



HEADLESS ARCHITECTURE IN A DIGITAL LANDSCAPE

As enterprises increasingly embark on their Digital Transformation Journeys and redefine their business models, there has been an uncompromising trend of positioning Customer Experience in the centre of Enterprise Digital Strategies. With the proliferation of digital technologies and endless choices of touchpoints offered to customers today, Digital Marketers strive to offer a consistent and personalized experience unrestrained by technology platforms. With all touchpoints, including

digital assets capable of being potential sales channels, it is an imperative for Enterprise Digital Architecture to offer the needed level of agility and flexibility to support digital business models.

In this context, we discuss about Headless Architecture, an architectural paradigm that enables enterprises to overcome the challenges posed by traditional and monolithic systems, like insufficient extensibility, high customization cost,

slower time-to-market and delayed response to customer, also lacking context at times.

We also look at the applicability of Headless Approach in the domain of Digital Commerce along with its nuances in Content Management space, while touching upon broader architectural concepts like Microservices and Service Oriented Architecture, to the extent relevant to this context.

What is Headless Architecture?

Headless Architecture is a specialization of Decoupled Architecture, in which the presentation layer of an application is separated from backend services. It is realized as a set of Business, Content and Data Services that are implemented and exposed as well defined web-services, and consumed by customer facing channels.

This paradigm has gained patronage over recent years. Although this is relevant to all multi-tiered applications and apps that provide digital touchpoints to end customers, it is becoming the primo choice for Digital Commerce Platforms of large enterprises that seek agility and flexibility in delivering personalized Omni-channel

Digital Customer Experience unrestrained by the underlying platforms and systems. It has emerged as a proven solution to blend Content and Enterprise Services, which include Commerce, to provide a rich and compelling experience to customers.

