ECS on Tell40

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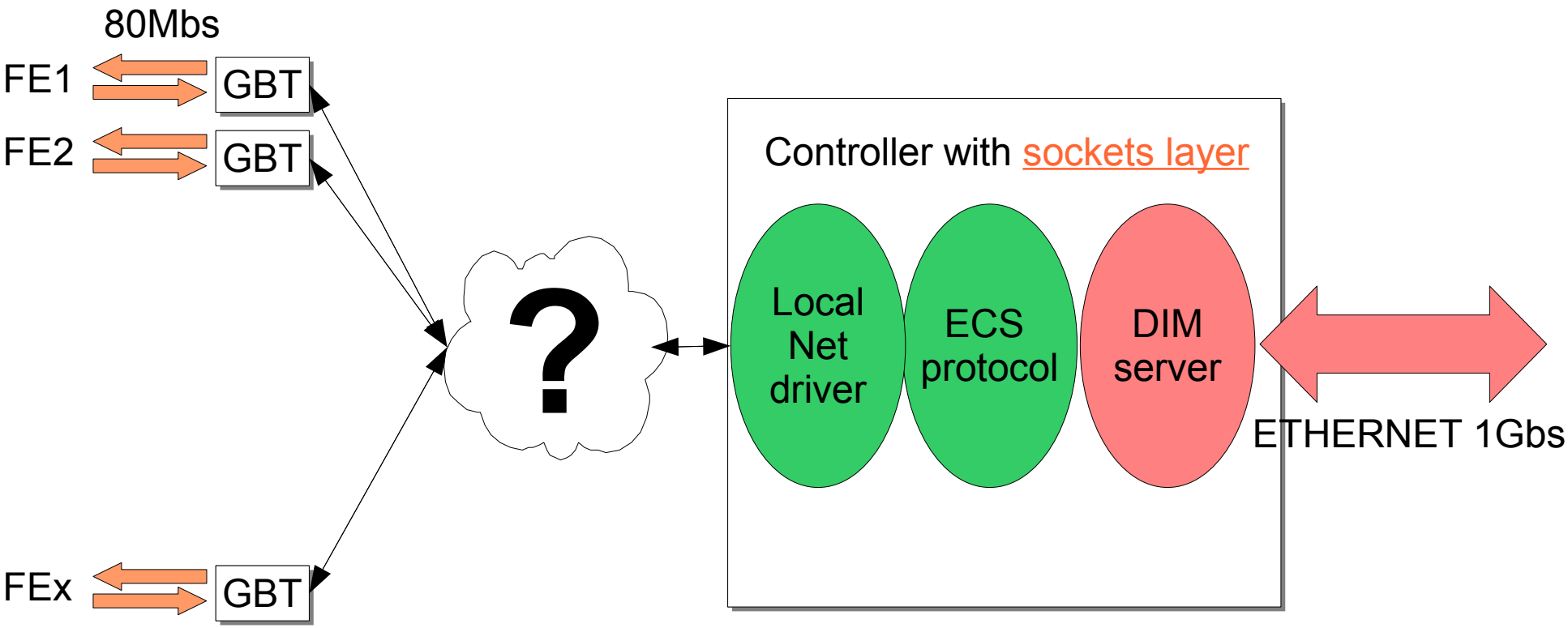
Outline

