[dstl] The Science Inside

Simulating Urban Operations

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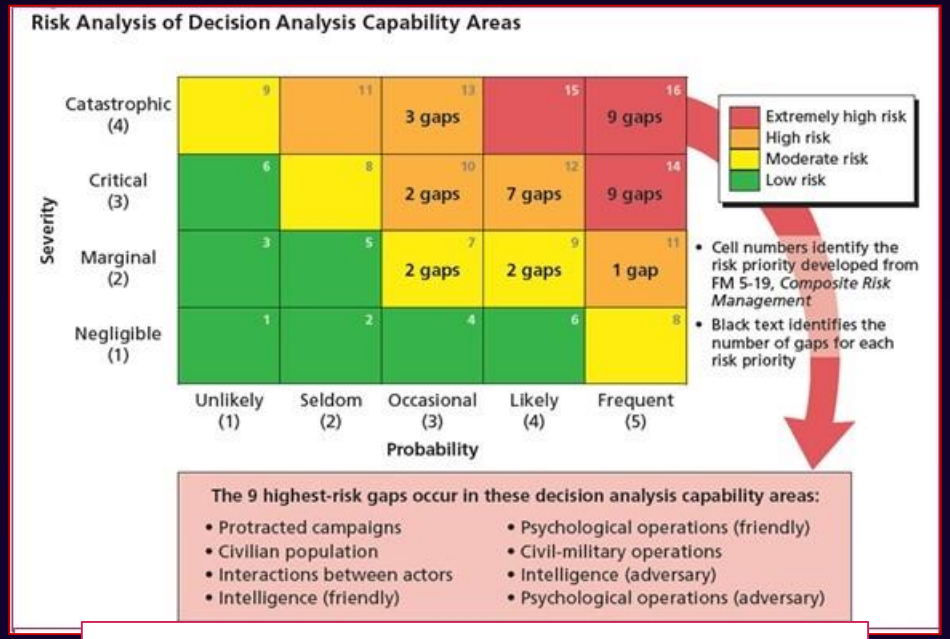
Contents

- Why simulating Urban Ops (UO) is so hard
- How UO are simulated
  - Live
  - Manual wargaming
  - Computer/Virtual
- Strengths and Weaknesses of each method
- Recent examples
  - CUE21
  - Commercial Games for analysis

