Google Cloud

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Migrating to the Cloud

How to leverage commercetools and the Google Cloud infrastructure to increase agility and drive business

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Executive Summary

Moving workloads to the cloud offers many benefits for brands and retailers. According to Gartner[1], "Enterprise adoption of public cloud is growing to the point that public cloud is an expected approach to IT". With the adoption of public cloud infrastructure comes increased business agility, broader geographic distribution, and scalability.

[...] Gartner's latest IT spending forecast shows that spending on data center systems is forecast to be $195 billion in 2019, but down to $190 billion through 2022. In contrast, spending on cloud system infrastructure services (IaaS) will grow from $39.5 billion in 2019 to $63 billion through 2021[2].

Accordingly, businesses with a legacy, on-premise infrastructure are increasingly looking for efficient, organized ways to move to the cloud. Through cloud service providers such as Google Cloud, and retail platform specializations such as the commercetools commerce API, the market has become mature enough for organizations to transform their legacy infrastructure and move their applications to a cloud-based environment.

[1] Ji, Kevin, Build the Right Justification for Moving to the Cloud, Gartner Research, https://www.gartner.com/en/documents/3715018/build-the-right-justification-for-moving-to-the-cloud, 2018-07-27
[2] https://www.gartner.com/smarterwithgartner/cloud-shift-impacts-all-it-markets/

Why Cloud?

Although there might be professionals in the market who use "cloud" as synonym for being modern and advancing digital capabilities, putting one's applications in the hands of a public cloud vendor is not a means to an end. Here are the three most important business considerations:

Better business agility

As one of the primary reasons organizations choose to migrate to the cloud is to speed up development time and increase business agility. In the old on-premise world, it could take weeks, or even months, to have server hardware ordered, put into a data center and provisioned with all the necessary software, all before deploying your custom applications. This latency has the potential to kill motivation at an early stage; waiting to launch a new feature ready to go public can be quite a frustrating experience.

What's more is that under those circumstances, you can (or cannot!) react to new initiatives by your competitors. They might be targeting a new audience or test-driving a new business idea while your devops team is still busy installing the OS or getting the network up to speed. This is both a frustrating, business-critical problem.

Being able to start a new virtual machine with a few clicks, deploy your application and have it seen and tested by a large fraction of your audience helps to foster growth and innovation. It enables a lean and iterative approach to software development and lets hosting and delivery be the on-demand commodity it should be.

Finally, having access to cloud-based resources can alter the way in which software is built in the first place - think microservices. One of the most important features of those is isolation; ideally they should not share any resources such as databases. Also, if a microservice goes down, it shouldn't take all the others with it. In a traditional hosting environment, it would be quite a task to guarantee this kind of separation, especially if there's a diversity in front and backend technologies. What if your basket microservice was a Ruby application, the inventory service uses Perl and the price service was a Java solution?

In a cloud environment, even a "zoo of microservices" can be separately hosted, monitored and maintained, and together with strategies such as serverless, enable a whole new paradigm of software development.

Geographic distribution and availability

Cloud solutions have become a prerequisite for success in global business. If you are a retailer addressing multiple locales around the world, it is important to have an infrastructure in place which enables fast response times for your customers. Imagine you are based in Europe and would like to target audiences in the US and APAC. Running your own data center, say in London, might result in higher latency, and therefore a poor experience for someone from Sydney using your apps or websites.

Public cloud providers now provision standardized resources in data centers around the world; Google Cloud, for example, provides fast and reliable connections to its users from data centers across 20 regions, spanning 200+ countries and territories. As with most of cloud infrastructure, choosing whether a specific part of your application is served out of mainland Europe or the US is just one click away.

Performance and Scalability

With cloud infrastructure, you get access to the best equipment available: the newest Intel processors, the most optimized RAM memory, solid-state drive (SSD) storage, arrays of graphics processing units (GPUs), and even cloud-programmable hardware. This comes with a wide ecosystem of software platforms to choose from: managed databases and warehouses, orchestration platforms, caching, queuing systems, and just about anything you need for any software architecture. The impact on your business when you move to the cloud can be immediate, especially if you operate in a competitive market that is advancing swiftly.

If your business model has some amount of seasonality built in, and is impacted by events such as Black Friday or Christmas, a cloud infrastructure supports you when traffic peaks occur. Cloud providers offer the required elasticity and automatically start new nodes when there is an unusually high amount of parallel visits on your apps. If the number of visitors drops again, these extra virtual machines are shut down, using your IT budget efficiently. In the old, on-premise world, businesses were required to gauge how many resources they would need for the holiday season long in advance, and pay for hardware which wouldn't be needed for the rest of the year.

