

LIGHT-WEIGHT WEB-BASED CONTROL APPLICATIONS WITH THE WEB2CTOOLKIT

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Abstract

The Web2cToolkit is a frame-work for web-based control clients. Key elements are Java servlet and AJAX technologies. Applications based on the Web2cToolkit allow world-wide user access and provide user authentication and authorization. Typical use cases are overview panels, service panels for remote maintenance or user access to stored data for off-line analysis. The paper summarizes the conceptual design and presents example applications implemented for the PETRA3 project at DESY.

OVERVIEW

The Web2cToolkit [1] [2] is a collection of web-based tools designed to configure and visualize customer-specific client pages for accelerator control. It consists of a synoptic display viewer, a corresponding graphical editor and a specific viewer for retrieving and rendering archived accelerator parameters. The Web2c toolkit was developed within the scope of the PETRA 3 [3] controls project at DESY.

Web2c pages are browser-hosted internet applications. The usage of the Web2c toolkit requires no specific programming skills by the users. Web2c pages provide an interactive graphical user interface with user-friendly look-and-feel. The typical use cases are overview or

information panels, service panels for remote maintenance, user forms to access stored data for off-line analysis or summary accelerator operation reports based on archived parameter data.

By design, Web2c pages are accessible from every valid network address if not otherwise restricted. A secure user authentication and authorization procedure with encrypted password transmission is provided.

Web2c applications (Fig. 1) run as server-side Java applications (servlets) and are published as dynamic web pages to the clients. Web2c pages contain only HTML tags and JavaScript code snippets. Web2c is platform independent and runs without any additional specific software installation. Communication between Web2c client pages and the Web2c server applications is asynchronous and uses the http protocol and standard TCP ports.

Each Web2c page corresponds to its unique Web2c server session. A pre-configured, individual and user-application specific configuration file (.xml) describes the attributes and methods of the components embedded in the client page. The configuration files are stored on the web server's file system. For performance reasons, all Web2c sessions using the same configuration file are updated through a caching mechanism providing an n-to-1 data funnel.

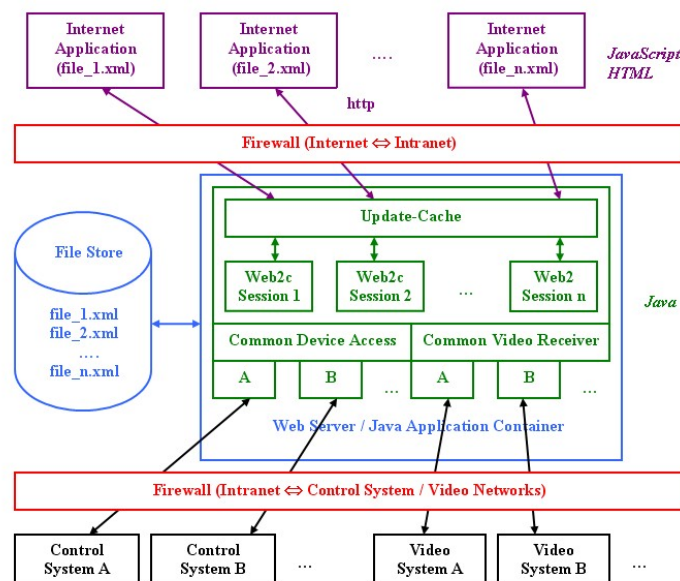


Figure 1: Web2c System Architecture

Connectors to all major control systems (TINE, DOOCS, EPICS, TANGO) are provided. Access to EPICS-based and TANGO-based control systems is provided through the DOOCS client API which embeds both control systems. Simultaneous mixed access to all control systems listed above is possible.

The Web2c server application is capable of receiving and processing jpeg-type video streams transmitted through the RTP protocol as well as control system embedded video streams (TINE).

The Web2cToolkit servlets are tested with Apache Tomcat 5.x running with Java version 1.6. All client-side tools work properly with Microsoft Internet Explorer 7.0.x.x and 8.0.x.x (Windows), Mozilla Firefox 3.5.x (Windows, Linux), Safari 4.0.x (Windows, MAC OS X iPhone 3.0), Opera 10.x (Windows, Windows Mobile 6.1) and Google Chrome 3.0.x.x (Windows, Android 1.5). Other web-browser implementations might also work but have not been tested.

WEB2C SYNOPTIC DISPLAY VIEWER

A Web2c page generated by the synoptic display viewer run-time engine updates its dynamic content actively at a rate as specified in its configuration file. Typical update intervals are one to three seconds. In addition, synoptic display pages automatically try to re-establish lost server connections.

Web2c supports different user roles (layman, expert and supervisor). The corresponding privileges are individually granted according to the settings in the page configuration files. Similarly, access can be restricted to specific network addresses or subnets.

The list of available synoptic display widgets (Tab. 1) has been extended by an input field, a chat form and a

video window. The image displayed by the video component is refreshed at the same rate as the parent page. Chat sessions can be configured to be open for everyone or restricted to a group of pre-registered participants. The input field is only visible to users with expert or supervisor privilege.

All widgets support the multi language feature of Web2c. If component captions and other text fields are specified in more than one language, the user can easily switch between the languages provided.

