



# Leveraging Open Standards to Create Mixed Reality Medical Simulations

A Standards-Based Approach to Tactical Combat Casualty Care Training

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# Presentation Overview and Objectives

1

## Leveraging Open Standards

Open standards enable interoperability and flexibility in mixed reality medical simulation systems.

2

## Enhancing Training Effectiveness

Modular architectures and interoperability improve training for Tactical Combat Casualty Care and similar fields.

3

## Multi-vendor Integration Insights

Lessons learned from integrating multiple vendors highlight the importance of standardization and scalability.

4

## Future Directions

Future efforts focus on expanding standardization for military and civilian healthcare applications.

# The Challenge: Bridging the Gap in Medical Training

# Traditional Medical Training Faces Critical Limitations

## High-Fidelity Manikins

- ✓ Provide essential tactile feedback
- ✓ Enable hands-on procedural practice
- ✗ Costly and difficult to reconfigure
- ✗ Limited scenario flexibility
- ✗ Require significant instructor supplementation

## Virtual Simulations

- ✓ Flexible and cost-effective
- ✓ Easy to modify scenarios
- ✗ Lack physical interaction
- ✗ Cannot build procedural confidence
- ✗ Missing tactile realism

**The Gap: Need both tactile realism AND scenario flexibility**

# Our Solution - Mixed Reality Trainer

**Physical Foundation:** Manikins provide tactile interaction

**AR Enhancement:** Augmented reality overlays add dynamic content

**Virtual Anatomy:** See internal structures aligned with physical manikin

**Real-Time Feedback:** Physiological simulation responds to interventions

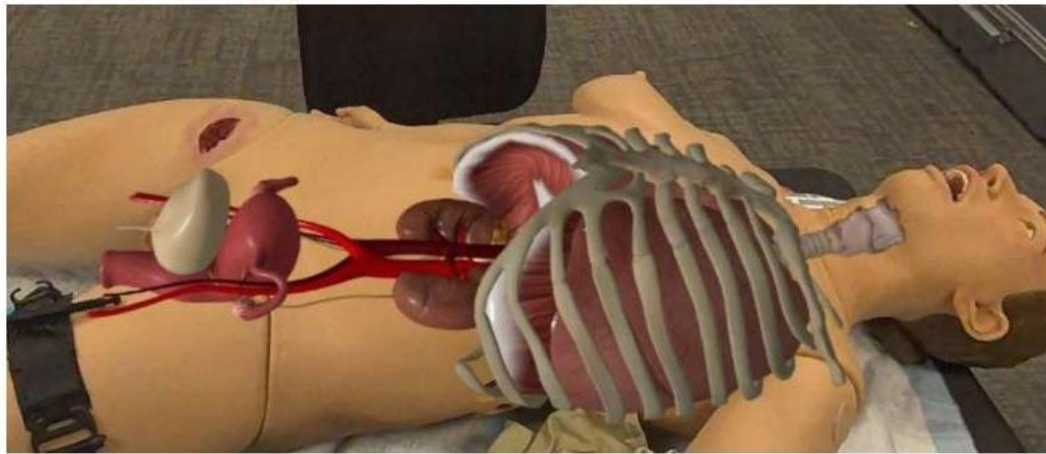
**Reduced Costs:** Enhance affordable manikins vs. expensive high-fidelity systems



## Key Benefits:

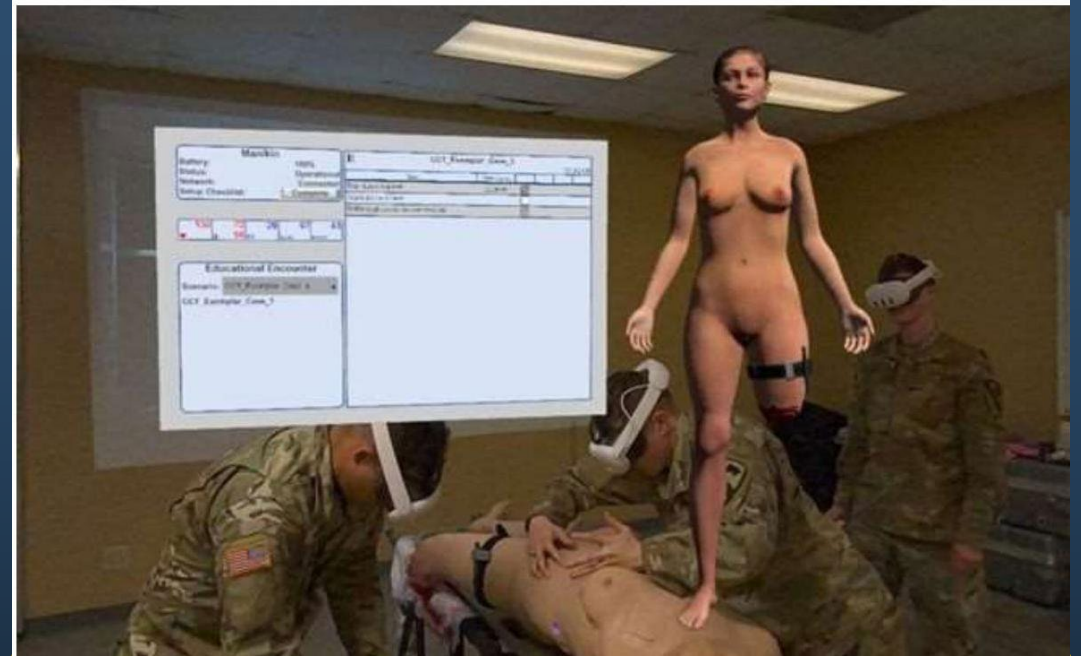
- Hands-on practice with enhanced realism
- Flexible scenarios without hardware reconfiguration
- Reduced instructor burden through automation
- AR adds value to manikins through use as instruction aids
- Affords use with lower fidelity/lower cost manikins or task trainers

# Training Capabilities in Mixed Reality



## Underlying Anatomy Visualization

AR overlays present 3D anatomical models registered to the manikin. The anatomy responds dynamically to injuries and interventions, such as lung collapse in a pneumothorax scenario.



