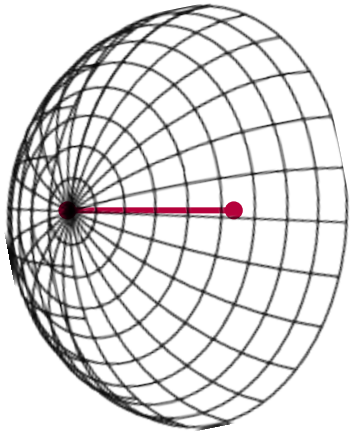


Advanced Telecommand Verification

Andy Armitage aba@terma.com Vidjai Kalicharan vik@terma.com **SESP 2015**

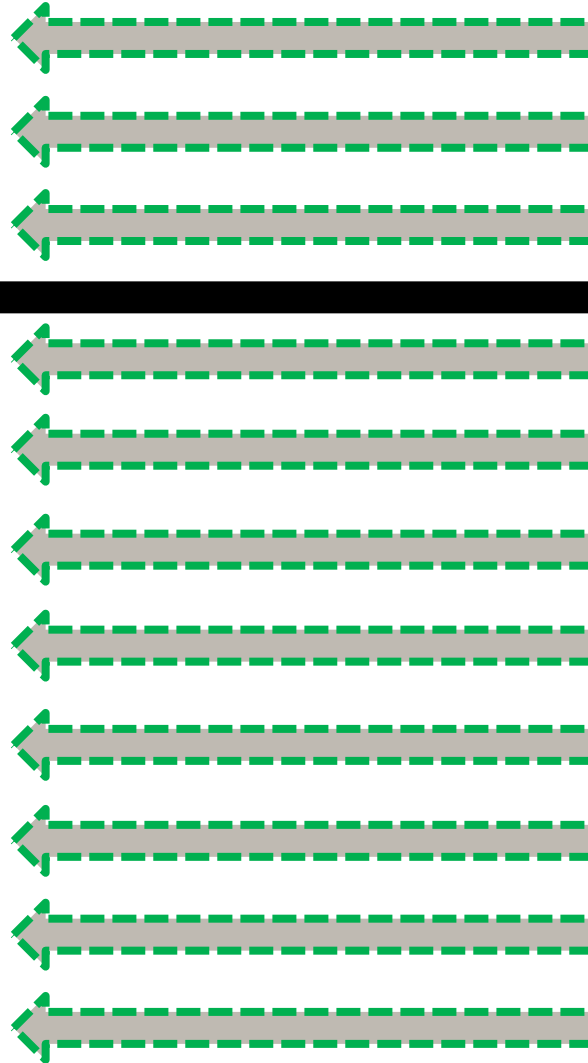
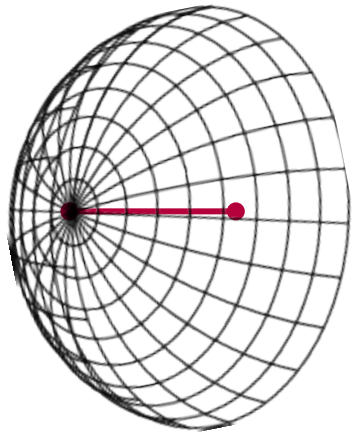
TC VERIFICATION BASICS



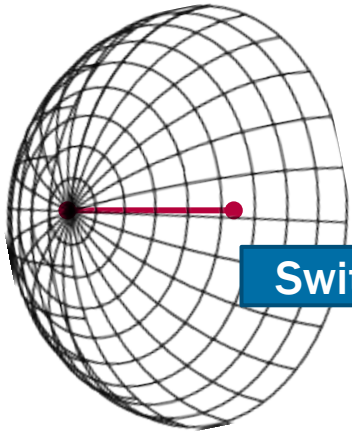
+T?



