# Web Extensible Display Manager (WEDM)*

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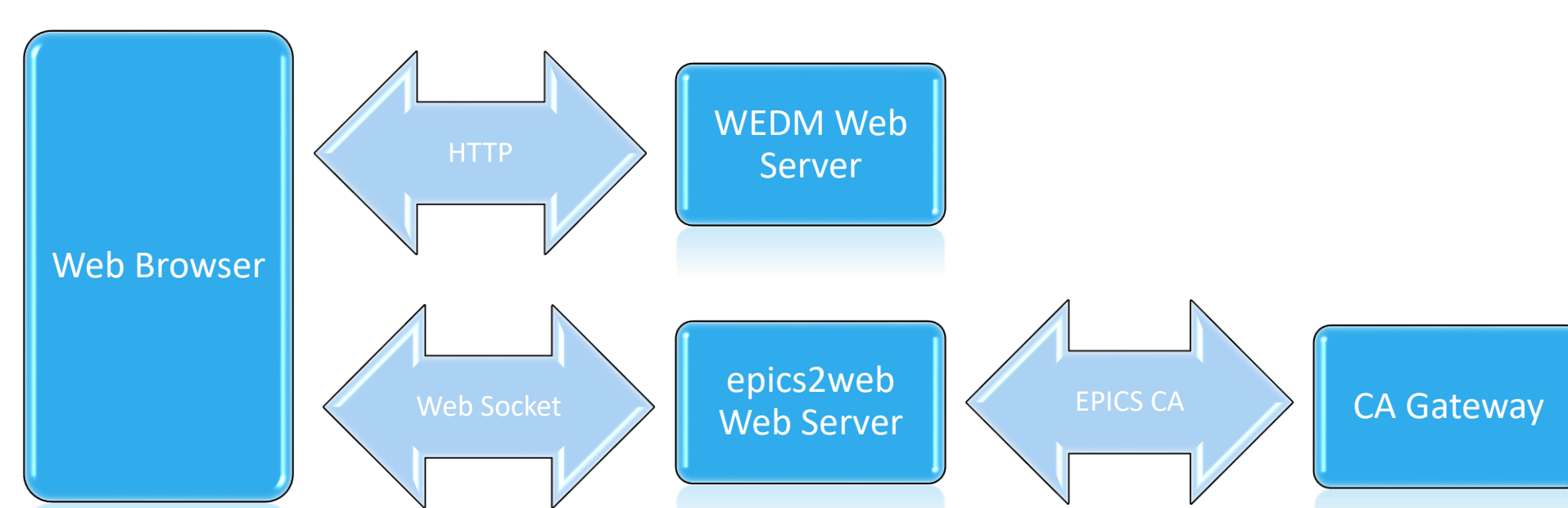
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## Introduction

