Creating Effective Online Training Videos from Live Training Event Recordings

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ABSTRACT

Posting video of live training events is frequently requested but can often benefit from planning and minor editing. In this presentation, we will describe how live training events were staged and recorded with an eye toward later reuse, followed by a description of post-processing tips to prepare the recording for asynchronous training use. Techniques to produce online training videos quickly and cost-effectively will be described. We will then discuss online training video usage data and feedback collection plans, and the application of analytics to understand learner behavior and improve future training materials.

CCS CONCEPTS

• **Social and professional topics** → **Computing education programs**; **Computational science and engineering education**; *Informal education*; Adult education; • **Computer systems organization** → **Embedded systems**; *Redundancy*; Robotics; • **Networks** → Network reliability;

KEYWORDS

Training, Scientific Computing, HPC, XSEDE

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1 INTRODUCTION

Live training events are a powerful learning medium, but it is not always possible for learners to attend events due to time, distance, and budget constraints. Subsequently, training organizations are frequently asked to post recordings of live events to widen their availability. Unfortunately, presentations that are well-received as live events often are not well-received when recorded and posted "as-is" due to missing content, poor quality audio or video, context issues, etc. The XSEDE [4] Workforce Development training team offers monthly workshops [1] on high performance computing (HPC) topics that are multicast to approximately twenty-five satellite sites with classroom moderators. To realize our goal of effectively sharing these workshops online and asynchronously, we developed a process to thoughtfully record and efficiently edit these events that minimizes production time and maximizes student learning.

For online postings of lecture and workshop recordings to be of acceptable quality, proper planning is needed prior to recording the event. Creating effective asynchronous online training videos from recordings of live events can be difficult and time-consuming. Editing the event can be particularly problematic if it was not recorded with reuse in mind. Post-production editing, indexing, and captioning can add value to an event recording, as can structuring labs and adding search, guidance, and reference features. Assessments in the form of quizzes and badges may also be added to measure results and to enhance learner motivation and completion rates. However, there are two main constraints in producing effective training videos: they must be low-cost and they must be released soon after the event so that the training content is timely and relevant. We have developed a method to record and format live training events for reuse that fits these criteria. We have begun posting HPC training videos online and will be evaluating their use and effectiveness as an asynchronous training medium.

In an effort to evaluate effectiveness and improve the quality of the online training videos that we're producing, we requested input from the XSEDE Evaluation team. They will employ standard evaluation measures and special evaluation approaches to assess the training videos once they are posted on open platforms. While

open platforms provide usage data, these numbers alone are not sufficient to adequately assess whether online video is effective as a learning medium or to inform strategic decision making by the XSEDE Workforce Development training team. To address gaps in the availability of high-quality assessment data, both quantitative and qualitative techniques will be used to address each evaluation area.

2 STAGING AND RECORDING OF LIVE TRAINING EVENTS

Given the intention to capture XSEDE monthly workshops for reuse as persistent videos, we adopted several policies to facilitate high quality conversions.

2.1 Capturing Content

The foremost concern was to make sure that all live training event content was captured with high quality and as independently as possible. The events are multicast and recorded as shown in Figure 1. We found that while the live streaming mechanism used by the Wide Area Classroom format for content (Cisco WebEx) and two-way HD video (Cisco TelePresence 4520 MCU operated by MCNC.org) were selected with resiliency as the priority, their recording mechanisms were less robust. In the diverse spectrum of available teleconferencing tools, each has its strengths and weaknesses. Indeed, naive satellite site managers often question why we don't just use WebEx for everything. Brief reflection about the ways that WebEx, or Skype, or Zoom, etc. can fail usually settles the issue, especially given the very compressed agendas and large scale of these events. Our selection of WebEx and the MCU, with other Wide Area Classroom protocols, has resulted in no critical failures over many large events. Their likely failure modes allow for quick recovery of satellite sites independently and without injecting noise or other distractions into the main feed.

