Enterprise Systems: Creating the Perfect Cloud

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Emerging Trends

The emergence of *social, mobile, analytics and cloud* are fundamentally changing how we live, work and interact ...

Pervasive connectivity

Big data

Social

Mobile

Cloud

Analytics
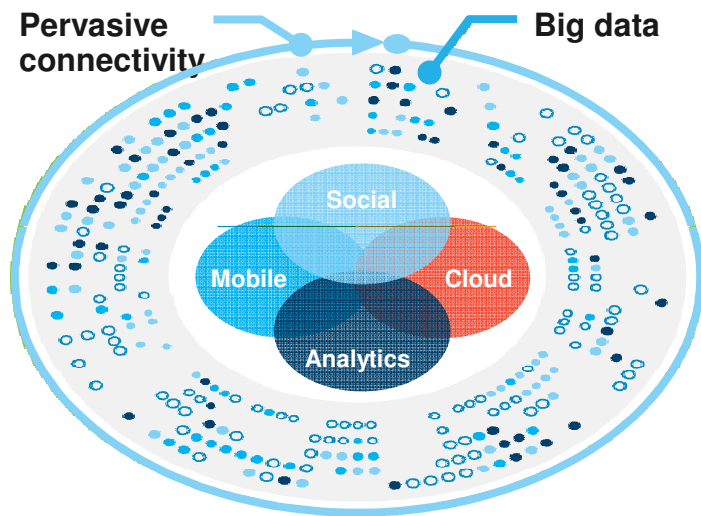
77%

of chief information officers
plan to allow staff to use personal mobile devices to access company data and applications[1]

82%

of 493 enterprises surveyed
have migrated or plan to migrate customer relationship management (CRM) workloads to the cloud[2]

Over 30%

of organizations

expect the majority of their IT capability will be delivered through public cloud services within five years[3]

45%

of IT resources
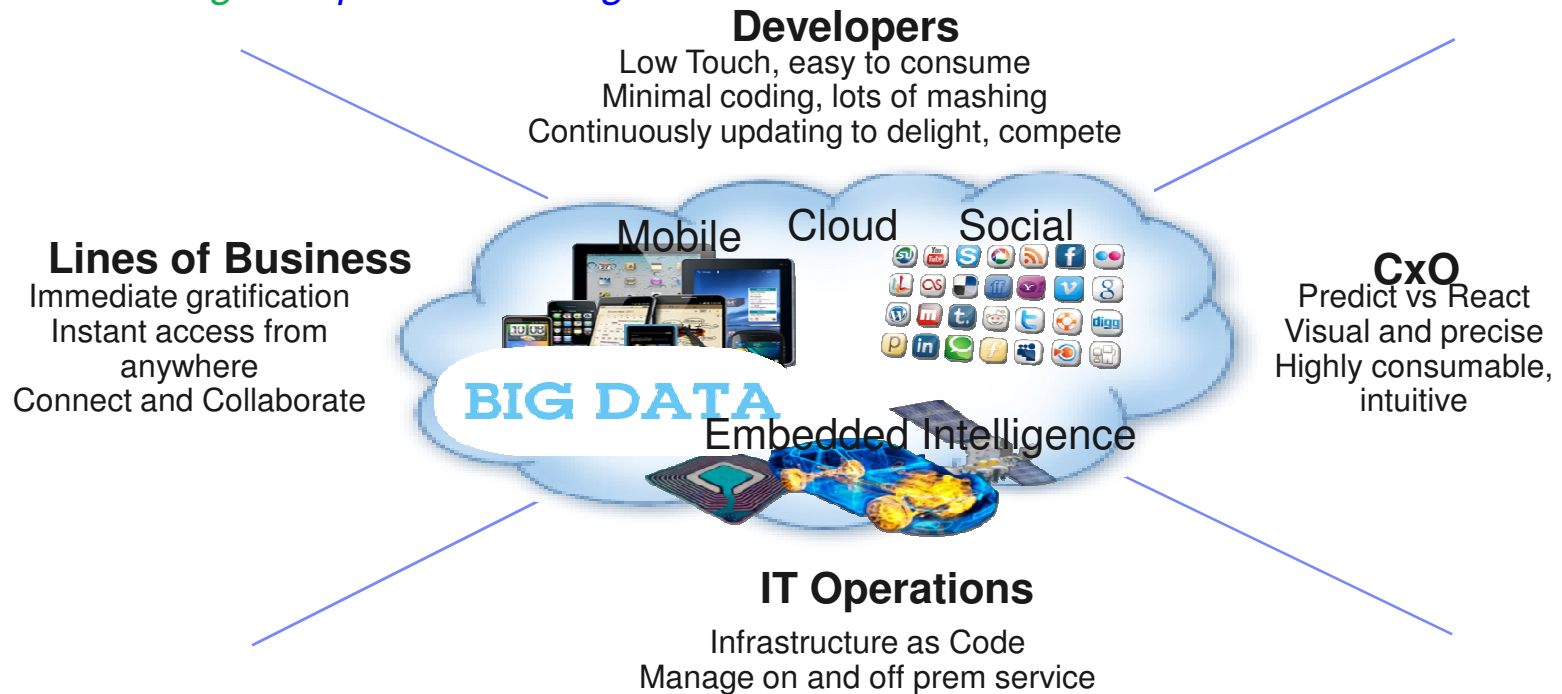are expected to be accessed through some form of cloud—public, private or hybrid—within three years[4]

[1]McKinsey and Company, A CIO Perspective, by Janaki Akella, Brad Brown, Greg Gilbert and Lawrence Wong; September 2012;
[2]The Everest Group, Cloud Connect Enterprise Adoption Survey, 2013; [3]IDC Cloud Maturity Model, IDC #239772, March 2013; [4]Ibid

Emerging Trends …

… with corresponding changes in the dynamics of the marketplace
Expectations on how Business and IT want to interact with systems and applications are driving disruptive technologies

Developers
Low Touch, easy to consume
Minimal coding, lots of mashing
Continuously updating to delight, compete

Lines of Business
Immediate gratification
Instant access from
anywhere
Connect and Collaborate

Mobile   Cloud   Social

BIG DATA

Embedded Intelligence

CxO
Predict vs React
Visual and precise
Highly consumable,
intuitive

IT Operations
Infrastructure as Code
Manage on and off prem service

… and a need to drive innovation while improving the economics of IT

Lower Costs & Efficiency

Transformation & Innovation

Rethink IT
- React with Agility
- Speed innovation
- Improve economics

Reinvent Business
- Improve operating dexterity
- Reinvent client relationships
- Provide new profit opportunity
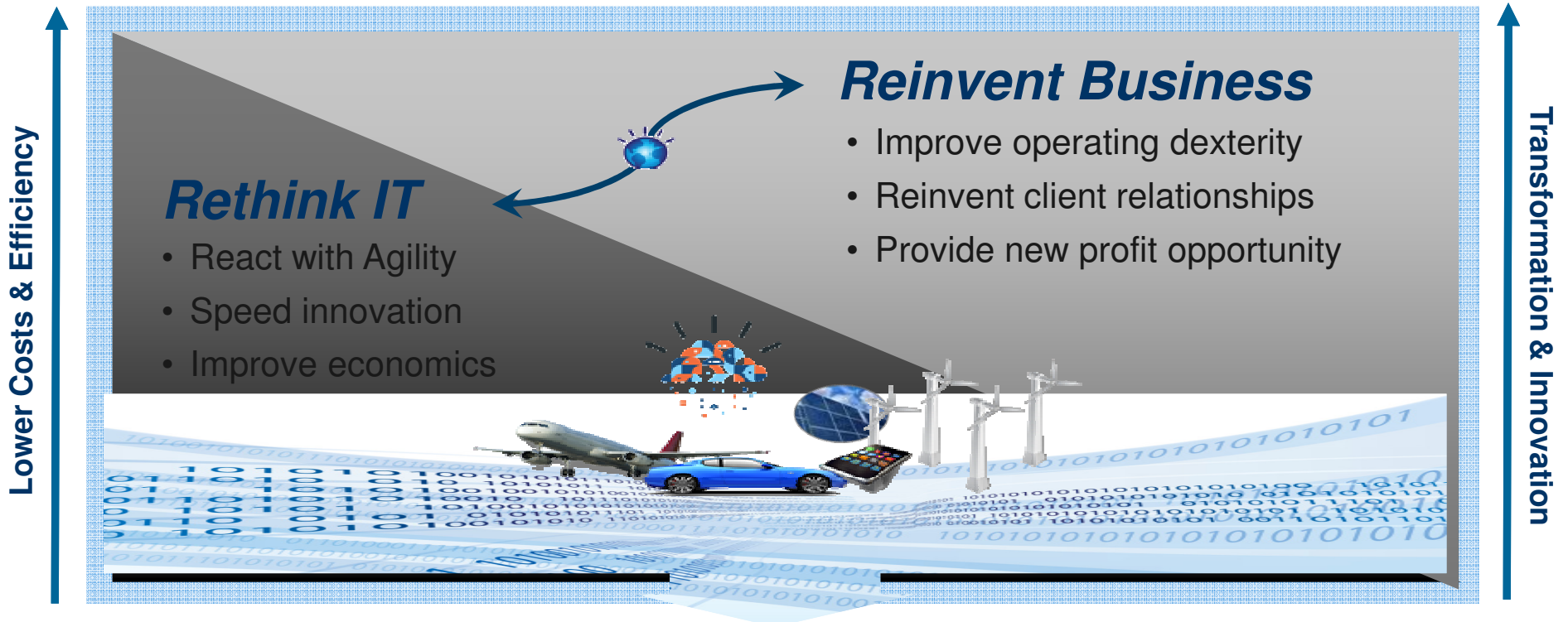
The Economics of Computing are Changing

