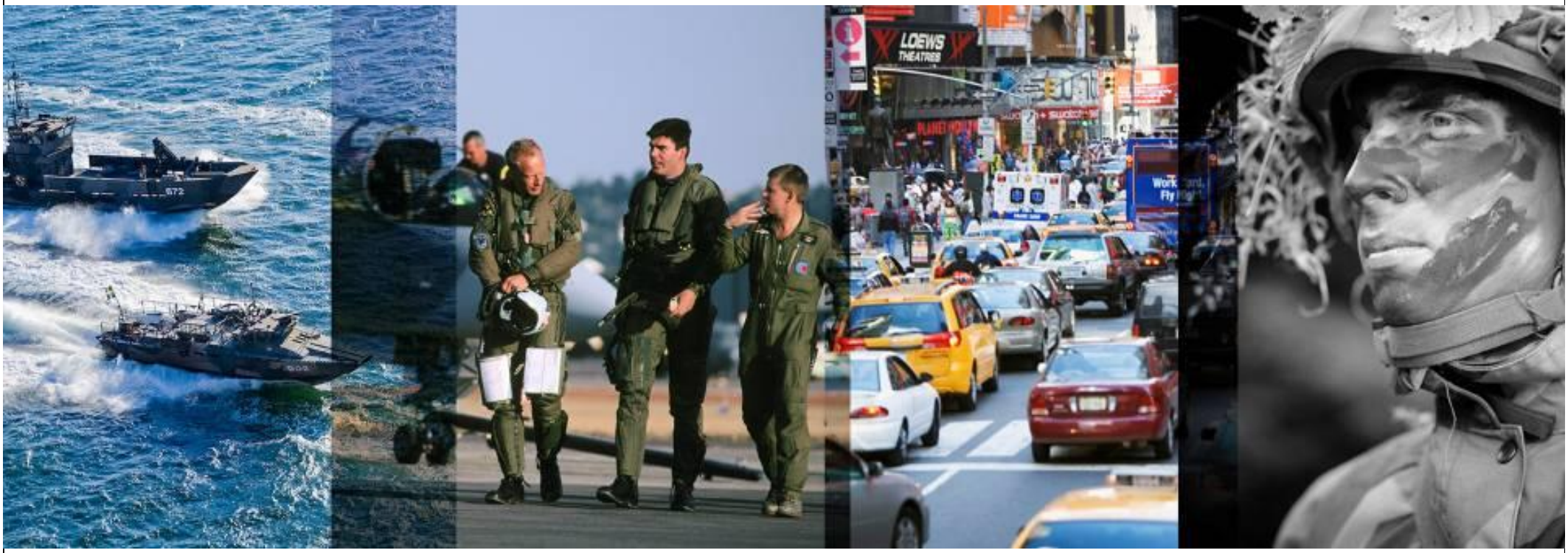
SW architecture for testing

A real world example



NAME Patrik Servin, Technical Manager Software Architecture

DATE 2011

Agenda

- Background
- Architecture description
- Architecture extended for testing
- Testing tool
- The technology behind it
- Taking it one step further…
- Conclusion

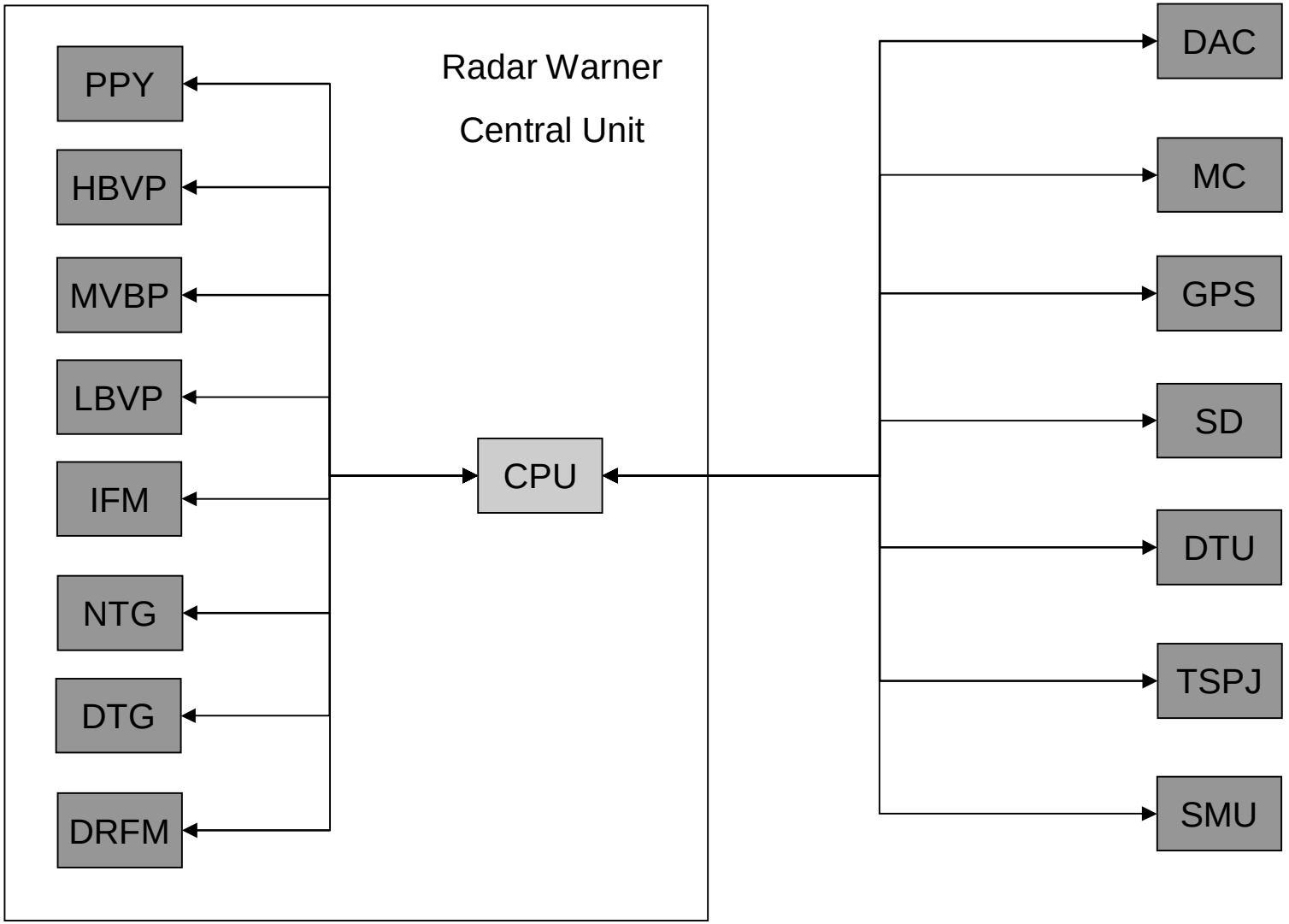
Background

- Systems for
  - Radar warning
  - Electronic Surveillance Monitoring (ESM)