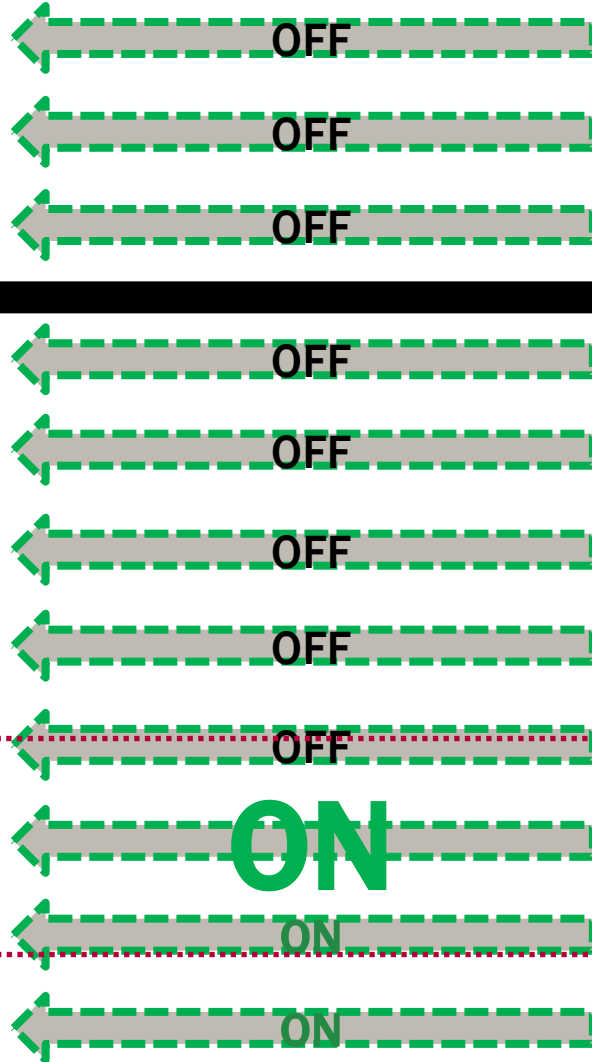
OPEN-ENDED



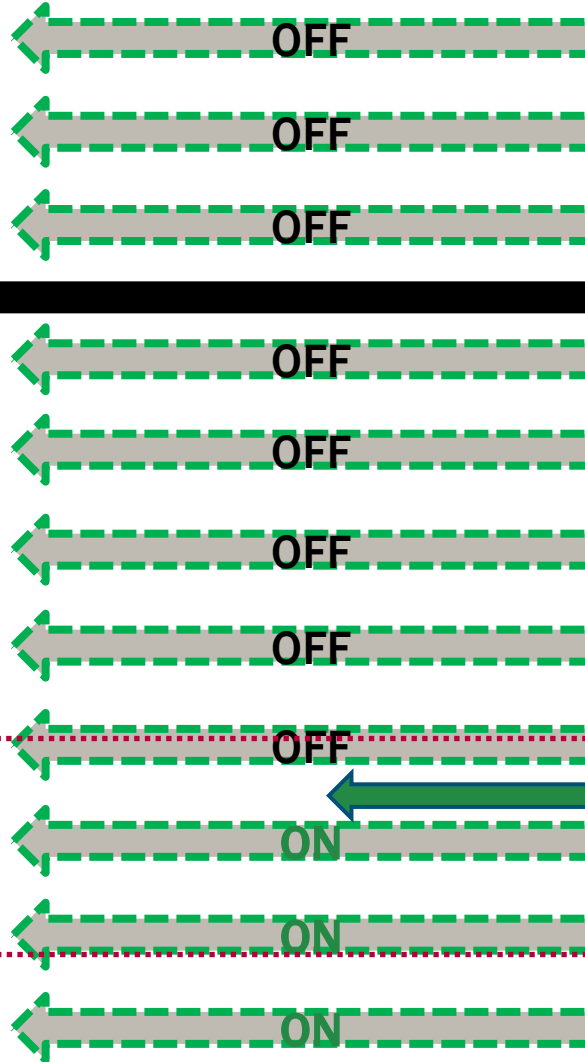
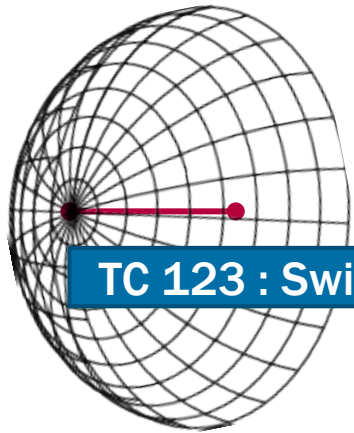
TM PARAMETER BASED



