

The Wide Area Virtual Environment – Lessons Learned

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ENHANCING THE IMMERSIVE EXPERIENCE &
MONITORING/CONTROLLING THE WAVE

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Enhancing the Immersive Experience

- The forgotten backdrop
- Better way to tie training (foreground) with WAVE
 - Virtual actions → Affect trainees
 - Trainee reactions + physical environment reactions
 - User actions → influence virtual environment
 - Based on user decisions + interactivity with VE



The Wide Area Virtual Environment – Lessons Learned

Causing Physical Environment Reactions



The Wide Area Virtual Environment – Lessons Learned

Causing Physical Environment Reactions: Debris & Destruction Devices



Air cannon + debris attachment



Air cannon + pusher attachment

The Wide Area Virtual Environment – Lessons Learned

Causing Physical Environment Reactions: Debris & Destruction Devices



The Wide Area Virtual Environment – Lessons Learned

Causing Physical Environment Reactions: Smell & Smoke Devices



Smell generator



Smoke generator

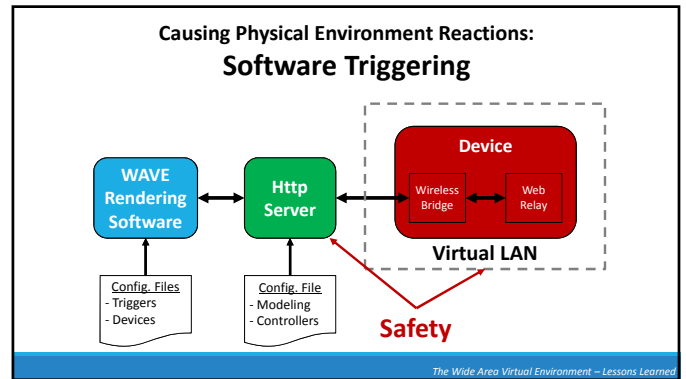
The Wide Area Virtual Environment – Lessons Learned

Causing Physical Environment Reactions: Hardware Triggering

Web relay

Wireless networking

The Wide Area Virtual Environment – Lessons Learned



Causing Physical Environment Reactions: Software Triggering

- Tied to VE events
- Timing considerations
 - Latency
 - Event → Relay → Device
 - Event trigger time vs. Physical reaction time
 - E.g. RPG = trigger smell/smoke early, debris synched with AV effects

The Wide Area Virtual Environment – Lessons Learned

Causing Physical Environment Reactions: Device Placement

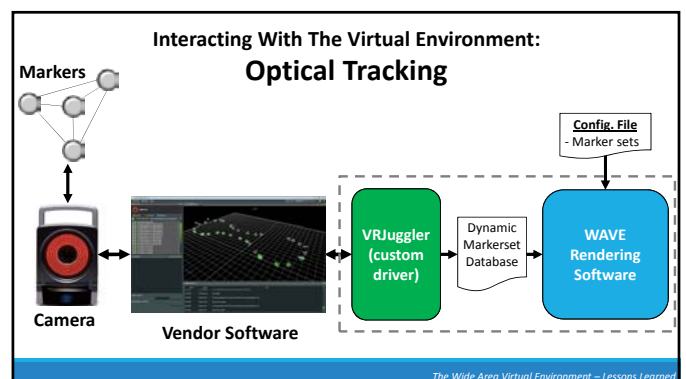
- Smoke/smell planning
- Debris field
- User & equipment safety

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Interacting With The Virtual Environment

- Operator triggered events
- Based on trainee decisions
- User triggered events → tracking
 - Head tracking
 - Simulated weapons

The Wide Area Virtual Environment – Lessons Learned



Interacting With The Virtual Environment: Optical Tracking – Head Tracking

- Marker configurations
- Non-symmetric
- Spacing \geq 2 inches



Prototype

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Interacting With The Virtual Environment: Optical Tracking – Simulated Weapons

- 1st Prototype + hand gesture glove
- False positives
- Latency issues
- Current = Fully integrated
- LED to simulate markers
- Occlusion test detects weapon fire

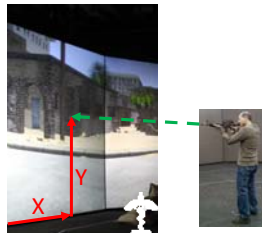


M4 - image

The Wide Area Virtual Environment – Lessons Learned

Interacting With The Virtual Environment: Optical Tracking – Simulated Weapons

- Firing weapon (intersection testing)
- Map physical \rightarrow virtual environment
- Physical screen intersection
- Physical – Virtual mapping (viewport)
- Camera-VE intersection along ray



