Presented by

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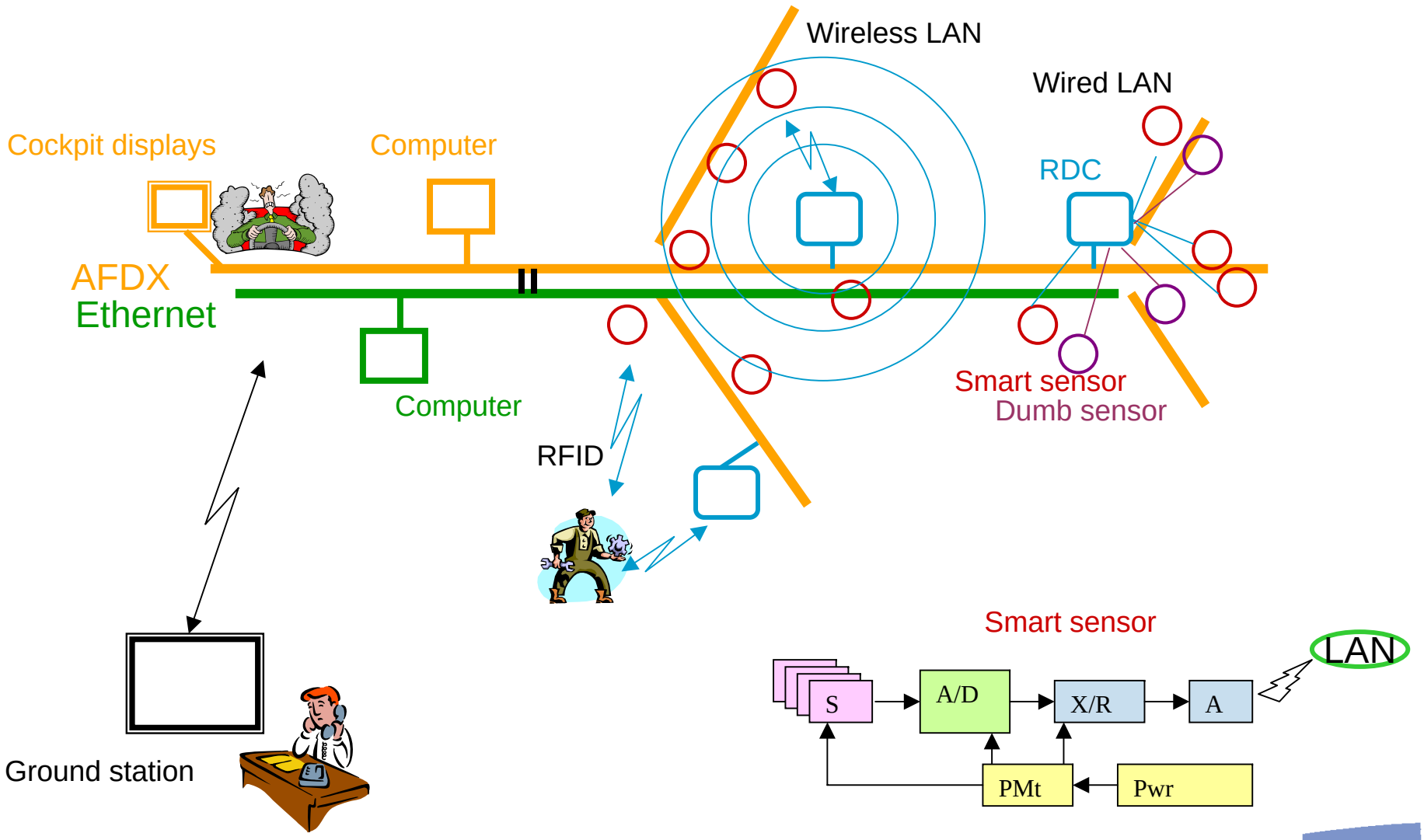
Fly-by-Wireless