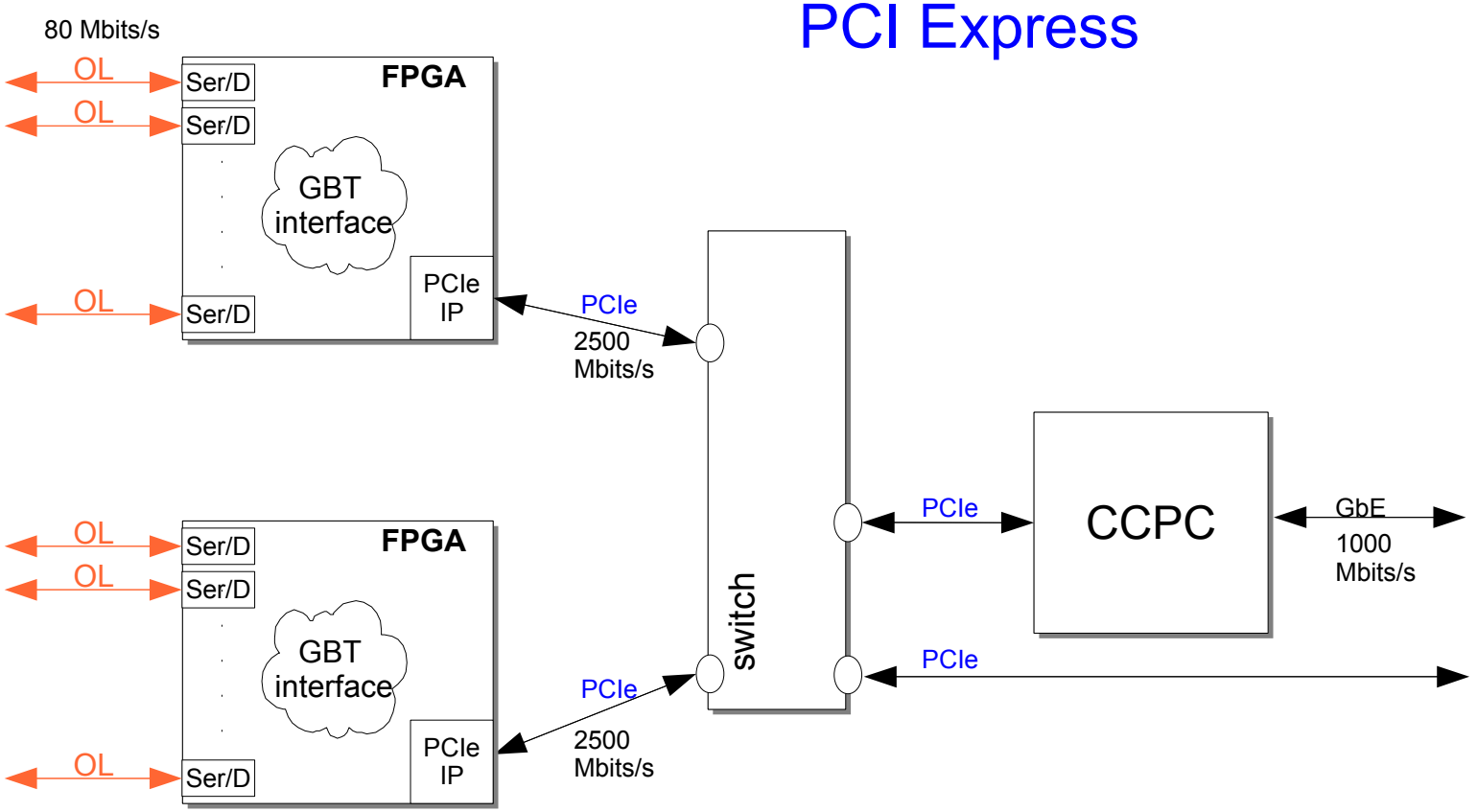
- ECS dimensionning
- Few possible solutions
- ECS and data acquisition on a single card ?

Dimensionning: What we know ...