Experience

Content

Commerce

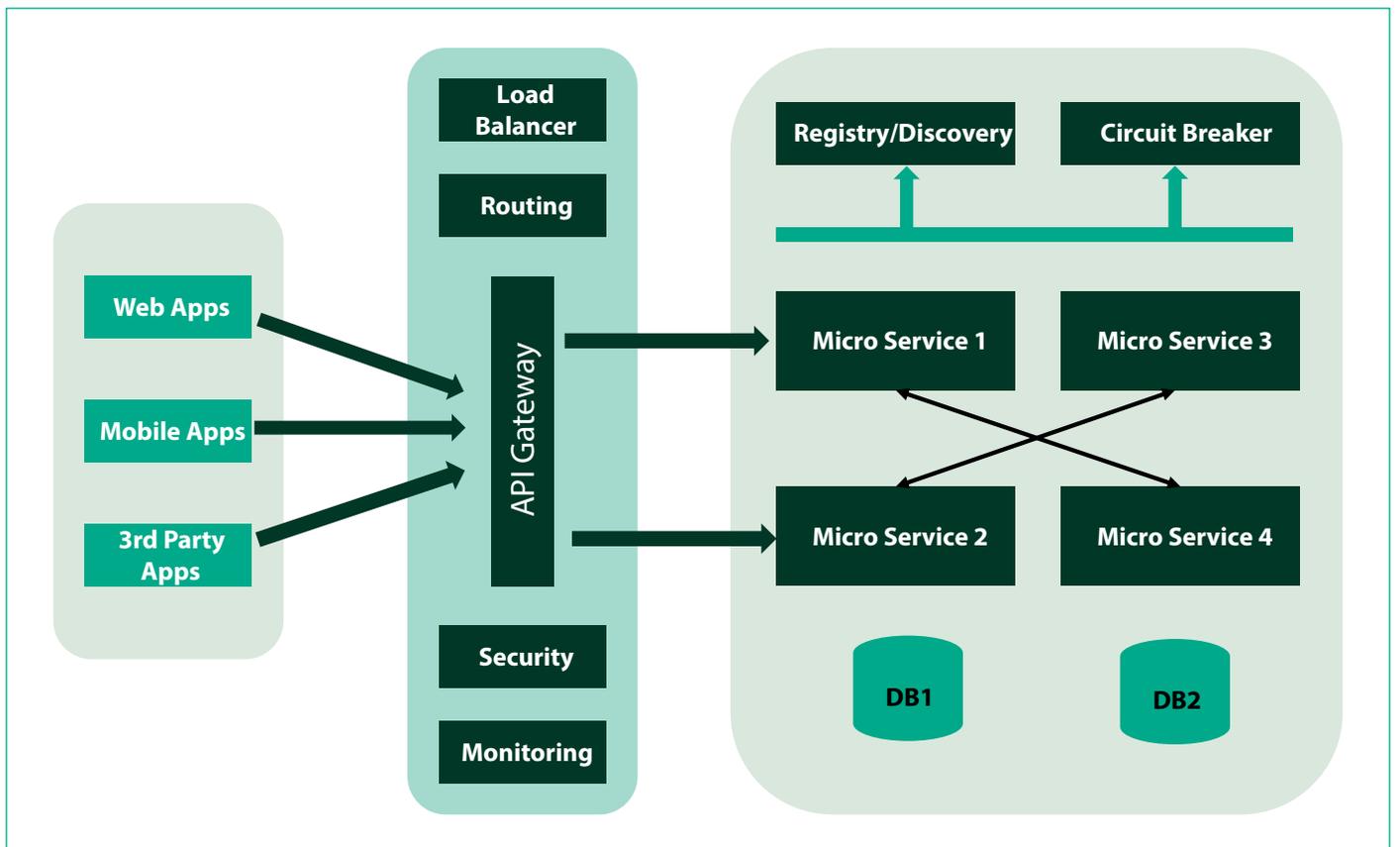
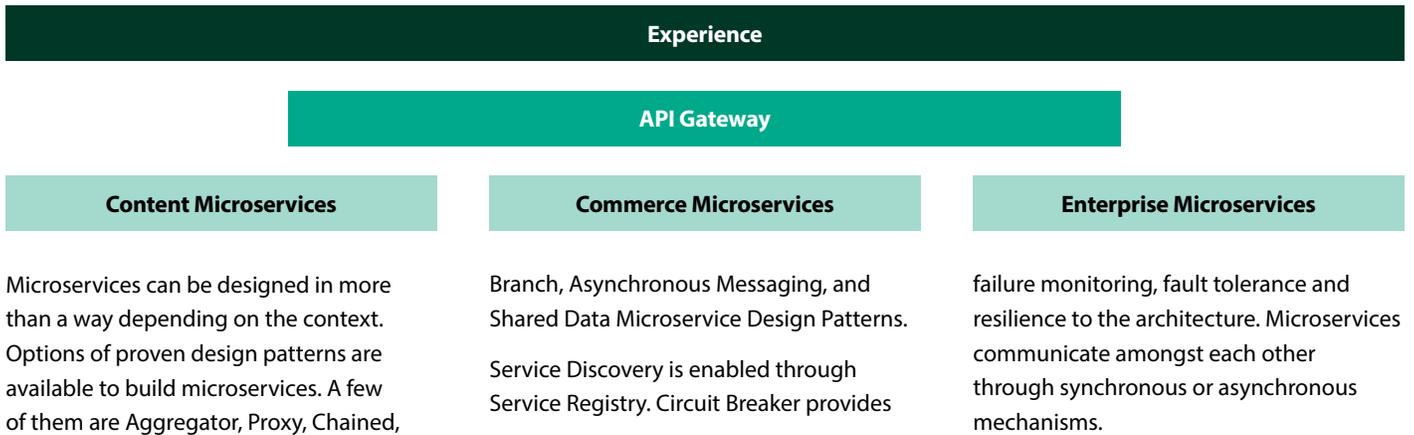


Microservices in Headless Architecture

Microservices are structural blocks of the business domain of an enterprise, and are modelled as autonomous, self-contained services. Microservices can be built upon disparate technologies, and can be independently deployed and scaled. This Flexibility enables decentralized governance and data management and

rapid evolution of features across services. Functional decomposition of the system allows achieving loose coupling and high cohesion among components. It enhances agility, flexibility and scalability in applications development. As much as the approach has garnered prominence in applications development in recent

times, leading vendors of customer engagement platforms are re-engineering their solutions based on microservices architecture. It has gained momentum with the wake of API Gateway technologies, Monetization Flexibility and emergence of Marketplace Service Models.