What exactly is Cloud - and is it Safe?

If you ask ten people about what they think what cloud is, you will get at least ten different answers. One of the reasons for this is that software builders are using the term in all kinds of ways. Kelly Goetsch, CPO at commercetools, says "[I] t's simply ridiculous how far "cloudwashing" has gotten out of hand. No wonder then that many are confused by all of these new "Cloud Commerce" offerings on the market. They are not created equal"[3].

Today, there is a formal definition we can use. The NIST definition of cloud computing from September 2011, which still holds today[4], is this:

On-demand self-service: A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

Broad network access: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).

[3] https://www.linkedin.com/pulse/beware-false-commerce-clouds-kelly-goetsch/
[4] https://csrc.nist.gov/publications/detail/sp/800-145/final

Resource pooling: The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth.

Rapid elasticity: Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

Measured service: Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported.

Security

Since its beginnings, cloud offerings were faced with questions regarding data security. Many claim that there's no such thing as cloud, only other people's computers. Many are sceptical about why their business critical data should leave the hardware owned by the company. They fear that criminals could hack into their system, steal and publish sensitive data, and effectively ruin the business.

For others, it's part of their IT governance not to store data anywhere outside their own legislation because they fear foreign administrations can get access to their data:

Even if data isn't stolen or published, it can still be viewed. Governments can legally request information stored in the cloud, and it's up to the cloud services provider to deny access. Tens of thousands of requests for user data are sent to Google, Microsoft, and other businesses each year by government agencies. A large percentage of the time, these companies hand over at least some kind of data, even if it's not the content in full.[5]

One way to alleviate this problem is to use strong encryption that keeps data secure. Even if the data as such are stolen, the cryptographic key is required to decipher them.
For Gartner, the real security issue does not lie in the cloud service per se, but in the people and applications interacting with this infrastructure. They claim[6]:

- In 2018, the 60% of enterprises that implement appropriate cloud visibility and control tools will experience one-third fewer security failures.
- Through 2020, public cloud infrastructure as a service (IaaS) workloads will suffer at least 60% fewer security incidents than those in traditional data centers.
- Through 2022, at least 95% of cloud security failure will be the customer's fault.

In other words, organizations need to enforce policies on cloud ownership and handle responsibility accordingly. Those policies need to be monitored and updated to stay up-to-date, and need to build a viable basis for interaction with something as complex as a public cloud infrastructure.

[5] https://www.globaldots.com/data-safe-cloud/
[6] https://www.gartner.com/smarterwithgartner/is-the-cloud-secure/

Preparations

A roadmap for moving applications and data into the cloud.

Assessing the Status Quo

As a first step it is important to conduct a due diligence assessment of the applications and infrastructure landscape. This assessment is required to gather an overall understanding of the application functionalities, infrastructure, connectivity, and other pre-requisites, to enable smooth migration, business continuity and disaster recovery. Things which you should typically do in this discovery phase are:

- Catalog and document current state of architecture and policies
- Assess existing infrastructure and application setup
- Review application architecture for hosted environment suitability
- Determine performance benchmarks and standards for the existing application
- Identify risks, dependencies and migration constraints for each workloads

Geographic distribution and availability

Cloud solutions have become a prerequisite for success in global business. If you are a retailer addressing multiple locales around the world, it is important to have an infrastructure in place which enables fast response times for your customers. Imagine you are based in Europe and would like to target audiences in the US and APAC. Running your own data center, say in London, might result in higher latency, and therefore a poor experience for someone from Sydney using your apps or websites.

Defining the Desired End State

Next up in the planning process should be to define your desired end state. What goals are you looking to accomplish by migrating workloads to a public cloud vendor such as Google Cloud? Generally speaking, there is a hybrid approach which utilizes both an on-premise data center and a cloud vendor, as well as a full-cloud approach. Let's look at each of those in more detail and discuss which types of businesses those approaches make sense.

1. Hybrid cloud with workload separation.

This is a common approach to hybrid cloud, locating workloads either on-premises or in the cloud, based on business requirements. For example, static or legacy workloads may remain on-premises, while dynamic workloads are hosted on the public cloud.

This scenario is typical for retailers who are getting started with the world of cloud, because it avoids unnecessary risk. Organizations don't have to touch their legacy applications, because they keep running in an on-premise data center like they used to. New developments like functionality for new lines of business, is deployed to the cloud, benefiting from a scalable infrastructure.

