Cisco Unified ICM Interactions

Network VRU Types

This section discusses the Network VRU types for Unified ICM, and how Unified ICM relates to Unified CVP deployments.

This section describes the following topics:

- Unified ICM Network VRUs. See Unified ICM Network VRU, on page 1
- Unified CVP Type 10 VRU. See Unified CVP Type 10 VRU, on page 2
- Unified CVP Type 7 VRU (Correlation ID Mechanism). See Unified CVP Type 7 VRU (Correlation ID Function), on page 3
- Unified CVP Type 8 VRU (Translation Route ID Mechanism). See Unified CVP Type 8 VRU (Translation Route ID Function), on page 4

Note The terms voice response unit (VRU) and interactive voice response (IVR) are used interchangeably throughout this document.

Unified ICM Network VRU

Unified ICM perceives calls that need IVR treatment as having two portions: the Switch leg and the VRU leg. The Switch is the entity that first receives the call from the network or caller. The VRU is the entity that plays audio and preforms prompt-and-collect functions. If you use Unified ICM, Unified CVP can participate in the Switch role or the VRU role, or both. In a network deployment, multiple Unified CVP devices provide the Switch and VRU portions independently.

The call delivery to VRU can be based on either a Correlation ID or a translation route ID function, depending on the network capability to pass the call reference identification to the VRU. Call reference identification is needed because Unified ICM has to correlate the two legs of the same call in order to provide instructions for completing the call. In the Unified ICM application, the VRU supplies this call reference ID to Unified ICM when the VRU asks for instructions on how to process the incoming call that it receives from the switch. This method enables Unified ICM to retrieve the appropriate call context for this same call, which at this stage is to proceed to the IVR portion of the call.

- **Correlation ID**—This method is used if the network can pass the call reference ID to the VRU when the VRU is located in the network with the switch and the call signaling can carry this information (for example, the Correlation ID information is appended to the dialed digits when Unified ICM is used). This function usually applies to calls being transferred within the VoIP network.
- **Translation Route ID**—This method is used when the VRU is reachable across the PSTN (for example, the VRU is at the customer premise) and the network cannot carry the call reference ID information in delivering the call to the VRU. You must configure a temporary directory number (known as a translation route label) in Unified ICM to reach the VRU, and the network routes the call normally to the VRU as with other directory number routing in the PSTN. When the VRU requests instructions from Unified ICM, the VRU supplies this label (which can be a subset of the received digits), and Unified ICM can correlate the two portions of the same call. Generally, the PSTN carrier contains a set of translation route labels to be used for this purpose.

Note The deployed VRU can be located in the network (Network VRU) or at the customer premises. At the customer premises, a Network Applications Manager (NAM) is deployed in the network and a Customer ICM (CICM) is deployed at the customer premises. The corresponding Correlation ID or Translation Route ID is used, depending on the location of the VRU.

Unified CVP Type 10 VRU

Unified CVP Type 10 VRU simplifies the configuration requirements in Unified CVP Comprehensive Model deployments. Use the Type 10 VRU for new installations except for the VRU-only deployments. In deployments that need to use ICM Customers, you cannot initiate a two-step transfer from the Unified CVP VRU switch leg to a completely separate Unified CVP (for example, a two-step CVP-to-CVP transfer using SendToVRU). You are require to use a translation route for these two-step transfers to work.

Type 10 Network VRU operates as follows:

- Transferred routing client responsibilities are handed off to the Unified CVP switch leg.
- An automatic transfer to the Unified CVP VRU leg occurs resulting in a second transfer when calls are originated by the VRU, ACD, or Cisco Unified Communications Manager (Unified CM).
- For calls originated by Unified CM, the Correlation ID transfer mechanism is used. The Correlation ID is automatically added to the end of the transfer label defined in the Type 10 Network VRU configuration.
- The final transfer to the Unified CVP VRU leg is similar to a Type 7 transfer, which includes a RELEASE message to be sent to the VRU prior to any transfer.

You need to define a single Type 10 Network VRU in Unified CVP implementations without the ICM Customers feature (that is, in Unified CVP implementations with a single Network VRU), and associate all Unified ICM VRU scripts. One label for the Unified CVP Switch leg routing client, transfers the call to the

Unified CVP VRU leg. If calls are transferred to Unified CVP from Unified CM, another label for the Unified CM routing client, and this label should be different from the label used for the CVP Routing Client. This label transfers the call to the Unified CVP Switch leg. The Unified ICM Router sends this label to Unified CM with a Correlation ID concatenated to it. You must configure Unified CM to handle these arbitrary extra digits.

Configure the Unified CVP Switch leg peripheral to point to the same Type 10 Network VRU. Also, associate all incoming dialed numbers for calls that are to be transferred to Unified CVP with a Customer Instance that points to the same Type 10 Network VRU.

For calls that originate at a Call Routing Interface VRU or at a TDM ACD, a TranslationRouteToVRU node is required to transfer the call to a Unified CVP's Switch leg peripheral. For all other calls, use either a SendToVRU node, a node that contains automatic SendToVRU function (such as the queuing nodes), or a RunExternalScript.

