PSCR

User Interface & User Experience

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Disclaimer

Certain commercial entities, equipment, or materials may be identified in this document in order to describe an experimental procedure or concept adequately.

Such identification is not intended to imply recommendation or endorsement by the National Institute of Standards and Technology, nor is it intended to imply that the entities, materials, or equipment are necessarily the best available for the purpose.

*Please note, all information and data presented is preliminary/in-progress and subject to change.

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Acronym Glossary

- AR/VR = Augmented Reality/ Virtual Reality
- EKG = Electrocardiogram
- EMS = Emergency Medical Services
- HUD = Heads-Up Display
- PS = Public Safety
- PSIAP = Public Safety Innovation Accelerator Program
- UI/UX = User Interface/ User Experience

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Agenda

- Portfolio Overview
- Project Highlights
- PSIAP-UI Grant
- Prize Challenge
- VR Usability – Kevin Mangold
- Video Quality Survey – Margaret Pinson

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PSCR User Interface & User Experience

Mission:
Work with the public safety community, stakeholders, and vendors to create an environment that encourages industry to develop reliable, intuitive, and mission-focused technology for the public safety community.

- Projects
  - User Experience Research and Testing Methodologies for New PSCR Technologies
  - Video and Image Quality
  - Leveraging AR/VR for Improved UI - Tests, Development, and Measurement

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Usability Research and Testing Methodologies

Principal Investigator – Mary Theofanos

Goal: Capture and define first responder user requirements for next gen technology

Approach:

- Conducted 200+ interviews across the United States
- Large scale surveys to capture user problems, needs, and future requirements and opportunities.

Outcome:

- User-Identified Needs and Requirements
- Context-based Usability Guides
- Test Method and Environment for Assessing Technology Effectiveness

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Image and Video Quality – No Reference Metric

Principal Investigator – Margaret Pinson

Goal: Intelligent cameras and networks

Approach:

- Datasets that demonstrate PS needs and problems.
- Conduct multiple surveys to capture human assessment of video and image quality.

Outcome: Work with industry, academia, and public safety to create solutions.