First, the bad news…

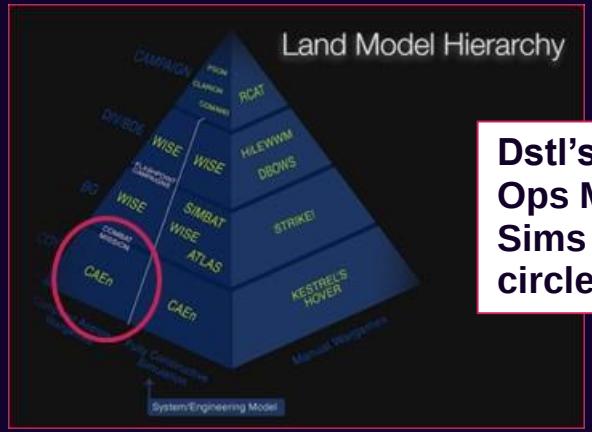
Simulating UO is really hard



US Army Futures Command assessment

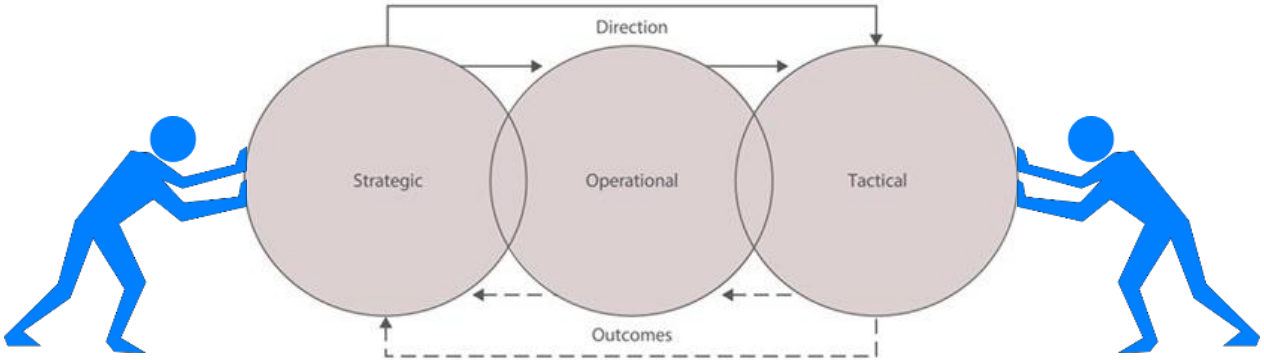
Legacy System Assessment	
OneSAF	PMESII–PT
VBS3	PMESII–PT
JCATS	PMESII–PT
JLCCTC - WARSIM	PMESII–PT

US Army Futures Command assessment



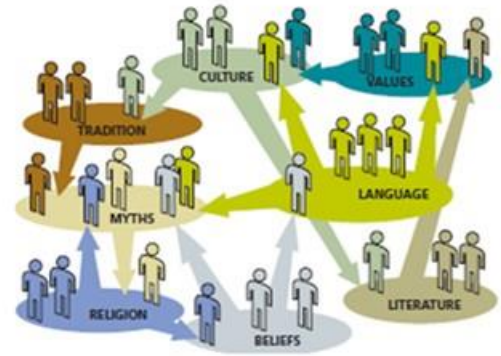
Dstl's Land Ops Models. Sims for UO circled

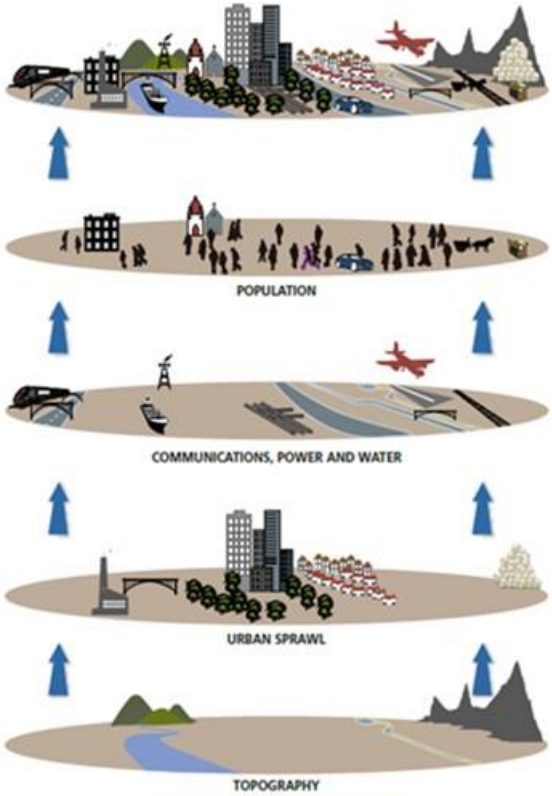
Why so complicated? (Operational Context)



Why so complicated? (Complex Environment)

- Layers of urban “terrain”
  - Physical
  - Human
  - Informational
  - Infrastructure
- Urban systems/flows
- Multi-dimensional
- Multiple Urban Terrain Zones





Why so complicated? (Military Activities)

- Weapon effects
  - Against structures
  - Short engagements
  - Elevation issues
- Communications difficulties
- ISTAR degradation
- Airspace management
- Influence activities (Psy Ops)
- Novel weapons and tactics
- 2nd/3rd order effects across all of these