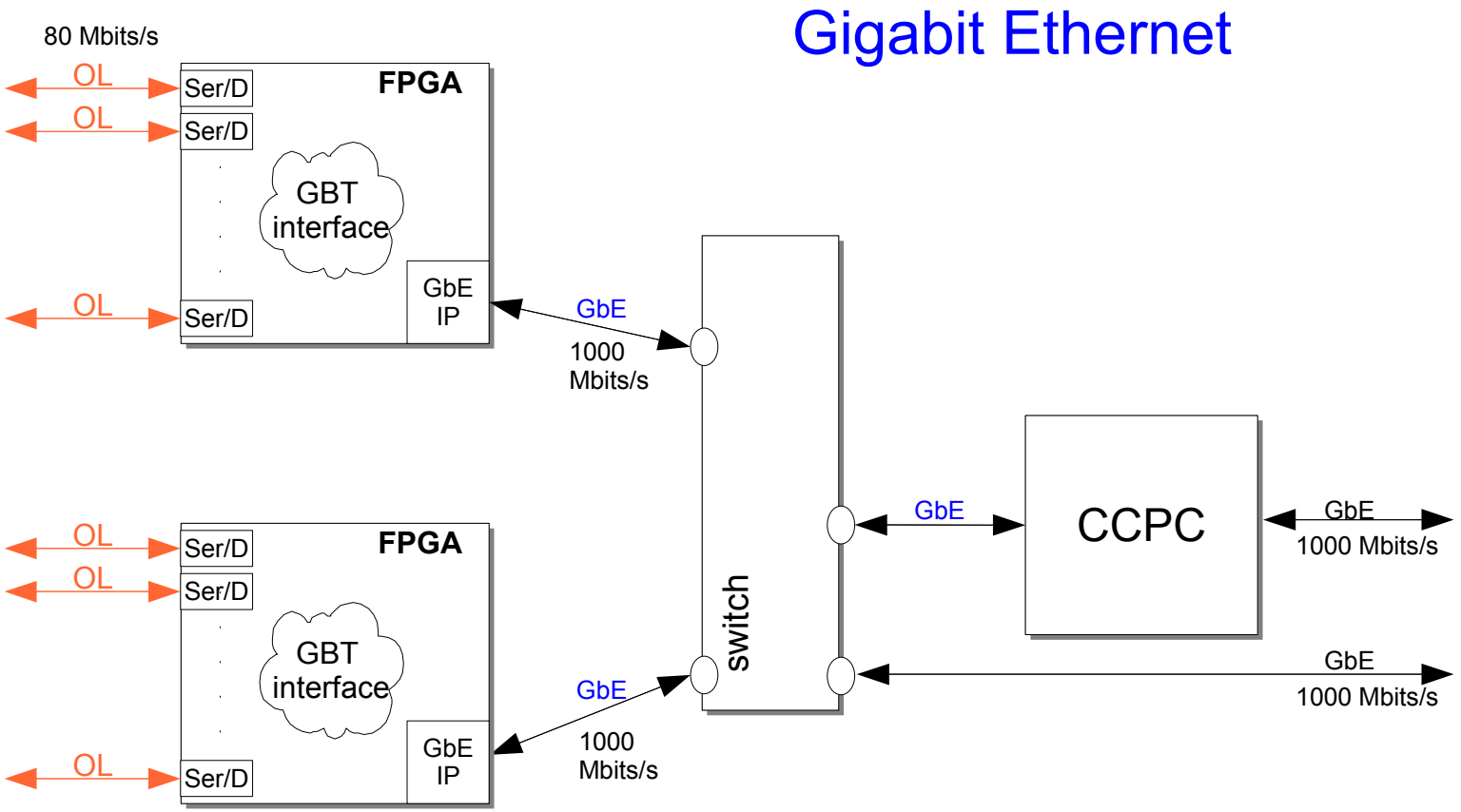
Maximum bandwidth through GBT = 80 Mbits/s
Maximum bandwith in output for a card = 1 Gbit/s
- ⇨ 12 Front-Ends
- ⇨ Actual bandwidth from Front-Ends needed

Possible techniques for mapping ECS over GBT (1)



