Introduction to the Dojo Toolkit

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Key elements of Ajax

- JavaScript
  - Orchestrates the Ajax user experience
- Cascading Style Sheets
  - Defines the visual styling of page elements
- Document Object Model (DOM)
  - Organizes the view
    - by presenting the structure of web pages as a set of programmable objects that can be manipulated with JavaScript.
- XMLHttpRequest
  - Enables the retrieval of data from web resources as a background activity.

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Defining principles of Ajax

- The browser hosts an application, not content
- The server delivers data, not content
- User interaction with the application can be fluid and continuous
- Ajax development is real coding and requires discipline
  - The Ajax “application” must run without breaking, slowing down, or generating memory leaks.
  - Requires writing high-performance, maintainable code following the same discipline applied to server resources

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Ajax requests types ?

- RESTful
  - An Architectural Style, Not a Standard.
  - Entity Oriented
  - Client-Server: a pull-based interaction style: consuming components pull representations.
  - Stateless: each request from client to server must contain all the information necessary to understand the request, and cannot take advantage of any stored context on the server.
  - Uniform interface: all resources are accessed with a generic interface (e.g., HTTP GET, POST, PUT, DELETE).
  - Named resources - the system is comprised of resources which are named using a URL.
  - **http://<host>/customer**
    - GET: Returns list of customers
    - POST: Creates Customer Record
  - http://<host>/customer/roland
    - GET: Returns Roland customer record
    - PUT: Updates Roland Record
    - DELETE: Delete Roland Record
- Vanilla XML (Not SOAP)
- JSON (JavaScript Object Notation)
- SOAP (Non RESTful)

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JSON

- Java Script Object Notation

```
var myJSONObject = {"bindings": [ {"ircEvent": "PRIVMSG",
"method": "newURI", "regex": "^http://.*"}, {"ircEvent":
"PRIVMSG", "method": "deleteURI", "regex": "^delete.*"},
{"ircEvent": "PRIVMSG", "method": "randomURI", "regex":
"^random.*"} ] };
```

- JavaScript equivalent of :
  - XML, ValueObject, Cargo Beans
- JSON-RPC can be used to send Serialized JavaScript from Browser to Server.
  - Alternative to RESTful

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Ajax Adoption

- Issues:
  - JAVASCRIPT IS DIFFICULT!
    - Difficult to code, debug, make portable, etc…
  - JSON is faster than XML, community knows this.
  - JSON or REST is preferred over SOAP in most popular frameworks
- Success of Ajax will be on tools and frameworks that can hide as much JavaScript as possible.
  - Frameworks needed in the browser.
    - **Dojo**
  - Tooling needed
    - **Eclipse Ajax Toolkit**

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Dojo Toolkit

IBM is supporting the Dojo Toolkit

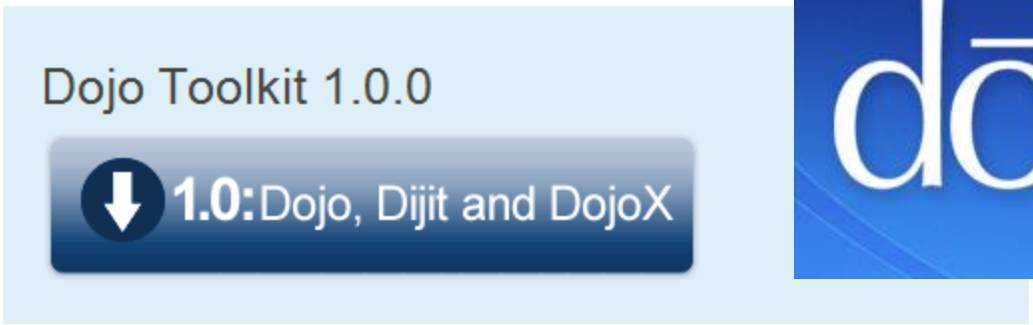
Good News Ajax works with WebSphere and Portal Server Today

IBM sees this as one of the most flexible of all the toolkits on the current market.