Resulting in a new consumption and delivery model called:

Cloud Computing
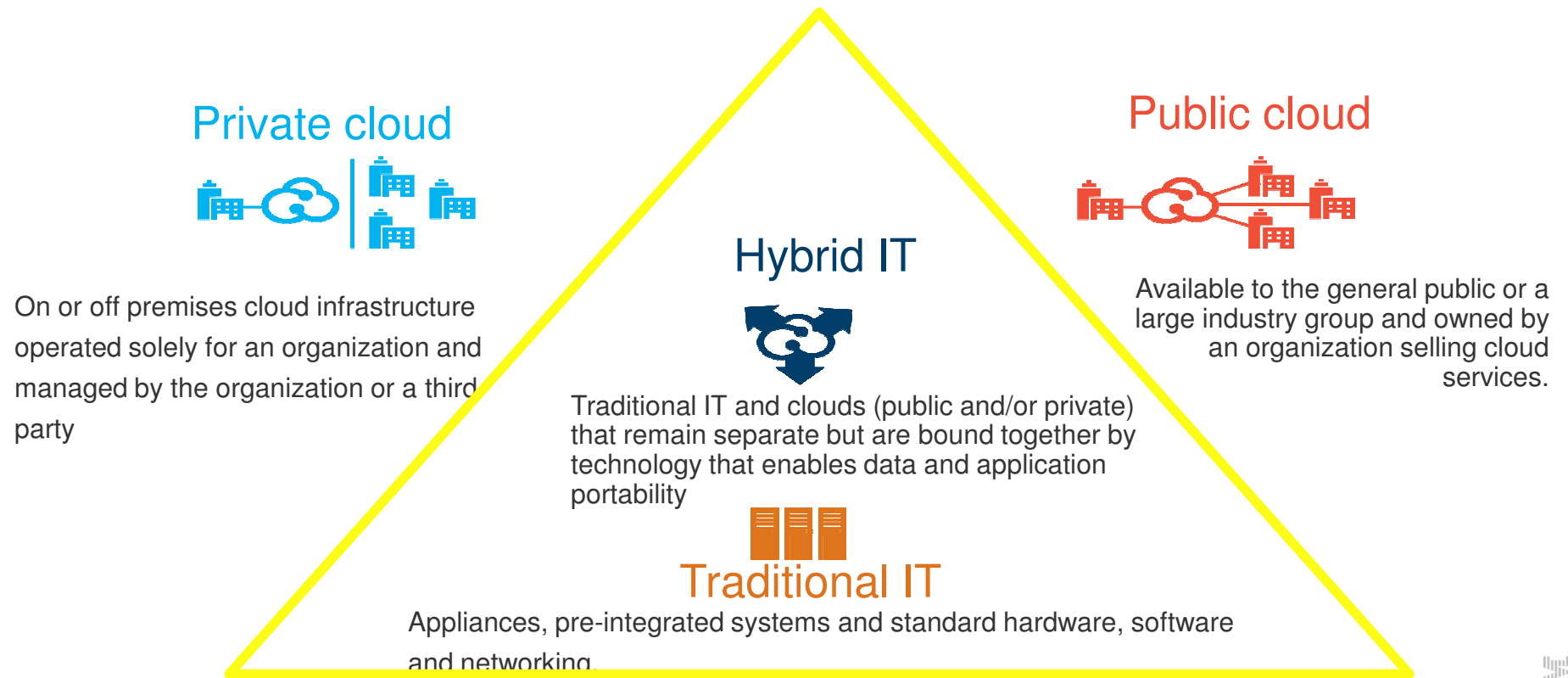
Common Cloud Terms

Service Models

- **Infrastructure as a Service - IaaS** (layer includes server, storage, data center fabric, networking)

- **Platform as a Service - PaaS** (layer includes middleware, databases, development tools, service management, runtimes, security**)**

- **Software as a Service- SaaS** (Some examples of SaaS solutions are CRM, Collaboration, Financials, ERP, HR, etc**)**

- **Business Process as a Service – BPaaS** (Some examples are Payroll, Benefits Management, Travel Expenses, etc)

Deployment Models

- **Public Cloud:** Client leverages a third party cloud either to use their infrastructure (e.g.,AWS, IBM SCE) or to access SaaS (e.g., IBM Smarter Commerce, salesforce.com)

- **Private Cloud:** Client builds a cloud on their site using HW, SW, Svcs. Often used for highly mission critical workloads or compliance reasons

- **Hybrid Cloud:** Integration of cloud to legacy systems or private to public (IBM Cast Iron helps here)

Five Essential Cloud Characteristics:

1. On-demand self-service
2. Broad network access
3. Location independent resource pooling
4. Rapid elasticity
5. Measured Service

*National Institute of Standards and Technology

The reality of today's IT environment is that it is heterogeneous

Private cloud

On or off premises cloud infrastructure operated solely for an organization and managed by the organization or a third party

Public cloud

Available to the general public or a large industry group and owned by an organization selling cloud services.

Hybrid IT

Traditional IT and clouds (public and/or private) that remain separate but are bound together by technology that enables data and application portability

Traditional IT

Appliances, pre-integrated systems and standard hardware, software and networking.
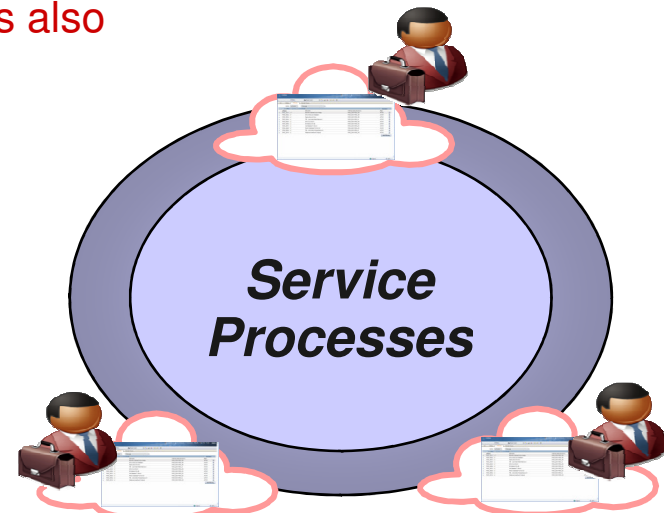
At the Heart of any Cloud --- Service Management

Cloud Computing is more than a computing model, it is also a Service Delivery model and requires 2 components:

Process Platform

+

Service Processes

- A Process Platform to **manage the virtual infrastructure**

- Service Processes that **deliver the user experience**

The effectiveness and efficiency of a cloud implementation is predicated on the interaction of these components
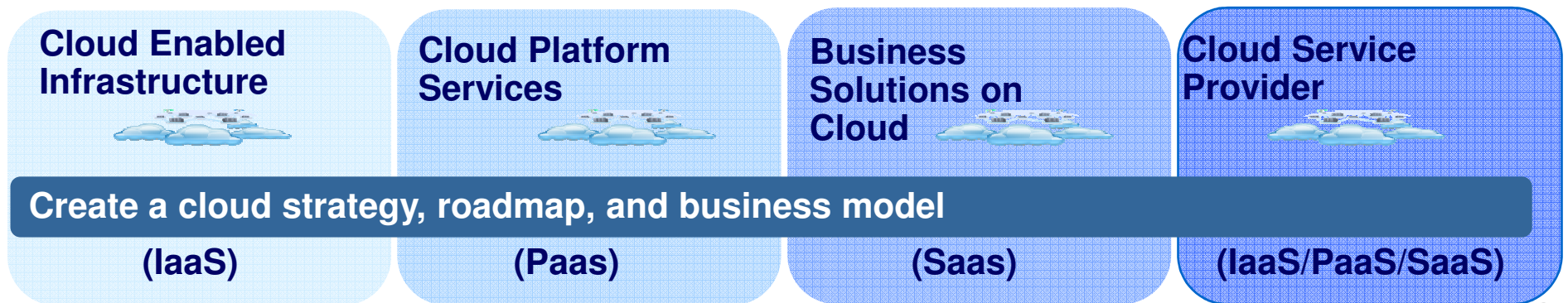
When Building a Cloud

- Organizations choose a cloud model based on their business model requirements

  - **I**nfrastructure **as a s**ervice (**IaaS**)
    - Dynamically shared set of virtual computing resources
      - **(**analogous to **zEnterprise)**

  - **P**latform **as a s**ervice (**PaaS**)
    - Builds on IaaS to provide application middleware
      - **(**analogous to **IMS)**

  - **S**oftware **as a s**ervice (**SaaS**)
    - Provides higher levels of service delivery
      - **(**analogous to **IMS SOA Integration and Enterprise Suites)**

  - **B**usiness **p**rocess **as a s**ervice (**BPaaS**)
    - Customer-written applications or business processes

When Building a Cloud …

- Such as:
  - Enabling a datacenter (IaaS)
  - Adopting cloud platform services to enable legacy applications and to create new cloud centric applications (PaaS)
  - Adopting business solutions from the cloud (SaaS)
  - Becoming a service provider (IaaS, PaaS, SaaS)

Cloud Enabled Infrastructure	Cloud Platform Services	Business Solutions on Cloud	Cloud Service Provider
Create a cloud strategy, roadmap, and business model			
(IaaS)	(Paas)	(Saas)	(IaaS/PaaS/SaaS)

Example of a Public Cloud: AWS

In 2006, Amazon Web Services (AWS) began offering IT infrastructure services to businesses in the form of web services

lets you provision a private, isolated section of the Cloud where you can launch resources in a virtual network that you define. You can define a virtual network topology that closely resembles a traditional network that you might operate in your own datacenter.

