

Presenting an Online Graduate Computer Science Program at Low Cost Using Open-Source Software

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Presentation Outline

- Synchronous online education
- Benefits of simluteaching
- NEW open source software suite
- GMU online MSCS program
- Initial student outcomes
- Summary/conclusions

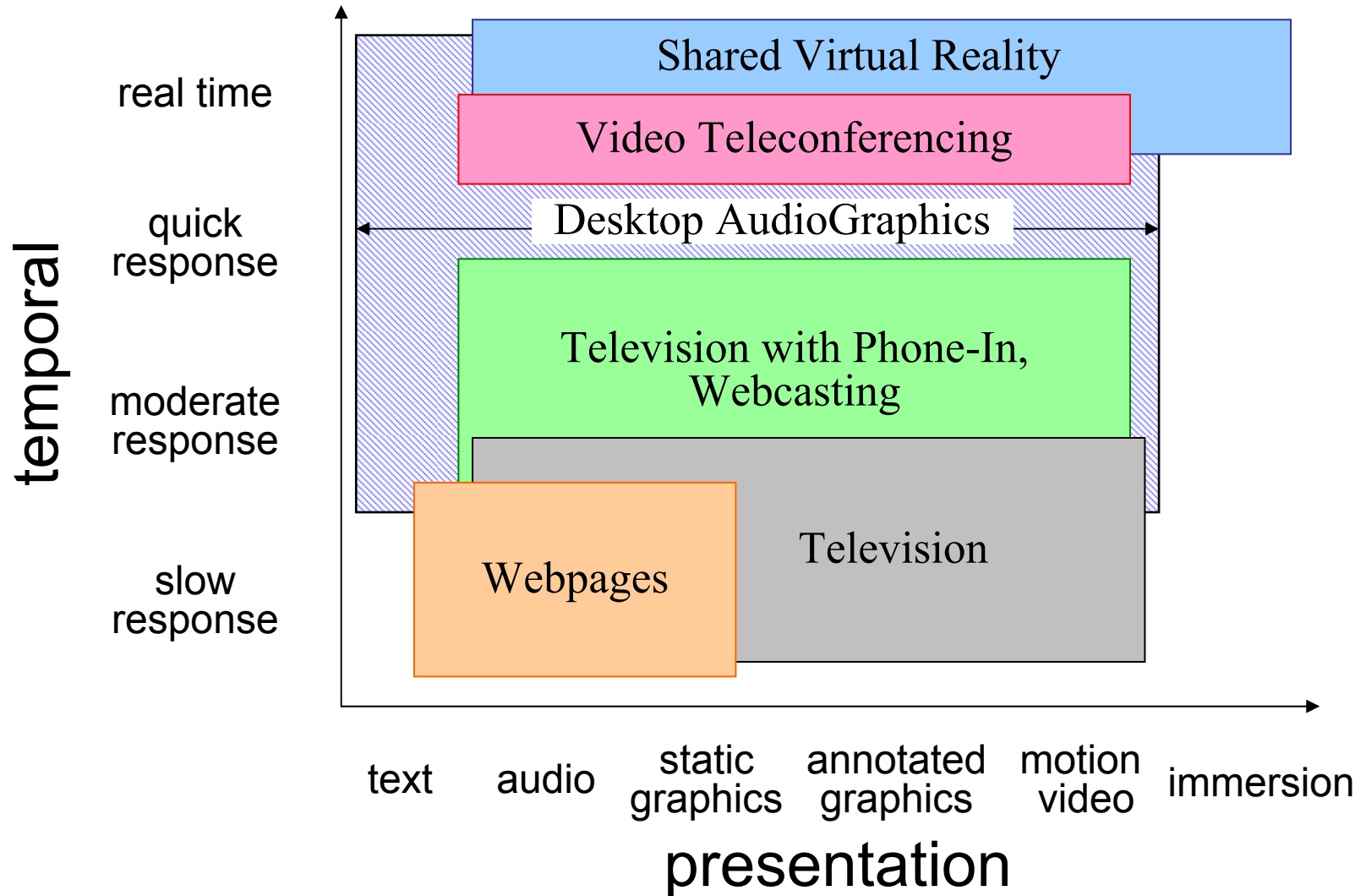
Synchronous Online Education

- Ubiquitous Internet offers greater accessibility of education
 - Electronic delivery of course materials
 - Real time delivery of courses
 - GMU has been a pioneer
- We find students are best served by combination of synchronous & asynchronous delivery
 - Live streaming of class
 - Playback of streaming delivery
 - Course materials accessed via webpages

