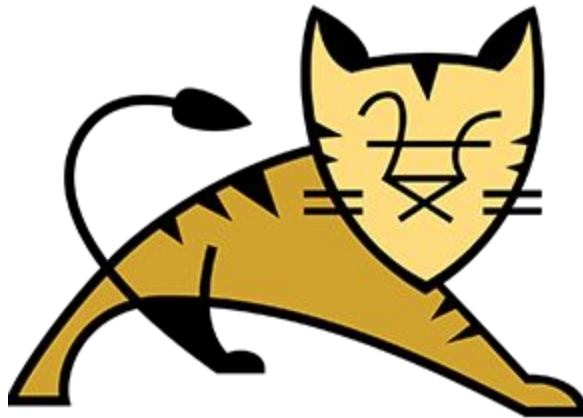# JBoss 7.x

## Software Maintenance Engineer

# Agenda

- **JBoss EAP 7 Overview**

- **JBoss EAP 7 As A Multi-platform Load Balancer**

- **JBoss Data Grid 7 Overview**

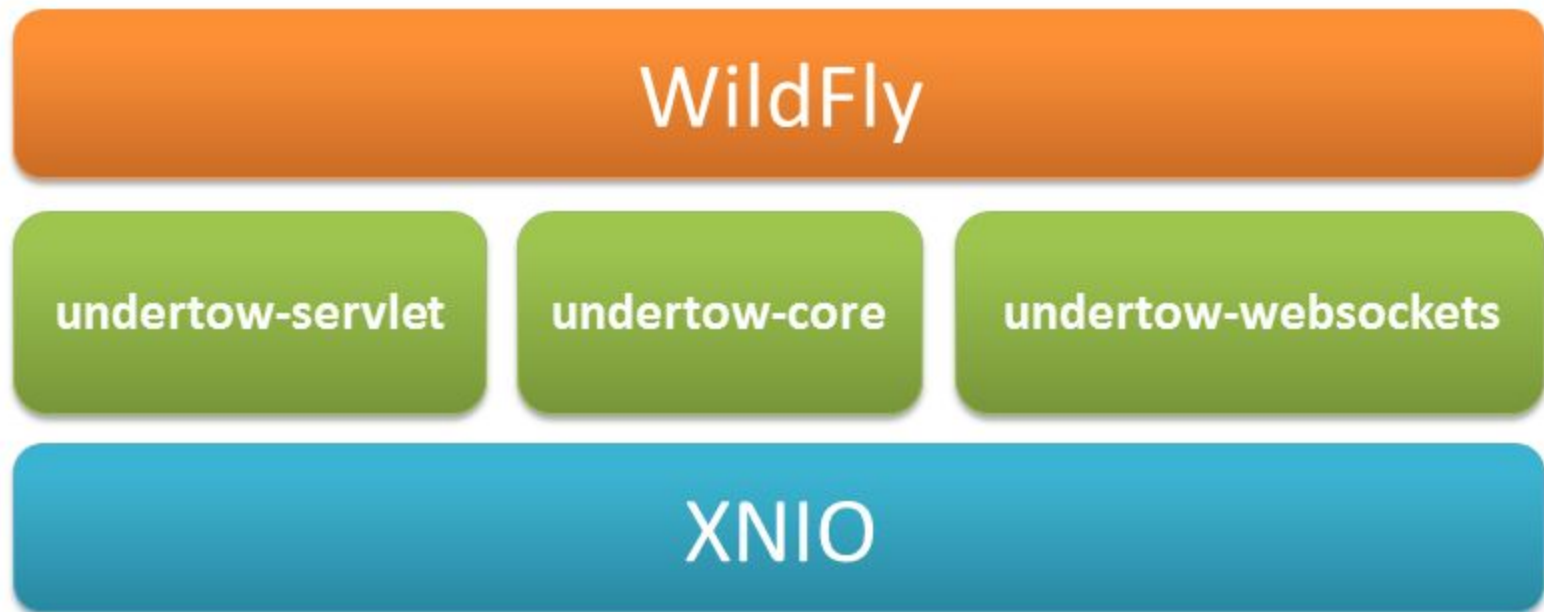- **JBoss Data Grid 7 & Apache Spark Integration**

# EAP 7 - New Features and Enhancements

- *Released at 2016 May*

1. Full Support  for Java EE 7 Specification

2. Requires Java SE 8

3. New Optimized Clustering

4. Server Suspend Mode/Graceful Shutdown

5. JBoss EAP 7 Management Improvements

6. **Highly Scalable Web Server - Undertow**
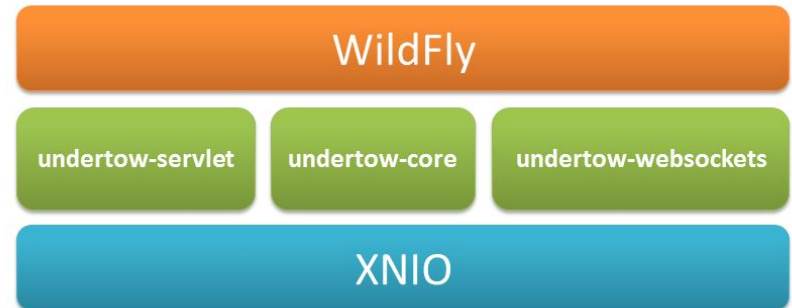
https://access.redhat.com/documentation/en-us/red_hat_jboss_enterprise_application_platform/7.0/html/7.0.0_release_notes/

