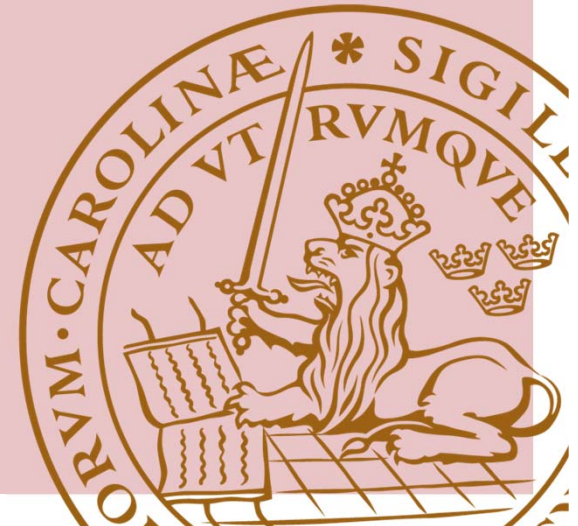




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ETSF10 2017 Routing Project

JENS A ANDERSSON

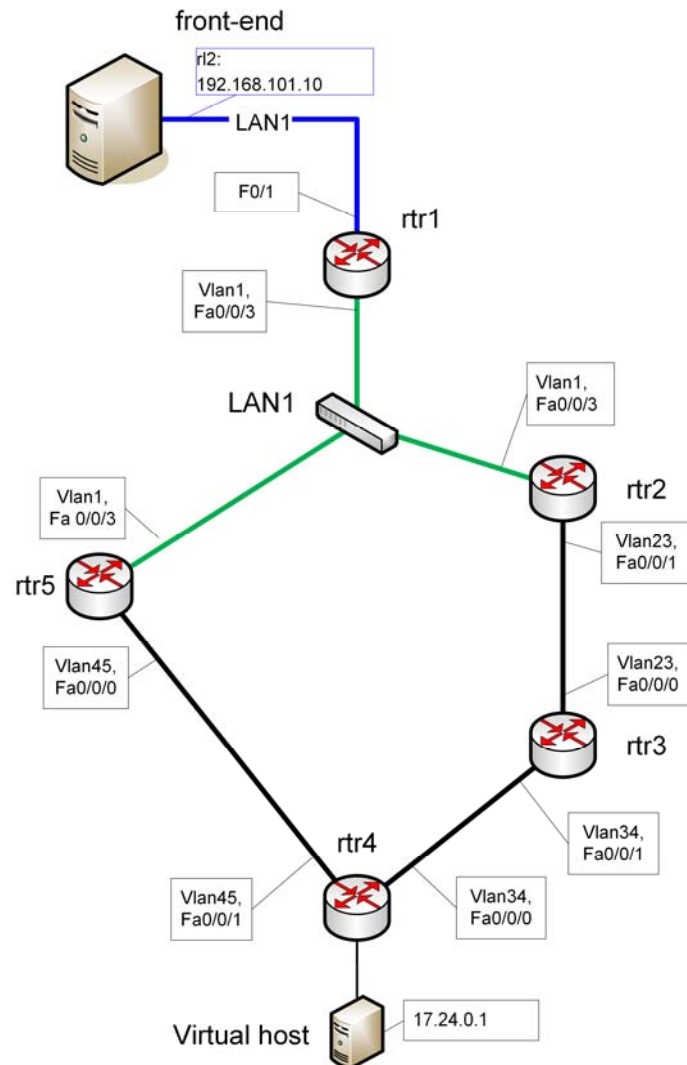


The project

- **Objective: compare routing protocols in different error conditions**
- **First phase – Getting familiar with it all**
 - Configure the routers and the lab environment
- **Second phase – Experimentation**
 - Explore two different routing protocols and observe how they deal with failures and changes in the network.
- **Challenge**
 - Study/Learning on your own material needed for the project
 - Typical engineering task



The task



Study

- Two routing protocols
 - RIP
 - OSPF
- Two different error conditions
 - Loss of Link
 - Loss of Neighbour
- Both failure onset and restore to normal conditions of interest!



