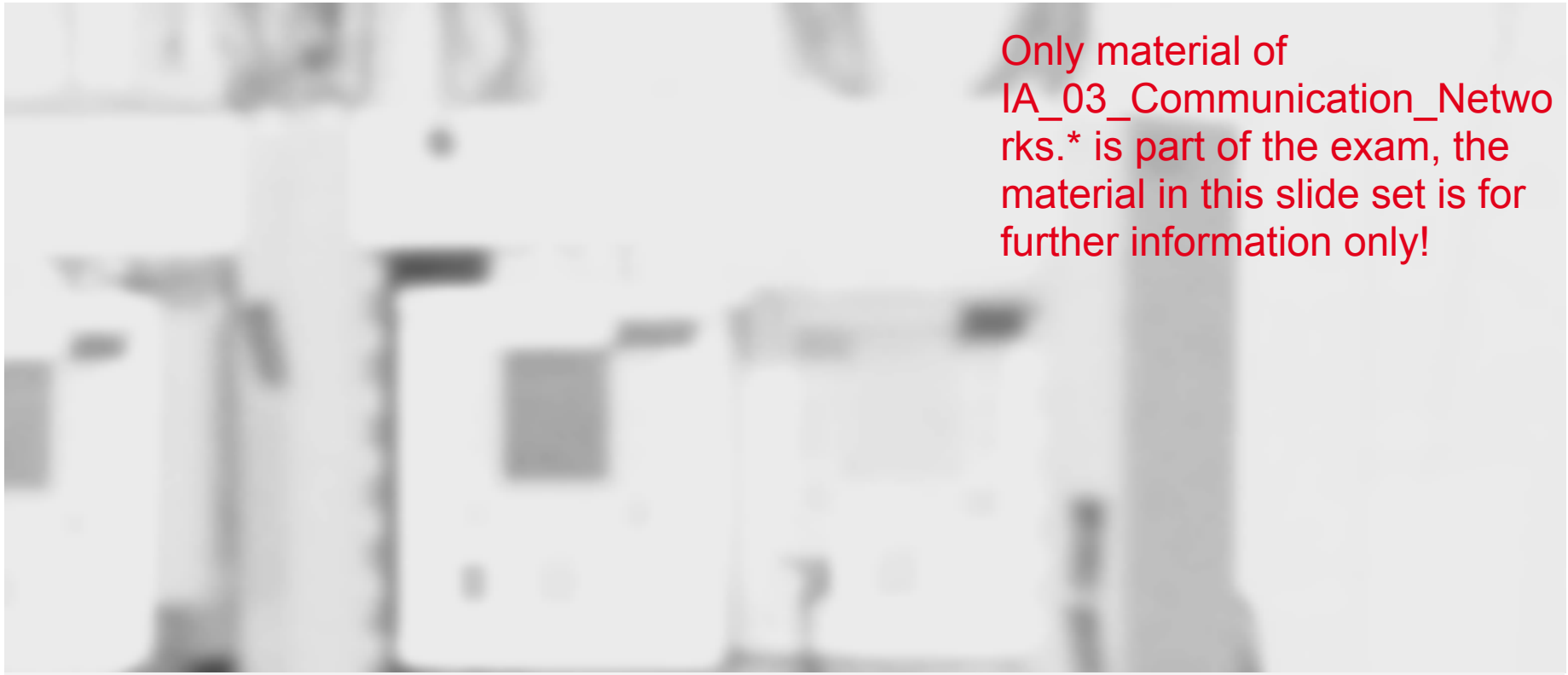


Only material of IA_03_Communication_Networks.* is part of the exam, the material in this slide set is for further information only!

EPFL, Spring 2020

3 Introduction to OSI Model

The OSI model

The Open System Interconnection (OSI) model is a standard way to structure communication software that is applicable to any network.

