Ancillary firmware:
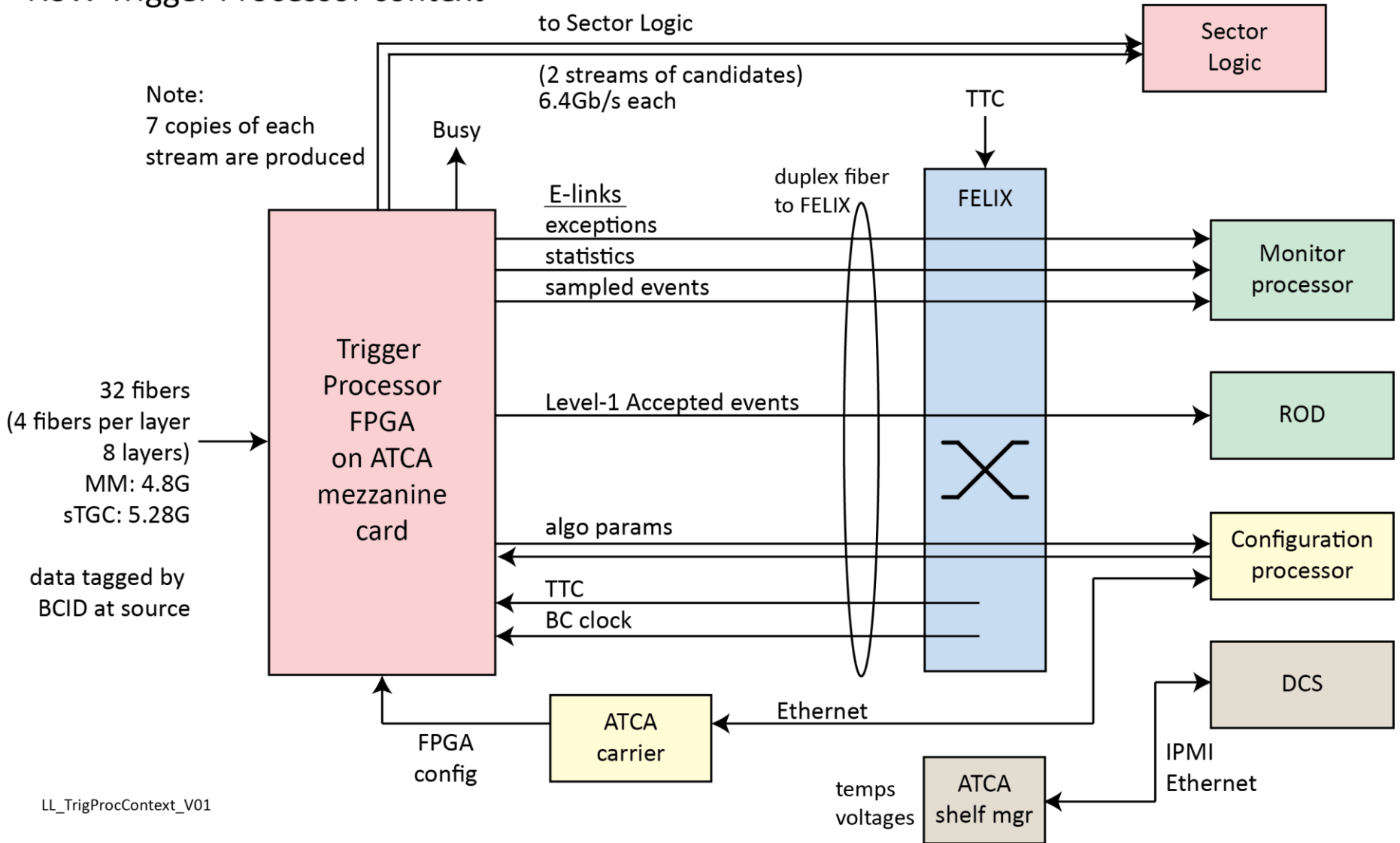# division between mezz and carrier