The *Simulteaching* Model

- Regional online course delivery
 - Avoids long travel time to attend class
- Students may attend in-person or online
 - or time-delayed via recording
- Classroom and online students have equal access to class and opportunity for interaction
- Lowest-cost approach
 - No webpages to create; use existing slides
 - Teaching two groups at same time lowers costs
 - Video benefit marginal; provide if network is available

Temporality of Student Interaction

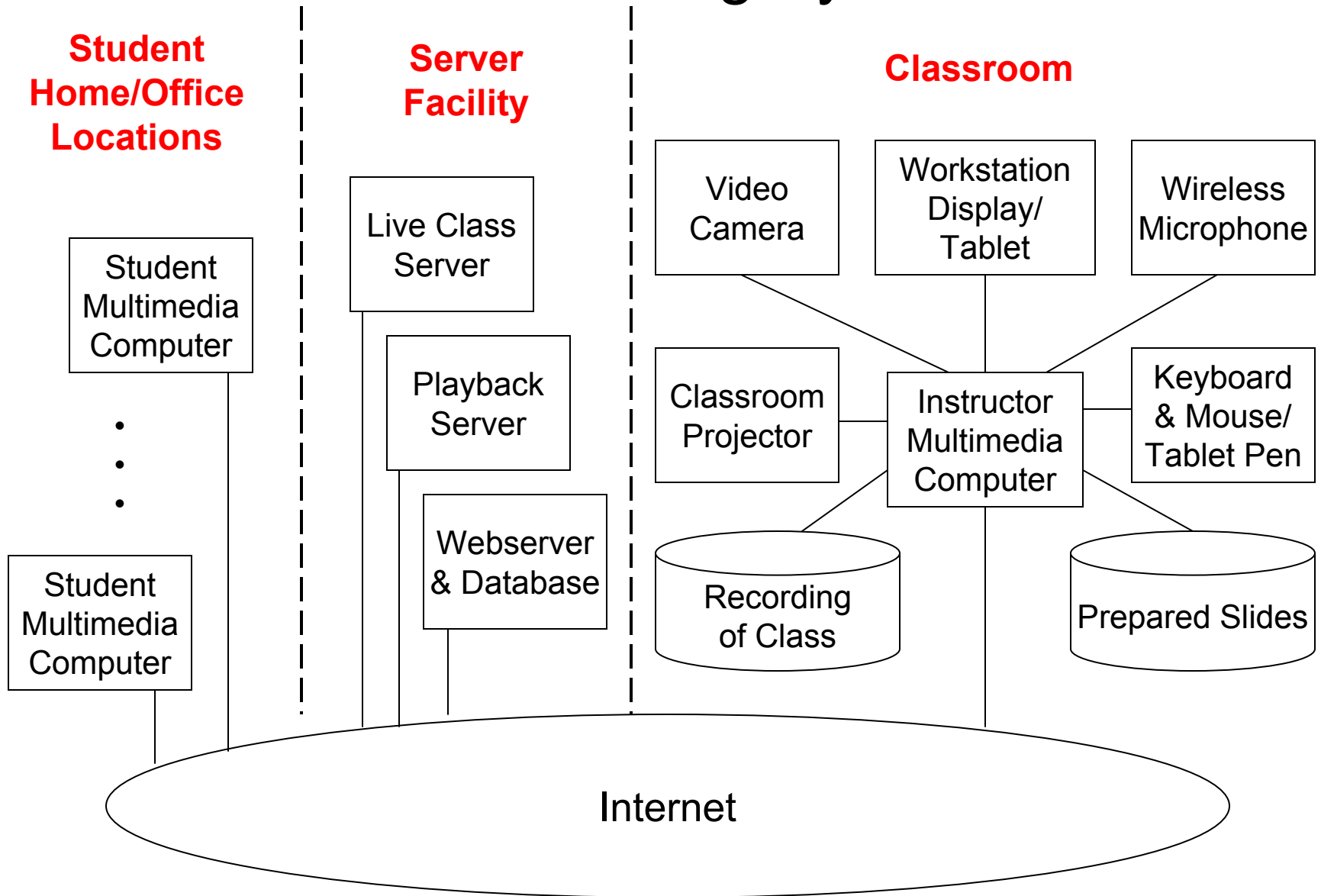


Network EducationWare (*NEW*)

