



## **Cisco Webex CCE Routing Controls Service Developer Guide and Best Practices**

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# CHAPTER 1

## Introduction

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- [Document Purpose, on page 1](#)
- [History, on page 1](#)
- [Routing Controls Overview, on page 1](#)

## Document Purpose

This document provides the technical details required to configure and operate the Routing Controls Application Gateway Service and best practices for efficient use of Routing Controls Application Gateway Service. The document is divided into the following sections:

- **Architecture**
  - A description of the Routing Controls Application Gateway Service solution.
- **Developers Guide**
  - The ICM script writer's user guide to access the Application Gateway and the various query types that are supported by Application Gateway

## History

Prior to this version, Routing Controls was a standalone portal running under JBoss Portal Server and the Routing Controls Application Gateway component was installed as Windows Service communicating with ICM Application Gateway Service using socket

## Routing Controls Overview

The Webex CCE Administration Portal:

- Allows Route Controls management
- Extends all its already existing features to Route Controls
  - Active Directory Integration
  - User Profile Management
  - Access Control
  - Role & Feature Management
  - Audit on Route Control changes

The Routing Controls Application Gateway is re-architected, re-designed and re-developed in Java. The Routing Controls App Gateway service is now deployed in the Webex CCE Administration Portal Support Server under WildFly.

The Routing Controls Application Gateway service integrates with the ICM through a custom Application Gateway that connects to the ICM's application gateway service. The ICM Console affects changes in scripts primarily by changing the values of ICM user variables that may be associated with Skill Groups or Peripherals (Sites).





# CHAPTER 2

## Architecture

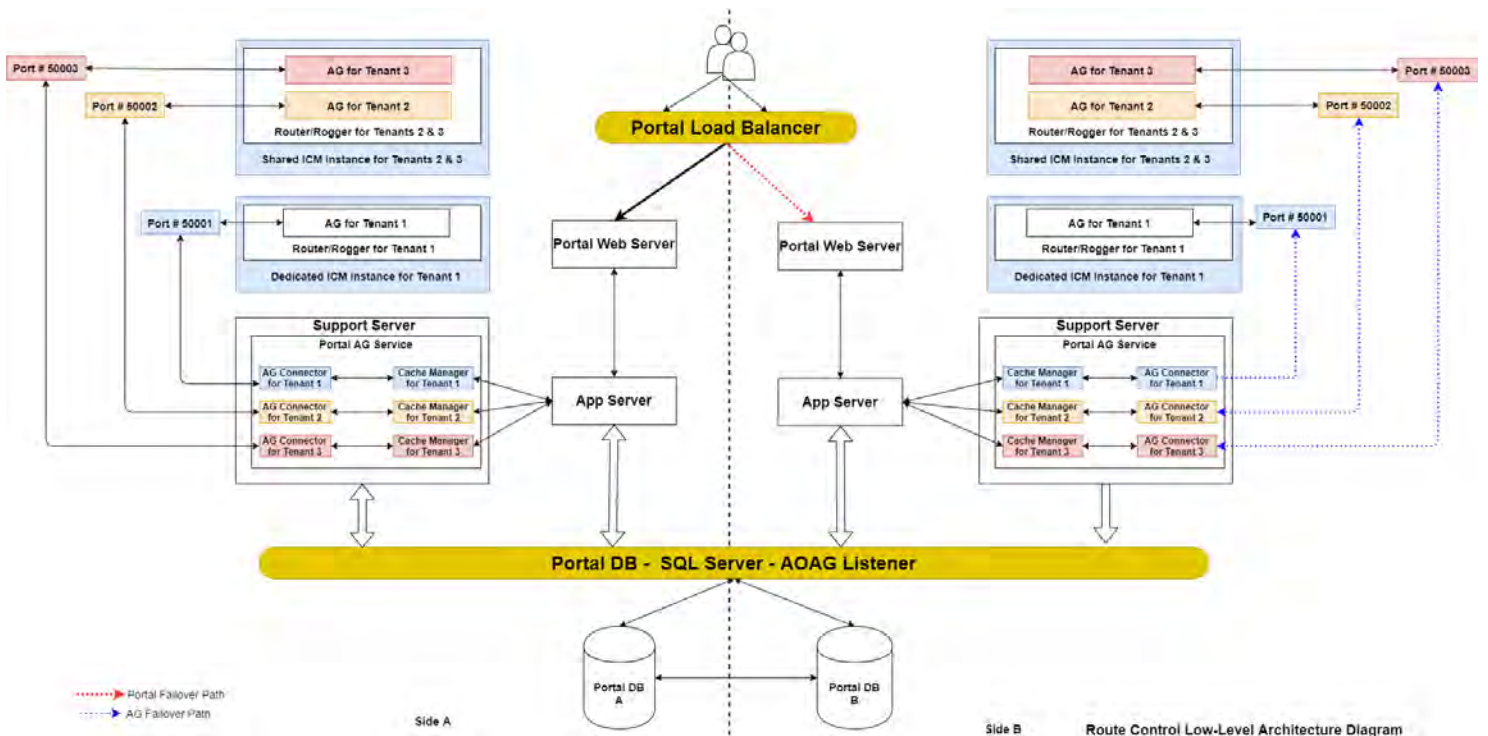
- [Architecture Diagrams, on page 1](#)
- [Application Architecture, on page 3](#)

## Architecture Diagrams

The following diagrams provides an overview of the Routing Controls Application Gateway Service Architecture for various implementations.

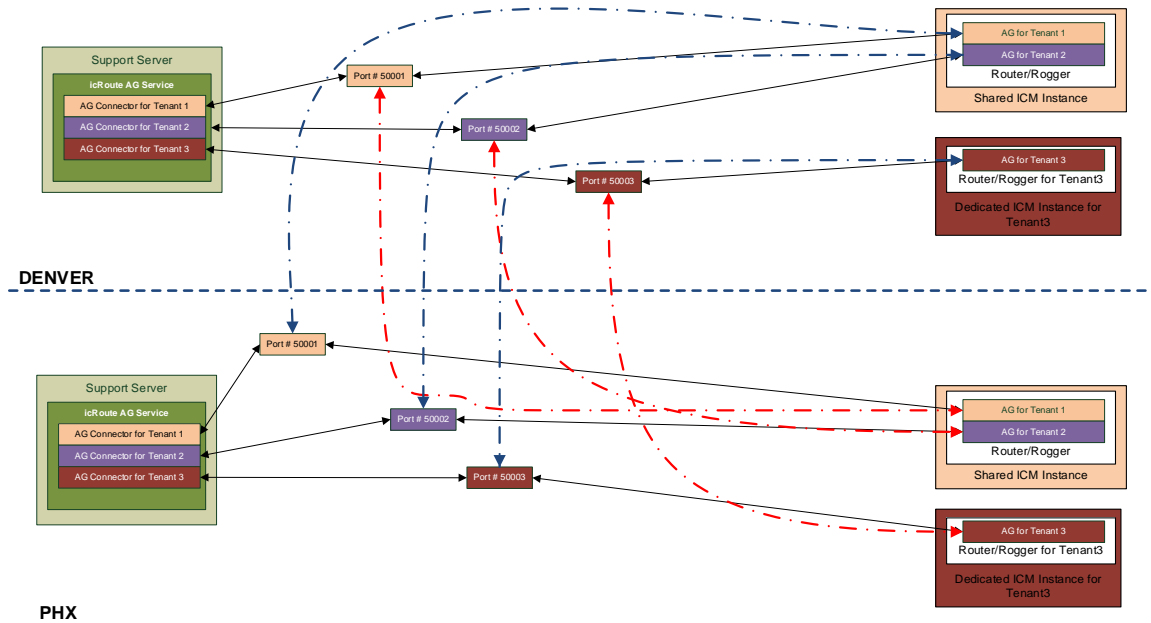
### Cloud Architecture

#### Low-Level



For every tenant in the Shared UCCE instance (SCC) must have its own Application Gateway Setting.

