(intel®)

Data Center
Cloud Service Provider

# Making More Money from the Cloud: A Guide for CSPs

## Opportunities and Next Steps for Cloud Services Innovation

## Introduction

Worldwide spending on public cloud services is set to reach USD 122.5 billion in 2017, an increase of 24.4 percent over 2016[1]. In fact, the compound annual growth rate (CAGR) of spending on public cloud services is almost seven times that of overall IT spending growth and IDC predicts that by 2020, it will top USD 203.4 billion worldwide[2]. The size of the opportunity for cloud service providers (CSPs) is huge but fierce competition, accelerating innovation and the need to keep prices low continue to create enormous pressure.

With more CSPs launching every month, enterprises and consumers have a wealth of choice from large, generalist public cloud providers to niche players specializing in particular services, markets or regions. This is great news for customers but CSPs can find that these combined stresses can seriously impact profitability. Even in a growing market, increasing profitability and sustaining market share are no easy feat for today's cloud businesses.

This paper outlines some of the primary challenges faced by CSPs in making and keeping their business profitable and suggests strategies and innovations that can help cloud businesses to take a greater share of the market opportunity.
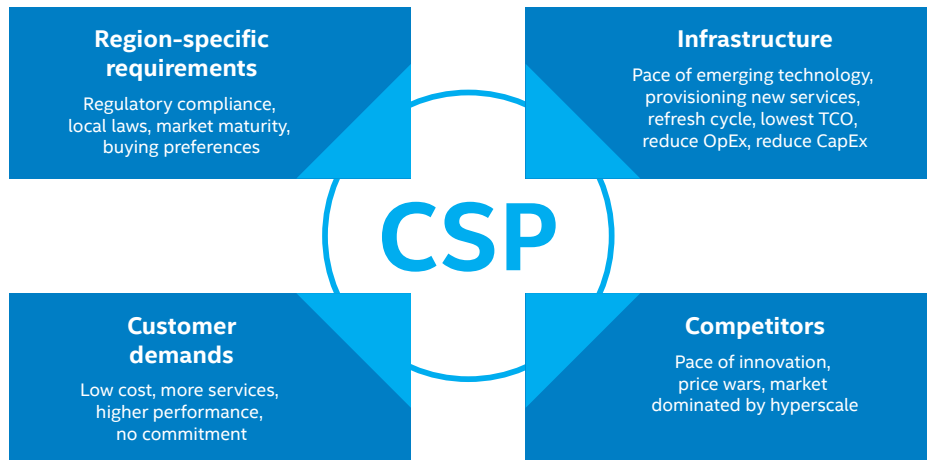


**Region-specific requirements**
Regulatory compliance, local laws, market maturity, buying preferences

**Infrastructure**
Pace of emerging technology, provisioning new services, refresh cycle, lowest TCO, reduce OpEx, reduce CapEx

**CSP**

**Customer demands**
Low cost, more services, higher performance, no commitment

**Competitors**
Pace of innovation, price wars, market dominated by hyperscale

**Figure 1.** CSPs are under pressure from a variety of sources

## The Profit Challenge for CSPs

CSPs face pressure from a range of sources. In addition to the competitive and quickly evolving market, many CSPs struggle to keep pace with developments in the sector's technology and services. Some of the largest CSPs globally introduce a vast number of new services every month, at an average rate of three new services per day[3]. This scale of innovation is unachievable to any but the top few CSPs because of the huge capital expenditure (CapEx) and resource needed for research and development (R&D) at this scale. Amazon's R&D bill is steep, with the company spending USD 14.2 billion in the second quarter of 2016[4], the majority of which is believed to be on extending the capabilities of its public cloud division. The good news for CSPs however, is that spending money on R&D and growing market share and profits are not directly correlated[5] – in other words, while budgeting for product development is important, successful innovation is about much more than money.