Advantage: Risk mitigation
Disadvantage: Maintenance cost for on-premise data center

2. Hybrid cloud with workload balancing.

In this model, a single workload is hosted across both private data centers and in the cloud. The workload is deployed in an active-active configuration and is load balanced between the different environments, or uses cloud for on-demand, scalable capacity.

This scenario is typically chosen by businesses who experience a steep growth curve. To alleviate traffic spikes which happen because of TV advertisements or seasonal business such as the Cyber week or the holiday season, the same workload is cloned and running both on-premise and in the cloud.

Advantage: Increased availability
Disadvantage: Maintenance cost for on-premise data center

3. Hybrid cloud for disaster recovery.

A simpler approach is spreading a single workload across the cloud and the data center, using one site for the primary and the other for the disaster recovery, or failover site. Depending on SLAs, you can replicate data and standby systems to the alternate site to be used in case of failure at the primary site.

Advantage: Increased availability
Disadvantage: Maintenance cost for on-premise data center

4. All-in on the cloud.

The most straightforward approach, of course, is to go all-in on cloud. This approach is typically the easiest to manage and is often less expensive than hybrid approaches. On the other hand, it also requires a lot of confidence that the internal processes and the knowhow are on par with using this technology on a day-to-day basis.

Advantage: Lower cost, benefits of fully scalable infrastructure
Disadvantage: Risk if no adequate knowhow is available

The last question to consider is what will your cloud infrastructure look like? Which instance types should you use, and in which configurations? Which reserved instances should you purchase to maximize your investments? To properly answer these questions, you must look at historical performance data across CPU, memory, network, and disk for servers, and across throughput, capacity, and IO for storage. Decide how much "headroom" you want to give each asset (typically 25%), and then look at the actual minimum, maximum, and average usage across these metrics to determine which instance type makes the most sense.

Cost-Benefit Analysis

Because of the significant cost of maintaining an on-premise infrastructure across hardware, physical data centers, and IT labor, many organizations are now looking at ways to reduce this burden. By migrating to a public cloud vendor, they take advantage of immediate savings in hardware and data center costs and benefit from optimized IT management and access to first-class single vendor support.

Risk & Mitigation

As mentioned above, before entering a cloud migration project, a business must make sure to understand the risks they are undertaking. Here are some common challenges in those kinds of projects and how they can be addressed:

Typical Risk/Challenges	Mitigation Options
The complexity of hardware interdependencies between applications poses risk during application migration	Detailed application interdependency analysis needs to be performed.
• Some legacy applications run hardware or OS that may not be supported on cloud • Some vendor support SW / Tools not compatible	• Re-architect application to be compatible with Cloud • Migrate older OS versions until the application is re-architected
• Network latency	• Architect the cloud to nearest regions/ zones & exploring the VDI solutions to meet requirements.
• Large data replication requirements • Backup and data protection requirements	• Utilize direct connect/express route options available

Executing the right Migration Strategy

To help retailers migrate away from a self-hosted environment or find a hybrid solution, there are various migration strategies which are used in moving customers to the cloud. Once you've determined your end state and which workloads you will begin with, you must decide on a migration strategy. You may have multiple strategies depending on the workload, application, and business unit, but organizations typically pick one of the following options:

Lift and Shift (a.k.a. The IaaS Approach)

This approach is the most common. In the Lift and Shift approach, a business rehosts all of their applications and moves them from an on-premise environment to a cloud infrastructure. Simply speaking, it's like cutting and pasting applications from their old to a new home, using core functionalities of the public cloud vendor as Infrastructure-as-a-Service (Iaas). The workload is generally not changed, and the architecture stays the same. For this reason, it's also the fastest approach and typically used by companies to protect their investments in business processes and data which are locked in an on-premise infrastructure.

Other executives are biased toward a rehosting strategy because they have a compelling reason to migrate quickly (for example, a data center lease expiry), want to avoid a costly refresh cycle, or simply need a quick budget win, which tends to be in the neighborhood of 30% when you're honest about your on-premises TCO[7].

While this migration strategy is fast, it can come with problems. Since many of the applications that are being "forklifted" to their new environment have been architected to run on individual and isolated hardware with completely known and finite resources, they are not leveraging cloud efficiencies like on-demand provisioning or multi-tenant architecture. They do the job, but they don't do it particularly efficiently. In moving whole data centers to run in the cloud, all limitations that were caused by the internal setup of the data centers in the first place are also inherited by the new infrastructure.

Benefits:

- Fast migration path
- Reduced risk compared to refactoring, the codebase stay the same
- Process can be highly automated using vendors' tool chains

Risks:

- Not leveraging cloud resources efficiently
- No real understanding of how cloud infrastructure works.

