CAML and Web CA Status (Channel Access Markup Language)

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Primary Participants

- Tom Pelaia
- David Purcell
- Matej Sekoranja (Cosylab principal developer)

Web CA

- Web Channel Access Plugin
- JavaScript API wrapper to native channel access calls
  - put, get and monitor PV values
  - support for alarm status and severity
  - basic control record information
- Allows web browsers to become a channel access client
  - You write HTML, CSS and JavaScript to make controls
  - Supports standards based web browsers including Firefox, Safari and others that support open standards
- Runs on Linux, Mac OS X and Windows

CAML

- Channel Access Markup Language
- XML display language for describing and rendering channel access controls
  - Generates HTML, JavaScript and CSS for controls
  - Enforces site specific formatting rules using CSS
- Integrates with Web CA plugin for rendering control displays through web browsers
  - Supports standards based web browsers including Firefox, Safari and others that support open standards
  - Runs on platforms where Web CA runs

Web CA / CAML Projects

- Phase I: Developed Web CA Plugin
- Phase II: Developed CAML version 1
- Phase III: Work is nearing completion
- Funded by SNS Controls Group

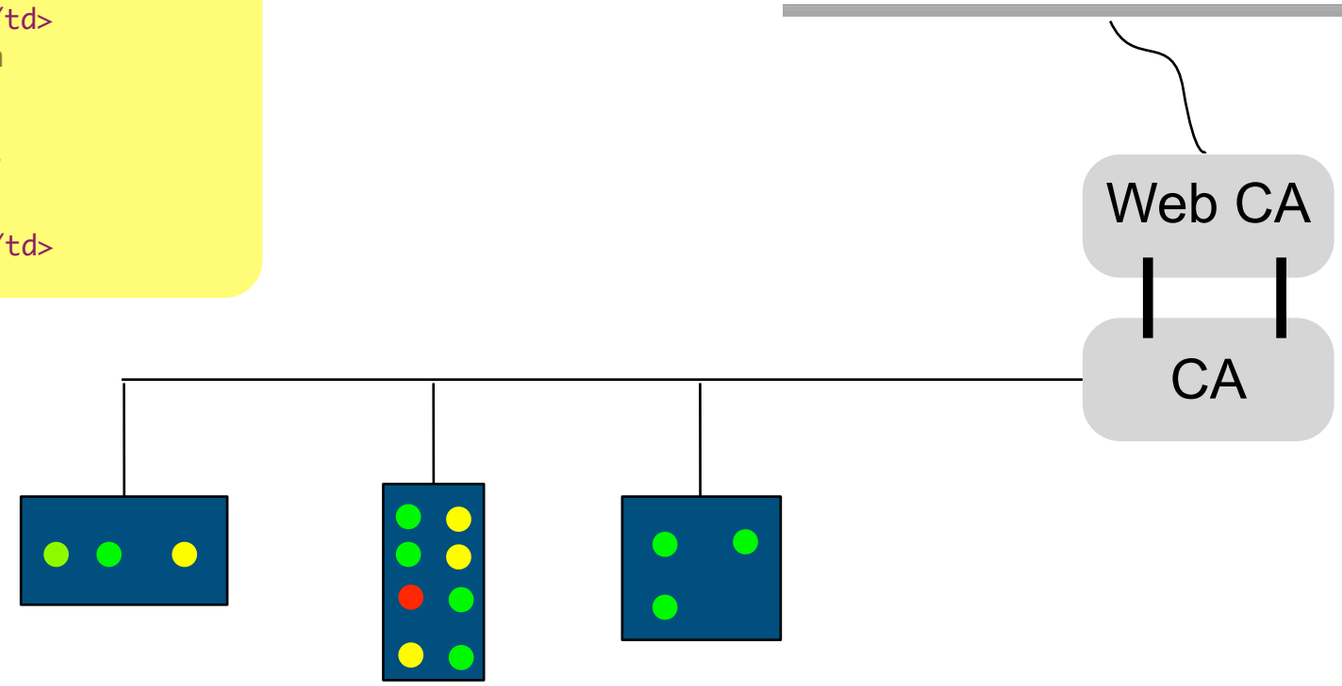
- Contracts awarded to Cosylab
- Matej Sekoranja has been the principal developer