Further pressure on CSPs comes from their customers, where the hype around cloud services combined with a lack of understanding about what the cloud can achieve leads to unrealistic expectations and sometimes disappointment. In fact, around 50 percent of small and medium sized businesses (SMBs) and 20 percent of enterprises are dissatisfied with the cloud services they subscribe to[6]. Cost is the biggest complaint across all customers, with SMBs additionally disappointed with reliability and scalability, and enterprise customers struggling with security and the ease of implementation. Perhaps due to some of these issues, Gartner anticipates that 70 percent of CIOs will change their technology sourcing relationships in the next two to three years[7].
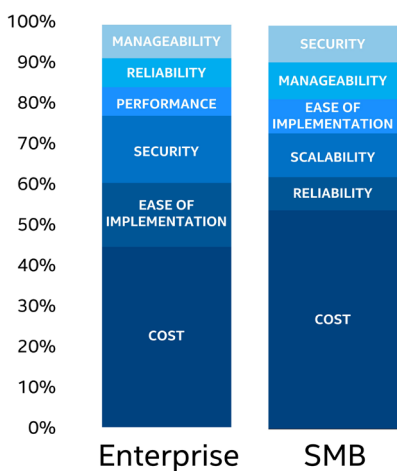


**Figure 2.** Sources of dissatisfaction with public cloud, split by enterprise and SMB. Source: Intel (2017) Build A Better Cloud ebook

The willingness to change providers underlines another issue that CSPs face: stickiness. In a crowded market where differentiating from the competition is difficult, CSPs must find ways to retain customers over the long term. In a market based on pay-as-you-use models, customers are free to change provider at the end of each billing cycle. Most enterprise customers are under intense pressure to reduce their IT operating expenditure, so without clearly differentiated services, products or customer support, a CSP will be judged on its prices.

Differentiating themselves by offering new services changes the game, however, with nimble and innovative CSPs able to compete with established players by bringing unique services to market and competing on quality and delivery of those services instead of on price.

Combined pressures from competitors and customers create a challenging market for new and established public cloud providers, one in which making more money requires CSPs to innovate new services. Attempting to chase each new technology or service innovation that evolves is unachievable for any CSP outside of the largest few. It could even lead to disaster for a smaller business as finite resources are stretched thin, potentially compromising core services and impacting customers. There is also a huge financial risk for smaller players if investment in innovating new services doesn't pay off.

The next chapter evaluates some of the key areas of cloud growth and how CSPs can look to innovate profitably in these areas.

## Increasing Profitability with New Services

In a market teeming with cloud providers introducing new services at a rapid rate, along with niche service providers who create specific industry or regional solutions, understanding where to innovate in order to maximize profit is challenging. The potential benefits of cloud service innovation - increased profit and market share - are compelling enough, but with a successful innovation strategy, a CSP can go further, adding value to its customers by supporting their innovation capabilities in turn. It is this kind of support and added value that will help CSPs create a strong foundation for resisting the pull of other providers' lower costs, helping to retain customers as well as improve profit margins.

Building new services that help to differentiate a CSP from its competitors is only part of the solution, however. If these services are to be profitable, it is imperative to consider wider market trends and patterns. Analyst reports, market insights and the buying patterns of early adopters reveal some areas where interest or budget allocation is set to increase. The following cloud service areas are shaping up to be big business for CSPs over the next few years:

### A. CLOUD MEDIA SERVICES

#### The Opportunity

Analysts Technavio forecast the global video services market growing at a CAGR of almost 25 percent from 2016-2020 and Markets and Markets predicts the video on demand segment will be worth USD 61.41 billion in 2019[8, 9]. There are two key factors in the increased demand for cloud media: the increasing number of media files that enterprises and consumers want to store, edit and stream, and the larger size of each individual media file, which is in turn driven by the uptake of new high definition formats such as 4K and H.265. Businesses of all sizes, and indeed consumers, are finding it difficult to store these bulky files in on-premises storage and are turning to CSPs to help.

There are additional complications when it comes to real-time streaming of live events, which are similarly seeing market growth as more organizations rely on live broadcasts to communicate with a diverse and global audience.

## Technology snapshot

The term Cloud Media Services covers various types of media delivery over the public cloud, including video and audio streaming and cloud gaming services.

### Anticipated market value
## USD 61.41 billion by 2019

In addition to the challenges associated with typical cloud media delivery, all live streamed video content must be transcoded end-to-end in real time for delivery on every type of device. And as with any streamed service, customers expect the same high-quality user experience across each device. Meeting these technical challenges can put pressure on a CSP's profitability and delivering high-quality live streams cost-effectively can seem out of reach.

