GENSO Presentation for Cal Poly Spring Workshop April 2012

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Problems to be Solved

How do we break the mold of one ground station – one satellite for science missions?

For a 3-6 month mission, is it worth it to build a ground station?

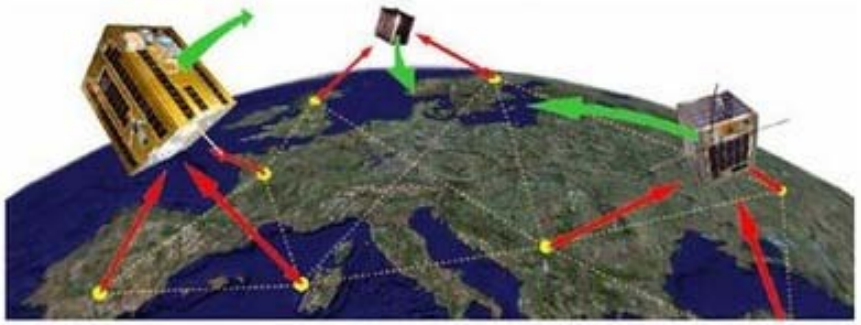
How do we facilitate the Ground segment to make it easier to get educational missions to space?

Can a larger community capitalize on these efforts?

Background – GENSO

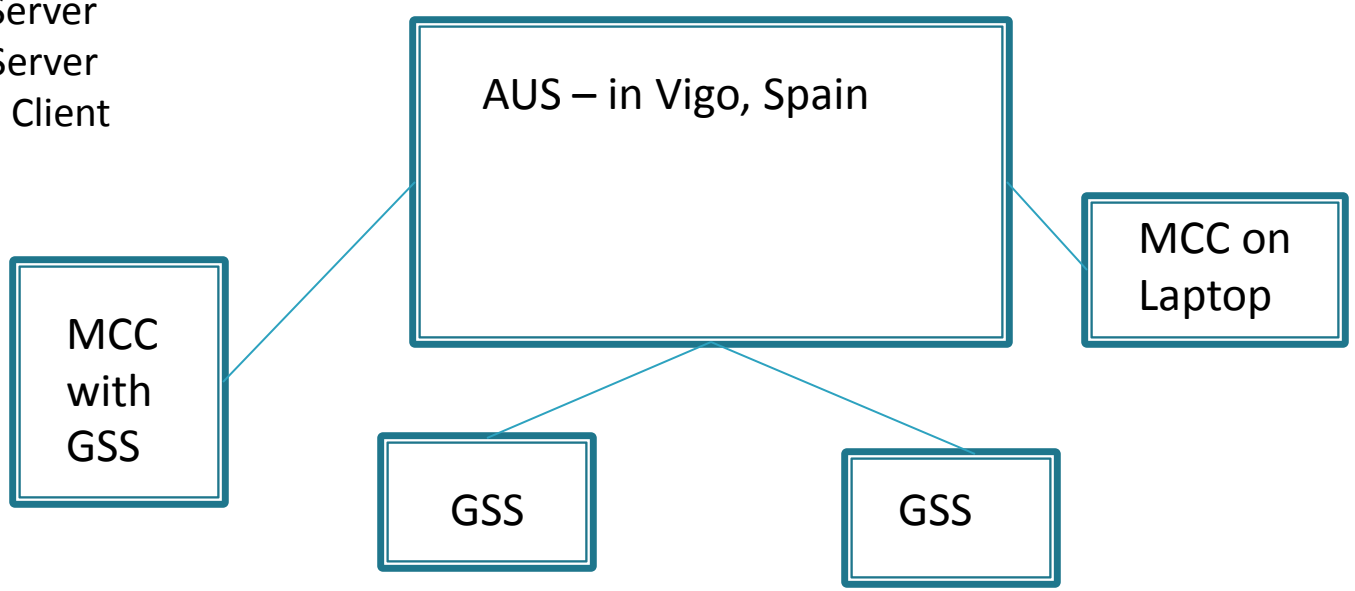
Global Education Network for Satellite Operations (GENSO) is a software standard which allows each ground station on the network to communicate with non-local spacecraft and transmit data to different ground terminals that have access to the specific satellite.

GENSO was developed primarily by volunteers in the educational / amateur radio community. ESA took the lead under auspices of the International Space Education Board



GENSO Network Details

*AUS = Authentication Server
*GSS = Ground Station Server
*MCC = Mission Control Client



One MCC will be assigned for each GENSO registered spacecraft when fully functional

All GSS receive and distribute a piece of the puzzle but only one MCC sees the entire picture. Since the GSS is tied to a physical ground station, it only sees what is available during a pass whereas the MCC has access to the aggregate of all downloaded data.

