FE-electronics/DAQ V2 schedule details
25/7/2017

D.A.

Details of operations and assumptions in V2 schedule

Pre-requirements to installation V2:

- **Chimneys** ready with warm flanges installed and blades ready for mounting
- **Availability of material from 3x1x1**: White Rabbit System, 20 FE cards, 4 uTCA crates, 20 AMC cards, 4 WR cards (if not →back-up plan for further installation of 4 chimneys/crates later on), WR GrandMaster/GPS (if cannot be moved from 3x1x1 CERN loan ?)
- **uTCA crates installed** (cabled to 230V, White Rabbit optical fiber and data optical fiber)
- Availability of **DAQ backend network** for commissioning
- No interference from general **cabling (slow control, grounding etc .. already in place)**

Installation: V2 (FE 25/9-3/11: points 1-4), uTCA (18/12-9/2/17: points 5-8)

1) Fixation of FE cards to blades and insertion in chimney + cabling to warm flanges
2) Cabling of LV PS, distribution/filtering box
3) Cabling of warm flanges to LV, pulser, SC
4) Basic noise tests
5) Insertion of AMC cards (10 per crate) + WR cards (1 per crate) in uTCA crates
6) Checks of uTCA part
7) Cabling of VHDCI cables from warm flanges to AMCs
8) System commissioning, noise tests (can be extended in the following months)

FE cards:

- ASICS procured in 2016
- Production of FE cards (V2 assumes that this has to be launched by the end of July) → cards ready by end of August
- Test of FE cards: September
- Installation of FE cards since end of September (compatible with V2)

uTCA cards:

- Production of 100 new AMC → launched, first validation card to be delivered in August
- Extensive tests of first AMC card: September
- Production of other 99 AMCs: October
- Test of AMCs: November
- Installation of AMCs: December (compatible with V2)

- Routing corrections to the AMCs used for the 3x1x1 (IDT memory, flash memory), procedure already tested on two cards in the past months with the selected company

→ 1 month since when can be available from 3x1x1

- Test of the modified cards: 2 weeks

uTCA crates:

- 8 crates reserved by NAT, to be purchased by September, (critical path, if not purchased risk to delay by 8 months, 61.7 Keur)
- 4 Installed on 3x1x1 → to be moved to EHN1
- 1 crate for LRO purchased → to be moved to EHN1, when ?
- New 9 crates: Installation of MCH, power unit, ventilation unit, configuration of MCH (2 weeks)

DAQ Back-end:

- 20 Storage Servers, procured by IN2P3: installation beginning of September (transportation from IPNL, programmed with Filippo/Giovanna)
- DAQ Network Infrastructure (switches being ordered by Giovanna): installation in September/October
- Online Farm: already installed
- DAQ event builders machines, configuration defined: LV1 x2 R730 (256GB RAM), LV x3 R630 (128 GB RAM) 24 keur (to be purchased: funding TBD) → Installation October
- Metadata servers for EOS distributed file system x2 R630 ~6 keur (to be purchased: funding TBD) → Installation October

Cabling of uTCA crates and chimneys

Same cabling elements used for 3x1x1:

- 220 V AC distribution: 1 power chord per crate, possibly distribution path separated from LV paths to chimneys. Local connection of crates to grounding plate on the chimney with a copper chord.
- Data fiber (1 per crate) from MHC to back-end: for the 3x1x1 purchased 20 m fiber patches LC-LC multimode OM3 (**FOPC-F2-O3-DX-LCU-LCU-200)** 20 m or less should be probably fine to go from the crates to the patch panel on the passerelle. Longer similar fibers from the passerelle to the racks at the bottom of the DAQ room (this second part being looked with Giovanna)
- White Rabbit fiber (1 per crate): for 3x1x1 used 20 m fiber patches single mode LC-LC (**FOPC-F2-S9-SX-LCU-LCU-200).** Probably 30 m are enough to reach the first barrack (the closest one to the passerelle) where the WR system is installed to be checked with the layout

