Instrument control software

INAF – ICT Workshop 2017
27 Novembre – 1 Dicembre 2017
Bologna Area Ricerca CNR

Astrophysics Instrumentation Software Development

Instrument commanding

Instrument health monitoring and control

Data Acquisition & pre-processing

Data packetization and formatting

Digital Signal Processing

Instrument Remote commanding

Instrument Real time monitoring

Requirements Analysis

SW criticality analysis

SW Design

SW development

SW testing

SW Validation and Qualification

Software Development is a Key Activity
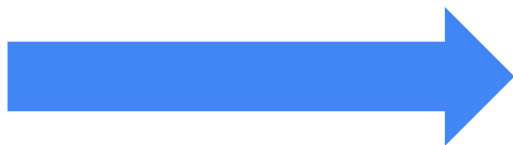
Part of every major INAF project

Enable our participation in many international programs

Ensures our access to instruments data, even if not released to public

Increases our capability to cross correlate data from different sources

Increases our capability to produce up-to-date publications

High costs if outsourced - we have in house know how

Improves our competitiveness

Instrument control software development @INAF

Ground instruments

SRT
SKA
ASTRI
CTA
EST
E-ELT
VLT
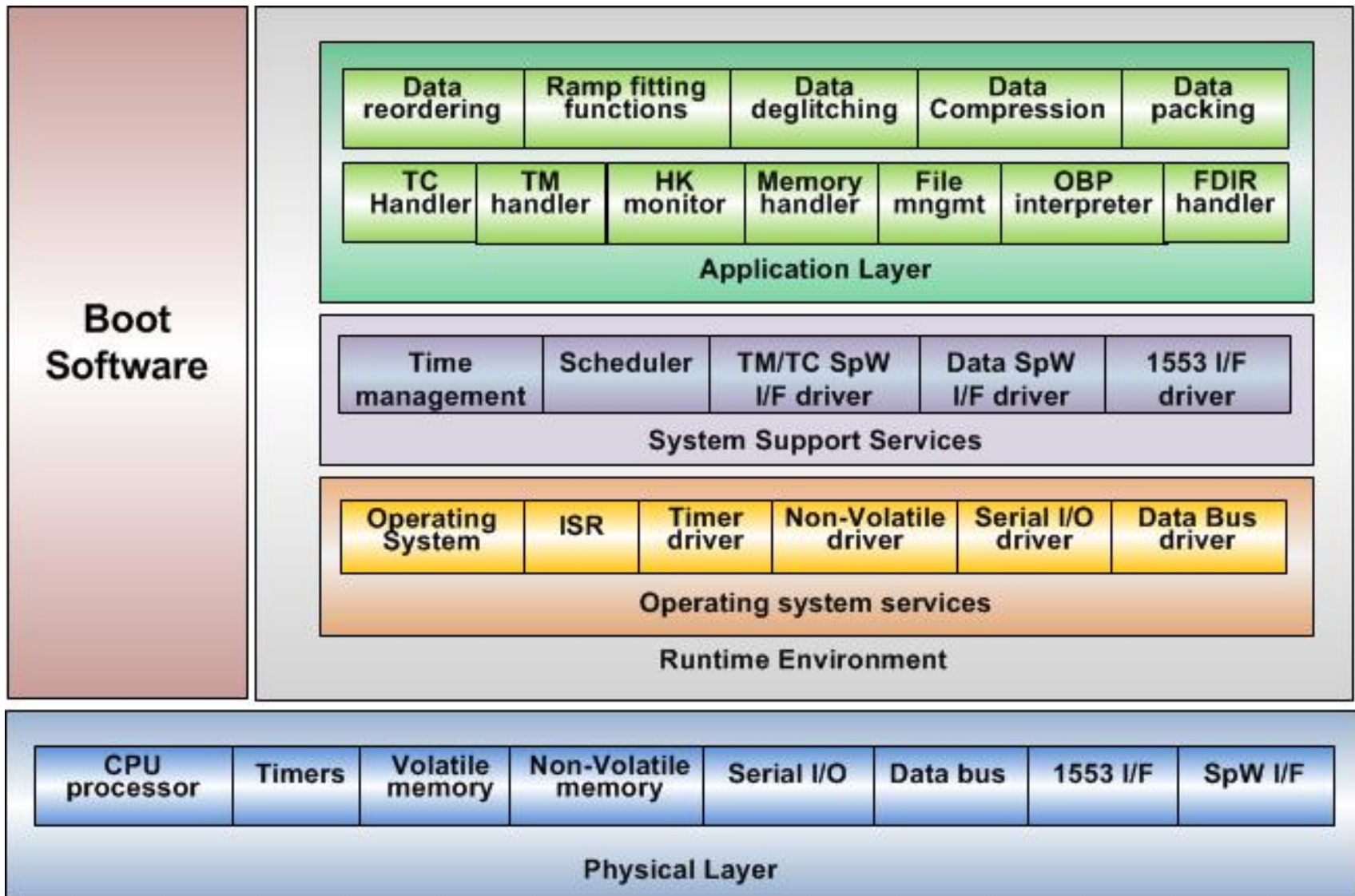TNG
...

