Now Showing
Video on Demand
Presentation

Multi-Protocol Video on Demand System for Distance Education with Pedagogical Enhancements
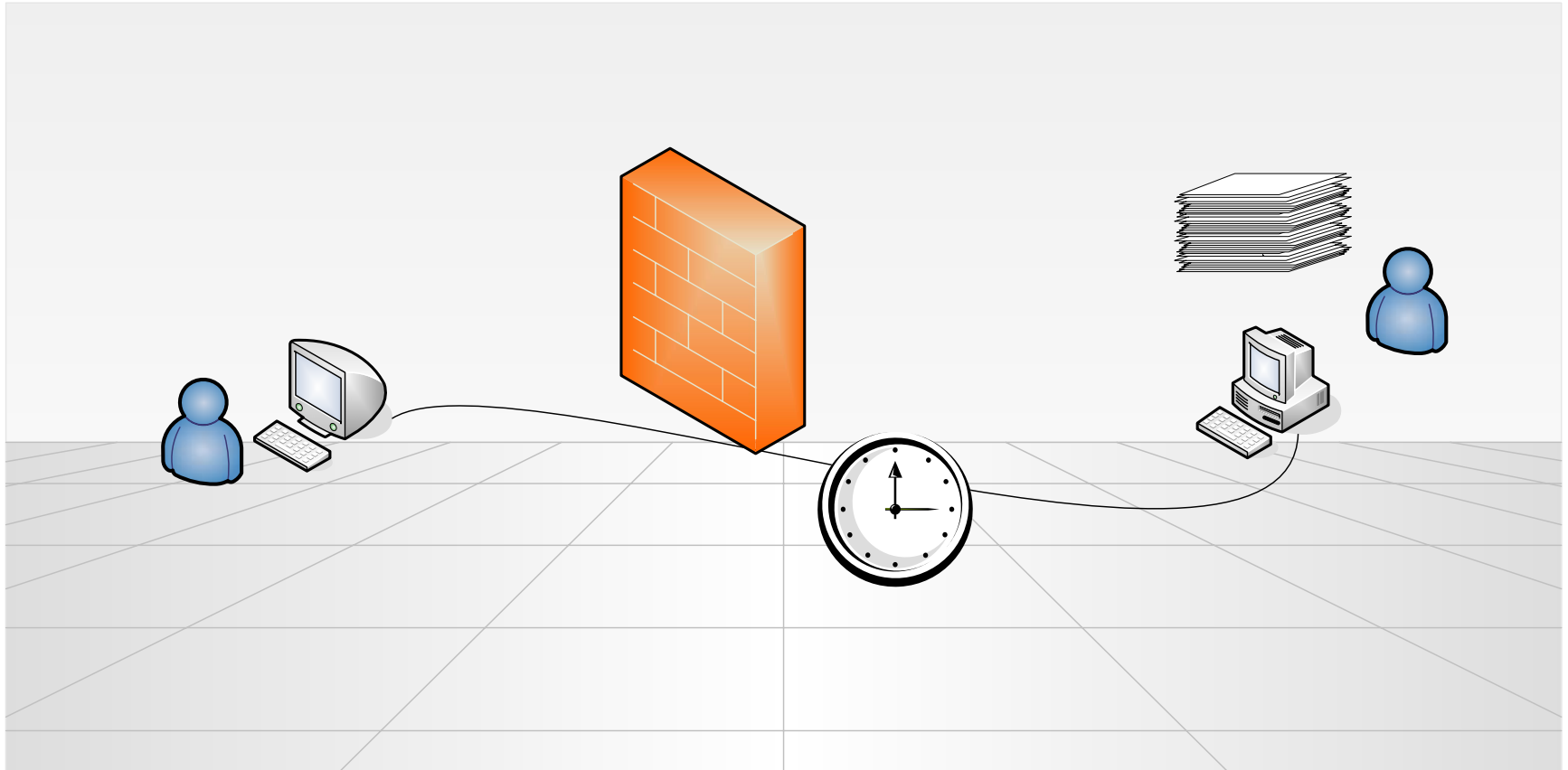
Thesis Presentation

21/01/2004

Cem KARACA

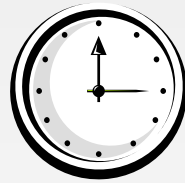Supervisor: Assoc. Prof. Dr. Derviş Z. DENİZ

