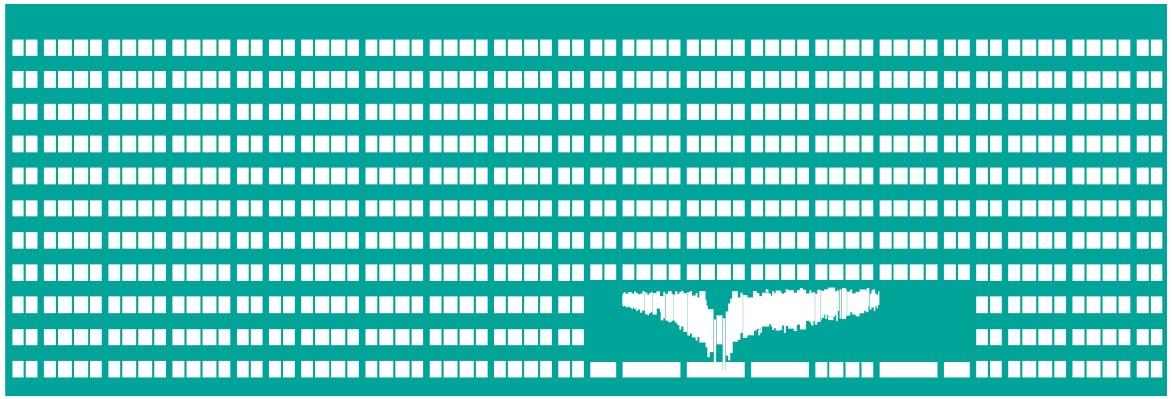
VSB TECHNICAL UNIVERSITY OF OSTRAVA | FACULTY OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE | DEPARTMENT OF COMPUTER SCIENCE