CAML Architecture

CAML XSL Transform

```
<table class="data">
            <caption>MEBT Correctors</caption>
            <tr> <th>Magnet</th> <th>Current RB</th>
<th>Current Set</th> </tr>
            <tr>
                <td>DCH 01</td>
                <td><caml:textUpdate
readbackPV="MEBT_Mag:PS_DCH01:I" /></td>
                <td><caml:wheelSwitch
alarmSensitive="false"
controlPV="MEBT_Mag:PS_DCH01:I_Set"
displayFormat="+000.000" size="small"

readbackPV="MEBT_Mag:PS_DCH05:I" /></td>
```



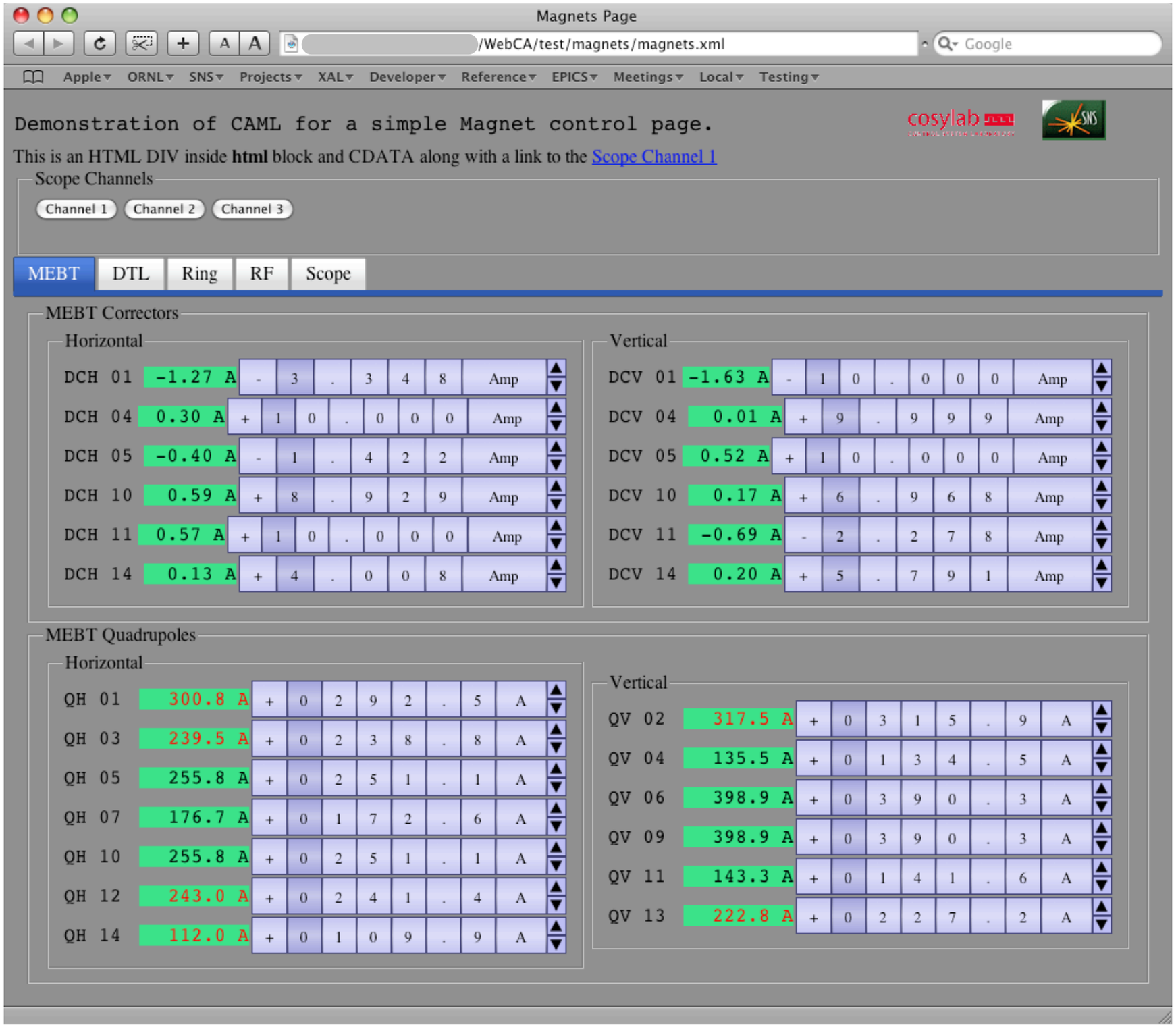
CAML 1

- CAML is pure XML
- Pages written in CAML
- CAML code defines CA controls and layout
- XSLT transforms code into HTML, CSS and JavaScript
- Supports PV macro substitution for various elements

CAML 1 Channel Access Controls

Type	Controls
Enumerated	Menu, Radio, Toggle
Incremental	Slider, Wheel Switch
Text	Text Entry (put), Text Update (monitor)
Plotting	X-Y scatter and line, Bar chart, Waterfall, Intensity
Meter	Gauge

CAML 1 Sample User Interface



CAML 1 Limitations

- No automated download and installation of Web CA plugin
- Difficult to integrate with custom HTML, JavaScript and other web technologies
- Plotting is limited and slow