## Virtual Casualty & Assessment

A virtual “homunculus” provides visual patient cues, while the instructor's AR view includes an automated checklist for objective performance tracking, reducing cognitive load.

# Open Standards

# Why Open Standards?



## Challenges of Proprietary Systems

Proprietary architectures increase costs and limit innovation due to custom interfaces and vendor lock-in.

## Benefits of Open Standards

Open standards enable modularity, interoperability, and competitive sourcing, reducing development time and costs while aligning with the Department of Defense's **Modular Open Systems Approach** (MOSA).

## Layered Integration Approach

Standards like **MoHSES**, **JETS**, and clinical ontologies enable seamless communication and semantic consistency.

## Strategic Impact

Open standards support resilient, scalable, and future-ready training ecosystems with multi-vendor interoperability.

# The Open Standards Framework

We use a layered stack of open standards, each addressing a specific integration challenge—from real-time data messaging to consistent clinical terminology.

Standard	Layer	Integration Challenge Addressed	Implementation
xAPI	Data	Sharing learner performance data across unrelated systems	xAPI Gateway with Clinical Simulation Profile
FMA	Semantic	Anatomical location mapping	Standardized terms across 5 vendors
SNOMED-CT	Semantic	Intervention & physical findings terminology	Standardized procedure codes across 5 vendors
DDS	Transport	Real-time publish-subscribe messaging	OMG DDS 1.4 with custom QoS
MoHSES	Component	Vendor-specific APIs, real-time data	DDS pub/sub with clinical topics
JETS	Federation	Site-to-site coordination, patient ownership	HLA gateway with ownership transfer

# Data Interoperability: xAPI (Experience API)

- **Flexible Learning Data Standard**
- xAPI captures detailed learning data from varied digital and real-world experiences beyond traditional LMS platforms.
- **Actor-Verb-Object Statements**
- Learning statements use a simple Actor-Verb-Object structure to describe learner actions clearly and effectively.
- **Interoperability and Openness**
- xAPI is an open standard enabling interoperability across devices, vendors, and systems for unified training data.
- **Unified Data for Analytics**
- xAPI unifies data from multiple sources, supporting analytics and adaptive training in realistic environments.



# Semantic Interoperability: Clinical Ontologies

## The Challenge

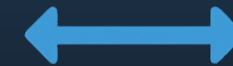
- Technical connectivity  $\neq$  Meaningful interoperability
- Systems must share common vocabulary

## SEMANTIC INTEROPERABILITY

Clinical Ontologies



FMA



SNOMED-CT

# Semantic Interoperability: Anatomical Locations

## Foundational Model of Anatomy (FMA)

- 75,000+ anatomical entities
- 120,000+ relationships
- Precise specification of locations
- Down to cell level (not useful in this context)
- Identifying body locations for insults and injuries
- Traversing up or down to find a highest-common-denominator level of granularity for modules (MoHSES)
- Subset the data – reduce to a small enough data set that it can be used as a graph in real-time
- Example: "femoral artery" = FMA:70248

# Semantic Interoperability: Clinical Terminology

## Systematized Nomenclature of Medicine - Clinical Terms (SNOMED-CT)

- Comprehensive clinical terminology
- Standardizes procedures, physical findings, diseases
- Identifying clinical findings for insults/injuries.
- Identifying clinical procedures for interventions.
- Example: "penetrating wound" = SNOMED: 262560006
- Example: "tourniquet application" = SNOMED:225369003
- Example: "needle decompression" = SNOMED:g1602002

# Transport Interoperability

## Data Distribution Service (DDS)

- Middle-ware specification from Object Management Group (OMG).
- Describes a data-centric publish/subscribe model for distributed application communication and integration.
- Enables scalable, real-time, dependable, high-performance, and interoperable data exchanges.
- <https://www.omg.org/spec/DDS/>

# Component-Level Interoperability: Modular Healthcare Simulation & Education System (MoHSES)

## MoHSES Modules:

- **Physiology Engine Module**

Manages patient state (BioGears)  
Publishes vital signs: HR, BP, SpO2, RR  
Responds to intervention messages

