ISIS – Innovative Solutions In Space

Don't Worry, We'll Fix it in Software

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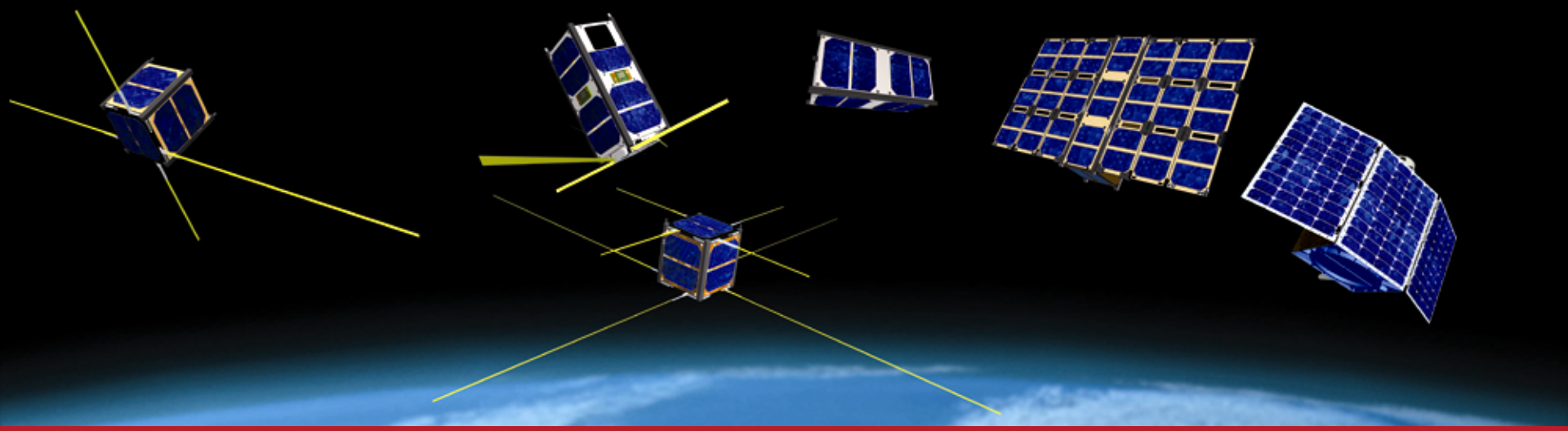


