T1: SIMON O'TOOLE

AUSTRALIAN ASTRONOMICAL OBSERVATORY

EVERYTHING YOU'VE HEARD ABOUT AGILE DEVELOPMENT IS WRONG

I PROPOSE AN EDUCATIONAL SESSION ON AGILE SOFTWARE DEVELOPMENT. THERE ARE MANY ASTRONOMICAL PROJECTS WHERE USING AGILE METHODS CAN LEAD TO GREAT EFFICIENCY GAINS. THIS IS ESPECIALLY IMPORTANT IN A TIME OF EVER-LIMITED RESOURCES. I WILL PUT TO REST MANY OF THE MISCONCEPTIONS ABOUT AGILE AND PROVIDE AN OVERVIEW OF THE VARIOUS AGILE METHODOLOGIES. THE MAIN FOCUS OF THE SESSION WILL BE TO INTRODUCE THE COMMON AGILE TECHNIQUES AND THE BASICS OF PRIORITISATION AND TIMEBOXING. THE GOAL OF THE TUTORIAL IS TO TEACH SKILLS THAT CAN BE INCORPORATED INTO NEW, AND EVEN EXISTING, ASTRONOMICAL SOFTWARE PROJECTS.

T2: THOMAS ROBITAILLE

FREELANCE SCIENTIFIC SOFTWARE DEVELOPER

MULTI-DIMENSIONAL LINKED DATA EXPLORATION WITH GLUE

MODERN DATA ANALYSIS AND RESEARCH PROJECTS OFTEN INCORPORATE MULTI-DIMENSIONAL DATA FROM SEVERAL SOURCES, AND NEW INSIGHTS ARE INCREASINGLY DRIVEN BY THE ABILITY TO INTERPRET DATA IN THE CONTEXT OF OTHER DATA. GLUE (HTTP://WWW.GLUEVIZ.ORG) IS A GRAPHICAL ENVIRONMENT BUILT ON TOP OF THE STANDARD SCIENTIFIC PYTHON STACK TO VISUALIZE RELATIONSHIPS WITHIN AND BETWEEN DATA SETS. WITH GLUE, USERS CAN LOAD AND VISUALIZE MULTIPLE RELATED DATA SETS SIMULTANEOUSLY, SPECIFY THE LOGICAL CONNECTIONS THAT EXIST BETWEEN DATA, AND THIS INFORMATION IS TRANSPARENTLY USED AS NEEDED TO ENABLE VISUALIZATION ACROSS FILES. GLUE INCLUDES A NUMBER OF DATA VIEWERS SUCH AS A SCATTER PLOT VIEWER, AN IMAGE VIEWER, AND MORE ADVANCED 3D VIEWERS, AND ALSO PROVIDES A MECHANISM FOR USERS TO BUILD THEIR OWN CUSTOM VISUALIZATIONS. THE AIM OF THIS (BEGINNER) TUTORIAL WILL BE TO GET USERS SET UP WITH GLUE, LOADING DATASETS, INTERACTIVELY LEARNING ABOUT THE DIFFERENT VIEWERS, AND EXPLORING DATA WITH LINKED SELECTIONS.

I1.1: CRISTOPHE ARVISET

ESA, EUROPEAN SPACE ASTRONOMY CENTRE, MADRID, SPAIN

FROM ISO TO GAIA : A 20-YEARS JOURNEY THROUGH DATA ARCHIVES MANAGEMENT

IN THE MID-90S, ESA DECIDED TO CHANGE ITS DATA MANAGEMENT STRATEGY AND STARTED TO BUILD AT ESAC DATA ARCHIVES FOR ITS SPACE SCIENCE MISSIONS, INITIALLY FOR ITS INFRARED SPACE OBSERVATORY AND THEN EXPANDING THROUGH OTHER ASTRONOMY MISSIONS AND LATER ON, TO PLANETARY AND SOLAR HELIOSPHERIC MISSIONS. THE ESAC SCIENCE DATA CENTRE NOW HOSTS MORE THAN 15 SCIENCE ARCHIVES, WITH VARIOUS OTHERS IN PREPARATION.
TECHNOLOGY HAS EVOLVED A LOT THROUGH THIS PERIOD, FROM THE SIMPLE WEB PAGES TOWARDS RICH THIN LAYER WEB APPLICATIONS, INTEROPERABLE AND VO BUILT-IN ARCHIVES. MAINTAINING OLD LEGACY ARCHIVES WHILE BUILDING NEW AND STATE OF THE ART ONES (EG GAIA), MANAGING PEOPLE AND PRESERVING EXPERTISE OVER MANY YEARS, OFFERING INNOVATIVE MULTI MISSIONS SERVICES AND TOOLS TO ENABLE NEW SCIENCE (ESASKY) HAVE BEEN SOME OF THE MANY CHALLENGES THAT HAD TO BE DEALT WITH.
FUTURE PROSPECTS AHEAD OF US ALSO LOOK EXCITING WITH THE ADVENT OF THE "ARCHIVES 2.0" CONCEPT, WHERE SCIENTISTS WILL BE ABLE TO WORK "WITHIN" THE ARCHIVE ITSELF, BRINGING THEIR ANALYSIS CODE TO THE DATA, SHARING THEIR DATA, CODE AND RESULTS WITH OTHERS.
DATA ARCHIVES HAVE BEEN AND CONTINUE TO BE IN CONSTANT TRANSFORMATION AND THEY ARE NOW TO EVOLVED TOWARDS COLLABORATIVE SCIENCE EXPLOITATION PLATFORMS.

01.2: SARA NIETO

ESAC - EUROPEAN SPACE ASTRONOMY CENTER, EUROPEAN SPACE AGENCY, SPAIN

THE EUCLID ARCHIVE SYSTEM: A DATA-CENTRIC APPROACH TO BIG DATA

EUCLID IS THE ESA M2 MISSION AND A MILESTONE IN THE UNDERSTANDING OF THE GEOMETRY OF THE UNIVERSE. EUCLID FACES TWO MAIN CHALLENGES FROM THE POINT OF VIEW OF THE DATA PROCESSING. FIRSTLY, THE UNPRECEDENTED ACCURACY WHICH MUST BE ACHIEVED IN ORDER TO MEET THE SCIENTIFIC GOALS. SECONDLY, THE MISSION WILL DEPEND HEAVILY ON THE PROCESSING AND REPROCESSING OF GROUND-BASED DATA WHICH WILL FORM THE BULK OF THE STORED DATA VOLUME. IN TOTAL EUCLID WILL PRODUCE UP TO 26 PB PER YEAR OF OBSERVATIONS. THE EUCLID ARCHIVE SYSTEM (EAS) IS IN THE CORE OF THE EUCLID SCIENCE GROUND SEGMENT. IT SUPPORTS THE PROCESSING AND STORAGE OF EUCLID DATA FROM THE RAW FRAMES TO THE CREATION OF SCIENCE-READY IMAGES AND CATALOGUES.

THE EUCLID ARCHIVE SYSTEM CONSISTS OF THREE COMPONENTS. THE DATA PROCESSING SYSTEM (DPS) PROVIDES A CENTRALIZED METADATA STORAGE SYSTEM TO SUPPORT DATA PROCESSING WHILE THE DISTRIBUTED STORAGE SYSTEM (DSS) STORES THE DATA FILES. REGARDING THE LONG TERM PRESERVATION, THE EAS WILL PROVIDE ACCESS TO THE MOST VALUABLE SCIENTIFIC METADATA THROUGH THE SCIENCE ARCHIVE SYSTEM (SAS). THE SAS IS BEING BUILT AT THE ESAC SCIENCE DATA CENTRE (ESDC), WHICH IS RESPONSIBLE FOR THE DEVELOPMENT AND OPERATIONS OF THE SCIENTIFIC ARCHIVES FOR THE ASTRONOMY, PLANETARY AND HELIOPHYSICS MISSIONS OF ESA. THE SAS IS FOCUSED ON THE NEEDS OF THE SCIENTIFIC COMMUNITY AND IT WILL PROVIDE ACCESS TO THE MOST VALUABLE SCIENTIFIC METADATA COMING THROUGH A SET OF PUBLIC DATA RELEASES.

THE DPS IMPLEMENTS THE OBJECT-ORIENTATED EUCLID COMMON DATA MODEL WHICH DESCRIBES BOTH THE SCIENTIFIC DATA (DATA PRODUCTS GENERATED BY PIPELINES) AND THE PROCESSING/OPERATIONAL METADATA. THE LATTER INCLUDES THE PROCESSING AND DATA DISTRIBUTION ORDERS, LOCATION OF THE FILE IN THE DSS AND PROCESSING PLANS. THE CONTENT OF THE DPS IS MAPPED TO THE SAS WHICH IMPLEMENTS THE RELATIONAL SCIENCE EXPLOITATION DATA MODEL, OPTIMISED FOR USE IN SCIENTIFIC EXPLORATION.

WE REVIEW THE ARCHITECTURAL DESIGN OF THE SYSTEM, IMPLEMENTATION PROGRESS WITH TESTS AND THE MAIN CHALLENGES IN THE BUILDING OF THE EAS.

01.3: STEPHAN WITZ

NRAO - NATIONAL RADIO ASTRONOMY OBSERVATORY

TOWARDS A SELF-HEALING ARCHIVE

THE NEW NRAO ARCHIVE ENCOMPASSES DATA FROM THE JANSKY VLA, THE LEGACY VLA, THE GREEN BANK TELESCOPE AND THE VLBA WHILE ADDITIONALLY PROVIDING ACCESS TO ALMA DATA STORED AND MANAGED SEPARATELY. IN THIS ENVIRONMENT, METADATA IS EXTRACTED CENTRALLY BUT GENERATED INDEPENDENTLY BY DIFFERENT SOFTWARE FOR EACH INSTRUMENT. ERRORS IN METADATA GENERATION AND EXTRACTION ARE UNAVOIDABLE, BUT AFTER FIXING THE BUG, HOW DO YOU CORRECT THE DATA? THIS PAPER INTRODUCES A SELF-HEALING APPROACH THAT LEVERAGES OTHERWISE IDLE ARCHIVE STORAGE NODES BY HAVING THEM CONTINUOUSLY RE-PARSE STORED METADATA WITH THE LATEST SOFTWARE. UPON DETECTING A DIFFERENCE, THE RE-PARSER CAN TAKE CERTAIN ACTIONS, SUCH AS UPDATING INCORRECT RECORDS IN THE SEARCHABLE METADATA DATABASE, OR BROADCASTING A NOTIFICATION. DATA VALIDITY CAN BE VERIFIED AT THE SAME TIME IF DESIRED.

O2.1: WALTER LANDRY

IRSA - NASA/IPAC INFRARED SCIENCE ARCHIVE

INSTANTANEOUS ARCHIVES

THE NASA/IPAC INFRARED SCIENCE ARCHIVE (IRSA) IS ONE OF THE LARGEST AND BUSIEST ASTRONOMY ARCHIVES IN THE WORLD. IN THE PAST, OUR MAIN EMPHASIS WAS ON MAKING NEW DATA AND NEW CAPABILITIES AVAILABLE. WITH THE WIDESPREAD IMPLEMENTATION OF VIRTUAL OBSERVATORY PROTOCOLS, THERE ARE A NUMBER OF USEFUL TOOLS THAT CAN QUICKLY AND EASILY PERFORM INSIGHTFUL, SOPHISTICATED QUERIES FROM ARCHIVES AROUND THE WORLD. THE QUERIES, IF NOT HANDLED QUICKLY, CAN EASILY OVERWHELM THE SITE AND INTERFERE WITH OTHER USERS. IN ADDITION, REDUCING LATENCY BELOW THE POINT OF HUMAN PERCEPTION ENABLES MORE INTERACTIVE AND EXPLORATORY SCIENCE.

IN THIS TALK, I WILL DISCUSS OUR MULTI-PRONGED EFFORTS TO IMPROVE PERFORMANCE ON ALL LEVELS. THIS INCLUDES:

1) UPGRADING NETWORK HARDWARE AND LINKS.

2) FINE TUNING THE INDEXING AND PARTITIONING STRATEGIES FOR OUR TRADITIONAL DATABASES.

3) BENCHMARKING VARIOUS SPATIAL INDEXING SCHEMES (HTM, Q3C, H3C, POSTGIS).

4) REARCHITECTING OUR QUERY PIPELINE TO ELIMINATE PROCESS,FILESYSTEM, AND DATABASE CONNECTION OVERHEADS.

TAKEN TOGETHER, THESE IMPROVEMENTS HAVE DELIVERED RADICAL, ORDER OF MAGNITUDE IMPROVEMENTS IN LATENCY AND THROUGHPUT. I WILL ALSO DISCUSS HOW DISTRIBUTED AND IN-MEMORY DATABASES COULD BE USED TO IMPROVE PERFORMANCE EVEN MORE.

O2.2: SARAH FRANCES GRAVES

EAST ASIAN OBSERVATORY

THE JCMT SCUBA-2 LEGACY RELEASE: UNEXPECTED BENEFITS AND LESSONS LEARNED

EAST ASIAN OBSERVATORY IS CURRENTLY RELEASING ALL SCUBA-2 850UM DATA TAKEN FROM 2011 TO 2015, RE-REDUCED IN A UNIFORM MANNER WITH AUTOMATICALLY PRODUCED COADDS AND CATALOGS. WHILE THE PRIMARY REASON FOR DOING THIS RELEASE WAS TO PRODUCE A SCIENTIFICALLY USEFUL DATA PRODUCT FOR OUR COMMUNITY, THE PROCESS OF CREATING IT GENERATED MANY BENEFITS FOR THE OBSERVATORY ITSELF. WE PRODUCED A NEW 'GENERIC' CONFIGURATION FILE FOR OUR REDUCTIONS THAT WE MOVED TO USING AS OUR DEFAULT CONFIGURATION DUE TO THE IMPROVEMENT IN MAP QUALITY WE SAW WITH IT. WE HAVE ALSO DEVELOPED NEW AND IMPROVED SOFTWARE AND SYSTEMS FOR RUNNING (AND EASILY RE-RUNNING) VARIOUS AUTOMATED PIPELINE REDUCTIONS. WE BUILT INTO THIS A NEW, AND FAIRLY FLEXIBLE QUALITY ASSURANCE SYSTEM NOW USED FOR OUR NIGHTLY REDUCTIONS. THE ANALYSIS OF THE DATA PRIOR TO RELEASE HELPED US DISCOVER (AND FIX) SOME BUGS AND IDENTIFY AREAS RIPE FOR FURTHER INVESTIGATION. THIS PAPER WILL DESCRIBE THESE SIDE BENEFITS, AND ALSO DISCUSS WHAT ATTITUDES AND POLICIES AT THE OBSERVATORY ENSURED THEY OCCURRED. THE WHOLE PROCESS HAS ALSO HELPED THE OBSERVATORY GAIN A CLEARER UNDERSTANDING OF EXACTLY WHICH PIECES OF INFORMATION AND METADATA ARE MOST NEEDED TO BE ABLE TO EASILY SELECT 'GOOD' SCIENCE OBSERVATIONS FROM A HETEROGENEOUS DATA SET OF DIFFERING PI AND CALIBRATION OBSERVATIONS. WE CAN NOW USE THIS INFORMATION TO IMPROVE OUR SYSTEMS AND OUR ARCHIVE; THEREBY BETTER SUPPORTING BOTH OUR OWN, FUTURE DATA RELEASES, AND OUR COMMUNITY'S USE OF THE JCMT SCIENCE ARCHIVE.

O2.3: JESÚS SALGADO

ESAC - ESA SCIENCE ASTRONOMY CENTRE, MADRID, SPAIN

ESASKY: A SIMPLE/PERFORMANT INTERFACE ON MASSIVE ASTRONOMICAL DATA

OVER THE PAST FEW YEARS, THE AMOUNT OF ASTROPHYSICAL DATA AND RESOURCES AVAILABLE FOR THE SCIENTIFIC COMMUNITY AT THE DIFFERENT PROJECT SCIENCE ARCHIVES AT THE EUROPEAN SPACE ASTRONOMY CENTRE (ESAC) IS GROWING QUICKLY. THE WAY TO OFFER THESE DATA TO THE COMMUNITY HAS BEEN DONE, HISTORICALLY, THROUGH THE IMPLEMENTATION OF INDIVIDUAL PROJECT ARCHIVES THAT OFFER A DETAILED AND EASY ACCESS FROM THE DIFFERENT MISSIONS.

HOWEVER, MULTI-WAVELENGTH AND HETEROGENEOUS DISCOVERY OF DATA COULD BE CUMBERSOME AND IT USUALLY REQUIRES SPECIFIC KNOWLEDGE OF MISSION DEPENDENT LANGUAGE.

THE ESAC SCIENCE DATA CENTER (ESDC) HAS DEVELOPED A SCIENCE-DRIVEN DISCOVERY PORTAL, CALLED ESA SKY (HTTP://SKY.ESA.INT), THAT ALLOWS THE EXPLORATION OF ASTRONOMICAL RESOURCES AND THAT SERVES ALREADY MOST OF THE DATA OF ALL THE ESA ASTRONOMICAL MISSIONS. ALSO, IT IS IN THE PROCESS TO BE EXTENDED TO MISSIONS FROM OTHER ORGANIZATIONS AS AN IMPORTANT RESOURCE FOR THE ASTRONOMICAL COMMUNITY.

ESA SKY INTERFACE IS SIMPLE, INTUITIVE AND PROJECT AGNOSTIC AND, TO FULFILL THESE DIFFICULT TASKS, IT MAKES USE OF DIFFERENT ENGINEERING TECHNIQUES LIKE, E.G., VISUALIZATION OF MULTI-ORDER ALL-SKY MOSAICS BASED ON HEALPIX (HIPS), MISSION COVERAGES (MOC) AND OBSERVATIONAL FOOTPRINTS. AT SERVER SIDE, OTHER TECHNIQUES LIKE TAP SERVICES ON COMMON DATA MODELS FOR FAST AND PERFORMANT SEARCHES, DB GEOMETRICAL INDEXES, INTERNAL CONNECTIONS BETWEEN DATABASES AND WRAPPERS AROUND THE PROJECT ARCHIVES TO DOWNLOAD THE FINAL SCIENCE READY DATA ARE NEEDED TO ALLOW THE HANDLING OF BIG AMOUNTS OF DATA IN A SIMPLIFIED WAY.

WE WILL PRESENT ALL THE TECHNIQUES THAT HAVE BEEN USED TO ALLOW THE PRESENTATION OF THESE MULTI-WAVELENGHT AND MASSIVE DATA IN A SIMPLE AND PERFORMANT WEB-BASED INTERFACE AND, ALSO, THE CURRENT STATUS OF THE TOOL AND FUTURE PLANS.

O2.4: XIUQIN WU

IPAC, CALTECH

NEXT GENERATION FIREFLY FOR WEB APPLICATION

FIREFLY IS A WEB FRAMEWORK FOR ASTRONOMICAL DATA ARCHIVE AND VISUALIZATION DEVELOPED IN THE INFRARED PROCESSING AND ANALYSIS CENTER (IPAC). THE DEVELOPMENT STARTED WITH SPITZER HERITAGE ARCHIVE (SHA), AND CONTINUED IN WISE IMAGE ARCHIVE, PLANCK IMAGE ARCHIVE, AND OTHER WEB APPLICATIONS IN THE NASA/IPAC INFRARED SCIENCE ARCHIVE (IRSA) APPLICATIONS. BACK IN 2008, WE MADE THE DECISION TO USE JAVA/GWT FRAMEWORK FOR WEB CLIENT SIDE CODE. THE DECISION HAS SERVED US WELL IN LAST EIGHT YEARS, ENABLING US TO DEVELOP AND DEPLOY SEVERAL DATA ACCESS APPLICATIONS IN SHORT TIME FRAME. TWO YEARS AGO, IPAC STARTED TO DEVELOP THE SCIENCE USER INTERFACE AND TOOLS FOR THE LARGE SYNOPTIC SURVEY TELESCOPE (LSST). FIREFLY MUST MEET THE NEEDS OF ARCHIVE ACCESS AND VISUALIZATION FOR THE 2021 LSST TELESCOPE AND MUST SERVE ASTRONOMERS BEYOND THE YEAR 2030. WE NEED TO TAKE FIREFLY INTO THE NEXT GENERATION, MAKING IT MORE FLEXIBLE, STABLE, MAINTAINABLE, AND RELIABLE. WITH THE EVOLUTION OF THE WEB, ADVANCEMENT OF JAVASCRIPT PROGRAMMING , ALL THE WEB DEVELOPMENT FRAMEWORKS BASED ON JAVASCRIPT, WE HAVE A LOT MORE CHOICES IN THE WEB APPLICATION DEVELOPMENT TECHNOLOGY.

AFTER MUCH RESEARCH AND EXPERIMENTS, WE DECIDED TO REWRITE THE CLIENT SIDE CODE IN JAVASCRIPT, ADOPTING REACT/REDUX FRAMEWORK. THE WORK STARTED IN LATE 2015, AND BY END OF JULY 2016 WE COULD DECLARE THAT WE SUCCESSFULLY PORTED THE 150,000 LINES JAVA CODE INTO JAVASCRIPT.

THIS TALK WILL GIVE A REPORT ON THE DECISION MAKING PROCESS, THE CHALLENGES WE FACED, THE NEW DEVELOPMENT PROCESS WE ADOPTED ALONG THE WAY, AND THE FIREFLY IMPROVEMENTS WE ACHIEVED BY GOING TO JAVASCRIPT.

F1: NICOLAS BUCHSCHACHER

GENEVA OBSERVATORY, UNIVERSITY OF GENEVA, SWITZERLAND

PLANETS DACE PLATFORM - DATA AND ANALYSIS CENTER FOR EXOPLANETS

THE DATA ANALYSIS CENTER FOR EXOPLANETS (DACE) IS A WEB PLATFORM BASED AT THE UNIVERSITY OF GENEVA (CH) DEDICATED TO EXTRASOLAR PLANETS DATA VISUALISATION, EXCHANGE AND ANALYSIS.

OBSERVATIONAL DATA LIKE RADIAL VELOCITIES, LIGHT CURVES AND IMAGING MEASUREMENTS ARE AVAILABLE AS WELL AS SOPHISTICATED ANALYSIS TOOLS. KEPLERIAN MODELS CAN BE ANALYSED USING SYNTHETIC PLANETARY POPULATIONS AND EVOLUTION TRACKS PROVIDED BY THE UNIVERSITY OF BERN. NUMERICAL SIMULATIONS CAN BE DONE BY N-BODY ALGORITHMS DEVELOPED BY THE UNIVERSITY OF ZURICH AND RUNNING ON GPU CARDS. DACE ALSO CONTAINS STAR POSITION TOOL HELPING ASTRONOMERS TO PREPARE FUTURE OBSERVATIONS ACCORDING TO THE LOCATION OF THE OBSERVATORY AND TIME CONSTRAINTS. THESE TOOLS ARE DEVELOPED IN COLLABORATION WITH THE PLANETS SUB PROJECTS AND INTEGRATED IN THE PLATFORM.

DACE IS BASED ON WEB TECHNOLOGIES USING COMMON PROGRAMMING LANGUAGES LIKE PHP, JAVASCRIPT, JAVA. POSTGRESQL AND MONGODB ARE USED AS DATABASE MANAGEMENT SYSTEMS. THE PLOTTING LIBRARY HAS BEEN FULLY DEVELOPED ACCORDING TO THE DIFFERENT PROJECT VISUALISATION REQUIREMENTS. THE PLATFORM OFFERS THE POSSIBILITY TO RUN LONG COMPUTATIONS IN BACKGROUND AS JOBS. IN THIS MANNER, THE PROJECTS CAN CONTRIBUTE BY PROVIDING ANALYSIS CODE IMPLEMENTED IN DIFFERENT PROGRAMMING LANGUAGES.

DACE IS FUNDED BY THE SWISS NATIONAL CENTRE OF COMPETENCE IN RESEARCH (NCCR) PLANETS, FEDERATING THE SWISS EXPERTISE IN EXOPLANET RESEARCH.

I3.1: LUISA REBULL

IRSA/IPAC

NASA'S LONG-TERM ASTROPHYSICS DATA ARCHIVES

NASA REGARDS DATA HANDLING AND ARCHIVING AS AN INTEGRAL PART OF SPACE MISSIONS, SINCE THE IRAS SATELLITE IN 1983. ARCHIVES ENABLE A MAJOR RETURN ON INVESTMENT, WHERE IT HAS BEEN SHOWN THAT THE PRESENCE AND ACCESSIBILITY OF THE ARCHIVE DOUBLES (AT LEAST!) THE NUMBER OF PAPERS RESULTING FROM THE DATA. EASE OF ACCESS AND EASE OF DATA USE IS CRITICAL, AND FUNDING OF ARCHIVAL RESEARCH (E.G., THE ADAP PROGRAM) IS ALSO IMPORTANT NOT ONLY FOR MAKING SCIENTIFIC PROGRESS, BUT ALSO FOR ENCOURAGING AUTHORS TO DELIVER DATA PRODUCTS BACK TO THE ARCHIVE. NASA HAS ALSO ENABLED A ROBUST SYSTEM THAT CAN BE MAINTAINED OVER THE LONG TERM, THROUGH TECHNICAL INNOVATION CAREFUL ATTENTION TO RESOURCE ALLOCATION. THIS TALK WILL PROVIDE A BRIEF OVERVIEW OF SOME OF NASA'S MAJOR ARCHIVES, INCLUDING IRSA, MAST, HEASARC, KOA, NED, THE EXOPLANET ARCHIVE, AND ADS.

03.2: PIERRE FERNIQUE

CDS - OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, STRASBOURG, FRANCE

LONG-TERM MANAGEMENT OF 1000S OF ALL-SKY REFERENCE DATA SETS USING THE HIPS NETWORK

OVER THE PAST FEW YEARS THE HIERARCHICAL PROGRESSIVE SURVEYS (HIPS) SYSTEM HAS BECOME A KEY METHOD FOR THE BROWSING AND DISTRIBUTING ALL-SKY SURVEY DATA. AS OF TODAY, HIPS DATA OCCUPY ABOUT 100 TB OF DATA, AND THIS VOLUME IS EXPECTED TO DOUBLE IN SIZE EVERY YEAR AS THE PRODUCTION OF A DOZEN OF HIPS PROVIDERS INCLUDING ESAC, JAXA, CADC AND CDS GROWS. HIPS TILES ARE USED BY THOUSANDS OF USERS EVERY DAY THROUGH VARIOUS HIPS COMPATIBLE CLIENTS: ALADIN, MIZAR, ALADIN LITE, AND ALADIN-LITE BASED ESASKY AND JUDO2. IN THIS EXTREMELLY FAST GROWING CONTEXT, WE WILL DISCUSS WHY THE HIPS NETWORK HAS EXCELLENT CAPABILITIES FOR LONG TERM MANAGEMENT OF ALL-SKY DATA. WE WILL ALSO HIGHLIGHT HOW THE INTRINSIC HIPS ARCHITECTURE BASED ON THE WELL KNOWN HEALPIX TESSELLATION, A SIMPLE TILE STRUCTURE, AND IMPLEMENTED USING A SIMPLE DISTRIBUTION METHOD BASED ONLY ON A BASIC HTTP SERVER, AND BEING STANDARDISED BY IVOA, CONSTITUTES AN EXTREMELY ROBUST FOUNDATION FOR A SYSTEM THAT WILL SUPPORT ALL-SKY DATA DISCOVERY AND DISTRIBUTION FOR THE NEXT DECADE.

O3.3: CÉCILE LOUP

OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, CDS, UNIVERSITÉ DE STRASBOURG, CNRS, UMR 7550

WHAT IS SIMBAD, AND WHAT IS IT NOT?

SIMBAD IS A DYNAMIC DATABASE OF ASTRONOMICAL OBJECTS THAT HAVE BEEN PRESENTED IN SCIENTIFIC ARTICLES. IT PROVIDES THE BIBLIOGRAPHY, AS WELL AS BASIC INFORMATION SUCH AS THE NATURE OF THE OBJECT, ITS COORDINATES, MAGNITUDES, PROPER MOTIONS AND PARALLAX, VELOCITY/REDSHIFT, ANGULAR SIZE, SPECTRAL OR MORPHOLOGICAL TYPE, AND THE MULTITUDE OF NAMES (IDENTIFIERS) GIVEN IN THE LITERATURE. THE INFORMATION IN SIMBAD IS A COMPILATION BUILT FROM WHAT IS PUBLISHED IN THE LITERATURE WITH EXPERT CROSS-IDENTIFICATION PERFORMED AT THE CDS BASED ON THE COMPATIBILITY OF SEVERAL PARAMETERS, IN THE LIMIT OF REASONABLY GOOD ASTROMETRY. THE SIMBAD DATABASE IS MADE AVAILABLE AS A MAJOR REFERENCE SERVICE OF THE CDS WITH A NUMBER OF DIFFERENT INTERFACES SUCH AS WEB INTERFACE, A NAME RESOLVING SERVICE, A SCRIPTING INTERFACE, A TAP SERVICE PLUS OTHERS. IT IS A HEAVILY USED DATABASE WITH SOME 200,000 TO 500,000 QUERIES PER DAY. THIS PRESENTATION HIGHLIGHTS SOME OF THE MOST USED FEATURES AND THE RELATIONSHIP OF SIMBAD TO OTHER CDS SERVICES IN PARTICULAR TO THE CDS CATALOGUE SERVICE VIZIER. WE IDENTIFY SOME OF THE MOST COMMON MISUNDERSTANDINGS ABOUT SIMBAD IN TERMS OF ASTRONOMICAL AND TECHNICAL SERVICE USE, AND HIGHLIGHT THE ROLE OF SIMBAD IN THE RAPIDLY EVOLVING LANDSCAPE OF JOURNAL PUBLISHING AND ON-LINE ASTRONOMY SERVICES.

03.4: KAREN L LEVAY

STSCI - SPACE TELESCOPE SCIENCE INSTITUTE

LINKING THE LITERATURE TO THE DATA

ONE OF THE GOALS FOR ANY ARCHIVE IS ENABLING DISCOVERY FOR DATA FOR SCIENTISTS TO USE FOR NEW SCIENCE OBJECTIVES AND ALSO TO ENABLE SCIENTISTS TO REPRODUCE AND UTILIZE RESULTS OF PUBLISHED DATA. CURRENTLY, AUTHORS ARE LIMITED IN HOW THEY CAN UTILIZE THE SPACE IN THEIR PAPERS TO IDENTIFY THE DATA USED IN THEIR ANALYSIS. MOREOVER, READERS SOMETIMES FIND IT CHALLENGING TO ACTUALLY IDENTIFY THE SPECIFIC DATA USED IN THE PAPER, ESPECIALLY THOSE READERS UNFAMILIAR WITH THE RELEVANT INSTRUMENT..

STAFF FROM THE MIKULSKI ARCHIVE FOR SPACE TELESCOPES (MAST) AND THE STSCI LIBRARY HAVE LONG IDENTIFIED PAPERS FROM THE REFEREED LITERATURE THAT USE DATA ARCHIVED AT MAST AND HAVE PROVIDED LINKS BETWEEN THOSE JOURNAL ARTICLES AND THE ACTUAL DATA USED. IN COLLABORATION WITH AAS AND THE EJ PRESS, MAST HAS DEVELOPED A NEW PARADIGM FOR LINKING THE DATA TO THE PAPERS. USING DOIS AND BUILT ON TOP OF THE MAST DATA DISCOVERY PORTAL, THIS NEW MAST DOI SERVICE SHOULD REDUCE THE EFFORT BY ARCHIVE STAFF AND GREATLY IMPROVE THE COMPLETENESS AND ACCURACY OF DATA LINKS.

I4.1: ERIC CHASSANDE-MOTTIN

UNIVERSITÉ DE PARIS 7

SEARCHES OF GRAVITATIONAL-WAVE TRANSIENTS WITH LOW LATENCY

A NEW ERA FOR TRANSIENT ASTRONOMY BEGINS WITH THE FIRST GRAVITATIONAL-WAVE EVENTS DETECTED BY THE LIGO DETECTORS. IT IS NOW IMPORTANT TO ESTABLISH CONNECTIONS BETWEEN THIS NEW TYPE OF OBSERVATIONS AND THAT OF CONVENTIONAL ASTRONOMY. LOW-LATENCY SEARCHES FOR GRAVITATIONAL WAVE TRANSIENTS ARE A KEY INGREDIENT AS THEY ALLOW TO PINPOINT POSSIBLE ELECTROMAGNETIC COUNTERPART TO A DETECTED EVENT. WE WILL REVIEW THOSE DATA ANALYSIS PIPELINES AND PRESENT THE PERFORMANCES AND RESULTS OBTAINED SO FAR, IN TERMS OF LATENCY AND ESTIMATION OF THE SOURCE PROPERTIES, IN PARTICULAR ITS SKY LOCATION, AND GIVE PROSPECTS FOR THE FUTURE SCIENCE RUNS.

04.2: ANDREA ZOLI

INAF - IASF BOLOGNA, BOLOGNA, ITALY

THE AGILE PIPELINE FOR GRAVITATIONAL WAVES EVENTS FOLLOW-UP

THE FIRST DIRECT DETECTION OF GRAVITATIONAL WAVES (GW) BY ADVANCED LIGO DETECTORS IN SEPTEMBER 2015 HAS DRAWN THE ATTENTION OF THE ASTROPHYSICAL COMMUNITY THAT IS NOW SEARCHING FOR THE ELECTROMAGNETIC COUNTERPARTS OF THE DETECTED GW EVENTS. THE AGILE (ASTRO-RIVELATORE GAMMA A IMMAGINI LEGGERO) MISSION IS PRIMARLY DEVOTED TO THE HIGH- ENERGY ASTROPHYSICAL STUDY OF GAMMA-RAY SOURCES IN THE 30 MEV TO 30 GEV ENERGY RANGE. THE CAPABILITY OF THE AGILE SATELLITE FOR THE DISCOVERY OF TRANSIENTS IS UNIQUE: THE ACTUAL SPINNING CONFIGURATION OF THE SATELLITE, TOGETHER WITH A LARGE FIELD OF VIEW AND A GOOD SENSITIVITY OF F=(1–2)X10-8 ERG CM -2 S-1 FOR ~100 S INTEGRATIONS, PROVIDES A COVERAGE OF 80% OF THE SKY, WITH EACH POSITION EXPOSED FOR 100 SECONDS,
200 TIMES A DAY. THE AGILE TEAM SIGNED A MEMORANDUM OF UNDERSTANDING WITH THE LIGO/VIRGO COLLABORATION TO FOLLOW THE GW NOTICES PROVIDED THROUGH THE GCN NETWORK.

IN THIS PAPER WE DESCRIBE OUR AUTOMATIC PIPELINE THAT REACTS TO LIGO/VIRGO GW NOTICES AND PERFORMS DIFFERENT KIND OF AUTOMATED ANALYSIS TO BOOST THE SEARCH FOR OF GW EVENT COUNTERPARTS.

04.3: ARPAD SZOMORU

JIVE -- JOINT INSITUTE FOR VLBI ERIC, DWINGELOO, THE NETHERLANDS

CLEOPATRA: CONNECTING LOCATIONS OF ESFRI OBSERVATORIES AND PARTNERS IN ASTRONOMY FOR TIMING AND REAL-TIME ALERTS

THE H2020 ASTERICS PROJECT (ASTRONOMY ESFRI & RESEARCH INFRASTRUCTURE CLUSTER), KICKED OF IN MAY 2015. IT BRINGS TOGETHER, FOR THE VERY FIRST TIME, THE ASTRONOMY, ASTROPHYSICS AND ASTROPARTICLE PHYSICS FACILITIES ENCOMPASSED WITHING THE ESFRI ROADMAP. THE GOAL IS TO IDENTIFY, ADDRESS AND SOLVE KEY CHALLENGES OF COMMON INTEREST, ADOPTING CROSS-CUTTING SOLUTIONS.
THE TOPIC OF MY PRESENTATION WILL BE CLEOPATRA, ONE OF THE WORK PACKAGES IN ASTERICS. WITH A BUDGET OF ABOUT 2.5 MEURO AND 12 DIFFERENT PARTNERS, THIS WORK PACKAGE IS IN FACT A SIZEABLE PROJECT IN ITS OWN RIGHT.
ITS AIM IS TO IMPROVE THE SCIENTIFIC CAPABILITIES OF THE RESEARCH INFRASTRUCTURES USING MODERN COMMUNICATION METHODS AND BROADBAND CONNECTIVITY, AND TO ENABLE SYERGETIC OBSERVING MODES, WITH FAST AND RELIABLE ACCES TO LARGE DATA STREAMS.
SPECIFICALLY, TECHNOLOGY IS BEING DEVELOPED, BASED ON THE WHITE RABBIT PROTOCOL, FOR LONG-HAUL MANY-ELEMENT TIME AND FREQUENCY DISTRIBUTION, OVER PUBLIC NETWORKS. THIS IS HIGHLY RELEVANT FOR BOTH CURRENT AND FUTURE RADIO ASTRONOMY FACILITIES (LOFAR, EVN, SKA) BUT ALSO FOR ASTROPARTICLE INSTRUMENTS (CTA, MK3NET).

METHODS FOR RELAYING ALERTS ARE BEING DESIGNED, USING VOEVENTS, SIGNALING TRANSIENT EVENT DETECTIONS AND ENABLING JOINT OBSERVING PROGRAMMES. A DEMONSTRATION WILL BE SET UP IN WHICH LOFAR, THE EVN AND CTA WILL RESPOND IN NEAR-REAL TIME TO ALERTS GENERATED BY VIRGO.
DATA STREAMING SOFTWARE IS ANOTHER ASPECT OF THIS WORK PACKAGE, AND WILL PROVIDE TOOLS FOR ROBUST AND EFFICIENT DATA DISSEMINATION.
FINALLY, ADVANCED SCHEDULING ALGORITHMS ARE BEING WORKED ON, USING AI APPROACHES FOR OPTIMAL USAGE OF THE ESFRI FACILITIES.

04.4: BERNARD MEADE

CENTER FOR ASTROPHYSICS AND SUPERCOMPUTING, SWINBURNE UNIVERSITY OF TECHNOLOGY, MELBOURNE, AUSTRALIA

OPTIMISED WORKSPACES ENHANCE TIME-CRITICAL ASTRONOMY

FAST RADIO BURSTS (FRBS) AND HIGH-ENERGY TRANSIENTS CAN NOW BE DETECTED IN SECONDS, HOWEVER OBTAINING OPTICAL COUNTERPARTS TO UNDERSTAND THEIR NATURE HAS PREVIOUSLY BEEN TOO TECHNOLOGICALLY CHALLENGING. THE DEEPER WIDER FASTER PROGRAM OVERCOMES THESE CHALLENGES BY COORDINATING SIMULTANEOUS OBSERVATIONS USING THE PARKES RADIO TELESCOPE, THE NASA SWIFT SPACE TELESCOPE, AND THE DECAM OPTICAL IMAGER AT CERRO TOLOLO INTER-AMERICAN OBSERVATORY TO DETECT FAST TRANSIENTS AND PERFORMING REAL-TIME ANALYSIS OF THE DATA. A KEY CHALLENGE FOR THE PROJECT TEAM IS THE NEED TO VIEW MANY CANDIDATE TRANSIENT OBJECTS THAT ARE IDENTIFIED BY AN AUTOMATED PIPELINE. ONLY ONCE THERE IS CERTAINTY ABOUT A TRANSIENT CANDIDATE WILL A FURTHER TRIGGER BE SENT TO SEVERAL STANDBY TELESCOPES, INCLUDING THE GEMINI AND SALT OBSERVATORIES, FOR RAPID SPECTROSCOPIC FOLLOW UP. WITH MORE THAN 1855 CCD IMAGES PRODUCED BY THE DECAM IMAGER TO INSPECT, AT 4000 X 2000 PIXELS PER IMAGE, THE WORKFLOW IS TAXING FOR INDIVIDUAL ASTRONOMERS TO CONTRIBUTE FROM THEIR DESKTOPS. A COLLABORATIVE WORK SPACE WAS USED SUCCESSFULLY DURING THE DECEMBER 2015 CAMPAIGN. THIS WORK SPACE COMPRISED A 98 MEGAPIXEL TILED DISPLAY WALL, OPERATING WITH THE SAGE2 SOFTWARE, AND A LARGE-FORMAT CURVED PROJECTION SPACE. BASED ON LESSONS LEARNT, WE REPORT HERE ON THE USE OF AN IMPROVED VERSION OF THIS DISPLAY ECOLOGY DURING THE JULY 2016 CAMPAIGN. WE HIGHLIGHT THE IMPROVEMENTS WE HAVE MADE TO THE WORKFLOW: (I) A REVISED PHYSICAL CONFIGURATION OF THE TILED DISPLAY TO IMPROVE COLLABORATIVE INSPECTION; (II) A MOVE AWAY FROM SAGE2 SO THAT NATIVE ASTRONOMICAL SOFTWARE AND FILE FORMATS CAN BE BETTER UTILISED; AND (III) THE INTEGRATION OF CANDIDATE TRACKING THROUGHOUT THE ANALYSIS PROCESS.

B1: YAN GRANGE

ASTRON, THE NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY

OPERATIONS IN THE ERA OF LARGE DISTRIBUTED TELESCOPES

THE PREVIOUS GENERATION OF ASTRONOMICAL INSTRUMENTS TENDED TO CONSIST OF SINGLE RECEIVERS IN THE FOCAL POINT OF ONE OR MORE PHYSICAL REFLECTORS. BECAUSE OF THIS, MOST ASTRONOMICAL DATA SETS WERE SMALL ENOUGH THAT THE RAW DATA COULD EASILY BE DOWNLOADED AND PROCESSED ON A SINGLE MACHINE.

IN THE LAST DECADE, SEVERAL LARGE, COMPLEX RADIO ASTRONOMY INSTRUMENTS HAVE BEEN BUILT AND THE SKA IS CURRENTLY BEING DESIGNED. MANY OF THESE INSTRUMENTS HAVE BEEN DESIGNED BY INTERNATIONAL TEAMS, AND, IN THE CASE OF LOFAR SPAN AN AREA LARGER THAN A SINGLE COUNTRY. SUCH SYSTEMS ARE ICT TELESCOPES AND CONSIST MAINLY OF COMPLEX SOFTWARE. THIS CAUSES THE MAIN OPERATIONAL ISSUES TO BE RELATED TO THE ICT SYSTEMS AND NOT THE TELESCOPE HARDWARE. HOWEVER, IT IS IMPORTANT THAT THE OPERATIONS OF THE ICT SYSTEMS ARE COORDINATED WITH THE TRADITIONAL OPERATIONAL WORK. MANAGING THE OPERATIONS OF SUCH TELESCOPES THEREFORE REQUIRES AN APPROACH THAT SIGNIFICANTLY DIFFERS FROM CLASSICAL TELESCOPE OPERATIONS.

THE GOAL OF THIS SESSION IS TO BRING TOGETHER MEMBERS OF OPERATIONAL TEAMS RESPONSIBLE FOR SUCH LARGE-SCALE ICT TELESCOPES. THIS GATHERING WILL BE USED TO EXCHANGE EXPERIENCES AND KNOWLEDGE BETWEEN THOSE TEAMS. ALSO, WE CONSIDER SUCH A MEETING AS VERY VALUABLE INPUT FOR FUTURE INSTRUMENTATION, ESPECIALLY THE SKA AND ITS REGIONAL CENTRES.

B2: LUCIO CHIAPPETTI

INAF - IASF MILANO

FITS (FLEXIBLE IMAGE TRANSPORT SYSTEM) AND DATA REPRESENTATIONS WG BOF

FITS (FLEXIBLE IMAGE TRANSPORT SYSTEM) DATA FORMAT, DEVELOPED IN THE LATE 1970S, HAS PROVEN A SUCCESSFUL DE FACTO STANDARD DATA INTERCHANGE FORMAT OF ASTRONOMY.

SINCE 1988 THE IAU FITS WORKING GROUP HAS BEEN CHARGED, WITH A RESOLUTION OF THE INTERNATIONAL ASTRONOMICAL UNION, TO MANTAIN THE FITS DATA FORMAT EXISTING STANDARD AND APPROVE FUTURE EXTENSIONS.
WITH THE RECENT REFORM OF IAU COMMISSIONS AND WORKING GROUPS, THE FITS WG WILL BE ABSORBED IN THE NEW DATA REPRESENTATIONS WG, IN ORDER TO CONSIDER THE BROADENING OF THE DATA LANDSCAPE, WHERE SOME NEW FACILITIES ARE EXPLORING ALTERNATIVES TO THE FITS STANDARD IN ORDER TO MANAGE THEIR ISSUES OF DATA SCALE AND COMPLEXITY.

THE NEW WG SHALL MANAGE A CAREFUL AND MINIMALLY DISRUPTIVE TRANSITION FROM FITS TO MORE MODERN AND CAPABLE DATA REPRESENTATIONS, IN A WAY TO ASSURE AND MAINTAIN THE FLUENT INTEROPERABILITY OF TELESCOPE DATA THAT HAS NOT ONLY MADE MULTI-WAVELENGTH ASTRONOMICAL RESEARCH COMMONPLACE, BUT HAS ALSO MADE OUR DATA MANAGEMENT PRACTICES THE ENVY OF MANY OTHER DISCIPLINES.
THE PROPOSED BOF SESSION WILL ALLOW TO PRESENT COLLECTIVELY THE LAST UPDATES TO THE FITS STANDARD, WITH THE TIME REPRESENTATION WCS AND THE INCORPORATION OF A NUMBER OF USEFUL CONVENTIONS, AS WELL AS TO ACT AS A "CONSTITUENT PHASE" FOR THE NEW DATA REPRESENTATION WG.

I5.1: ROBERT LUPTON

UNIVERSITY OF PRINCETON, USA

LESSONS WE SHOULD HAVE LEARNED FROM SDSS, HSC, AND LSST

SURVEYS SUCH AS SDSS, THE `SSP' USING HSC ON SUBARU, AND LSST ARE LARGE SOFTWARE PROJECTS WITH SOME ASSOCIATED HARDWARE, BUT WE MANAGE THEM AS IF WE WERE BUILDING SKYSCRAPERS OR BATTLESHIPS. I'LL TAKE THE LESSONS THAT I TOOK FROM THE SDSS PROJECT AND EXAMINE THEM IN THE LIGHT OF HSC AND LSST; SOME THINGS HAVE IMPROVED, BUT MANY THINGS HAVE STAYED THE SAME.

05.2: WILLIAM O MULLANE

ESA/ESAC EUROPEAN SPACE ASTRONOMY CENTRE

COTS SOFTWARE IN SCIENCE OPERATIONS, IS IT WORTH IT?

OFTEN, PERHAPS NOT OFTEN ENOUGH, WE CHOOSE COMMON OFF THE SHELF (COTS) SOFTWARE FOR INTEGRATION IN OUR SYSTEMS. THESE RANGE FROM REPOSITORIES TO DATABASES AND TOOLS WE USE ON A DAILY BASIS. IT IS VERY HARD TO ASSESS THE EFFECTIVENESS OF THESE CHOICES. WHILE NONE OF US WOULD CONSIDER A PROJECT SPECIFIC WORD PROCESSING SOLUTION WHEN LATEX (OR EVEN WORD) MANY WILL CONSIDER WRITING THEIR OWN DATA MANAGEMENT SYSTEMS. WE WILL LOOK AT SOME OF THE COTS WE HAVE USED AND ATTEMPT TO EXPLAIN HOW WE CAME TO THE DECISION AND IF IT WAS WORTH IT.

05.3: FRANCOISE GENOVA

CDS - OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, STRASBOURG, FRANCE

THE RESEARCH DATA ALLIANCE: BUILDING BRIDGES TO ENABLE SCIENTIFIC DATA SHARING

THE RESEARCH DATA ALLIANCE (HTTPS://RD-ALLIANCE.ORG/NODE) IS AN INTERNATIONAL ORGANIZATION WHICH AIMS AT BUILDING THE TECHNICAL AND SOCIOLOGICAL BRIDGES THAT ENABLE THE OPEN SHARING OF SCIENTIFIC DATA. IT IS A REMARKABLE FORUM TO DISCUSS ALL THE ASPECTS OF SCIENTIFIC DATA SHARING WITH COLLEAGUES FROM ALL AROUND THE WORLD: IN MAY 2016,AFTER SLIGHTLY MORE THAN 3 YEARS OF EXISTENCE, IT HAS 4 000 MEMBERS FROM 110 COUNTRIES. THE BI-YEARLY PLENARY MEETINGS, WHICH GATHER SEVERAL HUNDRED PARTICIPANTS, ARE ROTATING BETWEEN DIFFERENT REGIONS. THE MARCH 2017 ONE WILL BE HELD IN BARCELONA, AFTER TOKYO AND DENVER IN 2016.

THE RDA WORK IS ORGANIZED BOTTOM-UP, WITH WORKING GROUPS WHICH HAVE 18 MONTHS TO PRODUCE “IMPLEMENTABLE” DELIVERABLES AND INTEREST GROUPS WHICH SERVE AS PLATFORMS OF COMMUNICATION AND DISCUSSION AND ALSO PRODUCE IMPORTANT OUTPUTS SUCH AS SURVEYS AND REPORTS. THERE ARE CURRENTLY 27 WORKING GROUPS AND 45 INTEREST GROUPS, TACKLING A WIDE DIVERSITY OF SUBJECTS, INCLUDING COMMUNITY NEEDS, REFERENCE FOR SHARING, DATA STEWARDSHIP AND SERVICES, AND TOPICS RELATED TO THE BASE INFRASTRUCTURE OF DATA SHARING.

SOME SCIENTIFIC COMMUNITIES USE THE RDA AS A NEUTRAL FORUM TO DEFINE THEIR OWN DISCIPLINARY DATA SHARING FRAMEWORK, WITH MAJOR SUCCESSES SUCH AS THE “WHEAT DATA INTEROPERABILITY WORKING GROUP” WHICH WORKED IN COORDINATION WITH THE INTERNATIONAL INITIATIVE WHICH COORDINATES GLOBAL RESEARCH FOR WHEAT. ASTRONOMY HAS THE IVOA TO DEFINE ITS INTEROPERABILITY STANDARDS, AND SO WE DO NOT NEED TO CREATE A GROUP FOR THAT PURPOSE IN THE RDA. BUT MANY TOPICS DISCUSSED IN THE RDA HAVE A STRONG INTEREST FOR US, FOR INSTANCE ON DATA CITATION OR CERTIFICATION OF DATA REPOSITORIES. WE HAVE A LOT TO SHARE FROM WHAT WE HAVE LEARNT IN BUILDING OUR DISCIPLINARY GLOBAL DATA INFRASTRUCTURE; WE ALSO HAVE A LOT TO LEARN FROM OTHERS. I WILL DISCUSS RDA CURRENT THEMES OR RESULTS OF INTEREST FOR ASTRONOMY DATA PROVIDERS, AND TOPICS ON WHICH WE MAY WANT TO PROPOSE NEW RDA GROUPS.

05.4: SÉVERIN GAUDET

NATIONAL RESEARCH COUNCIL – CADC, VICTORIA, CANADA

EXTENDING SUPPORT FOR LARGE DISTRIBUTED PROJECTS THROUGH INTEROPERABILITY

MANY ASTRONOMY PROJECTS TODAY ARE EXECUTED BY DISTRIBUTED SCIENCE TEAMS WITH ACCESS TO DIFFERENT COMPUTATION AND STORAGE RESOURCES. AS WE MOVE INTO THE ERA OF PETABYTE AND EXABYTE DATASETS, IT IS RECOGNIZED THAT MOVING THE CODE TO THE DATA BECOMES NECESSARY AS THE ALTERNATIVE BECOMES INFEASIBLE. THE QUESTION BECOMES HOW CAN RESOURCE INFRASTRUCTURES SUPPORT THESE LARGE PROJECTS SUCH THAT A TEAM HAS INTEGRATED ACCESS TO THE DIFFERENT DISTRIBUTED RESOURCES AVAILABLE TO PROJECT. EXAMPLES OF RESOURCES THAT COULD BE INTEGRATED ARE FILES AND DIRECTORIES, STORAGE ALLOCATIONS, PROCESSING ALLOCATIONS, DOCKER CONTAINER AND VIRTUAL MACHINE IMAGES, DATABASES AND TABLES, ETC. A FIRST STEP IN THIS DIRECTION IS THE INTEROPERABILITY OF AUTHORIZATION SERVICES.

THE INTERNATIONAL VIRTUAL OBSERVATORY ALLIANCE (IVOA) HAS DEVELOPED MANY STANDARDS TO SUPPORT ACCESS AND INTEROPERABILITY OF INFRASTRUCTURE SUCH AS SINGLE-SIGN ON (SSO), CREDENTIAL DELEGATION PROTOCOL (CDP) AND VOSPACE. BOTH CANADIAN ADVANCED NETWORK FOR ASTRONOMICAL RESEARCH (CANFAR) AND INAF-OSSERVATORIO ASTRONOMICO DI TRIESTE (INAF–OAT) USE THESE STANDARDS FOR PROVISION OF USER STORAGE TO SUPPORT PROJECTS. IN THE VOSPACE IMPLEMENTATION, USERS ASSIGN READ-ONLY AND READ/WRITE PERMISSIONS TO GROUPS THAT ARE DEFINED IN THEIR RESPECTIVE HOME INSTITUTION GROUP MANAGEMENT SERVICES. IN 2015, THE EGI-ENGAGE PROJECT IN EUROPE PARTIALLY FUNDED AN EXPLORATION OF INTEROPERABILITY OF AUTHORIZATION SERVICES IN A JOINT PROJECT BETWEEN THE CANFAR AND INAF–OAT. THIS HAS ALSO LED TO THE INCLUSION OF THIS WORK IN THE ADVANCED EUROPEAN NETWORK OF E-INFRASTRUCTURES FOR ASTRONOMY WITH THE SKA (AENEAS) PROPOSAL. THE JOINT CANFAR/INAF–OAT PROJECT HAS ADDED SUPPORT TO INTEROPERATE THEIR VOSPACE SERVICES BY ADDING THE CAPABILITY OF GRANTING AUTHORIZATION TO A ACCESS A RESOURCE TO GROUPS DEFINED IN AN EXTERNAL GROUP MANAGEMENT SERVICE AND TO ALLOW FOR THE DYNAMIC CREATION OF INTERNAL USER IDS THAT ARE ASSOCIATED WITH AN EXTERNAL IDENTIFY PROVIDER. THIS TALK WILL MOTIVATE THE PROBLEM, DESCRIBE THE SOLUTION AND LESSONS LEARNED AND DISCUSS THE PATH FORWARD FOR BOTH THE IVOA STANDARDS PROCESS AND FOR INTEROPERABILITY AT THE RESOURCE PROVIDER LEVEL.

06.1: CHIARA MARMO

GEOPS - PARIS SUD UNIVERSITY, ORSAY, FRANCE

THE FRIPON PROJECT OR PRIDE AND PREJUDICE IN CITIZEN SCIENCES

FRIPON (FIREBALL RECOVERY AND INTERPLANETARY OBSERVATION NETWORK, WWW.FRIPON.ORG) IS A FRENCH PROJECT AIMING TO MONITOR THE FRENCH SKIES 24 HOURS A DAY. FRIPON WILL DETECT METEORS IN ORDER TO ESTIMATE THEIR ORBIT OUTSIDE THE ATMOSPHERE AND TO STATISTICALLY DETERMINE POSSIBLE PARENT BODIES, BUT ALSO THEIR TRAJECTORY INSIDE THE ATMOSPHERE TO DISCOVER POSSIBLE METEORITES ORIGINATED BY THE FALL. THE LINK BETWEEN THEM WILL ENLIGHTEN US ABOUT THE ORIGIN OF THE SOLAR SYSTEM. A NETWORK OF ONE HUNDRED LOW-COST ALL-SKY CAMERAS IS BEING INSTALLED ALL OVER FRANCE, COUPLED WITH RADIO RECEIVERS AND SPECTROSCOPES. IN ADDITION TO THAT, FRIPON WILL EXPLOIT DATA FROM OTHER NETWORKS (SISMOGRAPHS, INFRASOUND MICROBAROMETERS) TO INCREASE CHANCES OF METEORITE RECOVERY AND TO IMPROVE THE UNDERSTANDING OF ITS PROPERTIES. DATA RETRIEVING AND ANALYSIS ARE AUTOMATIZED IN ORDER TO MINIMIZE THE TIME ELAPSED BETWEEN THE METEOR DETECTION AND THE METEORITE FIELD RESEARCH. FURTHERMORE, FRIPON DATA COULD BE USED IN STUDIES ABOUT CLOUD COVER OR LIGHT POLLUTION. THIS PRESENTATION WILL SKETCH THE ORGANIZATION OF THE PROJECT AND THE PRINCIPAL STEPS LEADING TO THE COMPLETE DEPLOYMENT OF THE NETWORK (BY THE END OF 2016).

THE PROJECT HAS BEEN FUNDED BY THE FRENCH ANR (AGENCE NATIONALE DE LA RECHERCHE). IT FEDERATES FOUR RESEARCH INSTITUTIONS BUT IT IS FOUNDED ON THE PARTICIPATION OF A NUMBER OF RESEARCH LABORATORIES, AND OF CIVILIAN AND CULTURAL ASSOCIATIONS. ASTRONOMERS, GEOLOGISTS AND ENGINEERS WORK TOGETHER WITH A RICH AND ALREADY INDEPENDENTLY STRUCTURED AMATEURS COMMUNITY. FRIPON IS A PROJECT WHERE OPENNESS AND TRANSPARENCY MUST COOPERATE WITH CENTRALIZATION AND CONTROL, A GOOD EXAMPLE OF THE DELICATE BALANCE BETWEEN OUTREACH, UNAVOIDABLE TO INSPIRE PROUD PEOPLE INVOLVEMENT, AND TECHNICAL NEEDS OF SCALING INFRASTRUCTURES AIMED TO PRODUCE RIGOROUS SCIENCE.

06.2: NIKOLAOS APOSTOLAKOS

ASTRONOMY DEPARTMENT OF THE UNIVERSITY OF GENEVA, GENEVA, SWITZERLAND

DESIGNING MODULAR SOFTWARE FOR TEMPLATE FITTING PHOTO-Z ESTIMATION

PRODUCING PHOTO-Z FOR THE EUCLID MISSION CONSTITUTES A CHALLENGE, BOTH TECHNICALLY, DUE TO THE BIG AMOUNT OF DATA, AS WELL AS ALGORITHMICALLY, DUE TO THE DEMANDING SCIENTIFIC REQUIREMENTS. TO FULFIL THIS TASK USING THE TEMPLATE FITTING METHOD, WE HAVE DEVELOPED THE PHOSPHOROS TOOL. THIS TOOL PROVIDES THE MODULARITY AND FLEXIBILITY REQUIRED TO EASILY EMBED ALGORITHM VARIATIONS AND NEW FEATURES, AS PROVIDED FROM THE SCIENTIFIC COMMUNITY, WITHOUT COMPROMISING ITS PERFORMANCE AND SCALABILITY TO THE SIZE OF THE EUCLID DATA. IT IS DESIGNED TO BE USED BOTH IN THE DATA CENTERS FOR THE EUCLID PRODUCTION PIPELINE AND BY THE SCIENTIFIC COMMUNITY FOR PERFORMING PHOTO-Z ANALYSIS OR POST-PROCESSING PHOTO-Z RESULTS. THIS PRESENTATION FOCUSES ON THE DESIGN ASPECTS OF PHOSPHOROS, THE DIFFERENT MODULES IT CONSISTS OF, AND ITS INTEGRATION WITH THE REST OF THE EUCLID SOFTWARE ECOSYSTEM.

06.3: MARÍA JOSÉ MÁRQUEZ

UNED

OPTIMIZATION OF MULTI-BAND GALAXIES CATALOGUING: DESCRIPTION OF THE DATA MANGEMENT PIPELINE

THE ANALYSIS OF MULTI-BAND IMAGES OF COSMOLOGICAL FIELDS PRESENTS SEVERAL TECHNICAL DIFFICULTIES RELATED TO THE ASSEMBLY OF CONSECUTIVE KNOWLEDGE EXTRACTION TASKS FROM SOURCE IDENTIFICATION TO PHOTOMETRIC MEASUREMENTS, CROSS-MATCHING AND SOURCE LABELLING. WE PRESENT THE DESIGN OF A NEW SOFTWARE PIPELINE TO CARRY OUT SOME OF THESE TASKS IN AN AUTOMATIC WAY USING TECHNIQUES BORROWED FROM THE FIELD OF ARTIFICIAL INTELLIGENCE. WE AIM TO PROVIDE THE COMMUNITY WITH THREE OPEN SOURCE SOFTWARE MODULES TO I) LABEL SOURCES IN AN ASTRONOMICAL IMAGE ACCORDING TO THE PROBABILITY THAT EACH ONE IS BLENDED OR CONTAMINATED WITH SURROUNDING SOURCES; II) EXTRACT PHOTOMETRIC MEASUREMENTS OF EXTENDED OBJECTS USING ACTIVE CONTOURS; AND III) CARRY OUT A PROBABILISTIC CROSS-MATCH OF SOURCES FROM DIFFERENT IMAGES AND BANDS, USING ALL ASTRO-PHOTOMETRIC INFORMATION AVAILABLE. ALL THIS BEING INTEGRATED IN A CONFIGURABLE ARCHITECTURE WHICH ALLOWS TO MAKE THE BEST USAGE OF THE DIFFERENTE FEATURES. ASPECTS RELATED TO BIG DATA, MEMORY MANAGEMENT AND COMPUTATIONAL COST ARE AN IMPORTANT PART IN THE EVALUATION OF THE FEASIBILITY OF THE SOLUTION PROPOSED. FINALLY WE SHOW SEVERAL EXAMPLES OF THE APPLICATION OF THIS PIPELINE TO BOTH REAL ASTRONOMICAL IMAGES AND SIMULATED ONES.

07.1: ANNE-MARIE WEIJMANS

UNIVERSITY OF ST ANDREWS, ST ANDREWS, UK

THE CHALLENGES OF A PUBLIC DATA RELEASE: BEHIND THE SCENES OF SDSS DR13

THE IMPACT OF AN ASTRONOMICAL SURVEY IS SET BY THE REACH OF ITS DATA DISTRIBUTION SYSTEM. IF THE DATA DOES NOT REACH THE ASTRONOMERS FOR THEIR RESEARCH PROJECTS TO MAKE NEW DISCOVERIES, THE TEACHERS TO TEACH THEIR STUDENTS HOW TO WORK WITH ASTRONOMICAL DATA, AND THE GENERAL PUBLIC TO INCREASE THEIR AWARENESS OF ASTRONOMY AND SCIENCE, THEN IMPACT WILL BE LIMITED TO A SMALL CORE SURVEY TEAM. A SUCCESSFUL PUBLIC DATA RELEASE, ESPECIALLY ONE AIMED AT A VARIETY OF END USERS, THEREFORE NEEDS TO ENSURE THAT THE DATA IS NOT ONLY FREELY AVAILABLE, BUT ALSO CLEARLY DOCUMENTED AND IN ACCESSIBLE FORMATS. THIS REQUIRES NON-TRIVIAL EFFORT FROM THE SURVEY'S DATA, SCIENCE AND EDUCATION TEAMS, WHICH END-USERS ARE OFTEN NOT AWARE OF.

THE SLOAN DIGITAL SKY SURVEY (SDSS) HAS A LONG HISTORY OF PUBLIC DATA RELEASES, WITH 267 TB OF DATA NOW PUBLICLY ACCESSIBLE ON ITS SERVERS AND MORE THAN 7000 PUBLISHED PAPERS BASED ON SDSS DATA. OVER 30% OF THE ASTRONOMICAL COMMUNITY IN THE US ALONE HAS REPORTED TO BE USING SDSS DATA IN THEIR RESEARCH. IN THIS TALK I WILL PROVIDE A LOOK BEHIND THE SCENES OF OUR MOST RECENT DATA RELEASE: DR13 (SUMMER 2016). I WILL DISCUSS THE MECHANISMS WE HAVE IN PLACE TO DISTRIBUTE AND DOCUMENT DATA, AND HOW WE ORGANISED OUR DATA, SCIENCE AND EDUCATION TEAMS TO WORK EFFICIENTLY TOGETHER TO MAKE THIS DATA RELEASE HAPPEN. I WILL ALSO PROVIDE AN OUTLOOK ON HOW WE CAN INCREASE THE INVOLVEMENT OF OUR END-USERS IN THE DATA RELEASE PROCESS, TO MAKE OUR DATA PROCESSES MORE TRANSPARENT AND OPTIMISE OUR OUTPUTS.

07.2: ANASTASIA GALKIN

LEIBNIZ-INSTITUT FOR ASTROPHYSICS POTSDAM (AIP), GERMANY

HOSTING ASTRONOMICAL DATA IN SHARDED SQL DATABASES

AT LEIBNIZ--INSTITUTE FOR ASTROPHYSICS POTSDAM (AIP) WE HOST AND PUBLISH TERABYTES OF COSMOLOGICAL SIMULATIONS AND OBSERVATIONAL DATA USING SHARDED MARIADB (SPIN-OFF OF MYSQL) NODES. A DEDICATED WEB APPLICATION ALLOWS THE SCIENTISTS ALL AROUND THE WORLD TO RUN SQL QUERIES WHICH INCLUDE SPECIFIC ASTROPHYSICAL FUNCTIONS AND GET THEIR DESIRED DATA IN REASONABLE TIME.

THE SETUP IS BASED ON SHARDED MARIADB DATABASE NODES, ORCHESTRATED BY A HEAD NODE WHICH RUNS THE MARIADB SPIDER ENGINE. PARALLELQUERY (PAQU) REFORMULATES THE SQL QUERIES FOR THE USE IN DISTRIBUTED ENVIRONMENT. ON TOTHE WEB FRAMEWORK DAIQUIRI OFFERS A DEDICATED WEB INTERFACE FOR EACH OF THE HOSTED SCIENTIFIC DATABASE. ALL SOFTWARE WE DEVELOP IS OPEN SOURCE.

