

**“I can see clearly now” -
deploying training simulators
in a distributed
heterogeneous cloud
environment.**

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Introduction



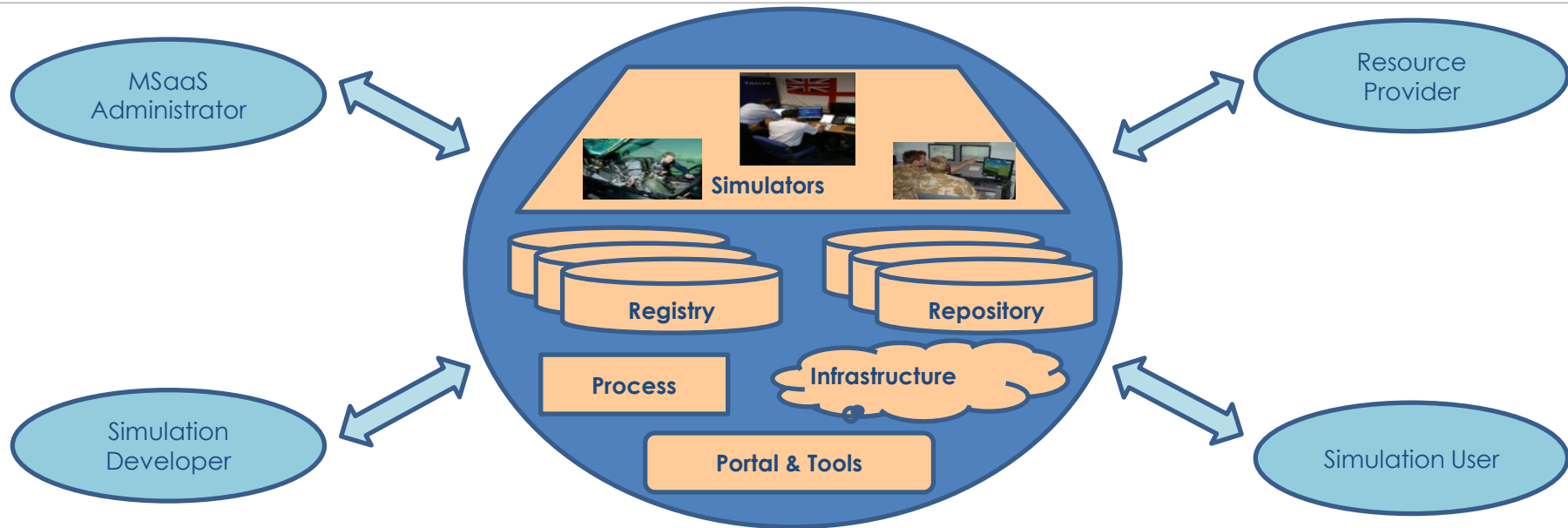
Purpose of presentation

- Modelling and Simulation as a Service (MSaaS) is on the way
- Technical focus on MSaaS developments continues
- How do we exploit and deploy the technology ?

Looking forward

- What business and technical problems need to be solved before adoption?
- What does a deployed solution employing MSaaS look like ?

What is MSaaS ?



SHARING OF NEW AND RE-USE OF ACQUIRED CAPABILITY AND DATA, including hardware, software, services, data repositories and infrastructure

PLATFORM INDEPENDENT semi-automated deployment and execution of simulations enabling flexible and scalable use

An **ON-DEMAND** method of moving from an *operational requirement* to an *executable simulation* that can deliver that requirement in a fully transparent and integrated manner

'You canna change the laws of physics' – Montgomery Scott

■ **The simulation industry has been trying to get better interoperability for many years with limited success**

■ **Tolk's paper* discusses the difficulty of conventional approaches**

➤ Mathematical, Computational, Epistemological

■ **MSaaS may offer a way out**

➤ Services are relatively easy to combine into a common system & offers:

- Technical maturity
- Aligned governance
- Cyber security
- Common Business model
- Composable Services

■ **Conceptual alignment is still unsolved but MSaaS is a good potential approach**

■ **"Interoperability enables 'fair fights', Composability ensures 'fair fights'!"**

* A. Tolk, "Interoperability and Composability - A journey through Mathematics, Computer Science and Epistemology," NATO modeling and simulation group, ref 17-2589, Lisbon, 2017.

