



Cisco Networking Academy
Mind Wide Open

CCNA R&S 6.0

The way to teach!

Thomas Meuser,
based on presentations of Cisco
product and technical managers

September 2016



NEW Cisco CCNA R&S Certifications announced May 17, 2016

Certifications	New Exam Number	Old Exam Number	EoL Date of Old Exam
CCENT	100-105 ICND1	100-101 ICND1	August 20, 2016
ICND2	200-105 ICND2	200-101 ICND2	September 24, 2016
CCNA R&S	200-125 CCNA	200-120 CCNA	August 20, 2016

*** CCNA R&S exam voucher validity period will be temporarily extended from three to six months during the transition



Networking Academy CCNA R&S Curriculum Strategy



CCNA R&S Curriculum Objectives

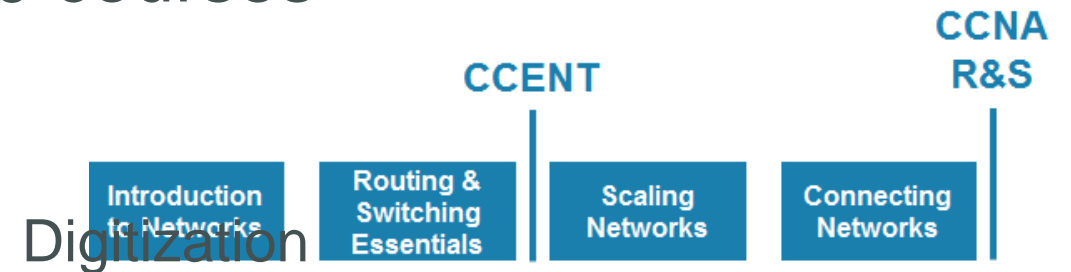
- Develop and release CCNA R&S 6.0 courses based on:

New certification alignment

Latest industry requirements and Cisco strategy

Feedback from NetAcad instructors

- Teach fundamental and essential networking knowledge
- Address certification gap in a timely manner with the CCNA R&S 6.0 Bridging Course
- Availability will be communicated when more information becomes available (s. August 31st)

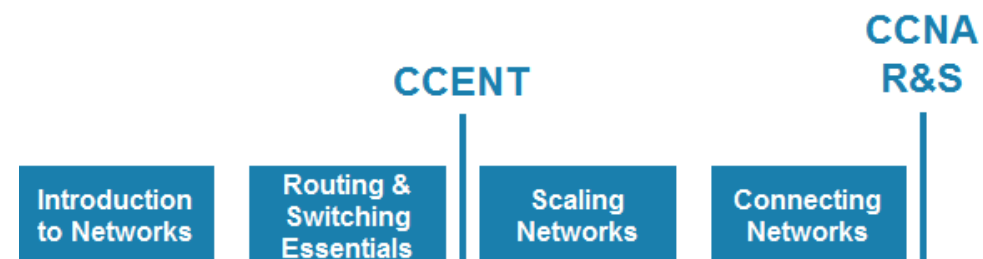


This course is designed to support you as you incorporate new content in the CCNA Routing and Switching courses.

Click [here](#) to get started.

CCNA R&S 6.0 Curriculum Recommendations

- Continue to teach CCNA R&S 5.X courses
- Leverage the CCNA R&S 6.0 Bridging Course to align to the new CCNA R&S certifications
- Adopt the CCNA R&S 6.0 Courses when they become available



CCNA R&S Bridging

This course is designed to support you as you incorporate new content in the CCNA Routing and Switching courses.

Click [here](#) to get started.

CCNA R&S 6.0 Curriculum Plan

Course	Language	Projected Release
Introduction to Networks (ITN) v6.0	English	December 2016
Introduction to Networks (ITN) v6.0	Arabic, Chinese, French, Portuguese, Spanish and Russian	December 2016
Routing and Switching Essentials (RSE) v6.0	English	December 2016
Routing and Switching Essentials (RSE) v6.0	Arabic, Chinese, French, Portuguese, Spanish and Russian	Jan-April 2017 timeframe
Scaling Networks (ScaN) v6.0	English	June 2017
Connecting Networks (CN) v6.0	English	July 2017
ScaN and CN v6.0	Arabic, Chinese, French, Portuguese, Spanish and Russian	TBD

Draft document for Scope-and-Sequence is available on the Bridging resource page.

