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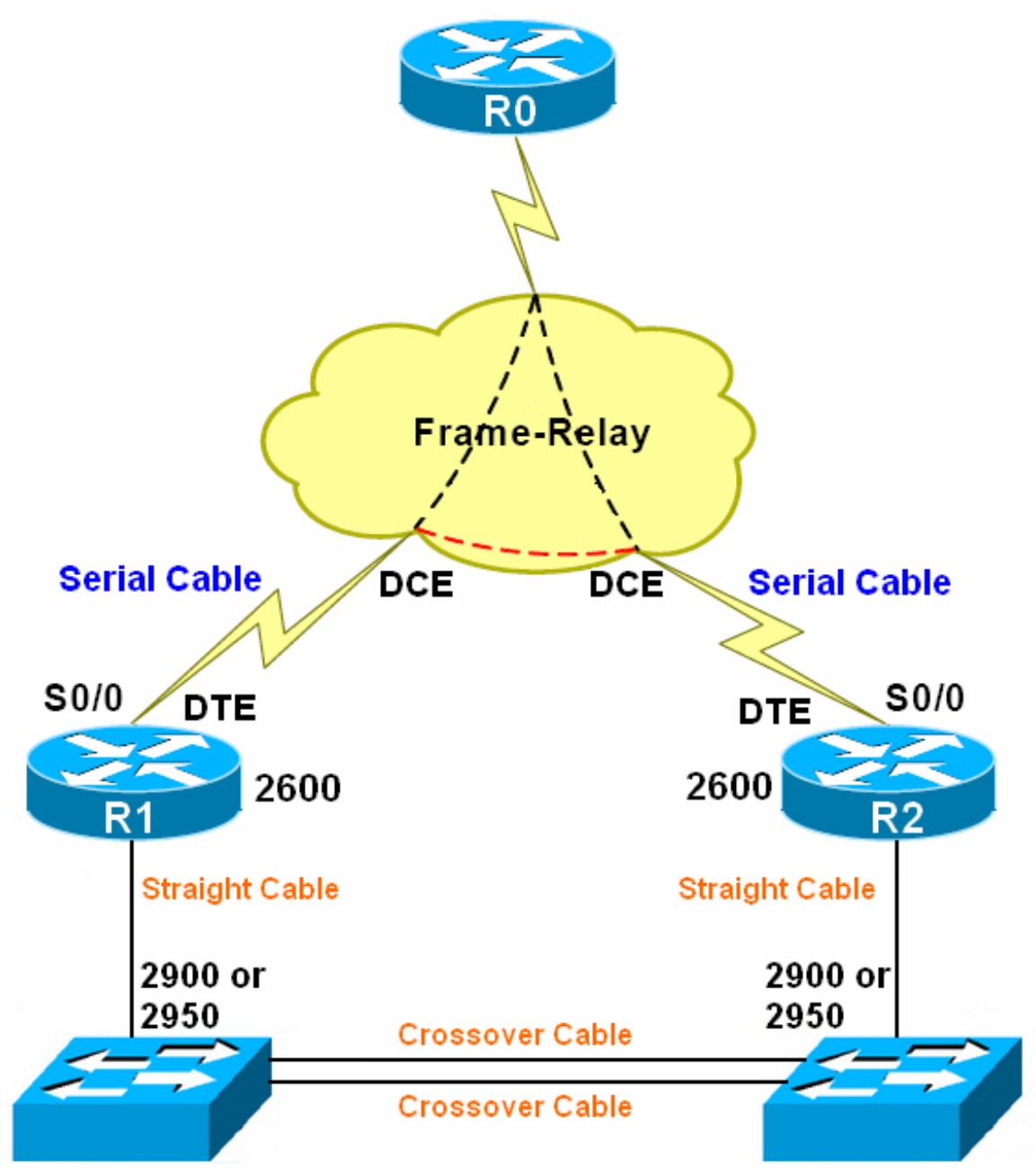
Cisco CCNA Lab Setup Instructions



Thank you again for choosing our Cisco CCNA Lab kit! This document provides easy to follow setup instructions, which apply to most of our **CCNA kits with Frame Relay capability** (either 2-Ports or 4-Ports Frame Relay Switch)

The above diagram shows the Topology (Lab Layout) used in our kits. This diagram shows a **2-Ports Frame Relay Switch** (R0) and two "Spoke Routers" (R1 & R2), as well as a pair of LAN Switches. To implement a Frame Relay Switch we typically employ a Cisco 1700, 2600, or a 2600XM Router.

