Monitoring the data quality of the real-time event reconstruction in the ALICE High Level Trigger

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Introduction

ALICE (A Large Ion Collider Experiment) produces vast amounts of data, which imposes great challenges both concerning storage and when analyzing the data. The High Level Trigger (HLT) is implemented in order to reduce the data volume and filter events with desirable physics content. Events are reconstructed in real time within the HLT framework and trigger decisions are issued based on the physics content.

ALICE detectors in HLT
Time Projection Chamber (TPC)
Inner Tracking System (ITS)
ElectroMagnetic CALorimeter (EMCAL)
PHOton Spectrometer (PHOS)
Transititon Radiation Detector (TRD)
Muon Spectrometer (MUON)

TABLE 1: Some of the subdetectors in ALICE which are incorporated into HLT to compute real-time event reconstruction.

Monitoring the reconstructed data

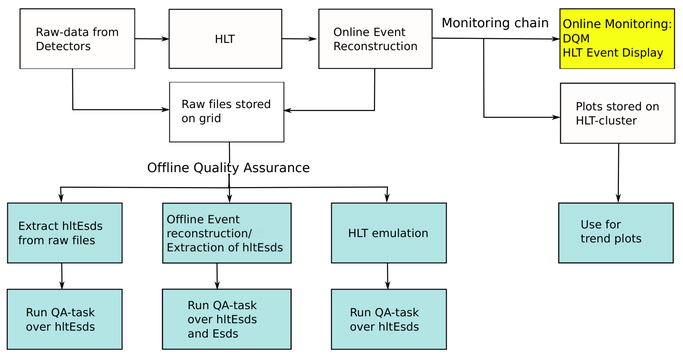

FIGURE 1: The data flow for monitoring of HLT TPC+ITS tracking and data reduction of HLT TPC data. Online monitoring (yellow box) is performed during data taking. Offline Quality Assurance (blue boxes) is performed after data has been transferred to storage and here one can compare the output to the offline reconstruction. One can also run the online reconstruction over again in an HLT emulator.

Online Monitoring

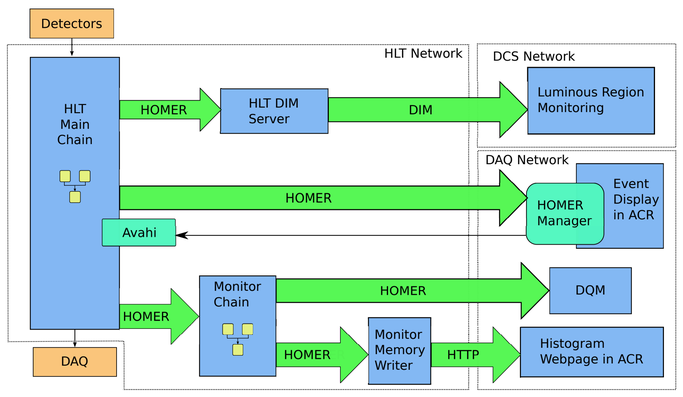

FIGURE 2: Schematic view of the HLT monitoring system. Monitoring components produce the monitoring histograms and are shown both in a display in the ACR and also forwarded to DQM. A small fraction of the events are also shown in an online event display. HLT provides a publication of the luminous region based on the SPD vertex and forwards this to DCS and further to LHC.

Track Information	Event Properties
TPC clusters per track	SPD Vertex X,Y,Z
DCAr	SPD vertex X-Y
Transverse momentum	V0A vs V0C
ITS clusters per track	V0 vs ZDC
Multiplicity	Centrality
Polarity	
Phi	

TABLE 2: The track- and event information histograms produced in the monitoring chain which are sent to DQM. There is a dedicated poster for EMCAL which also shows the forwarded EMCAL histograms.

TPC cluster	Performance
Charge	Reduction factor vs number of clusters
Q_{max}	
Q_{max} vs sector	
σ_Y vs sector	
σ_Z vs sector	
Pad vs Row per sector	

TABLE 3: The data reduction information histograms produced in the monitoring chain which are sent to DQM. Q_{max} is the maximum charge.

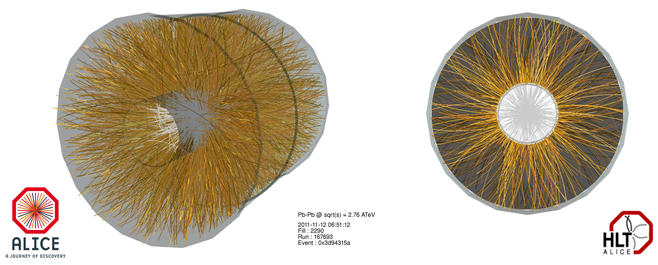

FIGURE 3: Pb-Pb collision recorded during Pb-Pb run of 2011. These images are produced with the online reconstructed data.

Performance of the HLT tracking

FIGURE 4: Trend for 2011 pp data - The mean value of DCAr and number of TPC clusters per track for each run is calculated and plotted versus the runnumber. There were no monitoring components running for TPC in LHC11e, thus there are no points for this period.

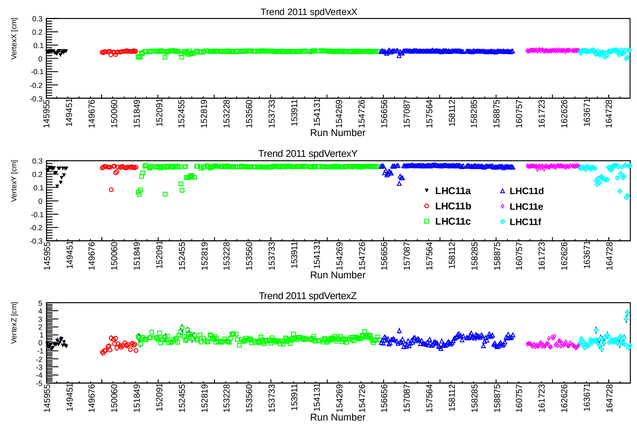

FIGURE 5: Trend for 2011 pp data - SPD vertex. The mean value of X, Y and Z distributions per run is calculated and then plotted versus the run number. The outliers seen in especially the Y distribution have been found to be runs with larger background. This means this is not a performance issue but rather illustrates changes in the run conditions.

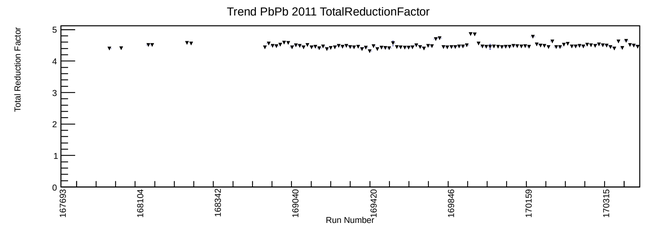

FIGURE 6: Trend of the total reduction factor when storing clusters calculated by HLT rather than storing raw data from the TPC detector in Pb-Pb 2011. The missing points are runs where the monitoring histograms were not available due to technical problems with the monitoring chain in the beginning of the Pb-Pb run period. The total data reduction is seen to be very stable for the entire period achieving an overall data reduction factor of at least 4.4.

Conclusion

With the continuous operation of the ALICE HLT in 2011, the online monitoring of the event reconstruction performance has become an integral part of the ALICE online system. The environment for online monitoring and offline quality assurance has been expanded and improved during 2011 and with this one has a very stable tool to monitor and assess the data quality of the online reconstruction on the fly.

References

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[5] von Haller B *et al* 2010 *J. Phys.: Conf.Series* **219** 022023