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Microservice Architecture For Integrations

2017

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Purpose & Scope

- The purpose of the document is to provide a Point-of-View on Microservice Architecture for Service Oriented Architecture (SOA) & Enterprise Application Integration (EAI).
- It states some of the key architecture principles and its implications for SOA and EAI.
- These guiding principles will be applied for designing an **API-led Microservice Architecture** solution for our clients.
- It also provides mapping of Capgemini's Integration Reference Architecture and accelerators to microservice architecture strategy
- This document is not a primer for Microservice Architecture

Table of Content

Microservice Architecture (MSA)

Microservice architecture (MSA) is an architecture pattern for building and delivering service-oriented applications with two primary objectives: **agility of delivery** and **flexibility of deployment**.

- Source Gartner

MSA combines **SOA best practices** with **modern application delivery tooling** and **organizational disciplines**.

- Source Gartner

Microservices are **small**, **autonomous services** that **work together**.

— Sam Newman, Thoughtworks

Microservice Architecture Characteristics

- Componentization via services
- Organized around business capabilities
- Products not projects
- Smart endpoints and dumb pipes
- Decentralized governance
- Decentralized data management
- Infrastructure automation
- Design for failure
- Evolutionary design

— *Martin Fowler and James Levis, "Microservices", March 2014*

"SOA Done Right -

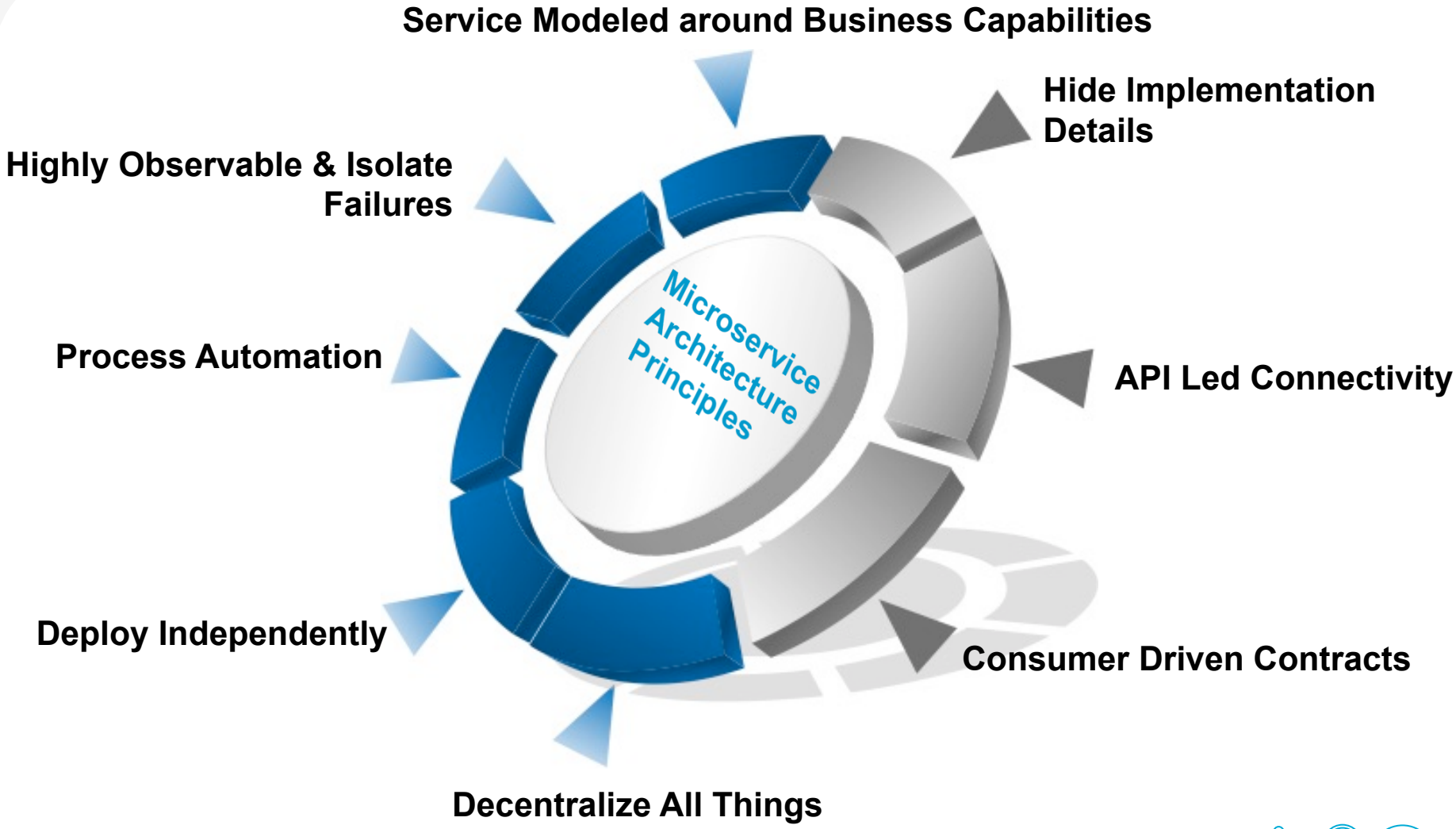
A flexible systems built as a collection of services that are built around business capabilities*, that can adapt to its complex environments, make changes without rigid dependencies "*

