



Skype for Business Network Considerations

This Advance7 Briefing is for the network managers. It outlines how the voice and video calling features of Skype for Business will impact the network and how the support model may present extra challenges to the network team.

Increasing numbers of corporates are adopting Skype for Business. Although an organisation may already use an enterprise-wide VoIP solution, smooth deployment of Skype for Business and maintenance of good call quality will be challenging.

What is Skype for Business?

Skype for Business is a new name for Lync, with a new look and feel. It provides staff with instant messaging, presence, voice calling, video calling and conferencing. It can also provide the same facilities to federated external partners. It integrates with Microsoft Exchange and Office software for voice messaging and other facilities. The Skype for Business servers may be on-premise or hosted by a cloud solution that Microsoft calls Skype for Business Online. A hybrid mode is also supported. Crucially, Skype for Business can provide PSTN breakout either locally or in the cloud and so can replace or complement your current PBX and desk phones.

Impact on the Network Team

Skype for Business will affect the network team in two ways:

- It will disrupt current internal support structures for voice and video
- It requires additional QoS-configured bandwidth across the network estate

Support Structures

Whereas voice and video facilities have conventionally been supported by one of the network teams, it seems likely that responsibility for Skype for Business will initially lie within the Windows operating system or Exchange teams.

This will not be ideal for the network team. The team may find the network blamed if call quality is not first-rate, but will not be in a position to properly investigate the problem.

Support will be further complicated if Skype for Business is integrated with an existing VoIP solution because the user experience may be affected by both technologies. Clear troubleshooting scripts will need to be agreed to ensure that the correct team deals with any user problems.

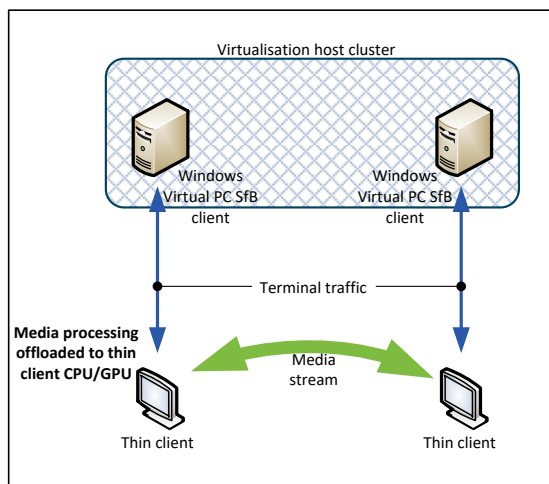
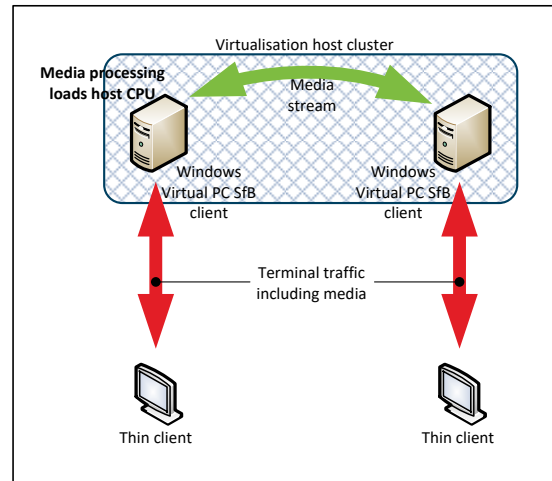
Traffic Patterns

As with an IP Telephony solution, peer-to-peer media flows are signalled by central servers but once set up, the media stream flows directly between the user PCs. Again like IPT, QoS will need to be set up on the network to ensure correct prioritisation of the voice and video traffic. Conferencing

streams will be radial from the Skype for Business servers. If these are in the cloud or across the corporate WAN then sufficient bandwidth and QoS must be provided.

Virtual Desktops

If the user PCs are virtualised the traffic flows are significantly different. As with physical desktops, peer-to-peer media flow will be between their virtual desktops. However, the VDI streams must carry this media to the end user client, whether in-band or out of band with terminal traffic. Therefore the media streams between two people in the same office will *trombone* from the user LAN to the data centre and back again. Moreover, media processing will be performed by the virtualisation host system significantly increasing the CPU load which, if unmanaged, will adversely impact the performance of other virtualised application.



Citrix has worked closely with Microsoft to solve this problem and incorporate the solution in their HDX technologies, which it also licenses to thin client manufacturers. Using a feature called HDX Real-Time Optimisation, the Citrix receiver or thin client can be signalled to pass peer-to-peer media streams directly between VDI clients. The Microsoft Lync VDI plugin provides similar features when using Hyper-V or VMware ESXi. These solutions allow appropriate thin clients to be used as media end-points. This means that these peer-to-peer media streams can stay on the local LAN and the media processing is offloaded to the thin client CPU and GPU, freeing the virtualisation host CPU for application processing.

External Connectivity

Skype for Business requires external connectivity for a variety of purposes:

- Connectivity to Microsoft Azure, either via the Internet or Azure ExpressRoute¹, if a cloud or hybrid solution is adopted
- Connectivity for remote workers, mobile workers and to federated partners
- Internet fall-back for branch-to-branch communication

¹ Azure ExpressRoute is a marketing umbrella for a variety of dedicated connectivity options to Azure from your premises or co-lo data centre.

