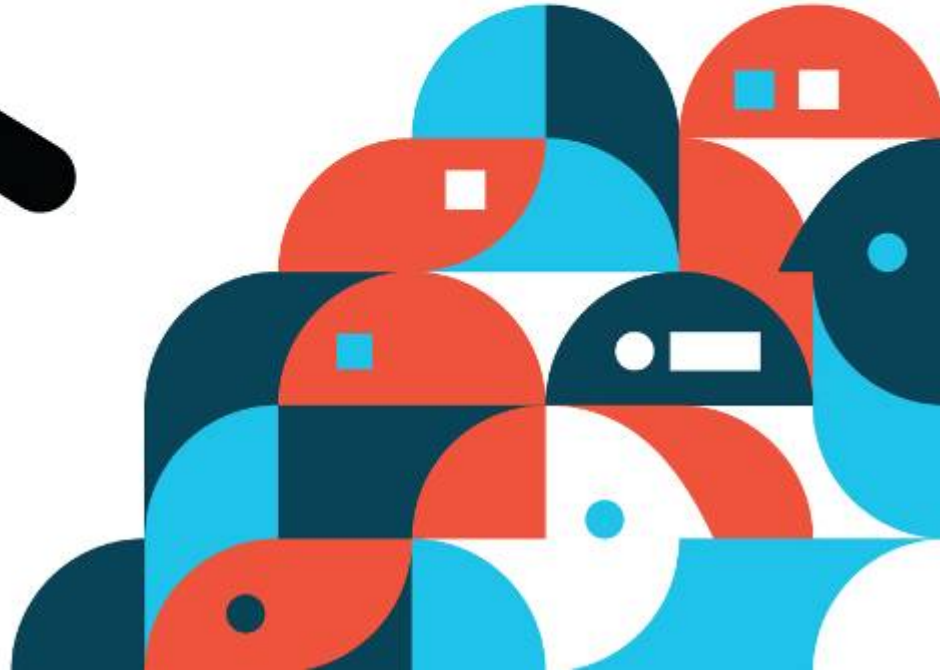
Rethink IT.
Reinvent Business.
Smart, Secure and Ready for Business

IBM SmartCloud Foundation



Pietro Iannucci - STSM, Cloud Computing Client Engagements Architect (*pietro.iannucci@it.ibm.com*)

Topics

- Cloud Architectural view
- Cloud Solutions view
- Cloud Customers view

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Pressures like increasing productivity and the changing economics of computing are placing greater demands on IT systems.

Accelerating globalization of value chains

35 The typical manufacturer uses components from 35 partners across the globe

Increased demands

10x growth in digital data from 2007 to 2011.

Customer-driven innovation

56% of customers demand increased self-service capabilities

54%

of surveyed enterprise IT budgets in 2010 were spent on ongoing operations and maintenance costs.*

*Source: Forrester Research, Inc. "2011 IT Budget Planning Guide," October 7, 2010 by Craig Symons

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IT and Business are attracted to cloud for different reasons

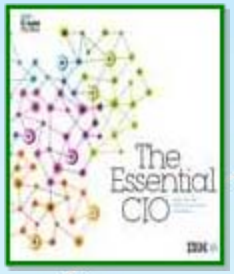
Efficiency

Transformation

Rethink IT

- **Rapidly deliver services**
- **Integrate services across cloud environments**
- **IT governance and policies**
- **Radically exploiting standardization**
- **Increase efficiency**

60%
of CIOs plan to use cloud (up from 33% 2 years ago)



- **Creating new business models**
- **Faster time to market and innovation**
- **Reengineering business process**
- **Meet changing customer expectations**

Reinvent Business

55%
of business executives believe cloud enables business transformation and leaner, faster, more agile processes

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As a result, cloud is an increasingly attractive means of creating and delivering IT services.

"Our commitment to informed decision making led us to consider private cloud delivery of Cognos via System z, which is the enabling foundation that makes possible +$20M savings over 5 years."

– IBM Office of the CIO

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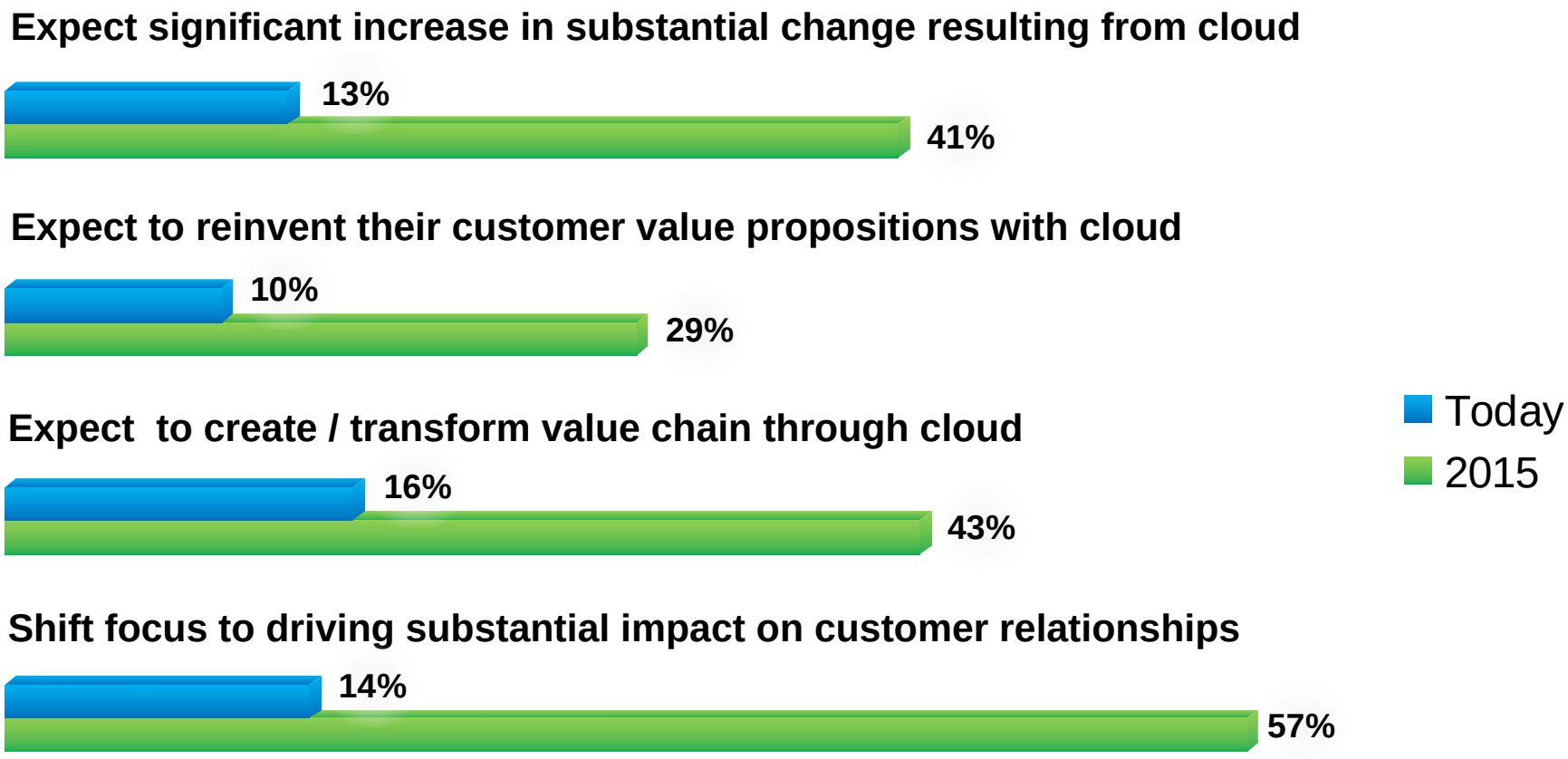
The most forward-thinking companies also see cloud as a force that will impact their business models



*Source: Institute for Business Value / The Economist study 2011

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IBM identified four Cloud Adoption Initiatives to match the market approach to the Cloud topic

Cloud enabled Data Center (IaaS)

Integrated service management, automation, provisioning, and self service

Cloud Platform Services (PaaS)

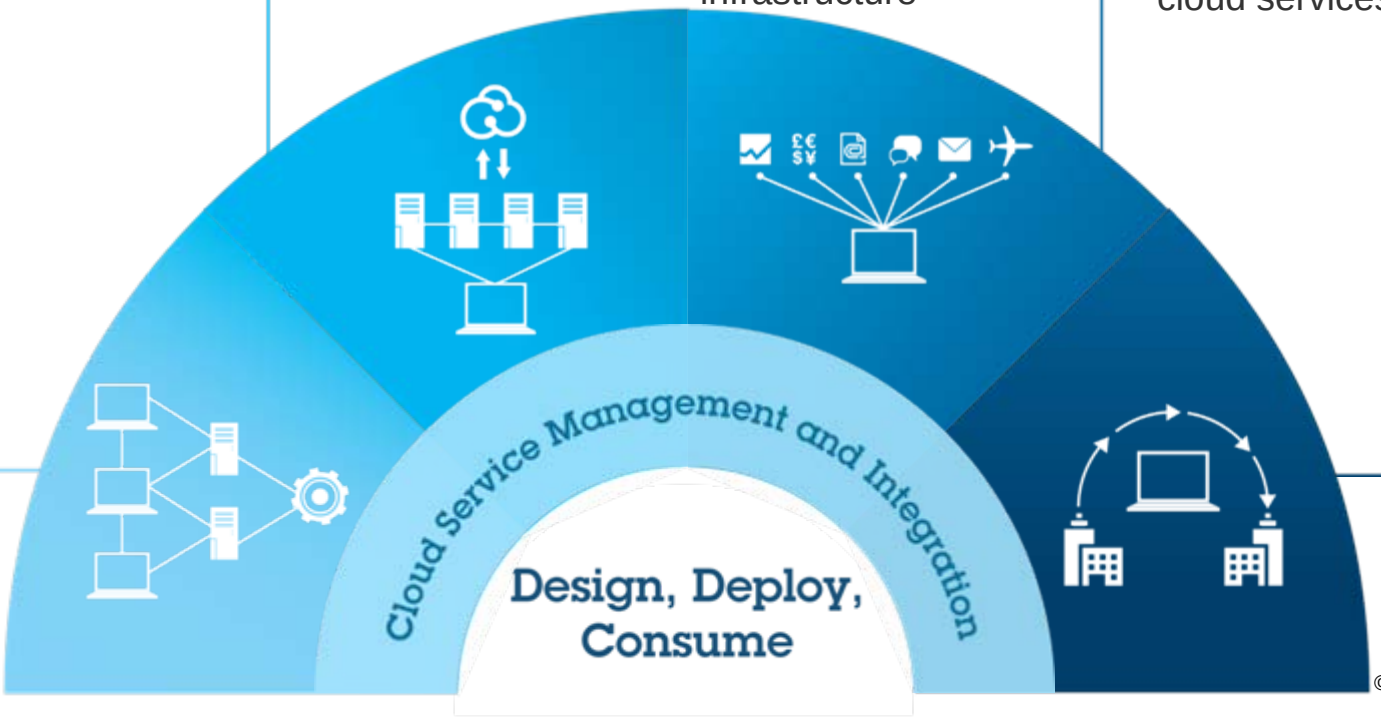
Pre-built, pre-integrated IT infrastructures tuned to application-specific needs

Business Solutions on Cloud (SaaS)

Capabilities provided to consumers for using a provider's applications running on a cloud infrastructure

Cloud Service Provider

Advanced, reliable, highly secure and scalable platform for creating, managing, and monetizing cloud services



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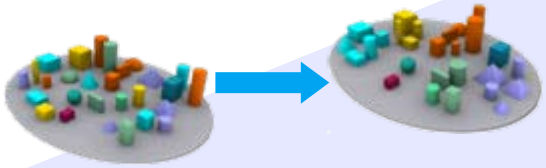
The journey of IT Transformation to a Cloud Enabled Datacenter

Cut IT expenses, manage complexity and optimize your infrastructure

Consolidate and Virtualise



Standardise

Automate and Manage

Self-service

Optimise Cloud Ready

Infrastructure efficiency…

Virtualisation of hardware

Virtualisation drives **lower capital** requirements

Utilisation of infrastructure

Virtualised environments only get **benefits of scale** if they are highly utilised

Industrialization of labour…

Standardisation of workloads

Lower complexity = more automation possible = **reduced IT labour costs** and faster delivery

Automation of management

Take repeatable tasks and automate services to **lower labour costs**, reduce errors and deliver faster

Self service

Clients who can "serve themselves" **require less support, improve productivity and get services faster**

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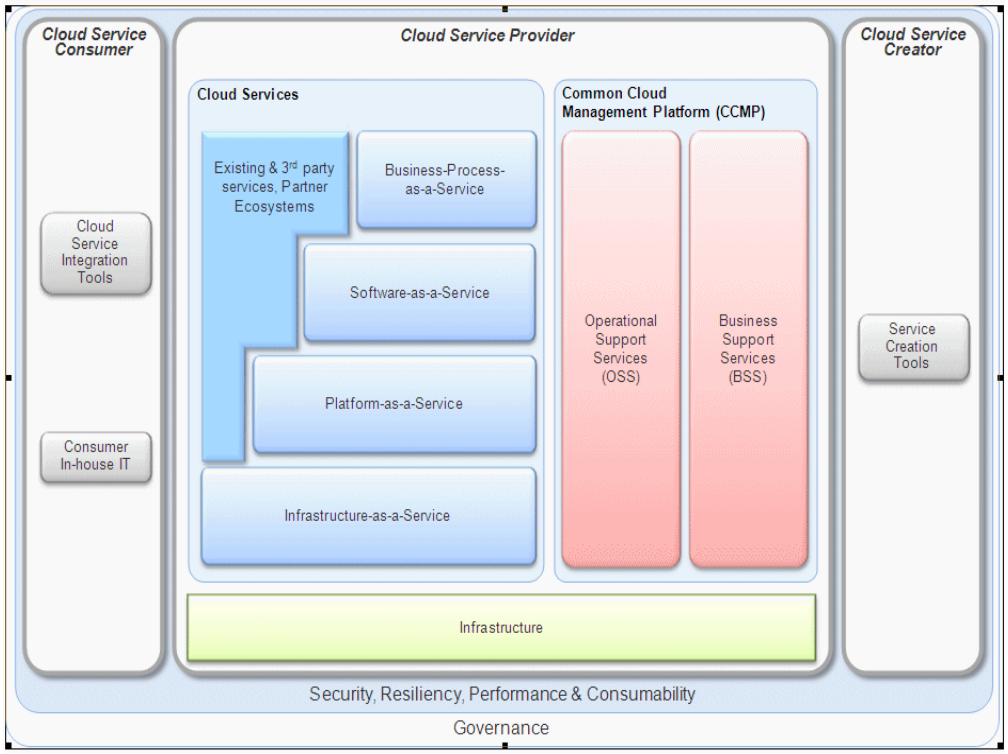
Cloud projects and Cloud environments have to be managed with a clear reference architecture in mind

The IBM Cloud Computing Reference architecture (CC RA) is based on knowledge of IBM's services,software & system experiences, including IBM Research and Service Innovation Lab.

The IBM Cloud Computing Reference Architecture is reflected in the design of:

- IBM-hosted cloud services implemented for clients
- IBM cloud appliances
- IBM cloud service management products

The CC RA consists of tens of detailed documents representing IBM knowledge on how to architect, design and implement clouds