Note Type 5 and Type 2 VRU types are not supported. Instead of these VRU types, use Type 10 VRU.

Unified CVP Type 7 VRU (Correlation ID Function)

When the VRU functions as an IVR with the Correlation ID function, Unified ICM uses Type 3 and Type 7 to designate suboperations of the VRU with the Peripheral Gateway in the Correlation ID scheme. Both Type 3 and Type 7 VRUs can be reached with the Correlation ID function, and a Peripheral Gateway is needed to control the VRU. However, the difference between these two types is in how they release the VRU leg and how they connect the call to the final destination.

In Type 3, the switch that delivers the call to the VRU can take the call from the VRU and connect it to a destination (or agent).

In Type 7, the switch cannot take the call away from the VRU. When the IVR treatment is complete, Unified ICM must disconnect or release the VRU leg before the final connect message can be sent to the Switch leg to instruct the switch to connect the call to the destination.

When used as an Intelligent Peripheral IVR, Unified CVP supports only Type 7 because it gets a positive indication from Unified ICM when its VRU leg is no longer needed (as opposed to waiting for the VoiceXML Gateway to inform it that the call has been pulled away). Type 3 has been deprecated.

A call has two legs: the Switch leg and the VRU leg. Different Unified CVP hardware can be used for each leg. A service node along with a Unified CVP for VRU leg with Peripheral Gateway acting as VRU Type 7 can be used to complete the IVR application (for example, self service and queuing).

Note Use Type 10 VRU for all new implementations of Unified CVP using Unified ICM 7.1 or greater, except as VRU Only (Model #4a).

For configuration examples of the Unified CVP application with VRU Type 7, see the *Configuration Guide for Cisco Unified Customer Voice Portal*at http://www.cisco.com/en/US/products/sw/custcosw/ps1006/products_installation_and_configuration_guides_list.html.

Unified CVP Type 8 VRU (Translation Route ID Function)

When the VRU functions as an IVR with the Translation Route ID function, Unified ICM uses Type 8 or Type 10 to designate suboperations of the VRU through the Peripheral Gateway in the translation route scheme. Both Type 8 and Type 10 VRUs can be reached through the Translation Route ID mechanism, and Peripheral Gateway is needed to control the VRU. However, they differ in how they connect the call to the final destination.

In Type 8, the switch that delivers the call to the VRU can take the call from the VRU and connect it to a destination or agent.

When the switch cannot take the call away from the VRU to deliver it to an agent, use Type 10. In that case, when the IVR treatment is complete, Unified ICM sends the final connect message to the VRU (rather than to the original switch) to connect the call to the destination. The VRU assumes control of the switching responsibilities when it receives the call. This process is known as handoff.

Similar to the Correlation ID, there are two legs of the call: the Switch leg and the VRU leg. Use Unified CVP for either the Switch leg or the VRU leg. For example, when Network Interface Controller (NIC), NAM, or CICM is taken, configure Unified CVP as Type 8 or Type 10 in the VRU leg.

Note Use Type 10 VRU for new implementations of Unified CVP using Unified ICM 7.1 or greater, except as VRU Only (Model #4a).

For configuration examples of the Unified CVP application with VRU Type 8 or Type 10, see *Configuration Guide for Cisco Unified Customer Voice Portal* at http://www.cisco.com/en/US/products/sw/custcosw/ps1006/products_installation_and_configuration_guides_list.html.

Network VRU Types and Unified CVP Deployment Models

This section describes how Network VRU types relate to the Unified CVP deployment models and describes the following topics:

- Model #1: Standalone Self-Service. See Standalone Self-Service Deployments
- Model #2: Call Director. See Model #2: Call Director, on page 6
- Model #3a: Comprehensive using ICM Micro-Apps. See Model #3a: Comprehensive Using ICM Micro-Apps, on page 6
- Model #3b: Comprehensive using VXML Server. See Model #3b: Comprehensive Using VXML Server, on page 6
- Model #4: VRU-Only. See Model #4: VRU-Only, on page 6
  - Model #4a: VRU-only with NIC Controlled Routing. See Model #4a: VRU-Only with NIC Controlled Routing, on page 6
  - Model #4b: VRU-only with NIC Controlled Pre-routing. See Model #4b: VRU-Only with NIC Controlled Prerouting, on page 7

In Unified ICM, a Network VRU is a configuration database entity that you can access by using Network VRU Explorer. A Network VRU entry contains the following information:

- Type—A number from 7, 8, and 10, which corresponds to one of the types.
- Labels—A list of labels that you use in Unified ICM to transfer a call to the particular Network VRU. These labels are relevant only for Network VRUs of Type 7 or 10 (that is, those VRU types that use the Correlation ID Mechanism to transfer calls). Each label consists of two parts:
  - A digit string, which becomes a Dialed Number Identification Service (DNIS). A SIP Proxy Server or a static route table (when SIP is used), or gateway dial peers understand DNIS.
  - A routing client, or switch leg peripheral. Each peripheral device that acts as a Switch leg must have its label, although the digit strings are the same in all cases.