→Both the data and White Rabbit fibers are fragile and should be hosted in the corrugated profiles to protect them (Thierry procured them for the 3x1x1)

- Chimneys LV (1/chimney): multiconductor shielded cables with 9 conductors for critical EMI applications + shielded Sub-D 9, Alpha Wire 6345 SL005 from LV filtering/distribution box to chimneys (for the 3x1x1 used 5 m), for the 6x6x6 8-10 m depending on the PS position
- Chimney SC (same cable type as for LV, 1/chimney) to pulser box (5 m on 3x1x1, 8-10 m for 6x6x6)
- Coax cable 1/chimney (lemo like) with SMA connectors to pulser box (5m on 3x1x1, 8-10 m for 6x6x6)
- Chimneys connection to AMC: shielded VHDCI 32 differential pairs cables, 1m MOLEX 79918-0080 , 240 cables needed (20/chimney), 40 cables from 3x1x1, 10 keur funding for the remaining 200 ones TBD
- LV power supply Wiener PL506 (433x133x325) same model as used for SP. Installed on the cryostat (external crown) at minimal distance to chimneys together with shielded filtering/distribution box (extension of the one of the 3x1x1) and pulser box (extension of the one of the 3x1x1). x1 220V power chord to be foreseen + SC connection.

DAQ back-end (see detailed system schemes in the next slides)

- **Infrastructure**: DAQ rooms (back-end nodes/storage servers, racks, cooling, power), Counting rooms → already made available by the Neutrino Platform

- **DAQ/online storage and processing facility network architecture:**

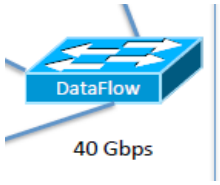
→ Designed in collaboration with Neutrino Platform and IT, procurement of the 40 Gbit/s connection DAQ switch and 10 Gbit/s router in progress

40 Gbps DAQ switch 26 ports (expandable to 32) Brocade ICX 7750-26Q
10 Gbps Router 48 ports with 6 uplinks at 40 Gbps Brocade ICX7750-48F

Figure 3: The Brocade ICX 7750-26Q features 26 40 GbE QSFP+ ports that can be split into as many as 96 10 GbE SFP+ ports.

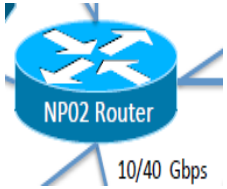
Figure 1: The Brocade ICX 7750-48F features 48 1/10 GbE SFP+ ports and 6 40 GbE QSFP+ ports that can each be split into 4×10 GbE SFP+ ports. The front panel also displays the unit stacking ID.

Dataflow→ ICX7750-26Q



DAQ backend switch

NP02 router→ ICX7750-48F



Online storage
Processing router

- **High bandwidth (20GBytes/s) distributed EOS file system for the online storage facility**

→ Storage servers already procured by IN2P3: 20 machines + 5 spares, installation foreseen in September (DELL R510 72 TB per machine, up to 1.44 PB total disk space for 20 machines, 10 Gbit/s connectivity for each storage server)

- **LV1 and LV2 event builders:**

→ servers architecture and connectivity defined: LV1 (8x 10 Gbit/s input connectivity, 2x40 Gbit/s output connectivity per machines. Two LV1 machines producing event halves. Up to 4 LV2 machines (2*40 Gbit/s connectivity per machine) joining event halves and producing multi-event files of ~3 GB size then pushed to the EOS online storage facility. Procurement of the servers to be launched