### Steps to Profit

**Build services in line with your strengths.** Cloud media services are about much more than video streaming. Different CSPs will be better positioned to offer different types of media streaming – perhaps live video streaming is most appropriate for a particular CSP's customer base, whereas another might look to offer streamed digital content services. Rather than committing to a range of media services at once, it may make sense to focus on a single offer targeted at a specific customer base to begin with and build out from there.

**Partner wisely to reduce TCO.** Often CSPs rely on specialist technology solutions at each stage of the end-to-end workflow when providing live video PaaS, for example. There are solutions that CSPs can leverage to deliver on premise video encoding, high-performance cloud processing and end-to-end transport technology. Cloud media services provider Haivision, for example, offers a one-stop, highly scalable solution incorporating encoding, transport technology and cloud transcoding that enables CSPs to deliver live video PaaS profitably across a range of devices and locations. You can read more about the Haivision solution here.

### LeCloud boosts profits and performance with video innovation

LeCloud has enhanced the performance of its video transcoding solution by 1.51 times using the Intel® Xeon® processor Scalable family. This means that LeCloud is able to serve more customers with demanding high-quality video content using the same hardware configuration, allowing it to better compete in the crowded Chinese cloud video market. By optimizing its video transcoding solution with Intel® Advanced Vector Extensions 512 (Intel® AVX-512), LeCloud has boosted the performance of its video transcoding solution by a further 22 percent, allowing it to offer its customers 4K and H.265 content in real time.

**Make sure your infrastructure is ready.** Optimal video processing requires powerful CPU and GPU processing capabilities, such as optimized data center graphics and hardware-accelerated transcoding. Processing demanding 4K UHD media may require visual compute acceleration and create additional demand for fast, scalable storage.

## B. MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

### The Opportunity

AI is transforming every industry, so whether its cloud services are targeted at consumers, industry, government, finance, health or all of the above, a CSP needs to pay attention.

## Technology snapshot

Artificial Intelligence or AI is the science of enabling computers to complete tasks that we have previously relied on humans for. Machine learning is a subfield of AI that is concerned with getting computers to learn, usually from large sets of data.

### Anticipated market value
## USD 16.06 billion by 2022

Markets and Markets forecasts the entire AI industry to be worth USD 16.06 billion by 2022, at a compound annual growth rate (CAGR) of almost 63 percent[10]. Yet it's not just the anticipated value that makes machine learning (ML) and related technologies so interesting for CSPs; AI in the cloud is hotly tipped to be the next big disruptor to the way that computing is done by enterprises and consumers alike[11]. As the amount of data moving to the cloud and the level of intelligence we can apply to that data both increase exponentially over the coming decade, the possibilities for businesses become staggering. Single-input automated solutions based on ML are already commonplace – simple telephone banking queries, for example, are now likely to be resolved by a combination of voice recognition and language processing without any human intervention. The next stage for businesses is to work out how they can use the cloud to synthesise and apply ML or deep learning algorithms to a huge variety of different data streams – say, publicly available social media data and an entire CRM database - to create truly disruptive products and services.

CSPs are fundamental to this industry transformation. The public cloud is, after all, the only arena in which most businesses will be able to explore AI, due to the vast amounts of compute and storage it requires. But the opportunities for CSPs extend far beyond providing the foundational infrastructure services that support the burgeoning AI economy. AWS, Microsoft and Google all made significant announcements on AI in 2016, offering services around natural language understanding, speech recognition, visual search, image recognition and text-to-speech to enterprise and consumer customers, as well as access to machine learning technologies for developers.
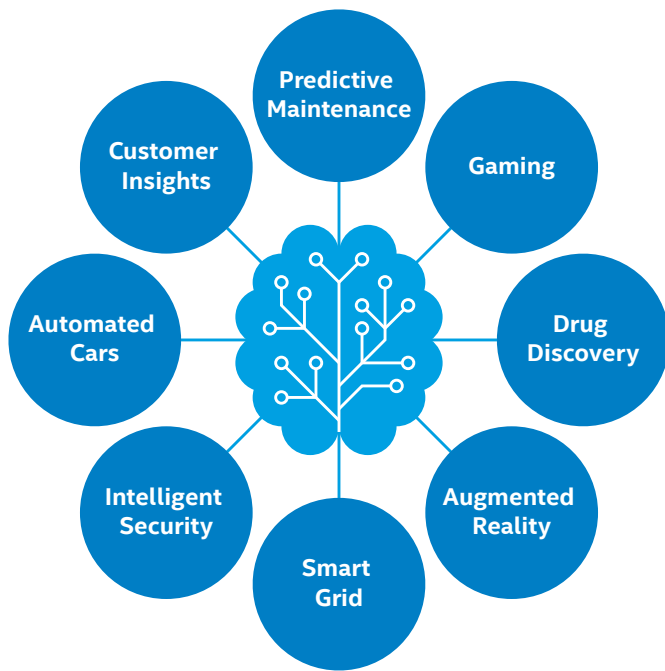
**Figure 3.** New use cases for AI are emerging across all industries