Switching: VLANs, Spanning Tree



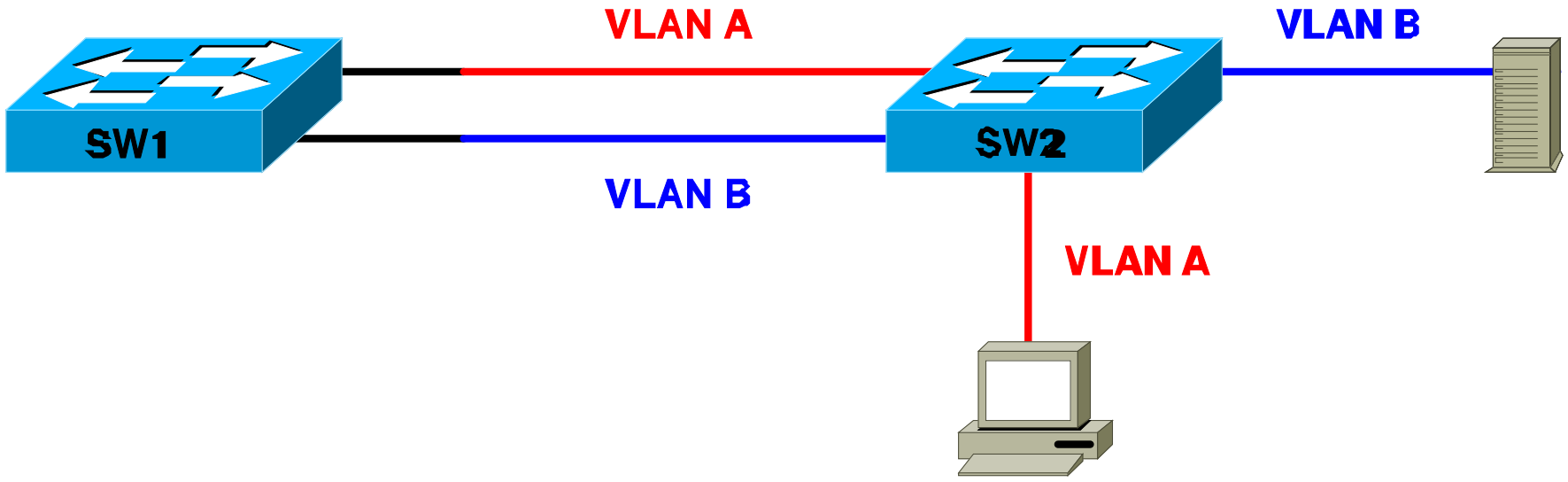
Computer networks
Seminar 4

Virtual networks – VLANs

- Traffic separation on Data link layer (L2)
- Software separation of broadcast domains
- Ethernet frames are not transmitted between VLANs
  - Several logically separated networks
- Interconnecting more switches by Trunk ports
  - There is the information added to the frame header telling which VLAN the frame belongs to. (problem with max. size of the frame)