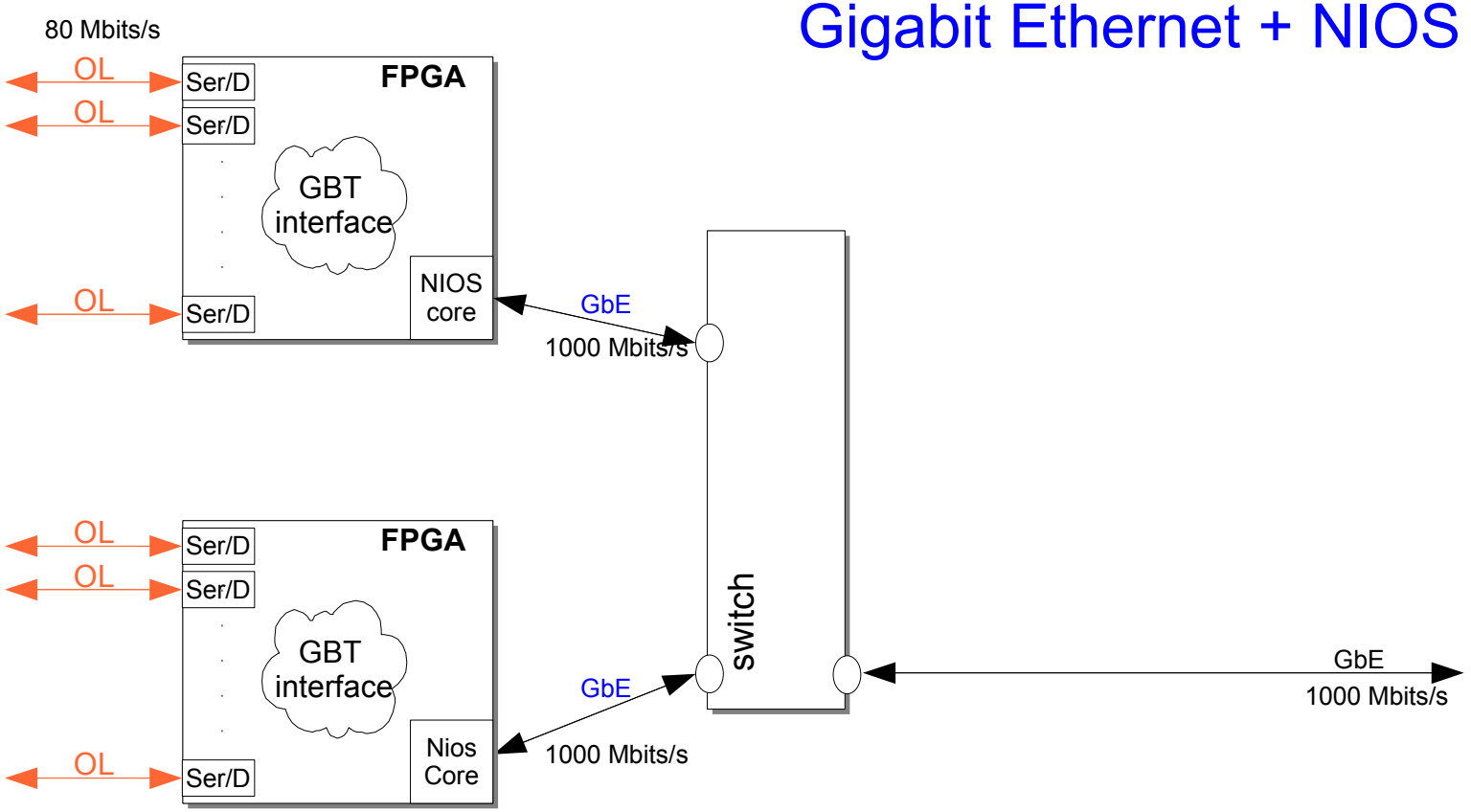
- High bandwidth between CCPC and FPGAs
- Limited by connection with external world

Possible techniques for mapping ECS over GBT (2)



- High bandwidth between CCPC and FPGAs
- Limited by connection with external world
- Possibility to bypass CCPC for simpler configurations (Mini Read-out)

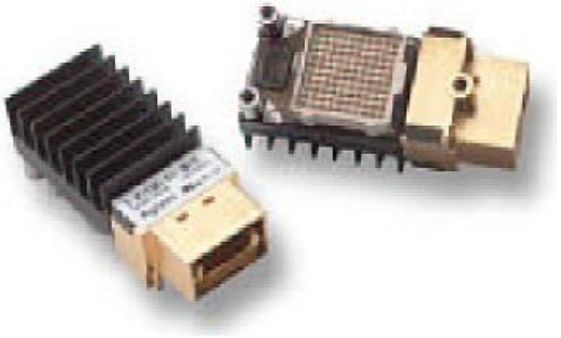
Possible techniques for mapping ECS over GBT (3)



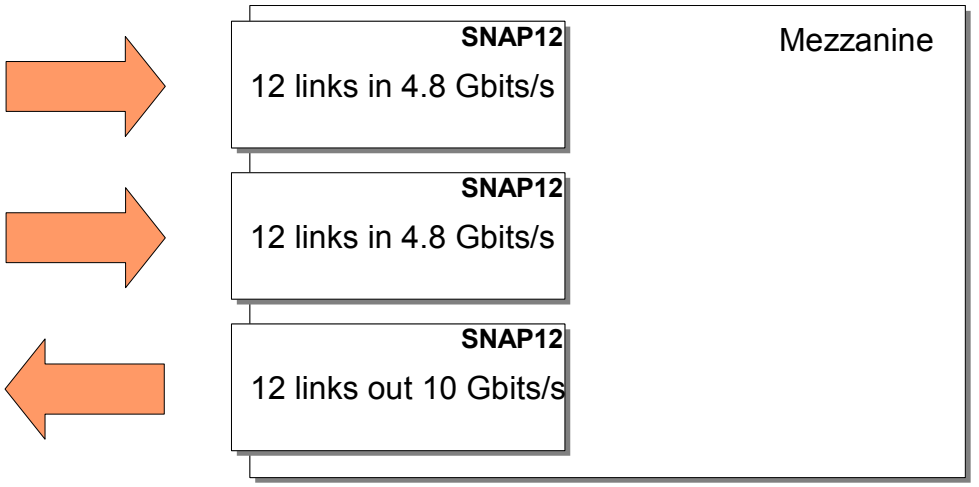
- Low effective bandwidth between PC and FPGAs (measured 13 Mbits/s)
- Maybe not sufficient for massive FE ECS management
- Sufficient for controlling Tell40 devoted to data acquisition
- But optimization + hardware acceleration could lead up to 300 Mbits/s