Most of our Lab kits come with a 2-Ports Frame Relay Switch. However, **you may upgrade it to a Multiport-Port** Frame Relay Switch (4-Ports F/R Switch).

Some of our Advanced CCNA kits already include a 4-Ports Frame Relay Switch, which allows you to practice **Frame Relay Hub & Spoke Lab scenarios**; more about that later.

But for now we are going to restrict our discussion to the regular 2-Ports Frame Relay Switch, which is represented by R0 in our diagram. **R1 & R2** are the **end-points of this F/R network**. With this in mind, we'll proceed to describe the basic connections, which include the **WAN Ports** (Serial Interfaces) as well as the **LAN connections**.

WAN Ports and the Frame Relay Function

All of our CCNA Lab kits include WAN Ports which are implemented with Serial Interfaces of different types. These WAN Ports can be configured with any **Layer-2** (Link level) **Protocols**, such as HDLC (default Protocol), PPP or Frame Relay (among others).

When using the Frame Relay Protocol we need to distinguish between the following terms: **Frame Relay Switch** and **Frame Relay End-Point** (clients of a F/R Switch).

Any Router can be configured to perform either function and **they can even do it at the same time!** (more about that later). Please notice that the term **"Switch"** should not be confused with **LAN Switches**, which are very different devices and perform totally different functions.

Our CCNA kits come with one the Routers configured as a Frame Relay Switch; typically a 2-Ports Switch, although some kits do include a Multiport (4-Ports) Frame Switch.

To connect the WAN Ports (or Serial Interfaces) from the F/R Switch to the WAN Ports in the F/R End-Points or Clients, we need special **"Serial Cables"**, which are different from regular Ethernet cables used for LAN connections. It is important to notice that in practice both types of cables are "serial in nature". That is, all bits are sent over the cable in a "serial way", one after the other. However, all cables used to establish connections between WAN Ports are commonly known as "Serial Cables".

Since these Serial Cables connect the Transmitting end of one Port to the Receiving end of the other Port, they need to be "**Crossover Cables**". Our Lab kits include at least **two Serial Crossover Cables. The specific type of Serial Cable depends on the type of Serial Interfaces used**. Some Serial Cables have **RJ-45** connectors (used for WIC-**T1** cards), while other cables have **DB60** (DCE/DTE) connectors (used for WIC-**1T** cards).

Serial Interfaces:

There are several WIC (WAN Interface Card) cards that can be used to implement Serial Interfaces. The most typical is the **WIC-1T** card. However, it can also be done with **WIC-1DSU-T1** (or WIC-T1) and **WIC-1DSU-56K**.

We typically use either **WIC-T1 or WIC-1T cards**. The both perform the **same basic function:** implement a WAN Port. But they are distinguished by the transmission speed supported and by the type of connector used.

WIC-1T cards have a **DB-60 connector** and require Serial Cables with a DCE/DTE designation. WIC-T1 cards, instead, use a **T1 crossover cable** with an **RJ-45** connector and with no distinction between the DCE and DTE side!

When the WAN Ports are implemented with **WIC-T1** cards (as we do in most of our CCNA kits with a 2-Ports Frame Relay Switch), of course we need to use **Serial Cables with RJ-45 connectors**.

But when the WAN Ports are implemented with **WIC-1T** cards (as we do in our CCNA kits with a 4-Ports Frame Relay Switch), of course we need to use **Serial Cables with DB-60 connectors**. In these cases, the Frame Relay Switch actually uses an NM-4A/S module to implement four WAN Ports. But these ports also have DB-60 connectors.

Frame Relay Configuration

Our kits come with extensive documentation about all the different CCNA topics. This documentation includes a **series of Frame Relay Lab Exercises**, including all the specific commands needed to configure a Frame Relay Switch. The F/R Switch is shipped pre-configured as such, but if you wish you can remove this default configuration and do it yourself using the respective config file given in the CD.

But although this configuration is given in the CD, here we want to explain some of the basic commands used to **configure a Frame Relay Switch**.

In the case of kits with a 2-Ports Frame Relay Switch, its serial interfaces (Serial 0/0 & Serial 0/1) are configured for the Frame Relay Switching function with the following basic command: **frame-relay route**.

We also need to configure the **interface type,** which needs to be set to **DCE** with the following command: **frame-relay intf-type dce.** Both WAN Ports in the Frame Relay Switch need to be configured with these commands.