Open Source Online Teaching Software

- Based on freely available Internet multimedia/multicasting software
 - Audio/whiteboard/video
 - Control software by GMU
- Client package for Windows
 - GMU porting Linux and Macintosh versions
- Server package in Java runs on any platform
 - By GMU software supports client multicasting
 - Uses TCP tunnels to deal with NAT
- Web-based access and course management

Simulteaching System



NEW Open Source Client Tools

Streaming Internet Course Delivery

- Audio
 - Speak Freely by John Walker (GUI by GMU)
- Whiteboard
 - WBD by Loughborough University UK (extended by GMU)
- Video
 - VIC by U of CA and University College London
- Floor control
 - NEWFC by GMU
- Record and Play controls
 - RC and PC by GMU
- Master Client (controls client configuration)
 - TLMC by GMU
- Platform: Windows now; Linux & MacOS Fall'05

Voice Level 83% Mic Gain

Send **SENDING (AGC ON)** Stop

Sound Test About

Speaker/Earphone Gain 97%

John Mark Pullen
mpullen@127
1.0 f/s 21 kb

mute

New Recorder

Elapsed Time 0:00:00

ABOUT

THE RECORDER IS WAITING TO BE STARTED



Network EducationWare

Synchronous Internet Distributed Education

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Import Slide Import Next Blank Page Prev Page Next Page Go To Page Import Window 01Network_Educati.pdf This Page Number: 1 Page Count: 1

Release Floor

Grant Next

Floor Rules

About FC

RED HAS THE FLOOR

mpullen			

SEND TO ALL:

SYSTEM MESSAGES:

RECEIVED MESSAGES:
mpullen >hello there!