IBM Cloud Computing Reference Architecture

Cloud Standards Customer Council

THE Open GROUP
Making standards work®

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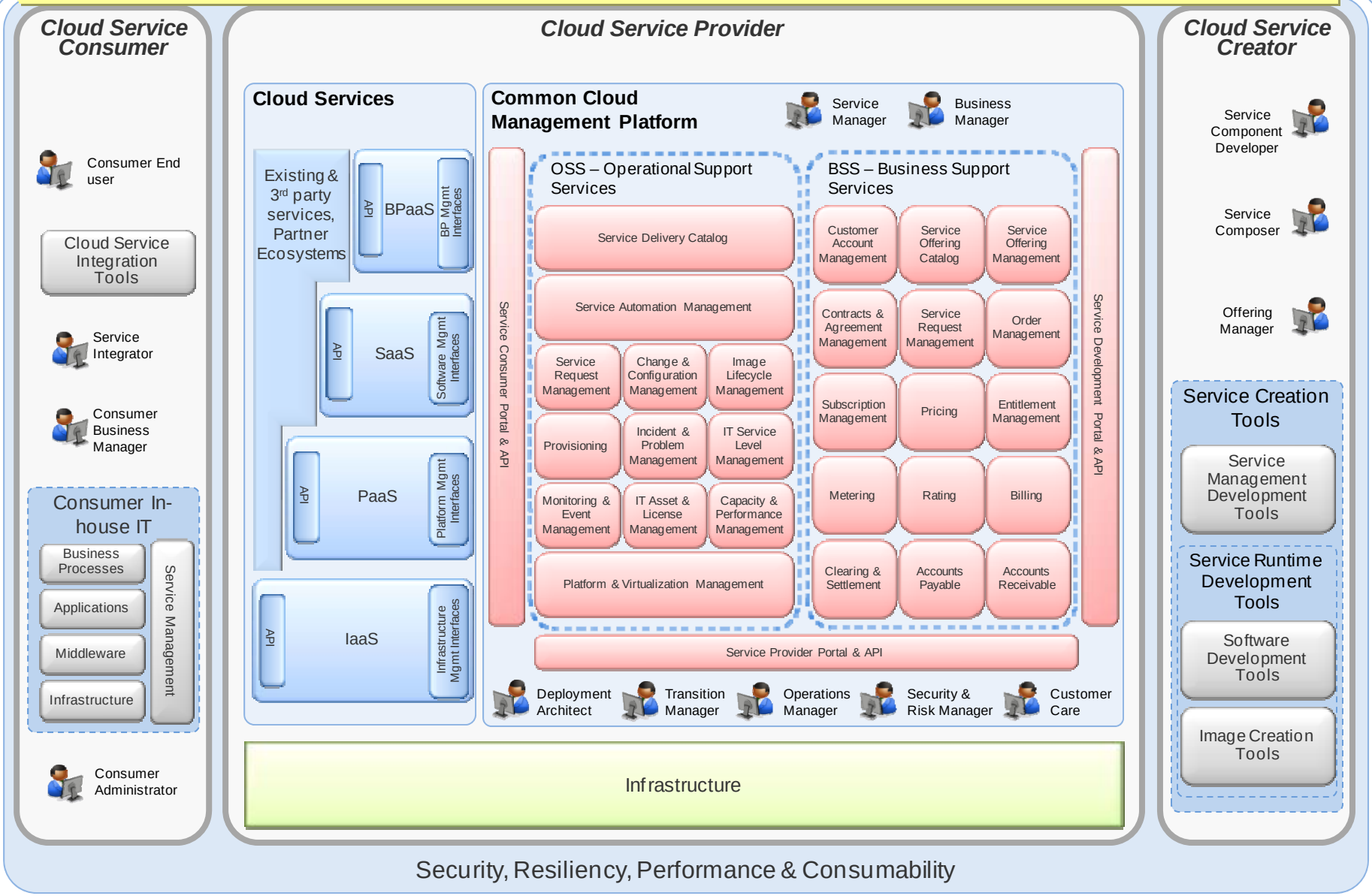
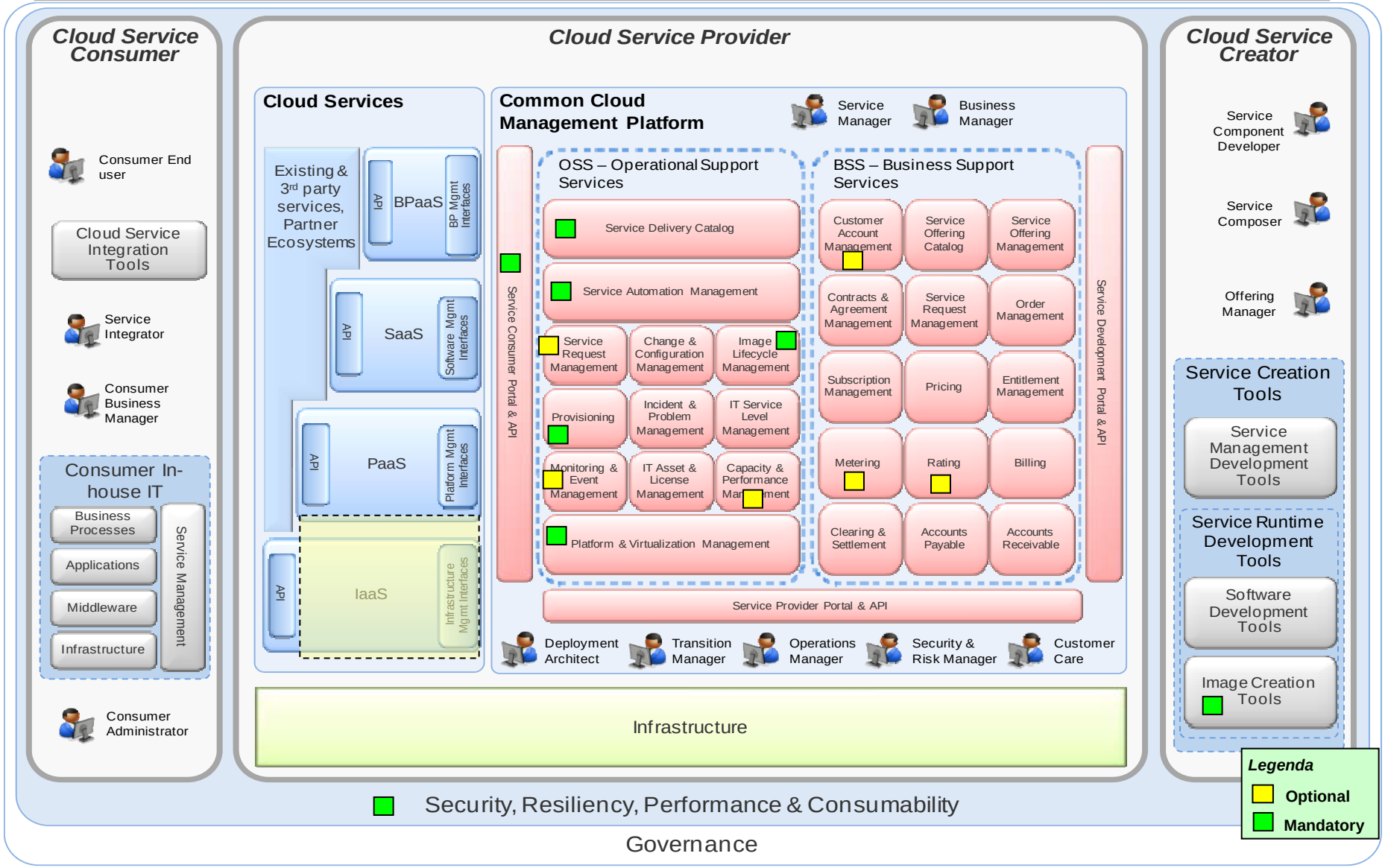
IBM Cloud Computing Reference Architecture – Detail

IBM CCRA provides Architectural framework to implement cloud adoption patterns *incrementally*



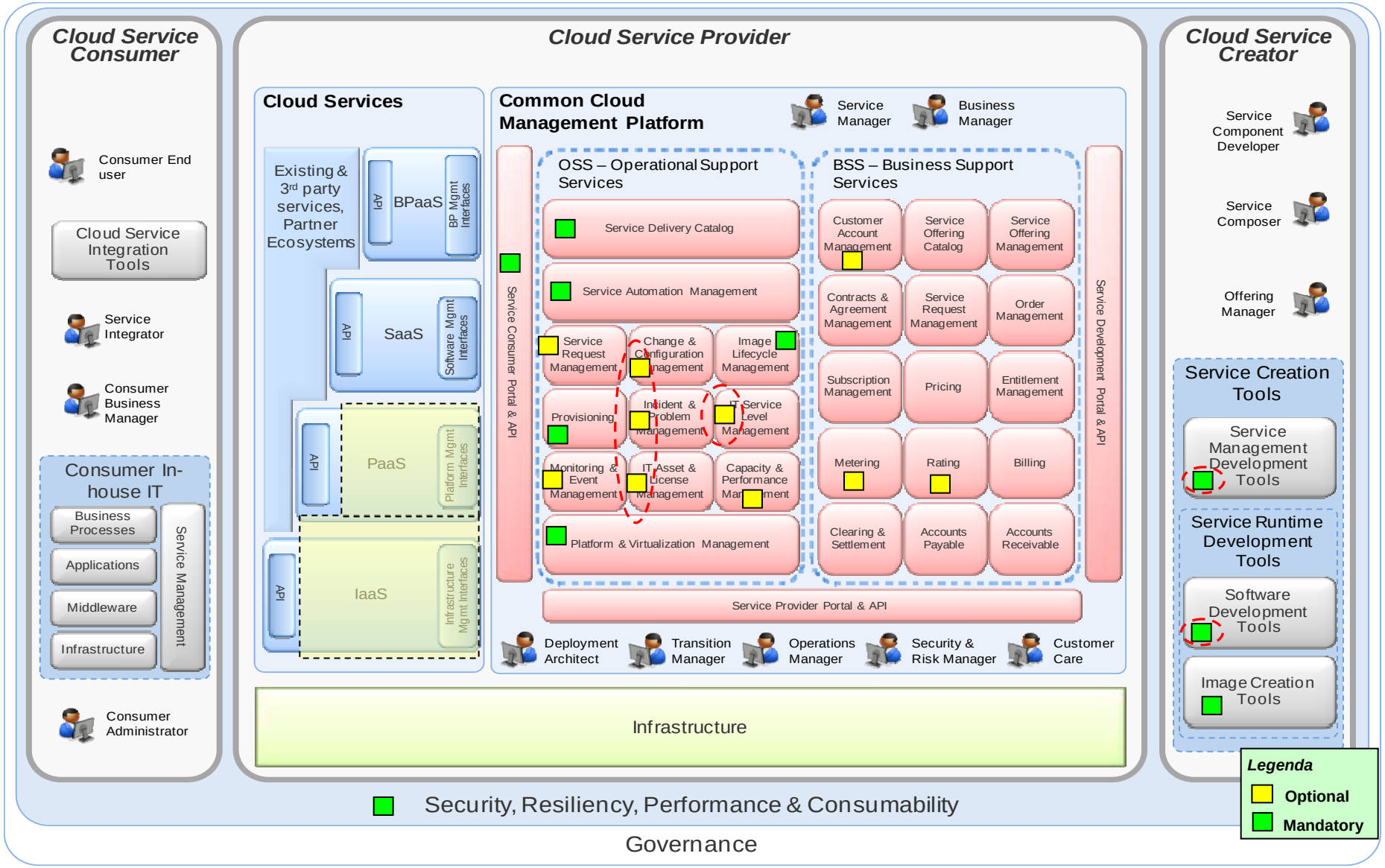
Cloud Enabled Datacenter – CCRA components mapping

Minimum set of capabilities needed to implement Iaas and IaaS+ (single VMs with middleware S/W stack) to deliver dev/test and production services internally to the enterprise



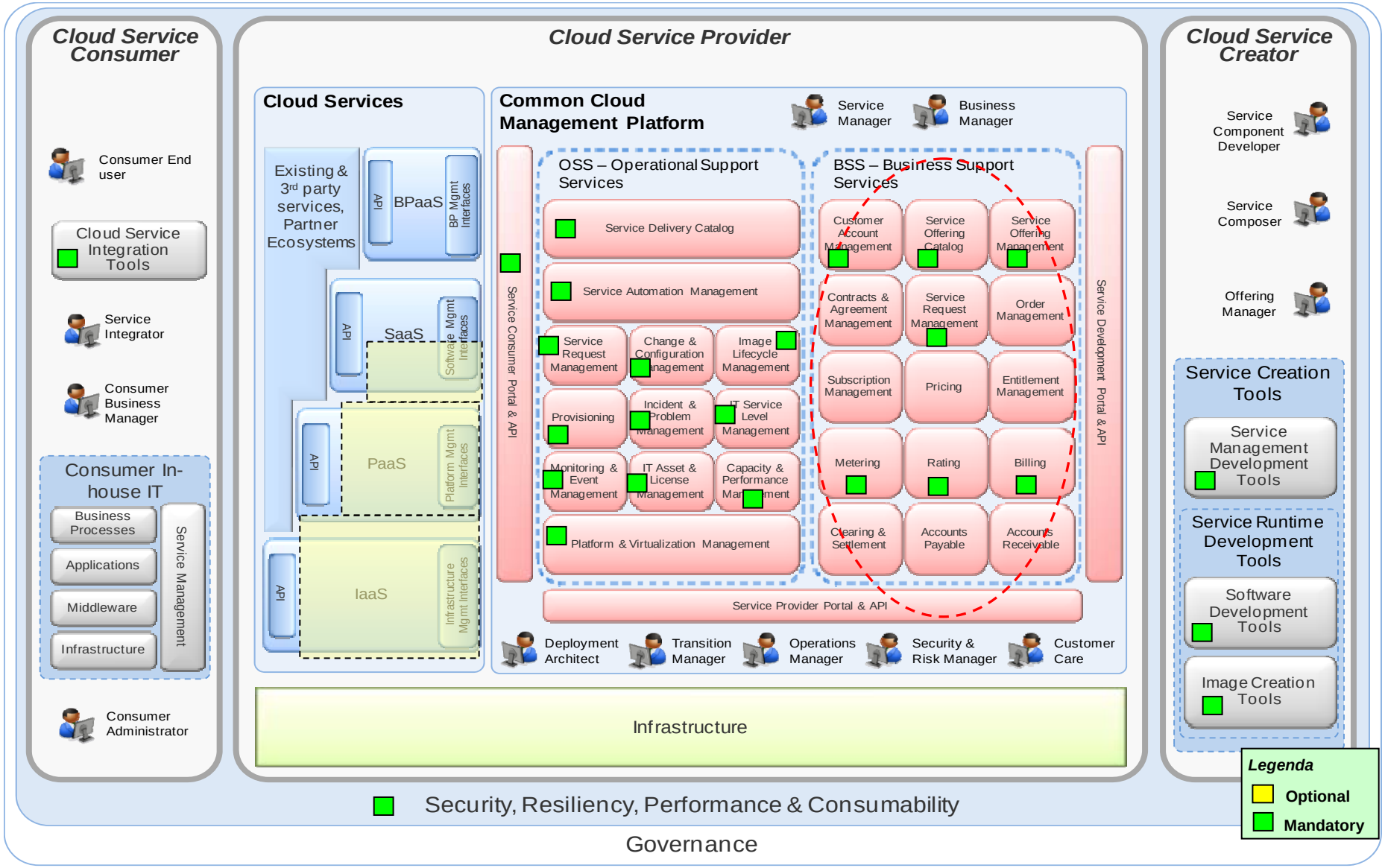
Cloud Platform Services – CCRA components mapping

Minimum set of capabilities needed to provide a PaaS solution (middleware stacks and topologies) for production ready environments integrated with major System Management processes and tools



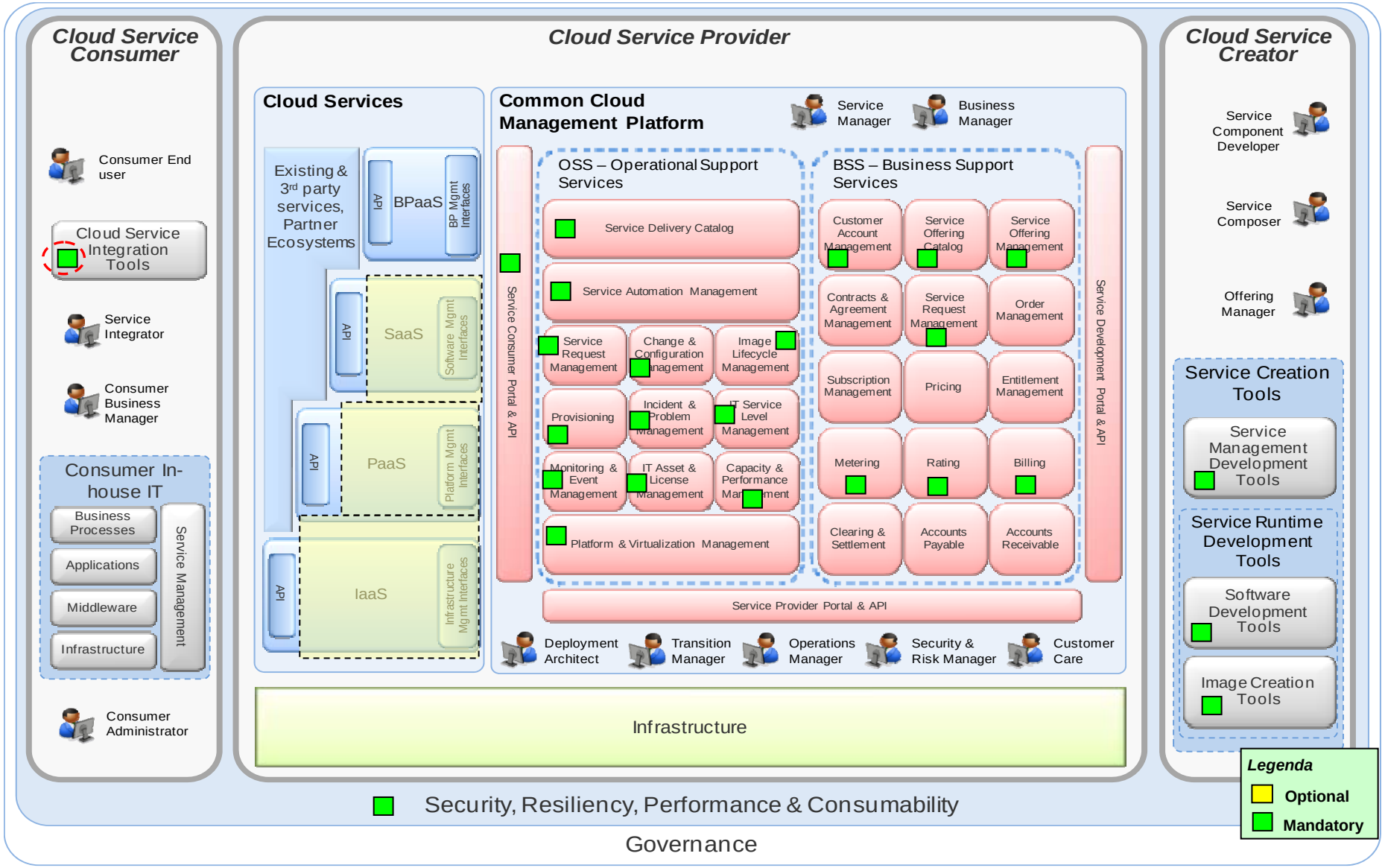
Cloud Service provider – CCRA components mapping

Set of capabilities needed to deliver advanced PaaS services to external customers with a strict governance and management model for Carrier grade Services Providers



Business solutions on Cloud – CCRA components mapping

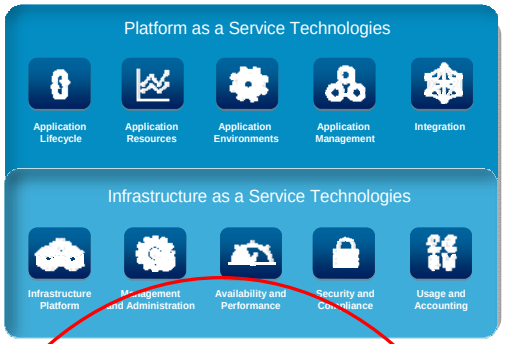
Set of capabilities needed to provide PaaS, SaaS and BPaaS to consumers and to allow integration with internal and external rocesses and applications



IBM SmartCloud has a comprehensive cloud portfolio

IBM SmartCloud Foundation

Private and Hybrid Clouds

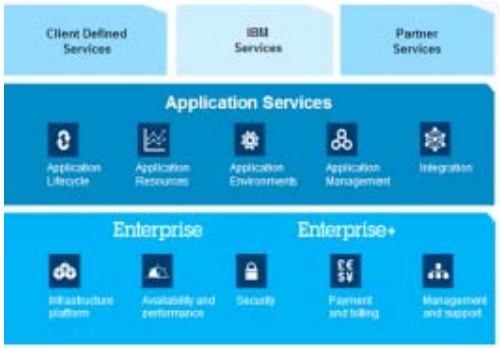


Cloud Enablement Technologies

- Technology to deploy cloud with support for image management and rapid provisioning
- Build and rapidly scale private or hybrid cloud environments with unparalleled time-to-market, integration and management

IBM SmartCloud Services

Managed Cloud Services



Infrastructure and Platform as a Service

- IBM SmartCloud Service Delivery platform for deploying enterprise applications
- Delivered by IBM Cloud Data Center SmartCloud service delivery platform

IBM SmartCloud Solutions

Cloud Business Solutions

Software and Business Process as a Service

- Software as a service coupled with deep industry iinsights and solutions
- BPM, Analytics, Social Business, Smarter Commerce, Smarter City

