Prototype of a Multi-Messenger platform

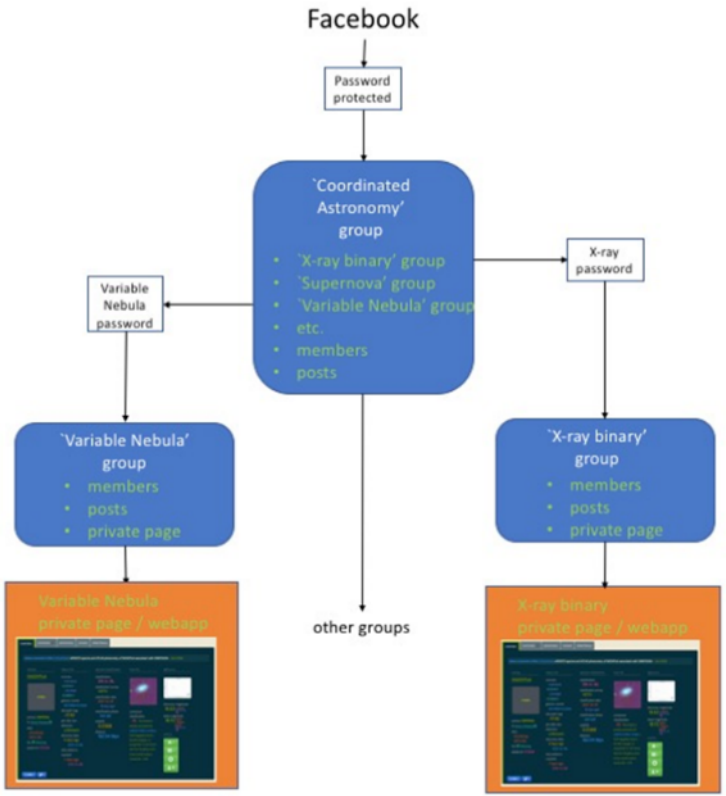
DADI Technology Forum

27th February 2019, Strasbourg

Alan Bridger & John Lightfood (WP5, ATC/STFC), Eduard Díez (WP5, GTD), Mark Kettenis (WP5, JIVE), Marjan Timmer (WP1, ASTRON), Andy Lawrence & Dave Morris (WP4, UEDIN-ROE), Josep Colomé (WP5, IEEC)

