



Virtual Reality in Land Training (VRLT)

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Scope - 'BISim narration of VRLT 1'

- VRLT - Overview and Background
- Purpose and Objectives
- Approach - when, how, who and where
 - the sprints - 'crawl, walk, run'
- 'Innovation as a Service'
- Results and lessons learned
- Conclusions
- Questions





Bohemia Interactive Simulations

- BLSim is a leading software developer in virtual simulation
 - 270+ staff in seven offices internationally
 - 18-year heritage in game-based simulation development
 - Own our Game Engine and have total control of it
- Flagship training product called VBS3 (Virtual Battlespace 3)
 - Trains hundreds of thousands of soldiers every year in 59 countries
 - Tens of millions of dollars of investment from militaries
 - Integrated into many Military Simulators across the globe with numerous leading OEM customers
- BLSim is focused on the military/paramilitary marketplace. Enterprise sales with tens of thousands of licences and support services to
 - U.S. Army Game For Training (GFT) program of record
 - USMC DVTE training software program of record
 - UK MOD Defence Virtual Simulation (DVS) platform
 - French MinArm SOCLE Virtual Simulation platform





Overview

- Bohemia Interactive Simulations (UK) Ltd selected to lead Training Capability Branch, HQ British Army Virtual Reality in Land Training (VRLT) pilot study:
 - *Aim: 'to identify the opportunities that VR offers the Future Collective Training System (FCTS)...to investigate the opportunities of VR, the Army approach seeks to conduct a VR in Land training (termed VRLT) Pilot, which explores the strengths, weaknesses, opportunities, threats and benefits of the technology and its employment. The pilot would consider the effectiveness, fidelity, practicality/ constraints, architecture, scale, interoperability, infrastructure and mobility of useable VR capabilities. Insights would be harvested for the FCTS.'*
- *Caveat: Army report being finalised, was a **pilot study** and NOT an experiment - delivered training.*
- *Funding: Defence Innovation fund.*

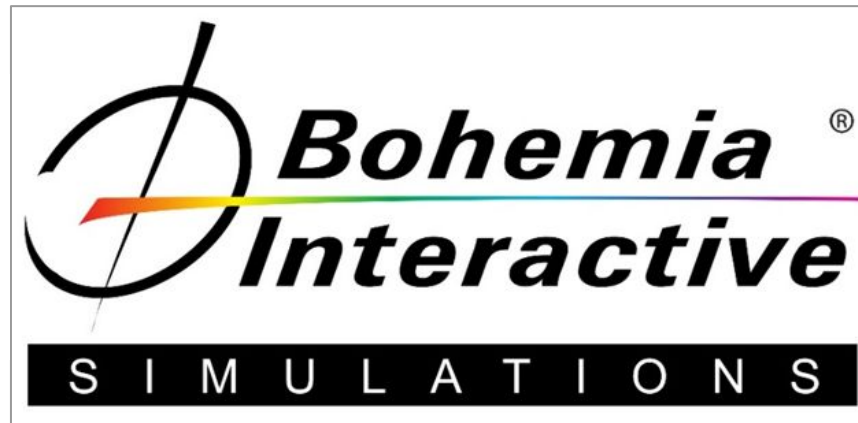


Industry Delivery Team



Data and exercise management

<https://www.cervusdefence.com/>



Prime - Project Management,
Commercial lead, Sprint
design, technology supplier
and systems integrator

Roke

Part of the
Chemring Group

Project
Management and
Exploitation



Background - BLSim view

- Exploit COTS technology
 - pace of technology development rapid
- Other industries using VR for training e.g. construction, aviation, F1
 - Construction - [crane operator training](#)
- Mission rehearsal, mission repeat (MR2)
- Affordability and accessibility to low availability but highly capable systems
 - access to assets
- Immersiveness - Virtual Simulation vs Virtual Reality
- Soldiers more technologically aware through gaming industry - **the PEOPLE!**



'Harnessing the Xbox Generation' - Digital Natives

- **Younger operational staff actively want to use simulation**
 - Take advantage of enthusiastic 'gamers' - you will find plenty of them
 - (In militaries, experience is that young soldiers actively volunteer to get involved and lead)
 - Utilise those staff who 'get it' as instructors and SMEs
 - Offer career development opportunities to learn and grow for instructors and ensure consistency in trainers and participants alike