Key Benefits

Business Agility	▪ Enable organization to deliver business features and functions more quickly
Greater Efficiency	▪ Reduce cost in design, implementation & support ▪ Independent manageability of systems
Improved Visibility	▪ Well structured monitoring of application and platform
Improved Resilience	▪ High Availability of systems ▪ Better Scalability that allows systems to scale up/down based on needs

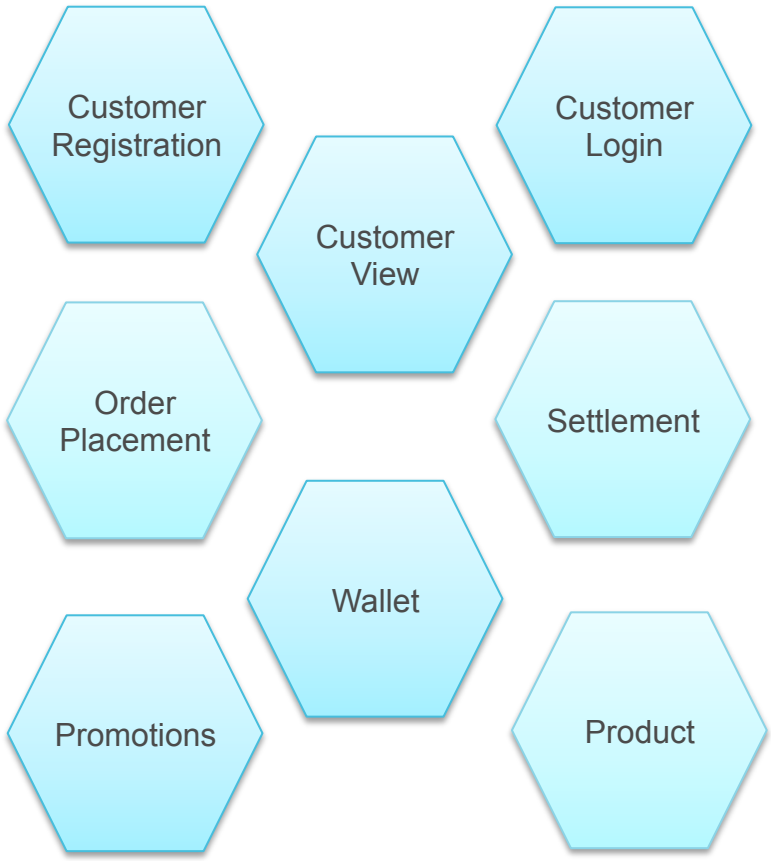
Microservice Architecture Principles For Service-Oriented Integration

