



Theater Battle Management Core Systems (TBMCS)
Virtual University
Proof-of-Concept Trade Study

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Overview

- Problem Definition
- Solution – Trade Study
- Research Questions
- Proof-of-Concept Test Phases
- Methodology
- Findings
- Capability Summary
- Expected ROI
- Lessons Learned
- Summary



Problem Definition

- Electronic Systems Center (ESC)/ACF Theater Battle Management Core Systems (TBMCS) system program office training requirements continued to increase and training budget continued to decrease
- TBMCS end users dispersed world wide
- Approximately 50% of training budget for Mobile Training Team (MTT) travel costs
- High ops tempo for user base (military)
 - Need for anytime, anywhere training
- Compliance with DOD Advanced Distributed Learning (ADL) concept
 - Very little lessons learned /best practices amongst the DOD community



Solution – Proof-of-Concept Trade Study

- Requirements committee opened action item for TBMCS System Program Office to research feasibility of implementing alternative training to MTT.
- ESC/ACF conducted trade study Jun-Dec 03 to determine if a Virtual University (VU) is an effective alternative to MTTs. Key concepts included:
 - Asynchronous/Synchronous Training
 - Application Sharing
 - Collaborative Tools
 - Run over NIPRNet/Internet



Key Concepts Defined

- **Synchronous Training**
 - Instructors and students are in the classroom real time
 - Instructor and students are geographically separated but connected by computer network
 - Emulates a live classroom
 - Hands-On Practice with Instructor Over-the Shoulder
- **Asynchronous Training**
 - Recordings of Synchronous classes
 - Self-paced/web-Based training courses
 - Training materials



Research Questions

1. Can joint training requirements be effectively met via synchronous/asynchronous distance learning?
2. Can the current DOD infrastructure support synchronous distance learning technologies?
3. Is there a cost savings for a virtual course vs. MTTs?



VU Proof-of-Concept Test Phases

- Phase I – Request for Information
 - Select Vendor Candidates
- Phase II – Fly-off Between Vendor Finalists*

*Focus of report



Phase II

VU Fly-off Testing

Four Objectives

1. Assess the VU performance on DOD network and computing infrastructure
2. Assess the overall capability/functionality of VU SW to insure compatibility with TBMCS unique training solutions
3. Assess the ease of use of the VU by students and instructors
4. Assess the task-technology fit to determine if the VU is an appropriate technology for teaching TBMCS tasks



Methodology

*Evaluation Types**

Approach	Description	Collection Method
Objective-oriented Approach	The focus of this approach is on specifying goals and objective and determining the extent to which they have been attained.	<u>Type:</u> Test Cards <u>Who:</u> Participants, Observers, Instructors
Participant-oriented Approach	This is dependent upon the involvement of the participants. Stakeholders are central in determining the values, criteria, needs and data for the evaluation.	<u>Type:</u> Test Cards/TAM Survey <u>Who:</u> Participants, Instructors
Experience-oriented Approach	This approach is dependent upon the direct application of professional expertise to judge the training objectives can be met in a virtual environment.	<u>Type:</u> Observation <u>Who:</u> Subject Matter Experts
Management-oriented Approach	This approach is used when the central concern is on identifying and meeting the informational needs of managerial decision makers.	<u>Type:</u> Systems Evaluation Approach <u>Who:</u> Program Manager

*Worthen, B., Sanders, J., Fitzpatrick, J (1997). *Program Evaluation alternative Approaches and Practical Guidelines*. Longman NY.



