



LUND
UNIVERSITY

ETSF10 2016 Routing Project

JENS A ANDERSSON



The project

- Explore two different routing protocols and observe how they deal with failures and changes in the network.
- **First phase – Getting familiar with it all**
 - Configure the routers and the lab environment
- **Second phase – Experimentation**
 - RIP
 - OSPF
 - Configure the routing protocols
 - **Objective: compare routing protocols in different error conditions**

Groups of two

Register groups

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**  **UNIVERSITY** accepted.

Milestones and deliverables

- Milestones:
 - Project internal document
 - Basis for deliverable
- Deliverable
 - Project resultats
 - Aimed for project owner

Deadlines

Date	Document	
2016-11-03	M1	Forming of groups
2016-11-10	M2	Get to know the lab
2016-11-17	M3	Hands on
2016-11-24	M4	RIP
2016-12-01	M5	OSPF
2016-12-08	D1	Final report

Moodle deadlines are the effective deadlines!



Supervision

- Supervisor
 - Jens Andersson
- Open-office: See website
- E-mail for support, see format on website
- E-mail to book a time if you need hands-on support outside of office hours

Submission

- Submit through elearning.eit.lth.se (a.k.a. Moodle)
 - PDF-file
 - File name:
[ETSF10-16-\[Group number\]-\[milestone/deliverable id\]](#)
e.g. *ETSF05-16-14-M2*
 - Your answers must include the question and the maximum score for that question.
 - **All other formats are rejected**

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.

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.)