GENSO Network Entities – AUS

- AUS
  - Security
    - Entities authentication
  - Management
    - Network Management and Statistics
    - Metadata on accesses results
    - User Management
  - Information
    - TLE autoupdate

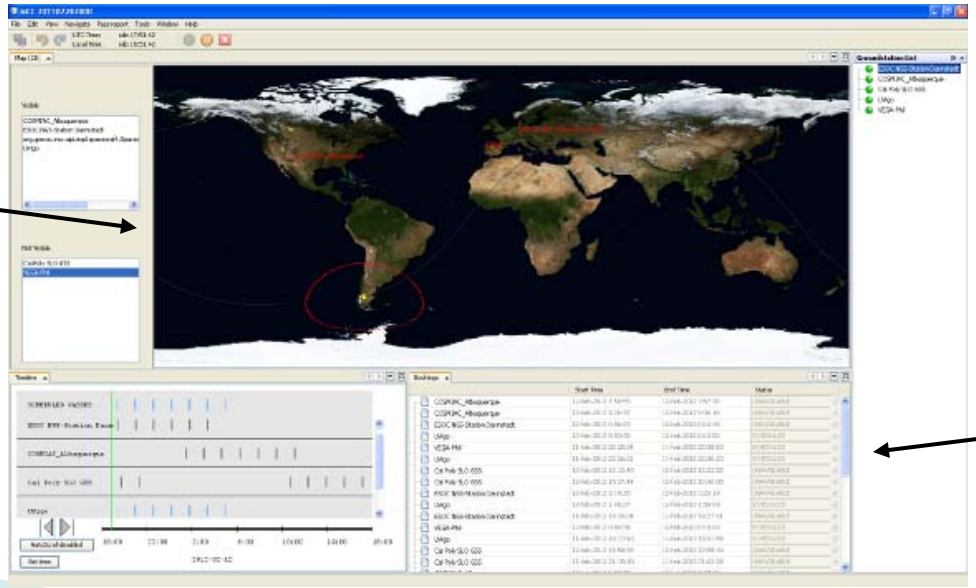
GENSO Network Entities – GSS

- GSS
  - Autonomous tracking and telemetry downlink
  - Automated sending of passreports to Mission Controllers
  - Real-time connection to MCC (requires manual request and confirmation)

University of Vigo Backup Station, GENSO Station

GENSO Network Entities – MCC

- MCC
  - Passreport viewer
  - Scheduling over network stations
  - “Wallplug” to Mission Software (Serial port interface (virtual modem) / audio stream)



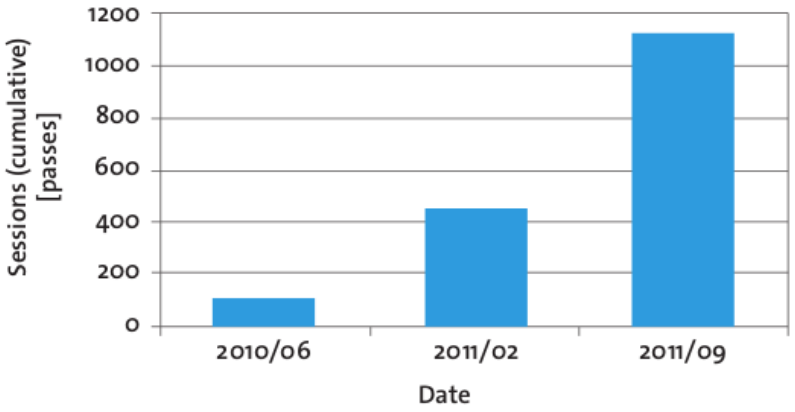
Snapshot of GENSO R2 MCC (ongoing development)

R1E – Release 1 for ELaNa

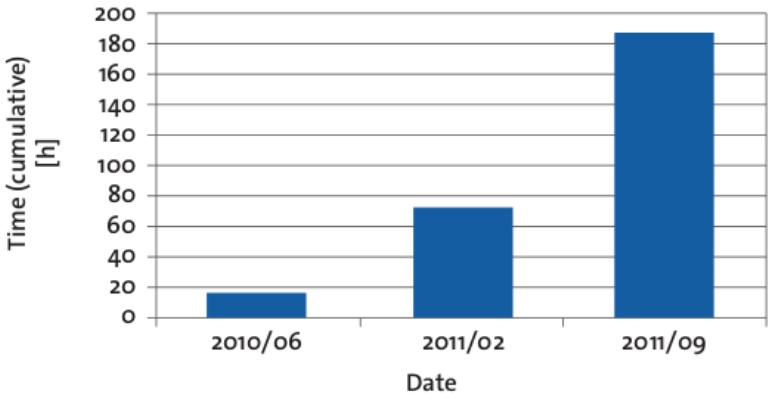
- First mission test case
- Network created specifically for ELaNa I with GSSs running the R1 software
- Allow real-time distribution and use of TLEs in early mission stages
- Deployed February 2011
- Many schools and individuals trained

