



Developing and Reusing Game-Based Simulations using NATO Standards

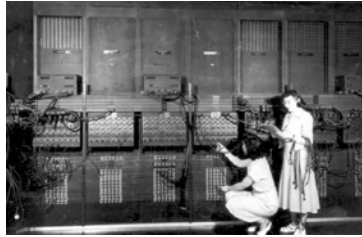
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2021 NATO CA2X2 Forum/MSG-192

Agenda

- Military and Defense Technologies
- The Defense Market vs the Game Market
- Potential for Game Engines in Defense Training
- NATO and ET-044 perspective
- An HLA Plug-in for Unreal Engine
- Some Game Technology Challenges
- Early Experience and Customer Feedback
- Game Engines, Interoperability and Reuse
- Pitch Unreal Engine Connector and NATO Standards
- Conclusions

Military and Defense Technology

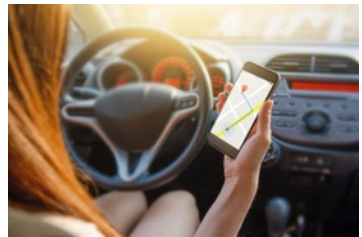
Defense Technologies



Computers



Internet



GPS



Duct tape



Civilian Technologies



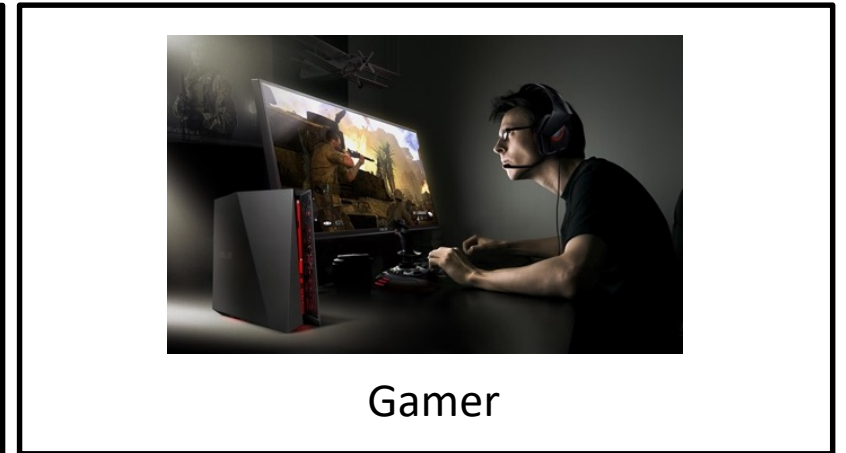
Graphics Cards



Game Engines

- Then: Defense technology changes the civilian world
- Now: Civilian technology changes the defense world

The Defense Market vs the Game Market



	Defense Training Solution	Consumer Game
Acquisition time	Months to years, formal	Minutes, informal
Requirements' owner	Customer	Vendor
Model focus	Training value, Fidelity, Validation, Verification & Accreditation	Entertainment, Returning customers
Life cycle	5-30 years	Months to a few years
Investment	MUSD	MUSD
Customers	National defense organizations	Millions of individuals
End user price	High, MUSD	Free or very low, in-game purchase

Potential for Game Engines in Defense Training

C2 Training



- Common operational picture
- Situational awareness
- Fog-of-war
- UAV feed
- VR/AR

Crew and Individual Training



- Out-the-window view
- Instrumentation
- Immersion
- VR/AR

Maintenance Training



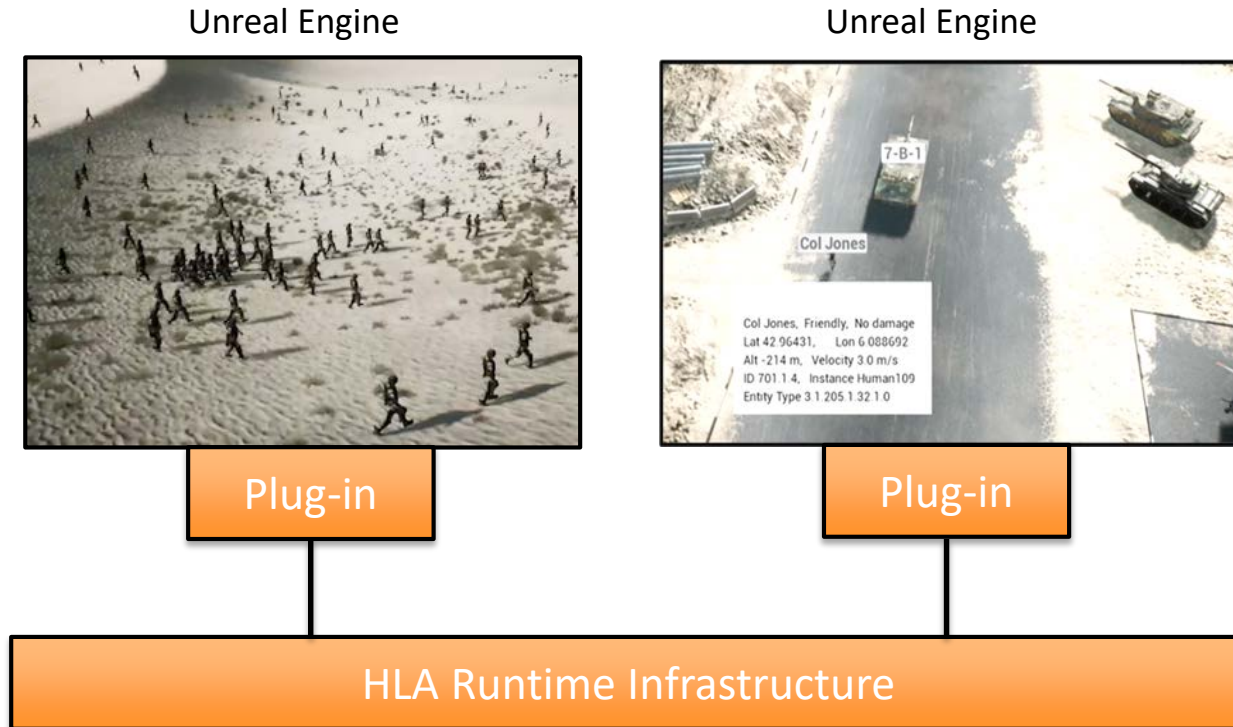
- CBT
- Procedures
- Collaboration
- VR/AR

