



Introduction to SpaceWire Backplanes 23rd March 2011

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SpW backplanes



The aim of this presentation is to answer 4 questions:

1. What is a backplane?
2. Why do we need a SpW backplane?
3. What are SpW passive and active backplanes?
4. Who benefits?

1. What is a backplane?



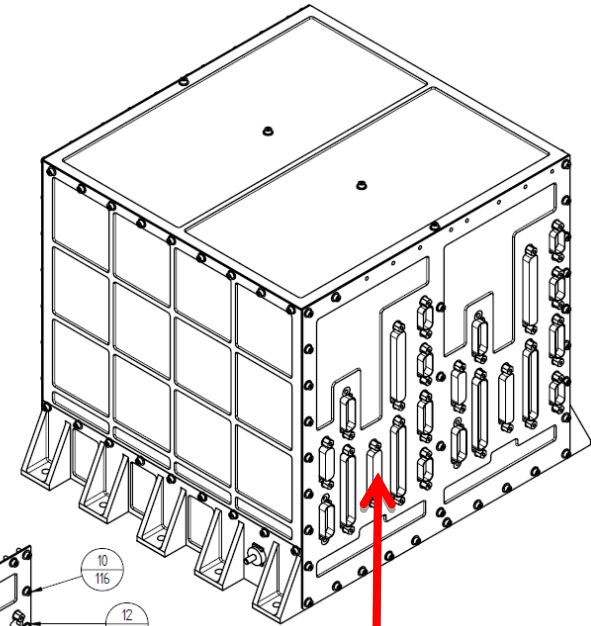
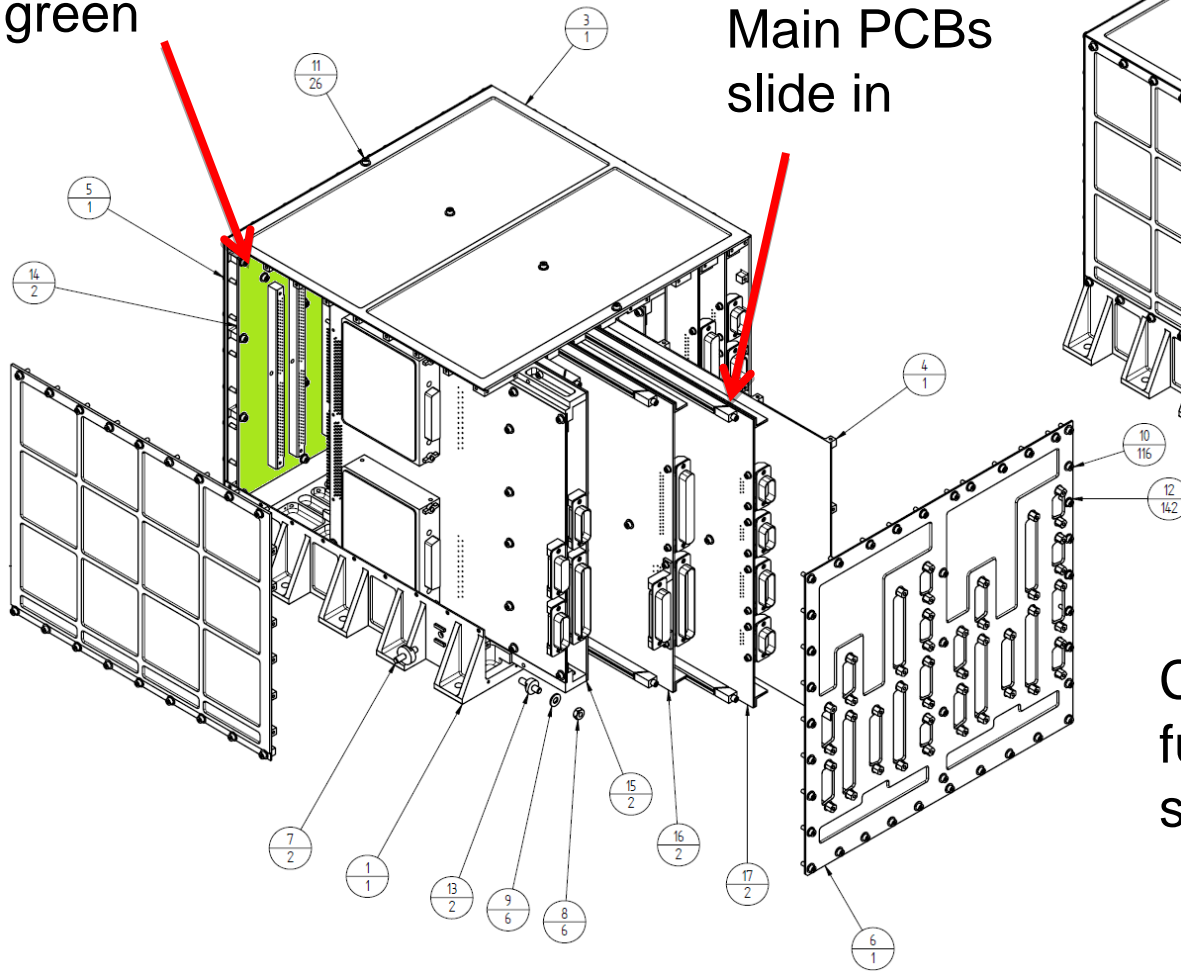
- Spacecraft electronic systems are typically composed of a number of units connected together using harnesses
- The units usually contain more than one printed circuit board for:
 - Power conversion to produce unit internal voltage rails
 - Processing – usually a microprocessor running software
 - Mass memory
 - Interfaces to command/data busses, sensors and actuators
- The boards need to be electrically linked inside the unit
- It is convenient for assembly, integration and test if the boards are “plugged” into the unit
- The backplane is a circuit board that links the boards together