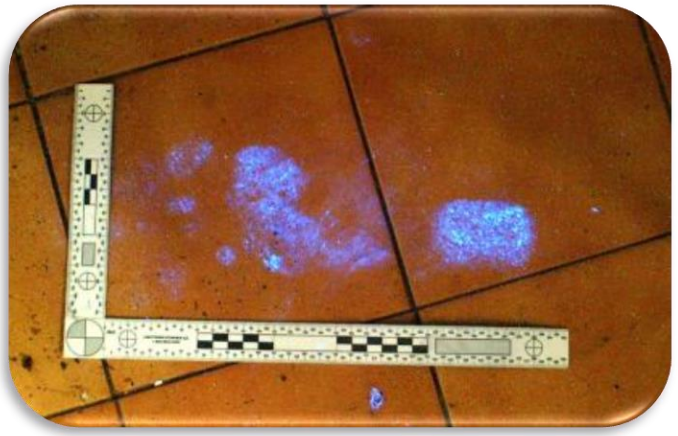

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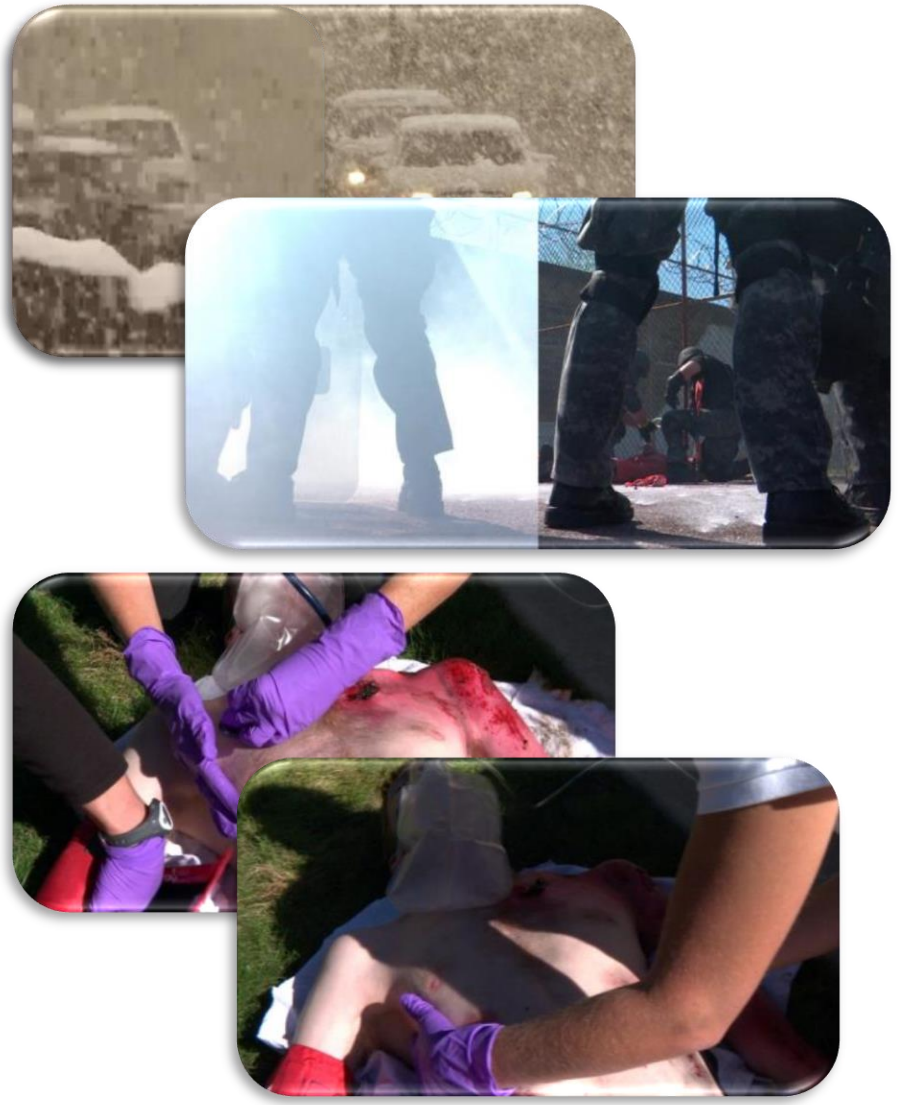
Image and Video Quality – Obscurant Removal and PS Camera Apps

Identified state of current technology for First Responder Cameras

Issues preventing practitioner from key information

Solution: Develop algorithms and applications to improve public safety camera applications



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AR/VR Environment for Improved UI

Principal Investigator – Scott Ledgerwood

Goal: Leverage virtual reality and augment reality as a tool to develop and test user interfaces for public safety.

Approach:

- Create unique content for variety PS scenarios.
- Incorporate instrumentation to assess the effectiveness and efficiency

Outcome:

- An environment that can be reproduced with simple equipment
- Rapid prototyping for industry and academia
- Lower resources and risks are testing new technology
- Potential to leverage testing environments for training on interfaces

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Example PSCR VR Environment

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PSIAP-UI Award Recipients

NC STATE UNIVERSITY

RTI INTERNATIONAL

- Investigating Emergency Response Performance with VR-based Intelligent User Interfaces

Georgia Tech Research Institute

- ARTEMIS: Augmented Reality Testing of Equipment in Multiple Immersive Simulations

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PSIAP-UI Award Recipients

- FirstSimVR - a versatile multimodal platform for simulating and evaluating first responder interfaces

- Design, Prototyping and Evaluation of Next Generation Public Safety User Interfaces

- Glove-Based Home-to-Ambulance Simulation Environment

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PSIAP-UI Award Recipients

traclabs

- Virtual and Augmented Laboratory for Objective Realities (VALOR)

