Client and Event Driven Data Hub System at CDF

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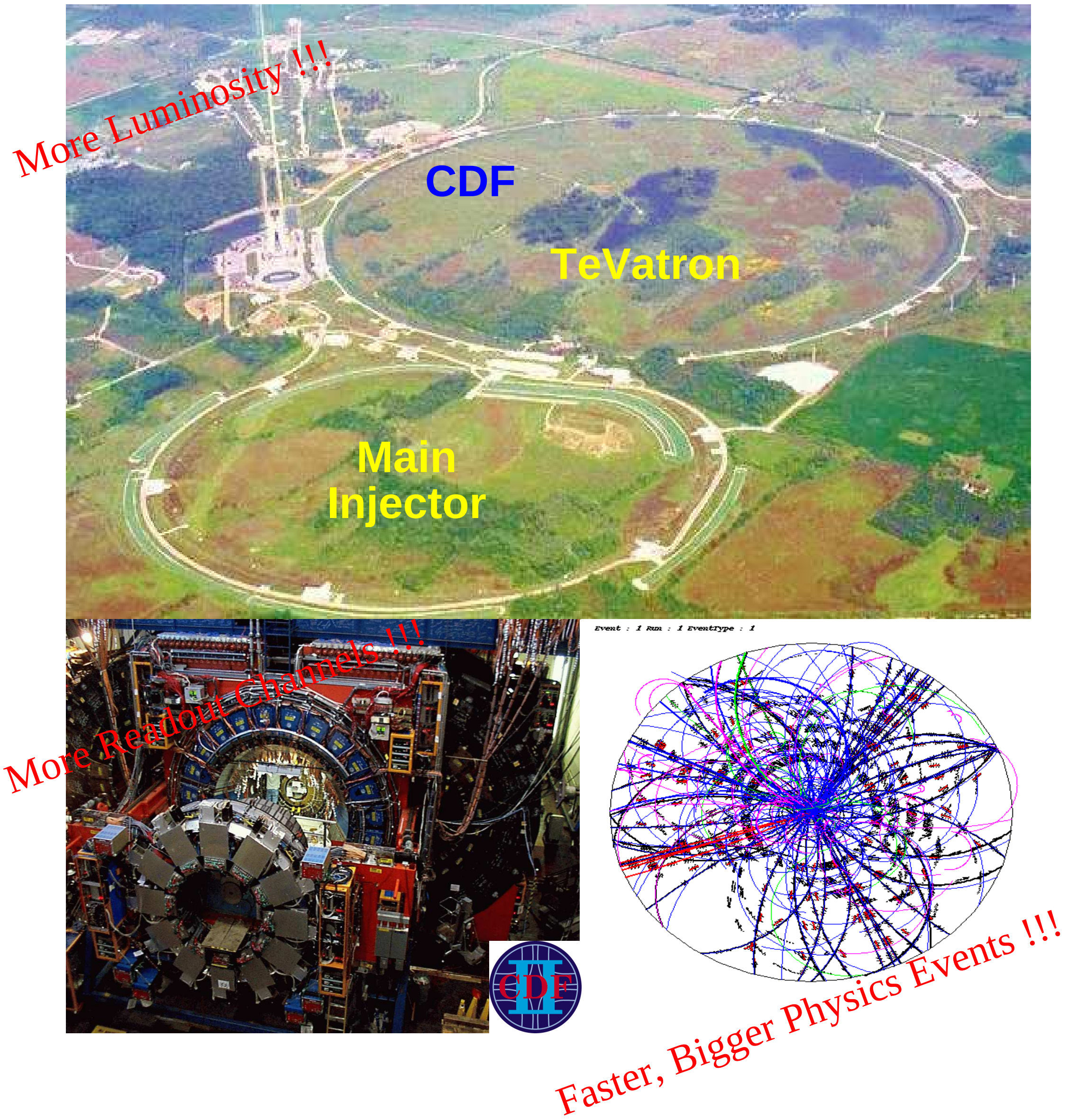
CDF Run II Physics with the TeVatron