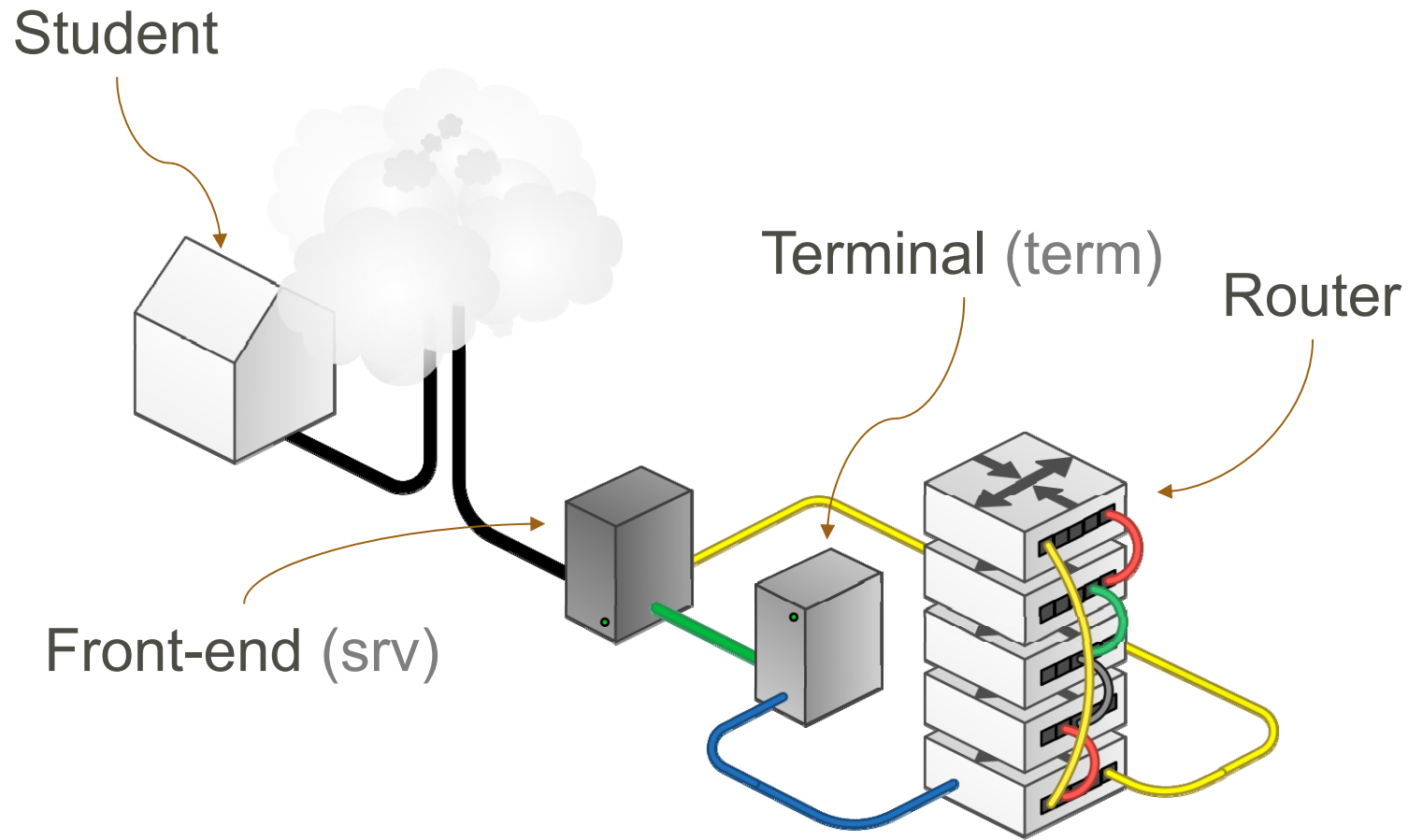


LUND
UNIVERSITY

The lab environment



The lab environment



Accessing the lab

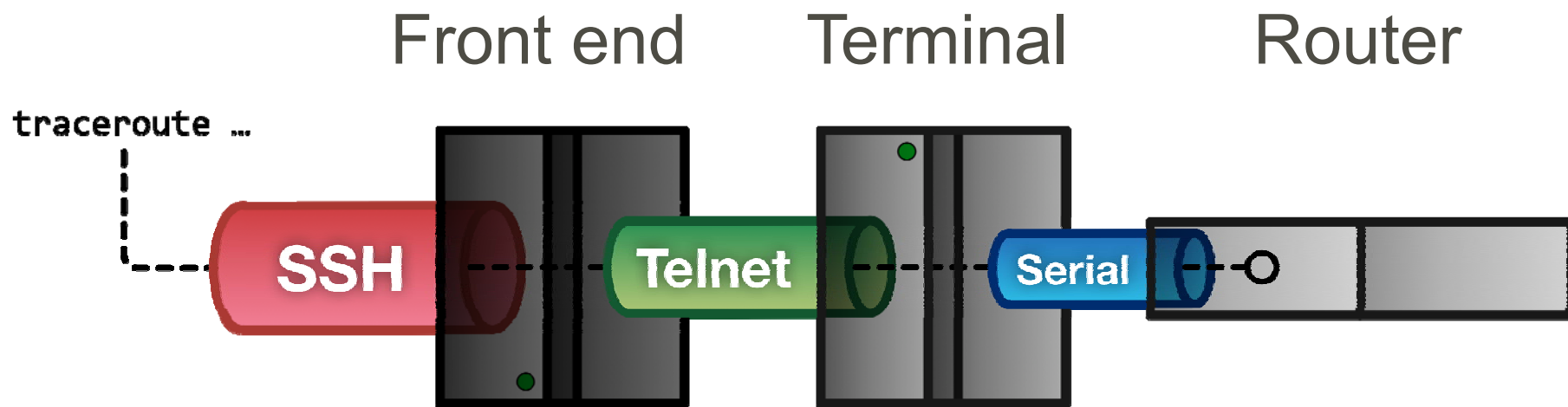


Bild 13

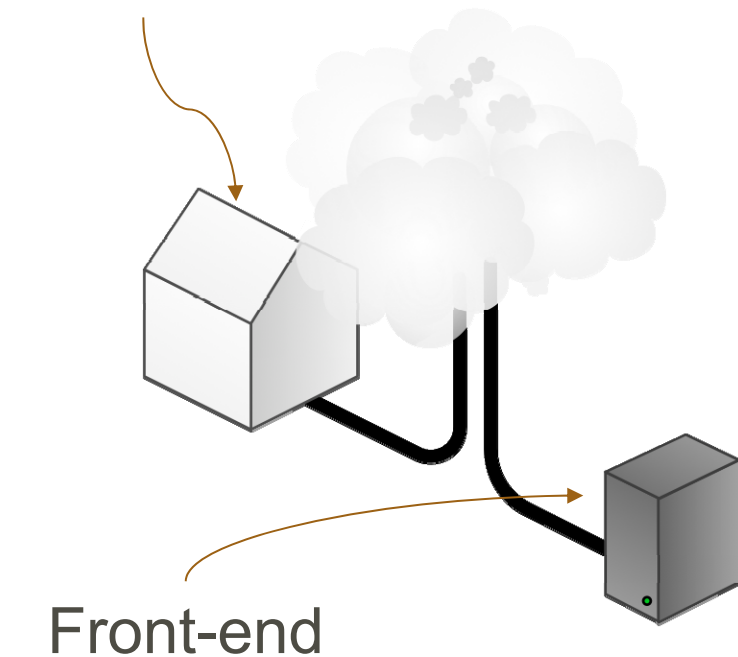
WT1