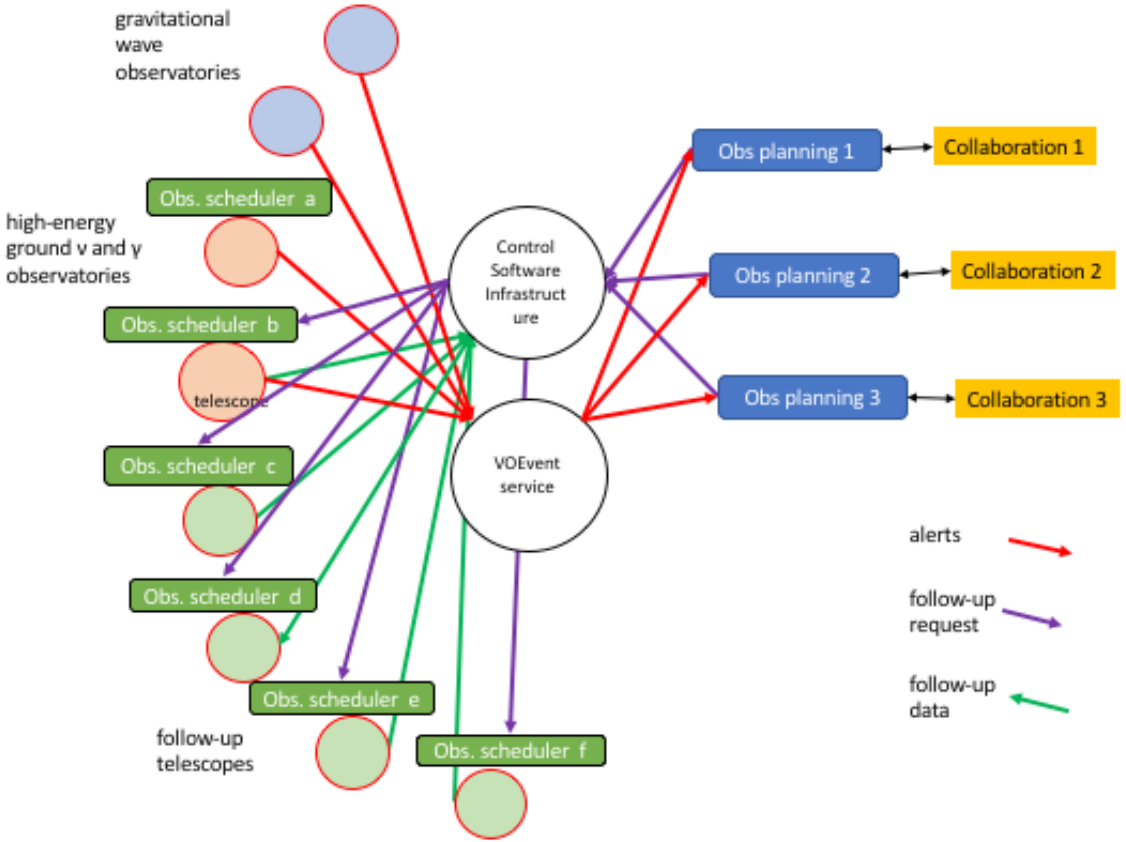
Coordinated observing for MM

- MM: transients & common programs
- Observation planning
  - The forming of a collaboration
    - Self-assembling (high-profile objects) & Architect designed collaborations (PESSTO, SNeX)
    - Single-object (SmartNet)
  - The working of a collaboration
    - Private or public (open-science)
    - Time allocation: ToO, DDT, MoU, Access Policies, etc.

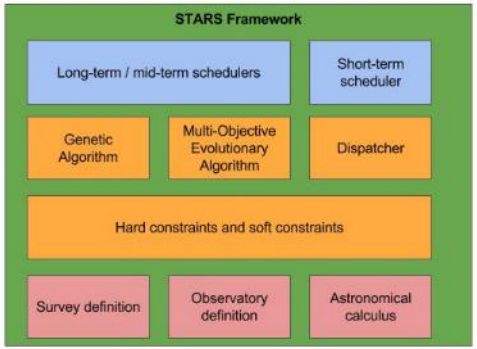


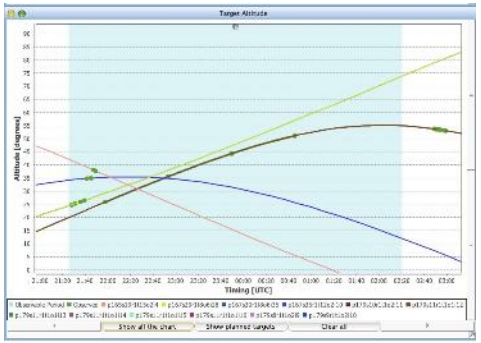
Coordinated observing for MM

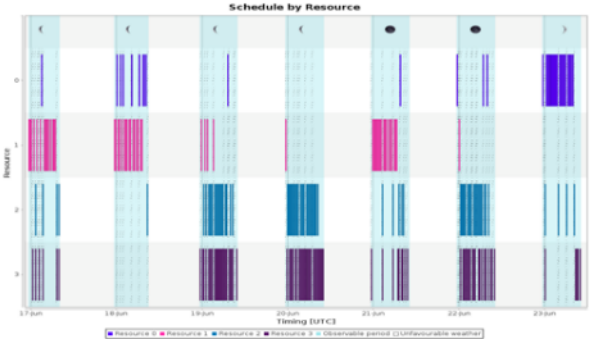
- Observations scheduling
  - Observation Plan
  - Operational Environment
  - Scheduling Algorithm
  - Matrix of Observation Planners and Schedulers



