

SAP BusinessObjects EPM RIG How-To Guide



Title:

How to Implement Load Balancing on SAP BusinessObjects Planning and Consolidation, version for SAP NetWeaver

Applies to:

SAP BusinessObjects Planning and Consolidation 7.0, version for SAP NetWeaver, SP07 and higher
SAP BusinessObjects Planning and Consolidation 7.5, version for SAP NetWeaver, SP04 and higher

Summary

The objective of this guide is to show how to implement Load Balancing in BPC NW 7.0 and 7.5, both at the application server level and at the .Net server level. The guide also describes various options for Load Balancing, including their benefits and limitations.

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1 - Business Scenario

Availability and scalability are important aspects of IT systems. A system can be unavailable because it has not been sized to handle a sufficient number of simultaneous requests. Or it can be unavailable because it depends on a unique server, what is usually called a Single Point of Failure.

A Business scenario can, for example, dictate that the SAP BusinessObjects Planning and Consolidation system be capable of handling 250 concurrent users. Since the servers have limits, the solution is not larger servers but more servers.

Of course this should be transparent to the end users, and the solution is a mechanism called Load Balancing.

Load Balancing is one way of mitigating those factors and ensuring a better availability of systems.

The purpose of this guide is to explore Load Balancing solutions applied to SAP BusinessObjects Planning and Consolidation 7.x, Version for the NetWeaver Platform.

2 - Background Information

SAP BusinessObjects Planning and Consolidation, version for SAP NetWeaver (hereafter referred to as BPC NetWeaver or BPC), is a 3-tiered application:

- An Application Server tier (In this case the platform is SAP NetWeaver) often referred to as the ABAP server
- A Web Server tier, also called the .Net server
- A Client tier

The main software components of a typical BPC NetWeaver installation can be broken down into each of the different tiers described above:

- The Application Server consists of SAP NetWeaver 7.0 EHP1, configured with the BPC 7.x add-on.
- The Web server runs BPC .NET components on a Microsoft IIS platform
- The BPC Client is installed on the user's laptop or work machine.

There are two main factors that affect the distribution and scalability of BPC:

- On the Application Server (ABAP server) each request from a BPC client uses a single worker process on the ABAP server. However, an instance of NetWeaver is limited to 100 dialog processes and 100 background processes. Different BPC actions use different process types.
- On the Web Server (.NET server) the BPC components run in a 32-bit architecture, and as such cannot address more than 4 Gb of RAM, limiting the number of concurrent users.
 - o Note: That limitation is not a hard number but a maximum of 150 users is advisable.

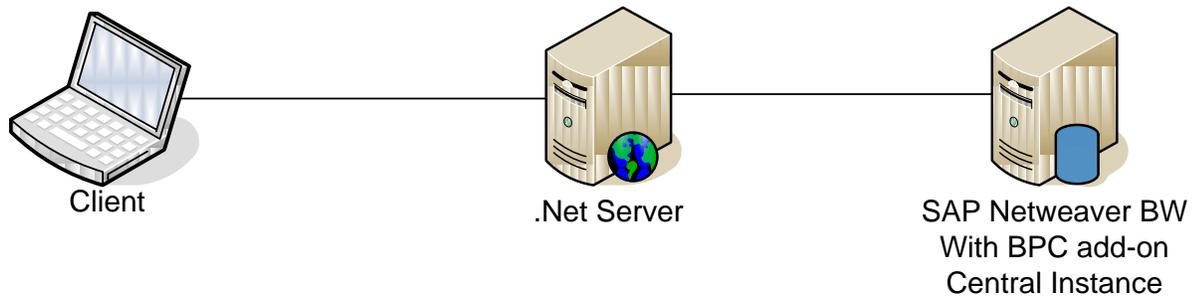
Load balancing can be achieved in several manners. Two approaches stand out: Network Load Balancing at the Web Server tier (.NET server), and Load Balancing at the Application Server Tier (ABAP server).

A Network Load Balancer (NLB), as the name indicates, distributes requests at the network level, between several servers. There are many possible algorithms, from a simple round-robin to very sophisticated systems that will take into account several metrics in order to distribute the load more effectively. Some of them can provide some level of High Availability. Network Load Balancing can be handled by software or by a hardware device. Some editions of Microsoft Windows Server includes a load balancing feature that can be used for the .Net servers, but because of the overhead involved, a hardware device is highly preferable.

For Load Balancing at the Application Layer, SAP NetWeaver includes a feature called logon groups, in which several instances of NetWeaver can be grouped together to offer a single connection point (on the Central Instance). This approach is very powerful for designing large scale enterprise landscapes. Using logon groups allows you to direct the user traffic of a particular application (such as BPC NW) to its own dedicated instance. For additional information about the capabilities of Logon Groups and Load Balancing within SAP NetWeaver, please refer to Section 3, Additional Documentation.

