Space Telecommunication Interface (STI) Submission Discussion

Secure Network Communications (SNC WG)
Middleware and Related Services (MARS PTF)

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Agenda

- Recap of the Space Telecommunication Interface (STI) RFP
- Overview of STI submission from NASA Glenn Research Center

Submission Team

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Space Telecommunication Interface RFP

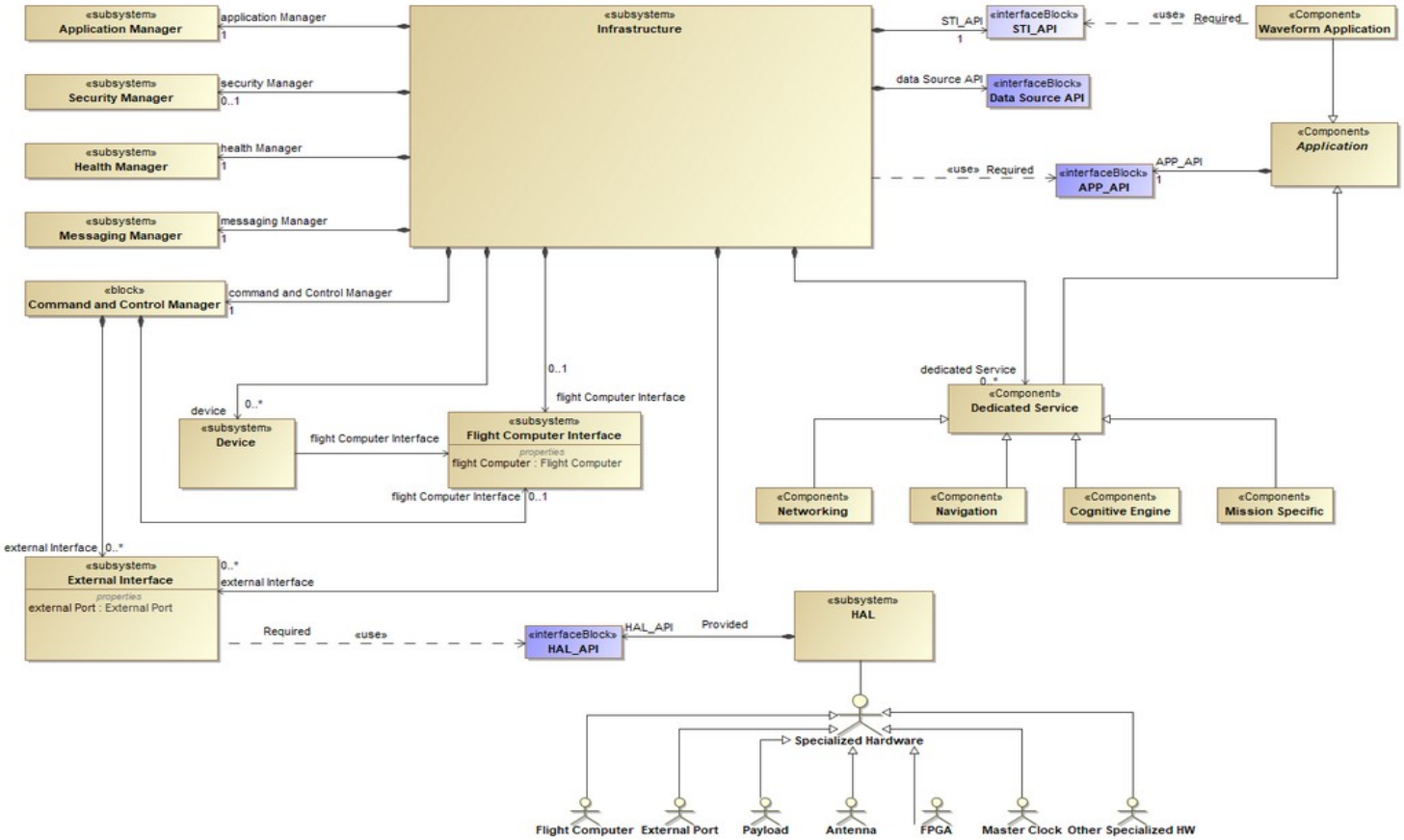
- Published as OMG document mars/19-09-21
- The objective of this RFP is to expand the PIM and PSM for the Software Radio Components Specification to support space communications.
- Seeks to address areas where existing SWRadio specification does not address key communications and platform requirements imposed by the space domain sufficiently, for example:
  - Spacecraft Resource Constraints,
  - Radiation Suitable Processing,
  - Reliability and Availability,
  - Specialized Signal Processing Abstraction,
  - Static Deployment,
  - Long Mission Development Times,
  - Space-Specific Waveforms.

