ACCELERATING DIGITAL TRANSFORMATION THROUGH CLOUD-NATIVE & MICROSERVICES

AUTHORS

Satyanarayan Dash
Associate Partner, Technology Consulting Group

Kapil Gupta
Vice President, Technology Consulting Group
Executive Summary

IT Modernization and Digital transformation is disrupting business models in every industry and is expected to deliver over a trillion USD of value over the next 3 years. To unlock the potential of digitalization, IT leaders are struggling with mass disruption and transformation that are crucial to driving sustained and continuous growth, competitive advantage, and customer experience. One of the key levers of this transformation lies in leveraging cloud-native solutions that drive modern application frameworks through rapid innovation, continuous delivery, continuous integration, deployment and superior experiences across any infrastructure, whether on-premises or in a public cloud.

The key impetus to cloud adoption across industry is agility and flexibility to accelerate digital innovations and disruptions. These days, enterprises are realizing that simply moving and shifting their legacy systems to the cloud is not enough to meet their needs. Their systems, built with a monolithic architecture, are holding them back from realizing their goals. Besides, the process of delivering software is ever evolving. Mostly, evolution is a result of technology shifts and advancements that make incremental improvements to the process. But occasionally a seismic shift occurs that transcends minor variations on the old routines. Born out of necessity for the digital services on a global scale is the Cloud Native and Microservices driven solution architectures.

Drivers to Cloud-native with Microservices based development

Most of enterprise applications are built on monolithic architecture and have following key disadvantages:

- Difficulty in fault detection and isolation contained
- Very difficult to scale-up
- Time consuming and cumbersome deployments
- Tightly coupled process interactions and are usually developed with legacy technology

Microservices and serverless/container-based architectures help build distributed loosely coupled systems and consumerization of services across the Enterprise landscape.

What is cloud native?

**Objectives**
- Speed: Deliver value early through rapid, agile software delivery
- Scale: Adopt a Cloud-First strategy and extract the greatest value from on-demand cloud services
- Serviceability: Build applications to exploit Cloud Integration, hence easy to install, configure and monitor

**Features**
- Are automated and scalable
- Based on microservices and Cloud architecture patterns
- Are packaged and deployed within Container or serverless
- Support APIs and a range of interfaces
- Support Continuous Integration and Continuous Delivery (CI&CD) and DevOps methodologies
- Are supported by community-driven open source initiatives

How is Microservices different than Traditional Monolithic Architectures?

**Monolithic Application** - A monolithic application is built as a single deployable unit, e.g., a single WAR file in Java or a single Web Application/Web Site in .NET. They are usually built in three parts:
- A database
- A client-side user interface layer
- A server-side application

Monoliths are developed with object-oriented principles, these are usually long-lived and are of critical importance to the health of the business. A monolithic application is self-contained, has deep and wide class hierarchies and many interdependencies.

**Microservices** – An architecture approach that decomposes an application into modules with well-defined interfaces, so that each module performs one and only one business function. Microservices are independently deployed and operated by a small team who test, develop, do DevOps, and own the entire lifecycle of the service. Microservices can be deployed within container or serverless.
Approach for Cloud-Native, containerized serverless microservice based development

Today’s organizations require a platform for developing and operating cloud-native applications. And need services that automate and integrate CI/CD, DevOps, Micro-services and containers.

CI/CD & DevOps
Helps software developers and IT operations to constantly deliver good quality software, releasing rapid changes to software without disrupting existing deployment.

Serverless
Serverless computing allows enterprises to run their applications without owning the server and using existing, auto-scaling cloud services.

Cloud-Native Application Development

Microservices and Containers
Microservices architecture aims at development of small services that are mutually exclusive, stateless. They can be independently developed, deployed and upgraded. Container is a self-contained package comprising all resources, libraries and configurations to run a code and are not embedded with OS; can be provisioned in the right sized capacity to scale up or scale down as needed.