Dojo has lots of interesting features

IBM has successfully included developers as contributors to the project

IBM will be including it future product releases



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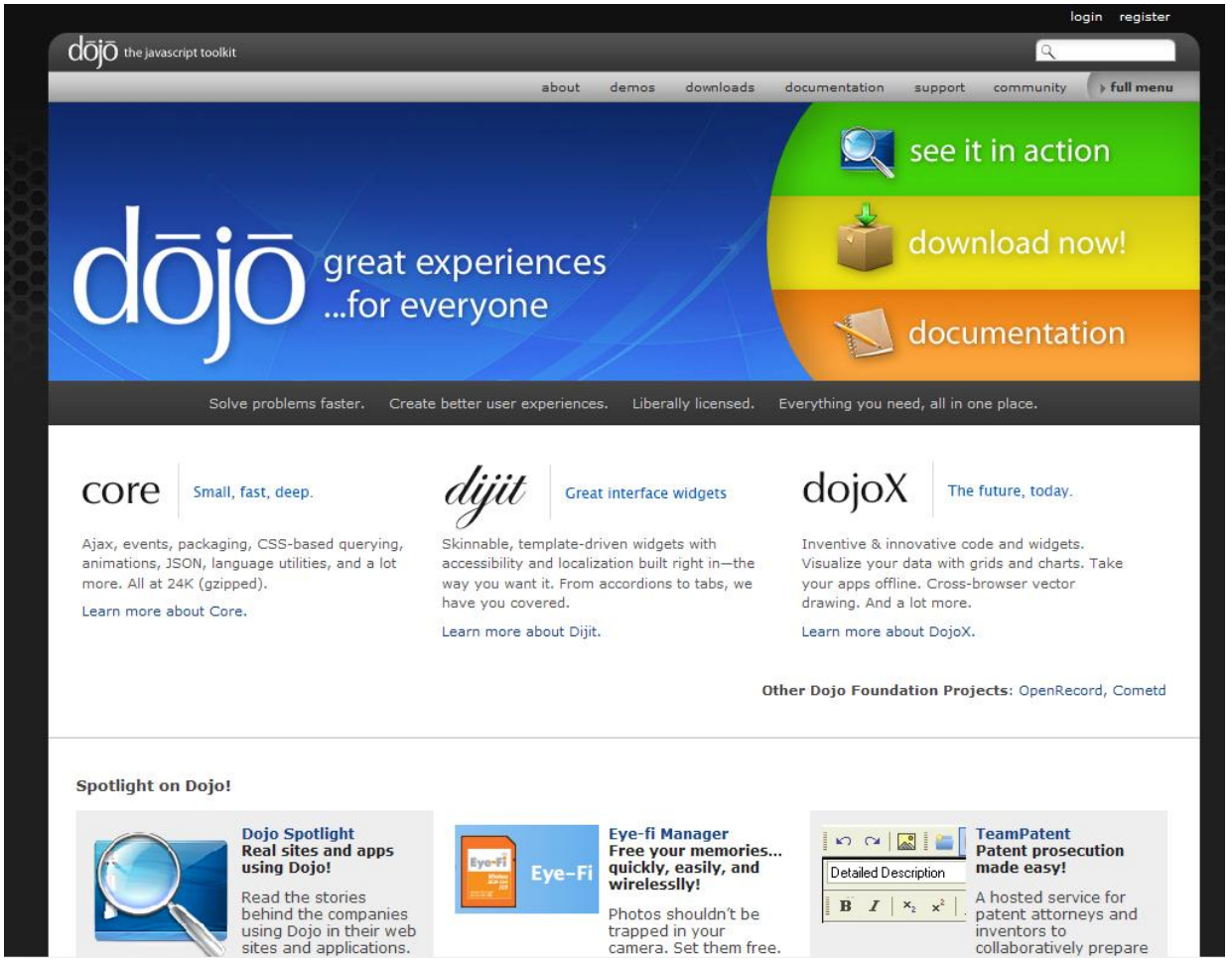
Dojo Website

www.dojotoolkit.org



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Dojo Broswer Toolkit

- Dojo is an Open Source DHTML toolkit written in JavaScript. It builds on several contributed code bases.
  - Provides Rich Set of Widgets
  - Web UI Framework
  - Rich Event handling System
  - General Purpose HTML Libraries
  - Several other utilities
  - Math, XML to JS parsing, etc…
  - Turbo Ajax Grid Widget

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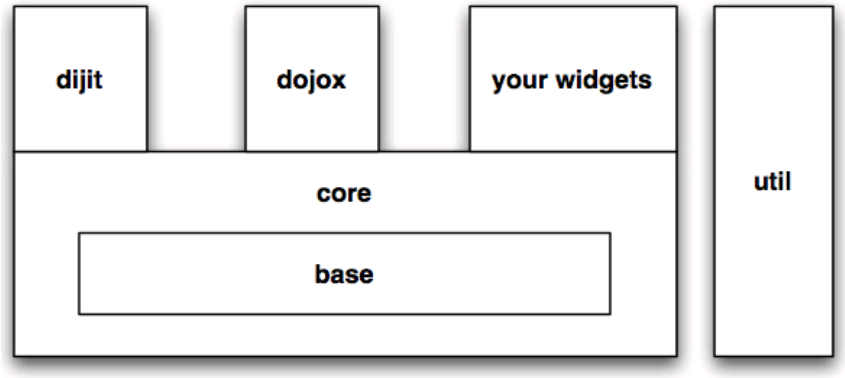
Dojo Architecture

- Base
  - The kernel of the toolkit wrapped into a 25k js file (dojo.js). Base bootstraps the toolkit, includes AJAX utilities, class based inheritance, packaging system and more
- Core
  - Provides addition facilities on top of the base for accessing data stores, effects such as wipes/slides, internationalization (i18n) and back-button handling among other things. Separate package keeps base small
- Dijit
  - Shorthand for "Dojo widget". Could refer to a single Dojo widget (a dijit) or to the entire component of the toolkit containing all of Dojo's widgets (Dijit)
- DojoX
  - “Dojo Experimental" and contains features that stand a chance of one day migrating into Core, Dijit or even a new module. A great proving ground for new features while maintaining standards of core and base.
- Util
  - A collection of Dojo utilities (more later)



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Dojo Core: “Base”

Dojo “Base” libraries are Dojo “Core” functions that are always available inside the base dojo.js bootstrap.

- Module Loader
- Lang Utils & Array Extras
- Cookie functions
- Query, Node & Style Utils
- I/O (XHR in Base)
- JSON serialization
- Events (simple connect)
- Color functions
- Browser detection
- URL functions
- Doc Load/Unload Hooks
- Effects
  - fade, slide, anim props

Note: For special-case builds, it is possible to create lighter-weight versions of dojo.js; however, the standard profile always includes the above functions in dojo.js

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Dojo “Core”

Dojo “Core” libraries are modules that are common to **most** Ajax applications. They are optionally included using dojo.require()

- Drag N Drop
- Undo
- String
- Rpc
- I18n
  - Date
  - Number
  - Currency
- Html & Style Extras
- Math
- String functions
- Topics
- Data Access
- Regular Expressions
- Debug (via Firebug Lite)
- Build System
- Markup Parser
- OpenAjax Hub 1.0

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Core: i18n

- Resource bundles
- Build creates optimized single-hit loading per locale
- Format and Parse for Dates, Numbers, Currencies
- CLDR used for localization data
- Embedded (English) UI strings have been broken out into bundles
- Debug and development strings remain in English
- Web page content (non-widget) must be localized by other means, typically on server

