



Hardware and Software Tools for the Oracle Fusion Middleware Architect

Arijit Das, Greg Belli, Tony
Kendall, Erik Lowney, Riqui
Schwamm



Presentation Outline

- Who we are (our Mission)
- Our Challenge: Replace our KM Portal
- Quick overview of our current KM Portal
- Overview of the replacement KM Portal Using Oracle Beehive and Portal 11g.
- Review of the tools, tips and techniques learned in building the new KM portal.





Our Mission

- The Distributed Information Science and Experimentation (DISE) uses KM/Collaborative tools for DOD experimentation.
- Example: the annual Trident Warrior (TW) exercise.
- During the whole process (preparation, execution, reporting) collaboration and exchange of documents takes place in a web workspace.





The Challenge

- Replace an aging OCS (Oracle Collaboration Suite) with KM Portal Using Beehive and Oracle 11g Portal
- Limited Resources
 - Small Team
 - Security and IA constraints
 - Small Budget





Beehive Licensing

- Navy has been given a site-wide license for Oracle
- DISE pays for Fusion Middleware license.
- Perpetual License \$30 to \$100 per user (GSA \$48)
- Support costs from \$11 to \$22 per user.
- Tip: User 3rd party such as SEWP (Solutions for Enterprise-Wide Procurement).
- Tip: Do a cost analysis on two basic licensing options (per CPU vs. per user)





FIRE KM (Current)

Collaboration (OCS)

ORACLE Collaboration Suite Workspaces

Search: All Workspace Content [Go]

My Workspaces

Favorite Workspaces | All Workspaces

Select items and ... Add To Favorite Workspaces

Select All | Select None

| Select Workspace | Action | Description |
|--|--------|--|
| <input type="checkbox"/> A2C2 | [Icon] | A2C2 Workspace |
| <input type="checkbox"/> BTF | [Icon] | Biometrics Task Force |
| <input type="checkbox"/> Coalition 08 | [Icon] | This workspace will be the repository... |
| <input type="checkbox"/> Collaborative COP | [Icon] | Collaborative COP workspace |
| <input type="checkbox"/> DISE | [Icon] | Distributed Information and Systems... |
| <input type="checkbox"/> DISE Repository | [Icon] | All sunsetted projects are housed here. |
| <input type="checkbox"/> EC10 - JBAIC | [Icon] | |
| <input type="checkbox"/> Empire Challenge 07 | [Icon] | Empire Challenge 07 Workspace |
| <input type="checkbox"/> FIRE Help | [Icon] | Contains reference materials and... |

- workspaces
- email
- tasks and calendar
- content services (library)
- web conferencing

FIRE KM Portal (Oracle App Server)

FIRE Innovation & Research Enterprise

Trident Warrior 10

Home Portal Logout

Calendar

2009

- 1-4 Dec: RIMPAC MPC (PH)
- 8-10 Dec: TW10 MPC (SD)

2010

- 11-22 Jan: Risk Reduction LOE
- 6-8 Apr: TW 10 FPC (SD)
- 12-16 Apr: RIMPAC FPC (SD)
- 26 May: TW10 Pre-Sail Conference
- 14 Jun-16 Jul 2010: TW10 Execution
- 1 Nov: Final Report
- Dec: Military Utility Assessment

Area Update Status

| Date | Author | FA | Information Updated |
|-----------|------------|----|--|
| 15-JUL-10 | [Redacted] | | Results tabs for all focus areas are live. |
| 09-JUL-10 | [Redacted] | | Added a photo folder to the TW10 library. Feel free to upload or copy pics |
| 09-JUN-10 | [Redacted] | | MEL UPDATED/UPLOADED June 9, 2010 at 0915 |
| 09-JUN-10 | [Redacted] | | ships manning as of 8 June uploaded |
| 28-MAY-10 | [Redacted] | | Manning 28 May and Ships only manning added |
| 26-MAY-10 | [Redacted] | | MEL UPDATED May 26, 2010 at 1104 - Added 3 Time Tabs and ADMIN Tab |
| 26-MAY-10 | [Redacted] | | Manning updated/uploeaded 26 May 2010 |

Documents and Links

(all links open in a new window)

- [TW10 Workspace](#)
- [Critical Documents](#)
- [MEL](#)
- [Installation Matrix](#)
- [Manning](#)
- [Pre-sail Brief \(9MB\)](#)
- [Ship Schedules](#)
- [FIRE for TW: Quick How-to \(pdf\)](#)

Roles and Responsibilities

DAWG Consultants by Focus Area:

- C2: [Redacted]
- DS: [Redacted]
- Fire: [Redacted]
- IA: [Redacted]
- IO: [Redacted]
- IT: [Redacted]
- ISR: [Redacted]
- MD: [Redacted]
- Net: [Redacted]
- A-Z: [Redacted]

Other Roles:

- Network Systems Data: [Redacted]
- COP/Ground Truth Data: [Redacted]

Trident Warrior Intent

Create an environment in which to assess, in quantitative and qualitative terms, FORCENet systems including technology and tactics/ techniques/ procedures (TTPs). Provide specific insights and dedicated procurement and development decision information. Provide "speed to capability" (S2C) - the rapid fielding of improved FORCENet command and control warfighting capabilities to the fleet with full supportability and maintainability. Includes the development of supporting TTPs, Military Utility Assessment (DOTMLPF) recommendations.

- focus areas and forms
- reports
- other portlets (applications within the web page)




Next Generation Fire

- Two Oracle products replace the aging OCS
 - Beehive replaces the collaboration tools
 - Oracle Portal 11g/WebLogic replaces Oracle App Server (Experiment development area—the portal)
- Modular and more scalable than OCS
- Compatible with Windows 7 and Mac
- No new licensing costs. Upgrade from OCS license.






New FIRE (Portal Side)


FIRE 

Forces Innovation & Research Enterprise
experiment planning, execution and analysis - program, information and knowledge management


FIRE Home Portal [FIRE Home](#) [Account Info](#) [Help](#) [Logout](#)

Links 


- My Workspaces
- My Team Collaboration
- Beehive Central
- Downloads


Experiment Development Links 

- HAF A2Q
 - BLOS
 - TACPOD
- Trident Warrior
 - Trident Warrior 12 (other system)
- JBAIIC
 - EC 11 (other system)

Archived Projects 


Any project that is neither current nor listed under "Experiment Development Links" has been archived. Archived projects have restricted access. If you require access to view a specific project archive, please contact your Project PI.

Notices 

Help Center 

For frequently asked questions and instructions for various sections and features of FIRE see the FIRE Help Center workspace.


| | |
|--|--|
| <p>Quick Help Links</p> <ul style="list-style-type: none">Email the DISE Help DeskSubmit a Trouble Ticket (a .docx file, save to your desktop)How to: PasswordsExperiment Development Help | <p>Other Links</p> <ul style="list-style-type: none">About FIREAbout DISEsurveyorAbout DISE |
|--|--|

About 

The Forces Innovation & Research Enterprise (FIRE) is administered by the Distributed Information Systems Experimentation (DISE) Group at Naval Postgraduate School.



New FIRE (Portal Side)

FIRE 
Forces Innovation & Research Enterprise
experiment planning, execution and analysis - program, information and knowledge management

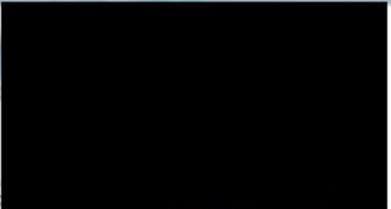

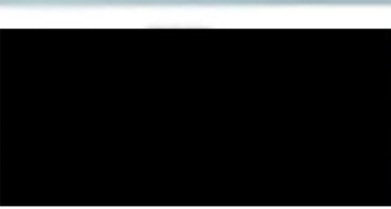

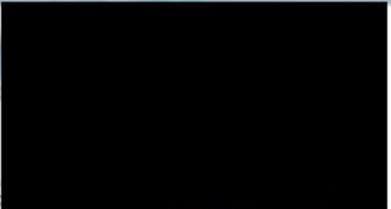

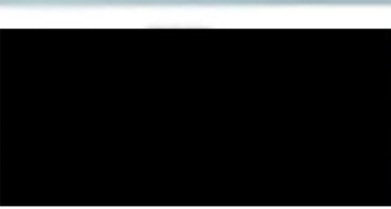

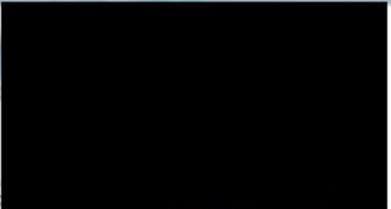

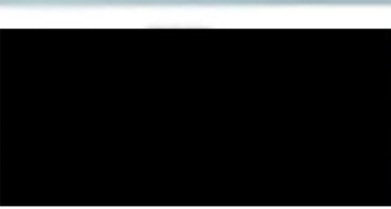

[Edit](#) [Home Portal](#) [Logout](#)

