

## Generic IOS

### Voice VLAN

```
S(config-if)# switchport mode access
S(config-if)# switchport access vlan 50
S(config-if)# switchport voice vlan 10
S(config-if)# spanning-tree portfast
```

There is a reason to have voice vlan a lower number  
Automatic w/ voice VLAN; accommodates fast-booting phones

```
R# show interfaces switchport
S# show power inline
```

Tells access & voice vlans  
POE status

### DHCP

```
R(config)# ip dhcp excluded-address 10.10.0.1 10.10.0.9
R(config)# ip dhcp excluded-address 10.50.0.1 10.50.0.9
R(config)# ip dhcp pool VOICE_SCOPE
R(dhcp-config)# network 10.10.0.0 255.255.255.0
R(dhcp-config)# default-router 10.10.0.1
R(dhcp-config)# option 150 ip 10.10.0.1
R(dhcp-config)# dns-server 4.2.2.2
R(config-subif)# ip helper-address 10.0.0.12

R# show ip dhcp binding
```

Range of numbers not to offer to hosts  
In each VLAN / Subnet ( this VLAN for data )  
TFTP Server Address—holds telephone config files  
OR, give this VLAN the address of a centralized DHCP server

### NTP

```
R(config)# ntp server 149.20.68.17 [ prefer ]
R(config)# clock timezone PST -8
R(config)# clock summer-time PDT recurring
R(config)# ntp master 4
R# clock set 15:24:00 16 August 2014

R# show ntp associations [detail]
R# show clock
```

Can have several of these lines, hence the "prefer" option  
(Unnecessary) Be an NTP server, stratum 4; radio stratum=1  
Manual set—may need to get close enough for NTP to take over

### CCP

```
R(config)# username student privilege 15 secret cisco
R(config)# ip http { server | secure-server }
R(config)# ip http authentication local
R(config)# line vty 0 15
R(config-line)# transport input ssh telnet
R(config-line)# login local
R(config)# ip http server

R# show ip http server status
```

**Cisco Configuration Professional—http(s), ssh / telnet**  
Not mentioned in curriculum

## CME

### Base Config

```
R(config)# telephony-service
R(config-telephony)# no auto-reg-ephone
R(config-telephony)# ip source-address 10.0.0.3 [ port 2000 ]
R(config-telephony)# max-ephones 24
R(config-telephony)# max-dn 48
R(config-telephony)# time-zone 5
R(config-telephony)# system message Something
R(config-telephony)# cnf-file location tftp://10.0.0.2 (optional)
R(config-telephony)# secondary-dialtone 9
R(config-telephony)# [no] create cnf-files

R# show telephony-service
R# show telephony-service tftp-bindings
```

For the phones' benefit. 5 is PST/PDT. Use "?" for list.  
Collect phone MACs in "show ephone attempted-registrations"  
Where phones register (router port for CME)  
Dictated by number of purchased licenses. ? tells router max  
For the phones' benefit. 5 is PST/PDT. Use "?" for list.  
Banner on the phone display, replacing "Cisco Unified CME"  
(optional) Where phones get their configs (tftp)  
(optional) Second (different) dialtone after access number.  
No longer needed, but "no, yes" pair can refresh default files  
Creates default template files for phones  
Top line tells CME version ( or not started yet )  
Lists files available via tftp

### ephone-DN

```
R(config)# ephone-dn 1 [ dual-line ]
R(config-ephone-dn)# number 1001 [ secondary 4805551001 ]
R(config-ephone-dn)# name Fred Flinstone
R(config-ephone-dn)# label Fred Flinstone
R(config-ephone-dn)# description Front Receptionist
```

**Directory Number**  
1 is a tag, 1...max-dn. To change dual-line, must delete  
Extension number you would dial [ direct-inward-dial ]  
Used for the company directory  
optional. Shows next to line button. No effect on caller ID  
optional. Shows in phone display header bar when dn used

**Ephone**

```
R(config)# ephone 1
R(config-ephone)# mac-address 0017.9538.48a3
R(config-ephone)# button 1:3 [ 2f1 3s2 4b4... ]
R(config-ephone)# type 7940
R(config-ephone)# username fflin password cisco
R(config-ephone)# pin 1234
R(config-ephone)# { restart | reset }
```

```
S#show ephone [ attempted registrations ]
```

**Company Directory**

```
R(config-telephony)# directory entry 1 1599 name Fax Machine Manual entry if lack ephone-dn. 1 is a tag 1-100
R(config-telephony)# directory { first-name-first | last-name-first }
R(config-telephony)# directory entry clear
```

