

Design and Build a Small Business Network (Capstone Project)

(Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Objectives

Explain how a small network of directly connected segments is created, configured and verified.

Students will demonstrate that they know how to design, configure, verify and secure a very small network. Documentation and presentation are also vital parts of this Capstone Project.

Background /Scenario

Note: This activity is best completed in groups of 2-3 students.

Design and build a network from scratch.

- Your design must include a minimum of one router, one switch, and one PC.
- Fully configure the network and use IPv4 or IPv6 (subnetting must be included as a part of your addressing scheme).
- Verify the network using at least five show commands.
- Secure the network using SSH, secure passwords and console passwords (minimum).

Create a rubric to use for informal peer grading. Alternatively, your Instructor may choose to use the rubric provided with this activity.

Present your Capstone Project to the class and be able to answer questions from your peers and Instructor!

Instructor notes: This Modeling Activity is suggested to be a graded assignment after completing Chapters 1-11. Students should be able to show how small networks are designed, configured, verified and secured. Documentation is a large factor of this project and students must be able to explain their network design and verification through the use of **show** commands.

Required Resources

- Packet Tracer
- Student/group-created rubric for assessment of the assignment

Reflection

1. What was the most difficult portion of this activity?

Answers will vary.

2. Why do you think network documentation is so important to this activity and in the real world?

Documentation is imperative to good network management and without it, network administrators have to recreate topologies, physically check addressing, etc. This takes time, which could be used elsewhere.

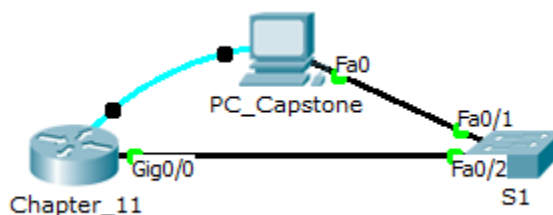
A suggested rubric and documentation examples are provided below:

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Note: This rubric includes a total of 100 points for the points earned category (if minimum standards are met). Instructors may wish to consider adding bonus points for additional/advanced work in any requirement category.

Requirement	Points Earned
Physical Topology – minimum 1 router, 1 switch, 1 PC	(20 suggested)
Logical Addressing – subnetting used?	(20 suggested)
Connectivity test – ping the router	(20 suggested)
Show commands (at least 5 documented as baseline)	(20 suggested)
Security – SSH, secure passwords, console security – documented by show running-configuration	(20 suggested)

Create a small network of directly connected segments, at a minimum 1 router, 1 switch and 1 PC, and include a screenshot of the network in your final documentation.



Configure the network to include switches, routers, and end devices and use your own network addressing. You must use subnetting of some type and you can use either IPv4 or IPv6 logical addressing. Create a table showing your physical addressing scheme for the router, switch, and PC and include it in your final documentation.

Device Name	IP Address	Subnet Mask
Chapter_11	Gig0/0 – 192.168.1.30	255.255.255.224
S1	VLAN1 – 192.168.1.20	255.255.255.224
PC_Capstone	Fa0 – 192.168.1.10	255.255.255.224

Verify the network by using show commands (at least 5) to provide a performance baseline. Be able to discuss why you chose the show commands you selected and what the output means (use all Packet

Tracer activities for Chapters 1-11). Keep screenshots of your output and include in your final documentation.

```
Chapter_11# show arp
Protocol Address           Age (min)  Hardware Addr  Type   Interface
Internet 192.168.1.10           42  0006.2AAC.4D31  ARPA   GigabitEthernet0/0
Internet 192.168.1.20           15  0006.2A79.8B1E  ARPA   GigabitEthernet0/0
Internet 192.168.1.30           -   0060.7032.3601  ARPA   GigabitEthernet0/0
Chapter_11#
```

```
S1#show arp
Protocol Address           Age (min)  Hardware Addr  Type   Interface
Internet 192.168.1.10           13  0006.2AAC.4D31  ARPA   Vlan1
Internet 192.168.1.20           -   0006.2A79.8B1E  ARPA   Vlan1
Internet 192.168.1.30           13  0060.7032.3601  ARPA   Vlan1
S1#
```

```
Chapter_11#show protocols
Global values:
  Internet Protocol routing is enabled
GigabitEthernet0/0 is up, line protocol is up
  Internet address is 192.168.1.30/27
GigabitEthernet0/1 is administratively down, line protocol is down
Vlan1 is administratively down, line protocol is down
```

```
Chapter_11#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/27 is directly connected, GigabitEthernet0/0
L       192.168.1.30/32 is directly connected, GigabitEthernet0/0
Chapter_11#
```

```
S1#show vlan
```

