What's New in Lync Server 2010 – A Dell Perspective

A Dell Technical White Paper

Dell

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November 2010

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Introduction

The next generation of communications for enterprises large and small is here. Lync Server 2010 and Lync 2010 (previously called Office Communications Server and Office Communicator) provide sweeping changes to enterprise communications and build on the core Office Communications Server functionalities such as A/V conferencing, instant messaging, web conferencing and VoIP. With the use of virtualization and role collocation, customers can combine multiple functionalities into fewer machines. For example, the Lync Front-End, Lync Audio/Video, and Lync Mediation roles can be collocated on one virtual machine. The host could be a rack mounted 2 socket Dell PowerEdge R710 with Intel Xeon 5680 (six core) based processors and up to 192 GB of memory. The added virtualization support in Lync 2010, compared to OCS R2, could result in lower power and cooling costs as well as capital expenditure reduction. Dell 11G servers, including rack-mounted, modular and tower configurations that provide significant processor, memory and power efficiency improvements over the previous generation, are ideally suited for Lync Server deployment.

Among the other enhancements in Lync Server are the topology builder for planning deployment of your Lync infrastructure, the central management store within the backend database, DNS load-balancing features for servers in a Front-End pool, and management tools that include a Powershell interface and a web-based console called Control Panel. A number of architectural changes have also been made which include the introduction of enhanced resiliency with multiple site deployments, branch office appliance options for small branches which cannot afford to have Lync server infrastructure, bandwidth management functionality due to network clogging, and mediation server bypass capability among other enhancements. Dell PowerConnect switches can meet your LAN and WAN needs of your Unified Communications infrastructure when implemented with the bandwidth management functionality and fully complement the PowerEdge server portfolio.

Dell has been actively collaborating with Microsoft on on the testing and deployment of Lync. The End to End Solutions team and internal IT groups have been involved with the TAP program for Microsoft Lync since its inception and have lab and production deployments of Lync, continually experimenting with its new and exciting features. Sizing guidance for Unified Communications can be found in the Advisor Tool at dell.com/unified (OCS R2 only supported at present) and the Microsoft Lync Server Planning Tool.

Central Management Store

The central management store resides in the Back-End Database storage and holds the configuration information about the topology for the entire Lync Server deployment. This is an architectural improvement over Office Communications Server 2007 and Office Communications Server 2007 R2, since configuration information is no longer stored both on Active Directory and the Back-End. The central management store's configuration information is then replicated in a consistent manner to the Lync servers in the setup. The following information is still stored in Active Directory Domain Services (AD DS):

- User SIP URI and other user settings. The SIP URI is the unique identifier with which each user signs into the Lync client. It is prefixed by the letters sip: and followed usually by the user's email address.
- Contact Objects for the Response Group and Conferencing Attendant applications. Response Groups allow multiple CS14 users to be associated with a single sip uri so that all the users can

> be contacted when a call is being made. This is useful in helpdesk scenarios. The Conferencing Attendant is a phone number that users can dial in to for on-premise conferencing.

- A service connection point (SCP) for the Central Management Store to connect with the Active Directory. The SCP allows the client, the Back-End SQL Server to publish information into the Active Directory schema.

As can be deduced, deployment is considerably easier with the Central Management Store in place. The server that hosts the central management also keeps a record of all the servers within the Lync deployment and their functions. The settings for the deployment are stored in XML documents and a schema that outlines the data that can be contained in it. For example, the "Topology document" contains all the servers within a particular Lync deployment and can be viewed using the Topology Builder.

Dell provides a number of options for the Back-End storage, including the PowerVault series of Direct-Attach and Equallogic series of iSCSI storage. For large deployments, it would be preferable to use SAS disks over SATA disks to adequately serve the IOPS generated during peak hours of user login. Dell Equallogic PS 6000 series SAN enclosures are ideally suited to handle High IO traffic with fault tolerance at every level. Other features available include management tools, monitoring capabilities using SAN Headquarters, and custom storage virtualization technology.

