

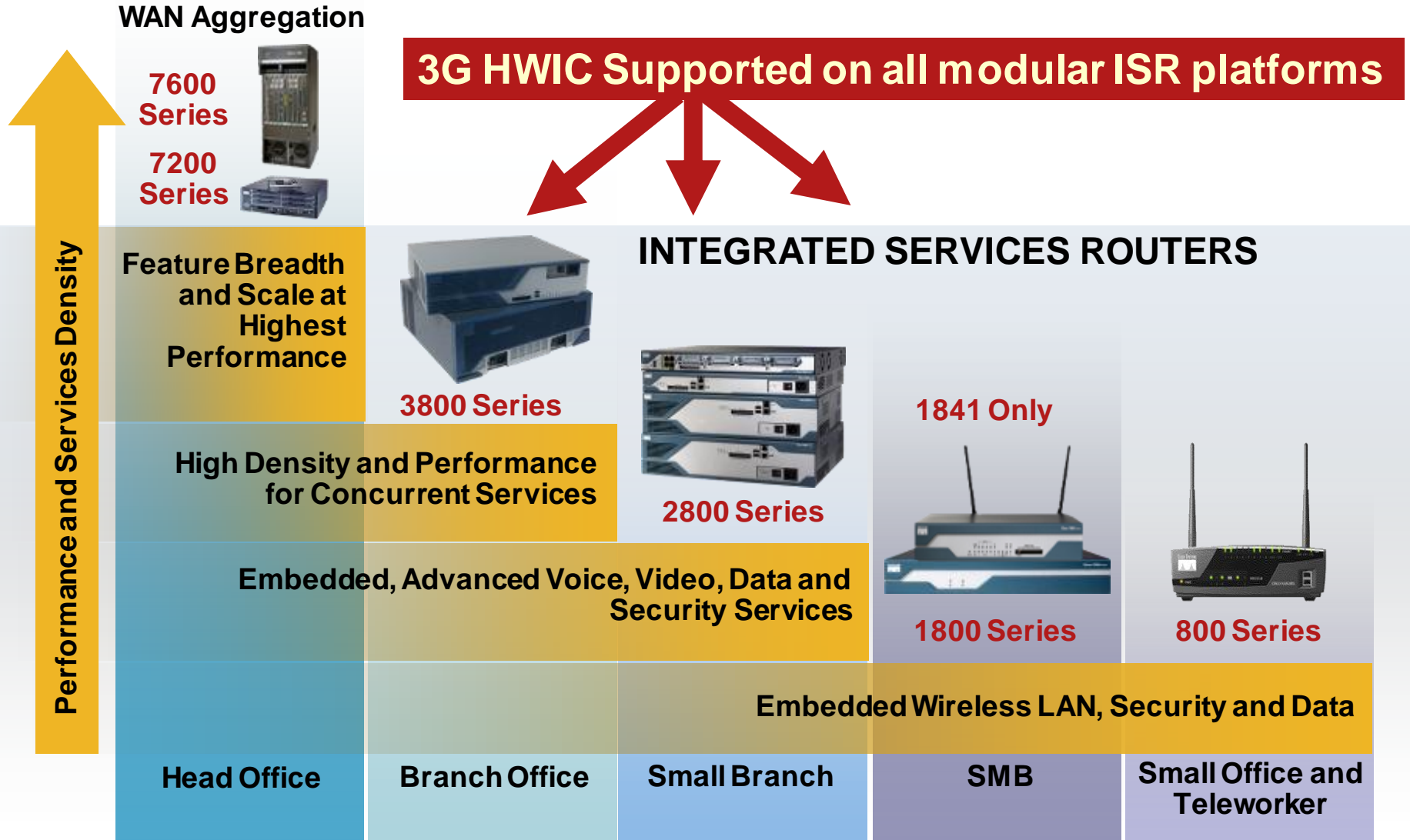


## 3G Cellular Solutions

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# Cisco Integrated Services Router Portfolio