Rapid adoption of this architecture style has led to the emergence of a plethora of features from cloud platform providers

from build, deployment and automation standpoint. Capabilities as Service Registry, API Gateways, Load balancing, and

Containerization are available as Platform as a Service (PaaS) offerings from leading Public Cloud Providers.

In relation to SOA

Service Oriented Architecture (SOA) is an architectural style, a set of principles, patterns and criteria that address characteristics such as modularity, encapsulation, loose coupling, and separation of concerns, reuse and composability. Components provide service to each other within an application. Service

description, discoverability and mediation requirements are more formal. SOA ascribes to centralized governance.

In the context of Headless Architecture, SOA is an architectural imperative; microservices are one among the means to achieve it. Microservices are an

Extension or Specialization of SOA in which functional area boundaries are used to define domain models, with finer level of service granularity. It is the Service Oriented Delivery approach for a well-architected SOA solution.

Headless Commerce

Customer touchpoints for Digital Commerce has seen rapid evolution from Desktop Browsers to Mobiles, Social Media, Kiosks, Wearables, Smart Assistants, Appliances, any IoT enabled device and even Digital Assets. An ecommerce solution is expected to deliver a buying experience that is seamless across touchpoints.

Applicability of Headless Architecture has never been more illustrated than in the business domain of e-commerce in the recent years. Indeed, it has become an architectural imperative for e-commerce applications across business models like B2C, B2B, B2B2C and B2E. It allows for deployment of best-of-breed tools for different parts of the application, and allows businesses to focus on digital marketing and conversions independently of the underlying ecommerce platform and transactional nuances. It also provides agility in responding to market trends in providing rich, hyper-personalized and consistent customer experience across channels seamlessly, and has opened wider possibilities in offering commerce capabilities with personalization, recommendations and interoperability with existing systems of records

In Headless Architecture, it is imperative for all commerce capabilities to be exposed as APIs by backend applications and enterprise systems. In a microservices based solution, services are identified and designed with dedicated functional scope, defined boundaries, while enabling interaction amongst themselves especially for data synchronizations. Solution components like API Gateway and Enterprise Service

Bus (ESB) play a vital role in securing and performing orchestration among services

Depicted here is a reference set of e-commerce services that span across different stages of customer journey, and process cycle. It is to be noted that, as described earlier, services within an enterprise could be implemented using

disparate technology stacks and at different levels of granularity. For example, pricing service could be implemented as a rule engine, Inventory service as a cache, and payment service using a serverless framework. Services can also be independently developed, deployed, scaled and governed.



Traditionally, larger enterprises with higher business and IT maturity levels in ecommerce space have ventured into Headless approach, either to realize the best of both worlds from marketing and commerce standpoint, or to reuse and augment their existing investments in marketing platforms with ecommerce offerings. Although, the intrinsic complexity associated with the sophisticated nature of solution and associated cost of ownership

are apparent, adoption rate has been significantly higher in recent years by both larger and mid-level enterprises, considering the undeniable benefits offered by this approach that is future-proofed and resilient to constant explosion of customer touchpoints and expectations.

Commercial ecommerce products like elasticpath and commercetools are engineered on Headless and Microservices based architectural patterns.

Headless Experience

Experience layer of any Headless Architecture is all about the freedom that it is entitled to, by design. It typically represents all customer interfacing applications and touchpoints, which include

Web UI, Mobile Apps, In-store Kiosks, Digital Signage, Shoppable Media and Micro-Moments from within digital marketing channels. These are unrestrained by the technological composition of business

services provide by layers underneath. However, the experience layer comes under the purview of two larger architectural paradigms as depicted below:



Although, the illustration above applies only when a Digital eXperience Platform

(explained subsequently) is existential in the Digital Landscape, its prevalence is assumed

meritoriously, and to draw a comparison against potential solution options.