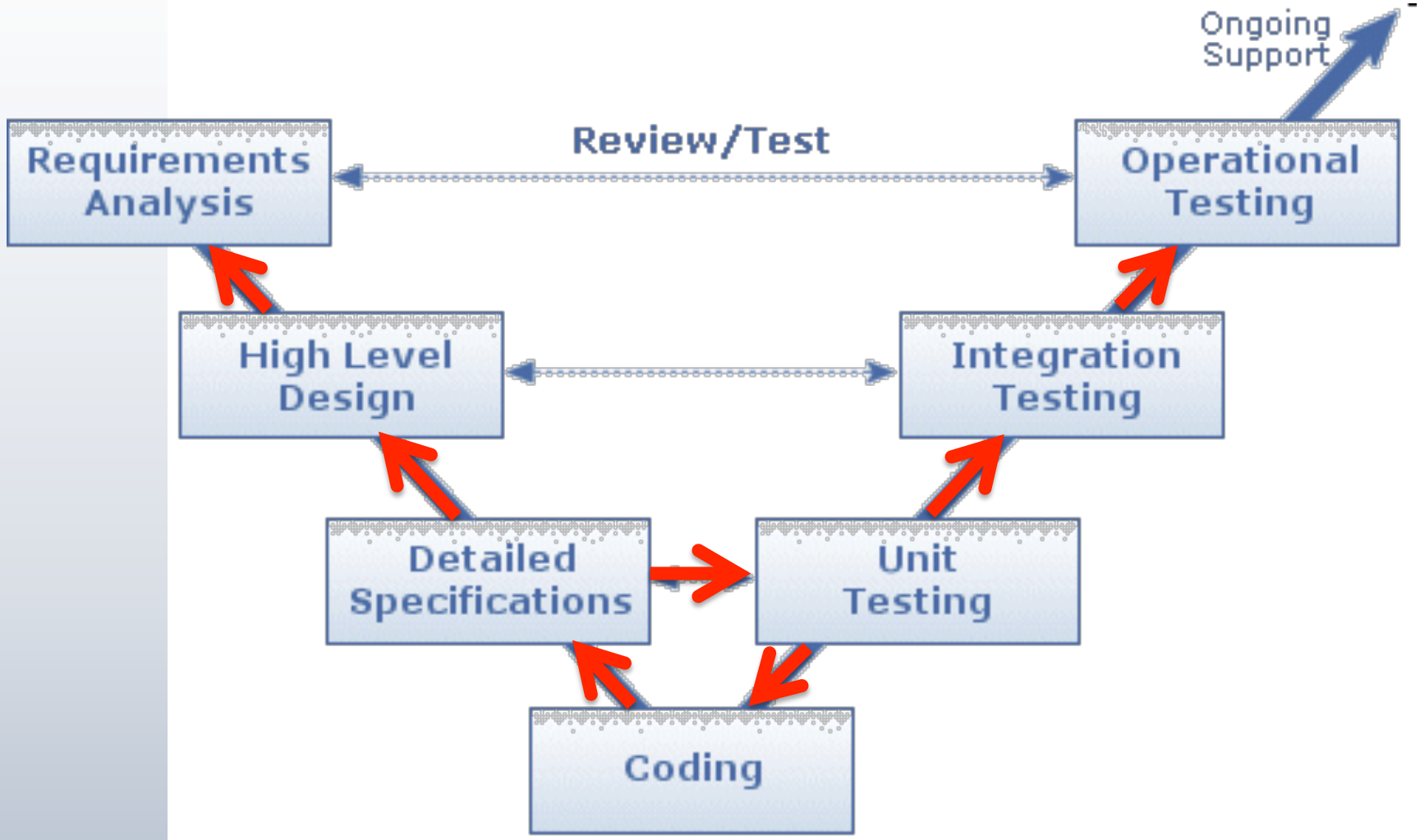
Summary

- The software Myths
- The software project cycle
- The flight software
- The embedded stack
- Sw / Hw interaction phases
- Subsystems VS Systems testing
- Pitfalls to be avoided
- Conclusion

Software Myths

- Flexibility of the software
- Software effort estimation
- Re-usability
- Maturity / Testing of the software
- Bug fixing
- Fixing everything ‘later’ in software

The software project cycle



The software project cycle

- Flow-down software and hardware requirements from the mission requirements => Not the opposite.

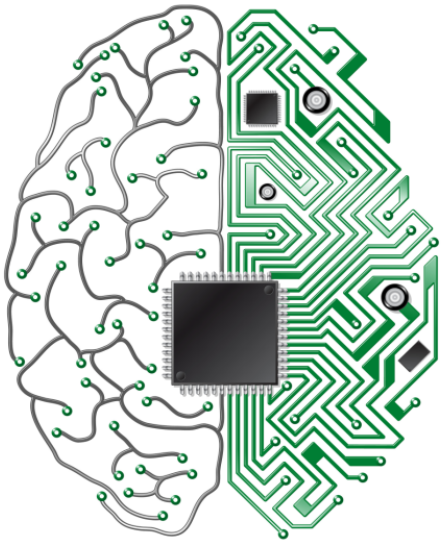
- Involve the software team early on in the mission definition.

- Plan testing early enough.