Microservice Architecture Principles Overview



MSA Principle: Service Modeled around Business Capabilities

Use **Domain Driven design** to structure around **business-bounded context**



- Functional system decomposition into services organized around **business capability** that are **independently deployable** & **manageable** components
- Line of separation is along **functional boundaries**, not along tiers *i.e. vertical slicing in contrast to horizontal slicing through layers*
- Each microservice is functionally complete with **resource representation** & its **data management**

MSA Principle: Hide Implementation Details

Each Microservice is primarily an **encapsulation** of a coarse-grained business capability

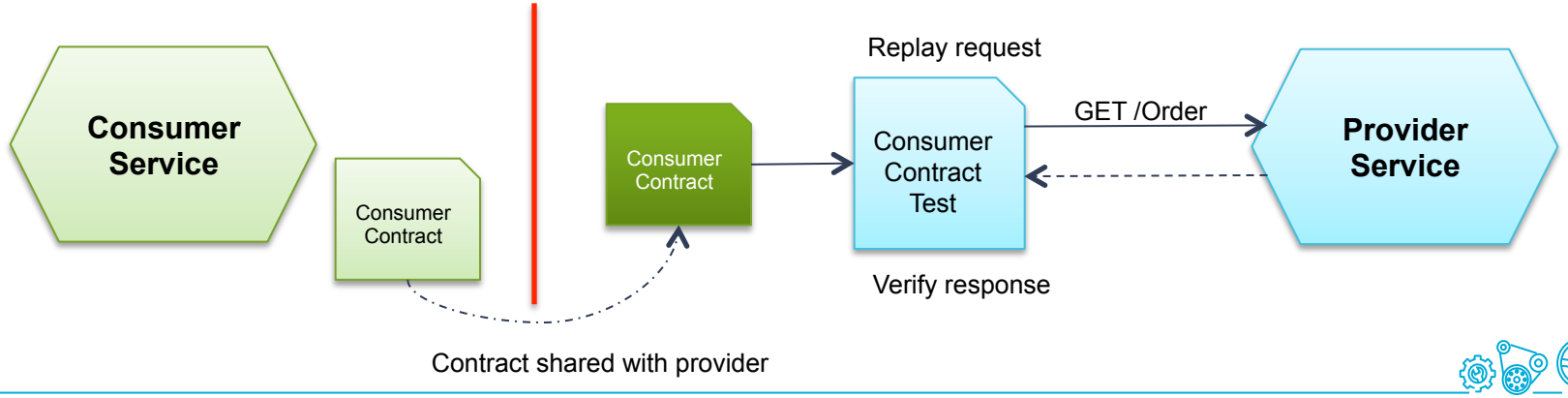
- Each Microservice should be designed with enough abstraction to hide information about technology, implementation logic, data source, physical location and **underlying systems of record**
- **Services contracts and interfaces** must not leak implementation details e.g. expose implementation types, details of technical implementation, details on data source physical location
- Each Microservice should have a well documented contracts i.e. API document or service contract documents

MSA Principle: API Led Connectivity

- Each microservice should expose a **well-defined API** that is consumed by other microservices or by application's clients.
- Communication between microservices should be through standardized communication protocol - HTTP(s), REST, JSON
  - ***HTTP*** *offers a rich set of standardized interaction mechanisms that still allow for scaling*
  - ***JSON*** *offers a simple data format that can be (partially) validated*
  - ***REST*** *provides principles and ideas for leveraging* ***HTTP and JSON to build evolvable microservice interfaces***
- For **pub-sub model**, it is recommended to have messaging over a lightweight messaging bus that offers reliable asynchronous fabric. The endpoints producing and consuming messages should have smart processing logic i.e. services
- Use tools such as Swagger or RAML for API documentation

MSA Principle: Consumer Driven Contracts

- **Consumer-Driven Contract** pattern helps Microservice provider create service APIs that reflect client needs & evolve services without breaking existing clients.
- Service owners should have consumer's integration tests from each client and incorporate these tests into the service's test suite.
- The set of integration tests received from all existing clients represents the service's aggregate obligations with respect to its client base.
- The service owner is then free to change and evolve the service just so long as the existing integration tests continue to pass.



