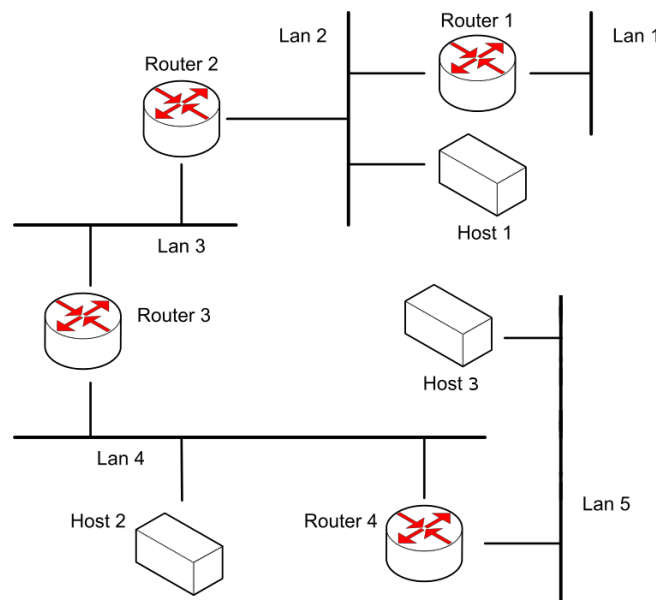


## 1. Virtual LANs

- What is the purpose of a virtual LAN?
- What information can be used to automatically assign hosts to a particular VLAN?
- Why do you need VLAN tagging of Ethernet frames in 802.1Q?

## 2. Subnets

Consider the following network:



- You got the IP block 137.226.0.0/16 assigned. Assign IP addresses for the devices in the network depicted above. Justify your assignment policy.
- Assume that *Router 1* has an additional connection to the Internet. Based on the routing information, each router should be able to determine where all packets have to be forwarded to such that all nodes can reach each other. Specify the routing tables of all nodes.

## 3. Internet Protocol Version 4

- Capture some datagrams with Wireshark while visiting `heise.de` and `golem.de` and evaluate both samples.
- Plot the distribution of datagram sizes.
- How large are IPv4 datagrams usually?
- What is the maximum size of IPv4 datagrams?
- What happens when datagrams get very large?

- (f) Consider the following scenario. 13.5 kByte of data shall be send from host *A* to host *B* using IP as network layer protocol. How large is the protocol overhead? What happens when the datagrams have to pass a network with a MTU of 500 Bytes and how does this change the overhead?
- (g) How are datagrams handled by routers when the DF flag is set in the flag field?
- (h) What purpose has the Type of Service (TOS) field in the IP header?

#### 4. Checksum

The Internet Protocol as well as other protocols use a common checksum algorithm.

- (a) How is the algorithm called?
- (b) Give a (pseudo) code implementation.
- (c) Calculate the checksum over the following sequence of bytes: 0x00, 0x01, 0xf2, 0x03, 0xf4, 0xf5, 0xf6, 0xf7

#### 5. Join the RIOT!

In the following assignments we will use *RIOT*, an operating system for the Internet of Things (IoT), to implement basic mechanisms introduced in the lecture. RIOT is developed by the Computer Systems & Telematics group and others since 2008. It is designed to run on very lightweight devices, but can also run as a process on your linux computer (native RIOT). More information can be found on <http://www.riot-os.org/>.

- (a) Make yourself familiar with the RIOT operating system.
- (b) Download the software (RIOT and projects) to your computer (<https://github.com/RIOT-OS/RIOT/wiki>).
- (c) Compile and run a sample project from the projects repository (e.g. hello world).

