MIT Video Strategy Recommendations

ACCORD Working Group

Presentation to the
MIT Council on Educational Technology

September 22nd 2009

Outline

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- Assumptions
- Current State Assessment
- Desired Outcomes/Requirements
- Recommendations

Background

- Presented video study findings to MITCET in November 2008
  - Video is something students appreciate, use, and want; they believe it benefits their learning experience
  - MIT landscape for lecture video capture is costly and confusing
    - Multiple steps, service providers, choices
    - Currently no one-stop shopping
    - Cost and complexity inhibits faculty adoption
  - MIT lacks a coherent strategy
- ACCORD was asked to develop strategy options that meet the needs of interested faculty to use video lecture capture at lower costs and:
  - addresses other types of video used by faculty in teaching
  - details the policy, infrastructure, technical standard, and business model issues for an end-to-end service that captures, encodes, distributes, and stores video for educational purposes

Project Objectives

- Develop strategy options that provide several levels of service choices
- Develop recommendations addressing:
  - video capture and distribution approaches
  - technical standards
  - privacy considerations
  - policy needs
  - preservation approaches
  - classroom infrastructure
- Detail approximate costs for one-time investments and ongoing support
- Identify related issues regarding support for video at MIT

Cross-Institute Project Team

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- Sonia Brathwaite, DUE – Office of Faculty Support
- Steve Gass, Libraries (ACCORD sponsor)
- Kate James, OCW
- Wayne Johnson, DUE - Registrar's Office
- Duncan Kincaid, School of Architecture and Planning
- Andrew McKinney, DUE - OEIT
- Elaine Mello, Libraries - AMPS
- Kathy Pagones O'Neill, IS&T (project manager)
- Chris Terman, EECS
- Oliver Thomas, IS&T (ACCORD sponsor)
- Bonnie White Washington, Sloan

Approach

- Assembled cross-institute team with relevant experience
- Assessed current services and DLC capture processes
- Identified high-level list of needs and service requirements
- Compiled use cases of current and potential scenarios for lecture video capture
- Identified current technology landscape
- Created sub-groups to identify potential new options
- Sought input from Institute subject matter experts and/or future customers
- Used content from sub-groups to define service framework
- Identified implementation options and estimated one-time and ongoing costs

Environmental Scan

- Recent (Feb. 2009) survey on lecture capture in higher education (150 institutions) documents heterogeneous environment
  - Lack of standardization; no firmly established best practices
  - 25% have automated capture systems in place; most systems require some level of hands-on support
  - Approx. 50% make content available via course management system; just over a half make a portion available to the public
  - While central IT organization is most often the group leading implementation and management, almost a third indicated this was done at the individual school, department, or even faculty member level
- Some peer programs to learn from:
  - Berkeley: "industry" leader and is co-lead on the opencast Matterhorn project to create an enterprise-level, easy-to-install open source podcast and rich media capture, processing & delivery system
  - Stanford Medical School: captures all required pre-clinical courses
  - Harvard FAS

Slide 7 notes:

The full survey and its results, “Lecture Capture in Higher Education”, conducted by Northwestern University is available upon request.

Strategy Guiding Principles

- Pragmatic
- In the best interest of the Institute
- Simple to use as possible
- User friendly/ user centric
- Accessible to community
- Modular & "pluggable"
- Options by cost
- Minimize impact on faculty where possible
- Recognize different teaching and learning styles
- Leverage what is available where it makes sense
- Addresses video lifecycle, capture through archive

