ZK Framework in Navis TOS

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ZK U.S. User Group Nov 7, 2011, Cypress, CA

Agenda

- Background
  - Navis
- Why ZK Framework?
- Product Demo
- ZK Framework Integration
  - Macro Component, Template
- ZK Server+Client Fusion
  - OpenLayers Map
- Unit + Integration Testing
- Debugging Tips

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Navis

- Oakland, CA
- Proven TOS functionality for State of The Art Automated Terminals
  - Equipment automation
  - Gate operation automation
- Help Terminal Operators increase capacity and optimize operations to lower costs

RailPictures.Net - Image Copyright © Thomas Johnson

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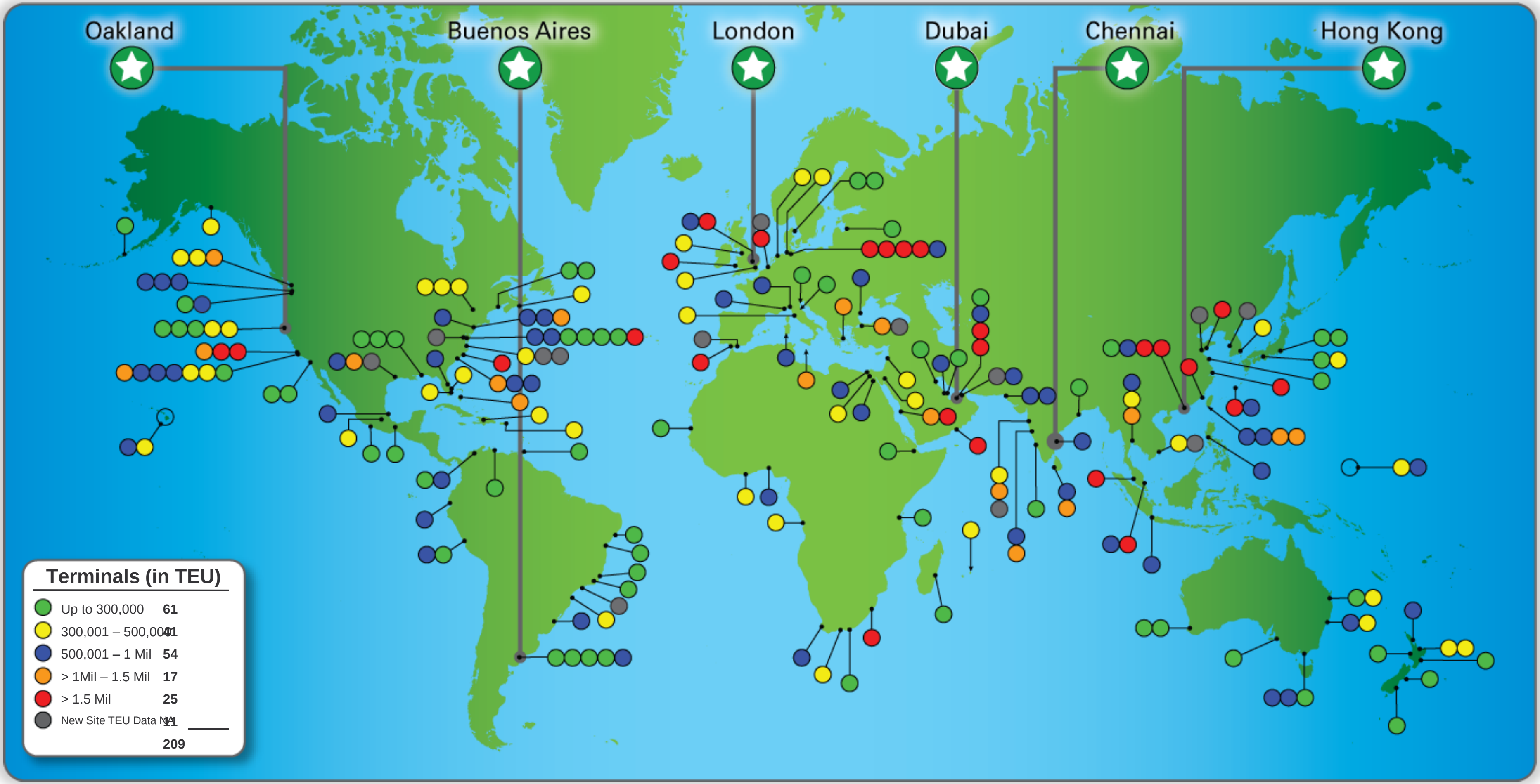
Navis TOS Client Locations



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Product Demo

- [demo]

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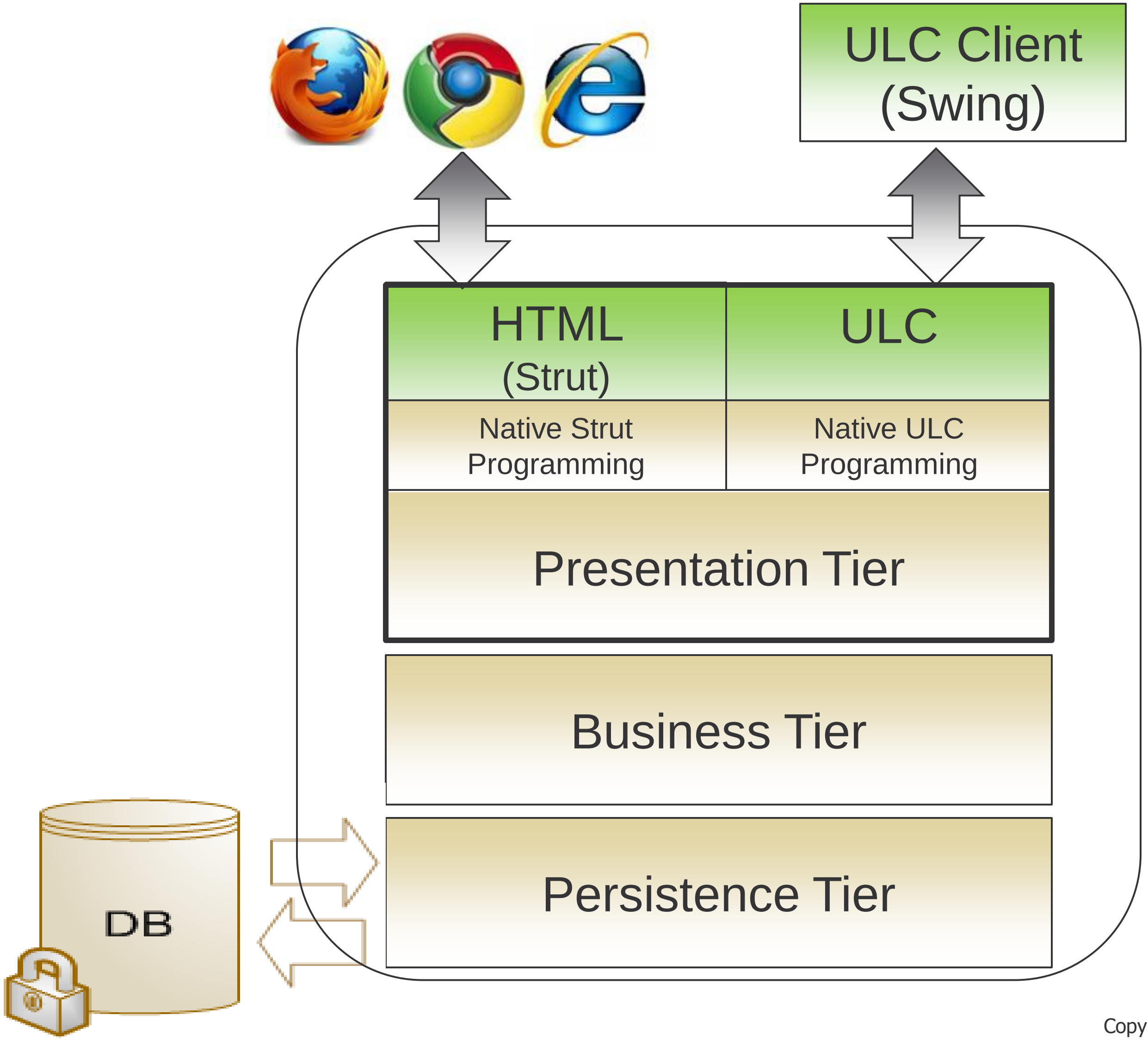
Choosing a Web Technology



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Choosing a Web Technology

- Business Requirements
  - Investment Protection
  - Engineers’ Skill Set
- Technical Requirements
  - Open Source Ajax
  - Low Learning Curve - Productivity
  - Component-based MVC (as opposed to request-based)
  - Integration Friendly
- 2 Months Evaluation in 2009
  - Prototyping
  - Architecture Reviews