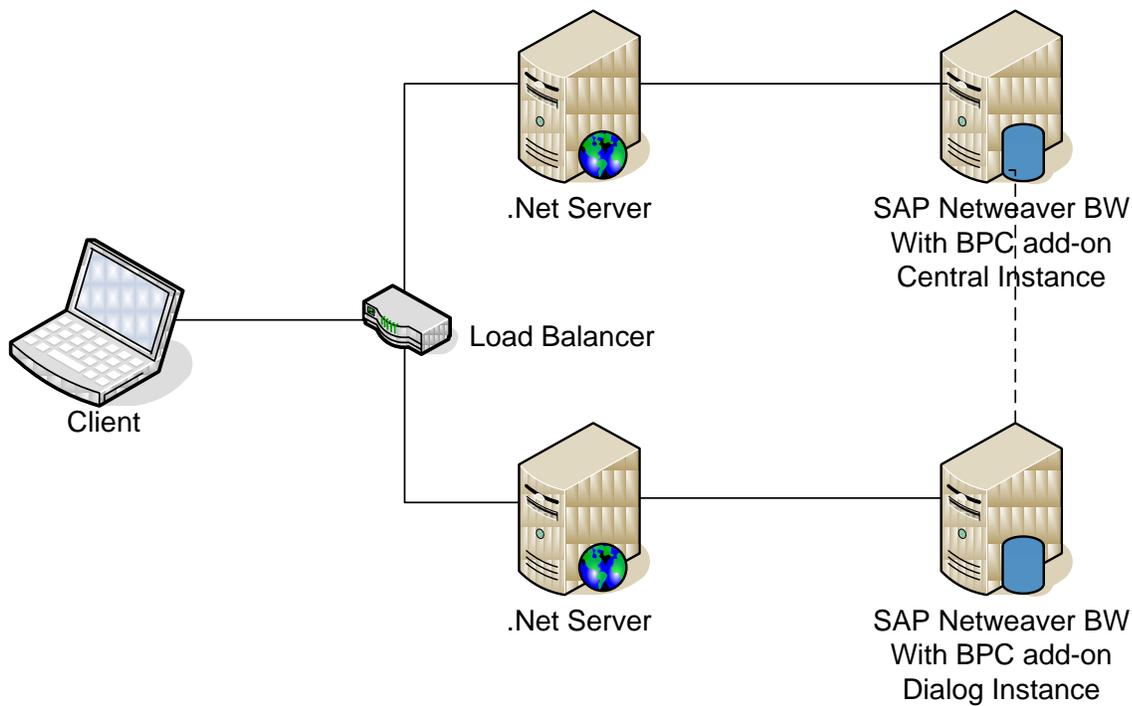
Given the architecture of Planning and Consolidation for SAP NetWeaver, there are several topologies that can be considered, depending on the needs:

First, a basic Planning and Consolidation for SAP NetWeaver environment:



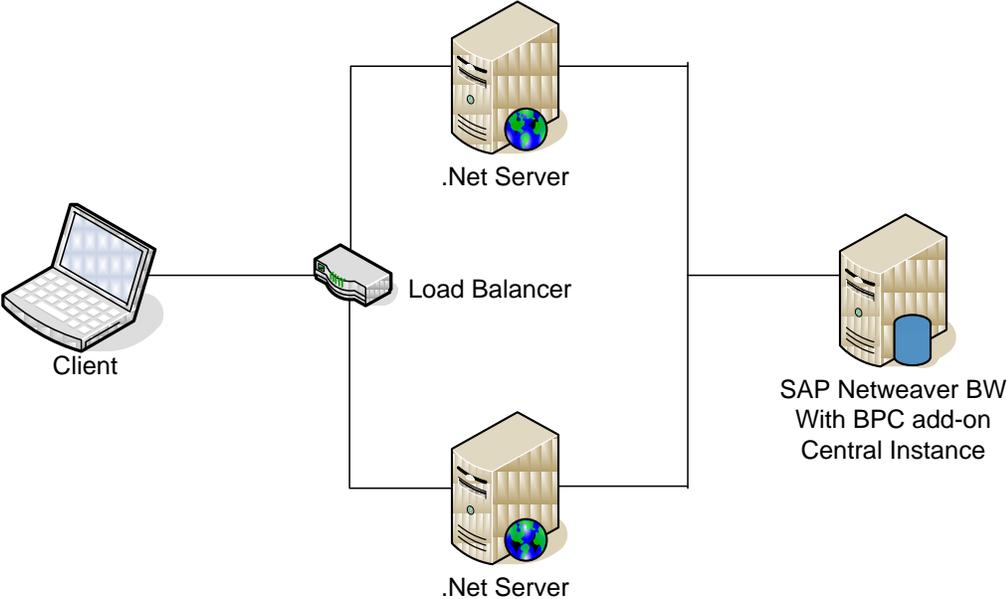
This environment is not scalable over 100 concurrent users, and does not provide High Availability

One way of scaling out is to add pairs of .Net server and NetWeaver server, with a network load balancer between the clients and the .Net servers

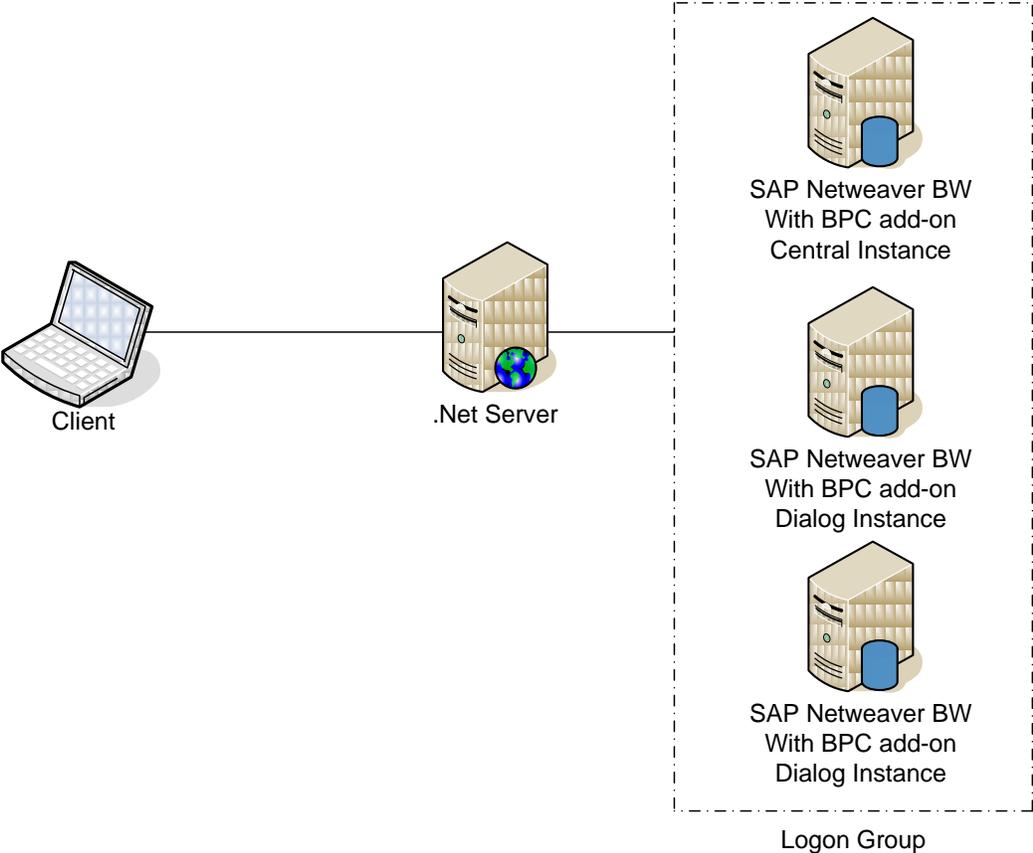


This setup can provide some level of redundancy depending on the algorithm used in the load balancer. The main downside is the lack of flexibility due to the 1:1 mapping between the .Net servers and the NetWeaver servers

