Pros and Cons for Teaching Courses in the Classroom and Online Simultaneously

J. Mark Pullen
Department of Computer Science and C^{4}I Center
George Mason University
Fairfax, VA, 22030, USA
mpullen@netlab.gmu.edu
http://netlab.gmu.edu

Presentation Outline

- Introduction: what is *simulteaching*?
- Delivery modes: synchronous, asynchronous and hybrid
- Simulteaching pros and cons
- Experience with simulteaching
- Open source software for simulteaching
- Conclusions

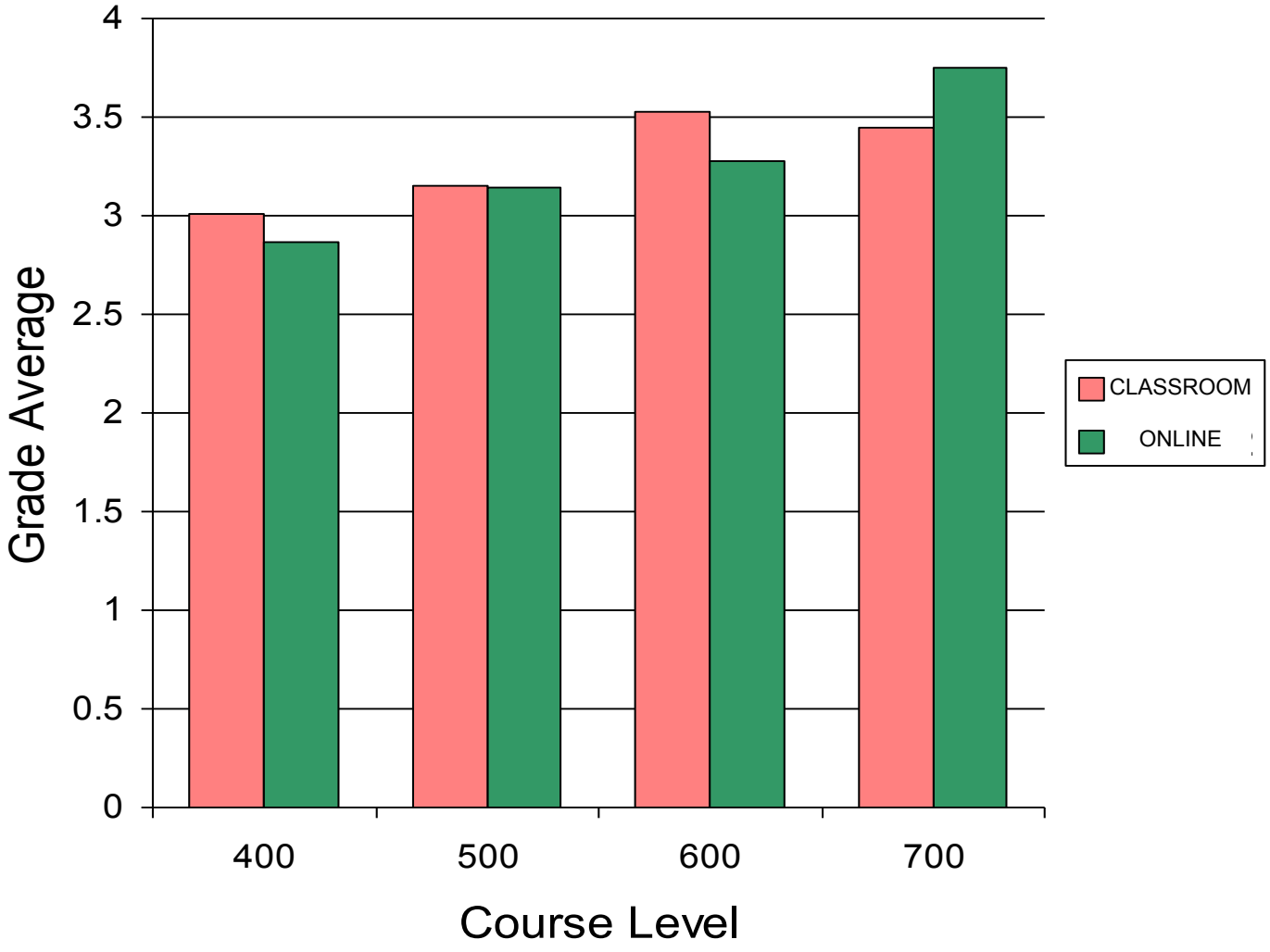
Introduction

How Can We Best Help the Student to Learn?
ESTABLISHED PRINCIPLES

- *There is no significant difference in educational outcomes, based purely on mode of delivery*
- *Given technologies available today, the most effective way to present material in order to facilitate student learning is a hybrid or blended approach, combining options for*
  - classroom learning
  - online synchronous delivery
  - online asynchronous learning materials

This paper is written to explain the choices we have made in adopting the hybrid approach and to review their validity.

GMU CS Grades: No Significant Difference



Synchronous and Asynchronous Delivery

Two Schools of Thought

- The majority of Internet-based distance education today is delivered **asynchronously**, via webpages
  - Natural progression from earlier "correspondence courses" and course library compilations
  - Web offers faster delivery, flexible linkage
- However, a growing amount is delivered **synchronously**, as it is being taught
  - Progression from TV and VTC teaching
  - We have found audigraphics, not video, most useful for CS teaching
  - Offers interaction, desktop delivery, high quality graphics, and replay

Which is Best?

- Research shows students learn about as well either way
  - "no significant difference"
- So, "best" would mean a system that
  - Minimizes student time to learn the same amount of material
  - Minimizes faculty time to present
  - Minimizes institutional cost to deliver

Hybridizing DE Technologies

- Ubiquitous Internet offers greater accessibility of education
  - Electronic delivery of course materials
  - Real time delivery of courses
  - GMU Volgenau School of IT&E has been a pioneer
- Combination of synchronous & asynchronous delivery
  - Live streaming of class accessed through Web interface
  - Playback of streaming delivery
  - Course materials accessed via webpages
  - Supporting Learning Management System
    - Accessed by Web
    - With links to Playback for review

Hybridizing Student Locations: *Simulteaching*

- 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
- Low-cost approach
  - No new webpages to create; use existing slides
  - Teaching two groups at same time lowers costs
  - Video possible but benefit marginal
    - Major cost is Internet connection
    - Could provide if network is available

Pro Simulteaching

Simulteaching Pros 1

- Low barriers to participation
  - Easy extension of regular classroom
  - Use existing teaching materials
  - Online office hours made easy
- Good interaction with students
  - Good quality Internet synchronous teaching software enables spoken and typed interaction with students
  - As in the classroom, lack of interaction is a pedagogical problem, not a delivery problem
- Reduced faculty preparation/support time
  - Reduces requirement to spend large amounts of time preparing asynchronous materials
  - Most communication with students takes place in class and is heard by all – reduces need for email

Simulteaching Pros 2

- Faculty salary savings
  - Primarily for advanced courses with lower enrollment
  - Classroom and online groups combined require only a single presentation
- Enables more distance education courses
  - Students want full online degree program
  - Hard to justify small online sections in graduate courses
  - Much easier when combined with classroom
- Low support cost
  - Doing simulteaching well requires student monitor online
  - But the monitors are much less expensive than faculty
  - And can be shared among multiple simultaneous courses

Simulteaching Pros 3

- Enables flexible distance education delivery
  - Individual sections using recordings, mentored by presenter
  - Expands range of courses available in summer
  - Recordings also can support inverted or "flipped" classroom
- Enables expansion of local programs
  - Many programs do not seek global scope (ours included)
  - Local/regional simulteaching can serve time-challenged students while keeping benefits of nearby physical campus

Con Simulteaching

Simulteaching Cons

- Classroom equipment requirements
  - Need good, uninterrupted Internet service in teaching room
  - And some form of tablet (SmartBoard style favored by many)
- Administrative complexity
  - Somebody must keep track of linked groups
  - Schedule facilities (classroom and Internet)
  - Account for difference in tuition/fees (if any)
- Faculty technophobia
  - Faculty need to be confident of teaching tool so they can focus on effective presentation
  - Need simple and robust supporting software
- Technology problems can disrupt class
  - Need on-call help and software that deals with problems