TO NAME A FEW SCIENTIFIC DATABASES IN USE SINCE 2013:

- AIP IS ONE OF THE FOUR DATA CENTERS TO STORE THE GAIA DATA STARTING FROM THE DATA RELEASE IN SEPTEMBER 2016. A MOCK DATASET IS ALREADY PUBLISHED FOR GAIA INTERNAL TEST PURPOSES. HTTPS://GAIA.AIP.DE/

- MULTIDARK AND BOLSHOI SIMULATION RESULTS CAN BE ACCESSED ON HTTPS://COSMOSIM.ORG

- DIGITALIZED ARCHIVE FOR ASTRONOMICAL PHOTOGRAPHIC PLATES: XHTTPS://WWW.PLATE-ARCHIVE.ORG

OUTLINE
THIS CONTRIBUTION WILL ANSWER FOLLOWING QUESTIONS:

- WHY WOULD IT MAKE SENSE TO STORE TERABYTES OF ASTRONOMICAL DATA IN A SQL DATABASE?

- HOW TO WORK WITH BILLIONS OF LINES IN MYSQL/MARIADB AND BE FAST?

A SHORT OVERVIEW OVER THE RUNNING APPLICATIONS AND PLANNED FUTURE DEVELOPMENT WILL BE GIVEN.

THESE THEMES WILL BE EXPLAINED IN DETAIL:
- SPIDER AND FEDERATED STORAGE ENGINES IN MYSQL/MARIADB
- REORMULATING SQL QUERIES USING PAQU
- REUSABLE WEB APPLICATIONS WITH THE DAIQUIRI FRAMEWORK

LINKS
- SUPERCOMPUTING AND E-SCIENCE AIP: HTTP://ESCIENCE.AIP.DE
- DAIQUIRI DOCUMENTATION: HTTP://ESCIENCE.AIP.DE/DAIQUIRI
- PAQU PARALLEL QUERIES FOR THE TECHIE:

07.3: ALEXANDER KOROTKOV

POSTGRES PROFESSIONAL, MOSCOW, RUSSUA

SPATIAL INDEXES IN POSTGRESQL FOR ASTRONOMY

POSTGRESQL IS THE WORLDS'S MOST ADVANCED OPEN SOURCE DATABASE, WHICH IS EXTENSIVELY USED IN ASTRONOMY TO STORE AND QUERY LARGE VOLUMES OF SPATIAL DATA. IT IS A GENERAL-PURPOSE RDBMS WITH STRONG SUPPORT OF EXTENDABILITY, SO DATA DOMAIN EXPERTS COULD DEVELOP THE FULL-FLEDGED

CUSTOM DATA TYPES WITH QUERIES AND OPERATORS WITHOUT DEEP KNOWLEDGE OF DATABASE CORE. POSTGRESQL WAS INTRODUCED TO ASTRONOMICAL COMMUNITY IN ADASS IN 2003 YEAR AND IT'S WORTH TO REVIEW THE NEW FEATURES OF POSTGRESQL FROM THE ASTRONOMICAL POINT OF VIEW. WE WILL BRIEFLY OUTLINE THE CURRENT STATUS OF POSTGRESQL AND ITS ROAD MAP TO INFORM ASTRONOMICAL COMMUNITY WHICH IMPORTANT FEATURES ARE AVAILABLE RIGHT NOW AND WHAT TO EXPECT IN THE CLOSEST FUTURE. SCALABILITY OF MODERN POSTGRESQL ON HIGH-END MULTI-CORE SERVERS, PARALLEL QUERY EXECUTION, DISTRIBUTED TRANSACTIONS, JIT-COMPILATION, SUPPORT OF PLUGGABLE STORAGES (IM-MEMORY, VERTICAL) - THESE FEATURES ARE WHAT CURRENTLY IS BEING DISCUSSED IN POSTGRES HACKERS CONFERENCES.

WE REVIEW THE EXISTING IMPLEMENTATIONS OF SPHERICAL DATA SUPPORT AVAILABLE FOR POSTGRESQL IN Q3C, PGSPHERE (OLD AND NEW VERSIONS), POSTGIS ETC AND COMPARE THEIR PERFORMANCE IN SEVERAL USE CASES -- FROM BULK LOADING TO RANGE QUERIES TO LIVE UPDATE. WE DEMONSTRATE HOW DIFFERENT INDEX TYPES (B-TREE IN Q3C, GIST+R-TREE IN PGSPHERE AND

POSTGIS) COULD BE USED TO OPTIMIZE DATA HANDLING FOR SPECIFIC PROBLEMS.

B3: PETER TEUBEN

ASTRONOMY DEPARTMENT, UNIVERSITY OF MARYLAND, COLLEGE PARK, MD

IMPLEMENTING IDEAS FOR IMPROVING SOFTWARE CITATION AND CREDIT

IMPROVING SOFTWARE CITATION AND CREDIT CONTINUES TO BE A TOPIC OF INTEREST ACROSS AND WITHIN MANY DISCIPLINES, WITH NUMEROUS EFFORTS UNDERWAY. LAST YEAR, THE CENTER FOR OPEN SCIENCE (1) PUBLISHED TRANSPARENCY AND OPENNESS PROMOTION (TOP) GUIDELINES (2) AND EARLIER THIS YEAR, THE FORCE11 (3) SOFTWARE CITATION WORKING GROUP (4) RELEASED ITS SOFTWARE CITATION PRINCIPLES (5). THE WORKSHOP ON SUSTAINABLE SOFTWARE FOR SCIENCE: PRACTICE AND EXPERIENCES (WSSSPE) (6) CONTINUES ITS EFFORTS (7) ON SOFTWARE PUBLICATION, CITATION, CREDIT, AND SUSTAINABILITY, AND A DAGSTUHL PERSPECTIVES WORKSHOP ON ENGINEERING ACADEMIC SOFTWARE (8) WILL SOON RELEASE A MANIFESTO ADDRESSING MANY ISSUES IN THIS AREA. THESE EFFORTS AND LAST YEAR'S ADASS BOF ON IMPROVING SOFTWARE CITATION AND CREDIT (9) HAVE ALL GENERATED ACTIONABLE IDEAS, SOME OF WHICH THE COMMUNITY AT LARGE -- SUCH AS ADASS PARTICIPANTS! -- CAN IMPLEMENT, SUCH AS:

- COLLECTING AND PUBLISHING STORIES FROM PEOPLE WHO HAVE RELEASED THEIR SOFTWARE AND WHAT THEIR VIEWS ARE ON RELEASING SOFTWARE;

- ENCOURAGING YOUR UNIVERSITY TO ASK ABOUT SOFTWARE ON THE ANNUAL RESEARCH ACTIVITY REPORT; AND

- CREATING A PATH FOR ORGANIZATIONS TO AWARD A PRIZE TO SOFTWARE AUTHORS FOR SOFTWARE CONTRIBUTIONS TO RESEARCH RESULTS.

IN THIS BOF, WE WILL START WITH A LIST OF ACTIONABLE IDEAS AND THEN WORK IN PAIRS OR SMALL GROUPS TO BEGIN THE WORK OF IMPLEMENTING THEM. WE WILL THEN SHARE WITH THE ENTIRE GROUP THE PROGRESS MADE AND DISCUSS HOW TO DISSEMINATE OR CONTINUE THE WORK ALREADY DONE.

(1) HTTP://CENTERFOROPENSCIENCE.ORG/
(2) HTTP://CENTERFOROPENSCIENCE.ORG/TOP/
(3) HTTPS://WWW.FORCE11.ORG/
(4) HTTPS://WWW.FORCE11.ORG/GROUP/SOFTWARE-CITATION-WORKING-GROUP
(5) HTTPS://WWW.FORCE11.ORG/SOFTWARE-CITATION-PRINCIPLES
(6) HTTP://WSSSPE.RESEARCHCOMPUTING.ORG.UK/
(7) HTTPS://GITHUB.COM/DANIELSKATZ/WSSSPE/ISSUES
(8) HTTP://WWW.DAGSTUHL.DE/DE/PROGRAMM/KALENDER/SEMHP/?SEMNR=16252
(9) HTTP://ARXIV.ORG/ABS/1512.07919

08.1: MOHAMMAD AKHLAGHI

CRAL, OBSERVATOIRE DE LYON, LYON, FRANCE

SEPARATING DETECTION AND CATALOG PRODUCTION: A STEP TOWARDS ALGORITHMS FOR LARGE DATABASES AND VICE-VERSA

DETECTION IS DEFINED AS THE PROCESS OF SEPARATING (IN AN IMAGE, THE PIXELS OF) SIGNAL FROM NOISE. THESE LABELED PIXELS ARE ANALYZED WITH THE ORIGINAL DATA TO REDUCE THE DATA TO HIGHER LEVEL PRODUCTS (A CATALOG), E.G. THE LIGHT WEIGHTED CENTER OF THE OBJECT, OR ITS MAGNITUDE. HOWEVER, THE SIGNAL FROM ASTRONOMICAL TARGETS (FOR EXAMPLE GALAXIES, NEBULAE, STARS OR THE PSF, COMETS, AND ETC) SINKS INTO THE NOISE VERY GRADUALLY, MAKING RAW (NON-PARAMETRIC) DETECTION VERY HARD. TO DIG INTO THE NOISE, ASTRONOMERS HAVE TRADITIONALLY USED MODELLING OF THE REGIONS ABOVE A GIVEN FLUX THRESHOLD (FOR EXAMPLE THE KRON RADIUS IN GALAXY PHOTOMETRY). THUS THE CLEAR DISTINCTION MENTIONED ABOVE BETWEEN DETECTION AND CATALOG PRODUCTION WAS NOT POSSIBLE FOR ASTRONOMICAL TARGETS, HENCE CATALOG PRODUCTION IS VIEWED AS COMPUTATIONALLY EXPENSIVE, THUS DECREASING SCIENTIFIC CREATIVITY.

IN THE 25TH ADASS, WE INTRODUCED A NEW METHOD TO DETECT EXTREMELY FAINT AND DIFFUSE SIGNAL WITH THRESHOLDS THAT ARE SIGNIFICANTLY BELOW THE SKY VALUE (SEE AKHLAGHI AND ICHIKAWA 2015, APJS 220, 1. ARXIV:1505.01664). IT IS THUS NOW POSSIBLE TO DO DETECTION ACCURATELY WITHOUT ANY HIGH-LEVEL CALCULATION/ASSUMPTION. HENCE THE ULTIMATE GOAL OF SEPARATING THE DETECTION FROM CATALOG PRODUCTION IS NOW POSSIBLE IN ASTRONOMY FOR THE FIRST TIME. THIS METHODOLOGY IS APPLIED IN THE GNU ASTRONOMY UTILITIES: ONE UTILITY (NOISECHISEL) IS IN CHARGE OF DETECTION, WHILE ANOTHER (MAKECATALOG) USES THOSE LABELED IMAGES TO GENERATE A CATALOG. HAVING SEPARATED THESE TWO STEPS, USERS CAN RUN THE EXPENSIVE DETECTION PROCESS ONCE, AND BE VERY CREATIVE IN CATALOG PRODUCTION WITH A MUCH LOWER COMPUTATIONAL COST. THIS WAS THE MAIN IDEA BEHIND THE SUGGESTED "REDUCTION AND ANALYSIS ALGORITHMS FOR LARGE DATABASES AND VICE-VERSA" THEME WHICH WAS VOTED AS THE MOST IMPORTANT THEME BY THE ADASS MEMBERS. MAKECATALOG WILL SOON ALLOW USERS TO DEFINE A FUNCTION AT RUN TIME WHICH WILL ALLOW DATA BASE USERS EVEN MORE CREATIVITY. INSTEAD OF ONLY UPLOADING COORDINATES, USERS OF LARGE DATA BASES CAN NOW UPLOAD LABELED IMAGES (THAT CAN BE HIGHLY COMPRESSED) WITH WCS INFORMATION AND EVEN DEFINE THEIR OWN FUNCTIONS FOR WHAT TO DO WITH THE PIXEL POSITIONS AND FLUXES TO GENERATE AS A CATALOG. THESE LABELED IMAGES CAN BE CREATED/DOWNLOADED FROM OTHER INDEPENDENT DATABASES AND WARPED. THE DATABASES CAN ALSO EFFICIENTLY KEEP LABELED IMAGES OF MULTIPLE DETECTION CONFIGURATIONS FOR THE USERS TO CHOOSE FROM.

08.3: KRISTINA NYLAND

NRAO - NATIONAL RADIO ASTRONOMICAL OBSERVATORY, CHARLOTTESVILLE, VA USA

AN ENHANCED MULTIWAVELENGTH PHOTOMETRIC CATALOG FOR THE SPITZER EXTRAGALACTIC REPRESENTATIVE VOLUME SURVEY

ALTHOUGH OUR KNOWLEDGE OF THE PHYSICS OF GALAXY EVOLUTION HAS MADE GREAT STRIDES OVER THE PAST FEW DECADES, WE STILL LACK A COMPLETE UNDERSTANDING OF THE FORMATION AND GROWTH OF GALAXIES AT HIGH REDSHIFT. THE SPITZER EXTRAGALACTIC REPRESENTATIVE VOLUME SURVEY (SERVS) AIMS TO ADDRESS THIS ISSUE THROUGH DEEP SPITZER OBSERVATIONS AT [3.6] AND [4.5] MICRONS OF 4 MILLION SOURCES DISTRIBUTED OVER FIVE WELL-STUDIED "DEEP FIELDS" WITH ABUNDANT ANCILLARY DATA FROM GROUND-BASED NEAR-INFRARED SURVEYS. THE LARGE SERVS FOOTPRINT COVERS 18 SQUARE DEGREES AND WILL PROVIDE A CENSUS OF THE MULTIWAVELENGTH PROPERTIES OF MASSIVE GALAXIES IN THE REDSHIFT RANGE Z = 1-6. A CRITICAL ASPECT OF THE SCIENTIFIC SUCCESS AND LEGACY VALUE OF SERVS IS THE CONSTRUCTION OF A ROBUST SOURCE CATALOG. WHILE MULTIWAVELENGTH SOURCE CATALOGS OF THE SERVS FIELDS HAVE BEEN GENERATED USING TRADITIONAL TECHNIQUES, THE PHOTOMETRIC ACCURACY OF THESE CATALOGS IS LIMITED BY THEIR INABILITY TO CORRECTLY MEASURE FLUXES OF INDIVIDUAL SOURCES THAT ARE BLENDED AND/OR INHERENTLY FAINT IN THE IRAC BANDS. TO IMPROVE UPON THIS SHORTFALL AND MAXIMIZE THE SCIENTIFIC IMPACT OF SERVS, WE ARE USING THE TRACTOR IMAGE MODELING CODE TO PRODUCE A MORE ACCURATE AND COMPLETE MULTIWAVELENGTH SOURCE CATALOG. THE TRACTOR OPTIMIZES A LIKELIHOOD FOR THE SOURCE PROPERTIES GIVEN AN IMAGE CUT-OUT, LIGHT PROFILE MODEL, AND THE PSF INFORMATION. THUS, THE TRACTOR USES THE SOURCE PROPERTIES AT THE FIDUCIAL, HIGHEST-RESOLUTION BAND AS A PRIOR TO MORE ACCURATELY MEASURE THE SOURCE PROPERTIES IN THE LOWER-RESOLUTION IMAGES AT LONGER WAVELENGTHS. WE PROVIDE AN OVERVIEW OF OUR PARALLELIZED IMPLEMENTATION OF THE TRACTOR, DISCUSS THE SUBSEQUENT IMPROVEMENTS TO THE SERVS PHOTOMETRY, AND SUGGEST FUTURE APPLICATIONS.

08.4: LORENZO RIMOLDINI

DEPARTMENT OF ASTRONOMY, UNIVERSITY OF GENEVA, SWITZERLAND

CROSSMATCHING VARIABLE OBJECTS WITH THE GAIA DATA

TENS OF MILLIONS OF NEW VARIABLE OBJECTS ARE EXPECTED TO BE IDENTIFIED IN OVER A BILLION TIME SERIES FROM THE GAIA MISSION. CROSSMATCHING KNOWN VARIABLE SOURCES WITH THOSE FROM GAIA IS CRUCIAL TO INCORPORATE THE CURRENT KNOWLEDGE, UNDERSTAND HOW THESE OBJECTS APPEAR IN THE GAIA DATA, TRAIN SUPERVISED CLASSIFIERS TO RECOGNISE KNOWN CLASSES, AND VALIDATE THE RESULTS OF THE VARIABILITY PROCESSING AND ANALYSIS COORDINATION UNIT (CU7) WITHIN THE GAIA DATA ANALYSIS AND PROCESSING CONSORTIUM (DPAC). THE METHOD EMPLOYED BY CU7 TO CROSSMATCH VARIABLES FOR THE FIRST GAIA DATA RELEASE INCLUDES A BINARY CLASSIFIER TO TAKE INTO ACCOUNT POSITIONAL UNCERTAINTIES, PROPER MOTION, TARGETED VARIABILITY SIGNALS, AND ARTEFACTS PRESENT IN THE EARLY CALIBRATION OF THE GAIA DATA. CROSSMATCHING WITH A CLASSIFIER MAKES IT POSSIBLE TO AUTOMATE ALL THOSE DECISIONS WHICH ARE TYPICALLY MADE DURING VISUAL INSPECTIONS. THE CLASSIFIER CAN BE TRAINED WITH OBJECTS CHARACTERISED BY A VARIETY OF ATTRIBUTES TO ENSURE SIMILARITY IN MULTIPLE DIMENSIONS (ASTROMETRY, PHOTOMETRY, TIME-SERIES FEATURES), WITH NO NEED OF A-PRIORI TRANSFORMATIONS TO COMPARE DIFFERENT PHOTOMETRIC BANDS, OR OF PREDICTIVE MODELS OF THE MOTION OF OBJECTS TO COMPARE POSITIONS. OTHER ADVANTAGES AND SOME DISADVANTAGES OF THE METHOD ARE DISCUSSED. IMPLEMENTATION STEPS FROM THE TRAINING TO THE ASSESSMENT AND OPTIMIZATION OF THE CROSSMATCH CLASSIFIER AND OF THE RESULTS ARE DESCRIBED. THIS PROCEDURE IS APPLIED TO A SET OF SURVEYS (SUCH AS OGLE, THE OPTICAL GRAVITATIONAL LENSING EXPERIMENT, AND EROS, THE EXPÉRIENCE POUR LA RECHERCHE D'OBJETS SOMBRES) WHICH ARE PARTICULARLY RELEVANT TO THE VARIABLE SOURCES PUBLISHED IN THE FIRST GAIA DATA RELEASE.

08.5: RONALDO DA SILVA

ASI SCIENCE DATA CENTER, INAF-OSSERVATORIO ASTRONOMICO DI ROMA, ROME, ITALY

EUCLID NEAR-INFRARED IMAGING REDUCTION PIPELINE: ASTROMETRIC CALIBRATION, RESAMPLING AND STACKING

EUCLID IS AN ESA SURVEY MISSION DESIGNED TO UNDERSTAND THE ORIGIN OF THE UNIVERSE'S ACCELERATING EXPANSION USING WEAK GRAVITATIONAL LENSING AND REDSHIFT CLUSTERING AS MAIN PROBES. VERY HIGH IMAGE QUALITY IS REQUIRED FOR GALAXY SHAPE MEASUREMENTS, WHILE ACCURATE PHOTOMETRY AT VISIBLE AND NEAR-INFRARED WAVELENGTHS AND NEAR-INFRARED SPECTROSCOPY ARE NEEDED TO MEASURE PHOTOMETRIC AND SPECTROSCOPIC GALAXY REDSHIFTS.

WITHIN THE EUCLID SCIENCE GROUND SEGMENT, THE NEAR-INFRARED IMAGING (NIR) PROCESSING FUNCTION HAS THE TASK TO REDUCE ALL THE IMAGES PRODUCED BY THE NEAR-INFRARED INSTRUMENT (NISP) IN PHOTOMETRIC MODE. STARTING FROM LEVEL 1 RAW FRAMES, THE NIR PIPELINE SHALL PRODUCE INDIVIDUAL IMAGES AND STACKED MOSAICS IN Y, J, AND H BANDS ACCOUNTING FOR INSTRUMENTAL EFFECTS, SUBTRACTING THE SKY BACKGROUND, PERFORMING BOTH ASTROMETRIC AND PHOTOMETRIC CALIBRATIONS, AND PROVIDING ALL THE INFORMATION NEEDED FOR CATALOGUE PRODUCTION SUCH AS PSF, VARIANCE, WEIGHTS, AND QUALITY FLAGS.

AFTER AN OVERVIEW OF THE PIPELINE DESIGN, WE PRESENT THE CURRENT STATUS OF THE NIR PROCESSING FUNCTION DEVELOPMENT. WE FOCUS ON PRELIMINARY RESULTS FROM THE APPLICATION OF ASTROMETRIC CALIBRATION, RESAMPLING, AND STACKING PROCEDURES TO SIMULATED IMAGES, AND WE DISCUSS THE DIFFERENT APPROACHES THAT WE TESTED IN ORDER TO FULFILL SPECIFIC REQUIREMENTS.

09.1: ASMITA KORDE-PATEL

NASA GODDARD SPACE FLIGHT CENTER

APPLICATION OF COMPRESSIVE SENSING TO GRAVITATIONAL MICROLENSING DATA AND IMPLICATIONS FOR MINIATURIZED SPACE OBSERVATORIES

COMPRESSIVE SENSING IS A TECHNIQUE FOR SIMULTANEOUS ACQUISITION AND COMPRESSION OF DATA THAT IS SPARSE OR CAN BE MADE SPARSE IN SOME DOMAIN. IT IS CURRENTLY UNDER INTENSE DEVELOPMENT AND HAS BEEN PROFITABLY EMPLOYED FOR INDUSTRIAL AND MEDICAL APPLICATIONS. WE HERE DESCRIBE THE USE OF THIS TECHNIQUE FOR THE PROCESSING OF ASTRONOMICAL DATA. WE OUTLINE THE PROCEDURE AS APPLIED TO EXOPLANET GRAVITATIONAL MICROLENSING AND COMPARE MEASUREMENT RESULTS AND UNCERTAINTY VALUES WITH PUBLISHED SCIENTIFIC FINDINGS BASED ON STANDARD PROCESSES. WE DESCRIBE IMPLICATIONS FOR ON-SPACECRAFT DATA PROCESSING POWER, DATA VOLUMES, TRANSMISSION BANDWIDTH AND TRANSMISSION POWER REQUIREMENTS. OUR FINDINGS SUGGEST THAT APPLICATION OF THESE TECHNIQUES MAY YIELD SIGNIFICANT, ENABLING BENEFITS ESPECIALLY FOR POWER AND VOLUME-LIMITED SPACE APPLICATIONS SUCH AS MINIATURIZED OR MICRO-CONSTELLATION SATELLITES.

09.2: MICHAL PAWLAK

WARSAW UNIVERSITY ASTRONOMICAL OBSERVATORY, WARSAW, POLAND

MACHINE LEARNING VARIABILITY CLASSIFICATION IN THE OGLE PROJECT

THE OGLE PROJECT IS ONE OF THE LARGEST PHOTOMETRIC VARIABILITY SURVEYS REGULARLY MONITORING ABOUT ONE BILLION SOURCES IN THE DENSEST SKY REGIONS. THE HUGE AMOUNT OF DATA COLLECTED GIVES A UNIQUE POSSIBILITY TO DETECT AND STUDY DIFFERENT TYPES OF VARIABLES BUT ON THE OTHER HAND IT MAKES THE AUTOMATISATION OF THE CLASSIFICATION PROCESS A MUST. MACHINE LEARNING APPROACH HAS BEEN SUCCESSFULLY APPLIED TO SOLVE THIS PROBLEM, BOTH IN CASE OF TRANSIENT EVENTS LIKE GRAVITATIONAL MICROLENSING, AS WELL AS PERIODIC VARIABLES, ESPECIALLY ECLIPSING BINARIES IN EACH CASE A MULTI-STEP CLASSIFICATION PROCESS BASED ON RANDOM FOREST ALGORITHM IS PROPOSED. THE PERFORMANCE OF THE METHODS IS EVALUATED RESULTING IN HIGH ACCURACY, IN EACH CASE OVER 80%.

013.2: MAURICE PONCET

CNES - FRENCH SPACE AGENCY, TOULOUSE, FRANCE

USING CERNVM-FS TO DEPLOY EUCLID PROCESSING S/W ON COMPUTING CENTRES

CERNVM-FS IS BEING TESTED BY THE SYSTEM TEAM OF THE SCIENCE GROUND SEGMENT (SGS) WITHIN THE EUCLID PROJECT (HTTP://WWW.EUCLID-EC.ORG/) AS THE PRIMARY EXECUTION ENVIRONMENT AND SOFTWARE DISTRIBUTION TOOL FOR PROCESSING MISSION DATA. IN PARTICULAR, CERNVM-FS IS VIEWED AS A POSSIBLE SOLUTION TO THE PROBLEM OF PROVIDING A HOMOGENOUS EXECUTION ENVIRONMENT ACROSS HETEROGENEOUS COMPUTING RESOURCES AT 9 DIFFERENT SCIENCE DATA CENTRES (SDCS) LOCATED ACROSS EUROPE AND THE US. IT ALSO IS SEEN AS AN IDEAL SOLUTION FOR ENABLING A DEVOPS METHODOLOGY OF SOFTWARE DEVELOPMENT, TESTING, AND DISTRIBUTION THAT DOES NOT REQUIRE REGULAR INTERVENTION BY SYSTEMS ADMINISTRATORS AT INDIVIDUAL SDCS.

CERNVM-FS IS CURRENTLY BEING TESTED AT SCALE THROUGH A TECHNICAL SGS IT CHALLENGE INVOLVING EXISTING SDC COMPUTE CLUSTERS AND THE EUCLID CONTINUOUS INTEGRATION PLATFORM (CODEEN).

THIS PRESENTATION WILL FOCUS ON THIS CHALLENGE AND ITS MAIN OUTCOMES.

F2: ANTONIO RAGAGNIN

LRZ - LEIBNIZ-RECHENZENTRUM, BOLTZMANNSTR. 1, 85748 GARCHING, GERMANY

A WEB INTERFACE TO FEDERALIZE THE OUTCOME OF LARGE, COSMOLOGICAL, HYDRO-DYNAMICAL SIMULATIONS

WE CONSTRUCTED A FULL DATA CENTER (HTTP://C2PAPCOSMOSIM.SRV.LRZ.DE/) FOR COSMOLOGICAL SIMULATIONS (LIKE WWW.MAGNETICUM.ORG) WHICH ALLOWS TO FEDERALIZE THE OUTCOME OF LARGE, COSMOLOGICAL, HYDRO-DYNAMICAL SIMULATIONS, WHICH TYPICALLY EXCEEDS HUNDREDS OF TERRABYTES OF PLAIN SIMULATION DATA. THIS SERVICE ALLOWS TO DELIVER SCIENTIFIC DATA PRODUCTS OF VARIOUS LEVELS TO A BROAD SCIENTIFIC COMMUNITY. FOR OUR DATA PORTAL, THE FULL OUTCOME OF SEVERAL, LARGE, COSMOLOGICAL, HYDRO-DYNAMICAL SIMULATIONS ARE STORED ON A HPC SYSTEMS (LIKE SUPERMUC AT LRZ IN OUR CASE) AND FEDERALIZED VIA A WEB INTERFACE BY RUNNING POST PROCESSING ON DEMAND ON A SEPARATE, MUCH SMALLER SCALE COMPUTING SYSTEM (LIKE THE C2PAP CLUSTER IN OUR CASE). USERS ARE ABLE TO ACCESS DATA PRODUCTS VIA A USER-FRIENDLY WEB INTERFACE, RUNNING ON EASY EXPANDABLE, VIRTUAL SERVER MACHINES. USERS BROWSE THROUGH VISUALIZATIONS OF COSMOLOGICAL STRUCTURES, GUIDED BY QUERIES ON META DATA
TO SELECT GALAXY CLUSTERS AND GALAXY GROUPS OF INTEREST. USERS INTERACTIVELY COMPOSE SUCH COMPLEX, SCIENCE ORIENTED QUERIES AGAINST A DATA BASE, WHERE THE META DATA IS STORED. THE META DATA OF THE CURRENT QUERIED OBJECTS IN ADDITION CAN BE DISPLAYED OR DOWNLOADED FORM OF CSV TABLES FOR A MORE COMPLEX ANALYSIS BY THE USER. FOR A FINALLY SELECTED OBJECT, DIFFERENT CATEGORIES OF DATA PRODUCTS ARE MADE AVAILABLE, WHERE ALL OF THEM WILL INVOLVE PERFORMING REMOTE POST PROCESSING ON THE ORIGINAL, RAW SIMULATION DATA. SO FAR, WE PROVIDE THREE MAIN SERVICES: (I) SIMCUT ALLOWS THE USER TO OBTAIN A SUB-VOLUME AROUND THE SELECTED OBJECT WITHIN THE SIMULATION, CONTAINING ALL THE ORIGINAL, HYDRO-DYNAMICAL INFORMATIONS; (II) SMAC ALLOWS TO OBTAIN IDEALIZED 2D MAPS OF VARIOUS, PHYSICAL
QUANTITIES OF THE OBSERVED OBJECTS; (III) PHOX ALLOWS PERFORM VIRTUAL OBSERVATIONS WITH VARIOUS, EXISTING AND FUTURE X-RAY TELESCOPES. THE LARGE DATA PRODUCED BY THE COSMOLOGICAL HYDRO-DYNAMICAL SIMULATIONS ARE ORGANIZED TO ALLOW SUCH POST-PROCESSING TO BE PERFORMED IN A FAST AND RESOURCE OPTIMIZED WAY.

I10.1: MIREILLE YVONNE LOUYS

CDS, OBSERVATOIRE DE STRASBOURG AND ICUBE LABORATORY, UNIVERSITÉ STRASBOURG

DATA MODELING IN THE VIRTUAL OBSERVATORY FRAMEWORK

THIS PAPER DESCRIBES THE SCOPE OF THE EFFORT AND THE ADOPTED STRATEGY, AND PROVIDES A NUMBER OF EXAMPLES TO HIGHLIGHT THE INTEROPERABILITY BENEFITS.
WE DESCRIBE THE MAIN CONCEPTS NEEDED TO CHARACTERISE DATA SETS INCLUDING THE COVERAGE PROFILE OF THE DATA IN TERMS OF: SPATIAL, SPECTRAL, TEMPORAL, OBSERVABLE, AND POLARIMETRIC AXES; AND QUALITY INDICATORS SUCH AS: RESOLUTION, ACCURACY, STATISTICAL ERRORS ALONG EACH OF THESE AXES. ALSO INCLUDED ARE THE GENERIC RESOURCE METADATA THAT ARE NEEDED TO IDENTIFY A DATA FILE IN A PUBLISHING ARCHIVE, INCLUDING INFORMATION SUCH AS THE INSTRUMENT AND FACILITY NAME. HOW THE METADATA PROFILE GENERATED FROM THESES DATA MODELS ARE PUT IN ACTION IN IVOA PROTOCOLS AND APPLICATIONS IS ALSO PRESENTED. WE DESCRIBE THE IMPACT OF DATA MODELING IN THE IVOA ARCHITECTURE AND HOW IT CAN PROVIDE A GENERAL SEMANTICAL BACKGROUND FOR OBSERVATIONAL DATA.

I10.2: GERARD LEMSON

JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD, USA

DATA MODELS FOR ASTRONOMICAL DATA INTEGRATION: LANGUAGE, PATTERNS AND REPRESENTATIONS

I DESCRIBE A MODEL ORIENTED APPROACH TO DATA INTEGRATION IN ASTRONOMY, DEVELOPED IN THE CONTEXT OF THE INTERNATIONAL VIRTUAL OBSERVATORY EFFORT. THE MAIN IDEA IS THAT COMMON DATA MODELS SHOULD BE USED TO DESCRIBE THE DATA HOLDINGS IN DISTRIBUTED ASTRONOMICAL ARCHIVES. THIS SHOULD ALLOW USERS TO INFER INFORMATION ABOUT THESE ARCHIVES AND POSSIBLY QUERY THOSE WITHOUT NEEDING TO KNOW THE DETAILED STRUCTURE OF THE INDIVIDUAL ARCHIVES THEMSELVES.

TO ENABLE THIS APPROACH WE WERE LED TO DEVELOP FIRST A STANDARDIZED MODELLING LANGUAGE FOR EXPRESSING THE COMMON DATA MODELS, AND SECOND A MAPPING LANGUAGE THAT ALLOWS US TO DESCRIBE HOW INSTANCES OF THOSE MODELS ARE STORED IN TABULAR DATA SETS.

I WILL DESCRIBE SOME FEATURES OF THE MODELLING LANGUAGE, WHICH WE NAMED VO-DML AND WHICH SHARES THE ESSENTIAL CONCEPTS OF THE CLASS DIAGRAMS IN UML. VO-DML IS DEFINED THROUGH AN XML SERIALIZATION FORMAT THAT IS BOTH MACHINE READABLE AND HUMAN WRITABLE WITH NO GREAT DIFFICULTY. A SPECIAL FEATURE OF THE LANGUAGE IS THAT IT ALLOWS REUSE AND INTEROPERABILITY OF DIFFERENT MODELS.

BUT THE LANGUAGES ARE ONLY ONE PIECE OF THE PUZZLE; TO SUPPORT INTEROPERABILITY GREAT CARE MUST BE TAKEN IN THE DESIGN OF THE MODELS THEMSELVES. I WILL TRY TO ARGUE THAT THE TYPE OF MODELS THAT ARE BEST SUITED FOR THIS PURPOSE ARE THE ONES CORRESPONDING TO THE DOMAIN MODELS PRODUCED IN THE ANALYSIS PHASE OF STANDARD MODELLING APPROACHES AND I WILL SHOW SOME ANALYSIS PATTERNS THAT HAVE BEEN USED IN SEVERAL SCIENTIFIC MODELLING EFFORTS, RANGING FROM COSMOLOGICAL SIMULATIONS TO GENOMICS.

O10.3: PATRICK DONOVAN DOWLER

CADC, NATIONAL RESEARCH COUNCIL CANADA

THE COMMON ARCHIVE OBSERVATION MODEL: INSIDE THE DATA CENTRE

THE COMMON ARCHIVE OBSERVATION MODEL (CAOM) IS USED AS THE CORE DATA MODEL FOR ALL DATA HOLDINGS AT THE CANADIAN ASTRONOMY DATA CENTRE (CADC): ~12 MILLION DATA PRODUCTS SPANNING 15 COLLECTIONS AND INCLUDING IMAGES, SPECTRA, CUBES, TIME SERIES, AND CATALOGUES. THE CADC SUPPORTS BOTH IN-HOUSE AND EXTERNAL DATA ENGINEERING EFFORTS BY PROVIDING CLIENT TOOLS AND OPERATING A CAOM OBSERVATION REPOSITORY SERVICE WHERE DATA ENGINEERS HAVE PERMISSION TO CREATE, UPDATE, AND DELETE OBSERVATION METADATA.

CAOM SUPPORTS ANONYMOUS ACCESS FOR PUBLIC DATA AND AUTHENTICATED ACCESS TO PROPRIETARY METADATA AND DATA. THE CONTENT IS LOOSELY COUPLED TO DATA STORAGE AND DELIVERY SYSTEM. IN ADDITION TO THE CADC ADVANCEDSEARCH (WEB PORTAL), CAOM ALSO SUPPORTS IVOA SERVICES AND DATA MODELS TO PROVIDE AN END-TO-END SOLUTION FOR DATA DISCOVERY AND DATA ACCESS: TAP, OBSCORE, SIA, DATALINK, AND SODA.

CAOM IS AN OPEN SOURCE MODEL AND OPEN SOURCE CODEBASE THAT IS EVOLVING ALONG WITH THE DEMANDS OF BOTH DATA VARIETY AND THE NEEDS OF SCIENCE USERS, SCIENCE TEAMS, AND DATA CENTRE OPERATIONS.

O10.4: KRISTIN RIEBE

AIP - LEIBNIZ-INSTITUTE FOR ASTROPHYSICS POTSDAM

A PROVENANCE DATA MODEL FOR ASTRONOMY

IN ASTRONOMY AS WELL AS IN OTHER SCIENCES IT IS OF CRUCIAL IMPORTANCE TO HAVE INFORMATION ABOUT THE ORIGIN AND HISTORY OF DATA, BE IT SCIENCE-READY IMAGES FROM A TELESCOPE, CATALOGS OF OBJECTS AND THEIR PROPERTIES, OBSERVED SPECTRA OR ANY OTHER KIND OF DATA PRODUCT.

IN THE INTERNATIONAL VIRTUAL OBSERVATORY ALLIANCE (IVOA) WE ARE WORKING ON A PROVENANCE DATA MODEL FOR OBSERVATIONS, WHICH SHALL DESCRIBE HOW PROVENANCE OF DATA CAN BE MODELED, STORED AND EXCHANGED.

THE PROVENANCE INFORMATION SHALL ENABLE SCIENTISTS TO RECOVER THE PROCESSING STEPS THAT LED FROM A RAW IMAGE OR DATA FILE TO THE (PUBLISHED) SCIENCE-READY DATA SET. THIS IS NECESSARY FOR GIVING SCIENTISTS THE POSSIBILITY TO GAIN A BETTER UNDERSTANDING OF THE DATA AND BE ABLE TO DECIDE IF AND WHICH PART OF THE DATA IS SUITABLE FOR A CERTAIN TASK. THE PROVENANCE INFORMATION CAN ALSO BE USED TO SEARCH FOR POSSIBLE ERROR SOURCES, JUDGE THE QUALITY OF DATA AND TO GIVE GUIDANCE FOR REPRODUCING DATA, WHICH IS ONE OF THE KEY POINTS FOR ENSURING GOOD SCIENTIFIC PRACTICE.

IN THIS TALK I WILL GIVE AN OVERVIEW ON THE CURRENT STATUS OF THE IVOA PROVENANCE DATA MODEL, ITS CONNECTION TO THE PROVENANCE DATA MODEL OF THE WORLD WIDE WEB CONSORTIUM (W3C) AND PRESENT SOME USE CASES FOR PROVENANCE IN ASTRONOMY.

I11.1: THOMAS ROBITAILLE

FREELANCE SCIENTIFIC SOFTWARE DEVELOPER

THE RISE OF PYTHON AND THE OPEN-DEVELOPMENT REVOLUTION IN ASTRONOMY

OVER THE LAST DECADE, THE RAPID ADOPTION OF THE PYTHON PROGRAMMING LANGUAGE BY ASTRONOMERS HAS BEEN COUPLED WITH THE RISE OF SOME OF THE LARGEST OPEN-SOURCE AND OPENLY-DEVELOPED PROJECTS IN ASTRONOMY TO DATE, INCLUDING THE ASTROPY AND YT PROJECTS. IN THIS TALK, I WILL GIVE A BROAD OVERVIEW OF THESE PROJECTS, AND WILL FOCUS ON THE HUMAN AND TECHNOLOGICAL ELEMENTS THAT HAVE MADE THESE TYPES OF INTERNATIONAL COLLABORATIONS POSSIBLE. IN PARTICULAR, I WILL GIVE A BROAD OVERVIEW OF THE FREELY-AVAILABLE AND CONSTANTLY-EVOLVING ONLINE TOOLKIT THAT CAN BE USED BY ANYONE INTERESTED IN DEVELOPING OPEN-SOURCE SOFTWARE AND COLLABORATING REMOTELY. IN ADDITION, I WILL DISCUSS CHALLENGES THAT ARE INEVITABLE AS THESE KINDS OF OPEN-SOURCE PROJECTS GROW, AS WELL AS LESSONS LEARNED ALONG THE WAY.

O11.2: MAURICIO A ARAYA

UNIVERSIDAD TÉCNICA FEDERICO SANTA MARÍA

JOVIAL: JUPYTER OVERRIDE FOR ASTRONOMICAL LIBRARIES

JUPYTER NOTEBOOKS HAVE PROVEN TO BE A POWERFUL TOOL FOR TEACHING SCIENCE, BECAUSE THEY HANDLE EXECUTABLE CODE SNIPPETS, CONTEXT ENVIRONMENTS, VISUALIZATION, EQUATIONS AND EXPLANATORY TEXT, ALL WITHIN THE SAME WEB-INTERFACE. WE PROPOSE EXTENDING ITS USAGE FROM TEACHING ACTIVITIES TO SCIENCE ACTIVITIES THROUGH THE INTEGRATION OF ASTRONOMICAL LIBRARIES TO THE JUPYTER ENVIRONMENT AND ITS EXECUTION AS A CLOUD SERVICE. THE REMOTE EXECUTION OF PROCESSING TASKS THROUGH NOTEBOOKS NOT ONLY SIMPLIFIES THE USAGE OF LIBRARIES, BUT ENABLES BIG DATA PROCESSING ON DATA CENTERS WHILE HIDING THE INFRASTRUCTURE AND PLATFORM-DEPENDENT DETAILS. THIS ALLOWS MOVING COMPUTATIONS CLOSER TO THE DATA ARCHIVES, EXECUTING TASKS IN A GRAPHICAL YET NON-BLOCKING FASHION, USING HIGH-PERFORMANCE COMPUTING ROUTINES TRANSPARENTLY AND WORKING WITH VERY LARGE DATA FILES WITHOUT EXHAUSTING LOCAL MEMORY. MOREOVER, A PROPER USE OF THE NOTEBOOKS PRODUCES SELF-DOCUMENTED, EXPORTABLE AND REPRODUCIBLE PIPELINES WITH GRAPHICAL SUPPORT. OUR PROTOTYPE USES JUPYTER HUB AS THE BASE SERVICE, INCLUDING ASTROPY, ACALIB AND CASAC LIBRARIES TO THE PYTHON KERNEL, AND WE ARE CURRENTLY PORTING CUPID (STARLINK), MPICASA AND ADMIT THROUGH SUITABLE WRAPPERS. THE INTEGRATION WITH THE VO IS TWO-FOLD: THROUGH THE DATA ACCESS LAYER SERVICES VIA VOTABLES, AND THROUGH THE APPLICATION LAYER VIA THE SAMP PROTOCOL. BESIDES INCLUDING MORE LIBRARIES, THE NEXT STEPS ARE EXPLORING THE INTEGRATION WITH BIG DATA FRAMEWORKS SUCH AS APACHE SPARK, AND THE PROPER PARALLELIZATION OF THE MAIN ALGORITHMS OF THE LIBRARIES. TO ENCOURAGE ITS USAGE WE ALSO PLAN TO ASSEMBLE A LITE DISTRIBUTION OF JOVIAL TO BE USED OFF-LINE.

O11.3: OMAR LAURINO

SMITHSONIAN ASTROPHYSICAL OBSERVATORY

SHERPA, PYTHON, AND ASTRONOMY. A SUCCESSFUL CO-EVOLUTION.

SHERPA IS A FITTING TOOL ORIGINALLY DEVELOPED AS PART OF THE CHANDRA X-RAY OBSERVATORY DATA ANALYSIS SOFTWARE, CIAO: ITS FIRST VERSION WAS DISTRIBUTED IN OCTOBER 1999. A FEW MONTHS EARLIER, PYTHON 1.5.2 HAD BEEN RELEASED: AT THE TIME, THE PYTHON SOFTWARE FOUNDATION DID NOT EXIST AND SINCE THEN PYTHON, SHERPA, AND THE WAY ASTRONOMERS WRITE AND INTERACT WITH SOFTWARE HAVE CHANGED SIGNIFICANTLY. AT THE TIME, SHERPA ROUTINES WERE WRITTEN IN C, C++, AND FORTRAN, WITH A DEDICATED COMMAND LINE INTERPRETER, AND LATER WITH A S-LANG SCRIPTING INTERFACE.

SEVENTEEN YEARS LATER, SHERPA IS A PYTHON PACKAGE WITH C, C++, AND FORTRAN EXTENSIONS, OPENLY DEVELOPED ON GITHUB. ALTHOUGH X-RAY SCIENTIFIC DRIVERS REMAIN STRONG, OTHER PROJECTS OUTSIDE OF THE X-RAY ASTRONOMICAL DOMAIN ARE STARTING TO USE SHERPA AS A DEPENDENCY IN THEIR SYSTEMS AND BUILDING ON ITS STRENGTHS.

THE TRANSITION FROM A MISSION-SPECIFIC INTEGRATED PACKAGE WITH A CUSTOM USER INTERFACE, TO A COMMUNITY-DEVELOPED, GENERAL PURPOSE, EXTENSIBLE AND REUSABLE MODULE, REQUIRED NOT ONLY A MAJOR OVERHAUL OF THE SHERPA CODE, AND HOW IT WAS BUILT AND TESTED, BUT IT REPRESENTED A PARADIGM SHIFT THAT POSED SEVERAL CHALLENGES: CODING STANDARDS, USER INTERFACE, BUILD AND TESTING PROCEDURES, AND DOCUMENTATION ALL HAD TO BE REEVALUATED AND REDESIGNED AS THE FOCUS SHIFTED FROM A SIMPLE COMMAND-LINE INTERPRETER USER INTERFACE TO A MODULAR, OBJECT-ORIENTED, EXTENSIBLE PYTHON APPLICATION PROGRAM INTERFACE (API), WHILE KEEPING HIGH PERFORMANCE STANDARDS.

IN THIS PRESENTATION WE DISCUSS THE CHALLENGES WE FACED IN INCREMENTALLY ADAPTING OUR SOFTWARE AND CONFIGURATION MANAGEMENT TO THE EMERGING TRENDS IN COMPUTING, ESPECIALLY WITHIN THE ASTRONOMICAL COMMUNITY. WE DESCRIBE HOW SOME PYTHON TECHNOLOGIES LIKE CONDA AND IPYTHON HELPED US IN THIS MIGRATION. WE PRESENT PYTHON PROJECTS THAT EXTEND SHERPA OUTSIDE OF THE ORIGINAL X-RAY DOMAIN, AND WE SHOW HOW SHERPA CAN NOW BE SEAMLESSLY INTEGRATED IN HETEROGENEOUS PYTHON ENVIRONMENTS USING WIDESPREAD TOOLS LIKE ASTROPY, MATPLOTLIB, AND JUPYTER. WE SHOW HOW NON-PYTHON APPLICATIONS CAN ALSO INTERACT WITH SHERPA THROUGH VIRTUAL OBSERVATORY INTEROPERABILITY STANDARDS AND A PYTHON SAMP ADAPTER. FINALLY, WE WILL OUTLINE THE NEW OPPORTUNITIES OFFERED BY NEWER TECHNOLOGIES WE ARE EVALUATING LIKE DOCKER, THAT COULD ALLOW SHERPA TO BECOME A CLOUD APPLICATION.

O11.4: PETER TEUBEN

ASTRONOM DEPARTMENT - UNIVERSITY OF MARYLAND, COLLEGE PARK, MD , USA

ADMIT: ALMA DATA MINING TOOLKIT

ADMIT (ALMA DATA MINING TOOLKIT) IS A PYTHON TOOLKIT THAT ALLOWS PIPELINES TO BE BUILT IN TERMS OF RE-RUNNABLE FLOWS. THE CURRENT IMPLEMENTATION CALLS CASA TASKS AND TOOLS, IN ORDER TO PROCESS LARGE ALMA DATACUBES, IDENTIFY SPECTRAL LINES, CUT LINE CUBES, PRODUCE MOMENT MAPS, IDENTIFY SOURCES AND CLUMPS ETC. THE TALK HIGHLIGHT BOTH THE CONCEPTS OF AN ADMIT FLOW, AS WELL AS THE DATA PRODUCTS IT PRODUCES, WHICH EVENTUALLY WILL MAKE THEIR WAY INTO THE ALMA ARCHIVE FOR USERS TO DOWNLOAD AND RE-RUN.

B4: THOMAS ROBITAILLE

FREELANCE SCIENTIFIC SOFTWARE DEVELOPER

THE ASTROPY PROJECT - COMMUNITY DISCUSSION AND FEEDBACK

THE ASTROPY PROJECT (HTTP://WWW.ASTROPY.ORG) IS A COMMUNITY EFFORT TO DEVELOP A SINGLE CORE PACKAGE FOR ASTRONOMY IN PYTHON AND FOSTER INTEROPERABILITY BETWEEN PYTHON ASTRONOMY PACKAGES. THE AIM OF THIS BOF SESSION WILL BE TO BRING TOGETHER DEVELOPERS AND USERS OF THE ASTROPY CORE AND AFFILIATED PACKAGES TO DISCUSS FUTURE PLANS FOR PROJECT. THIS WILL INCLUDE A BRAINSTORMING SESSION TO PRIORITIZE FUTURE DEVELOPMENT, AS WELL AS A DISCUSSION OF THE VARIOUS WAYS FOR PEOPLE TO CONTRIBUTE TO THE PROJECT.

I12.1: GIULIANO TAFFONI

INAF-OATS, TRIESTE, ITALY

SHALL NUMERICAL ASTROPHYSICS STEP INTO ERA OF EXASCALE COMPUTING?

THE DEVELOPMENT OF EXASCALE COMPUTING FACILITIES WITH MACHINES CAPABLE OF EXECUTING O(10^18) OPERATIONS PER SECOND WILL BE CHARACTERISED BY SIGNIFICANT AND DRAMATIC CHANGES IN COMPUTING HARDWARE ARCHITECTURE FROM CURRENT PETASCALE CAPABLE SUPER-COMPUTERS.
TO BUILD AN EXASCALE RESOURCE WE NEED TO ADDRESS SOME MAJOR TECHNOLOGY CHALLENGES RELATED TO ENERGY CONSUMPTION, NETWORK TOPOLOGY, MEMORY AND STORAGE, RESILIENCE AND OF COURSE PROGRAMMING MODEL AND SYSTEMS SOFTWARE.
FROM A COMPUTATIONAL SCIENCE POINT OF VIEW, THE ARCHITECTURAL DESIGN OF EXISTING PETA-SCALE SUPERCOMPUTERS, WHERE COMPUTING POWER IS MAINLY DELIVERED BY ACCELERATORS (GPU, FPGA, CELL PROCESSORS ETC.), ALREADY IMPACTS ON SCIENTIFIC APPLICATIONS. THIS WILL BECOME MORE EVIDENT ON THE FUTURE EXASCALE RESOURCES THAT WILL INVOLVE MILLIONS OF PROCESSING UNITS CAUSING PARALLEL APPLICATION SCALABILITY ISSUES DUE TO SEQUENTIAL APPLICATION PARTS, SYNCHRONISING COMMUNICATION AND OTHER BOTTLENECKS. FUTURE APPLICATIONS MUST BE DESIGNED TO MAKE SYSTEMS WITH THIS NUMBER OF COMPUTING UNITS EFFICIENTLY EXPLOITABLE.

AN APPROACH BASED ON HARDWARE/SOFTWARE CO-DESIGN IS CRUCIAL TO ENABLE EXASCALE COMPUTING BY SOLVING THE APPLICATION-ARCHITECTURE PERFORMANCE GAP (THE GAP BETWEEN THE PEACE CAPABILITIES OF THE HARDWARE AND THE PERFORMANCE RELEASED BY HPC SOFTWARE) CONTRIBUTING TO THE DESIGN OF SUPERCOMPUTING RESOURCES THAT CAN BE EFFECTIVELY EXPLOITED BY REAL SCIENTIFIC APPLICATIONS.

IN ASTRONOMY AND ASTROPHYSICS, HPC NUMERICAL SIMULATIONS ARE TODAY ONE OF THE MORE EFFECTIVE INSTRUMENT TO COMPARE OBSERVATION WITH THEORETICAL MODELS, MAKING HPC INFRASTRUCTURES A THEORETICAL LABORATORY TO TEST PHYSICAL PROCESSES. MOREOVER THEY ARE MANDATORY DURING THE PREPARATORY PHASE AND OPERATIONAL PHASE OF SCIENTIFIC EXPERIMENTS. THE SIZE AND COMPLEXITY OF THE NEW EXPERIMENTS (SKA, CTA, EUCLID, ATHENA, ETC.) REQUIRE BIGGER NUMERICAL LABORATORIES, PUSHING TOWARD THE USE OF EXASCALE COMPUTING CAPABILITIES.

THIS TALK WILL SUMMARISE THE MAJOR CHALLENGES TO EXASCALE AND HOW MUCH PROGRESS HAS BEEN MADE IN THE LAST YEARS IN EUROPE. I WILL PRESENT THE EFFORT DONE BY THE EXANEST EU FUNDED PROJECT TO BUILD A PROTOTYPE OF AN EXASCALE FACILITY BASED ON ARM CPUS AND ACCELERATORS, DESIGNED USING A HARDWARE SOFTWARE CO-DESIGN APPROACH, WHERE ASTROPHYSICAL CODES ARE PLAYING A CENTRAL ROLE IN DEFINING NETWORK TOPOLOGY AND STORAGE SYSTEM. FINALLY I WILL DISCUSS HOW THE CO-DESIGN WILL IMPACT ON NUMERICAL CODES THAT MUST BE RE-ENGINEERED TO PROFIT OF THE EXASCALE SUPERCOMPUTERS.

012.2: FRANCESCO PIERFEDERICI

IRAM, GRANADA, SPAIN AND ECMWF, READING, UK

MASSIVE SCIENTIFIC WORKLOADS: LESSONS LEARNED FROM PETAFLOP-SCALE WEATHER SIMULATIONS

WEATHER FORECASTS RUN AT THE EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS (ECMWF) ARE COMPLEX WORKLOADS WHICH USE TENS OF THOUSANDS OF CPU CORES FROM TWO OF THE MOST POWERFUL SUPERCOMPUTERS IN THE WORLD (TOP TWENTY OF THE TOP 500 LIST). THEY RUN FOR POTENTIALLY WEEKS ON END AND PROCESS HUNDREDS OF MILLIONS OF OBSERVATION DATASETS.

EACH OF THESE FORECAST SIMULATIONS IS A HETEROGENEOUS MIX OF HYBRID MPI-OPENMP FORTRAN/C/C++ NUMERICAL CODE SURROUNDED BY A HOST OF PYTHON AND SHELL SCRIPTS STAGING DATA IN AND OUT OF DATABASES, CREATING HIGH-LEVEL PRODUCTS, PERFORMING SANITY CHECK ON INPUTS AND OUTPUTS ETC. WHEN RUNNING ON A HPC CLUSTER, THEY EACH SPAWN TENS OF THOUSANDS OF JOBS IN A VERY DEEP DEPENDENCY GRAPH.

MONITORING, PROFILING, DEBUGGING THESE COMPLEX WORKLOADS AND THEIR DEPENDENCY RULES IS A HERCULEAN TASK, MADE MORE DIFFICULT BY THE FACT THAT THE TOOLS ONE CAN USE TO ANALYSE COMPILED EXECUTABLES (E.G. DARSHAN AND ALLINEA MAP) LOSE MUCH OF THEIR POWER OR ARE COMPLETELY UNUSABLE WHEN DEALING WITH SCRIPTS. IMPORTANT ISSUES OF MACHINE OVER-SUBSCRIPTION AND CPU POWER MANAGEMENT ARE ALSO LEFT UN-TACKLED.

TOOLS AND TECHNIQUES DEVELOPED AT ECMWF TO APPROACH WHOLE-WORKLOAD PROFILING OF WEATHER SIMULATIONS WILL BE PRESENTED. THEIR APPLICABILITY TO PRESENT AND FUTURE ASTRONOMY PROCESSING NEEDS WILL BE INVESTIGATED AS WELL.

O12.3: SANDRA CASTRO

ESO - EUROPEAN SOUTHERN OBSERVATORY

HPC DEVELOPMENT FOR THE ALMA PIPELINE

CASA, THE COMMON ASTRONOMY SOFTWARE APPLICATIONS, HAS THE PRIMARY GOAL OF SUPPORTING THE DATA PROCESSING NEEDS OF ALMA AND VLA. THE PARALLELISATION FRAMEWORK IMPLEMENTED IN CASA USES MPI, THE MESSAGE PASSING INTERFACE, WHICH IS ACCESSIBLE AT RUN TIME THROUGH A WRAPPER OF THE MPI EXECUTOR CALLED “MPICASA”. WE USE MPI PYTHON BINDINGS TO CONTROL THE PARALLELIZATION OF HIGH-LEVEL CASA TASKS AND WILL SOON START TO USE MPI C BINDINGS FOR SPECIFIC LOW-LEVEL C++ PARTS OF CASA.

THE PARALLELISATION IN CASA IS ACHIEVED BY PARTITIONING THE INPUT MEASUREMENTSET (MS) INTO SEVERAL PIECES THAT ARE VIRTUALLY CONCATENATED. ONCE THE DATA IS PARTITIONED INTO A SO-CALLED MULTI-MS, THE CASA PARALLELISED TASKS ARE ABLE TO DETECT IT AUTOMATICALLY AND IF A CLUSTER IS AVAILABLE, SUB-TASKS ARE SENT TO THE CLUSTER NODES USING MPI.

THE ALMA PIPELINE WILL SOON START USING THE CASA PARALLELISATION FRAMEWORK TO CREATE SCIENCE-READY DATA PRODUCTS TO USERS. IN THIS TALK, I WILL SHOW DETAILS OF THE TIER APPROACHES USED IN THE PARALLELISATION OF THE PIPELINE AND GIVE PRELIMINARY PERFORMANCE NUMBERS OF THE ALMA PIPELINE PARALLEL PROCESSING.

012.4: JENS BJOERN BUSS

ASTRO-PARTICLE PHYSICS, DEPARTMENT OF PHYSICS, TU DORTMUND, DORTMUND, GERMANY

FACT-TOOLS – PROCESSING HIGH-VOLUME TELESCOPE DATA

SEVERAL LARGE EXPERIMENTS SUCH AS MAGIC, FACT, VERITAS, HESS OR THE UPCOMING CTA PROJECT DEPLOY HIGH-PRECISION CHERENKOV TELESCOPES TO MONITOR CELESTIAL OBJECTS. THE FIRST G-APD CHERENKOV TELESCOPE (FACT) IS PIONEERING THE USE OF SOLID STATE PHOTO DETECTORS FOR IMAGING ATMOSPHERIC CHERENKOV TELESCOPES. SINCE OCTOBER 2011, THE FACT COLLABORATION HAS SUCCESSFULLY BEEN SHOWING THE APPLICATION AND RELIABILITY OF SILICON PHOTO MULTIPLIERS FOR EARTH-BOUND GAMMA-RAY ASTRONOMY.

THE AMOUNT OF DATA COLLECTED BY MODERN CHERENKOV TELESCOPES POSES BIG CHALLENGES FOR THE DATA STORAGE AND THE DATA ANALYSIS. THE CHALLENGES RANGE FROM DOMAIN SPECIFIC PHYSICS ASPECTS, SUCH AS FINDING GOOD FILTERING ALGORITHMS/PARAMETERS FOR BACKGROUND REJECTION, TO SCALABILITY ISSUES, REQUIRING ANALYTICAL SOFTWARE TO BE SCALED TO LARGE CLUSTERS OF COMPUTE NODES FOR AN EFFECTIVE REAL-TIME ANALYSIS.MODERN CLUSTER ENVIRONMENTS, WHICH EMERGED FROM THE BIG DATA COMMUNITY, AIM AT DISTRIBUTED DATA STORAGE WITH A STRONG EMPHASIS ON DATA LOCALITY AND FAULT-TOLERANT COMPUTING. THESE CLUSTERS PERFECTLY MATCH THE REQUIREMENTS OF MODERN DATA-DRIVEN PHYSICS EXPERIMENTS. HOWEVER, THEIR PROGRAMMING DEMANDS EXPERT KNOWLEDGE TO GAIN THE FULL PERFORMANCE ADVANTAGES AT THE USER LEVEL.

IN A JOINT EFFORT OF PHYSICISTS AND COMPUTER SCIENTISTS WE TARGETED THIS AREA OF CONFLICT USING THE GENERIC STREAMS FRAMEWORK, A PLUGGABLE DATA PROCESSING ENVIRONMENT DEVELOPED AT THE COLLABORATIVE RESEARCH CENTER SFB-876. USING STREAMS ALLOWS FOR THE HIGH-LEVEL DESIGN OF ANALYTICAL DATA FLOWS, WHILE MAINTAINING COMPATIBILITY TO LARGE SCALE STREAMING PLATFORMS. THIS ENABLES PHYSICISTS TO DEVELOP AND TEST NEW ALGORITHMS IN A LOCAL ENVIRONMENT AND DEPLOY THEIR SOLUTIONS ON MODERN COMPUTE CLUSTERS WITHOUT ADAPTIONS.

USING THE \STREAMS FRAMEWORK, WE BUILT A PROCESSING LIBRARY FOR DESIGNING A DATA PIPELINE FOR THE FACT TELESCOPE. THE RESULTING FACT TOOLS PROVIDE A RAPID-PROTOTYPING ENVIRONMENT FOR THE DEVELOPMENT OF ANY DATA PROCESSING STAGE REQUIRED WITHIN FACT. THE TOOLSUITE SUPPORTS READING RAW CAMERA OUTPUT AND APPLYING VARIOUS DATA CLEANING AND FEATURE EXTRACTION STAGES. THE INTEGRATION OF POPULAR MACHINE LEARNING LIBRARIES ADDITIONALLY SUPPLIES SMART FILTERING OF RELEVANT EVENTS TO SUPPRESS BACKGROUND NOISE. THE ABSTRACT MODELLING OF DATA PIPELINES ALLOW FOR AN EFFICIENT DATA PROCESSING ON LARGE SCALE CLUSTERS WITHIN THE APACHE HADOOP ECOSYSTEM.

I13.1: TIZIANA FERRARI

EGI FOUNDATION

EGI TECHNICAL PLATFORMS FOR ADVANCED COMPUTING

EGI IS THE EUROPEAN INFRASTRUCTURE FOR DISTRIBUTED COMPUTING FEDERATING MORE THAN 300 DATA CENTRES WORLDWIDE TO DELVER SECURE COMPUTE, STORAGE AND DATA MANAGEMENT FOR INTERNATIONAL RESEARCH COLLABORATIONS IN ALL SCIENTIFIC DSCIPLINES.
THE TALK PROVIDES AN OVERVIEW OF THE TECHNICAL PLATFORMS THAT ALLOW DISTRIBUTED COMPUTING TO BE ACCESSIBLE BY SCIENTIFIC APPLICATIONS, AND MORE SPECIFICALLY HOW THESE ARE BEING USED BY ASTRONOMERS IN THEIR RESEARCH WORKFLOWS.

013.3: ANDRE SCHAAFF

OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, UNIVERSITÉ DE STRASBOURG, CNRS, UMR 7550, 11 RUE DE L'UNIVERSITÉ, F-67000 STRASBOURG, FRANCE

IMPROVING ASTRONOMICAL ONLINE SERVICES WITH APACHE SPARK AND DOCKER

TO FACE THE INCREASING VOLUME OF DATA WE WILL HAVE TO MANAGE IN THE COMING YEARS, WE TEST AND PROTOTYPE IMPLEMENTATIONS IN THE BIG DATA DOMAIN (BOTH DATA AND PROCESSING).

THE CDS PROPOSE A "X-MATCH" SERVICE WHICH DOES A CROSS CORRELATION OF SOURCES BETWEEN VERY LARGE CATALOGUES (10 BILLIONS ROWS).

IT IS A FUZZY JOIN BETWEEN TWO TABLES OF SEVERAL HUNDRED MILLIONS OF LINES (E.G. 470,992,970 SOURCES FOR 2MASS). A USER CAN DO A CROSS-MATCH OF THE (OVER 10,000) CATALOGUES PROPOSED BY THE CDS OR HE CAN UPLOAD HIS OWN TABLE (WITH POSITIONS) TO CROSS-MATCH IT WITH THESE CATALOGUES. IT IS BASED ON OPTIMIZED DEVELOPMENTS IMPLEMENTED ON A WELL-SIZED SERVER. THE AREA CONCERNED BY THE CROSS-MATCH CAN BE THE FULL SKY (WHICH INVOLVES ALL THE SOURCES), A CONE WITH ONLY THE SOURCES (WHICH ARE AT A CERTAIN ANGULAR DISTANCE FROM A GIVEN POSITION), OR A HEALPIX CELL.

THIS KIND OF TREATMENT IS POTENTIALLY "HEAVY" AND REQUIRES APPROPRIATE TECHNIQUES (DATA STRUCTURE AND COMPUTING ALGORITHM) TO ENSURE GOOD PERFORMANCES AND TO ENABLE ITS USE IN ONLINE SERVICES.

APACHE SPARK SEEMED VERY PROMISING AND WE DECIDED TO IMPROVE THE ALGORITHMS, BY USING THIS TECHNOLOGY IN A SUITABLE TECHNICAL ENVIRONMENT AND BY TESTING IT WITH LARGE DATASETS. COMPARED TO HADOOP, SPARK IS DESIGNED TO DO AS MUCH AS POSSIBLE THE TREATMENTS IN THE RAM.

WE PERFORMED COMPARATIVE TESTS WITH OUR X-MATCH SERVICE. IN A FIRST STEP WE USED AN INTERNAL AND LIMITED TEST BED TO LEARN AND TO GAIN THE NECESSARY EXPERIENCE TO OPTIMIZE THE PROCESS. IN A SECOND STEP WE DID THE TESTS WITH A RENTED EXTERNAL CLUSTER OF SERVERS.

AT THE END WE REACHED AN EXECUTION TIME BETTER THAN THE X-MATCH SERVICE. WE WILL DETAIL THIS EXPERIMENT STEP BY STEP AND SHOW THE CORRESPONDING METRICS.