Sample Topology

Consider the topology requirements below:

Table 1.   User Input for Sample Topology

| Number of Users	2 x 12500 per Central Site
	2 x 500 per Branch Site
A/V Conferencing	Yes
Dial In Conferencing	Yes
Web Conferencing	Yes
Enterprise Voice	Yes
Exchange Unified Messaging	Not included
Monitoring	Yes
Archiving	Yes
Federation	No
High Availability	Yes
Network	Shared WAN
Percentage of Users on Enterprise Voice	100%
Calls to the PSTN per user per hour	2
Type of Telephony Infrastructure	SIP Trunking
Percentage of Users on Unified Messaging	100%
Number of times voicemail is checked per user per day	4
WAN usage	108.6 kbps for audio session 250 kbps for video session
Edge Servers	Yes

The following table shows the server/storage portfolio that would meet these requirements.

Table 2.   **Server and Storage Requirements for Sample Topology.**

Server Configuration	Details
Microsoft Lync 2010 Server	Enterprise Edition
ESX/Hyper-V (Host) Server	3 x PowerEdge R710 Rack with 2 x Six Core and 48GB
Front-end Server Virtual Machine	3 x VM (1 on each Host Server) 4 vCPUs/24 GB virtual memory
AUDIO/VIDEO Conferencing Server Virtual Machine	3 x VM (1 on each Host Server) 4 vCPUs/16 GB virtual memory
Lync Server Director Virtual machine	2 x VMs with 2 vCPU's and 8GB
Archiving /Monitoring Server	2 x PowerEdge R710 Rack with 2 x Quad Core and 12 GB
Back-end Server	2 x PowerEdge R710 Rack with 2 x Quad Core and 24 GB
Survivable Branch Appliance	2 (1 per branch site)
Storage Configuration	Details
Hardware	2x Dell EqualLogic PS6000XV
Number of Drives	48
Disk Type	600 GB 15k SAS
RAID Type	RAID 10

Note that the sizing guidance for the Edge Server Role is approximate. The figure includes a suggested configuration of these servers as well. The following figure shows the topology as it would be setup in an enterprise:

Figure 1. Layout of 26000 users, 12500 users per Central Site and 500 users per Branch Office.
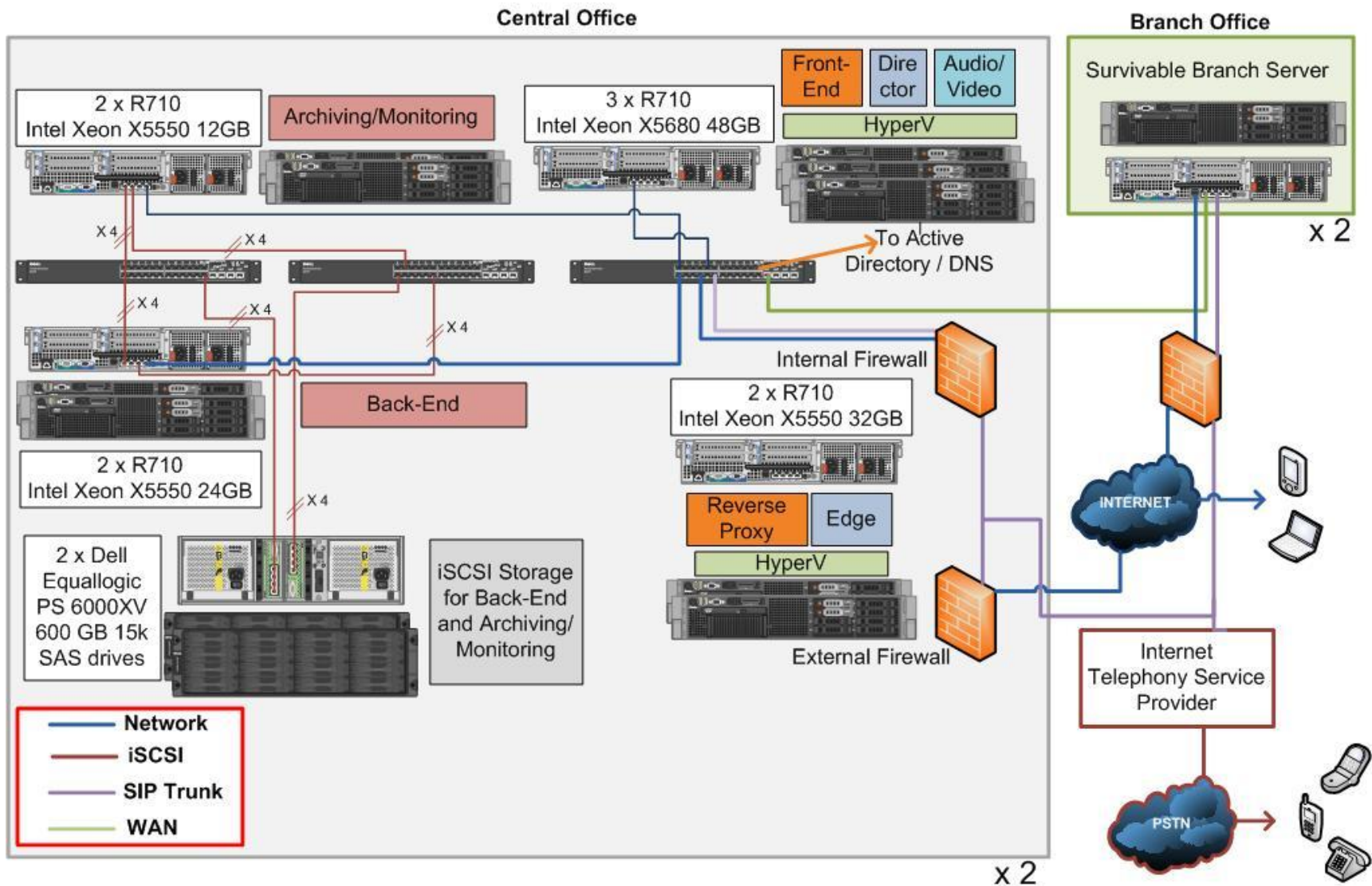
The primary site has a number of components in this topology including the A/V Conferencing Server, Front-End, Archiving/Monitoring and Back-End server and storage. The secondary site has a Standard Edition Server that supports a small number of users. Shown here are only the external clients and the internal clients are omitted for simplicity. These would be present within the internal firewall on the primary site and secondary site. Two Dell Equallogic PS series storage units are used for the Back-End Database which contains the central management store and Archiving/Monitoring Server database. The Front-End, Director and Audio/Video Conferencing roles are virtualized. The Back-End and Archiving/Monitoring server roles are deployed on physical machines.

Topology Builder

The Topology Builder is first deployed in the Local Area Network and then the required configuration is built on the tool. Following this, the configuration should be published on to the central management store and the roles are then deployed on the servers. Here is a screenshot of the topology builder for a particular configuration deployed in the Enterprise Solutions Engineering Lab.