Outline

- Distance Education

- Video on Demand (VoD) Systems

- Pedagogical Enhancements on VoD Systems

- Networking Technologies for VoD Systems

- Buffering

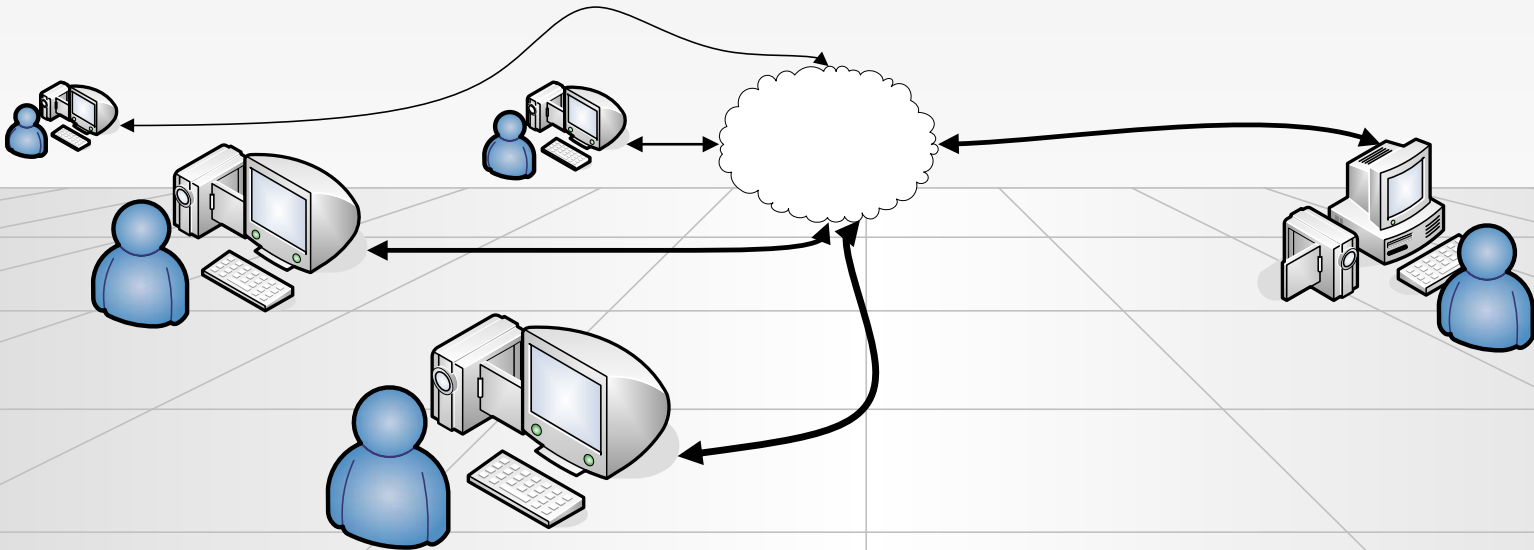- The Interfaces

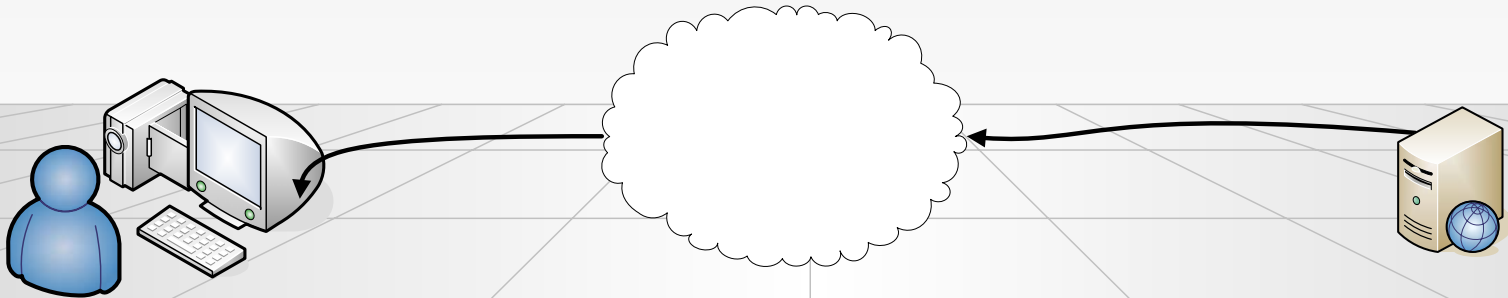- Conclusions

- Questions

Distance Education (DE)

Synchronous Distance Education (SDE)

- Must be scheduled
- Multicast

Asynchronous Distance Education (ADE)

- Peer to peer (Unicast)

- No time limitation

- No interaction

Comparision of SDE and ADE

	SDE	ADE
Orientation	Classroom	User or Group
Scheduling	Required	Not required
Presentation	Multicast	Unicast(peer to peer)
Network Load	Continuous	When streaming
Distribution	WAN	WAN and Internet
Hardware	Any compatible	Mass storage
Interaction		
Broadcast	Real-time	Streaming

The Problems

ASE Systems

- ASE System session quality is dependant on time and place.

