CiSE-ProS: Cyberinfrastructure Security Education for Professionals and Students

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Introduction

Mission Statement:
To adopt well-established teaching and learning practices to provide in-person and online training avenues for practitioners to develop core competencies in secure computing relevant to advanced cyberinfrastructure (CI). There is a need to develop programs that prepare CI-professionals and open the gates for new workers in the field. In conjunction with training, a certification system will help recognize trained CI professionals, validating the
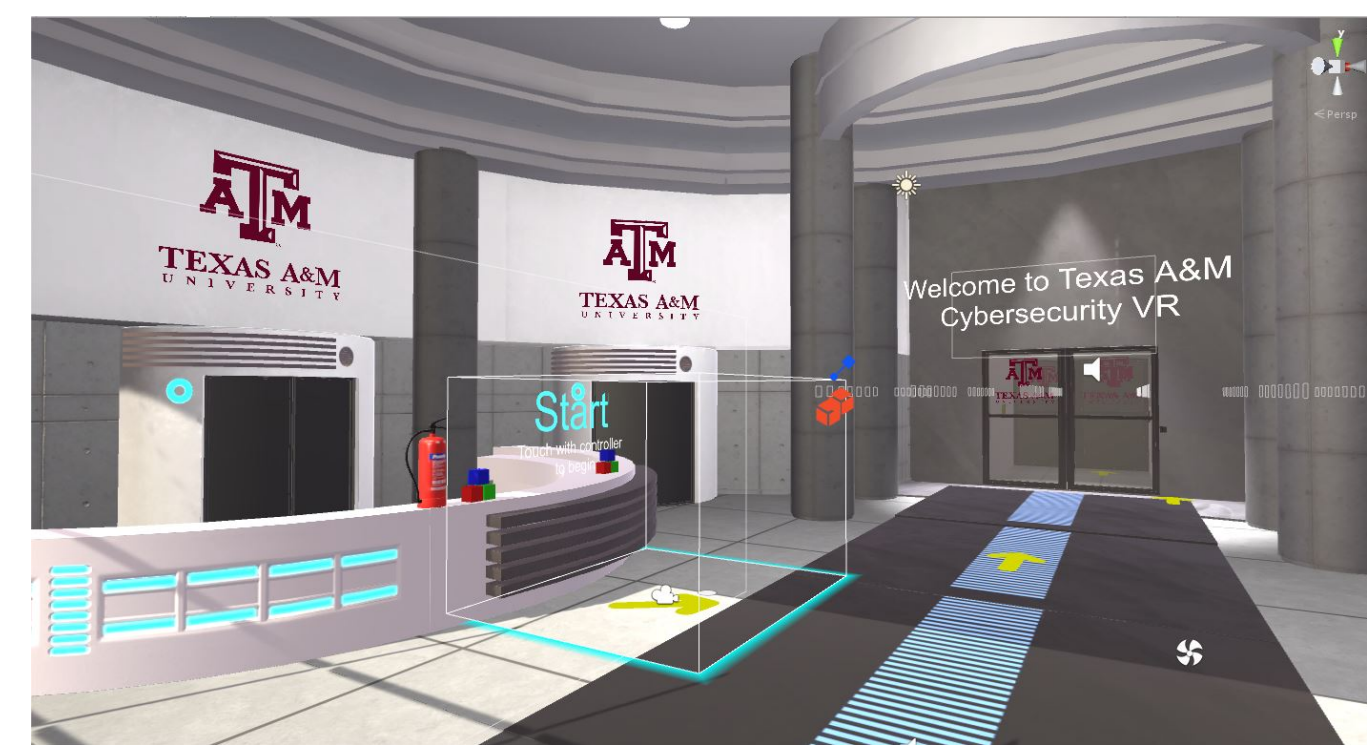
Our Purpose:
A spate of intrusions at advanced cyberinfrastructure sites across the nation demonstrates the urgent need to train system administrators in securing data and computational resources. The rapidly evolving nature of the cybersecurity landscape requires CI professionals to be prepared to address current threats, while simultaneously identifying and mitigating new threats. The Cyberinfrastructure Security and Education for Professionals and Students (CiSE-ProS) training program will build core competencies in secure-computing using hands-on activities. The project leverages competencies in an academic-public-private collaboration to determine certification standards in CI cybersecurity training.