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Dojo “Dijit”

- **Form Widgets**
  - Button
    - DropdownButton
    - ComboButton
    - Checkbox
    - Radio
  - ComboBox
- CheckBox
  - Form
  - Select , FilteringSelect ✇
  - Textbox
    - Validation
    - Currency
    - Date, Time
    - Integer
  - Textarea
  - Slider
  - NumberSpinner
  - InlineEditBox
  - DropdownCalendar

- **Layout Widgets**
  - AccordionContainer
  - ContentPane
  - PageContainer
  - TabContainer
  - LinkPane
  - LayoutContainer
  - SplitContainer
  - StackContainer
  - Dialog

- **Advanced Widgets**
  - Declaration
  - Editor, RichText
  - ContextMenu
  - ProgressBar
  - Toaster
  - Toggler
  - Toolbar
  - Tooltip
  - ColorPalette
  - Tree ✇
  - Grid ✪✇
  - Chart ✪✇

✪ Available via dojox
✇ Supports data binding

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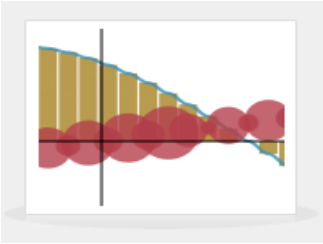
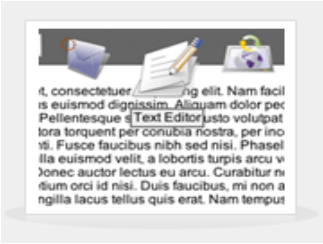
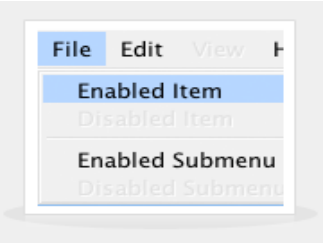
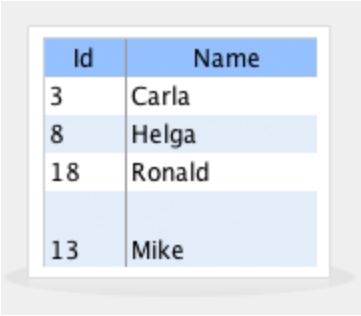
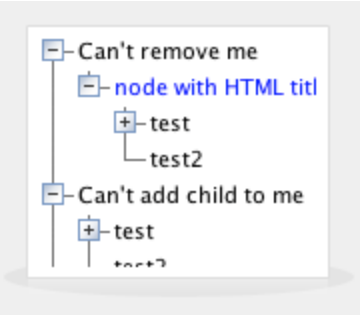
Sample Dojo Widgets

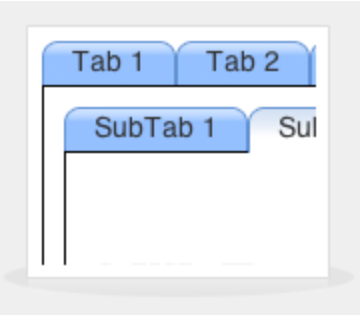












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Dijit (cont.)

- **Core Widget Quality**
  - Internationalized
  - Accessible
  - Standard Look & Feel
  - Developer documentation
    - API
    - Manual
- **Built-in Data Binding**
  - Tree
  - Grid
  - Select
  - Chart
- **Supported Browsers**
  - Windows
    - IE6/7
    - Firefox 2/3
    - Safari 3 on Windows,
  - Mac
    - Safari 3
    - Firefox 2/3
  - Linux
    - Firefox 2/3

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Dijit Accessibility

- Keyboard support in IE6+, FF2.0+
- Support for High Contrast Mode
  - IE and FF
- Full screen reader support in FF only
- Exceptions:
  - Keyboard support for drag and drop not guaranteed
  - Widgets will not function properly with CSS turned off due to heavy reliance on positioning
    - However, for Section 508 US Access Board – Gov't requirement, can claim "equivalent facilitation" for low-vision users

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Dijit i18n

- Dijit widgets are fully localized
- Dojox widgets are localized best-effort
- Resource translation for **Dijit** widgets to G1 & G2 languages (1.0 and later)
- Bidi
  - Dijit widgets are Bidi enabled in v1.0
  - Chart & Grid will be Bidi enabled in v1.1

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Grid

- General Features
  - Sub-grids, nested grids
  - In-place editing
  - Context menus and tooltips specific to a particular row or column
  - Data sorting through sort functions or custom sort filter functions
  - Data binding: dojo.data
  - Cell formatters for separation of data from layout
  - Documentation and unit tests

