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ReSTful OSGi Web Applications Tutorial

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AGENDA

- Background and discussion on technology
- The architecture that works for us
- Brief Demo of Application
- Tutorial and Exercises
- Best Practices
- Conclusion

Background

Frameworks, Technologies, and Protocol

HTTP

- Standard protocol for communication between a client and server
- URI
  - addressability
  - Hypermedia links
- CRUD operations
  - PUT
  - GET
  - POST
  - DELETE
- Stateless
- Cacheable

ReST and ROA

- Applications divided into resources
- Communicate through exchanging representations of resources : **Re**presentational **S**tate **T**ransfer
- Statelessness
- Uniform interface
- Addressability

OSGi

- Revolutionary level of modularity
- Dynamic extensibility
- Scoping of modules

Technologies

- Restlet
- Equinox
- Jetty and Apache Tomcat

Motivation

Why we went this route?

Requirements

- Serve a diverse Set of consumers
  - Standalone java, C, C++ applications
  - RCP Applications
  - Perl
  - Shell Scripts
- Collaborative development from three NASA centers (Ensemble)
- Rapid prototyping, development, and deployment of services and clients
- Decoupling Services (Untangling the Web)
- Security
- High performance

Ensemble ReST leverages… Eclipse and OSGi

- Eclipse
  - Rapid development within Eclipse
  - Eclipse Debugger
  - Test application from within Eclipse
  - Easy export process to production servers
- OSGi
  - Modularity in code
  - Runtime extensibility
  - Changes can be limited to specific modules
    - Rapid deployment of modifications
    - Minimizes risks when redeploying

Ensemble ReST leverages … HTTP and ReST

- HTTP Protocol
  - Widely supported
    - Programming Languages
    - Web Browsers
  - Resources are completely decoupled
  - Fast performance, especially for binary transfers
  - Standardized authentication and encryption schemes
- ReST
  - Uniform interface to do operations on resources
  - Hierarchical URIs makes writing and consuming sources more intuitive
  - Addressability
  - Statelessness is great for performance

Tutorial

Scenario

- Restbots
    - Goal and Direction
    - Charges
- Restbot Arena
- Server Application
- RCP Application
- Java Restbot installer

Exercise 1

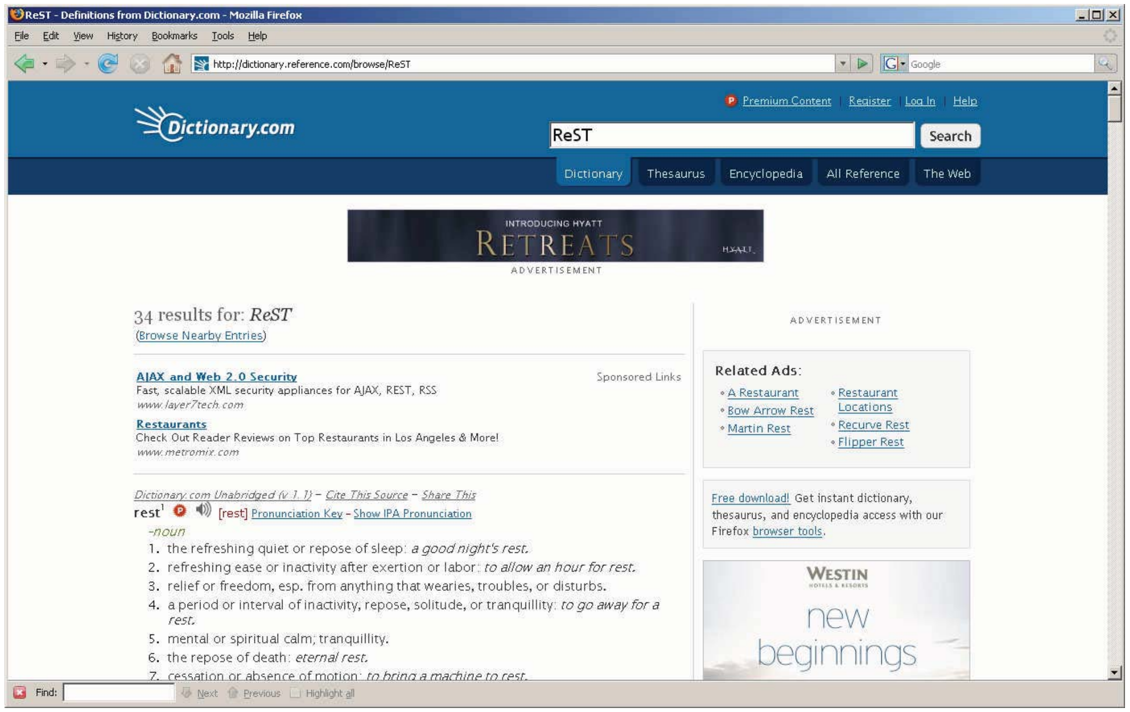
- Goals:
  - Learn how to :
    - accept updates to a resource
    - write a client that updates a resource
- Tasks:
  - Modify ReSTlet code to accept updates in Restbot goals
  - Modify RCP application to update Restbot goals on click

