Tips, Tips, and Gotchas of Running Your Business Objects Enterprise Platform on UNIX Operating System

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In This Session …

- Understand the advantages and drawbacks to selecting UNIX
- Learn how to architect a UNIX-based solution
- Walk through a typical installation
- Discover how to maintain and upgrade the system after installation
- Learn how to tune and monitor your UNIX-based system
- See how clustering can add increased availability and failover
- Design clusters that combine the strengths of UNIX and Windows

What We'll Cover …

- UNIX advantages and disadvantages
- Architecting a UNIX solution
- UNIX requirements
- Installation
- Configuration
- Maintenance
- Upgrades
- Tuning
- Monitoring
- Clustering
- Wrap-up

Why UNIX? Common Reasons

- **Cost**
  - Operating system is less expensive than Windows
  - Much lower for Linux installations
- **Stability**
  - UNIX servers are rarely rebooted
- **Bandwidth**
  - More processes can run at the same time

Why Unix? Transportability

- **No system-wide registry**
  - A registry exists PER Business Objects installation (node)
  - Many installations can run on the same physical machine
  - Each is completely independent of the others
- **Installation files are stored under one home directory**
  - Backing up the application is extremely easy
  - Makes a big difference during in-place upgrades

Why Unix? Machine Reuse

- One physical server can host many Business Objects environments
  - Different versions can co-exist peacefully
  - Different ports separate the traffic per installation

BO 3.1 @ Port 8080

BO 3.1 @ Port 18080

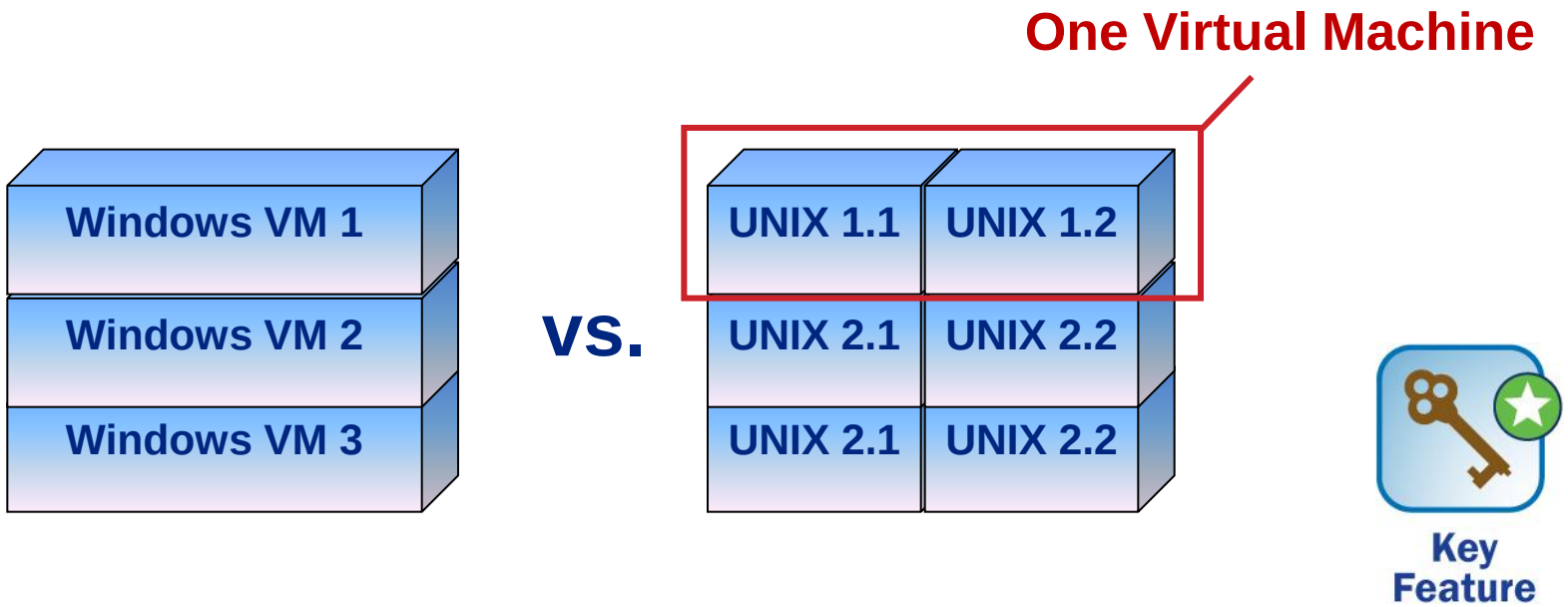
BO 4.0 @ Port 28080

BO = Business Objects

Key Feature

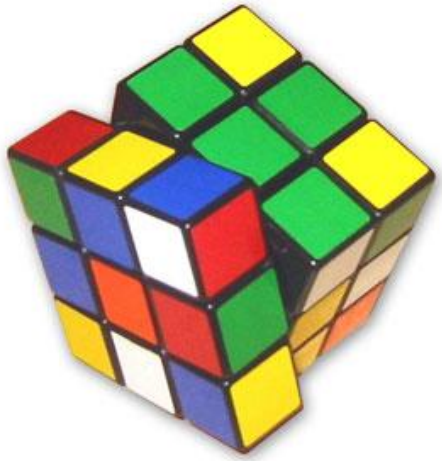
Why Unix? Virtualization

- Some contend that Windows virtualized machines (VMs) have the same advantages
  - Many Windows VMs can run on the same machine
- Certain UNIX variants, like Linux, offer the same advantages
  - Linux can be virtualized like Windows (often better)
  - Can run multiple installations per VM



Why Not Unix?

