

Blackboard Learn

Deployment Guide

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Table of Contents

1 Introduction **4**

1.1 Document Purpose 4

1.2 Intended Audience 4

1.3 Prerequisites 4

2 Template **5**

3 Load Balancing Blackboard Learn™ **6**

3.1 Configure the LoadMaster 7

3.1.1 Configure Global Settings 7

3.1.1.1 L7 Configuration 7

3.1.1.2 Enable Subnet Originating Requests Globally 8

3.1.2 Configure a Content Rule for the HTTPS Virtual Service 9

3.1.3 Configure the Virtual Services 10

3.1.3.1 Configure a HTTP Virtual Service 10

3.1.3.2 Configure a HTTPS Virtual Service 12

References **16**

Last Updated Date **17**

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1 Introduction

Blackboard Learn™ is a Learning Management System (LMS) developed by Blackboard Inc. It is web-based server software which features course management, customizable open architecture and scalable design that allows integration with student information systems and authentication protocols. Its main purpose is to add online elements to courses which are traditionally delivered face-to-face and develop completely online courses with little or no face-to-face meetings.

To improve performance and provide High Availability (HA), Blackboard Learn™ supports using a hardware or software load balancer and multiple application servers. The Kemp LoadMaster can be used to load balance Blackboard Learn™ traffic.

1.1 Document Purpose

The purpose of this document is to describe how to configure the LoadMaster to load balance Blackboard Learn™. This document is based on Blackboard Learn 9.1 SP8. Kemp supports other versions of Learn, but there may be some features that do not work with older versions of Learn.

1.2 Intended Audience

This document is intended to be used by anyone who is interested in finding out how to configure the LoadMaster to load balance Blackboard Learn™.

1.3 Prerequisites

The following prerequisites must be satisfied before configuring the LoadMaster to work with Blackboard Learn™:

- The Blackboard Learn™ application must be deployed and successfully tested
- The Application Servers must have the relevant JDK and JRE installed.
- A Microsoft SQL Server must be installed

For additional information about the prerequisites, please refer to the Blackboard Learn, Deployment Guide.

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2 Template

Kemp has developed a template containing our recommended settings for this workload. You can install this template to help create Virtual Services (VSs) because it automatically populates the settings. You can use the template to easily create the required VSs with the recommended settings. For some workloads, additional manual steps may be required such as assigning a certificate or applying port following, these steps are covered in the document, if needed.

