

# Dynamic Languages & Web Frameworks in GlassFish v3

11, 12 Dec. 2009

Pune, India

**IndicThreads.com** Conference On Java Technology

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Sun Microsystems, Inc.

# What is a Dynamic Language ?

- Broadly a language that allows a program to change its own code at runtime
  - Evaluate data as code ("The name is: #{@name}" )
  - Manipulate code as data ({"name"=>"Duke"}.each {|data| puts data})
  - High order functions
  - Dynamic Typing
  - Closures, Continuations, Macros, ...
- Simple, human-readable syntax
- List, Ruby, Python, Groovy, ...



# Web Frameworks

- Full-stack
  - Object relational mapping
  - MVC-pattern
  - Templating
  - JavaScript library
  - Extension points
- Agile Development
  - No compile, redeploy, restart cycles
  - Testing built into the framework



# Design Principles

- **Convention over Configuration (CoC)**
  - Common cases easily served
  - Encourages standard practices
  - Everything simpler and smaller
- **Don't Repeat Yourself (DRY)**
  - Framework written around minimizing repetition



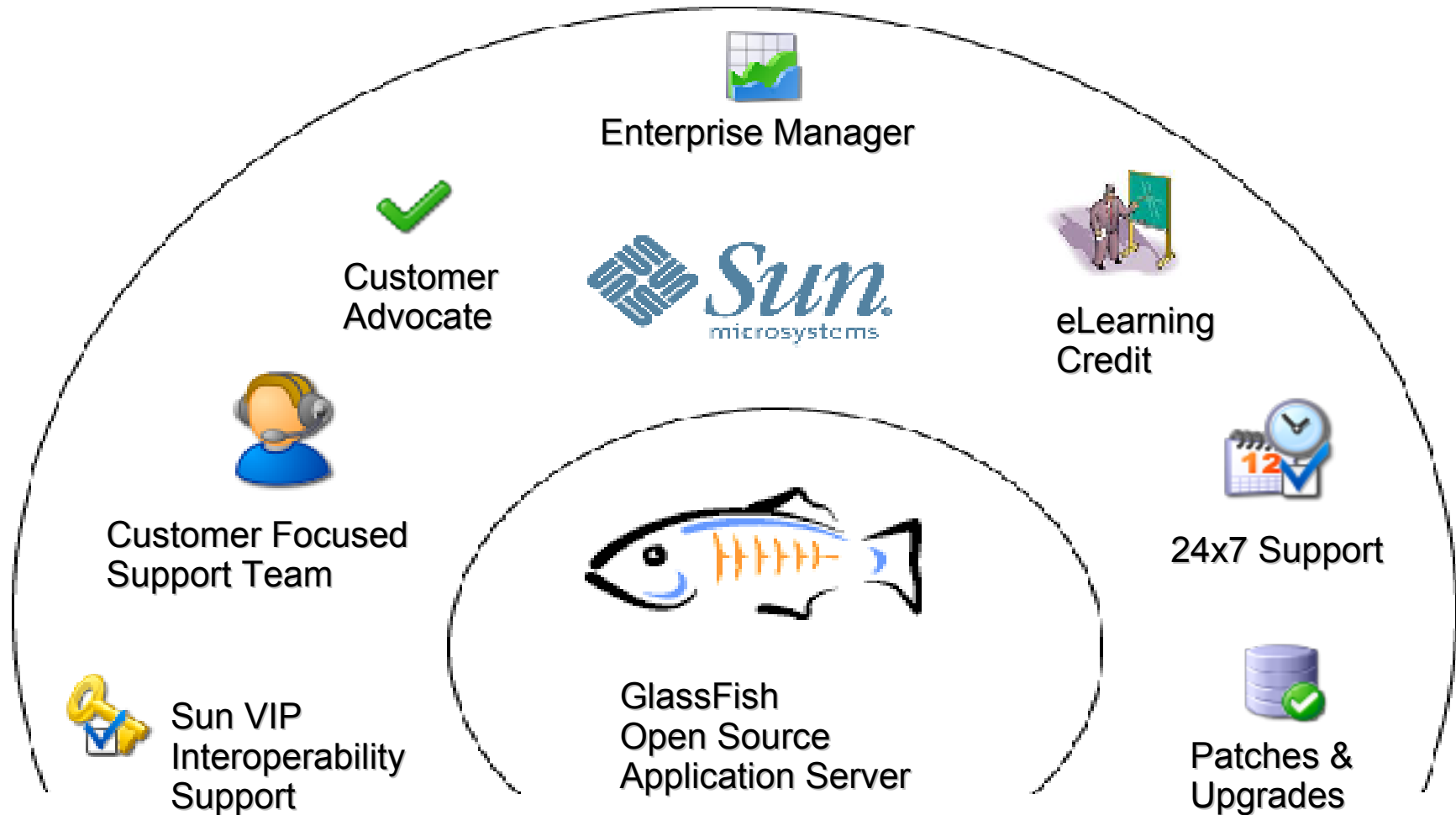
# What is GlassFish ?



- A community
  - Users, Partners, Testers, Developers, ...
  - Started in 2005 on java.net
- Application Server
  - Enterprise Quality and Open Source
  - Java EE Reference Implementation
  - Full Commercial Support from Sun



