Build Cloud Aware Applications

Chris Haddad
@cobiacomm on Twitter

Read more about Cloud Aware Apps at
http://blog.cobia.net/cobiacomm

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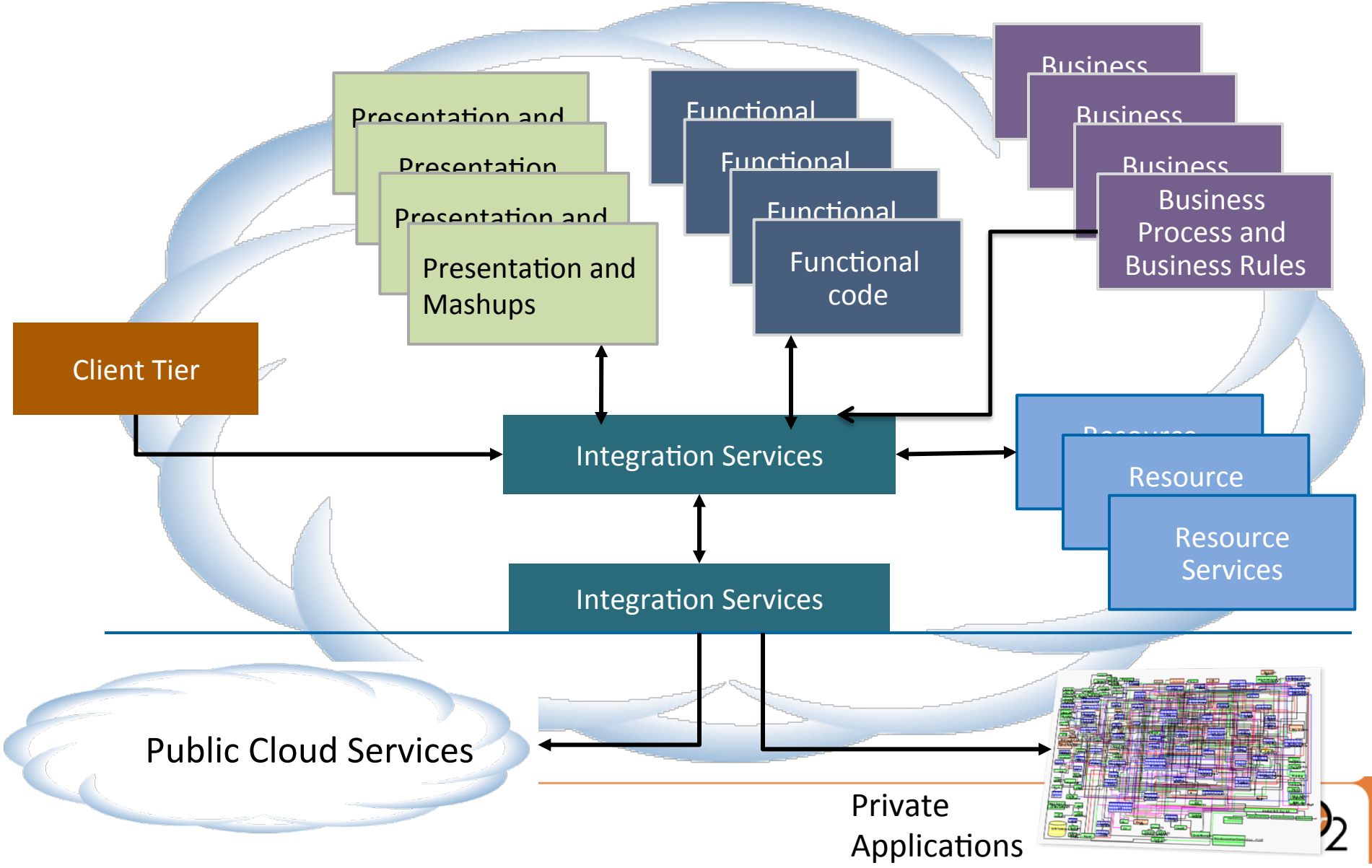
Skating towards the puck