- The Slider control fails with Safari
- Some display anomalies with Firefox 2
- Firefox 3 has a bug which limits where the CAML resources can be located

Roadmap

- Third phase of Web CA / CAML project began September 2008
- Address current identified CAML limitations
  - CAML 2
  - Web CA enhancements
- Develop CAML pages for staff use in their offices and at home

Phase III Task Highlights
CAML 2

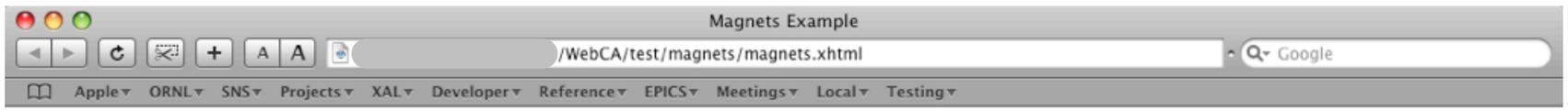
- Stability on supported web browsers
- Migrate CAML from pure XML to XHTML with a CA namespace
- Automated download and installation of Web CA
- Support Virtual (CALC) PVs
- Template repetition with macro substitution
- Add new controls and improve existing ones
- Add contextual menu items to controls such as Copy PV, Copy Value, Inspect, etc.
- EDL to CAML and limited CAML to EDL translators

Migrating to XHTML CAML

- CAML library of controls
- Pages mix CAML code within HTML
- HTML code defines the layout and anything else
- CA namespace like: <caml:wheelSwitch ...>

- Full access to web technologies
- XSLT transforms only CAML control code into HTML, CSS and JavaScript
- Existing CAML pages will mostly continue to work