T

Eraser

Color

Width

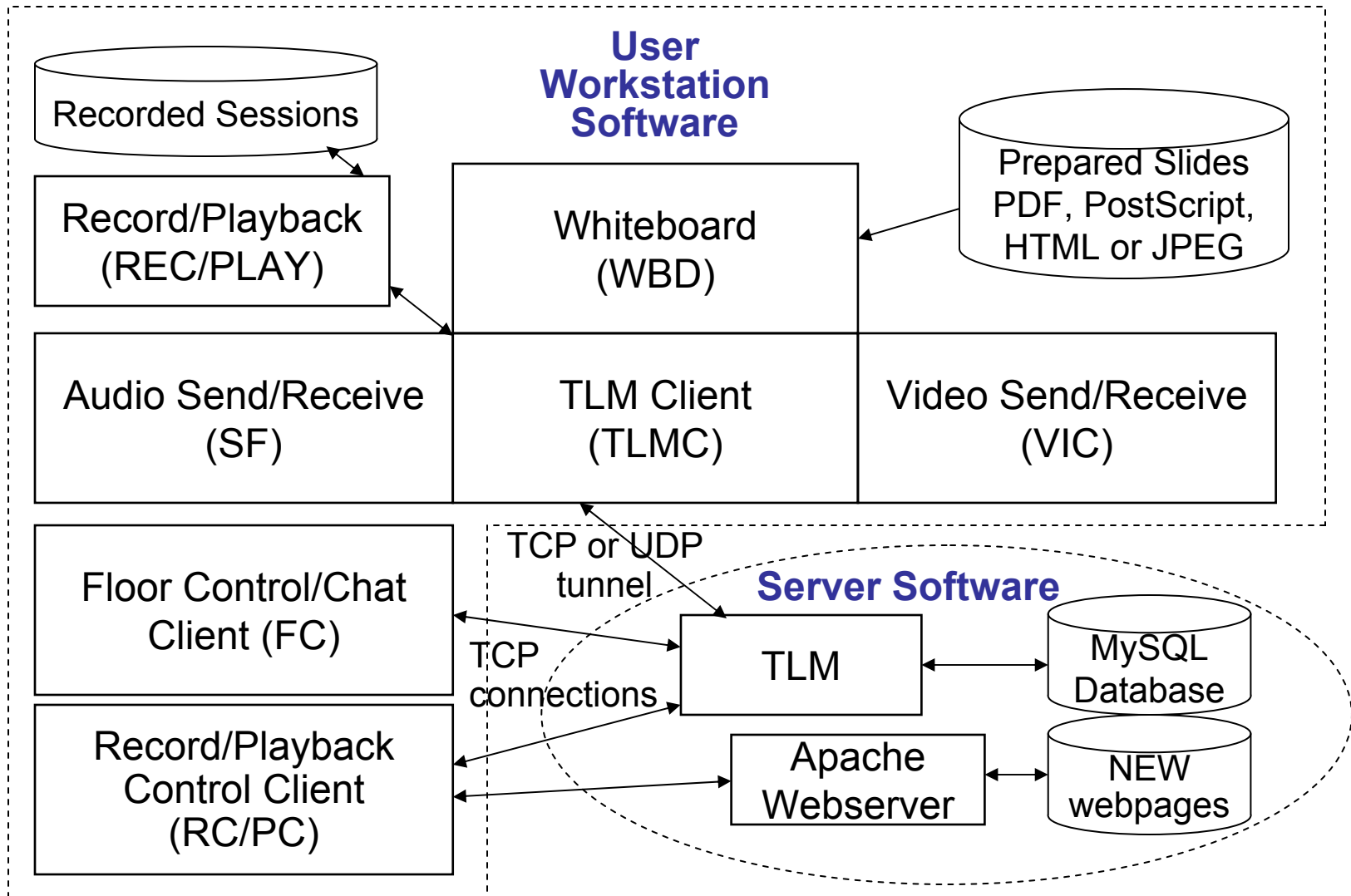
Font

Convert Slides

About WBD

Quit

NEW Software Components



NEW Open Source Server Software

Usually on Linux Platform

- Live class
 - Transport Layer Multicaster (TLM) by GMU
- Playback/Record
 - PLAY/REC by GMU, with help from NPS
- Database
 - MySQL widely used relational DBMS
- Webserver
 - Apache with PHP widely used Internet-wide
- Web portal
 - NEW Course Management pages by GMU
- Platform: usually Unix; Windows possible

NEW Web Portal

- Simple interface to complex functions
 - Software load and test
 - Live access
 - Multiple client configurations from webpage
 - Playback
 - Multiple client configurations from webpage
 - Chat rooms
- Focal point for course management
 - For instructors, database management and statistics
 - For administrators, server and webpage management
- Scalability
- *NEW* won International Competition for non-commercial Web-based education software

MENU

[Disted HELP/FAQs](#)
[Report a problem](#)

[Admin Functions](#)
[Instructor FAQs](#)

[Disted Home](#)
[NEW Home](#)
[NEW User](#)
[Interface](#)
[NetLab Home](#)

Welcome to the **NEW** Distance Education System

Instructor: Priscilla McAndrews Course: IT441-3

Select:

Preparation

- Download/install software
- Test your connection

Live Class Connection

Communication

- Chat room
- Email all IT441 students
- Email IT441.3 (net) students

Review

- Streaming playback
- Download playback
- See class slides

Uploads/Downloads

Submit Slides

Download Slides

Submit Recordings

Course records

- View course status
- View course roster
- View course statistics
- Update session/add comment
- Add student (all sections)
- Update student (all sections)

Operating Costs Per Classroom

Using *NEW* with existing electronic classroom

- One Linux server
- Small fraction (<10%) of a system administrator's time
- Two graduate student Information Technology Assistants
 - provide class setup
 - monitor outgoing session quality
 - post recordings, etc.
- Network cost
 - if usage grows beyond existing capacity