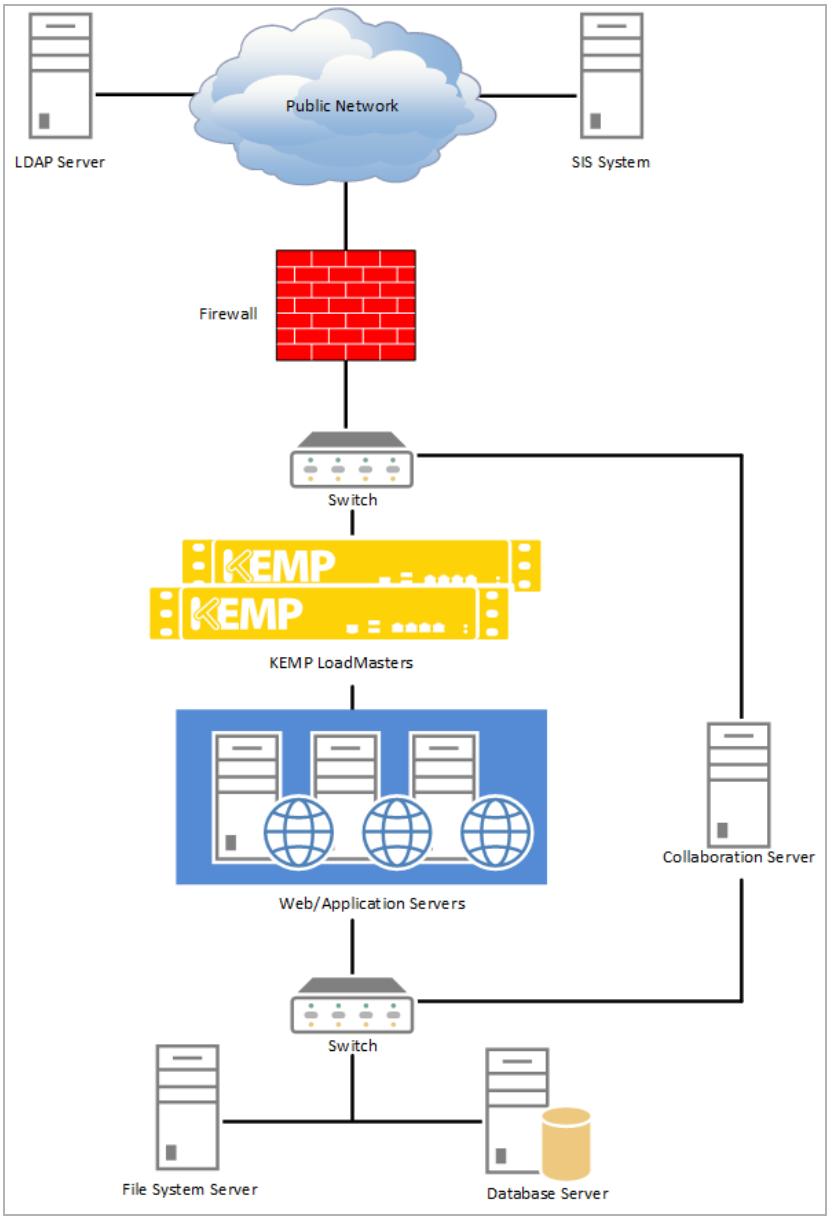
You can remove templates after use and this will not affect deployed services. If needed, you can make changes to any of the VS settings after using the template.

Download released templates from the following page: LoadMaster Templates.

For more information and steps on how to import and use templates, refer to the Virtual Services and Templates, Feature Description on the Kemp Documentation page.

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3 Load Balancing Blackboard Learn™



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The above diagram depicts a typical load-balanced configuration. Load-balanced configurations include multiple application servers, a database server (or failover cluster), a file system server and a collaboration server. A network switch is used to handle communications from the client machines to the application servers and the collaboration server. A separate switch is used to handle a secure, private connection between the application servers and the file system and database servers. The database and file system must be on a secure, private network.

The LoadMaster is primarily used for load balancing and providing HA for the web/application servers and collaboration servers. The collaboration server can also be optionally load balanced. For more information on how to load balance the collaboration server, refer to this link: https://help.blackboard.com/en-us/Learn/9.1_2014_04/Administrator/070_Server_Management_and_Integrations/Performance_Optimization/Load_Balancing_-_Configuration_and_Best_Practices

The diagram above also shows integration with an LDAP server (or servers) to handle authentication and a Student Information System (SIS) to share data with Blackboard Learn™.

3.1 Configure the LoadMaster

The following sections describe how to configure the LoadMaster and associated Virtual Services.

