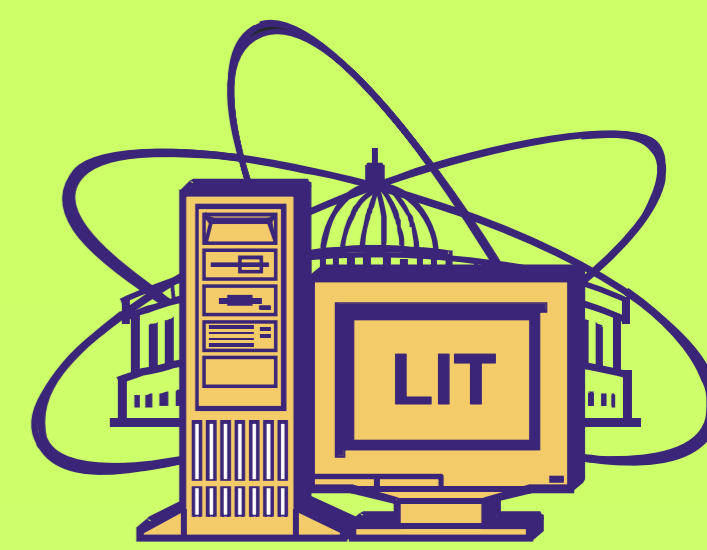


The technology of integration online-services of the ATLAS LHC experiment and services of Grid-infrastructure

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The main problem of modern large-scale international projects in basic science is a geographically disunity project participants which needed to provide remote access to experimental facilities, and information and computing resources for processing the experimental data.

An important component of participation in the processing and analysis of data obtained in experiments at the LHC is the creation in the Joint Institute for Nuclear Research (JINR), Dubna, the System Remote Access Real-Time (SRART) and its integration into the global service-oriented architecture of Grid-system data acquisition and processing of experiments at the LHC.

Functionality of the SRART should provide not only a remote monitoring of the processes of collecting and processing data, but also provide the conditions for the participation of JINR in a geographically distributed system of quality analysis of data obtained during the experiments at the LHC.

SRART must meet the following criteria:

- provide a safe and secure access to information in ATLAS Control Room (ACR), and in other operations centers ATLAS at CERN (Satellite Control Room (SCR));
 - provide control access and resource management in real time, in order to prevent people working at remote locations from any interfering with operating activities of data collection and processing of the ATLAS experiment at CERN;
 - provide collaborative tools, as remote operators in the ACR, and to participate in a distributed system of quality analysis of data obtained during the experiment ATLAS;
- In addition, this service can be used for training and pre-training people from JINR for use in the ATLAS experiment at CERN.

Model of the composite service

SRART as a composite service uses a technology and services that are included in the monitoring and management of treatment at different stages of data acquisition and processing of the experiment ATLAS, as well as Grid-services data access and transfer to the SRART JINR.

