IRON MOUNTAIN®
DATA CENTERS

Customer Solution Brief

From Console To Cloud

An overview of the current challenges, drivers and opportunities for Gaming digital infrastructure.

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Solution Snapshot

This IMDC solution overview sets out the key drivers behind the major platform shift currently taking place in the gaming industry, covering the streaming arms race, partnerships/supply chain opportunities and edge requirements, with a particular focus on the role of colocation.

From Console to Cloud

From Console to Cloud

The negative impact of the Covid pandemic on AAA game launches has been described as 'just a speed bump' as the industry powers on at 7%+ CAGR towards 3 billion players worldwide and $200 billion in value. While overall revenues dipped, time spent gaming went up almost 40% in 2020, creating a whole new set of players and opportunities, and delayed console launches were quick to offset the slowdown in 2021.

But in the midst of growth the industry is restructuring fast, driven by an overwhelming need for speed. Gaming is a pioneer business in terms of creativity, user demand and the infrastructure that supports it. Where gaming goes, others follow. This puts pressure on gaming businesses to make first-mover decisions about new technologies and undeveloped markets. As cloud infrastructure providers move into the front end of the market, this has never been more true for the gaming sector. Strategic investment and partnerships and the development and prioritization of fresh release and expansion pipelines have never been so critical.

The key factors behind those decisions are the fast-moving nature of the gamer market and the accelerating shift in delivery technologies and platforms as it begins to converge with OTT entertainment:

- Cloud gaming is 'white hot' just now. This is fuelling an arms race as virtually every tech giant pours funds and talent into its games portfolio. While success has been mixed so far, cloud gaming is forecast to hit $6.5 billion by 2024. But this modest 3% share of the industry is just a taste of things to come.
- The move to mobile has already happened; for the first time in 2021 mobile gaming accounted for over 50% of the global market. Could this spell the end for connected consoles? Everyone is currently placing their bets, although console games are still performing strongly.
- Multiplayer games are in the ascendant: MMOGs now generate more mobile game revenue than PC/Mac, console and handheld games put together.
- Another facet of the broader multiplayer/mainstream entertainment shift: with a 50% increase to a $1 billion segment in 2021, eSports are on the rise. With large sums at stake, where Asia and North America lead, the rest of the world will follow.
- 5G is the ultimate game-changer on the technology side, bringing new virtual worlds to life for cloud and mobile offerings and rewriting the rulebook.

One of the core challenges that these shifts create is future-proof infrastructure design, a problem which can only be solved through a series of strategic partnership agreements which will locate the next generations of games (and the next generation of the Internet) on the doorstep of both current and next generation gamers.

Commercial | Drivers

Latency/Lag

Packet loss or delay can ruin the gaming experience, especially in synchronous multiplayer competitive games. Games on mobile devices are even more sensitive to latency and internet connection problems because the connection can be interrupted at any time.

5G Market Opportunity

5G offers huge revenue potential. 95% of gamers would pay a higher premium for 5G-enabled gaming services and 60% say they would pay 50% more than they pay now. This holds a lot of promise for the industry as well as challenges.

Omni-Channel Publishing

A lot of cloud gaming service providers now play down the technological side. Instead, they present themselves as tools that enable gamers to play the latest titles instantly and seamlessly on any device. In the not-too-distant future most games will need to be distributed/available on all platforms.

Complexity/Strategic Partnerships

Particularly for global players, there is a need for more and better strategic partnerships to address the scale and complexity of operational challenges and the potential for future growth. A critical question for developers is what to outsource and what to manage in-house.

GaaS/Cloud Partnerships

On a macro level, the cloud and GaaS may hold the answer to these issues as a real-time development, delivery and backup environment. But will one cloud be enough to guarantee uptime? Also, from a strategic point of view, being tied to a single cloud provider may raise costs and reduce agility. Game core definition, hosting and interoperability will be key.

Skills

Key to this decision-making process is how far to skill up internally to retain full control of game assets and avoid lock-in.

Third-Party Layers/ Microservices

According to IDC, by next year, API-enabled microservice architectures will support 90 percent of all applications—improving the ability to design, debug, update, and leverage third-party code. Microservices and application containerization provide independent operational scalability, better system availability, and new service launches which don't require massive reconfigurations.

Sustainability

Everyone is aware of the tension between game expansion and minimizing environmental impact. Considering the extremely environmentally aware gamer-base, renewables and offsetting are a must and all operational improvements must be fact-based.

Timing to Market

Timing is the key to matching new experiences to new platforms like 5G. Overall use increases when speed increases, but there is often a delay between the increase in speed and increased use.