R1E – Release 1 Statistics

- Currently supporting five CubeSats from ELaNa 3 including ISS and AO-51, Fast1, Fast2 and Vega launch cubesats
- All AFRL UNP teams trained

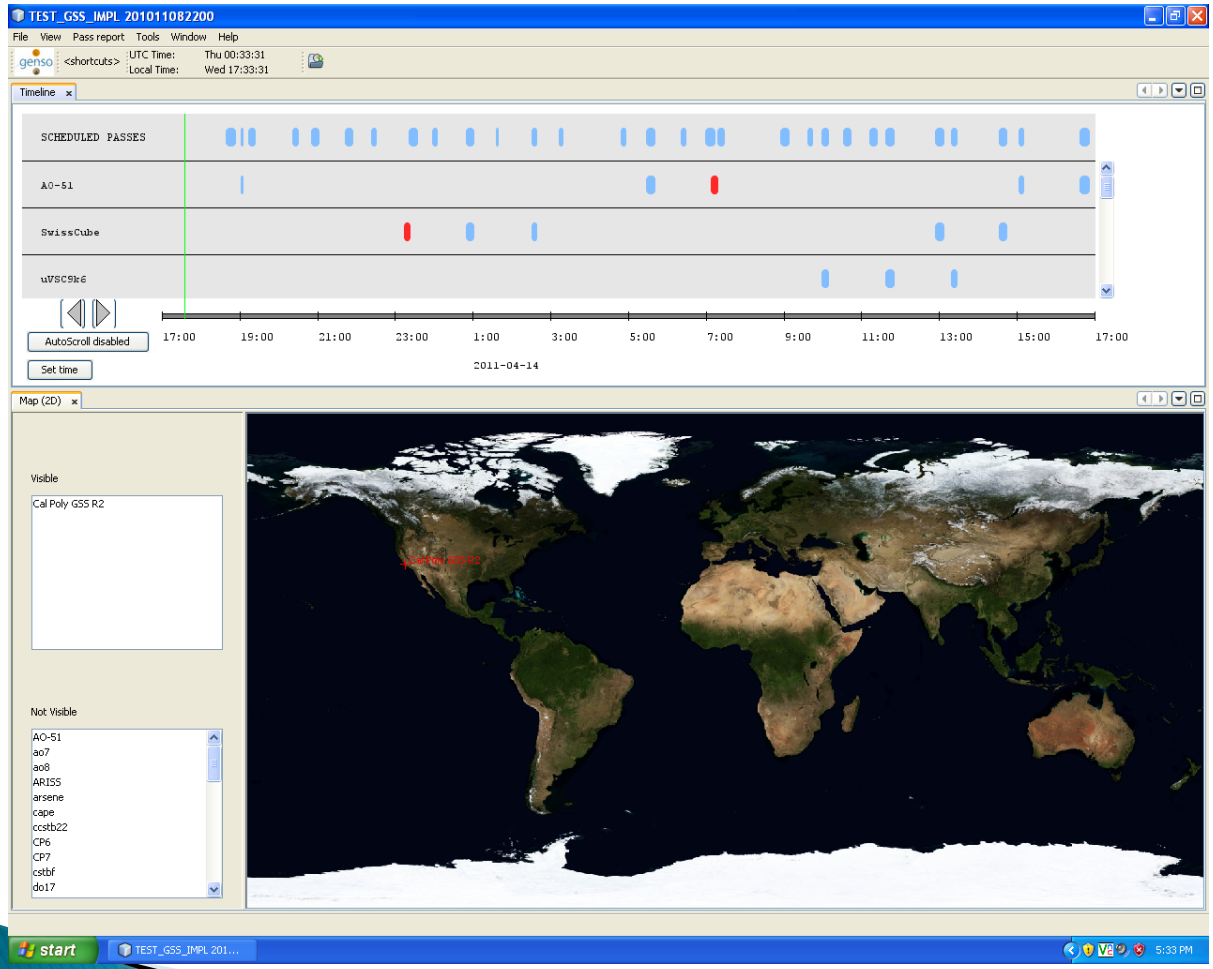


↑ GENSO stations passes providing telemetry services



↑ GENSO Stations Telemetry Support Time

R2 – Improved Capability



- Released in 2011
- Required major upgrades/fixes
- Rereleased in 2012
- Currently undergoing testing
- Plans for ESA to release this as open source soon

Summary

- R1 – Stable testing release
  - Successful proof of concept test
- R1E – Mission-support test release
  - Successfully supporting FASTRAC
- R2 – Currently being developed
- Beyond – Open-source release
  - Follows R2 completion
- Training sessions are available and limited assistance