Methodology

VU Test Collection Instruments

- **Test Cards – Derived from Test Plan Objectives**
 - Individual test cards to measure: ease of use for pre-class preparation, entering/exiting classroom, capability for student to receive lecture/demonstration of a learning objective, student attempts to complete exercises, independent practice, etc.
- **Observer Field Notes – Log**
 - Student reactions, voice/data quality, etc.
- **Technology Acceptance Model Survey* – Captured Qualitative, Overall Impressions**
 - Perceived usability & ease of use
- **Performance Monitoring – System Metrics**
 - Topaz Prism/Mercury Interactive tool

*Technology Acceptance Model Defined -- http://www.absoluteastronomy.com/encyclopedia/T/Te/Technology_acceptance_model.htm



Methodology

VU Test Activities

- Student logs-in and enrolls
- Student takes pre-test
- Student down-loads needed worksheets and handouts
- Class in session*
 - Instructor explains and demonstrates TBMCS operation
 - Students practice using real application
 - Instructor provides individual over-the-shoulder help as needed
 - Student takes post test and completes critique

*system performance metrics collected

Activities emulate a traditional classroom environment



Methodology

VU Test Participants

Organization	Location	Number of Testers	Number of Tests They Participated In
12AF	Davis-Monthan	3	2
7AF	Osan	1	1
8AF	Barksdale	2	2
9AF	Shaw	5	2
ACC/DOY	Langley	2	4
CENTAF	Al Udeid	1	1
ESC/ACF	Hanscom	6	7
NORAD	CMOC	3	4
PACAF/DOQ	Hickam	1	3
USAFE	Ramstein	3	1
USMC	Hanscom/Hurlburt	3	1
USN	St. Juliens Creek	2	3

Representative of target audience



Methodology

Limitations

- Paradigm Change
 - Perceptions/attitudes that on-line environments are not as efficient (both instructors and students)
 - A new way of teaching/learning for everyone
 - Determining non-verbal feedback from students
- Bandwidth at Selected DoD Installations
- Program Level Security



Findings

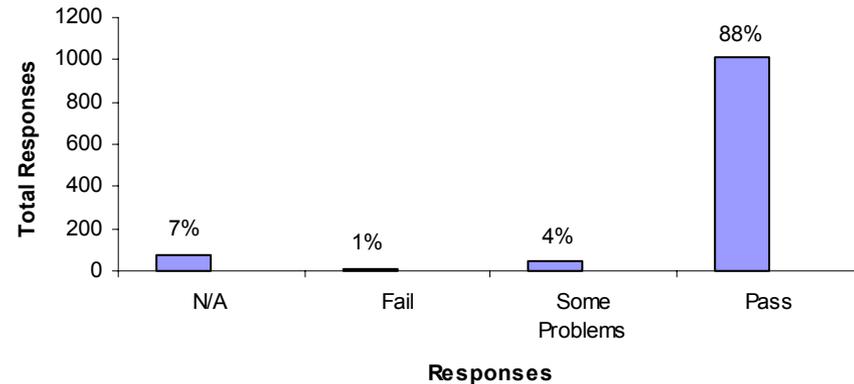
Data Results – Test Cards

- Tests
 - One Connectivity Test
 - Two Informal Tests
 - Four Formal Tests
- Seven Test Cards
 - Class Prep
 - Classroom Entry
 - Intro to Class
 - Instructor Demo
 - Supervised Practice
 - Independent Practice
 - Close Class
- Participants
 - 42 total participants
 - 28 returned surveys
 - 66% response rate