- was developed to structure telecommunication protocols in the ‘70 (Pouzin & Zimmermann)

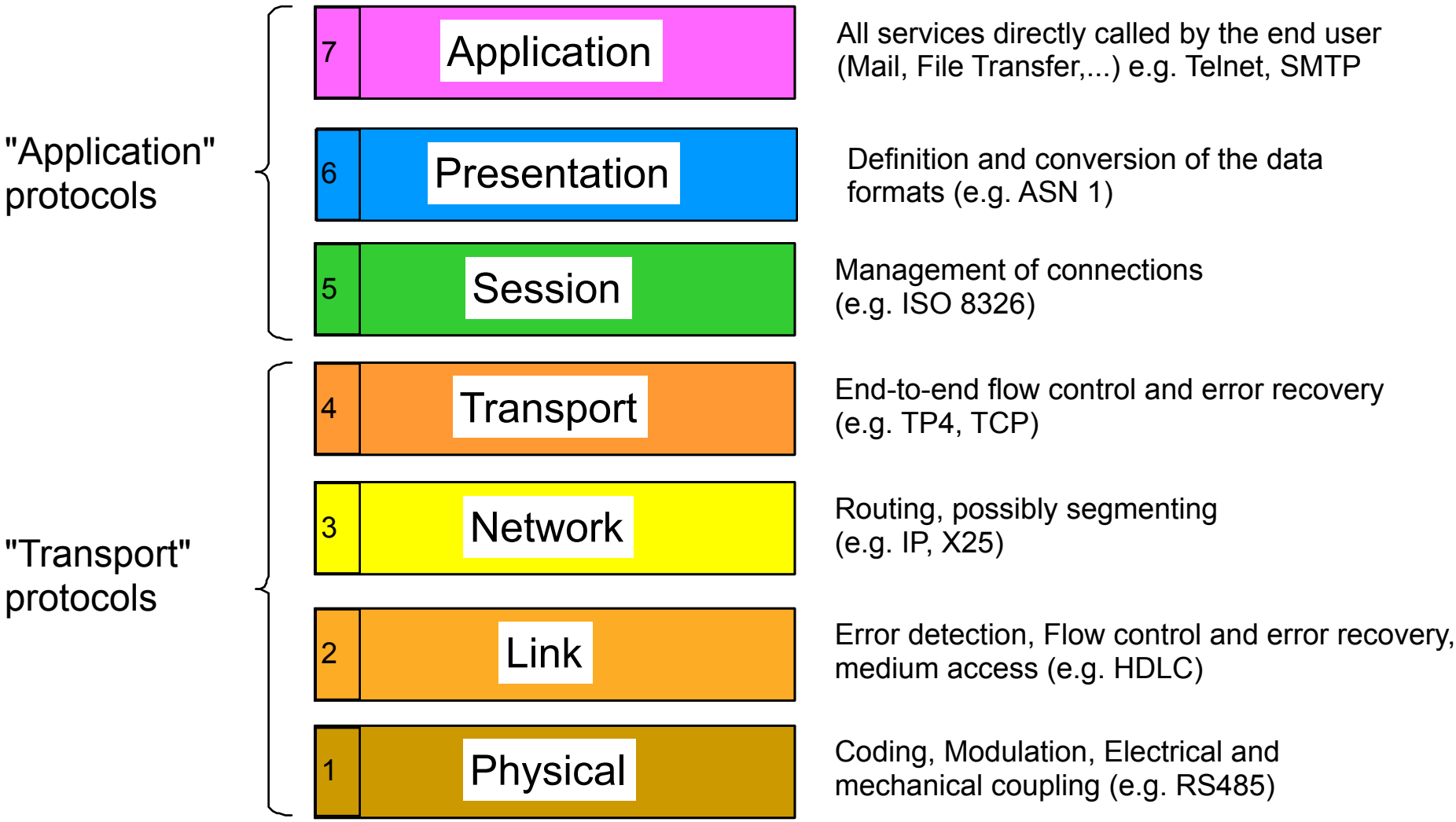
- standardized by CCITT and ISO as ISO / IEC 7498

- all communication protocols (TCP/IP, Appletalk or DNA) can be mapped to the OSI model.