Routing protocols

- Routers have to
 - Learn the outline of the network
 - » Information from other routers
 - Calculate best paths
 - » Two principles
 - Distance Vector (RIP)
 - Link State (OSPF)
 - Forward packets accordingly



Milestones and Deliverables

- Milestones:
 - Project internal documents
 - Base for deliverables
 - Discussion with the supervisor
- Deliverables
 - Project external document
 - Project results
 - Aimed for the project owner



Deadlines

Date	Document	
2016-11-02	M1	Forming of groups
2015-11-10	M2	Get to know the lab
2015-11-17	M3	Hands on
2015-11-24	M4	RIP
2015-12-01	M5	OSPF
2015-12-08	D1	Final report

For current deadlines see moodle.

Submission

- M1
 - Start forming groups now.
 - Submission via mail to supervisor
- M2-M5
 - Submit through elearning.eit.lth.se (a.k.a. moodle)
 - **Your answers must include the question for that question.**
 - **Avoid screen dumps! Your own words!**
 - **All other formats are rejected**



Supervision

- Supervisor
 - Jens Andersson
- Open-office: See moodle
- E-mail for support
- E-mail to book a time if you need hands-on support outside of office hours
- Telephone
- Zoom(?)



How to reserve the lab

- Reserve at: <https://rtrlab.eit.lth.se>
 - Use VPN if outside of campus
- 24 slots in a day.
- Policy:
 - Reserve 4 slots concurrently
 - Use or cancel slots to make new reservations
 - Book consecutive slots as you consume them.



Register groups

Groups of two

1. Enroll to the course instance at elearning.eit.lth.se (moodle)
2. Mail to jens_a.andersson@eit.lth.se

– The mail **must contain**

- Line 1 (one line): Group members full name:
Given_name1 Surname 1<space>;<space>given_name2 surname2
- Line 2 (one line): Group members full mail addresses:
Mail1<space>Mail2

– Example:

John Doe ; Jane Roe
john@test.com jane@test.com

Group registrations not following this outline will not be **accepted.**



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moodle

- Problems with group assignments
 - Lack of mail info
 - » No notifications to me when you submit
 - » No notifications to you when I have graded
 - Annotated PDFs
 - » I cannot see old annotated submissions
 - » You have to colour mark changes from last version