The **CiSE-ProS** program will:
- Train the current CI workforce to secure data and computational resources using on-site and continuing education programs
- Prepare undergraduate and graduate students for productive cybersecurity careers.

Our Goals:
- Increase awareness of cybersecurity issues in research computing via a seminar series
- Prepare learning outcomes that describe standards for CI professionals prepared to address cybersecurity threats
- Design activities through which preparedness with respect to the standards can be evaluated
- Design scoring schemes to evaluate performance on the evaluation activities
- Develop learning activities, including virtual reality modules, to develop learners with respect to the learning outcome standards

Competencies for Workshops

- Software development
- Systems architecture
- Cybersecurity management
- Vulnerability assessment and management
- Data Administration
- Secure networking
- Secure authentication and remote access
- Auditing maintenance for secure data
- Penetration testing
- Securing cloud computing

Virtual Reality Prototype

- **Experience:** In the prototype the user learns about the security procedures involved in a data center and inspects hardware for signs of tampering. The user must follow the security protocol and replace a rack with another.
- **Software:** Unity 3D
- **Hardware:** HTC Vive VR Headset and Controllers powered by NVIDIA GPUs.

Timeline of Deliverables

Efforts and Deliverables 2017-2020	YEAR 1			YEAR 2			YEAR 3		
	FA.	SP.	SU.	FA.	SP.	SU.	FA.	SP.	SU.
Project Website	✓								
Evaluate Existing Resources	✓	✓							
Needs assessment workshop	✓	✓							
Virtual reality Modules		✓	✓						
E-learning Modules		✓		✓	✓				
Initial Assessment Report	✓	✓				✓			
Formative Assessment Reports		✓	✓	✓	✓	✓	✓	✓	✓
Annual Assessment Reports			✓			✓			✓
Module Releases			✓	✓	✓	✓	✓		
Conference Presentations	✓	✓		✓			✓		
Workshops			✓	✓	✓	✓	✓	✓	✓

Broader Impact and Outreach

- **Train the next generation of CI professionals** - Outreach activities targeted towards K-12 students will include HPC boot camps and using volunteer computing and crowd sourcing applications through the Citizen Science Grid and the A&M Cybersecurity club.
- **K-12 outreach efforts** – The project team will promote CiSE-ProS efforts directly to K-12 students and teachers by organizing classroom demonstrations, events and pilot projects at local schools.
- **Addressing national priorities for cybersecurity workforce development** - The project trains the next generation of cybersecurity proficient CI professionals and students. As part of this, it will connect students to potential employers of interest.
- **Research opportunities for undergraduates and teachers** – School teachers and undergraduate students will be able to participate in CiSE-ProS via collaborating Research Experiences for Undergraduates (REU) and Research Experiences for Teachers (RET) programs at Texas A&M.
- **Summer Computing Academy**– The project team organized the Summer Computing Academy at Texas A&M University in Summer 2017. The camp was attended by 22 high school students. We sought to create an educational experience that addressed the needs to impart *computing skill and comprehension to* upcoming members of the research community through interactive activities and unique experiences. Topic areas included comprehension of Unix/Linux text-base; understanding of how HPC relates to science; confidence in ensuring strong cybersecurity practice and enhanced motivation to pursue a career in STEM.

Project Team

Dhruva Chakravorty HPRC Texas A&M University	**Jinsil Seo** Soft Interaction Lab Texas A&M University	**Honggao Liu** HPRC Texas A&M University	**Donald McMullen** HPRC Texas A&M University	**Daniel Ragsdale** Cybersecurity Center Texas A&M University
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	Crystal Buchanan HPRC Texas A&M University	**Dylan Rodriguez** HPRC Texas A&M University	**Derek Rodriguez** HPRC Texas A&M University	

Advisory Board

The advisory board will help the project team prioritize learning outcomes, assessment activities, scoring schemes, and learning exercises throughout the development process, allowing the project team to evaluate the efficacy of the practices in both academic and continuing education contexts. The board and the assessment team includes:

- NVIDIA
- Lenovo
- Von Welch, Indiana University
- Anita Nikolich
- Jill Gemmill, Clemson
- Florence Hudson, Internet 2
- Kenneth M. Merz Jr., Michigan State

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High Performance Research Computing

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