Simulteaching Experience

CS Distance Education at GMU

- Northern Virginia (in Washington DC metro area) is known for extreme traffic congestion
  - Commuting to class can require as much time as the class itself!
- Many of our graduate students are employed in government or industry – must travel for work
  - Can connect to evening classes via Internet from hotel
  - Or keep up with class on weekly basis using recordings of classes
- Pullen was early adopter of online teaching
  - By 2004, convinced colleagues to offer MSCS online
- Approach has proved successful
  - Popular with students
  - Faculty find it easy and like providing expanded student access
  - Administration likes enrollment increase but would prefer to avoid support burden

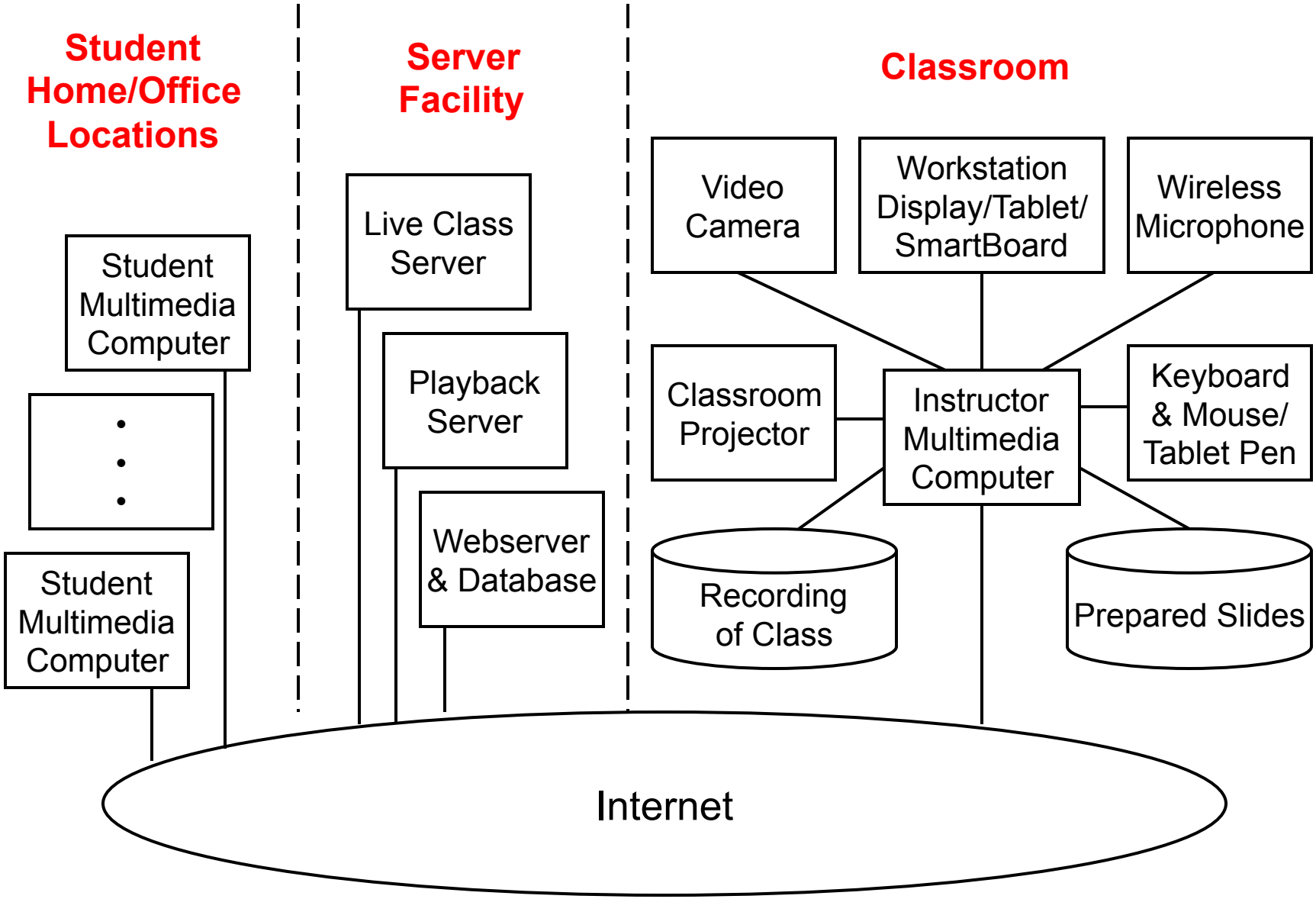
Online Courses in GMU MSCS

CS 540	Language Processors
CS 555	Computer Communications and Networking
CS 571	Operating Systems
CS 580	Introduction to Artificial Intelligence
CS 583	Analysis of Algorithms
SWE 619	Object-Oriented Software Specification and Construction
SWE 620	Software Requirements Analysis and Specification
SWE 621	Software Modeling and Architectural Design
CS 640	Advanced Compilers
CS 652	Computer Graphics
ISA 656	Network Security
CS 658	Networked Virtual Environments
CS 672	Computer System Performance Evaluation
CS 706	Concurrent Software Systems
CS 755	Advanced Computer Networks
CS 756	Performance Analysis of Computer Networks

Moodle Integrated Synchronous Teaching/Conferencing (MIST/C)

Open Source Software for Simulteaching

Simulteaching System



Purpose of MIST/C

- Provide a quality, easy to use, open-source tool for teaching and conferencing over the Internet, supporting student and instructor with:
  - Audio, graphics (slides and annotations), video, and text chat
  - Floor control, breakout rooms, and voting
  - Real-time interaction and recording of sessions
  - Simulteaching classroom and online students

