APACHE GERONIMO

J2EE Development with Apache Geronimo 1.1

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Speaker

- Aaron Mulder
- Geronimo Developer
  - Works on deployment, management, console, kernel, plugins, ...
  - Online Geronimo book at `http://chariotsolutions.com/geronimo/`
- CTO of Chariot Solutions
  - Java/Open Source consulting firm
  - Partnerships with companies that provide Geronimo support (IBM, Covalent, etc.)

Agenda

- Overview & Status
- Server Installation and Configuration
- Administration Console
- Deployment & Tools
- Little G
- Geronimo Plugins
- Q&A

Overview and Status

Overview

- Complete J2EE 1.4 Application Server
  - Or lightweight, web-focused “Little G”
- Built on best of breed components (Tomcat, Jetty, ActiveMQ, OpenEJB, HOWL, etc.)
- Modular architecture (entirely built w/modules)
- Plugins make it easy to add features
- Web-based admin console for configuration
- Web & JMS clustering support
- In-place upgrades with no restart

Why is Geronimo Necessary?

- Other open source application servers are encumbered by:
  - *GPL licensing
  - Not entirely open community, limited options for support, training, etc.
- Tomcat has only web features
  - Even if you don't buy into EJB, the world needs more (messaging, transactions, etc.)
- The app server market is losing innovation (versus, for example, Ruby on Rails)

Project Status

- 1.0 release in January, 1.1 due this week, 1.2 in September/October
- J2EE certified, all J2EE features complete
- Administration console handles common configuration/deployment tasks and keeps growing
- Command-line & IDE tools available
- Initial project documentation, plus a number of books, many articles, etc.

Community

- 28+ committers from 9+ companies
- Extremely active mailing lists
  - dev list for build/development issues
  - user list for questions & support
- Many companies provide stacks including Geronimo and/or 24/7 support
- Multiple companies building applications on Geronimo, open source and commercial
- Sites as big as Ebay deployed on Geronimo

Advantages

- Open community & open license
- First app server with plugins
  - Can build and clone a custom distribution
- Web management console
- High-speed JMS messaging server included
- Integration with many other products, open source and commercial
- Many training and support options (both free and commercial support available)

Management

- Admin console includes:
  - Add/configure network ports
  - Deploy & manage applications
  - Deploy & configure database pools, JMS connection factories, and JMS destinations
  - Deploy & configure security realms
  - Configure keystores & HTTPS
  - Configure Geronimo with Apache HTTP
  - Create or install plugins

Performance

- Tested with the DayTrader sample application (also open source)
  - Can be configured and run on many app servers for comparison purposes
  - Can test different APIs (JDBC vs CMP, Web, JNDI, EJB, JMS, Web Services, etc.)
- Performance is competitive with commercial J2EE application servers
  - Still occasional weak spots (such as CMP)

Security

- Definitely a project priority
- Pluggable security realms
  - For J2EE application security
- Initial pluggable JACC support as well
- Password encryption used in config files
- Authentication required for remote deployment and management
- Security bugs are a high priority

Installation and Configuration

Installation

- Windows and Mac/UNIX/Linux distrubutions
- Download and unzip either the Jetty or the Tomcat distribution
- Start it up and go!

- In case of conflict, edit network ports in `var/config/config.xml` (more in a bit)
  - Have to get the web container running before the admin console is available

Start and Stop

- Easy start and stop commands for developers
- Scripts support various execution and logging options, as well as allowing JVM customization
- Can run Geronimo as a Windows service or UNIX daemon
- Can start/stop in scripts (e.g. for testing)
- Can use admin console or command-line tools to shut down or restart a remote server
  - Can't yet start a remote server

Startup Sequence

```
Booting Geronimo Kernel (in Java 1.4.2_09)...
Starting Geronimo Application Server
[************] 100% 18s Startup complete

  Listening on Ports:
    1099 0.0.0.0 RMI Naming
    1527 0.0.0.0 Derby Connector
    4201 0.0.0.0 ActiveIO Connector EJB
    4242 0.0.0.0 Remote Login Listener
    8080 0.0.0.0 Jetty Connector HTTP
    8443 0.0.0.0 Jetty Connector HTTPS
    61616 0.0.0.0 ActiveMQ Message Broker Connector
  Started Application Modules:
    EAR: org/apache/geronimo/Console/Jetty
    WAR: org/apache/geronimo/applications/Welcome/Jetty
  Web Applications:
    http://server-hostname:8080/
    http://server-hostname:8080/console
    http://server-hostname:8080/console-standard

Geronimo Application Server started
```