- Sessions are non-repeatable

ADE Systems

- Current implementations are not interactive

- The DE content cannot be expandable by the learner

- Mostly web based and multimedia is only used where necessary

The Solution

Need for a Complete DE System

- Learner oriented,

- That will be accessed on demand over the WAN or the Internet,

- It will also include course content related knowledge base.

- It will allow learner interaction to the knowledge base.

The VoD System

Pedagogically Enhanced Video on Demand (VoD) System for ADE

- Streaming on demand video,

- VCR Capabilities,

- Applicable over the Internet

- The network and storage load could be distributed.

The VoD System Infrastructure
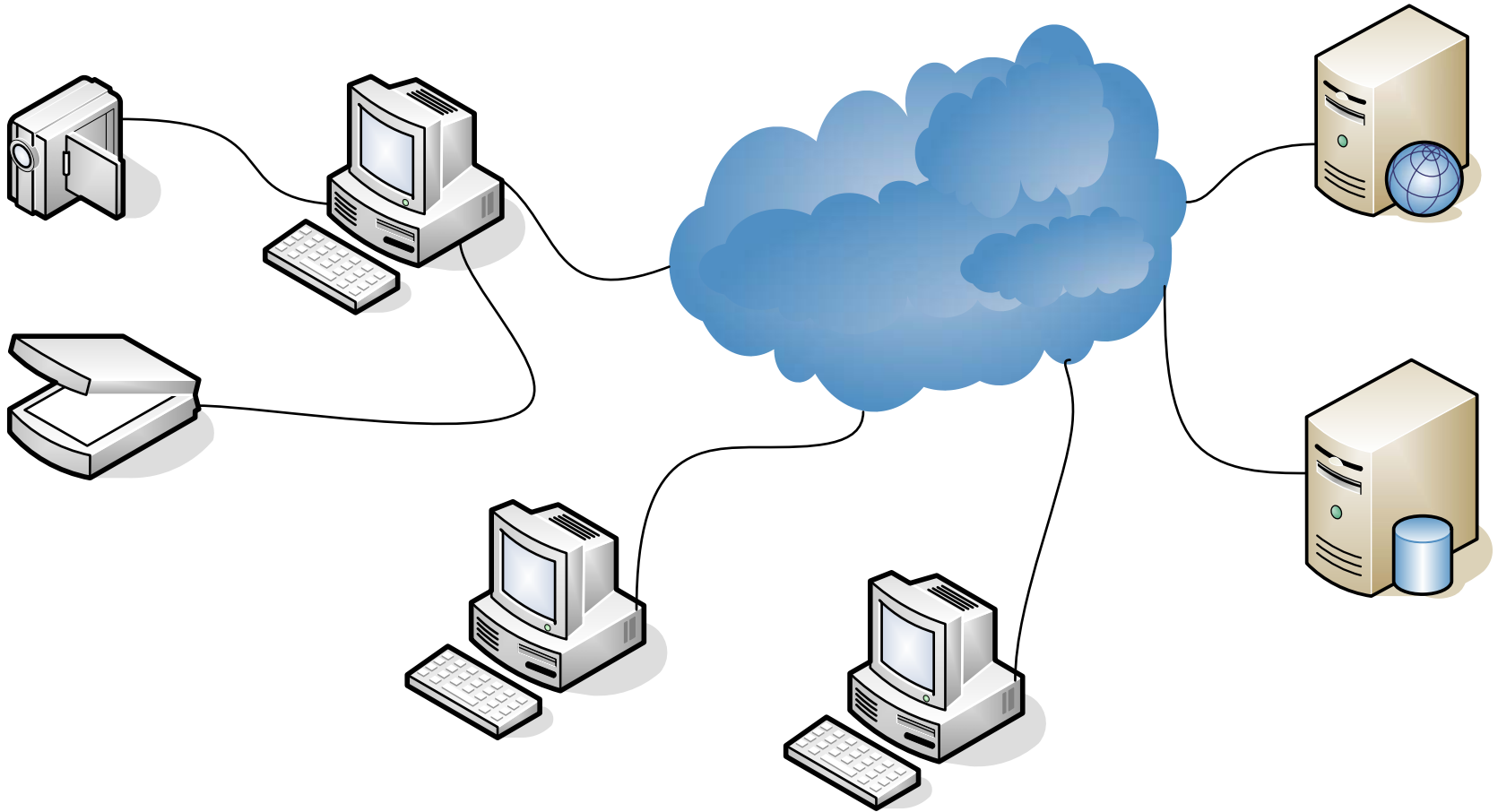
Servers

Mediation Server

- Authentication
- Storing important databases
- Mediates between client side applications and Content Servers

Content Servers

- Storing lecture videos
- Content materials and their bounded obects
- Serving VoD DE projects with the transport/application protocols such as TCP, FTP, UDP and RUDP.