Assumptions

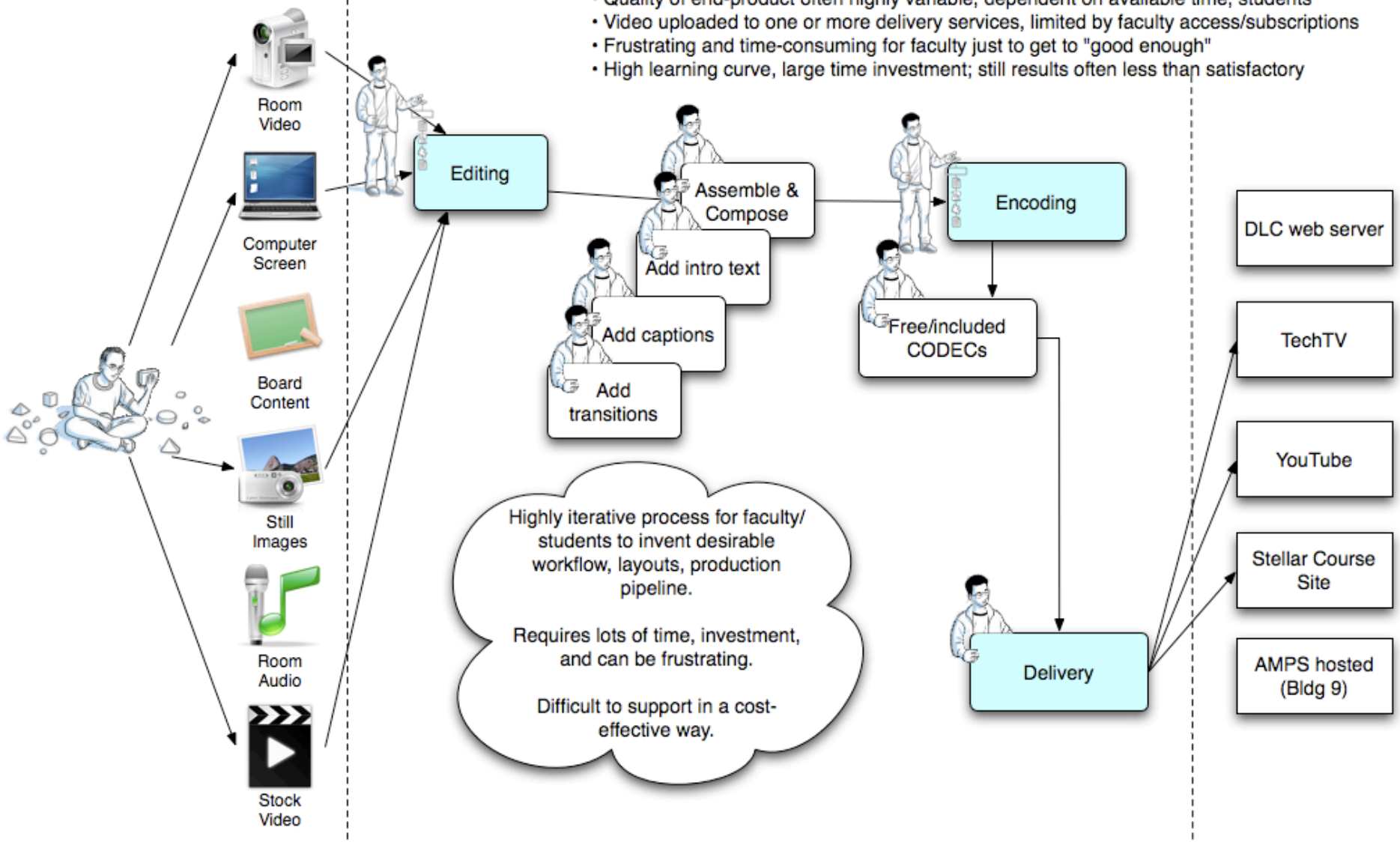
- Some level of technology and support infrastructure is needed to support production, distribution, and archiving of captured video
- Video in support of teaching and learning is critical to MIT's future
- Leverage appropriate off-the-shelf tools and outside distribution services
- Intellectual Property considerations are not a significant constraint for video limited to the MIT community, but privacy issues are
- Department budgets are tight; unless there is some level of service available to DLC's at minimal cost we will never attain the benefit of having the service broadly used and adopted
- Lecture video supports time-shifting and student review, important but currently unmet needs
- Teaching and learning happens in a variety of contexts in addition to lecture, and many of these approaches can benefit from video capture