[Home](#) [Focus Areas](#)

AS C2 Cyber EW IO IO ISR

Create New Thread

Objective Planning ThreadEx W4 Analysis

| | | | | | | | | | |
|---|--|---|---|--------|-------|---|--|---|---|
| Thread | AS-01.01 | | | | | | | | |
| Objective Status | | | | | | | | | |
| AOR | | | | | | | | | |
| Short Title | | | | | | | | | |
| Tech Description | Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum. | | | | | | | | |
| Objective | | | | | | | | | |
| Objective-Question | | | | | | | | | |
| System Data Required | Yes | | | | | | | | |
| Human Data Required | Yes | | | | | | | | |
| Specific Measures Required | Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum. | | | | | | | | |
| OV1 | <table border="1"><tr><td>OV-1</td><td>SV-2</td><td>IDEF-0</td><td>OV-6c</td></tr><tr><td></td><td></td><td></td><td></td></tr></table> | OV-1 | SV-2 | IDEF-0 | OV-6c |  |  |  |  |
| OV-1 | SV-2 | IDEF-0 | OV-6c | | | | | | |
|  |  |  |  | | | | | | |





New FIRE (Beehive Side)

ORACLE BEEHIVE Team Collaboration Home **Workspaces** Profiles Tony | Applications

DISE Tech

+ New Upload Marked as Favorite

Overview
Recent Activity
Tags
Announcements
Forums
Library
Tasks
Wiki Pages
Participants
Settings
Workspace Trash

You are in **DISE Tech Overview**

Wiki Home

Overview

(insert the goals, overview and background information about your workspace here)

Shortcuts to Relevant Information

| | |
|-------------|---------------------|
| Wiki Pages | (insert links here) |
| Documents | (insert links here) |
| Other Sites | (insert links here) |

Help

Here is some basic information about this workspace

| | |
|---------------------|---|
| End-user Help | End-user help is always available through the Help icon in the upper-right corner. |
| Calendar Enrollment | Participants of this workspace are automatically enrolled in its calendar. Events created in this workspace will be added to participants personal calendars unless they unenroll themselves. Participants can unenroll themselves in the Overview page. Alternatively, workspace coordinators can access the Settings to change the default settings for new participants. |

Recent Activity

- Created:** TW12_0217_2012.zip
Yesterday 3:34 PM by Riqui.
- Moved:** TW12Archive
Feb 16, 2012 10:55 AM by Diane.
- Updated:** Move workspace files from OCS to
Feb 16, 2012 10:49 AM by Diane.
- Updated:** TW12 Backups
Feb 16, 2012 10:48 AM by Diane.
- Created:** TW12 Data from FIRE to FIMS
Feb 16, 2012 10:40 AM by Diane.
- Created:** Backups
Feb 16, 2012 10:37 AM by Diane.
- Created:** TW12_0210_2012.zip
Feb 10, 2012 6:40 PM by Riqui.
- Added:** Randy
Feb 10, 2012 3:47 PM by Riqui.
- Added:** Shelley
Feb 10, 2012 3:47 PM by Riqui.



New FIRE (Beehive Side)

ORACLE Team Collaboration Home **Workspaces** Profiles

BEEHIVE

DISE Tech Search DISE Te

+ New Upload Open Lock Unlock Check Out/In Properties

Overview
Recent Activity
Tags
Announcements
Forums
Library
Documents
Public Documents
Tasks
Wiki Pages

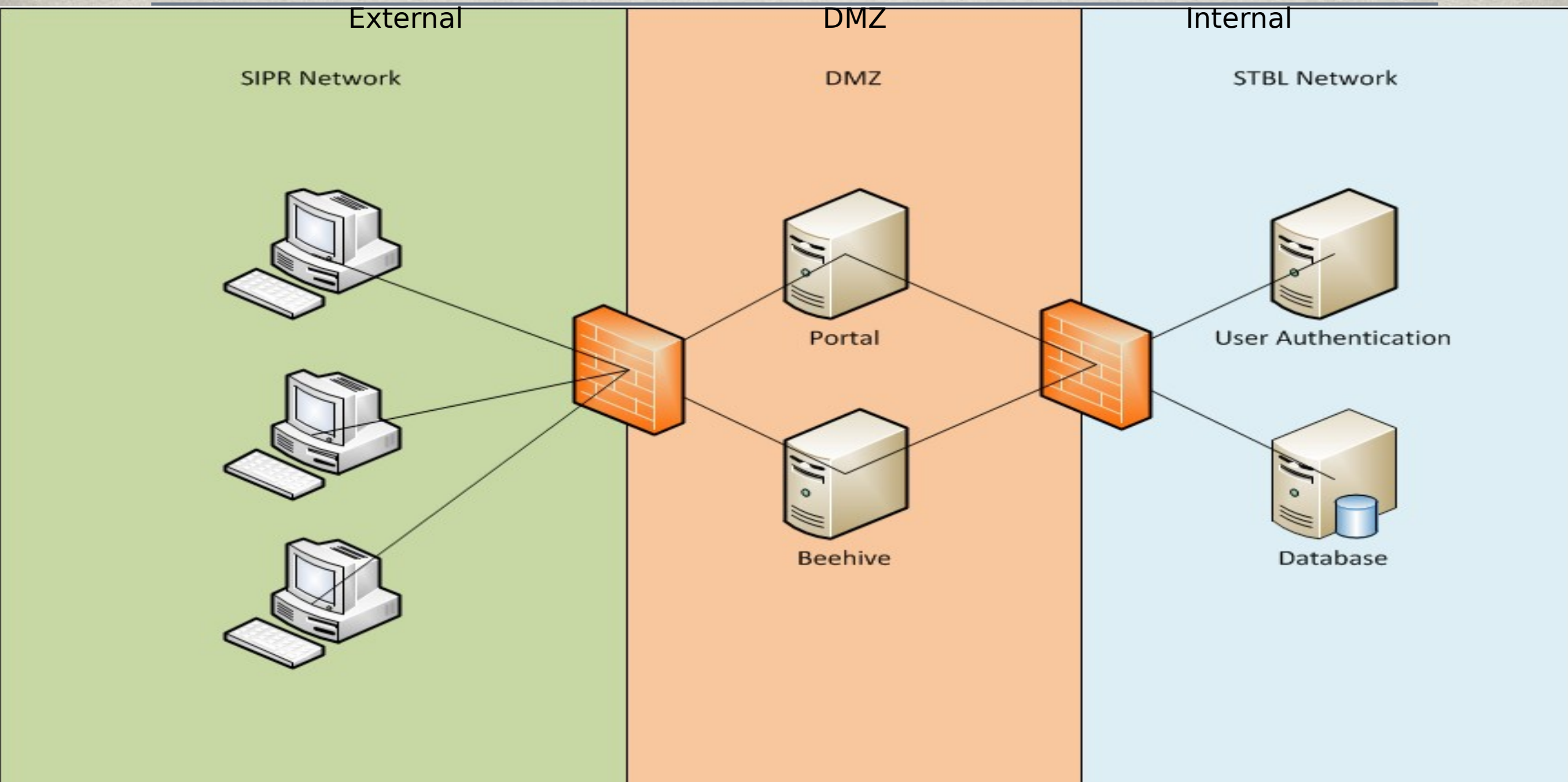
You are in **DISE Tech > Library > Documents > Backups**

Backups

1 item.

