

Trigger Summary



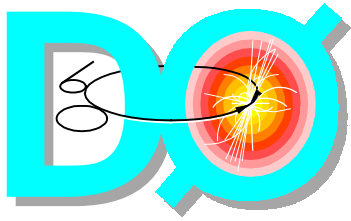
H.Evans

Columbia U.

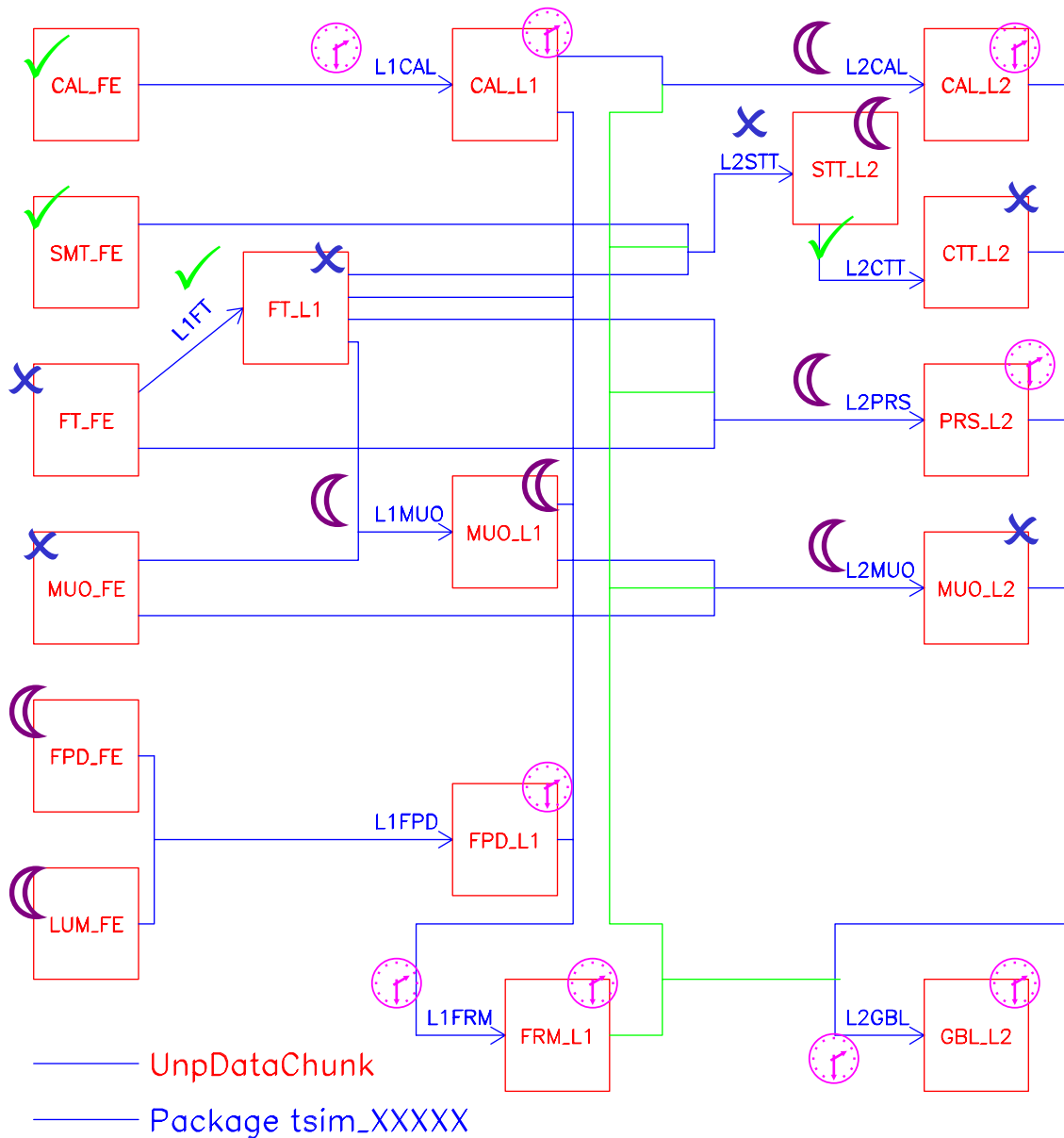
- **Trigger in “No Significant Issues” category of Lehman Review**
 - (we all know what that means)
- **But we’ve had our share of Reviews:**
 - **L1: 1/22/99**
 - * d0server1\Operations\Upgrade Project\TDRs\L1_report.ps
 - **L2: 2/6/99**
 - * <http://d0lbln1.lbl.gov/level2.ps>
 - **L3: 4/17/99**
 - * d0server1\...\TDRs\L3review_report_april99.ps
- **Lots of Progress since then!**
 - **But can you stay awake to hear about it?**

! Exciting Outline !