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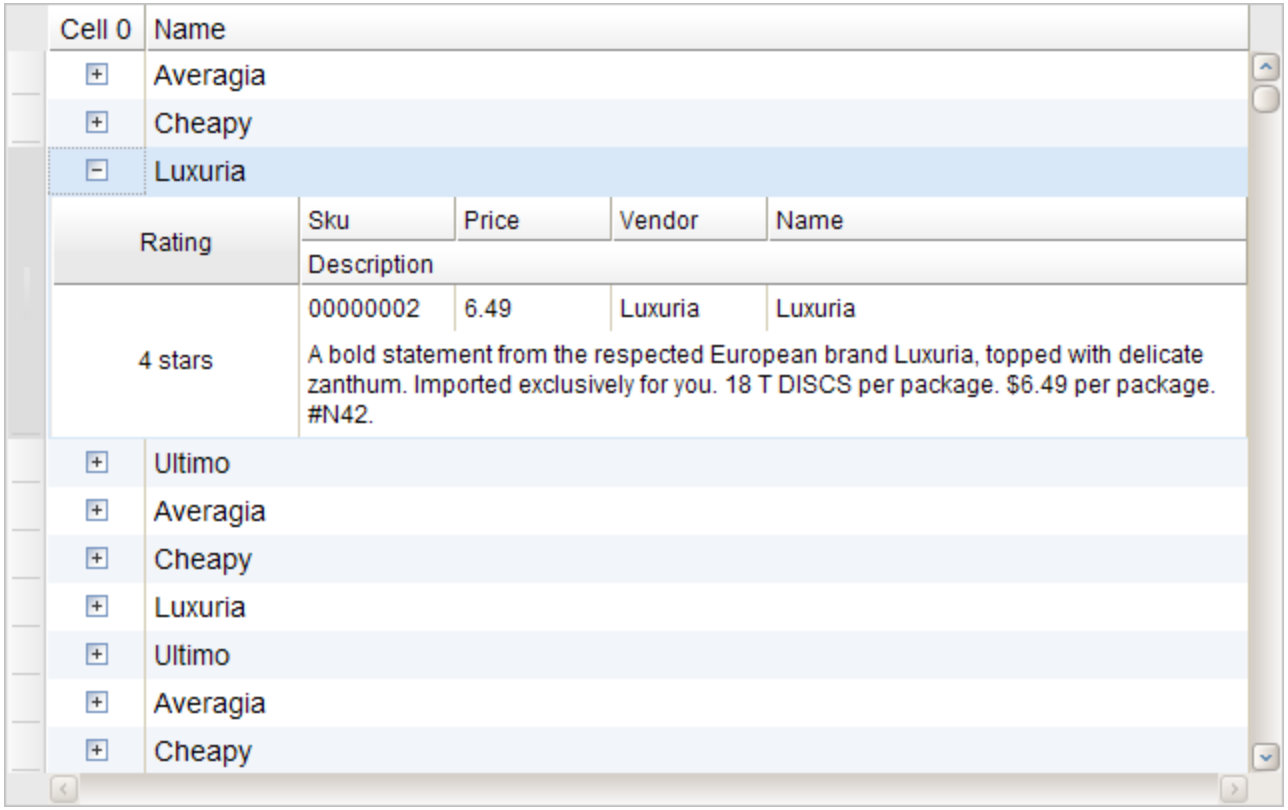
Grid

Sub-grids



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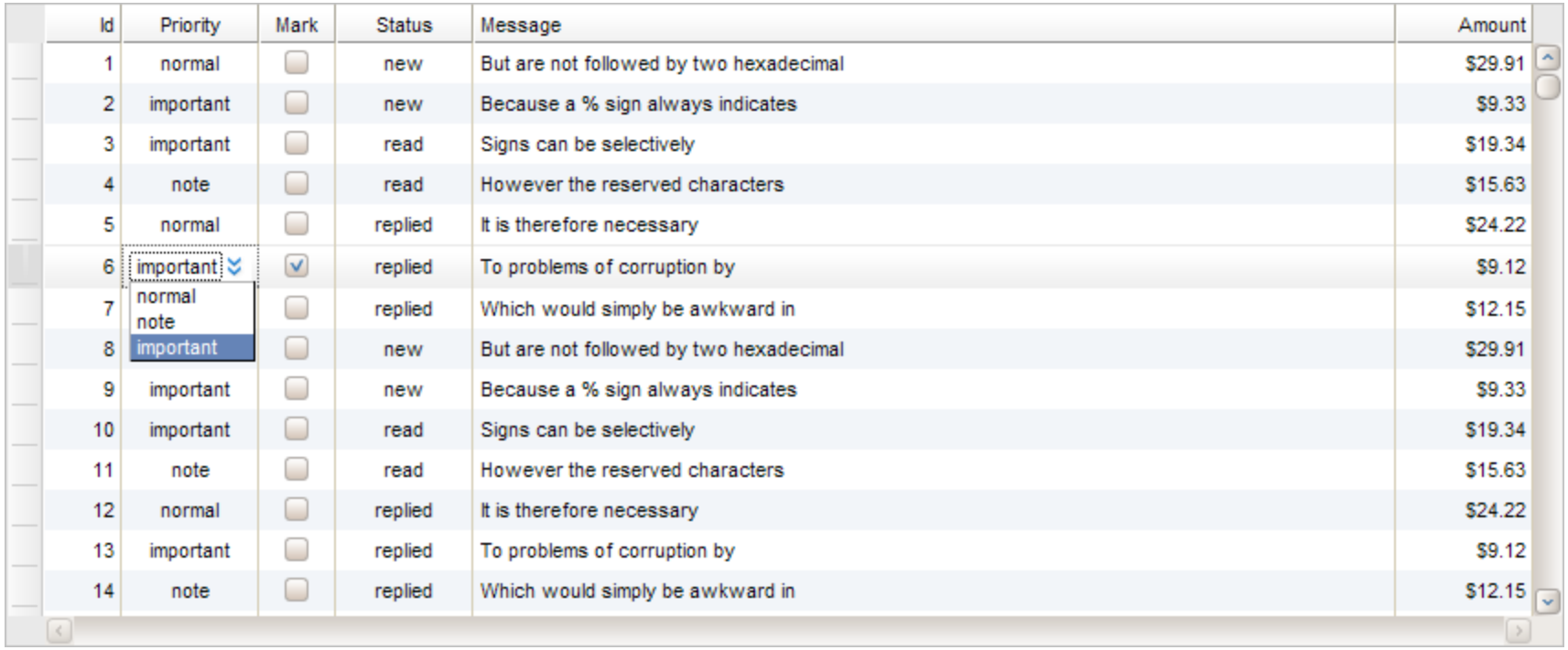
Grid