- **Manikin Module**

Publishes intervention detection events  
Synchronized breathing/pulse rates

- **AR Student Display Modules**

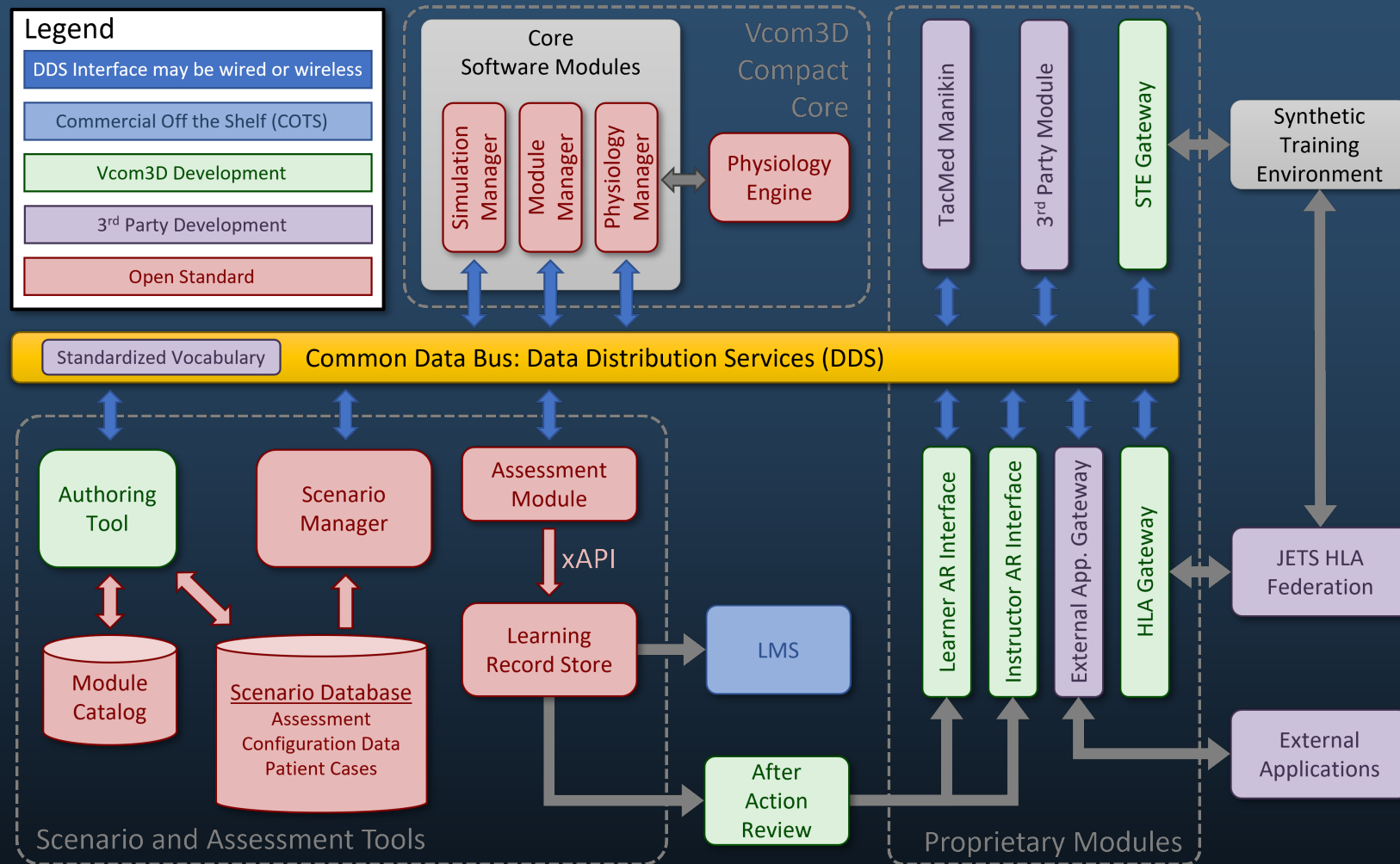
Subscribe to patient state  
Publish user interactions

- **AR Instructor Interface**

Publishes scenario control commands  
Subscribes to all data for assessment

- **Virtual Patient Monitor**

Subscribes to vitals  
Displays patient monitor interface



# Federation-Level Interoperability: Joint Emergency Trauma Simulation (JETS)

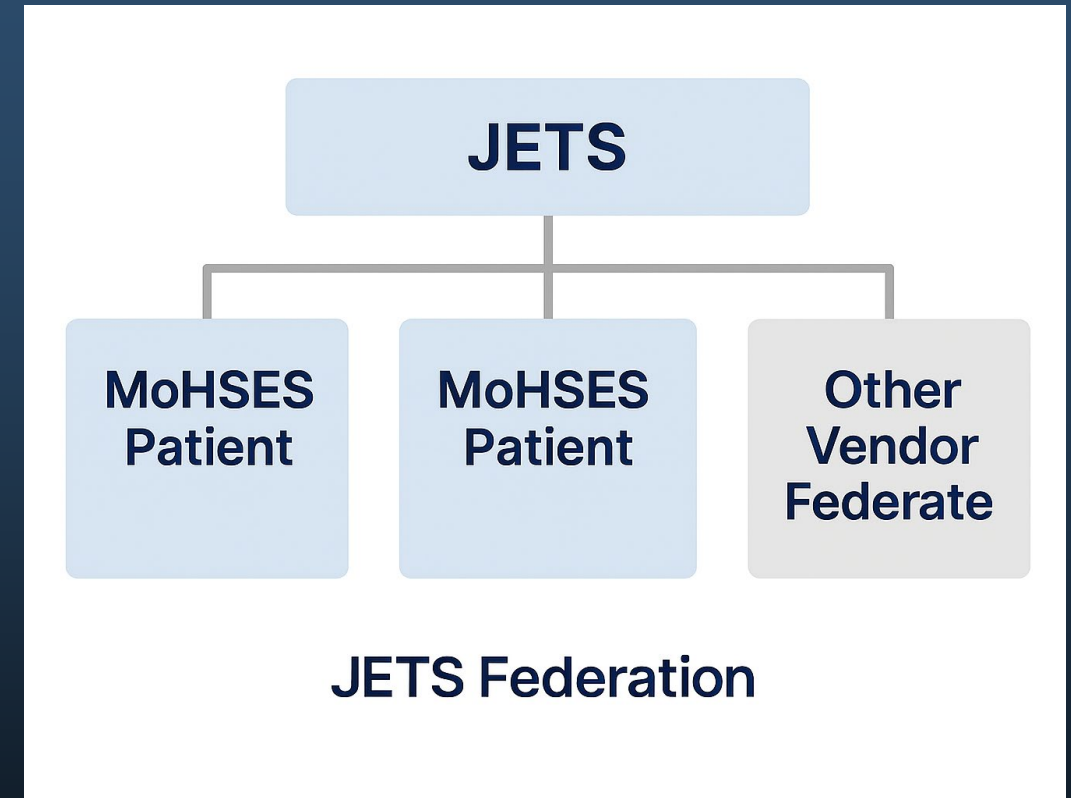
## What is JETS?