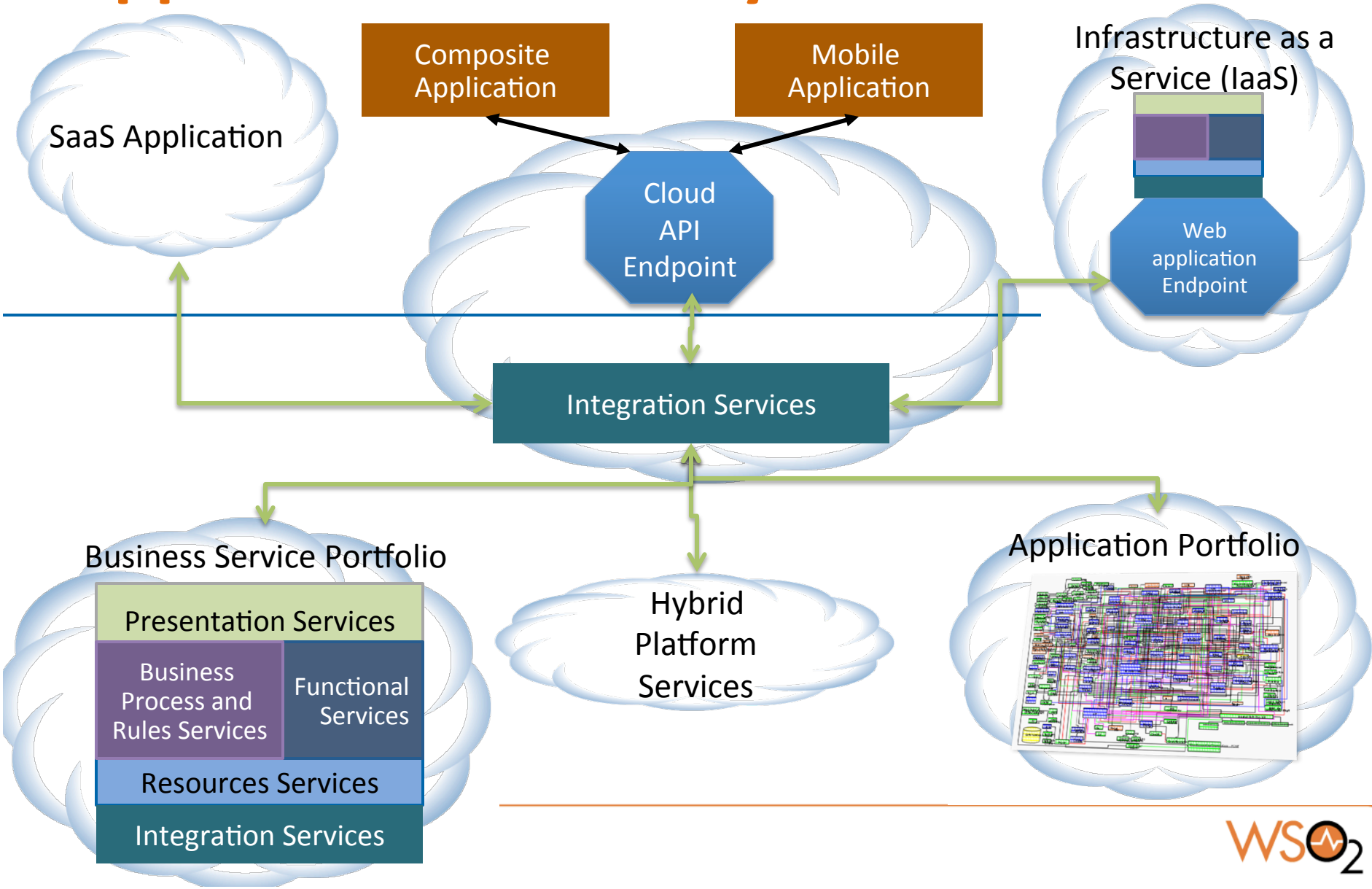
Build Cloud Aware Applications

- Why cloud aware applications rise above Web applications
- Where to make applications cloud aware
- What open source projects deliver cloud awareness