- **it’s a model, not a standard protocol**, but a suite of protocols with the same name has been standardized by UIT / ISO / IEC for open systems data interconnection (but with little success)

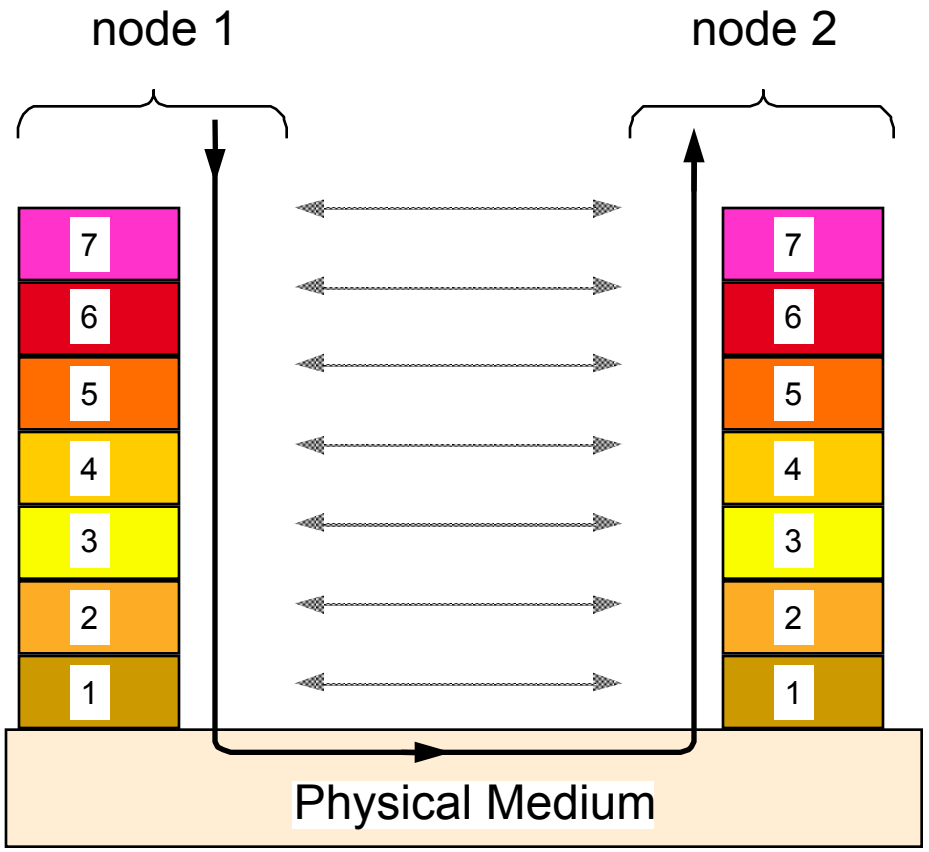
- mapping of OSI to industrial communication requires some additions

OSI-Model (ISO/IEC standard 7498)