Network VRU configuration entries have no value until they are associated with active calls. Unified ICM association is made at the following locations:

- In the **Advanced** tab for a given peripheral in the PG Explorer tool
- In the Customer Instance configuration in the Unified ICM Instance Explorer tool
- In every VRU Script configuration in the VRU Script List tool

Depending on the protocol-level call flow, the currently used Unified ICM Enterprise looks at either the peripheral or the Customer Instance to determine how to transfer a call to a VRU. The Unified ICM Enterprise examines the Network VRU associated with the Switch leg peripheral when the call first arrives on a Switch leg, and examines the Network VRU that is associated with the VRU leg peripheral when the call is being transferred to the VRU using the Translation Route Mechanism. The Unified ICM Enterprise examines the Network VRU that is associated with the Customer Instance when the call is being transferred to the VRU using the Correlation ID Mechanism.

Unified ICM Enterprise also checks the Network VRU that is associated with the VRU Script every time it encounters a RunExternalScript node in its routing script. If Unified ICM determines that the call is currently not connected to the designated Network VRU, the VRU Script is not executed.

Unified ICM Enterprise Release 7.1 introduced Network VRU Type 10, which simplifies the configuration of Network VRUs for Unified CVP. For most call flow models, a single Type 10 Network VRU replaces the place of the Type 2, 3, 7, or 8 Network VRUs that are associated with the Customer Instance and the switch, and VRU leg peripherals. VRU Only (Model #4a) still requires Type 7 or 8.

Note For existing deployments, the previously suggested VRU types work in the similar way, new installations are required to use Type 10. Existing deployments should switch to Type 10 on upgrade.

Model #1: Standalone Self-Service

The Standalone Self-Service model usually does not communicate with Unified ICM VRU scripts, so a Network VRU setting is not required. The Standalone Self-Service model with Unified ICM Label Lookup does not use the VRU scripts in Unified ICM. It issues a Route Request to the VRU Peripheral Gateway (PG) Routing Client, which does not require this Network VRU model.

Model #2: Call Director

In this model, Unified ICM (and also Unified CVP) is responsible for call switching only. This model does not provide queuing or self-service, so there is no VRU leg. A Network VRU setting is not required in this case.

Model #3a: Comprehensive Using ICM Micro-Apps

In this model, Unified CVP devices act as both the Switch and the VRU leg. However, the call needs to be transferred from the Switch leg to the VRU leg before any call treatment (for example, playing .wav files or accepting user input) can take place. Associate all Unified CVP peripherals with a Type 10 Network VRU in this case.

Note

- Type # 10 is available in Unified ICM 7.1 and later, and new implementations must use this configuration.
- Associate all incoming dialed numbers with a Customer Instance that is associated with a Type 10 Network VRU. You must associate all the VRU Scripts that this call executes with the same Type 10 Network VRU. Although it is not always necessary, we recommend that the Unified ICM routing script execute a SendToVRU node prior to the first RunExternalScript node.

Model #3b: Comprehensive Using VXML Server

If you consider call routing and the Network VRU, you will find this model identical to Model #3a.

Model #4: VRU-Only

In this model, the call arrives at Unified ICM through an ICM-NIC interface. Initially, Unified CVP is not responsible for the Switch leg; its only purpose is as a VRU. However, depending on the type of NIC being used, it may be required to take over the Switch leg after it receives the call.

This model has two submodels, which are described in the following sections.

Model #4a: VRU-Only with NIC Controlled Routing

Note This submodel has the following assumptions:

- A fully functional NIC can deliver the call temporarily to a Network VRU (that is, to Unified CVP's VRU leg) and then retrieving the call and delivering it to an agent when that agent is available.
- If the agent is capable of requesting that the call be retransferred to another agent or back into queue or self-service, the NIC can retrieve the call from the agent and redelivering it as requested.

Two variants of this submodel exist, depending on whether the Correlation ID or the Translation Route function is used to transfer calls to the VRU. Most NICs (most PSTN networks) cannot transfer a call to a particular destination directory number and carry an arbitrary Correlation ID along with it. The destination device can

pass back to Unified ICM to make the Correlation ID transfer mechanism function properly. For most NICs, you must use the Translation Route function.

However, a few exceptions to this rule exist, in which case the Correlation ID function can be used. The NICs transmits a Correlation ID include Call Routing Service Protocol (CRSP), and Telecom Italia Mobile (TIM). However, because this capability also depends on the PSTN devices that connect behind the NIC, check with your PSTN carrier to determine whether the Correlation ID can be passed through to the destination.

If the NIC is capable of sending the Correlation ID, the incoming dialed numbers must all be associated with a Customer Instance that is associated with a Type 7 Network VRU. The Type 7 Network VRU must contain labels that are associated to the NIC routing client, and all the VRU Scripts must also be associated with that same Type 7 Network VRU. The peripherals do not need to be associated with any Network VRU. We recommend that to execute the Unified ICM routing script SendToVRU node prior to the first RunExternalScript node.

If the NIC cannot send a Correlation ID, then the incoming dialed numbers must all be associated with a Customer Instance that is not associated with any Network VRU. However, the Unified CVP peripherals must be associated with a Network VRU of Type 8, and all the VRU Scripts must also be associated with that same Type 8 Network VRU. In this case, it is necessary to insert a TranslationRouteToVRU node in the routing script prior to the first RunExternalScript node. If the call is going to the VRU leg because it is being queued, generally the TranslationRouteToVRU node appears after the Queue node. In that way, you can avoid an unnecessary delivery and removal from Unified CVP when the requested agent is already available.

