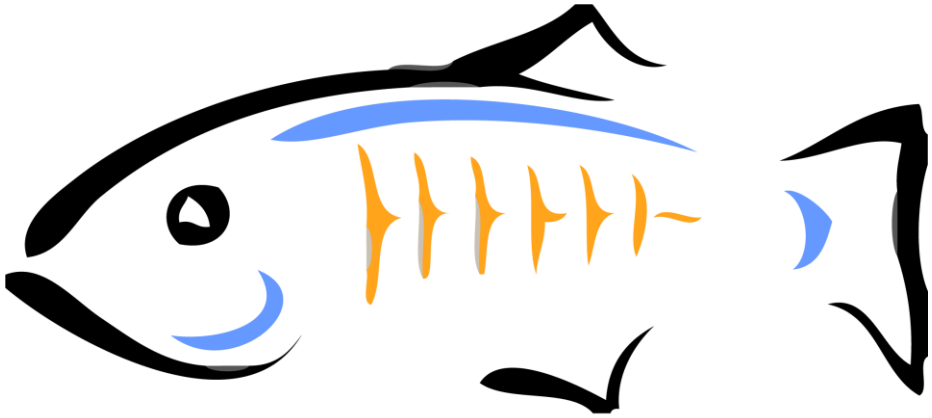
GlassFish : From the clustering to the cloud



GlassFish

JavaOne™

Fabien LEROY

10/02/2012

SERLI

A few words about SERLI

- Software engineering company based in France
- 65 people
- Small company working for big ones
- 80% of the business is Java-related
- OSS contribution : 10% of workforce
  (GlassFish, JOnAS, Weld-OSGi, Ceylon …)
- www.serli.com @SerliFr

Fewer words about me

- Java Engineer at SERLI
- Currently developing VMware plugin for GlassFish
- fabien.leroy@serli.com

GlassFish 3

- Java EE 6 (Servlet 3.0, EJB 3.1, JSF 2.0, CDI 1.0, web profile ..)
- CLI and GUI
- NetBeans and Eclipse plugin
- Active redeployment (`keepState = true`)
- Based on OSGi (Felix, Equinox …) and HK2

50K active users in 30 days
20 millions downloads in 1 year

GlassFish 3.1

- Released in February, 2011
- Performance optimization
- Clustering
  - High availability
  - Load-balancing
- Application versioning
- Current version is 3.1.2.2