Space missions

EUCLID
PLATO
ATHENA
HERSCHEL
PLANCK
ROSETTA
BEPI-COLOMBO
EXOMARS
...

Control Systems challenges

Boot Software

Application Layer

| Data reordering | Ramp fitting functions | Data deglitching | Data Compression | Data packing |

| TC Handler | TM handler | HK monitor | Memory handler | File mngmt | OBP interpreter | FDIR handler |

System Support Services

| Time management | Scheduler | TM/TC SpW I/F driver | Data SpW I/F driver | 1553 I/F driver |

Operating system services

| Operating System | ISR | Timer driver | Non-Volatile driver | Serial I/O driver | Data Bus driver |

Runtime Environment

Physical Layer

| CPU processor | Timers | Volatile memory | Non-Volatile memory | Serial I/O | Data bus | 1553 I/F | SpW I/F |

Common Misconceptions

1. Control Systems are cheap (4-7% of total project budget for ground based instruments)

2. Lower priority wrt hardware

3. Everybody can do it, it does not need specific expertise

4. We can easily buy it or there is a free framework X that solves our problem

Control Software & INAF : a difficult relationship

What we need

RESPECT we need to address software development as a **first class citizen** in the panorama of our research activities.

MANPOWER we must unde[...] simply bought. It should be [...]fic expertise. We now have thes[...]em.

INVESTMENT and a better p[...]o be allocated to software pro[...]d from the planning phases.

<div style="color:white; background:red;">
Space systems SW:
IAPS, IASF, OATO, OAPD

Ground based instruments:
IASF, IRA, OAA, OAB, OABO, OAC, OACT,
OAPD, OAR, OATe, OATO, OATs
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BEST PRACTICES Big software projects and participation in international contexts impose the use of software engineering standards both at process and project level.

EXCHANGE of know-how and tools between INAF structures and people.

We thus propose

-Add SW development to the top priority technological activities of INAF

- Explicitly include instrument control systems within this context

	Il software di controllo del sottosistema di ottica adattiva di LBT — *Luca Fini*
	SKA CSP il sistema di controllo — *Carlo Baffa* 📎
10:00	
	Software di Controllo per strumentazione VLT — *Andrea Baruffolo*
	Coffee *Bologna*
11:00	**Telescope Control System of the ASTRI SST-2M prototype** — *Elisa Antolini*
	iTPM, scheda di acquisizione dati per la parte bassa frequenza... — *Andrea Mattana*
12:00	**Il SW di bordo della Instrument Control Unit di Euclid-NISP** — *Vito Capobianco*
	Discussione *room 216* 12:30 - 13:00