If redundancy at the .Net level is the main goal, the following topology can be used:

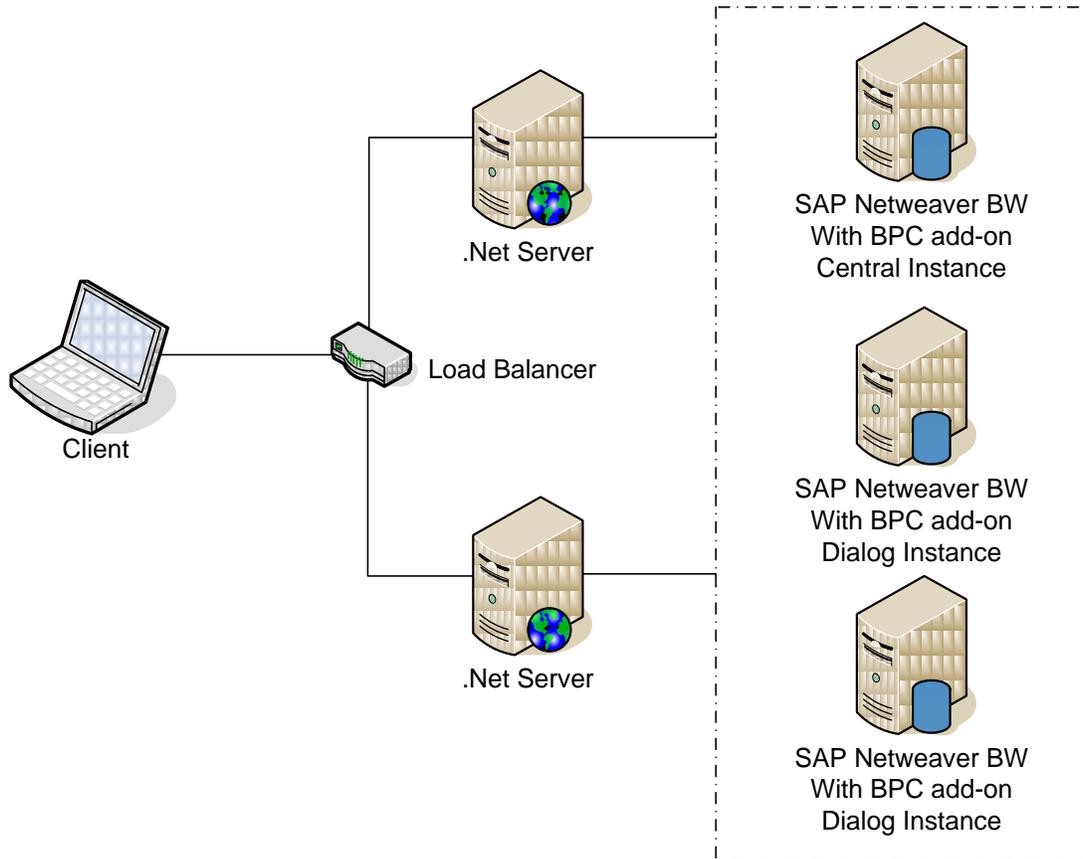


However the lack of scalability (100 concurrent users maximum) limits the appeal of this choice of topology. If High Availability is not the goal, but scalability to little more than 100 concurrent users is needed, this layout is a possibility:



The limiting factor here is the .Net server architecture. The 32-bit architecture limits the amount of addressable RAM, and as a result the number of connections that the server can handle.

Now if we combine logon groups and Load Balancing of the .Net server, we get the best of both worlds:



The logon groups can include as many BW servers as necessary to accommodate the desired user concurrency, and the Load Balancer can address as many .Net servers as needed, also for scalability. The Load Balancer may be able to provide high availability depending on its configuration and capability.

NOTE: As with all NetWeaver installations, SAP Supports several types of High Availability solutions. The purpose of this guide is not to discuss high availability but load balancing for BPC NetWeaver. For more information on High Availability for SAP NetWeaver, please refer to Section 3, Additional Information.

Section 4 describes the step by step procedure to setup Load Balancing and Logon Groups for BPC NetWeaver.

3 - Prerequisites

- SAP Business Objects Planning and Consolidations 7.0 SP03 or higher (including 7.5), version for SAP NetWeaver
- For most scenarios, the .Net tier should be on a separate physical server.
- For certain scenarios, a hardware Load Balancer is recommended
- The reader should be familiar with Microsoft IIS and with SAP NetWeaver Basis, as well as with a standard Planning and Consolidation for SAP NetWeaver installation
- All servers performing similar functions should run identical versions and service pack levels of SAP software.
- All .Net servers should be using the same port for HTTP or HTTPS traffic, should be in the same domain, and should be using identical authentication mechanism.

