Cisco Unified Bed Management interface (CUBM)





CUBM v2.3

Feature Guide

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# Introduction

HCA has deployed a Bed-Management system within Meditech. Some hospitals are still using “Markers on Boards” instead of the Bed Management system because they have no automated mechanism to get the Room Status updates to Meditech. Other hospitals are using inexpensive interfaces to connect their existing legacy PBXs electronically to Meditech. Each PBX vendor requires different protocol interpretation to communicate with Meditech and a different end-user interaction.

CUBM is a script that runs on a Cisco router to provide an interactive voice response service for Room Status updates and transmits them electronically to Meditech. CUBM can integrate with all of HCA’s current voice PBXs. CUBM can run on routers already in place at every hospital. CUBM provides a simple voice interface requiring very little training for end-users. CUBMs operation for end-users is the same no matter what vendors PBX is being used.

# Operation – End User perspective

Call Flow

* Maid enters room and dials CUBM pilot number on phone. It could be a strange number like \*1234.
* Call is routed by PBX to router which launches CUBM script.
* CUBM answers call and says “Please enter Maid ID.”
* Caller enters digits for their personal maid id defined in Meditech.
* CUBM asks user to enter Room Status, 1 for In Progress and 2 for Room Cleaned.
* Caller enters room status.
* CUBM sends caller’s Maid ID, room number (pulled from caller’s phone number) Room Status and a TimeStamp to Cloverleaf.
* CUBM says “Goodbye” and hangs up call.
* Cloverleaf formats message in HL7 format and sends it to Meditech.

**Note: A second phone number like \*1235 can be defined to force CUBM to ask for the room number – this is used where the dialing number does NOT match the room number.**

# Components

* Cisco ISR Router
  + Standard HCA Cisco router software image
  + DSP resources (PVDM)
  + A VWIC2-MFT PRI card if PRI is used to connect router to legacy PBX, or analog (FXO ports) if analog trunks are used to connect router to legacy PBX. H.323 or SIP trunking over Ethernet is supported/preferred by Cisco PBX.
* CUBM Files loaded on the router’s flash
  + cubm.tcl – The code to run the CUBM program.
  + cubm-eem.tcl – Cisco IOS Router Embedded Event Manager policy for CUBM.
  + en\_get\_maid\_id.au – Prompt file asking for maid id.
  + en\_get\_room\_num.au – Prompt file asking for room number.
  + en\_get\_status.au – Prompt file asking for room cleaning status.
  + en\_goodbye.au – Prompt file to let user know program is done.
  + Example config file – Router Config file with changes needed for CUBM.

# Site Specific Changes for Router Config File

## Create Application instance and point to Cloverleaf IP/Port number belonging to facility

The changes highlighted in RED are unique per facility. Only the router config file needs facility changes – the rest of the files can be left alone.

application service cubm flash:cubm.tcl

paramspace english index 0

**param aa-pilot 234 ! Phone number dialed auto room# entry**

**param aa-pilot2 235 ! Phone number dialed manual room# entry**

**param cloverleaf-port 10846 ! Cloverleaf port for this facility**

**param cloverleaf-ip 170.150.226.10 ! Cloverleaf IP for this facility**

**param room-digits 4 ! Number of digits in room#**

**param central-timezone-offset 0 ! HCA requires central timezone !on router, this is how many hours from Central is this facility. i.e. !west coast would put -2 here and cubm will subtract two hours !from central time for the timestamp it sends to cloverleaf.**

! OPTIONAL MONITORING

monitor

interface stats

interface event-log

stats

event-log

## Dial Peers in Router Config to receive calls and direct them to CUBM

### For IP Phones running on the same router

!Create Dial Peer to receive calls and direct them to the cubm application

dial-peer voice 3001 voip

service cubm

incoming called-number \*....

dtmf-relay h245-alphanumeric

codec g711ulaw

no vad

! If you happen to be using the same router for cubm and Call Manager Express, you  
! must do a little trick to allow local IP phones to dial cubm’s pilot number because   
! normally only inbound calls are accepted and a local IP phone would be dialing   
! “outbound” to get to the cubm pilot number.  
! So, create a Loopback interface. Send calls destined for the cubm pilot to the   
! Loopback interface. When the call hits the loopback, it will be picked up by   
! cubm as an “incoming” call.