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Issues and potential solutions / 1

Composable service definitions

- How do we resolve granularity of services ?
- What level of integration is needed ?
- What is the interface?

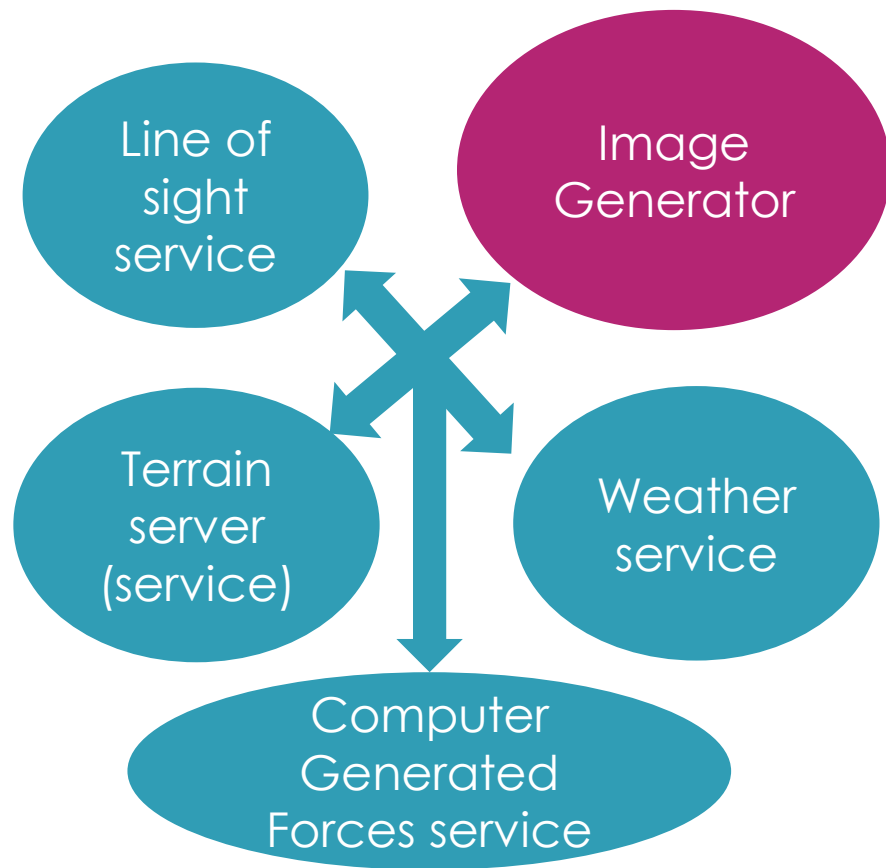
Cloud latency

- Latency / variability depending on time of day, location of cloud service ?
- How do we define what is needed ?
- How do we measure it ?
- How much does it matter ?

Some potential solutions

- Local clouds
- Experience from previous systems
- Standardisation of interfaces

Experimentation is needed



Issues and potential solutions / 2

How do we integrate these systems ?

