

WHAT'S NEW AND DIFFERENT ABOUT COLDFUSION 10 ON TOMCAT

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INTRODUCTION

- You may have heard of a fundamental change in CF10:
 - CF10 now comes bundled atop Apache Tomcat, instead of Adobe Jrun
 - Should mostly be transparent to most CF users/admins
 - But there are some differences
 - Alternately, can also deploy CF on native Tomcat, as CF EAR/WAR
 - Most people will not do that. More of an advanced option. Not focus here
- 3 main messages:
 - CF bundled with Tomcat differs in some ways from CF/JRun
 - Some things about native Tomcat don't apply to Tomcat as under CF
 - Lots more about Tomcat features than Adobe may ever document

INTRODUCTION (CONT.)

- 3 primary audiences, used as basis for sections of this talk:
 - For those familiar with CF running on JRun
 - how CF is different running atop Tomcat
 - For those familiar with Tomcat
 - how Tomcat is different as bundled under CF10
 - For those familiar with CF but not Tomcat
 - what features of Tomcat may be useful to CFers

ABOUT CHARLIE AREHART

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- Frequent speaker to conf's worldwide
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- ~100 presentations, 80+ articles, ~300 blog entries
- UGTV: recordings of 600+ presos by 300+ speakers
- CF411.com: 1800+ tools/resources, 150+ categories
- CF911.com: CF server troubleshooting resources
- Hosting courtesy of EdgeWeb Hosting
- Consulting: available for CF troubleshooting, tuning
 - Remote or on-site; on-demand, single instance is ok

NOTES

- These slides are available on my web site
 - Admittedly, rather text heavy. Want you to have the details needed
- I offer just a couple things that I also offered in my “Hidden Gems in CF10”
 - In case you didn’t see that talk yet (also available on my site)
- There are recordings of me giving both talks, though I’ve tweaked since
- I will show folders/file as in Windows
 - I trust Mac/Linux/Unix folks can determine the equivalents! :-)

NOTES

- If viewing this after cfobjective, note that I tweaked the talk slightly:
 - Added page on deploying CF on native Tomcat
 - Session Manager page
 - Reference to Bilal Solyu's "IIS to Tomcat Connector" as web server connector alternative
 - Reference in "learning more" to Matt Woodward's guide to running CFML on Tomcat natively
- For those who saw it on SOTR Road show, also tweaked slightly for format
 - No significant content changes

FOR THOSE FAMILIAR WITH CF ON JRUN,
HOW CF IS DIFFERENT ON TOMCAT

- Differences to be discussed:
 - Installation/deployment
 - Logging
 - Web servers, internal and external

INSTALLATION/DEPLOYMENT

- No longer a separate Multiserver install option. Instead:
 - If CF10 "Server" deployed w/ Enterprise license or as Trial/Developer edition
 - "Instance Manager" still offered to create/manage instances/clusters
- By default with "Server" deployment (whether Standard or Enterprise/Trial/Dev):
 - Main instance name is cfusion, files in [cf10]\cfusion
 - New instances, no longer buried deep in instance dir, but [cf10]\[instance]
 - For remainder of talk, I may refer to [cf10]\cfusion or [cf10]\[instance]
- Option to create EAR/WAR still offered during Enterprise/Trial/Dev installation
 - To deploy on any of many supported JEE servers and servlet engines

INSTALLATION/DEPLOYMENT (CONT.)

- Other Multiserver enhancements
 - Each instance has its own JVM.config (yea!), used on instance startup
 - Also, "Java & JVM page" now available within instances
 - New AdminAPI method to get instancename (versus old JRun API)
 - getInstanceName in runtime.cfc
 - http://www.carehart.org/blog/client/index.cfm/2012/6/30/get_instancename_in_cf10
 - Supposed to be able to finally run CFSTAT on instances (was not supported in CF 6-9)
 - CF Admin "Debug Output Settings" page lets you set port for it to use
 - I am having difficulty getting it to work. Have reported to Adobe

INSTALLATION/DEPLOYMENT (CONT.)