Backplane within a unit



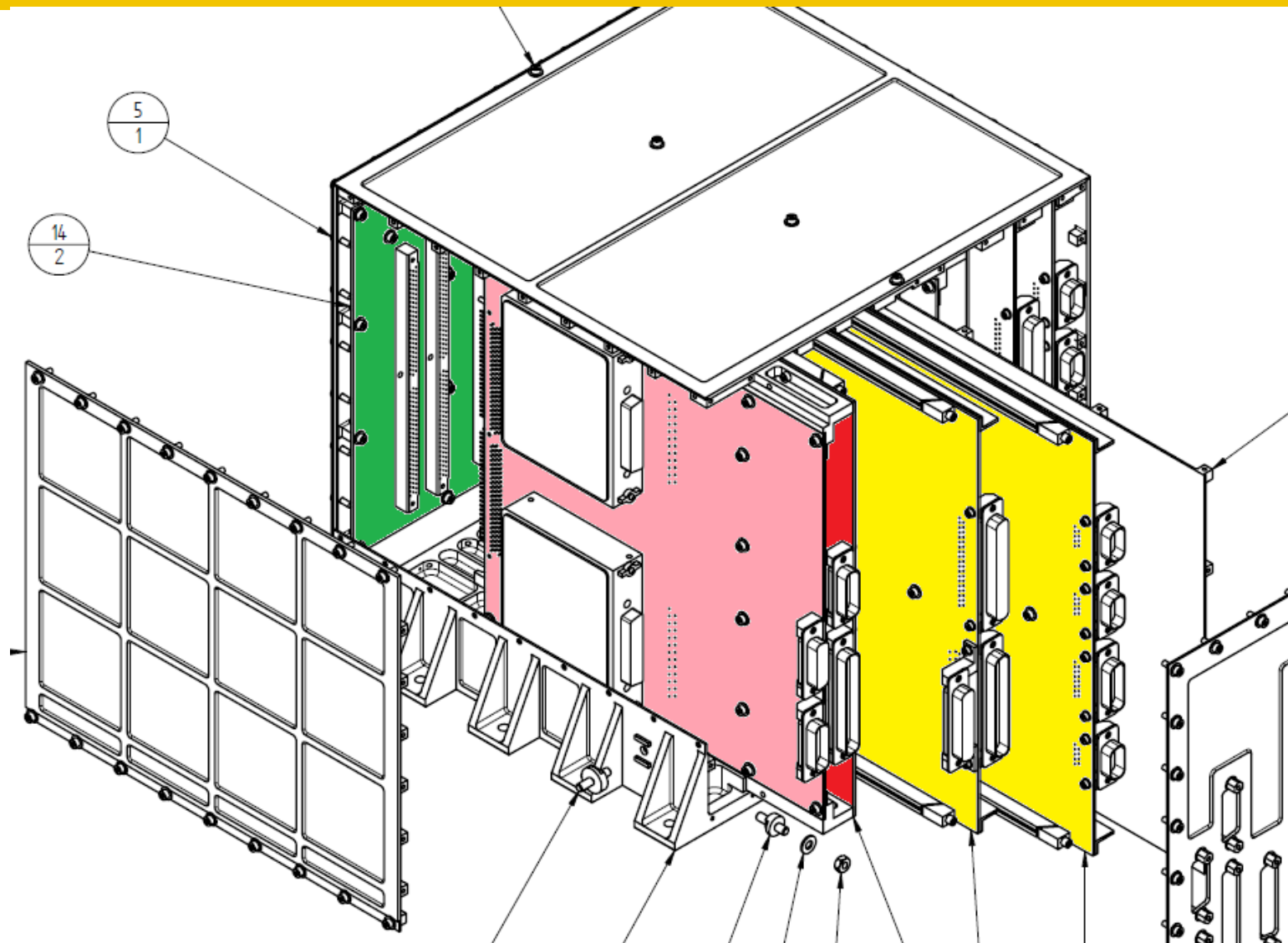
Backplane highlighted in green

Main PCBs slide in



Connectors to other functions (power