# EAP 7 - New Web Server

**WildFly**

**undertow-servlet**     **undertow-core**     **undertow-websockets**

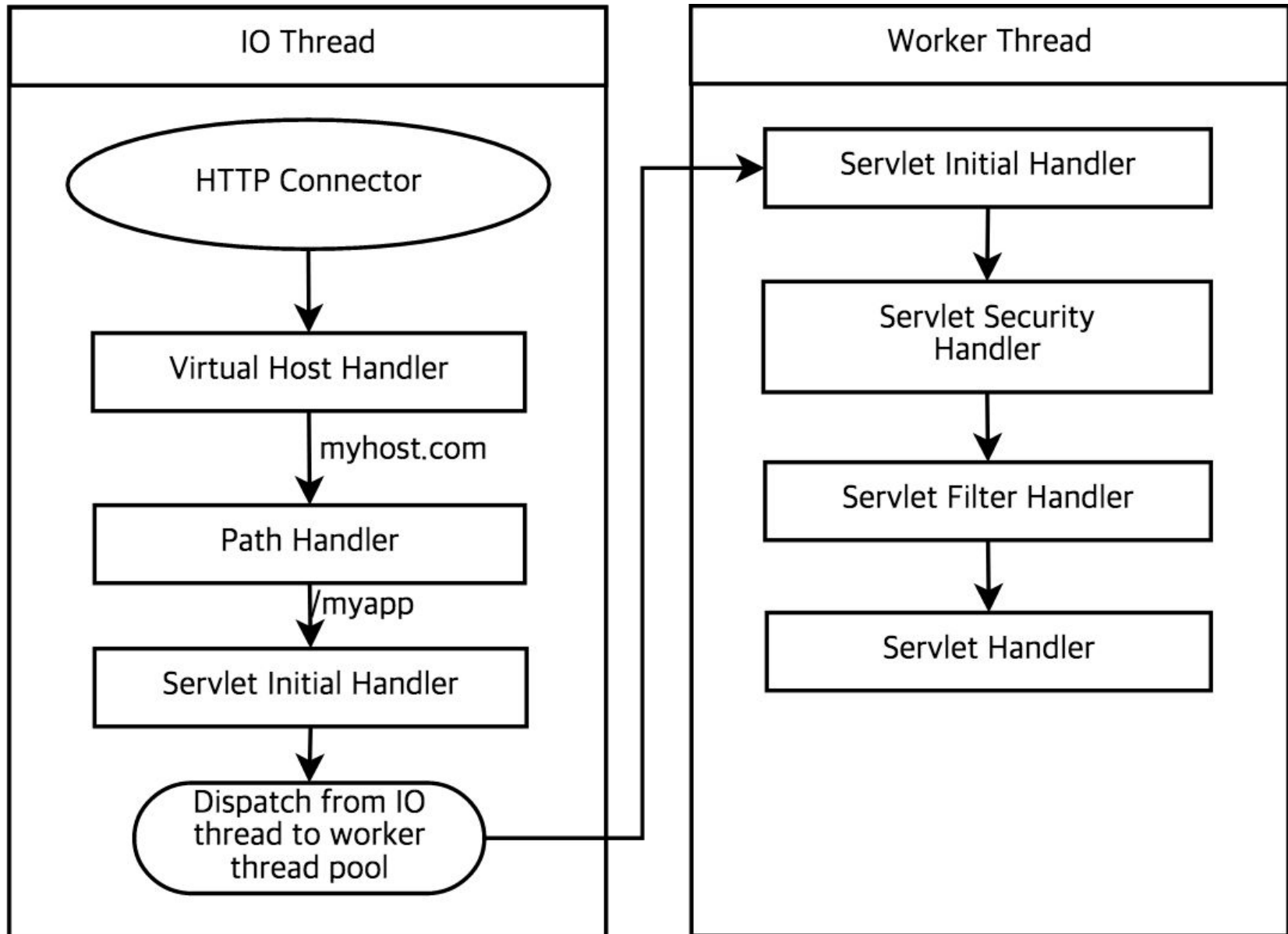**XNIO**

# What is Undertow

- Modern NIO Web Server

- Non-blocking handler

- High Performance

- Embeddable

- Servlet 3.1

- Built-in Handlers for JBoss Web valves

- Supports HTTP Upgrade

- Supports Web Sockets & HTTP/2 (Experimental)