WebEx recording, however, has limitations on HD image quality, and the MCU does not directly provide recording at all. Both use compression, which can be very detrimental to dense text-based content, and neither provide a real-time interface to monitor recording. This last item means that recordings can easily be silently and permanently lost due to human or technical error. A simple and pragmatic solution is for us to record the presenter with a separate HD camera at the host site and maintain the slide content as the original PowerPoint file in the event that WebEx quality is not sufficient. This requires slightly more attention on the part of the event producer (to start and stop the cameras), but it is easily monitored by both the producer and lecturer.

The end result is that we maintain our real-time robustness for live attendees and have archival quality recordings for video post-production.

2.2 Planning for Partial Updates

Given that XSEDE has a rotating calendar of events, we also have the ability to use multiple passes of any one curriculum to create the highest quality final video. For example, we provide the "Big Data and Machine Learning" workshop approximately every quarter. While there are updates to address advances in the field, and improvements driven by our feedback and evaluation system, there is a lot of stable material. Much of the updated content could be spliced into the previous iteration almost undetectably. We aid this process as the backdrops are consistent and the instructors even make an effort to wear the same wardrobe.

2.3 Isolate Platform Dependence

There is a very important content authoring policy that allows the final product to be generically useful, and that is to minimize and isolate the platform dependence of the workshop content. While this might be considered a noble goal in general, as even most live attendees don't want to learn specifics that don't apply to their home environments, it is even more important for content that may be viewed piecemeal later. For a live event it is acceptable to gradually insert or address the quirks of the local computing environment as it arises. As the students progress through the curriculum serially, they will accumulate whatever particular knowledge they need for the next exercise. At the very least they can ask their fellow students or an instructor if they are stymied.

2.4 Standalone Topics

However, one of the benefits of online videos is that students may skip around freely. If a student already understands one module of content, then it would be unreasonable for them to view it simply to pick up some magic compiler switches or a reference to some local file paths. We anticipate this and make every effort to isolate the platform dependent information to one talk ("Our Local Environment") and then to minimize these references in succeeding content. This is often abetted by a clever login script or similar techniques to hide site-specifics from the live students. The end result is that later lectures are very self-contained and self-explanatory as far as compilation, shell or utility invocation, example codes, and documentation.

In aggregate, these policies combine to make it possible for the post-producer to use archival quality video, audio and slide content as well as to mix, edit and splice the agenda into the format favorable for the asynchronous video viewer.

3 EFFICIENT EDITING OF LIVE TRAINING RECORDINGS

We will now discuss the process to prepare the recording for asynchronous online use, with an emphasis on techniques to get individual videos finished and ready for online posting quickly and inexpensively.

3.1 Training Materials Collection

We begin by collecting the available training materials. In our case, we had video of the screen, video of the speaker, and the speaker's slide deck. An early setback was that some of the materials were in an incompatible format. The video producer and video editor evaluated conversion tools, and decided it was easiest to convert at the source. We chose a subset of the materials to make formatting decisions and create a first draft.

