Appendix A: Sample Performance Data

Cisco Unity Bridge Server Storage Considerations

Table 6. Bridge Server Storage Considerations

Object	Disk Space Consumption
Database The Bridge uses a Microsoft Access database to store its data. The database file name is starfish.mdb. The Directory table in starfish.mdb, which stores all Unity Node directory entries and Octel Node directory entries, will be the largest table in the starfish.mdb database.	• Allow 25 MB for 10,000 directory entries • Allow 125 MB for 20,000 directory entries • Allow 500 MB for 40,000 directory entries
Recorded Voice Names for Unity Node Directory Entries The Bridge server contains folders named with the serial number of each Unity Node. Each folder contains recorded voice name files for the directory entries associated with the node. The files for Unity Node directory entries are stored in the G.711 format (8 KB per second).	• Disk space storage for a 2-second voice name will be 16 KB, a 5-second voice name will be 40 KB, and so on. • For example: 5,000 Unity Node directory entries with an average of 3-second voice name recordings will consume 120 MB on the Bridge server (5,000 x 24 KB).

Object	Disk Space Consumption
Recorded Voice Names for Octel Node Directory Entries The Bridge server contains folders named with the serial number of each Octel Node. Each folder contains recorded voice name files for the directory entries associated with the node. The files for Octel Node directory entries are stored in the G.711 format (8 KB per second). Additionally, once a recorded voice name for an Octel subscriber has been included in a directory update sent to Unity, a copy of the recording is stored with the propagation data sent. Therefore, the recorded voice name for an Octel Node directory entry effectively consumes disk space equivalent to two times the size of the recording. Note: When G.729a is selected as the Unity Node codec, transcoding to G.729a occurs on the fly when sending a directory message to the bridgehead. All Octel subscriber recorded voice names are stored on the Bridge in G.711 regardless of Unity Node codec settings.	• Disk space storage for a 2-second voice name will be 16 KB, a 5-second voice name will be 40 KB, and so on. • For example, 5,000 Octel Node directory entries with an average 3-second voice name recording will consume 240 MB on the Bridge server (5,000 x 24 KB x two copies of each voice recording).
Propagation Records The Bridge sends Octel subscriber directory information to the bridgehead in the form of vCards within the SMTP directory messages. The vCard information by default is stored on the Bridge server in the changes.vcf file for 60 days.	Allow 1 MB disk space per 5,000 vCards sent from the Bridge to the bridgehead for any 60-day period.
Queued Analog Messages to Octel Once queued for analog delivery to an Octel node, the files are in G.711 format for playout via the Brooktrout TR114. This is true whether the original message from Cisco Unity arrived in G.711 or G.729a.	• A 30 second message is approximately 240 KB • 100 messages x 240 KB is approximately 24 MB • A 60 second message is approximately 480 KB • 100 messages x 480 KB is approximately 48 MB

Object	Disk Space Consumption
Queued SMTP Messages to Cisco Unity Rarely do SMTP messages queue for any significant amount of time when outbound to Cisco Unity. However, if Retention Days for Temporary SMTP Messages is set for more than zero days on the Digital Networking page in the Bridge Administrator, copies of all messages sent to Cisco Unity are stored on the Bridge server, and disk space for the messages needs to be considered. The amount of disk space consumed by the SMTP messages depends on whether the Bridge is configured to send messages by using the G.711 codec or the G.729a codec.	**G.711** • Approximately 10 KB per second • A 60 second message is approximately 600 KB • 100 messages x 600 KB is approximately 60 MB **G.729a** • Approximately 1.25 KB per second • A 60 second message is approximately 75 KB • 100 messages x 75 KB is approximately 7.5 MB

Directory Synchronization Considerations

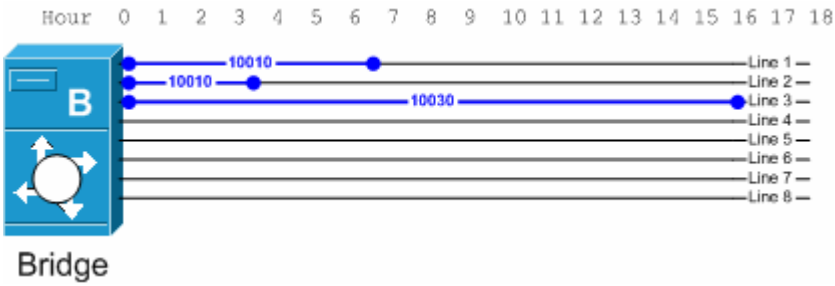
Initial Directory Propagation

When first configuring the Bridge(s) to communicate with Octel servers, consider the following issues related to directory propagation.