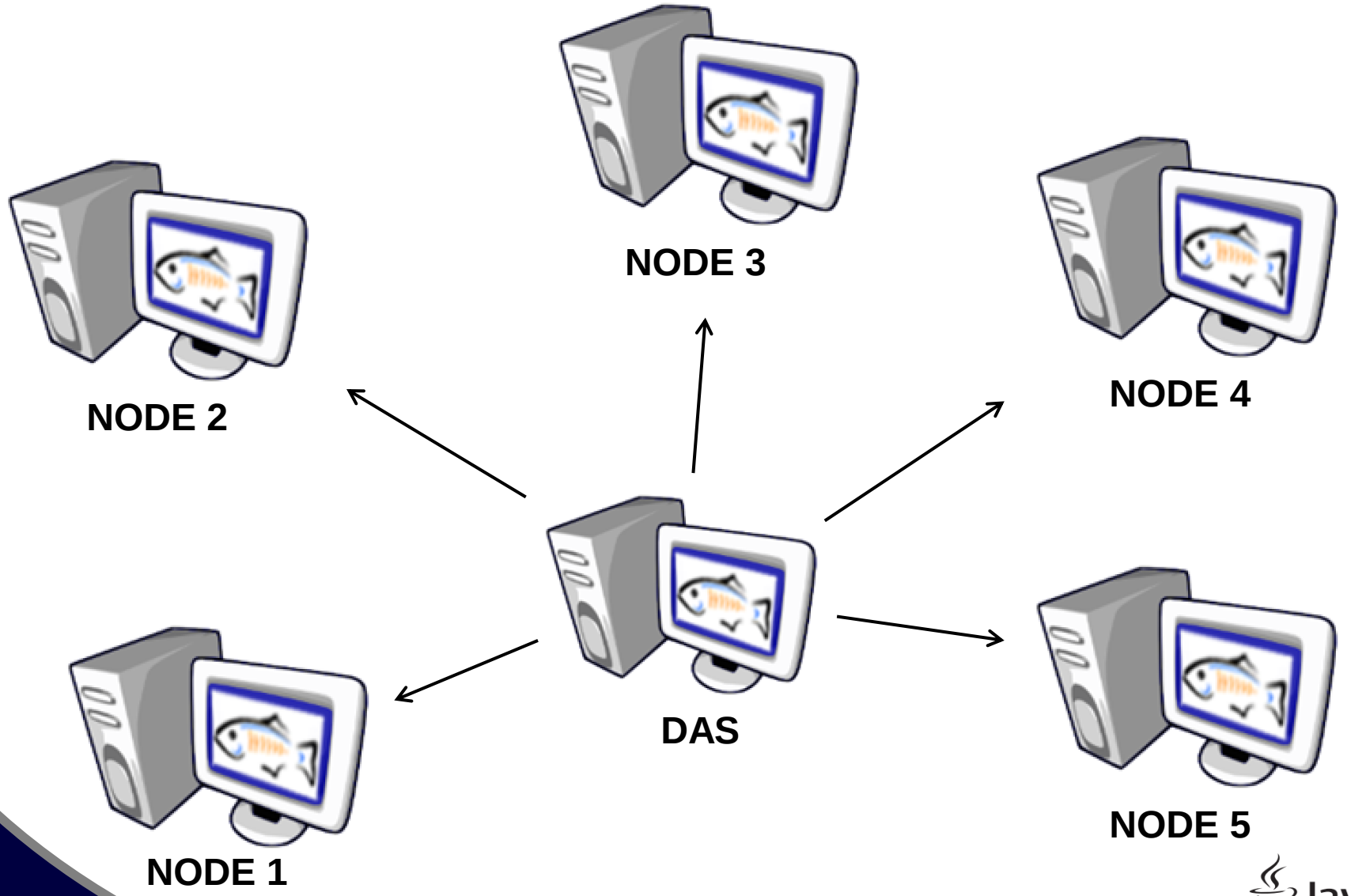
Application versioning

- Several versions deployed, only 1 enabled
  - `asadmin deploy --name=foo:BETA-1.0 foo.war`
  - `asadmin deploy --name=foo:BETA-1.1 --enable=false foo.war`
  - `asadmin enable foo:BETA-1.1`
  - `asadmin undeploy foo:BETA-*`
- `Cluster-proof`

Production redeployment

- Upgrade application without loss of availability
  - Relies on application versioning
  - 2 versions enabled in parallel
    - `asadmin deploy --name foo:2.0 --retire-timeout=3600 foo2.war`
  - New users redirected to newer version
- Glassfish 4.x ?