# Sun GlassFish Enterprise Server

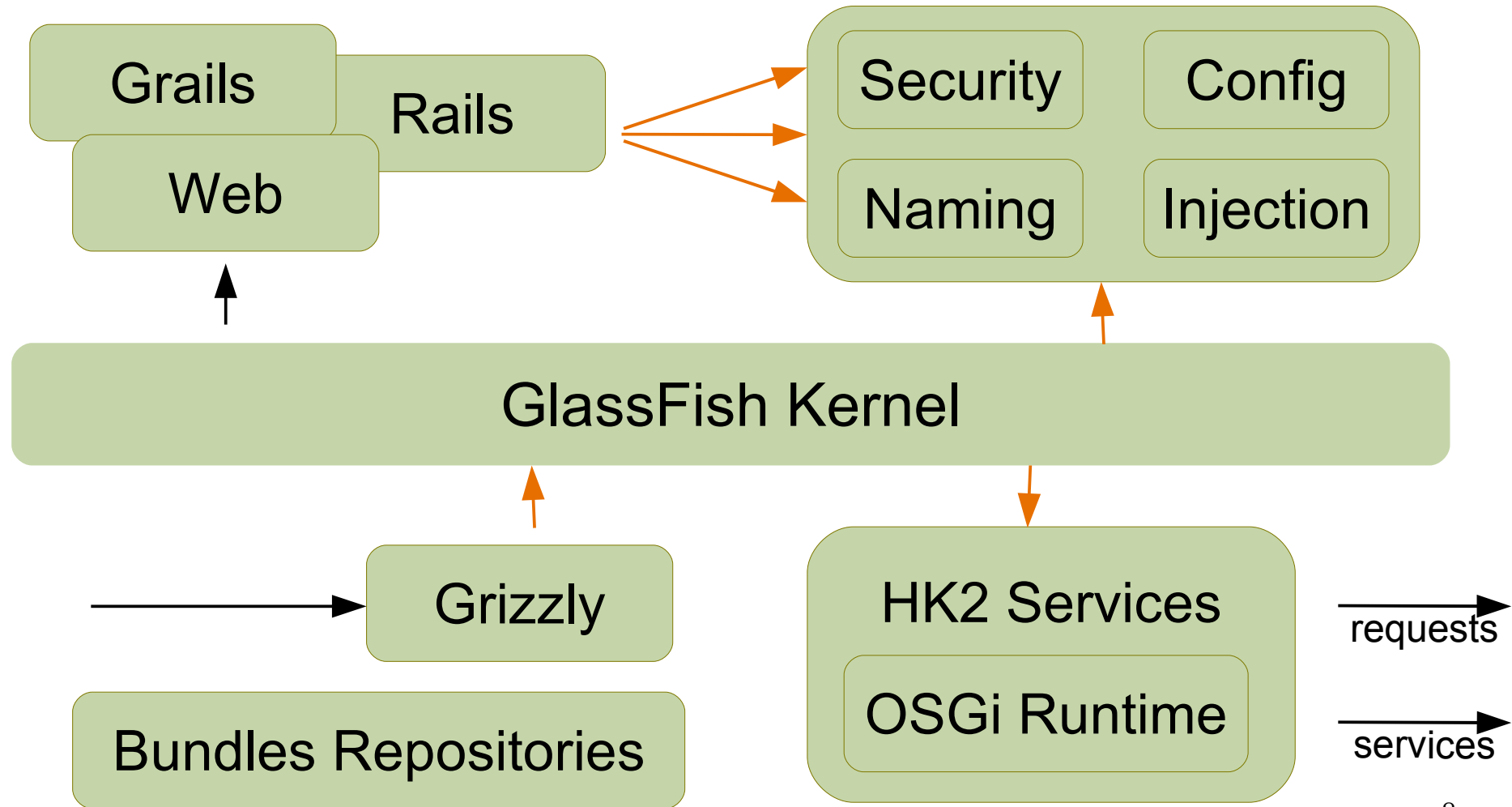


# GlassFish v3

- Modular:
  - Maven 2 – Build & Module description
  - Felix – OSGi runtime (216 bundles)
  - Allow any type of Container to be plugged
    - Start Container and Services on demand
- Embeddable: runs in-VM
- Extensible
  - Rails, Grails, Django, ...



# GlassFish v3 Architecture





# Dynamic Languages & Frameworks



<http://glassfish-scripting.dev.java.net>

# What is JRuby ?

- Ruby interpreter written in Java
- Current Version: 1.4.0
- Ruby 1.8.6 compatible
- Some Ruby 1.9 support
  - --1.9 flag
  - 80% of 1.9.1
- 9 Active committers

<http://jruby.kenai.com/presentations/JRubyConf%202009%20Keynote.pdf>



# JRuby Compatibility

- ~37,000 passing rubyspecs
- ~22,000 passing assertions
- Continuous Integration
  - On commit ~3 Java versions \* 4 vendors
  - Nightly: 30 minute “full” run





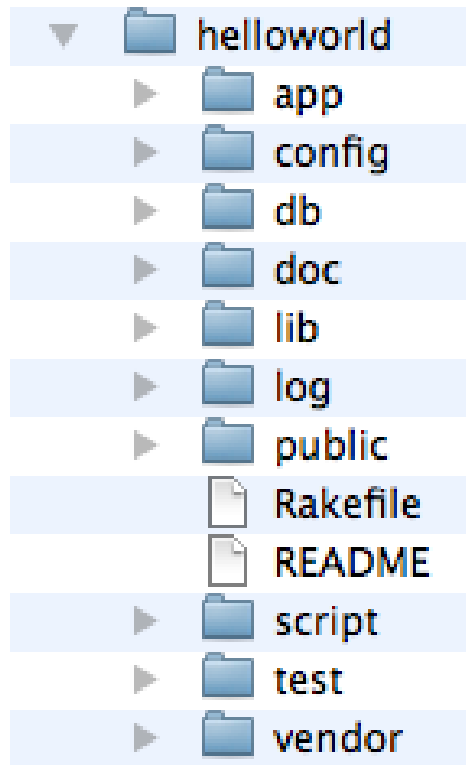
- Solid performance ( ~ Ruby 1.9)
  - Startup is poor, execution usually better than 1.9
- Runs native threads
- Foreign Function Interface (FFI) for C libraries
- Runs Rails great!



# What is ?

- Full-stack Web development MVC framework in Ruby
- Current Version: Rails 2.3.4
- Getting Started
  - Install Rails: “`jrubby -S gem install rails`”
  - Generate Rails app: “`jrubby -S rails helloworld`”

# Rails Deployment Choices



Credits: <http://birdwatchersdigest.com>

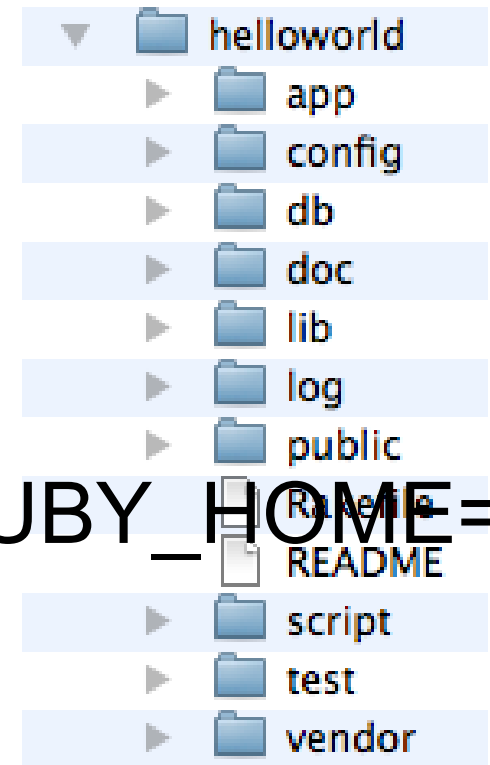
# Directory-based Deployment: How ?

```
jruby -S rails helloworld
```

```
asadmin start-domain
```

```
asadmin create-jvm-options -DJRUBY_HOME=...
```

```
asadmin deploy railsconf
```



# Directory-based: Capistrano Recipes

```
set :context_root, "/" # You can obviously change this if you want to
set :glassfish_location, "/path/to/your/glassfish"
namespace :deploy do
  desc "Cold start Glassfish v3"
  task :cold do
    run "#{glassfish_location}/bin/asadmin start-domain domain1"
    start
  end

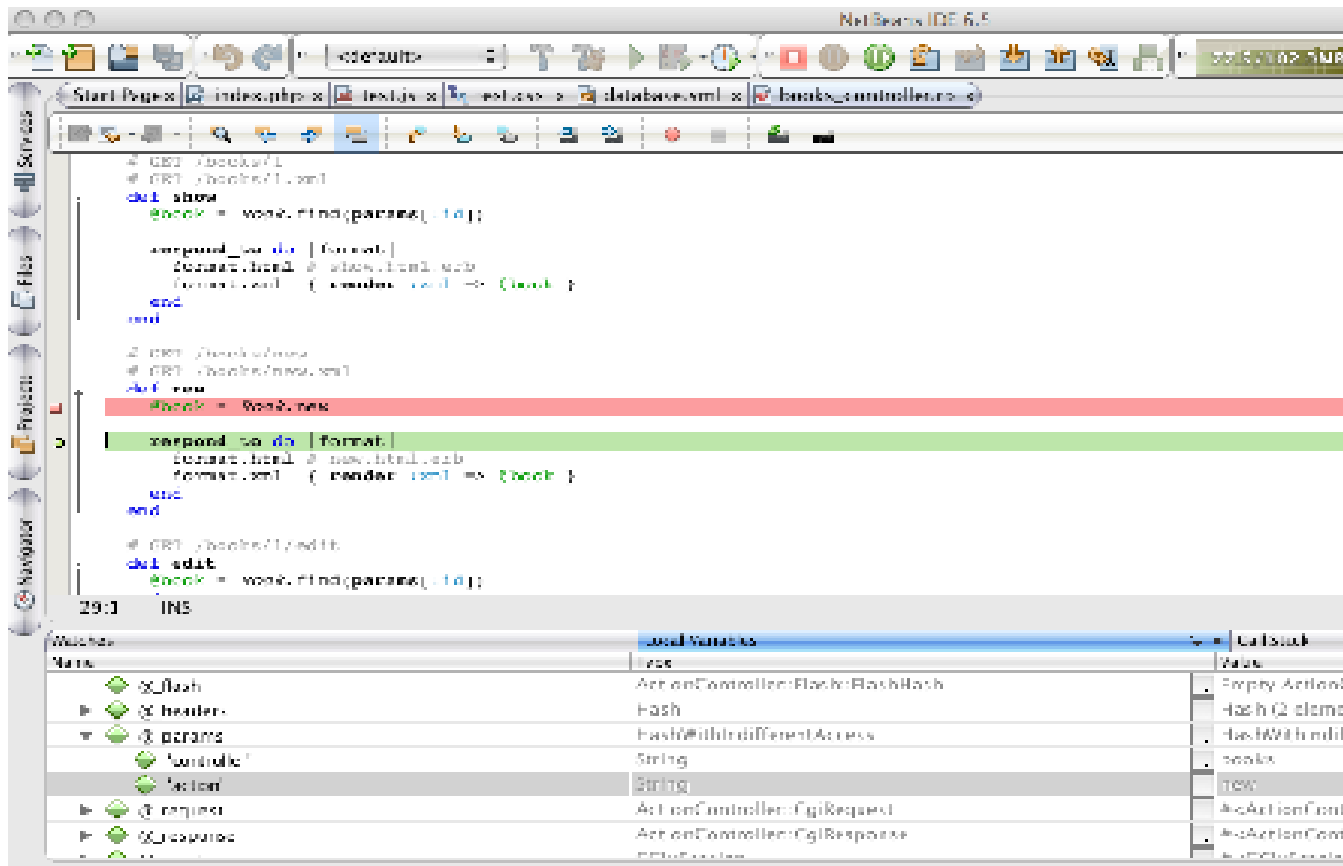
  desc "Stop a server running Glassfish v3"
  task :stop do
    run "#{glassfish_location}/bin/asadmin undeploy #{current_dir} || true"
    run "#{glassfish_location}/bin/asadmin stop-domain domain1"
  end

  desc "update and deploy to Glassfish v3"
  task :start do
    update
    run "#{glassfish_location}/bin/asadmin deploy --contextroot #{context_root}"
  end
end
```

