Simulating the Future Operating Environment for Training and Education

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Gaps in Simulation Capabilities

- Operational environment effects are not represented in a consistent manner across simulation components
- Representation of operational environment effects is limited
- Simulation components are often large and cannot be readily updated to meet defence training requirements

Research Aims

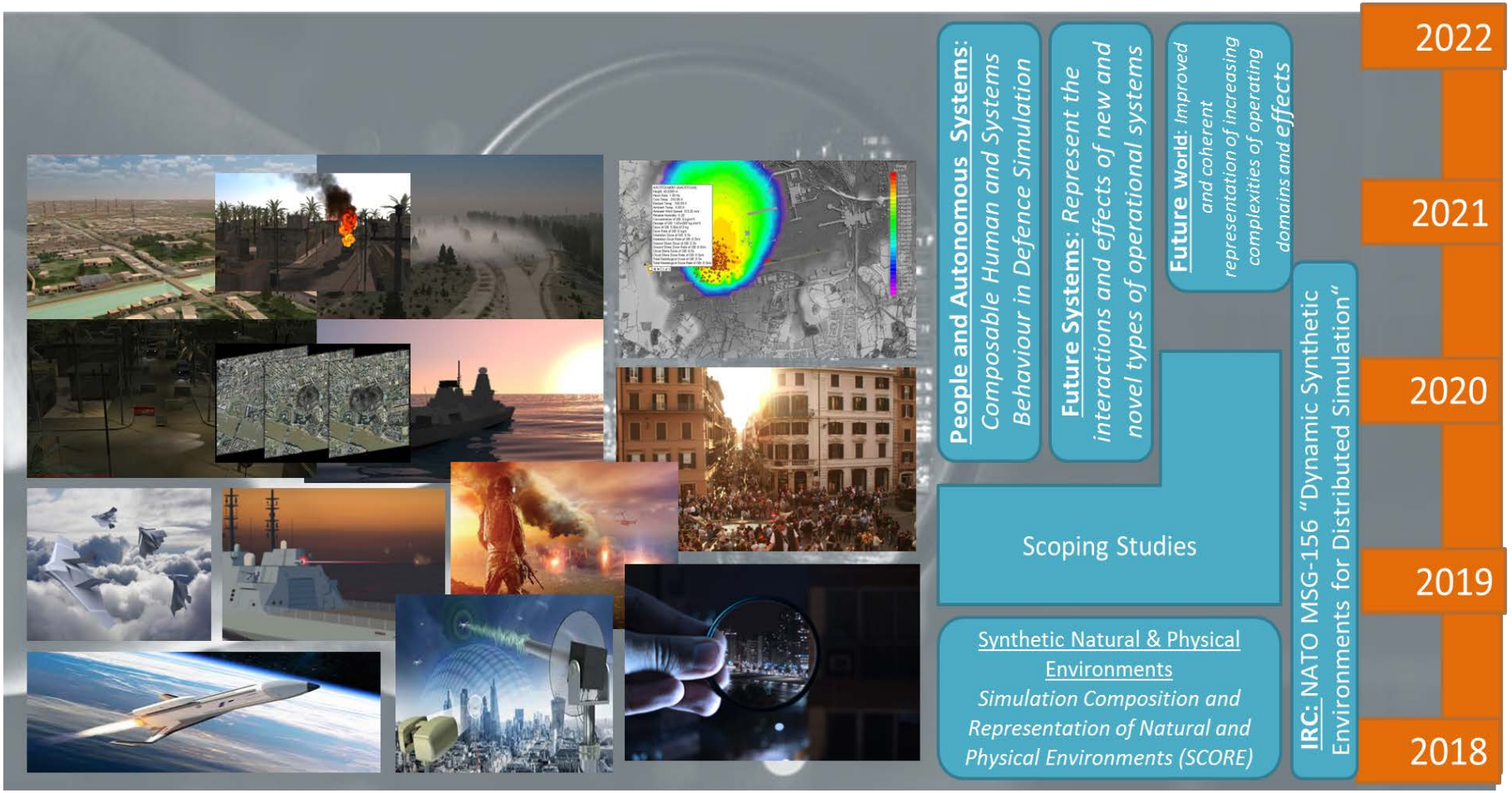
To inform methods and approaches for the increasing complexities of future defence operational environments to be represented across Simulation and Synthetic Environments (SEs) in a more timely and coherent manner