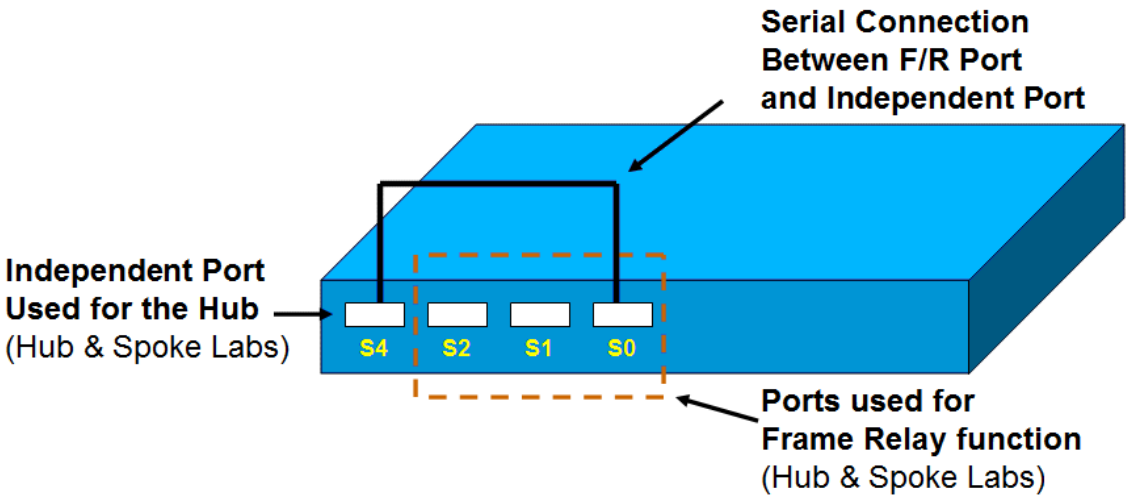
When a Port is configured with the Frame Relay (Layer 2) Protocol, **it basically disables any Layer 3 or IP function.** In other words, an IP address can't be assigned to it. The command **no ip address** is recommended for clarity purposes, although it is not strictly necessary.

However, even when the Router is configured as a Frame Relay Switch, it is still a Router and therefore it is still **capable of routing packets through its other interfaces!** It just can't route packets through its interfaces doing the Frame Relay Switching function. Thus, since the Router also has an **Ethernet interface** (LAN Port), this one could be still used as a **regular IP interface**.

In the case of kits with a Multiport-Port Frame Relay Switch, typically we do the following: Three out of the four Serial Ports in the Frame Relay Switch are used for the actual F/R Switching function. The fourth Port is left as an **Independent Port** and therefore can be used a **regular IP interface**.

Since this fourth Port is totally independent, it can be used for Routing using ANY Layer 2 technology. **That of course includes Frame Relay!** Therefore, we can connect this fourth Port to a Frame Relay Switch, **which happens to be itself!**

The following Diagram illustrates this configuration:



Important: The Frame Relay configuration is actually independent of the type of Router and type of serial interfaces being used! For the 2-Ports Frame Relay Switch, this configuration can be found in the following file:

Frame Relay Switch**Frame-Relay-2-Ports-Config.TXT**

Always keep in mind that Serial connections require a "**clocking signal**". In real life this clock is usually provided by the actual carrier (through a CSU/DSU). But it can also be provided by a Cisco Router. The actual command used to do so depends on the particular type of serial interface being used.

Let's first consider a Frame Realy Switch implemented with either WIC-1T cards or with an NM-4A/S module**.** In this case, the command used to configure the clocking signal is: **clock rate** <clock speed> command.

The side of the link that provides the clocking signal is called the **DCE** (Data Communications Equipment) and the side that receives this signal is the **DTE** (Data Terminal Equipment). Please make sure that you **connect the DCE side of the Cable to the Frame Relay device** and the **DTE side to the 2600's**.

You can also make direct serial connections between the pair of End-Point Routers (2600/2600XM)**.** If you do so, you must configure the "clock" command on the Router with the DCE side of the Cable.

```
2610(config)# interface serial 0/0
2610(config-if)#clock rate 64000
```

You can use a Back-to-Back physical connection with any Data Link Protocol such us **HDLC** (default), **PPP or Frame Relay**. Each one has its own configuration details, which are covered in the different documents included in the CD.

But if you want to use Frame Relay, then you must follow the instructions given in file: "Frame Relay Switch**Back-to-Back Frame-Relay.PDF**" that can be found in the documentation CD.