Total Responses*

N/A	Fail	Some Problems	Pass
79	11	49	1011

Test Cards Totals Summary



*frequency count



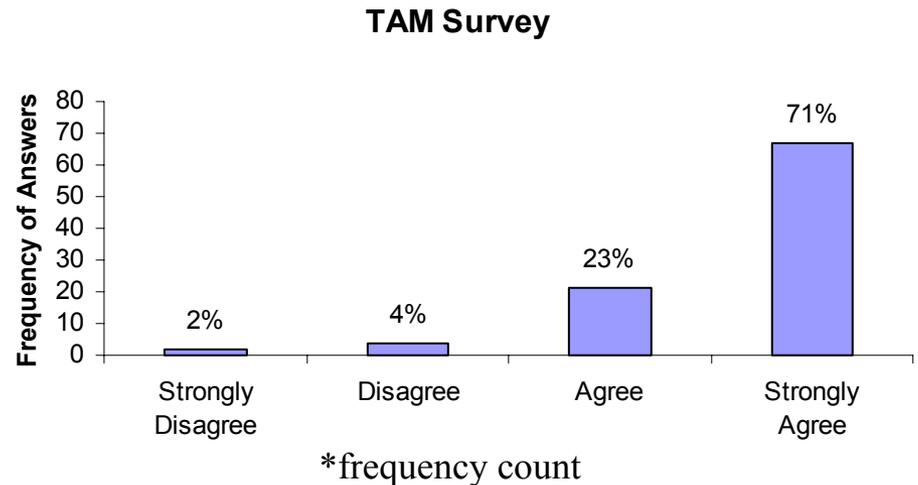
Findings

Data Results – TAM Survey

- Test
 - Surveys conducted simultaneously with the test cards and were turned in at the conclusion of each test
- Survey focus
 - **Perceived usefulness** –“The degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989).
 - **Perceived ease-of-use** –“The degree to which a person believes that using a particular system would be free from effort” (Davis, 1989).
- Participants
 - 51 total participants
 - 14 returned surveys
 - 27% response rate

Total Responses

Strongly Disagree	Disagree	Agree	Strongly Agree
2	4	21	67



Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.



Findings

Data Results – Observations

- Test
 - Observations were conducted simultaneously with formal tests
- Observer Log
 - Detailed notes to annotate observations as they occur.
- Focus Group
 - Facilitate discussions through posing initial questions to obtain reactions from others in the group.

“Just wanted to give you my two-cents worth of impressions about Virtual University. It's great!

'Nuff said!?”

Bill Smith/46 Test Squadron

“Great product. Good tool for collaborative training”

Sherry Robinson/ESC Langley AFB

“Product is easy to use and captured interests/needs of testers. Excellent choice for on-line application sharing”

Meredith Briscollino/AOC Training Manager



Capability Summary (At End of Testing)

- VU can emulate live classroom
 - Delays in audio and video negligible
 - Instructor able to demonstrate as live classroom
 - Q&A interactions as effective as live classroom
 - Students easily able to operate actual TBMCS applications
 - Over-the-Shoulder Help as effective as live classroom
 - Once users participated, the attitudes were quickly changed



ROI Expectations

- Decreased travel expenses for students or instructors
- Decreased physical classroom space
- Increased productivity because instructors can stay on task and continue to get part of their day job accomplished
- Lower course distribution costs
- A wider student populace is trained because individuals may not have the time or budget to attend a traditional class
- The best instructors can be made available worldwide at the same time to support user needs



Return On Investment (ROI) – Projected Estimates

- Cost Per Student Training Hour
- MTT Specific Costs (Travel)

	Year 1	Year 2
– 240 Students	– \$24.68	\$26.41
– 480 Students	– \$12.34	\$13.20

- VU Specific Costs (Setup/Sustainment)

	Year 1	Year 2
– 240 Students	– \$25.87	\$6.45
– 480 Students	– \$12.94	\$3.23



Research Questions – Concluded

1. Can joint training requirements be met via synchronous distance learning?
 - Yes
2. Can the current DOD infrastructure support synchronous distance learning technologies?
 - Yes
3. Is there a cost savings for a virtual course vs. MTTs?
 - Yes (projected)



Lessons Learned

- Limit Class Size to 10-15
- Provide “101” class separate from course
- Provide clearer registration and enrollment instructions
- Early sign-in required
- Local NIPRNet workstations security lockdowns problematic



Summary

- VU Proof-of-Concept trade study was an effective means to identify, assess and select a vendor that would best meet the Government needs
- Final vendor demonstrated on-line synchronous/asynchronous, application sharing capability which is beneficial to the Government in solving training problems
- VU product is a viable solution as an alternative to MTTs

**Training when
you need it!**



**Virtual University
delivers training
when you need it,
wherever you are.**

Virtual University is being pioneered through the Theater Battle Management Core Systems (TBMCS) program, the system that plans and manages all joint and coalition air operations.