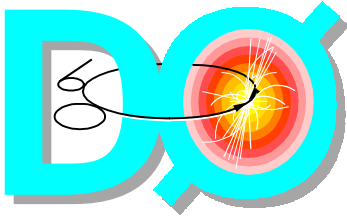
- | | |
|----------------|------------------|
| 1) Trigger Sim | 4) Level 1 |
| 2) Level 3 | 5) Trigger Lists |
| 3) Level 2 | 6) Milestones |



If All Else Fails... Simulate It!



✓ ~Done
 ✗ Draft Design
 ☾ In Progress
 🕒 Started

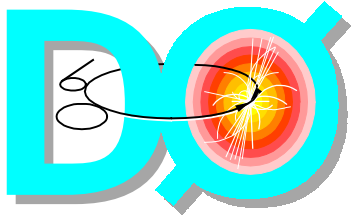


...And Keep Simulating

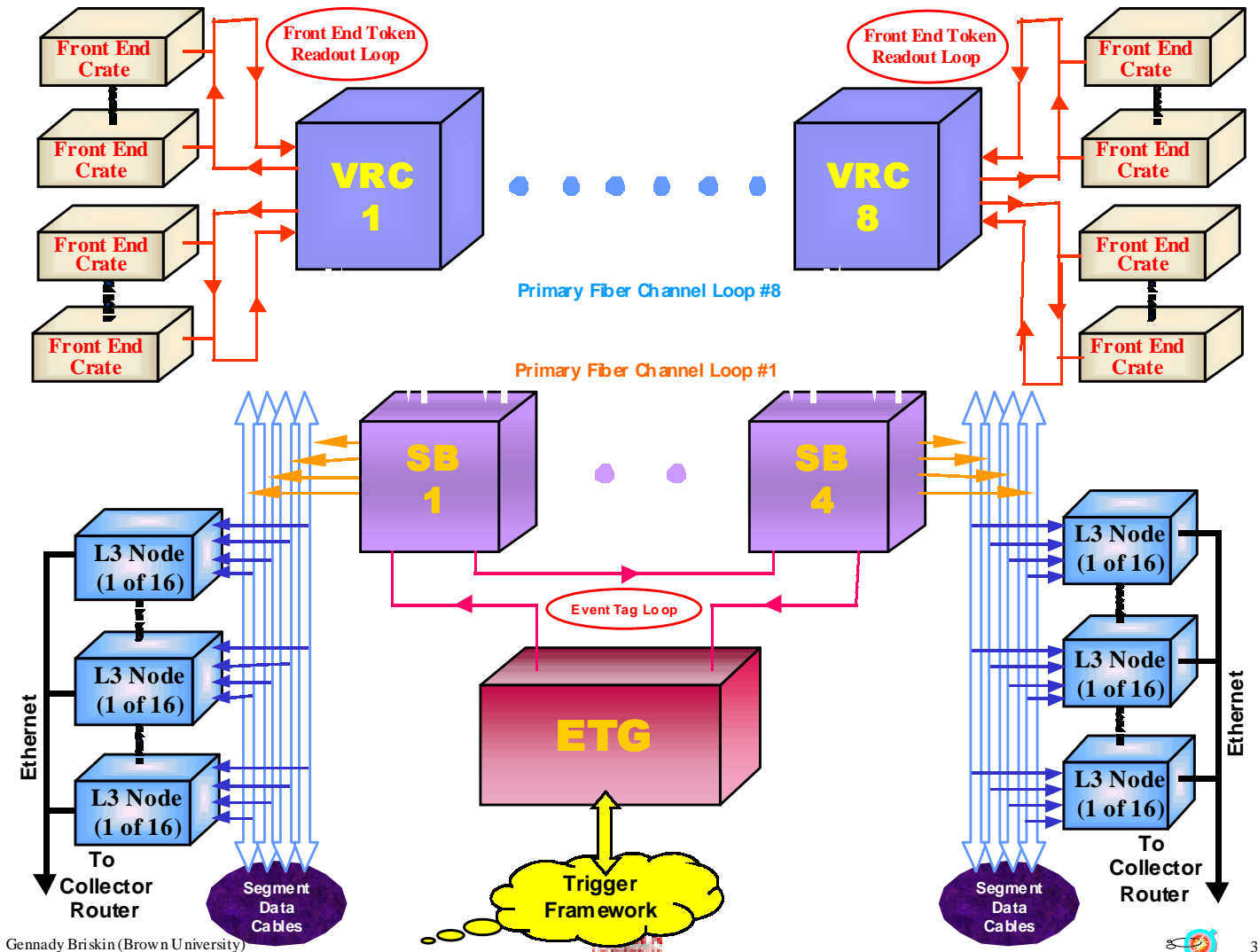
- **Good Start on Most Elements**
 - Progress Quick w/ Concentrated Effort
 - Tools/Support Exist
- **Trigger Simulation has been an Impoverished Relative!**
 - Only beginning now to be more integrated w/ the rest of the trigger
- **Still a Long Way to Go !!!**
 - Easy for New People to make an Impact (contact Dave Toback)

Subtle Advertisement

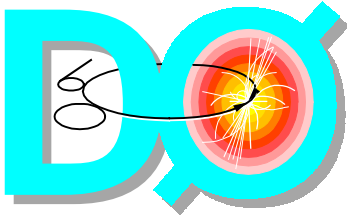




Down on the Farm with L3

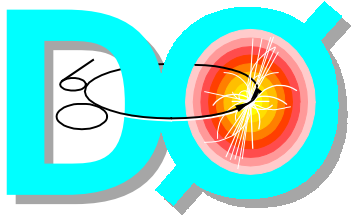


G.Briskin - 4/17/99

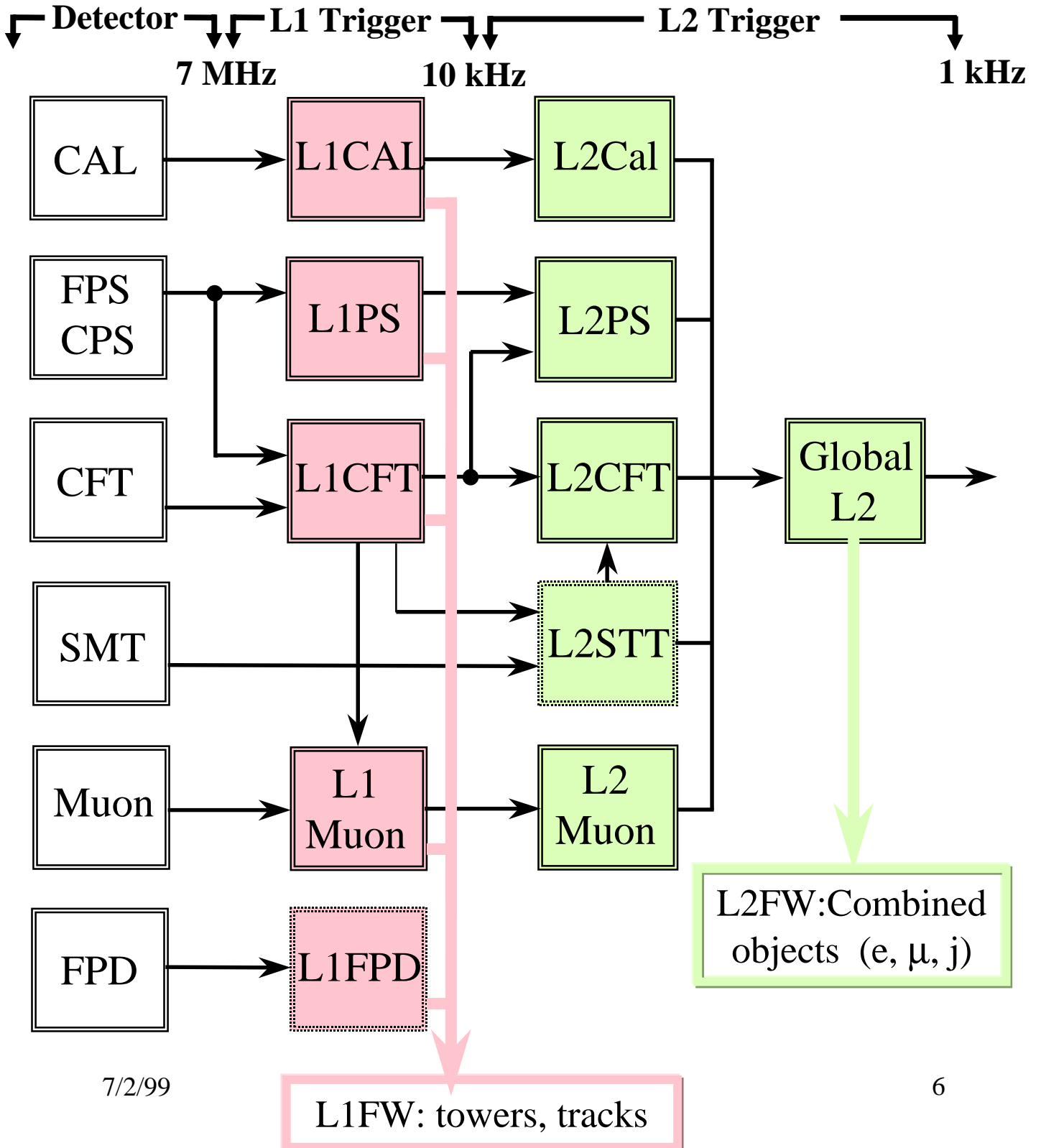


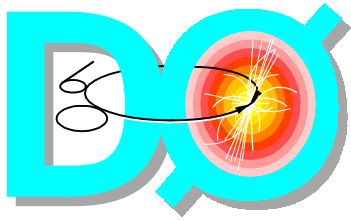
The L3 Harvest

- **Goal: provide continuous DAQ capability at DØ**
 - Important for Detector Develop & Commiss
 - Already Exists ! – Upgrades Ongoing
- **Detailed Hardware Design Underway**
 - Schedule in July
- **Tested: Single Crate Readout & Connection to Online System at DØ**
 - waiting for Trigger Framework for multi-crate / multi-detector & L1 Trig Integration
- **Online Test at Brown**
 - Build L3 Node Framework & Use ScriptRunner from L3 Filter
 - **NT Compatibility Problems**
- **Raw Data Packing/Unpacking**
 - Task Force formed to Address