Configuration (easy)

- Start server and point browser to `http://localhost:8080/console/`
- Use the screens there to edit network ports, add database connection pools, configure security and JMS resources, etc.
- Can't use if original network ports conflict
  - Use the next option to resolve ports and then go into the console. :)

Configuration (hard)

- Most configuration is controlled by `config.xml` in `var/config`
  - Controls which modules to load
  - Lets you override settings on any server component (identified by config name + component name + attribute name)
- Note that the server rewrites this file while it's running
  - Edit it only while the server is down!

config.xml

```
<attributes
xmlns="http://geronimo.apache.org/xml/ns/attributes-1.1">
  <module name="geronimo/rmi-naming/1.0/car">
    <gbean name="RMIRegistry">
      <attribute name="port">1099</attribute>
    </gbean>
    <gbean name="NamingProperties">
      <attribute name="namingProviderUrl">
        rmi://0.0.0.0:1099
      </attribute>
    </gbean>
  </module>
  <module name= ...  />
  ...
</attributes>
```

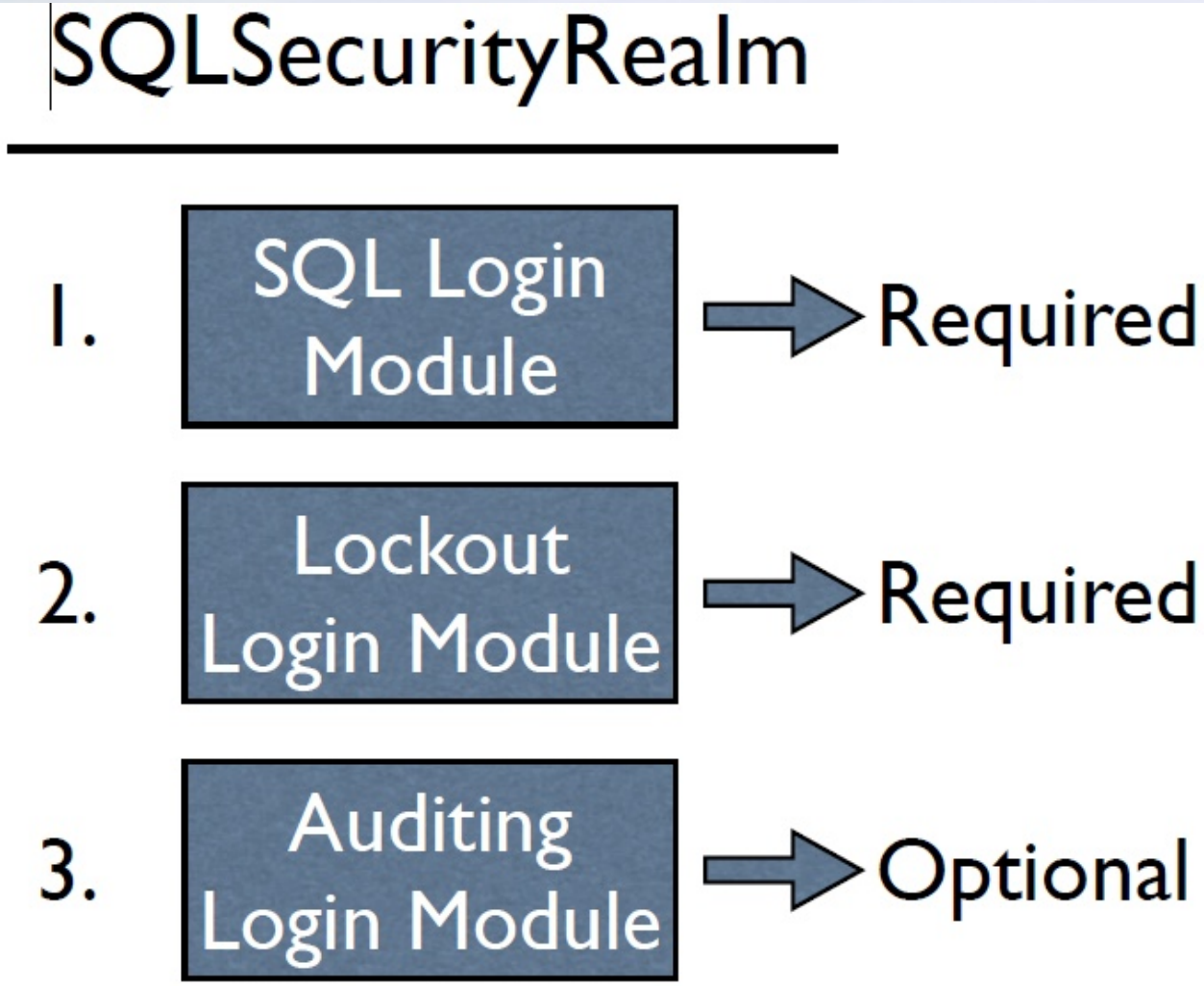
Logging

- Uses Log4J
- Config file at `var/log/server-log4j.properties`
- Server log at `var/log/geronimo.log`
- Can easily customize log output, rolling log files, logging to NT/UNIX system logs, etc.
- Can search and view server logs from the admin console

Security & Login Modules

- A security realm normally uses one JAAS LoginModule, but may include several
- Extra features are added by using multiple LoginModules for the realm
  - auditing, lockout, extra credentials, etc.
- Can also use mutiple login modules to access users in separate back-end security repositories (2 LDAP servers, LDAP for users and database for application roles, etc.)

Realm Example



Included Login Features

- Properties File
- Database
- LDAP
- Active Directory
- Kerberos
- Auditing
- Lockout on repeated failure
- Save credentials to use when invoking a web service or CORBA EJB

Administration Console

Database Pools

Geronimo Console - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://localhost:8080/console/portal/services/services_jdbc/_rp_services

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Server Console

About Log Out

Console Navigation

- Welcome
- Server
  - Information
  - JVM
  - Server Logs
  - Shutdown
  - Web Server
  - JMS Server
- Services
  - Common Libraries
  - Database Pools
  - JMS Resources
- Applications
  - Deploy New
  - Application EARs
  - Web App WARs
  - EJB JARs
  - J2EE Connectors
  - App Clients
  - System Modules
- Security
  - Console Realm
  - Security Realms
  - Keystore