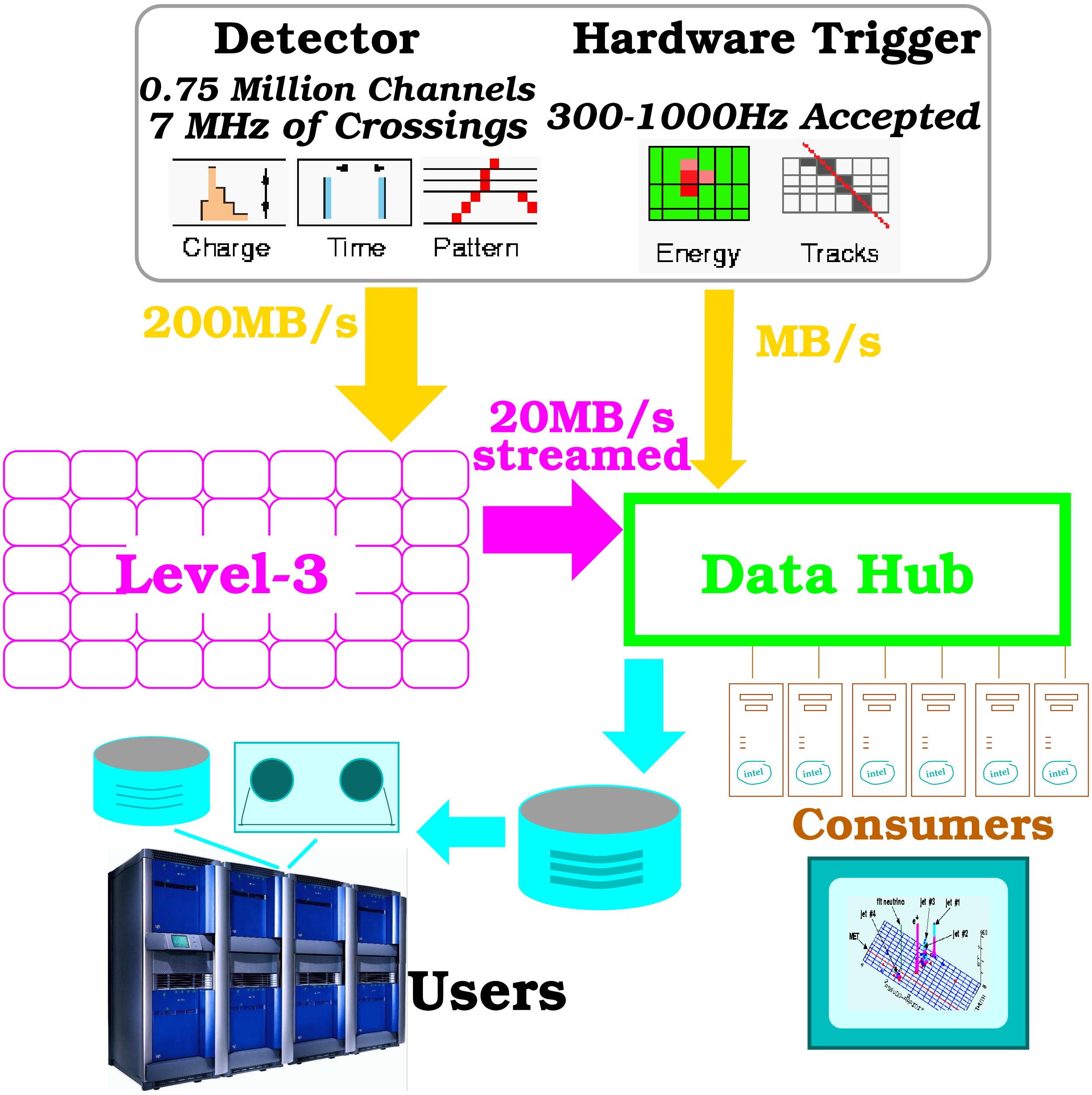


- $\mathcal{L} \sim 2 \times 10^{32}\ \mathrm{cm}^{-2}\mathrm{sec}^{-1}$(20 $\times$ Run Ib)
- 0.75 Million Readout Channels (10 $\times$ Run Ia)

Better Detector + Better Accelerator =
7 MHz beam crossings $\rightarrow$
(1KHz hardware trigger accepts) $\times$ 250 KB
events

That's a lot of Data ...