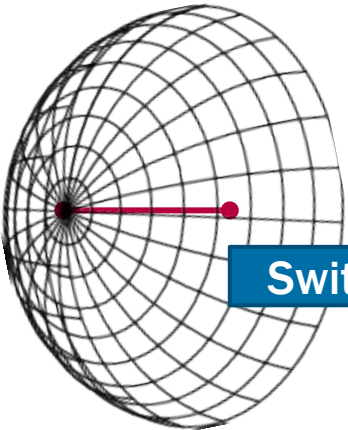
Switch ON



TM PACKET BASED



CHANGE-ON-COMMAND-ONLY



Switch ON



← OFF

← ON

← OFF

← OFF

← OFF

← OFF

← OFF



← OFF

← ON

← ON

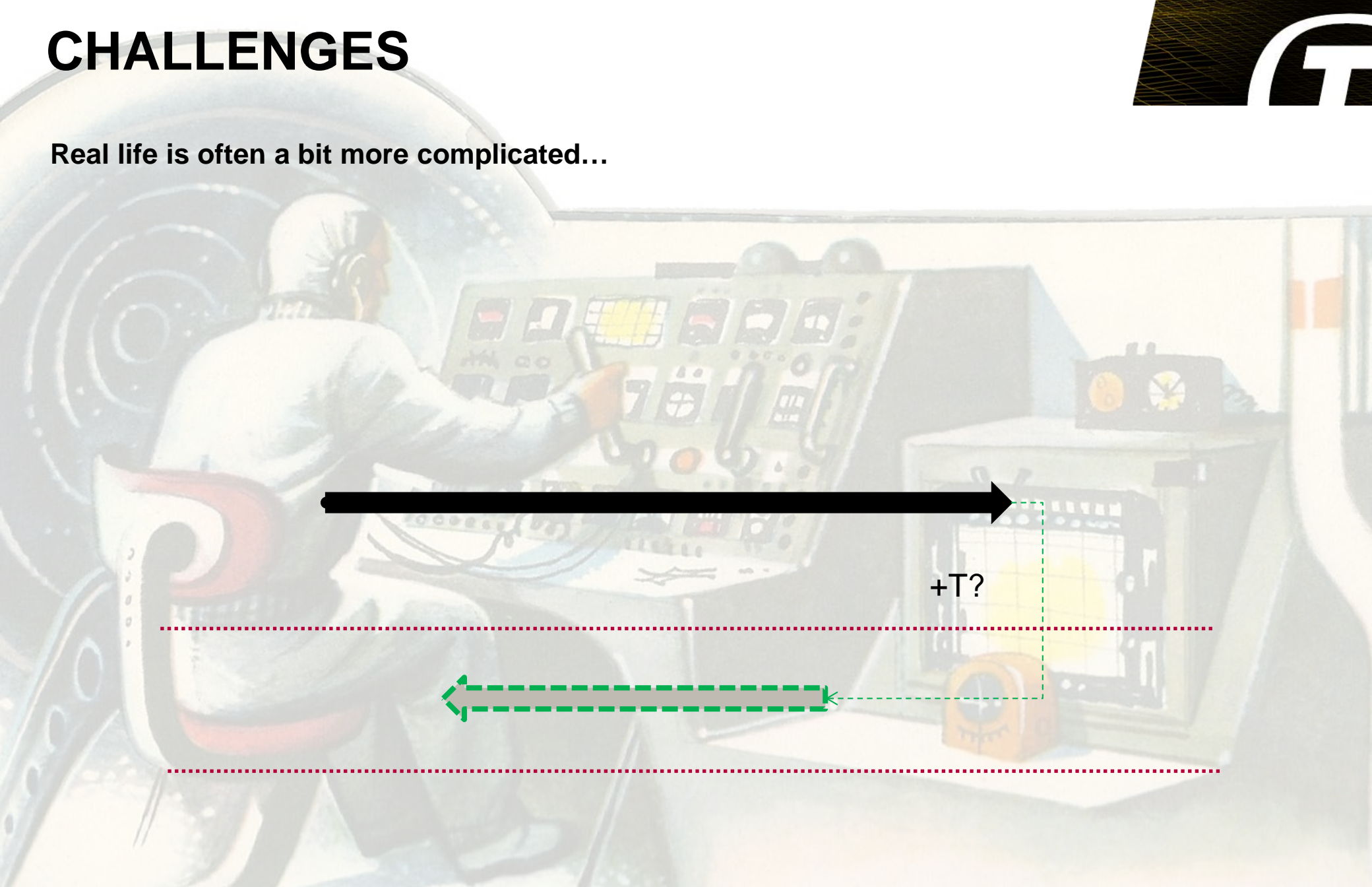


← ON

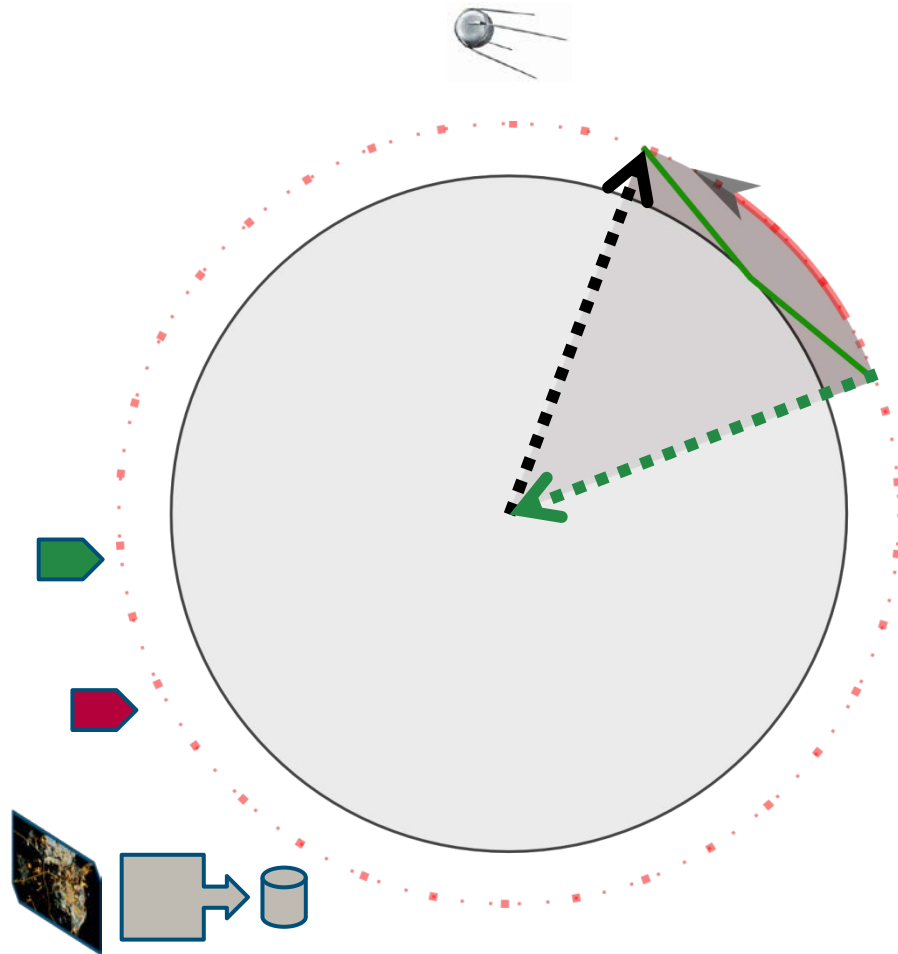
CHALLENGES



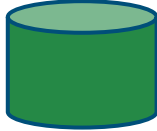
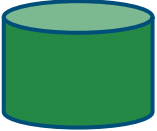
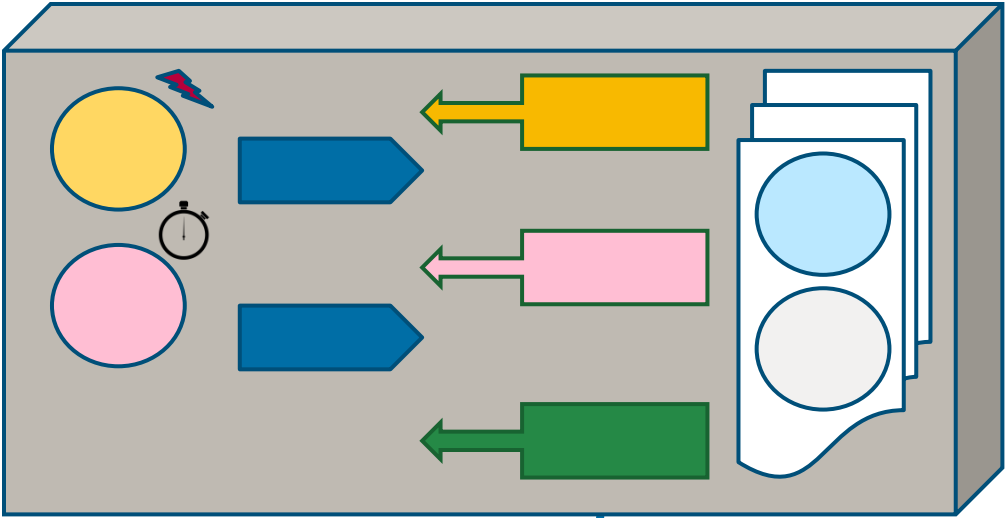
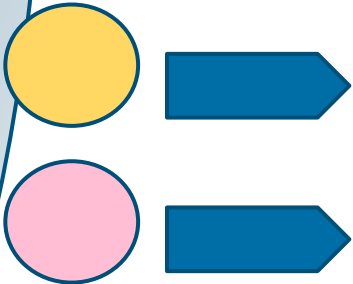
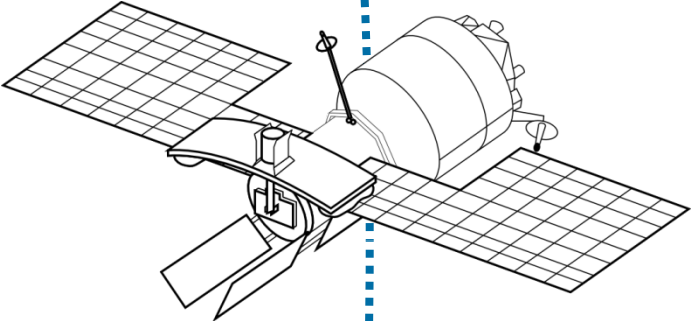
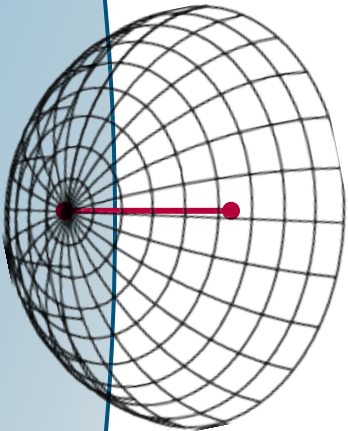
Real life is often a bit more complicated...