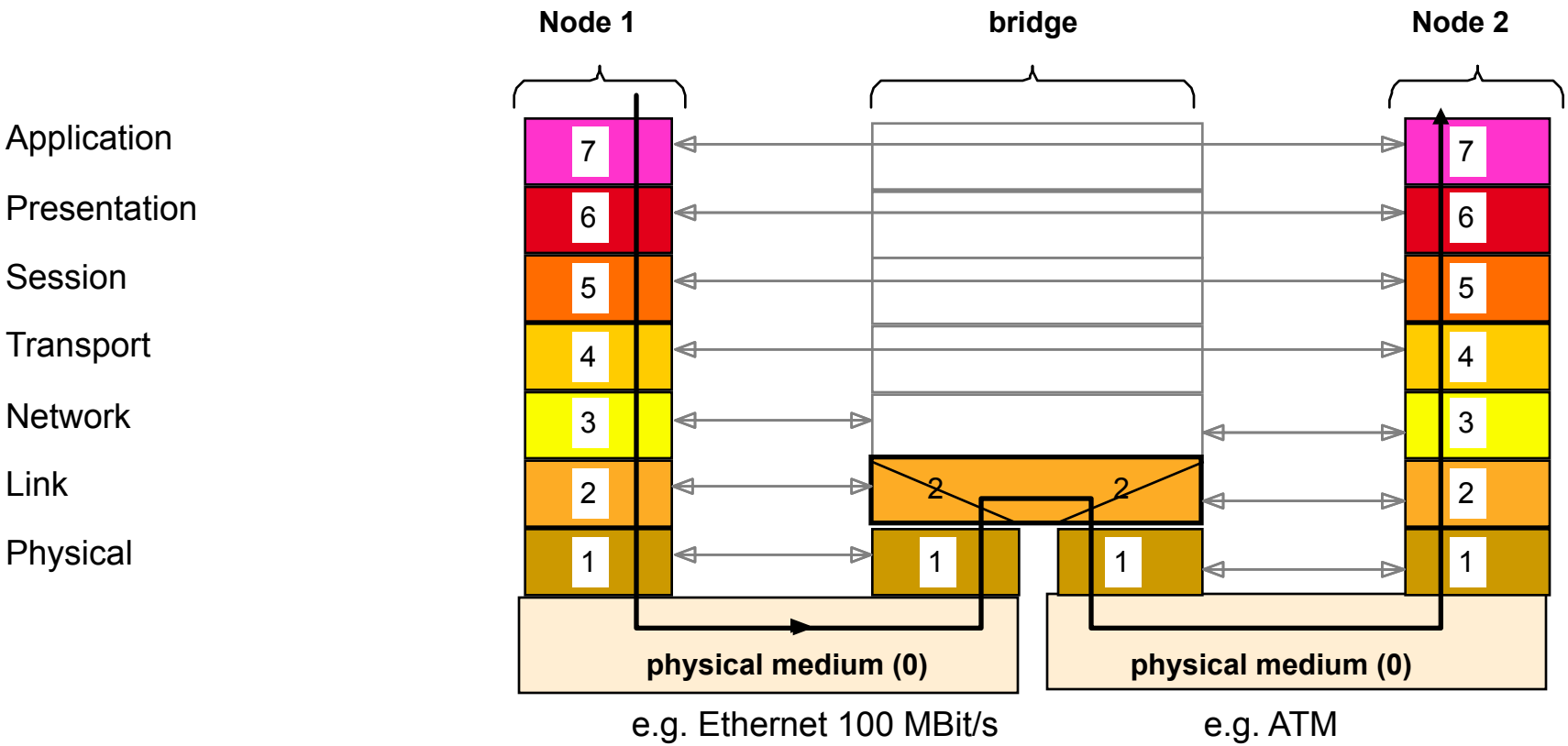


OSI Model with two nodes

Application
Presentation
Session
Transport
Network
Link
Physical



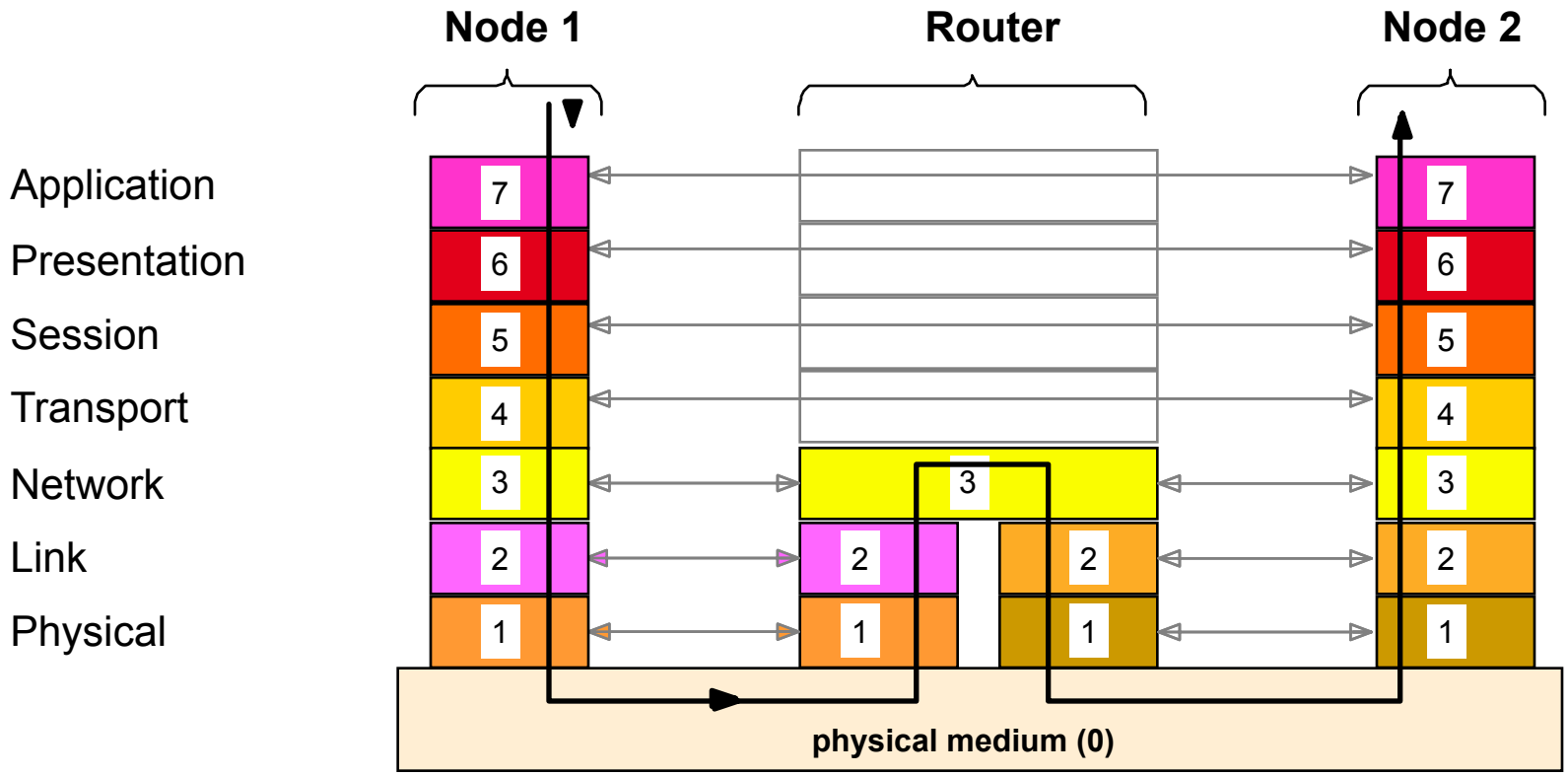
OSI model with three nodes (bridge)



The subnet on both sides of a bridge have:
- the same frame format (except header),
- the same address space (different addresses on both sides of the bridge)
- the same link layer protocol (if link layer is connection-oriented)

Bridges filter the frames on the base of their link addresses

OSI Model with three nodes (router)

