Studio di un'architettura di rete locale sincrona per i servizi multimediali del futuro

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In the beginning

CIRCUIT SWITCHING
- **wasted bandwidth**
- **no re-routing for fault recovery**
- **limited and constant delay**
- **packet loss only due to channel errors**
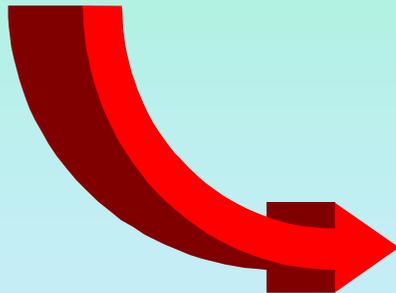
PACKET SWITCHING
- **reliable**
- **efficient**
- **mostly connectionless**
- **packet loss due to channel errors and network congestion**

Question

- Why using a packet-based network just to emulate the features of circuit-switching?
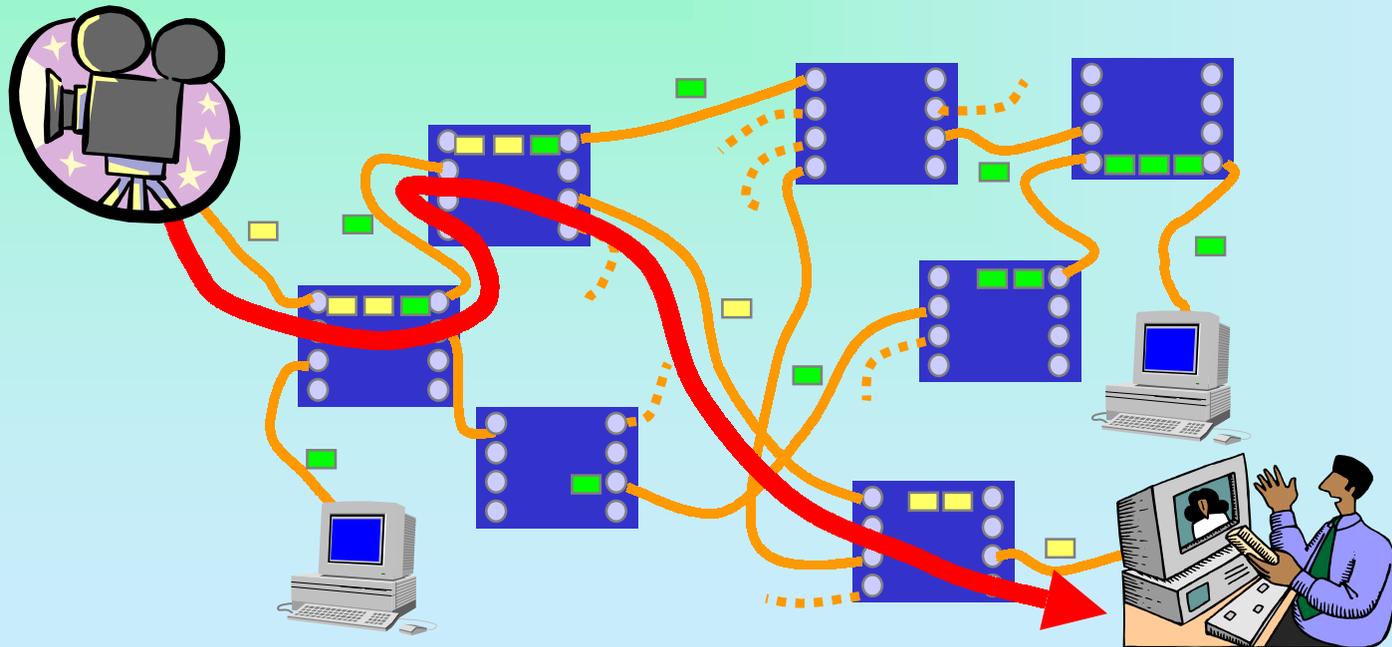
Our efforts are...