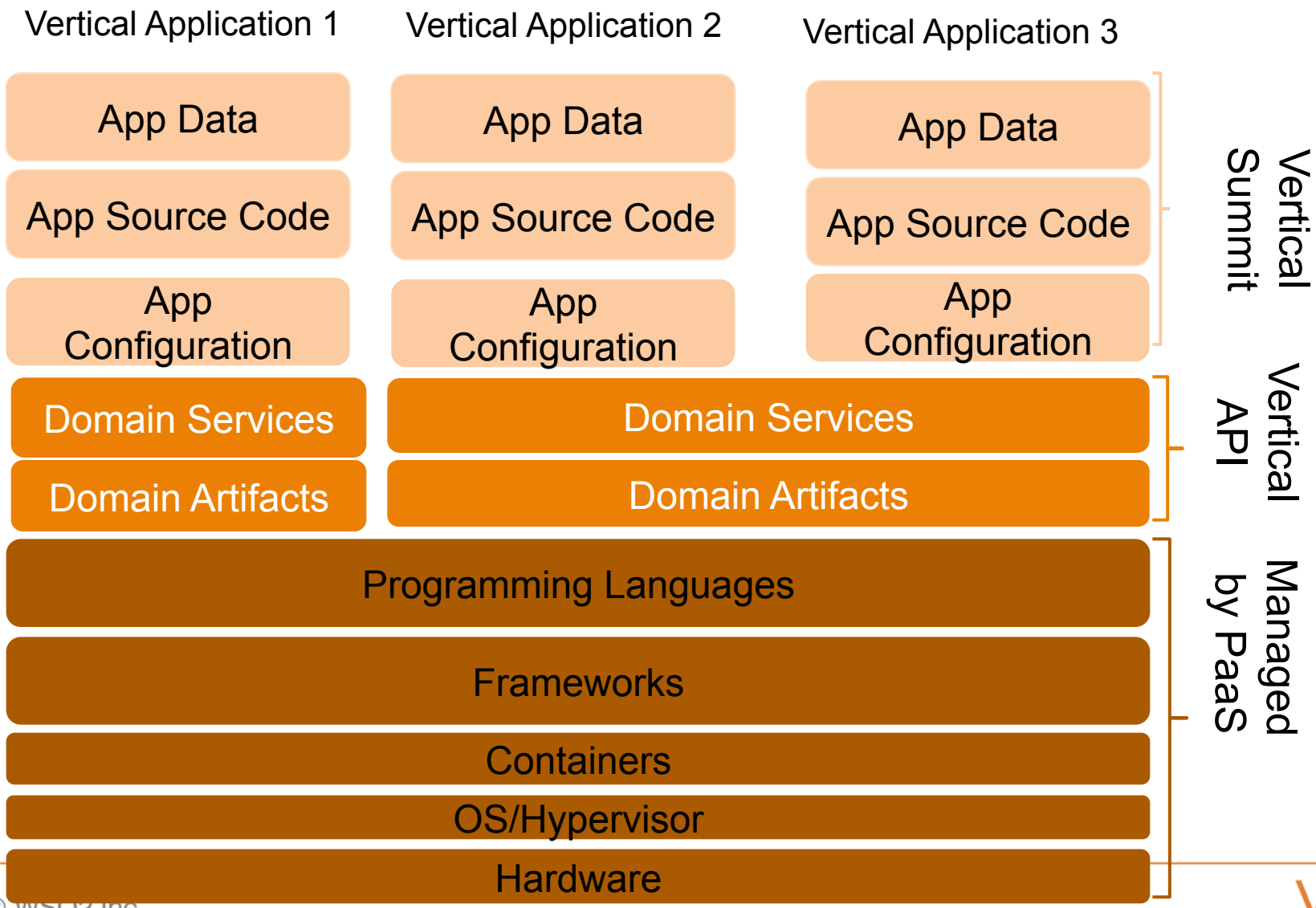
Rise Above:
Cloud Scale and Distributed Providers



Rise Above:
Application Resiliency and Composition



Rise Above:
Deliver Cross-Partner Digital Business Platform



When to make applications Cloud Aware

- Deliver application to massive consumer base
- Infrastructure cost optimization strategy
- Application resiliency improvement strategy
- Create an ecosystem platform supporting cross-partner digital business