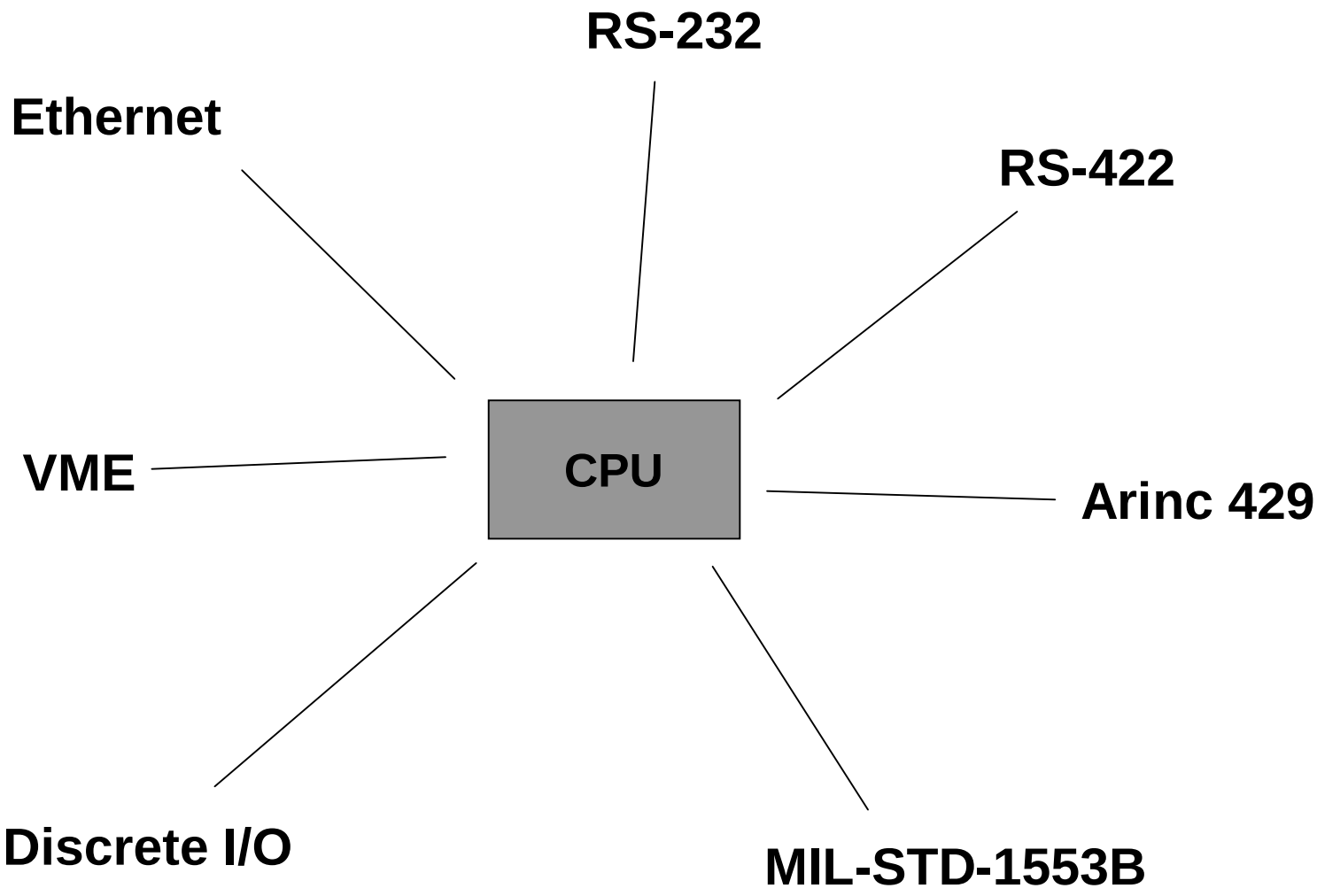
Background


EWCS – EW Central Unit
EWCS – Wing Tip Unit
EWCS – Fin Pod Unit
EWCS – Rear Antenna Unit
BOP-C – CM Dispenser
EWCS – Forward Transmitter Unit
802
EWCS – Forward Antenna Unit
BOQ-X310 – Jammer Pod
BOL – CM Dispenser
BOP-B – CM Dispenser
MAW – Missile Approach Warning System

Background


Radar Warner
Central Unit
PPY
HBVP
MVBP
LBVP
IFM
NTG
DTG
DRFM
CPU
DAC
MC
GPS
SD
DTU
TSPJ
SMU

Background


RS-232
Ethernet
RS-422
VME
CPU
Arinc 429
Discrete I/O
MIL-STD-1553B

Background

- The CPU usually integrates 10-15 internal and external systems
- Hundreds of different kinds of messages sent and received
- Thousands of parameters…

…and each and every parameter has to be correct!

Background

- CPU
  - PowerPC
  - VxWorks
  - 400-1000 kloc
  - RTCA 178B level D

- Complex embedded real-time systems

Background – About testing

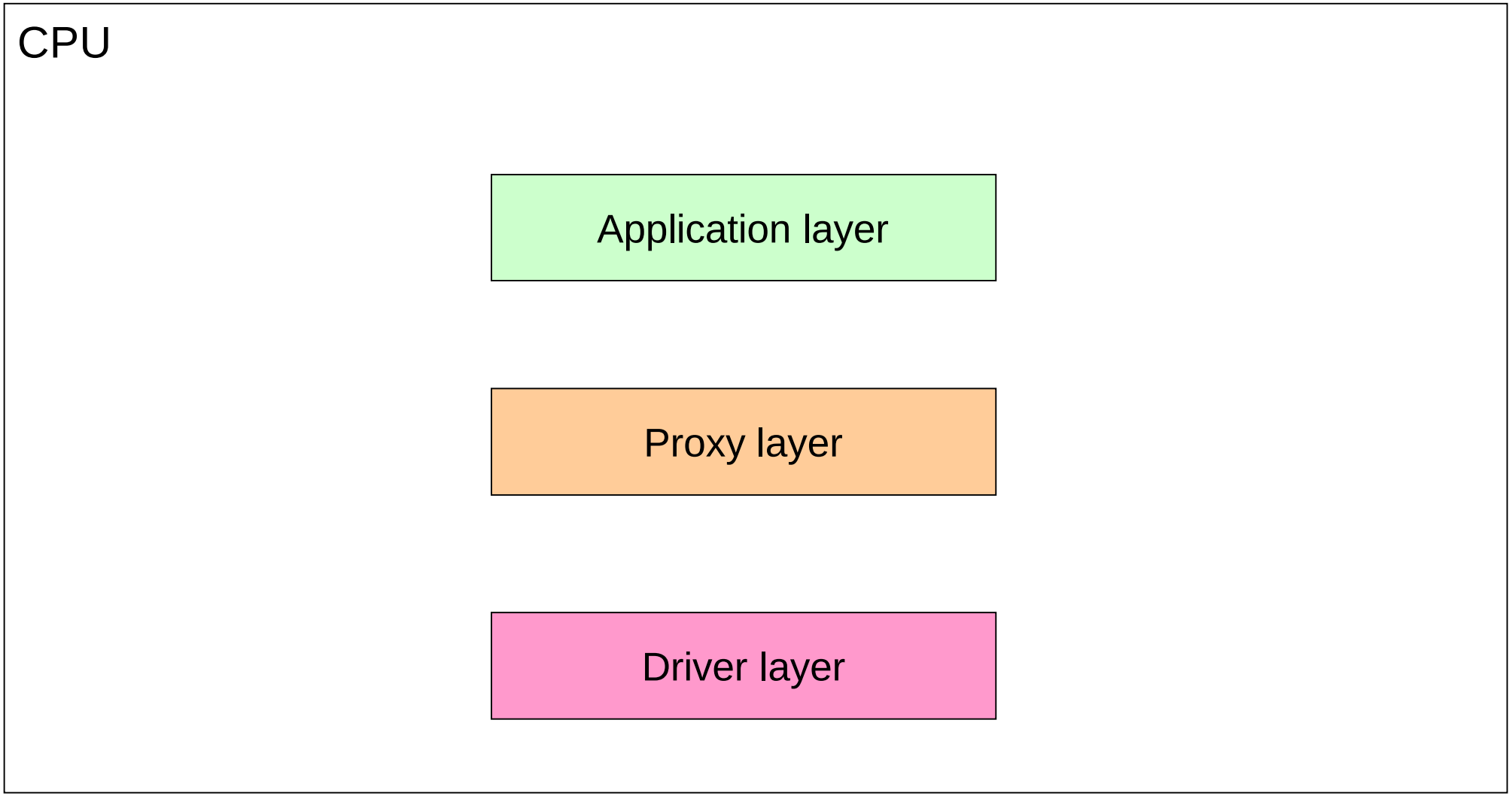
- Target system are expensive
- Simulators based on HW are expensive
- Hard to see what is going on inside the system
  - HW interface listeners exists but are expensive
- Unit testing and sub system testing works great but…

… we still find too many errors during integration!

Is there a way to simplify the integration testing?