- Learning curve
  - UNIX environments are harder to master
- Not the friendliest interface
  - Business Objects installation and tools are command-line driven
- Not Microsoft-focused
  - May not be the environment for Microsoft-only (.NET) shops
- Not able to run Windows-based applications
  - Need another machine to run client-only tools
    - Universe Designer, Crystal Reports, Import Wizard, …



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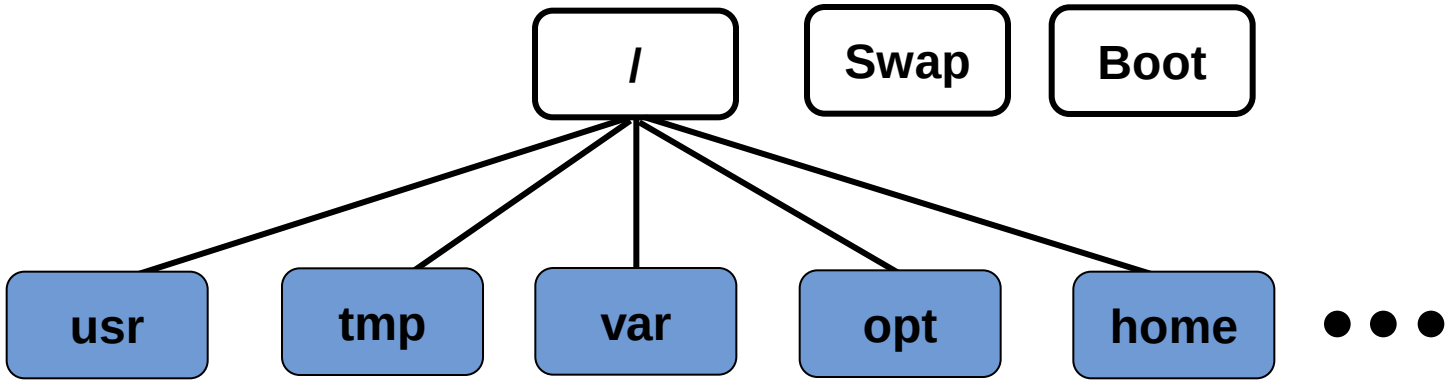
A Few Disclaimers …

- Designing a proper system requires some pre-work
  - Business Requirements Gathering
  - Load Estimation
  - Failover and High Availability Analysis
  - Sizing / Capacity Plan
- Those tasks are common to any environment, not just UNIX
- We'll focus on the portions that are UNIX-specific

Layout

- UNIX storage is designed as a series of partitions
- File systems are mounted by partition
- The central partition contains the root file system
- The swap partition is used by UNIX internally
- Several other file systems mount under root



Partition Map

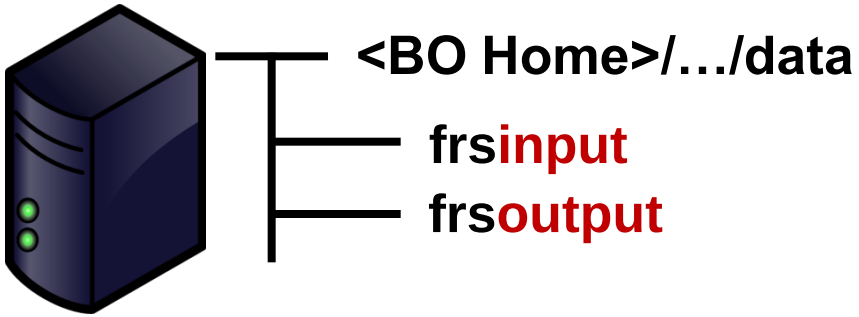
- A partition map tells UNIX how much space to allocate for each partition
- It also assigns file systems and sizes
- Business Objects recommends a swap space of 4 – 8GB
- Temp space should be at least 500 MB

This is a SAMPLE map. Companies may choose other partitions and sizes for Business Objects executables and file systems

Partition	Size (MB)	Description
/boot	128	Contains programs that initialize the server
swap	4096	Used to increase processing memory
/	2048	Root filesystem
/usr	5120	System programs
/opt	20480	Where Business Objects executables and files are installed
/var	20480	Where Business Objects filestores will be located
/stage	20480	Where Business Objects installation files are kept
/home	2048	Home directories/files for individual UNIX accounts

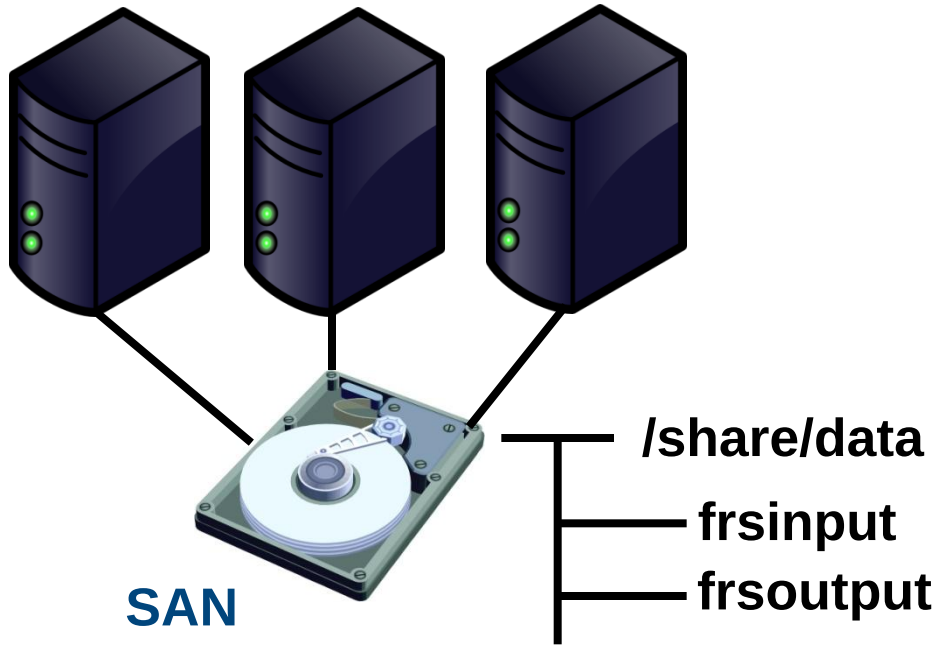
Filestores

- Directories that hold Business Objects content
- An INPUT filestore contains:
  - Reports and Documents (Crystal, Webl, Deski, …)
  - Universes
- An OUTPUT filestore only contains reports that have been previously scheduled
  - These are known as report instances
- These directories can rapidly grow in size, especially the Output filestore