Airbus End-user viewpoint

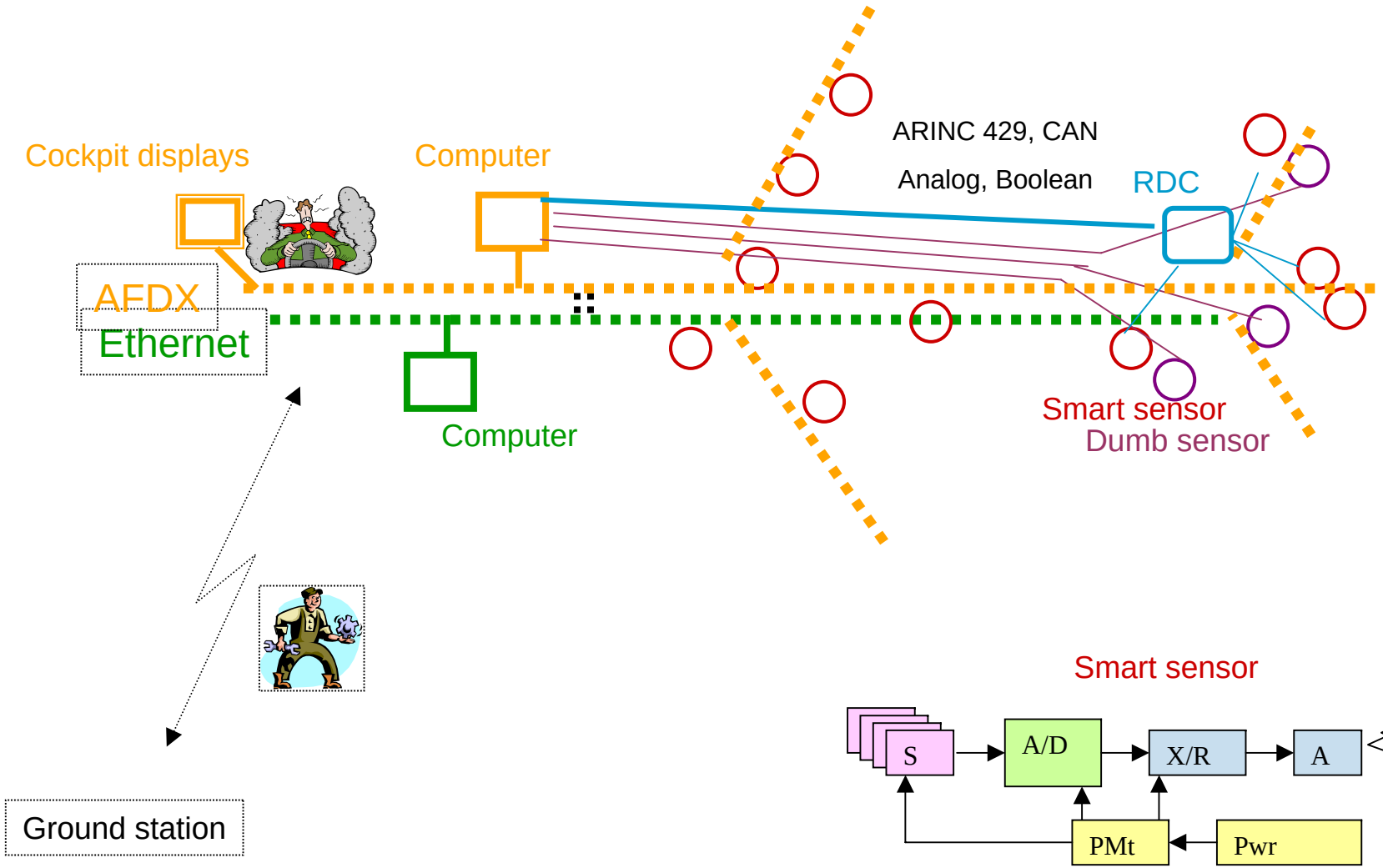
Fly-by-Wireless, opportunities and risks

- An architecture to minimise wirings
- Some numbers
- Business case
- Performances, safety
- Certification, EMC
- Security
- Way forward