Soldier at a highly complex individual and team training task



‘Generation Z’

- Digital natives with huge dependency on communications
- Greater reliance upon technology and with a different approach to problem solving
- Individualistic, impatient and with differing levels of attention span
- See greater value in work experience than education
- Approach risks differently

Sparks and Honey Report, June 2017:

Meet Generation Z, Forget Everything You Learned about Millennials





Purpose and Objectives

- Investigate the strengths, weaknesses, opportunities and threats (**SWOT**) of Virtual Reality (VR) technology and its application to support British Army Collective Training (CT) focusing on the **flexibility and reconfigurability** of VR to meet changing demands.
- Explore the ability of VR to meet fidelity requirements focusing specifically on limitations in scalability and interoperability and to define a technical architecture and requirements for the future delivery of VR, to help inform future procurement.





Method

- BISim delivered 3 Sprints, 'crawl, walk, run' with VR, as 'Innovation as a Service'
- Each Sprint was a Platoon in a Company Context executing a Combined Arms Armoured Infantry Company attack - Taken from DATE - Lovella scenario, SE Europe
- Increase in complexity through the sprints - assets and scenario





Detailed scenario

Lovella Scenario: Conflict in Southern Protectorate – SE Europe Theatre

- Civil war between ethnic groups backed by professional military and militia in historically volatile region (war in mid 90s)
- Widespread violence
- NATO Intervention to create safe and secure environment, UN deadline not met resulting in NATO military action to clear UWS forces from occupied EKDE region
- 90 days into NATO operation, UK have cleared BADA0 town (*Bath*) and are static preparing to clear LOVELLA up to National Boundary Line (NBL)





Delivery - [video \(You Tube\)](#)


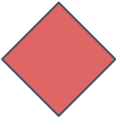
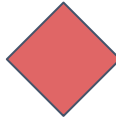
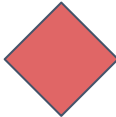



- Sprint 1 (Jan 19) - the baseline - 17 players
- Sprint 2 (Feb 19) - 37 players, high fidelity model, avatar customisation, crew trainer, cloud architecture, AAR and data
- Sprint 3 - (Mar/Apr 19) 54 players, (37 in VR), mixed reality, face/voice analysis, instrumented live gun, briefings in VR

My point here is that it was RAPID DELIVERY!





VRLT Timeline

Dec 18	Jan 19	Feb 19	Mar 19	April 19
				
Contract Award	Sprint 1		Sprint 2	Sprint 3
	18 Soldiers in VR		37 Soldiers in VR	37 Soldiers in VR
	Oculus Rift, Vive, DVS/VBS3		Oculus Rift, Haptics, Polystream Cloud, Training Data Cloud Capture, Unity, DVS/VBS3	OR, Vive, Mixed Reality, 105mm Gun Integration, Haptics, Unity, Polystream Cloud, Training Data Machine Learning, DVS/VBS3
				



Who



1 YORKS (AI Bn)

- 3 x WR Crew and Dismounts
- Provide feedback on VRLT pilot training experience



Armour Centre

- Challenger 2 Crew
- Provide feedback on VRLT pilot training experience



1 R WELSH (AI Bn) & Land Warfare Centre

- Observer Mentors



Royal School of Artillery

- Fire Support Team
- 105mm Lt Gun Crew



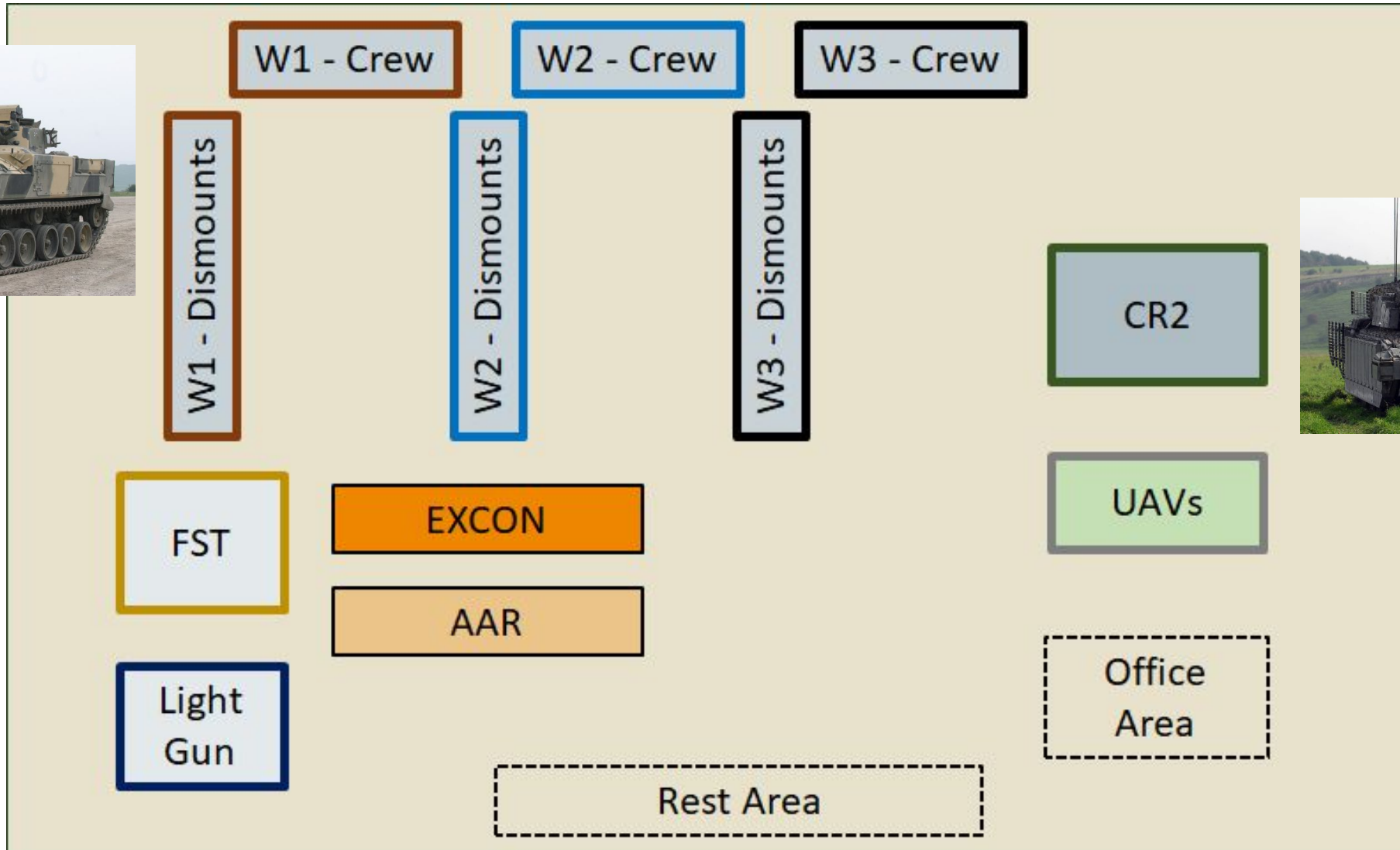
Where - the set up

- Tank shed, Warminster, Wiltshire, UK
- Power and temperature!





Garage Plan for Sprint 3





Player Preparation

- It is normal training
- Get the soldiers familiar with the technology
- It was a pilot study - require feedback and ideas
- Data - collect for training improvement
- Opportunity to shape what the Army gets in the future





Example Daily Routine

23-Jan-19	0800-0830	System run up	Garage	JD	Technical Team
	0830-0900	Morning Brief	Garage	AR	Project Team
	0900-1030	Vignette 2-ADVANCE TO CONTACT	Garage	AR	Participants, Observers Project and Technical Team
	1030-1100	Data Capture	Garage	AR/CR	Participants, Observers Project and Technical Team
	1100-1130	BREAK			
	1130-1200	AAR	Garage	Observer 1/AR	Participants, Observers
	1200-1300	LUNCH	Cookhouse		
	1300-1500	Vignette 3-CLEAR RURAL	Garage	AR	Participants, Observers Project and Technical Team
	1500-1545	Data Capture	Garage	AR/CR	Participants, Observers Project and Technical Team
	1545-1615	BREAK			
	1615-1645	AAR		Observer 1/AR	Participants, Observers
	1645-1700	Close down brief and look forward		AR	Participants, Observers
	1645-1700	Project Team Brief		AF	Project Team