Space Telecommunication Interface (STI) Proposal

History

- A predecessor to this STI specification was developed by NASA as part of a technology demonstration of software-defined radio technology.
  - The intent was to improve the return on investment in software development by allowing the related components to be deployed in more than one project/mission without incurring significant additional development time
  - A “lightened” framework based on/inspired by SWRADIO (SDRP) and Software Communications Architecture Specification (SCA)
- NASA has performed significant testing/validation on real space applications
  - Deployed and tested on the SCaN Testbed on the International Space Station
  - Lessons learned over a decade of testing and waveform development was fed back into NASA-STD-4009A, on which this proposal is based

STI System Architecture Overview



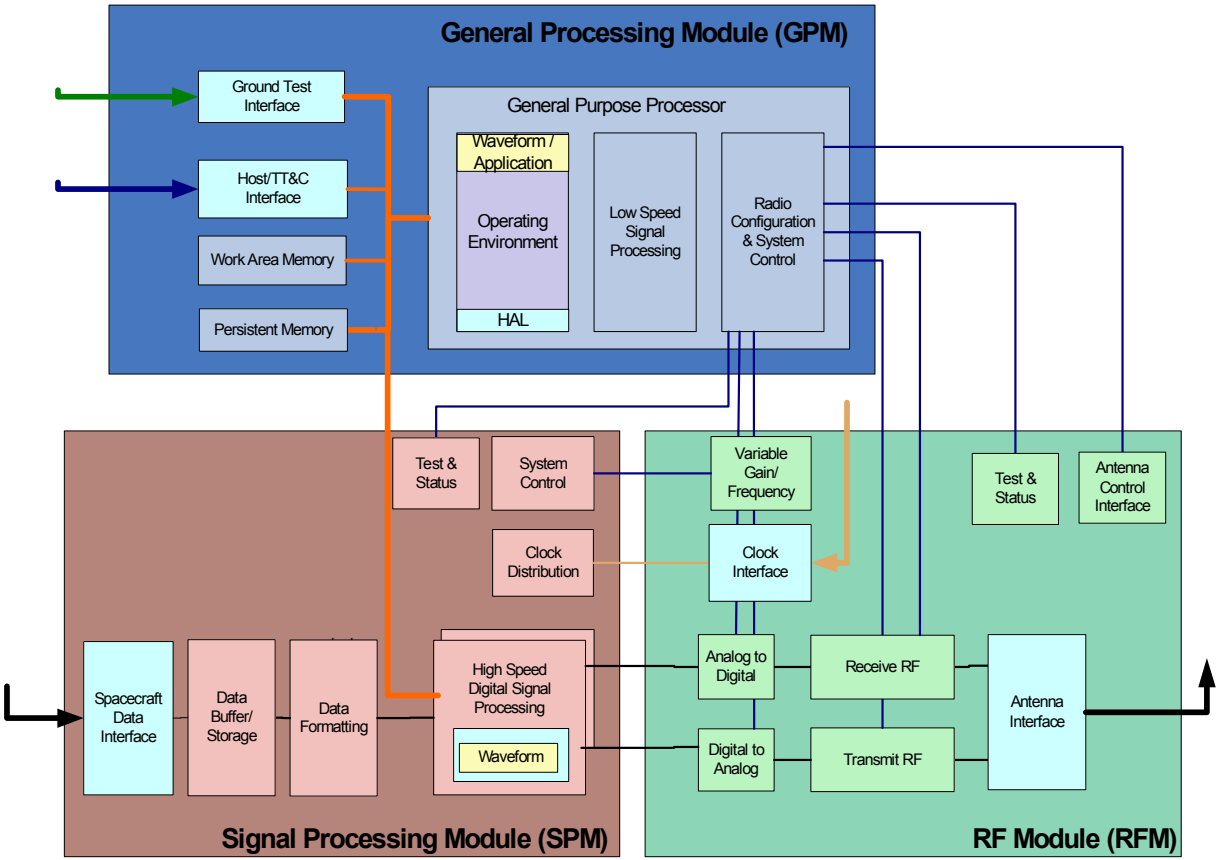
System Architecture