Architecture description

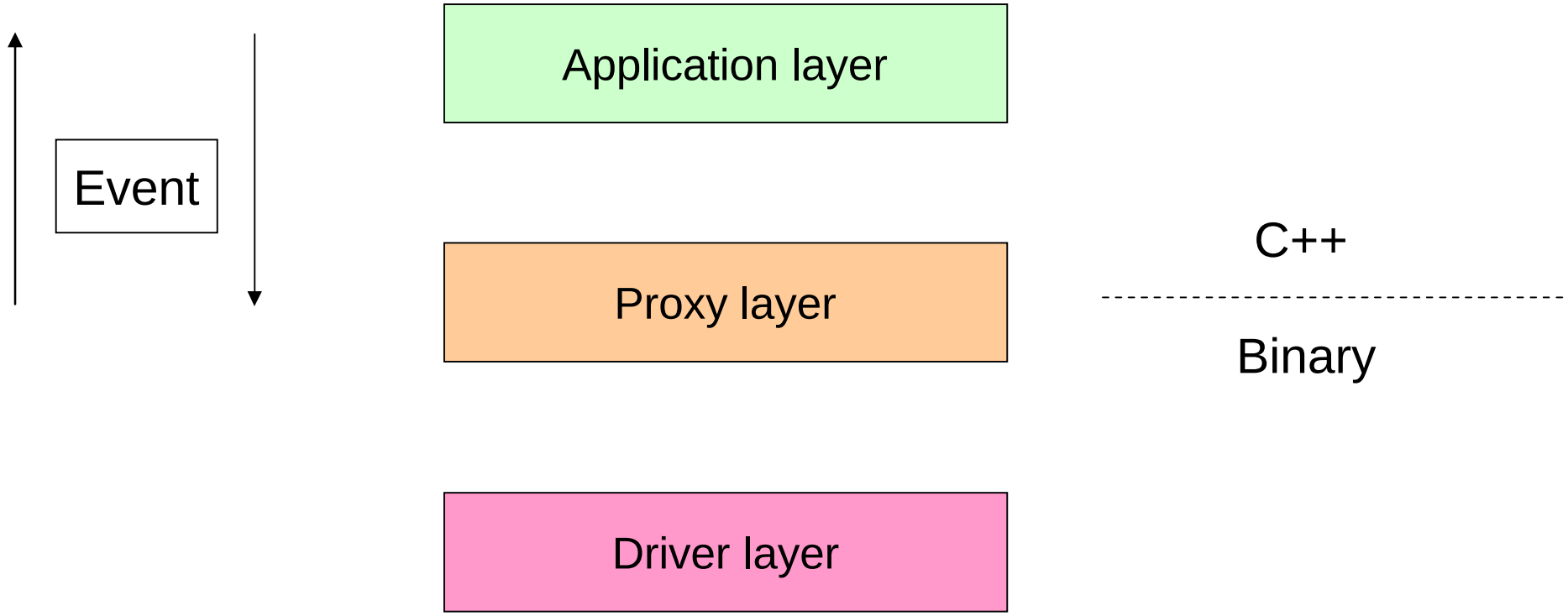
Software architecture - layers



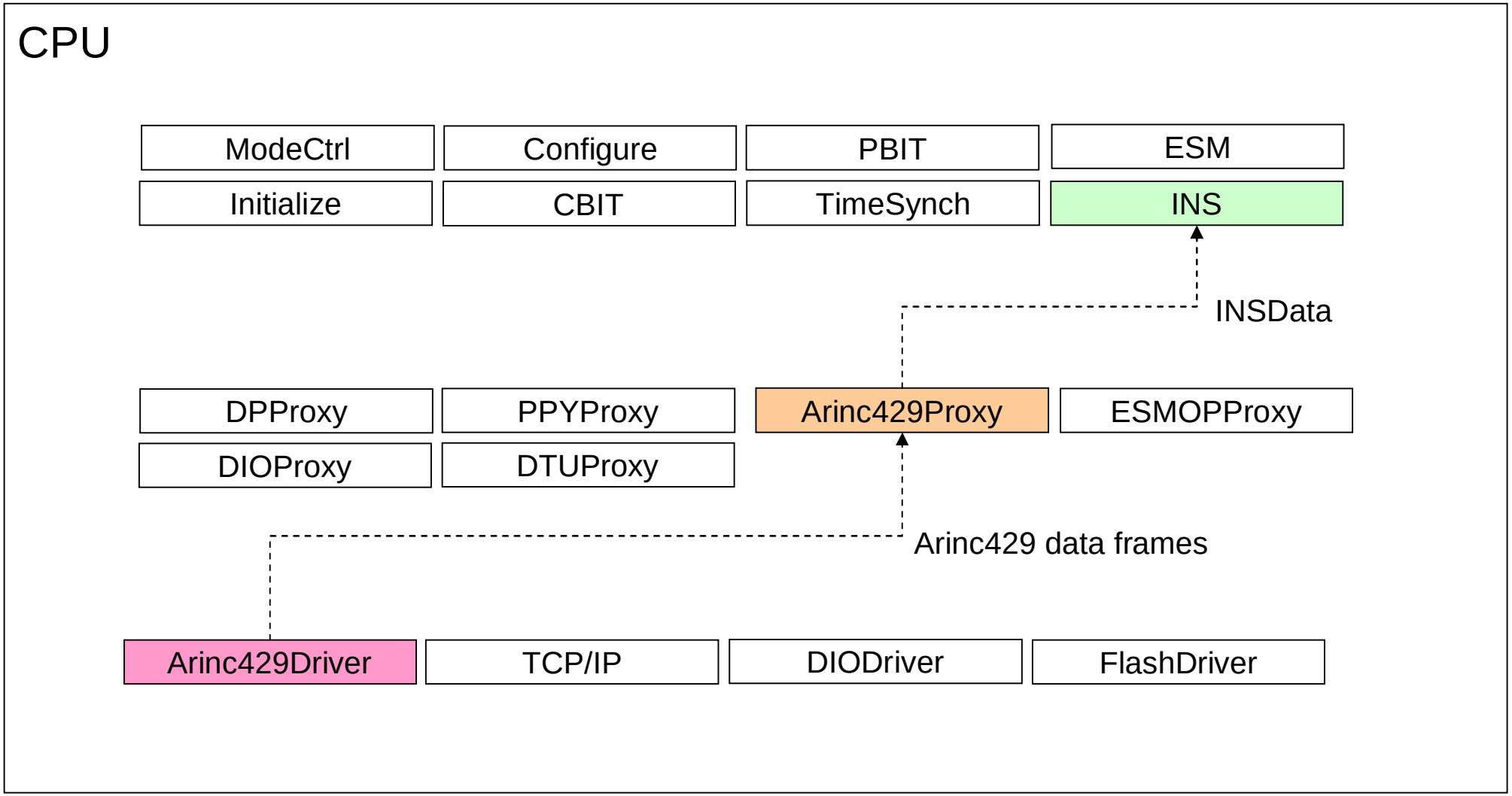
Software architecture

- Event driven system – one Event for each message
- Events are implemented as classes in C++
- Proxies transform between C++ classes and binary representation