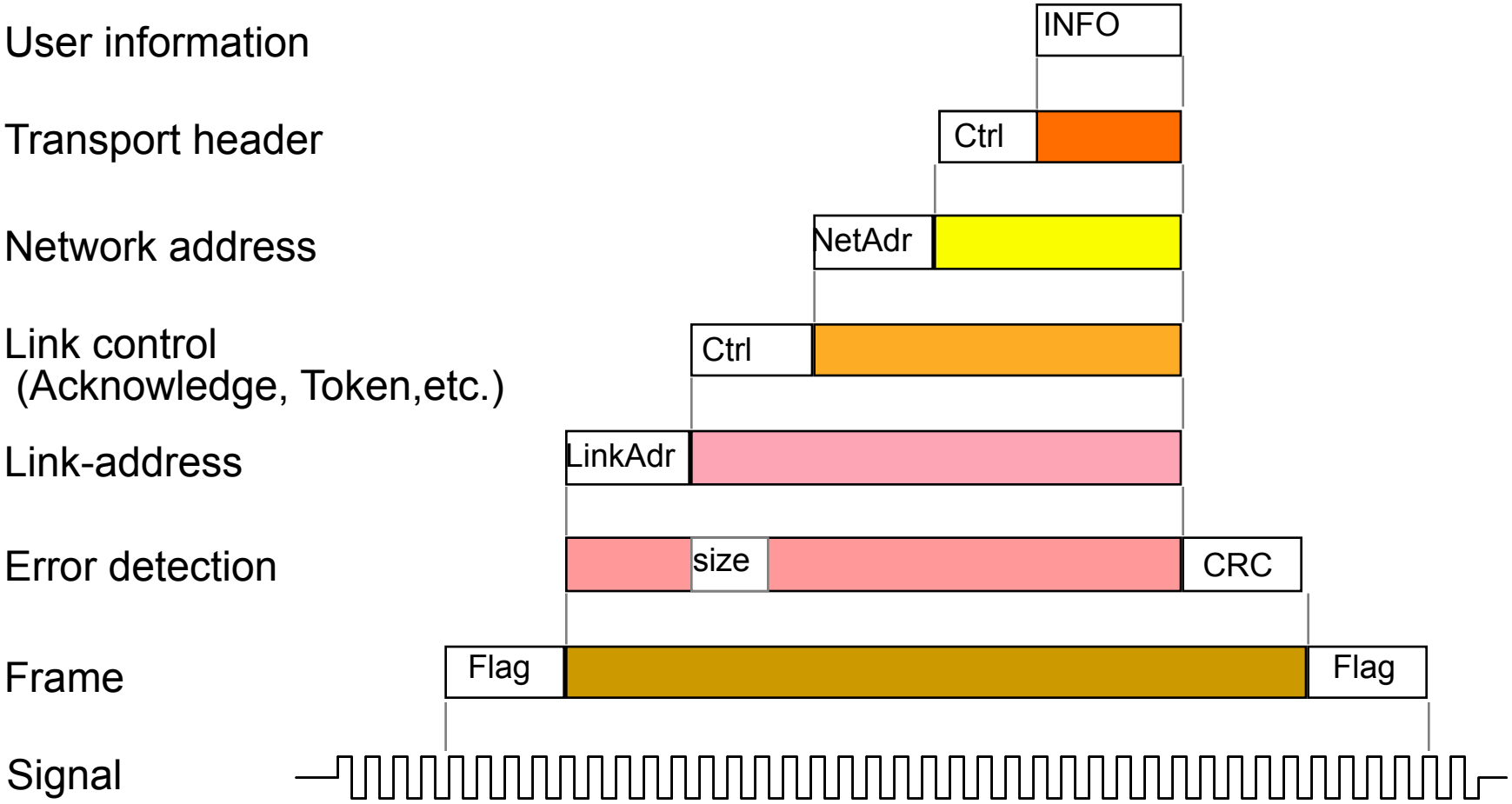


The router routes the frames on the base of their network address.

The subnets may have different link layer protocols

Frames in transit are handled in the network layer .

Encapsulation



Each layer introduces its own header and overhead

Conclusions

The OSI model is the reference for all industrial communication
Even when some layers are skipped, the concepts are generally implemented

Further reading: Computer Networks, Andrew S. Tanenbaum, Chapter 1, page 27-45

Assessment

1. Name the layers of the OSI model and describe their function
2. What are the reasons for using layered protocols?
3. What is the difference between a repeater, a bridge and a router ?
4. What is encapsulation ?
5. Do frames encapsulate packets or do packets encapsulate frames?
6. A system has an n-layer protocol hierarchy. Applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers?