GEOGRAPHY AND GAMES PLAY WELL TOGETHER

COLLABORATION AND COMMITMENT TO OPENNESS BETWEEN GEOSPATIAL AND GAME TECHNOLOGISTS IS DRIVING INNOVATION IN BOTH FIELDS – AND ACROSS INDUSTRIES, SAYS **SHEHZAN MOHAMMED**

When Cesium announced we would collaborate with Epic Games to unlock GIS capability for game engines, we were flooded with enquiries. We heard from simulation experts, aerospace engineers, game developers, architects and urban planners, world heritage organisations, environmental scientists, and media and entertainment companies – a fraction of the huge number of industries that will benefit from the ability to stream a highly precise, full-scale virtual globe into game engines like Unreal.

The geospatial enablement of game engines has been a long time coming, but its greatest technical challenge is also the very one we've been building our platform to overcome for nearly a decade – how can we efficiently stream cloud-based, high-resolution, real-world, 3D content with accuracy, performance and visual quality?

The answer, we believe, is much bigger

than Cesium – it's 3D Tiles, the widely-adopted OGC community standard. This is a spatial index that adds global-scale accuracy to UE's high-fidelity rendering.

An open approach is especially crucial for industries such as modelling, simulation and training, where future-proof solutions for real-world content and analytics require interoperability with data formats that are already deeply entrenched. For mod-sim, these include CDB, an open database format for synthetic environments, and the One World Terrain (OWT) Well Formed Format, the standard at the centre of the US army's effort to enhance global 3D terrain capabilities in the synthetic training environment, the civilian counterpart of which is 3D Tiles.

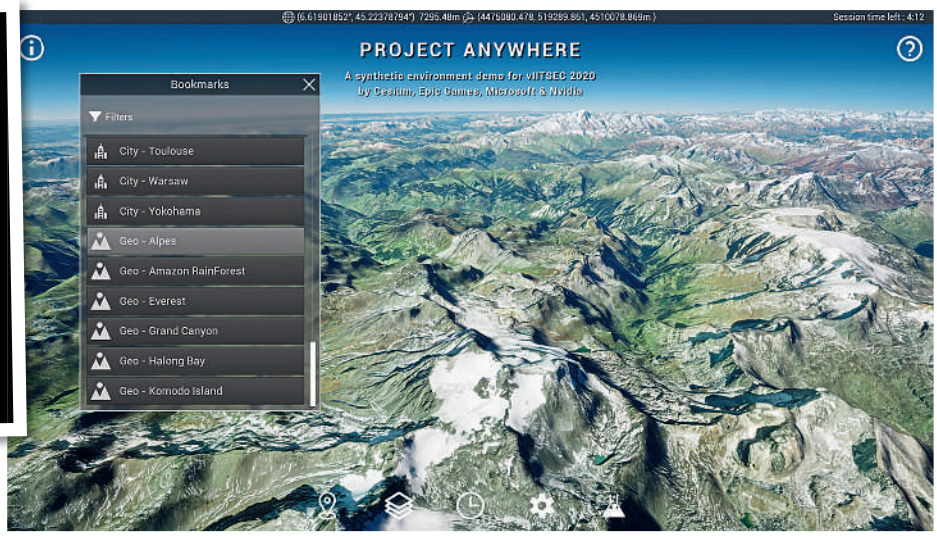
Precision and Big Data

Of the two main technical challenges we faced, the first was maintaining the accuracy of the data. Game engines are built on 32-bit floating-point precision. This means that geometry is stored using 32-bits in memory, with errors between numbers increasing with magnitude. While this provides enough accuracy for reasonably sized virtual worlds, it does not meet the necessary requirements for rendering a full-scale globe. The Earth is more than 12 million metres in diameter, and with standard 32-bit rendering, this creates artifacts known as jittering, which distorts the geometry as it renders on your screen.

To overcome this limitation, Cesium uses 3D Tiles' spatial indexing with Unreal Engine's "world origin rebasing" feature, combined with careful adjustment for the new origin in full 64-bit precision. The technique allows not only rendering geometry on the surface of the Earth, but also in space, and is accurate for visualisation, analytics and simulation down to sub-millimetre precision.

