VIRTUAL LEARNING ENVIRONMENT

NATIONAL CENTER OF ACADEMIC EXCELLENCE - CYBER OPERATIONS

UNIVERSITY OF ARIZONA
JASON DENNO
2018

OVERVIEW

- Purpose built Cyber Virtual Learning Environment specifically designed to support an NSA CAE-CO degree program -

2016

Created in 2016 to support the Bachelor of Applied Science degree in Cyber Operations

Web-based access with multi-factor authentication and encrypted communications to ensure security, accounting, and auditability.

850$^+$

Over 850 students enrolled covering 20 different locations including US, South/Central America, Europe, Africa, Asia, and Afghanistan.

Why we built and use our VLE

– Consistently deliver all 26 courses across the Cyber Operations program

– Focus all course time on achieving the learning objectives – not fighting their systems

– Avoid distributing USB drives or requiring students to download and install 100s of security tools and files

– Simplify and minimize student environment maintenance & support requirements

– Create an environment to deliver Offensive Cyber Operations (OCO) education – Not on the open Internet!

– No weaponization of students

How we achieve this

– Provide a hybrid cloud-based solution that includes student desktops

– Baseline all students and prevent installation, versioning, and configuration management issues

– Preconfigure and test all desktops, tools, data, and networking

– Centrally manage all updates, data distribution, software versioning and patching, etc.

CYBERAPOLIS

15,000 Detailed Virtual Residents
- 100+ Highly Detail Virtual Persona
- Underground Hacker Community
- Organized Crime Element
- Entity & Data Relational Linkages
- Patterns of Life
- Web Browsing, Emailing, Social Media Posts

Web and Network Infrastructure
- City Infrastructure with IRC Servers
- Water Company
- Power Company
- 2 Online News Agencies
- Bank
- Hospital
- Shipping Company
- Large Retailer
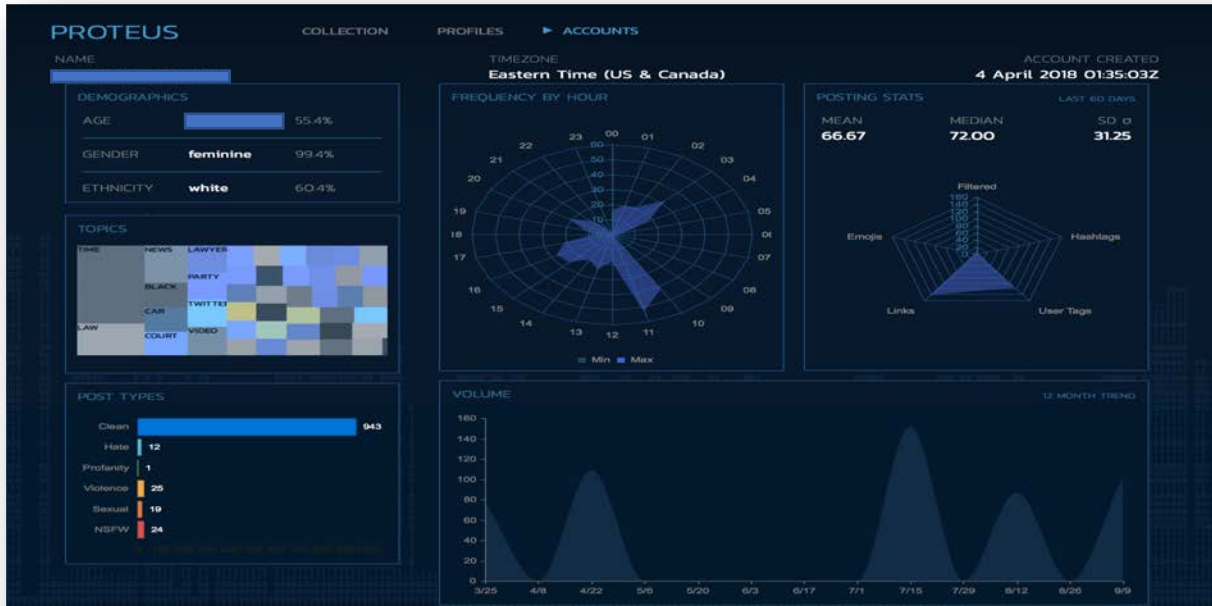- 20 Small Retailers/Service Providers

