Tango Web Access Modules and Web Clients for NICA Control System

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NICA

The Nuclotron-based Ion Collider fAcility is a new accelerator complex being constructed at JINR. It is aimed to study the properties of nuclear matter in the region of the maximum baryonic density. It includes injection complex, new superconducting Booster synchrotron, the existing superconducting heavy ion synchrotron Nuclotron, collider having two new superconducting rings and new beam transfer channels. Tango Controls has been chosen as a basis for the NICA control system.

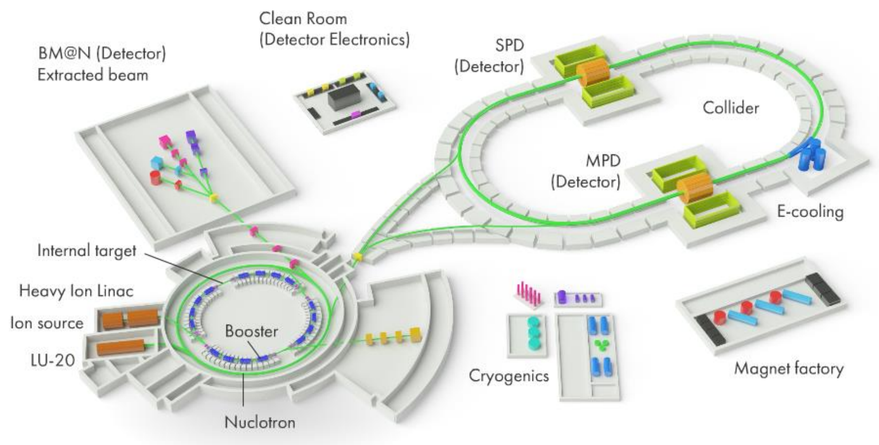

Fig. 1 NICA accelerator complex general scheme

WEB CLIENTS

Websockets

Dramatic progress of web technologies.
Advantages of web client applications:

- Universal
- Flexible
- Well-looking
- Convenient

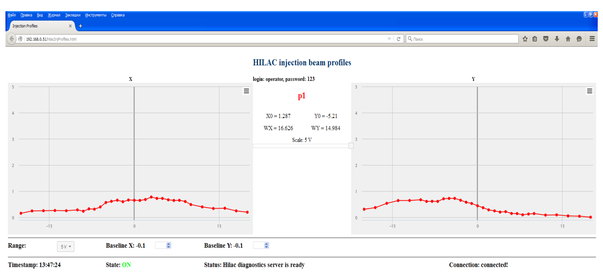

Fig. 2 Old web client example

Universal tools for communication between Tango Controls and Web clients are required

WEBSOCKET

is a computer communications protocol, providing full-duplex communication channels over a single TCP connection.
WebSocketDS Tango module is used to communicate tango devices to the outside world through the WebSocket. Requests and responses are encoded in JSON. Device server was developed in C++ with Boost, OpenSSL and WebSocket++.
Features:

- Periodic attributes reading;
- Attributes reading on demand;
- Tango commands execution.
- Tango event subscription (change, periodic, user, archive).
- Git: http://tangodevel.jinr.ru/git/elkinvg/WebSocketDS.git

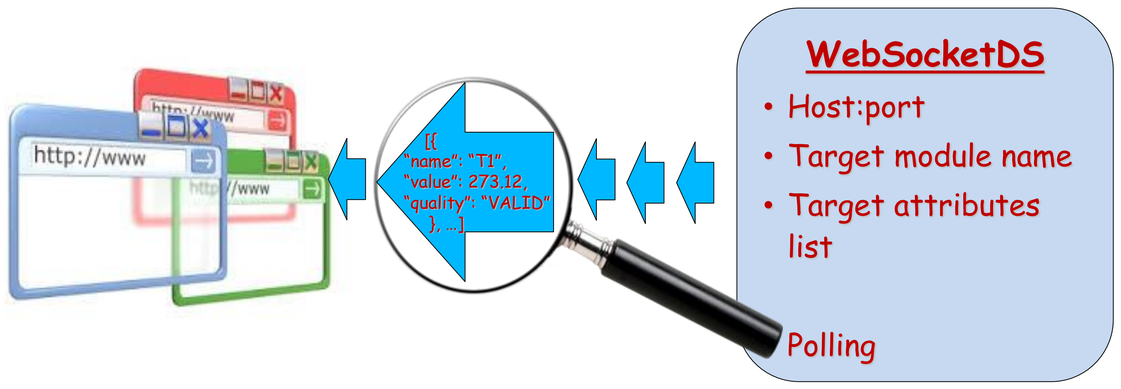

Fig. 3 WebSocketDS operation diagram

REST

REpresentational State Transfer – architectural principles to design web services that focus on system's resources.

- Global identification of resources (URL);
- Manipulation of resources through the standard protocol (HTTP);
- Stateless;

RestDS is a Tango module, designed to provide access to Tango control system units through http requests. It was developed in C++ with Boost and OpenSSL.