Joint Emergency Trauma Simulation

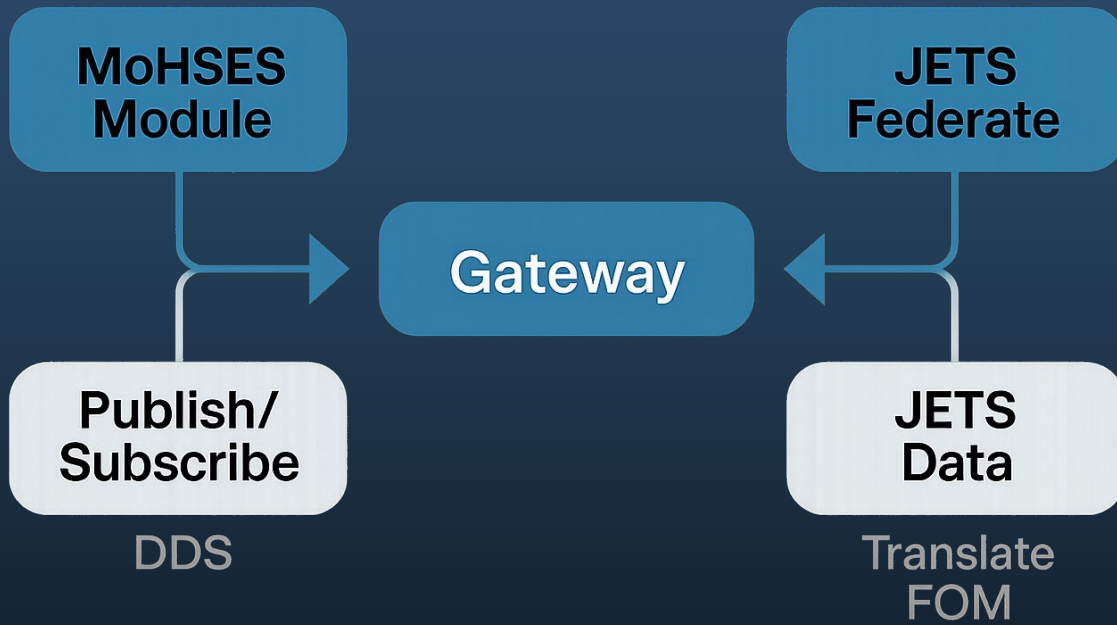
HLA federation for distributed military medical training

## JETS Enables:

- **Mass casualty exercises**  
Multiple patients managed simultaneously
- **Echelon of care progression**  
Point-of-injury → Role 1 → Role 2 → Role 3
- **Multi-site training**  
Geographically distributed learners
- **After-action review**  
Aggregated data from all systems



# Connecting MoHSES and JETS



## MoHSES/JETS Gateway:

- Operates as both MoHSES module AND JETS federate
- Translates between component-level and federation-level data
- Built to dynamically load the current JETS Federate Object Model (FOM)
- Reusable pattern for standards integration

# Case Study: Combat Casualty Trainer (CCT)

Multi-Vendor Interoperability Architecture

# System Architecture: A Modular Open Systems Approach (MOSA)

## 1. Enhance competition

open architecture with severable modules, allowing components to be openly competed.

## 2. Facilitate technology refresh

delivery of new capabilities or replacement technology without changing all components in the entire system.

## 3. Incorporate innovation

operational flexibility to configure and reconfigure available assets to meet rapidly changing operational requirements.

## 4. Enable cost savings/cost avoidance

reuse of technology, modules, and/or components from any supplier across the acquisition life cycle.

## 5. Improve interoperability

allow severable software and hardware modules to be changed independently.

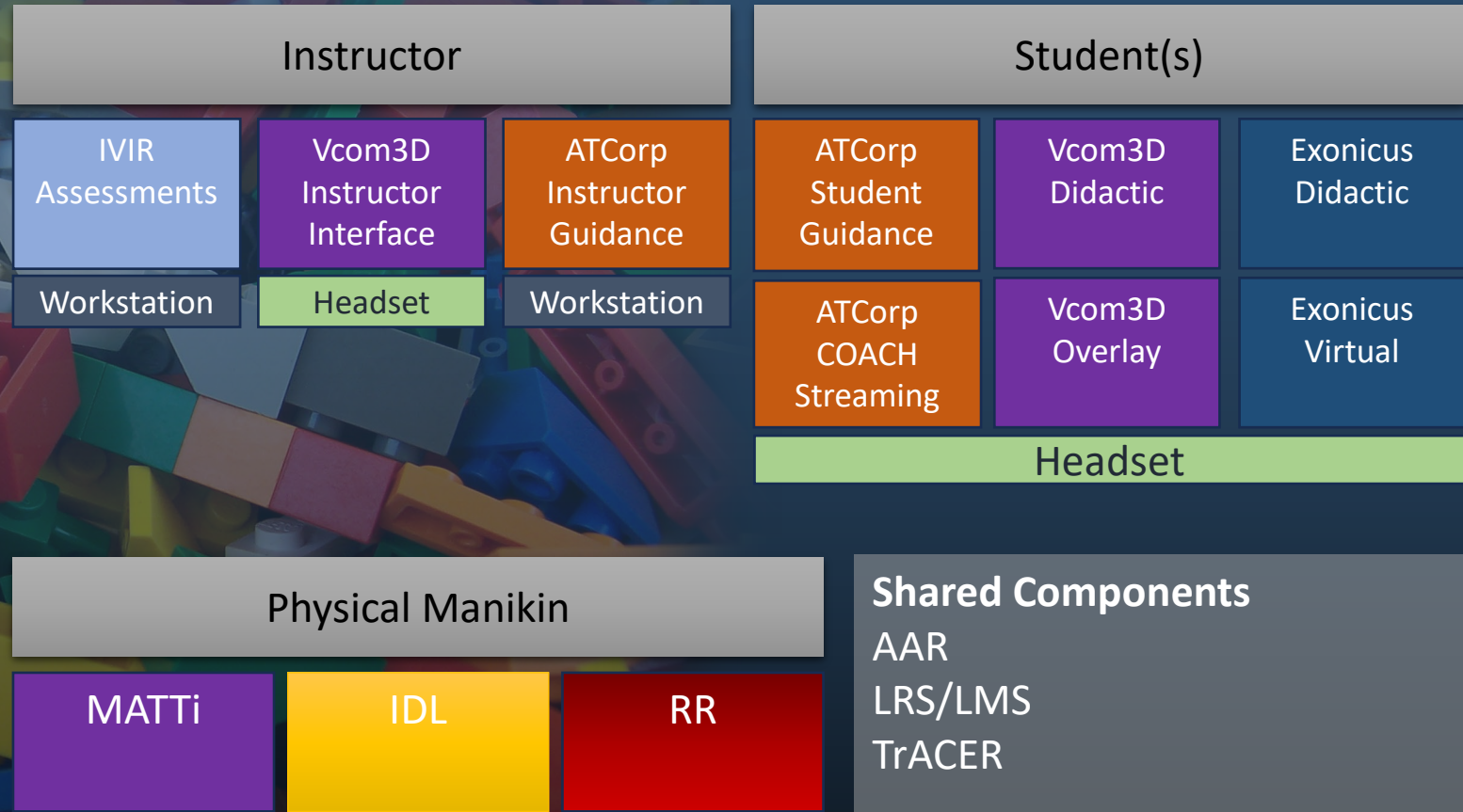
- Defense Acquisition Guidebook 3-2.4.1, Modular Open Systems Approach (2017)