Allows business to run their Websites, blogs, etc

run all types of enterprise applications, from small departmental solutions to mission-critical applications that automate company-wide business processes.

For personal computing -- allows you to have a personal hard drive in the cloud

Another example:
the **IBM Cloud**

Softlayer Gobal Cloud Infrastructure (IaaS)
Powers the most demanding cloud applications with modular services utilizing a single self-service portal and one powerful API.

IBM Cloud
Overview   Marketplace   Solutions ▾

Cloud apps may be less effective if they can't integrate with back-office apps

The IBM Cloud uses open technology to help you integrate with existing systems

→ Learn about IBM Cloud open standards

Catalog with best-in-class software-as-a-service **(SaaS)** applications and business process-as-a-service **(BPaaS)** capabilities, all delivered with the enterprise-grade security,

BlueMix
Cloud platform

IBM Cloud marketplace
Growing cloud ecosystem tha allows marketplace users to discover the most advanced cloud offerings from IBM and business partners

an open standards-based Platform as a Service **(PaaS)** environment for building, running, and managing web and mobile applications in the cloud.

Enterprise-grade sandbox for developers

Globally distributed database-as-a-service **(DBaaS)** for operational application data, Cloudant enables developers to quickly create next-generation apps. Cloudant runs on our SoftLayer cloud platform today and is available in the IBM Business Partner marketplace.

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IBM Cloud is based on a framework

IaaS: Cloud Enabled Infrastructure

PaaS: Cloud Platform Services

SaaS: Busines Solutions on Cloud

IaaS /PaaS /SaaS: Cloud Service Provider

Create a cloud strategy, roadmap, and business model

IBM SmartCloud Framework

IBMSmartCloud Foundation

IBMSmartCloud Services

IBMSmartCloud Solutions

Cloud Enablement Technologies
Enables private/hybrid cloud service delivery and management

Managed Cloud Services
Secure and scalable cloud managed services platform

Cloud Business Solutions
Pre-built Cloud SaaS business applications and solutions

Common Open Standards Technology and Industry Ecosystem

IBM Cloud is based on a Framework…

- Infrastructure as a service (IaaS)
  - E.g., SoftLayer global cloud infrastructure

- Platform as a service (PaaS)
  - E.g., BlueMix cloud platform

- Software as a service (SaaS) and Business process as a service (BPaaS)
  - E.g., SaaS Catalog and IBM Cloud Marketplace which delivers hundreds of IBM and business partner services
  - Integration solutions that support customer-written applications or business processes

- Database as a service (DBaaS)
  - E.g., Cloudant scalable NOSQL globally distributed database-as-a-service for operational application data,

Cloud (Public, Private, Hybrid) Trends

- Addressing New and Legacy Workloads

  Cloud -Enabled
  - Integration of traditional, mission-critical and operational applications with cloud solutions and increasing business agility

  Cloud –centric
  - Created to run in the cloud without any ties to infrastructure configuration

Cloud-centric

- Elastic

- Multi-tenant

- Integrated Lifecycle

**Emerging
Platform Workloads**

Exploitation of new environments

+

Cloud-enabled

- Scalable

- Virtualized

- Automated Lifecycle

- Heterogeneous

**Existing Middleware
Workloads**

Compatibility with existing systems

15
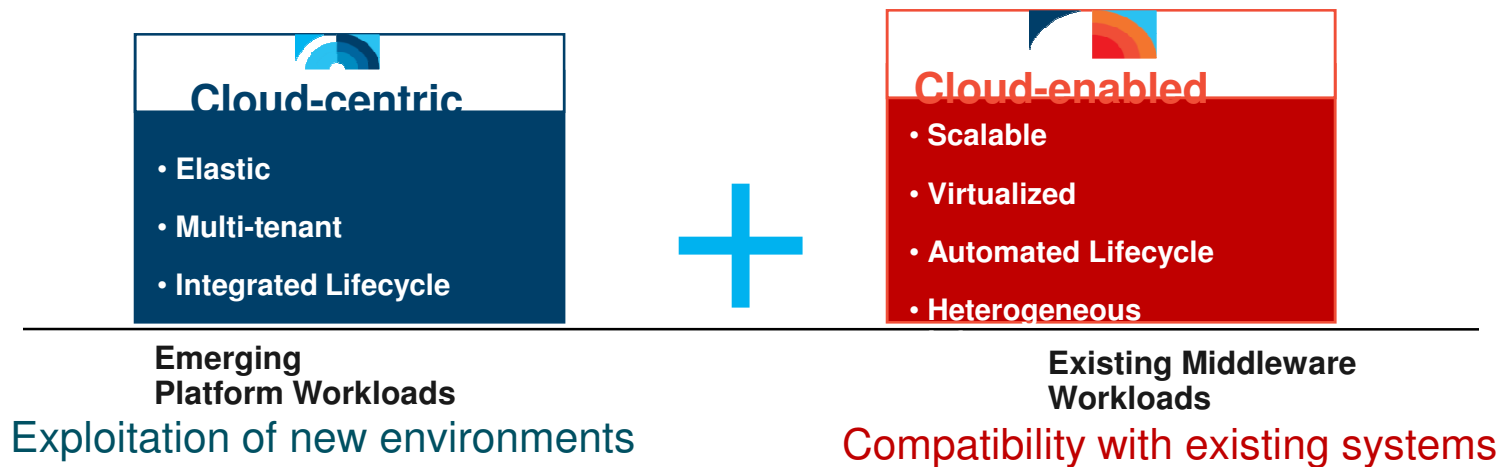
Cloud (Public, Private, Hybrid) Trends…

… Through the integration of business models

Systems of Engagement

IMS, CICS, DB2
Systems of Record

Innovate

Drives Investment

Drives Need

Optimize

Focus on Speed and Agility

- Assemble solutions from verified components and services
- Fast deployment and redeployment
- Agile to DevOps model
- User first delivery model

Business Models

- "xaaS"
- MSPs
- Brokers

Focus on Operational Costs

- Consolidation and modernization
- Operations Automation
- Risk and compliance Management
- Manual policy to analytics driven optimization

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Systems of Engagement meet Systems of Record

BlueMix

Customer

Secure Connector

DataPower
API Management

3rd Party

Employee

IBM Integration Bus

Cache

WebSphere

MobileFirst

z/OS Connect

DB2

CICS

IMS

z/VM & zLinux

z/OS

IBM

Systems of Engagement meet Systems of Record

- Systems of Engagement (SoE)
  - Social, Mobile, People, Distributed applications and service consumers, …

- Integration capabilities
  - DataPower, IMS Soap Gateway, WebSphere Application Server, etc…

- Systems of Record (SoR)
  - Data, Process, APIs, Service providers
    - IMS, CICS, DB2,..
    - zOS Connect (WAS Liberty Profile z/OS)
      - *A service that encapsulate calling z/OS target applications using REST calls*
      - *Supports JSON payloads for calls from external cloud or mobile-based*

- ***Goal: Combine SoE with SoR using private and hybrid cloud infrastructure capabilities to build secure and scalable systems***

Systems of Engagement meet Systems of Record …

- **Integrating into existing Applications**
  - *Combine mobile and cloud for best of both* – mobile applications in the cloud linked to the enterprise is your competitive advantage
  - *Fast time to market of cloud based applications* – combined with the trusted transactions of traditional mainframe systems
  - *Securely connect* – leverage data from your existing enterprise systems

API Management   Cast Iron Integration   Secure Connector   Data Mapper   Private API Catalog

BlueMix

Secure Connector

DataPower

Traditional Enterprise Subsystems
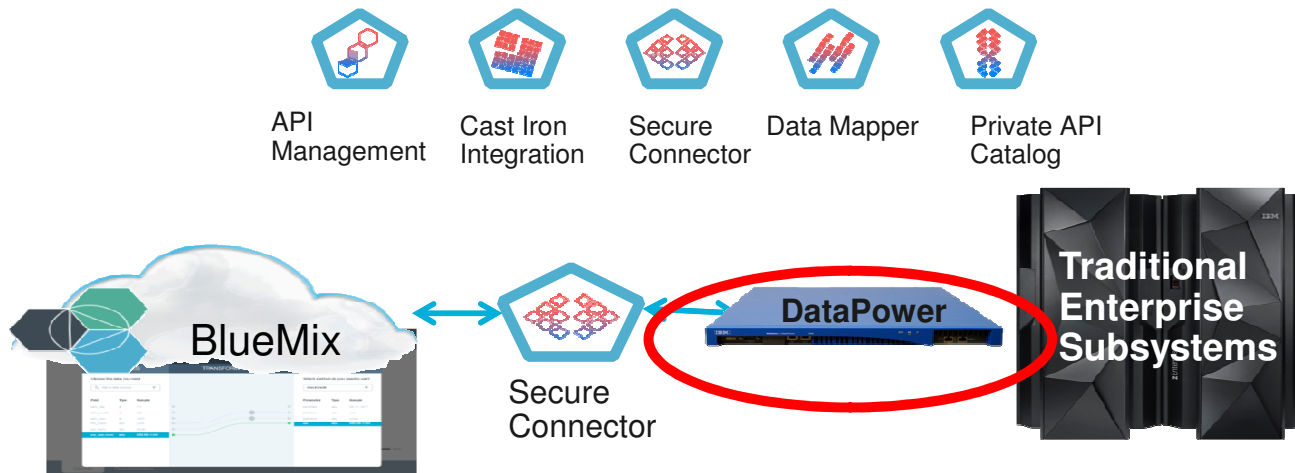
DataPower

