SimEOC:

A Virtual Emergency Operations Center Simulator

Cynthia Nikolai, Tim Wright, Greg Madey

Overview

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  - Types of Disasters
  - Disaster Governance
  - When Disaster Strikes
  - Emergency Operations Centers (EOCs)
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Our Dangerous World

Natural hazards

- naturally occurring phenomena caused either by rapid or slow onset events which can be **geophysical** (earthquakes, landslides, tsunamis, volcanic activity), **hydrological** (avalanches, floods), **climatological** (extreme temperatures, drought, wildfires), **meteorological** (blizzards, tornados, cyclones, storms/wave surges) or **biological** (disease epidemics, plagues).

Technological or **man-made** hazards

- events that are caused by humans and occur in or close to human settlements (conflicts, famine, displaced populations, industrial accidents, transportation accidents, terrorism, biological, chemical, radiological threats)

Disaster Governance (in US)

- Management of a disaster in the US consists of a subsidiarity model
  - Incidents are handled at the lowest level (county level), until further assistance is needed (by the state and then by the federal government)

Disaster Governance (in US)

- At the local level, emergency management falls to the county, and emergency managers are county employees whose full time job is to plan for and manage emergencies
- At the state level, emergency managers exist in state run Emergency Operations Centers
- At the federal level, emergency managers fall under the Federal Emergency Management Agency (FEMA)
- FEMA is under the direction of the Department of Homeland Security

When Disaster Strikes

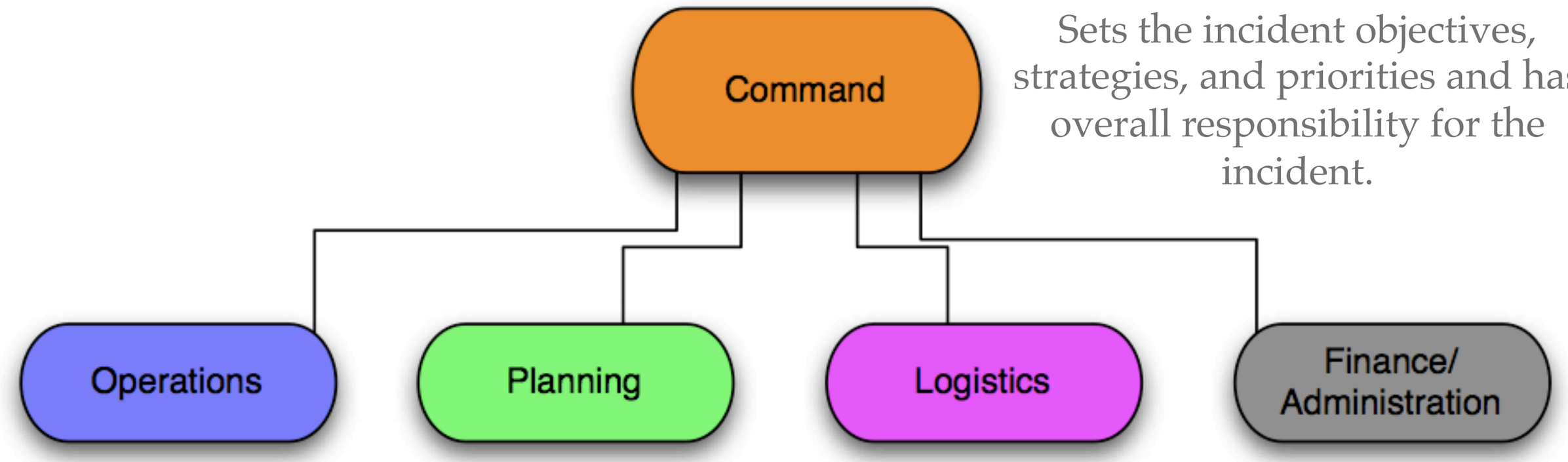
- When disaster strikes, emergency managers, elected officials, and volunteers gather together to manage the emergency.

- They set up a **Command Post** and command structure (**Incident Command System**) to manage the situation.

Emergency Operations Center

- Emergency Operations Center (EOC): Secure location in which upper-level emergency managers and elected officials gather together to prepare for, manage, and coordinate activities in response to an emergency situation (e.g. hurricane, pandemic, earthquake, tsunami)
- EOCs exist on local, state, and national levels.

Command Structure



Sets the incident objectives, strategies, and priorities and has overall responsibility for the incident.

Conducts operations to meet the incident objectives. Establishes tactics and directs all operational resources.

Supports the incident action planning process by tracking resources, collecting/ analyzing information, and maintaining documentation.

Arranges for resources and needed services to support achievement of the incident objectives.

Monitors costs related to the incident. Provides accounting, procurement, time recording, and cost analyses.

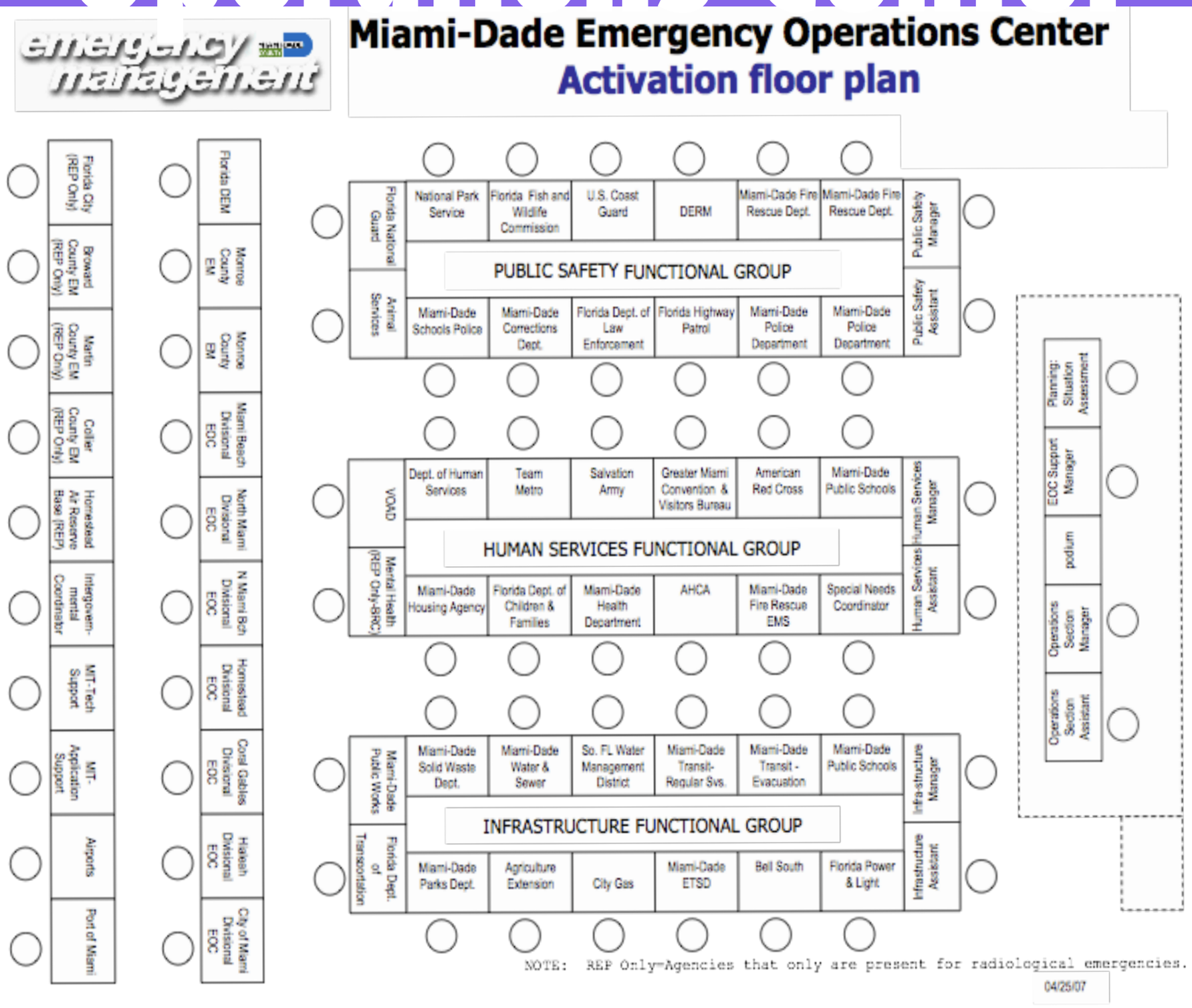
Our Collaborations

- In our research, we have been working with Miami-Dade County, FL, to build a virtual EOC for

  (1) Training emergency personnel

  (2) Research into emergency management decision-making

Miami-Dade Emergency Operations Center



Inside Miami-Dade EOC

The SimEOC Application

Key Features

- Distributed
- Web-based
- Intelligent Agents
- Dashboards
- Advanced Learning Tutor
- Individual and Group Training

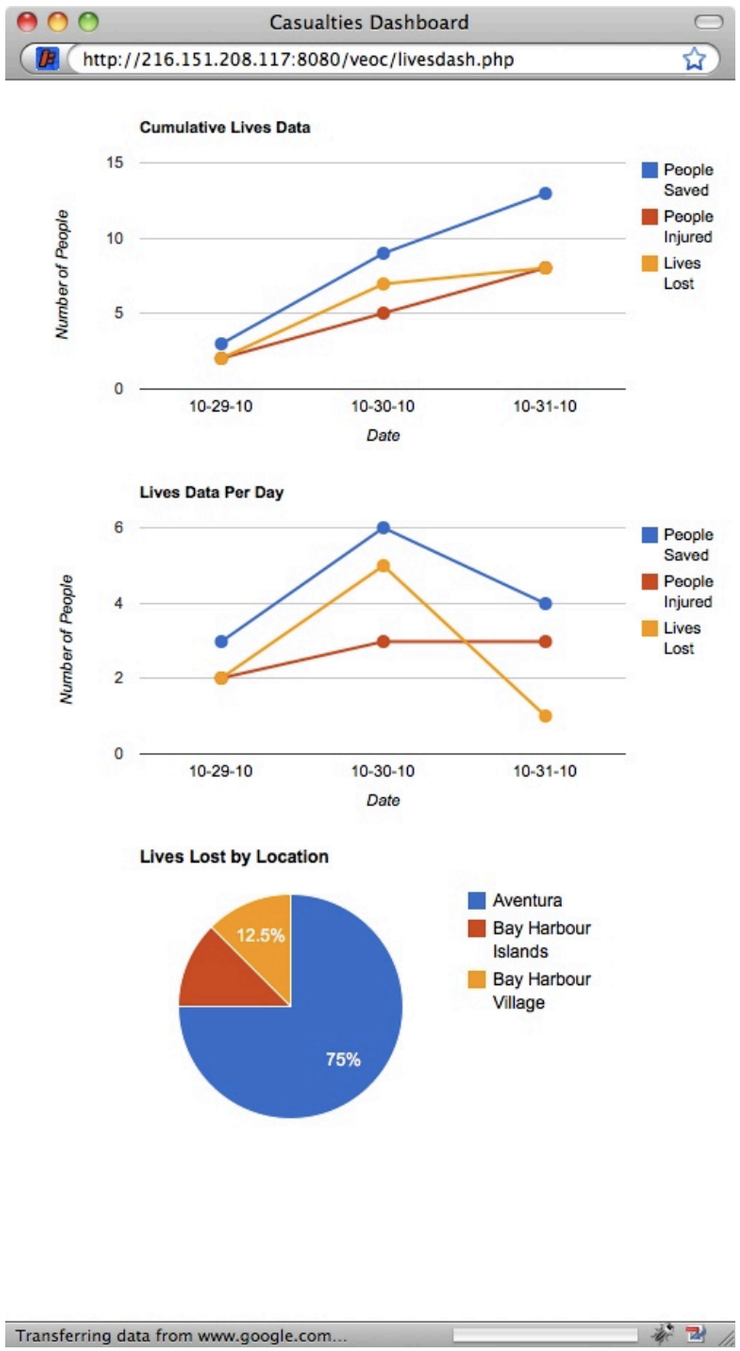
Distributed & Web-based

- Individuals can train in SimEOC from any web browser from any computer from anywhere in the world

Intelligent Agents

- Goal is to have artificially intelligent agents that can simulate any individual or group of individuals in the EOC

Dashboards



- a series of visual indicators that give the trainees immediate feedback on their decisions. Example indicators include lives lost, lives saved, and total cost of resources to date.
- these can be turned on or off as researchers desire

Advanced Learning Tutor

- an advanced artificial agent that acts as a tutor and gives hints to players as they participate in the training.

Individual and Group Training

- Training can be accomplished on an individual basis or for a group or organization.
- Training on an individual basis can consist of training a single liaison or branch director.
- Training on a group level can consist of an entire group such as the public safety group or the infrastructure group.
- Finally, training can consist of training the entire organization/EOC as well.

Future Work

- Implement intelligent agents that can simulate human trainees
- More advanced Learning Tutor
- More advanced Dashboards
- More advanced Research Metrics

Technologies Employed

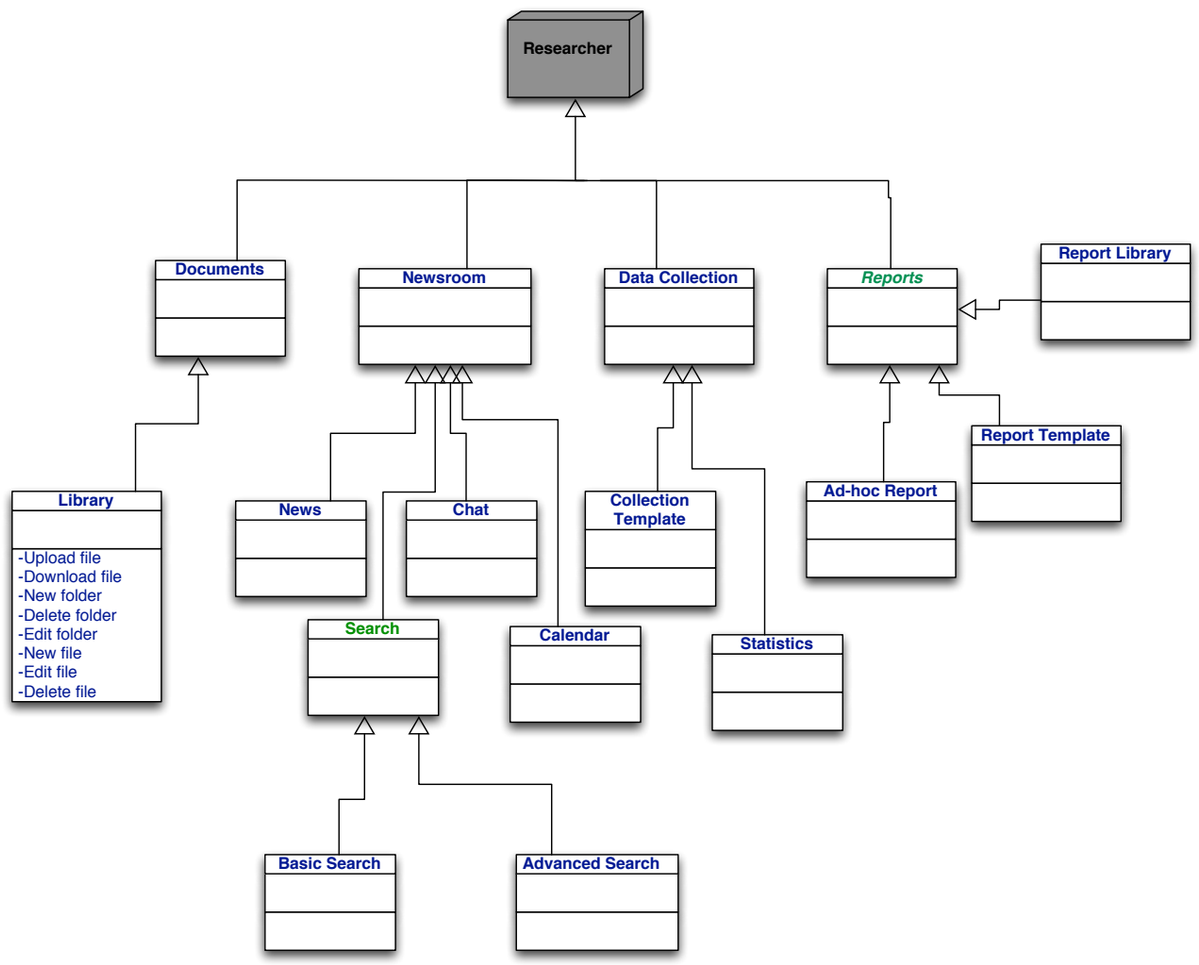
- On the client side:
  - XHTML, CSS, Dynamic HTML, AJAX, Reverse AJAX, and JavaScript.
- On the server side:
  - PHP, MySQL, Dojo and the Jetty server.
- Virtual machines: all development and deployment has been accomplished in virtual machines

Deployment

Successful deployment at

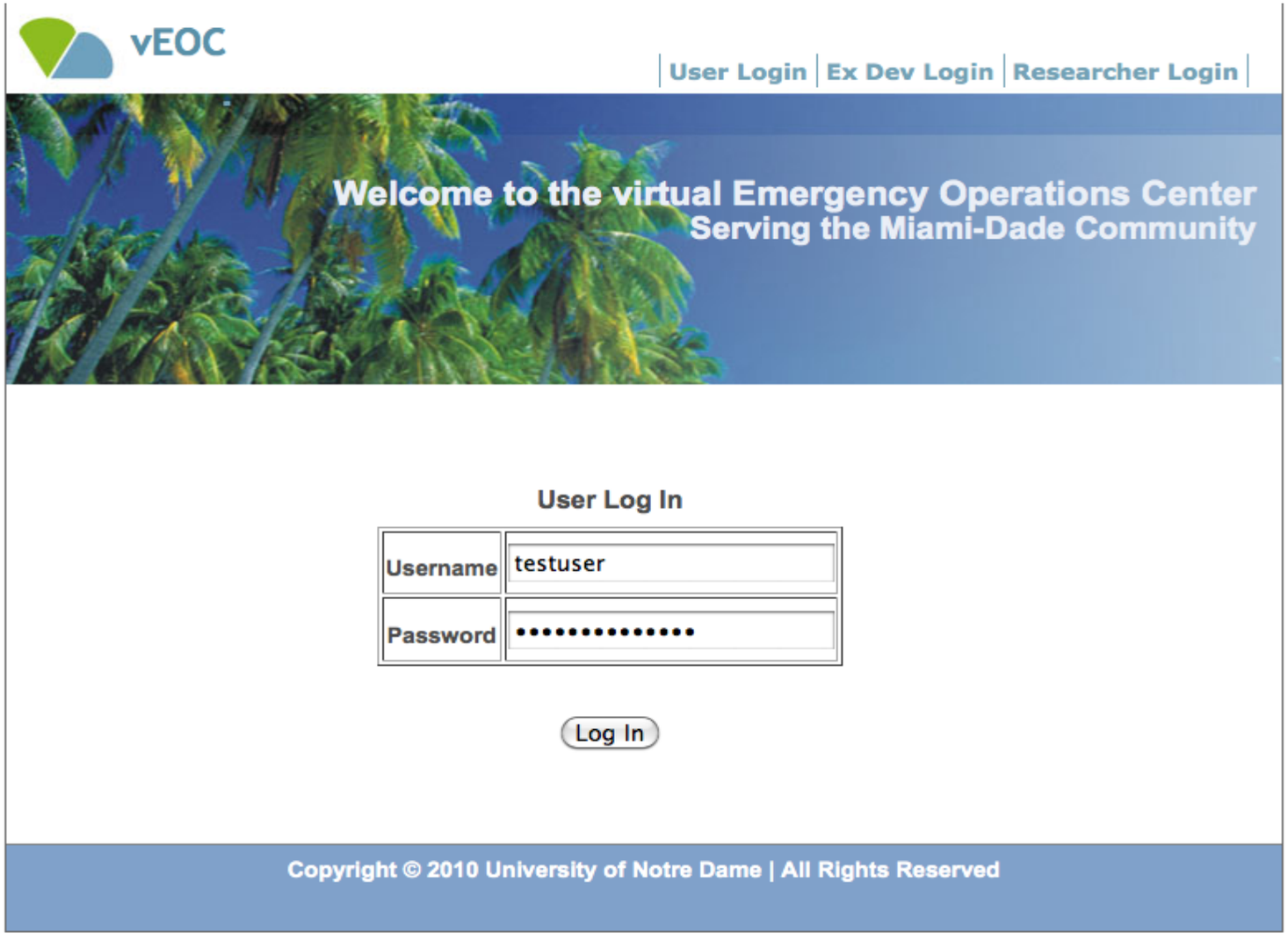
www.simeoc.org

The Application



- 4 Main Consoles
- ~20 Modules

Consoles



- Trainee
- Exercise Controller / Developer
- Researcher
- Administrator (in development)

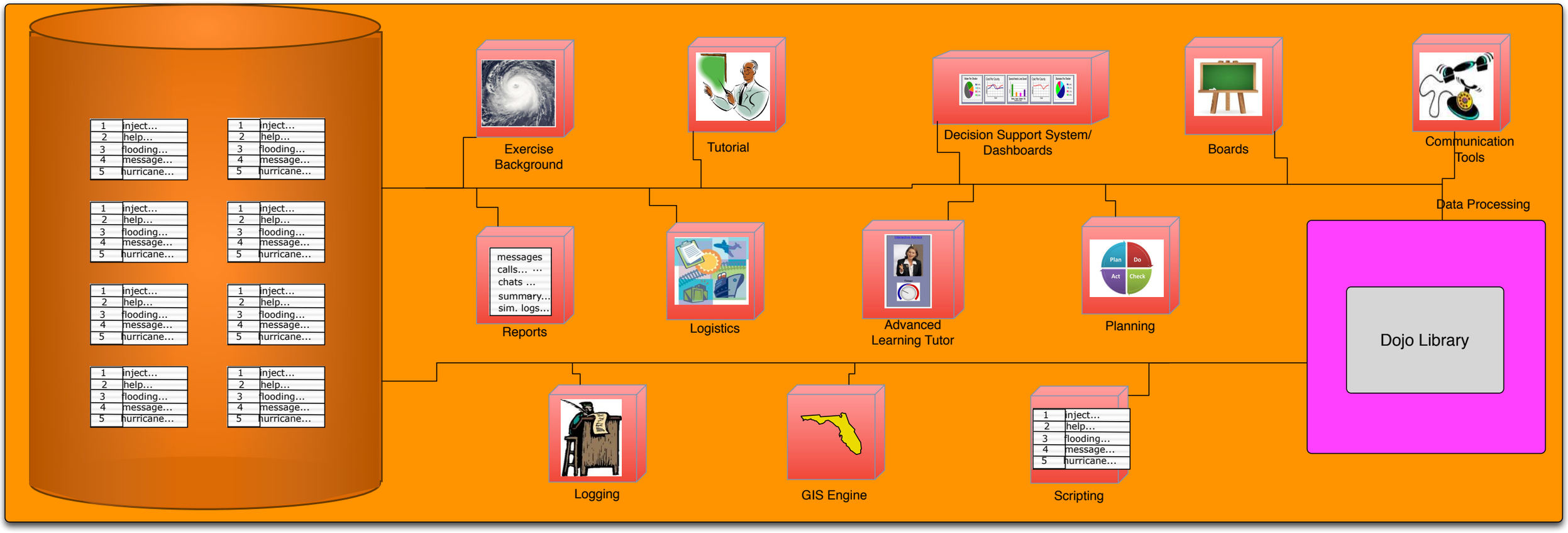
vEOC User Roles

- Trainee
  - Prepares for emergency situations; practices decision making by interacting with vEOC
- Exercise Controller/Developer
  - Creates scripts to train emergency personnel; moderates training during a simulation

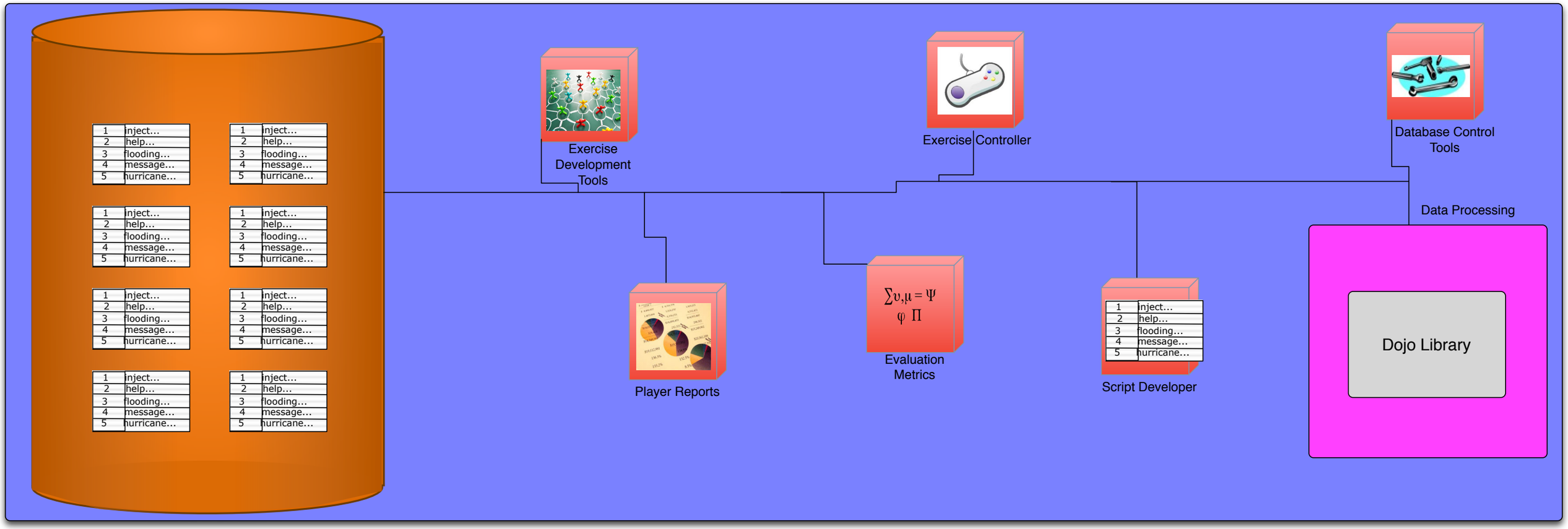
vEOC User Roles (cont'd)

- Researcher
  - Individuals interested in studying various aspects of decision making and emergency response
- Administrator
  - Maintains the vEOC software; also sets up and moderates user profiles

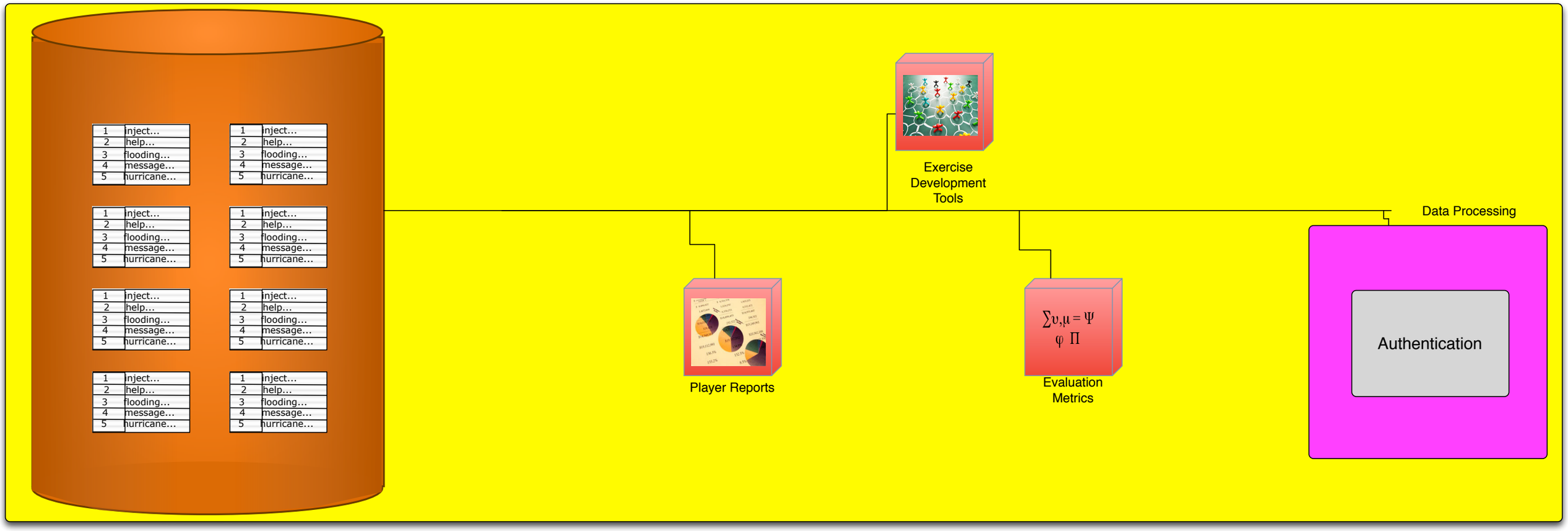
Trainee Architecture



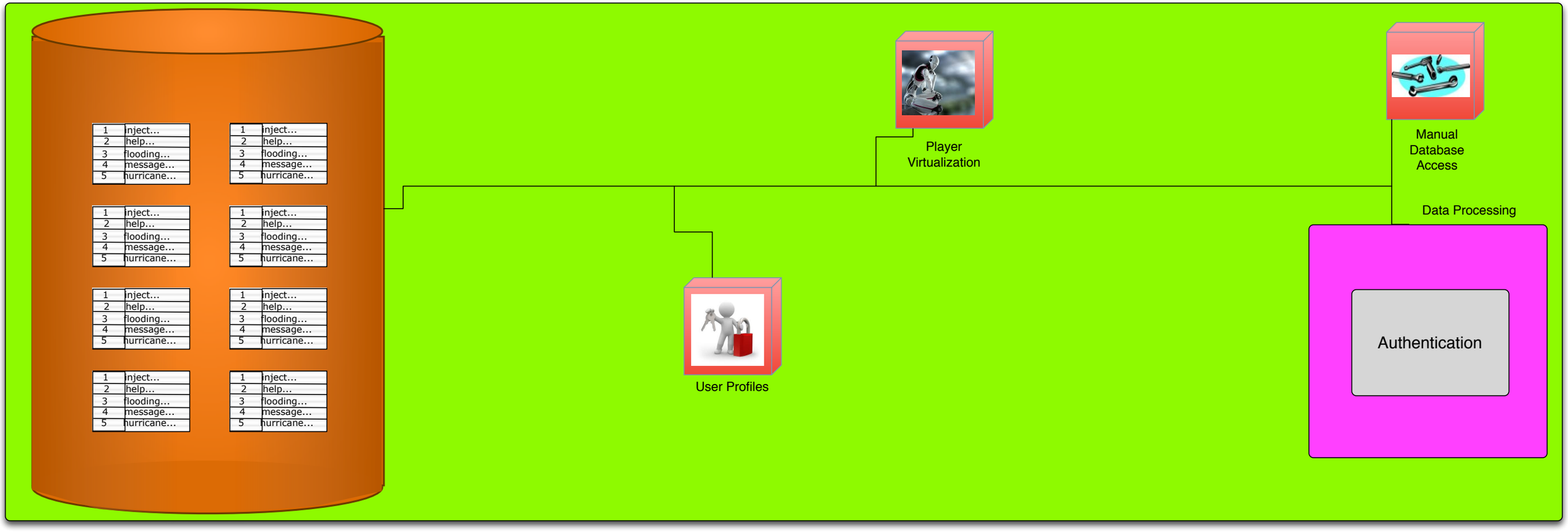
Exercise Developer Architecture



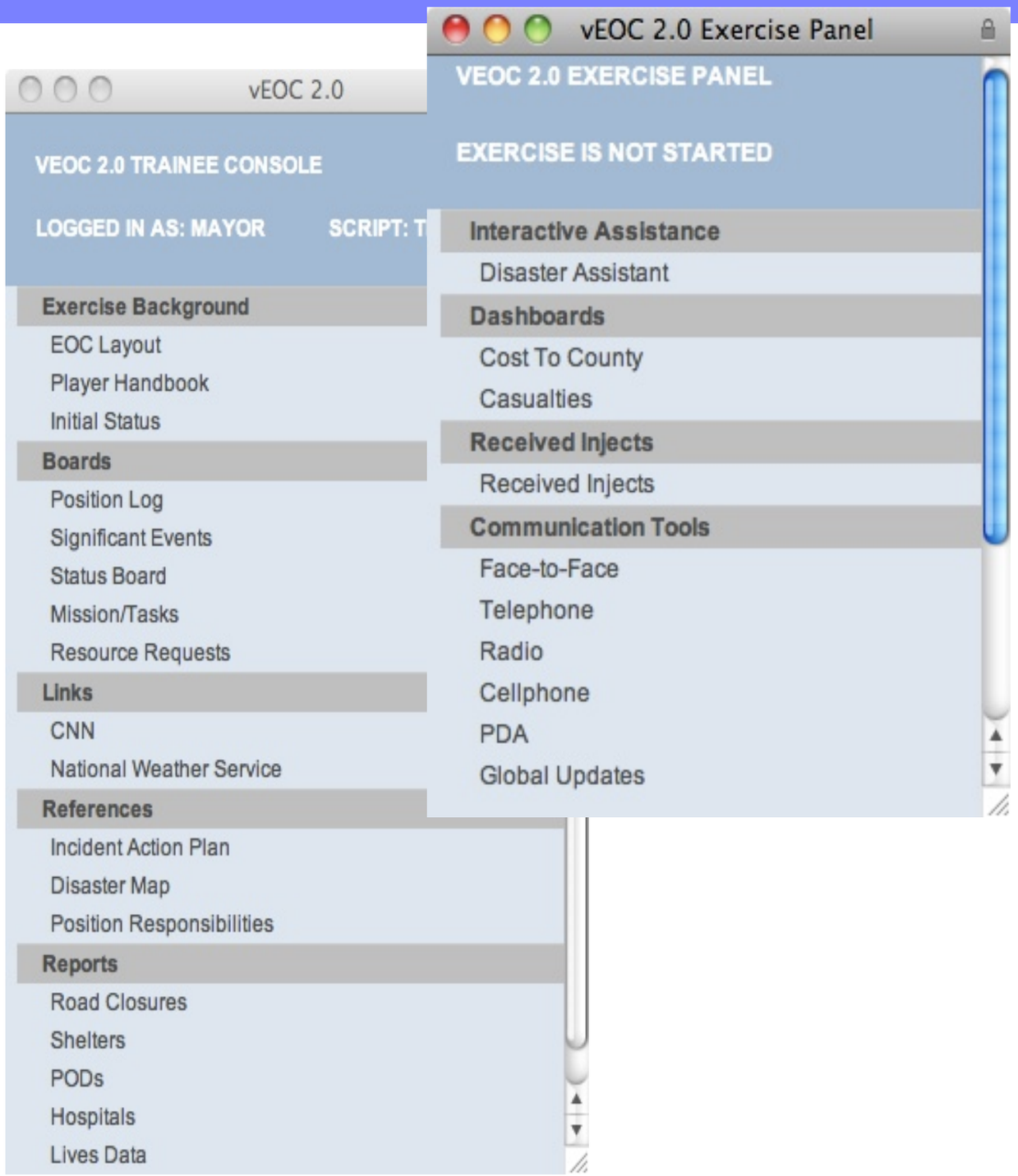
Researcher Architecture



Administrator Architecture



Trainee Desktop



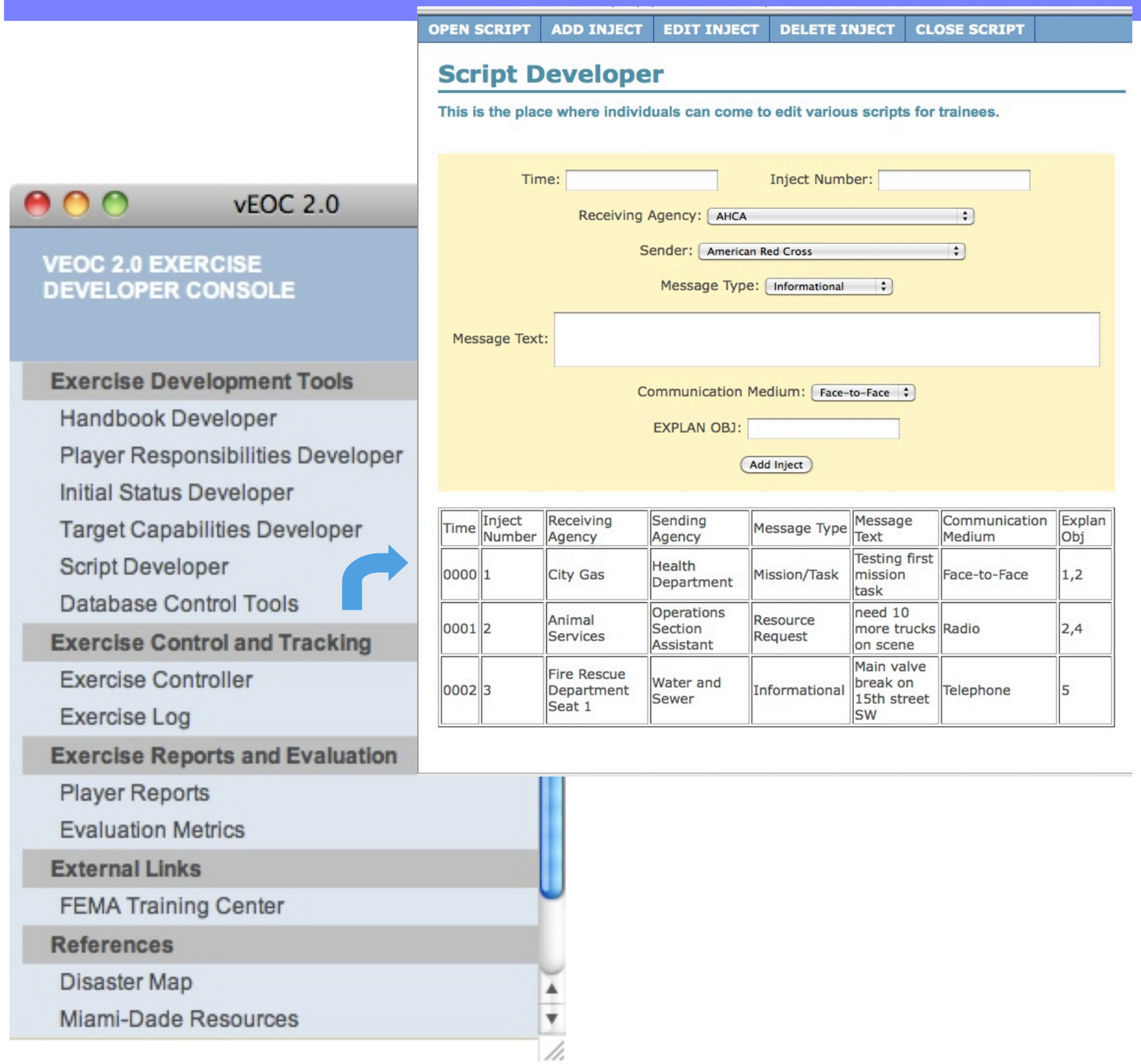
Main Panel (left)

- Main place in which user interacts in the vEOC.
- Includes Exercise Background, Boards, Links, References, and Reports

Exercise Panel (right)

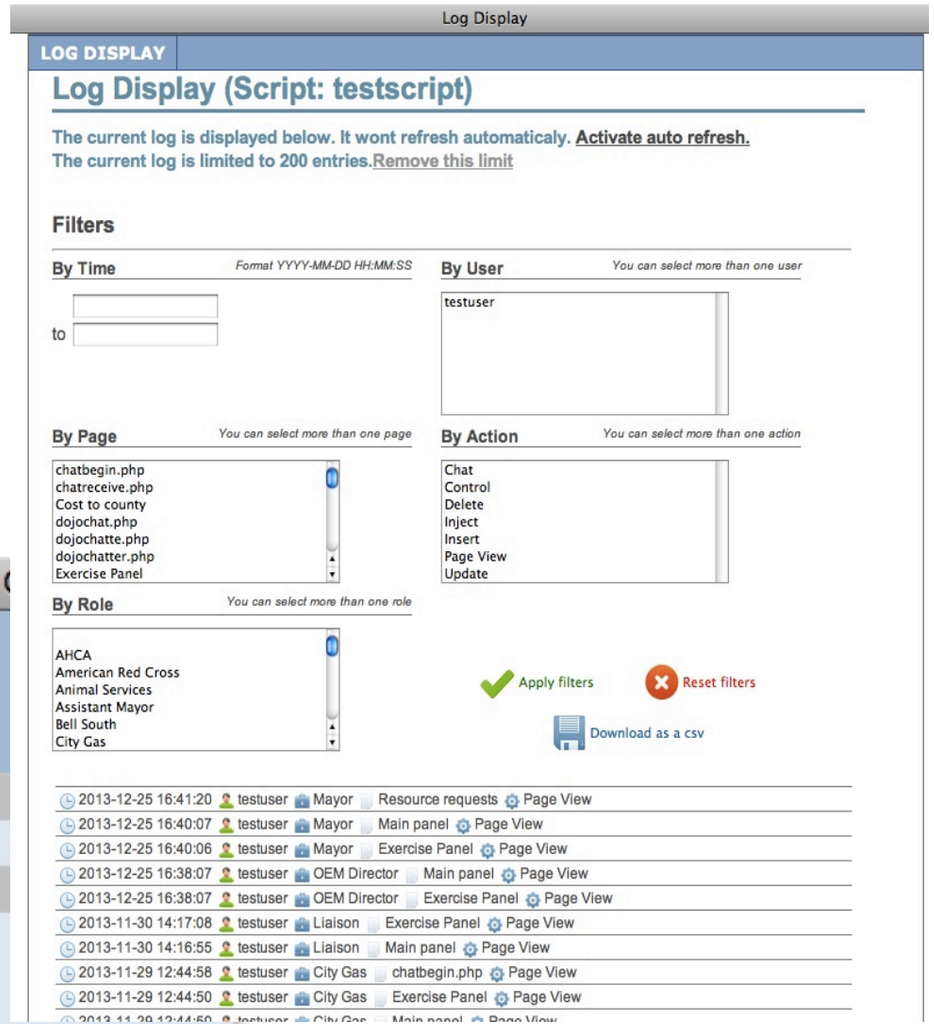
- Main place in which users interact with the exercise.
- Includes an Advanced Learning Tutor, Dashboards, and Communication Tools.

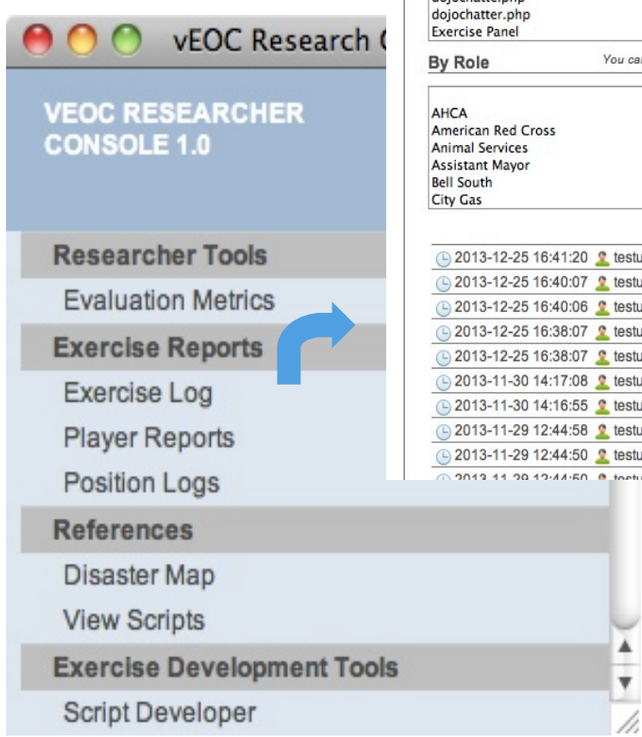
Exercise Developer Console



- Includes Exercise Development Tools, Database Controls, Exercise Control and Tracking Tools, and Reports and Evaluations

Researcher Console





- Includes Researcher Tools, Exercise Reports, and References

References to Review

Grant Proposals

Dr. Madey

Project Website

http://www3.nd.edu/~veoc/

References to Review

Publications

- Nikolai, C., Johnson, T., Becerra-Fernandez, I., Prietula, M., & Madey G. (2014). SimEOC: a distributed web-based virtual emergency operations center simulator for Training and Research. *International Journal of Information Systems for Crisis Response and Management*, in work.

- Xia, Weidong, Irma Becerra-Fernandez, Arvind Gudi, and Jose Rocha-Mier, "Emergency management task complexity and knowledge-sharing strategies." *Cutter IT Journal* 24.1 (2011): 20.

- Becerra-Fernandez, I. Prietula, M., Madey, G. , Rodriguez, D., Gudi, A., and Rocha, J., "Project Ensayo: A Virtual Emergency Operations Center ", *Sixteenth International Conference on Management of Technology (IAMOT'07)*, May 2007, Miami Beach, Florida.

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Field Research Report

- Nikolai, C. (2010, June). *Miami-Dade Emergency Operations Center Field Research Report*. Field Research Report, University of Notre Dame Zahm Grant.

Project Posters

- Cynthia Nikolai, Gregory Madey, Irma Becerra-Fernandez, Michael Prietula, "Virtual Emergency Operations Center for Training and Research", *7th International Conference on Information Systems for Crisis Response and Management (ISCRAM 2010)*, Seattle, May 2010 (poster)

References to Review

Design Documents

- Cynthia Nikolai, "SimEOC Summary", March 15, 2014
- vEOC Assumptions and Requirements Document v.5 (Jan 2012)
- vEOC System Capabilities (2011)

Emergency Management Background

- **IS-230.D: Fundamentals of Emergency Management**
- http://www.training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=IS-230.d
- **IS-100.B: Introduction to Incident Command System, ICS-100**
- http://www.training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=IS-100.b

Acknowledgments

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Acknowledgments (cont'd)

- You, for your service

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Questions

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