Best of telecom: connection-oriented, low delay & jitter, 100% QoS

Best of datacom: common IP platform, flexibility
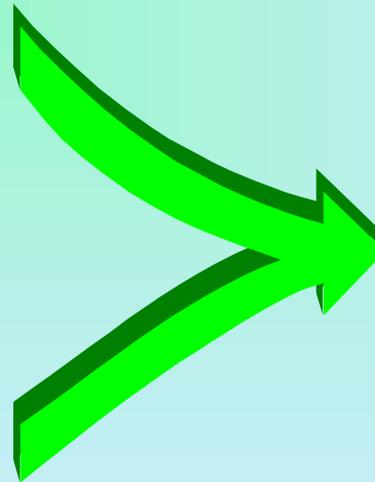
Development of a new LAN architecture...

+ WAN in the future

A new research direction

The keyword: GLOBAL VIEW

WHERE DO CURRENT ARCHITECTURAL APPROACHES (E.G. PROTOCOLS) COME FROM?

FROM YESTERDAY'S TECHNOLOGICAL LIMITS!

So what?

- It's time to start a research activity for the networking of the future

- Industries are too busy in developing Next Quarter's products

- Let's start (almost) from scratch and let's think on a 5-years-from-now basis

- Let's start from the LANs with the possible extension to the WANs in mind

Compatibility issues

Traditional WAN & IP technology, could change in the future

MAN WAN

LAN

LAN

gateway

Efficiency and guaranteed QoS
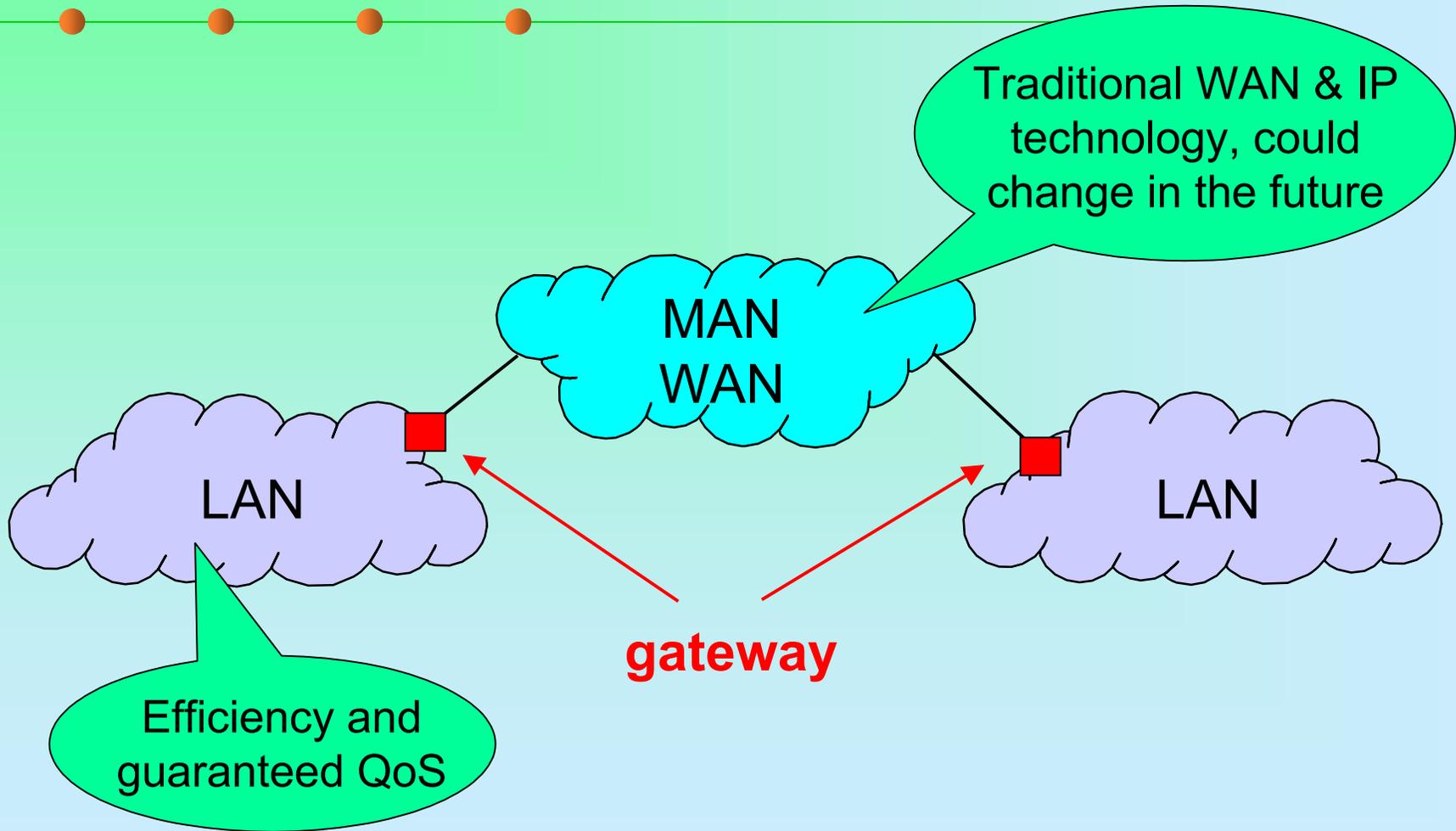
Project scopes

