

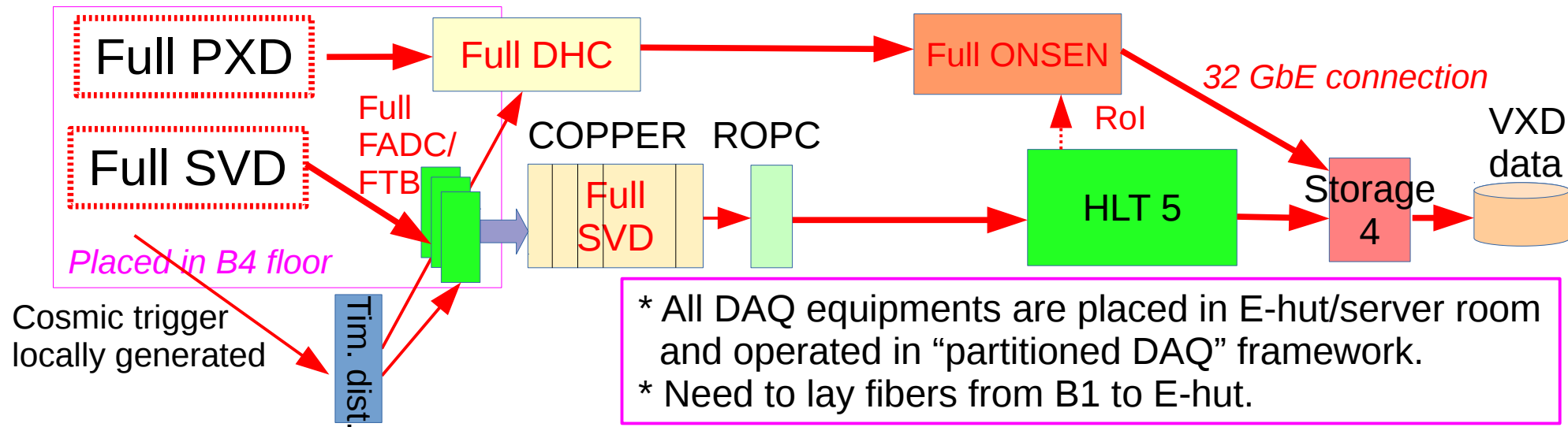
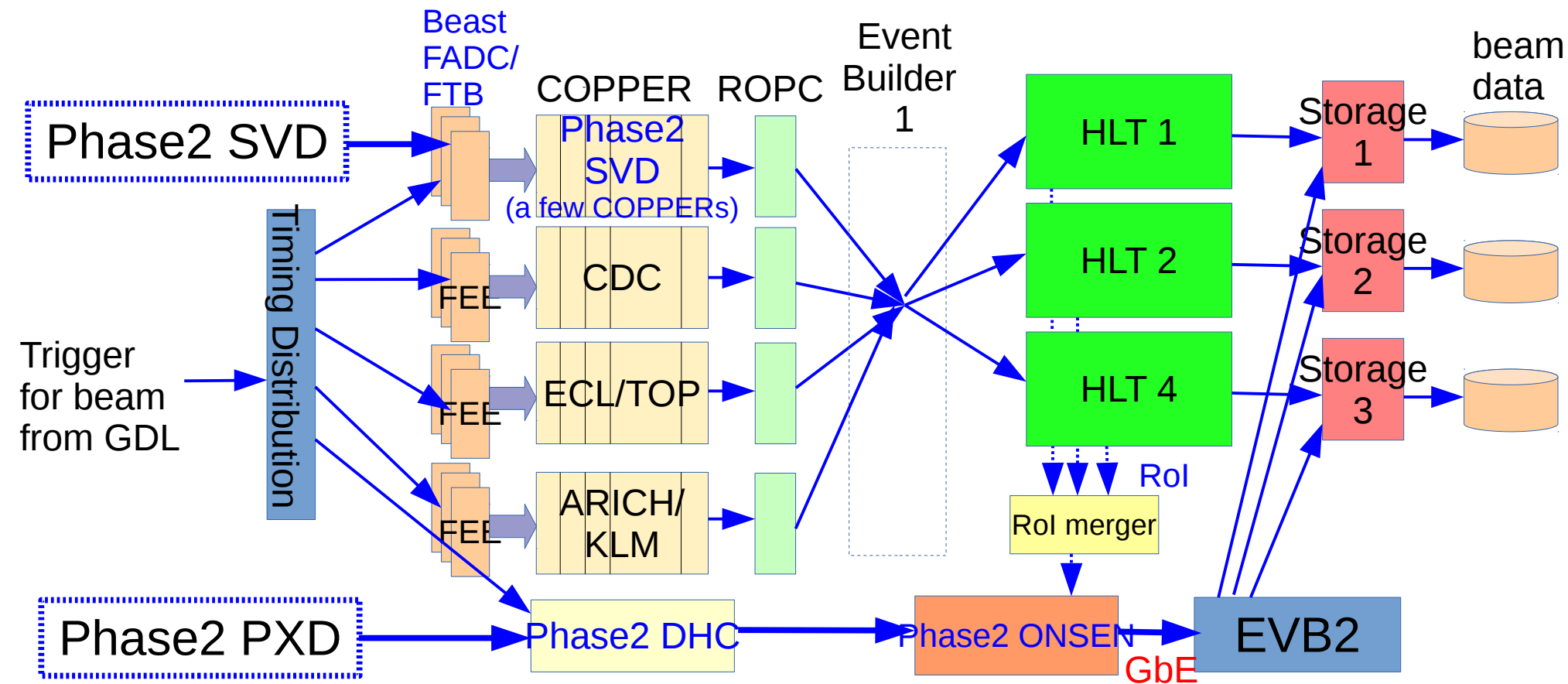
# HLT operation in Phase 2 run

