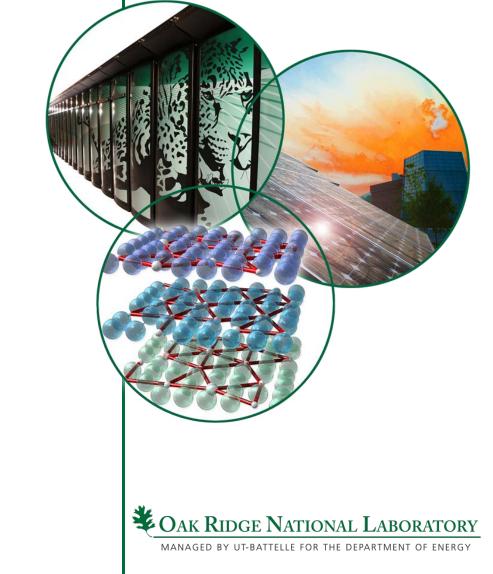
Bringing Control System User Interfaces to the Web

Xihui Chen, Kay Kasemir ICALEPCS 2013







http://www.newfangled.com/stuff/contentmgr/files/1/c1f7d2c4ad78741b63693113c3ace2a4/misc/mobile_devices.jpg http://bocsupportnetwork.com/wp-content/uploads/2012/05/convenient-christian.jpg

• What can we do with web?

Shopping, Trading, Gaming, Chatting, Reading, Social, Entertainment, ...

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• Why web?

Easy and convenient



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- Special Requirements for Control System UI
 - Flexible and easy UI creating

- Real-time updating
 - Server side push

http://www.simplesharebuttons.com/wp-content/uploads/2013/03/simple1.png http://www.theladiezlounge.com/wp-content/uploads/2012/09/0f7ee160befabe76c7dd009c9a7dd291.gif http://media.techtarget.com/tss/static/articles/content/WhatistheAsynchronousWeb/HttpPolling.gif



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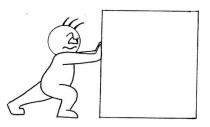
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 - HTTP Long Polling
 - Dead time between requests
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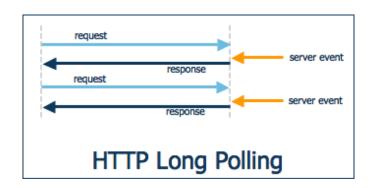




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HTML5 to the Rescue



http://cached.imagescaler.hbpl.co.uk/resize/scaleWidth/460/?sURL=http://offlinehbpl.hbpl.co.uk/ News/OMC/F149B3D4-FA76-A45B-BDA16FE293691B96.jpg

HTML5 to the Rescue



- <Canvas> element
 - Allows easy graphical drawing in web browser
- WebSocket
 - Full duplex
 - Single TCP connection
 - Real server side push, low latency, extremely small header
- Standards of future web



Control System *Mets***HTML5**



Control System *Mets***HTML5**





Control System *Mets* **HTML5**

WEBOPI

Directly run BOY OPI in web browser



Control System Mets HTML5

WEBOPI

Directly run BOY OPI in web browser





Control System Mets HTML5

WEBOPI

Directly run BOY OPI in web browser

WEBPRA Access control system data easily with WebSocket





• Run BOY OPI in web browser without extra effort



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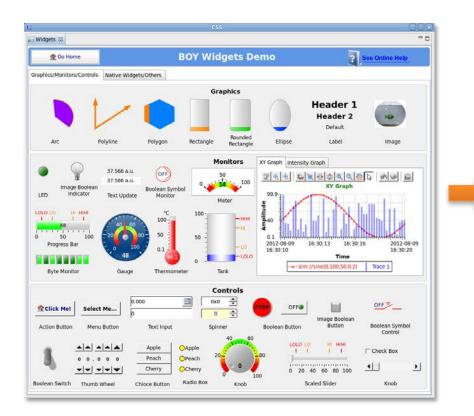


