

ENABLING TEST AND TRAINING SYNERGIES IN LVC ENVIRONMENTS

By Mr. Rafael Vila, TASC, Inc.



**Mr. Bruce Lipe
Session Chair**

GET CONNECTED to LEARN, SHARE, AND ADVANCE.





AGENDA

- **Bottom Line Up Front**
- **The LVC-TE**
- **Communication Requirements**
- **Interoperability**
- **The System Under Test**
- **Concept, Challenges, and Tools**
- **LVC-TE for T&E Benefits**
- **Conclusion**



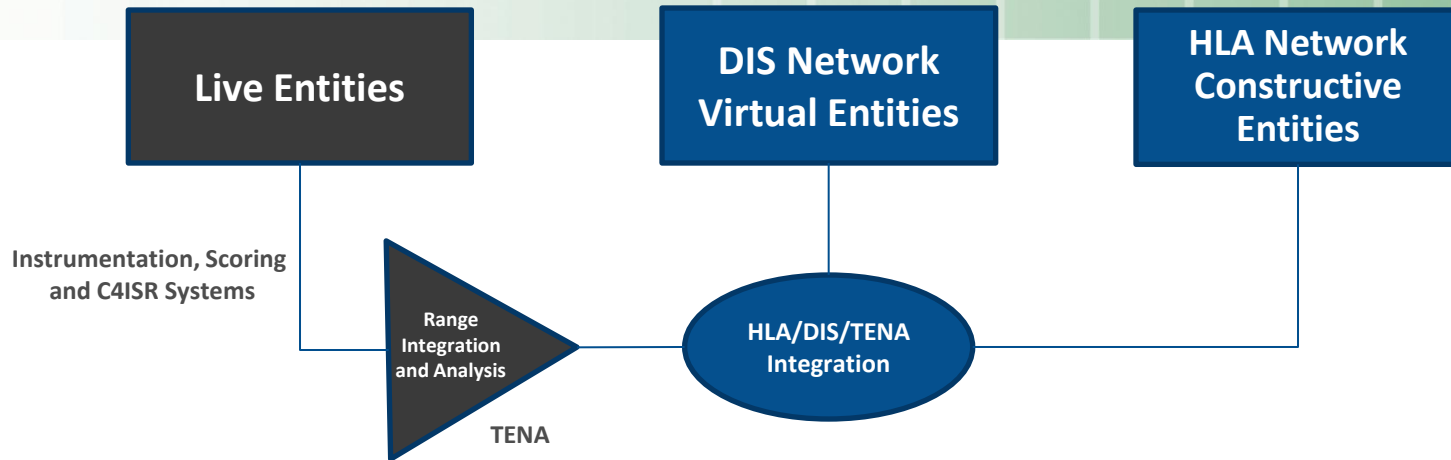
BOTTOM LINE UP FRONT

- **LVC-TE is key to the training of military forces**
 - LVC-TE technologies and realism continue to improve
 - Essential for net-centric systems training
 - Range Limitations
 - Encroachment and environmental pressures
 - 5th Generation Weapon Systems
- **The LVC-TE enables the advancement of net-centric concepts and operations**
 - Can help improve/simplify interoperability certification process for Live systems

Future of military training will rely on mirror images of weapons operating in the LVC-TE



THE DISTRIBUTED LCV-TE



- **LVC-TE facilitates training audience needs across Services**
 - Each block can execute training scenarios internally
 - Integration enhances training experience; careful orchestration
- **Each block may limit contributions in/out of the environments**
 - Safety, Fidelity, Latency, Standards, Bandwidth, Synchronization
 - Portals and Gateways required to integrate
- **Varying LVC-TE complexity; planning can take hours to months**



COMMUNICATION REQUIREMENTS

- **Account for challenges in the form of:**
 - Interoperability
 - Interfaces/protocols
 - Network transports
 - Information assurance, encryption, MLS
- **Rely on non-operational networks supporting COIs**
 - DREN, SDREN, JMETC, JTEN, DMON, and/or Other
 - Focus on Tactical edge - GIG interfaces - to Strategic level

**Must mimic operational network performance on
NIPRNet, SIPRNet, JWICS, and Data-Links**



INTEROPERABILITY

- **NR-KPP evaluation**
 - **In General, five elements evaluated**
 - (1) **Solution Architecture – Operationally Effective Information Exchanges**
 - (2) **Net-Centric Data and Services**
 - (3) **Global Information Grid Technical Guidance**
 - (4) **Information Assurance**
 - (5) **Supportability**
- **Similar requirements in the LVC-TE**
 - **Parallel interoperability problems effectively dealt with**