If you are using MBUpload.exe on the Bridge server to bulk import mailboxes, and to have the Bridge retrieve the names from the Octel server(s), allow 6 to 7 hours per 1,000 Octel subscribers for a node. These figures are based on the maximum recorded voice name length of 8 seconds, and assume that all Octel subscribers have a recorded voice name, so your actual time may be less. The Bridge will only place one administrative call to any single Octel node at a time, but can call any number of separate Octel nodes simultaneously.

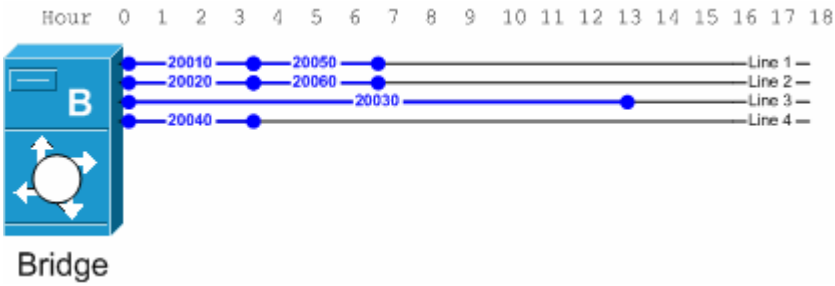
- Example 1 (see Figure 36): 8 port Bridge server; MBUpload.exe used to import the following mailboxes on the Bridge:
  - 1,000 mailboxes for node serial number 10010
  - 500 mailboxes for node serial number 10020
  - 2,500 mailboxes for node serial number 10030

Figure 36: Maximum Analog Call Durations to Retrieve Names from Remote Octel Servers



- Example 2 (see Figure 37): 4 port Bridge server; MBUpload.exe used to import the following mailboxes on the Bridge1:
  - 500 mailboxes for node serial number 20010
  - 500 mailboxes for node serial number 20020
  - 2,000 mailboxes for node serial number 20030
  - 500 mailboxes for node serial number 20030
  - 500 mailboxes for node serial number 20050
  - 500 mailboxes for node serial number 20060

Figure 37: Maximum Analog Call Durations to Retrieve Names from Remote Octel Servers



The analog administrative retrieval of names from Octel servers will result in SMTP directory messages being sent from the Bridge to the Cisco Unity bridgehead. The rate and size of these messages will vary greatly, depending on whether the remote Octel subscribers have recorded voice names, and how long the recordings are. A good estimate to use when the Bridge is retrieving a long list of records from an Octel node would be approximately 150 to 250 records per hour per analog line (assuming continuous administrative retrieval and approximately 10 records per message). The Bridge will process all records as received, but will send SMTP directory messages to the bridgehead with an interval of 60 seconds between each message. In Example 1, this would mean that the Bridge is processing approximately 45 to 75 SMTP

directory messages containing 450 to 750 vCards for the first three plus hours, 30 to 50 SMTP directory messages containing 300 to 500 vCards for the next three plus hours, and 15 to 25 SMTP directory messages containing 150 to 250 vCards for approximately nine hours. If the processing of messages during the first three plus hours results in more than 60 messages per hour, SMTP directory messages queued for delivery to the bridgehead may back up temporarily, but will eventually all be sent as the 60-second interval allows. The SMTP directory messages are spaced at 60 second send intervals to ensure proper sequencing. A backlog of SMTP directory messages has no impact on delivery of voice messages. Voice messages are always sent immediately from the Bridge to Cisco Unity upon processing.

Keep an eye on the Exchange server on which the Voice Connector is installed, and monitor the following:

- Disk space consumed by Exchange logs as the Voice Connector handles a large volume of directory messages.
- Disk space consumed by the Exchange databases as the Voice Connector handles a large volume of directory messages.

Additionally, monitor the resources for the Digital Networking (vpim.exe) and Unity Bridge (starfish.exe) services on the Bridge server. If the Unity Node profiles on the Bridge server are configured such that the Bridge is sending recorded voice names to Unity in G.729a format, the average size of the messages sent to Cisco Unity will usually be somewhat less, but the resources necessary to convert the G.711 recordings of the Bridge to G.729a in the SMTP messages can result in heavy periods of % Processing Time consumed by the Digital Networking (vpim.exe) service.

