

White Paper

Estimating Trunk Channel Requirements for VoIP Gateways in Unified Communications Deployments

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Executive Summary

Unified Communications (UC) solutions typically use VoIP to deliver phone calls and are connected to the PSTN either through an IP PBX or via VoIP gateways, such as a Dialogic® Media Gateway (DMG Gateway), which can provide easy and cost-effective connectivity to an organization's TDM-based PBX or directly to the PSTN.

Estimating the number of trunk channels that must be supported through VoIP gateways can be a challenge. This white paper provides information that can help survey users and characterize call volume, assign a ratio of users to trunk channels, summarize an organization's needs, and localize requirements. Some other considerations are discussed, including the effect of UC conference usage, remote worker requirements, and why some organizations may need more or less resources than average usage estimates. Finally, summary worksheets are provided.

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Connecting Unified Communications Solutions to the PSTN

In a quest to increase efficiency, improve productivity, and decrease communications costs, enterprises are adopting Unified Communications (UC) through solutions such as Microsoft® Lync Server 2010, Microsoft Office Communication Server 2007, and IBM® Lotus® Sametime® Unified Telephony. UC solutions typically use Voice over IP (VoIP) to deliver phone calls and are connected to the Public Service Telephone Network (PSTN) via an IP PBX or a VoIP gateway, such as a Dialogic® Media Gateway (DMG Gateway), which, in turn, connects to the PSTN or to a legacy TDM-based PBX.

If a gateway connection is chosen, enterprises face the challenges of deciding on suitable connectivity options and of gauging sizing requirements. This white paper discusses both of these challenges and offers general guidelines for making a sound estimate of PSTN channel usage, including related considerations, such as conferencing, remote workers, and organization type.

Step 1: Identify User Types and Characterize Call Volume

A logical first step in deciding an enterprise's sizing requirements is to survey the type of employees who will use the UC solution and characterize the call volume for each, based on the number of calls they make and receive each business day.

Within the [Enterprise Voice Server-Side Component section](#) of its Microsoft® TechNet Library for Microsoft Office Communications Server 2007 R2, Microsoft discusses "Gateway Size and Number" and suggests the following guidelines for call volume characterization, which have been used in Table 1:

- **Light** — One PSTN call per hour
- **Moderate** — Two PSTN calls per hour
- **Heavy** — Three or more PSTN calls per hour

Since the number and types of positions are likely to vary in each organization, Table 1 suggests some common job titles and associates a call volume characterization with each as an example.

Sample Job Titles	Call Volume
Accounting Clerk IT Staff Operations Specialist Programmer Security Guard	Light
Marketing Specialist Research Director	Moderate
Call Center Agent Executive Management Field Support Engineer Quality Control Staff Sales Representative	Heavy

Table 1. Job Title and Call Volume Example

What is important is surveying the actual organization that will use the gateway option and deciding on the basic type of call volume for each job title. Call volume for users with the same job title in different organizations can easily vary.

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Step 2: Associate Call Volume with Channel Ratios

In the TechNet Library section cited in Step 1, Microsoft also provides guidelines for estimating channel ratios, using the call volume characterizations noted in the previous section. These guidelines are summarized in Table 2.

Call Volume	Number of Users Per PSTN Channel	Ratio (Users: Channel)
Light	15	15:1
Moderate	10	10:1
Heavy	5	5:1

Table 2. Call Volume and Channel Ratios

Note: The term “channel” in this white paper refers to PSTN or TDM PBX connections, but the alternative term “port” is also commonly used. VoIP connections are generally referred to as “sessions,” and a media gateway converts each PSTN or TDM PBX channel into a corresponding VoIP session.

Step 3: Estimate Total Channels Needed

After surveying the types of users in an organization, estimating their call volume, and assigning channel ratios based on the number of users in each type, a detailed summary can follow. Table 3 is a hypothetical summary of an organization with 500 employees located at a single site.

Job Title	Call Volume	Users	Ratio	Channels
IT Staff	Light	100	15:1	6.7
Programmers	Light	100	15:1	6.7
Accounting Clerks	Light	25	15:1	1.7
Marketing Specialists	Moderate	100	10:1	10.0
Sales Representatives	Heavy	135	5:1	27.0
Call Center Agents	Heavy	15	5:1	3.0
Executive Management	Heavy	25	5:1	5.0
Total		500		60.0

Table 3. Hypothetical Summary of an Organization with 500 Employees

Step 4: Localize

In different regions, PSTN or PBX-TDM circuit interfaces (T1 or E1) have the trunk channel characteristics shown in Table 4 for the protocols generally used in different regions. Widely used protocols include primary rate ISDN (PRI) and QSIG.