What happens to my request after launch?

- HTTP Status Codes
- Successful Codes (2XX):
  - 200 OK
  - 201 Created
  - 202 Accepted
  - 204 No Content
- Redirection Codes (3XX):
  - 301 Moved Permanently
  - 304 Not Modified
- Client Error (4xx)
  - 400 Bad Request
  - 401 Unauthorized
  - 403 Forbidden
  - 404 Not Found
  - 405 Method Not Allowed
- Server Errors (5xx)
  - 500 Internal Server Error

What is a resource?

- Addressability
- CRUD
- Statelessness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rest^1 [rest] Pronunciation Key – Show IPA Pronunciation

-noun

1. the refreshing quiet or repose of sleep: *a good night's rest.*
2. refreshing ease or inactivity after exertion or labor: *to allow an hour for rest.*
3. relief or freedom, esp. from anything that wearies, troubles, or disturbs.
4. a period or interval of inactivity, repose, solitude, or tranquillity: *to go away for a rest.*
5. mental or spiritual calm; tranquillity.
6. the repose of death: *eternal rest.*
7. cessation or absence of motion: *to bring a machine to rest.*

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Exercise 2 : Your own resource

- Goals:
  - Learn:
    - How to create, register, and develop a new resource
    - How to leverage ReSTlet API for operating on the resource
    - How to leverage HTTP status codes
- Tasks:
  - Create a new resource
  - Register the resource through extension point
  - Implement required methods
  - Modify client to access the resource
  - Add status codes to your resource
  - Modify client to interpret and handle status codes

Best Practices

HTTP Methods

- Safe Methods
  - GET
  - HEAD
- Idempotent methods
  - GET
  - HEAD
  - PUT
  - DELETE
- Unsafe and non-idempotent method:
  - POST
- Why this is important?

Apache HTTP Client Performance

- Use only one client for your entire application
- Application multithreaded?
  - Use MultiThreadedHttpConnectionManager
- Release a connection after you are done with the request; eg: get.releaseConnection()
- Request and Response Streaming

Recipe for ReSTful Web Applications

- Identify Resources that you would like to expose
- Address addressability
- Decide which operations should be allowed
- Develop the resources (make extensive use of the status codes)
- Test and Deploy

Conclusion

Key Development Considerations

- How modular is your code base? (OSGI)
- How easy is it to access you application? (ReST)
- How hard is it to debug the application (Eclipse)
- What impact does adding a resource have on:
  - Existing clients
  - Existing applications
- How can you test your application?
  - JUnit
  - Firefox Poster Plugin
- How to secure the application and still make it accessible? (HTTP, SSL)

For more information…

- ReSTful Web Services in Perl
    - http://www.onlamp.com/pub/a/onlamp/2008/02/19/developing-restful-web-services-in-perl.html
- OSGi on the Server Side
    - http://dev2dev.bea.com/pub/a/2007/12/osgi-introduction.html
- RESTful Web Services