Forum della Ricerca Sperimentale e Tecnologica in INAF

«Science data segment» @ OATs

Daniele Tavagnacco on behalf of

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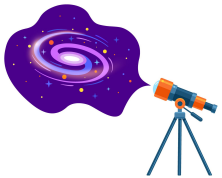
Science Data Segment



From Instrument

Processing Archive

RAW (L0/L1)

Simulations

ANALYSIS (L2)

SCIENCE (L3)

To Archive

Requirements

SW development

Documents

SW test / validation

SW Quality tools

homogenization / optimization

SW creation / Optimization

SW deploy

Data Collection / Distribution

Data modelling / description

Metadata management

Data Abstraction Layer

Software/Data analysis

Science workflows

Validation

Data Quality

Performance assessment

HW Abstraction Layer

HW

Scheduling

Computing infrastructure

images from: Vecteezy

Activity Areas

Infrastructure

Software design and optimization

Data analysis

images from: Vecteezy

Activity - Infrastructure

- Data analysis infrastructure design and maintenance
- Data modeling and big data persistence for data processing
  - Object Relational Mapping (ORM)
  - XML Schema languages
  - FITS and HDF5 data organization
  - I/O optimization (on shared file systems)
- Data Storage and distribution
  - Distributed and redundant storage systems (RAID6, BeeGFS, Lustre, Object Storages)
- Data processing
  - automatization of data processing (Workflow managers OtS and dedicated);
  - resource optimization and distribution (PBS, Slurm, HTCondor, cron)

Software design and optimization

- Refactoring
  - Porting of legacy code
  - design (OOP)
  - building system (Cmake)
- Maintenance and deploy
  - version control (git), CI (GitLab, Jenkins), containerization (VM, docker, singularity)
- SW Optimization
  - HPC optimizations (distributed-MPI, parallel-OpenMP, accelerated-GPU)
  - Code profiling (cProfile, valgrind, psutil,...)
  - Code Metrics (SonarQ)
- SW validation
  - Following the ECSS-E-ST-40C standard on software engineering
  - Map requirements to test cases, from software test specification
  - Development of a common software infrastructure for test cases execution and automatic reporting (wikies, formal documents)
  - Full requirements->software components->test cases traceability matrices
- SW Documentation and reviewing
  - SDD, SUMs, VPs, redmine,
- E2E simulation SW:
  - high level design (System Engineering), tool selection and integration, holistic performance assessment, end-to-end simulation of instruments

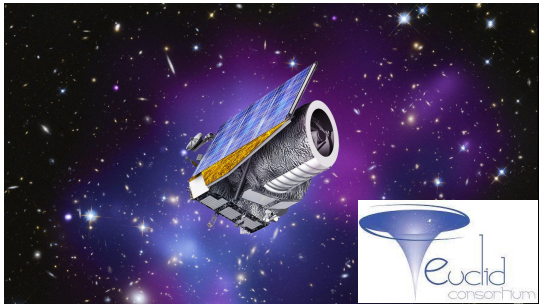
Data analysis and Processing

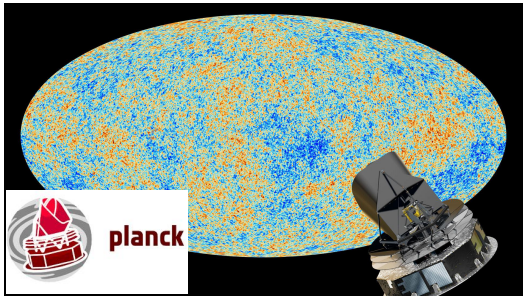
- Tools for spectral analysis
  - Reduction of long-slit and echelle spectra;
  - quasar continuum fitting;
  - modeling of absorption systems;
  - creation and modeling of synthetic spectra

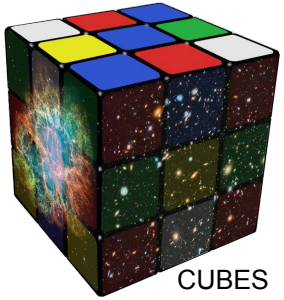
- Tools for TOI signal processing
  - Systematic effects characterization,simulation, removal
- Tools for image processing
  - exposure processing to detrended and calibrated images,
  - defects removal, astrometric and photometric calibration, coaddition of overlapping images
  - models for the surface brightness, position-dependent PSF modelling for stacked images.
  - Optimization of deblending, morphology and photometry algorithms in peculiar scenarios (Analysis and minimization of ICL (Intracluster light), template fitting, brightness profile fitting, photometry)
- Instrument control
  - web oriented interface software to generate and manage instrument tele-commands.(Space based projects)

Progetti

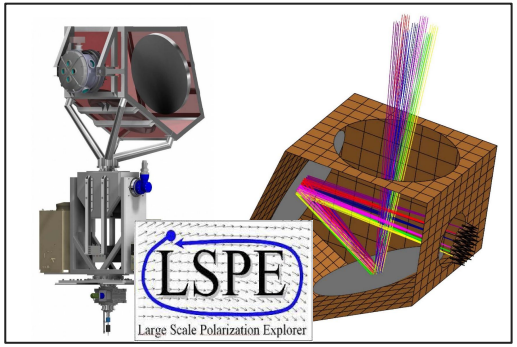
ANDES

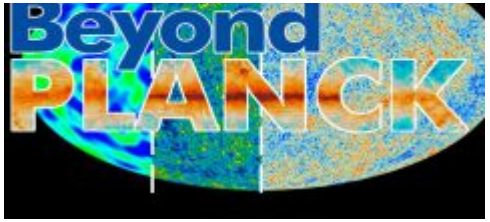






CUBES





Interactions

Other INAF structures / institutions /

several INAF structures; ESA; ASI; ESO; instrument(s) consortia; project(s) consortia; University Milano; SISSA; INFN

Other sections

<<HW & SW strumentale (Monitoring e control)>>

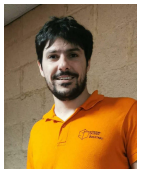
<<project management e PA/QA>>

People and expertise

Marco Frailis

Andrea Zacchei

Samuele Galeotta



Erik Romelli

Federico Rizzo

Thomas Vassallo

SW design, SW optimization, SW profiling, workflows, SW testing/validation, SW quality, data modelling, big-data, SW containers, distributed processing, GPU computing, data analysis imaging/spectra/TOI,

Marius Lepinzan

Michele Maris

Giovanna Jerse

Giorgio Calderone

Gianmarco Maggio

Daniele Tavagnacco

Guido Cupani

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