## Failover Architecture



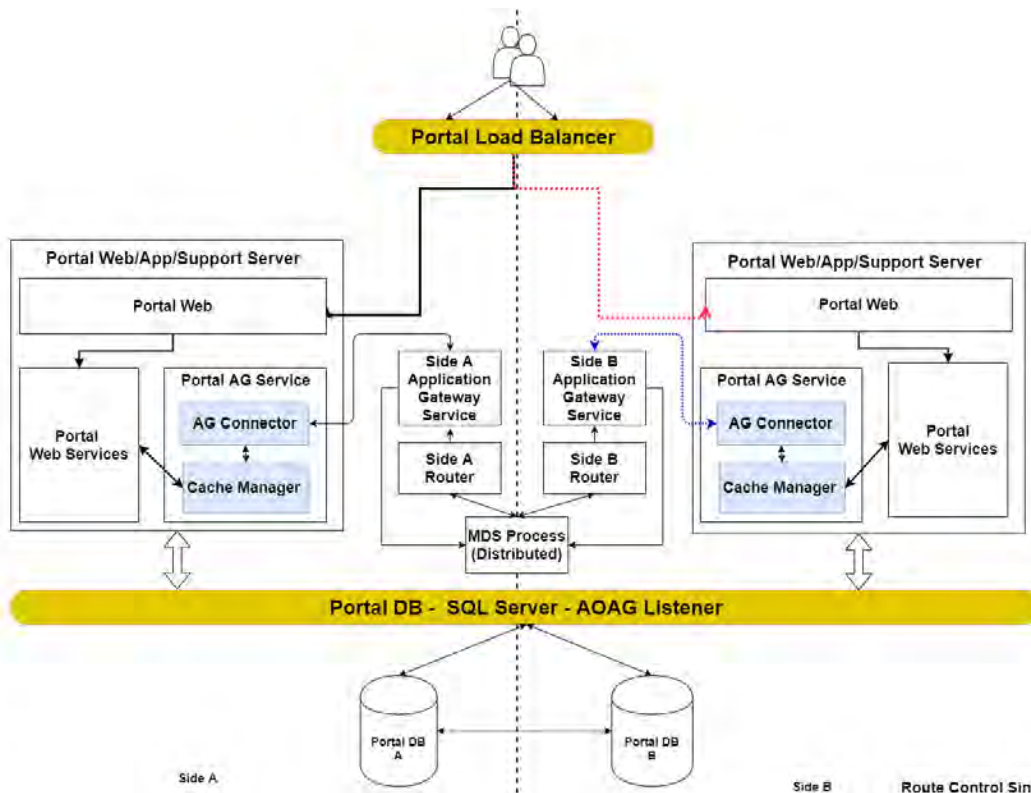
## Routing Controls AG Failover Behavior

Scenario				Resulting failover behavior				Remarks
Routing Controls AG Side A	ICM Side A AG Service	Routing Controls AG Side B	ICM Side B AG Service	Routing Controls AG Side A	ICM Side A AG Service	Routing Controls AG Side B	ICM Side B AG Service	
UP	UP	UP	UP	ACTIVE	ACTIVE	IDLE	IDLE	As the Preferred Side Setting in App Gateway setting is set to Side A, Side A will be active, and Side B will be idle
DOWN	DOWN	UP	UP	DOWN	DOWN	ACTIVE	ACTIVE	
DOWN	DOWN	DOWN	UP	DOWN	DOWN	DOWN	IDLE	Routing Controls Side B AG will be waiting for ICM to connect
UP	DOWN	UP	UP	IDLE	DOWN	ACTIVE	ACTIVE	
UP	DOWN	UP	UP	ACTIVE	DOWN	ACTIVE	IDLE	Taking ICM Side B AG Service down and putting it back will make the ICM Side B AG Service to Routing Controls AG Service Side A
DOWN	DOWN	UP	UP	DOWN	ODWN	ACTIVE	ACTIVE	
DOWN	UP	UP	UP	DOWN	IDLE	ACTIVE	ACTIVE	
ODWN	UP	UP	UP	DOWN	ACTIVE	IACTIVE	IDLE	Taking the ICM Side B down and putting it back will make the ICM Side A AG Service to connect to Routing Controls Side B AG Service.
UP	UP	DOWN	UP	ACTIVE	ACTIVE	DOWN	IDLE	
UP	UP	DOWN	UP	ACTIVE	IDLE	DOWN	ACTIVE	Taking the ICM Side A down and putting it back will make the ICM Side B AG Service to connect to Routing Controls Side A AG Service

## Routing Controls Premise Architecture(s)

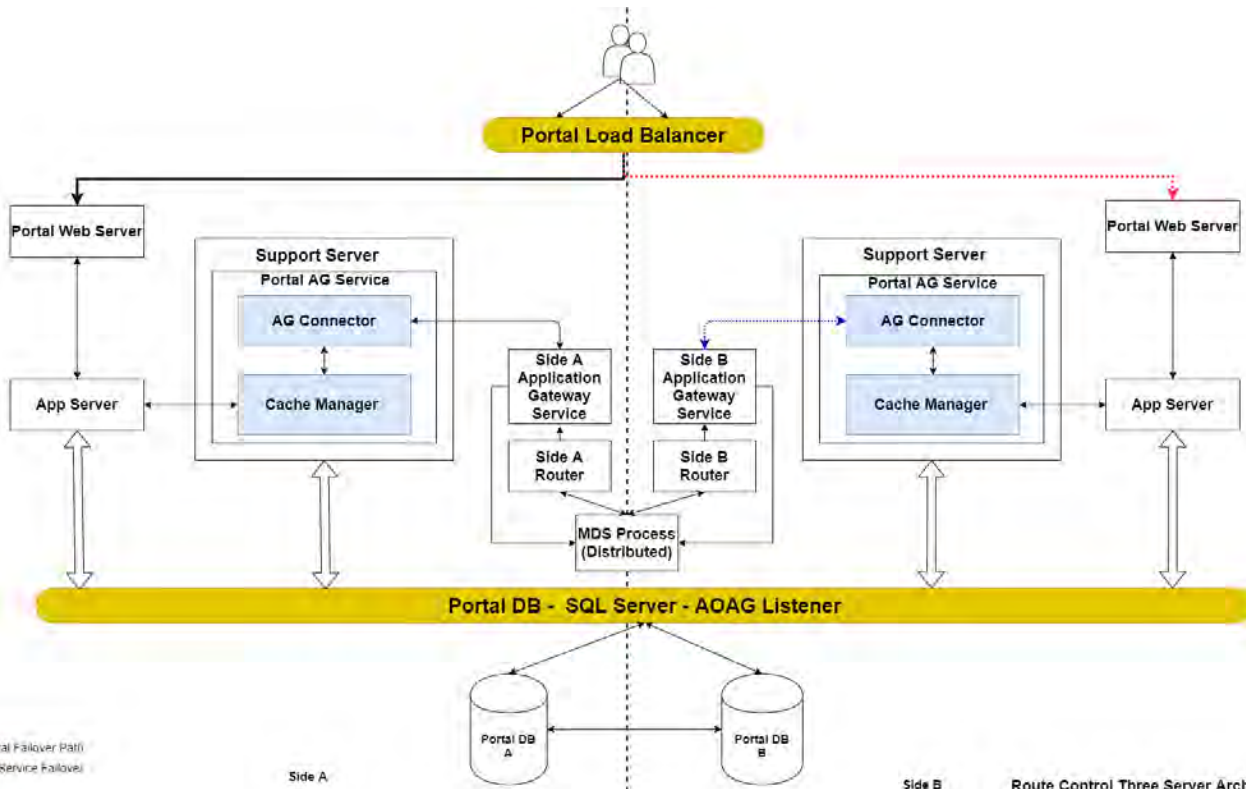
### Single Server on each side





Side B Route Control Single Server Architecture Diagram

### Three Server on each side



Side B Route Control Three Server Architecture Diagram

# Application Architecture

## Webex CCE Administration Portal

Webex CCE Administration Portal was enhanced to support Routing Controls within the portal. In

Portal, new Object Type called “Route Controls” and new Global Navigation Link “Route Controls” was added. The “Route Controls” allows to manage Route Controls. Please refer to the Webex CCE Administration Portal User Guide for more information.