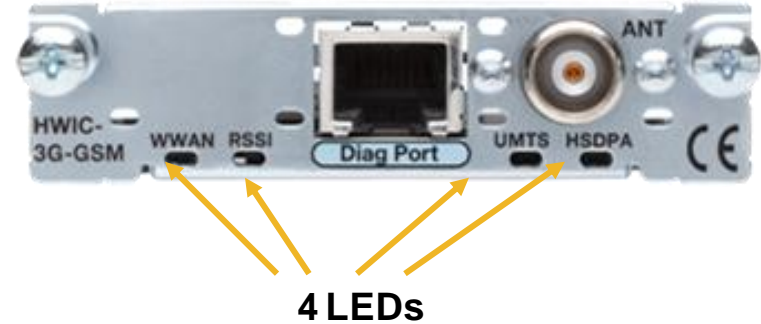


# 3G HWIC Performance

<i>Technology/ Service</i>	<i>Uplink</i>	<i>Downlink</i>	<i>Latency (1-way)</i>
EDGE	80 Kbps	140 Kbps	250-300 ms
UMTS	250 Kbps	400 Kbps	150-200 ms
HSDPA	<b>300 Kbps</b>	<b>700 Kbps</b>	<b>100-125 ms</b>
1xRTT	80 Kbps	150 Kbps	250 ms
EVDO Rel0	140 Kbps	500Kbps	125 ms
EVDO RevA	<b>500 Kbps</b>	<b>800 Kbps</b>	<b>75-100 ms</b>

**Note: The above speeds are average speeds observed over multiple carrier networks at different times of the day. Actual speeds vary based on number of active users, distance from BTS and Signal Strength/Interference.**

# Faceplate LEDs



LED	Function	States
RSSI	Denotes Received Signal Strength	<b>off</b> = low RSS <b>blinking green</b> = good <b>solid green</b> = excellent <b>solid yellow</b> = no service
WWAN	WAN Activity	<b>Off</b> <b>Blinking green/Solid green</b>
1xRTT/EVDO (CDMA)	Denotes Active Service	<b>On/Off</b>
UMTS/ HSDPA (GSM)	Denote Active Service	<b>On/Off</b>

# Antenna Options

## Antenna Connectors

HWIC-3G-CDMA: Main + Diversity

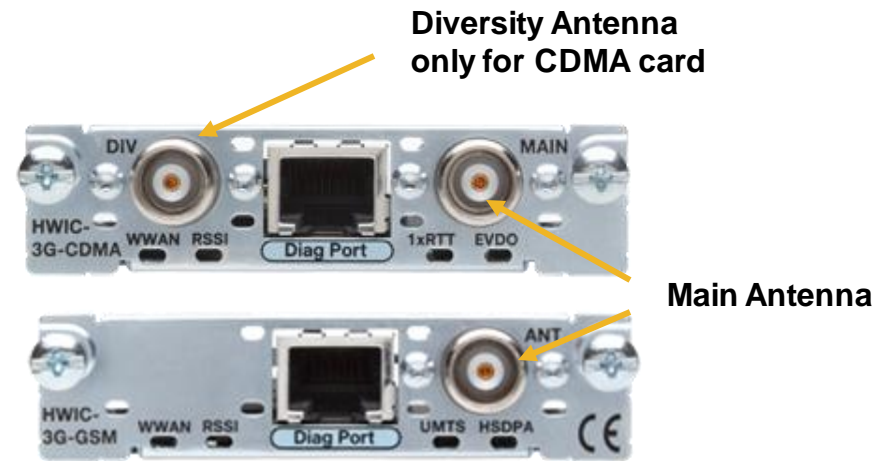
HWIC-3G-GSM: Only Main Antenna

## Antenna Accessories:

- Multi-Band Dipole Antenna
- Remote cradle with 15ft Cable
- Multi-Band Omni Ceiling Mount Antenna