NATO and ET-044 Perspective



- NATO MSG-ET-044 produced the report “Recommendations for Modular Game Architectures” (Nov 2017)
- “Based on literature review and discussions between industry experts and NATO/national experts, the ET-044 concluded that there is a real issue that needs to be solved: more flexibility and reusability of game engine components would make systems more valuable and cost-effective.”
- “ET-044 concluded that a solution that benefits all stakeholders and is based on (open) standards, is possible, ...”

Experiences from an HLA Plug-in for Unreal Engine



**UNREAL
ENGINE**



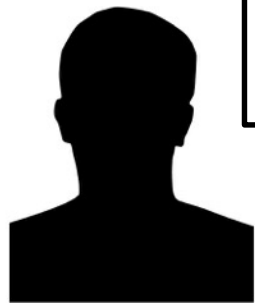
- A COTS plug-in that adds HLA interoperability to Unreal Engine has been developed by Pitch
- Partly sponsored by Epic Games through an Epic MegaGrant
- Connects HLA object instances to Unreal Engine Actors
- Available in free and paid editions
- Support for DIS also available

Some Game Technology Challenges

- Game engines provide unprecedented visualization, but...
 - Integration challenges
 - Monolithic implementation
 - Not developed with open standards in mind
 - Scalability/filtering
 - Simulations may contain millions of entities, game engines can only display thousands of entities
 - Game engines need to be provided with a filtered subset
 - Terrain data
 - Availability, quality and format
 - Entity models/meshes
 - Articulated parts, different levels of detail (LOD), etc

Early Experience and Customer Feedback

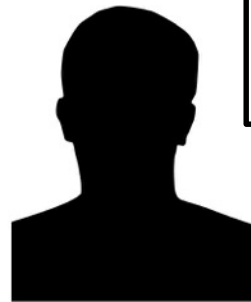
- Large number of downloads, individual developers, industry, gamers
- Several commercial projects starting up
- Defense industry needs to learn game technology
- Game industry needs a better understanding of defense requirements and get access to testing data/environments



I used your plug-in and got connectivity, but how do I develop the rest of the game?



How can I find and integrate vehicle models and terrain data?



How can I test my game with a variety of scenarios?

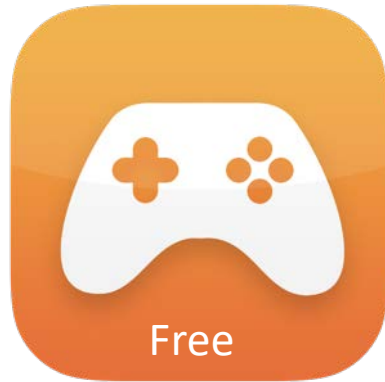
Games Engines, Interoperability and Reuse

- Game development may be just as complex and need as much resources as any other professional software development project.
- When investing in a game-based solution, consider interoperability and reuse to maximize return of investment.
- Open NATO/IEEE/SISO standards provide interoperability and reuse.



Pitch Unreal Engine Connector and NATO Standards

Free Edition



- Visualize RPR FOM platforms and warfare

Standard Edition



- Commonly used RPR FOM platforms and warfare with full “HLA/DIS to Game” interactivity
- Extended set of attributes and classes
- Commercial licensing

SDK Edition



- Full RPR FOM and NATO NETN FOM integration
- Includes CBRN, Entity Tasking and Reporting, Aggregate, METOC, MRM, and more
- SpaceFOM and Custom FOMs
- Commercial licensing

Conclusions

- Commercial game engines offer unprecedented visualization and interactivity at low cost on standard computer hardware
- Using a game is easy but game development is as demanding as any other systems development
- Substantial investments are required, and a number of particular challenges need to be understood
 - Game engine architecture, terrain data, models, scalability, etc
- To maximize interoperability and reuse, such investments should be based on open international standards
 - COTS plug-in exists



*Leader in Standards-Based
Distributed Simulation Solutions*

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