Mapping Status

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- Summary

Overview

- Quite a bit of work done in 2013
  - Lots of spreadsheets exploring fanout/mapping options
  - Then long pause, waiting for link speed decision...
- Meanwhile there have been some changes
  - Addition of gFEX fibres
  - Very recent new 6.4 Gb/s baseline jFEX needing more fanout
  - Some FEX PDRs already passed
  - DPS AMC now to be made by LAPP
    - Previous discussions were all with BNL/Stonybrook
    - Need to check our assumptions are still OK
  - While the link speed choice is still a year away...
- Work on mappings resumed for imminent "FOX" PDR
  - Draft document circulated first within L1Calo (yesterday)
  - To be sent to reviewers next week

Basic Assumptions (1)

- Some remapping already from LTDB to LDPB
  - Fibres from one LTDB split to two (or more) different AMCs
    - One EM AMC covers 0.8*0.4 uniformly across eta phi space
    - Barrel/Endcap overlap handled by sending 0.4 in phi from Endcap special crate to corresponding AMCs for the Barrel (scheme by Stefan Simion)
    - Possibility to group HEC and forward EMEC in one AMC
    - All new LAr front end crate baseplane designs should allow for this
- But most of the remapping is after the DPS
  - Single 48 way ribbon from each AMC to FOX (optical plant)
  - Must be split into fibres for eFEX, jFEX, gFEX
  - Possibly additional passive optical splitting
    - Required at "low" speed (6.4), may be avoidable at high speed (>=9.6)
  - Regrouped into ribbons for FEX inputs
  - Complicated mappings, varies across eta phi space
    - Special treatment in places, eg HEC/Tile overlap

Basic Assumptions (2)

- **Provide fanout (multiple copies) at source if possible**
  - Most challenging for hadronic fibres (HEC, Tile)
    - Additional DPS modules for HEC, extra minipods on PPM Tile RTMs
      - Even so, passive optical splitting still needed at 6.4 Gbit/s
    - NB total of 29 DPS modules: 8 central barrel, 8 barrel/endcap overlap, 8 standard endcap, 4 HEC+EMfwd, 1 FCAL (reserve 1 for sFCAL?)
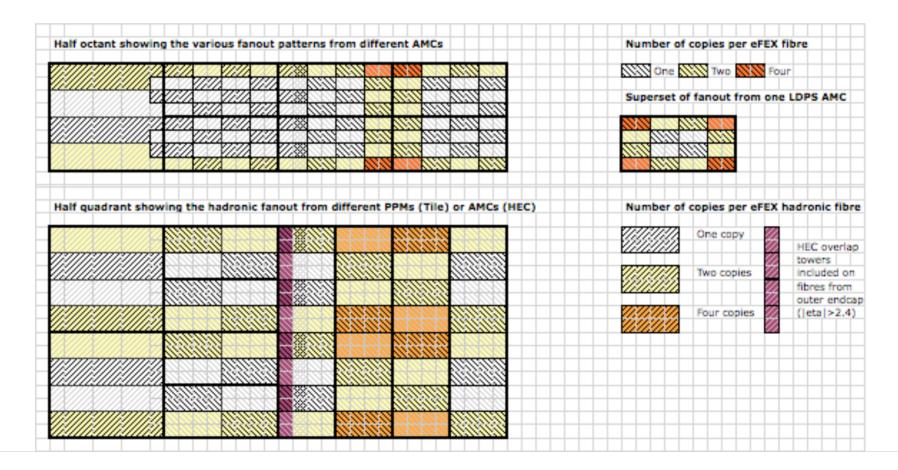- **Geometry is constrained by many boundaries**
  - Limited choices for n. supercells/towers/gTowers per fibre
  - For eFEX EM: 20 supercells (0.2*0.1) per fibre
    - With BCMUX at 6.4 Gbit/s
    - No need for BCMUX at ~10 Gbit/s
  - For jFEX and eFEX Hadronic:
    - 8 towers (0.4*0.2 or 0.2*0.4) per fibre at 6.4 Gbit/s
    - 16 towers (0.4*0.4) per fibre at ~10 Gbit/s
  - For gFEX 8 gTowers (0.8*0.4) per fibre

Diagrams from FOX PDR

- Numbers of copies (fanout) of eFEX fibres
  - Corners in eFEX design require additional copies at particular eta,phi locations