- STI defines the various roles and responsibilities of the stakeholders
  - Defined roles and integration points allows for more parallel development efforts, vendor independence
- Emphasis is different for different system roles
  - Some aspects focus on a specific interface (e.g. Software API) to ensure portability
  - Other aspects focus on documentation of system capabilities rather than a prescribing a specific set
- This approach allows some component re-use while still allowing the overall system to be tailored to the specific deployment environment and requirements

STI Overview – Hardware Architecture

STI defines fundamental blocks of a generic SDR platform

- GPM hosts the control plane
- SPM hosts the data plane
- RF module provides the radio interface



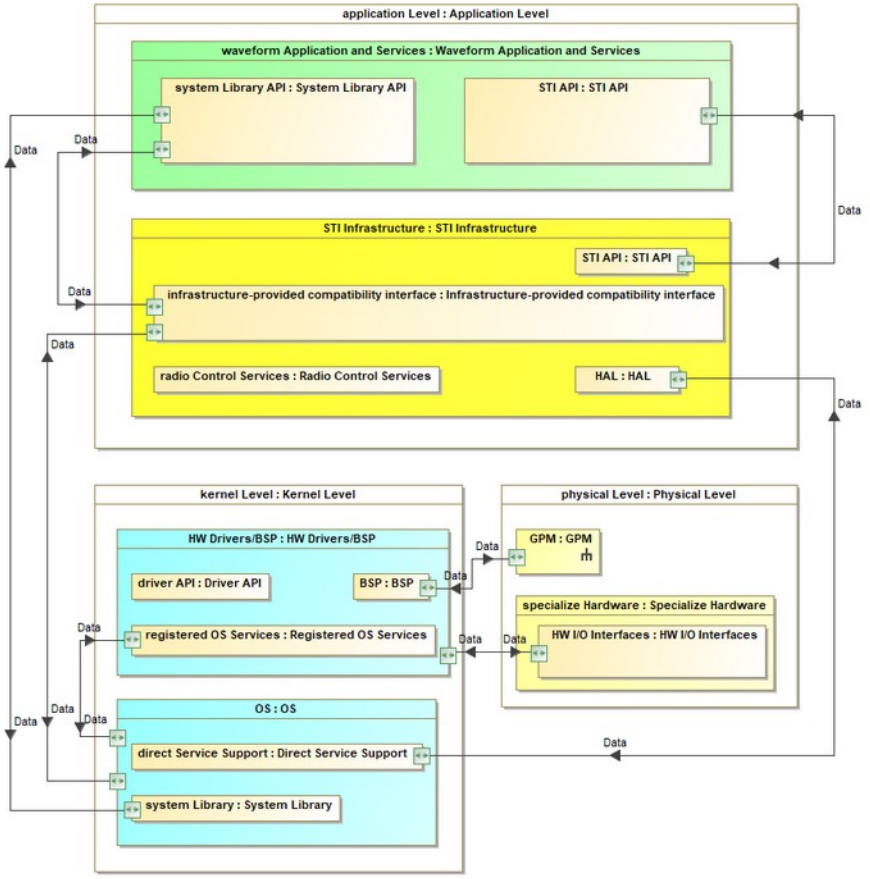
STI Software Operating Environment Model

Proposal prescribes specific API requirements for items between the STI Infrastructure and waveform/application services layers