Use Cases

- **Faculty DIY**: 6.004, Chris Terman
  - Hardware, software, time investment: FireWire camera, USB wireless microphone, Apple MacBook, QuickTime Pro, commercial screen recording software; special (physical) lecture setup to facilitate simultaneous slide and presenter views; 1 hr. time investment in post-processing and encoding per 1 hr. lecture
  - http://6004.csail.mit.edu/Spring07/videos.htm
  - http://6004.csail.mit.edu/surveys/survey.doit?survey=video_survey&results=1
- **Local DLC Support**: 11.201, Xavier Briggs
  - Support provided by DUSP IT staff (Duncan Kincaid
  - Capture hardware (camera, HD camera, video deck); Computers for video (3 Mac desktops, 1 MacBook, 1 server); Software: Apple QuickTime Streaming and Broadcaster server software for streaming, iMovie for editing, TeleStream
  - http://dusp.mit.edu/subjectmm/11201.html
- **Professional Services**: 3.091, Don Sadoway
  - AMPS provides end to end service leveraging 10-250 infrastructure
  - 35 lectures @ $250/lecture = $8,700 for semester
  - http://web.mit.edu/3.091/www/videos.htm

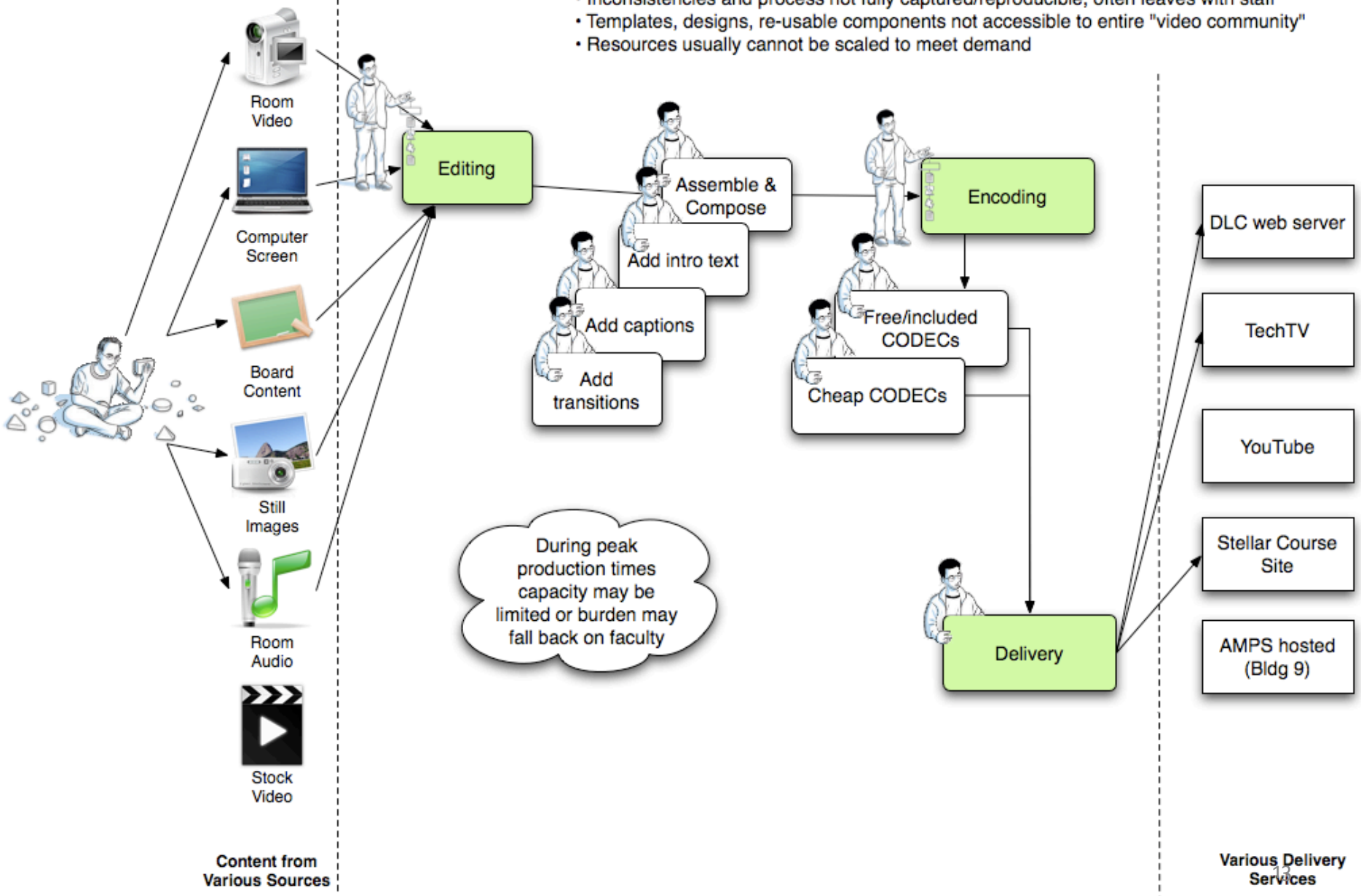
1 Current state (DIY fac./stu. efforts)