!

interface Loopback0

ip address 100.100.100.1 255.255.255.0

!

dial-peer voice 3000 voip

destination-pattern \*....

session target ipv4:100.100.100.1

dtmf-relay h245-alphanumeric

codec g711ulaw

no vad

!

!

### IF YOU ARE USING A CISCO CUCM AS YOUR PBX:

### Create Connection from Cisco CUCM (PBX) to cubm router

Cisco PBXs can communicate directly from the PBX to the router over the HCA corporate LAN/WAN. No PRI or analog ports needed.

On the CUCM (Cisco Unified Communications Manager) side, use the web based administration to add a “Device/Gateway/H.323 Gateway” using the IP address of the router as the H.323 Gateway name.

Then add a Call Routing/Route Plan/Dial Pattern so the phones on CUCM will be able to dial the CUBM application. i.e. “\*1234” Have the route pattern point to the H.323 Gateway defined above.

On the CUBM router, put the following in the router’s config so it can receive calls from CUCM:

!Create Dial Peer to receive calls and direct them to the cubm application

dial-peer voice 3001 voip

service cubm

incoming called-number \*....

dtmf-relay h245-alphanumeric

codec g711ulaw

no vad

**IF YOU HAVE** **Analog trunks from Avaya/Nortel/NEC/Phone**

! If you have analog FXO ports, PLAR the port to cubm’s pilot number :

!

voice-port 0/1/0 ! Where 0/1/0 is an FXO port on the router.

call connect 23. ! Where 23. is the number you dial for CUBM

!

!

dial-peer voice 4010 pots service cubm

incoming called-number 23.

! Run CUBM if call to 23. comes in on analog port

port 0/1/0

!

!

### IF YOU ARE CONNECTING A NORTEL PBX WITH PRI

### PRI T1 Trunk from Nortel

!

controller T1 0/0/0

cablelength short 133 ! Use short command if router is next to PBX.

pri-group timeslots 1-24

description TONORTEL

!

!

interface Serial0/0/0:23

description TONORTEL

no ip address

encapsulation hdlc

isdn switch-type primary-dms100 ! Emulate Nortel DMS100 (Q.SIG/NI/NI2..many options)

isdn protocol-emulate network ! Cisco D-Channel is network side

isdn incoming-voice voice

isdn channel-id invert extend-bit

no cdp enable

!

!

dial-peer voice 4000 pots service cubm

incoming called-number 23. ! Run CUBM if call to 23. comes in on PRI

direct-inward-dial

port 0/0/0:23

!

### PRI E1 (Could be T1 as well) Trunk from Avaya

!

controller E1 1/0 ! This example is PRI E1 instead of T1

framing NO-CRC4

pri-group timeslots 1-31

description ECN-4

!

interface Serial1/0:15

description D-channel for ECN-4

no ip address

no logging

event link-status

isdn switch-type primary-net5

isdn overlap-receiving

isdn incoming-voice voice

isdn send-alerting

isdn bchan-number-order ascending

isdn sending-complete

isdn outgoing display-ie

no cdp enable

!

!

dial-peer voice 4000 pots service cubm

incoming called-number 23. ! Run CUBM if call to number 23. comes in on PRI

direct-inward-dial

port 1/0:15

!

## Enable the Embedded Event Manager service

scheduler allocate 20000 1000

event manager directory user policy "flash:/"

event manager policy cubm-eem.tcl

# Installation

## Load cubm files onto router flash

* Set up a tFTP server on your laptop
* From the router’s privileged prompt, load all the cubm files including \*.tcl, \*.au.:
  + Copy tftp: flash:

## Alter router config file with local facility parameters

* See the [router config changes](#config_file_changes) section of this document and make the necessary additions.