Additional Documentation:

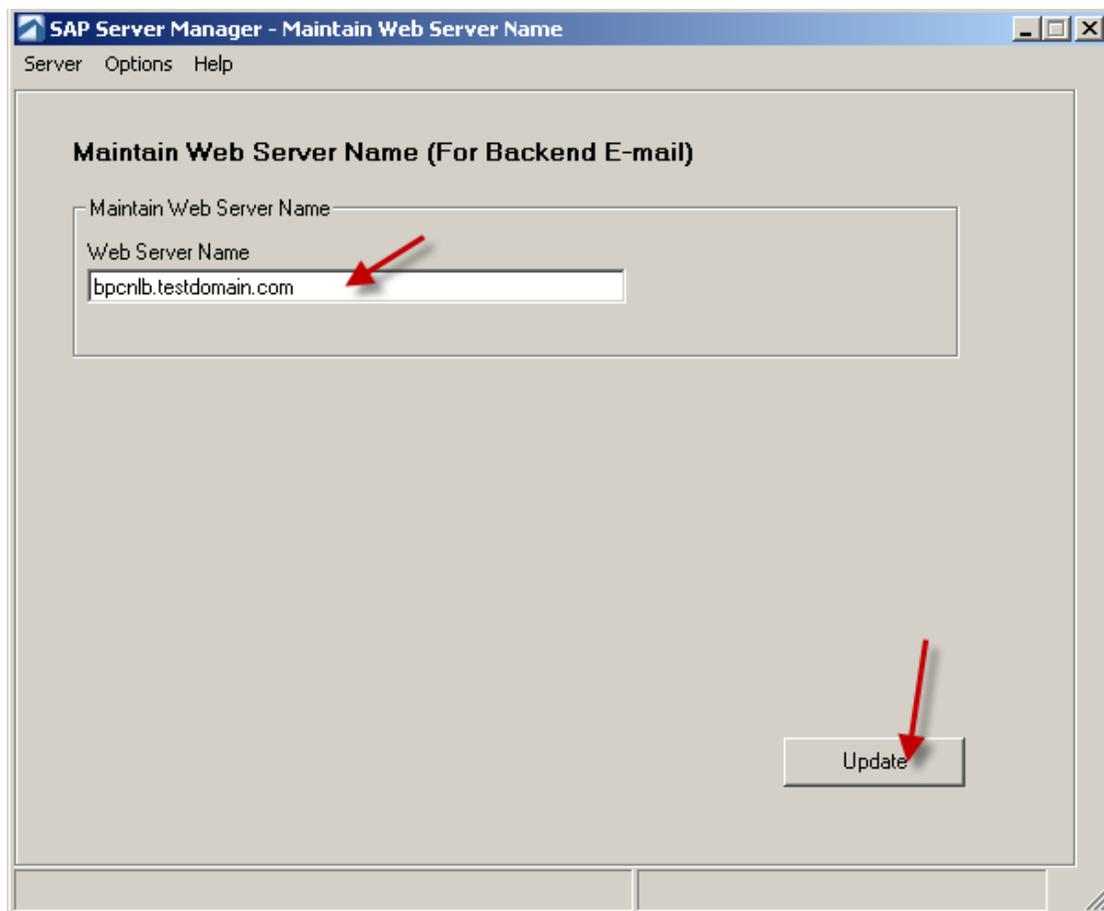
- RKT Online Knowledge Product
 - <http://service.sap.com/rkt> On the left hand side, navigate to SAP Ramp-Up Knowledge Transfer -> SAP BusinessObjects EPM Solutions -> SAP BO PC 7.5, version for SAP NetWeaver
 - Other EPM How-To Guides
 - <http://wiki.sdn.sap.com/wiki/display/BPX/Enterprise+Performance+Management+%28EPM%29+How-to+Guides>
 - SAP Help Library – Configuring Logon Groups
 - http://help.sap.com/saphelp_nw70ehp1/helpdata/en/a9/775a421b5ec153e10000000a1550b0/frameaset.htm
 - SAP Help – Recommendations for Logon Load Balancing and Logon Groups
 - http://help.sap.com/saphelp_nw70ehp1/helpdata/en/c4/3a64c1505211d189550000e829fbbd/frameaset.htm
- SAP Help Library – BPC NetWeaver
- http://help.sap.com/saphelp_bpc75_nw/helpdata/en/bpc_nw_index.htm
- SAP SDN – High Availability
 - <https://www.sdn.sap.com/irj/sdn/ha>

4 - Step-by-Step Procedure

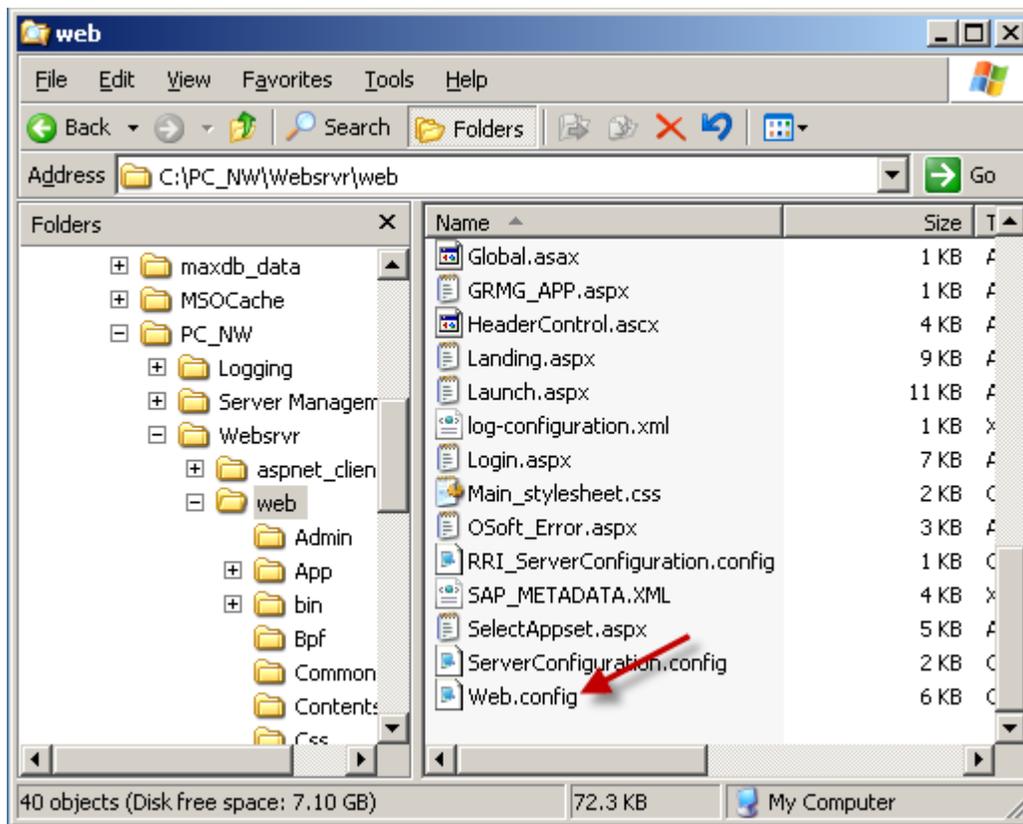
First we will look at the Load Balancing of the .Net servers, and then at the setup of Logon Groups in SAP NetWeaver