• Run BOY OPI in web browser without extra effort



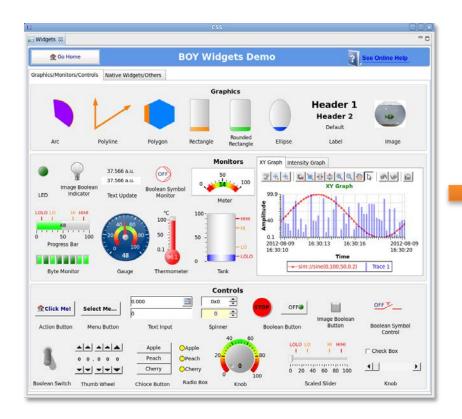


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Run BOY OPI in web browser without extra effort







http://1.bp.blogspot.com/itKZ_CwP6eQ/Tx09UYqNWDI/AAAAAAAAbeDs/NCs1cmpPK8A/s160 0/sunny_happy_day.png





• Reusing existing BOY OPI files

- Leverage BOY OPI Editor
 - WYSIWYG
 - Drag & Drop
 - 50+ widgets
 - Programming is not necessary
 - Rules and Scripts are optional

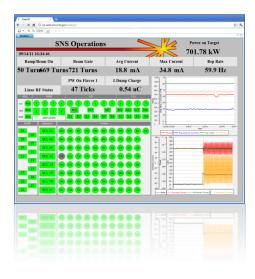
Single Sourcing



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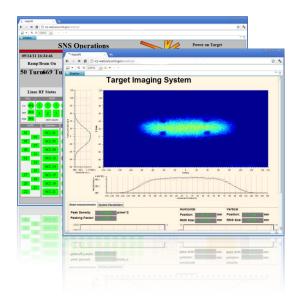




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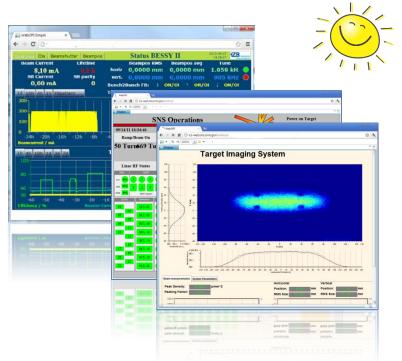
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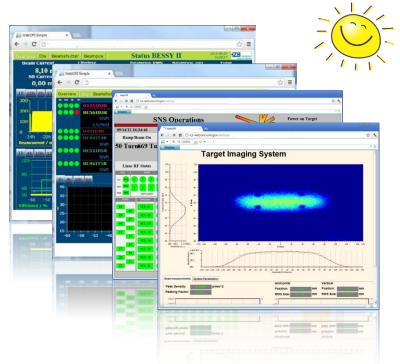


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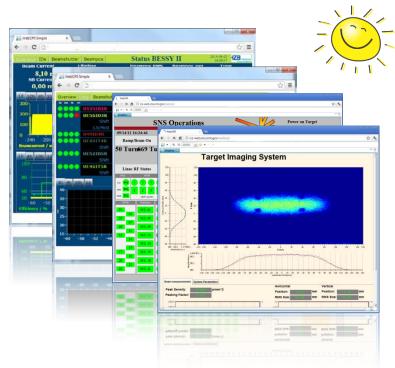


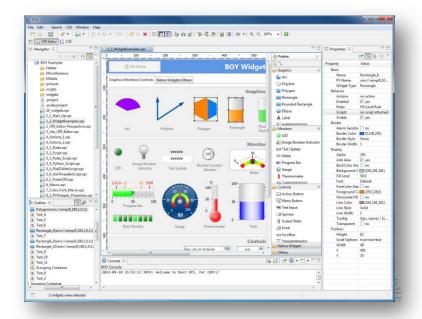
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WebOPI - the dark side







