COMPASS

The COMPASS OBC, paving the way to a centralized avionics architecture

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adcss → 10th ESA WORKSHOP

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Typical key drivers of a space system

- ❑ Mass ?
- ❑ Volume ?
- ❑ Power ?
- ❑ Performances ?
- ❑ Schedule ?
- ❑ Cost ?

What are the key drivers of New Space ?

- ☑ Mass
- ☑ Volume
- ☑ Power
- ☑ Performances
- ☑ Schedule
- ☑ Cost

All of them !

Plus the challenges of

- ☑ **Industrialisation** with high volume production
- ☑ **Safety/Reliability** including deorbitation procedure

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Objective 1
Push the centralized avionics concept to reality

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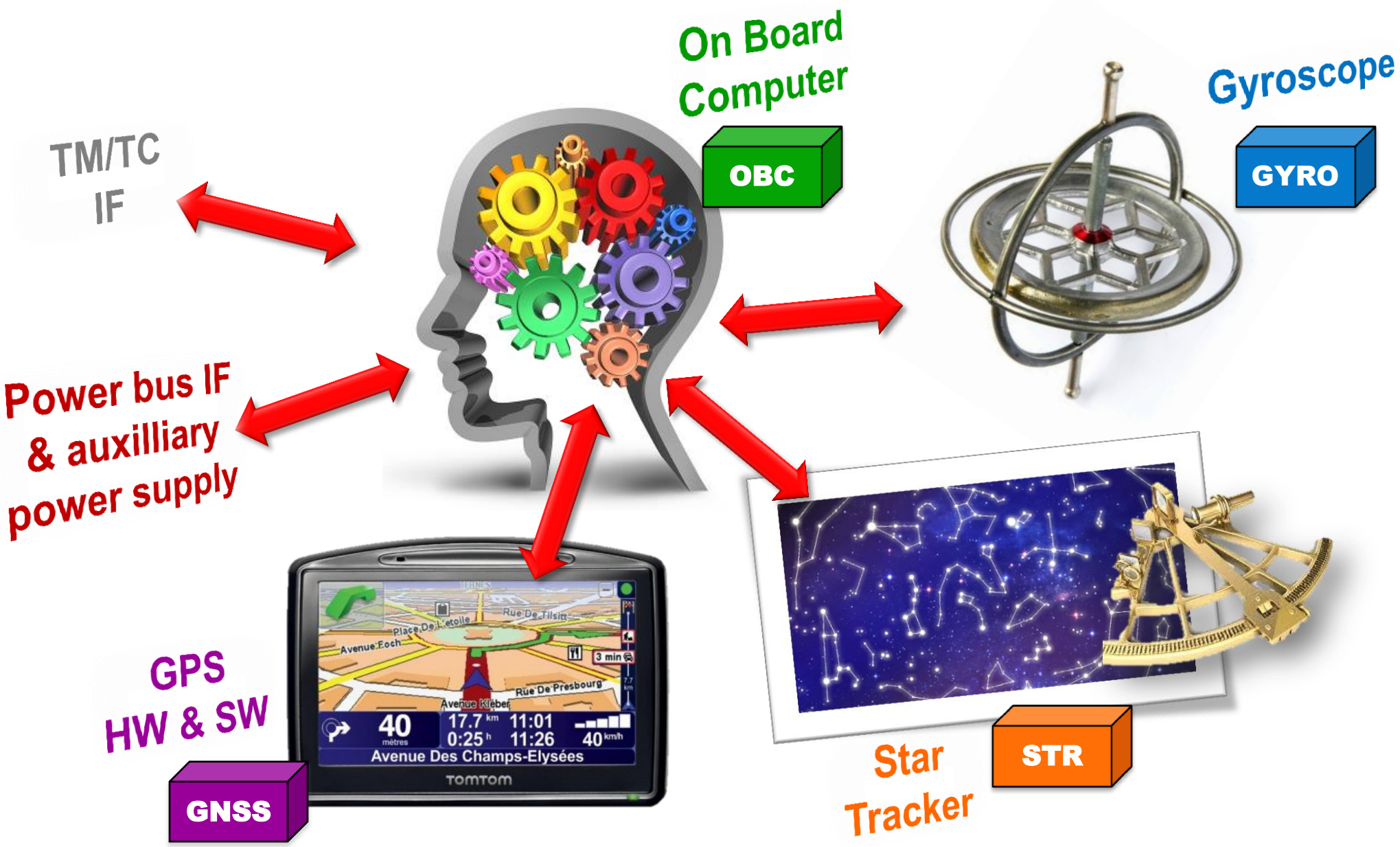
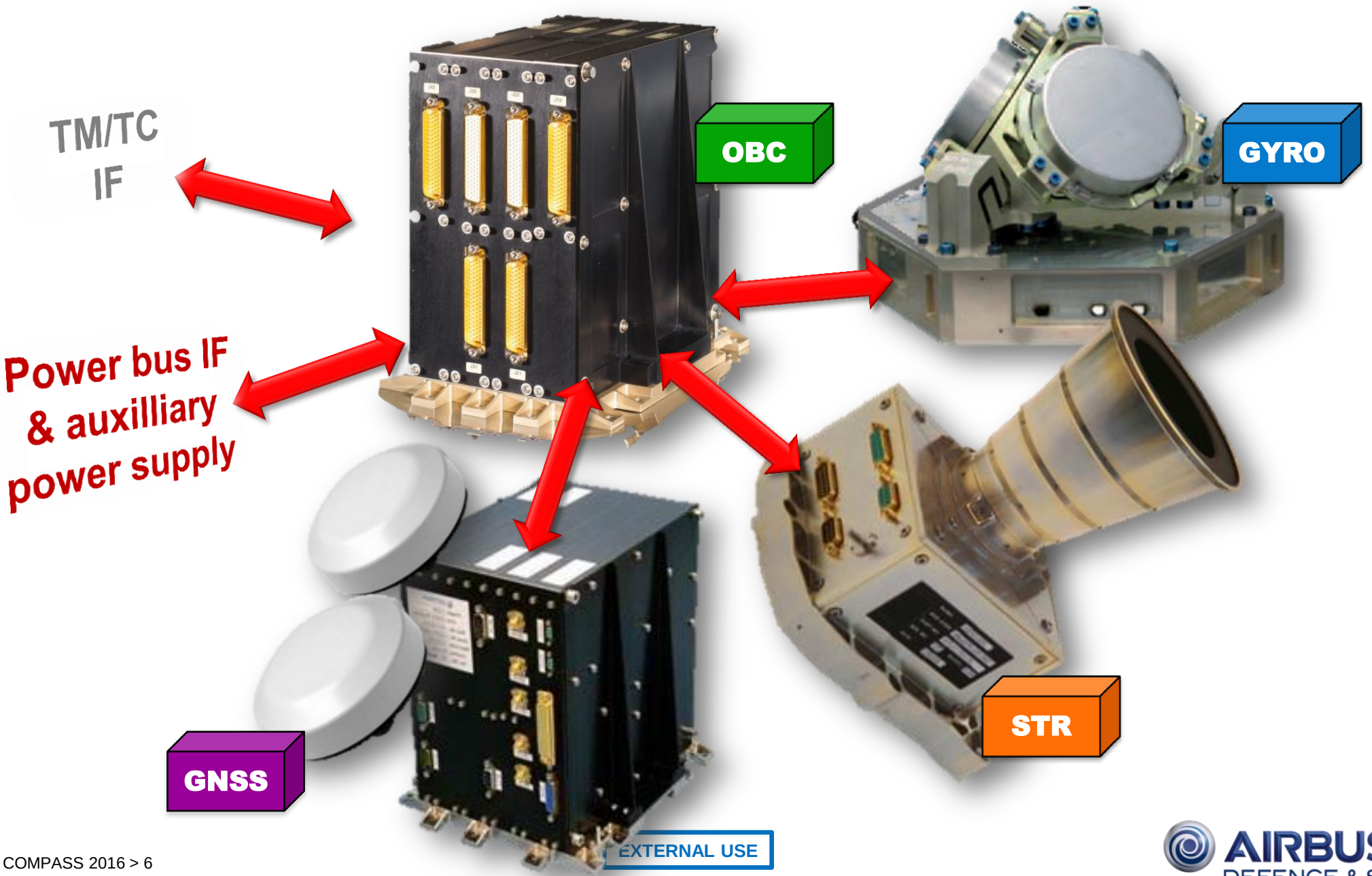
Avionics : various functions



