A word from our sponsor

- Dell's Vancouver software product development team is growing!
- We're a small dynamic team using cutting edge products to develop great software.
- If you have a passion for software, come speak with our team about the opportunities at Dell.
- We have current openings for developers (Front End and Java), QA and Pre-Sales Engineers.

About me

- Tommy Chan
- Polyglot developer interested in web technologies and different languages
- Reach me at tommytcchan@gmail.com
- Github (for slides and demo code): tommytcchan

Introduction to Knockout.js

Agenda

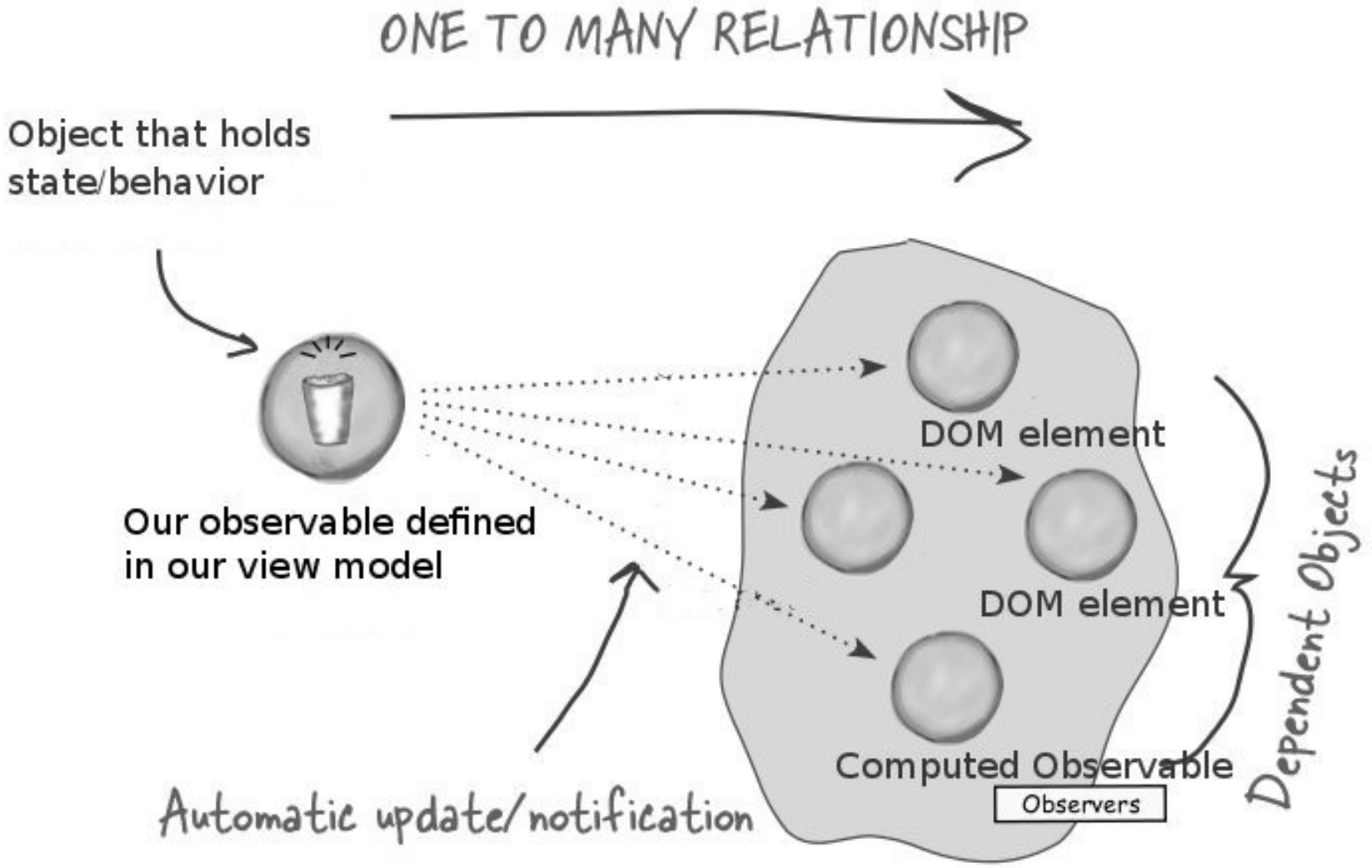
- Review the Observer pattern
- Introduction to the MVVM pattern
- Introduction to Knockout
- Observables/Observable arrays
- Default Bindings
- Custom bindings
- Using the mapping plug-in
- Common pitfalls/Gotchas

Review of the Observable Pattern

- Central to the KnockoutJS framework is the Observer pattern.
- The Observer Pattern defines a one-to-many dependency between objects so that when one object changes state, all of its dependents are notified and updated automatically.

  “Don't call me, I'll call you.”