Digital experience Platforms (DXP)

Digital eXperience Platforms represent CMS, Portal and Search technologies that provide content management, aggregation and personalization capabilities. Typically, these information aggregation platforms provide rich, unified and personalized experiences with cross-channel consistency. More often, these capabilities are augmented by pre-integrated digital marketing capabilities like behaviour analytics, targeted content delivery, recommendations and campaigns management.

Web content and digital assets play a significant role in providing a compelling and engaging customer experience. Web Content Management and Digital Assets Management capabilities assume one of the foundational roles in digital platforms. DXPs provide CMS capabilities like page templating, content authoring, tagging, publishing and workflow services.

In a Headless Architecture, business processes and data services exposed

by backend applications, potentially as microservices are consumed as stateless RESTful APIs by DXPs thereby totally decoupling customer experience and business services.

Product vendors like Adobe, Oracle, Sitecore and Acquia are offering enterprise ready DXP platforms hosted on public clouds, and are made available for on-premise deployments alike.

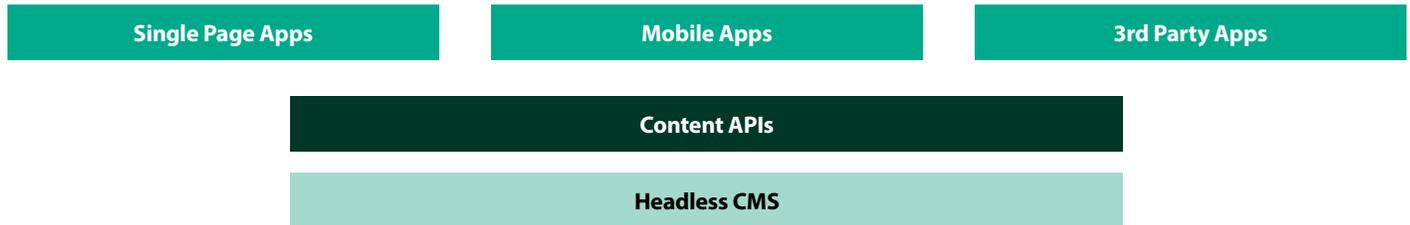


Headless CMS

With the proliferation of modern UI technologies, and rapid adoption of rich and lightweight UI frameworks, there has been a growing want of decoupling experience from content itself. Content here represents both Web Content and Digital Assets. Headless CMS aka Content as a Service

(CaaS) is a distilled variant of Headless Architecture, in which the digital landscape designates a Content Management System (CMS), or Content Management Module of a Digital Experience Platform only for Content Management and Administrative use that includes setting up content, taxonomies

and workflows. Hence, we use DXP and CMS interchangeability in this context. The approach has gained growing patronage together with the emergence of Single Page Applications (SPA) built on popular technologies like Angular, ReactJS and Vue.



CaaS decouples content authoring from presentation and consumer channels. It enables reuse and delivery of content across channels and touchpoints. It also provides the developers of UI applications with the needed freedom and flexibility to develop features without having to be constrained by the limitations imposed by CMS frameworks.

CaaS is built on API-first approach. The CMS platform exposes content as stateless RESTful APIs in JSON format. It is typically cloud centric and supports cloud deployments through PaaS or SaaS. Architecturally, the approach has proved