When first configuring Cisco Unity to communicate with the Bridge, or when an Octel node is first migrated to Cisco Unity, consider the following issues related to directory propagation:

If you have a large number of Cisco Unity subscribers in your network (more than 2,000), or have just imported a large number of Cisco Unity subscribers into your network, there may be a period of heavy SMTP directory message traffic from the bridgehead server to the Bridge. Keep an eye on the Exchange server on which the Voice Connector is installed, and monitor the following:

- Disk space consumed by Exchange logs as the Voice Connector handles a large volume of directory messages.
- Disk space consumed by the Exchange databases as the Voice Connector handles a large volume of directory messages.

Additionally, monitor the resources for the Digital Networking (vpim.exe) and Unity Bridge (starfish.exe) services on the Bridge server. The Unity bridgehead can send 300 or more directory messages per hour to the Bridge, containing 3,000 or more records. If the majority of Cisco Unity subscribers have recorded voice names, and if those names are in the G.729a format, the % Processing Time for the Digital Networking (vpim.exe) service may show usage of 80 to 90 percent for periods as the Bridge processes the inbound directory messages. This behavior is specific to conditions when the bridgehead is sending full directory data for a group of Cisco Unity subscribers associated with a particular Node ID, which only occurs when first adding a Unity Node profile to the Bridge server, or when manually initiating a send of full Cisco Unity subscriber data to the Bridge. Sequencing of all other directory messages sent from the

bridgehead to the Bridge (for example, regular moves, adds, and changes) is such that a heavy processing spike on the Bridge server will not be common.

In general, when first deploying a Bridge, allow as much initial directory propagation between the Bridge and Cisco Unity to finish as your situation allows before subscribers start sending messages. After the initial directory propagation has concluded, there will be minimal affects from normal directory propagation patterns, unless you add a substantial number of subscribers at one time.

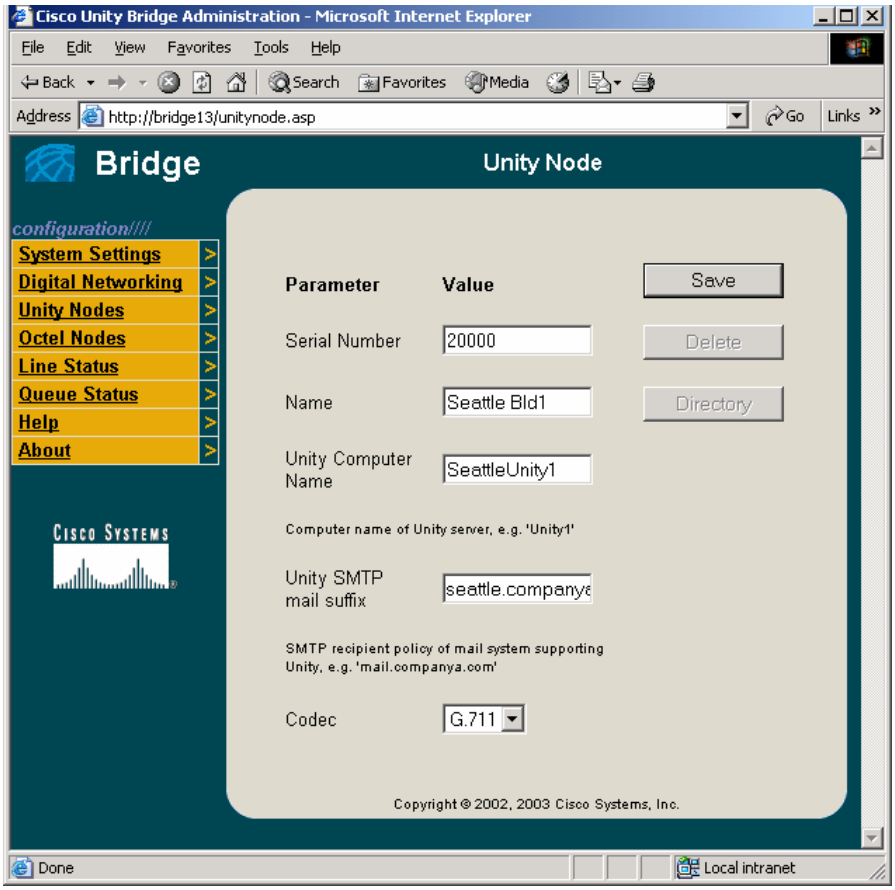
Effect of Multiple Bridge Servers on Directory Synchronization

Cisco Unity subscriber update information must be sent to each Bridge server. Therefore, using two Bridge servers will result in twice the directory message traffic from the bridgehead(s) to the Bridge(s). Likewise, three Bridge servers will result in three times the directory message traffic, and so on.