WEDM employs native web technologies including Web Sockets, HTML 5 and SVG to deliver faithful renderings of control system EDM screens for remote users who can view them using nothing more than a web browser. The WEDM server parses EDL files directly in real-time allowing existing screens to work without modification. The familiar drag and drop EDM screen creation tool can be used to create optimized screens sized specifically for smart phones and then rendered by WEDM.
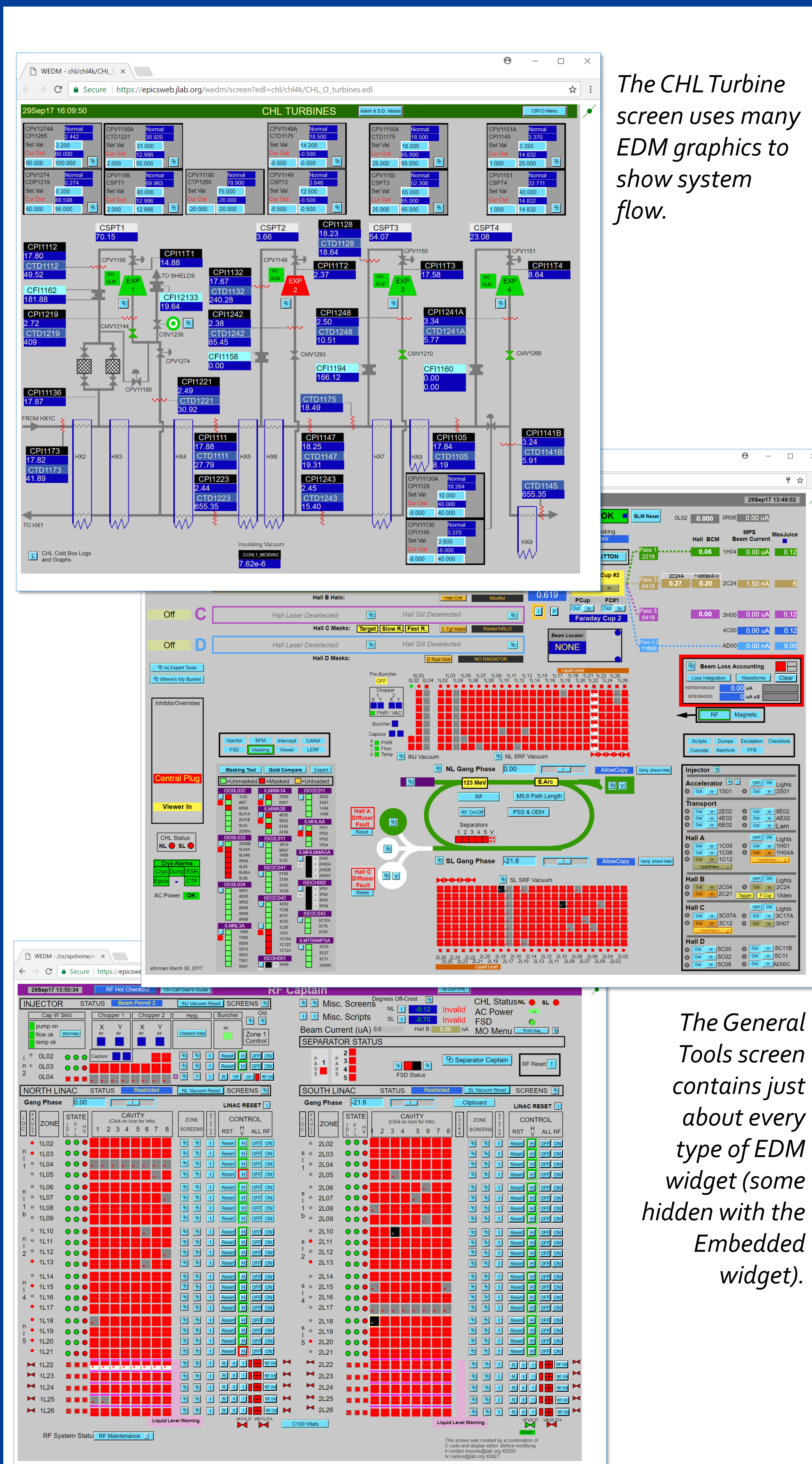
## Process Overview

The WEDM server provides a web page for users to browse a file system for an EDL file and a web service to generate an HTML view of a selected screen file. Each EDM object is converted to either an HTML div or an embedded SVG element and positioned in an absolute layout. The WEDM server's response to the client web browser contains all necessary HTML to render a screen and data attributes to setup CA monitors with the epics2web server.

The WEDM server transfers an HTML screen over HTTP, and the Web Socket protocol is used to deliver asynchronous Channel Access (CA) updates from the a web server to a client web browser in real time. The epics2web server interfaces with a read-only EPICS gateway.

## Implementation

Web-based screens present a few challenges. Fonts vary by device and therefore are dynamically sized to fit bounding boxes on page load. Mouse events must be captured and propagated to stacked widgets to mimic EDM's behavior. CALC expressions and color rules are executed using the JavaScript "eval" statement. Web URL parameters are used for EDL macros.