- Misc
  - Embedded DB
    - DB Info
    - DB Manager

Database Pools [view]

Create Database Pool -- Step 2: Select Driver, JAR, Parameters

JDBC Driver Class: org.postgresql.Driver

See the documentation for your JDBC driver.

Driver JAR:

The JAR holding the selected JDBC driver. Should be installed under GERONIMO/repository/ (or Download a Driver)

DB User Name:

The username used to connect to the database

DB Password:

The password used to connect to the database

Driver Connection Properties

Typical JDBC URL: jdbc:postgresql://<Host>:<Port>/<Database>

Port: 5432

A property used to connect to PostgreSQL. May be optional (see JDBC driver documentation).

Host:

A property used to connect to PostgreSQL. May be optional (see JDBC driver documentation).

Database:

A property used to connect to PostgreSQL. May be optional (see JDBC driver documentation).

Next

Cancel

Done

- Can deploy by hand
- Can deploy as part of an application
- Options include pool size, exception handler, etc.

JMS Messaging Resources

Geronimo Console - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://localhost:8080/console/portal/services/services_jms/_rp_services

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JMS Resources [view]

JMS Resource Group -- Configure Connection Factory

Connection Factory Name: AnotherConFactory

A unique name for the connection factory; used to refer to this connection factory when mapping resource references from application components.

Transaction Support: XA

Which JMS interface this connection factory should support.

Connection Pool Parameters

Pool Min Size: 2

The minimum number of connections in the pool. Leave blank for default.

Pool Max Size: 10

The maximum number of connections in the pool. Leave blank for default.

Blocking Timeout: 5000 (in milliseconds)

The length of time a caller will wait for a connection. Leave blank for default.

Idle Timeout: 10 (in minutes)

How long a connection can be idle before being closed. Leave blank for default.

Next

Current Status for JMS Resource Group AaronRA

- 2 Connection Factories
  - CustomCF
  - *In Process*
- 2 Destinations
  - TestQueue
  - TestTopic

Cancel

Done

- Geronimo starts an ActiveMQ broker by default
- Can deploy JMS resources by hand or as part of an application

Security Realms

Geronimo Console - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://localhost:8080/console/portal/Security/Security_realms/_pm_Secu

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Security Realms [view]

Create Security Realm -- Step 2: Configure Login Module

User SELECT SQL: select username, password from TEST_USER where username=?

