# Lab 2: Lab Fundamentals
*or: A 2 Hour face-to-face Intensive about Real equipment, Real networks*

What You Will Do (WYWD):
1. Learn the setup of the Lab room (T108): lab cabling, access switches, control PCs
2. Confirm your knowledge of network cabling: recognition and use of each of the 3 types.
3. Confirm your ability to identify equipment based on its physical characteristics.
4. Cable & boot up all the required equipment and resolve any startup issues.
5. Complete the configuration for basic connectivity for 4 routers configured in a ring.
6. Capture and submit configs and other device details.
7. Demo your ability to use and understand the output of simple network monitoring tools: ping and traceroute.
8. Demo your ability to **work in a shared environment**!!!  This is shown by completing the previous steps **and** leaving the equipment cleared of all configs.


Things that you will need to know or learn:
1. Essential device configuration – hostname, MOTD, Loopback/Vlan1, *basic security* , IPv4
2. The purpose and value of loopback interfaces.
3. Designing and implementing default static routes for small or stub networks
4. The HUGE importance and value of validating full network connectivity.
5. How to capture configs and CLI output
6. Understand how ping and traceroute work, key differences, and what they can tell you.

What you need to submit and when:
1. Complete the Lab 2 pre-lab quiz on BrightSpace, **before** your lab period.
2. Complete the in-lab checkpoints (see below), **before** the end of your lab period.
3. Complete the Lab 2 Post-lab exercise and quiz on BrightSpace, **before** your next lab.

Required Equipment:
- A laptop and/or a USB memory stick to save results for post-lab questions
- **Hard-cover lab notebook**, for reference during **SBA** at the end of the course.

In-Lab Marks:
[1 mark]  Demo of full, end-to-end network connectivity   [Checkpoint **A]**
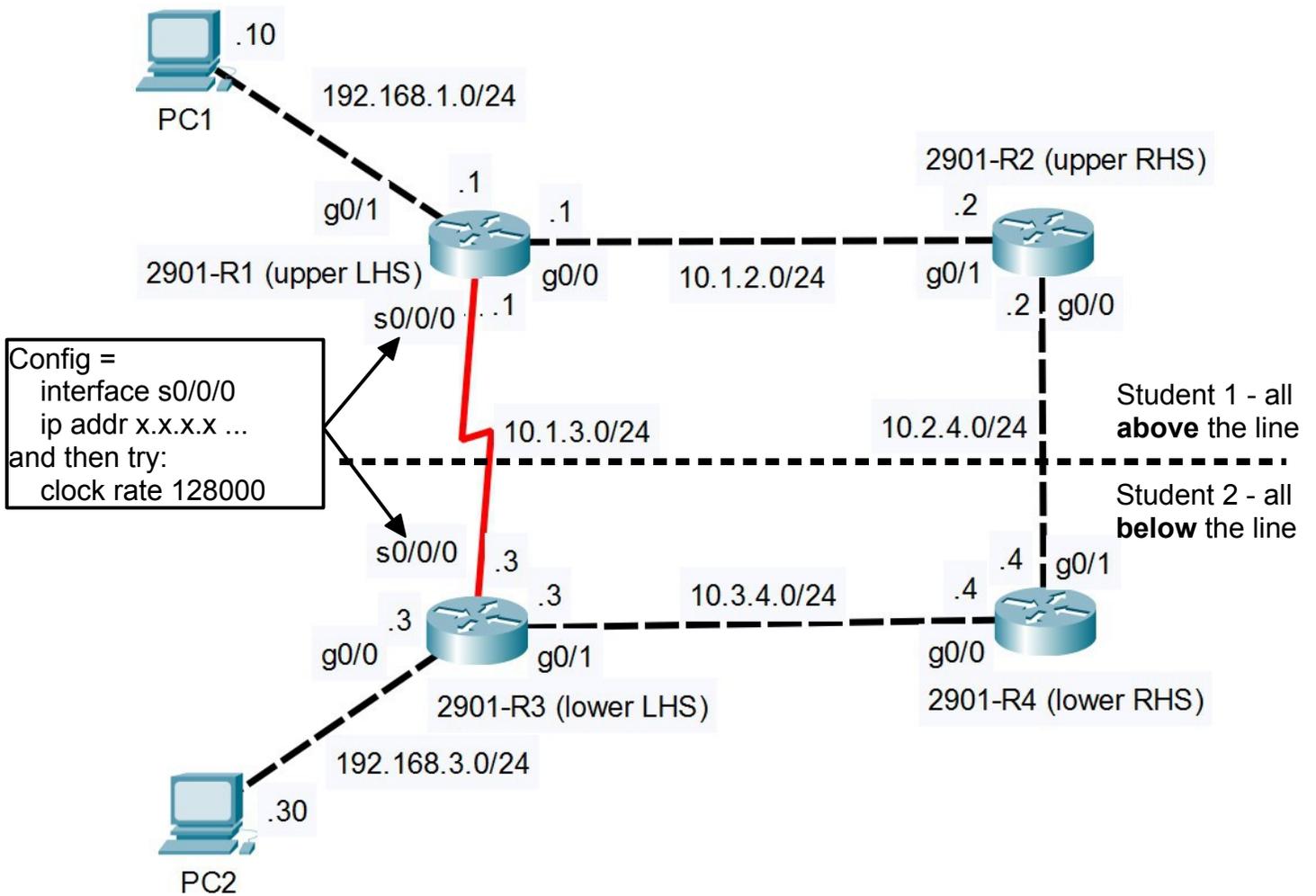[1 mark]  Demo that your lab equipment is clear of any configs   [Checkpoint **B**]
[2 marks]  Zip file of configs, **all** correctly named, submitted on BrightSpace

The pre-lab is worth **30%**, the in-lab is worth **35%**, and the post-lab is worth **35%** of this lab, even though the number of points may differ between each part.