- Different vendors for services
- Different locations for service delivery
- Need to reduce cost, time and risk for integration

Cyber protection and security accreditation

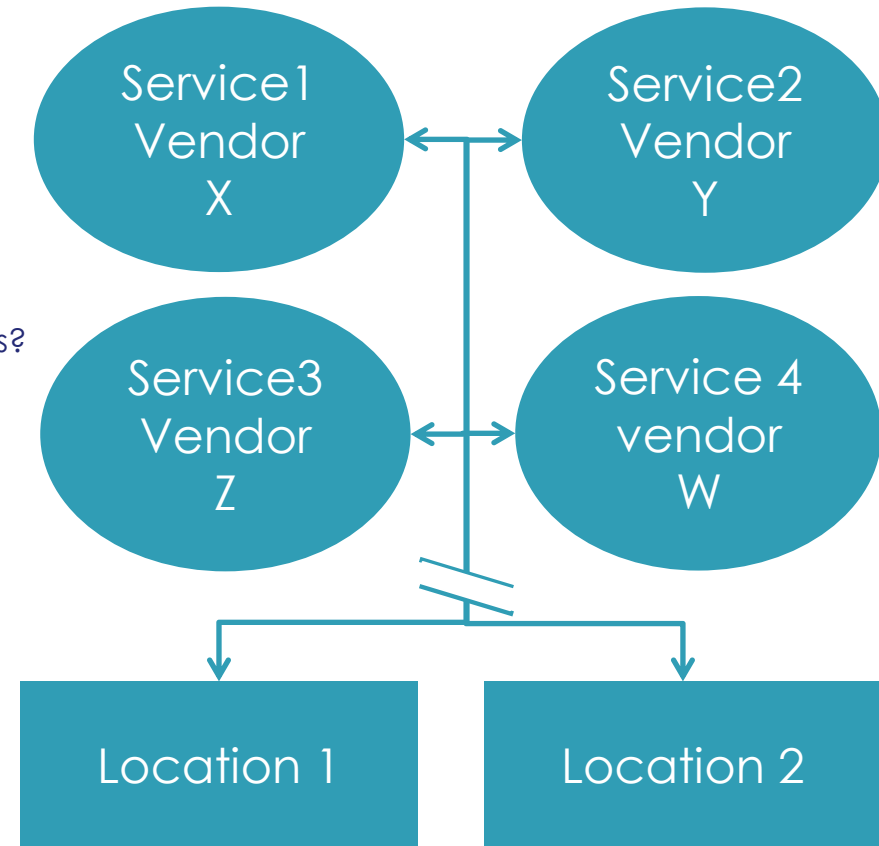
- How to get security accreditation for these configurations?
- Cross domain security issues?
- Cyber protection of networks?

Validation and verification

- Ensuring components work properly and meet requirements

Some potential solutions

- Simulation 'blueprints' for pre-deployment testing of network and service designs
- Capability badges for components/services



Issues and potential solutions /4

How do we apportion ownership of risk?

- Integration risk
- Service delivery risk
- Validation and verification risk

Payment model

- 'Is it worth it?' versus legacy approach
 - 'Pay as you go' by the hour or by the event,
 - Enterprise licencing, Catalogue
 - Mixed model

Some potential solutions

- Secure auditable log of events
- Digital contracting for speed and flexibility
- Flexible structure to handle different models
- Simulation blueprints and capability badges
- Rapid updates



'Dream implementation' of MSaaS for training applications

1. Registry services linkable to local, 3rd party or international registries
2. Repository services, including terrain, models, scenarios, 'blueprints'
3. Automatic deployment tools
4. After action review and analysis support - on different execution environment
5. Component tools – scenario development, resource scheduling, communication, sharing, visualisation and monitoring
6. Support for security accreditation
7. Quality of service monitoring
8. Support for COTS and legacy components
9. Support for remote cloud and local compute environments
10. Support for metering, monitoring and charging
11. Full support of standards approaches, and VV&A
12. Great User Experience (Ux)



“Enter when ready...”