Where to make applications Cloud Aware

- Maximize utilization and optimize cost
  - Achieve deterministic performance
  - Load balance based on tenant, service, and workload, context
  - Increase tenant density
  - Lower infrastructure footprint (e.g. CPU, memory, network i/o)
- Increase reliability, availability, scalability
  - Shared nothing architecture
  - Stateless server-side elements
  - Consensus protocols
  - Services distributed across multiple providers and zones
- Ecosystem platform
  - Monetize assets based on business value
  - Tenant/Consumer personalization and isolation
  - Sharing domain specific business capabilities

Architectural Difference Between a Web Application and Cloud Application

Web Application

- Synchronous request-reply interaction
- Centralized state (i.e. single database) and session management
- Clustered server instances
- Silo architecture

Cloud Application

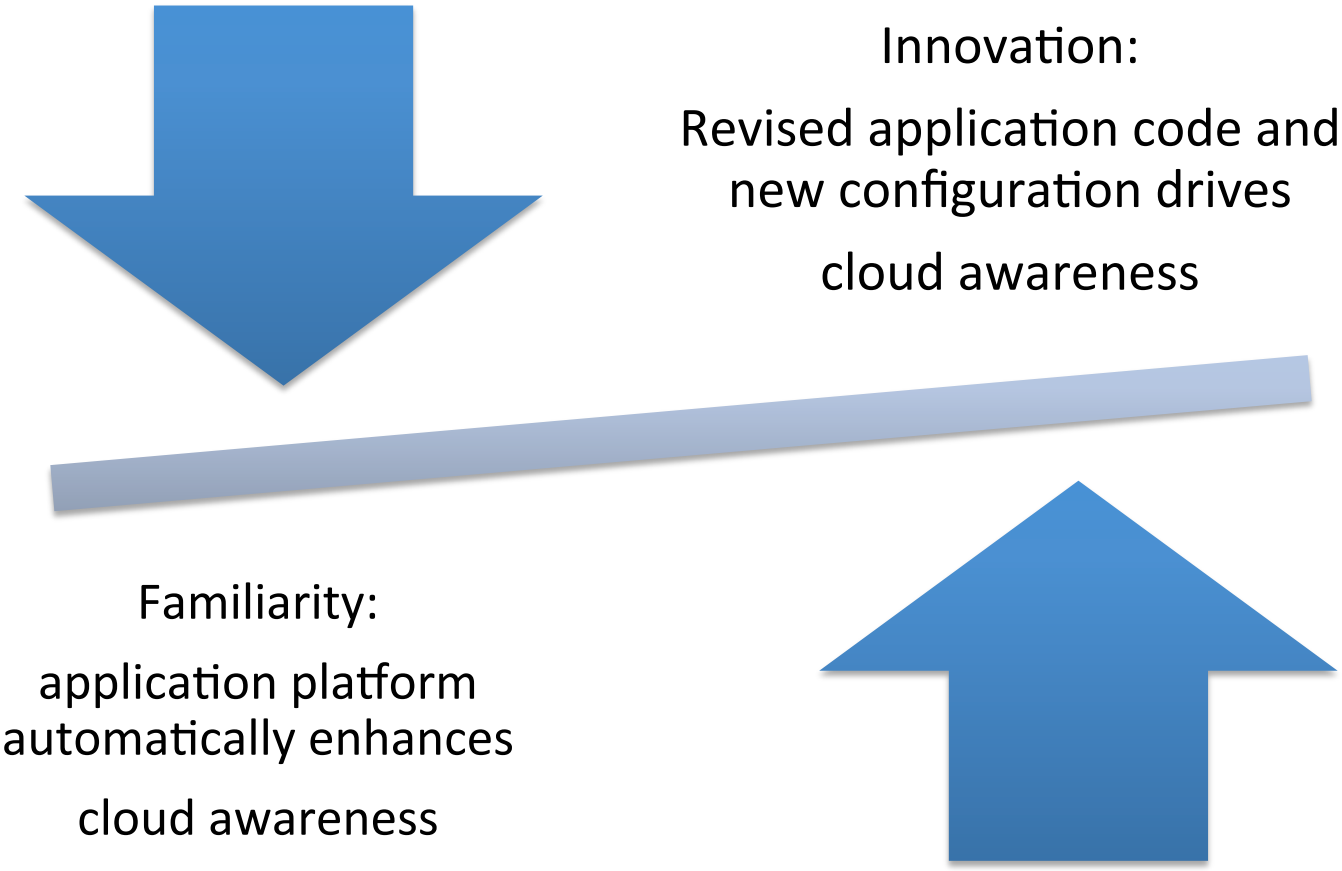
- Asynchronous interaction
- Queues and workers
- Scale out across datacenters and providers
- Distributed state and session management
- Autonomous service instances
- Tenant context personalization
- Shared JVM / Shared Schema
- Shared nothing architecture