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Topics

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- Cloud Customers view

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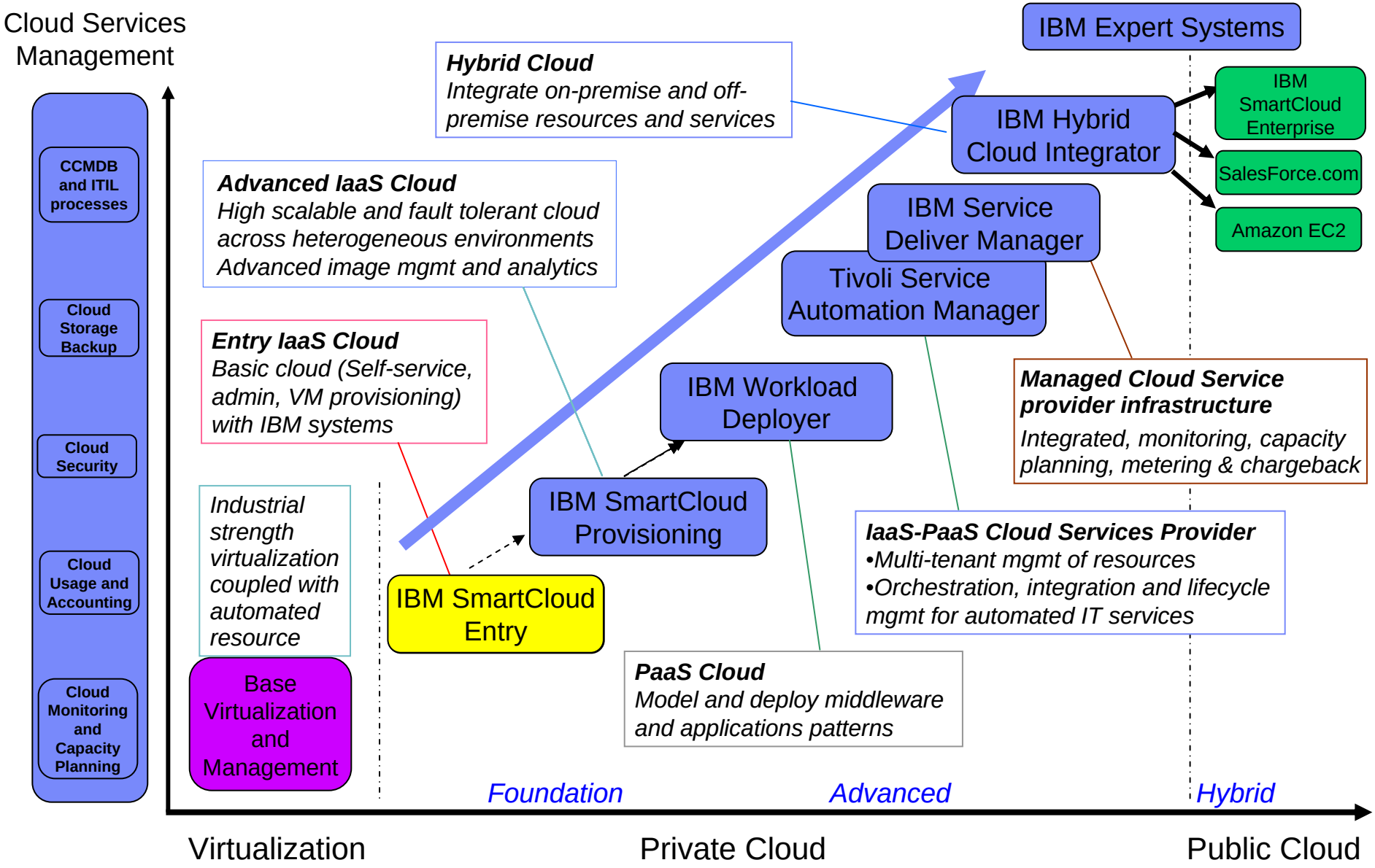
Multiple entry points for implementing Private and Hybrid Clouds



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IBM SmartCloud Entry

Clients need to quickly extend their new and existing infrastructure to the cloud while lowering capital costs and risk.

- **Simplified Cloud administration with intuitive interface** lowers administrative overhead
- **Improved operations productivity** with easy self-service User Interface
- **Open and extensible** for easy customization to changing business needs
- **Standardization of virtual machines and images** reduces management costs and accelerates responsiveness to changing business needs
- **Improved utilization of infrastructure** by highly optimized IBM systems, simpler consolidation / management

- **Accelerate Time to Market** Demonstrated 35x time to market improvement for new applications
- **Integrated Management** Approvals, metering, billing, users and projects through a single pane of glass
- **Flexible, modular design:** Small Footprint -- simple, quick install on systems w/ VMControl, Extensible via REST API lets partners easily customize the UI

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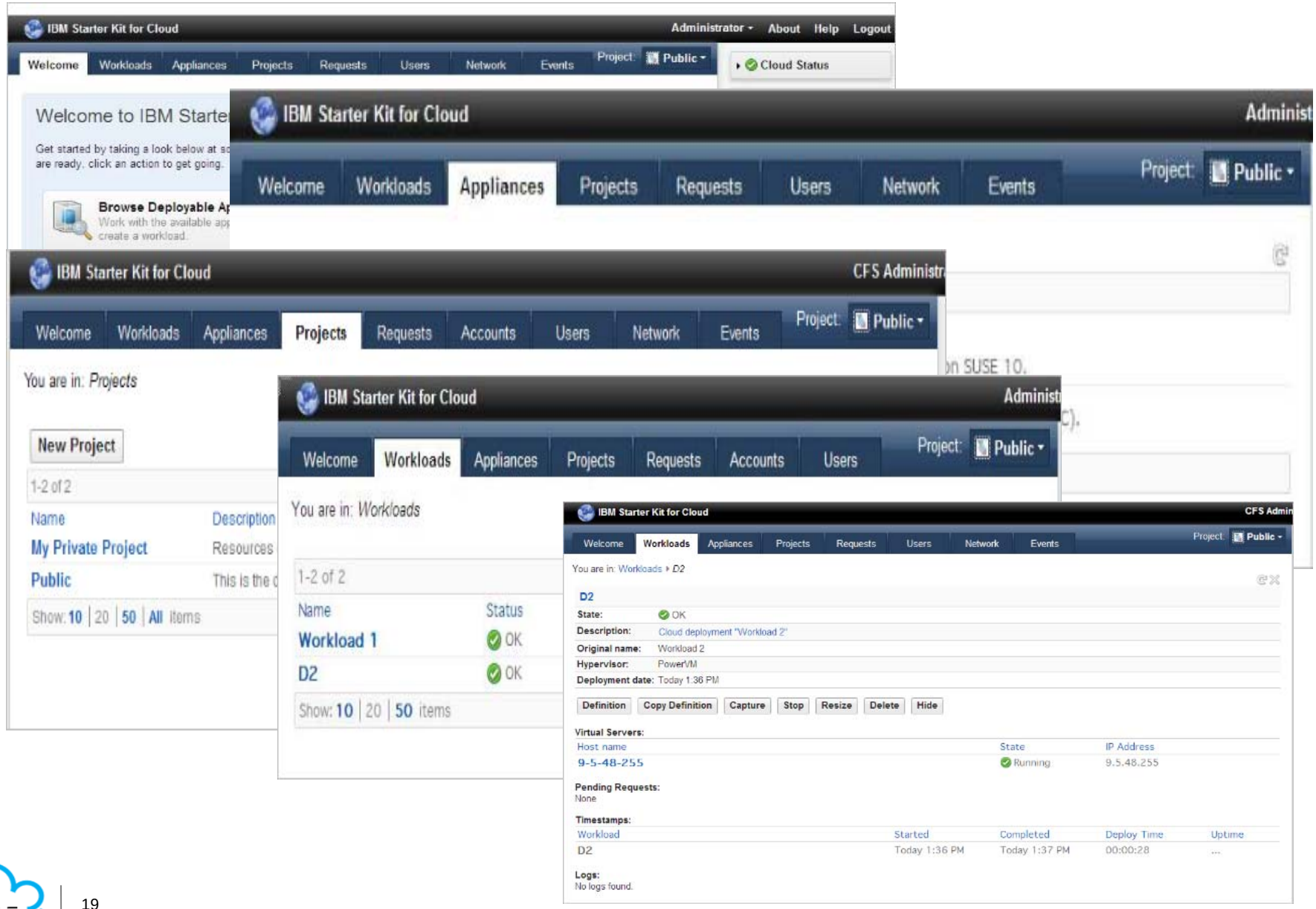
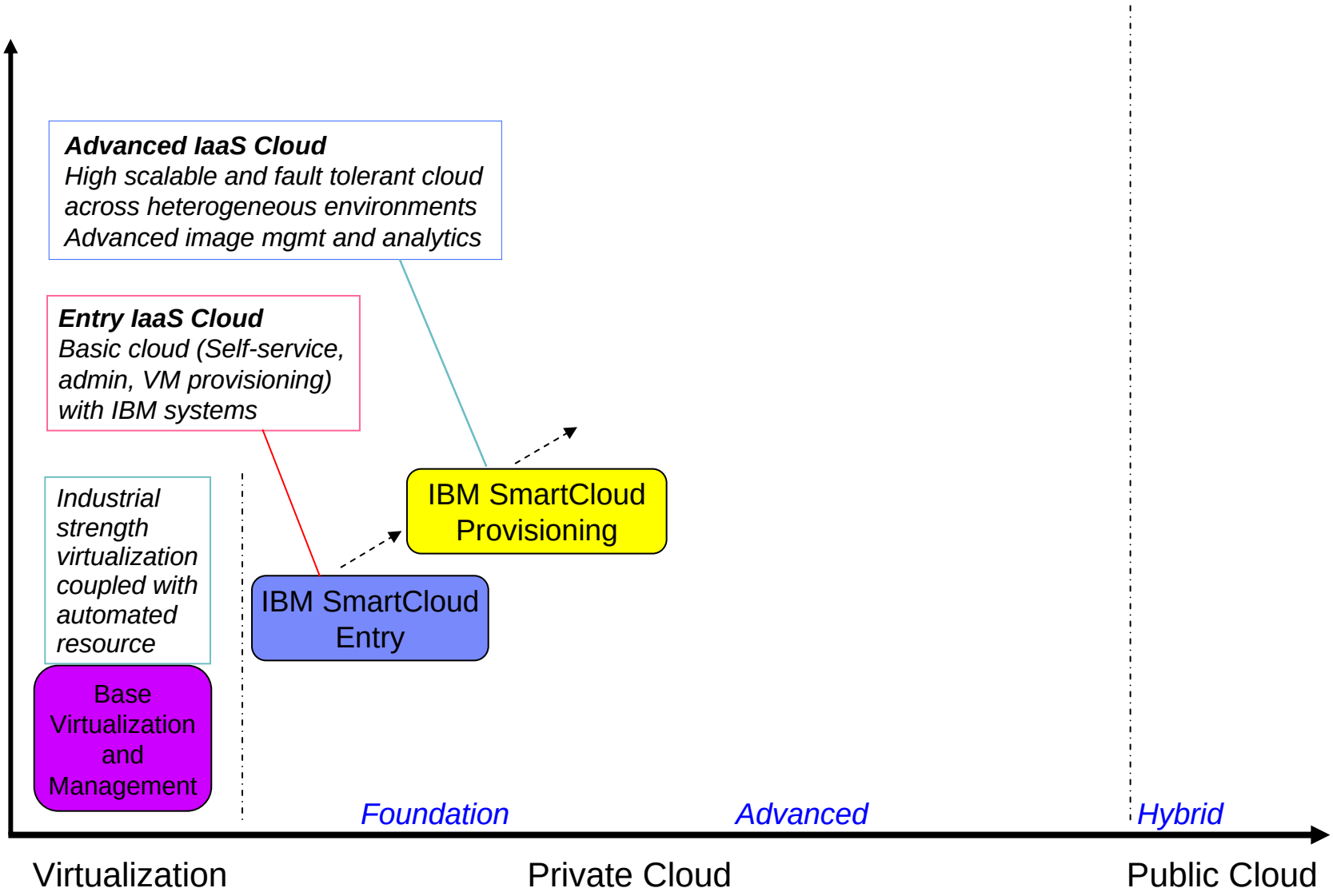
IBM SmartCloud Entry - Appliances, Projects, Workloads



Multiple entry points for implementing Private and Hybrid Clouds



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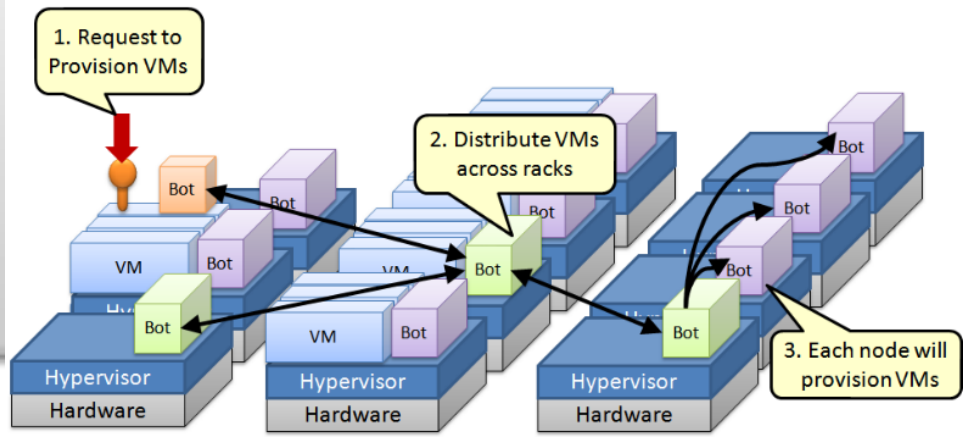
Smart Cloud Provisioning – High-scale, Low-touch cloud

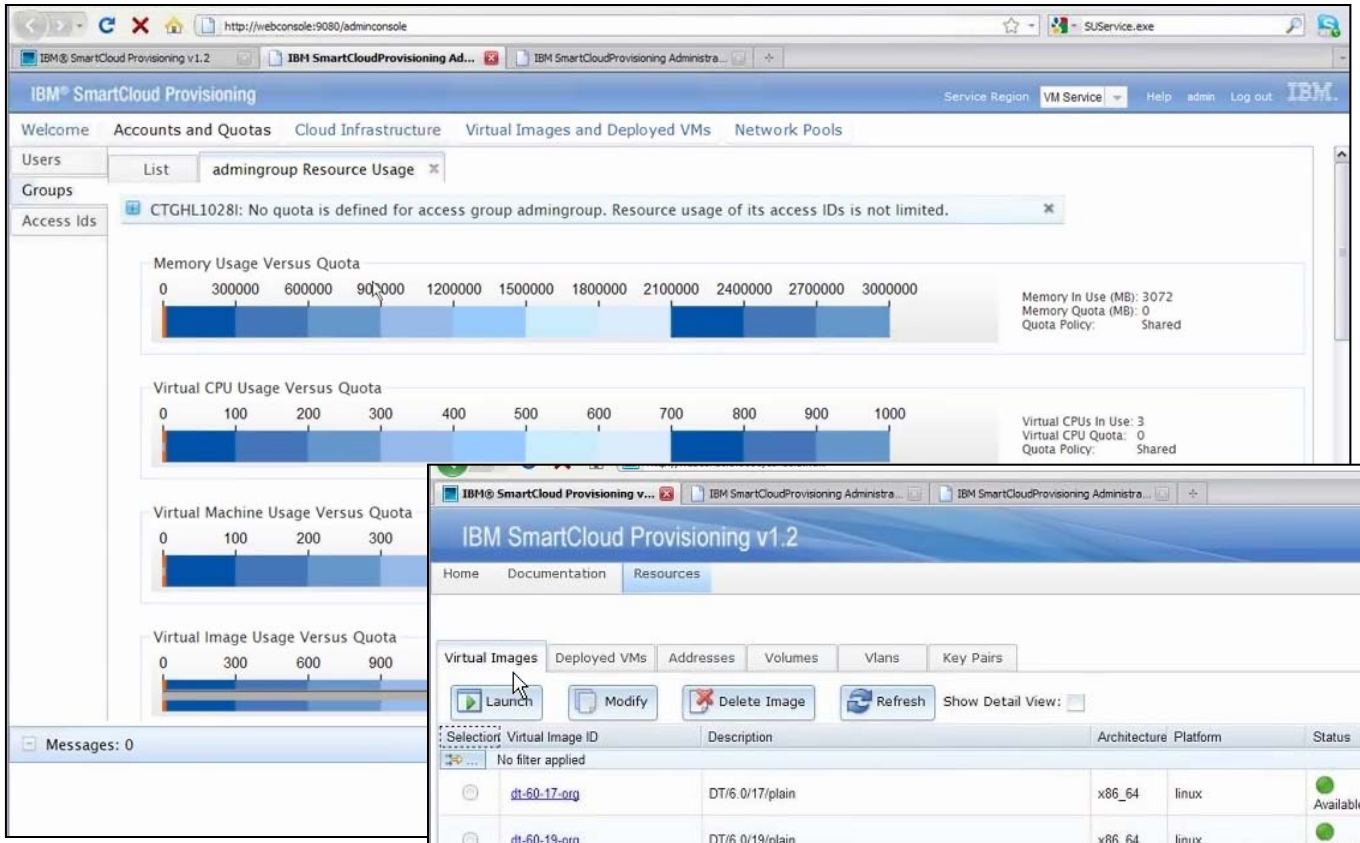
IBM Smart Cloud Provisioning provides a true Infrastructure-as-a-Service cloud, reducing cost and providing a highly scalable, rapid-deployment environment with near-zero downtime and automated recovery across heterogeneous platforms.

