IPV6

- ✓The working standard for the IPv6 protocol was published by the Internet Engineering Task Force (IETF) in 1998.
- ✓In 1997, IBM became the first commercial vendor to support IPv6 through its AIX 4.3 OS.
- ✓In 2004, Japan and Korea were acknowledged as having the first public deployments of IPv6.
- ✓The explosive growth in mobile devices including mobile phones, notebook computers, and wireless handheld devices has created a need for additional blocks of IP addresses.
- ✓IPv4 currently supports a maximum of approximately 4.3 billion unique IP addresses. IPv6 supports 340,282,366,920,938,463,463,374,607,431,768,211,456 .

340-Undecillion 282-decillion 366 nonillion 920-octillion 938-septillion 463-sextillion 463-quintillion 374-quadrillion 607-trillion 431 billion 768-million 211-thousand 456

3.6 million IPs for 1 square feet

- ✓Recent advancements in network technology including Network Address Translation (NAT) have temporarily lessened the urgency for new IP addresses, however, recent estimates indicate that IPv4 addresses could be exhausted before 2020.

SYSTECH Makes Hard Things Easy

Activate Wind
Go to Settings to a

IPV6 ADDRESS

2031:0000:0000:013F:0000:0000:0000:0001

2031::13F:0:0:0:1

Use : : only once

2031:0:0:13F::1

1080:0000:0000:0000:0000:0034:0000:417A

1080:0:0:0:0:34:0:417A

1080::34:0:417A

SYSTECH
Make Hard Things Easy

Activate Windows
Go to Settings to a

IPV6 Static routing

2001:1::1/64

NID 2001:1::/64

2001:3::1/64

NID 2001:3::/64

SYSTECH
Makes Hard Things Easy

RA

```
#int e0/0
#ipv6 add 2001:1::1/64
#no sh
#int s0/2
#ipv6 add 2001:2::1/64
#no sh
#exit
#ipv6 unicast-routing
#ipv6 route 2001:3::/64  2001:2::2
```

RB

```
#int e0/0
#ipv6 add 2001:3::1/64
#no sh
#int s0/1
#ipv6 add 2001:2::2/64
#no sh
#exit
#ipv6 unicast-routing
#ipv6 route 2001:1::/64  2001:2::1
```

```
#sh ipv6  route
```

Activate Wind
Go to Settings to a

IPV6 ADDRESS TYPES

- ✓**Unique local:** It's like ipv4 private address, its range is FD00::/8
- ✓**Link local:** Generated automatically for each interface FE80::/10
- ✓**Global unicast:** It's like public address, its address space is 2000::/3
- ✓**Unspecified:** Shows as ::/128 when host has no usable IPV6 address
- ✓**Loopback:** Same as 127.0.0.1 in IPV4, in IPV6 ::1/128
- ✓**Multicast:** Reserved space for this is FF::/8
- ✓**Tunneling:** 2002::/16 range reserved for tunneling

IPV6 Dual Stack

SYSTECH Makes Hard Things Easy

Activate Wind
Go to Settings to a

I O S (Internetwork operating systems)

- IOS is stored in flash
- Running configuration is stored in RAM
- Startup configuration is stored in NV RAM. (Non-volatile)

SYSTECH
Makes Hard Things Easy

Router Config-Registry Value:

Normal Mode	:	**0x2102**
RX-boot mode	:	**0x2101**
To by pass NV- RAM	:	**0x2142**

TO BACKUP	:	**(Normal mode & RX-boot Mode)**
TO RESTORE	:	**(Only RX-boot Mode)**

Install TFTP (Trivial File Transfer Protocol)

Activate Wind
Go to Settings to a

ROUTER HARDWARE COMPONENTS

There are 7 major internal components of a router:

- CPU
- RAM
- NVRAM
- Flash
- ROM
- Console
- Interfaces

SYSTECH
Makes Hard Things Easy

CPU

The CPU performs functions just as it does in a normal PC. It executes commands given by the IOS using other hardware components. High-end routers may contain multiple processors or extra slots to add more CPUs later.

RAM

Random Access Memory; this component is dynamic. Meaning, its content changes constantly. The main role of the RAM is to: Store routing tables, hold fast-switching cache, performs packet buffering, and hold queues. It also provides temporary memory for the configuration file of the router while the router is powered on. However, the RAM loses content when router is restarted or powered off. This component is upgradeable!

Activate Wind
Go to Settings to

NVRAM

Nonvolatile RAM is used to store the startup configuration files. This type of RAM does not lose its content when the router is restarted or powered off.

Flash

Flash memory is very important because it holds the Cisco IOS image file, as well as backups. This flash memory is classified as an EEPROM (*E*lectronically *E*rasable *P*rogrammable *R*ead *O*nly *M*emory). The flash ROM is upgradeable in most Cisco routers.

ROM

The ROM performs the same operations as a BIOS. It holds information about the systems hardware components and runs POST when the router first starts up.
This component can be upgraded by "unplugging" the chip and installing a new one.
A ROM upgrade ensures newer versions of the IOS.

SYSTECH
Makes Hard Things Easy

Console

The console consists of the physical plugs and jacks on the router. The purpose of the console is to provide access for configurations.

Interfaces

The interfaces provide connectivity to LAN, WAN, and Console/Aux. They can be RJ-45 jacks soldered onto the motherboard, transceiver modules, or card modules. Cisco routers, especially the higher-end models, can be configured in many different ways. They can use a combination of transceivers, card modules and onboard interfaces.