- Application
- Presentation
- Session
- Transport
- **Network**
- **Data Link**
- **Physical**
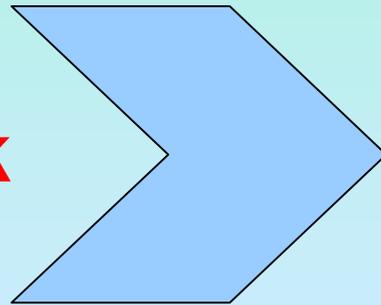
Identification of application flows

Quality of Service requirements

Connectivity between points in a network

Project scopes

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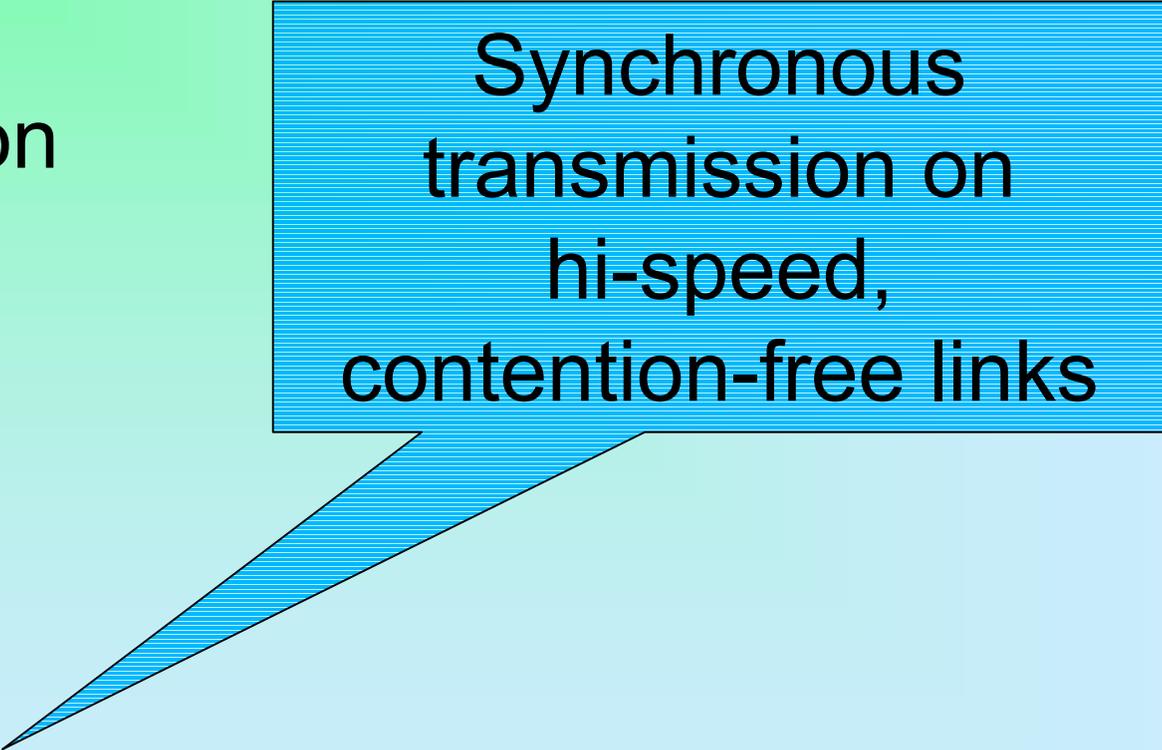
Synchronous transmission on hi-speed, contention-free links