- One feature lost: can no longer create an instance and deploy ear/war into it
 - For more, see “What’s the deal with Tomcat in CF10?”, Rupesh Kumar
 - <http://blogs.coldfusion.com/post.cfm/what-s-the-deal-with-tomcat-in-coldfusion-10>
- So again, can still deploy CF as EAR/WAR on any JEE server, just not on CF10 “instance”
 - Again, can create EAR/WAR during installer
 - Or use “Packaging&Deployment” in CF Admin (Enterprise/Trial/Developer)
 - Then deploy atop native Tomcat or other Servlet Container/JEE server
 - Will see this later, but again this is NOT the focus of this talk
 - Mostly talking to those who install ColdFusion using “Server” deployment

INSTALLATION/DEPLOYMENT (CONT.)

- JVM as deployed within CF10:
 - Is 1.6.0_29 by default, as of final release of CF10
 - Is located at [cf10]\jre
- Version of Tomcat in final release of CF10: 7.0.23.0
 - Both shown on CF Admin system info page
 - (Tomcat version not shown if CF 10 is deployed on native Tomcat)
- Adobe working on support for Java 7, later Tomcat versions
 - Planned quarterly updates of Tomcat, and sooner if needed for security
 - Update should be possible through new autohotfix feature

LOGGING

- Log locations are different
 - Old "out" logs, previously in [cf]\runtime\logs or [jrun]\logs
 - Now in [cf10]\cfusion\logs, with other traditional CF logs
 - Web server connector logs: [cf10]\config\wsconfig\wsconfig.log

LOGGING (CONT.)

- New metrics logging (similar to JRun metrics), can be enabled in CF Admin
 - "Debugging output settings" page, "Enable metrics logging"
 - Writes to [cf10]\[instance]\logs\metrics.log
 - Or console if started from cmd line
 - Writes a line every minute
 - Sample line:
 - "Information", "scheduler-2", "08/06/12", "16:08:50", "Max threads: 150
Current thread count: 4 Current thread busy: 1 Max processing time:
279876 Request count: 748 Error count: 3 Bytes received: 281578 Bytes
sent: 7375153 Free memory: 120128728 Total memory: 442957824 Active
Sessions: 9"

LOGGING (CONT.)

- New "access logs" enabled by default (in addition to your web server logs)
 - In [cf10]\[instance]\runtime\logs, in form localhost_access_log.2012-03-14.txt
 - Format: [ip] - [date/time] "GET [path/file] HTTP/1.1" [statuscode] [bytessent]
- Can configure file location, extension, name pattern, request details logged
 - See later discussion of Tomcat Valves
- Solr access logs also enabled by default
 - In [cf10]\[instance]\jetty\logs\, in form 2012_03_14.request.log
 - Configuration controlled similarly in [cf10]\[instance]\jetty\etc\jetty.xml

WEB SERVERS, INTERNAL AND EXTERNAL

- CF10, as before, asks during installation:
 - Whether to use external web server (IIS/Apache) or built-in one
 - In CF10, that internal one is Tomcat's own web server
 - Unlike JRun's built-in web server, Tomcat's is production-capable
- Enabling/disabling the built-in web server after install
 - Edit [cf10]\[instance]\runtime\conf\server.xml
 - To enable /disable, either uncomment or comment the xml element:
 - `<Executor name="tomcatThreadPool" namePrefix="catalina-exec-" ...`
 - Can set/change port in its PORT attribute. Defaults to 8500, 8501, etc.
 - Could even set to 80, if not using external web server

WEB SERVERS, INTERNAL AND EXTERNAL (CONT.)

- Can also tweak built-in web server configuration:
 - Change the default web root from [cf10]\[instance]\wwwroot
 - Add a virtual directory
 - Define custom error pages
 - Disabling directory browsing
- For more on the above and many of the previous items, see:
 - "Working with Tomcat as the built-in application server", by Kavya Maiya, Adobe
 - Technically, applies to more than just CF 10 on Tomcat web server
 - <http://www.adobe.com/devnet/coldfusion/articles/coldfusion-tomcat.html>
 - "Getting Started with Tomcat in ColdFusion 10", by Asha Kasala of Adobe
 - <http://blogs.coldfusion.com/post.cfm/getting-started-with-tomcat-in-coldfusion-10>
 - Also covered some in part of Chapter 2, *Installing ColdFusion 10*

WEB SERVERS, INTERNAL AND EXTERNAL (CONT.)