Cloud-awareness

Building Cloud-aware applications

- Cloud Architecture
- Cloud Aware Design Patterns
- Programming Model

Application Architecture Crossroads



Innovation:

Revised application code and new configuration drives

cloud awareness

Familiarity:

application platform automatically enhances

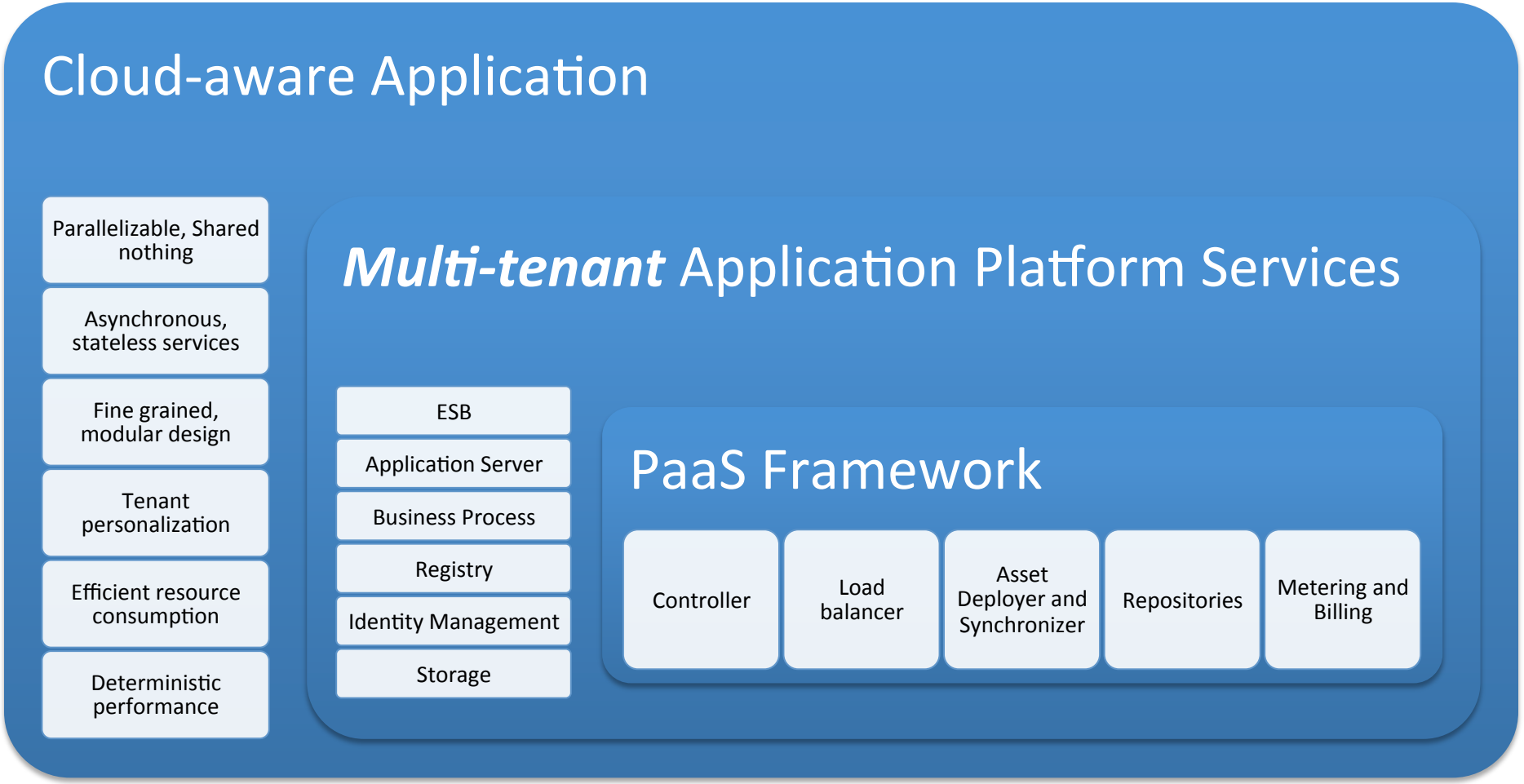
cloud awareness

Cloud Architecture Best Practices

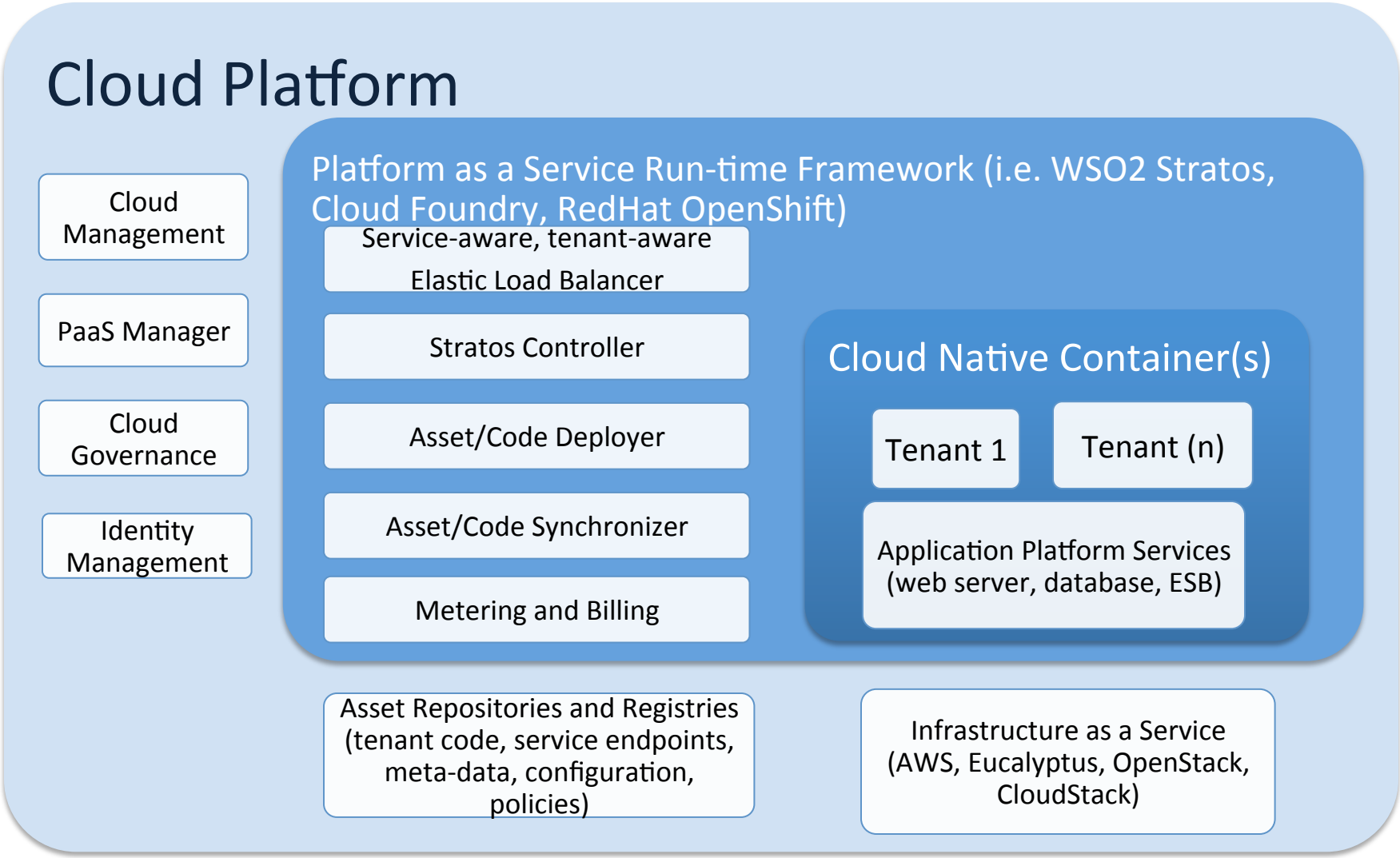
Transitioning to a new normal

- Distributed and federated interactions
  - Event based, heterogeneous systems, network latency
- Configurable containers and engines
  - Declarative data, rules, and process definitions
- De-normalized and simplified data models
  - Hadoop/BigTable, Hypertext media, simple NoSQL entities
- Expect failure
  - Systems span transactional control, automatic recovery
- Applications decomposed into distinct services
  - Federated environment drives autonomy, statelessness, and composition
  - Automatic discovery and re-composition

Cloud-aware Design Patterns



Platform as a Service Architecture



Cloud-awareness

Programming Model

- Shared nothing architecture
  - Actor model (i.e. message passing instead of function invocation
  - Functional programming
  - Asynchronous rather than synchronous interactions
- RESTful interactions and orchestration
- Dynamic recoverability
- Data Decomposition Strategies
  - Consensus protocols, data partitioning/sharding, federated data queries