Avionics : various units with similar Electronics



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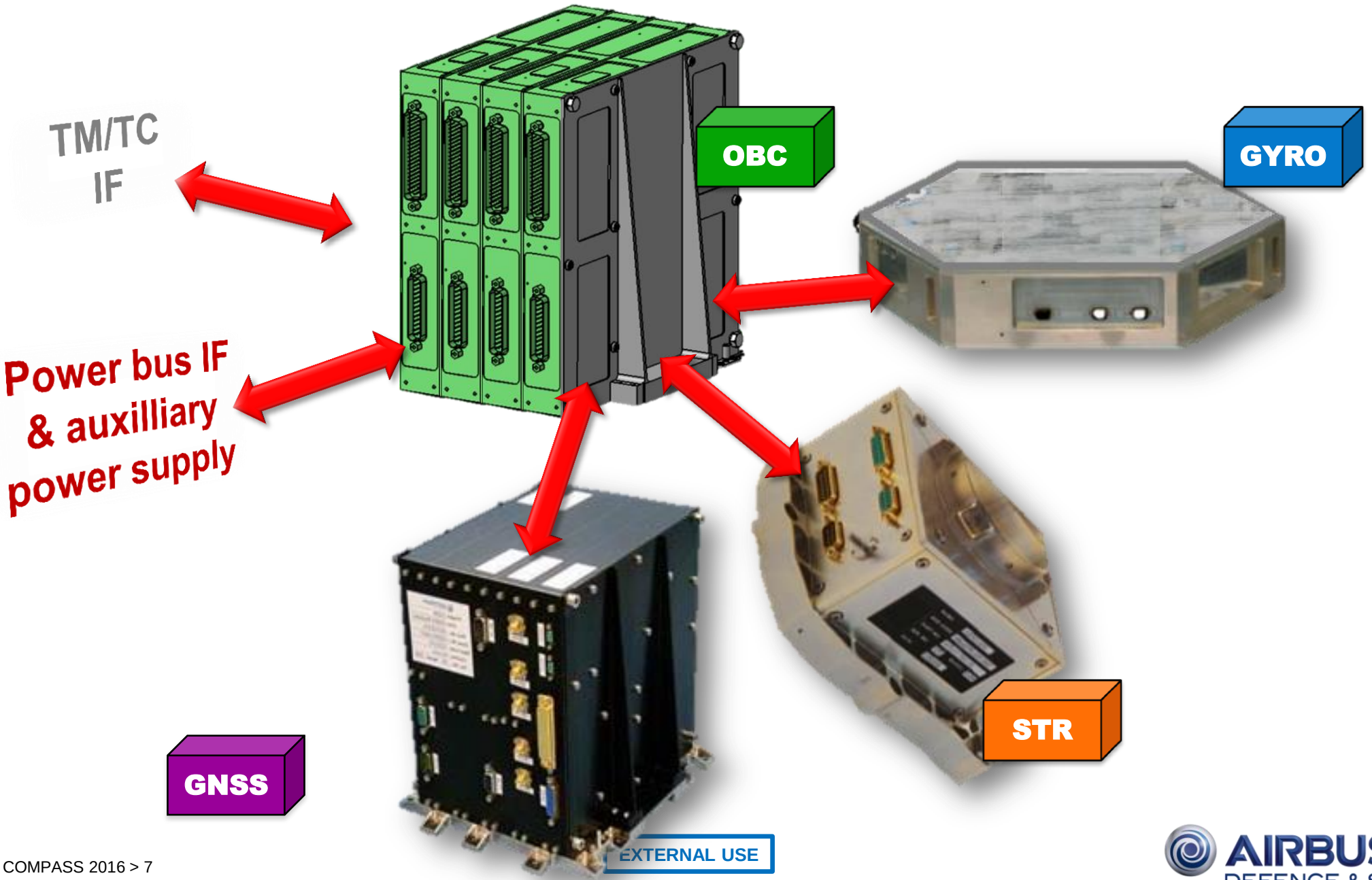
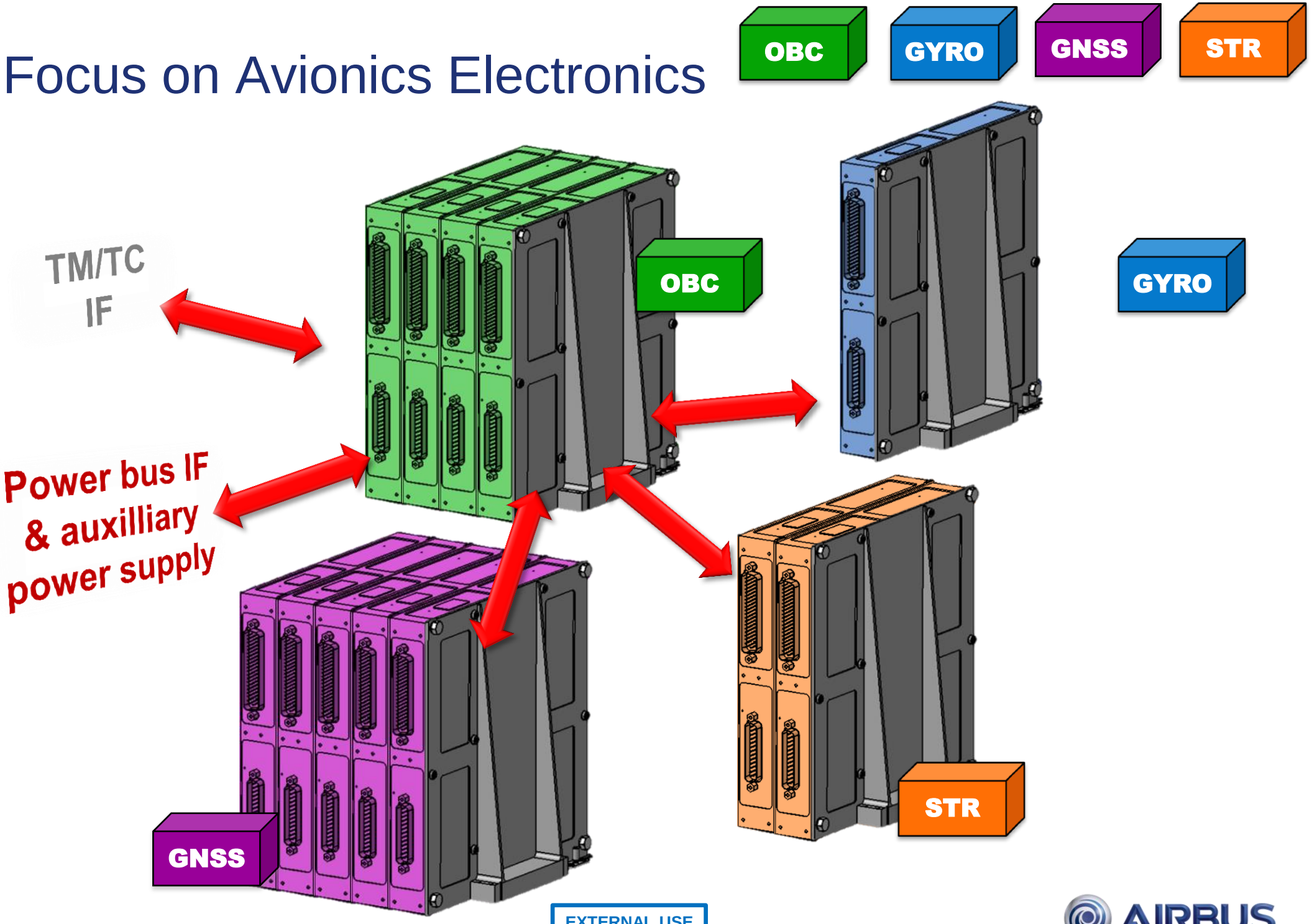
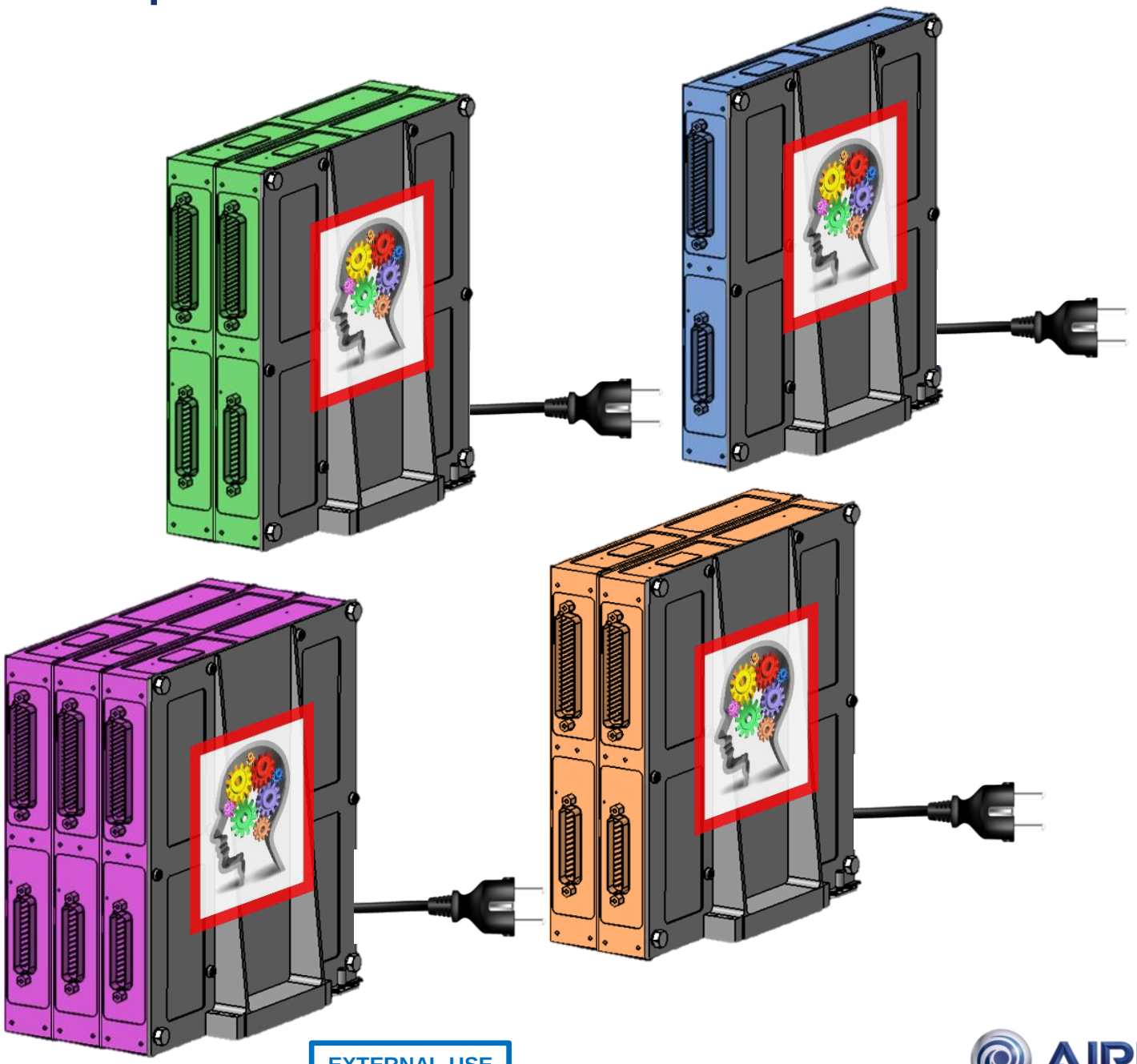