Edge Visibility

Total visibility is necessary for end-to-end quality control; this includes extending control of the network to the Mobile Virtual Network Operator (MVNO).

Technological | Drivers

5G

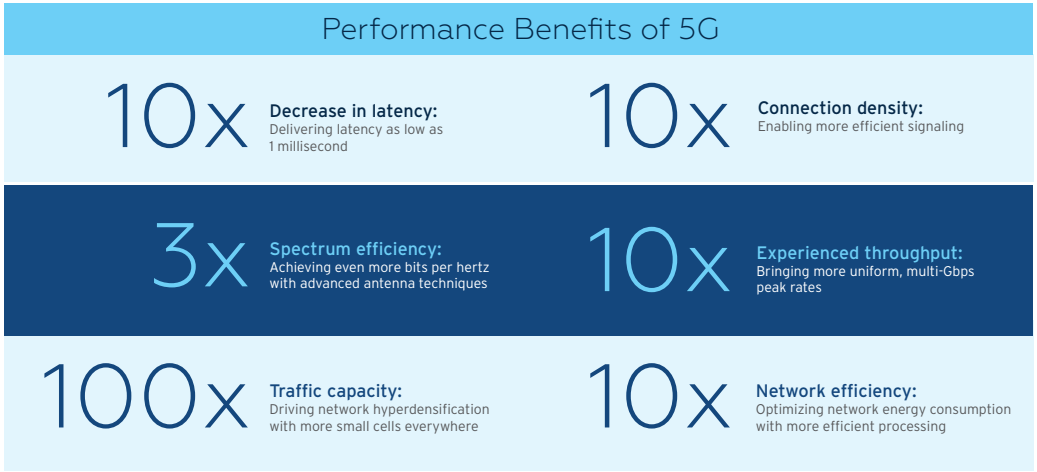
5G doesn't just deliver speed, it offers more efficiency and traffic potential (hyper densification) with the ability to compute independently at the network edge, generating next step immersive experiences. Mobile users can now experience the same play quality as Fiber to the Home (FttH) owners.

Bandwidth: AR to VR

Current VR games demand between 10 and 50 Mbps, but more recent VR games/headsets need 50 to 200 Mbps to react to player movements at speeds to ensure undetectable lag.

Chip Shortages

The global semiconductor shortage has hindered the supply of high-end PC components and new-generation consoles; this underlines cloud gaming's use case of high-end gaming without needing expensive hardware.



Containerization

The key to successful partnerships, portability, and scalability

Scalability/Sharing

Horizontal rather than vertical scaling to mitigate the demands of gamer growth; bandwidth burstability and scalability; based on pay-per-use, plus GPU resource sharing for streaming scalability and cost reduction

AI/ML Gamer Analytics

Increasingly sophisticated and richer real-time analytics required to both monetize games and optimize user experience.

Blockchain/Play to Earn

New financial models using crypto and NFTs to challenge traditional pay-to-play.

Network Automation

According to Cisco, for increased efficiency, network automation (25 percent), Software-Defined Networks (SDN) (23 percent), and Intent-Based Networking (IBN) (16 percent) are among the technologies that will have the most impact on networking over the next five years.

Cybersecurity

PII protection; two-factor authorization (2FA); security centralization layers (Centralized Trust) for multi-cloud platforms running protocols like /SAFESEH and /NX.

Infrastructure

From ecosystems to uptime, sustainability to edge expansion, the key to making data center decisions that will power next generation gaming platforms is the mix of reliability and investment in growth which make for a productive long-term partnership.

Critical Ecosystems

In regional core data centers, a growing set of directly connected supply chain partners is critical to both end-to-end performance and innovative revenue generation. Directly connecting to partners and providers within the same data center eliminates latency and increases efficiency, cutting a huge amount off network costs and accelerating connections to new services. Global interconnections and direct cloud connects will support data transit and core flows. A range of network, sdn, and internet exchange services will make data costs more competitive. Look for proximity to nsp, payment, advertising, and security partners.

Uptime, Resilience, Security

Tier 3 and above facilities with redundant and resilient infrastructure and failproof configuration are necessary. Comprehensive physical and data security layers should guard your vital assets. For maximum physical security under-ground facilities offer even greater protection from intrusion and natural disasters. A good indicator of security at smaller edge facilities is whether the facility complies with us government scif (sensitive compartmented information facility) standards.

Reach & Scalability

The edge will be physically building out on a massive scale over the coming few years. Provider capability in capacity and power planning must be up to providing timely space and operational support for core and partner servers and connections. For edge developments, expertise on the ground and access to space are critical in working with utilities, regulators, logistics, contractors and staff.