Project scopes

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- **Physical**
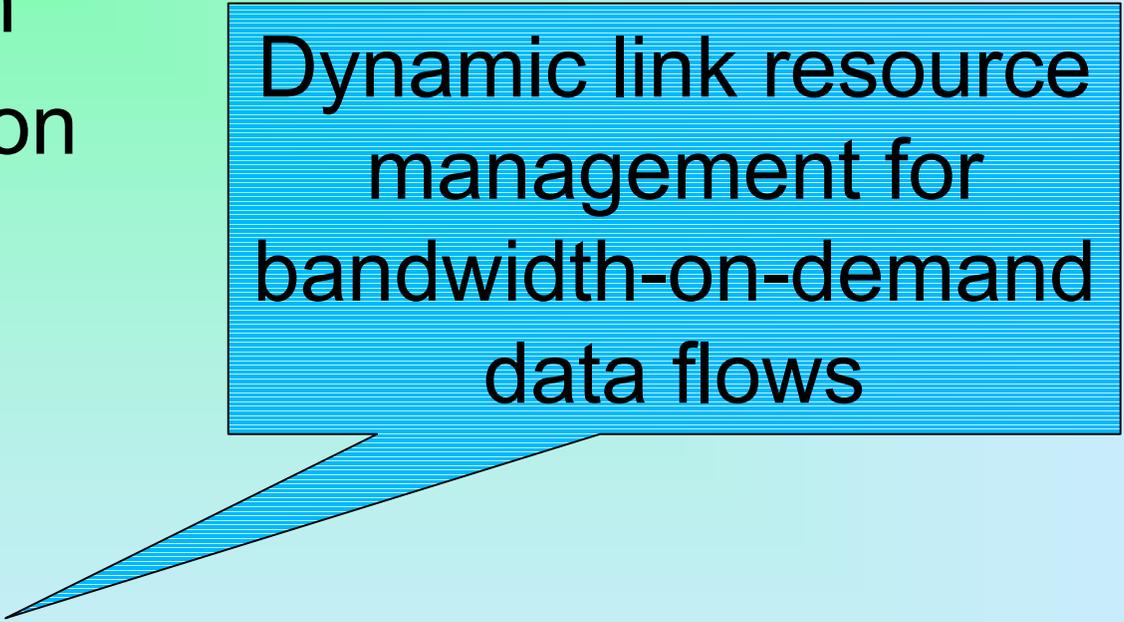
Dynamic link resource management for bandwidth-on-demand data flows