<http://wiki.glassfish.java.net/Wiki.jsp?page=DeployUsingCapsitrano>



# Rails Development using NetBeans 6.8



[http://blogs.sun.com/arungupta/entry/screencast\\_26\\_develop\\_run\\_debug](http://blogs.sun.com/arungupta/entry/screencast_26_develop_run_debug)

# Rails Deployment: GlassFish Gem

Files	Classes	Methods
History.txt LICENSE.txt README.txt script/asadmin.rb script/command_line_parser.rb script/config.rb	GlassFish GlassFish::ASAdmin GlassFish::CommandLineParser GlassFish::Config GlassFish::Server RDoc	fail (GlassFish::Config) init_opts (GlassFish::CommandLineParser) parse (GlassFish::CommandLineParser) startup (GlassFish::Server) usage_no_exit (RDoc) validate (GlassFish::Config)

## README.txt

Path: README.txt  
Last Update: Sun Mar 15 22:43:02 -0700 2009

### GlassFish v3 server for Rack based web frameworks (Rails, Merb, ...)

GlassFish gem is a lightweight and robust deployment solution for Ruby on Rails applications deployed on JRuby runtime. It is based on [GlassFish v3](#) application server.

GlassFish v3 is a Java based application server that allows deployment, administration and monitoring of JavaEE as well as dynamic languages based web frameworks such as Ruby On Rails, Grails etc.

GlassFish gem is based on [GlassFish v3 nucleus](#). [GlassFish v3 nucleus](#) is the core module of [GlassFish v3](#).

For more information on [GlassFish v3](#) application server see [glassfish.dev.java.net/v3](http://glassfish.dev.java.net/v3).

### Requires JDK 6

Get JDK 6 from [here](#)