Whenever a new Routing Control is created, modified, or deleted, the cache that was previously loaded into the memory also gets updated on both sides of the Routing Controls App Gateway service.

## Routing Controls AG Service

This is a MBean Service and deployed under Wildfly in the Webex CCE Administration Portal Support Server. This service is responsible for:

- This is the core service which communicates with ICM using the Cisco ICM Application Gateway Interface Protocol (aka GED-145 Protocol).
- Gets the AG config data from APM in the Webex CCE Administration Portal Database
- Starts the AG Server
  - Starts the Cache Manager
    - It uses the EHCACHE API ( <http://ehcache.org> ) to cache the Control information
    - Separate Cache Placeholders for every program and for every category (see below) of controls.
      - ScheduleControlsCache - which includes only the ControlType: Schedule
      - DateTimeControlsCache - which includes only the ControlType: DateTime
      - DateTimeRangeControlsCache - which includes only the ControlType: DateTimeRange
      - TableControlsCache - which includes only the Table Control Type
      - SimpleControlsCache - which includes all other control types
  - Starts the AG Client Connector Thread
    - Opens up the Server Socket
    - Listens/Accepts request messages from ICM
    - Spawns new thread to process every request message that comes from ICM
    - Process the ICM request messages and responds back to ICM
      - Parse the input variables in the query Request message
      - Calls the WS on Routing Controls AGWS and request the WS either to use cache or go to database based on the prior communication between the icAppsCache and Routing Controls AGService.
        - If Caching is Enabled (runtime value), then it retrieves the Route Control information from the Cache
        - If Caching is disabled, then it retrieves the Route Control information from the database
      - Builds the response message based on the control information and writes back into the socket to ICM
      - Calls the stored procedure to update the controls status in the database
- Provides ways to start/stop/restart the AG service

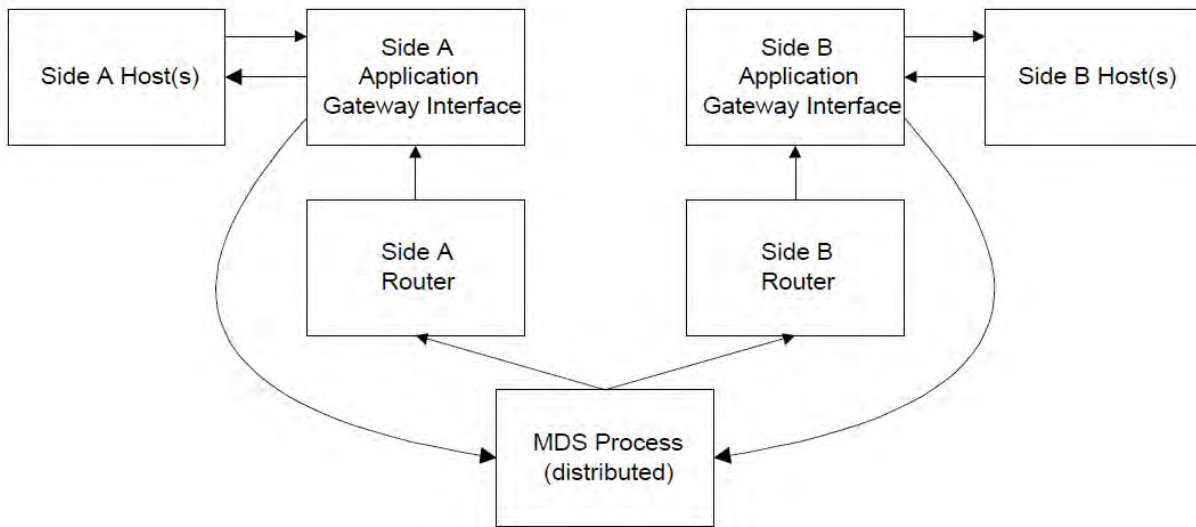
## Webex CCE Administration Portal Database

The tables related to Routing Controls are maintained within the Webex CCE Administration Portal database. Both the app servers and the Routing Controls App Gateway Service points to the same database server (primary). SQL Server AAOG is set up to replicate the data between the redundant database servers.

## ICM Router Based Components

### Application Gateway Server

The ICM Application Gateway is a feature available from Cisco to allow the ICM to integrate with external systems. The Application Gateway runs as a separate process on the ICM router. In a redundant configuration the ICM Application Gateway should be configured for hot standby mode. This ensures that the requests are normally sent to the preferred application gateway (normally the A side). The secondary side only receives requests while the preferred side is not accessible. The ICM Console AG Service is designed to disable itself when it encounters a database issue that causes a failover to the secondary AG.



### Administrative Scripts

The Routing Controls are used to set ICM Skill Group, Global, and Peripheral user variables. The setting of these ICM variables is performed by the Administrative Scripts. The Administrative Scripts are scheduled to run every 30 seconds, but this time can be varied depending on the responsiveness needs of the solution. When the Administrative Script runs, it assigns values to the call variables and then invokes the application gateway passing the call variables and requesting the results. The CDPD variable is used on the request to identify the desired query and on the return to identify the result of the query. Upon completing a query, the Administrative Script validates the returned data using built-in functions and assigns the returned values to the ICM Skill Group, Global, and Peripheral user variables.

### Variables

Routing Controls are used to set ICM routing variables. Normally these variables are user variables associated with a Skill Group or Peripheral. The site variables are normally associated with a peripheral, and skills at sites are associated with a Skill Group. Occasionally Global User Variables are employed to store variables that do not fit into the skill group or site model.

### Routing Scripts

The call routing scripts are designed to employ the variables set by the administrative scripts. For example, a peripheral variable may be used to indicate whether a site is open, and a skill group

variable may be used to indicate whether a skill at a site is open.



# CHAPTER 3

## Developer Guide

- [Types of Route Controls, on page 7](#)
- [Control Names Versus Control Identifiers, on page 8](#)
- [Query Types, on page 8](#)
- [Recommended Built-in Functions, on page 18](#)
- [Table Control Data and Usage in ICM Routing Scripts, on page 18](#)

## Types of Route Controls

The Routing Controls support several route control types. The Route Control types are:

Control Types	Purpose	Data Values	Display Values	Usable in IM / ISE
Switch	A flag to indicate on or off for a service. Typically used to control access to special routing services.	0 or 1	Off / On	Both
Switch Or Default	A flag to indicate open, close, or default for a service. Typically used to control access to special routing services.	0, 1, 2	Open / Close / Default	ISE
Throttle	A scalable factor used to indicate how open a site or service may be.	Integer in the range 0 to 200	Integer in the range 0% to 200%	ISE
Text	A text value.	String of characters up to 40 characters long.	String of characters up to 40 characters long.	ISE
Percentage	A percentage value.	Integer in the range 0 to 100	Integer in the range 0 to 100	ISE
Number	A numeric value.	Integer in the range 0 to 10,000,000	Integer in the range 0 to 10,000,000	ISE
Schedule	A schedule for a variable with a simple numeric value. This control type has 3 other additional	A schedule (by day)  When Intervals Enabled is turned on then this control	A schedule (by day and half hour) coupled with a simple numeric value (0 to 999,999)	Both (If Intervals Enabled, Throttle Enabled, or Switch Enabled options are

	<p>attributes: Intervals Enabled Switch Enabled Throttle Enabled The Intervals Enabled attribute is independent. It can be set to enabled or disabled.</p> <p>The attributes Switch Enabled and Throttle Enabled are toggle. Only one attribute can be enabled. If Switch is enabled, then the Throttle must be disabled and vice-versa. But both can be disabled.</p>	<p>allows to specify the schedule by day and half hour coupled with a simple numeric value (0 to 99,999)</p>	<p>When Switch Value is enabled, then Shift value can be either 0 (off) or 1 (on)</p> <p>When Throttle is enabled, then the Shift Value can be between 0 and 200</p>	<p>enabled, then it cannot be used in IM.)</p>
Date/Time	A specific date and time value	A string in the format YYYYMMDDHHMMSS	Jan 1, 2008 14:20:00	ISE
Date/Time Range	A pair of date and time values	A string in the format YYYYMMDDHHMMSS YYYYMMDDHHMMSS	Start: Jan 1, 2008 14:20:00 End: Jan 5, 2008 09:00:00	ISE
Table	A table of values with key field and up to 10 columns of related information.	Up to 40 characters per field. Fields are type specific. You can have unlimited number of rows.		IM (Table Control data is usable within ISE. Refer to section <a href="#">Table Control Data and Usage in ICM Routing Scripts</a> for more information.)