ECS and data acquisition on a single card ?

Optical mezzanine for data acquistion: physical implementation



SNAP12 :
12 unidirectional optical links

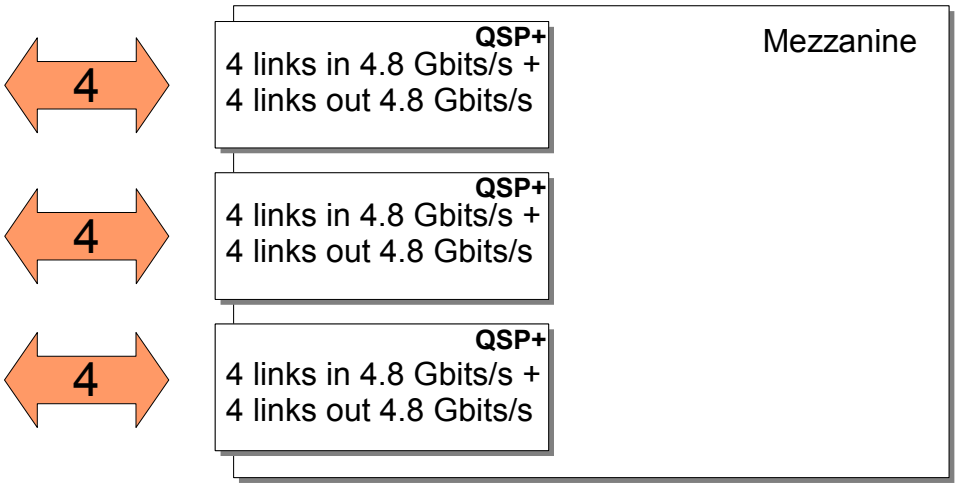


Mezzanine implementation:
no possibility to merge
bidirectional links at 4.8 Gbits/s

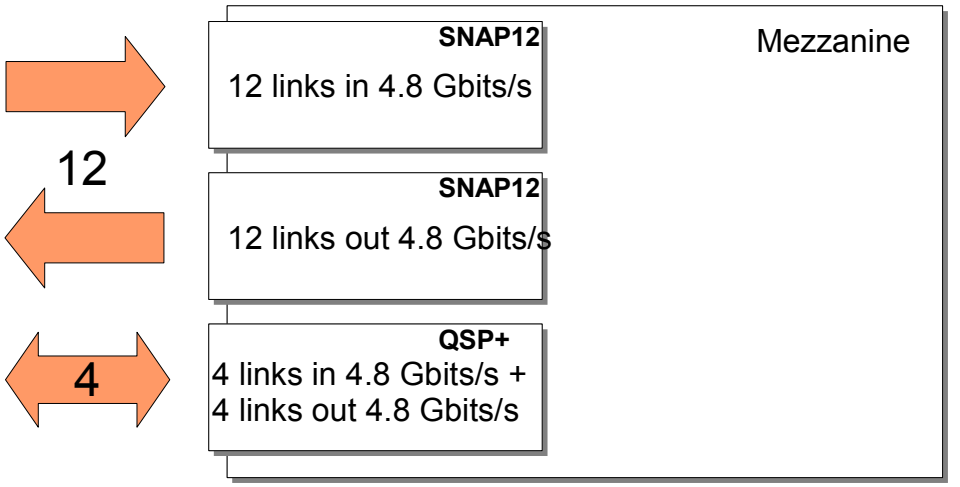
Optical mezzanine for ECS: physical implementation

QSFP+ :
quad bidirectional optical devices

Mezzanine implementation: 2 possibilities



12 bidir links



16 bidir links

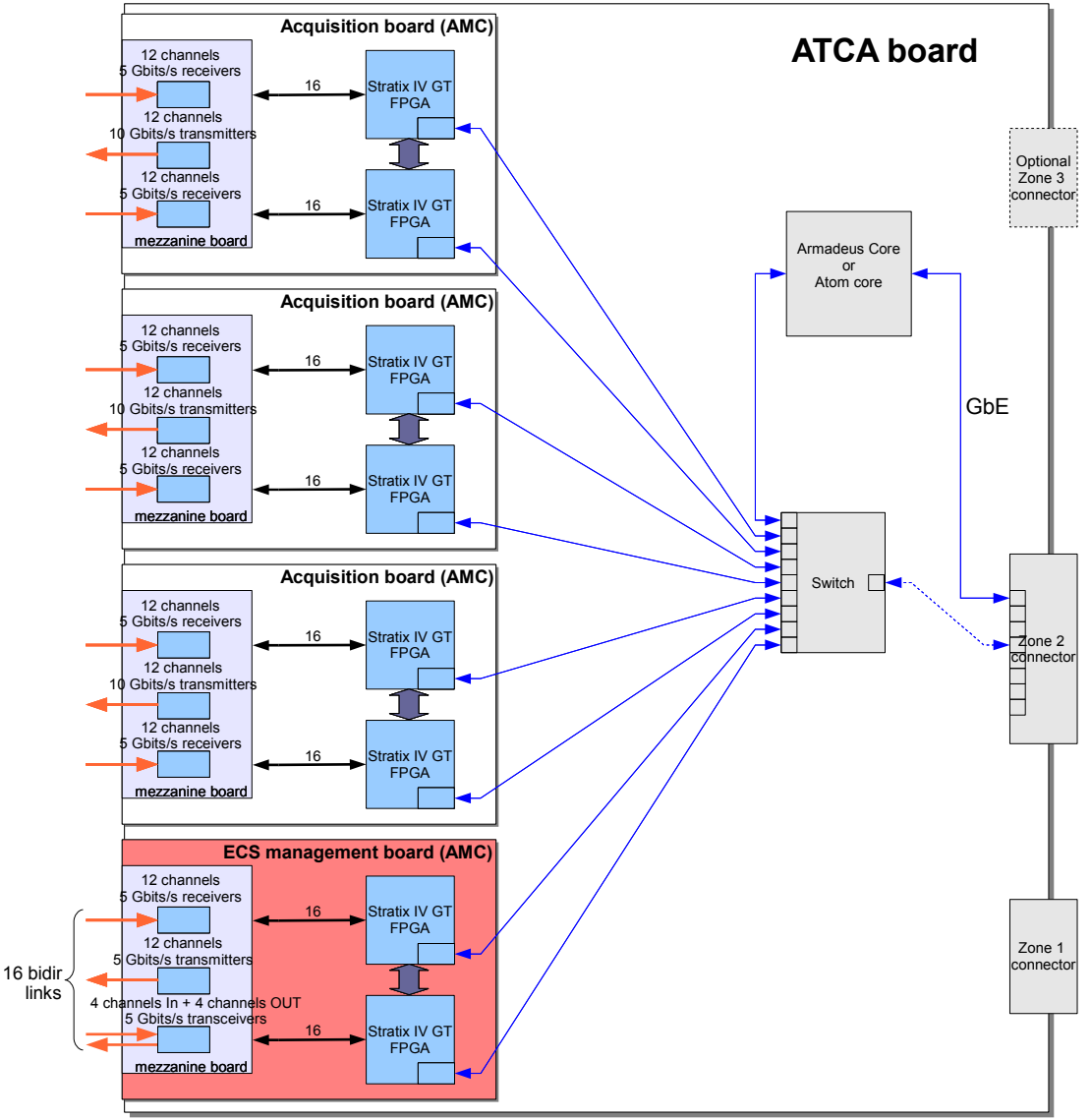
Tell40 merging acquisition and ECS

from FE

72 GBT channels IN

to switches/ farms

36 GbE channels OUT



At least 1 mezzanine must be used per card depending on the ratio *Number of acquisition links / Number of ECS links*

- Suboptimal allocation: ex. 1 ECS for 10 links = 132 cards
- Increase Number of boards