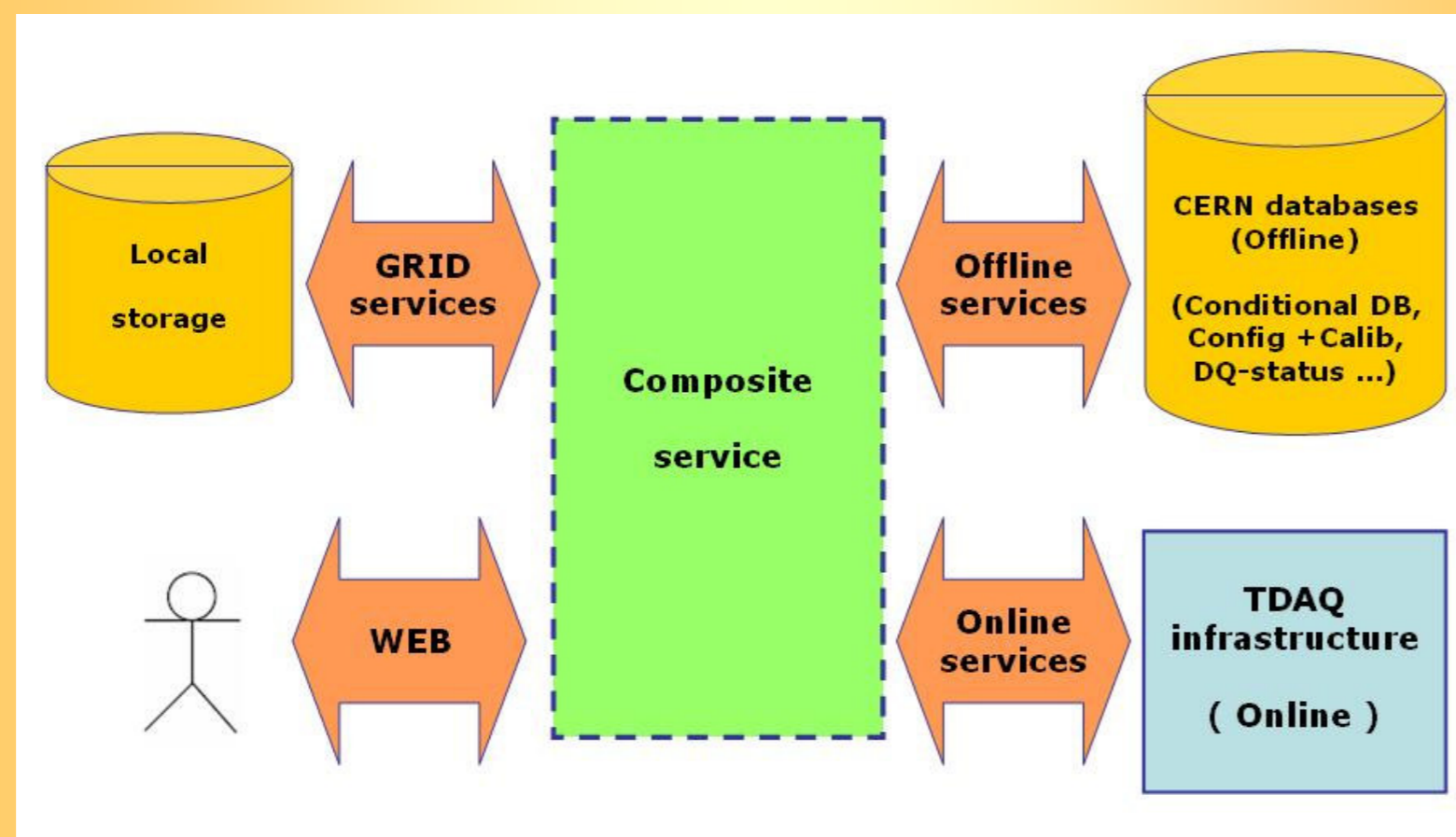


Fig. 1. Model of the composite service

The sources of experimental data obtained during the current run, in real-time incoming to ACR, act online - services of data acquisition and processing TDAQ ATLAS, and above all service WebIS, which provides remote access to real-time. To access data on the conditions of run (the configuration of detectors and subsystems, amendments to the magnetic field, the calibration data) using services of database of the experiment ATLAS (ConfDB, ConditionDB).

To transfer the measurement data in SRART JINR for the quality analysis used Grid-services (FTS), so the integration of services, real-time TDAQ and Grid-services is one of the main functions and features as SRART composite service and allows one to organize the union of hardware and software resources to solving problems in the form of composite applications that are required for further processing and analysis of the quality of measurement data in the mode, near a real-time one.

Technology of Composite Service Remote Data Aggregator (RDA)

The main element of a composite service is Remote Data Aggregator (RDA). Technologies and services used to create the RDA, can be divided into external and internal.

External services

As the external services of RDA used services of data acquisition and processing TDAQ ATLAS and services of Grid-infrastructure for LHC experiments at CERN.

File Transfer Service (FTS) - service of data transfer is implemented within the framework of WLCG (Grid). FTS service provides reliability of data transfer and interaction between other services of Grid-infrastructure, required for data transfer rapid analysis of the quality from CERN in the local storage SRART JINR.

The Service-Oriented Architecture composite service integrates the basic infrastructure services SRART (online - services TDAQ Software and Grid- services), providing remote users an effective tools for further processing and analysis of the quality of data obtained in the experiment ATLAS. This approach is fully consistent with the concept of the remote monitoring of the experiment ATLAS, and ensures the participation of JINR in the geographically distributed system monitoring and real time analysis of data quality.

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WebIS - remote monitoring service provides access to the service of information exchange (Information service (IS)) of system of data acquisition and processing TDAQ ATLAS. WebIS is designed to transmit real-time information about the processes of collecting and processing data. IS is the bus of inter-processor data sharing of specialized middleware software of TDAQ software.

WebIS service allows a remote user to perform interactive queries to access information from the internal IS-servers TDAQ, and is an effective tool in the development of composite applications of remote monitoring.

Data Quality Monitoring Framework (DQMF) - is a tool for the development of composite applications for the analysis of data quality within TDAQ ATLAS. DQMF service interacts with services of online monitoring and services of configuration and management of infrastructure TDAQ ATLAS.

RDA uses DQMF for create queries to retrieve data needed for a remote user to analyze data quality, ensuring completeness and consistency of data.

Internal services

Internal modules (services) are software components that are designed specifically for RDA.

