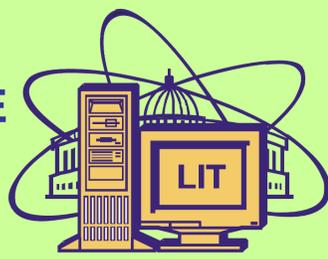# FTS (FILE TRANSFER SERVICE) MONITORING FOR WORLDWIDE LHC COMPUTING GRID (WLCG) PROJECT

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File Transfer Service (FTS) is one of the grid-services responsible for distribution of data from LHC according to the scheme produced by WLCG (Worldwide LHC Computing Grid) [1] and is one of the most important data transfer services in gLite - a Grid middleware produced by the EGEE (Enabling Grids for E-sciencE project) and used by WLCG.

Main aim of the FTS monitoring system is to take care about many aspects of FTS work: state of the whole service and its components, different service settings and representing errors. While transferring data from one site to another an error could happen at the storage system of source or destination site, on some of storage system interfaces, while transferring, etc. [2]. FTS process the errors but there was no representation mechanism. Good monitoring system could provide such a mechanism and seriously improve reliability and performance of the FTS. Works in this direction are carried out by JINR and SINP MSU researchers in collaboration with CERN.

FTS is used by the experiment frameworks (Fig.1). Data streams in WLCG-infrastructure have so high volumes that they need to be managed. FTS allows one to: balance usage of site resources according to Virtual Organization (VO) and site policies; prevent network overload; prevent storage overload; monitor and understand problems on the service. FTS provides users with a reliable point to point movement of files, site managers with a manageable way of serving file movement requests from their experiments, control and monitoring, and VO managers with the ability to control requests coming from their users, re-order and prioritize them.

General information about the monitoring system:

- Module based structure;
- Information about 5 objects (channels, sites, host, errors, VOs);
- 4 different user groups: VO managers, Site administrators, Management and FTS operators.
- Different time cuts: latest information, information for last 24 hours or any period in days;
- General and detailed information;
- Different filters and possibilities of aggregation or separation of data;
- Information representation: tables, charts and graphics;
- 2 types of error representation – error categories and specific errors;
- Possibility of correlation analysis between different errors to understand their sources;
- Different ratings of channels and sites with the greatest number of errors at a certain time interval;
- Advanced administrator panel;
- Alarm mechanism;
- Module of expert system.

There are 7 modules that represent different information: FTS settings, Alarms, Channels, VO, Hosts, Sites, Errors. User can start work with a certain module, or with the main interface (Fig.4), where the most general reports are presented.
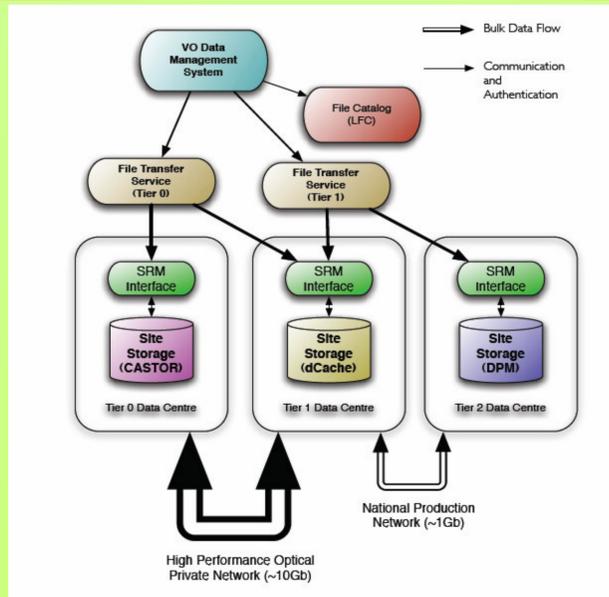

Fig.1: Data Management Service in WLCG

Fig.4: Main interface of the monitoring system

Every hour more than 3 Tb of data are transferred using FTS between T0, T1 and T2 – sites in WLCG - infrastructure, average throughput (Fig.2) is more than 600 MB/s. It is clear that reliability and performance of the FTS is vital for the WLCG project.
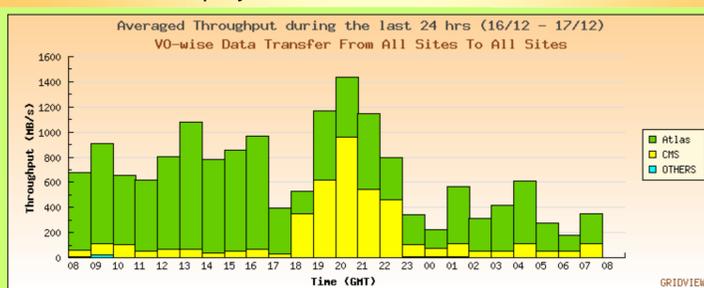

Fig. 2: Averaged Throughput

In the monitoring system an advanced administrator panel (Fig.5) has been developed. Using the administration panel, administrator can manage the monitoring system objects and the settings, and some FTS settings.