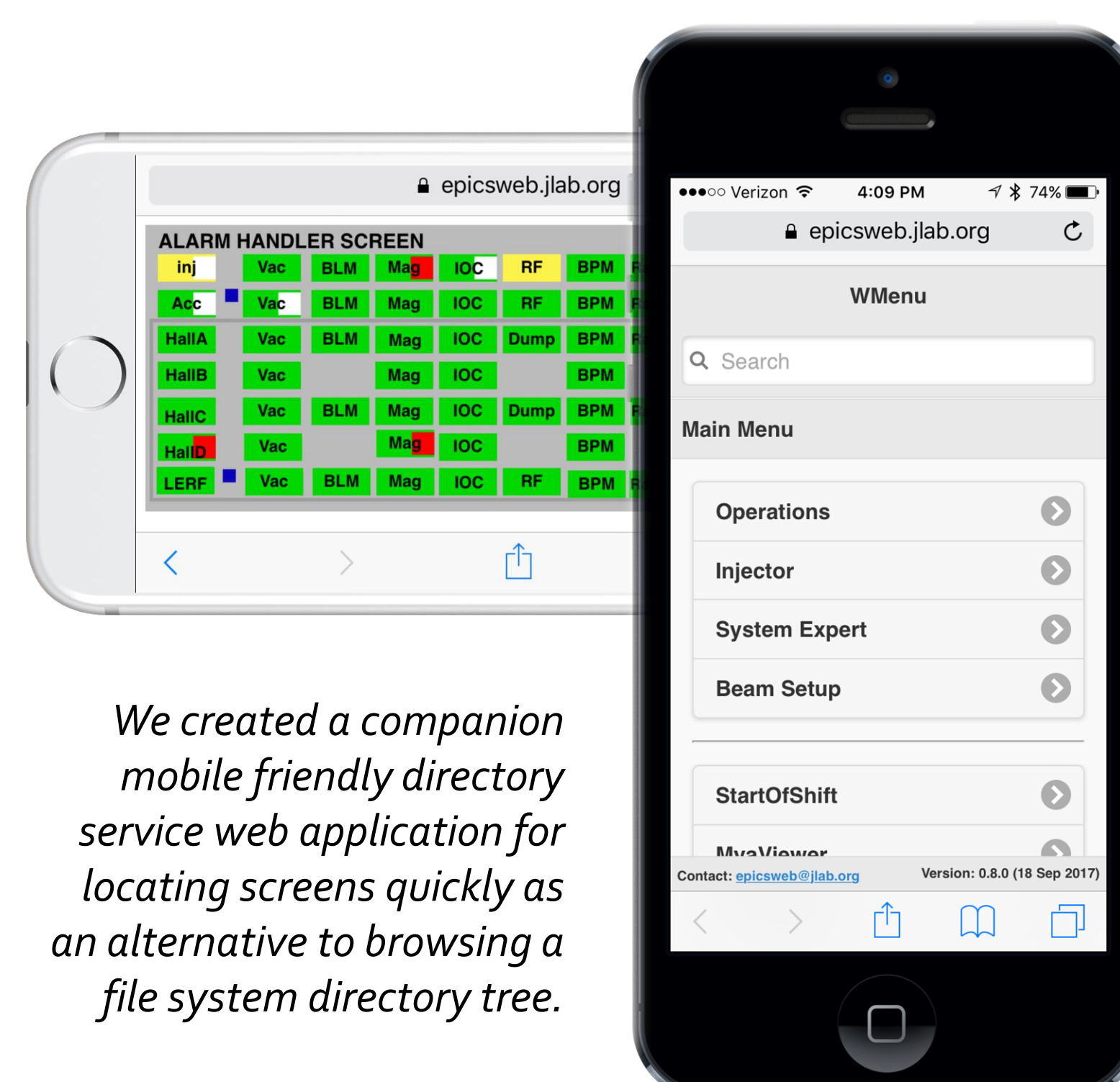*The CHL Turbine screen uses many EDM graphics to show system flow.*

*The General Tools screen contains just about every type of EDM widget (some hidden with the Embedded widget).*

*The RF Captain screen contains 4,426 EDM widgets and creates 1,546 PV monitors.*

## Goals

The objectives we wish to achieve at JLab with deployment of WEDM are:

1. Enable faster response times by support personnel
2. Reduce the number of staff granted accounts on control system workstations
3. Reduce the number of special-purpose EPICS kiosks in use

*We created a companion mobile friendly directory service web application for locating screens quickly as an alternative to browsing a file system directory tree.*

One of the first customers of WEDM is the facilities management department, which is switching from expensive proprietary monitoring software to EPICS for monitoring their gas, water, and electricity meters. They'll be using WEDM to view screens to avoid an accelerator account and 2-factor authentication.

## EPICS Web Gateway

We created a Web Socket based web service named epics2web to access CA from a web browser via a JavaScript API. Messages are encoded using JavaScript Object Notation (JSON). The server is written in Java and uses Channel Access Java (CAJ).

*Test page for the epics2web web service.*

## Performance

Parsing an EDL file and translating it to HTML every time a screen is requested can be time consuming for large screens. A caching layer has been implemented and screens are stored in memory as they are created and returned on later requests. Screens are transferred from server to client web browser encoded in gzip format.

## Extensibility

The source code is available on github.com and new widgets can be added by following a template. A Java Ant build file is provided for compiling and packaging the application.

Download at:
github.com/JeffersonLab/wedm

## Conclusion

The WEDM application provides an easy to deploy out-of-the-box solution for viewing existing EDM screens remotely. It also encourages technicians to use the EDM screen creation tool to create new mobile friendly screens. System experts and on-call staff can now quickly monitor systems from anywhere.