Weapon simulation in WAVE

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Interacting With The Virtual Environment: Optical Tracking – Simulated Weapons

- Event handling
- Objects configured with EventHandlers
- ObjectShotEvent sent to object \rightarrow VE reaction



Insurgent in Virtual Environment

The Wide Area Virtual Environment – Lessons Learned

Monitoring/Controlling the WAVE

IP-Based
Programmable/Controllable



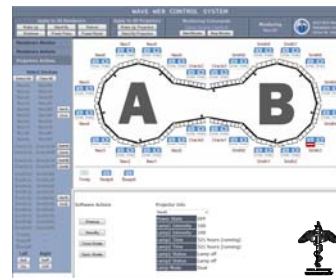
Network



Control Station

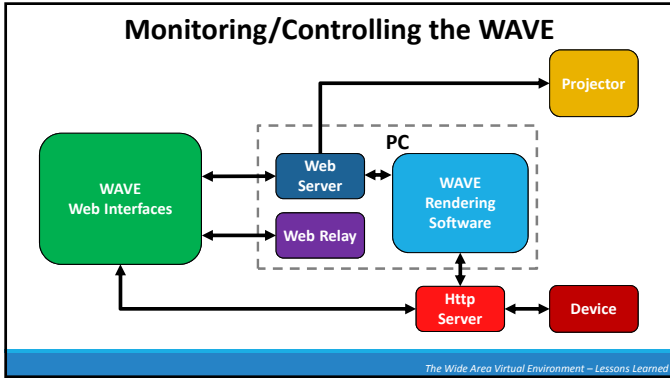
The Wide Area Virtual Environment – Lessons Learned

Monitoring/Controlling the WAVE: Web Interface



- Turn on/off equipment
- Monitor equipment status
- Run training scenarios
- Observe/record training
- Safety overrides

The Wide Area Virtual Environment – Lessons Learned



Monitoring/Controlling the WAVE: Running the WAVE

- 1 Large VE
- Transition between pods

The image shows a large, circular virtual environment pod with multiple computer workstations around the perimeter. Red arrows indicate the transition between different pods.

The Wide Area Virtual Environment – Lessons Learned

Monitoring/Controlling the WAVE: Running the WAVE

- 4 Configurable zones
- Load scenes
- Mapped inputs
- Linkable

The image shows a top-down view of a virtual environment pod divided into four zones labeled A, B, C_A, and C_B. Red dashed lines separate the zones, and yellow circles with arrows indicate movement or transitions between them.

The Wide Area Virtual Environment – Lessons Learned

Monitoring/Controlling the WAVE: Running the WAVE

- Exercises
- Linear progression
- Hotspots → triggering
- Map inputs to zones

The image shows a screenshot of the 'WAVE Exercise Control' web interface. It features a 3D street scene with various hotspots and a control panel on the right with a list of exercises.

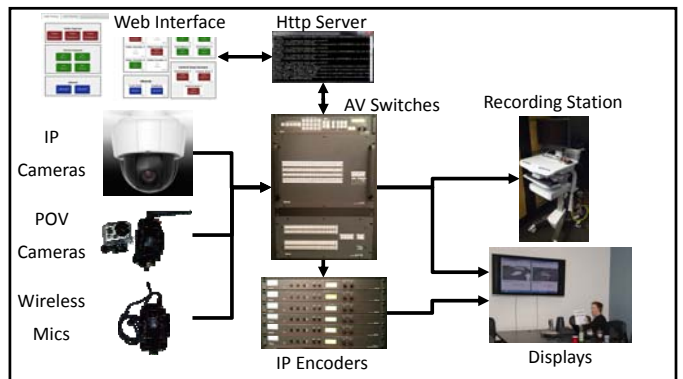
Web Interface

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Monitoring/Controlling the WAVE: Observing & Recording

The diagram shows the observation and recording system. It includes an 'IP PTZ Camera' (top left), a 'Web Interfaces' panel (middle) with multiple camera feeds, and a 'Recording Station' (bottom right) with a monitor and keyboard.

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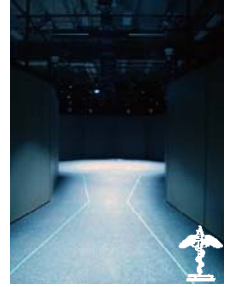
In the Works

- Integrated training equipment
 - e.g., Human patient simulators (HPS)
- Other uses for tracking
 - Swap out physical devices
 - Enable/disable devices (safety)



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In the Works – Heaters & Lighting



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In the Works



Wearable Remote



Motion Platform

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Thank You

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