Features:

- Tango REST API RC4 partial support (so far without pipes);
- Multiplatform (Windows and Linux);
- Lightweight;
- Http and https supports;
- Basic authentication supports;
- Git: http://tangodevel.jinr.ru/git/tango/web/RestDS.git

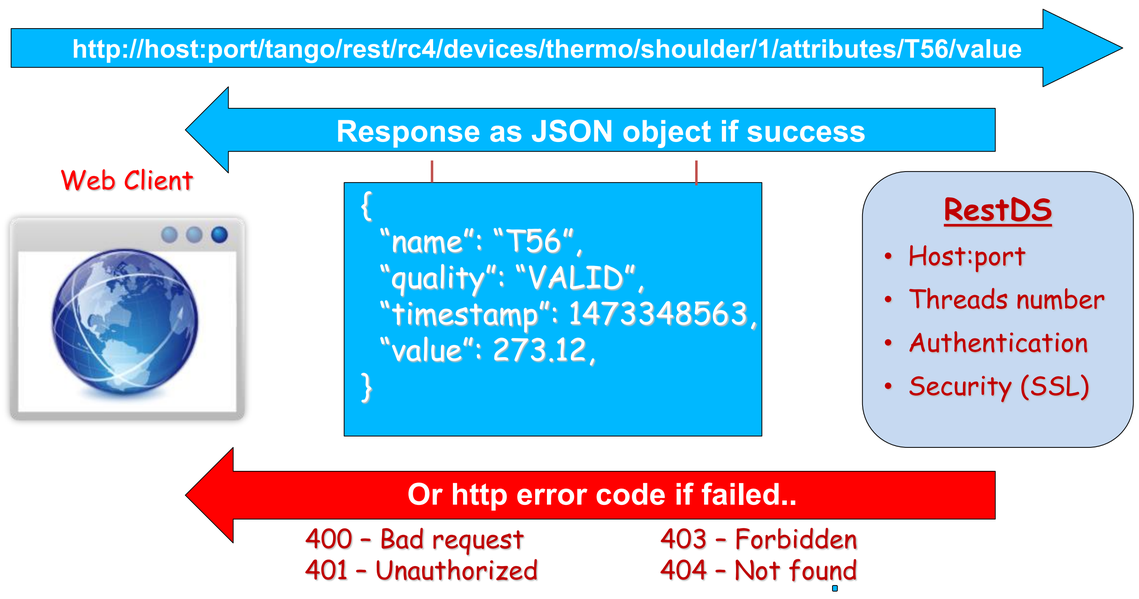

Fig. 4 RestDS operation diagram

http(s)://tangodevel.jinr.ru:8080/tango/rest/rc4/nuclotango.jinr.ru/20000/devices/sys/tg_test/1/attributes/DevDouble/
/commands
/properties
/pipes
/value
/value/plain
/info

Rest service URL — Tango host — Tango device ID — Name

Fig. 5 REST API usage

WEB ACCESS CONTROL

Custom server-side role-based Tango access control system are used as web permission control and access logging system.
More info: TUPHA171 – Development of NICA Control System: Access Control and Logging.

WEB CLIENTS

are becoming widely distributed within the NICA Control System. They are developed using JavaScript with help of ExtJS framework or jQuery and HightCharts libraries.

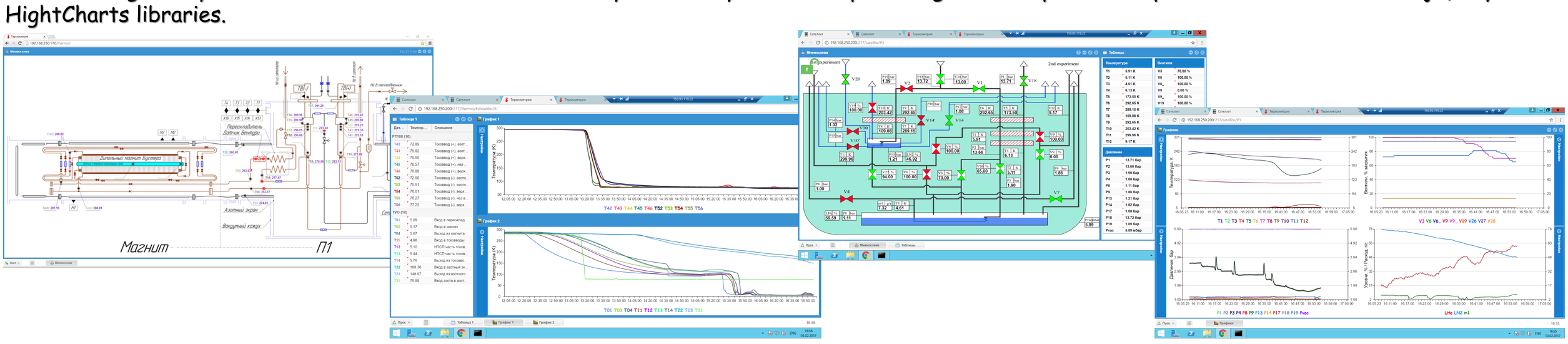

Fig. 6 NICA Control System web client application examples

SUMMARY

- Web client applications are cross-platform, well-looking and convenient;
- Web clients are widely distributed within the NICA Control system;
- Tango web access modules have been developed to provide universal way to communicate between web client and Tango-based control system.

PLANS

- To implement Tango REST API RC4 fully support to RestDS.
- To develop web generic data browser for Tango. It should display historical data from HDB++ and live data from Tango attributes.