Reference: <https://ac.cto.mil/mosa/>

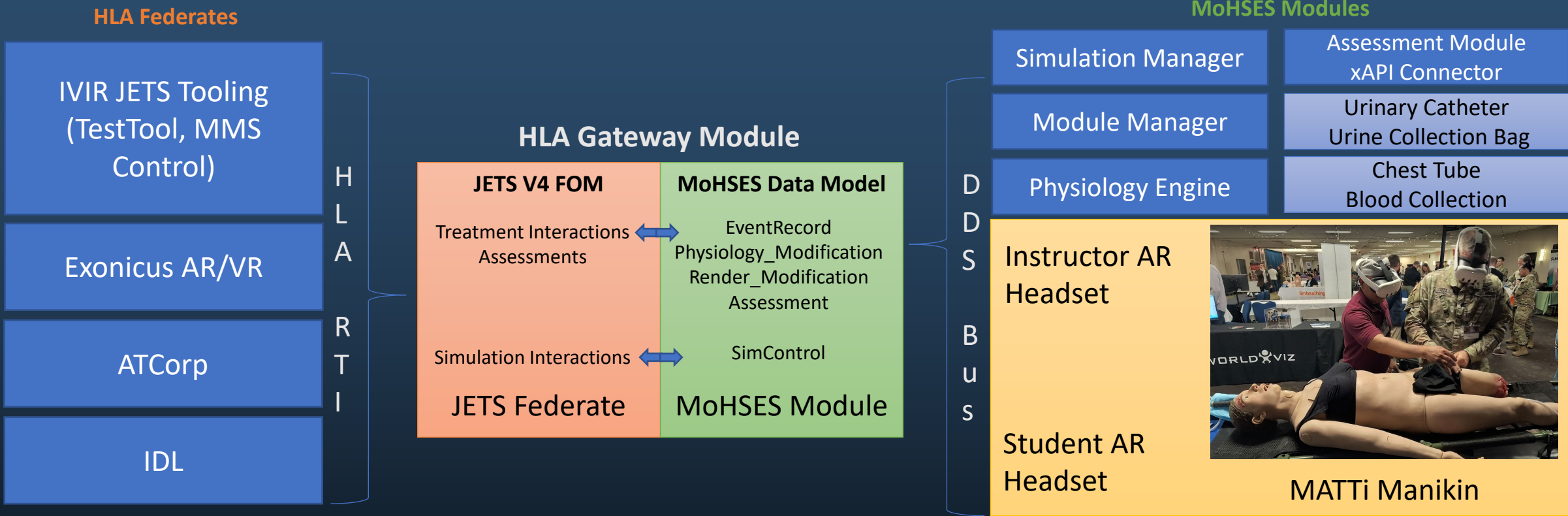
# What is composability?

A key concept within MOSA is composability, which refers to the ability of modular components to be easily combined and integrated to create larger, more complex systems. It's about designing modules with well-defined interfaces that allow them to work together seamlessly, regardless of their origin or creator.

# CCT Components and Composability



# CCT Final Touchpoint / Demonstration High Level Data Flow



## Collaborative Patient Case for Interoperability (developed with Interoperability Working Group)

A female Soldier has sustained traumatic blast injuries from a drone attack, including:





- Penetrating injury to the right side of her chest from shrapnel
- Tension pneumothorax on right side
- Amputation of the left lower leg

### Interventions

- Tourniquet
- Chest Seal
- Needle-D



# CCT Patient Case

Right pleural cavity	<b>FMA/9741</b>	C0225782 - Structure of right pleural cavity	
Right inframammary part of chest	<b>FMA/35348</b>	C0827121 - Right inframammary part of chest	
Penetrating wound	<b>SNOMEDCT_US/262560006</b>	C0043254 - Wounds, Penetrating	
Tension pneumothorax	<b>SNOMEDCT_US/233645004</b>	C0264558 - Tension Pneumothorax	
Traumatic amputation of limb	<b>SNOMEDCT_US/210771000</b>	C0433593 - Traumatic amputation of limb	
Wound hemorrhage	<b>SNOMEDCT_US/239161005</b>	C0241742 - Wound hemorrhage	
Space of right second intercostal compartment	<b>FMA/321189</b>	C4246466 - Space of right second intercostal compartment	
Needle chest decompression	<b>SNOMEDCT_US/1290622004</b>	C5880451 - Needle chest decompression	
Tourniquet procedure	<b>SNOMEDCT_US/241730005</b>	C0412797 - Tourniquet procedure	

# Injury: Penetrating Chest Wound

## SNOMED-CT Concept

- Penetrating wound

## FMA Location(s)

- Right side of chest
- Right inframammary part of chest

## JETS Location

- anteriorRightUpperChest

## JETS Type

- TissueDamageInjury

### Penetrating wound (262560006)

[Add to List](#)

Names	
Name	Term Type
Penetrating wound	PT
Penetrating wound (disorder)	FN
Penetrating injury	SY

UMLS Concepts	
Name	CUI
Wounds, Penetrating	C0043254

Hierarchy	
SNOMED CT Concept	
Clinical finding	
Disease	
Traumatic or non-traumatic injury	
Wound	
Open wound	
<b>Penetrating wound</b>	
Pellet wound of mouth	
Penetrating injury by arrow	
Penetrating injury by knife	
Penetrating injury caused by glass fragment	
Penetrating injury of oral cavity	
Penetrating injury of oropharynx	

Attributes	
ACTIVE:	1
DEFINITION_STATUS_ID:	900000000000073002
EFFECTIVE_TIME:	20020731
CTV3ID:	XA016

### Right inframammary part of chest (35348)

[Add to List](#)

Names	
Name	Term Type
Right inframammary part of chest	PT
Right inframammary part of chest wall	SY
Right inframammary region	SY

UMLS Concepts	
Name	CUI
Right inframammary part of chest	C0827121

Hierarchy	
Foundational Model of Anatomy Ontology	
Anatomical entity	
Physical anatomical entity	
Material anatomical entity	
Anatomical structure	
Postnatal anatomical structure	
Subdivision of cardinal body part	
Subdivision of body proper	
Subdivision of trunk	
Subdivision of front of trunk	
Subdivision of thorax	
Region of anterior chest	
Inframammary part of chest	
<b>Right inframammary part of chest</b>	

Attributes	
None.	