**Figure 2.**　　　 Topology Builder Screenshot.
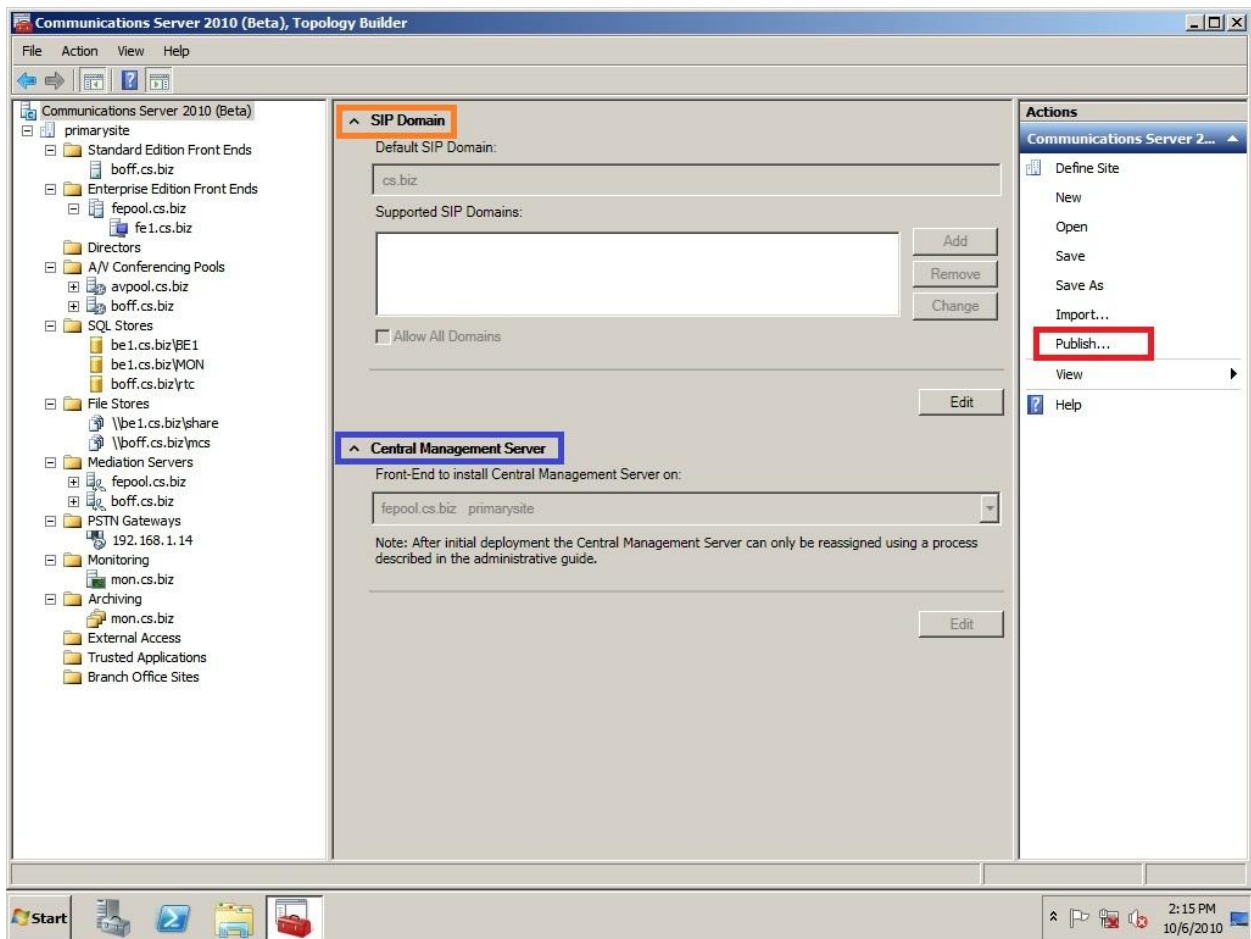
The left side of the picture shows the deployment that is being considered, including the single site called "primarysite." Primarysite consists of an Enterprise Edition Front-End server and a standard-

edition server for a back-office. The Archiving/Monitoring and PSTN gateways are also specified. Each of the listed items can be selected and their configurations modified through the Builder. After the changes are made, the configurations are published to the Central Management Store.

Planning Tool

The planning tool allows Enterprise Administrators to input their requirements for Lync and the produces the topology that would be required along with the specifications per server. The topologies can be viewed globally and per site as shown below. Topologies can also be exported into an xml file and then used within the Topology Builder. The planning tools gives you the option to deploy multiple sites, branch offices, and options to deploy audio/video conferencing, dial-in conferencing, web conferencing, enterprise voice, unified messaging, call admission control, high availability, shared WAN infrastructure and media bypass. Shown below is the topology for the 25000 user configuration.