## Reload the router or load cubm application

* “call application voice load cubm” from the router’d privileged command prompt will reload the cubm.tcl file from the flash into memory. Resetting the router will do the same thing, but will take longer. Watch for errors on the router console as the cubm program loads. There shouldn’t be any.

# Troubleshooting

* CUBM does not answer when dialed:
  + PBX isn’t routing the call correctly.
  + Connection from PBX to PRI is broken.
* CUBM plays garbled sounding prompts:
  + Router is overloaded with other tasks
  + Prompt file is incorrect format
* Meditech/Cloverleaf is not receiving any information from CUBM
  + Check network connectivity from router to Cloverleaf
  + Check Cloverleaf connection to Meditech
* Provide debug details for the next call into CUBM
  + monitor call application event-log app-tag cubm next
* Debug the cubm application as it runs – view diag info on terminal screen
  + From the router command prompt: "debug voice application script" will print copious embedded help messages to router console as program runs
* To debug the Embedded Event Manager
  + **debug event manager action cli**
* Reload cubm application after making changes
  + “call application voice load cubm” from the router’s privileged command prompt will reload the cubm.tcl file from the flash into memory. Resetting the router will do the same thing, but will take longer. Watch for errors on the router console as the cubm program loads. There shouldn’t be any.

# Caveats/Warnings

* The data passes “In the clear” over the network.
* There aren’t many authentication controls – would be possible to “spoof” cubm over the network and create a denial-of-service attack against bed management. (Un-likely)

# Upgrade Requests

# Version Fixes

Version 0.7

* + Remove much of the code in cubm.tcl that remained from the original sample script.
  + Add the ability to use ANI for automatic room number insertion.
  + Change the formatting of cubm.tcl to streamline the look.

Version 0.8

* Added parameter aaPilot2. Dialing this number forces CUBM to ask for the room number instead of just using the dialing number for the room number. (Sometimes there is more than one bed in a room and only one phone, or for whatever reason the phone number doesn’t match the room number.) Procedure act\_Setup in cubm.tcl now looks at the dialed number and determines whether or not to use the ANI as the room number based on the number dialed. If aaPilot is dialed, don’t ask for room number. If aaPilot2 is dialed, ask for the room number.
* Nortel PBX is padding 000 after the calling party extension number.   
  Added “set roomID [string range $ani 0 3] to procedure act\_ValidateMaidID in cubm.tcl to strip out the extra 0s. This command accepts the first four digits and strips the rest.

Version 0.9

* Added routine in cubm.tcl for system to say “Goodbye” after caller enters their information – so the caller knows they are done.

Version 1.1

* changed printf function in sendCloverleaf procedure to accept leading 0s for room number and maidID #

Version 1.2

* "debug voice application scripts" will now print embedded help messages to router console as program runs
* Added a catch in cubm-eem.tcl to print error message to router console if tcp connection to Cloverleaf failed.
* NEW TIMESTAMP ADDED TO PACKET SENT TO CLOVERLEAF - positions 25-32 inserted
* Added NTP commands to example router config to get/set correct time on router.

Version 2.0

* Added param central-timezone-offset to router config and cubm.tcl . This parameter allows you to use central timezone for the router so logging done at corporate will have correct timestamps and still send the correct time to cloverleaf in the cubm messages. A -2 would mean a two hour difference from central time (pacific time). A +1 would mean a plus one hour difference from central time. (Eastern Time.) So cubm.tcl will take central time and subtract or add hours based on this parameter.
* Added param room-digits to router config. This maps to roomDigits in cubm.tcl. You put in the number of digits in the room number.. i.e. 2004 would be a 4 digit room number, 12004 would be a 5 digit room number. 7 digits is max room number.

Version 2.1

* Room numbers were not working correctly at OneVoice sites… 10 digit ANI not being read correctly. Changed the way procedure “act\_ValidateMaidID” reads the room number.

Version 2.3

* Cloverleaf appears to have a problem where it cannot receive messages near simultaneously. It will disregard the second message. Cubm-eem.tcl was edited to allow output queuing on messages from cubm to cloverleaf. Current setting puts a 3 second delay between outgoing messages.