The Frame Relay Switch is configured as follows:

a) The first serial port (serial 0) is configured with **DLCI 102**

b) The second serial port (serial 1) is configured with **DLCI 201**

When configuring the End-Point or Client Routers, you must use these particular **DLCI numbers**. Since the DLCI numbers are kept in a 10 bits field, then the **valid range of DLCI numbers is: 0-1023**. You can always issue the "**sh frame pvc**" command to see what DLCI number (or numbers) your Router is receiving from the Frame Relay Switch (multiple DLCI's can be configured).

When connecting two Routers Back-to-Back using the Frame-Relay Layer 2 Protocol (that is, with **NO** Frame-Relay Switch in between), you have to use the **SAME DLCI number on both Routers!** In addition, you must configure the command: "**no keepalive**" on both sides, **otherwise the link won't come up!**

Please refer to the file "Frame Relay Switch**Back-to-Back Frame-Relay.PDF**" for more details about it.

Please notice that if your Frame Relay Switch is implemented with **WIC-T1 cards**, the configuration changes a little bit. Since in this case there is no DCE side, then **no clock rate command is needed!**

However, a clock signal is still needed! The configuration of this clock signal is done with the command: **service−module T1 clock source internal**

Once you complete the Frame Relay setup section of the Lab, you can start working on the different Lab scenarios included in the CD. Please check out file: Frame Relay Switch**Frame-Relay-Labs-1-15.PDF**. Here you'll find **15 different Frame Relay Lab exercises**, which should give a TOTAL understanding of this technology!

These 15 Lab Scenarios are based on a 2-Ports Frame Relay Switch. Therefore, **no Hub & Spoke Lab scenarios are included in this set of exercises.**

If you want to work on Hub & Spoke Lab scenarios, of course you would need to either get a kit with a 4-Ports Frame Relay Switch already in it, or upgrade your 2-Ports Switch to a **Multiport-Port one.**

Please check out our website (www.ciscoland.net) for the latest prices on these and other upgrade options available.

For a more in-depth look at the Frame Relay Technology, please take a look at the following Cisco document: Frame Relay Switch**Frame Relay Basics.PDF**.

LAN Connections:

The LAN Connections section of the Lab should be very straightforward. You should use the **Straight Cables** (yellow ones) to connect the Ethernet ports of each Router to the any port in the **LAN Switches** (2900 or 2950). By default they are configured with **Auto settings**, but you can play with different Speed & Duplex settings (Full Duplex, Half Duplex, 10 or 100 Mbps).

Please note that **you MUST use a Crossover Cable** (orange cables) **to make a Switch-to-Switch connection!** Otherwise the link won't come up! Please try with the Straight Cables and check by yourself!

Two Crossover Cables are provided, so that you can do different types of exercises. Having two connections between the same pair of Switches creates a redundant path that **may cause some Layer 2 problems!**

Fortunately, these potential problems are taken care of by the **Spanning Tree Protocol** which is enabled by default in the Switches!

With Spanning Tree in place, one link is put in "Active State" (or Forwarding Mode), while the second one is put in "Standby State" (or Listening Mode).

You can make both Switch-to-Switch Links to be active at the same time by creating an **EtherChannel**. For more details about this very useful and important technology, please check this file:

e-Lectures\Cisco Switching**EtherChannel and 802 dot1Q Trunks.PDF**

This completes the Lab Setup Instructions. However, you can use this Lab in many other different ways.

If you don't have a lot of experience with Cisco Equipment, then you should check out the document: Lab Setup Instructions**How to Get Started.DOC**

This document should give a good and quick jump start. **Perhaps you should follow these guidelines even before you start assembling this Lab**, because you don't really need the suggested connections to complete the basic sections.

If you do have some experience with Cisco Equipment, then you can skip this document and can simply peek around the CD to find the particular topics you are interested in.

You should be able to find information about any CCNA/CNNP topic such as **Dynamic Routing Protocols** (RIP, IGRP, EIGRP, OSP & BGP, etc.), **Spanning Tree Protocol, Network Security, Wireless Technology, VPN, etc.**

Finally, please don't forget to check out the "**Cisco Questions & Answers**" **folder** for exam-like questions (with answers & explanations) that should give you a pretty good idea of what topics you need to master for your exam!

That's it for now! Please don't forget to check out our website (www.ciscoland.net) for the latest prices on all of the upgrade options available.

Thank you!!