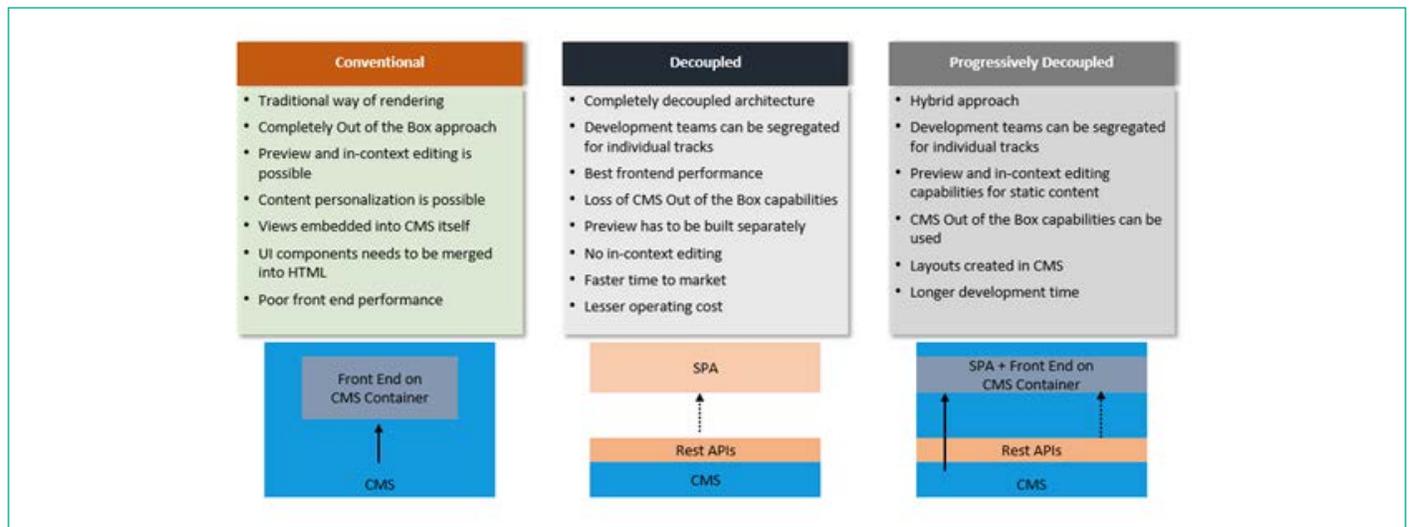
its significance in multiple fronts like performance, cloud scalability, security and flexibility. It also provides businesses users with benefits like rich and customizable UX, multi-channel publishing, reduced time to market and lower operating costs.

However, the approach also has its drawbacks in compromising prominent CMS capabilities like in-context editing and WYSIWYG/previews, and marketing capabilities like targeting and personalization.

Product vendors continue to evolve their offerings in the space as well. For

instance, Adobe AEM provides content service variants as Content Fragments and Experience Fragments; while the former is about pure content, latter also enables mark-ups and layouts along with content. SPA Editor feature too is introduced to enable WYSIWYG for SPAs in CaaS mode.

Enterprises that implement CMS platforms have the choice of designing it to the degree of decoupling desired between it and backend services or systems and frontend applications. There are distinct ways of adopting CMS to one's needs.



Conventional Approach is the de facto choice for implementing frontend applications that are content-heavy, static, and with high configurability

and personalization needs, whereas its decoupled counterpart finds its relevance in applications that are transactional in nature. Progressively decoupled approach strikes

the middle ground across parameters and scenarios.