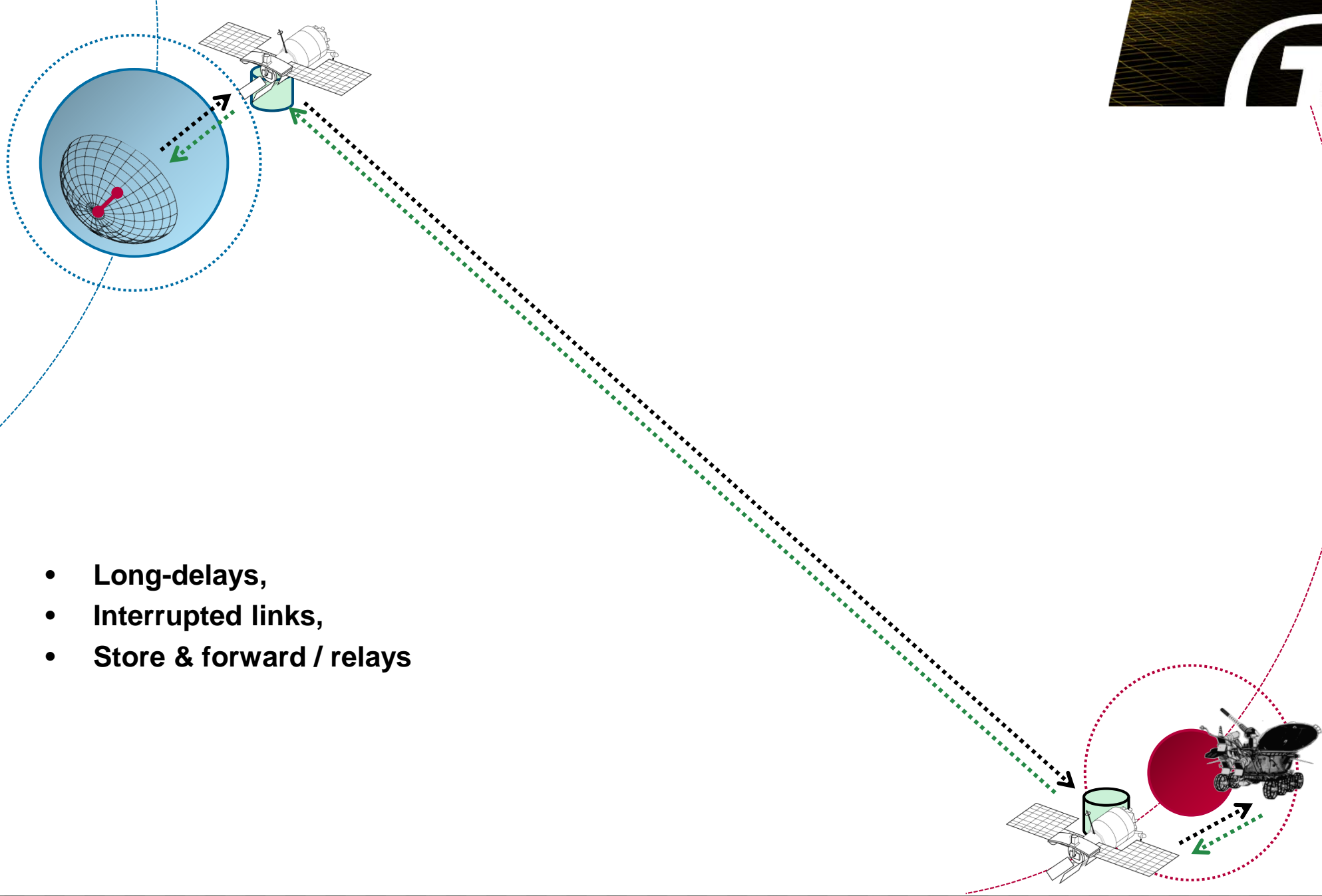


VISIBILITY & SCHEDULING



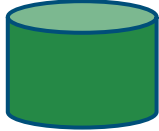
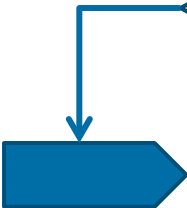
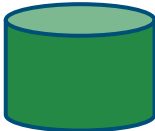
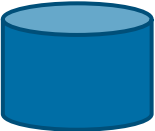
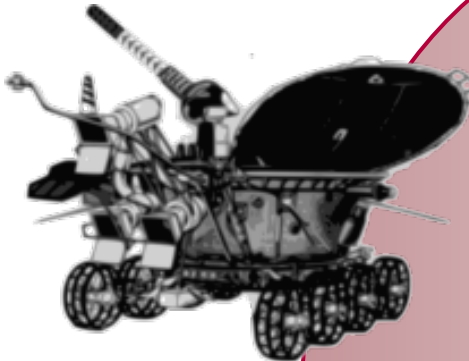
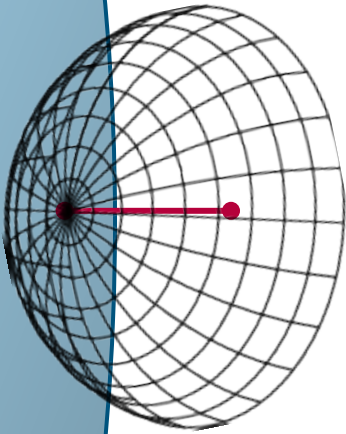
ONBOARD APPLICATIONS