A bridgehead server combined with a Bridge server (or servers) can represent the serial number of each Octel whose subscribers have migrated to Cisco Unity. Up to 998 nodes can be represented. On the Bridge server, you add a Unity Node for each node that the bridgehead and Bridge servers represent in the network. Each Unity Node is identified by serial number, and each Cisco Unity subscriber is assigned a serial number that corresponds to a Unity Node serial number.

Figure 38 shows that the Unity Node does not require much in the way of configuration settings. Therefore, the disk space that a Unity Node consumes on the Bridge server is negligible.

Figure 38: Unity Node Page in the Bridge Administrator



Effect of Multiple Unity Nodes on Directory Synchronization Between Cisco Unity and the Bridge

Directory messages from the bridgehead server to the Bridge are batched per Unity Node. A single directory message can contain multiple add, change, and delete requests, but only for one Unity Node. The number of Unity Nodes affects the number of directory messages sent to the Bridge, but not the number of requests. Therefore, the number of Unity Nodes does not affect the amount of the data that is sent over the network.

For example, assume that one Unity Node has been configured on the Bridge, and that all Cisco Unity subscribers are assigned the Unity Node serial number. If you were to add a new Unity Node, and reassign half of the subscribers to the serial number of the new Unity Node, the number of directory messages sent from the bridgehead to the Bridge server would increase. However, the total amount of data sent from the bridgehead to the Bridge would be the same.

Effect of Multiple Unity Nodes on the Processing of Analog Voice Messages

Analog voice messages from an Octel node to the Bridge are batched by serial number. A message from an Octel subscriber that is addressed to three Cisco Unity subscribers who have the same serial number would be delivered to all three recipients on the same call, with one transmission of the message. However, a message from an Octel subscriber that is addressed to three Cisco Unity subscribers who have different serial numbers would result in three separate calls and transmissions of the message, as illustrated in Figures 39 and 40. The transmission of three separate messages either ties up three separate ports (if three ports are available), or if only one port is available, the port is tied up three times as long. Either way, the three transmissions result in three messages processed on the Bridge server, and three separate messages sent from the Bridge to Cisco Unity. This results in an increase in network traffic and processing by Exchange and the Voice Connector.

Figure 39: Voice Messages Sent from an Octel Node to the Bridge Where Cisco Unity Recipients Are Represented By Multiple Serial Numbers

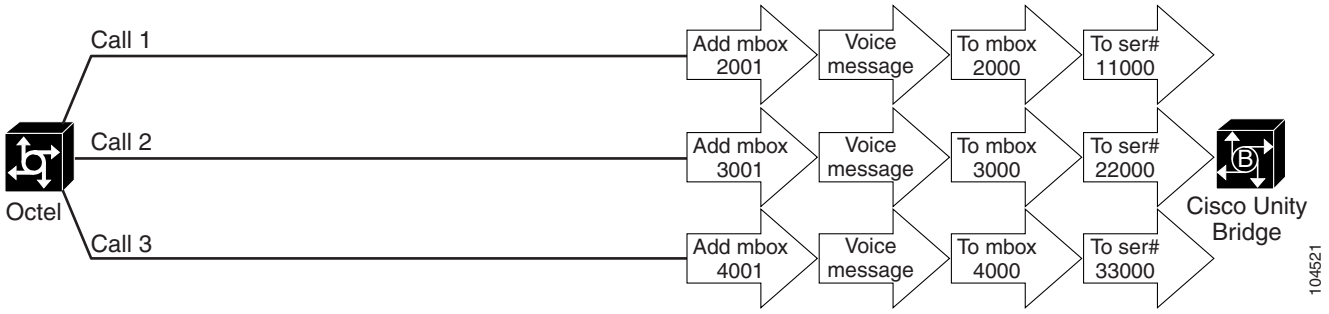
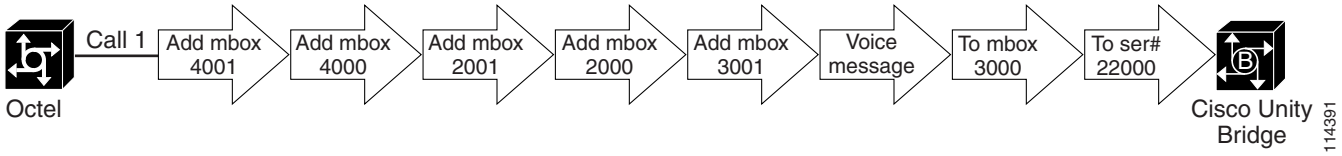