TEXAS A&M UNIVERSITY

Northeastern

- Cognition-driven Display for Navigation Activities (Cog-DNA): Personalized Spatial Information System Based on Information Personality of Firefighters

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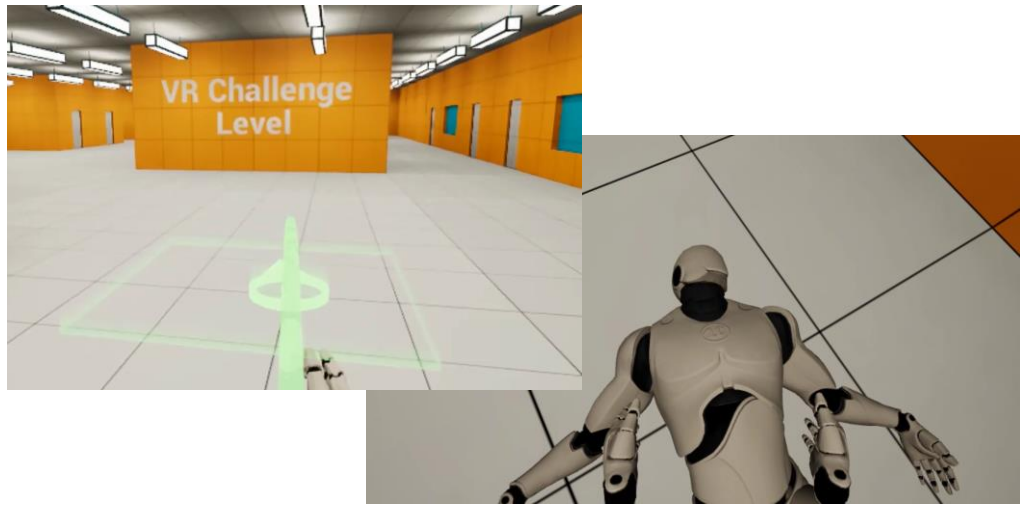
AR/VR Environment for Improved UI

Contestants created innovative user interfaces in a virtual heads-up display to assist participants in navigating to an objective while avoiding hazards.

- Compete for fastest time – built-in instrumentation for time/distance
- Functionality and quality of HUD
- Drive public safety content in VR.
- Go beyond HUD and develop innovative technology that may be used when interacting for first responder.

Live Challenge is taking place tomorrow!

Demos Thursday and Friday



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VR Navigation Heads-up Display Environment

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AR/VR Environment for Improved UI – Finalist

FEATURING:

Screen Door Labs

ENGR DYNAMICS

ENGINEERING: IT'S A PEOPLE PROBLEM

FACTUALVR

FACTUALVR - COMPLETE SITUATIONAL AWARENESS

FEATURING:

'Protect Communities, for Life Flows from Them'

Guardian Airwaves

AR/VR Development for Public Safety Professionals & First Responders

NEXTGEN Interactions

LOOKON MEDIA

VIRTUAL REALITY TECHNOLOGY UNIVERSE

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Measuring Usability of Virtual Reality

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Measuring Usability of Virtual Reality

- New doesn't *always* mean better
  - How do we define *better*?
  - Is it *actually* better?
  - How much better?
  - How much of a learning curve is needed to become proficient?
  - How do we know?

- Virtual/augmented reality has the potential to be a significant game changer…
  - … but there is more to it than just the technology.

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Measuring Usability of Virtual Reality (cont.)