### Supported Rack based frameworks

- Rails
- Merb

# GlassFish Gem: How ?

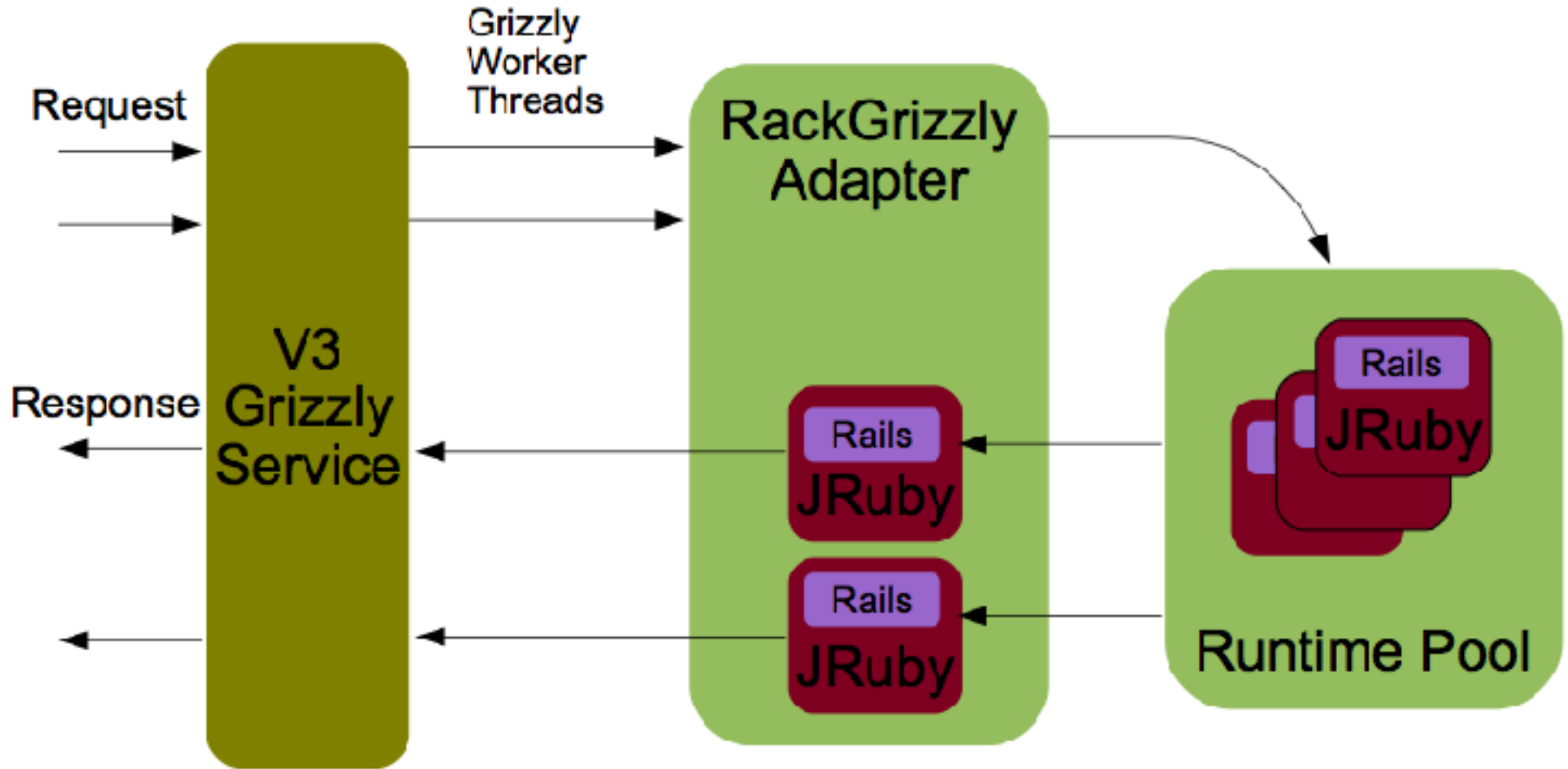
```
jruby -S rails helloworld
```



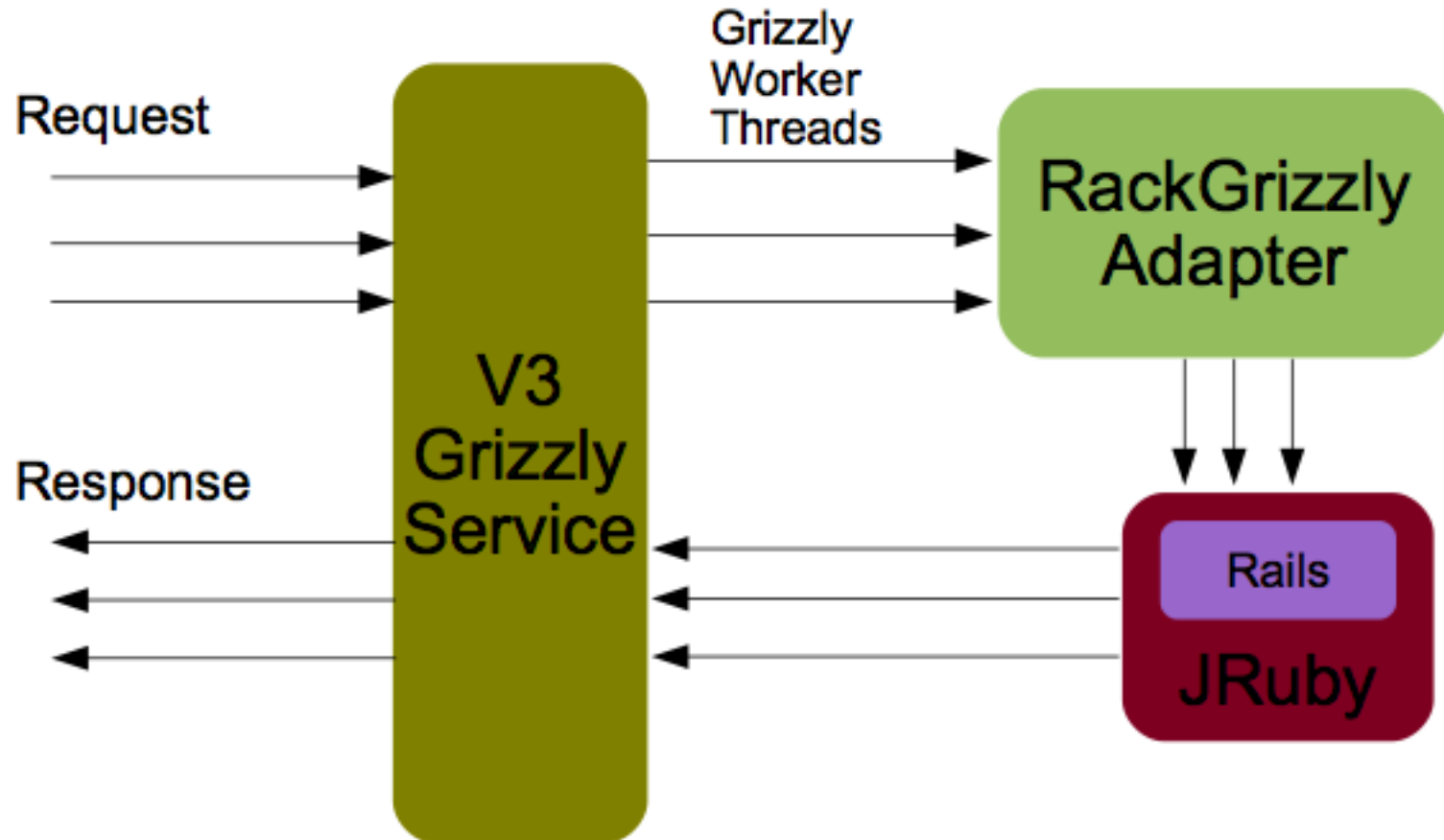
```
jruby -S gem install glassfish  
cd helloworld  
jruby -S glassfish
```



# Single Threaded Rails < v 2.2



# Multi Threaded Rails or Merb or ...



# GlassFish Gem: Capistrano Recipes

```
namespace :gem do

  desc "Start Glassfish Gem from a shutdown state"

  task :cold do

    start

  end

  desc "Stop a server running Glassfish Gem"

  task :stop do

    run "kill -INT $(cat #{current_path}/capistrano-#{applicati

  end

  desc "Starts a server running Glassfish Gem"

  task :start do

    run "#{jruby_location}bin/jruby -S glassfish --contextroot

  end

  desc "Restarts a server running Glassfish Gem"
```

<http://wiki.glassfish.java.net/Wiki.jsp?page=DeployUsingCapsitrano>

# GlassFish Gem Options

```
jruby -S glassfish -h
```

- n: Number of JRuby runtimes to create initially
- runtimes-min: Minimum runtimes
- runtimes-max: Maximum runtimes
- c: change the context root
- e: environment
- d: Runs as daemon
- P: location of PID file
- l: log file location
- log-level: Logging level (0-7)

# Demo

## GlassFish Gem

[http://blogs.sun.com/arungupta/entry/totd\\_76\\_jruby\\_1\\_2](http://blogs.sun.com/arungupta/entry/totd_76_jruby_1_2)

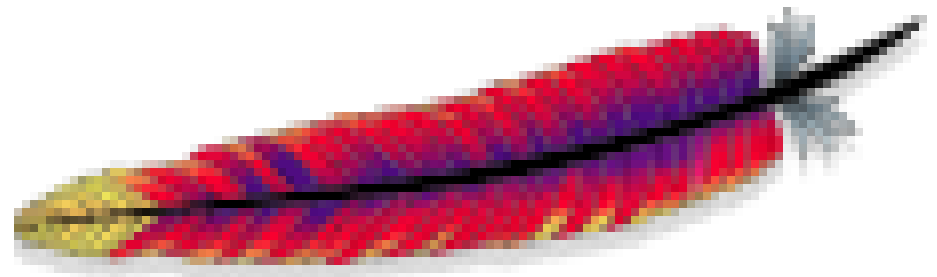


# GlassFish Gem in Production

- Easy, **green** deployment
  - Reverse proxy not required
  - JRuby runtime pool provides required scaling
    - Rails is single threaded by default
  - MT frameworks scales automatically
    - JRuby and JVM support native threads
- Configuration using “glassfish.yml”

# Optional front-ending

# NGINX



[http://blogs.sun.com/arungupta/entry/totd\\_81\\_how\\_to\\_use](http://blogs.sun.com/arungupta/entry/totd_81_how_to_use)  
[http://blogs.sun.com/arungupta/entry/totd\\_84\\_using\\_apache\\_mod](http://blogs.sun.com/arungupta/entry/totd_84_using_apache_mod)

# Rails Deployment: WAR-based



# WAR-based: How ?

```
jruby -S rails helloworld
```

```
jruby -S gem install warbler  
cd helloworld
```

```
jruby warble config
```

```
Edit "config/warble.rb"
```