3.1.1 Configure Global Settings

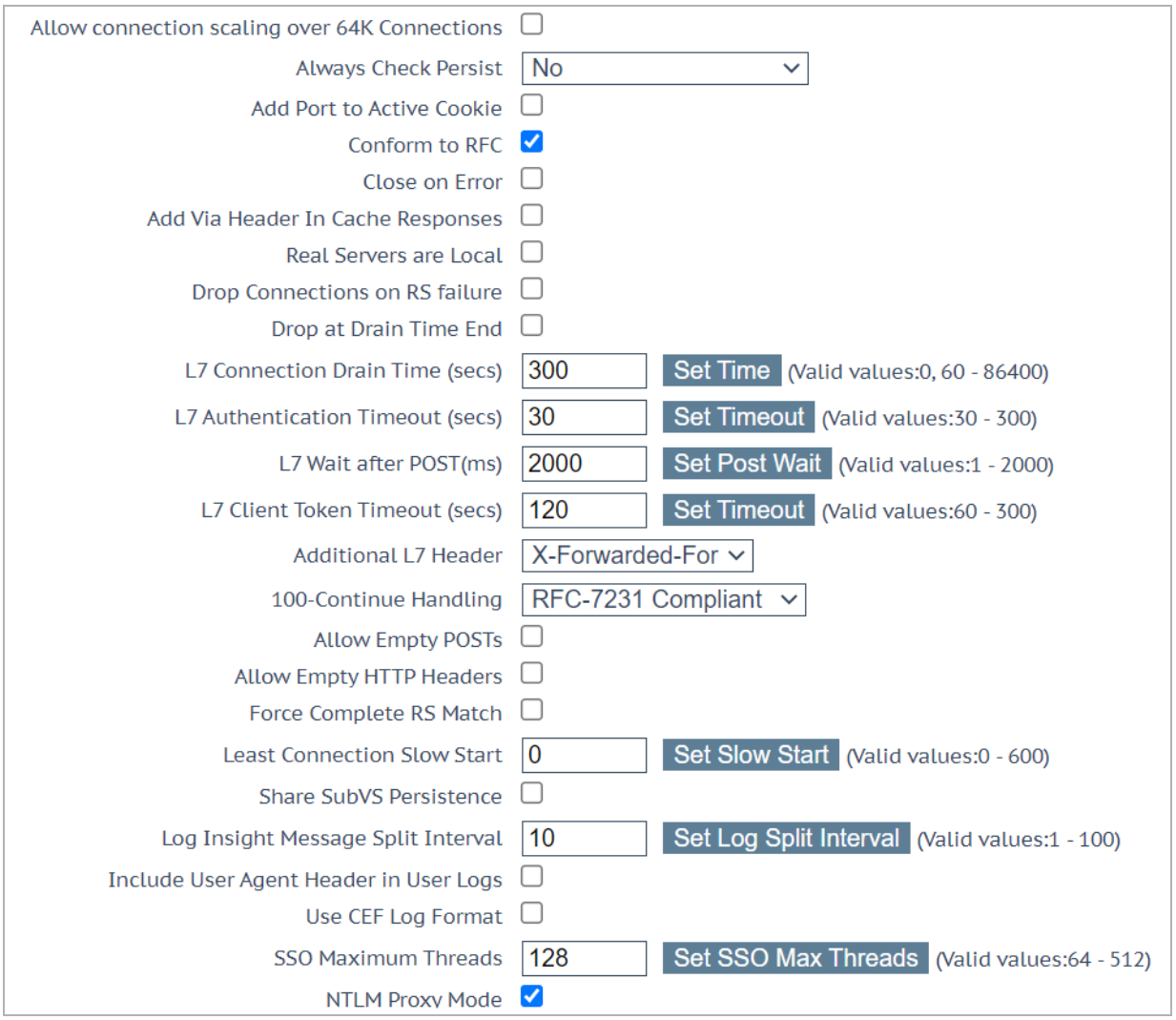
The following sections explain how to configure various settings globally.

3.1.1.1 L7 Configuration

The **Additional L7 Header** field in the LoadMaster must be set to **X-Forwarded-For**. To do this, follow the steps below in the LoadMaster Web User Interface (WUI):

1. In the main menu of the WUI, go to **System Configuration > Miscellaneous Options > L7 Configuration**.

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2. Select **X-Forwarded-For** as the **Additional L7 Header**.

The Blackboard Learn™ server must be configured to look at this header. If you are using IIS, an Internet Server Application (ISAPI) filter must be used to see the X-Forwarded-For header.

3.1.1.2 Enable Subnet Originating Requests Globally

It is best practice to enable the **Subnet Originating Requests** option globally.

In a one-armed setup (where the Virtual Service and Real Servers are on the same network/subnet) **Subnet Originating Requests** is usually not needed. However, enabling **Subnet Originating Requests** should not affect the routing in a one-armed setup.