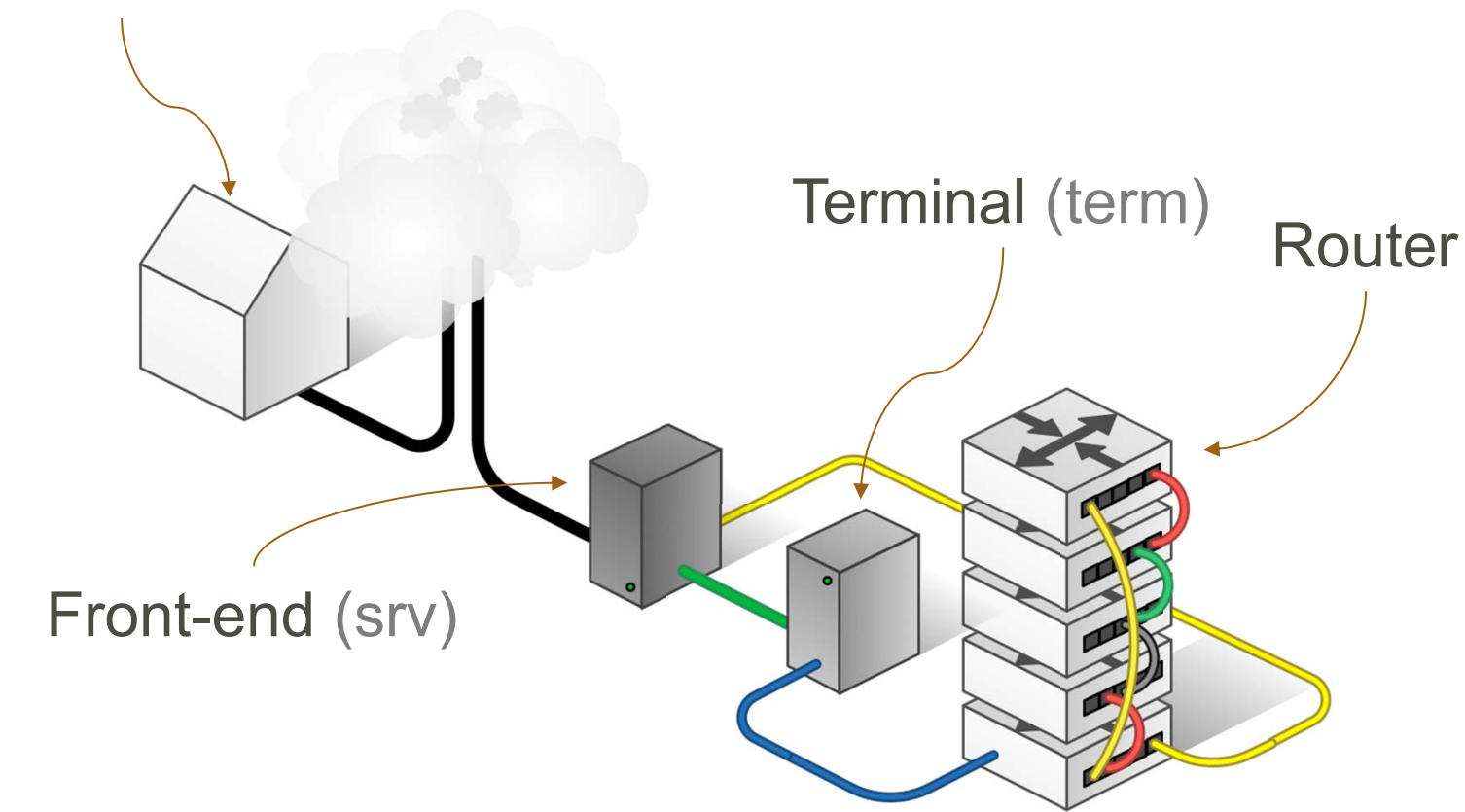


The lab environment



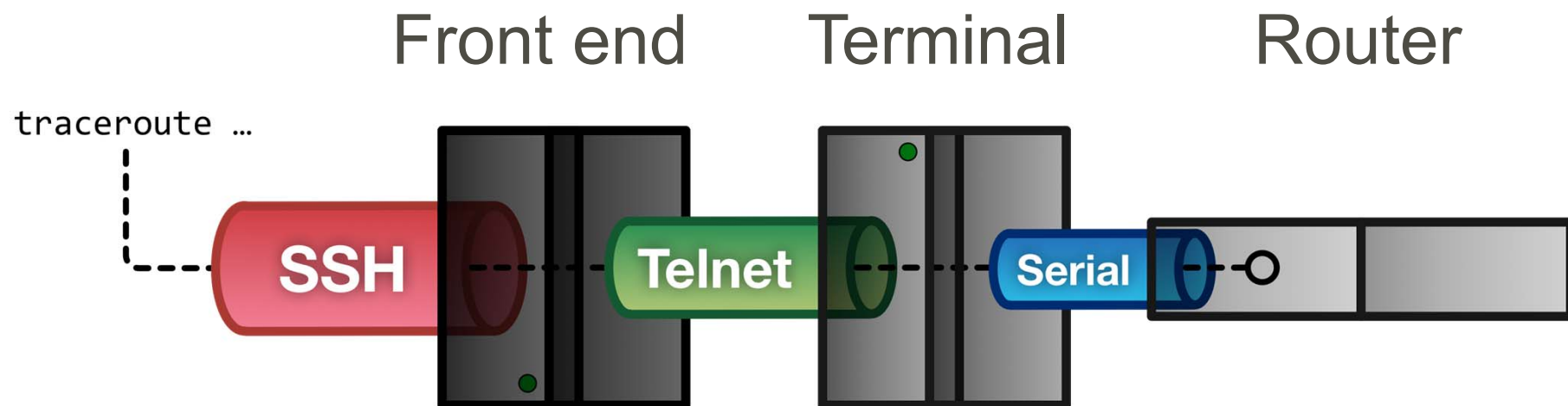
The lab environment

Student



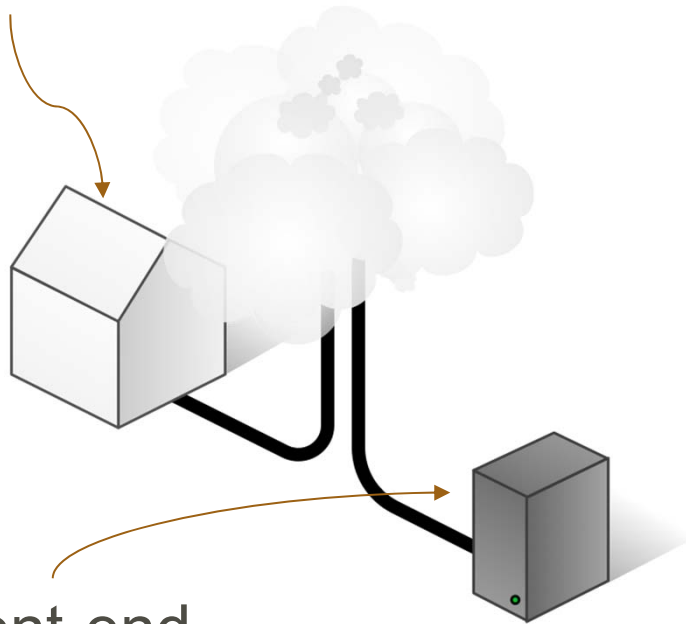