When a new route control is created through the Webex CCE Administration Portal the control type is identified. Once the route control is created, the control type cannot be changed.

## Control Names Versus Control Identifiers

Each Route Control has both a name and a code. The name is displayed primarily by the Webex CCE Administration Portal user interface and known to the end users. The ICM scripts refer to the Control Code and do not refer to the name. The separation of name and code allows the name to be changed easily without affecting the ICM script processing.

## Query Types

The application gateway supports several query types. The query type differs depending on the control types. The query types are:

Query Type	Purpose	Control Types
Simple (CDPD = 1)	Used to retrieve a simple value from the database with no additional processing.	Switch Switch or Default Throttle Text Percentage Number
Scheduled (CDPD = 2)	Used to retrieve a scheduled value from the database with potential ramp down processing.	Schedule
Multi (CDPD = 3)	Similar to the Simple query but allows the retrieval of up to 10 variables. NOTE: all variables must be of a single type.	Switch Switch or Default Throttle Text Percentage Number SimpleText
Date/Time (CDPD = 4)	Returns false ("0") if the passed date and time are earlier than the one stored in the Webex CCE Administration Portal DB. Returns true ("1") otherwise.	Date/Time
Date/Time Range (CDPD = 5)	Returns false ("0") if the passed date and time are earlier or equal to the lower bound or greater than the upper bound stored in the Webex CCE Administration Portal DB. Returns true ("1") otherwise.	Date/Time Range
TableQuery (CDPD = 7)	Used to retrieve the column values from the database for the given route control and for the given key column	Table

## Simple Query

The Simple Query has the following usage:

### Input Variables

Field	Value to be passed
CDPD	set to '1'
CED	Not used anymore. For the backward compatibility, the variable is not removed but the value is ignored by the Routing Controls App Gateway

	service.
<b>Variable 1</b>	Set to be the Control Code of the route control. (not the control display name) The Route Control's Type should be one of the following: Switch Switch Or Default Number Text Throttle Percentage

## Processing

The variable value is returned from the database. There is no special processing or data transformation performed.

## Output Variables

Field	Output Values
<b>CDPD</b>	Is used to return a status for the query. The value is 'OK' if the query succeeds or an error message if the query fails.
<b>Variable 1</b>	Set to be the value of the route control. (if the CDPD returned with an error message then this value is not valid and should not be used) The Route Control's Type should be Schedule

## Possible Errors

ERROR: MISSING\_VARIABLE\_1  
 ERROR: INVALID\_QUERY\_TYPE\_IN\_CDPD  
 ERROR: ERROR\_CONTROL\_NOT\_FOUND  
 ERROR: SYSTEM ERROR

## Scheduled Query

The Scheduled Query has the following usage:

### Input Variables

Make sure to set the correct number of variables turned on in the Send and Receive tab of the App Gateway Node.

Field	Value to be passed
<b>CDPD</b>	Set to '2'
<b>CED</b>	Not used anymore. For the backward compatibility, the variable is not removed but the value is ignored by the Routing Controls App Gateway service.
<b>Variable 1</b>	Set to be the Control Code of the route control



	(not the control display name)
<b>Variable 2</b>	The current router time in HHMMSS format. **
<b>Variable 3</b>	A ramp down time for the schedule in minutes from 0-59. This is only applicable for variables of the Scheduled Skill Variable Type
<b>Variable 4</b>	The current date in YYYYMMDD format. **
<b>Variable 5</b>	The day of the Week from 1-7 where Sunday is 1. **

*Note: The Router passes date and time to the eCCS to ensure that only the router's time is used in the processing.*

*\*\* these variables are best set with ICM built-in functions. See the section called [Recommended Built-in Functions](#).*

## Processing

The query identifies the route control and then identifies which schedule is applicable based on the date and day of week. The date is used for special schedules. A special date specific schedule will preclude a normal day or week schedule.

Once the schedule is identified the time of day is located in the schedule and the value is retrieved. For a Scheduled Skill Control Type the processing will continue to factor in the throttle value and a ramp down factor.

The ramp down factor is basically an automatic throttle on a variable when a schedule approaches within the range of the ramp down time of a closure point.

Time zone adjustment is based on the zone of the Central Controller versus the zone of the route control.

**Algorithm of processing the Control Schedule information is as follows:**

```
IntervalsBucketValue=" " ;
```

```
var1 = " " ; // currently staff
```

```
var2 = " " ; // percent open
```

```
var3 = " " ; // var value
```

```
if (IntervalsEnabled == true)
```

```
    IntervalsBucketValue = finds the interval bucketvalue based on the current time (as per control's time zone code)
```

```
    currentShiftCode = finds the current shift code based on the current time (as per control's time zone code)
```

```
IF (requestedTime not within any of the shift)
```

```
    then var1 = 0
```

```
        var2 = 0
```

```
        var3 = OffShiftValue
```

```
ELSE
```

```
    if (scheduleSwitchValueEnabled)
```

```
        if (scheduleSwitchValue equals to " 1" ) ( that is forced closed)
```

```

then set    var1=0 (forced closed)
           var2=0
           var3= ShiftValue
           else
             var2=100 // static value indicates 100%
             var3=ShiftValue
             if (IntervalsEnabled == true)
               var1 = intervalsBucketValue
             else
               var1 = " 1" (that is open)

           else if (sheduleThrottleEnabled)
             then var2 = (scheduleThrottleValue / 100) * rampDown;
             var3 = ScheduleThrottleValue (that is ShiftValue)
             if (IntervalsEnabled == true)
               var1 = IntervalsBucketValue
             else
               var1 = " 1"

           else (that is neither ScheduleSwitchValueEnable and nor
(scheduleThrottleEnabled))
             then var2 = " 100" static value indicates 100%
             var3 = ShiftValue
             if (intervalsEnabled)
               var1 = intervalsBucketValue;
             else
               var = " 1"

```

when two shifts are enabled:

```
var4 = 0800|1700|1400|2300|NONE|NONE|NONE|NONE
```

## Output Variables

**CDPD:** is used to return a status for the query. The value is 'OK' if the query succeeds or an error message if the query fails.

Variable 1, Variable 2 and Variable 3: The values returned in these fields will be based on the Criteria.

Criteria	Interval s Slider	Var1	Var2	Var3
<b>If requested time falls NOT within any of the shifts</b>		0	0	Off Shift Value
<b>If requested time falls in one of the shifts, and if the Schedule switch slider is turned ON and if the Switch Value=1 (Forced Closed)</b>		0	0	Shift Value
<b>If requested time falls in one of the shifts, and if the Schedule switch slider is turned ON and if the Switch Value =0 (NOT Forced Closed) and Intervals Slider is turned OFF</b>	OFF	1	100	Shift Value

<b>If requested time falls in one of the shifts, and if the Schedule switch slider is turned ON and if the Switch Value=0 (NOT Forced Closed</b>	ON	Interval Bucket Value	100	Shift Value
<b>If requested time falls in one of the shifts, and if the Schedule Throttle slider is turned ON</b>	OFF	1	<i>(schedule Throttle Value / 100) * rampDown;</i>	<i>Schedule Throttle Value (that is Shift Value)</i>
<b>If requested time falls in one of the shifts, and if the Schedule Throttle slider is turned ON</b>	ON	Interval Bucket Value	<i>(schedule Throttle Value / 100) * rampDown;</i>	<i>Schedule Throttle Value (that is Shift Value)</i>
<b>If requested time falls in one of the shifts, and if the Schedule Throttle slider is turned OFF and Switch Slider is turned OFF</b>	OFF	1	100	Shift Value
<b>If requested time falls in one of the shifts, and if the Schedule Throttle slider is turned OFF and Switch Slider is turned OFF</b>	ON	Interval Bucket Value	100	Shift Value

#### Variable 4

The open and close times for each shift separated by pipe ('|') characters. Each time is in HHMM format. If a certain time is not set, the word 'NONE' is returned. Four times are returned for shift 1 open, shift 1 close, shift 2 open, and shift 2 closes respectively.

