Converging Virtual, Constructive and Gaming through Cloud Technologies

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Bohemia Interactive ®
SIMULATIONS
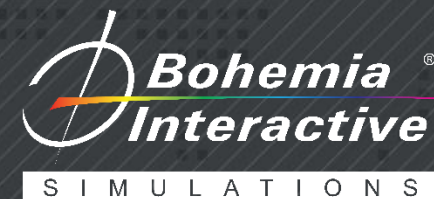
Scope

- **What is "the Cloud?"**
  - Cloud scalability vs deployment/virtualization

- **The Ambition – Moving Simulation to the Cloud**
  - NGG and STE and other acronyms
  - Cloud gaming?

- **Back Down to Earth**
  - How hard can Google Earth be anyway?
  - Entities, Converge!

- **The Secret Sauce: Architecture**
 - How we achieved convergence

- **Pete's Opinion**

What is "the Cloud"?
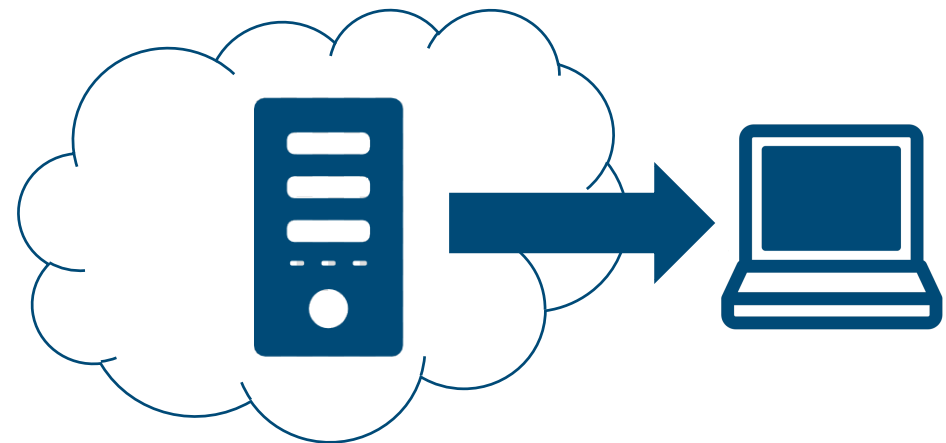
"What cloud computing is not about is your hard drive"

"The cloud is just a metaphor for the Internet"

aws

Google Cloud

Azure

The cloud uses multiple servers – or a server cluster – to either dynamically scale (automatically increasing the number of servers to increase processing power) or to virtualize (to use a computer somewhere else).
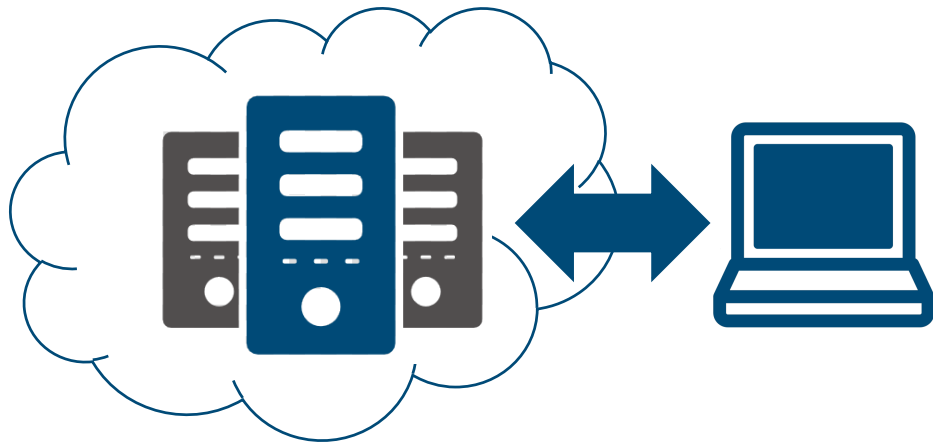
Cloud scalability

Cloud deployment / virtualization

Why Does It Matter?

- For Defense, the cloud offers connectivity, scalability, virtualization and storage.