R.Itoh, KEK

# Requirements to HLT in Phase 2 Run

1. The luminosity of the machine is not so high, up to a few times of  $10^{34}$ , however the trigger rate is expected to be quite high because of
  - \* high background
  - \* possible single photon trigger for “dark” search.
    - > my rough guesstimation :
      - \* 10-15 kHz L1 rate.
      - \* >80% of taken events are junk.
2. In the early stage of the data taking, all events are supposed to be recorded without any selection.
3. In the stable operation, “Level 3” trigger is supposed to be turned on. -> supposed to discard junk events.
4. RoI feedback to Phase 2 ONSSEN is required for every event for event building even though no tracks in Phase 2 VXD.

# Partitioned DAQ operation during Phase II run



\* All DAQ equipments are placed in E-hut/server room and operated in "partitioned DAQ" framework.  
 \* Need to lay fibers from B1 to E-hut.

## HLT script

### a) “Level 3” selection

- Fast reconstruction of events with CDC+ECL
- Rough event selection using
  - \* track multiplicity
  - \* energy sum in ECL
  - \* L1 trigger bit
  
- Two choices in the code
  - a) “FastReco” : default
    - CDC tracking + ECL clustering code used in the offline reconstruction.
    - Tested only with simulation data for now
  - b) Belle 1 “Level 3” code : backup
    - Fast reconstruction recycling Belle 1's code.
    - Combat proven in Belle 1.
    - Introduce another systematics in the offline reconstruction.

## b) Reconstruction code

- Basically the similar reconstruction code to that used in the cosmic ray test.
  - \* CDC tracking
  - \* ECL clustering
  - \* PID (TOP+ARICH)
  - \* KLM clustering
- SVD data (+ PXD, of course) are not used in the reconst. But partial track reconstruction using SVD+CDC for RoI generation is required.

