Hosted Payloads Interfaces

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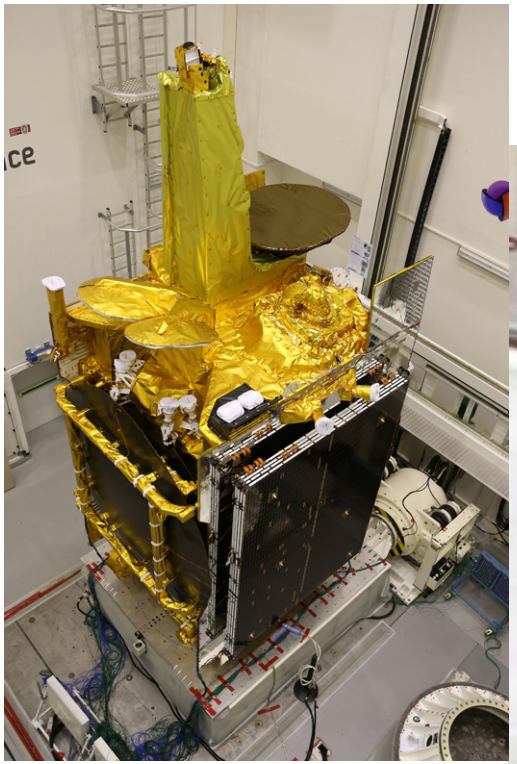
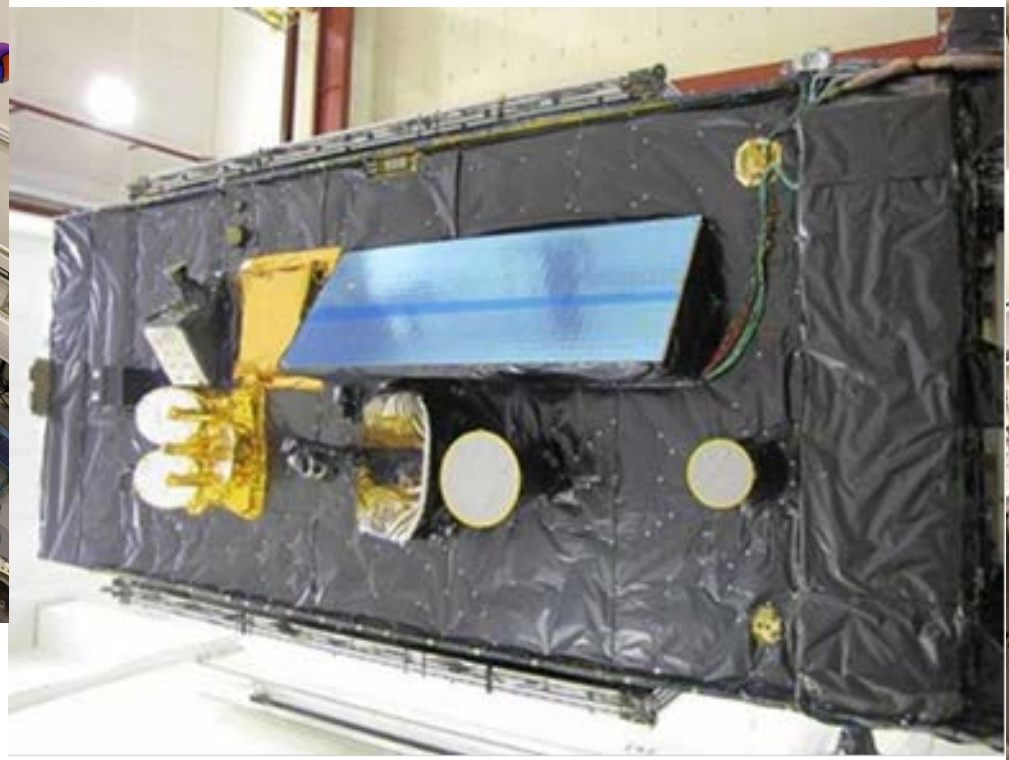
Some of our recent Hosted Payload programmes



