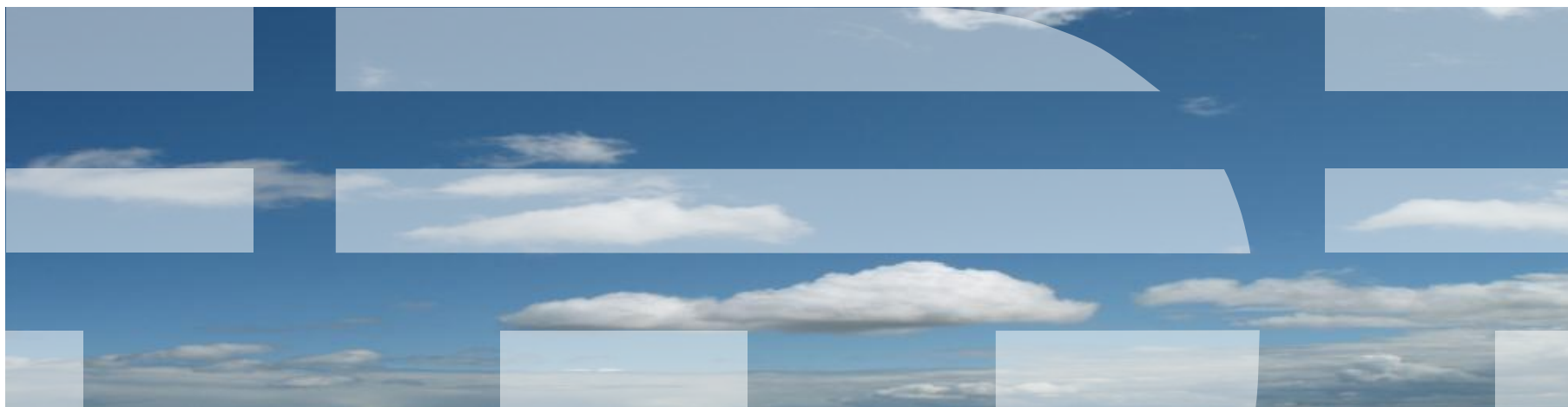


Software Defined Environments based on OpenStack and TOSCA



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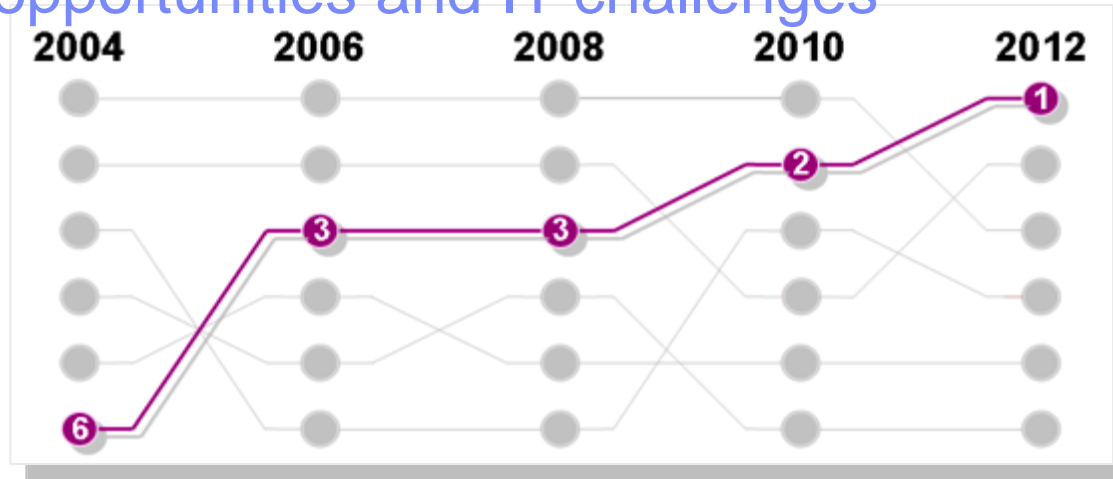
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Agenda

- **Introduction**
- OpenStack and TOSCA
- SmartCloud Orchestrator as a first implementation of a „TOSCA Container“ based on OpenStack
- Software Defined Environments
- Summary

Mobility, big data, analytics, social collaboration and cloud are creating a new wave of business opportunities and IT challenges



1. Technology factors

2. People skills
3. Market factors
4. Macro-economic factors
5. Regulatory concerns
6. Globalization
7. Socio-economic factors
8. Environmental issues
9. Geopolitical factors



Speed Value

90%

view cloud as critical to their plans

Extended Reach

1 Billion

Smartphones and 1.2 billion mobile employees by 2014

Responsiveness

20B+

Intelligent business assets

New Insights

2.7ZB

of digital content in 2012, up 50% from 2011

Systems of Record

- Data & Transactions
- App Infrastructure
- Virtualized Resources

Next Generation Architectures

New Modes of Engagement

- Expanding Interface Modalities
- Big Data and Analytics
- Social Networking

Data & Transaction Integrity

Smarter Devices & Assets





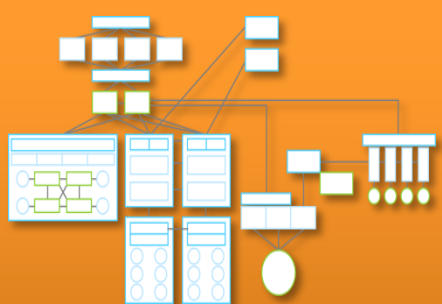
Resource Orchestration
Onboard, provision, manage

This block contains three icons: a 3D bar chart with red, green, and blue bars; a stack of four silver disks; and a blue globe with white latitude and longitude lines.



Workload Orchestration
Dynamic optimization

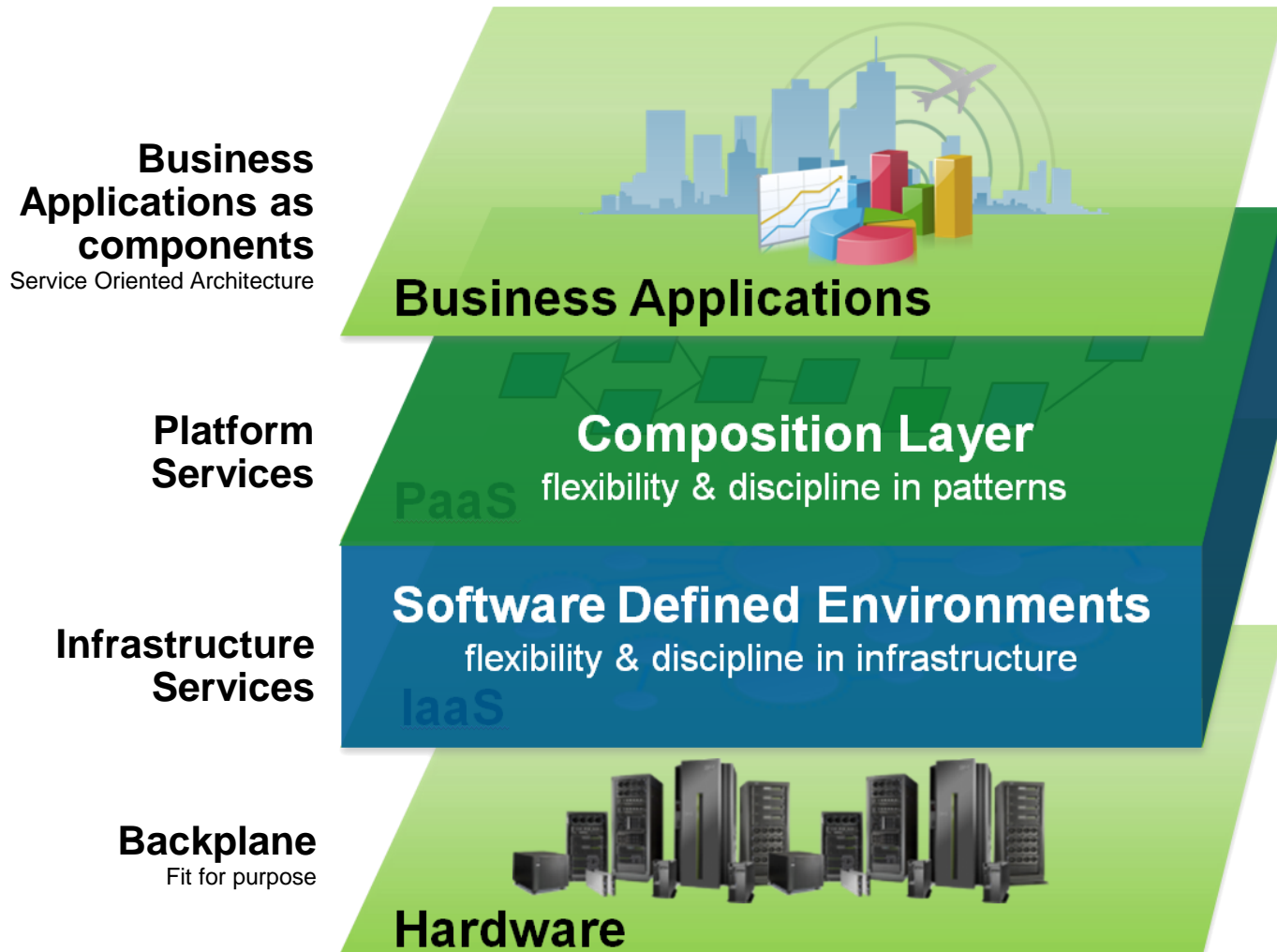
This block contains two icons: a stack of four white documents with binary code (0s and 1s) on them, and a green 3D cube with a white arrow pointing downwards.