- **Reverse proxy implementation**



WildFly

undertow-servlet   undertow-core   undertow-websockets

XNIO

http://blog.csdn.net/zhaowen25

# Undertow Flow Diagram

## IO Thread

HTTP Connector

↓

Virtual Host Handler

↓ myhost.com

Path Handler

↓ /myapp

Servlet Initial Handler

↓

Dispatch from IO thread to worker thread pool

## Worker Thread

Servlet Initial Handler

↓

Servlet Security Handler

↓

Servlet Filter Handler

↓

Servlet Handler

# EAP 6 - Web subsystem

```xml
<subsystem xmlns="urn:jboss:domain:web:2.2"
           default-virtual-server="default-host"
           native="false">
    <connector name="http" protocol="HTTP/1.1"
               scheme="http" socket-binding="http"/>
    <virtual-server name="default-host" enable-welcome-root="true">
        <alias name="localhost"/>
        <alias name="example.com"/>
    </virtual-server>
</subsystem>
```

```xml
<subsystem xmlns="urn:jboss:domain:undertow:3.1">
    <buffer-cache name="default"/>
    <server name="default-server">
        <http-listener name="default" socket-binding="http" redirect-socket="https"/>
        <host name="default-host" alias="localhost">
            <location name="/" handler="welcome-content"/>
            <filter-ref name="server-header"/>
            <filter-ref name="x-powered-by-header"/>
        </host>
    </server>
    <servlet-container name="default">
        <jsp-config/>
        <websockets/>
    </servlet-container>
    <handlers>
        <file name="welcome-content" path="${jboss.home.dir}/welcome-content"/>
    </handlers>
    <filters>
        <response-header name="server-header" header-name="Server"
                         header-value="JBoss-EAP/7"/>
        <response-header name="x-powered-by-header" header-name="X-Powered-By"
                         header-value="Undertow/1"/>