- **Standardize** and automate images provisioning across compute and storage resources with newer operations techniques and self-service to reduce costs and errors
- **Rapidly provision** hundreds of virtual machines in minutes
- **Scale up** to thousands of physical machines running thousands of VMs
- **Quickly deploy** the application management infrastructure
- **Automatically tolerate and recover** from SW and HW failures assuring service continuity and provide near zero down time

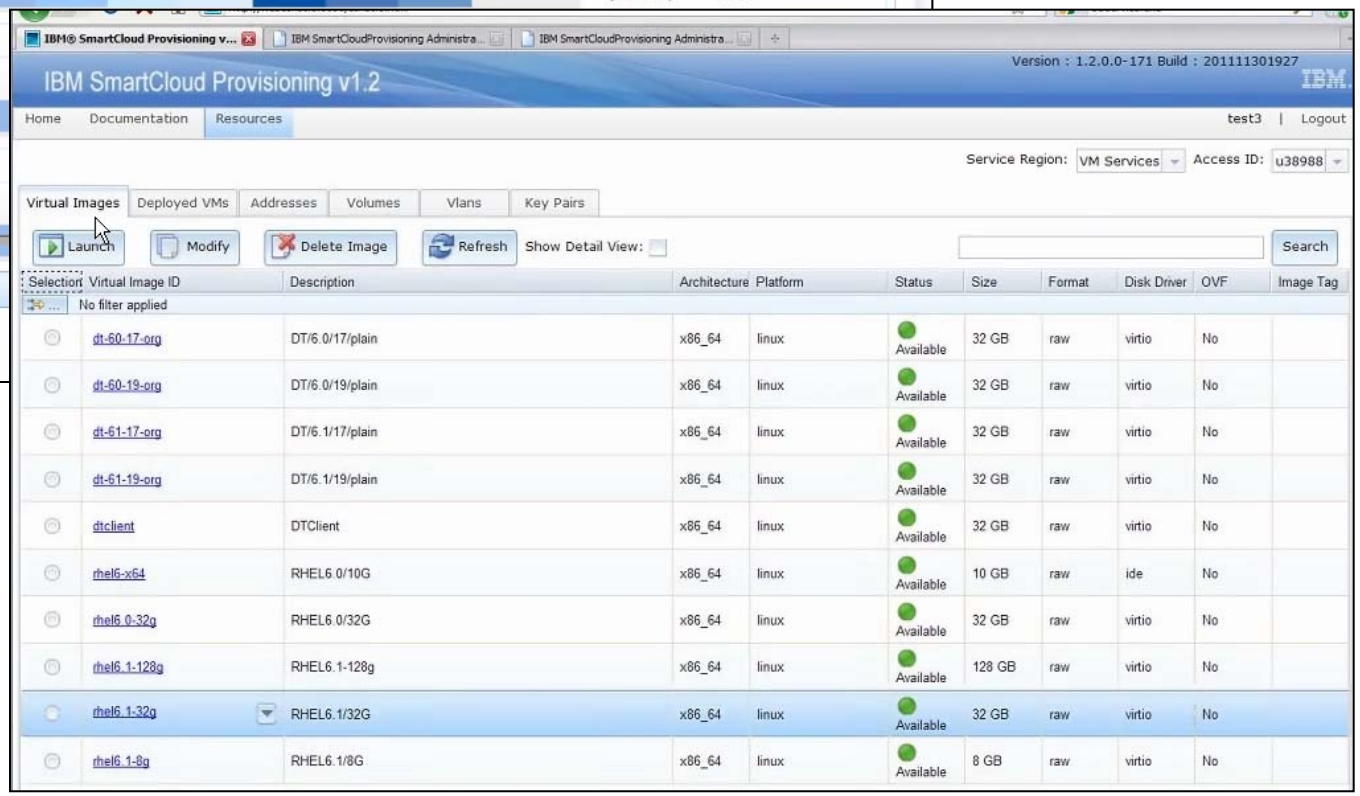
- **Federated image library** allows management of image complexity spread across multiple locations and hypervisors
- **Image sprawl and image drift** Off-line analysis of image content.
- **Tops-down construction** of images including configuration time parameters to reduce number of master images



Smart Cloud Provisioning – Administrative and end-user interfaces

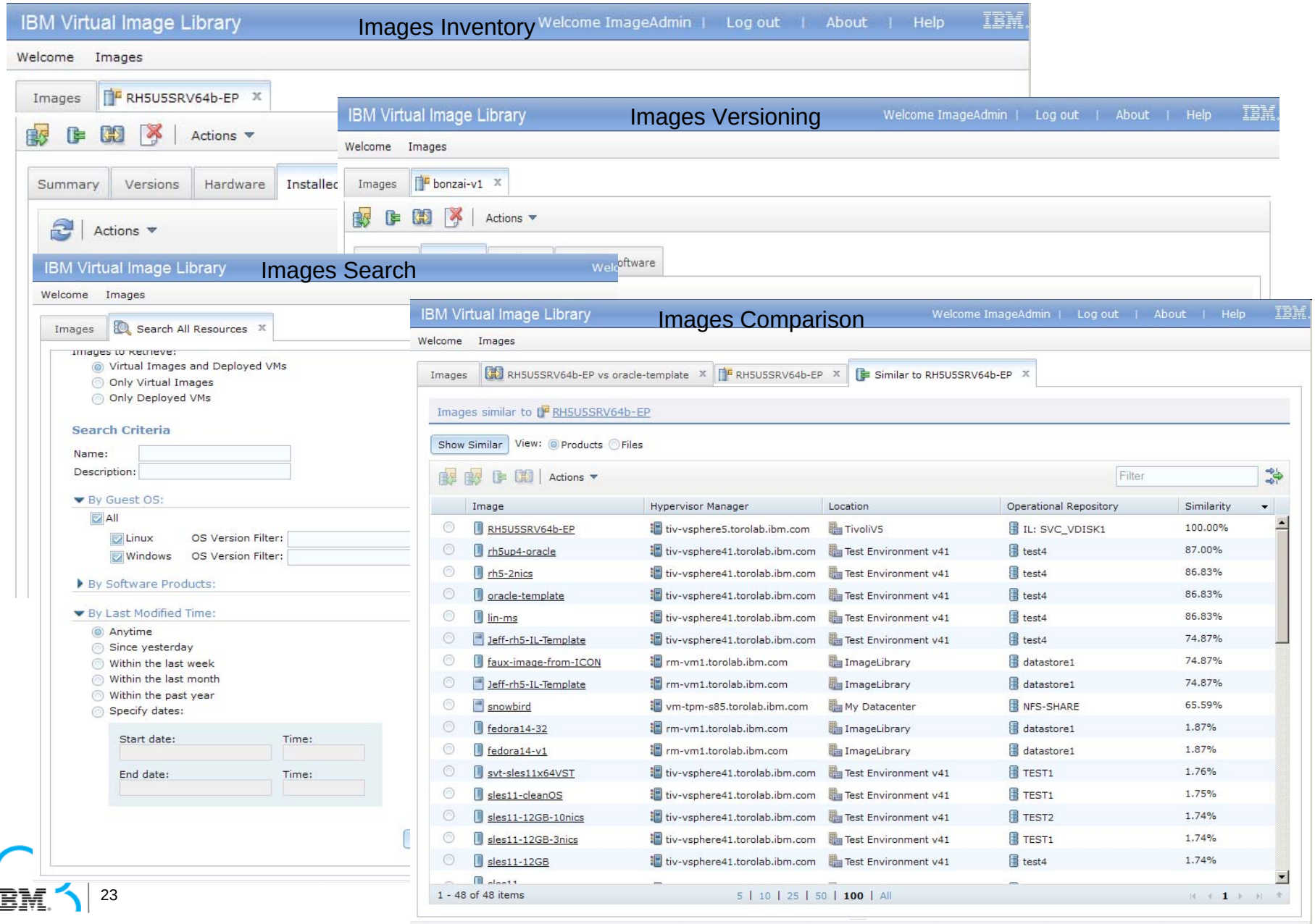


Manage Resources usage and quotas

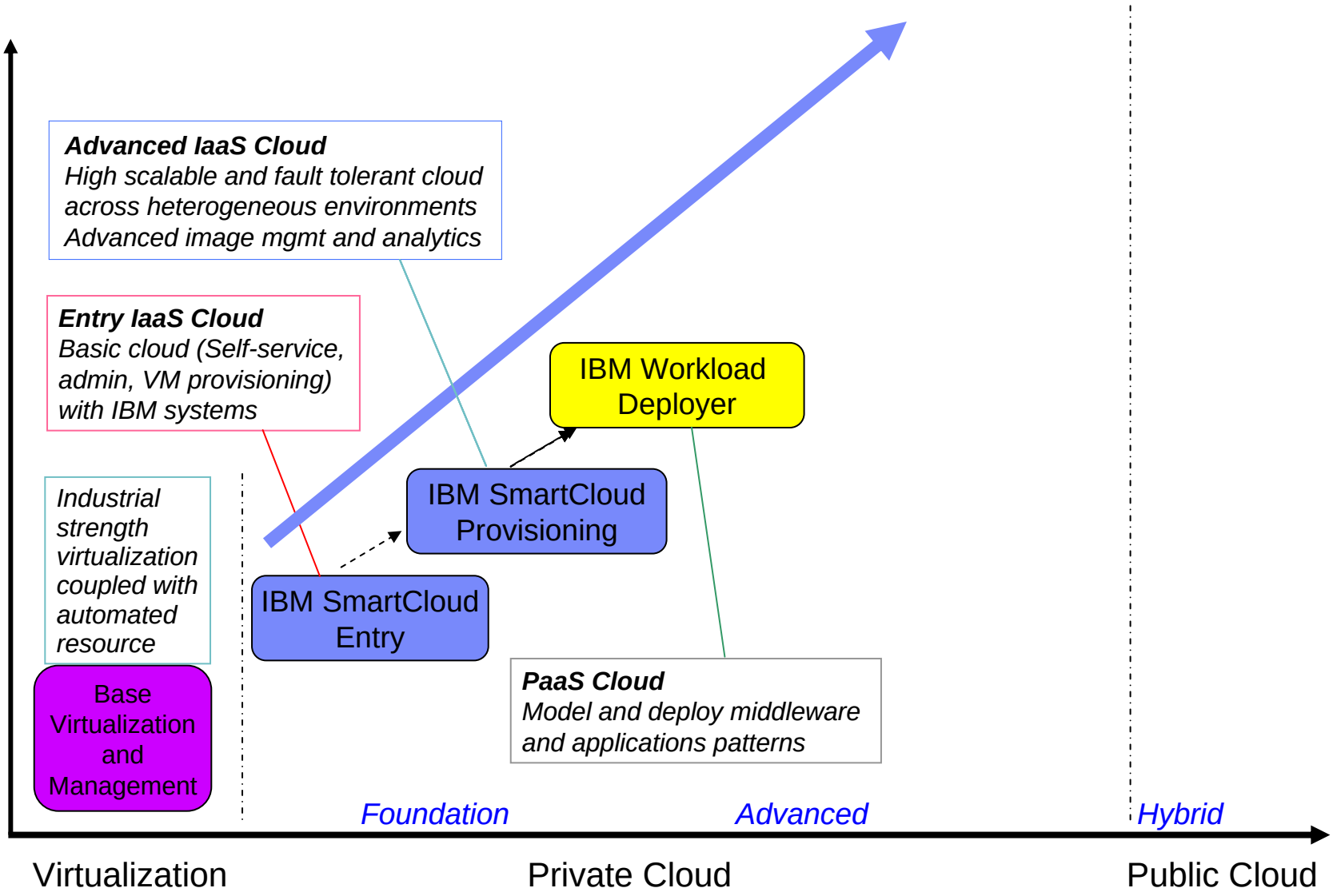


Deploy and activate a Virtual Image

Smart Cloud Provisioning – Image management



Multiple entry points for implementing Private and Hybrid Clouds



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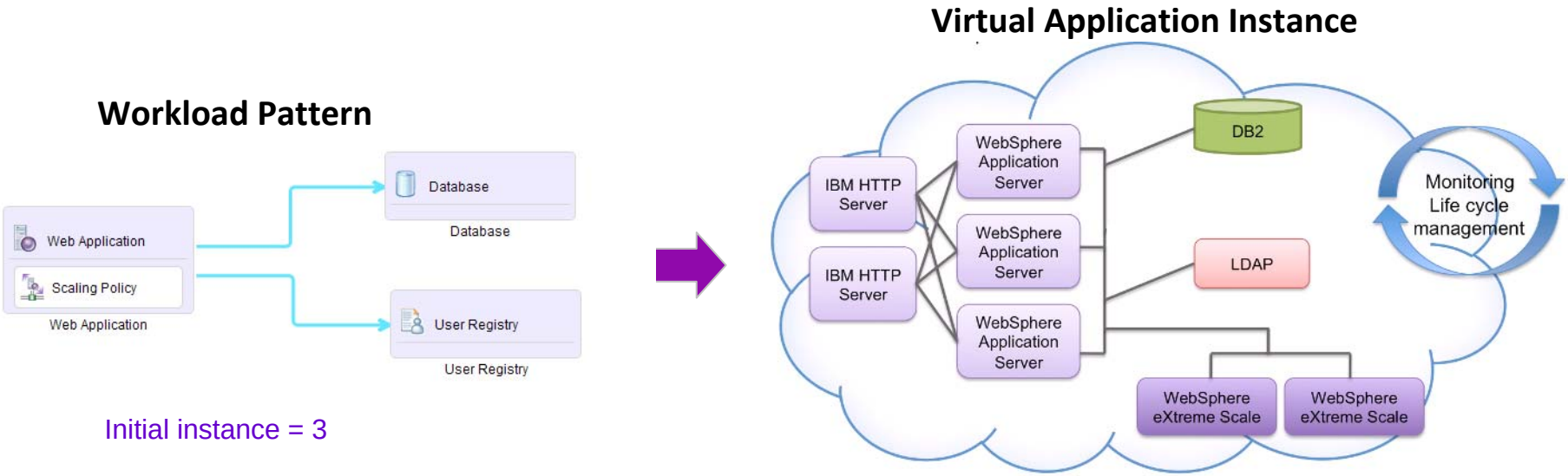
Characteristics of a Workload Centric Cloud

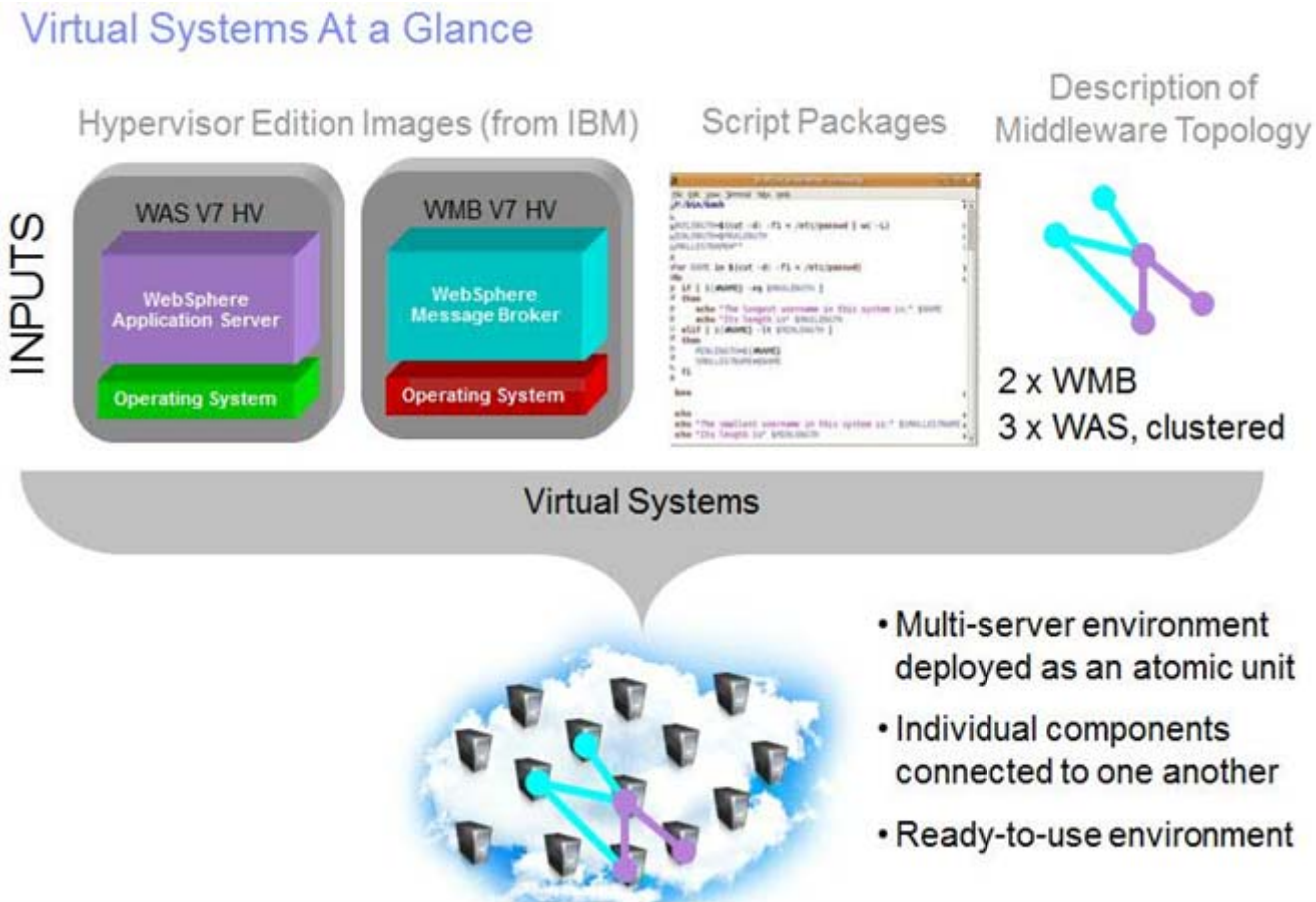
- Awareness and optimizations for specific workloads
  - Integrated stacks of middleware optimized for particular workloads
- Consolidating workloads under a simplified management system
  - Expose radically simplified management model optimized for specific workloads
- Elastic, efficient, multi-tenant, automated mgmt and execution of application workloads
  - Integrated monitoring, metering, logging, security, caching, etc.
  - Automated policies for resource consumption and balancing