Software architecture - layers

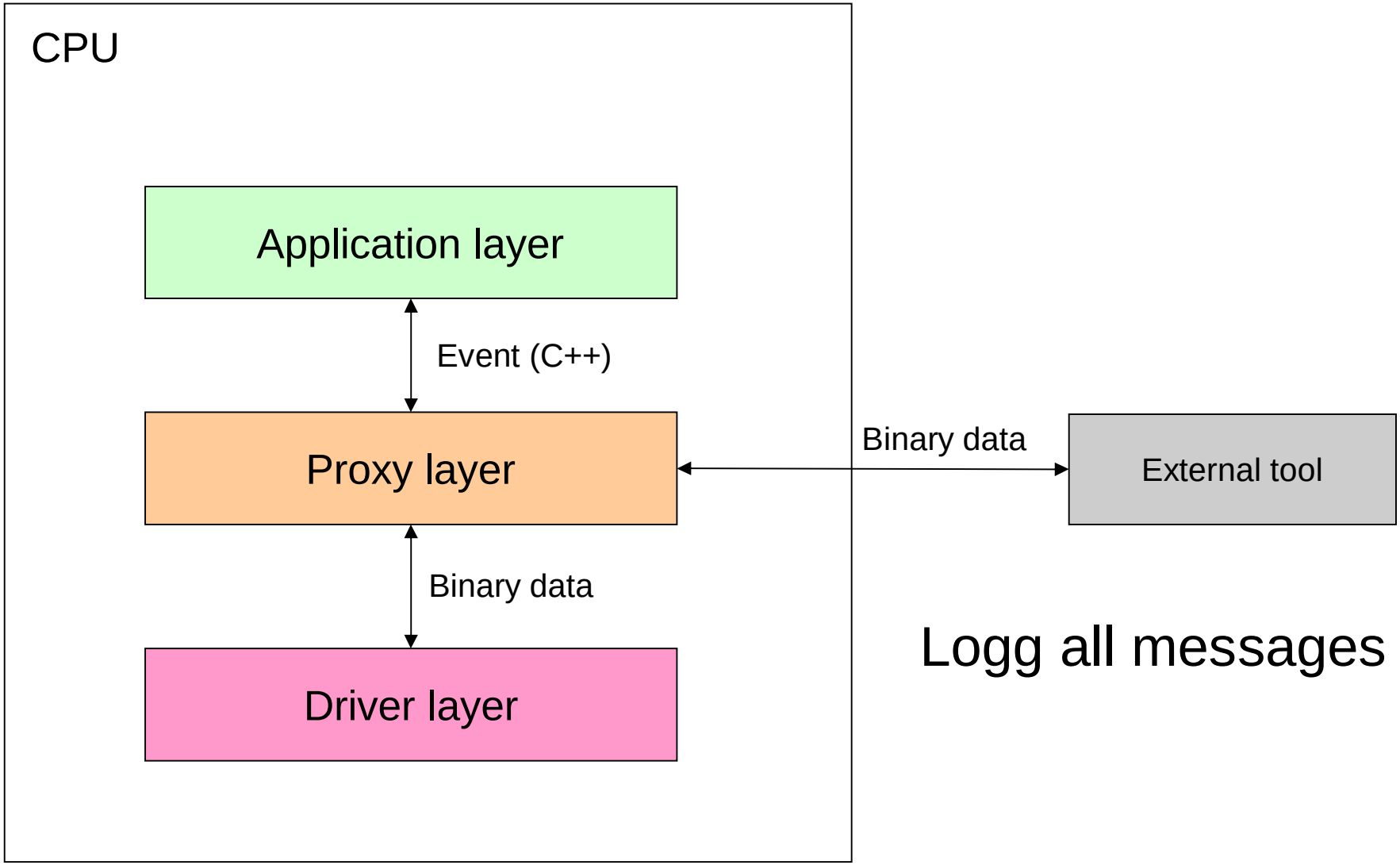


Software architecture - layers

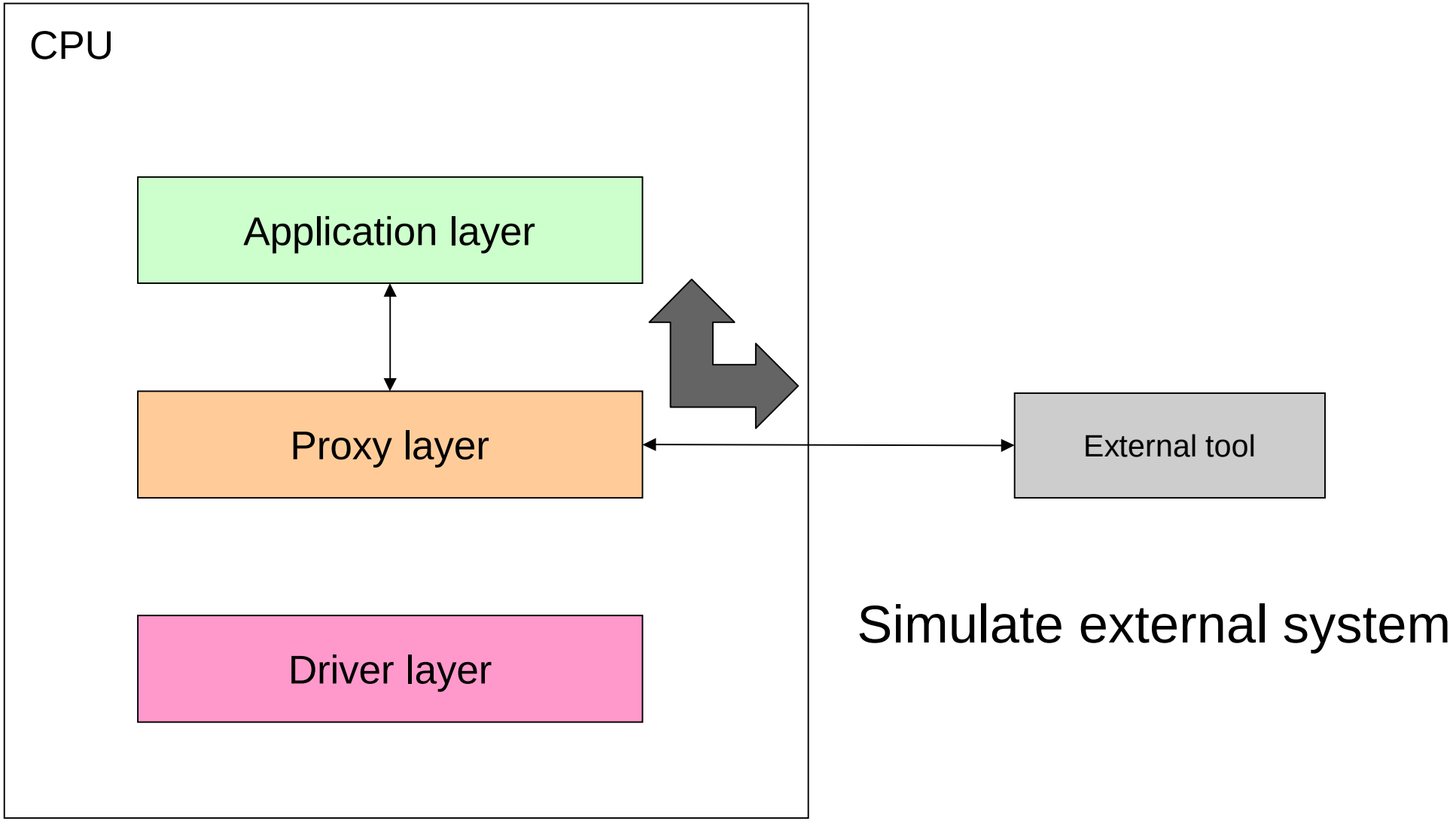


Architecture extended for testing

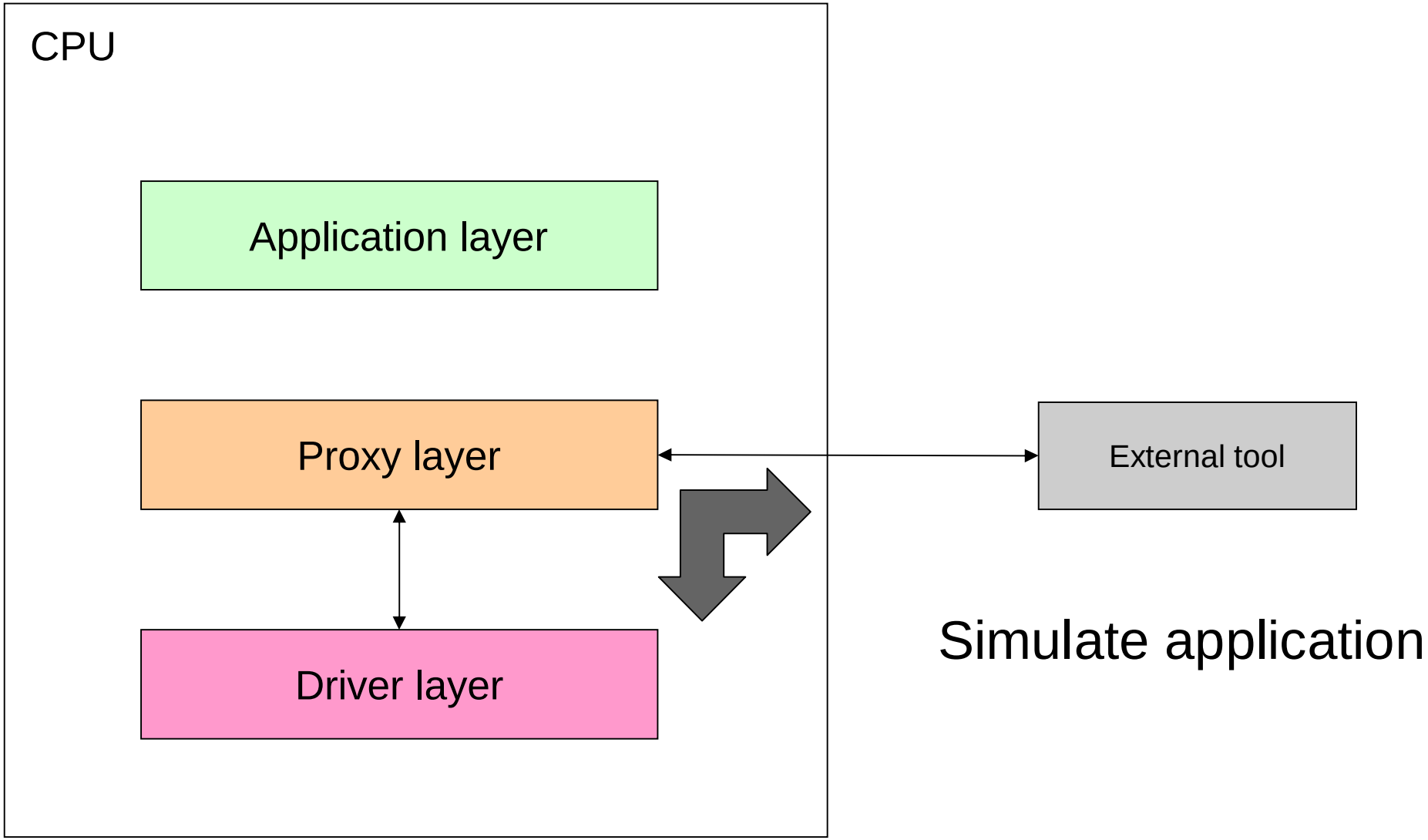
Architecture extended for testing



Architecture extended for testing



Architecture extended for testing