Service Orchestration
Lifecycle of cloud services

This block contains a complex icon representing a network or service architecture, with various boxes, lines, and a central circular node.

A layered and open cloud architecture is emerging



Cloud Standards Customer Council

openstack

OSCL

OASIS

W3C

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS

Agenda

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OpenStack in a nutshell

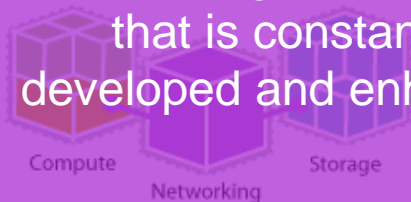
Open source software for building private and public clouds.



Software

OpenStack Software delivers a massively scalable cloud operating system.

Working software that is constantly developed and enhanced



About OpenStack Software...

Community

Join our global community of technologists, developers, researchers, corporations and cloud computing experts.

A vivid community of developers and cloud computing experts, driven by different companies

6024

PEOPLE

87

Meet Our Community

Cisco WebEx Runs

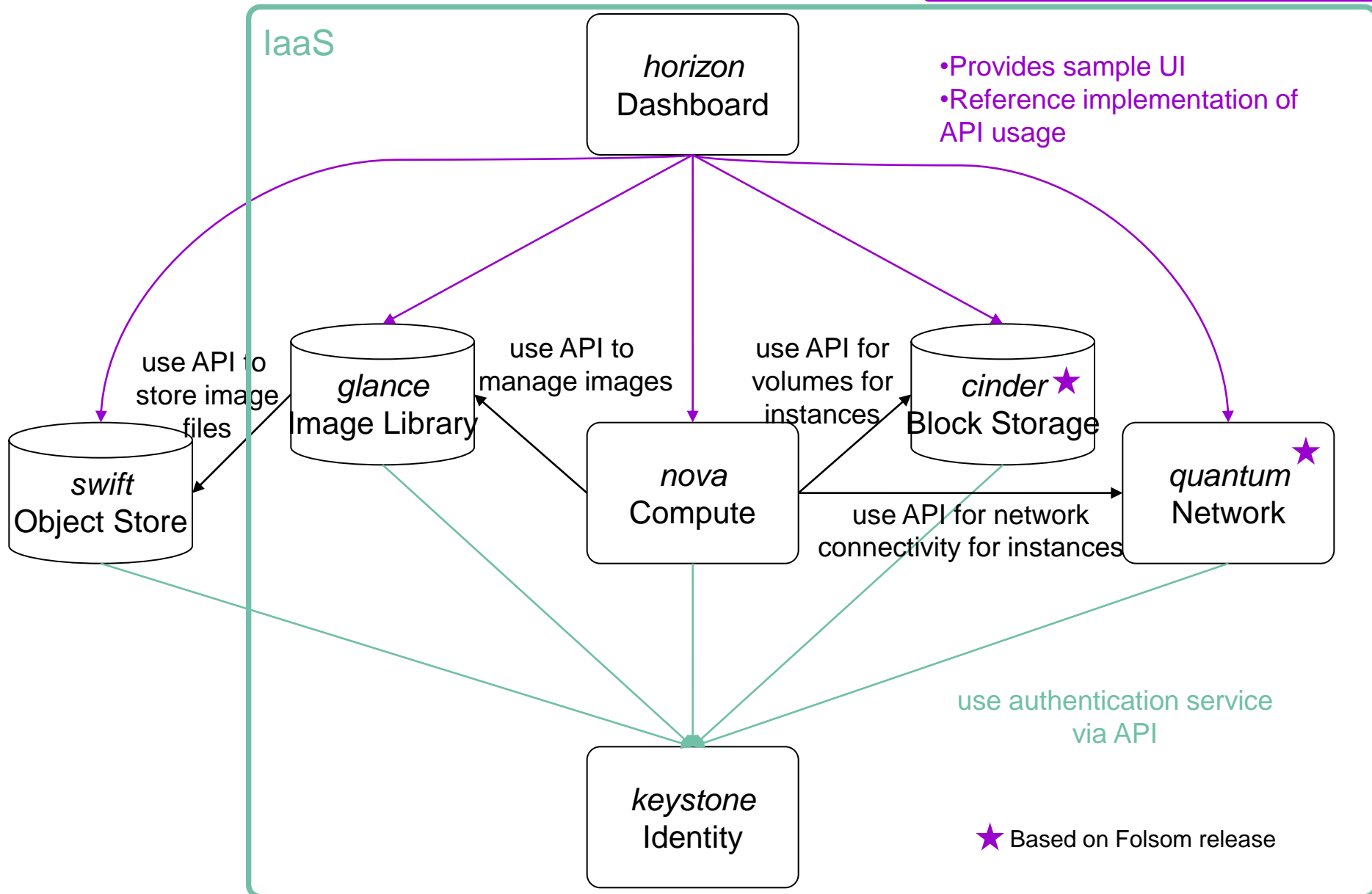
An increasing number of enterprises either base their cloud implementations on OpenStack – or build on top of it!

User Stories

screenshot from
openstack website

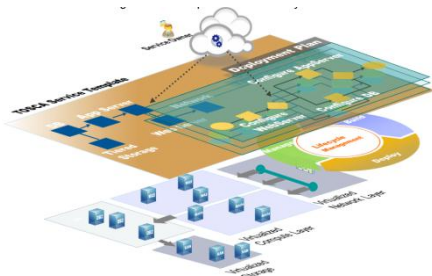
Openstack projects – conceptual architecture

working software

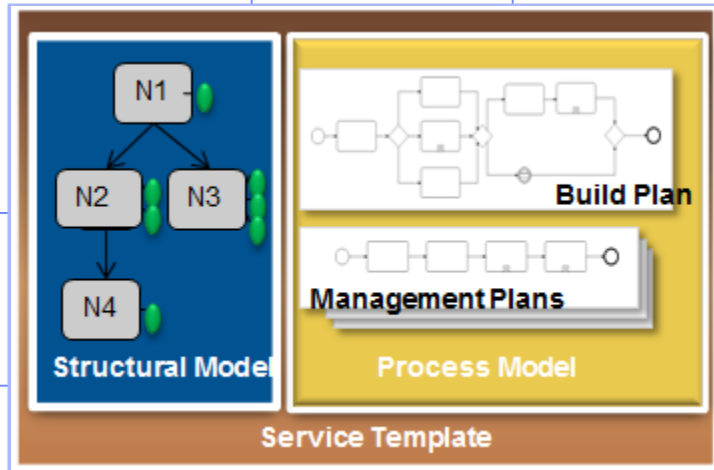
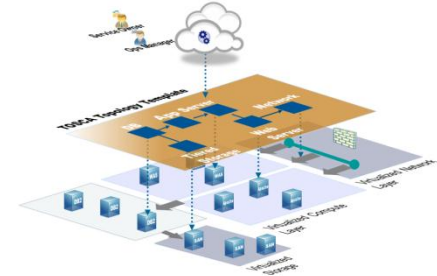


OASIS TOSCA High Level Overview

Topology and Orchestration Specification for Cloud Applications



A declarative model spanning software applications to virtual and physical infrastructure



TOSCA Standard enables

- Portability and Interoperability of Cloud Services
- Model Driven Cloud Service Management
- „Appstore“ for Cloud Services
 - Open Hybrid Clouds