CAML 2 Preview
Web Page Demo



MEBT Correctors

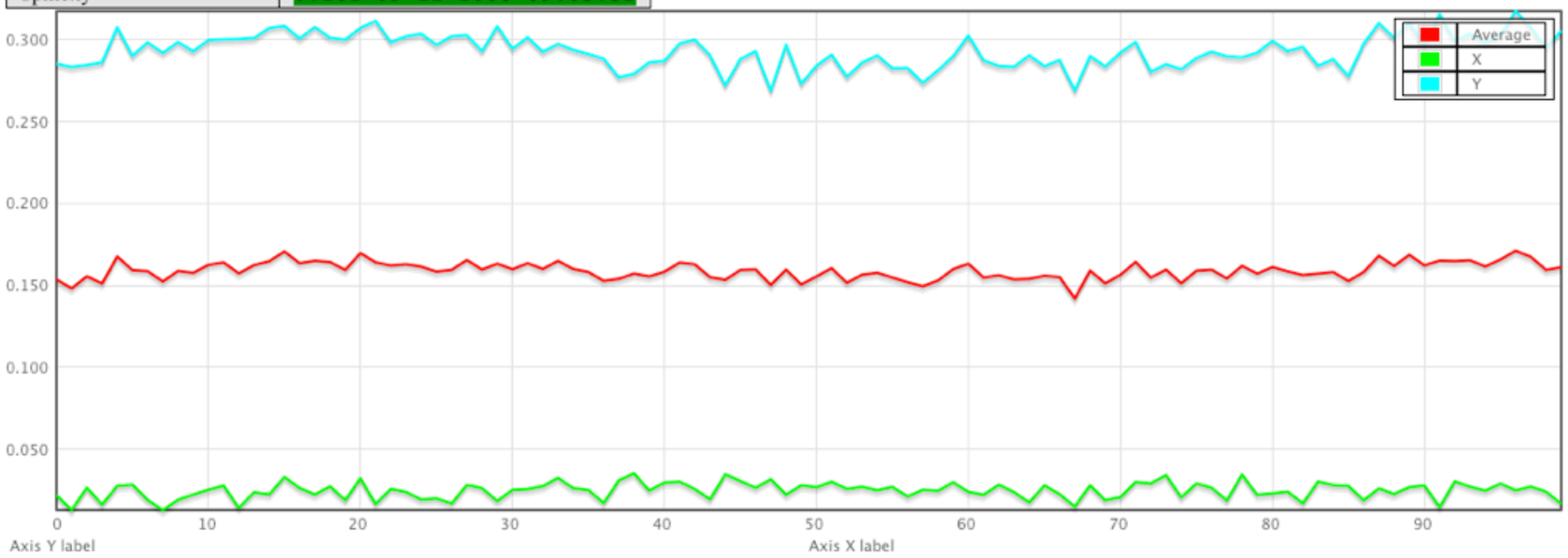
MEBT Correctors

Magnet	Current RB	Current Set
DCH 01	-1.26 A	- 0 0 3 . 3 4 8 Amp
DCH 04	0.30 A	+ 0 1 0 . 0 0 0 Amp
DCH 05	-0.40 A	- 0 0 1 . 4 2 2 Amp
DCH 10	0.59 A	+ 0 0 8 . 9 2 9 Amp
DCH 11	0.58 A	+ 0 1 0 . 0 0 0 Amp
DCH 14	0.12 A	+ 0 0 4 . 0 0 8 Amp

Virtual PV Demo

Here we display the horizontal and vertical beam position at a beam position monitor along with their average (virtual PV) and plot the values against time along the X axis.

PV	Value
MEBT_Diag:BPM01:xAvg	0.016 09-12-2008 09:05:52
MEBT_Diag:BPM01:yAvg	0.305 09-12-2008 09:05:52
bpm1xy	0.161 09-12-2008 09:05:52



Demo Page CAML 2 Code Head Snippet

```
<?xml version="1.0"?>
<?xml-stylesheet href="file:///Library/EPICS/CAML/xsl/webca.xsl" type="text/xsl" ?>

<!-- start html element and define caml namespace -->
<html xmlns:caml="http://webca.cosylab.com/caml">

    <head>
        <title>Magnets Example</title>
        <style>
        table.data {background-color: #DDD; border-collapse: collapse;}
        th, td { margin: 5px; border-style: solid; border-width: 1.0px; border-color: black; padding-left: 10px; padding-right: 10px; }
        th { padding-left: 2em; padding-right: 2em; background-color: #BBB; }
        td.numeric { text-align: right; color: maroon; padding-left: 2em; }
        td.plain { margin: 0px; border-style: none; }
        </style>
    <!-- this is required for CAML, some initializaion has to be done, e.g. to instantiate plugin -->
    <caml:head webcaPath="file:///Library/EPICS/CAML/" pendEvents="30" pendEventsPeriodMs="100"/>
</head>
<body>
```