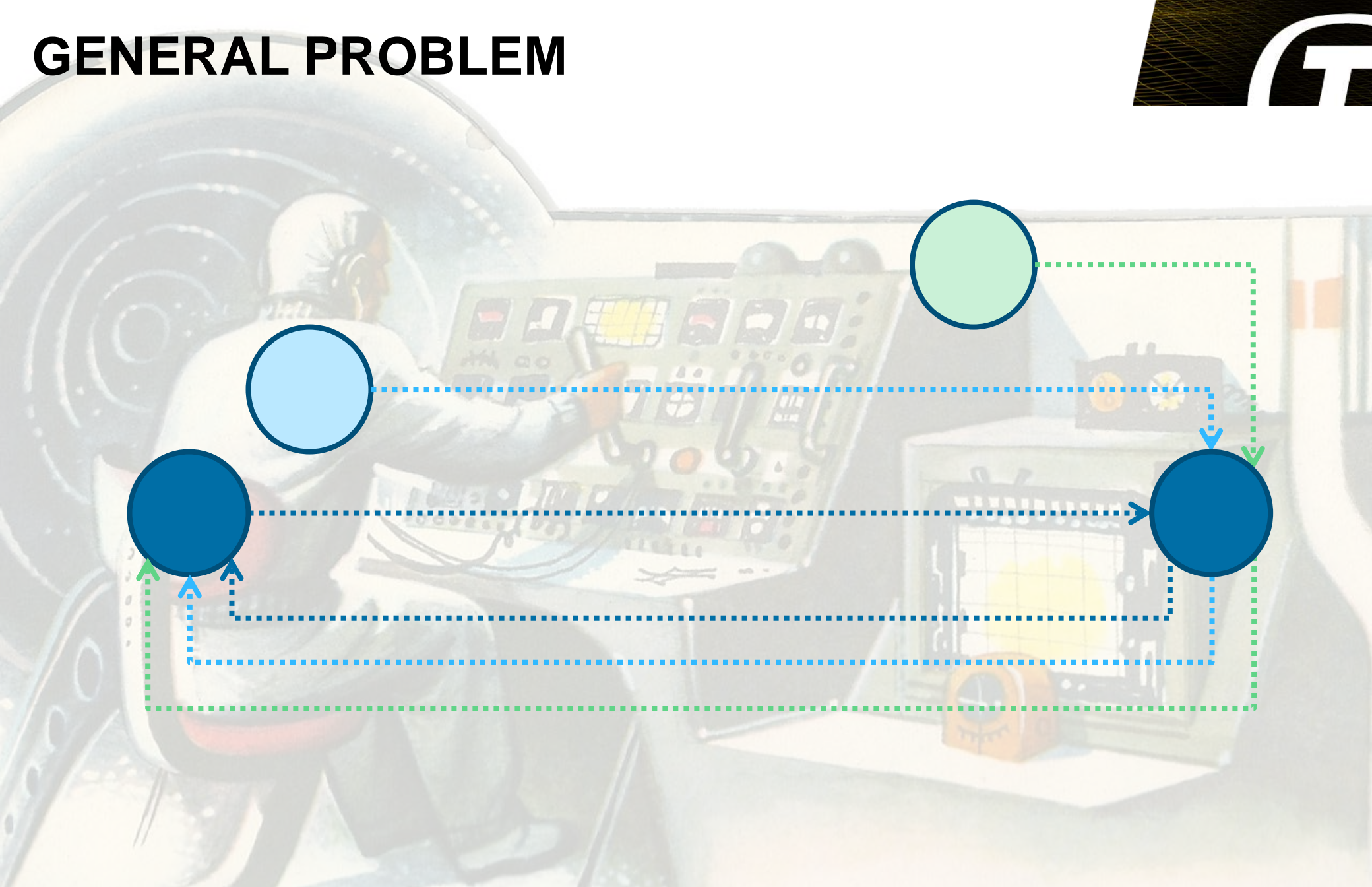


- Long-delays,
- Interrupted links,
- Store & forward / relays

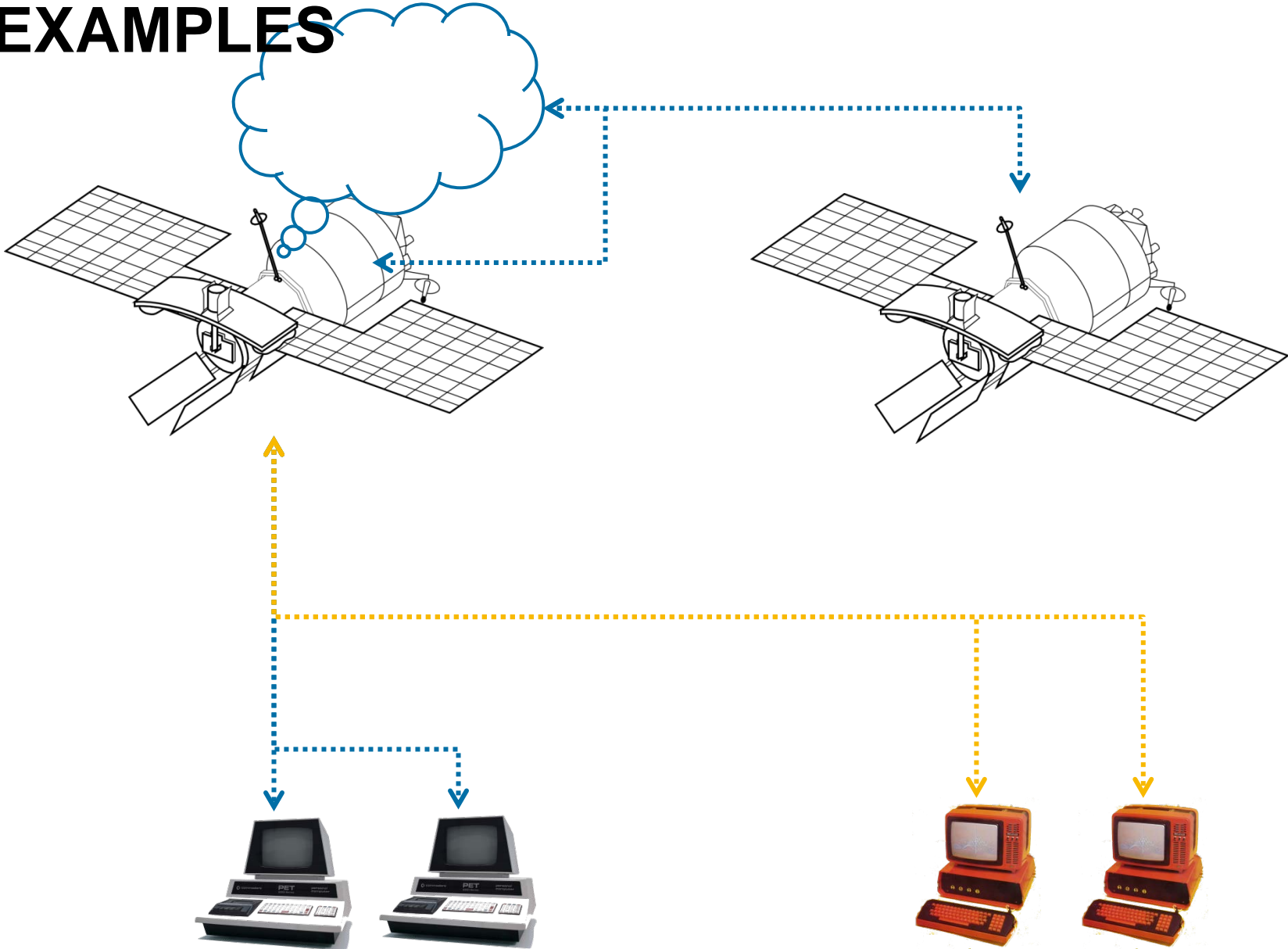
ON-BOARD PROCEDURES



GENERAL PROBLEM

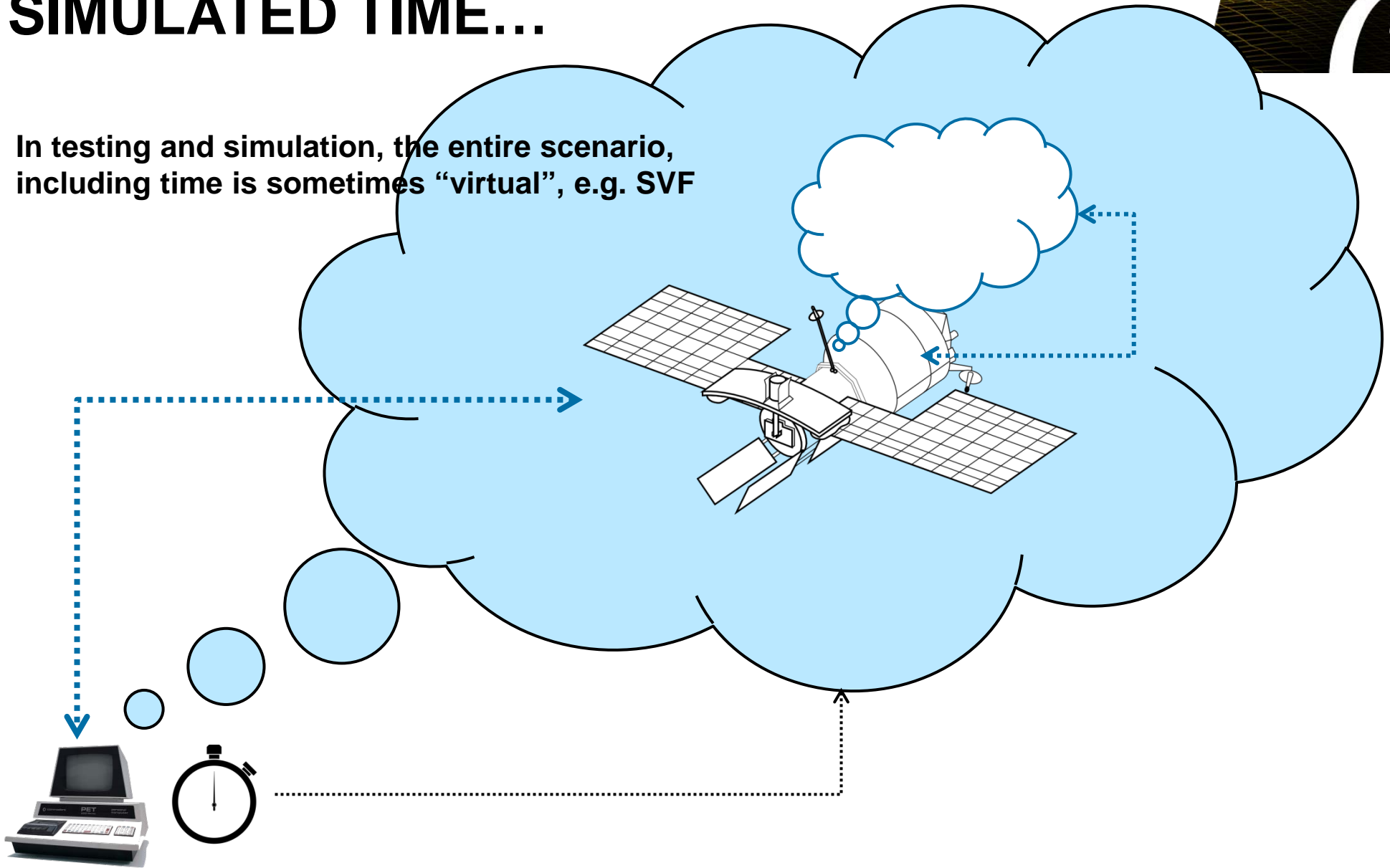


EXAMPLES