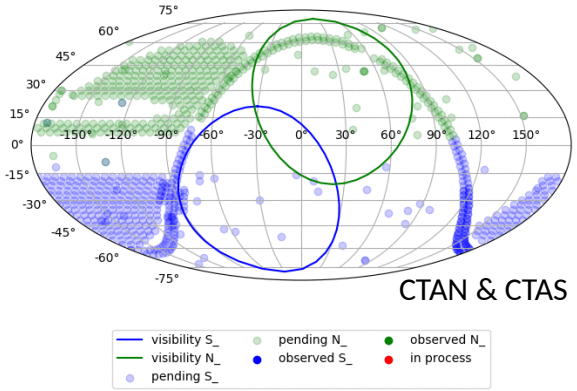
Coordinated observing for MM





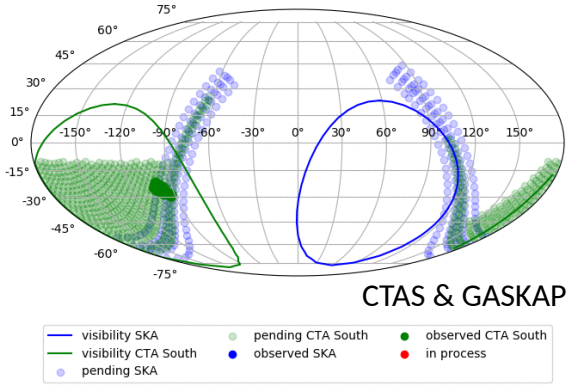


Equatorial Coordinates 2021-01-09 19:23:33.576



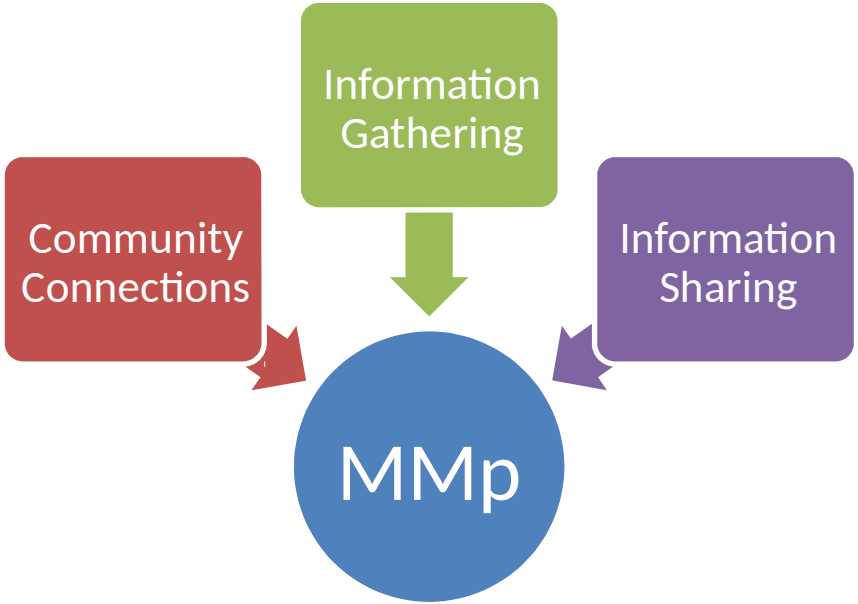
CTAN & CTAS

Equatorial Coordinates 2017-01-02 13:17:45.576



CTAS & GASKAP

MM Platform: WHAT



New paradigm

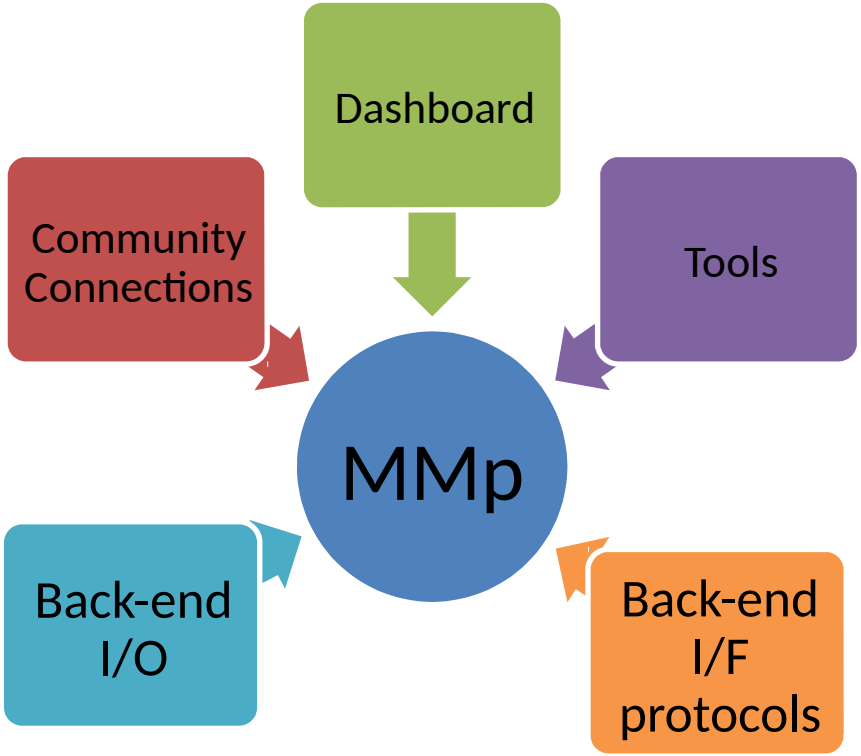
Grid and collaborative operation of large astronomical facilities and space missions driven by

