

# PROJECT PROPOSAL for CS6460 Summer 2017 (OMSCS)

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## PROBLEM STATEMENT

In the workplace, technical content is typically self-authored by subject matter experts using Microsoft PowerPoint and delivered non-interactively to groups via live teleconference or recordings. Repurposing content through the addition of interactive elements and integration with a Learning Management System [LMS] would potentially add value by improving learning effectiveness, consistency of delivery, and student satisfaction with the experience. Doing so efficiently in terms of time and resources, however, presents a considerable challenge. This content-track project demonstrates a solution.

## BACKGROUND

During 2015, some AT&T colleagues independently expressed an interest in learning more about the fundamentals of virtual computing as it related to our work; using PowerPoint, I developed and delivered a series of four hour-long monthly “brown bag” talks introducing virtualization, OpenStack, and Docker in a practical and approachable manner. Invitees included our entire department, and many people forwarded the announcement to their associates in other organizations. As a result, the audience represented a wide range of skills, experience, subject matter familiarity, etc. from total beginners to staff members who worked with virtualization technology as end users every day. A major concern in this situation is content preparation at an appropriate level of detail which would hold everyone’s interest to the extent possible without confusion or boredom. Emphasis was placed on relating concepts to the real-world where possible through actual examples run on a demonstration system. Humor was also used to make the learning experience entertaining and inviting compared to typical “training”.

The slides were interleaved at the time of presentation on the teleconference with screen sharing of hands-on demonstrations. Several hundred employees and contractors viewed one or more of these sessions live; in addition, recordings were made available for on-demand replay. Based upon informal personal feedback as well as the results of an ad hoc survey conducted separately on SurveyMonkey, this initial effort was well-received. However, some areas for improvement quickly became evident:

- The overall flow of the presentations can be “tightened” up considerably to eliminate miscues and awkward pauses --- especially during screen sharing of hands-on demonstrations --- while I was distracted by the mechanics of operating multiple PCs. Similarly, the latter portions of each talk seem “rushed” because the preceding material took longer to present than anticipated. Removing extraneous or unintended content while equalizing the pace of delivery would improve both situations to the learner’s benefit.
- While URLs were included on screen as references for supplementary or background material, participants were disincentivized from actually accessing them. Live viewers would have to copy them down rapidly by hand or be ready to take a screen capture, while those watching the recording could at least pause playback. In either case, however, the information would then need to be manually reentered into a web browser. Delivery of clickable hyperlink URLs to the learner would address this concern.
- The default on screen cursor was used throughout as a pointer. It would be advantageous to actually highlight content of interest in a more distinctive manner as it is mentioned by the narrator.
- There was no opportunity for pedagogies such as meaningful formative or summative assessment.
- There was no way to formally record a student’s participation, collect his feedback, or verify that all the sessions had been viewed in the proper sequence.
- The recordings were retained by the teleconference system for a limited period of time, and access required advance knowledge of a cryptic URL. It was possible for an individual to convert them to MP4 files with a little-known custom converter application provided the retention period had not expired. Handout materials were ‘published’ in advance by file sharing on an internal social media site with the URL announced via broadcast

emails to all invitees. There were no provisions for managing “enrollment” or ensuring consistent and convenient access to course resources.

Fortunately the original PowerPoint files, MP4 copies of the recordings, and even the survey results still remain privately accessible. A unique opportunity exists to address these specific concerns (and others) by repurposing much of this content while uniformly incorporating interactivity and integrating delivery with an LMS in support of the problem statement.

## PROPOSED SOLUTION

### ALTERNATIVES

A “brute-force” approach would require all content to be authored using the tools available on the LMS. Unfortunately, most LMS provide a fairly simple text or HTML editor GUI which provides a user experience similar to that available in Piazza or Gmail when composing a message. Content creation using this type of tool instead of PowerPoint proves both cumbersome and overly restrictive in terms of unavailable features such as animation and image transitions, and it requires familiarity and proficiency with yet another graphic user environment. Alternatively, a skilled intermediary can reenter the PowerPoint content manually into the LMS in an attempt to replicate it. However cost and completion time will increase, accuracy may suffer and the result will not necessarily be faithful to the original intent of the presenter.