Remote management

By moving to a full-service colocation model which offers cross connects, builds and installs, smart hands and migration management via a web interface, game providers can become more location independent without the need to travel to a physical building or location. Operators can also use virtualized control surfaces with distributed monitoring from satellite or home locations.

Infrastructure I

Standards

A consistent global approach to standards will give the physical and operational support your asset management system needs. Look for iso 27001, ssae18 soc 2 (type ii)/soc 3*, pci-dss, iso -50001. Region-specific certifications are also key; in north america, nist sp 800-53*, fisma high, fedramp and hipaa (type i); ospar in asia; iso 450001 and 9001 in emea.

Sustainability

As data levels rise, sustainability is critical to long-term value and should be integral to standards. For instance, last year imdc became the only colocation provider to offer simultaneous, global iso 50001 energy management and iso 14001 environmental management certifications. These standards should be extended to cover the edge; both build and operations. Energy should be sourced or offset with renewable generation. Demand 100% renewables as providers should be able to offer this by now. And go a step further if possible. Look for a carbon credit scheme like imdc green power pass for your csr reporting, energy load-matching and, if the site is suitable, renewable generation as close as possible to the point of use. For both efficiency and impact reduction, check that it asset lifecycle optimization and recycling, remarketing and secure disposal are available.

Infrastructure II

Cloud to Core Convergence

Having servers in multiple regions reduces latency time and improves streaming quality as well as the responsiveness of the game to player actions. Many gaming businesses have already invested in their regional architecture and want to build on what they have achieved. The need for lower latencies to enable cloud streaming play is driving game developers to grow this list and also drawing cloud providers to take space in these/nearby facilities as cloud and core converge on key colocation points. Your new cores will need these multi-cloud connections.

Edge Expansions

Next generation gaming needs next level infrastructure, both for mobile and home play. On the move, the time it takes data to travel from mobiles to centralized data centers for processing and then make a return trip all the way back to the devices (rtt) is simply too long for 5g-level gaming. Even from consoles, the amount of data being created by next-generation games will overwhelm the network, create bottlenecks, and disrupt play.

The solution is edge infrastructure. Gaming companies will need connections at as many edge pops as possible to ensure the latency and bandwidth requirements can be met to enable them to thrive. A huge amount of the data that is created and processed will be outside a traditional centralized data center or cloud, in a 5g-connected edge data center. According to the linux foundation the global power footprint for infrastructure edge deployment will grow from 1 gw in 2019 to 40 gw by 2028.

The edge is a moving target. The most useful metric for defining required locations and capacity is latency. These can be usefully subdivided into four categories by application.

Locations & Latency		
Latency (ms)	Data Center Type	Typical Applications
> 60	Core	Core compute and cloud apps, orchestration, backup
40-60	Network Edge	Consumer VR/AR, Hosted Desktops, Remote Data Processing
< 5	Metro Edge	Ultra HD and AR. IoT Gateways, Telecom NFV, Cloud Gaming, Cloudlets, AR
< 1	Outer Edge	5G processing, Industry 4.0 (drones, robots)

Meet You At The Edge

Colocation partners are racing to the edge. In addition to 20 core data centers in North America, EMEA and APAC, Iron Mountain owns 1400+ facilities worldwide, all of which are used for secure media asset storage. 695 of these facilities are located close to city centers or airports in the sub-5ms zone – the Metro Edge. Spread across 50 countries, they provide a valuable source of potential Network Edge and Metro Edge gaming PoPs.

IMDC is rolling out a proprietary highly secure and customizable modular edge solution. For a straightforward deployment typical build and deployment is 24 weeks, but warehousing components can shave time off this.