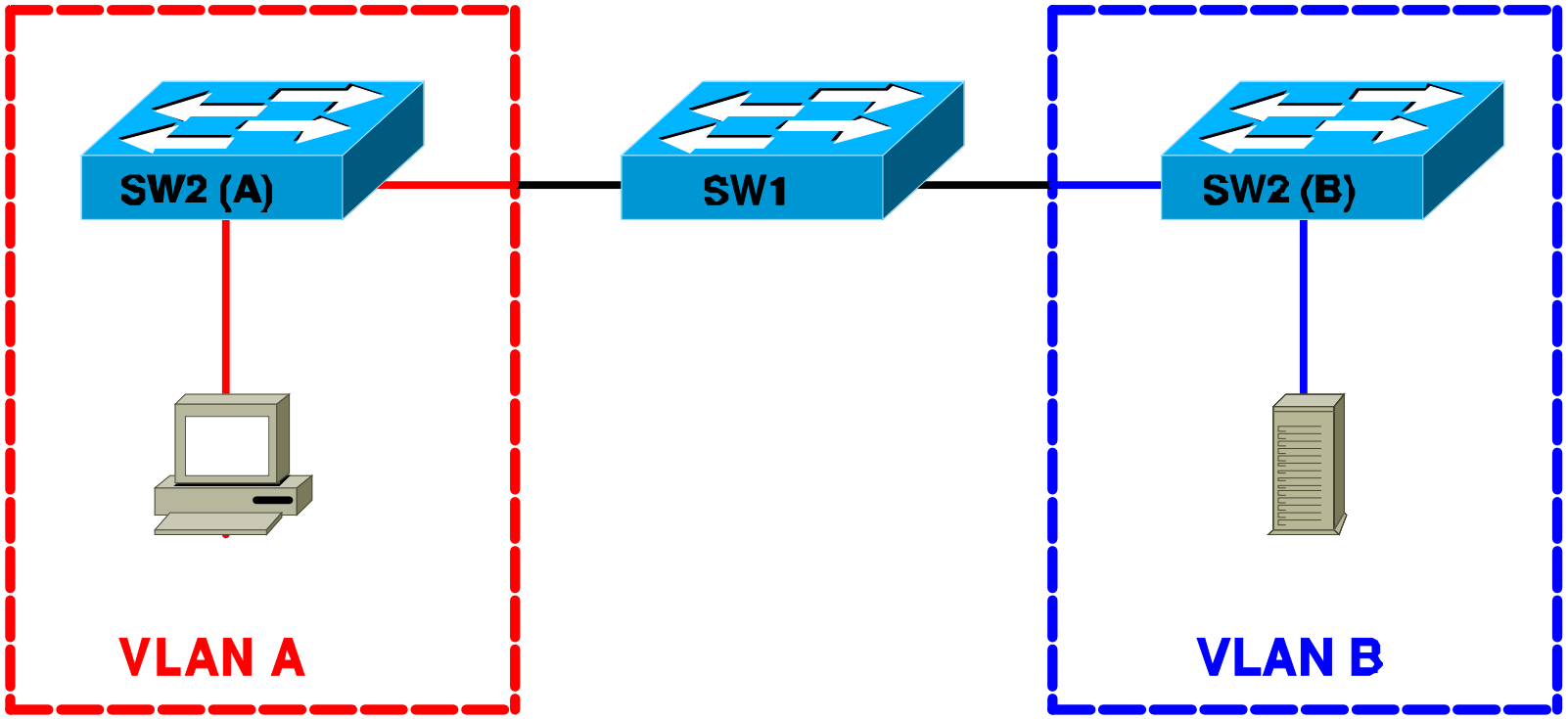
VLAN topology analysis example 1

- 2 VLANs connected to the switch SW1 with no VLAN configuration