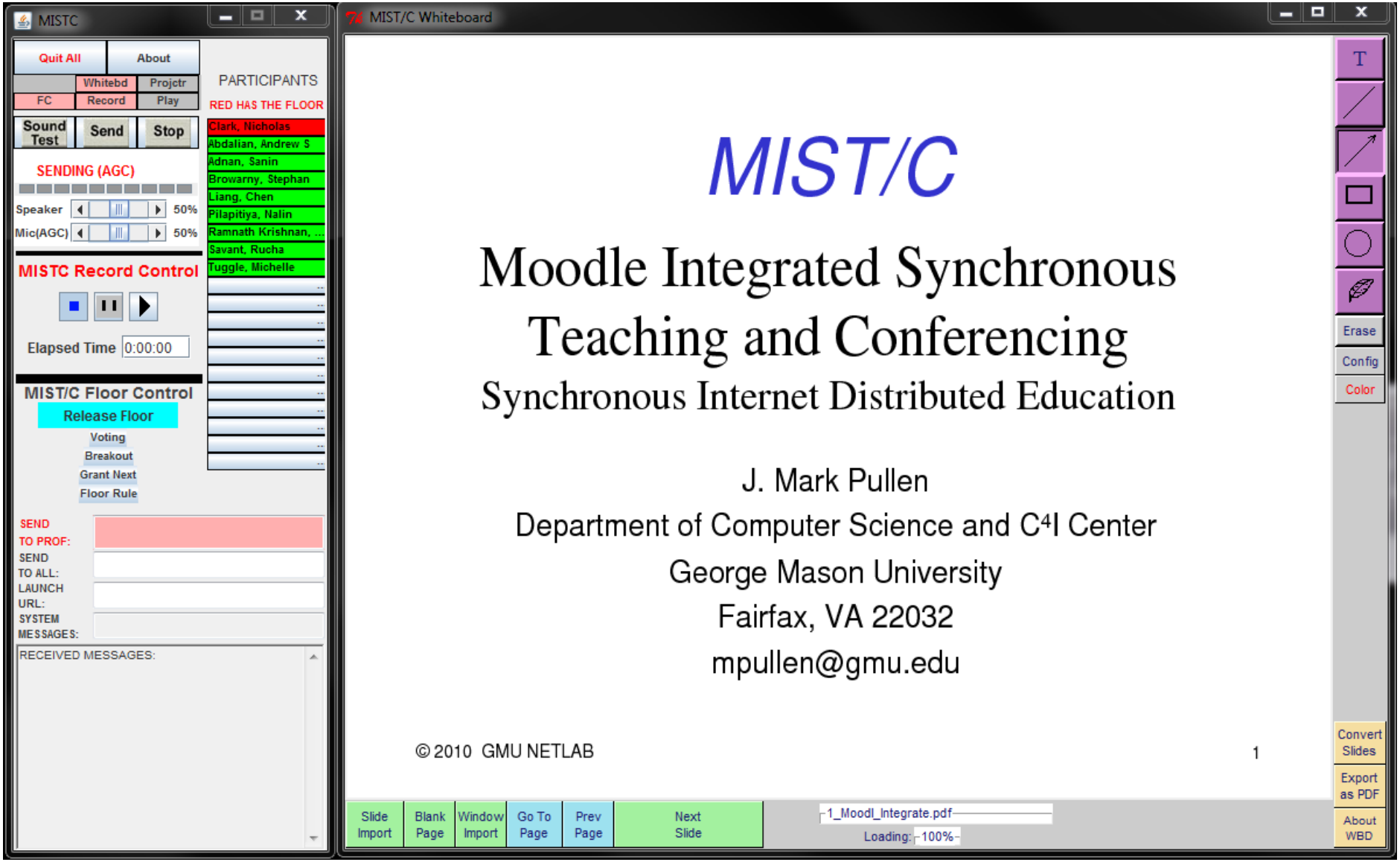
Commercial Alternatives

- When we starting developing online teaching software the only commercial systems were very expensive and not Internet-capable
- Imitation is the sincerest form of flattery!
  - Commercial systems now available but not free:
    - Blackboard Collaborate (formerly Elluminate)
    - Adobe Connect (oriented toward conferencing)
    - Echo 360 “classroom capture” (video oriented)
- More expensive than MIST/C
- They are not designed for simulteaching
  - And user interfaces while elegant are more complex

Features of MIST/C

- Multiplatform (Windows, Linux, Macintosh)
  - Clients for download at http://netlab.gmu.edu
  - With presenter guide and extensive documentation
- Multimedia (Audio, Whiteboard, Video, Text)
- Integrated, adaptive control window
- Communicates via TCP for best access
  - Through Network Address Translators and Firewalls
  - Low data rate: dialup connection (without video)
- Server and client run on low-cost computers
- Free and open source (posted to SourceForge)