Analysts predict that in 2017, enterprise developers will increasingly look to integrate AI and machine learning into their cloud applications[12], indicating that this is a critical time for CSPs to support them with new services.

Market intelligence firm Tractica predicts that the revenue businesses will be able to generate off the back of AI services will be close to USD 60 billion in 2025, and some companies have started to tap that revenue stream already. CrowdAI is an AI-as-a-Service (AIaaS) offering that allows customers to submit their satellite or drone imagery for image recognition and analysis, returning data identifying all of the car parks in a given area, for example. Chinese CSP giant Alibaba meanwhile focuses its efforts on offering real-time speech to text services in multiple languages, which is offering new ways for court proceedings to be captured and interpreted. These services are great examples of CSPs generating entirely new revenue streams from AI and ML that can genuinely save their customers time and money. There is an inconceivable number of potential use cases for the AI and ML technologies already available, let alone the new technologies yet to emerge. Making strides in AI now is imperative for CSPs not to miss the boat, as IDC predicts that 62 percent of enterprises will be leveraging AI technologies by 2018[13].

### Steps to Profit

**Think through the problem with them.** Most enterprise customers and many consumers will be aware of AI but unsure of what it can do for them. Offering consultancy, whether bespoke service development help for enterprise developers or snackable content for more casual users on how AI could help to further their objectives could help to turn interest into revenue growth. For enterprise customers, CSPs should identify specific initiatives to help them understand the use case for AI and then help them to find solutions to solve their particular problems. It is this one-to-one specificity that will drive sales of AI-related solutions and services, as well as working with customers to manage the complexity that AI brings.

**Be the 'smart' your customers need.** Except for the very largest enterprises and dedicated AI companies, businesses do not want to build their own artificial intelligence[14]. Enterprises want to solve a business problem that either saves them money or brings them additional profit – be that automating their supply chain, better navigating their fleet through traffic or more effectively targeting their customers with offers. CSPs should look to build out AIaaS offerings that capitalize on their own existing strengths and bridge the gap from their customers' needs and the AI or ML technology that will help meet those needs. In the first instance, CSPs need not build intelligent services from scratch. Offering or white labelling access to open source frameworks such as Caffe*, H2O* or TensorFlow* and adding a layer of consultancy on top of this to help your customers identify the best use cases is a good place to start.

**Provide powerful business insights.** If your cloud service model is based on offering customers large amounts of storage, a logical next step is offering them AI services that utilize the data they already host with you. Whether this is leveraging business intelligence to produce actionable insights or providing them with marketing strategies based on a 360-degree analysis of various pools of customer data.

**Prepare to deliver intensive AI workloads.** Hardware and software are both crucial to delivering game-changing AI applications. Modernizing your compute, memory, storage, and networking capabilities is essential and taking advantage of the most appropriate libraries, frameworks and tools is important to support your specific AI goals. You can find more information on what AI is enabling and the technology required to support it online here.

## C. REAL-TIME STREAMED SERVICES

### The Opportunity

Real-time streamed services offer a great opportunity for CSPs to build a long-term customer base and maximize customer lifetime value. Two particularly fast-growing application areas are Virtual Desktop Infrastructure (VDI), expected to be worth USD 9.41 billion by 2019[15] and cloud gaming, expected to grow at a CAGR of 28.86 percent in the period 2017 to 2021[16]. VDI provides businesses with a fundamentally different way of delivering enterprise computing to their users, on whichever devices their employees need to use. It can drive down costs for the enterprise's IT department and empower employees to work more flexibly.

