Proxing to tomcat with httpd

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What I will cover

- Proxy what and why.
- Protocols
  - AJP
  - HTTP/HTTPS (1.1)
  - HTTP/2 (H2 and H2C)
  - Others proxy and Other protocols (web-socket etc)
- Configuration
  - mod_jk, mod_proxy, http/1.1 basic, h2c, h2
  - https /TLS proxying
- **Demo**
- **QUESTIONS?**

Who I am

Jean-Frederic Clere

Red Hat

Years writing JAVA code and server software

Tomcat committer since 2001

Doing OpenSource since 1999

Cyclist/Runner etc

Lived 15 years in Spain (Barcelona)

Now in Neuchâtel (CH)

What is Proxy?

- Something between the application server and the internet.
- Load-balancer
- Failover
- Protocol termination
  - TLS/SSL
  - HTTP/2 and (soon) HTTP/3
- Understands a protocol and possible upgrades.

APACHECON 2022

Why a proxy?

- Control the load
- Serve static pages
- Control requests: mod_security / mod_rewrite etc
- Dynamic configuration (mod_balancer/mod_cluster…)
- Protocol translations

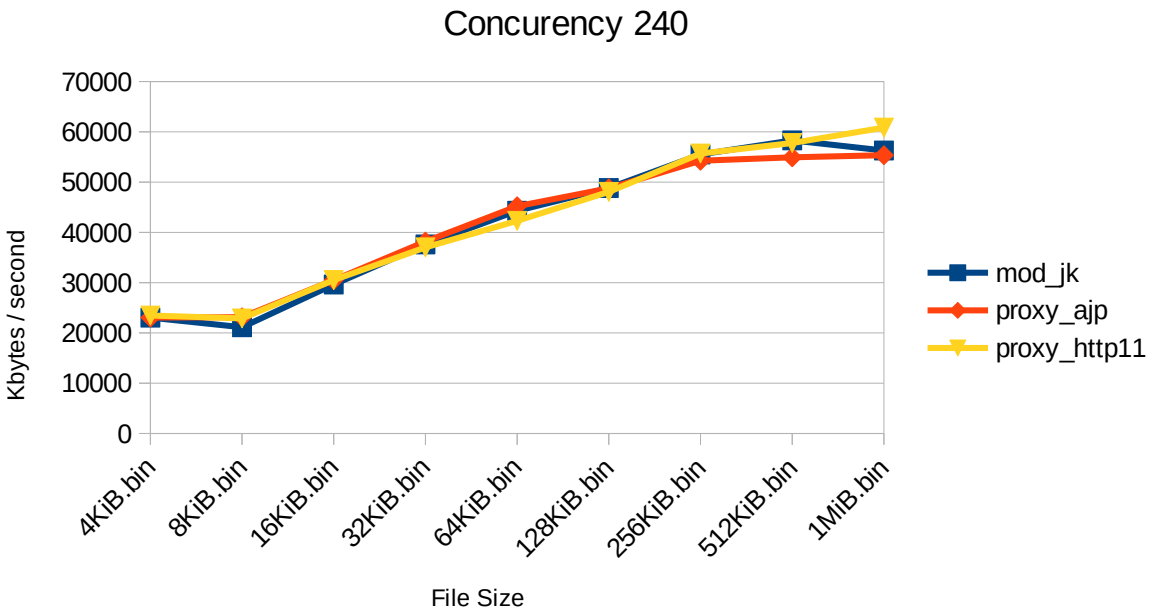
AJP

- When
  - Easy TLS/SSL forwarding
- Limitations
  - No upgrade
  - Header size
  - No encryption
  - Limited “authentication” (secret)
- mod_proxy_ajp and mod_jk