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Accessing the lab



Student to Front end - SSH

Student



Front-end

- Point of entry to lab
- SSH (Putty for Windows)
- `rtrlab.eit.lth.se`
- User name
- Linux terminal
- Exit to leave

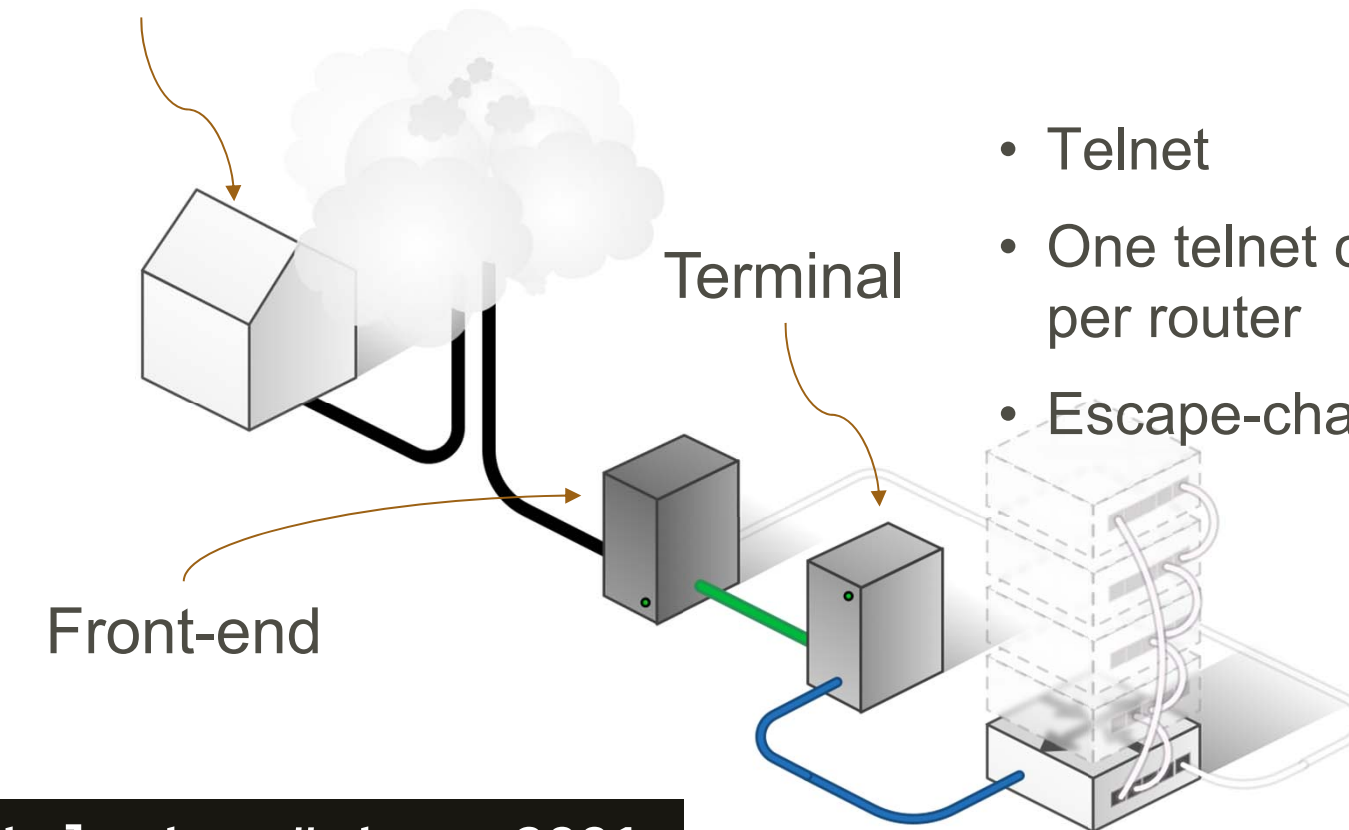
```
ssh <username>@rtrlab.eit.lth.se
```