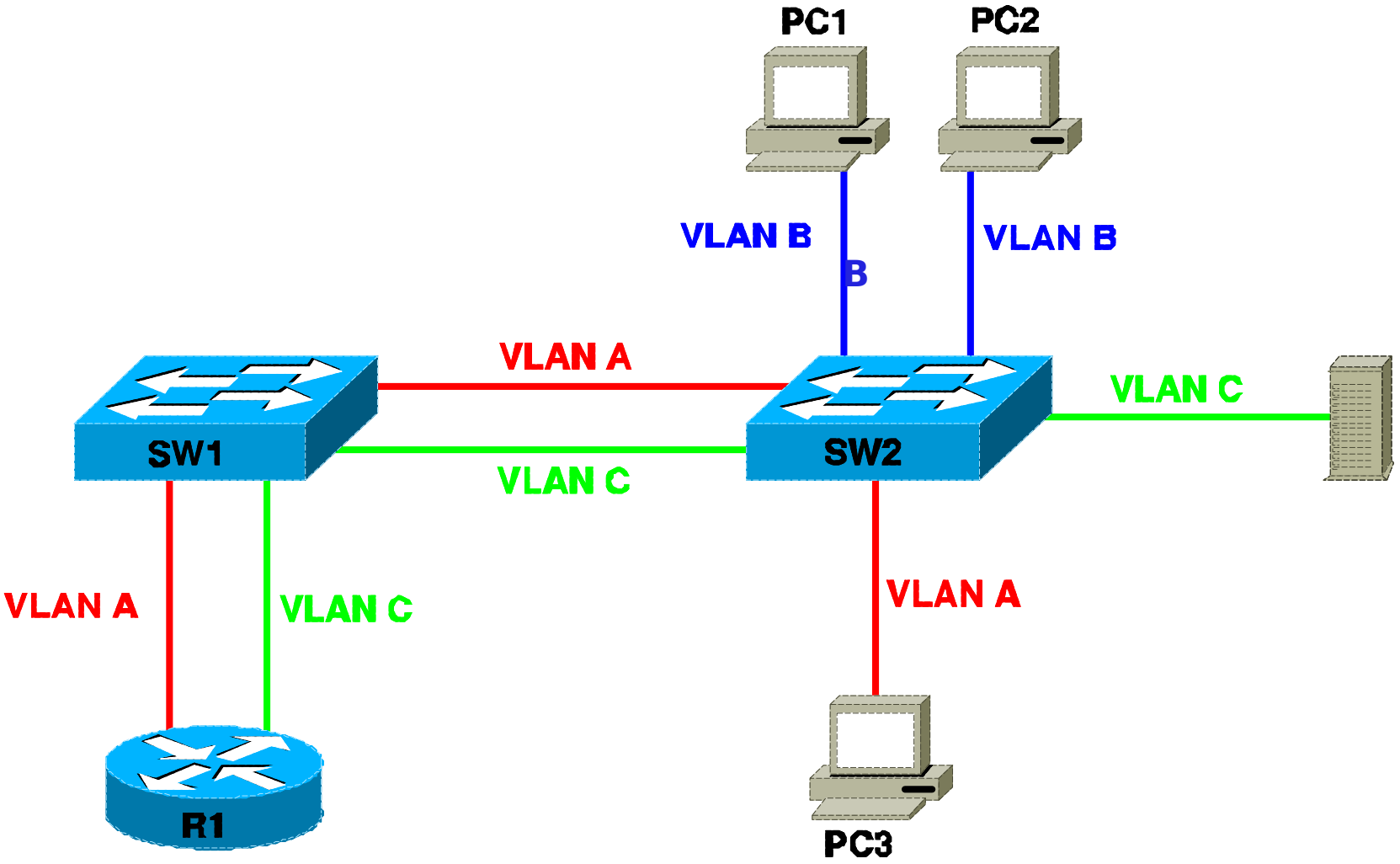


VLAN topology analysis ex. 1 – L3 equiv. topology

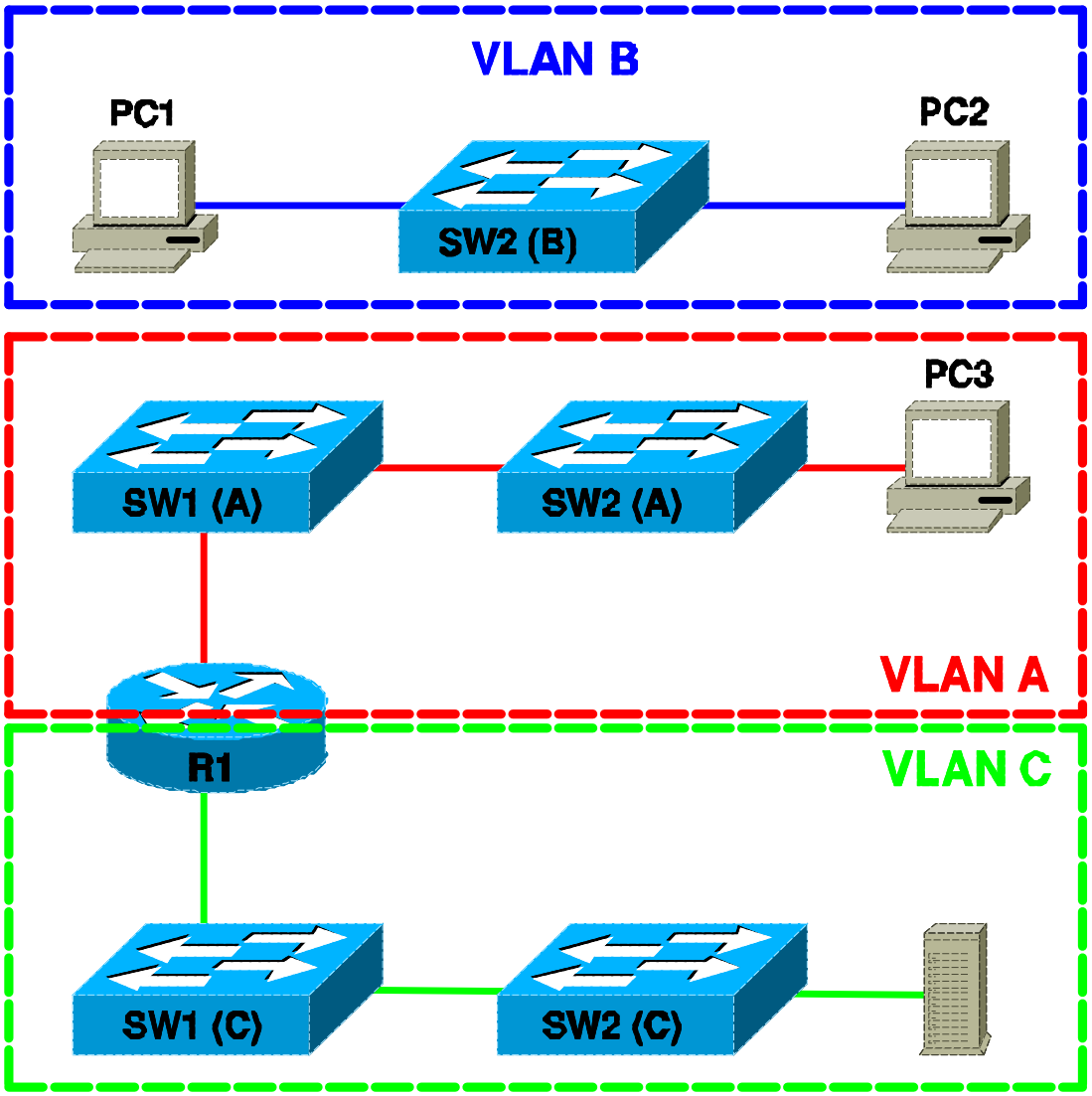
- 2 VLANs connected to the switch SW1 with no VLAN configuration
  - VLANs are useless here, because the frames will be mixed on switch SW1 anyway