- Cloud Aware Patterns and Dwarfs
- Computational fit analysis, parallelism and workload decomposition, concurrency, state, structural , scale

Apply Computational Patterns

Evaluate 13 Dwarfs

1. Dense linear algebra – matrix calculations
2. Sparse linear algebra – sparse matrix calculations and storage
3. Spectral methods – operational engineering
4. N-body methods – particle force calculations
5. Structured grids – mechanical and fluid engineering, meteorology
6. Unstructured grids – mechanical and fluid engineering
7. **Mapreduce – Monte Carlo simulations, data processing**
8. Combinational logic – data transformation
9. **Graph traversal – social networking**
10. Dynamic programming – DNA pattern matching, web search, shipping
11. back-track / branch & bound - travel route mapping
12. graphical model reference – speech and image recognition
13. finite state machines – workflow optimization

Open Source Projects

Cloud aware Infrastructure

- PaaS Framework
  - WSO2 Stratos, Cloud Foundry, Red Hat OpenShift
- Multi-tenant Application Platform Services
  - WSO2 Stratos
- Infrastructure as a Service
  - OpenStack, CloudStack, Eucalyptus, OpenNebula
- DevOps Programming
  - Chef, Puppet, Jclouds, Apache DeltaCloud

Open Source Projects

Application Development Frameworks

- Parallel Process Execution and Coordination
  - Apache ZooKeeper
- Distributed Map-Reduce
  - Apache Hadoop, Apache MapReduce, StarFish MapReduce