A SQL statement to load user/password information. It should return 2 columns, the first holding a username and the second holding a password. The statement may use the PreparedStatement syntax of ? for a parameter, in which case the username will be set for every parameter. A typical setting would be `SELECT username, password FROM app_users WHERE username=?`

Group SELECT SQL: select username, group_name from TEST_USER_GROUPS where usernam

A SQL statement to load group information for a user. It should return 2 columns, the first holding a username and the second holding a group name. The statement may use the PreparedStatement syntax of ? for a parameter, in which case the username will be set for every parameter. A typical setting would be `SELECT username, group_name FROM user_groups WHERE username=?` or for a more normalized schema, `SELECT u.username, g.name FROM app_users u, groups g, user_groups ug WHERE ug.user_id=users.id AND ug.group_id=g.id AND u.username=?`

A SQL security realm must either have a database pool or JDBC connectivity settings to connect to the database. Please select EITHER the database pool, OR the rest of the JDBC settings.

Database Pool SystemDatasource

A database pool that the login module will use to connect to the database. If this is specified, none of the rest of the settings after this are necessary.

JDBC Driver Class

The fully-qualified JDBC driver class name. This driver must be located in the JAR specified in the next field.

Driver JAR:

The JAR holding the selected JDBC driver. Should be installed under GERONIMO/repository/ to appear in this list.

JDBC URL

Done

- Based on JAAS LoginModules
- Can deploy by hand or as part of an application
- Default security settings in `var/security` properties files

Keystore Manager

- Create and unlock a keystore with server's private key, trusted CA certificates, etc.

Keystore Configuration [view]

This screen lists the contents of a keystore.

Alias	Type	Certificate Fingerprint
geronimo	Private Key	A6:77:EB:E0:92:3F:33:40:82:96:00:88:CF:71:D6:63

Add Trust Certificate Create Private Key Return to keystore list

- Choose it for HTTPS web connectors

SSL Settings

Key Store: geronimo-default

The keystore to use for accessing the server's private key

Trust Store: ssl-truststore

The keystore to use for accessing the server's private key

Apache HTTP Configuration

- Select web applications to expose through Apache, and console generates the config files

Apache mod_jk Configuration [view]

Apache mod_jk -- Web App Selection

For each web application *currently running* in Geronimo, select:

Through Apache
Whether the web application should be exposed through Apache

Static Content
Whether Apache should serve static content for the web application (instead of all content being handled by Geronimo)

Dynamic Paths
If Apache is serving static content, which URL paths should be passed to Geronimo (e.g. `/servlet/*` or `*.jsp`)

Web Application	Through Apache	Static Content	Dynamic Paths
geronimo/remote-deploy-jetty/1.1-SNAPSHOT/car	☐	☐	
framework.war	☑	☑	/console/portal/*
standard.war	☑	☐	
geronimo/welcome-jetty/1.1-SNAPSHOT/car	☐	☐	

Finish

Cancel

Deployment & Tools

Deployment Overview

- For applications: need an archive or directory with a J2EE deployment descriptor, and typically a Geronimo deployment plan
- For services (custom configurations): need a Geronimo deployment plan (with optional JAR)
- Use the deploy tool, maven plugin, console, or hot deploy directory to deploy the module
  - Deploy tool and Maven plugin return errors and a success code to the caller; better for scripting