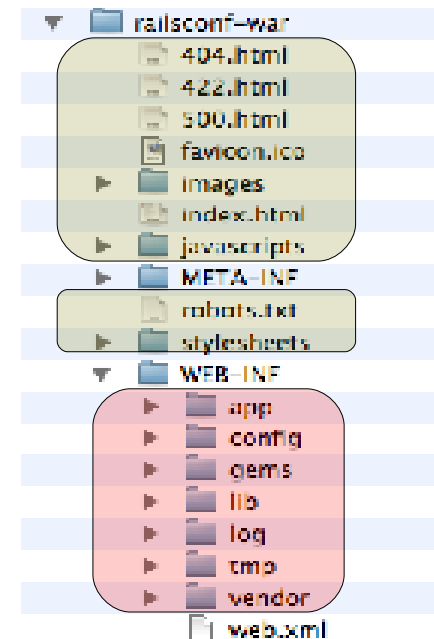
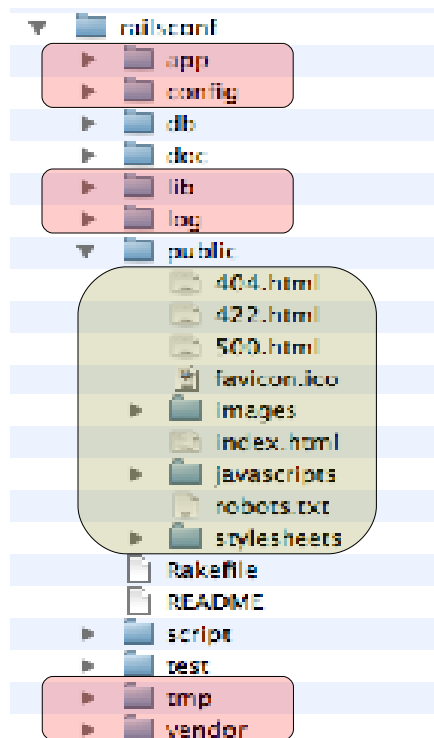
```
Include gems, Change RAILS_ENV
```

```
jruby warble
```

```
asadmin deploy helloworld.war
```



# WAR Deployment: Packaging



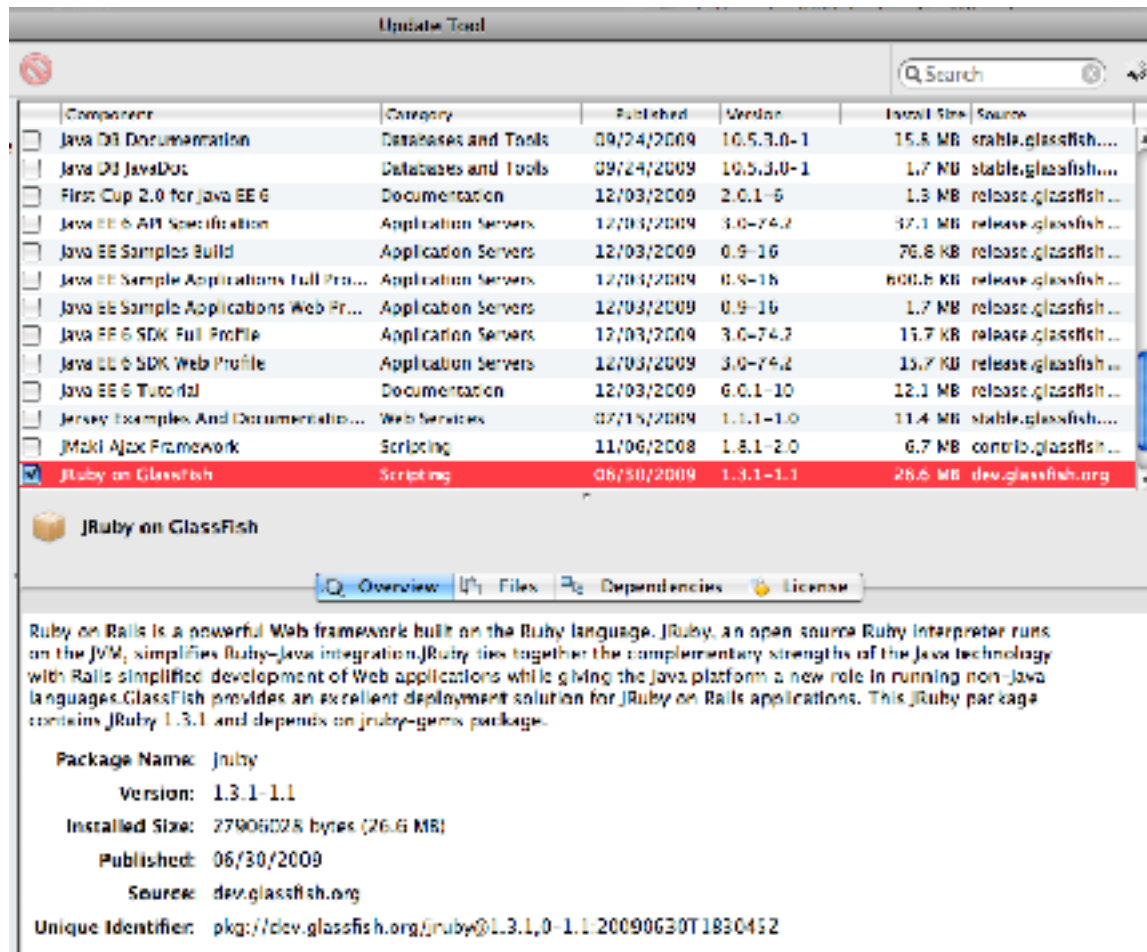
# Demo

## WAR-based Deployment

[http://blogs.sun.com/arungupta/entry/totd\\_73\\_jruby\\_and\\_glassfish](http://blogs.sun.com/arungupta/entry/totd_73_jruby_and_glassfish)



# JRuby Module on GlassFish Update Center



The screenshot shows the GlassFish Update Tool interface. At the top, there is a search bar and a list of components. The 'JRuby on GlassFish' component is selected and highlighted in red. Below the list, there are tabs for 'Overview', 'Files', 'Dependencies', and 'License'. The 'Overview' tab is active, displaying a description of JRuby on GlassFish and its package details.

Component	Category	Published	Version	Install Size	Source
Java DB Documentation	Databases and Tools	09/24/2009	10.5.3.0-1	15.5 MB	stable.glassfish...
Java DB JavaDoc	Databases and Tools	09/24/2009	10.5.3.0-1	1.7 MB	stable.glassfish...
First Cup 2.0 for Java EE 6	Documentation	12/03/2009	2.0.1-5	1.3 MB	release.glassfish...
Java EE 6 API Specification	Application Servers	12/03/2009	3.0-74.2	37.1 MB	release.glassfish...
Java EE Samples Build	Application Servers	12/03/2009	0.9-16	76.8 KB	release.glassfish...
Java EE Sample Applications Full Pro...	Application Servers	12/03/2009	0.9-16	600.6 KB	release.glassfish...
Java EE Sample Applications Web Pr...	Application Servers	12/03/2009	0.9-16	1.7 MB	release.glassfish...
Java EE 6 SDK Full Profile	Application Servers	12/03/2009	3.0-74.2	11.7 KB	release.glassfish...
Java EE 6 SDK Web Profile	Application Servers	12/03/2009	3.0-74.2	15.7 KB	release.glassfish...
Java EE 6 Tutorial	Documentation	12/03/2009	6.0.1-10	12.1 MB	release.glassfish...
Jersey Examples And Documentatio...	Web Services	07/15/2009	1.1.1-1.0	11.4 MB	stable.glassfish...
JMaki Ajax Framework	Scripting	11/06/2008	1.8.1-2.0	6.7 MB	contrib.glassfish...
<b>JRuby on GlassFish</b>	<b>Scripting</b>	<b>06/30/2009</b>	<b>1.3.1-1.1</b>	<b>26.6 MB</b>	<b>dev.glassfish.org</b>

**JRuby on GlassFish**

Overview | Files | Dependencies | License

Ruby on Rails is a powerful Web framework built on the Ruby language. JRuby, an open source Ruby interpreter runs on the JVM, simplifies Ruby-Java integration. JRuby ties together the complementary strengths of the Java technology with Rails simplified development of Web applications while giving the Java platform a new role in running non-Java languages. GlassFish provides an excellent deployment solution for JRuby on Rails applications. This JRuby package contains JRuby 1.3.1 and depends on jruby-gems package.