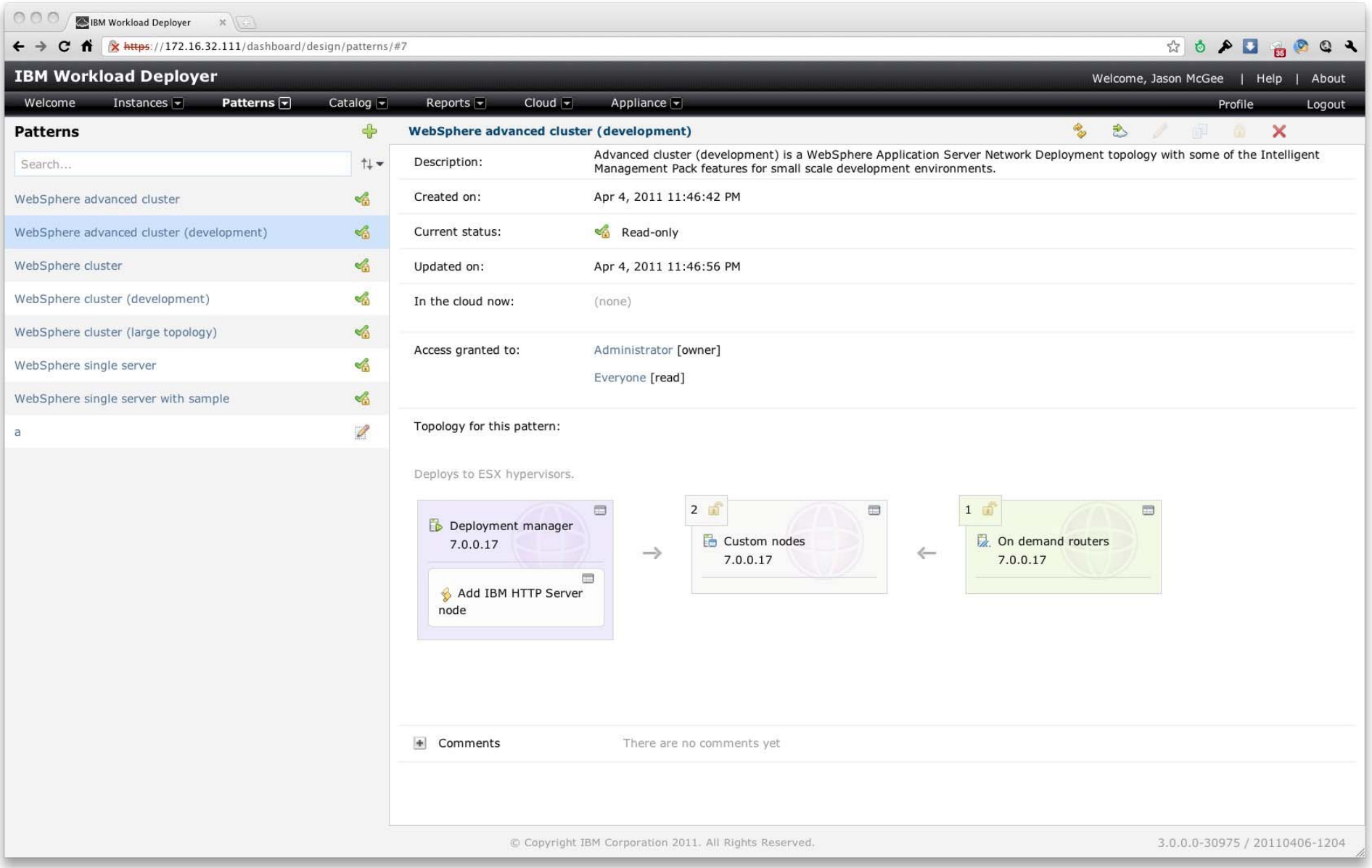
Composite Application Patterns (PaaS) – Virtual Systems

- Pattern-based application design and deployment
- Middleware patterns and deployment of environments in few minutes, using IBM provided or ICON created HV images

- Significant reduction in time to market from days to hours



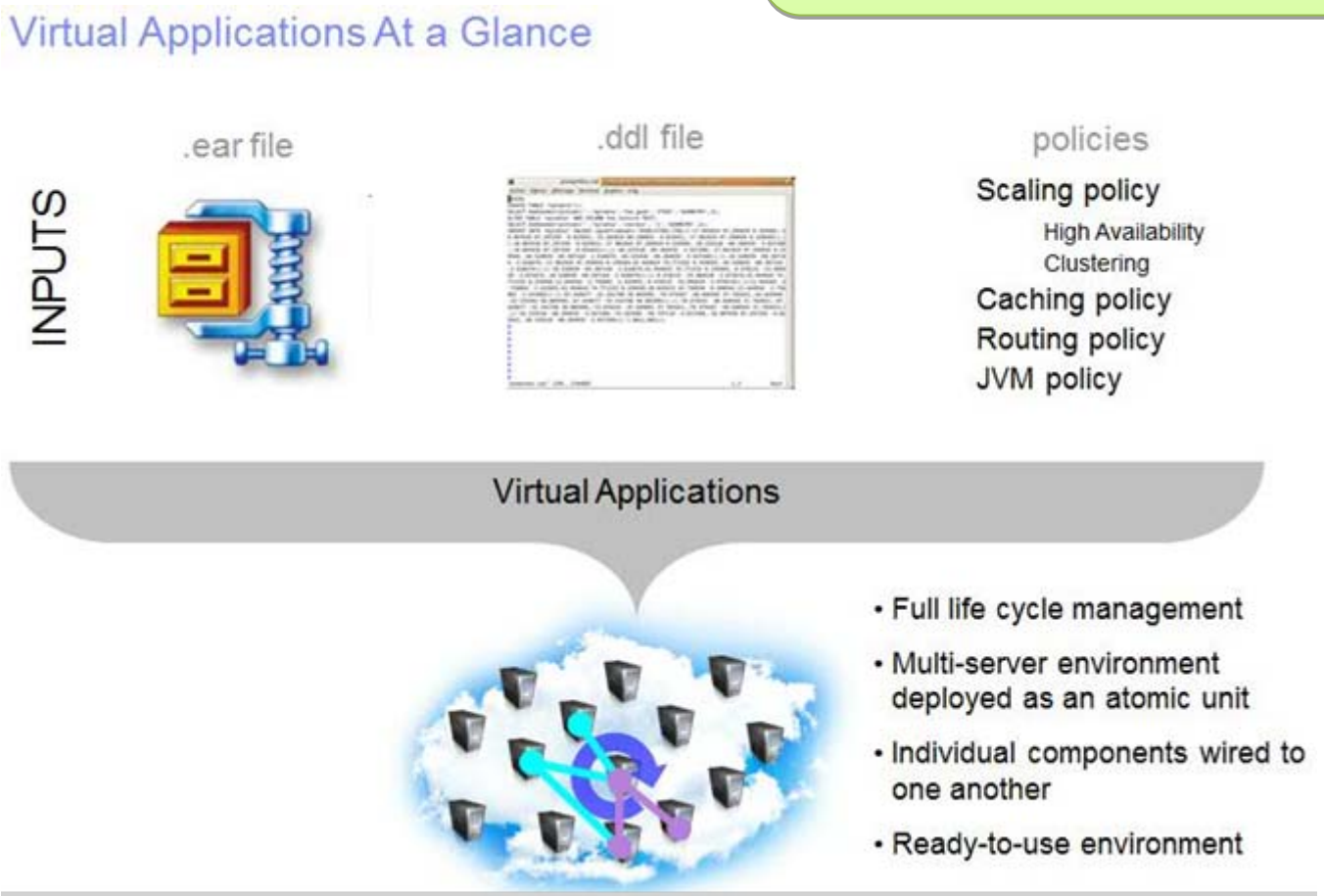
Virtual System Patterns



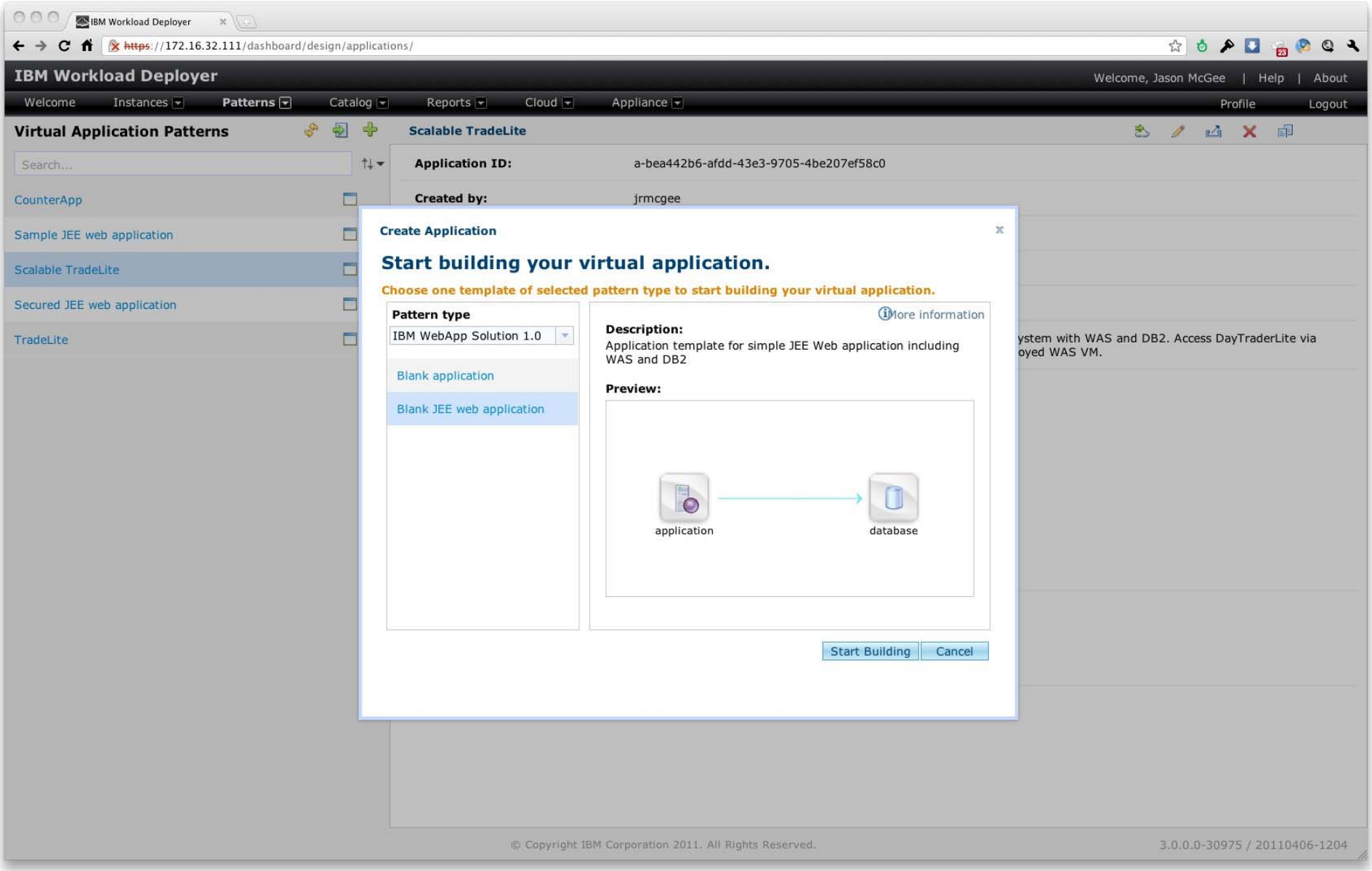
Composite Application Patterns (PaaS) – Virtual Applications

- Policy driven application quality of services for e.g. scaling, caching
- Custom plugin and application pattern support for 3rd party software

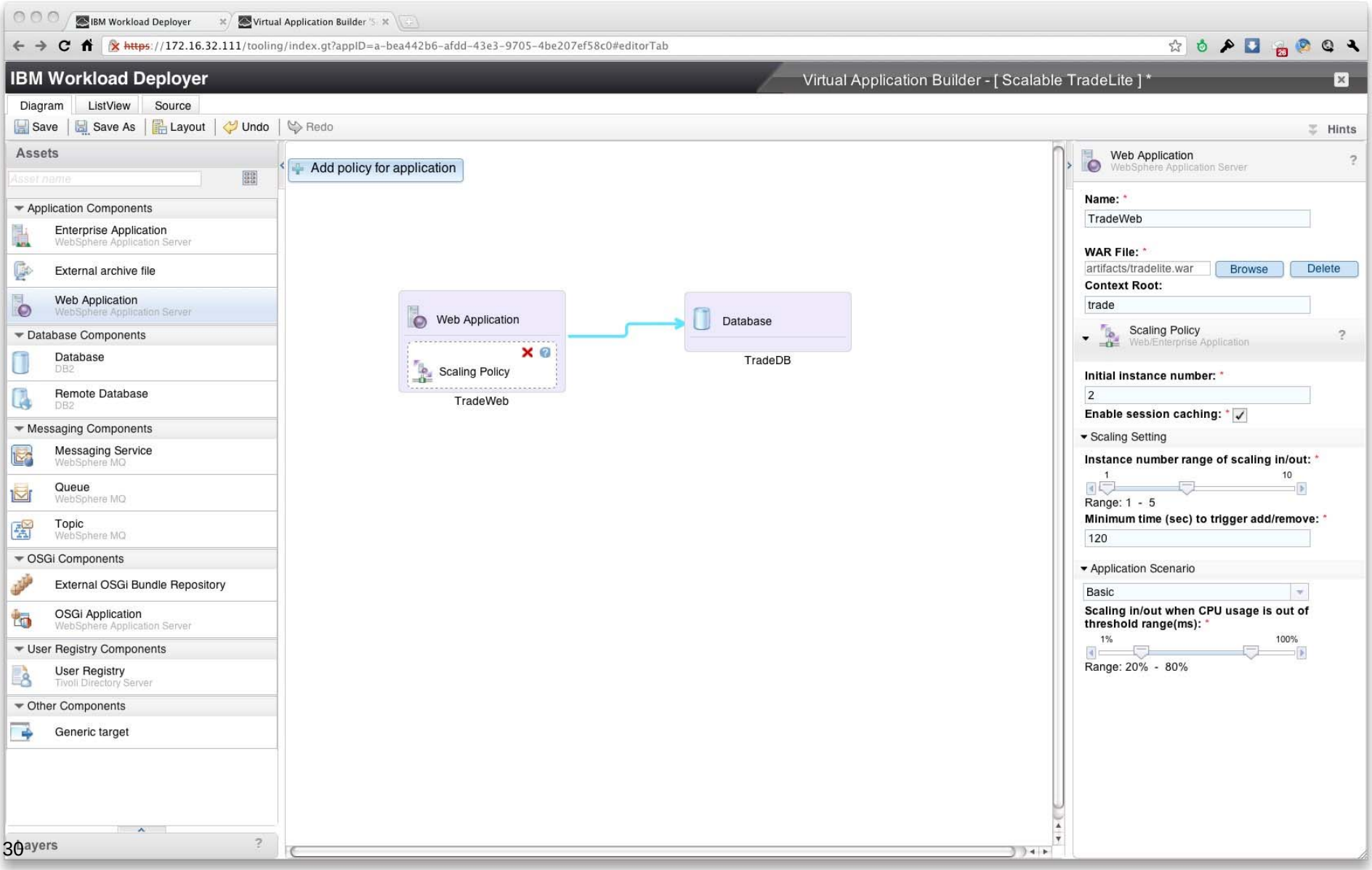
- Focus on core business application rather than underlying middleware
- Built-in autonomic elasticity and high- availability of application patterns