CCNA R&S 6.0 Bridging Course



Bridging Course Information

- All technical content and quizzes are within the course
- Content order is based on the order for CCNA 6.0 courses
- No new equipment needed to teach bridge
- No instructor training required
- Upgrade to Packet Tracer 6.3 (or 7.0)
- Quiz defaults:
 - Published – may choose to unpublish quizzes
 - Quiz grades do not show in the course gradebook

CCNA R&S 6.0 Bridging Course Overview

- Course Content

4 bridging modules (it's not an online curriculum)

9 hands-on labs & 11 Packet Tracer activities

3 topic quizzes & 4 module quizzes

4.4 Quiz BGP

⚠ This is a preview of the published version of the quiz

Started: Apr 30 at 9:44am

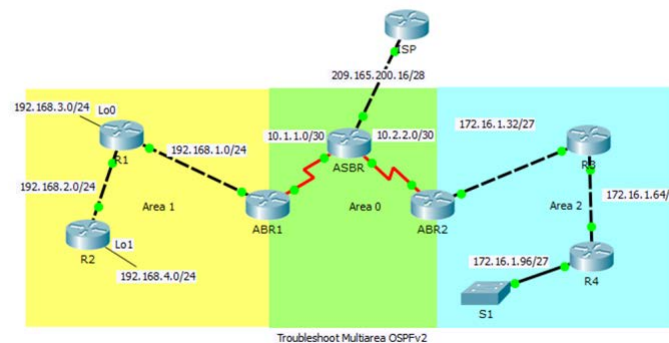
Quiz Instructions

This quiz covers the content in **CCNA R&S 6.0 CN Bridge Module - BGP**. It is designed to test the skills and knowledge presented in the module. You will be allowed multiple attempts

Form 31104

Lab – Troubleshoot Multiarea OSPFv2

Topology



Course Overview

Introduction

Course Completion Overview

Introduction to Networks - Bridge Content

Routing & Switching Essentials - Bridge Content

Scaling Networks - Bridge Content

Connecting Networks - Bridge Content

CCNA R&S 6.0 Bridging Course Overview

1.2.2.1: Duplex Oper Quizlet - Device Discovery with CDP

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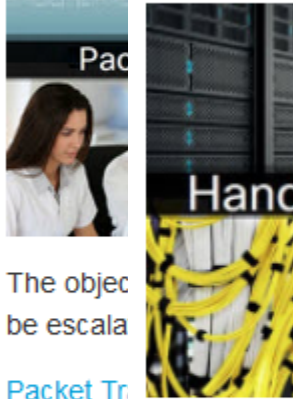
Ethernet a
capabilities:
mode.

Figure 1:



1.2.3.6: Packe

1.2.3.5: L



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Packet Tr

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- Impleme
- Verify F
- Docume

Lab - Troub

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◀ Previous

◀ Previous

Restliche
13

Falsch
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Richtig
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Begriff zuerst anzeigen

Audiowiedergabe

Neu starten

an IOS command that displays information about the CDP protocol, including its operational status

Weiß ich nicht

Antworten


Quizlet Dieses Lernset ansehen

◀ Previous


- Lernmodus wählen
- Lernmodus wählen
- Zuordnen
- Lernen
- Testen
- Karteikarten
- Schreiben

Resources

1. Bridging Videos
 - Bridging Course Overview
 - Importing Bridging Content
2. Instructor Planning Guides
 - Activities
 - Best Practices
 - Assessment
 - Recommended New Content Placement
 - Content with Reduced Emphasis
3. Instructor PowerPoints
4. Instructor and Student Lab & Packet Tracer Files




Importing CCNA R&S 6.0 Bridging Course content into existing CCNA R&S 5.X Courses




Echo Rantanen
Technical Manager, US & Canada

May 2016



Instructor Materials
Routing & Switching
Essentials - Bridging Content



CCNA Routing & Switching 6.0 Bridging

Cisco | Networking Academy®
Mind Wide Open®

New Instructor Resource Page

Live April 21, 2016

Resources / Course Resources

Course Resources

- [CCNA R&S 6.0: Bridging](#)
- [CCNA R&S: Intro to Networks 5.1 | older versions 5.0](#)
- [CCNA R&S: Routing and Switching Essentials 5.0](#)
- [CCNA R&S: Scaling Networks 5.0](#)
- [CCNA R&S: Connecting Networks 5.0](#)
- [CCNA Security 2.0 | older version 1.2](#)
- [CCNP Routing & Switching 7.1](#)
- [IT Essentials 6.0 | older versions 5.0](#)

- [Introduction to IoT](#)
- [Introduction to Cybersecurity 2.0 | older version 1.1](#)
- [NDG Linux Essentials](#)
- [NDG Linux I & II](#)
- [CPA: Programming Essentials in C++](#)
- [Be Your Own Boss](#)
- [Entrepreneurship](#)
- [Get Connected](#)

Additional Instructor Resources

- [Packet Tracer Resources](#)
- [General Assessment Resources](#)
- [Instructor Professional Development](#)
- [FAQs and Tutorials for Instructors](#)
- [Academy Orientation courses](#)