Social Media Sites
- Social Park
- ChirpyHub

VIRTUAL PERSONAS

– Reverse Engineered to Support Learning Objectives

– Relationships & Patterns of Life

  – Web Surfing, Email, Social Media, Purchasing, Shipping, Work & School

– Functional CyberApolis Accounts

  – Bank, Credit Cards, Customer Accounts, Digital Health Records

– Metadata Embedded in Documents & Pictures

– Proteus AI Driven and/or Manually Crafted Activities

CYBERAPOLIS ORGANIZATIONS
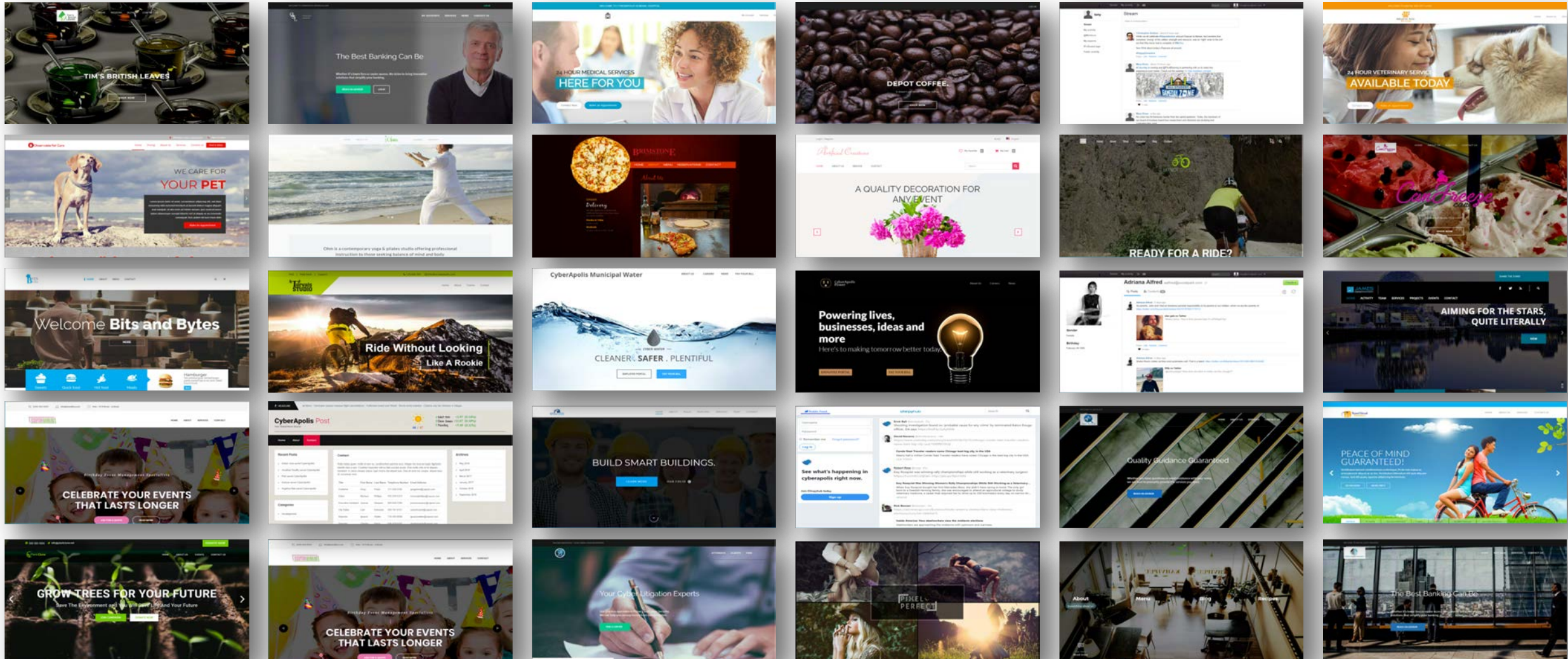
CYBERAPOLIS WATER COMPANY

– Organizational Structured Tied to Website & Network
– 136 Detailed Employees (Future Scenario Growth)
– Corporate Data & Metadata to Support Scenarios
– Security Vulnerabilities Built Into Website & Networks
– Full Network Architecture Implemented in the Cloud
– Students Segmented in Separate Security Groups