Fig.5: Administrator control panel of the system (alarm system trigger settings)

The main task of the work was to increase reliability, usability and performance of the FTS basing on new monitoring tools.

The monitoring system inherited all the best features of the previous systems developed at CERN and some Tier1 sites. Main investment was done by its prototype [3]. The prototype was used for tracking errors on the CERN-T1 and T1-CERN channels for more than 9 months. Lots of errors have been found by the prototype. The monitoring system [4] has a module-based structure, provides a wide functionality, and was integrated into the FTS Data Base scheme (Fig.3).
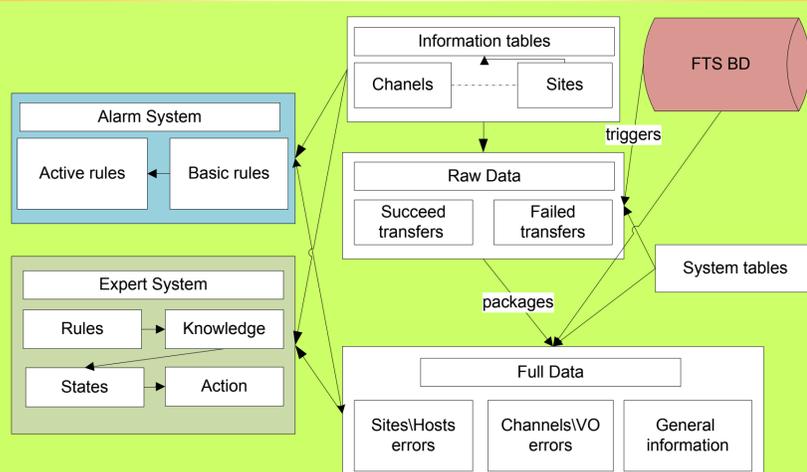
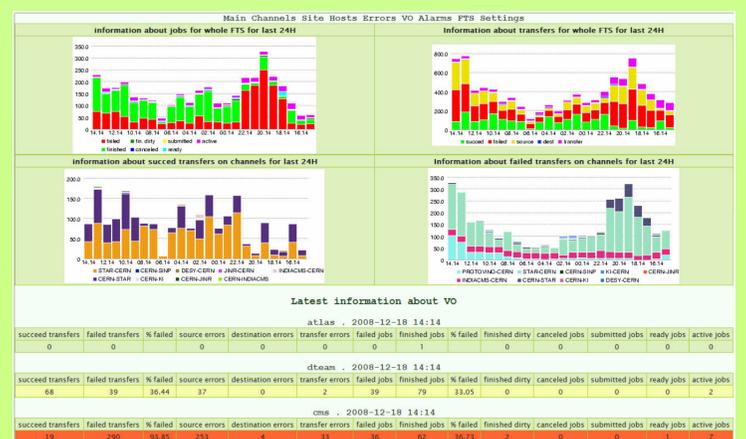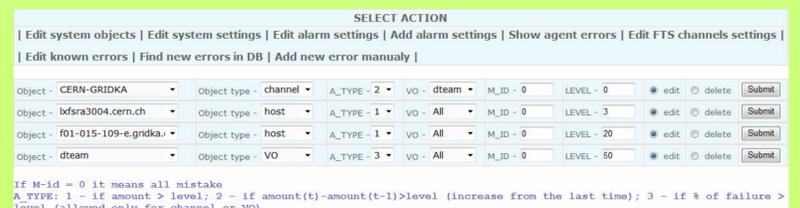The alarm mechanism of the system allows any FTS administrator to set a list of rules (alarm triggers). If the alarm triggers is activated, FTS administrator will receive a message through a web-interface, a mail, sms etc. The alarm mechanism is flexible enough to minimize the administrator job. This mechanism allows administrators to use the system only when something really important happens.

Conclusion

The developed monitoring system provides a convenient and reliable tool for receiving a detailed information about the FTS current state and the analysis of errors on data transfer channels, maintaining FTS functionality and optimization of the technical support process. The system could seriously improve the FTS reliability and performance.

Fig.3: Data Base scheme of the system

References:

[1] V.V. Korenkov, A.V. Uzhinskiy: Architecture of the Data Transfer Service in Grid ("Архитектура сервиса передачи данных в грид"), Open System, 2008, N2. C.52-56.

[2] Some examples of errors - https://twiki.cern.ch/twiki/bin/view/LCG/TransferOperationsPopularErrors

[3] Ужинский А., Кореньков В.: Система мониторинга сервиса передачи данных (FTS) проекта EGEE/WLCG, Сообщения ОИЯИ, Дубна, 2008, Р11-2008-80

[4] Кореньков В.В, Ужинский А.В.: Система мониторинга сервиса передачи данных (FTS) проекта EGEE/WLCG // Вычислительные методы и программирование. - 2008.- Т.10 – С.96-100.