Latest News

- [Translated Languages Bridging Course Available](#)
August 17, 2016
- [Professional Development Opportunity](#)
März 22, 2016
- [New Student Interface Images Available](#)
Juli 20, 2016
- [Learning Portfolio Grows with Programming Course](#)
Juli 27, 2016
- [Get the Latest Packet Tracer](#)
Juni 23, 2016

Packet Tracer Resources
Version 6.3 | Released March 2016 [Release Notes & Versions](#)
Quick links: [Packet Tracer Community](#), [Packet Tracer 6.3 FAQ](#)

Introduction to the Internet of Everything
Version 1.2 | Released June 2015 [Release Notes & Versions](#)
Quick links: [Packet Tracer Resources](#)

CCNA Security
Version 2.0 | Released September 2015 [Release Notes & Versions](#)
Quick links: [Scope and Sequence](#), [FAQ](#)

CCNA R&S: Introduction to Networks
CCNA Routing & Switching Curriculum
Version 5.1 | Released June 2015 [Release Notes & Versions](#)
Quick links: [Packet Tracer Resources](#), [General Assessment Resources](#), [Best Practices for Teaching CCNA R&S](#), [CCNA R&S ITN 5.1 FAQ](#), [CCNA R&S Curriculum FAQ](#), [Scope and Sequence](#), [New Link](#)

Course Overview
CCNA R&S: Introduction to Networks (ITN) covers networking architecture, structure, and functions. The course introduces the principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations to provide a foundation for the curriculum.
By the end of the course, students will be able to:

Classroom Resources
[Instructor PPT](#)
[Instructor Planning Guide](#)
[Activity Map](#)
[List of YouTube URLs](#)
[Syntax Checker](#)
[Icon Glossary](#)

Lab Resources
[Student Lab Source Files](#)
[Student Packet Tracer Source Files](#)
[Instructor Lab Manual](#)
[Instructor Lab Source Files](#)
[Instructor Packet Tracer Manual](#)
[Instructor Packet Tracer PDF Files](#)
[Instructor Packet Tracer Source Files](#)
[Instructor Packet Tracer PKA Files](#)

Assessment Resources
[Skills Assessment](#)
[Exam Design Document](#)

Marketing Resources
[Curriculum Overview PPT](#)
[Curriculum At-A-Glance](#)

Latest News
[Arabic CCNA R&S 5.0.3 Available](#)
April 09, 2016
[Polish CCNA R&S: ScaN v 5.02](#)
March 16, 2016
[Japanese CCNA R&S 5.03 Available](#)
March 09, 2016
[Traditional Chinese CCNA RSE Now Available](#)
February 03, 2016
[Russian and Turkish CCNA R&S 5.03 Available](#)
January 27, 2016
[go to news & events](#)

[go to news](#)



Resources / Course Resources

Course Resources

[CCNA R&S 6.0: Bridging](#)

2

[CCNA R&S: Intro to Networks 5.1](#) | older versions 5.0

[CCNA R&S: Routing and Switching Essentials 5.0](#)

[CCNA R&S: Scaling Networks 5.0](#)

[CCNA R&S: Connecting Networks 5.0](#)

[CCNA Security 2.0](#) | older version 1.2

[CCNP Routing & Switching 7.1](#)

[IT Essentials 6.0](#) | older versions 5.0

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INSTRUCTOR RESOURCES

[Course Resources](#)

1

[Assessment Resources](#)

[Additional Resources](#)

[Packet Tracer Resources](#)

[General Assessment Resources](#)

[Instructor Resources](#)

[FAQs and Troubleshooting](#)

[Academy Reports](#)

[Academy Recognition Program](#)

[Cisco Recognition Program](#)

[Instructor Training Locator](#)

[ASC Locator](#)

Latest News

[Translating Bridging](#)
August 1, 2016

[Professional Services](#)
März 22, 2016

[New Student Resources](#)
Juli 20, 2016

[Learning Program](#)
Juli 27, 2016

[Get the Career Advantage](#)
Juni 23, 2016

STUDENT RESOURCES

[Course Catalog](#)

[Cisco Certifications and Vouchers](#)

[Find an Academy](#)

[Download Packet Tracer](#)

[All Resources](#)

[Career Resources](#)

[Career Advantage Webinars](#)

CCNA R&S 6.0 Bridging Course

Instructor Resources

- Classroom Resources
- Lab Resources
- Instructor Training Resources
- Product Introduction Resources

Classroom Resources

[Instructor Planning Guide and PPT \(English\)](#)

for all four modules: ITN, RSE, ScaN and CN

[Instructor Resources - Arabic](#)

[Instructor Resources - Chinese](#)

[Instructor Resources - French](#)

[Instructor Resources - Portuguese](#)

[Instructor Resources - Russian](#)

[Instructor Resources - Spanish](#)

Instructor Training Resources

[Video: Bridging Course Overview](#)

[Video: Importing Bridging Content](#)

