

Data Acquisition Software

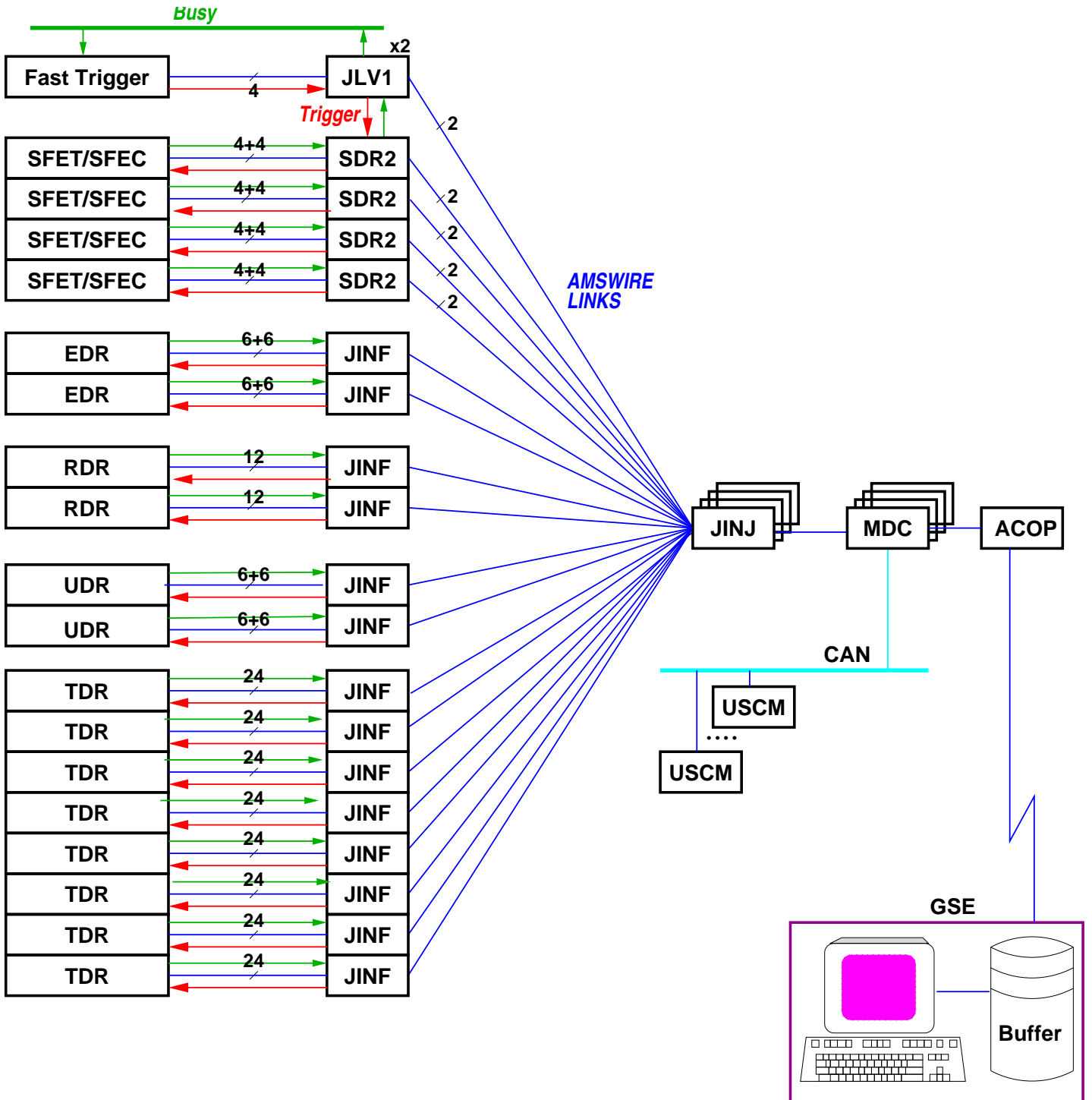
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CERN, 28 October 2003