- Allows portability of software elements between different OE implementations

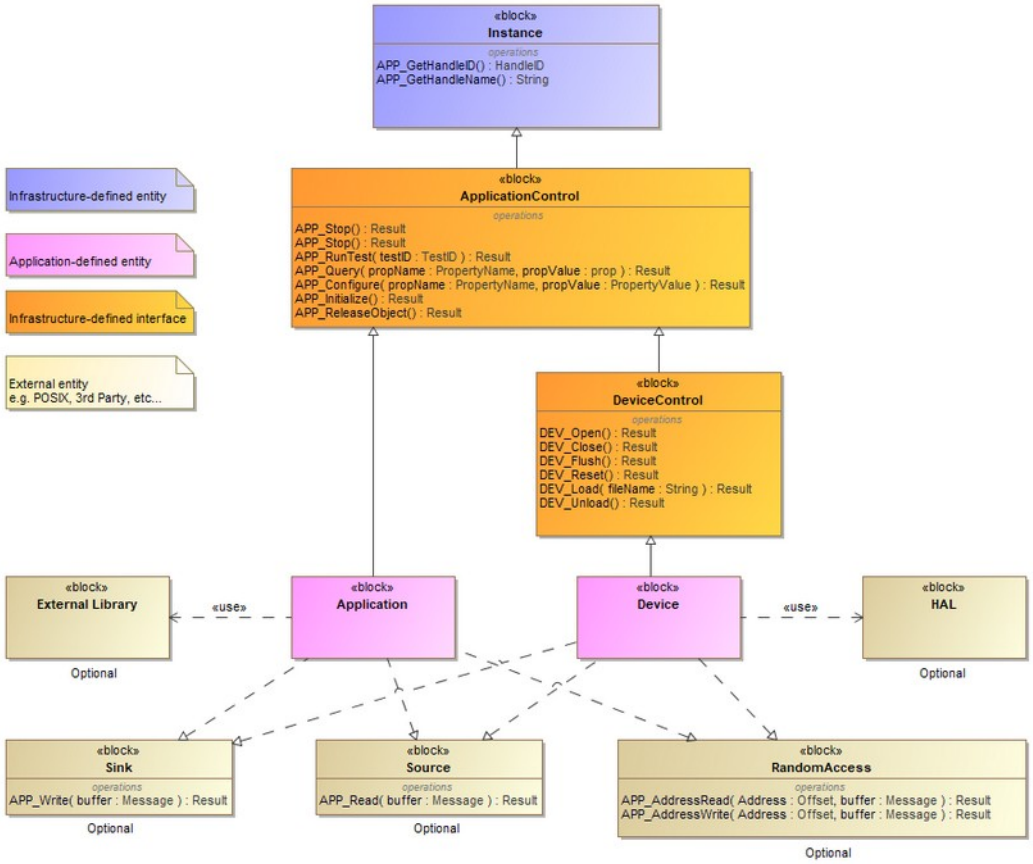
Proposal prescribes documentation requirements for layers below the STI Infrastructure

- Specialized hardware and hardware system limitations/capabilities defined in vendor-supplied documentation.



STI Application Software Interface Structure

- Proposes a SW Interface structure similar to existing SDR standards (NASA STRS, SWRADIO, SCA)
- Software written for these other environments should be usable without extensive rewrites or refactoring



Compliance Points (from RFP section 6.5.2)

1) Standard interfaces for control, management and status retrieval of the subsystems.
   - Provided in section 10.6 of proposal (STI API), Subsystem lookup APIs defined in 10.6.1.2, various control and management APIs defined in 10.6.2.
2) Control interfaces with functionality to control the synchronization of subsystems.
   - Specialized device control in section 10.6.3, Generic Messaging, Event Publish/ Subscribe, Logging, Time sync APIs defined in sections 10.6.4 – 10.6.8
3) Interfaces that allow setting and querying parameters defined in the hardware abstraction of subsystem elements.
   - PropertySet interfaces defined in section 10.6.2.3
4) Application interfaces and related metadata defined separately for each subsystem.
   - Application interfaces defined in section 10.5 (Application and Device Control Interface)
   - Proposal dictates that each subsystem/instance has separate objects in memory, separate properties and property definitions

RFP Items not fully addressed in Proposal

Networking (RFP section 6.5.3)

- STI is primarily defining a system architecture and control plane and is agnostic to the data plane
  - Any type of underlying network routing/structure could be accommodated while still complying with the architecture
  - Scheduling, intermittent connectivity can all be handled via applications/waveforms running in the environment

Security (RFP section 6.5.4)

- A security manager is part of the overall architecture but the specific role is not defined in the PIM
  - Different SDR deployments have different security requirements
- Architecture does allow for each waveform to be executed in a “secure enclave”
  - OE may provide isolated/containerized environment, validate all I/O operations, etc.
  - Transparent to applications and does not change the general system architecture

Questions and Answers