Figure 3.   Global View of the 26000 user configuration with 2 branch offices.
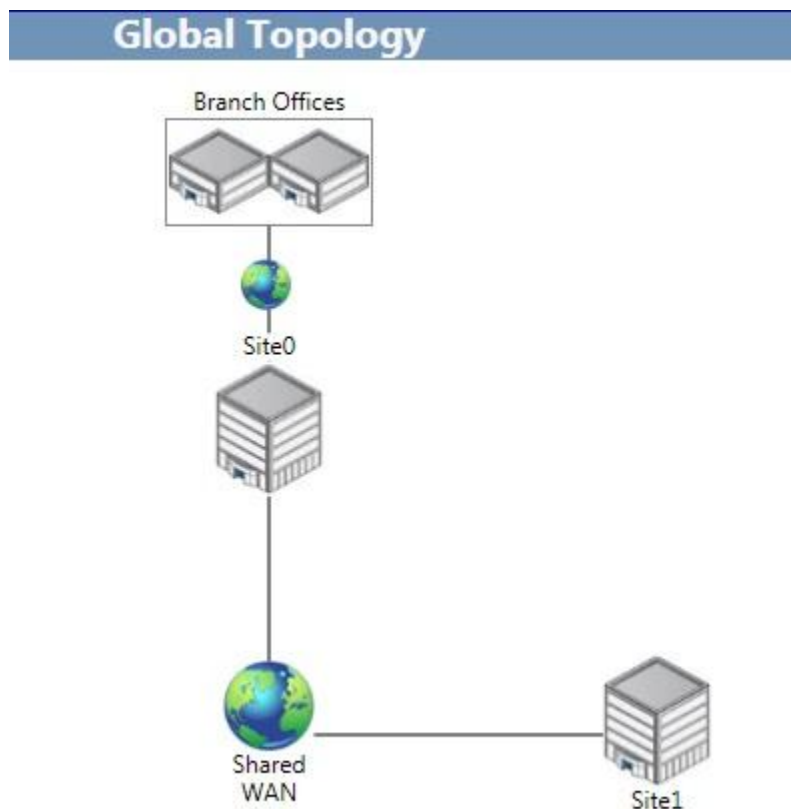
New A/V Conferencing Server Role

In previous versions, the A/V Conferencing Server was deployed as role within the front-end server (except in the rarely used expanded configuration for OCS pools). In Lync, there are 3 options to deploy the A/V conferencing server:

- Collocated with the Front-End Server or Front-End Server Pool. This was the traditional deployment in the two previous OCS editions.
- Deployed separately as a single server. It is possible to have a scaled-up server to be made available to a Standard Edition Lync Front-End or Enterprise Edition Lync Front-End pool.
- Deployed separately as an A/V Conferencing Server Pool. This would be the case for larger deployments that require more than one A/V conferencing server. This was the case in figure 1.

Data Conferencing and Web Conferencing functionality is collocated with the Front-End server always in Lync.

Enterprise Voice Functionality

There are a number of new features of Enterprise Voice, including:

Call Admission Control

Consider the WAN links between sites. It is possible that these links get congested under heavy instant messaging, audio-video conferencing, telephony and application sharing traffic. In the case of audio-video, the conventional mechanisms of queuing do not solve this problem. This is because real-time traffic is delay sensitive. Under congestion, therefore, Lync Server does not allow new audio, video and conferencing calls to be admitted into the network as QoS cannot be guaranteed. This does not mean, however, that the call will not go through. Lync Server will attempt to re-route the call through the Internet and then the PSTN. If both these mechanisms fail, Lync will direct the caller to voice mail.

As can be deduced, the type of codec used to communicate real-time traffic does make a difference in congestion avoidance. Codecs such as G.711 and G.722 are more bandwidth intensive than RTAudio and Siren.

Table 3.   Codec Bandwidth Requirements.