Meanwhile, the cloud gaming market is set to be worth more than USD 1.63 billion by 2020 according to Technavio, an increase of over USD 1 billion since 2015[17]. Gaming via the cloud offers the ultimate flexibility for users, allowing them to play across devices and platforms and in different locations just by logging in, without requiring large amounts of storage on individual devices or consoles. Each of these relies on delivering streamed services with low and consistent latency and high image fidelity, presenting technical challenges when it comes to delivering in real-world applications.

A great user experience for both cloud gaming and VDI relies on delivering exceptional image quality, low and consistent latency, and seamless delivery to a range of device types.

The economic challenge lies in ensuring enough concurrent sessions per server to make the infrastructure costs manageable. For CSPs, making these services work commercially can be a challenge but emerging graphics and video technology provides the foundation for low latency cloud-based streaming services at a total cost of ownership that facilitates profit.

## Technology snapshot

Real-time streamed services can be any streamed service from the public cloud that requires delivery in real- or near real-time, such as Virtual Desktop Infrastructure (VDI) or cloud gaming.

### Anticipated market value
### VDI - USD 9.41 billion by 2021;
### Cloud gaming - USD 1.6 billion by 2020

### Steps to Profit

**Choose the right middleware.** Delivering real-time streamed services profitably means reliably and consistently minimizing network latency. Advanced middleware technologies are available that optimize graphics, network, compute and device performance to keep latency to a minimum across streamed applications. Scalable Graphics 3D Middleware, for example, consists of a series of unique algorithms which together deliver low and consistent latency.

**Focus on graphics.** Ensure that your client graphics are up to scratch – the user experience on real-time streamed services, particularly cloud gaming, is heavily graphics dependent. High image fidelity requires optimum graphics capabilities and fast decoding and encoding capabilities.

**Get ready to stream at high volume.** To support real-time streamed services, an infrastructure must be based on technologies that can cope with the speed and scaling required.

## D. NEXT-GENERATION BARE METAL-AS-A-SERVICE

### The Opportunity

Bare Metal-as-a-Service (BMaaS) has been around since 2009 but is seeing a dramatic increase in uptake as I/O intensive and time-sensitive workloads increase[18].

In fact, analysts predict that the market is growing at a CAGR of 40 percent and will reach USD 4.1 billion by 2021[19]. The reason for the striking growth is that certain demanding workloads experience 'noisy neighbor' problems when running on virtual machines in public cloud environments. In particular, Big Data/Hadoop deployments and high-volume real-time analysis and bidding applications in the ad buying and financial services markets tend to suffer in a traditional IaaS environment. Ultimately, for enterprise customers with highly performance-intensive workloads or those with strict privacy requirements, a virtualized, multi-tenant cloud environment may not be the best solution.

## Technology snapshot

Bare Metal-as-a-Service (BMaaS) differs from other forms of public cloud as a customer will rent dedicated hardware resources from a CSP.

### Anticipated market value
### USD 4.71 billion by 2021

BMaaS offers a dedicated server environment with the same cloud agility, scalability and efficiency, which provides a good alternative where IaaS fails to meet specific workload requirements. In addition, BMaaS offers customers a consistent performance and the ability to scale up and down extremely quickly without needing to worry about virtual machines or hypervisors.

For CSPs, however, provisioning BMaaS has typically required lengthy and resource-intensive processes, which have impacted the ability to make a substantial profit from this relatively niche service. As customers' BMaaS demands will vary widely depending on their particular workload and plans, each instance needs to be planned and provisioned individually – there are no meaningful economies of scale. Another issue stems from the project basis on which BMaaS solutions are often provisioned by enterprises – once the customer has finished running the workload and exited the service, what is the CSP to do with the hardware? Manually reprovisioning the compute, storage and networking is timely and expensive. Fortunately, there are ways to minimize the manual component of BMaaS provisioning and offer it to customers at a lower price point while continuing to generate profit.