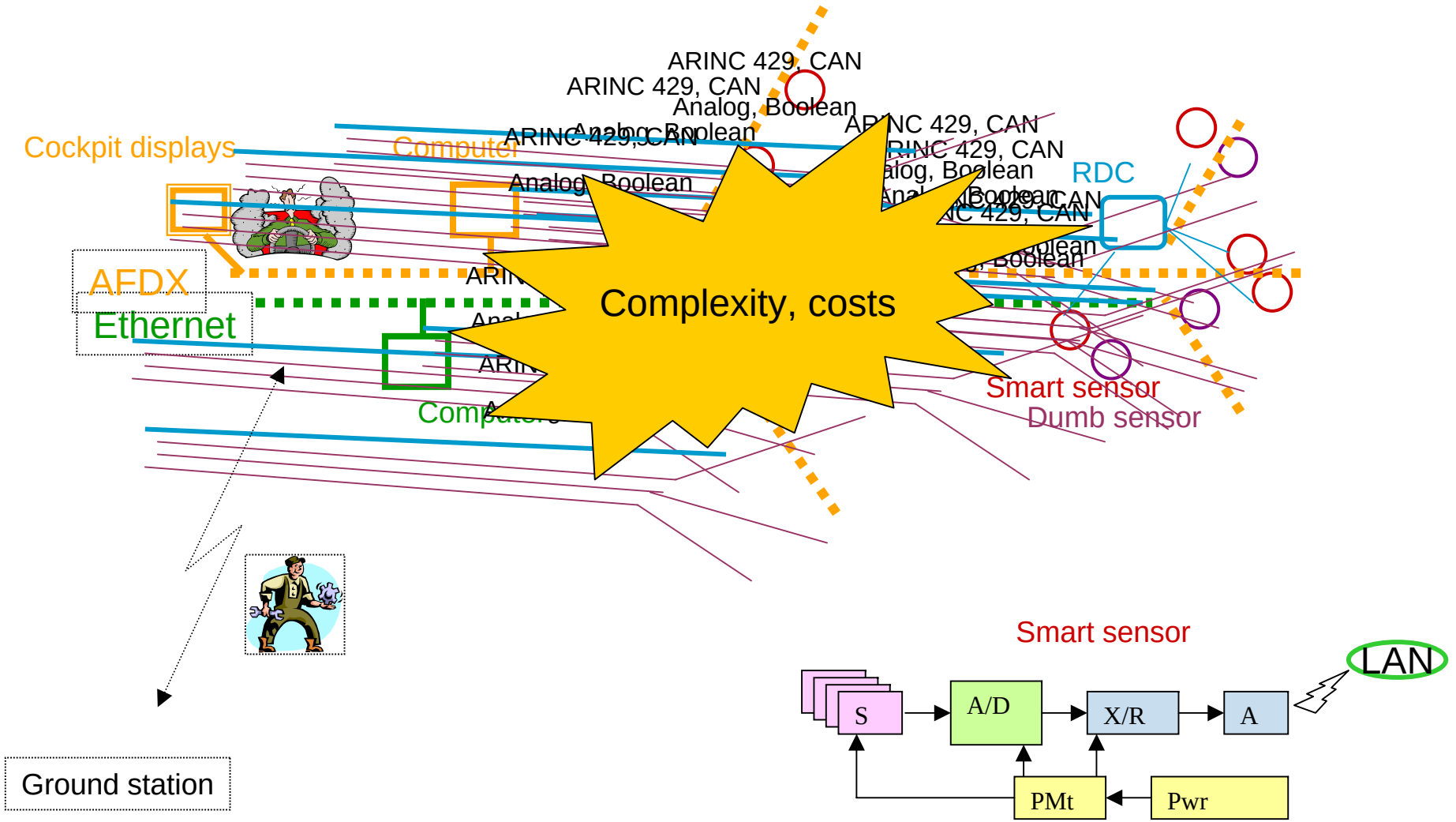
Aircraft sensor network architecture



Legacy aircraft sensor architecture



Legacy aircraft sensor architecture (repetita)



