

Console gaming from PC. Photo courtesy of Intel



Cloud gaming - the rise of games broadcasting

Cloud gaming is the latest next-generation technology taking the video games industry by storm. Unlike the clunky peripheral sensations of years past, cloud gaming stresses its innovation through the power of connectivity, making use of emergent cloud technology to stream video games to users, just as they would with satellite cable TV. The broadcast industry stands to be forever changed by the inclusion of gaming media as a streamed product.

Laurence Russell, News & Social Editor, Satellite Evolution Group

Ever since its inception, the video games industry has been growing exponentially to the point that it now represents both a massive market, a huge culture and even the privilege of being recognised as its own competitive sport as part of the e-sports revolution.

As a highly lucrative form of connected entertainment, gaming is becoming increasingly relevant to connective technologies, but most stridently so with the inception of cloud gaming.

The technology works just like remote desktop access allowing users to stream video games without installing them, or even owning the console they're designed to run on, instead relying on offsite infrastructure being streamed to you through the cloud. This Netflix-style service allows users to purchase and play AAA digital games in 4K via PC, tablet, or even phone.

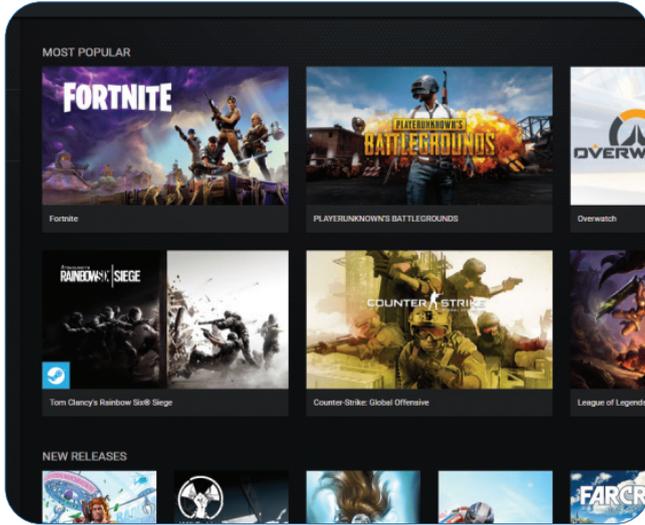
Because no local technology is being used, with cloud

processing centres doing all the heavy lifting, cloud gaming is only recommended for users with at least 25Mbps. This has led many to suggest that it's best suited for the cutting-edge power of LEO satellite networks, especially in the case of more rurally located hardcore gamers, since many GEO satellite services are often outperformed by terrestrial services like fibre.

Google Stadia – The flagship platform leading the charge

Perhaps the most high profile of these platforms is Google Stadia, which launched as the first of its kind in November 2019 to relatively lukewarm acclaim, as so many emergent experiments in the video game market have, before sequentially gaining steam as it became better supported and more widely understood. Though it is true that modern connectivity results in many users complaining of issues of latency, the minority of consumers enjoying with super-fast connections report “perfect” performance while streaming new AAA titles. Of course, such connections aren't available everywhere, leaving many consumers eager for the LEO

Photo courtesy of NVIDIA GeForce



services that prove practical outside of well-served urban environments.

One of the more futuristic applications of cloud gaming is a capability to run a home console game on your phone over mobile data. While the process is still in its infancy, capped at a maximum resolution of 720p, and understandably requires the most demanding data plans one can subscribe to, the feature is available to certain phones and certain games.

Stadia's funding method has also seen commentary from the uniquely critical gaming community. The so called "games-as-a-service" model has been hotly debated for some time now, not least with Stadia's current library, which is often said to be smaller than what can be expected from games subscription models like Xbox Game Pass or PlayStation Plus, the exact problem so many new TV streaming services are accused of.

Many popular commentators across gaming culture remain distrustful of the games-as-a-service model by the

simple fact that it distances the user further from true ownership of the games they purchase. Regardless, a recent survey by Simon-Kucher & Partners revealed that 35 percent of all games consumers are already paying for a subscription model of some kind, with 80 percent of those participants reporting that they were open to multiple simultaneous subscriptions.

Competition across the board – Rivals hot on Google's heels

GeForce Now is another cloud gaming model, run by the graphics card manufacturer, which uses a repertoire of supported games from Steam's distribution platform, which may prove strong competition against Stadia by making use of what is commonly regarded as the most loved library of PC games of any distribution platform out there.

That said, GeForce Now is accused of possessing more loading and occasional queue times before users can claim a connection to one of the stations streaming their game to them through the cloud, though the actual performance in comparison to Stadia is hotly debated, as they are both very competitive with seamless 4K and raytracing on a super-fast connection.

