Generic Payload Data Handling System functions and modules
- PADAPAR -

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All the space you need

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General presentation

- Define a generic architecture for future payloads:
  - matching mid-term needs
  - optimizing the development process through standard building blocks definition
  - Taking into account the ESA harmonisation dossier on payload data processing systems.
- Activities:
  - Survey of Payload Data Processing state-of the art and technology trends
  - Future needs estimation and trend analysis
  - Specification and Architecture
  - Demonstration platform definition
  - Development, Integration and Validation

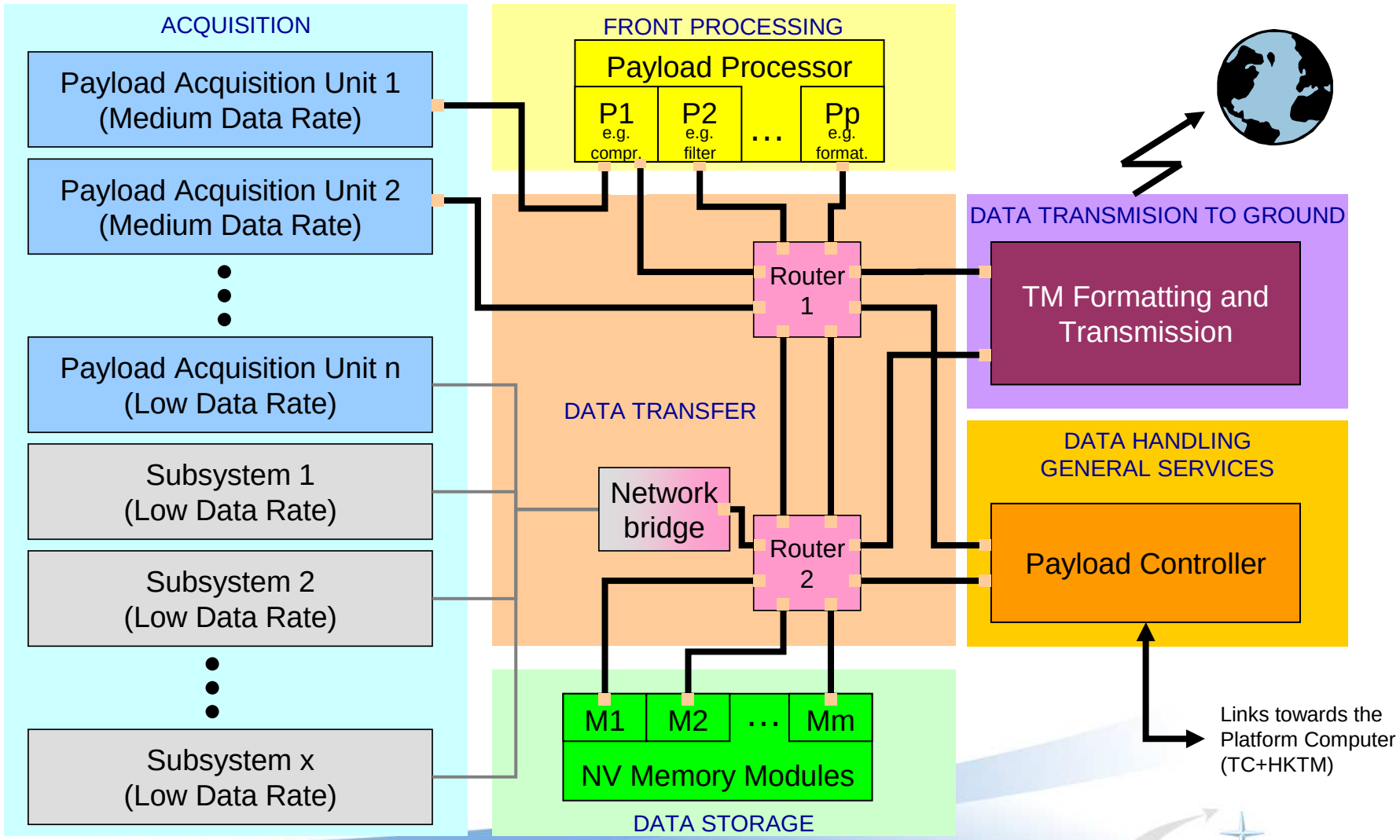
Functional architecture analysis

- Survey of recent and current payload architectures
  - GOCE, SMOS, PLEIADES, METOP, ROCSAT2/THEOS, AEOLUS, TerraSAR-X, Cryosat, SWARM, SPIRALE
  - Venus Express, Rosetta, LISA Pathfinder
  - Inmarsat, ANIK F1R
  - LOLA
- Projection of future needs
  - Proba-2, EarthCare, ExoMars Orbiter, BepiColombo, MSR Orbiter, Solar Orbiter, A3SYSDEF (Study for generic Avionics System Architecture in the frame of the AURORA programme for Mars Exploration)
- Definition of a list of standard building blocks and a reference architecture.