Make in steps

William Tärneberg; 2015-08-26

Student to Front end - SSH

Student



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

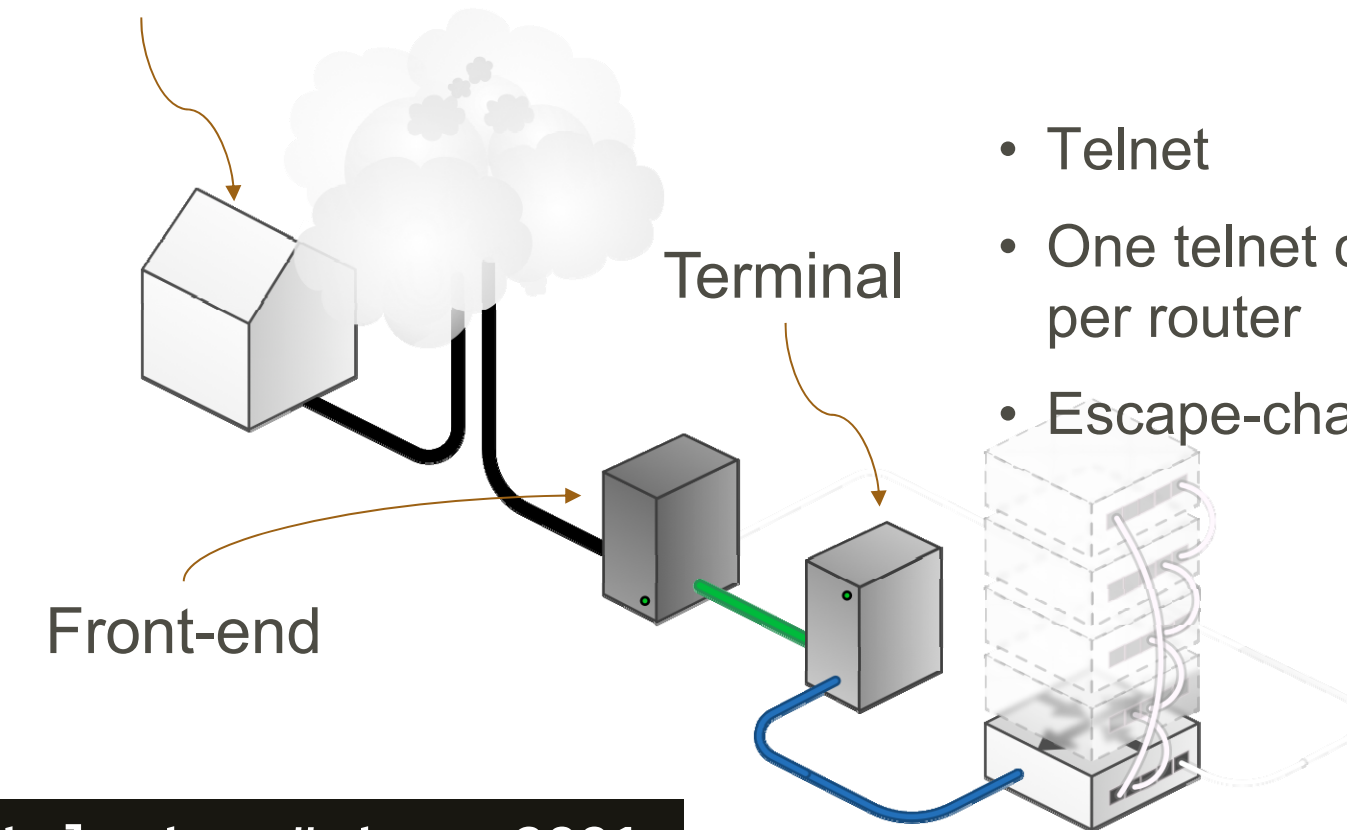
```
ssh <username>@rtrlab.eit.lth.se
```