Research Objectives

- Simulating Future Battlespace Complexity
  - Methods and approaches to compose more effective and efficient simulation in a timely, agile and consistent manner
  - Improved Force Readiness

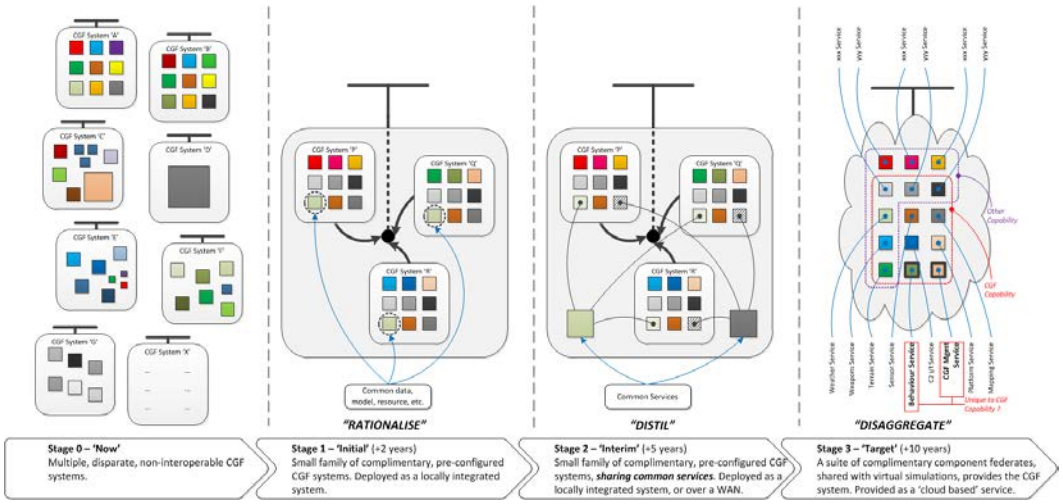
- Inform Defence Policy and Strategy
  - UK Defence Modelling & Simulation Coherence (DMaSC)
    - Provision of coherent, common, shared enablers to maximise the utility of Modelling and Simulation (M&S)
    - Improved interoperability and re-use of simulation

Research Scope



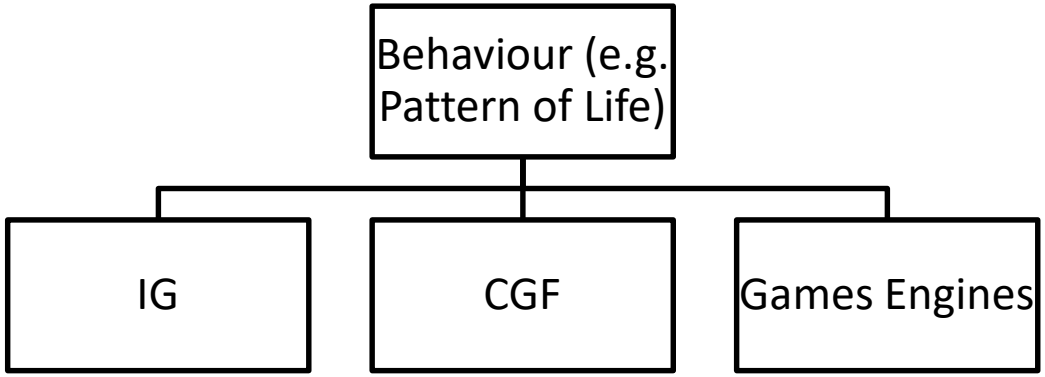
Composition and Deployment of Simulation Systems

- No single CGF represents the breadth of operational behaviours
- Evolving CGF's over the next 10 years
- MSG-164 MSaaS activities are a key enabler for delivering this vision