If media streams originate or terminate off-premise then the transmission medium will need to be suitable for the quality expected. If PSTN access, conference hosting or transcoding is cloud-based a QoS-capable solution such as Microsoft Azure ExpressRoute should be considered.

Microsoft clearly differentiates between “managed” and “unmanaged” communications infrastructure. Connectivity to federated partners would normally be unmanaged and should, therefore, be subject to a lower quality expectation.

There are some grey areas. Should home workers be considered managed or unmanaged? The same question also applies to internal WLAN users.

Internet fall-back can be used for excess branch-to-branch traffic. When your managed WAN link between branches is full, the call admission control can route new calls across the Internet. Again this should obviously be subject to a lower quality expectation.

Whereas these expectations seem reasonable, you will need very effective communications to the user base to ensure that people understand these differences and will tolerate any loss of quality when using unmanaged infrastructure. This is particularly important for heading off any possible disappointment felt by higher-level executives.

Network Dependencies for External Connectivity

External connectivity is provided by Skype for Business edge servers. If there are multiple edge servers then the Skype for Business architecture dictates that a hardware load balancer must be used. Depending on your current network configuration, this may be a new requirement in your DMZ. Edge servers will also need public IP addresses.

Codecs and Bandwidth Requirements

The default voice codec for peer-to-peer calling is SILK, which has a lower bandwidth demand than G.711. Skype for Business uses G.711 for PSTN calls. G.729, a popular IP Telephony codec, is not used at all. Video uses H.264. Outside of the “managed network” FEC (Forward Error Correction) is applied, increasing the bandwidth used.

The easy availability of high-resolution video calling and conferencing means that bandwidth demand will increase across the corporate network, including in the data centre.

Microsoft publishes the following table² to illustrate voice codec bandwidth requirements:

| Audio codec | Scenario | Audio payload bitrate (Kbps) | Bandwidth audio payload and IP header only (Kbps) | Bandwidth audio payload, IP header, UDP, RTP and SRTP (Kbps) | Bandwidth audio payload, IP header, UDP, RTP, SRTP and forward error correction (Kbps) |
|--------------------------|---------------------------|------------------------------|---|--|--|
| RTAudio Wideband | Peer-to-peer | 29.0 | 45.0 | 57.0 | 86.0 |
| RTAudio Narrowband | Peer-to-peer PSTN | 11.8 | 27.8 | 39.8 | 51.6 |
| G.722 | Conferencing | 64.0 | 80.0 | 95.6 | 159.6 |
| G.722 Stereo | Peer-to-peer Conferencing | 128.0 | 144.0 | 159.6 | 223.6 |
| G.711 | PSTN, Conferencing | 64.0 | 80.0 | 92.0 | 156.0 |
| Siren | Conferencing | 16.0 | 32.0 | 47.6 | 63.6 |
| SILK Wideband | Peer-to-peer | 36.0 | 52.0 | 64.0 | 100.0 |
| SILK Wideband | Peer-to-peer | 26.0 | 42.0 | 54.0 | 80.0 |
| SILK Wideband | Peer-to-peer | 20.0 | 36.0 | 48.0 | 68.0 |
| SILK wideband/narrowband | Peer-to-peer | 13.0 | 29.0 | 41.0 | 54.0 |

Quality of Service

Microsoft specifies QoS classification for the traffic. As the user agent will be a PC, the enforcement of DSCP marking is less clear-cut than in a typical VoIP environment with a voice VLAN and centrally-controlled turrets.

Skype for Business includes call admission control but, since this does not integrate with other call managers, if Skype for Business is not the only call manager each system will need its own bandwidth pool.

Any firewalls in the media path will also need to be QoS-capable. This is not such a problem with a conventional VoIP solution as the media streams can be isolated in separate VLANs and therefore bypass most firewalls, but with Skype for Business, it is likely that the media will be carried in the data VLAN and will, therefore, traverse the same firewalls as the data.

Next Steps

If you have a Skype for Business project starting in your organisation:

- Ensure that the network team is represented on the project right from initiation
- Discuss the support model immediately
- Plan to analyse bandwidth and QoS requirements and provision across the entire network estate
- Ensure that there is a project framework in place for agreeing and communicating quality expectations to the users

² <https://technet.microsoft.com/en-gb/library/gg425841.aspx>

Base Information

The content of this paper has been produced through desk-based research and experience with current ongoing Skype for Business Projects.

Further Resources

Technical information is published by Microsoft at the following URL:

<https://technet.microsoft.com/en-us/library/gg398616.aspx>

SfB Bandwidth Calculator: <https://www.microsoft.com/en-gb/download/details.aspx?id=19011>

Azure ExpressRoute: <https://azure.microsoft.com/en-gb/services/expressroute>

About Advance7

Formed in 1989, Advance7 is an independent consultancy that advises IT departments on matters relating to IT systems performance and stability. With a reputation for excellence, impartiality and honesty, we are trusted advisors to many FTSE 250 and Fortune 500 companies. We help IT departments avoid and resolve performance and stability issues by providing them with data-driven information on which they can make sound decisions.

It's through the delivery of our IMPACT service that we have gained an insight into the challenges presented by Skype for Business. We are currently working with two financial services companies to assess the impact of Skype for Business on their network infrastructure, as well as determining call quality at varying levels of network infrastructure degradation.

If you would like to discuss your Skype for Business project with one of our consultants, call us on 01279 211 668.