L2 Global
Status and Opportunities

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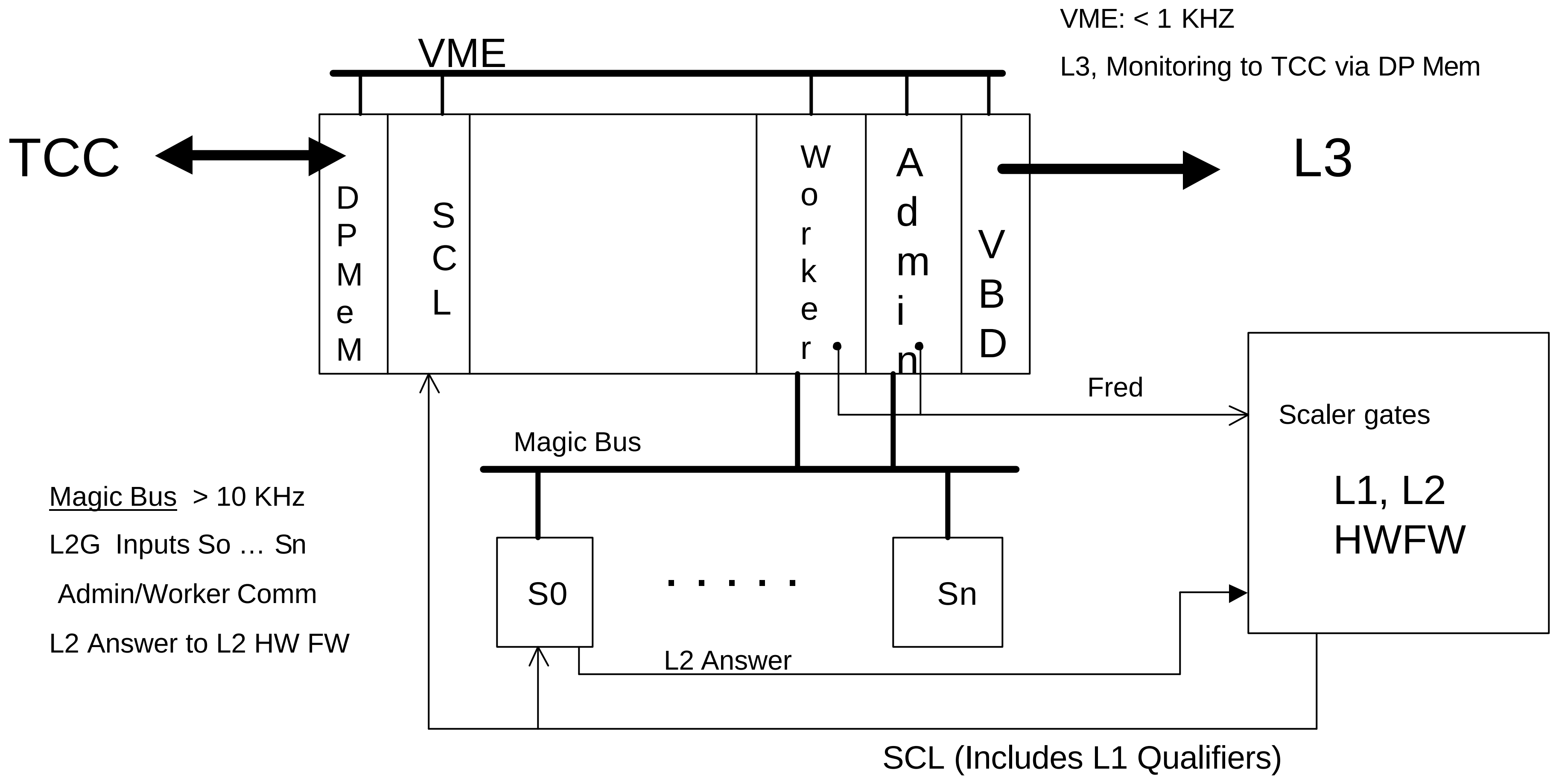
L2 Trigger

- 10 KHz L1 out to 1 KHz L2 out
  - 128 L2 decision bits, 1:1 with L1
  - few % deadtime
- Global Processor selects events
  - threshold for object
  - matching objects from different detectors
  - cuts on quality
  - kinematic variables (but Zv=0…probably)
- Objects from single-detector preprocessors

L2 Preprocessors

- Cal em TT clustered em pt, η, ϕ, quality (L1)
- Cal jet TT clustered jet pt, η, ϕ, quality (L1)
  - no ICD
  - large tiles only from tower seeds
- CFT pt, ϕ, quality (no uv so no η)
  - tags with CPS
  - STT: confirmed CFT tracks; impact parameter-oriented lists
- FPS E, η, ϕ, quality (upstream*downsteam)
- Mu pt, η, ϕ, quality
- No vertex position information (η_{detector})

L2 Global



VME: < 1 KHZ

L3, Monitoring to TCC via DP Mem

Magic Bus > 10 KHz

L2G Inputs So … Sn

Admin/Worker Comm

L2 Answer to L2 HW FW

L2Global Hardware

- Alpha processor for Worker
- Another for Administrator
- Add more Workers if can’t keep up
    - , hidden from user software