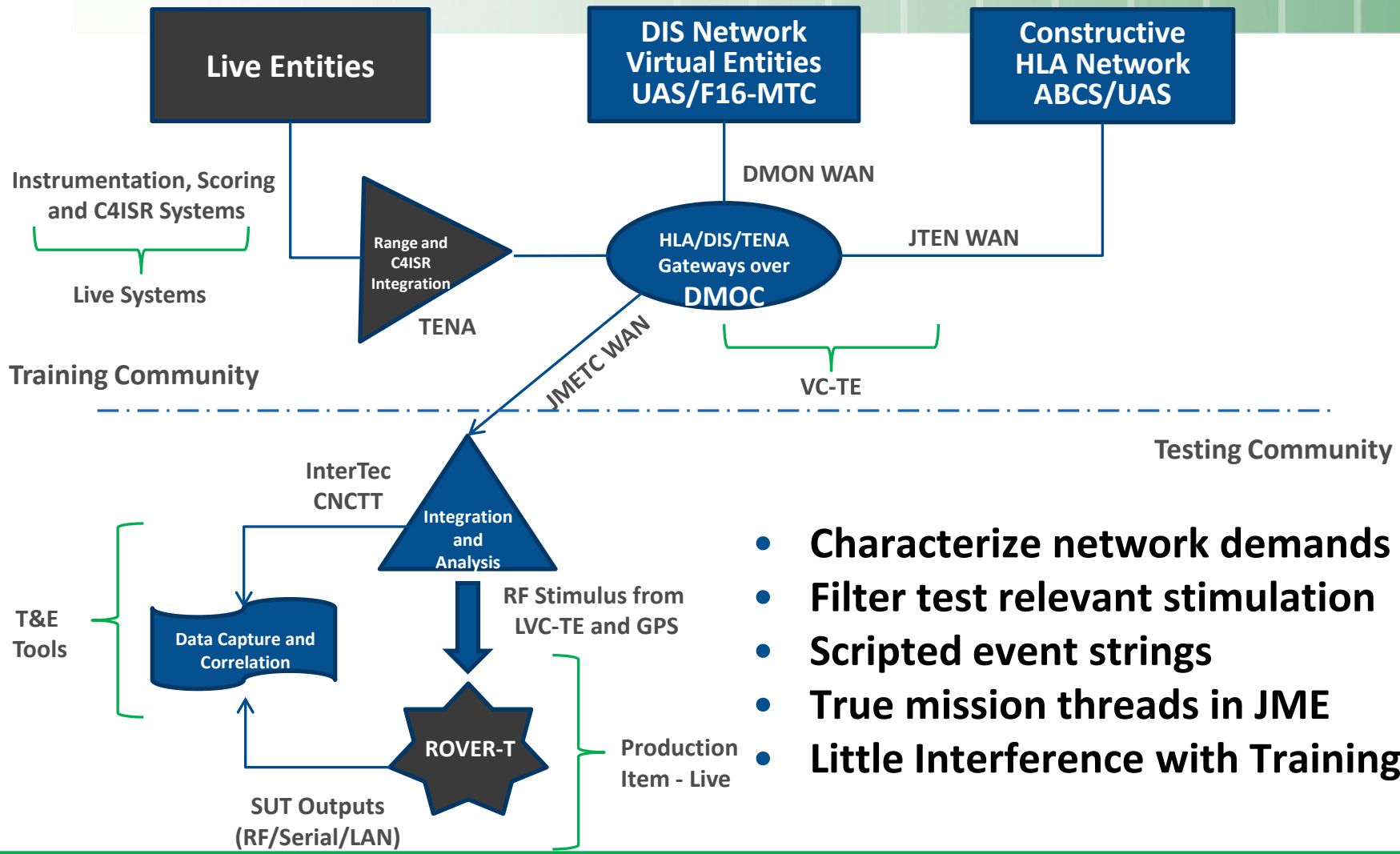
THE SYSTEM UNDER TEST

- **Notional System = ROVER-T**
 - Transmit/Receive free text chat, GPS data
 - Receive land blue/red force data and UAS video
 - Transmit video captures and digital 9-line
- **Information exchanges with**
 - UAS and operators (via Radio as a sub-component)
 - Air support offensive platform (F-16 MTC)
 - Army SA application with chat capability (ABCS)
 - Air Force mapping application (ASOC)