Results and Lessons Learned - Sprint 1

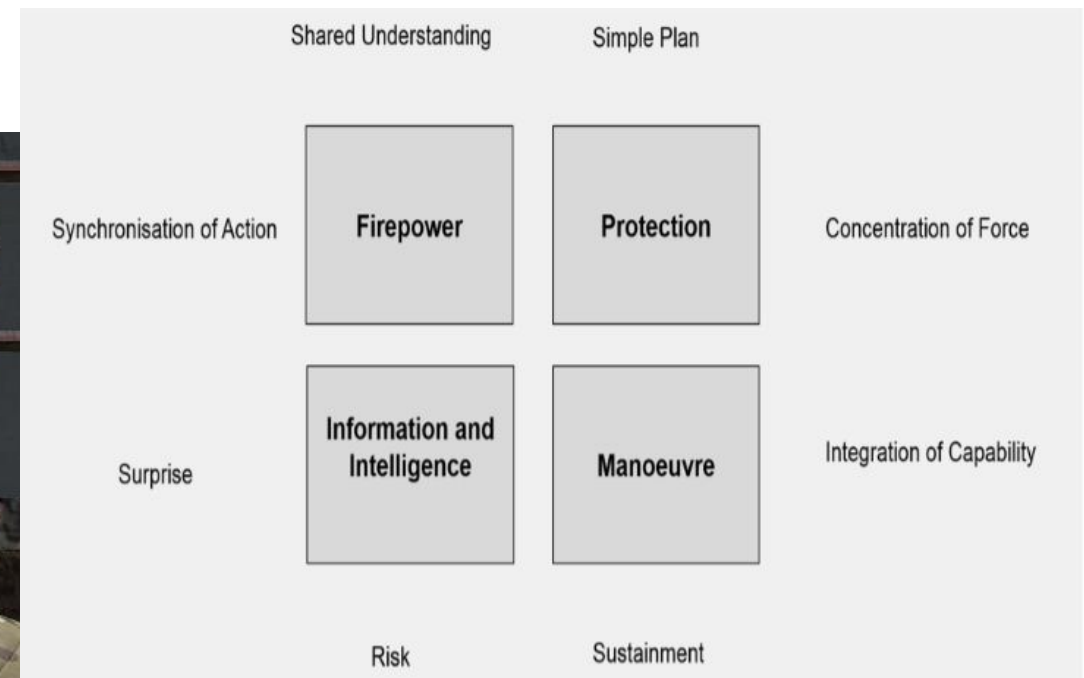
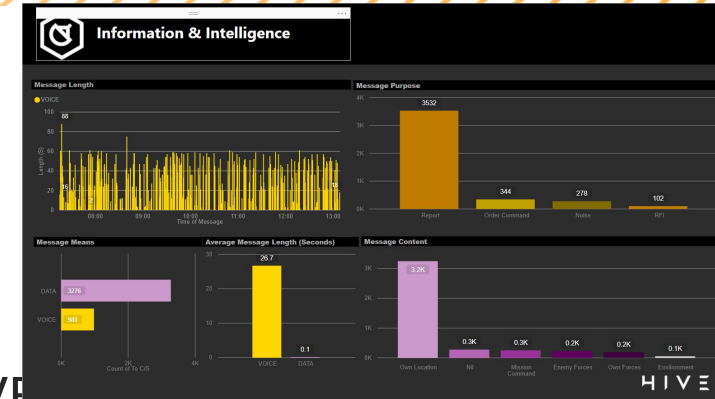
- Established the baseline with 17 players in VR
- Established could probably support ~100 players in VR
- Power resolved - generators
- VBS3 engine good enough for VR
- Frame rate and variation fine and minimal nausea
 - 30-60 mins in VR
- Identified need for high-fidelity 3D model
- VR experience better than desktop 2D
- Targeted fidelity grips difficult (impossible) to use





Sprint 2

- 3D high-fidelity model introduced
 - more immersive
- Scaled to 37 players in VR
- UAV and Fire Support introduced
- Observer Mentors immersed in the game - AAR from VBS to Cervus HIVE
- DIS inter-operability with Challenger 2 tank and Cloud enabled thin clients
- Customised avatars
- Performance measurement