Cell Editors – Using Digit/Custom Editors



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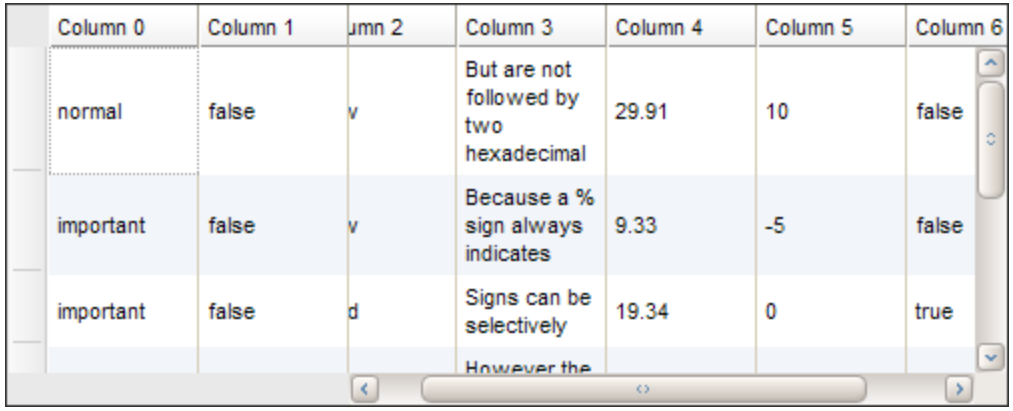
Grid

Subviews (Column locking)



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Grid

Custom CSS Styling

Column 0	Column 1	Column 2	Column 3	Column 4	Column 5	Colun
normal	false	new	But are not followed by two hexadecimal	29.91	10	fals
important	false	new	Because a % sign always indicates	9.33	-5	fals
important	false	read	Signs can be selectively	19.34	0	true
note	false	read	However the reserved characters	15.63	0	true
normal	false	replied	It is therefore necessary	24.22	5.5	true
important	false	replied	To problems of corruption by	9.12	-3	true

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Data and Data Binding

- **Dojo Data API**
  - Read
  - Write
  - Result
  - Identity
  - Notification
- **Dojo Data Stores**
  - Item Store (JSON-based)
- **DojoX Data Stores**
  - CSV
  - XML Item Store
  - Flickr, Flickr REST, Picassa
  - HTMLTable
  - OPML
- **DojoX Wiring**
  - Wire
  - DataWire
  - CompositeWire
  - Actions
  - Invocation
  - Data, DataStore
  - Service
  - Transfer
- **Data Bound Widgets**
  - Select
  - Grid
  - Tree
  - Chart

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DojoX - Extension Libraries

- Comet/Bayeux
- Offline **
  - Google Gears
  - Flash Storage
- Crypto **
- Vector Graphics
  - 2d
  - 3d
- XML
- XSLT
- Logging
- Uuid

- Collections
- Presentation
- Timing
- Validation
- UUID
- Posix Date
- Grid
- Charting
- Specialized Data Binding
- DTL (Django Template Language)

*** Not included in IBM Distribution*

Unless otherwise stated, all dojox. code is available on an **as-is** basis.*

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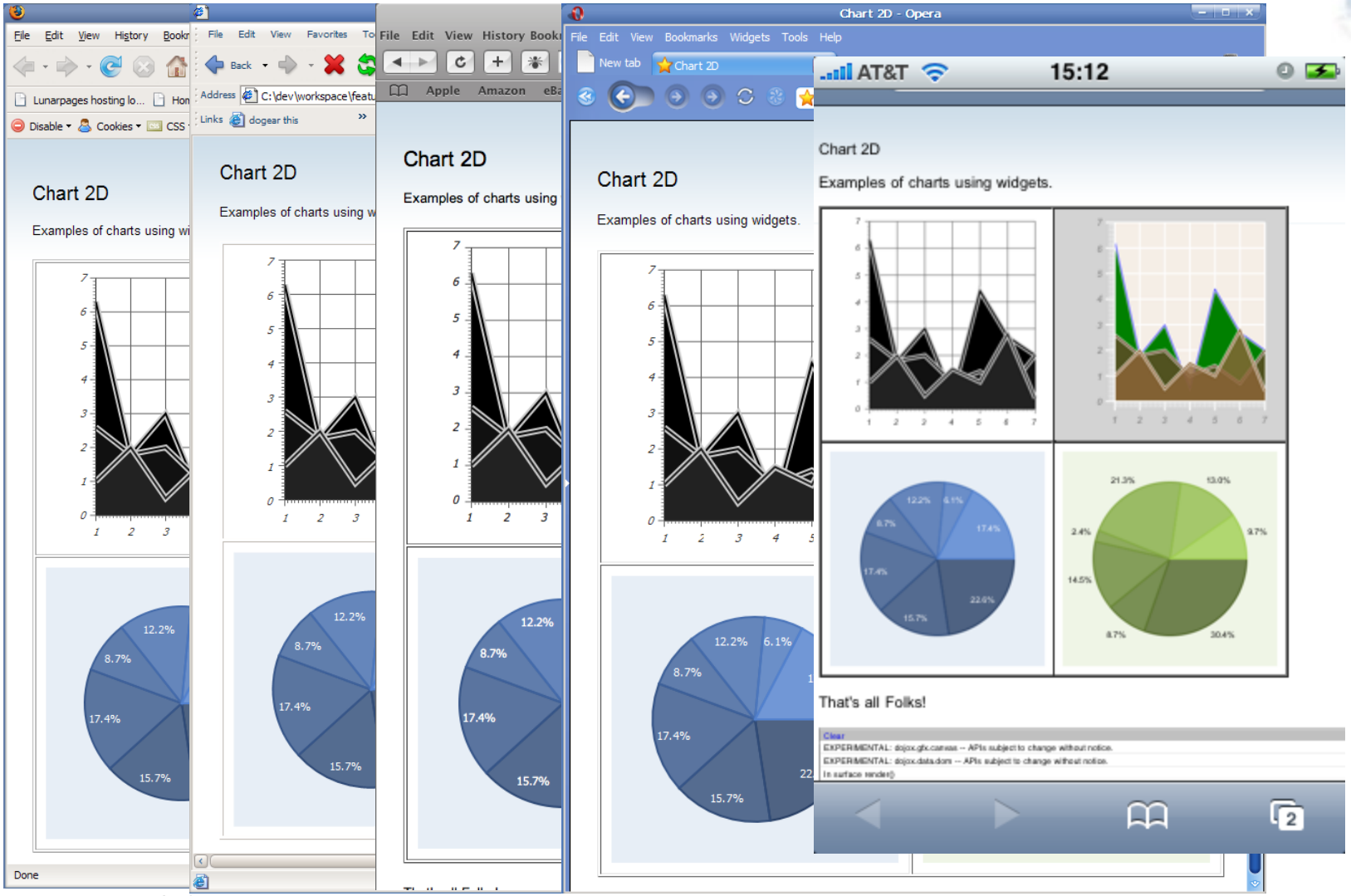
Gfx: 2d Vector Graphics