Figure 40: Voice Messages Sent From an Octel Node to the Bridge Where Cisco Unity Recipients Are Represented by a Single Serial Number

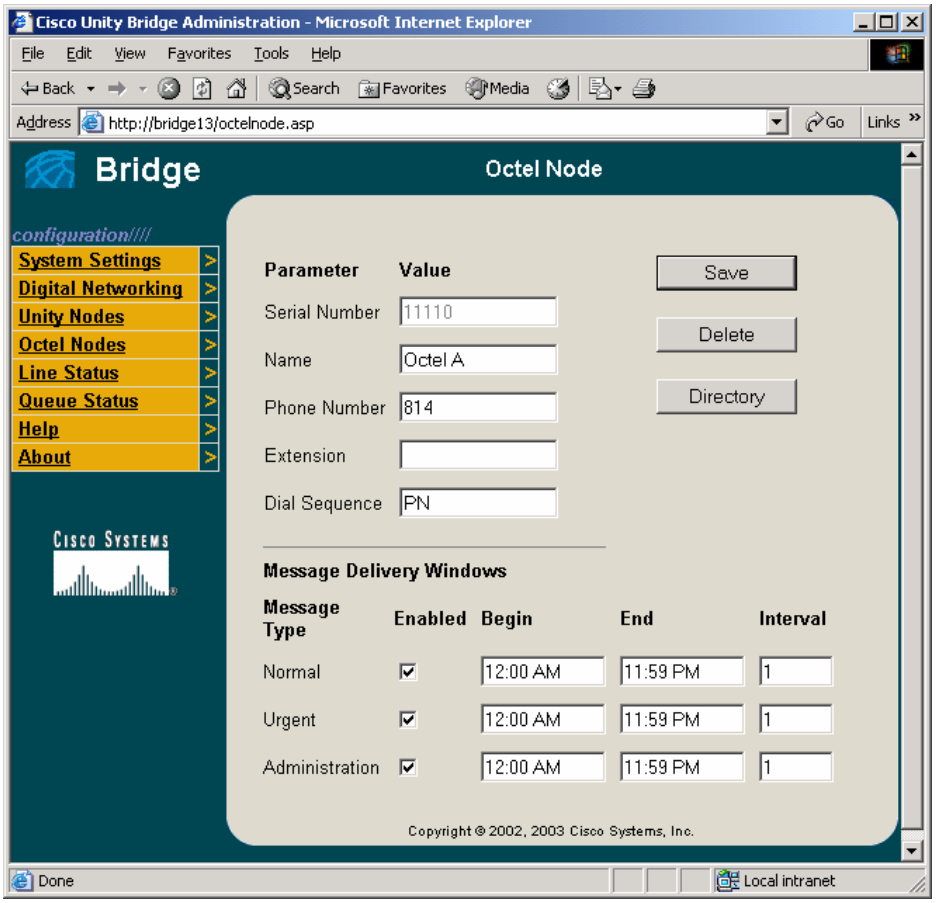


Octel Node Considerations

A bridgehead server combined with a Bridge server (or servers) can communicate with up to 998 Octel nodes in the Octel analog network. On the Bridge server, you add an Octel Node for each node with which the bridgehead and Bridge servers will communicate. Each Octel Node is identified by serial number.

Figure 41 shows that the Octel Node does not require much in the way of configuration settings. Therefore, the disk space that a Unity Node consumes on the Bridge server is negligible.