### Steps to Profit

**Sell speed and flexibility.** Enterprises will consume BMaaS differently than typical virtualized IaaS or PaaS. To ensure your BMaaS offering is competitive, it will need to provide flexible billing options and fast provisioning for your customers.

One of the leading BMaaS providers, Softlayer, offers 30-minute provisioning and billing by the hour, giving customers a real on-demand option for their critical workloads[20]. This has set the standard for bare metal and CSPs should look to provide a similar flexibility where possible.

**Implement SDI at rack level.** The key to delivering BMaaS profitably is automation, and this means implementing software-defined infrastructure (SDI) at the rack level[21]. Alongside this, CSPs can use open APIs including Redfish and protocols such as Intelligent Platform Management Interface to manage discovery, composition and decomposition of resources in the data center for provisioning instances of bare metal services. Intel® Rack Scale Design (Intel® RSD) allows CSPs to grow data center capacity incrementally at the rack level, offering a straightforward way to inventory and pool cloud resource and provide the optimal conditions for each bare-metal instance and its high-performance workload. You can read more about Intel Rack Scale Design below.

**Think about management.** Management tools for BMaaS have traditionally lagged IaaS cloud offerings, which may put off potential customers who are low on resource or skills[22]. Advising customers on bare metal management solutions may help to increase uptake of BMaaS services.

## E. CONTAINERS AND CLOUD NATIVE DEVELOPMENT

### The Opportunity

According to analysts 451 Research, application containers will be a USD 2.7 billion market by 2020[23]. As the 'platform economy' ramps up, businesses of all sizes are seeking to emulate the success of giants like Uber, Netflix and Airbnb – and CSPs have a big role to play. Even long-standing traditional enterprises are waking up to the fact that a lot of their future potential will come from services that they can deliver over the top to customers. This is especially important for companies that typically exist a few steps away from their customers – car manufacturers, for example. The platform economy offers an opportunity to embrace digital transformation and create direct user experiences quickly and cost-effectively, building deeper relationships with customers to elevate brand loyalty. There are huge risks for enterprises who fail to take this step and evolve their business model. If the car manufacturer is slow to build out their services offering, there will be an integrated satellite navigation provider that jumps in to fill the gap with a journey services application.

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### Technology snapshot

Cloud native applications are programs designed specifically for a cloud computing architecture. Containers are composed of an entire runtime environment making the application platform, differences in OS distributions and changes in infrastructure irrelevant to the application's operation. Together they solve the problem of reliably running software when it is moved between computing environments, such as to and between cloud environments.

Anticipated market value
**USD 2.7 billion by 2020**

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Containers and cloud native development are critical for businesses to be able to launch these new services quickly and cost-effectively. An enterprise developer can simplify software deployment, since cloud native or container development makes it easier to 'debug' environment issues in scenarios where the development, production and test environments are all different. It also makes it easier to manage or scale the application as needed. As a result of this platform economy shift, many larger enterprises now understand the role that container solutions and cloud native application development play in their cloud strategy[24,25]. This realization is not ubiquitous, however, even within one company.

More traditional or operational parts of an enterprise may not see the opportunities and threats that the platform economy brings, whereas newer, more commercially-focused areas of the business may 'get it'. Current data suggests that around a third of businesses are actively testing container computing in DevOps scenarios to minimize development time or for niche or discrete projects, however roughly 10 percent of enterprises have already moved on to production[26].

Substantial hurdles remain, however, as organizations struggle to build cloud native applications as well as deal with the management, security, storage and microservices issues it brings alongside the rest of their IT setup. As established CSPs and specialist niche players compete to support their enterprise customers' use of containers, there remains an opportunity for new container services and solutions from CSPs, as well as a strong need for consultancy and support.

### Steps to Profit

**Establish where your customers are in their platform economy journey.** Do they understand the opportunities and threats it presents? Do they have a vision for bringing dynamic new services to their customers? If their understanding of the platform economy is limited, CSPs can add value by describing the possibilities it entails, as well as the risks of doing nothing. Helping customers to identify their most pressing needs for offering new services and working with them to leverage containers or cloud native development to build and test these can help accelerate their existing customers' journeys toward making the most of the cloud.