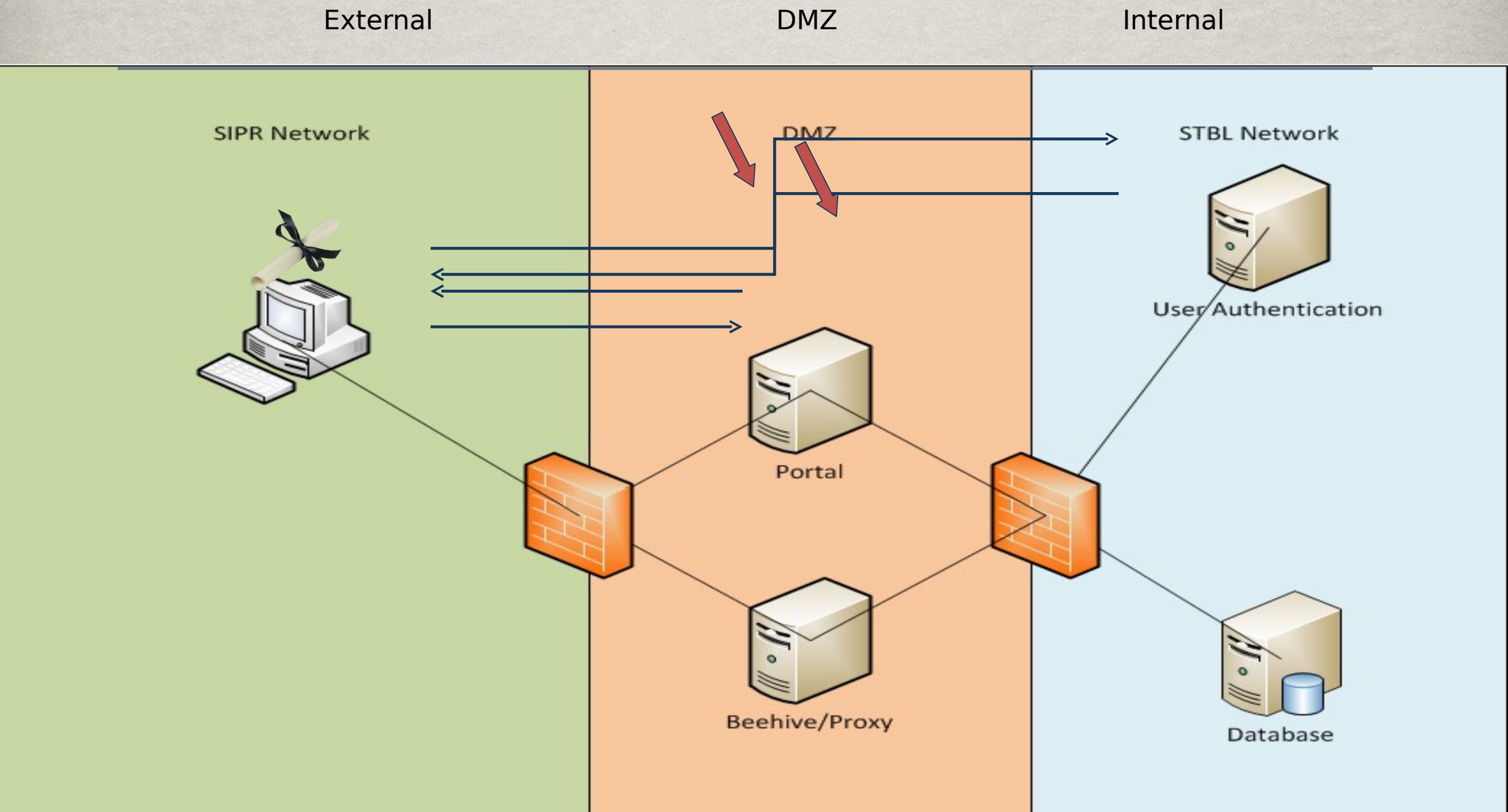
| Name ▲ | Size | Modified On | Modified By |
|-------------|------|-------------------|-------------|
| TW12Archive | | Yesterday 3:30 PM | Riqui |

Architecture Overview



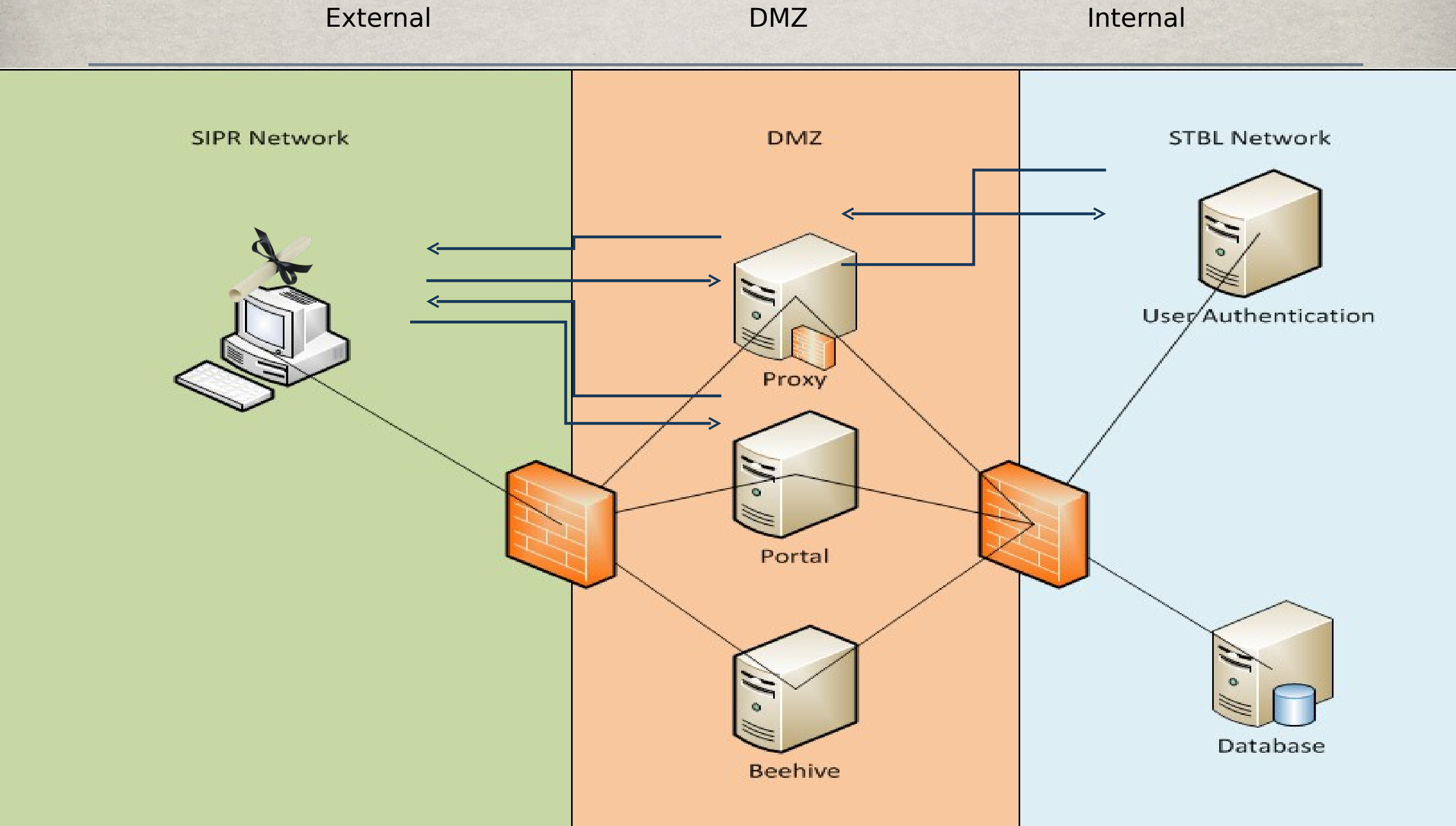


The Problem





The Solution





Squid Proxy Server

Why we chose Squid

- Easy to setup
- Free
- Preapproved by DoD/IA
- Oracle options not suitable





Squid Proxy Server

Technical Considerations

- Proxy on an existing server
- Use a default HTTPS port

Problem

- The port is already in use

Solution

- New hostname/IP address for the reverse proxy





The Solution

External

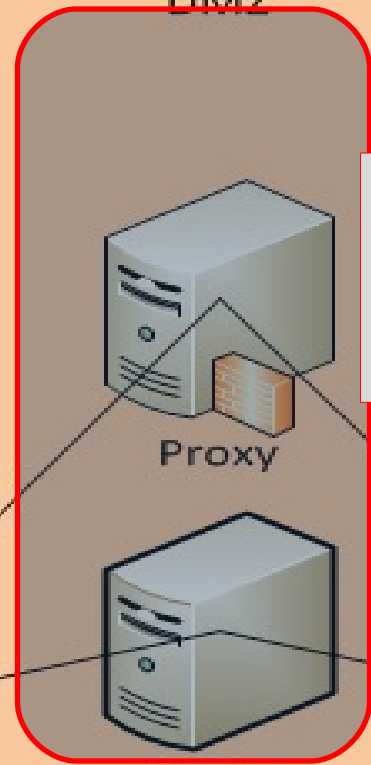
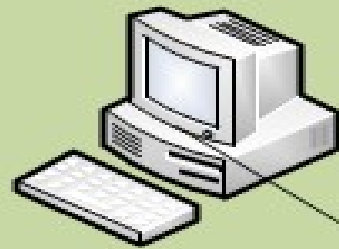
DMZ