The even newer Xbox xCloud cloud gaming service is yet another competitor, making use of Microsoft Azure cloud computing centres, and the existing Xbox game library. In the case of xCloud, users will be using actual Xbox servers, replete with existing player bases, rather than relying on the matchmaking pools of very newly established servers on Stadia and GeForce Now.

Amazon of course has their own alternative in Amazon Luna, supported by Amazon Web Services' Elastic Compute Cloud (EC2 G4) infrastructure, which has only recently been announced but has already boasted a US\$5.99 a month "all-you-can-play" model via gaming "channel" packages, already supported by Ubisoft who plan to feature their own channel on the service.

Fascinatingly, this service closely imitates a cable TV model with a Netflix-style price, offering a singular monthly

leading in VSAT antenna innovation

eutelsat
type approved for Broadband Services

INTELSAT

Azure Shine International Inc.
[Http://www.azureshine.com.tw](http://www.azureshine.com.tw)

cost for whatever entertainment a user wishes to consume on a given channel.

Rumours abound that Sony has also entered a partnership with Microsoft for use of their Azure technology for their own cloud services as Nintendo President Shuntaro Furukawa has gone on record stating the company must “keep up with cloud gaming.” Though at the time of writing no concrete plans have been released.

Pushing innovation – How cloud gaming is fuelling the future

Various emergent technologies and techniques have been theorised to further advance the performance of Cloud Gaming such as GPU resource sharing or predictive input. GPU sharing involves cloud-connected GPUs being unbound from exclusively performing for individual users, instead running as part of a network shared by many users simultaneously, which could cause all manner of issues if improperly implemented.

Predictive input is an even more astonishing technique. It involves the use of algorithms to predict a player’s inputs and think ahead to render game assets associated with them in advance. Majd Bakar, Stadia’s Head of Engineering, described it as a method to “[minimise] latency to the point where it’s basically non-existent” to the point where a state

of “negative latency” is maintained. The rendering of “speculative frames” for the most likely player input is a truly dizzying concept and one that’s been proven with systems like Outatime, which have successfully run such processes on previous generation titles like Doom 3. The frontier of cloud gaming could represent the proving ground upon which the true practicality of predictive input is realised.

While it seems that cloud gaming is still certainly finding its feet, it’s clear that huge amounts of money are going into the sector, fuelling its relevance across gaming culture via exclusive early access to certain games and demos, special partnerships with live-streaming platforms like Twitch or YouTube, and rampant advertising and promotion.

It seems likely that just as with virtual reality, cloud gaming’s golden age sits over the horizon, as developers and publishers come to embrace its ubiquity, gamers come to accept yet another paradigm shift in the nature of their entertainment, and perhaps most importantly, LEO satellite coverage provides the connection strength to support a wide player-base. Indeed, cloud-gaming could become a pillar of why a consumer may feel the need to sign up for a LEO connection. At present, the technology represents an exciting novelty, much as mobile phones or home cinema once were, though possesses the potential to become just as colossal to our daily lives. ■



Xbox xCloud running Halo 5 on an Android phone at E3 2020

SPACE FLIGHT LABORATORY

50 51 52 53 54 55 56

MICROSATS, NANOSATS & CUBESATS

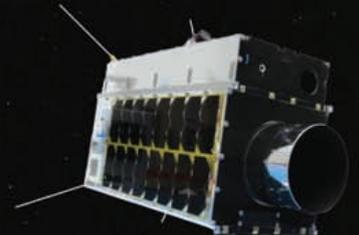
DISTINCT MISSIONS LAUNCHED, UNDER CONSTRUCTION OR READY TO LAUNCH



HawkEye 360 Pathfinder
Dec. 3, 2018



NEMO-HD
Sept. 2, 2020



GHG Sat-C1
Sept. 2, 2020

...AND COUNTING

Space Flight Laboratory (SFL) provides bigger returns from smaller satellites at lower cost. We are developing innovative and budget-aggressive satellites and constellations today for tomorrow's NewSpace applications in Earth observation, maritime monitoring, communications, and environmental sensing.

PIONEERING AND OPERATIONAL MISSIONS
COMMERCIAL AND GOVERNMENT APPLICATIONS



Phone: 1-416-667-7400
Email: info@utias-sfl.net

University of Toronto Institute for Aerospace Studies
Toronto, Ontario, Canada

Twitter: [@SFL_SmallerSats](https://twitter.com/SFL_SmallerSats)
Web: www.utias-sfl.net