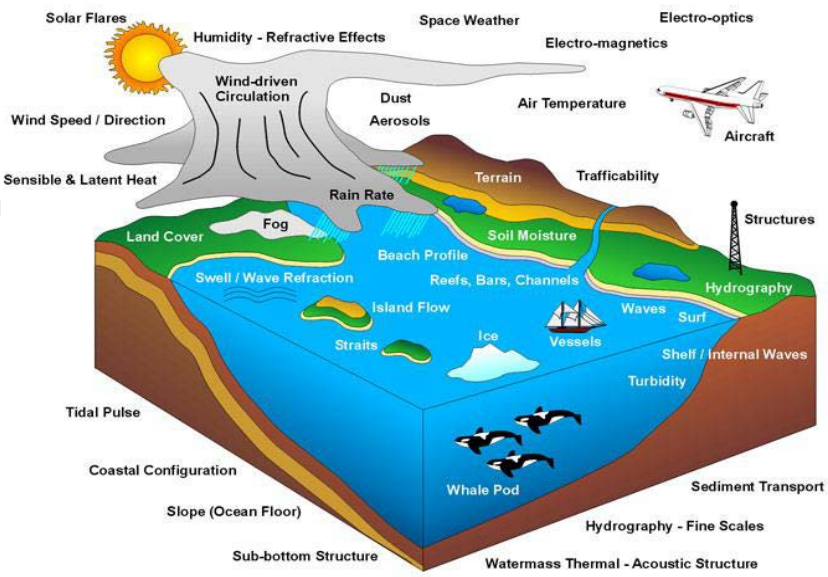
Dstl CGF Strategy Roadmap

Representation of Human and Autonomous System Behaviour



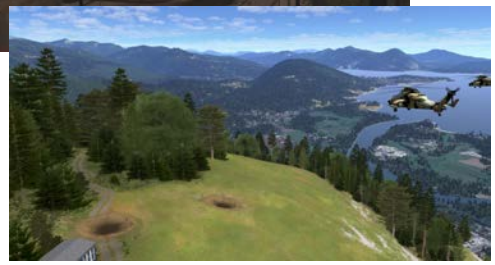
Representation of Environmental Effects

- Prototyped methods for coherent representation of weather/weather effects in simulation systems,
  - Weather data sets managed via a common data repository
  - Deployment and integration of weather data into simulations based on OGC standard based Web Services
- Use of real weather data from authoritative sources (e.g. UK Met Office), being investigated
- Ongoing research being carried out in conjunction with MSG-156



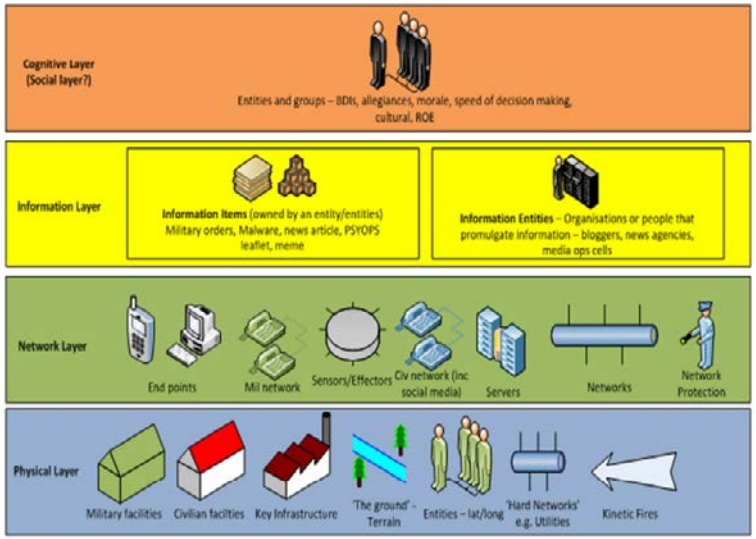
Representation of Physical Force Effects

- Approaches to achieve coherent representation of terrain deformation across simulation systems
  - Implementation of a GeoServer Open Source geospatial data server to host source and 'refined' terrain datasets created from a CDB database (i.e. CDB-S, CDB-R)
  - Development of micro-services to retrieve CDB-S elevation or imagery data
  - Process of 'down-sampling' the data to reduce the Level of Detail (LoD) from the high resolution CDB-S data to the resolution required for the target simulation
- MSG-156 involvement to explore and develop common approaches