Internal

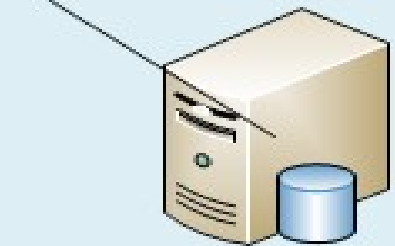
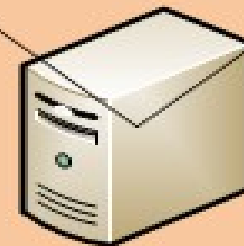
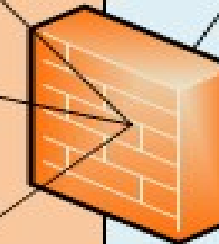
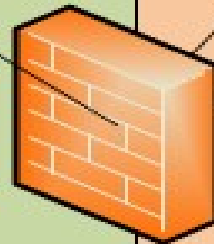
SIPR Network

One physical server

STBL Network



IP1:443
IP2:443



Beehive

Database



Running Simultaneous Software Systems

- Need to run several software systems.
- Hardware is limited
- Need to use one physical server for all systems
 - Limited by heat
 - Power
 - Rack space
- Hardware is fast enough to run multiple software systems
- Each software system has its own network card but share CPU and RAM

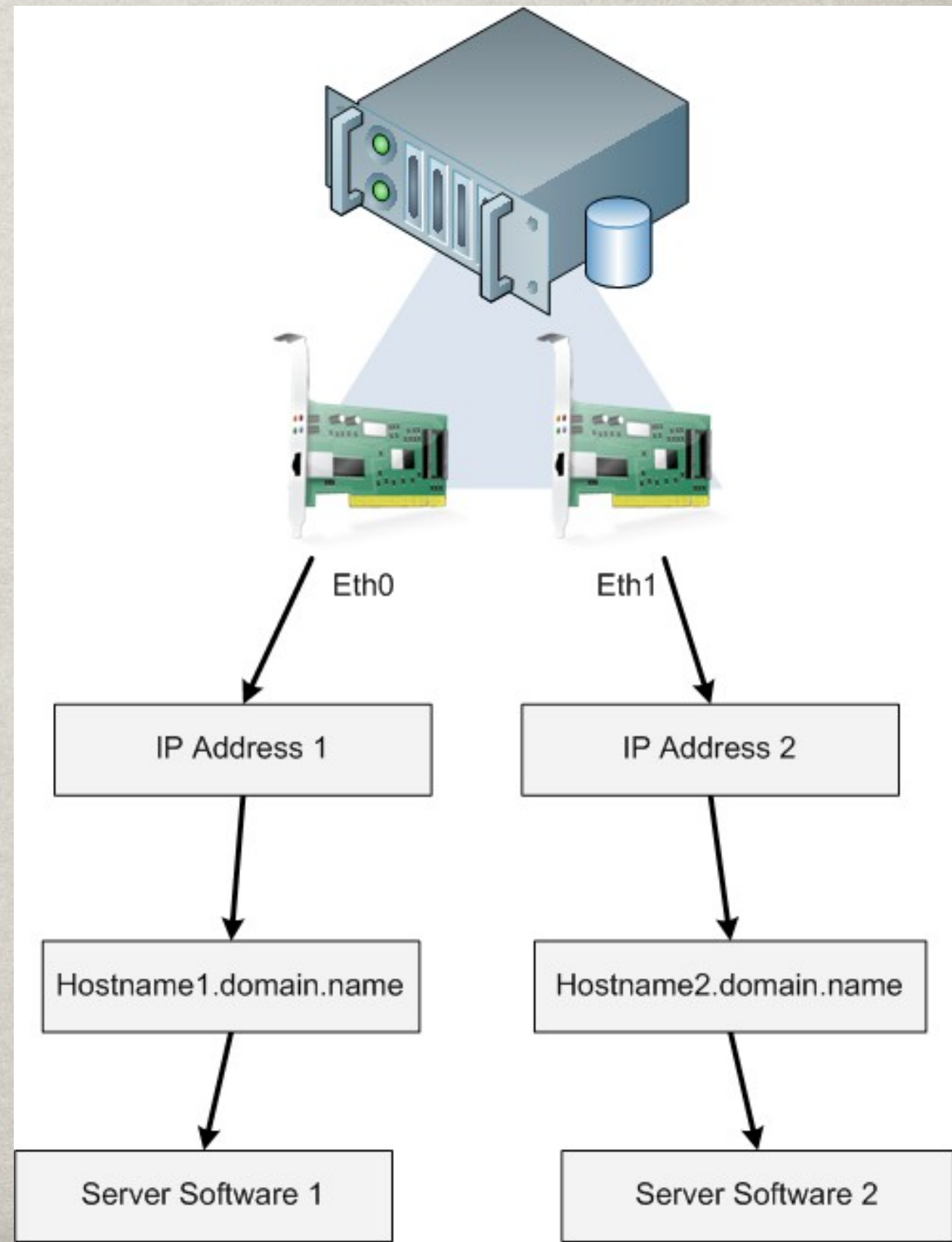




Running Simultaneous Software Systems

Each server software can run its own:

- Port number
- Domain name
- SSL certificate





Interface to IP Mapping

Assign each IP address to the appropriate physical interface

/etc/sysconfig/network-scripts/ifcfg-eth0

```
# Broadcom Corporation NetXtreme II BCM5709 Gigabit Ethernet
DEVICE=eth0
BOOTPROTO=static
DHCPCLASS=
HWADDR=18:03:33:00:11:22
IPADDR=192.168.1.1
NETMASK=255.255.255.0
ONBOOT=yes
```

/etc/sysconfig/network-scripts/ifcfg-eth1

```
# Broadcom Corporation NetXtreme II BCM5709 Gigabit Ethernet
DEVICE=eth1
BOOTPROTO=static
DHCPCLASS=
HWADDR=18:03:33:00:11:44
IPADDR=192.168.1.2
NETMASK=255.255.255.0
ONBOOT=yes
```





IP to Hostname Mapping

Assign a unique hostname to each IP address:

/etc/hosts

```
# Do not remove the following line, or various programs
# that require network functionality will fail.
127.0.0.1          localhost.localdomain localhost
::1              localhost6.localdomain6 localhost6
192.168.1.1       hostname1.domain.name
192.168.1.2       hostname2.domain.name
```





Problem:

Standard Red Hat installation not IA/Oracle Compliant

Solution:

Red Hat's Kickstart tool automates the installation process to ensure IA/Oracle compliance

Benefits:

- A standard base installation to follow best practices
- Time saving
- Post install script preconfigures the system





A kickstart file consists of three pieces:

- Red Hat Anaconda (Installation) instructions/script installs the OS
- A list of software packages to install or remove
- A post-install shell script to customize the installation





Sample Post Install Script

```
# Post-install script
```

```
%post --log=/var/log/kickstart.log
```

```
#!/bin/bash
```

```
groupadd oinstall
```

```
groupadd dba
```

```
useradd -g oinstall -G dba oracle
```

```
mkdir /opt/app
```

```
mkdir /opt/oracle
```

```
sed -ri 's/^#?
```

```
PermitRootLogin.*/PermitRootLogin no/'
```

```
/etc/ssh/sshd_config
```

Oracle
customizations

IA compliance
customizations



IA Considerations

Information Assurance is:

- The practice of managing risks related to the use, processing, storage, and transmission of information
- A challenge for a small team in a large enterprise

IA is a major factor in system design and maintenance





```
# GEN004000 (G633)
# This effectively prevents any non-root user from running
traceroute
echo "Locking down GEN004000"
chmod 700 /bin/traceroute
chmod 700 /bin/traceroute6
echo "GEN004000 Complete"

# GEN005400 (G656)
# Reset the permissions to a DISA-blessed rw-r-----
echo "Locking down GEN005400"
#chmod 640 /etc/syslog.conf

# Not good enough for SECSCAN, lock it down more

chown root:root /etc/syslog.conf
chmod 600 /etc/syslog.conf

echo "GEN005400 Complete"
```





```
# Search and replace entries in the SSHd configuration file
```

```
# Set maximum authorization retries to 1
```

