

A facility and a web application for real-time monitoring of the TTC backbone status

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The Timing Trigger and Control (TTC) system distributes timing signals from the LHC Radio Frequency (RF) source to the four experiments. A copy of these signals is also transmitted to a monitoring system, installed in the Control Center in Preveessin, which provides continuous measurement of parameters such as Bunch Clock jitter and frequency, Orbit period in BC counts, transmission delay over fiber versus temperature. A web application has been designed to ensure real time remote monitoring and post-mortem analysis of these data.

The paper discusses the architecture of the monitoring system including measurement setup as well as different concerns of data acquisition, storage and visualization.

Summary

As a distribution of synchronous timing signals for the LHC and experiments is of great importance, there has been a need for CERN TTC backbone global monitoring system with a real time and post-mortem analysis facility.

The designed system is mostly based on the measurement equipment installed in the Rack zone of the CERN Control Center (CCR) in Preveessin site. However as the RF timing signals have to reach different destinations, it is necessary that they are monitored all the way from their sources in Echenevex, through CCR, where they are retransmitted, and down to all the four experiments.

Data Interchange Protocol (DIP) is used to send status of monitored signals from different places around CERN sites. The status of RF/TTC receivers is first published to DIP and then collected and stored in a database for the post-mortem analysis.

The monitoring system in CCR is based on a copy of the TTC receiver crate of the experiments (basically a VME crate equipped with a VP110 crate controller connected to the Technical Network (TN), RF_Rx optical receivers, ECL fanouts and an RF2TTC board). Two oscilloscopes are installed to analyze the quality of the timing signals, together with three frequency meters using the 10MHz GMT clock for precise frequency tracking.

Among the measured and monitored values, the TTC monitoring system will focus on bunch clock and orbit frequency and synchronization, as well as jitter and temperature drift. These values are complemented with Beam Synchronous Timing (BST) system modes and status.

The main computer server responsible for data gathering is installed in CCR. While having to deal with data acquisition from all the monitoring devices and signal sources, it has also to comply with the existing CERN infrastructure and available services. This includes security restrictions that are enforced on data transmission between Technical Network (TN) and General Public Network (GPN), database access and other.

A web based application will provide fast data visualization means to the LHC experiments, in order to monitor the TTC status in real time. This application will be available to the users and will help them to quickly detect unexpected conditions and cross correlate those with other events. As all the data will be time-stamped and stored in a database, data analysis and post-mortem will also be simplified.

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