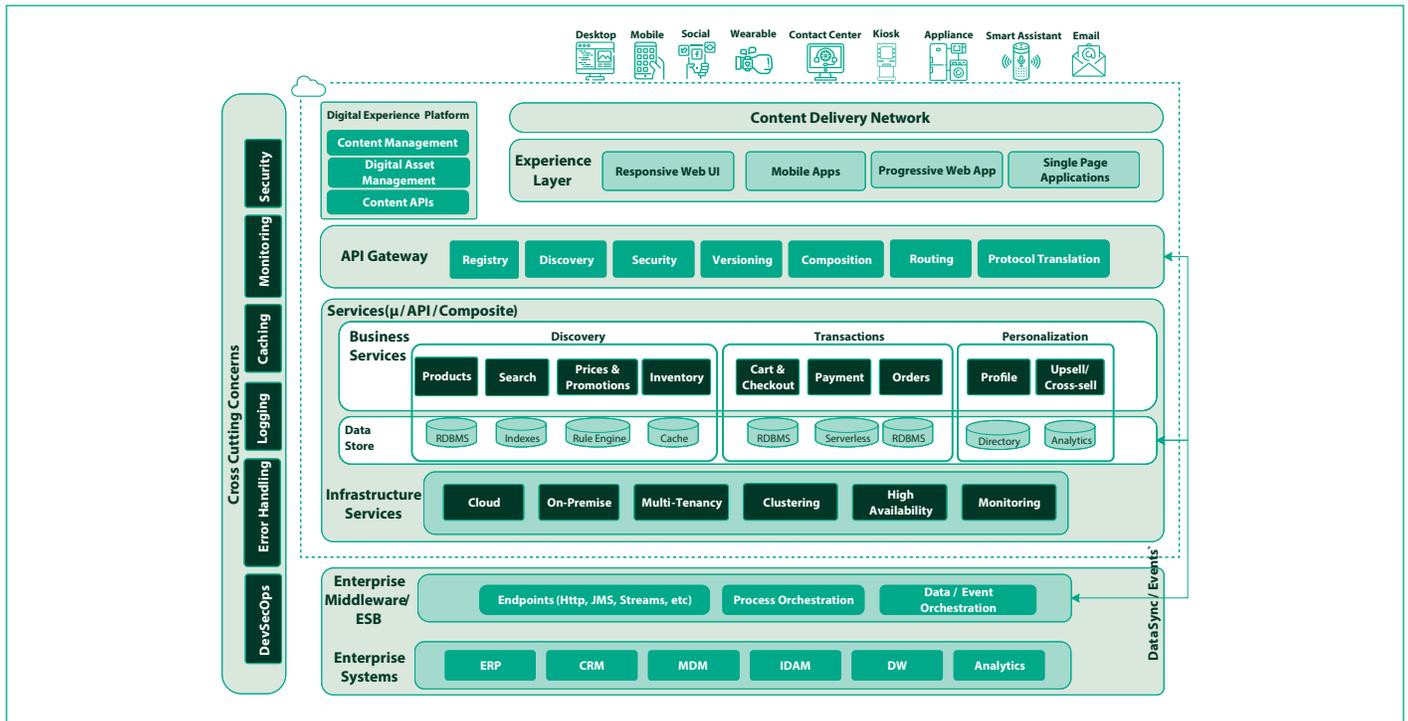
Reference Solution Architecture

Multiple solution components have to come into play to stitch together an end-to-end solution in a digital landscape using Headless Architecture as the pattern. However, leading public cloud providers like Amazon, Google and Microsoft keep rolling out features and capabilities on

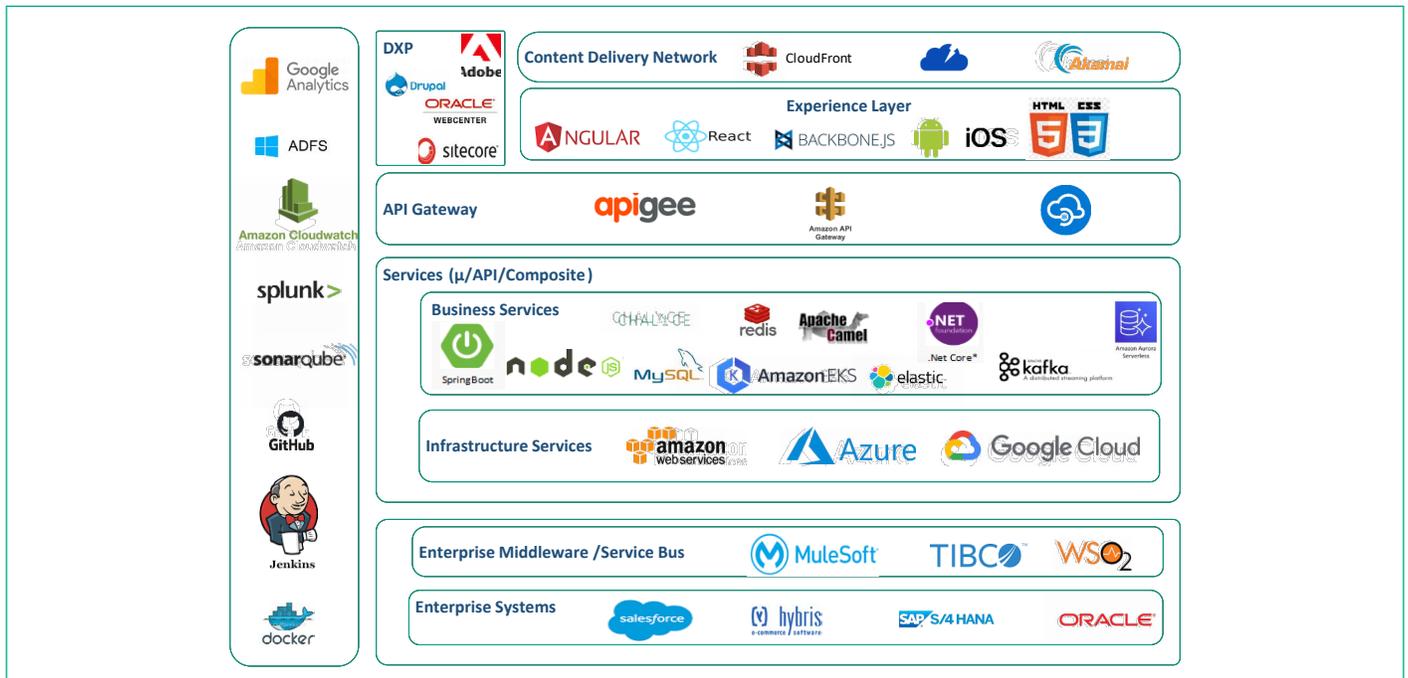
Platform as a Service (PaaS) mode that enables realization of most components of a Headless/Microservices based solution as low/no code ones. It is only getting efficient and easier.