    </filters>
</subsystem>
```

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```xml
<subsystem xmlns="urn:jboss:domain:io:1.1">
    <worker name="default"/>
    <buffer-pool name="default"/>
</subsystem>
```

# EAP 7 - XNIO IO subsystem

```xml
<subsystem xmlns="urn:jboss:domain:io:1.1">
    <worker name="default"
            io-threads="2"
            task-max-threads="16"/>
    <buffer-pool name="default"/>
</subsystem>
```

# EAP 7 - Model Reference

Wildfly 10.0.0.Final / subsystem=undertow

Undertow subsystem

## Children (4)

- buffer-cache The buffer cache used to cache static content
- **configuration** null
    - ○ filter Undertow filters
    - ○ handler Undertow handlers
- server A server
- servlet-container A servlet container

## Attributes (6)

- default-security-domain The default security domain used by web deployments
- default-server The default server to use for deployments
- default-servlet-container The default servlet container to use for deployments

# JBoss EAP 7
# As A Multi-platform
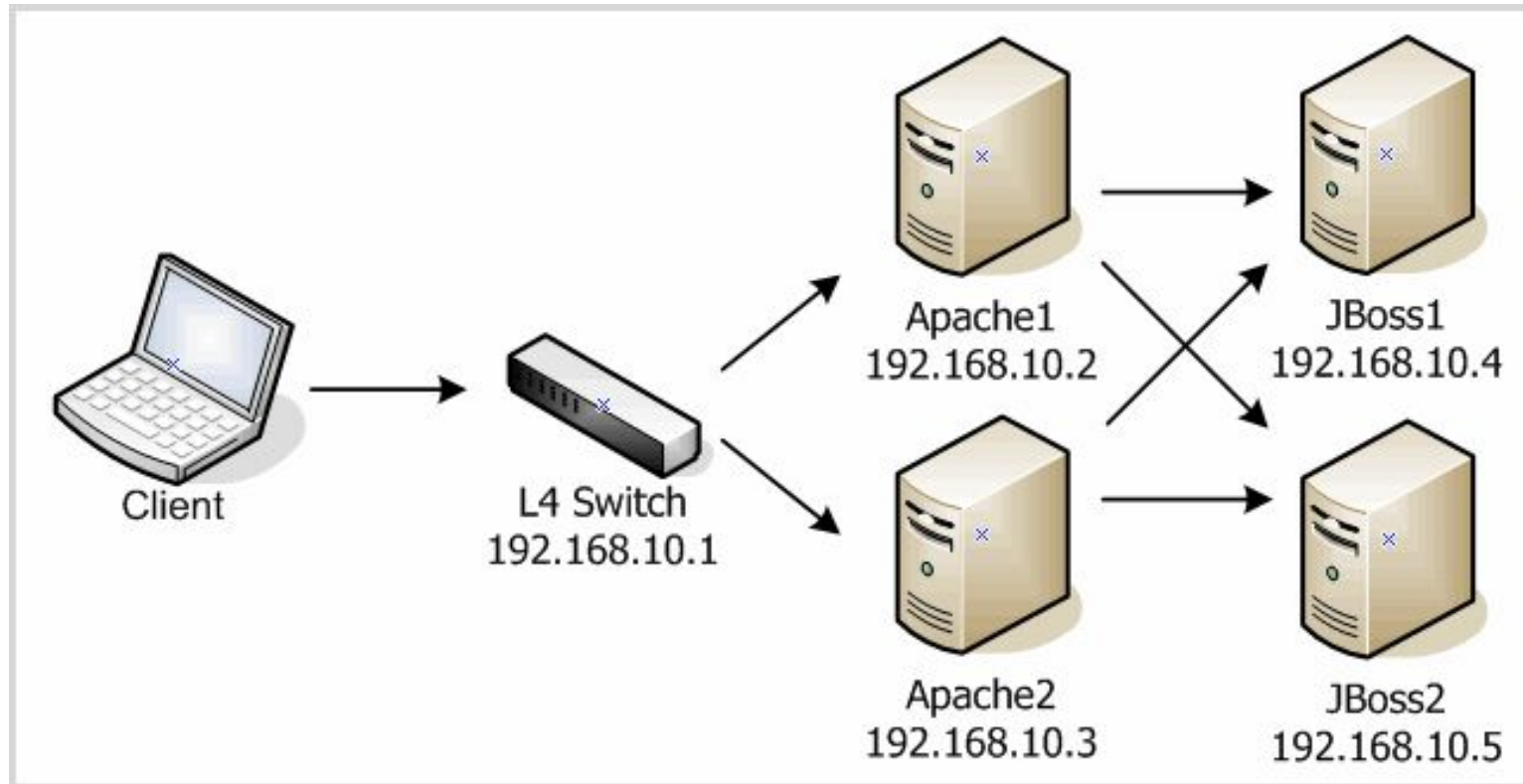# Load Balancer

*Undertow As A Reverse Proxy Using mod_cluster*
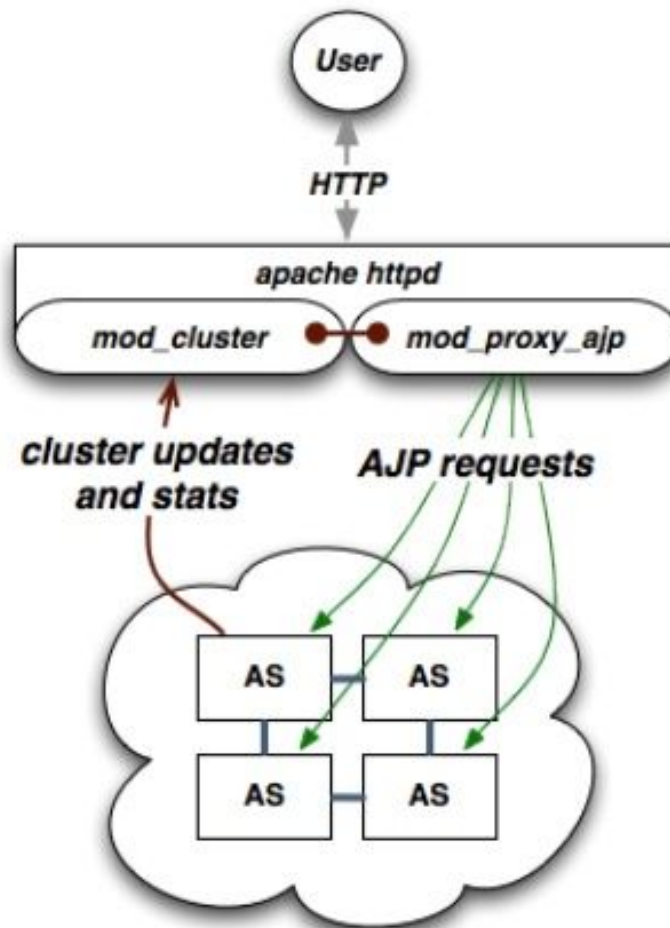
# Reverse Proxy

# Pros & Cons - Apache

- Traditional load balancer with mod_jk

- Native code

  - Apache, module

- Unable to apply dynamic load balancing factor

- Static Worker in workers.properties

- No dynamic scale-out

- No cloud-friendly

- Hard to trace issue

- Hard to monitor with EAP as an integrated view

# Undertow Reverse Proxy

- High performance reverse proxy

- All written in Java Architecture

- Dynamic scale-in/out

- Cloud-friendly

- Minimized profile

- Handles AJP, HTTP and HTTP/2 backends

- Supports static proxy list

- **Supports mod_cluster**

  ○ Ported to Java from C version

## Configuring a front-end load balancer