## Antenna Cables:

- LMR400 20 feet
- LMR400 50 feet



Dipole Antenna



Dipole on Cradle

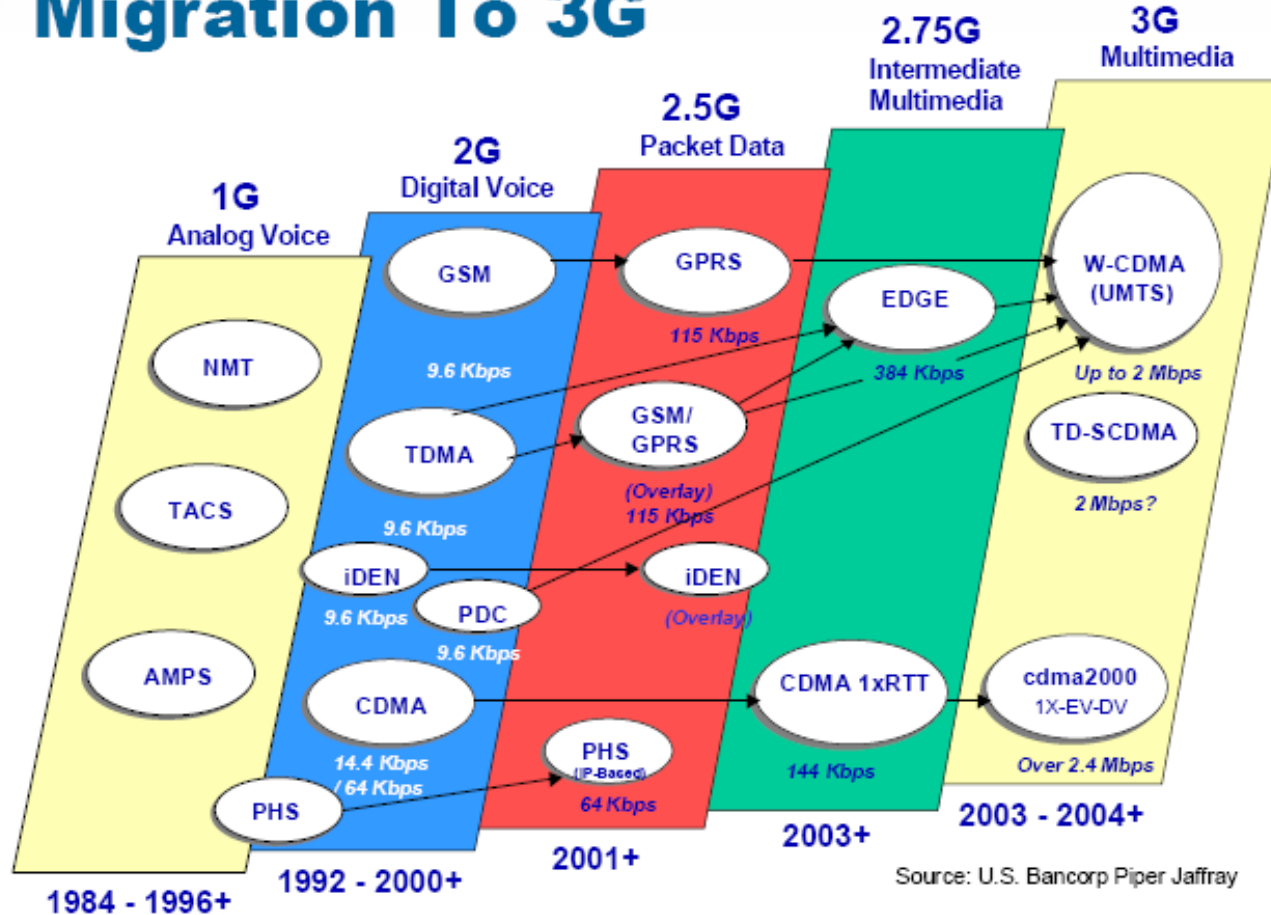


Ceiling Mount



Antenna LMR Cable

# Migration To 3G



**4G Wireless networks are currently being piloted – Sprint (Xohm/Wimax) and Verizon Wireless (LTE) will deliver multi-megabit speeds.**