Activate Wind
Go to Settings to a

I O S BACKUP

```
# sh version
# sh flash
      File  Length   Name/status
      1   5672636 systech
      [5672700 bytes used, 11104516 available, 16777216 total]
      16384K bytes of processor board System flash (Read ONLY)

# int e0
# ip add 10.0.0.1 255.0.0.0
# no sh
# exit
# ping 10.0.0.2
# copy flash: tftp:
Source filename [ ]?  Systech
Address or name of remote host [ ]?  10.0.0.2
Destination filename [systech]? abc
!!!
```

I O S CONFIGURATION BACKUP

Configure any protocol e.g.: RIP.

sh startup-config (configuration is not viewed)

%% Non-volatile configuration memory is not present

#copy running-config startup-config

Destination filename [startup-config]? enter

sh startup-config (configuration is viewed)

#copy startup-config tftp:

Address or name of remote host [ ]? 10.0.0.2

Destination filename [startup-config]? Xyz

!!

608 bytes copied in 0.216 secs

Now xyz file is stored in

C:\Program Files\Cisco Systems\Cisco TFTP Server\xyz

SYSTECH Makes Hard Things Easy

Activate Wind
Go to Settings to a

I O S CONFIGURATION RESTORE

#	erase startup-config
Change mode to RX- boot mode	
#	configure terminal
#	config-register 0x2101
#	ctlr z
#	reload
Router(boot)>	enable
Router(boot)#	configure terminal
Router(boot)(config)#	int e0
Router(boot)(config-if)#	ip add 10.0.0.1 255.0.0.0
Router(boot)(config-if)#	no sh
Router(boot)(config-if)#	ctrl z
Router(boot)#	ping 10.0.0.2
Router(boot)#	copy tftp startup-config
Host or network configuration file [host]?	Enter
Address of remote host [255.255.255.255]?	10.0.0.2
Name of configuration file [ ]?	Xyz
Configure using xyz from 10.0.0.2? [confirm]	enter
Loading xyz from 10.0.0.2 (via Ethernet0): !	
OK - 608/32723 bytes]	
[OK]	
Router(boot)#	configure terminal
Router(boot)(config)#	config-register 0x2102
Router(boot)(config)#	exit
Router(boot)#	reload

SYSTECH
Make Hard Things Easy

Activate Wind
Go to Settings to a

I O S RESTORE

Change mode to RX- boot mode	
#	configure terminal
#	config-register 0x2101
#	ctlr z
#	reload
Router(boot)>	enable
Router(boot)#	configure terminal
Router(boot)(config)#	int e0
Router(boot)(config-if)#	ip add 10.0.0.1 255.0.0.0
Router(boot)(config-if)#	no sh
Router(boot)(config-if)#	ctrl z
Router(boot)#	ping 10.0.0.2
Router(boot)#	copy tftp flash
Address or name of remote host [255.255.255.255]?	10.0.0.2
Source file name?	abc
Destination file name [abc]?	Systechccna

Erase flash device before writing? [confirm] Flash contains files. Are you sure you want to erase? [confirm]
enter

Copy 'abc' from server as 'systechccna' into Flash WITH erase? [yes/no] y

Erasing device... eeee

PASSWORD RECOVERY

Set password to console mode.

Switch OFF and ON the router

Press ctrl – break (to enter rom monitor mode)

> o/r 0x2142

> i (it will reboot)

enable

sh startup-config (now note the password)

configure terminal

config-register 0x2102

ctrl z

reload

SYSTECH Makes Hard Things Easy

Activate Wind
Go to Settings to

TFTP

(Cross Over Cable)

E0/0

TFTP Server

Router A

IP Address: 10.0.0.2
SubnetMask:255.0.0.0

TFTP Server

Download and store CISCO IOS in server. View > Options (for deselect the two check Boxes logging and file transfer progress.)

SYSTECH
Makes Hard Things Easy

ROUTER A

rommon 16 > IP_ADDRESS=10.1.1.1
(10.1.1.1 is the temporary IP address assigned to the router)
rommon 17 > IP_SUBNET_MASK=255.255.255.0
(Same as on the TFTP server)
rommon 18 > DEFAULT_GATEWAY=10.1.1.2
(Use the IP address of the TFTP server)
rommon 19 > TFTP_SERVER=10.1.1.2
(TFTP server's IP address)
rommon 20 > TFTP_FILE=c2600-is-mz.120-7.T.bin
(Exact name is case sensitive)

Activate Wind
Go to Settings to

rommon 21 > TFTP_CHECKSUM=0
(This prevents checksum errors with earlier 2600 boot ROMs)
rommon 22 > tftpdnld
This command must be lower case.
IP_ADDRESS: 10.1.1.1
IP_SUBNET_MASK: 255.255.255.0
DEFAULT_GATEWAY: 10.1.1.2
TFTP_SERVER: 10.1.1.2
TFTP_FILE: c2600-is-mz.120-7.T.bin

Invoke this command for disaster recovery only.
WARNING: all existing data in all partitions on flash will be lost!
Do you wish to continue? y/n: [n]: y

Receiving c2600-is-mz.120-7.T.bin from 10.1.1.2
!!!!!.!!!!!!!!!!!!!!!!!!!!.!!
File reception completed.
Copying file c2600-is-mz.120-7.T to flash.
Erasing flash at 0x607c0000
program flash location 0x60440000
rommon 22 >reset

SYSTECH
Makes Hard Things Easy

Activate Wind
Go to Settings to a