```xml
<subsystem xmlns="urn:jboss:domain:undertow:3.1">
    <buffer-cache name="default"/>
    <server name="default-server">
        <http-listener name="default" record-request-start-time="true"...>
        <host name="default-host" alias="localhost">
            <filter-ref name="modcluster"/>
        </host>
    </server>
    <servlet-container name="default"...>
    <handlers...>
    <filters>
        <mod-cluster name="modcluster" security-key="mypassword"
                     advertise-socket-binding="modcluster"
                     management-socket-binding="http"/>
    </filters>
</subsystem>
```

## Configuring back-end servers

```xml
<subsystem xmlns="urn:jboss:domain:modcluster:2.0">
    <mod-cluster-config advertise-socket="modcluster"
                        advertise-security-key="mypassword"
                        connector="ajp">
        <dynamic-load-provider>
            <load-metric type="cpu"/>
        </dynamic-load-provider>
    </mod-cluster-config>
</subsystem>
```
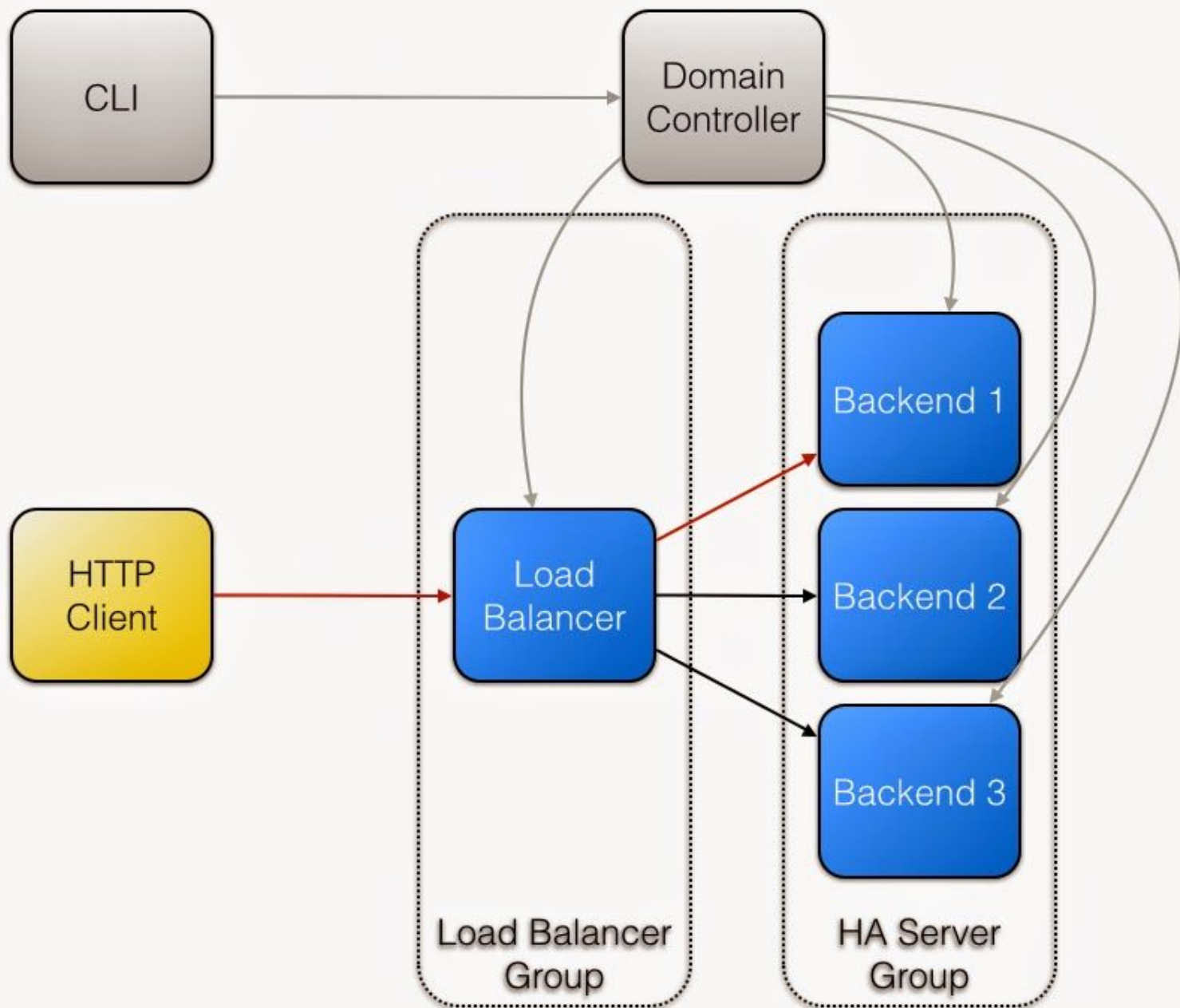
## Undertow As A Load Balancer Using mod_cluster

*https://github.com/stuartwdouglas/modcluster-example*

# Undertow Reverse Proxy

## Undertow As A Load Balancer Using mod_cluster

# Undertow Reverse Proxy

## Undertow As A Load Balancer Using mod_cluster

JBoss EAP Management +

localhost:9990/console/App.html#domain-deployments;backButton=

**RED HAT JBOSS ENTERPRISE APPLICATION PLATFORM**

| Home | **Deployments** | Configuration | Runtime | Access Control | Patching |

| **Browse By** | **Server Group (2)** | **Deployment (1)** | Add |
|---|---|---|---|

Content Repository

Unassigned Content

Server Groups

backend-servers

load-balancer

clustering-demo.war    View ▼

clustering-
■ Deployment

Details
Last enabled at
The deployment
Runtime name:

Reference S

The information

# Undertow Reverse Proxy

## Undertow As A Load Balancer Using mod_cluster

# Undertow Reverse Proxy

- http://wildfly.org/downloads/
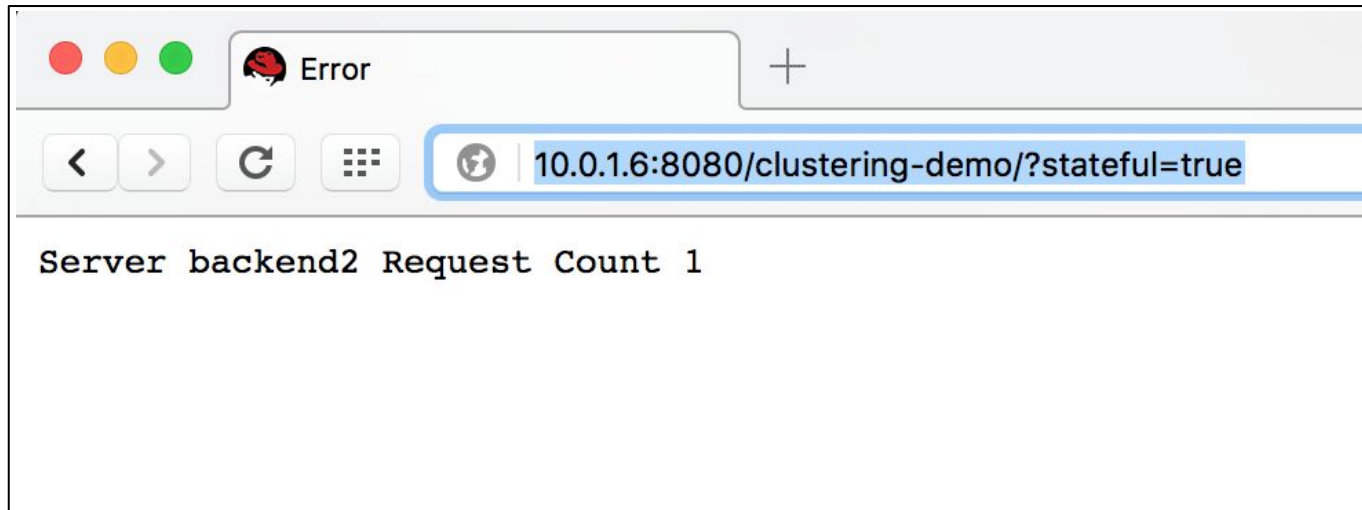
- cd wildfly-11.0.0.Alpha1

- bin/add-user.sh -m -u 'admin' -p 'admin123!'

- bin/domain.sh -b <IP ADDRESS>

- bin/jboss-cli.sh --connect

- http://localhost:9990/console

- https://github.com/stuartwdouglas/modcluster-example

- cd modcluster-example/load-balancing-demo/

- mvn package

-

wildfly-11.0.0.Alpha1/domain/configuration/host.xml

…