Observer pattern - visually



MVVM - motivation

- Want to decouple the view and the view's data/behaviors (the view model).
- View defines how it should be displayed.
- The view model defines your data and behaviors.
- Knockout will manage the synchronization between your view and your view model (using the observer pattern).

Introducing the MVVM model

- MVVM stands for Model-View-ViewModel.
- The M and the V stands for the Model and View respectively.
- The difference here is the View Model, which as a model for the view.
- Theoretically this separates our data/behavior on the client side with the view, which is essentially the pattern.

Why use KnockoutJS

- Version 2.1.0
- Open sourced (MIT license)
- Under active development
- Tested/Works with different mainstream browsers
- Awesome tutorial

A sample teaser...

```
<script type="text/javascript" src="js/knockout-2.1.0.js"></script>
</head>
        <body>
        <p>Choose your costume:
                <select data-bind="options: availableCostumes, optionsCaption: 'Choose one...', value: selectedCostume"></select>
        </p>
        <div data-bind="with: selectedCostume">
                On Halloween this year, I will be a <span data-bind="text: $root.makeScaryCostume"></span>.
        </div>
        </body>
        <script type="text/javascript">
            function CostumeViewModel() {
                var self = this;
                self.selectedCostume = ko.observable();
                self.availableCostumes = ko.observableArray(['Pirate', 'Ghost', 'Banana']);
                self.makeScaryCostume = ko.computed(function() {
                        return "very scary " + self.selectedCostume();
                });
            };
        model = new CostumeViewModel();
        ko.applyBindings(model);
        </script>
</html>
```

Defining the view model

- First thing that we need to do is to define the view model that contains the model/behaviors to be associated with the HTML elements.
- This is done via a view model object.
- The view model can contain functions, variables, and observables.
- Example: example1.html

Binding the view model to the view

- KO uses the HTML 5 compliant custom 'data-bind' attribute to bind DOM elements to the view model
- Example usage:
  - Hello, my name is:
- Example: onewaybinding.html

Binding the view model to the view

- The data-bind attribute can accept multiple bindings.
- For example, a dropdown box can be bound to an observable array to populate its values and an observable so that the selected value is stored.
- Example: example1.html

Binding the model with the view

- To associate the view model with the view, a call to ko.applyBindings(model) needs to made.
- Eg.

```
ko.applyBindings(new CostumeViewModel());
```

- This is only required once!

Observables

- In order to take advantage of using Knockout, we need observables.
- Declare an observable like so:

```
var viewModel = {
   tweetContent: ko.observable();
}
```

- Whenever the value changes, it will notify everyone who subscribes to it (ie. DOM elements, derived observables).

Observables

- To read the value of an observable, invoke it:

```
myViewModel.name();
```

- To write the value, set it as a param:

```
myViewModel.name('Tommy');
```

- To write values to multiple observable properties, can using chaining:

```
myViewModel.name('Tommy').costume('pirate');
```

Observable Arrays

- Detects and responds to changes of a collection of things.
- Note that KO only tracks the objects in the array, **NOT** the state of those objects.
- Notifies listeners when the objects in the array are added or removed.

Observable arrays

- Property instantiated with the ko.observableArray(array) syntax:

```
self.tweets = ko.observableArray([
  new Tweet(“tweet1”),
  new Tweet(“tweet2”)
]);
```

- Observable arrays provides convenience methods:

```
tweet.remove(myOldTweet);
tweet.add(myNewTweet);
```

  - Convenience methods work in a consistent way across all browsers, so use them instead of native methods.

Remove() vs Destroy()

- Knockout provides a way for you to conveniently mark objects in arrays to be deleted (so you can send it back to the server), using the destroy() method.
- When using destroy(), KO will add a flag _destroy to each of the items to be removed, instead of actually removing it.
- Destroyed items won't display on the UI, but will show up and objects to be deleted as a _destroy flag set.

Computed Observables

- These are functions that are dependent on one or more observables, and will automatically update whenever any of these dependencies change.
- For example:

```
function AppViewModel() {
  this.firstName = ko.observable(“Tommy”);
  this.lastName = ko.observable(“Chan”);
  this.fullName = ko.computed(function() {
    return this.firstName() + " " + this.lastName() + “ is scary.”;
  });
}
```

Bindings

- Bindings define what actions they should perform given the model data.
- KO provides a set of bindings that you can use for showing elements on the UI.
- For example:
  - The default **text/html** binding:

```
<div data-bind="html: details"></div>
```

Default bindings

- The **visible** binding:

```
<div data-bind="visible:
shouldShowMessage">visible</div>
```

- The **css/style** binding:

```
<div data-bind="style: { color:
currentProfit() < 0 ? 'red' : 'black' }">
Profit Information</div>
```

- The **attr** binding:

```
<a data-bind="attr: { href: url, title:
details }">Report</a>
```