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Front-end to Terminal - Telnet

Student



- Access the routers
- Telnet
- One telnet connection per router
- Escape-character

```
telnet -e# term 2001
```



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One port per router

- rtr1 = TCP port 2001
- rtr2 = TCP port 2002
- rtr3 = TCP port 2003
- rtr4 = TCP port 2004
- rtr5 = TCP port 2005



Warning before you are kicked out

While in the lab, you will be warned before your reservation ends.

WARNING!

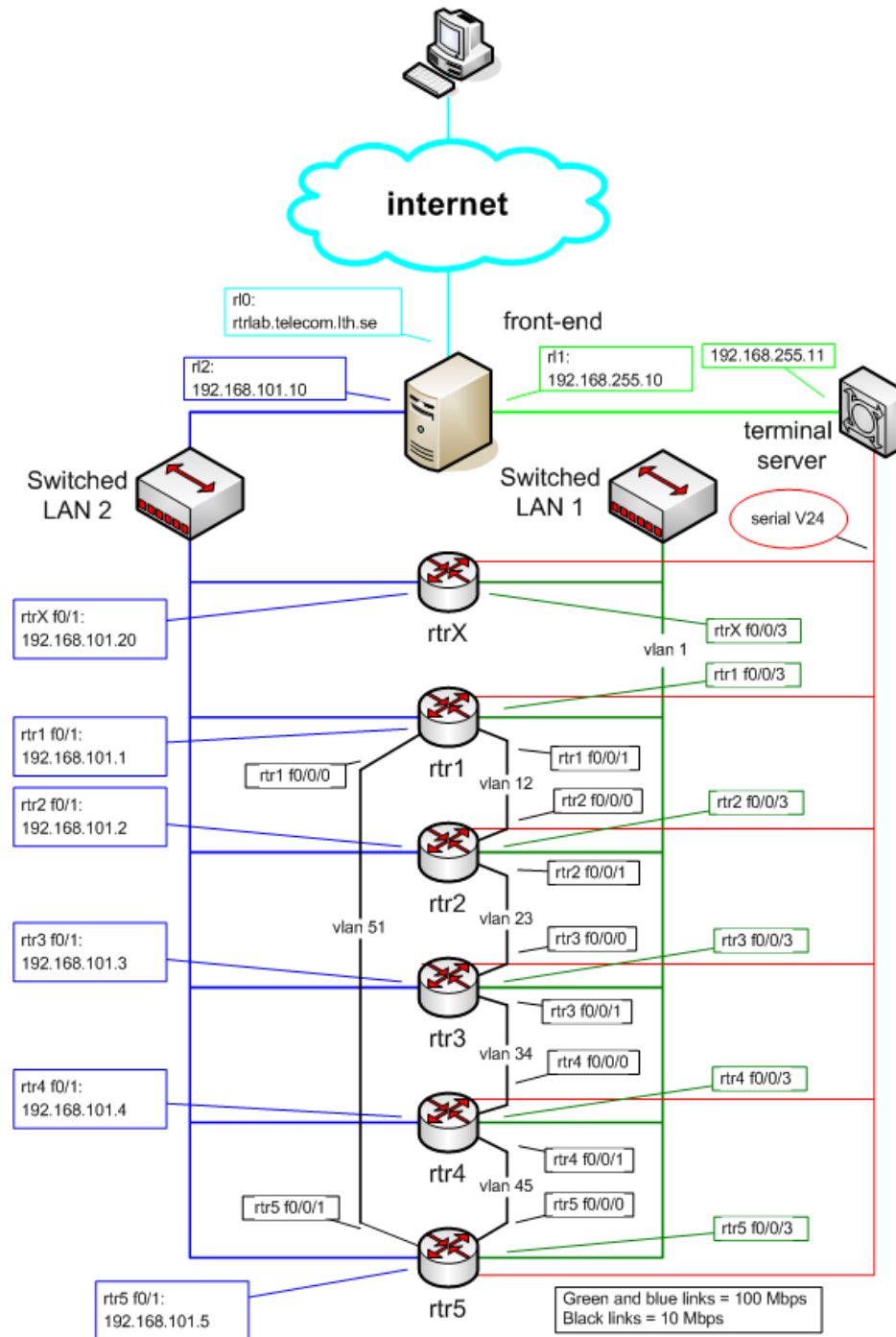
Your booked session will END in 15
(FIFTEEN) minutes.

Remember to save all your work, since you
will be FORCIBLY disconnected
at the end of this session.

(You can prevent this by booking the next
session, if it is available.)



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The routers



- Cisco 1841
- IOS version 15



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Router interfaces: Two types