Firefox 2.x+ [SVG,Canvas]

IE6+ [VML,Silverlight]

Safari (Webkit3) [SVG,Canvas]

Opera 9 [SVG]

iPhone (Webkit2) [Canvas]

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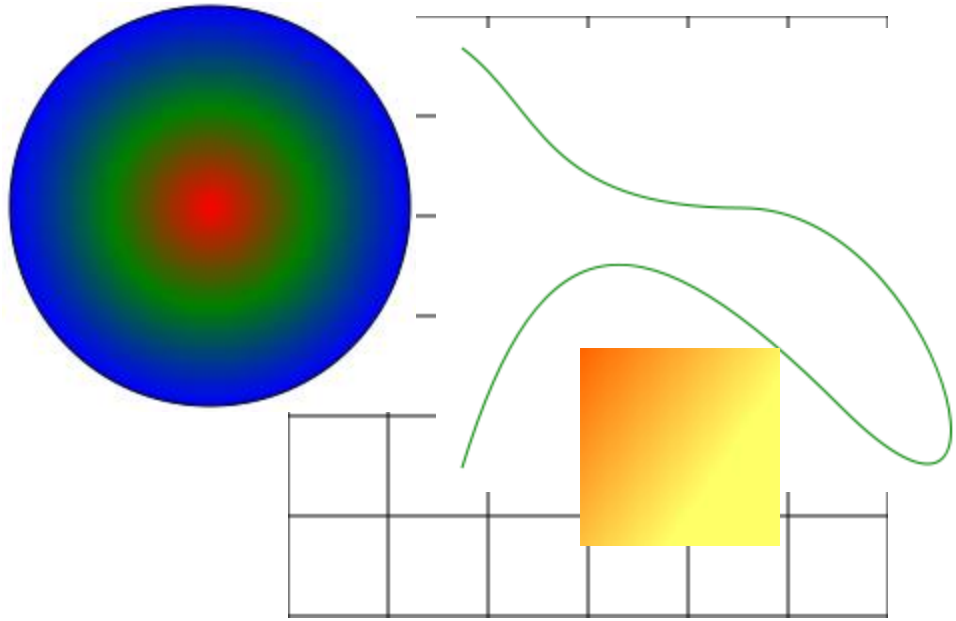
Gfx: 2d Vector Graphics

- Cross-browser, Interactive, Programmatic API
- Multiple Renderers
  - SVG
  - VML
  - Canvas*
  - Silverlight
- SVG Import
- 2d Primitives
  - Surface
  - Polygon
  - Rectangle
  - Ellipse/Arc
  - Image
  - Text/TextPath
  - Paths (Based on SVG Path)
  - Bezier (Cubic, Quadratic)
  - Strokes & Fills (alpha transparency, linear/radial gradients)



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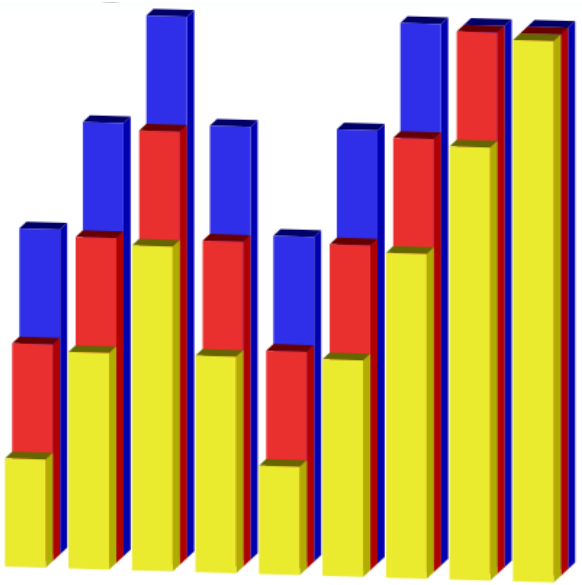
Gfx3d: 3d Graphics

- **Interactive Cross-browser 3d Graphics**
  - Programmatic API
  - Intended for Charting & primitive 3d rendering
  - Currently a layer on top of gfx 2d vector graphics
    - Mappable in future over Canvas3d (for native acceleration)

- **Chart Types**
  - Bar (2d/3d)
  - Horizontal Bar
  - Stacked Area
  - Line
  - Area
  - Curved Area
  - Scatter
  - Pie charts