Relations		
<b>isa</b>		
Related From	Relation	Related to
Right inframammary part of chest	isa	Inframammary part of chest
<b>regional_part_of</b>		
Related From	Relation	Related to
Right inframammary part of chest	regional_part_of	Anterior chest wall
Right inframammary part of chest	regional_part_of	Anterior female chest
Right inframammary part of chest	regional_part_of	Female anterior chest wall
Right inframammary part of chest	regional_part_of	Male anterior chest wall

1 - 1 of 1 |< < > >|  
Items per page: 5

# Injury: Pneumothorax (open)

## SNOMED-CT Concept

- Tension pneumothorax

## FMA Location(s)

- Right side of chest
- Right pleural cavity

## JETS Location

- anteriorRightUpperChest

## JETS Type

- pneumothorax

### Tension pneumothorax (233645004)

[Add to List](#)

Names	
Name	Term Type
Tension pneumothorax	PT
Tension pneumothorax (disorder)	FN

UMLS Concepts	
Name	CUI
Tension Pneumothorax	C0264558

Hierarchy	
SNOMED CT Concept	Clinical finding
	Finding of trunk structure
	Finding of upper trunk
	Disorder of thoracic segment of trunk
	Disorder of thorax
	Disorder of pleura and pleural cavity
	Pneumothorax
	<b>Tension pneumothorax</b>
	Spontaneous tension pneumothorax
SNOMED CT Concept	Clinical finding

Attributes	
DEFINITION_STATUS_ID:	9000000000000074008
EFFECTIVE_TIME:	20020131
CTV3ID:	X101C
ACTIVE:	1

### Right pleural cavity (9741)

[Add to List](#)

Names	
Name	Term Type
Right pleural cavity	PT

UMLS Concepts	
Name	CUI
Structure of right pleural cavity	C0225782

Hierarchy	
Foundational Model of Anatomy Ontology	Anatomical entity
	Physical anatomical entity
	Immaterial anatomical entity
	Anatomical space
	Anatomical cavity
	Organ cavity
	Cavity of serous sac
	Pleural cavity
	<b>Right pleural cavity</b>

Attributes	
None.	

Relations	
-----------	--

# Injury: Limb amputation

## SNOMED-CT Concept

- Traumatic amputation of limb

## FMA Location(s)

- Left Leg (working on identifying left lower leg)

## JETS Location

- anteriorLeftProximalLowerLeg and posteriorLeftProximalLowerLeg

## JETS Type

- n/a

### Traumatic amputation of limb (210771000)

[Add to List](#)

Names	
Name	Term Type
Traumatic amputation of limb	PT
Traumatic amputation of limb (disorder)	FN

UMLS Concepts	
Name	CUI
Traumatic amputation of limb	C0433593

**Attributes**

ACTIVE: 1

**Hierarchy**

SNOMED CT Concept  
Clinical finding  
Disease  
Disorder of limb  
Open wound of limb  
**Traumatic amputation of limb**  
Traumatic amputation of lower extremity  
Traumatic amputation of upper limb

### Left leg (24981)

[Add to List](#)

Names	
Name	Term Type
Left leg	PT

UMLS Concepts	
Name	CUI
Structure of left lower leg	C0230443

**Attributes**

None.

**Relations**

has_constitutional_part		
Related From	Relation	Related to
Left leg	has_constitutional_part	Left fibula
Left leg	has_constitutional_part	Left tibia
Left leg	has_constitutional_part	Musculature of left leg

**Hierarchy**

Foundational Model of Anatomy Ontology  
Anatomical entity  
Physical anatomical entity  
Material anatomical entity  
Anatomical structure  
Postnatal anatomical structure  
Subdivision of cardinal body part  
Limb region  
Free limb region  
Free lower limb region  
Middle free lower limb region  
Leg  
**Left leg**

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Items per page: 5

# Injury: Hemorrhage

## SNOMED-CT Concept

- Wound hemorrhage

## FMA Location(s)

- Left Leg (working on identifying left lower leg)

## JETS Location

- anteriorLeftProximalLowerLeg and posteriorLeftProximalLowerLeg

## JETS Type

- hemorrhage

### Wound hemorrhage (239161005)

[Add to List](#)

Names	
Name	Term Type
Wound hemorrhage	PT
Wound hemorrhage (finding)	FN
Wound haemorrhage	PTGB

UMLS Concepts	
Name	CUI
Wound hemorrhage	C0241742

**Attributes**

EFFECTIVE\_TIME: 20140131

**Hierarchy**

SNOMED CT Concept  
Clinical finding  
Wound finding  
**Wound hemorrhage**  
Postoperative wound hemorrhage

SNOMED CT Concept  
Clinical finding  
Bleeding  
**Wound hemorrhage**

### Left leg (24981)

[Add to List](#)

Names	
Name	Term Type
Left leg	PT

UMLS Concepts	
Name	CUI
Structure of left lower leg	C0230443

**Attributes**

None.