Five NR-KPP Elements



CONCEPT, CHALLENGES, AND TOOLS



- Characterize network demands
- Filter test relevant stimulation
- Scripted event strings
- True mission threads in JME
- Little Interference with Training COI



CONCEPT, CHALLENGES, AND TOOLS

- Entity interaction between the LVC-TE and the SUT
- DIS, HLA, and TENA integration over WANs
- Encryption and gateway requirements
- Awareness of event flows in the LVC-TE
- Synchronization between environments
- Common terrain and environmental effects
- Information assurance requirements



CONCEPT, CHALLENGES, AND TOOLS

- **Training COI successfully manage these challenges**
 - DMON is one of the best examples
 - DMOC the “integrator of integrators”
 - Army/Navy/Marines advancing similarly capable systems
- **JTEN**
 - Instrumental in expanding the LVC-TE to the Training COI
 - JMETC could serve a similar role for the T&E
 - Gateways between the two or a solution for both?
- **InterTec Toolset and TENA**
 - CNCTT



CONCEPT, CHALLENGES, AND TOOLS

- **JCATS/JLCCTC**
 - Both capable of stimulating or interacting with ABCS for blue/red force SA and chat with Operations Center
- **AFSERS or DMO MQ-9**
 - Multiple UAS video feed
- **Transmission of 9-line and pictures to ASOC, F-16 MTC or T&E toolset for standard evaluation**
 - Other CAS platforms available over DMO
- **GPS data could be used to correlate position and time in addition to evaluating SAASM compliance**



LVC-TE FOR T&E BENEFITS

- **True JMEs and mission threads**
- **Characterize networks**
 - Similar NETOPS between LVC-TE and net-centric systems
- **LVC-TE for SUT stimulation can support better DOE and advance VV&A of M&S**
- **Passive approach: Based on SUT stimulus only**
 - Rely on T&E tools required to capture SUT outputs, analysis, correlation, and lessons from multiple sources
 - Evaluate prototypes early in acquisition cycle
- **Active approach: Yields a better understanding and advancement of net-centric concepts**
 - User and System-of-Systems team interaction feedback



CONCLUSION

- **Trainers learned valuable M&S lessons years ago**
 - Helped advance a highly effective LVC-TE
- **Testers need a similar, deliberate approach to advance LVC-TE centric T&E concepts**
 - Approach of last resort not sufficient
 - Benefits will likely go beyond what we can envision today



ACRONYMS

ABCS:	Army Battle Command System	JWICS:	Joint Worldwide Intelligence Communications System
AFSERS:	Air Force Synthetic Environment for Reconnaissance and Surveillance	LVC-TE:	Live, Virtual, and Constructive Training Environment
ASOC:	Air Support Operations Center	M&S:	Modeling and Simulation
C4ISR:	Command, Control, Communications, Computers, Intelligence Surveillance and Reconnaissance	MTC:	Mission Training Center
CNCTT:	Capability for Net-Centric Test and Training	NETOPS:	Network Operations
COI:	Community of Interest	NIPRNet:	Unclassified-But-Sensitive Internet Protocol Router Network
DIS:	Distributed Interactive Simulation	ROVER-T:	Remotely Operated Video Enhanced Receiver-Transmitter
DMO:	Distributed Mission Operations	SA:	Situational Awareness
DMOC:	Distributed Mission Operations Center	SAASM:	Selective Availability Anti-Spoofing Module
DMON:	Distributed Mission Operations Network	SDREN:	Secure DREN
DOE:	Design of Experiments	SIPRNet:	Secret Internet Protocol Router Network
DREN:	Defense Research and Engineering	SUT:	System Under Test
GPS:	Global Positioning System	T&E:	Test and Evaluation
HLA:	High-Level Architecture	TENA:	Test and Training Enabling Architecture
JCATS:	Joint Conflict and Tactical Simulation	UAS:	Unmanned Aircraft System
JLCCTC:	Joint Land Component Constructive Training Capability	VV&A:	Verification, Validation, and Accreditation
JMETC:	Joint Mission Environment Test Capability	WAN:	Wide Area Network
JTEN:	Joint Training and Experimentation Network		