**Understand your customers' priorities.** Cloud native development with containers can offer customers increased agility in their business model, create a dynamic environment for innovation and even provide the foundation for digital transformation. Do they want to build smarter services? Could they benefit from a deeper connection to their customers or improve the customer experience? The answers to these questions will provide the insight you need to deliver the container service that will meet your customers' needs.

**Be flexible.** Some customers will arrive with a vision of how they want to use containers to build new revenue streams, others will barely have heard of the technology. Building a suite of container-based services that range from simple access to a software container platform through to white labelled services and platforms for achieving cloud native development will ensure that the needs of most businesses are met.

**Get your platform in shape.** Running containers on bare metal instead of Virtual Machines (VMs) opens up new possibilities. Rather than waiting for the Virtual Machine Manager (VMM) to enable hardware features, CSPs can use them directly. For example, on the Intel Xeon processor Scalable family, it is now possible to take direct advantage of the accelerated performance enabled by Intel Advanced Vector Extensions 512 (Intel AVX-512), as well as higher memory bandwidth. Factors which contribute to higher density containers, improved server utilization and lower total cost of ownership. Intel contributes to key open source container projects like Kubernotes (orchestration), Prometheus (logging/ monitoring), and Calico (networking), and can advise CSPs on launching Container as a Service and implementing a cloud native development environment.

**Intel® Rack Scale Design (Intel® RSD)** brings transparency to the data center, offering a single combined view of what's happening with hosted software applications and their underlying infrastructure resources. It enables system views from a single application instance or hardware resource to a view that spans the entire data center. Crucially for CSPs, Intel RSD allows the infrastructure to change in line with customer needs, reallocating storage, compute and network resources in real time. Bottlenecks can be addressed as they arise and underutilized capacity is easily allocated instead of lying idly in the data center.

## Where to Start

The starting point for making more money from the cloud is for the CSP to understand as much as possible about its customer, ensuring its team is well-equipped to deliver new services and modernizing its infrastructure to optimize for performance and cost-effectiveness.

### Knowing Your Customer

For really accurate innovation decision making and pinpoint customer targeting for marketing new services, CSPs should look to engage in data analytics to generate a 360-degree view of their customer base. Ultimately, big data solutions offer CSPs the opportunity to generate insights based on customer behaviors and improve their success rate in understanding which new services to offer to customers and how to engage specific customers with promotions and campaigns.

True Corporation, a leading CSP in Thailand, recently developed a 360-degree view of 1 million individual customers by integrating multiple data sources into a single repository and analyzing behaviors. The process allowed data scientists to discover new trends and patterns to improve decision making and support business development. You can read more about how True Corporation developed its customer insights using big data analytics here (requires log in).

### Skilling up to Build New Cloud Services

Cloud engineers and architects are in high demand as the cloud market continues to expand and evolve, making hiring and retaining talent more challenging. The much-lamented cloud skills shortage may be hitting CSPs but it is their enterprise customers facing most of the problems. Recent research shows that 53 percent of enterprises are struggling to hire the right people to take their cloud strategy forward[27]. This creates a dual challenge for CSPs as they work to hire the engineers they need in addition to support staff who are able to work with less skilled customers and smooth their cloud adoption process.

One way to mitigate the skills issue is to focus on continuous training for existing employees. CSPs can take advantage of a range of free training resources that allow their team to learn quickly about emerging technologies. The Intel® Cloud Insider Program, for example, is an online resource dedicated to helping cloud professionals to deepen their expertise and efficiency in the cloud, with access to cloud solutions and technologies, education and industry events, software and tools, industry insights and a community of fellow experts.

Another way to make life easier for engineers is to modernize the IT infrastructure (see below) which research shows can improve IT personnel efficiency by up to 60 percent[28].

### Building the Foundation for Cloud Services Success

Modernizing your cloud infrastructure can make the difference between profitable and costly new service innovation. Research suggests that a software-defined infrastructure, for example, can reduce operating costs up to 75 percent versus a traditional infrastructure, with software savings of up to 70 percent[29].

Intel's Cloud Infrastructure Maturity Model for Cloud Service Providers is designed to provide more detail about this six stage journey to greater agility, beginning with a relatively inflexible ad hoc infrastructure and moving step-by-step towards a highly flexible, agile and automated organic infrastructure. In 2017, CSPs tend to sit between stages two and four, with the market leaders operating at the SDI level but there is plenty of road ahead for improvement.