**FXS Ports**

```
R(config)# voice-port 0/0/0
R(config-voiceport)# signal { groundstart | loopstart }
R(config-voiceport)# cptone { US | FR | GB | ... }
R(config-voiceport)# station-id name 3rd floor fax
R(config-voiceport)# station-id number 5551000
```

```
S#show voice port [ summary ]
```

**FXO Ports**

```
R(config)# voice-port 0/0/0
R(config-voiceport)# signal { groundstart | loopstart }
R(config-voiceport)# station-id name 3rd floor fax
R(config-voiceport)# station-id number 5551000
R(config-voiceport)# dialtype { dtmf | pulse }
R(config-voiceport)# ring number 3
```

**Digital Ports—T1 with CCS**

```
R(config)# card type t1 0 2
R(config)# isdn switch-type { primary-ni | ... }
R(config)# network-clock-participate wic 0
R(config)# controller t1 1/0
R(config-controller)# framing esf
R(config-controller)# linecode b8zs
R(config-controller)# clock source line
R(config-controller)# pri-group timeslots 1-24
```

```
R(config)# interface serial 0/0/0:23
R(config-if)# isdn protocol-emulate network
```

```
R# show hardware
R# show controllers t1
R# show voice dsp group all
R# show isdn status
```

**Digital Ports—T1 with CAS**

```
R# show controllers t1
R(config)# controller t1 1/0
R(config-controller)# framing { esf | sf }
R(config-controller)# linecode { ami | b8zs }
R(config-controller)# clock source { free-running | internal | line } line=telco; internal good for PBX
R(config-controller)# ds0-group 1 1-24 type { fxo-loop-start | ... } Group # (0-23) and Channel (timeslot) range
```

**VOIP Dial Peers**

```
R(config)# dial-peer voice 1101 voip
R(config-dial-peer)# destination-pattern 2...
R(config-dial-peer)# session target ipv4:10.1.1.2
R(config-dial-peer)# codec { g711ulaw | ... }
```

```
R#show dial-peer voice [ summary ]
```

```
R#show voice call summary
R#show dialplan number 5551234
R#debug voip dialpeer [all]
```

Qty limited by max-ephones  
From back of phone, its box, or its settings menu  
Ephone-dn 3 on button 1, etc. Separate lines OK. {;s|b|f|m|w|...}  
From show attempted registrations (? has shorthand keywords)  
For users to log in and manage their own settings

{ Warm | Cold } boot the phone to reload config from tftp

DN and ext #s for each. Unregistered OK; Deceased=KAs lost

Wipe ALL directory entries (just manual ones?) (option for one?)

**Foreign Exchange Station**

Call progress tone style (ringing, busy, etc. base on country)

For Caller ID

Summary is one line per voice port ( could be one T1 timeslot )

**Foreign Exchange Office—Trunk to PSTN or PBX**

First 3 commands same as FXS

For Caller ID

How soon router answers; default 1

**Common Channel Signaling**

If card can be E1 or T1 (0,2=module,slot; eg ports 0/2/0 & 0/2/1)  
Match the telco's ISDN switch  
For 2800 routers; 0 is physical slot ( middle 0 in T10/0/0 )  
Book says no signaling-type options; router assumes ISDN PRI  
(Lab 6-2) Book says unnecessary; router assumes ISDN PRI  
(Lab 6-2) Book says unnecessary; router assumes ISDN PRI  
(Lab 6-2) Book says unnecessary; router assumes ISDN PRI

Serial Interface (Channel 23 is CCS signaling channel)  
Only on one end of the line; Pretend to be the telco. (like clock)

Find the T1 WWIC card (channelized T1)  
Tells Framing, Line Code, Clock Source  
Shows installed DSPs; each T1 channel needs a DSP channel  
Look for L2 status "MULTIPLE\_FRAME\_ESTABLISHED"

**Channel Associated Signaling**

Shows unconfigured WWIC cards ( usable for voice or data )

Dictated by telco; USA usually ESF ( Extended SuperFrame )

Dictated by telco; USA usually B8zs

Dictated by telco; USA usually B8zs

Dictated by telco; USA usually B8zs

**Main difference is the "session target" command**

Other end needs reciprocal before success

No digit stripping on VOIP dial peers

Next hop. This command is the difference from POTS

Optional. Call fails (fast busy) if mismatch between routers

Summary is one line per voice port ( could be one T1 timeslot )