Selecting Partitions for Filestores

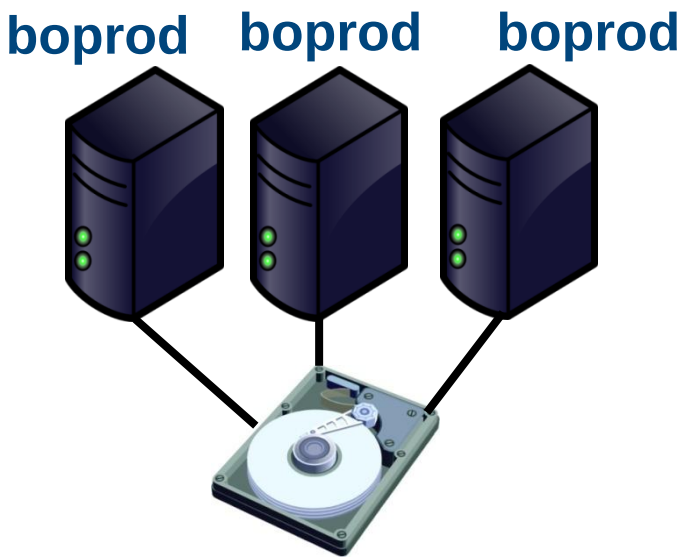
- For a Business Objects cluster, a shared filestore should be established
  - This partition will be accessed by multiple Business Objects installations (nodes)
  - The directories in that partition should be owned by the Business Objects application owner



Best Practice

Selecting an Application Owner

- A UNIX account that will own the Business Objects executables and filestores
  - For a single installation (node):
    - Account will own all Business Objects content
  - For multiple nodes (cluster):
    - The same account created for every node
    - This is crucial when accessing a shared filestore



Best Practice

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PAR and PAM

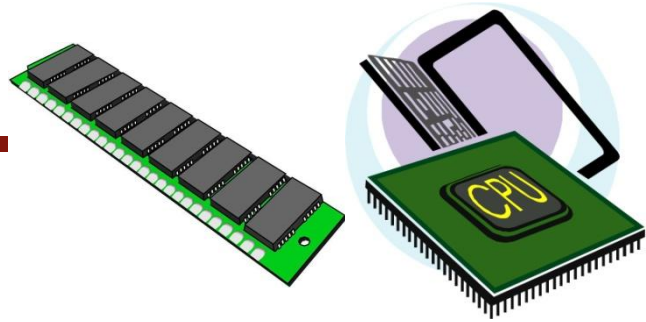
- Product Availability Report (PAR)
  - SAP Support Portal
    - Help and Support > SAP BusinessObjects Support, under Find Documentation, click Supported Platforms/PARs
  - For Business Objects XI 3.1 and below
  - Shows compatible components for a selected release
    - Operating system level, Java VM, Databases, …
- Product Availability Matrix (PAM)
  - SAP Support Portal
    - Release & Upgrade Info > Product Availability Matrix (PAM)
  - For Business Objects 4.0 and higher

NOT checking compatibility requirements will lead to quick failure … and frustration

Disk

- **Storage Requirements**
  - 6.6 GB needed for base installation
  - 3.5 GB per service pack
  - Much more space needed for input/output filestores
    - Combined storage space here could reach 2 TB or greater
  - Staging
    - Reserve enough space to copy AND unzip all executables
    - 20 GB should be adequate for this purpose
  - Temp
    - Reserve at least 500 MB for /tmp
  - Swap
    - Set swap space to 4 GB (8 GB on AIX)

Memory and CPU



- **Memory**
  - 2 GB is the stated minimum
  - 8 GB RAM is preferred
  - Additional memory may be needed based on sizing plan
    - Number and type of reports scheduled / refreshed can drive this estimate much higher
    - Large installations may have 32 GB per machine
- **CPU**
  - 4 CPUs is usually considered a minimum
  - These may be revealed as “logical” CPUs to UNIX
    - One CPU > 4 cores > 8 hyperthreads
    - Large installations may have 16 logical CPUs or more

User Settings (Business Objects v3.1)

- Set for [illegible]r
- Use limit, ulimit

Alan: Should this be unlimit?

Parameter	Value
data segment	unlimited
file size	unlimited
open files	1024 (Linux, Solaris)
	2000 (AIX)
	16384 (HP-UX)
stack size	8192 (Linux, Solaris)
	unlimited (AIX)
maximum user processes	1535 (Linux)
	unlimited (all others)
virtual memory	unlimited
cpu time	unlimited

Many of these settings are recommended as unlimited in BI 4.0. Check PAM for your UNIX type to be sure.

Language and Locale

- **Language**
  - Use a Unicode character set for most databases
    - UTF-16 should support international characters
    - ODBC: Set in ODBC.ini

- **Locale**
  - Set variables like LANG, LC_ALL to a supported locale

```
export LANG=en_US.UTF8
export LC_ALL=en_US.UTF8
```

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Our Installation Advice

- The following slides will focus on UNIX-specific installation issues
  - Portions like banners, software key entry screen, and progress meters are not covered
  - This will focus our attention on the relevant issues
- A few experience-proven tips while installing
  - Find the installation log and display the most recent activity while installing
    - tail –f <installation log name>
    - Sometimes the installation screens freeze, but the install log will accurately show progress
- Take screenshots during installation

Tip

Installing Multiple Languages

```
                SAP BusinessObjects Enterprise XI 3.1 SP3

          Please select the language packs that you wish to install:

[X]  English ( Required field )
[ ]  French
[ ]  Japanese
[ ]  German
[ ]  Spanish
[ ]  Italian
[ ]  Korean
[ ]  Dutch
[ ]  Polish
[ ]  Portuguese
[ ]  Russian
[ ]  Swedish
[ ]  Simplified Chinese
[ ]  Traditional Chinese
[ ]  Danish

                Use the arrow keys to select a menu item,
                       [x] to Select/Unselect it,
                       and [Enter] to continue.
                Press [Ctrl-B] to go back, [Ctrl-X] to quit.
```

Installing multiple languages is NOT a good idea if you don't need them.

It will dramatically increase the time to upgrade.

Type of Installation

SAP BusinessObjects Enterprise XI 3.1 SP3

Would you like to perform a system install or a user install?