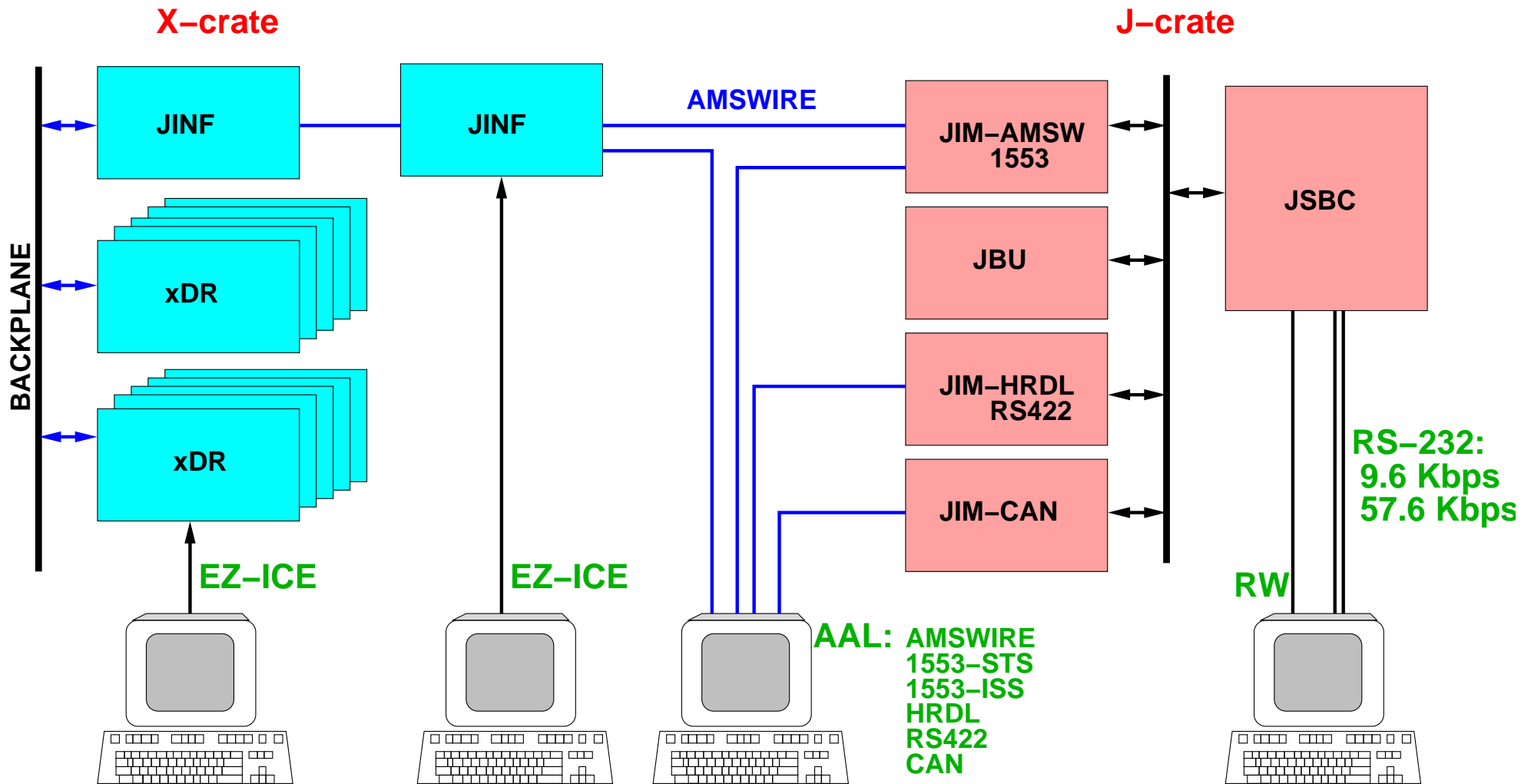
OUTLINE:

- DAQ structure
- Performance issues
- CDP/CDDC software
- MDC software

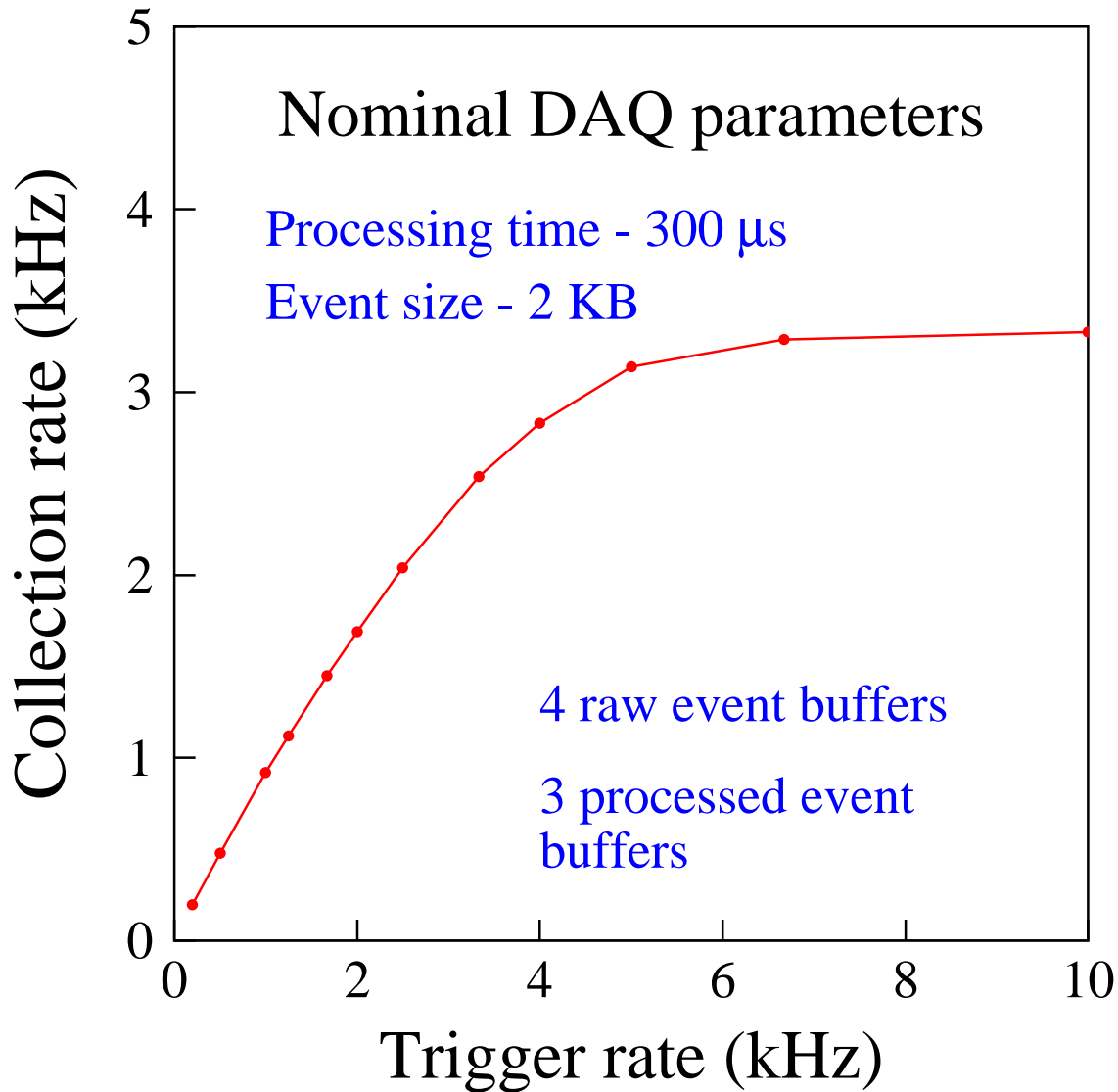
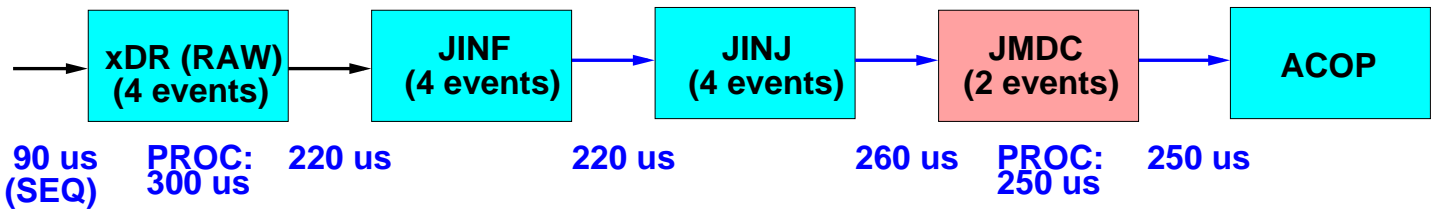
DAQ tree