VLE ARCHITECTURE
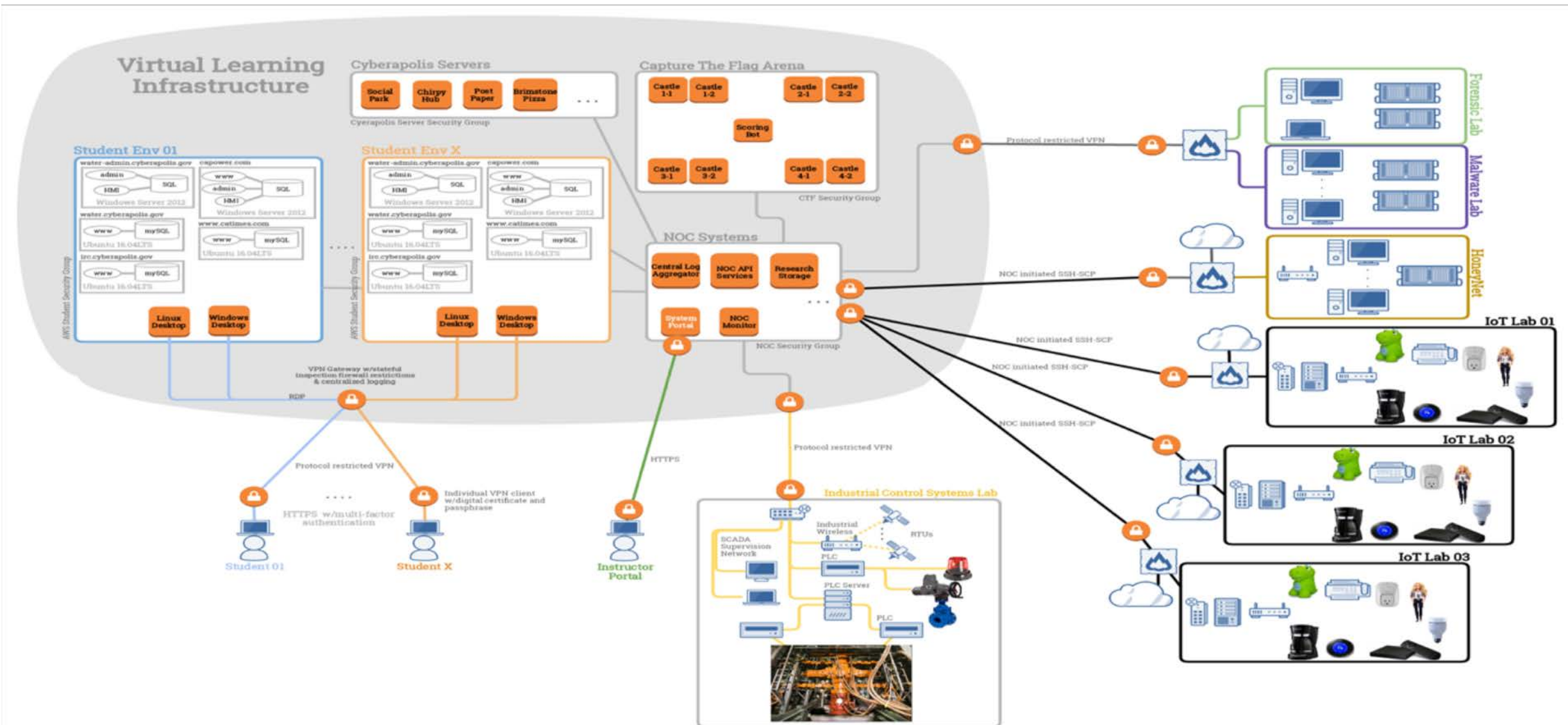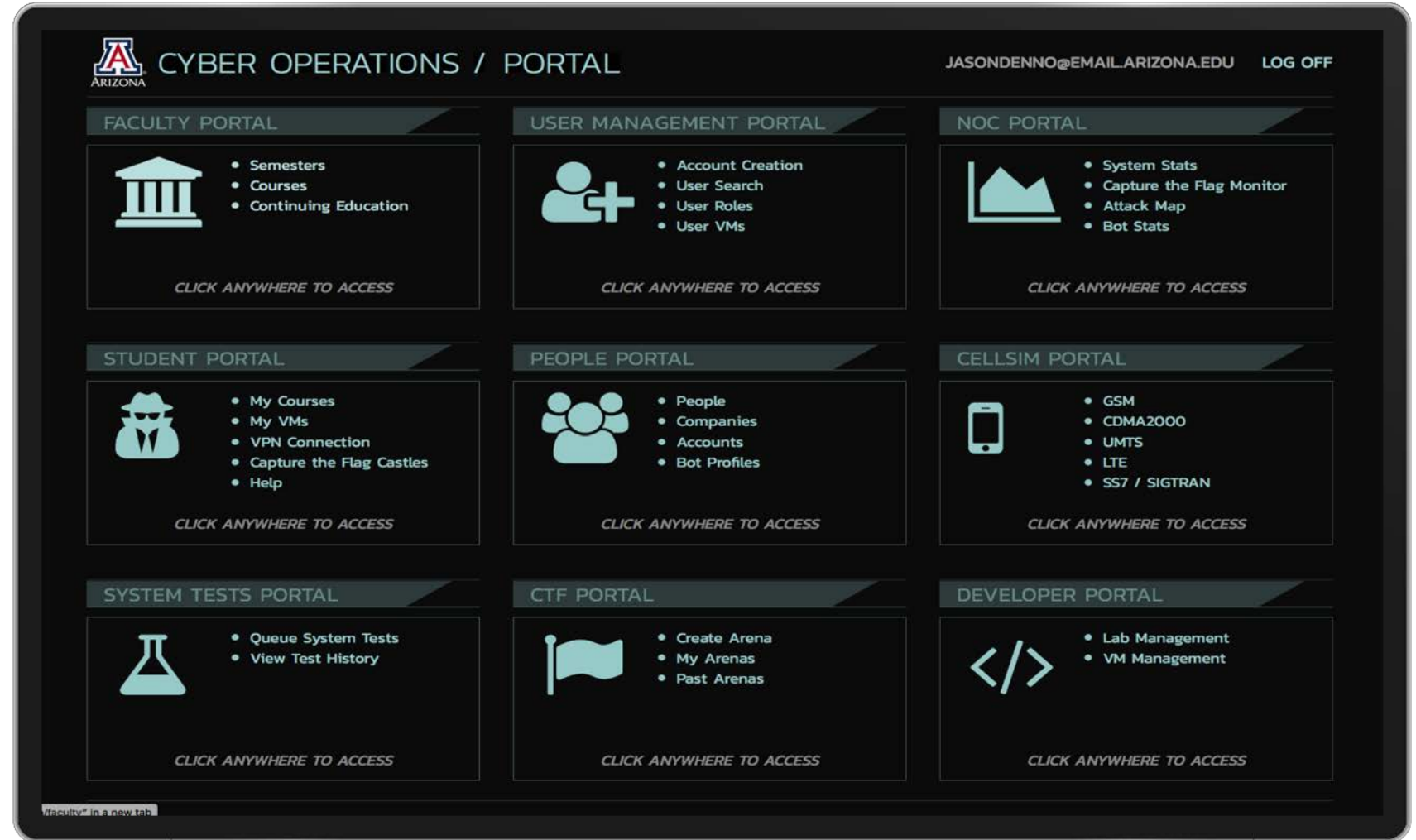
VLE MAIN PORTAL