**Relations**

has_constitutional_part		
Related From	Relation	Related to
Left leg	has_constitutional_part	Left fibula
Left leg	has_constitutional_part	Left tibia
Left leg	has_constitutional_part	Musculature of left leg

**Hierarchy**

Foundational Model of Anatomy Ontology  
Anatomical entity  
Physical anatomical entity  
Material anatomical entity  
Anatomical structure  
Postnatal anatomical structure  
Subdivision of cardinal body part  
Limb region  
Free limb region  
Free lower limb region  
Middle free lower limb region  
Leg  
**Left leg**

1 - 1 of 1 |< < > >|  
Items per page: 5

# Intervention: Needle Decompression

## SNOMED-CT Concept

- Needle chest decompression

## FMA Location(s)

- Space of right second intercostal compartment

## JETS Location

- anteriorRightUpperChest

## JETS Type

- releaseIntrapleuralPressure

### Needle chest decompression (1290622004) Add to List

Names	
Name	Term Type
Needle chest decompression	PT
Needle chest decompression for tension pneumothorax (procedure)	FN
Needle decompression thoracostomy	SY
Needle chest decompression for tension pneumothorax	SY

UMLS Concepts	
Name	CUI
Needle chest decompression	C5880451

**Hierarchy**

SNOMED CT Concept

- Procedure
- Procedure by site
- Procedure on body system
- Procedure on respiratory system
- Procedure on pleural cavity
- Pneumothorax relief
- Tension pneumothorax relief
- Needle chest decompression**

### Space of right second intercostal compartment (321189) Add to List

Names	
Name	Term Type
Space of right second intercostal compartment	PT
Right second intercostal space	SY
Right second intercostal compartment space	SY

UMLS Concepts	
Name	CUI
Space of right second intercostal compartment	C4246466

**Hierarchy**

Foundational Model of Anatomy Ontology

- Anatomical entity
- Physical anatomical entity
- Immaterial anatomical entity
- Anatomical space
- Anatomical compartment space
- Space of intercostal compartment
- Space of second intercostal compartment
- Space of right second intercostal compartment**

**Attributes**

None.

# Intervention: Chest Seal

## SNOMED-CT Concept

### FMA Location(s)

- Right side of chest
- Right inframammary part of chest

### JETS Location

- anteriorRightUpperChest

### JETS Type

- sealChestWound

**Right inframammary part of chest (35348)** [Add to List](#)

Names	
Name	Term Type
Right inframammary part of chest	PT
Right inframammary part of chest wall	SY
Right inframammary region	SY

UMLS Concepts	
Name	CUI
Right inframammary part of chest	C0827121

**Attributes**  
None.

**Relations**

isa		
Related From	Relation	Related to
Right inframammary part of chest	isa	Inframammary part of chest

regional_part_of		
Related From	Relation	Related to
Right inframammary part of chest	regional_part_of	Anterior chest wall
Right inframammary part of chest	regional_part_of	Anterior female chest
Right inframammary part of chest	regional_part_of	Female anterior chest wall
Right inframammary part of chest	regional_part_of	Male anterior chest wall

**Hierarchy**

- Foundational Model of Anatomy Ontology
- Anatomical entity
- Physical anatomical entity
- Material anatomical entity
- Anatomical structure
- Postnatal anatomical structure
- Subdivision of cardinal body part
- Subdivision of body proper
- Subdivision of trunk
- Subdivision of front of trunk
- Subdivision of thorax
- Region of anterior chest
- Inframammary part of chest
- Right inframammary part of chest**

1 - 1 of 1 |< < > >|  
Items per page: 5

# Intervention: Tourniquet

## SNOMED-CT Concept

- Tourniquet procedure

## FMA Location(s)

- Left Leg (working on identifying left lower leg)

## JETS Location

- anteriorLeftProximalLowerLeg and posteriorLeftProximalLowerLeg

## JETS Type

- stopHemorrhage

### Tourniquet procedure (241730005)

[Add to List](#)

Names	
Name	Term Type
Tourniquet procedure	PT
Tourniquet procedure (procedure)	FN
Obsolete / Suppressible Names <span>▼</span>	

UMLS Concepts	
Name	CUI
Tourniquet procedure	C0412797

Hierarchy	
SNOMED CT Concept	
Procedure	
<b>Tourniquet procedure</b>	
Application of tourniquet	
Pneumatic tourniquet precautions	
Tourniquet cuff inflation	
Tourniquet positioned on patient	
Tourniquet positioning (uninflated)	
Tourniquet release	
Tourniquet removal (already released)	

Attributes	
EFFECTIVE_TIME	20050731
DEFINITION_STATUS_ID	9000000000000073002
CTV3ID	X70qb
ACTIVE	1

1 - 1 of 1 ◀ ▶ Items per page: 5

### Left leg (24981)

[Add to List](#)

Names	
Name	Term Type
Left leg	PT

UMLS Concepts	
Name	CUI
Structure of left lower leg	C0230443

Hierarchy	
Foundational Model of Anatomy Ontology	
Anatomical entity	
Physical anatomical entity	
Material anatomical entity	
Anatomical structure	
Postnatal anatomical structure	
Subdivision of cardinal body part	
Limb region	
Free limb region	
Free lower limb region	
Middle free lower limb region	
Leg	
<b>Left leg</b>	

Attributes	
None.	

Relations		
has_constitutional_part		
Related From	Relation	Related to
Left leg	has_constitutional_part	Left fibula
Left leg	has_constitutional_part	Left tibia
Left leg	has_constitutional_part	Musculature of left leg

1 - 1 of 1 ◀ ▶ Items per page: 5

# Validation

Multi-Vendor Interoperability Demonstrations

# Validation: Multi-Vendor Interoperability Demonstrations

At Soldier Touchpoints, we validated the architecture's effectiveness through three interoperability scenarios involving all five vendors, verifying the system works in complex, real-world conditions.

1	2	3
<p><b>Mass Casualty</b> Five vendors simultaneously managed separate patient instances, with a central system aggregating data from all five via the JETS federation, demonstrating large-scale coordination.</p>	<p><b>Paired Integration</b> Mixed and matched components across vendors, such as using one vendor's computer vision to detect interventions on another vendor's manikin, proving true composability.</p>	<p><b>Patient Handoff</b> Seamlessly transferred patient ownership and data between two different vendor systems, simulating patient movement through echelons of care with full data continuity.</p>

# Demonstration Highlight: Content Portability

## Decoupling Content from Hardware

A key validation of the MOSA approach was demonstrating that AR training content is not locked to specific hardware. Our anatomical overlays were successfully transferred from our primary manikin to a competitor's manikin with minimal changes.