Development setup



DAQ Performance - measurements



Analog electronics should behave in the range
0–5 KHz (minimum) !

CDP/CDDC software

Ingredients:

Detector independent:

1. Boot procedure;
2. FLASH operations;
3. Data protection;
4. AMSWIRE operations;
5. Event building;
6. In-situ test procedures;

Detector dependent:

7. Data reduction;
8. Calibration procedures.

Software bits:

1. LV1 Trigger (C.H.Lin);
2. Silicone Tracker (D.Haas);
3. Ring–Imaging Cerenkov Detector (G.Martinez);
4. Transition Radiation Detector (F.Hauler);
5. Electromagnetic Calorimeter (F.Spinella);
6. Time–of–Flight and Anti–Coincidence Counters (F.Cindolo).
7. Detector independent framework (A.Kounine, V.Koutsenko).

CDP/CDDC software status

CDP:

1. LV1 software – used in ESS/TVT tests;
2. Tracker software – used in beam tests;
3. RICH software – verified using test setups;
4. TRD software – used in beam tests;
5. ECAL software – work in progress;
6. TOF software – work in progress;

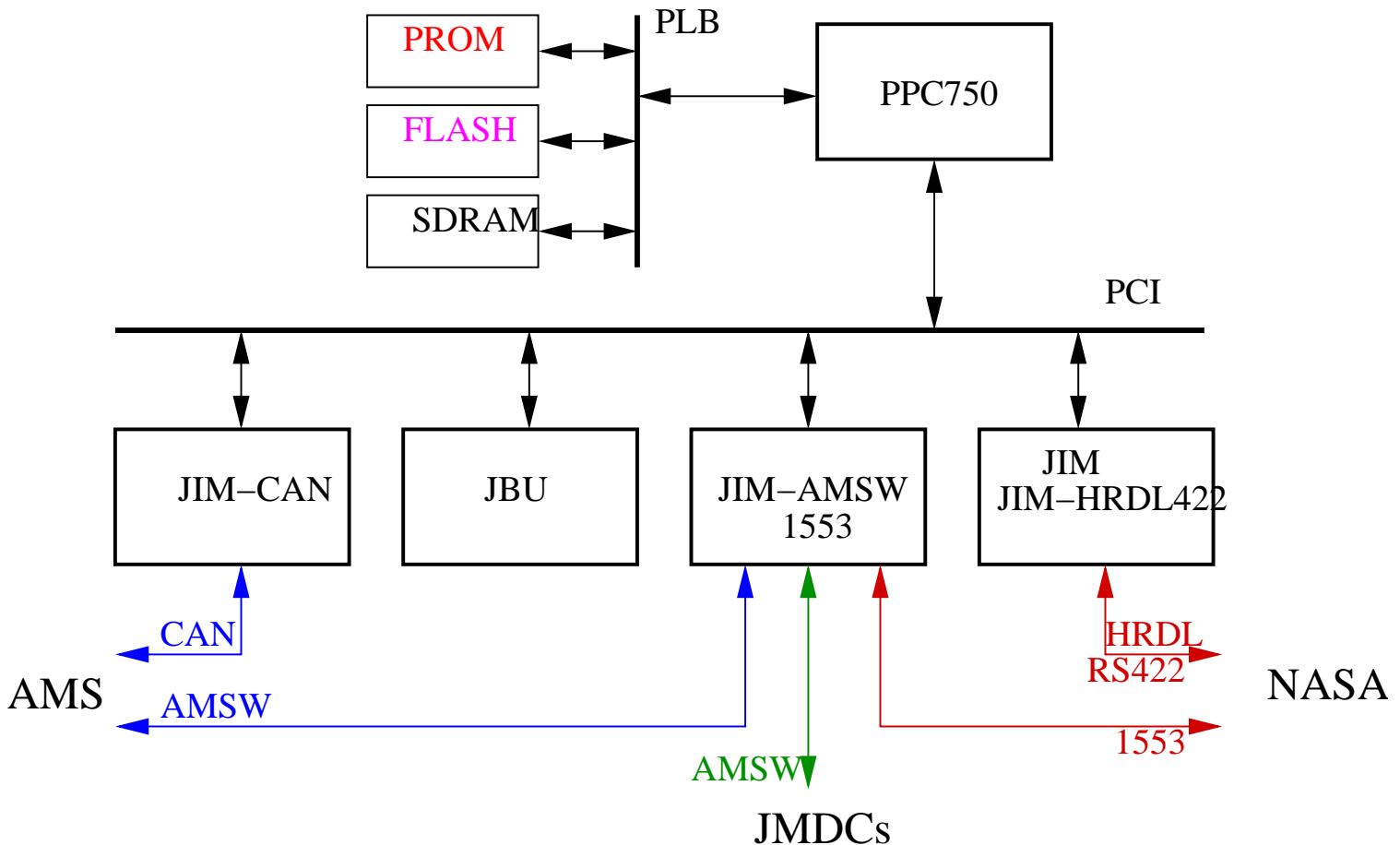
JINF/JINJ:

1. Verified using test setups;
2. JINF software used in the beam test.

If JINF replaces USCM in X-crates:

1. Detector-dependent procedures in JINF.
(AMSWIRE–LRS conversion);
2. No temperature measurements in X-crates;
3. No voltage and current measurements in X-crates;
4. DAQ performance should not be compromised.

JMDC software



ROM Monitor (A.Kounine, P.J.Hong):

- Resides in PROM, currently 100 KBytes;
- Executes on RESET;
- Simple and robust.

DAQ Program (X.Cai, S.Xu):

- Resides in FLASH, currently 3 MBytes;
- Loaded by ROM Monitor;
- Has full functionality.

JMDC software status

PIT test, June 2003:

- Validate NASA interfaces.

Environmental tests, September 2003:

- Validate J-crate functionality under environmental stress conditions;

TVT test, September 2003:

- Verify J-crate heat dissipation in space;