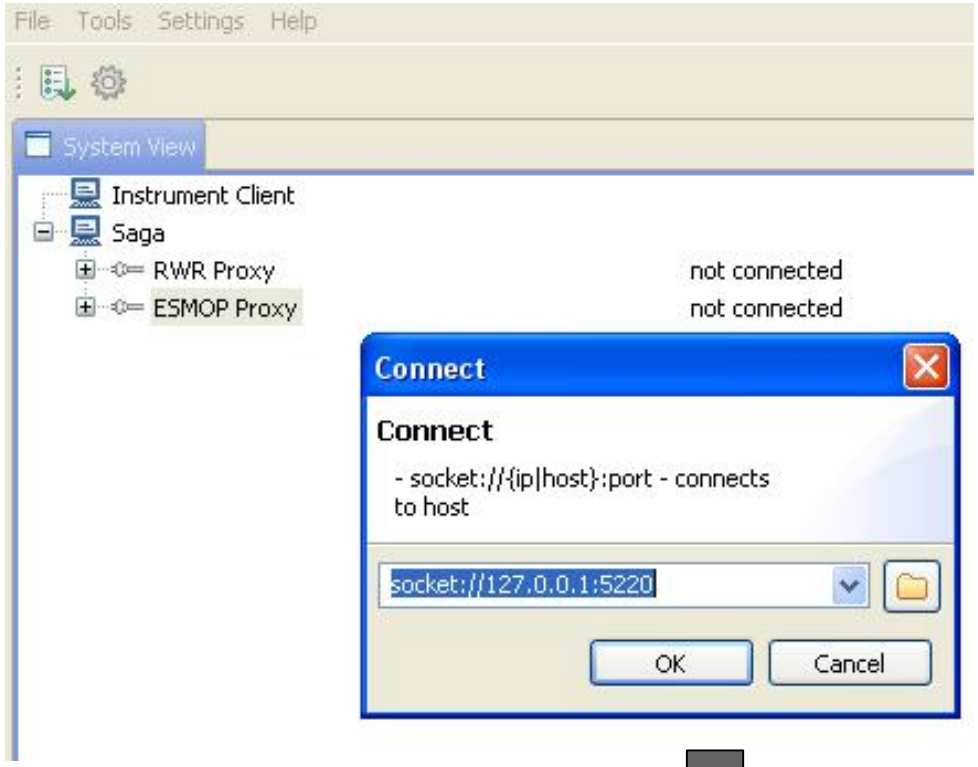
Testing tool

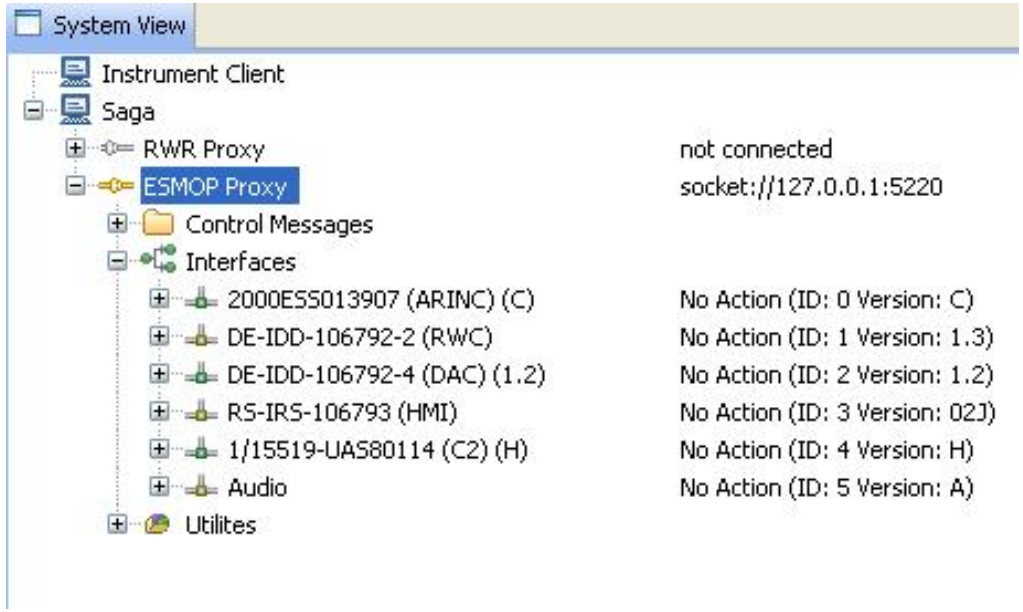
Testing tool

- Eclipse based
- Automatic discovery of interfaces/proxies
- Display all messages in HEX format
- XML definitions of interfaces to interpret messages
- Record all messages
- Replay messages
- Filter messages
- Set up triggers for specific parameter values