- Supports Enterprise Integration
  - Provides a Multi-Protocol Gateway (MPG)
    - Connects client requests that are transported over one or more protocols to a remote destination that uses the same or a different protocol
      - Supports the FTP, HTTP, HTTPS, IMS™, MQ, NFS, SFTP, TIBCO EMS, and WebSphere® JMS protocols

DataPower …

❖ **IMS Integration (XI50, XI50B, XI50z, XI52, XB60, XB62...)**

• **Three interfaces to get <u>to IMS</u> transactions:**

  • **IMS Connect Client**
    • Access to IMS applications using a DataPower embedded IMSClientConnect handler to IMS Connect

  • **Soap**
    • Access to IMS web services via the IMS SOAP Gateway

  • **MQ Client**
    • Access to IMS applications using an MQ server on system z and the MQ Bridge for IMS

http://www.redbooks.ibm.com/redbooks/pdfs/sg247988.pdf
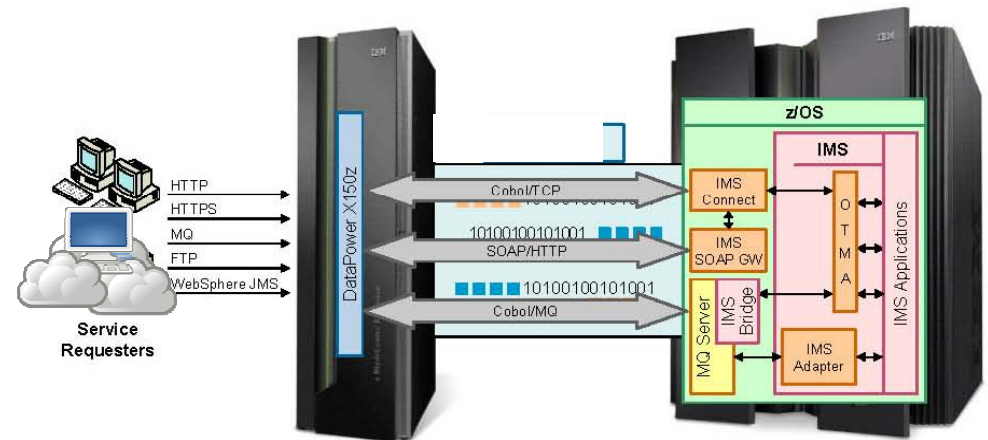
DataPower …

❖ **IMS DB feature**

- Firmware 6.0 and one of the following DataPower models
  - XG45 or XG45 Virtual Edition (with Database Integration Module feature)
  - XI52, XI52 Virtual Edition or XI50B (with Database Connectivity feature)
  - WebSphere DataPower B2B Appliance XB62

- Provides a standard WS façade to IMS
  - SOAP or REST call is mapped to a JDBC (DRDA) invocation
  - Exposes database content (information) *as a service*
  - Leverages extensive Web Services security and management capabilities of DataPower to more securely expose critical data to the enterprise

Client

SOAP or REST

DataPower

DRDA

IMS

WebSphere DataPower Family

IBM

Service Gateway XG45
- Entry-level device, slim footprint (1U)
- Security gateway (AAA, XML threat, etc)
- Service level management and monitoring
- Intelligent load distribution & dynamic routing
- Lightweight ESB functions (optional module)

Integration Appliance XI52
- High density 2U form
- Consumable hardware ESB Optimization
- "Any-to-Any" conversion at wire-speed
- Bridges multiple transport protocols
- Mainframe integration & enablement

Integration Blade XI50B/XI50z
- Functionally equivalent to XI52
- Form factor flexibility
- XI50B: BladeCenter form factor
- XI50z: zEnterprise BladeCenter Extension (zBX) form factor

B2B Appliance XB62
- High density 2U form
- B2B Messaging (AS1/AS2/AS3/ebMS)
- Trading Partner Profile Management
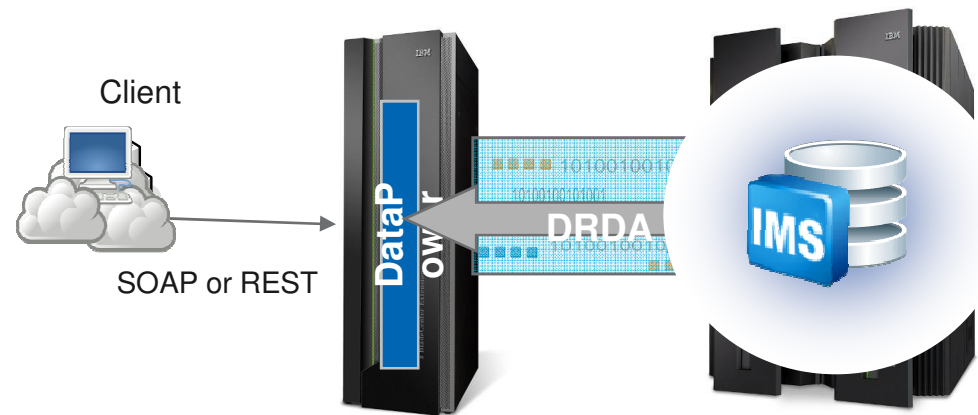- B2B Transaction Viewer

DataPower …

❖ **IMS DB feature**

- Access to IMS DB leverages existing and proven technology
  - IMS Universal JDBC driver
  - IMS DRDA server: IMS Connect/ODBM
  - IMS Catalog

DataPower
XG45, XI52,
XI50B, XB62

client

Routing/ data Trans-

SQL sends / receives

IMS Universal JDBC Driver

DRDA sends / receives

IMS Connect

DRDA/DDM

ODBM

DLI

IMS 12

IMS DB

IMS Catalog

DataPower…

❖ **IMS Callout support**

- Allows IMS applications to call a web service in the cloud
- Firmware 6.0 and one of the following DataPower models
  - WebSphere DataPower Integration Appliance XI52, XI52 Virtual Edition
  - WebSphere DataPower Integration Blade XI50B
  - WebSphere DataPower B2B Appliance XB62

WebSphere DataPower Family

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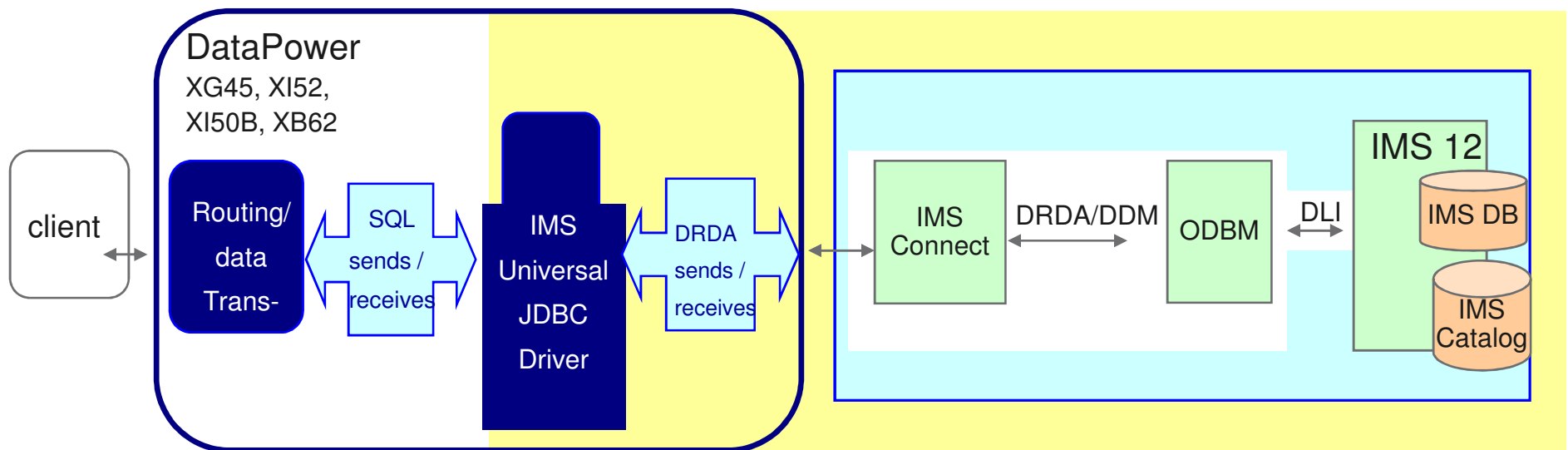
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- High density 2U form
- B2B Messaging (AS1/AS2/AS3/ebMS)
- Trading Partner Profile Management
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Client — TCP/IP — DataPower — TCP/IP —