Standardization driven with

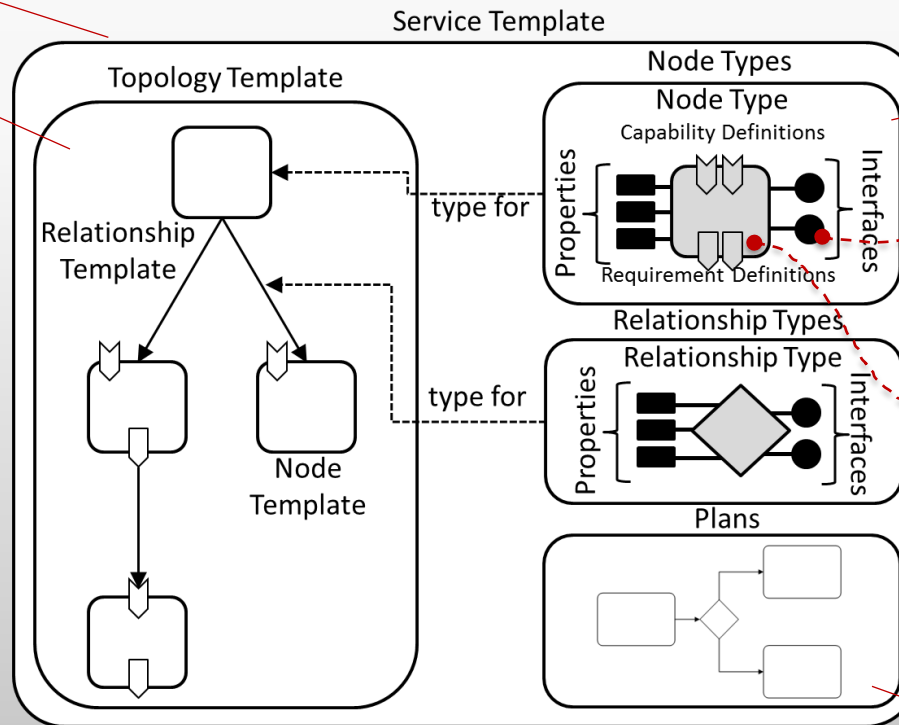


TOSCA – Technical Overview

OASIS Topology and Orchestration Specification for Cloud Applications

A language for defining
Service Templates ...

... including a Topology
Template describing the
structure of a service



... including the
definition of
building blocks for
services

... including the
definition
implementation
artifacts for
manageability
operations

... including the
definition
deployment
artifacts for
components

... including the
definition plans for
orchestrating the
application

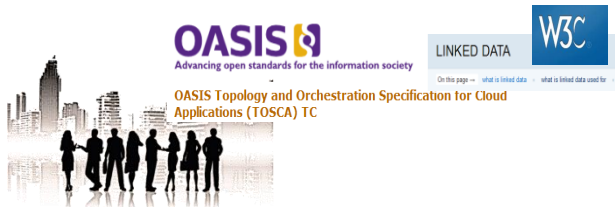
Cloud Service ARchive (CSAR)

TOSCA defines a packaging
format (CSAR) for packaging
models and all related
artifacts.

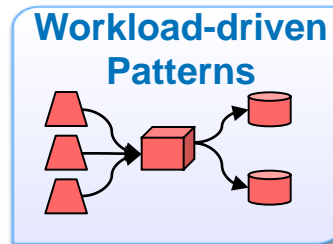
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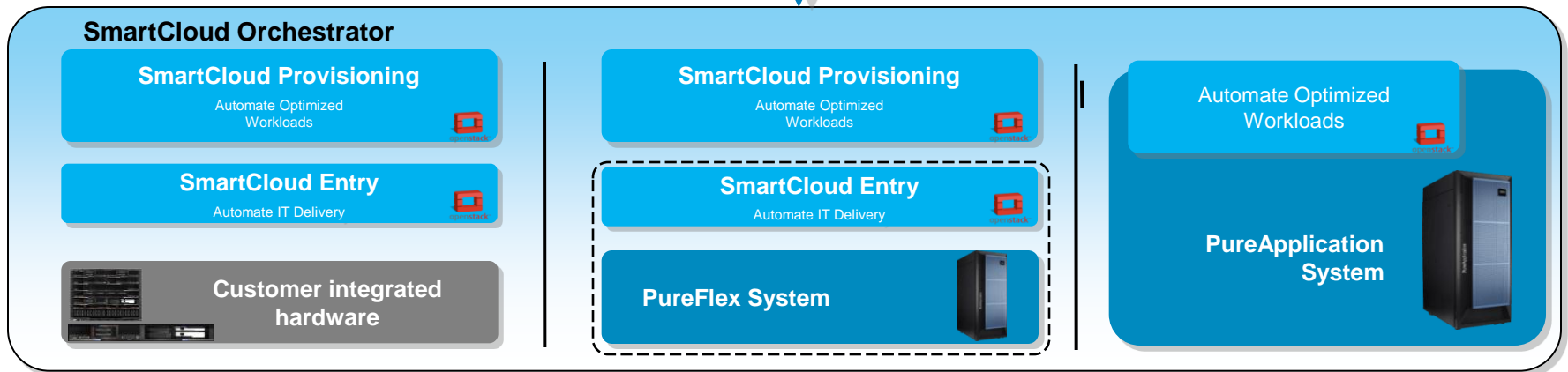
Orchestration of Cloud Services based on a Common Cloud Stack



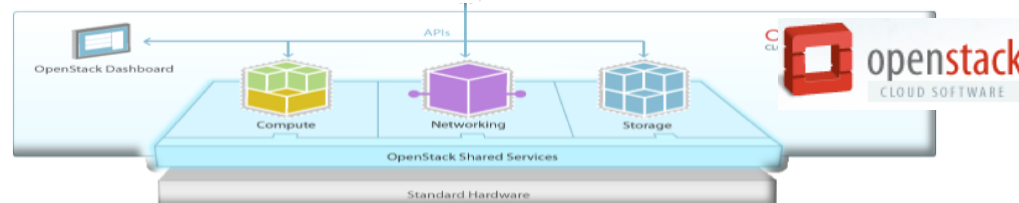
Leveraging Topology and Orchestration Specification for Cloud Applications (TOSCA)