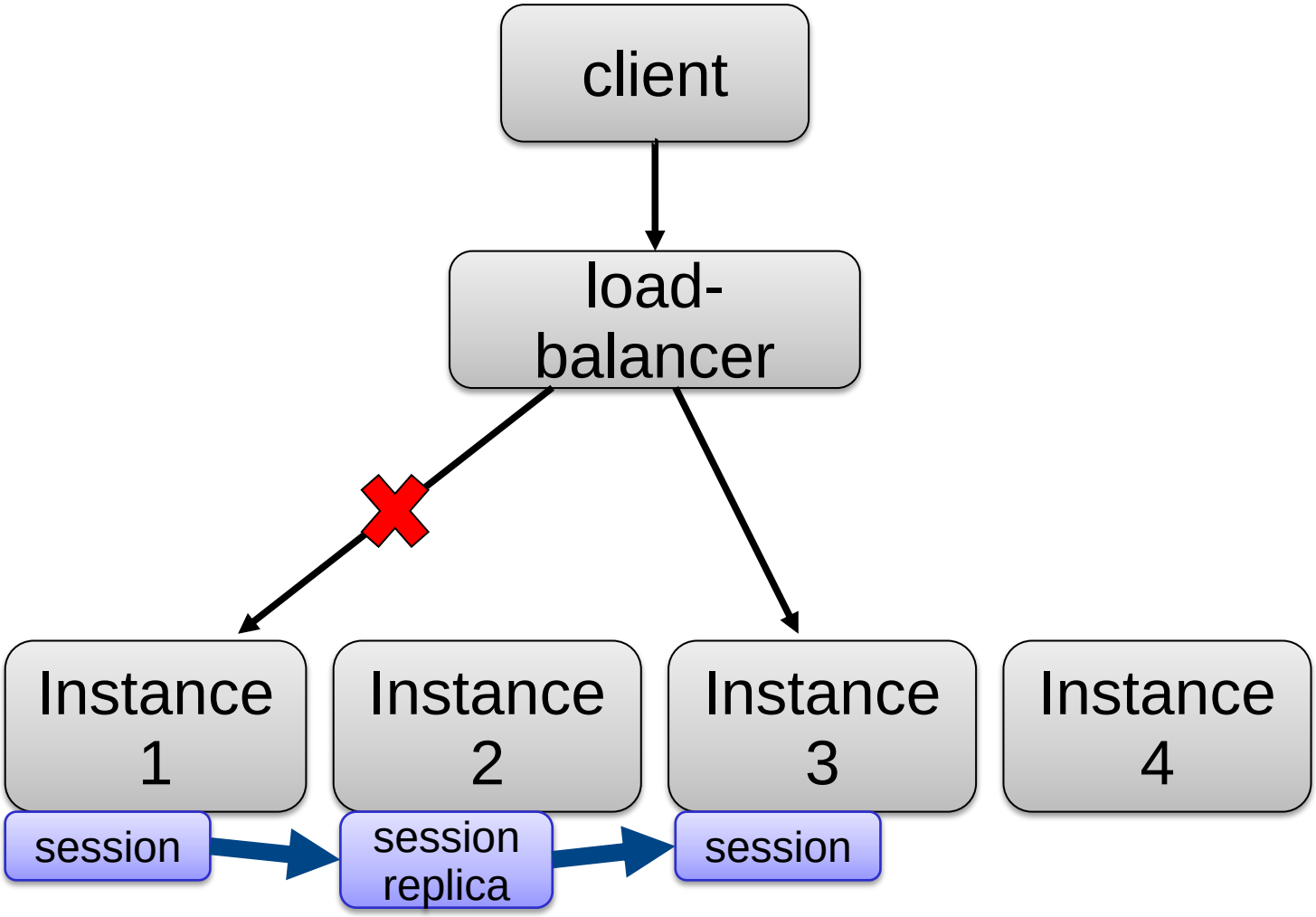
Cluster Infrastructure



GlassFish 3.1 : Clustering features

- Load-balancing
  - HTTP server, for example Apache + mod_jk
- High availability
  - Failure handling
  - Session replication
- Scalability
  - Possibility to add new instances at any time

Session replication



Session replication

- web.xml :

```
<web-app … >
   <distributable/>
   …
</web-app>
```

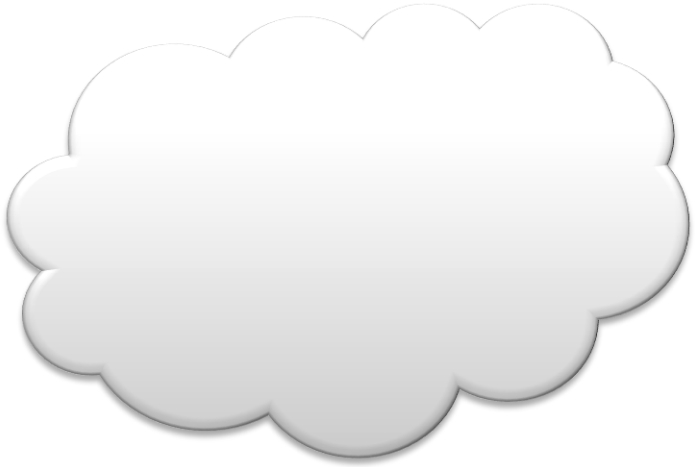
- `asadmin deploy --availabilityenabled=true`

JAVA EE 7

- 2013
- GlassFish 4.0
- New features and JSR updates
  - HTML 5 support (Web socket/JSONP)
  - JAX-RS client API
  - Temporary caching
  - Batch applications
  - …

JAVA EE 8

- 2015
- Move into the cloud
  - PAAS features
  - Multi-tenancy

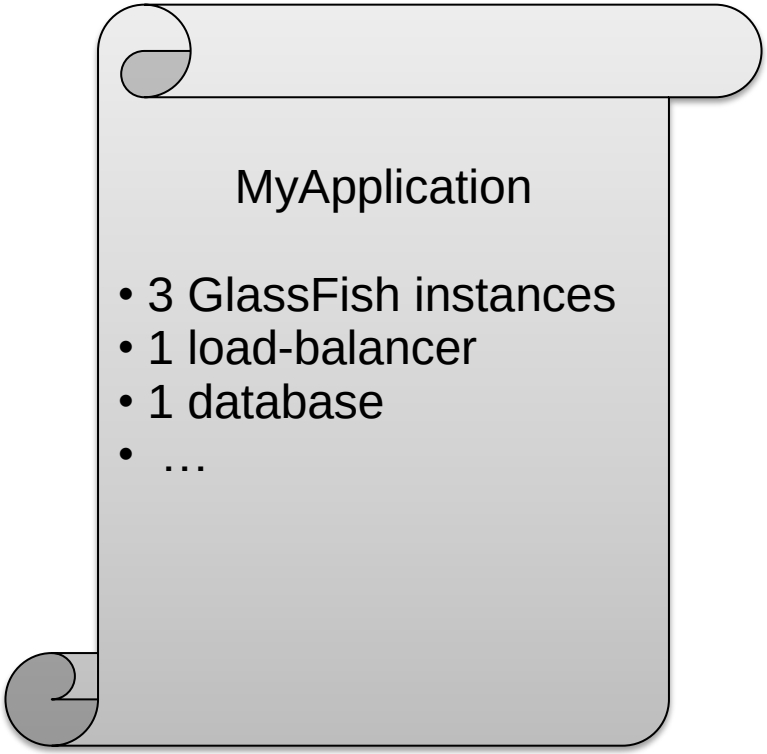


Clustering

- Manual tasks
  - Creating the cluster and adding the nodes
  - Creating glassfish instances
  - Configuring the HTTP load-balancer
  - Creating the external services
  - Defining resources in GlassFish to consume the external services
  - Deploying the application
  - Scaling the cluster