Model #4b: VRU-Only with NIC Controlled Prerouting

Note This submodel assumes a less capable NIC that can deliver the call only once, either to a VRU or to an agent. After the call is delivered to retrieve a call and then it is redelivered somewhere else, Unified CVP takes control of the switching responsibilities for the call. Unified ICM considers this process as a handoff.

Calls that fit this particular submodel must use the Translation Route function to transfer calls to the VRU. A handoff cannot be implemented by using the Correlation ID function.

To implement this model with Unified ICM 7.1 and later, the incoming dialed numbers must all be associated with a Customer Instance that is associated with a Type 10 Network VRU. The VRU labels are associated with the Unified CVP routing client, not the NIC. The Unified CVP peripherals and VRU Scripts must be associated with the Type 10 Network VRU. You need to insert a TranslationRouteToVRU node in the routing script, followed by a SendToVRU node, before the first RunExternalScript node. If the call is going to the VRU leg because it is being queued, these two nodes should appear after the Queue node. An unnecessary delivery and removal from Unified CVP can be avoided if the requested agent is already available.

Note Two different VRU transfer nodes are required. The first one transfers the call away from the NIC with a handoff, and it establishes Unified CVP as a Switch leg device for this call. Physically the call is delivered to an Ingress Gateway. The second transfer delivers the call to the VoiceXML Gateway and also establishes Unified CVP as the call's VRU device.

Hosted Implementations

Hosted implementations incorporate a two-level hierarchy of Unified ICM systems. The Network Application Manager (NAM) is at the top level, and one or more Customer ICMs (CICMs) is below it. Both the NAM and CICM are complete ICMs, with a communication link between them known as Intelligent Network Call Routing Protocol (INCRP). Each CICM functions in an isolated way; it is unaware of the other CICMs, and it is unaware that the NAM is another ICM. A CICM has no connection to the other CICMs, but its connection to the NAM is through the INCRP NIC.

Customers implement hosted setups because they are service providers. They want to provide ICM contact center services to multiple customers of their own. Each customer is hosted on its own CICM, and the NAM is responsible for routing calls. The calls are delivered to the service provider and to the appropriate customer's CICM. The individual customers run their own contact centers with their own Automatic Call Distributors (ACDs) connected to Peripheral Gateways at their own premises. The Peripheral Gateways, then are connected to their assigned CICMs at the service provider. The service provider owns and hosts the NAM and all the CICMs, but individual customers own and host all the ACDs. The Peripheral Gateways for those ACDs are owned by the service provider but are located at the customer's premises, next to the ACDs. The service provider does not necessarily operate any ACDs of its own. Those Peripheral Gateways can be connected to a CICM that is assigned to the service provider, or they can be connected to the NAM.

For ICM scripting, all incoming calls initially invoke an appropriate NAM routing script that has the primary responsibility of identifying the appropriate target customer. After NAM, these actions identify the appropriate target customer:

- The script delegates control to a routing script that is running on that customer's CICM.
- The CICM-based routing script selects the appropriate ACD to which to deliver the call, and it can return the necessary translation route label to the NAM.
- The NAM instructs its routing client to deliver the call to the designated target ACD. If the CICM routing script determines that no ACD can currently take the call or that it cannot yet identify which ACD should take the call, it can ask the NAM to place the call into queue at a Service Control VRU.
- The CICM routing script issues Network VRU Script requests through the NAM to that VRU until a routing decision is made.

Many hosted customers use this topology to get more calls or more Peripheral Gateways through their ICM setup. Other customers use CICMs, not for customer contact centers, but for external customers. In these situations, the NAM might handle the same number of calls as the CICM, and the CICM machines might be located far away from the NAM. Also, the NAM and CICM architecture was designed at a time when all contact centers ran on TDM-based ACDs. The addition of VoIP routing and ACDs based on Unified CM (that is, Unified CCE) with direct agent routing made matters more complicated.

Unified CVP in Hosted Environments

When Unified CVP is in hosted environment, it is used as a self-service or queuing platform connected to the NAM and physically located within the service provider's data center. Unified CVP enables a service provider to not only to route calls to the appropriate customer-owned ACDs but also to retain control of calls that are queued for those ACDs and to provide either basic prompt-and-collect capability or full-featured self-service applications to its customers. The latter situation typically incorporates VXML Servers into the network. Depending on the customer's needs, the service provider may host the VXML Servers or the customer may host them. The service provider also may write and own the self-service application, or the customer may

write and own them. Allowing the customer to own or host the VXML Servers is a convenient solution when the self-service application needs to reference back-end services. This solution allows the customer to retain control of that interaction within its own enterprise network while transmitting only VoiceXML over HTTP to the service provider's VoiceXML Gateway.

