Virtual Reality in Land Training (VRLT)

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Project Director - VRLT

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

- BISim 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

- BISim 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.*
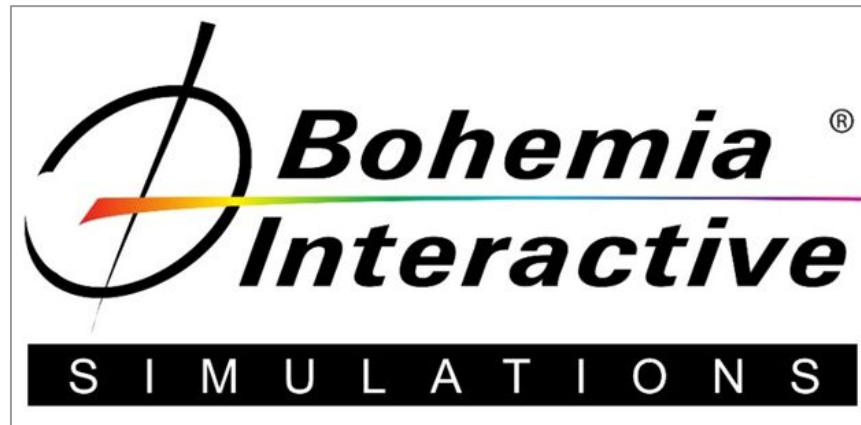 - *Funding: Defence Innovation fund.*

Industry Delivery Team

Data and exercise management

https://www.cervusdefence.com/

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

Project Management and Exploitation

Background - BISim view

- Exploit COTS technology
  - pace of technology development rapid
  - due to MOD procuremnt today's COTS technology is nearly next generation for MODs
- Other industries using VR for training e.g. construction, aviation, F1
  - Construction - [crane operator training](#)
- 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 BADAO 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

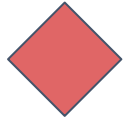My point here is that it was RAPID DELIVERY!

VRLT Timeline

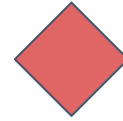| Dec 18	Jan 19	Feb 19	Mar 19	April 19

Contract Award

Sprint 1
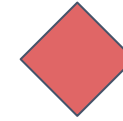
18 Soldiers in VR

Oculus Rift, Vive, DVS/VBS3

Sprint 2

37 Soldiers in VR

Oculus Rift, Haptics, Polystream Cloud, Training Data Cloud Capture, Unity, DVS/VBS3