Even shows the automatic dial-peers for ephone-dns

Operation up=off hook; in-status off-hook = off-hook

Tell which dial peer would be matched by that number

Shows each digit as it's dialed & finally rule that matched

## POTS Dial Peers

```
R(config)# dial-peer voice 1101 pots
R(config-dial-peer)# preference 1
R(config-dial-peer)# destination-pattern 1101
R(config-dial-peer)# description blah blah blah
R(config-dial-peer)# port 0/0/0[:23]
R(config-dial-peer)# no digit-strip
R(config-dial-peer)# forward-digits [ 3 | all ]
R(config-dial-peer)# default forward-digits
R(config-dial-peer)# prefix 1512555
```

## POTS Incoming Dial Peer

```
R(config)# dial-peer voice 1101 pots
R(config-dial-peer)# incoming called-number 530527...
R(config-dial-peer)# direct-inward-dial
R(config-dial-peer)# port 0/0/0;23
```

```
R(config)# telephony-service
R(config-dial-peer)# dialplan-pattern 1 530527...
```

## Digit Manipulation & PLAR

```
R(config)# num-exp 0 5000
R(config)# num-exp 4... 5...
R(config-voiceport)# connection plar 0
R(config-telephony)# dialplan-pattern 1 5105551...
```

## Translation Profiles

```
R(config)# voice translation-rule 1
R(cfg-translation-rule)# rule 1 /6/ /5/
R(config)# voice translation-profile CHANGE_DID
R(cfg-translation-profile)# translate {called|calling|redirect-called|redirect-target} 1 1 is rule #
R(config)# dial-peer voice 100 pots
R(config-dial-peer)# translation-profile incoming CHANGE_DID Assign the profile to a peer
```

```
R# test voice translation-rule 1 6546
```

## Class of Restriction

```
R(config)# dial-peer cor custom
R(config-dp-cor)# name LOCAL
R(config-dp-cor)# name LD
```

```
R(config)# dial-peer cor list LOCAL-LD
R(config-dp-corlist)# member LOCAL
R(config-dp-corlist)# member LD
```

```
R(config)# dial-peer cor list LOCAL-CALL
R(config-dp-corlist)# member LOCAL
```

```
R(config)# ephone-dn 2
R(config-ephone-dn)# corlist incoming LOCAL-LD
```

```
R(config)# dial-peer voice 11 pots
R(config-dial-peer)# corlist outgoing LOCAL-CALL
R(config-dial-peer)# destination-pattern 9.....
R(config-dial-peer)# port 0/0/0
```

## Auto-QoS

```
R(config-if)# auto qos voip
R/S(config-if)# auto qos voip trust
R/S(config-if)# auto qos voip cisco-phone
R/S(config-if)# auto qos voip cisco-softphone
```

## Call Forward

```
R(config-ephone-dn)# call-forward { all | busy | noan | night-service } 1559 timeout 25
R(config-ephone-dn)# call-forward max-length 4 Prevent toll fraud; 0 dims & disables the transfer button
```

## Call Transfer

```
R(config-telephony)# transfer-system { full-blind | full-consult | local-consult } System-wide
R(config-telephony)# transfer-pattern 5... Only allow transfers to numbers matching pattern (line repeatable)
```

## Call Parking

```
R(config-ephone-dn)# number 3001 Create an ephone-dn as a parking slot (can name it too)
R(config-ephone-dn)# park-slot
R(config-ephone-dn)# park-slot [ reserved-for <dn> ] [ timeout <secs> ] [ limit <#> ]
[ notify <ext> | recall [ alternate <dn> ] | retry <secs> ] | transfer <dn> ] Chap. 7
```

## Like static routes for voice calls

1101 is only a tag  
 Optional for Failover. Lower better. Default 0 (doesn't show)  
 Now, it's a phone number. Wildcards ok, [46-7] is 4 or 6 or 7  
 Optional  
 Port as in "show voiceport summ" :23 is T1 CCS or CAS group  
 Keep the literal (non-wildcard) digits (only POTS digit strip)  
 Strip all but the last 3 digits before forwarding; all = no digit-strip  
 "no" doesn't undo a forward-digits instruction  
 Add these before sending to PSTN. Comma = 1 sec. delay

## "Port" outbound (above) can also double as incoming

Doesn't seem to really be necessary

Chop the PSTN incoming # to 4 digits for internal extensions  
 extension-length 4 Or just use DN secondary number

## Global, not per-dial-peer

Always send 0 to the receptionist at 5000. Global  
 Both numbers are regular expressions  
 Automatically send all incoming calls to 0 ( becomes 5000 )  
 extension-length 4 Inbound from PSTN to internal #

Replace "6" with "5"