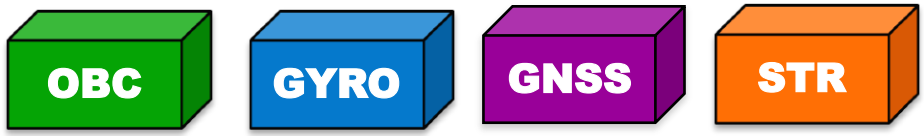
Focus on Avionics Electronics



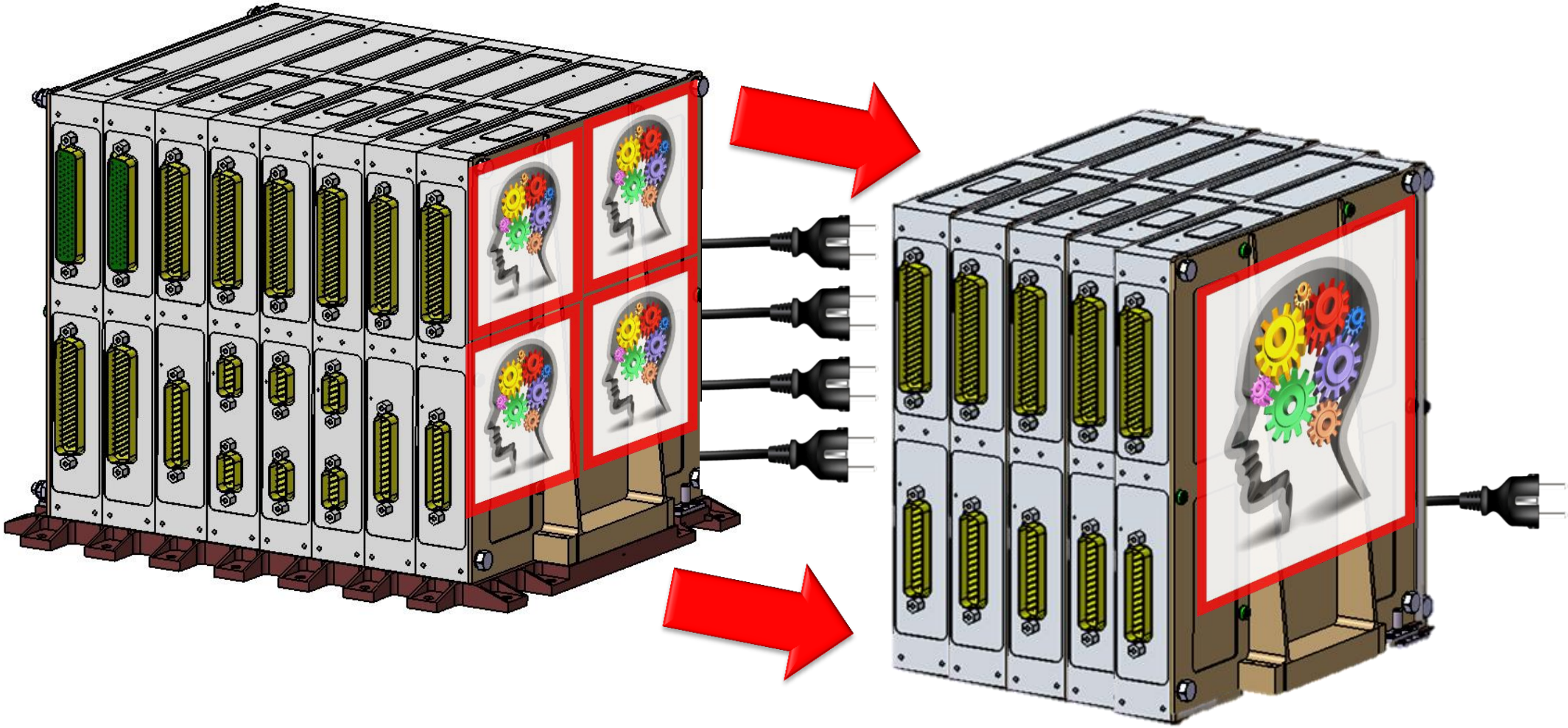
COMPASS concept



COMPASS concept



Power & **Processing** are common needs that can be shared by each function



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Objective 2
Drastically drop down
the avionics hardware acquisition cost

