Stability monitor of sPHENIX intermediate tracker detector

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The sPHENIX experiment is an upgrade of the PHENIX experiment at the Relativistic Heavy Ion Collider at the Brookhaven National Laboratory and aims to study quark-gluon plasma and cold quantum chromodynamics.[1] The intermediate tracker (INTT) is a tracking sub detector located in the sPHENIX detector complex.

The INTT is a two-layer barrel detector using silicon strip sensors. The barrel is constructed using 56 ladders consisting of silicon sensors. A stability monitor is newly developed to monitor the appropriate functioning of the INTT detector throughout the experiment. Several key parameters, such as the hit rate, total number of events per run, and number of hot channels, can be used to check the functioning of the INTT detector. The stability monitor is designed to store and visualize these key information. Applications such as the stability monitor have two major advantages. First is notification of condition changes in the INTT operation or beam quality, which frequently occur with hit rate change. Second is easy traceability when a change occurs.

Multiple INTT experts analyze data to evaluate the performance of the INTT. The stablity monitor is designed under the framework that any analyzer can provide run by run basis outcomes of its analysis in a text format. The stability monitor can serve as a platform to visualize them. Figure 1 shows an example of information visualized by the stability monitor. It is obtained using the PostgreSQL database and Grafana web application, as shown in Fig. 2. The PostgreSQL database[2] stores the information for the stability monitor, and the Grafana application[3] visualizes that information on the Grafana website. In practice, the detector data are stored in the data storage pool, and we transfer the data from the pool and analyze the parameters in the computation nodes. The framework requires a CSV file from the analyses. The CSV file contains the run number and outcome parameters.

Fig. 1. Hit rate, number of events, and number of hot channels as functions of run.

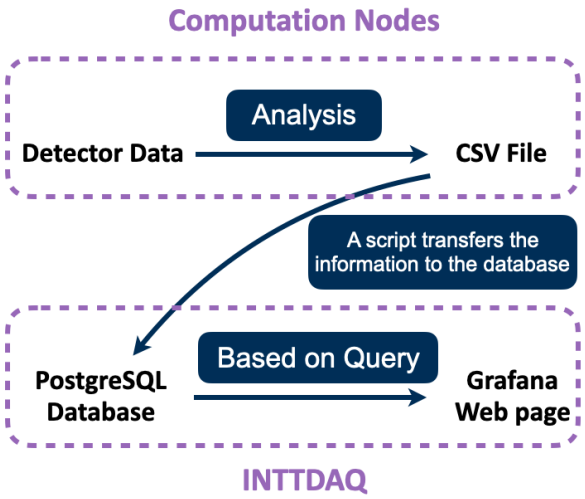

Fig. 2. Framework of stability monitor.

The CSV file is fed to the framework by a script that transfers all information to INTTDAQ, which is the server for the stability monitor, and stores the information in the PostgreSQL database. Once the information is stored in the PostgreSQL database, the Grafana application automatically queries the information from the database every 1 min. The information is shown on the Grafana web page.

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2) https://www.postgresql.org/.
3) https://grafana.com/oss/grafana/.

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