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In a two-armed setup where the Virtual Service is on network/subnet A, for example, and the Real Servers are on network B, **Subnet Originating Requests** should be enabled on LoadMasters with firmware version 7.1-16 and above.



When **Subnet Originating Requests** is enabled, the Real Server sees traffic originating from 10.20.20.21 (LoadMaster eth1 address) and responds correctly in most scenarios.

With **Subnet Originating Requests** disabled, the Real Server sees traffic originating from 10.0.0.15 (LoadMaster Virtual Service address on **eth0**) and responds to **eth0** which could cause asymmetric routing.

When **Subnet Originating Requests** is enabled globally, it is automatically enabled on all Virtual Services. If the **Subnet Originating Requests** option is disabled globally, you can choose whether to enable **Subnet Originating Requests** on a per-Virtual Service basis.

To enable **Subnet Originating Requests** globally, follow the steps below:

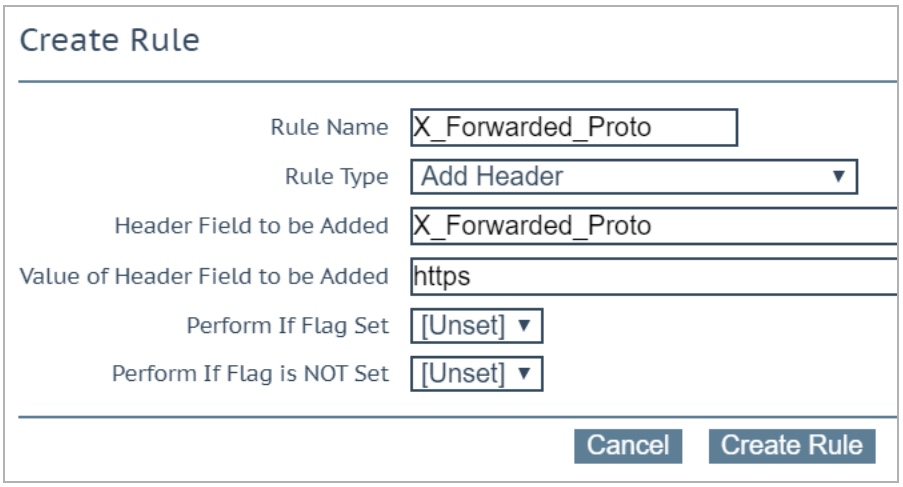
1. In the main menu of the LoadMaster User Interface (UI), go to **System Configuration > Miscellaneous Options > Network Options**.
2. Select the **Subnet Originating Requests** check box.

3.1.2 Configure a Content Rule for the HTTPS Virtual Service

To add a content rule, make the following selections:

1. In the main menu, select **Rules & Checking > Content Rules**.
2. Click the **Create New...** button.

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3. In the Create Rule screen, make the following selections:

    - Enter **X_Forwarded_Proto** as the **Rule Name**.

    - Select **Add Header** from the **Rule Type** drop-down list.

    - Enter **X_Forwarded_Proto** in the **Header Field to be Added** text field.

    - Enter **https** as the **Value of Header Field to be Added**.

    - Click the **Create Rule** button.