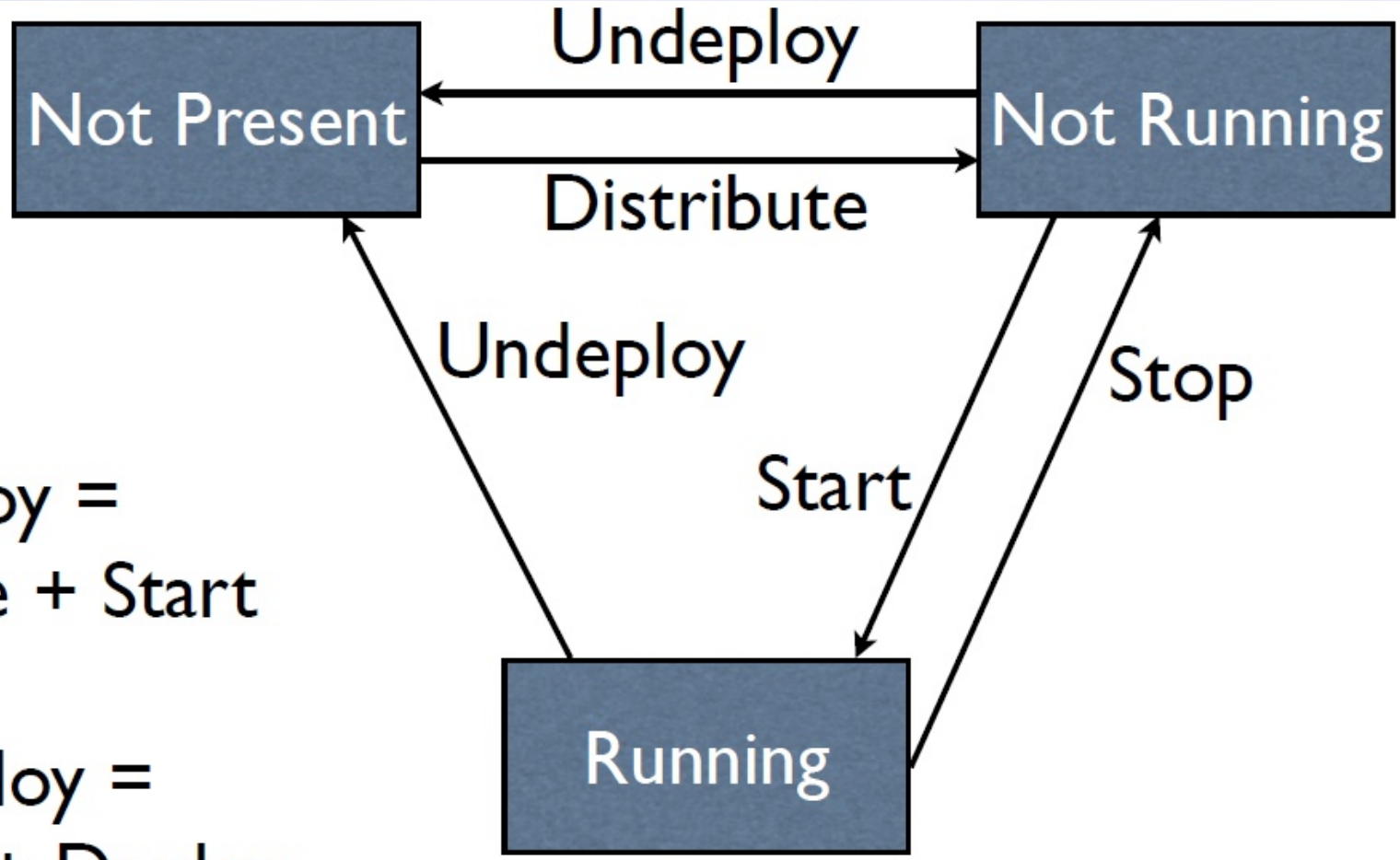
Deployment Plan

- aka “server-specific deployment descriptor”
- Geronimo plans are based on XML Schemas (normally one per module type)
- Schemas can be found in schemas/
- All plans can have a `moduleId` (a unique ID for the module) and optional `dependency` elements as well as a couple others
  - used to set up class loaders and force dependencies to start first

Typical Deployment Plan

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app
xmlns="http://geronimo.apache.org/xml/ns/j2ee/web-1.1">
  <environment>
    <moduleId>
      <groupId>BigCo</groupId>
      <artifactId>TestApp</artifactId>
    </moduleId>
    <dependency>
      <artifactId>commons-collections</artifactId>
      <version>3.1</version>
   </dependency>
  </environment>
  <context-root>/debug-tool</context-root>
</web-app>
```

Module Lifecycle



Deploy =
Distribute + Start

Redeploy =
Undeploy + Deploy

Command-Line Deploy Tool

- Communicates with a running server
- Run with `java -jar bin/deployer.jar [options] command [command-options]`
- Commands include `login`, `help`, `deploy`, `undeploy`, `redeploy`, `list-modules`, `search-plugins`, `install-plugin`, etc.
- Normally prompted for a username and password ("system" and "manager")
  - see `var/security/*.properties`

Remote Deployment

- Deploy tool can manage and deploy to a remote server
- Need to be able to access the RMI port (1099) and an HTTP(S) port (8080)
- Must have the remote-deploy web application deployed on the server
  - It is deployed by default
- use `--host` and `--port` (or perhaps `--uri`)

Sample Commands

- `java -jar bin/deployer.jar ...`
  - `login`
  - `distribute [archive] [plan]`
  - `deploy [archive] [plan]`
  - `undeploy configId`
  - `redeploy [archive] [plan] [configId]`
  - `stop configId`
  - `start configId`
  - `list-modules`
  - `search-plugins url`

Hot Deploy Directory

- `geronimo/deploy/`
- Copy files to this directory to deploy
  - update file to redeploy
  - delete file to undeploy
- On startup, recognizes new and updated deployments (but will not undeploy)
- Don't try to deploy with the command-line tool and then copy a newer version into the hot deploy dir

Maven Plugin

- Deployment plugin for Maven 1.x can start & stop server, deploy/undeploy/redeploy applications, start server and wait until it runs, etc.
- Can be included in build scripts and won't return until application is running (for subsequent testing, etc.)
- Maven 2 & Ant plugins should be coming in 1.2 or 2.0

Eclipse Plugin

- Works with Eclipse WTP (1.0.x)
- Can create Geronimo apps, including XDoclet-based EJBs, etc.
- Can run an embedded Geronimo server
- Can deploy to Geronimo
- Can debug the embedded Geronimo
  - Can debug into JSPs, etc.
- Versions available for Geronimo 1.0 and 1.1

Debugging

- In IDEA, create a new debugging configuration and select “Remote”
- IDEA gives you a bunch of command-line parameters; start Geronimo with those