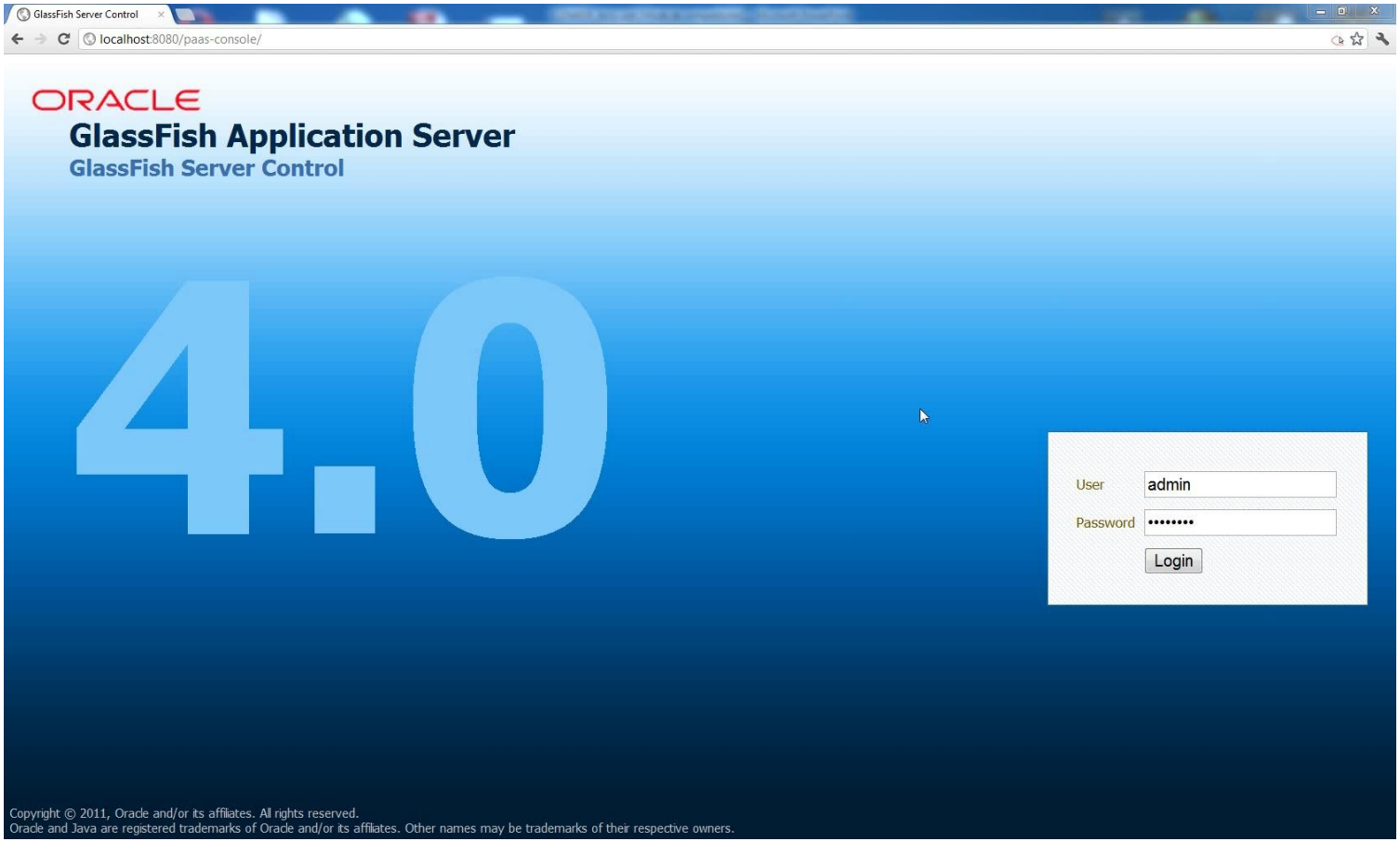
The checklist theory

- Make the deployment process easier
  - Define the cluster infrastructure
  - Write a service checklist
  - Deploy the application
  - Go take a coffee
- What is about scaling ?



DEMONSTRATION

PAAS


GlassFish Server Control
localhost:8080/paas-console/
ORACLE
GlassFish Application Server
GlassFish Server Control
4.0
User
admin
Password
Login
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PAAS

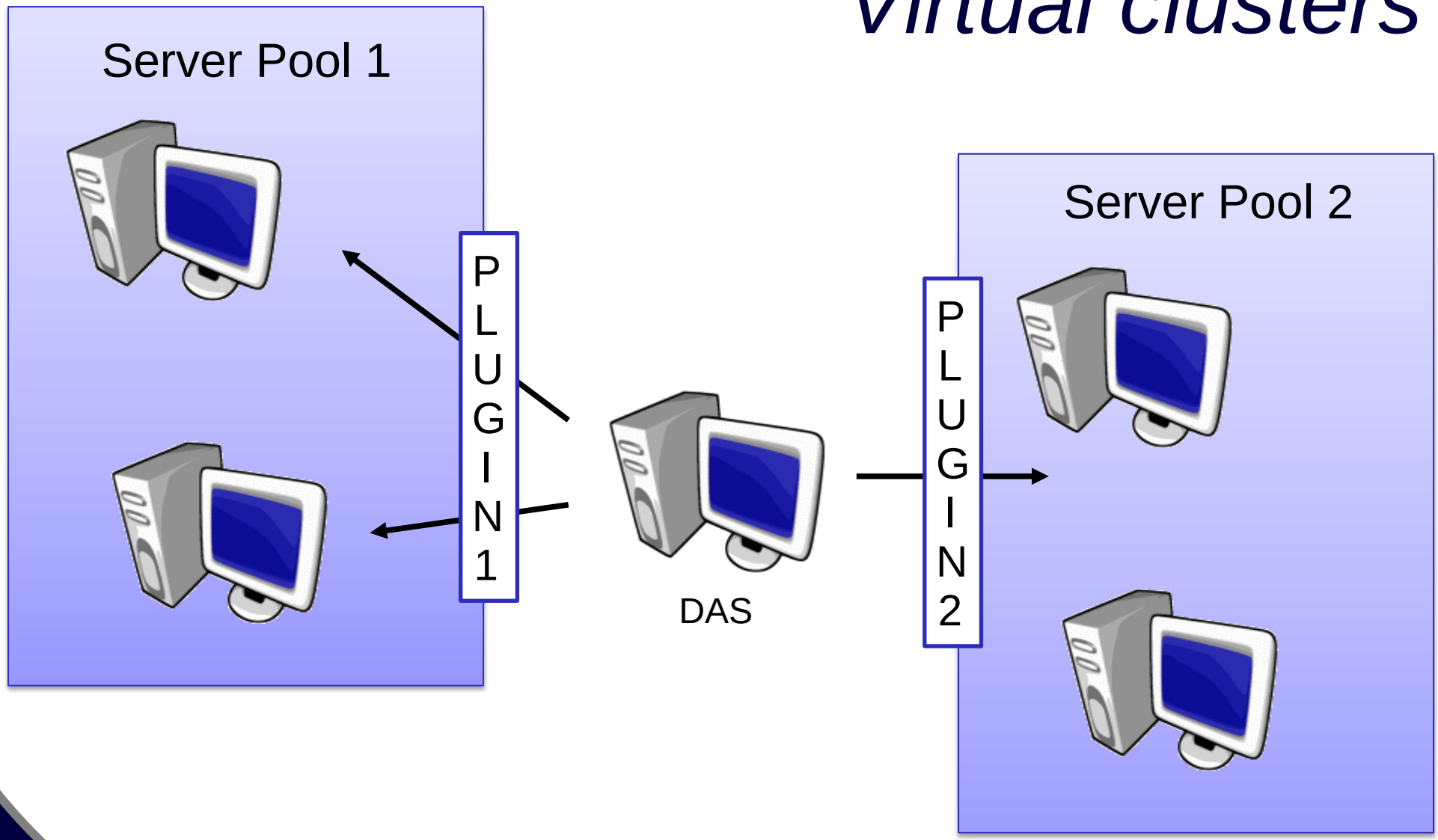
- Dynamic service provisioning
  - JavaEE, Database, MQ, LB …
- High-availability
  - Clustered instances
- Auto-scaling
- Native or virtualized

Service discovery

- Implicit (by introspection)
- Or explicit

```
<glassfish-services>
<service-description name="gf-service-javaone" init-type="lazy">
  <characteristics>
    <characteristic name="service-type" value="JavaEE"/>
  </characteristics>
  <configurations>
    <configuration name="min.clustersize" value="1"/>
    <configuration name="max.clustersize" value="2"/>
  </configurations>
</service-description>
</glassfish-services>
```