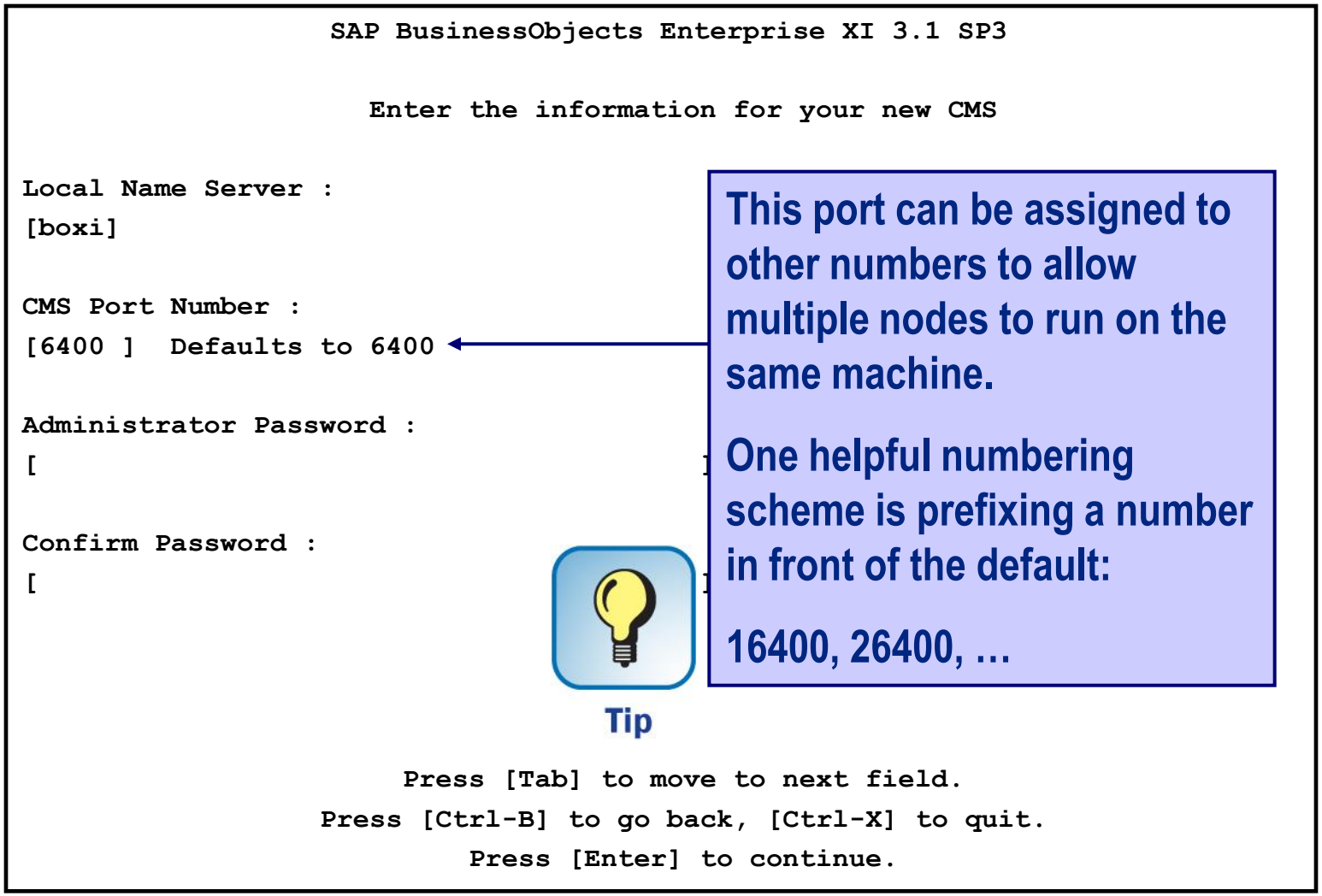
1 - User - Regular SAP BusinessObjects Enterprise installation
2 - System - User installation plus system initialization scripts. *

Most customers choose User installations. This gives them more control over starting their servers, especially in clusters.

* Requires root access to run initialization scripts post-install.

Use arrow keys to select an option.
Press [Enter] to validate your choice.
Press [Ctrl-B] to go back.
Press [Ctrl-X] to quit.

Alternative CORBA Ports



This port can be assigned to other numbers to allow multiple nodes to run on the same machine.

One helpful numbering scheme is prefixing a number in front of the default:

16400, 26400, …

Tip

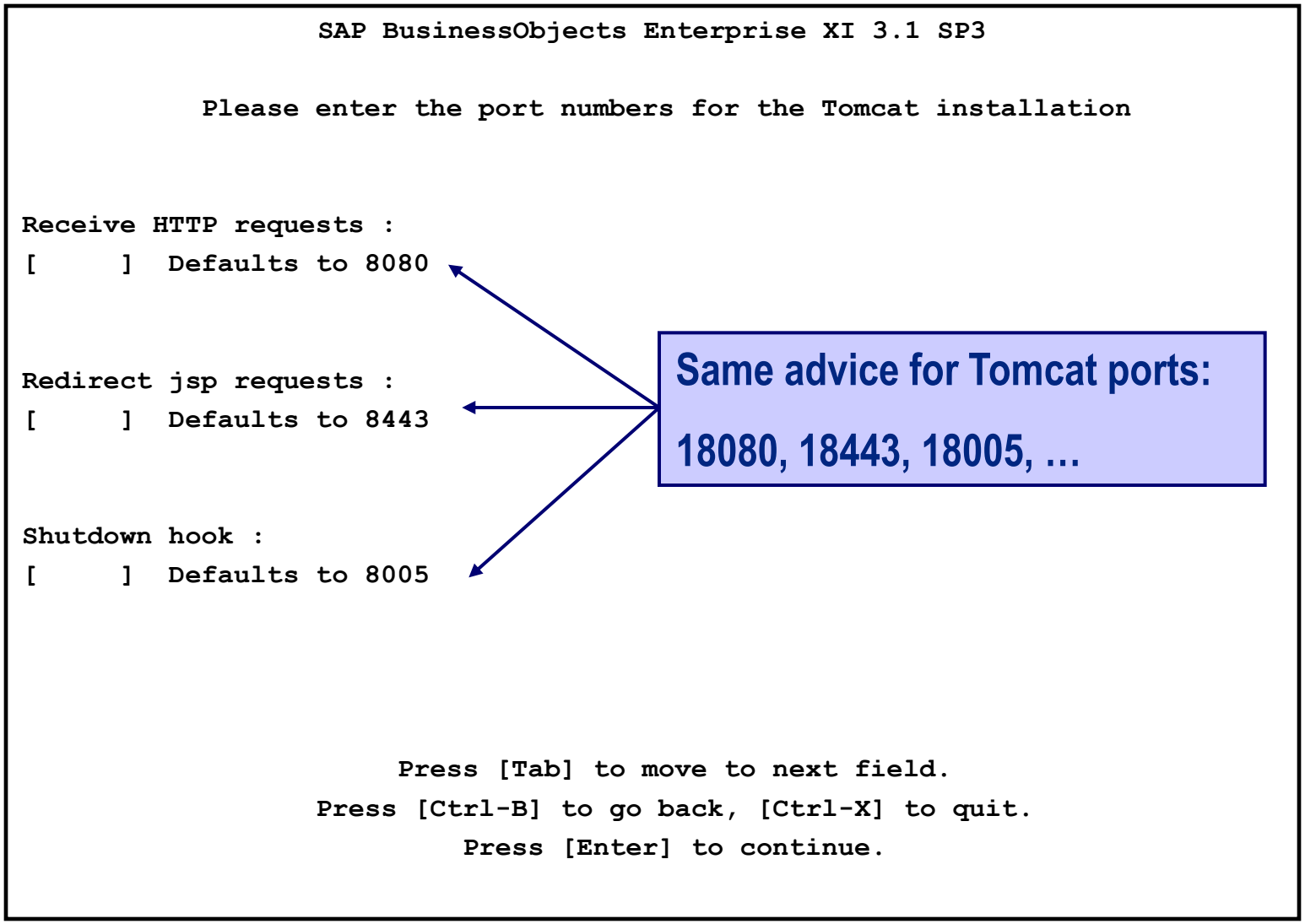
Alternative Server Intelligence Agent Ports

```
                Enter Server Intelligence Agent information

Server Intelligence Agent is the visible component of Server Intelligence,
the service functionality of SAP BusinessObjects Enterprise XI 3.1. This
utility simplifies the deployment and management of the SAP BusinessObjects
Enterprise servers and improves fault-tolerance by automating the starting,
restarting and stopping of those servers.

Local Name Server :  [boxi3]

Choose a name for the Server Intelligence Agent Node :
[sia1        ] * Required field (spaces, dashes, and periods are not allowed)

Server Intelligence Agent Port :
[     ] Defaults to 6410

                Press [Tab] to move to next field.
            Press [Ctrl-B] to go back, [Ctrl-X] to quit.
                    Press [Enter] to continue.
```

Same advice for SIA ports:

16410, 26410, …

Alternative Server Intelligence Agent Ports



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Memory Changes (XI 3.1)

- Increase the maximum memory allowed by Tomcat from 1024 MB to 1536 MB (XI 3.1)
  - Adjusted in catalina.sh (<BO Install>/bobje/tomcat/bin)

```
# ----- Execute The Requested Command ------
export JAVA_OPTS="-Xms256m -Xmx1536m"
```

- Memory can be increased for ALL Business Objects processes using the same modification
  - Adjusted in env.sh (<BO Install/bobje/setup)
  - Default is 128 MB min, 256 MB max

```
JAVA_OPTS="$JAVA_OPTS -Xms256m -Xmx1536m"
```

Tomcat Modifications (XI 3.1)

- **Increase the number of processors and threads**
  - **This will increase the number of requests Tomcat can handle concurrently**
  - **Adjusted in server.conf (<BO Install>/bobje/tomcat/conf)**

```
<!-- Define a non-SSL Coyote HTTP/1.1 Connector on port 8080 -->
    <Connector URIEncoding="UTF-8"
    acceptCount="100" connectionTimeout="20000" debug="0"
    disableUploadTimeout="true" enableLookups="false"
    maxSpareThreads="75"
    maxThreads="150"
    minSpareThreads="25"
    port="8080" redirectPort="8443"
    maxProcessors="150"
    minProcessors="5" />
```

Configuration Changes (XI 4.0)

- Much more memory can be configured in Business Objects 4.0 if needed
  - A 64-bit application has a much higher memory ceiling
  - Traditional 2 GB limit per process is no longer the case
- The same advice goes for processing changes
  - 64-bit CPUs can process more data and larger files
  - Processing bandwidth increases
  - Adding additional worker threads is possible

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Routine Maintenance

- UNIX-based systems are RARELY restarted or bounced
  - No need
  - This may happen for OS-based changes or hardware replacement
- Planned downtime for the BO environment is more common
  - Stopping / starting Business Objects processes
  - Done every 2 – 4 weeks
- Why a maintenance window at all?
  - Cold backups
  - Preventative

Common Downtime Routine

- Disable all job servers
  - This allows running jobs to complete
  - Will not accept any new scheduled requests
- Stop all machines in the cluster
- Stop Tomcat application server
- Restart machines running CMS first
  - Sequentially – Not in parallel
- Restart Business Objects processes on remaining machines
- Enable job servers
  - This may be selective based on the number of jobs

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Upgrading vs. Migrating

- Upgrading refers to modifications made within the same major release
  - Service Packs
  - Fix Packs
  - Example:
    - XI 3.1 SP4 to XI 3.1 SP5
- Migrations refer to moving to the next major release
  - Either release can have various service, fix packs applied
  - Example:
    - XI 3.1 to BI 4.0

Decision Point

Why the Difference?