- Main Entry Point to VLE
  - Access All Areas of VLE
  - NOC Portal
  - Faculty Portal
  - Student Portal
  - User Management Portal
  - People Portal
  - CTF Portal
  - Development Portal
  - System Test Portal
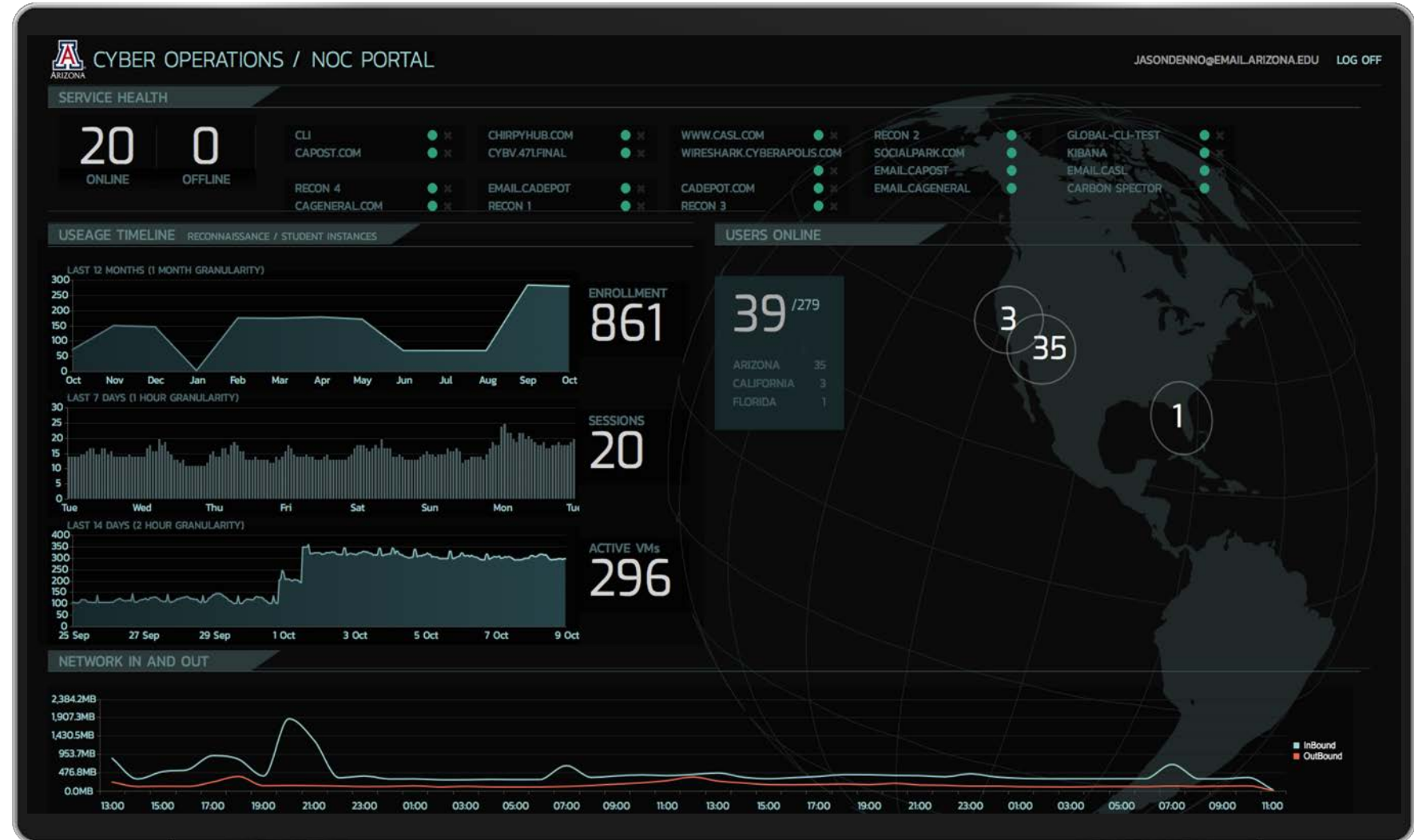 - CellSim Portal
- Rules-Based Access Control

NOC PORTAL

– Status of VLE Servers

– Online Users & Locations

– Total Enrollment

– Active Sessions

– Active VMs

– Bandwidth Usage

FACULTY PORTAL

- Central Faculty Dashboard

- Search, Schedule and Launch Existing Courses

- Dynamically Create New Cyber Courses & Training

- Enroll & Monitor Students

- Record Learning Sessions

- Add, Delete, & Update Course Content

- Reset Student & Environment Resources

- Monitor Course Interactions & Record Statistics

CYBER OPERATIONS / FACULTY PORTAL

JASONDENNO@EMAIL.ARIZONA.EDU   LOG OFF

Dashboard   Semester   Cyber Training

⚠ System may be offline 9–10am AZ (UTC-7) M–F for updates

SEMESTER MANAGEMENT

SPRING 2018 15W   FALL 2018 7W1   FALL 2018 15W   FALL 2018 7W2   + ADD SEMESTER

Fundamentals of Cybersecurity
CYBV 301
Jewkes, Tom
Wed
1700 – 2200
student connections
☑ EDIT   🗑 DELETE