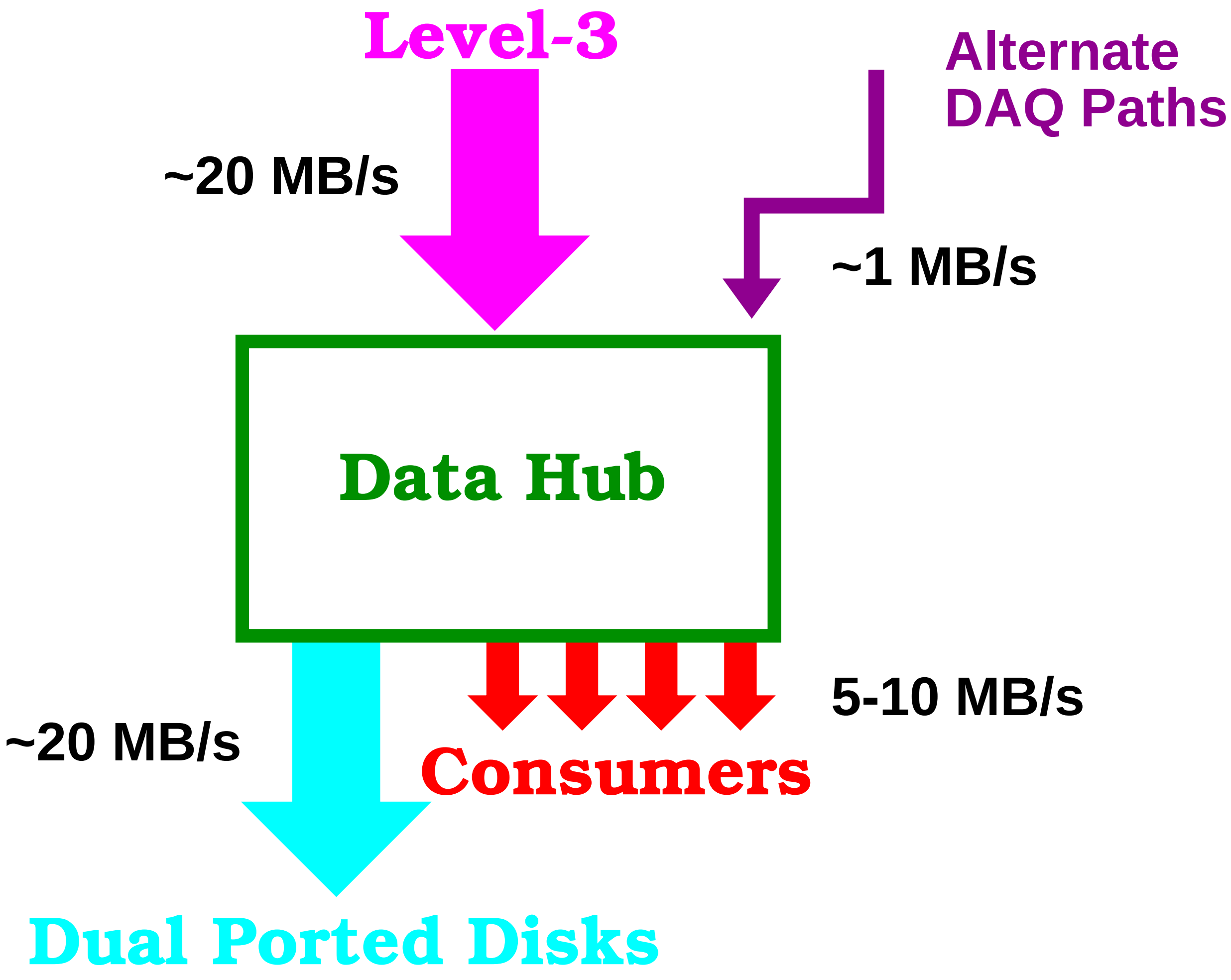
Data Acquisition Sequence



Jargon

- Consumer: Program to view and analyze data on-line
- Level-3 Farm: Final Filter of data: 200 MB/s → 20 MB/s
  Online software-based reconstruction and filtering