MSA Principle: Decentralize All Things

Each microservice should be implemented on its own technology stacks that fits the task best. This implies:

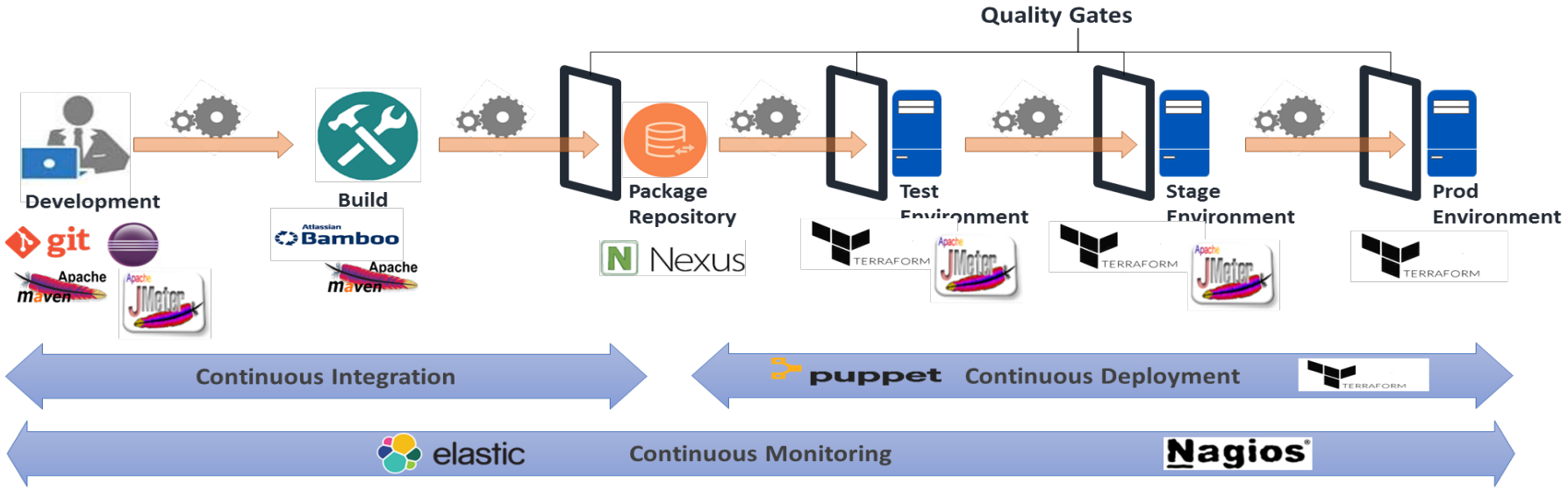
- **Different Programming language** that fits the need
  - No accidental cross-dependencies between code bases
- **Decentralize technology Governance** –
  - Focus on standardizing the relevant parts (communication protocol, message format and communication pattern) and leverage best suited technology for implementing business capability
- **Decentralize Data management** - Each service can choose the persistence solution that fits best
  - Data access patterns
  - Scaling and data sharding requirements

MSA Principle: Deploy Independently

- **Independent Code base** for each microservice that can be deployed independently without impacting other microservice
- **Location Independence** for each microservice i.e. cloud /on-premises or in hybrid model
- **Independent scaling** (horizontal & vertical) of each microservice to fit business needs
- **Automate deployment** of applications inside independent portable **containers**
- **Service Versioning**
  - **Co-exist of service endpoints** with different versions.
  - APIs should be backward compatible in order to enable change

MSA Principle: Process Automation

- **Continuous integration -** automation in Build and deployment process.
- **Automated testing** – unit and regression testing
- **Monitoring** – automated failure detection
- **Support for Containerization**
- **Support for DevOps automation**