Lorne Levinson, Weizmann Institute
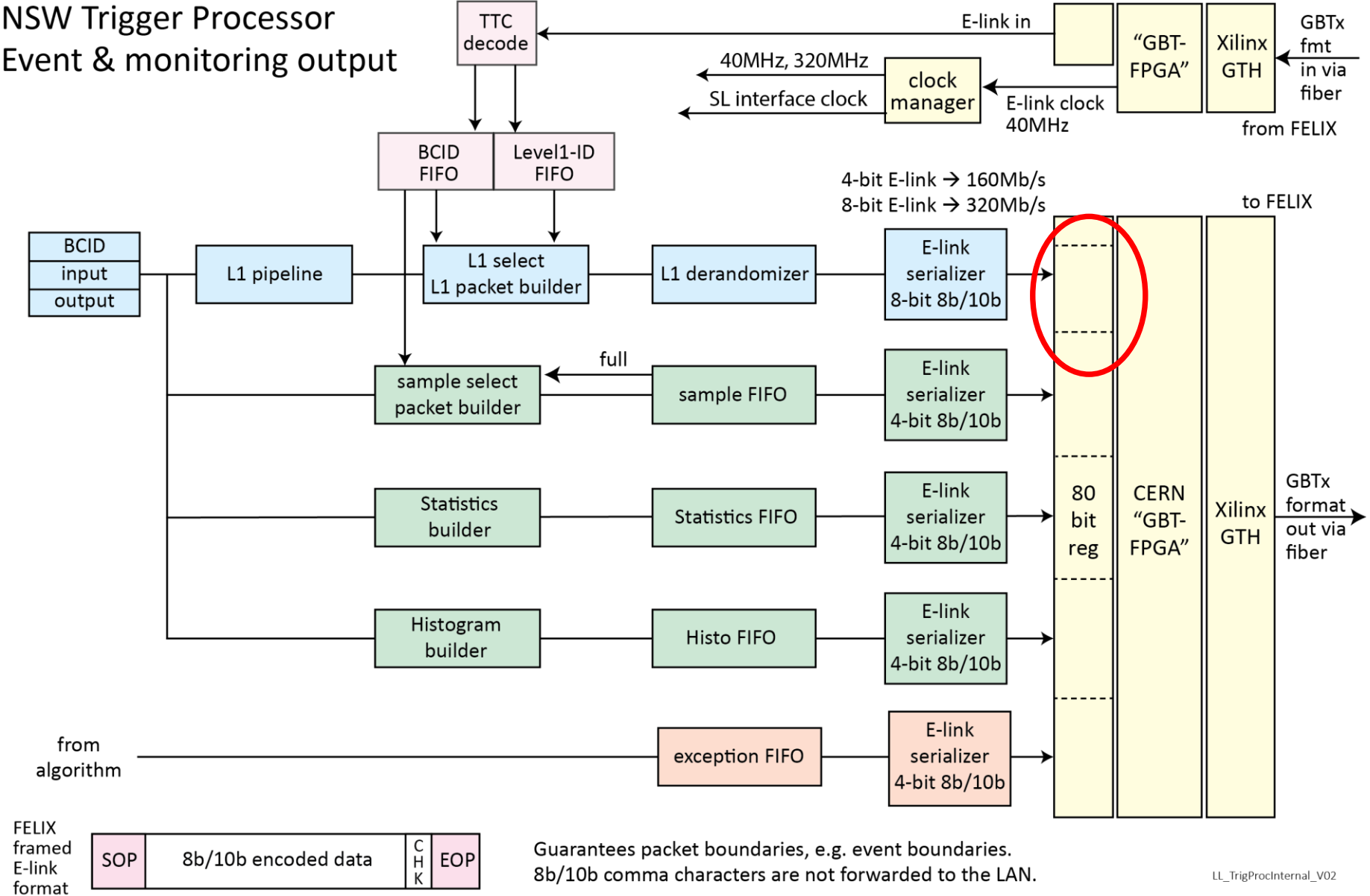
NSW Trigger Processor context

Note:
7 copies of each
stream are produced

to Sector Logic

(2 streams of candidates)
6.4Gb/s each

TTC

Busy

Sector
Logic

E-links
exceptions
statistics
sampled events

duplex fiber
to FELIX

FELIX

Monitor
processor

32 fibers
(4 fibers per layer
8 layers)
MM: 4.8G
sTGC: 5.28G

data tagged by
BCID at source

Trigger
Processor
FPGA
on ATCA
mezzanine
card

Level-1 Accepted events

ROD

algo params

TTC

BC clock

Configuration
processor

DCS

FPGA
config

ATCA
carrier

Ethernet

IPMI
Ethernet

temps
voltages

ATCA
shelf mgr

LL_TrigProcContext_V01

NSW Trigger Processor
Event & monitoring output

E-link in

GBTx fmt in via fiber

"GBT-FPGA"

Xilinx GTH

TTC decode

40MHz, 320MHz
SL interface clock

clock manager

E-link clock 40MHz

from FELIX

BCID FIFO

Level1-ID FIFO

4-bit E-link → 160Mb/s
8-bit E-link → 320Mb/s

to FELIX

| BCID |
| input |
| output |

L1 pipeline

L1 select L1 packet builder

L1 derandomizer

E-link serializer 8-bit 8b/10b

sample select packet builder ← full — **sample FIFO**

E-link serializer 4-bit 8b/10b

Statistics builder

Statistics FIFO

E-link serializer 4-bit 8b/10b

80 bit reg

CERN "GBT-FPGA"