**For example, if shift 1 opens at 7AM and closes at 2PM and shift 2 is not set the string returned would be '0700|1400|NONE|NONE|NONE|NONE|NONE|NONE'.**

#### Possible Errors

ERROR: MISSING\_VARIABLE\_1  
 ERROR: MISSING\_VARIABLE\_2  
 ERROR: MISSING\_VARIABLE\_3  
 ERROR: MISSING\_VARIABLE\_4  
 ERROR: INVALID\_QUERY\_TYPE\_IN\_CDPD  
 ERROR: INVALID\_DATE\_FORMAT\_IN\_VAR4  
 ERROR: INVALID\_TIME\_FORMAT\_IN\_VAR2  
 ERROR: INVALID\_RAMPDOWN\_VALUE\_PASSED\_IN\_VAR3  
 ERROR: GET\_SCHEDULE\_CONTROL\_INFO\_FAILED  
 ERROR: CONTROL\_NOT\_FOUND!  
 ERROR: DATA\_PROBLEM\_INVALID\_SHIFT\_CODE  
 ERROR: TIME\_ZONE\_CONVERSION\_PROBLEM  
 ERROR: SYSTEM\_ERROR

# Multi-Control Query

The Multi-Controls Query has the following usage:

## Input Variables

Field	Value to be passed
<b>CDPD</b>	set to '3'
<b>CED</b>	Not used anymore. For the backward compatibility, the variable is not removed but the value is ignored by the Routing Controls App Gateway service.
<b>Variable 1</b>	Set to be the Control Code of the route control (not the control display name) Only CDPD & Variable1 are a required
<b>Variable 2</b>	Set to be the control code of the route control
<b>Variable 3</b>	Set to be the control code of the route control
<b>Variable 4</b>	Set to be the control code of the route control
<b>Variable 5</b>	Set to be the control code of the route control
<b>Variable 6</b>	Set to be the control code of the route control
<b>Variable 7</b>	Set to be the control code of the route control
<b>Variable 8</b>	Set to be the control code of the route control
<b>Variable 9</b>	Set to be the control code of the route control
<b>Variable 10</b>	Set to be the control code of the route control

*Notes:*

*Make sure to set the correct number of variables turned on in the Send and Receive tab of the App Gateway Node.*

*Make sure the number of controls that you are passing matches with the Send Variables in the Application Gateway Node.*

## Processing

The control values are returned.

## Output Variables

Field	Output Values
<b>CDPD</b>	Is used to return a status for the query. The value is 'OK' if the query succeeds or an error message if the query fails.
<b>Variable 1</b>	Set to be the value of the control that was passed in Variable 1 of the input.
<b>Variable 2</b>	Set to be the value of the control that was passed in Variable 2 of the input.
<b>Variable 3</b>	Set to be the value of the control that was passed in Variable 3 of the input.
<b>Variable 4</b>	Set to be the value of the control that was passed in Variable 4 of the input.
<b>Variable 5</b>	Set to be the value of the control that was passed in Variable 5 of the input.
<b>Variable 6</b>	Set to be the value of the control that was passed in Variable 6 of the input.
<b>Variable 7</b>	Set to be the value of the control that was passed in Variable 7 of the input.
<b>Variable 8</b>	Set to be the value of the control that was passed in Variable 8 of the input.
<b>Variable 9</b>	Set to be the value of the control that was passed in Variable 9 of the input.

<b>Variable 10</b>	Set to be the value of the control that was passed in Variable 10 of the input.
--------------------	---

*Note:*

1. If the CDPD returned with an error message, then this value is not valid and should not be used.
2. All the routing controls passed in input must exist in the Portal. Even if one of the control codes passed in one of the input variable doesn't exist in Portal, the whole request will fail.
3. If a variable (say var2) is required but not passed, returned with an error message 'Error\_Missing\_Variable\_2'.
4. No Schedule, DateTime, DateTimeRange and Table controls are allowed.

**Possible Errors:**

GET\_SIMPLE\_CONTROL\_INFO\_LIST\_FAILED  
 ERROR: MISSING\_VARIABLE\_1  
 ERROR: SYSTEM ERROR  
 ERROR: INVALID\_QUERY\_TYPE\_IN\_CDPD

## Date/Time Query

The Date/Time Query has the following usage:

### Input Variables

Field	Value to be passed
<b>CDPD</b>	Set to '4'
<b>CED</b>	Not used anymore. For the backward compatibility, the variable is not removed but the value will be ignored by the Routing Controls App Gateway service.
<b>Variable 1</b>	Set to be the Control Code of the route control (not the control display name)
<b>Variable 2</b>	The current date in YYYYMMDD format. **
<b>Variable 3</b>	The current router time in HHMMSS format. **

*Note: The Router passes date and time to the Routing Controls to ensure that only the router's time is used in the processing.*

*\*\* These variables are best set with ICM built-in functions. See the section [Recommended Built-in Functions](#).*

## Processing

The query identifies the route control's value and then compares with the passed date and time values to the stored value. If the passed values are less than the stored value, the query returns "0". Otherwise, the query returns "1".

Time zone adjustment based on the **zone of the Central Controller** versus the **zone of the variable**.

## Output Variables

Field	Output Values
-------	---------------

<b>CDPD</b>	Is used to return a status for the query. The value will be either 'OK' if the query was successful or an error message if the query failed.
<b>Variable 1</b>	"0" if the passed date/time is less than the stored date/time, "1" otherwise.

### Possible Errors

ERROR: MISSING\_VARIABLE\_1  
 ERROR: MISSING\_VARIABLE\_2  
 ERROR: MISSING\_VARIABLE\_3  
 ERROR: INVALID\_DATE\_FORMAT\_IN\_VAR2  
 ERROR: INVALID\_TIME\_FORMAT\_IN\_VAR3  
 GET\_DATETIME\_CONTROL\_INFO\_FAILED  
 ERROR: CONTROL\_NOT\_FOUND!  
 ERROR: SYSTEM ERROR  
 ERROR: INVALID\_QUERY\_TYPE\_IN\_CDPD

## Date/Time Range Query

The Date/Time Range Query has the following usage:

### Input Variables

Field	Value to be passed
<b>CDPD</b>	Set to '4'
<b>CED</b>	Not used anymore. For the backward compatibility, the variable is not removed but the value will be ignored by the Routing Controls App Gateway service.
<b>Variable 1</b>	Set to be the Control Code of the route control with Control Type: DateTimeRange (not the control display name)
<b>Variable 2</b>	The current date in YYYYMMDD format. **
<b>Variable 3</b>	The current router time in HHMMSS format. **

*Note: The Router passes date and time to the Routing Controls to ensure that only the router's time is used in the processing.*

*\*\* These variables are best set with ICM built-in functions. See the section called [Recommended Built-in Functions](#).*

### Processing

The query identifies the route control's value and then compares with the passed values for the date and time to the stored value for low and high range. If the passed values are less than the stored value's low range, the query returns "0". If the passed values are greater than the stored value's high range, the query returns "0". Otherwise, the query returns "1".