The second challenge was the availability of accurate, high-resolution real-world 3D content in a form that works in runtime game engines for visualisation and analysis. While there's been an exponential increase in 3D location data because of the ubiquity of sensors, game technology has created high user expectations for graphics quality and performance. Cloud-based high-resolution 3D data with global coverage that meets these expectations can run into hundreds of terabytes.

We solved this by using our ion platform for tiling, hosting and streaming high-resolution 3D geospatial data. In addition to built-in global 3D content, the platform also provides an end-to-end workflow for users to upload their own data to be optimised as 3D Tiles for efficient streaming into runtime engines such as CesiumJS and Cesium for Unreal, based on open APIs and standards.



Real-world data

The modelling, simulation and training industry has invested heavily in game engines over the past few decades. This has led to rapid advancement in areas such as visual quality, performance and integration with VR, AR and mobile devices. But they lacked a crucial missing piece – the ability to effectively render real-world data at global scale.

"Conflicts aren't confined to rectangular sections of cities like levels in a game," says Brady Moore, a former US army special forces officer who serves as our director of mission support. "Tactical actions are very important – but they're enabled by support and resources at the operational and strategic level. This key development enables the accurate representation of operations that span the globe, from engagements at individual buildings all the way up to movements that cross continents."

And the industry has even more to gain, as the technology makes simulations not only more realistic, but also more accessible. Unlocking 3D geospatial capability in game engines marks a shift from simulations that place the war-fighter in "geotypical" (artist-created) environments to "geospecific" environments based on precise real-world 3D geospatial data collected from sensors such as satellites and UAVs, enabling them to effectively train in a digital twin of the real-world physical environment without having boots on the ground.

"Historically, access to highly accurate and capable simulators and the training they provide has been limited by physical location and hardware capability. Very often, individuals and organisations that need training have had to ship to a facility and wait their turn to access simulations. We're changing that," says Moore. "We're empowering developers to build large-scale simulations that can run on laptops or mobile devices from anywhere in the world."

The future

The Cesium for Unreal plugin is a first: a full-scale WGS84, high-fidelity globe being rendered efficiently in a leading game engine as 3D Tiles. The possibilities for the tech are innumerable. We will soon see game experiences that span real-world global terrain, soldiers training in realistic virtual environments, and command and control systems that leverage the high-performance of game engines to make data-driven decisions at lightning speed.

We want to advance 3D geospatial technology as an ecosystem that's built around open standards and interoperability of data and APIs – an approach that harnesses collective wisdom by letting everyone get in the game. By enabling an open and interoperable ecosystem for data providers, application developers and end-users, we create technology that thrives on innovation, performance and cutting-edge analytics.

As our CEO Patrick Cozzi says: "The future will be an ecosystem of digitalised worlds with 3D geospatial data coming from a variety of commercial, government, and crowdsourced sources."