Project scopes

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- **Physical**
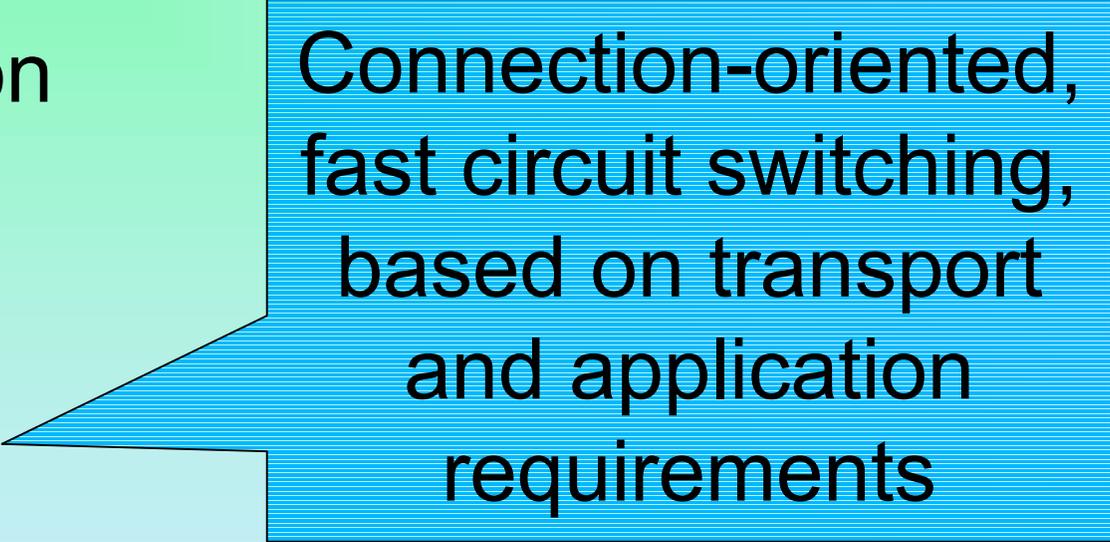
Connection-oriented, fast circuit switching, based on transport and application requirements

Research directions

1. Transmission

   Further development of DTM (Dynamic synchronous Transfer Mode) to obtain both packet-switching and circuit-switching performances from a time-slot based switching infrastructure

Research directions

2. Flow control

   Here the goal is to restore the level 2 flow control (lost together with the MAC protocols) and to merge it with the level 4 flow control

   Key point: today all the transmission media are bi-directional

Research directions

3. Routing and topological information handling

Future network devices could handle much more information about the topology and the data flows than today

Dynamic bandwidth allocation is needed

New algorithms must be developed

Research directions

4. Internetworking

Compatibility with the current development of TCP/IP is a must

Services and protocols re-mapping will be developed

Call for participants!

- Universities are the forge for innovative research projects (and not for products)
- Synergic cooperation among national research groups, sharing studies, experiences and results
- GARR infrastructure could become the testbed for experiments and prototypes

Conclusions

- New research directions for future LAN architectures

- Possible extension to the WANs

- TCP/IP compatibility

- DTM as actual technological framework

Allied Telesyn

Simply connecting the world

A research collaboration between University of Udine and Allied Telesyn

Some details of the project

Network layer issues

- Propagation delay dominates the setup time for small amounts of payload data and over several switching nodes

- To make the access delay independent from distance, a sender could not wait for a confirmation from the receiver

# Unconfirmed connection establishment scheme
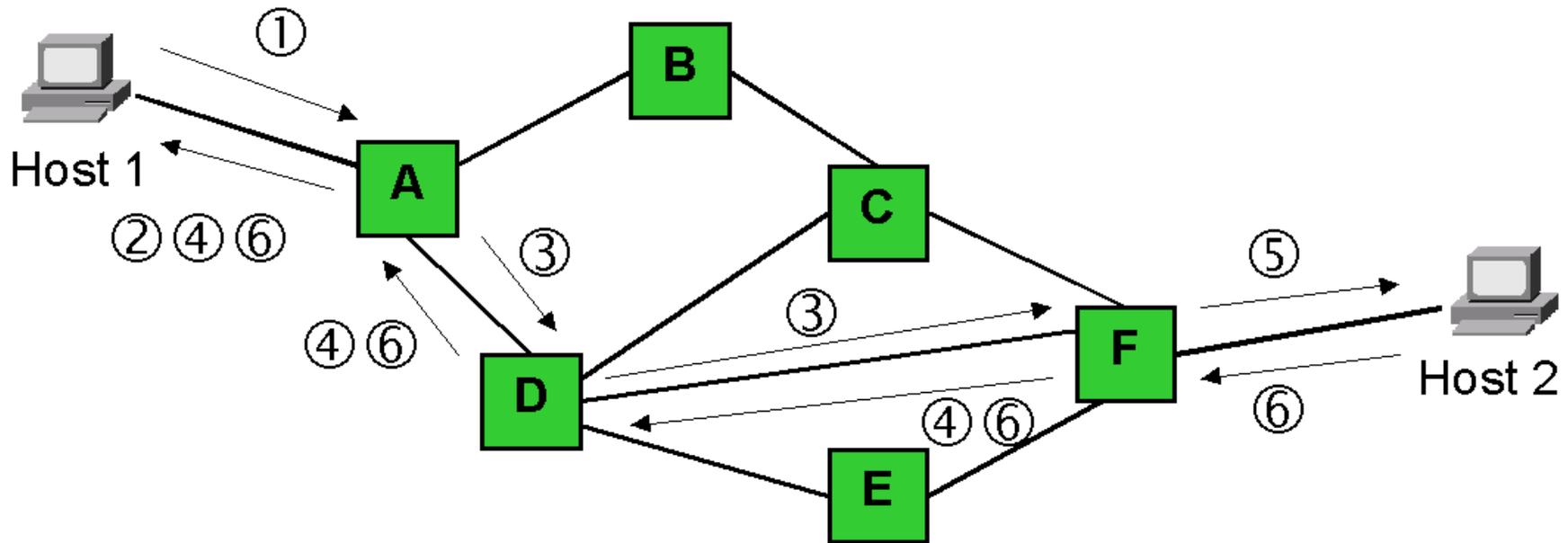
Unconfirmed connection establishment scheme