Circuit Interface	Channels Per Interface	Description	Region
T1	24	Typically 23 “bearer” channels carrying audio plus one signaling channel for call control data	North America
E1	31	Typically 30 “bearer” channels carrying audio plus one signaling channel for call control data	EMEA, LAR, APAC

Table 4. Typical Trunk Channel Capacity

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In the hypothetical summary described in Table 3, an estimated 60 trunk channels were needed for an organization with 500 employees. Using the information in Table 4, a gateway (or gateways) supporting at least three T1 interfaces (69 “bearer” channels) would be required if the organization is located in North America. If the organization is located outside of North America, E1 interfaces would typically be used, and two of these should deliver the 60 “bearer” channels that the example organization needs.

Other Considerations

When analyzing an organization for trunk channel usage, three additional factors may have an impact: conferencing, remote workers, and organization type.

Conferencing

As organizations move from hosted conference bridge services to conference servers that are part of UC solutions, PSTN trunk channel usage may decline. For example, if an organization has 200 employees who each use an average of 2 hours of hosted conference time per 8-hour business day, the average conference bridge service usage is approximately 400 hours per day (which is equivalent to consuming about 50 PSTN channels or roughly two T1 or E1 trunk channels for audio conferencing alone).

By migrating to premise-based UC conference servers and VoIP-based UC endpoints, much of the employee conferencing traffic will remain on the corporate LAN/WAN, and will not use PSTN channels.

Depending on the confidence that an organization has that it will be moving to UC-based conferencing quickly, its technical staff may consider factoring in a trunk channel reduction according to the guidance in the example cited here or one that is appropriate to the organization’s average usage of hosted conferencing services.

PSTN trunk channel sizing must be planned differently for organizations that regularly host large conferences with external participants. For example, supporting a maximum conference with 50 external PSTN callers requires at least 50 gateway channels.

Remote Workers

Organizations can provide UC voice clients to remote and home-office-based employees using softphones or USB headsets. Using these, UC clients can both raise and lower PSTN channel trunk usage.

When employees use UC voice communications delivered through a broadband internet connection instead of using a direct PSTN line or a separate VoIP provider service, the remote employees require PSTN trunk channel access in the same way as colleagues in corporate or branch offices do. Depending on the type of employee using the remote access (light, moderate, or heavy user), PSTN trunk channel usage can increase substantially. For example, sales professionals are often heavy users of voice communications, regardless of location.

On the other hand, remote workers with UC voice clients can use broadband connections and the corporate WAN and VPN for VoIP calls to other employees also using UC, and this will decrease PSTN usage.

A hypothetical example can make this usage pattern clearer. If an organization based in North America adds 100 remote sales professionals who use UC voice clients from home offices equipped with PSTN or VoIP voice circuits, these employees could be expected to use voice services for about 4 hours each day, for a total of 400 usage hours per day. Generally, 75% of this usage would consist of calls to customers and 25% for voice calls and conference calls with fellow employees.

Since sales professionals often call customers during an 11-hour day (9 am Eastern Time to 5 pm Pacific Time), this organization can estimate that 300 hours (75% of the sales professionals’ voice call time) spread over an 11-hour day will increase usage by approximately 28 PSTN channels or one additional T1 trunk channel.

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Organization Type

Needless to say, organizations vary according to the type of product or service they provide, regional factors, and corporate culture. In many instances, factoring in these differences is helpful when estimating PSTN trunk channel requirements. For example, a large percentage of employees in high-tech organizations tend to be engineers who are more likely to use email instead of voice calls to communicate. In addition, the focus is normally on internal collaboration, even across geographies and with remote employees, most of which can be handled with UC and without accessing the PSTN. Planners for these types of organizations may want to plan for less than average voice call usage.

In contrast, financial service firms are likely to communicate heavily via voice calls with clients, and many such organizations will not (or cannot) use email for transacting business. Voice calls and fax communications that are required to satisfy legal or governmental rules are normal parts of the transaction process (for example, voice calls can be recorded for verification and signatures on faxes are often as binding as original documents). Planners in this type of organization should normally provide additional capacity when making their estimates.

Worksheets

This section contains a summary worksheet with the formulas discussed in this paper followed by a blank worksheet for your convenience.

Job Title	Call Volume (Light, Moderate, Heavy)	Number of Users	Ratio (Users:Channel)	
			Light = 15:1	Estimated Trunk Channels Needed
Programmers	Light	X	Moderate = 10:1	A = X/15
Marketing Specialists	Moderate	Y	Heavy = 5:1	B = Y/10
Call Center Agents	Heavy	Z		C = Z/5
Total		X + Y + Z		A + B + C

Table 5. Summary Worksheet with Formulas

Job Title	Call Volume (Light, Moderate, Heavy)	Number of Users	Ratio (Users:Channel)	
			Light = 15:1	Estimated Trunk Channels Needed
			Moderate = 10:1	
			Heavy = 5:1	
Total				

Table 6. Blank Worksheet

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