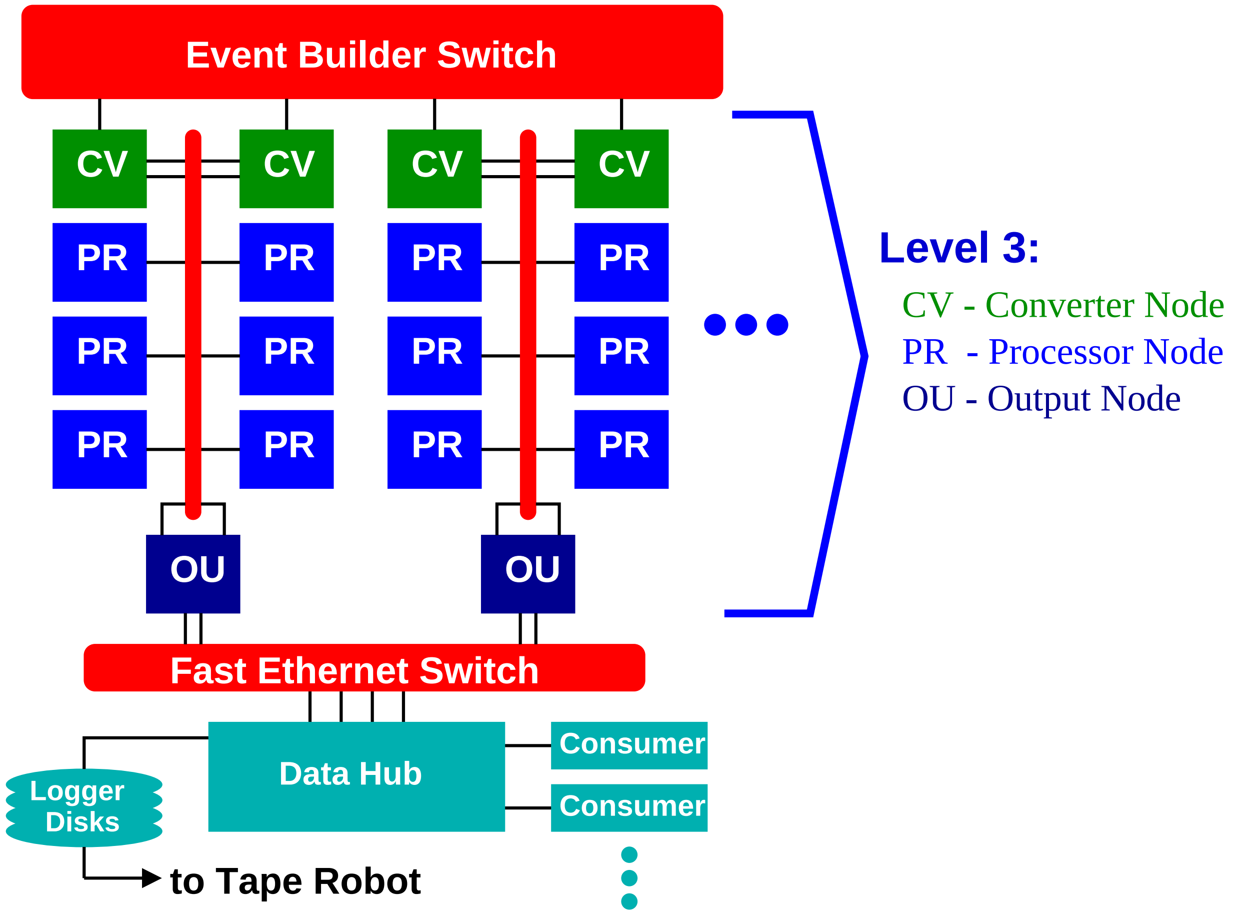
Data Hub in the DAQ System



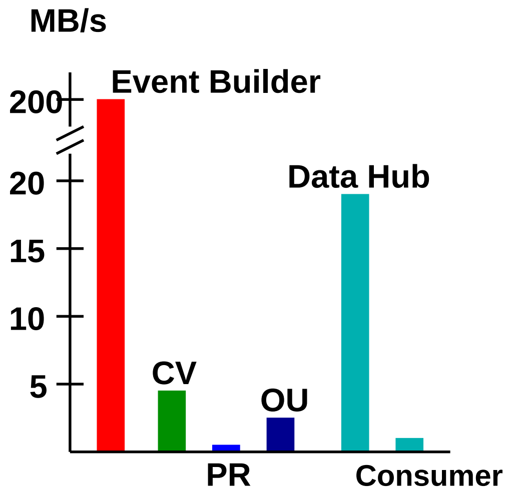
Data Hub Primary Responsibilities

- Sender Server:Receive events from multiple event senders in varied formats
- Consumer-Server: Send 50 % of data to Consumers based on physics triggers and filters
- Logger Write out data to files according to event type

Level 3 Farm



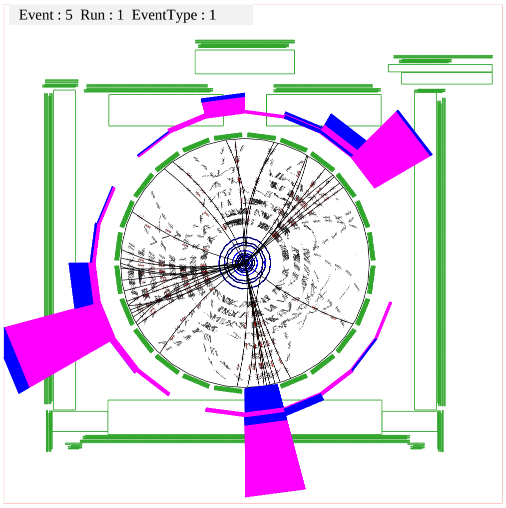
Comparison of Data Hub rate to other DAQ components



Consumer Interface

Examples of Consumers

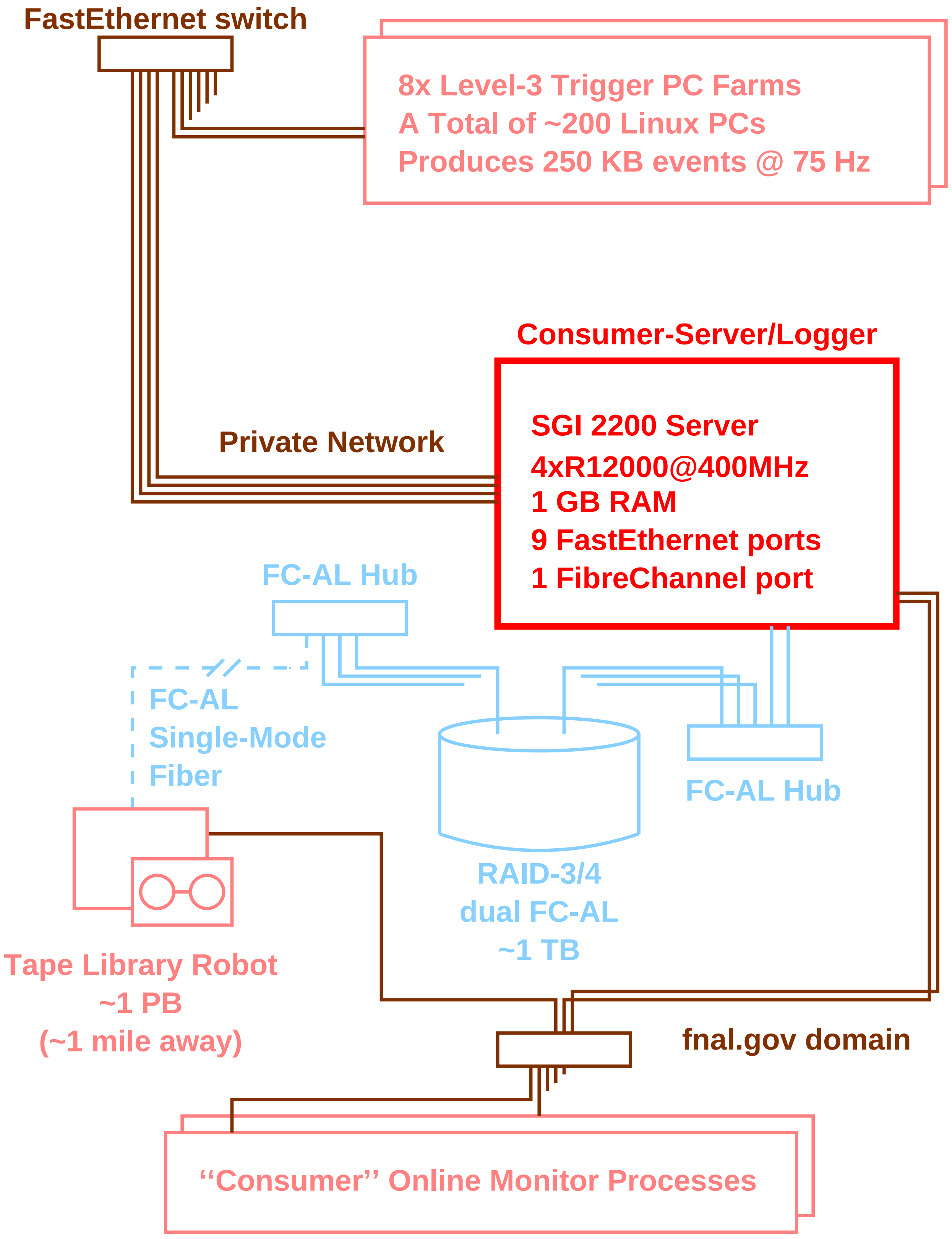
- Luminosity monitor
- detector occupancy monitor
- Trigger efficiency monitor
- Physics monitor (number of W $\rightarrow e\nu$)
- Event Display