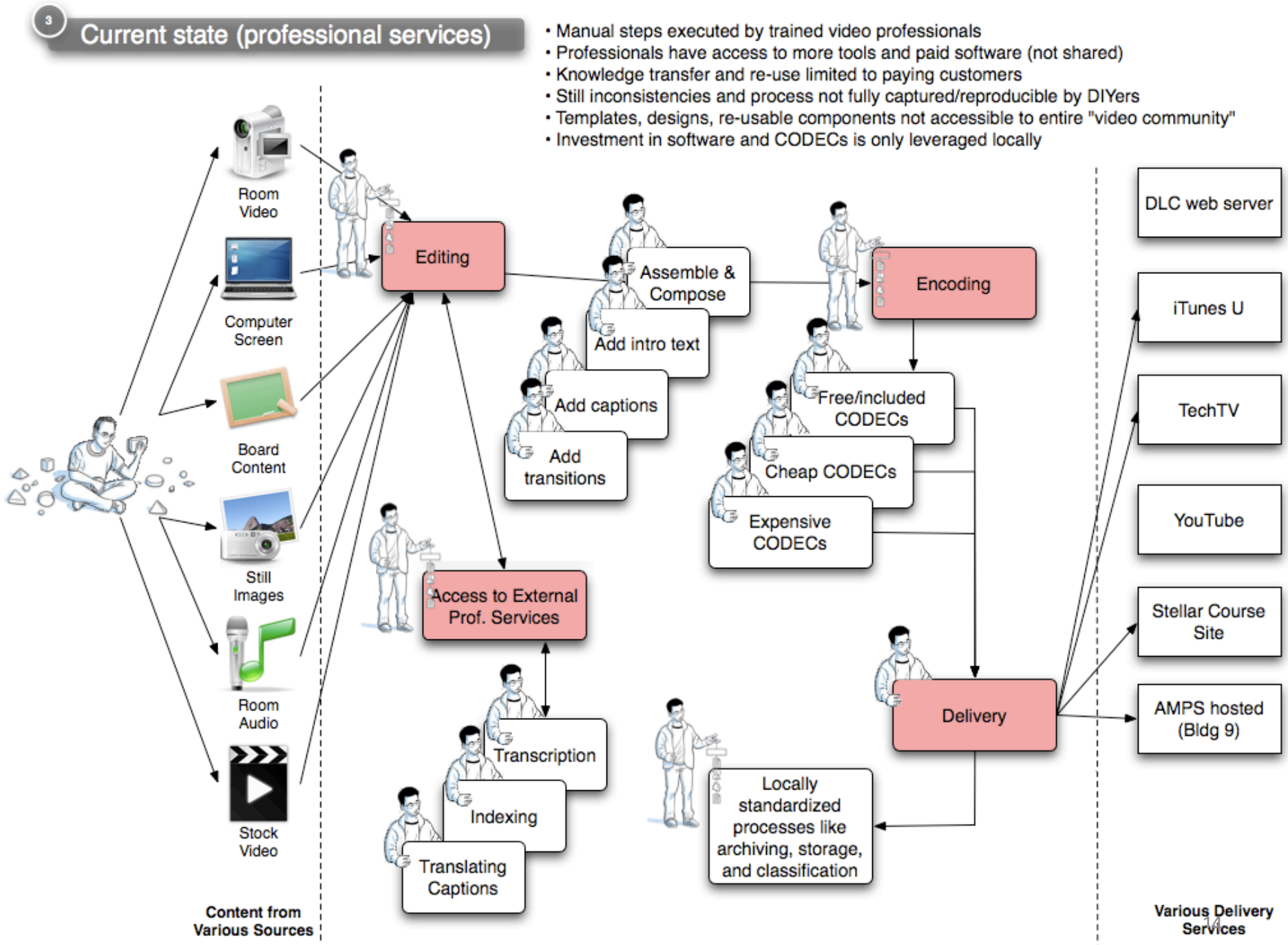
- Faculty and students have access to more limited number of sources, tools, software
- Access based on "personal" resources, budgets, personal knowledge, skills
- Knowledge transfer and re-use entirely local
- Quality of end-product often highly variable, dependent on available time, students
- Video uploaded to one or more delivery services, limited by faculty access/subscriptions
- Frustrating and time-consuming for faculty just to get to "good enough"
- High learning curve, large time investment; still results often less than satisfactory



2 Current state (local DLC support)

- Manual steps executed by faculty, students, and DLC resources
- DLC may be able to pool some resources for tools and paid software
- Knowledge transfer and re-use limited to DLC
- Inconsistencies and process not fully captured/reproducible, often leaves with staff
- Templates, designs, re-usable components not accessible to entire "video community"
- Resources usually cannot be scaled to meet demand

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Current state (professional services)
• Manual steps executed by trained video professionals
• Professionals have access to more tools and paid software (not shared)
• Knowledge transfer and re-use limited to paying customers
• Still inconsistencies and process not fully captured/reproducible by DIYers
• Templates, designs, re-usable components not accessible to entire "video community"
• Investment in software and CODECs is only leveraged locally
Room Video
Computer Screen
Board Content
Still Images
Room Audio
Stock Video
Content from Various Sources
Editing
Assemble & Compose
Add intro text
Add captions
Add transitions
Encoding
Free/included CODECs
Cheap CODECs
Expensive CODECs
Access to External Prof. Services
Transcription
Indexing
Translating Captions
Delivery
Locally standardized processes like archiving, storage, and classification
DLC web server
iTunes U
TechTV
YouTube
Stellar Course Site
AMPS hosted (Bldg 9)
Various Delivery Services

Current State Summary

0. Planning	1. Capture	2. Editing	3. Encoding	4. Delivery	5. Archive
Resources OCW planning documents Open source, open standards promotion	*Methods/Services* AMPS with brought equipment AMPS with installed equipment OCW with own HD camcorders Locally (DLC, individual faculty) Student camcorders Robotic camera in classroom *Non-video sources* Synchronized slides Screen capture	*Methods/Services* AMPS OCW with iLife apps Locally (DLC, individual faculty) *Processes* Manual indexing Automatic indexing Transcription *Accessibility* Manual captioning Commercial captioning service	*Service Providers* AMPS Locally (individuals, DLCs) *Tools* iLife Apps Final Cut Pro Sorenson Squeeze *Formats* mp3 audio MPEG4 (various) Real Media Flash Silverlight	*Services* Off-campus YouTube Akamai iTunesU Internet Archive videolectures.net On MITnet AMPS Bldg 9 AMPS real-time streaming m:media Stellar AFS DLC servers TechTV - Limelight - Viddler	*Services* Dspace AMPS *Media* Tape DVD Files Blueray disc Local hard disk

Future State: *Make it Easier!*

- Improve faculty efficiency and engagement
  - Reduce time & required level of expertise needed by faculty
  - Support multiple teaching styles
- Improve student efficiency and engagement
  - Students will have easier access to material
  - Consistent capture makes review/learning opportunities more predictable
- Make video tools more broadly available and accessible
  - Centralize things that are costly and inefficient to do locally
    - Expensive tools and CODECs
    - Ability to reuse workflows and content
  - Outfit additional classrooms across campus
  - Guidelines, standards & training for video capture and distribution
  - Framework to capture class activities to complement Stellar
- Several levels of service options
  - Introduce low cost options
  - Maintain high end options

Recommendations

1. A tiered, modular service model based on a GIB-funded common video infrastructure service to support video production, distribution, and life cycle management
2. Outfit additional classrooms with video capture capability
3. Do-it-Yourself (DIY) video kits to enable DIY video capture
4. Common guidelines, standards, training and support services
5. Centrally coordinate collaboration with educational communities outside of MIT on video

A new common video infrastructure service for everyone

Anyone capturing content, manually, automatically, or professionally...

...can upload and process through a new central web service...

...which can connect to existing and new repositories and publishing services.

Common Guidelines Standards

Classrooms outfitted w/video capture capability

DIY Video Kit

Other Sources

Content from Various Sources

Editing

Encoding

Delivery

- Easy to use web interface
- Minimal time and knowledge needed for common workflows and compositions
- Upload from a variety of sources and access stock materials
- Provide access to centrally licensed or open source CODECs, editing tools, and software through web interface
- Access to professionally designed templates
- Tools to tag, classify, and specify rights restrictions; allow this to suggest and set rules for direct upload to appropriate delivery services
- System can be enhanced by video experts & users through new tools, scripts, integration of new delivery services, etc.
- Give MIT tools for rights and distribution auditing, video inventory

Video Repository

DLC web server

TechTV

YouTube

Stellar Course Site

AMPS hosted (Bldg 9)

Archive

Various Delivery Services

Proposed web-based video service

Other proposed enhancements/ recommendations

Other Infrastructure services that may need to eventually be created or enhanced to handle video

External existing services

2. Outfit Additional Classrooms with Video Capture Capability

- Current installed base limited and expensive
- Outfit six additional large lecture halls and approx. six mid-level classrooms
- Enabled for low-cost capture
- Criteria based
  - GIR's
  - Departmental priorities
  - Room characteristics
- Estimated cost per classroom for one camera installation ~ $2,000

3. Do-It-Yourself (DIY) video kits to enable DIY video capture

- Create standard video kits that include video camera, tripod, microphones, cables and best practices guidelines; could be used in any classroom on campus.
- Equipment would be specified by AMPS and AV with large size purchases through AV to maximize potential savings and continuity of equipment for deployment.
- Some number of kits could be rented from AV; start with 3 kits
- DLCs can buy their own based on AMPS/AV spec
- Kits become more valuable in the context of the common service/ infrastructure; Kits alone = a little more capture, Kits + Service = more capture and central, easy access to edit and publish
- Maintenance and assistance to be provided by AMPS and AV on an SLA basis for DLC-purchased kits
- Total cost of equipment kit ~ $1,200

4. Common Guidelines, Standards, Training and Support Services

- Provide guidelines, standards, and training to support entire cycle from capture through archive
- Collect current standards from AMPS, OCW, TLL, etc.
- Make it available via Teaching with Technology website, AMPS, with DIY video kit, and through the common video infrastructure service
- Summaries posted in classrooms

Implementation Approach

- Guidelines/Standards Handbook/Website/Training (low effort, short timeframe)
  - Leverage AMPS & OCW expertise and resources
  - Collect and publish content from this project
  - Make available video guidelines book from IAP
- Projects (medium effort, short timeframe)
  - Publish and distribute DIY Video Kit specifications, standards, cost and support models; acquire and host 3 kits at AV for rental
  - Equip 6 medium and 6 large venues for video capture; update scheduling process to prioritize by intended use
- Prototype common video infrastructure service (high effort, longer timeframe)
  - Two-year timeframe
  - Define and capture metrics to inform production infrastructure
- Focus initial implementations around capturing all GIR lectures for student review

Opportunities: Potential Open Source and Commercial Platforms to Leverage

- **OpenCast**
  - Berkeley-initiated open video technology consortium developing a video platform for higher education
  - Project Matterhorn aims to deliver a deployable solution within the next two years
  - ETH Zürich's REPLAY is offered as an interim solution
  - http://www.opencastproject.org/project/matterhorn
  - http://replay.origo.ethz.ch/
- **Kaltura**
  - Company offering open source video platform with central, extensible hosting or "community edition" for local hosting
  - Open API and widget kits for creating web-based workflows, editing, and mash-up tools
  - Highly active in the open video community, partnering with Wikipedia, Google, NYU, others
  - Includes hosting and distribution infrastructure options
  - http://corp.kaltura.com