```
java -Xdebug -Xnoagent... -jar bin/server.jar
```

- Then remote connection works perfectly
- Eclipse can run and debug Geronimo locally
- Should be able to debug both the server (if you have the source) and applications

Little G

Lightweight Geronimo

- 1.0 release only offers a full J2EE server configuration
- Lots of installation overhead if you just want to use it for lightweight applications
- “Little G” is a web-oriented version of Geronimo – about a 20 MB download
- Can be scaled up to JMS (or full J2EE) using additional plugins

Little G Considerations

- Can use transactions, database pools, security, tools, etc. out of the box with Little G
- Console does not run without upgrading to a fatter stack
  - Currently depends on things like JMS
  - In the next release (1.2) should be flexible enough to run with only the installed features
- Can always upgrade later (no restart!)

Geronimo Plugins

Geronimo Plugins

- A plugin is a packaged Geronimo module, either an application or a service module
- Can be installed by pointing the console at a plugin repository and selecting from a list, or downloading the plugin and installing from the command line
- No configuration or XML required – plugins “just work”

Plugin Repository

- Plugins live on a web site (using the Maven 2 repository format)
- Dependencies (other plugins or JARs) are downloaded from the same or sites
- Default plugin hosting site supports plugins with any license (OSS/proprietary)
- ibiblio.org (used for many common open source projects) is the default site hosting dependency JARs

Installing Plugins

- Geronimo checks prerequisites to ensure that the plugin can be installed
- Any obsolete modules are stopped
- Each dependency is downloaded if it's not already available to the server
  - And their dependencies, and so on...
- The plugin is installed and started, and is immediately available

Creating Plugins

- Any application or module running in Geronimo can be exported as a plugin
- Console prompts for the necessary metadata (friendly name, license, etc.), then gives you a “save as” dialog
- Just a few things to keep in mind:
  - Declare dependencies explicitly, and don't pack them into the application if you want to share them with other apps/plugins/etc.

Plugin Inspirations

- Geronimo uses plugin infrastructure to clone features from server to server
  - First developer gets everything set up, next developer just pulls it all down
  - Can migrate apps from dev to test, etc.
- Plugins help integrate other products
  - LDAP server, scheduler, portal, etc.
- Plugins can be used to simplify application installation

Summary

Next Release: 1.2

- Still more powerful plugins
  - Include admin console screens/features
- Admin console for Little G
- More statistics & console monitors
- EJB clustering
- Improved Spring integration
- Initial Java EE 5 support
  - JPA, Web, Web Service features

Closing Thoughts

- A complete J2EE server
  - Open license and community
  - Extremely customizable (modular, w/ plugins)
- Can pack resources & services in an EAR
- Deployment, configuration, and monitoring through the web admin console
- Many additional deployment tools and plugins
- Integration available with projects like Apache Directory, ServiceMix, Liferay, Quartz, etc.

Q&A

Slides

- http://chariotsolutions.com/presentations.html

E-Mail Lists

- user@geronimo.apache.org
  - user-subscribe@geronimo.apache.org
- dev@geronimo.apache.org
  - dev-subscribe@geronimo.apache.org

IRC

- #geronimo on irc.freenode.net