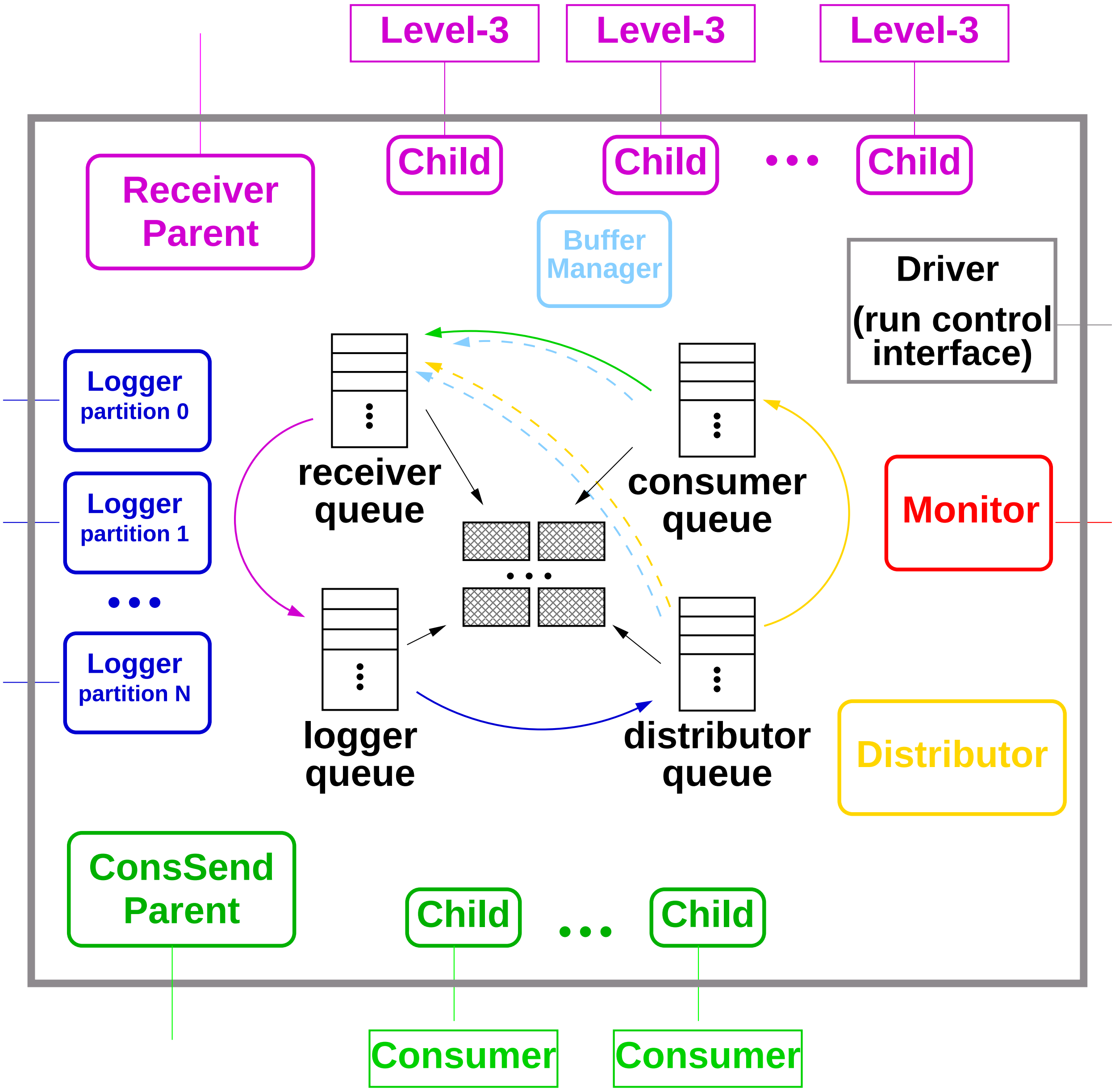
Interface with Data Hub

- Consumers want different types of events
- Consumers may dynamically choose types of events