In many hosted environments, when the service provider is a PSTN carrier, all of the actual call routing occurs through an ICM NIC. These deployments are similar to Model #4b: VRU Only with NIC Controlled Pre-Routing (See Model #4b: VRU-Only with NIC Controlled Prerouting, on page 7). The same situation applies if a Peripheral Gateway is being used to route calls using (typically) the ICM NIC. However, quite often the service provider does not have a NIC interface at all, and all calls arrive through TDM interfaces, such as T3 or E3. In those cases, Unified CVP is used as the Switch leg as well as the VRU leg. This situation is similar to Model #3a: Comprehensive Using ICM Micro-Apps (See Model #3a: Comprehensive Using ICM Micro-apps) or Model #3b: Comprehensive Using VXML Server (See Model #3b: Comprehensive Using VXML Server, on page 6).

Hosted Environment Unified CVP Placement and Call Routing

If Unified CVP is used in a valid Network VRU, it is connected at the NAM. However, various requirements might cause Unified CVP to be placed at the CICM level or in addition. Use the following guidelines when considering where to place Unified CVP components:

- If you place Unified CVP at the NAM, and Unified CVP handles both the Switch leg and the VRU leg, use the Correlation ID transfer function. The SendToVRU node may be executed by either the NAM or the CICM routing script. (The RunExternalScript nodes should also be in the same script that executed the SendToVRU.)
- If you place Unified CVP at the NAM and a NIC handles the Switch leg while Unified CVP handles the VRU leg, either the Correlation ID transfer function or the Translation Route transfer function may be used, depending on the capabilities of the NIC. (See Model #4a: VRU Only with NIC Controlled Routing, Model #4a: VRU-Only with NIC Controlled Routing, on page 6). In this case, the following guidelines also apply:
  - If you use Correlation ID transfer, then the SendToVRU node may be contained in either the NAM or the CICM routing script. (The RunExternalScript nodes should also be in the same script that executed the SendToVRU.)
  - If you use Translation Route transfer, then the TranslationRouteToVRU node, and all RunExternalScript nodes must be in the NAM routing script. The assumption here is that the call is queued (or treated with prompt-and-collect) before the particular CICM is selected. This configuration does not facilitate queuing. However, this configuration can be useful for service providers who want to offer initial prompt-and-collect before delegating control to the CICM.
- If you place Unified CVP at the CICM, and a NIC handles the Switch leg while Unified CVP handles the VRU leg, only the Translation Route transfer method can be used. The TranslationRouteToVRU node, together with all RunExternalScript nodes, must be in the CICM routing script.

Adding calls initiated by Unified CM or an ACD creates additional constraints. Both of these devices are considered ACDs from the ICM perspective, and they are connected at the CICM level. Assuming these are new calls (as opposed to continuations of existing calls), the route request comes from the ACD and the resulting label is returned to the ACD. Neither Unified CM nor any ACD can send a Correlation ID upon transfer. You can only use the Translation Route transfer method. This limitation also implies that the transfer destination (for example, Unified CVP) must also be connected at the CICM level, and not the NAM level.

If the calls are not new but continuations of existing calls, then they are attempts to transfer an existing inbound caller from one agent to another agent. The customers may want these transfers to be either blind network transfers or warm consultative transfers. The following guidelines apply to these transfers:

- Blind network transfers

  If the original call is introduced to the NAM through a NIC or Unified CVP Switch leg, the transfer label is passed from the CICM to the NAM to the original Switch leg device. Blind network transfers have two subcases:

  - If the Switch leg device is Unified CVP or a NIC that can handle Correlation ID, the Correlation ID transfer function can be used. The SendToVRU node and all RunExternalScript nodes must be incorporated in the CICM routing script. The Unified CVP VRU leg can be connected to the NAM. This combination of blind transfer with Correlation ID transfer is suitable for Unified CVP.
  - If the Switch leg device is a NIC that cannot handle Correlation ID, then the Translation Route transfer method must be used, which further implies that the Unified CVP VRU leg device must be connected to the CICM.

  

  Note In this situation, the customer may need to deploy additional dedicated Unified CVP Call Servers at the CICM level because the NAM-level Unified CVP Call Servers cannot be used.

- Warm consultative transfers

  Unified CVP provides warm consultative transfers only in the case of Unified CCE agents transferring calls to other Unified CCE agents, where Unified CVP owns the initial Switch leg for the inbound call. For TDM agents, the ACD functions are used and Unified CVP is not involved. When the incoming calls to Unified CCE agents arrive through a NIC, the Unified ICM Network Consultative Transfer facility is used and not Unified CVP.

  In the one supported case where Unified CVP owns the initial Switch leg and the transfer is among Unified CCE agents, the Translation Route transfer method must be used because Unified CM cannot handle Correlation ID transfers. The Unified CVP VRU leg device must be connected to the CICM.

Note In this situation, the customer may have to deploy additional dedicated Unified CVP Call Servers at the CICM level because the NAM-level Unified CVP Call Servers cannot be used.

Network VRU Type in Hosted Environment

In a hosted environment, there are two types of ICM systems, the NAM and the CICM. Network VRU types are configured differently in the NAM and CICM.

The NAM gets new calls either from the NIC or from Unified CVP, and is aware of the Unified CVP VRU leg device. The NAM Network VRU types must be configured exactly as an independent ICM, operating with those devices. You can ignore that the transfer labels sometimes come from CICM when configuring Network VRU types. CICM sees new calls that arrive from the Intelligent Network Call Routing Protocol (INCRP) NIC.