Running to catch up

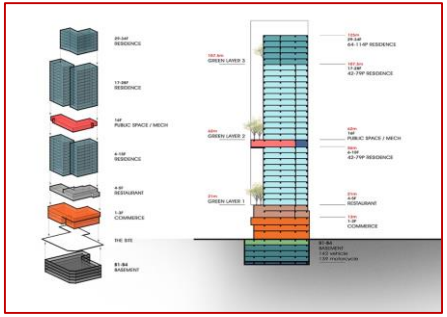
- Limited investment in all urban simulation capabilities
- Long way to go to…

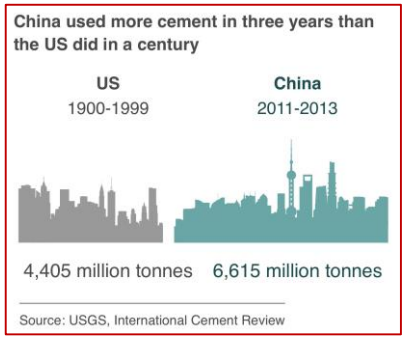
Current UO Simulations

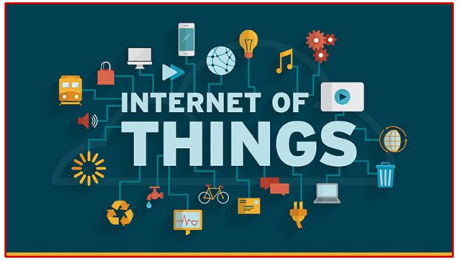
Current Urban Operations

Trends in Cities

Cities are evolving faster than our understanding (and simulations) are







Not all bad news

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- No tool can do it all, but it doesn't have to
- **Master Question**; What do you need the Simulation for?
  - How much detail is ***enough***?
  - Which aspect of UO are you trying to sim?
  - What level of command are you focusing on?
  - What level of evidence rigor are you trying to achieve?
  - Are you analysing new capabilities/technologies?
  - What is your budget?

Dstl and Simulating Urban Ops

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Simulating Urban Operations

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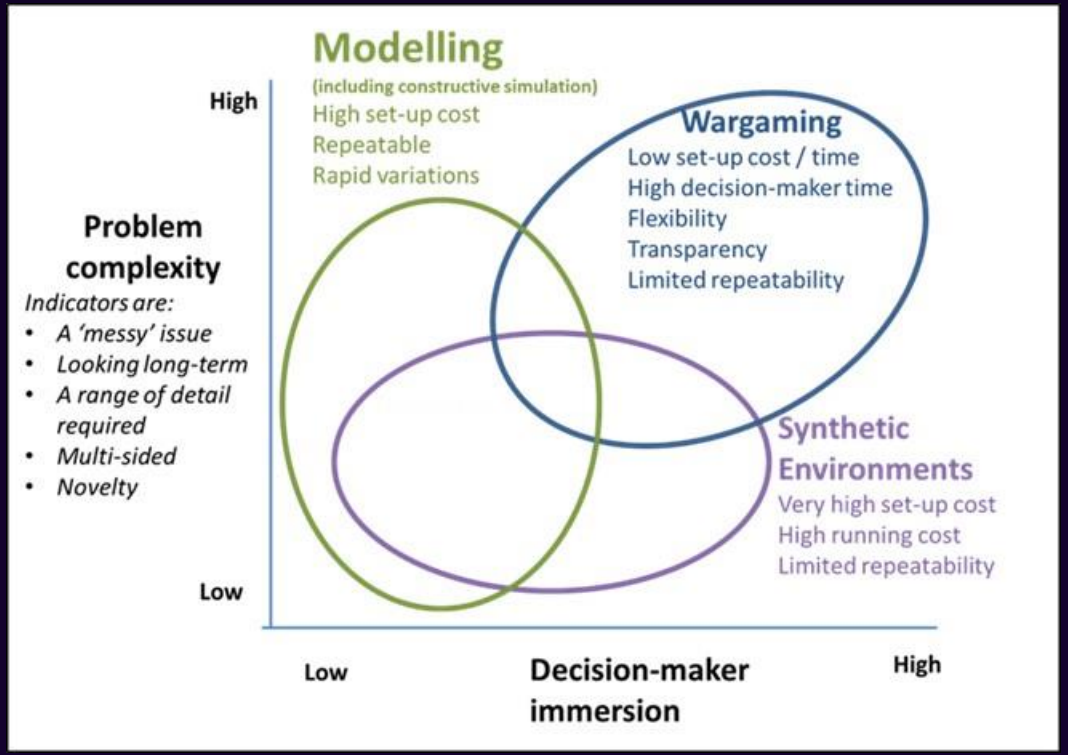