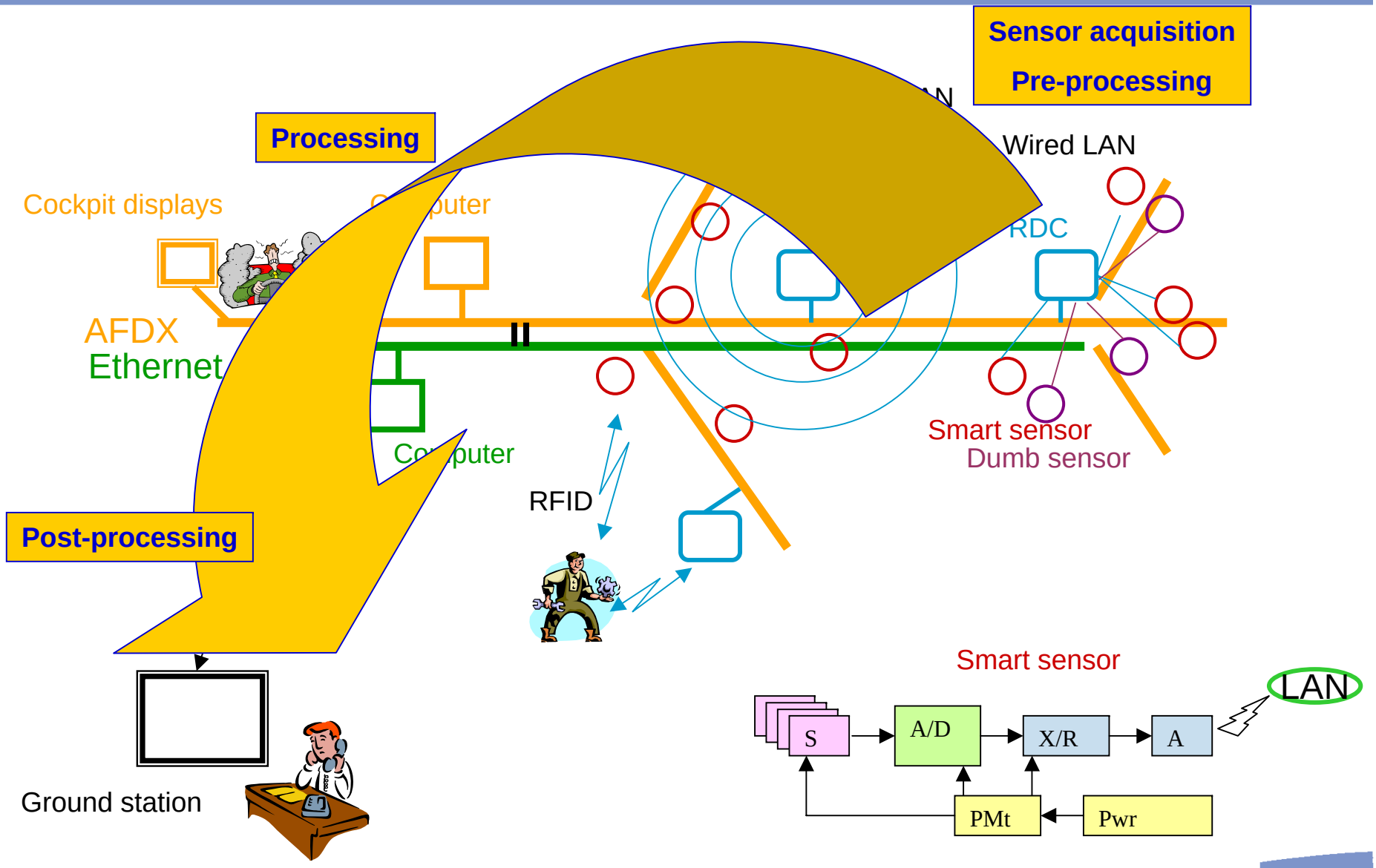
Some numbers, from a current LR aircraft

- Wires: 13400 functional lines, 240 km, 1800 kg
  - Including power and signal lines, of green aircraft and cabin
  - For connectors and brackets, add 20% weight