WE WILL FOCUS ON THE BOTTLENECK WE ENCOUNTERED DURING THE SHUFFLE PHASE OF SPARK AND ESPECIALLY THE DIFFICULTY TO ENABLE THE « DATA CO-LOCATION » WHICH IS A WAY TO DECREASE THE DATA EXCHANGE BETWEEN THE NODES. FOLLOWING DISCUSSIONS AROUND SPARK, WE ARE NOW WORKING ON THE HARDWARE DEFINITION OF A NEW TEST BED AND ON THE USE OF SPARK 2.0, WHICH IS NEAR THE OFFICIAL RELEASE. WE HAVE ALSO STARTED TO EVALUATE DOCKER IN THE FRAME OF "BRINGING THE COMPUTING TO THE DATA". THE ENCAPSULATION OF THE COMPUTING ALGORITHMS IN DOCKER COMPONENTS COULD BE A SOLUTION TO DEPLOY QUICKLY AND EASILY A PROCESSING ENVIRONMENT NEAR THE DISTRIBUTED DATA (BASED ON HADOOP DISTRIBUTED FILE SYSTEM). WE PROPOSE AN OVERVIEW OF THE STUDY FROM A TECHNICAL AND BUDGETARY PERSPECTIVE.

014.1: ARNA KARICK

FREELANCE (FORMERLY SWINBURNE UNIVERSITY OF TECHNOLOGY)

BUILDING A COMMUNITY OF TECH SAVVY ASTRONOMERS IN THE ERA OF "BIG-DATA" AND "DATA SCIENCE"

THE RISE OF "BIG DATA" AND "DATA SCIENCE" IN THE TECHNOLOGY INDUSTRY AND ITS PREVALENCE IN ACADEMIC RESEARCH IS CREATING A NEW GENERATION OF SAVVY ASTRONOMERS, EAGER TO EXPLORE NEW APPROACHES, AND EMBRACE NEW TECHNIQUES AND DIGITAL TOOLS AND TO MANIPULATE, EXPLORE, ANALYSE, INTERPRET COMPLEX DATASETS.

THROUGH TECH-FOCUSSED CONFERENCES, COLLABORATIVE CODING, AND HACK EVENTS, THE NEXT-GENERATION ASTRONOMERS NOW HAVE A BROADER RANGE OF RESEARCH, PROGRAMMING AND SOFTWARE DEVELOPMENT SKILLS IN THEIR ARSENAL THAN TRADITIONALLY REQUIRED. EVENTS SUCH AS PYTHON IN ASTRONOMY; DOTASTRONOMY; ASTRO HACK WEEK; AAS, NAM AND SPIE HACK DAYS, SPACE HACK, SCICODER AND ANITA WORKSHOPS BRING TOGETHER A DIVERSE COMMUNITY OF ASTRONOMERS, INSTRUMENT SCIENTISTS, SOFTWARE DEVELOPERS, DATA ARCHIVISTS, WRANGLERS, AND EDUCATORS. THEY PROVIDE A FORUM FOR DISCUSSING THE LATEST TECH TOOLS, SHARING SKILLS AND INCREASING DIGITAL LITERACY, PROMOTING BEST PRACTISES IN SCIENTIFIC COMPUTING, AND THE OPPORTUNITY FOR ASTRONOMERS TO CREATE INNOVATIVE RESEARCH AND OUTREACH TOOLS IN A COLLABORATIVE ENVIRONMENT.

THIS TECH-FOCUSSED PHILOSOPHY OF HOW ASTRONOMY RESEARCH COULD BE DONE, HAS ENORMOUS BENEFITS TO "BIG-DATA" ASTRONOMY RESEARCH, FOR EXAMPLE BETTER-HANDING OF SKA, LSST AND JWST DATA PROCESSING AND PRODUCTS, AND TOOLS DEVELOPMENT TO MAXIMISE EARLY SCIENCE DISCOVERIES AND SOCIETAL IMPACT. WITH EXAMPLES, I WILL SHOW HOW MOMENTUM IS SLOWLY BUILDING IN THIS SPACE AND HIGHLIGHT THE MANY BENEFITS THAT COME WITH THIS NEW PHILOSOPHY; FROM BRIDGING THE GAP BETWEEN ASTRONOMERS, INSTRUMENT SCIENTISTS, SOFTWARE DEVELOPERS AND THE WIDER ADASS COMMUNITY, TO INCREASING ENGAGEMENT WITH THE TECH INDUSTRY, ENHANCING EVERYDAY ASTRONOMY RESEARCH PROJECTS, AND PROVIDING EARLY CAREER RESEARCHERS WITH THE CRITICAL TECH AND DATA SCIENCE SKILLS NEEDED FOR ALTERNATIVE CAREER PATHS IN OTHER SECTORS.

D1: MARK ALLEN

OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, UNIVERSITÉ DE STRASBOURG, CNRS, UMR 7550

CDS

THE CENTRE DE DONNÉES ASTRONOMIQUES DE STRASBOURG (STRASBOURG ASTRONOMICAL DATA CENTRE, CDS) PROVIDES A NUMBER OF REFERENCE ASTRONOMY SERVICES. SIMBAD IS THE REFERENCE DATABASE FOR THE IDENTIFICATION AND BIBLIOGRAPHY OF ASTRONOMICAL OBJECTS (OUTSIDE THE SOLAR SYSTEM); VIZIER IS A CATALOGUE SERVICE FOR LARGE SKY SURVEYS, CATALOGUES AND TABLES PUBLISHED IN ACADEMIC JOURNALS, AND INCREASINGLY FOR OTHER TYPES OF DATA "ATTACHED TO PUBLICATIONS"; THE ALADIN INTERACTIVE SKY ATLAS PROVIDES AN INTERACTIVE PORTAL FOR ACCESS TO COLLECTIONS OF IMAGES AND DATA AVAILABLE IN THE VIRTUAL OBSERVATORY; THE CDS FAST CROSS-MATCHING SERVICE PROVIDES CAPABILITIES FOR POSITIONAL CROSS-MATCHING OF VERY LARGE CATALOGUES. THIS BOOTH WILL PROVIDE LIVE DEMONSTRATIONS OF THESE SERVICES, AND ALSO PRACTICAL ADVICE ON ACCESSING THE CDS SERVICES VIA DIFFERENT INTERFACES. WE HIGHLIGHT USE OF THE HIERARCHICAL PROGRESSIVE SURVEYS (HIPS), A HEALPIX BASED SCHEME FOR IMAGES, CATALOGUES AND 3-DIMENSIONAL DATA CUBES, AND ITS USE IN ALADIN LITE. WE WELCOME THE OPPORTUNITY FOR INTERACTIONS AND FEEDBACK FROM THE ADASS COMMUNITY.

D2: JENS BJOERN BUSS

TU DORTMUND - ASTROPARTICLE PHYSICS

FACT-TOOLS (DEMO) – PROCESSING HIGH-VOLUME TELESCOPE DATA

THE FIRST G-APD CHERENKOV TELESCOPE (FACT) IS AN IMAGING ATMOSPHERIC CHERENKOV TELESCOPE (IACT) LOCATED ON THE ISLAND OF LA PALMA NEAR THE SUMMIT OF THE ROQUE DEL LOS MUCHACHOS. FACT'S PURPOSE IS THE MONITORING OF BRIGHT TEV BLAZARS IN THE NORTHERN SKY IN ORDER TO DETECT STATES OF HIGH ACTIVITY OF THESE SOURCES. MOREOVER, IT IS PIONEERING THE USE OF SILICON PHOTOMULTIPLIERS IN GAMMA-RAY ASTRONOMY.

IN ORDER TO COORDINATE MULTI-WAVELENGTH CAMPAIGNS, OTHER EXPERIMENTS NEED TO BE ALERTED QUICKLY IN CASE OF FLARING SOURCES. AT THE TELESCOPE SITE, A REAL-TIME DATA ANALYSIS IS RUNNING WHICH PERFORMS A RAW DATA ANALYSIS AND ONLINE APPLICATION OF MACHINE LEARNING ALGORITHMS TO DISTINGUISH SIGNAL EVENTS FROM BACKGROUND EVENTS. A WEB INTERFACE PROVIDES VISUALIZATIONS OF THE DATA USING THE D3 JAVASCRIPT LIBRARY. IT DISPLAYS THE TELESCOPE STATUS, DATA RATES AND ANALYSIS RESULTS IN REAL TIME. THE HIGH PERFORMANCE REQUIREMENTS FOR THE REAL-TIME ANALYSIS ARE MET BY USE OF A DISTRIBUTED DATA STREAMING ENGINE CALLED THE STREAMS-FRAMEWORK. IT IS A MODULAR DATA STREAMING ENVIRONMENT WORKING IN CONJUNCTION WITH POPULAR BIG DATA SOLUTIONS FOR DISTRIBUTED COMPUTING LIKE APACHE SPARK. THE STREAMS-FRAMEWORK EXPLICITLY MODELS THE DATA AND CONTROL FLOW AS A GRAPH USING EDGES AND NODES. THESE CAN BE VISUALIZED BY A DASHBOARD LIKE GRAPHICAL USER INTERFACE.

IN ADDITION TO THE REAL-TIME ANALYSIS OF THE TELESCOPE DATA, OFFLINE COMPUTATIONS ON THE TELESCOPE DATA HAVE TO BE DONE, E.G., TO TEST NEW RECONSTRUCTION ALGORITHMS ON OLDER DATA OR TO APPLY ADVANCED ANALYSIS TECHNIQUES. SOME OF THESE TASKS CAN, COMPUTATIONALLY, BE TOO EXPENSIVE TO BE DONE IN THE REAL-TIME CASE WITH THE LIMITED RESOURCES ON THE ROQUE DE LOS MUCHACHOS. AT THIS POINT, THE INTEROPERABILITY OF THE STREAMS FRAMEWORK WITH MODERN LARGE-SCALE BIG DATA FRAMEWORKS LIKE APACHE HADOOP OR SPARK IS A BIG ADVANTAGE.

THIS DEMO WILL SHOW HOW THE DATA ANALYSIS PIPELINE FOR FACT'S DATA IS SETUP WITH THE STREAMS-FRAMEWORK. PROGRESS AND STATE CAN BE MONITORED VIA A DASHBOARD WHICH ALSO VISUALIZES THE DATA FLOW. MOREOVER, THE DEMO WILL SHOW A MOCKUP OF THE RUNNING SYSTEM AS WELL AS THE MENTIONED STATUS WEBSITE WITH REAL-TIME ANALYSIS RESULTS.

D3: GIUSEPPE CIMO

JIVE - JOINT INSTITUTE FOR VLBI ERIC; ASTRON - NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY. DWINGELOO, THE NETHERLANDS

ASTERICS - ASTRONOMY ESFRI AND RESEARCH INFRASTRUCTURE CLUSTER

THE ASTRONOMY ESFRI AND RESEARCH INFRASTRUCTURE CLUSTER, ASTERICS, BRINGS TOGETHER ASTRONOMERS AND ASTROPARTICLE PHYSICISTS OF 23 EUROPEAN INSTITUTES TO HELP WORLD-LEADING FACILITIES, SUCH AS SKA, CTA, KM3NET, AND E-ELT, WORK TOGETHER TO FIND COMMON SOLUTIONS TO THEIR BIG DATA CHALLENGES, THEIR INTEROPERABILITY AND SCHEDULING, AND THEIR DATA ACCESS.

MAJOR GOAL OF ASTERICS IS THE DEVELOPMENT OF COMMON SOLUTIONS FOR STREAMING DATA PROCESSING AND EXTREMELY LARGE DATABASES BY MAXIMISING SOFTWARE RE-USE AND CO-DEVELOPMENT OF TECHNOLOGY FOR THE ROBUST AND FLEXIBLE HANDLING OF HUGE DATA STREAMS. CRITICAL FOR REACHING THIS GOAL IS THE CREATION OF AN OPEN INNOVATION ENVIRONMENT FOR ESTABLISHING OPEN STANDARDS AND SOFTWARE LIBRARIES FOR MULTI-WAVELENGTH/MULTI-MESSENGER DATA. CROSS-FACILITY COORDINATION IS CRUCIAL IN TERMS OF RESPONSE TO MULTI-MESSENGER TRANSIENT ALERTS. THEREFORE, ASTERICS IS DEVELOPING INNOVATIVE METHODS FOR RELAYING ALERTS, WHICH WILL SIGNAL THE DETECTION OF TRANSIENT EVENT BETWEEN FACILITIES FOR JOINT OBSERVING PROGRAMMES. IN PREPARATION FOR THE ERA OF MULTI-MESSENGER OBSERVATIONS, ASTERICS ADDRESSES COMMON CHALLENGES TO CONNECTIVITY, SYNCHRONISATION, AND SCHEDULING.

FINALLY ASTERICS AIMS TO OPEN UP MULTI-WAVELENGTH AND MULTI-MESSENGER ASTRONOMY TO SCIENTISTS, THROUGH THE VIRTUAL OBSERVATORY BY ADAPTING THE VO FRAMEWORK AND TOOLS TO THE ESFRI PROJECT NEEDS, AND TO THE GENERAL PUBLIC, WHICH IS NOT ONLY SEEN AS TARGET FOR OUTREACH BUT AS A RESEARCH TOOL BY MEANS OF CITIZEN SCIENCE MASS PARTICIPATION EXPERIMENTS.

D4: PATRICK DOWLER

CADC, NATIONAL RESEARCH COUNCIL CANADA

THE COMMON ARCHIVE OBSERVATION MODEL: OPEN SOURCE MODEL AND INFRASTRUCTURE

CAOM IS AN OPEN SOURCE MODEL AND OPEN SOURCE CODEBASE THAT ACTS AS THE FOUNDATION OF A COMPLETE ASTRONOMY DATA CENTRE. CAOM IS EVOLVING TO MEET THE DEMANDS OF BOTH DATA VARIETY AND THE NEEDS OF SCIENCE USERS, SCIENCE TEAMS, AND DATA CENTRE OPERATIONS.

WE WILL PROVIDE AN INFORMAL OVERVIEW AND DISCUSSION OF CAOM: THE MODEL, THE AVAILABLE CODE, AND THE COMMUNITY.

D5: FABRIZIO GIORDANO

ESA-ESAC EUROPEAN SPACE ASTRONOMY CENTRE

ESAC SCIENCE DATA CENTRE

THE ESAC SCIENCE DATA CENTRE PROVIDES SERVICES AND TOOLS TO ACCESS AND RETRIEVE OBSERVATIONS AND DATA FROM ALL ESA SPACE SCIENCE MISSIONS (ASTRONOMY, PLANETARY SCIENCE AND HELIOPHYSICS). WE HAVE RECENTLY DEVELOPED A NEW SUITE OF USER-FRIENDLY WEB-BASED APPLICATIONS THAT ARE EASY TO USE AND ALLOW THE SEAMLESS EXPLOITATION OF THE SCIENTIFIC DATA FROM CURRENT AND PAST ESA ASTROPHYSICS MISSIONS. WE WILL OFFER INTERACTIVE DEMONSTRATIONS OF SOME OF THESE NEW SERVICES, INCLUDING THE EUROPEAN HUBBLE SCIENCE ARCHIVE, THE GAIA ARCHIVE, THE PLANCK LEGACY ARCHIVE, THE XMM-NEWTON SCIENCE ARCHIVE AND ESASKY, WHICH PROVIDES FULL ACCESS TO THE ENTIRE SKY AS OBSERVED WITH ESA (AND OTHER) MISSIONS.

D6: JAI WON KIM

JHU

SCISERVER/COMPUTE: BRING ANALYSIS CLOSE TO THE DATA

WE PRESENT A DEMO THAT ILLUSTRATES THE CAPABILITIES OF SCISERVER/COMPUTE. SCISERVER/COMPUTE IS A COMPONENT OF SCISERVER, A BIG-DATA INFRASTRUCTURE PROJECT DEVELOPED AT JOHNS HOPKINS UNIVERSITY THAT WILL PROVIDE A COMMON ENVIRONMENT FOR SHARABLE COMPUTATIONAL RESEARCH.

SCISERVER/COMPUTE USES JUPYTER NOTEBOOKS RUNNING WITHIN SERVER-S¬IDE DOCKER CONTAINERS ATTACHED TO BIG DATA COLLECTIONS IN RELATIONAL DATABASES AND FILE STORAGE TO BRING ADVANCED ANALYSIS CAPABILITIES CLOSE TO THE DATA. APART FROM INTERACTIVE NOTEBOOKS IN PYTHON, R AND MATLAB, SCISERVER/COMPUTE OFFERS AN API FOR RUNNING ASYNCHRONOUS TASKS, ALSO IN DOCKER CONTAINERS.

SCISERVER/COMPUTE CONTAINS CUSTOM LIBRARIES FOR ACCESSING DATABASES AVAILABLE IN CASJOBS AS WELL AS VARIOUS STORAGE SYSTEMS. SCISERVER/MYSCRATCH PROVIDES TERABYTES OF SCRATCH STORAGE SPACES AND SCISERVER/SCIDRIVE OFFERS A DROPBOX LIKE SERVICE FOR LONG TERM STORAGE OF SCIENTIFIC RESULTS. THESE COMPONENTS ARE ACCESSIBLE THROUGH A SINGLE-SIGN-ON MECHANISM.

SCISERVER SUPPORTS A RANGE OF SCIENTIFIC DISCIPLINES AND IT INTEGRATES LARGE EXISTING DATABASES AND FILE COLLECTIONS IN THE FIELDS OF ASTRONOMY, COSMOLOGY, TURBULENCE, GENOMICS, OCEANOGRAPHY AND MATERIALS SCIENCE.

THE DEMO WILL HIGHLIGHT THE DATA FLOW BETWEEN VARIOUS COMPONENTS OF SCISERVER INCLUDING FILE STORAGE, DATABASE, AND COMPUTE WITH DATA SETS FROM DIVERSE SCIENTIFIC FIELDS.

D9: LARS LUNDIN

ESO - EUROPEAN SOUTHERN OBSERVATORY

ESO-REFLEX FOR THE VERY LARGE TELESCOPE

ESO-REFLEX FOR THE VERY LARGE TELESCOPE

WE PRESENT ESO-REFLEX, A GRAPHICAL TOOL FOR REDUCING VLT/VLTI SCIENCE DATA USING THE ESO PIPELINES.

ESO-REFLEX IS BASED ON THE CONCEPT OF A SCIENTIFIC WORKFLOW, BUILT UPON THE KEPLER WORKFLOW SYSTEM, AND IS USED FOR THE DEVELOPMENT OF DATA REDUCTION WORKFLOWS BASED ON THE ESO COMMON PIPELINE LIBRARY FOR ALL NEW VLT INSTRUMENTS. THE DATA REDUCTION CASCADE IS RENDERED GRAPHICALLY AND DATA SEAMLESSLY FLOW FROM ONE PROCESSING STEP TO THE NEXT. THE DATA ORGANIZATION NECESSARY TO REDUCE THE DATA IS BUILT INTO THE SYSTEM AND IS FULLY AUTOMATIC. IT IS DISTRIBUTED WITH A NUMBER OF COMPLETE TEST DATASETS SO THAT USERS CAN IMMEDIATELY START EXPERIMENTING AND FAMILIARIZE THEMSELVES WITH THE SYSTEM.

D7: CHRISTOPHER ANDREW ZAPART

NAOJ - NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN, MITAKA, TOKYO, JAPAN

ALMAWEBQL V2: A MODERN INTERACTIVE CLIENT-SERVER ARCHITECTURE FOR FAST PREVIEWING OF LARGE ALMA DATASETS

WE DEMONSTRATE A RE-DESIGNED VERSION 2.1 OF THE ALMA WEBQL WEB SERVICE - AVAILABLE THROUGH THE JVO ALMA FITS ARCHIVE - WHICH ALLOWS USERS TO PREVIEW ALMA FITS FILES OF ANY SIZE WITHOUT HAVING TO DOWNLOAD LARGE AMOUNTS OF DATA TO USER PCS. LARGE FITS FILES (I.E. > 20GB) CAN BE PREVIEWED SMOOTHLY IN A WEB BROWSER RUNNING ON A RELATIVELY LOW-SPEC CLIENT PC. USERS CAN INTERACTIVELY ZOOM-IN TO SELECTED AREAS OF INTEREST WITH THE CORRESPONDING FREQUENCY SPECTRUM UPDATED IN NEAR REALTIME (NETWORK CONNECTION-DEPENDENT). AT A GLANCE USERS GAIN ACCESS TO LARGE IMAGES AS WELL AS THE CORRESPONDING FREQUENCY SPECTRA THAT ARE VISIBLE BOTH AT THE SAME TIME.

THE ALMA WEBQL SERVICE ADHERES TO A MODERN CLIENT-SERVER ARCHITECTURE. A FAST FITS PROCESSING WEB APPLICATION SERVER RUNS A CUSTOM C/C++ HTTP DAEMON DEVELOPED IN-HOUSE ON TOP OF THE OPEN-SOURCE GNU LIBMICROHTTPD C LIBRARY. THE CLIENT (A WEB BROWSER) IS A RICH INTERACTIVE INTERNET APPLICATION BUILT ON AJAX, HTML5 AND SVG STANDARDS. IN ORDER TO FACILITATE FAST ON-DEMAND VIEWING OF LARGE ALMA DATASETS, FITS FILES ARE CACHED LOCALLY USING NVME PCI EXPRESS SOLID STATE DRIVES HOUSED IN THE ALMA WEBQL SERVER. LARGE FITS FILES CAN THEREFORE BE LOADED BY THE ALMA WEBQL APPLICATION AT SPEEDS OVER SEVERAL GIGABYTES PER SECOND.

THE LATEST VERSION 2.1 GIVES A CHOICE OF DIFFERENT COLOURMAPS, PRINTING SUPPORT (WORKS BEST IN FIREFOX), AUTOMATIC INTEGRATION WITH THE LOVAS MOLECULAR DATABASE, DISABLING Y-AXIS AUTOSCALE, SYNTHESIZED BEAM OVERLAY AND MANUAL REFERENCE FREQUENCY/SOURCE VELOCITY CORRECTIONS.

P3.1: KAREL ADÁMEK

OXFORD E-RESEARCH CENTRE, UNIVERSITY OF OXFORD, OXFORD

A REAL-TIME SINGLE PULSE DETECTION ALGORITHM FOR GPUS

DETECTING NON-REPEATING EVENTS IN THE RADIO SPECTRUM HAS BECOME INCREASINGLY IMPORTANT IN RADIO ASTRONOMY OVER THE LAST DECADE DUE TO THE DISCOVERY OF FAST RADIO BURSTS (FRBS). BECAUSE WE DO NOT KNOW THE SIGNAL PROPERTIES A PRIORI, WE CHOOSE TO USE A SERIES OF BOXCAR FILTERS OF DIFFERING LENGTHS. THE BOXCAR FILTER MATCHING THE SINGLE PULSE WIDTH OF A SIGNAL PRESENT IN THE DATA SWEEPS UP THE SIGNAL LIFTING IT OUT OF THE BACKGROUND NOISE. GIVEN THE VAST DATA RATES OF NEXT GENERATION RADIO TELESCOPES AND THE NUMBER OF COMPUTATIONAL OPERATIONS REQUIRED BY BOXCAR FILTERING, TO ACHIEVE REAL-TIME DETECTION THE USE OF HIGH PERFORMANCE COMPUTING TECHNIQUES AND HARDWARE IS REQUIRED. WE HAVE IMPLEMENTED A GPU SINGLE PULSE DETECTION ALGORITHM, FOR NVIDIA GPUS, WHICH USE BOXCAR FILTERS OF VARYING WIDTHS. OUR CODE PERFORMS THRESHOLDING BASED ON THE SIGNAL-TO-NOISE RATIO PRODUCED BY A BOXCAR FILTER OF A GIVEN WIDTH AND PRESENTS THE HIGHEST SIGNAL-TO-NOISE RATIO DETECTED IN THE DATA. WE PRESENT OUR PARALLEL IMPLEMENTATION OF OUR SINGLE PULSE DETECTION ALGORITHM, ALONG WITH PERFORMANCE RESULTS FOR SKA LIKE DATA.

P8.30: FRANÇOIS AGNERAY

CNRS - LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE, MARSEILLE, FRANCE

ASTRONOMICAL INFORMATION SYSTEM V3

ANIS (ASTRONOMICAL INFORMATION SYSTEM) IS A WEB GENERIC TOOL DEVELOPED AT CESAM TO FACILITATE AND STANDARDIZE THE IMPLEMENTATION OF ASTRONOMICAL DATA OF VARIOUS KINDS THROUGH PRIVATE AND/OR PUBLIC DEDICATED INFORMATION SYSTEMS. THE ANIS ARCHITECTURE IS COMPOSED OF A DATABASE SERVER WHICH CONTAINS THE PROJECT DATA, A WEB USER INTERFACE TEMPLATE WHICH PROVIDES HIGH LEVEL SERVICES (SEARCH, EXTRACT AND DISPLAY IMAGING AND SPECTROSCOPIC DATA USING A COMBINATION OF CRITERIA, AN OBJECT LIST, A SQL QUERY MODULE OR A CONE SEARCH INTERFACES), A FRAMEWORK COMPOSED OF SEVERAL PACKAGES, AND A METADATA DATABASE MANAGED BY A WEB ADMINISTRATION ENTITY.

A NEW VERSION OF ANIS IS CURRENTLY IN DEVELOPMENT AND THE MAIN GOAL FOR THIS NEW IMPLEMENTATION IS TO PROVIDE SEVERAL WEB SERVICES ACCESS. INDEED THE NEW VERSION IS BASED ON A RESTFUL ARCHITECURE AND USERS OR SOFTWARES WILL BE ABLE TO CALL ANIS SERVER VIA URLS. FINALLY USER INTERFACE WAS REDESIGNED IN SINGLE PAGE APPLICATION (SPA) IN ORDER TO STREAMLINE THE USER EXPERIENCE.

P8.1: ALICE ALLEN

ASTROPHYSICS SOURCE CODE LIBRARY

ASTROPHYSICS SOURCE CODE LIBRARY: HERE WE GROW AGAIN!

THE ASTROPHYSICS SOURCE CODE LIBRARY (ASCL) IS A FREE ONLINE REGISTRY OF CODES USED IN RESEARCH; IT IS INDEXED BY ADS AND WEB OF SCIENCE AND HAS OVER 1300 CODE ENTRIES. ITS ENTRIES ARE INCREASINGLY USED TO CITE SOFTWARE; CITATIONS HAVE BEEN AT LEAST DOUBLING EACH YEAR SINCE 2012, AND EVERY MAJOR ASTRONOMY JOURNAL ACCEPTS CITATIONS TO THE ASCL. CODES IN THE RESOURCE COVER ALL ASPECTS OF ASTROPHYSICS RESEARCH AND MANY PROGRAMMING LANGUAGES ARE REPRESENTED. IN THE PAST YEAR, THE ASCL HAS ADDED DASHBOARDS FOR USERS AND ADMINISTRATORS, STARTED MINTING DOIS FOR CODES IT HOUSES, AND ADDED METADATA FIELDS REQUESTED BY USERS. THIS PRESENTATION COVERS THE ASCL'S GROWTH IN THE PAST YEAR AND THE OPPORTUNITIES AFFORDED TO IT AS ONE OF THE FEW DOMAIN LIBRARIES FOR SCIENCE RESEARCH CODES, AND WILL SOLICIT IDEAS FOR NEW FEATURES.

P1.1: ANDREY ANDRIANOV

ASC LPI(ASTRO SPACE CENTER OF LEBEDEV PHYSICAL INSTITUTE)

ASC CORRELATOR AND ASTRO SPACE LOCATOR SOFTWARE: DATA PROCESSING IN "RADIOASTRON" MISSION.

THE "RADIOASTRON" SPACE MISSION IS THE UNIQUE PROJECT OF RUSSIAN SPACE AGENCY (ROSCOSMOS) AND RUSSIAN ACADEMY OF SCIENCES TO INVESTIGATE THE UNIVERSE BY MEANS OF VLBI IMPLEMENTATION WITH "SPEKTR-R" SPACE SATELLITE. "SPEKTR-R" ONBOARD 10-M RADIO TELESCOPE HAS BEEN OPERATING SINCE 15 NOVEMBER, 2011 AS THE SPACE ELEMENT OF THE SPACE-GROUND INTERFEROMETER AT THE ORBIT WITH ITS APOGEE UP TO 350000 KM. THE FIRST AND THE BASIC STEP IN VLBI DATA PROCESSING IS CORRELATION. SPACE-VLBI BRINGS NEW REQUIREMENTS TO THE CORRELATION PROCESS DUE TO SIGNIFICANT UNCERTAINTIES IN DELAY MODEL FOR SPACE TELESCOPE. "RADIOASTRON" MISSION CORRELATOR IS A PART OF ASL (ASTRO SPACE LOCATOR) SOFTWARE PACKAGE, WHICH WAS DEVELOPED IN ASTRO SPACE CENTER (ASC) OF LEBEDEV PHYSICAL INSTITUTE. IN THIS REPORT THE MAIN FEATURES AND OPERATIONAL PROCEDURES OF THE ASC CORRELATOR ARE DESCRIBED WITH THE EMPHASIS ON THE SPACE-VLBI DATA-PROCESSING DIFFERENCES COMPARED TO THE GROUND VLBI. IT INCLUDES A TIME DELAY AND ITS DERIVATIVES CALCULATION ALGORITHM AND THE PROCEDURE OF CORRECTION FOR THESE PARAMETERS. THIS APPROACH IS CRITICAL FOR THE CORRELATION OF SPACE-GROUND INTERFEROMETER DATA. IN THIS REPORT WE ALSO SHOW THE IMPORTANCE OF THE ORBIT ACCURACY AND CORRELATOR REQUIREMENTS FOR THE FUTURE SPACE-VLBI MISSIONS, SUCH AS THE "MILLIMETRON" PROJECT.

ALSO, WE DESCRIBE THE MAIN FEATURES OF ASL SOFTWARE PACKAGE, WHICH IS AN UNIQUE SET OF SOFTWARE INSTRUMENTS AND TOOLS FOR VLBI DATA REDUCTION, CALIBRATION AND VLBI IMAGING DECONVOLUTION.

P4.1: MARIA AREVALO SANCHEZ

ESA/ESAC

DISCOVERING EUROPEAN HUBBLE SCIENCE ARCHIVE DATA

THE EUROPEAN HUBBLE SCIENCE ARCHIVE IS LOCATED AT ESAC SCIENCE DATA CENTRE (ESDC), WHERE IT HAS BEEN COMPLETELY REENGINEERED AND REDESIGNED, AND IT IS NOW FULLY INTEGRATED WITH THE REST OF THE ESA SCIENCE ARCHIVES FOR ASTRONOMICAL MISSIONS, TO ENSURE LONG PRESERVATION AND MAINTENANCE OF THE HUBBLE DATA: OVER 1.2 MILLION OBSERVATIONS FROM 10 DIFFERENT SCIENTIFIC INSTRUMENTS THAT CONFORM A TREASURE OF ASTRONOMICAL DATA.

ALL THE PUBLIC HST DATA, HUBBLE LEGACY ARCHIVE AND HIGH-LEVEL SCIENCE DATA PRODUCTS ARE AVAILABLE TO THE USER FROM THE FROM THE EUROPEAN HST ARCHIVE (EHST), RELEASED IN OCTOBER 2015. IN ADDITION TO THE DEDICATED ARCHIVE, THE ESDC OFFERS HUBBLE SCIENCE ARCHIVE DATA FROM THE ESASKY TOOL, AND THE HUBBLE SOURCE CATALOGUE INTO THE GAIA ARCHIVE. BOTH VISUALIZATION AND SCIENCE RETURN POSSIBILITIES BECOME NOW GREATER THAN EVER.

WE PRESENT HERE ALL THE MEANS THAT THE ESAC SCIENCE DATA CENTRE OFFERS TO THE ASTRONOMY COMMUNITY INTERESTED IN HUBBLE SCIENCE ARCHIVE DATA, AS WELL AS THE NEW FEATURES RECENTLY INCORPORATED INTO THE EHST.

P8.2: ROBERTO JOSE AVILA

STSCI - SPACE TELESCOPE SCIENCE INSTITUTE, BALTIMORE, MD

SBC POINT SPREAD FUNCTIONS AND ENCIRCLED ENERGY CURVES

WE PRESENT UPDATED POINT SPREAD FUNCTIONS (PSF) FOR THE ADVANCED CAMERA FOR SURVEYS SOLAR BLIND CHANNEL (ACS/SBC). THE CURRENTLY AVAILABLE PSF MODELS (VIA TINY TIM) WERE DERIVED DURING GROUND TESTING AND WERE NEVER UPDATED ONCE THE INSTRUMENT WAS PUT IN ORBIT. AS PART OF A CAMPAIGN TO IMPROVE THE INSTRUMENT CALIBRATIONS, WE OBSERVED A WHITE DWARF USING THREE FILTERS (F125LP, F140LP, F150LP) AND DERIVED NEW PSFS. THE NEW PSFS CONTAIN MORE FLUX IN THE WINGS THAN THE TINY TIM MODELS. WE ALSO GENERATED NEW ENCIRCLED ENERGY CURVES, OF WHICH ONLY TWO FILTERS WERE AVAILABLE. WITH THESE NEW MEASUREMENTS IN HAND, A MORE ACCURATE ABSOLUTE FLUX CALIBRATION CAN BE DETERMINED.

P3.2: ELLIOTT AYLING

SCHOOL OF CREATIVE TECHNOLOGIES, UNIVERSITY OF PORTSMOUTH, UNITED KINGDOM

ACCELERATED DISTRIBUTED VISUALISATION IN THE THEORETICAL ASTROPHYSICAL OBSERVATORY (TAO)

MOCK OBSERVATIONS OF GALAXY SURVEY DATA ARE AN INTEGRAL PART OF MODERN ASTRONOMICAL ANALYSIS. THEIR CREATION DEMANDS EXPERT KNOWLEDGE OF GALAXY MODELLING AND SIMULATION, AS WELL AS ACCESS TO HIGH PERFORMANCE COMPUTING (HPC). CONSEQUENTLY, IT IS A NON TRIVIAL TASK FOR OBSERVERS TO QUICKLY BUILD MOCK CATALOGUES SUITED TO THEIR NEEDS. THE THEORETICAL ASTROPHYSICAL OBSERVATORY (TAO) IS A VIRTUAL LABORATORY THAT PROVIDES A PIPELINE TO BUILD SUCH MOCK OBSERVATIONS AND OTHER DERIVED DATA PRODUCTS BASED ON DIFFERENT COSMOLOGICAL DARK MATTER SIMULATIONS AND SEMI-ANALYTIC GALAXY FORMATION MODELS. TAO INTUITIVE INTERFACE HIDES THE COMPLEXITY OF ITS DISTRIBUTED BACK-END AND PROVIDES AN EASY-TO-USE MECHANISM TO CONTROL ITS PROCESSING PIPELINES.

BRINGING ANALYSIS AND POST-PROCESSING CODES TO THE DATA IS THE PREFERRED SOLUTION FOR CUTTING EDGE BIG-DATA PROBLEMS IN ASTRONOMY. SUCH A SOLUTION IS NOT EASY TO ACHIEVE - ESPECIALLY ON MODERN MASSIVELY PARALLEL HETEROGENEOUS ARCHITECTURES. THE MAJORITY OF ASTRONOMERS OFTEN HAVE LITTLE OR NO KNOWLEDGE ON HOW TO BUILD COMPLEX LARGE-SCALE DATA ANALYSIS PIPELINES OR INTERACT WITH SUCH PLATFORMS. OUR PAPER DESCRIBES RECENT WORK TOWARDS WEB-BASED INTERACTIVE VISUAL EXPLORATION OF LARGE DATASETS IN TAO TO UNDERPIN BETTER EXPLOITATION OF ITS HIGH-PERFORMANCE DATA ANALYSIS AND PROCESSING PIPELINES.

THIS WORK FULLY INTEGRATES THE HIGH PERFORMANCE VOLUME RENDERING TECHNIQUE, SPLOTCH, WITHIN THE STANDARD TAO PIPELINE. SPLOTCH IS A RAY-CASTING APPROACH FOR VISUALIZING COMPLEX AND MULTIVARIATE LARGE-SCALE POINT CLOUDS AND IS IN CONTINUOUS DEVELOPMENT, TAKING INTO ACCOUNT EMERGING TECHNOLOGIES (E.G. GPUS, XEON PHI) AND HPC SOLUTIONS (E.G. MASSIVELY PARALLEL AND HETEROGENEOUS ARCHITECTURES). THROUGH A SMART COMBINATION OF CUDA, OPENMP AND MPI, AS WELL AS GPI, SPLOTCH IS HIGHLY SCALABLE AND CAPABLE OF PROCESSING HUNDREDS OF TBS WHILST KEEPING COMPUTATIONAL TIMES AT ACCEPTABLE LEVELS.

WE OUTLINE HOW SPLOTCH WAS ADAPTED TO ACCOMMODATE SPECIFIC TAO REQUIREMENTS AS A MEANS OF VISUAL EXPLORATION AND DISCOVERY FOR QUICKLY GAINING AN UNDERSTANDING OF LARGE DATASETS BY END USERS, THUS FACILITATING EFFECTIVE SELECTION OF TAO CONTENT FOR FURTHER QUANTITATIVE ANALYSIS. WE DISCUSS WORK TO EXPOSE FUNCTIONALITIES THROUGH A WEB INTERFACE BASED ON DJANGO GIVING NON TECHNICAL TAO USERS THE POSSIBILITY TO DEPLOY SPLOTCH IN AN HPC ENVIRONMENT FOR EASY ACCESS TO STATE-OF-THE-ART SIMULATED DATA FOR A WIDER USER BASE OF ASTRONOMERS.

P7.1: PHILIPPE BACON

CNRS ASTROPARTICULE ET COSMOLOGIE UNIVERSITE PARIS DIDEROT

PROSPECTS ABOUT X- AND GAMMA-RAY COUNTERPARTS OF GRAVITATIONAL WAVE SIGNALS WITH INTEGRAL

BY EXTRAPOLATING THE NUMBER OF DETECTIONS MADE DURING THE FIRST LIGO SCIENCE RUN, TENTHS OF GRAVITATIONAL WAVE SIGNALS FROM BINARY BLACK HOLE MERGERS ARE ANTICIPATED IN UPCOMING LIGO VIRGO SCIENCE RUNS. FINDING AN ELECTROMAGNETIC COUNTERPART TO COMPACT BINARY MERGER EVENTS WOULD BE A LANDMARK DISCOVERY. THE SEARCH FOR SUCH COUNTERPART IS CHALLENGING FOR A NUMBER OF REASONS, SUCH AS THE POOR RESOLUTION OF SOURCE POSITION RECONSTRUCTION FROM THE GRAVITATIONAL WAVE OBSERVATIONS ALONE, AND THE WEAKNESS OF THE EXPECTED ELECTROMAGNETIC SIGNAL. IN THIS POSTER, WE EVALUATE THE ABILITY OF CURRENT WIDE-FIELD X- AND GAMMA-RAY TELESCOPES ABOARD INTEGRAL TO FIND SUCH COUNTERPARTS. WE PRESENT THE RESULT OF AN END-TO-END SIMULATION FOR ESTIMATING THE FRACTION OF THE SOURCES THAT CAN BE FOLLOWED UP, AND THE FRACTION OF COUNTERPARTS THAT CAN BE DETECTED BASED ON DIFFERENT MODELS.

P1.2: JI-HYE BAEK

KOREA ASTRONOMY AND SPACE SCIENCE INSTITUTE

ANALYSIS TOOL USING RUNNING-DIFFERENCE POLAR REPRESENTATION OF SDO BIG DATA

WE HAVE DEVELOPED A SOFTWARE TOOL TO DETECT CORONAL FEATURES AUTOMATICALLY USING THE POLAR REPRESENTATION OF SOLAR DYNAMICS OBSERVATORY (SDO) DATA. WE FOCUSED ON THE OFF-LIMB SOLAR FEATURES WHICH SHOWS VIVID CONFIGURATION OF CORONAL FEATURE WITH HEIGHT. WE HAVE APPLIED THIS METHOD TO 12-SECOND CADENCE IMAGES OBTAINED BY SDO. THE SOFTWARE CONSISTS OF THREE PARTS: THE CREATION NEW IMAGES SUCH AS DIFFERENCE IMAGES AND POLAR REPRESENTATION, DETECTION OF CORONAL FEATURES, AND VISUALIZATION DATA SET. WE PARALLELIZED COMPUTING PROCESS FOR CREATING RUNNING DIFFERENCE AND POLAR REPRESENTATION BECAUSE SDO PRODUCES HUGE AMOUNT OF DATA ABOUT 1.5 TB A DAY. THE OUTPUT OF THIS SOFTWARE WILL EXPAND THE CORONAL FEATURE CATALOG, SEARCH ENGINE AND VIEWING SERVICE. WE EXPECT THAT THE ALGORITHM OF THIS TOOL WOULD BE CORONAL MASS EJECTIONS (CMES) DETECTION USING CORONAGRAPH DATA.

P2.1: CARLO BAFFA

INAF - OSERVATORIO ASTROFISICO DI ARCETRI

SKA MONITOR AND CONTROL: HARMONIZATION CHALLENGES

THE SQUARE KILOMETRE ARRAY (SKA) PROJECT IS AN INTERNATIONAL EFFORT TO BUILD THE WORLD'S LARGEST RADIO TELESCOPE, WITH EVENTUALLY OVER A SQUARE KILOMETRE OF COLLECTING AREA. THE PROJECT IS ONE OF THE LARGEST SCIENTIFIC ENDEAVOURS IN HISTORY AND WILL BRING TOGETHER CLOSE TO 100 ORGANIZATIONS FROM 20 COUNTRIES.

THIS IS WHY A RECENT DECISION HAS INTRODUCED (SKA-WIDE) A COHERENT APPROACH TO THE MONITORING AND CONTROL TASK. A DEDICATED WORKSHOP, HELD IN TRIESTE, HAS INDICATED AS THE TOOL OF CHOICE TANGO CONTROL FRAMEWORK.

THIS PROJECT IS SO LARGE THAT MANAGING, IN PSEUDO-REAL TIME, THE ENSEMBLE OF INTERACTING HARDWARE AND SOFTWARE IS EXTREMELY COMPLEX. ONCE WE HAVE IDENTIFIED THE RIGHT TOOL TO SOLVE IT, THE CURRENT CHALLENGE IS TO FIND THE SMARTEST STRATEGIES TO IMPLEMENT THE WHOLE SKA PROJECT BY USING THE TANGO CONTROL FRAMEWORK

IN PARTICULAR WE ARE DEVELOPING A UNIFORM CLASS SCHEMA PROPOSAL AND SOME ALTERNATIVE APPROACHES TO PROGRAM AND CONTROL THE COMPLEX SUBSYSTEMS WHICH CONSTITUTES A LARGE PART OF SKA.

P5.1: SYLVIA M. BAGGETT

STSCI - SPACE TELESCOPE SCIENCE INSTITUTE, BALTIMORE, MARYLAND

MITIGATING RADIATION DAMAGE EFFECTS IN THE HST/WFC3 CCD DETECTORS

CCD DETECTORS IN LOW-EARTH ORBIT ARE KNOWN TO SUFFER FROM ACCUMULATING RADIATION DAMAGE AND THE HUBBLE SPACE TELESCOPE WIDE FIELD CAMERA 3 (HST/WFC3) IS NO EXCEPTION. IN WFC3/UVIS, THE DAMAGE PRODUCES A GROWING HOT-PIXEL POPULATION ALONG WITH CHARGE TRAPS THAT CAUSE A PROGRESSIVE LOSS IN CHARGE-TRANSFER EFFICIENCY (CTE) OVER TIME. THE CTE DECLINE RESULTS IN BOTH A REDUCTION OF THE DETECTED SOURCE FLUXES AS WELL AS A SYSTEMATIC SHIFT IN THE MEASURED SOURCE CENTROIDS, AND THE IMPACT CAN BE SUBSTANTIAL, PARTICULARLY FOR FAINT SOURCES IN LOW-BACKGROUND IMAGES. IN THIS REPORT, WE SUMMARIZE THE STATE OF THE RADIATION-DAMAGE EFFECTS IN WFC3/UVIS AND DISCUSS THE AVAILABLE MITIGATION OPTIONS, WITH A FOCUS ON THE ALGORITHM AND SOFTWARE THAT COMPRISE THE PIXEL-BASED CTE CORRECTION AVAILABLE IN THE AUTOMATED WFC3 CALIBRATION PIPELINE IN 2016.

P3.3: VERONICA BALDINI

INAF - OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

A PLC DISTRIBUTED LAYOUT: THE CASE OF THE INSTRUMENT CONTROL ELECTRONICS OF ESPRESSO

ESPRESSO, THE ECHELLE SPECTROGRAPH FOR ROCKY EXOPLANET AND STABLE SPECTROSCOPIC OBSERVATIONS OF THE EUROPEAN SOUTHERN OBSERVATORY (ESO), IS PASSING THE INTEGRATION PHASE IN GENEVA BEFORE BEING SHIPPED TO CHILE AND INSTALLED AT THE VERY LARGE TELESCOPE (VLT) SITE ON THE CERRO PARANAL.

IT IS GOING TO BE ONE OF THE FIRST PERMANENT INSTRUMENTS OF VLT WITH A DISTRIBUTED CONTROL ELECTRONICS BASED ON BECKHOFF PLCS.

ABOUT 40 MOTORIZED STAGES, MORE THAN 90 SENSORS AND SEVERAL CALIBRATION LAMPS ARE CONTROLLED BY THE INSTRUMENT CONTROL ELECTRONICS (ICE) AND SOFTWARE (ICS).

ALL THE ESPRESSO FUNCTIONALITIES ARE MANAGED BY TWO MAIN CPUS THAT SHARE THE WORKLOAD.

THE BECKHOFF ETHERCAT DECENTRALIZATION MODULES ENSURE THE ETHERCAT CONTINUITY BETWEEN THE 7 PLC ELECTRONICS SUBRACKS PLACED IN DIFFERENT CABINETS, ALLOWING OPTIMAL DISTRIBUTED ARCHITECTURE.

FURTHERMORE, ONE OF THE TWO CPUS IS EQUIPPED WITH AN IEEE 1588 PROTOCOL INTERFACE, USED FOR THE TIME SYNCHRONIZATION OF DISTRIBUTED CLOCKS IN THE NETWORKS.

IN THIS PAPER THE FEATURES OF THE CPUS USED, THE FUNCTIONS DISTRIBUTION BETWEEN THEM, THE ELECTRONIC CABINETS CONFIGURATION AND A DETAILED OVERVIEW OF THE PLC CONTROL SYSTEM USED ARE PRESENTED.

P8.3: JIM BARRETT

UNIVERSITY OF BIRMINGHAM, UK

INTERPOLATION BETWEEN COMPACT BINARY POPULATION SYNTHESIS MODELS

AS WE ENTER THE ERA OF GRAVITATIONAL WAVE ASTRONOMY, IT SEEMS PROBABLE THAT WE ARE GOING TO HAVE MANY OBSERVATIONS OF BLACK HOLE AND NEUTRON STAR MERGERS. HOWEVER, THERE IS STILL A GREAT DEAL OF UNCERTAINTY AS TO HOW A MERGING COMPACT BINARY IS FORMED IN THE FIRST PLACE.

POPULATION SYNTHESIS CODES TIE TOGETHER CUTTING EDGE PHYSICS TO SIMULATE THE LIFETIMES OF A MILLIONS OF PAIRS OF STARS IN A UNIVERSE GOVERNED BY AN ARRAY OF 'HYPERPARAMETERS', CONTROLLING THINGS LIKE THE TRANSFER OF MASS BETWEEN STARS AND THE ASYMMETRY OF SUPERNOVA EXPLOSIONS.

UNFORTUNATELY, THIS PARAMETER SPACE IS LARGE AND THE SIMULATIONS EXPENSIVE. MY WORK IS CONCERNED WITH MAKING INFERENCES ABOUT THE SIMULATIONS WE HAVEN'T RUN YET, GIVEN THE ONES WE HAVE, AND DECIPHERING WHICH AREAS OF THE PARAMETER SPACE WE KNOW LEAST ABOUT, SO WE KNOW HOW BEST TO SPEND OUR CPU HOURS.

P2.2: ALEJANDRO JAVIER BARRIENTOS

UTFSM - UNIVERSIDAD TECNICA FEDERICO SANTA MARIA, SANTIAGO, CHILE

MACHINE LEARNING APPROACHES FOR DETECTION AND CLASSIFICATION OF ASTROCHEMICAL SPECTRAL LINES

ASTRONOMICAL SPECTROSCOPY IS A FIELD THAT HAS BEEN GROWING FOR A NUMBER OF YEARS, ANALYZING THE FEATURES OF MOLECULAR SPECTRAL LINES FROM ASTRONOMICAL DATA CUBES PROVIDES INSIGHT TO THE COMPOSITION AND DYNAMICS OF OUR UNIVERSE. WITH THE ARRIVAL OF STATE-OF-THE-ART HIGH SPECTRAL RESOLUTION RADIOTELESCOPES LIKE ALMA, THE SIZE OF THE DATA CUBES WILL BE CONSTANTLY GROWING IN TIME. THIS IS WHY WE BELIEVE THAT SOME AUTOMATIC ANALYSIS METHODS WILL BE HELPFUL ASSISTING THE ASTROCHEMISTS WORK. WE WOULD LIKE, TO GENERATE A METHOD TO ANALYZE ASTRONOMICAL DATA CUBES, DETECT THEIR REGIONS OF INTEREST, BY USING A NON SUPERVISED CLUSTERING ALGORITHM, AND THEN, GENERATE A SPECTRUM FOR EACH REGION OF INTEREST, AND CLASSIFY THE MOLECULAR SPECIES FOUND IN THE SPECTRA, BY USING A SUPERVISED TRAINING ALGORITHM. THE TRAINING FOR THE LEARNER IS DONE USING SYNTHETIC SPECTRA, AND THE VALIDATION IS DONE USING RADIO ASTRONOMICAL DATA CUBES FROM ALMA OBSERVATIONAL DATA. INITIAL EXPERIMENTS CONTEMPLATED A NAIVE PHYSICAL MODEL THAT WAS CONSIDERED TO START THE PROBLEM AND TWO POPULAR MACHINE LEARNING METHODS WERE TESTED FOR THE TASK OF CLASSIFYING MOLECULAR SPECTRA, SUPPORT VECTOR MACHINES AND NEURAL NETWORKS; RESULTS FOR CLASSIFICATION ACCURACY FOR THE TESTING DATA RANGED BETWEEN 86.2 AND 99.9 PERCENT.

WE CONCLUDE THAT THE PROBLEM IS MORE COMPLEX THAN CLASSIFYING LABORATORY SPECTRA, ALSO, THE SCARCITY OF REAL-WORLD EXAMPLES MAKES SYNTHETIC DATA USEFUL TO TEST THE MODELS. OUR FIRST APPROACH PROVIDES THE FOUNDATIONS FOR MORE COMPLEX MODELS, AND, AS WE KEEP ADDING PHYSICAL PARAMETERS INTO THE MODEL, THE NEED FOR A MORE POTENT APPROACH, SUCH AS THE MACHINE LEARNING APPROACH, BECOMES CLEARER.

P2.3: MARCO BARTOLINI

INAF - ISTITUTO DI RADIOASTRONOMIA, BOLOGNA, ITALY

DISCOS PROJECT STATUS AND EVOLUTION TOWARDS CONTINUOUS INTEGRATION

DISCOS (DEVELOPMENT OF THE ITALIAN SINGLE-DISH CONTROL SYSTEM) IS THE SOFTWARE PACKAGE PROVIDING A CONTROL SYSTEM TO THE THREE ITALIAN RADIO TELESCOPES (MEDICINA, NOTO AND SRT DISHES). IT IS BASED ON THE ALMA COMMON SOFTWARE (ACS) FRAMEWORK, AND CURRENTLY CONSISTS OF MORE THAN 500K LINES OF CODE. IT IS ORGANIZED IN A COMMON CORE AND THREE SPECIFIC PRODUCT LINES, ONE FOR EACH TELESCOPE. WE BRIEFLY DESCRIBE THIS ARCHITECTURE IN ITS CORE DETAILS.

IN THE LAST TWO YEARS WE HAVE SUPPORTED THE ASTRONOMICAL VALIDATION OF THE SRT RADIO TELESCOPE, LEADING TO THE OPENING OF THE FIRST PUBLIC CALL FOR PROPOSALS IN LATE 2015. DURING THIS PERIOD, WHILE ASSISTING BOTH THE ENGINEERING AND THE SCIENTIFIC STAFF, WE MASSIVELY EMPLOYED THE CONTROL SOFTWARE AND WERE ABLE TO TEST ALL OF ITS FEATURES: IN THIS PROCESS WE RECEIVED OUR FIRST FEEDBACK FROM THE USERS AND WE COULD VERIFY HOW THE SYSTEM PERFORMED IN A REAL-LIFE SCENARIO, DRAWING THE FIRST CONCLUSIONS ABOUT THE OVERALL SYSTEM STABILITY AND PERFORMANCE. THE EXPOSURE TO PUBLIC UTILIZATION HAS HIGHLIGHTED THE MAJOR FLAWS IN OUR DEVELOPMENT AND SOFTWARE MANAGEMENT PROCESS, WHICH HAD TO BE TUNED AND IMPROVED IN ORDER TO ACHIEVE FASTER RELEASE CYCLES IN RESPONSE TO USER FEEDBACK, AND SAFER DEPLOY OPERATIONS. IN THIS REGARD WE SHOW HOW THE INTRODUCTION OF TESTING PRACTICES, ALONG WITH CONTINUOUS INTEGRATION, HELPED US TO MEET HIGHER QUALITY STANDARDS. WE DESCRIBE HOW THE PROJECT EVOLVED OVER THE YEARS AND HOW SOFTWARE MANAGEMENT BEST PRACTICES BORROWED FROM THE INDUSTRY IMPACT ON THE SUCCESS OF SUCH A LARGE SCIENTIFIC SOFTWARE PROJECT.

P2.4: UGO BECCIANI

INAF - OSSERVATORIO ASTROFISICO DI CATANIA

VISUAL ANALYTICS IN ASTROPHYSICS: AN INTEGRATED TOOL BASED ON VISIVO

VISIVO PROVIDES AN INTEGRATED SUITE OF TOOLS AND SERVICES TO VISUALIZE MEANINGFULLY HIGHLY-COMPLEX AND LARGE-SCALE DATASETS. IN PARTICULAR THE DESKTOP APPLICATION HANDLES OBSERVATIONAL AND SIMULATED DATASETS, ESPECIALLY FOCUSING ON MULTIPLE DIMENSIONS, SUCH AS CATALOGS OR COMPUTATIONAL MESHES ON LOCAL PCS. THE DATA ARE REPRESENTED EITHER AS POINTS OR VOLUMES AND CAN BE VISUALIZED USING ADVANCED RENDERING ALGORITHMS.

THE VISIVO DESKTOP HAS BEEN RECENTLY RE-DESIGNED AS A TOOL FOR VISUAL ANALYTICS IN THE CONTEXT OF THE FP7 VIALACTEA PROJECT WHICH AIMS TO EXPLOIT THE COMBINATION OF ALL NEW-GENERATION SURVEYS OF THE GALACTIC PLANE TO BUILD AND DELIVER A GALAXY SCALE PREDICTIVE MODEL FOR STAR FORMATION OF THE MILKY WAY. USUALLY THE ESSENTIAL STEPS NECESSARY TO UNVEIL THE INNER WORKINGS OF THE GALAXY AS A STAR FORMATION ENGINE ARE OFTEN CARRIED OUT MANUALLY, AND NECESSARILY OVER A LIMITED NUMBER OF GALACTIC SOURCES OR VERY RESTRICTED REGIONS. THEREFORE SCIENTISTS REQUIRED NEW TECHNOLOGICAL SOLUTIONS ABLE TO DEAL WITH THE GROWING DATA SIZE AND QUANTITY COMING FROM THE AVAILABLE SURVEYS TO EXTRACT THE MEANINGFUL INFORMATIONS CONTAINED IN THE DATA. THIS RESULTED IN A NOVEL FRAMEWORK BASED ON ADVANCED VISUAL ANALYTICS TECHNIQUES, DATA MINING METHODOLOGIES, MACHINE LEARNING PARADIGMS AND VIRTUAL OBSERVATORY (VO) BASED DATA REPRESENTATION AND RETRIEVAL STANDARDS.

THE VISUAL ANALYTICS ENVIRONMENT ALLOWS THE ASTRONOMERS TO EASILY CONDUCT RESEARCH ACTIVITIES USING VIRTUAL REALITY METHODS FOR MULTIDIMENSIONAL DATA AND INFORMATION VISUALIZATION. IT PROVIDES REAL-TIME DATA INTERACTION TO CARRY OUT COMPLEX TASKS FOR MULTI-CRITERIA DATA/METADATA QUERIES ON SUBSAMPLES SELECTION AND FURTHER ANALYSIS, OR REAL-TIME CONTROL OF DATA FITTING TO THEORETICAL MODELS. IT IS IMPLEMENTED AS A CLIENT-SERVER APPLICATION WHERE ALL DATA, MODELS, ANALYSIS TOOLS AND DATA-MINING/MACHINE-LEARNING PIPELINES ARE ENCLOSED IN A STANDARDISED, HOMOGENEOUS AND INTEROPERABLE FRAMEWORK. THE TOOL IS A CROSS-PLATFORM APPLICATION, IT IS IMPLEMENTED IN C++ FOR THE CORE FUNCTIONALITIES USING QT FOR THE USER INTERFACE AND THE ADOPTED RENDERING ENGINE IS THE VISUALIZATION TOOLKIT (VTK). THE ACCESS TO VO-COMPATIBLE DATABASES AND ARCHIVES IS PERFORMED USING THE TAP SERVICE AND THE INTEROPERABILITY WITH THE OTHER VO-BASED TOOLS (E.G. ALADIN, TOPCAT) IS GUARANTEED THANKS TO THE IMPLEMENTATION OF THE SAMP (SIMPLE APPLICATION MESSAGING PROTOCOL) PROTOCOL.

P6.1: STEFAN BECKER

UNIVERSITY OF HEIDELBERG, HEIDELBERG, GERMANY

TAP SUPPORT IN PYVO

PYVO IS AN ASTROPY-AFFILIATED PACKAGE PROVIDING AN API FOR THE ACCESS AND RETRIEVAL OF ASTRONOMICAL DATASETS FROM THE VIRTUAL OBSERVATORY (VO) USING VARIOUS VO DATA ACCESS LAYER PROTOCOLS. THIS POSTER REPORTS ON THE RECENT ADDITION OF SUPPORT FOR THE TABLE ACCESS PROTOCOL (TAP) IN PYVO. METHODS FOR SYNCHRONOUS AND ASYNCHRONOUS QUERIES ARE PROVIDED, INCLUDING SUPPORT FOR UPLOADING LOCAL TABLES. PYVO'S TAP SUPPORT ALSO ALLOWS INSPECTION OF THE SERVICE METADATA. THANKS TO ASTROPY INTEGRATION, IT IS STRAIGHTFORWARD TO WORK WITH THE OBTAINED RESULTS AND RE-USE THEM EITHER IN FURTHER VO QUERIES OR IN CUSTOM PYTHON CODE.

P2.5: BRUCE BERRIMAN

IPAC, CALTECH

HOW MANAGING THE MONTAGE IMAGE MOSAIC ENGINE HAS EXPANDED ITS BREADTH OF USE

THE MONTAGE TOOLKIT IS FINDING EXCEPTIONAL BREADTH OF USAGE, FAR BEYOND ITS INTENDED APPLICATION AS A MOSAIC ENGINE FOR ASTRONOMY. NEW USES INCLUDE:

- VISUALIZATION OF COMPLEX IMAGES WITH DATA OVERLAYS: E.G. AS A RE-PROJECTION ENGINE INTEGRATED INTO THE SERVER-SIDE ARCHITECTURE OF A GBIT VISUALIZATION SYSTEM; SUPPORTING INVESTIGATIONS OF 3D PRINTING WITH THE X3D PROTOCOL; CREATION OF SKY COVERAGE MAPS FOR MISSIONS AND PROJECTS; BULK CREATION OF SUB-IMAGES OF MULTIBAND PHOTOMETRY DATA; CREATION OF PLOTS IN THE APLPY LIBRARY.

- CREATION OF NEW DATA PRODUCTS AT SCALE: MOSAICS OF GEMINI AO IMAGES FROM THE GEMINI MULTI-CONJUGATE ADAPTIVE OPTICS SYSTEM/GEMINI SOUTH ADAPTIVE OPTICS IMAGER (GEMS/GSAOI) INSTRUMENT, FROM THE VISTA VIDEO AND THE UKIDSS DXS SURVEYS; WELDING THE HERSCHEL INFRARED GALACTIC PLANE (HI-GAL) FAR-INFRARED SURVEY INTO A SET OF LARGE-SCALE MOSAICS, FOR PLANETARIUM SHOWS AT A DIGITAL AS WELL AS FOR RESEARCH;

- AS A RE-PROJECTION ENGINE TO SUPPORT DISCOVERY OF 86 NEAR EARTH ASTEROIDS (A U.S. CONGRESSIONAL MANDATE) IN THE LINCOLN NEAR-EARTH ASTEROID RESEARCH PROGRAM (LINEAR).

- INTEGRATION INTO DATA PROCESSING ENVIRONMENTS: INTEGRATION OF THE 4D IMAGE CUTOUT TOOL INTO THE VO-COMPLIANT CSIRO ASKAP SCIENCE DATA ARCHIVE (CASDA); AS A RE-PROJECTION ENGINE FOR THE DARK ENERGY SURVEY (DES) PIPELINE.

- DISCOVERY OF IMAGING DATA AT SCALE: USE OF MEMORY MAPPED R-TREE INDICES TO SUPPORT SEARCHES FOR SPATIALLY EXTENDED DATA, IN USE IN SPITZER AND WISE IMAGE SEARCHES AND IN SPATIAL AND TEMPORAL SEARCHES FOR WISE AND KOA.

IT HAS BEEN CITED AS AN EXEMPLAR APPLICATION FOR DEVELOPMENT OF NEXT GENERATION CYBER-INFRASTRUCTURE IN 238 PAPERS BETWEEN 2014 AND 2016 TO DATE.

WHAT HAS ENABLED THIS BROAD TAKE-UP IS THAT MONTAGE HAS BEEN BUILT AND MANAGED AS A SCALABLE TOOLKIT, WRITTEN IN C AND PORTABLE ACROSS ALL COMMON *NIX PLATFORMS, WITH MINIMAL DEPENDENCIES ON THIRD-PARTY SOFTWARE, SUCH THAT IT CAN BE BUILT WITH A SIMPLE “MAKE” COMMAND. ALL THE COMPONENTS HAVE PROVEN POWERFUL GENERAL-PURPOSE TOOLS IN THEIR OWN RIGHT, EVEN THOSE FIRST DEVELOPED TO SUPPORT MOSAIC CREATION, SUCH AS DISCOVERY OF IMAGES FOR INPUT TO THE ENGINE AND FOR MANAGEMENT OF MOSAICS. WE DESCRIBE HOW MONTAGE IS MANAGED TO ASSURE THAT THE BENEFITS OF THE ARCHITECTURE ARE RETAINED, AND HOW WE ENSURE THAT NEW DEVELOPMENT IS DRIVEN BY THE NEEDS OF THE COMMUNITY.

P8.4: EMMANUEL BERTIN

INSTITUT D'ASTROPHYSIQUE DE PARIS

VISIOMATIC 2: A WEB CLIENT FOR REMOTE VISUALIZATION WITH REAL-TIME MIXING OF MULTISPECTRAL DATA

VISIOMATIC (BERTIN ET AL. 2015) IS A JAVASCRIPT CLIENT BUILT ON TOP OF THE LEAFLET LIBRARY FOR VISUALIZING EXTREMELY LARGE SCIENTIFIC IMAGES IN REGULAR WEB BROWSERS. WE PRESENT THE VERSION 2 OF VISIOMATIC, WHICH OFFERS A NUMBER OF ENHANCEMENTS, INCLUDING REAL-TIME MIXING OF MULTISPECTRAL DATACUBES. VISIOMATIC IS EMBEDDABLE IN REGULAR WEB PAGES, BLOG POSTS, PORTALS, OR WIKI ENTRIES, AND COMPATIBLE WITH TOUCHSCREEN INTERFACES SUCH AS THOSE OFFERED BY IOS AND ANDROID MOBILE DEVICES. THE POSITION AND APPEARANCE OF WIDGETS IS FULLY CUSTOMIZABLE THROUGH MODULE OPTIONS AND CASCADING STYLE SHEETS.

P4.2: SARA BERTOCCO

INAF – OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

BUILDING AN INTEROPERABLE DISTRIBUTED STORAGE AND AUTHORIZATION SYSTEM

A JOINT PROJECT BETWEEN THE CANADIAN ADVANCED NETWORK FOR ASTRONOMICAL RESEARCH (CANFAR) AND THE INAF-OSSERVATORIO ASTRONOMICO DI TRIESTE (OATS), PARTIALLY FUNDED BY THE EGI-ENGAGE H2020 EUROPEAN PROJECT, IS WORKING TO DEPLOY AN INTEGRATED INFRASTRUCTURE, BASED ON INTERNATIONAL VIRTUAL OBSERVATORY ALLIANCE (IVOA) STANDARDS, TO ACCESS AND EXPLOIT ASTRONOMICAL DATA.