- Upgrades can usually be performed IN PLACE
  - No need to install software on a parallel environment
  - This is especially suited to the UNIX platform
- Migrations may force other options on customers
  - Side-by-side migration
    - Load new version on same machine as old
  - Installation on new machine
  - In-place migration is NOT allowed for BI 4.0

UNIX Upgrade / Migration Advantages

- **In-Place Upgrades are easier**
  - Backup the databases (system, audit) and filestores
  - Backup the entire Business Objects home directory
  - Install
- **Side-by-Side Migrations are easier**
  - Port selection during install separates CORBA communication between installations
  - Registry is loaded UNDER Business Objects home directory

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Tuning Advice Beyond the Books

- UNIX systems aren't necessarily faster …
  - Some use the same chipsets as Wintel servers
- Bandwidth is a different story, however
  - The NUMBER of Business Objects processes can be increased in UNIX
  - Traditional tuning advice in reference guides do not make this distinction
  - This is one of the main reasons why large businesses choose UNIX over Windows
    - In addition to stability, cost, maintenance, …

Bandwidth Examples

- **Web Intelligence Processing**
  - **By the book:**
    - **1 WebI Processing Server per CPU**
    - **25 – 40 concurrent requests per Processing Server**
    - **5 concurrent WebI Job Server jobs per CPU**
    - **20 concurrent WebI jobs per WebI Job Server**

Bandwidth Examples

- **Web Intelligence Processing**
  - **In reality:**
    - **8 CPU 32GB AIX server (16 Logical CPU)**
      - ***6 WebI Processing Servers***
      - ***11 WebI Job Servers***
      - ***5 Publication Job Servers***
      - ***5 Adaptive Processing Servers***
    - **Average CPU Utilization: 25%**
    - **Maximum CPU Peak: 40%**

Creating Benchmarks

- Benchmarks for UNIX systems don't exist (or aren't published)
- So … how can you find out what your system can handle?
- The answer: Create your own benchmark!
- One recipe
  - Create the load to be measured for each Business Objects server
  - Use one or more UNIX tools to measure resources used
    - CPU, memory, …
    - Several such monitoring tools coming up
  - Increase load until system resources are exhausted

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Resources are Limited

- UNIX servers have finite resources for processing
  - Memory
  - I/O (Disk)
  - Network
  - CPU
- Making the best use of these resources means monitoring them carefully
- This section will introduce several commands/utilities that will make the job easier

Monitoring Methodology

- Problems are often the result of several factors, sometimes interrelated
- What appears to be a CPU problem could be effects of a disk or memory problem
- Check your server resources in the following order for best results
  1. Virtual and physical memory
  2. Input/Output (I/O) from disk
  3. Network activity
  4. CPU utilization

Checklist

Memory

- Use the vmstat command to monitor your memory usage:

```
vmstat <delay> <number of iterations>
Example: vmstat 5 10
```

- Look for high pageouts (po or so depending on version)

```
procs      memory
R  b  w     swpd    free   buff   cache   si   so
1  0  0    13344   1444   1308   19692   0    168
1  0  0    13856   1640   1308   18524   64   516
3  0  0    13856   1084   1308   18316   56   64
.
.
```

High paging (> 100/sec)

Linux

Tool

Disk I/O

- **Use iostat to measure disk usage:**

```
iostat <interval>
Example: iostat 5 (Sample every 5 seconds)
```

- **Look for utilization > 60 – 80%, response times > 35 msec, uneven I/O distribution**

```
Device   r/s    w/s    kr/s      kw/s   wait   actv   svc_t   %w    %b
sd1      84.7   0.0    10615.1   0.0    0.0    1.6    19.0    1     100
sd4      27.6   6.8    220.5     51.6   0.0    2.9    83.0    0     98 s
sd6      0.0    0.0    0.0       0.0    0.0    0.0    0.0     0     0
```

Solaris

Tool

Average service time (response)

Utilization (% busy)

Network I/O

- Use the netstat command to monitor network traffic:

```
netstat -i -I <network> <sample interval>
Example: netstat -i -I en0 5
```

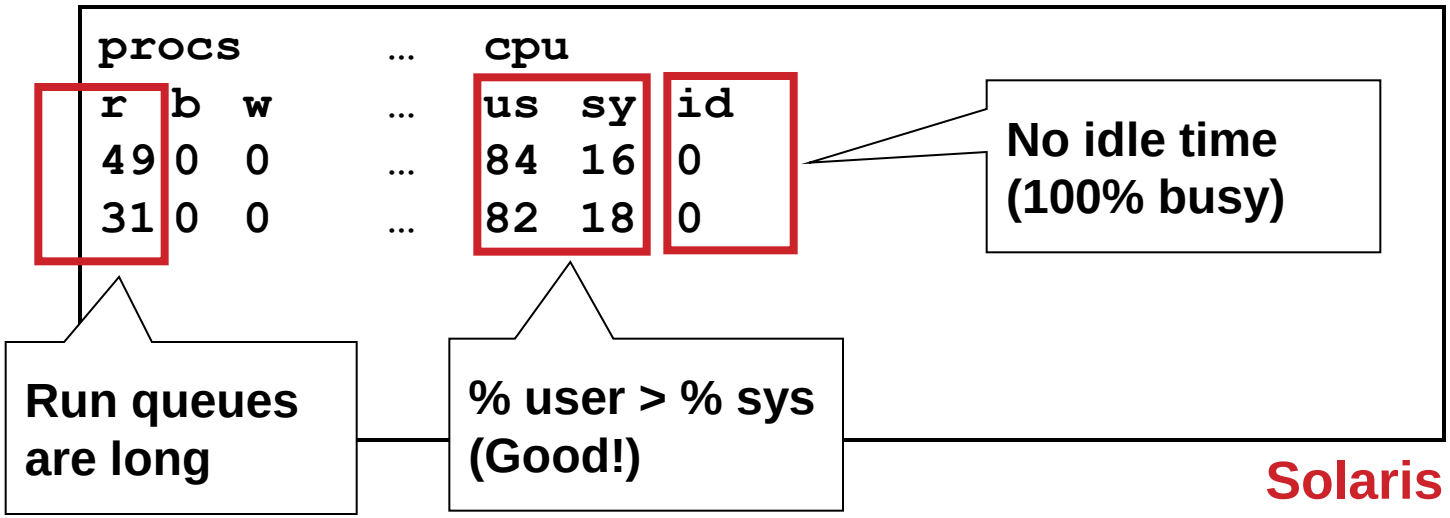
- Look for collisions > 10% of output packets

```
Name  Mtu   Network     Address      Ipkts  Ierrs  Opkts  Oerrs  Coll
en0   1500  <Link>                   96     0      67     0      0
en0   1500  192.100.61  nullarbor    96     0      67     0      0
```