A Tale of Two Cities

- UO simulations can be broken into two main categories;
  - **Tactical**
  - **Operational**

- **Tactical:**
  - Combat/Manoeuvre focused
  - Line of sight matters
  - Kinetic effects modelling critical
  - 3D terrain modelling (including interiors)
- **Operational:**
  - C2, and ISTAR focused (combat is aggregated, but must include cyber/EW)
  - Human terrain is critical (Info Ops, 2nd/3rd order effects)
  - Urban functions

Which is best?

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Live Simulation

- ✓ Greater realism
- ✓ Immersion for participants
- x Lots of constraints
- x Very tactically focused

Manual Wargame

- ✓ Cheaper, quicker and flexible
- ✓ Best for low TRL/concepts
- x Requires specialists to run
- x Slow tempo and repeatability

Virtual/ Constructive

- ✓ Highly complex modelling*
- ✓ Quick and repeatable
- ✓ Data recording
- x Requires specialists to run
- x Expensive and less flexible

Contested Urban Environment 2021

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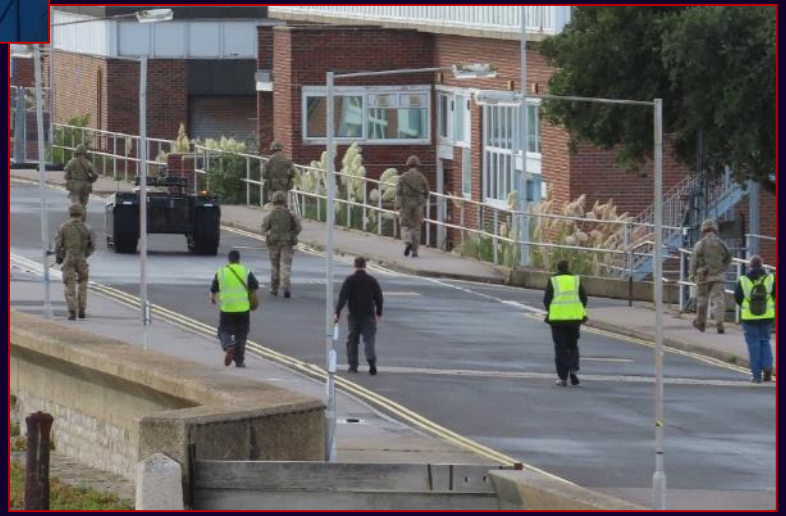
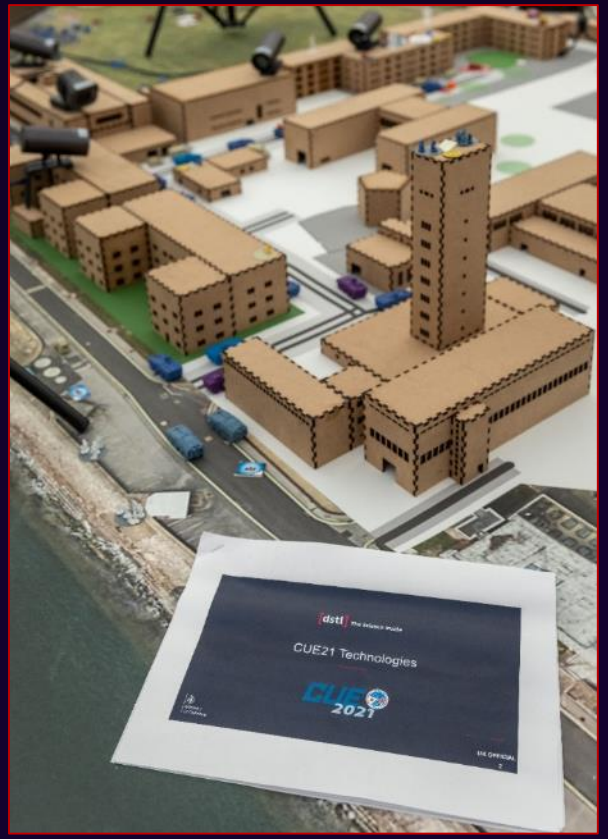
CUE 2021