  ➡ **Connectivity:** You can connect lots of players / trainees.

  ➡ **Scalability:** You can solve hard simulation problems by magically adding resources.

  ➡ **Virtualization:** You can centralize computer hardware.

  ➡ **Storage:** You can centrally store stuff, e.g. terrain and 3D content, and download only what you need.

- … all assuming you have appropriate bandwidth and have solved all security concerns ☺

The Ambition: Moving Simulation to the Cloud

- Demand for "cloud gaming" appeared in US Army RFIs around 2015 – e.g. "Next Generation Game"

- "Discuss the potential inclusion of technology to address the user experience via <u>web-based</u>, console, <u>thin/zero client</u>…"

- "The Government may desire to harness a <u>cloud base implementation</u> for GFT NGG"
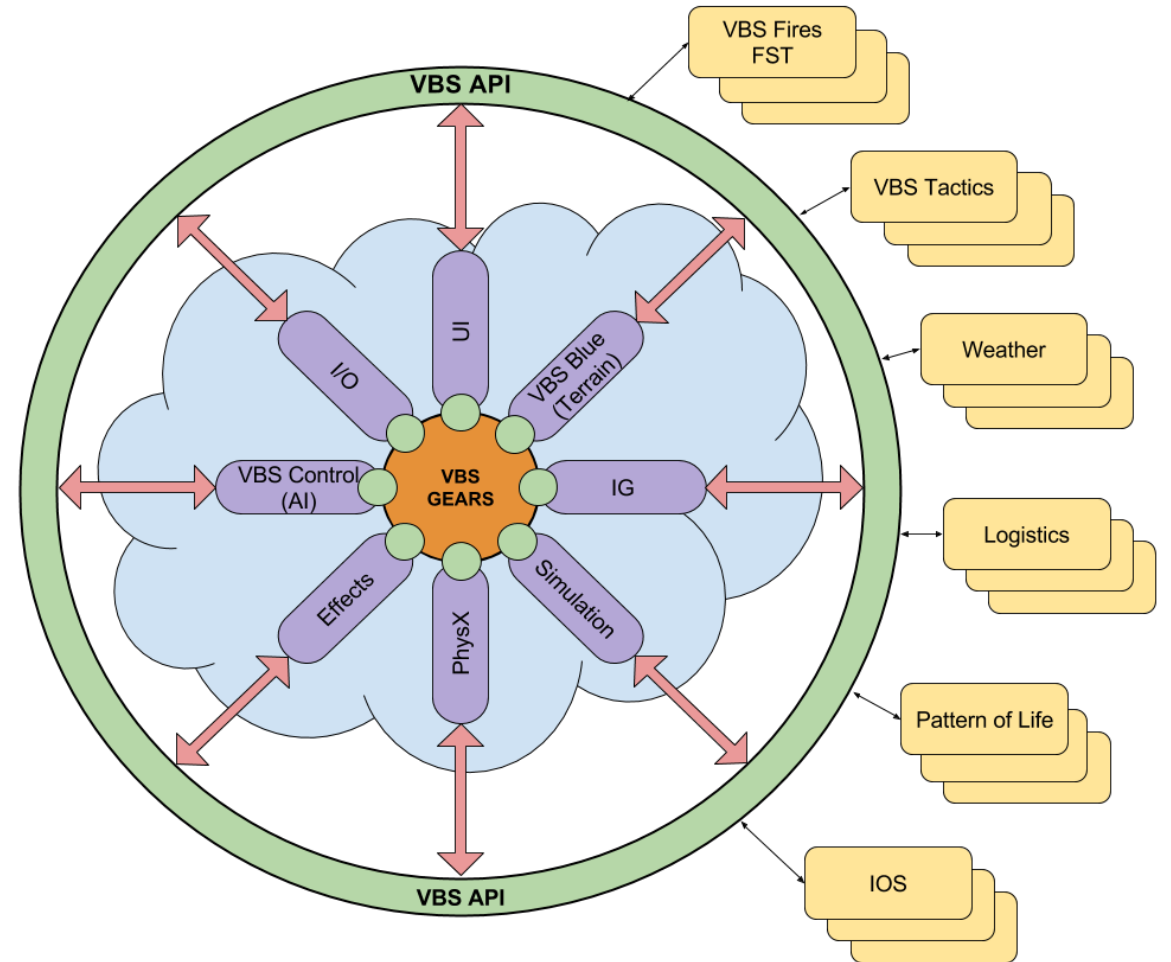
The Ambition: Moving Simulation to the Cloud