Virtual clusters



Virtualization plugins

- Responsible of :
  - Connecting to the server pool
  - Possibly adding/removing machines in the Server Pool
  - Creating VM from VM templates
  - Stopping/resuming/deleting virtual machines
  - Retrieving resource usage

Virtual Templates

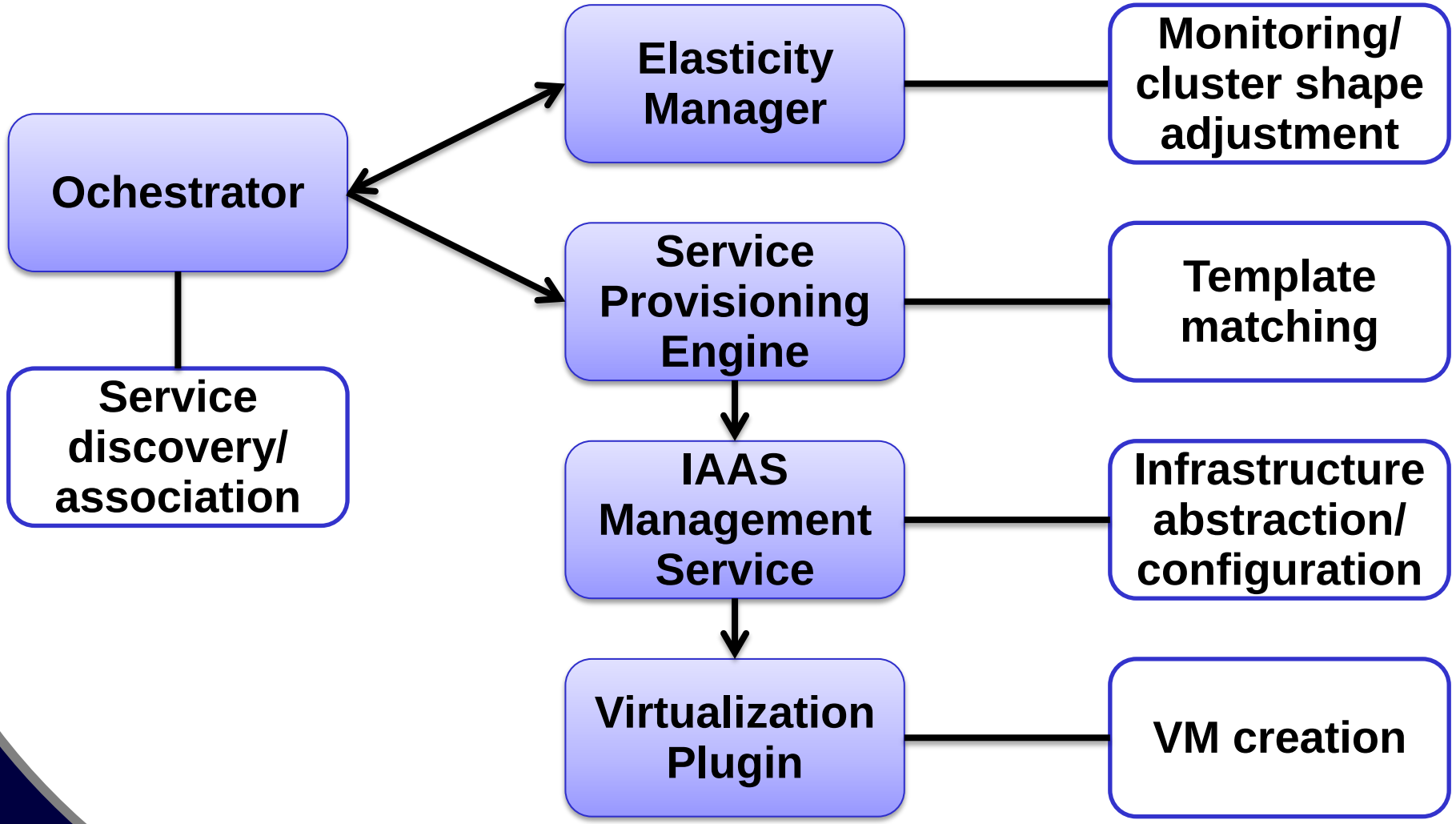
- Basis to create VMs
- One virtualization plugin
- One service type
- Usually a virtual disk and a configuration file

```
=> asadmin create-template --files
  "disk.img,conf.xml" --indexes
  "ServiceType=JavaEE,VirtualizationType=
  libvirt" myTemplate
```

Virtualization plugins

- Expected virtualization plugins :
  - Libvirt
  - OVM
  - VirtualBox
  - VMware

Virtualization Architecture



Plugin integration

- Each virtualization plugin :
  - Is an OSGi bundle
    - JAR
    - manifest.mf
  - Declares an HK2 service that implements ServerPoolFactory