```
<servers>

  <server name="backend1" group="backend-servers">

    <system-properties>

      <property name="server.name" value="backend1" boot-time="false"/>

    </system-properties>

    <socket-bindings port-offset="100"/>

  </server>

…

</servers>

…
```

# Undertow Reverse Proxy

- [https://mirocupak.com/logging-requests-with-undertow/](https://mirocupak.com/logging-requests-with-undertow/)

- /profile=default/subsystem=undertow/server=default-server/host=default-host/setting=access-log:\

   add(pattern="%h %t \"%r\" %s \"%{i,User-Agent}\"",

  use-server-log=true)

- /profile=ha/subsystem=undertow/server=default-server/host=default-host/setting=access-log:\

   add(pattern="%h %t \"%r\" %s \"%{i,User-Agent}\"",

  use-server-log=true)

- http://<IP_ADDRESS>:8080/clustering-demo/

```
[domain@localhost:9990 /] /profile=default/subsystem=undertow/configuration=filter/mod-cluster=modclus
{
    "outcome" => "success",
    "result" => {
        "advertise-frequency" => 10000,
        "advertise-path" => "/",
        "advertise-protocol" => "http",
        "advertise-socket-binding" => "modcluster",
        "broken-node-timeout" => 60000,
        "cached-connections-per-thread" => 40,
        "connection-idle-timeout" => 60,
        "connections-per-thread" => 40,
        "enable-http2" => false,
        "health-check-interval" => 10000,
        "http2-enable-push" => true,
        "http2-header-table-size" => undefined,
        "http2-initial-window-size" => undefined,
        "http2-max-concurrent-streams" => undefined,
        "http2-max-frame-size" => undefined,
        "http2-max-header-list-size" => undefined,
        "management-access-predicate" => undefined,
        "management-socket-binding" => "http",
        "max-ajp-packet-size" => undefined,
        "max-request-time" => -1,
        "request-queue-size" => 1000,
        "security-key" => "mypassword",
        "security-realm" => undefined,
        "use-alias" => false,
        "worker" => "default",
        "balancer" => undefined
```