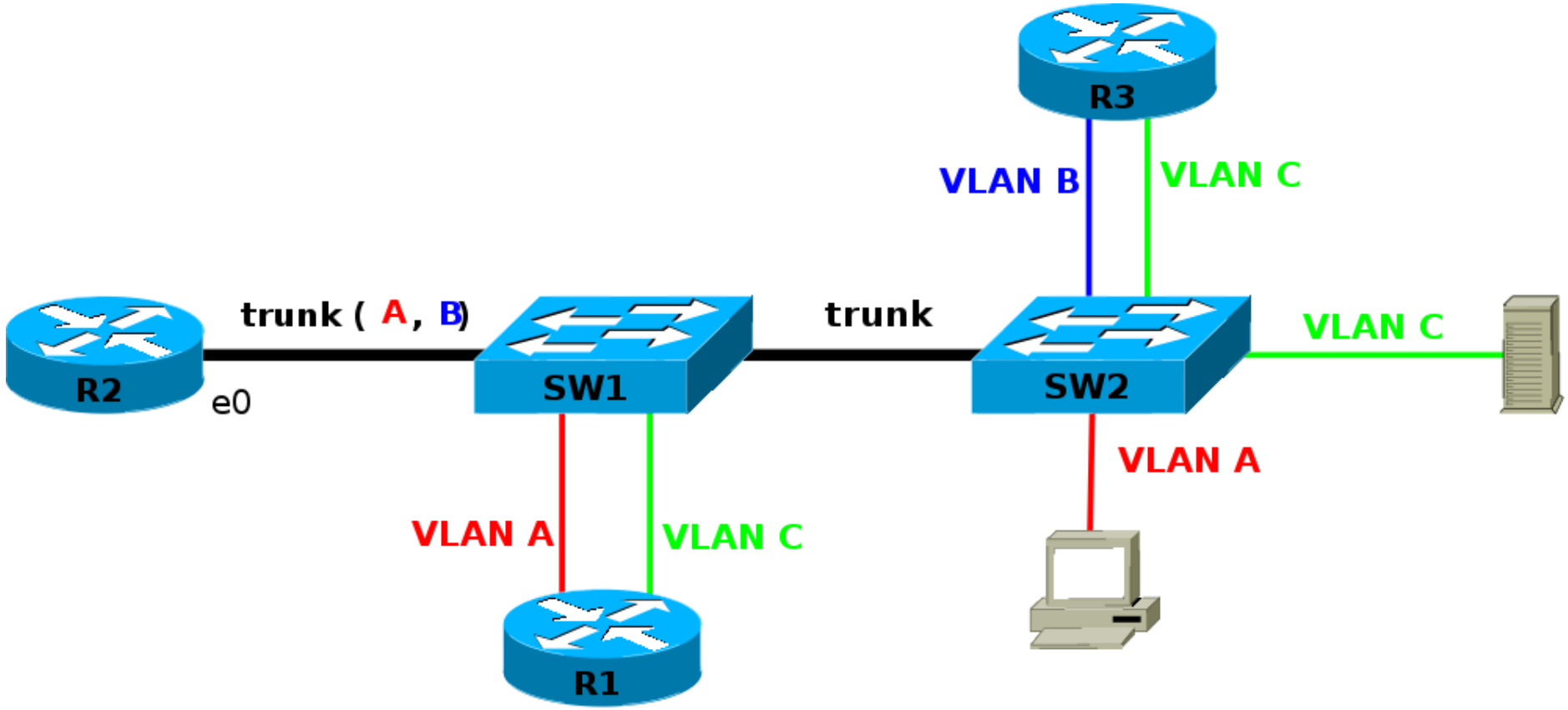
VLAN topology analysis example 2



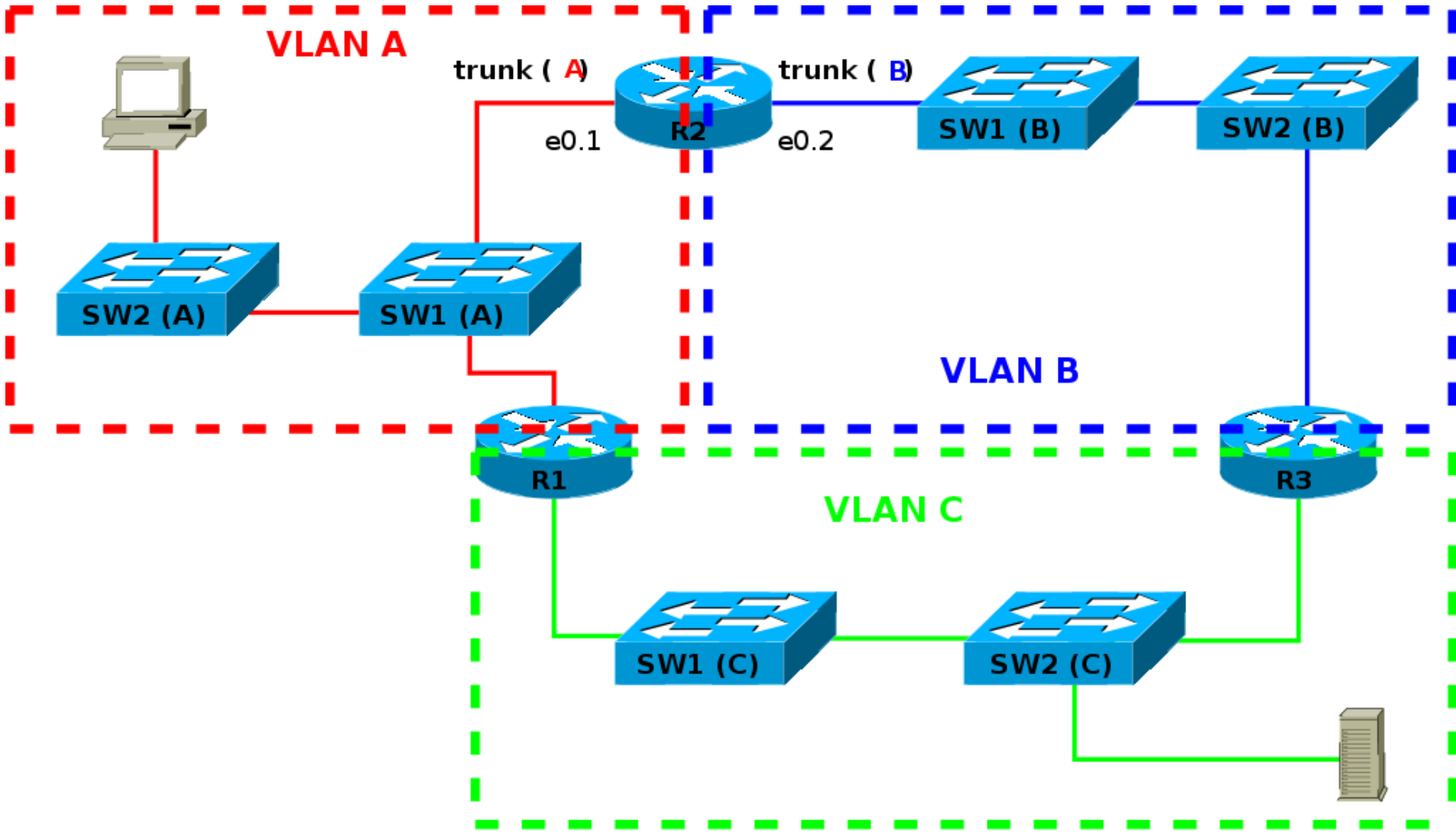
VLAN topology analysis ex. 2 – L3 equiv. topology



