Serverless Computing: A Compelling Opportunity for Today's Digital Enterprise

Abstract

Cloud computing has enabled organizations to focus less on their IT infrastructure and more on their core products and services. In fact, the cloud is no longer viewed as an alternative to hosting infrastructure: In today's world, all kinds of businesses are using cloud services without having to worry about any underlying infrastructure issues.

This new consumption model has evolved to serverless architecture. By adopting serverless architectures, customers can re-imagine their next-generation products from ideation to production, without waiting for, or worrying about, infrastructure. The benefits are significant, generating efficiencies, lowering costs, and speeding time to market.

An evolution of the cloud

The serverless cloud is an evolutionary step in leveraging the cloud to its full potential. In a serverless environment, your applications still run on servers, but you don't have to own, manage, or maintain those servers. You simply consume computing infrastructure in the same way that you consume other cloud services. The cloud service provider (CSP) is responsible for underlying infrastructure management, freeing your resources to focus on your core business functions.

Two key drivers

Advances in computing technology have enabled the serverless environment, and enterprises are embracing it because of two key drivers:

New business models: The digital era has greatly accelerated the pace of change and evolution for new products, services, and business models. Market dynamics are changing faster than ever before. Enterprises are under increasing pressure to release new features and products that meet the exponentially growing expectations of customers. Digital reimagination and the Internet of Things are affecting every industry.

This new environment makes the idea of serverless architecture more attractive than ever before. It effectively eliminates the time-consuming and expensive traditional approach: building components in-house, purchasing new hardware, installing servers, configuring, and troubleshooting.

A paradigm shift in the organizational mindset: DevOps and the agile development culture are driving organizations to fundamentally change the way they develop business applications. Monolithic applications are giving way to micro services, API, and function-based execution units. The trend of Continuous Integration and Continuous Deployment (CI-CD) is helping IT match pace with business agility. The long cycles of change management and waterfall execution models are giving way to weekly or bi-weekly sprints of smaller scrum teams pushing new code changes.

For many enterprises, the big questions today are these:

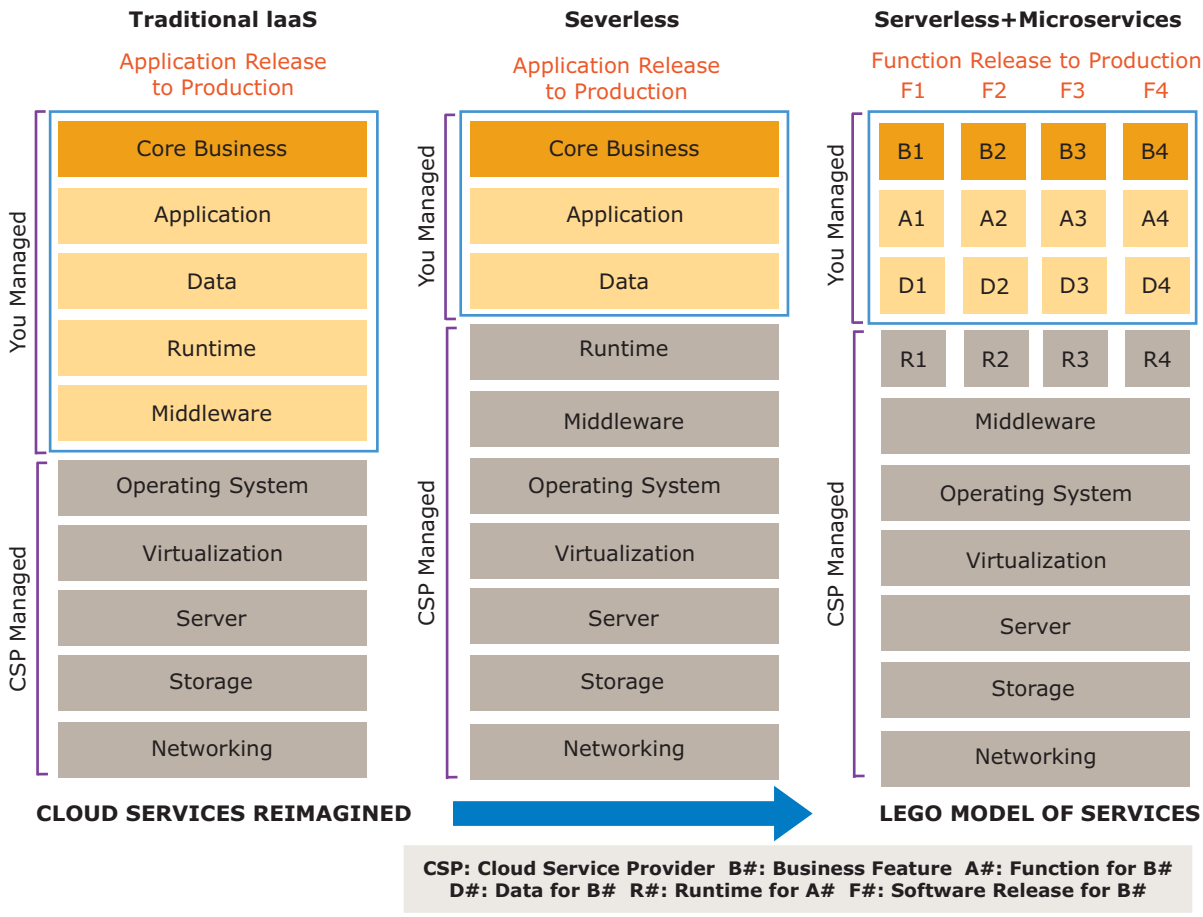
- How can my infrastructure support this agile approach characterized by frequent but small changes?
- How can we provide developers and operations teams with an infrastructure that can self-manage, scale on demand, and provide the compute and storage capacity needed to grow?