- Connection-oriented, unreliable service
- Useful for small, best effort data exchanges
- Connection setup messages contain user data
- Control channels are used for both link management and small data transfer

Data transfer issues (cont'd)

- Guaranteed transfer quality and constant delay are suitable for applications with timing requirements

- Resource reservation on packet-switching networks is hard to do for single packets

- Circuit switching allows large volumes of data to be transferred efficiently

# QoS-based fast connection establishment scheme
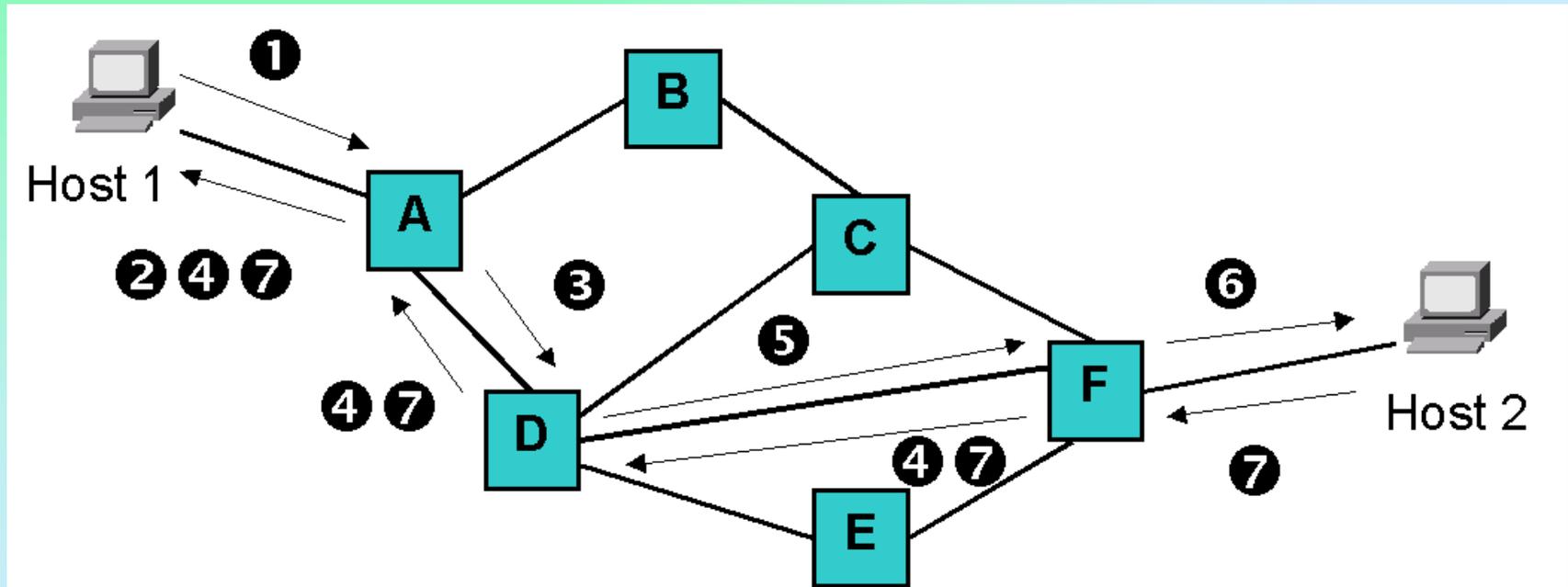
QoS-based fast connection establishment scheme

