

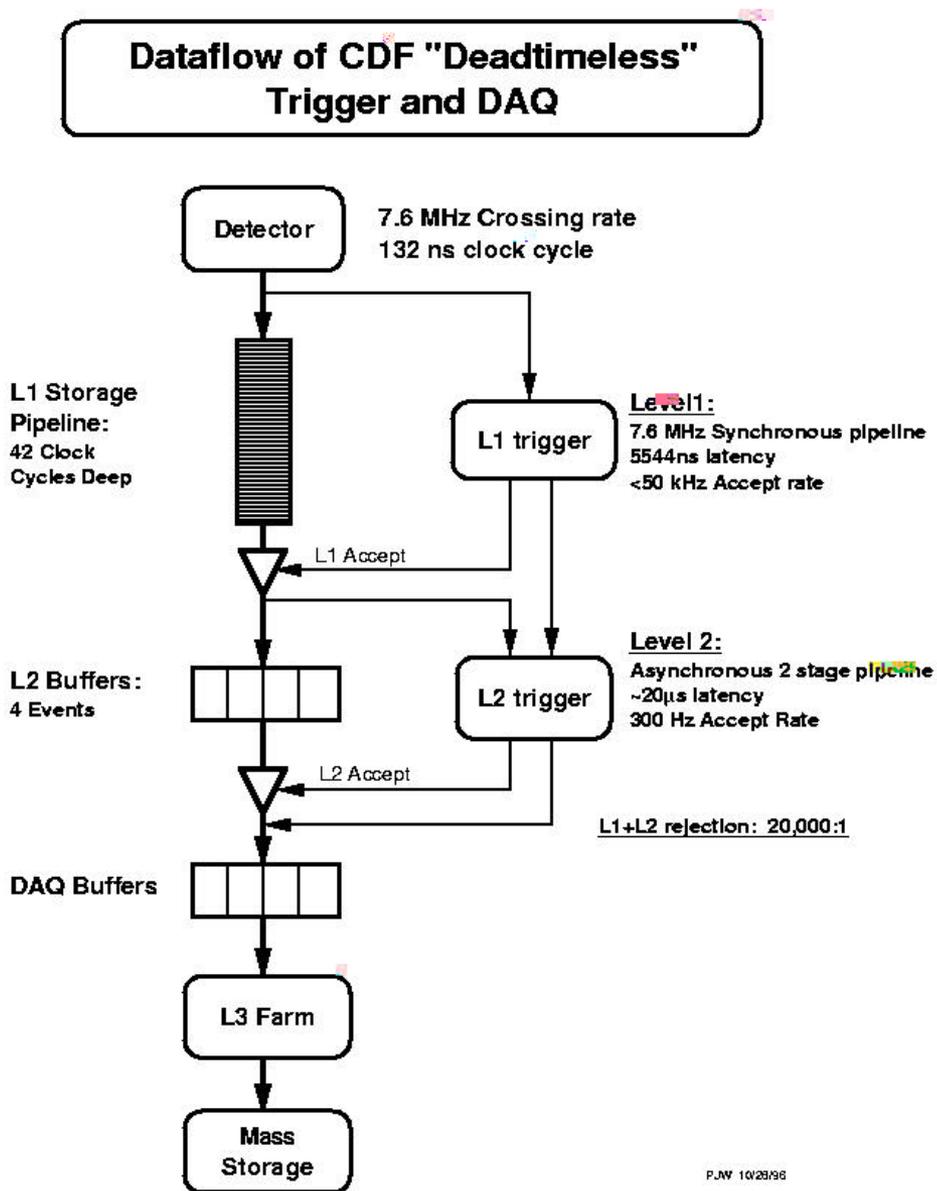
CDF Review – Run 2a Baseline and Status

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L2 Review
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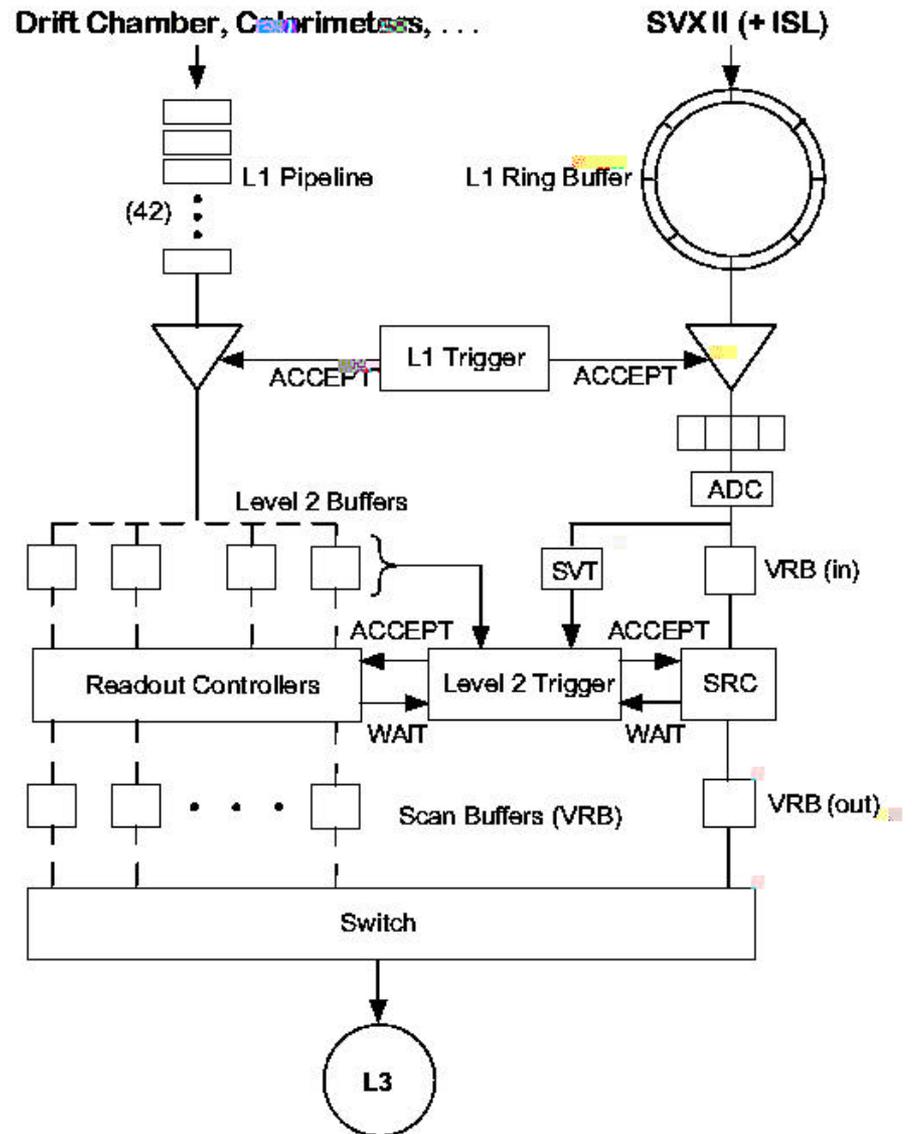
- Overview of Run 2a trigger and DAQ
 - Design trigger rates
 - Expected deadtime
- Run 2a performance to date
 - Current trigger rates and sources of deadtime