Time zone adjustment based on the **zone of the Central Controller** versus the **zone of the variable**.

### Output Variables

Field	Output Values
-------	---------------

<b>CDPD</b>	Is used to return a status for the query. The value will be either 'OK' if the query was successful or an error message if the query failed.
<b>Variable 1</b>	"0" if the passed date/time is outside the stored date/time range, "1" otherwise.

### Possible Errors

ERROR: MISSING\_VARIABLE\_1  
 ERROR: MISSING\_VARIABLE\_2  
 ERROR: MISSING\_VARIABLE\_3  
 ERROR: INVALID\_DATE\_FORMAT\_IN\_VAR2  
 ERROR: INVALID\_TIME\_FORMAT\_IN\_VAR3  
 ERROR: GET\_DATETIME\_CONTROL\_INFO\_FAILED  
 ERROR: CONTROL\_NOT\_FOUND!  
 ERROR: SYSTEM ERROR  
 ERROR: INVALID\_QUERY\_TYPE\_IN\_CDPD  
 ERROR: CURRENT\_VALUE\_IS\_NULL\_OR\_BLANK  
 ERROR: VALUE\_NOT\_IN\_EXPECTED\_FORMAT  
 ERROR: TIME\_ZONE\_CONVERSION\_PROBLEM

## Table-Variable Query

The Table-Variables Query has the following usage:

### Input Variables

Field	Value to be passed
<b>CDPD</b>	Set to '7'
<b>CED</b>	Not used anymore. For the backward compatibility, the variable is not removed but the value is ignored by the Routing Controls App Gateway service.
<b>Variable 1</b>	Set to be the Control Code of the route control with Control Type: DateTimeRange (not the control display name)
<b>Variable 2</b>	Set to be the value of the key column

### Processing

The query identifies the Table Control with value matches given in Variable1 and the key column matches with the value given in Variable2 and returns all the column values from identified row.

### Output Variables

Field	Return Value
<b>CDPD</b>	Is used to return a status for the query. The value is 'OK' if the query succeeds or an error message if the query fails.
<b>Variable 1</b>	Set to be the value of the column 1 of table variable.
<b>Variable 2</b>	Set to be the value of the column 2 of table variable.
<b>Variable 3</b>	Set to be the value of the column 3 of table variable.
<b>Variable 4</b>	Set to be the value of the column 4 of table variable.
<b>Variable 5</b>	Set to be the value of the column 5 of table variable.

<b>Variable 6</b>	Set to be the value of the column 6 of table variable.
<b>Variable 7</b>	Set to be the value of the column 7 of table variable.
<b>Variable 8</b>	Set to be the value of the column 8 of table variable.
<b>Variable 9</b>	Set to be the value of the column 9 of table variable.
<b>Variable 10</b>	Set to be the value of the column 10 of table variable.

### Possible Errors

ERROR: MISSING\_VARIABLE\_1

ERROR: MISSING\_VARIABLE\_2

ERROR: *ERROR\_CONTROL\_OR\_KEY\_NOT\_FOUND*

## Recommended Built-in Functions

### userECCSSetTime - Scheduled Query Variable 2

```
concatenate(right(concatenate(" 0" ,text(hour(now))),2),right(concatenate(" 0" ,text(minute(now))),2),right(concatenate(" 0" ,text(second(now))),2))
```

### userECCSSetDate - Scheduled Query Variable 4

```
concatenate(year(),right(concatenate(" 0" ,text(month(now))),2),right(concatenate(" 0" ,text(day())),2))
```

### userECCSSetDay - Scheduled Query Variable 5

```
weekday()
```

## Table Control Data and Usage in ICM Routing Scripts

### Limitations on using App Gateway Node in ICM Routing Scripts.

Using the Application Gateway Node in ICM Routing Scripts is NOT recommended or supported. Use the application gateway node only in the Admin Scripts. This limitation is due to performance reasons to use Application Gateway on a call-by-call basis.

This limitation makes it difficult to use the Table Control Type for routing purposes. Some of the business case scenarios require large amount of data in the Table Control to make routing decisions when the call arrives. Implementing the Table Control with the admin scripts is practically impossible (particularly when number of records in the Table Control is high).

### How to Set Up ICM Routing Scripts to use the Table Control Data from HuPortal

To overcome this limitation the following approach is recommended to follow:



1. As part of the Webex CCE Administration Portal Installation, the database: `icAppsTableControlSync` can be setup in the remote server.  
*Note that the remote DB server should be reside locally to Customer's Cisco UCCE Servers.*
2. The TMT (Tenant Management Tool), allows to specify the DB Server Info, User Name and Password in the Custom DB info tab.
3. HuPortal provides an option for Route Controls with the Table Control type alone to sync the data into another database in the remote DB server.  
In the Create Control Page when creating a Table Control, slider "Replicate to external DB" will control whether you want the data to be synced to the external DB (DB specified in the Custom DB Info tab in TMT).

The screenshot shows the 'Create Control' form with the following details:

- Control Name:** RoutingTestTable
- Control Code:** TestTable
- Control Description:** TestTable
- Control Type:** Table
- Replicate table to external DB:** NO (toggle is off)

*Note that whenever, the data in the table control is added/modified/deleted the commit will happen on both databases (Portal DB and as well as in the external DB).*

4. When the table control is created from Portal, a new Physical Table with the same name of the Table Control's Control code will be created in the External DB under the `icAppsTableControlSync` DB.
5. Define the Script table Use the Database Lookup Explorer in Configuration Manager.
6. Use the DB Node in the in the Routing Scripts to query the Table Control.



## CHAPTER 4

# ICM Configuration

- [Define an ICM Application Gateway, on page 20](#)
- [Create Administrative Scripts, on page 25](#)

## Define an ICM Application Gateway

To use the Gateway node in administration scripts, an Application Gateway must be defined in the ICM. Use *Configuration Manager* → *Tools* → *List Tools* → *Application Gateway List* to add an Application Gateway.

Make sure to set up the App Gateway as follows:

NAME: <PROGRAM\_PREFIX>\_ICROUTE\_AG  
Type: Custom Gateway  
Preferred Side: Side A  
Encryption: None  
Fault Tolerance: Hot Standby  
Connection: Duplex

## Application Gateway Settings for Routing Controls AG

The Application Gateway Settings for Routing Controls AG Service must be as follows:

The screenshot shows the 'Application Gateway List' window. On the left, there is a filter section with 'Optional Filter' set to 'None', 'Condition' and 'Value (Case Sensitive)' dropdowns, and buttons for 'Save', 'Retrieve', and 'Cancel filter changes'. Below the filter is a table with one entry: 'icRoute'. On the right, the configuration details for the selected gateway are shown. The 'Attributes' tab is active, showing fields for Name, Application gateway ID, Type, Preferred side, Encryption, Fault tolerance, Connection, and Description.