Ssh: log output to file

- `ssh <username>@rtrlab.eit.lth.se | tee <file name>`
- PuTTY:
 - Right click on windows top bar
 - Select Change settings / Session / Logging

Front-end to Terminal - Telnet

Student



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

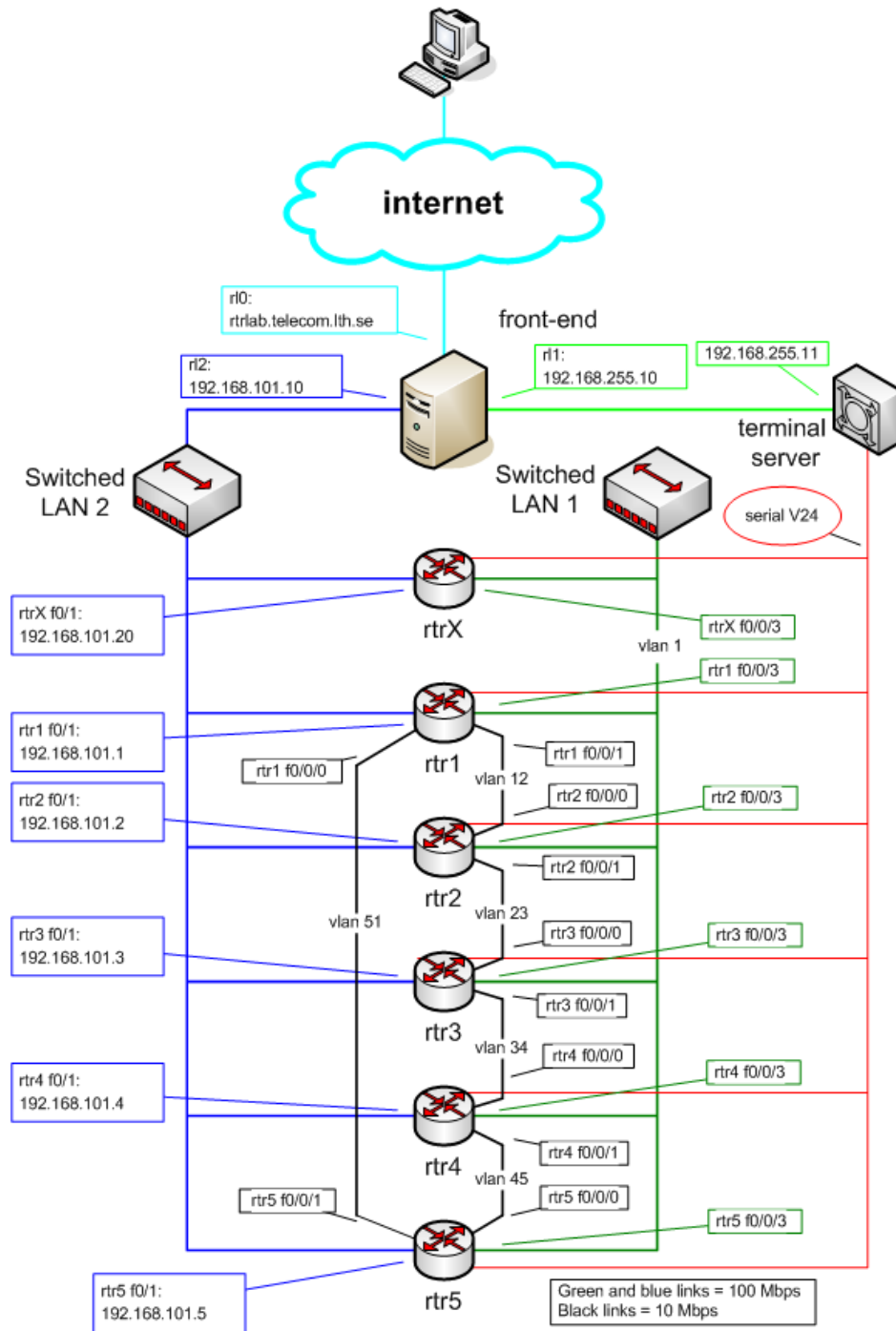
```
telnet -e# term 2001
```



LUND
UNIVERSITY

One port per router

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



The routers



- Cisco 1841
- IOS version 15



LUND
UNIVERSITY

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

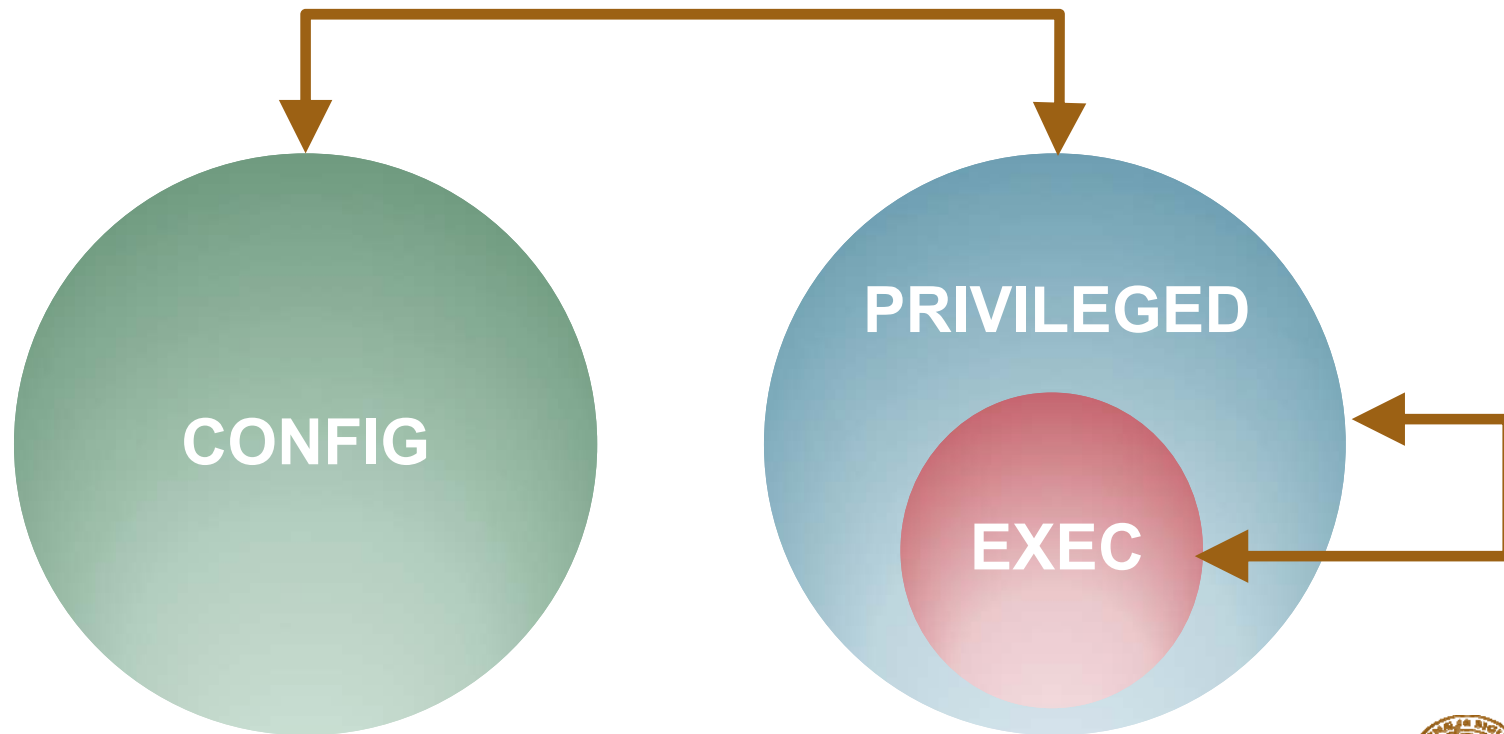
Understanding the lab environment



IOS CLI: Modes

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

IOS CLI: Modes



Some show command (EXEC)

- **show cdp neighbor**
- **show interface <if name>**
- **show ip interface**
- **show ip interface brief**
- **show ip route**
- **(show running-config (PRIVILEGED))**



Ping and Traceroute (EXEC)

- `ping <remote host>`
 - Exampel: `ping srv`
- `traceroute <remote host>`
 - **Very long timeout**
 - Cisco esc seq Ctrl+Shift+6 + x
 - Introduce escape character
 - » `terminal escape-character <0-255>`
 - » Example: `terminal escape-character 64 ->@`

The debug command (PRIVILEGED)

- Activate debug:
 - **Debug <cdp|ip...>**
- Enable debug output:
 - **terminal monitor**
- Deactivate debug:
 - **no debug all**

CONFIG

Overview

On-line configuration

Commands active immediately when entered!