References and Resources:
- Information page on three types of network cables (see last page)
- All the materials used in your previous networking courses, including https://netacad.com
- Packet Tracer ver 8.2 or higher (available from NetAcad)
- Algonquin's NetLab facility – http://netlab.algonquincollege.com

## Lab 2 – Topology and Addressing Diagram



Topology diagram:

- PC1 (.10) connects via 192.168.1.0/24 to 2901-R1 (upper LHS) interface g0/1 (.1)
- 2901-R1 (upper LHS): g0/0 (.1) connects via 10.1.2.0/24 to 2901-R2 (upper RHS) g0/1 (.2)
- 2901-R1 s0/0/0 (.1) connects via 10.1.3.0/24 (red line) to 2901-R3 s0/0/0 (.3)
- 2901-R2 g0/0 (.2) connects via 10.2.4.0/24 to 2901-R4 g0/1 (.4)
- 2901-R3 (lower LHS): g0/0 (.3) connects via 192.168.3.0/24 to PC2 (.30)
- 2901-R3 g0/1 (.3) connects via 10.3.4.0/24 to 2901-R4 (lower RHS) g0/0 (.4)

Config box:
```
Config =
   interface s0/0/0
   ip addr x.x.x.x ...
and then try:
   clock rate 128000
```

Student 1 - all **above** the line
Student 2 - all **below** the line

| Device | Interface | Address | Gateway |
|---|---|---|---|
| **R1** (student 1) **LHS** rack (odd # pods): R1, or R3, or R5 | Gi0/0 | 10.1.2.1/24 | default route goes to next router clockwise **address = ??** |
| | Gi0/1 | 192.168.1.1/24 | |
| | S0/0/0 | 10.1.3.1/24 | |
| **R2** (student 1) **RHS** rack (even #pods): R1, or R3, or R5 | Gi0/0 | 10.2.4.2/24 | default route goes to next router clockwise **address = ??** |
| | Gi0/1 | 10.1.2.2/24 | |
| PC1 (student 1) | Realtek NIC | 192.168.1.10/24 | ? |
| **R3** (student 2) **LHS** rack (odd # pods): R2, or R4, or R6) | Gi0/0 | 192.168.3.3/24 | default route goes to next router clockwise **address = ??** |
| | Gi0/1 | 10.3.4.3/24 | |
| | S0/0/0 | 10.1.3.3/24 | |
| **R4** (student 2) **RHS** rack (even #pods): R2, or R4, or R6) | Gi0/0 | 10.3.4.4/24 | default route goes to next router clockwise **address = ??** |
| | Gi0/1 | 10.2.4.4/24 | |
| PC2 (student 2) | Realtek NIC | 192.168.3.30/24 | ? |

## Task 1: Orientation to Lab Setup, Cables, Network Switches and Routers

This is a Professor-led group activity.  You will be given an orientation to the room and equipment that you will be using for this semester (and future semesters too).  For convenience, the last page of this lab has summary information on cable types.  Finally, there will be a brief discussion on what Cisco defines as "basic security settings" for their network devices.  [Ref: WYWD 1-3,5]

## Task 2: Cabling and Power-on

**Working in pairs**, wire up topology given on the previous page.  Please note that each student plays a different role in connecting the Cisco equipment.  [Ref: WYWD 4]

Step 1.    Cable the equipment, **including** a console cable to the first router (R1 or R3)
Step 2.    On each PC, start a Putty session for the console: e.g.Serial, COM1, 9600 baud
Step 3.    Power on your routers.  Examine the output as the device powers up.

## Task 3: Addressing Scheme and Determination of Gateway

The topology for this lab is a **ring** of four routers.  Each router has a **default route** pointing to the next router **clockwise** within the ring.

Together with the info in the topology diagram, determine the **default routes** for each router, and the default gateway for each PC.  <u>Complete the chart with the default addresses</u>.