20+ Iron Mountain Data Center Locations

50+ Proposed Iron Mountain Data Center Edge Locations

1,400+ Current Iron Mountain Locations

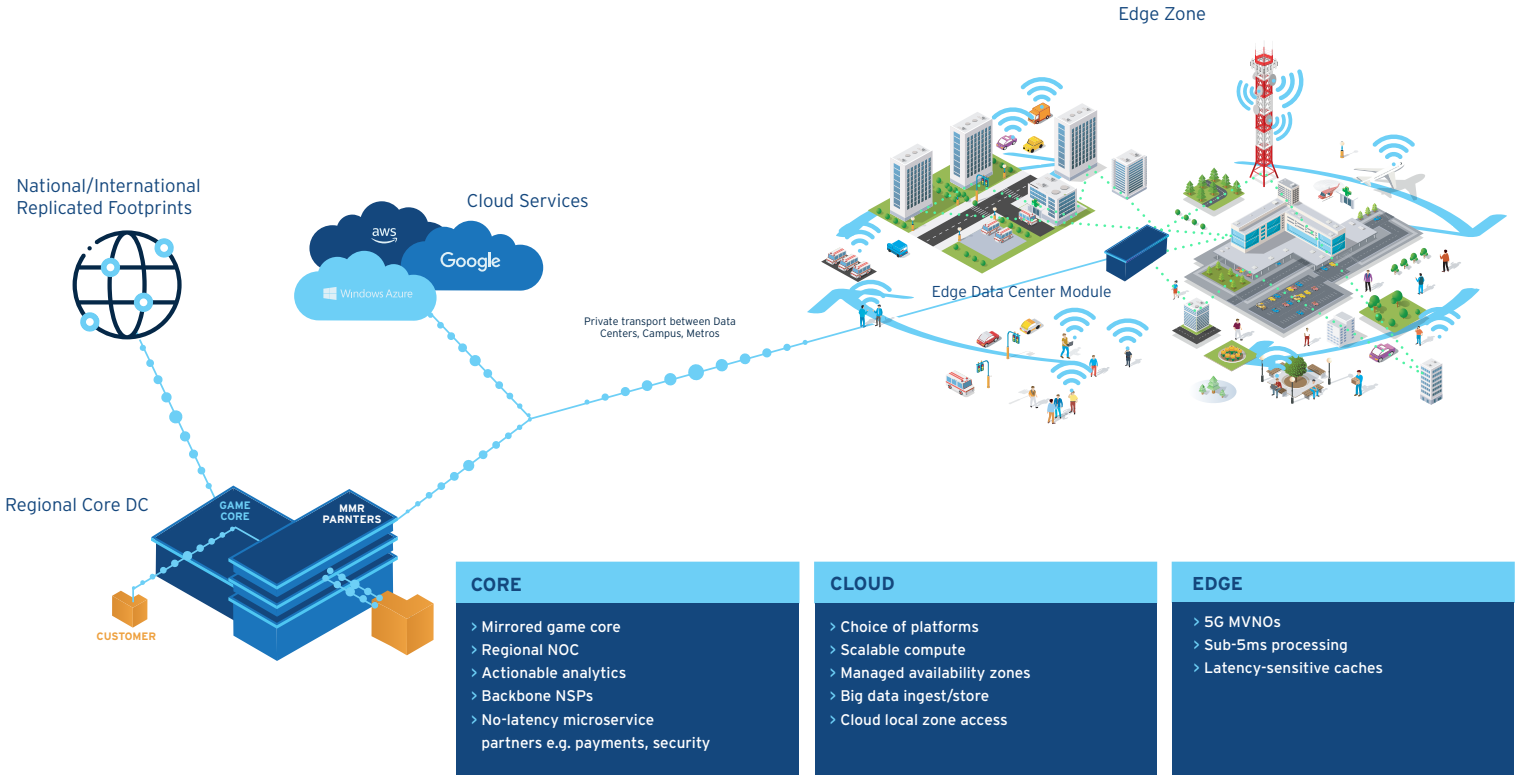
Core to Cloud to Edge

Versatile design, interconnectedness and proximity/latency will be the defining factors for tomorrow's successful gaming infrastructure.

Containerization enables businesses to manage what they want in-house and farm out/scale other parts of the game. New games are often launched in a 'monolithic' form with limited service provider support, and specific microservices are separated out as they prove useful or high-growth. Data log files are often handled by multiple cloud service providers (Amazon S3, Google Cloud Storage etc.) using advanced bandwidth optimization techniques to achieve very high transfer speeds between clouds. Outsourcing specific requirements to a mix of service providers increases efficiency while retaining the flexibility to shift from one new service to another as the market matures.

Established gaming businesses have a global NOC interconnected to a geographically diverse network of data centers that host their servers with adequate (say < 20ms) latency to the majority of potential players. Expansion of the growing role of the cloud and new delivery models mean that these businesses are now moving fast to more sites.

A multi-platform model delivered over 5G requires a large number of regional core data centers that integrate seamlessly with cloud partners with bolted on quick-expand near-edge compute infrastructure for single-millisecond processing and delivery. To deliver this reach in the near-term multiple cloud and colocation partners will be needed, and this attraction works both ways, applying as much to large cloud providers as to game owners.



Interconnected colocation capability that unites core, cloud and edge is critical to both game design and control and quality of gaming experience.