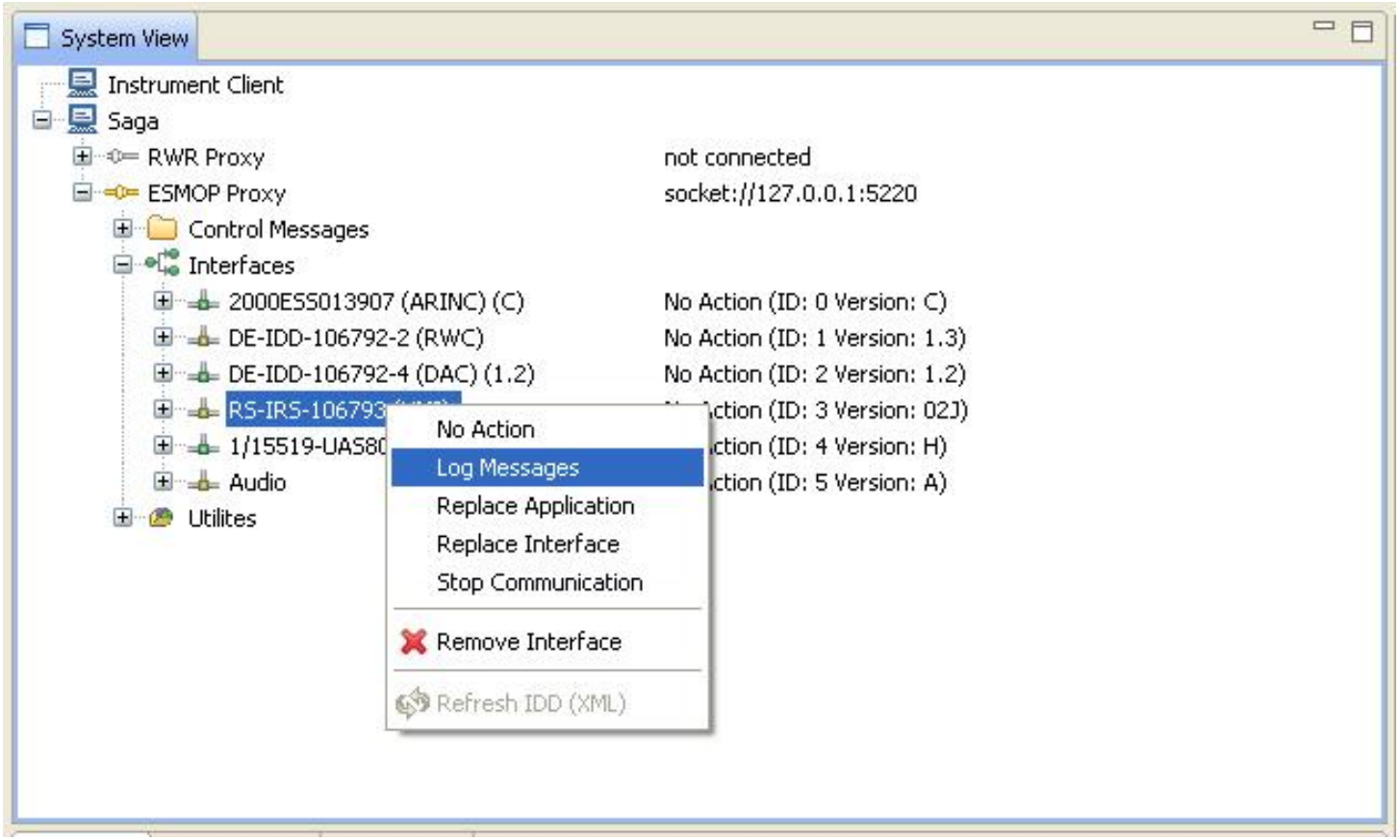
- JUnit test cases

Testing tool

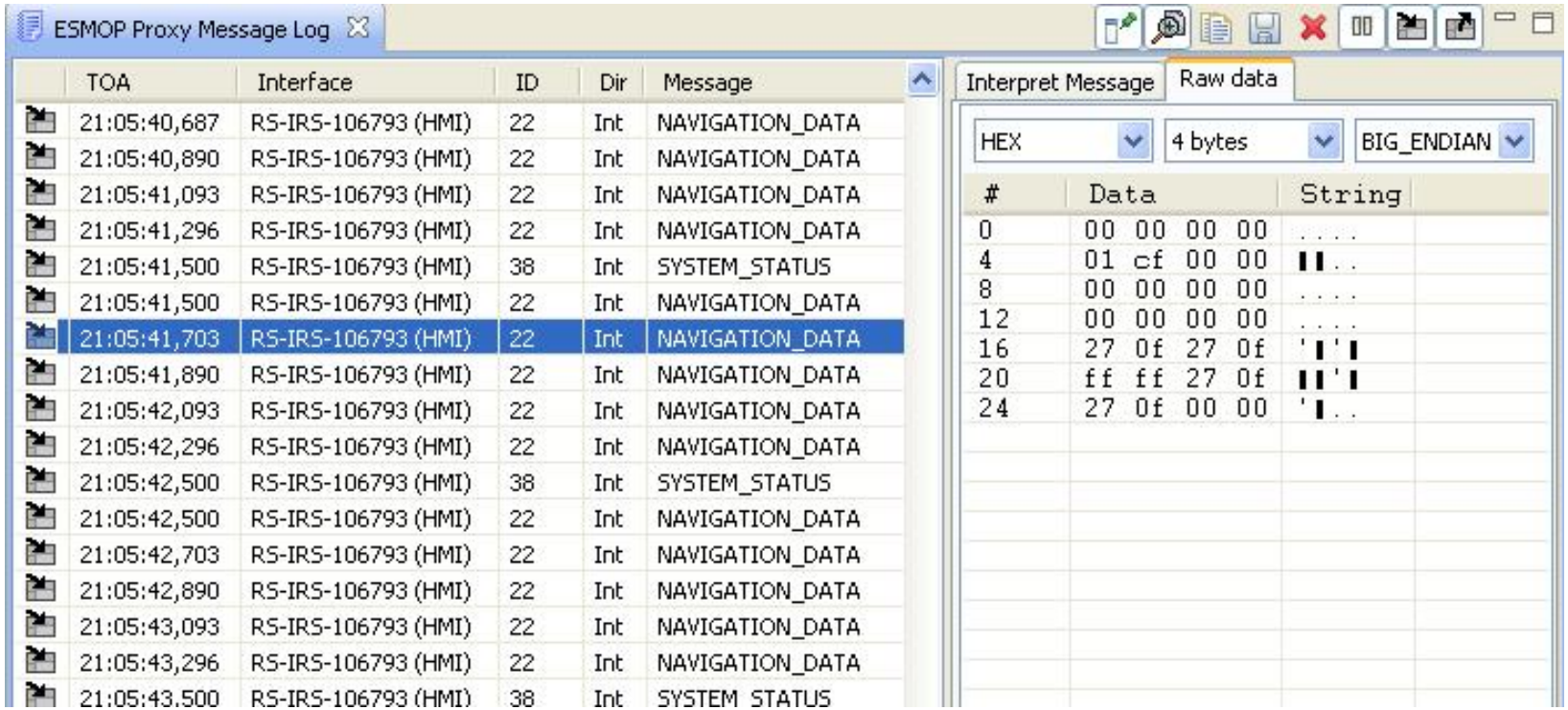




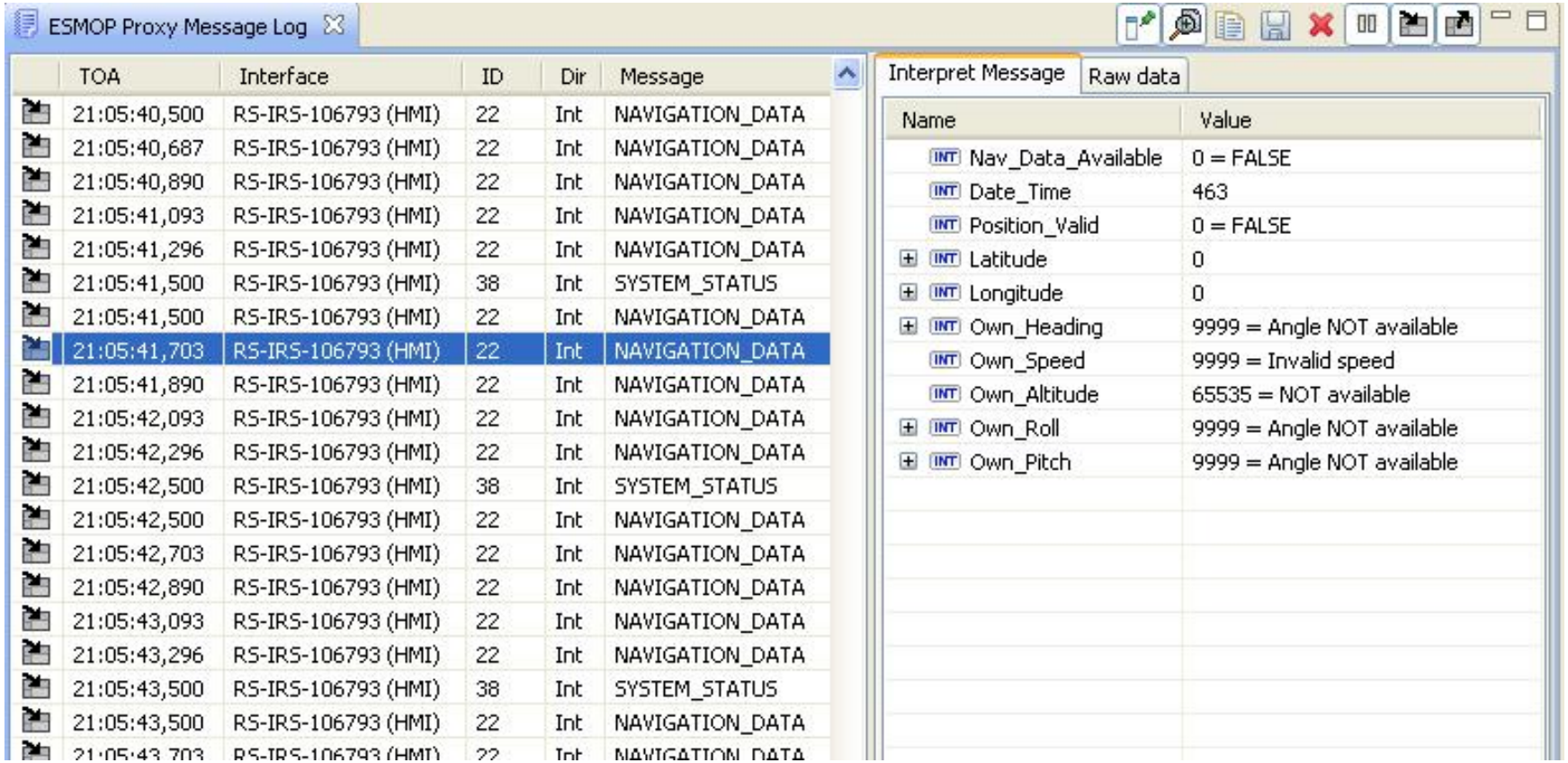
Testing tool



Testing tool

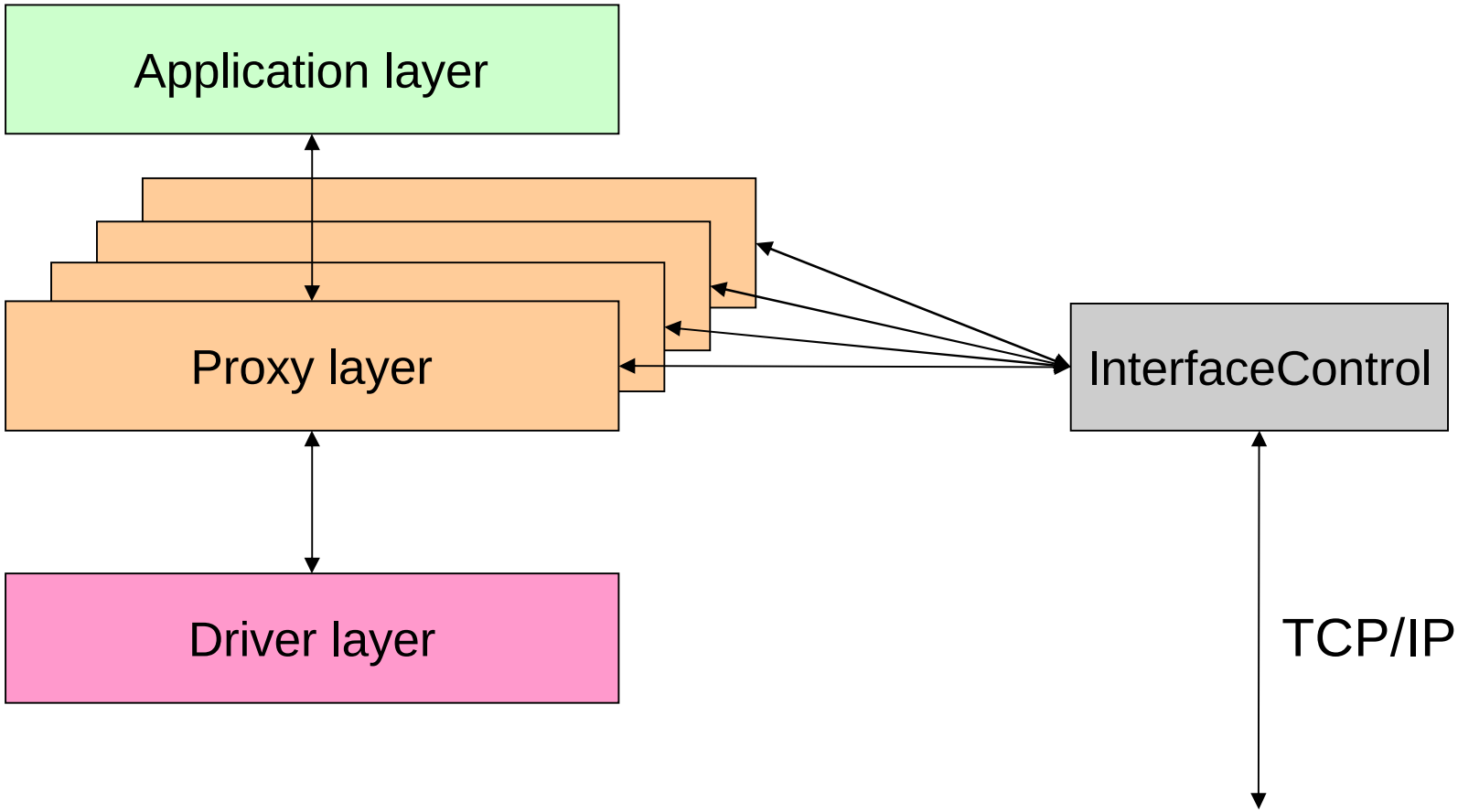


Testing tool

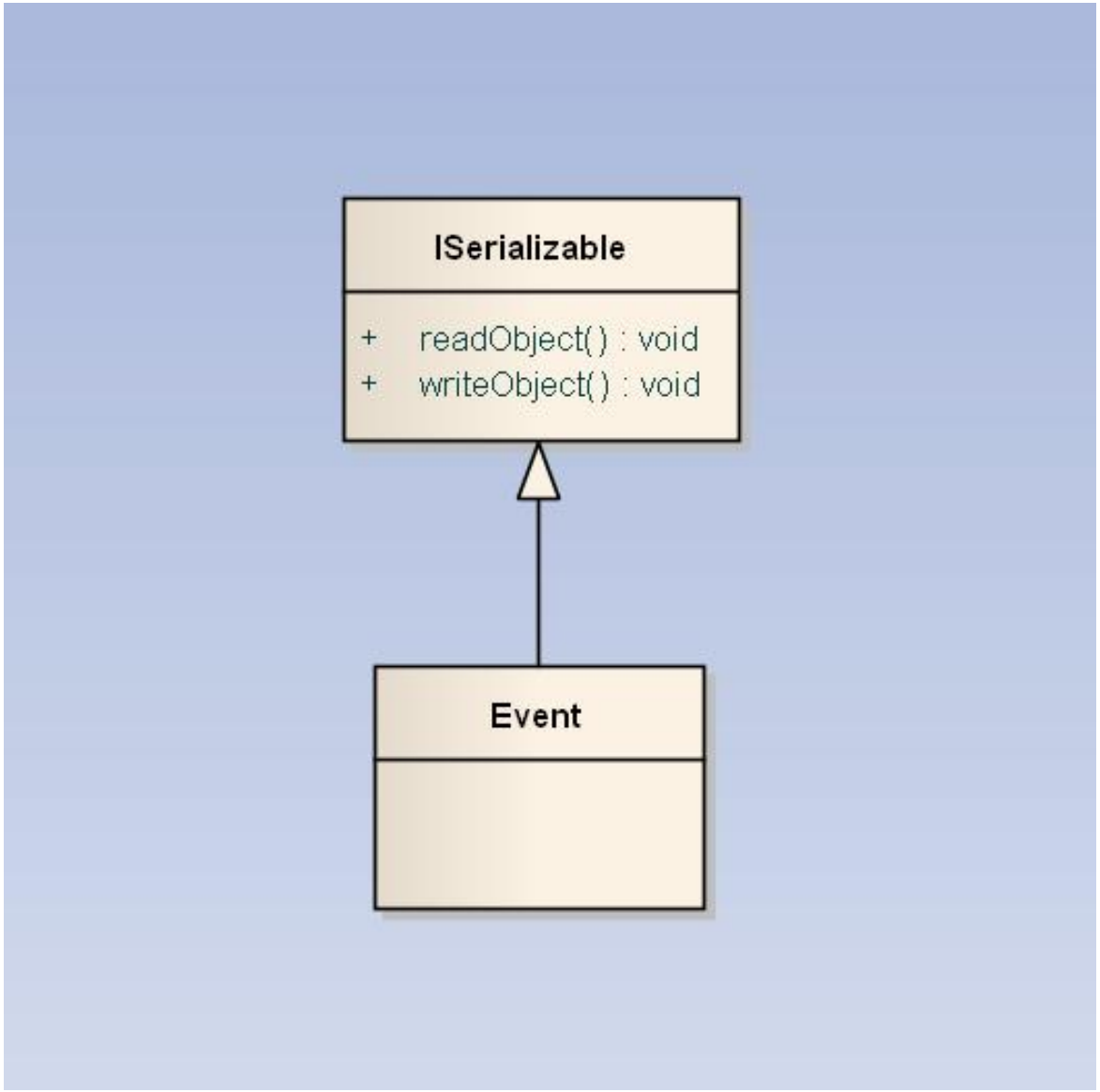


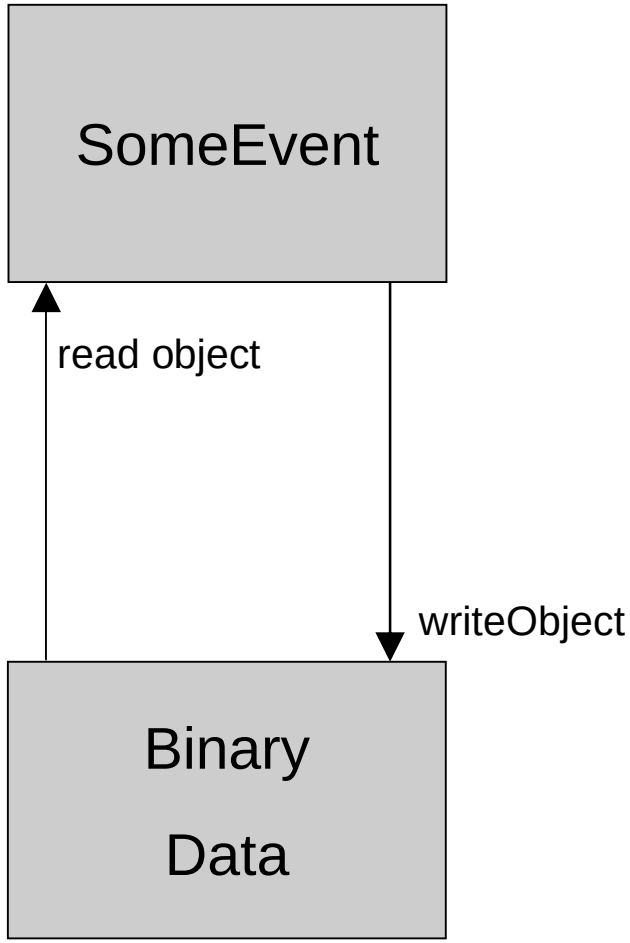
The technology behind it

The technology behind it