With Flexible and extensible deployment choices

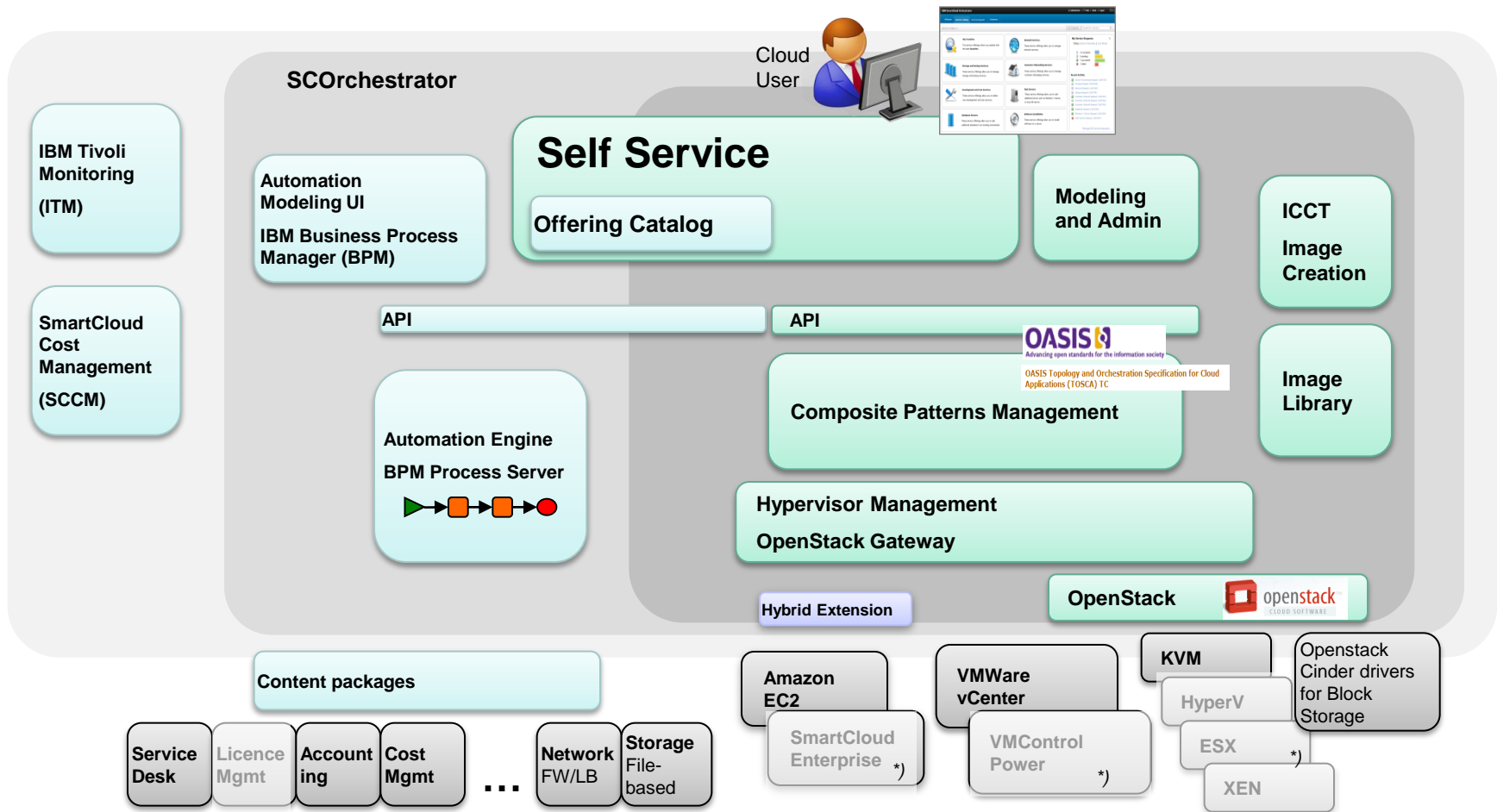


Exploiting an open infrastructure base



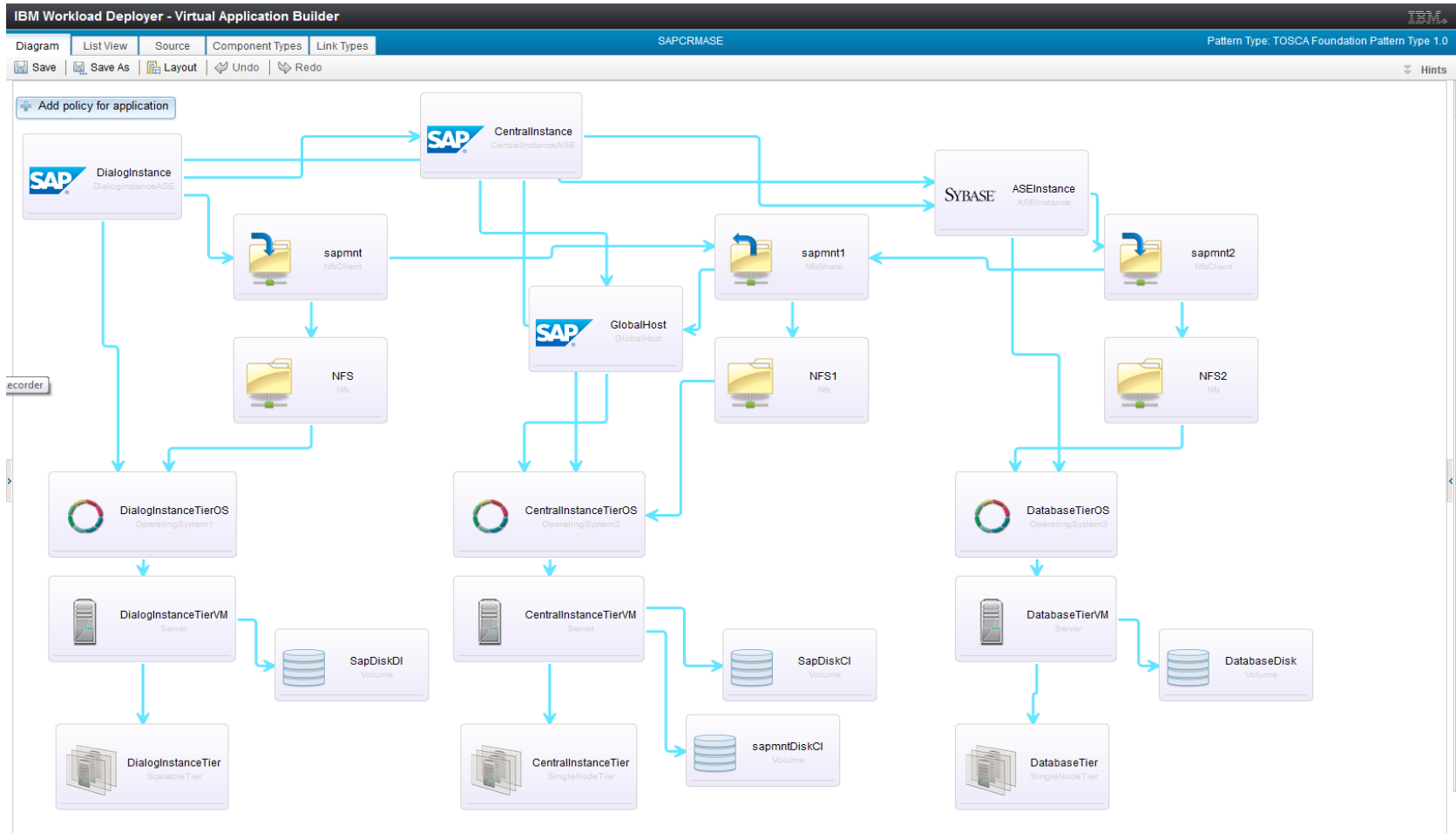
High level architecture

SmartCloud Orchestration and Provisioning



*) supported in following releases

Step 1: Cloud Admin: Import or define the structural model of the Cloud Service



Step 1 cont.: Cloud Admin: Import or define the process model of the Cloud Service

Tooling to edit, version, debug, optimize workflows

Access to rich libraries (toolkits) of reusable automation assets that enable to speed automation creation

Graphical editor for composing and connecting workflows

Actions types, flow control, data handling primitives that simplify creation of complex automations

Palette of library assets enable easy workflow composition through drag and drop

Easy workflow action editing for managing: data mapping, error recovery options, implementation details , etc.

```

graph LR
    Start((Start)) --> GetVM[Get VM Configuration]
    GetVM --> Parallel{Parallel}
    Parallel --> Register[Register Backup Agent]
    Parallel --> CreateOS[Create OS Backup Policy]
    Register --> IsMS[Is MS SQL Server]
    CreateOS --> IsMS
    IsMS --> Invoke[Invoke MS SQL Server Configuration]
    Invoke --> CreateDB[Create DB Backup Policy]
    CreateDB --> Join{Join}
    Join --> Change[Change Ticket Status]
    Change --> End((End))
  
```

Integration Service Implementation

- Cancel Backup
- Create Backup Policy
- Delete Backup Policy
- Register Backup Agent
- Request Backup
- Unregister Backup Agent
- Update Backup Policy

Behavior

- Loop Type: None
- Multi Instance Looping
- Simple Looping

System ID: bpdid:6311b1e4d26a3b044d0d9572:138e78d4282:-777b

Step 2 : Cloud Admin: Publish service in the catalogue

IBM SmartCloud Orchestrator
Administrator | Help | About | Logout

[Welcome](#)
[Service Catalog](#)
[Service Requests](#)
[Instances](#)

Service Catalog >>

All Categories

My Favorites

The service offerings which you marked with the label **favorites**.

Network Services

These service offerings allow you to manage network services.

Storage and Backup Services

These service offerings allow you to manage storage and backup services.

Development and Test Services

These service offerings allow you to define new development and test services.

Database Servers

These service offerings allow you to add additional database in an existing environment.

Customer Onboarding Services

These service offerings allow you to manage customer onboarding services.

SAP Applications

These service offerings allow you to use applications on SAP.

Software Installation

These service offerings allow you to install software on a server.

My Service Requests

Today | [Since Yesterday](#) | [Last Week](#)

3 in progress

5 pending

7 successful

2 failed

Recent Activity

- Server Provisioning Request (1067397)
- Storage Request (1067396)
- Network Request (1067395)
- Backup Request (1067394)
- Customer Onboard Request (1067393)
- Customer Onboard Request (1067392)
- Customer Onboard Request (1067391)
- Database Request (1067390)
- Windows 7 Server Request (1067389)
- LDAP Server Request (1067387)

[Manage My Service Requests...](#)

Step 3 – End User: Request the service – Fully automated, standardized, with a simple and intuitive interface

IBM SmartCloud Orchestrator
Administrator | Help | About | Logout

Welcome
Service Catalog
Service Requests
Instances

Service Catalog >> SAP Applications >> Invoice Management on SAP

SAP Applications
Search for a Service...

Invoice Management on SAP

This service allows you to deploy a new application on SAP to manage invoices.

Your request has been submitted. Click on the [link](#) if you want to monitor the service now.
28 Sep 2012 09:03 AM | [View All \(n\)](#)

Request Details

* Service name: Specify a name..