- External web server support: IIS 5-7, Apache 2.2.21, IBM HTTPServer
 - Config tool in [cf10]\[instance]\runtime\bin (wsconfig.exe)
 - And of course via Start menu in Windows
 - Web server connector files: [cf10]\config\wsconfig
 - Previously [cf9]\runtime\lib\wsconfig or [jrun4]\lib\wsconfig
 - For more on configuration/use
 - See "Installing CF10" manual, section "Configuring web servers"
- May also want to consider Bilal Soylu's "IIS to Tomcat Connector"
 - <http://tomcatiis.riaforge.org/>

FOR THOSE FAMILIAR WITH TOMCAT,
HOW TOMCAT IS DIFFERENT AS BUNDLED UNDER CF10

- Differences to be discussed
 - Some key differences from Native Tomcat
 - Some key Tomcat modifications by CF team
 - Features lost: CF deployed on Native Tomcat
 - Installing CF on Tomcat

SOME KEY DIFFERENCES FROM NATIVE TOMCAT

- There are key files that Tomcat users may often want to tweak
 - Where are they within CF (as bundled with Tomcat on CF10)?
- [cf10]\[instance]\runtime\conf\
 - server.xml, context.xml, web.xml
 - catalina.properties
 - More on these later, if you're new to Tomcat
- External web server connector properties
 - Again, [cf10]\config\wsconfig\[n]
 - Where [n] is a number from 1 to # of sites/hosts configured by CF
 - Holds especially workers.properties, uriworkermap.properties, isapi_redirect.properties
- Last key difference: "Manager" app cannot be enabled within CF10 atop Tomcat

SOME KEY TOMCAT MODIFICATIONS BY CF TEAM

- CF team tweaked deployment of Tomcat, to be more familiar to CFers
- Many aspects of configuration added in Tomcat as it exists under CF:
 - Support for CGI scope variables
 - Multiple webroot support (internal CF webroot supplements external)
 - Session replication supported in cluster
 - Search-Engine Safe/SES URL support, long in CF now added to Tomcat
- These are all discussed in:
 - "What's the deal with Tomcat in ColdFusion 10?"
 - <http://blogs.coldfusion.com/post.cfm/what-s-the-deal-with-tomcat-in-coldfusion-10>

SOME KEY MODIFICATIONS BY CF TEAM (CONT)

- As for these mods, CF team willing to offer modified Tomcat to CFers/others:
 - *"We will make ColdFusion's modified version of Tomcat (let's call it CF-Tomcat), as well as the connectors, available for you so that you can use it like a standard Tomcat installation.*
 - *This will allow you to take advantage of all the changes that we have made in Tomcat and at the same time, you can deploy any application on it the way you want.*
 - *We are also exploring the option of open-sourcing the changes that we have made in Tomcat."* (emphasis mine)
 - <http://blogs.coldfusion.com/post.cfm/what-s-the-deal-with-tomcat-in-coldfusion-10>

FEATURES LOST IF CF DEPLOYED ON NATIVE TOMCAT

- What if you decide to install CF WAR/EAR on Native Tomcat?
 - As opposed to normal deploy of CF (with Tomcat bundled under it)
- You can, but you lose the items above:
 - some CGI vars, multiple webroot support, CF session replication, SES URLs
 - Still, can tweak web.xml to at least get SES to work
 - See Rupesh's article for needed XML changes
- You do at least get things not in CF10's bundled Tomcat, like Manager app
- Issue to note, related to support, and which web connector you use
 - If you use Tomcat web server, that's supported
 - If you use Adobe's modified Tomcat web server connectors, that's supported
 - If you use Tomcat's IIS/Apache connector, that's not supported

INSTALLING CF ON TOMCAT

- Really pretty simple, if default config options are acceptable
- Download/install Java (required for Tomcat)
- Download Tomcat (tomcat.apache.org)
 - Available either as installer, or a zip you simply extract
 - If using zip, set java_home env. variable pointing to java JRE
 - For example set java_home=C:\Program Files\Java\jre6
 - Start Tomcat: in its \bin directory, run startup script
 - Test it as localhost:8080
- Run CF Installer (any release after 7), choose option to create WAR file
 - From resulting directory created, copy cfusion.war file to Tomcat webapps dir
 - for example, C:\tomcat-7.0.27\webapps
 - After a few mins, test it as <http://localhost:8080/cfusion/CFIDE/administrator/index.cfm>
- See "Installing CF" manual for more details, alternative config options
- Caution: Some have found that EAR/WAR created from CF Admin "Packaging&Deployment" did not install so readily