- The U.S. Army then released a Statement of Need for a Synthetic Training Environment (STE) in late 2017.
  - [Statement of Need](#)
  - [Industry Day Briefing](#)

- The goal of STE is to "converge" virtual and constructive simulation and deliver a holistic "one world terrain" to the point of need leveraging cloud technologies.
  - A single virtual environment for all U.S. Army simulation
  - "Massively multiplayer" through U.S. Army networks
  - Scalable from Squad to Corp level

- Comprised of the following primary components:
  - One World Terrain (OWT) – A virtual globe accessible via Cloud
  - Training Simulation Software (TSS) – The STE "game engine"
  - Training Management Tools (TMT) – Apps built on the TSS to facilitate training

- Mission command and legacy systems to be supported.

Cloud Gaming

- MMOGs can and have leveraged cloud technology… or at least the *appearance* of cloud technology

- World of Tanks, Warframe, PUBG etc. use cloud technology for *matchmaking*. These are termed MMOs but, it's only a handful of players – 4, 15 or up to a few hundred – playing together at the same time
  - They are simply using servers to match players together and spawn a dynamic game instance
  - Most multiplayer games are simply running a fixed number of players on a single server


World of Tanks – 15 vs 15 players

Warframe – 4 players

Back Down To Earth...

- Let's consider game-based training and how it could leverage the cloud.

- First, we need to recognize that this type of training game varies massively, from simple web-based training courses through to full 3D simulations.

- The more complex the game, the harder it is to "cloudify", because of its processing and 3D content needs.

But can we virtualize?
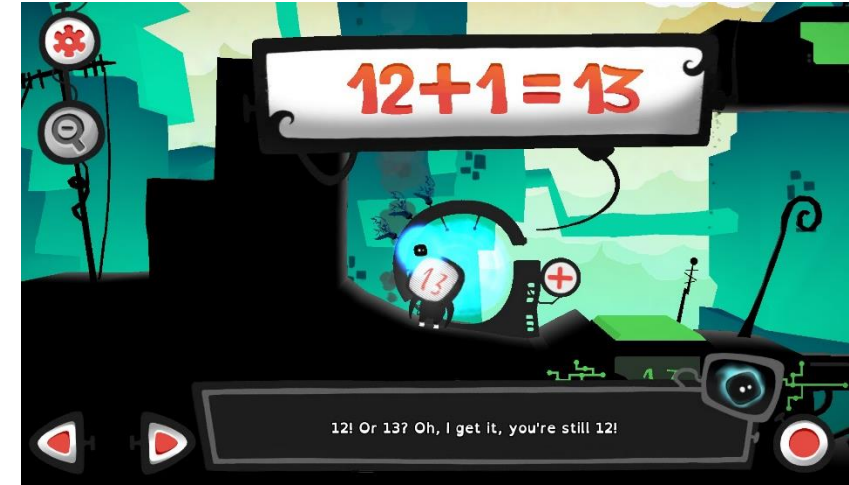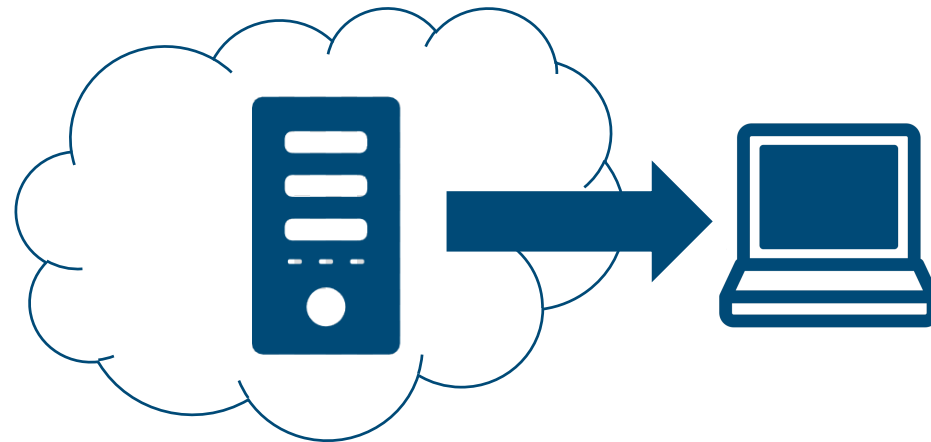