Sprint 3

37 Soldiers in VR

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
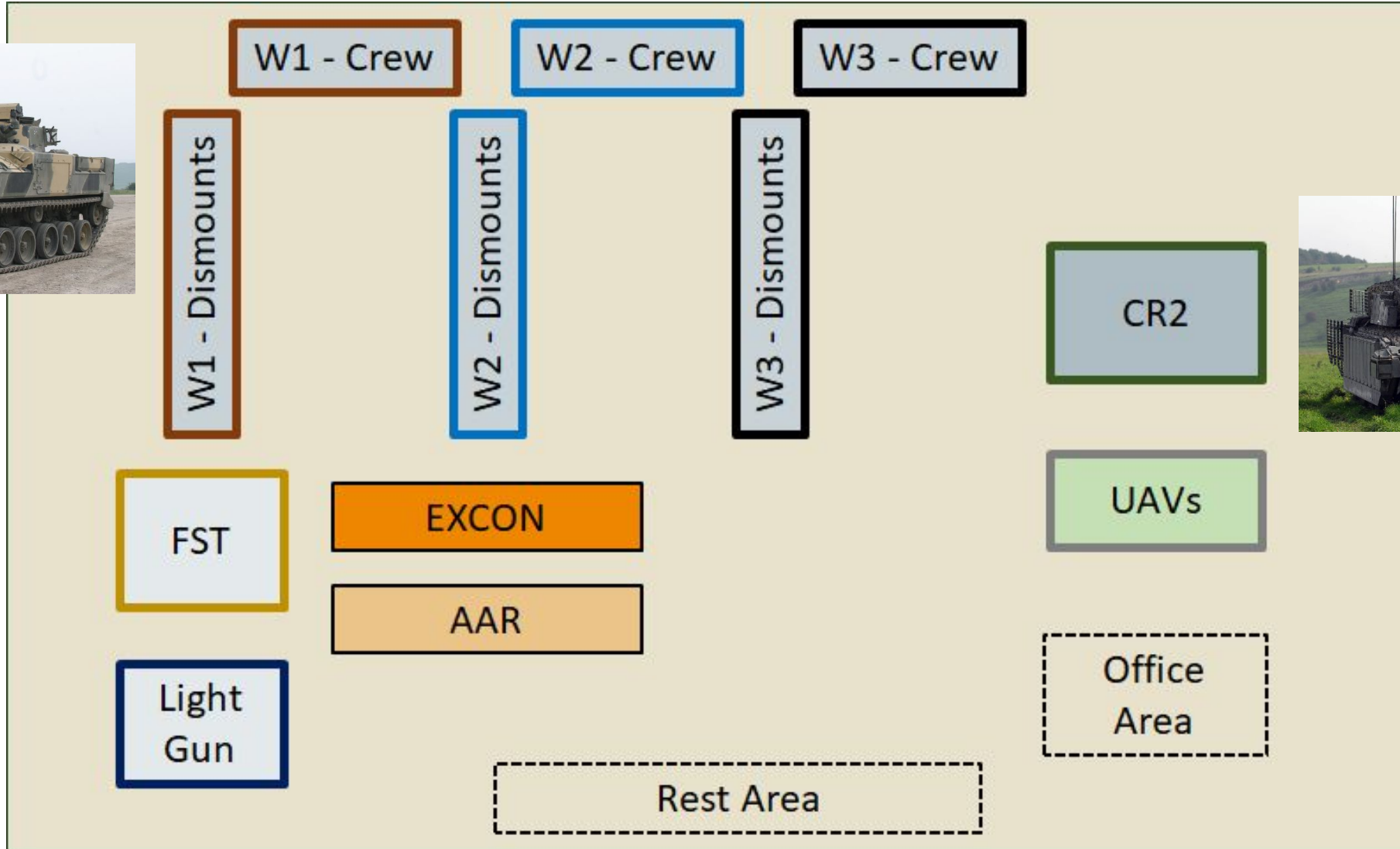- 105mm Lt Gun Crew

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

|					
	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
23-Jan-19	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

