Prototype Extension to NWS AWIPS II in Support of Collaboration with External Partners using Web Technologies

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Outline

● AWIPS/Collaboration Overview
● Architecture
● Challenges
● Technologies
● Software Engineering
● Future directions
● Demo
AWIPS Functions
The Critical Link to NWS Forecasters

169 separate AWIPS systems at 137 geographical locations

Warnings
Watches
Advisories
Forecasts

AWIPS Workstations and Servers
~900 Workstations (total)
~1200 Servers (total)

Service provided to 3066 US Counties
24 hrs/day, 365 days/yr
AWIPS II Extensions

- AWIPS Workstation
- Images Drawings Chat
- Forecaster in Boulder
- Forecaster in Pueblo
- External Collaboration
- NWS Firewall
- Laptop/Tablet/Smart Phone
- Fire Manager

Internal Collaboration
Challenges

Security - navigating the NWS Firewall
  ○ SSH Tunnel chat server/http traffic
  ○ By itself, tunneling is not sufficient to ensure security
  ○ Need to
    ■ Secure the OS - SELinux
    ■ Isolate disk access - CHROOT jails
    ■ Secure Tomcat - via configuration
    ■ Follow coding standards (sanitize user input)
    ■ Authenticate/Authorize
    ■ ....
Challenges

Simulating server-driven commands

- Servlet 3.0 Long-polling
- Good conceptual approach
- Issues in practice
Missed Command

Server

- Step to Frame 2
- Step to Frame 3
- Step to Frame 4

Client

- Process change to Frame 2
- Process change to Frame 3
- Request new state
- Request new state

Client waits vainly for step to Frame 4 cmd
Soln: Server-side timeout with exponentially increasing interval

<table>
<thead>
<tr>
<th>Server</th>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step to Frame 2</td>
<td>Process change to Frame 2</td>
</tr>
<tr>
<td></td>
<td>Request new state</td>
</tr>
<tr>
<td>Step to Frame 3</td>
<td>Process change to Frame 3</td>
</tr>
<tr>
<td>Step to Frame 4</td>
<td>Process change to Frame 4</td>
</tr>
<tr>
<td></td>
<td>Request new state</td>
</tr>
<tr>
<td>Request times out</td>
<td>Sync request current state</td>
</tr>
<tr>
<td>Current state</td>
<td>Process change to Frame 4</td>
</tr>
</tbody>
</table>
Remaining problem: Help from Audience?

- Client handles response quickly
- But next request sometimes delayed in arriving back to server
- So if forecaster steps through frames every second or two, some clients can experience a stuttering effect
Challenges

- Syncing many images can be slow
- Part of solution: Pipelining

![Diagram showing pipelining process]

Server:
- Generate KMZ for Image 1
- Notify client KMZ is ready
- Generate KMZ for Image 2
- Notify client KMZ is ready
- Generate KMZ for Image 3

Client:
- Process image 1
- Process image 2
- Process image 3
Challenges

KMZ wrapped images/drawings

- Works fairly seamlessly in Google Earth
- Google Maps requires unpacking/massaging
- More investigation needed
Technologies

Client Side
- Google Web Toolkit
- OpenLayers
  - Javascript library for rendering generalized layers
- GWT-OpenLayers
  - GWT wrapper for OpenLayers
- Google Maps
  - Is the "Base" OpenLayer

Server Side
- RESTeasy Web services
Google Web Toolkit

Pros

○ Code in Java, generates browser-independent Javascript
○ Can debug Java code in Eclipse before you deploy to app server
○ Can mix in raw Javascript code/libraries
Cons

○ Can be incompatibilities between GWT-generated and raw Javascript
○ Sometimes Javascript not really browser independent (chat problem on firefox)
○ What will happen if Google drops Javascript in favor of Dart? Will they abandon GWT?
○ New options gaining traction (PLAY web framework)
Software Engineering

● Git version control
  ○ Challenging but very powerful

● Software builds with Gradle
  ○ Declarative approach
  ○ Uses Maven repos
  ○ Without the ugly XML syntax

● Model/View/Presenter (MVP) design pattern
  ○ Separates client business logic from GUI
  ○ Facilitates unit testing
  ○ Advocated by GWT folks
Future Directions

● Operational version
  ○ Work with Raytheon to leverage operational internal collaboration solution

● Support for smart phones

● HTML5
Demo

• Scenario
  ○ Fire in the hills west of Boulder
  ○ Forecaster located at NWS in Boulder is briefing fire personnel (us) on broad synoptic situation and local wind forecasts

http://fxc.noaa.gov/extCol/extCollab/login.html
Demo

http://fxc.noaa.gov/extCol/extCollab/login.html

- Live test of scalability! (tested with at most 7 clients previously)
- Various browsers/versions (don't even think about using Internet Exploder!)
- Macs? (only Windows/Linux so far)
- Smart phones
- Wireless network
- The unknown unknowns (Donald Rumsfeld)
- **What could possibly go wrong?**