FOR THOSE FAMILIAR WITH CF BUT NOT TOMCAT, WHAT
FEATURES OF TOMCAT MAY BE USEFUL TO CFERS

- Differences to be discussed
 - First some fundamentals
 - Some Tomcat files you might explore
 - Some Tomcat concepts you might explore
 - Mobile apps for monitoring Tomcat

FIRST SOME FUNDAMENTALS

- Speaking primarily to those just running CF10 “Server” (Tomcat bundled)
 - Rather than those creating/installing CF EAR/WAR on native Tomcat
- Are some terms/names you’ll hear: main components underlying Tomcat
 - Catalina: servlet container
 - Coyote: http connector (its built-in web server)
 - Jasper: JSP engine
- Great resources for learning more on Tomcat at <http://tomcat.apache.org/>
 - Including history of previous releases
 - Focus on v7: <http://tomcat.apache.org/tomcat-7.0-doc/index.html>
- Still, be careful in reading Tomcat resources. Many concepts don’t apply...

SOME THINGS TO CONSIDER WHILE READING ABOUT TOMCAT (AS A CF'ER)

1. Some things apply only on a native Tomcat deployment, not the version within CF
2. Some things may apply only to a specific version of Tomcat, perhaps earlier than 7
3. Some things apply only to using Tomcat's built-in web server (vs Tomcat/IIS)
4. Some things can be used in Tomcat but maybe better configured in your web server
 - Such as SSL, compression, IP blacklists
5. Some things may exist in Tomcat from before JEE spec defined a new approach
 - Such as Valves vs Filters (more in a moment)
6. Some things refer to features of Tomcat already provided or handled by CF
 - JDBC connectivity, connection pooling, sessions, etc.
7. Some things refer to doing native JEE development
 - And don't generally apply to CFers doing deployment of CF on Java...

JEE CONCEPTS THAT DON'T GENERALLY APPLY TO CF'ERS USING TOMCAT

- All these were also part of JRun; we didn't need to worry about them then
- JSPs and servlets: Java way of web application development. Ours: CFML
- Use of WAR/EAR packaging, application "deployment", Tomcat's "Admin" application (for deployment)
 - Advanced CFers may use these things, but even then mostly as admins
- Other general or detailed JEE concepts we can ignore, to start:
 - JNDI, JMS, JTA, JAXP, JAAS (generally don't need to use)
 - APR, NIO (advanced features we don't need to worry about initially)
 - Realms (security concept in Tomcat we don't generally interact with)

SOME TOMCAT ARCHITECTURE TERMS YOU OUGHT TO BE FAMILIAR WITH

- “Apache” is an overarching entity encompassing many projects
 - It’s also the name of the Apache *web server*
- Tomcat is a servlet container, includes a web server / can connect to others
- JBoss is a JEE Application Server which bundles Tomcat
- Web server connectors: various flavors
 - HTTP 1.1 (Tomcat’s built-in web server/Coyote)
 - AJP (used with external web servers)

SOME TOMCAT FILES YOU MIGHT EXPLORE

- First, note that Tomcat has components implemented in a hierarchy
 - Server > service > engine > host > context
 - Again, we don't need to know all details, just high level
 - But configurable, may be useful to understand for some needs
- Server.xml
 - Represents entire servlet container, and multiple nested components
 - Found in [cf10]\[instance]\runtime\conf\server.xml
 - More: <http://tomcat.apache.org/tomcat-7.0-doc/config/server.html>
 - <http://tomcat.apache.org/tomcat-7.0-doc/config/service.html>
 - <http://tomcat.apache.org/tomcat-7.0-doc/config/engine.html>
 - <http://tomcat.apache.org/tomcat-7.0-doc/config/host.html>

SOME TOMCAT FILES YOU MIGHT EXPLORE (CONT.)

- Context.xml
 - Lowest level of that hierarchy
 - Represents a web application (in our case, our ColdFusion code)
 - Found in [cf10]\[instance]\runtime\conf\context.xml
 - More: <http://tomcat.apache.org/tomcat-7.0-doc/config/context.html>
- Catalina.properties
 - Where various low-level (internals) configuration is done
 - Sessions, logging, security, and other things
 - In [cf10]\[instance]\runtime\conf\catalina.properties
 - <http://tomcat.apache.org/tomcat-7.0-doc/config/systemprops.html>

SOME TOMCAT FILES YOU MIGHT EXPLORE (CONT.)