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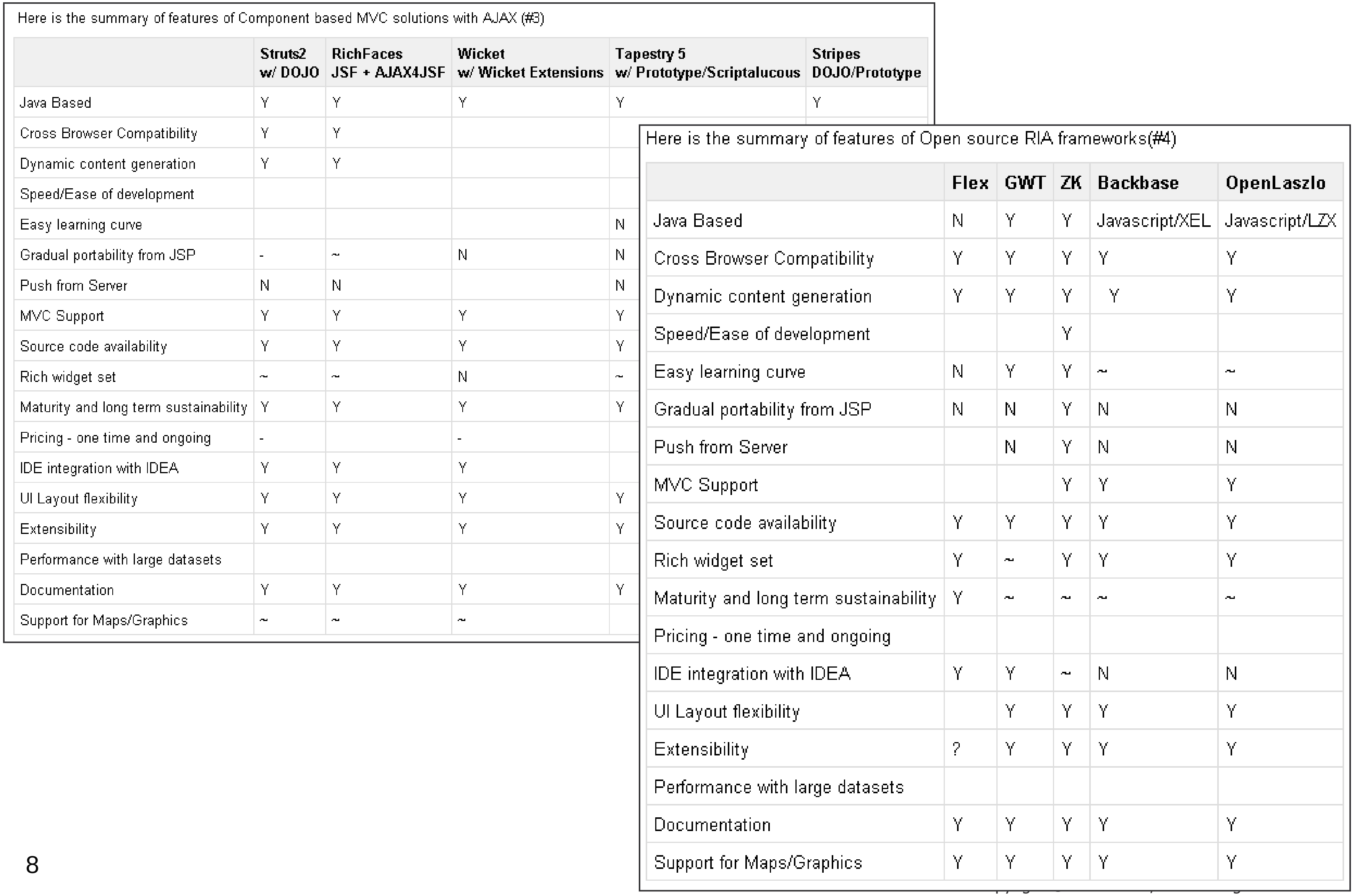
Web Technology Evaluation



Here is the summary of features of Component based MVC solutions with AJAX (#3)

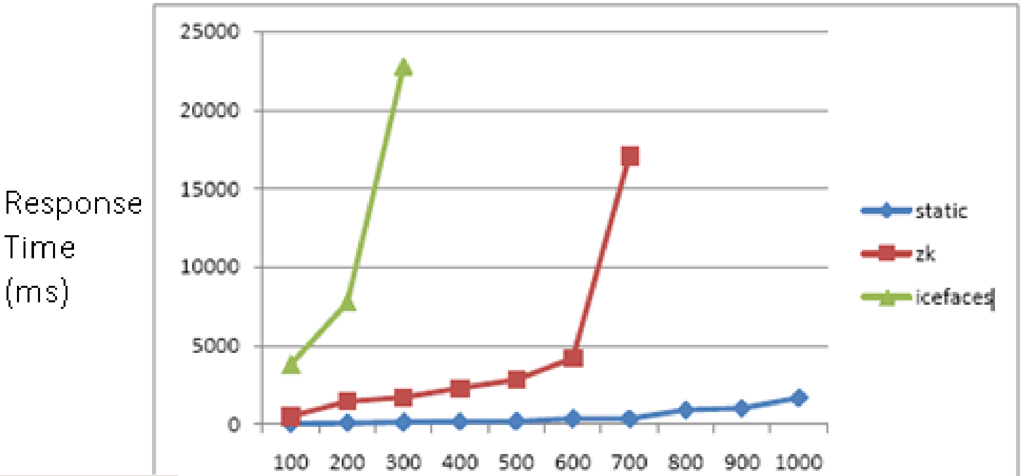
	Struts2 w/ DOJO	RichFaces JSF + AJAX4JSF	Wicket w/ Wicket Extensions	Tapestry 5 w/ Prototype/Scriptalucous	Stripes DOJO/Prototype
Java Based	Y	Y	Y	Y	Y
Cross Browser Compatibility	Y	Y			
Dynamic content generation	Y	Y			
Speed/Ease of development					
Easy learning curve				N	
Gradual portability from JSP	-	~	N	N	
Push from Server	N	N		N	
MVC Support	Y	Y	Y	Y	
Source code availability	Y	Y	Y	Y	
Rich widget set	~	~	N	~	
Maturity and long term sustainability	Y	Y	Y	Y	
Pricing - one time and ongoing	-		-		
IDE integration with IDEA	Y	Y	Y		
UI Layout flexibility	Y	Y	Y	Y	
Extensibility	Y	Y	Y	Y	
Performance with large datasets					
Documentation	Y	Y	Y	Y	
Support for Maps/Graphics	~	~	~		

Here is the summary of features of Open source RIA frameworks(#4)

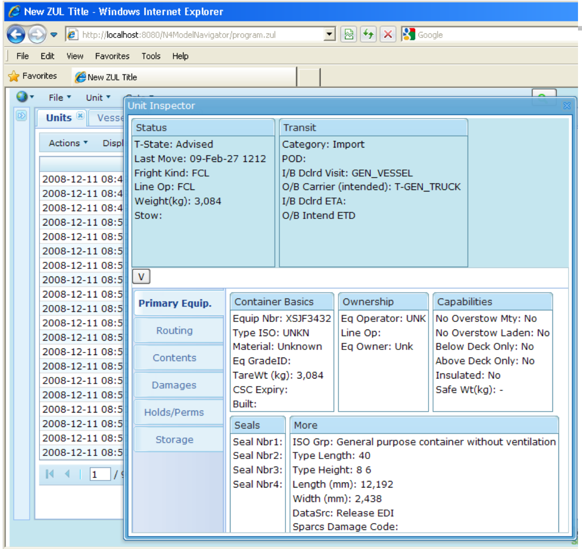
	Flex	GWT	ZK	Backbase	OpenLaszlo
Java Based	N	Y	Y	Javascript/XEL	Javascript/LZX
Cross Browser Compatibility	Y	Y	Y	Y	Y
Dynamic content generation	Y	Y	Y	Y	Y
Speed/Ease of development			Y		
Easy learning curve	N	Y	Y	~	~
Gradual portability from JSP	N	N	Y	N	N
Push from Server		N	Y	N	N
MVC Support			Y	Y	Y
Source code availability	Y	Y	Y	Y	Y
Rich widget set	Y	~	Y	Y	Y
Maturity and long term sustainability	Y	~	~	~	~
Pricing - one time and ongoing					
IDE integration with IDEA	Y	Y	~	N	N
UI Layout flexibility		Y	Y	Y	Y
Extensibility	?	Y	Y	Y	Y
Performance with large datasets					
Documentation	Y	Y	Y	Y	Y
Support for Maps/Graphics	Y	Y	Y	Y	Y

Choosing ZK Framework

- Check References
- Load Testing, Performance Comparison
  - Table with 150 Rows



- Prototype



2008-12-11 08:4
2008-12-11 08:4
2008-12-11 08:4
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
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2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5
2008-12-11 08:5

Status
T-State: Advised
Last Move: 09-Feb-27 1212
Fright Kind: FCL
Line Op: FCL
Weight(kg): 3,084
Stow:

Transit
Category: Import
POD:
I/B Dclrd Visit: GEN_VESSEL
O/B Carrier (intended): T-GEN_TRUCK
I/B Dclrd ETA:
O/B Intend ETD

Container Basics
Equip Nbr: XSJF3432
Type ISO: UNKN
Material: Unknown
Eq GradeID:
TareWt (kg): 3,084
CSC Expiry:
Built:

Ownership
Eq Operator: UNK
Line Op:
Eq Owner: Unk

Capabilities
No Overstow Mty: No
No Overstow Laden: No
Below Deck Only: No
Above Deck Only: No
Insulated: No
Safe Wt(kg): -

Seals
Seal Nbr1:
Seal Nbr2:
Seal Nbr3:
Seal Nbr4:

More
ISO Grp: General purpose container without ventilation
Type Length: 40
Type Height: 8 6
Length (mm): 12,192
Width (mm): 2,438
DataSrc: Release EDI
Sparcs Damage Code:

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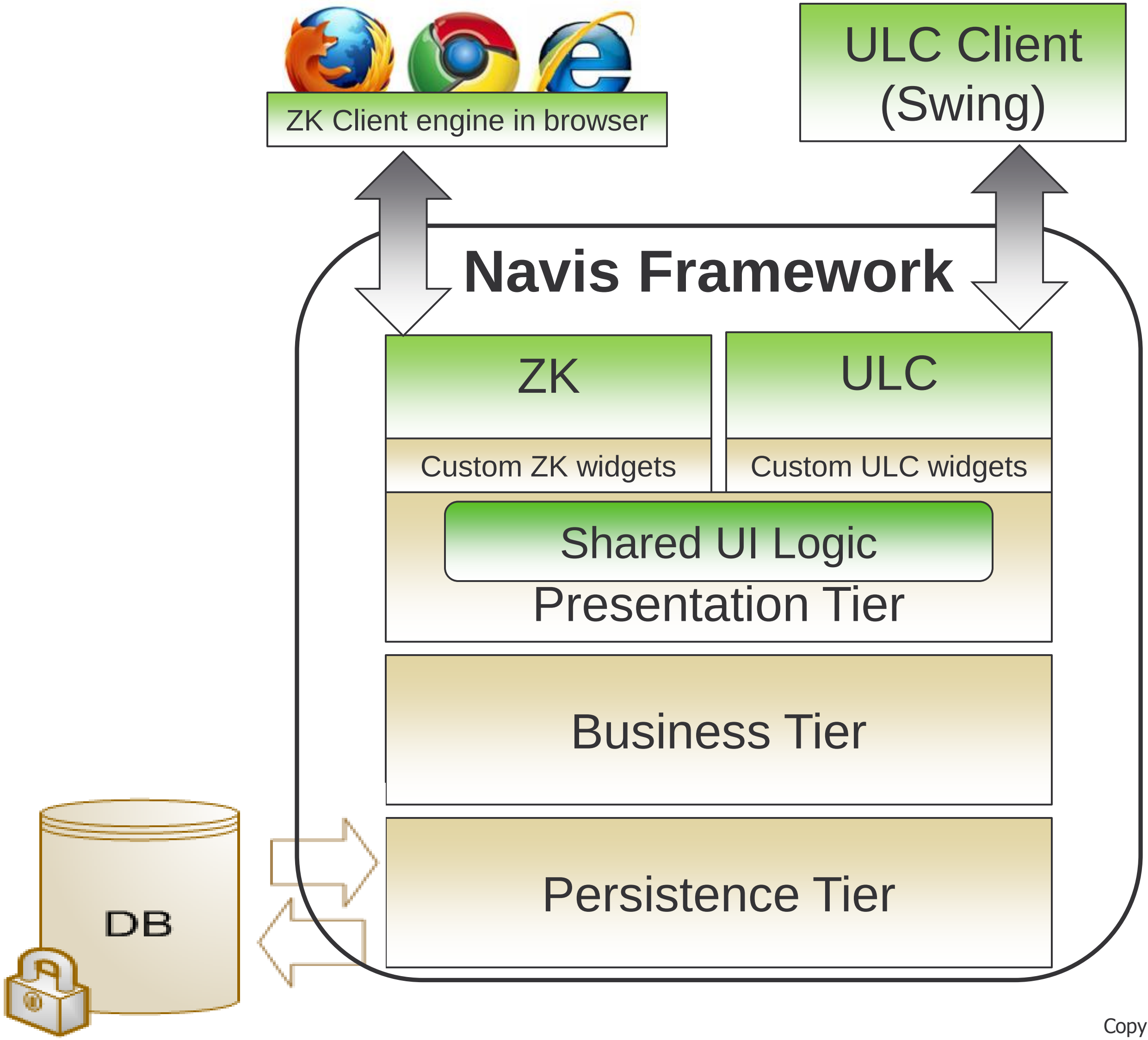
ZK Framework Integration



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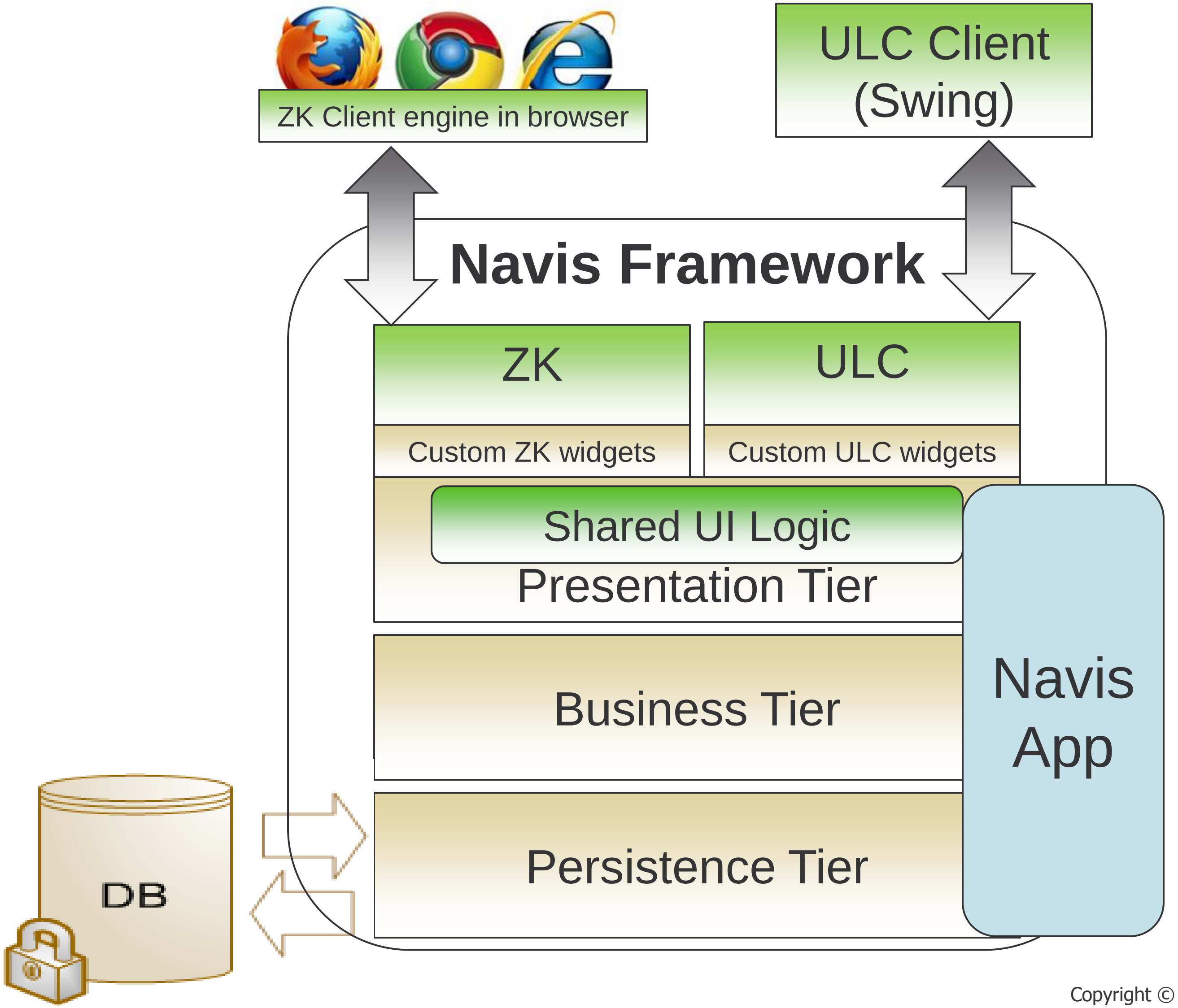
ZK Framework Integration



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ZK Framework Integration

- To overcome our challenges, ZK Framework offers
  - Swing-like Java API to build a UI tree
  - Desktop programming paradigm
  - Macro components
  - ZUL as templates