# CDMA Modem Activation CLI (Manual)

## CDMA Modem activation command:

```
cellular cdma activate manual <mdn> <min> <sid> <nid> <msl>
```

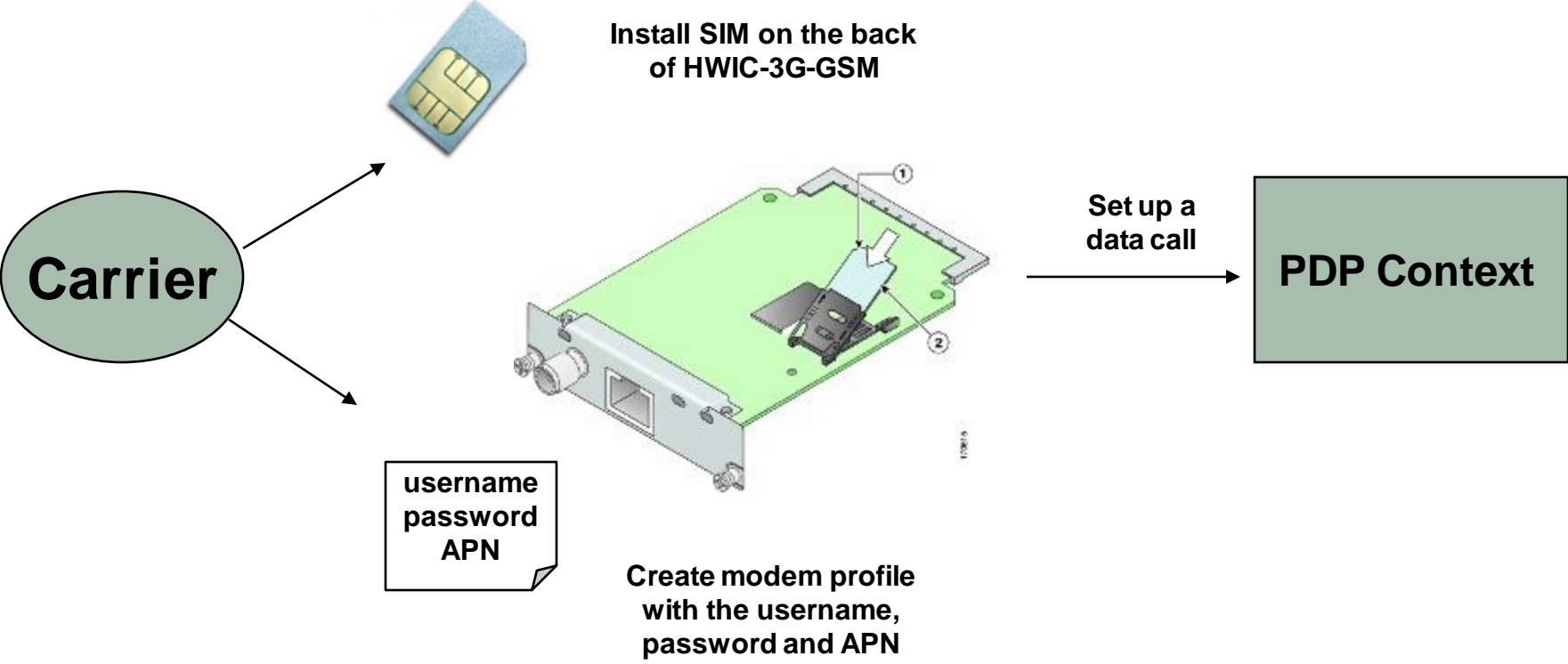
## Activation Parameters:

- mdn** 10-digit mobile directory number
- min** 10-digit mobile identity number
- sid** System ID
- nid** Network ID
- msl** Master Subsidy Lock (Activation Code)

**Note: Modem NAM parameters are provided by Wireless Services Center**

```
Router# cellular 0/0/0 cdma activate manual 4082099845 4082099845 41838 87 65535
NAM 0 will be configured and will become Active
Modem will be activated with following Parameters
MDN :4082099845; MSID :4082099845 ; SID :4183; NID 87:
Checking Current Activation Status
Modem activation status: Activated
Modem Parameters are being changed
Begin Activation
Account provisioning - Step 1 of 5
Account provisioning - Step 2 of 5
Account Provisioning - Step 3 of 5
Account Provisioning - Step 4 of 5
Account Provisioning - Step 5 of 5
Secure Commit Result: Succeed
Done Configuring - Resetting the Modem
```

# GSM/UMTS Account Provisioning



# GSM/UMTS Modem Profile Configuration CLI

## GSM Profile configuration command:

```
cellular x/x/x gsm profile create <number> <apn> [chap|pap] username passwd  
cellular x/x/x gsm profile delete <number>
```

