## Telephony Bed Status Updates to MEDITECH Overview

The MEDITECH Bed Management solution has a telephony feature that enables the housekeeping personnel to update the patient room status (“cleaning in progress” or “cleaned”) in the Meditech system via a telephone either in the patient room or a Nursing Station.

## Solution Overview

This solution integrates your facility’s PBX system (Nortel, Avaya, CISCO, NEC, etc) with an ISR Cisco Router to facilitate updating the patient room status in the Meditech system from a telephone. In addition, the solution provides interactive voice prompts that will prompt the user (housekeeping personnel) for a maid id, room number (conditional, see note below), and a room status code (1-room cleaning in progress or 2-room cleaned). After the user successfully responds to all the prompts, a “Goodbye” message will be heard and the system will hang up the call. All prompts are spoken in English followed by Spanish.

This solution utilizes two separate setup configuration options for integrating your PBX system with the Cisco Router: 1) a PRI-T1 card interface and/or 2) an Analog card interface.

The PRI-T1 card configuration will prompt the user to enter a maid-id and room status code. However, entering the patient room number will not be required, as the PRI-T1 configuration will automatically enter it behind the scenes. With this configuration, you may need to purchase a PRI-T1 card for your existing PBX. Also, with the PRI-T1 configuration, you will be required to setup two different access numbers for your housekeeping personnel to dial when updating the room status. One of the access numbers (i.e., “3333”) will be used when dialing from a patient room to update the room status and will enable the room number to be automatically entered/passed to Meditech. The other access number (i.e., “4444”) will be used when dialing from a Nursing Station to update the room status and it will suppress the automatic passing of the room number and will prompt the user to enter it manually. Rooms that have multiple beds and one phone may also require the user to enter bed numbers manually.

The Analog card configuration will prompt the user to enter the maid-id, room number, and room status. The value add for using this configuration is that it’s the simplest and cheapest solution, as 99% of PBX systems come with a standard Analog card by default; therefore, your facility won’t incur the expense of having to purchase one. The drawback to an analog solution is that the room number cannot be automatically derived from analog lines and the user will always have to enter the room/bed number manually.

The setup steps for both configurations (PRI-T1 and Analog) will be described in detail later in this document.

**Data Flow Diagram**

PRI or Analog connection – not PRI Analog Connection



# Operation – End User perspective

Call Flow:

* The Housekeeping personnel member enters the patient room and dials a predefined number to access the telephony interface. Alternatively, the Housekeeping personnel member may dial a different access number from a Nursing Station if the patient room doesn’t have a phone.
* The call is then routed by the PBX to a router, which launches voice prompt scripts.
* The first voice prompt says “Please enter Maid ID.” The Housekeeping personnel member enters their 4-digit personal maid id.
* Conditionally (if analog configuration was employed), the second voice prompt says “Please enter the room number.” The Housekeeping personnel member enters the room number, which corresponds to the 4-digit extension of the patient room phone.
* The third voice prompt says “Please enter room status”. The Housekeeping personnel member will either enter a “1” (room cleaning in progress) or a “2” (room cleaned).
* The maid ID, room number, room Status will be transmitted to Cloverleaf.
* The Housekeeping personnel member will hear the final “Goodbye” voice prompt, and the system will hang up the call.
* Cloverleaf formats the maid ID, room number, room status in an HL7 message and sends it to Meditech.

# Hardware/Software Components Required:

* PRI/T1 Card with “D” channel available (optional if your desire is to have the room number to be automatically entered by your PBX and not manually entered by the Housekeeping personnel)
* Cisco ISR Router (Model 2811 and 3845 are HCA standard, but any ISR will work.)
  + Standard HCA software image (Includes voice package)
  + DSP resources (PVDM) (HCA orders include PVDMs)
  + A PRI Card (MFT1-1T1 or MFT1 -2T1) card or Analog card (VWIC-2FXO or VWIC 4FXO) is used to connect Cisco router to legacy PBX. 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 router 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.

# 

# PBX Changes Required:

# For the PRI-T1 configuration, your PBX engineer will have to assign 2 dedicated unique access numbers that will be used to access the telephony phone system. One number will be used when dialling from the patient room phone. The other number will be used when for any situation where the user needs to manually enter the room/bed number. i.e. two beds in a room with one phone.