- QoS-based virtual circuits
- Dynamic allocation depending on upper layer QoS requests
- Bandwidth reallocation on established flows allows new connection requests to be satisfied
- Real-time feedback in flow control for application bandwidth adjustment

Internetworking

- A *gateway* translates internal protocols and data flows into TCP/IP protocols and packets

- Main functions are network layer adaptation and layer 4 service remapping

Unconfirmed connections: gateway features
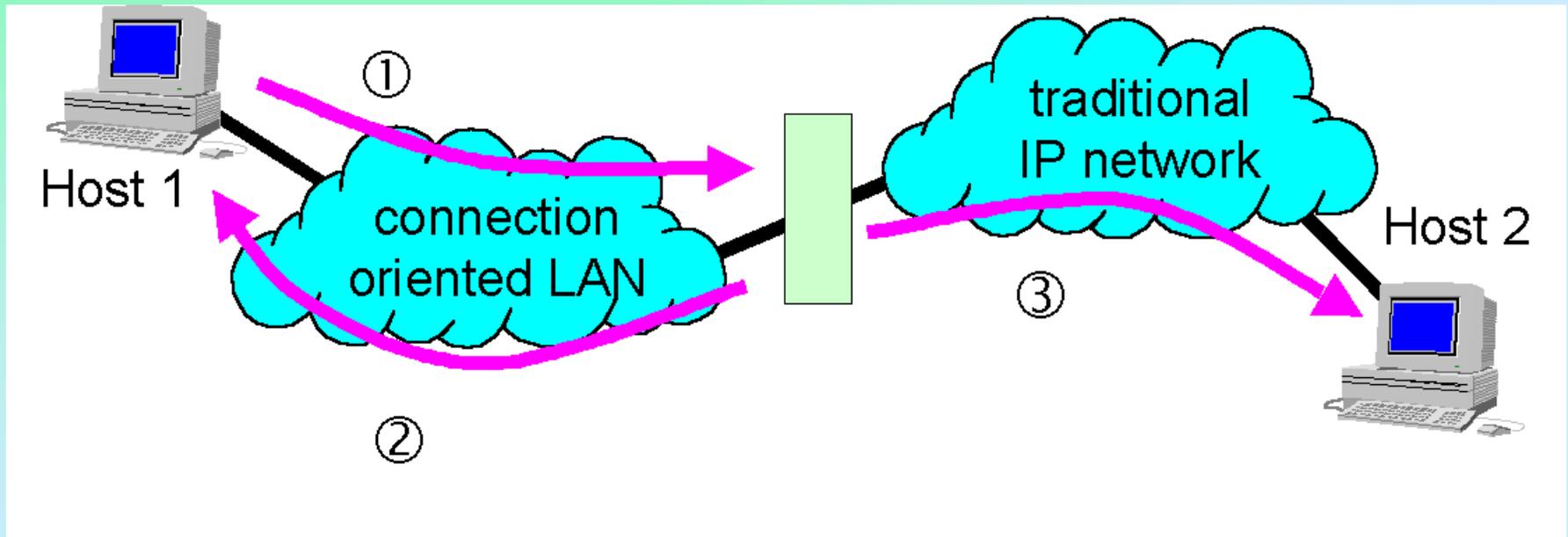
QoS-based connections: gateway features