## Profile Parameters

**username:** BSS authentication credential

**password:** BSS authentication credential

**authentication:** PAP/CHAP

**apn:** Access Point Name

16 GSM Profiles can be configured at one time

Note: When no profile is selected profile 1 is used

## Profile Selection

Using “**ATDT\*98\*<profile-number>#**” in the dialer chat script

```
Router# cellular 0/0/0 gsm profile create 1 ISP.CINGULAR chap  
ISP@CINGULARGPRS.COM CINGULAR1
```

```
Profile 1 = INACTIVE*
```

```
-----
```

```
PDP Type = IPv4, Header Compression = OFF
```

```
Data Compression = OFF
```

```
Access Point Name (APN) = ISP.CINGULAR
```

```
Authentication = PAP
```

```
Username: ISP@CINGULARGPRS.COM, Password: CINGULAR1
```

# Where would I use this stuff?

# New Cellular Interface configuration

The new Cellular interface is an Async Serial interface and requires following configuration

- **PPP Configuration**

```
encapsulation ppp
ppp chap hostname <username>
ppp chap password <passwd>
ppp ipcp dns request
```

- **Dialer Configuration**

```
async mode interactive
dialer in-band
```

- **IP Address configuration**

```
ip address negotiated
```

## Sample Configuration:

```
interface Cellular0/0/0
 ip address negotiated
 ip nat outside
 encapsulation ppp
 dialer in-band
 dialer string gsm
 dialer-group 1
 async mode interactive
 ppp chap hostname dummy
 ppp chap password 0 dummy
 ppp ipcp dns request
!
```

**Note: The ppp chap authentication credentials under the cellular interface needs to be obtained from the carrier.**

# DDR Configuration refresher

Cellular is an Async dialer interface similar to an analog modem

Interface Cellular → Implementation: **Routing**  
Encapsulation: **PPP**  
Media Type: **Async**

## DDR Configuration Steps:

1. Enable DDR on the interface
2. Define chat-script for the dialer interface
3. Define Interesting traffic
4. Create dialer list for interesting traffic
5. Map dialer list to the dialer interface

```
interface Cellular0/0/0  
  dialer in-band
```

```
chat-script gsm "" "ATDT*99#"  
interface Cellular0/0/0  
  dialer string cingular
```

```
ip access-list 1 permit any 66.0.0.0
```

```
dialer-list 1 protocol ip list 1
```

```
interface Cellular0/0/0  
  dialer-group 1
```

# Dialer/Chat Scripts for Cellular modem

- **GSM/UMTS**

**ATDT\*98\*<profile-number>#**

where profile-number could be 1-16 and represents the modem profile to be used for the call. Example chat script:

```
chat script gsm "" "ATDT*98*2" TIMEOUT 30 CONNECT
```

- **CDMA/EVDO**

**ATDT#777**

Example chat script:

```
chat script cdma "" "ATDT#777" TIMEOUT 30 CONNECT
```

# Dial Backup options

## Using Backup interface command:

- When primary interface goes down backup interface is activated
- While the primary line is up, the backup interface is placed in standby mode.
- Independent of routing protocol convergence

```
interface Serial 1/0:1
  backup interface cellular 0/0/0
  backup delay 30
!
```

Administrative  
Distance



## Using floating static route:

- Higher administrative distance used for the route over backup interface
- Independent of line protocol status of primary interface, dependent on routing protocol convergence

```
ip route 0.0.0.0 0.0.0.0 cellular 0/0/0 200
```

## Using Dialer Watch:

- DDR with no need to define interesting traffic
- Integrates dial backup with routing capabilities

```
interface cellular 0/0/0
  dialer watch-group 1
!
dialer watch-list 1 ip 3.1.1.0 255.255.255.0
dialer watch-list 1 ip 4.1.1.0 255.255.255.0
!
```

# Check for Signal/Service Availability

## Check RSSI :

```
show cellular x/x/x radio <history>
```



For a reliable connection RSSI should be  $> -90\text{dBm}$ . An RSSI value of  $-125\text{dBm}$  means no signal.