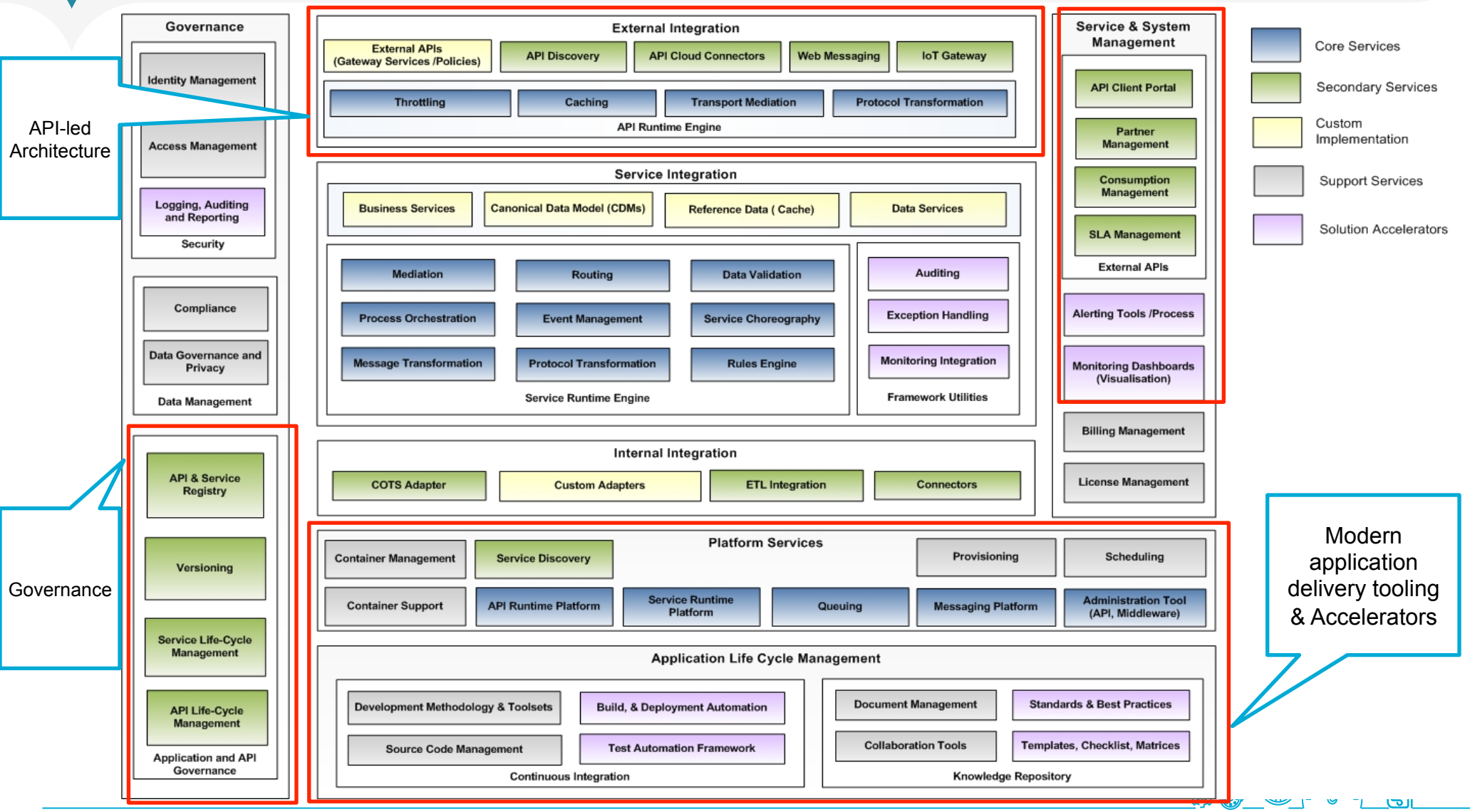


MSA Principle: Highly Observable & Isolate Failures

- **Use of centralised monitoring solution** that works for all technologies within Microservice platform
- **Monitoring Solution** should provide real-time statistics for key business services, feeds and business processes
- Monitoring Solution should provide **end-to-end business activity monitoring** for key business process
- Provision to **analyze performance** – message throughput and latency & reliability of middleware IT platform based on service level agreements and proactively take corrective actions ensuring better compliance
- Use of **correlation id** for tracking overall flow across microservices
- Individual services should be able to isolate its failure from other services and consumers