## c) Software Trigger and Pruning data

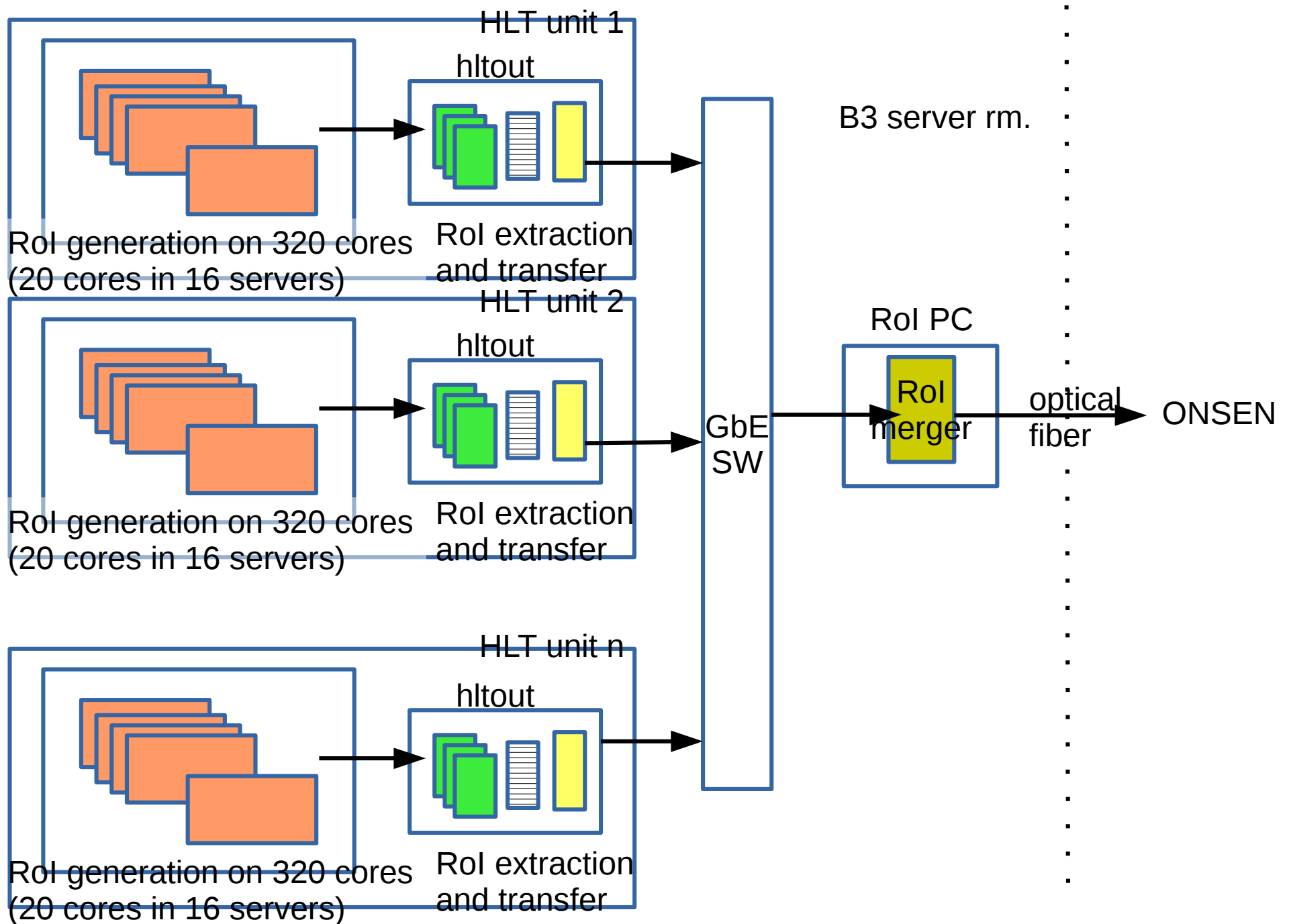
- From all the information obtained by the event reconstruction the trigger decision is made by “SoftwareTrigger” module.
- In phase 2, the module just leaves the trigger decision results and no events are discarded.
- In HLT processing, the events are discarded just by removing “raw data” and related objects from DataStore, while keeping “EventMetaData” and trigger decision information for every event.
- The removal of objects in discarded events is supposed to be done by “PruneDataStore” module.
  - > This will not be performed in Phase 2 run.

## d) RoI generation

- Since Phase 2 VXD coverage is limited (only 1 ladder), “real” Rols are supposed to be generated only when hits are there in Phase 2 SVD.
- The same code that used in DESY-TB is supposed to be used, but adding CDC hits in the tracking should be implemented.
- Rols are required for every event even though no hits in Phase 2 VXD so that ONSSEN can output event packets for the 2<sup>nd</sup> level event building.
- In the early stage, the full PXD data w/o RoI data reduction have to be recorded.

\* Rols have to be collected from ~1600 cores through up to 5 HLT units!  
<-> 24 cores thru. 1 HLT unit at DESY-TB

# RoI collection scheme in Phase 2 / 3





# Preparation of DAQ backend for Phase 2

- Optical fiber connection for data from ONSEN to HLT
  - \* In E-hut (ONSEN to optical concentrator)
  - \* In server room (optical concentrator to HLT1-5)
- Integration of Phase 2 Rol generation in HLT script
- Rol network connection from HLTs to Rol PC -> done
- Optical fiber connection for Rols from Rol PC to ONSEN
  - \* In server room (Rol PC to optical concentrator)
  - \* In E-hut (optical concentrator to ONSEN)
- Implementation of Event Building 2 in Storage
- Processing script in Express Reco  
(PXD DQM, partial PXD+SVD+CDC tracking)
- Feed back of vertex position to accelerator