Network Load Balancing of the .Net servers

1. As explained earlier we strongly recommend a hardware solution rather than using the Microsoft Network Load Balancing feature of Windows Server, for performance reasons.
2. Each server node should initially be setup with the .Net component of Planning and Consolidation server as if it were not load balanced
3. Decide on a virtual host name for accessing Planning and Consolidation through the load balancer. In this guide we will use "bpcnlb.testdomain.com" for illustration purpose.
4. That host name should be added to DNS, resolving to the virtual IP address of the NLB device.
5. The actual setup of the load balancer is specific to each manufacturer. We will not go into those details, nor do we endorse any specific vendor. Appendix A lists a few algorithms that are typically used by NLB devices. There is no one-size-fits-all, and the choice will depend on your specific needs and the topology of your network
6. Once the Load Balancer is setup, if you are using Planning and Consolidation version 7.5, on each server node, open Planning and Consolidation Server Manager. Click on Server, maintain Web Server Name. In this field, enter the host name chosen on step 3. This will ensure that email notifications sent by the server have URLs that point to the virtual host name rather than to a specific node.



- On each Web Server node, in Explorer, navigate to X:\PC_NW\websrvr\web or X:\BPC\Websrvr\web and select web.config.



- Edit Web.config with Notepad, scroll to the end and look for the "AppServer_URL" entry:

```

ine appSettings keys should use a naming convention so their purpose is clear
syntax : whoItBelongsTo_whatItMeans
They should be kept in logical groups within web.config
-->
<!-- base locations of servers -->
<add key="AppServer_URL" value="http://demo7a.testdomain.com:1080/osoft/app" />
<add key="AppServer_AUTH" value="1" />
</appSettings>
</configuration>

```

- Change the URL to point to the virtual host name:

```

-->
<!-- base locations of servers -->
<add key="AppServer_URL" value="http://bpcn1b.testdomain.com:1080/osoft/app" />
<add key="AppServer_AUTH" value="1" />
</appSettings>
</configuration>

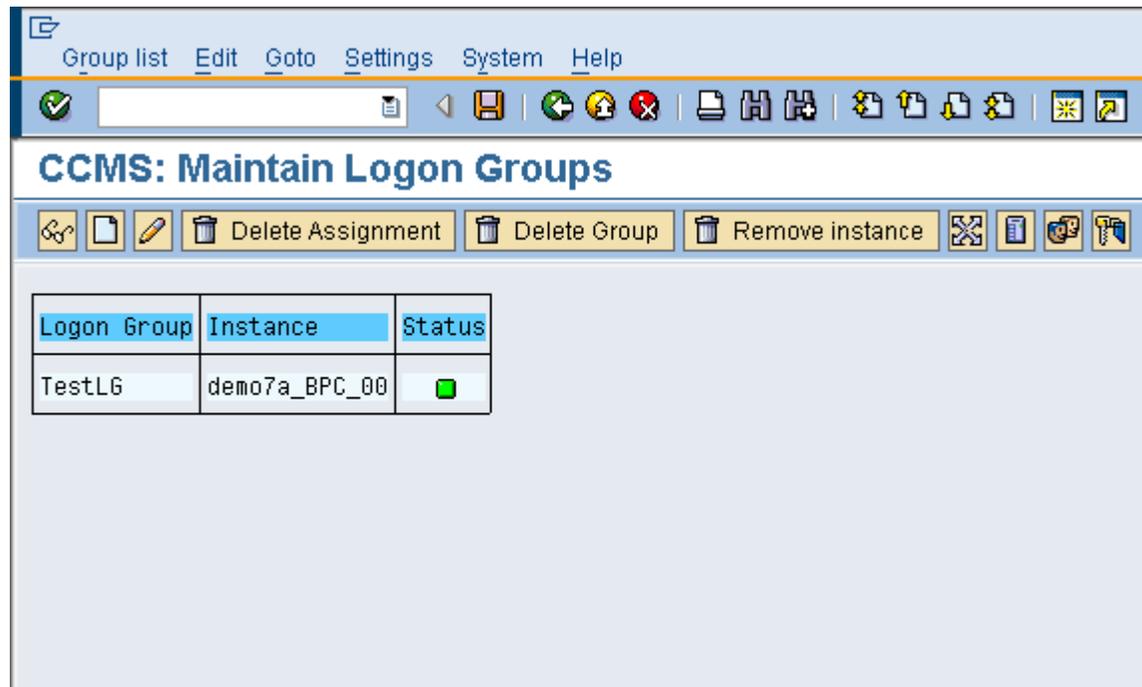
```

- Save the file
- Restart the Web Server
- This setup is valid for end users connecting with the Planning and Consolidation for Office Client but might not work properly with the Planning and Consolidation Administration Client. The reason is that the Administration client uses asynchronous communication to the server, sending a request and then

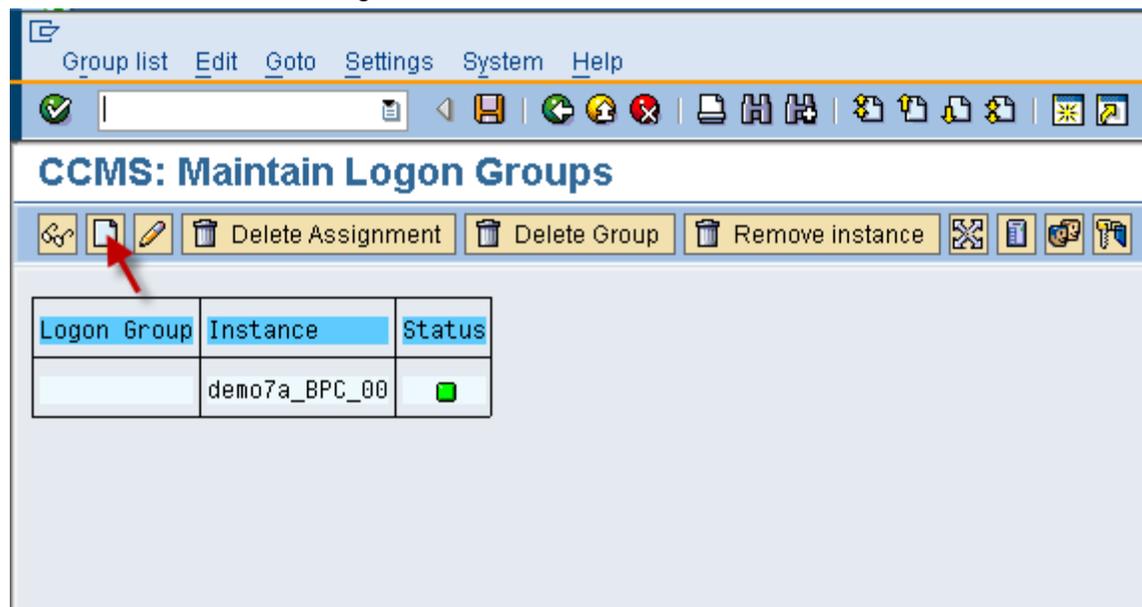
periodically checking for status. If the status check goes to a server other than the one that got the initial request, the client may hang. Please see Appendix B for further explanation and various strategies adapted to specific needs.

Logon Groups

1. Login to the SAP NetWeaver ABAP server with the SAP GUI, and call Transaction Code SMLG. You will get this screen:



2. Click on the "Create New Assignment" icon:



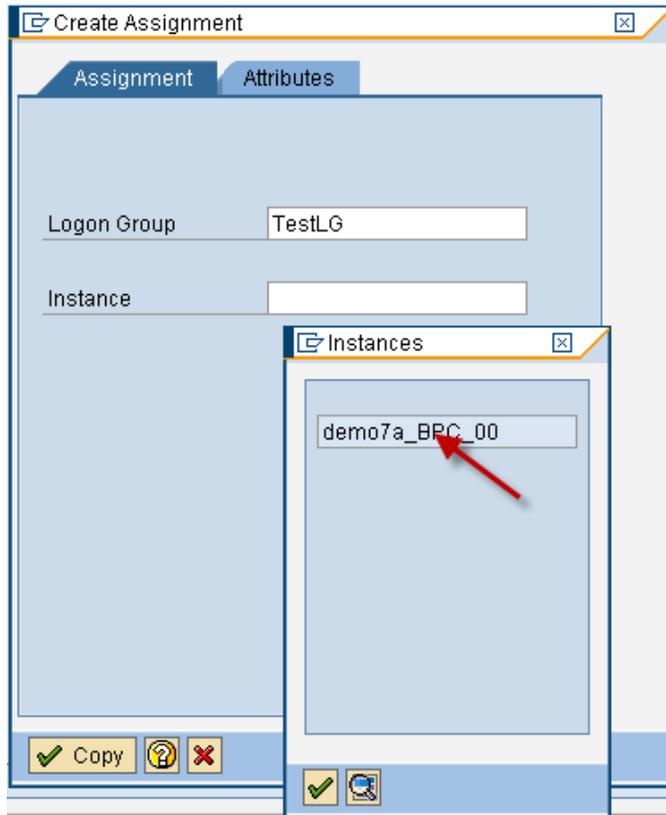
3. Enter a name for the new Logon Group

The screenshot shows a dialog box titled "Create Assignment" with two tabs: "Assignment" and "Attributes". The "Assignment" tab is active. It contains two input fields: "Logon Group" and "Instance". The "Logon Group" field is highlighted in yellow and has a selection button (a square with a plus sign) at its right end. The "Instance" field is empty. At the bottom of the dialog, there are three buttons: a green checkmark labeled "Copy", a yellow question mark, and a red "X".

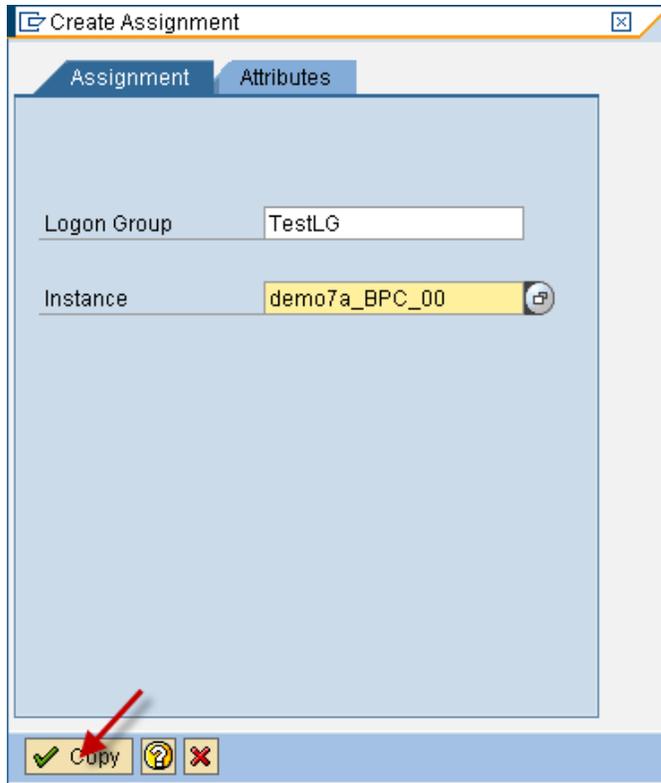
4. Go to the Instance field and click on the selection button at the end of the field

The screenshot shows the same "Create Assignment" dialog box. The "Logon Group" field now contains the text "TestLG". The "Instance" field is highlighted in yellow and has a selection button at its right end. A red arrow points to this selection button. The "Copy" button and other controls at the bottom remain the same.

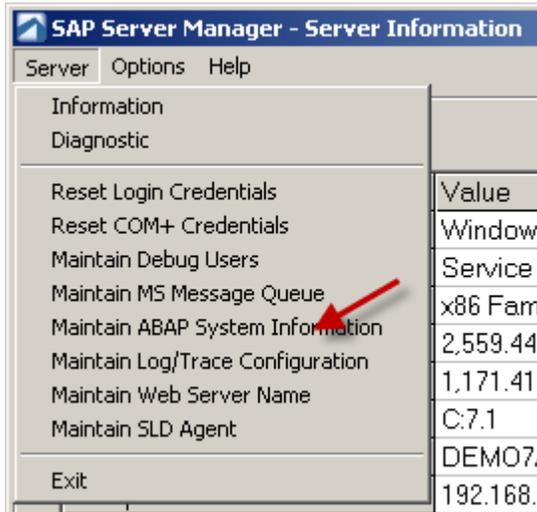
5. Select an existing instance of NetWeaver by double-clicking on it



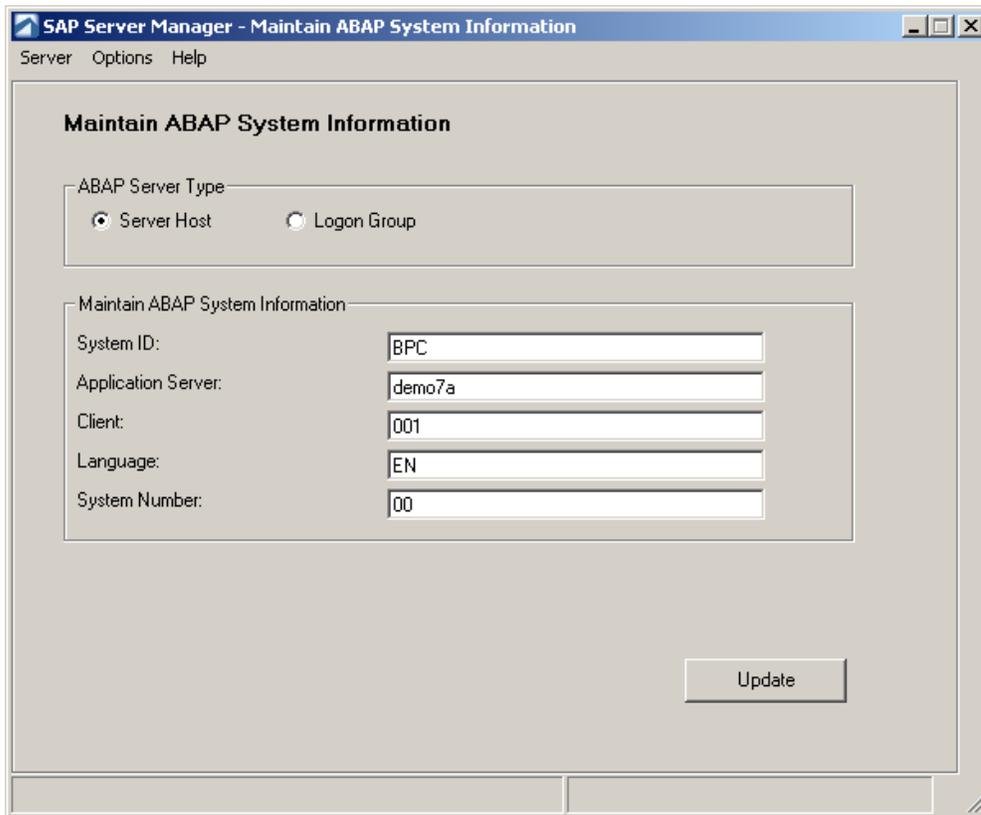
6. Click on the Copy button



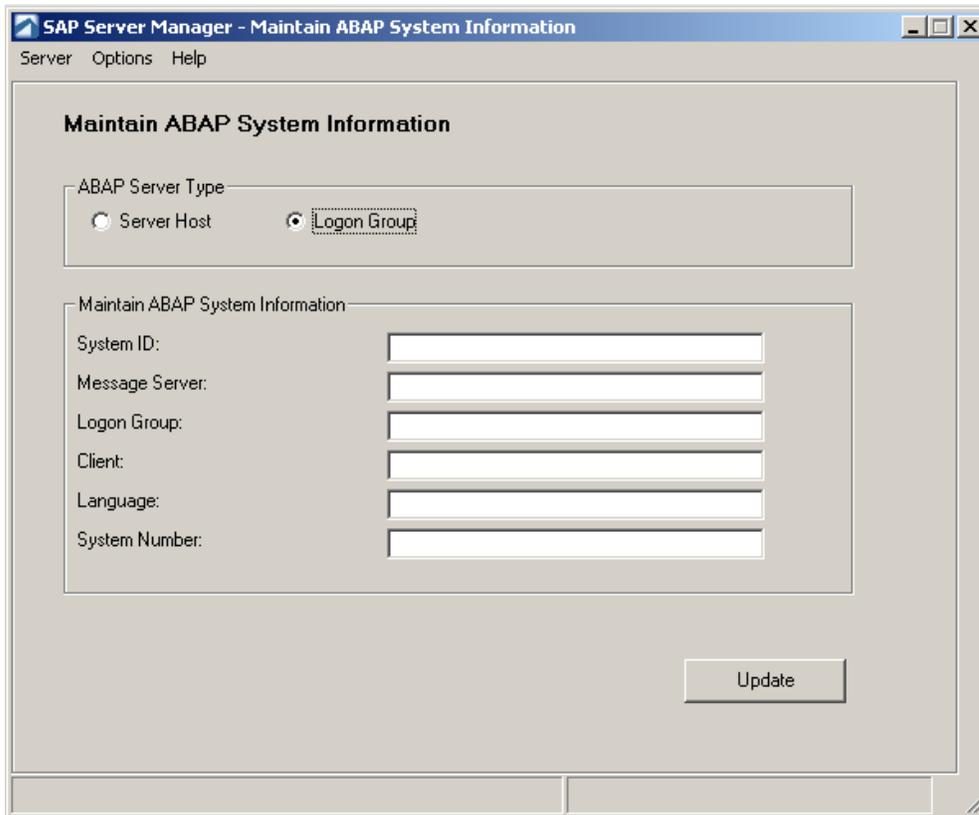
7. Repeat for step 2-6 for every instances that you wish to add to the group, but this time selecting the existing logon group rather than creating a new one
8. When you are done adding all the instances, click on the save icon
9. You may now exit the SAP GUI client
10. The .Net Web Server(s) needs to be updated with the new connectivity information to the ABAP servers
11. On the .Net server(s), login as the sysadmin account (usually the account that was used to install the Planning and Consolidation component) and open Planning and Consolidation Server 7.5 or BPC Server 7.0 (Server Manager). Select Server – Maintain ABAP System Information



12. The following screen appears:



- Click on Logon Group. The following screen appears:



The screenshot shows a window titled "SAP Server Manager - Maintain ABAP System Information". The window has a menu bar with "Server", "Options", and "Help". The main area is titled "Maintain ABAP System Information". Under "ABAP Server Type", there are two radio buttons: "Server Host" (unselected) and "Logon Group" (selected). Below this is a section titled "Maintain ABAP System Information" with several input fields: "System ID:", "Message Server:", "Logon Group:", "Client:", "Language:", and "System Number:". An "Update" button is located at the bottom right of the main area.

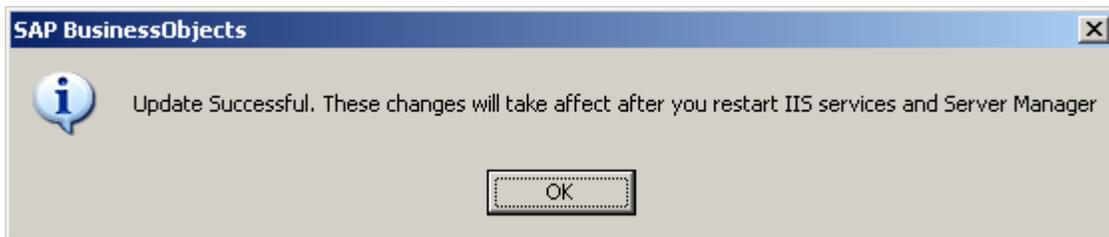
System ID: Same SID that was used prior to the switch to Logon Group

Message Server: Name of the server that hosts the Central Instance

Logon Group: As defined in step 3 above

Client, Language and System Number: same as prior to the switch to Logon Group

- Click on Update
- A dialog box appears, confirming the update



- Restart the .Net Web Server

Appendix

Appendix A – NLB Algorithms

When a Network Load Balancer receives a request from a client machine, it forwards it to one of the nodes in the pool of Load Balanced servers. But first, it needs to make a decision: Which node?

Manufacturers of Network Load Balancing appliances have a variety of algorithms that can be used to make that decision. Some are basic and simple, others are a lot more sophisticated. Note that most of those algorithms are not advisable for Planning and Consolidation unless dispositions are taken to address the issue with asynchronous requests (see Appendix B)

Here is a non-exhaustive list of common algorithms:

Random: The Load Balancer randomly assigns traffic to the nodes. Simple to implement but can lead to uneven distribution and overload of some nodes.

Round Robin: Also called “Next in Loop”. Simple, less likely than Random to lead to overload. However does not take into account actual traffic or server capacity

Weighted Round Robin: Same as Round Robin but with adjustments in order to send a higher percentage of connections to some servers than others, for example to take into account disparity of hardware performance.

Source IP: Distribution is calculated based on the IP address of the client. This must be handled with care as many clients could be hiding behind a NAT address, all appearing as the same IP address. As long as the servers are running, a given client will always connect to the same node. This is the only algorithm that is currently recommended as it addresses the issue with asynchronous requests.

Least Connections: The Load Balancer monitors the number of open connections on each server and sends the new request to the server with the least open connections

Weighted Least Connections: same as above with variances to allow intentionally uneven distribution

Appendix B – Asynchronous Communications

The Planning and Consolidation Administration client differs from the Planning and Consolidation for Office client in that its communication with the .Net server is status-based rather than connection-based. It sends a request and then checks periodically for a status update

As long as there is only one Web Server, the client sends a request, the web server relays the request to the ABAP server, which sends the update back to the webserver and when the client checks on update, it eventually gets a response, and all is well.

With multiple web servers, however, things get a bit more complex. Let’s consider a system with two web servers, which we will call Node A and Node B. The Administration Client sends a request to the load balancer, which decides to route it to Node A. The web server on Node A relays the request to the ABAP server, and the ABAP server sends the response to the web server that sent the request, Node A. Now the client checks for an update. It connects to the Load balancer, but this time the Load Balancer routes the request for update to Node B. The problem is, the web Server on Node B is not aware of the initial request and the client cannot get a status update. This can lead to errors or to hanging of the client.

There are two ways of resolving this: either make sure that the client always communicate with the same node, or make sure that all the web servers are aware of the request and are able to provide a status update even if they did not receive the initial request.

1 – Ensuring that the status is communicated to all the nodes

In Planning and Consolidation 7.x for SAP NetWeaver, the web server keeps track of Administration task status by using the Microsoft Message queue. Typically the server that hosts the Web Server component of Planning and Consolidation also hosts a Message Queue. In a load-balanced environment, we can either have one Message Queue on each node, or we can have a shared queue that all web servers connect to. Sharing the queue instantly resolves the administration client issue but introduces a single point of failure, and eliminates the potential High Availability benefit that Network Load Balancing can provide. Placing the

message queue on a high-availability cluster would mitigate this drawback but significantly complicates the environment.

2- Ensuring that a client always gets routed to the same node.

There are several ways of achieving this.

In a large environment with many web servers, it might make sense to keep one web server out of the load-balanced server-farm, and dedicate that web server to administration tasks.

Another way involves a smart load balancing algorithm that somehow always route a given client to the same node. The Source IP algorithm described in Appendix A is a possible choice. The main limitation of this method is when many clients are located behind a NAT (Network Address Translation) device, making many client request appear as coming from a single IP address (that of the NAT device), skewing the distribution of the load since all those requests would always end up on the same node.

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