The history option can be used to monitor network status over a period of time.



## Viewing the network and service status:

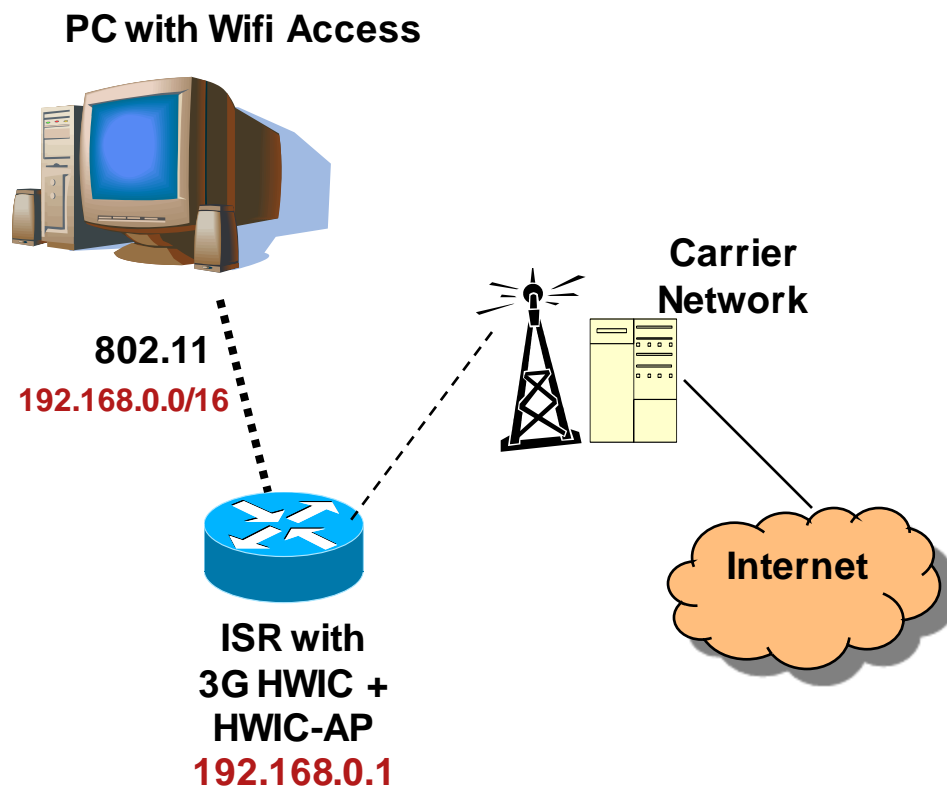
```
show cellular 0/0/0 network
```

If RSSI for WCDMA is less than  $-100\text{dBm}$ , modem automatically falls back to EDGE.

# Scenario1: Internet connectivity with NAT

## Configuration Elements

- 3G as primary
- Internet APN
- Dynamic IP Address
- Integrated WiFi Access Point
- Router acts as DHCP Server
- NAT



# Scenario-1: Configuration Snippet

```
dot11 ssid test
  authentication open
!
ip dhcp pool wlan-client
  network 10.4.0.0 255.255.0.0
  default-router 10.1.0.1
  dns-server 66.102.163.231 66.102.163.232
!
chat-script gsm "" "ATDT*99#" TIMEOUT 60 "CONNECT"
!
interface Dot11Radio0/2/0
  no ip address
  !
  ssid test
  !
  bridge-group 104
!
interface Cellular0/0/0
  ip address negotiated
  ip nat outside
  encapsulation ppp
  dialer in-band
  dialer string gsm
  dialer-group 1
  async mode interactive
  ppp chap hostname cisco@wwan.ccs
  ppp chap password 0 cisco
  ppp ipcp dns request
!
```

DHCP Pool for  
LAN Clients

Chat scripts for  
GSM data calls

Router 802.11g  
interface

Dynamically  
Allocated IP

Authentication  
Credentials

# Scenario-1: Configuration Snippet (contd.)

```
interface bvl
 ip address 10.4.0.1 255.255.0.0
 ip nat inside
 !
 ip route 0.0.0.0 0.0.0.0 Cellular0/0/0
 !
 ip nat inside source list 10 interface Cellular0/0/0 overload
 !
 access-list 1 permit any
 dialer-list 1 protocol ip list 1
 !
 line 0/0/0
 exec-timeout 0 0
 script dialer gsm
 login
 modem InOut
 no exec
 !
```