Simple web-based game for learning math

High fidelity content in VBS4

Back Down To Earth…

- Virtualization means that we run a virtual instance of a computer system in a layer that is abstracted from actual hardware.

- It's not magic – there is still a computer with a graphics card, running the game, somewhere else.
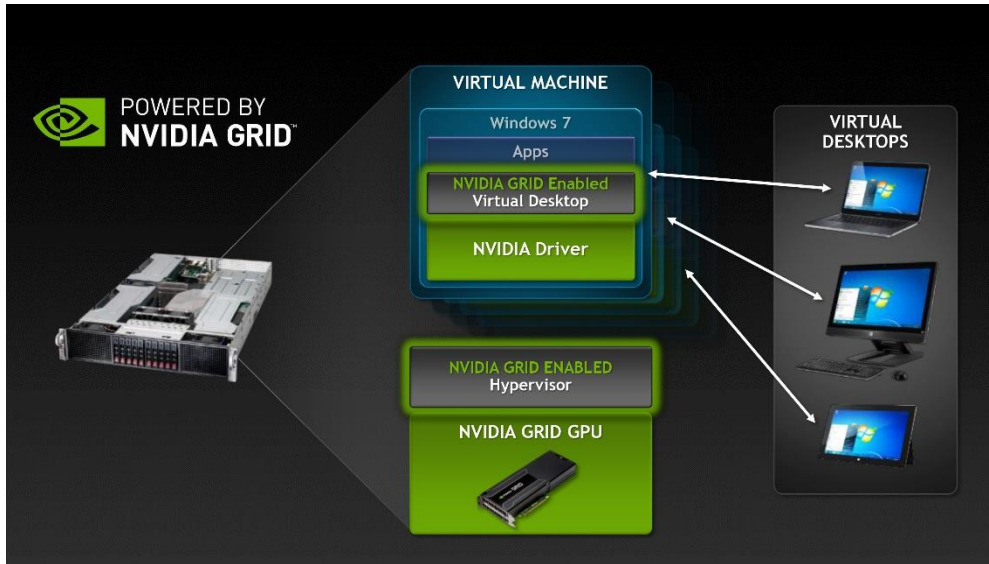
Back Down To Earth...

- Google Stadia aims to be the "Netflix of Gaming", streaming game content from the Cloud to multiple devices.

- Google Stadia requires a stable 10 Mbps connection for 720p, or 35 Mbps for 4K. For 720p streamed to a battle lab with 250 clients, that's 2.5 Gbps! Even on a local area network this is challenging.

Back Down To Earth…

- Even "local virtualization" of 3D games is still not affordable.

- We haven't yet reached the tipping point where a local server virtualizing 3D games is cheaper than buying gaming PCs.

Back Down To Earth...

The reality is (for the next 5 years at least) that a hybrid solution is the way to go (for complex 3D gaming).