Default bindings

- KO also has bindings to the input/form elements.
  - The **value** binding

```
<p>Login name: <input data-bind="value: userName" /></p>
```

  - The **submit** binding

```
<form data-bind="submit: doSomething">
   ... form contents go here ...
<button type="submit">Submit</button>
</div>
```

  - The **event** binding

```
<div data-bind="event: { mouseover: enableDetails,
mouseout: disableDetails }">Mouse over me</div>
```

Control Flow

- Knockout supports a few other bindings related to control flow:
- **Foreach**, **if/ifnot**, and **with**:

```
<tbody data-bind="foreach: people">
  <tr><td data-bind="text: firstName"></td></tr>
</tbody>
<div data-bind="if: displayMessage">Here is a message.
Astonishing.</div>
<div data-bind="ifnot: loggedIn">Please login.</div>
```

With binding

- Dynamically add/remove view elements depending on whether the associated value is null/undefined or not.
- Used to display areas of your HTML... good for single page apps.
- Example: example1.html

Let's go back to our example

- With our knowledge, let us revisit the example earlier.
- Example: example1.html

Custom bindings

- Custom binding provide flexibility for more complicated use cases.
- Let's take a look at how a custom binding looks like...
- Example: custom-binding.html

Custom bindings

- A couple of things to note:
- 'update' function should be provided.
- Optional 'init' function can filled in as well.

Mapping JSON data as observables

- There is a cool plugin called the Mapping plugin, that will automatically bind JSON objects to observables.
- Essentially takes this:

```
var data = getDataUsingAjax();

viewModel.serverTime(data.serverTime);

viewModel.numUsers(data.numUsers);
```

Mapping JSON data as observables

- There is a cool plugin called the Mapping plugin, that will automatically bind JSON objects to observables.
- Essentially takes this:

```
var data = getDataUsingAjax();

viewModel.serverTime(data.serverTime);

viewModel.numUsers(data.numUsers);
```

Mapping Plugin

- ..and turn it to this:

```
var viewModel = ko.mapping.fromJS(data);
```

- Then every time data is sent from the server, you can update the UI like so

```
ko.mapping.fromJS(data, viewModel);
```

Quiz #1

- Time for a giveaway. What is the output in the text field for this example?
- Example: quiz1.html

Best practices

- Store all the application data in one place

```
<p>First name: <strong data-bind="text:
firstName"></strong>Tommy</p>
```

```
this.firstName = ko.observable();
```

  Do this instead:

```
<p>First name: <strong data-bind="text:
firstName"></strong></p>
```

```
this.firstName = ko.observable('Tommy');
```

- With the first way, KO does not know the value!

Quiz #2

- What's the difference between these two functions?

```
update: function(element, valueAccessor) {
  var currentValue = valueAccessor();
  $(element).button("option", "disabled",
  currentValue.enable === false);
}
update: function(element, valueAccessor) {
  var observable = valueAccessor();
  $(element).button(“option”, “disabled”, index ===
  observable());
  });
}
```

Common sources of errors

- In one case the valueAccessor is a return that returns a value, where as in the other case the valueAccessor returns a function.
- Use ko.utils.unwrapObservable(obj) for situations where you don't know if something is an observable or not.

Common source of errors

- It is a mistake to call ko.applyBindings() more than once.
- Common for people new to the framework to call applyBindings() for each ajax request.
- An example of why you shouldn't do this...
- See applybindings-twice.html

Gotcha: Observable Arrays

- Consider this example with observable arrays:

```
tweets = ko.observableArray({id: 1,
author: 'tommytcchan'}, {id: 2, author:
'somebody'});

tweets.remove({id: 1, author:
'tommytcchan'});
```

- What will happen??

Fix: Observable Arrays

- The solution is to pass a filter to the remove() method:

```
tweets.remove(function(item) {
   return item.id === 1;
});
```

- KO will iterate through the tweets collection and remove the one with the matching id.

Common sources of errors

- Consider this example:

```
<div data-bind="with: selectedCostume">
    On Halloween this year, I will be a <span
    data-bind="text: makeScaryCostume"></span>.
</div>
```

- Error is thrown by KO – it creates a context inside the DOM tree structure, so it is unable to reference the view model directly within the context.
- Use the built-in $root instead to refer to the main model. (ie. $root.makeScaryCostume)

A note about manual DOM injection and KO

- Try to not manipulate the DOM on your own natively (using jQuery or any other libraries).
- Knockout uses the observable pattern for the view and view model, so use that mechanism instead.
- There is logic that KO runs when it thinks a bound HTML element its no longer part of the DOM.

Not so positives

- Documentation on the ko.util methods are not so great...have to read the source code.
- One can argue that it's not a clear separation between view and view model with bindings and logic in the view.

Questions?

- Q + A.
- Comments?
- Slides and examples posted on github.