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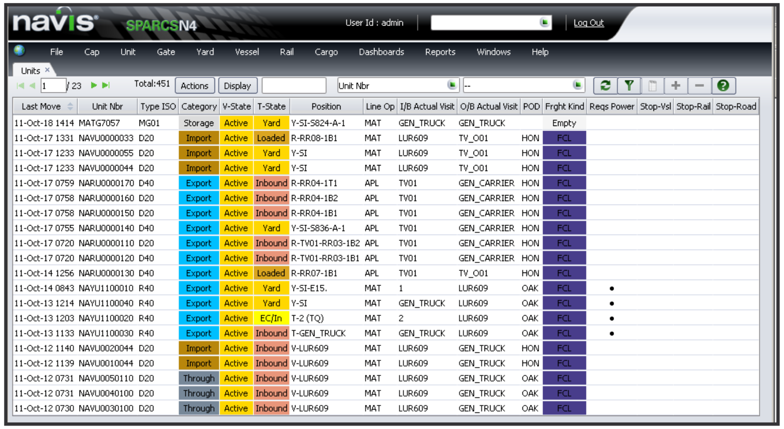
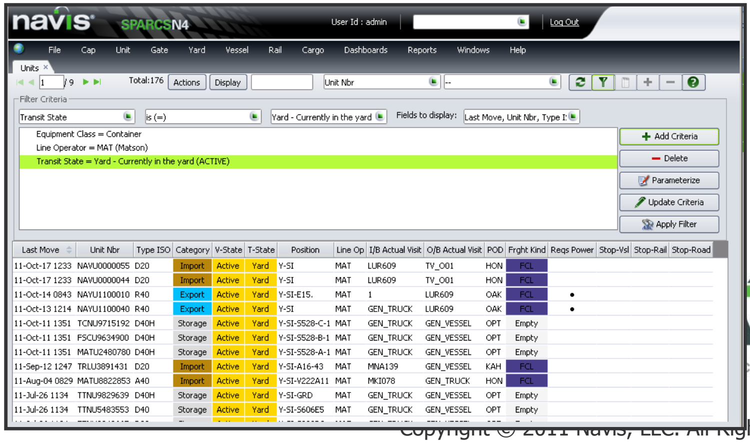
Macro Component

- “*Implement a new component by use of other components*” – ZK reference documentation
- Encapsulate a set of related functionality into a new reusable component
  - For an example in our app, every tab shows a table
    - Backed by a hibernate entity
    - UI for Query Filters
    - Context menu
    - Pagination



Last Move	Unit Nbr	Type ISO	Category	V-State	T-State	Position	Line Op	I/B Actual Visit	O/B Actual Visit	POD	Frght Kind	Reqs Power	Stop-Vsl	Stop-Rail	Stop-Road
11-Oct-18 1414	MATG7057	MG01	Storage	Active	Yard	Y-SI-S824-A-1	MAT	GEN_TRUCK	GEN_TRUCK		Empty				
11-Oct-17 1331	NAVU0000033	D20	Import	Active	Loaded	R-RR08-1B1	MAT	LUR609	TV_O01	HON	FCL				
11-Oct-17 1233	NAVU0000055	D20	Import	Active	Yard	Y-SI	MAT	LUR609	TV_O01	HON	FCL				
11-Oct-17 1233	NAVU0000044	D20	Import	Active	Yard	Y-SI	MAT	LUR609	TV_O01	HON	FCL				
11-Oct-17 0759	NARU0000170	D40	Export	Active	Inbound	R-RR04-1T1	APL	TV01	GEN_CARRIER	HON	FCL				
11-Oct-17 0758	NARU0000160	D20	Export	Active	Inbound	R-RR04-1B2	APL	TV01	GEN_CARRIER	HON	FCL				
11-Oct-17 0758	NARU0000150	D20	Export	Active	Inbound	R-RR04-1B1	APL	TV01	GEN_CARRIER	HON	FCL				
11-Oct-17 0755	NARU0000140	D40	Export	Active	Yard	Y-SI-S836-A-1	APL	TV01	GEN_CARRIER	HON	FCL				
11-Oct-17 0720	NARU0000110	D20	Export	Active	Inbound	R-TV01-RR03-1B2	APL	TV01	GEN_CARRIER	HON	FCL				
11-Oct-17 0720	NARU0000120	D40	Export	Active	Inbound	R-TV01-RR03-1B1	APL	TV01	GEN_CARRIER	HON	FCL				
11-Oct-14 1256	NARU0000130	D40	Export	Active	Loaded	R-RR07-1B1	APL	TV01	TV_O01	HON	FCL				
11-Oct-14 0843	NAYU1100010	R40	Export	Active	Yard	Y-SI-E15.	MAT	1	LUR609	OAK	FCL	•			
11-Oct-13 1214	NAYU1100040	R40	Export	Active	Yard	Y-SI	MAT	GEN_TRUCK	LUR609	OAK	FCL	•			
11-Oct-13 1203	NAYU1100020	R40	Export	Active	EC/In	T-2 (TQ)	MAT	2	LUR609	OAK	FCL	•			
11-Oct-13 1133	NAYU1100030	R40	Export	Active	Inbound	T-GEN_TRUCK	MAT	GEN_TRUCK	LUR609	OAK	FCL	•			
11-Oct-12 1140	NAVU0020044	D20	Import	Active	Inbound	V-LUR609	MAT	LUR609	GEN_TRUCK	HON	FCL				
11-Oct-12 1139	NAVU0010044	D20	Import	Active	Inbound	V-LUR609	MAT	LUR609	GEN_TRUCK	HON	FCL				
11-Oct-12 0731	NAVU0050110	D20	Through	Active	Inbound	V-LUR609	MAT	LUR609	GEN_TRUCK	OAK	FCL				
11-Oct-12 0731	NAVU0040100	D20	Through	Active	Inbound	V-LUR609	MAT	LUR609	GEN_TRUCK	OAK	FCL				
11-Oct-12 0730	NAVU0030100	D20	Through	Active	Inbound	V-LUR609	MAT	LUR609	GEN_TRUCK	OAK	FCL				



Filter Criteria

Transit State | is (=) | Yard - Currently in the yard | Fields to display: Last Move, Unit Nbr, Type I:

Equipment Class = Container
Line Operator = MAT (Matson)
Transit State = Yard - Currently in the yard (ACTIVE)

Last Move	Unit Nbr	Type ISO	Category	V-State	T-State	Position	Line Op	I/B Actual Visit	O/B Actual Visit	POD	Frght Kind	Reqs Power	Stop-Vsl	Stop-Rail	Stop-Road
11-Oct-17 1233	NAVU0000055	D20	Import	Active	Yard	Y-SI	MAT	LUR609	TV_O01	HON	FCL				
11-Oct-17 1233	NAVU0000044	D20	Import	Active	Yard	Y-SI	MAT	LUR609	TV_O01	HON	FCL				
11-Oct-14 0843	NAYU1100010	R40	Export	Active	Yard	Y-SI-E15.	MAT	1	LUR609	OAK	FCL	•			
11-Oct-13 1214	NAYU1100040	R40	Export	Active	Yard	Y-SI	MAT	GEN_TRUCK	LUR609	OAK	FCL	•			
11-Oct-11 1351	TCNU9715192	D40H	Storage	Active	Yard	Y-SI-S528-C-1	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				
11-Oct-11 1351	FSCU9634900	D40H	Storage	Active	Yard	Y-SI-S528-B-1	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				
11-Oct-11 1351	MATU2480780	D40H	Storage	Active	Yard	Y-SI-S528-A-1	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				
11-Sep-12 1247	TRLU3891431	D20	Import	Active	Yard	Y-SI-A16-43	MAT	MNA139	GEN_VESSEL	KAH	FCL				
11-Aug-04 0829	MATU8822853	A40	Import	Active	Yard	Y-SI-V222A11	MAT	MKI078	GEN_TRUCK	HON	FCL				
11-Jul-26 1134	TTNU9829639	D40H	Storage	Active	Yard	Y-SI-GRD	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				
11-Jul-26 1134	TTNU5483553	D40	Storage	Active	Yard	Y-SI-S606E5	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				