3.1.3 Configure the Virtual Services

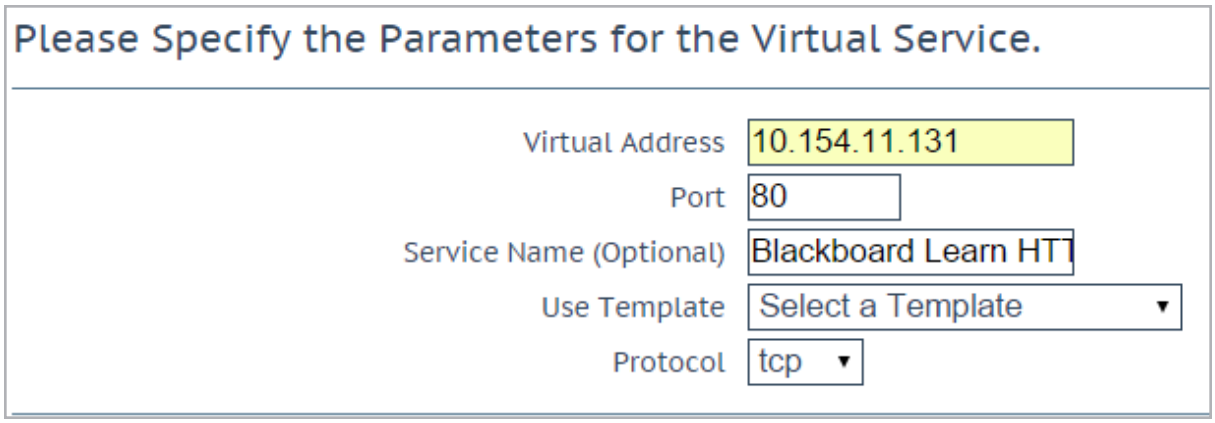
Either a HTTP or HTTPS Virtual Service needs to be created and configured in the LoadMaster to load balance Blackboard Learn™. Refer to the relevant section below for step-by-step instructions on how to create the relevant Virtual Service.

3.1.3.1 Configure a HTTP Virtual Service

To configure a HTTP Virtual Service, follow the steps below in the LoadMaster WUI:

1. In the main menu, select **Virtual Services > Add New**.

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2. Enter a valid IP address in the V**irtual Address** text box.
3. Enter **80** as the **Port**.
4. Enter a recognizable **Service Name**, such as Blackboard Learn HTTP.
5. Click **Add this Virtual Service**.
6. Expand the **Standard Options** section.
7. Enter the details shown in the following table:

Section	Option	Value	Comments
Standard Options	Transparency	Disabled	
	Persistence Mode	Active Cookie	
	Timeout	4 Hours	If the default timeout (3 hours) in Blackboard Learn™ is increased, the timeout value in the LoadMaster should be higher.
	Cookie name	KempBBCookie	
	Scheduling Method	least connection	
Advanced Properties	Enable Caching	Enabled	
	Maximum	20%	

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Section	Option	Value	Comments
	Cache usage		
	Enable Compression	Enabled	
	Add HTTP Headers	X-Forwarded-For (+Via)	
Real Servers	Real Server Check Parameters	HTTP Protocol	
	URL	/webapps/portal/healthCheck	Click **Set URL** then click **New**.

8. Enter the relevant **Real Server Address**.

> This is the address of the backend server.

9. Enter **80** as the **Port**.

> The **Port**, **Forwarding method** and **Weight** values are set by default. These can be changed by an administrator.

10. Click **Add This Real Server**.

11. Repeat steps **8** to **10** to add more Real Servers, as needed.

3.1.3.2 Configure a HTTPS Virtual Service

SSL offloading must also be configured on the Blackboard Learn™ servers. To find out how to configure SSL offloading on the Blackboard Learn™ servers, refer to the following page:

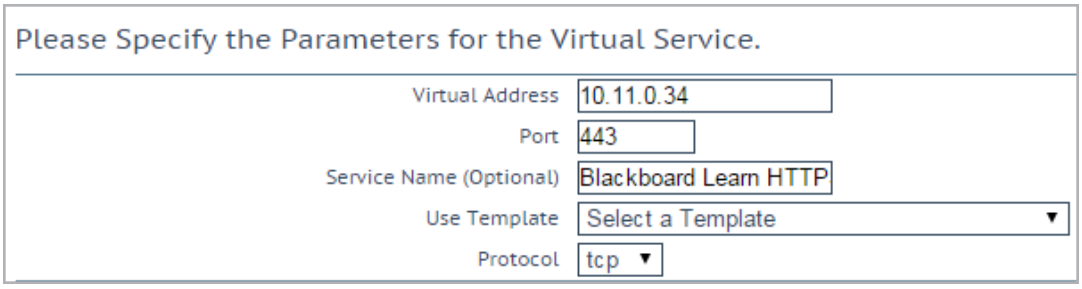
http://library.blackboard.com/ref/df5b20ed-ce8d-4428-a595-a0091b23dda3/Content/_admin_server_ssl/ssl_about.htm

> Kemp only supports SSL offloading on Blackboard Learn version 9.1 SP8 and above.

To configure a HTTPS Virtual Service, follow the steps below in the LoadMaster WUI:

12. In the main menu, select **Virtual Services > Add New**.

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13. Enter a valid **Virtual Address**.
14. Enter **443** as the **Port**.
15. Enter a recognizable **Service Nam**e, for example B**lackboard Learn HTTPS**.
16. Click **Add this Virtual Service**.
17. Enter the details shown in the following table:

Section	Option	Value	Comments
SSL Properties	Enabled	Selected	
Standard Options	Transparency	Disabled	
	Persistence Mode	Active Cookie	
	Timeout	4 Hours	If the default timeout (3 hours) in Blackboard Learn™ is increased, the timeout value in the LoadMaster should be higher.
	Cookie name	KempBBCookie	Click **Set Cookie**.
	Scheduling Method	least connection	
Real Servers	Real Server Check Parameters	HTTP Protocol	
	URL	/webapps/portal/healthCheck	Click **Set URL** then click **New**.

18. Enter the relevant **Real Server Address**.

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This is the address of the backend server.

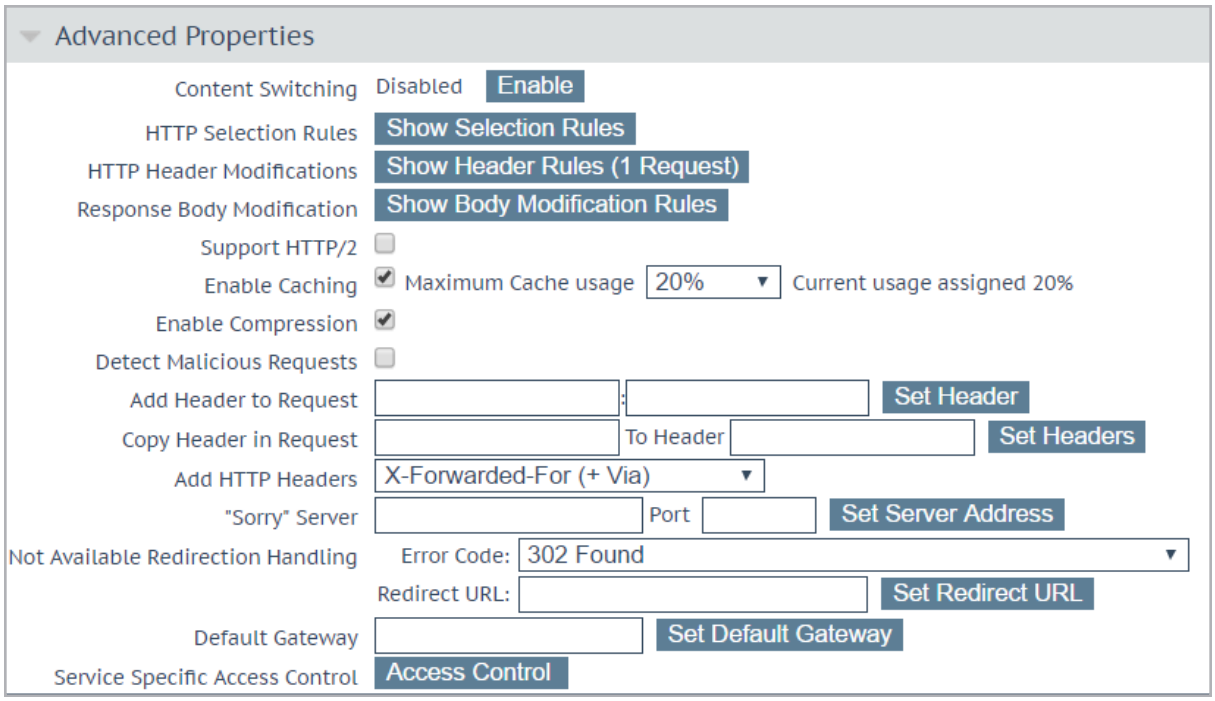
19. Enter **80** as the **Port**.

The **Forwarding method** and **Weight** values are set by default. These can be changed by an administrator.

20. Click **Add This Real Server**.

21. Repeat steps **7** to **9** to add any other Real Servers as needed.

22. Expand the **Advanced Properties** section.



In the **Advanced Properties** section, make the following selections:

23. Select **No VIP Selected** from the **Port Following** drop-down list.

24. Select the **Enable Caching** check box.

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25. Add the content rule added in the **Configure a Content Rule for the HTTPS Virtual Service** section.

    - Click the **Show Header Rules** button.

    - In the **Request Rules** section, expand the **Rule** drop-down list.

    - Select the **X_Forwarded_Proto** rule.

    - Click **Add**.

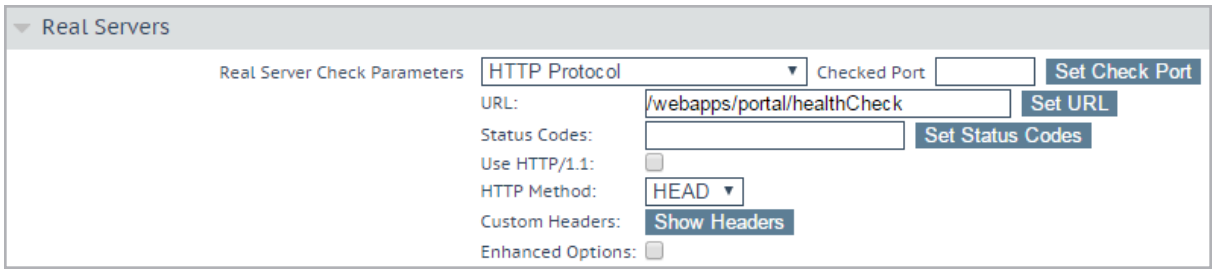
26. Select **20%** as the **Maximum Cache** usage.

27. Select the **Enable Compression** check box.

28. Select **X-Forwarded-For (+Via)** from the **Add HTTP Headers** drop-down list.

29. Click the **Add HTTP Redirector** button.

30. Expand the **Real Servers** section.



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References

For further information, refer to the following links:

Blackboard Learn Performance Optimization Guide
http://library.blackboard.com/d/?6692a745-b472-4360-b004-3c69b58c2b44

Blackboard Load Balancer Guidelines
http://library.blackboard.com/ref/df5b20ed-ce8d-4428-a595-a0091b23dda3/Content/_admin_server_planning/planning_load_balance.htm

Blackboard – About SSL and SSL Choice
http://library.blackboard.com/ref/df5b20ed-ce8d-4428-a595-a0091b23dda3/Content/_admin_server_ssl/ssl_about.htm

Blackboard – Load Balancing – Configuration and Best Practices
https://help.blackboard.com/en-us/Learn/9.1_2014_04/Administrator/070_Server_Management_and_Integrations/Performance_Optimization/Load_Balancing_-_Configuration_and_Best_Practices

Blackboard – Set up the Hardware Load Balancer
http://library.blackboard.com/ref/df5b20ed-ce8d-4428-a595-a0091b23dda3/Content/_admin_server_install/install_load_balancer.htm

Web User Interface (WUI), Configuration Guide
Web User Interface-Configuration Guide

Blackboard Learn, Installation Guide

http://www.google.com/url?sa=t&rct=j&q=blackboard%20learn%209.1%20installation%20guide&source=web&cd=1&ved=0CBoQFjAA&url=http%3A%2F%2Flibrary.blackboard.com%2Fd%2F%3F6968c5f7-7cb7-4251-87a0-d36f2b4c5bf5&ei=gWq8TpSqJcGIgwfgg9SjBw&usg=AFQjCNHnEqRJdrzNJJO8Ss7YVxgaMEwMVw&cad=rja

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