System Architecture
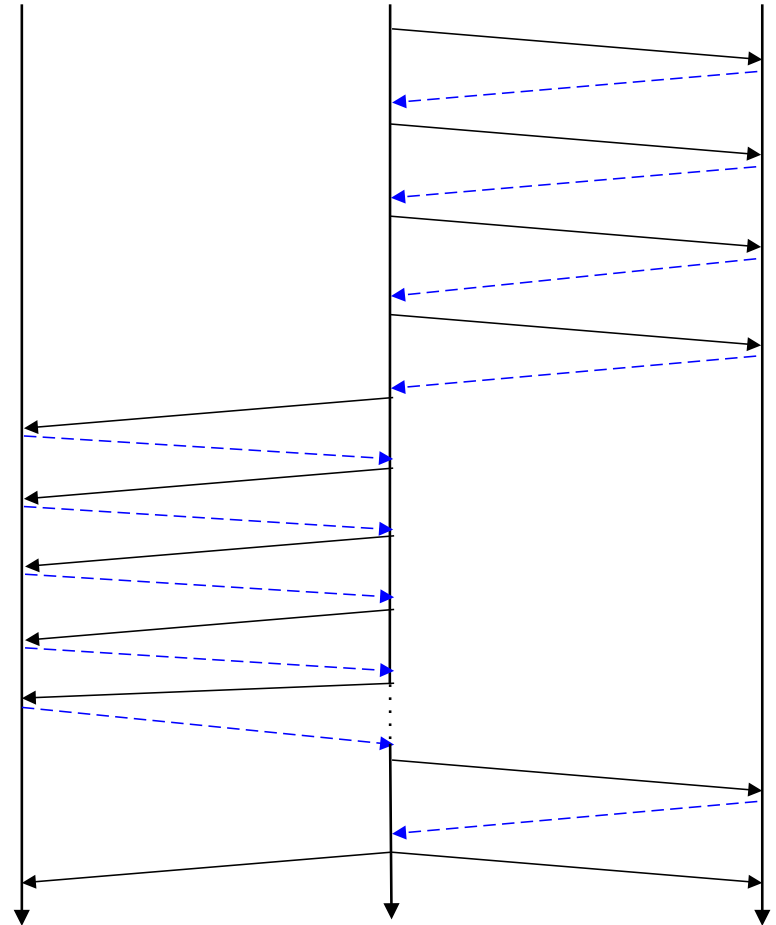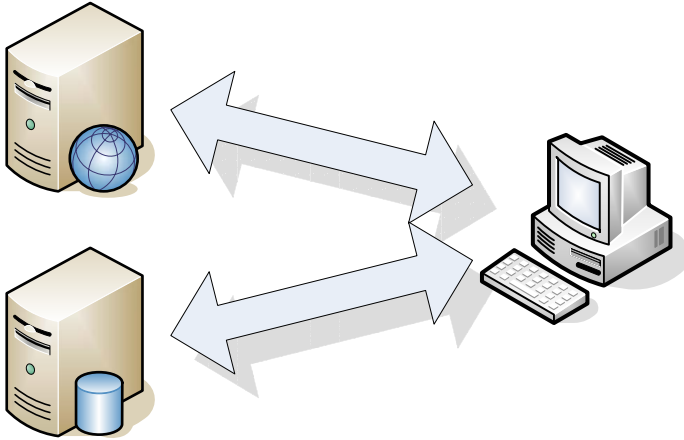
Pedagogical Enhancements on VoD System

- VoD Player is the only required tool for viewing VoD Projects.

- VoD Player is a video based system application, that is able to view content related supporting materials as "html" pages.

- VoD Player allows the learners to make their own additions.

- VoD Project Editor is the only tool for creating VoD DE projects.

- VoD Project Editor supports "html" creation, edition and synchronization to course videos.

System Applications

	Client-Server Applications	Software Component
Client Side	Student/Learner Client	VoD Player
	Project Editor/Instructor	VoD Project Editor
	Database and Content Admin	Web access to server resources
Server Side	VoD Mediation Server	User and password database, Video Project database, Content server IP database.
	VoD Content Server	TCP, UDP, RUDP and FTP Servers, Video Library, Supporting materials.