Who's Talking to Whom in L1 & L2

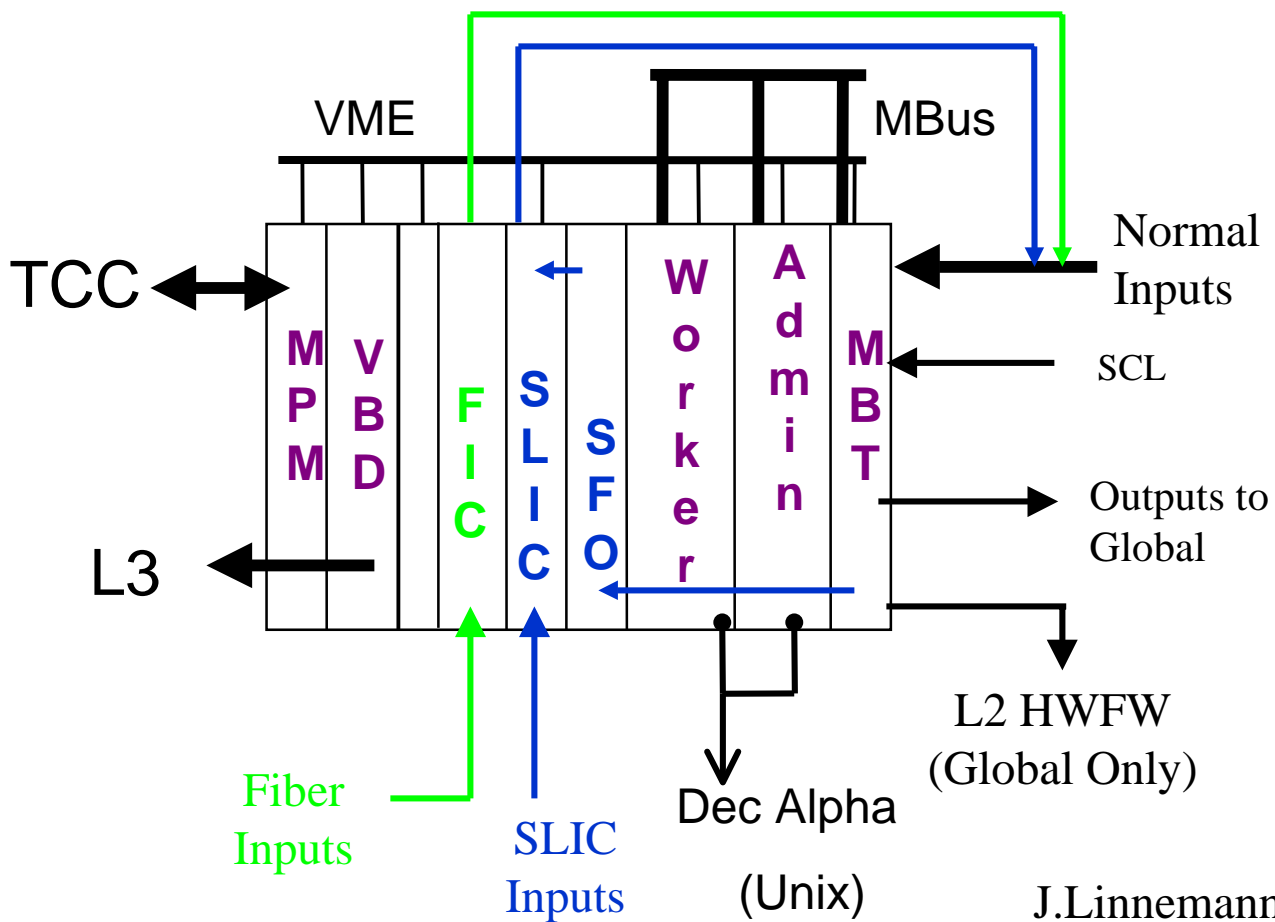




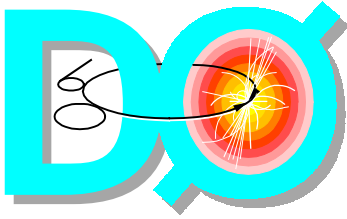
L2 is All the Same (more or less)

Standard L2 Crates

- All Crates: Alphas, MBT, VBD, MPM
- PS, CFT, CAL: FIC
- MUON: SLIC, SFO

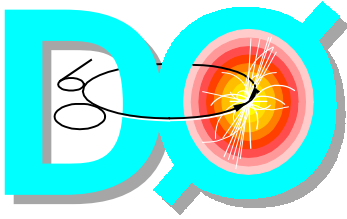


J.Linnemann
12/18/97



More of the Same

- **Alpha:** Main L2 CPU (500 MHz DEC Alpha)
Mbus: Custom J3 Backplane
 - All Parts Function Properly (except L3 Cache)
 - Developing Software to Run Online
 - Mbus bandwidth Measured !!!
 - * Faster than expected!
 - **Alpha Delivery Delayed → Late Fall**
- **MBT:** Interface to Alpha / SCL Receiver
 - Debugging Prototype
- **FIC:** Optical(G-Link) to Cable (Hotlink)
 - Production Cards at FNAL
- **SFO/CIC:** Fanout/Converter Cards
 - MoU in progress
- **SLIC:** Pre-pre-processor (L2 Muon)
 - Debugging Prototype
 - **Personnel Crisis Looming !**
 - * Opportunities in Real-Time Coding
 - * Talk with Hal Evans or Mike Fortner



...Except for STT

- **L2STT:**

- **Meeting at B.U. (6/11/99)**

- * **Identified Design Issues to Resolve this Summer**
- * **Signed Off on L1CTT Data Format**

- **Fit Processor Options:**

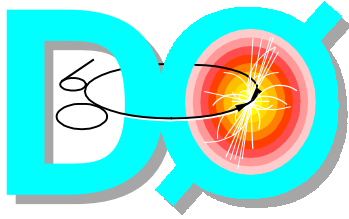
- 1) DSPs or FPGAs**

- 2) Alphas**


- * **Both approx. equivalent in speed & cost**
- * **Alpha Option requires more crate space**