- Accessible from PRIVILEGED mode
- Activate:
 - `config terminal`
- Revert to PRIVILEGED mode:
 - `exit`
`ctrlZ`

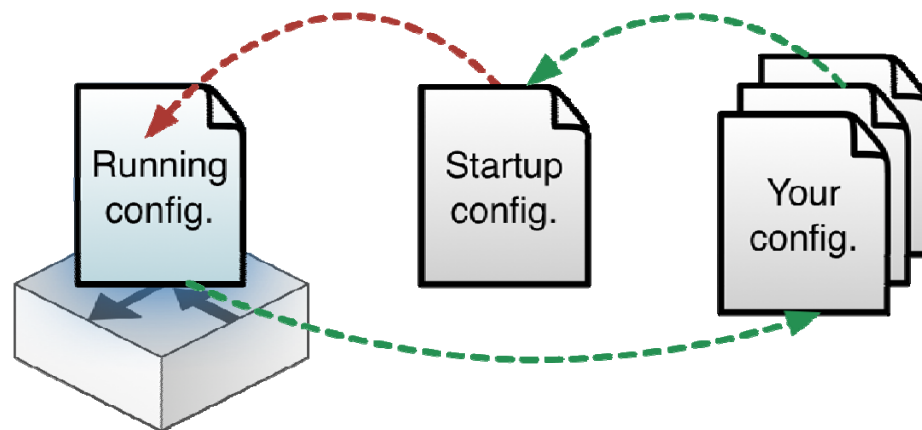
CONFIG

On-line interface configuration

- **interface f0/0**
 - **ip address 192.168.101.202 255.255.255.0**
 - **(no) shutdown**
- **interface vlan 51**
 - **ip address 192.168.110.111 255.255.255.0**
 - **(no) shutdown**
- **interface vlan 1**
 - **no ip address**

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



LUND
UNIVERSITY

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)