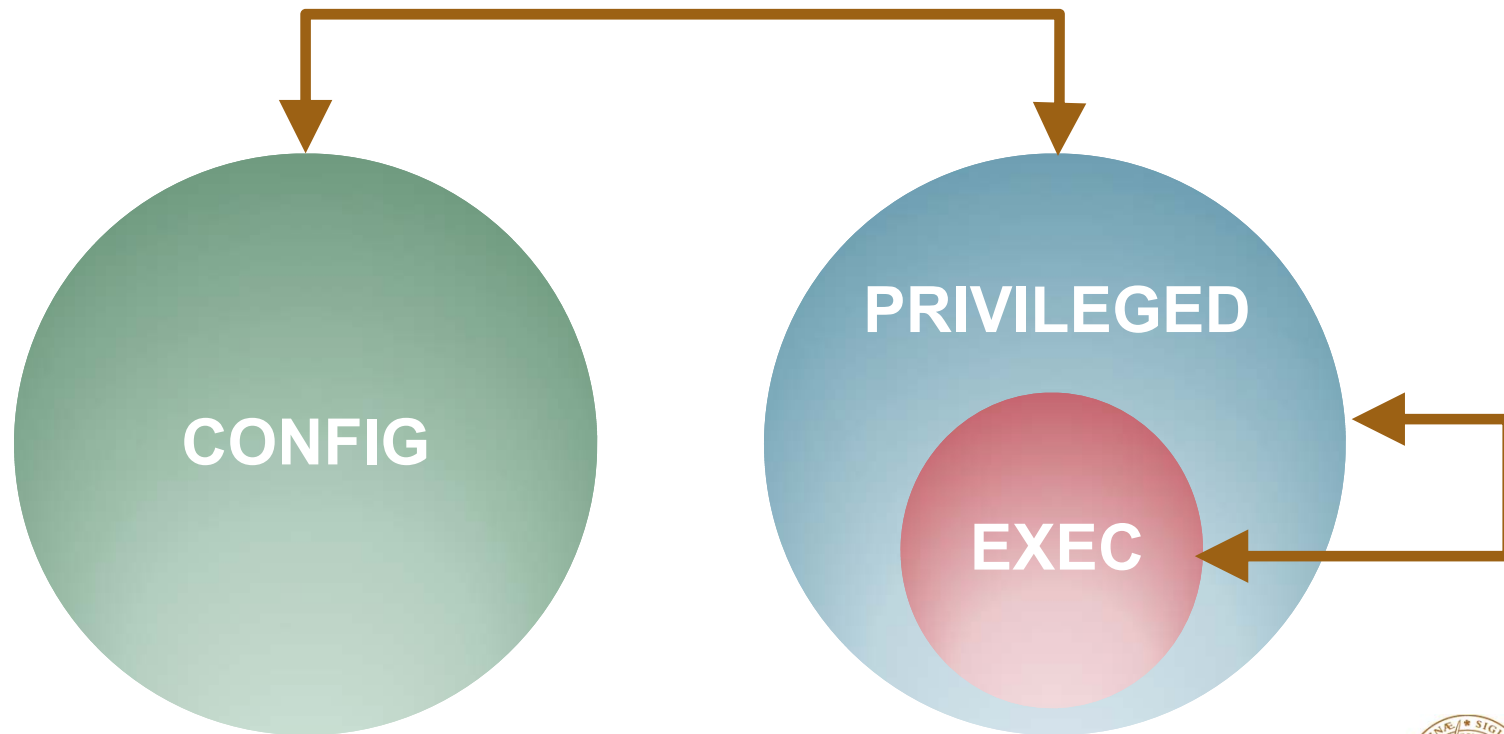
- "Normal" (compare with your computer)
 - `f0 / <n>`
 - One port, one IP address
- "VLAN/Switched"
 - `f0 / 1 / <n>`
 - Physical interface
 - IP cannot be configured here
 - 4-port switch with VLAN support
 - Default config: One vlan per switch port
 - One vlan, one IP address
 - At least one physical port link up for state up



Understanding the lab environment



IOS CLI: Modes



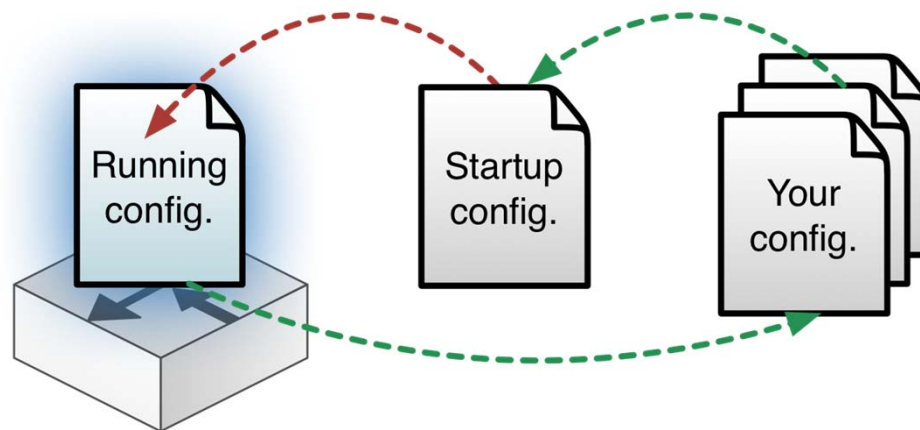
IOS CLI: Modes

- EXEC
 - Limited access
 - **rtr>**
- PRIVILEGED
 - All Access
 - **rtr#**
 - Activate: enable
password: enable
 - Deactivate: disable
- CONFIG
 - Activate: `config terminal`