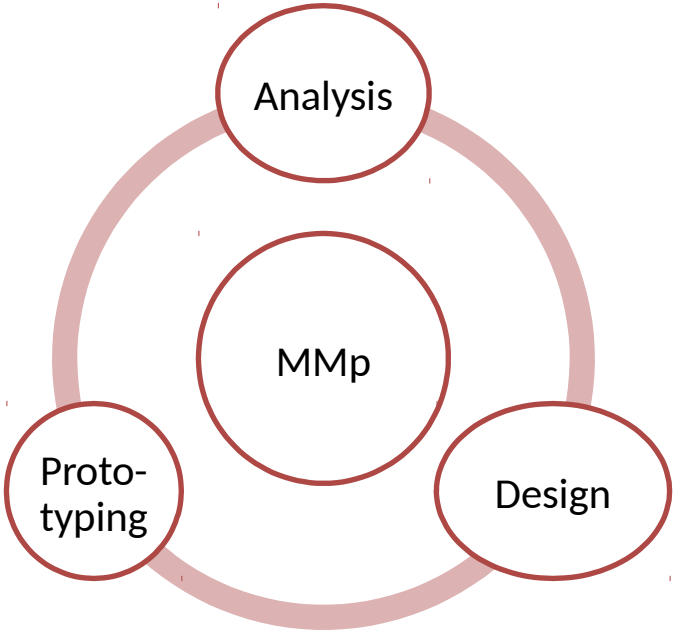
➔ MM Science

➔ Link Users

➔ Link Infra (GRD&ESFRIs&ESAs)

MM Platform: WHAT





MM Platform: WHAT

- Community Connections
  - User management
  - Creation of science driven groups
  - User publication of calls for shared MM proposals or request to contribute observations
  - Subscription to facility data levels (sky visibility, new transient alerts, nominal operation schedules, etc.)
  - Subscription to messenger data (GW, EM,…) from user groups & facilities

MM Platform: WHAT

- Dashboard: graphical representation of (part of) the sky or the Earth&Space with overlays that can be turned on and of. A certain amount of filtering (time/position/messenger/accessibility to subscribe) is probably needed.
  - Sky view with filtering layers and dynamic time variation
    - SB/observations layer: non-transient, transients, messenger selection
    - Facility layer: visibility & availability, messenger selection
    - Filtering features: visibility, sensitivity, messenger, facility source, user source
  - Earth&Space view
    - Identification of observatories & space missions subscribed to the platform
    - One layer per messenger
    - One layer per open/private time observatories

MM Platform: WHAT

- Tools
  - Information about facilities and multi-messenger policies
  - Information about facilities and proposal submission: facility policies, main facility messenger and submission procedures
  - Publication of events, conferences, workshops
  - Advertising MM Platform and similar initiatives
  - Data base retrieval for: observations (transient events, non-transients, etc.), facility plans (visibility), user plans, etc.
  - Utility codes:
    - Scheduling tools: scheduling routines to schedule a follower telescope/instrument based on a master telescope/instrument and on the observatory constraints, object visibility intervals, etc. Multi-observatory scheduling algorithms.
    - Counterpart selection: gather all reports of possible EM counterparts to an EM event (in an ideal world with time of detection, bandpass, and brightness, if available)