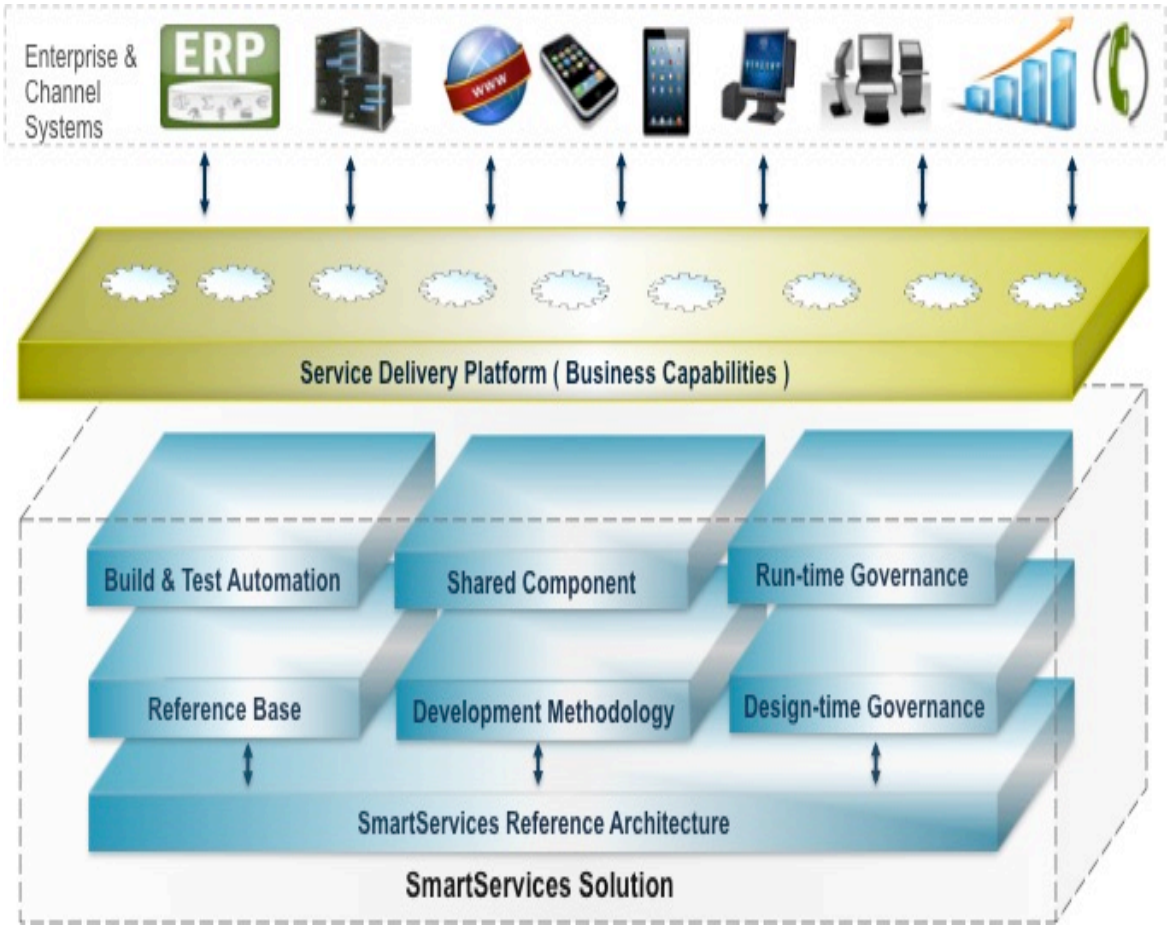
Capgemini’s Integrations Solution mapping to MSA Strategy