CANFAR PROVIDES SCIENTISTS WITH AN ACCESS, STORAGE AND COMPUTATION FACILITY, BASED ON SOFTWARE LIBRARIES IMPLEMENTING A SET OF STANDARDS DEVELOPED BY THE IVOA. THE DEPLOYMENT OF A TWIN INFRASTRUCTURE, BASICALLY BUILT ON THE SAME OPEN SOURCE SOFTWARE LIBRARIES, AVAILABLE AT HTTPS://GITHUB.COM/OPENCADC, HAS BEEN STARTED AT OATS-INAF. AT PRESENT, THIS INFRASTRUCTURE PROVIDES USERS WITH AN ACCESS CONTROL SERVICE AND A STORAGE SERVICE BASED ON THE VOSPACE 2.1 IVOA STANDARD.

THE IMPLEMENTATION OF THE IVOA STANDARD ENSURES THE INTEROPERABILITY OF THE WHOLE GEOGRAPHICALLY DISTRIBUTED STORAGE SERVICE.

THE ACCESS CONTROL SERVICE IS BASED ON THE GROUP MANAGEMENT SERVICE DEVELOPED AT CANFAR AND OPEN SOURCE AVAILABLE. IN THE SCOPE OF THE COLLABORATION, THE CANFAR SOFTWARE HAS BEEN MODIFIED TO ALLOW INTEGRATED USER AUTHENTICATION, I.E. USERS OF ONE OF THE INFRASTRUCTURES CAN USE RESOURCES LOCATED EITHER AT CANFAR OR AT OATS-INAF WITH A SINGLE-SIGN-ON ACCESS POINT.

THE STORAGE SERVICE IS BASED ON THE OPEN SOURCE IMPLEMENTATION, PROVIDED BY CANFAR, OF THE IVOA 2.1 VOSPACE STANDARD PLUS AN OPEN SOURCE DATA TRANSFER MANAGEMENT SERVICE DEVELOPED AT OATS-INAF IN THE SCOPE OF THE COLLABORATION.

THIS POSTER FOCUSES ON THE TECHNICAL CHOICES AND THE IMPLEMENTED SOLUTIONS.

P4.3: ANDREA BIGNAMINI

INAF - OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

LBT: INDIGO-DATACLOUD SOLUTIONS FOR AN ASTRONOMICAL DISTRIBUTED ARCHIVE

INDIGO-DATACLOUD (INTEGRATING DISTRIBUTED DATA INFRASTRUCTURES FOR GLOBAL EXPLOITATION), A PROJECT FUNDED UNDER THE HORIZON2020 FRAMEWORK PROGRAM OF THE EUROPEAN UNION, AIMS AT DEVELOPING A DATA AND COMPUTING PLATFORM TARGETING SCIENTIFIC COMMUNITIES, DEPLOYABLE ON MULTIPLE HARDWARE AND PROVISIONED OVER HYBRID (PRIVATE OR PUBLIC) E-INFRASTRUCTURES. SINCE THE MULTIDISCIPLINARY FIELD OF APPLICATION OF THE PROJECT, ALSO THE ASTRONOMICAL COMMUNITY DECIDED TO EMBRACE THE AMBITIOUS EFFORT TO DEVELOP AND RELEASE AN INFRASTRUCTURE ABLE TO FILLING EXISTING GAPS IN PAAS AND SAAS LEVELS, HELPING DEVELOPERS, RESOURCE PROVIDERS, E-INFRASTRUCTURES AND SCIENTIFIC ASTRONOMICAL COMMUNITY TO OVERCOME CURRENT CHALLENGES IN THE CLOUD COMPUTING, STORAGE AND NETWORK AREAS. OUR CURRENT ROLE IN THE INDIGO-DATACLOUD PROJECT IS TO PROVIDE TECHNICAL USE CASES, IDENTIFY REQUIREMENTS, AS WELL AS TEST THE PROPOSED SOLUTIONS.WE PRESENT A DESCRIPTION OF THE GOALS AND THE IDENTIFIED TECHNOLOGICAL STACK AND SOLUTIONS OFFERED BY INDIGO-DATACLOUD FOR THE LARGE BINOCULAR TELESCOPE USE CASE, CURRENT ASTRONOMICAL REQUIREMENTS AND NECESSITIES FOR DATA PERSISTENCE AND DISTRIBUTION OVER DISTINCT AND GEOGRAPHICALLY SEPARATED SITES AND ARCHIVES, AS WELL AS SUGGESTIONS ON HOW TO MEET THE CURRENT ASTRONOMICAL REQUIREMENTS AND INTEGRATE THEM WITHIN INDIGO-DATACLOUD SOLUTIONS.

P6.2: THOMAS BOCH

OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, UNIVERSIT\'E DE STRASBOURG, CNRS, UMR 7550, 11 RUE DE L'UNIVERSIT\'E, 67000 STRASBOURG, FRANCE

MOCPY, A PYTHON LIBRARY TO MANIPULATE SPATIAL COVERAGE MAPS

WE WILL PRESENT MOCPY, A PYTHON LIBRARY TO HANDLE AND MANIPULATE MOC (MULTI ORDER COVERAGE MAPS).

MOC IS A VIRTUAL OBSERVATORY STANDARD - BASED ON THE HEALPIX TESSELLATION - THAT HAS PROVEN TO BE QUITE USEFUL TO DESCRIBE AND COMPARE SPATIAL COVERAGE OF DATASETS. OUR LIBRARY ALLOWS FOR EASY CREATION OF MOC OBJECTS FROM A LIST OF SOURCES OR FOR A GIVEN VIZIER TABLE WITH POSITIONS. INTERSECTIONS OF COVERAGES CAN BE COMPUTED AND VIZIER TABLES DATA CAN BE EFFICIENTLY QUERIED TO RETRIEVE ONLY ROWS INSIDE A GIVEN MOC COVERAGE.

EVENTUALLY, WE WILL ALSO DISCUSS HOW WE USE JUPYTER NOTEBOOKS RUNNING ON MYBINDER.ORG SERVICE TO PROVIDE WITH INTERACTIVE EXAMPLES OF MOCPY USAGE.

P1.3: FRANÇOIS BONNAREL

CDS, OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, CNRS

PHOTOMETRIC CONSERVATION IN HIPS PROCESSING

THE HIPS TECHNOLOGY HAS ORIGINALLY BEEN DEVELOPPED WITHIN THE FRAME OF THE ALADIN PROJECT IN ORDER TO PROVIDE A PROGRESSIVE ACCESS TO SURVEY PIXEL DATA FROM ALLSKY VIEW UP TO FULL RESOLUTION IMAGES. HIPS IS CURRENTLY ENTERING AN IVOA STANDARDIZATION PROCESS, THE NUMBER OF HIPS SURVEYS HAS BEEN RISING STEEPLY SINCE ITS CREATION AND IS EXPECTED TO KEEP GROWING. HIPS TECHNOLOGY IS STRONGLY BASED ON THE HEALPIX TESSELLATION OF THE SKY. AS HIPS SURVEYS ARE PRODUCED, ORIGINAL IMAGES ARE REGRIDDED ONTO HEALPIX TILES AND VICE VERSA WHEN THE DATA ARE REPROJECTED BACK ON USUAL WCS FITS GRIDS. AS WITH ANY PROJECTION PROCESS, THIS MAY INTRODUCE SYSTEMATIC AND RANDOM UNCERTAINTIES IN THE PROJECTED DATA.

IN THIS POSTER THE AUTHORS PRESENT RESULTS FROM DIFFERENT PHOTOMETRIC CONSERVATION TESTS. THESES TESTS HAVE ESTIMATED THE PHOTOMETRIC ACCURACY IN LARGE APERTURES BETWEEN FLUXES MEASURED ON ORIGINAL AND HIPS IMAGES. PHOTOMETRIC UNCERTAINTIES FOR POINT SOURCES HAVE ALSO BEEN ESTIMATED BY COMPARING SOURCE EXTRACTION RESULTS AS OBTAINED WITH SEXTRACTOR ON ORIGINAL IMAGES AND ON HIPS REPROJECTED IMAGES.

P1.4: RENATO CALLADO BORGES

LAM - LABORATOIRE D'ASTROPHYISIQUE DE MARSEILLE. MARSEILLE, FRANCE

ARIADNE: A SYSTEM FOR EVALUATION OF AMAZED'S SPECTROSCOPIC REDSHIFT ESTIMATION EFFICIENCY

AMAZED (ALGORITHMS FOR MASSIVE AUTOMATIC Z EVALUATION AND DETERMINATION) IS A PROJECT DEVELOPED AT LAM (LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE) FOR SUPPLYING AUTOMATED SPECTROSCOPIC REDSHIFT ESTIMATION SOFTWARE FOR NEXT GENERATION SPECTROGRAPHS SUCH AS PFS (PRIME FOCUS SPECTROGRAPH) AND EUCLID. REDSHIFT CAN BE ESTIMATED BY CROSS-CORRELATING SPECTRAL DATA AND TEMPLATES OR BY IDENTIFYING KEY FEATURES IN A SPECTROGRAPH, WHICH ARE THEN MATCHED TO RELEVANT ASTROPHYSICAL MODELS (SPECTROSCOPIC TEMPLATES). BOTH STRATEGIES ARE PRESENT IN AMAZED'S REDSHIFT ESTIMATION LIBRARY, WHICH IS WRITTEN IN C++ WITH A PIPELINE BASED ON BOOST MODULES. IT PERFORMS A BAYESIAN RELIABILITY ASSESSMENT OF ITS RESULTS, WHICH CAN BE USED TO FLAG ESTIMATION QUALITY. AMAZED'S EFFICIENCY IS WELL-DEFINED FOR THE SET OF SPECTROGRAPHS FOR WHICH WE HAVE REFERENCE REDSHIFT VALUES. HERE WE PRESENT ARIADNE, AN AUTOMATION SUBSYSTEM FOR AMAZED, WHOSE PRIMARY TASK IS TO COMPUTE AMAZED'S REDSHIFT ESTIMATION EFFICIENCY. SECONDARILY, IT SERVES AS A TESTING HARNESS TO FACILITATE AMAZED'S DEVELOPMENT. ARIADNE IS IMPLEMENTED AT LAM IN PYTHON 3, IMPORTING WIDELY USED LIBRARIES SUCH AS ZEROMQ, SQLALCHEMY AND PYQT. IT IS DEVELOPED USING AGILE PRACTICES AND DESIGNED TO BE HIGHLY MODULAR. ARIADNE HAS MODULES FOR INTERPROCESS COMMUNICATION (NAMED PÉPIN), FOR DATABASE, STORAGE AND BATCH SYSTEM INTERFACE (NAMED MINOS) AND FOR USER INTERFACE (NAMED ARIADNE). MINOS' DATABASE STORES SPECTROGRAPH SETS, CONFIGURATION PARAMETERS WITH THEIR ALLOWED VARIATION INTERVALS, AND A LIST OF REPOSITORY TAGS (WHICH IS UPDATED BY JENKINS). IN A FUTURE WORK, WE WILL ADD TO MINOS AN AUTOMATION MODULE (TO BE CALLED TAUROS). THEN, ARIADNE WILL GIVE A MULTI-THREADED INTERFACE TO AID THE USER EXIT AMAZED WITH AN ESTIMATION OF ITS EFFICIENCY, AND KILL MINOS' TAUROS IF ITS PROCESS HANGS.

P6.3: DAVID BORNCAMP

SPACE TELESCOPE SCIENCE INSTITUTE

SATELLITE DETECTION IN ADVANCED CAMERA FOR SURVEYS/WIDE FIELD CHANNEL IMAGES

WE PRESENT A NOVEL PROCESS BY WHICH SATELLITE TRAILS CAN BE DETECTED AND ACCURATELY MASKED WITHIN INDIVIDUAL CHIPS OF AN ADVANCED CAMERA FOR SURVEYS (ACS) WIDE FIELD CHANNEL (WFC) IMAGE USING PYTHON. SINCE SATELLITES ARE TRANSIENT AND SPORADIC EVENTS, WE USED THE HUBBLE FRONTIER FIELDS (HFF) DATASET WHICH IS MANUALLY CHECKED FOR SATELLITE TRAILS HAS BEEN USED AS A TRUTH SET TO VERIFY THAT THE METHOD IN THIS DOCUMENT DOES A COMPLETE JOB WITHOUT A HIGH FALSE POSITIVE RATE. WE ALSO PRESENT THE PROCESS OF PRODUCING A MASK THAT WILL UPDATE DATA QUALITY INFORMATION TO INFORM USERS WHERE THE TRAIL TRAVERSES THE IMAGE AND PROPERLY ACCOUNT FOR THE AFFECTED PIXELS. THIS CODE IS NOW PUBLICLY AVAILABLE THROUGH THE ACSTOOLS (HTTPS://ACSTOOLS.READTHEDOCS.IO/EN/LATEST/) PACKAGE AND CAN BE INSTALLED THROUGH THE ASTROCONDA (HTTP://ASTROCONDA.READTHEDOCS.IO/EN/LATEST/) ANACONDA CHANNEL.

P6.4: MATTHEW BOURQUE

SPACE TELESCOPE SCIENCE INSTITUTE, BALTIMORE, MARYLAND, USA

THE HUBBLE SPACE TELESCOPE WIDE FIELD CAMERA 3 QUICKLOOK PROJECT

THE HUBBLE SPACE TELESCOPE'S WIDE FIELD CAMERA 3 (WFC3) INSTRUMENT HAS BEEN ACQUIRING ~50-100 IMAGES DAILY SINCE ITS INSTALLATION IN 2009. THE WFC3 QUICKLOOK PROJECT PROVIDES A MEANS FOR WFC3 INSTRUMENT ANALYSTS TO STORE, CALIBRATE, MONITOR, AND INTERACT WITH THESE DATA THROUGH THE VARIOUS QUICKLOOK SYSTEMS: (1) A ~200 TB FILESYSTEM, WHICH STORES THE ENTIRE WFC3 ARCHIVE ON DISK, (2) A MYSQL DATABASE, WHICH STORES IMAGE HEADER DATA, (3) A PYTHON-BASED AUTOMATION PLATFORM, WHICH CURRENTLY EXECUTES 28 UNIQUE CALIBRATION AND MONITORING SCRIPTS, (4) A PYTHON-BASED CODE LIBRARY, WHICH PROVIDES SYSTEM FUNCTIONALITY SUCH AS LOGGING, DOWNLOADING TOOLS, DATABASE CONNECTION OBJECTS, AND FILESYSTEM MANAGEMENT, AND (5) A PYTHON/FLASK-BASED WEB INTERFACE TO THE QUICKLOOK SYSTEM. THE QUICKLOOK PROJECT HAS ENABLED LARGE-SCALE WFC3 ANALYSES AND CALIBRATIONS, SUCH AS THE MONITORING OF THE HEALTH AND STABILITY OF THE WFC3 INSTRUMENT, THE MEASUREMENT OF ~20 MILLION WFC3/UVIS PSFS, THE CREATION OF WFC3/IR PERSISTENCE CALIBRATION PRODUCTS, AND MANY OTHERS. THE QUICKLOOK SYSTEM MAY BE EXTENDED TO SUPPORT THE FORTHCOMING JAMES WEBB SPACE TELESCOPE MISSION.

P8.5: ALAN BRIDGER

UK ASTRONOMY TECHNOLOGY CENTRE/STFC

HOSTS, GUESTS AND SHADOWS: SCHEDULING THE SKA TELESCOPES

THE SQUARE KILOMETRE ARRAY (SKA) WILL BE THE WORLD'S MOST ADVANCED RADIO TELESCOPE, DESIGNED TO EXPLORE SOME OF THE BIGGEST QUESTIONS IN ASTRONOMY TODAY, SUCH AS THE EPOCH OF RE-IONIZATION, THE NATURE OF GRAVITY AND THE ORIGINS OF COSMIC MAGNETISM. THE FIRST PHASE OF SKA CONSTRUCTION, SKA1, IS CURRENTLY BEING DESIGNED BY A LARGE TEAM OF EXPERTS WORLD-WIDE. SKA1 COMPRISES TWO TELESCOPES: A 200-ELEMENT DISH INTERFEROMETER IN SOUTH AFRICA AND A 130000-ELEMENT DIPOLE ANTENNA APERTURE ARRAY IN AUSTRALIA.

THE PLANNING OF OBSERVATIONS IN THE SKA IS OF PARTICULAR IMPORTANCE, TO ENSURE THE OPTIMAL USE OF THE FACILITIES AND THE MAXIMUM SCIENCE OUTPUT. IN ADDITION TO THE COMMON DATA ACQUISITION RESOURCES THE PLANNING TOOLS MUST PLAN THE USE OF THE DATA PROCESSING SYSTEM FOR EACH TELESCOPE. BECAUSE OF THE DATA RATES INVOLVED THE DATA PROCESSING FORMS A FULLY INTEGRATED PART OF THE SKA TELESCOPES, WITHOUT WHICH THEY CANNOT FUNCTION, SO THE PLAN FOR ITS USE CAN DICTATE USE OF THE OTHER RESOURCES, EVEN THOUGH PROCESSING LAGS BEHIND DATA TAKING. ALONG WITH THE PARTICULAR REQUIREMENTS OF COMMENSAL (SHARED-DATA) OBSERVING AND USE OF MULTIPLE PARALLEL EXECUTION OF SUB-ARRAYS, THE PLANNING OF OBSERVING WITH THE SKA1 TELESCOPES PRESENTS SOME UNIQUE CHALLENGES. IN
THIS PAPER THESE CHALLENGES ARE DESCRIBED, ALONG WITH THE CURRENTLY SUGGESTED SOLUTIONS.

P1.5: KAI BRÜGGE

ASTROPARTICLE PHYSICS, TU DORTMUND, DORTMUND, GERMANY

REAL TIME STREAMING ANALYSIS OF IACT DATA

IMAGING ATMOSPHERIC CHERENKOV TELESCOPES (IACT) LIKE FACT PRODUCE A CONTINUOUS DATA FLOW DURING MEASUREMENTS.

THE FIRST G-APD CHERENKOV TELESCOPE (FACT) IS DEDICATED TO MONITORING BRIGHT TEV BLAZARS IN THE NORTHERN SKY.

FACT'S CONTINUOUS MONITORING PRODUCES A DENSE SAMPLE OF OBSERVATION POINTS OVER LONG PERIODS OF TIME.

TO HELP UNDERSTAND THE MECHANISMS OF COSMIC RAY ACCELERATION, THE SOURCES NEED TO BE OBSERVED OVER A WIDE RANGE OF WAVELENGTHS SIMULTANEOUSLY.

TO COORDINATE SUCCESSFUL MULTI-WAVELENGTH CAMPAIGNS, OTHER EXPERIMENTS NEED TO BE ALERTED QUICKLY IN CASE OF FLARING SOURCES.

THIS PUTS STRONG CONSTRAINTS ON A REAL TIME DATA ANALYSIS PROCESS.

IT NEEDS TO ANALYZE THE DATA FASTER THAN THE TELESCOPE WRITES IT. OTHERWISE, DELAYS WILL ACCUMULATE OVER TIME.

THE USAGE OF SILICON PHOTON DETECTORS IN FACT ALLOWS FOR A LARGER DUTY CYCLE COMPARED TO TRADITIONAL PHOTO MULTIPLIER TUBES.

THIS RESULTS IN LARGE AMOUNTS OF COLLECTED DATA.

GIVEN GOOD WEATHER CONDITIONS, UP TO 1 TB OF RAW DATA ARE RECORDED PER NIGHT.

TO CALCULATE EXCESS RATES FROM RAW DATA, THE ENTIRE DATA ANALYSIS PROCESS INCLUDING DATA CALIBRATION, FILTERING, IMAGE CLEANING, PARAMETRIZATION AND SIGNAL/BACKGROUND SEPARATION NEEDS TO BE PERFORMED.

THE ONLINE ANALYSIS SOFTWARE FOR FACT IS BUILD ON TOP OF THE STREAMS-FRAMEWORK, A MODULAR DATA STREAMING ENVIRONMENT WORKING IN CONJUNCTION WITH POPULAR BIG DATA SOLUTIONS FOR DISTRIBUTED COMPUTING LIKE APACHE SPARK.

PRE-TRAINED MULTIVARIATE MODELS ARE APPLIED TO THE DATA WRITTEN BY THE TELESCOPE DATA ACQUISITION SYSTEM. THIS ALLOWS FOR EFFECTIVE BACKGROUND SUPPRESSION IN REAL TIME.

THE SYSTEM FEATURES A WEB INTERFACE SHOWING LIVE ANALYSIS RESULTS AND TELESCOPE STATUS DURING MEASUREMENTS.

WE SHOW EXCESS RATES FROM OBSERVATIONS OF TWO BRIGHT BLAZARS MARKARIAN 501 AND MARKARIAN 421 AND CROSS-CHECK THE RESULTS WITH AN EXISTING QUICK-LOOK-ANALYSIS FOR FLARE ALERTS.

THE TECHNOLOGIES DEMONSTRATED HERE ALSO SERVE AS A TESTBED FOR THE UPCOMING GENERATIONS OF IACTS AS PART OF THE CTA PROJECT.

P4.4: ROBERT BUTORA

INAF - OSSERVATORIO ASTRONOMICO DI TRIESTE

COMMON ACCESS TO 2-D AND 3-D GALACTIC RADIO SURVEYS WITHIN THE VIALACTEA PROJECT

VIALACTEA IS A PROJECT TO FACILITATE THE STUDY OF STAR FORMATION IN OUR GALAXY. IT IS BASED ON DATA COLLECTED IN VARIOUS GALACTIC SURVEYS FROM PAST YEARS. THIS SURVEY DATA IS AVAILABLE IN FORM OF FITS FILES WHICH ARE ACCESSED THROUGH A WEB SERVICE DEVELOPED BY IA2 (ITALIAN CENTER FOR ASTRONOMICAL ARCHIVES) AT INAF-OATS. THE SERVICE HANDLES ~30000 3-D RADIO CUBES AND 2-D IMAGES, ORIGINATING FROM ABOUT 20 SURVEYS, EACH OFFERING DATA ON SEVERAL MOLECULAR EMISSION LINES.

ALL THE DATA IS ACCESSIBLE FROM ONE INTERFACE IN FORM OF A WEB SERVICE. THE SERVICE OFFERS COMMON FUNCTIONALITIES: A SEARCH ENGINE TO PERFORM DATA DISCOVERY, A CUTOUT ENGINE TO CREATE SUB-CUBES OR SUB-IMAGES AND A MERGE SERVICE TO UNITE FITS-FILES DATA OF ADJACENT AREAS ON THE SKY IF STORED IN SEPARATE FILES. THIS ALLOWS ONE COMPACT 3-D OR 2-D DATA PACKAGE TO BE ACQUIRED AND IT WOULD CONTAIN ONLY THE SKY-SPECTRAL AREA WHICH THE ASTRONOMER IS INTERESTED IN.

THE SERVICES ARE UNIFORMLY PARAMETRIZED BY SKY- AND SPECTRAL-COORDINATES INDEPENDENTLY OF DATA CALIBRATION AND DATA SUBDIVISION IN THE ORIGINAL SURVEY FITS-FILES.

CURRENTLY SUPPORTED SKY-COORDINATES ARE GALACTIC AND ICRS. SPECTRAL AXIS IS GIVEN BY VELOCITY RELATIVE TO THE OBSERVER.

THE SEARCHES ARE PERFORMED AGAINST ALL DATABASE OR CAN BE NARROWED DOWN BY SURVEY NAME, SPECIES AND TRANSITION. POSITIONAL SEARCH ALLOW FOR CONE AND BOXED REGIONS.

OVERLAP FLAGS ARE RETURNED TO HELP THE USER RANK THE RESULTS.

SINCE SOME OF THE FUNCTIONS - SPECIFICALLY MERGING MORE FITS-FILE DATA - ARE VERY CPU INTENSIVE, INTERNALLY THE SERVICE FUNCTIONS CAN BE DISTRIBUTED THROUGH SEVERAL COMPUTING RESOURCES.

THIS ALLOWS TO CONFIGURE THE SYSTEM FOR OPTIMAL PERFORMANCE.

P8.6: MICHEL CAILLAT

LERMA, OBSERVATOIRE DE PARIS, PARIS, FRANCE

A VERSATILE SOFTWARE TO SUPPORT INTERFEROMETRIC ARRAY CONFIGURATION DECISION.

OPERATING A RECONFIGURABLE INTERFEROMETRIC ARRAY SUCH AS THE ATACAMA LARGE MILLIMETER/SUBMILLIMETER ARRAY (ALMA) IMPLIES MOVING THE INDI- VIDUAL TELESCOPES ON THE GROUND TO MEET IMAGING SPECIFICATIONS. IN THE CASE OF ALMA THE ANTENNAS HAVE TO BE ON CONCRETE STATIONS AND DECIDING THE CONFIGURATION MEANS CHOOSING THE STATIONS TO POPULATE. FOR A GIVEN SIT- UATION THE NUMBER OF POSSIBLE CONFIGURATIONS IS FINITE AND THE MOST ROBUST WAY TO CHOOSE THE BEST ONE IS TO ASSESS ALL OF THEM. IN THIS MEMO WE INTRO- DUCE A VERSATILE SOFTWARE THAT CAN BE USED TO PICK THE BEST CONFIGURATION AMONG ALL POSSIBLE SOLUTIONS TO A GIVEN PROBLEM.

WE HAVE DEVELOPED THIS SOFTWARE IN C++ AND WE HAVE IMPLEMENTED A JAVA GRAPHICAL USER INTERFACE AND A PARALLELIZED VERSION TOGETHER WITH A WEB SERVICE TO TAKE FULL ADVANTAGE OF COMPUTING FACILITIES AT PARIS OBSERVATORY.

THIS SOFTWARE IS USED BY THE ALMA PROJECT TO DECIDE THE CONFIGURATIONS WHEN PRACTICAL CONTINGENCIES HAVE TO BE TAKEN INTO ACCOUNT AND WHEN THE GENERAL PLAN INITIALLY FORESEEN FOR THE CONFIGURATIONS CANNOT BE APPLIED.

P1.6: GIORGIO CALDERONE

INAF – OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

QSFIT: A NEW SOFTWARE FOR AGN OPTICAL SPECTRAL ANALYSIS.

I WILL PRESENT QSFIT, A NEW SOFTWARE TO AUTOMATICALLY PERFORM THE ANALYSIS OF ACTIVE GALACTIC NUCLEI (AGN) OPTICAL SPECTRA. THE SOFTWARE PROVIDES ESTIMATES OF: AGN CONTINUUM LUMINOSITIES AND SLOPES AT 5 DIFFERENT REST FRAME WAVELENGTHS; HOST GALAXY LUMINOSITIES (FOR SOURCES WITH Z<~0.8); LUMINOSITIES, WIDTHS AND VELOCITY OFFSETS OF 20 EMISSION LINES (HALPHA, HBETA, MGII, OIII, CIV, ETC...); AND LUMINOSITIES OF IRON BLENDED LINES AT OPTICAL AND UV WAVELENGTHS.

THE PURPOSE IS SIMILAR TO PREVIOUS WORKS ON AGN SPECTRAL ANALYSIS, BUT THE ANALYSIS FOLLOWS A DIFFERENT APPROACH: INSTEAD OF FOCUSING ON A SINGLE EMISSION LINE AND ESTIMATE THE CONTINUUM IN THE SURROUNDING REGION, WE FIT ALL THE COMPONENTS SIMULTANEOUSLY USING AN AGN CONTINUUM WHICH EXTENDS OVER THE ENTIRE AVAILABLE SPECTRUM.

THE WHOLE FITTING PROCESS IS CUSTOMIZABLE FOR SPECIFIC NEEDS AND DATA SOURCES. WE ADAPTED IT TO ANALYZE THE SDSS OPTICAL SPECTRA AND RAN THE CODE OVER ~80,000 SPECRA OF TYPE 1 AGN AT Z<2. OUR RESULTS ARE GENERALLY IN VERY GOOD AGREEMENT WITH THOSE AVAILABLE IN LITERATURE WHERE THE CONSIDERED QUANTITITES ARE DIRECTLY COMPARABLE (E.G. THE CONTINUUM LUMINOSITIES). THE EMISSION LINE DECOMPOSITION, HOWEVER, STRONGLY DEPEND ON THE ADOPTED ALGORITHM, AND THE COMPARISON OF OUR ESTIMATES WITH PREVIOUS RESULTS SHOWS SIGNIFICANT SCATTER.

QSFIT IS OUR FIRST ATTEMPT TO PROVIDE A STANDARDIZED WAY TO ANALYZE THE AGN OPTICAL SPECTRA IN A SIMILAR WAY AS OTHER SOFTWARE (SUCH AS XSPEC) ARE USED TO ANALYZE X-RAY DATA. THE ULTIMATE PURPOSE OF QSFIT IS TO ALLOW ASTRONOMERS TO RUN A STANDARDIZED RECIPE TO ANALYZE THE DATA, IN A SIMPLE, REPLICABLE AND SHAREABLE WAY. MOREOVER, IT ALLOWS USERS TO FINE TUNE THE ANALYSIS FOR SPECIFIC NEEDS.

THE QSFIT CODE WILL BE RELEASED AS FREE SOFTWARE UNDER THE GPL LICENSE. ALSO, ALL DATA IN OUR AGN CATALOG, AS WELL AS THE PLOTS OF SPECTRUM WITH BEST FITTING MODEL AND RESIDUALS, WILL BE PUBLICLY AVAILABLE ONLINE.

P8.7: MATTEO CANZARI

INAF - OSSERVATORIO ASTRONOMICO DI TERAMO, TERAMO, ITALY

USING NAGIOS TO MONITOR THE TELESCOPE MANAGER (TM) OF THE SQUARE KILOMETER ARRAY (SKA)

SKA (SQUARE KILOMETER ARRAY) IS A PROJECT TO DESIGN AND BUILD A LARGE RADIO-TELESCOPE, COMPOSED USING THOUSANDS OF ANTENNAE AND RELATED SUPPORT SYSTEMS (TIMING GENERATION, SIGNAL REAL-TIME PROCESSING AND SO ON). THE ORCHESTRATION OF THIS LARGE AND COMPLEX FACILITY IS PERFORMED BY THE TELESCOPE MANAGER (TM), A SUITE OF SOFTWARE APPLICATIONS AIMED TO MANAGE OBSERVATIONS (PREPARATION AND EXECUTION), SIGNAL PROCESSING AND SCIENTIFIC DATA DELIVERY, AS WELL AS GATHERING ALL STATUS AND PERFORMANCE DATA FROM THE FACILITY.

IN ORDER TO ENSURE THE PROPER AND UNINTERRUPTED OPERATION OF TM, A LOCAL MONITORING AND CONTROL SYSTEM (TM. LMC) IS BEING DEVELOPED. AMONG ITS RESPONSIBILITIES, MONITORING, LIFECYCLE CONTROL AND FAULT MANAGEMENT ARE OF THE UTMOST IMPORTANCE. FOR THE VERY CENTRAL ACTIVITY OF LMC MONITORING, NAGIOS HAS BEEN PROPOSED AS THE GOOD SOLUTION TO MONITOR TM RESOURCES, SERVICES AND THE STATUS OF PROCESSES BOTH AT GENERIC LEVEL (DIRECTLY ACHIEVED BY NAGIOS) AND AT PERFORMANCE LEVEL. FOR THIS SPECIFIC PURPOSE, A CONFIGURABLE CUSTOM AGENT IS UNDER DEVELOPMENT. IT IS HANDLED BY LIFECYCLE MANAGER (THAT REALIZES THE ABILITY TO CONTROL A SOFTWARE APPLICATION IN THE FOLLOWING PHASES OF ITS LIFETIME: CONFIGURATION, START, STOP, UPDATE, UPGRADE OR DOWNGRADE), SENDS MONITORING DATA AND GENERATES ALARMS BASED ON THE LOGIC OF THE SPECIFIC TM APPLICATIONS THAT CAN BE BASED ON THE TANGO-CONTROLS FRAMEWORK (A CORBA-BASED INTERFACE TO CONTROL EACH ELEMENT OF THE TELESCOPE, WHICH THE SKA OVERALL ARCHITECTURE IS BASED ON), TOGETHER WITH STANDARD WEB-BASED APPLICATIONS OR GENERIC SCRIPTS. INTEGRATING MONITORING DATA AND CUSTOM PLUGIN HAVE BEEN POSSIBLE TO HANDLE FAULT MANAGEMENT, IN ORDER TO PREVENT AN ABNORMAL SITUATION OR RESTORE NORMAL BEHAVIOR IN CASE OF NOT MANAGED FAILURE. ALSO, THANKS TO THE HIGHLY FLEXIBILITY OF NAGIOS, AN INTEGRATION WITH LOGGING SYSTEM HAS BEEN DEVELOPED IN ORDER TO RETRIEVE THE WORKING OF TELESCOPE MANAGER USING HIS LOGGING DATA.

P6.5: NICOLÁS CARDIEL

DEPARTAMENTO DE ASTROFÍSICA Y CIENCIAS DE LA ATMÓSFERA, FACULTAD DE CIENCIAS FÍSICAS, UNIVERSIDAD COMPLUTENSE DE MADRID, SPAIN

USING PYTHON TO SIMPLIFY THE AUTOMATIC WAVELENGTH CALIBRATION OF EMIR SPECTROSCOPIC DATA

EMIR, THE NEAR-INFRARED CAMERA-SPECTROGRAPH OPERATING IN THE NEAR-INFRARED (NIR) WAVELENGTHS 0.9–2.5μM, IS BEING COMMISSIONED AT THE NASMYTH FOCUS OF THE GRAN TELESCOPIO CANARIAS. ONE OF THE MOST OUTSTANDING CAPABILITIES OF EMIR WILL BE ITS MULTI-OBJECT SPECTROSCOPIC MODE WHICH, WITH THE HELP OF A ROBOTIC RECONFIGURABLE SLIT SYSTEM, WILL ALLOW TO TAKE AROUND 53 SPECTRA SIMULTANEOUSLY. A DATA REDUCTION PIPELINE, PYEMIR, BASED ON PYTHON, IS BEING DEVELOPED IN ORDER TO FACILITATE THE AUTOMATIC REDUCTION OF EMIR DATA TAKEN IN BOTH IMAGING AND SPECTROSCOPY MODE.

FOCUSING ON THE REDUCTION OF SPECTROSCOPIC DATA, SOME CRITICAL MANIPULATIONS INCLUDE THE GEOMETRIC DISTORTION CORRECTION AND THE WAVELENGTH CALIBRATION. ALTHOUGH USUALLY THESE REDUCTIONS STEPS ARE CARRIED OUT SEPARATELY, IT IS IMPORTANT TO REALISE THAT THESE KIND OF MANIPULATIONS INVOLVE DATA REBINNING AND INTERPOLATION, WHICH IN ADDITION UNAVOIDABLY LEAD TO THE INCREASE OF ERROR CORRELATION AND TO RESOLUTION DEGRADATION. IN ORDER TO MINIMISE THESE EFFECTS, IT IS POSSIBLE TO INCORPORATE THOSE DATA MANIPULATIONS AS A SINGLE GEOMETRIC TRANSFORMATION. THIS APPROACH IS BEING USED IN THE DEVELOPMENT OF PYEMIR. FOR THIS PURPOSE, THE GEOMETRIC TRANSFORMATIONS AVAILABLE IN THE PYTHON PACKAGE SCIKIT-IMAGE ARE BEING USED.

P8.8: MARIA TERESA CEBALLOS

INSTITUTO DE FÍSICA DE CANTABRIA (CSIC-UC), SANTANDER, SPAIN

SIRENA: SOFTWARE FOR ATHENA X-IFU EVENT RECONSTRUCTION

THE X-RAY OBSERVATORY ATHENA WAS PROPOSED IN APRIL 2014 AS THE MISSION TO IMPLEMENT THE SCIENCE THEME "THE HOT AND ENERGETIC UNIVERSE" SELECTED BY ESA FOR L2 (THE SECOND LARGE-CLASS MISSION IN ESA'S COSMIC VISION SCIENCE PROGRAMME).

ONE OF THE TWO X-RAY DETECTORS DESIGNED TO BE ONBOARD ATHENA IS X-IFU, A CRYOGENIC MICROCALORIMETER BASED ON TRANSITION EDGE SENSOR (TES) TECHNOLOGY THAT WILL PROVIDE SPATIALLY RESOLVED HIGH-RESOLUTION SPECTROSCOPY.

X-IFU WILL BE DEVELOPED BY AN INTERNATIONAL CONSORTIUM LED BY IRAP (PI), SRON (CO-PI) AND IAPS/INAF (CO-PI) AND INVOLVING ESA MEMBER STATES, JAPAN AND THE UNITED STATES.

WE PRESENT HERE A SOFTWARE PROTOTYPE PACKAGE (SIRENA) IN DEVELOPMENT AS AN ANTICIPATED CONTRIBUTION OF IFCA/SPAIN TO X-IFU THROUGH THE DIGITAL READOUT ELECTRONICS (DRE) UNIT, IN PARTICULAR IN THE EVENT PROCESSOR SUBSYTEM.

SIRENA CONSISTS OF A SET OF ON BOARD PROCESSING ALGORITHMS AIMED TO RECOGNIZE, FROM A NOISY SIGNAL, THE INTENSITY PULSES GENERATED BY THE ABSORPTION OF THE X-RAY PHOTONS, TO LATELY RECONSTRUCT THEIR ENERGY, POSITION AND ARRIVAL TIME.

THE CURRENT STATUS OF THE PACKAGE (INTEGRATED IN THE X-IFU ENDO-TO-END SIMULATOR SIXTE), REGARDING THE ALGORITHMS TRADE-OFFS AND DIFFERENT TRIGGERING TECHNIQUES UNDER STUDY WILL BE DISCUSSED IN THIS POSTER.

P1.7: SEO-WON CHANG

YONSEI UNIVERSITY OBSERVATORY, SEOUL, KOREA

APPLICATIONS OF OPEN-SOURCE SPATIO-TEMPORAL DATABASE SYSTEMS IN WIDE-FIELD TIME-DOMAIN ASTRONOMY

WE PRESENT OUR EXPERIENCES WITH OPEN-SOURCE SPATIO-TEMPORAL DATABASE SYSTEMS FOR MANAGING AND ANALYZING BIG ASTRONOMICAL DATA ACQUIRED BY WIDE-FIELD TIME-DOMAIN SKY SURVEYS. CONSIDERING PERFORMANCE, COST, DIFFICULTY, AND SCALABILITY OF THE DATABASE SYSTEMS, WE CONDUCT COMPARISON STUDIES OF OPEN-SOURCE SPATIO-TEMPORAL DATABASES SUCH AS GEOMESA AND POSTGIS THAT ARE ALREADY BEING USED FOR HANDLING BIG GEOGRAPHICAL DATA. OUR EXPERIMENTS INCLUDE INGESTING, INDEXING, AND QUERYING MILLIONS OR BILLIONS OF ASTRONOMICAL SPATIO-TEMPORAL DATA. WE CHOOSE THE PUBLIC VVV (VISTA VARIABLES IN THE VIA LACTEA) CATALOGS OF BILLIONS MEASUREMENTS FOR HUNDREDS OF MILLIONS OBJECTS AS THE TEST DATA. WE DISCUSS ISSUES OF HOW THESE SPATIO-TEMPORAL DATABASE SYSTEMS CAN BE ADOPTED IN THE ASTRONOMY COMMUNITY.

P2.6: BRIAN CHERINKA

JHU - JOHNS HOPKINS UNIVERSITY

INTERACTING WITH SDSS-IV MANGA DATA USING MARVIN

THE MANGA SURVEY IS AN ON-GOING SURVEY A PART OF THE SLOAN DIGITAL SKY SURVEY. IT IS A WIDE-FIELD OPTICAL IFU SURVEY, DELIVERING 3D SPECTROSCOPIC DATA CUBES, AS WELL AS 2D MAPS OF DERIVED ANALYSIS PROPERTIES (GAS +STELLAR KINEMATICS, EMISSION/ABSORPTION LINE MEASUREMENTS), FOR OVER 10000 GALAXIES. OVER THE LIFETIME OF THE SURVEY, MANGA WILL DELIVER A LARGE, COMPLEX, N-DIMENSIONAL DATASET. INTERACTING WITH THIS DATASET IS A MAJOR CHALLENGE. ONE THAT REQUIRES A SMART FRAMEWORK TO ALLOW FOR EASY AND INTUITIVE EXPLORATION OF THE MANGA GALAXIES, NO MATTER THE DATA LOCATION. MARVIN IS THAT TOOL. MARVIN IS A PYTHON PACKAGE THAT PROVIDES A SUITE OF TOOLS TO PROGRAMMATICALLY INTERACT WITH LOCAL MANGA FILES. IT HAS A BUILT-IN API FOR REMOTE ACCESS TO THE DATA, AS WELL A WEB FRONT-END FOR PURE BROWSER-BASED REMOTE EXPLORATION. PERFORM COMPLEX SEARCHES OVER THE ENTIRE MANGA DATASET AT ONCE, AND GET ONLY WHAT YOU ASK FOR. INTERACT WITH INDIVIDUAL OBJECTS EXTRACTING ONLY THE INFORMATION AT THE SPAXELS YOU WANT. MARVIN CAN SEAMLESSLY INTEGRATE INTO YOUR SCIENTIFIC WORKFLOW ABSTRACTING AWAY ALL THE COMPLEXITIES OF SIFTING THROUGH A LARGE 3D IFU DATASET.

P8.9: VITO CONFORTI

INAF - ISTITUTO DI ASTROFISICA SPAZIALE E FISICA COSMICA, BOLOGNA, ITALY

SOFTWARE INTEGRATION FOR THE ASTRI SST-2M PROTOTYPE PROPOSED FOR THE CHERENKOV TELESCOPE ARRAY

THE CHERENKOV TELESCOPE ARRAY (CTA) PROJECT IS AN INTERNATIONAL INITIATIVE TO BUILD A NEXT GENERATION GROUND-BASED OBSERVATORY FOR VERY HIGH ENERGY GAMMA-RAYS. THREE CLASSES OF TELESCOPES WITH DIFFERENT DISH SIZES WILL COVER THE FULL ENERGY RANGE FROM 20 GEV UP TO 300 TEV. FULL SKY COVERAGE WILL BE PROVIDED BY TWO ARRAYS, LOCATED IN THE NORTHERN AND SOUTHERN HEMISPHERES, RESPECTIVELY. THE ARRAY IN THE SOUTHERN HEMISPHERE WILL INCLUDE SEVENTY SMALL SIZE TELESCOPES (SST, 4M DIAMETER). THEIR IMPLEMENTATION HAS DIFFERENT PHASES. THE ASTRI MINI-ARRAY OF CTA PRE-PRODUCTION TELESCOPES IS ONE OF THE SST MINI-ARRAYS PROPOSED TO BE INSTALLED AT THE CTA SOUTHERN SITE. THE CONSTRUCTION OF THE ASTRI MINI-ARRAY IS AN EFFORT LED BY THE ITALIAN NATIONAL INSTITUTE FOR ASTROPHYSICS (INAF) AND CARRIED ON BY INSTITUTES FROM ITALY, BRAZIL, AND SOUTH AFRICA. THE ASTRI MINI-ARRAY WILL BE COMPOSED OF NINE ASTRI UNITS BASED ON THE END-TO-END PROTOTYPE ALREADY INSTALLED ON MT. ETNA (ITALY) AND THAT IS CURRENTLY UNDERGOING ENGINEERING TESTS. THE NEWLY-FORMED ASTRI SOFTWARE INTEGRATION TEAM WILL MANAGE SOFTWARE RELEASES, THEIR DEPLOYMENT AND THE PRELIMINARY INTEGRATION TESTS. THE AIM OF THIS TEAM IS TO SUPPORT THE END-TO-END PROTOTYPE OPERATIONS ACCORDING TO THE SYSTEM ASSEMBLY INTEGRATION AND VERIFICATION (AIV) PLAN. THE SOFTWARE COMPONENTS, INDIVIDUALLY DEPLOYED AND FIRST TESTED WITH THEIR ENGINEERING GRAPHICAL USER INTERFACES (GUIS), ARE ROUTINELY USED, AND THEREFORE VERIFIED IN THE OVERALL SYSTEM TESTS. THIS CONTRIBUTION PRESENTS THE TRANSITION FROM THE ENGINEERING TEST ENVIRONMENT TO THE OPERATION ENVIRONMENT.

P1.8: SIMON CONSEIL

UNIV LYON, UNIV LYON1, ENS DE LYON, CNRS, CENTRE DE RECHERCHE ASTROPHYSIQUE DE LYON

ADVANCED DATA REDUCTION FOR THE MUSE DEEP FIELDS

THE MULTI UNIT SPECTROSCOPIC EXPLORER (MUSE) IS A SECOND GENERATION INSTRUMENT INSTALLED AT THE VERY LARGE TELESCOPE (VLT). IT IS AN INTEGRAL-FIELD SPECTROGRAPH OPERATING IN THE VISIBLE WAVELENGTH RANGE.

THE OFFICIAL MUSE PIPELINE IS AVAILABLE FROM ESO. HOWEVER, FOR THE DATA-REDUCTION OF THE DEEP FIELDS PROGRAM (BACON ET AL., IN PREP.), WE HAVE BUILT A MORE SOPHISTICATED REDUCTION PIPELINE, WITH ADDITIONAL RECIPES, TO EXTEND THE OFFICIAL ONE.

WHEN THERE ARE MANY EXPOSURES (~300 IN OUR CASES, ~2.2TB OF RAW DATA), IT BECOMES INFEASIBLE TO MANUALLY KEEP TRACK OF EVERYTHING. INSTEAD IT IS CRUCIAL TO BUILD AUTOMATED AND REPRODUCIBLE PROCEDURES FOR TASKS LIKE ASSOCIATING MULTIPLE CALIBRATION FILES WITH A SPECIFIC OBSERVATION. SIMILARLY, SINCE THE OFFICIAL PIPELINE ONLY PROVIDES TOOLS FOR REDUCING A SINGLE EXPOSURE, WE HAVE BUILT A CUSTOM DATA-REDUCTION SYSTEM WITH A DATABASE THAT CONTAINS ALL OF THE INFORMATION FROM THE SCIENCE AND CALIBRATION EXPOSURES. THIS LETS US RELIABLY IDENTIFY FILES, BASED ON CRITERIA SUCH AS TIME OFFSETS OR TEMPERATURE DIFFERENCES.

A NUMBER OF ADDITIONAL RECIPES ARE ALSO USED TO REDUCE THE DATA:

- AN AUTOMATIC FLAT-FIELDING PROCEDURE, USING THE SKY LEVEL AS A REFERENCE. THIS IS PART OF THE RECENTLY RELEASED MPDAF PYTHON PACKAGE (SEE THE PRESENTATION AT ADASS).

- ADVANCED SKY SUBTRACTION USING ZAP (SOTO ET AL., 2016MNRAS.458.3210S), ALSO RELEASED THIS YEAR. ZAP USES A PCA TO ISOLATE AND REMOVE THE RESIDUAL SKY SUBTRACTION FEATURES.

- VARIOUS MASKING STEPS, TO REMOVE INSTRUMENTAL ARTIFACTS THAT CANNOT BE CORRECTED.

- EXPOSURES COMBINATION APPLIED ON DATA CUBES, WHICH ALLOW TO RUN ADDITIONAL STEPS ON THE CUBES BEFORE COMBINING THEM. ALSO PART OF MPDAF.

- AN AUTOMATED PROCEDURE FOR ESTIMATING POINTING ERRORS AND PSF DIMENSIONS BY COMPARING MUSE AND HST IMAGES OF THE SAME FIELDS.

THIS REDUCTION PIPELINE IS BUILT WITH PYTHON AND VARIOUS LIBRARIES LIKE PYTHON-CPL (WRAPPER FOR ESO PIPELINES) AND DOIT (WORKFLOW MANAGEMENT SYSTEM). WE ALSO MAKE FREQUENT USE OF THE JUPYTER NOTEBOOK FOR QUALITY ANALYSIS. THIS CAN BE RUN ON A SERVER COMPUTER AND ACCESSED REMOTELY. ONCE A NOTEBOOK IS READY, WE USE IT TO GENERATE HTML PAGES FOR EACH INDIVIDUAL EXPOSURE, OR FOR THE COMBINED CUBES.

P1.9: JUAN PABLO CÓRDOVA BARBOSA

CUCEA - UNIVERSIDAD DE GUADALAJARA, ZAPOPAN, MÉXICO

COMPUTATIONAL INTELLIGENCE FOR STELLAR MAGNETIC FIELDS PARAMETER DETERMINATION

NOWADAYS THERE ARE PLENTY OF ASTRONOMICAL DATABASES AVAILABLE, CONTAINING ENORMOUS QUANTITIES OF RAW DATA. HENCE, ANALYSIS AND AUTOMATIC EXTRACTION OF RELEVANT INFORMATION FROM THESE HAS BECOME A CRUCIALLY IMPORTANT TASK. IN THIS WORK, WE PRESENT THE FIRST RESULTS OF APPLYING AN ALGORITHM WHICH ENABLES AUTOMATIC DETERMINATION OF A COUPLE OF PARAMETERS FROM POLARIZED STELLAR SPECTRA: EFFECTIVE TEMPERATURE (TEFF) AND MEAN LONGITUDINAL MAGNETIC FIELD (HEFF). OUR METHOD IS BASED ON SUPERVISED LEARNING FOR ARTIFICIAL NEURAL NETWORKS.

FOR THIS PURPOSE, FOR EACH STELLAR ATMOSPHERIC MODEL WE FIRST GENERATED A SYNTHETIC DATABASE OF POLARIZED STELLAR SPECTRA USING THE CODE COSSAM. THE DATABASE CONSISTS OF 200 DIFFERENT MAGNETIC MODELS EACH ONE CORRESPONDING TO A DIFFERENT COMBINATION OF THE MODEL PARAMETERS (7 FREE PARAMETERS). THEN, WE CHARACTERIZE THE PERFORMANCE OF THE ALGORITHM FOR THE INFERENCE OF THE PARAMETERS OF INTEREST, HEFF AND TEFF, AT DIFFERENT LEVELS OF SIGNAL-TO-NOISE RATIO. CONSIDERING 10 DIFFERENT ATMOSPHERIC MODELS, A TOTAL OF 2000 INDIVIDUAL SPECTRA WERE SYNTHESIZED WITH THE CODE COSSAM WHICH WERE USED TO CONDUCT THE PROPER TRAINING OF OUR NEURAL NETWORK.

IN THIS WORK WE WILL PRESENT THE FIRST RESULTS OF THE NETWORK PERFORMANCE UNDER A SUPERVISED REGIME. OUR FINAL GOAL IS TO ACHIEVE A GOOD EFFICIENCY IN THE CODE TO RETRIEVE THE HEFF AND TEFF PARAMETERS, TO SUBSEQUENTLY APPLY IT TO A BIG DATABASE OF REAL OBJECTS (HTTP://POLARBASE.IRAP.OMP.EU/).

P1.10: LUIS J. CORRAL

INSTITUTO DE ASTRONOMÍA Y METEOROLOGÍA, UNIVERSIDAD DE GUADALAJARA, MÉXICO

EFFECT OF THE SIGNAL TO NOISE RATIO ON THE ACCURACY OF THE AUTOMATIC SPECTRAL CLASSIFICATION OF STELLAR SPECTRA.

THE SIGNAL TO NOISE RATIO (S/N) IS AN IMPORTANT PARAMETER THAT GREATLY AFFECT THE ACCURACY OF THE AUTOMATIC SPECTRAL CLASSIFICATION. WE PRESENT THE ANALYSIS MADE OVER THE AUTOMATIC SPECTRAL CLASSIFICATION OF STELLAR SPECTRA WITH DIFFERENT LEVELS OF S/N. WE TRAINED SPECIALIZED NEURAL NETWORKS WITH SPECTRA AT DIFFERENT S/N LEVELS IN ORDER TO MINIMIZE SUCH EFFECT AND PRESENT HERE THE QUANTITATIVE ANALYSIS OF THE ACCURACY IN THE SPECTRAL CLASSIFICATION.

P6.6: STEVE CRAWFORD

SOUTH AFRICAN ASTRONOMICAL OBSERVATORY

REDUCING OPTICAL OBSERVATIONS WITH PYTHON

IN ADDITION TO INSTRUMENT SPECIFIC PYTHON PIPELINES, THERE NOW EXISTS A SUITE OF TOOLS AVAILABLE FOR GENERAL REDUCTION OF OPTICAL OBSERVATIONS. THIS INCLUDES CCDPROC, AN ASTROPY AFFILIATED PACKAGE FOR BASIC CCD REDUCTIONS. THE PACKAGE IS USEFUL FROM STUDENT TUTORIALS FOR LEARNING CCD REDUCTIONS TO BUILDING SCIENCE-QUALITY REDUCTION PIPELINES FOR OBSERVATORIES. IN ADDITION, WE ALSO PRESENT SPECREDUCE, A PYTHON PACKAGE FOR REDUCING OPTICAL SPECTROSCOPY. THE PACKAGE INCLUDES AN INTERACTIVE GRAPHICAL USERS INTERFACE FOR LINE IDENTIFICATION AS WELL AS TOOLS FOR EXTRACTING SPECTRA. WITH THIS SET OF TOOLS, PIPELINES CAN BE BUILT FOR INSTRUMENTS IN RELATIVELY SHORT TIMES. WHILE NEARLY COMPLETE, FURTHER IMPROVEMENTS AND ENHANCEMENTS ARE STILL NEEDED AND CONTRIBUTIONS ARE WELCOME.

P1.11: NICHOLAS JAMES GERAINT CROSS

INSTITUTE FOR ASTRONOMY, EDINBURGH

MATCHED APERTURE PHOTOMETRY IN THE WIDE FIELD ASTRONOMY UNIT SCIENCE ARCHIVES

THE WIDE FIELD ASTRONOMY UNIT ARCHIVES OPTICAL/NEAR-INFRARED IMAGING DATA FROM UKIRT/WFCAM, VISTA/VIRCAM AND VST/OMEGACAM. THE CURRENT DATA STRUCTURES ARE BASED ON INDEPENDENT DETECTIONS IN EACH BANDS, BUT THERE ARE MANY SCIENCE CASES WHERE FORCED PHOTOMETRY IN ALL BANDS (AND INDEED ON IMAGES FROM OTHER DATASETS) ARE NECESSARY TO GET THE PRECISION NECESSARY TO FIT MODELS, OR TO GIVE UPPER LIMITS ON NON-DETECTIONS.

HOWEVER, MANY OF THE SCIENCE CASES GIVEN BY PIS AND OTHERS REQUIRE A RANGE OF SOFTWARE TO ACHIEVE THE PHOTOMETRIC ACCURACY, RANGING FROM THE CASU IMCORE_LIST FOR BEST POINT-SOURCE PHOTOMETRY TO GAAP AND LAMBDAR FOR IMPROVED EXTRAGALACTIC PARAMETERS. THIS POSTER WILL DISCUSS THE SCOPE OF THE NEW PIPELINE AND THE DATA MANAGEMENT STRUCTURES THAT CONTROL IT FOR THE DIFFERENT USE CASES.

P1.12: ANDRÉ CSILLAGHY

FHNW - UNIVERSITY OF APPLIED SCIENCES NORTHWESTERN SWITZERLAND

RECONSTRUCTION OF SOLAR X-RAY IMAGES FROM VISIBILITIES WITH COMPRESSED SENSING

X-RAY SOLAR IMAGES ARE KEY TO UNDERSTANDING SOLAR FLARES, AS THEY ALLOW TO SEE RIGHT IN THE SOURCE OF SUCH EVENTS. HOWEVER, IT IS COMPLICATED TO MAKE X-RAY IMAGES. X-RAYS CANNOT BE FOCUSED USING OPTICAL LENSES. THEREFORE, INDIRECT IMAGING METHODS ARE TYPICALLY USED THAT ARE MATHEMATICALLY EQUIVALENT TO THOSE USED BY INTERFEROMETERS, SUCH AS ALMA OR THE SKA. ACCORDINGLY, THEIR OUTPUT ARE VISIBILITIES, WHICH ARE MEASUREMENTS IN FOURIER SPACE. IMAGES MUST BE RECONSTRUCTED BY TRANSFORMING THESE FOURIER COEFFICIENTS INTO SPATIAL IMAGES. SEVERAL IMAGE RECONSTRUCTION ALGORITHMS ARE IN USE, SUCH AS CLEAN OR MAXIMUM ENTROPY. INTERESTINGLY, COMPRESSED SENSING (CS) FOR SOLAR IMAGES HAS RAISED ONLY LIMITED INVESTIGATION SO FAR, EVEN THOUGH THIS IS OFTEN CONSIDERED AS THE MOST STATE OF THE ART AND/OR PROMISING ALGORITHM FOR VISIBILITY-BASED RECONSTRUCTION, AND CS IS ALSO BEING USED SUCCESSFULLY IN VARIOUS DOMAINS SUCH AS MEDICAL IMAGING FOR MRI/CT. IN OUR POSTER, WE SHOW THAT CS CAN ALSO BE APPLIED TO X-RAY OBSERVATIONS OF THE SUN. WE PRESENT OUR VERSION OF THE ALGORITHM AS WELL AS A PUBLICLY AVAILABLE PROTOTYPE TO RECONSTRUCT IMAGES FROM THE NASA RHESSI SPACECRAFT, THE CURRENT X-RAY SOLAR OBSERVATORY. WE SHOW HOW WE CAN APPLY OUR ALGORITHM ALSO TO THE NEXT GENERATION SOLAR X-RAY IMAGER, STIX, WHICH WILL FLY AS ONE OF THE 10 INSTRUMENTS ON BOARD THE ESA SPACECRAFT SOLAR ORBITER. WE DISCUSS RESULTS, THE POTENTIAL AND LIMITATIONS OF OUR ALGORITHM, AND FUTURE DIRECTIONS.

P1.13: GUIDO CUPANI

INAF – OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

FIELD TESTS FOR THE ESPRESSO DATA ANALYSIS SOFTWARE

THE DATA ANALYSIS SOFTWARE (DAS) FOR VLT ESPRESSO IS AIMED TO SET A NEW BENCHMARK IN THE TREATMENT OF SPECTROSCOPIC DATA TOWARDS THE EXTREMELY-LARGE-TELESCOPE ERA, PROVIDING CAREFULLY DESIGNED, FULLY INTERACTIVE RECIPES TO TAKE CARE OF COMPLEX ANALYSIS OPERATIONS (E.G. RADIAL VELOCITY ESTIMATION IN STELLAR SPECTRA, INTERPRETATION OF THE ABSORPTION FEATURES IN QUASAR SPECTRA). A FEW MONTHS AWAY FROM THE INSTRUMENT'S FIRST LIGHT, THE DAS IS NOW MATURE FOR SCIENCE VALIDATION, WITH MOST ALGORITHMS ALREADY IMPLEMENTED AND OPERATIONAL. IN THIS TALK, I WILL SHOWCASE THE DAS FEATURES WHICH ARE CURRENTLY EMPLOYED ON HIGH-RESOLUTION HARPS AND UVES SPECTRA TO ASSESS THE SCIENTIFIC RELIABILITY OF THE RECIPES AND THEIR RANGE OF APPLICATION. I WILL GIVE A GLIMPSE ON THE SCIENCE THAT WILL BE POSSIBLE WHEN ESPRESSO DATA BECOME AVAILABLE, WITH A PARTICULAR FOCUS ON THE NOVEL APPROACH THAT HAS BEEN ADOPTED TO SIMULTANEOUSLY FIT THE EMISSION CONTINUUM AND THE ABSORPTION LINES IN THE LYMAN-ALPHA FOREST OF QUASAR SPECTRA.

P6.7: CHRISTOPH DEIL DEIL

MPIK, HEIDELBERG, GERMANY

AN OPEN CATALOG FOR TEV GAMMA-RAY ASTRONOMY

THE FIRST COSMIC TEV GAMMA-RAY SOURCE DETECTED FROM THE GROUND WAS THE CRAB NEBULA IN 1989. SINCE THEN, TEV ASTRONOMY HAS SEEN RAPID GROWTH. BY NOW, OVER
160 SOURCES HAVE BEEN DETECTED. MEASUREMENTS OF SOURCE POSITION, MORPHOLOGY, SPECTRUM AND SOMETIMES LIGHTCURVES HAVE BEEN PUBLISHED, MOSTLY IN INDIVIDUAL PAPERS. OFTEN THE SOURCE PARAMETERS ARE NOT GIVEN IN A MACHINE-READABLE FORMAT, AND EVEN IF THEY ARE, THERE IS NO COMMON DATA FORMAT.

WE PRESENT AN EFFORT TO COLLECT THE AVAILABLE DATA ON TEV SOURCES, AND CURATE IT INTO AN AS-UNIFORM AND AS-COMPLETE AS POSSIBLE FORM, AND HAVE IT FREELY AVAILABLE FOR DOWNLOAD AT HTTPS://GITHUB.COM/GAMMAPY/GAMMA-CAT . THIS POSTER PRESENTS THE PROJECT IDEA AND STATUS, AS WELL AS ITS TECHNICAL IMPLEMENTATION, WHICH INCLUDES YAML, ECSV, JSON AND FITS FILES AND PYTHON SCRIPTS USING GAMMAPY (HTTP://GAMMAPY.ORG), AND SEVERAL OTHER PYTHON PACKAGES. A WEB FRONT-END TO BROWSE THIS TEV SOURCE CATALOG AND OTHER GAMMA-RAY AND MULTI-WAVELENGTH DATA IS UNDER DEVELOPMENT AT HTTP://GAMMA-SKY.NET .

P6.8: ARANCHA DELGADO

INSTITUTE OF ASTRONOMY, UNIVERSITY OF CAMBRIDGE, CAMBRIDGE, UK

PUBLISHING GAIA SCIENCE ALERTS

THE GOAL OF THE GAIA SCIENCE ALERTS PROJECT IS TO HIGHLIGHT THE TRANSIENT EVENTS DISCOVERED BY THE GAIA MISSION WHILE IT IS MAPPING THE MILKY WAY. THE DATA ARE TRANSMITTED FROM THE SPACECRAFT EVERY DAY, AND RECEIVED AND PROCESSED AT THE INSTITUTE OF ASTRONOMY (CAMBRIDGE, UK), WHERE THE GAIA PHOTOMETRIC SCIENCE ALERTS SYSTEM EXTRACTS THE TRANSIENT CANDIDATES.

ONCE ALERTS ARE IDENTIFIED, A PYTHON APPLICATION GAIA SCIENCE ALERTS (GSA AT HTTP://GSAWEB.AST.CAM.AC.UK) CHECKS IF THESE FINDINGS ARE NEW DISCOVERIES BY GAIA. FOR THIS PURPOSE, AN ETL (EXTRACT, TRANSFORM, LOAD) SYSTEM GATHERS THE DATA REPORTED BY OTHER MAJOR TRANSIENT SURVEY WEB SITES, AND THE GAIA ALERT CANDIDATES ARE CROSS-MATCHED AGAINST THESE EXTERNAL DATA. ADDITIONALLY THE APPLICATION CHECKS ONLINE FOR THE LATEST TNS (TRANSIENT NAME SERVER) DISCOVERIES, AND CONNECTS TO IMCEE-SKYBOT TO IDENTIFY POSSIBLE COINCIDENT SMALL SOLAR SYSTEM BODIES.

THE GSA APPLICATION MAKES SELECTED ALERTS PUBLICLY AVAILABLE, BY GENERATING PER-ALERT WEB PAGES WHICH CONTAIN DETAILED SCIENTIFIC SOURCE INFORMATION, INCLUDING THE LIGHTCURVES, SPECTRA, FINDING CHARTS AND PHOTOMETRIC FOLLOW-UP WHEN AVAILABLE. ON ALERT PUBLICATION, THE GAIA TRANSIENTS ARE BROADCAST TO THE TNS SERVER, AS VOEVENTS, TO THE GAIAALERTS MOBILE APPLICATION AND TO GAIA IN THE UK WEBSITE (HTTPS://GAIA.AC.UK). FURTHERMORE, THE APPLICATION UPDATES THE PUBLISHED ALERTS WITH THE LATEST DATA FROM GAIA AS IT COMES IN.

P4.5: SÉBASTIEN DERRIERE

OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, UNIVERSITÉ DE STRASBOURG, CNRS, UMR 7550

VOALERTS : VO-ENABLED DATA SERVICE DISCOVERY

THE NUMBER OF ASTRONOMICAL DATA SERVICES IS INCREASING AT AN ACCELERATING PACE, AND IT CAN BE DIFFICULT FOR ASTRONOMERS TO COPE WITH THIS DATA AVALANCHE.

WITH THE VIRTUAL OBSERVATORY PROJECT, NEW DATA SERVICES CAN BE REGISTERED IN A REGISTRY, BUT ASTRONOMERS STILL HAVE TO PULL INFORMATION FROM THE REGISTRY TO DISCOVER NEWLY PUBLISHED SERVICES.

MOREOVER, IN ORDER TO DISCOVER WHAT DATA (IMAGES, CATALOGUES, SPECTRA) ARE AVAILABLE FOR THEIR FAVORITE SKY TARGET, ASTRONOMERS HAVE TO QUERY EACH SERVICE TO SEE IF THEY ARE RELEVANT OR NOT.

WE PRESENT A NEWLY DEVELOPED SERVICE DUBBED VOALERTS TO HELP ASTRONOMERS DISCOVER RELEVANT DATA SERVICES. THE SCIENTISTS SIMPLY SUBSCRIBE TO THE SERVICE, AND PROVIDE A LIST OF SKY TARGETS THEY ARE INTERESTED IN. VOALERTS TAKES CARE OF MONITORING THE VO REGISTRY FOR NEWLY PUBLISHED SERVICES. FOR EACH NEW SERVICE, VOALERTS TESTS IF IT CONTAINS DATA AROUND THE FOLLOWED TARGETS, AND SENDS SUMMARY NOTIFICATIONS TO THE ASTRONOMER WITH DETAILS ON HOW TO RETRIEVE THE RELEVANT DATA.