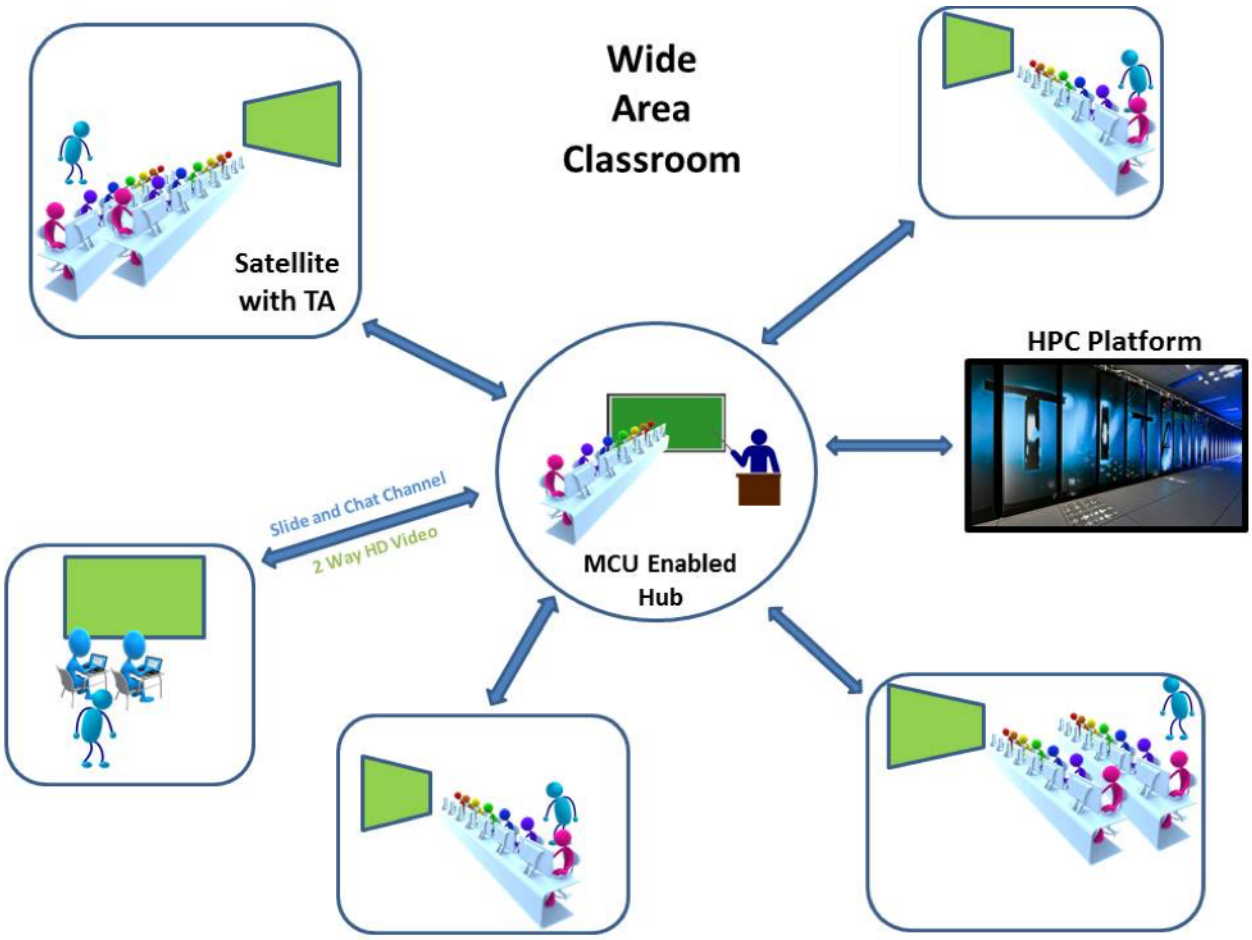

Figure 1: Wide Area Classroom

3.2 Formatting Decisions

Next, we made formatting decisions based on experimenting with a subset of the materials. These are the steps we recommend: (1) decide whether to use slides (if the video quality is poor or output must be minimized) or video of the screen (a faster option and may be essential if the speaker uses demos or highlights screen content), (2) decide whether to use an inset, (3) if there is more than one input source, decide whether the main focus will be the presenter or their slides (usually the slides due to the technical nature of our materials), (4) decide whether the inset will be shown throughout the video; editing is simplified if the inset is always present, but in some applications, it is not possible to do so without obscuring content, (5) check to see if it is feasible to put the inset in one location and leave it there; if you have the opportunity to discuss this with the speaker ahead of time, you may want to request that one corner stays clear, or, you may choose the same trade-off as we did, that it is worth a little extra editing to move the inset in order to make the video more engaging, as shown in Figure 2, (6) scan the speaker video to see if the speaker is consistently framed; if not, assess whether it is worthwhile to clip separate sections to an appropriate framing, or it might make more sense to choose the framing that works most of the time, and simply not include the insert for the other sections, (7) choose your aspect ratio; this is usually driven by the materials you are given, (8) plan for a series of videos; for our application, a training workshop with five lectures will be reused as five stand-alone videos; to show context at the beginning of each, the speaker recorded a short introduction that could be used for all of the pieces in a given topic, along with a slide to indicate the topics covered before and after the one at hand, for context, (9) decide whether to end with a standard "contact" slide, and finally, (10) take lots of notes on your decisions, for example how any required formatting was accomplished, the most efficient editing order, and size decisions. Of course, this process should be followed by having your test case reviewed and updating your editing process notes accordingly.

