Best Practices for Load Balancing the Blackboard Application

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What is High Availability

- **Redundancy**
  - Multiple components able to perform the same tasks

- **Clustering (Database/Storage)**
  - MSCS (SQL Server)
  - Oracle RAC

- **Load Balancing**
  - Distributing load on independent nodes
Load Balancing Cons

- **Price**
  - Multiple servers
  - More switch ports
  - More power
  - More cooling

- **Complexity**
  - More equipment
  - More people
Load Balancing Pros

- Reliability
  - Fewer single points of failure
- Performance
  - More systems doing less
- Transparency
  - Maintain one system without impacting others
Load Balancing Options

- DNS Round Robin
  - Multiple A records for the same name pointing to multiple Addresses

- Software
  - Each Server
  - Gateway Server

- Hardware
  - Network Level
DNS Round Robin

- **Pros**
  - Inexpensive
  - Easy to Configure

- **Cons**
  - No automatic failover
  - No application monitoring
  - No SSL or Caching options
Software

- **Types**
  - Windows NLB or similar
  - Gateway Server

- **Pros**
  - Inexpensive
  - Server Failover
  - Application monitoring

- **Cons**
  - Additional software running on the app servers
  - Balancing at the software level
  - SSL and Caching in software
Hardware

- **Pros**
  - Server and Application Monitoring
  - SSL and caching hardware
  - Balancing Happens at the Network

- **Cons**
  - Expensive
  - Increased Complexity
Load Balancing at UK

- Call Center Application (BigIP 1500)
  - Telephone Operators
  - Doctor’s Offices and Clinics
  - IT Helpdesks
- E-Mail (BigIP 3400)
  - Exchange
  - Generic SMTP
- Everything Else (BigIP 6400)
  - Web Applications
  - Campus Directory Services
What is Everything Else?

- SAP NetWeaver Portal
- Microsoft Office SharePoint 2007
- Office Communicator
- LDAP
- RADIUS
- General use Application and web servers
- Blackboard
Blackboard Environment
Database and File Servers

- Two Dell PowerEdge R900
  - 16 Core
  - 64Gig Ram
  - 5x73 15k SAS Hard Drives RAID 10
- Software
  - Windows Server 2003 Enterprise R2 x64
  - Microsoft Cluster Services
    - Cluster Group
    - MS SQL Server 2005 Enterprise x64 Group
    - File Server Group
    - SQL Server Analysis Services Group
Database and File Server Storage

- Shared SAN Storage
  - Each server has two Fibre HBAs for SAN connection to separate switches
- RAID type based on job
  - RAID 1 or 10 for best performance
    - Database Files
    - Database Logs
  - RAID 5 or 6 for size
    - Content System
    - Course Files
## Storage LUNs

<table>
<thead>
<tr>
<th>LUN Description</th>
<th>Size</th>
<th>RAID Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Databases</td>
<td>36 GB</td>
<td>RAID 1</td>
</tr>
<tr>
<td>Temp Database</td>
<td>36 GB</td>
<td>RAID 1</td>
</tr>
<tr>
<td>Temp Log</td>
<td>36 GB</td>
<td>RAID 1</td>
</tr>
<tr>
<td>Blackboard Databases</td>
<td>146 GB</td>
<td>RAID 10</td>
</tr>
<tr>
<td>Blackboard Log</td>
<td>73 GB</td>
<td>RAID 10</td>
</tr>
<tr>
<td>Blackboard Shared Content</td>
<td>1 TB</td>
<td>RAID 5</td>
</tr>
<tr>
<td>Cluster Quorum</td>
<td>4 GB</td>
<td>RAID 5</td>
</tr>
</tbody>
</table>
Application Servers

- 6 Dell PowerEdge 1850
  - 4 Cores
  - 4Gig Ram
  - 2x36 15K SCSI Hard Drives RAID 1

- Software
  - Windows Server 2003 Standard R2
  - IIS 6
  - JDK 1.5.0_15
  - Blackboard Academic Suite 8.0.209.9
App Server Configuration

- **IIS Settings**
  - ISAPI Filter for x-ForwardedFor Header
  - Account Settings for Execution

- **Blackboard Settings (bb-config)**
  - File path for shared storage
  - Startup account for Tomcat and Collab services
  - Startup options for services
  - URL for Collab Services
Collaboration Servers