P2.32: FU QING DUAN

BNU -- BEIJING NORMAL UNIVERSITY

EXTRACTING FILAMENTS BASED ON MORPHOLOGY COMPONENTS ANALYSIS FROM RADIO ASTRONOMICAL IMAGES

FILAMENTS ARE A TYPE OF WIDE-EXISTING ASTRONOMICAL STRUCTURE. IT IS A CHALLENGE TO SEPARATE FILAMENTS FROM RADIO ASTRONOMICAL IMAGES BECAUSE THEIR RADIATION IS USUALLY WEAK AND FILAMENTS OFTEN MIX WITH BRIGHT OBJECTS, E.G. STARS, WHICH LEADS DIFFICULTY TO SEPARATE THEM. IN 2013, A. MEN' SHCHIKOV PROPOSED A MULTI-SCALE, MULTI-WAVELENGTH FILAMENT EXTRACTION METHOD, WHICH DECOMPOSES A SIMULATED ASTRONOMICAL IMAGE CONTAINING FILAMENTS INTO SPATIAL SCALE IMAGES TO PREVENT INTERACTION INFLUENCE OF DIFFERENT SPATIAL SCALE STRUCTURES. HOWEVER, THE ALGORITHM OF PROCESSING EACH SINGLE SPATIAL SCALE IMAGE IN THE METHOD IS USED TO SIMPLY REMOVE TINY STRUCTURES BY COUNTING CONNECTED PIXELS NUMBER. REMOVING TINY STRUCTURES BASED ON LOCAL INFORMATION MIGHT REMOVE SOME PART OF THE FILAMENTS BECAUSE FILAMENTS IN REAL ASTRONOMIC IMAGE ARE USUALLY WEAK. WE ATTEMPT TO USE MORPHOLOGY COMPONENTS ANALYSIS (MCA) TO PROCESS EACH SINGE SPATIAL SCALE IMAGE. MCA USES A DICTIONARY WHOSE ELEMENTS CAN BE WAVELET TRANSLATION FUNCTION, CURVELET TRANSLATION FUNCTION OR RIDGELET TRANSLATION FUNCTION TO DECOMPOSE IMAGES. DIFFERENT SELECTION OF ELEMENTS IN THE DICTIONARY CAN GET DIFFERENT MORPHOLOGY COMPONENTS OF THE SPATIAL SCALE IMAGE. BY USING MCA, WE CAN GET LINE STRUCTURE, GAUSS SOURCES AND OTHER STRUCTURES IN SPATIAL SCALE IMAGES AND EXCLUDE THE COMPONENTS THAT ARE NOT RELATED TO FILAMENTS. OUR EXPERIMENTS SHOW THAT OUR METHOD IS EFFICIENT IN FILAMENTS EXTRACTION FROM REAL RADIO ASTRONOMIC IMAGES, AND IMAGES PROCESSED BY OUR METHOD HAVE HIGHER PSNR (PEAK SIGNAL TO NOISE RATIO).

P4.6: KIMBERLY DUPRIE

SPACE TELESCOPE SCIENCE INSTITUTE

DECOUPLING THE ARCHIVE

THE JAMES WEBB SPACE TELESCOPE (JWST) ARCHIVE WILL STORE NUMEROUS METADATA FOR THE VARIOUS FILES THAT IT CONTAINS: AT THE TIME OF THIS WRITING A SINGLE FITS FILE CAN HAVE UP TO 250 DIFFERENT METADATA FIELDS IN THE ARCHIVE, MOST OF WHICH MAP TO KEYWORDS IN THE PRIMARY HEADER OR HEADER EXTENSIONS. ONE OF THE GOALS OF THE ARCHIVE DESIGN IS TO ALLOW FOR CHANGES TO THE FIELDS STORED IN THE DATABASE WITHOUT HAVING TO CHANGE THE INGEST CODE. WE HAVE FOUND THIS TO BE VERY HELPFUL DURING THE CODE DEVELOPMENT PHASE OF THE MISSION WHEN THE FITS FILE DEFINITIONS ARE FREQUENTLY CHANGING. WE ALSO ANTICIPATE IT WILL BE ADVANTAGEOUS DURING THE LIFETIME OF THE MISSION AS CHANGES TO PROCESSING WILL LIKELY RESULT IN CHANGES TO THE KEYWORDS BUT SHOULD NOT REQUIRE CHANGES TO THE INGEST CODE. THIS POSTER DESCRIBES THE METHODS WE USE TO DECOUPLE THE ARCHIVE FROM THE INGEST PROCESS.

P4.7: JAVIER DURAN

ESA/ESAC - EUROPEAN SPACE ASTRONOMY CENTER

GENERATION AND PUBLICATION OF GAIA DATA RELEASE 1 IN THE GAIA ARCHIVE

ESAC SCIENCE DATA CENTER GROUP (ESDC) AT ESA/ESAC WAS HEAVILY INVOLVED IN THE GENERATION AND WAS IN CHARGE OF THE PUBLICATION OF THE GAIA DATA RELEASE 1 IN THE GAIA ARCHIVE.

ESDC GROUP CONTRIBUTED TO THE GENERATION OF GAIA AND TGAS CATALOGUES. THIS TASK REQUIRED A FILTERING PROCESS OF THE ORIGINAL DATA TO REMOVE ALL SOURCES THAT DO NOT COMMIT THE QUALITY REQUIREMENTS. ONCE THESE FILTERS WERE APPLIED, THE NUMBER OF GAIA SOURCES GOES BEYOND 1.1 BILLION AND BEYOND 2 MILLIONS IN CASE OF TGAS SOURCES. SEVERAL TRANSFORMATIONS WERE ALSO NEEDED FOR THE ORIGINAL DATA BEFORE IT COULD BE PART OF THE FINAL RELEASE AND INGESTED IN THE GAIA ARCHIVE.

ASIDE FROM THE MENTIONED CATALOGUES, FIVE MORE TABLES CONTAINING ONLY VARIABLE SOURCES WERE ALSO PART OF THE GAIA DATA RELEASE 1. ESDC ALSO PARTICIPATED IF THE GENERATION OF THOSE TABLES AND WAS RESPONSIBLE OF ITS INGESTION IN THE GAIA ARCHIVE.

WE PRESENT HERE THE TOOL ESDC DESIGNED AND DEVELOPED TO GENERATE ALL MENTIONED TABLES AND TO PUBLISH THEM IN THE GAIA ARCHIVE.

P8.10: DANIEL DURAND

NATIONAL RESEARCH COUNCIL CANADA - CADC

HIPS FOR SPECTROSCOPIC OBSERVATIONS

WE ARE ALL WELL AWARE OF THE SUCCESS OF THE HIERARCHICAL PROGRESSIVE SURVEYS (HIPS) IF FOR IMAGES SURVEYS AND CATALOGUES. WE ARE PROPOSING TO EXTEND THE HIPS USABILITY TO

SPECTRA DATA. SPECTRUM ARE NEITHER POINTS (SUITABLE FOR CATALOGUE) AND NEITHER IMAGES. SINCE EVERY SPECTRUM REPRESENTS AN APERTURE ON THE SKY FROM FROM WHICH THE LIGHT IS SPREAD OVER TA DEFINED WAVELENGTH COVERAGE, IT SHOULD POSSIBLE TO REPRESENT AS HIPS TILES THE ACTUAL APERTURE USED ON THE SKY AND USE THE HIPS METADATA EXTRACTION TO EXPOSE THE WAVELENGTH COVERAGE. THE ADVANTAGES OF USING HIPS IN ADDITION TO MOC ARE THE LINK TO ALL INPUT SPECTRA AS WELL AS GIVING THE USER AN INDICATION OF THE NUMBER OF INPUT FOR EACH HIPS PIXEL. ALTHOUGH NOT

AVAILABLE YET, WE PROPOSE A WAY TO SEARCH AND FILTER THE HIPS ENTRIES BASED ON A USER SELECTED FILTER ON THE METADATA TO BE ABLE TO SEARCH AND SELECT ON THE WAVELENGTH AXIS.

P2.7: KEN EBISAWA

JAXA/ISAS

WEB-BASED QUICK DATA ANALYSIS TOOLS JUDO2 AND UDON2

WE HAVE BEEN OPERATING THE WEB-BASED QUICK DATA ANALYSIS TOOLS JUDO2 AND UDON2 AT DARTS (HTTP://DARTS.ISAS.JAXA.JP). JUDO2 ADOPTS ALADIN-LIGHT TO DISPLAY VARIOUS ASTRONOMICAL SURVEY DATA. IN PARTICULAR, WE HAVE CREATED HIPS DATA OF SUZAKU, MAXI, ASCA AND SWIFT, AND PUBLISH THEM FROM DARTS (HTTP://DARTS.ISAS.JAXA.JP/PUB/JUDO2/HIPS/). IN ADDITION, WE MADE VARIOUS TYPES OF THE CONSTELLATION DATA IN HIPS FORMAT. RECENTLY, THANKS TO COOPERATION BY ESA-SKY TEAM, XMM FIELDS OF VIEW (FOOT-PRINTS) AND DIRECT LINKS TO THE XMM-ARCHIVE AT ESA ARE MADE AVAILABLE IN JUDO2,

UDON2 ALLOWS USERS TO EXTRACT SPECTRA AND LIGHT-CURVES OF MAXI, SUZAKU AND ASCA DATA. USERS CAN DISPLAY TARGET-STARS OR SKY REGIONS IN JUDO2, AND JUMP TO UDON2 TO QUICKLY ANALYSE THESE TARGETS. WE ARE PLANNING TO ADD JAXA'S OTHER ASTRONOMICAL DATA (E.G. AKARI) TO JUDO2 AND UDON2.

P3.4: SATOSHI EGUCHI

FUKUOKA UNIVERSITY, FUKUOKA, JAPAN

PRE-FEASIBILITY STUDY OF ASTRONOMICAL DATA ARCHIVE SYSTEMS POWERED BY PUBLIC CLOUD COMPUTING AND HADOOP HIVE

THE SIZE OF ASTRONOMICAL OBSERVATIONAL DATA IS INCREASING YEARLY. FOR EXAMPLE, WHILE ATACAMA LARGE MILLIMETER/SUBMILLIMETER ARRAY IS EXPECTED TO GENERATE 200 TB RAW DATA EVERY YEAR, LARGE SYNOPTIC SURVEY TELESCOPE IS ESTIMATED TO PRODUCE 15 TB RAW DATA EVERY NIGHT. SINCE THE INCREASING RATE OF COMPUTING IS MUCH LOWER THAN THAT OF ASTRONOMICAL DATA, TO PROVIDE HIGH PERFORMANCE COMPUTING (HPC) RESOURCES TOGETHER WITH SCIENTIFIC DATA WILL BE COMMON IN THE NEXT DECADE. HOWEVER, THE INSTALLATION AND MAINTENANCE COSTS OF A HPC SYSTEM CAN BE BURDENSOME FOR THE PROVIDER. I NOTE PUBLIC CLOUD COMPUTING FOR AN ALTERNATIVE WAY TO GET SUFFICIENT COMPUTING RESOURCES INEXPENSIVELY. I BUILD HADOOP AND HIVE CLUSTERS BY UTILIZING A VIRTUAL PRIVATE SERVER (VPS) SERVICE AND AMAZON ELASTIC MAPREDUCE (EMR), AND MEASURE THEIR PERFORMANCES. THE VPS CLUSTER BEHAVES DIFFERENTLY DAY BY DAY, WHILE THE EMR CLUSTERS ARE RELATIVELY STABLE. SINCE PARTITIONING IS ESSENTIAL FOR HIVE, SEVERAL PARTITIONING ALGORITHMS ARE EVALUATED. IN THIS POSTER, I REPORT THE RESULTS OF THE BENCHMARKS AND THE PERFORMANCE OPTIMIZATION IN CLOUD COMPUTING ENVIRONMENT.

P6.9: JUSTIN CHARLES ELY

SPACE TELESCOPE SCIENCE INSTITUTE

THE JWST DATA ANALYSIS TOOLKIT

THE NOMINAL 5 YEAR MISSION OF JWST MANDATES THAT THE USER COMMUNITY BE ABLE TO PERFORM ROBUST SCIENTIFIC ANALYSIS AND VISUALIZATION FROM THE VERY FIRST DAY OF OPERATIONS. THOUGH THE JWST CALIBRATION PIPELINES WILL PROVIDE A THOROUGH AND ROBUST CALIBRATION TO THE DATASETS, THIS WILL BY NECESSITY NOT ADDRESS THE SPECIFIC NEEDS OF EVERY POSSIBLE SCIENCE CASE. A MORE TAILORED RE-CALIBRATION, AS WELL AS THE FOLLOWING SCIENTIFIC INVESTIGATION, REQUIRE USERS TO BE ABLE TO EFFICIENTLY EXPLORE AND ANALYZE THEIR DATASETS. WHERE THE JWST CALIBRATION PIPELINES LEAVE OFF WITH HIGH-QUALITY CALIBRATED DATA, THE DATA ANALYSIS TOOLS PICK UP AND PROVIDE A SUITE OF BOTH JWST SPECIFIC AND GENERALIZED TOOLS TO FACILITATE SCIENTIFIC INVESTIGATIONS.

THIS TOOLKIT IS AN EVOLVING COLLECTION OF STAND-ALONE TOOLS, ALGORITHMS, AND LIBRARIES PERTINENT TO JWST DATA AND ASTRONOMICAL DATA ANALYSIS. THOUGH THE FULL-SUITE OF TOOLS WILL BE EVEN RICHER AT LAUNCH, ALREADY INCLUDED ARE SPECTRAL AND IMAGE VIEWERS, TOOLS FOR GENERAL LINKED-DATASET ANALYSIS, AND LIBRARIES FOR PHOTOMETRY, SPECTROSCOPY, AND IMAGE MANIPULATION. THESE TOOLS ARE BEING BUILT PREDOMINANTLY IN THE PYTHON PROGRAMMING LANGUAGE, HOSTED PUBLICLY ON GITHUB, AND DISTRIBUTED IN STSCI'S ANACONDA CHANNEL; ASTROCONDA.

P1.37: ILARIA ERMOLLI

INAF OSSERVATORIO ASTRONOMICO DI ROMA, MONTE PORZIO CATONE, ITALY

IBIS-A THE IBIS SOLAR SPECTROPOLARIMETRIC DATA ARCHIVE

WE REVIEW THE EFFORTS UNDERTAKEN TO SET UP AND OPERATE THE IBIS-A ARCHIVE OF GROUND-BASED SOLAR SPECTROPOLARIMETRIC OBSERVATIONS, IN THE VSO (VIRTUAL SOLAR OBSERVATORY) FRAMEWORK, BY USING IBIS DATA, SOAP/XML WEB SERVICES, AND USAGE-CENTERED DESIGN APPROACH.

THE IBIS (INTERFEROMETRIC BIDIMENSIONAL SPECTROPOLARIMETER) IS A HIGH CADENCE, DUAL FABRY-PEROT INTERFEROMETER SPECTROPOLARIMETER CONSTRUCTED BY A CONSORTIUM OF ITALIAN INSTITUTES AND INSTALLED AT THE DUNN SOLAR TELESCOPE OF THE US NATIONAL SOLAR OBSERVATORY IN NEW MEXICO. THE INSTRUMENT ALLOWS FOR SPECTROPOLARIMETRIC OBSERVATIONS OF THE SOLAR PHOTOSPHERE AND CHROMOSPHERE AT HIGH SPATIAL, SPECTRAL, AND TEMPORAL RESOLUTION, WITHIN THE 550-860 NM RANGE.

THE IBIS-A IS REALIZED IN THE FRAMEWORK OF THE FP7 SOLARNET HIGH-RESOLUTION SOLAR PHYSICS NETWORK PROJECT THAT AIMS AT INTEGRATING THE MAJOR EUROPEAN INFRASTRUCTURES IN THE FIELD OF HIGH-RESOLUTION SOLAR PHYSICS, AS A STEP TOWARDS THE REALISATION OF THE 4M EST EUROPEAN SOLAR TELESCOPE.

P8.11: TONY JOHN FARRELL

AUSTRALIAN ASTRONOMICAL OBSERVATORY

2DFDR - STILL GOING STRONG AFTER 20 YEARS!

THE 2DFDR FIBRE MOS REDUCTION PACKAGE ORIGINATED WITH THE ORIGINAL 2DF INSTRUMENT AND ITS ORIGINAL SPECTROGRAPH IN THE MID 1990S. AS THE 2DF INSTRUMENT HAS BEEN UPGRADED WITH NEW SPECTROGRAPHS AND FEATURES THROUGH ITS 20 YEARS OF LIFE TO ADDRESS NEW SCIENCE ROLES, SO HAS 2DFDR. ORIGINALLY DESIGNED TO REDUCE SPECTRA FOR THE 2DF GALAXY REDSHIFT SURVEY ON WHAT IS NOW CONSIDERED VERY SLOW HARDWARE, IT IS NOW REDUCING SPECTRA FROM AAT'S AAOMEGA SPECTROGRAPH TO THE DRAMATICALLY HIGHER QUALITY REQUIRED FOR SURVEYS SUCH AS SAMI AND OZDES, AS WELL AS REDUCING DATA FROM HERMES AND WITH THE SOON TO BE COMMISSIONED TAIPAN INSTRUMENT BEING ADDED. WE EXAMINE SOME OF THE MORE SIGNIFICANT IMPROVEMENTS IN RECENT YEARS AND THE QUALITY OF THE RESULTS FROM THE CURRENT VERSION.

P3.5: MARCO FRAILIS

INAF - OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

THE EUCLID SCIENCE GROUND SEGMENT DISTRIBUTED INFRASTRUCTURE: SYSTEM INTEGRATION AND CHALLENGES

THE SCIENCE GROUND SEGMENT (SGS) OF THE EUCLID MISSION PROVIDES DISTRIBUTED AND REDUNDANT DATA STORAGE AND PROCESSING, FEDERATING 9 SCIENCE DATA CENTRES (SDCS) AND A SCIENCE OPERATIONS CENTRE.

THE SGS REFERENCE ARCHITECTURE IS BASED ON LOOSELY COUPLED SYSTEMS AND SERVICES, BROADLY ORGANIZED INTO A COMMON INFRASTRUCTURE OF TRANSVERSE SOFTWARE COMPONENTS AND THE SCIENTIFIC DATA PROCESSING FUNCTIONS (PFS).

THE SGS COMMON INFRASTRUCTURE INCLUDES: 1) THE EUCLID ARCHIVE SYSTEM (EAS), A CENTRAL METADATA REPOSITORY WHICH INVENTORIES, INDEXES AND LOCALIZES THE HUGE AMOUNT OF DISTRIBUTED DATA; 2) A DISTRIBUTED STORAGE SYSTEM (DSS), PROVIDING A UNIFIED VIEW OF THE SDCS STORAGE SYSTEMS AND SUPPORTING SEVERAL TRANSFER PROTOCOLS; 3) AN INFRASTRUCTURE ABSTRACTION LAYER (IAL), ISOLATING THE SCIENTIFIC DATA PROCESSING SOFTWARE FROM THE UNDERLYING IT INFRASTRUCTURE AND PROVIDING A COMMON, LIGHTWEIGHT WORKFLOW MANAGEMENT SYSTEM; 4) A COMMON ORCHESTRATION SYSTEM (COORS), PERFORMING A BALANCED DISTRIBUTION OF DATA AND PROCESSING AMONG THE SDCS.

THE EUCLID SCIENTIFIC DATA PROCESSING LEVELS ARE DECOMPOSED INTO 11 PROCESSING FUNCTIONS, WHICH ARE THE HIGHEST-LEVEL BREAK-DOWN OF THE COMPLETE PROCESSING. THEY ARE DEVELOPED BY DISTRIBUTED TEAMS, WITH THE CONSTRAINT THAT EACH PF PIPELINE SHOULD RUN IN ANY SDC.

VIRTUALIZATION IS ANOTHER KEY ELEMENT OF THE SGS INFRASTRUCTURE. THE EUCLIDVM IS A LIGHTWEIGHT VIRTUAL MACHINE, DEPLOYED IN ANY SDC PROCESSING NODE, WITH A REFERENCE OS, SELECTED STABLE SOFTWARE LIBRARIES AND "DYNAMIC" INSTALLATION OF THE EUCLID PFS BASED ON THE CERNVM-FS FILE SYSTEM.

WE PRESENT THE STATUS OF THE EUCLID SGS SOFTWARE INFRASTRUCTURE, THE PROTOTYPES DEVELOPED AND THE CONTINUOUS SYSTEM INTEGRATION AND TESTING PERFORMED THROUGH THE EUCLID "SGS CHALLENGES".

P6.10: MARCO FUMANA

INAF-IASF MILANO

PNGS: AN API ECOSYSTEM FOR ASTRONOMICAL APPLICATIONS DEVELOPMENT

PNGS (PANDORA NEXT GENERATION SOFTWARE, WHERE PANDORA IS AN ACRONYM FOR PROGRAMS FOR ASTRONOMICAL DATA ORGANIZATION REDUCTION AND ANALYSIS) IS A COLLECTION OF OBJECT ORIENTED APPLICATION PROGRAMMING INTERFACES (APIS) IMPLEMENTING A BROAD SET OF FUNCTIONALITIES AND ROUTINES AIMED AT THE MANIPULATION OF SPECTROSCOPIC ASTRONOMICAL DATA. IN PARTICULAR A SUBSET OF GUI-ORIENTED APIS ARE AVAILABLE.

DEVELOPED IN PYTHON FOR SIMPLE AND FAST ADOPTION WITH CORE IMPLEMENTATION IN C TO BOOST PERFORMANCES.

BASED ON THE FASE (FUTURE ASTRONOMICAL SOFTWARE ENVIRONMENT) FRAMEWORK, PNGS OFFERS A FULLY CUSTOMISABLE SOFTWARE ECOSYSTEM WHICH ALLOWS TO DEVELOP APPLICATIONS SPANNING THE WHOLE SPECTROSCOPIC DATA LIFECYCLE, FROM DATA CLASSIFICATION TO ITS ORGANISATION ON DISK, ANALISYS, REDUCTION, VISUALIZATION AND ARCHIVING.

THE IDEA OF THE PNGS APIS COLLECTION AS AN ECOSYSTEM HAS LED US TO CONCEIVE AND DESIGN THEM AS A MODULAR AND INDEPENDENT SET OF OBJECTS, TAKING INTO CONSIDERATION SOC (SEPARATION OF CONCERNS) AND ENCAPSULATION PRINCIPLES (THUS ENSURING A CONSISTENT NAMING CONVENTION TOGETHER WITH COMPREHENSIVE AND COHERENT INTERFACES TO DATA); AT THE SAME TIME, THE WAY PNGS IS DESIGNED MAKES IT SIMPLE TO EXPAND THIS ECOSYSTEM IN TERMS OF NEW FUNCTIONALITIES AND DATA CONTAINERS.

PNGS APIS HAVE BEEN USED TO IMPLEMENT THE RECENT, IMPROVED VERSIONS OF VIPGI (VIMOS PIPELINE INTERACTIVE GRAPHICAL INTERFACE) AND EZ (EASY-Z) TOOLS: THE FORMER IS A GRAPHICAL APPLICATION FOR DATA REDUCTION AND ORGANIZATION, WHILE THE LATTER IS AN INTEGRATED ENVIRONMENT FOR SPECTRA ANALISYS AND VISUALISATION.

P8.12: CESAR ENRIQUE GARCIA DABO

ESO

MOSCA: A GENERIC LIBRARY FOR MOS DATA REDUCTION

MOSCA (MULTIOBJECT SPECTROSCOPY COMMON ALGORITHMS) IS A C++ LIBRARY DEVELOPED AT ESO TO EASE THE REDUCTION OF DATA FROM MULTI-OBJECT SPECTROGRAPHS. THE MAIN PROJECT GOALS ARE:

- PLUGGABLE DESIGN TO SUPPORT DIFFERENT REDUCTION PARADIGMS.

- SELF-CALIBRATION APPROACH USING PATTERN MATCHING TECHNIQUES.

- BASED ON CONCEPT OF PSEUDO-SLITS WHICH CAN MAP TO REAL MOS SLITS, LONG SLITS, FIBRES, ETC.

- BASED ON CPL (COMMON PIPELINE LIBRARY) AND GSL (GNU SCIENTIFIC LIBRARY) FOR LOW LEVEL DATA PROCESSING.

- SUPPORT FOR MULTIPLEXED SPECTRA.

RECENT VERSIONS OF THE FORS AND VIMOS INSTRUMENT PIPELINES ARE BASED ON MOSCA, DEMONSTRATING THAT THE LIBRARY IS GENERIC ENOUGH TO BE USED ACROSS INSTRUMENTS. THIS BRINGS BENEFITS IN TERMS OF SCIENTIFIC TESTING AND MAINTENANCE COSTS.

WE PRESENT HERE THE MAIN DESIGN OF THE LIBRARY AS WELL AS EXAMPLES OF ITS USE IN EXISTING INSTRUMENTS.

P1.14: VINCENT CARLO GEERS

STFC UK ASTRONOMY TECHNOLOGY CENTRE, EDINBURGH, UNITED KINGDOM

THE ALMA SCIENCE PIPELINE

THE ALMA SCIENCE PIPELINE IS THE AUTOMATED DATA REDUCTION SOFTWARE FOR THE ATACAMA LARGE MILLIMETER/SUBMILLIMETER ARRAY (ALMA). IT IS DEVELOPED AS PART OF THE COMMON ASTRONOMY SOFTWARE APPLICATIONS (CASA) SOFTWARE PACKAGE BY AN INTERNATIONAL CONSORTIUM OF SCIENTISTS AND SOFTWARE DEVELOPERS BASED AT THE NATIONAL RADIO ASTRONOMICAL OBSERVATORY (NRAO), THE EUROPEAN SOUTHERN OBSERVATORY (ESO), AND THE NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN (NAOJ).

THE CASA PIPELINE IS DESIGNED TO SUPPORT ALMA AND VERY LARGE ARRAY (VLA) INTERFEROMETRIC DATA, AS WELL AS SINGLE DISH DATA FROM ALMA. THE PIPELINE COMPRISES (1) "HEURISTICS" IN THE FORM OF PYTHON SCRIPTS THAT SELECT THE BEST PROCESSING PARAMETERS AND CALL THE UNDERLYING CASA DATA REDUCTION TASKS (WRITTEN IN C++), (2) "CONTEXTS" THAT ARE USED FOR THE BOOK-KEEPING PURPOSE OF DATA PROCESSES, AND (3) A "WEBLOG" GENERATOR THAT SHOWCASE THE OUTCOME OF EACH CALIBRATION / IMAGING TASK FOR USERS TO VIEW IN A BROWSER.

THE ALMA INTERFEROMETRIC CALIBRATION PIPELINE WAS ACCEPTED FOR SCIENCE OPERATIONS SINCE CYCLE 2 (MID-2014), FOLLOWED BY SINGLE-DISH DATA END-TO-END ACCEPTANCE IN 2015. THE ALMA PIPELINE WAS PUBLICLY RELEASED TO THE SCIENCE COMMUNITY IN OCTOBER 2014. AT THE JOINT ALMA OBSERVATORY, THE ALMA PIPELINE IS USED FOR DATA REDUCTION AND QUALITY ASSURANCE OF PI OBSERVING PROGRAMS TAKEN IN STANDARD OBSERVING MODES. IT HAS CONSIDERABLY REDUCED THE WORKLOAD ON MANUAL PROCESSING, WITH ABOUT 17% OF PIPELINE PROCESSED PROJECTS IMMEDIATELY READY FOR DELIVERY TO PIS, AND A FURTHER ~70% REQUIRING ONLY MANUALLY ADDED FLAGGING.

RECENT PIPELINE RELEASES IN 2015/2016 HAVE ADDED NEW FUNCTIONALITY SUCH AS PARALLELIZED PROCESSING OF THE PRE-IMAGING CALIBRATION STEPS AND THE AUTOMATED IMAGING OF THE CALIBRATOR TARGETS. THE UPCOMING CYCLE 4 RELEASE (OCT 2016) WILL INTRODUCE SUPPORT FOR SCIENCE TARGET IMAGING.

IN THIS POSTER, WE REPORT ON THE CURRENT STATUS OF THE PIPELINE CAPABILITIES AND PRESENT INITIAL RESULTS FROM THE IMAGING PIPELINE.

P2.8: RANPAL GILL

RHEA FOR ESA

EVALUATION OF COTS TOOLS – LESSONS FROM BEPICOLOMBO PROVIDE A METHODICAL APPROACH

BEPICOLOMBO IS EUROPE'S FIRST MISSION TO MERCURY. A COLLABORATIVE BETWEEN ESA AND THE JAPAN AEROSPACE EXPLORATION AGENCY (JAXA), EXECUTED UNDER ESA LEADERSHIP. THE MISSION COMPRISES TWO SPACECRAFT: THE MERCURY PLANETARY ORBITER (MPO), BUILT BY ESA, AND THE MERCURY MAGNETOSPHERIC ORBITER (MMO), BUILT BY JAXA, THEY ARE DEDICATED TO THE DETAILED STUDY OF THE PLANET AND ITS MAGNETOSPHERE RESPECTIVELY. THE ESA ORBITER PAYLOAD COMPRISES 11 INSTRUMENTS COVERING DIFFERENT SCIENTIFIC DISCIPLINES DEVELOPED BY SEVERAL INTERNATIONAL TEAMS. THE LAUNCH OF THE MPO-MMO COMPOSITE IS PLANNED FOR APRIL 2018 ON AN ARIANE 5 FROM KOUROU. APPROXIMATELY 6.5 YEARS LATER, AFTER TWO VENUS AND FOUR MERCURY FLYBYS, THE SPACECRAFT WILL PERFORM ITS FINAL APPROACH TO MERCURY ARRIVING IN 2024, AND GATHER DATA DURING A 1-YEAR NOMINAL MISSION, WITH A POSSIBLE 1-YEAR EXTENSION. SCIENCE OPERATIONS WILL BE PLANNED AND COORDINATED BY THE BEPICOLOMBO SCIENCE GROUND SEGMENT (SGS) LOCATED IN THE EUROPEAN SPACE ASTRONOMY CENTRE (ESAC) BASED IN MADRID.

THROUGHOUT THE DEVELOPMENT PHASE OF THE SGS DECISIONS ON WHICH COMMERCIAL OFF-THE-SHELF (COTS) TOOL TO USE HAVE BEEN MADE AND WILL CONTINUE TO BE MADE IN THE FUTURE. EVALUATION OF COTS TOOLS HAS BEEN CARRIED OUT IN EACH CASE, BUT LARGELY WITHOUT ANY GUIDANCE OR BEST PRACTICE METHODOLOGY. EVALUATION OF TOOLS FOR REQUIREMENTS MANAGEMENT AND BUG AND ACTION TRACKING HAVE BEEN PERFORMED IN THE LAST FIVE YEARS. IN THIS PAPER WE EXPLAIN THE METHOD THAT WAS CHOSEN FOR THE EVALUATION, THE REASONS WHY THE METHOD WAS CHOSEN, WHAT WAS GOOD ABOUT IT AND HOW IT CAN BE IMPROVED AND APPLIED TO ANY COTS EVALUATIONS THAT MAY TAKE PLACE IN THE FUTURE.

THE PAPER WILL GIVE THE READER A GOOD STARTING POINT TO STRUCTURE THEIR OWN EVALUATION OF COTS TOOLS ULTIMATELY PROVIDING JUSTIFICATION FOR CHOOSING ONE TOOL OVER ANOTHER AND SUPPORTING DECISION MAKING.

P8.13: PEDRO GOMEZ-ALVAREZ

ESA / ISDEFE - ESAC, MADRID, SPAIN

THE EUCLID MISSION PLANNING SOFTWARE

THE EUCLID MISSION IS A COSMOLOGICAL SURVEY TO MAP THE GEOMETRY OF THE DARK UNIVERSE AND TO UNDERSTAND THE NATURE OF DARK MATTER AND ENERGY INCLUDING THE NATURE OF THE GRAVITY ITSELF. EUCLID WILL USE TWO PROBES POR THESE PURPOSES: WEAK LENSING AND GALAXY CLUSTERING MEASURING THE SHAPE AND REDSHIFTS OF BILLIONS AND MILLIONS OF GALAXIES RESPECTIVELY. EUCLID WILL EXECUTE ONE WIDE SURVEY COVERING THE COSMOLOGICAL SKY (15.000 SQ^2 DEGREES) AND THREE DEEP SURVEYS NEAR THE GALACTIC POLES.

MISSION PLANNING IS A KEY MISSION ASPECT TO OPTIMIZE THE SCIENTIFIC RETURN OF THE MISSION. THERE ARE A NUMBER ASPECTS THAT SHOULD BE TAKEN INTO ACCOUNT: RESTRICTED SKY AREA AT A GIVEN TIME, WIDE/DEEP SURVEYS AND CALIBRATION INTERLEAVING, DENSITY OF GALAXIES AND STARS, EXTINCTION, ZODIACAL LIGHT, CCD DEGRADATION, STRAYLIGHT, ...

THE NEEDED MISSION PLANNING SOFTWARE HAS BEEN DEVELOPED BY ESA AT ESAC. THIS SOFTWARE HAS BEEN ALREADY USED TO PRODUCE AND EVALUATE SEVERAL VERSIONS OF THE SO-CALLED REFERENCE SURVEYS USED TO SUPPORT OTHER ASPECTS OF THE MISSION. IT OFFERS EXCELLENT VISUALIZATION CAPABILITIES, CHECK ANY PRODUCED SURVEY AGAINST A NUMBER OF VALIDATION CRITERIA, IT PRODUCES A NUMBER OF FIGURES OF MERIT AND IT HAS BEEN EVOLVED INTO AN OPERATIONAL SYSTEM CAPABLE OF INGEST AND PRODUCE THE NEEDED OPERATIONAL PRODUCTS TO ALLOW A ROBUST AND FLEXIBLE OPERATION.

P6.11: JUSTO GONZALEZ

EUROPEAN ORGANISATION FOR ASTRONOMICAL RESEARCH IN THE SOUTHERN HEMISPHERE (ESO)

"PYTHON CODE PARALLELIZATION, CHALLENGES AND ALTERNATIVES"

IN THE LAST FEW YEARS DEVELOPMENT OF PYTHON CODE FOR SCIENCE AND DATA REDUCTION PURPOSES HAS GAINED SIGNIFICANT POPULARITY. ESO IN ITSELF USES A PYTHON-BASED ARCHIVING SYSTEM FOR VLT AND ALMA DATA. ALSO THE DATA REDUCTION SUITE FOR ALMA DATA IS PYTHON-BASED. RAPID DEVELOPMENT IS FOSTERED BY A BIG COMMUNITY AND A WIDE RANGE OF ALREADY AVAILABLE PACKAGES. HOWEVER PYTHON ENFORCES LOCKING MECHANISMS, TO ENSURE THREAD SAFETY, THAT EFFECTIVELY REDUCE THE CAPACITY OF PYTHON TO USE ONLY ONE CORE. IN THIS CONTEXT A NUMBER OF ALTERNATIVES HAVE BEEN DEVELOPED BY THE COMMUNITY TO EMULATE ACTUAL MULTI-THREADING AND MAKE PARALLEL PROCESSING EASIER TO USE FROM PYTHON, PRESERVING INTERACTIVITY.

P1.15: JUAN GONZALEZ-NUÑEZ

EUROPEAN SPACE ASTRONOMY CENTRE (ESAC)

DATA DELIVERY FOR THE ESA GAIA DATA RELEASE 1

THE FIRST ESA GAIA INTERMEDIATE DATA RELEASE, DR1, SCHEDULED TO BE PUBLISHED ON 10TH JULY 2016 WILL BE READILY AVAILABLE ONLINE THROUGH SEVERAL SOFTWARE DISSEMINATION SYSTEMS DEVELOPED UNDER THE UMBRELLA OF THE COORDINATION UNIT 9 (CU9) AS THE GAIA ARCHIVE. THESE SYSTEMS WILL BOTH PROVIDE SYSTEMS FOR DIRECT ACCESS TO GAIA DATA (SIMPLE FORMS, ADQL EDITOR, VISUALISATION APPLICATIONS, GAVIP PLATTFORM) AS WELL AS RELIABLE SERVICES WITH OPEN APIS AND PROTOCOLS THAT THESE SYSTEMS USE (VO TAP+, VOSPACE). THIS WILL ENABLE SEAMLESS DELIVERY THIS DATA TO THIRD PARTY APPLICATIONS. DELIVERY MECHANISMS WILL ALSO ENSURE AVAILABILITY OF DATA TO DATA CENTRES WISHING TO OFFER MIRROR SERVICES AND OPEN RETRIEVAL OF FULL DATA PRODUCTS TO THE PUBLIC.

BEING THE FIRST OF HIS KIND FOR AN ESA MISSION, THE GAIA ARCHIVE HAS PLAYED A ROLE IN THE DATA PROCESSING CHAIN FOR THE GENERATION OF THE DR1 DATA PRODUCTS AS THE FINAL QUERIABLE REPOSITORY FOR PROCESSED CATALOGUES. INCLUDED AS INGESTION PROCEDURES FOR THE ARCHIVE, DATA MODELS CONVERSION AND DATA FILTERING HAVE PERFORMED THE LAST STEPS FOR THE GENERATION OF GAIA CATALOGUES IN THE VERY CORE OF THE ARCHIVE SYSTEMS. INTEGRATION OF THESE SYSTEMS WITH CU9 VALIDATION PROCEDURES HAS CREATED A TESTING PLATFORM WHERE NOT ONLY THE SCIENTIFIC QUALITY OF THE DATA, BUT THE VERY RELIABILITY OF THE SOFTWARE SYSTEMS HOSTING IT IS DEEPLY TESTED.

WE WILL REVIEW THE DATA RELEASE PROCESS FROM THE ARCHIVAL POINT OF VIEW; BOTH THE ARCHITECTURE OF THE SOFTWARE SYSTEMS DEVELOPED FOR DR1 AS WELL AS THE OPERATIONS WORKFLOW.

P8.14: YAN GRANGE

ASTRON, THE NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY

CHARACTERISING RADIO TELESCOPE SOFTWARE WITH THE WORKLOAD CHARACTERISATION FRAMEWORK

MODERN LOW-FREQUENCY RADIO INTERFEROMETERS, SUCH AS LOFAR, MWA AND IN THE FUTURE THE SKA, ARE COMPRISED OF COMMODITY HARDWARE. THE CORE OF SUCH INSTRUMENTS IS THE SOFTWARE USED TO CORRELATE AND PROCESS THE DATA — REFLECTED BY THE COMMUNITY TERM "SOFTWARE TELESCOPE". SUCH SOFTWARE TELESCOPES ARE MODULAR AND UNDER CONSTANT DEVELOPMENT BY LARGE INTERDISCIPLINARY RESEARCH COLLABORATIONS, WORKING ACROSS CONTINENTS; CONSEQUENTLY, OBTAINING A HOLISTIC VIEW OF THE ENTIRE SYSTEM BECOMES A CHALLENGING TASK.

MANAGING A SOFTWARE TELESCOPE REQUIRES INSIGHT INTO THE PERFORMANCE AT DIFFERENT LEVELS, FROM THE UNDERLYING COMPUTE HARDWARE TO THE SOFTWARE PROCESSING PIPELINES. PROFILING OF PIPELINES IS USED TO PROVIDE IN-DEPTH UNDERSTANDING OF SOFTWARE (IN)EFFICIENCY; HOWEVER, PROFILING DOES NOT PROVIDE A BROADER UNDERSTANDING OF THE INTERACTION BETWEEN THE SYSTEM (I.E. THE HARDWARE AND OPERATING SYSTEM) AND THE SOFTWARE (I.E. THE PIPELINES AND THEIR UNDERLYING ALGORITHMS), NOR DOES IT PROVIDE INSIGHT ABOUT THE ENERGY CONSUMPTION. TO STUDY THE BEHAVIOUR OF THESE INTERACTIONS AND THE ENERGY CONSUMED, THE WORKLOAD NEEDS TO BE CHARACTERISED. WORKLOAD CHARACTERISATION IS A USEFUL INPUT TO R&D (E.G. FOCUSING DEVELOPMENT EFFORTS, AIDING ALGORITHM VERIFICATION AND OBSERVING BOTTLENECKS), TELESCOPE OPERATIONS (E.G. SCHEDULING OF OBSERVATIONS, THE MAPPING RESOURCES TO SOFTWARE REQUIREMENTS AND RESOURCE MONITORING) AND HARDWARE MANAGEMENT (E.G. CAPACITY PLANNING AND HARDWARE ACQUISITION). TO ENSURE THAT THE CHARACTERISATION OBTAINED BY DIFFERENT DEVELOPERS AND/OR OPERATIONAL TELESCOPES ARE COMPARABLE AND REPRODUCIBLE, THE STANDARDISATION FOR GATHERING METRICS AND STORING RESULTS IS ESSENTIAL.

WE PRESENT A MODULAR FRAMEWORK, THE WORKLOAD CHARACTERISATION FRAMEWORK (WCF), THAT IS DEVELOPED TO OBTAIN, STORE AND COMPARE KEY CHARACTERISTICS OF RADIO TELESCOPE SOFTWARE; AT THE SAME TIME, THE FRAMEWORK PROVIDES RESOURCE INFORMATION USEFUL FOR OPTIMISING SCHEDULING AND MAPPING RESOURCES. THE WCF IS BEING DEVELOPED AS PART OF THE SKA SCIENCE DATA PROCESSOR (SDP) DESIGN. IT IS AVAILABLE AS OPEN SOURCE SOFTWARE AND CAN BE USED FOR OTHER RESEARCH SOFTWARE STACKS; RADIO TELESCOPES BEING ONLY THE FIRST USE CASE.

WE DISCUSS THE DESIGN CONSIDERATIONS AND SHOW HOW THE WCF IS USED TO GAIN INSIGHTS INTO THE BEHAVIOUR OF SOFTWARE. AS A DEMONSTRATION, WE DISCUSS THE EXPERIENCES USING THE FRAMEWORK TO CHARACTERISE A LOFAR PIPELINE.

P8.15: CARL JOHANN GRILLMAIR

IPAC - CALIFORNIA INSTITUTE OF TECHNOLOGY

SEARCHING FOR STELLAR DEBRIS STREAMS IN ALL-WISE

WE MODEL COMPLETENESS AS A FUNCTION OF SKY POSITION FOR POINT SOURCES IN THE ALL-WISE CATALOG. AFTER CORRECTING FOR THIS COMPLETENESS, WE EXAMINE THE DISTRIBUTION OF POINT SOURCES TO SEARCH FOR NEARBY STELLAR DEBRIS STREAMS.

P2.27: JUAN CARLOS GUZMAN

CSIRO ASTRONOMY AND SPACE SCIENCE

MANAGING THE ASKAP COMPUTING PROJECT: FROM INCEPTION TO EARLY SCIENCE OPERATIONS

THE AUSTRALIAN SKA PATHFINDER (ASKAP) COMPUTING PROJECT STARTED IN EARLY 2008. THE SCOPE OF THE COMPUTING PROJECT WAS (AND STILL IS) THE DEVELOPMENT OF THE END-TO-END OBSERVING SYSTEM FOR THE ASKAP TELESCOPE, INCLUDING OBSERVATION PREPARATION, EXECUTION, (REAL-TIME) CALIBRATION AND IMAGING, SCIENCE DATA ARCHIVING. THE ASKAP PROJECT IS NOW IN FULL COMMISSIONING MODE WITH THE START OF EARLY SCIENCE OPERATIONS "JUST AROUND THE CORNER". SEVERAL OF OUR ASKAP SOFTWARE PACKAGES HAVE BEEN IN PRODUCTION BUT THERE ARE STILL SEVERAL FEATURES TO BE COMPLETED. OUR CURRENT SOFTWARE DEVELOPMENT APPROACH IS ITERATIVE, WITH SEVERAL ADAPTED BEST-PRACTICES FROM AGILE SOFTWARE ENGINEERING METHODS. THIS PAPER DESCRIBES THE ASKAP COMPUTING MANAGEMENT APPROACH FROM SOFTWARE DEVELOPMENT PROCESSES TO STRATEGIES ON DEALING WITH THE CHANGING PROJECT ENVIRONMENT. IT ALSO SHARES SOME EXPERIENCES ON MANAGING THIS TYPE OF COMPLEX SOFTWARE PROJECTS, HOW THE PROJECT EVOLVED OVER TIME AND THE CHALLENGES AHEAD.

P2.28: JOSÉ MARÍA HERRERA FERNÁNDEZ

QUASAR SCIENCE RESOURCES, S.L

VIRTUAL INFRASTRUCTURE ARCHITECTURE FOR THE STARFORMMAPPER H2020 SCIENCE PROJECT

WE INTRODUCE STARFORMMAPPER, A PROJECT FUNDED BY THE EUROPEAN UNION UNDER THE HORIZON 2020 PROGRAMME. THIS CONTRIBUTION IS FOCUSED ON THE DESCRIPTION OF THE VIRTUAL AND SOFTWARE INFRASTRUCTURE TO BE IMPLEMENTED FOR THE PROJECT BY THE COMPANY QUASAR SCIENCE RESOURCES. THIS INFRASTRUCTURE IS NEEDED IN ORDER TO FULLY EXPLOIT THE SCIENTIFIC CONTENTS OF THE ARCHIVE OF TWO OF ESA'S SPACE MISSIONS, GAIA AND HERSCHEL.

P8.16: NEAL HURLBURT

LOCKHEED MARTIN ADVANCED TECHNOLOGY CENTER, PALO ALTO, CA, USA

EVOLVING SOLAR DATA ANALYSIS ENVIRONMENT

THE RAPID GROWTH OF SOLAR DATA IS DRIVING CHANGES IN THE TYPICAL WORKFLOW AND ALGORITHMIC APPROACH TO SOLAR DATA ANALYSIS. WE PRESENT RECENTLY DEPLOYED TOOLS TO AID THIS EVOLUTION AND LAYOUT THE PATH FOR FUTURE DEVELOPMENT. THE MAJORITY OF SPACE-BASED DATASETS INCLUDING THOSE FROM THE MULTI-PETABYTE SOLAR DYNAMICS OBSERVATORY AND THE HINODE AND INTERFACE REGION IMAGING SPECTROGRAPH (IRIS) MISSIONS ARE MADE AVAILABLE TO THE COMMUNITY THROUGH A COMMON API WITH SUPPORT IN IDL (VIA SOLARSOFT), PYTHON/SUNPY AND OTHER EMERGING LANGUAGES. STELLAR ASTRONOMERS MAY FIND THE IRIS DATA PARTICULARLY USEFUL FOR RESEARCH INTO STELLAR CHROMOSPHERES AND FOR INTERPRETING UV SPECTRA.

P2.29: AITOR IBARRA IBAIBARRIAGA

XMM-NEWTON SOC (ESAC/ESA)

SCIAPP: A SCIENTIFIC WEB COLLABORATION TOOL

ONE OF THE CURRENT PRACTICAL CHALLENGES OF MODERN ASTRONOMY IS TO EFFECTIVELY MANAGE COLLABORATIONS BETWEEN A GEOGRAPHICALLY DIVERSE NETWORK OF SCIENTISTS USING MULTI-WAVELENGTH FACILITIES. HERE, WE PRESENT A WEB APPLICATION DESIGNED TO INTEGRATE THE MAIN FUNCTIONS NEEDED IN A COLLABORATION, IN A FORMAT WHICH CAN BE USED ON MOBILE DEVICES OR DESKTOPS. THE WEB APP. SUPPORTS INSTANT MESSAGING, DATA EXCHANGE, CAMPAIGN MANAGEMENT, ACCESS TO A DATABASE OF OBJECTS, VISIBILITY CHECKING, A DATABASE OF RELEVANT PUBLICATIONS AND ACCESS TO STANDARD
RESOURCES SUCH AS SIMBAD, VIZIER AND NED.
A FIRST PROTOTYPE OF THE WEB APP IS BEING BUILT TO SUPPORT THE COMMUNITY OF AROUND 100 ASTRONOMERS WHO WORK ACTIVELY IN THE FIELD OF TIDAL DISRUPTION EVENTS (TDE). A TDE OCCURS WHEN A STAR APPROACHES A SUPPER-MASSIVE BLACK HOLE AND IS
PULLED APART BY THE GRAVITATIONAL FORCES AND SUBSEQUENTLY ACCRETED. TO DATE THERE HAVE BEEN AROUND 50 CANDIDATE TDE DISCOVERED, MAINLY FROM THE X-RAY AND OPTICAL FLARES PRODUCED BY THE ACCRETION EVENT.

P6.12: TIM JENNESS

LSST - LARGE SYNOPTIC SURVEY TELESCOPE

PORTING THE LSST DATA MANAGEMENT PIPELINE SOFTWARE TO PYTHON 3

THE LSST DATA MANAGEMENT SCIENCE PIPELINES SOFTWARE CONSISTS OF MORE THAN 100,000 LINES OF PYTHON 2 CODE. LSST OPERATIONS WILL BEGIN AFTER SUPPORT FOR PYTHON 2 HAS BEEN DROPPED BY THE PYTHON COMMUNITY IN 2020, AND WE MUST THEREFORE PLAN TO MIGRATE THE CODEBASE TO PYTHON 3. DURING THE TRANSITION PERIOD WE MUST ALSO SUPPORT OUR COMMUNITY OF ACTIVE PYTHON 2 USERS AND THIS COMPLICATES THE PORTING SIGNIFICANTLY. WE HAVE DECIDED TO USE THE PYTHON “FUTURE" PACKAGE AS THE BASIS FOR OUR PORT TO ENABLE SUPPORT FOR PYTHON 2 AND PYTHON 3 SIMULTANEOUSLY, WHILST DEVELOPING WITH A MINDSET MORE SUITED TO PYTHON 3. IN THIS PAPER WE REPORT ON THE CURRENT STATUS OF THE PORT AND THE DIFFICULTIES THAT HAVE BEEN ENCOUNTERED.

P6.13: ERIC JESCHKE

SUBARU TELESCOPE, NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN

QUEUE MODE SOFTWARE FOR SUBARU TELESCOPE

SUBARU TELESCOPE HAS OPERATED UNDER A CLASSICALLY-SCHEDULED REGIMEN SINCE STARTING OPEN USE IN Y2000. HOWEVER, FROM SEMESTER 16A ONWARD SUBARU IS TRANSITIONING TO QUEUE SCHEDULING FOR THE HYPER SUPRIME-CAM INSTRUMENT AND HAS PLANS TO OPERATE FUTURE INSTRUMENTS ALSO IN QUEUE MODE.

SUBARU CAREFULLY STUDIED THE QUEUE OPERATION AT GEMINI, JAC AND CFHT BEFORE SETTING ON A MODEL FOR SUBARU. IN THIS PAPER WE DISCUSS THE RATIONALE FOR MOVING TO QUEUE MODE, THE TYPE OF SCHEDULING MODEL ADOPTED BY THE OBSERVATORY, THE DESIGN CHOICES FOR THE QUEUE SOFTWARE LAYER AND THE CURRENT STATUS AFTER ONE SEMESTER OF OPERATION. SUBARU FAVORS THE USE OF PYTHON FOR BUILDING SOFTWARE, AND THE QUEUE MODE TOOLS ARE NO EXCEPTION. WE DESCRIBE THE ARCHITECTURE OF THE PYTHON-BASED TOOLS THAT WHERE DEVELOPED FOR THIS PROJECT.

P2.9: CRISTINA KNAPIC

INAF - OSSERVATORIO ASTRONOMICO DI TRIESTE

ASTERICS/OBELICS AUTHENTICATION AND AUTHORIZATION: INVESTIGATIONS AND STATUS

ASTERICS AIMS TO ADDRESS THE CROSS-CUTTING SYNERGIES AND COMMON CHALLENGES SHARED BY THE VARIOUS ASTRONOMY ESFRI FACILITIES (SKA, CTA, KM3NET & E-ELT).

THE MAJOR OBJECTIVES OF ASTERICS ARE TO SUPPORT AND ACCELERATE THE IMPLEMENTATION OF THE ESFRI TELESCOPES, TO ENHANCE THEIR PERFORMANCE BEYOND THE

CURRENT STATE-OF-THE-ART, AND TO SEE THEM INTEROPERATE AS AN INTEGRATED, MULTI-WAVELENGTH AND MULTI-MESSENGER FACILITY. OBELICS (OBSERVATORY E-ENVIRONMENTS LINKED BY COMMON CHALLENGES - WP3) WORK PACKAGE AIMS TO ENHANCE THE INTEROPERABILITY AND SOFTWARE RE-USE FOR THE DATA GENERATION, INTEGRATION AND ANALYSIS OF THE ASTERICS ESFRI AND PATHFINDER FACILITIES.

ONE OF THE MOST RELEVANT TOPIC IN THIS IS THE USER ACCESSIBILITY TO DATA ACQUIRED, PARTICULARLY IN THE SCOPE OF USER AND DIGITAL IDENTITY RECOGNITION ADDRESSED BY THE OBELICS WP.

SEVERAL TECHNOLOGIES ARE AVAILABLE NOWADAYS AND A DEEP AND PROFICUOS WORK HAS DONE IN WP3 TO INVESTIGATE DIFFERENT REQUIREMENTS, ASPECTS AND AND CONSTRAINTS IMPOSED BY THE PROJECTS. AN OVERVIEW OF THE INVESTIGATIONS IS EXPOSED AND SOME ARCHITECTURAL SOLUTIONS ARE DESCRIBED.

P1.36: SERGEI KOLOSOV

CMC MSU - FACULTY OF COMPUTATIONAL MATHEMATICS AND CYBERNETICS OF LOMONOSOV MOSCOW STATE UNIVERSITY, MOSCOW, RUSSIA

ARCHITECTURE OF PROCESSING AND ANALYSIS SYSTEM FOR BIG ASTRONOMICAL DATA

NEW DISCOVERIES IN MODERN ASTROPHYSICS ARE DIRECTLY DEPENDENT ON THE QUALITY OF THE ALGORITHMS FOR PROCESSING OF A HUGE AMOUNT OF ASTRONOMICAL IMAGES AND EVENT LISTS, PRODUCED BY SURVEY TELESCOPES, AND ACCURATE METHODS FOR THE THEIR SUBSEQUENT ANALYSIS. CURRENTLY, THE VOLUME OF DATA COLLECTED THROUGH THE DIGITAL SKY SURVEYS IS EXPERIENCING THE EXPLOSIVE GROWTH. PER NIGHT THE MODERN OPTICAL SURVEY TELESCOPE CAN DO UP TO A SEVERAL THOUSANDS PICTURES OF THE NIGHT SKY, PROVIDING THE SCIENTIFIC DATA STREAM OVER 1TB / DAY. THE RATE OF OBTAINING ASTRONOMICAL DATA WILL CONTINUE TO GROW EXPONENTIALLY WITH THE NEXT GENERATION OF SURVEY TELESCOPES COMING INTO OPERATION, SUCH AS LSST, WFIRST, EUCLID, EROSITA. ALONG WITH NEW SKY SURVEYS PROJECTS, THE CURRENT AMOUNT OF ASTRONOMICAL IMAGES STORED IN PUBLIC ASTRONOMICAL ARCHIVES ALREADY CONTAINS SEVERAL PETABYTES OF (MOSTLY) IMAGING DATA.

OUR PROJECT IS DEDICATED TO CREATION THE ASTRONOMICAL DATA REDUCTION AND ANALYSIS SYSTEM BASED ON (I) MODERN ACHIEVEMENTS IN BIG DATA TECHNOLOGIES (HADOOP AND SPARK ECOSYSTEM) AND (II) HIGH-PRECISION METHODS OF MACHINE LEARNING ANALYSIS OF BIG COLLECTIONS OF DATA. THE AIM OF OUR SYSTEM DEVELOPMENT IS TO GIVE TO A SINGLE ASTRONOMER, OR A SMALL GROUP OF RESEARCHERS, A POWERFUL TOOL (READILY AVAILABLE IN THE CLOUD), WHICH ENABLES THEM THE CONSOLIDATION OF LARGE VOLUMES OF MULTIWAVELENGTH IMAGING DATA AND THEIR UNIFIED PROCESSING INTO CATALOGS OF SKY OBJECTS, AND A (II) SUBSEQUENT APPLICATION OF SUPERVISED AND UNSUPERVISED MACHINE LEARNING ALGORITHMS FOR EFFECTIVE ANALYSIS.

WEBSITE OF OUT GROUP: WWW.ASTROMINING.ORG/PUBLICATIONS

P2.10: DANA KOVALEVA

INASAN - INSTITUTE OF ASTRONOMY, RUSSIAN ACAD. SCI., MOSCOW, RUSSIA

THE BINARY STAR DATABASE BDB V3.0

AMONG THE DIVERSITY OF ASTRONOMICAL DATA, DATA ON BINARY AND MULTIPLE STARS ARE REMARKABLE BY NON-HOMOGENOUS VARIETY AND DIFFICULTY TO AUTOMATED PROCESSING. BINARIES ARE OBSERVED BY VARIOUS METHODS RESULTING IN VARIOUS DATASETS. THERE ARE MANY CATALOGUES AND DATABASES ADDRESSING TO CERTAIN OBSERVATIONAL TYPES OF BINARIES (E.G. ECLIPSING, VISUAL, SPECTROSCOPIC, ETC.) HOWEVER, DATA IN THESE DATASETS ARE OFTEN RELATED WITH DIFFERENT TYPES OF OBJECTS (SAY, WITH COMPONENTS, OR WITH A PAIR AS A WHOLE), AND CROSS IDENTIFICATIONS FOR THE OBJECTS WERE OFTEN NON-EXISTENT OR UNRELIABLE. THIS PREVENTED DATA AGGREGATION FOR THE SAME OBJECTS TO PERFORM COMPREHENSIVE INVESTIGATIONS OF BINARY AND MULTIPLE STARS. ON THE OTHER HAND, THE POPULATION OF BINARY AND MULTIPLE STARS IS NUMEROUS AND REPRESENTS SUBJECT OF INTEREST TO INVESTIGATORS OF MANY FUNDAMENTAL FIELDS, SUCH AS STAR FORMATION, GALACTIC AND STELLAR EVOLUTION, AND SO ON. THE BINARY STAR DATABASE (HTTP://BDB.INASAN.RU) IS INTENDED TO JOIN ALL CATALOGUED DATA FOR BINARY AND MULTIPLE STARS TO ALLOW USER ITS COMBINED ANALYSIS. THIS INVOLVED DEVELOPMENT OF DATA MODEL FOR BINARY AND MULTIPLE STARS INCLUDING THREE CATEGORIES OF OBJECTS, SYSTEMS, PAIRS AND COMPONENTS, TO ESTABLISH CORRECT LINKS BETWEEN OBJECTS AND DATA. TO SOLVE PROBLEMS OF CROSS-IDENTIFICATION FOR THE OBJECTS IN BINARY AND MULTIPLE STARS, WE'VE CREATED AN INDEX CATALOGUE OF BINARY AND MULTIPLE STARS ILB IMPLEMENTING SPECIALLY DEVELOPED DESIGNATION SCHEME BSDB SO THAT OBJECTS AND DATA ARE PROPERLY ASSIGNED TO EACH OTHER.

THE CURRENT VERSION OF BDB IS IMPLEMENTED IN STACKLESS PYTHON USING THE NAGARE (HTTP://WWW.NAGARE.ORG/) FRAMEWORK. ALL OF THE DATA IS STORED IN POSTGRESQL DATABASE. THE WEB-INTERFACE INCLUDES A MODULE, SIMPLIFYING PROCESS OF CATALOGUES INTEGRATION AND VERIFICATION. USERS CAN QUERY THE DATA USING ID'S, BELONGING TO ONE OF 12 IDENTIFICATION SYSTEMS, OR VIA PARAMETER SEARCH.

WE SHALL DISCUSS COMMON PROBLEMS WHICH WE FACED ON DURING BDB DEVELOPMENT. ALSO THE UPDATE TO VERSION 3.0 WILL BE ANNOUNCED, PLANNED FOR RELEASE BY FALL 2016. IT WILL INTRODUCE BATCH MODE REQUEST OPTION AND IMPROVED SEARCH BY PARAMETER (IMPLEMENTING VO CONESEARCH PROTOCOL), AND NEW DATA OUTPUT OPTIONS. THE SET OF CATALOGUES NEWLY ADDED TO THE BDB, WILL BE REFERRED. THE BDB TENDS TO BE A MAJOR DATA SOURCE AND TOOL FOR DIFFERENT TYPES OF BINARY SYSTEMS, AND THE RELEASE OF NEW VERSION BECOMES AN IMPORTANT STEP TOWARD THIS PURPOSE.

P8.17: LIUDMYLA KOZAK

(1) KYIV TARAS SHEVCHENKO UNIVERSITY; (2) SPACE RESEARCH INSTITUTE NATIONAL ACADEMY OF SCIENCES OF UKRAINE AND STATE SPACE AGENCY OF UKRAINE, GLUSHKOV AVE 40, 4/1, 03680, KYIV 187, UKRAINE

ANALYSIS OF SATELLITE FLUXGATE MAGNETIC FIELD MEASUREMENTS

STATISTICAL PROPERTIES OF MAGNETIC FIELD FLUCTUATIONS IN BOUNDARY REGIONS OF THE EARTH'S MAGNETOSPHERE AT DIFFERENT TIMESCALES WERE CONSIDERED. DATA OF FLUXGATE MAGNETIC FIELD MEASUREMENTS WITH HIGH RESOLUTION (22.5 HZ) OBTAINED BY CLUSTER MISSION FROM 2004 TO 2014 WERE USED. CHANGES IN THE FORM AND PARAMETERS OF THE PROBABILITY DENSITY FUNCTION HAVE BEEN STUDIED FOR THE PERIODS WHEN THE SATELLITE WAS IN THE SOLAR WIND PLASMA, DIFFERENT MAGNETOSHEATH REGIONS, AND THE EARTH'S MAGNETOSHEETH. VARIATIONS IN THE PROBABILITY DENSITY FUNCTION MAXIMUM AND THE KURTOSIS VALUE AS CHARACTERISTICS OF THE TURBULENCE PROPERTY EVOLUTION ON DIFFERENT TIMESCALES HAVE BEEN STUDIED. TWO ASYMPTOTIC REGIMES OF P0, WHICH ARE CHARACTERIZED BY DIFFERENT POWER LAWS, HAVE BEEN FOUND. THE STRUCTURAL FUNCTIONS OF DIFFERENT ORDERS AND THE TYPES OF DIFFUSION PROCESSES IN DIFFERENT REGIONS, DEPENDING ON TIME VARIATIONS IN THE GENERALIZED DIFFUSION COEFFICIENT, HAVE BEEN STUDIED IN ORDER TO ANALYZE THE CHARACTER OF DIFFUSION PROCESSES. FOR THE MAGNETOSHEATH REGIONS, IT HAS BEEN FOUND THAT THE DIFFUSION COEFFICIENT INCREASES IN THE COURSE OF TIME (I.E., THE REGIME OF SUPERDIFFUSION HAS BEEN OBTAINED).

THE WORK IS DONE IN THE FRAME OF COMPLEX PROGRAM OF NAS OF UKRAINE ON SPACE RESEARCHES FOR 2012-1016, WITHIN THE FRAMEWORK OF THE EDUCATIONAL PROGRAM NO.2201250 \EDUCATION, TRAINING OF STUDENTS, PHD STUDENTS, SCIENTIFIC AND PEDAGOGICAL STAFF ABROAD" LAUNCHED BY THE MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE AND UNDER A PARTIAL SUPPORT OF THE GRANT AZ. 90 312 FROM THE VOLKSWAGEN FOUNDATION («VW-STIFTUNG»).

P1.16: MARTIN KUEMMEL

LUDWIG-MAXIMILIANS-UNIVERSITAET MUENCHEN

EUCLID DETECTIONS

THE EUCLID SATELLITE IS AN ESA MISSION SCHEDULED FOR LAUNCH IN 2020. IT WILL OBSERVE AN AREA OF 15,000 DEG^2 WITH TWO INSTRUMENTS, THE VISIBLE IMAGING CHANNEL (VIS) AND THE NEAR IR SPECTROMETER AND IMAGING PHOTOMETER (NISP). GROUND BASED IMAGING DATA IN GRIZ FROM SURVEYS SUCH AS THE DARK ENERGY SURVEY COMPLEMENT THE EUCLID DATA TO ENABLE PHOTO-Z DETERMINATION. THE MISSION INVESTIGATES THE DISTANCE-REDSHIFT RELATIONSHIP AND THE EVOLUTION OF COSMIC STRUCTURES BY MEASURING SHAPES AND REDSHIFTS OF GALAXIES AND CLUSTERS OF GALAXIES OUT TO REDSHIFTS ~2

GENERATING THE MULTIWAVELENGTH CATALOG FROM EUCLID DATA WITH THE EXPECTED 10^9 OBJECTS IS A CENTRAL PART OF THE ENTIRE EUCLID DATA REDUCTION PIPELINE IMPLEMENTED BY THE SCIENCE GROUND SEGMENT. IN ORDER TO FIND THE BEST STRATEGIES AND CONCEPTS FOR THE OBJECT DETECTION WE HAVE SET UP A SIMULATION PIPELINE TO GENERATE EUCLID IMAGES WITH THE EXPECTED DEPTHS AND RESOLUTION (0.2" FOR VIS DATA AND ~1.0" FOR GROUND BASED DATA). THE SIMULATIONS ARE BASED ON A MOCK UNIVERSE WITH REALISTIC FLUXES AND MORPHOLOGIES FROM EMPIRICAL DESCRIPTIONS AND ALLOW THE USAGE OF THE MOST RECENT FILTER BANDPASSES FROM THE MISSION DATABASE.