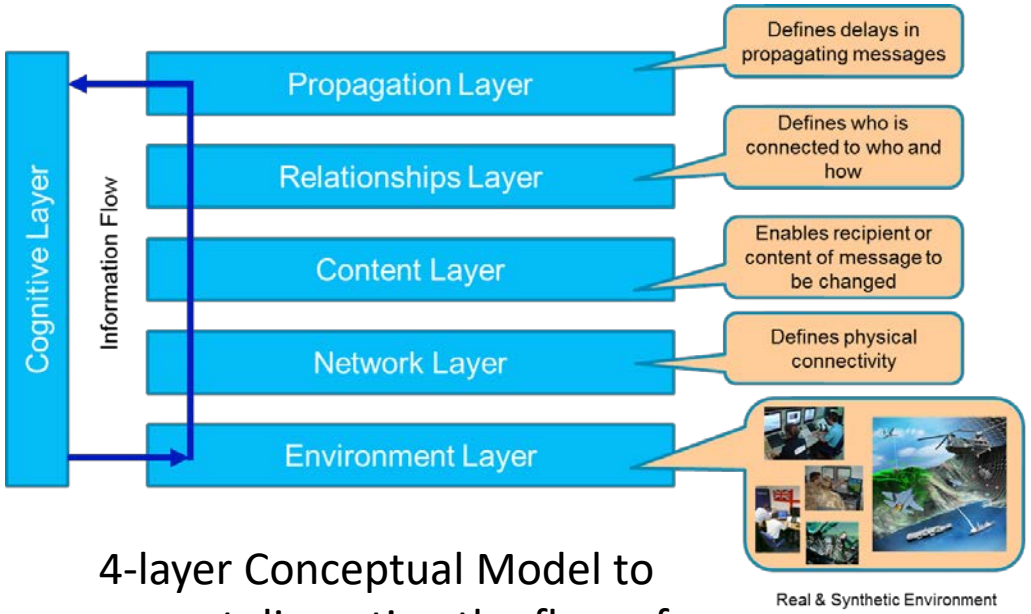


Representation of Non-Physical Effects

- Approaches to represent non physical force effects including Cyber and Electromagnetic Activities (CEMA) / Information Warfare (IW)



4-layer Information Warfare Conceptual Model Architecture



4-layer Conceptual Model to support disrupting the flow of information in the operational space

Representation of Future Systems

- Future operational environments will include future platforms, weapons, sensors and their effects

- The role of simulation in representing emergent systems for defence training and education needs to be understood and developed appropriately

Research Outcomes

- Common taxonomy and shared vocabulary for the coherent representation of Human and Systems Behaviour (HASB) in simulation systems
- A simulation agnostic method for authoring Patterns of Life (PoL) for use in simulation
- An approach to effective and efficient composability of simulation components
- Methods for representing a wider spectrum of effects in simulation
- Representation of emerging operating domains in simulation

NATO Collaboration

- Continue to ……..
  - Understand the MSaaS approach, utilising efficient and effective simulation composition, deployment, integration and execution (re: MSG-164)
  - Inform the development of Simulation Open Standards (re: MSG-145)
  - Develop methods for the coherent representation of dynamic synthetic environments, including terrain deformation due to weather and force effects (re: MSG-156, -163)

- Build Upon ……..
  - Representation of Human and Autonomous Behaviours: Developing standards and common vocabulary (re: MSG-127)
  - Developing consistent, standards based representation of non physical effects (MSG-151, -170, -181)
  - Representation of Autonomous Systems (MSG-154, -183)

NATO Collaboration

- Instantiate …….
  - A common taxonomy for the representation of simulated behaviour
  - Methods for authoring Patterns of Life (PoL) in simulation
  - Representation of emerging operating domains in simulation
    - Space, Megacities
  - Coherent representations of Non-Physical effects in simulation
    - EW, IW, Cyber
  - Representation of Future Weapons, Platforms and Sensors in simulation

"Simulating Future Battlespace Complexity" is 1 of 5 UK Defence Innovation Priorities announced in September 2019