Package Name: jruby  
Version: 1.3.1-1.1  
Installed Size: 27906028 bytes (26.6 MB)  
Published: 06/30/2009  
Source: dev.glassfish.org  
Unique Identifier: pkg://dev.glassfish.org/jruby@1.3.1,0-1.1:20090630T183045Z

# Ruby Rack Support

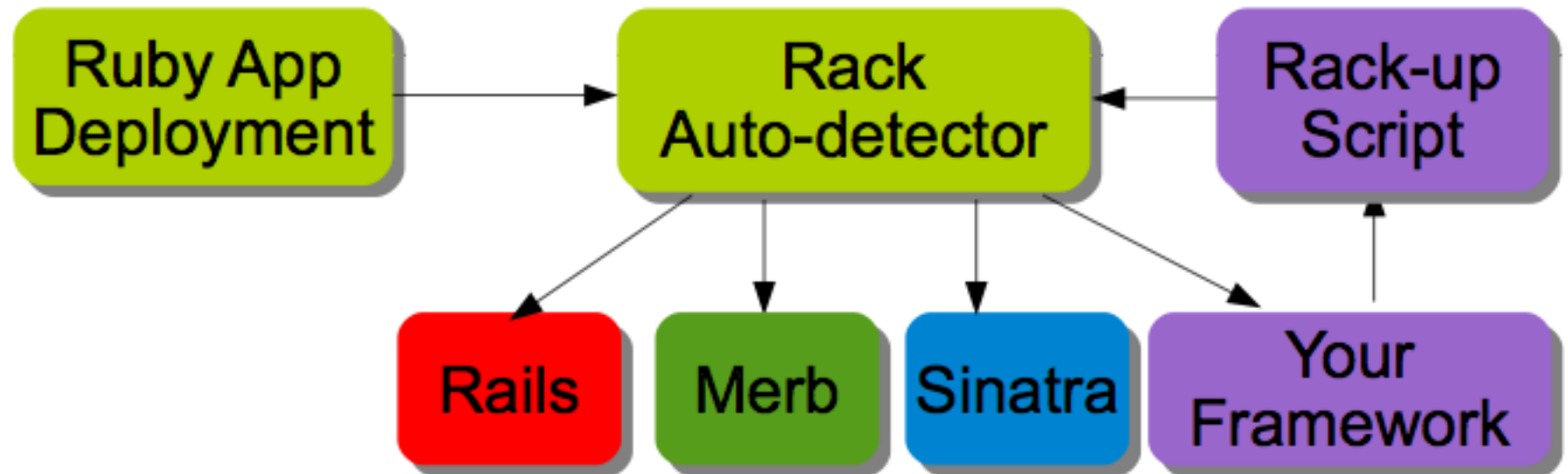


- A Ruby Web server interface
- Plugin any Rack compliant framework
  - Rails, Merb, Sinatra, Ramaze, Campsite, ...
- Rack support in GlassFish
  - GlassFish Gem
    - Plugin any Rack metal (such as RackCache)
  - GlassFish v2 & v3 through Warbler
- Use your own framework
  - Rackup script
  - `jruby.applicationType` property

```
class MyApp
  def self.Run
    "Hello World"
  end
end
```



# Ruby Application Auto-detection



# Performance

- Need JVM tuning for production
  - Use Server profile where possible (-server)
- GC settings
  - -XX:+DisableExplicitGC, -XX:NewRatio=2
- Memory settings
  - Use large settings for -Xmx -Xms and -XX:MaxPermSize
  - Use at least 20 MB perm gen space for each JRuby runtime

# Scaling

- Rails is single-threaded by default
- Setup JRuby runtime pool
  - With gem
    - glassfish -n 3 –runtime-min 2 –runtime-max 4
- 2 HTTP Worker Threads per runtime
- Turn on file caching
  - network-config>protocols>protocol>http>file-cache#enabled
- MT frameworks (Rails > 2.2, Merb)
  - No configuration needed

# Rails Monitoring

- Basic Monitoring
  - **jinfo**: System properties and VM CLI flags
  - **jmap**: Shared object memory map
  - **jstack**: Stack traces of Java threads
  - **jstat**: Performance stats on class, JIT compiler, GC
- Advanced
  - jconsole / Visual VM
  - NewRelic, FiveRuns, ...



# Rails Monitoring in GlassFish v3

- `asadmin enable-monitoring --level jruby-container=HIGH`
- `asadmin list --monitor=true "*"`
- `asadmin list --monitor=true "*jruby*"`
- `asadmin list-probes | grep jruby`
- `dtrace` or JavaScript-based monitoring

[http://blogs.sun.com/arungupta/entry/totd\\_104\\_glassfish\\_v3\\_monitoring](http://blogs.sun.com/arungupta/entry/totd_104_glassfish_v3_monitoring)



# Endorsements

had no reliability and performance issues with Glassfish

Look like the **best deploying option** I ever found for Rails, GREAT!

nice way to deploy and manage my app while **leaving things open for scaling**

money is on **JRuby (and Glassfish) for the long haul**; if you haven't checked out Glassfish yet, you're doing yourself a disservice!

the **easiest rails stack** in the world, jruby 1.2rc, rails 2.3rc, glassfish v3

...

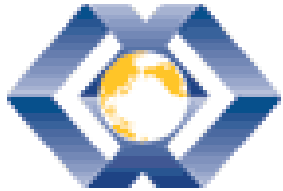
**too easy** to run jruby/rack/glassfish behind nginx

**leading the way to simple, scalable, no-hassle hosting** for Ruby web applications.

...

**it's true one-step deployment.**

# Who loves Rails on GlassFish ?



**WORLDxCHANGE**  
**COMMUNICATIONS**  
*Your connection to the world*

**Linked in® Polls**

**k=nai.co** beta

**involver™**



**SeaChange®**

**springbook**

**mediacast.sun.com**



**Auktionskompaniet.com**

EN DEL AV BUKOWSKIS





# What is ?

- Agile dynamic language for the JVM
- Seamlessly integrates with all existing Java objects & libraries
  - Compiles straight to bytecode
- Current version: 1.6.7
- `groovy -e "println 'Hello ' + args[0]" World`

# What is **GRAILS** ?

- MVC Web framework for the Java platform
  - Persistence framework (Hibernate)
  - Templating using GSP (Groovy Server Pages)
  - Tag libraries to create web page components
  - Good Ajax support
  - Web server & automatic resources reload
- Current Version: 1.1.2, 1.2 RC1 released 12/5



# Grails “Hello World”

- Create app: “grails create-app bookstore”
  - Create domain class: “grails create-domain-class book”
  - Edit “grails-app/domain/Book.groovy” and add attributes
  - Create controller: “grails create-controller Book”
  - Edit “grails-app/controllers/BookController.groovy”
  - Add scaffold: “def scaffold = Book”
- Run app: “grails run-app”



# Grails on GlassFish App Server

- Create WAR: “grails war”
- Deploy: “asadmin deploy helloworld-0.1.war”