[7] https://medium.com/aws-enterprise-collection/cloud-native-or-lift-and-shift-99970053b25b

Refactoring and Replatforming (a.k.a. The PaaS Approach)

The second migration strategy is to rewrite parts of your workload to be compatible with the new cloud infrastructure. Some aspects of your applications can remain as is, but other parts may need to be rebuilt to operate properly on a cloud service provider such as Google Cloud. A partial refactor may also leave the existing application as is, and build additional supporting services on top of it. A full rebuild of your application is the most time-consuming approach, but it also represents the greatest opportunity to take advantage of the elasticity and availability of the cloud. This could also be a good opportunity to break an application down into microservices, or build out a container-based architecture.

Typically, businesses rely on cloud provider's services together with toolkits, languages, and frameworks as a basis to build real cloud-native applications. Organizations following this approach use cloud infrastructure as Platform-as-a-Service (PaaS), combining the benefits of a set of standardized services and building customized business applications on top of them. One example for such a best-of-breed set of services is the commercetools platform, which delivers a rich set of commerce functionalities and processes, all accessible via APIs, that can be consumed by customized, cloud-based applications.

Benefits:

- Leverage dedicated cloud services
- Run workload efficiently

Risks:

- Re-architect parts or the complete workload
- Knowhow required regarding cloud infrastructure

Replace (a.k.a. The SaaS Approach)

If the workload you are migrating is a commodity application (e.g., email, CRM), or has commodity components (e.g., a relational database), you can incorporate a Software-as-a-Service (SaaS) approach into the mix. This will help accelerate migration plans, as well as reduce management overhead. In this scenario, the SaaS solution is configured to model businesses' internal processes and the respective data that is being imported. Even though there might be the chance to extend those kinds of services, usually they work out-of-the-box and cannot be customized. Following this cloud migration strategy is recommended when business requirements change so rapidly that businesses would like to avoid investing time and resources in building customized applications.

Benefits

- Fastest migration path
- No cloud knowhow required

Risks:

- Limited flexibility

Of course, there is no clear-cut division between those strategies, and organizations might decide to use hybrid approaches or change the strategy successively.

In the following interview, a well-known retailer from the UK talks about why they chose to migrate away from an on-premise infrastructure and what their migration path looked like.

Use Case: Cloud migration at Moonpig


Ronan Tighe,
CPO at Moonpig

All about making people's days brilliant – true to this motto Moonpig creates more than 17 million personalized gifts, cards, and flowers per year. The good thing: right from the start in July 2000 Moonpig is a rapidly growing business, with up to 300 orders a minute during peak periods like Mother's Day. The pain point: 18 years of adding features left a lot of technical debt with a monolithic database. We asked Ronan Tighe, CPO of Moonpig, how it was going with the migration to a cloud infrastructure.

What does your current IT strategy look like?
We're currently rebuilding our frontend in React and we're moving to a headless content management system, where we're really trying to essentially decouple the frontend business logic with the backend. And we've got a number of key architectural principles that we're working towards. So we need to operate on massive scale, especially around our peaks, that's Mother's Day, we can easily take in over 300 orders a minute at peak time. Here, we're fully integrated. From a customer placing an order on the site to the card being printed in one of our factories, it takes about 10 seconds. And that's all through our own stack. So we really need to build a highly scalable, reliable system that meets those business needs. And we are really focused on making data first-class systems and using GraphQL and to expose that.

What are the challenges which you're trying to master by building a cloud infrastructure?
Seasonality is definitely a challenge, and we've got four peaks in the year. Christmas has a bit of a lower ramp-up period. We find that the way people shop at Christmas, it happens over a couple of weeks. So if you're going to send Christmas cards to all your family and friends, you might send 20-30 cards, and you tend to do that, maybe towards the end of November. And as you get closer to Christmas, people usually buy individual cards and gifts. So that's a two-three week peak. And Valentine's Day is a massive peak for us, especially for flowers. We will sell 100,000 bouquets of roses in three or four days during Valentine's Day. So you can imagine the operation and effort that that takes. We have to build and pop up warehouses in order to satisfy the demand of customers and people are shopping later and later due to expectations of eCommerce retailers like Amazon they're accessing. So it's those peaks that really drives the biggest number of orders, the rest of the year tends to be a lot flatter. But birthdays are the predominant kind of use case and outside of the peaks. So this is our main challenge. And the forward plan is where we're leveraging more cloud infrastructure. We're moving to kind of platform as a service and serverless infrastructure where all the instructions are in code and we can spin up new services when needed. We're not paying for massive data centers when we don't need them during peaks. And so we now have all of our kind of legacy architecture on AWS. But we're going to move into this new architecture to in order to make it faster, more scalable, and more cost-efficient.