Web2cEmbeddedPage	Web2cValue/ Web2cValueList
Web2cSection	Web2cIndicator/ Web2cIndicatorList
Web2cLabel/ Web2cLabelList	Web2cText/ Web2cTextList
Web2cImage	Web2cAnimatedImage
Web2cTicker	Web2cButton
Web2cTime	Web2cSlider
Web2cTrend	Web2cWheelSwitch
Web2cHisto	Web2cInput
Web2cVideo	Web2cChat

Table 1: List of Web2c synoptic display components

The synoptic display viewer is used to visualize and remotely control the vacuum components of the beamlines at the DORIS and PETRA3 synchrotron light facilities at DESY (Fig. 2). Other examples are the operation history pages available from the DESY home page [4].

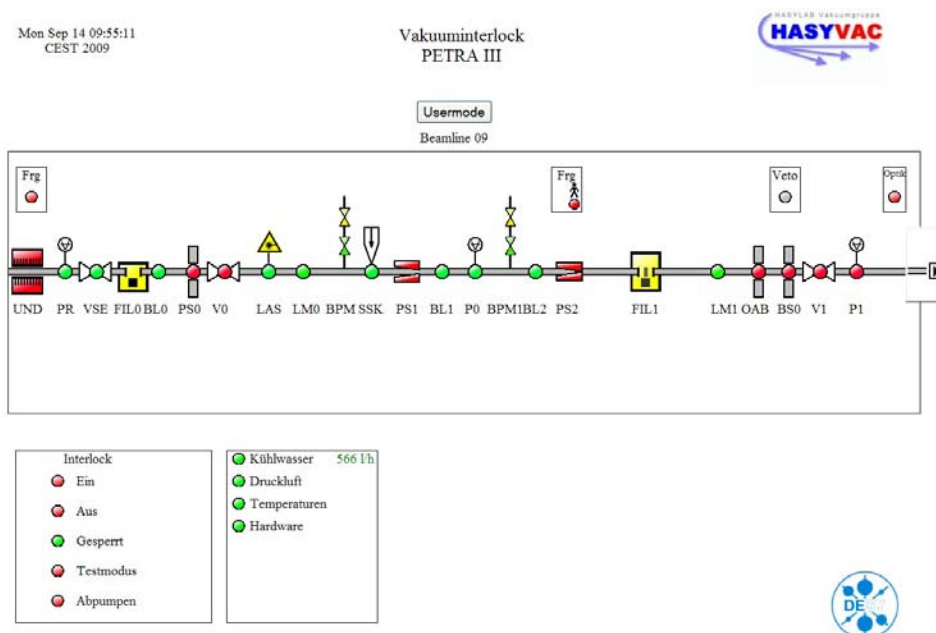


Figure 2: Web2c Synoptic Display Viewer

Data Selection

☒ User-defined selection:

PIA Ejection Current [mA]
 DESY2 Flat-Top Energy [GeV]
 DESY2 Machine State

 >>

DESY2 Machine State

clear selection

☐ Predefined selection:

DESY2 Beam Overview

 >>
 clear selection

Time Period Selection

☐ Archive:
 Year:
 Month:
 Day:
 Hour:
 Minute:
 from to
clear selection

☒ Live:

 >>

clear selection

get data (plot)
get data (table)

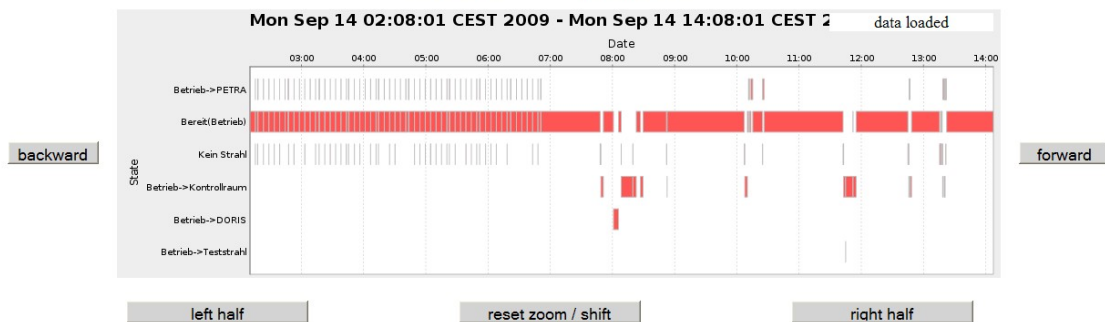


Figure 3: Web2c Archive Viewer

WEB2C ARCHIVE VIEWER

The archive viewer is a web-based form to request data from a control system archive and to display the retrieved data as a plot chart or a table. All users have unrestricted access to the features of the archive viewer.

Various plot options such as linear, logarithmic or Gantt-chart like are provided. On-line zooming capability via mouse click is provided retrieving fresh data for the region of interest from the archive system. Fig. 3 displays the operation states of the DESY 2 pre-accelerator as a function of time.

The archive viewer can be used in two modes. In the manual mode, the user can select the data channels through the data selector form. In the automatic mode, the data selector form is hidden and only the chart with pre-selected data channels and time interval is displayed automatically after page download. This mode is regularly used to generate interactive summary report pages of the accelerator operation at DESY [4].

OUTLOOK

Performance and features of the Web2cToolkit are being continuously enhanced and adapted according to the user's needs and experiences. It is planned to improve the control system device and archive access by implementing plugs for the

- Data Access Layer (DAL) and the Archive Access Layer (AAL) used in Control System Studio [5]
- EPICS and TANGO parameter archive systems.

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