 - Current L2 decision time
 - Limits on L2 decision time
- Summary

Overview of Run 2a DAQ and Trigger

- Level 1
 - Synchronous, pipelined
 - ~45 kHz Accept rate
- Level 2
 - Asynchronous, buffered
 - 300 Hz Accept rate
- Changes to date
 - 1.7 MHz crossing rate
 - 3 L1 pipelines;
37, 42, 45 clock cycles



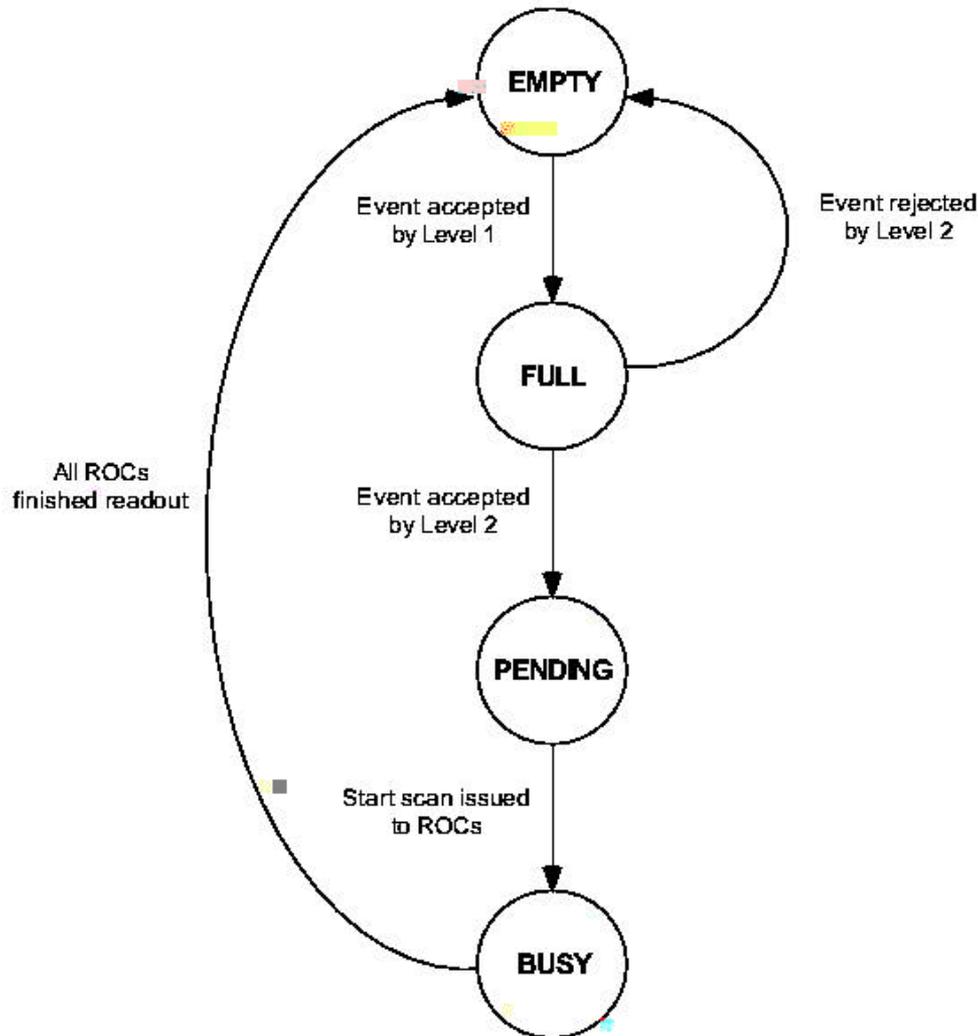
Overview of Run 2a DAQ and Trigger – with Silicon