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Macro Component

lang-addon.xml

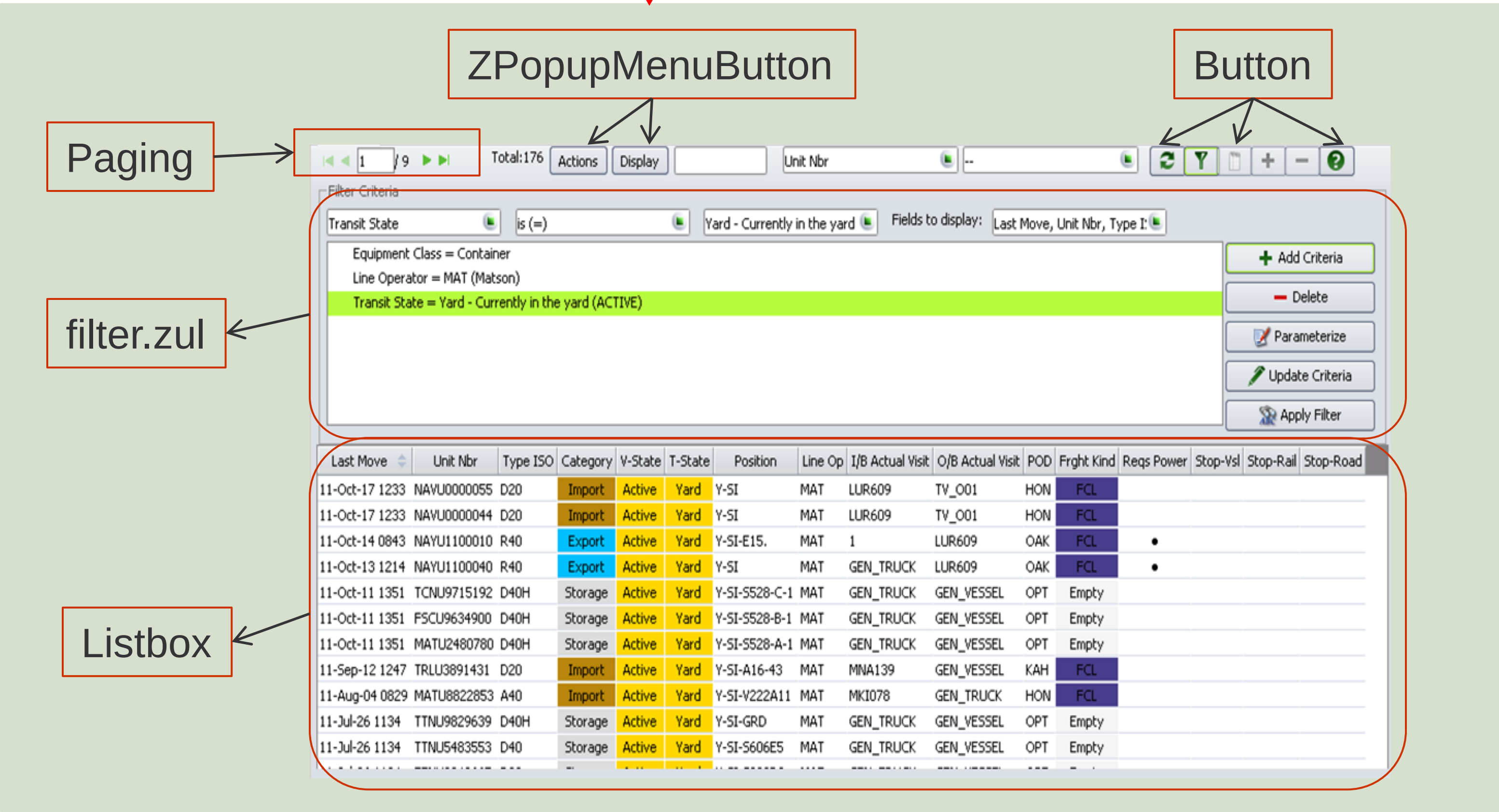
```
<component>
        <component-name>zTable</component-name>
        <extends>listbox</extends>
        <component-class>com.navis.framework.zk.view.ZTable</component-class>
 </component>
```

Reusable in any zul or in code

```
<zk>
    <zTable apply="…" customAttr="…"/>

</zk>
```

a composite ui of the following



1 / 9 Total:176 Actions Display Unit Nbr --

Filter Criteria

Transit State | is (=) | Yard - Currently in the yard | Fields to display: Last Move, Unit Nbr, Type I:

Equipment Class = Container
Line Operator = MAT (Matson)
Transit State = Yard - Currently in the yard (ACTIVE)

Add Criteria
Delete
Parameterize
Update Criteria
Apply Filter

Last Move	Unit Nbr	Type ISO	Category	V-State	T-State	Position	Line Op	I/B Actual Visit	O/B Actual Visit	POD	Frght Kind	Reqs Power	Stop-Vsl	Stop-Rail	Stop-Road
11-Oct-17 1233	NAVU0000055	D20	Import	Active	Yard	Y-SI	MAT	LUR609	TV_O01	HON	FCL				
11-Oct-17 1233	NAVU0000044	D20	Import	Active	Yard	Y-SI	MAT	LUR609	TV_O01	HON	FCL				
11-Oct-14 0843	NAYU1100010	R40	Export	Active	Yard	Y-SI-E15.	MAT	1	LUR609	OAK	FCL	●			
11-Oct-13 1214	NAYU1100040	R40	Export	Active	Yard	Y-SI	MAT	GEN_TRUCK	LUR609	OAK	FCL	●			
11-Oct-11 1351	TCNU9715192	D40H	Storage	Active	Yard	Y-SI-S528-C-1	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				
11-Oct-11 1351	FSCU9634900	D40H	Storage	Active	Yard	Y-SI-S528-B-1	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				
11-Oct-11 1351	MATU2480780	D40H	Storage	Active	Yard	Y-SI-S528-A-1	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				
11-Sep-12 1247	TRLU3891431	D20	Import	Active	Yard	Y-SI-A16-43	MAT	MNA139	GEN_VESSEL	KAH	FCL				
11-Aug-04 0829	MATU8822853	A40	Import	Active	Yard	Y-SI-V222A11	MAT	MKI078	GEN_TRUCK	HON	FCL				
11-Jul-26 1134	TTNU9829639	D40H	Storage	Active	Yard	Y-SI-GRD	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				
11-Jul-26 1134	TTNU5483553	D40	Storage	Active	Yard	Y-SI-S606E5	MAT	GEN_TRUCK	GEN_VESSEL	OPT	Empty				

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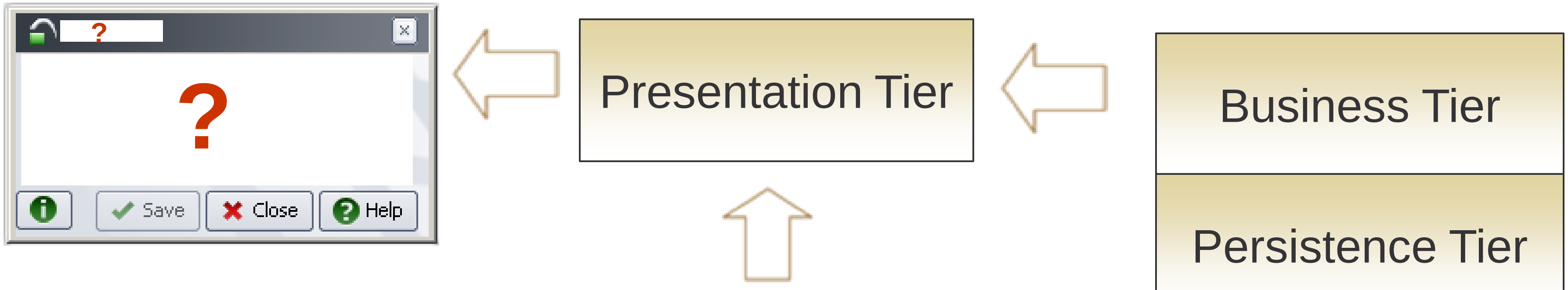
Zul as Template

- Build skeleton UI structure quickly
- Dynamically Bind, via VariableResolver
  - Controller
  - Data Model
  - Custom Attributes
- Reusable, *Executions.createComponents(“template.zul”, args)*



Generic form.zul

```
<zk>
   <window closable="true" >
      …
      <zForm apply=“…” customAttr=“…”/>
      …
   </window>
</zk>
```

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Dynamic Layout

- Dynamically populated view means we can’t hard-code the width and height in our views (in code or in zul)
- How is the width calculated?
- Outside-in layout
  - The UI resizes based on the size of the browser
  - We want our components embedded on the page to maximize the width and height the container allows
- Inside-out layout
  - Our floating form dialogs resize based on its content
  - We want our form dialog to minimize its width and height to show its content fully.
- ZK offers ways for us to achieve without hard-coding width and height

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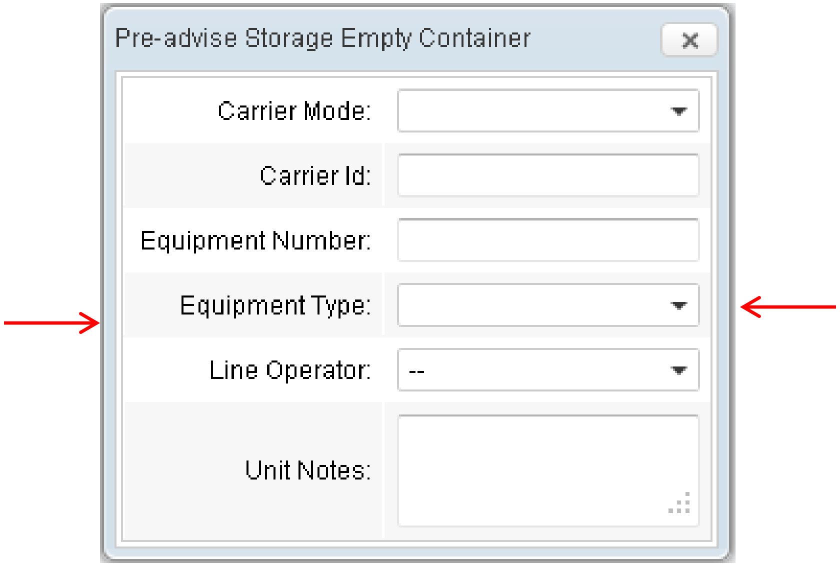
Inside-Out Calculations