Intro to Cyber Intelligence
CYBV 435
Drennan, David
student connections   student servers
■ 17 running
■ 33 stopped
☑ EDIT   🗑 DELETE

Cyber Investigations & Forensics
CYBV 388
Wagner, Paul
student connections   student servers
■ 16 running
■ 71 stopped
☑ EDIT   🗑 DELETE

Active Cyber Defense
CYBV 400
Jewkes, Tom
student connections   student servers
■ 18 running
■ 42 stopped
☑ EDIT   🗑 DELETE

Computational Thinking & Doing
INFV 320
Wolf, Odile
student connections
☑ EDIT

FACULTY PORTAL – COURSE MANAGEMENT

— Central Course Dashboard

— Enroll/Drop Students

— Launch Learning Sessions

— Visualize Course Resources

— Visualize Student Interactions
& Resource Status

— Centrally Manage Student &
VM Files

— Reset Student Resources
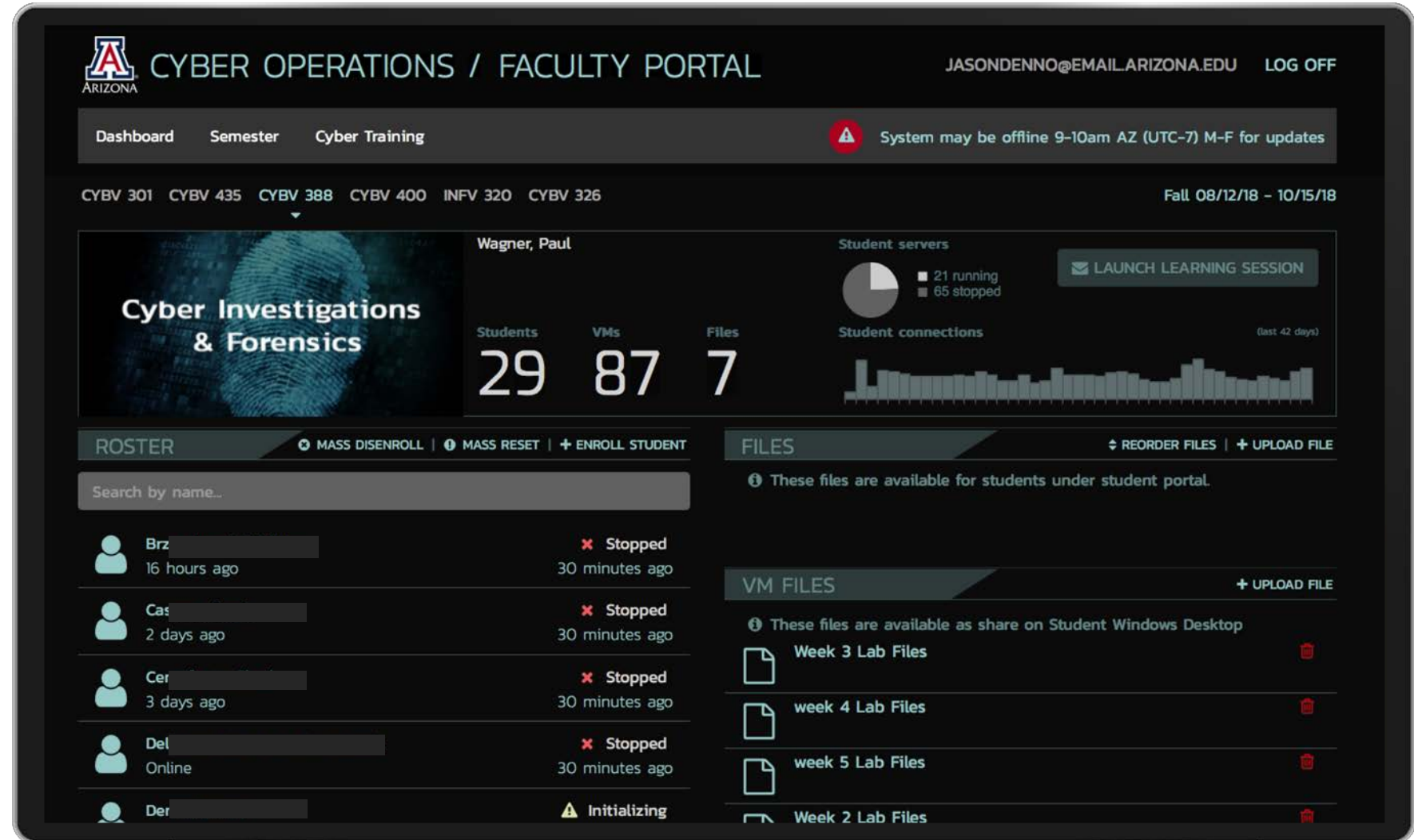
STUDENT PORTAL

