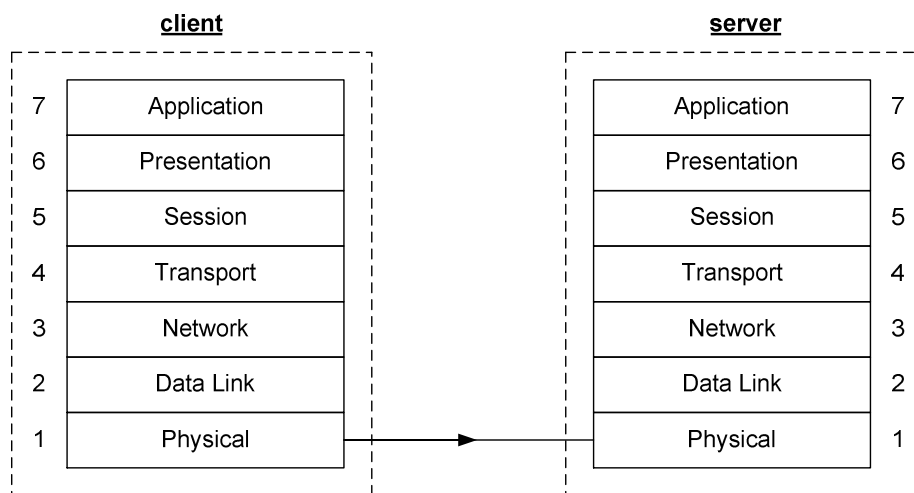


## 2. OSI layer model, segmentation & encapsulation

### 2.1 OSI layer model

The OSI layer model is an attempt to define all the steps necessary to realize any technical communication work. These steps are called layers. The OSI model has 7 layers.



The data we want to communicate is generated in the application layer and then passed down the different layers. The client and server are connected on the physical layer by a medium, for example a copper cable.

The presentation and session layer won't be treated in this course as they have no relevance on Ethernet networks.

### 2.2 Segmentation & Encapsulation

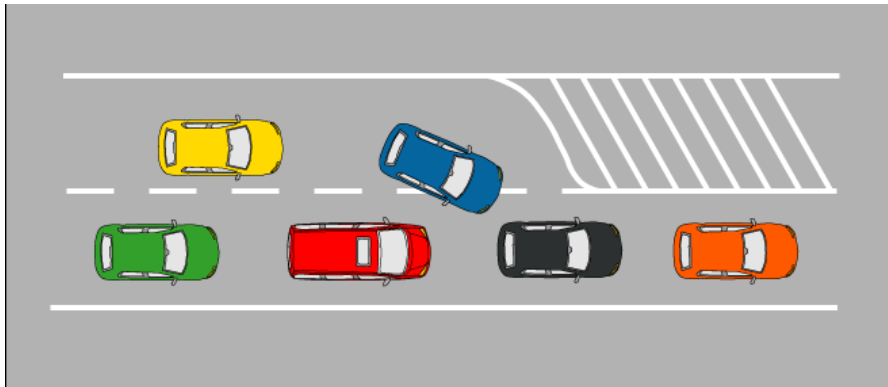
#### 2.2.1 Segmentation

Sending large amount of data in one block over a network will avoid that other messages can reach their destination. Therefore it is smart to split the data into smaller pieces which are transported one by one over the network. This process is called *segmentation*.

The primary advantages of segmentation are:

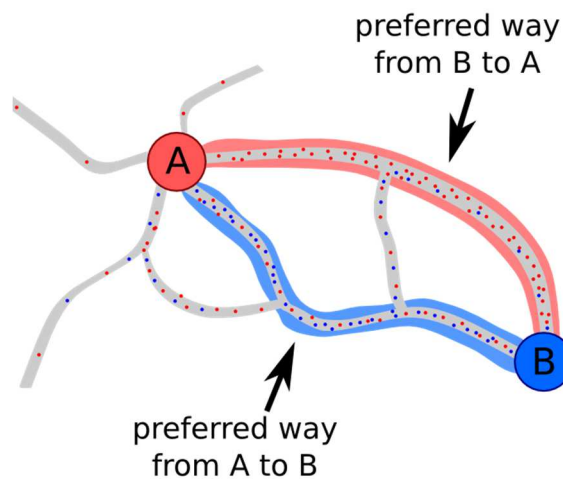
- multiplexing
- higher efficiency

Multiplexing occurs when data pieces of different senders alternatively use the same communication line. This is comparable to the zipper method in the traffic management.



source: [www.stmi.bayern.de](http://www.stmi.bayern.de)

Another advantage of segmentation is that not all pieces have to use the same way over the network to reach its destination. This allows to raise the efficiency of a network.

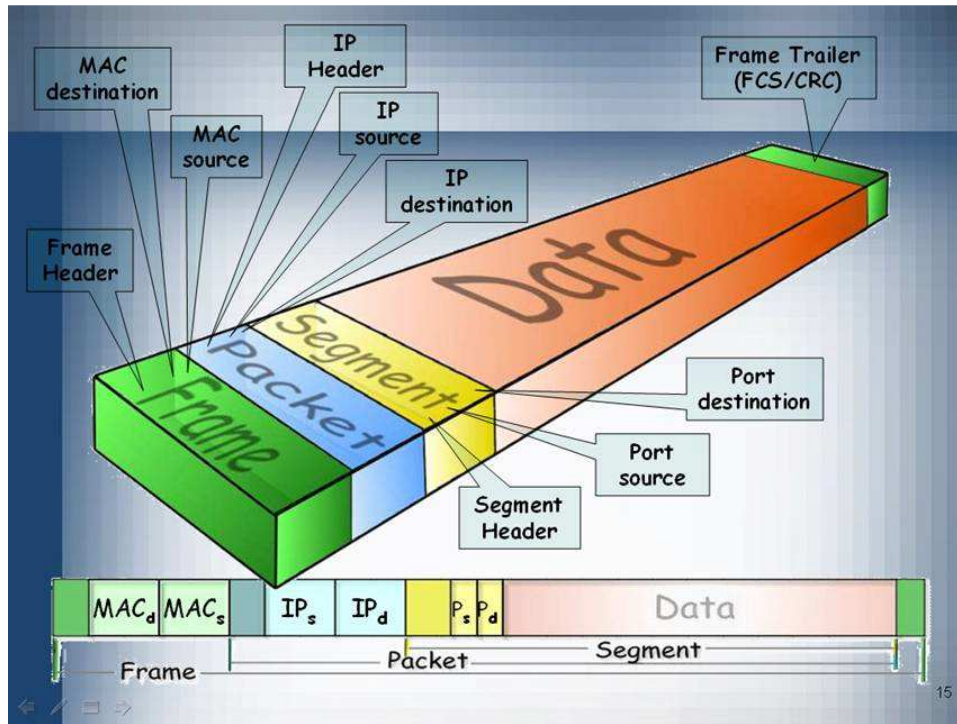


source: [www.des-testbed.net](http://www.des-testbed.net)

The third reason to segment data is that if a transmission error occurred, you only need to resend one segment and not the whole amount of data.

## 2.2.2 Encapsulation

Every layer adds information to the data it receives from the layer above it. The additional information is put into the so called *header*.



source: [www.itipacinotti.it/~cisco/](http://www.itipacinotti.it/~cisco/)

layer	header contains	header & data are called
Transport	source port number destination port number	segment
Network	source IP address destination IP address	packet
Data Link	source MAC address destination MAC address	frame

A header plus its data is also called PDU (protocol data unit). So segments, packets and frames are examples of PDU's.