OnLine Application Processing

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Stichting ASTRON (Netherlands Foundation for Research in Astronomy)
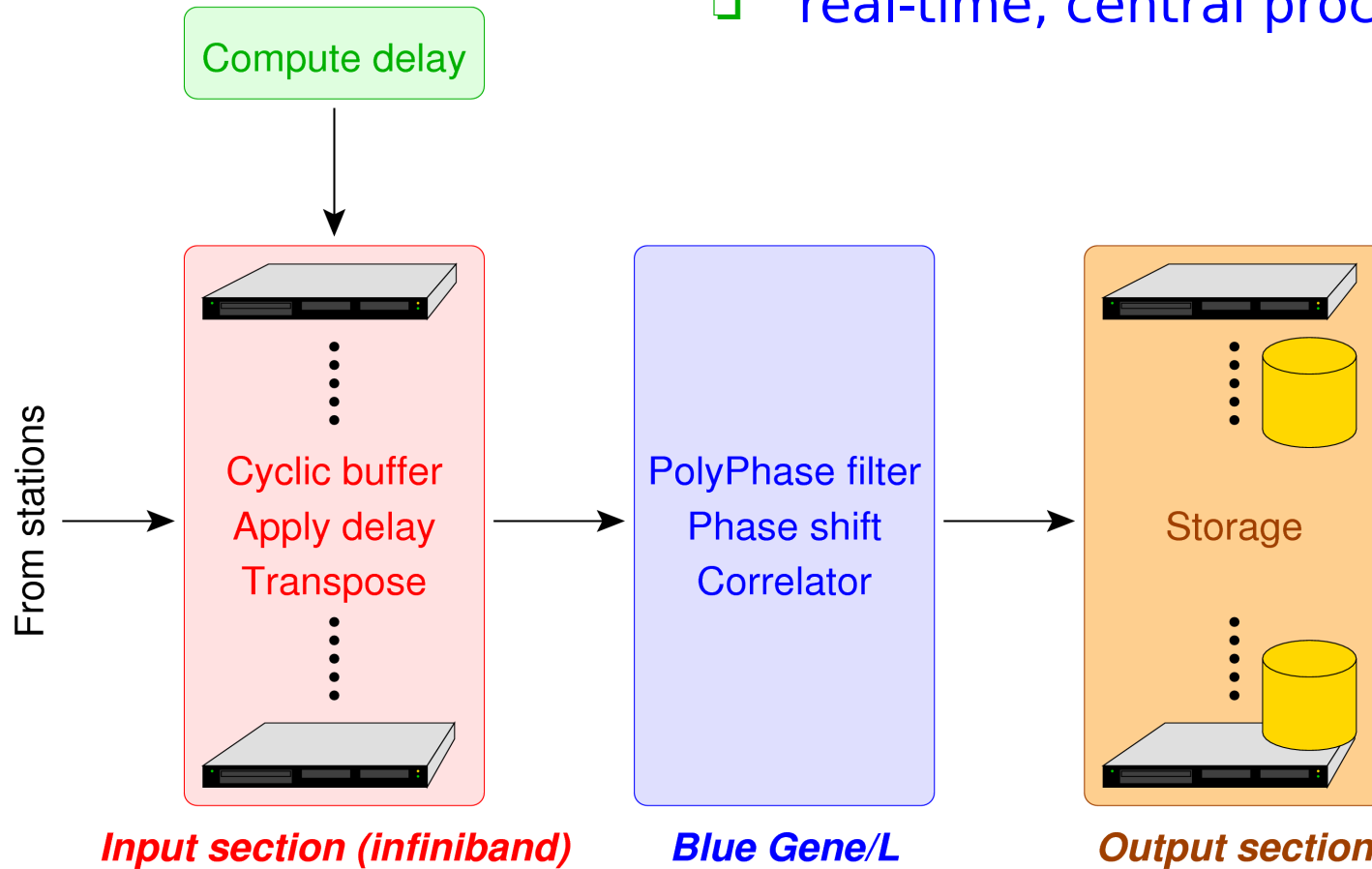*Dwingeloo, the Netherlands*