Demo Page CAML 2 Code Magnet Table Snippet

```
<h3>MEBT Correctors</h3>
<table class="data">
    <caption>MEBT Correctors</caption>
    <tr> <th>Magnet</th> <th>Current RB</th> <th>Current Set</th> </tr>
    <tr>
        <td>DCH 01</td>
        <td><caml:textUpdate readbackPV="MEBT_Mag:PS_DCH01:I" /></td>
        <td><caml:wheelSwitch alarmSensitive="false" controlPV="MEBT_Mag:PS_DCH01:I_Set" displayFormat="+000.000" size="small" /></td>
    </tr>
    <tr>
        <td>DCH 04</td>
        <td><caml:textUpdate readbackPV="MEBT_Mag:PS_DCH04:I" /></td>
        <td><caml:wheelSwitch alarmSensitive="false" controlPV="MEBT_Mag:PS_DCH04:I_Set" displayFormat="+000.000" size="small" /></td>
    </tr>
    <tr>
        <td>DCH 05</td>
        <td><caml:textUpdate readbackPV="MEBT_Mag:PS_DCH05:I" /></td>
        <td><caml:wheelSwitch alarmSensitive="false" controlPV="MEBT_Mag:PS_DCH05:I_Set" displayFormat="+000.000" size="small" /></td>
    </tr>
    <tr>
        <td>DCH 10</td>
        <td><caml:textUpdate readbackPV="MEBT_Mag:PS_DCH10:I" /></td>
        <td><caml:wheelSwitch alarmSensitive="false" controlPV="MEBT_Mag:PS_DCH10:I_Set" displayFormat="+000.000" size="small" /></td>
    </tr>
    <tr>
        <td>DCH 11</td>
        <td><caml:textUpdate readbackPV="MEBT_Mag:PS_DCH11:I" /></td>
        <td><caml:wheelSwitch alarmSensitive="false" controlPV="MEBT_Mag:PS_DCH11:I_Set" displayFormat="+000.000" size="small" /></td>
    </tr>
    <tr>
        <td>DCH 14</td>
        <td><caml:textUpdate readbackPV="MEBT_Mag:PS_DCH14:I" /></td>
        <td><caml:wheelSwitch alarmSensitive="false" controlPV="MEBT_Mag:PS_DCH14:I_Set" displayFormat="+000.000" size="small" /></td>
    </tr>
</table>
```

Demo Page CAML 2 Code
Virtual PV Snippet

```
       <hr />
        <h3>Virtual PV Demo</h3>
           <div>
                Here we display the horizontal and vertical beam position at a beam position monitor along with their average (virtual PV) and plot
the values against time along the X axis.
           </div>
        <span style="display: none;"><caml:virtualPV name="bpm1xy" init="0" eval="(pvs.MEBT_Diag:BPM01:xAvg + pvs.MEBT_Diag:BPM01:yAvg)/2"
scan="1000" /></span>
           <table class="data">
                <tr> <th>PV</th> <th>Value</th> </tr>
                <tr> <td>MEBT_Diag:BPM01:xAvg</td> <td><caml:textUpdate readbackPV="MEBT_Diag:BPM01:xAvg" displayFormat="v(0.000) u t(mm-dd-yyyy
HH:MM:ss)" /></td> </tr>
                <tr> <td>MEBT_Diag:BPM01:yAvg</td> <td><caml:textUpdate readbackPV="MEBT_Diag:BPM01:yAvg" displayFormat="v(0.000) u t(mm-dd-yyyy
HH:MM:ss)" /></td> </tr>
                <tr> <td>bpm1xy</td> <td><caml:textUpdate readbackPV="bpm1xy" displayFormat="v(0.000) u t(mm-dd-yyyy HH:MM:ss)" /></td> </tr>
           </table>
        <div>
           <caml:xyChart flavor="advanced" xAxisLabel="Axis X label " yAxisLabel="Axis Y label ">
                <caml:xySeries Y-PVname="bpm1xy" name="Average" />
                <caml:xySeries Y-PVname="MEBT_Diag:BPM01:xAvg" name="X" />
                <caml:xySeries Y-PVname="MEBT_Diag:BPM01:yAvg" name="Y" />
           </caml:xyChart>
        </div>
    </body>
</html>
```

CAML 2 Template Repetition with Macro Substitution

- Specify a list of items each which contains one or more macro substitutions
- Specify a template of arbitrary XHTML which refers to the macros
- CAML Transform performs the repetition of the template with the macro substitutions