Service level:

Gold
Gold
Silver
Bronze

Submit
Cancel

My Service Requests

Today | Since Yesterday | Last Week

3 in progress

5 pending

7 successful

2 failed

Recent Activity

Invoice Managemenet on SAP Request

Server Provisioning Request

Storage Request

Network Request

Backup Request

Customer Onboard Request

Customer Onboard Request

Customer Onboard Request

Database Request

Windows 7 Server Request

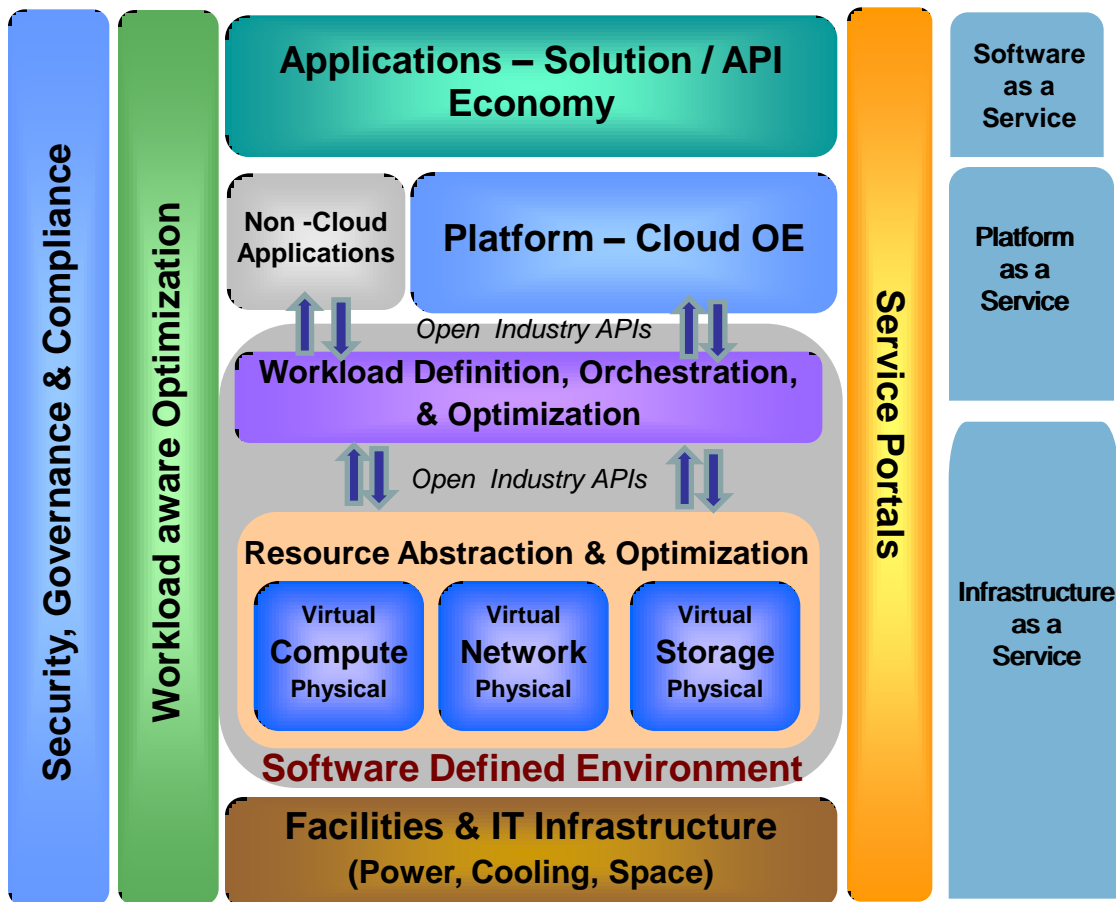
[Manage My Service Requests...](#)

- Introduction
- OpenStack and TOSCA
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- **Software Defined Environments**
- Summary

What is a Software Defined Environment (SDE)?



*A new approach to IT service delivery, utilizing a programmable open standards-based **foundation** as an enabler for cloud, mobile and other dynamic enterprise solutions*



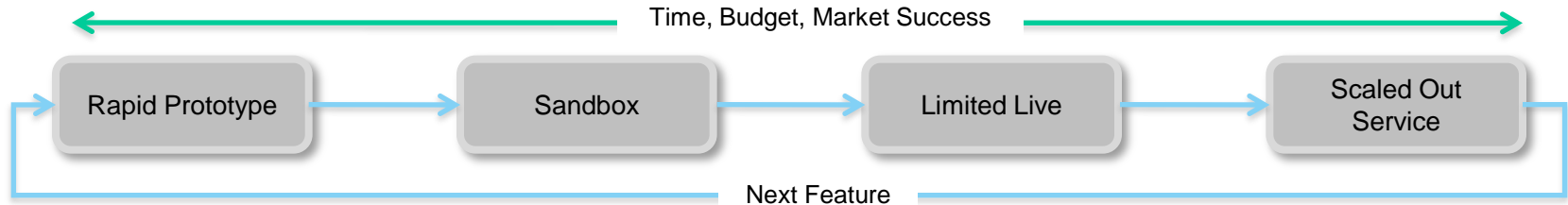
SDE Characteristics

- **Open industry API integration** encourages broad ecosystem of solutions providers
- Workloads **dynamically** assigned to resources based on app characteristics and best available resources
- **Analytics-based** compliance checking reduces security exposure and business risk
- **Continuous optimization** to instantly address infrastructure issues and improve response to business needs
- **Proactive** management of IT resources to improve efficiency and control costs of service delivery

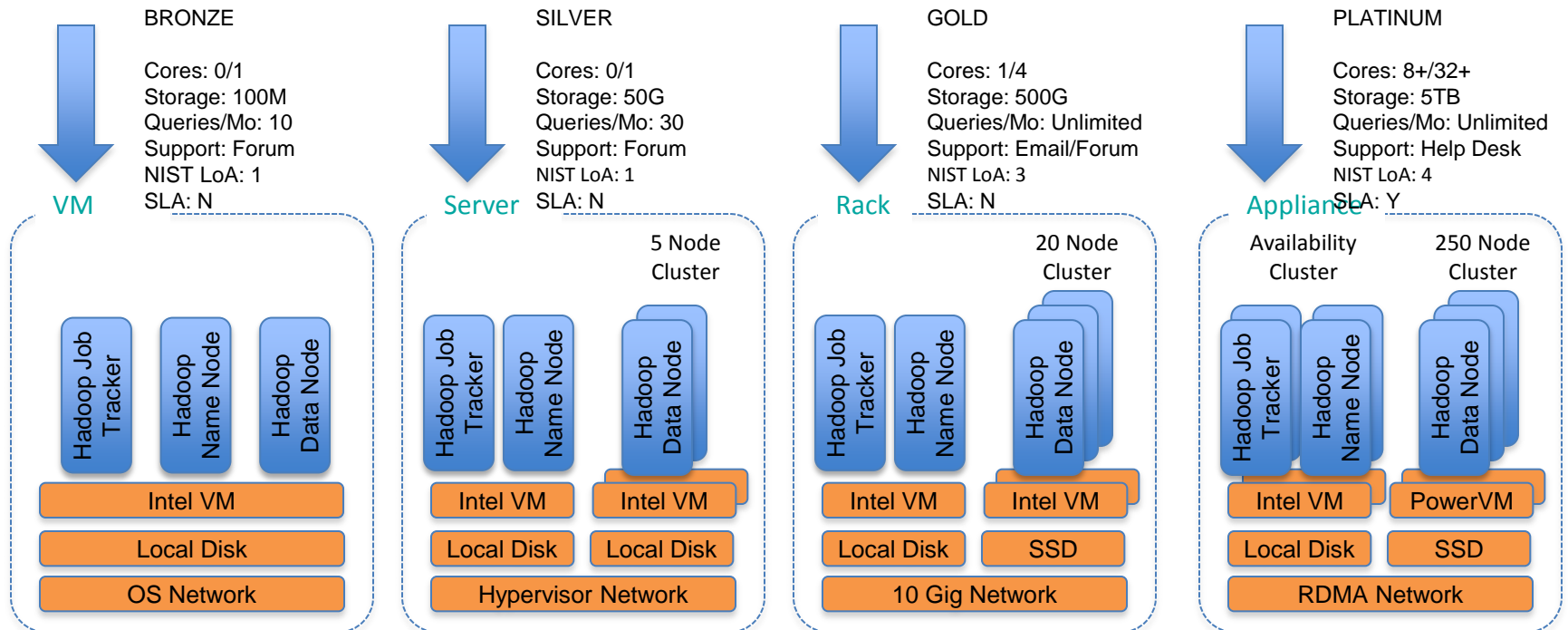
Simple, Responsive, Adaptive

Business Opportunity: New “Ad-fraud detection” application that uses real-time correlation of transaction data with ad click log data

Service Development and Delivery: Using Hadoop service for correlation and log analytics