Figure 41: Octel Node Page in the Bridge Administrator



Effect of Multiple Octel Nodes on Directory Synchronization Between the Bridge and Cisco Unity

Directory messages from the Bridge to the bridgehead server are batched per Octel Node. A single directory message can contain multiple add, change, and delete requests, but only for one Octel Node. The number of Octel Nodes affects the number of directory messages sent to the bridgehead, but not the number of requests. Therefore, the number of Octel Nodes does not affect the amount of the data that is sent over the network.

The main factor in directory synchronization traffic is the total number of Octel Node directory entries, and how often they are updated. The number of Octel Nodes to which the Octel Node directory entries are distributed is less of an issue. Note that only one copy of the Octel subscriber directory information is sent to the bridgehead, regardless of the number of Unity Nodes configured.

Effect of Multiple Octel Nodes on the Processing of Analog Voice Messages

Each Octel Node has three delivery windows, each with its own schedule (see Figure 41). Outgoing messages from the Bridge to an Octel node are placed in queues. The Bridge maintains three queues for each node—one queue each for normal, urgent, and administrative messages. Queued messages are processed in first-in-first-out (FIFO) order. The more Octel Nodes that are configured, the more server resources will be consumed for analog call processing.

Performance Impact of Directory Synchronization to the Bridge

Table 7 describes the performance impact to the Bridge server of the Digital Networking service (vpim.exe) and the Bridge service (starfish.exe). These are the two main services that make up the Bridge software.

Table 7. Performance Impact to the Bridge Server

Service	Processing Rate	Physical Memory Increase	Virtual Memory Increase	CPU Percentage Increase
Digital Networking service processing changes from Cisco Unity	3,000 vCards per hour	2 MB	0 to 5 MB	7 percent
Cisco Unity Bridge service processing changes from Cisco Unity	3,000 vCards per hour	None	None	None
Digital Networking service processing changes to Cisco Unity	Maximum rate	2 MB	0 to 5 MB	• G.729: Maximum available • G.711: 60 percent
Cisco Unity Bridge service processing changes to Cisco Unity	Maximum rate	None	None	None

Unity Nodes

Table 8. Unity Node Description

Maximum number of Unity Nodes	998
HDD/database consumption per Unity Node	Impact is negligible for the node object itself. For more information, see Unity Node Directory Entries.
Impact of X number of Unity Nodes on directory synchronization between the bridgehead and the Bridge server	The number of messages sent from the bridgehead to the Bridge server increases when more Unity nodes are being represented, because each message sequence can contain only the subscribers with the same Unity Node serial number. However, the total amount of data sent from the bridgehead to the Bridge server is the same regardless of the number of Unity nodes. Cisco Unity subscriber update information must be sent to each Bridge server. Therefore, using two Bridge servers results in twice the directory message traffic from the bridgehead(s) to the Bridge(s). Three Bridge servers would result in three times the directory message traffic, and so on.
Impact of X number of Unity Nodes on the processing of analog voice messages under load	There is no significant difference, in terms of the resources required to process X number of calls or X number of messages. For example, a message from an Octel subscriber that is addressed to six Cisco Unity subscribers, where the six subscribers are represented by different serial numbers (two subscribers to each of three serial numbers) will result in three separate calls to deliver the message to the Bridge. If the same message is addressed to six Cisco Unity subscribers who are all represented by the same serial number, the message is delivered to all recipients on the same call, with only one transmission of the message.

Octel Nodes

Table 9. Octel Node Description

Maximum number of Octel Nodes	998
HDD/database consumption per Octel Node	Impact is negligible for the node object itself. For more information, see Unity Node Directory Entries.
Impact of X number of Octel Nodes on directory synchronization between the bridgehead and the Bridge server	Having more Octel Nodes for same total number of Octel Node directory entries would result in potentially more SMTP directory message traffic from the Bridge to the bridgehead. However, the total number of subscriber updates sent in the messages would be the same. The main factor in directory sync traffic is total number of Octel Node directory entries, and the number of updates for them that occur. Relative to that, the number of Octel Nodes that the Octel Node directory entries are distributed across is less of an issue. Only one copy of Octel subscriber directory information is sent to the bridgehead, regardless of the number of Unity Nodes configured.
Impact of X Octel Nodes on the processing of analog voice messages under load	For each Octel Node there are three delivery windows—each with its own schedule and queue handling—for the Bridge to maintain. More Octel Nodes configured results in more server resources consumed for analog call processing.