## Control which phones dial what numbers

Create the tags  
 They'll only gain meaning when in a list applied to a dial-peer (#)

INCOMING list—will be applied incoming to an ephone-dn  
 The tag from above—privilege(s) to be granted to an ephone-dn

OUTGOING LIST—will be applied outgoing to a dial-peer  
 Tag(s) needed by a phone to use the peer (dial the number)

An ephone-dn with no corlist can make any call it wants  
 This phone will have two tags LOCAL and LD ( corlist contents )

Don't trust existing marks; re-mark using ACLs or NBAR  
 Trust markings if CDP verifies phone presence  
 Trust markings if CDP verifies phone presence  
 Trust if CDP verifies a Cisco softphone (IP Communicator)

**Call Pickup**

```
R(config-ephone-dn)# pickup-group 5509
R(config-telephony)# no service directed pickup
```

Assign a dn to a pickup-group  
Only allow group pickup; can't choose which phone to answer

**Intercom**

```
R(config)# ephone-dn 60
R(config-ephone-dn)# number A100
R(config-ephone-dn)# intercom A101 label "Manager"
R(config)# ephone-dn 61
R(config-ephone-dn)# number A101
R(config-ephone-dn)# intercom A100 label "Assistant"
```

**Speed-dial & auto-answer (muted) speed-dial pair**

Create a new dn with an undialable number (auto-dial only)

Mutuality of these two is what allows auto-answer  
Options: barge-in, no-auto-answer, no-mute

```
R(config)# ephone 1
R(config-ephone)# button 2:60
R(config)# ephone 2
R(config-ephone)# button 2:61
```

followed by "restart"

**Paging**

```
R(config)# ephone-dn 80
R(config-ephone-dn)# number 5555
R(config-ephone-dn)# paging [ ip 239.1.1.100 port 2000 ]
```

Establish a paging group (#80)  
Dial 5555 to page group 80

The ip option establishes multicast paging

```
R(config)# ephone 1
R(config-ephone)# paging-dn 80
```

Assign this phone to paging group 80

```
R(config)# ephone-dn 82
R(config-ephone-dn)# number 5557
R(config-ephone-dn)# paging group 80,81
```

Company-wide paging—a paging group of paging groups

Up to 10 groups

**After-Hours Call Blocking**

```
R(config-telephony)# after-hours day mon 17:00 8:00 Repeat for each day of the week
R(config-telephony)# after-hours date jan 1 00:00 00:00 Whole day
R(config-telephony)# after-hours block pattern 91..... What to block (repeat at will)
R(config-telephony)# after-hours block pattern 91900..... 7-24 Even exempted phones subject to 7-24 rules
```

```
R(config)# ephone 1
R(config-ephone)# after-hour exempt
```

```
R(config)# ephone 2
R(config-ephone)# pin 1234
R(config-telephony)# login timeout 120 clear 23:00
```

Enable the "login" softkey on phones. Idle time (default 60) + PINs need to be reentered after 11pm

**Call Accounting**

```
R(config)# logging buffered 512000
R(config)# dial-control-mib retain-timer <minutes>
R(config)# dial-control-mib max-size 700
```

**Call Detail Records**

512 KB RAM dedicated to store logging  
How long to keep CDRs ( 10080 minutes = 7 days )  
Store up to 700 CDRs

```
R(config)# gw-accounting syslog
R(config)# logging 172.30.100.101
```

Tell CME to use syslog  
Normal SysLog statement from ICND2

```
R# show logging
```

Displays logging config, then RAM buffer entries

**Music on Hold**

```
R(config-telephony)# moh bonjovi.wav
R(config-telephony)# multicast moh 239.1.1.55 port 2123
```

.wav or .au in router flash

Optional. RTP port range 2000 - 65535

**Single Number Reach**

```
R(config)# ephone-dn 2 dual-line
R(config-ephone-dn)# snr 14805551212 delay 8 timeout 30 cfwd-noan 2000 2000 = voicemail
R(config-ephone-dn)# mobility
```

Also ring cell phone after 2 rings (2+4+2)

Enable the "Mobility" softkey to transfer active calls

**CME GUI**

```
R(config)# ip http server
R(config)# ip http secure-server
R(config)# ip http path flash:/gui
R(config)# ip http authentication local
```

<http://<ip>/ccme.html>

If files are in a subdirectory

```
R(config-telephony)# web admin system name Ninja secret 0 cisco
R(config-telephony)# { dn-webedit | time-webedit }
```

Allow web to edit ephone-dns or set clock ( don't use if NTP )

**ToDo**