All of the dialed numbers that arrive from the NAM must be associated with a Customer Instance that is associated with the corresponding Network VRU on CICM. Associate that Network VRU with all VRU scripts, and provide the same label that you need in the NAM Network VRU definition, but with the INCRP NIC as its routing client. No peripherals have Network VRUs configured.

For more information on Network VRU Type support, see the *Configuration Guide for Cisco Unified Customer Voice Portal* at http://www.cisco.com/en/US/products/sw/custcosw/ps1006/products_installation_and_configuration_guides_list.html.

Unified CM, ACD Call Deployment Models, and Sizing Implications

The information in this section applies to ACDs and Cisco Unified Communications Manager (Unified CM) integrations that use Unified CVP instead of Cisco IP IVR for queuing. If Unified CVP is considered, these devices share the following characteristics:

- Manage agents, and can be destinations for transfers.
- Can issue Route Requests, and can be Switch leg devices.
- Although they can be Switch leg devices, they cannot handle more than one transfer and they might not be able to handle the Correlation ID.

A Unified CM or ACD user issues a Route Request for one of the following reasons:

- To be connected to another agent in a particular skill group
- To reach a self-service application
- To blind-transfer a previously received call to one of the above entities

A Unified CM user might also issue a Route Request for one of the following reasons:

- To deliver a successful outbound call from the Unified ICM Outbound dialer to a self-service application based on Unified CVP
- To warm-transfer a call that the user had previously received to either a particular skill group or a self-service application

Each of the above calls invokes an Unified ICM routing script. The script searches for an available destination agent or service and if an appropriate destination is found, it sends the corresponding label either back to the ACD or, if blind-transferring an existing call, to the original caller's Switch leg device. If it needs to queue the call or if the ultimate destination is intended to be a self-service application rather than an agent or service, the script sends a VRU translation route label either back to the ACD or, if transferring an existing call through blind-transfer, to the original caller's Switch leg device.

If the above sequence results in transferring the call to Unified CVP's VRU leg device, a second transfer is done to deliver it to a VoiceXML gateway. To ensure that these events take place, the following Unified ICM configuration elements are required:

- For new calls from the ACD or warm transfers of existing calls:
  - Configure the Unified CVP peripheral to be associated with a Type 10 Network VRU.

- Associate the dialed number that the ACD dialed with a Customer Instance that is associated with a Type 10 Network VRU.
- When an ACD is not configured Unified CM, the routing script that is invoked by the ACD dialed number must contain a TranslationRouteToVRU node to get the call to Unified CVP's Switch leg, followed by a SendToVRU node to get the call to the VoiceXML gateway and Unified CVP's VRU leg.
- The routing script that is invoked by Unified CM should use a SendToVRU node to send the call to Unified CVP using the Correlation ID. The Type10 VRU performs an automatic second transfer to the VoiceXML gateway VRU leg.
- Associate all the VRU scripts that are executed by that routing script with the Type 10 Network VRU.

- For blind transfers of existing calls:
  - The Unified CVP peripheral can be associated with any Network VRU.
  - The dialed number that the ACD dialed must be associated with a Customer Instance that is associated with a Type 10 Network VRU.
  - The routing script that is invoked by the ACD dialed number must contain a SendToVRU node to send the call to the VoiceXML gateway and Unified CVP's VRU leg.
  - All the VRU scripts that are executed by that routing script must be associated with the Type 10 Network VRU.

When Unified ICM chooses an agent or ACD destination label for a call, it tries to find one that lists a routing client that can accept that label. For calls originated by an ACD or Unified CM that are not blind transfers of existing calls, the only routing client is the ACD or Unified CM, after the call is transferred to Unified CVP, because of the handoff operation, the only routing client is the Unified CVP Switch leg. However, in the case of blind transfers of existing calls, two routing clients are possible:

- The Call Server switch leg that delivered the original call.
- The ACD or Unified CM. For calls that originate through Unified CVP, you can prioritize Unified CVP labels above ACD or Unified CM labels by checking the **Network Transfer Preferred** check box in the **Unified ICM Setup** screen for the Unified CVP peripheral.

When using Unified CVP for network transfers, an agent blind-transfers the caller to a new destination with the Network Transfer Preferred option. In this scenario, the agent uses CTI Agent Desktop (and not the phone itself) to invoke the transfers. In addition to the CTI Agent Desktop, the Agent uses the Unified ICM Dialed Number Plan. If configured with the same DN as the CTI Route Point, the Unified ICM Dialed Number Plan causes Unified ICM to intercept the transfer and run the Unified ICM routing script without sending the transfer commands to Unified CM through JTAPI. When the Unified ICM script returns a label, that label is used for the Network routing client (Unified CVP), and the caller is sent directly to the new destination. This configuration avoids a timing problem that can occur if an agent uses Unified CM CTI Route Points to initiate a network transfer.

