



Small Payload Ride Share Symposium

Hosted Payloads Session – CII Project

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What is CII (Common Instrument Interface)?

- NASA's Earth Science Division (ESD) will be developing secondary payloads under the Earth Venture Instrument (EVI) AOs. These Earth Science instruments will need to be matched up with Hosting Opportunities (Ideally, by PDR).
 - So, how can this matching be improved?
 - If these Earth Science instruments have common instrument to S/C interfaces then there would be a better possibility for this matching to occur.

Goal:

- To develop a set of Common Instrument Interface (CII) guidelines for Secondary Earth Science instruments that will improve the match up with Hosting Opportunities and reduce instrument to spacecraft interface complexity.
 - Reduces the number of unique Interface Control Documents (ICDs)



Products: *Hosted Payloads Interface Guide (HPIG) for Proposers.*

- Public document
- NASA and the Air Force (AF) Hosted Payload Office (HoPS) share information and the AF has a technically identical document.
- A Host Opportunities Database
 - <https://cii.jpl.nasa.gov/>
- CII Web Page:
 - <http://science.nasa.gov/about-us/smd-programs/earth-system-science-pathfinder/common-instrument-interface-workshop/>

Goal:

- To develop a set of CII guidelines for Secondary Earth Science instruments that will improve the match up with Hosting Opportunities and reduce instrument to spacecraft interface complexity.
 - This will also reduce the number of unique ICDs



Approach

- A NASA CII Team was formed to work with industry, academia, and other government agencies to see how instrument interface guidelines could be developed to understand the key drivers that help or hinder the matching of these secondary payloads.

Team Determined

- Which interfaces could be common or cannot be common
- If an interface cannot be common, then look at additional options
- Best Practices guide was created to help developers during implementation



Approach (cont'd)

- Host CII Workshops once a year to receive feedback on the guide's revisions
- Participate in Satellite and Hosted Payload conferences.

Workshop #3

- Conducted at Satellite 2017 Conference (Washington, D. C. Convention Center)
- Provided summary of changes from originally signed version of HPIG to current version



Contents of *HPIG*:

Provides a prospective Instrument Developer with technical recommendations to assist them in designing an Instrument or Payload that may be hosted on commercial satellites flown to Low Earth Orbit (LEO), or Geostationary Earth Orbit (GEO).

- **Easily hosted payloads exhibit the following characteristics:**
 - Well-defined interface and mission requirements
 - Simple interfaces to minimize integration complexity
 - On-time delivery to the host with no impact to satellite integration and test (I&T) schedule
 - Operations decoupled from host satellite operations



Development team for *HPIG* used:

- Personal engineering experience
- Publicly available information
- Information provided by industry to define the primary technical components of this document and to establish its content
- Stakeholder feedback and numerous peer review workshops to guide efforts, established appropriate levels of breadth and depth of source material as a means to generate a general all-encompassing guidelines document



Development team for *HPIG* used:

- Interface guidelines generally prescribed by the **most restrictive** values from the set of likely spacecraft known to operate in both the LEO and GEO domains.
- Characterized environments, whereby the most strenuous environment expected in both the LEO and GEO domains inform this guide.
 - HPIG document team based environmental guidance on independent modeling of particular LEOs that are commonly considered advantageous in supporting Earth science measurements.



How to Use the *HPIG*:

- Document is **guidelines document only**.
- It is **not** a requirements document! The content of this document represents recommendations, not requirements, and should be used as interface design guidelines only by the proposer.
- Should be used primarily for **pre-proposal and proposal efforts**. Once a user has determined a host spacecraft opportunity, then they will interface with the host spacecraft project for specific design and interface accommodations.



How to Use the *HPIG*:

- Conformance will enhance the “hostability” of the payload to a commercial satellite host.
- These guidelines are not meant to replace Instrument Developer collaboration with Spacecraft Manufacturers, rather to provide familiarity of Spacecraft interfaces and accommodations in order to assist with such collaboration.
- Instruments that do not comply with guidelines specified in this document can be accommodated with additional resources



How to Use the *HPIG*:

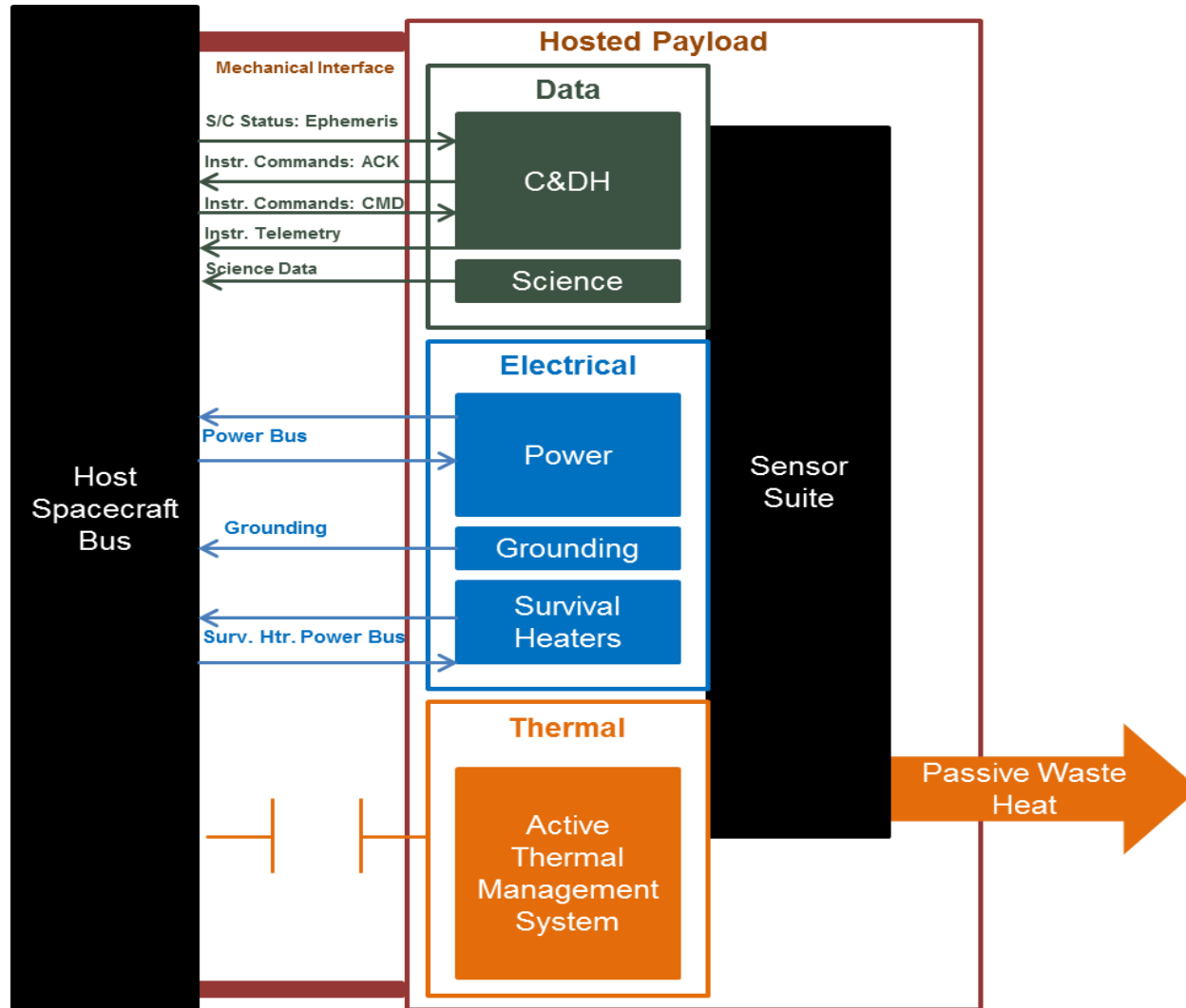
- One limitation of the “all-satisfy” strategy is that it constrains all instrument accommodation parameters to a greater degree than might be expected once the Instrument is paired with a Host Spacecraft.
- One size does not fit all in Hosted Payloads.
- Spacecraft Manufacturers tailor their bus design to each Satellite Operator’s requirements, which may allow Instrument Developers to negotiate an agreement for a larger bus or upgraded spacecraft performance than originally specified for the Satellite Operator.



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Hosted Payloads Interfaces





HPIG Contents:

For GEO AND LEO:

- *Assumptions*
- *Hosted Payload World View*
- *Mission Risk*
- *Instrument End of Life*
- *Prevention of Failure Back-Propagation*
- *Data Guidelines*



HPIG Contents (cont'd):

For GEO **AND** LEO:

- *Electrical Power System Guidelines*
- *Mechanical Guidelines*
- *Thermal Guidelines*
- *Instrument Models*
- *Environmental Guidelines*



HPIG Contents (cont'd):

- *Acronyms*
- *Reference Documents*
- *Units of Measure and Metric Prefixes*
- *Appendices, including:*
 - Hosted Payload Concept of Operations
 - Analysis for LEO and GEO Guidelines
 - Instrument Modes
 - Examples of Data Deliverables for Verification
 - Examples of Payload-Provided Hardware and Associated Tasks



Back-up Charts