Rendering in a client application or web browser ⟷ 1. Scalability
2. Connectivity
3. Terrain
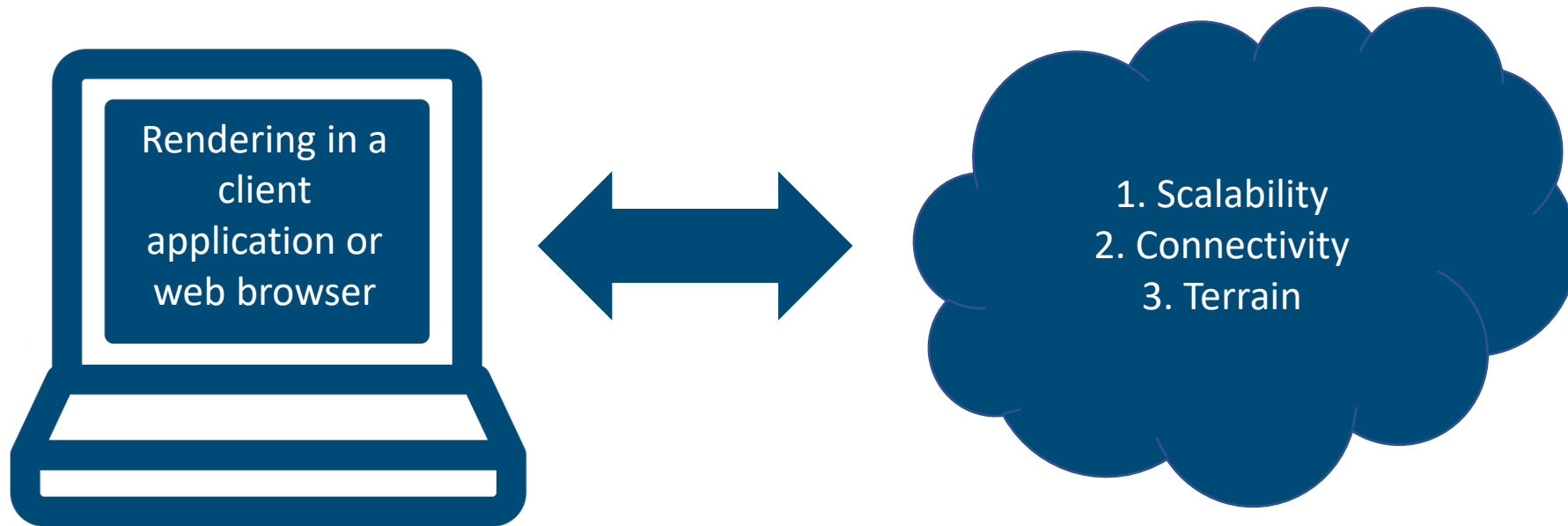
Cloud Scalability

- In the context of simulation, cloud scalability is interesting for doing *more*
  - More physics, more entities, more connections…

- The idea is that additional processing power is auto-magically added as needed – effectively adding more virtual servers / processors

- In the context of a 3D game this is typically done by breaking down complex simulation into discrete components. Components are processed separately, but these processes can still interact.

- Several companies are working on generic approaches to cloud scalability, for use in games.
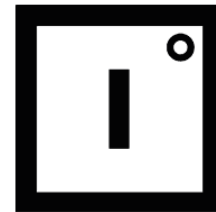
hadean   IMPROBABLE

Cloud Scalability

The promise of cloud scalability in games is exciting! **But…**

➡ It is highly reliant on stable (but not necessarily high) bandwidth.

➡ You need to build your game to support cloud scalability.

➡ You need to consider license fees for Government end users.