bus, sensors, actuators etc)

Module interface to backplane

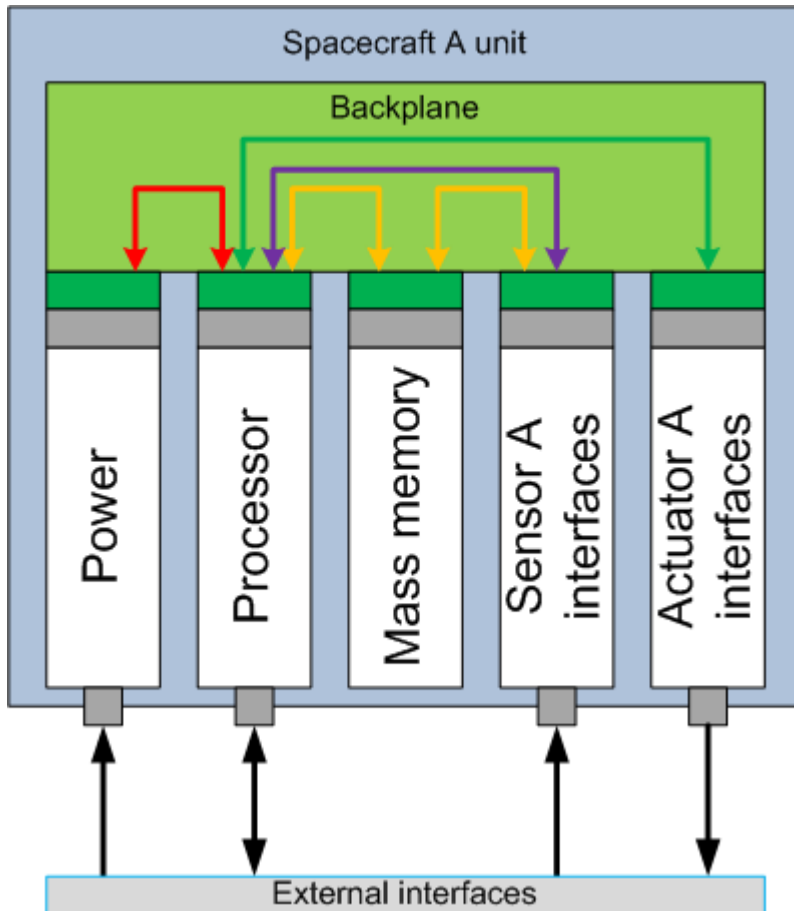


2. Why do we need a SpW backplane?



Spacecraft A unit:

- Modules designed specifically for the mission
- Backplane connects different modules via **different electrical interfaces** (to simplify design)
- Processor supports all backplane interfaces



Typical backplane interfaces



- Power
- Discrete on/off lines
- Address lines to control multiplexers
- Periodic, pulse or PWM signals
- Parallel busses to ADCs and DACs
- Serial busses to ADCs and DACs
- Miscellaneous control and status monitoring signals
- Etc
- Etc

Adaption for Spacecraft B

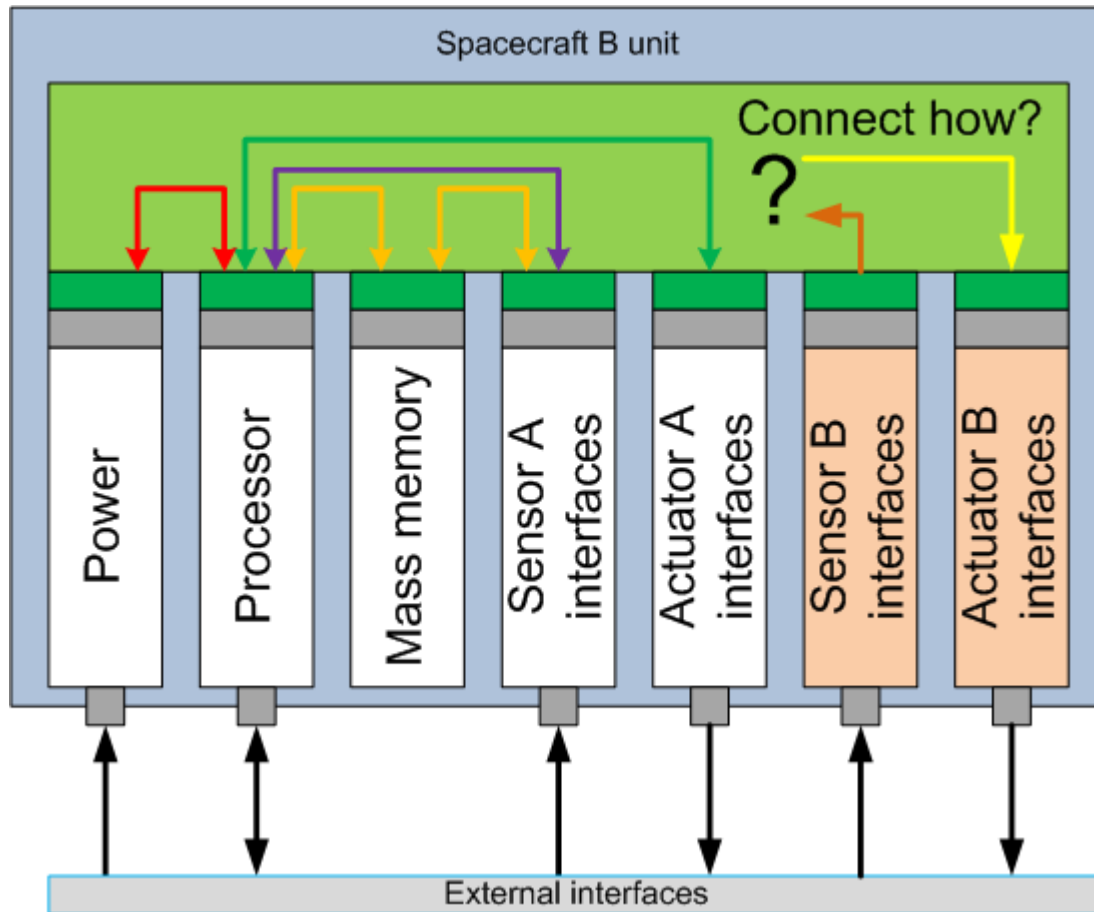


- For the next mission we need a new unit for “Spacecraft B” that is similar to “Spacecraft A”, but the unit needs additional interfaces (or mass memory etc)?

This raises some new questions:

- Can we re-use existing Spacecraft A hardware?
- What do we need to re-design?
- Can we interface with modules from another supplier who has already developed designs for the additional interfaces?

Spacecraft B unit



We must re-design:

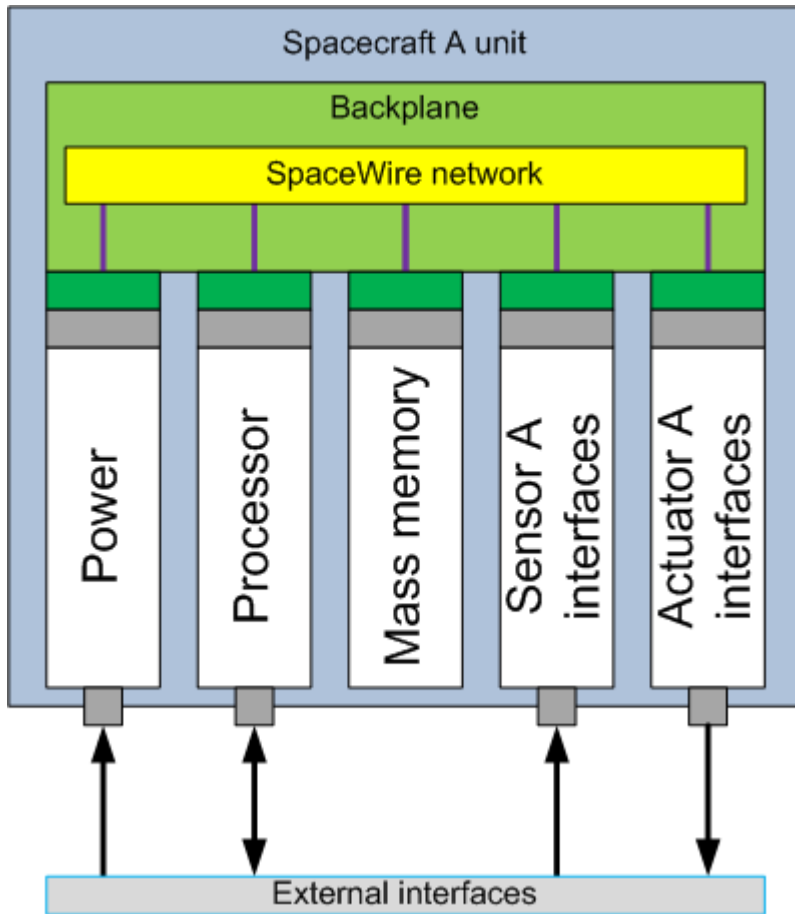
- Backplane
- Processor backplane interfaces
- Mass memory backplane interfaces

If modules are available from another vendor, it is likely the interfaces will be incompatible!

The solution.....

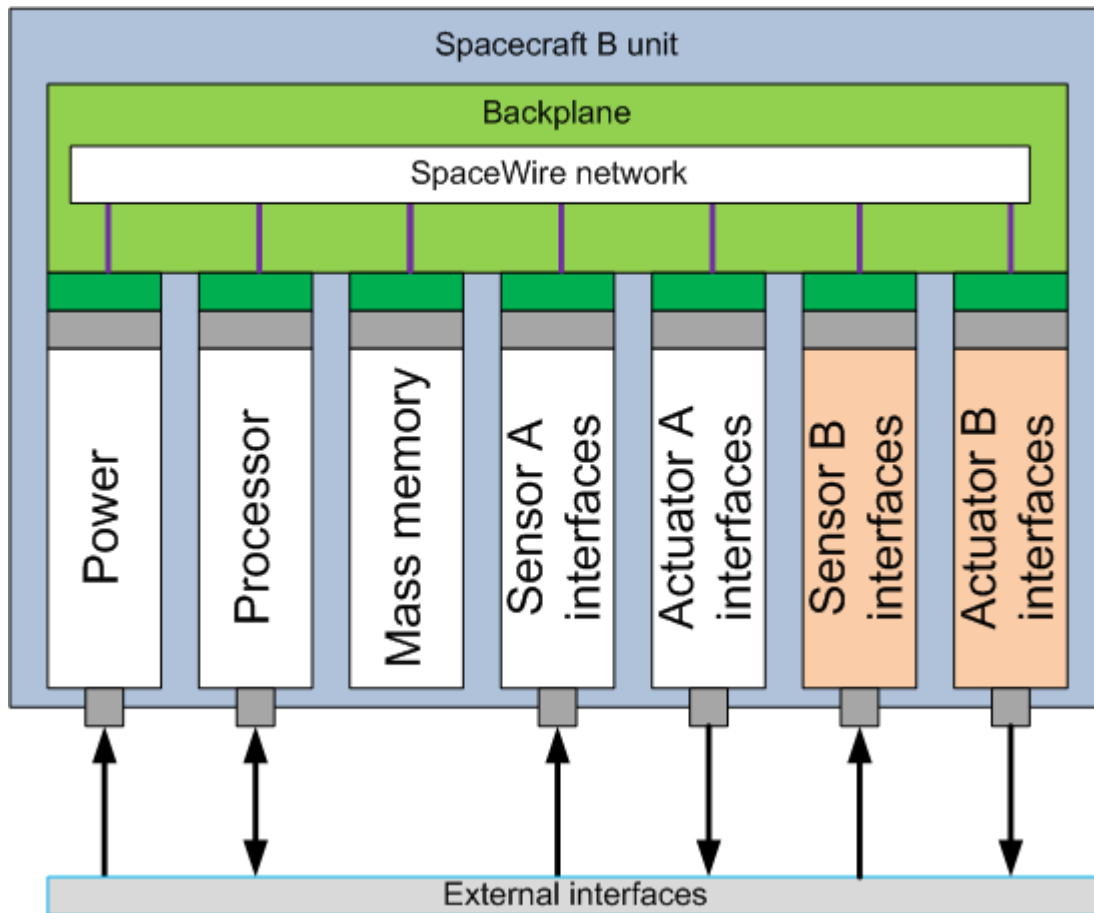


A SpW Backplane is the solution!



- Modules may be designed specifically for the mission but have the capability for re-use
- All modules connected via a SpW network (this can be an active or a passive SpW backplane)

Migration Spacecraft B is easier!

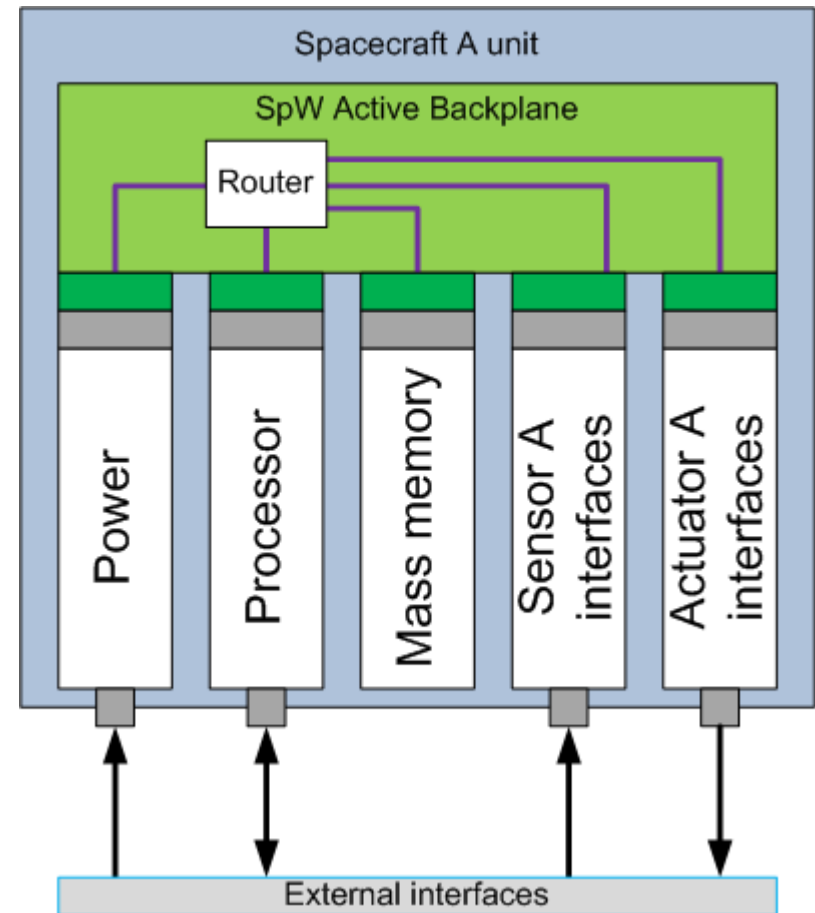
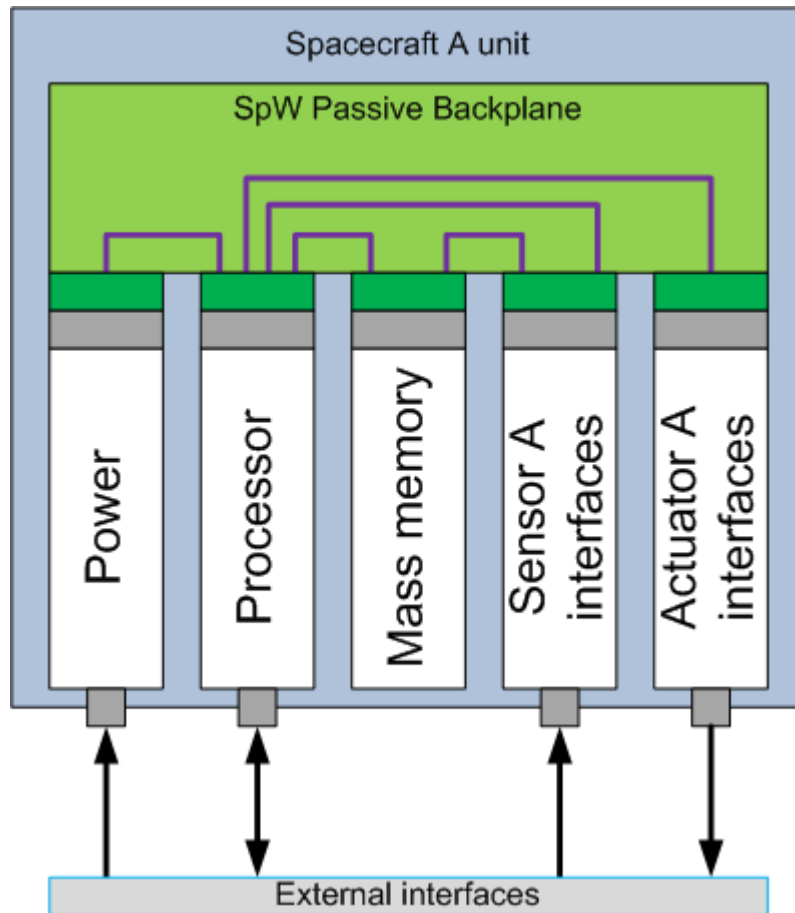


Backplane extended to add more SpW interfaces

If modules are available from another vendor, the interfaces will be electrically compatible!

Software extended to support new modules.

3. What are SpW passive and active backplanes?



4. Who does it benefit?



- The unit system designer – re-use of well specified and understood interfaces
- The hardware designer – interface well defined, possible design re-use
- The software designer – common user interface, software re-use
- Module tester – common backplane interface test equipment to debug module, other modules can be emulated
- Integrator – test equipment available to monitor SpW traffic and emulate module functions
- Unit tester – monitoring backplane traffic is possible

Further questions?



- The original questions have been answered, ie:
 1. What is a backplane?
 2. Why do we need a SpW backplane?
 3. What are SpW passive and active backplanes?
 4. Who benefits?
- Any questions from the audience?