```
[domain@localhost:9990 /] /profile=ha/subsystem=modcluster/mod-cluster-config=configuration:read-resource
{
    "outcome" => "success",
    "result" => {
        "advertise" => true,
        "advertise-security-key" => "mypassword",
        "advertise-socket" => "modcluster",
        "auto-enable-contexts" => true,
        "balancer" => undefined,
        "connector" => "ajp",
        "excluded-contexts" => undefined,
        "flush-packets" => false,
        "flush-wait" => -1,
        "load-balancing-group" => undefined,
        "max-attempts" => 1,
        "node-timeout" => -1,
        "ping" => 10,
        "proxies" => undefined,
        "proxy-list" => undefined,
        "proxy-url" => "/",
        "session-draining-strategy" => "DEFAULT",
        "simple-load-provider" => undefined,
        "smax" => -1,
        "socket-timeout" => 20,
        "status-interval" => 10,
        "sticky-session" => true,
        "sticky-session-force" => false,
        "sticky-session-remove" => false,
        "stop-context-timeout" => 10,
        "ttl" => -1,
        "worker-timeout" => -1,
        "dynamic-load-provider" => {"configuration" => undefined},
```

# EAP/Undertow with JON

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**redhat.**

JBoss ON: Resource | Config

localhost:7080/coregui/#Resource/26691/Configuration/Current

**RED HAT JBOSS OPERATIONS NETWORK**

Dashboard | Inventory | Reports | Bundles | Administration | Help

- EAP 7 Domain Controller (master 127.0.0.1:9990)
  - DomainDeployments
    - clustering-demo.war
  - Hosts
  - Managed Servers
    - EAP backend1
    - EAP backend2
    - EAP backend3
    - EAP load-balancer
  - Profiles
    - default
      - Subsystems
        - Connector
        - Container
        - Core
        - infinispan
        - naming
        - remoting
        - Security (Profile)
        - Web
          - undertow
            - Buffer Cache (Profile)s
            - Filter configurations (Profile)s
            - Handler configuration (Profile)s
            - Server (Profile)s
              - default-server
                - Http Listener (Profile)s
                  - **default**
                - Undertow Host (Profile)s

## default ( Http Listener (Profile) )

Summary | Inventory | Alerts | Monitoring | **Configuration**

**Current** | History

| Property | Unset? | Value | | Description |
|---|---|---|---|---|
| Allow Encoded Slash | ☐ | ○ Yes | ● No | If a request comes in with encoded / characters (i.e. % The default value is false. |
| Allow Equals In Cookie Value | ☐ | ○ Yes | ● No | If this is true then Undertow will allow non-escaped e unquoted cookie values. Unquoted cookie values may characters. If present the value ends before the equa the cookie value will be dropped. The default value is |
| Always Set Keep Alive | ☐ | ● Yes | ○ No | If this is true then a Connection: keep-alive header wi even when it is not strictly required by the specificatio |
| Buffer Pipelined Data | ☐ | ○ Yes | ● No | If we should buffer pipelined requests. The default va |
| Buffer Pool | ☐ | default | | The AJP listeners buffer pool. The default value is def |
| Certificate Forwarding | ☐ | ○ Yes | ● No | If certificate forwarding should be enabled. If this is e take the certificate from the SSL_CLIENT_CERT attribu enabled if behind a proxy, and the proxy is configure headers. The default value is false. |
| Decode Url | ☐ | ● Yes | ○ No | If this is true then the parser will decode the URL and the selected character encoding (UTF-8 by default). If decoded. This will allow a later handler to decode the desired. The default value is true. |
| Disallowed Methods | | TRACE | | A comma separated list of HTTP methods that are no |
| | | ⊟ Delete | ⊞ New | |
| Enable Http 2 | ☐ | ○ Yes | ● No | Enables HTTP2 support for this listener. The default v |

33

Save

# JDG 7 & Spark Integration

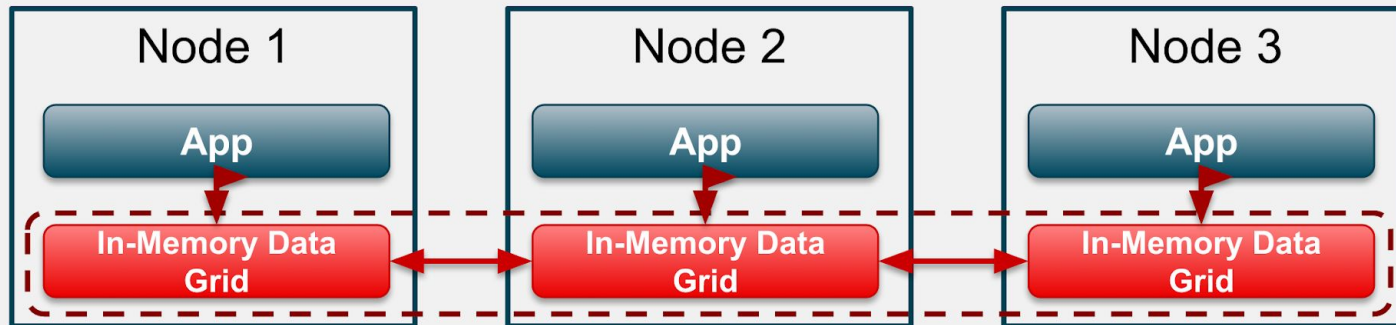*JBoss Data Grid 7's new feature*

**RED HAT® JBOSS®**
DATA GRID

*APACHE*
Spark™

# What is JBoss Data Grid

- Distributed cache

- In-memory NoSQL key/value data store

- Good harmony with real-time data processing framework

- In-memory HDFS for real-time processing

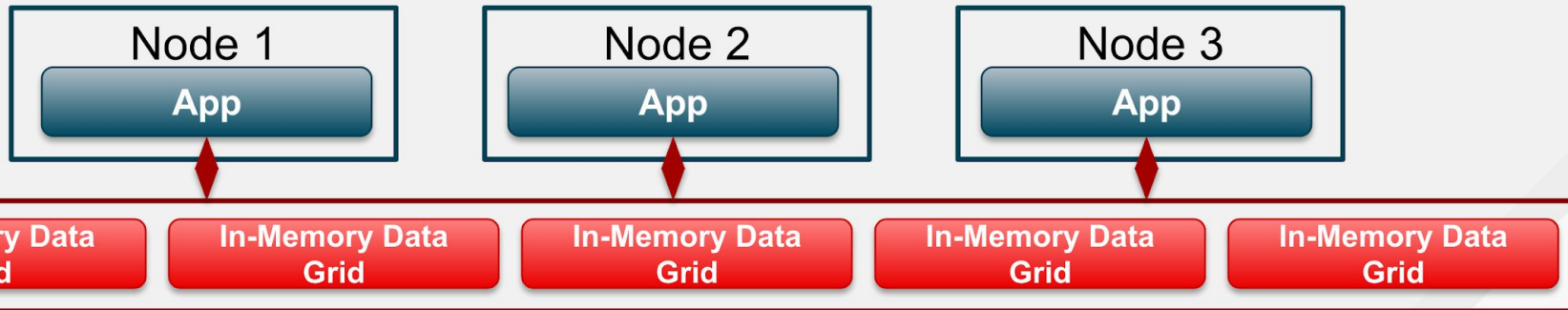- Extremely highly availability and scalability

- And more ...

# What is JBoss Data Grid

| Node 1 | Node 2 | Node 3 |
|---|---|---|
| **App** | **App** | **App** |
| **In-Memory Data Grid** | **In-Memory Data Grid** | **In-Memory Data Grid** |