[Enroll in the IPD Course to Access the Training Videos and Resources](#)

Lab Resources

[Student Lab Source Files](#)

[Student Packet Tracer Source Files](#)

[Instructor Lab Manual](#)

[Instructor Lab PDF Files](#)

[Instructor Lab Source Files](#)

[Instructor Packet Tracer Manual](#)

[Instructor Packet Tracer PDF Files](#)

[Instructor Packet Tracer Source Files](#)

[Instructor Packet Tracer PKA Files](#)

Product Introduction Resources

[Video: Message from NetAcad Executives](#)

[Video: Product Overview from PM](#)

[Product Overview PPT](#)




[FAQ](#)

[Scope and Sequence](#)

<https://www.netacad.com/group/resources/ccna-rs-bridge/6.0>

Global IPD Week Archives

Technical Sessions - CCNA R&S and Beyond

Topic	Recording Link	Resource Link
Basics of PPPoE	Recording 	Resources
HSRP	Recording 	Resources
Introduction to eBGP	Recording 	Resources
Network Programming	Recording 	Resources
Troubleshooting Multi-Area OSPF	Recording 	Resources
Understanding Quality of Service (QoS)	Recording 	Resources
SNMPv3	Recording	Resources
SPAN	Recording	Resources
Cloud Computing and Virtualization	Recording	Resources
Host Routes	Recording	Resources
Device Management (password recovery)	Recording	Resources
Switch Stacks	Recording	Resources
Extended VLANs	Coming Soon	
DMVPN	Coming Soon	

Introduction to eBGP.zip



eBGP Demo.pkt
Typ: Cisco Packet Tracer



Introduction to eBGP.pptx
Typ: Microsoft PowerPoint-Präsentation

Instructor Planning Guide for each Module

- Classroom Resources
 - What activities are associated with this chapter?
 - Best Practices for teaching and assessment
 - Recommended new content placement within curricula 5.x
 - Content with reduced emphasis!!!
 - Additional help
- Instructor ppts for classroom presentations

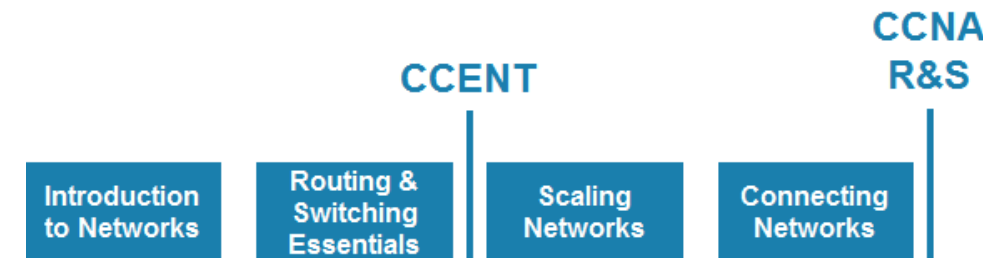
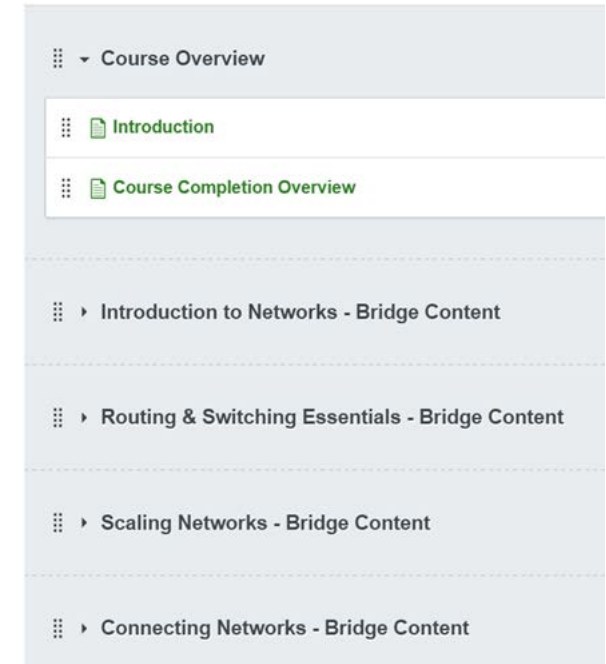
Content with reduced emphasis

Introduction to Networks	Routing & Switching Essentials	Scaling Networks	Connecting Networks
None :-{	Section 6.3 Review of CIDR and VLSM	Chapter 4 Wireless	Chapter 4 Frame Relay
	Section 6.4 Configure Summary and Floating Static Routes	Topic 5.1.5 Secure OSPF	No repetition of NAT (RSE chapter 11)
	Topic 7.3.2 Configuring the RIPng Protocol	Topic 6.2.3 OSPF Route Summarization	Section 6.1 Teleworking
		Topic 8.1.5 Secure EIGRP	Section 7.3 Introducing IPsec
		Topic 8.1.2 Manual Summarization	Section 7.4 Remote Access
			Section 8.3 NetFlow

CCNA R&S 6.0 Bridging Course

Four Options for Instructors

1. Create a Bridge Course with all four modules and enroll students
2. Integrate the new content at the end of Routing and Switching Essentials and Connecting Networks
3. Integrate the new content at the end of each course
4. Integrate the new content into existing CCNA R&S 5.X chapter



Four Options for Implementation

1.