Hardware Architecture

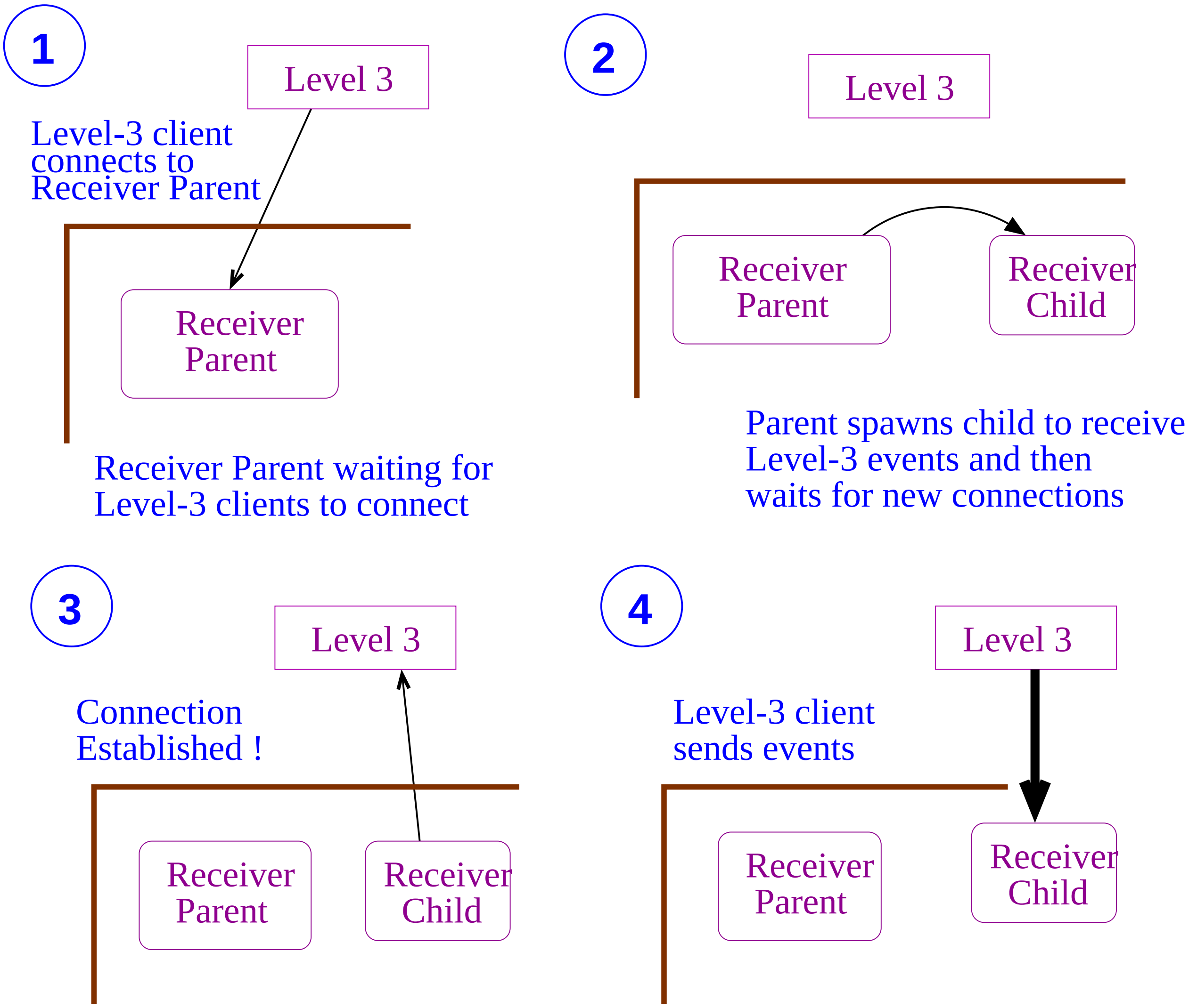


Software Design



- Interprocess Communication handled by System V IPC
- Monitor/Driver Communication via Smartsockets