ServerPool interface

- Defined in the IMS
- Methods to :
  - Install a template
  - Allocate a VM based on a template
  - Find a VM by name
- But nothing on physical machine management !
  - Public cloud plugins

PhysicalServerPool interface

- Inherits ServerPool
- Adds methods to
  - Find a machine
  - Retrieve all the machines of the server pool
  - Get the size of the server pool
- Private cloud plugin

Plugin development

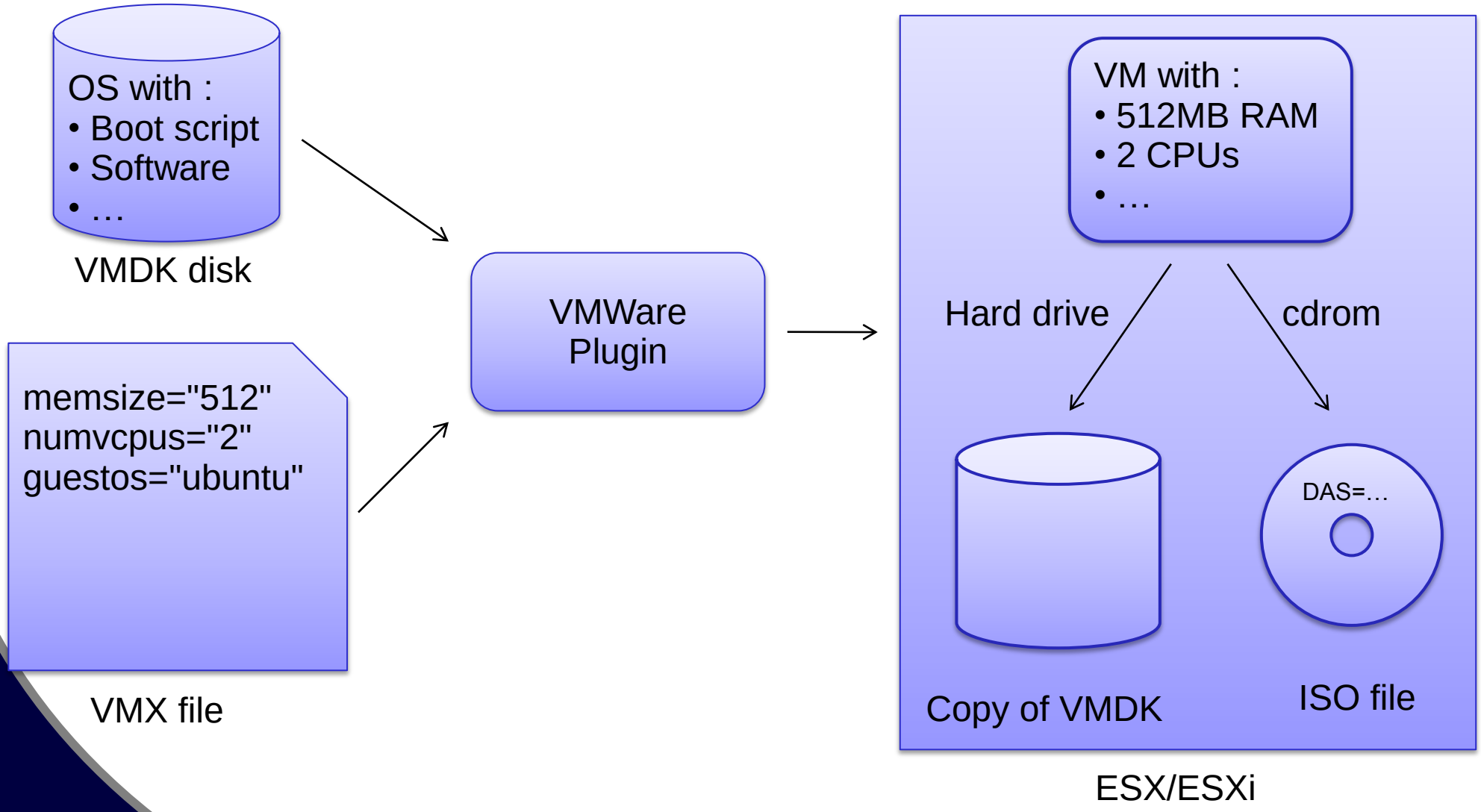
- ServerPoolFactory service
- Interfaces
  - ServerPool, Machine, VirtualMachine, StoragePool …
- Configuration
  - Virtualization, ServerPoolConfig
- Create-ims-config-myplugin command

Case study : VMware plugin

- VI Java for the interaction with the hypervisors
- SCP for file transfers
- Template files :
  - VMDK virtual disk : OS + service application
  - VMX file : physical parameters (optional)

```
memsize = "512"
numvcpus = "1"
guestos = "ubuntu"
ethernet0.present = "true"
```