**Embedded / Library Mode**

**Client / Server Mode**

| Node 1 | Node 2 | Node 3 |
|---|---|---|
| **App** | **App** | **App** |

| **In-Memory Data Grid** | **In-Memory Data Grid** | **In-Memory Data Grid** | **In-Memory Data Grid** | **In-Memory Data Grid** |
|---|---|---|---|---|

# What is JBoss Data Grid 7

- *Released at 2016 July*

- JDG 7 is based on Infinispan 8.3.0 and EAP 7.0.0.GA

- New GUI Admin console

- Easy to install and configure clustering and cache

- Easy to monitor and change configuration

- Easy to create a new cache through admin console in runtime

- **Provides API for integration with Apache Spark**

# JBoss Data Grid 7

## JDG 7 - New Features and Enhancements

1. DISTRIBUTED STREAMS

2. REMOTE TASK EXECUTION

3. **APACHE SPARK INTEGRATION**

4. APACHE HADOOP INTEGRATION

5. NEW ADMINISTRATION CONSOLE

6. CONTROLLED SHUTDOWN AND RESTART OF CLUSTER

7. NODE.JS (JAVASCRIPT) HOT ROD CLIENT

8. CASSANDRA CACHE STORE

9. HOT ROD C# & C++ ENHANCEMENTS

https://access.redhat.com/documentation/en-US/Red_Hat_JBoss_Data_Grid/7.0/html-single/7.0.0_Release_Notes/index.html#chap-New_Features_and_Enhancements

APACHE Spark™

**RED HAT® JBOSS®**
DATA GRID

hadoop
HDFS

# Infinispan Spark connector

*JBoss Data Grid 7's new feature*

## What is Infinispan Spark connector

● RDD and DStream integration with Apache Spark 1.6

● Use JDG as a data source for Spark

● Easy to read & write cache data in a Spark job

● Provides seamless functional programming style and syntactic sugar

● **Good to share RDD with other Spark jobs**

● JDG 7 Document https://goo.gl/9BXp98

● https://github.com/infinispan/infinispan-spark

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## Features of Infinispan Spark connector

1.  Create an Spark RDD from a JDG cache data
    ○   Read cache data from Spark job

2.  Use JDG server side filters to create a cache based RDD
    ○   Using Infinispan Query DSL

3.  Write any key/value based RDD to a JDG cache
    ○   Write intermediate or final data to cache

4.  Create a Spark DStream from JDG cache-level events
    ○   Insert, Modify and Delete event in a cache

5.  Write any key/value DStream to JDG
    ○   Write any DStream to cache

**Performance Considerations**

- The number of Spark workers should be greater than JDG nodes
  - To take advantage of the parallelism
- Support locality with co-located in the same node as JDG and Spark worker
  - Spark worker only processes data in the local node with connector

# Wrapped up

- **JBoss EAP 7 Overview**

- **JBoss EAP 7 As A Multi-platform Load Balancer**

- **JBoss Data Grid 7 Overview**

- **JBoss Data Grid 7 & Apache Spark Integration**

# Thank You

# References

- **EAP 7**
- https://access.redhat.com/documentation/en-US/Red_Hat_JBoss_Data_Grid/7.0/html-single/7.0.0_Release_Notes/index.html#chap-New_Features_and_Enhancements
- https://access.redhat.com/documentation/en-us/red_hat_jboss_enterprise_application_platform/7.0/html/7.0.0_release_notes/
- http://middlewareblog.redhat.com/2016/06/27/jboss-eap-7-the-7-new-features-you-need-to-know-about/
- http://middlewareblog.redhat.com/2016/06/ 27/announcing-jboss-eap-7/
- http://undertow.io/undertow-docs/undertow-docs-1.4.0/index.html
- https://en.wikipedia.org/wiki/Reverse_proxy
- https://access.redhat.com/documentation/en-us/red_hat_jboss_enterprise_application_platform/7.0/html/development_guide/undertow
- https://rawgit.com/stuartwdouglas/presentations/master/undertow-webinar.html
- https://github.com/stuartwdouglas/modcluster-example
- https://access.redhat.com/documentation/en-us/red_hat_jboss_enterprise_application_platform/7.0/html/configuration_guide/configuring_high_availability#configuring_jboss_eap_load_balancer
- https://issues.jboss.org/browse/JBEAP-9855
- **JDG 7**
- https://access.redhat.com/documentation/en-US/Red_Hat_JBoss_Data_Grid/7.0/html/Developer_Guide/Integration_with_Apache_Spark.html
- https://access.redhat.com/documentation/en-US/Red_Hat_JBoss_Data_Grid/7.0/html/7.0.0_Release_Notes/chap-New_Features_and_Enhancemnts.html
- https://access.redhat.com/documentation/en-us/reference_architectures/2017/html/red_hat_jboss_data_grid_7_and_apache_spark/
- https://en.wikipedia.org/wiki/Apache_Spark
- http://spark.apache.org/docs/1.6.2/programming-guide.html
- https://github.com/infinispan/infinispan
- https://github.com/infinispan/infinispan-sparkhttps://github.com/tedwon/infinispan-spark-connector-examples
- https://hub.docker.com/r/gustavonalle/infinispan-spark/