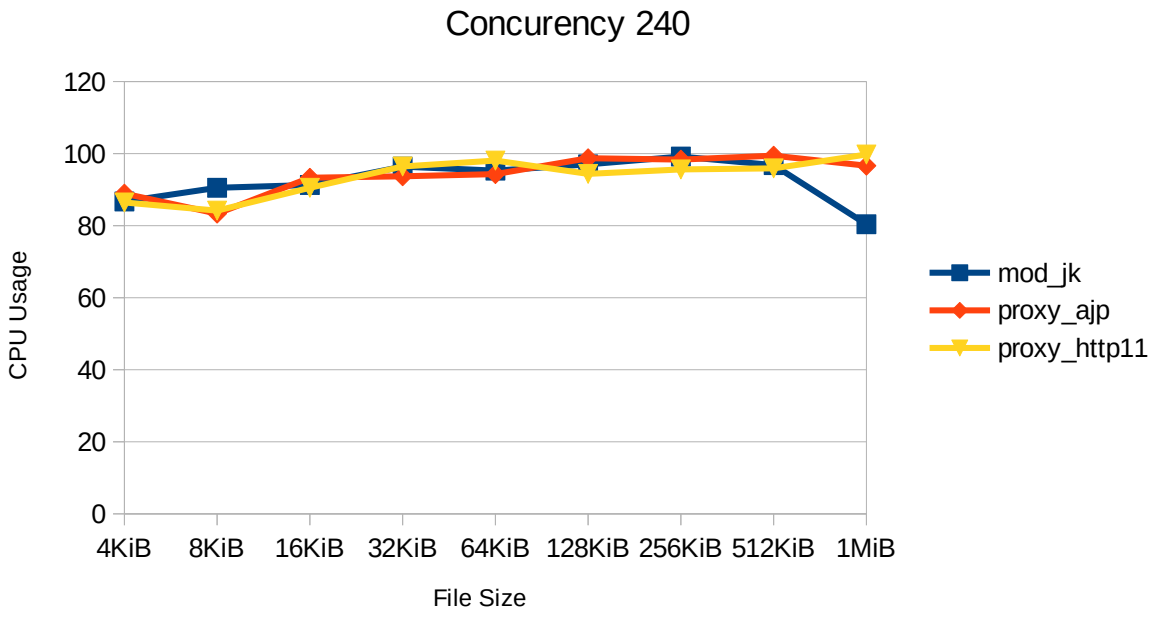
HTTP and HTTPS 1.1

- When:
  - No SSL forwarding
  - Using SSLValve
- HTTP/HTTPS:
  - HTTPS might be needed (Encryption/Authentication)
  - HTTPS on tomcat (openssl again?)
  - HTTP if you trust your intranet. (really?)
- Other reasons:
  - HTTP is more developed than AJP

Comparations mod_jk / mod_proxy



Comparations mod_jk / mod_proxy



Conclusion AJP/HTTP

- No big difference mod_proxy_ajp/mod_jk
- AJP more easy (no Valve needed)
- AJP not encrypted
- AJP has no upgrade

H2C

- h2c is only for reverse proxy
  - <UpgradeProtocol className="org.apache.coyote.http2.Http2Protocol" />
- Supported by httpd

Demultiplexing h2 in proxy

- Keep the back-end unchanged
- Keep the overhead of h2 in the proxy

Other proxies

- HAProxy (in the cloud / openshift for example)
- mod_cluster (httpd dynamic load balancer)
- Undertow proxy (jboss servlet container)
- Ingress (in kubernetes, well Nginx or GCE)
- Traffic Server
- Nginx

Other protocols

- Jboss-remoting
- Mix HTTP/1.1 websockets
- mod_proxy_wstunnel
- ProxySet "ws://localhost:8080/" upgrade=jboss-remoting
- LoadModule proxy_wstunnel_module modules/mod_proxy_wstunnel.so

So proxy or not proxy

- Fail-over : yes
- H2 and old HTTP/1.1 tomcat : yes? Really? Danger?
- Pure java tomcat + TLS/SSL : yes
- Otherwise: Not needed

mod_jk configuration

- Httpd.conf

```
LoadModule    jk_module  modules/mod_jk.so
JkMount  /jkaj/* worker1
JkWorkersFile conf/workers.properties
```