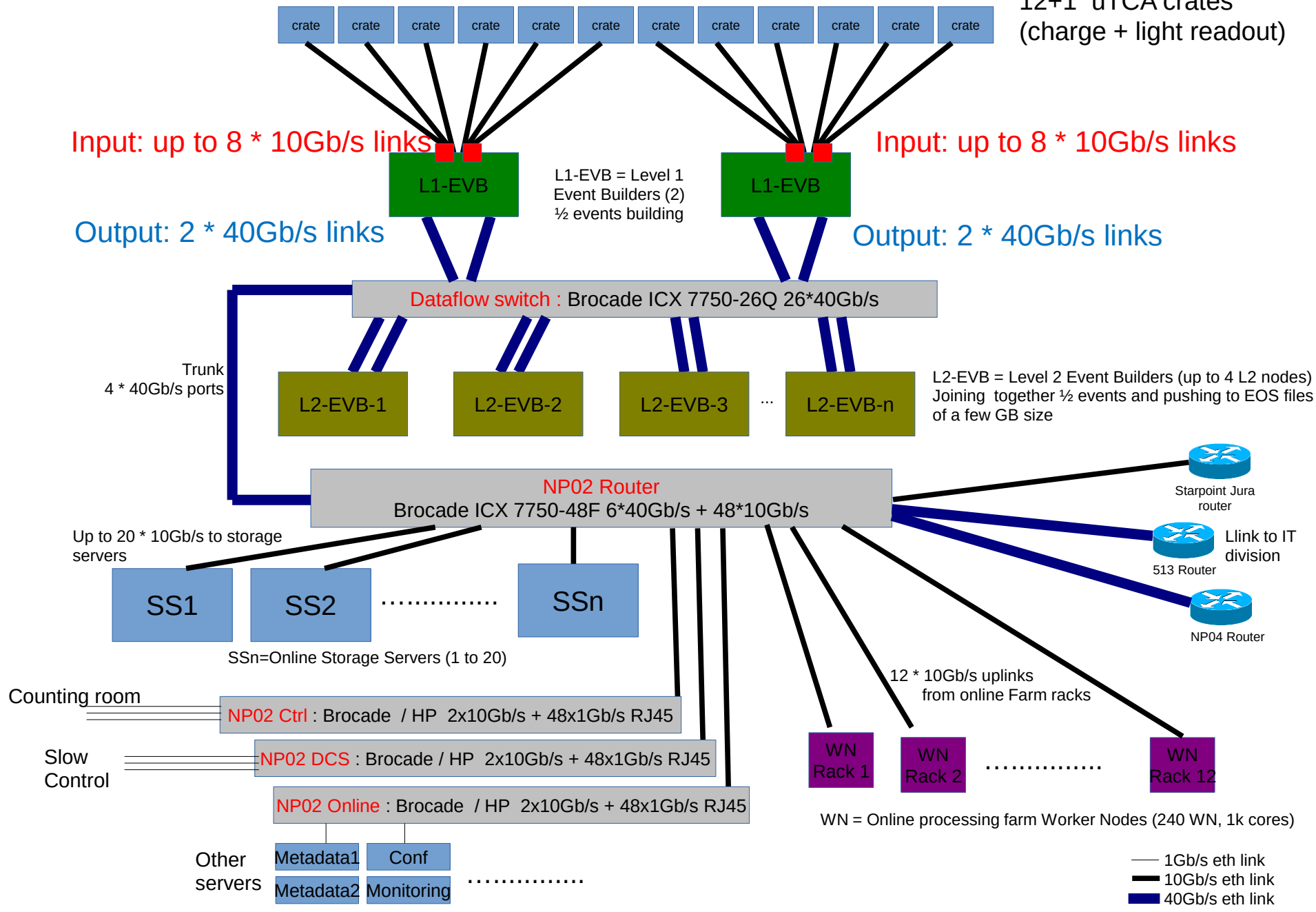
- **Online computing farm:**

→ Procured by Neutrino Platform. ~1k cores already installed in a dedicated room at EHN1
12 racks, 10 Gbit/s connectivity per rack