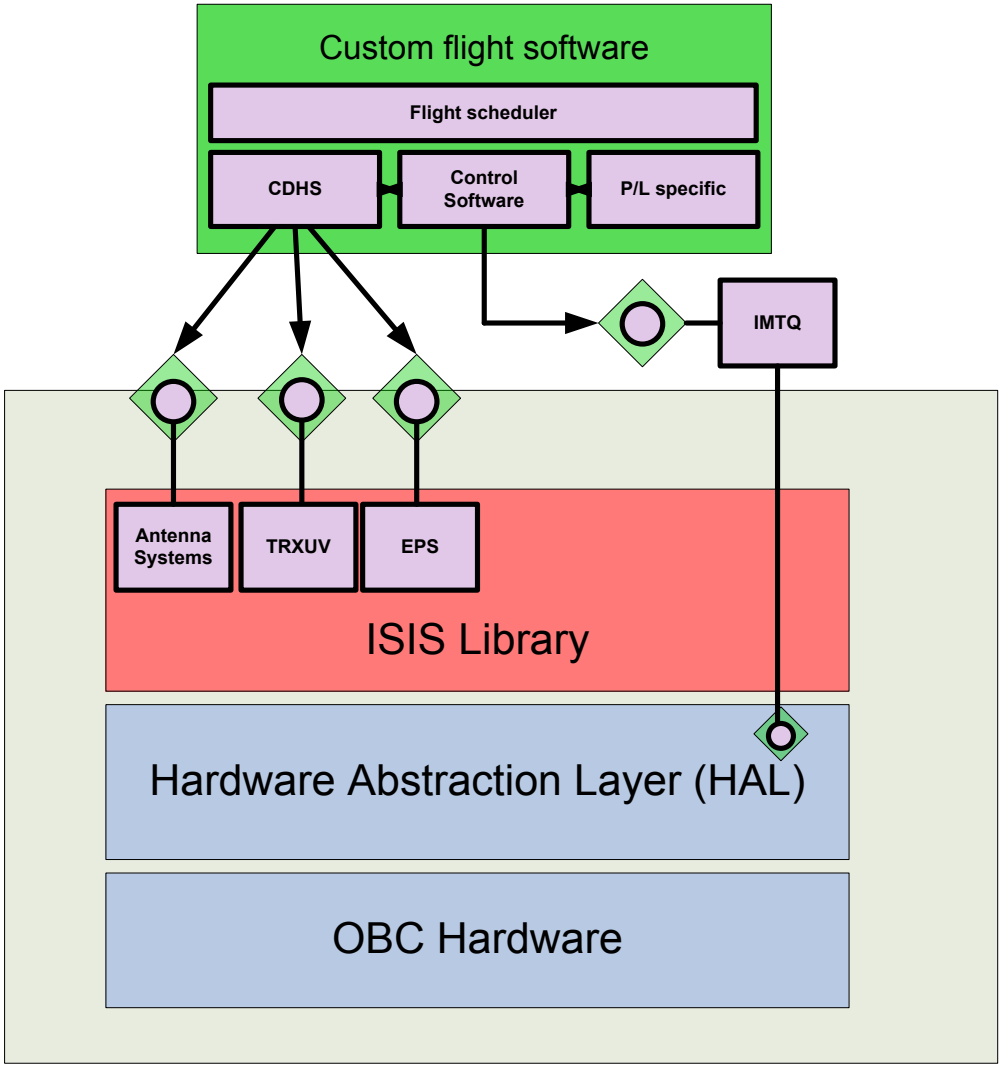
- Document every step.

The flight software

- On-board Computer
  - Definition of the databus
  - Overall satellite operational mode
  - Flight scheduling
  - Command and Data Handling
- ADCS Computer
  - Sensors reading
  - Actuators commanding
  - Attitude determination algorithms
- Local intelligence of the subsystems
  - Housekeeping data collection
  - Command handling



The embedded stack

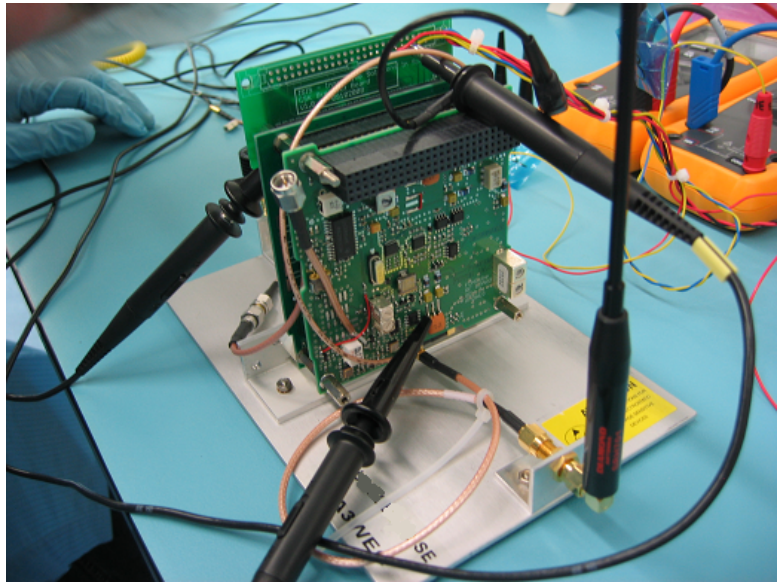


Sw / Hw interaction phases

- Stubbing phase
  - When hardware not available
  - I/F being defined
- Development board phase
  - When hardware not finalized or fully defined
  - I/F still open
- Breadboard phase
  - When hardware characterized and under-test
  - I/F frozen
- EM phase
  - When hardware on the table