PADAPAR Building blocks

- ACQUISITION
  - Includes all analog functions which allow to acquire the analogue signal coming from the detector and convert it to digital.
- FRONT PROCESSING
  - Includes all processing functions used on the different payloads taken into account.
- DATASTORAGE
  - Includes all functions associated with the long term storage capacity of the payload.
- DATA TRANSFER
  - Includes all functions dedicated to the data transfer between the different modules & equipment.
- DATA TRANSMISSION TO GROUND
  - Includes all functions dedicated to the data transmission to the ground.
- DATA HANDLING GENERAL SERVICES
  - Includes all additional functions necessary to get underway the payloads.

Functional architecture mapping



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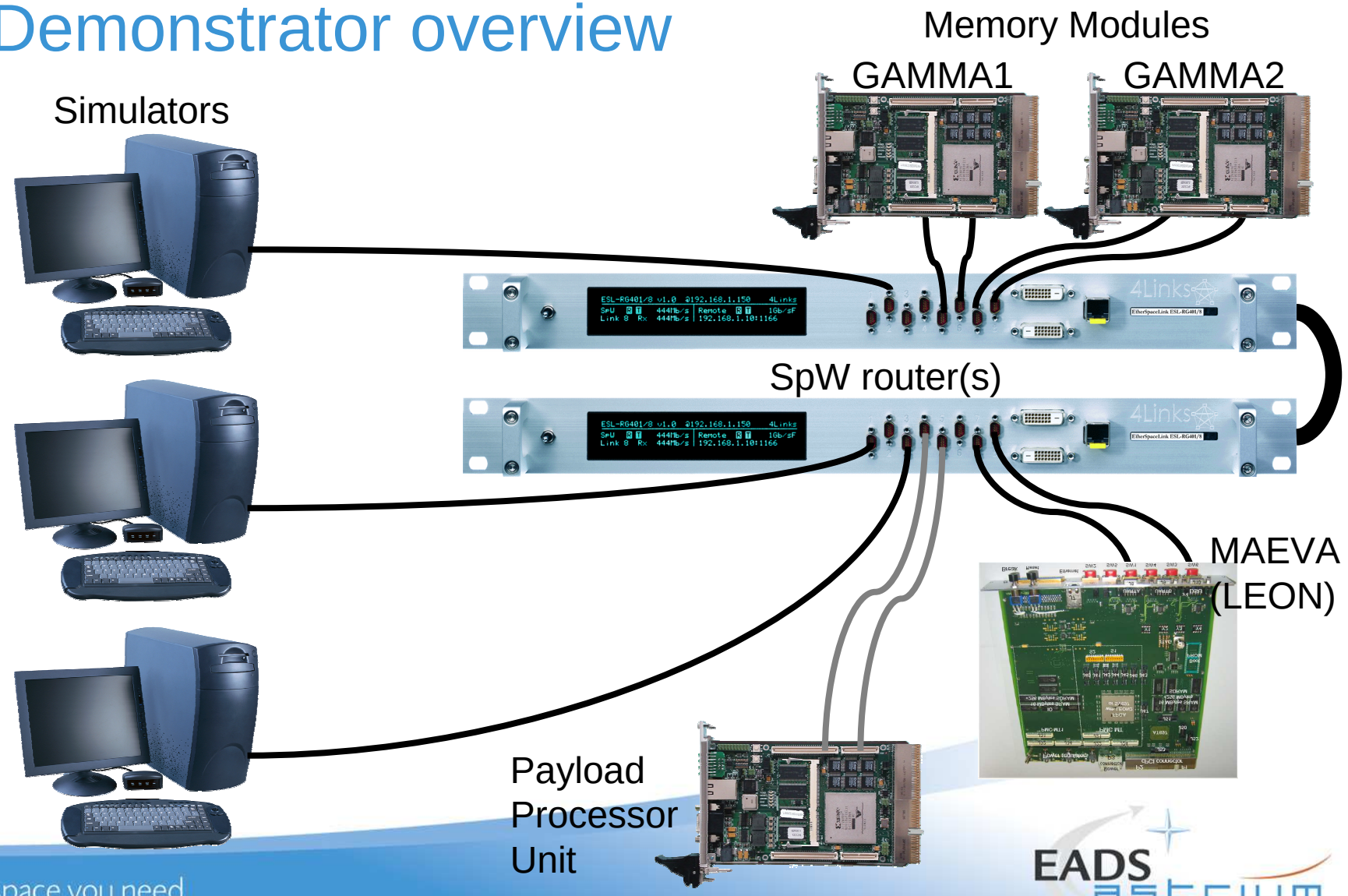
Demonstrator overview