Configuration files

Overview



```
show running-config  
show startup-config
```

RUNNING-CONFIG

On-line

Changes made in CONFIG-mode are directly made to RUNNING_CONFIG

STARTUP-CONFIG

Activated after restart

Own configuration file in /tftpboot under your home directory



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Configuration files

Revert

```
config replace  
flash:rtr1-config
```

```
config replace  
tftp://srv/rtr1-lab-  
config
```

```
config replace  
ftp://<userid:passwd>@s  
rv/myconfig
```

- Revert to the default configuration from flash
- Revert to lab configuration on front-end over TFTP
- Revert to default configuration on front-end over FTP
- Tftp and ftp requires working path to srv!



Configuration files

Copy and backup

```
copy running-config  
\ftp://<username>:<pass  
word>@srv
```

```
copy \  
ftp://<username>:<passw  
ord>@srv/ \  
<filename> startup-  
config
```

- Copy RUNNING-CONFIG to your home directly on front-end over FTP
- Copy your configuration file from your home directly on front-end to RUNNING-CONFIG over FTP

(How to resume a lab)



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Most common error

```
Trying 192.168.255.11...
Connected to term.
Escape character is '#'.
Connection closed by foreign host.

/home/group $ ps
  PID TT  STAT   TIME COMMAND
 11638 p0  Is    0:00.02 -ksh (ksh)
 22733 p0  I+    0:00.01 /bin/sh ./rtr1
21110 p0  I+    0:00.05 telnet -e# term
2001
 2934 p1  Is    0:00.02 -ksh (ksh)
```

- Find PID for hanged telnet session
- Apply shell command
kill -9 <pid>
- **Check FAQ or Reference Guide!**



If “something” is not working

- Review which commands you just entered
- Revert to a working config
 - **config replace**
- Restart the routers
 - **reload**
- Revert to default configuration
 - **copy flash:rtr1-conf startup-config**
 - **reload**



A diagram showing a simple house with a chimney. Smoke is coming out of the chimney, and an arrow points to the house.



- Electric relay do cut power to the switches

- Email supervisor if you needed to do this



Electric relay

From the front-end server:

```
k8056 [-S|-C|-T]<router number>
```

S = set

C = clear

T = toggle

Have patience!

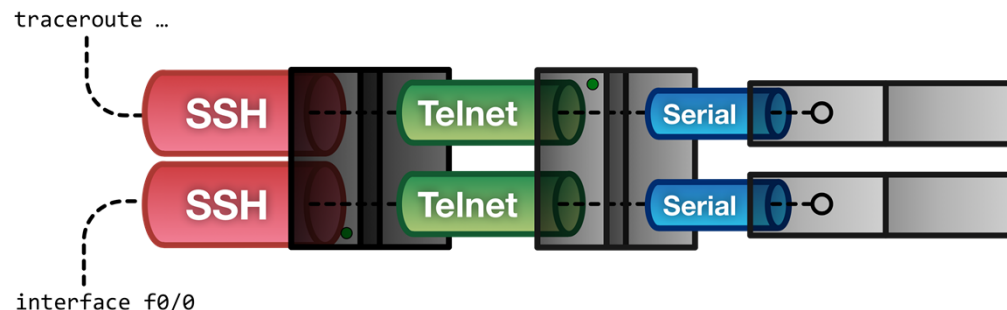
- Cold start takes time.
- Long periods with no print out on the console



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Tips

- The assignments cannot be completed in just 4 hours.
- You need to be thoroughly prepared
- Don't rely on eduroam
- Dont misspell the commands:
 - Translating "**enab**el"...domain server (255.255.255.255)
- Use multiple SSH connections, from one computer, to access multiple routers.



Tips

- **Shorts**

- term = terminalen. *Instead of 192.168.255.11*
- srv = front-end. *Instead of 192.168.101.10*

- **Mode**

- EXEC: **rtr1>**
- PRIVILEGED: **rtr1#**
- CONFIG: **rtr1(config...)#**

- Command completion (Tab): sh -> show



Warning!

Never, ever, copy anything to flash:



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