GMU MSCS Degree

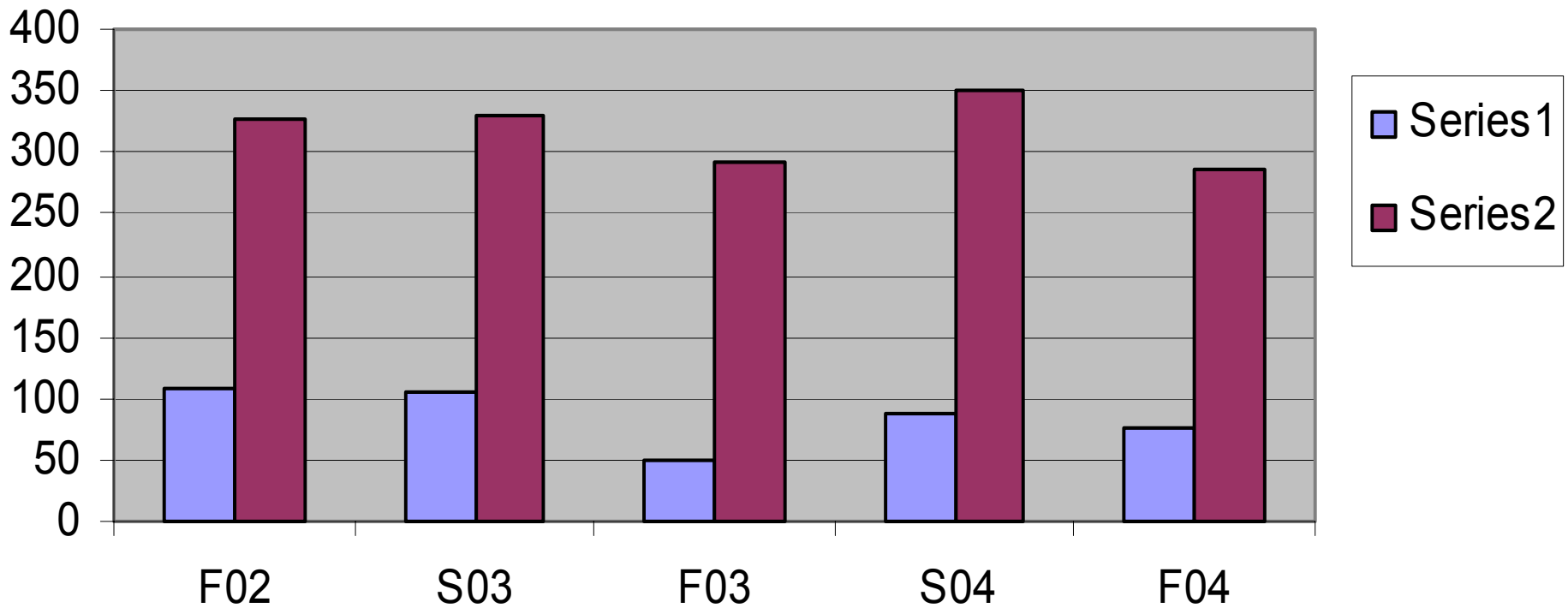
- 30 credits Computer Science graduate study
- Specializations
 - **Systems and Networks (now online)**
 - Artificial Intelligence
 - Image Processing and Graphics
 - Parallel and Distributed Systems
 - Software Engineering
- Breadth requirement
 - Courses from 3 specializations

GMU MSCS Online Courses

Course Number	Course Name	Offered at Least
CS 540	Language Processors	Annually
CS 571	Operating Systems	Annually
CS 580	Introduction to Artificial Intelligence	Annually
CS 583	Analysis of Algorithms	Annually
CS 631	Object-Oriented Design Patterns	Annually
CS 635	Foundations of Parallel Computation	Biannually
CS 640	Advanced Compilers	Biannually
CS 656	Computer Communications and Networking	Annually
IT 657	Advanced Network Science	Biannually
CS 706	Concurrent Software Systems	Biannually
CS 755	Advanced Computer Networks	Biannually
CS 756	Perf Analysis of Computer Networks	Biannually