MM Platform: WHAT

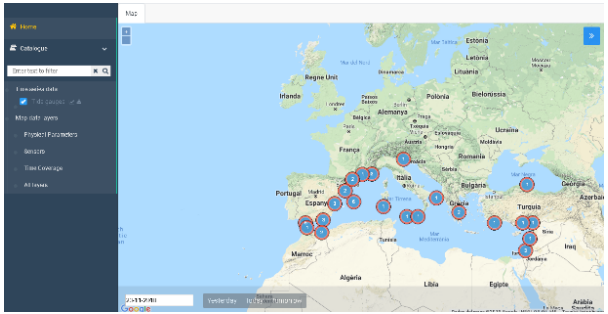
- Back-end data formats (I/O)
  - xml structures (IVOA ObsLocTAP) partially/totally used
- Back-end interfaces (I/F)
  - Data sources
    - Ideally through ObjVisSAP VO Protocol, but in protoype through a pre-filled backend database
    - Ideally through ObjLocTAP VO Protocol, but in prototype through a pre-filled backend database
  - User input
  - VOEvent streams & other protocols, ingested through a database

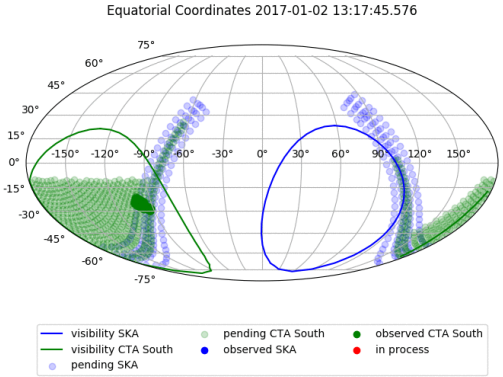
MM Platform: WHY

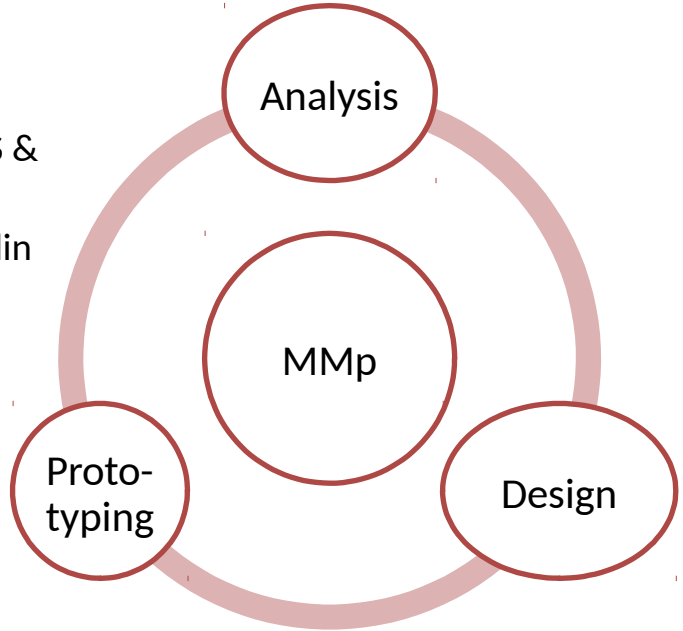
- Useful tool for the different interested groups
  - ASTERICS partners, VO community, ESA, ESO, IAU, LIGO&VIRGO, others
- Serves the needs of both data providers and data users
- Useful for both planned multi-observatory observations and reactive observations following transients
- Create a central place for anyone interested in doing MM science
- Now?
  - LIGO-Virgo observing round (O3) in early 2019 perfect timing to test its functionality in gravitational wave follow-up
  - ESA/ESAC visibility and planning information standards
  - ASTERICS Policy Forum (SKA, CTA, ELT, KM3NET)
    - Joint time allocation, observing strategies for MW/MM campaigns, data access and sharing, general policies of common interest.
  - Open Science
  - ASTERICS best community to promote a successful framework that persists beyond the project

MM Platform: Implementation

- Prototype for a demonstration
- Web-based platform
- Based on existing expertise & on synergies with other groups (ASTERICS & other)
- Complemented by & supported on existing open-source tools (i.e., Aladin Lite)
- First beta version: ASTERICS Conference - Gröeningen







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