- **hflex=“min”** means it depends on the width of the inner container
- To show a floating form dialog with minimal width without specifying a fixed width in our code:



Pre-advise Storage Empty Container

Carrier Mode:	
Carrier Id:	
Equipment Number:	
Equipment Type:	
Line Operator:	--
Unit Notes:	

```
<window mode="modal“>
    <div hflex=“min”>
        <grid hflex=“min”>
            <columns>
                <column hflex=“min” align="right"/>
                <column hflex=“min”/>
            </columns>
            <rows>
                <row>….</row>
                <row>….</row>
            </rows>
        </grid>
    </div>
</window>
```

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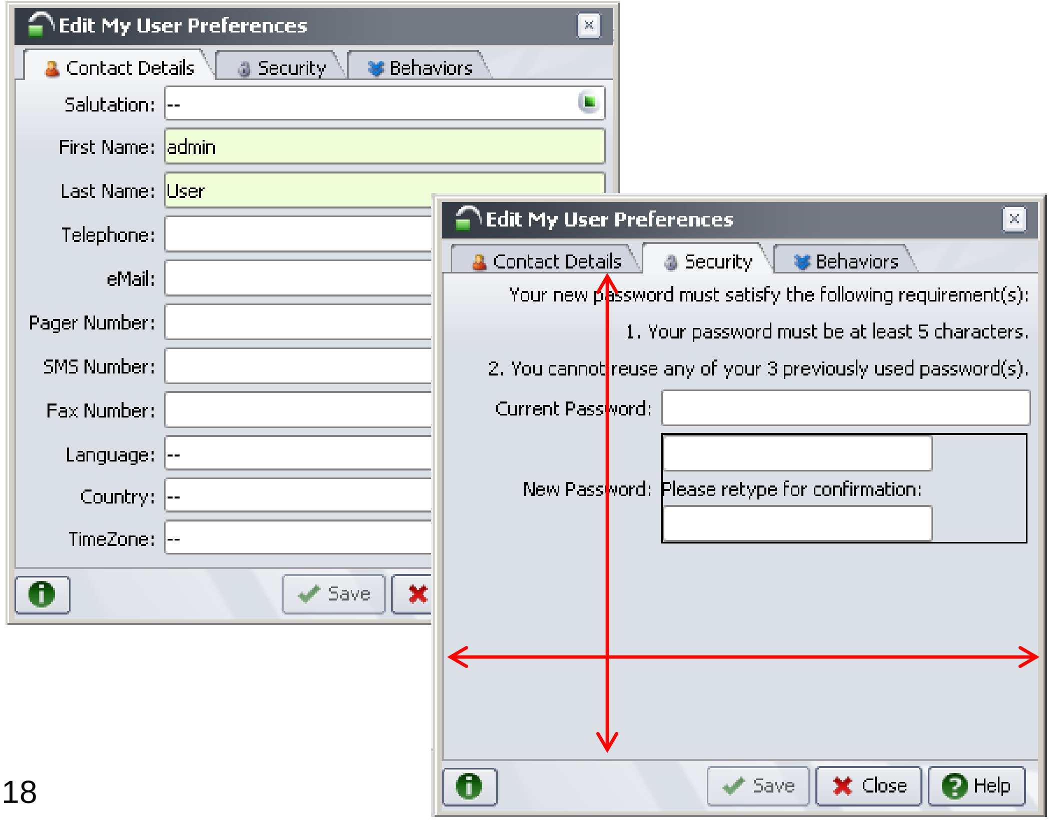
Inside-Out Calculations

- **hflex=“1”** means it depends on the width of the outer container
- To maximize the available space the child components can occupy:



Salutation: --
First Name: admin
Last Name: User
Telephone:
eMail:
Pager Number:
SMS Number:
Fax Number:
Language: --
Country: --
TimeZone: --

Your new password must satisfy the following requirement(s):
1. Your password must be at least 5 characters.
2. You cannot reuse any of your 3 previously used password(s).
Current Password:
New Password: Please retype for confirmation:

```
<window mode="modal“>
   <div hflex=“min”>
      <tabbox vflex=“1”>
         <tabs>...</tabs>
         <tabpanels>
            <tabpanel>
               <grid hflex=“1”>
               …
               </grid>
            </tabpanel>
         </tabpanels>
      </tabbox>
</div>
</window>
```

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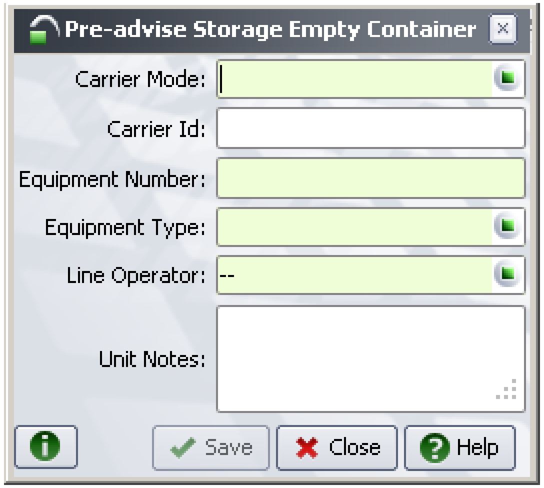
Inside-Out Calculations

- Leveraging hflex and vflex to auto-calculate the best minimal width and height for floating form dialogs, we can recursively build more complicated floating dialogs



Pre-advise Storage Empty Container

Carrier Mode:

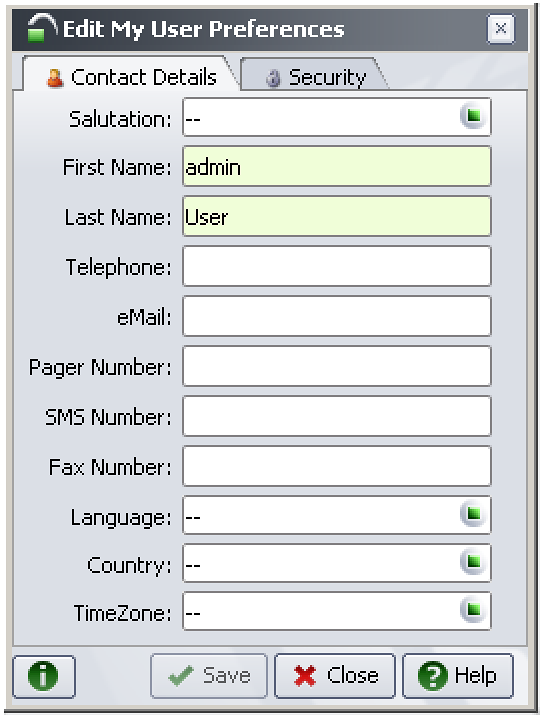
Carrier Id:

Equipment Number:

Equipment Type:

Line Operator: --

Unit Notes:



Edit My User Preferences

Contact Details | Security

Salutation: --

First Name: admin

Last Name: User

Telephone:

eMail:

Pager Number:

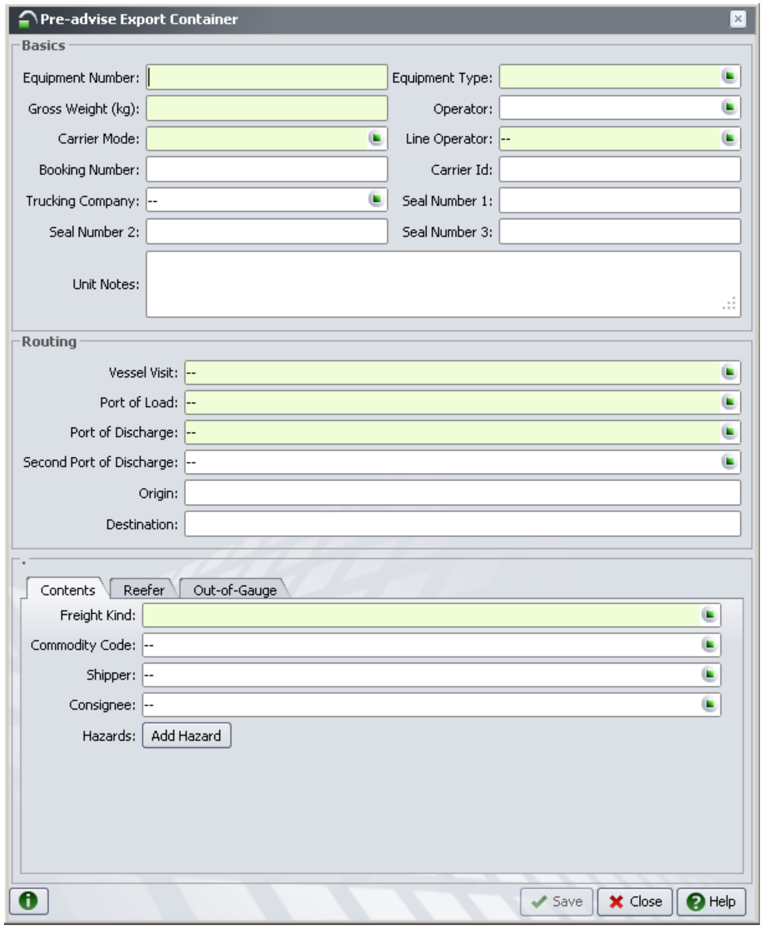
SMS Number:

Fax Number:

Language: --

Country: --

TimeZone: --



Pre-advise Export Container

Basics

Equipment Number:

Equipment Type:

Gross Weight (kg):

Operator:

Carrier Mode:

Line Operator: --

Booking Number:

Carrier Id:

Trucking Company: --

Seal Number 1:

Seal Number 2:

Seal Number 3:

Unit Notes:

Routing

Vessel Visit: --

Port of Load: --

Port of Discharge: --

Second Port of Discharge: --

Origin:

Destination:

Contents | Reefer | Out-of-Gauge

Freight Kind:

Commodity Code: --

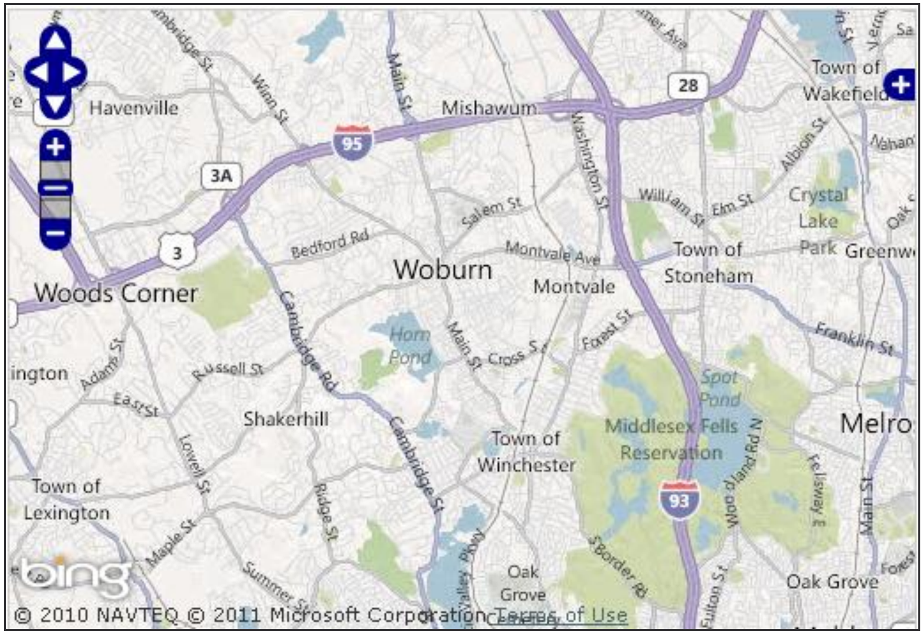
Shipper: --

Consignee: --

Hazards: Add Hazard

ZK Server+Client Fusion

- ZK Server+Client Fusion architecture allows us to wrap Javascript libraries to the backend Java developers
- OpenLayers
  - Free Maps for the Web (BSD License)
  - Pure JavaScript library for display map data
  - No server-side dependencies



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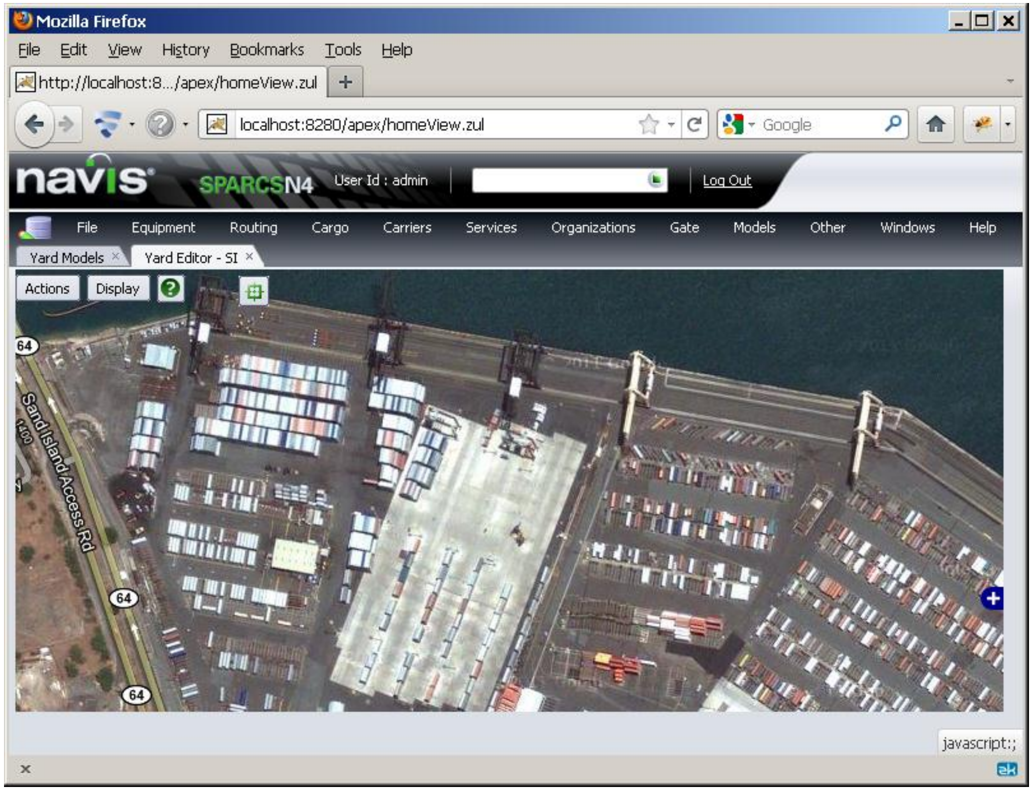
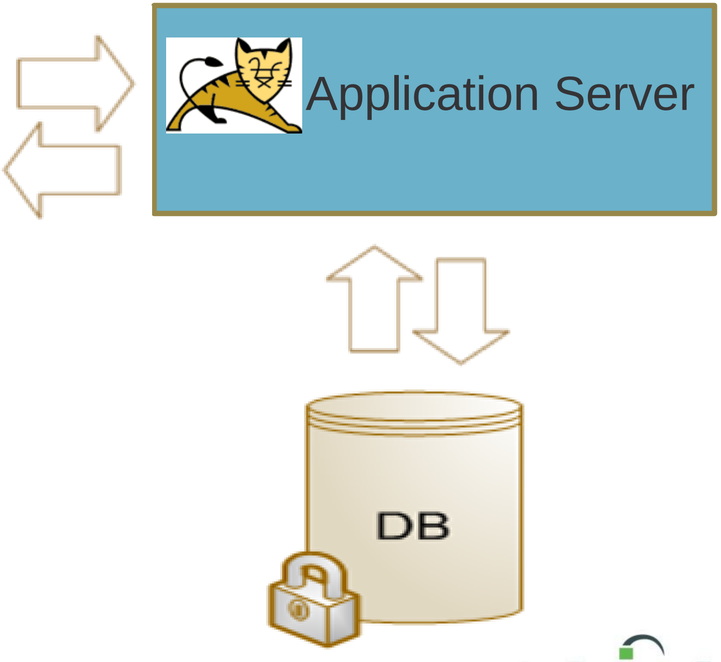
ZK Server+Client Fusion with OpenLayers

- Yard Planning and Control Application
- Replace existing C++ rich-gui desktop program
- [demo]


Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://localhost:8.../apex/homeView.zul
localhost:8280/apex/homeView.zul
Google
navis
SPARCSN4
User Id : admin
Log Out
File Equipment Routing Cargo Carriers Services Organizations Gate Models Other Windows Help
Yard Models
Yard Editor - SI
Actions
Display
64
Sand Island Access Rd
javascript:;