For further information about the CSP Cloud Infrastructure Maturity Model, download the Build A Better Cloud ebook.

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **Ad Hoc** | **Virtualized** | **Scalable Infrastructure** | **Software-Defined Infrastructure** | **Intelligent Infrastructure –Optimized** | **Organic Infrastructure** |
| Based on multitenant physical segmentation | Based on virtualized compute resources with traditional architecture model | Based on scale-out and modular architecture | Based on programmable infrastructure | Smart infrastructure managed by policies and service-level agreements | Always optimized, fully automated and reprogrammable on-the-fly for best results |

**AGILITY**

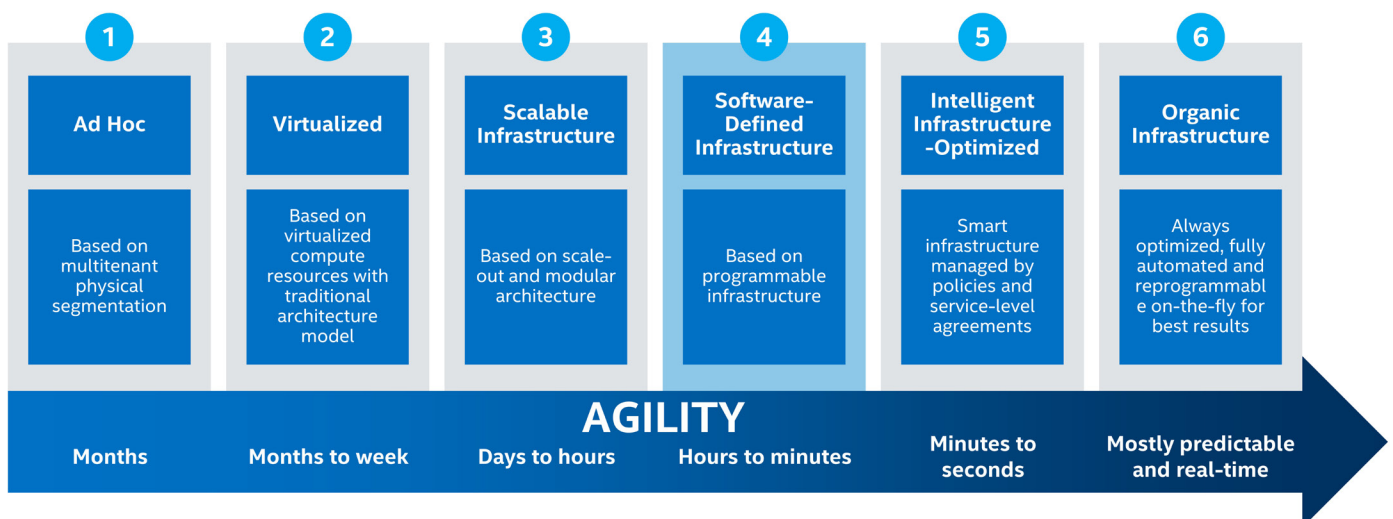| Months | Months to week | Days to hours | Hours to minutes | Minutes to seconds | Mostly predictable and real-time |
|---|---|---|---|---|---|

**Figure 4.** Intel Cloud Infrastructure Maturity Model. Source: Intel (2017) Build A Better Cloud ebook

## Summary

Facing significant pressures in a highly competitive and fast-paced sector, CSPs need to commit resource to introducing and profitably delivering new cloud services. An innovative approach will help them to retain existing customers, attract new customers and secure their slice of this rapidly expanding sector.

This paper has outlined some of the critical success factors for successfully innovating and delivering new cloud services, and identified some of the services with promising market opportunity.

For more information on making more money from cloud services, visit intel.com/CSP

## Further reading

- Intel Cloud Service Provider Hub
- Intel Cloud Insider Program (sign up required)
- Build A Better Cloud ebook (sign up required)
- Modernize to Make Money Infographic
- Trusted Cloud Deployment Guide
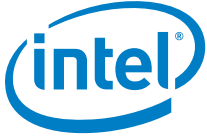
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http://www.idc.com/getdoc.jsp?containerId=prUS42321417
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