- properties

```
# Define 1 real worker using ajp13
 worker.list=worker1
 worker.worker1.type=lb
 worker.worker1.balance_workers=clusterdev03,clusterdev04
 # Set properties for workers (ajp13)
 worker.clusterdev03.type=ajp13
 worker.clusterdev03.host=192.168.0.130
 worker.clusterdev03.port=8009
 worker.clusterdev04.type=ajp13
 worker.clusterdev04.host=192.168.0.140
 worker.clusterdev04.port=8009
```


mod_proxy_ajp configuration

- Httpd.conf

```
LoadModule slotmem_shm_module modules/mod_slotmem_shm.so

LoadModule proxy_module modules/mod_proxy.so

LoadModule proxy_ajp_module modules/mod_proxy_ajp.so

LoadModule lbmethod_byrequests_module modules/mod_lbmethod_byrequests.so

LoadModule proxy_balancer_module modules/mod_proxy_balancer.so

<Proxy balancer://ajp>

#192.168.0.140 192.168.0.130 clusterdev04 / 03

BalancerMember ajp://192.168.0.130:8009

BalancerMember ajp://192.168.0.140:8009

</Proxy>

ProxyPass /tcaj balancer://ajp/tcaj
```


mod_proxy_httpd configuration

- Httpd.conf

```
LoadModule slotmem_shm_module modules/mod_slotmem_shm.so

LoadModule proxy_module modules/mod_proxy.so

LoadModule proxy_http_module modules/mod_proxy_http.so

LoadModule lbmethod_byrequests_module modules/mod_lbmethod_byrequests.so

LoadModule proxy_balancer_module modules/mod_proxy_balancer.so

<Proxy balancer://http>

BalancerMember http://192.168.0.130:8080

BalancerMember http://192.168.0.140:8080

</Proxy>

ProxyPass /tchp balancer://http/tchp
```


H2C configuration

- Httpd.conf

```
LoadModule http2_module modules/mod_http2.so

Protocols h2 http/1.1

LoadModule proxy_module modules/mod_proxy.so

LoadModule proxy_http_module modules/mod_proxy_http.so

LoadModule proxy_http2_module modules/mod_proxy_http2.so

ProxyPass "/tch2" "h2c://192.168.100.215:8888/tch2"
```

H2C configuration

- server.xml

```
<Connector port="8888" protocol="HTTP/1.1" redirectPort="8443">
    <UpgradeProtocol className="org.apache.coyote.http2.Http2Protocol" />
</Connector>
```

Using TLS (1 tomcat)

server.xml

```
<Connector port="4433" protocol="org.apache.coyote.http11.Http11NioProtocol"
        address="localhost"
        maxThreads="150" SSLEnabled="true">
    <SSLHostConfig>
        <Certificate
            certificateFile="/home/jfclere/CERTS/localhost/newcert.pem"
            certificateKeyFile="/home/jfclere/CERTS/localhost/newkey.txt.pem"/>
    </SSLHostConfig>
</Connector>
```

Using TLS (1 httpd)

httpd.conf

```
SSLProxyEngine on
SSLProxyCACertificateFile  "/etc/pki/CA/cacert.pem"

ProxyPass "/examples" "https://localhost:8443/examples"
ProxyPassReverse "/examples" "https://localhost:8443/examples"
```

Using TLS (2 tomcat)

server.xml

```
<Valve className="org.apache.catalina.valves.SSLValve" />
```


Using TLS (2 httpd)

Httpd.conf add headers for Valve

```
# export the ssl variables
SSLOptions +StdEnvVars +ExportCertData

# Use mod_headers to add them as headers.
RequestHeader set SSL_CLIENT_CERT "%{SSL_CLIENT_CERT}s"
RequestHeader set SSL_CIPHER "%{SSL_CIPHER}s"
RequestHeader set SSL_SESSION_ID "%{SSL_SESSION_ID}s"
RequestHeader set SSL_CIPHER_USEKEYSIZE "%{SSL_CIPHER_USEKEYSIZE}s"
```

Demo

8007: just encrypt httpd-tomcat (makes no sense!!!).

8000: encrypt both. (makes sense)

8888: encrypt both. (makes sense) and get client certificates. (remember PEM vs pem)

9999: h2c proxy

9998: h2 proxy

See: https://github.com/jfclere/AC2022/blob/main/proxy/tomcat-proxy.conf

Remember: LogLevel proxy_module:debug (or ssl_module:debug) will help!

Questions?

Thank you!

- jfclere@gmail.com
- users@tomcat.apache.org
- Repo with the examples for the demo:
  - https://github.com/jfclere/AC2022