Attributes	Connection Side A	Connection Side B
Name	* icRoute	
Application gateway ID	5000	
Type	* Custom Gateway	
Preferred side	Side A	
Encryption	* <None>	
Fault tolerance	* Hot Standby	
Connection	Duplex	
Description	icRoute	

## Connection Side A Settings

In the connection Side A tab:

Host: should point to the Webex CCE Administration Portal Side A Support Server IP Address  
Make sure to set the Timeouts, Heartbeats and Sessions section as in the following screen shot.  
*Note that the portal number (marked in yellow) must be different for every customer. The port number must match with the port number for the tenant in the TMT. By default, the port number will be 50000 + <idProgram>. If the idProgram of the tenant is 45 then the default port number will be set to 50045*

The screenshot displays the configuration interface for Connection Side A. The fields are as follows:

- Address:** 10.38.236.27 50029 (highlighted in yellow)
- Connect info:** (empty)
- Description:** (empty)
- Command:** None
- Command parameter:** 0
- Protocol:** TCP/IP
- Timeouts:**
  - Request: 30000 millisecc  Override default
  - Abandon: 50000 millisecc  Override default
  - Late: 3000 millisecc  Override default
- Heartbeats:**
  - Request timeout: 30000 millisecc  Override default
  - Retry timeout: 3000 millisecc  Override default (highlighted in blue)
  - Retry limit: 10  Override default (highlighted in purple)
  - Interval: 15000 millisecc  Override default (highlighted in red)
- Sessions:**
  - Retry timeout: 60000 millisecc  Override default
  - Retry limit:  Forever  Override default
  - Open timeout: 15000 millisecc  Override default
- Errors:**
  - Number after which host declared unavailable: 10  Override default

Attributes | **Connection Side A** | Connection Side B

Address: 8.8.242.248:50045 Enter addresses

Connect info:  In service

Description: Production Side A

Command: None  Command parameter: 0

Protocol: TCP/IP

**Timeouts** Override default

Request: 50000 millisec

Abandon: 50000 millisec

Late: 300 millisec

**Heartbeats** Override default

Request timeout: 3000 millisec

Retry timeout: 2000 millisec

Retry limit: 10

Interval: 15000 millisec

**Sessions** Override default

Retry timeout: 60000 millisec

Retry limit:  Forever

Open timeout: 15000 millisec

**Errors** Override default

Number after which host declared unavailable: 10

### Heartbeat Intervals

Cisco ICM uses a heartbeats mechanism to periodically check the state of the host server (in this case the iCApps Support Server). They are sent for the interval specified by the setting: Heartbeats Interval. (Marked in Red)

### Heartbeat Retry Timeout

Heartbeats are only sent when the link has been idle for the number of seconds specified by interval parameter. (Marked in blue)

### Heartbeat Retry Limit

If the router doesn't see the reply in time, it will retry heartbeats at the interval specified by 'Retry timeout' (marked in blue), until either they succeed, or the connection is declared dead. The connection will be declared as dead after X number of times, where X is the number specified by the setting: Retry Limit (Marked in Purple)

### **Heartbeat Timeout**

### **Request Timeout**

How long in milliseconds the software waits before timing out a request

### **Abandon Timeout**

An internal timeout in milliseconds for communication between the CallRouter and the Application Gateway interface. If a request exceeds this limit, the CallRouter assumes the Application Gateway interface process is off-line.

### **Late Timeout**

An internal timeout in milliseconds for communication between the CallRouter and the Application Gateway interface. If a request exceeds this limit, the software considers the request to be late.

## **Connection Side B Settings**

The Connection Side A and Side B Settings must be exactly the same, except for the IP address. The Port Number must be same.

In the connection Side B tab:

Host: should point to the Webex CCE Administration Portal Side B Support Server IP Address. In the Cloud environment, the Public IP of the Support Server should be used.

Port: should match with the Side A Port Number

Make sure to set the Timeouts, Heartbeats and Sessions section as in the following screen shot.

Attributes Connection Side A Connection Side B

Address

Connect info   In service

Description

Command  Command parameter

Protocol

**Timeouts**

Override default

Request  millsec

Abandon  millsec

Late  millsec

**Heartbeats**

Override default

Request timeout  millsec

Retry timeout  millsec

Retry limit

Interval  millsec

**Sessions**

Override default

Retry timeout  millsec

Retry limit   Forever

Open timeout  millsec

**Errors**

Override default

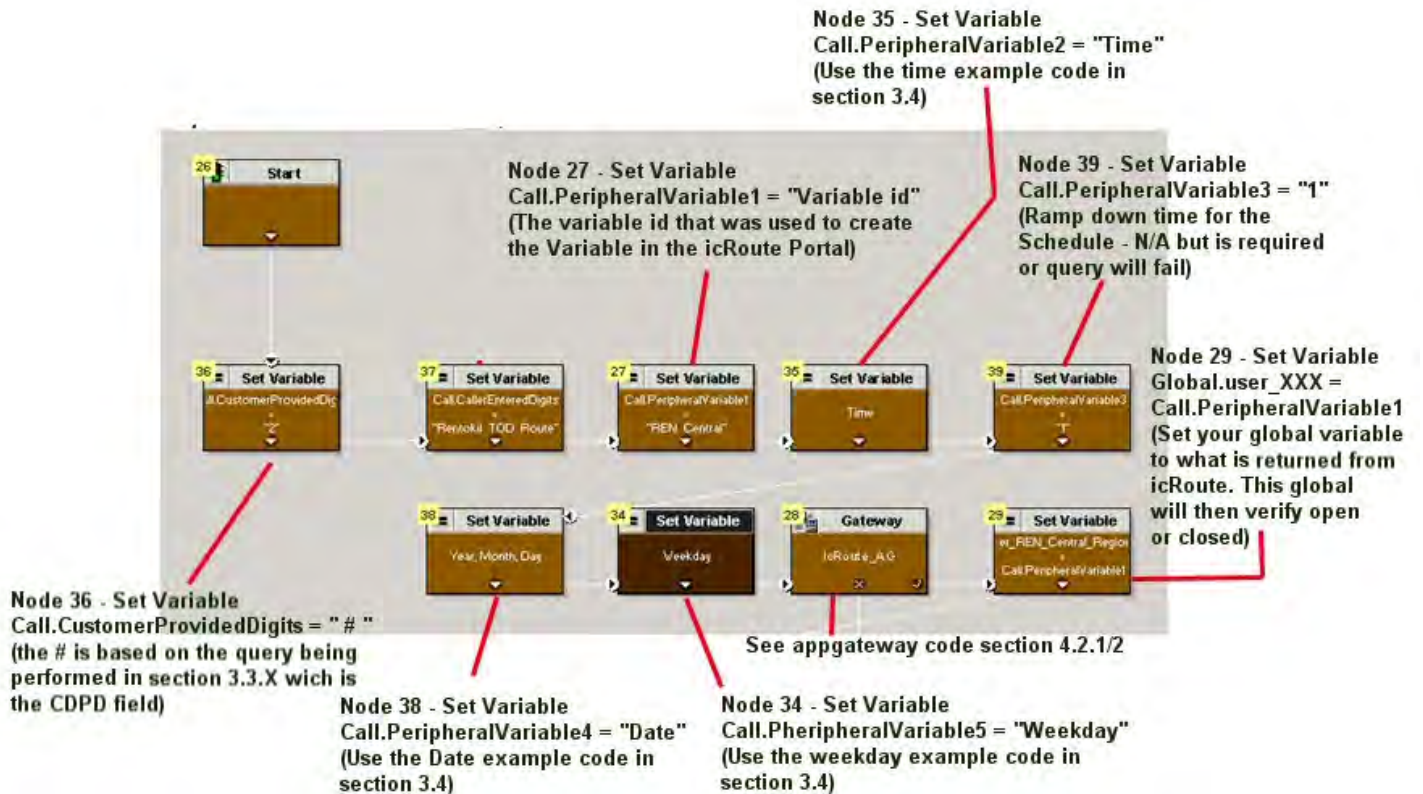
Number after which host declared unavailable

Create an admin script to assign variable names to control codes that are referenced in routing scripts.

# Create Administrative Scripts

The Routing Controls Control code defined in Webex CCE Administration Portal are associated to the ICM global user variables through ICM administrative scripts. Basically, the administrative script queries a Routing Control by the Control Code and assigns the result of the query to the corresponding ICM global user variable.