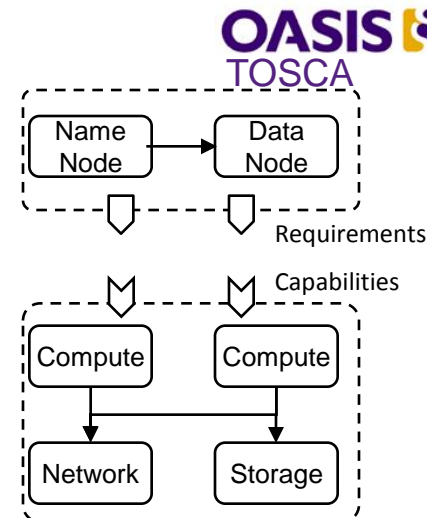
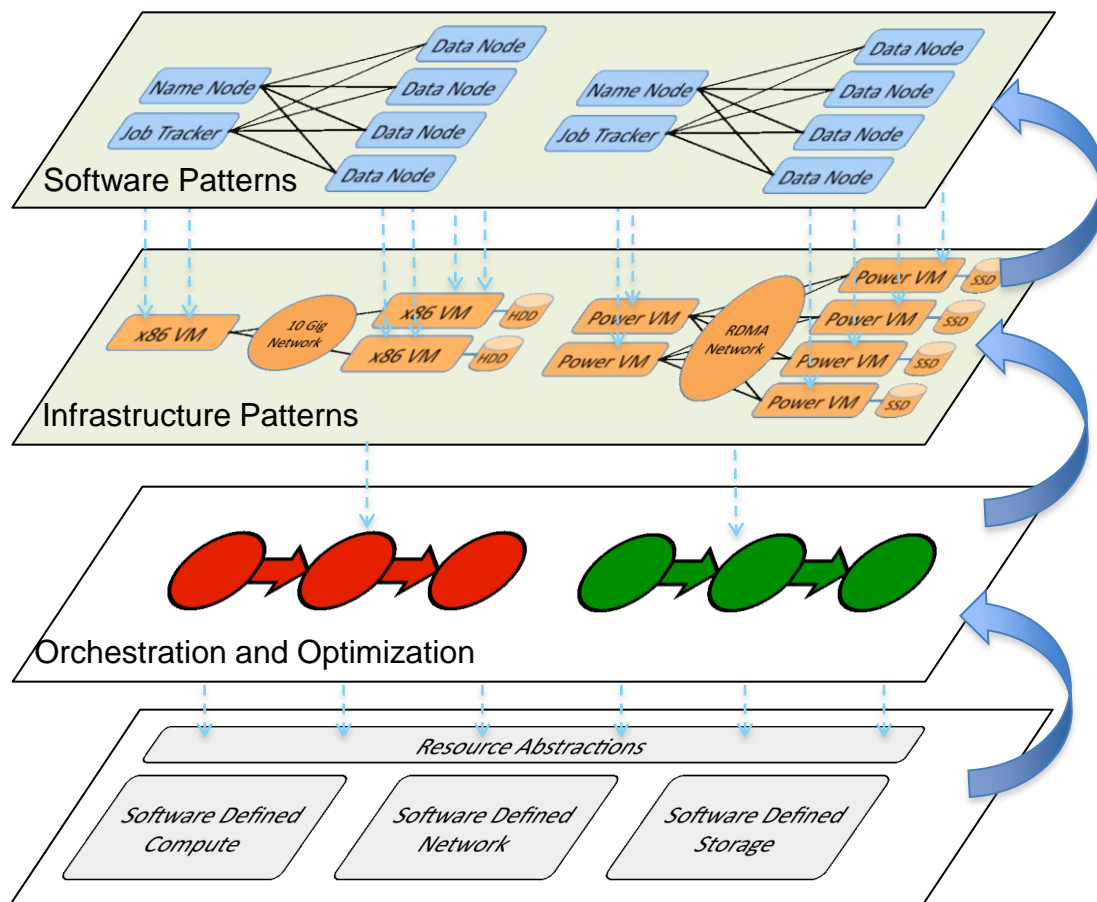
Deployment Configurations: Based on Cost, Performance, Security and Availability Requirements



Orchestration of Software Defined Environments



- Capture the software and infrastructure definition of workloads
- Link software patterns to infrastructure patterns based on requirements
- Automatically orchestrate deployment and update of workloads on SDI
- Enable and differentiate orchestration with analytics



Value: enables rapid and continuous delivery of diverse set of workloads with *agility* and *optimization* on programmable heterogeneous infrastructure leveraging *reusable* building blocks