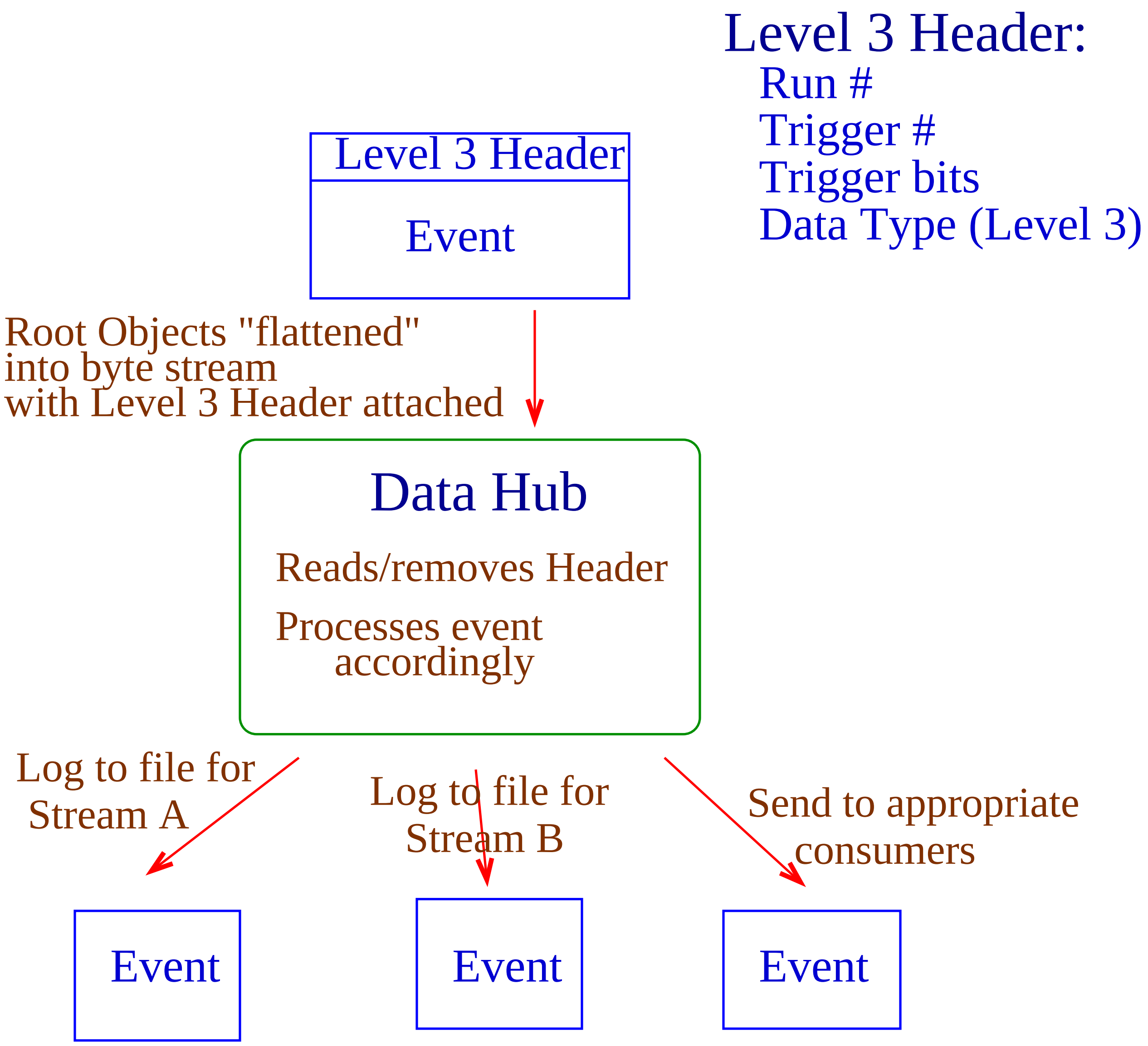
It's a server !