Scheduled Query Example (Corresponds with section 3.3.2)



## Application Gateway Node - Send

The screenshot shows the 'Application Gateway Properties (Read Only)' dialog box with the 'Send' tab selected. The 'Application gateway' dropdown menu is set to 'IcRoute\_AG'. Below it is an empty 'Subtype' text box and a 'Formula Editor...' button. The 'Call variables' section contains a list of variables with checkboxes:

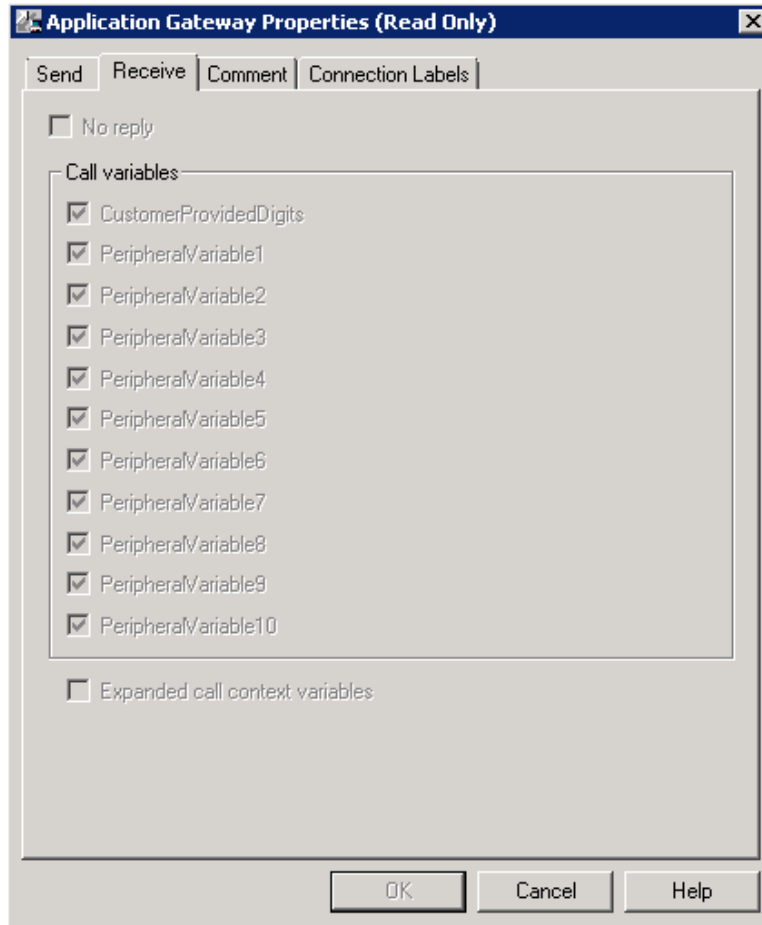
Variable Name	Checked
CallerEnteredDigits	Yes
CallingLineID	No
CustomerProvidedDigits	Yes
DialedNumberString	No
RoutingClient	No
PeripheralVariable1	Yes
PeripheralVariable2	Yes
PeripheralVariable3	Yes
PeripheralVariable4	Yes
PeripheralVariable5	Yes
PeripheralVariable6	No
PeripheralVariable7	No
PeripheralVariable8	No
PeripheralVariable9	No
PeripheralVariable10	No

At the bottom of the 'Call variables' section is an unchecked checkbox labeled 'Expanded call context variables'. The dialog box has 'OK', 'Cancel', and 'Help' buttons at the bottom.

The application gateway node requires that a check be entered by every item that will be sent to the Routing Controls. This is spelled out in sections 3.3.X - Input Variables section of each query. *It is very important to make sure to set this correctly on every Application Gateway Node within the Admin script.*



# Application Gateway Node - Receive



A checkmark will be needed next to every variable that you want to receive information back on. This information is spelled out in Section 3.3.X - Output Variables section for each query.

## Time Zone Support Details

Route Control Service supports time zones for Schedule, DateTime and DateTimeRange Control Type Route Controls. The User Interface allows you to specify the date/time values in the time zone that is defined for the route control. The Routing Controls App Gateway Service converts the requested time that's passed from ICM in Central Controller's Time zone to the Time zone that's specified for the Route Control to compare the shift time.



# CHAPTER 5

## Routing Controls Troubleshooting

- [Logging, on page 28](#)

### Logging

To see what is happening, the logging within icRouter and on ICM must be turned up. This section outlines this process as well as dumping the log and viewing the details.

### Routing Controls AG Tracing

By default, the App Gateway Tracing is disabled. If you need to enable the tracing, first find out the active side. To find out active side, follow these steps:

1. Log in to portal with your domain credentials or use the generic owner user account for the Tenant
2. Navigate to Administration->Support
3. The page will list all the service and the status.

Denver			
Status	Name	Host	
●	AD Service	10.38.235.27	⌂
●	AD Service	10.38.236.30	⌂
●	icApps Conapl Service	10.188.118.11	
●	icRoute Application Gateway Service	10.38.236.27	▶ ⏹ ⌂ ☑ ☐ 📄
Phoenix			
Status	Name	Host	
●	AD Service	10.35.107.27	⌂
●	AD Service	10.35.107.31	⌂
●	icApps Conapl Service	10.188.119.11	
●	icRoute Application Gateway Service	10.35.107.24	▶ ⏹ ⌂ ☑ ☐ 📄

4. Look for status of the Routing Controls Application Gateway Service on both Side A and Side B. The Green icon indicates the side is Active and either Red or yellow icons indicates that the side is inactive or idle

To enable the tracing, click the icon  for the Routing Controls Application Gateway Service.

To disable the tracing, click the icon  for the Routing Controls Application Gateway Service.

Enabling the tracing triggers Routing Controls AG Service to log more debug lines into the log file.

The log file icroute-ag.log can be found under /opt/wf/standalone/log

When done, turn off the AGTracing. Note that it is recommended to turn off the AGTracing.

You will also find individual tenant level logging with the name: ???-ag.log where ??? represents the tenant instance id.

## ICM AGI Tracing

RDP to the ICM Router and log in. Once logged in do the following:

- In the registry editor, go to HKEY\_LOCAL\_MACHINE \SOFTWARE\Cisco Systems, Inc.\ICM\\RouterA\EMS\CurrentVersion\Library\Processes\agi
- Change EMSTraceMask to 1111
- When finished, change EMSTraceMask back to 0



## CHAPTER 6

# Guidelines

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- [Best Practices, on page 30](#)
- [Limitations on Multi-Control Query, on page 30](#)
- [Typical ICM Application Gateway Settings in Configuration Manager, on page 31](#)

## Best Practices

1. Avoid using SimpleQuery as much as possible.
  - a. Use MultiControl Query instead.
2. Do not use Date/Time Range control for Holiday Handling.
  - a. Using the Date/Time Range control for handling Holidays will increase the number of admin scripts and eventually could cause performance issues. You may see frequent App Gateway disconnects.
  - b. Use only Schedule Type Control for Holiday Handling and have Special Schedules for the Holidays.
3. Do not use multiple App Gateway nodes in one Admin script. Instead, have separate Admin Script for each app gateway node and use the ICM User Variable to store the app gateway returned value(s). Not following this will cause App Gateway failures and will eventually cause contact center outages.
4. Avoid using Schedule Controls with Intervals Enabled to true. In the new Routing Controls, we have introduced two new fields called ShiftValue and OffShift Value for the Schedule Controls.
  - a. Traditionally, the Schedule Control is used with intervals (30 mins) buckets by setting the value to 1 for time between the shift open and close. And for bucket intervals which falls outside the shift open and close time, the interval values are set to 0.
  - b. The same can be achieved in the Routing Controls with the following setup:
    - i. Have a Schedule Control with Intervals Enabled=false (unchecked). Set the Shift Value to 1 and set the OffShift value to 0.
    - ii. When the requested time falls outside the shift open and close time, the Offshift value is returned by the App Gateway in Var3 and returns 0 in Var1.
    - iii. When the requested time falls within the shift open and close time, the ShiftValue is return by the App Gateway in Var3 and returns 1 in Var1.
  - c. If you have a special schedule, you can set different ShiftValue and Offshift value (for example, you can have 2 in the shift value and 99 in the Offshift value), so in the routing script you can have different messages played back based on the value you get from App Gateway.

## Limitations on Multi-Control Query

- Routing Controls Types Schedule, DateTime and DateTimeRange cannot be queried using the Multi-Control Query
- Only the following Routing Controls Types are allowed in the Multi-Control Query:
  - Switch
  - Switch or Default
  - Throttle
  - Text
  - Percentage
  - Number

## Typical ICM Application Gateway Settings in Configuration Manager