MEBT Orbit with Repetition

MEBT Orbit

Index	Magnet	Current	Current Set	Field	Field Set	BPM	X (mm)	Y (mm)
1	DCH01	-1.26 A	-003.348 Amp	-0.00129 T	-00.00341 Tesla	BPM01	-0.01	+0.39
2	DCH04	0.30 A	+010.000 Amp	+0.00030 T	+00.00120 Tesla	BPM04	+0.24	+0.89
3	DCH05	-0.40 A	-001.422 Amp	-0.00031 T	-00.00110 Tesla	BPM05	+0.71	-0.32
4	DCH10	0.59 A	+008.929 Amp	+0.00045 T	+00.00695 Tesla	BPM10	+0.93	-0.23
5	DCH11	0.58 A	+010.000 Amp	+0.00058 T	+00.01020 Tesla	BPM11	-1.22	+0.09
6	DCH14	0.12 A	+004.008 Amp	+0.00011 T	+00.00408 Tesla	BPM14	-0.85	+0.13

CAML 2 Repetition Code Snippet

```
<h3>MEBT Orbit with Repetition</h3>
<table class="data">
	<caption>MEBT Orbit</caption>
	<tr> <th>Index</th> <th>Magnet</th> <th>Current</th> <th>Current Set</th> <th>Field</th> <th>Field Set</th> <th>BPM</th> <th>X (mm)</th> <th>Y (mm)</th> </tr>

	<caml:repetition name="RepMag">
		<caml:list>
			<caml:item>
				<caml:macroValuePair macroName="$(CORRECTOR)" macroValue="DCH01" />
				<caml:macroValuePair macroName="$(BPM)" macroValue="BPM01" />
			</caml:item>
			<caml:item>
				<caml:macroValuePair macroName="$(CORRECTOR)" macroValue="DCH04" />
				<caml:macroValuePair macroName="$(BPM)" macroValue="BPM04" />
			</caml:item>
			<caml:item>
				<caml:macroValuePair macroName="$(CORRECTOR)" macroValue="DCH05" />
				<caml:macroValuePair macroName="$(BPM)" macroValue="BPM05" />
			</caml:item>
			<caml:item>
				<caml:macroValuePair macroName="$(CORRECTOR)" macroValue="DCH10" />
				<caml:macroValuePair macroName="$(BPM)" macroValue="BPM10" />
			</caml:item>
			<caml:item>
				<caml:macroValuePair macroName="$(CORRECTOR)" macroValue="DCH11" />
				<caml:macroValuePair macroName="$(BPM)" macroValue="BPM11" />
			</caml:item>
			<caml:item>
				<caml:macroValuePair macroName="$(CORRECTOR)" macroValue="DCH14" />
				<caml:macroValuePair macroName="$(BPM)" macroValue="BPM14" />
			</caml:item>
		</caml:list>
		<caml:template>
			<tr>
				<td><caml:staticText>$(RepMag:index)</caml:staticText></td>
				<td><caml:staticText>$(CORRECTOR)</caml:staticText></td>
				<td><caml:textUpdate readbackPV="MEBT_Mag:PS_$(CORRECTOR):I" /></td>
				<td><caml:wheelSwitch alarmSensitive="false" controlPV="MEBT_Mag:PS_$(CORRECTOR):I_Set" displayFormat="+000.000" size="small" /></td>
				<td><caml:textUpdate readbackPV="MEBT_Mag:$(CORRECTOR):B" displayFormat="+0.00000" /></td>
				<td><caml:wheelSwitch alarmSensitive="false" controlPV="MEBT_Mag:PS_$(CORRECTOR):B_Set" displayFormat="+00.00000" size="small" /></td>
				<td><caml:staticText>$(BPM)</caml:staticText></td>
				<td><caml:textUpdate readbackPV="MEBT_Diag:$(BPM):xAvg" displayFormat="+0.00" /></td>
				<td><caml:textUpdate readbackPV="MEBT_Diag:$(BPM):yAvg" displayFormat="+0.00" /></td>
			</tr>
		</caml:template>
	</caml:repetition>
</table>
```

Resources

- **Project Home:** http://www.ornl.gov/~t6p/Main/CAML.html
- **News Feed:** http://www.ornl.gov/~t6p/Main/CAMLBlog/CAMLBlog.html
- **Source Code:** http://webca.cosylab.com/