Why are you moving away from a software monolith?

I think when you understand the pain of that monolith, you really want to move towards a world where you've got microservices. So it really enables teams to independently deliver without creating lots of internal dependencies. When it comes to releasing something, you have to coordinate massively, and that slows you down. We're really trying to build a platform where we can have smaller cross-functional full-stack teams that can just ship things quickly.

How did you plan the process of going to the cloud?

About a year ago, we looked at our stock, and we took a step back and looked at where we were spending our engineering time. And we realized that we're focusing and building on too many things that are now commoditized eCommerce capabilities, where we really should have been focussing on parts of the customer experience that are unique to our market. And we'll be able to differentiate us from our current competitors and any potential new entrants. And so around this time last year, we kicked off a three months vendor selection process, and we chose commercetools.

We just built stuff. We didn't spend months working on very long, detailed functional specs and listening to lots of sales presentations, we just got a team and we gave them a few weeks to create a proof of concept of the number of vendors that we shortlisted. So when it came to making the decision, we had a really clear understanding of what it would take. What we liked about commercetools was it will allow us to sequentially move parts of our existing stack over time, so we can continue to deliver to customers without taking a significant portion of our team out and building something behind the closed wall for months on end. And so we're now at a point where we're releasing new parts of our stack to customers and in different markets. And I'm rolling it out sequentially over the next year.

Which cloud-based services are you using or will you be using in the future?

We're moving to a headless CMS, we're using contentful for that. And we're using GraphQL as an intermediate layer. We're fully on AWS, and we're going to use Lambda functions and Cloud Front within that. And together with commercetools as a commerce platform that will be the core. We're currently looking at different server-side A/B testing frameworks as well.

Summary

With brands and retailers targeting new audiences, developing new lines of business and being faced with seasonal business, moving to the scalable and flexible infrastructure seems like the next logical step. After a thorough assessment of the status quo has been done and the business as well as the tech side of the business understand the risks and benefits of this move, organizations can significantly increase their agility while decreasing their operating costs. Understandably, there's no one-size-fits-all transition for moving workloads from your on-premise data center to the cloud, but the roadmap outlined in this whitepaper can serve as a theoretical framework.

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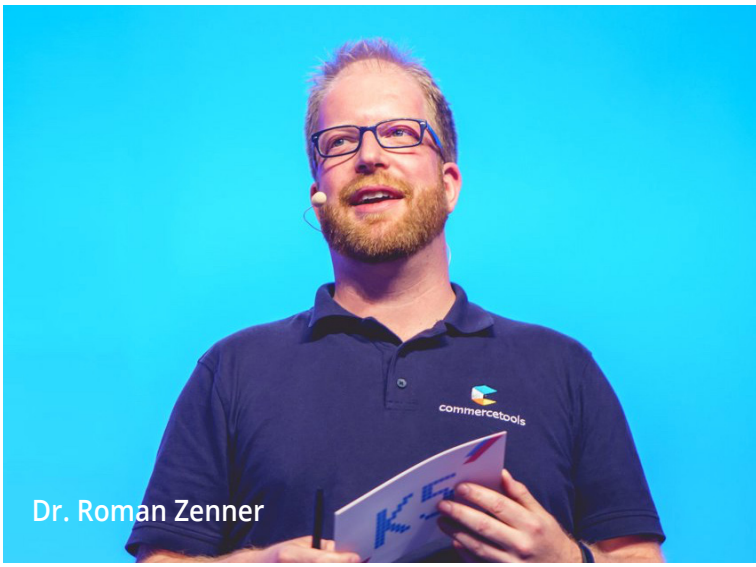
About the author

Since 2001, Dr. Roman Zenner works as an author, consultant, and speaker in e-commerce. He has written several books on web shop software and regularly publishes articles in professional magazines and blogs. Dr. Zenner runs shoptechblog.de as well as the podcast ShopTechTalks. Furthermore, he speaks at conferences, teaches university classes and moderates expert panels.

In his work, Roman focuses on next generation commerce technologies and explores what retail will look like in a post-web world. Since 2015, he is a full-time employee of commercetools GmbH, working as an Industry Analyst.



Dr. Roman Zenner

About commercetools

commercetools is a next-generation software company that offers a cloud-based, headless commerce platform, providing the building blocks for the new digital commerce age. Founded in 2006 commercetools is one of the fastest growing enterprise software companies in Europe with 190 employees at its European and US offices serving international brands such as Bang & Olufsen, Carhartt WIP, C.H. Beck, Cimpress and Express.

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