LUND
UNIVERSITY

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)
```

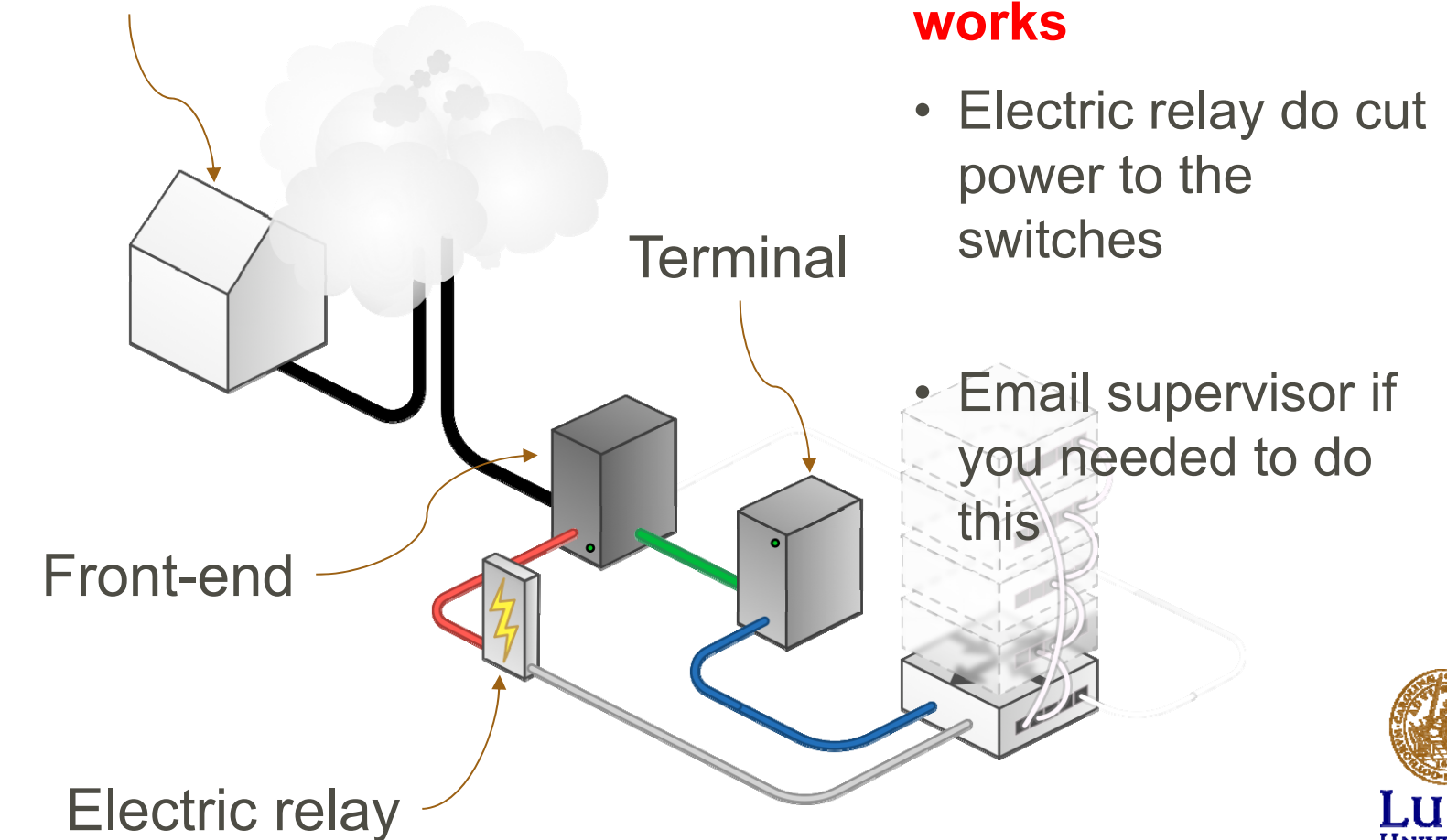
- Find PID for hanged telnet session
- Apply shell command
`kill -9 <pid>`
- Check FAQ or Reference Guide!

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**
 - **copy tftp startup-config**
 - **reload**

If something goes horribly wrong

Student



ONLY if nothing else works

- Electric relay do cut power to the switches

- Email supervisor if you needed to do this



LUND
UNIVERSITY

Electric relay

From the front-end server:

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

S = set

C = clear

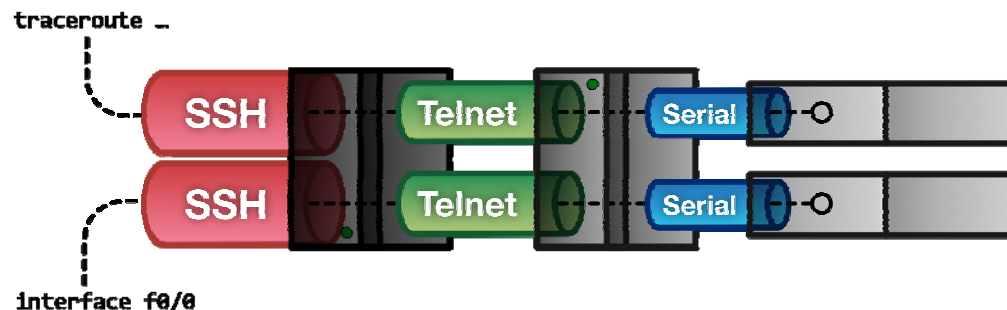
T = toggle



LUND
UNIVERSITY

Tips

- The assignments cannot be completed in just 4 hours.
- You need to be thoroughly prepared
- **Don't rely on eduroam**
- Don't misspell the commands:
 - Translating "**enable**"...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:



Clean up

- Save your configuration files
- Restore the default configuration on all routers
- Disconnect all connections properly

How to proceed

1. Reference Guide to the Router Lab

- Lab Layout
- Cisco Router Configuration Tutorial
- Cisco IOS 15.0M Resources
- Cisco IOS 15.0M Command referenc
- How to configure IP addresses
- How to configure RIP (see the required steps)
- How to configure OSPF
- How to configure BGP
- Cisco 1800 Series Integrated Services Routers

2. Lab manual and assignment for ETSF10





LUND
UNIVERSITY