Subsystems VS Systems testing

- Subsystems testing
  - Unit testing on embedded systems
  - Regression testing
- System testing
  - Flat sat setup
  - Hardware stubbing
  - Full stack testing
- E2E testing
  - Gaining uptime
  - Full chain testing



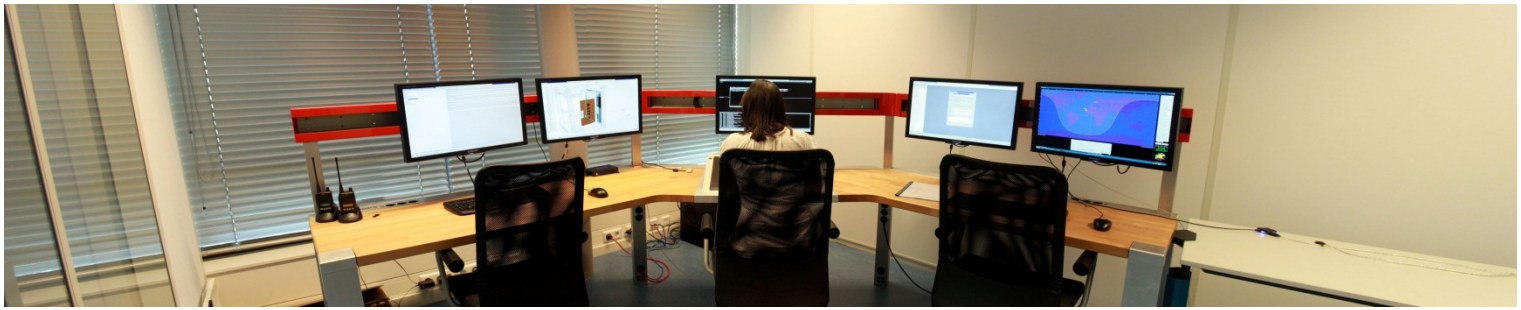
Pitfalls to avoid

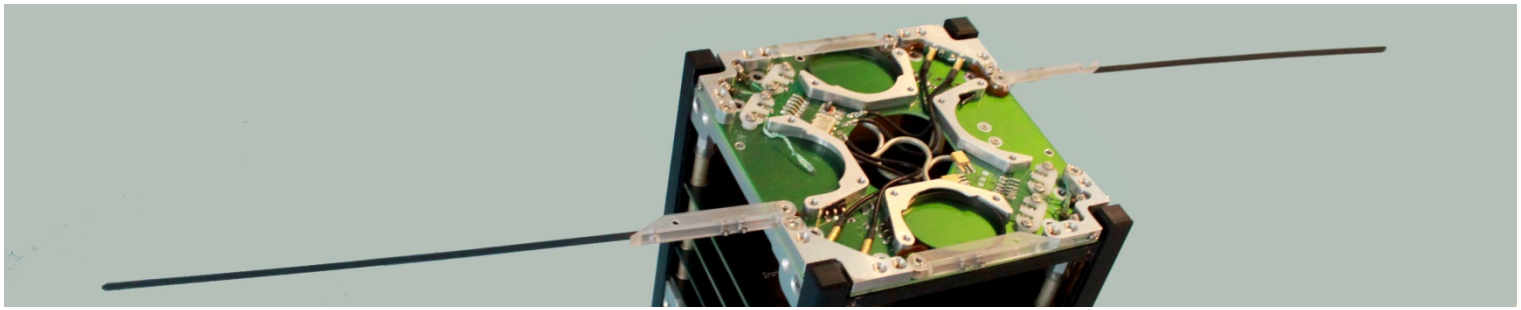
- Involving software people too late.
- Involving software people too early.
- Underestimating the need for mission specific knowledge.
- Cutting corners on software testing.
- Excessively re-using old software.
- Changing databus philosophy late in the project.
- Assuming that writing flight software is the same as regular software development.
- Forgetting that your code will be in space.

Conclusion

- Software can’t fix everything
- Proper interfaces are everything
- Involvement of the team is critical
- Educate the software team
- Let the software team educate you

- **An untested software is nothing else than a project risk**





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