Composable Patterns supporting different roles in the Eco System



Flexible selection of deployment topologies



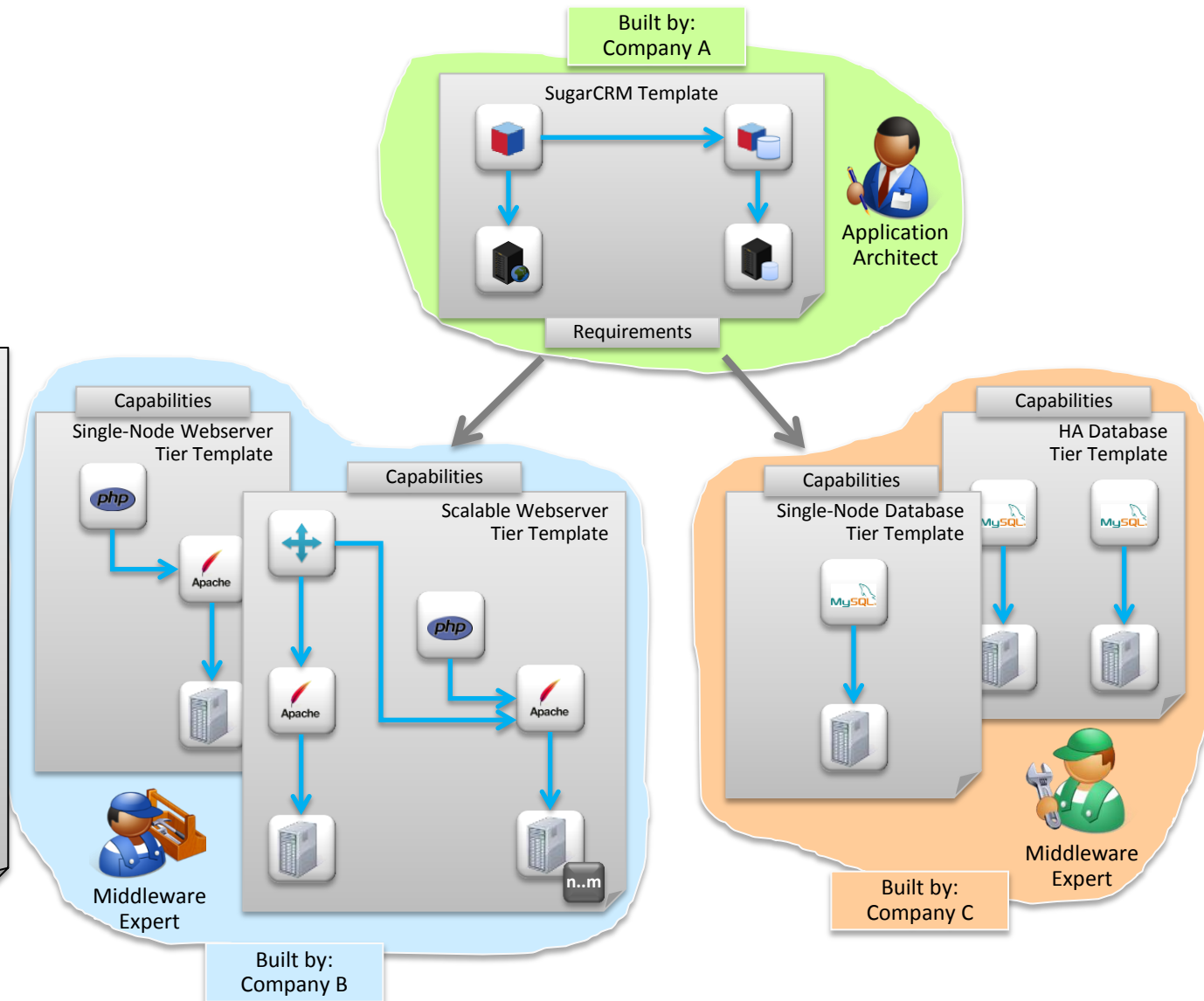
Separation of concerns



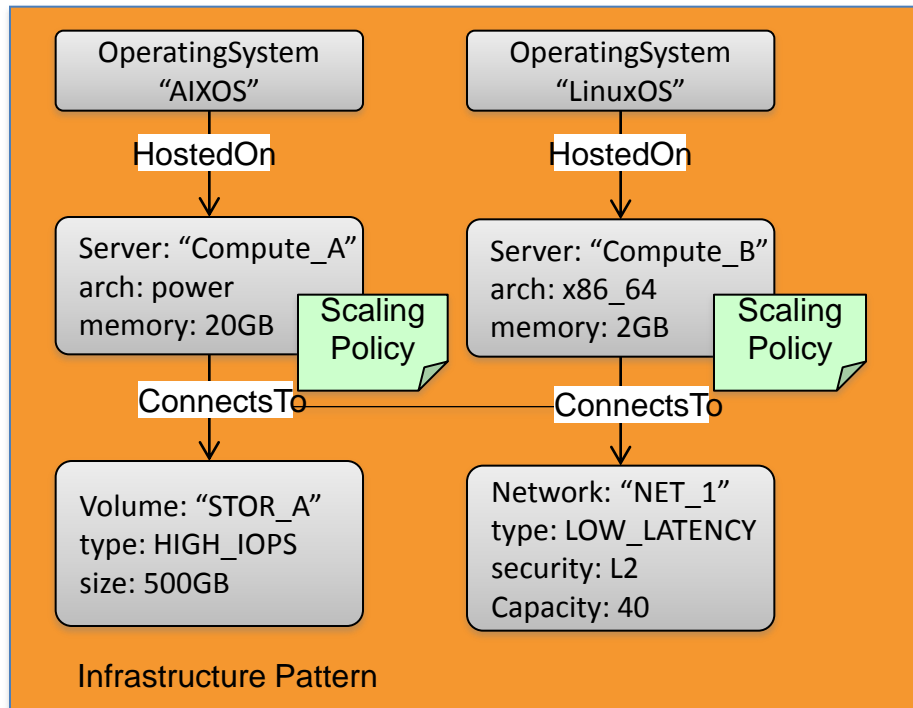
Integration of models delivered by different providers

Supported use cases from user perspective:

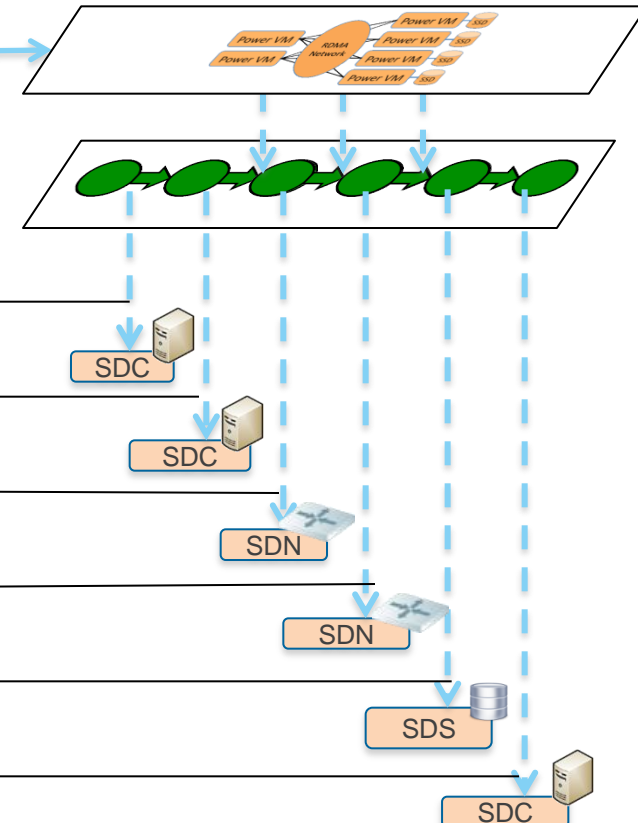
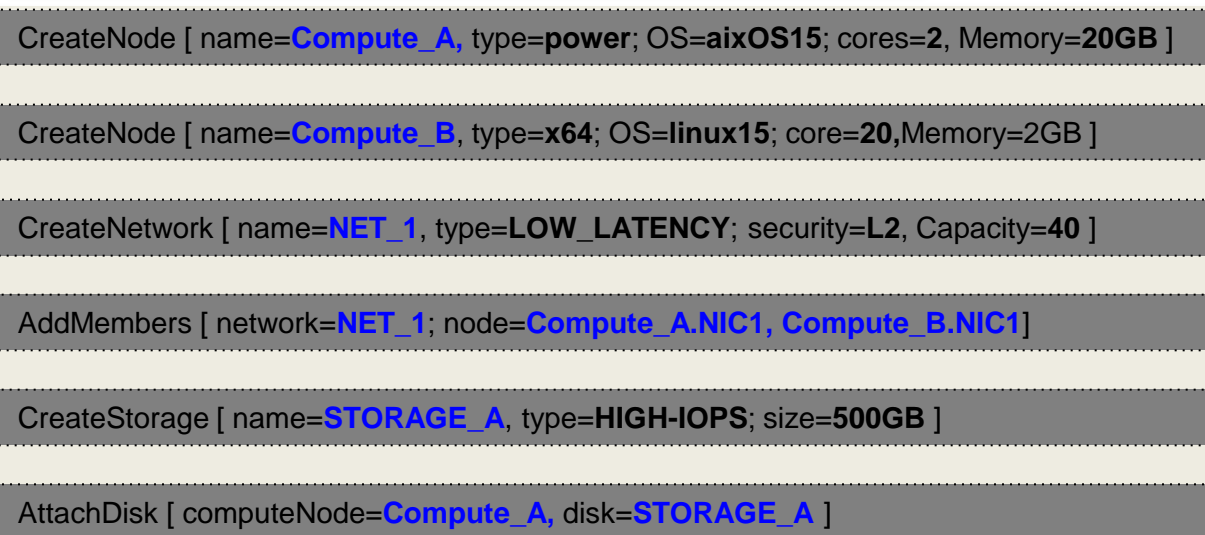
- Import self-contained models from application down to infrastructure
- Deploy fully refined models
- Import componentized models with separation of application and middleware/infrastructure
- Deploy applications with variable selection of infrastructure templates based on policies
- Deploy middleware/infrastructure only patterns
- Edit or create new application or middleware/infrastructure models based on know Node- and Relationship Types



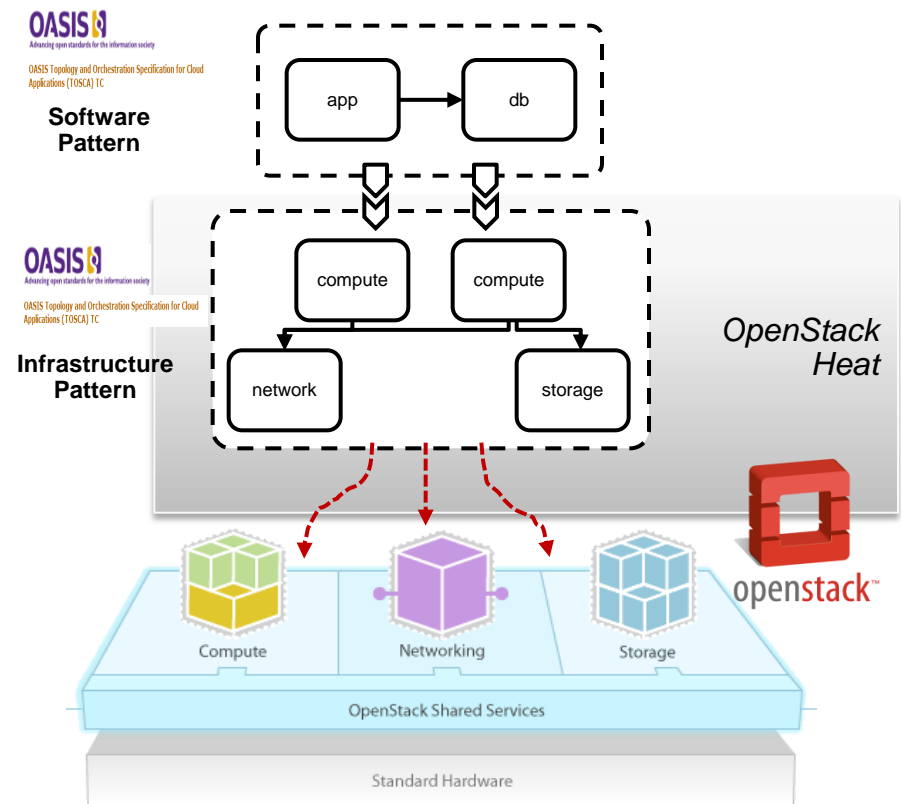
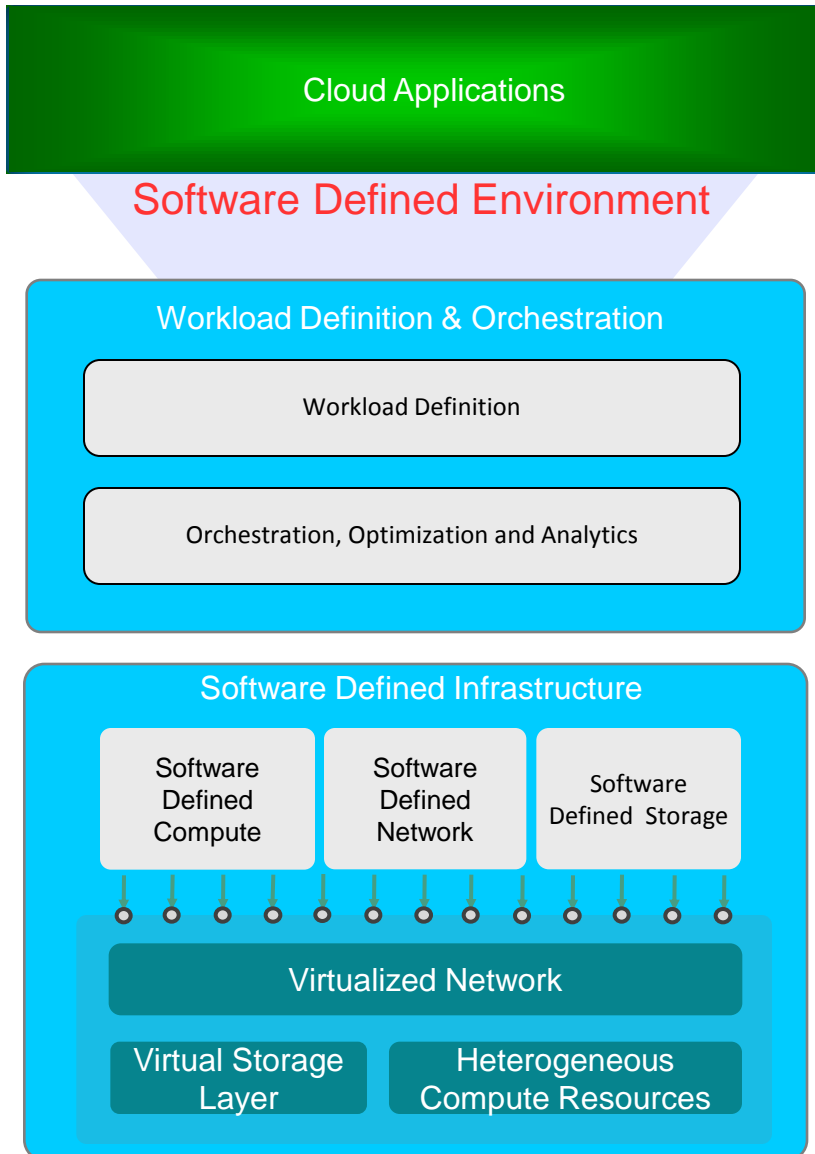
Example: Orchestrating an Infrastructure Pattern