- From ISO 9241-11:2018:
  - Usability
    - is the extent to which a system, product or service can be used by specified users to achieve specified goals with **effectiveness**, **efficiency** and **satisfaction** in a specified context of use
  - Effectiveness
    - **accuracy** and **completeness** with which users achieve specified goals
  - Efficiency
    - **resources used** in relation to the results achieved
  - Satisfaction
    - extent to which the user's physical, cognitive and emotional responses that result from the use of a system, product or service **meet the user's needs and expectations**

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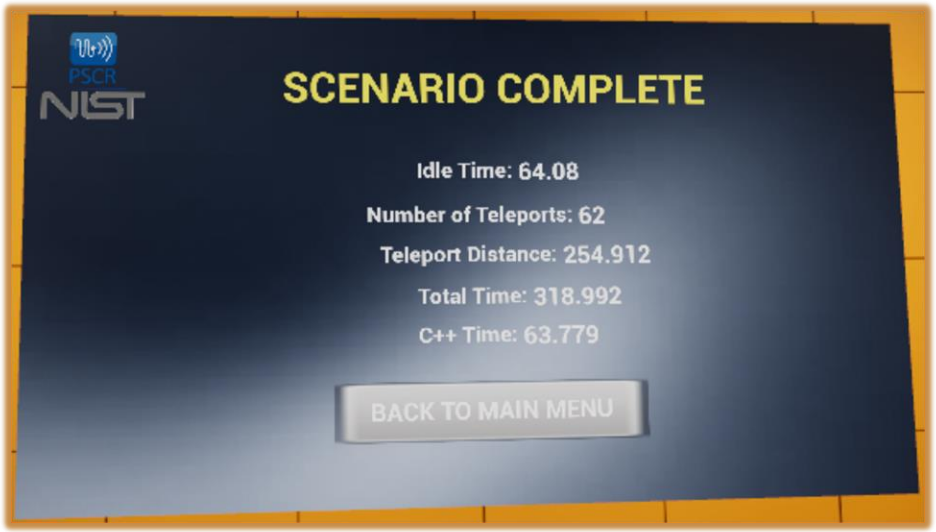
Measuring Usability of Virtual Reality (cont.)

- What interactions will be measured?
  - Currently
    - Button presses and how it relates to in-environment actions
      - E.g., a trigger pull/release maps to teleportation or movement
    - Timing
      - Total duration
      - Timestamps for all inputs/interactions
  - Under investigation
    - Eye gaze
    - Head movement
    - Controller movement
    - Physiological characteristics (e.g., EKG)



Measuring Usability of Virtual Reality (cont.)

- What are some visual user interface components that will be looked at?
  - User location(s)
  - Time
  - First Responder Equipment
    - Internal temperature, remaining oxygen, heart rate
  - Environmental concerns
    - Temperature, carbon monoxide

- Which characteristics of each component are important?
  - Necessity
    - Avoid information overload
  - Size
  - Location
  - Visual representation
    - For example, would the remaining air in the tank be best represented as a 0-100, a thermometer-like gauge, or a typical pressure gauge?

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Measuring Usability of Virtual Reality (cont.)

- How will we generate user feedback and data?
  - Follow methods and guidance from *NIST Handbook 161, Usability Handbook for Public Safety Communications: Ensuring Successful Systems for First Responders*
- Parallel Design
  - This is already in progress through the submissions of the challenge participants
- Record performance data within the virtual environment
  - E.g.,

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[2018.05.07-17.36.28] [CONTROLLER] [14428 - TriggerPressed]
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- Cognitive walkthroughs / expert reviews
  - Focus Groups
- Usability testing
  - Followed by user interviews
- Surveys and questionnaires