- ⇒ **Proceed w/ DSPs or FPGAs**

- **Funding: waiting for results of MRI**

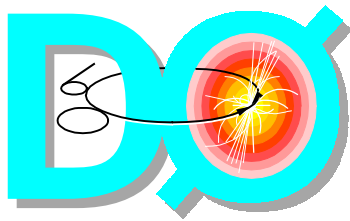


In the Trenches with L1

- **Framework: Installed at DØ !**
- **L1MU:**
 - Final Layouts for muon L1 Trigger
 - Use Muon Trig. Manager for CTT,FPS,RPD
 - Goal: Cosmic Ray Triggers w/ PDTs by Fall
- **L1CAL:**
 - Decision to use Quadrant Matching b/w L1CAL & CTT or CPS
- **L1CTT/PS:**
 - Definition of Architecture/Protocols Final
 - * <http://d0server1.fnal.gov/www/protocols/>
 - * details of overlap regions for matching in flux
 - Design/Optimization Progressing
 - * **Need Personnel: (physicist & eng.)** 
 - 6 Daughterboards + 17 Firmware Versions
 - Use Minimum CTT P_T of 1.5 GeV
 - Dual Level PS Discrimination & Digitization for CPS(axial & stereo), FPS downstream
 - * Low & High P_T e's & γ 's + MIP Calibration

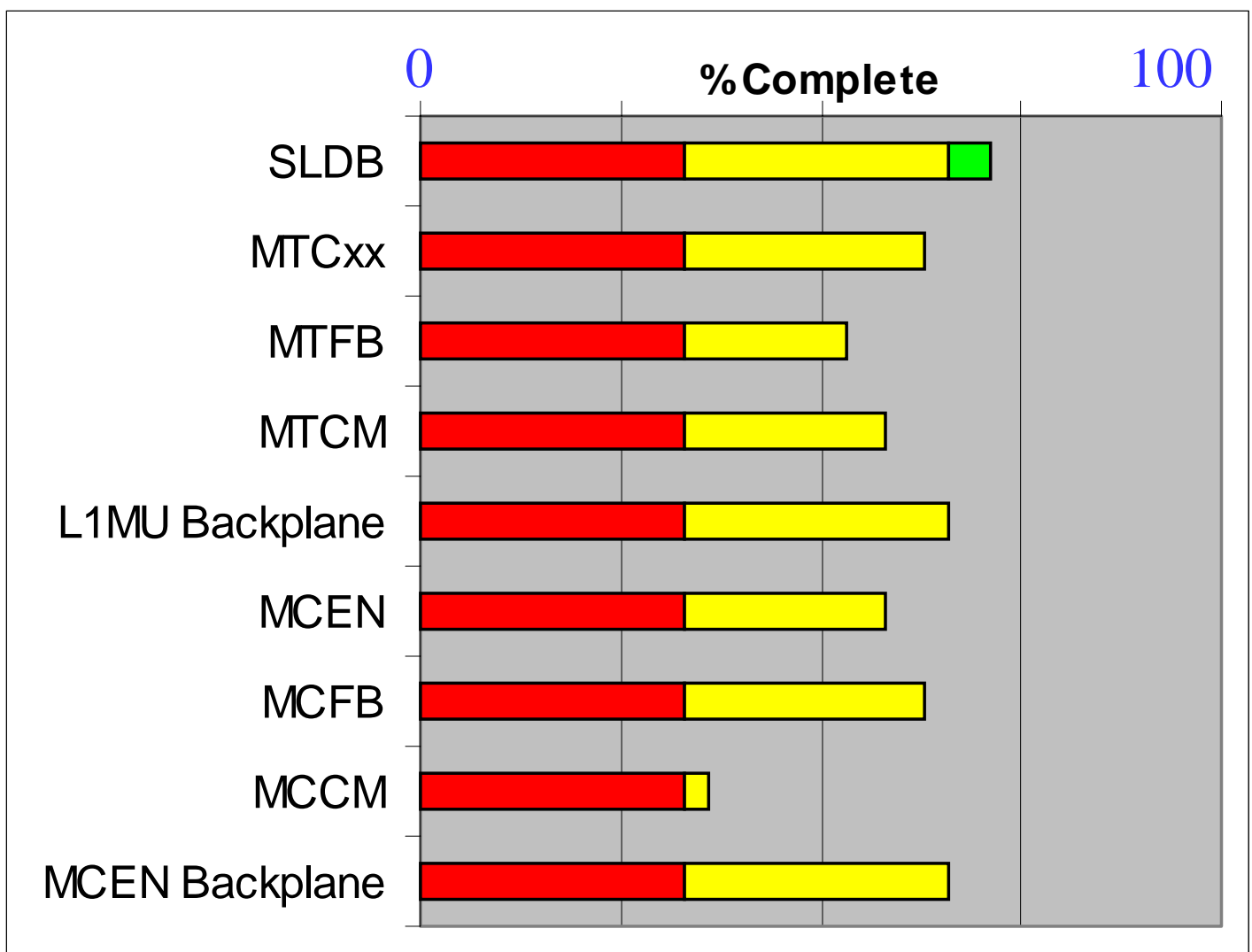
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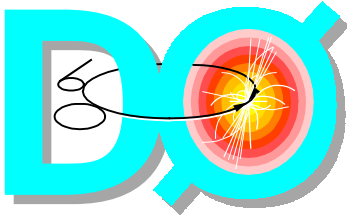