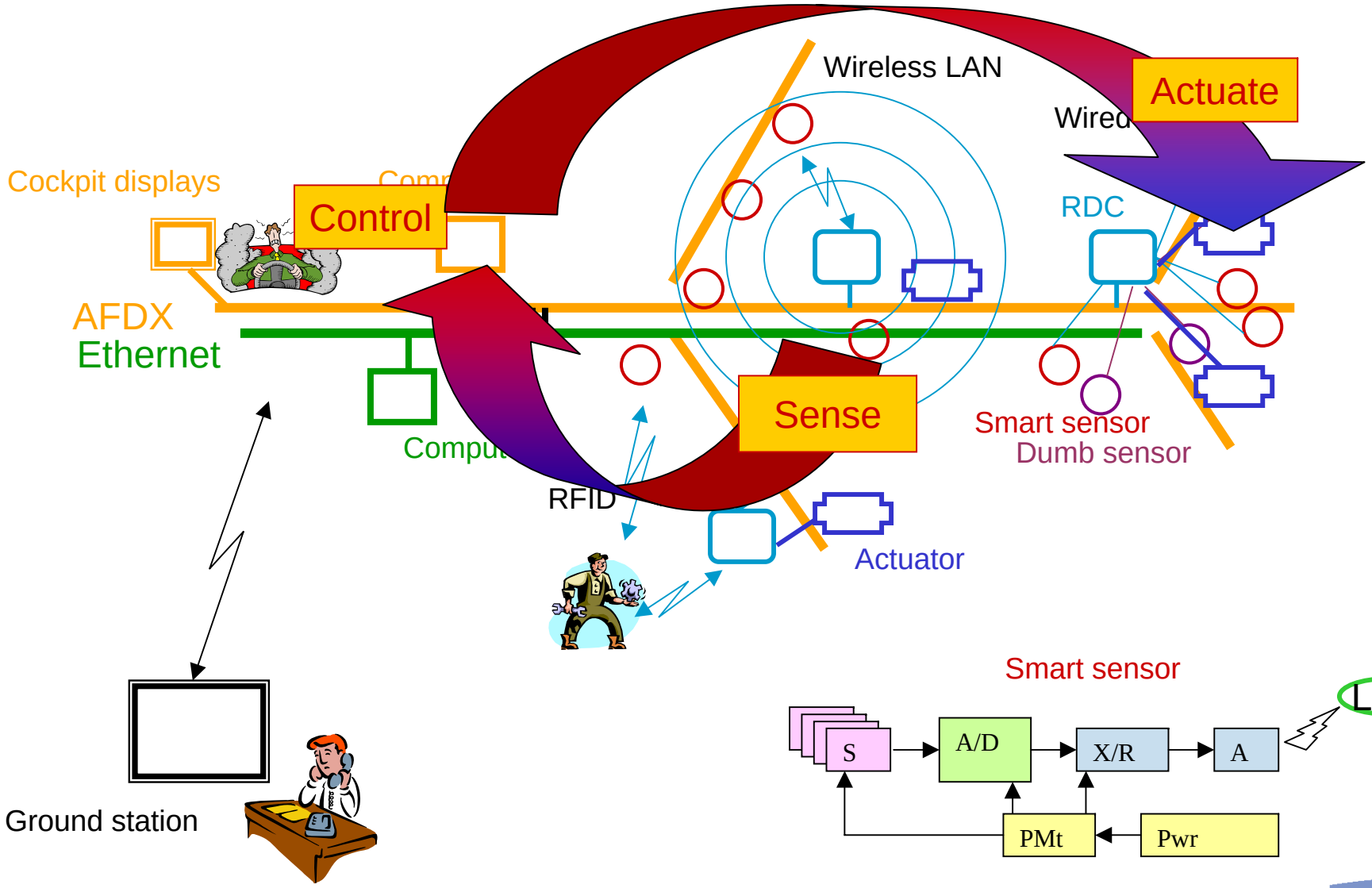
- Signals: 7800 lines, 170 km, 700kg
  - 5400 mono-wires analog, discrete signals
  - 2050 twisted pairs analog, A 429 (20-25%)
  - 350 Coax, quadrax