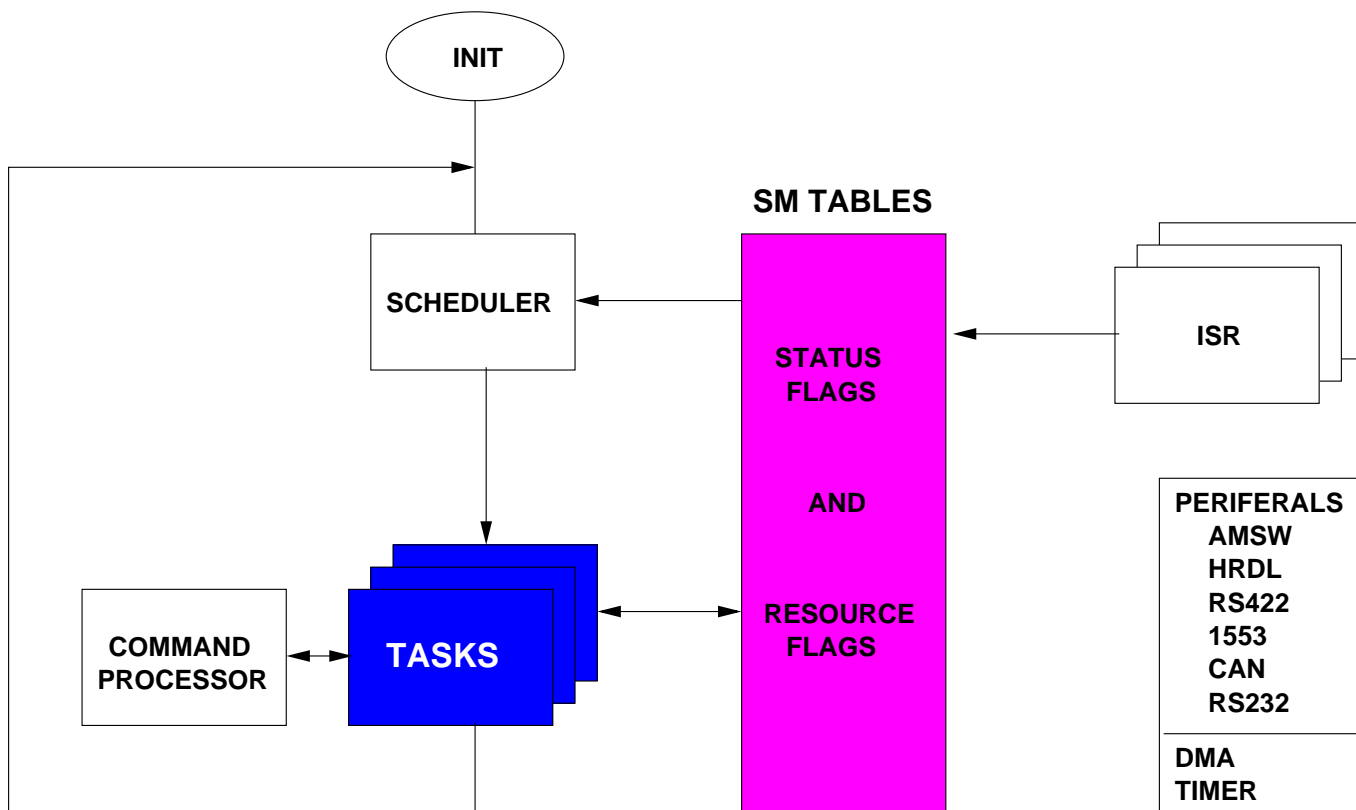
Test software:

- ROM monitor and Linux-based test programs.
- Independent tests of all interfaces.

Work in progress:

- ROM Monitor – add SW for all interfaces;
- DAQ program – improve on interface throughput.

ROM Monitor Program Flow



1. Cooperative OS / monolithic executable:

- scheduler selects a task to execute upon current active requests, assigned task priority and available resources;
- task returns control to the scheduler on completion,
- task guaranteed completion time – $500\mu\text{s}$;

2. ISRs do bare minimum – free buffers for newcoming blocks, set request/resource flags for the scheduler;

3. ROM Monitor is a permanent resident in System Memory (L1 Cache).

ROM Monitor – max functionality

Software bits:

- Initialisation;
- Boot procedure;
- AMSW/HRDL/1553/RS422/CAN protocols;
- Processing of AMS–blocks;
- FLASH operations, including FFS;
- Test procedures;
- Event processing, including LV3 and data protection;
- Slow control.

Tasks:

- DAQ tasks (building, LV3 filtering);
- Slave tasks (HRDL422/1553/AMSW/CAN);
- Telemetry tasks (HRDL422/1553);
- Master tasks (AMSW/CAN);
- Slow control tasks (TRD gas, HV, ...)