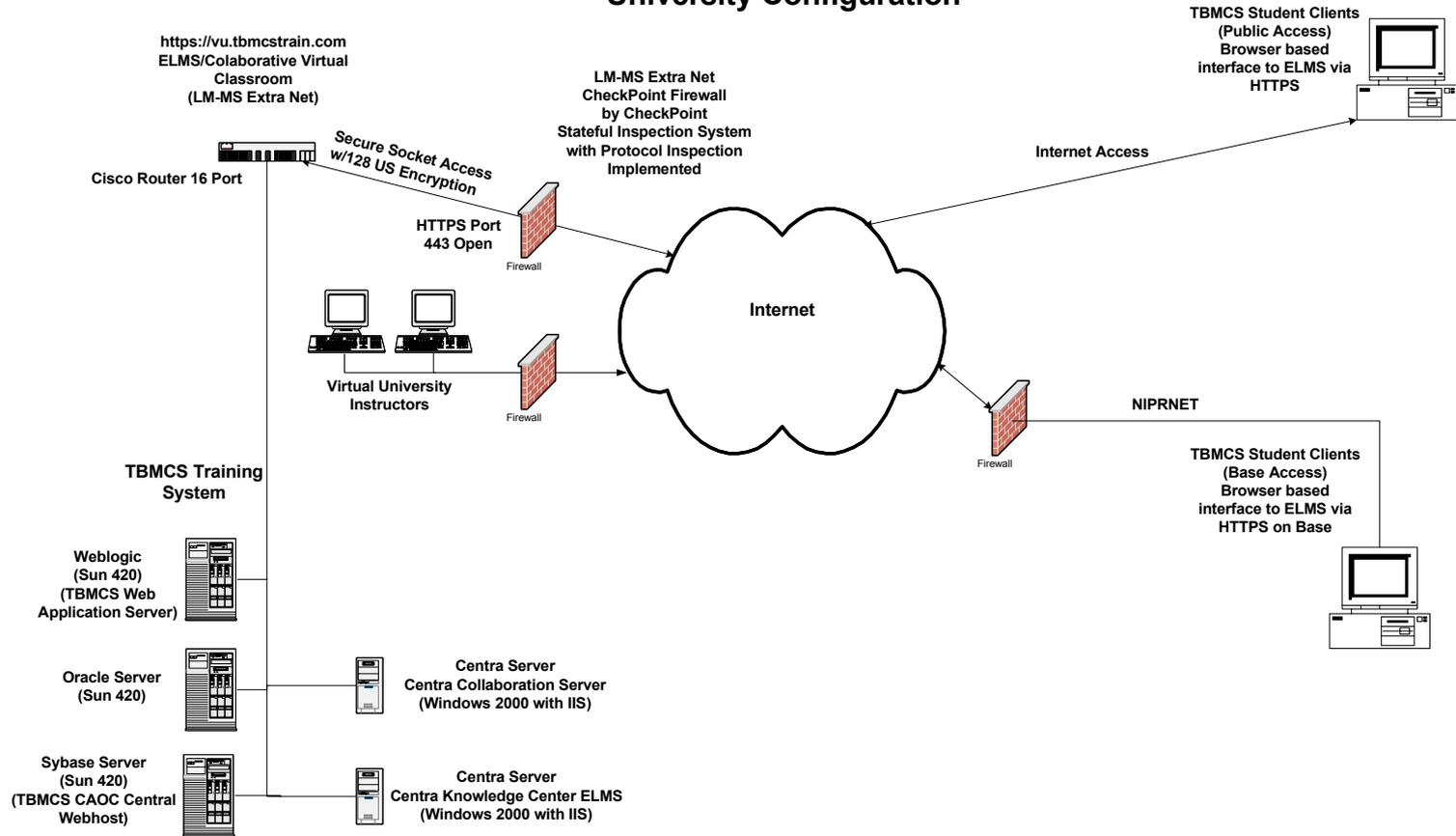


Back Ups



Network Architecture

TBMCS Training Virtual University Configuration





VU Test Suite Hardware

- Windows PC with Headset or Microphone and Speakers
 - 2 Instructor Workstations
 - 1 Moderator Workstation
 - 1 Support (Help Desk) Workstation
 - Multiple Student Workstations
- TBMCS Lite Application Suite (Unclassified)
 - ORASVR (Fictional Dataset)
 - SYBSVR (Fictional Dataset)
 - WebLogic (Enhanced Web Applications)