Eutelsat 9B /
EDRS-A



Alphasat /
ESA hosted payloads

SES Astra 5B /
EGNOS

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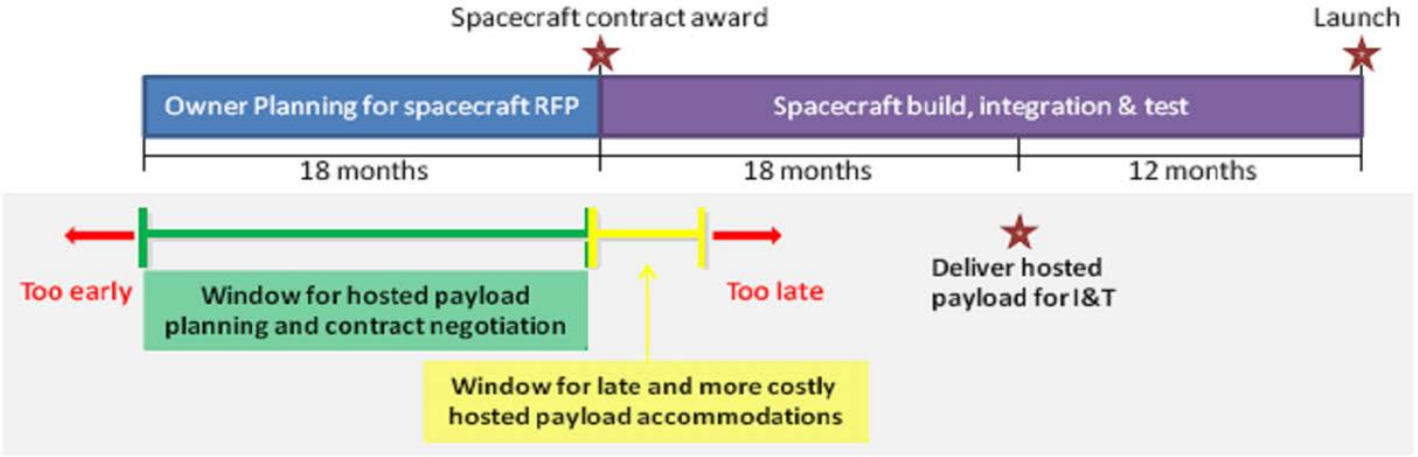
Technical and schedule drivers to make hosted payloads a success

Some key design drivers for the hosted payload

- **Do No Harm principle**
- **Key interface requirements**
  - Hosted payload TC/TM and image telemetry
  - Data bus interface
  - Attitude and jitter control
  - Thermal control

The hosted payload has to meet the commercial schedule



Indicative schedule
May be faster

(Courtesy of NASA)

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Interface standard

More and more missions are implemented using standard platform and avionics products

Extra capacity allows for complementing the main mission with secondary payloads

Hosted Payload is a step further
=> HP Interface Requirement Document

SeoSat/Ingenio

The HP IRD constitutes the foundation of a successful hosting

- Develops the Do not Harm principle
- Let some other points open to discussion

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International efforts

Some efforts have been done in the U.S.A to standardize hosted payload interfaces

NASA CII guideline document (Common Instrument Interface)

AFSPC/SMC HoPS IDIQ with its HPSIS document (Hosted Payload Standard Interface Specification)

Both documents available on the web.

Hosted payload interfaces are also discussed in working groups in the following forums

- SUMO (Space Universal Modular architecture)
- CSIS (Consortium for Space Industry Standards)

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Airbus DS way forward

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Airbus DS has been selected by the European Commission (H2020) to promote IOD/IOV opportunities as hosted payloads on commercial satellites

Currently in grant preparation phase

- Standardization of hosted payload interfaces

- Website and call for ideas in 2015.