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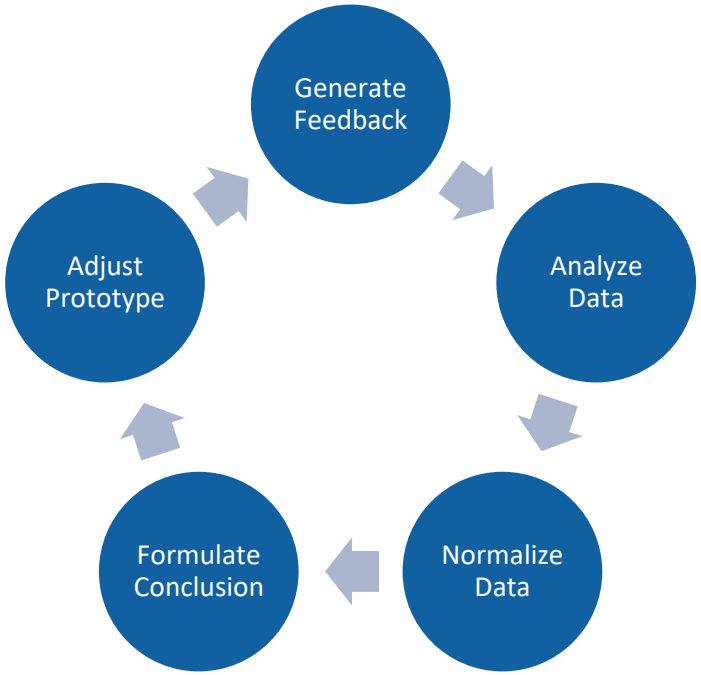
Measuring Usability of Virtual Reality (cont.)

- How will this all be measured and evaluated?
  - Iterative process
  - Start with baseline virtual reality environment (initial prototype)
  - Generate feedback / data
  - Data analysis and normalization
    - Compare with baseline
    - Compare with the other participants
  - Formulate conclusion
    - Final findings will be published and publicly available
  - Adjust prototype and repeat



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Video Quality Survey

Margaret Pinson
National Telecommunications and
Information Administration
Institute for Telecommunication Sciences

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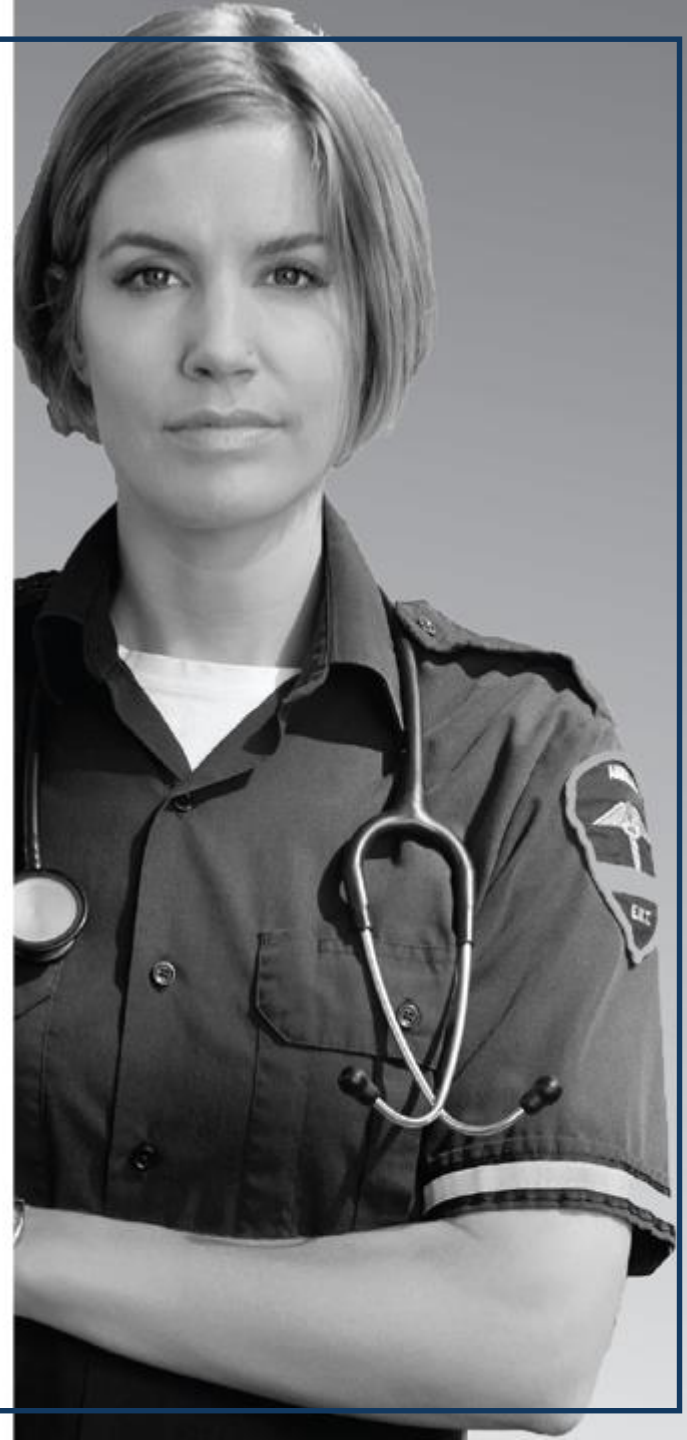