Application Server

DB

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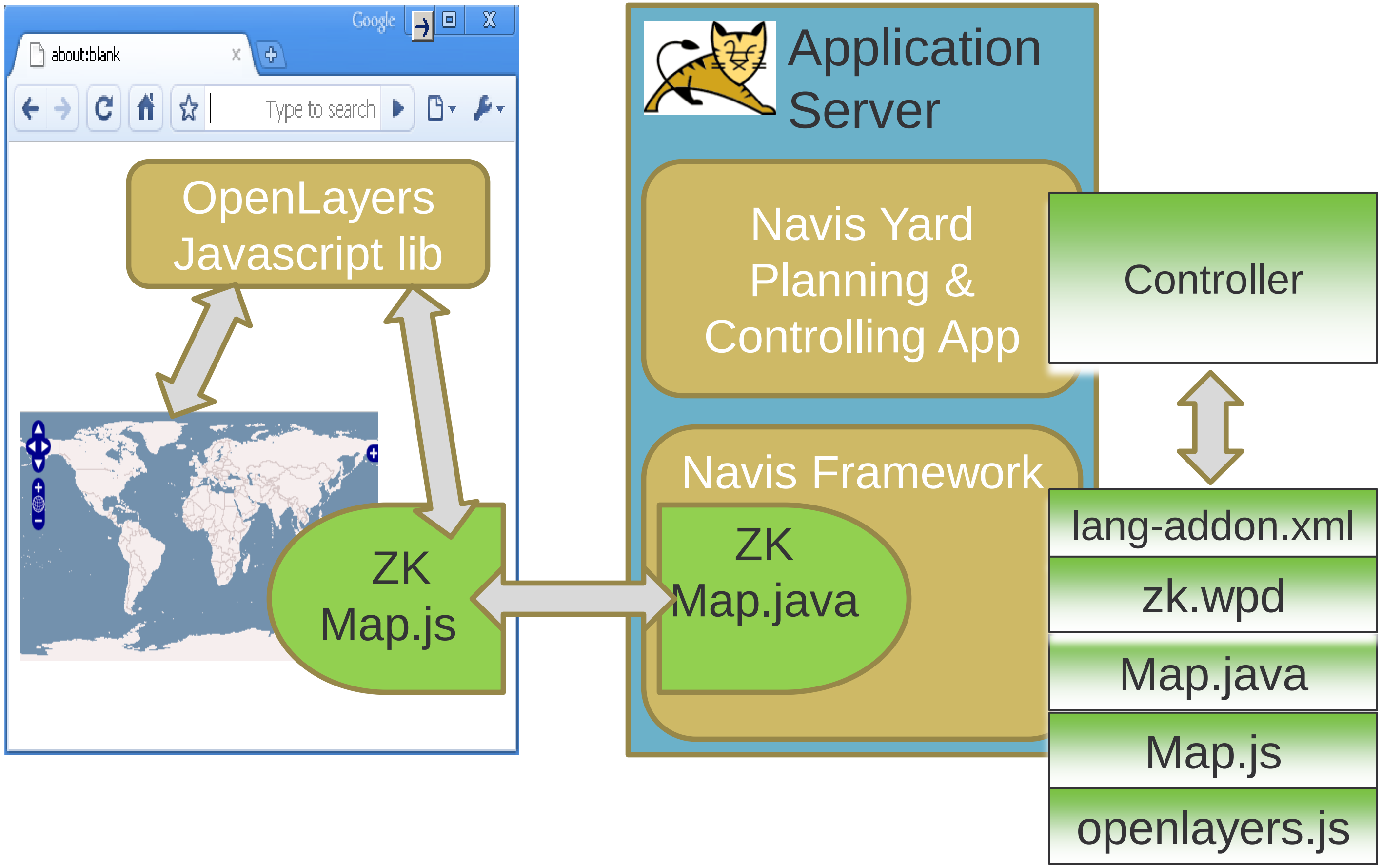
ZK Server+Client Fusion with OpenLayers



1. Populate map data to client
2. Handle forwarded events from client

1. Encapsulate mapping functionality
2. Send/receive client map events

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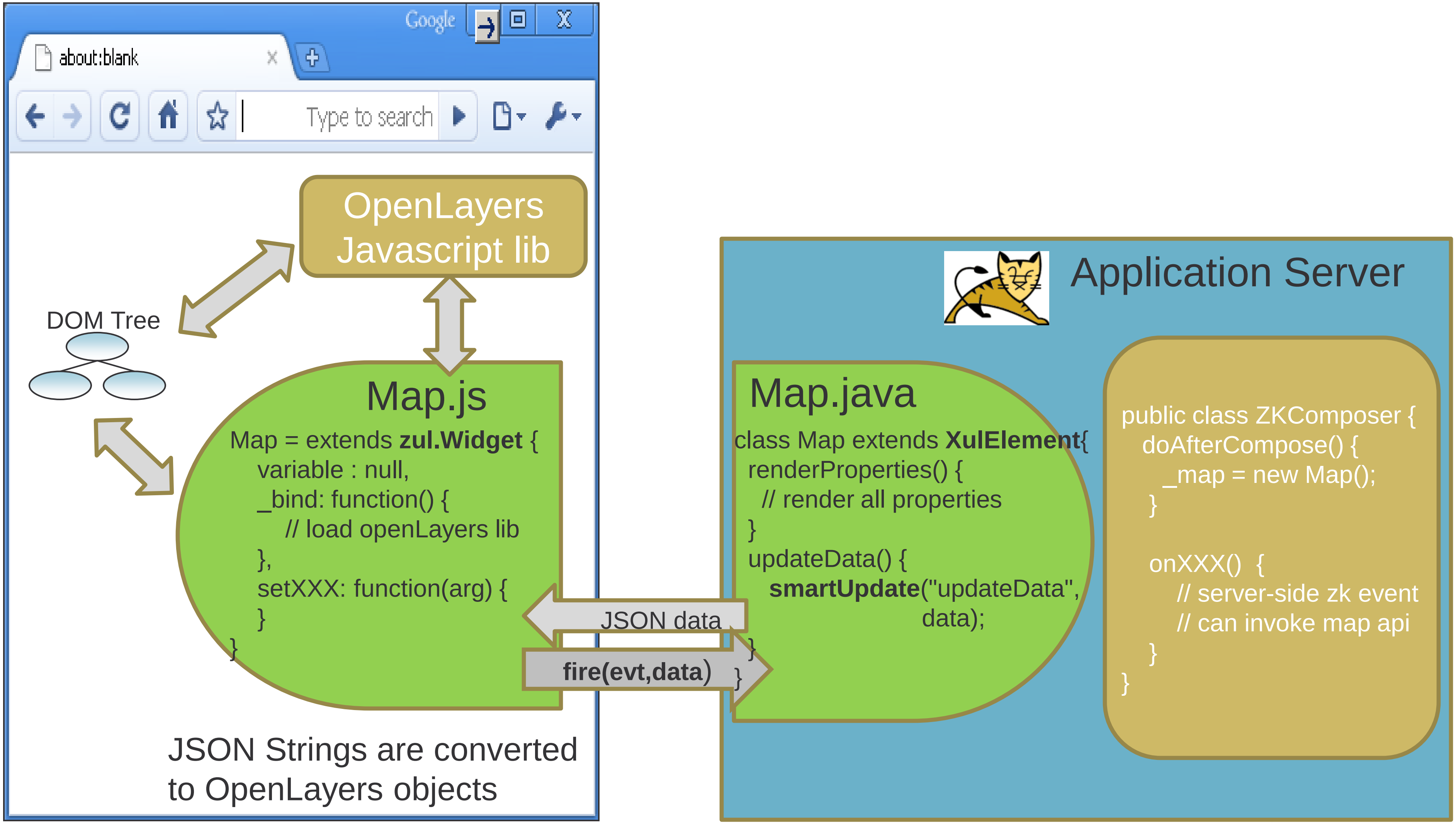

```
Map = extends zul.Widget {
    variable : null,
    _bind: function() {
        // load openLayers lib
    },
    setXXX: function(arg) {
    }
}
```

```
class Map extends XulElement{
  renderProperties() {
    // render all properties
  }
  updateData() {
     smartUpdate("updateData",
                         data);
  }
}
```

```
public class ZKComposer {
  doAfterCompose() {
     _map = new Map();
  }

  onXXX()  {
     // server-side zk event
     // can invoke map api
  }
}
```

JSON Strings are converted to OpenLayers objects

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Testing

- Selenium Unit Tests
  - Switch in IdGenerator for non-production build

```
 <system-config>
     <id-generator-class>com.navis.framework.zk.util.ZIdGenerator</id-generator-class>
</system-config>
```

  - Give unique IDs to our components for selenium to identify
- QTP (HP QuickTest Pro)
  - Integration Test
  - Add custom Javascript plugins
  - Access ZK components in the client-side context, using ZK client API

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Debugging Tips

- Install Eclipse + ZK Studio
  - Create sample program for learning and testing
- Install Firefox with Firebug and ZK Jet
  - Help identify the problems
  - Generate ZK zul which can be copied and pasted out
  - Debug in an Eclipse project
- User Forum
- ZK Support
  - Sample zul
  - Video capture

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