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HP IRD themes (avionics)

Various interface standardisation areas

Several possibilities per area

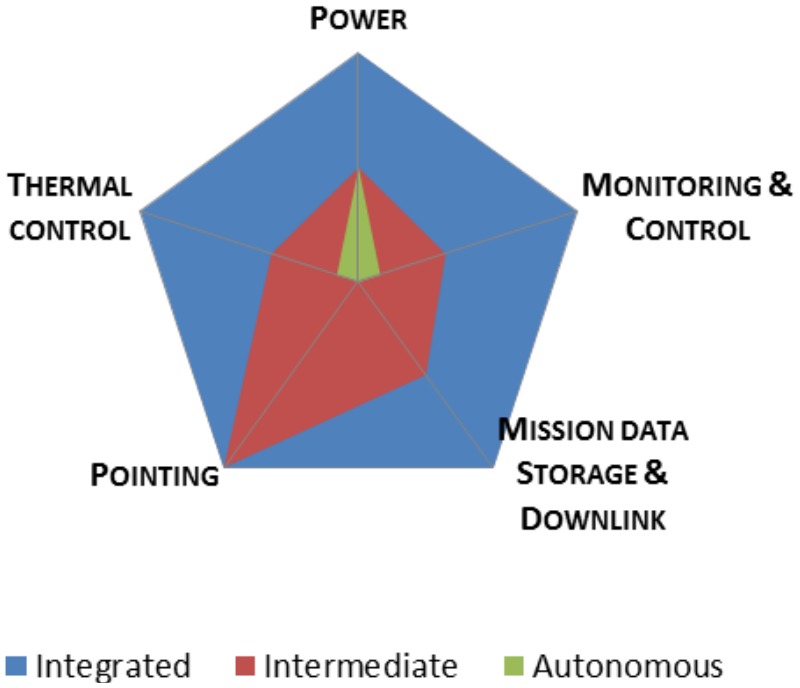
Various HP interfacing schemes

Drive the HP complexity, number and location of avionics interfaces, verification efforts

Do not Harm principle

Conducts to physical segregation and interface securization,

Possibly requires additional interfaces



Level of platform service

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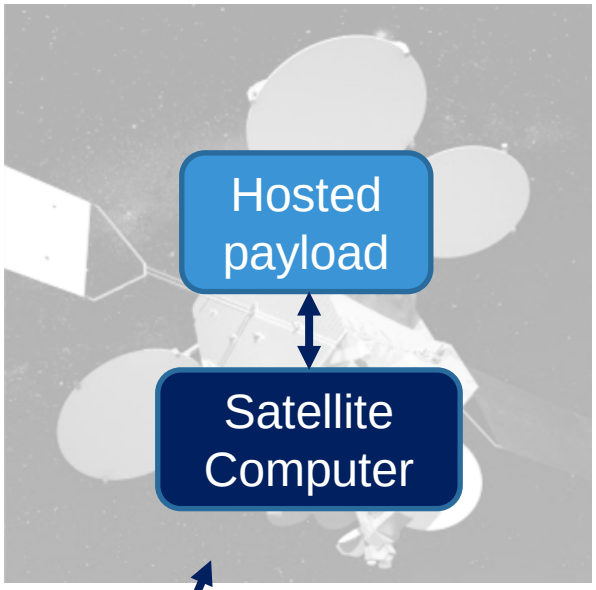
Possible TM/TC architectures for hosted payloads

First possible option : Hosted payload operations through the Satellite Control Centre

- Cost effective

But

- Cyber-security may become an issue (depending on the nature of the HPOCC-SOCC link)



Hosted Payload Operations Control Center

(courtesy ESA)

Satellite Operations Control Centre

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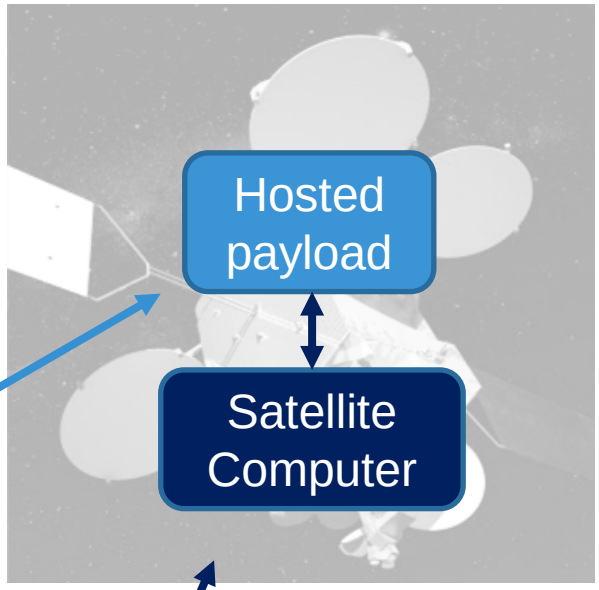
Possible TM/TC architectures for hosted payloads