The VoD Player

The VoD Player Plus

Content Synchronization
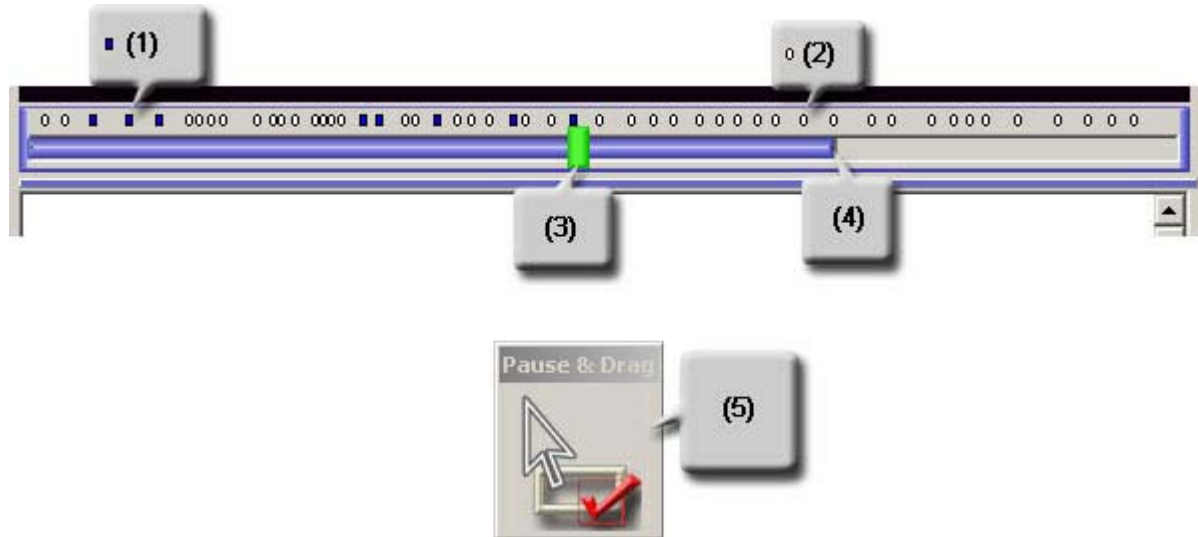
1) Learner additions

2) Standard content material

3) Video Slider

4) Buffer progress

5) Content addition window for the use of learners

The VoD Project Editor

1.) Video Preview Screen

2.) Project tree

3.) Content addition ruler

4.) "html" editing screen

Distributed Server Architecture for VoD System

Java C

OSI and VoD

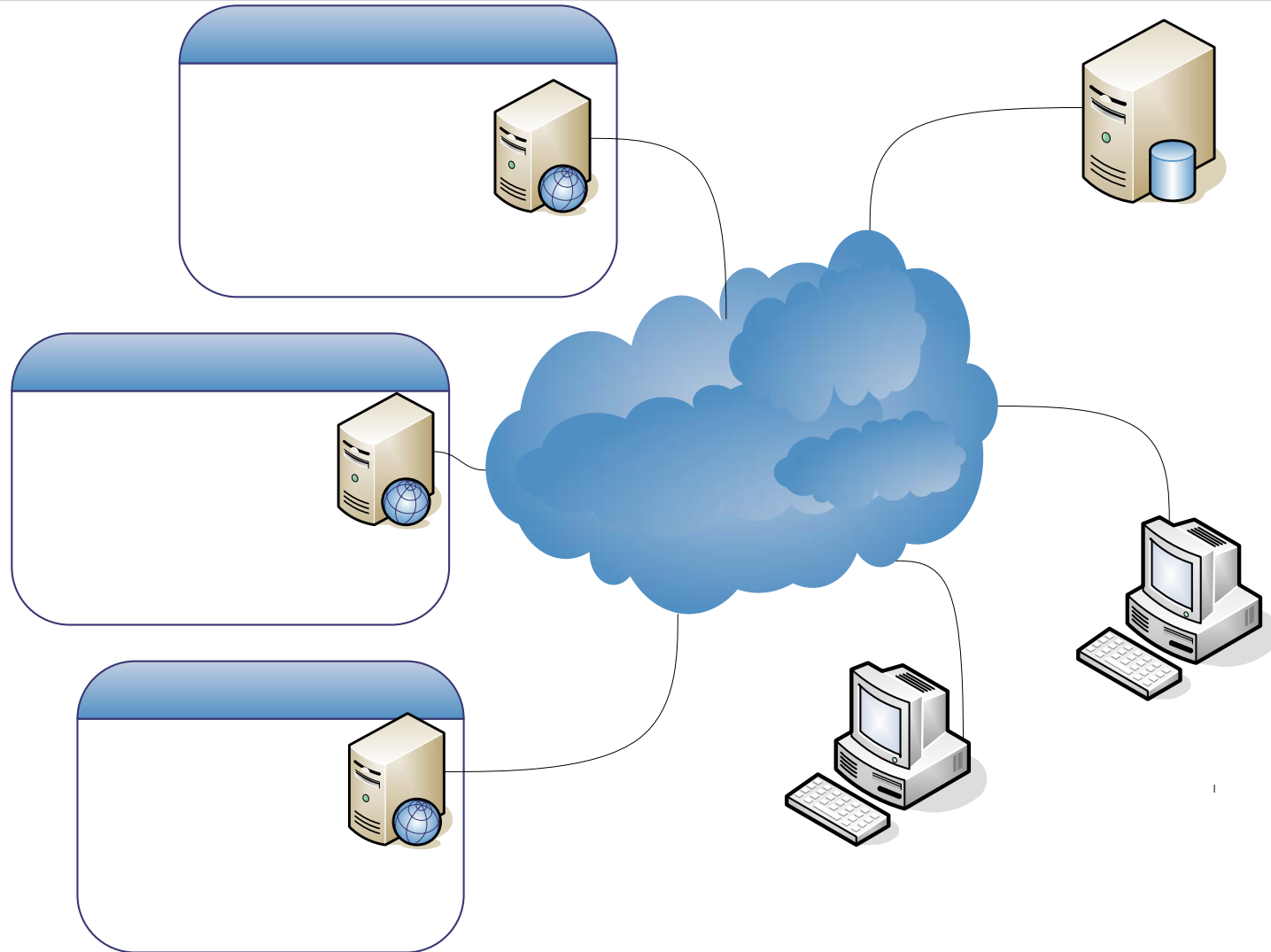|			
7	Application Layer		
6	Presentation Layer		
5	Session Layer	MySQL	
4	Transport Layer	TCP	UDP
3	Network Layer	IP	
2	Data Link Layer	Ethernet, ATM, FR, ISDN, ADSL	
1	Physical Layer	Fiber, Twisted, Coax, Satellite	