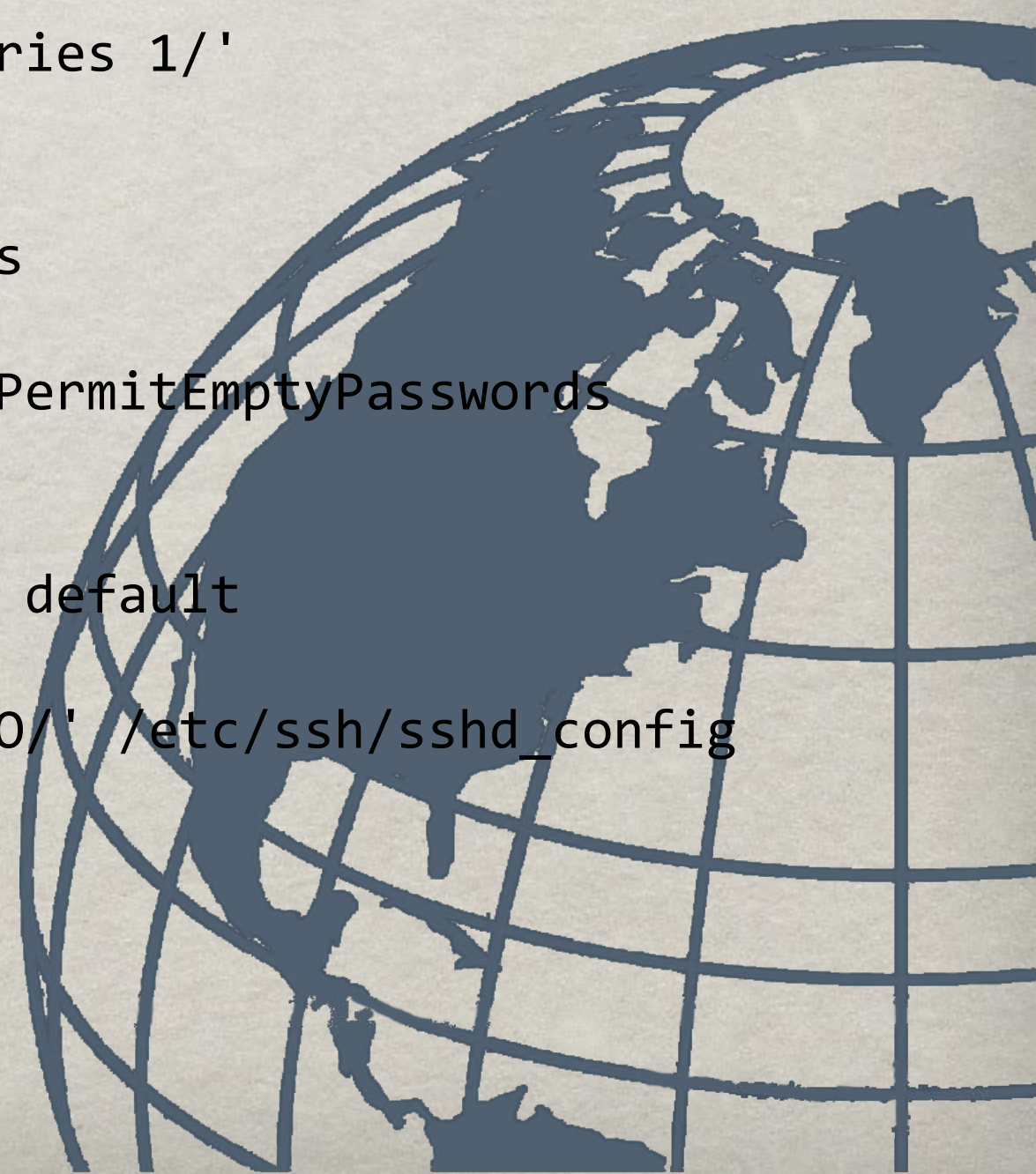
```
sed -ri 's/^#?MaxAuthTries.*/MaxAuthTries 1/'  
/etc/ssh/sshd_config
```

```
# Prevent logins with blank passwords
```

```
sed -ri 's/^#?PermitEmptyPasswords.*/PermitEmptyPasswords  
no/' /etc/ssh/sshd_config
```

```
# Increase the logging level from the default
```

```
sed -ri 's/^#?LogLevel.*/LogLevel INFO/' /etc/ssh/sshd_config
```





Red Hat Automated Install

Installation and configuration of Red Hat servers for Oracle software is a time-intensive task.

We developed a way to automate this process as much as possible using 3rd party multi-boot CD creation tools.

Installation options:

- Red Hat version (5.5, 5.6, etc).
- 32-bit vs. 64-bit
- Choice of Kickstart scripts

Automated installation reduces installation time and effort

Simple to create a standardized deployment using an



Automated Installation Process

- Step 1: User boots off customized multi-boot CD. User selects desired Red Hat and kickstart combination. This is the first and only interaction the user has during this process.

```
ISOLINUX 1.68 0x3c7f7718 Copyright (C) 1994-2001 H. Peter Anvin
```

```
Redhat Enterprise Linux Multi-boot CD  
v1.0 19 July 2011 elowney@nps.edu
```

- ```
0) Boot from first harddisk (automatically in 30 seconds)
1) Boot RHEL 5.5 64bit kickstart
2) kickstart w/ manual partition
3) manual install
4) Boot RHEL 5.6 32bit kickstart
5) kickstart w/ manual partition
6) manual install
7) Boot RHEL 5.6 64bit kickstart
8) kickstart w/ manual partition
9) manual install
10) Boot RHEL 5.7b 32bit kickstart
11) kickstart w/ manual partition
12) manual install
13) Boot RHEL 5.7b 64bit kickstart
14) kickstart w/ manual partition
15) manual install
```

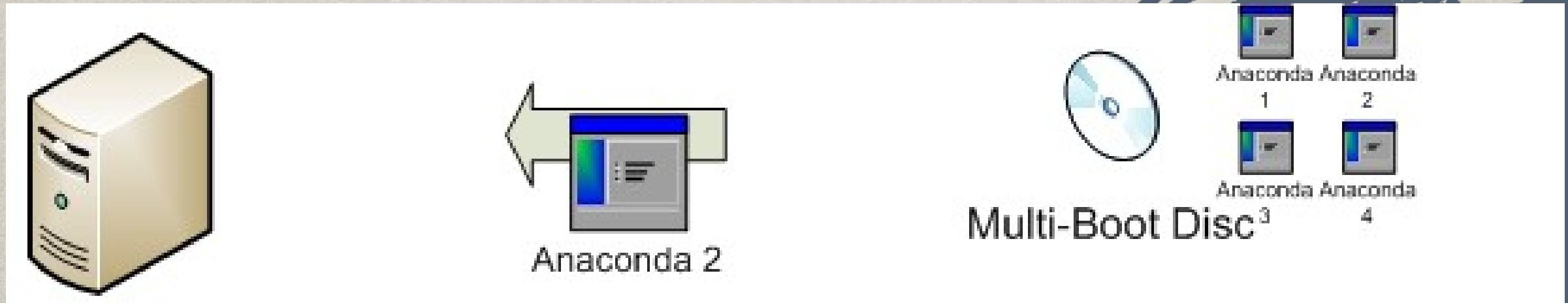
```
boot: _
```





# Automated Installation Process

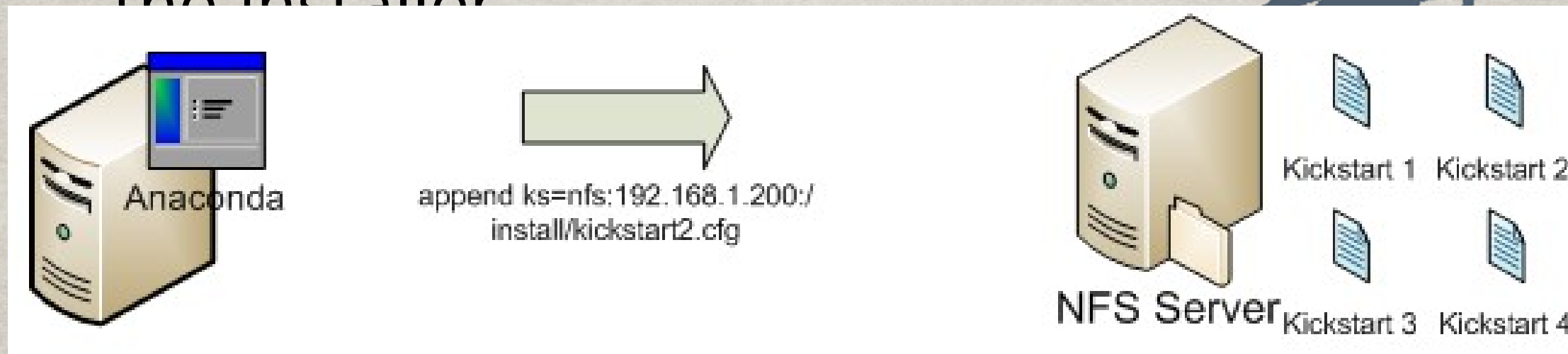
- Step 2: The corresponding Red Hat installer is retrieved off of the Multi-boot CD and starts.