While most LMS allow inclusion of video segments as files or as hosted on YouTube, and recent versions of PowerPoint do provide the capability to record finished presentations in .mp4 or .wmv formats without requiring external applications, at least some degree of interactivity will be lost with this approach. It is also possible to convert the PowerPoint file into an intermediate format such as Shareable Content Object Reference Model [SCORM] which can be accommodated by some LMS; since PowerPoint cannot natively export a presentation in this format, external conversion must be performed online or with middleware.

Open edX Studio leverages extensibility through installation of additional XBlock components. An XBlock, named “Office Mix” has been installed on the Georgia Tech instance of Studio allowing direct integration of course material authored in PowerPoint while retaining full interactivity including hyperlinks, screen captures of other Windows applications, and camera/microphone sources. Open edX Studio also facilitates the insertion of additional interactive elements such as quizzes throughout the course.

### CONTENT and SCOPE

The series of presentations described above maps well to an Open edX course consisting of four sections. Due to limited time, however, I propose to create one section of an Open edX course tentatively titled “Virtualization: Under the Hood and Hands-on” in keeping with the original theme. This would be derived from the approximately 60 minutes worth of material in the first talk. The section topic will be “Introduction to Virtualization and OpenStack”. For completeness and realism, placeholder sections will also be created for the remaining three sessions although they will remain unused at this time.

### WORKFLOW and TOOLS

The MP4 recordings of the original sessions contain video of the PowerPoint slides intermixed with screen captures of the demonstration segments, while the accompanying low-quality audio is the presenter speaking on the teleconference bridge to the audience.

The first step is to ingest the entire recording into OpenShot Video Editor and isolate the demonstration segments into individual clips. These clips are then trimmed to eliminate unneeded portions containing dead space, inadvertent errors, and extraneous content. New high-quality audio narration is recorded with Audacity, and the audio track synchronized with the video, before each clip is re-encoded as a separate MP4 file.

Next, Microsoft PowerPoint 2013 with the OfficeMix plugin will be used to edit the original PowerPoint source files which contain the slides and other animated effects. The plug-in provides composite functionality to record a high-quality audio voiceover, insert hyperlinks, and permit screen markup with 'digital ink' by the narrator to accompany the slides. Intermediate PPTx files will then be generated and uploaded to a secure public server operated by Microsoft.

Finally, the Georgia Tech Open edX platform serves as the LMS. The OfficeMix xBlock extension to the Studio content creation GUI downloads and ingests the intermediate PowerPoint files described above. The Studio GUI will be used per the outline below to sequentially assemble the OfficeMix content with the edited demonstration video segment MP4 files while also interleaving built-in interactive elements such as quizzes. The result is the finished course which is then published and released to the enrolled learners.

## OUTLINE (SUBJECT TO MINOR CHANGES)

An Open edX course is organized hierarchically into sections, subsections and units. Each unit consists of one or more learning elements.

*Outline color code for Open edX Studio structure:*

*RED – Section, Green – Subsection, Blue – Unit, Violet – Interactive elements*

### 1. "Introduction to Virtualization and OpenStack"

#### a. Introduction

- i. Welcome
- ii. Sneak peek at Demonstration System

#### b. Background

- i. Conceptual view of traditional computer system hardware and software
- ii. Expository question for student engagement ("wish list" of features)
- iii. What attributes do we really need?
- iv. Brief look at Virtual Memory
- v. Linux refresher (processes, threads, etc.)
- vi. Quick Quiz for Formative Assessment

#### c. Virtualization Overview

- i. Emulation
- ii. QEMU emulation of CoreLinux - demo video
- iii. QEMU emulation of MS-DOS - demo video
- iv. Hypervisors
- v. Quick Quiz for Formative Assessment

Milestone #1

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#### d. OpenStack Overview

- i. What is OpenStack ?
- ii. Architecture
- iii. Services
- iv. Identity Management
- v. Quick Quiz for Formative Assessment
- vi. Images
- vii. Instances
- viii. Quick Quiz for Formative Assessment

#### e. Hands-on OpenStack

- i. PackStack demonstration environment
- ii. Spin up Cirros VM instance from CLI - demo video
- iii. Spin up LAMP server VM using Horizon dashboard GUI - demo video