## Task 4: Initial Connectivity between the PCs and connected routers  [Ref: WYWD 5]

Step 1.    [PC], configure the Realtek NIC with the address / mask /gateway from the
                address table.
Step 2.    [Rx] Config hostname - **you must ALWAYS use this format whenever you are in
              lab:  {Alg-NetID}-R{#}**  where: **Alg-NetID** = your Algonquin Network ID; **#** = router number
Step 3.    Configure the essentials of basic device security:
                – an exec password: **class**                              – console login password: **class**
                **–** a user account with user/pass of **cisco** / **class**
                – vty login is enabled, and uses local authentication
Step 4.    Configure G0/0 (or G0/1) on the Router with the correct address, and default route.
Step 5.    Now verify your work!!  From the PC, ping the router and then login via telnet.
                Troubleshoot the config on your PC and router until it's working properly.
Step 6.    Disconnect the console cable from R1 (or R3)  You've still got a telnet connection,
              right?!  Connect the console cable to R2 (or R4); you can leave there it for the rest of lab.

## Task 5: Second Router and Ring Configuration  [Ref: WYWD 5]

In this task, you configure your second router, and ensure that routing around the ring is set up.

Step 1.    Connect to the second router using the console cable.
Step 2.    [Rx] Config hostname - **you must ALWAYS use this format whenever you are in
              lab: {Alg-NetID}-R{#}**  where: **Alg-NetID** = your Algonquin Network ID; **#** = router number
Step 3.    Configure the bare-bones device security as you did in the first router:
                – an exec password, console login password, the user account, and vty login security
Step 4.    Configure the interfaces addresses as well as the default static route.

## Task 6: Connectivity Verification and Troubleshooting

If you've reached this task, you've got connectivity from your PC to it's gateway router. What remains is confirm connectivity between routers that are immediate neighbours, and then the default static routes which give full end-to-end connectivity. [Ref: WYWD 5]

Step 1.   One by one, ping between each pair of adjacent routers to test connectivity.
            R1<—>R2, R2<—>R4, R4<—>R3, R3<—>R1
            For any pings that fail, verify you've correctly assigned the proper address to the correct interface! Remember, it's not unusual for a few of the initial pings to fail.

Step 2.   Once all adjacent connectivity is working and proven, move on to the default routes. Attempt to ping the non-adjacent router: R1<—>R4, R3<—>R2
            If no pings work after 2 attempts, verify the addresses you determined for the default routes, confirm they're typed in correctly, and that they're active and appear in the output of the verification command:  `show ip route`

Step 3.   From a CMD window(s) on the PC, confirm that you can ping to all routers.

Step 4.   With windows **already open** showing that all tests are successful, put your name on the whiteboard in the _Demo_ list. Proceed with the next tasks if you need to wait for the lab Professor.

**CHECK POINT A**:  Demo full, end-to-end connectivity

## Task 7: Backup of Configs

Back up your Router configs. If you don't know how to do this, ask a classmate or Lab Professor for ideas. It's possible and even likely that you haven't needed backups when working in virtual environments, but with real equipment we definitely need & want them. For that reason, complete the command details are provided here. [Ref: WYWD 6,7]

Step 1.
     A. Make local copies of the Router configs. For each one, make the filename: **{exact-same-as-the-hostname}.txt**.
     B. Zip just the files (NOT in a subdirectory!); make the filename **{Alg-NetID}-L02.zip**
     C. **Submit the zip file** on BrightSpace **within 1 hr** of the end of your lab session.

## Task 8: Clearing the equipment  [Ref: WYWD 8]

Hopefully you know how to clear Cisco equipment, but just in case:
<u>Router</u>: `erase startup-config` (<u>Switch</u>: `erase startup-config` then `del vlan.dat`)

**CHECK POINT B**:  Demo to the Prof that all Routers are cleared of all config.

## <u>Homework</u>
  –   Get your hard-cover lab notebook and make some tidy notes about this lab: default routes, configuring serial interfaces, and _start_ the list of basic config required on any/every device.
  –   Grab the post-lab exercise from the course site and complete the quiz on BrightSpace!

See you next week in lab.  ☺

# Cables

## Learning Objectives

Upon completion of this lab, you will be able to:
- ☐ Correctly identify cables for use in the network.

## Cables and more Cables

At the Physical layer (Layer 1) of the OSI model, end devices must be connected by media (cables). The type of media required depends on the type of device being connected. In the lab, you'll find three different types of cables:

**Straight-through Cables**:
Straight through cable has connectors in each end that are terminated the same in accordance with either the T568A or T568B standards.

Use a straight-through cable for the following connections:
- • Switch to router Ethernet port
- • Computer to switch
- • Computer to hub
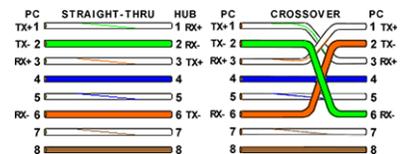
**Crossover cable:**
Directly connects two network devices of the same type to each other over Ethernet.
In this lab, are cross-over cables a specific colour?  Is this consistent for all cross-overs?

Use a crossover cable for the following connections:
- • Switch to Switch
- • Switch to hub
- • Hub to hub
- • Router to router Ethernet port

**Console Cables**:
Connects a computer to a Cisco device via the console port. Our rollover cables have DB9 connector at one end and a RJ45 connector in the other end.

Use a console cable for the following connections:
- • Computer to a switch console port
- • Computer to a router console port

In T108 and T113, the console cable is already attached to the computer it is plugged in the GREEN connector.  You would then cable from the patch panel into the console port of the switch/router with a straight through cable.