L1MU Trigger Status

- Finishing prototype testing
- Goal is to be generating cosmic ray triggers (with PDT's) by mid-fall

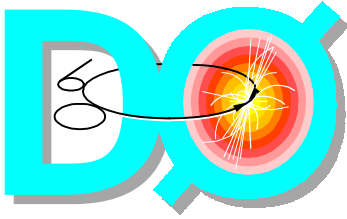


K.Johns - 6/24/99



Quadrant Matching

- Needs: Driven by rates for low P_T ee
 - No Matching \Rightarrow ~ 1400 Hz
 - Goal: geometric match between L1CAL objects and L1CTT or L1PS
- 2 Options: that work w/ CAL Hardware
 - Both based on Trigger Tiles ($0.8 \times 2\pi/4$)
 - 1) Tile : use $E_{\text{tile}} > \text{thresh}$
 - 2) Tower : count Trig Towers $> \text{thresh}$ in Tile
 - + less sensitive to noise, low-E stuff, etc
 - takes longer in firmware (too long for 132ns)
- Details: Matching requires OR
 - e.g. $E1*P1 + E2*P2 + E3*P3 + E4*P4$
 - So far AND/OR terms really *AND/OR-else*
 - Solution: PTERMs = Pseudo AND/OR
 - * HTERM: Hardware AND/OR only AND
 - limit = 256 from L1 Hardware
 - * PTERM: In L1FrmWrk Firmware AND & OR
 - constructed from HTERMs: limit ~ 40
 - Trigger Terms = HTERMs AND PTERMs



More Matchmaking

- Results:

- $J/\psi \rightarrow e^+e^-$ Rate Reduction:

- * $\times 3-4$

Tower Scheme

- * $\times 2-3$

Tile Scheme

- * $B \rightarrow J/\psi K^0_S$ Efficiency loss

10-15%

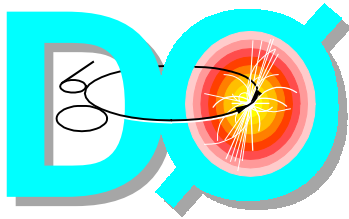
- High P_T Single-e Rate Reduction

- * Approximately $\times 2$

- Decision: (tentative)