Codec	Typical bandwidth usage per Microsoft
RTAudio (8khz)	25.9 kbps
RTAudio (16khz)	34.8 kbps
Siren	22 kbps
G.711	59.8 kbps
G.722	42.8 kbps

It should be noted that each one-to-one voice or video call consists of two sessions, one for each direction of communication. For example, a G.711 audio session will use 119.6 kbps of bandwidth.

Media Bypass

Media Bypass refers to removing the Mediation Server from the audio stream thereby reducing latency, packet loss, and points of failure. The feature can also reduce the number of mediation servers that may be required in larger enterprise deployments.

Media Bypass is made possible by assigning bypass ID's to each subnet in the Enterprise Domain. When a user makes a call, the bypass ids of the client subnet and the gateway subnet are compared. If they are the same, the mediation server is skipped for real-time packet communication.

Multiple Gateway Support

Unlike previous versions, Lync Server now supports multiple gateways to be deployed and communicate with a single mediation server. Also, multiple mediation servers can be deployed as a pool on the same site. The following must be taken into consideration when multiple mediation servers are deployed:

1. PSTN gateways must be set for DNS round robin so that the connection is established to the least utilized mediation server.
2. SIP Trunks must be setup so that traffic is sent to any of the mediation servers from the pool. This means that multiple SIP Trunk connections should be setup to each mediation server ip address from the SBC (Session Border Controller) on the ITSP.
3. For an IP-PBX, individual direct-SIP connections are made from the IP PBX to the mediation server in the pool.

In the case of multiple mediation servers connecting to a single gateway, virtual gateways are setup. Each of these gateways resolves to a different FQDN in the DNS.

Voice Resiliency (Central Site)

Resiliency refers the ability to continue operations when the central site, WAN, or any other equipment in the infrastructure fails. The Central site can be made resilient by having a backup pool in a separate geographic location. However, the following features will not work during the event of such a fail-over:

- Voice mail deposit and retrieval
- Conference Auto-Attendant
- Conferencing
- Updating call-forward settings
- Response Group Service and Call Park
- Provisioning of new phones and clients

Branch Site Resiliency

Branch office site resiliency can be provided through three means, depending on the site requirements. Consider a Survivable Branch Appliance for 25 to 1000 users, Survivable Branch Server for 1000 to 5000 users and a Standard Edition server for more than 5000 users. A survivable branch appliance is a blade server with Server 2008 R2 and an installation of Microsoft Lync Server 2010 Registrar and Mediation server. The device provides a PSTN and WAN connection. The PSTN connection allows for resiliency in case of the WAN link failure by providing audio connectivity to the central site, but the conferencing and IM functionality will be lost.

The Survivable Branch Server consists of the Registrar and Mediation Server. It needs to be equipped to be connectable to the local network and either to the voip gateway or SIP trunk.

The final option of preparing a Standard Edition site involves a completely resilient setup that provides a PSTN connection if the link to the Central office fails. It also provides Presence and IM capabilities in the event of a Central Site failure.

Call Management and Call Handling
Parking a call means that that the user on the other end of the line is put on hold temporarily until the call is retrieved at another location. Lync continues to support the Response Group scenario to handle multiple callers by call-agents within a support group. For example, larger corporations could have IT help desks as response groups, and calls routed to the agents in a round-robin fashion.

## Virtualization Support and High Availability

Both HyperV and VMware virtualization scenarios are supported on all the roles. However, since virtual machine deployments of the Back-End and Archiving/Monitoring servers could impact the latency, it is presently recommended that these two roles be deployed on physical machines. Even for large deployments, however, the number of servers per site can almost always be limited to two for each of these roles. However, simultaneous registration of a large number of clients will demand more IO, that is, larger number of SAS drives.

The performance impact of using virtualization is approximately 50% according to initial estimates from Microsoft, and HyperV supports a maximum of four virtual CPU's for each virtual machine. This restriction does mean that the physical servers for these servers have to be scaled-out for larger deployments and dual processor quad-cores should be sufficient.