3.3 Editing Procedure

Over the course of editing many live training events, an efficient editing procedure emerged: (1) add all media to your video editor, e.g., video(s), audio, slides, graphics, etc., (2) add the elements to the time line in roughly the correct order, one type of media per track, (3) sync up tracks with audio sources by using the audio signature

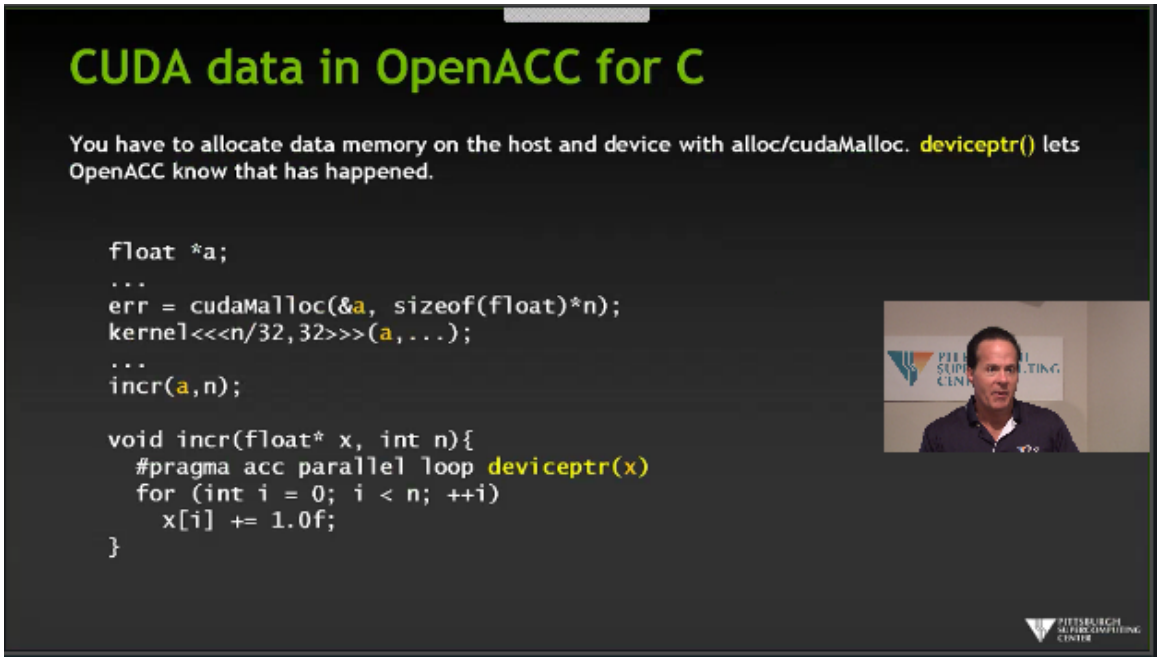

Figure 2: Inset Location Selection: In our application, we needed to move the inset because one corner was not clear, and to make the video more engaging. This unusual insert location was chosen for a portion of the video because scanning the video showed that this space was unobstructed longer than any other.

as a guide, (4) sync up visual sources using the visual output; at this stage, place your elements where they all can be seen, (5) clip to the appropriate start and end points, (6) choose your main audio source; on any secondary sources, split out and remove the audio to reduce the size and any possible echo, (7) finalize size and location of your main screen and inset; if steps 6 and 7 are done before making any internal cuts, size, placement, and audio separation are only done once rather than on every section, (7) check the inset by doing a quick visual scan; clip out just that track as needed as shown in Figure 3, (8) scan the audio signature, anomalies are fairly easy to spot; editing while listening to a complete lecture can lead to expensive over-editing, and (9) produce the final output video; for maximum flexibility, we produced the video as an MP4 file; this can be easily embedded and styled as you wish. We used Camtasia from Techsmith for video editing.