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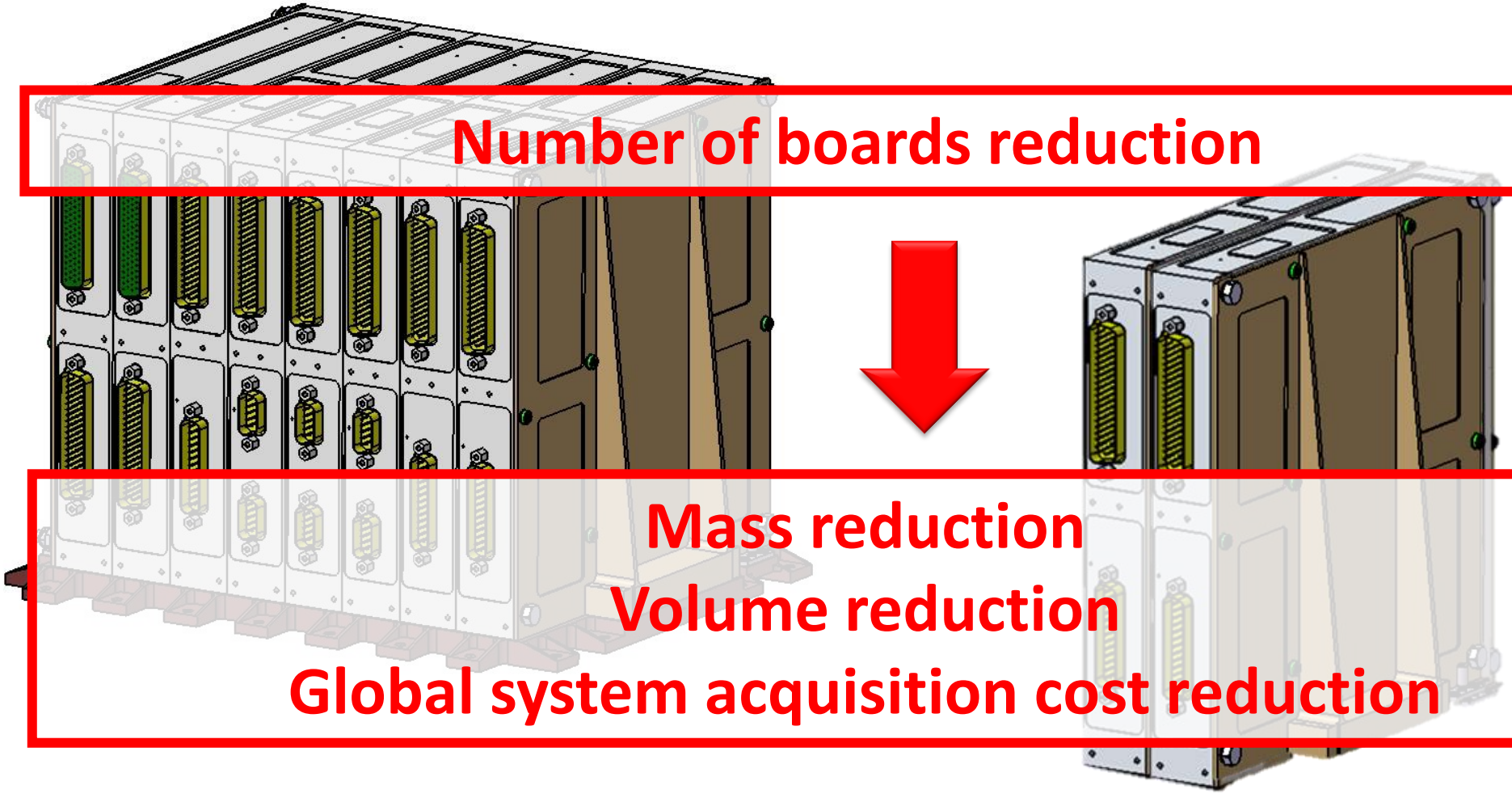
COMPASS reality

Power & **Processing** are common needs that can be shared by each function



Number of boards reduction

Mass reduction

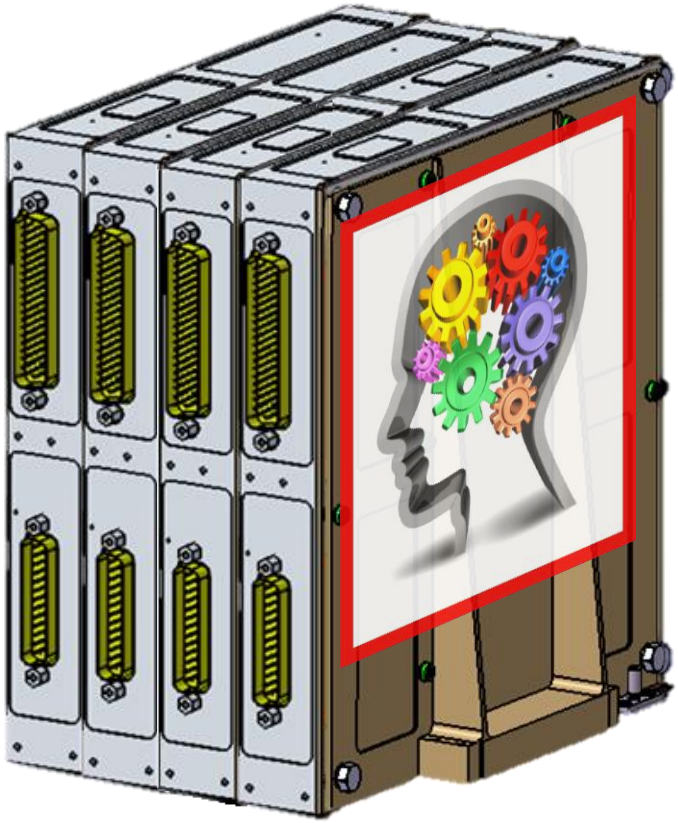
Volume reduction

Global system acquisition cost reduction

COMPASS reality

Centralized avionics shall rely on a highly integrated processing system

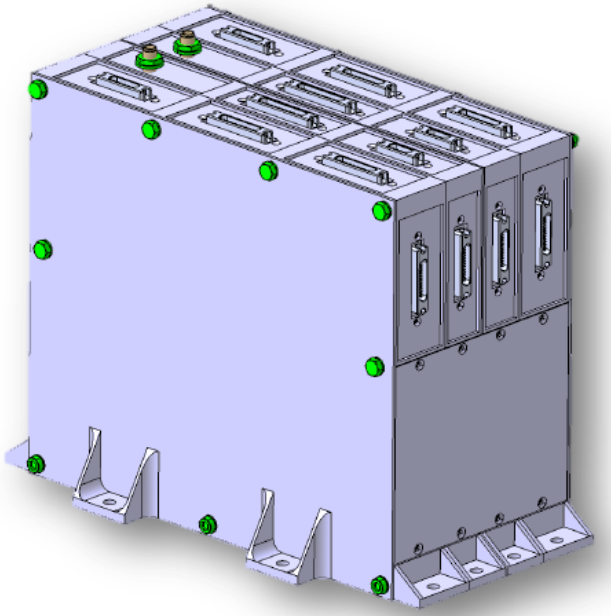
COMPASS is based on ARM core enhanced by hardening techniques



COMPASS Performance Summary

11 x 24 x 17 cm³

Assembly volume including boards leads



4 kg

Complete assembly weight
Including 20% contingencies

20 W

Consumption of the whole OBC

above 200 DMIPS

Processing performance of one OBC side

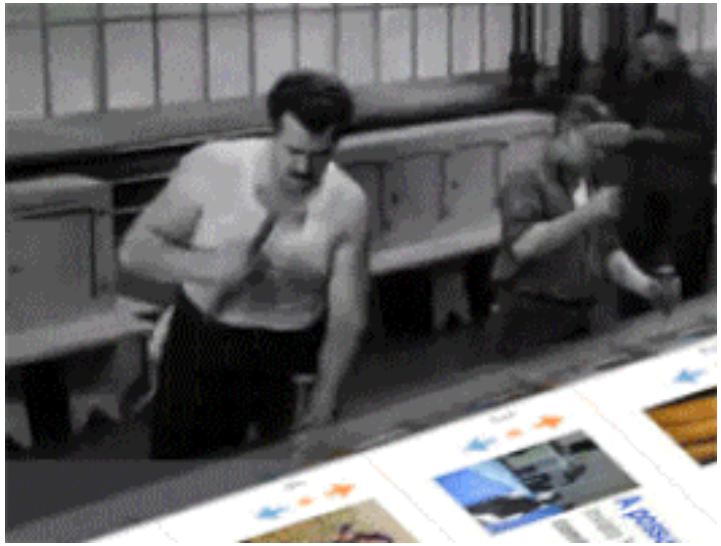
Cost oriented approach

COTS topic is in fashion, but for space applications, we shall not forget that they can easily jeopardize the full unit reliability

So COTS shall be combined with appropriate hardened mechanisms and with robust architecture choices based on strong heritage

Cost oriented approach through industrialization

- High volume production baseline
- Full automatic process (fabrication and test)
- Dedicated assembly line
- Quality indicator on assembly line to detect any process divergence



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Objective 3
Design with uncompromising reliability and radiation tolerance

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COMPASS Hardware

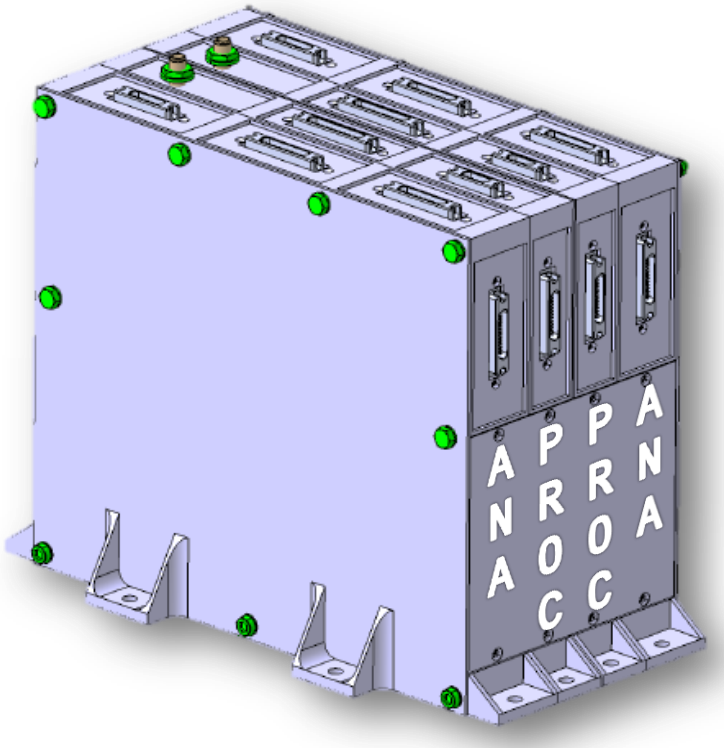
The full COMPASS OBC unit is composed of 4 boards for its 2 rad tolerant sides

One OBC side is constituted by two boards:

- 1 PROC board for processing & digital functions
- 1 ANA board for power management & analog functions

The functions performed by the OBC are :