Bridge group for  
802.11 interface

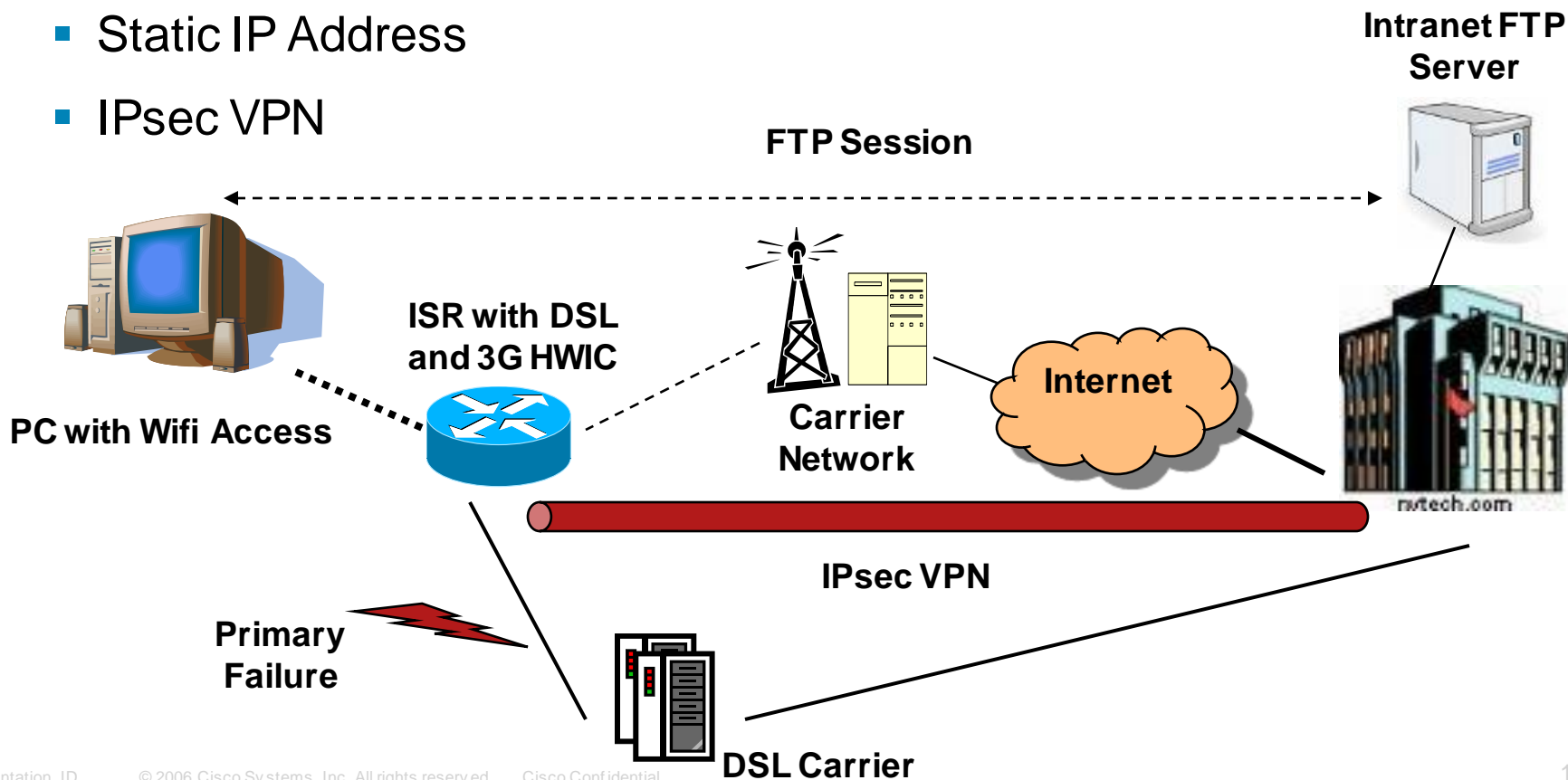
Dynamic NAT  
configuration

Dialer list for  
interesting traffic

# Scenario-2: WAN Failover from DSL to 3G

## Configuration Elements

- DSL as primary
- 3G as backup
- Static IP Address
- IPsec VPN



# Scenario-2: Configuration Snippet

```
track 234 rtr 1 reachability
!
interface ATM0/0/0.1 point-to-point
 backup interface Cellular0/3/0
 crypto map tunnel
 ip virtual-reassembly
 no snmp trap link-status
 pvc 0/35
  pppoe-client dial-pool-number 2
!
!
interface Cellular0/0/0
 ip address negotiated
 crypto map tunnel
 encapsulation ppp
 dialer in-band
 dialer string gsm
 dialer-group 1
 async mode interactive
 ppp chap hostname cisco@wwan.ccs
 ppp chap password 0 cisco
 ppp ipcp dns request
!
ip route 0.0.0.0 0.0.0.0 Dialer2 track 234
!
```

3G configured as  
Backup under  
DSL primary

## Scenario-2: Configuration Snippet (contd.)

```
interface Dialer2
 ip address negotiated
 ip mtu 1492
 ip nat outside
 encapsulation ppp
 load-interval 30
 dialer pool 2
 dialer idle-timeout 0
 dialer persistent
 dialer-group 2
 ppp authentication chap callin
 ppp chap hostname ciscoenzo1@sbcglobal.net
 ppp chap password 0 Enzo221
 ppp pap sent-username ciscoenzo1@sbcglobal.net password 0 Enzo221
 ppp ipcp dns request
 crypto map tunnel
!
ip sla 1
 icmp-echo 209.131.36.158 source-interface Dialer2
 timeout 1000
 frequency 2
ip sla schedule 1 life forever start-time now
!
access-list 102 permit icmp any host 209.131.36.158
!
route-map track-primary-if permit 10
 match ip address 102
 set interface Dialer2
!
```

Dialer config for  
the DSL interface



# New 'show cellular' commands

```
c3825#show cellular 0/0/0 ?
  all          Display all the information
  connection   Current active connection and statistics
  hardware     Cellular modem hardware information