VLAN Name	Status	Ports
1 default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig1/1, Gig1/2
1002 fddi-default	act/unsup	
1003 token-ring-default	act/unsup	
1004 fddinet-default	act/unsup	
1005 trnet-default	act/unsup	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

Remote SPAN VLANs

Primary	Secondary	Type	Ports
S1#			

Chapter_11#show int

GigabitEthernet0/0 is up, line protocol is up (connected)

Hardware is CN Gigabit Ethernet, address is 0060.7032.3601 (bia 0060.7032.3601)
Internet address is 192.168.1.30/27
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
Full-duplex, 100Mb/s, media type is RJ45
output flow-control is unsupported, input flow-control is unsupported
ARP type: ARPA, ARP Timeout 04:00:00,
Last input 00:00:08, output 00:00:05, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: fifo
Output queue :0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
7 packets input, 196 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
0 watchdog, 1017 multicast, 0 pause input
0 input packets with dribble condition detected
9 packets output, 252 bytes, 0 underruns
0 output errors, 0 collisions, 1 interface resets
0 unknown protocol drops
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier
0 output buffer failures, 0 output buffers swapped out

GigabitEthernet0/1 is administratively down, line protocol is down (disabled)

Hardware is CN Gigabit Ethernet, address is 0060.7032.3602 (bia 0060.7032.3602)
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
Full-duplex, 100Mb/s, media type is RJ45
output flow-control is unsupported, input flow-control is unsupported

ARP type: ARPA, ARP Timeout 04:00:00,
Last input 00:00:08, output 00:00:05, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: fifo
Output queue :0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
0 packets input, 0 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
0 watchdog, 1017 multicast, 0 pause input
0 input packets with dribble condition detected
0 packets output, 0 bytes, 0 underruns
0 output errors, 0 collisions, 1 interface resets
0 unknown protocol drops
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier
0 output buffer failures, 0 output buffers swapped out
out
Vlan1 is administratively down, line protocol is down
Hardware is CPU Interface, address is 000b.be45.b842 (bia 000b.be45.b842)
MTU 1500 bytes, BW 100000 Kbit, DLY 1000000 usec, reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
ARP type: ARPA, ARP Timeout 04:00:00
Last input 21:40:21, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
1682 packets input, 530955 bytes, 0 no buffer
Received 0 broadcasts (0 IP multicast)
0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
563859 packets output, 0 bytes, 0 underruns
0 output errors, 23 interface resets
0 output buffer failures, 0 output buffers swapped out
out
Chapter_11#

```
Chapter_11#show version
Cisco IOS Software, C1900 Software (C1900-UNIVERSALK9-M), Version 15.1(4)M4, REL
EASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 23-Feb-11 14:19 by pt_team

ROM: System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
cisco1941 uptime is 1 hours, 47 seconds
System returned to ROM by power-on
System image file is "flash0:c1900-universalk9-mz.SPA.151-1.M4.bin"
Last reload type: Normal Reload

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.
Cisco CISC01941/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
2 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)

License Info:

License UDI:

-----
Device#      PID                      SN
-----
*0           CISC01941/K9             FTX152453SZ

Technology Package License Information for Module:'c1900'

-----
Technology    Technology-package      Technology-package
Current       Type                    Next reboot
-----
ipbase        ipbasek9               Permanent          ipbasek9
security      None                   None               None
data          None                   None               None

Configuration register is 0x2102

Chapter_11#
```

Design and Build a Small Business Network (Capstone Project)

Secure the network using common configuration to include SSH, secure passwords, console security, etc. and show the commands configured by enacting a show running-configuration screen as output. Include in your final documentation.

Chapter_11#show run

Building configuration...

Current configuration : 842 bytes

!

version 15.1

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

security passwords min-length 8

!

hostname Chapter_11

!

login block-for 120 attempts 3 within 60

!

license udi pid CISCO1941/K9 sn FTX152453SZ

!

spanning-tree mode pvst

!

interface GigabitEthernet0/0

ip address 192.168.1.30 255.255.255.224

duplex auto

speed auto

!

interface GigabitEthernet0/1

no ip address

duplex auto

speed auto

shutdown

!

interface Vlan1

no ip address

shutdown

!

ip classless

!

line con 0

password 7 0822455D0A16

login

!

line aux 0

!

line vty 0 4

password 7 0822455D0A165445415F5952

login

!

end

Identify elements of the model that map to real-world applications:

All facets of this activity map to IT-related content and real-world applications because this is a culminating activity for all 11 Chapters.