WE PRESENT THE RESULTS OF APPLYING THE EUCLID DETECTION TO THE SIMULATED DATA AND DISCUSS THE ADVANTAGES OF USING DIFFERENT COMBINED IMAGES (COADD, CHI-SQUARE) FOR THE BASIC DETECTION AND SHOW THE DESIGN AND THE PROTOTYPE IMPLEMENTATION OF THE DETECTION PIPELINE. WE ALSO PRESENT THE SURROUNDING CATALOGING PIPELINE WHICH INCLUDES STAR/GALAXY SEPARATION AND PHOTOMETRY IN ALL BANDS (AS AN INPUT TO PHOTO-Z) AND FACES A MAJOR MILESTONE WITH THE EUCLID SCIENCE CHALLENGE AT THE END OF 2016.

P6.14: RAFAEL KUENG

UNIVERSITY OF ZURICH, ZURICH, SWITZERLAND

A CITIZEN SCIENCE POWERED DISTRIBUTED MODELING SOFTWARE STACK WRITTEN IN PYTHON: SPAGHETTILENS

WE PRESENT AN UP AND RUNNING SOFTWARE STACK CALLED SPAGHETTILENS USED IN A CITIZEN SCIENCE CONTEXT TO ALLOW VOLUNTEERS TO CREATE MASS MODELS OF STRONG GRAVITATIONAL LENSES.

THE STACK FEATURES AN INTERACTIVE, WEB-BASED USER INTERFACE (HTML5) RUNNING ON A PYTHON BASED WEB SERVER (DJANGO) WHICH COMMUNICATES WITH A DOCUMENT ORIENTED, NOSQL DATABASE (COUCHDB) AND AN ASYNCHRONOUS TASK DISTRIBUTION SYSTEM (CELERY). IT GATHERS RAW IMAGE DATA FROM DIFFERENT ONLINE SOURCES AND DELIVERS IT TO USERS FOR BEING MODELED. IT THEN GETS THE USERS INPUT, DISTRIBUTES THE COMPUTATIONALLY HEAVY TASK OF CREATING AND VISUALLY RENDERING MODELS (GLASS) TO DEDICATED WORKER NODES IN DIFFERENT PHYSICAL LOCATIONS AND RETURNS A RENDERED VERSION OF THE MODEL TO THE USER FOR VISUAL FEEDBACK. THE STACK IS WRITTEN MOSTLY IN PYTHON AND DESIGNED TO BE MASSIVELY SCALABLE.

P1.17: ELA KULIGOWSKA

ASTRONOMICAL OBSERVATORY OF JAGIELLONIAN UNIVERSITY, CRACOW, POLAND

EXTRACTING THE DOUBLE-DOUBLE AND MULTIPLE RADIO STRUCTURES BASED ON BIG RADIO SURVEYS

THE PROBLEM OF SEARCHING FOR THE CLASSICAL DOUBLE RADIO GALAXIES ON THE EXISTING RADIO MAPS DERIVED FROM THE BIG RADIO ASTRONOMICAL SURVEYS (NVSS, FIRST, WENSS ETC.) IS RAISED ONCE AGAIN IN RELATION TO THE PRESENTLY ONGOING RESEARCH PROJECT "WHY ONLY SELECTED GALAXIES ARE ACTIVE?" HELD AT THE JAGIELLONIAN UNIVERSITY. IN MY SCIENTIFIC WORK,
THE MAIN GOAL WAS TO DERIVE "AS MUCH REAL RADIO STRUCTURES LINKED WITH ACTIVE GALAXIES AS POSSIBLE" BASED ON RADIO MAPS, BUT IN (AT LEAST PARTIALLY) AUTOMATED MANNER. THE ALGORITHMS THAT I DEVELOPED FOR THIS PURPOSE WAS SUPPOSED TO HAVE TWO IMPORTANT QUALITIES: 1) PROVIDE "NOT LOOSING" THE RADIO SOURCES WITH LESS TYPICAL CHARACTERISTICS, 2) REDUCE HUMAN WORKLOAD ON MANUALLY REVIEWING THE RESULTING MAPS AND VERIFICATION OF THE OUTPUT OF THE PROGRAMS. TO DO THIS, I DEVELOPED A SPECIAL STRATEGY FOR EXTRACTING DATA FROM RADIO (NVSS AND FIRST) AND OPTICAL (SDSS) SURVEYS.
AS A RESULT IT ALLOWS TO REDUCE THE FACTOR OF ALL THE DATA TO MANUAL REVIEW TO ABOUT 1/5 - 1/6 PART OF ALL THE GALAXIES HAVING ANY TYPE OF RADIO-LIKE COMPONENTS IN ITS VICINITY. FURTHER RESEARCH, TESTING AND SUGGESTIONS IN THIS MATTER, HOWEVER, ARE NEEDED TO ACHIEVE EVEN HIGHER RATIO OF DETECTION REAL-TO-FALSE RADIO GALAXY OBJECTS.

P3.6: BLAISE CHAN KUO TIONG

CANADA FRANCE HAWAII TELESCOPE CORPORATION

CLOUD DRIVEN MULTIDISCIPLINARY CHANGES TO COMPUTING INFRASTRUCTURE AT CANADA FRANCE HAWAII TELESCOPE CORPORATION

WITH THE PROLIFERATION AND AVAILABILITY OF SOFTWARE AS A SERVICE AND INFRASTRUCTURE AS A SERVICE, MANY ORGANIZATIONS FACE DECISIONS ON THEIR COMPUTING SYSTEMS ARCHITECTURE THAT TAKE INTO ACCOUNT THE CLOUD LOOMING OVERHEAD. AT CFHT, COMPUTING HAS MAINLY STAYED UNDER THE ROOF OR DOME, BUT THE CLOUD HAS HAD AN UNDENIABLE EFFECT ON SYSTEMS DESIGN. INCREASINGLY, THE SOLUTIONS TO ADDRESS GOALS AND TARGETS ARE MULTIDISCIPLINARY IN NATURE SINCE WE DO NOT SEEK MERE FUNCTIONALITY AND USABILITY, BUT NOW ALSO EXPAND TO SEEK EFFICIENCY, GREEN OPERATIONS AND CONTINUITY. STARTING WITH THE DATA CENTER, A FEW CONSIDERATIONS WERE MADE ON HOW TO OPTIMIZE THE ROOM'S ENERGY USE BY LOOKING AT ROOM LAYOUT, LOCAL CLIMATE AND MATERIALS. COUPLED WITH RENEWABLE ENERGY SOURCES, NOT ONLY WERE POWER USE EFFICIENCIES IMPROVED BUT ALSO CARBON IMPACT. TO BE ABLE TO INCREASE UTILIZATION AND ALSO REDUCED COSTS, A LINUX BASED VIRTUALIZED ENVIRONMENT WAS IMPLEMENTED AND FINER GRANULATION IS BEING EXPLORED WITH CONTAINERS. FINALLY, CERTAIN SERVICES HAVE BEEN MIGRATED TO SOFTWARE AS A SERVICE OPTIONS AND FACETS LIKE STORAGE AND NETWORK SERVICES HAVE BEEN TRANSITIONED TO READILY DEPLOYABLE OPEN SOURCE SOLUTIONS TO INCREASE CONTINUITY.

P5.2: GILLES LANDAIS

CDS - STRASBOURG ASTRONOMICAL OBSERVATORY

MAPPING IMAGES AND SPECTRA METADATA WITH OBSCORE DM

IN ADDITION TO ITS CATALOGUES COLLECTION, VIZIER PROVIDES ACCESS TO ASSOCIATED DATA USING METADATA FROM THE OBSCORE DATA MODEL.

OBSCORE IS A STANDARD OF THE VIRTUAL OBSERVATORY USED TO MAP IMAGES, SPECTRA OR TIME-SERIES RESOURCES WITH STANDARDIZED METADATA. THEN THE RESOURCES CAN BE QUERIED THROUGH THE VO.

ASSOCIATED DATA SUCH AS IMAGES AND SPECTRA ARE USUALLY PROVIDED IN FITS FORMAT, THEREFORE ONE HAS TO MAKE THE MAPPING BETWEEN FITS HEADERS AND OBSCORE.

HOWEVER THE HETEROGENEITY OF THE FITS HEADERS OR INCOMPLETE FITS HEADERS INCREASE THE DIFFICULTY TO MAKE THIS MAPPING.

WE WILL PRESENT STATISTICS ON THE FITS HEADERS CONTENTS AMONG THE RESOURCES PROVIDED IN VIZIER.

A NEW VIZIER SERVICE GIVES ACCESS TO SPECTRA OR IMAGES. THESE RESOURCES ARE INGESTED WITH TOOLS DEVELOPED BY CDS AND BUILT ON THE SAADA ENGINE.

THESE SERVICES ASSIST USERS TO CREATE THE MAPPING INCLUDING VALIDATION.

P6.15: KIERAN LESCHINSKI

DEPARTMENT OF ASTROPHYSICS, UNIVERSITY OF VIENNA, AUSTRIA

SIMCADO - A PYTHON PACKAGE FOR SIMULATING DETECTOR OUTPUT FOR MICADO AT THE E-ELT

WITHIN THE NEXT 10 YEARS A NEW GENERATION OF EXTREMELY LARGE TELESCOPES WILL BECOME AVAILABLE TO THE ASTRONOMICAL COMMUNITY. THESE TELESCOPES AND THE INSTRUMENTS ATTACHED TO THEM WILL ALLOW OBSERVATIONS OF THE DARKEST AND FURTHEST PHENOMENA IN THE UNIVERSE. THE WORK HORSE NIR IMAGING CAMERA FOR THE EUROPEAN EXTREMELY LARGE TELESCOPE WILL BE MICADO. AS PART OF ITS DEVELOPMENT WE HAVE CREATED A PYTHON PACKAGE - SIMCADO - WHICH SIMULATES THE OUTPUT OF THE MICADO DETECTOR ARRAY.

WITH THE HELP OF THE SCAO AND MCAO OBSERVING MODES, MICADO WILL HAVE THE ABILITY TO OBSERVE AT THE DIFFRACTION LIMIT IN THE 0.7-2.5UM WAVELENGTH RANGE. IT WILL OFFER A WIDE FIELD (4MAS/PIXEL) AND A ZOOM (1.5MAS/PIXEL) IMAGING MODE, AS WELL AS A LONG SLIT SPECTROGRAPHIC MODE. FOR EACH OF THESE MODES THE SIMCADO PACKAGE COMBINES THE EFFECTS THAT ELEMENTS ALONG THE OPTICAL PATH HAVE ON PHOTONS TRAVELLING FROM THEIR POINT OF ORIGIN, THROUGH THE E-ELT/MICADO SYSTEM AND ONTO THE DETECTOR CHIPS. THE OUTPUT OF A SIMCADO SIMULATION RUN IS THEREFORE AKIN TO THE RAW OUTPUT EXPECTED FROM THE MICADO DETECTOR ARRAY.

SIMCADO IS, AND WILL BE, USED BY VARIOUS TEAMS WITHIN THE MICADO CONSORTIUM. CONSORTIUM-INTERNAL USES OF SIMCADO INCLUDE: PROVIDING A SINGLE PLATFORM FOR THE SCIENCE TEAM TO SOLIDIFY THE SCIENCE DRIVERS FOR MICADO; ACTING AS A STAND-IN FOR THE MICADO INSTRUMENT TO AID IN CREATING THE SPECIFICATIONS FOR THE DATA FLOW INFRASTRUCTURE; CONFIRMING THE EFFECT ON THE QUALITY OF THE SCIENCE OUTPUT FOR DETAILED DESIGN TRADE-OFF STUDIES; GENERATING UPDATED DATA TABLES FOR THE ESO EXPOSURE TIME CALCULATOR; ETC. SIMCADO WILL BE A USEFUL TOOL FOR SIMULATING A BROAD VARIETY OF ASTROPHYSICAL OBJECTS AND PROCESSES IN ORDER TO EFFICIENTLY PREPARE OBSERVING PROGRAMS FOR MICADO AT THE E-ELT. IN THESE PROCEEDINGS WE PROVIDE A OVERVIEW OF THE INTERNAL WORKING OF THE SIMCADO PACKAGE AS WELL AS PROVIDE AN EXAMPLE OF A USE-CASE SIMULATION.

P3.7: CHANGHUA LI

NATIONAL ASTRONOMICAL OBSERVATORIES, CHINESE ACADEMY OF SCIENCES (CAS), CHINA

ASTRONOMICAL COMPUTING ENVIRONMENT OF THE HYBRID ARCHITECTURE

WITH MANY LARGE SCIENCE EQUIPMENT CONSTRUCTING AND PUTTING INTO USE, ASTRONOMY HAS STEPPED INTO THE BIG DATA ERA. THE NEW METHOD AND INFRASTRUCTURE OF BIG DATA PROCESSING HAS BECOME A NEW REQUIREMENT OF MANY ASTRONOMERS. CLOUD COMPUTING, MAP/REDUCE, HADOOP, SPARK, ETC. MANY NEW TECHNOLOGY HAS SPRUNG UP IN RECENT YEARS. COMPARING TO THE HIGH PERFORMANCE COMPUTING(HPC), DATA IS THE CENTER OF THESE NEW TECHNOLOGY. SO, A NEW COMPUTING ARCHITECTURE INFRASTRUCTURE IS NECESSARY, WHICH CAN BE SHARED BY BOTH HPC AND BIG DATA PROCESSING. BASED ON ASTRONOMY CLOUD PROJECT OF CHINA VIRTUALIZATION OBSERVATORY (CHINA-VO), WE HAVE MADE MUCH EFFORTS TO OPTIMIZE THE DESIGNATION OF THE HYBRID COMPUTING ENVIRONMENT. WHICH INCLUDE THE HARDWARE ARCHITECTURE, CLUSTER MANAGEMENT, JOB AND RESOURCE SCHEDULING.

P4.8: ELISA LONDERO

INAF – OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

ASIAGO ASTRONOMICAL ARCHIVE: STATUS AND FEATURES

GEOGRAPHICALLY DISTRIBUTED ARCHIVES PRESENT CHALLENGES WHEN INGESTING AND DELIVERING LARGE AMOUNTS OF ASTRONOMICAL DATA. THE MAIN ISSUES ARE RELATED TO REMOTE CONTROL AND CONFIGURATION, MONITORING AND LOGGING ANOMALOUS CONDITIONS, FAULT TOLERANCE AND ERROR HANDLING.

THE NEW ARCHIVING DISTRIBUTED INFRASTRUCTURE (NADIR) DEVELOPED AND IMPLEMENTED WITHIN THE ITALIAN ASTRONOMICAL ARCHIVE (IA2) PROJECT, HAS SHOWN TO BE ABLE TO OVERCOME SUCCESSFULLY THESE ISSUES. NADIR IS CURRENTLY INSTALLED AND WORKING AT THE LARGE BINOCULAR TELESCOPE OBSERVATORY (LBTO) AND AT TELESCOPIO NAZIONALE GALILEO (TNG) AND IS SCHEDULED TO BE INSTALLED AT ASIAGO OBSERVATORY IN THE NEAR FUTURE.

IN ORDER TO SPEED-UP THE DISTRIBUTION PROCESS, THE ARCHIVING SYSTEM PLANNED FOR ASIAGO OBSERVATORY WILL CONSIST OF A TEMPORARY ARCHIVE AND A WEB INTERFACE TO ACCESS THE ARCHIVE DIRECTLY ON SITE. THE TEMPORARY ARCHIVE (STORING DATA LESS THAN THREE MONTHS OLD) WILL BE AVAILABLE ONLY FROM WITHIN THE LOCAL LAN AT THE OBSERVATORY AND ITS AIM IS TO ENHANCE THE LOCAL USABILITY OF THE SERVICE.

THE MAIN (PUBLIC) ARCHIVE WILL BE HOSTED IN TRIESTE. THIS ARCHIVE WILL BE MANAGED BY THE METADATA AND DATA IMPORTER AND EXPORTER BRANCHES OF NADIR WHICH ARE IN CHARGE OF EXPORTING THE FILES FROM THE ACQUISITION SITE AND IMPORTING THEM TO REMOTE SITES.

THE ACCESS TO THE ARCHIVE IS MADE POSSIBLE THROUGH A WEB APPLICATION INSTALLED BOTH LOCALLY AT THE ASIAGO SITE AND PUBLICLY IN TRIESTE. THE WEB INTERFACE ALLOWS PUBLIC AND PRIVATE ACCESS TO THE RESOURCES VIA TRADITIONAL QUERIES ON THE MAIN INSTRUMENTAL AND OBSERVING PARAMETERS. THE QUERY RESULT IS ALSO EXPORTABLE VIA SAMP PROTOCOL TO THE VIRTUAL OBSERVATORY COMPLIANT CLIENTS (ALADIN, TOPCAT). USER AUTHENTICATION WILL BE PERFORMED USING THE EDUGAIN FEDERATION.

P6.16: MARCEL LOOSE LOOSE

ASTRON, NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY, DWINGELOO, THE NETHERLANDS

MONITORING & CONTROL SOFTWARE FOR THE NEW WESTERBORK PHASED-ARRAY FEED SYSTEM

THE WESTERBORK SYNTHESIS RADIO TELESCOPES (WSRT) FACILITY HAS RECENTLY BEEN UPGRADED WITH PHASED-ARRAY FEED (PAF) RECEPTORS. THESE NEW RECEPTORS ENABLE A HUGELY INCREASED SKY SURVEY SPEED, BECAUSE UP TO 42 BEAMS CAN BE SYNTHESIZED SIMULTANEOUSLY, THUS INCREASING THE FIELD-OF-VIEW TREMENDOUSLY.

IN ORDER TO PROPERLY MONITOR AND CONTROL THIS NEW INSTRUMENT, THE EXISTING MONITORING AND CONTROL SOFTWARE HAD TO BE COMPLETELY OVERHAULED. WE SEIZED THE OPPORTUNITY TO BUILD AN ALMOST COMPLETELY NEW SOFTWARE STACK USING MODERN SOFTWARE ENGINEERING TECHNIQUES. MOST OF THE CODE HAS BEEN WRITTEN IN PYTHON, EXCEPT FOR SOME PERFORMANCE CRITICAL PARTS, WHERE WE USED C++.

THE NEW SOFTWARE STACK CONSISTS OF THREE LAYERS. THE LOWEST LAYER CONTAINS THE DRIVERS THAT DIRECTLY DRIVE THE, MOSTLY CUSTOM-MADE, HARDWARE. THE MIDDLE LAYER CONTAINS THE CONTROLLERS THAT CONTROL THE UNDERLYING DRIVERS, AND TRANSLATE COMPLEX COMMANDS LIKE "START OBSERVATION" INTO A SERIES OF COMMANDS TO THE DIFFERENT DRIVERS. THE TOP LAYER CONTAINS THE SERVICES. SOME OF THESE SERVICES ARE INVOLVED WITH THE REAL-TIME ONLINE SYSTEM THAT IS TAKING THE ASTRONOMICAL DATA. OTHER SERVICES ARE INVOLVED IN OBSERVATION SPECIFICATION, DATA TRANSFER, OR OFFLINE DATA PROCESSING. ALL COMMUNICATION BETWEEN CONTROLLERS AND SERVICES IS DONE USING A MESSAGING MIDDLE-WARE LAYER BASED ON THE ADVANCED MESSAGE QUEUING PROTOCOL (AMQP) STANDARD.

IN THIS PRESENTATION I WILL NOT ONLY PRESENT THE DESIGN AND THE UNDERLYING CONSIDERATIONS, BUT ALSO FOCUS ON OUR EXPERIENCES WITH AGILE/SCRUM SOFTWARE DEVELOPMENT PRACTICES.

P6.17: MICHELE MARIS

INAF – OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

MODELLING OF ZODIACAL LIGHT EMISSION FOR SPACE MISSIONS

ACCURATE PLANNING OF FORTHCOMING MISSIONS REQUIRES AN ACCURATE KNOWLEDGE OF DIFFUSE SOURCES IN ORDER TO OPTIMIZE MISSION PARAMETERS AND THE SCANNING STRATEGY TO MEET THE EXPECTED PERFORMANCES.
ZODIACAL LIGHT (ZL OR ZODY) IS A WELL KNOWN CONTAMINANT FOR GROUND BASED AND SPACE-BORNE OBSERVATIONS IN THE OPTICAL AND INFRARED BANDS, AND RECENT RESULTS FROM THE PLANCK COLLABORATION HIGHLIGHT ITS IMPORTANCE FOR HIGH SENSITIVITY OBSERVATIONS IN THE MILLIMETER DOMAIN.
THE PHYSICS OF ZL IS WELL KNOWN. ZL IS DOMINATED BY SCATTERING OF SUN LIGHT FROM INTERPLANETARY DUST FOR WAVELENGHTS SHORTER THAN 12 MICRON, WHILE THERMAL EMISSION DOMINATES AT LARGER WAVELENGTHS. HOWEVER PREDICTING AND MODELLING OF ZODY IS COMPLICATED BY A NUMBER OF SUBTLETIES.
THE CLOUD OF INTERPLANETARY DUST PARTICLES HAS A QUITE COMPLEX 3D STRUCTURE. ITS MAIN GEOMETRICAL PARAMETERS HAVE BEEN ASSESSED IN THE LAST TWO DECADES, BUT THE PHOTOMETRICAL PROPERTIES OF ZL ARE AFFECTED BY A SIGNIFICANT LEVEL OF UNCERTAINTY. AT OPTICAL WAVELENGTHS, MEASURES OF ZL CONTAMINATION ARE AFFECTED BY LIGHT FROM BACKGROUND STARS. IN SUB-MM THE WORST UNCERTAINTY IS THE MODEL OF DUST GRAINS EMISSIVITY.
IN ADDITION IT MUST BE TAKEN IN ACCOUNT THAT THE OBSERVER IS MOVING WITHIN THE CLOUD OF INTERPLANETARY DUST PARTICLES, LEADING TO AN IMPORTANT TIME DEPENDENCE IN THE PERTURBING SIGNAL AND ASKING FOR A PRECISE KNOWLEDGE OF THE EXPECTED TRAJECTORY AND SCANNING STRATEGY OF THE MISSION.
IN THIS TALK I WILL DISCUSS HOW TO BUILD A RELIABLE PREDICTOR FOR ZODIACAL LIGHT CONTAMINATION. I WILL PRESENT PYZOD, A PYTHON CODE WHICH IMPLEMENT SUCH MODEL. THE PLANCK, EUCLID, CORE+ MISSIONS ARE DISCUSSED AS USE CASES.

P5.3: THOMAS MCGLYNN

NASA/GSFC

THE SKYVIEW SURVEY DATA MODEL

THE SKYVIEW VIRTUAL TELESCOPE SUPPORTS OVER ONE HUNDRED SURVEY DATA SETS RANGING FROM THE RADIO THROUGH THE GAMMA-RAY REGIME. SKYVIEW INCLUDES DATA SPANNING 18 ORDERS OF MAGNITUDE IN FREQUENCY, 4 ORDERS OF MAGNITUDE IN RESOLUTION, AND MANY DIFFERENT COORDINATE SYSTEMS AND PROJECTIONS. TO ENABLE QUICK AND EASY ACCESS TO THESE MYRIAD NASA AND NON-NASA DATASETS SKYVIEW HAS DEFINED A SIMPLE DATA MODEL FOR SURVEYS. IT TAKES ADVANTAGE OF EXISTING DATA MODELS: THE WORLD COORDINATE SYSTEMS OF FITS AND THE IMAGE MODELS OF THE VIRTUAL OBSERVATORY. OUR MODEL IS EASILY IMPLEMENTED IN XML AND ALLOWS STRAIGHTFORWARD INTEGRATION OF NEW SURVEYS INTO THE SYSTEM.

THE SKYVIEW DATA MODEL UNITES THREE DISTINCT ASPECTS OF THE SURVEY: THE QUANTITATIVE DESCRIPTION OF THE SURVEY CONTENT, I.E., WHAT PIXELS ARE AVAILABLE; THE SCIENCE METADATA FOR THE SURVEY, THE PROVENANCE, BANDS, EPOCH AND SUCH; AND THE SPECIAL PROCESSING REQUIREMENTS OR OPPORTUNITIES ASSOCIATED WITH THE SURVEY. THIS PAPER DISCUSSES THE ISSUES ASSOCIATED WITH DEFINING THE SURVEY MODEL INCLUDING MULTIPLE LEVELS OF PRECISION IN DEFINING THE COVERAGE OF THE DATASETS, THE COUPLING OF QUANTITATIVE SCIENCE INFORMATION WITH APPROXIMATE DESCRIPTIVE METADATA, HANDLING THE DIFFERENCES BETWEEN DIFFERENT WAVELENGTH REGIMES, AND ENABLING SPECIAL PROCESSING OF DATASETS WITH PARTICULAR QUIRKS.

P1.18: STEFAN MEINGAST

UNIVERSITY OF VIENNA, INSTITUTE FOR ASTROPHYSICS, VIENNA, AUSTRIA

VIENNA SURVEY IN ORION - VISTA DATA REDUCTION TECHNIQUES

THE VISIBLE AND INFRARED SURVEY TELESCOPE FOR ASTRONOMY (VISTA) OPERATED BY ESO AT CERRO PARANAL HAS BEEN MONITORING THE SOUTHERN SKY IN NEAR-INFRARED AND OPTICAL WAVELENGTHS FOR SEVERAL YEARS. MOST OF THE AVAILABLE OBSERVING TIME IS INVESTED IN LARGE PUBLIC SURVEYS AND ONLY A MINOR FRACTION IS AWARDED TO NORMAL PROGRAMS. IN A 30 HOUR LONG PROGRAM WE HAVE OBSERVED 18 SQ DEG OF SKY TOWARD THE ORION STAR FORMING REGION, A PRIME LABORATORY FOR RESEARCH INTO THE ORIGIN OF STARS AND CLUSTERS. IN OUR ANALYSIS OF THE DATA WE FOUND SEVERAL DRAWBACKS IN THE DEDICATED ESO VISTA PIPELINE ARCHITECTURE, MOST NOTABLY LEADING TO DEGRADED RESOLUTION IN THE STACKED OUTPUT FRAMES AND INCONSISTENT PHOTOMETRIC RESULTS. TO CIRCUMVENT SEVERAL OF THE IDENTIFIED KEY ISSUES WE HAVE DEVELOPED A STAND-ALONE DATA REDUCTION ENVIRONMENT TAILORED TO VISTA/VIRCAM BUT APPLICABLE TO ANY OTHER OPTICAL/NEAR-INFRARED CAMERA SYSTEM CURRENTLY IN USE IN PROFESSIONAL ASTRONOMY. FOR VISTA DATA OUR STACKED OUTPUT FRAMES YIELD ON AVERAGE 20% BETTER IMAGE QUALITY (FWHM) THAN THE STANDARD PIPELINE, A CRITICAL IMPROVEMENT ESPECIALLY WHEN STUDYING DENSE ENVIRONMENTS SUCH AS STELLAR CLUSTERS OR REGIONS NEAR THE GALACTIC CENTER. THIS NEW PIPELINE, COMPLETELY WRITTEN IN PYTHON, HAS VERY FEW PREREQUISITES AND HAS BEEN DESIGNED FOR USER-FRIENDLY, (PYTHON-TYPICAL) SEMI-AUTOMATIC AND INTERACTIVE OPERATIONS. THE SOFTWARE SUITE WAS DEVELOPED NOT ONLY FOR BETTER PROCESSING OF THE ALREADY EXISTING DATA, BUT ALSO FOR THE UPCOMING NEW GENERATION OF PUBLIC SURVEYS WITH THE VISTA TELESCOPE STARTING IN LATE 2016.

P6.18: MARCELO MENDOZA

UNIVERSIDAD TÉCNICA FEDERICO SANTA MARÍA

SCALING UP DATA CUBE INDEXING SERVICES FOR CONTENT-BASED SEARCHES IN THE CHILEAN VIRTUAL OBSERVATORY

CONTENT-BASED SEARCH TOOLS ARE KEY BUILDING BLOCKS FOR THE CONSTRUCTION OF LARGE SCALE VIRTUAL OBSERVATORIES. RECENTLY, WE CREATE AN AUTOMATIC METHOD FOR DATA CUBE INDEXING [AC16] CAPABLE OF AUTOMATICALLY DETECTING AND RECORDING ROIS WHILE REDUCING THE NECESSARY STORAGE SPACE. CURRENTLY, WE ARE PUTTING OUR CODES IN THE PRODUCTION PIPELINE OF CHIVO [CHIVO], THE CHILEAN VIRTUAL OBSERVATORY, AN INITIATIVE WHICH BELONGS TO IVOA AND SEEKS TO PROVIDE THE CAPABILITY OF CONTENT-BASED SEARCHES ON DATA CUBES TO THE ASTRONOMICAL COMMUNITY. IN THIS PRESENTATION WE SHOW HOW TO SCALE UP OUR FIRST PROTOTYPES TO A LARGE-SCALE DATA CENTER. EFFORTS INVOLVED IN CODE MIGRATION FROM R-BASED CODES [ASCL1512.010] TO CASA/PYTHON-BASED SOFTWARE GIVE US INSIGHTS FOR CODE REFACTORING AND DATA INTEGRATION ISSUES THAT CAN BE HELPFUL FOR RESEARCHERS AND PRACTITIONERS IN ASTROINFORMATICS.

[AC16] ARAYA, M., CANDIA, G., GREGORIO, R., MENDOZA, M., SOLAR, M. [2016]. INDEXING DATA CUBES FOR CONTENT-BASED SEARCHES IN RADIO ASTRONOMY, ASTRONOMY AND COMPUTING, 14:23-34.

[CHIVO] CHILEAN VIRTUAL OBSERVATORY, HTTP://WWW.CHIVO.CL

P2.11: LAURENT MICHEL

SSC-XMM - STRASBOURG OBSERVATORY

A NEW WEB INTERFACE FOR SAADA

SAADA HAS BEEN DESIGNED TO HELP ASTRONOMERS TO BUILD LOCAL ARCHIVES BY THE SIMPLEST WAY. A DATABASE CREATED BY SAADA, A SAADADB, CAN HOST MULTIPLE COLLECTIONS OF HETEROGENEOUS DATA (SPECTRA, CATALOGS IMAGES, SPECTRA, FLATFILES, MISCELLANEOUS) .

META-DATA EXTRACTED FROM INPUT FILES (FITS OR VOTABLES) ARE FIRST STORED INTO THE DATABASE AND THEN MAPPED TO A COMMON INTERFACE ALLOWING CONSISTENT QUERIES COVERING THESE HETEROGENEOUS DATASETS.

DATA COLLECTIONS CAN BE LINKED TO EACH OTHER WITH PERSISTENT RELATIONSHIPS.

A SAADADB COMES WITH A RICH WEB INTERFACE AUTOMATICALLY GENERATED AND MANAGED.

DATA COLLECTIONS CAN ALSO BE EXPOSED THROUGH VO SERVICES (SCS, SIA, SSA OR TAP).

AN API IS AVAILABLE FOR THOSE WHO WANT TO BUILD THEIR OWN WEB INTERFACE OR TO FEED ANOTHER PIECE OF SOFTWARE WITH DATA RETRIEVED FROM THE DATABASE.

A SAADADB CAN BE MANAGED WITH A GRAPHICAL TOOL OR BY SCRIPT.

ALTHOUGH BEING ENABLE TO BE OPERATED AUTOMATICALLY, THE DATA LOADER CAN BE CONFIGURED BY HAND TO EXTRACT THE PROPER META-DATA.

P4.9: ALBERTO MICOL

ESO - EUROPEAN SOUTHERN OBSERVATORY

ENHANCED CAPABILITIES OF THE ESO SCIENCE ARCHIVE FACILITY USER INTERFACES

THE ESO SCIENCE ARCHIVE FACILITY (SAF) PROVIDES ACCESS TO RAW DATA, SCIENCE PRODUCTS AND AMBIENT INFORMATION FOR THE LA SILLA-PARANAL OBSERVATORY. THROUGH THE USER INTERFACES, THE ARCHIVE USERS BROWSE/QUERY/REQUEST AND DOWNLOAD RAW DATA AND THE QUICKLY-GROWING CONTENT OF SCIENCE-READY DATA PRODUCTS (IMAGES, FLUX MAPS, SPECTRA, DATA CUBES, SOURCE TABLES, CATALOGS).

THE SAF USER INTERFACES PROVIDE SUPPORT TO QUERIES FOR THE ESO APPROVED OBSERVING PROGRAMS, THEIR ABSTRACTS, AND SCHEDULING INFORMATION. THE AMBIENT CONDITIONS OF THE DIFFERENT SITES CAN ALSO BE BROWSED TO OBTAIN (DOWNLOAD/DISPLAY) MEASUREMENTS OF SEEING, COHERENCE TIME, PRECIPITABLE WATER VAPOUR, AND OTHER PARAMETERS, LIKE THE VERTICAL PROFILE OF THE ATMOSPHERIC TURBULENCE, IMPORTANT TO SUPPORT NEW ADAPTIVE OPTICS REQUIREMENTS, FOLLOWING THE UPGRADE OF THE PARANAL ASTRONOMICAL SITE MONITORING INSTRUMENTATION.

IN THIS ARTICLE WE WILL REVIEW THE RECENT DEVELOPMENTS, HIGHLIGHTING THE NEW CAPABILITIES AVAILABLE TO THE USERS, AND DESCRIBING THE LOOK&FEEL AND THE ARCHITECTURAL CHOICES TAKEN TO PROVIDE A SMOOTH, INFORMATIVE, AND RESPONSIVE USER EXPERIENCE (ALADINLITE, JQUERY, AJAX, ENRICHED PHYSICAL DATA MODEL, ETC.).

P4.22: JESSICA MINK

SAO - SMITHSONIAN ASTROPHYSICAL OBSERVATORY

SAO'S PUBLIC ARCHIVE OF ECHELLE RETICON SPECTRA

FROM DECEMBER 1978 THROUGH MAY 2009, OVER 250,000 HIGH DISPERSION (R~20,000 AT 5177 ANGSTROMS) OPTICAL SPECTRA OF BRIGHT STARS (V<13 ON 1.5M, V<15 ON 6.4M) WERE RECORDED ON SINGLE-ORDER ECHELLE SPECTROGRAPHS ON THE TILLINGHAST 1.5-METER REFLECTOR AND MMT TELESCOPE ON MT. HOPKINS IN ARIZONA AND THE WYETH 1.5-METER REFLECTOR IN HARVARD, MASSACHUSETTS. THE SPECTRA WERE OBTAINED PRIMARILY FOR RADIAL VELOCITY STUDIES. THE SPECTRA HAVE BEEN UNIFORMLY REDUCED AND ARE BEING MADE PUBLIC, A VALUABLE RESOURCE IN COMBINATION WITH GAIA PROPER MOTION AND PARALLAX MEASUREMENTS.

P3.8: JAN DAVID MOL

ASTRON - NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY, THE NETHERLANDS

DOCKER IN PRODUCTION: EXPERIENCES WITH DATA PROCESSING AND INSPECTION

WE WANT TO SHARE OUR EXPERIENCES WITH USING DOCKER AS PART OF A PRODUCTION SYSTEM. DOCKER IS A PROMISING CONTAINER TECHNOLOGY THAT AIDS SOFTWARE DEVELOPMENT AND DEPLOYMENT IN THE DEVOPS ENVIRONMENT. IN LOFAR, WE RECENTLY INTEGRATED DOCKER INTO OUR WORK FLOW FOR OUR AUTOMATED DATA PROCESSING AS WELL AS FOR OUR MANUAL DATA INSPECTION.

WE ARE NOW ABLE TO LEVERAGE MANY ADVANTAGES THAT DOCKER HAS TO OFFER. FOR EXAMPLE, WE CAN DEPLOY AND RUN MULTIPLE SOFTWARE VERSIONS, EACH WITH THEIR OWN CONFIGURATIONS AND DEPENDENCIES, IN PARALLEL ON THE SAME SERVER. THE DEPLOYMENT, TESTING, AND UPGRADING OF BOTH OUR OWN AND 3RD PARTY SOFTWARE, BUT ALSO SYSTEM MAINTENANCE OF LOFAR IS MADE BOTH EASIER AND MORE POWERFUL. FINALLY, DOCKER ALLOWS US TO SHIP OUR SOFTWARE STACK TO END USERS, WHICH ARE ABLE TO RUN OUR PIPELINES AND TOOLS FROM SCRATCH USING A SINGLE COMMAND, PROVIDED THAT THEY HAVE DOCKER INSTALLED.

P3.9: GIJS MOLENAAR MOLENAAR

ANTON PANNEKOEK INSTITUTE

KLIKO - A SCIENTIFIC COMPUTER CONTAINER FORMAT

KLIKO WAS BORN OUT OF OUR NEEDS TO HAVE A MORE FORMAL AND UNIFORM WAY OF SCHEDULING BATCH COMPUTE TASKS ON ARBITRARY PUBLIC AND PRIVATE CLOUD PLATFORMS. DOCKER IS PERFECT FOR ENCAPSULATING AND DISTRIBUTING SOFTWARE, BUT THE INPUT OUTPUT FLOW IS NOT DEFINED. KLIKO IS AN ATTEMPT TO CREATE A STANDARD WAY TO DEFINE COMPUTE INPUT, OUTPUT AND PARAMETERS.

KLIKO IS ALREADY BEING USED IN PRODUCTION AT SKA SOUTH AFRICA.

P8.18: FAVIOLA ZUHE MOLINA

UNIVERSITY OF CHILE

VISUALIZATION AND CUSTOMIZED ANALYZES WITH ASTROCLOUD

IT IS COMMON TO FIND ASTRONOMERS RUNNING THEIR OWN TOOLS, OR DISTRIBUTED COMPUTATIONAL PACKAGES, FOR DATA ANALYSIS AND THEN VISUALIZING THE RESULTS WITH GENERIC APPLICATIONS. THIS CHAIN OF PROCESSES COMES AT HIGH COST: (A) ANALYSES ARE MANUALLY APPLIED, THEY ARE THEREFORE DIFFICULT TO BE AUTOMATIZED, AND (B) DATA HAVE TO BE SERIALIZED, THUS INCREASING THE COST OF PARSING AND SAVING INTERMEDIARY DATA. WE ARE DEVELOPING ASTROCLOUD, AN AGILE VISUALIZATION MULTIPURPOSE PLATFORM INTENDED FOR SPECIFIC ANALYSES OF ASTRONOMICAL IMAGES (HTTPS://ASTROCLOUDY.WORDPRESS.COM). THIS PLATFORM INCORPORATES DOMAIN-SPECIFIC LANGUAGES WHICH MAKE IT EASILY EXTENSIBLE. ASTROCLOUD SUPPORTS CUSTOMIZED PLUG-INS, WHICH TRANSLATE INTO TIME REDUCTION ON DATA ANALYSIS. MOREOVER, IT ALSO SUPPORTS 2D AND 3D RENDERING, INCLUDING INTERACTIVE FEATURES IN REAL TIME. ASTROCLOUD IS UNDER DEVELOPMENT. CURRENTLY, IT INCORPORATES THE MOST USED PYTHON LIBRARIES SUCH AS ASTROPY. WE ARE CURRENTLY IMPLEMENTING DIFFERENT CHOICES FOR PHYSICAL ANALYZES.

P4.10: MARCO MOLINARO

INAF – OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

ORGANIZING STANDARDISATION OF ASTRONOMICAL DATA ACCESS: THE IVOA DAL WG CURRENT EXPERIENCE

THE TREMENDOUS AMOUNT OF DATA AVAILABLE IN ASTRONOMY AT ALL WAVELENGTHS ALLOW ASTRONOMERS TO MAKE NEW SCIENCE AND TO CORRELATE AN EXTREMELY WIDE RANGE OF PHENOMENA. IT IS ALSO A CHALLENGE FOR DIGITAL DATA MANAGEMENT DISTRIBUTION AND PROCESSING. INTEROPERABLE DATA ACCESS PROTOCOLS AS DESIGNED BY THE IVOA TAKE A MAJOR PLACE IN THIS CHALLENGE. THIS CONTRIBUTION REVIEWS THE CURRENT TRENDS OF IVOA EFFORTS IN THIS CONTEXT.

P2.30: CHRYSTEL MOREAU

CNRS - LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE, MARSEILLE, FRANCE

ASPIC & GAZPAR : NATIONAL SERVICES OBSERVATION IN ASTRONOMY - ASTROPHYSICS AT CESAM

THE ASTROPHYSICAL DATA CENTER OF MARSEILLE (CENTRE DE DONNÉES ASTROPHYSIQUES DE MARSEILLE -CESAM) IS A CENTER OF EXPERTISE WHICH INCLUDES ALL ACTIVITIES AT LAM PROCESSING, ANALYSIS, ARCHIVING AND DISTRIBUTION OF DATA FROM LARGE-SCALE OBSERVATION EXTRA-GALACTIC PROGRAMS, IN ORDER TO MAKE THEM AVAILABLE TO THE COMMUNITY.

CESAM ENABLES THE PRODUCTION OF HIGH-VALUE DATA , THROUGH THE DEVELOPMENT OR INTEGRATION OF SPECIFIC SOFTWARES (GAZPAR) AND MAKE THEM AVAILABLE TO THE SCIENTIFIC COMMUNITY THROUGH GENERIC TOOLS AND / OR SPECIFIC PROJECTS DEVELOPED WITHIN THE FRAMEWORK SCIENTISTS (ASPIC).

P1.19: MIKIO MORII

INSTITUTE OF STATISTICAL MATHEMATICS

DATA COMPRESSION FOR OPTICAL MOVIE DATA OF THE TOMO-E GOZEN

THE TOMO-E GOZEN IS A WIDE-FIELD CAMERA ON 1-M SCHMIDT TELESCOPE ON KISO OBSERVATORY AT JAPAN.

BY USING THE CAMERA, WE PLAN TO MONITOR THE WIDE AREA OF THE SKY WITH HIGH SPEED OF 2 HZ, TO SEARCH OPTICAL TRANSIENTS.

FULL OBSERVATION WILL START ON THE NEXT YEAR.

THE CAMERA CONSISTS OF 84 CMOS CHIPS AND COVER THE FIELDS OF VIEW WITH 20 DEG^2.

THE DATA OBTAINED BY ONE NIGHT OBSERVATION WILL BECOME ABOUT 30 TB. THEN, DATA COMPRESSION IS NECESSARY.

WE HAVE APPLIED A MATRIX FACTORIZATION METHOD FOR THE MOVIE DATA AND SHOWED THAT THE METHOD CAN COMPRESS THE DATA INTO ONE-TENTH OF ORIGINAL SIZE, WITHOUT LOSING SCIENTIFICALLY IMPORTANT INFORMATION.

WE DEMONSTRATED THAT THE METHOD CAN PROCESS THE DATA WITH SUFFICIENTLY HIGH SPEED.

P1.21: SILVANA GUADALUPE NAVARRO

INSTITUTO DE ASTRONOMÍA Y METEOROLOGÍA, CUCEI, UNIVERSIDAD DE GUADALAJARA

AUTOMATIC SPECTRAL CLASSIFICATION OF GALAXIES USING SPITZER DATA

IN THIS WORK WE PRESENT THE ANALYSIS OF THE SPECTRAL SAMPLE OBTAINED FROM THE SPITZER INFRARED SPECTROGRAPH (IRS) . WE APPLIED UNSUPERVISED NEURAL NETWORKS: COMPETITIVE (CNN) AND SELF ORGANIZED MAPS (SOM), TO THE SAMPLE OF 747 GALAXY SPECTRA. ALL OF THEM WERE OBTAINED FROM THE CENTRAL PART OF THE GALAXIES. THE REDSHIFT (Z) OF THE SAMPLE GALAXIES IS BETWEEN 0.0001 AND 0.3. ALL ARE HIGH RESOLUTION SPECTRA (R ~ 600) OBTAINED WITH THE SHORT-HIGH (9.9-19.6 μ M) AND LONG-HIGH (18.7-37.2 μ M) MODULES OF IRS. WE OBTAINED AN AUTOMATIC CLASSIFICATION ON 17 GROUPS WITH THE CNN, AND WE COMPARE THE RESULTS WITH THOSE OBTAINED WITH SOM. THE OBTAINED CLASSIFICATION WITH BOTH METHODS ARE CONSISTENT. WE ARE ANALYZING THE PHYSICAL PROPERTIES OF THE GALAXIES IN EACH GROUP TO DETERMINE WHAT TYPE OF OBJECTS DOMINATES EACH ONE AND TO CONFIRM IF THE CLASSIFICATION COULD BE EXTENDED TO A LARGER DATABASE.

P2.12: VICENTE NAVARRO

ESA

TOWARDS A COMMON SOFTWARE ENGINEERING ENVIRONMENT FOR SCIENCE OPERATIONS

THE EUROPEAN SPACE ASTRONOMY CENTRE (ESAC) HAS BEEN ESA'S SCIENCE OPERATIONS CENTRE (SOC) SINCE 2008. FOR EACH SCIENCE MISSION ESAC HOSTS A NUMBER OF OPERATIONAL SYSTEMS TYPICALLY RELATED TO MISSION PLANNING, INSTRUMENT HANDLING, DATA PROCESSING, SERVICES AND TOOLS TO USERS, AND DATA ARCHIVING. AS PART OF THIS ROLE, ESAC IS RESPONSIBLE FOR THE MANAGEMENT AND IMPLEMENTATION OF SCIENCE OPERATIONS SYSTEMS THROUGHOUT THE SOFTWARE DEVELOPMENT LIFECYCLE.

THEREFORE HIGH QUALITY SOFTWARE ENGINEERING FLOW-DOWN FROM MISSION REQUIREMENTS TO SCIENCE OPERATIONS REPRESENTS A CRITICAL SUCCESS FACTOR FOR ESAC IN PARTICULAR, AND ANY SPACE PROJECT IN GENERAL.

ALTHOUGH STANDARDS AND PRINCIPLES FOR 'GOOD' SOFTWARE ENGINEERING HAVE BEEN ESTABLISHED FOR QUITE SOME TIME, OVER RECENT YEARS MORE AND BETTER SUPPORT TOOLS HAVE BECOME AVAILABLE. THESE TOOLS REPRESENT KEY ENABLERS FOR INCREASED EFFICIENCY, CONTRIBUTING TO DELIVER HIGHER QUALITY SOFTWARE SYSTEMS WITH LESS EFFORT AND TIME.

THE MAIN GOAL OF THIS ACTIVITY IS TO DEFINE A COMMON SOFTWARE ENGINEERING ENVIRONMENT WHERE A CORE SET OF TOOLS AND PROCEDURES ARE SHARED ACROSS TEAMS. THIS ENVIRONMENT IS TO BE USED FOR ALL UPCOMING MISSIONS WHILE CURRENT MISSIONS, WITH SOFTWARE ENGINEERING ENVIRONMENTS OFTEN CHARACTERISED BY A HETEROGENEOUS APPROACH, WILL MIGRATE DEPENDING ON THEIR SPECIFIC CIRCUMSTANCES..

IN ORDER TO MAXIMIZE PRODUCTIVITY THE PROJECT HAS FOLLOWED AN EVOLUTIVE / AGILE APPROACH, FOCUSING ON THOSE AREAS WITH HIGHER POTENTIAL FOR COMMONALITY:

- PROJECT MANAGEMENT
- PROBLEM AND CHANGE MANAGEMENT
- SOURCE / DOCUMENTATION VERSION CONTROL
- RELEASE MANAGEMENT

OTHER AREAS LIKE REQUIREMENTS ENGINEERING OR TEST MANAGEMENT, WERE TACKLED AS PART OF THE PROJECT NEEDS IN A GENERIC WAY, DEFINING A POTENTIAL SOLUTION FOR OTHER PROJECTS.

MOREOVER THE DESIGN OF THE NEW ENVIRONMENT HAS BEEN DONE IN COOPERATION WITH A MULTI-DISCIPLINARY TEAM FROM DIFFERENT MISSIONS, LEVERAGING ON EXISTING PRACTICES AND TOOLS ALREADY IN PLACE.

THIS PAPER PRESENTS THE APPROACH, ARCHITECTURE DESIGN AND IMPLEMENTATION OF THE FUTURE SCIENCE OPERATIONS CONFIGURATION CONTROL INFRASTRUCTURE AT ESAC.

P2.13: KARI NILSSON

FINNISH CENTRE FOR ASTRONOMY WITH ESO

THE DESIGN STRATEGY OF SCIENTIFIC DATA QUALITY CONTROL SOFTWARE FOR EUCLID MISSION.

THE MOST VALUABLE ASSET OF A SPACE MISSION LIKE EUCLID ARE THE DATA. DUE TO THEIR HUGE VOLUME, THE AUTOMATIC QUALITY CONTROL BECOMES A CRUCIAL ASPECT OVER THE ENTIRE LIFETIME OF THE EXPERIMENT. HERE WE FOCUS ON THE DESIGN STRATEGY FOR THE SCIENCE GROUND SEGMENT (SGS) DATA QUALITY COMMON TOOLS (DQCT), WHICH HAS THE MAIN ROLE IN PROVIDING SOFTWARE SOLUTIONS TO GATHER, EVALUATE, AND RECORD QUALITY INFORMATION ABOUT THE RAW AND DERIVED DATA PRODUCTS FROM A PRIMARILY SCIENTIFIC PERSPECTIVE. THE STAKEHOLDERS FOR THIS SYSTEM INCLUDE CONSORTIUM SCIENTISTS, USERS OF THE SCIENCE DATA, AND THE GROUND SEGMENT DATA MANAGEMENT SYSTEM ITSELF.

THE SGS DQCT WILL PROVIDE A QUANTITATIVE BASIS FOR EVALUATING THE APPLICATION OF REDUCTION AND CALIBRATION REFERENCE DATA (FLAT-FIELDS,

LINEARITY CORRECTION, REFERENCE CATALOGS, ETC.), AS WELL AS DIAGNOSTIC TOOLS FOR QUALITY PARAMETERS, FLAGS, TREND ANALYSIS DIAGRAMS AND ANY OTHER METADATA PARAMETER PRODUCED BY THE PIPELINE, COLLECTED IN INCREMENTAL QUALITY REPORTS SPECIFIC TO EACH DATA LEVEL AND STORED ON THE EUCLID ARCHIVE DURING PIPELINE PROCESSING.

IN A LARGE PROGRAM LIKE EUCLID, IT IS PROHIBITIVELY EXPENSIVE TO PROCESS LARGE AMOUNT OF DATA AT THE PIXEL LEVEL JUST FOR THE PURPOSE OF QUALITY EVALUATION. THUS, ALL MEASURES OF QUALITY AT THE PIXEL LEVEL ARE IMPLEMENTED IN THE INDIVIDUAL PIPELINE STAGES, AND PASSED ALONG AS METADATA IN THE PRODUCTION. IN THIS SENSE MOST OF THE TASKS RELATED TO SCIENCE DATA QUALITY ARE DELEGATED TO THE PIPELINE STAGES, EVEN THOUGH THE RESPONSIBILITY FOR SCIENCE DATA QUALITY IS MANAGED AT A HIGHER LEVEL.

THE DQCT SUBSYSTEM OF THE SGS IS CURRENTLY UNDER DEVELOPMENT, BUT ITS PATH TO FULL REALIZATION WILL LIKELY BE DIFFERENT THAN THAT OF OTHER SUBSYSTEMS. THIS IS PRIMARILY DUE TO A HIGH LEVEL OF PARALLELISM AND TO THE WIDE PIPELINE PROCESSING REDUNDANCY. FOR INSTANCE THE MECHANISM OF DOUBLE SCIENCE DATA CENTER FOR EACH PROCESSING FUNCTION, THE DATA QUALITY TOOLS HAVE NOT ONLY TO BE WIDELY SPREAD OVER ALL PIPELINE SEGMENTS AND DATA LEVELS, BUT ALSO TO MINIMIZE THE OCCURRENCES OF POTENTIAL DIVERSITY OF SOLUTIONS IMPLEMENTED FOR SIMILAR FUNCTIONS, ENSURING THE MAXIMUM OF COHERENCY AND STANDARDIZATION FOR QUALITY EVALUATION AND REPORTING IN THE SGS.

P6.19: MAXIMILIAN NOETHE

TU DORTMUND, EXPERIMENTAL PHYSICS 5, DORTMUND, GERMANY

TOWARDS ROBOTIC OPERATION OF THE FIRST G-APD CHERENKOV TELESCOPE

THE FIRST G-APD CHERENKOV TELESCOPE (FACT) IS AN IMAGING ATMOSPHERIC CHERENKOV TELESCOPE LOCATED ON THE CANARY ISLAND OF LA PALMA.

IN ADDITION TO ITS PHYSICS GOAL OF MONITORING BRIGHT GAMMA-RAY SOURCES IN THE TEV REGIME, E.G. THE AGNS MRK 501 AND 421, FACT IS ALSO STRIVING FOR ROBOTIC OPERATION, IN ORDER TO MAXIMIZE ITS DUTY CYCLE WHILE SAVING MANPOWER AND RESOURCES.

THE NECESSITY TO OPERATE THE TELESCOPE ON SITE, WAS ONLY GIVEN FOR A BRIEF PERIOD OF TIME AFTER DEPLOYMENT AS HUMAN INTERACTION HAS BEEN MINIMIZED IN A STEPWISE PROCEDURE. FULLY REMOTE OPERATION OF FACT HAS BEEN ACHIEVED 10 MONTHS AFTER THE BEGINNING OF ITS OPERATION IN OCTOBER 2011. TO DATE ONLY THE TELESCOPE SYSTEM AND THE WEATHER CONDITIONS HAVE TO BE MONITORED BY A SHIFTER.

TO REACH FULLY ROBOTIC OPERATION, SEVERAL UTILITIES WERE DEVELOPED.

IN THIS TALK, THREE OF THEM WILL BE PRESENTED.

MAIN FOCUS WILL BE ON THE SHIFTHELPER, A SOFTWARE WRITTEN IN PYTHON THAT CONTINUOUSLY CHECKS THE SYSTEM VIA OUR WEB SERVICES AND USES DIFFERENT MEANS OF COMMUNICATION TO ALERT SHIFTERS IN CASE INTERVENTION IS REQUIRED.

THIS INCLUDES CALLING THE SHIFTERS ON THEIR PHONES, SENDING MESSAGES AND PLOTS VIA THE TELEGRAM INSTANT MESSENGER AND SENDING EMAILS. THE CODE IS OPEN SOURCE, AVAILABLE VIA GITHUB, AND WE PLAN TO CREATE A FRAMEWORK THAT OTHER EXPERIMENTS COULD USE.

FOR A MEASUREMENT OF THE TRIGGERING BEHAVIOR, THAT FACT IS PERFORMING ONCE PER NIGHT, AN AREA IN THE SKY NEAR ZENITH AND WITH VERY LOW STAR LIGHT IS REQUIRED. USING THE HIPPARCOS STAR CATALOG, A PROGRAM WAS WRITTEN THAT SELECTS A SUITABLE TARGET POSITION FOR A GIVEN DATE AND TIME.

TO GET A VISUAL OVERVIEW ABOUT THE CONDITIONS AT NIGHT, A SMALL TOOL GATHERING IMAGES FROM LOCAL WEBCAMS AND INFORMATION FROM WEATHER STATIONS IS PRODUCING TIMELAPSE VIDEOS OF THE NIGHTS ON LA PALMA.

P8.19: JUNICHI NOUMARU

SUBARU TELESCOPE, NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN

PROGRESS OF COMPUTER AND NETWORK REPLACEMENT AT SUBARU TELESCOPE

WE'LL PRESENT THE DESIGN OF SUBARU TELESCOPE'S COMPUTER AND NETWORK SYSTEM WHICH WILL BE REPLACED IN 2018, AND THE REPLACEMENT STRATEGY. WE WILL MAKE THE FIVE-YEAR CONTRACT WITH A VENDOR THAT WILL PROVIDE US WITH THE SERVICES THAT WE REQUIRE, BY HARDWARE AND SOFTWARE THAT THE VENDOR WILL OWN, AND BY THE OPERATION AND MAINTENANCE MADE BY THE VENDOR'S WORKFORCE.

THE GOAL OF THIS PROCUREMENT IS TO DELIVER QUALITY SERVICE TO THE OBSERVATORY STAFF AS WELL AS THE TELESCOPE USERS WITHIN THE BUDGET CONSTRAINT.

TO ACHIEVE THIS GOAL, WE WILL CONSOLIDATE HARDWARE AS MUCH AS POSSIBLE AND SHARE ONE DEVICE FOR MULTIPLE PURPOSES. BECAUSE OF THIS, OUR PROJECT WILL COVER MORE COMPUTERS THAN EVER - THE COMPUTERS FOR DATA REDUCTION, OBSERVATION CONTROL, INSTRUMENT CONTROL AND MAINTENANCE, DATA ARCHIVE, INTERNAL/EXTERNAL WEB SERVERS, VM PLATFORM FOR VARIOUS SERVERS, INTERNAL NETWORK, WIFI, FIREWALL AND SECURITY. MOST PRODUCTS ARE LOCATED IN SUBARU TELESCOPE PREMISES IN HAWAII, BUT A COUNTERPART OF DATA ARCHIVE SYSTEM IN HAWAII IS LOCATED AT THE HEADQUARTERS OF NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN IN MITAKA, TOKYO.

THIS PROCUREMENT IS MADE WITH A "RENTAL CONTRACT" WITH A VENDOR AT THIS TIME, FOR FIVE YEARS. THIS RENTAL CONTRACT COVERS THE DESIGN, DELIVERY, INSTALLATION, BEING A PRODUCT LICENSEE, CONFIGURATIONS, DATA MIGRATION FROM THE PREVIOUS SYSTEM, OPERATION, TROUBLESHOOTING AND MAINTENANCE BY ONE VENDOR. SINCE A VENDOR WILL COMMIT TO EVERY STEP OF THE COMPUTER PROCUREMENT, THE VENDOR MUST GUARANTEE THE FUNCTIONS AND PERFORMANCE IT PROMISED. THE RESULTS FROM THE PAST PROCUREMENTS WERE SATISFACTORY IN FUNCTION, PERFORMANCE AND STABILITY.

BECAUSE THIS PROJECT IS FUNDED BY JAPANESE GOVERNMENT, THE PROCUREMENT PROCESS MUST BE COMPLIANT WITH JAPANESE GOVERNMENT'S RULE. AS OF THE ADASS MEETING, THE RFI (REQUEST FOR INFORMATION) WOULD HAVE BEEN MADE PUBLIC AND WE WOULD HAVE RECEIVED FEEDBACK FROM THE BUSINESS THAT IS INTERESTED IN THE CONTRACT.

WITH THIS PRESENTATION, WE WOULD LIKE TO SHARE THE IDEAS BEHIND THE RFI WE WILL DISCLOSE WITH THE ADASS PARTICIPANTS. AND WE MAY INTRODUCE TECHNICAL BREAKTHROUGH THAT WE LEARNED THROUGH THE PROCESS TOWARD THIS PROCUREMENT.

P6.20: ALAN O'BRIEN

UK ASTRONOMY TECHNOLOGY CENTRE/STFC

MAISIE: A MULTIPURPOSE ASTRONOMICAL INSTRUMENT SIMULATOR ENVIRONMENT

INSTRUMENT SCIENCE SIMULATORS ARE A USEFUL TOOL TO TEST DATA REDUCTION PIPELINES AND PREVIEW DATA PRODUCTS. OFTEN THESE SIMULATORS ARE BUILT FROM THE GROUND UP FOR EACH PROJECT, LEADING TO DIFFERENT DESIGNS, INTERFACES AND CAPABILITIES. ADAPTING A SIMULATOR FOR ANOTHER PROJECT IS A DIFFICULT PROCESS; DIFFERENCES IN PHYSICAL DESIGN CAN REQUIRE LARGE AMOUNTS OF CODE REFACTORING AND CODE DUPLICATION TO CHANGE A SINGLE PURPOSE SIMULATOR. MAISIE (MULTI-PURPOSE ASTRONOMICAL INSTRUMENT SIMULATOR ENVIRONMENT) PROVIDES A COMMON FRAMEWORK FOR SIMULATORS. AT THE CORE OF MAISIE IS THE EFFECTOR INTERFACE WHICH IS USED TO CREATE TO OBJECTS THAT SIMULATE A SINGLE EFFECT, THE BUILDING BLOCKS OF THE SIMULATION. COMBINATIONS OF EFFECTORS CAN BE USED TO SIMULATE REAL COMPONENTS, SUB-SYSTEMS AND SYSTEMS IN ASTRONOMICAL INSTRUMENTS. BY PROVIDING A SIMPLE COMMON DESIGN FOR INSTRUMENTS MAISIE AIMS TO REDUCE EFFORT REQUIRED TO DESIGN AND BUILD INSTRUMENT SIMULATORS. A COLLECTION OF WELL TESTED EFFECTORS AND TOOLS ARE INCLUDED WITHIN MAISIE FOR COMMON, SIMPLE USE CASES. MAISIE HAS BEEN DESIGNED TO BUILD SIMULATORS FOR SINGLE AND MULTI-CHANNEL INSTRUMENTS, IMAGERS AND SPECTROMETERS, GROUND AND SPACE BASED INSTRUMENTS. FOR NEW AND NOVEL INSTRUMENTS, NEW FUNCTIONALITY CAN BE ADDED BY CREATING NEW CLASSES THAT REPRESENT THE ADDED FEATURES AND USED WITH THE EXISTING SIMULATOR FRAMEWORK. MAISIE IS AVAILABLE FROM GITHUB AND IS WRITTEN IN PYTHON, A FREELY AVAILABLE AND OPEN-SOURCE LANGUAGE. RECENTLY MAISIE HAS BEEN USED TO DEVELOP THE SIMULATOR FOR THE JAMES WEBB SPACE TELESCOPE' MID-INFRA RED INSTRUMENT MEDIUM RESOLUTION SPECTROMETER.

P3.10: SIMON O'TOOLE

AUSTRALIAN ASTRONOMICAL OBSERVATORY

TAPPING INTO HADOOP WITH AAO DATA CENTRAL

WE PRESENT AAO DATA CENTRAL, AN ASTRONOMICAL DATA ARCHIVE USING APACHE HADOOP THAT INCORPORATES A TAP SERVICE, A RESTFUL API, AS WELL AS A WEB FRONTEND. HADOOP ALLOWS US TO QUERY DATA USING SQL SYNTAX, HOWEVER THE UNDERLYING SYSTEM USES AN OBJECT ORIENTED DATA MODEL TO MANAGE HETEROGENEOUS DATASETS, RATHER THAN A MORE TRADITIONAL RELATIONAL MODEL. AAO DATA CENTRAL WILL INITIALLY HOST THE SAMI SURVEY DATA RELEASE 1 AND THE GAMA SURVEY DATA RELEASE 2, WITH ALL AAT AND UKST SURVEYS EVENTUALLY BEING HOSTED IN THE SYSTEM. WE WILL DISCUSS THE TECHNICAL DETAILS AND CHALLENGES OF OUR SYSTEM.

P4.11: ANAIS OBERTO

CDS - OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, FRANCE

WHAT IS IN SIMBAD ?

SIMBAD IS A DYNAMIC DATABASE OF ASTRONOMICAL OBJECTS. IT PROVIDES THE BIBLIOGRAPHY, AS WELL AS BASIC INFORMATION SUCH AS THE NATURE OF THE OBJECT, ITS COORDINATES, MAGNITUDES, PROPER MOTIONS AND PARALLAX, VELOCITY/REDSHIFT, ANGULAR SIZE, SPECTRAL OR MORPHOLOGICAL TYPE, AND THE MULTITUDE OF NAMES (IDENTIFIERS) GIVEN IN THE LITERATURE. THE INFORMATION IN SIMBAD IS A COMPILATION BUILT FROM WHAT IS PUBLISHED IN THE LITERATURE WITH EXPERT CROSS-IDENTIFICATION PERFORMED AT THE CDS BASED ON THE COMPATIBILITY OF SEVERAL PARAMETERS, IN THE LIMIT OF REASONABLY GOOD ASTROMETRY.

P1.22: MAXIME PAILLASSA

IAP - INSTITUT D'ASTROPHYSIQUE DE PARIS

DEBLENDING IN CROWDED STAR FIELDS USING CONVOLUTIONAL NEURAL NETWORKS

ASTRONOMICAL IMAGES WITH HIGH STELLAR DENSITY POSE A CHALLENGE TO SOURCE EXTRACTION ALGORITHMS. WE PRESENT A NEW STAR DETECTION AND DEBLENDING METHOD BASED ON A CONVOLUTIONAL NEURAL NETWORK. THE OBTAINED DETECTOR CAN DEAL WITH A WIDE VARIETY OF ASTRONOMICAL IMAGES, AND SHOWS NOTABLE GAIN IN BOTH COMPLETENESS AND RELIABILITY WHEN COMPARED TO TRADITIONAL SINGLE-PASS ALGORITHMS. WE DISCUSS FURTHER PROSPECTS AND IMPROVEMENTS TO THE METHOD.