IMS Connect
User exit (e.g..
HWSSMPL1)
User exit
(HWSDPWR1)

IMS OTMA — Appl1 Appl2 Appl3

IMS OTMA — Appl1 Appl2 Appl3

Callout scenario

New zOS Connect Liberty for IMS

zConnect Liberty for IMS

BlueMix
- CloudOE Java
- CloudOE Javascript
- Mobile/APIM

RESTful

zConnect
JSON to/from byte[] (C structure)

Data binding conversion/routing

zConnect
JSON to/from byte[] (Cobol copybook)

Security / Auditing / Metering

zConnect
JSON to/from byte[] (PL/I structure)

DB2

DLI

IMS

WOLA

TCP/IP

OTMA

IMS Connect

OTMA

ODBM

IMS DB

DLI

Dependent Region Message Processing Program (MPP)

Dependent Region Java Message Proc (JMP)

Dependent Region Batch Message Processing Program (BMP)

Dependent Region Java Batch Proc (JBP)

Dependent Region IMS Fast Path (IFP)

IMS dependent regions

- **zOS Connect Liberty for IMS**
- Same zConnect implementation – WOLA or the IMS Connect service provider handles requests targeted to existing IMS transactions and data.

DataPower and zOS Connect

Scenario	Portion of the solution provided by Data Power	Portion of solution provided by zOSConnect
Bluemix application running in the cloud connecting to CICS or IMS program via REST using zOSConnect	Secure tunnel from the Bluemix cloud to inside the zOSConnect security domain that routes and potentially augments REST calls to the target - Tailor JSON input/output - Build new API based on the response and potential calls to other subsystems	zOS platform common connector to CICS, IMS (and others) that plugs into: - zOS capacity planning metric and charge back data (SMF) - zOS workload mgmt - zOS IT analytics - zOS security connection with auditing - zOS log integration for diagnostics and mgmt Consumes JSON and products JSON
Bluemix application running in the cloud connection to a CICS or IMS program via SOAP WebService	Secure tunnel from Bluemix to inside the zOS security domain, parses XML, generates binary structures to call IMS and CICS	Not involved in runtime – but involved in discovering APIs for API management

IMS – is a Private Cloud

- Provides the Infrastructure (IaaS)
  - Dynamically shared set of virtual computing resources
    - zEnterprise platform
    - Parallel Sysplex adds new instances of IMS control regions
      - Shared queues and data sharing
    - Dynamically defined IMS resource

- Builds on IaaS to provide the IMS platform as a service (PaaS)
  - IMS provides the application middleware environment for high-performing applications
  - DL/I and JDBC interfaces to get to resources

IMS – is a Private Cloud …

- Provides service delivery to access software as services (SaaS)
    - IMS Enterprise Suite
    - Inbound – expose IMS transactions and data as services
    - Outbound – Callout to web services

- Supports business processes as a service (BPaaS)
    - Customer-written applications or business processes

- Hybrid Cloud-Enabled
    - Integration of traditional IT, mission-critical applications with clouds
    - Public Cloud + IMS Private Cloud = the Perfect Hybrid "cloud"

Dynamic Definition of IMS Resources

Five Essential Cloud Characteristics:

1. On-demand self-service
2. Broad network access
3. Location independent resource pooling
✓ **4. Rapid elasticity**
5. Measured Service

IMS

DATABASES
APPLCATIONS
TRANSACTIONS

CREATE
UPDATE
DELETE
QUERY
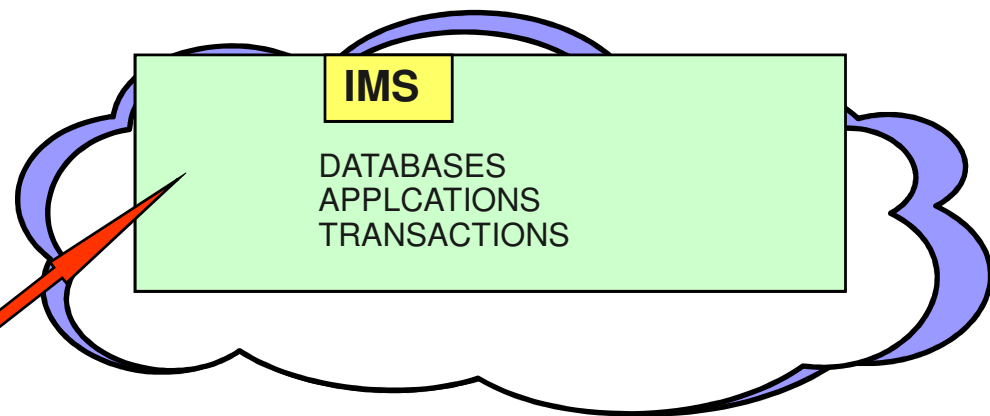
Dynamic Metadata Management

- Database and Application Program resources are managed by IMS

- IMS Catalog

- database definitions

- Segments, Mappings, Fields and data types

- program specifications

IMS Metadata

ACBLIB

ACBGEN
DBDGEN/PSBGEN

IMS Explorer

Extended
PSB source

Extended
DBD source

IMS 12 and 13

- Database versioning

- HALDB and DEDB dynamic alter

- Dynamic DB buffer management

- Synchronous program switch

- Max 4095 concurrent application threads per IMS image

IMSPlex – Parallel Server Environment IaaS and PaaS

- IMS is a dynamic and configurable platform

- Provides standard interfaces to access resources

- Does not require application program recompiles even if the IMS release is changed

- Does not require application program changes even when the network or db structure changes

Five Essential Cloud Characteristics:

- ✓ 1. On-demand self-service
- ✓ 2. Broad network access
- ✓ 3. Location independent resource pooling
- ✓ 4. Rapid elasticity
- ✓ 5. Measured Service

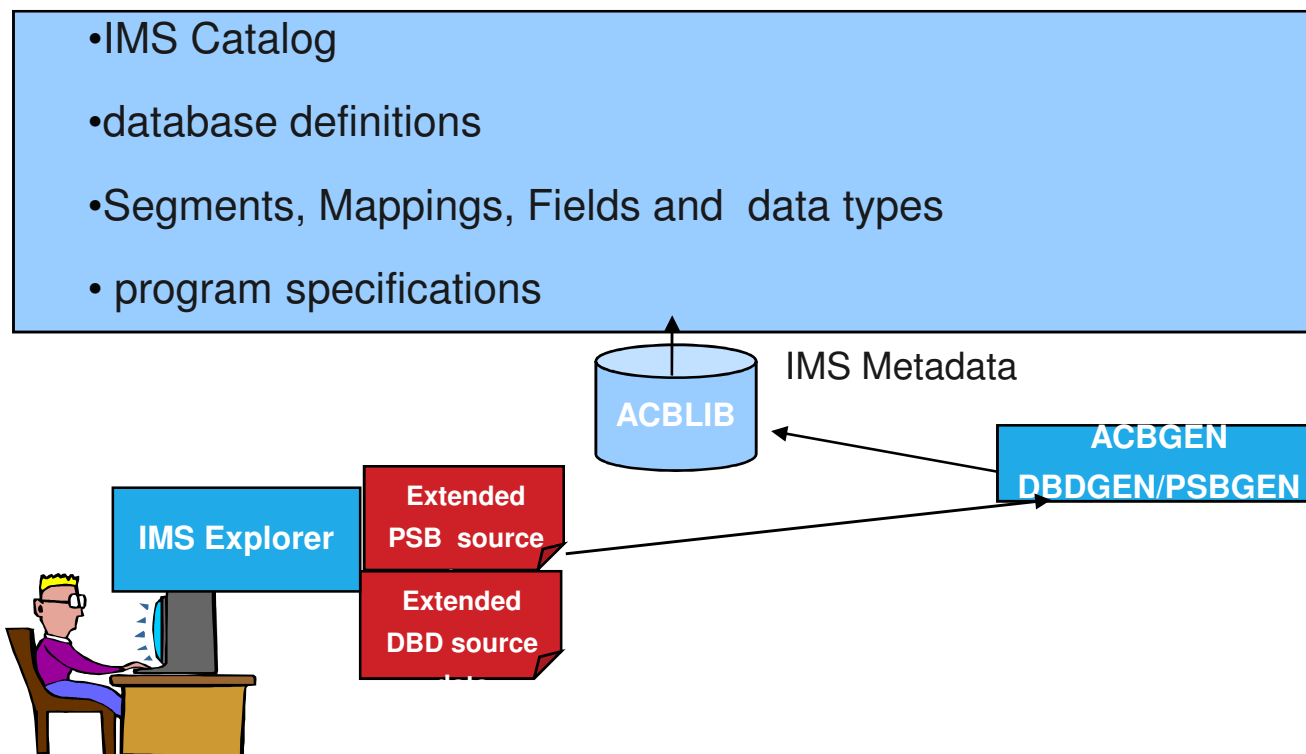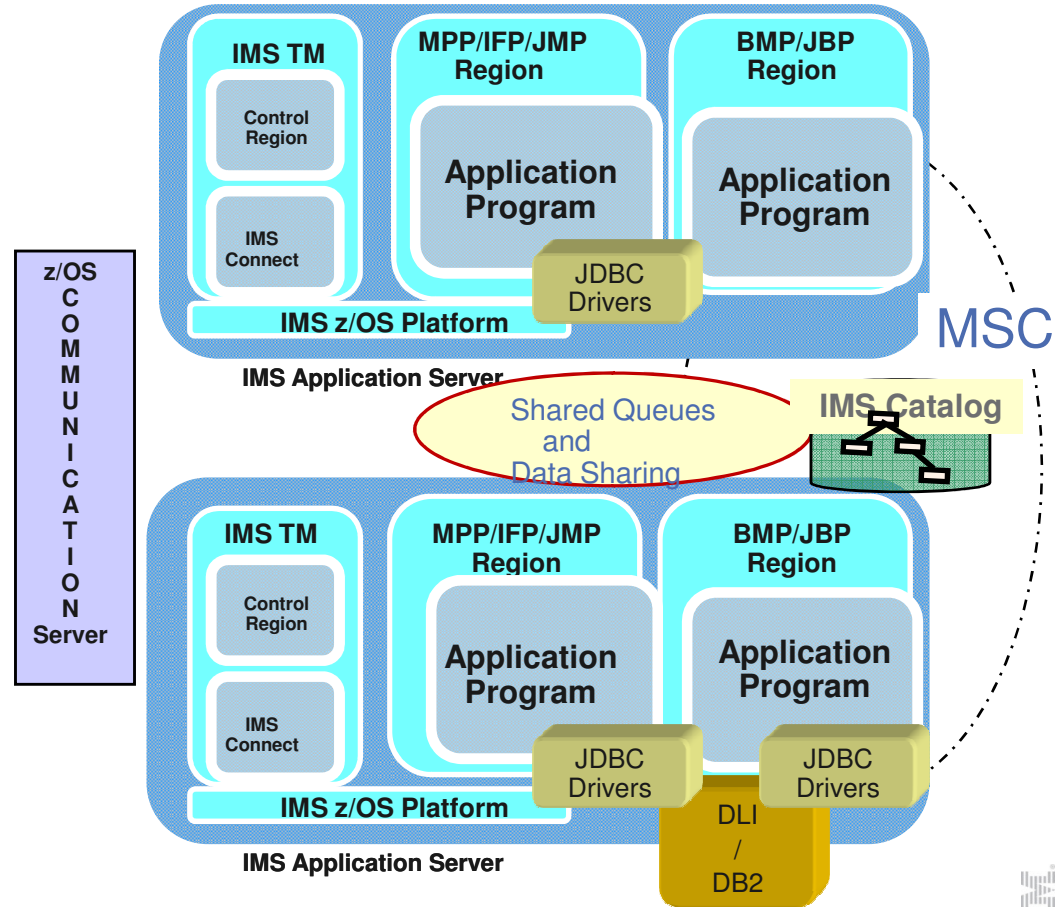z/OS COMMUNICATION Server