➡ If the middleware disappears or becomes unsupported, you might be in trouble.
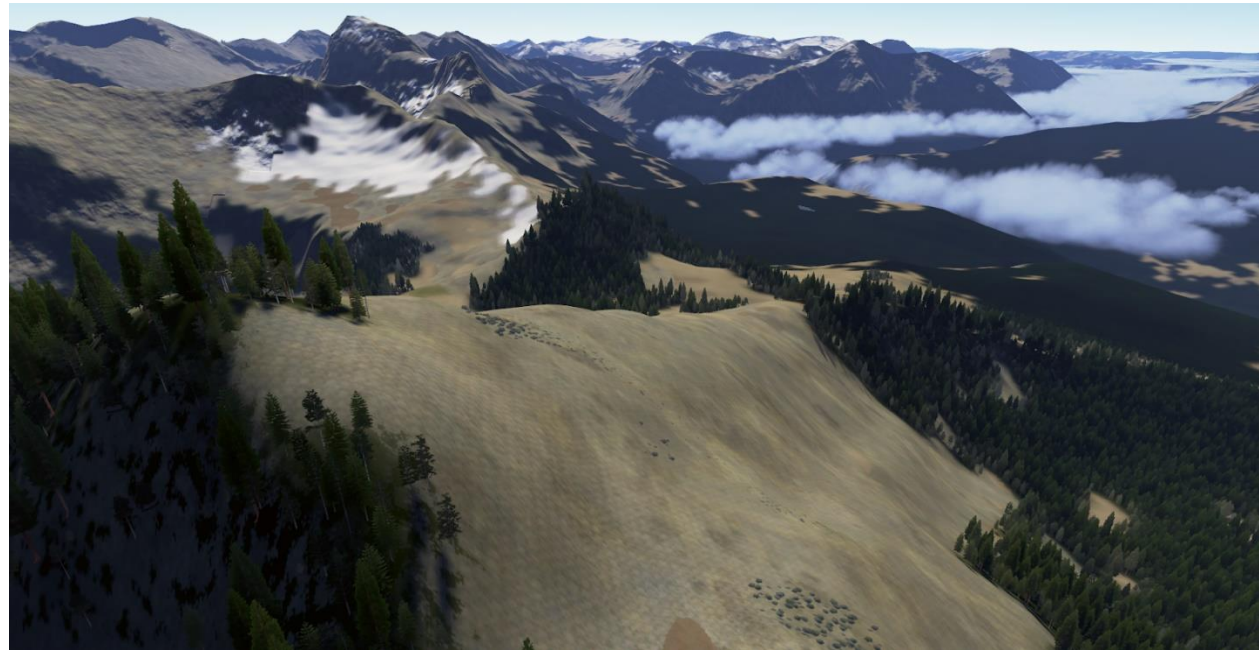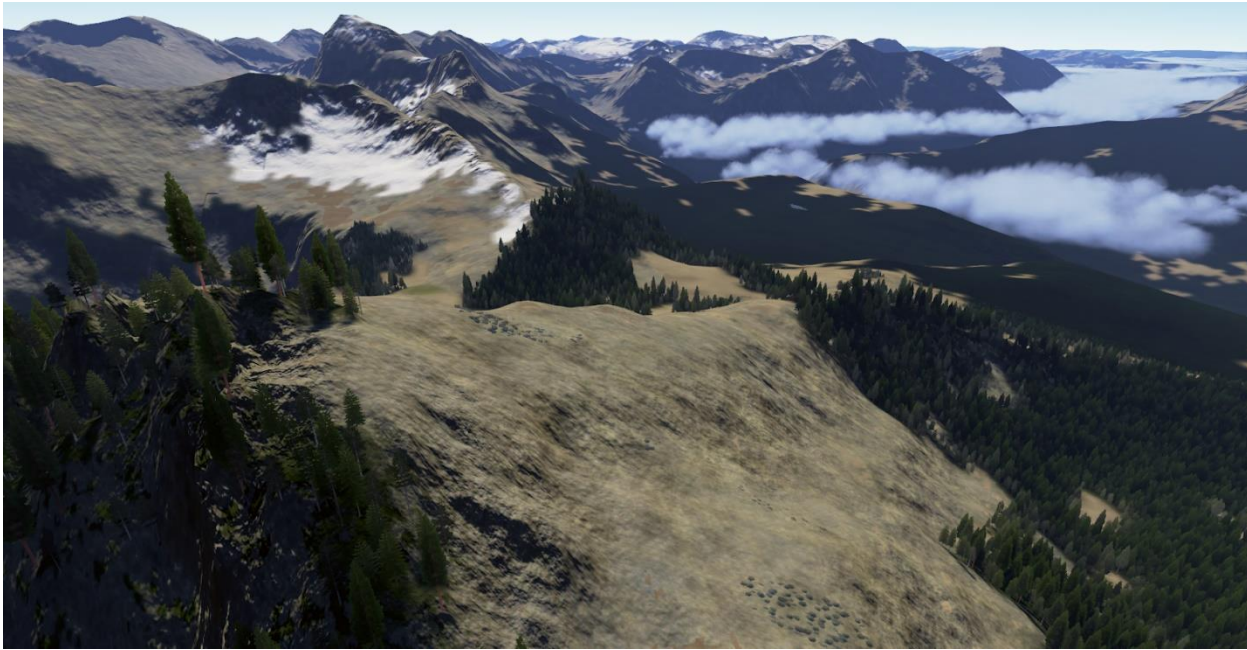
➡ Cloud resources are not free!