Here we present a Reference Solution

Architecture that depicts solution components blending experience, content and commerce. While commerce has been used as an illustrative example throughout, this architecture is applicable across business processes and domains.



Technology View



Headless Challenges

Along with the speed and agility that it offers to business, Headless Architecture brings with it, its own set of challenges that need to be dealt with to successfully build and operate. The decoupled nature of the architecture necessitates handling of QoS parameters like security, scalability, reliability, extensibility and maintainability at individual solution component level. It is also an imperative to govern it centrally taking the end-to-end solution architecture into consideration. For instance, while security policies can be enforced at component or service level, system design should implement authentication and authorization of end users, typically using an IDAM solution, and enable transfer and validation of security token (SAML/Oauth2.0/JWT) across levels.

In the scenario of decoupled CMS and Commerce, a core capability like Enterprise Search would prove more complex in the context of data synchronization among multiple services. Also, business users would be expected to handle multiple and disparate administrative tooling – Web Content Management, Digital Asset Management, Product Information Management, Users Management, Order Management, Marketing Operations etc.

When it comes to microservices, flexible technology choices also imply deployment of associated disparate test suites and DevOps tools for build, deployment and automation. On a cloud, microservices are typically coupled with container and orchestration technologies like Kubernetes and Docker Swarm to achieve the full range of benefits that the architecture offers.

Sophistication and complexity of this architecture could prove effort and cost intensive compared to its monolithic counterpart. At organization level, it also demands relevant niche skill-set and sometimes structural changes in terms of setting up cross-functional teams within the ambit of each service.

Despite the complexities and challenges pertaining to adoption of Headless and Microservices based Architecture, outcomes listed below are far significant and tangible to be ignored by customer centric organizations.

- Seamless omni-channel enablement
- Flexible experience development
- Enhanced extensibility and scalability
- Agility and faster time to market

The Infosys Advantage

In the era of customer obsession and technology driven disruptions, businesses constantly strive to leap ahead of, or are compelled to keep pace with growing customer needs and expectations, that are beyond transactions. To reshape customer engagement strategies, responsiveness come to the fore. From that perspective, all emergent and relevant digital solutions,

technologies and practices are to be embraced sooner than later, should businesses aspire to be contextual and future-proofed.

Infosys has extensive experience in delivering successful Digital Transformation Programs using Headless Architecture paradigm and microservices based solutions, to multiple customers across

geographies and business domains like Retail, Manufacturing and Telco. We have wide and deep expertise in executing Headless Commerce and Headless CMS implementations using a plethora of commercial products from prominent vendors like SAP, Adobe, Oracle, IBM, Sitecore, Drupal and OpenText.

About the Author



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Rajadurai has over 19 years of IT experience. He is specialized in Digital Enterprise Architecture. He has played pivotal roles in delivering large-scale digital transformation programs, and has led architecture consulting engagements for customers across business domains such as Retail, Telecom, Manufacturing and Finance.

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