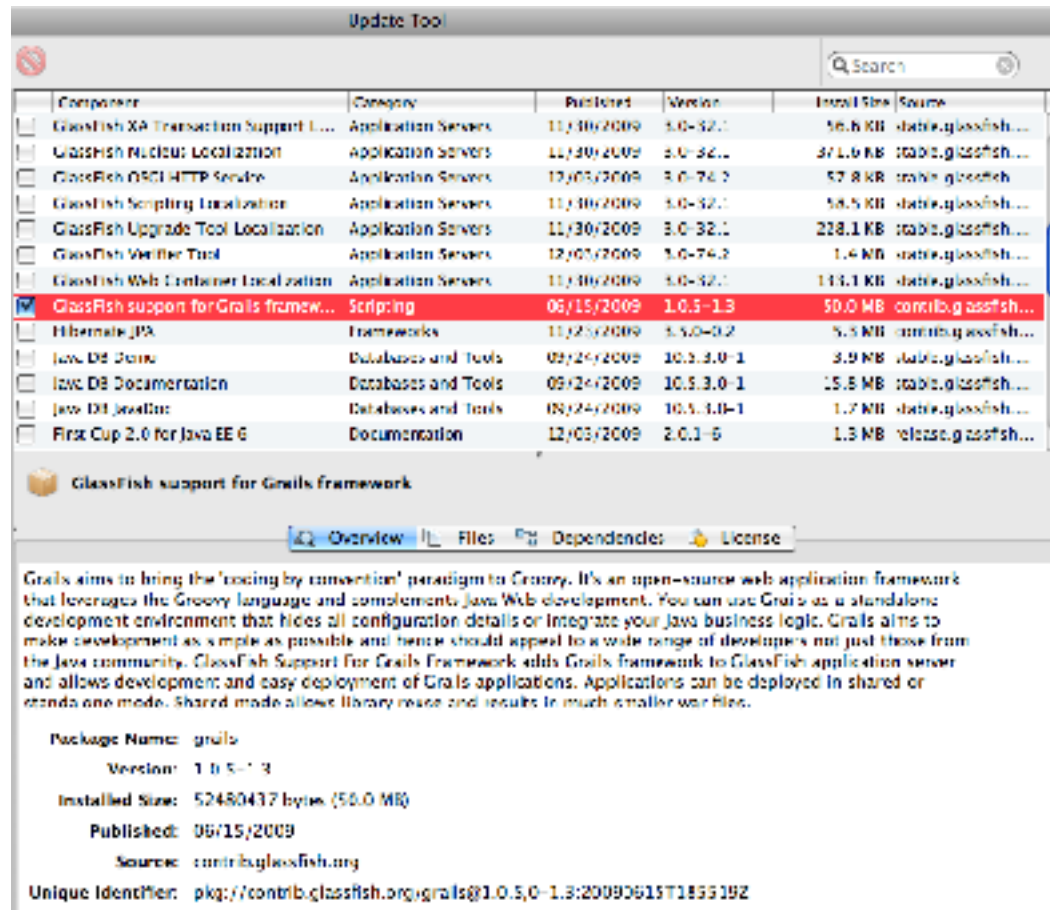
# Demo

## Grails & GlassFish

[http://blogs.sun.com/arungupta/entry/getting\\_started\\_with\\_grails\\_on](http://blogs.sun.com/arungupta/entry/getting_started_with_grails_on)  
[http://blogs.sun.com/arungupta/entry/totd\\_75\\_getting\\_started\\_with](http://blogs.sun.com/arungupta/entry/totd_75_getting_started_with)  
[http://blogs.sun.com/arungupta/entry/grails\\_on\\_glassfish\\_v3\\_embedded](http://blogs.sun.com/arungupta/entry/grails_on_glassfish_v3_embedded)  
[http://blogs.sun.com/arungupta/entry/tic\\_tac\\_toe\\_using\\_rails](http://blogs.sun.com/arungupta/entry/tic_tac_toe_using_rails)



# Grails Module on GlassFish Update Center



The screenshot shows the GlassFish Update Tool interface. A table lists various components available for update. The component 'GlassFish support for Grails framework' is selected and highlighted in red. Below the table, the details for this component are displayed, including a description of Grails, package information, and a unique identifier.

Component	Category	Published	Version	Install Size	Source
<input type="checkbox"/> GlassFish XA Transaction Support L...	Application Servers	11/30/2009	3.0-32.1	56.8 KB	static.glassfish...
<input type="checkbox"/> GlassFish Nucleus Localization	Application Servers	11/30/2009	3.0-32.1	371.6 KB	static.glassfish...
<input type="checkbox"/> GlassFish OSC HTTP Service	Application Servers	12/01/2009	3.0-74.2	57.8 KB	static.glassfish...
<input type="checkbox"/> GlassFish Sampling Localization	Application Servers	11/30/2009	3.0-32.1	58.5 KB	static.glassfish...
<input type="checkbox"/> GlassFish Upgrade Tool Localization	Application Servers	11/30/2009	3.0-32.1	228.1 KB	static.glassfish...
<input type="checkbox"/> GlassFish Verifier Tool	Application Servers	12/01/2009	3.0-74.2	1.4 KB	static.glassfish...
<input type="checkbox"/> GlassFish Web Container Localization	Application Servers	11/30/2009	3.0-32.1	113.1 KB	static.glassfish...
<input checked="" type="checkbox"/> GlassFish support for Grails framew...	Scripting	06/15/2009	1.0.5-1.3	50.0 MB	contrib.glassfish...
<input type="checkbox"/> Hibernate JPA	Frameworks	11/23/2009	3.5.0-0.2	5.5 MB	contrib.glassfish...
<input type="checkbox"/> Java DB Demo	Databases and Tools	09/24/2009	10.5.3.0-1	3.9 MB	static.glassfish...
<input type="checkbox"/> Java DB Documentation	Databases and Tools	09/24/2009	10.5.3.0-1	15.8 MB	static.glassfish...
<input type="checkbox"/> Java DB Javadoc	Databases and Tools	09/24/2009	10.5.3.0-1	1.7 MB	static.glassfish...
<input type="checkbox"/> First Cup 2.0 for Java EE 6	Documentation	12/03/2009	2.0.1-6	1.3 MB	release.glassfish...

**GlassFish support for Grails framework**

Overview | Files | Dependencies | License

Grails aims to bring the 'coding by convention' paradigm to Groovy. It's an open-source web application framework that leverages the Groovy language and complements Java Web development. You can use Grails as a standalone development environment that hides all configuration details or integrate your Java business logic. Grails aims to make development as simple as possible and hence should appeal to a wide range of developers not just those from the Java community. GlassFish Support for Grails Framework adds Grails framework to GlassFish application server and allows development and easy deployment of Grails applications. Applications can be deployed in shared or stand-alone mode. Shared mode allows library reuse and results in much smaller war files.

Package Name: grails  
Version: 1.0.5-1.3  
Installed Size: 52480437 bytes (50.0 MB)  
Published: 06/15/2009  
Source: contrib.glassfish.org  
Unique Identifier: pkg://contrib.glassfish.org/grails@1.0.5.0-1.3:20090615T185519Z

# Efficient Deployment

- Grails Application WAR
  - Large
    - Over 48 Grails dependent JARs
    - ~20MB for a simple app
  - Expensive to bundle in single WAR
  - Issues when hot deployment is required

# GlassFish proposes light-weight WAR

- Don't package dependencies!
- Smaller WAR file: ~200KB vs ~20MB
- GlassFish knows how to find dependencies
- Only one copy of dependencies in GlassFish
  - Less memory consumption and deployment speed-up

\$ grails shared-war

With Grails 1.1 use `-nojars` option

\$ asadmin deploy helloworld-0.1.war





# GlassFish/Grails: Coming up ...

- Use “grails –nojars”
  - JIRA-5174, JIRA-5175
- “grails install-plugin glassfish –global”
  - grails run-app
- “asadmin deploy grailsApp”



# What is Jython ?

- Implementation of Python in Java
  - Seamless integration of Python and Java
  - Java  $\Leftrightarrow$  Python
  - Just Python
  - Dynamic compilation to Java bytecodes
- Jython 2.5.1 released (Sep 2009)
- Works with Django 1.0

# What is ?

- MVC-based framework written in Python
  - Object-relational mapper
  - A lightweight, standalone Web server
  - A regular expression based URL dispatcher
  - A templating system
  - A caching framework
  - An internationalization system
  - . . .