Architecture Slides (Detail Removed)

- BISim and its partners have developed a solution for *convergence* of LVC through leveraging cloud technologies.

- For more information please contact us at sales@bisimulations.com.
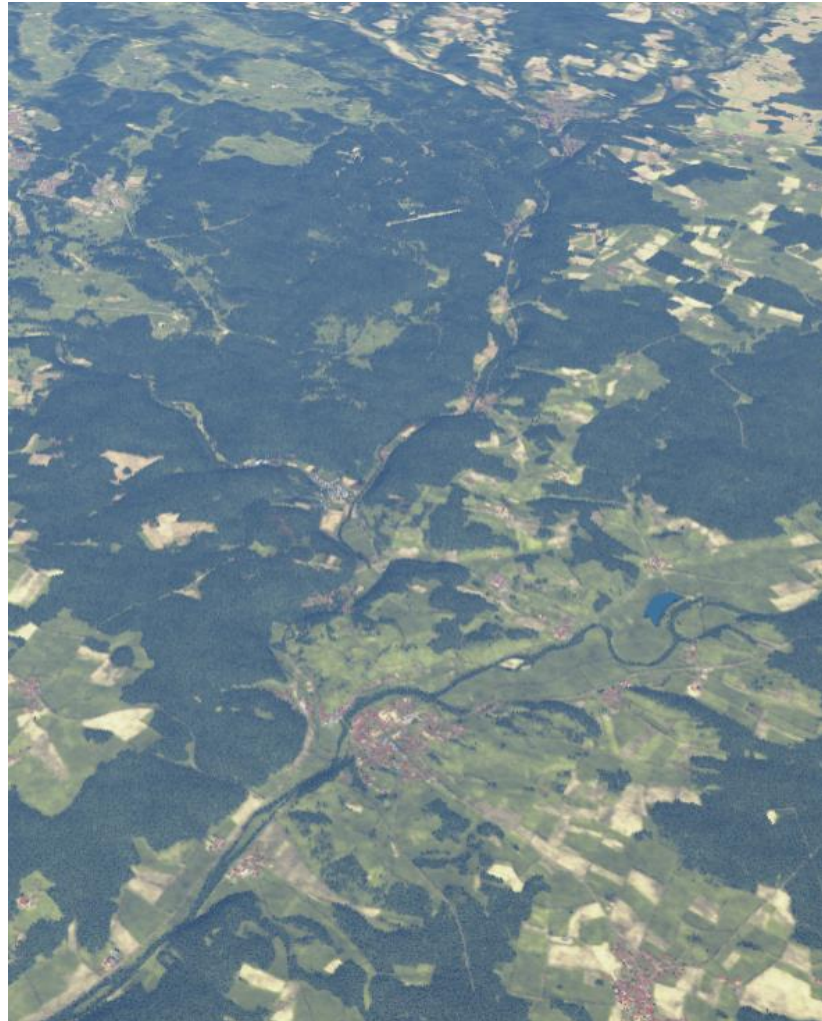
Procedural Generation

Rendered global baseline data with procedural details (left) and without (right).

Procedural Generation

Procedural terrain rendered in VBS4

Summary

- Cloud technology is here and offers massive potential but be aware of the pitfalls.

- For the next few years, hybrid solutions will be necessary for complex 3D simulations – virtualization remains expensive and not practical (or affordable) for products like VBS. But this will change.

- Convergence of LVC is possible, and a worthy vision for the future of military simulation.