Web Sockets and SignalR Building the Real Time Web

DDD South West

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Agenda

- Introduction – What is Real Time? Interactive?
- Web Sockets
  - Who What When How?
  - Examples (Client and Server)
- SignalR
  - Who What When How?
  - Examples
- Web Sockets and SignalR

Real Time? Interactive?

- Real Time
  - Stock Market
  - Weather
- Interactive
  - Chat
  - Auctions
- How do we handle these on the web?

Web Sockets - What

- What is a Socket?
- Why ‘Web’ Sockets?
- W3C Standard – Version 13, RFC 6455
- Part of ‘HTML5’
- Limited Support in Browsers today
  - RFC 6455 only implemented in latest browsers

Web Sockets - How

- Normal HTTP Request, Firewall Friendly
- Socket connection negotiated using Upgrade headers
- Two way, traditional sockets, can stream data
- Supports Cross Domain Requests

- ws://server:port/resourceName?queryString
- wss://server:port/resourceName?queryString

Web Socket Connection

Request

```
GET http://localhost:12345/ HTTP/1.1
Upgrade: websocket
Connection: Upgrade
Host: localhost:12345
Origin: http://localhost:50476
Sec-WebSocket-Key: 9wYvPVuDBcdZyz0+Xzlgjg==
Sec-WebSocket-Version: 13
```

Response

```
HTTP/1.1 101 Switching Protocols
Upgrade: websocket
Connection: Upgrade
Sec-WebSocket-Accept: VSe8UdgTAkwh7bHFNHT8ECx7+CM=
```

Web Sockets – Client API

- new WebSocket(url)
- onopen
- onclose
- onerror
- onmessage
- close
- send
- readyState – Connecting, Open, Closing, Closed

Demo

Web Sockets Client API

Demo – Web Sockets Client API

We looked at:

- Making a WebSocket Connection
- Connection and Disconnection Events
- Sending Data
- Receiving Data
- Watching Connection in Fiddler

Web Sockets - Server

- Many server implementations available
- Support coming in .NET 4.5

- HttpContext.IsWebSocketRequest
- HttpContext.AcceptWebSocket

- Use Microsoft.WebSockets NuGet Package for additional helpers

Demo

Web Sockets Server API – Windows 8

Demo – Web Sockets Server API

We looked at:

- .Net 4.5 WebSockets Functionality
- Microsoft.WebSockets Package
- Implemented Web Sockets Handler
- Requirement for Full IIS

Web Sockets – When

- Levels of support across platforms
- Performance
- Low level control of messages sent
- Open standards
- Support in .NET
  - Windows 8 Support
  - Azure – not until Win8 Deployed

SignalR - What

- ‘Async library for .NET to help build real-time, multi-user interactive web applications.’

- Open Source, hosted on GitHub – currently on 0.5 release
- Damian Edwards and David Fowler (ASP.NET Team @ Microsoft)
- Get it from NuGet
- .NET & Mono, Clients for a number of platforms
- Uses Dynamic, jQuery, Task Parallel Library, service location and other neat things!

SignalR – What

- Two Types of Connection
  - Persistent Connection
  - Hub Connection

- Supports multiple methods of connecting (transports)
  - Ajax Long Polling, Web Sockets, Forever Frame (IE Only), Server Sent Events
- More than just connection
  - Makes Client / server interaction seamless

SignalR Persistent Connections

- Basis of all SignalR services
- Lower level API
- Similar to WebSockets API, having:
  - Events for:
    - Connect
    - Disconnect
    - Receive
    - Error
  - Methods for:
    - Send
    - Broadcast

Hub API

- What is a Hub?
- Server / Client
  - Make method calls between each
  - Share variables
  - Serialisation
  - Capture connect / disconnect
- Server Implementation uses Hub base class
  - Dynamic types used for proxy
- Clients vary in in how API presented

Demo

SignalR Hub Connections

Demo – SignalR Hub Connections

We looked at:

- Server Implementation of Hub
- Use of HubName attribute
- Caller
- Reference Client Library and Hubs
- Calling methods on server from client (and vice versa)

SignalR in Web Applications

- Introduce to replace periodic polling
  - Don’t have to go ‘All In’ – can just use SignalR for notification
- Build interactive types of application – chat, enhance LOB

Demo

SignalR Web Application

Demo – SignalR Web Application

We looked at:

- Waiting on Async operations
- Casing of Methods called from JavaScript
- Setting variables on Hub
- Clients property to call methods on all client
- Discussed Connection Groups
- Serialized Parameters

SignalR and Hub Considerations

- Must wire up methods client side before connecting
- New hub on each request
- Store server state yourself – static dictionary
- Transports can timeout
- Hub communication isn't limited to code in the hub
- Think about Server
  - lots of concurrent connections
  - optimise settings
    - Max Concurrent Connections
    - Max Concurrent Requests Per CPU
    - Request Queue Limit

SignalR – Other clients

- SignalR
  - JavaScript
  - .NET
  - WinRT
  - Silverlight
  - Windows Phone 7.0,7.1
- Community
  - iOS
  - MonoTouch
  - Java
  - Android
  - .NET Micro Framework

Demo

SignalR on Windows Phone

Demo – SignalR on Windows Phone

We looked at:

- Windows Phone Client for SignalR
- Called remote methods from phone
- Called local methods from server

SignalR Hosting Options

- Windows and .NET or Mono

- ASP.NET
- Self Host
- OWIN

- Scale out to Webfarm
  - Redis
  - Azure Queues

SignalR *and* WebSockets

- Web Sockets is an available transport
- Only works on Win8 – needs OS Web Sockets Support
- Broken in current 0.5 release
  - Can get it working using a build from source
- Web sockets give good performance Client - Server

Demo

SignalR and Web Sockets

Demo – SignalR and Web Sockets

We looked at:

- Source Build Required Currently
- No Change to Hub Implementation
- Specifying Transports to use
- Performance

SignalR Summary

- Easy to build great client server applications
- Range of connections possible
- Smooth upgrade of transports
- Good range of client support
- Scale-out and Performance being worked on
- Vibrant community

Comparison

Web Sockets

- Low Level
- Cross Platform
- Client & Server must support Web Sockets
- Performs well – lightweight data frames
- Raw data frames

SignalR

- High Level API
- .NET & Mono
- Range of Transports with fallback
- Performance varies due to transport
- Supports serialisation of objects

Resources

Web Sockets

http://www.w3.org/TR/websockets/
http://tools.ietf.org/html/rfc6455
https://github.com/Olivine-Labs/Alchemy-Websockets

http://msdn.microsoft.com/en-us/hh969243.aspx
http://buildnewgames.com/websockets/

SignalR

http://www.signalr.net
http://github.com/signalr
http://weblogs.asp.net/davidfowler
http://damianedwards.wordpress.com/
http://stackoverflow.com/questions/tagged/signalr
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The End

THANK YOU

http://www.flickr.com/photos/gahjr2000/330593008/sizes/l/in/photostream/