ITN

RSE

ScaN

CN

CCNA R&S 6.0
Bridging Course Modules 1 - 4

2.

ITN

RSE

CCNA R&S 6.0
Bridging Course
Modules 1 & 2

ScaN

CN

CCNA R&S 6.0
Bridging Course
Modules 3 & 4

3.

ITN

Bridging
Module
1

RSE

Bridging
Module
2

ScaN

Bridging
Module
3

CN

Bridging
Module
4

4.

ITN

Bridging
Module
1

RSE

Bridging
Module
2

ScaN

Bridging
Module
3

CN

Bridging
Module
4

Reference Instructor Planning Guides for recommended placement of Bridging Materials

CCNA R&S 6.0 Bridging Course Certification Alignment Options

Scenario	Add Content from 6.0 Bridging Course	Other Content (at instructors' discretion)
Starting ITN 5.X	ITN 6.0 Bridging Content	
Starting RSE 5.X	RSE 6.0 Bridging Content	ITN 6.0 Bridging Content
Starting ScaN 5.X	ScaN 6.0 Bridging Content	ITN 6.0 Bridging Content RSE 6.0 Bridging Content
Starting CN 5.X	CN 6.0 Bridging Content	ITN 6.0 Bridging Content RSE 6.0 Bridging Content ScaN 6.0 Bridging Content

- ☰ Course Overview
 - ☰ Introduction
 - ☰ Course Completion Overview
- ☰ Introduction to Networks - Bridge Content
- ☰ Routing & Switching Essentials - Bridge Content
- ☰ Scaling Networks - Bridge Content
- ☰ Connecting Networks - Bridge Content

CCNA R&S 6.0 Bridging Course Option for Students

- A Self-paced CCNA R&S 6.0 Bridging Course will be offered to NetAcad student alumni
- Available on NetSpace since May 2016

CCNA R&S 6.0: Bridging

Prepare for the latest Cisco CCENT and CCNA Routing and Switching Certification exams. Recommended for current and recent CCNA students.

Enroll Now

■ ■ ■ Intermediate Duration: 20 hours

Instructor-led/Self-paced

Course Summary

The most sought after networking career certifications are getting better. Cisco CCENT and CCNA Routing and Switching Certifications have been updated to meet the new demands of today's networking careers. Cisco Networking Academy instructors who teach CCNA will be incorporating the new skills into current courses. Students who have completed courses in the [CCNA Routing and Switching](#) curriculum can enroll in the self-paced CCNA R&S 6.0: Bridging course to prepare for the updated certification exams.

- CCNA R&S: Introduction to Networks now includes extended traceroute activities and more practice in debugging and network troubleshooting.
- CCNA R&S: Routing and Switching Essentials has added material related to host routes, device discovery, NTP, and password recovery.
- CCNA R&S: Scaling Networks has added VTP, extended VLANs, and DTP. You will also learn more about troubleshooting multi-VLAN and multi-area OSPF, switch stacking, and how to implement HSRP.
- CCNA R&S: Connecting Networks has the most updates with new content in the areas of: WAN topologies, IP errors, security best practices, quality of service, cloud and virtualization, and network programming.

Languages:

Career Pathways

CCNA R&S 6.0: Bridging prepares CCNA students for certification exams. Students who enroll in the course can choose the material they need to review based on the courses they have taken and their intended certification.



















Certification: [Cisco CCENT](#) or [CCNA Routing and Switching](#)