- Files related to web server config (created/configured by CF, may want to tweak)
- workers.properties
 - In [cf10]\config\wsconfig\[n]\workers.properties
 - <http://tomcat.apache.org/connectors-doc/reference/workers.html>
- uriworkermap.properties
 - Handles reception of requests from web server. Rules-based
 - In [cf10]\config\wsconfig\[n]\URIWorkermap.properties
 - <http://tomcat.apache.org/connectors-doc/reference/uriworkermap.html>
- See also http://tomcat.apache.org/connectors-doc/webserver_howto/iis.html
 - http://tomcat.apache.org/connectors-doc/webserver_howto/apache.html

SOME TOMCAT CONCEPTS YOU MIGHT EXPLORE

- Valves and Filters (more in a moment)
- Listeners
- Clustering and Load Balancing
- Virtual hosting
- Connectors
- Session Managers
- For more on these, see docs starting at:
 - <http://tomcat.apache.org/tomcat-7.0-doc/config/index.html>

VALVES

- General concept of valves and filters
 - They can inspect/modify incoming request, outgoing response
 - Similar in some ways to CF's onrequeststart/onrequestend processing
 - Filters are JEE spec approach, but Tomcat long had (still has) valves
 - More: <http://tomcat.apache.org/tomcat-7.0-doc/config/valve.html>
- We saw one valve enabled by default, for access logs – AccessLogValve
 - Can tweak that in various ways. See link above for details
 - Configured in [cf10]\[instance]\runtime\conf\server.xml

VALVES (CONT.)

- Consider also:
 - CrawlerSessionManagerValve
 - Sets requests from listed crawler “user agents” to share single session
 - ExtendedAccessLogValve, RemoteAddrValve (block/allow certain IPs), RemoteHostValve, SingleSignOn, RemoteIpValve
 - BasicAuthenticator, DigestAuthenticator, FormAuthenticator, SSLAuthenticator
 - StuckThreadDetectionValve – similar to CF Admin’s “log slow pages”
- These would be configured in [cf10]\[instance]\runtime\conf\server.xml
 - Again, more at <http://tomcat.apache.org/tomcat-7.0-doc/config/valve.html>

FILTERS

- Filters are similar in concept to valves. Just the JEE spec equivalent
 - Can often find ones created by various JEE developers
 - and which should work across all JEE servers/servlet containers
 - See my "Fun with Filters": http://www.carehart.org/articles/#2003_2
- Can consider other built-in Tomcat ones:
 - AddDefaultCharsetFilter, CSRFPreventionFilter, ExpiresFilter, RemoteAddrFilter, RemoteHostFilter, RemoteIpFilter, RequestDumperFilter, SetCharacterEncodingFilter, FailedRequestFilter
- These can be configured in [cf10]\[instance]\runtime\conf\web.xml
 - More at <http://tomcat.apache.org/tomcat-7.0-doc/config/filter.html>

LISTENERS

- Components that fire on given events
 - Some already implemented in CF10:
 - `AprLifecycleListener`, `GlobalResourcesLifecycleListener`
 - `JreMemoryLeakPreventionListener`: provides work-arounds for known jvm classloading leaks
 - Others to consider:
 - `SecurityListener`, `ThreadLocalLeakPreventionListener`, `JmxRemoteLifecycleListener`
 - These would be configured in `[cf10]\[instance]\runtime\conf\server.xml`
 - Details at <http://tomcat.apache.org/tomcat-7.0-doc/config/listeners.html>

AND ALSO THOSE OTHER CONCEPTS LISTED...

- Clustering
 - <http://tomcat.apache.org/tomcat-7.0-doc/cluster-howto.html>
 - <http://tomcat.apache.org/tomcat-7.0-doc/config/cluster.html>
- Load Balancing
 - <http://tomcat.apache.org/tomcat-7.0-doc/balancer-howto.html>
 - http://tomcat.apache.org/connectors-doc/generic_howto/loadbalancers.html
- Virtual Hosting
 - <http://tomcat.apache.org/tomcat-7.0-doc/virtual-hosting-howto.html>
- Connectors (external web server connectors)
 - <http://tomcat.apache.org/tomcat-7.0-doc/connectors.html>

FINAL CONCEPT: "SESSION MANAGERS"