VLAN topology analysis example 3



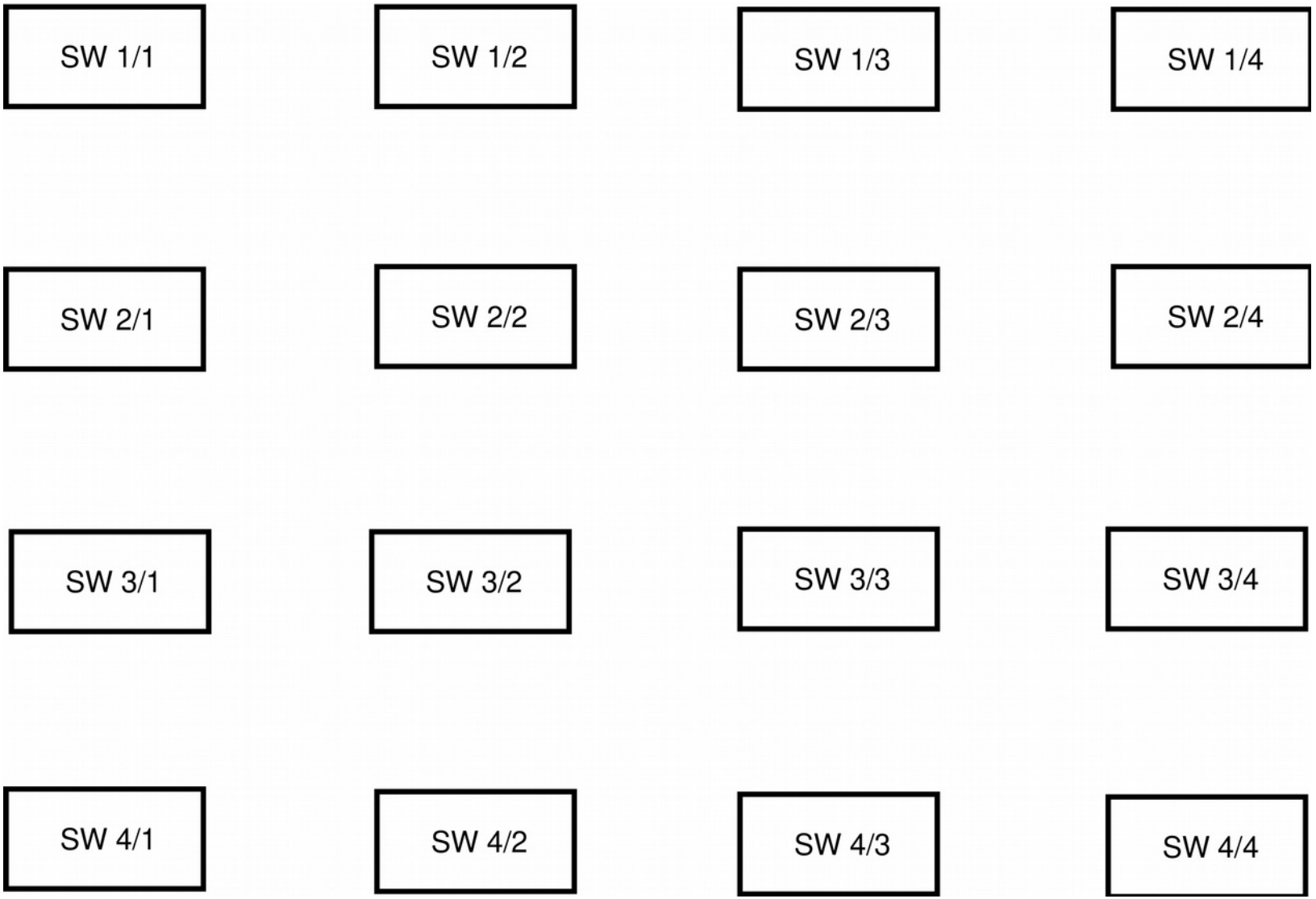
VLAN topology analysis
ex. 3 – L3 equiv. topology