- Central Student Dashboard
- View Course Details
- Access Enrolled Courses
- ~320kbs Bandwidth <200ms
- Access Virtual Desktops
- View VLE Alerts & Messages

STUDENT PORTAL – COURSE ACCESS

- Start, Stop, Reset, and Fix Assigned Compute Resources
- View Assigned Account Details
  - IP Address
  - User Name
  - Reset Password
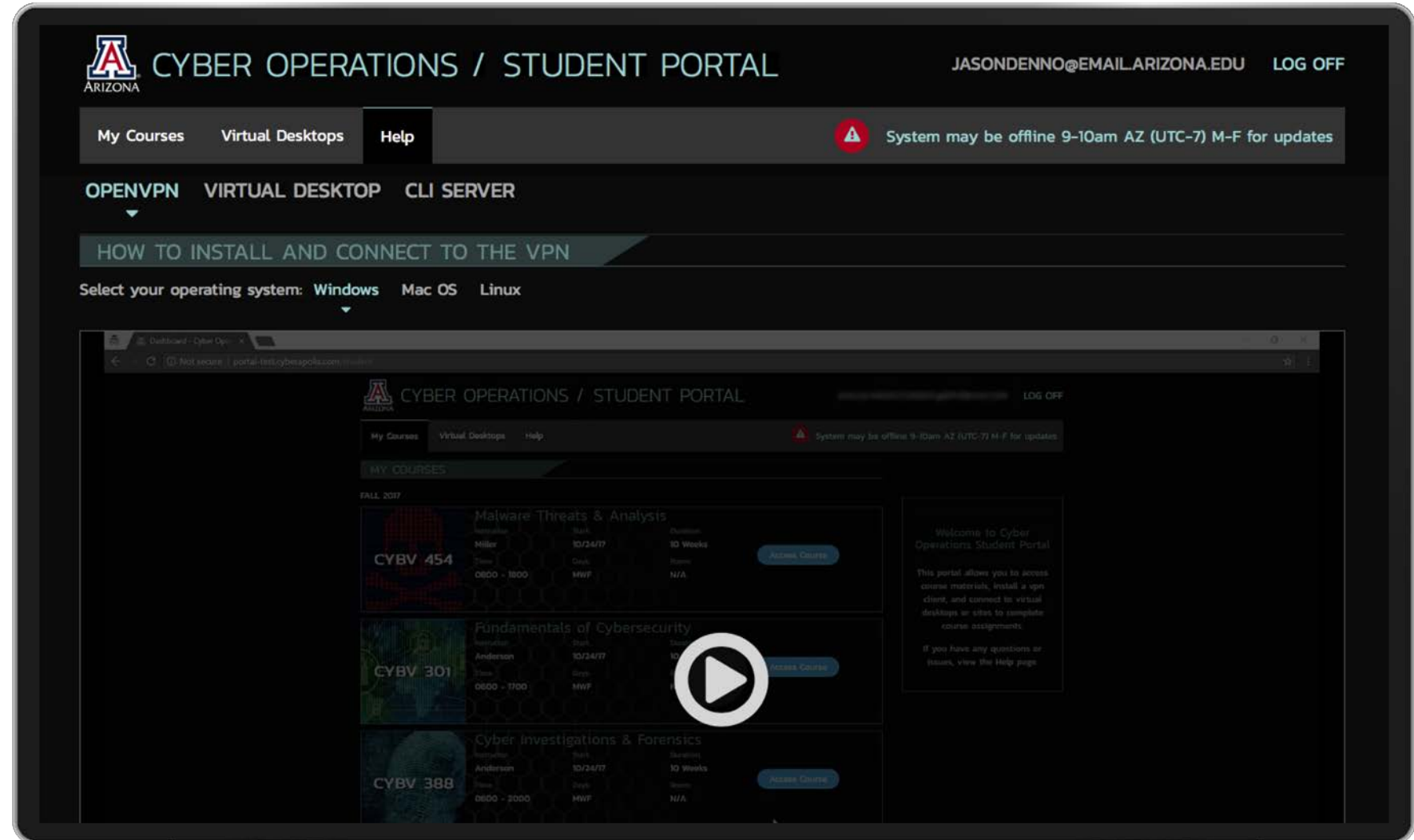- View and Access Assigned Courses Material and VM Files
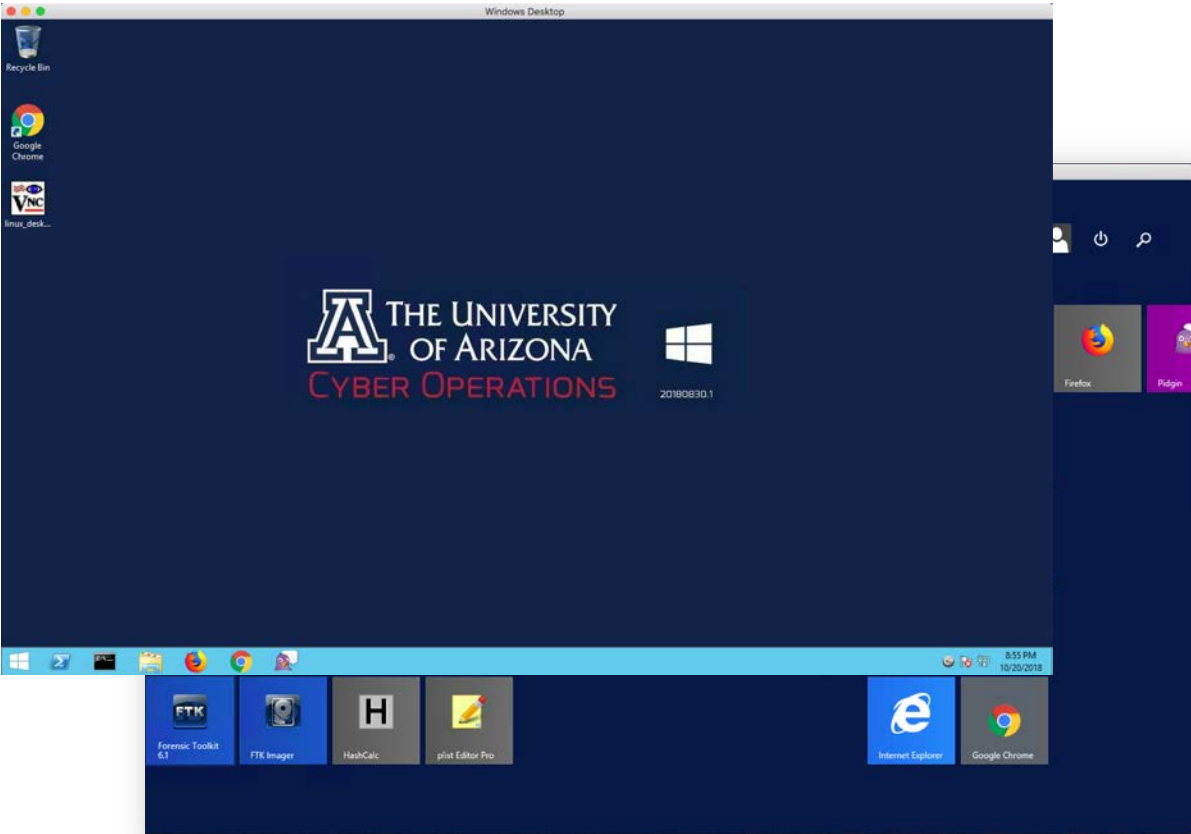
STUDENT PORTAL – HELP PAGES

