

LVL1/LVL2 Interface (RoI Builder)

1. Introduction

- 1.1. The LVL1 trigger system (LVL1) provides to the LVL2 trigger system (LVL2) an information (LVL1 RoI Data) about events, accepted by the LVL1, namely:
 - an event identification information (L1ID and BCID),
 - an information about Regions of Interest (RoI) identified by the LVL1,
 - other information useful for the LVL2,via an LVL1/LVL2 interface (an RoI Builder).
- 1.2. The tasks of the RoI Builder (and its parts) are:
 - collection and preprocessing of the LVL1 RoI Data (Local RoI Builders),
 - transmission of the LVL1 RoI Data to the LVL2 (RoI Links),
 - distribution of the LVL1 RoI Data in the LVL2 (Global RoI Builder).
- 1.3. The LVL1 may provide the LVL1 RoI Data at the rate of up to 100 kHz, the latency for providing LVL1 Data shall not exceed 100 us.

2. Assumptions

- 2.1. The LVL1 consists of a number of partitions (Appendix A), each:
 - generates Raw LVL1 RoI Data,
 - has an individual Local RoI Builder,
 - sends formatted LVL1 RoI Data to the Global RoI Builder via individual RoI Link as an LVL1 RoI Data Fragment.
- 2.2. The Local RoI Builder performs within the LVL1 partition:
 - raw LVL1 RoI Data collection,
 - zero-suppression of the Raw LVL1 RoI Data,
 - formatting of the zero-suppressed LVL1 RoI Data (Appendix B) into an LVL1 RoI Data Fragment,
 - injecting LVL1 RoI Data Fragments into the RoI Link.
- 2.3. The RoI Links are identical for all LVL1 partitions (e.g. S-Link).
- 2.4. The Global RoI Builder receives the LVL1 RoI Data Fragments from the RoI Links, builds a complete LVL1 RoI Data Records and distributes them to destinations in the LVL2 (RoI Processors of the LVL2 Supervisor).

3. Boundary of responsibility

- 3.1. The Local RoI Builders and the transmitter side of the RoI Links are the responsibility of the LVL1.
- 3.2. The RoI Link (cable and receiver side) and the Global RoI Builder are the responsibility of the LVL2.

Appendix A.

A.1. LVL1 has the following partitions and the number of partitions:

- Electron/photon and single-hadron/tau trigger 4
- Jet trigger 4
- Missing/total transverse energy trigger 1
- Muon_CTP interface 1
- Central Trigger Processor 1

Appendix B.

B.1. LVL1 RoI Data Fragment format is identical for all LVL1 partitions and follows the ATLAS Read-Out Link Data Format recommendations:

(<http://www.cern.ch/HSI/format/>).

B.2. All words are 32-bit.

B.3. First word - Begin of Fragment - hex B0F00000.

B.4. Second word - 24-bit event identification number (L1ID).

B.5. Third word - 12-bit bunch crossing number (BCID).

B.6. Fourth word - number of following data words (see D.7). Fixed for missing/total transverse energy trigger partition and Central Trigger Processor partition. Variable for other partitions.

B.7. Data words:

- Electron/photon and single-hadron/tau trigger partition - one word per RoI:
 - * 4-bit RoI type (electron/photon = 1, single-hadron/tau = 2)
 - * 12-bit eta-phi index with granularity 0.1x0.1
 - * 8-bit RoI threshold set
- Jet trigger partition - one word per RoI:
 - * TBD
- Missing/total transverse energy trigger partition - 3 words:
 - * First word - N-bit missing energy
 - * Second word - N-bit transverse energy X
 - * Third word - N-bit transverse energy Y
- Muon_CTP interface partition - one word per RoI:
 - * 8-bit sector number
 - * 5-bit sub-sector number
 - * 3-bit Pt value
- Central Trigger Processor partition - 10 words:
 - * First 4 words - 128 bit pattern - input data from the calorimeter, muon and other triggers:
 - 8*3 bits electron/photon
 - 8*3 bits jet
 - 8*3 bits tau/hadron
 - 4 bits missing ET
 - 4 bits total ET
 - 6*3 bits muon
 - 30 bits - reserved
 - * Next 3 words - 96 bit pattern - trigger candidates (before prescaling and inhibits)
 - * Last 3 words - 96 bit pattern - trigger candidates (after prescaling and inhibits).

B.8. Last word - End of Fragment - hex E0F00000.