ASTRON

NWO
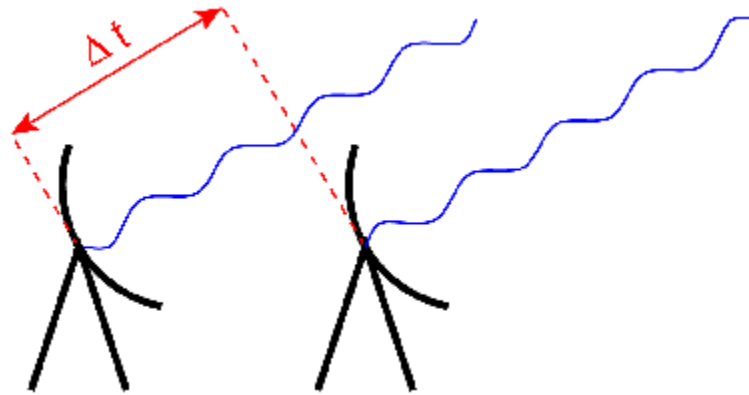Netherlands Organisation for Scientific Research

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OnLine Application Processing

Delay compenstation

Compute delay

❑ real-time, central processing

From stations →

Cyclic buffer
Apply delay
Transpose

PolyPhase filter
Phase shift
Correlator

Storage

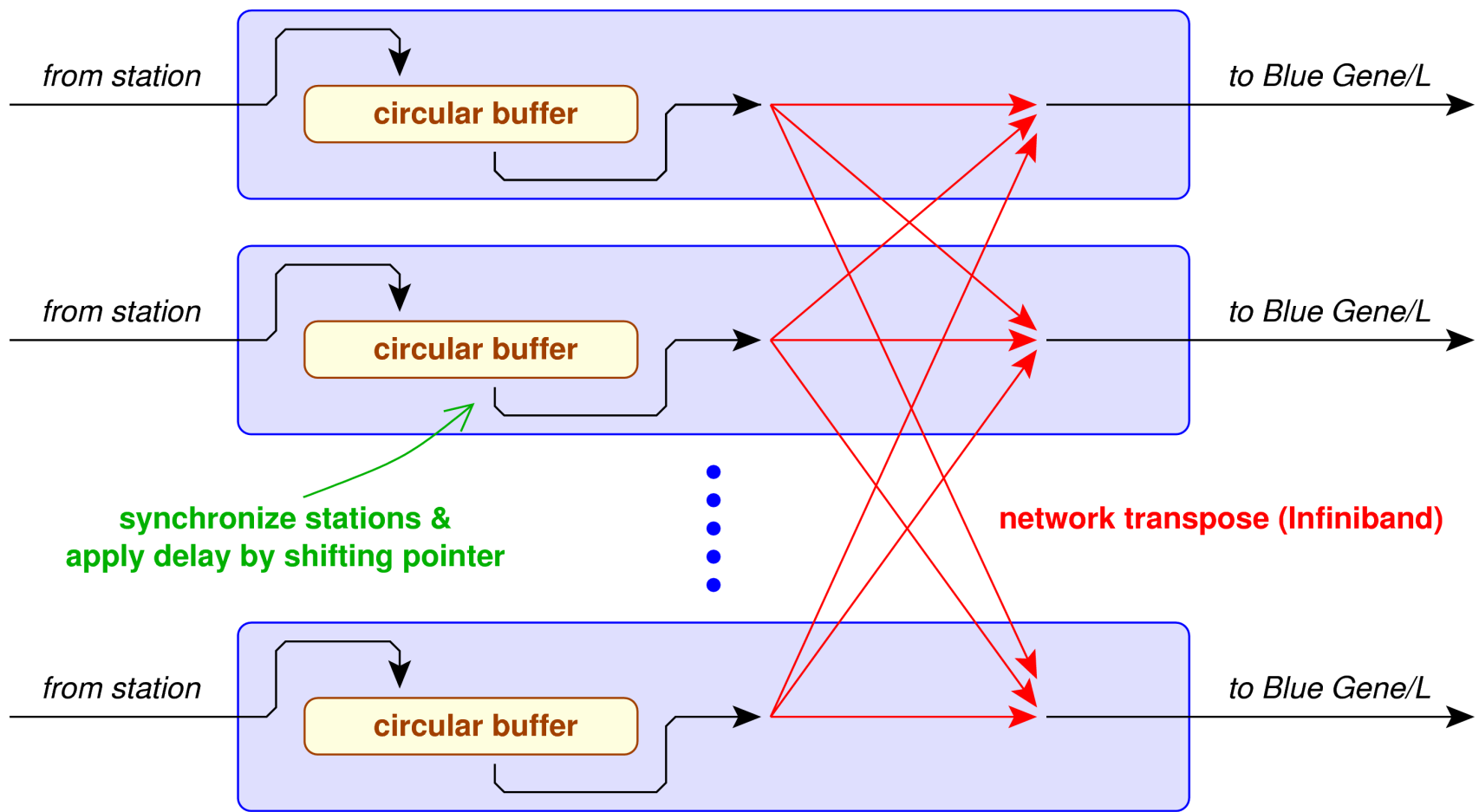**Input section (infiniband)**   **Blue Gene/L**   **Output section**
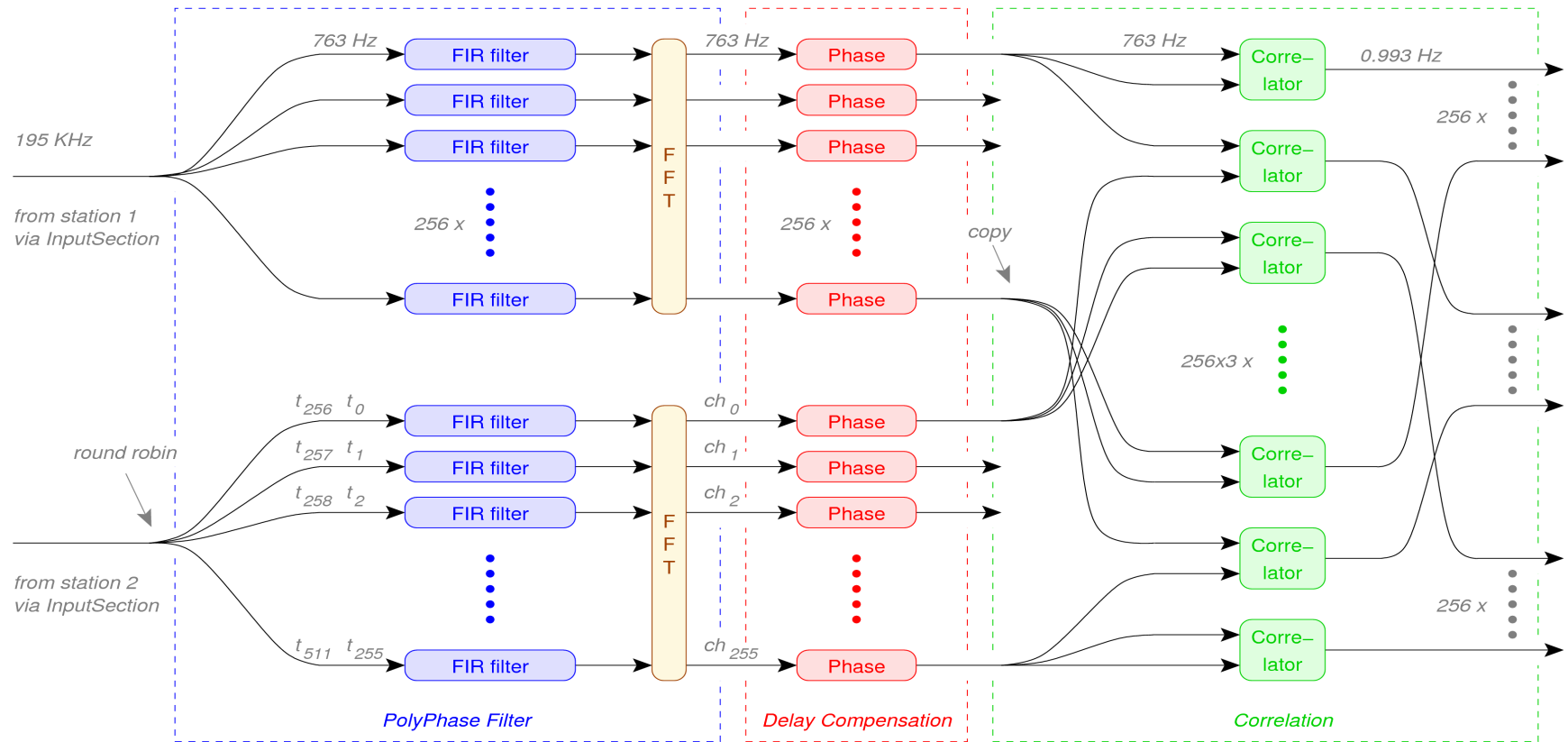
Delay Compensation