MySQL API

VoD Client

VAP

FTP

RUDP

UDP Server on Content Server

TCP Server on Content Server

VoD Mediation Server

RUDP

FTP

DB

MySQL

UDP

TCP

IP

Ethernet, ATM, FR, ISDN, ADSL

Fiber, Twisted, Coax, Satellite

Supported Protocols for Video Streaming

- Transport Control Protocol (TCP)

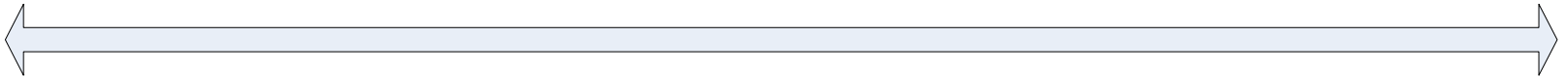- User Datagram Protocol (UDP)

- File Transfer Protocol (FTP)
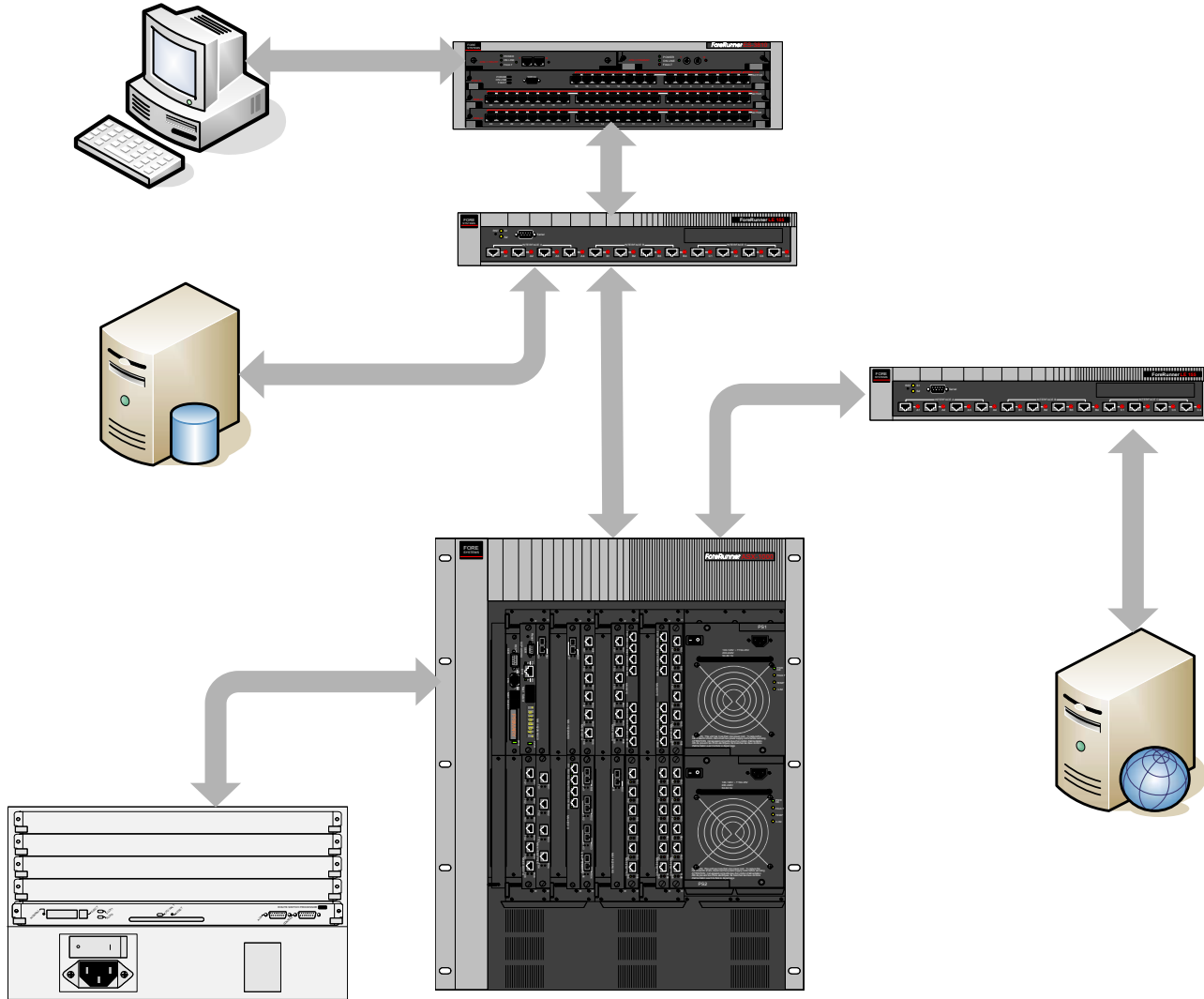
- Reliable User Datagram Protocol (R-UDP)