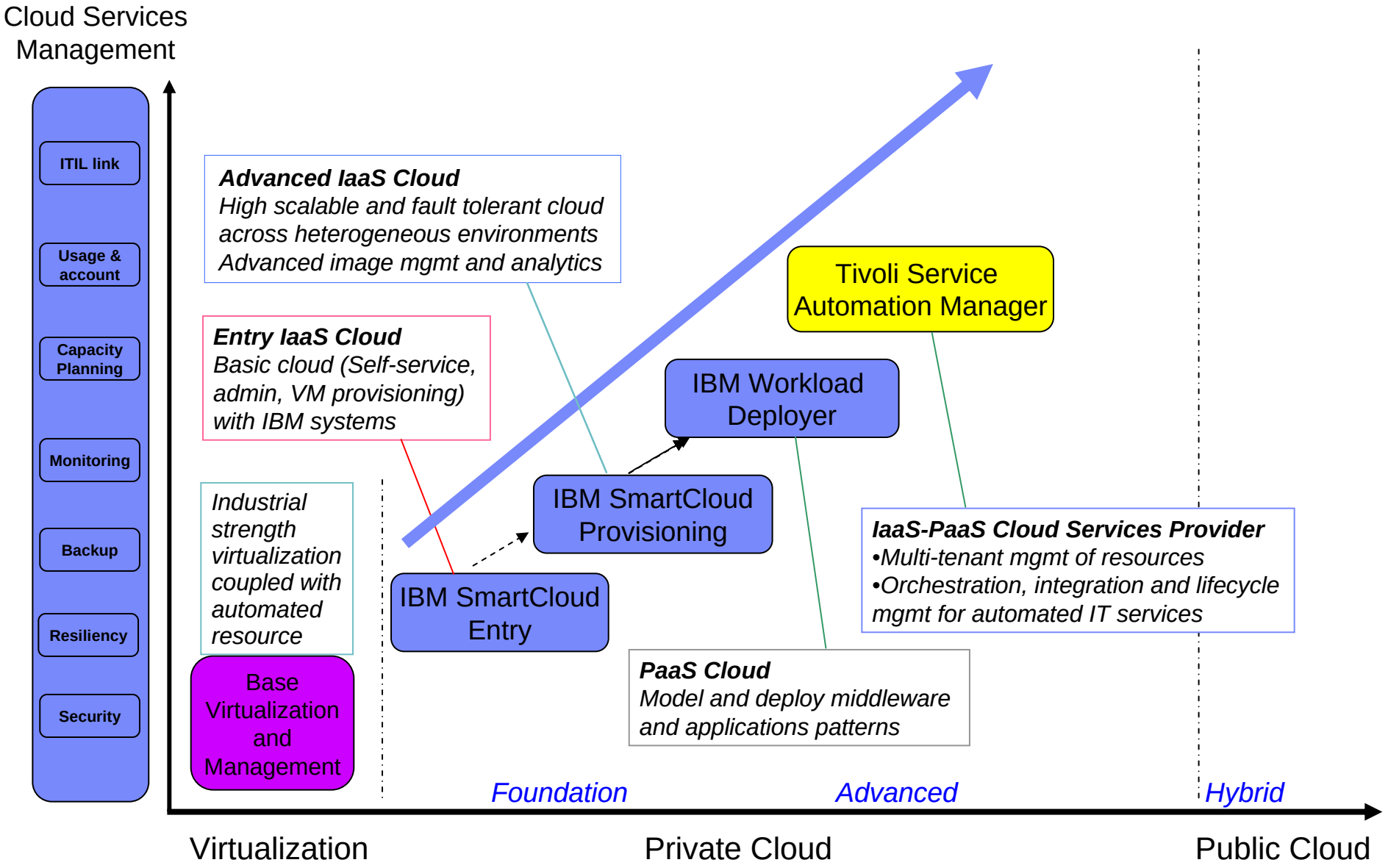
Creating a Virtual Application



Virtual Application Builder - Elasticity



Multiple entry points for implementing Private and Hybrid Clouds



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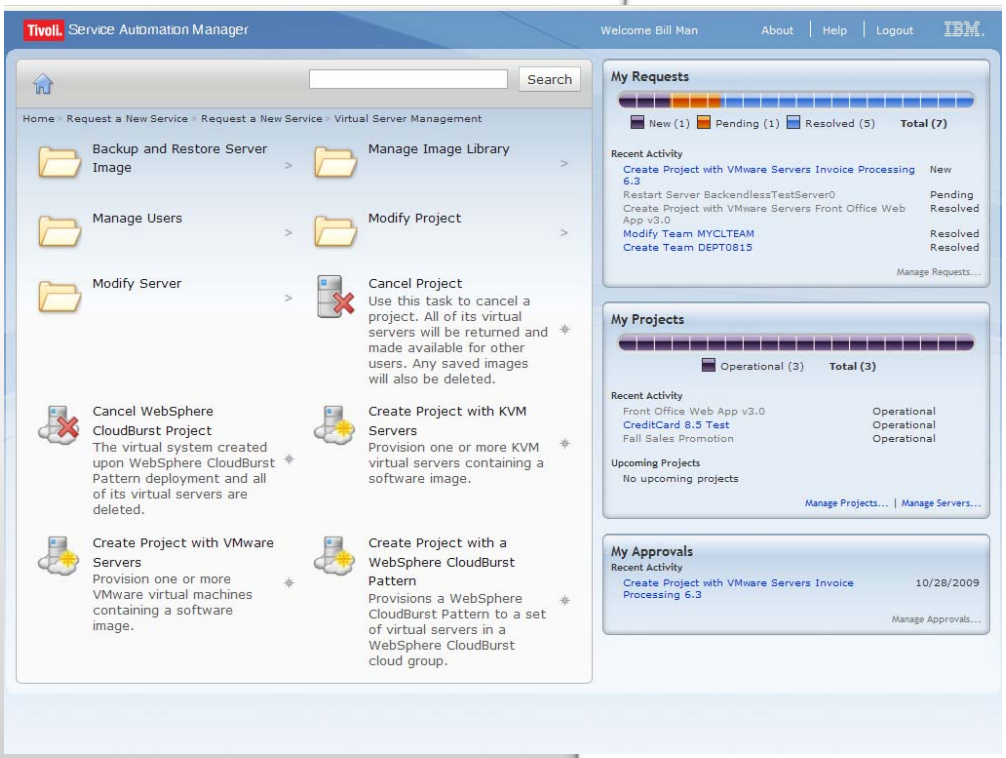
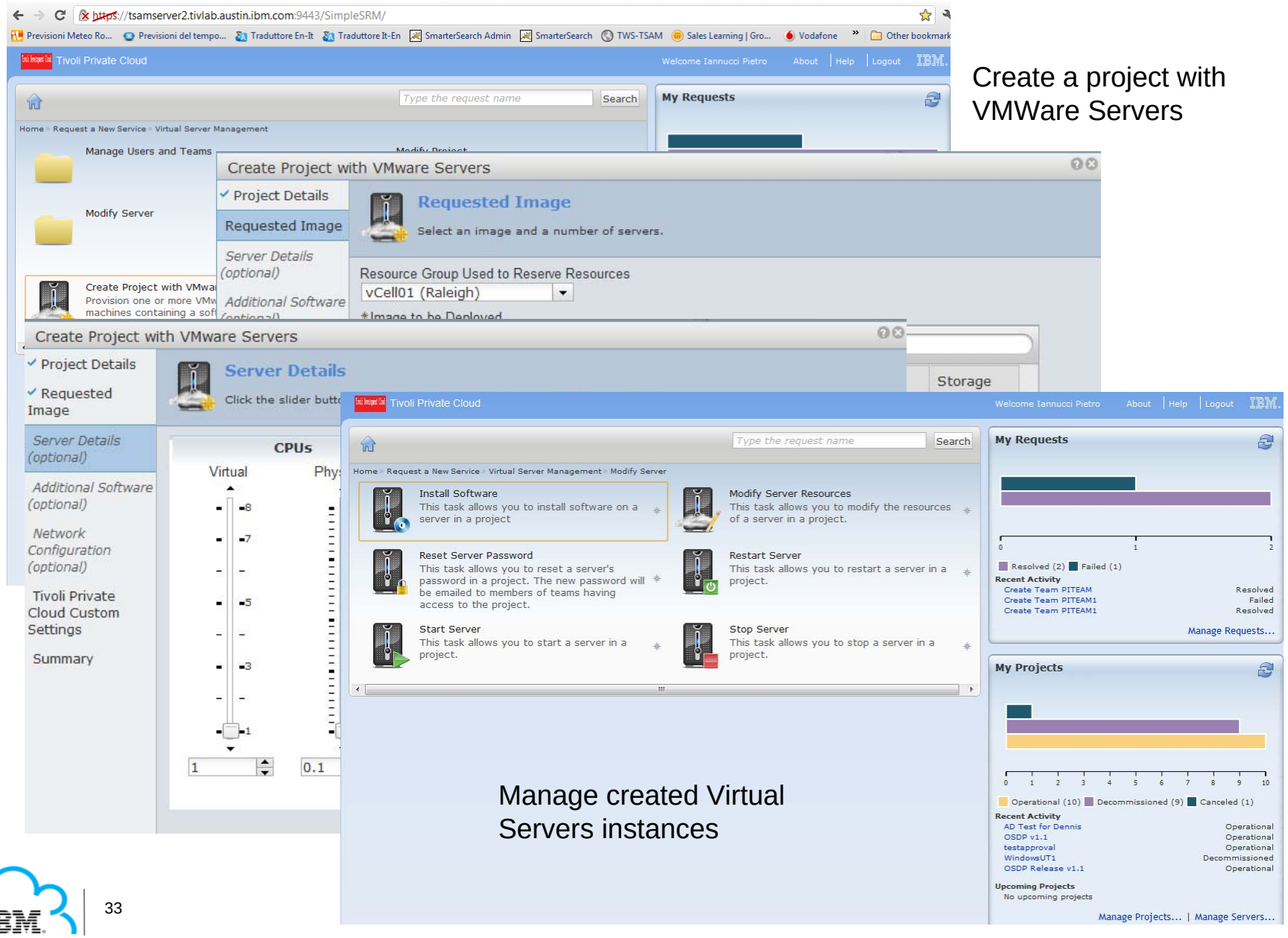
Service Automation Manager

Provides the flexibility and choice of network and storage options and the ability to span platform architectures

- Full automation of service delivery
- Service delivery catalog
- Multi-tenancy with automated customer on boarding and resource segregation
- Quota and Reservation systems
- Support multiple hypervisors
- Advanced image management
- Extensible



Service Automation Manager Self-Service catalog UI



Create a project with VMWare Servers

Manage created Virtual Servers instances

Run book automations

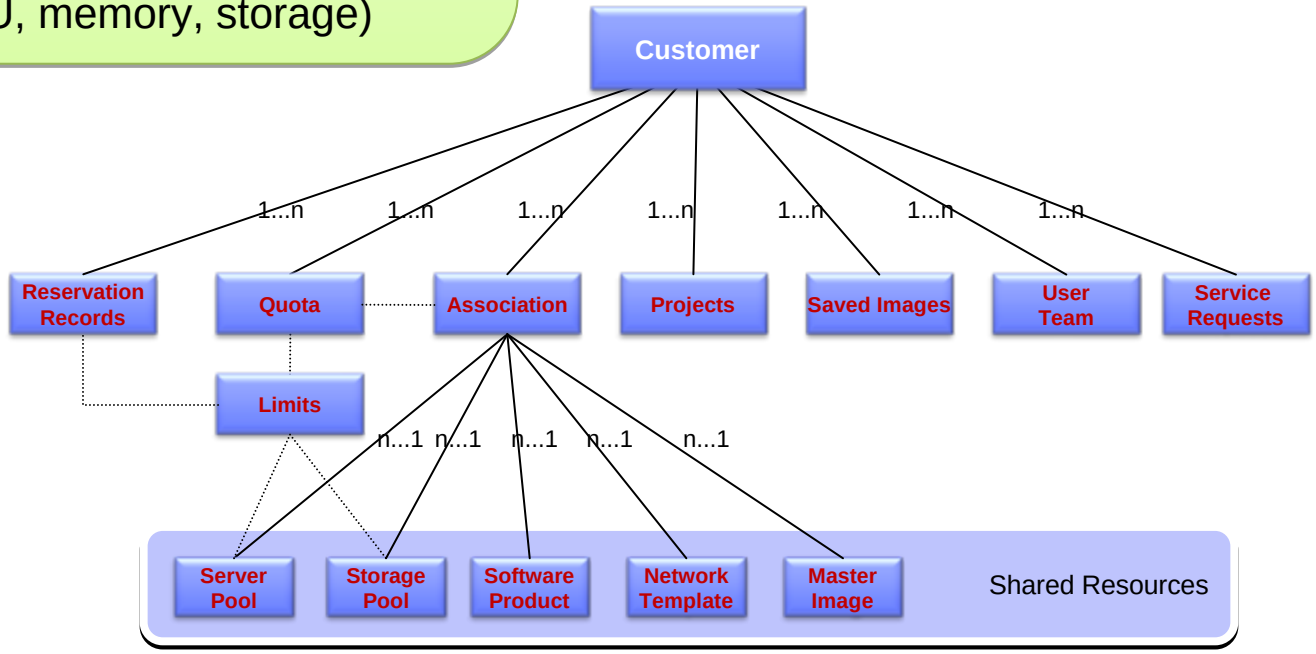
- Customizable approval policies and worflows
- Customize the existing service request and delivery flows
- Plug additional provisioning and configuration actions (i.e. Configure a filrewall, create a user, etc...)
- Add custom actions to integrate with existing processes (i.e. Open a ticket, update CI in CMDB, etc..)

- Single mgmt platform across different infrastructures reduce operational cost
- Standardization of service design and full automation of service delivery reduce operational costs and increase speed of service delivery
- Integrate compute, network, storage and application delivery: enable organizational integration

Advanced Multi tenancy support

- Resources, data segregation and access configuration for
  - image templates, service catalogue, server, network, storage resources, etc..
- Flexible Security Model
- Simplified customer onboarding through
  - Customer templates
  - Network templates
- Quotas and limits per customer and per resource (CPU, memory, storage)

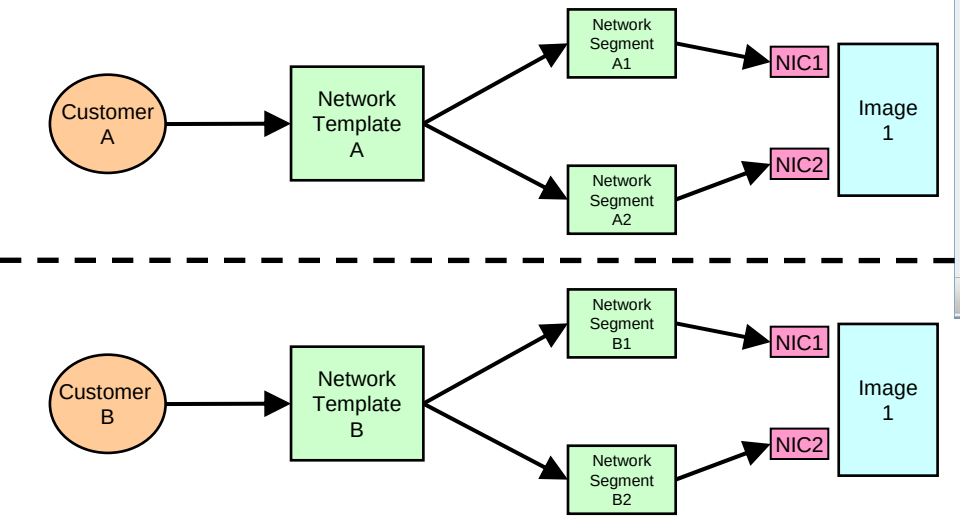
- Increased resource utlization
- Reduced operational cost by centralizing administrative tasks
- Securely share the same physical infrastructure across multiple customers or LOBs
- Support service prodivers business model

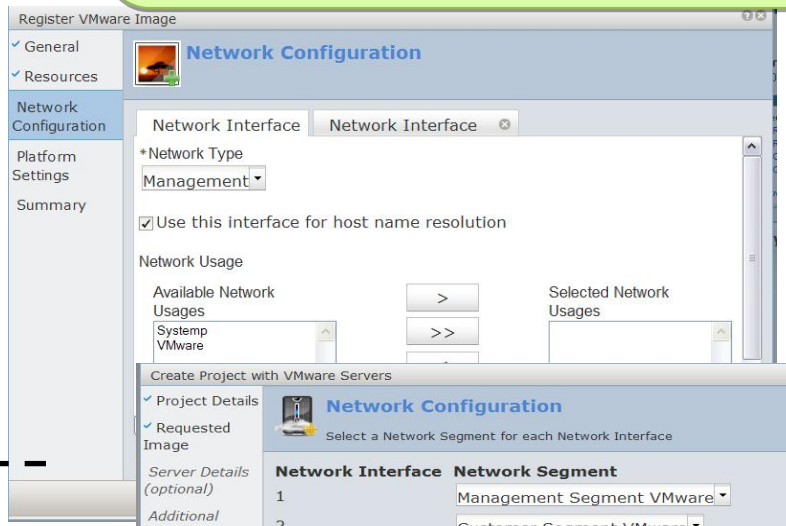


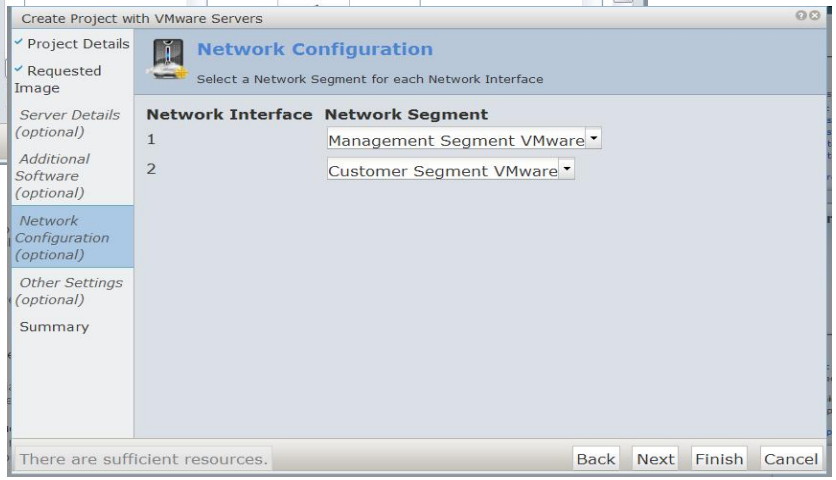
Advanced Network configuration flexibility and segregation

- Predefined network configuration per customer
- Support for sophisticated network configurations
  - Customize network configuration per resource pool/application/OS image template
  - Dynamically assign network resources to network segments during “customer on-boarding” or server deployment

- Flexible security and network segregation
- Automate/standardize network security policies
- Cloud platform can adapt to existing network topologies. No need for network re-design



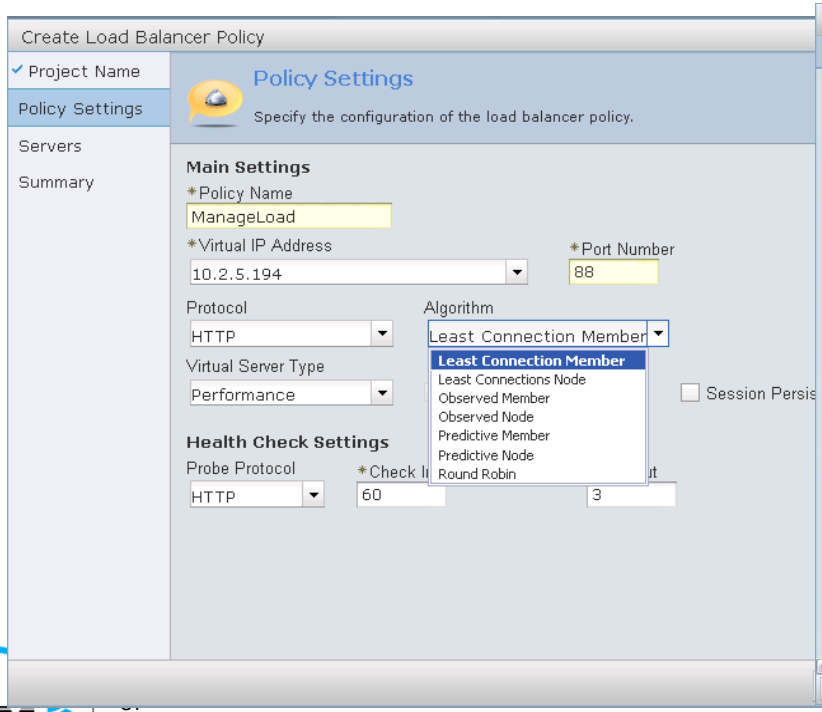


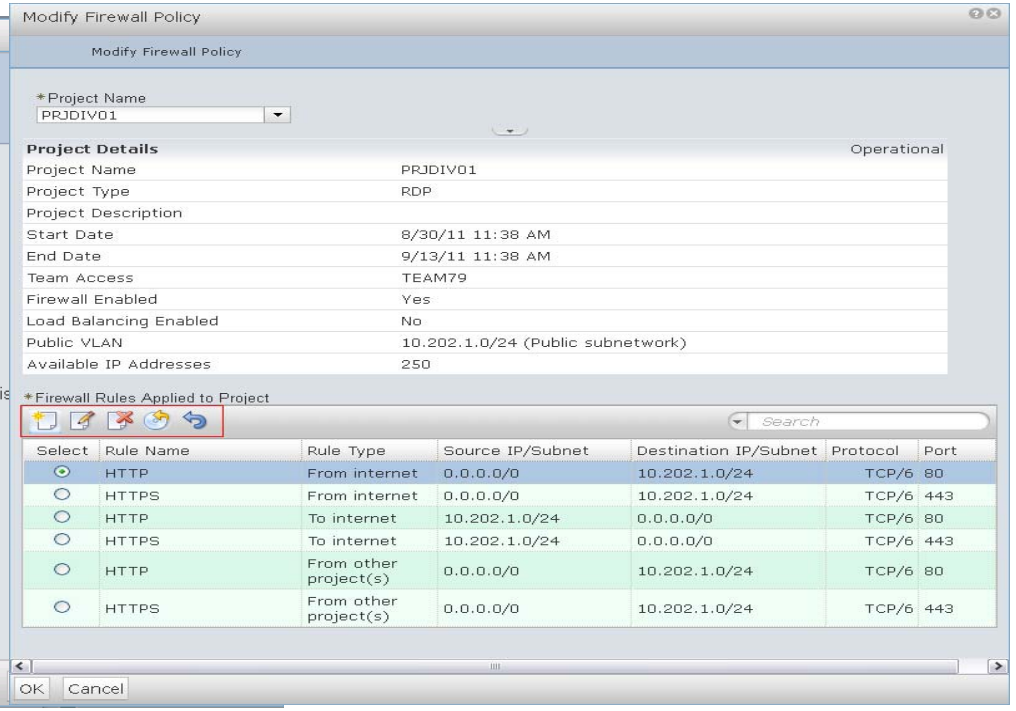


Provisioning and configuration of Network services

- Automated configurations of Firewalls rules and protocols
  - Add, change, remove firewall policies when deploying virtual servers
- Automated configuration of load balancing policies
  - Select virtual IP address, protocol, load balancing algorithm, virtual server type

- Groups of servers can be deployed with the needed changes of network settings
- Allow true E2E automation of the whole service delivery process, including configuration of network elements.