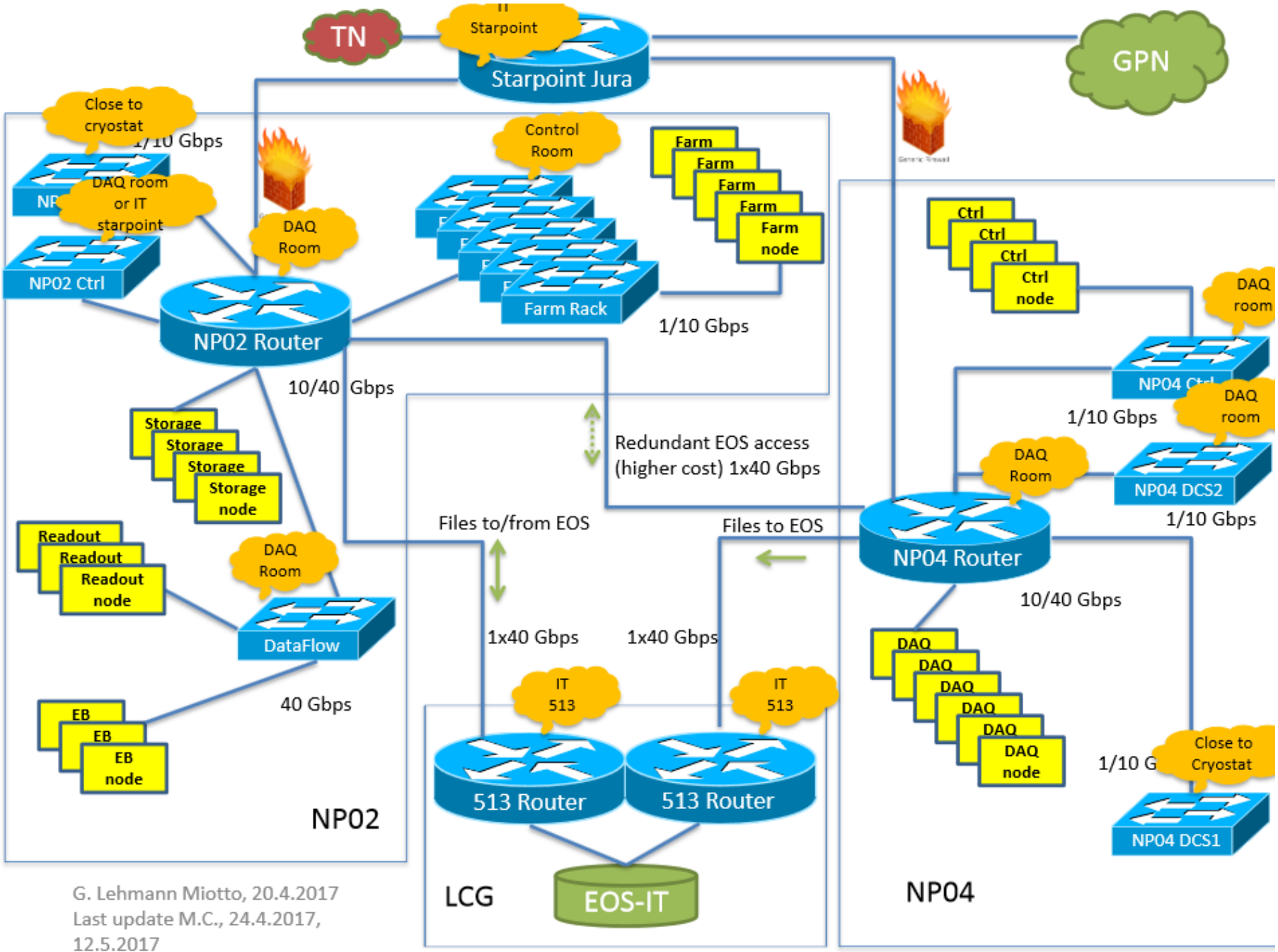
- **Connectivity to central EOS storage at IT division:**

40 Gb/s link for NP02/WA105

Details of WA105 DAQ back-end network structure



Overall DAQ network infrastructure of NP02/NP04 at EHN1



G. Lehmann Miotto, 20.4.2017
Last update M.C., 24.4.2017, 12.5.2017