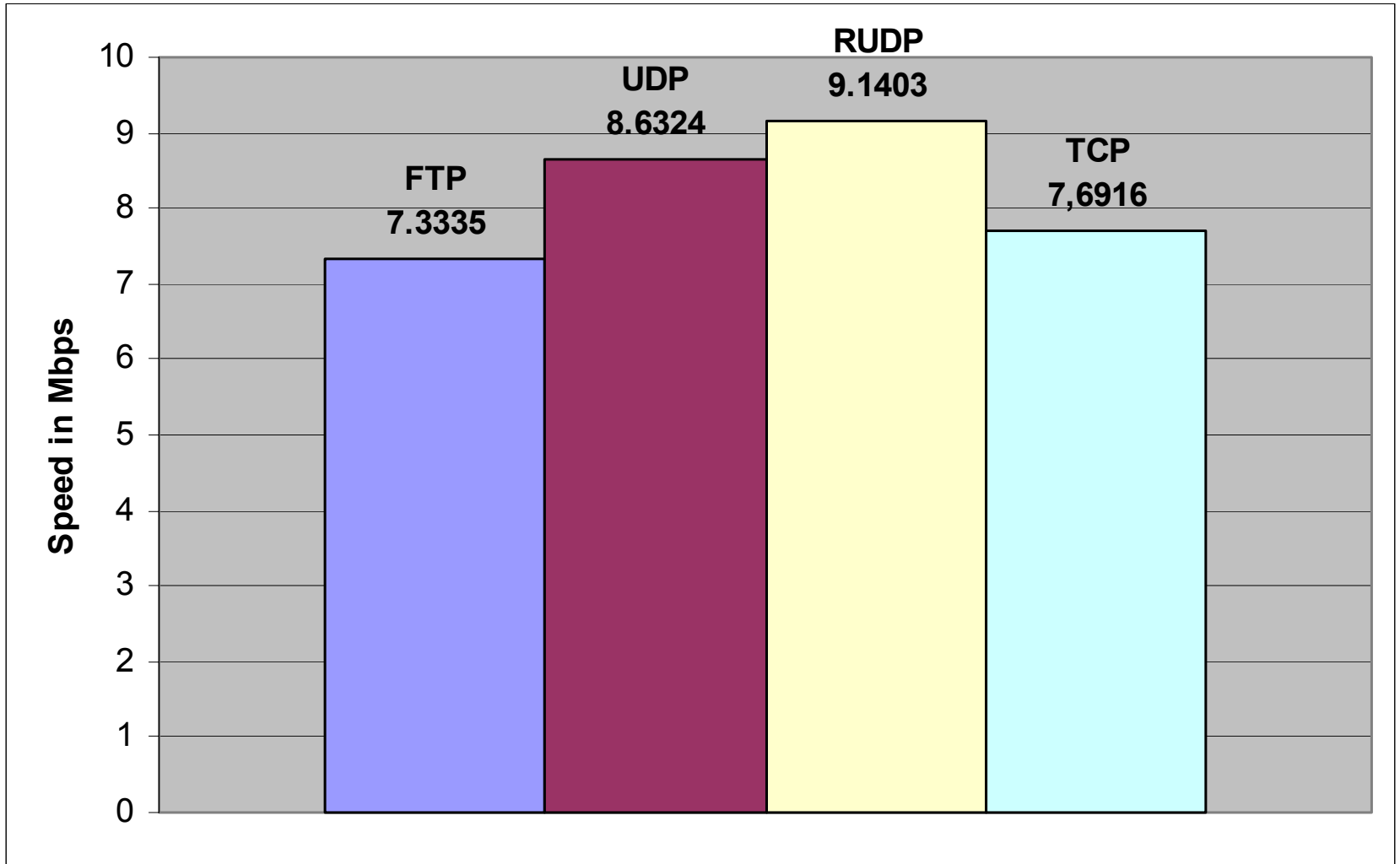⟵————————————————————————————⟶

* In ideal cases

Reliable UDP

- Connection Oriented
- Error control with 32 bit CRC
- Packet Recovery

- Less overhead
- Fast
- Designed for video transportation

0	8	1 6	3 1
Source Port		Destination Port	
UDP Length		Checksum	
Size			
32 bit CRC			
Packet Number			
Bulk data …. 65467 bytes			

System Performance Measurments

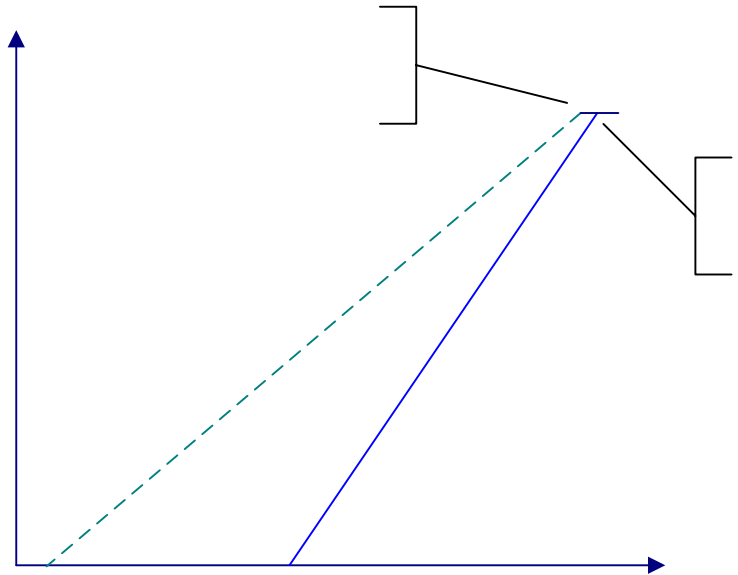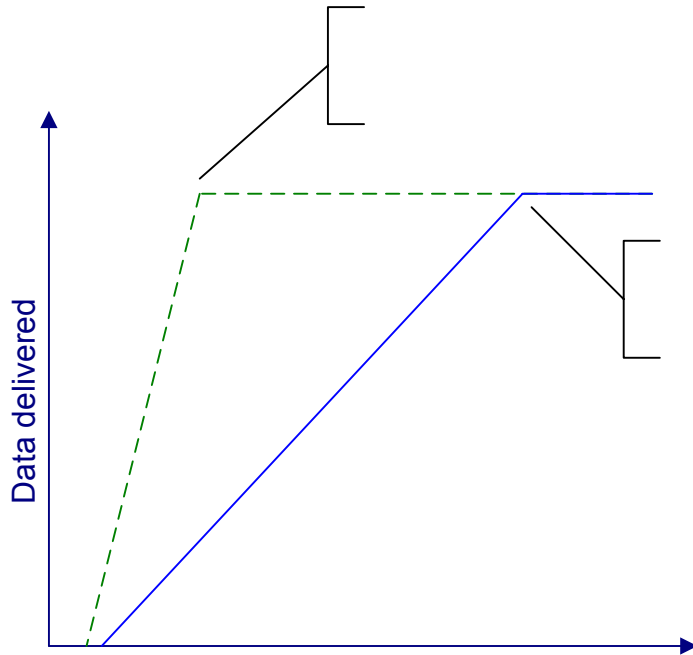# Results

Smooth Buffering

$$t_W = \begin{cases} 0 & : Sp < S_D \\ \dfrac{t_P * S_P}{S_D} - t_P & : S_P > S_D \end{cases} \Leftrightarrow S_D > 0$$

Conclusions

- A complete ADE system could be implemented

- Pedagogical aspects are developed for VoD systems

- A new streaming protocol R-UDP is developed for low bit error rate networks

- Comparisions of the transport/application protocols are made

- Smooth buffering is developed