For many deployments, it would definitely be worthwhile to virtualize the Front-End, the A/V conferencing and Director Roles on the same physical machine and scale-up the server. Given the increased number of cores and DIMM slots in Dell 11G servers (up to 2 x 6 cores of Intel 5680 and 18 slots of 16 GB in R710). In figure 1, for example, 12500 users are distributed among 3 R710's with six-cores each.

For larger deployments, the figure below shows the suggested virtualization of roles. The recommended best practice is to virtualize multiple roles on a single physical machine rather than virtualize multiple instances of the same role on a single physical machine. The figure below illustrates this scenario.

Figure 4.   A Suggested Virtualization Scenario.
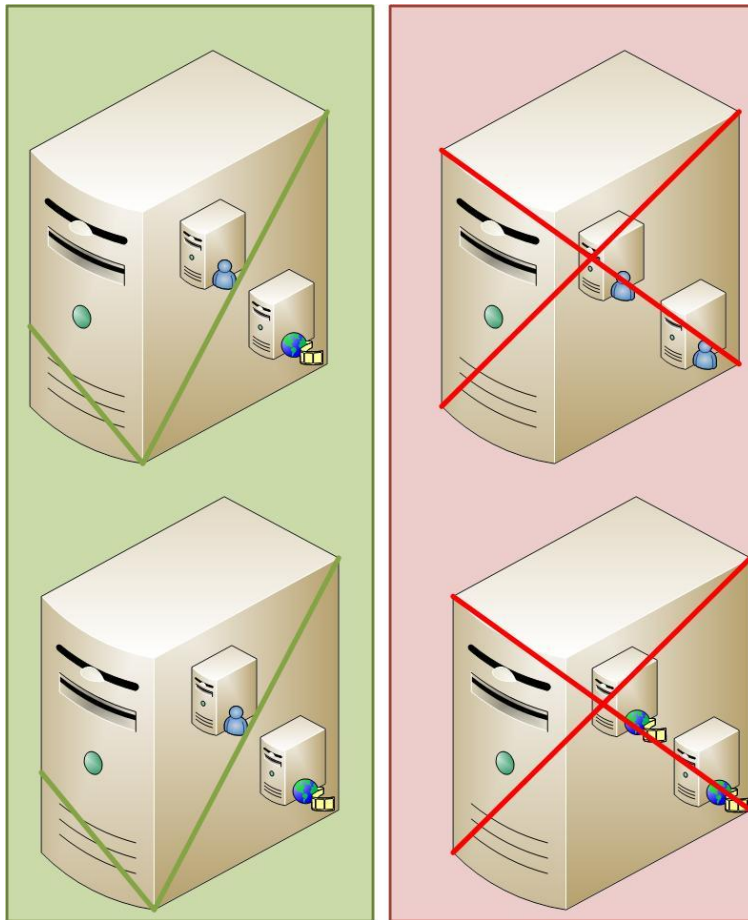
As shown above, in the first scenario, the Front-End and the A/V Conferencing virtual machines are virtualized correctly in the same physical machine. In the second case, there are 2 instances of the Front-End and A/V conferencing virtual machines incorrectly virtualized on the same physical machine. The reason for virtualizing the roles in this manner is to avoid complete loss of service should one of the physical machines become non-operational.

Summary

Lync Server introduces a whole set of new features including a topology builder, new A/V conferencing server role that is detached from the Front-End, a Planning Tool whose topologies can be imported into the topology builder, a Central Management Store, and resiliency and high availability options. The topology builder simplifies the configuration and deployment of servers. The new A/V conferencing server role reduces the processing overhead on the front-end. The Central Management Store resides in the Back-End SQL Database and minimizes the Acitve Directory queries from Lync Server. Virtualization support means that Front-End and A/V roles can be hosted on physical machines for larger deployments. Dell has been working with Lync Server as part of the TAP program and has been testing it on various Dell server and storage configurations. These efforts, along with our tight partnership with Microsoft result in expert Lync Server architecture and sizing guidance that can be passed on to our customers.