AIX

CPU

- Use the vmstat command to check system utilization
- Look for % CPU utilization, large run queues, %sys > %user
- Don't automatically assume that 100% utilization is bad!
  - 100% utilization over extended periods is bad
  - Aim for 70 – 80% utilization



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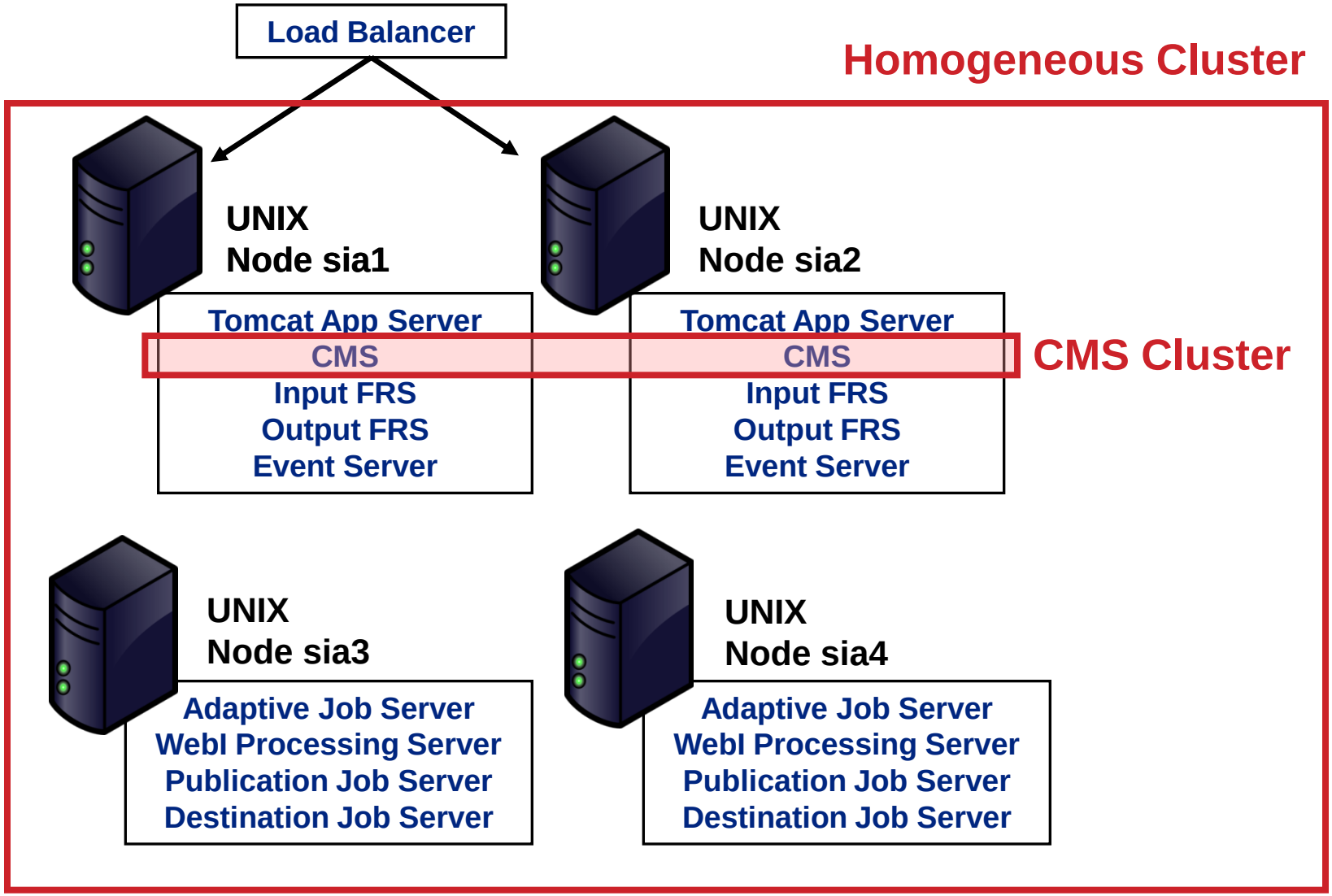
Clustering in UNIX

- UNIX machines may be clustered to provide horizontal scaling
  - Known as a HOMOGENEOUS cluster
    - All nodes point to the same CMS system database
  - CMS clustering is possible
    - Two or more nodes would manage a CMS process
    - They would share all authentication / authorization tasks as peers
    - A few caveats for CMS clustering:
      - *Same specifications per machine (CPU, memory)*
      - *Same UNIX version*
      - *Same database middleware*