Two-part format

Live Experimentation

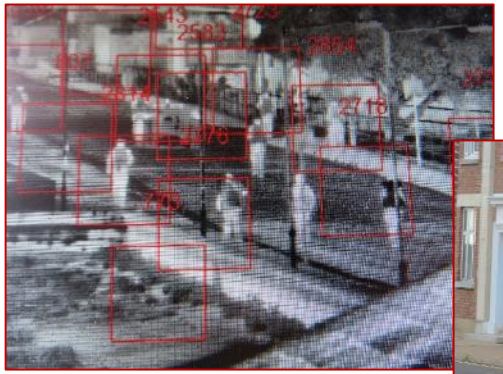


Table Top Experimentation

Two-part format

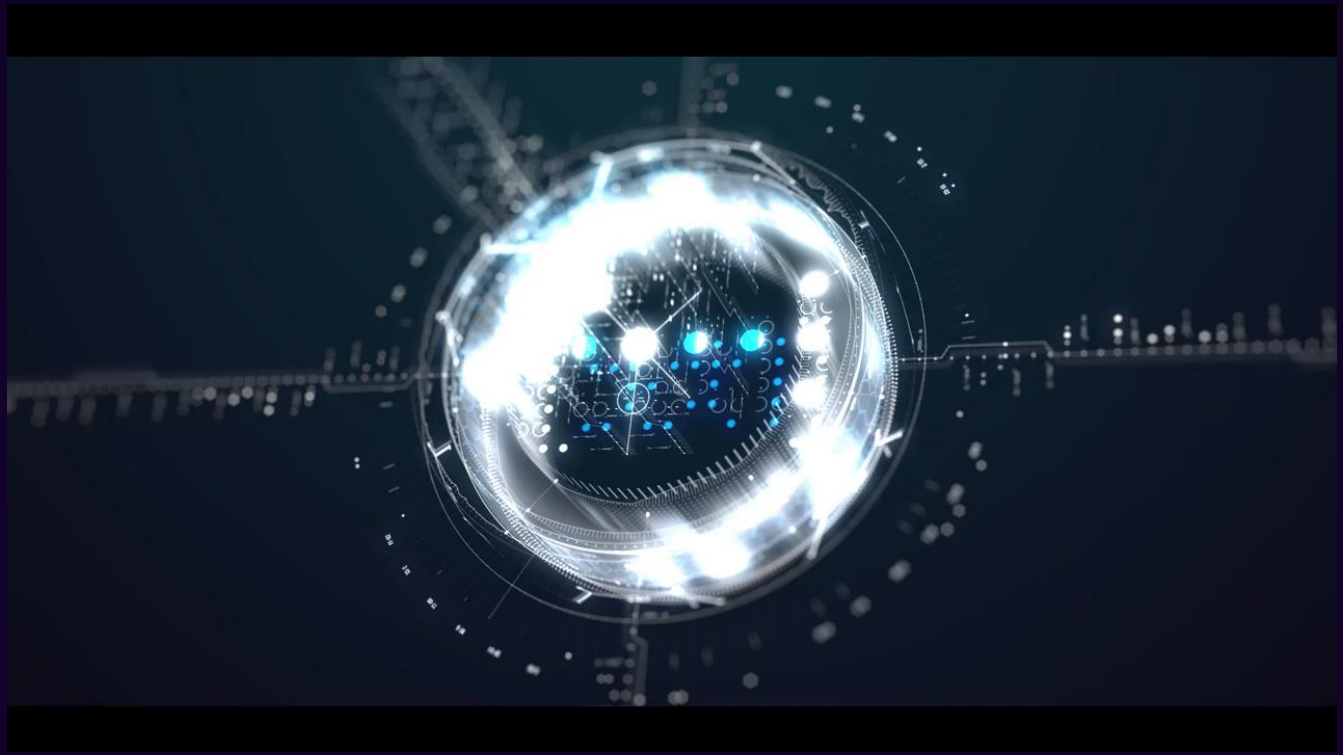
Live Experimentation

- Permissions was “complicated”
- Multi-agency approach
- Realistic urban stressors
- Understanding the baseline was as hard as testing the tech
- Tech enabled low-bandwidth sensor operation
- Scalable, layered ISR is essential

Table Top Experimentation

- C2 support essential to reduce cognitive overload
- Layered ISR essential to overcome urban constraints
- ISR fusion assists timely reaction
- **Needs** to be reinforced with suitable effectors

Exploiting Commercial Games

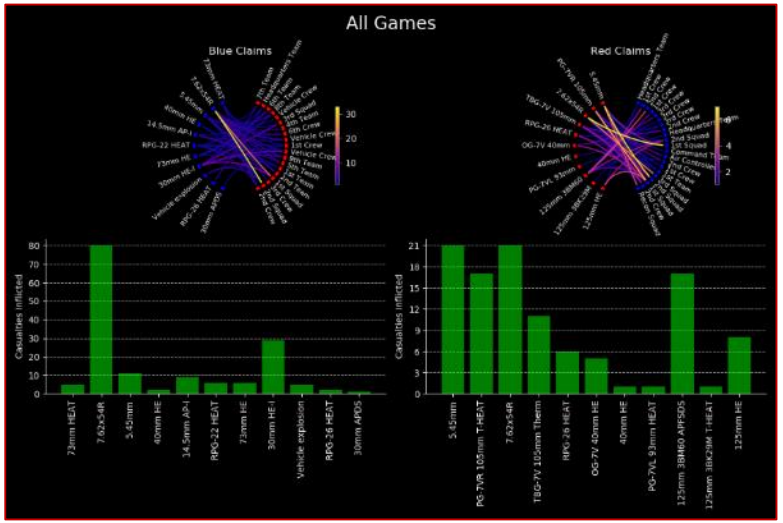


Why?

- Reduced development/running costs
- Improved immersion
- New visualisation options
- Ease of use
- Allows a rapid layering of simulations

Decentralised Wargaming

- Effectively crowdsourcing wargamers
- Scenario designed by central team
- Participants wargame at unit
- Allows:
  - Multiple baselines
  - Multiple variations
  - Virtual participation



Summary

- Simulating UO is as complicated as the real thing
- No single system can do it all
- Users must determine if they want to sim Tactical or Operational UO
- Then determine which aspect they want to focus on

Live Simulation	Manual Wargaming	Virtual Simulation
High decision-maker immersion	Cheap, quick to run and flexible	Moderate cost, highest confidence evidence (data dependent), repeatable
Expensive and not very comprehensive. Limited best use cases	Less rigorous evidence, limited repeatability	Less flexible than manual, require specialist pers/infra

Key Requirements

- Different simulations for different things
- Still require players with specialist knowledge
- Simulations must be adaptable
- Must represent complexity across the urban environment (physical, human, informational, infrastructure)
- Operational level sims must represent city functions, not just buildings and people
- Don’t ignore sustainment and CEMA

Questions?

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