- Distributed Storage for Large Scale Structured Data (aka Big Table / Big Data)
  - Apache Cassandra, Apache Hbase, Neptune, Hypertable
- Actor model
  - Akka, Jetlang, Actors Guild, Actor Foundry

Open Source Projects

Languages

- Functional, Parallel, Actor Model
  - Haskell, Occam, ***Clojure***
  - Erlang, ***Scala***
  - Pig
  - Bloom

- Working on becoming cloud-aware
  - Java

Building Cloud-awareness

Focus on adopting Cloud-friendly Architecture

- Tenancy, dynamic discovery, and distributed cache
- Fine-grained metering, billing, and reporting of business entities, activities, and interactions
- Scale discrete application service instances instead of scaling monolithic application instances
- Shared nothing architecture, Thirteen Dwarf Patterns, parallel processing, resource coordination
- Cloud service provisioning and load balancer

Resources

- Try StratosLive right now:
  - https://stratoslive.wso2.com/
- Read about Stratos:
  - http://wso2.com/cloud/stratos/
  - Source Download available
- White Paper
  - Selecting Platform as a Service
  - Platform as a Service TCO: multi-tenant shared container
- Blog Articles
  - What is Platform as a Service?
  - PaaS Evaluation Framework for CIOs and Architects
  - How to simplify Platform as a Service Complexity
  - Searching for Cloud Reference Architecture
- Contact us:
  - bizdev@wso2.com

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