- Protects investment in training content
- Reduces vendor lock-in for hardware
- Enables use of best-of-breed components

Vcom3D's anatomical overlay and virtual casualty successfully registered onto an IDL manikin.

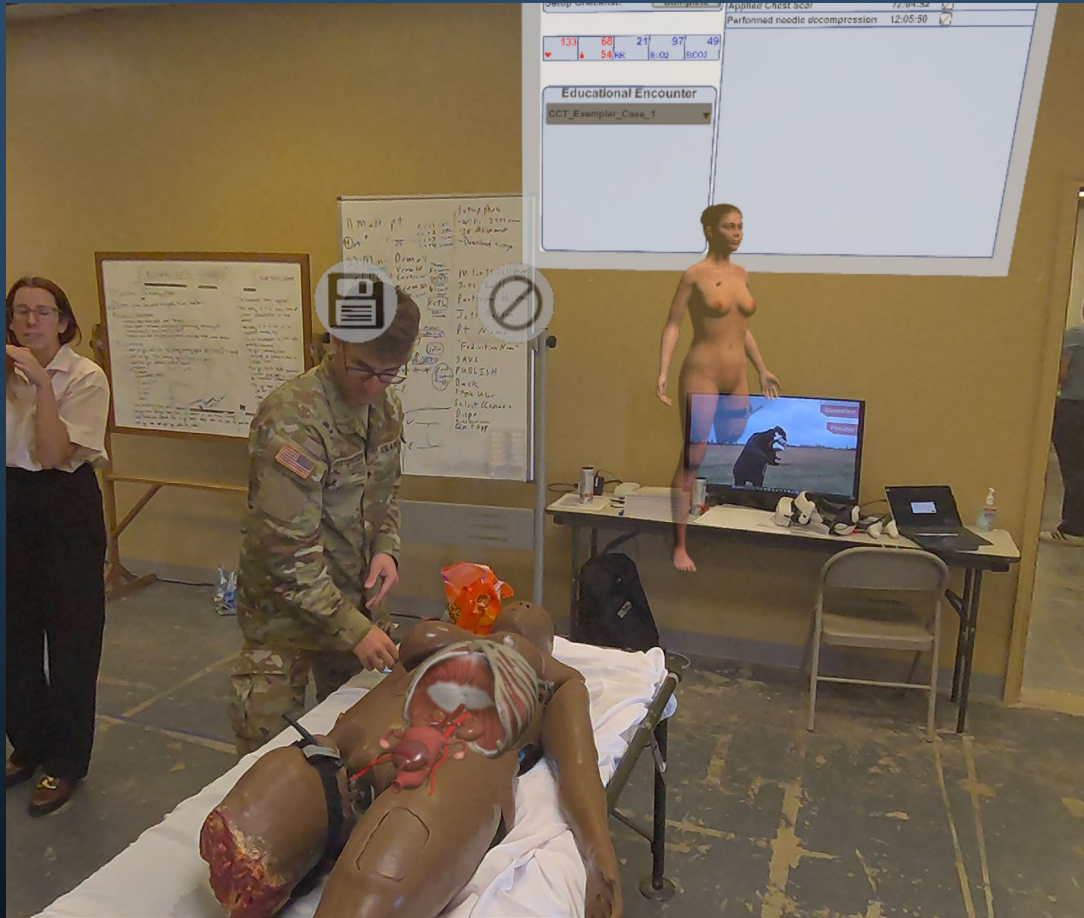


# Interoperability Highlights

- Exonicus Student Headset
- IDL Manikin
- Vcom3D Instructor View
- JETS MMSControl



# Interoperability Highlights



- Exonicus Student Headset
- IDL Manikin
- Vcom3D Instructor View
- JETS MMSCControl

# Key Lessons Learned for Interoperability

## **Semantics are Harder than Tech**

Agreeing on shared clinical vocabularies (FMA/SNOMED-CT) required sustained, collaborative effort through dedicated working groups.

## **Performance Demands Tiered Architecture**

To meet AR's low-latency needs (<20ms), use a two-tiered data architecture: high-frequency data locally (MoHSES) and lower-frequency data for federation (JETS).

## **Standards Need Reference Implementations**

Well-documented standards accelerate integration. Custom development for undefined protocols creates bottlenecks. Gateway patterns must be documented.

## **Integration Events are Essential**

Regular, hands-on workshops are non-negotiable for identifying and resolving cross-vendor issues that can't be found on paper.

# Next Steps

Where do we go from here?

# A Roadmap for Healthcare Simulation Interoperability

The SISO Medical Simulation Multi-Modality Data Transfer Study Group is the ideal forum to drive these efforts forward.

Near-Term (1-2 Years)	Mid-Term (2-4 Years)	Long-Term (4+ Years)
<ul style="list-style-type: none"><li>• Document gateway patterns</li><li>• Develop conformance test suites</li><li>• Extend FMA/SNOMED-CT mappings</li></ul>	<ul style="list-style-type: none"><li>• Define profiles for civilian healthcare</li><li>• Standardize AR content registration</li><li>• Develop certification programs</li></ul>	<ul style="list-style-type: none"><li>• Integrate with real EHR systems</li><li>• Support AI-driven adaptive training</li><li>• Build an international coalition</li></ul>

# Conclusion & Call for Engagement

## Our Contribution

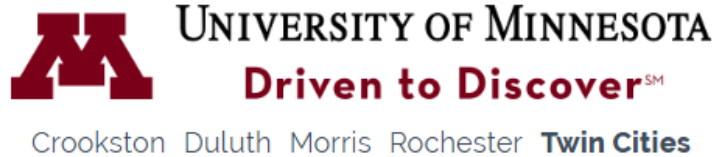
We have proven that a layered, open-standards approach enables practical, multi-vendor interoperability in complex medical simulations.

## How You Can Engage

We invite the SISO community to collaborate with us to build on this foundation.

- Join the Medical Simulation Multi-Modality Data Transfer Study Group:
  - Find at <https://www.sisostandards.org/>
- Attend and present at SISO workshops
- Contribute to open-source implementations
- Participate in vocabulary working groups

# Attribution / Acknowledgement



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**EXONICUS**



# Q&A