❑ compute delays between stations

  ❑ observation direction, station positions

  ❑ AIPS++

❑ apply delays in Input Section & BG/L

Input Section

from station → circular buffer → to Blue Gene/L

from station → circular buffer → to Blue Gene/L

synchronize stations & apply delay by shifting pointer

network transpose (Infiniband)

from station → circular buffer → to Blue Gene/L

# Blue Gene/L processing

- ❏ highly optimized (assembly)
  - ❏ correlator: 98% of peak performance

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Output Section

- ❏ AIPS++ measurement sets
  - ❏ offline tools use AIPS++
  - ❏ different format in future?

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Current work

- integration with SAS/MAC
  - start/stop observations automatically
- ZOID
  - replaces standard network software
  - developed with ANL, Chicago
  - faster
    - 16 µstations @ 200 MHz: 24 → 36 subbands
    - 16 µstations @ 160 MHz: 36 → 48 subbands
  - more flexible
    - do work on I/O nodes

ethernet tree tree

I/O node

compute nodes

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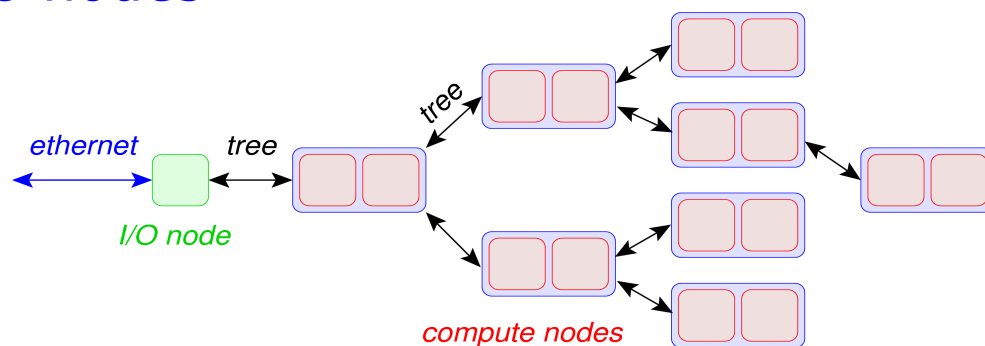
Do we need an Input Section?

❑ send station data directly to BG/L
  ❑ buffer (synchronization, delay): I/O nodes
  ❑ transpose: 3D torus
❑ implications:
  ☺ huge cost reduction
  ☹ smaller buffer (5 sec.)
  ☺ faster
  ☹ less flexible
  ☹ more complex ?
  ☺ more reliable ?
  ☺ environmental savings
  ❑ ...
❑ possible?
  ❑ 3D-torus sufficiently fast
  ❑ I/O node sufficiently fast ?

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Future work

- ❑ fault tolerance
- ❑ multiple beams
- ❑ TBB readout
- ❑ KSP pipelines
  - ❑ EoR should work
  - ❑ need pseudo code

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Issue: OLAP latency

- ❑ optimized for resource usage, not for latency
  - ❑ EoR: resources scarce, latency unimportant
- ❑ 77 stations: BG/L 12 sec.
  - ❑ + input section buffer
- ❑ too large for Transient Buffer Boards
- ❑ < 1 second impossible?

additional programming effort / latency