Second possible option : Hosted payload operations through dedicated TC/TM link

- Better segregation

But

- Increases the cost and mass of the hosted payload (and requires spectrum rights from satellite operator)



Hosted Payload Operations Control Center

(courtesy ESA)

Satellite Operations Control Centre

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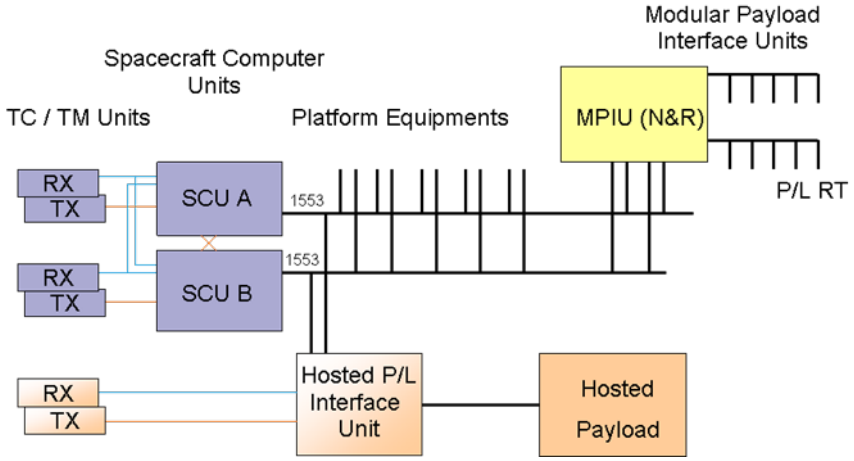
Interface control

Connecting the hosted payload on a spacecraft data bus may require additional segregation to prevent failure propagation (HPIU for ex.)



One possible architecture

HPIU benefits

- Decoupling the HP from the platform
- Bridging standard PF product to standard/non-standard PL
- Providing operational services & resources to HP

… may be considered a common building block

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High speed science telemetry in GEO

GEO instruments hosted on commercial spacecraft may require to download « science » or observation telemetry at rates about 100 Mbps typically.

Various options are available, including :

- Implement a dedicated RF chain (Modulator, Amplifier, Antenna) : extra cost and mass, requires frequency rights from Satellite owner
- Rent a transponder channel from the main payload (modulator to be provided by Satellite. Manufacturer)

Solution driven by economic terms

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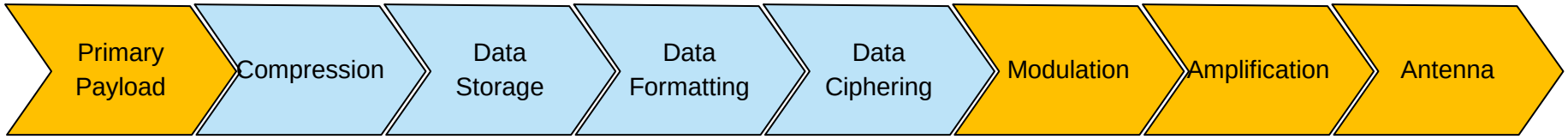
HP mission data storage & downlink in LEO



Option to open an access to the Payload Data Handling Unit

Mission Mass Memory interface concerns

- Compatibility rules
- Memory allocation scheme
- Organisation of the data in memory
- Memory management
- Physical interface & access protocol

Data downlink concerns

- Full segregation (physical channel or downlink session)
- Shared session with allocation scheme

A very basic service may be considered (transfering all data management tasks to the Ground).

Pointing performance

Commercial Communications satellites are usually less constrained in pointing performance than Science or Earth Observation missions

Typical requirements which need to be assessed when accommodating an instrument on a satcom bus :

- Pointing performance
- Pointing stability
- Pointing knowledge
- Jitter control

Acceptable solutions are usually agreed after technical discussions between the hosted payload designer and the satellite manufacturer.

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Concluding words

HP interface concerns

Do not Harm principle

Some degree of flexibility to leverage the opportunities

HP interface standard should reflect these concerns

Happy to answer your questions.

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