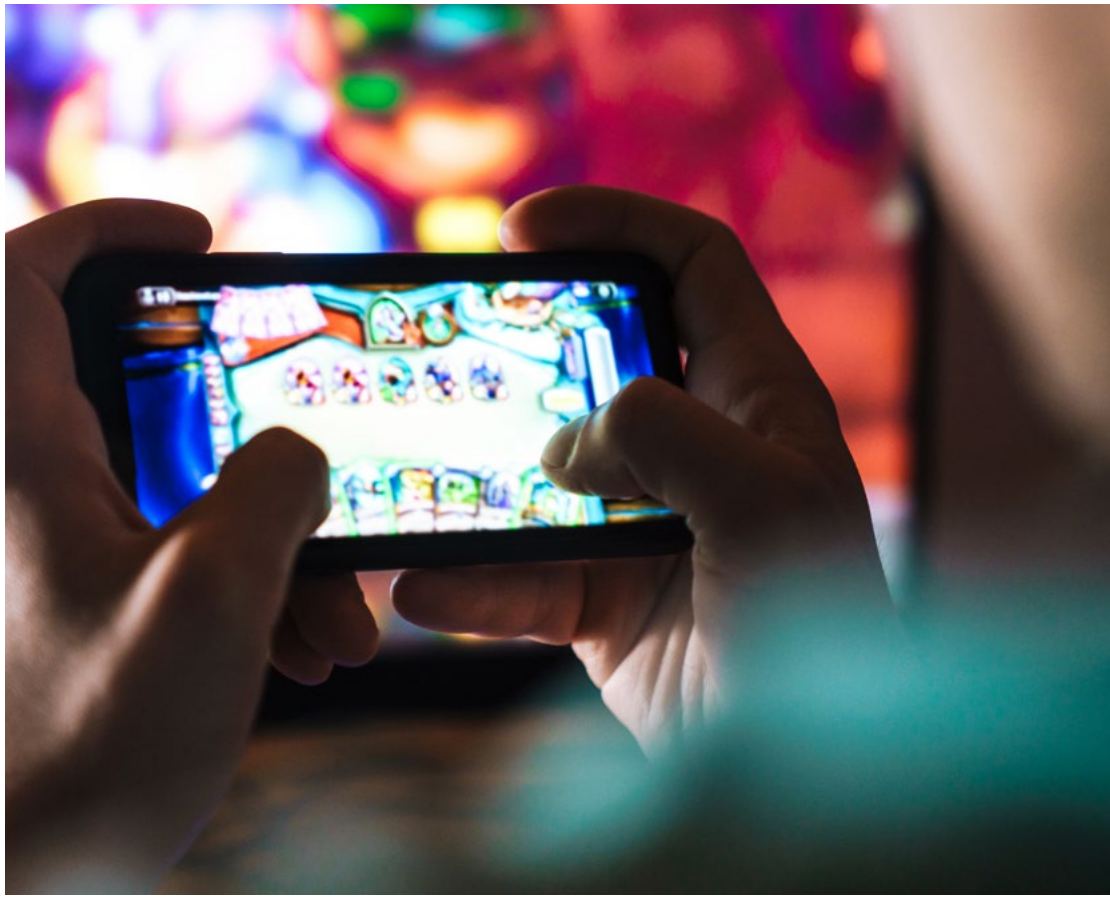
Mobile Multi-Platform Online Gaming

Being a first mover brings many disadvantages and challenges, but it also offers the greatest possible rewards. As gaming, entertainment and social media markets merge over a robust, mobile sub-5ms end-point architecture, the rewards for future-proof gaming architecture could not be greater.

On the infrastructure side, well populated carrier and cloud-neutral facilities will power the core of the next generation of games, at the same time as acting as cloud aggregators. Security, sustainability, remote hands and API-enabling standards will be non-negotiable factors.

Multi-layered partnerships will make it possible to launch games on new platforms, enrich the gamer experience, protect the game core and scale processing and data levels while retaining control. Mature ecosystems in the data center will support this. Fiber, SDN and IP connectivity and exchanges will keep data flowing across regions. Horizontal microservice partners will add value and share management tasks.

Adding Near Edge (<5ms) 5G-connected facilities will open up new revenue and design opportunities,processing data beyond the core and the cloud, opening up new lucrative markets and delivering exciting new immersive experiences for mobile gamers.



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About

Iron Mountain Data Centers operates a global colocation platform that enables customers to build tailored, sustainable, carrier and cloud-neutral data solutions. As a proud part of Iron Mountain Inc., a world leader in the secure management of data and assets trusted by 95% of the Fortune 1000, we are uniquely positioned to protect, connect and activate high-value customer data. We lead the data center industry in highly regulated compliance, environmental sustainability, physical security and business continuity. We collaborate with our 2,000+ customers in order to build and support their long-term digital transformations within our 3.5M SF global footprint spanning 3 continents. For more information, visit www.ironmountain.com/data-centers

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