Assignment – POS exam

- In the picture there is a network scheme which consists of virtual LANs (VLANs) named as V1, V2 etc. The numbers with slashes stand for port numbers to which the lines are connected (in the form: module/port). Draw equivalent L3 topology of the network (how it appears to 3. layer of OSI model). Switches of equivalent L3 topology representing the ports belonging to VLANX on switch Y from real topology mark as SW Y/X. Draw trunk links dashed. Write down to the picture also the port numbers of switches from the original topology. (it is possible to write just port numbers without prefix '0/', port number of trunk link can appear multiple times for single VLANs). Use predrawed scheme. Ignore unused items/VLANs, sketch in missing ones.

Assignment – POS exam



Loop occurrence prevention - Spanning Tree

1. Election of tree root based on priority of switches.
   - Root switch – no blocked ports
2. Tree building (spanning tree), different costs of the lines
3. Port with maximum cost in the loop is blocked
4. In the case of link failure the tree is being built again. Previously blocked port can be unblocked.

Note: The cost of the links is set by default depending on link speed. And It can be changed.

Spanning Tree on Cisco 29x0

- Changing the priority of the switch (configuration mode)
  - **spanning-tree** vlan 1 **priority** <*p*> - the smaller **p is**, the higher priority is, don't use 0 (= it must not be a root)
- Spanning Tree port configuration (configuration mode)
  - **interface FastEthernet 0/1**
    - **spanning-tree cost** <*cost*> – link cost (>= 10)
    - **spanning-tree port-priority** <*p*> – port priority
- Spanning Tree information (privileged mode)
  - **show spanning-tree** – state of Spanning Tree protocol (without VLANs)

Task – Configurating Spanning Tree

- Interconnect four switches with non-trunk links to the square.
- Discover which port is blocked
  - Draw the topology
- By configuring STP parameters make sure that the port specified by the teacher will be blocked instead of actually blocked port.
- By configuring STP parameters make sure that the switch specified by the teacher will become the root

VLANs and Cisco 29x0

- VLAN names database (configuration mode)
  - **`vtp mode transparent`** own VLAN names on switch
  - **`vlan`** *<number>*
    - **`name`** *<name>* – naming VLAN
- Assigning port to VLAN (configuration mode)
  - **interface fastethernet0/1**
    - **switchport mode access**
    - **switchport access vlan** *<number>* – port in VLAN
- Trunk port setting (configuration mode)
  - **interface fastethernet0/4**
    - **switchport mode trunk** – trunk port activation
    - **switchport trunk allowed vlan {add | except | none | remove} vlan-list**
      Defining allowed VLANs (vlan-list) on trunk link

VLANs and Cisco 29x0

- List of existing VLANs (privileged mode)
  - **`show vlan`** [**`id`** *<number>*]
- Printing the configuration of specific interface
  - **show running-config interface fastethernet0/1**
  - **show interfaces fastethernet0/1 switchport**
- Deleting VLANs (at the end of the seminar)
  - **`no vlan`** <number> - deleting one VLAN (config mode)
  - **`delete vlan.dat`** – deleting VLAN database (privileged mode)
- Troubleshooting the encapsulation mode of a trunk (routing switch Cisco 3560, interface configuration)
  - **`switchport trunk encapsulation dot1q`**