Provisioning and configuration of Storage

Use-cases

Manage additional disks

- Discover and register hypervisor dependent storage
  - VMWare datastores
  - Power SAN disks
- Create VMs with multiple disks
- Add/remove disks to VMs

Manage additional File Systems

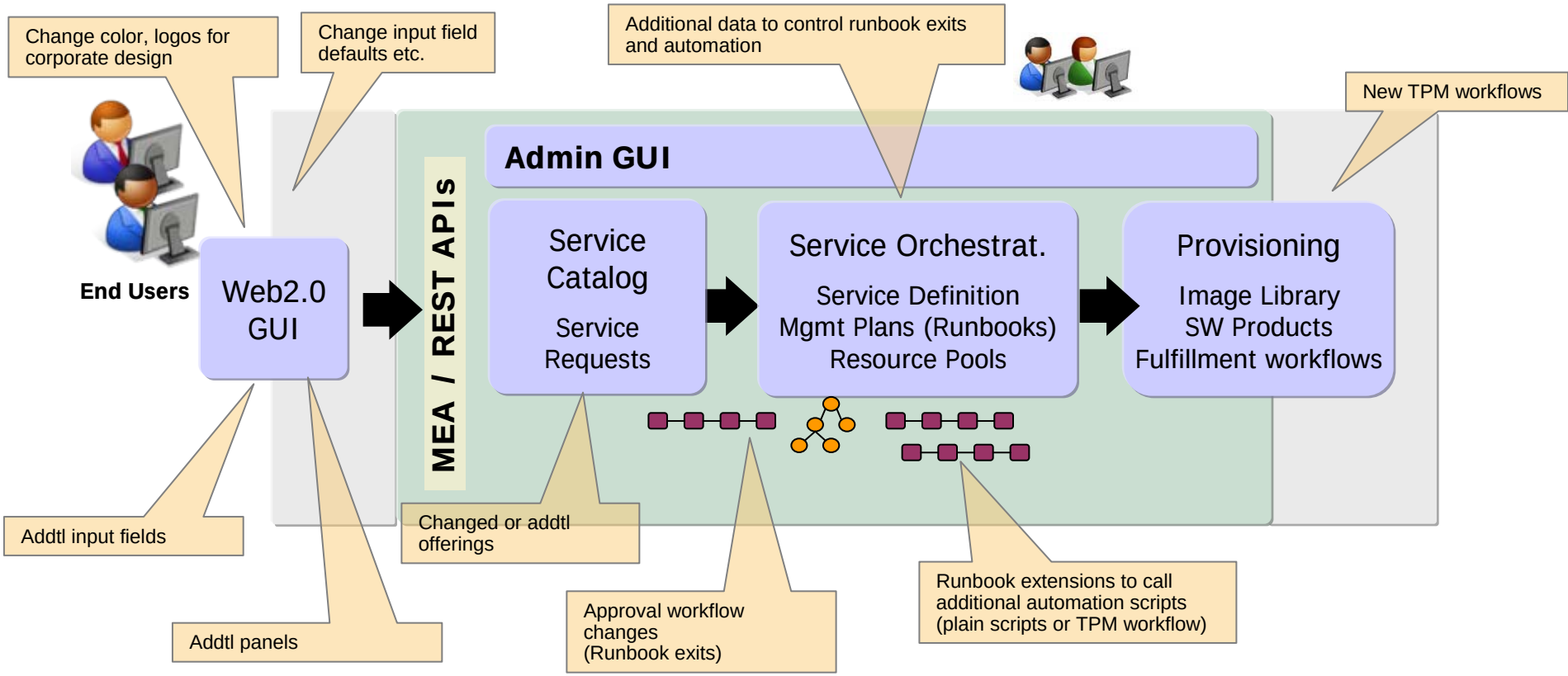
- Discover and register independent storage pools out of
  - NetApp and IBM NSeries storage
  - Sonas, StorWize V700 and others via TPC (to come in 2Q 2012)
- Create/Delete/Modify File-Systems
- Mount file systems via
  - NFS
  - CIFS and iSCSI (to come in 2Q2012)

	Hypervisor dependent storage	Hypervisor independent storage
Storage Provider	→ VMware datastores, POWER SAN Disks, KVM,...	→ SoNAS, NetApp, NFS, etc..
Lifecycle	Same lifecycle as VM → Allocate storage during creation of VM or add later on	Independent of VM lifecycle
Access Scope	Non-shared access	Shared or non-shared access

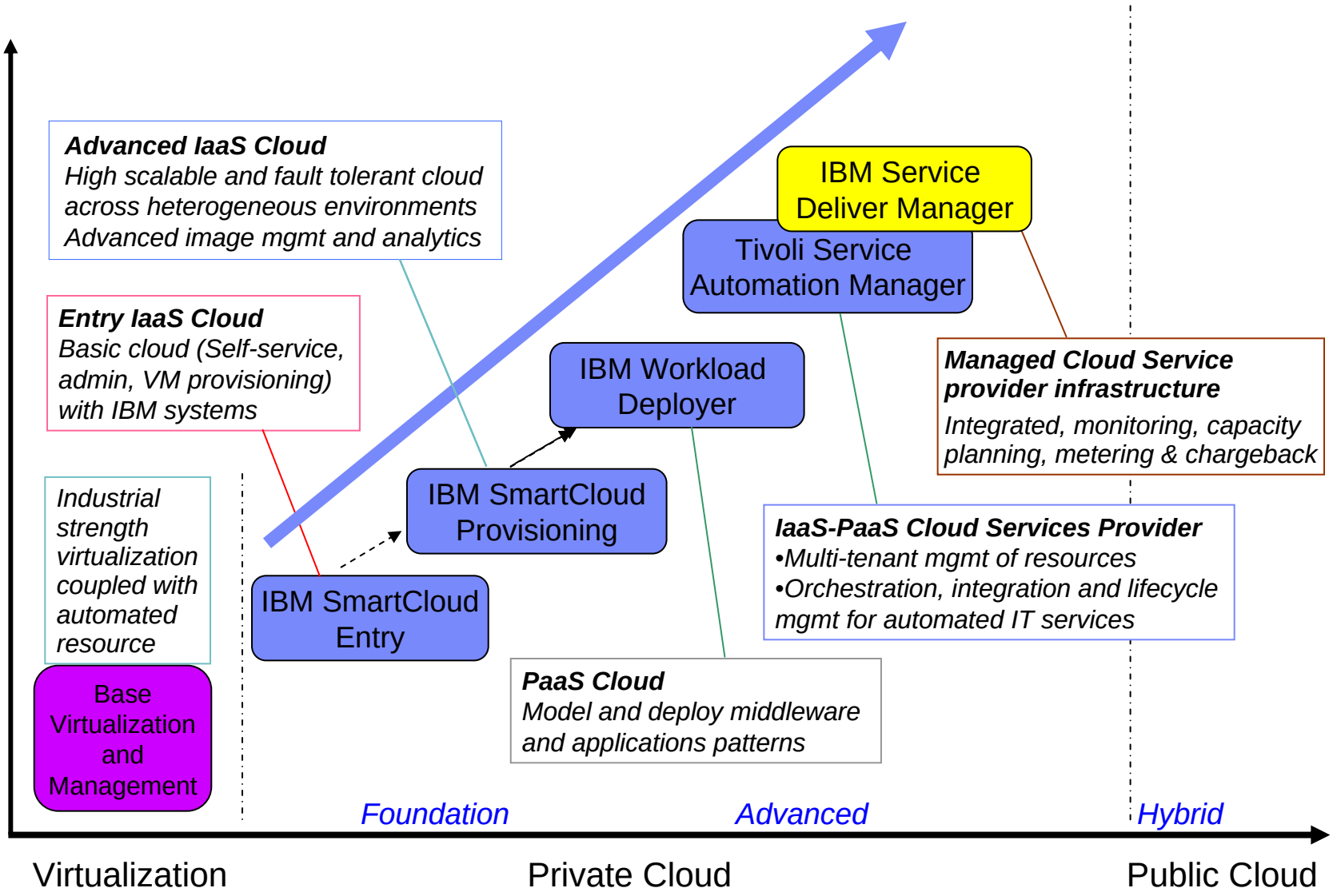
Extensible Architecture

- Services are ready to be used, but can also be easily customized
  - UI appearance: to comply with corporate standard
  - Workflow modification to adapt to corporate processes
  - Creation of new services to enrich the out of the box capabilities

- The service catalogues becomes the integration point of IT process automations.
- No need to adapt processes to tools. The tool can adapt to existing process
- Reduce time to value and allow faster adoption of cloud benefits



Multiple entry points for implementing Private and Hybrid Clouds



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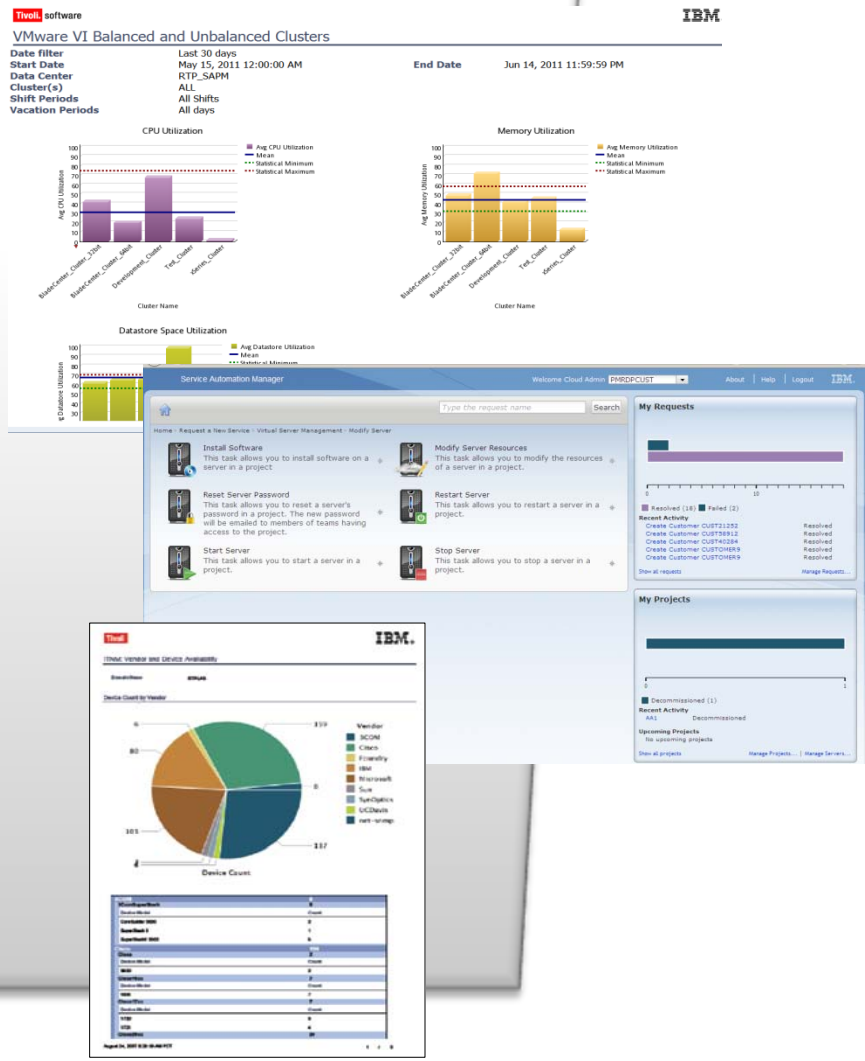
Service Delivery Manager

Self-contained, software-based service delivery platform for Advanced Clouds

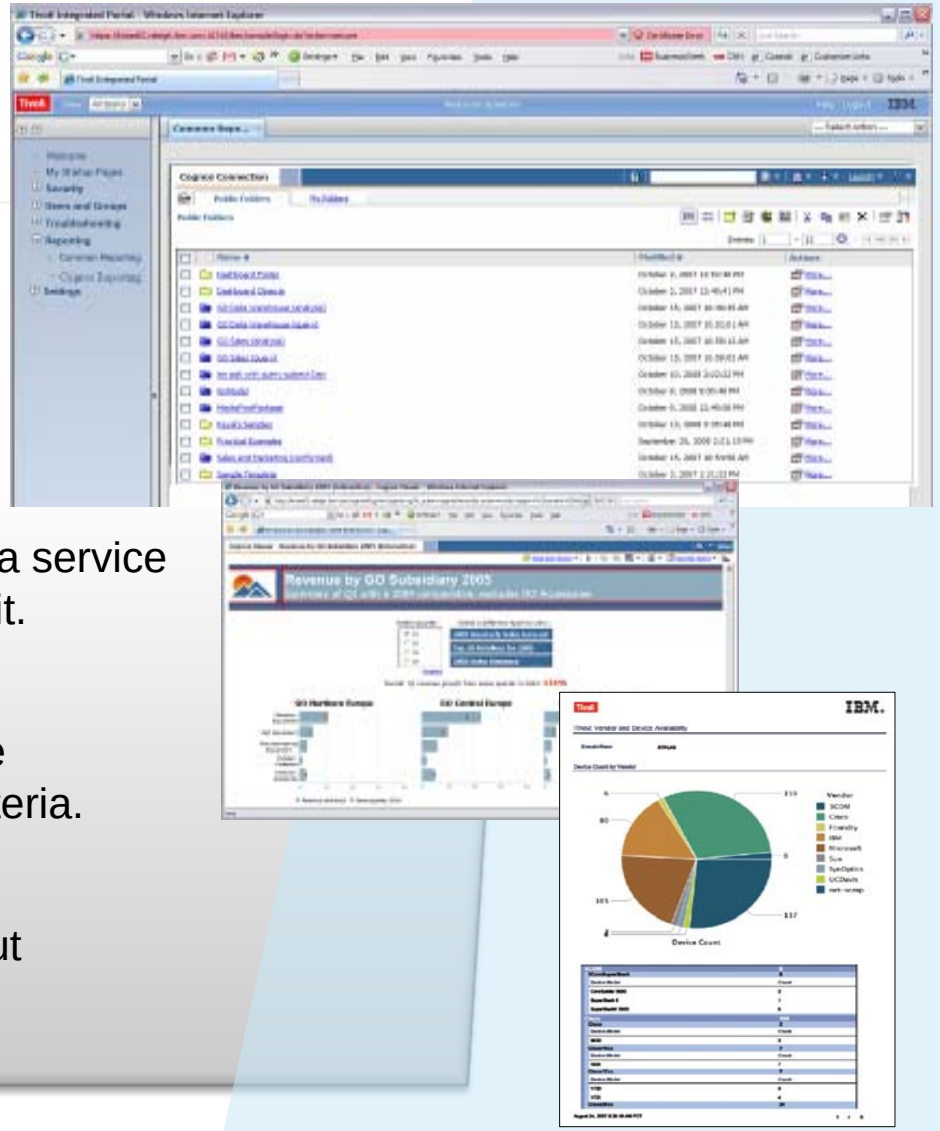
- Integrated service management software solution delivered as virtual images
- Fast installation and rapid time to value
- Self-service portal interface for reservation of computer, storage, and networking resources
- Built-in monitoring and analysis
  - Real time hypervisors and application monitoring
  - Workload Forecasting and Capacity planning
  - What-if analysis
- Usage and Accounting for customer billing
- Cloud Management high availability



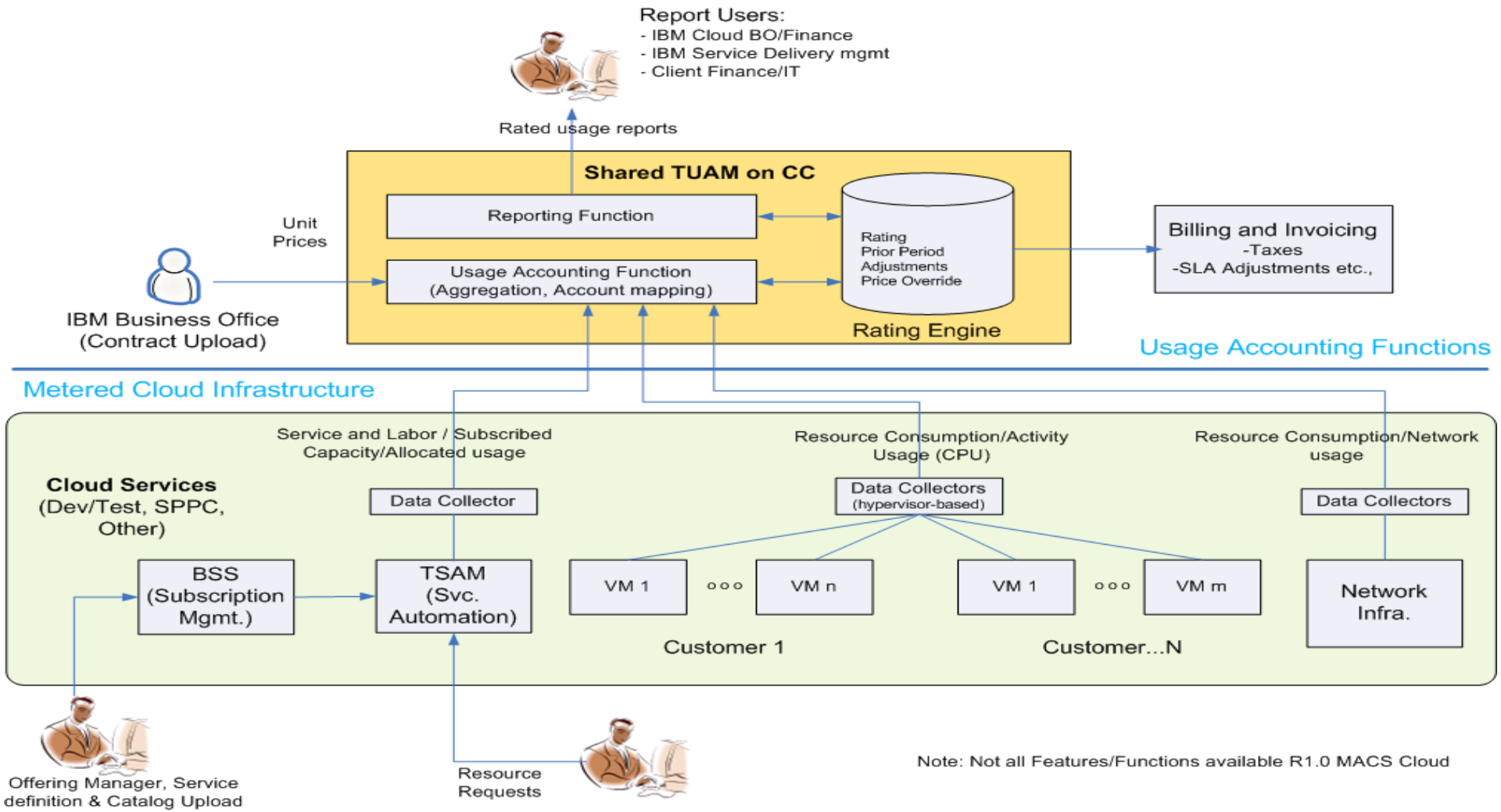
Service Usage and Accounting Metering, Usage and Accounting