Xilinx GTH

GBTx format out via fiber

Histogram builder

Histo FIFO

E-link serializer 4-bit 8b/10b

from algorithm

exception FIFO

E-link serializer 4-bit 8b/10b

FELIX framed E-link format

| SOP | 8b/10b encoded data | C H K | EOP |

Guarantees packet boundaries, e.g. event boundaries.
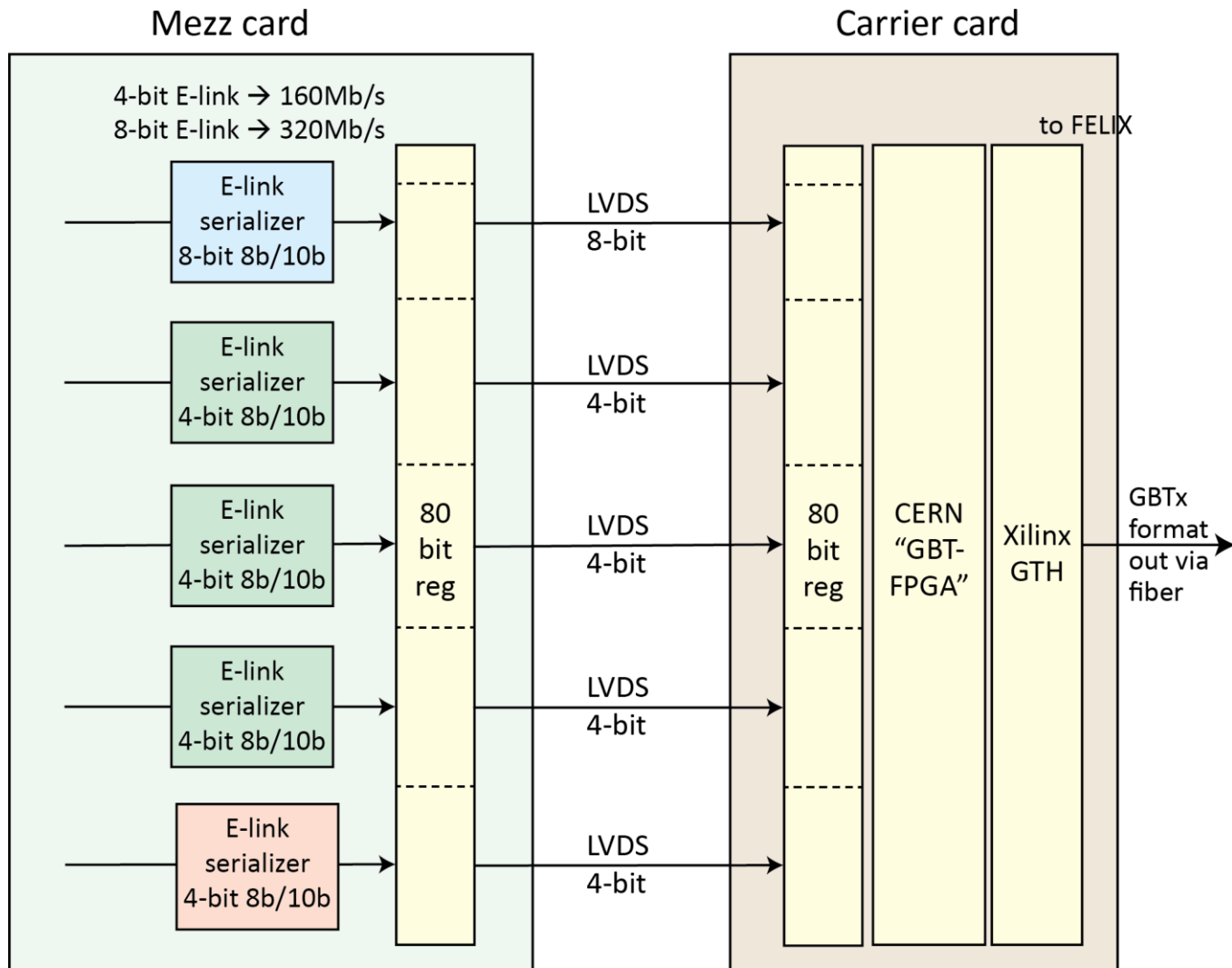8b/10b comma characters are not forwarded to the LAN.

LL_TrigProcInternal_V02

Routing of logical data streams

- For simplicity, all the IO streams (except the found segments) are transferred via E-links on a single GBT link connected to FELIX.

  - The GBTx ASIC is emulated by the CERN GBT-FPGA firmware and the Xilinx GTH serializer/deserializer.

- FELIX then routes the various logical data streams to the appropriate network end-points.

- Interfacing the streams to the GBT protocol as E-links is extremely simple, much simpler than Ethernet TCP-IP.

- FELIX then translates to standard Ethernet to allow communicating with processes on PCs.

Division between mezz and carrier