Third-Party VRU

A third-party TDM VRU can be used in any of the following ways:

- As the initial routing client (using the GED-125 Call Routing Interface)
- As a VRU (using the GED-125 Call Routing Interface)
- As a Service Control VRU (using the GED-125 Service Control Interface)

In the first and second operations, the VRU works as an ACD, as described in *Unified CM and ACD Call Deployment Models, and Sizing Implications*. Similar to ACD, the VRU can be a destination for calls that arrive from another source. Calls can even be translation-routed to such devices to carry call context information. (This operation is known as a traditional translation route, not a TranslationRouteToVRU). Also like an ACD, the VRU can issue its own Route Requests and invoke routing scripts to transfer the call to subsequent destinations or even to Unified CVP for self-service operations. These transfers almost always use the Translation Route transfer function.

In the third operation, the VRU replaces either Unified CVP's Switch leg or Unified CVP VRU leg, or it can also replace Unified CVP. Such deployments are beyond the scope of this document.

DS0 Trunk Information

Through Unified CVP, Unified ICM passes the gateway trunk and DS0 information from the arriving SIP call.

PSTN gateway trunk and DS0 information received at ICM has the following purposes:

- Reporting
- Routing in the Unified CCE Script Editor where TrunkGroupID and TrunkGroupChannelNum information is available for routing decisions.

Following message is used in the examples:

The PSTN trunk group data comes from the PSTN Gateway in the SIP INVITE as shown:

```
Via: SIP/2.0/UDP
192.168.1.79:5060;x-route-tag="tgrp:2811-b-000";x-ds0num="ISDN 0/0/0:15
0/0/0:DS1 1:DS0";branch
```

The following logic is used in Unified CVP to parse and pass the PSTN trunk group information to Unified ICM:

- For TrunkGroupID, look for **tgrp:** in the **x-route-tag** field.
  - If **tgrp:** found **TrunkGroupID=value after tgrp:**> + <**data between ISDN and :DS1 tags**>· Using the above example: **TrunkGroupID = 2811-b-000<space>0/0/0:15 0/0/0.**
  - TrunkGroupID = <**IP addr of originating device in Via header**> + <**data between ISDN and:DS1 tags**>

    Using the above example: **TrunkGroupID=192.168.1.79<space>0/0/0:15 0/0/0.**

- For TrunkGroupChannelNum, look for **DS0** in **x-ds0nun** field.
  - If found, **TrunkGroupChannelNum** = <**value before the :DS0**>· Using the above example: **TrunkGroupChannelNum = 1**
  - **TrunkGroupChannelNum** = <**max int value**> to indicate we did not find the DS0 value.

    Using the above example: **TrunkGroupChannelNum = Integer.MAX_VALUE (2^31 - 1)**

Trunk Utilization Routing and Reporting

Through the Trunk Utilization feature, a gateway is used for real-time Unified CVP routing and Unified ICM reporting and scripting. A gateway pushes the status of memory, DS0, DSP, and CPU to Unified CVP. Because this feature uses a push method to send resource data to Unified CVP, resources are monitored more closely and failover can occur faster when a device goes down or is out of resources.

This feature has the following characteristics:

- Each gateway can publish an SIP OPTIONS message with CPU, Memory, DS0, and DSP information to Unified CVP every three minutes when operation conditions are normal on the gateway.
- The push interval is configurable through the Cisco IOS CLI on the gateway.
- If a high watermark level is reached, the gateway sends the SIP OPTIONS message immediately with an **Out-Of-Service = true** indication, and does not send another OPTIONS message until the low watermark level is reached with an **Out-Of-Service = false** indication.
- Up to five Resource Availability Indication (RAI) targets can be set up on the gateway.

Trunk Utilization Routing can also be used to update trunk group status in the Unified CCE router. A PSTN call (through the ICM script) can query the router with a preroute from a NIC to use the available ingress gateway for the post route to Unified CVP.

Note DS0 is the data line that provides utilization information about the number of trunks free on a gateway.

Gateway Trunk Utilization with Server Group Pinging Combination

When you combine the Server Group element polling feature with the Cisco IOS Gateway trunk utilization feature, your solution has faster failover for high availability call signaling.

Deployment Considerations

- For Proxy Server deployment with CUSP:
  - Configure TDM originating gateways for resource allocation indication-targets (RAI-targets) to provide status in OPTIONS message to primary and secondary Unified CVP Call Servers, for reporting purposes. The data is used for reporting, and not routing so the data needs to be sent to Call Servers that have reporting enabled.
  - Configure primary and secondary CUSP proxy servers with Server Groups pinging to Unified CVP, VXML Gateways, and Unified Communications Manager elements.
  - Configure Unified CVP with Server Group that pings to both primary and secondary CUSP proxies for outbound calls.
- For a non-proxy deployment:
  - Configure TDM originating gateways for RAI-targets to provide status in OPTIONS message to primary and secondary Call Servers. Unified CVP can handle the messages for both reporting and

routing purposes. If used for routing, then the gateway must be in a server group by itself on Unified CVP.

- Configure Unified CVP with Server Groups that pings to Unified CVP, VXML Gateways, and Unified Communications Manager elements for outbound calls.
- Configure VXML gateways for RAI-targets to provide status in the OPTIONS message to primary and secondary Call Servers.