- **Hardware**
  - Two Dell PowerEdge 850
    - 2 cores
    - 2Gig Ram
    - 2x36 15K SCSI Hard Drives RAID 1

- **Software**
  - Windows Server 2003 Standard R2
  - JDK 1.5.0_15
  - Blackboard Academic Suite 8.0.209.9
Collab Server Config

- IIS Settings
  - Installed but Not Running
- Blackboard Settings (bb-config)
  - File path for shared storage
  - Startup account for Tomcat and Collab services
  - Startup options for services
  - URL for Collab Services
Snapshot Server

- One Virtual Machine
  - Windows Server 2003 Standard R2
  - IIS 6.0
  - Blackboard Snapshot Tool

- Tasks
  - Runs jobs to pull data from AD and SAP
  - Snapshot Data into Blackboard Daily, or on demand
  - Fallback host if all app server are down
SSL Offload

- What is SSL Offloading
- Why Offload SSL
  - Performance
  - Troubleshooting
  - License Costs
- SSL and BigIP
  - Hardware Encryption
  - License Costs
SSL Offloading and Blackboard

- Application Support
  - Disable SSL inside Blackboard
- Stream Profile
  - Single Replace
  - Multiple Replace
- Selective Replace iRule
  - Ignore non-text file types
- Firewall off App Servers
  - Limited access to the Blackboard App servers
Hardware Cache

- What is hardware caching
- Why use hardware caching
  - Performance
  - Reduce Load on app servers
BigIP LTM Configuration

- **Nodes**
  - App Servers
  - Collaboration Servers

- **Monitors**
  - HTTP Monitor

- **Pools**
  - Blackboard HTTP Pool
  - Collaboration HTTP Pool
  - Collaboration TCP Pool

- **iRules**
  - SSL Offload
  - SSL Redirect
  - Compression
Pool Configuration

- Custom Health Monitor
- Select new member on serviced down
iRules and Stream Profile

- Purpose of iRules
  - Request and Response inspection and modification
  - Security checking

- iRules and Blackboard
  - SSL OffLoad
  - SSL Redirect
  - Selective Compression

- Stream Profile
  - http -> https
iRules

HTTPS Rewrite

when HTTP_RESPONSE {
HTTP::header remove "Pragma"
    if { [HTTP::header Content-Type] contains "text/html;charset=UTF-8" } {
        STREAM::expression "@http://FQDN@https://FQDN@"
    }
}

HTTP to HTTPS redirect

when HTTP_REQUEST {
    #Redirects all to HTTPS keeps URI intact
    HTTP::redirect https://[HTTP::host][HTTP::uri]
}

Selective Compression

when HTTP_REQUEST {
    if {[matchclass [IP::remote_addr] equals $::campus_address] } {
        COMPRESS::disable
    } else {
        COMPRESS::enable
    }
}
HTTP Profile

- Fallback Host
  - Not in same pool as app servers
- Redirect Rewrite
  - SSL Offload
- Insert XForwardedFor
  - Logging
- Compression
- Ram Cache
  - Pin/Exclude list
Virtual Servers

- HTTP Server
  - Redirects Traffic to HTTPS
- HTTPS Virtual Server
  - iRules
  - SSL
  - HTTP Profile
  - Stream Profile
  - Persistence Profile
Collaboration Virtual Servers

- HTTPS Virtual Server
  - SSL
  - HTTP Profile
  - iRule
  - Port 8010

- Collaboration TCP Virtual Server
  - Port 8011
  - Layer 4
  - One Active Server
RAMCache

- PIN items
  - /images/*
  - /javascript/*
  - /ui/*
  - /branding/*

- Exclude Items
  - /webapps/*
  - /webapps-net/*
Backup and Recovery

- Database Backup and Recovery
  - Use method prescribed by database vendor

- Content files
  - Files not stored on App Servers
  - Permissions

- Disaster Recovery
  - Databases and Shared Content
  - User Migration
  - Application servers
External Monitoring

- **Database**
  - Microsoft Systems Center Operations Manager 2007

- **File Server**
  - SCOM 2007

- **Individual App Servers**
  - SCOM 2007
  - F5 BigIP Monitors

- **Load Balanced VIP**
  - SCOM 2007
  - What’s Up
Summary

- Blackboard has become Mission Critical
  - High Stakes Online Exams
  - Online Only Courses
- Load Balancing Improves Uptime and Performance
  - Fewer single points of failure
  - Increased cost and complexity
Questions, Comments

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