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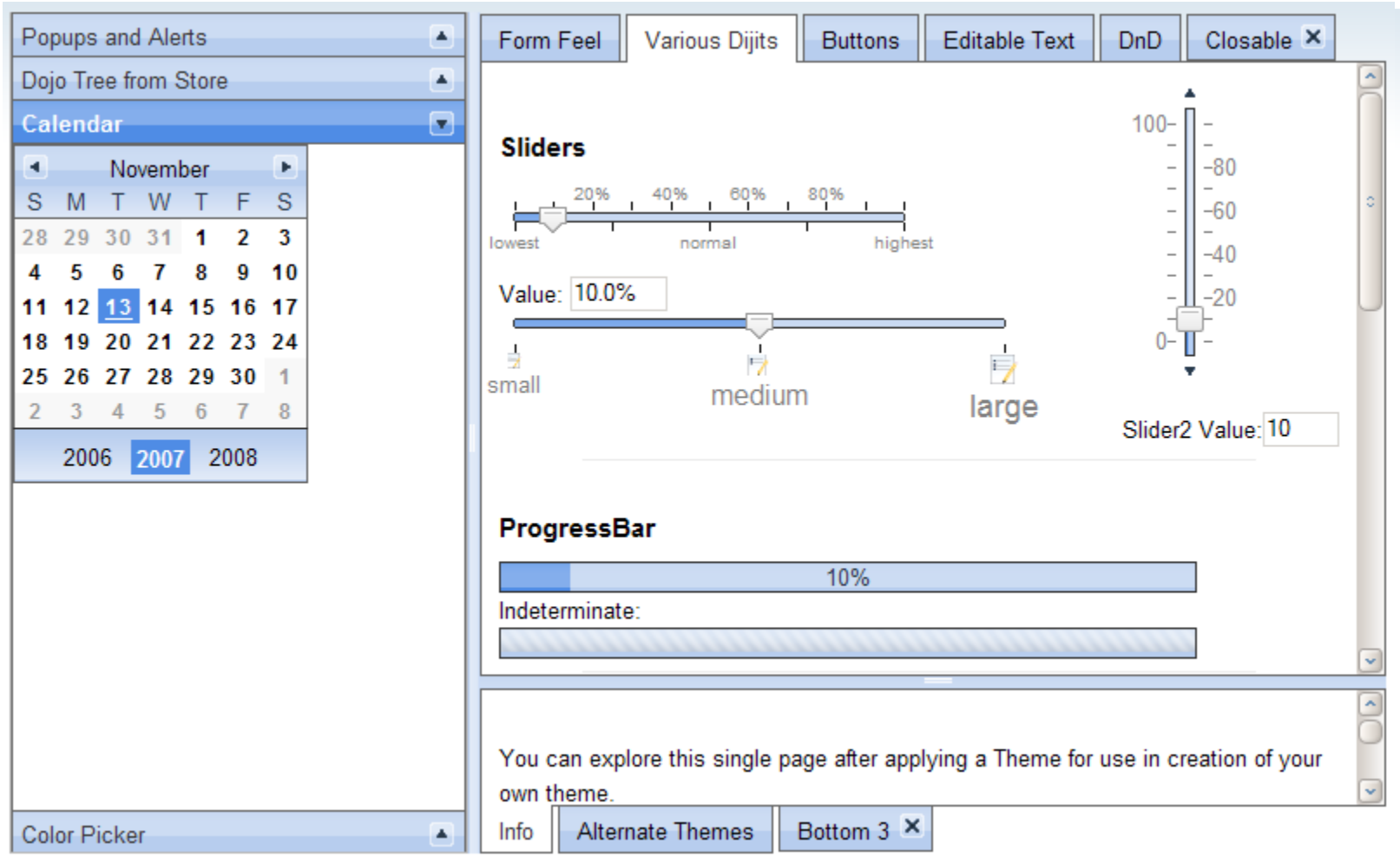
Out-of-box Themes

“Tundra” “Soria”



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Dojo Modules and Packages

- **Modules**
  - Dojo's code is split into logical units called modules. These are much like packages in java, except that in dojo a module can contain both constructors (like classes in java) and simple functions.
- **Packages**
  - In the simple case, a dojo module is defined in a single javascript file, but sometimes, a single module is split into multiple files.
  - Each of these files is called a package.
    - The line:

      `dojo.require("dojo.html.extras")`

      will include the file `src/html/extras.js`, which in turn defines a number of functions (but not all the functions) in the dojo.html module.

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Dojo Modules and Packages

- Using Dojo in a page

```
<script type="text/javascript" src="../../dojo.js"></script>
<script language="JavaScript" type="text/javascript">
 dojo.require("dijit.Tooltip");
 dojo.require("dijit.Toolbar");
 dojo.require("dijit.Menu");
 dojo.require("dijit.Dialog");
</script>
```

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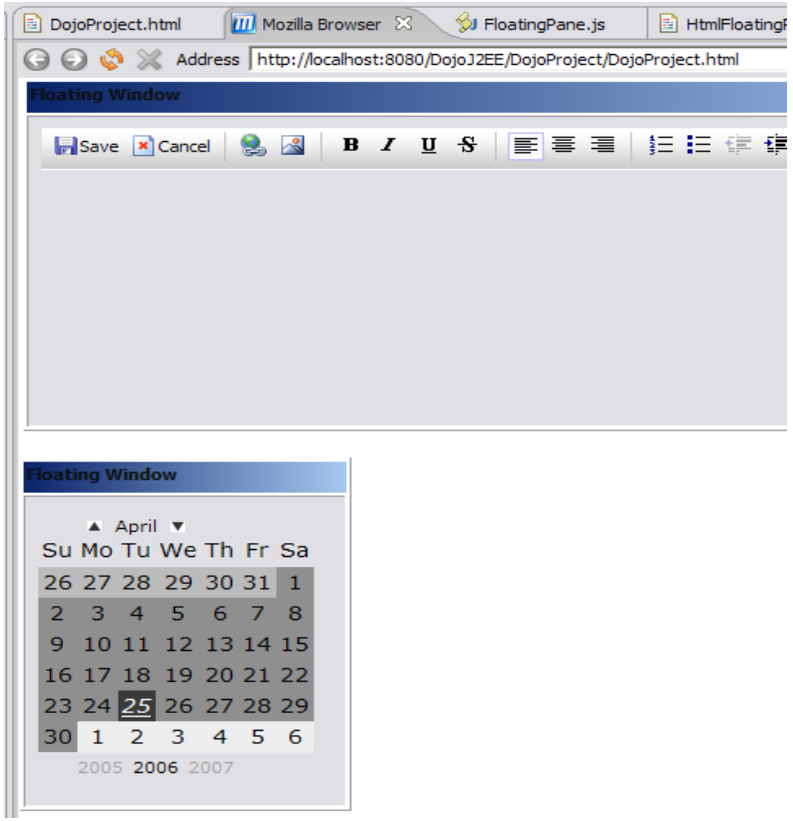
Using Dojo Widgets

```
<div dojoType="FloatingPane" title="Floating
    Window" constrainToContainer="1"
    style="width: 75%; height:
    250px; left: 0px; top: 20px; background:
    white;">
    <div class="dojo-Editor">

    </div>
</div>

<div dojoType="FloatingPane" title="Floating
    Window" constrainToContainer="1"
style="width: 25%; height: 250px; left: 0px;
    bottom: 20px; background: white;">
    <div dojoType="DatePicker">

    </div>
</div>
```