These trends have fundamentally changed the way enterprises approach infrastructure. The cloud has enabled organizations to build their own enterprise-grade infrastructure at commodity cost. Nonetheless, whether servers reside on premise or in cloud, you still need to invest in creating, maintaining, and managing the infrastructure to ensure high availability, scalability, and elasticity. For enterprise developers, the resulting dependency on infrastructure in the cloud makes the development and release process slow.

Serverless architecture characteristics

The solution is the serverless architecture. With this approach, you don't have to purchase, rent, or provision servers or virtual machines to run your code (see Figure 1). Serverless architectures are defined by these features:

- Built using services (not servers or virtual machines) provided by CSP and fully managed by the CSP
- Services that support elasticity and fault tolerance while providing enterprise-level global security
- Automatic scaling
- Built-in high availability
- Integrated security
- Event-driven compute to execute business logic (examples include AWS Lambda, Azure functions, IBM Bluemix OpenWhisk, Google Cloud Functions
- Pay-as-you go fee structure (for consumed services only)
- Developer-productivity centric
- Promotes continuous build, integration, and deployment efforts
- Innovation by focusing on developing and deploying business functionality
- Reduced time to market



Serverless Architecture Building Blocks

Use cases for serverless

When should you choose a serverless architecture over a server-based one? There are no specific rules, but examining the following attributes and use case possibilities can help you come to the right decision:

- Data in terms of variety (structured vs unstructured), volume, and variability
- Security requirements: Legal, regulatory, compliance, encryption, tokenization
- Management control: Governance and reporting
- Licensing: Third-party products, license extensibility
- Portability/Lock-ins: Ability to bring software components in house to port to different CSP, lock-ins
- Geographical restrictions: Serverless components may not be available in all geographies
- Integrations: Number and complexity of integrations with on-premise systems, other cloud services, and SaaS

- Feasibility of redesigning components and time to market
- Resource availability and skill sets
- Cost of hosting infrastructure in cloud versus cost of running business function

Serverless architectures can be useful in several situations:

- Web/Mobile applications
- Streaming and telematics solutions
- IoT solutions
- Advanced analytics and artificial intelligence solutions
- Cloud automation and DevOps enablement

Before making an architectural decision, it's critical to make a thorough evaluation of the attributes and use cases.

The benefits of going serverless

Reduce costs: Like cloud services, serverless is a new way of offloading IT overhead. A serverless architecture eliminates the responsibility of managing servers, databases, and even application logic, reducing set-up and maintenance costs. You only pay for the time your code executes, reducing operational costs. Serverless architecture lowers cloud administration cost (cloud server management and associated people costs).

Rapid development and deployment: Serverless architectures are built to enhance developer productivity and to make build, test and release cycles inherently agile. With the serverless approach, you can do as many test runs as you like without having to worry about when your infrastructure will be ready or when other components in the solution will be available for rollout. Cloud service providers are also investing to standardize development environments to encourage use of serverless architectures (such as the 2016 announcement of AWS Lambda supporting C#).

Reduced time to market: By using a serverless architecture, you can transform ideas into reality in a matter of minutes or hours. Serverless architectures also enable running multiple versions of code to meet tight deadlines.

For example: To develop a functionality that returns credit score for mobile users as part of your mobile banking app, a traditional cloud IaaS model (such as AWS EC2) could requires

days or even a week for developing, testing, and delivering the functionality. Using AWS Lambda (serverless, event-driven computing) you can develop the same functionality in matter of few hours. It takes just a few clicks to provision serverless services with scaling, fault tolerance, and elasticity all built in.

Built-In scaling: Like cloud services, serverless offerings have built-in scalability. There's no need for guesswork when it comes to scaling policies or over-/under-provisioning concerns. Just pay for the service usage, and the serverless architecture infrastructure will grow or shrink based on demand.

Failover: Disaster recovery is integrated into CSP offerings. Because serverless components are based on the pay-per-use model, setting up failover infrastructure in paired regions of a given geography comes at fraction of the cost of the traditional server-based architecture. The additional benefit is bringing the recovery time (RTO) down to near zero, making seamless switchover a possibility at fractional cost of existing setups.

The risks of going serverless

Loss of control over infrastructure: The cloud service provider controls the underlying infrastructure, so you will not be able to customize/optimize the infrastructure to suit specific needs. CSP-established service limits for serverless components may challenge the applicability for your use case. Multiple customers sharing the same serverless architecture may raise security concerns. CSPs are addressing these concerns by allowing customer to use serverless offerings in a virtual private network.

Lock-In: Switching from one vendor's serverless offering to another's may require significant time and efforts. (TCS Digital Enterprise offers frameworks and professional services to help customers choose the right set of serverless components and make cloud portability a possibility.)

Compliance concerns: CSPs are responsible for doing vulnerability scanning and penetration tests on infrastructure underlying serverless offerings. But as a consumer of serverless offerings, you cannot do these tests. For example, you cannot perform penetration test on underlying infrastructure for your AWS Lambda function. For most customers this may not be an issue but if your use case requires you to perform penetration tests on infrastructure for compliance, legal reasons you may prefer a more traditional, server-based approach.

Monitoring, logging and debugging: Monitoring, logging and debugging of serverless architecture may often need customized code and/or third-party software adding more costs.

Conclusion

Adopting serverless can deliver many benefits—but the road to serverless can get challenging depending on the use case. And like any new technology innovations, serverless architectures will evolve en route to becoming a well-established obvious standard. While serverless architecture may not be a solution to every IT problem, it surely represents the future of many kinds of computing solutions in the coming years.

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