# Automated Installation Process

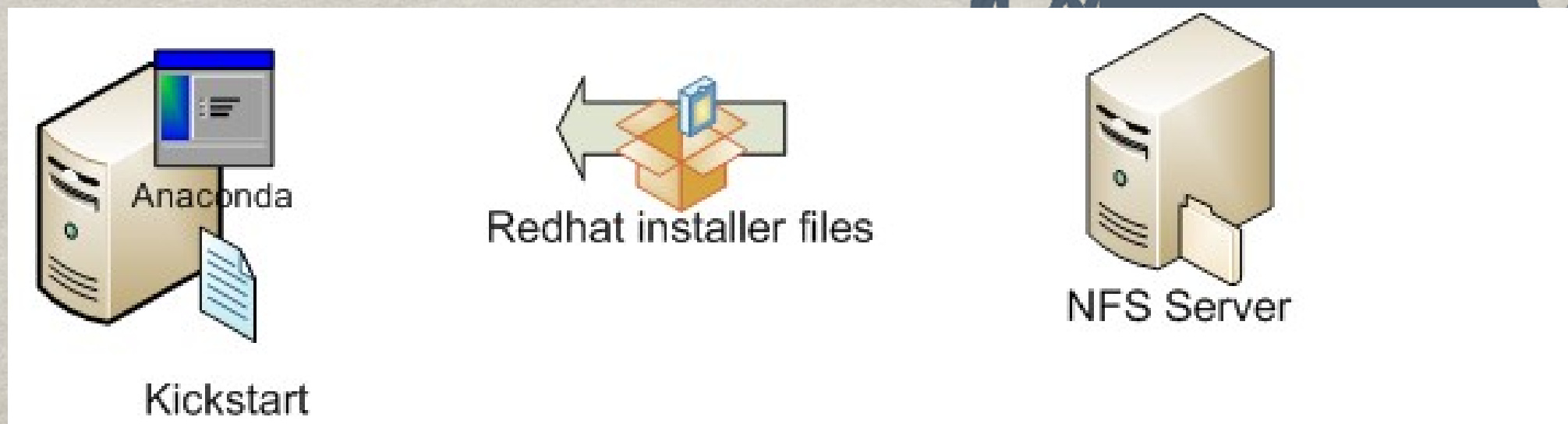
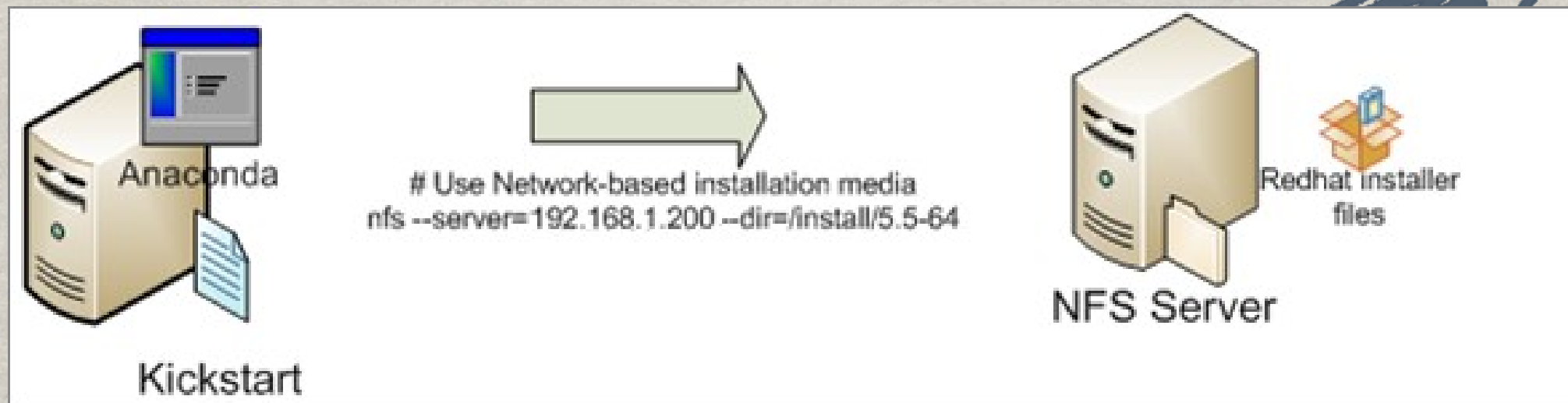
- Step 3: The installer retrieves the appropriate kickstart file located on a NFS share – this is passed via command line to the installer





# Automated Installation Process

- Step 4: The installer runs the kickstart file. The kickstart file directs the installer to retrieve the appropriate Red Hat installation media from a NFS share.







# Automated Installation Process

- Step 5: Red Hat is installed according to the directives in the kickstart. After installation, a post-install script is run to customize the system.
- The end of the script directs the installer to eject the boot disc and restart the server.



Kickstart script

```
Post-install script

%post --log=/var/log/kickstart.log
#!/bin/bash
groupadd oinstall
groupadd dba
useradd -g oinstall -G dba oracle
```





Certificates used to secure communication

Decide what communication will be secured

- User  $\leftrightarrow$  Proxy
- User  $\leftrightarrow$  Portal
- User  $\leftrightarrow$  Beehive

Each service uses a different method for setting up SSL

- Portal uses WebCache
- Beehive uses Application Server with wallet





## Configuring Certificates for Middleware

1. Generate a Certificate Request
  - Beehive: Oracle Wallet
  - Oracle Portal: WebCache keystore
2. Submit Certificate Request to the Certificate Authority
3. Import the signed certificate into the Middleware software
  - Beehive: Oracle Wallet
  - Oracle Portal: WebCache keystore
4. Configure SSL for Portal and Beehive
  - Beehive: Quick and Easy
  - Portal: 60+ steps





# Remote Administration

PuTTY with Cygwin/X can be used to remotely run Xwindows applications such as Oracle Universal Installer and administration applications(oidadmin)

## Benefits:

- Free and easy to use
- Works with any SSH client and Xserver software
- Can remotely setup and administer the system