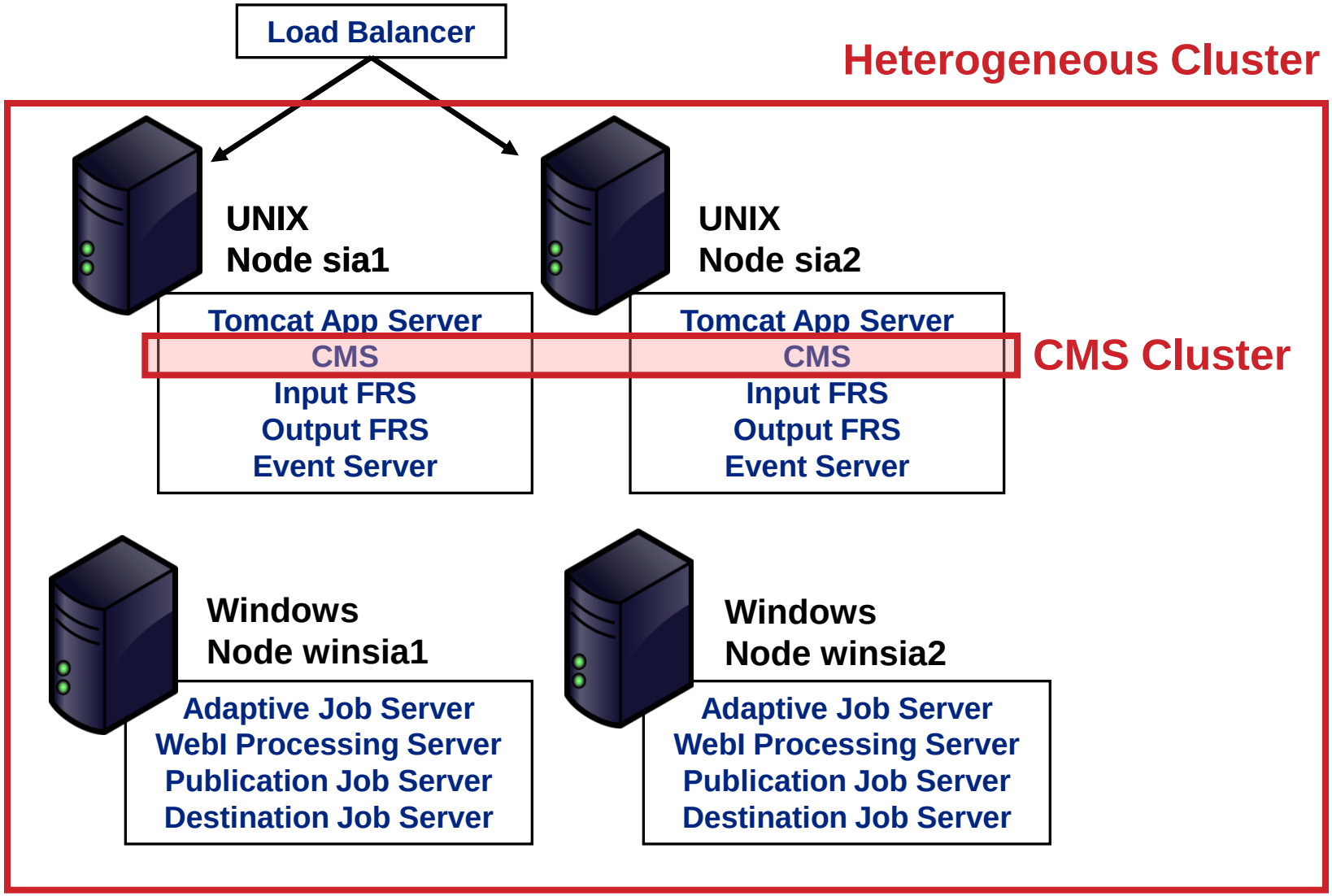
UNIX Clustering Example (Webl)



Clustering UNIX and Windows Machines

- UNIX and Windows machines may be clustered together
  - Known as a HETEROGENEOUS cluster
    - As before all nodes point to the same CMS system database
  - CMS clustering is NOT possible between Linux and Windows
    - The UNIX server would host the CMS
    - CMS clustering is possible between Linux servers
    - Windows server(s) would reference that CMS

UNIX / Windows Clustering Example (Webl)



How to Cluster

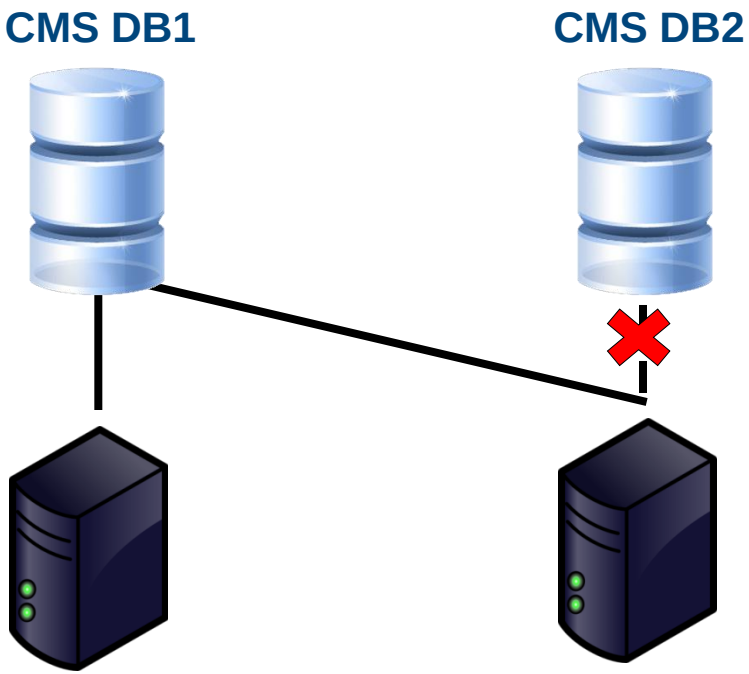
- **Machines are clustered using one of two methods:**
  - **New installation**
    - **Selecting the "Custom or Expand" option**

```
                    SAP BusinessObjects Enterprise XI 3.1 SP3

                                Installation Type

 1  -   New (Install a new Enterprise system)
 2  -   Custom or Expand (Select which components you wish to install)
 3  -   Install Web Tier features

[X] -   Enable servers after installation
```

  - **Existing installation**
    - **serverconfig.sh used to alter existing node(s)**
    - **Modification allows the Server Intelligence Agent to point to the desired CMS database**

Clustering Demonstration

- For this demonstration, only two servers will be considered
  - Both servers have Business Objects software installed
  - serverconfig.sh will be used to cluster the second server



Demo

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Additional Resources

- BusinessObjects Enterprise XI 3.1 Installation Guide for UNIX (http://help.sap.com/businessobject/product_guides)
- BusinessObjects Enterprise Administrator's Guide (XI 3.1) (http://help.sap.com/businessobject/product_guides)
- Business Intelligence Platform Installation Guide (UNIX) BO 4.0 SP02, (http://help.sap.com/businessobject/product_guides)
- Business Intelligence Platform Administrator Guide, BO 4.0 SP02, (http://help.sap.com/businessobject/product_guides)
- Mitra Moini, “Growing Up UNIX”, (BusinessObject Insight, October 2007)

7 Key Points to Take Home

- UNIX-based systems have some great advantages
- Designing a UNIX-based system is different (not harder) than Windows
- Installation offers the chance for several systems to run on the same machine
- Maintenance and upgrading is easier than Windows
- Tuning and monitoring offers more control
- Clustering can add increased availability and failover
- Clusters can combine the strengths of UNIX and Windows

Your Turn!

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Disclaimer