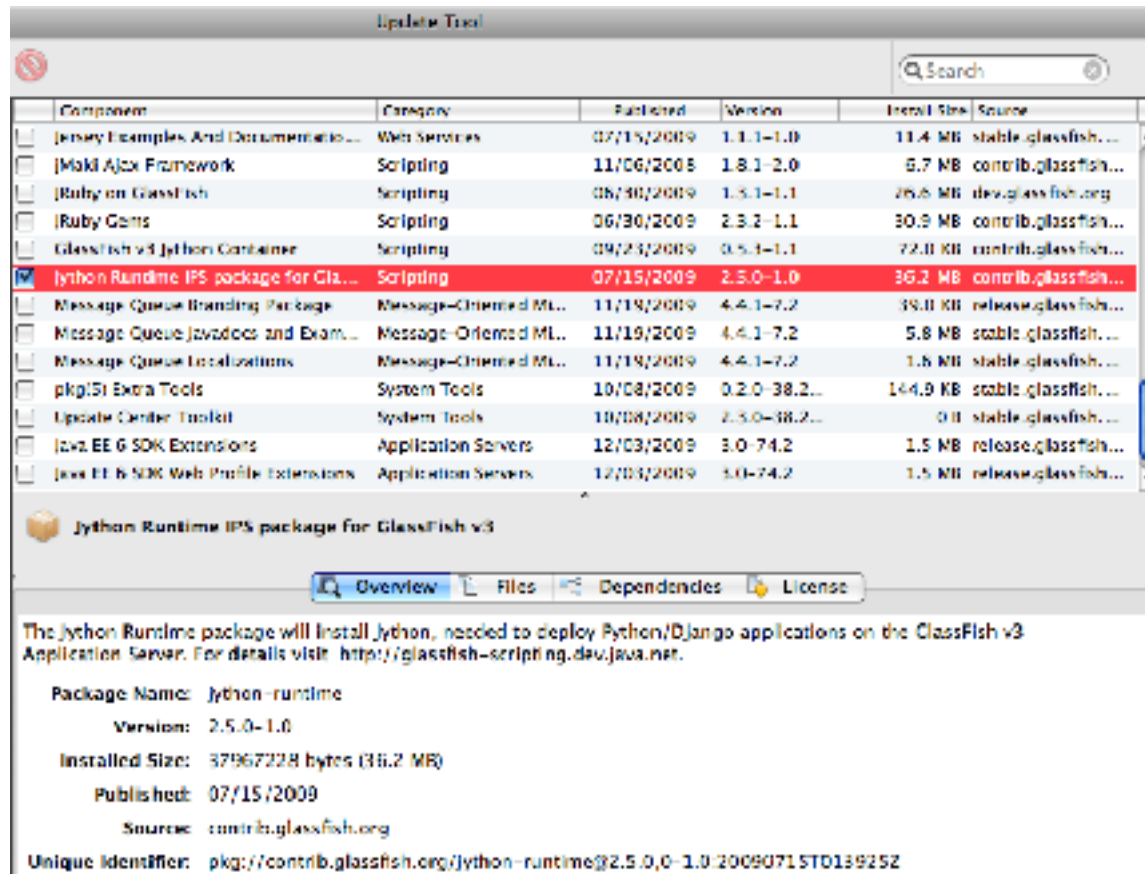
# GlassFish Deployment

- Deploy as WAR
  - Modjy
    - Servlet, ServletContextListener + WSGI Implementation
    - Integrated with Jython 2.5
- Pure Django Deployment
  - Grizzly + WSGI => Django
  - No WAR, no packaging
  - `asadmin deploy myDjangoApp`

# How does it work ?

- Download Jython
- Install Django (jython25 setup.py install)
- GlassFish v3 Jython OSGi module from UC
- `asadmin create-jvm-options -Djython.home=...`
- `cd DjangoApp`
- `asadmin deploy .`

# Jython Module on GlassFish Update Center



The screenshot shows the GlassFish Update Center interface. A table lists various components, with the 'Jython Runtime IPS package for GlassFish v3' highlighted in red. Below the table, the details for this package are displayed, including its name, version, size, and source.

Component	Category	Published	Version	Install Size	Source
Jersey Examples And Documentation...	Web Services	07/15/2009	1.1.1-1.0	11.4 MB	stable.glassfish...
JSR166 Ajax Framework	Scripting	11/06/2008	1.8.1-2.0	5.7 MB	contrib.glassfish...
JSR166 Ruby on GlassFish	Scripting	06/30/2009	1.5.1-1.1	26.6 MB	dev.glassfish.org
JSR166 Ruby Gems	Scripting	06/30/2009	2.3.2-1.1	30.9 MB	contrib.glassfish...
GlassFish v3 Jython Container	Scripting	09/23/2009	0.5.1-1.1	72.0 KB	contrib.glassfish...
<b>Jython Runtime IPS package for Gla...</b>	<b>Scripting</b>	<b>07/15/2009</b>	<b>2.5.0-1.0</b>	<b>36.2 MB</b>	<b>contrib.glassfish...</b>
Message Queue Branding Package	Message-Oriented ML...	11/19/2009	4.4.1-7.2	35.0 KB	release.glassfish...
Message Queue Javadocs and Exam...	Message-Oriented ML...	11/19/2009	4.4.1-7.2	5.8 MB	stable.glassfish...
Message Queue Localizations	Message-Oriented ML...	11/19/2009	4.4.1-7.2	1.5 MB	stable.glassfish...
pkg(S) Extra Tools	System Tools	10/08/2009	0.2.0-38.2...	144.9 KB	stable.glassfish...
Update Center Toolkit	System Tools	10/08/2009	2.5.0-38.2...	0 B	stable.glassfish...
Java EE 6 SDK Extensions	Application Servers	12/03/2009	3.0-74.2	1.5 MB	release.glassfish...
Java EE 6 SDK Web Profile Extensions	Application Servers	12/03/2009	3.0-74.2	1.5 MB	release.glassfish...

**Jython Runtime IPS package for GlassFish v3**

Overview | Files | Dependencies | License

The Jython Runtime package will install Jython, needed to deploy Python/Django applications on the GlassFish v3 Application Server. For details visit: <http://glassfish-scripting.dev.java.net>.

Package Name: jython-runtime  
Version: 2.5.0-1.0  
Installed Size: 37967228 bytes (36.2 MB)  
Published: 07/15/2009  
Source: contrib.glassfish.org  
Unique Identifier: pkg://contrib.glassfish.org/jython-runtime@2.5.0,0-1.0:20090715TD139252

# Demo

## Django & GlassFish

[http://blogs.sun.com/arungupta/entry/totd\\_85\\_getting\\_started\\_with](http://blogs.sun.com/arungupta/entry/totd_85_getting_started_with)







[http://blogs.sun.com/arungupta/entry/tic\\_tac\\_toe\\_using\\_rails](http://blogs.sun.com/arungupta/entry/tic_tac_toe_using_rails)

# Java EE & Dynamic Languages

- JavaEE is a mature and robust platform
  - Servlet, EJB, JMS, JAX-RS, JAX-WS...
- Hybrid Rails and Servlet/JSP application
  - Forward to and from Rails to Servlet/JSP
  - HttpSession as Rails session
  - ServletRequest/Response API available to Rails
- JDBC connection pool
- JMS: Async messaging in Rails

# Servlet 3.0 Pluggability

- JavaEE 6 and Dynamic Languages
  - No boilerplate web.xml
  - Dynamically add ServletFilter and ServletContextListener
- Simple packaging
  - No need to package as WAR, No Warbler
  - Place application inside WEB-INF directory

# References

- [glassfish.org](http://glassfish.org)
- [glassfish-scripting.dev.java.net](http://glassfish-scripting.dev.java.net)
- [sun.com/glassfish](http://sun.com/glassfish)
- [blogs.sun.com/theaquarium](http://blogs.sun.com/theaquarium)
- [twitter.com/glassfish](https://twitter.com/glassfish)
- [glassfish@sun.com](mailto:glassfish@sun.com)



# Dynamic Languages & Web Frameworks in GlassFish v3

11, 12 Dec. 2009

Pune, India

**IndicThreads.com** Conference On Java Technology

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