Reference Architecture

One of the key objectives of Cloud Native is to build applications to exploit the cloud. More precisely, build applications that can:

- Be quick and easy to deploy
- Be deployed to secure operating environments with resource isolation
- Achieve high performance characteristics
- Minimize cost
- Avoid vendor/cloud lock-in

With all this, the enterprise can focus on solving business problems instead of spending time on technical issues in static and inflexible legacy architectures.

PaaS Container based

<table>
<thead>
<tr>
<th>Microservice A</th>
<th>Microservice B</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Experience (UX) Layer (HTML/ CSS/ JS Component)</td>
<td>User Experience (UX) Layer (HTML/ CSS/ JS Component)</td>
</tr>
<tr>
<td>API Interface (REST / Message/Binary)</td>
<td>API Interface (REST / Message/Binary)</td>
</tr>
<tr>
<td>Business Logic Layer (Service Component)</td>
<td>Business Logic Layer (Service Component)</td>
</tr>
<tr>
<td>Data Access Layer (DAO Component)</td>
<td>Data Access Layer (DAO Component)</td>
</tr>
<tr>
<td>Container (Docker)</td>
<td>Container (Docker)</td>
</tr>
</tbody>
</table>

Platform based

Platform-as-a-Service (PaaS) – Enables application deployment and scaling through set of runtimes, bindings data into applications without manual intervention. Focuses on the application and lets the platform handle the rest.

Examples: Cloud Foundry, Heroku, OpenShift, Deis.

Serverless

Enables businesses not to own/provision servers/virtual machines to run their applications and depends on third party services.

Functions-as-a-Service (FaaS)

Provides a computational power to execute a function written by user as small pieces of code.

Examples: AWS Lambda, IBM Cloud Functions on Apache OpenWhisk, Azure Functions, Google Cloud Functions, Kubeless, iron.io, function, fission, nuclio, etc.

Backend-as-a-Service (BaaS)

Provides backend support for mobile apps or single page web apps.

Examples: AWS API Gateway, AWS Dynamo DB, BackA, Google Cloud Datastore, Kii, OAuth.io, etc.
Benefits of Cloud-Native & Microservices based architecture

**Benefits of Cloud-Native & Microservices based architecture**

- **LOW COST:** Pay only for what you use. Resources can be created and deleted on demand.
- **AUTO-PROVISIONING:** Manage Resources automatically.
- **AUTO-SCALABILITY:** Handle continuous Business Needs automatically.
- **AUTO REDUNDANCY:** Minimize Failure Risks Automatically.
- **INDEPENDENCE:** Enables apps to be built independently, updated, managed and deployed individually.
- **SPEED OF DEPLOYMENT:** With the use of CI & CD, services get built faster.
- **SECURITY:** Enable Developers to build security into application from the start rather than an afterthought.

**Conclusion**

The Cloud Native & microservices architecture paradigm represents an evolutionary step in custom application development. It goes beyond migrating and porting applications to run in the cloud. Rather, it focuses on how to exploit cloud computing to maximize its benefits. In order to achieve this, IT organizations need to focus on how they use cloud services, how they architect applications for the cloud, and how they develop those applications.

---

**About ITC Infotech**

ITC Infotech is a specialized global full service technology solutions provider, led by Business and Technology Consulting. ITC Infotech’s Digitaligence@work infuses technology with domain, data, design, and differentiated delivery to significantly enhance experience and efficiency, enabling its clients differentiate and disrupt the business.

The company caters to enterprises in Supply Chain based industries (CPG, Retail, Manufacturing, Hi-Tech) and Services (Banking, Financial Services and Insurance, Airline, Hospitality) through a combination of traditional and newer business models, as a long-term sustainable partner.

ITC Infotech is a fully-owned subsidiary of ITC Ltd, one of India’s foremost private sector companies and a diversified conglomerate.

www.itcinfotech.com | Email: contact.us@itcinfotech.com