P1.23: JONGYEOB PARK

KOREA ASTRONOMY AND SPACE SCIENCE INSTITUTE, DAEJEON, SOUTH KOREA

DEVELOPMENT OF A FORECAST MODEL OF SOLAR WIND SPEED USING THE CONVOLUTION NEURAL NETWORK

THE SOLAR DYNAMIC OBSERVATORY (SDO) PRODUCES THE HUGE SIZE OF SCIENTIFIC IMAGING DATA OF THE SUN FROM AIA AND HMI. THE KOREA DATA CENTER FOR SDO (KDC-SDO) HAS STORED THE FULL COVERAGE DATA OF THE SDO WHICH ARE IDENTICALLY SAME IN JOINT SCIENCE OPERATIONS CENTER (JSOC). WE DEVELOP A PRELIMINARY FORECAST MODEL OF SOLAR WIND SPEED (VSW) USING THE CONVOLUTION NEURAL NETWORK (CNN) IN THE TENSORFLOW OF GOOGLE. FOR THIS, CORONA HOLES ARE IDENTIFIED AS DARK AREA WHOSE INTENSITY ARE LOWER THAN MEDIAN VALUE USING AIA 193Å IMAGES. THE INPUT DATA FOR CNN ARE BINARY IMAGES WITH -10 AND 10 DEGREES IN LONGITUDE: 1 FOR CORONA HOLES AND 0 FOR THE OTHER AREAS. THREE DAY DATA WITH 1 HOUR TIME RESOLUTION ARE USED FOR THE SOLAR WIND SPEED FORECAST WITH ONE DAY ADVANCE. THE FORECASTING EVENTS ARE DEFINED AS POSITIVE SAMPLES WHICH ARE VSW>500KM/S FOR THE WHOLE DAY. THE NUMBER OF POSITIVE SAMPLES ARE 204 FROM 2010 TO 2016. THE CNN IS CONFIGURED TO 1 CONVOLUTION LAYER, 1 POOLING LAYER, AND 1 FULLY-CONNECTED LAYER THAT HAS 4 NODES AT LAST. THE FORECAST MODEL CAN CLASSIFY THE EVENTS TO HAPPEN OR NOT. WITH K-FOLDS CROSS-VALIDATION IN A TRAINING PROCESS, THE AVERAGE OF ACCURACY FOR THE MODEL IS 0.49 AND ITS STANDARD DEVIATION IS 0.12. FINALLY, THE MODEL IS EVALUATED WITHIN A MONTH AND ITS ACCURACY IS 0.54. WE WILL USE SOHO EIT IMAGES FOR MORE TRAINING SAMPLES, AND SOHO LASCO IMAGES TO CONSIDER CORONAL MASS EJECTIONS. IN ADDITION, WE CAN EXTEND THIS STUDY TO FORECAST OTHER SOLAR AND GEOMAGNETIC PARAMETERS.

P2.14: SERGIO PASCUAL

UNIVERSIDAD COMPLUTENSE DE MADRID, MADRID, SPAIN

INTEGRATION OF THE DATA REDUCTION PIPELINE OF EMIR DURING ITS COMMISSIONING

EMIR, THE INFRARED MULTIOBJECT SPECTROGRAPH FOR THE 10M GRAN TELESCOPIO CANARIAS, IT IS CURRENTLY IN ITS PERIOD OF COMMISSIONING AT THE TELESCOPE SITE.

I PRESENT HERE THE DETAILS OF THE INTEGRATION OF THE PIPELINE IN THE GTC CONTROL SYSTEM, AND THE CHANGES REQUIRED IN BOTH SYSTEMS. THE EMIR DATA REDUCTION PIPELINE IS WRITTEN IN PYTHON AND CAN BE USED AS A STANDALONE PROGRAM (HTTPS://GITHUB.COM/GUAIX-UCM/PYEMIR). THE GTC CONTROL SYSTEM IS WRITTEN IN C++ AND JAVA AND USES CORBA FOR COMMUNICATION BETWEEN SUSBSYSTEMS

P8.20: JOSE VICENTE PEREA-CALDERON

ESAC - ESA. EUROPEAN SPACE ASTRONOMY CENTRE

CATALOGUE OF THE XMM-NEWTON PIPELINE PRODUCTS. PRESENT AND FUTURE

THE AIM OF THE XMM-NEWTON PIPELINE PROCESSING SYSTEM (PPS) IS TO PROVIDE A SET OF DATA PRODUCTS WHICH ARE OF IMMEDIATE VALUE FOR THE XMM-NEWTON OBSERVER AS WELL AS FOR THE XMM-NEWTON SCIENCE ARCHIVE (XSA), WHERE THEY ARE ALSO STORED FOR EVENTUAL PUBLIC RELEASE. THE DEDICATED PIPELINE REDUCES DATA FROM EACH OF THE EPIC, RGS AND OM SCIENCE INSTRUMENTS ON XMM-NEWTON.

THE RESULTING PIPELINE PRODUCTS ARE A MIXTURE OF FILES THAT ARE USEFUL AS INPUTS TO FURTHER SCIENTIFIC ANALYSIS BY THE USER AND FILES THAT PROVIDE A FIRST CURSORY VIEW OF THE DATA. THE PRODUCTS INCLUDE CALIBRATED CLEANED EVENT LISTS FOR ALL X-RAY CAMERAS, SKY IMAGES, SOURCE LISTS, CROSS-CORRELATIONS WITH ARCHIVAL CATALOGUES AND SPECTRA AND TIME SERIES OF SUFFICIENTLY BRIGHT INDIVIDUAL SOURCES.

THIS POSTER IS AN OVERVIEW OF THE CURRENT DATA PRODUCTS OBTAINED BY THE XMM-NEWTON PIPELINE AND THE PLANS TO IMPROVE THE QUALITY OF THE DATA AND THE VISUALIZATION OF THAT RESULTING DATA.

P2.15: FERNANDO PEREZ-LOPEZ

ESAC - EUROPEAN SPACE ASTRONOMY CENTRE, MADRID, SPAIN

APPLICABILITY OF AGILE SCRUM TO BEPICOLOMBO MPO SCIENCE GROUND SEGMENT DEVELOPMENT

BEPICOLOMBO IS AN INTERDISCIPLINARY ESA-JAXA MISSION TO EXPLORE THE PLANET MERCURY CONSISTING OF TWO SEPARATE ORBITERS: ESA'S MERCURY PLANETARY ORBITER (MPO) AND JAXA'S MERCURY MAGNETOSPHERIC ORBITER (MMO. THE ESA ORBITER PAYLOAD COMPRISES 11 INSTRUMENTS COVERING DIFFERENT SCIENTIFIC DISCIPLINES DEVELOPED BY SEVERAL TEAMS. THE SCIENCE GROUND SEGMENT (SGS), LOCATED AT THE EUROPEAN SPACE ASTRONOMY CENTRE (ESAC), WILL BE IN CHARGE OF THE SCIENTIFIC PAYLOAD OPERATIONS PLANNING, THE SCIENCE OPERATIONS, THE DATA PROCESSING AND DISTRIBUTION TO THE INSTRUMENT TEAMS, THE PRELIMINARY ANALYSIS OF THE SCIENTIFIC DATA AND THEIR ARCHIVING IN A CENTRAL ARCHIVE ACCESSIBLE TO THE SCIENCE COMMUNITY.

BEPICOLOMBO WILL SET OFF IN 2018 AND WILL ARRIVE AT MERCURY IN LATE 2024 AND THE SGS SHALL FULFIL THE DIFFERENT INSTRUMENT TEAMS' NEEDS DURING MORE THAN EIGHT YEARS OF OPERATIONS, FROM LAUNCH UNTIL THE END OF POST-OPERATIONS PHASE. THIS LONG MISSION LIFETIME IMPOSES STRONG REQUIREMENTS ON SYSTEM DEVELOPMENT AND MAINTAINABILITY AND ALSO ON HOW THE SYSTEM IS ABLE TO ACCOMMODATE THE USER NEEDS DURING THE DIFFERENT MISSION PHASES.

INITIALLY THE SGS SOFTWARE DEVELOPMENT FOLLOWED AN INCREMENTAL APPROACH, THE CLASSICAL WATERFALL MODEL (GENERALLY USED IN GROUND CONTROL SYSTEMS DEVELOPMENT AT ESA), WHICH MEANS TO DELIVER A WORKING PART OF A TOTAL PRODUCT OR SOLUTION SLICING THE SYSTEM FUNCTIONALITY INTO INCREMENTS. HOWEVER, AFTER TWO YEARS OF EXPERIENCE, THIS 'CLASSIC' APPROACH HAS NOT DEMONSTRATED TO BE AS EFFICIENT AS WAS INITIALLY EXPECTED. FOR THIS REASON, THE SGS HAS CHANGED THE DEVELOPMENT METHODOLOGY INTO AN AGILE SCRUM APPROACH WHICH GUARANTEES THE INVOLVEMENT OF THE USERS DURING THE DEVELOPMENT, AND THEREFORE THE ADEQUACY OF THE SYSTEM WITH RESPECT THE REAL SYSTEM NEEDS DURING ALL MISSION PHASES, AND ENSURES THE CONTINUOUS SYSTEM VERIFICATION AND VALIDATION ACTIVITIES.

THIS PAPER DESCRIBES THE PROBLEMS EXPERIENCED BY THE SGS WITH THE WATERFALL APPROACH AND HOW THE SGS HAS BEEN ABLE TO MIGRATE FROM IT TO THE NEW AGILE METHODOLOGY, MAINTAINING THE CONSISTENCY BETWEEN USES CASE, SCIENCE/SYSTEM/SUBSYSTEM REQUIREMENTS, USER STORIES, TEST CASES, ETC. IN ADDITION, IT DESCRIBES A GOOD CASE OF STUDY ON THE APPLICABILITY AND EFFECTIVENESS OF SCRUM TO A SCIENCE GROUND SEGMENT DEVELOPMENT WITH LONG LIFE DEVELOPMENT CYCLE WHICH IS QUITE DIFFERENT CASE FROM THE 'TRADITIONAL' APPLICABILITY OF AGILE METHODOLOGIES.

P1.24: FRANÇOIS-XAVIER PINEAU

OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, UNIVERSITÉ DE STRASBOURG, CNRS, UMR 7550, 11 RUE DE L'UNIVERSITÉ, F-67000 STRASBOURG, FRANCE

HIPS CATALOGUE GENERATION

HIPS (HIERARCHICAL PROGRESSIVE SURVEY) OFFERS A USER-FRIENDLY WAY TO EXPLORE POTENTIALLY VERY LARGE CATALOGUES ON THE SKY, SUCH AS THE GAIA CATALOGUE.

THE USER CAN BROWSE THE SKY BY ZOOMING AND PANNING, WHILE ALL DATA TRANSFERS ARE TRANSPARENTLY HANDLED BY THE CLIENT (E.G. ALADIN).

THE ALL-SKY VIEW DISPLAYS THE MOST INTERESTING OBJECTS GIVEN A SPATIAL DISTRIBUTION MIMICKING THE GLOBAL SPATIAL DISTRIBUTION OF OBJECTS.

ONCE THE USER HAS IDENTIFIED A REGION OF INTEREST AND CENTRED IT BY PANNING, MORE OBJECTS EMERGED AS HE KEEPS ZOOMING IN.

THE CDS HAS DEVELOPED A TOOL (HIPSGENCAT) TO GENERATE HIPS VERSIONS OF THE CATALOGUES IT HOSTS.

THIS TOOL HAS BEEN MADE PUBLIC SO ANYONE CAN GENERATE ITS OWN HIPS CATALOGUES.

AFTER A REMINDER OF THE HIPS CATALOGUE DATA-STRUCTURE, WE DETAIL THE ALGORITHM USED IN THE HIPSGENCAT TOOL.

P6.21: LAURE PIQUERAS

CENTRE DE RECHERCHE ASTROPHYSIQUE DE LYON

MPDAF - A PYTHON PACKAGE FOR THE ANALYSIS OF VLT/MUSE DATA

MUSE (MULTI UNIT SPECTROSCOPIC EXPLORER) IS AN INTEGRAL-FIELD SPECTROGRAPH MOUNTED ON THE VERY LARGE TELESCOPE (VLT) IN CHILE AND MADE AVAILABLE TO THE EUROPEAN COMMUNITY SINCE OCTOBER 2014. THE CENTRE DE RECHERCHE ASTROPHYSIQUE DE LYON HAS DEVELOPED A DEDICATED SOFTWARE TO HELP MUSE USERS ANALYZE REDUCED DATA.

IN THIS PAPER WE INTRODUCE MPDAF, THE MUSE PYTHON DATA ANALYSIS FRAMEWORK, BASED ON SOME WELL-KNOWN PYTHON LIBRARIES (NUMPY, SCIPY, MATPLOTLIB, ASTROPY) WHICH OFFERS NEW OBJECTS TO MANIPULATE MUSE-SPECIFIC DATA.

WE WILL PRESENT DIFFERENT USAGES EXHIBITING HOW THIS PYTHON MODULE MAY BE VERY USEFUL FOR THE MUSE ANALYSIS:

- MPDAF PROVIDES A WAY TO LOAD A MUSE CUBE CREATED BY THE MUSE PIPELINE (I.E. A FITS DATA CUBE OF 3GB, ~ 300X300X3680 PIXELS) INTO A PYTHON OBJECT HANDLING THE WORLD COORDINATES, THE VARIANCE AND THE BAD PIXELS INFORMATION. IT IS THEN RELATIVELY EASY TO EXTRACT SMALLER CUBES OR NARROW-BAND IMAGES FROM A CUBE, SPECTRA FROM AN APERTURE, AND PERFORM COMMON OPERATIONS LIKE MASKING, INTERPOLATING, RE-SAMPLING, SMOOTHING, PROFILE FITTING... THE WORLD COORDINATES, THE ASSOCIATED VARIANCE AND THE MASK ARE PROPAGATED INTO THE EXTRACTED CUBE, IMAGE, OR SPECTRA.

- SEVERAL OPERATIONS CAN BE PERFORMED ON THE MUSE PIXEL TABLE. THE PIXEL TABLE IS THE MAIN INTERMEDIATE PRODUCT OF THE REDUCTION, STORED AS A FITS TABLE OF 8GB, AND CONTAINS THE LISTS OF DETECTOR PIXELS TOGETHER WITH OUTPUT COORDINATES AND VALUES. BEFORE RECONSTRUCTING A DATA CUBE, ONE CAN PERFORM ANY OPERATION ON THE PIXEL TABLE AS FOR EXAMPLE MASKING DATA OR APPLYING AN ADDITIONAL FLAT FIELD CORRECTION.

- COMBINING INDIVIDUAL EXPOSURES IS USUALLY DONE WITH THE PIPELINE USING PIXEL TABLES, BUT MPDAF ALSO ALLOWS TO COMBINE DATA CUBES. THIS ALLOWS TO PERFORM ADDITIONAL CORRECTIONS, BEFORE COMBINING THE CUBES. CLASSIC COMBINATION ALGORITHMS ARE AVAILABLE SUCH AS MEDIAN, SIGMA-CLIPPED MEAN, AND CAN INCLUDE INTEGER OFFSETS.

FINALLY, WE WILL CONCLUDE WITH THE FUTURE PLANS LIKE OFFERING TOOLS TO DETECT AND MANAGE SOURCES OR, AS MPDAF IS NOW MADE PUBLICLY AVAILABLE, INCLUDING CONTRIBUTIONS FROM THE COMMUNITY OF MUSE USERS.

P2.16: KAI LARS POLSTERER

HEIDELBERG INSTITUTE FOR THEORETICAL STUDIES

PROBABILITY DENSITY FUNCTIONS FOR ASTRONOMY

IN MANY APPLICATIONS IN ASTRONOMY, UNCERTAINTY QUANTIFICATION PLAYS AN IMPORTANT ROLE. PROBABILITY DENSITY FUNCTIONS ALLOW TO QUANTIFY THE LIKELIHOOD OF CERTAIN RESULTS AND THEREFORE ENABLE SCIENTIST TO PRODUCE BETTER ANALYSIS RESULTS. WE PRESENT A PYTHON PACKAGE TO GENERATE PDFS FOR CLASSIFICATION AND REGRESSION TASKS. BESIDES PROVIDING SEVERAL FUNCTIONALITIES TO GENERATE SUCH PDFS, WE PRESENT A WHOLE TOOL SET FOR EVALUATING THE QUALITY AND VISUALIZING THE PERFORMANCE OF THE GENERATED PDFS.

P6.22: FREDERIC RAISON

MPE - MAX-PLANCK-INSTITUT FÜR EXTRATERRESTRISCHE PHYSIK

SCALABILITY OF AN MPI4PY IMPLEMENTATION OF A 2D CORRELATION CODE VERSUS MPI

A 2D CORRELATION CODE HAS BEEN DEVELOPED BASED ON MPI4PY IN ORDER TO PERFORM STATISTICAL ANALYSIS OF GALAXY SURVEYS. INPUT DATA HAVE BEEN PRODUCED BY THE MILLENNIUM COSMOLOGICAL SIMULATION. TWO ALGORITHMS HAVE BEEN IMPLEMENTED: THE FIRST ONE CONSIDERS POINT-LIKE LOCATIONS OF THE SOURCES ALONG THE REDSHIFT AXIS. THE OTHER ALGORITHM IS USING THE PROBABILITY DENSITY FUNCTION ALONG THE REDSHIFT DIRECTION. WE RAN THE CODE ON A LARGE CLUSTER AND COMPARED ITS SCALABILITY TO AN MPI IMPLEMENTATION.

P4.12: ANNE CATHERINE RAUGH

UNIVERSITY OF MARYLAND, COLLEGE PARK

25 YEARS OF PLANETARY DATA ARCHIVING WITH NASA'S PDS: LESSONS LEARNED THE HARD WAY

NASA'S PLANETARY DATA SYSTEM (PDS) WAS ESTABLISHED TO ENSURE NASA'S RETURN ON INVESTMENT IN ITS PLANETARY SPACE PROGRAM. SPECIFICALLY, THE PDS MANDATE WAS AND IS TO ENSURE THAT THE DATA RETURNED BY THESE MISSIONS ARE NOT MERELY PRESERVED, BUT MAINTAINED AND USABLE BY SUBSEQUENT INVESTIGATORS LONG AFTER THE ORIGINAL MISSION SCIENCE TEAMS HAVE DISBANDED. DURING THE INTERVENING GENERATIONS (1 HUMAN, ABOUT 5 TECHNOLOGICAL), PDS HAS AMASSED A HIGHLY DIVERSE ARCHIVE AND DEALT WITH FORMIDABLE ISSUES OF DATA FILE FORMAT, LONG-TERM MAINTENANCE, AND METADATA COLLECTION AND PRESERVATION. SOME DESIGN CHOICES HAVE STOOD THE TEST OF TIME; OTHERS THAT SEEMED OBVIOUS CONTEMPORARILY HAVE BEEN DISASTROUS IN THE LONG TERM - REQUIRING SOME PDS PERSONNEL TO HAVE TO RESCUE DATA IN THEIR OWN ARCHIVES FROM BECOMING UNREADABLE. PDS RECENTLY REDESIGNED ITS STANDARDS AND REQUIREMENTS BASED ON THIS HARD-EARNED EXPERIENCE, APPLYING MODERN INFORMATION TECHNOLOGY THEORY. THE CULMINATION OF THIS EFFORT IS THE NEW PDS4 INFORMATION MODEL-BASED STANDARDS, WITH A REQUIREMENT FOR DATA STRUCTURES THAT HAVE ATTRIBUTES WELL SUITED TO LONG TERM ARCHIVING AND USABILITY, AND METADATA THAT IS COMPLETE TO THE POINT OF EXHAUSTION. WE WILL PRESENT THE KEY LESSONS LEARNED OVER THE PAST 2+ DECADES, AND THEIR DIRECT IMPACT ON THE DESIGN DECISIONS AND PHILOSOPHY NOW MANIFEST AS THE NEW PDS4 ARCHIVING STANDARDS.

P1.25: GIUSEPPE RICCIO

INAF - OSSERVATORIO ASTRONOMICO DI CAPODIMONTE, NAPOLI, ITALY

C3: A COMMAND-LINE CATALOGUE CROSS-MATCHING TOOL FOR MODERN ASTROPHYSICAL SURVEY DATA

THE EMERGING NEED FOR EFFICIENT, RELIABLE AND SCALABLE ASTRONOMICAL CATALOG CROSS-MATCHING IS BECOMING MORE PRESSING IN THE CURRENT DATA-DRIVEN SCIENCE ERA, WHERE THE SIZE OF DATA HAS RAPIDLY INCREASED UP TO THE PETABYTE SCALE. C3 (COMMAND-LINE CATALOGUE CROSS-MATCHING) IS A MULTI-PLATFORM TOOL DESIGNED TO EFFICIENTLY CROSS-MATCH MASSIVE CATALOGUES FROM MODERN ASTRONOMICAL SURVEYS, ENSURING HIGH-PERFORMANCE CAPABILITIES THROUGH THE USE OF A MULTI-CORE PARALLEL PROCESSING PARADIGM. THE TOOL HAS BEEN CONCEIVED TO BE EXECUTED AS A STAND-ALONE COMMAND-LINE PROCESS OR INTEGRATED WITHIN ANY GENERIC DATA REDUCTION/ANALYSIS PIPELINE, PROVIDING THE MAXIMUM FLEXIBILITY TO THE END USER, IN TERMS OF PARAMETER CONFIGURATION, COORDINATES AND CROSS-MATCHING TYPES. WE PRESENT THE ARCHITECTURE OF THE TOOL AND SOME PRACTICAL EXAMPLES OF THE POTENTIAL USE AND PERFORMANCE. MOREOVER, SINCE THE MODULAR DESIGN OF THE TOOL ENABLES AN EASY CUSTOMIZATION TO SPECIFIC USE CASES AND REQUIREMENTS, WE PRESENT ALSO AN EXAMPLE OF A CUSTOMIZED C3 VERSION DESIGNED AND USED IN THE FP7 PROJECT VIALACTEA, DEDICATED TO CROSS-CORRELATE HI-GAL CLUMPS WITH MULTI-BAND COMPACT SOURCES.

P5.4: SIMONA RIGHINI

INAF - ISTITUTO DI RADIO ASTRONOMIA

MEDICINA, NOTO AND VLBI-IT RADIO ARCHIVE: MODELLING RADIO DATA FORMATS.

RADIO ASTRONOMICAL DATA MODELS ARE BECOMING VERY COMPLEX SINCE THE HUGE POSSIBLE RANGE OF INSTRUMENTAL CONFIGURATIONS AVAILABLE WITH THE MODERN RADIO TELESCOPES. WHAT IN THE PAST WAS THE LAST FRONTIERS OF DATA FORMATS IN TERMS OF EFFICIENCY AND FLEXIBILITY, IS NOW EVOLVING WITH NEW STRATEGIES AND METHODOLOGIES ENABLING THE PERSISTENCE OF VERY COMPLEX, HIERARCHICAL, AND MULTI-PURPOSE INFORMATION.

MODERN SINGLE DISH ACQUISITION MODES ARE DESCRIBED BY A VAST NUMBER OF POSSIBLE INSTRUMENTAL SETUP PARAMETERS. THIS REQUIRED THE DESIGN AND IMPLEMENTATION OF A RADIO DATA MODEL ABLE TO STORE ALL THE INFORMATION NEEDED TO FULLY CHARACTERIZE THE VARIOUS OBSERVATIONS. THE DEVELOPED RADIO DATA MODEL HAS BEEN BUILT ON TOP OF THE DATA/METADATA STRUCTURE DEFINED IN THE MBFITS STANDARD FOR THE ATACAMA PATHFINDER EXPERIMENT (APEX)

AND IS CAPABLE TO HANDLE RADIO DATA WRITTEN IN FITS FORMAT AS WELL.FOR VLBI-IT ACQUISITION MODE, A CUSTOMIZED XML SUMMARY FILE STORES THE MAIN CONFIGURATION PARAMETERS FOR THE INTERFEROMETRIC OBSERVATIONS AND IS A SUBSET OF THE PREVIOUSLY MENTIONED RADIO DATA MODEL.

THIS AIMS AT ENHANCING THE ARCHIVING SYSTEM PERFORMANCE,MAINTENANCE AND BEHAVIOR, PROVIDING THE (INTER) NATIONAL COMMUNITY WITH A STATE-OF-THE-ART ARCHIVE FOR RADIO ASTRONOMICAL DATA AND WILL IN THE NEAR FUTURE BE PROVIDED ALSO WITH VIRTUAL OBSERVATORY COMPLIANT SERVICES TO INCREASE THE INTEROPERABILITY OF DATA. THE ARCHIVING SYSTEM ITSELF IS EQUIPPED WITH AN INTERNAL DATA MODEL IN ORDER TO HANDLE TRANSPARENTLY ALL THE VARIOUS RADIO RAW DATA FORMATS MENTIONED ABOVE. A WEB USER INTERFACE ALLOWS FOR EASY AND USER FRIENDLY ACCESS TO DATA. QUERYING FUNCTIONS AND COLUMN INDEXES HAVE BEEN IMPLEMENTED INTO THE DATABASE TO OPTIMIZE THE INVESTIGATION OVER THE HIERARCHICAL DATABASE STRUCTURE, RETURNING INFORMATION ORGANIZED IN A TABLE ON THE OUTPUT WEB PAGE.

P4.13: LUCA RIZZI

W. M. KECK OBSERVATORY

THE KECK OBSERVATORY ARCHIVE

WE PRESENT THE CURRENT STATUS AND FUTURE PLANS FOR THE LONG TERM STORAGE, DISTRIBUTION AND REDUCTION OF DATA OBTAINED AT THE W. M. KECK OBSERVATORY

P8.21: YANNICK ROEHLLY

LAM - LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE

XID+ A NEW PRIOR-BASED EXTRACTION TOOL FOR HERSCHEL-SPIRE MAPS

WE PRESENT XID+ A NEW GENERATION OF SOFTWARE FOR PRIOR-BASED PHOTOMETRY EXTRACTION IN THE HERSCHEL SPIRE MAPS. BASE ON A BAYESIAN FRAMEWORK, XID+ ALLOWS TO INCLUDE PRIOR INFORMATION AND GIVES ACCESS TO THE FULL POSTERIOR PROBABILITY DISTRIBUTION OF FLUXES. XID+ IS DEVELOPED WITHIN THE HERSCHEL EXTRAGALACTIC LEGACY PROJECT (HELP).

P8.22: ERIK ROMELLI

UNIVERSITY OF TRIESTE, INAF-OATS

USAGE OF AN END-TO-END SIMULATOR FOR INSTRUMENT OPERATIONS: APPLICATION TO THE EUCLID MISSION

WE HERE PROPOSE TO USE AN END-TO-END MISSION PERFORMANCE SIMULATOR (E2ES) AS A TOOL TO SUPPORT INSTRUMENT OPERATIONS. SUCH SIMULATOR ENABLES THE GENERATION OF SIMULATED OUTPUT DATA FOR SELECTED TEST SCENARIOS TO SUPPORT THE ASSESSMENT OF INSTRUMENT CONFIGURATION CHANGES ON THE MISSION PERFORMANCE AND TO ANALYSE THE IMPACT OF INDIVIDUAL ERROR SOURCES ON THE OUTPUT OF AN IDEAL SYSTEM.

E2ES HAVE BEEN WIDELY USED FOR EARTH OBSERVATION (EO) MISSIONS. THEY DEMONSTRATED TO BE A USEFUL TOOL TO ASSESS THE MISSION PERFORMANCE AND SUPPORT THE CONSOLIDATION OF THE TECHNICAL REQUIREMENTS AND CONCEPTUAL DESIGN, AS WELL AS TO ALLOW END-USERS ASSESSING THE FULFILMENT OF REQUIREMENTS BY THE MISSION. E2E MISSION PERFORMANCE SIMULATORS ARE BASED ON A REFERENCE ARCHITECTURE CONTAINING THE BASIC MODULES FOR THE SIMULATOR, PROVIDING THE REQUIRED FLEXIBILITY TO SUPPORT EXTENSIVE AND EVOLUTIONARY GROWTH. THIS, COUPLED TO A SIMULATOR FRAMEWORK AND A REPOSITORY OF MODELS (OR BUILDING BLOCKS), ALLOWS DEFINING AND IMPLEMENTING THE E2ES FASTER AND WITH LESS EFFORT. IN THIS WORK WE PRESENT A STUDY FOR AN E2ES TAKING THE EUROPEAN SPACE AGENCY (ESA) MISSION EUCLID AS A TEST CASE.

EUCLID WILL INVESTIGATE THE DISTANCE-REDSHIFT RELATIONSHIP AND THE EVOLUTION OF COSMIC STRUCTURES BY MEANS OF TWO INSTRUMENTS: THE VISUAL IMAGER (VIS) AND THE NEAR-INFRARED SPECTROMETER AND PHOTOMETER (NISP). WE HERE PRESENT THE DESIGNED ARCHITECTURE OF AN E2ES FOR EUCLID INSTRUMENT OPERATIONS AND AN IMPLEMENTED PROTOTYPE, PROVIDING BASIC FUNCTIONALITIES, FOCUSED ON THE NISP INSTRUMENT, WITH SOME PRELIMINARY RESULTS. NISP AND VIS ARE OPERATED BY THE INSTRUMENT OPERATION TEAMS (IOTS). THE IOTS SHALL PLAY A CRUCIAL ROLE IN THE SUCCESSFUL EXECUTION OF THE EUCLID MISSION; THEY ARE IN CHARGE OF THE MONITORING, CONTROL AND MAINTENANCE OF THE EUCLID PAYLOAD, FROM INITIAL DIAGNOSTICS OF FIELD QUALITY TO DETAILED TREND ANALYSIS OF INSTRUMENT CHARACTERISTICS AND CALIBRATION. THE SIMULATION OF SYNTHETIC DATA IS COMMONLY USED BY SCIENTIST AND ENGINEERS TO CONSOLIDATE THE INSTRUMENT CONFIGURATION AND TO DEFINE OPERATIONAL STRATEGIES ON SUCH COMPLEX MISSIONS. THE IOTS WILL BE EQUIPPED WITH DEDICATED SOFTWARE TOOLS TO ALLOW A QUASI-AUTOMATIC MONITORING AND MANAGE OPERATIONAL ACTIVITIES. WE PROPOSE OUR E2ES AS A TOOL FOR THE IOTS TO SIMULATE TEST SCENARIOS IN ORDER TO ASSESS THE MISSION PERFORMANCE, CHANGES IN THE INSTRUMENT CONFIGURATION AND TO ANALYSE POSSIBLE ERROR SOURCES.

P1.35: ARNOLD ROTS

SAO/CXC - SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MA, USA

CROSS-MATCHING THE CHANDRA SOURCE CATALOG

CROSS-MATCHING AGAINST THE CHANDRA SOURCE CATALOG (CSC) PRESENTS SPECIAL CHALLENGES, SINCE THE POINT SPREAD FUNCTION (PSF) OF THE CHANDRA X-RAY OBSERVATORY VARIES CONSIDERABLY OVER THE FIELD OF VIEW. THIS IS NOT ONLY A SIGNIFICANT PROBLEM WHEN CROSS-MATCHING AGAINST OTHER CATALOGS, BUT ALSO IN CROSS-MATCHING SOURCE DETECTIONS FROM OVERLAPPING CHANDRA OBSERVATIONS. AMONG THE SOURCE PARAMETERS IN RELEASE 2 OF THE CSC ARE ERROR ELLIPSES FOR THEIR POSITIONS, AS WELL AS PSF ELLIPSES. WE DEVELOPED A CROSS-MATCH TOOL THAT IS BASED ON THE BAYESIAN ALGORITHMS BY BUDAVARI, HEINIS, AND SZALAY (APJ 679, 301 AND 705, 739), MAKING USE OF THE ERROR ELLIPSES.

HOWEVER, WE RAN INTO TWO MAJOR ISSUES: CALCULATING MATCH PROBABILITIES ONLY ON THE BASIS OF ERROR ELLIPSES BREAKS DOWN WHEN THE PSFS ARE SIGNIFICANTLY DIFFERENT; AND THE NUMBER OF MATCHES TO BE CONSIDERED INCREASES ALARMINGLY WHEN THE NUMBER OF CATALOGS INVOLVED IN THE MATCH IS MORE THAN JUST A HANDFUL. TO COUNTER THIS WE MADE MODIFICATIONS IN THE ALGORITHM AND THE PROCEDURE, RESPECTIVELY WHICH WE WILL REPRESENT, ACCOMPANIED BY EXAMPLES OF INTRA-CSC CROSS-MATCH RESULTS.

THIS WORK HAS BEEN SUPPORTED BY NASA UNDER CONTRACT NAS 8-03060 TO THE SMITHSONIAN ASTROPHYSICAL OBSERVATORY FOR OPERATION OF THE CHANDRA X-RAY CENTER. IT DEPENDS CRITICALLY ON THE SERVICES PROVIDED BY THE ADS.

P1.26: TIM RUHE

TU DORTMUND UNIVERSITY

MINING FOR SPECTRA - THE DORTMUND SPECTRUM ESTIMATION ALGORITHM

OBTAINING ENERGY SPECTRA OF INCIDENT PARTICLES SUCH AS NEUTRINOS OR GAMMA-RAYS IS A COMMON CHALLENGE IN NEUTRINO- AND AIR-CHERENKOV ASTRONOMY, AS THE PARTICLE'S ENERGY CANNOT BE OBSERVED DIRECTLY BUT HAS TO BE INFERRED FROM OTHER OBSERVABLES E.G. ENERGY LOSSES OF SECONDARY PARTICLES UTILIZED FOR DETECTION. THE TASK IS FURTHER MADE DIFFICULT BY THE FACT THAT THE PRODUCTION OF SECONDARIES, E.G. IN A NEUTRINO-NUCLEON INTERACTION IS GOVERNED BY STOCHASTICAL PROCESSES. MATHEMATICALLY THIS CORRESPONDS TO AN INVERSE PROBLEM, WHICH IS DESCRIBED BY THE FREDHOLM INTEGRAL EQUATION OF THE FIRST KIND. SEVERAL ALGORITHMS FOR SOLVING INVERSE PROBLEMS EXIST, WHICH ARE, HOWEVER, SOMEWHAT LIMITED, FOR EXAMPLE IN THE NUMBER OF INPUT VARIABLES OR IN THE SENSE THAT ONLY THE UNFOLDED DISTRIBUTION IS RETURNED AND INFORMATION ON INDIVIDUAL EVENTS IS LOST.

WE PRESENT THE DORTMUND SPECTRUM ESTIMATION ALGORITHM (DSEA), WHICH AIMS AT OVERCOMING THE AFORE MENTIONED OBSTACLES BY TREATING THE INVERSE PROBLEM AS A MULTINOMINAL CLASSIFICATION TASK. WITHIN DSEA THE FINAL SPECTRUM IS OBTAINED BY SUMMING THE CLASS-CONFIDENCES OF THE INDIVIDUAL EVENTS. DSEA, THEREFORE, OFFERS THE ADVANTAGE THAT ANY LEARNING ALGORITHM CAN BE USED AS LONG AS IT RETURNS THE CONFIDENCES OF THE INDIVIDUAL CLASSES. THIS RESULTS IN A MODULAR AND HIGHLY FLEXIBLE ALGORITHM THAT CAN EASILY BE TAILORED TO A PROBLEM AT HAND. TO AVOID A POTENTIAL BIAS ON THE CLASS DISTRIBUTION USED FOR THE TRAINING OF THE LEARNER, DSEA CAN BE USED ITERATIVELY USING A UNIFORM CLASS-DISTRIBUTION AS INPUT.

P1.34: PHILIPPE SALOMÉ

LERMA, OBSERVATOIRE DE PARIS

ARTEMIX (ALMA REMOTE MINING EXPERIMENT)

EVEN IF NOT YET IN FULL OPERATION MODE, THE ALMA OBSERVATORY HAS ALREADY DELIVERED HUGE AMOUNTS OF DATA. THOSE DATA ARE ACCESSIBLE TO DOWNLOAD VIA THE ALMA SCIENCE ARCHIVE PORTAL FROM THEIR PARENT PROJECT ID. WE PRESENT HERE ARTEMIX (ALMA REMOTE MINING EXPERIMENT), A DEVELOPMENT FROM THE PARIS OBSERVATORY THAT AIMS AT EXPLORING NEW TOOLS FOR METADATA AND DATACUBE REMOTE VISUALISATION. ARTEMIX DOES NOT REPROCESS THE CALIBRATED DATA. IT IS THOUGHT AS A COLLECTION OF DISPLAY FACILITIES WHICH AIM IS TO EASE THE DEFINITION OF TRANS-PROJECT SUBSAMPLES. FUTURE DEVELOPMENTS, LIKE AUTOMATED SUBSAMPLE SELECTION VIA HIGHER-LEVEL DATA ANALYSIS ARE POSSIBLE, BUT REQUIRE THE ACCESS TO FULLY IMAGED DATA-CUBES THAT ARE NOT PROVIDED YET.

P4.14: MARÍA HENAR SARMIENTO

ESAC SCIENCE DATA CENTER (ESDC) - ESA/ESAC, MADRID, SPAIN

XMM-NEWTON SCIENCE ARCHIVE (XSA)

SINCE APRIL 2002, FIRST VERSION OF THE XMM-NEWTON SCIENCE ARCHIVE (XSA), THE ESA SCIENCE DATA CENTRE TEAM (ESDC) HAS IMPROVED AND UPDATED THIS VALUABLE SERVICE TO THE X-RAY ASTRONOMICAL COMMUNITY.

BASED ON THE ABSI (ARCHIVE BUILDING SYSTEM INFRASTRUCTURE), THE XSA HAS A COMMON ARCHITECTURE WITH THE REST OF THE ARCHIVES DEVELOPED BY ESA FOR THE ASTRONOMICAL MISSIONS. THAT PRODUCES A SIMILAR LOOK AND FEEL AND IT GETS BENEFIT OF UPGRADES ON OTHER ARCHIVES.

IN 2013, A FULL REDESIGN WAS IMPLEMENTED INTO THE ARCHIVE TO PRODUCE A PURE WEB BASED INTERFACE USING STATE OF THE ART TECHNOLOGIES: A MODERN USER INTERFACE USING GWT (GOOGLE WEB TOOLKIT), COMPLEX GEOMETRICAL QUERIES SUPPORT BY USING DATA BASE GEOMETRICAL INDEXING (PGSPHERE) AND UPDATES ON THE VIRTUAL OBSERVATORY SERVICES.

RECENTLY, A NEW IVOA TAP COMPLAINT SERVICE (TABULAR ACCESS PROTOCOL) INTERFACE HAS BEEN MADE AVAILABLE TO ACCESS THE METADATA OF THE XMM EPIC SOURCE CATALOGUE, OM SOURCE CATALOGUE AND SLEW CATALOGUE IN A VERY POWERFUL INTERFACE, ALLOWING DATA MINING TASKS.

ALSO, AND IN LINE WITH THE DEVELOPMENT OF THE ESA SKY APPLICATION, NEW HIPS (HIERARCHICAL PROGRESSIVE SURVEY) HAS BEEN GENERATED FOR EPIC AND OM CAMERAS TO EXPOSE XMM-NEWTON DATA IN AN EXPLORATION INTERFACE.

FINALLY, ALTHOUGH XMM-NEWTON MISSION IS STILL IN OPERATIONS, THE XMM-NEWTON SCIENCE ARCHIVE IS ALREADY READY FOR THE LEGACY PHASE THAT WILL TAKE PLACE IN THE NEXT YEARS.

P2.17: RENAUD SAVALLE

DIO-PADC, PARIS OBSERVATORY, FRANCE

APERICUBES - AN ON-LINE ASTRONOMICAL AND PLANETARY ERGONOMIC RESEARCH INTERFACE FOR DATA CUBES

WE HAVE DEVELOPED A WEB-BASED TOOL TO PREVIEW DATA CUBES AND FACILITATE THEIR EXPLORATION WITH EXISTING SPECTRUM ANALYSIS PROGRAMS. THE APERICUBES TOOL IS PART OF VESPA, AN INTEGRATED SYSTEM CONNECTING MANY DATA SERVICES RELATED TO PLANETARY SCIENCES AND HELIOPHYSICS. APERICUBES WAS ORIGINALLY DESIGNED TO HANDLE PDS CUBES FROM THE VIRTIS IMAGING SPECTROMETER ON THE ESA VENUS EXPRESS MISSION, BUT ITS ARCHITECTURE IS VERSATILE ENOUGH TO ACCOMMODATE OTHER FITS IFU DATA CUBES (DATA FROM THE ESO GIRAFFE SPECTROGRAPH ARE SUPPORTED). AFTER BEING PREPARED ON THE SERVER, THE CUBE IMAGE PLANES ARE AVAILABLE THROUGH JS9 (A JAVASCRIPT PORT OF THE POPULAR IMAGE VISUALIZATION TOOL DS9). THE USER HAS ACCESS TO VARIOUS PLUGINS FOR IMAGE ANALYSIS, AND CAN SELECT A PIXEL OR A REGION OF INTEREST. THE CORRESPONDING SPECTRUM, COMPUTED BY A SERVLET IN REAL-TIME, IS THEN PLOTTED. THANKS TO THE VO SAMP PROTOCOL THE GENERATED SPECTRA CAN BE SENT TO DEDICATED CLIENTS SUCH AS CASSIS TO BE ANALYZED AND COMPARED.

P2.18: PAOLO LUIGI SCALA

INAF-IASF MILANO

EASYLIFE: A CONCEPTUAL FRAMEWORK FOR SEMI-AUTOMATIC SURVEY MANAGEMENT

EASYLIFE IS A CONCEPTUAL FRAMEWORK AIMED AT THE SEMI-AUTOMATIC MANAGEMENT OF A SPECTROSCOPIC SURVEY.

THE FRAMEWORK FORESEES THE USE OF A GRAPHICAL USER INTERFACE (GUI) TO ORGANISE, REDUCE AND AUTOMATICALLY CLASSIFY SURVEY DATA, AND A WEB-BASED INTERFACE TO MONITOR THE SURVEY, WHICH AUTOMATICALLY RETRIEVES THE SURVEY STATUS IN TERMS OF OBSERVED, TO BE REDUCED, AND ALREADY REDUCED POINTINGS.

THE FACT MODERN ASTRONOMICAL SURVEYS PRODUCE HUGE DATA VOLUMES (HUNDRED OF THOUSANDS SPECTRA) MAKES EASYLIFE A FUNDAMENTAL TOOL IN SURVEY MANAGEMENT.

ITS FIRST IMPLEMENTATION, IN 2012, HAS BEEN SUCCESSFULLY USED TO MANAGE THE VIPERS SURVEY; THE MORE RECENT IMPLEMENTATION OF THE EASYLIFE FRAMEWORK EXPLOITS PNGS (PANDORA NEXT GENERATION SOFTWARE, WHERE PANDORA IS AN ACRONYM FOR PROGRAMS FOR ASTRONOMICAL DATA ORGANIZATION REDUCTION AND ANALYSIS) APIS AND THE FASE (FUTURE ASTRONOMICAL SOFTWARE ENVIRONMENT) FRAMEWORK.

ITS USER INTERFACES (BOTH GUI AND COMMAND-LINE) ARE DEVELOPED IN PYTHON, WHILE THE COMPUTATIONAL CORE IS IMPLEMENTED IN C TO BOOST PERFORMANCES AND TO ALLOW THE REUSE OF STABLE AND THOROUGHLY TESTED LEGACY CODE.

EASYLIFE IS CURRENTLY USED TO MANAGE THE ONGOING VANDELS ESO PUBLIC SPECTROSCOPIC SURVEY.

P4.15: PIETRO SCHIPANI

INAF

THE PIPELINE FOR THE EXOMARS DREAMS SCIENTIFIC DATA ARCHIVING

DREAMS (DUST CHARACTERISATION, RISK ASSESSMENT, AND ENVIRONMENT ANALYSER ON THE MARTIAN SURFACE) IS A PAYLOAD ACCOMMODATED ON THE SCHIAPARELLI ENTRY AND DESCENT MODULE (EDM) OF EXOMARS 2016, THE ESA – ROSCOSMOS MISSION TO MARS SUCCESSFULLY LAUNCHED ON 14 MARCH 2016.

THE DREAMS DATA ARE TO BE ARCHIVED INTO THE EUROPEAN SPACE AGENCY'S PLANETARY SCIENCE ARCHIVE (PSA), THE CENTRAL REPOSITORY FOR ALL SCIENTIFIC AND ENGINEERING DATA RETURNED BY ESA'S SOLAR SYSTEM MISSIONS. THE EXOMARS MISSION AND CONSEQUENTLY THE DREAMS ARCHIVE ADOPTS THE NASA'S PLANETARY DATA SYSTEM (PDS) STANDARDS AS A BASELINE FOR THE FORMATTING AND STRUCTURE OF ALL DATA.

THE PDS STANDARD PROVIDES GUIDELINES ON HOW THE DREAMS TEAM SHOULD CONSTRUCT A DATA SET SUITABLE FOR LONG-TERM ARCHIVING. THIS STANDARD CONTAINS REQUIREMENTS IN TERMS OF DATA SET STRUCTURE AND DOCUMENTATION THAT SHOULD ALLOW FOR ANY DREAMS DATA TO BE USED AND UNDERSTOOD FOR MANY YEARS AFTER THE END OF THE MISSION.

IN PDS, EACH DATA PRODUCT IS ASSOCIATED TO A LABEL CONTAINING FULL DETAILS ON THE STRUCTURE AND CONTENT OF THE PRODUCT. THE USERS RECEIVE MANY USEFUL INFORMATION THROUGH THE LABELS PROVIDED WITH EACH PRODUCT, THAT CONTAIN THE META-DATA NEEDED FOR A TOOL TO ACCESS AND INTERPRET THE PRODUCT.

THE EXOMARS MISSION AND DREAMS ADOPT THE PDS VERSION 4 STANDARDS, ACKNOWLEDGED AS PDS4. PDS4 HAS A MODERNIZED APPROACH TO ARCHIVING DATA WITHIN THE PDS; LABELS ARE EXPRESSED AS XML DOCUMENTS THAT ARE TIED TO A CENTRALIZED, SELF-CONSISTENT MODEL PROVIDING UNIFORMITY ACROSS THE PDS.

IN ORDER TO ENSURE COMPLIANCE WITH THE PDS STANDARDS AND WITH ALL OF THE REQUIREMENTS FOR INGESTION AND RELEASE IN THE PSA, SEVERAL TOOLS ARE AVAILABLE FROM ESA AND NASA FOR THE DATA SET VALIDATION.

THIS PAPER SUMMARIZES THE FORMAT AND CONTENT OF THE DREAMS DATA PRODUCTS AND ASSOCIATED METADATA. THE PIPELINE TO CONVERT THE RAW TELEMETRIES TO THE FINAL PRODUCTS FOR THE ARCHIVE IS SKETCHED AS WELL.

P1.27: ALAIN SCHMITT

LAM - LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE

AMAZED : ALGORITHM FOR MASSIVE AUTOMATED Z EVALUATION AND DETERMINATION

AS OF TODAY, AT Z>1, THE BEST REDSHIFT ESTIMATION IS DONE BY HUMANS. NEXT GENERATION GALAXY SURVEYS WITH MILLIONS OF GALAXIES REQUIRE A FULLY AUTOMATED PROCESS WITH NO HUMAN INTERVENTION. THE GOAL OF AMAZED IS TO AUTOMATICALLY MEASURE THE REDSHIFT OF ANY GALAXY AND ASSOCIATED REDSHIFT RELIABILITY. THIS REQUIRES NEW GENERATION ALGORITHMS.

AMAZED IS AN AUTOMATIC REDSHIFT ESTIMATION SOFTWARE PACKAGE DEVELOPED IN THE FRAMEWORK OF BOTH EUCLID AND PFS LARGE-SCALE SPECTROSCOPIC SURVEYS INVOLVING THE LAM. THE AMAZED PROJECT AIMS AT PROVIDING A FULLY AUTOMATED AND VERSATILE (INSTRUMENT TYPE, RESOLUTION, ...) REDSHIFT ESTIMATION TOOL.

AMAZED FOCUSES ON FUTURE ALL-SKY SURVEYS LIKE THE NISP SLITLESS SPECTROGRAPH SURVEYS ON THE ESA-EUCLID MISSION (APPLICABLE TO NASA-WFIRST), AS WELL AS FUTURE DEEP POINTED SURVEYS WITH MASSIVELY MULTIPLEXED SPECTROGRAPHS LIKE THE SUBARU PRIME FOCUS SPECTROGRAPH.

THIS POSTER IS FOCUSED ON SOME ALGORITHMIC CONCEPTS AND RESULTS OBTAINED WITH SIMULATED DATA AND REAL DATA.

P2.19: CHRISTOPHER THABISO GREGORY SCHOLLAR

SKA AFRICA

MEERKAT DATA CENTER TECHNOLOGY SPOTLIGHT

THE POSTER CONTAINS AN OVERVIEW OF THE MEERKAT SCIENCE PROCESSING AND ARCHIVE DATA CENTRE. IT PROVIDES SOME DETAIL ON THE PROPOSED SOLUTIONS FOR THE PROCESSING AND ARCHIVAL REQUIREMENTS OF THE MEERKAT TELESCOPE.

THIS INCLUDES A DESCRIPTION OF A PROPOSED IMAGER PROVIDING 500 TFLOPS OF PROCESSING POWER USING NVIDIA TEGRA SOC'S AND UTILISING IMMERSION COOLING IN OIL. THIS CONTRASTS TRADITIONAL SERVER AND AIR COOLING APPROACH. THIS DESIGN, IF SUCCESSFUL, SHOULD PROVIDE SIGNIFICANT SAVINGS IN BOTH THE THERMAL AND ELECTRIC BUDGET OF THE RUNNING SYSTEM.

THE POSTER DESCRIBES THE SCIENCE ARCHIVE WHICH WILL PROVIDE 10PB OF HDD STORAGE FOR LONG TERM ARCHIVAL OF SCIENCE DATA PRODUCTS.

WE DETAIL THE VISIBILITY ARCHIVE, AN 18PB TAPE BASED ARCHIVE FOR STORING RAW VISIBILITY DATA FOR A LIMITED WINDOW. THIS WILL ALLOW REPROCESSING OF OBSERVATIONS WITHIN ~4 MONTHS OF AN OBSERVATION.

P5.5: MATHIEU SERVILLAT

LUTH - OBSERVATOIRE DE PARIS, MEUDON, FRANCE

STRUCTURING METADATA FOR THE CHERENKOV TELESCOPE ARRAY

THE LANDSCAPE OF GROUND-BASED GAMMA-RAY ASTRONOMY IS DRASTICALLY CHANGING WITH THE PERSPECTIVE OF THE CHERENKOV TELESCOPE ARRAY (CTA). FOR THE FIRST TIME IN THIS ENERGY DOMAIN, CTA WILL BE OPERATED AS AN OBSERVATORY OPEN TO THE ASTRONOMY COMMUNITY.

IN THIS CONTEXT, A STRUCTURED DATA MODEL IS BEING DEVELOPED FOR A CTA OBSERVATION. THE DATA MODEL INCLUDES DIFFERENT CLASSES OF METADATA DESCRIBING THE PROJECT DEFINITION, THE CONFIGURATION OF THE INSTRUMENT FOR THE OBSERVATION, THE AMBIENT CONDITIONS, THE DATA ACQUISITION AND THE DATA PROCESSING. THIS LAST PART RELIES ON THE PROVENANCE DATA MODEL DEVELOPED WITHIN THE VIRTUAL OBSERVATORY (VO), FOR WHICH CTA IS ONE OF THE MAIN USE CASES. FURTHERMORE, THE WHOLE CTA DATA MODEL SHOULD BE COMPATIBLE WITH THE DIFFUSION OF DATA THROUGH THE VO. WE THUS DEVELOPED A WEB-BASED DATA DIFFUSION PROTOTYPE TO TEST THIS REQUIREMENT AND ENSURE THE COMPLIANCY.

I WILL PRESENT THE LATEST DEVELOPMENTS ON THE CTA DATA MODEL, ITS IMPLEMENTATION AS A DATA DIFFUSION SERVICE, AND THE IMPLICATIONS FOR RELATED DEVELOPMENTS WITHIN THE PROJECT.

P4.16: MARINA SHATSKAYA

LPI - P.N. LEBEDEV PHYSICAL INSTITUTE OF THE RUSSIAN ACADEMY OF SCIENCES, MOSCOW, RUSSIA

STORAGE AND PROCESSING OF BIG DATA VOLUME FOR SPACE-VLBI PROJECTS (RADIOASTRON AND MILLIMETRON MISSIONS).

IN THIS REPORT IT SUPPORT FOR TWO SPACE-VLBI PROJECTS ARE CONSIDERED: CURRENTLY OPERATING RADIOASTRON MISSION AND FUTURE MILLIMETRON MISSION. RADIOASTRON DATA PROCESSING CENTER WAS IMPLEMENTED TO COLLECT, PROCESS AND ARCHIVE THE DATA AND TO ORGANIZE THE INFORMATIONAL EXCHANGE BETWEEN ALL PARTICIPANTS OF THIS PROJECT.

MORE THAN 40 GROUND TELESCOPES ARE INVOLVED IN JOINT OBSERVATIONS WITH RADIOASTRON. DIGITAL DATA FROM SPACE AND GROUND TELESCOPES IS COLLECTED IN DATA PROCESSING CENTER. LARGE INTEREST OF SCIENTIFIC COMMUNITY AROUND THE WORLD IN RADIOASTRON MISSION LED TO THE GROWTH OF NUMBER AND DURATION OF OBSERVATIONS, AS WELL AS TO THE GROWTH OF NUMBER OF GROUND TELESCOPES PARTICIPATING IN THESE OBSERVATIONS AND THE TOTAL AMOUNT OF DATA. CURRENTLY, THE VOLUME OF STORED DATA IS MORE THAN 2 PB.

USUALLY IN VLBI PROJECTS THE INITIAL OR RAW DATA IS BEING DELETED AFTER SUCCESSFUL CORRELATION. IN RADIOASTRON MISSION WE HAVE MADE A DECISION TO SAVE AND STORE ALL RAW OBSERVATIONAL DATA, BECAUSE OF ITS UNIQUENESS IN ORDER TO HAVE A POSSIBILITY FOR FUTURE REPROCESSING AND RE-CORRELATION. THIS IS ONE OF THE REASONS TO EXPAND OUR DATA ARCHIVE.

WE HAVE ORGANIZED THE DATA STORAGE, COMPUTER COMPLEX, HIGH-SPEED INTERNAL AND EXTERNAL NETWORKS AND ARCHIVE FOR TRANSFERRING, PROCESSING AND ARCHIVING ALL DATA OF RADIOASTRON MISSION. ALL THESE COMPONENTS WORK AS AN INTEGRATED SYSTEM. WE HAVE DONE AN OPTIMIZATION OF OUR EQUIPMENT, BY IMPROVING OUR OPERATION SCHEME AND DIVIDING THE DATA FLOWS. IN THIS REPORT WE PAY SPECIAL ATTENTION TO THE ELIMINATION OF “BOTTLE NECKS” IN OUR DATA PROCESSING COMPLEX.

ADDITIONALLY, WE PAY GREAT ATTENTION TO CONTROL THE RADIOASTRON MISSION DATA TRANSFER AND STORAGE RELIABILITY.

THE STRUCTURE AND FUNCTIONS OF THE ASTRO SPACE CENTER DATA PROCESSING CENTER FULFILL THE REQUIREMENTS FOR THE RADIOASTRON MISSION DATA PROCESSING AND HAVE BEEN SUCCESSFULLY CONFIRMED DURING THE WHOLE PERIOD OF OUR OPERATION.

IN OUR NEXT SPACE-VLBI PROJECT – MILLIMETRON MISSION, THE EXPECTED VOLUME OF SCIENTIFIC INFORMATION IS ESTIMATED TO BE AT LEAST 100 PB. IT IS MUCH MORE THAN FOR RADIOASTRON MISSION. IN THIS CASE FOR MILLIMETRON MISSION WILL BE ORGANIZED A SEPARATE DATA CENTER. WE BELIEVE THAT OUR EXPERIENCE IN PROCESSING, TRANSFERRING AND STORING OF LARGE DATA VOLUMES FOR RADIOASTRON MISSION WILL BE VERY USEFUL.

P8.23: YUJI SHIRASAKI

NAOJ, TOKYO, JAPAN

UPDATE OF THE JVO SUBARU SUPRIME-CAM MOSAIC IMAGE ARCHIVE

SUPRIME-CAM IS A WIDE FIELD IMAGER ATTACHED TO THE SUBARU TELESCOPE, WHICH CONSISTS OF TEN 2048 X 4096 CCDS AND COVERS A 34'X27' FIELD OF VIEW. SINCE THE START OF OPERATION IN 2001, IT HAS BEEN GENERATING MORE THAN 16 TB OF DATA FOR 2000 DEG^2 OF THE SKY.

ALTHOUGH THE ROLE AS A DEEP AND WIDE FIELD SURVEYER WAS HANDED OVER TO THE NEW INSTRUMENT, THE HYPER-CAM, THE ARCHIVED DATA STILL GIVE US A LOT OF SCIENTIFIC VALUES.

WE HAVE DEVELOPED A FULLY AUTOMATED DATA REDUCTION PIPELINE, AND THE PROCESSED DATA HAS BEEN RELEASED ON THE JVO SUBARU REDUCED DATA ARCHIVE. IN THE LAST YEAR, WE UPDATED THE REDUCTION PIPELINE TO INCREASE THE MOSAIC SUCCESS RATE, AND ALL THE DATA WERE REPROCESSED ON JVO ANALYSIS SYSTEM WITH 348 CPU CORES IN TOTAL. THOSE DATA WERE RELEASED ON THE JVO PORTAL IN APRIL OF 2016.

THE GUI INTERFACE OF THE SUPRIME-CAM ARCHIVE ON THE JVO PORTAL WAS ALSO UPDATED TO INCORPORATE THE ALADIN-LITE TO DISPLAY THE DATA COVERAGE OF EACH IMAGE ON THE SKY.

WE PRESENT THE ALGORITHM OF THE UPDATED REDUCTION PIPELINE, PROCESSING ENVIRONMENT, CHARACTERISTICS OF THE MOSAIC IMAGES, AND GUI OF THE JVO SUPRIME-CAM ARCHIVE.

P8.24: HASSAN SIDDIQUI

ESA/ESAC

GAIA DOWNLINK AND UPLINK PROCESSING

GAIA IS A SURVEY MISSION WITH THE AIM TO DETERMINE THE POSITIONS, DISTANCES AND PROPER MOTIONS OF SOME 1.2 BILLION STARS. LAUNCHED AT THE END OF 2013, IT IS NOW IN ITS THIRD YEAR OF OPERATIONS, PROCESSING TYPICALLY 40 GB OF COMPRESSED RAW TELEMETRY PER DAY AND AT THE TIME OF WRITING THE FIRST GAIA DATA RELEASE WILL BE MADE AVAILABLE TO THE GENERAL PUBLIC. THIS POSTER DESCRIBES THE DOWNLINK PROCESSING FROM RAW TELEMETRY FROM THE SPACECRAFT UP TO THE INTERMEDIATE LEVEL WHERE INITIAL ESTIMATES OF STAR POSITIONS ARE COMPUTED, AND THE UPLINK SYSTEM WHERE PAYLOAD CHANGE REQUESTS ARE ISSUED IN ORDER TO OPTIMISE THE PERFORMANCE OF THE PAYLOAD. PROBLEMS, CHALLENGES AND LESSONS LEARNT ARE DISCUSSED.

P1.28: PETR ŠKODA

ASTRONOMICAL INSTITUTE OF THE CZECH ACADEMY OF SCIENCES, ONDREJOV, CZECH REPUBLIC

USING MACHINE LEARNING FOR IDENTIFICATION OF ARTIFACTS AND INTERESTING CELESTIAL OBJECTS IN LAMOST SPECTRAL SURVEY

THE LAMOST DR1 SURVEY CONTAINS ABOUT TWO MILLION OF SPECTRA LABELLED BY ITS PIPELINE AS STELLAR OBJECTS OF COMMON SPECTRAL CLASSES. THERE IS, HOWEVER, A LOT OF SPECTRA CORRUPTED IN SOME WAY BY BOTH INSTRUMENTAL AND PROCESSING ARTIFACTS, WHICH MAY MIMIC SPECTRAL PROPERTIES OF INTERESTING CELESTIAL OBJECTS, NAMELY EMISSION LINES OF BE STARS AND QUASARS.

WE HAVE TESTED SEVERAL CLUSTERING METHODS AS WELL AS OUTLIERS ANALYSIS ON A SAMPLE OF ONE HUNDRED THOUSAND SPECTRA USING SPARK SCRIPTS RUNNING ON HADOOP CLUSTER CONSISTING OF TWENTY-FOUR SIXTEEN-CORE NODES. THIS EXPERIMENT WAS MOTIVATED BY AN ATTEMPT TO FIND RARE OBJECTS WITH INTERESTING SPECTRA AS OUTLIERS MOST DISSIMILAR FROM ALL COMMON SPECTRA.

THE RESULT OF THIS TIME-CONSUMING PROCEDURE IS A LIST OF SEVERAL HUNDRED CANDIDATES WHERE DIFFERENT ARTIFACTS ARE PROMINENT, BUT ALSO TENS OF VERY INTERESTING EMISSION-LINE SPECTRA REQUIRING FURTHER DETAILED EXAMINATION. MANY OF THEM MAY BE QUASARS OR EVEN BLAZARS AS WELL AS YET UNKNOWN BE-STARS.

IT DESERVES MENTIONING THAT MOST OF THE WORK BENEFITTED CONSIDERABLY FROM TECHNOLOGIES OF VIRTUAL OBSERVATORY.

P4.17: RICCARDO SMAREGLIA

INAF - OSSERVATORIO ASTRONOMICO DI TRIESTE

ARCHIVE, DISCOVER AND MATCH COMPACT AND DIFFUSE OBJECTS ON THE GALACTIC PLANE IN THE VIALACTEA PROJECT

AMONG THE SCIENTIFIC GOALS OF THE EU-FP7 VIALACTEA PROJECT, THERE ARE SOME RELATED TO THE ARCHIVING, DISCOVERING AND ACCESSING CATALOGUES OF INFRARED/SUB-MM OBJECTS THAT ARE NOT SIMPLE POINT-LIKE SOURCES ON THE SKY, BUT COMPACT OR DIFFUSE STRUCTURES.

THESE STRUCTURES MAY HAVE MORE GENERAL SHAPES, BUBBLE-LIKE OR FILAMENT-LIKE THE TWO CATEGORIES IDENTIFIED BY THE PROJECT.

ALSO, ALONGSIDE CATALOGUE SEARCH AND ACCESS, A SERVICE TO MATCH COMPACT SOURCES THAT ARE LOCATED INSIDE A MORE DIFFUSE STRUCTURE LIKE A BUBBLE OR A FILAMENT, IS NEEDED.

IN THIS CONTRIBUTION WE DESCRIBE THE SCENARIO AND CATALOGUES RELATED TO THE PROJECT SCIENTIFIC TASKS AND THE SOLUTIONS PUT IN PLACE TO GRANT THE VIALACTEA (AND ASTROPHYSICAL COMMUNITY) USERS INTERACTION WITH THESE COMPACT AND DIFFUSE OBJECT CATALOGUE DATA.

TOPICS SPAN FROM SHAPE AND CONTOUR ARCHIVING INSIDE A CATALOGUE TO FAST CATALOGUE CROSS-MATCHING USING TESSELLATION SOLUTIONS.

P1.29: JEFFREY CLAIBORNE SMITH

SETI INSTITUTE/NASA AMES RESEARCH CENTER, MOFFETT FIELD, CA

REDUCE, REUSE, RECYCLE: THE SUCCESS OF THE KEPLER TRANSIT FINDING PIPELINE AND ITS ADAPTATION TO THE TRANSITING EXOPLANET SURVEY SATELLITE (TESS)

BUILDING UPON THE GREAT SUCCESS OF THE KEPLER MISSION, THE TEAM AT NASA AMES RESEARCH CENTER IS ADAPTING THE KEPLER SCIENCE PROCESSING PIPELINE FOR USE WITH THE TRANSITING EXOPLANET SURVEY SATELLITE (TESS), WHICH WILL CONDUCT A SEARCH FOR EARTH'S CLOSEST COUSINS STARTING IN LATE 2017. TESS WILL CONDUCT AN ALL-SKY TRANSIT SURVEY OF F, G AND K DWARF STARS BETWEEN 4 AND 12 MAGNITUDES AND MOST KNOWN M DWARF STARS WITHIN 200 LIGHT YEARS. TESS WILL DISCOVER ~1,000 SMALL PLANETS AND MEASURE THE MASSES OF AT LEAST 50 PLANETS OF LESS THAN 4 EARTH RADII. FOR EACH 27.4-DAY PERIOD, TESS WILL OBSERVE A 24° BY 96° SWATH OF SKY EXTENDING FROM NEAR THE ECLIPTIC EQUATOR TO THE ECLIPTIC POLE.

THE TESS SCIENCE PROCESSING OPERATIONS CENTER (SPOC) IS BEING DEVELOPED BASED ON THE KEPLER SCIENCE OPERATIONS CENTER. THE PIPELINE WILL RUN ON THE NAS PLEIADES SUPERCOMPUTER AND PROVIDE CALIBRATED PIXELS, SIMPLE AND SYSTEMATIC ERROR-CORRECTED APERTURE PHOTOMETRY, AND CENTROID LOCATIONS FOR ALL 200,000+ TARGET STARS, OBSERVED OVER THE 2-YEAR MISSION, ALONG WITH ASSOCIATED UNCERTAINTIES. THE SPOC WILL SEARCH FOR PERIODIC TRANSIT EVENTS AND GENERATE VALIDATION PRODUCTS FOR THE TRANSIT-LIKE FEATURES IN THE LIGHT CURVES. ALL TESS SPOC DATA PRODUCTS ARE MODELED ON THE KEPLER ARCHIVE PRODUCTS AND WILL BE ARCHIVED TO THE MIKULSKI ARCHIVE FOR SPACE TELESCOPES (MAST).

THE TESS PIPELINE WILL SEARCH THROUGH ALL LIGHT CURVES FOR EVIDENCE OF PERIODIC TRANSIT SIGNALS THAT OCCUR WHEN A PLANET CROSSES THE DISK OF ITS HOST STAR. IT WILL GENERATE A SUITE OF DIAGNOSTIC METRICS FOR EACH TRANSIT-LIKE SIGNATURE DISCOVERED, AND EXTRACT PLANETARY PARAMETERS BY FITTING A LIMB-DARKENED TRANSIT MODEL TO EACH POTENTIAL PLANETARY SIGNATURE. THE RESULTS OF THE TRANSIT SEARCH WILL BE SIMILAR IN CONTENT TO THE HIGHLY SUCCESSFUL KEPLER TRANSIT SEARCH PRODUCTS (TABULATED NUMERICAL RESULTS, TIME SERIES PRODUCTS, AND PDF REPORTS) ALL OF WHICH WILL BE ARCHIVED TO MAST.