Enroll Now

CCNA R&S 6.0 Bridging Course Objectives



Summary of New Content

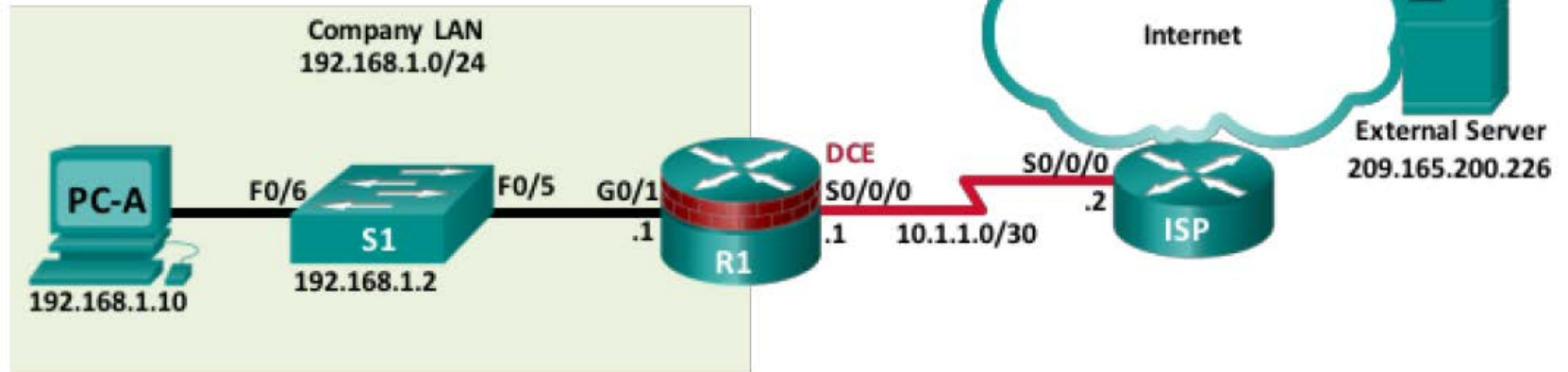
Introduction to Networks	Routing & Switching Essentials	Scaling Networks	Connecting Networks
Extended Traceroute (P)	Host Routes (P)	VTP, Extended VLANs, and DTP (S)  	WAN Topologies DMVPN (P)
Debugging (T)	Device Discovery (S)  	Troubleshoot Multi-VLAN (S)	Implement PPPoE (T) 
Network Troubleshooting (S)  	NTP (T) 	Switch Stacking (T)	Implement eBGP (S)  
	Password Recovery (P)	Implement HSRP (S)  	Common IPv6 ACL Errors (T) 
		Troubleshoot Multi-area OSPF (T) 	LAN Security Best Practices (T)
			SNMPv3 Configuration (T)
			SPAN (S) 
			Quality of Service (C)
https://www.netacad.com/group/resources/ccna-rs-bridge/6.0			Cloud and Virtualization (S)
 Hands-on Lab	 Packet Tracer Lab		Network Programming (S)
			Using IP SLA (T) 

C = Chapter (contains Sections), **S** = Section (contains Topics), **T** = Topic (contains Pages), **P** = Page.

CCNA1 - ITN Bridging - Objectives

- Network Testing and Verification
 - How to use the extended traceroute (like extended ping)
 - How to use the tracert options on a Windows PC
 - How to use debugging commands
 - Warning to use unspecified debug in real networks (e.g. debug ip packets)
 - Stop data capturing (undebug all – u al)
 - Re-direct log messages on a Telnet or SSH using ‘terminal monitor’
- Network Troubleshooting
 - Basic Troubleshooting Approaches
 - Describe how to use the **show**, **debug**, **ping**, and **traceroute** commands for network troubleshooting.

Troubleshooting – Best Practice



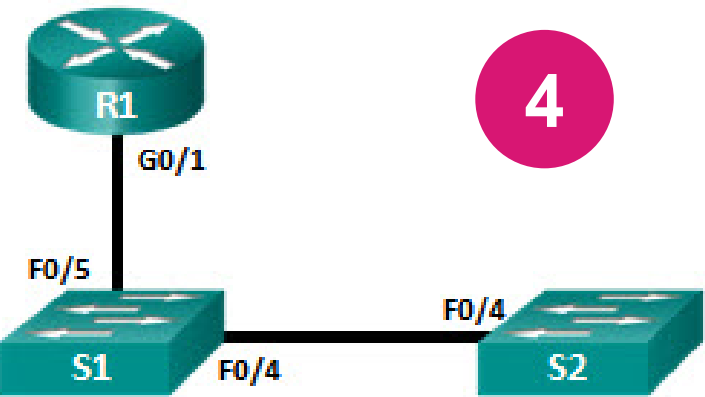
1. ping default gateway from PC;
in case of failure check using 'ipconfig' on PC-A and 'sh ip int brief' on R1
2. ping serial interface of R1 from PC; see step 1.
3. ping serial interface of ISP;
in case of failure check using 'sh ip int brief' and 'sh ip route' on R1
4. ping external server;
of failure check 'ipconfig' on server or 'sh ip route' 'sh ip protocols' on ISP in case
5. if necessary check all routers in the same way

CCNA2-RSE Bridging – Objectives (part 1)

- Create a Host Route (subnet mask equal /32)
 - Automatically listed as **L**ocal interface in the routing table when an IP address is configured on the router
 - It can be configured as a static host route
 - Host route automatically obtained through a routing protocol like OSPF
- Device Discovery using CDP and LLDP
 - Link discovery protocol that is used to gather information about devices which share the same data link
 - Each device sends periodic CDP advertisements to connected devices. Advertisements share information about the type of device, the name of the devices, and the number and type of the interfaces.
 - CDP is Cisco proprietary Layer 2 protocol whereas LLDP is an open, vendor neutral protocol also for non-Cisco devices