Milestone #2

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#### f. Conclusion

- i. Summary of material covered / preview of next section

- ii. Summative assessment
- iii. Feedback Survey
- 2. “Networking in Open Stack” (placeholder section only)
- 3. “Storage and Orchestration in OpenStack” (placeholder section only)
- 4. “Using Containers with Docker” (placeholder section only)

## DELIVERABLES

### TASK LIST

- ✓ Review recordings of original sessions, and select candidate (Session #1)
- ✓ Create high-level outline (shown above)
- ✓ Select and become familiar with video editing software (OpenShot Video Editor)
  - Create course in Open edX (in progress)
  - Create four sections in course (in progress)
  - Create subsections in section 1 of course per outline (in progress)
  - Create units per outline (in progress)
  - Design feedback survey for delivery with Open edX ‘survey’ tool
  - Choose conference or journal for optional submission of project paper
- For each unit,
  - Edit/revise individual slides as necessary in PowerPoint
  - Verify references & add hyperlinks
  - Prepare script for voiceover to accompany slides
  - Add audio narration and digital ink “markup”
  - Produce intermediate PPTx file and upload to Microsoft OfficeMix server
  - Edit video captures of demonstration(s) from original recording in OpenShot; trim nonessential content
  - Prepare script for voiceover to accompany demonstration segments
  - Record audio narration and synchronize with video
  - Re-encode as MP4 file(s) each containing a demonstration segment
  - Download and ingest intermediate PPTx file to Studio GUI using OfficeMix xBlock
  - Define associated interactive content (e.g., quiz questions, etc.)
  - Build interactive element(s) in Studio GUI
  - Assemble slides, MP4 demonstration video segment(s), and interactive element(s) in Studio GUI to form component of course per outline above
- Publish and schedule final version of completed course in Open EdX
- Solicit viewers (Piazza, G+, etc.) to enroll, participate as student, and complete feedback survey
- Meanwhile,
  - Prepare project paper
  - Prepare final presentation
- Collect and summarize survey results for inclusion in deliverables
- Final editing of project paper and presentation
- Package all source materials and other documentation into cataloged zip file representing final project
- Submit final project, project paper, and project presentation to T-Square

## WEEKLY STATUS CHECKS

I will provide 5 weekly status checks to my mentor via the private Piazza thread beginning on 6/19/2017 and continuing through 7/23/2017. These brief reports will cover (a) progress made in the past week, (b) challenges encountered in the past week, and (c) any new expectations that your final project will differ from what was described in this proposal.

## INTERMEDIATE MILESTONES TABLE

	Due Date		Goal
Intermediate Milestone 1	7/2/2017	Prototype #1	First 3 subsections (a - c) of course created in LMS; solicit feedback
Intermediate Milestone 2	7/17/2017	Prototype #2	First 5 subsections (a – e) of course created in LMS; solicit feedback

## PROJECT PAPER

At this time, I have not yet chosen a specific journal or conference as a destination for the project paper. However, I expect that my work would be more suitable for reporting at an industry conference rather than publication in an academic journal. The project paper will be editorially complete and in a format ready for submission in full compliance with the style requirements. It will describe the motivation behind my solution to the stated problem of efficiently repurposing existing content for interactive delivery by an LMS, and contrast it to other alternatives. It will then discuss specific details of the process I followed and any content enhancements which were included in the finished course. Finally, it will summarize the results in terms of time required and feedback received from participants along with any “lessons learned” and recommendations for future work.

## PROJECT PRESENTATION

My project presentation will likely be a short (estimated length: 10-15 minutes) video presentation which contains brief excerpts from the original talk for comparison purposes followed by a narrated screen capture of a learner interacting with the finished product on Open edX. I also anticipate including narrated graphics which convey the project’s motivation, illustrate the workflow involved and display examples of information obtainable from the LMS.

## FINAL PROJECT

The completed course will be released and published on the Georgia Tech instance of Open edX. Enrollment will remain open for an unlimited time.

Due to their relatively large size, MP4 recordings of the original talks and the edited MP4 demonstration segments will be uploaded to an accessible server; the respective links will be provided in the catalog.pdf file contained in the .zip file submitted to T-Square. The .zip file will also contain copies of relevant resources used during creation of the revised course including (but not limited to) narration scripts, logs of “time worked” on various tasks, original PPTx files, and results of the 2015 feedback surveys.