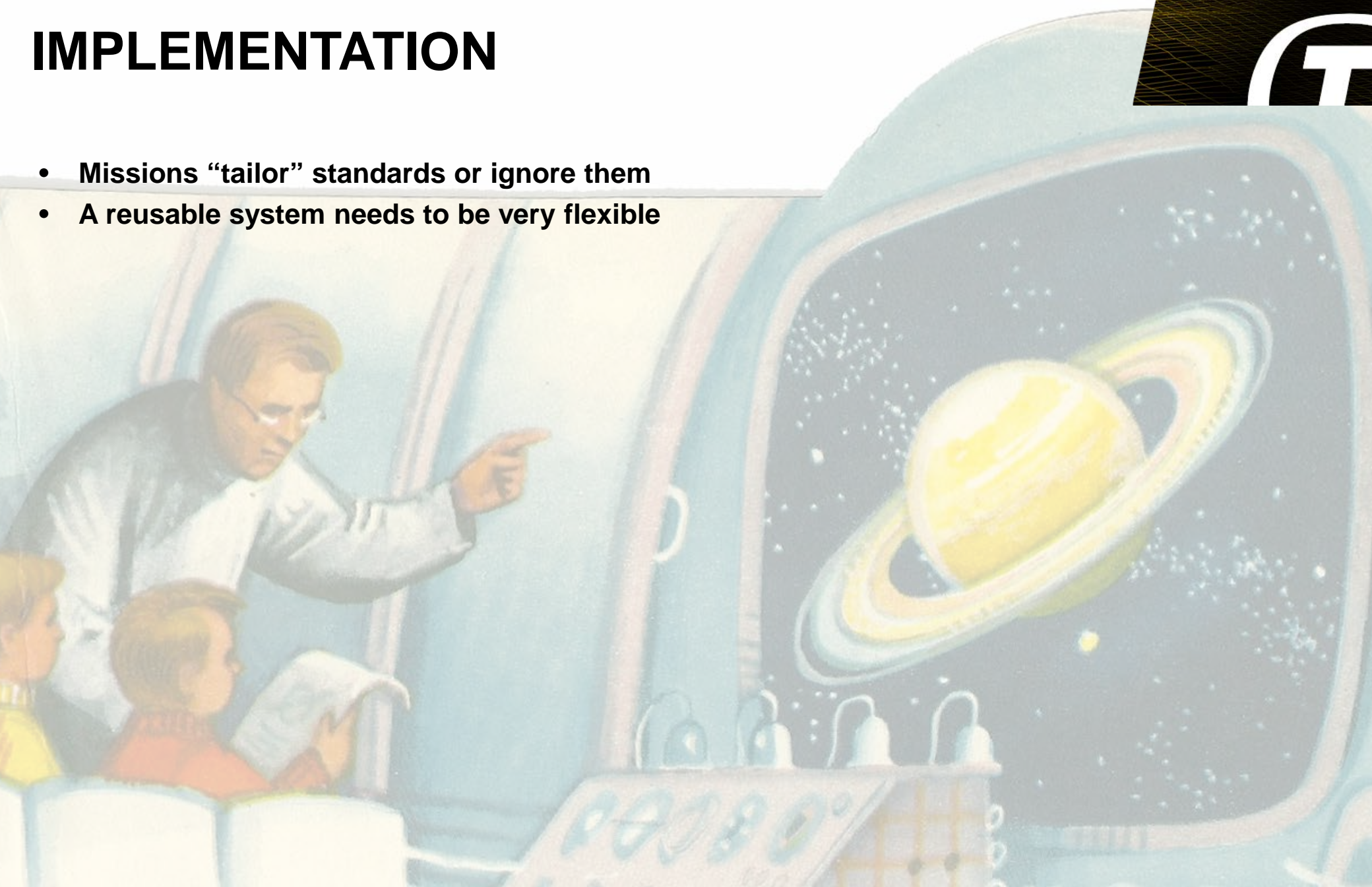
SIMULATED TIME...

In testing and simulation, the entire scenario, including time is sometimes “virtual”, e.g. SVF



IMPLEMENTATION

- Missions “tailor” standards or ignore them
- A reusable system needs to be very flexible