IMS TM

Control Region

IMS Connect

MPP/IFP/JMP Region

Application Program

BMP/JBP Region

Application Program

JDBC Drivers

IMS z/OS Platform

IMS Application Server

MSC

Shared Queues and Data Sharing

IMS Catalog

IMS TM

Control Region

IMS Connect

MPP/IFP/JMP Region

Application Program

BMP/JBP Region

Application Program

JDBC Drivers

JDBC Drivers

DLI / DB2

IMS z/OS Platform

IMS Application Server

IMS Cloud Parts

SaaS

IMS Cloud TM Extensions

IMS

IMS Connect

Transaction manager

IMS APP

OTMA

ODBM

Database manager

ODBA /DRA

Database

IMS Catalog

IMS Cloud DB Extensions

DBaaS

Specifically

- IMS provides interfaces that can be deployed in the cloud to access IMS
  - IMS SOA Enterprise Suite – SaaS (Software as a Service)
    - IMS Enterprise Suite Connect API
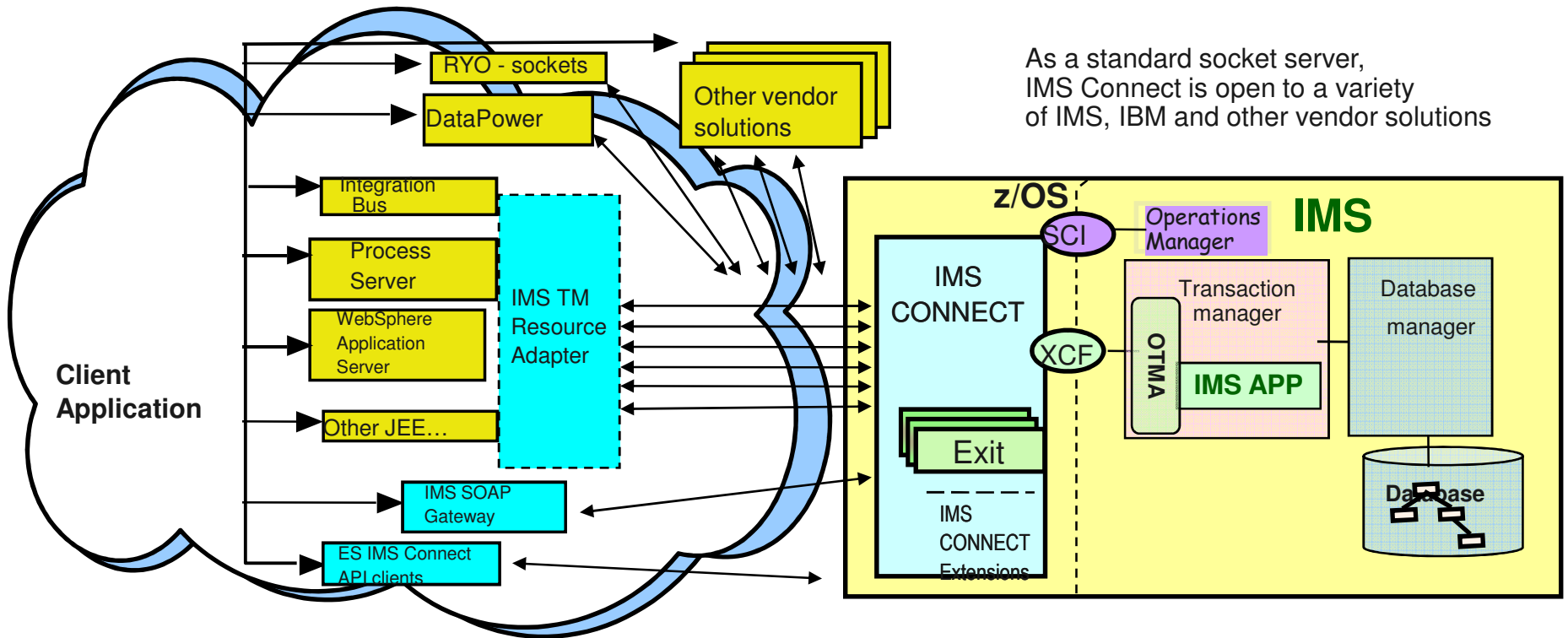   - IMS Enterprise Suite SOAP Gateway
    - IMS Enterprise Suite Data Provider for Microsoft .NET
    - IMS Enterprise Suite Explorer for Development
    - IMS Enterprise Suite Java Message Service (JMS) API
    - IMS Mobile Feature Pack (IMS Mobile)
    - IMS TM Resource Adapter
    - IMS MFS SOA Support
    - IMS solutions for Java development

WWW.IBM.COM/IMS

IMS Connect and IMS TM (Supports SaaS)

As a standard socket server, IMS Connect is open to a variety of IMS, IBM and other vendor solutions

Client Application

- RYO - sockets
- DataPower
- Other vendor solutions
- Integration Bus
- Process Server
- WebSphere Application Server
- IMS TM Resource Adapter
- Other JEE…
- IMS SOAP Gateway
- ES IMS Connect API clients

z/OS

IMS

- IMS CONNECT
- SCI
- Operations Manager
- XCF
- OTMA
- Transaction manager
- IMS APP
- Database manager
- Exit
- IMS CONNECT Extensions
- Database
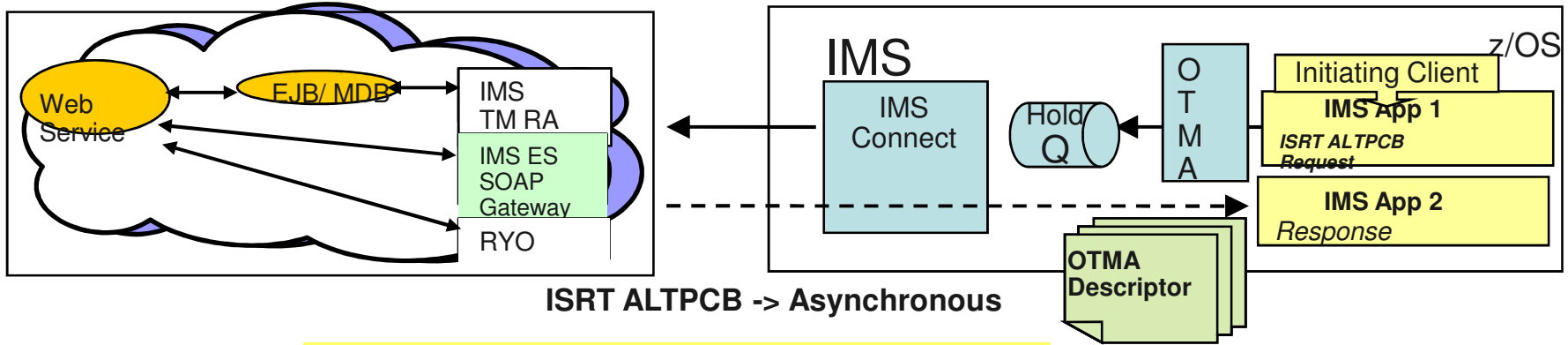
IMS Components that can be deployed in a cloud