VMware Template



VMWareServerPoolFactory

```java
/**
 * Implementation of the {@link ServerPoolFactory} for VMware.
 *
 * @author Fabien Leroy - fabien.leroy@serli.com
 */
@Service(name="vmware")
public class VMWareServerPoolFactory implements ServerPoolFactory {

    @Override
    public ServerPool build(ServerPoolConfig config) {
        return new VMWareServerPool(injector, config);
    }
```

VMWareServerPool

```
/*
 * Represents a group of VMware host machines.
 *
 * @author Fabien Leroy - fabien.leroy@serli.com
 */
public class VMWareServerPool implements PhysicalServerPool, ConfigListener {

    final ConcurrentMap<String, Machine> machines =
            new ConcurrentHashMap<String, Machine>();
    final AtomicInteger allocationCount = new AtomicInteger();
    final ServerPoolConfig config;
```

VMWareVirtualization

```java
/**
 * Configuration for the vmware virtualization related features.
 *
 * @author Fabien Leroy - fabien.leroy@serli.com
 */
@Configured
public interface VMWareVirtualization extends Virtualization {

    @Attribute(defaultValue= "https://#{target.host}/sdk")
    String getConnectionString();
    void setConnectionString(String connectionString);

}
```

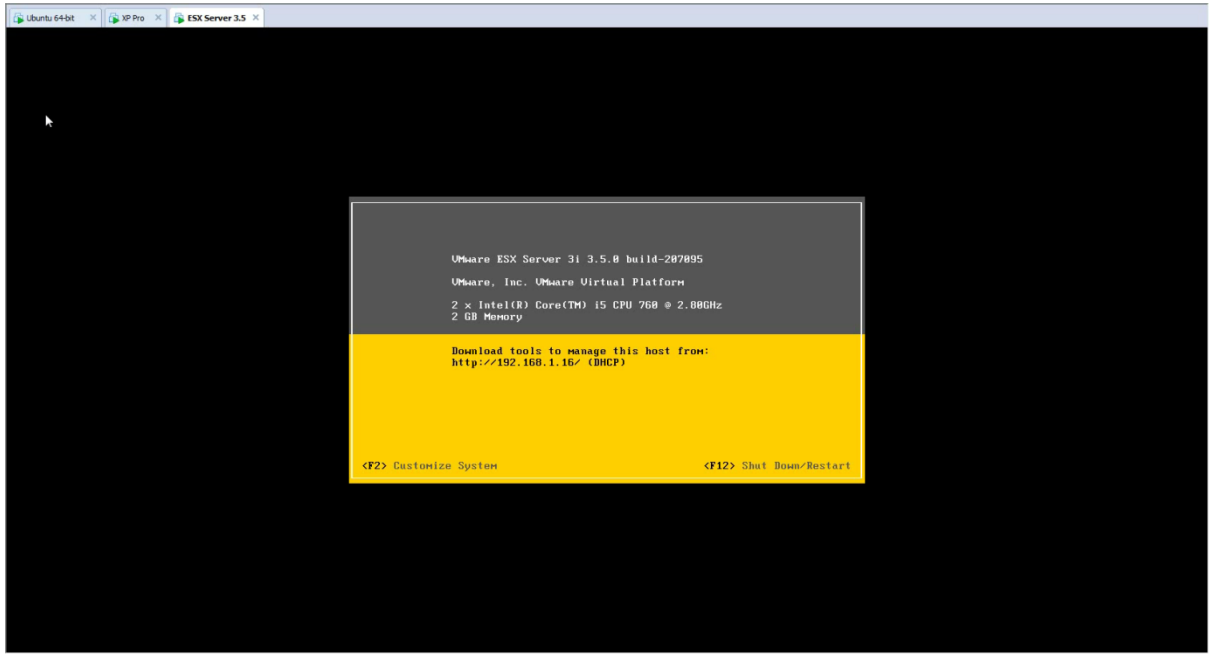
VMware plugin

- http://java.net/projects/vmware-plugin/
- Promoted builds do not include the virtualization libraries anymore
- JIRA 18573
  - Need to hack GlassFish to run external plugins

VMware virtual cluster

DEMONSTRATION

VMware virtual cluster



Elasticity manager

- Auto-scaling
  - `asadmin create-alert`
  - `asadmin add-alert-action`

Challenges

- Service configuration
- Application redeployment
- Service sharing
- Allocation strategies
- …

Conclusion

- PAAS features
  - Postponed to JAVA EE 8
  - Elasticity with dynamic service provisioning and auto-scaling
  - Extensible virtualization support :
    - SERLI : VMware plugin
- Multitenancy, JSR updates …

Acknowledgements

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Questions

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