Task Scheduler

Task Scheduler is the central module of the RDA-service. Task Scheduler provides coordination interaction modules and services RDA. Task Scheduler handles the routing of tasks (requests) received from the user and provides support them throughout the course of query processing.

Request Processing Service

The purpose of this service is the user interaction. The service provides a web-based interface that allows the user to query the required data for transmission.

Data Collection Service

Service collects data from various sources of infrastructure experiment at the LHC at CERN, provides a pre-processing and packaging data for transmission by means of the Grid-services into SRART JINR.

Data Processing Service

The purpose of this service is the interaction with the service FTS, extracting data and writing to local file storage SRART JINR for further processing.

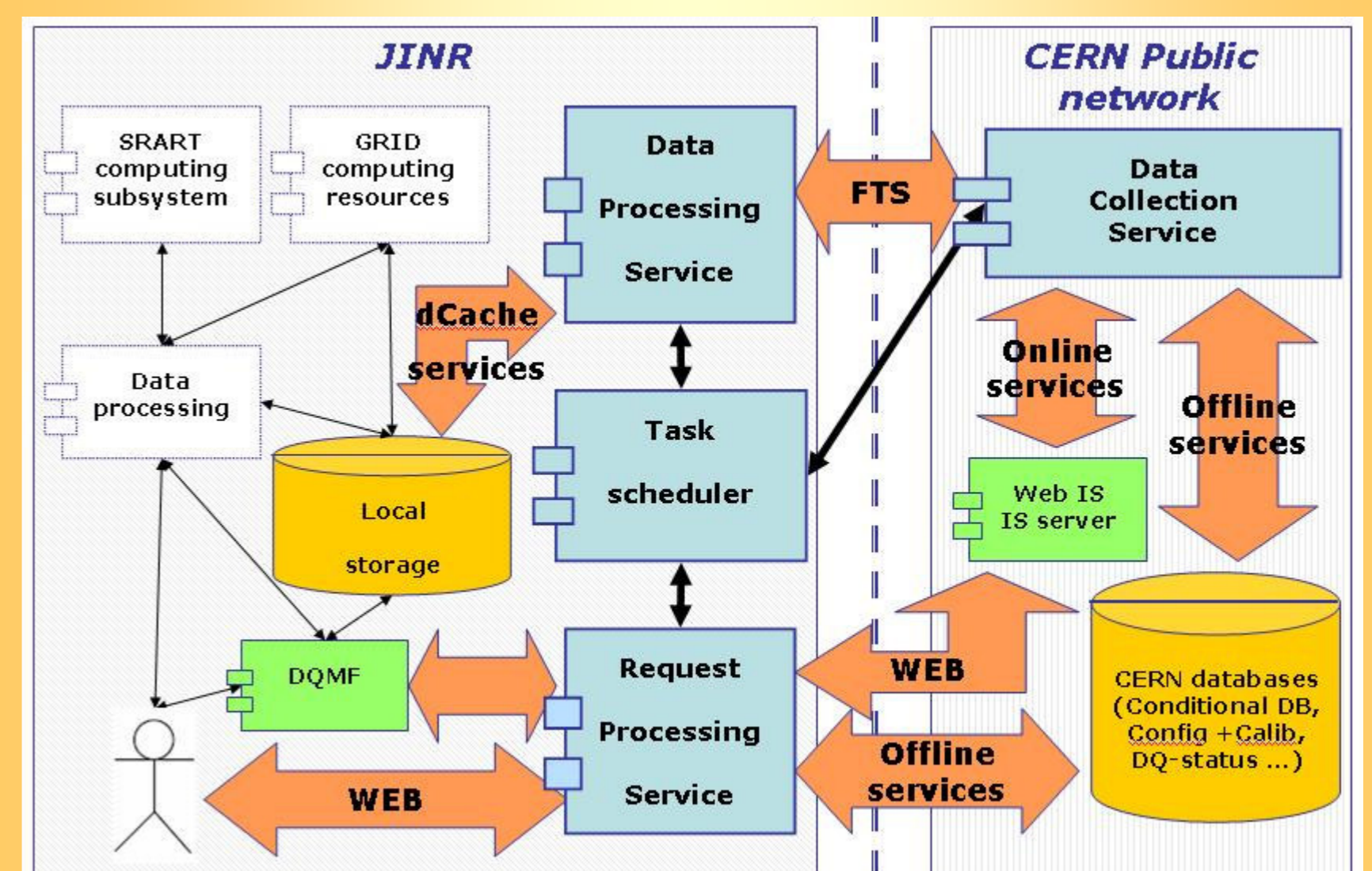


Fig.2. Service-oriented architecture components RDA, integrated into the structure of SRART