Us

S



2

1

```
R1# show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source
                  S - Switch, H - Host, I - IGMP, r - Repea
                  D - Remote, C - CVTA, M - Two-port Mac Re

Device ID      Local Intrfce   Holdtme    Capability  P
S1             Gig 0/1        122        S I W
```

```
R1# show cdp neighbors detail
-----
Device ID: S1
Entry address(es):
  IP address: 192.168.1.2
Platform: cisco WS-C2960-24TT-L, Capabilities: Switch IGMP
Interface: GigabitEthernet0/1, Port ID (outgoing port):
FastEthernet0/5
Holdtime : 136 sec

Version :
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M),
Version 15.0(2)SE7, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2014 by Cisco Systems, Inc.
Compiled Thu 23-Oct-14 14:49 by prod_rel_team
```

3

telnet auf Switch S1 und erneut cdp

```
S1# show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
                  D - Remote, C - CVTA, M - Two-port Mac Relay

Device ID      Local Intrfce   Holdtme    Capability  Platform  Port ID
S2             Fas 0/4        158        S I        WS-C2960- Fas 0/4
R1             Fas 0/5        136        R B S I    CISCO1941 Gig 0/1
```

```
advertisement version: 2
Protocol Hello: OUI=0x00000C, Protocol ID=0x0112; payload
1... 07
221FF000000000000000002291210380FF0000
```

CCNA2-RSE Bridging – Objectives (part 2)

- Configure and verify NTP – Network Time Protocol
 - NTP enables routers to synchronize time settings with an NTP server (local master clock or publicly available NTP server on the Internet)
 - NTP networks use a hierarchical system of time sources with each level called a stratum (0 = is the authoritative time source)

```
R1# show clock detail
20:55:10.207 UTC Fri Dec 11 2015
Time source is user configuration
```

```
R1(config)# ntp server 209.165.200.225
R1(config)# end
```

```
R1# show clock detail
21:01:34.563 UTC Fri Dec 11 2015
Time source is NTP
```

```
R1# show ntp associations

address          ref clock      st   when  poll reach  delay  offset  disp
*~209.165.200.225 .GPS.          1    61    64   377  0.481  7.480  4.261
* sys.peer, # selected, + candidate, - outlyer, x falseticker, ~ configured
```

```
R1# show ntp status
Clock is synchronized, stratum 2, reference is 209.165.200.225
```

CCNA2-RSE Bridging – Objectives (part 3)

Password Discovery

- If any password is lost or unknown, then password recovery must be performed to access a network device
- This procedure cannot be done remotely as you must have physical access and console access to the device
- Steps are slightly different for different Cisco devices
 - Step 1: Enter the ROMMON mode - break power on sequence or remove flash
 - Step 2: Change config-register to 0x2142 to ignore the startup config file
 - Step 3: Reset / reboot the device – it should look like an un-configured device
 - Step 4: Enter enable mode and load the start-up configuration
 - Step 5: Make necessary password changes and save configuration
 - Step 6: Set back the config-register to 0x2102 and reload the device

CCNA3-SN Bridging – Objectives (part 1)

- VTP, Extended VLANs, and DTP
 - Implement VTP
 - Explain how to delete a VLAN and troubleshoot DTP and VTP configurations
 - Topics have been part of CCNA, version 4.x. Now there are back again 😊
- Implement HSRP (Hot Standby Routing Protocol)
 - HSRP operation – more detailed view as in version 5.x
 - Configure, verify, and troubleshoot HSRP; in version 5.x included in a hand-on lab, now extended as section of the curriculum

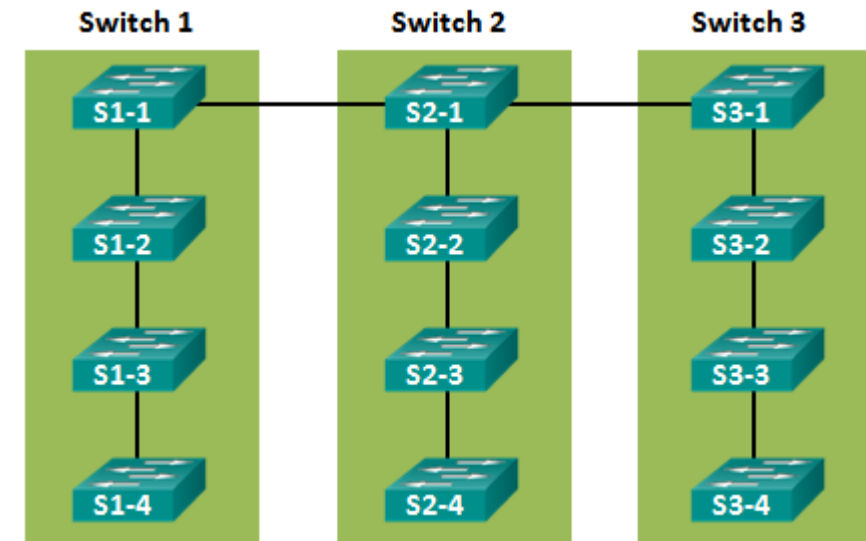
CCNA3-SN Bridging – Objectives (part 2)