- What is deadtime?
 - Deadtime occurs when the TS must send a L1 Reject for a L1 trigger Accepted event because there are no free L2 buffers.
- Sources of deadtime (DAQ)
 - **Level 2** - All L2 are buffers full. TS awaiting trigger decision from Level 2.
 - Readout – One L2 buffer is being read out. The other three are awaiting Readout
 - L2 or Readout – Combination of 1 and 2.
 - BUSY – All scan (VRB) buffers are full

L2 buffer management in the TS

CDF Note 4480



L2 decision time is how long the TS has a buffer marked as full

L2 decision time is the time from a FRED L1A to the Alpha L2A/R

The TS also requires the return of L1DONE from the SRC before changing the buffer status from full to empty or pending

DAQ simulations and deadtime

CDF Note 2306

CDF Note 3495

CDF Note 4213

⇒ Choice of 4 L2 buffers, L1A = 45 kHz, L2A = 300 Hz

- CDF Note 3495 – 1996 !
 - L1A rate = 45 kHz (132 ns crossing ...)
 - Pipelined (and parallel) L2 processing
 - 10 μ s loading time
 - 10 + $\exp\langle 1.75 \rangle$ μ s processing time
 - Buffer readout (200 + $\exp\langle 50 \rangle$ μ s) also modeled
 - ⇒ 5% deadtime at L2A = 1 kHz
- www.physics.ucla.edu/~saltzberg/dead.f - 2002
 - Gives reasonable predictions given current configuration
- Models are useful but no substitute for **measurements!**
 - More on this later ...

Current trigger rates and deadtimes

From the Record Luminosity Weekend – July 26, 2002

- Luminosity = 2.5×10^{31}
 - L1A rate = 10 kHz
 - L2A rate = 200 Hz
 - Deadtime = 5 %
 - Level 2: 1.3 %
 - Readout: 2.7 %
 - L2 or RO: 0.8 %
 - BUSY: 0.2 %

Current status of Level 2 decision time

- Pipelined L2 performance
 - 25 μs loading data
 - 21 μs processing (L2 Reject)
 - 95 μs processing (L2 Accept \Rightarrow TL2D creation)
- Data loading times (from L1A to data in Alpha processor)
Average numbers – ignoring exponential tails
 - Level 1 data: 0.5 μs
 - Cluster data: 4 μs
 - Track data: 6 μs
 - Isolist data: 9 μs
 - SVX data: 26 μs (12 μs SVX readout, 14 μs in SVT)

Summary

- L2 performance keeping apace with TeV luminosity so far
 - No significant deadtime
 - No real compromises made in implementing planned Run 2 trigger table (CDF note [4718](#))
- Most limitations on L2 processing time found to be contained in the Global L2 crate – See other talks for details on local timing improvements
 - Exception is readout of SVX trigger data
 - Conversations have begun with SVX experts ...
 - Studies show current SVX readout time might be acceptable up to 30 kHz – see next talks

- Most limitations on DAQ Livetime expected to be due to L2 processing at higher L1A rates (barring planned improvements!)
 - L2 output to VRB and L3 will still be 300 Hz.
 - However, most of the front end crates have not been sufficiently exercised running at an L1A = 40 kHz (with real data) ...

- In addition to projections from simulations we need to make some measurements running the DAQ at 40 kHz to prepare for the future
 - This can be done using the current trigger table with an appropriate adjustment of L1 and L2 prescales
 - Expect to begin this soon. Must be well prepared as to minimized beam time required