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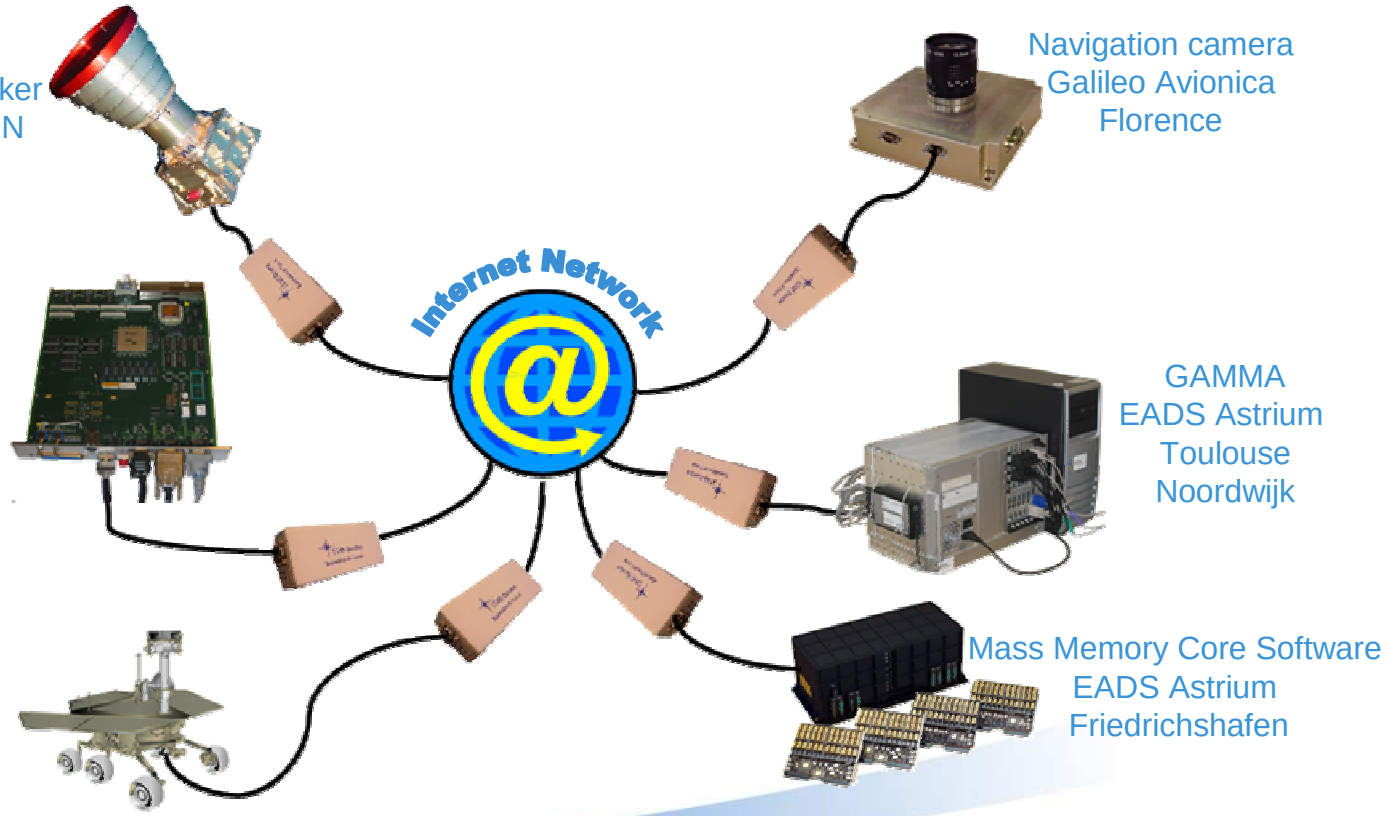
Demonstration plan

- SpaceWire Characterisation
  - Verification and initial performance characterisation
  - Influence of network topology
- Use case image processing
  - Definition of realistic traffic scenarios
- Use case mass memory access
  - Future development of Flash based Mass Memory File system (fast prototyping).
  - Support to fast prototyping
- Use case Payload Data Handling
  - Data management for payloads on-board applications (concurrent accesses)
  - Command/Control of payload applications
- Overall Integration
  - Execution of applications using different profiles.

TopNet Pilot Operation Implementation

- Use of SpaceWire on Ethernet for early functional integration is foreseen (ESA ITT).



Conclusion

- PADAPAR provides technical assessment for the consolidation of the ESA harmonisation dossier on payload data processing systems.
- PADAPAR provides support for fast prototyping and evaluation of payload data processing modular systems with:
  - New mass memory devices (e.g. GAMMA)
  - New Payload controllers (e.g. Leon based using Maeva)
  - New Payload processors (e.g. MDPA, AGGA-3, …)
  - New SpaceWire router (SPROUT)
- To target next missions:
  - BepiColombo
  - Sentinel
  - SolO
  - Aurora

Benefits of the architecture

- Scalable architecture that easily support add of modules.
- Support a step by step development process starting with applications running on simulator, ported on FPGA and integrated using EM.
- Uncoupled development and functional integration of modules eased by use of a decentralized approach (TopNet).
- Representative modules (simulators, Leon boards) support fast prototyping with relevant performance measurements.
- Space qualified Hardware components under development.