- 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
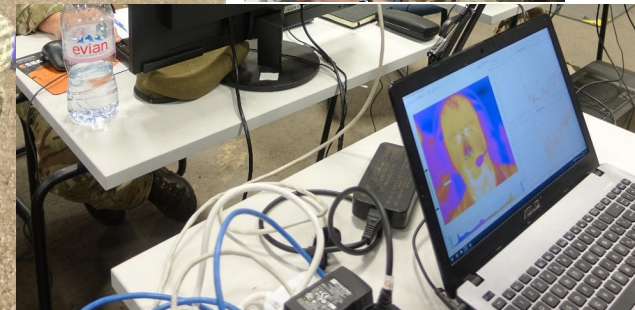- Performance measurement
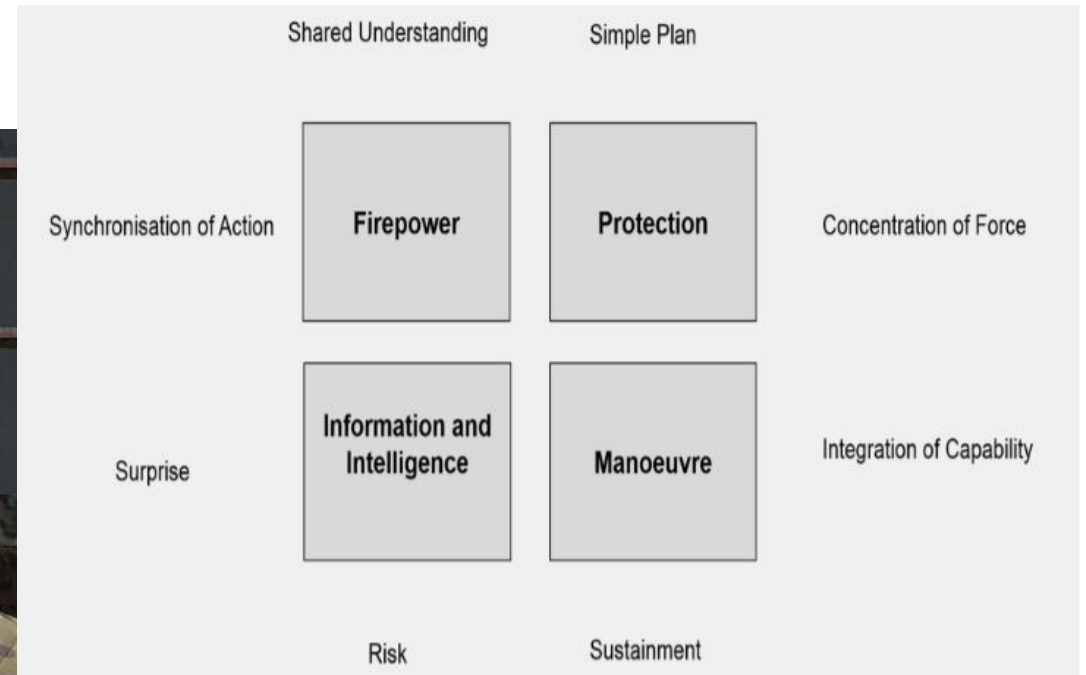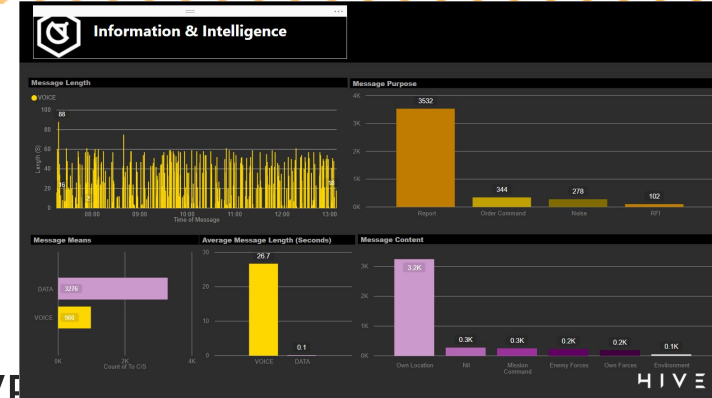
Sprint 3 - 'Innovation as a Service'

- '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 then 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!
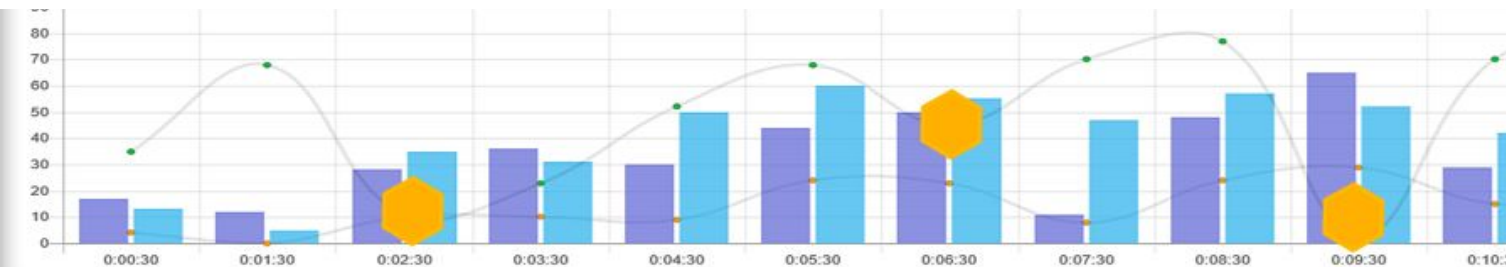
Questions

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.