Trends towards 2025

Stove – piped systems will die out being replaced by dynamic composable systems which may be changed in minutes

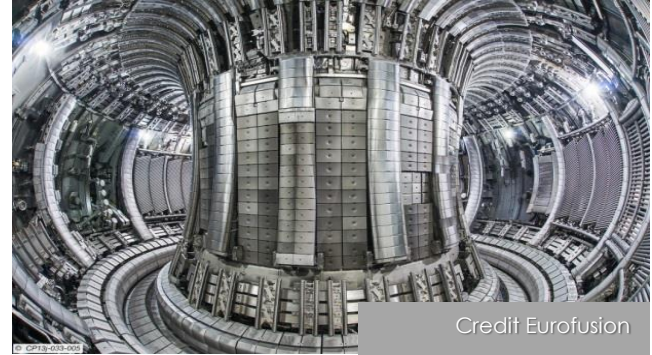
Components and infrastructure may be sourced from multiple competitive organisations

Users will be able to generate, reuse and modify scenarios

Components will be paid for on as-used basis rather than outright purchased, and may be cloud based rather than physically located

Simulation hardware will be repurposed dynamically

BUT...



Next steps – A Thales view

MSaaS is disruptive to existing ways of working

- Industry and customers need to work together to ensure it is not destructive

We cannot solve all the problems at once

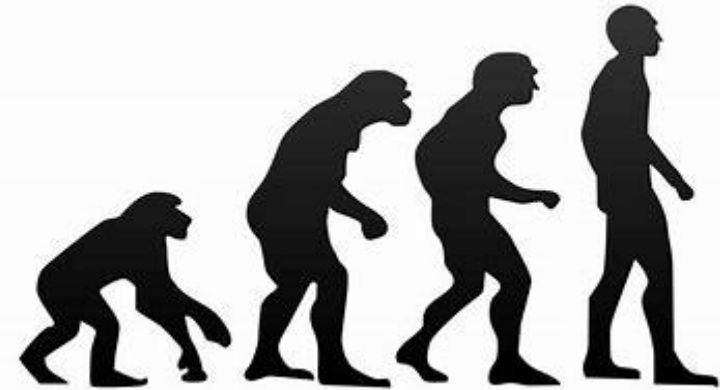
- And Tolk's work would indicate we cannot solve them all anyway

We propose an evolutionary approach which includes:

- An open approach to working with diverse stakeholders – reducing stovepipes
- Technical experimentation
- Business model experimentation

Initial small steps are important

- Start with things that matter for the rest of the ecosystem
 - Good registry metadata standards to enable consistent discovery results
 - Ensuring terrain data repositories are in common readable formats



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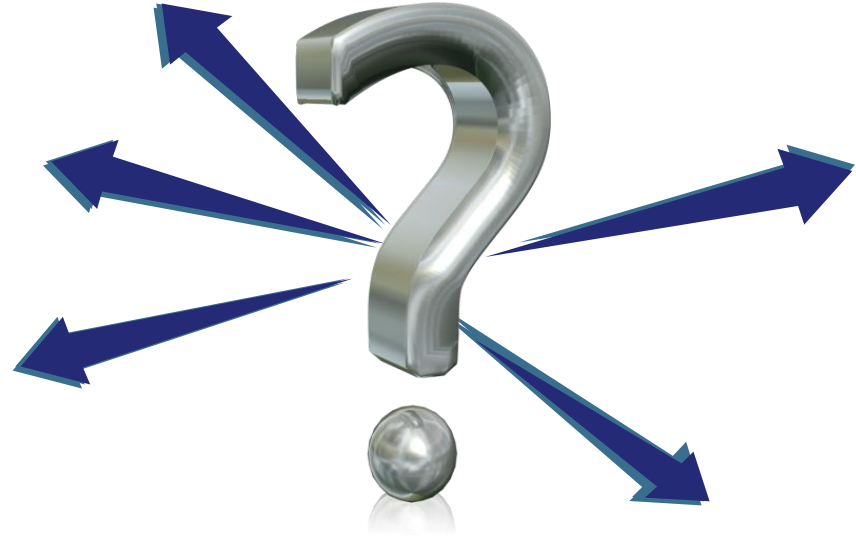
Questions ?

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