IMS Mobile Solution Version 3.1.1
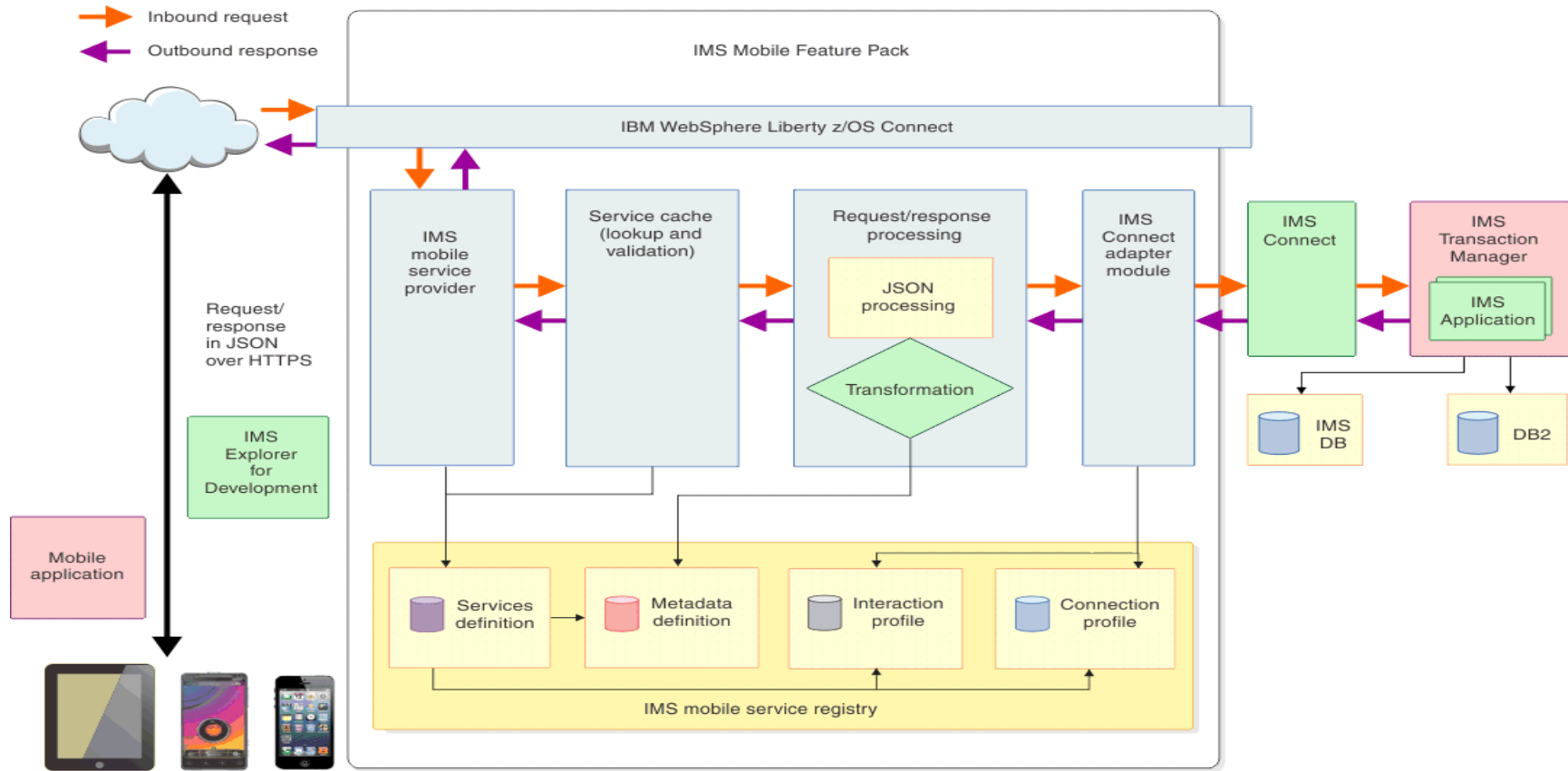
IMS Callout Models

Asynchronous callout

ISRT ALTPCB -> Asynchronous

Synchronous callout

JMS or DL/I ICAL -> Synchronous
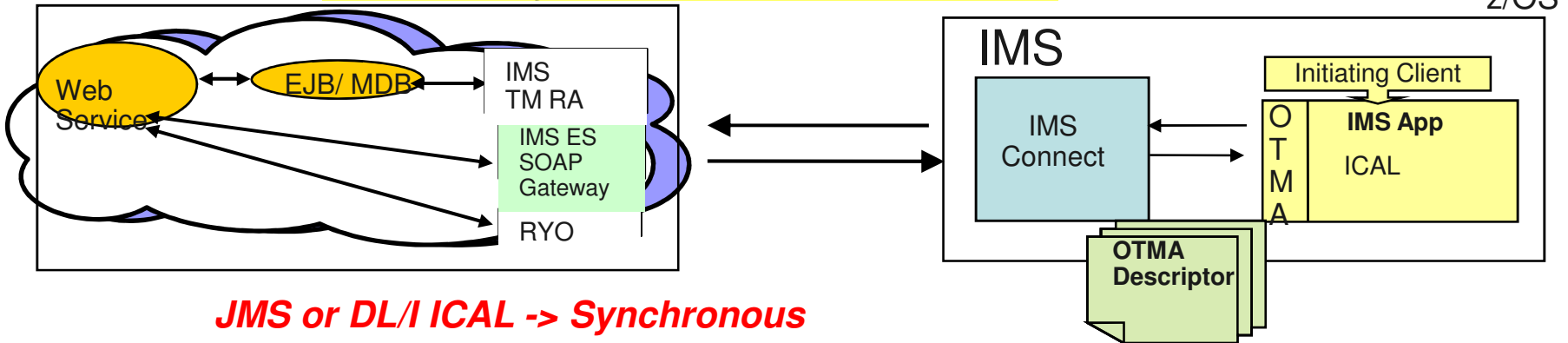
IMS Connect and IMS DB

(Supports DBaaS)