- Explain how switch stacking improves STP deployment
 - Up to 9 connected switches, the stack master controls all stack members
 - The master contains the configuration files for the stack
 - each member has a current copy for backup and is an eligible master
 - Layer 2 and Layer 3 protocols present the entire switch stack as a single entity to the network.
 - Switch stacks are managed using a single IP address



CCNA3-SN Bridging – Objectives (part 3)

- Switch stacks help to reduce the impact of diameter on STP reconvergence deployment; IEEE recommends a maximum of 7 switches
 - Switch stacking also has the ability to add more switches to a single STP instance without increasing the STP diameter.
 - In a switch stack, all switches use the same bridge ID for a given spanning-tree instance.



CCNA3-SN Bridging – Objectives (part 4)

- Troubleshooting Multiarea OSPF – understand operation and data flows

Data Structure	Description
Interface table sh ip ospf interface	<ul style="list-style-type: none">• Table includes a list of all active OSPF enabled interfaces.• Type 1 LSAs include the subnets associated with each active interface.
Neighbor table sh ip ospf neighbor	<ul style="list-style-type: none">• Table is used to manage neighbor adjacencies using hello timers and dead timers.• Neighbor entries are added and refreshed when a hello is received.• Neighbors are removed when the dead timer expires.
Link-state database sh ip ospf database	<ul style="list-style-type: none">• This is the primary data structure used by OSPF to store network topology information.• It includes full topological information about each area that the OSPF router is connected to, as well as any paths that are available to reach other networks or AS.
Routing table sh ip route	<ul style="list-style-type: none">• After the SPF algorithm is calculated, the best routes to each network are offered to the routing table.

CCNA4 - CN Bridging – Objectives (part 1)

- WAN Technologies Overview - Explanation of a **WAN topologies** only.
- Describe Dynamic Multipoint VPN (**DMVPN**) - Cisco software solution for building multiple VPNs in an easy, dynamic, and scalable manner.
- Implement a Cisco router with **PPPoE** (PPP over Ethernet).
A customer's router is connected to the ISP router using DSL. Both routers have been configured for PPPoE.
Curriculum only include troubleshooting of PPPoE using show and debug
- **eBGP** (external Border Gateway Protocol) is an Exterior Gateway Protocol used to route between networks administered by two different organizations
Overview, basic configuration and verification.
Configure eBGP in a single-homed remote access network.

CCNA4 - CN Bridging – Objectives (part 2)

- Troubleshoot common **IPv6 ACL errors** using CLI commands in 3 scenarios
- LAN Security - Explain how to mitigate common LAN security attacks
 - Use **DHCP snooping** to mitigate DHCP spoofing attacks
 - AAA with **RADIUS** and **TACACS+**
 - **IEEE 802.1X** as a port-based access control and authentication protocol
- Configure **SNMPv3** to monitor network operations in a small to medium-sized business network.
- Troubleshoot a network problem using Cisco Switch Port Analyzer (**SPAN**).

CCNA4 - CN Bridging – Objectives (part 3)

- **QoS Overview** on purpose and characteristics of QoS.
 - Improve network transmission quality by prioritizing traffic
 - Transmission quality is based on bandwidth, congestion, delay, and jitter
 - Voice, video, and data have different traffic characteristics
 - Explanation of different queuing algorithms
- **QoS Mechanisms** - how networking devices implement QoS
 - Three QoS policy models: Best Effort, Integrated Services, and Differentiated Services
 - Three QoS tool classes:



CCNA4 - CN Bridging – Objectives (part 4)

- Explain why **cloud computing** and **virtualization** are necessary for evolving networks. Introduction to:
 - Cloud Services, Cloud Models and Cloud Computing
 - Virtualization, Abstract layers, and Hypervisor
- Explain why network programmability is necessary for evolving networks. Introduction to **Software Defined Networking (SDN)**
- **IP Service Level Agreements (IP SLAs)** are a feature of the Cisco IOS that allows the analysis of IP service levels.

IP SLAs use generated **ICMP** echo-based traffic to measure network performance between two networking devices, multiple network locations, or across multiple network paths.

IP SLA configuration is shown