The technology behind it

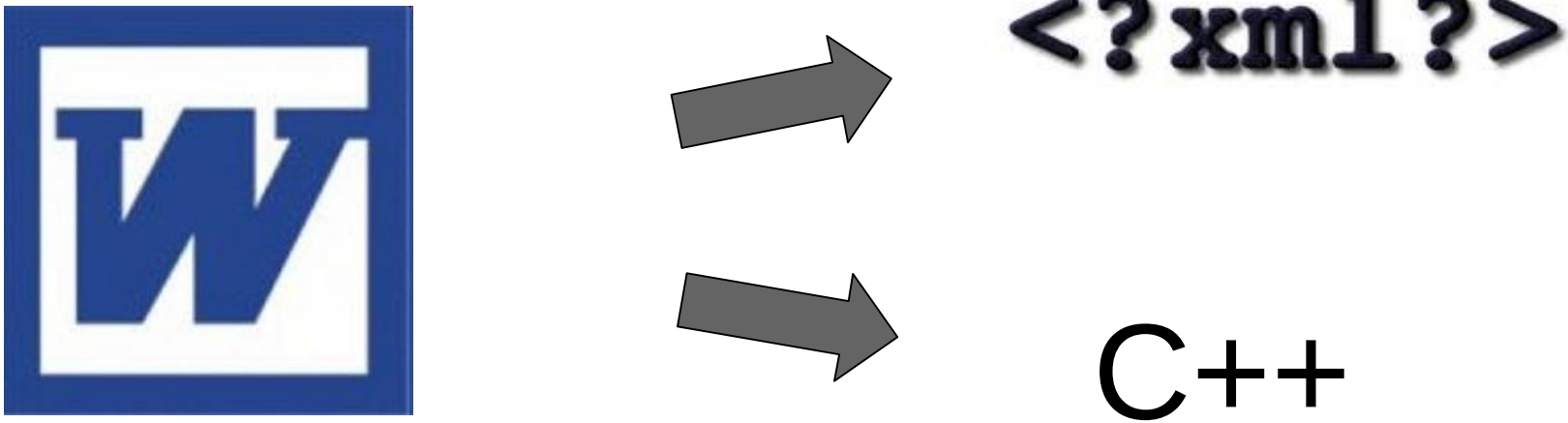




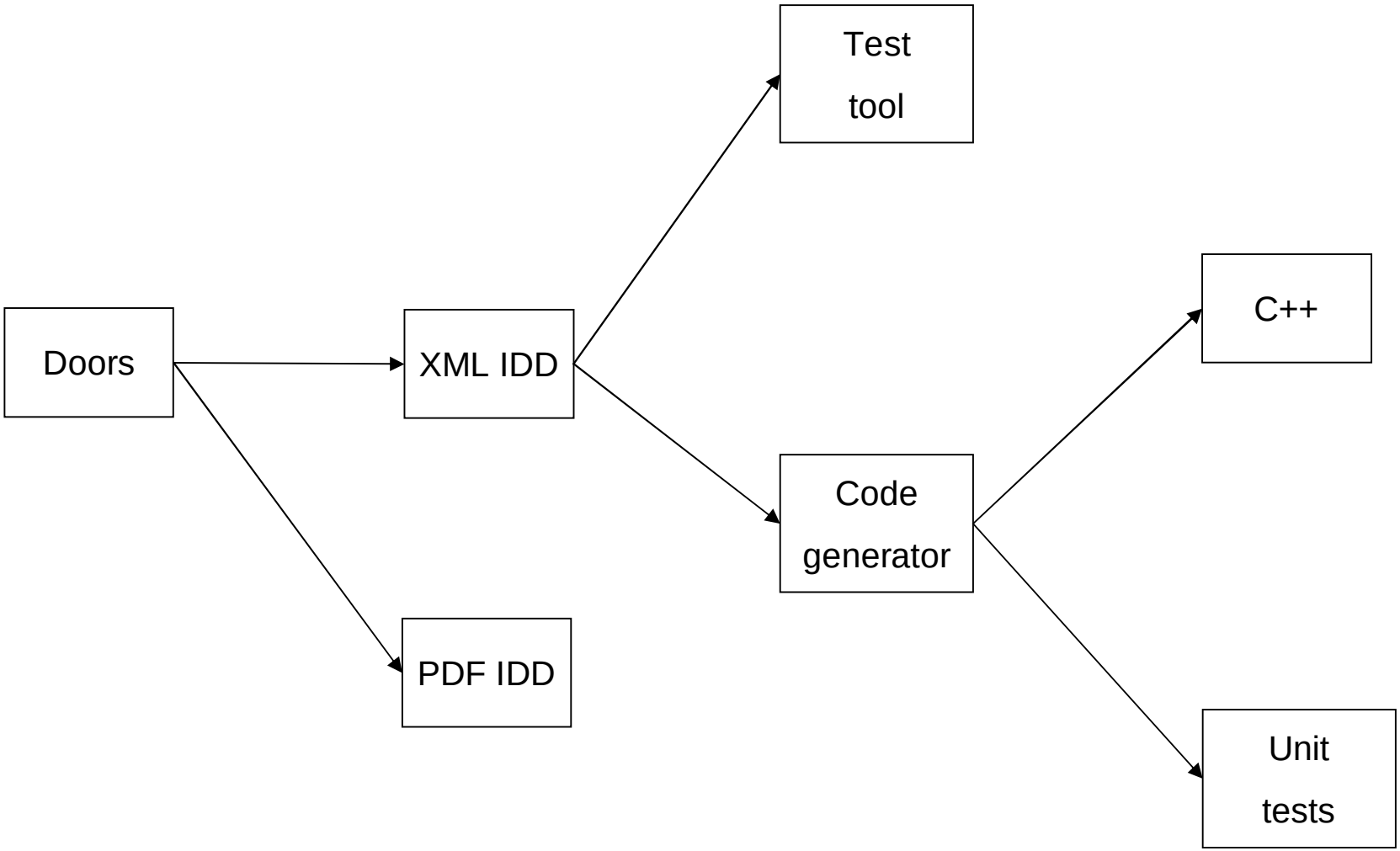
Taking it one step further

Taking it one step further

- The XML descriptions of the interface descriptions becomes much more important than the paper version!
- Tedious job to implement all Events by hand



Taking it one step further



Conclusion

Conclusion

- The integrators loves this functionality!
- Developers can test the integrated software on a desktop computer
- Automated unit test on system level (for a small cost)

- It’s important to consider integration testing when working with the architecture

Questions?

patrik.servin@saabgroup.com

http://se.linkedin.com/in/patrikservin

SAAB

SAABGROUP.COM