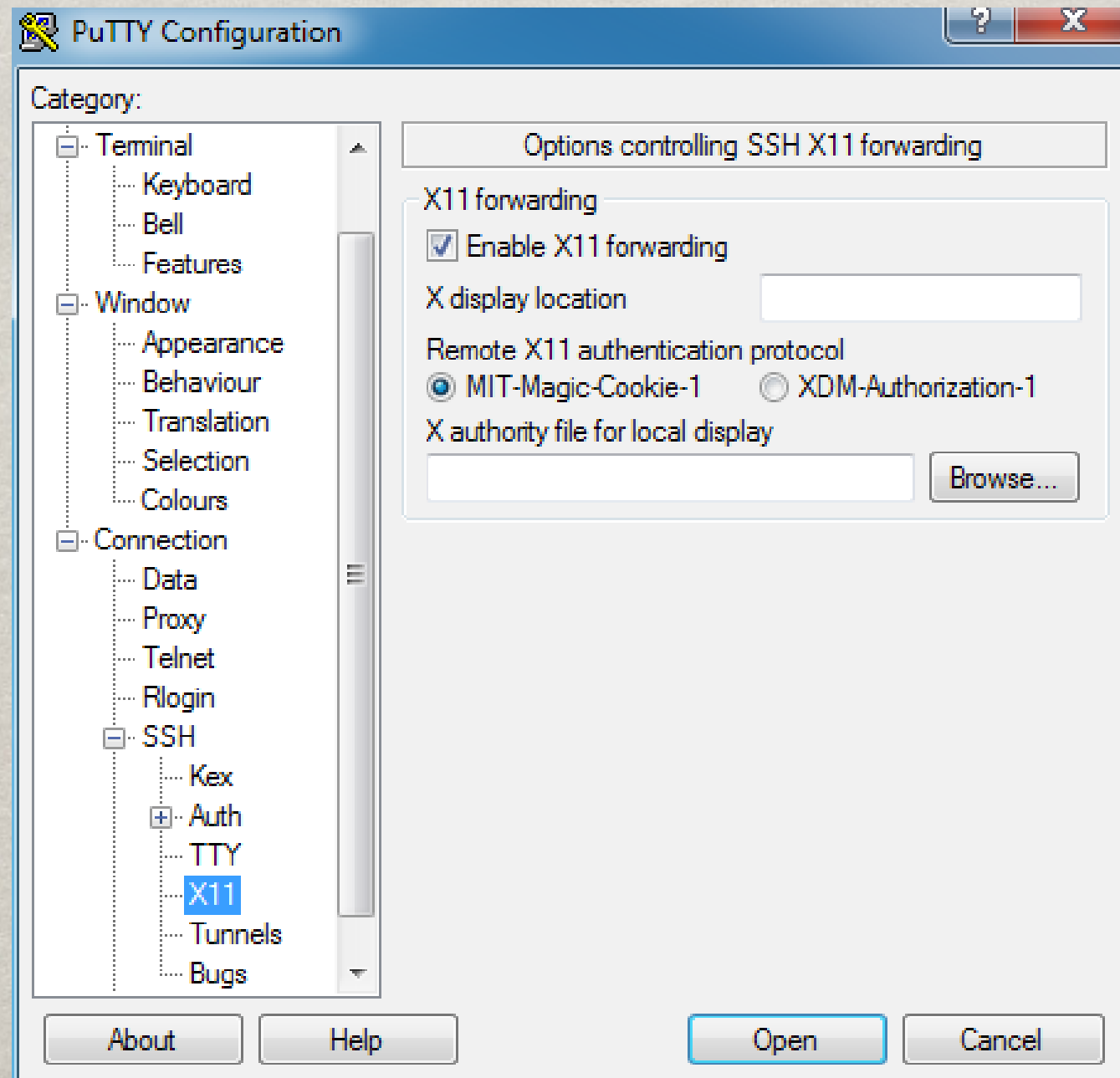






# Remote Administration

## PuTTY Setup







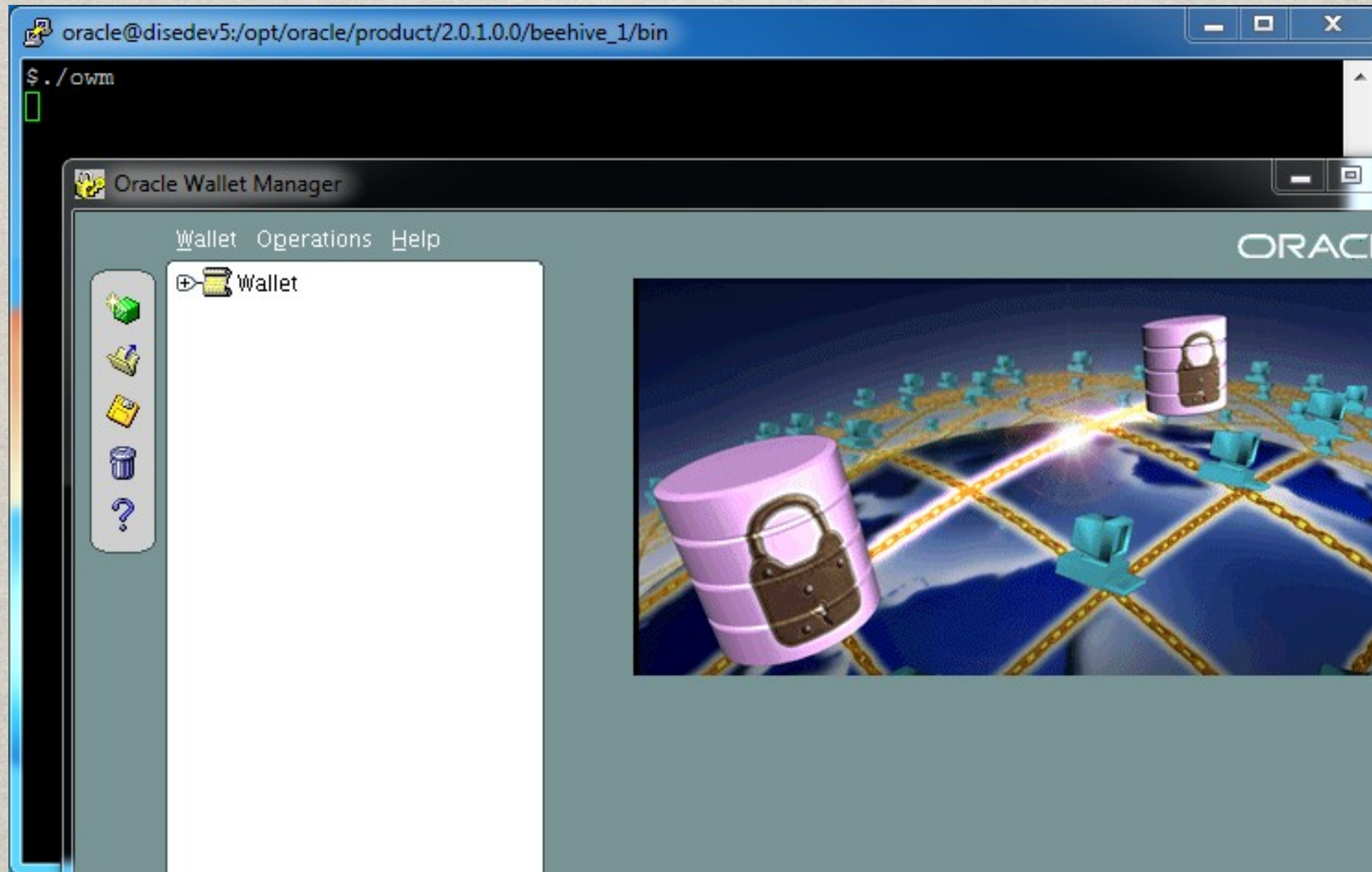
# Remote Administration

xclock displaying on the MS Windows desktop





Oracle Wallet Manager displaying on MS Windows







- Beehive/Database Memory Tuning
  - Our servers have large amounts of RAM (32GB+)
  - Software doesn't use all this RAM.
  - Memory settings can be tuned to utilize the physical RAM.
  - Two issues with memory tuning
    - Localizing the problem
    - Remedy







## === ODM Solution / Action Plan ===

increase the Java settings for the BEECORE, BEECLIENT and BEEAPP by running the following command

### 1.) Change the settings for the BEECLIENT container:

```
beectl modify_property --component BEECLIENT_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name MaximumHeapSizeInMB --value 1024
```

```
beectl modify_property --component BEECLIENT_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name InitialHeapSizeInMB --value 1024
```

```
beectl modify_property --component BEECLIENT_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name MaximumPermanentGenerationSizeInMB --value 1024
```

### 2.) Change the settings for the BEEAPP container:

```
beectl modify_property --component BEEAPP_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name MaximumHeapSizeInMB --value 1024
```

```
beectl modify_property --component BEEAPP_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name InitialHeapSizeInMB --value 1024
```

```
beectl modify_property --component BEEAPP_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name MaximumPermanentGenerationSizeInMB --value 1024
```

### 3.) change the setting for BEECORE:

```
beectl modify_property --component BEECORE_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name MaximumHeapSizeInMB --value 1024
```

```
beectl modify_property --component BEECORE_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name InitialHeapSizeInMB --value 1024
```

```
beectl modify_property --component BEECORE_<replace_by_beehive_instance_name>:StartJavaExecutionArguments --name MaximumPermanentGenerationSizeInMB --value 1024
```

### 4. After any of the above steps, apply the changes:

```
beectl activate_configuration
```

```
beectl modify_local_configuration_files
```