Opportunities: Potential Open Source and Commercial Platforms to Leverage

- **Echo 360**
  - Commercial system for highly automated classroom lecture video capture and on-campus redistribution
  - Includes scheduling, capture, encoding, monitoring, and reporting features
  - Open APIs for integration with course management systems
  - http://www.echo360.com
- **Podcast Producer / Final Cut Pro Server (Apple)**
  - Commercial workflow and encoding tool set optimized to integrate with (often "free" / OS included) Apple editing tools
  - Part of a full encoding and production suite (Mac-only)
  - Workflows can be very sophisticated but also heavily leverage desktop applications and server-side scripts for full functionality (limited web-based interfaces)
  - Highly integrated with Apple OS X server and a polished Mac experience
  - http://www.apple.com/server/macosx/features/podcast-producer.html

Implementation Recommendations: Cost and Impact

Prototype common video infrastructure services			
Recommendation	*One-Time Cost*	*On-Going Cost/Year*	*Impact/Notes*
Limited prototype to support initial assessment and decision on a scalable production infrastructure	$25,000 - $50,000	$10,000 - $25,000	Small Podcast Producer installation, support for faculty/students willing to invest learning time
Scalable, expandable foundational pilot that can be developed into a production infrastructure	$500,000 - $750,000	$350,000 - $500,000	Fully-developed video service scalable to meet large-scale participation and minimize faculty overhead (Berkeley-scale)
Outfit additional classrooms with video capture capability			
Recommendation	*One-Time Cost*	*On-Going Cost/Year*	*Impact/Notes*
Larger Classrooms with Cameras (6)	$30,000 (6 x $5,000) + labor costs (TBD)	$1,800 (6 x $300) + labor costs (TBD)	Infrastructure for GIR capture, makes AMPS capture cheaper & supports DIY use
Small to mid-sized classrooms with cameras (6)	$18,000 (6 x $3,000) + labor costs (TBD)	$1,800 (6 x $300) + labor costs (TBD)	Makes AMPS capture cheaper and supports DIY and recitation use
Do-It-Yourself Video Kits & Guidelines/Standards			
Recommendation	*One-Time Cost*	*On-Going Cost/Year*	*Impact/Notes*
DIY Video Kits	$3,600 (3 x $1,200)	$1,000	Provides resources, support options for DLC-level or DIY capture
Guidelines, Standards, Training & Basic Support	7000	3600	Necessary to promote best practices and market service options

Slide 25 notes:

The low-end estimate for the common video infrastructure is based on an estimate for a bare-bones minimal Podcast Producer system as specified by Duncan Kincaid in DUSP, basic 24/7 hosting services for the system, and a support model based primarily on creating initial documentation and guidelines but then relying solely on peer support and community-maintained documentation in a wiki-based knowledge base. It assumes a 1-year experiment that will be terminated at the end of the first year or replaced by a more fully scaled service, so the on-going costs do not include upgrades or on-going license fees. The scale of the system would facilitate a proof of concept and allow MIT to gauge interest and use, but would not allow for a production use.
Hardware and software ~ $10,000 - $20,000
Initial documentation, training, and guidelines ~$10,000 - $20,000
Some student and staff time to enable specific, targeted faculty experiments ~ $5,000 - $10,000
On-going (first year after launch)
Hosting, backup, system maintenance: $7,000
Minimal student and staff time for care and feed of peer support infrastructure and content: $3,000

The high-end estimate for the common video infrastructure is based on Berkeley actual costs for their webcast systems infrastructure (servers, software, development) and their webcast systems maintenance and operations costs. Taken from spreadsheet "Webcast Program Costs_20070705.xls. The full Berkeley cost breakdown is available upon request.

A viable production prototype system will probably live somewhere between these two extremes. Actual costs will depend heavily on design and implementation decisions made later in the project lifecycle.

Implementation Next Steps

- Confirm sponsorship, scope and funding
- Appoint sponsoring DLC
- Identify project manager and build team