- Perhaps best hidden gem in CF10 (and Tomcat)
- Ability to save sessions over restarts. Yes!
 - Some important pros and cons to seriously consider
- Takes some knowledge of configuration within Tomcat (which you now have)
 - More: <http://tomcat.apache.org/tomcat-7.0-doc/config/manager.html>
 - Need to modify [cf10]\[instance]\runtime\conf\context.xml
- Adobe doc's brief discussion in "Installing CF 10" is confused, sadly
 - See p20, "Enabling persistent session" (sic)
 - Says to uncomment an already uncommented line of XML
 - Key is, if uncommented, MANAGER element must not have blank PATH, so:
 - Can either comment it (it's not commented by default in CF10, but PATH is blank)
 - Or can set a PATH value. PATH="sessions.ser" would save sessions to sessions.ser file
 - In [cf10]\[instance]\runtime\work\Catalina\localhost\tmp

PERSISTENT SESSIONS (CONT.)

- CF needs to be restarted after change to take effect
 - Test: config/restart/create sessions/restart again/test if saved
- Good news: even complex variables persist (queries, CFCs, structs, etc.)
- Gotcha: only saves sessions at normal CF shutdown
 - If CF crashes/is killed, sessions are NOT saved/restored
 - But then no different than things are now. Just bad if you “expect” save
- Also, can be a lot of I/O at shutdown, then startup, esp. if many sessions
 - You may have more sessions than you think, due to spiders, bots, etc.
- May confuse you: sessions.ser file will not appear while CF is up
 - Is created on shutdown, deleted after startup

PERSISTENT SESSIONS (CONT.)

- Yet another opportunity:
 - Tomcat has several different “managers” (session managers)
 - Default is StandardManager
 - Can instead enable PersistentManager
 - Configuring it causes persistence of sessions during run of CF/Tomcat
 - Saves one file per session instead of all in one file
 - Can also be configured to save to a database
 - Both options still have potential I/O, shutdown/startup considerations
 - More: <http://tomcat.apache.org/tomcat-7.0-doc/config/manager.html>

FINALLY, MOBILE APPS FOR MONITORING TOMCAT

- Watchdog for Tomcat (IOS)
 - <http://itunes.apple.com/us/app/watchdog-for-tomcat/id388474856>
- TomcatStats (IOS)
 - <http://itunes.apple.com/us/app/id397989929>
- Tomcat Administrator (Android)
 - <http://www.appbrain.com/app/tomcat-administrator/com.neven.tomcat>
- FusionReactor also offers mobile monitoring apps for FR
 - For monitoring both CF, and Native Tomcat (any JEE server)
 - For both IOS and Andriod
 - <http://www.fusion-reactor.com/fr/mobile/>

WHERE TO LEARN MORE

- Tomcat docs
 - <http://tomcat.apache.org/>
- Tomcat books
 - Apress has "Apache Tomcat 7" by Vukotic and Goodwill (modern, slim)
 - Wrox had "Pro Apache Tomcat 6", by Chopra, et al (really useful info)
 - O'Really had "Tomcat: The Definitive Guide", not updated since 2007

WHERE TO LEARN MORE (CONT.)

- "Getting Started with Tomcat in ColdFusion 10", by Asha Kasala of Adobe
 - <http://blogs.coldfusion.com/post.cfm/getting-started-with-tomcat-in-coldfusion-10>
- "Working with Tomcat as the built-in application server", by Kavya Maiya, Adobe
 - <http://www.adobe.com/devnet/coldfusion/articles/coldfusion-tomcat.html>
- "What's the deal with Tomcat in ColdFusion 10?", by Rupesh Kumar, Adobe
 - <http://blogs.coldfusion.com/post.cfm/what-s-the-deal-with-tomcat-in-coldfusion-10>
- Matt Woodward's "Definitive Guide to Running CFML on Tomcat"
 - <http://bit.ly/cfmlontomcat>
- See also "Installing ColdFusion 10 under MAMP Pro 2 on OS X Lion"
 - <http://www.brilang.com/2012/06/installing-coldfusion-10-under-mamp-pro-2-on-os-x-lion/1137>

CONCLUSION

- Hope you feel that there's a lot more to CF10 on Tomcat than you thought
- How many features/resources do you think we covered?
 - Over 100!
- How many were valuable to you?
 - Share your opinion by your applause! :-)
- With that, enjoy the rest of the event!
 - Questions, if we have time?
 - And if I can help you with CF Server Troubleshooting, contact me below!