Capgemini's Integration Reference Architecture – Comprehensive Integration Strategy aligned to API-based MSA



Integrations Accelerators – Capgemini SmartServices Framework

***SmartServices** is our Integration foundation framework for API and microservices based Enterprise Integration Service Delivery platform*



SOA with DevOps Model:

- Information **Reference Base**
- Technology-specific **Integration Shared Component**
- **Build & Test Automation Framework**
- **Monitoring Solution**
- **Design-time Governance**
- **Integration Development Methodology**

Case Study

Ladbrokes - Integration Competency Centre using Microservice Strategy

Requirements

- ***Migration of a point-to-point legacy integration solution on to a strategic enterprise integration platform***
- IT shared service to cater for business change demands
- Development of SOA-aligned Integration services for their key business programs
- Enterprise Service Management
- Application Support & Environment Management

Solution Approach

- Migrated legacy integration solution to new Strategic enterprise middleware platform
- ***Delivered API-led Microservices based Middleware platform***
- Implemented Ladbrokes core Integration framework
- Providing end-to-end Enterprise Integration services
- Integration DevOps model
- ***Application Life Cycle & Platform Management using Atlassian and opensource toolset***
- Enterprise Agile Methodology

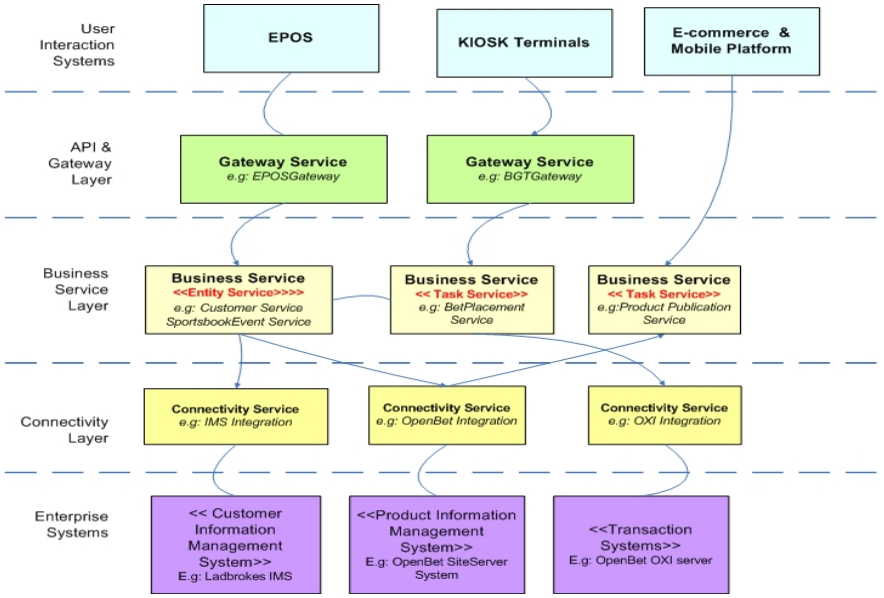
Benefits

- ***Reduced costs of business change function & maintenance by 20% - 30%***
- 40% service reusability
- Improved ROI through creation and reuse of framework and services
- Average Response time for processing <500ms with 50% YoY growth in traffic
- Peak load of 34M transaction /day
- ***100% Availability for the last 2 years***