- Can create/access widgets from JS or DIV

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Dojo IO

- Dojo Transports
  - XMLHttp - Default
  - IFrame I/O - The IFrame I/O transport is useful because it can upload files to the server. Example usage
  - ScriptSrcIO - Due to security restrictions, XMLHttp cannot load data from another domain.

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AJAX with Dojo

Simplifies API for making asynchronous calls.

```
dojo.xhrGet( {
      url: "http://hostname:9080/services/subscriptions/json",
      handleAs: "json",
      timeout: 9000, // Time in milliseconds

      // The LOAD function will be called on a successful response.
      load: function(response, ioArgs) {
         subscriptions = response.subscriptions;
         var subArea = document.getElementById("root");
         for(var i = 0; i < subscriptions.length; i++)
         {
                  createPublicationZone(subArea,subscriptions[i]);
                  sendSubscriptionRequest(subscriptions[i]);
         }
         return response;
       },

      // The ERROR function will be called in an error case.
      error: function(response, ioArgs) {
        console.error("HTTP status code: ", ioArgs.xhr.status);
        return response;
      }
    });
```

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Dojo JSON/RPC

- RPC Style Remote invocation
- ➢ Service Description

```
{"SMDVersion":".1","objectName":"StockService",
 "serviceType":"JSON-RPC",
 "serviceURL":"/DojoSOAWebBinding/JSON-SCA/StockServicePartner",
 "methods":[
  {"name":"getStockData",
      "parameters":[{"name":"symbol","type":"STRING"}]},
       {"name":"addAcquisition",
     "parameters":[
       {"name":"acquisitions","type":"STRING"}]}
 ]
}
```

- ➢ Service Access

```
function submitStock()
{
   try
   {
    stockService = new dojo.rpc.JsonService("../StockService.smd");
    var stockInput = dojo.byId('stockInput');
    stockService.getStockData(stockInput.value).
    addCallback(stockResultCallBack);
  }
  catch(e)
  {
    alert(e);
  }
}
```

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Dojo Events

- Events in JavaScript or Dojo based applications are essential to making applications work.
- Connect a simple widget event to javascript function:

```
function helloPressed(){
  alert('You pressed the button');
}

function init(){
  var helloButton = dojo.widget.byId('helloButton');
  dojo.event.connect(helloButton, 'onClick', 'helloPressed')
}
```

- Can also connect two JS objects, i.e. when foo is called on obj1, bar is called on obj2:

```
dojo.event.connect( obj1, "foo", obj2, "bar", "aroundFunc");
```

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Dojo Publish Subscribe Events

- Use publish and subscribe to communicate events anonymously between widgets or any JavaScript functions of your choosing

```
var foo = new function() {
            this.init = function()
            {
            dojo.subscribe("/mytopic", this, processMessages);          }

            function processMessages(message)
            {
                        alert("Message: " + message.content);
            }
}
var bar = new function()
{
   this.showMessage = function(message)
   {
            dojo.publish("/mytopic", {content: message});
   }
}
foo.init();
bar.showMessage("Hello Dojo Master");
```

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Dojo Utilities

- Dojo Objective Harness
  - A testing framework
- ShrinkSafe based on Rhino
  - Make highly compressed dojo packages for production use
- General purpose libraries
  - html, string, style, dom, regular expression, and several other utilities.
- Data structures
  - Dictionaries, ArraryLists, Queues, SortedList, Sets, and Stack.
- Visual Web
  - animation affects, validation, drag and drop, and several others
- Math and cryptography
- Storage components
  - Browser storage
- XML parsing

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Summary

- Dojo offers a powerful component based JavaScript library that is supported on IBM Software Platform
- Very powerful programming model and dijit library
- Offers an abstraction above proprietary solutions like Flex and Silverlight
- Is an evolutionary step for modern day RIA solutions not revolution
- Dojo is build on the standards that exist in Browsers today.

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Additional Resources

- Ajax for WebSphere
  - https://www14.software.ibm.com/iwm/web/cc/earlyprograms/websphere/ibmajaxw/
- Dojo
  - http://www.dojotoolkit.org/
- JSON
  - http://www.json.org/
- Dojo SOA clients
  - http://www-128.ibm.com/developerworks/websphere/library/techarticles/0606_barcia/0606_barcia.html
- Eclipse Ajax Toolkit
  - http://www.alphaworks.ibm.com/tech/ajaxtk
  - http://www.eclipse.org/atf/
- Project Zero Site
  - http://www.projectzero.org

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