About 7000 signals
potentially replaceable by wireless data

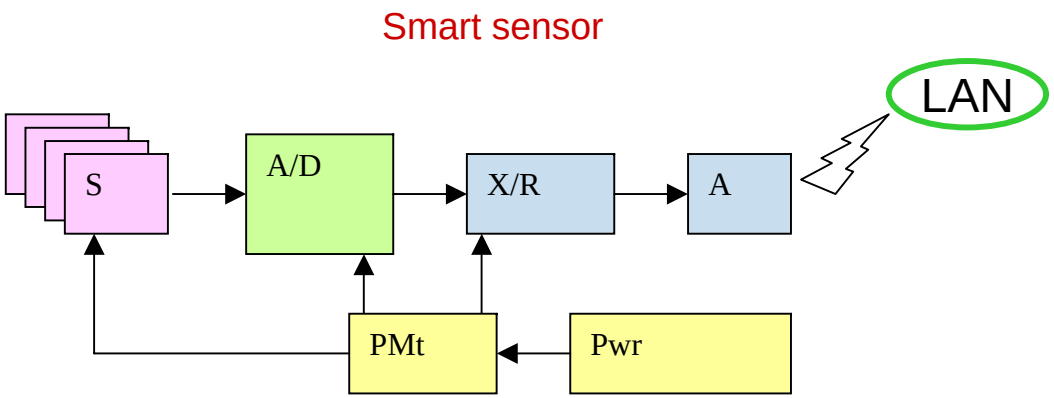
Target Health Monitoring system architecture



Target Aircraft System architecture



Sensor power supply architecture



Energy for sensors?

Harvest it?

Scavenge it?

Load it in batteries?

or Wire it?

Fly-by-Wireless business case

To compare Wireless LAN architecture versus Wired LAN architecture

- Costs of [sensor +wires +connections +installation +acquisition by computer]
  with [sensor +transmission +acquisition by computer]
  - at design,
  - at manufacturing
  - in-service
  - obsolescence
- Weight
- Complexity, design, manufacturing and in-service capabilities
- Guaranteed performances, dependability
- Acceptability world-wide

Performances, safety

Wireless LAN shall provide a quality of service equivalent to the field bus LAN (LAN's) it replaces, eg ARINC 429's, CAN, FLEXRAY…

- Effective data rate, latency, periodicity, ..real time characteristics
- Error rate, MTBF
- Reliability, testability, maintainability
- Avionability

A must is to perform propagation analyses in the airframe environment, including metal and composites, multiple paths, fluids and humans.

The safety level depends on the user system.

If used in critical system, dissimilarity of redundant means may be mandatory:

- Wireless / Wired?
- Frequency?
- Protocol?
- Technology?

Certification, EMC

To make it simple…,

Aircraft certification is a safety assessment in the aeronautical environment, in reference to safety regulations established by authorities.

In the case of Fly-by-Wireless, it shall also establish:

- No interference with other LAN's, other systems, impacting efficiency,
- No harm to humans nor interference with their personal equipment,
- No interference with other aircraft, nor any thing within range on an airfield, or in flight.

Main issue is ElectroMagnetic Compatibility.

Susceptibility to other particular risks (common mode failures).

Security issues

Wireless communications are subject to well known security issues :

- Confidentiality : Non disclosure
- Availability : Service Deny
- Authentication : Origin

Thus, a risk assessment has to be performed first and foremost

A trade off is mandatory between :

- The gain and savings of the solution
- The constraints answer (technical & organizational)

Way forward

We all need an open industrial standard, certifiable, worldwide acceptable, efficient, mature, reliable, growth capable, …

Shall we go for it?

The statements made herein do not constitute an offer. They are based on the mentioned assumptions and are expressed in good faith. Where the supporting grounds for these statements are not shown, AIRBUS S.A.S. will be pleased to explain the basis thereof.