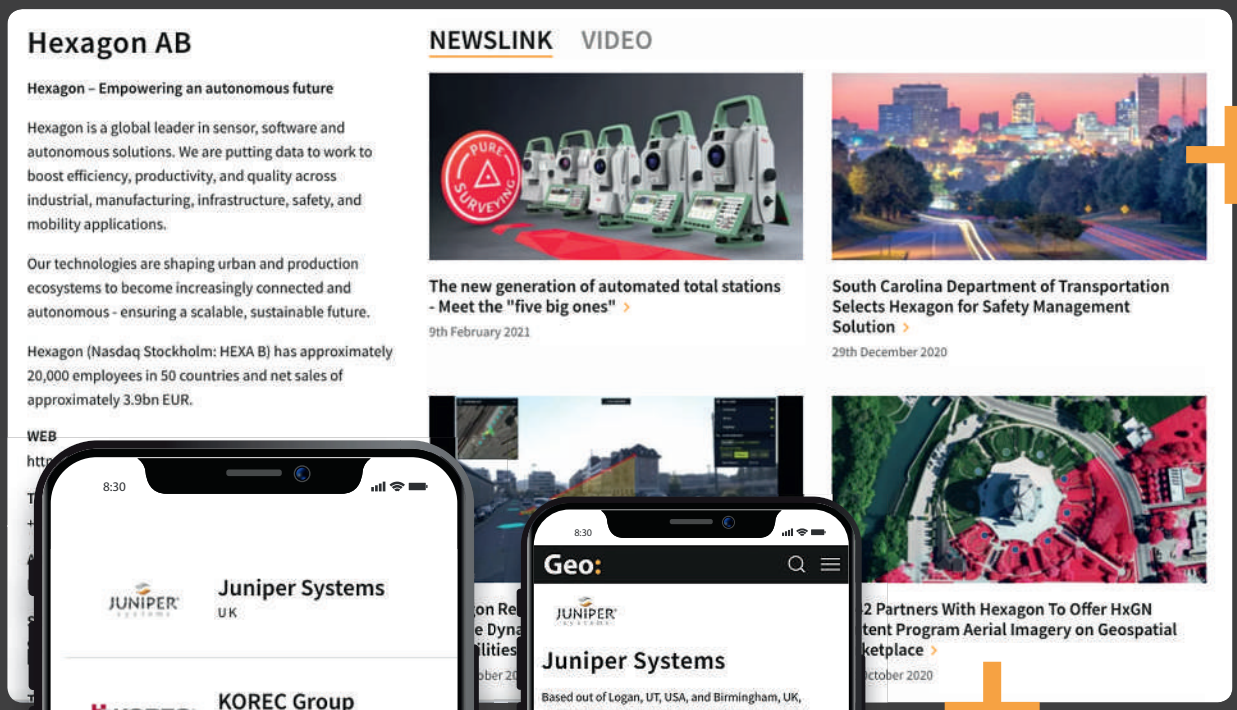
In truth, there are far too many possibilities for any company or handful of companies to deliver on. The value of 3D location data belongs to us all, but still, no one is more excited than we are.

Shehzan Mohammed is director of product management at Cesium (www.cesium.com)

GeoConnexion

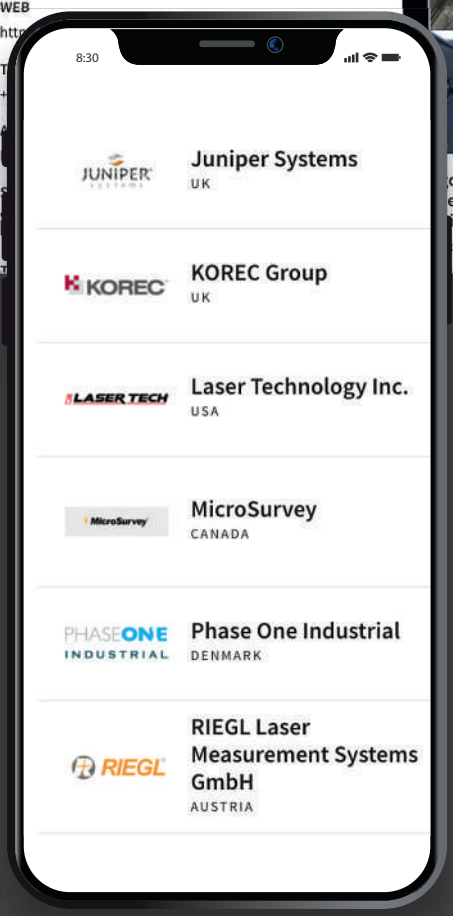
Company Directory

Our Company Directory offers a full website page on which to profile your company's News and Videos showcasing your Products and Services. These can be categorised by vertical markets and applications for easy reader shortlisting. As a bonus, we can also feature your company on our homepage for added exposure. The Directory can be accessed easily and instantly online and on mobile.



+ **86**

Editorial Topics



+ **3,500**

News, Articles, Videos, Events posting a year

+ **324** GeoSpatial Companies contribute

To book your entry, contact us at **info@geoconnexion.com**