Use cURL or wget as a minimal web browser

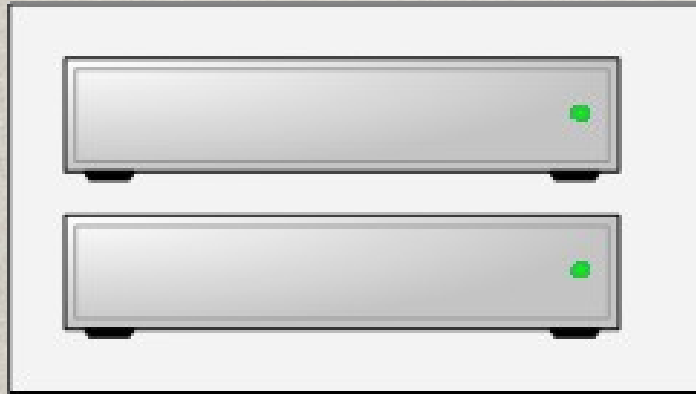
```
oracle@disedev5:~
$ curl http://www.google.com -I
HTTP/1.1 200 OK
Date: Tue, 21 Feb 2012 22:16:57 GMT
Expires: -1
Cache-Control: private, max-age=0
Content-Type: text/html; charset=ISO-8859-1
Set-Cookie: PREF=ID=c21017bc055a8c9f:FF=0:TM=1329862617:LM=1329862617:S=pHIM173aIF0VZ3_L;
expires=Thu, 20-Feb-2014 22:16:57 GMT; path=/; domain=.google.com
Set-Cookie: NID=57=GXCuK-0lhYaz3O3SmVvgHON6qNGkXdEDG_H1-9-dvGxgiyGZZY_I_ZulhHWJsvjYXttlQsP
9tE4u5GebPiMzn6ma-ggoon7sGstmYDzaxjiZYixBZZzkWEggygsu3tke; expires=Wed, 22-Aug-2012 22:16:
57 GMT; path=/; domain=.google.com; HttpOnly
P3P: CP="This is not a P3P policy! See http://www.google.com/support/accounts/bin/answer.p
y?hl=en&answer=151657 for more info."
Server: gws
X-XSS-Protection: 1; mode=block
X-Frame-Options: SAMEORIGIN
Transfer-Encoding: chunked

$ curl http://www.google.com -o source.html
 % Total % Received % Xferd Average Speed Time Time Time Current
 Dload Upload Total Spent Left Speed
100 12373 0 12373 0 0 178k 0 --:--:-- --:--:-- --:--:-- 673k
$
```

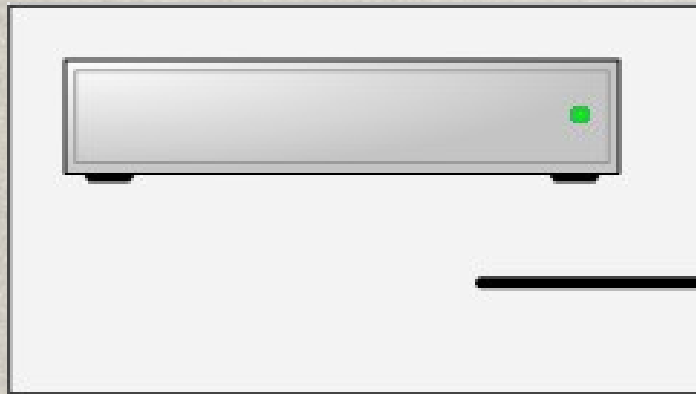




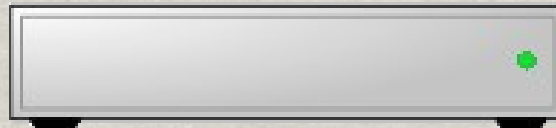
# Quick Tips



Two hard drives in a RAID 1 Array (Mirror)



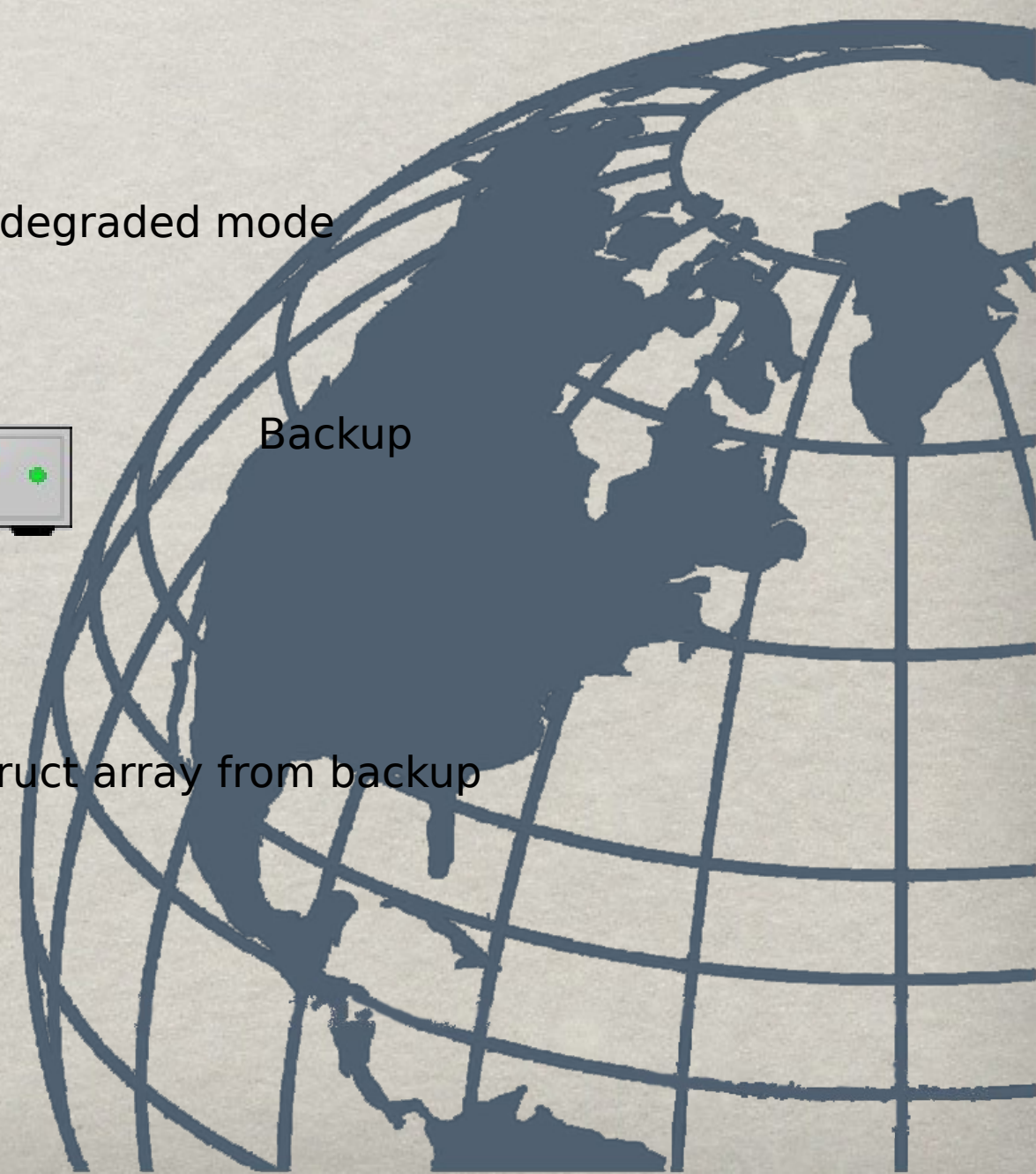
RAID-1 in degraded mode



Backup



Reconstruct array from backup





## Simple script to start DB, Listener and EM

```
1 #!/bin/bash
2
3 echo "Creating SQL script..."
4
5 echo "startup" > script.sql
6 echo "exit;" >> script.sql
7
8 chown oracle:oinstall script.sql
9 chmod 755 script.sql
10
11 mv script.sql /home/oracle
12
13 echo "Running SQL script..."
14
15 su oracle -c 'source /home/oracle/.bash_profile; $ORACLE_HOME/bin/sqlplus / as sysdba @/home/oracle/script.sql'
16 su oracle -c 'source /home/oracle/.bash_profile; $ORACLE_HOME/bin/lsnrctl start'
17 su oracle -c 'source /home/oracle/.bash_profile; $ORACLE_HOME/bin/emctl start dbconsole'
```





# Contact information

Arijit Das - [adas@nps.edu](mailto:adas@nps.edu)

Tony Kendall - [wakendal@nps.edu](mailto:wakendal@nps.edu)

Greg Belli - [gfbelli@nps.edu](mailto:gfbelli@nps.edu)

Erik Lowney - [eslowney@nps.edu](mailto:eslowney@nps.edu)

Riqui Schwamm - [rschwamm@nps.edu](mailto:rschwamm@nps.edu)







# Questions?