MIST/C Client Interface



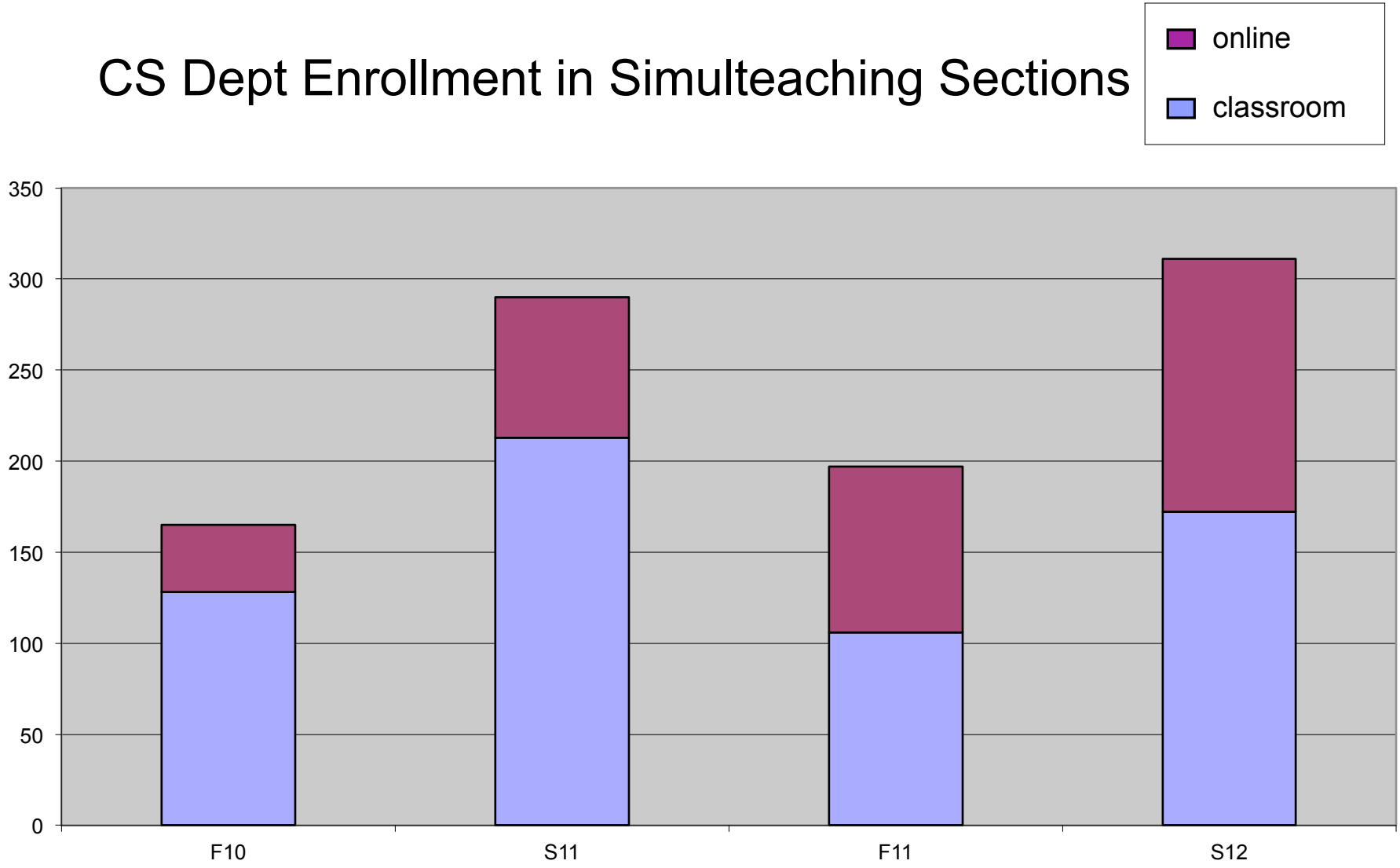
MIST/C and moodle

- Moodle provides access control and file management for MIST/C
  - MIST/C has access to Moodle database
- Instructor saves slide files and recordings in Moodle for student access
- This allows all course materials to be available through Moodle
  - Or MIST/C in Blackboard or Sakai via link to Moodle
- Easy-install package contains full server in VM
  - Moodle, MIST/C, Apache Webserver, MySQL, Linux
  - Instructors configure 24x7 MIST/C rooms

MIST/C Features supporting Simulteaching
(based on user suggestions)

- Auto-reconnect
  - Instructor can continue with classroom session in event of network outage; MIST/C reconnects to server if possible
  - Online student can recover using recordings
- Server-side backup recording
  - Classroom recording is better but instructor may forget to start
- Simple, intuitive interface
  - Includes bell + visual alert when online users need attention
- Whiteboard supports range of open media and imports desktop window contents
- Voting and breakout rooms improve online interaction
- Second full-screen whiteboard for projector
  - No other system we know of has this!

MIST/C Usage in GMU MSCS



Conclusions/Future Directions

- Simulteaching with synchronous plus asynchronous delivery minimizes costs and additional faculty time
  - Pros far outweigh cons in our situation
- moodle + **MIST/C** supports it in free, easy-to-use software that is integrated with Moodle
  - Online delivery increases access for students
  - Best combined with Moodle asynchronous
- GMU has used simulteaching to extend its MSCS online to reach more regional students
- Results are highly promising
  - Enrollment, grades, student evaluations all good
  - We intend to continue expanding **MIST/C** capabilities