- Configure the Unified CVP Call Servers to send the same hostname in the contact header of OPTIONS requests to the gateways. This process enables a single RAI-target to be configured to all Call Servers and is important because the limit is five targets. The parameter to set is called Options Header Override.

Note See the Cisco IOS documentation for guidelines on the high and low watermark settings.

Limitations:

- RAI is not supported on Proxy Servers.

  CUSP servers do not handle the RAI header of OPTIONS messages, so they do not mark the status of elements with that information. If VXML Gateways are down, Unified CVP may send the call using the proxy, because the proxy does not handle incoming RAI headers in OPTIONS. It is possible to use a local static route scheme on Unified CVP to send all calls to the proxy except the Voice XML Gateways calls to create a server group for Voice XML Gateways and take advantage of RAI updates for routing.

Enhanced User-to-User Information

User-to-user information (UUI) is the data provided using ISDN Supplementary Services as user-to-user services. The UUI feature enables the information transfer between calling and called ISDN numbers during call setup and call disconnect with up to 128 octets of data for each message.

For calls involving Unified CVP transfers or disconnects, you can use the UUI feature to pass ISDN data provided from the PSTN, in the GTD, to the Unified ICM router, and then from Unified ICM to third-party ACDs.

The Ingress and Egress Gateways can use application specific data in the UUI field for use in CTI applications and for better third-party ACD integration.

For example, you can capture data from an external system (such as caller-entered digits from a third-party IVR) and pass that data to Unified ICM on a new call.

Unified CVP can send UUI in hex-encoded format on the outbound direction of Unified CVP, for example to the agent or even to the IVR.

While UUI is ISDN data, Unified CVP and the gateways support tunneling the ISDN data in SIP messages on the VoIP side. The data can be encapsulated in the content body of the SIP message in a Generic Type Descriptor (GTD) content type.

RTP media port and codec information is defined as a SDP body type, but the ISDN data is encapsulated in a Generic Type Descriptor body type by the Cisco IOS Gateways. When both RTP and ISDN data are sent to Unified CVP through the TDM Gateway, both body types are sent in a multipart and mixed mime type, that includes both SDP and GTD parts.

The following configuration in the gateway is required to enable the enhanced UUI feature:

```
voice service voip
        signaling forward unconditional
```

Manipulating UUS Field

You can set UUI by ICM scripts and extract it by Unified CVP to be resent in SIP messages.

UUI processing scenarios:

- When GTD (generic type descriptor) data is present in the inbound call leg of the SIP INVITE message in the mime body format for GTD, Unified CVP saves the GTD data as inbound GTD and the UUI portion (if present) is passed to Unified ICM.

  This GTD format is supported by the Cisco IOS gateways on outbound VoIP dial peers with SIP transport.

  If Unified ICM modifies the data, it sends the modified UUI back to Unified CVP. Unified CVP converts the UUI data it receives from Unified ICM into hex, modifies the UUS (if it is present), and overwrites the inbound GTD value. Only the UUS portion is modified, using the format:

  ```
  UUS,3,<converted Hex value of data from ICM>
  ```

  The rest of the GTD parameter values are preserved, saving the values as they arrived from the caller GTD.

- When GTD is not present in the inbound call leg, Unified CVP prints an informational message on the trace stating No GTD Body present in Caller Body, and the call continues as a regular call.

Note

- The modified UUI from Unified ICM is passed using the *user.microapp.uui* ECC variable, or the *Call.UsertoUserInfo* variable.
- If you use both variables, *Call.UsertoUserInfo* variable takes precedence.

Modified GTD is set in the outbound INVITE mime body from CVP SIP B2BUA, which includes IP originated callers as well as TDM callers. If a DTMF label for outpulse transfer is received on a connected call, then the BYE message is sent with the GTD only if UUI is passed by Unified ICM. The BYE message is sent immediately after the SIP INFO with DTMF.

Using UUI

Extract the UUI in your Unified ICM Script by looking at the *user.microapp.uui* Call ECC variable and the *Call.UserToUserInfo* variable, such as in the IF node. By using the SET node on either one of these variables, the variable can be set on the outbound direction of the call.

Setting *Call.UserToUserInfo* variable takes precedence over using the ECC variable.

Note Unified CVP sends a BYE message on the DTMF label only if UUI is received from Unified ICM.

If a BYE message is received, then the GTD from the received BYE is used to send it on the other leg.

Configure the Ingress Gateway with signaling forward unconditional, as in the following example, so that GTD with UUI and UUS are forwarded on the VoIP side.

Using UUI

```
voice service voip
        signaling forward unconditional
```

REFER, 302 Redirects, and UUI

If you configure UUI in the Unified CCE script, and if you use a REFER call flow, then the UUI is placed in a mime body and hex-encoded according to an ATT IP Toll Free NSS format. This placement of UUI also applies to 302 redirect responses.

Example of NSS Mime Body Format for UUI in REFER / 302 Messages

```
VER,1.00
PRN,t1113,*,att**,1993
FAC,
UUS,0,(hex encoded UUI string here)
```

Design Considerations

You cannot use the UUI data transfer feature with Hookflash or Two B Channel Transfer (TBCT).