# For the Analog configuration, your PBX engineer will have to assign 1 dedicated unique access number that will be used to access the telephony phone system. Since the Analog configuration requires the Housekeeping personnel member to enter the room number, this same access number may be used when accessing the telephony phone system from a Nursing Station. Each analog trunk line allows one call at a time – multiple analog trunk lines will allow multiple simultaneous calls. The pilot number should be programmed to hit a hunt group of numbers that will round-robin dial into the various analog trunks.

# These numbers should not be DID’s (Direct Inward Dial numbers that can be dialled from outside the facility) for security reasons.

# Your PBX engineer will need to configure the PBX for the PRI and/or analog trunks connecting to the Cisco router. The engineer will also need to provision your one/two access numbers on the PBX to route calls out the trunks to the Cisco router. Documentation is included later in this document to help guide the engineer in this provisioning process.

# Setup Steps for The Analog Interface Configuration:

# Load the TCL scripts and audio files onto your router flash as follows:

* Set up a tFTP server on your laptop
* From the router’s privileged prompt, load the following files by using the “Copy tftp: flash:” command:
  + cubm.tcl
  + cubm-eem.tcl
  + en\_get\_maid\_id.au
  + en\_get\_room\_num.au
  + en\_get\_status.au
  + en\_goodbye.au

## 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.

## Make the site-specific changes to the Router Config file by creating an application instance to point to the Cloverleaf IP Address/Port Number for your facility:

(Note: 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-piloT1 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-num-pattern ....

param maid-id-pattern ....

! OPTIONAL MONITORING

monitor

interface stats

interface event-log

stats

event-log

## Add the dial peers to the Router Config file to receive calls and direct them to the CUBM TCL script application:

### THIS IS NOT THE SECTION THEY WILL NEED –

# Add Analog trunks (Avaya/Nortel/NEC) to Router Config file:

Note: 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 port

port 0/1/0

!

!

# Enable the Embedded Event Manager service

scheduler allocate 20000 1000

event manager directory user policy "flash:/"

event manager policy cubm-eem.tcl

# Setup Steps for The PRI-T1 Interface Configuration:

# Load the TCL scripts and audio files onto your router flash as follows:

* Set up a tFTP server on your laptop
* From the router’s privileged prompt, load the following files by using the “Copy tftp: flash:” command:
  + cubm.tcl
  + cubm-eem.tcl
  + en\_get\_maid\_id.au
  + en\_get\_room\_num.au
  + en\_get\_status.au
  + en\_goodbye.au

## Reload the router or load cubm application

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param room-num-pattern ....

param maid-id-pattern ....

! OPTIONAL MONITORING

monitor

interface stats

interface event-log

stats

event-log

## Add the dial peers to the Router Config file to receive calls and direct them to the CUBM TCL script application:

### For IP Phones running on the same router

dial-peer voice 3001 voip

service cubm

incoming called-number \*....

dtmf-relay h245-alphanumeric

codec g711ulaw

no vad

Note: 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 23.

session target ipv4:100.100.100.1

dtmf-relay h245-alphanumeric

codec g711ulaw

no vad

1. **Add the router config file parameter changes for the PRI-T1 trunk:**

### Note: These are the PRI T1 Trunk parameter change if you have a Nortel PBX.

!

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

!

Note: These are the PRI T1 Trunk parameter changes if you have an AVAYA PBX

### 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. 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

### 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

# Troubleshooting

* CUBM script does not answer when dialed:
  + PBX isn’t routing the call correctly.
  + Connection from PBX to PRI is broken.
* CUBM script plays garbled sounding prompts:
  + Router is overloaded with other tasks
  + Prompt file is incorrect format
* Meditech/Cloverleaf is not receiving any information from CUBM script
  + Check network connectivity from router to Cloverleaf
  + Check Cloverleaf connection to Meditech
* Provide debug details for the next call into CUBM script
  + monitor call application event-log app-tag cubm next
* Debug the cubm script application as it runs – view diag info on terminal screen
  + From the router command prompt: Debug voip ivr script
  + Other options for debug voip ivr options: [**states** | **error** | **tclcommands** | **callsetup** | **digitcollect** | **script** | **dynamic** | **applib** | **settlement** | **all**]
* To debug the Embeded 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)