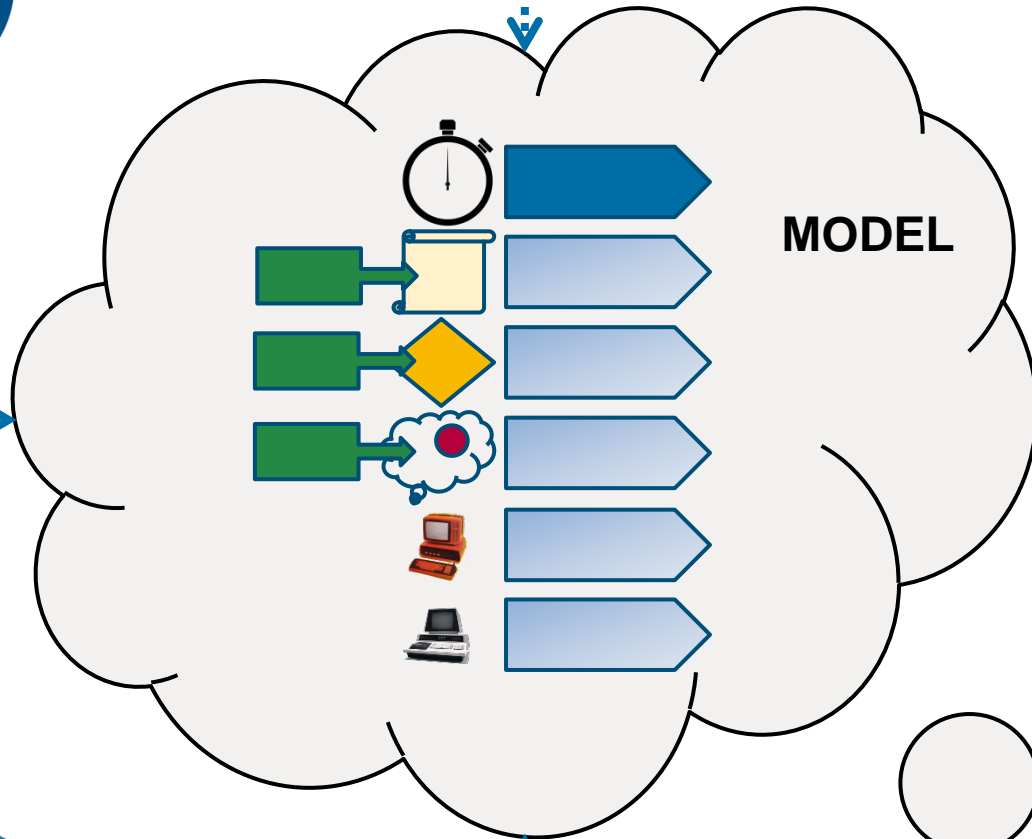




```

::tcsend
::tcraw
::tcformat
::tcmodel
::tcprop
::tcsubscribe
::gettccachedid
::updatecommand

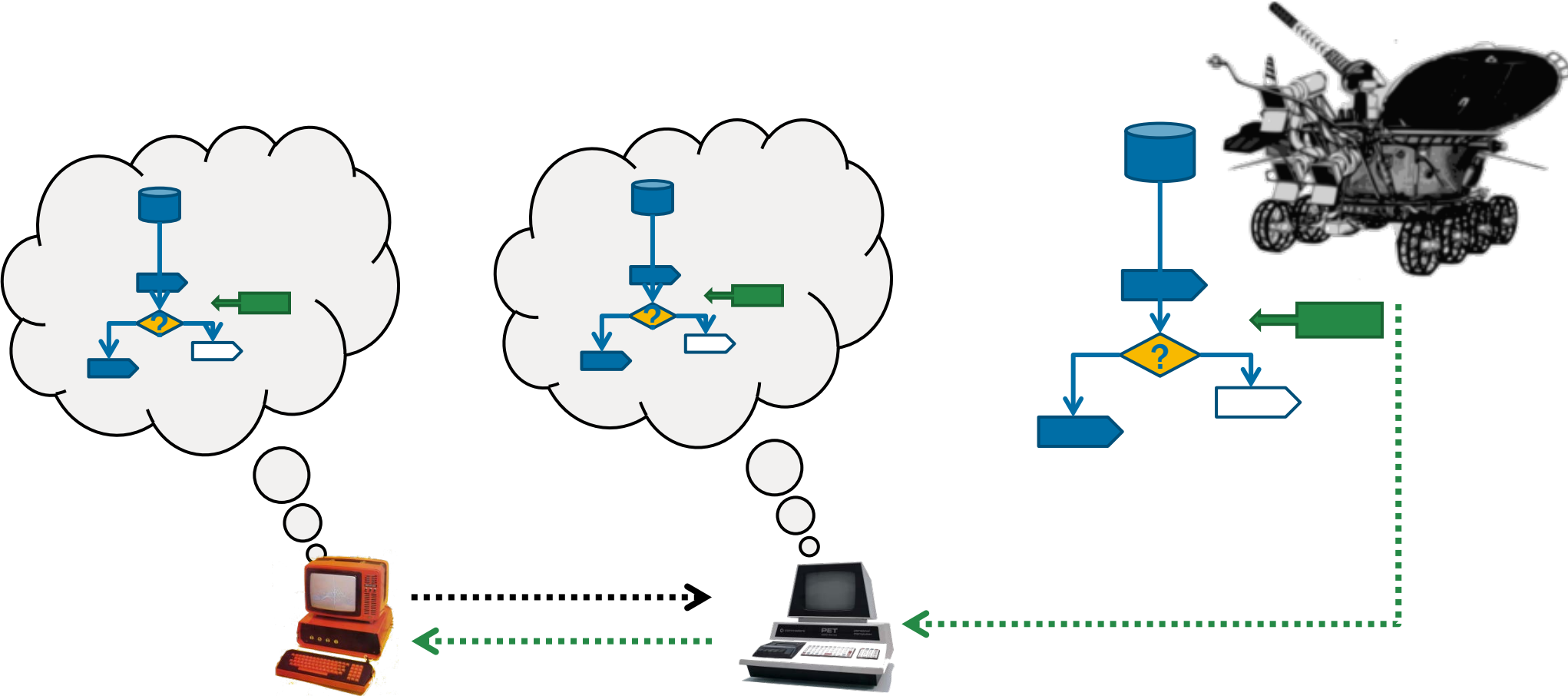
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FUTURE: PROCEDURE TOOLS



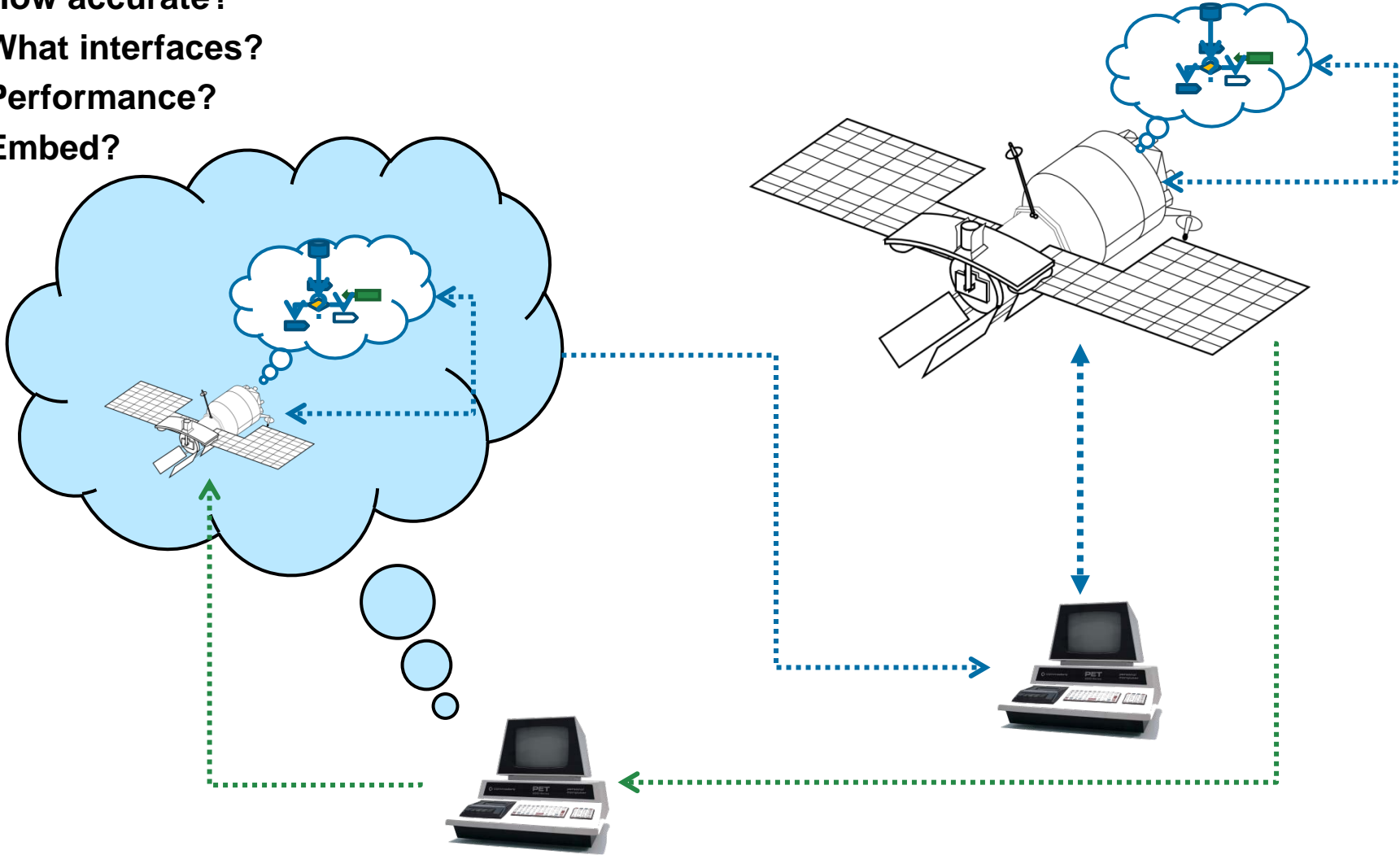
To embed, or interface to 3rd-party tools? (or both?)



FUTURE: EXTERNAL SIMULATORS



How accurate?
What interfaces?
Performance?
Embed?



INTO THE FUTURE....