  network      Cellular network information
  profile      Profile information in the modem
  radio        Cellular modem radio information
  security     Modem security status
```

# Router Software and modem Firmware

3G HWIC is supported on *ipbase* feature-set and above

- **Router IOS**

- 12.4(15)T1 [T-train, GA release]
- 12.5 Mainline [Available Oct 07]

- **Modem Firmware**

To check the latest firmware versions for different carriers, check the following table:

[http://www.cisco.com/en/US/products/hw/routers/networking\\_solutions\\_products\\_generic\\_content0900\\_aecd80601f7e.html](http://www.cisco.com/en/US/products/hw/routers/networking_solutions_products_generic_content0900_aecd80601f7e.html)

# 3G HWIC Resources

- **Product Page on cisco.com:**

<http://www.cisco.com/go/3g>

- **CEC Product Page:**

[http://www.in.cisco.com/artg/solutions/wireless/3G\\_HWIC/](http://www.in.cisco.com/artg/solutions/wireless/3G_HWIC/)

- **3G Wiki Site:**

<http://zed.cisco.com/confluence/display/3GWWAN/3G+Wireless+WAN>

- **3G HWIC Activation Process:**

<http://www.activationdesk.com/cisco.html>

- **3G HWIC Software Configuration Guide:**

[http://www.cisco.com/en/US/products/ps6441/products\\_feature\\_guide09186a00807ec85b.html](http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a00807ec85b.html) - For CDMA

[http://www.cisco.com/en/US/products/ps6441/products\\_feature\\_guide09186a0080802d77.html](http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a0080802d77.html) - For GSM

- **3G HWIC Hardware Installation Guide:**

[http://cisco.com/en/US/products/hw/modules/ps2641/products\\_module\\_installation\\_guide\\_book09186a0080692b21.html](http://cisco.com/en/US/products/hw/modules/ps2641/products_module_installation_guide_book09186a0080692b21.html)

# Questions?