The time needed to edit a one-hour lecture can vary from one to ten hours, or more, depending on many factors, such as will video of the presentations slides or static slides be used; will a speaker insert be included, and if so, for portions or the whole lecture; will the speaker insert remain in one location, or move; clipping the video at the start and end is expected; does the entire video need to be checked for sections that should be clipped out; will captioning be added; and how extensively will the final product be checked?

4 DEPLOYING XSEDE TRAINING ON YOUTUBE

Our choice of YouTube as our initial deployment platform is driven by multiple factors. YouTube has a dominant mindshare in online video content, including educational content. Hosting there meets the expectations of potential users and assures that search engines will index the material properly. Our intention is that relevant Google searches will find our materials quickly and easily.

YouTube has an organization scheme that is well-suited to the structure of our workshops. The XSEDE YouTube Channel will be used to distribute all of our workshops and YouTube Playlists will encapsulate them nicely by event. We require no more elaborate hierarchy.

The YouTube video interface is both powerful and intuitive. The ability for users to skip and review content freely is an important feature. In addition, the thumbnail preview and search feature is a very efficient way to navigate within any single lecture. Further, there are many plugins available to enable more advanced and specific features. A popular one is a "fine speed control" to allow the viewer to select a preferred playback speed, making the droning speaker into a lively one, for instance.

The YouTube captions and accessibility options are at the forefront of video-sharing technology, which is important given our limited resources.

YouTube data analytics are also quite powerful and will contribute to the evaluation of our success and help to identify areas for improvement. Beyond simple views, likes, and possibly comments, we will be able to see dwell times and other measures of engagement.

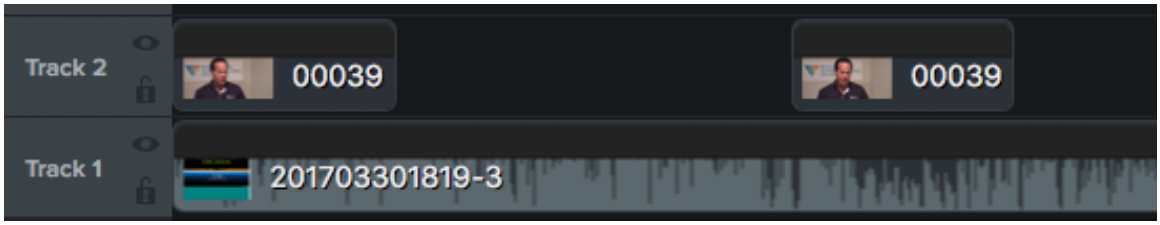

Figure 3: Video editing tracks aid in editing efficiency; areas needing closer review and edit can usually be spotted quickly by anomalies in the audio signature, Track 1 in this image, removing audio from the secondary source results in smaller files, and standardizing how tracks are used simplifies the process.

5 TRAINING MATERIAL EVALUATION

5.1 Overview

The training events discussed here are offered through the XSEDE program, which employs a robust evaluation led by Dr. Lizanne DeStefano and Lorna Rivera of the Georgia Institute of Technology as part of the broader XSEDE project external evaluation [2]. The evaluation is structured to provide formative feedback to guide program planning and implementation as well as a summative assessment of the program effectiveness and impact. The evaluation has been designed to answer four overarching questions addressing implementation, effectiveness, impact, and institutionalization of XSEDE resources, including training. This training evaluation framework is based on the Values-Engaged Educative Approach (VEE) to evaluating STEM programs which was developed by Greene, DeStefano, Burgon, and Hall in 2006 with NSF Directorate for Education and Human Resources support [3]. The ultimate goal of the evaluation is to guide learning and workforce improvement in the fields of scientific computing, evaluation, and STEM education.