- Flexible composition of patterns (re)using **standardized** building blocks
- Allows an **ecosystem** of content providers and content **reuse**
- "Deployment workflows" dynamically created based on pattern and policies



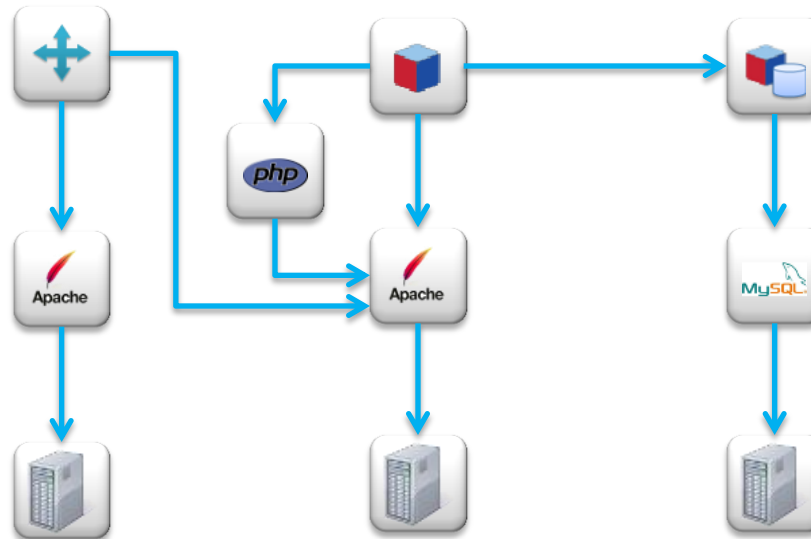
Software Defined Environments and OpenStack Heat



SugarCRM two-tier deployment with scalable web tier

Single, self-contained
model

Including scalable
components



Building blocks for SugarCRM (TOSCA Node Types)



SugarCRM
Application



SugarCRM
Database



Apache
Webserver



PHP
Module



MySQL



Virtual
Machine



Load
Balancer

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- **Summary**

- Generic Modelling Questions
 - Declarative vs. Imperative – when to use what? Define and Describe best practices
- Definition of the Base Model for SDS, SDN and SDC
 - What is the right granularity?
 - How do we link Software Patterns to Infrastructure Patterns?
 - Can we use more than one pattern engine and connect them via Reqs and Caps? If so, how do those engines interact?
- How do we manage SLAs and NFRs in SDE
 - How do we model and implement the autonomic behaviour of the SDE beyond deployment?
 - Implications on the TOSCA standard? For example: Need for standardization of eventing, signalling?
 - Imperative vs. Declarative approach wrt. NFRs and Policies?
 - „Autonomic Managers“ on various levels – how do they interact?
 - Where do we put optimization in the stack?

- Mobility, big data, analytics, social collaboration and cloud are creating a new wave of business opportunities and IT challenges
- IBM's open cloud architecture is based on emerging standards like OpenStack, TOSCA
- The Software Defined Environment (SDE) is composed of Software Defined Compute (SDC), Software Defined Storage (SDS), Software Defined Network (SDN) and an Orchestration component which allows to fully programmatically compose, deploy and manage all the elements which constitute the individual IT services.
- Resource and Workload Orchestration in SDE enables rapid and continuous delivery of diverse set of workloads leveraging reusable building blocks
- OpenStack Heat is an evolving orchestration engine for Software Defined Environments
- A new language called HOT based on the principles of TOSCA is currently being created for Heat

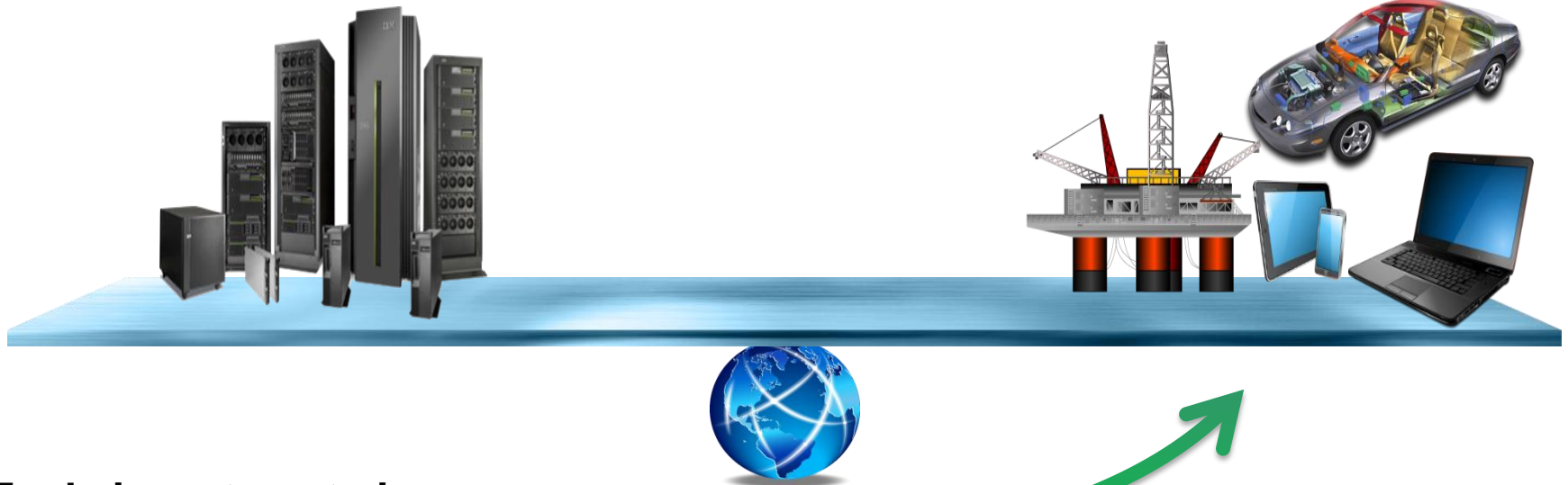
Backup

IT leaders are leveraging the transformational power of cloud to balance optimization of existing systems and innovation

Drives need for continuous IT **optimization**

Optimization

Innovation



Fuels investments in **innovation**