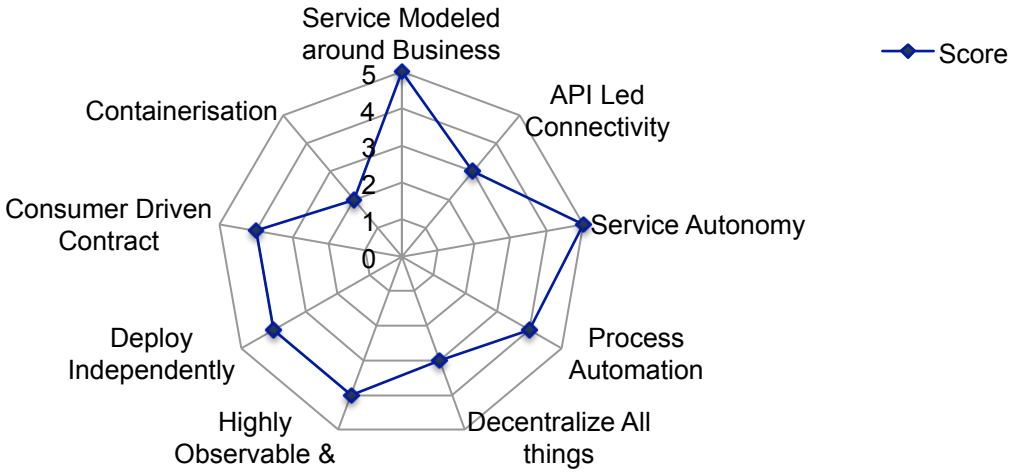
Ladbrokes - Integration Competency Centre using Microservice Strategy

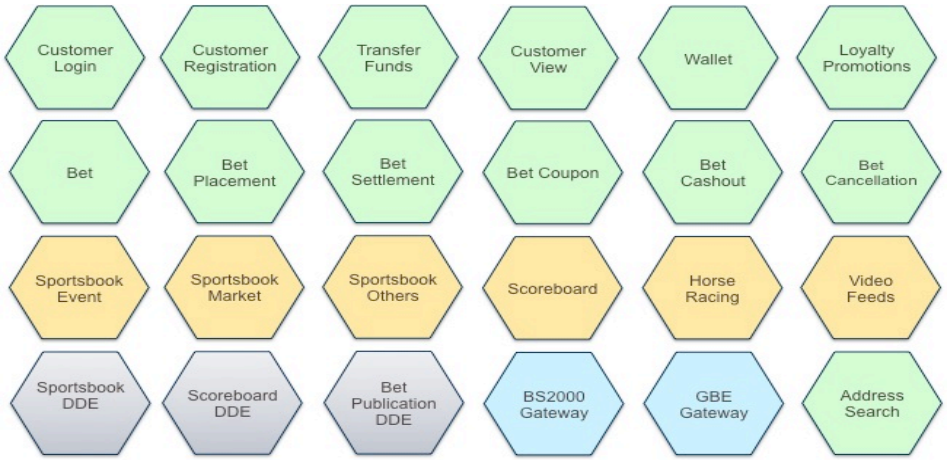
Microservice Highlights

- Domain driven Business-aligned services
- Services autonomous
- API driven architecture
- Process Automation in-place
- Well-defined monitoring solution and isolated failure



Microservice Readines





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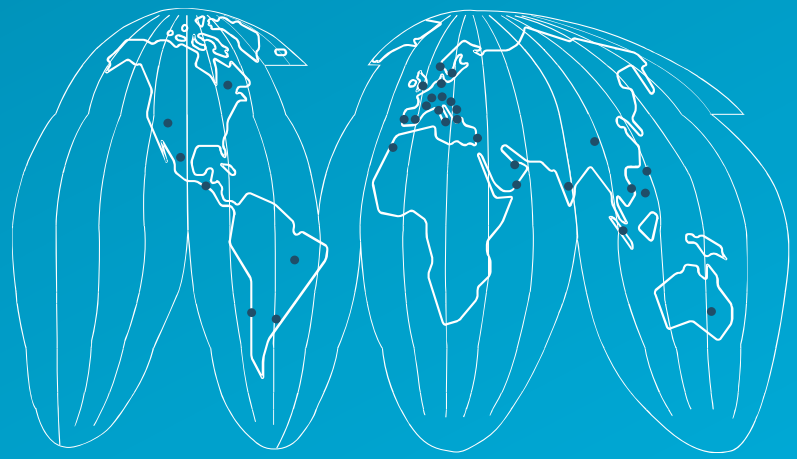

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