Camera Innovation

Camera Capture

Network Optimization

Video Quality for Public Safety Experiment

I need your help

- 6 choices
- 20 min
- Thank you gifts
  - $10 Amazon gift certificate
  - Stylus pen

Video Quality for Public Safety Experiment

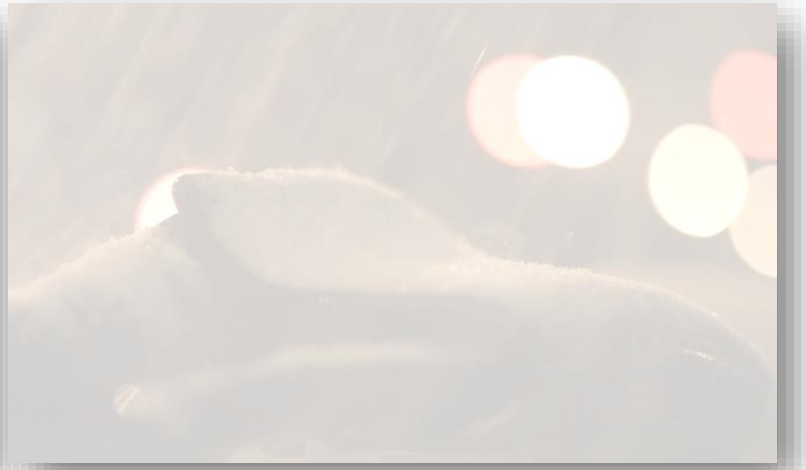
Crime Scene

Crime Walkthroughs!

Fireground

Search & Rescue

Prison Riot



Weather & Vehicles

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Video Quality for Public Safety Experiment

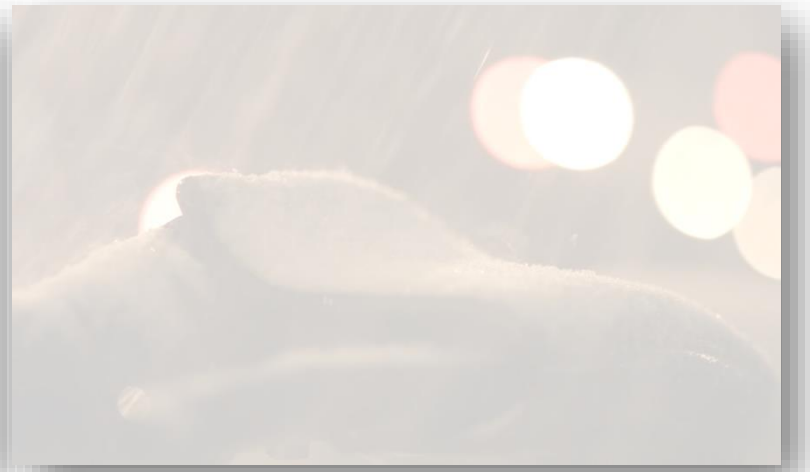
Crime Scene

Crime Walkthroughs

Fireground

Search & Rescue

Prison Riot



Weather & Vehicles

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Video Quality for Public Safety Experiment

Crime Scene

Crime Walkthroughs

Fireground

Search & Rescue

Prison Riot

Weather & Vehicles

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Video Quality for Public Safety Experiment

Crime Scene

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Fireground

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Weather & Vehicles

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Would you feel confident relying on these videos?

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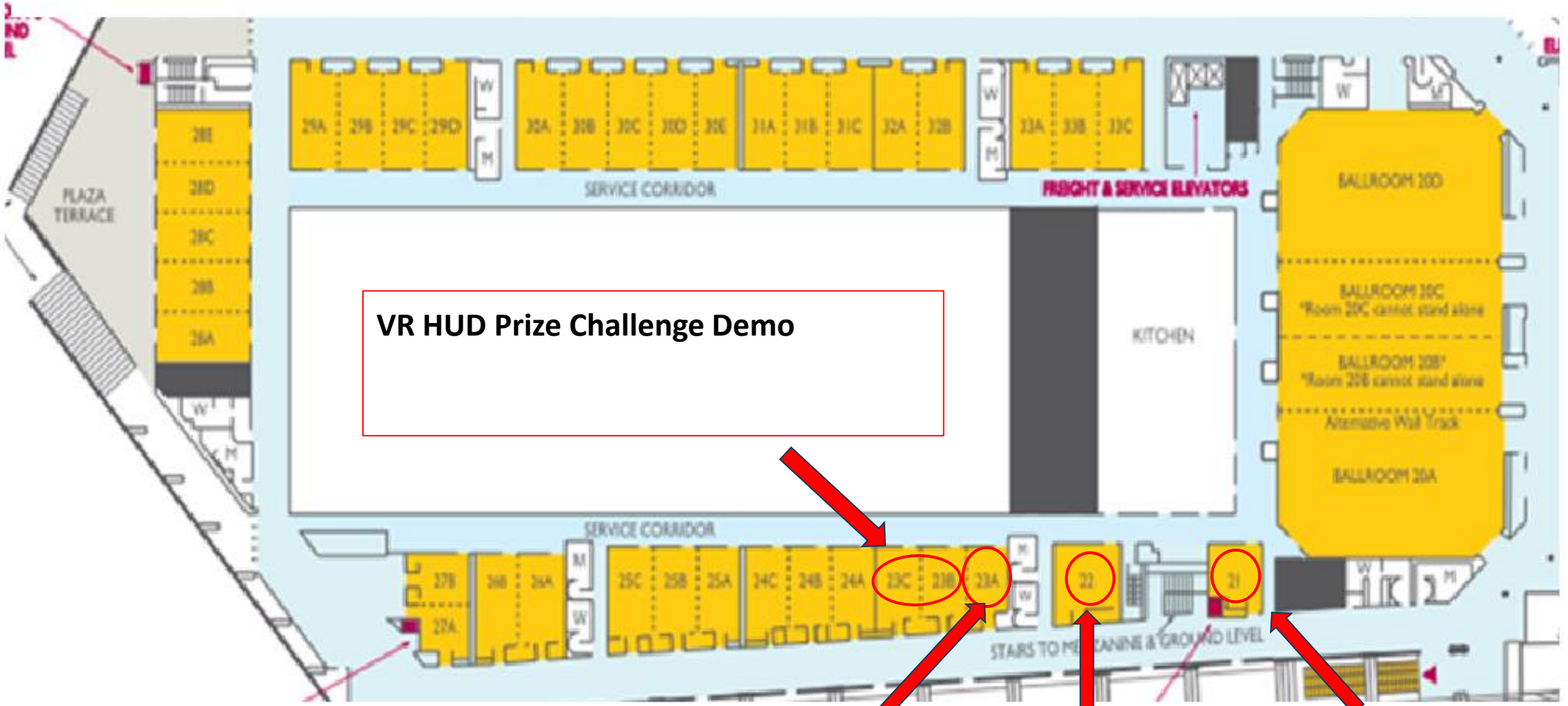
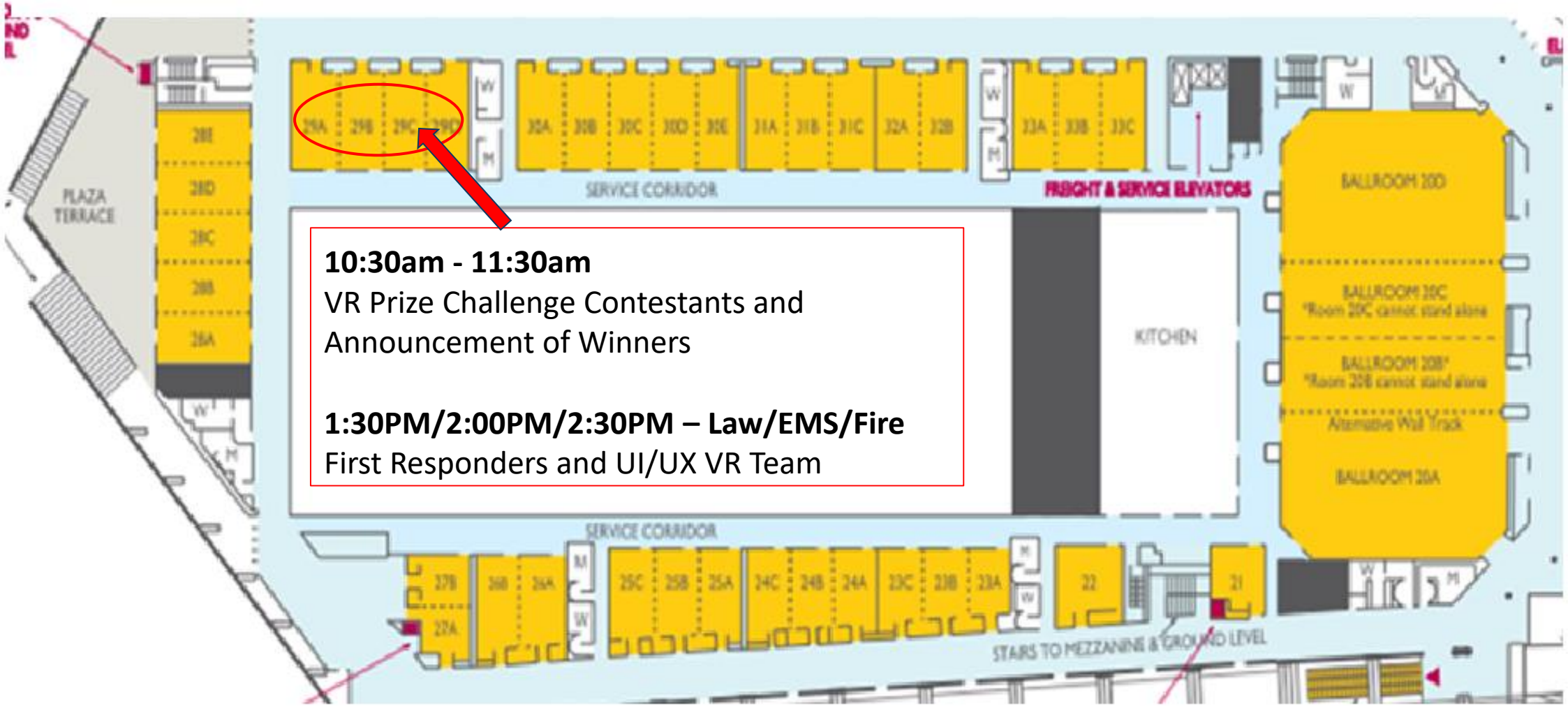
UI/UX Activities - Thursday

8:30am- 11:30am
UI/UX Track Sessions

UI/UX Activities – Tues-Fri



UI/UX Activities - Friday

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THANK YOU
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SPRINGS
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