Half octant showing the various fanout patterns from different AMCs

Number of copies per eFEX fibre

One   Two   Four

Superset of fanout from one LDPS AMC

Half quadrant showing the hadronic fanout from different PPMs (Tile) or AMCs (HEC)

Number of copies per eFEX hadronic fibre

One copy

Two copies

Four copies

HEC overlap towers included on fibres from outer endcap (|eta|>2.4)

Fibre Counts at 6.4 Gbit/s

Calo Region vs N.Fibres to FEXes at 6.4 Gbit/s	EM Barrel	EM Endcap	Special Crate		FCAL	Tile (PPM) min/max	Tile (sROD)
			EM Fwd	HEC			
N.AMC/PPM/ROD	*64*	*32*	*16*		*4*	*32*	*32*
eFEX (direct)	25	20	6	6	0	12/0	18
eFEX (via 1:2 f/o)	0	0	2	6	0	0/12	0?
eFEX (after f/o)	0	0	4	12	0	0/24	0?
jFEX (direct)	12	12	0	9	24	16	24
jFEX (via 1:2 f/o)	0	0	2	11	0	4	0?
jFEX (after f/o)	0	0	4	22	0	8	0?
gFEX (direct)	1	1	2	4	3?	2	2
Direct/AMC	38	33	8	19	27?	30/18	44
To Fanout/AMC	0	0	4	17	0	4/16	0
After Fanout/AMC	0	0	8	34	0	8/32	0
Total direct	2434	1056	432		108?	768	1408
Total fanouts	0	0	336		0	320	0
Total from AMCs	2434	1056	768		108?	1088	1408
Total to FEXes	2434	1056	1104		108?	1408	1408

Fibre Counts at ~10 Gbit/s

Calo Region vs N.Fibres to FEXes at ~10 Gbit/s	EM Barrel	EM Endcap	Special Crate		FCAL	Tile (PPM) min/max	Tile (sROD) min/max
			EM Fwd	HEC			
N.AMC/PPM/ROD	*64*	*32*	*16*		*4*	*32*	*32*
eFEX (direct)	25	20	10	9	0	6/12	6/12
eFEX (via 1:2 f/o)	0	0	0	0	0	0	0
eFEX (after f/o)	0	0	0	0	0	0	0
jFEX (direct)	12	12	4	17	16	12	12
jFEX (via 1:2 f/o)	0	0	0	0	0	0	0
jFEX (after f/o)	0	0	0	0	0	0	0
gFEX (direct)	1	1	2	4	3?	2	2
Direct/AMC	38	33	16	30	19?	20/26	20/26
To Fanout/AMC	0	0	0	0	0	0	0
After Fanout/AMC	0	0	0	0	0	0	0
Total direct	2434	1056	736		76?	736	736
Total fanouts	0	0	0		0	0	0
Total from AMCs	2434	1056	0		76?	736	736
Total to FEXes	2434	1056	736		76?	736	736

Notes

- Link speed related issues
  - More fibres and fanout required at 6.4 Gbit/s
    - Hard (but possible) to handle low speed jFEX
  - Easier and no(?) passive optical splitting at ~10 Gbit/s
    - Much better option for jFEX
- Link contents
  - No details here, but
    - Plenty of bits/supercell or bits/tower at 6.4 Gbit/s
      - But require BCMUX for eFEX EM
      - Maybe a little tight for gFEX?
      - Limited jet sizes in jFEX even with more challenging module
    - Very constrained bits/supercell or bits/tower at 9.6 Gbit/s
      - Some compromises on dynamic range may be required
    - 11.2 Gbit/s is very comfortable and 12.8 Gbit/s is quite generous
      - This is what I think we should be aiming for

Summary

- Mapping work has restarted for FOX PDR
  - Review of fibre counts and most recent options
  - New spreadsheets discarding obsolete investigations
    - Still in progress - to be published on the twiki in due course
- Detailed studies still required
  - Work out fibre by fibre mapping for at least one example
    - Eg EM barrel to eFEX (or something more complex?)
  - Then continue with the rest - at some point
    - But details for low and high speeds are very different in many places
    - Quite some effort to do the full detailed work for the whole system for both possible link speeds before the final choice is made
- Full mapping document to be written
  - FOX PDR only covers DPS to FEX part of the full system
- Keep talking to LAr and Tile...