- On board software is getting smarter!
- Ground control systems are not keeping up!

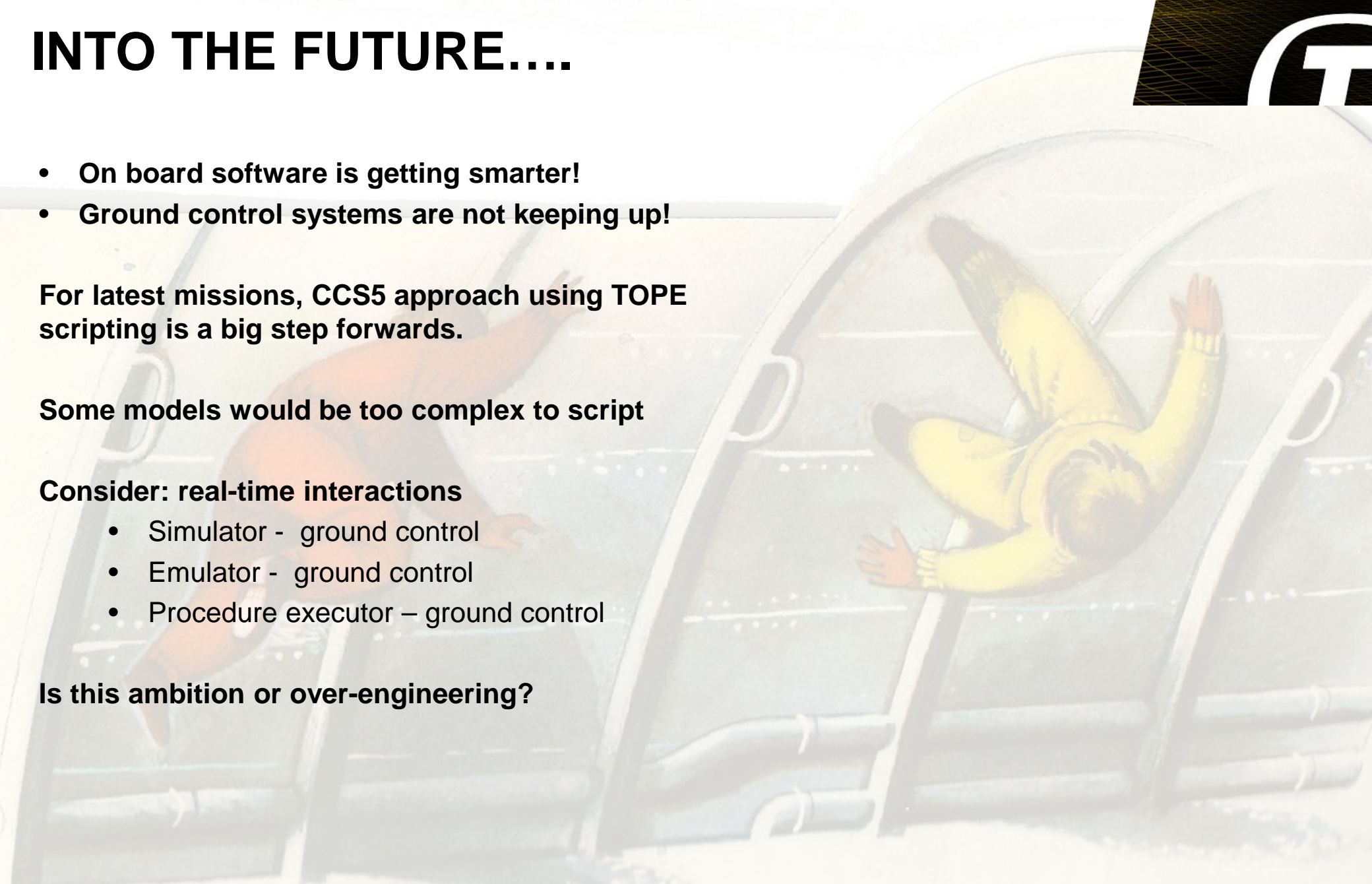
For latest missions, CCS5 approach using TOPE scripting is a big step forwards.

Some models would be too complex to script

Consider: real-time interactions

- Simulator - ground control
- Emulator - ground control
- Procedure executor – ground control

Is this ambition or over-engineering?





Thank you for listening!

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