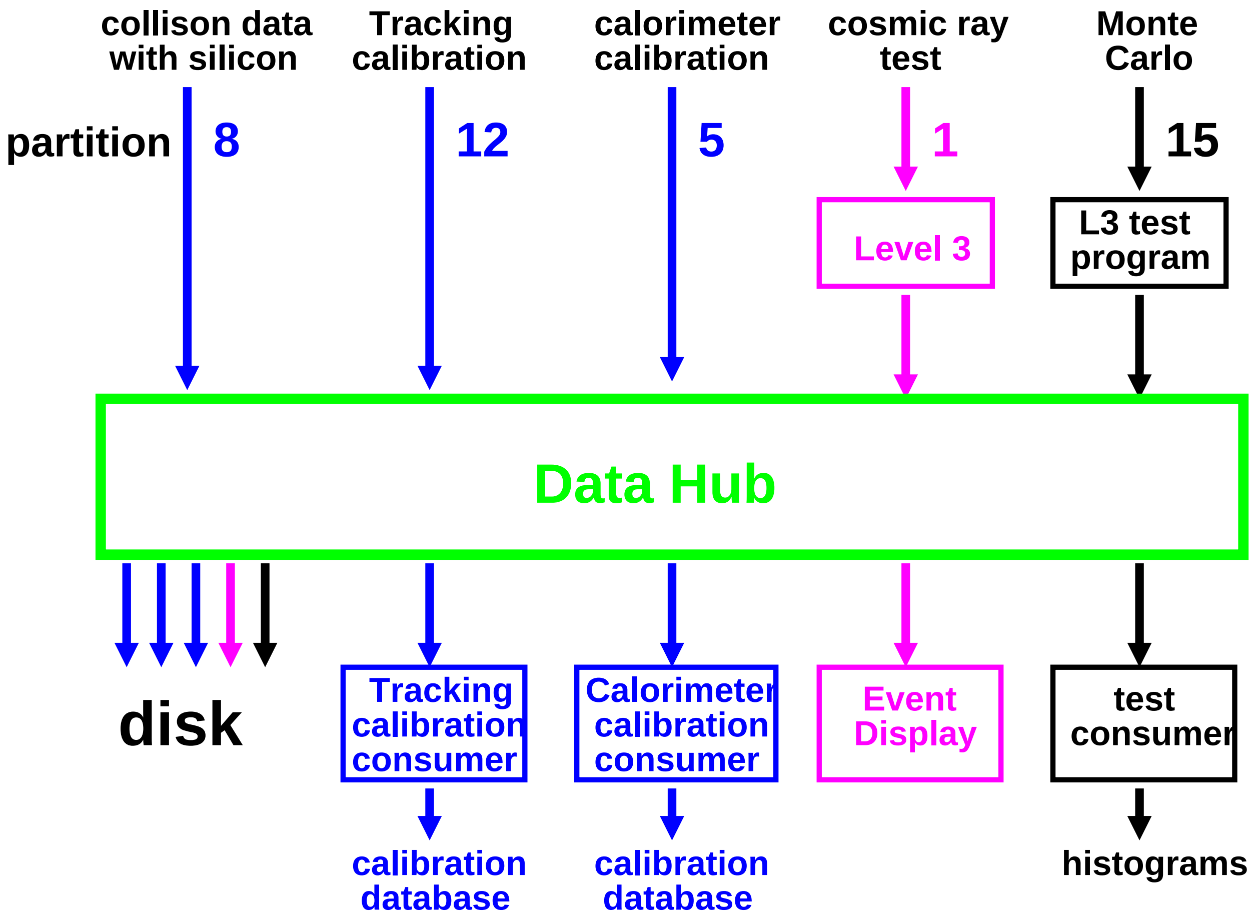
- Consumer clients handled similarly
  - ▷ Events flow in opposite direction
  - ▷ Consumer Sender process controls output to consumer

Event Selection

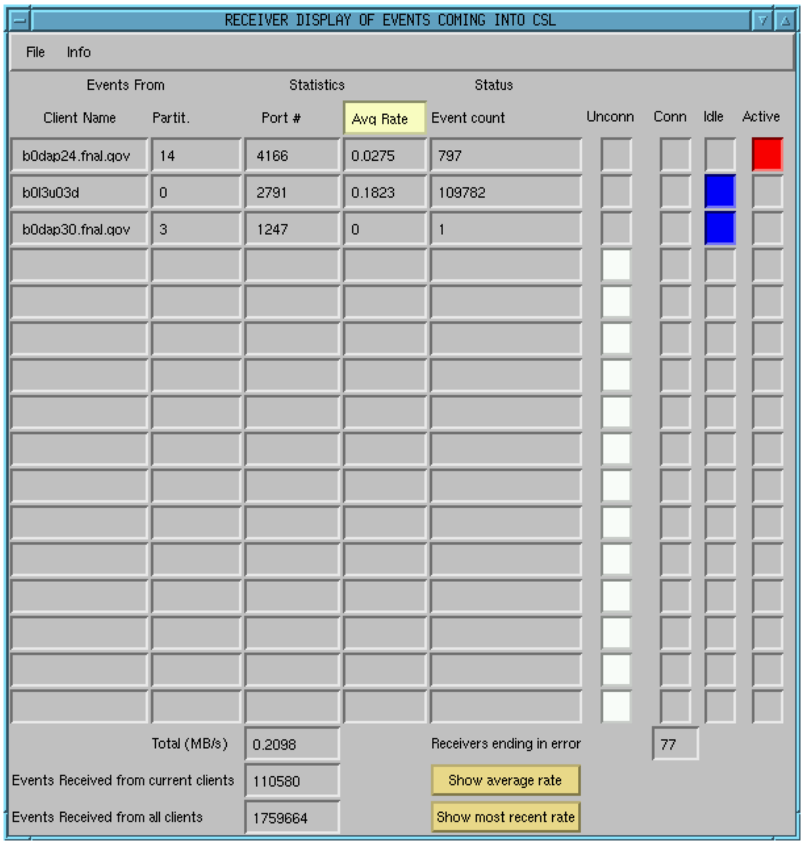
- Data Hub does not access event contents.
- However, for consumers and file logging Data Hub must know type of event.
- Done by Level 3 stamping header on each event



Multiply-partitioned



Monitoring



- Monitors Consumer and Sender Clients, Receiving rates, Sending rates, event totals, ...
- Monitoring info stored in shared memory
- Sent out remotely Via Smartsockets
- Received by Java GUI

Status

Open for business 24 - 7 - 365

- Heavily Used Since 1999.
- Has performed up to design specs.
- Past development and in operations mode.

Conclusions

We'd like to acknowledge contributions from:

- Root Team
- Rob Kennedy (Fermilab)
- CDF Task Force
- CDF Online Group