WebOPI - the dark side



- Behind protocol is HTTP long polling
- OPI logic is executed on the server
 - Limits the maximum number of concurrent users
- Transferring drawing info instead of control system data
 - Tremendous unnecessary data
 - HTTP Compression can help, but uses extra CPU



WebPDA

- backbone of future control system web applications



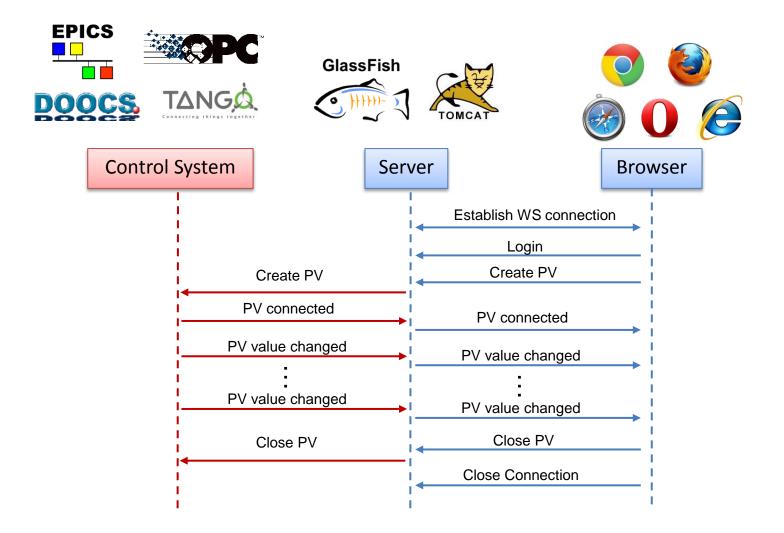
WebPDA

- backbone of future control system web applications

- WebSocket-based Process Data Access
 - Efficient control system data communication over the web
 - Real-time server side push
 - Binary format for value
 - Maximum efficiency
 - JSON format for other info
 - Flexible and extensible
 - Extensible to arbitrary control system or data source
 - Authentication and Authorization support



WebPDA communication sequence





Client Side JavaScript API

Focus on your PV instead of communication

```
var url = "ws://localhost:8080/webpda";
var wp = new WebPDA(url, "myname", "password");
var pv = wp.createPV("pvname", 1000, false);
pv.addCallback(function(evt, pv, data) {
     switch (evt) {
    case "conn": //connection state changed
         break;
    case "val": //value changed
         break;
    case "bufVal": //buffered values changed.
         break;
    case "error": //error occurred
         break;
    case "writePermission"://write permission changed.
         break;
    case "writeFinished": //writing finished.
         break;
    default:
         break;
     }
});
```



Even Simpler: Pre-wrapped Widgets

Bind a widget with PV in one line of code

<div class="webpda-widgets" data-widget="rgraph-gauge" data-pvname="sim://noise"></div>





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Security





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http://www.motionsecurity.co.za/wp-content/uploads/2013/06/url.png

Security

Please login!	\otimes
Username:	
ОК	Cancel





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http://www.motionsecurity.co.za/wp-content/uploads/2013/06/url.png

Security

- WebOPI
 - Authentication with JAAS
 - No authorization per user.
 - EPICS Channel Access security may help
- WebPDA
 - Authentication with JAAS
 - Authorization support for each user
- Encrypt data with TLS
 - https://
 - wss://

Please login!	\otimes
Username:	
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- WebOPI
 - Extremely easy to create rich UI
 - No programming
 - Reuse existing BOY OPI
 - slow on mobile, limited number of users
- WebPDA
 - Highly efficient, super fast
 - Supports large number of users
 - Responsive on mobile
 - Needs HTML, JavaScript programming





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Want Both?





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Want Both?

- Combine the best of two worlds
 - A drag & drop based UI editor as in BOY
 - Build UI with pre-wrapped WebPDA widgets
 - Automatically generates HTML+JavaScript pages
- A dream of the future

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