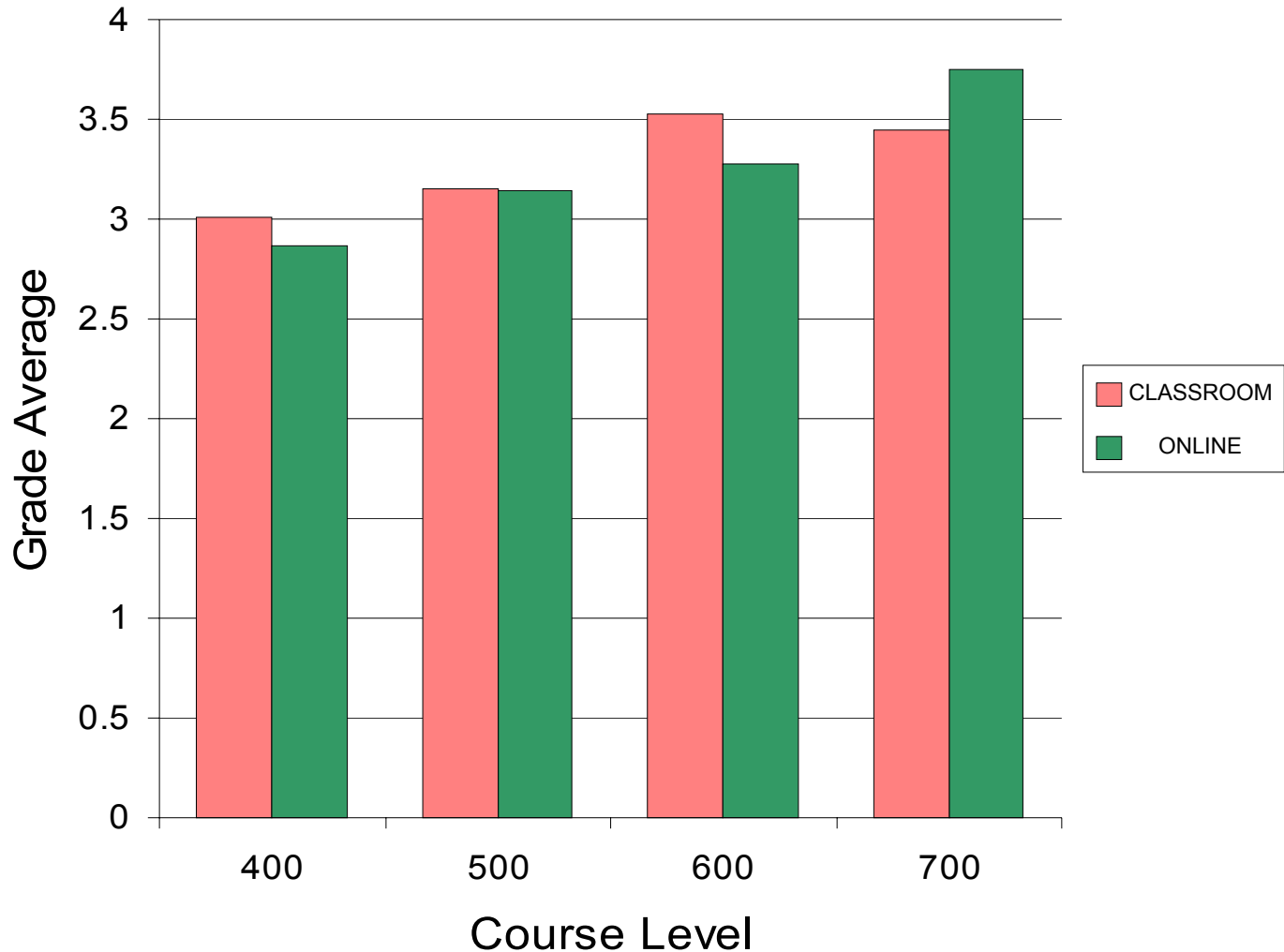
Initial Student Outcomes

All CS/IT Enrollment in Simulteaching Sections



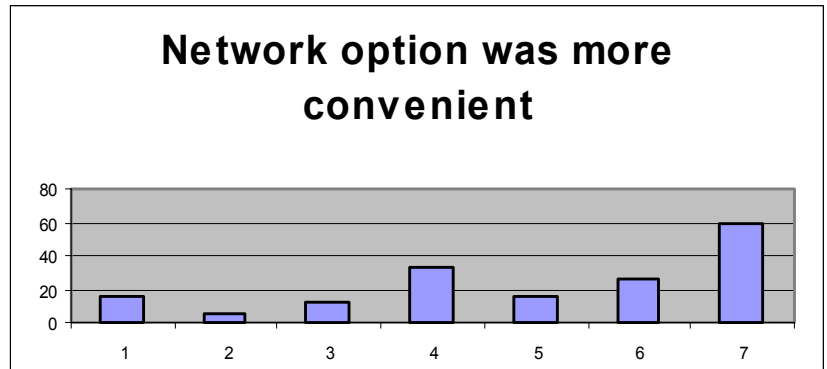
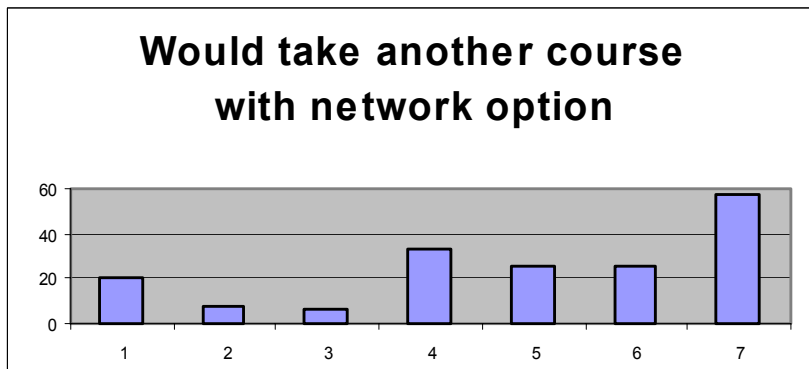
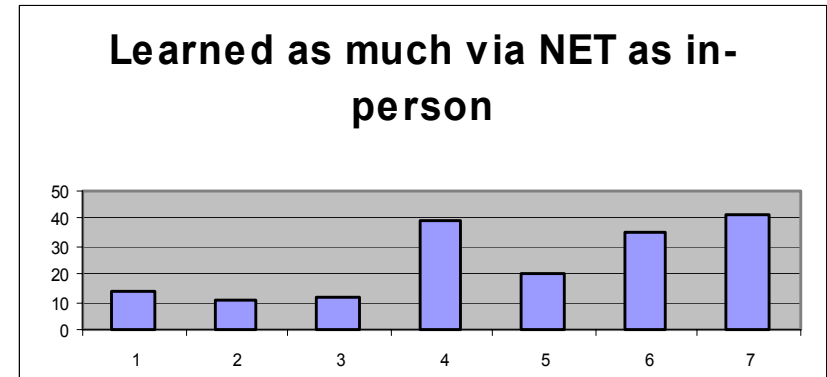
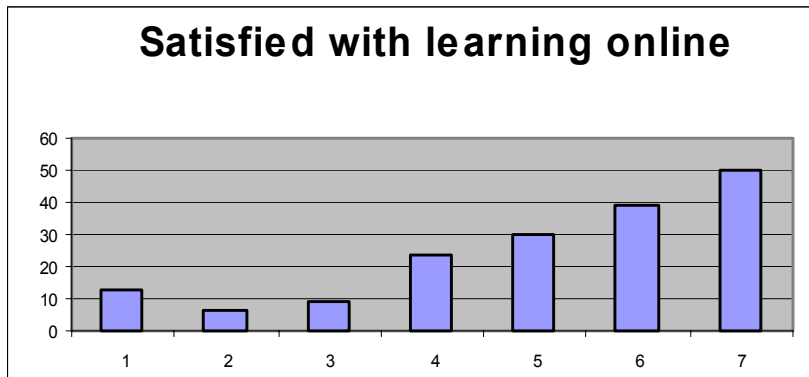
Initial Student Outcomes

Grades – “No Significant Difference”



Student Course-End Survey

Typical online student comments: The online mode allowed me to attend the lecture without commuting to school... I never had a problem connecting to NEW server and joining the class... one simply logs into the system and chooses a live connection from a web page menu ... I find NEW to be a great tele-learning tool.



Summary/Conclusions

- Online delivery increases accessibility of education
- Simulteaching with synchronous plus asynchronous delivery minimizes costs and additional faculty time
- Network EducationWare provides these functions in free, easy to use software for academia
 - See <http://netlab.gmu.edu/NEW> to download
- GMU has used this approach to extend its MSCS online to reach more regional students
- Results are highly promising
 - Enrollment, grades, student evaluations all good