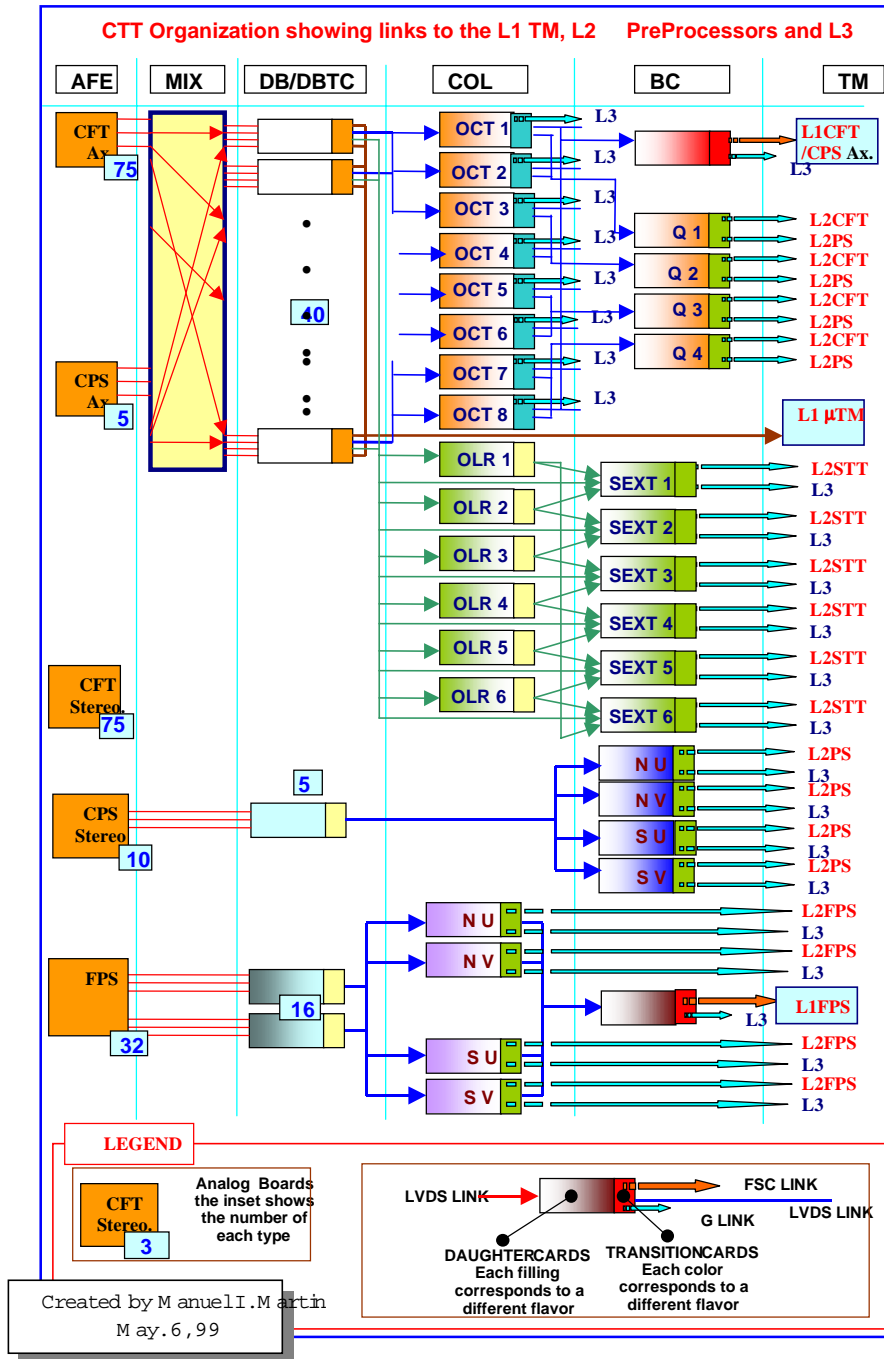
- Use **Tower Scheme** at start of Run II

- Fall back to **Tile Scheme** for 132 ns Running

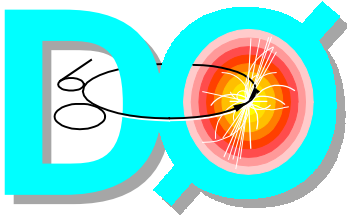


L1 Track Trigger

M. Martin - 6/23/99



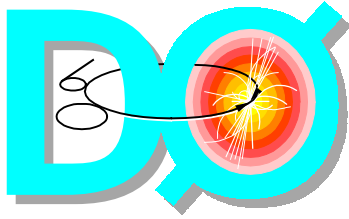
See <http://d0server1.fnal.gov/www/protocols/>



I've Got a Little List !

- **Trigger List now Divided by Objects**
 - http://www-d0.fnal.gov/~lucotte/TRG/trigger_list.html
 - http://d0ntwg01.fnal.gov/run2_triggers/
- **Number of L2 Triggers now < 128**
 - continue to pursue decoupling L1/L2 Lists
- **New Tau Triggers**
 - **Good Interaction w/ Hardware here !**
- **Need Updated Rate Simulations**
 - TrigSim will be used
- **Not Enough People Giving Physics Input to Trigger List**
 - **Act NOW - While there's still Time !**

More Advertising



Time on Our Hands?

System	Milestone	Date
TrigSim	Integrated L1 & L2 Sim. Prototype	Aug 99
	Full Simulator Available	Nov 99
L3	<i>First Downloadable Executable</i>	<i>Jul 99</i>
	Complete L3 Node Framework Software	Aug 99
	L3 Operational	Apr 00
L2	<i>Alpha Cards Received</i>	<i>Nov 99</i>
	L2CAL Commissioned	Feb 00
	Other L2 Systems Commissioned	Apr 00
	L2 Commissioned	May 00
L1	L1MU Commissioned	Feb 00
	L1CTT Commissioned	Mar 00
	L1MU Commissioned	Apr 00
	L1 Commissioned	May 00