VU Test Suite Software

- Software Plugin (Automatically downloaded)
 - Collaboration Software and Web Browser
- Certificate (Verisign) for Secure Connection
- Asynchronous Downloads of Course Materials
- Communicates Via the Internet and NIPRNET
 - Viable Voice Over IP (VOIP) Performance Via Connections As Low As 28Kbps Dial-Up
 - All Communication Transferred Via HTTP and HTTPS Ports 80, and 443



Phase I – Request for Information Select Vendor Candidates

- RFI sent to 8 vendors – 4 responded
 - ATC – Intranet U
 - Centra
 - Click2Learn
 - LearnLinc (NS Software)
- VU Team researched all 4 vendors for current customer satisfaction
 - Centra and Learnlinc customers – Highly Satisfied
- Based on a Weighted Rating Scale two vendors – Centra and Learnlinc products – received the highest score
 - Centra and Learnlinc met all of the requirements
- *Proceed with Phase II – VU Testing*



Example Test Instruments

Test Card Example

Test Card #2, Classroom Entry

Student enters classroom and receives an introduction to the class

- 1 You access TBMCS Website
- 2 You log into the TBMCS-Centra VU Homepage
- 3 You enter the VU classroom within 30 minutes of class start time
- 4 Voice communication established between tester (you) and instructor
- 5 You observe introduction slides
- 6 You can easily identify each slide
- 7 Instructor can easily display an earlier slide in response to a student's question
- 8 Screen and audio stay in sync

N/A	Fail	Some Problems	Pass

TAM Example

Technology Acceptance Model Survey

- 7.1 I would encourage my unit to use the VU for TBMCS training.
- 7.2 If I'm unable to get live TBMCS training, I will make time to attend VU TBMCS classes.
- 7.3 The VU technology provides a suitable alternative to live training.
- 7.4 I would recommend the VU system to others for training.
- 7.5 If I couldn't have a live instructor, I would want to attend the VU.
- 7.6 The VU interactions between instructor and students closely emulated the interactions in a live classroom.

Strongly Disagree	Disagree	Agree	Strongly Agree



Methodology Test Schedule

<u>Event</u>	<u>Type Test</u>	<u>Dates</u>
Vendor 1	Informal	Oct 03
Vendor 1	Formal/User Community	Oct 03
Vendor 2	Informal	Nov 03
Vendor 2	Formal/User Community	Nov 03
Vendor 1	Informal	Nov 03
Vendor 1	Formal/User Community*	Dec 04
Vendor 1	Formal/User Community*	Dec 04
Vendor 1	Formal/User Community*	Dec 04

*Multiple time zones



Test Results

<u>Event</u>	<u>Type Test</u>	<u>Dates</u>	<u>Results#</u>
Vendor 1	Informal	14 Oct 03	Satisfactory
Vendor 1	Formal/User Community	23 Oct 03	Unsatisfactory*
Vendor 2	Informal	17 Nov 03	Unsatisfactory
Vendor 2	Comparative Connection Test*	17 Nov 03	Elimination of Vendor #2 Satisfactory (2 hr connection)
Vendor 1	Stress Test*	20 Nov 03	
Vendor 2	Formal/User Community	4 Dec 04	Satisfactory
Vendor 2	Formal/User Community	4 Dec 04	Satisfactory
Vendor 2	Formal/User Community	5 Dec 04	Satisfactory

* 23 Oct test resulted in an unknown loss in connectivity. Performance metrics did not show loss in bandwidth...required additional connection/stress testing to determine cause

Total results included system capabilities, overall user reaction, and the notation of any significant problems encountered

06/13/05

Not sure if I like this slide