- Central Help Dashboard

- Access Download Links

- Video Demonstrations with

  Voice & Closed Caption

  Narration

- Step by Step Instructions

  - VPN Install & Launch

  - Virtual Desktops

  - CLI Servers

- All Platforms

  - Windows

  - Mac OS

  - Linux

STUDENT DESKTOPS

WINDOWS

LINUX
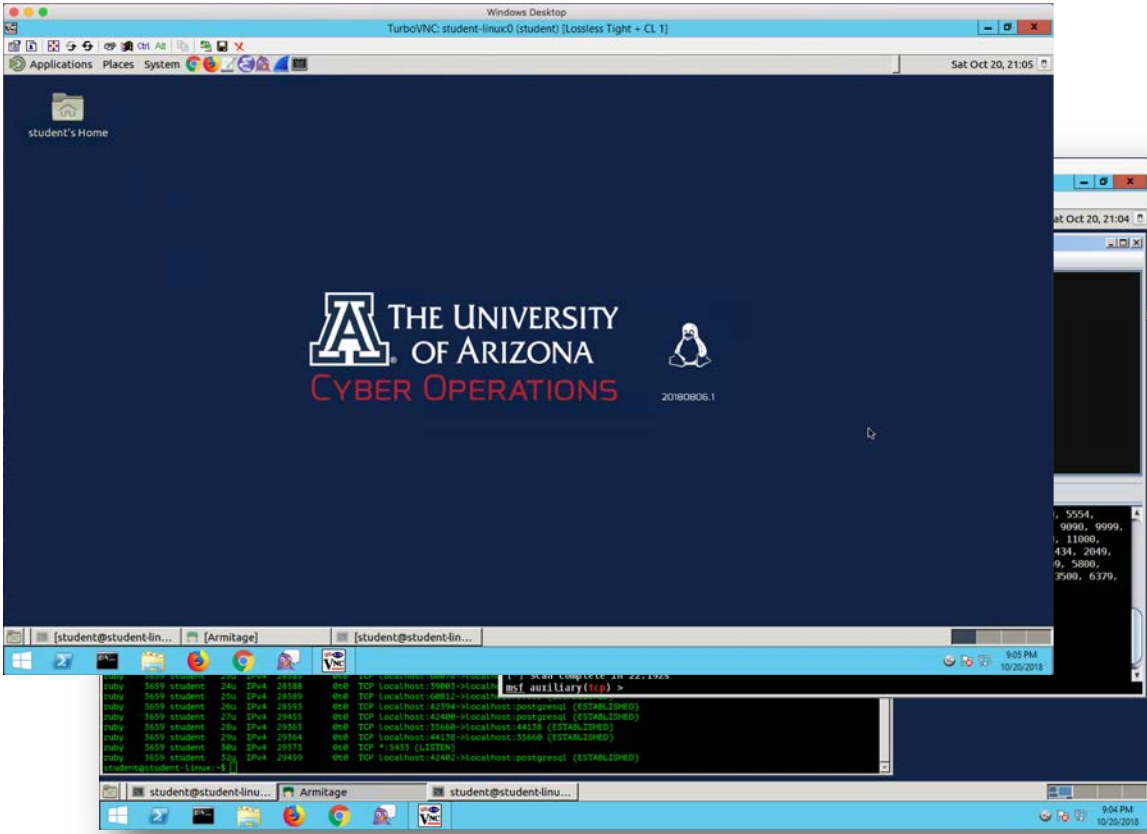
TRAINING & STAFFING REQUIREMENTS

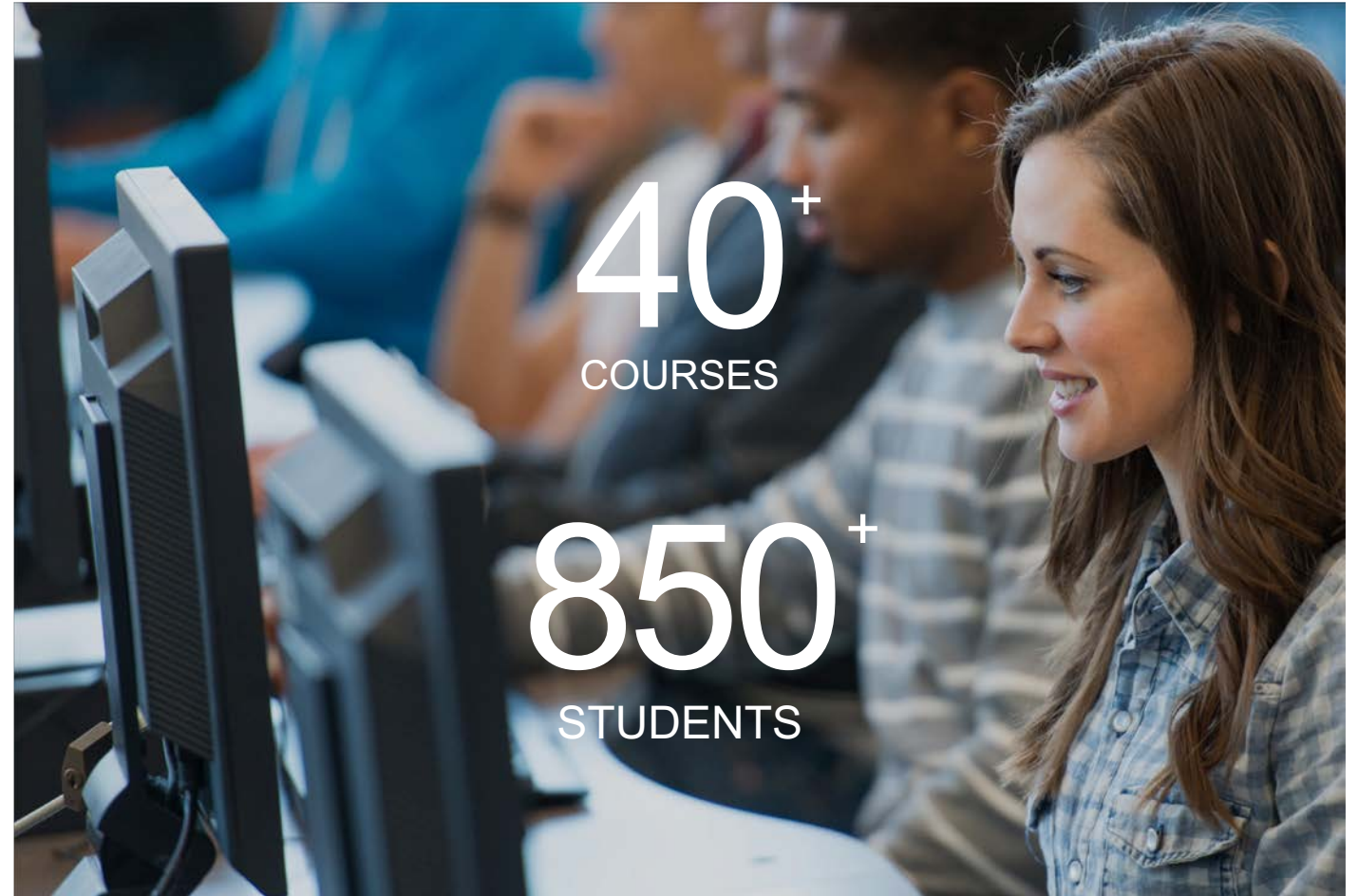|	New Student	New Faculty
Time	< 1 Hour	< 2 Hours
Skill	Use a Web browser	Use a Web browser

OUR SYSTEM IS MAINTAINED BY

1 Developer

1 Cloud Engineer

1 Product Manager

40⁺ COURSES

850⁺ STUDENTS

SYSTEM MAINTENANCE TOOLS

Fix Button

Course administrators are presented with a Fix

button when one of their students' VMs fails a

status check. e.g. If the VM's file system is

corrupted or there are hardware issues on the

physical host.

Self Healing

This is a job that runs nightly to ensure that each

student's environment is in a good state. It

automatically fixes impaired VMs, reassigns missing

VMs, and sends a summary of any fixes performed to

the development team.

POINT OF CONTACT

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VIRTUAL LEARNING ENVIRONMENT

THANK YOU