5.2 Values-Engaged Educative (VEE) Evaluation Approach

With the VEE approach, attention is placed on a program's scientific content, effective pedagogy relevant to diverse learners, and the diversity of the program participants and staff. Promoting program understanding and context among staff, participants, and stakeholders constitute the educative role of an evaluator utilizing this approach. Secondly, evaluators are responsible for engaging, determining, and describing the values of all stakeholders related to the program. The educational quality of the program can be found where STEM content, pedagogy, and diversity meet, while considering the multiple values of stakeholders and maintaining equity. "Application of the framework will result in an answer to the question, Which STEM programs work well, for which individuals, under what circumstances, and in what ways [3]?"

Criteria for judging the quality and effectiveness of XSEDE training programs are constantly refined during the evaluation process. Level 1, 2, and 3 managers, program coordinators, and XSEDE advisory bodies are involved in this process. All criteria are filtered through the VEE approach for judging program quality. This includes assessing the quality of the program implementation as well as the program efforts towards the advancement of and support for diversity and equity in STEM education. Criteria for judging quality of training activities are outlined in Table 1.

5.3 Evaluation Methods

The evaluation team has maintained Institutional Review Board (IRB) approval to evaluate all XSEDE training activities since 2011. Special considerations for open platforms require the evaluation to focus on the most meaningful measures for guiding programmatic decision making. While open platforms like YouTube provide useful information such as views, these numbers alone do not adequately inform strategic decision making. To address the gaps in available high-quality data, the team employs a mixed methods approach to address each evaluation area through quantitative and qualitative techniques. A longitudinal tracking system including XSEDE portal data, YouTube analytics, and a web-based survey system has been developed by the evaluation team to regularly monitor program implementation and track participants over time. To ensure program fidelity, evaluators disseminate monthly surveys and report on training progress to level 2 and 3 managers as well as program coordinators via live just-in time reports. The longitudinal tracking system captures demographic characteristics, mode of entry (through which area and program of XSEDE), level of XSEDE participation, subsequent use of XSEDE resources, application of knowledge and skills gained, research, educational, and ultimately career outcomes. The value-add of participation in XSEDE training will be assessed by comparing self-reported demographics and outcomes including diversity, research, curriculum development, publications, presentations, awards, retention, continued education, satisfaction, and (within the timeline of funding) time to degree and initial employment.

6 CONCLUSIONS

Our goal is to develop a process to produce and post video of live XSEDE training events that is high quality, low-cost, and effective and results in broader XSEDE learning opportunities for faculty, students, and cyberinfrastructure practitioners. While many decisions have been made with these factors in mind, we continue to refine the process as learning communities and technologies change, for example with respect to learner expectations or the latest editing tools.

Staging and recording live training events is now a refined process, but we will continue to watch for improvements; for example, we may be able to selectively capture and share Q & A from live

Table 1: Criteria for Judging Quality of Training Activites

Training Services	Program Quality Indicator	Indicator of Support for Diversity and Equity
Quality up to date training for XSEDE users	X	
Improved research and educational outcomes by users, especially those in underserved groups	X	X
Reduction in training material gaps	X	
High levels of user satisfaction across all target groups	X	X
Minimize travel for training	X	X
Address just in time learning	X	
Training accessible from the desktop	X	X
Training provided on more campuses	X	X

sessions. Editing video from live training events has been distilled to an efficient procedure, but there is outstanding work to be done in some areas such as cost-effective captioning; our explorations in this area have not uncovered tools that work well with the large percentage of specialized vocabulary used in high performance computing topics.

For our first round of posting videos online, we decided to keep time-to-posting short and costs down by omitting value-add elements, such as indexing and quizzes. We will add pointers to existing materials rather than building them into the edit process. We anticipate that indexing and quizzes and other value-add features will be built into future training videos.

The conversion of live training event videos into asynchronous online training videos will broaden the impact of XSEDE Workforce Development training investments. Future decisions regarding online training video topics, formats, and delivery methods will be driven by the results of the VEE evaluation.

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