L2 Global Software

- Above user level: buffer handling, monitoring
  - I/Ogen: a great deal of data access and formatting hidden from user
- Above user level: script interpretation
  - L2 script runs iff its L1 fires
    - , speed, and efficiency independent of other triggers
  - 128 bits 1:1 with L1 for now
    - , fanout later if needed (would need pre-scaling)
  - interface with user code defined
  - script runner implemented
  - parameter initialization still not implemented
- Working on adding to simulation

L2 Infrastructure

- 60 msec time budget for L2G overall
  - tight coding required
  - budget per algorithm less crisp--but shorter!
- C++ with static allocation, no user I/O
  - see L2 coding guidelines; error logger allowed
- Considerable effort made to hide complexities
  - buffers hidden; IOGen; classes for h, j
- modified Linux (eases debugging)
  - Linux turned off when run starts
    - , maybe even during run downloading

L2 Global Algorithms

- Some rough C++ code exists (timing tests)
  - not using real interfaces, environment
- Now ready to begin drafts of final algorithms
- L2Global algorithms differ from L2 Preprocessors algorithms:
  - don’t run every event
  - many accept multiple input object types
  - variable input parameters from script (instances)
- Dylan & Roger’s talks for details
  - writing, and adding to simulation

Doing a L2 Algorithm
includes liaison with ID group!

- Coding is demanding, *but a small part*
    - MSU: technical assistance, or even final rewrite if necessary
- Verify algorithm (each new version)
    - in simulation, before going online
        - test data, automated release tests
    - in test stand (larger data volumes); analyze results offline
- Monitor Online
    - make L3 EXAMINE histograms
    - compare simulation v.s. actual results
- Tune cuts   *(less relevant for simpler algorithms)*
    - as part of ID Group: define baseline cut values
        - possibly different tunings for different physics topics
- Measure, parameterize turn-on curve (mostly indep. of physics)
    - efficiency v.s. Et offline / Thresh L2 (resolution, tails, relative scale)
    - parameterize v.s. Et, $\mathcal{L}$;   put in parameterized MC

3 Types of L2G Object Algorithms

- Match
  - create by matching preprocessor objects
    - , threshold, # objects, quality cuts
  - e, g, m
  - jets, t (?)
- Cut
  - # CFT tracks with p_T> x
  - # tracks with impact significance > x
- Relation
  - Transverse Mass > x
  - Dj < x

Match

- Relatively complex:
  - multiple object type matches (but known in advance)
  - more cuts to study
  - will require interaction with preprocessor experts
- electromagnetic e, g :
  - matches among cal, ctt/stt, cps, fps
  - exact relation of e, g code to be determined
- m: matches among mu, ctt/stt (vary with quality req'd)
  - slow mover tag from scintillator timing?
- jets: is this just a cut on L2CAL output? Tracks too?
- t: ID group should define needs
  - or just further cuts on jets?

Cutting Tools

- Simplest
  - single object type, known in advance
  - mostly coding, technical verification
  - still, cut studies, turn-on curve measurement

    probably by preprocessor group
- Etmiss
- Tracks
  - CFT? Require STT confirm?
- Tracks with impact significance
- Jets (if just calorimeter jets)
- t? (even if cal-only, new cut studies needed)

Relations: t 2 L2G objects from previous tools in script

- Complexity similar to cutter but no preprocessor team
- Different input: pointers to passed object lists
- objects of different generic type
  - not known in advance: technical issues
- rapidity range: a degenerate case (n=1?)
- transverse mass, invariant mass
  - need Z_v or an approximation strategy
  - studies, and parameterization needed
- Dh, D j , and D$\mathcal{R}$ ***(=isolation)***
  - < x, > x, and 180^o variants (Jet co-linearity, etc.)
- H_T (from jets)

Speculative: not clear when/if done

- Zvertex
  - Define, then cut on?
  - Use in Et definition?
  - L0? Potentially STT ZV?
  - # primary vertices? Same issues
  - Luminosity-dependent efficiency--lots of studies!
- Displaced Vertex
  - x-y vertex finder among displaced tracks?

Responsibilities and Opportunities I

Matching

- MSU will do e, g tools:
  - probably most complex
  - with SUNYSB for PS, low Pt; UIC on Cal
- need volunteers for m tool
- Jet, and t tools
  - volunteers needed for both
  - also need crisper definitions from/with ID groups
    - , are these a small or large amount of work?

Responsibilities and Opportunities II

Cutting and Relational

- MSU: simple # CFT tracks > Thresh: sample cutting
- MSU will do transverse mass: sample relational
  - SUNYSB collaborates on invariant mass tool, esp. low mass

- *Need volunteers for rest of cutting and relational tools*

- If no volunteers mid-Feb, MSU will code 1st versions
  - so simulations can proceed
- Even if MSU codes 1st versions, may still need help
  - cut tuning, parameterization, monitoring