Backup Slides

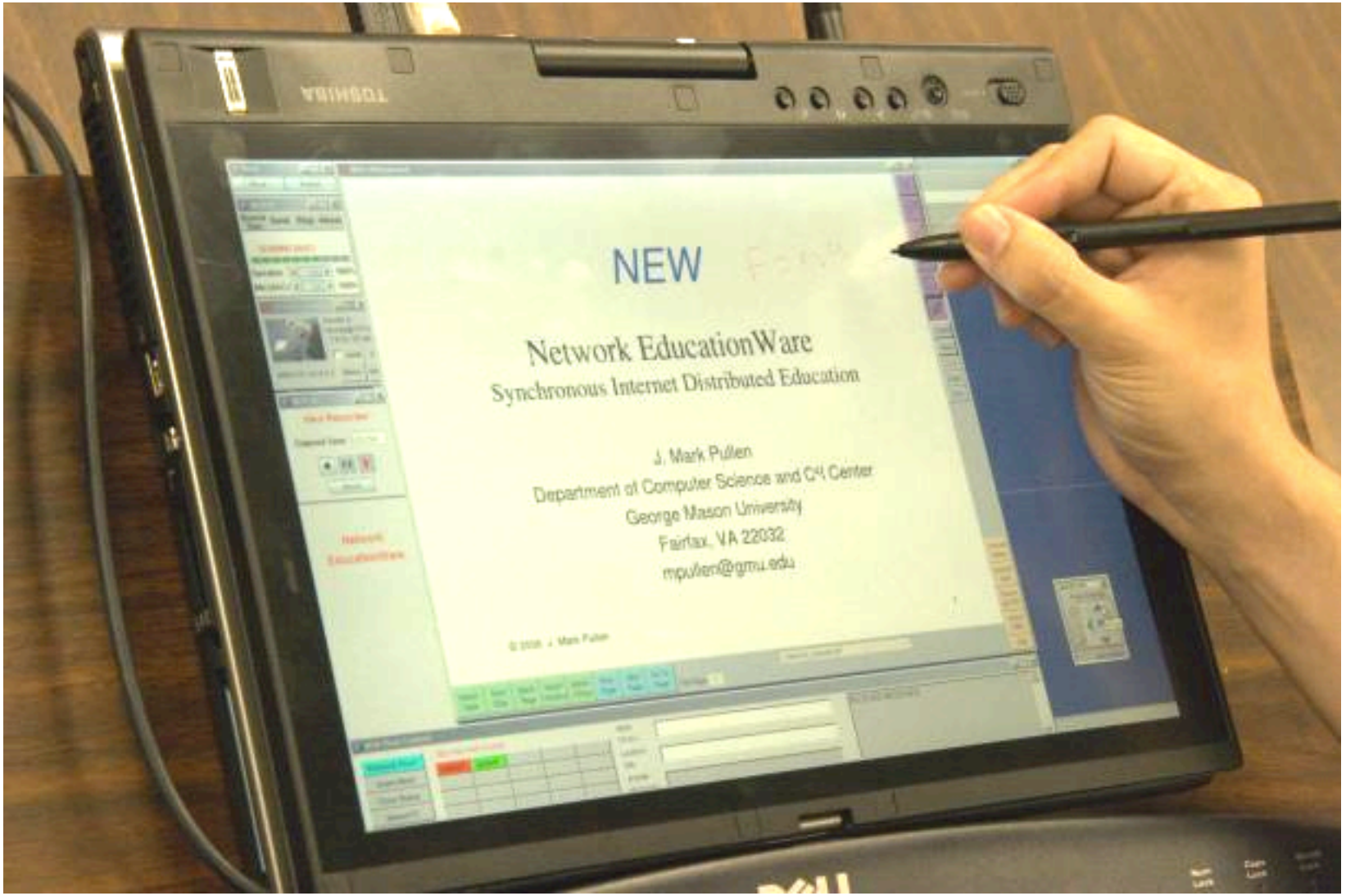
GMU C4I Center
Networking and Simulation Laboratory

MIST/C

For more details, see:

http://netlab.gmu.edu/MISTC

Using MIST/C with Tablet PC



Using MIST/C with SmartBoard