Client Application

.Net - DRDA

WebSphere Application Server

IMS Universal DB Resource Adapter

Watson

DataPower

QMF

COGNOS

IMS Universal JDBC Driver

BYO Java

IMS Universal JDBC or DL/I Driver

D R D A

z/OS

SCI

Operations Manager

IMS

IMS CONNECT

Exit

IMS CONNECT Extensions

SCI

ODBM

Database manager

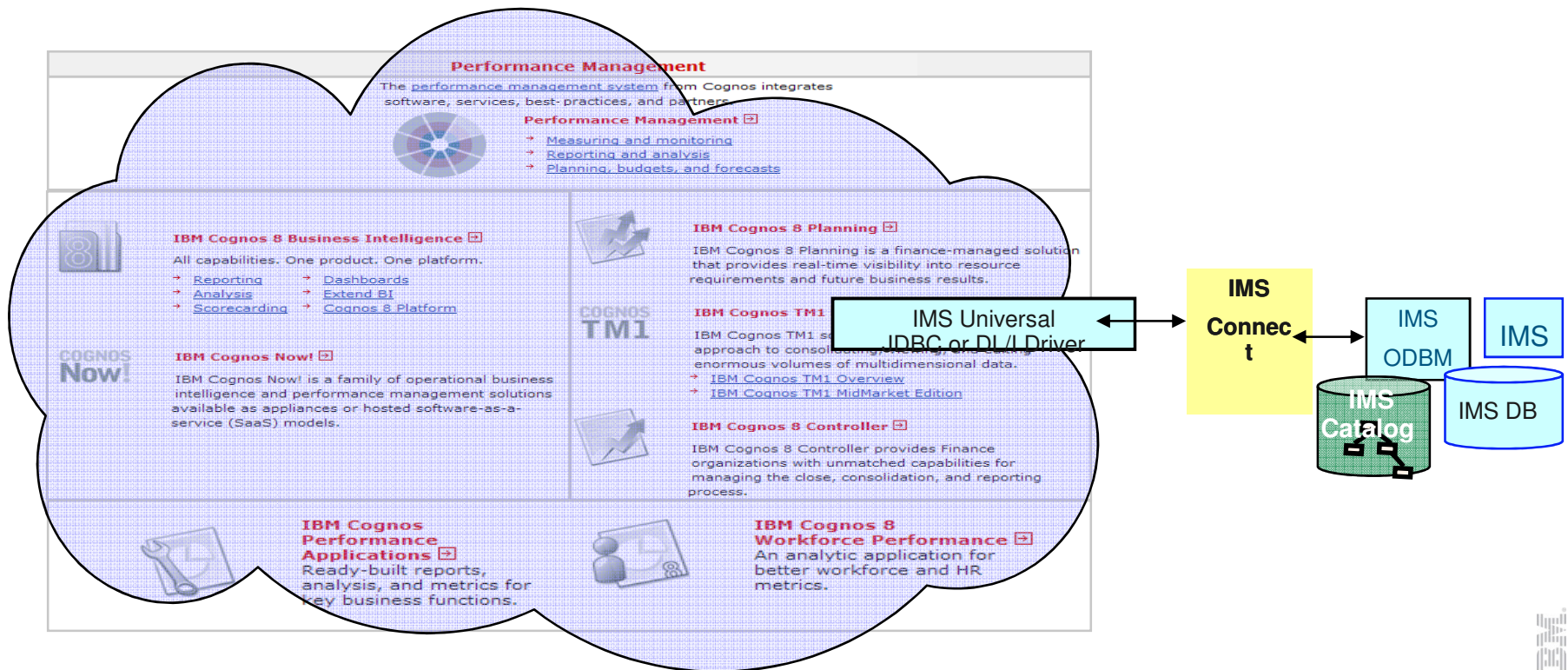IMS Catalog

Database

IMS DBaaS Private Cloud
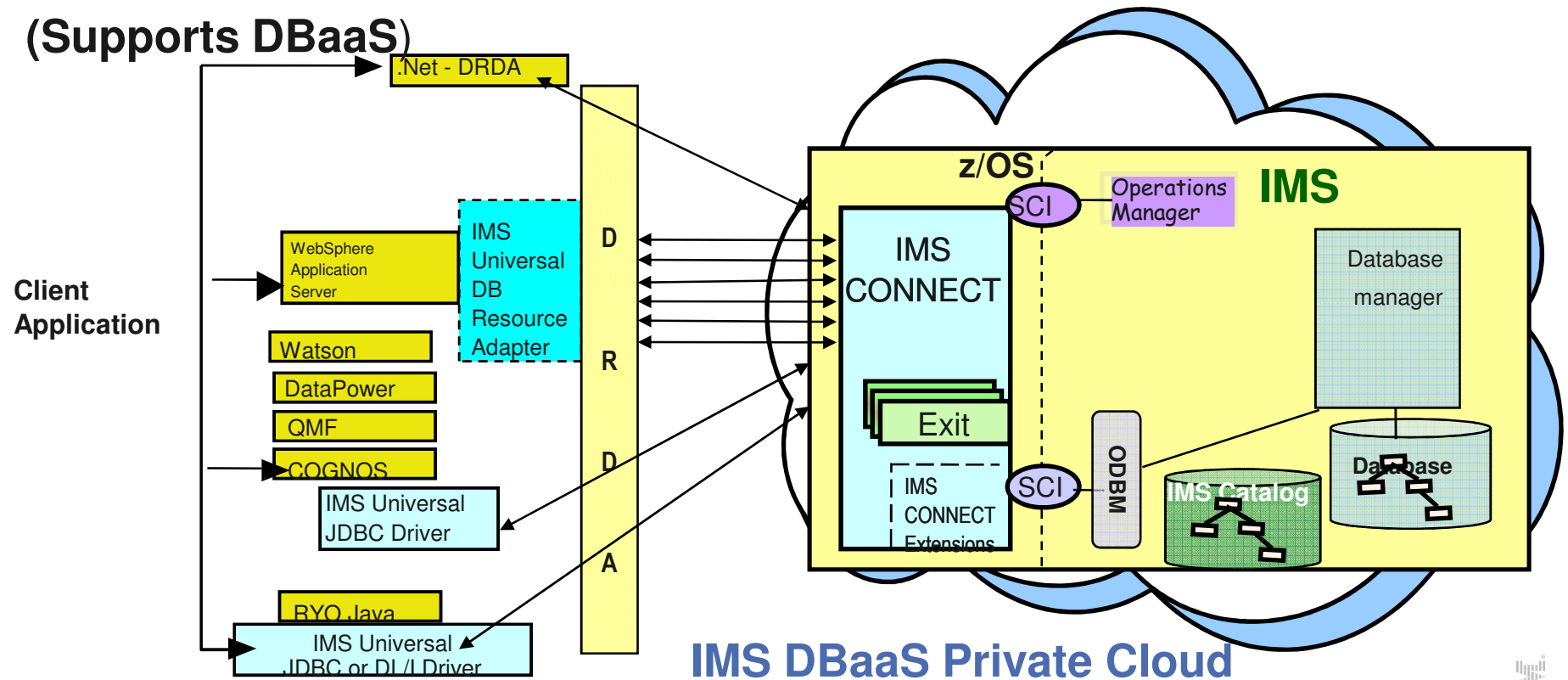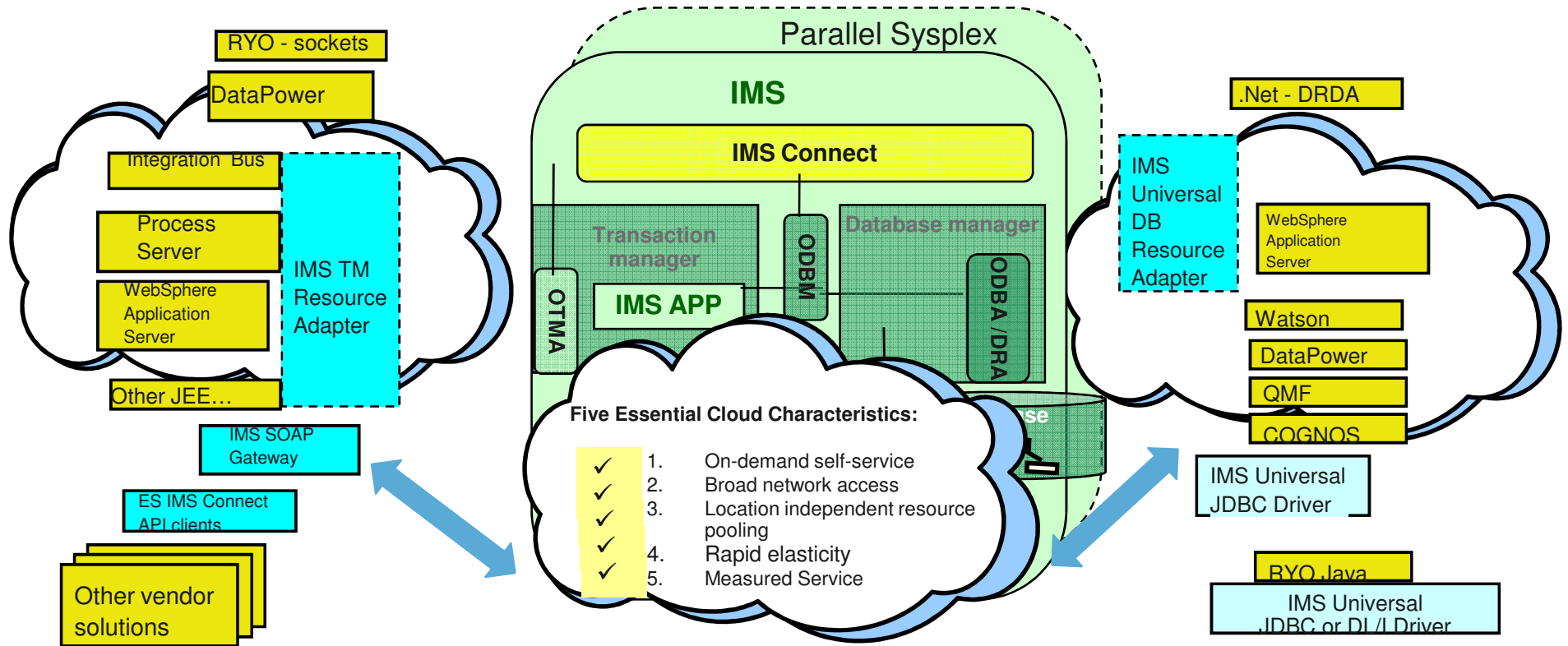
COGNOS – Operational BI and Reporting

The Perfect Cloud

- IMS interfaces can reside in a distributed cloud
  - IMS Soap Gateway
  - IMS TM Resource Adapter
  - IMS Connect API
  - IMS Connect RYO clients
  - IMS ES Data Provider for .NET
  - …

- IMS leverages z Systems functionality
  - High performing and comprehensive server

- IMS answers the requirements to be a private cloud

The Perfect Cloud

RYO - sockets

DataPower

Integration Bus

Process Server

WebSphere Application Server

IMS TM Resource Adapter

Other JEE…

IMS SOAP Gateway

ES IMS Connect API clients

Other vendor solutions

Parallel Sysplex

IMS

IMS Connect

Transaction manager

ODBM

Database manager

OTMA

IMS APP

ODBA /DRA

.Net - DRDA

IMS Universal DB Resource Adapter

WebSphere Application Server

Watson

DataPower

QMF

COGNOS

IMS Universal JDBC Driver

RYO Java

IMS Universal JDBC or DL/I Driver

Five Essential Cloud Characteristics:

✔ 1. On-demand self-service
✔ 2. Broad network access
✔ 3. Location independent resource pooling
✔ 4. Rapid elasticity
✔ 5. Measured Service

Public Cloud + IMS Private Cloud = the Perfect Hybrid "cloud"