THIS PRESENTATION PROVIDES AN OVERVIEW OF THE TESS SCIENCE PIPELINE AND DESCRIBES THE DEVELOPMENT REMAINING FOR THE SPOC PRIOR TO LAUNCH IN DECEMBER 2017. WE WILL DISCUSS THE PECULIARITIES OF THE TESS DATA, HOW THEY DIVERGE FROM THE KEPLER DATA AND CHALLENGES IN AUTOMATIC PROCESSING OF SUCH A LARGE DATA SET. THE DATA RATE FOR TESS IS ABOUT 10 TIMES GREATER THAN THAT OF KEPLER AND WE WILL DISCUSS IMPROVEMENTS AND OPTIMIZATIONS TO THE ALGORITHMS TO ALLOW THE MISSION TO KEEP UP WITH THE PLANNED 27 DAY DATA PROCESSING CYCLE FOR EACH SKY SECTOR.

P6.23: JAN SNIGULA

MAX-PLANCK-INSTITUT FÜR EXTRATERRESTRISCHE PHYSIK, GARCHING, GERMANY

MCP - THE WENDELSTEIN OBSERVATORY MASTER CONTROL PROGRAM

LMU MUENCHEN OPERATES AN ASTROPHYSICAL OBSERVATORY ON THE SUMMIT OF MT. WENDELSTEIN IN THE BAVARIAN ALPS. THE 2M FRAUNHOFER TELESCOPE IS EQUIPPED WITH A 64 MPIXEL, 0.5 X 0.5 SQUARE DEGREE FOV WIDE FIELD CAMERA (WWFI) AND A 3 CHANNEL OPTICAL/NIR CAMERA (3KK). TWO FIBER COUPLED SPECTROGRAPHS (UPGRADED ECHELLE SPECTROGRAPH FOCES WITH WAVECOMB, AND IFU SPECTROGRAPH VIRUS-W, CURRENTLY OPERATED AT THE 2.7 M TELESCOPE AT THE MCDONALD OBSERVATORY IN TEXAS) AND A WAVEFRONT SENSOR WILL BE ADDED IN THE NEAR FUTURE. IN ADDITION WE PLAN TO UPGRADE THE OBSERVATORIES 40CM TELESCOPE AND ITS CAMERA AND SPECTROGRAPH FOR THE STUDENTS LAB. THE OBSERVATORY ALSO HOSTS A MULTITUDE OF SUPPORTING HARDWARE, I.E. ALLSKY CAMERAS, WEBCAMS, METEOSTATION, AIR CONDITIONING ETC. ALL SCIENTIFIC INSTRUMENTS AND RELATED HARDWARE ARE MONITORED BY AND CAN BE CONTROLLED THROUGH A SINGLE, CENTRAL "MASTER CONTROL PROGRAM" (MCP). WE EXPLAIN CONCEPT AND IMPLEMENTATION OF THE MCP AS A MULTI-THREADED PYTHON DAEMON. FOR ALL HARDWARE DEVICES WE CREATED WRAPPER DEVICE PROGRAMS TRANSLATING THE VARIOUS DEVICE LANGUAGES TO A COMMON INTERFACE. WITHIN THE MCP EACH DEVICE IS CONTROLLED BY A SEPARATE DEVICE THREAD. INSTRUMENTS ARE REPRESENTED BY META DEVICES COMBINING DIFFERENT DEVICES. THE MCP PROVIDES COMPLETE HANDLING OF THE TCP SOCKET CONNECTIONS, LOGGING AND DATABASE BASED CONFIGURATION AND AN EXTERNALLY AVAILABLE STATUS DATABASE. THE MCP HAS BEEN BUILT TO ENABLE COMPLEX AUTOMATED OBSERVATIONS SCHEMES. IT SUPPLIES META DATA FOR SCIENTIFIC DATA CONTAINERS (I.E. FITS KEYS) AND CAN BE USED TO TRIGGER SIMPLE QUICKLOOK, CALIBRATION, OR EVEN FULL-FLEDGED DATA REDUCTION PROCESSES.

P1.30: DANUTA SOSNOWSKA

GENEVA OBSERVATORY, GENEVA, SWITZERLAND

MCMC ALGORITHMS AT THE SERVICE OF EXO-PLANETS HUNTERS

EXO-PLANETARY RESEARCH IS A FAST GROWING SCIENCE DOMAIN. MORE AND MORE ASTRONOMICAL INSTRUMENTS ARE DEDICATED TO EXO-PLANET SEARCHES, COLLECTING TERABYTES OF DATA. IN ORDER TO EXPLORE THIS HUGE AMOUNT OF DATA SOPHISTICATED ALGORITHMS ARE NECESSARY. THE MARKOV CHAIN MONTE CARLO IS A FAMILY OF ALGORITHMS VERY WELL SUITED FOR THE EXPLORATION OF THE HIGH DIMENSIONAL SPACE OF PARAMETERS DESCRIBING KEPLERIAN ORBITS. THE DATA & ANALYSIS CENTER FOR EXOPLANETS (DACE) CONTAINS A DATABASE WITH THOUSANDS OF RADIAL VELOCITIES MEASUREMENTS AND TRANSIT LIGHT CURVES AMONGST OTHER OBSERVATIONS. IT ALSO IMPLEMENTS ALGORITHMS FOR TREATING, DISPLAYING, OPTIMISING AND EXPLORING THIS DATA. ONE OF THE RECENTLY DEVELOPED ALGORITHMS FOR FITTING KEPLERIAN ORBITS IS THE MCMC ALGORITHM WITH TWO VARIATIONS: THE SIMPLE METROPOLIS-HASTINGS MCMC AND ITS CHANGE OF BASIS (COB) VERSION. THE SIMPLE MHMCMC IS VERY EFFICIENT FOR WELL CONSTRAINED ORBITAL PARAMETERS, THE COB WORKS BETTER FOR LESS CONSTRAINED CASES, SUCH AS WHEN THE ORBITS ARE NOT CLOSED. THE SOFTWARE WAS WRITTEN IN JAVA, WHOSE OBJECT ORIENTED STRUCTURE ALLOWS FOR NICE INTEGRATION OF SEVERAL SOLUTIONS INTO THE SAME SCHEME AND SEPARATION OF THE ALGORITHM FROM THE MODEL. IN THIS WAY, THE DACE MCMC CAN BE APPLIED TO ANY ASTROPHYSICAL MODEL WITHIN DACE. THE DACE MCMC IS DIRECTLY LINKED TO THE DACE DATABASE, SO IT CAN BE LAUNCHED ON THE DATA EXTRACTED FROM THE DB ON THE DACE SERVER OR LOCALLY ON THE USER COMPUTER. IT CAN ALSO BE RUN ON USER PRIVATE DATA. THE SOFTWARE DEVELOPMENT IS STILL ONGOING AND FUTURE FEATURES WILL INCLUDE THE INCORPORATION OF DIFFERENT MODELS AS WELL AS THE RUNNING OF SEVERAL MARKOV CHAINS IN PARALLEL WITH THEIR SOLUTIONS COMBINED.

P8.25: FELIX STOEHR

ESO

THE ALMA SCIENCE ARCHIVE: CONSTRUCTION

THE CONSTRUCTION OF THE ALMA SCIENCE ARCHIVE (ASA) IS IN FULL SWING. WE REPORT ABOUT THE WORK CARRIED OUT SINCE THE INITIAL DESIGN AND SINCE A FIST VERSION WENT INTO OPERATIONS. WE PRESENT THE FEATURES THAT WERE ADDED AS WELL AS THE PARADIGM SHIFT LEADING TO THE COMPUTATION OF "COLLAPSED" METADATA ROWS. FINALLY, WE GIVE AN OUTLOOK ON THE FUTURE DEVELOPMENT.

P2.20: OLE STREICHER

LEIBNIZ-INSTITUTE FOR ASTROPHYSICS POTSDAM, POTSDAM, GERMANY

DEBIAN ASTRO: AN OPEN COMPUTING PLATFORM FOR ASTRONOMY

OVER THE RECENT YEARS, THE AMOUNT AND QUALITY OF SOFTWARE FOR ASTRONOMY HAS GROWN SIGNIFICANTLY. MANY TRADITIONAL SOFTWARE PACKAGES HAVE EXPERIENCED ENORMOUS PROGRESS. WITH ASTROPY, A COMPLETELY NEW AND COORDINATED APPROACH WAS DEVELOPED. DESPITE OF THESE DEVELOPMENTS, A LOT OF LEGACY SOFTWARE IS STILL IN USE, PARTLY BASED ON OUTDATED DEPENDENCIES, AND SOMETIMES EVEN NOT MAINTAINED ANYMORE.

THE PROBLEM THAT ARISES IS TO MAINTAIN A CONSISTENT INTEGRATION OF THE ASTRONOMICAL SOFTWARE PACKAGES INTO A SINGLE USABLE SYSTEM, WHILE MANAGING THEIR REQUIREMENTS, AND PROVIDING SENSIBLE DEFAULTS TO THE USER.

DEBIAN ASTRO IS A DEBIAN PURE BLEND THAT AIMS TO DISTRIBUTE THE AVAILABLE ASTRONOMY SOFTWARE WITHIN THE DEBIAN OPERATING SYSTEM. USING DEBIAN AS THE FOUNDATION HAS UNIQUE ADVANTAGES FOR END USERS AND DEVELOPERS, E.G. AN EASY INSTALLATION AND UPGRADING OF PACKAGES, AN OPEN DISTRIBUTION AND DEVELOPMENT MODEL, OR THE REPRODUCIBILITY DUE TO THE STANDARDIZED BUILD SYSTEM.

WE SHALL PRESENT THE CURRENT STATUS OF DEBIAN ASTRO AND THE EXPERIENCES MADE IN THE PACKAGING PROCESS. WE DISCUSS THE VARIOUS UPSTREAM DEVELOPMENT PHILOSOPHIES AND THEIR IMPACT ON THE INTEGRATION WITHIN A FREE OPERATING SYSTEM.

P2.21: CHRISTIAN SURACE

LAM, AMU, CNRS , MARSEILLE , FRANCE

PF-SPE : A SPECTROSCOPIC REDSHIFT MEASUREMENT AND SPECTRAL FEATURES EXTRACTION PROTOTYPE FOR EUCLID

EUCLID IS A SPACE MISSION, CURRENTLY UNDER DEVELOPMENT, LED BY THE EUROPEAN SPACE AGENCY. THE REDUCTION PIPELINE HAS BEEN ORGANIZED IN PROCESSING FUNCTION. THIS CONTRIBUTION FOCUSES ON THE PROCESSING FUNCTION "SPE", THE GOAL OF WHICH IS TO MEASURE THE REDSHIFT AND THE SPECTROSCOPIC FEATURES OF THE OBJECTS OBSERVED WITH THE INSTRUMENT NISP. WE WILL DEFINE THE DIFFERENT ASPECTS OF THE PF-SPE REDUCTION ELEMENTS, THE WAY TO DEAL WITH DATA AND THE INSERTION INTO THE SPECIAL ENVIRONMENT THAT HAS BEEN CREATED FOR ALL EUCLID DEVELOPERS. NEW ALGORITHMS HAVE BEEN TESTED ON SIMULATED DATA AND HAVE SHOWN REALLY GOOD RESULTS.

P3.11: MICHAEL SHAWN SWAM

SPACE TELESCOPE SCIENCE INSTITUTE

HST/JWST DATA PROCESSING PERFORMANCE UNDER HTCONDOR/OWL

THE WORKFLOW MANAGEMENT SYSTEM NOW USED BY THE SCIENCE DATA PROCESSING PIPELINES FOR THE HUBBLE SPACE TELESCOPE (HST) AND THE JAMES WEBB SPACE TELESCOPE (JWST) IS CALLED HTCONDOR/OWL, AND CONSISTS OF THE WIDELY-USED HTCONDOR BATCH PROCESSING SOFTWARE, AND THE OPEN WORKFLOW LAYER (OWL), DEVELOPED AT THE SPACE TELESCOPE SCIENCE INSTITUTE (STSCI). THIS PAPER WILL DESCRIBE EARLY PERFORMANCE RESULTS OBTAINED UNDER THE NEW HTCONDOR/OWL SYSTEM WHEN PROCESSING LARGE SUBSETS OF THE HST ARCHIVE COLLECTION, AND JWST GROUND TEST DATA. DESCRIPTION OF THE COMPUTER HARDWARE CONFIGURATIONS AND DATA, THE PERFORMANCE METRICS GATHERED, AND ANALYSIS OF THE OVERHEADS AND EFFICIENCY MEASURES FOR THE SYSTEM WILL BE PRESENTED, ALONG WITH A SUMMARY OF CURRENT ISSUES AND FUTURE DEVELOPMENT PLANS.

P1.31: MARK TAYLOR

UNIVERSITY OF BRISTOL, UK

ALL OF THE SKY: HEALPIX DENSITY MAPS OF GAIA-SCALE DATASETS FROM THE DATABASE TO THE DESKTOP

THE GAIA ARCHIVE PROVIDES ACCESS TO OBSERVATIONS OF THE ORDER OF A BILLION SKY SOURCES. THE PRIMARY ACCESS TO THIS ARCHIVE IS VIA TAP SERVICES SUCH AS GACS, WHICH ALLOW EXECUTION OF SQL-LIKE QUERIES AGAINST A LARGE REMOTE DATABASE RETURNING A RELATIVELY SMALL RESULT SET FOR CLIENT-SIDE USE. SUCH SERVICES ARE GENERALLY USED FOR EXTRACTING RELATIVELY SMALL SOURCE LISTS ACCORDING TO POTENTIALLY COMPLEX SELECTION CRITERIA. BUT THEY CAN ALSO BE USED TO OBTAIN STATISTICAL INFORMATION ABOUT ALL, OR A LARGE FRACTION OF, THE OBSERVED SOURCES BY BUILDING HISTOGRAM-LIKE RESULTS.

WE EXAMINE HERE THE PRACTICALITIES OF PRODUCING AND CONSUMING ALL-SKY HEALPIX WEIGHTED DENSITY MAPS IN THIS WAY FOR GAIA AND OTHER LARGE DATASETS. WE PRESENT SOME MODEST REQUIREMENTS ON TAP/RDBMS SERVICES TO ENABLE SUCH QUERIES, AND DISCUSS VISUALISATION AND SERIALIZATION OPTIONS FOR THE RESULTS INCLUDING SOME NEW CAPABILITIES IN RECENT VERSIONS OF TOPCAT.

P6.24: JOANNA TAYLOR

SPACE TELESCOPE SCIENCE INSTITUTE

USING PYTHON AND DATABASES TO MONITOR THE COSMIC ORIGINS SPECTROGRAPH

THE COSMIC ORIGINS SPECTROGRAPH (COS) WAS INSTALLED ON THE HUBBLE SPACE TELESCOPE (HST) IN MAY 2009. COS IS DESIGNED TO PERFORM HIGH-SENSITIVITY MEDIUM- AND LOW-RESOLUTION SPECTROSCOPY OF ASTRONOMICAL OBJECTS IN THE FAR-ULTRAVIOLET AND NEAR-ULTRAVIOLET WAVELENGTH REGIMES. WE PRESENT AN OVERVIEW OF A NEW COMPREHENSIVE DATA REPOSITORY, COSMO (COS MONITORING) THAT IS CAPABLE OF AUTOMATIC DATA RETRIEVAL AND REDUCTION AS WELL AS MONITORING OF THE INSTRUMENT. COSMO IS WRITTEN ENTIRELY IN PYTHON AND RELIES ON A SYSTEM OF DATABASES THAT ALLOW FOR DYNAMIC QUERYING ACROSS A WIDE ARRAY OF DATA PARAMETERS. CALIBRATION PROGRAMS THAT MONITOR THE INSTRUMENT'S STABILITY AND BEHAVIOR HAVE BEEN INTEGRATED WITH COSMO TO PROVIDE TIMELY AND ACCURATE ANALYSIS OF THE COS DETECTORS.

P2.22: FRANCO TINARELLI

INAF - ISTITUTO DI RADIO ASTRONOMIA

SKA : THE A&A REQUIREMENTS AND PROTOTYPE

THE SQUARE KILOMETRE ARRAY (SKA) IS THE WORLD'S MOST ADVANCED RADIO TELESCOPE FORESEEN IN THE NEAR FUTURE, DESIGNED TO EXPLORE SOME OF THE BIGGEST OPEN QUESTIONS IN ASTRONOMY, LIKE THE EPOCH OF RE-IONIZATION, THE NATURE OF GRAVITY, THE ORIGINS OF COSMIC MAGNETISM, THE POSSIBLE LIFE BEYOND THE EARTH, THE GALAXY EVOLUTION, COSMOLOGY AND DARK ENERGY.

ONE OF THE MOST CHALLANGING EFFORT IN THE SKA ERA WILL BE THE MASSIVE AND UNSEEN HUGE AMOUNT OF DATA AND COMPUTATIONAL RESOURCES REQUESTED TO ENREACH THE SCIENTIFIC DISCOVERIES. STRONG INTERACTION WITH THE ASTRONOMICAL COMMUNITY IS FORESEEN THROUGH THE WEB ACCESS TO DATA.

ONE OF THE MOST RELEVANT TOPIC IN THIS SCOPE IS THE USER ACCESSIBILITY TO DATA ACQUIRED, PARTICULARLY IN THE SCOPE OF USER AND DIGITAL IDENTITY RECOGNITION.

SEVERAL TECHNOLOGIES ARE AVAILABLE NOWADAYS AND A STUDY AND A PROTOTYPING WORK HAVE DONE INSIDE ONE OF THE SKA CONSORTIA (TELESCOPE MANAGER - TM) TO INVESTIGATE DIFFERENT REQUIREMENTS, ASPECTS, CONSTRAINGS AND SOLUTIONS REQUESTED BY THE PROJECT. AN OVERVIEW OF THE INVESTIGATIONS IS EXPOSED AND SOME ARCHITECTURAL AND IMPLEMENTATIVE SOLUTIONS DESCRIBED.

P6.25: MAURIZIO TOMASI

UNIVERSITÀ DEGLI STUDI DI MILANO

COMPRESSION OF SMOOTH ONE-DIMENSIONAL DATA SERIES USING "POLYCOMP"

DATA COMPRESSION IS INCREASINGLY IMPORTANT IN ASTROPHYSICS, AS THE AMOUNT OF DATA ACQUIRED BY MODERN EXPERIMENTS OFTEN NEEDS HUNDREDS OF TERABYTES FOR THE STORAGE OF RAW DATA. IN THIS TALK I WILL PRESENT A FEW USAGE CASES OF THE C/PYTHON LIBRARY "POLYCOMP", A LIBRARY TO COMPRESS SMOOTH ONE-DIMENSIONAL DATA WHOSE ERROR IS EITHER ZERO OR NEGLIGIBLE. ONE OF THE ALGORITHMS IMPLEMENTED BY "POLYCOMP" COMBINES THE ADVANTAGES OF POLYNOMIAL LEAST-SQUARES FITTING AND THE PROPERTIES OF THE DISCRETE CHEBYSHEV TRANSFORM. THIS ALGORITHM CAN LEAD TO COMPRESSION RATIOS LARGER THAN 10 IN A NUMBER OF REALISTIC CASES. I WILL SHOW A FEW EXAMPLES OF DATASETS THAT CAN BE EASILY COMPRESSED USING THIS APPROACH, NAMELY (1) SPACECRAFT ATTITUDE INFORMATION, AND (2) TIMELINES OF POINTING INFORMATION FOR A REALISTIC ALL-SKY SURVEY EXPERIMENT.

P3.12: KEVIN VINSEN

THE UNIVERSITY OF WESTERN AUSTRALIA - INTERNATIONAL CENTRE FOR RADIO ASTRONOMY RESEARCH (ICRAR)

IMAGING SKA-SCALE DATA ON CLOUD AND SUPERCOMPUTER INFRASTRUCTURE USING DROPS AND A DATA FLOW MANAGEMENT SYSTEM

AT ADASS XXV WE PRESENTED THE DROP CONCEPT AND OUR INVESTIGATION INTO MANAGING THE PROCESSING OF SQUARE KILOMETRE ARRAY (SKA) SCALE DATA VOLUMES. IN THIS PAPER WE PRESENT THE RESULTS OF OUR ONGOING EFFORT TO DEVELOP A DROP-BASED DATA FLOW MANAGEMENT SYSTEM, CALLED DALIUGE, THAT CAN SCALE TO THE EXPECTED SIZE OF THE SKA PHASE 1, USING EITHER CLOUD OR HPC INFRASTRUCTURE. IT IS A DATA DRIVEN EXECUTION FRAMEWORK COMPLIANT WITH THE SKA1 SYSTEM REQUIREMENTS AND ARCHITECTURE. IT IS SCALABLE AND ITS PLUGGABLE SCHEDULING ROUTINES ALLOW WORKLOAD OPTIMIZATION ACCORDING TO VARIOUS CRITERIA SUCH AS DATA LOCALITY AND HARDWARE CONFIGURATION.

DALIUGE IS A FUNCTIONING SOFTWARE SYSTEM CAPABLE OF EXECUTING A DIRECTED ACYCLIC GRAPH (DAG) ACROSS MANY HUNDREDS OF COMPUTATIONAL NODES WITHIN A CLOUD OR HPC ENVIRONMENT. IN ADDITION WE PRESENT A LOGICAL GRAPH EDITOR, AND A STATIC SCHEDULER THAT TRANSLATES THE LOGICAL GRAPHS TO THE COMPLEX PHYSICAL GRAPHS (EXPRESSED AS DAGS) USED BY THE DALIUGE. MOST RADIO ASTRONOMY PIPELINES INVOLVE ITERATIVE ALGORITHMS THAT REQUIRE REPEATED EXECUTIONS IN LOOPS; ONE KEY FEATURE OF THE GRAPH EDITOR IS THAT IT CAN CONVERT USER-ORIENTED CYCLIC GRAPHS INTO DAGS BY UNROLLING THESE ITERATIVE LOOPS. MOREOVER, THE GRAPH SCHEDULER SPLITS THE HIGH LEVEL LOGICAL GRAPH INTO CHUNKS AND DISTRIBUTING THEM ACROSS THE NODES OF THE SYSTEM SUCH THAT THE COST OF DATA MOVEMENT OR RESOURCE UTILISATION IS MINIMISED, MAKING IT SIGNIFICANTLY MORE EFFICIENT TO DEPLOY AND RUN DAGS ON HETEROGENEOUS HARDWARE RESOURCES.

TO PROVIDE REAL LIFE TEST SCENARIOS WE HAVE CONTINUED OUR TESTING USING THE CHILES DATA AND WE HAVE INTRODUCED ASKAP, MWA AND LOFAR DATA SETS TO ENSURE DIFFERENT APPROACHES TO RADIO ASTRONOMY PIPELINES CAN BE ACCOMMODATED BY THE SOFTWARE. IN ADDITION WE HAVE USED SIMULATED SKA DATA TO INCREASE THE DATA SIZE TO CLOSER TO SKA PHASE 1 SCALE.

DALIUGE IS CAPABLE OF USING DROPS THAT ARE BASED ON: FILES, DIRECTORIES, AWS S3 FILES, STREAMS, NGAS, MEMORY, DATABASES (BOTH SQL AND NOSQL), LINUX PROGRAMS, PYTHON PROGRAMS, DOCKER CONTAINERS, AND BASH SCRIPTS.

THE RESULTS ARE EXTREMELY ENCOURAGING AND HAVE SHOWN THAT THE DROP CONCEPT IS EXTREMELY FLEXIBLE, AND THAT THE DALIUGE SOFTWARE IS VERY SCALABLE. THE NATURE OF THE DAG MEANS WE ARE FINDING THAT THE NEED TO MOVE DATA IS GREATLY REDUCED, A KEY REQUIREMENT FOR SYSTEMS WORK AT THE SCALE OF SKA PHASE 1.

THE SOFTWARE HAS BEEN WRITTEN IN PYTHON TO RUN UNDER LINUX. ALL THE SOFTWARE IS OPEN SOURCE AND AVAILABLE FROM GITHUB.

P2.23: DANY VOHL

CENTRE FOR ASTROPHYSICS & SUPERCOMPUTING – SWINBURNE UNIVERSITY OF TECHNOLOGY, HAWTHORN, AUSTRALIA

COLLABORATIVE VISUAL ANALYTICS OF LARGE RADIO SURVEYS

RADIO SURVEY DATASETS COMPRISE AN INCREASING NUMBER OF INDIVIDUAL OBSERVATIONS STORED AS SETS OF MULTI-DIMENSIONAL DATA. IN LARGE SURVEY PROJECTS, ASTRONOMERS COMMONLY FACE LIMITATIONS REGARDING: 1) INTERACTIVE VISUAL ANALYTICS OF SUFFICIENTLY LARGE SUBSETS OF DATA; 2) SYNCHRONOUS AND ASYNCHRONOUS COLLABORATION; AND 3) DOCUMENTATION OF THE DISCOVERY WORKFLOW. TO SUPPORT COLLABORATIVE DATA INQUIRY, WE PRESENT ENCUBE, A LARGE SCALE COMPARATIVE VISUAL ANALYTICS FRAMEWORK. ENCUBE CAN UTILISE LARGE TILED-DISPLAYS SUCH AS THE CAVE2 (A HYBRID 2D AND 3D VIRTUAL REALITY ENVIRONMENT POWERED WITH A 100 TFLOP/S GPU-BASED SUPERCOMPUTER) FOR COLLABORATIVE ANALYSIS OF LARGE SUBSETS OF DATA FROM RADIO SURVEYS. IT ALSO WORKS ON STANDARD DESKTOPS, PROVIDING A SEAMLESS VISUAL ANALYTICS EXPERIENCE REGARDLESS OF THE DISPLAY ECOLOGY. AT THE HEART OF ENCUBE IS A DATA MANAGEMENT UNIT BUILT IN PYTHON — MAKING IT SIMPLE TO INCORPORATE OTHER PYTHON-BASED ASTRONOMICAL PACKAGES AND VIRTUAL OBSERVATORY CAPABILITIES DEVELOPED WITHIN OUR COMMUNITY. WE DISCUSS HOW ENCUBE BUILDS A BRIDGE BETWEEN THE CAVE2 AND THE CLASSICAL DESKTOP, PRESERVING ALL TRACES OF THE WORK COMPLETED ON EITHER PLATFORM — ALLOWING THE RESEARCH PROCESS TO CONTINUE WHEREVER YOU ARE.

P2.31: CLAUDIO VUERLI

INAF - OSSERVATORIO ASTRONOMICO DI TRIESTE, ITALY

THE MANAGEMENT OF RISKS IN THE EUCLID SGS

THE MANAGEMENT OF RISKS IS ONE OF THE CRITICAL ASPECTS FOR A VERY LARGE AND COMPLEX PROJECT LIKE THE EUCLID SGS PROJECT (THE PROJECT RELATED TO THE SCIENCE GROUND SEGMENT OF THE EUCLID ESA MISSION). THE EUCLID CONSORTIUM WHICH FORMS THE SGS TOGETHER WITH THE SOC OPERATED BY ESA COUNTS 9 SDCS (SCIENCE DATA CENTRES) AND 10 OUS (ORGANIZATION UNITS) FOR THE DEFINITION OF THE PROCESSING FUNCTIONS WHICH FORM THE DATA PROCESSING PIPELINE, THE PIPELINE EXECUTION AND THE STORAGE OF THE DATA PRODUCED BY THIS EXECUTION AND THE COMPUTING INFRASTRUCTURE USED TO RUN THE DEFINED PIPELINES.

THE MANAGEMENT OF RISKS IN EUCLID SGS TAKES PLACE WITHIN THE ECSGS PROJECT OFFICE AND IS IN CHARGE OF THE PAQA MANAGERS (THE ECSGS PAQA MANAGER IS LOCATED IN TRIESTE WHEREAS THE SOC PAQA MANAGER OPERATES AT ESA/ESAC, MADRID). THE PAQA MANAGERS ARE IN CHARGE OF THE MAINTENANCE OF THE RISK REGISTER WHICH IS THE UNIQUE REPOSITORY WHERE ALL RISKS IDENTIFIED WITHIN EUCLID SGS ARE KEPT AND MANAGED. IN CARRYING OUT THIS TASK THE PAQA MANAGERS HAVE CONTINUOUS INTERACTIONS WITH THE EUCLID SGS MANAGERS (THE ECSGS MANAGER AND THE SOC DEVELOPMENT MANAGER).

PAQA MANAGERS ARE IN CHARGE OF IDENTIFYING AND COLLECTING ALL RISKS EMERGING WITHIN THE SGS; EACH IDENTIFIED RISK HAS ASSOCIATED A LIKELIHOOD OF OCCURRENCE AND A SEVERITY LEVEL; ON THE BASIS OF THESE TWO PARAMETERS SGS RISKS ARE LOCATED IN THREE AREAS: THE GREEN, YELLOW AND RED AREA. RISKS IN THE GREEN AREA ARE CONSIDERED NOT CRITICAL; THEIR OCCURRENCE CAN BE ACCEPTED WITHOUT UNDERTAKING REDUCTION OR MITIGATION ACTIONS FOR THEM. RISKS CODED AS YELLOW OR RED REQUIRE TO BE PROPERLY MANAGED, I.E. THEY ARE INCLUDED IN THE "MAIN RISKS" PAGE, AND PROPER RISK REDUCTION AND MITIGATION MEASURES ARE SPECIFIED FOR THEM. A RISK CAN ALSO BE RETIRED IF ITS SEVERITY AND/OR ITS LIKELIHOOD DROPS UNDER A CERTAIN THRESHOLD. ACCEPTED RISKS MAY BE RETIRED ALSO IF THEY ARE CONSIDERED TO BE PART OF THE “NORMAL WORK” OF THE SGS.

THE PURPOSE OF THE PROPOSED POSTER IS TO PRESENT IN DETAIL THE CLASSIFICATION OF THE RISKS IN EUCLID SGS AS MENTIONED BEFORE AND THE WAY RISKS ARE MANAGED STARTING FROM THEIR IDENTIFICATION UP TO THEIR INSERTION IN THE RISK REGISTER AND THE SUBSEQUENT MANAGEMENT/UPDATE DURING THE LIFETIME OF THE EUCLID SGS PROJECT.

P3.13: THOMAS VUILLAUME

LABORATOIRE D'ANNECY-LE-VIEUX DE PHYSIQUE DES PARTICULES, CNRS, FRANCE

APPLICATION OF HPC AND VECTORIZATION SOLUTIONS TO DATA CALIBRATION AND HILLAS-METHOD RECONSTRUCTION FOR IMAGING ATMOSPHERIC CHERENKOV TELESCOPES

IMAGING ATMOSPHERIC CHERENKOV TELESCOPES (IACT) DETECT COSMIC GAMMA-RAYS BY STUDYING THE ELECTROMAGNETIC SHOWERS THEY CREATE ENTERING THE ATMOSPHERE. IACT SYSTEMS RELY ON THE STEREOSCOPIC RECONSTRUCTION OF THESE SHOWERS IN ORDER TO OBTAIN THE DIRECTION AND ENERGY OF THE INCOMING GAMMA RAYS. IN CURRENT EXPERIMENTS, SUCH AS H.E.S.S., MAGIC AND VERITAS, DIFFERENT RECONSTRUCTION METHODS AND ALGORITHMS ARE APPLIED.

CTA, THE CONSTRUCTION OF WHICH IS PLANNED TO START IN 2017, WILL BE THE NEXT GENERATION OF GAMMA-RAY OBSERVATORY OPERATING IACTS. THE IMPROVEMENT OF SENSITIVITY WITH RESPECT TO THE CURRENT INSTRUMENTS WILL GENERATE AN UNPRECEDENTED DATA-FLOW IMPOSING SEVERE CONSTRAINTS IN TERMS OF DATA REDUCTION, REAL-TIME AND ON-SITE ANALYSES. THIS WILL DEMAND TO INVESTIGATE FASTER AND MORE SCALABLE ALGORITHMS.

THIS WORK DESCRIBES SOME HIGH PERFORMANCE COMPUTING (HPC) AND VECTORIZATION SOLUTIONS, DEVELOPED AND INTRODUCED FOR THE FIRST TIME IN IACT'S FIELD.

THEY ARE APPLICABLE TO THE DATA CALIBRATION AND TO HILLAS RECONSTRUCTION AS A FIRST STEP TO MORE SOPHISTICATED RECONSTRUCTION ALGORITHMS. THEY HAVE BEEN DEVELOPED IN THE FRAMEWORK OF THE ASTERICS-H2020 PROJECT AND AS SUCH ARE AVAILABLE AS AN OPEN-SOURCE SOFTWARE PACKAGE TO THE ASTRONOMY, ASTROPHYSICS AD ASTROPARTICLE PHYSICS SCIENTIFIC COMMUNITY.

P2.24: PASCAL WASSONG

OBSERVATOIRE ASTRONOMIQUE DE STRASBOURG, UNIVERSITÉ DE STRASBOURG, CNRS, UMR 7550

THE ASTRODEEP FRONTIER FIELDS PORTAL

WE PRESENT THE PUBLIC WEB PORTAL PROVIDING ACCESS TO DATA FROM FOUR FRONTIER FIELDS (TWO CLUSTERS ABELL 2744 AND MACS J0416.1-2403, AND TWO PARALLEL FIELDS) DEVELOPED IN THE FRAME OF THE ASTRODEEP PROJECT.

THE PORTAL INTEGRATES SEVERAL WIDGETS TO ANALYZE THE DATA. WE USE ALADIN LITE TO VIEW HIPS IMAGES IN TEN DIFFERENT BANDS, AND COLOR COMPOSITIONS. THE ASTRODEEP CATALOGUES FOR EACH FIELD ARE DISPLAYED AS A TABLE IN THE BROWSER, AND CAN ALSO BE DISPLAYED IN A DATAPLOT VIEWER.

ALL WIDGETS ARE LINKED TOGETHER, AND THE INTERACTIONS ALLOW THE USER TO EASILY ANALYZE INDIVIDUAL CATALOGUE SOURCES. THE WIDGETS RELY ON VO STANDARDS SUCH AS HIPS, VOTABLE AND SAMP.

THE ARCHITECTURE OF THE PORTAL IS FLEXIBLE ENOUGH SO THAT IT CAN BE EASILY REUSED FOR FUTURE ASTRODEEP CATALOGUES OR OTHER PROJECTS.

P4.18: OWEN REES WILLIAMS

DONALD SMITS CENTRE FOR INFORMATION TECHNOLOGY, UNIVERSITY OF GRONINGEN

THE ROLE OF THE EUCLID ARCHIVE SYSTEM IN THE PROCESSING OF EUCLID AND EXTERNAL DATA

THE EUCLID ARCHIVE SYSTEM (EAS) IS A CORE ELEMENT OF THE SCIENCE GROUND SEGMENT (SGS) OF EUCLID. EUCLID IS AN ESA M2 MISSION WHICH WILL CREATE A 15,000 SQUARE DEGREES SPACE-BASED SURVEY. TWO SUBSYSTEMS OF THE EAS, THE DATA PROCESSING SYSTEM (DPS) AND DISTRIBUTED STORAGE SYSTEM (DSS), PROVIDE THE METADATA AND DATA STORAGE FOR EUCLID DATA PROCESSING. THESE SUBSYSTEMS IMPLEMENT THE EUCLID COMMON DATA MODEL AND PROVIDE NUMEROUS SERVICES FOR EUCLID CONSORTIUM USERS AND SGS SUBSYSTEMS. IN ADDITION THE EAS-DPS ASSISTS IN THE PREPARATION OF THE EUCLID DATA RELEASES WHICH ARE COPIED TO THE THIRD EAS SUBSYSTEM, THE ESA-DEVELOPED AND MANAGED SCIENCE ARCHIVE SYSTEM (SAS) WHERE THEY BECOME AVAILABLE FOR THE WIDER ASTRONOMICAL COMMUNITY.

THE EAS FOLLOWS A DATA-CENTRIC APPROACH TO DATA PROCESSING WHERE THE EAS-DPS IS RESPONSIBLE FOR THE CENTRALIZED METADATA STORAGE AND THE EAS-DSS SUPPORTS THE DISTRIBUTED STORAGE OF DATA FILES.

THE EAS-DPS IMPLEMENTS THE OBJECT-ORIENTED EUCLID COMMON DATA MODEL USING A RELATIONAL DBMS FOR THE STORAGE. THE EAS-DPS SUPPORTS THE TRACING OF THE LINEAGE OF ANY DATA ITEM IN THE SYSTEM, PROVIDES SERVICES FOR THE DATA QUALITY ASSESSMENT AND THE DATA PROCESSING ORCHESTRATION. THE EAS-DPS SERVICES ARE BUILT ON THE FORWARD AND BACKWARD CONVERSION OF PYTHON OBJECTS TO TABLES OF RELATIONAL DATABASE AND EXTENSIVELY USE THE EXTREME DATA LINEAGE OF METADATA OBJECTS WHICH IS STORED IN EAS-DPS.

THE EAS-DSS IS A DISTRIBUTED STORAGE SYSTEM WHICH IS BASED ON A SET OF STORAGE NODES LOCATED IN EACH OF THE NINE SCIENCE DATA CENTERS OF THE EUCLID SGS. THE STORAGE NODES SUPPORTS A WIDE RANGE OF SOLUTIONS FROM LOCAL DISK USING A UNIX FILESYSTEM TO IRODS NODES OR GRID STORAGE ELEMENTS.

IN THIS PAPER THE ARCHITECTURAL DESIGN OF EAS-DPS AND EAS-DSS ARE REVIEWED: THE INTERACTION BETWEEN THEM AND TESTS OF THE ALREADY IMPLEMENTED COMPONENTS ARE DESCRIBED.

=== ABSTRACT ENDS HERE

PLEASE, NOTE THAT THIS ABSTRACT IS COMPLIMENTARY TO THE ORAL PRESENTATION "THE EUCLID ARCHIVE SYSTEM: A DATA-CENTRIC APPROACH TO BIG DATA"

P4.19: THOMAS WILLIS WINEGAR

SUBARU TELESCOPE - NAOJ

BEYOND THE LOGIN: TRANSACTIONAL RANDOMIZED AUTHENTICATION FOR DATA DOWNLOAD

FOR DATA MANAGEMENT WITHIN THE SUBARU TELESCOPE ARCHIVE, OBSERVERS CONSISTENTLY REPORT FAILURE TO REMEMBER PERSONALIZED LOGINS AND PERSONALIZED PASSWORDS. WE HAVE NUMEROUS EXAMPLES OF USERS WITH ONE PASSWORD FOR ALL THEIR USER ACCOUNTS FROM SOCIAL MEDIA AND COMMERCIAL INTERNET MEMBERSHIPS THROUGH PRIVATE OBSERVATORY-NETWORK PASSWORDS, USERS WITH ALL THEIR LOGINS AND PASSWORD WRITTEN INSIDE PUBLIC EMAIL MAILBOXES, USERS WITH PIECES OF PAPER IN THEIR WALLET OR ON THEIR DESK OR COMPUTER. THE SUBARU TELESCOPE STARTED PROVIDING HIGHER-SECURITY RANDOMIZED LOGINS AND PASSWORDS FOR DATA-DOWNLOAD, RESULTING IN A SUBSTANTIAL PERCENTAGE OF USERS PREFERRING TRANSACTION-UNIQUE RANDOMIZED-AUTHENTICATION VERSUS TRADITIONAL USER-UNIQUE AUTHENTICATION FOR DATA DOWNLOAD. BY USING LONG STRINGS OF RANDOM CHARACTERS FOR EACH DOWNLOAD-AUTHENTICATION, WE CAN BETTER PROTECT THE PRIVACY OF BOTH THE USER AND OUR DATA: REMOVE THE INCENTIVE FOR INSECURE STORAGE OF AUTHENTICATION DETAILS AND DECREASE AUTHENTICATION FAILURES DUE TO HUMAN ERROR. WE INTEND TO EXTEND THIS IDEA USING A PREDICTED AND PROGRESSIVE SYSTEM OF RANDOMIZED LOGINS AND PASSWORDS THAT AUTOMATICALLY ADVANCE TO A NEW AUTHENTICATION-PAIR WITH EACH NEW DOWNLOAD.

P8.26: KANOA WITHINGTON

CFHT, HAWAII

OPERA: AND OPEN-SOURCE PIPELINE FOR ESCELLE SPECTROGRAPHS

THIS ARTICLE DESCRIBES THE ALGORITHMS IMPLEMENTED IN THE OPERA PIPELINE SOFTWARE PACKAGE FOR THE REDUCTION OF CROSS-DISPERSED HIGH RESOLUTION SPECTROPOLARIMETRIC ESPADONS DATA. IT IS CURRENTLY THE ONLY OPEN SOURCE SOFTWARE AVAILABLE FOR FIBER-FED ECHELLE SPECTROGRAPHS AND SPECTROPOLARIMETERS THAT USE AN IMAGE SLICER. WE DESCRIBE THE SOFTWARE ORGANIZATION AND IT'S PERFORMANCE VALIDATION PLUS SOME NOVEL PROCESSING METHODS INCLUDING A TWO-DIMENSIONAL INSTRUMENT PRO□FILE THAT PROVIDES IMPROVED WAVELENGTH AND FLUX CALIBRATION, BETTER POLARIMETRIC PRECISION.

P4.20: MICHAEL D YOUNG

INDIANA UNIVERSITY

SPARC: PRESERVATION OF 20 YEARS OF SPECTROGRAPHIC DATA

FROM 1975 TO 1995 THE FOURIER TRANSFORM SPECTROGRAPH (FTS) MOUNTED ON THE KITT PEAK MAYALL 4M TELESCOPE COLLECTED SPECTRA IN THE REGIME FROM 0.9 TO 5 MICRONS. NEARLY 15,000 INFRARED SPECTRA OF ~800 DISTINCT ASTRONOMICAL OBJECTS WERE RECORDED AND MORE THAN 120 PAPERS WERE PUBLISHED AS A RESULT. THE DATA IN THIS ARCHIVE REPRESENTS A VALUABLE COLLECTION OF HISTORICAL OBSERVATIONS, USEFUL FOR LONG-TERM VARIABILITY STUDIES, SAMPLES OF PRECURSOR OBJECTS, OR OTHER INSTANCES WHERE THE VALUE OF THE DATA IS ONLY APPARENT IN HINDSIGHT. HOWEVER THE FTS OBSERVATIONS WERE STORED ON OBSOLETE AND INACCESSIBLE 9-TRACK MAGNETIC TAPE UNTIL A PRESERVATION EFFORT IN THE LATE 1990[1]S TRANSFERRED THE DATA TO AN ASCII CARD IMAGE FORMAT. WITH THE GOAL OF FURTHER IMPROVING ACCESSIBILITY THESE OBSERVATIONS WERE RECENTLY CONVERTED TO THE STANDARD FITS FORMAT, WITH THE ORIGINAL OBSERVATIONAL METADATA PRESERVED. THE SPECTRA ARCHIVE (SPARC) PORTAL WAS CREATED TO DISSEMINATE THIS REPOSITORY TO THE WIDER SCIENTIFIC COMMUNITY. SPARC IS A FREELY ACCESSIBLE, FLEXIBLE AND MODERN INTERFACE TO THE ARCHIVAL DATA, WHICH REQUIRES NO REGISTRATION AND THE UNDERLYING SOFTWARE IS OPEN-SOURCED. IN THIS PRESENTATION WE WILL DISCUSS THE MOTIVATIONS, METHODOLOGIES AND RESULTS OF SPARC, WHICH CAN SERVE AS A TEMPLATE FOR THE SUCCESSFUL PRESERVATION OF VALUABLE LEGACY ASTRONOMICAL DATA THAT LIES FORGOTTEN IN SIMILAR CACHES AT OTHER INSTITUTIONS.

P2.25: HAILONG YUAN

NAOC, BEIJING, CHINA

IMPLEMENTATION OF STELLAR PARAMETERS ESTIMATION IN ASERA

ASERA IS SHORT FOR A SPECTRUM EYE RECOGNITION ASSISTANT FOR QUASAR SPECTRA, WHICH HELPS USERS TO EYEBALL CHECK QUASAR SPECTRA. WITH THE EXTENSION OF MANY SPECTRAL TEMPLATES, ASERA CAN ALSO BE USED IN THE EYEBALL INSPECTION OF GALAXIES AND VARIOUS TYPES OF STARS EXCEPT QUASARS. WE RECENTLY ADD A NEW DEVELOPED FUNCTION IN ASERA TO ESTIMATE THE STELLAR PARAMETERS (E.G. VELOCITY, TEFF, LOGG AND [FE/H]) FROM SPECTRAL DATA FROM THE LAMOST SURVEY. A REMOTE SERVER IS DEVELOPED TO TRANSFER THE REQUEST FROM ASERA TO ULYSS, WHICH IS A WIDELY USED OPEN-SOURCE SOFTWARE PACKAGE WRITTEN IN THE GDL/IDL LANGUAGE TO ANALYZE ASTRONOMICAL DATA. A BUNCH OF ULYSS FITTING PARAMETERS ARE HANDLED SO USERS CAN ADJUST THE FITTING RESULTS ACCORDINGLY BY ASERA. USERS CAN ENJOY THE CONVENIENCE OF ASERA WITHOUT HAVING IDL AND ULYSS INSTALLED IN THEIR OWN COMPUTER SYSTEMS. THE LAMOST SPECTRAL FITS FORMAT IS SUPPORTED BY DEFAULT WHILE OTHERS DEPEND ON THE ULYSS PACKAGE.

P1.32: ALESSANDRA ZANICHELLI

INAF - ISTITUTO DI RADIOASTRONOMIA, BOLOGNA, ITALY

DISH WASHER: A SOFTWARE TOOL FOR RFI MITIGATION IN SINGLE-DISH RADIO ASTRONOMICAL OBSERVATIONS

RADIO FREQUENCY INTERFERENCE (RFI) IS ONE OF THE MOST PRESSING PROBLEMS IN CM-WAVELENGTH WORLD-WIDE RADIO ASTRONOMY IN PARTICULAR FOR SINGLE-DISH TELESCOPE OBSERVATIONS. IN CONTRAST TO INTERFEROMETERS, IN SINGLE-DISH

OBSERVATIONS THE ASTRONOMICAL AND RFI SIGNALS ARE ADDED COHERENTLY. AS A CONSEQUENCE, RFI MAY EASILY DETERIORATE THE DATA AND EVEN PREVENT THEIR SCIENTIFIC EXPLOITATION.

DUE TO BOTH THE INCREASING ABUNDANCE OF MAN-MADE INTERFERING SIGNALS AND THE IMPROVED PERFORMANCE OF THE TELESCOPES BACKENDS, THE IMPACT OF RFI AT THE ITALIAN RADIO TELESCOPE SITES IS NOW A MAJOR CONCERN AND STRATEGIES FOR ITS MITIGATION ARE TO BE APPLIED.

IN THIS POSTER WE PRESENT THE DISH WASHER (DW) SOFTWARE FOR THE DETECTION AND FLAGGING OF RADIO FREQUENCY INTERFERENCE IN SIGNALS COLLECTED BY SINGLE-DISH RADIO TELESCOPES.

DISH WASHER HAS BEEN DEVELOPED AT THE INSTITUTE OF RADIOASTRONOMY IN THE FRAMEWORK OF A PROJECT OF RELEVANT TECHNOLOGICAL INTEREST FUNDED BY THE ITALIAN NATIONAL INSTITUTE FOR ASTROPHYSICS.

DW PROVIDES GUI AND COMMAND LINE INTERFACE, THIS LAST THROUGH AN INTERACTIVE PYTHON CONSOLE, AND IS CURRENTLY CAPABLE TO HANDLE DATA IN THE STANDARD FITS FORMAT IN USE AT THE SINGLE-DISH ITALIAN RADIO TELESCOPES. ADDITIONAL DATA FORMATS FROM OTHER TELESCOPES CAN BE SUPPORTED VIA THE INTEGRATION OF APPROPRIATE SOFTWARE MODULES.

DW CURRENTLY IMPLEMENTS FUNCTIONALITIES FOR MANUAL INTERACTIVE FLAGGING PLUS SOME LEVEL OF AUTOMATIC DETECTION OF RFI THROUGH DEDICATED ALGORITHMS. ITS FIRST PUBLIC RELEASE IS FORESEEN IN THE COMING MONTHS AS FREE SOFTWARE UNDER GNU GENERAL PUBLIC LICENSE.

P1.33: YANXIA ZHANG

NATIONAL ASTRONOMICAL OBSERVATORIES,CAS

EXTRA-TREES FOR PHOTOMETRIC REDSHIFT ESTIMATION OF QUASARS

BASED ON THE SLOAN DIGITAL SKY SURVEY (SDSS) DR7 AND DR12,

UKIRT INFRARED DEEP SKY SURVEY (UKIDSS) AND WIDE-FIELD INFRARED

SURVEY EXPLORER (WISE), WE OBTAIN DIFFERENT CROSS-MATCHED SAMPLES AND USE A KIND OF TREE-BASED METHOD, EXTREMELY RANDOMIZED TREES (EXTRA-TREES) TO ESTIMATE THE PHOTOMETRIC REDSHIFTS OF QUASARS,

MOREOVER COMPARE THE PERFORMANCE OF THIS METHOD WITH K-NEAREST NEIGHBOR ALGORITHM (KNN). OUR EXPERIMENTAL RESULTS SHOW THAT THE ACCURACY OF PREDICTING PHOTOMETRIC REDSHIFTS IS INFLUENCED BY MANY FACTORS, SUCH AS THE SAMPLE QUALITY, SAMPLE SELECTION, FEATURE

SELECTION AND ADOPTED ALGORITHMS. OPTIMAL SELECTION OF SAMPLES AND FEATURES CONTRIBUTES TO THE PERFORMANCE IMPROVEMENT OF A REGRESSOR. EXTRA-TREES GET BETTER PERFORMANCE THAN KNN IN THE LOW DIMENSIONAL SPACE WHILE KNN IS SUPERIOR TO EXTRA-TREES IN THE HIGH DIMENSIONAL SPACE.

P2.26: MO ZHANG

NATIONAL ASTRONOMICAL OBSERVATORIES, CHINESE ACADEMY OF SCIENCES

PROTOTYPE VOEVENT NETWORK SYSTEM FOR THE SVOM CHINESE GROUND SEGMENT

WE PRESENT THE STATUS OF DESIGN, BUILD AND TEST OF OUR PROTOTYPE VOEVENT NETWORK SYSTEM FOR THE SVOM CHINESE GROUND SEGMENT BASED ON VTP AND XMPP. THE XMPP PROTOCOL ENABLES CROSS-PLATFORM MESSAGING AND INFORMATION SHARING AMONG HUMAN USERS. WE ALSO PRESENT A DEMONSTRATION OF AUTOMATIC VOEVENT-CONTROLLED FOLLOW-UP OBSERVATION, INCLUDING TRIGGERING, OBSERVATIONAL DATA TRANSFERRING, AS WELL AS OTHER PROCEDURES.

P8.27: JIANNAN ZHANG

NAOC-NATIONAL ASTRONOMICAL OBSERVATORY,CHINESE ACADEMY OF SCIENCES

AN AUTOMATED GALAXY RECOGNITION AND REDSHIFT MEASUREMENT SYSTEM FOR LOW-RESOLUTION SPECTRA

THE AUTOMATED SPECTRAL TYPE RECOGNITION AND REDSHIFT MEASUREMENT IS THE TARGET OF THE SPECTRA REDUCTION SYSTEM OF MODERN TELESCOPE SURVEY PROJECTS. IN THIS PAPER, WE ILLUSTRATE AN AUTOMATED GALAXY SPECTRA RECOGNITION SYSTEM USED IN LAMOST LOW-RESOLUTION SPECTRA REDUCTION. THE GALAXY SPECTRAL REDUCTIN ACHIEVES TWO GOALS: ONE IS THE GALAXY SPECTRA RECOGNITION , THE OTHER IS REDSHIFT MEASUREMET. COMPARED WITH THE PCAZ METHOD BASED ON THE WHOLE SPECTRAL DATA, WHICH HAS BEEN USED IN SDSS PIPELINE AND OTHER SPECTRA SURVEY PROJECTS, THIS SYSTEM IS BASED ON GALAXY SPECTRAL LINES DETECTION AND LINES PARAMETERS MEASUREMENT. THE RESULTS ON THE LOW-RESOLUTION SPECTRA OF LAMOST PROJECT SHOW THAT THE SYSTEM CAN ACHIEVE 92% CORECT RECOGNITION RATE FOR THE DATA WITH SNR > 5, AND MORE THAN 80% CORECT RECOGNITION RATE FOR THE DATA WITH SNR > 2, WHILE THE ACCURATION OF REDSHIFT MEASUREMENT IS 0.0002 (60KM/S). THE GALAXY SPECTRA RECOGNITION SYSTEM HAS ENHANCE THE LAMOST GALAXY RECOGNITION RATE, ESPECIALLY FOR THE LOW SNR DATA AND THE SPECTRA DATA WITH FLUX CALIBRATION PROBLEM.

P4.21: OLGA P. ZHELENKOVA

SAO RAS, NIZHNIJ ARKHYZ, RUSSIA; ITMO UNIVERSITY, SAINT-PETESBURG, RUSSIA

LONG-TERM DATA MANAGEMENT IN THE SAO RAS ARCHIVE SYSTEM

THE DATA OF EXPERIMENTS REQUIRE ARCHIVING AND RELIABLE STORAGE WITH ACCESSIBILITY AND SEMANTIC REENTERABILITY. IN THE SAO RAS IN THE EARLY 80-IES FOR THESE PURPOSES A DIGITAL ARCHIVE OF RADIO OBSERVATIONS WAS CREATED. THEN WITH THE INTRODUCTION OF CCD CAMERAS INTO OBSERVATIONS IN THE LATE 80S WE STARTED TO DEVELOP A DATA BANK, WHICH UNITED THE DIFFERENT DIGITAL COLLECTIONS. LATTER WE REALIZED AN ARCHIVING SYSTEM WITH A SEARCH INFORMATION SYSTEM. TO DATE, THE ARCHIVE CAPACITY IS 1.5 TB, ALSO THERE ARE 0.5 MILLION FILES AND 1 MILLION RECORDS IN THE DATABASE. THE SYSTEM SUPPORTS FREE WEB ACCESS TO 16 LOCAL ARCHIVES WITH DIGITAL COLLECTIONS OF DIFFERENT DEVICES USED, OR BEEN USED IN THE TELESCOPES OF THE OBSERVATORY. TWO SERVERS WITH POSTGRESQL DATABASE EACH SUPPORT THE SYSTEM. EACH SERVER DATA STORAGE AREA HAS A SIMILAR STRUCTURE AND CONTENT. ONE SERVER SUPPORTS AND CONTAINS THE WORKING VERSION OF THE SYSTEM, THE SECOND ONE SUPPORTS THE TEST VERSION, WITH WHICH WE CARRY OUT AND TEST ALL THE NEW DEVELOPMENTS. THE SYSTEM WAS DEVELOPED SO THAT IT WAS POSSIBLE TO ADD A NEW COLLECTION. THERE IS A POSSIBILITY OF HOSTING OTHER RUSSIAN TELESCOPE ARCHIVES. IN ORDER TO PROVIDE ADDITIONAL RELIABILITY OF INFORMATION KEEPING, ARCHIVAL DATA IS STILL STORED ON THE OPTICAL CD/DVD DISKS.

THERE IS NO DOUBT IN THE NEED FOR LONG-TERM STORAGE OF ASTRONOMICAL DATA. AS EXAMPLE, THE SKY SURVEY CONDUCTED BY THE RATAN-600 IN 1980, WITH THE RESULTS OF WHICH IT WAS OBTAINED THE FIRST RESTRICTION ON THE VALUE OF CMB FLUCTUATIONS, THEN THESE OBSERVATIONS WE USED TO STUDY THE VARIABILITY OF THE RADIO SOURCES AND TRANSIENTS SEARCH. THE LIFE CYCLE OF MODERN DIGITAL CARRIERS IS USUALLY 5-10 YEARS, THAT ALSO APPLIES TO THE READ-WRITE HARDWARE AND SOFTWARE. SO WHILE CHANGING MAGNETIC, DATA AND STREAMER TAPES TO HARD DRIVES SOME OF OUR COLLECTIONS, FORTUNATELY MINOR COULD NOT BE READ FROM THE CARRIERS FOR THESE REASONS. A TIMELY MIGRATION OF DIGITAL FILES ON THE MODERN CARRIERS IS REQUIRED TO ENSURE LONG-TERM STORAGE OF DATA. RECENTLY, A NEW STORAGE MEDIA IS APPEARED. IT IS THE M-DISC DESIGNED FOR LONG-TERM STORAGE OF UNCHANGING DATA (HTTP://MILLENNIATA.COM). WE PLAN TO MAKE MIGRATION OF THE ARCHIVED DATA TO THE M-DISCS. THE MANUFACTURER PROMISES SHELF LIFE OF THE DISKS UP TO 100 YEARS BUT IT IS A PREDICTED TERM. NEVERTHELESS, IT IS NOT POSSIBLE TO COMPLETELY ABANDON FROM EXTERNAL CARRIERS FOR LONG-TERM DATA STORAGE AND FULLY TRANSFER THE INFORMATION TO THE DATABASE ONLY.

P8.28: LIXIAO ZHOU

NATIONAL ASTRONOMICAL OBSERVATORIES, CHINESE ACADEMY OF SCIENCE,BEIJING, CHINA

ASTRONOMICAL BIG DATA TESTING OF ASTRONOMICAL DATA ANALYSIS SOFTWARE AND SYSTEMS

BIG DATA IS GROWING AT A RAPID PACE, AND ONE OF THE PRESENT HOT TRENDS IN TECHNOLOGY IS THE TOPIC OF BIG DATA AND PRODUCTS TARGETING THE BIG DATA PROBLEM. ACCORDING TO IBM, 90% OF THE WORLD'S DATA HAS BEEN CREATED IN THE PAST 2 YEARS, AND WITH BIG DATA COMES BAD DATA. SEVENTY OF ENTERPRISES HAVE EITHER DEPLOYED OR ARE PLANNING TO DEPLOY BIG DATA PROJECTS AND PROGRAMS AT PRESENT ACCORDING TO ANALYST FIRM IDG. NINETEEN POINT TWO OF BIG DATA APPLICATION DEVELOPERS SAY QUALITY OF DATA IS THE BIGGEST PROBLEM THEY CONSISTENTLY FACE ACCORDING TO EVANS DATA CORPORATION. ANALYST FIRM GARTNER SAYS THE AVERAGE ORGANIZATION LOSES $14.2 MILLION ANNUALLY THROUGH POOR DATA QUALITY. EXPERIAN DATA QUALITY REPORT STATES 99% OF ORGANIZATIONS HAVE A DATA QUALITY STRATEGY IN PLACE AND 75% OF BUSINESSES ARE WASTING 14% OF REVENUE DUE TO POOR DATA QUALITY.

ASTRONOMY HAS BEEN ONE OF THE FIRST AREAS OF SCIENCE TO EMBRACE AND LEARN FROM BIG DATA. THE AMOUNT OF DATA WE HAVE ON OUR UNIVERSE IS DOUBLING EVERY YEAR THANKS TO BIG TELESCOPES AND BETTER LIGHT DETECTORS. MOST LEADING RESEARCH IS BASED ON DATA FROM A HANDFUL OF VERY EXPENSIVE TELESCOPES LOCATED IN DESERTS, ON MOUNTAIN TOPS OR ON SATELLITES IN NEAR-EARTH SPACE. FOR EXAMPLE, WITH A MODEST COST OF AROUND $100 MILLION AND STILL THRIVING TODAY, THE SDSS TELESCOPE PRODUCES ABOUT 200GB OF DATA EVERY NIGHT, ADDING TO A DATABASE THAT STANDS AT AROUND 50TB TODAY. THE SCIENTIFIC IMPACT OF THE SDSS HAS BEEN PHENOMENAL: OVER 3000 PAPERS ON TOPICS RANGING FROM COMETS TO COSMOLOGY, GENERATING TODAY OVER 160000 CITATIONS. NASA'S HUBBLE SPACE TELESCOPE (HST) HAS HAD ROUGHLY 3 TIMES THE IMPACT, BUT AT ROUGHLY 100 TIMES THE COST. UNDOUBTEDLY, THE DATA QUALITY IS THE KEY BASIS FOR THE LEADING SCIENTIFIC FINDINGS. WITH THE RAPID DEVELOPMENT OF SPACE ASTRONOMICAL SCIENCE, THERE ARE SO MANY ASTRONOMICAL SATELLITE PROJECTS IN OPERATION OR IN PLAN. THEN, HOW DO WE MEASURE THE QUALITY OF DATA, PARTICULARLY WHEN IT IS UNSTRUCTURED OR GENERATED THROUGH STATISTICAL PROCESSES? HOW DO WE CONFIRM THAT HIGHLY CONCURRENT SYSTEMS DO NOT HAVE DEADLOCK OR RACE CONDITIONS? WHAT TOOLS SHOULD BE USED? IT IS IMPERATIVE THAT SOFTWARE TESTERS UNDERSTAND THAT BIG DATA IS ABOUT FAR MORE THAN SIMPLY DATA VOLUME.

THIS POSTER WILL ANALYZE AND SUMMARIZE DEFINITION, CHARACTERISTICS, PROCESS, TYPES, METHODS, STRATEGY, TOOLS, PROBLEMS AND CHALLENGES FOR BOTH GENERAL BIG DATA TESTING AND ASTRONOMICAL BIG DATA TESTING OF ASTRONOMICAL DATA ANALYSIS SOFTWARE AND SYSTEMS.

P8.29: SONIA ZORBA

INAF – OSSERVATORIO ASTRONOMICO DI TRIESTE, TRIESTE, ITALY

APOGEO: AN AUTOMATIC MANAGEMENT SYSTEM FOR ASTRONOMICAL PORTALS

THE ITALIAN CENTER FOR ASTRONOMICAL ARCHIVES (IA2) HOSTS SEVERAL WEB INTERFACES TO PROVIDE ACCESS TO ASTRONOMICAL DATA ACQUIRED BY VARIOUS TELESCOPES.

BUILDING, MANAGEMENT AND MAINTENANCE OF THESE PORTALS COULD TAKE A LOT OF TIME AND ERRORS CAN BE INTRODUCED BY UNSAFE CHANGES. BECAUSE THESE SEARCH INTERFACES HAVE SIMILAR REQUIREMENTS IT WAS POSSIBLE TO DEVELOP A TOOL THAT IS ABLE TO GENERATE THESE PORTALS IN A STANDARDIZED AND RELIABLE WAY, AFTER A PORTAL ADMINISTRATOR HAS PERFORMED AN AIDED CONFIGURATION PROCESS.

THE TOOL, CALLED APOGEO (AUTOMATIC PORTAL GENERATOR), CONSISTS IN A SET OF JAVA EE WEB APPLICATIONS: A TAP_SCHEMA MANAGER, A PORTAL SKELETON, A GENERATOR WIZARD AND A WEB SERVICE FOR MANAGING ASYNCHRONOUS PORTAL JOBS.

THE TAP_SCHEMA MANAGER IS USED TO CONFIGURE THE TAP_SCHEMA OF THE ASTRONOMICAL ARCHIVE OF WHICH ONE WANTS TO GENERATE THE PORTAL. THE TAP_SCHEMA IS A PARTICULAR DATABASE SCHEMA DEFINED IN THE VIRTUAL OBSERVATORY TAP STANDARD AND IT IS USED TO STORE METADATA OF OTHER SCHEMAS.

DATA STORED INTO THE TAP_SCHEMA IS USED BY THE GENERATOR WIZARD TO RETRIEVE INFORMATION ABOUT THE ASTRONOMICAL ARCHIVE STRUCTURE. THE WIZARD HAS A SET OF FORMS THAT ALLOW INSERTING CONFIGURATION DATA AND AN INTERACTIVE JAVASCRIPT TOOL THAT CAN BE USED TO SET UP POSITION OF SEARCH INTERFACE COMPONENTS (LABELS, INPUTS, DROP DOWN MENUS) SIMPLY USING THE MOUSE. ON THE FINAL STEP THE WIZARD ADDS TO THE PORTAL SKELETON SOME GENERATED FILES AND BUILDS A WAR PACKAGE THAT CAN BE DEPLOYED INSIDE AN APPLICATION SERVER (LIKE GLASSFISH OR TOMCAT).

THE GENERATED PORTAL HAS A SEARCH FORM THAT ALLOWS SEARCHING ON THE ARCHIVE. SEARCH RESULTS CONSIST IN A PAGINATED TABLE THAT SHOWS DATA ACQUIRED BY THE SCIENTIFIC INSTRUMENTS AND, POSSIBLY, THE LINKS TO THE RELATED FILES, IF THE USER HAS ACCESS POLICY TO THE ACTUAL DATA.

THE GENERATED PORTAL CAN BE USED BOTH BY ANONYMOUS AND REGISTERED USERS. USERS AUTHORIZATION IS MANAGED USING GROUPER, AN ENTERPRISE ACCESS MANAGEMENT SYSTEM PROVIDED BY THE INTERNET2 COMMUNITY.

GENERATED PORTALS INCLUDE ALSO FEATURES FOR DOWNLOADING MULTIPLE FILES AS A TAR ARCHIVE AND GENERATING VOTABLES. THIS TASKS ARE PERFORMED BY THE ASYNCHRONOUS SERVICE, THAT EXPLOITS THE IVOA UWS RECOMMENDATION. MOREOVER METADATA TABLES AND DATA FILES CAN BE SENT USING SAMP MESSAGING PROTOCOL.