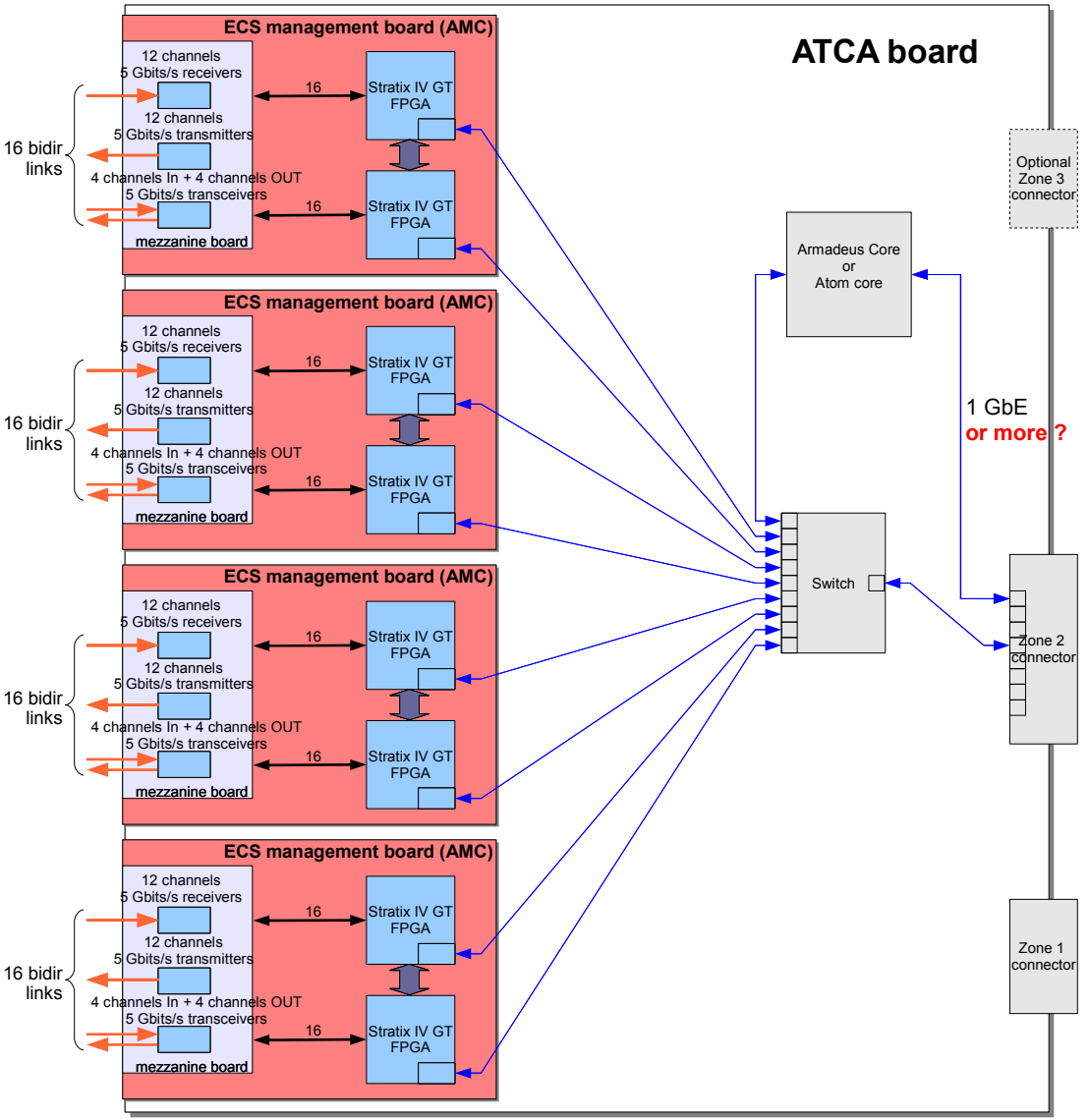
Tell40 version devoted to ECS

from FE

64 GBT channels IN

to FE

64 GBT channels OUT



Up to 64 ECS links controlled by a single TELL40

- Better optimization:
  ex. 1 ECS for 10 links = 114 cards
- Slower and cheaper FPGAs can be used

Conclusions

- Several possible implementations for ECS on Tell40
  No obvious choice now:
  - Need estimations from Front-Ends
  - Need further studies to validate dimensionning
  - Need simulations to identify bottle necks
- Separated implementation of data acquisition and ECS seems more flexible and cheaper
  - Need further studies to choose connection with Control PC