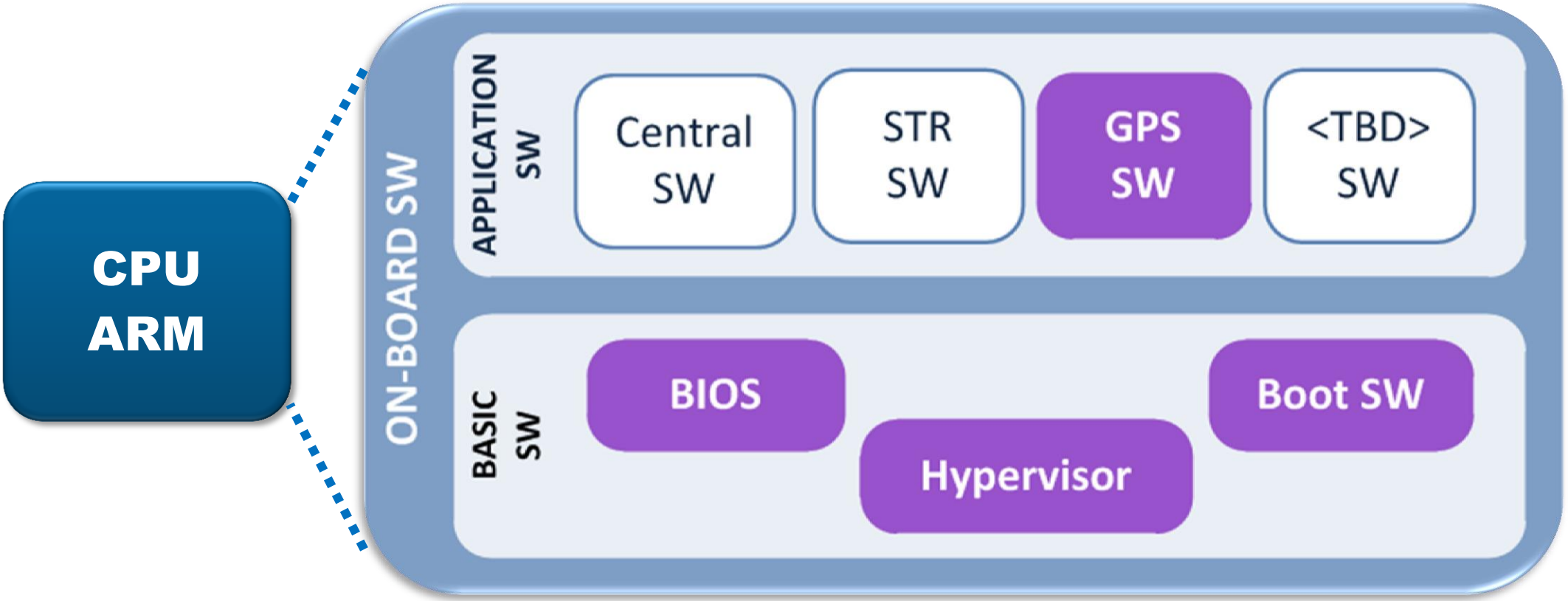
- Power bus interface
- Auxiliary power supply
- Processing based on an ARM core
- Reconfiguration unit
- On board time
- TM/TC interface
- Digital I/O
- Analog I/O
- GPS interface



COMPASS Software

Associated to an ARM-based HW, COMPASS is delivered with a complete SW environment:

- The Boot software
- The BIOS
- The Hypervisor providing the TSP environment.
- The GPS software



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Conclusion

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COMPASS key achievements

1. Pushing the centralized avionics concept to reality
2. Drastically dropping down the avionics hardware acquisition cost
3. ARM-based equipment with TSP
4. Uncompromising reliability and radiation tolerance

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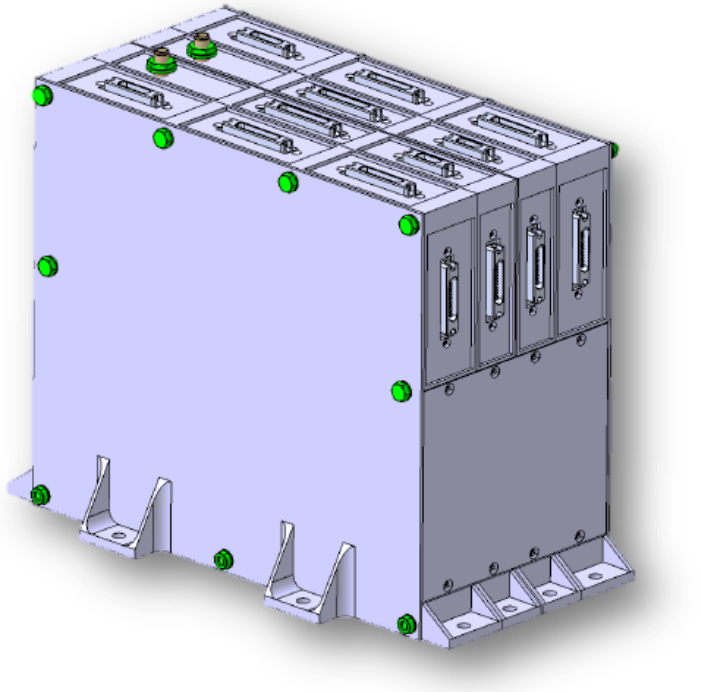
The Centralized Avionics



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