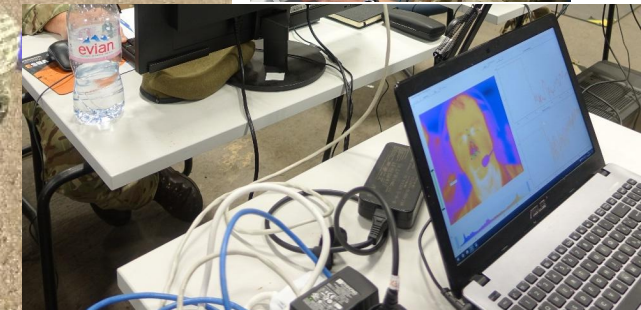






Sprint 3 - 'Innovation as a Service'

- 'Innovation as a Service' - the whole system
 - Novel technology - voice and face analysis to assess challenge
- Mixed Reality (MR) to view the Battlefield Management System
- Review of Concept in VR
- Out of the hatch tank commander view
- Instrumented live simulation light gun





Initial findings (SWOT)

- **S** - Takes you closer to the real platform than traditional desktop - aural and 3D
- **S** - Less investment compared to vehicle specific simulators
- **S** - Better cognitive competencies - situational awareness, decision making, communication and coordination compared desktop training
- **S** - More pressure
- **W** - Limited physical skills eg buttons and weapons and full motion on untethered
- **O** - Can deploy to point of need with varying scale
- **O** - MR
- **O** - wider use eg in game briefings, rehearsals, in and after action review
- **T** - power and building conditions
- **T** - VR sickness

Strength, Weaknesses, Opportunities and Threat - VR not perfect but better than traditional desktop virtual simulation and will get better



Recommendations

- VR can be used in the collective training environment - further investigations required
- Targeted grips in VR are challenging
- Simulation application control schemas need re-designed
- Certain compromises need to be made in the simulation due to lack of control inputs and resolution
- Choose a suitable level of fidelity for immersion and training benefit
- VR greatly enhanced by MR
- Simulation standards need to evolve beyond DIS/HLA and embrace APIs to exploit commercial sector
- Use novel performance measurement tools regularly used in other industries





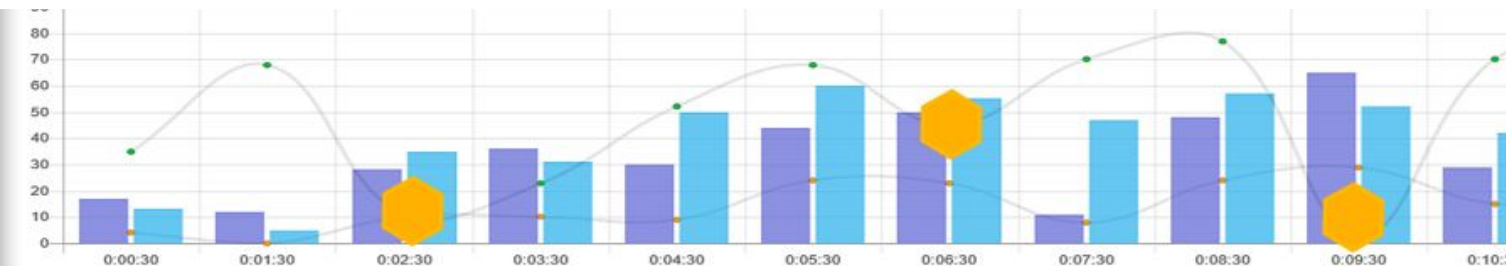
Next Steps

- British Army, Commander Field Army 3*, 9 April 2019, Warminster, VRLT Visitor Day -
 - *'more risk waiting for the findings of 'VR in training', than putting VR in the hands of soldiers for training, now'*
- VRLT3 - 2 years + 1 year option
- 26 Collective Training events
 - 40-85 players
- Deliver Jan 20 - Jul 21



Conclusions

- VR is not the solution for everything!...but it has its place - better than desktop.
- AR/MR has more training applicability.
- Targeted levels of fidelity for immersion
- Exploit the commercial sector; military standards can hinder ie use open APIs vs DIS/HLA
- Performance measurement tools for Training, Management and Evaluation
- This is all based on experiential learning - more investigations required ie VRLT3!





Questions



About me:

David 'Rusty' Orwin was the Project Director for VRLT. Rusty spent 14 years in the British Army, retiring as a Major, in operational and training roles and has worked in the live and virtual simulation domains in industry. He has a BSc in Communications and Media Studies and an MSc in Information Management and Technology.