…provide data for planning, budgeting, billing and accurate chargeback for services

- Collect, analyze and bill based on usage and costs of shared assets
  - CPU, Memory, Storage, Network
- Track creation, modification, and deletion of a service instance itself, and the capacity assigned to it.
- Understand costs, track, allocate and invoice by department, user and many additional criteria.
- Deliver detailed information and reports about the intricate use of shared resources



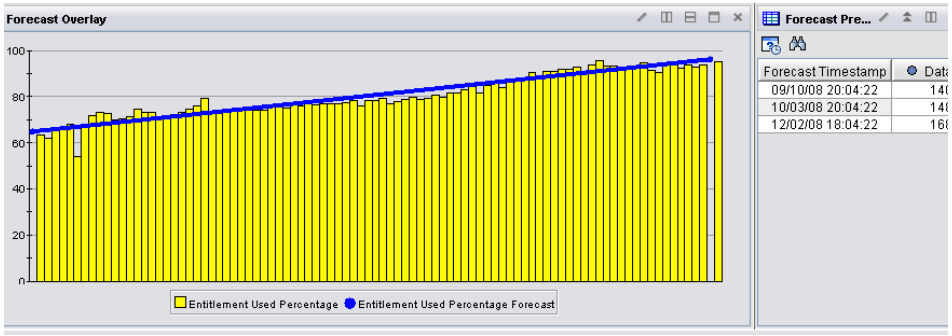
GTS/ITD Cloud Solution-Architecture
Metering and Chargeback Services (MACS)

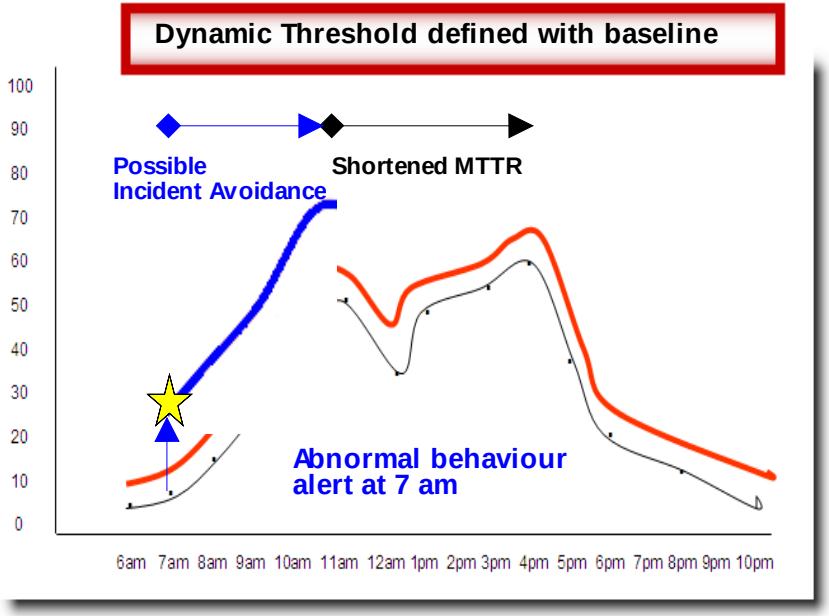


Monitoring, Forecasting and Capacity Planning of Cloud Environments

- **Monitoring** of the virtual environment in the context of the guest OS & application
- **Predictive trending**: what would be my resource utilization in the next month?
- **Dynamic thresholds**: tracks deviations from the norm as predictors of future problems
- **Capacity planning** and **what-if analysis**: how many more VMs can be placed on a server?

- Sense and isolate problems across virtualized servers, network and storage
- Optimize the environment and prevent for resources bottleneck
- Insure that business services are delivering at the right QoS
- Plan for adding new workload in the cloud

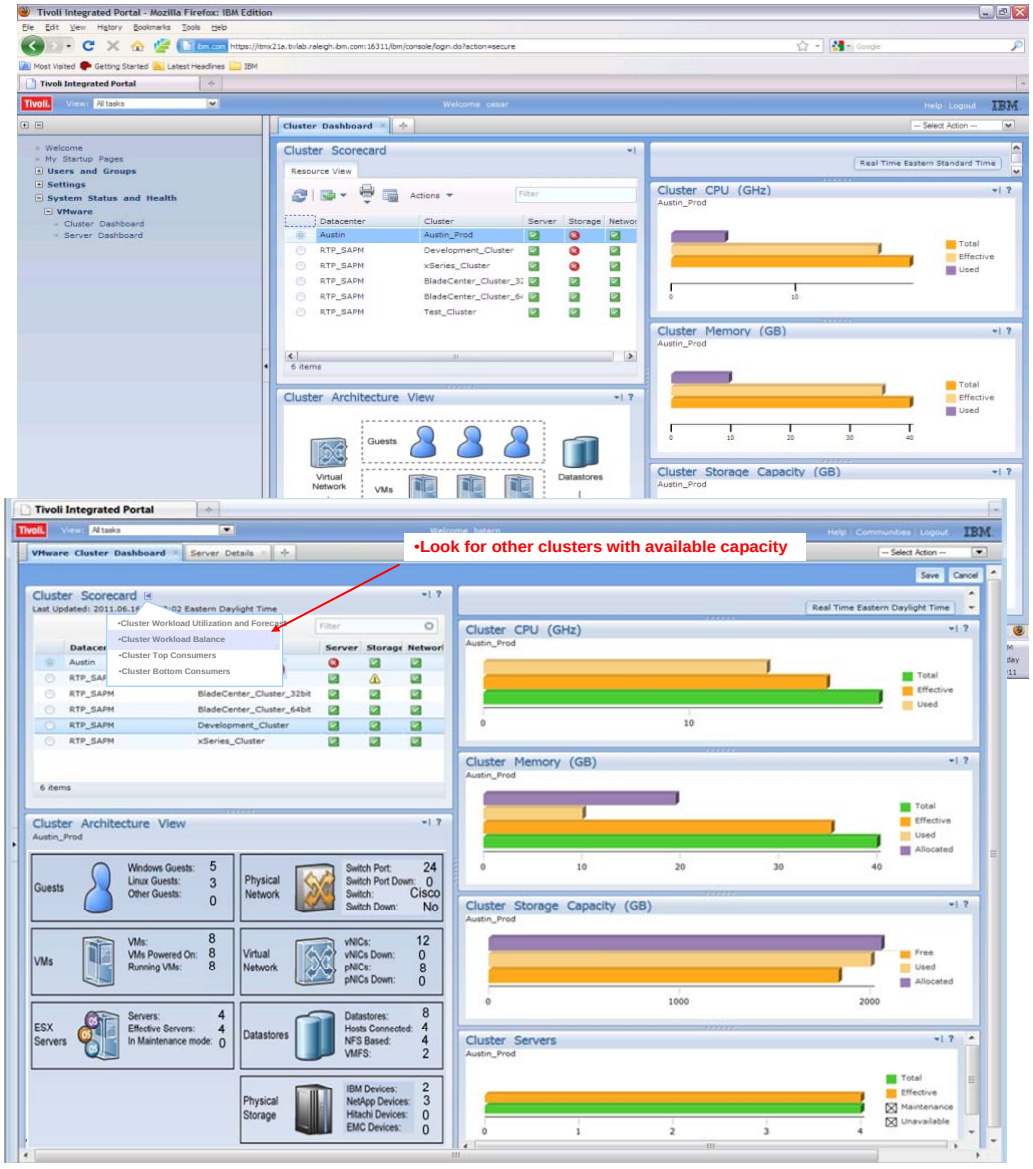




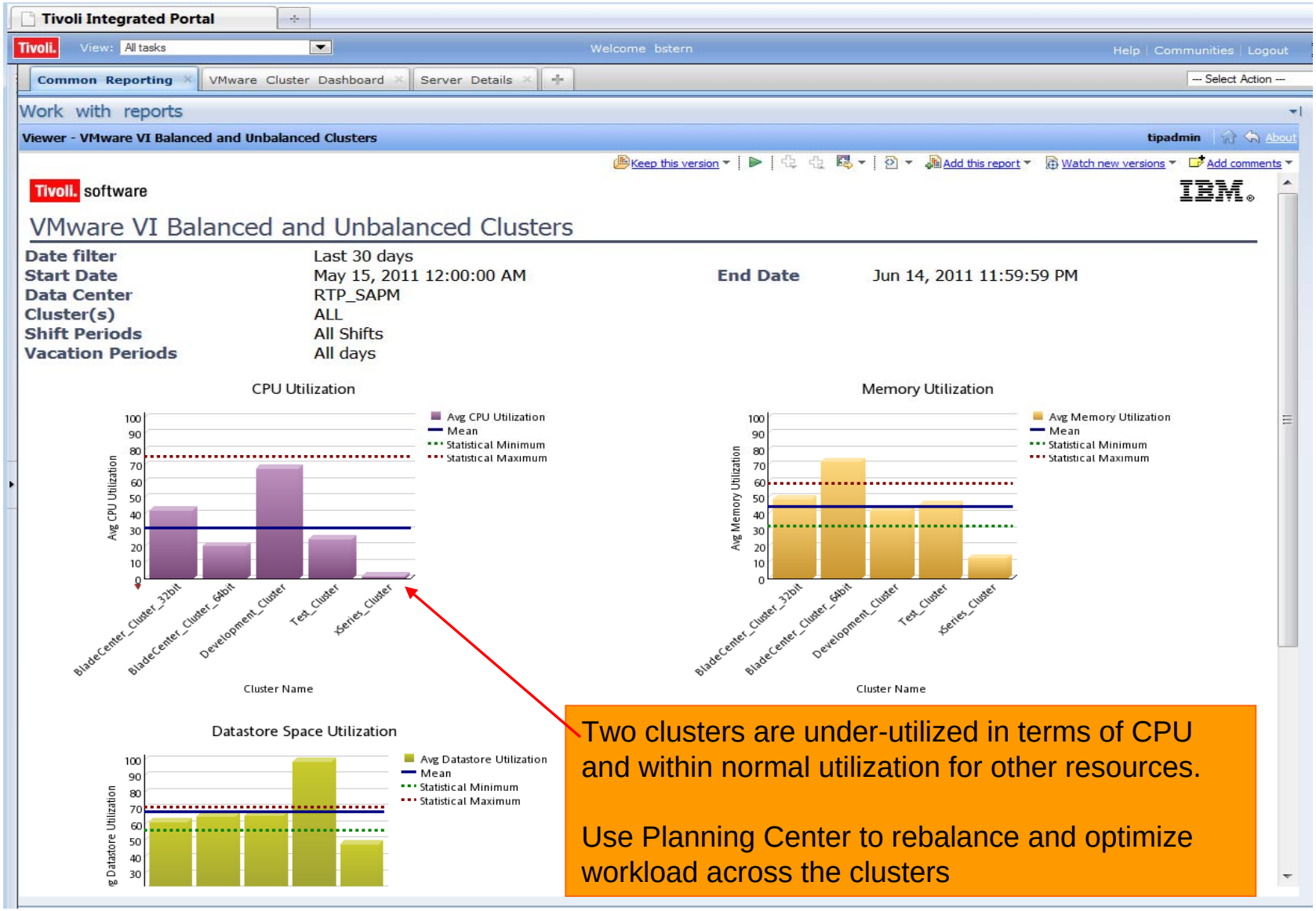
Monitoring Dashboard

- Integrated “out-of-the-box” contextual views of health and performance in the context of the virtual environment including *physical* and *virtual server*, *clusters*, *storage* and *network* resources.

- Receive real-time proactive & predictive alerts
  - Side-by-side and historical data to identify problems quickly



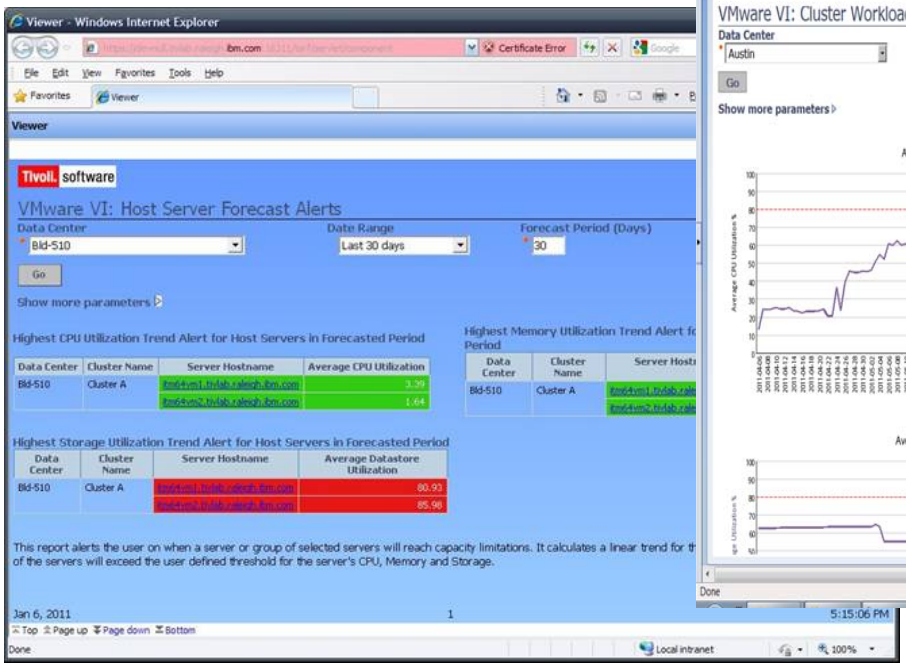
Workload Balancing analysis - How well used are resources in the environment?



Predictive trending - When will physical resources reach the breaking point?

- Resource usage forecasting based on historical data
- Identify breaking point

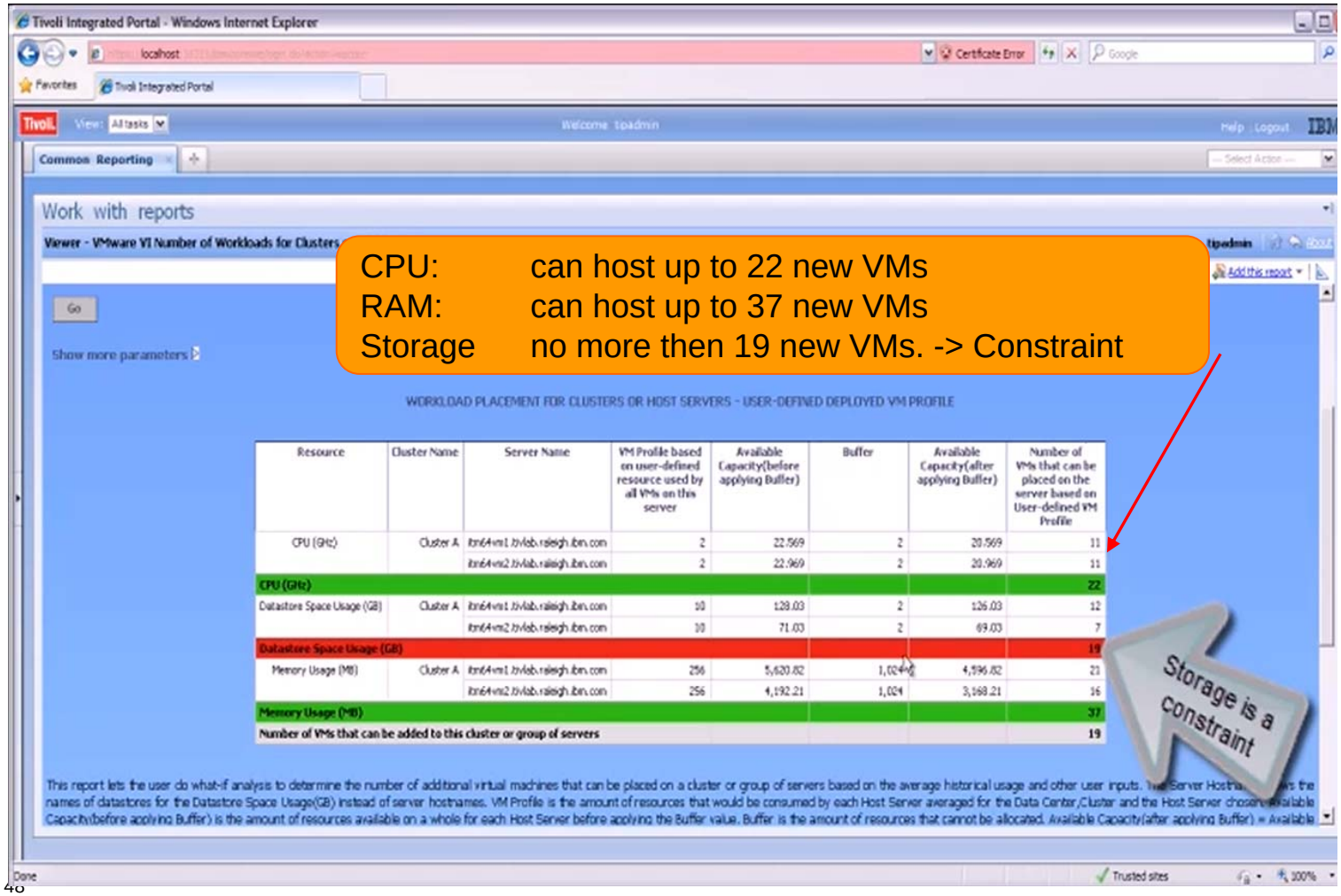
- Proactive identification of resource constraints
- Ensure visibility on future usage and allow forward planning of infrastructure investments



What-if analysis and Capacity Planning - How many more workloads can I sustain?

- What-if I need to add more VMs?

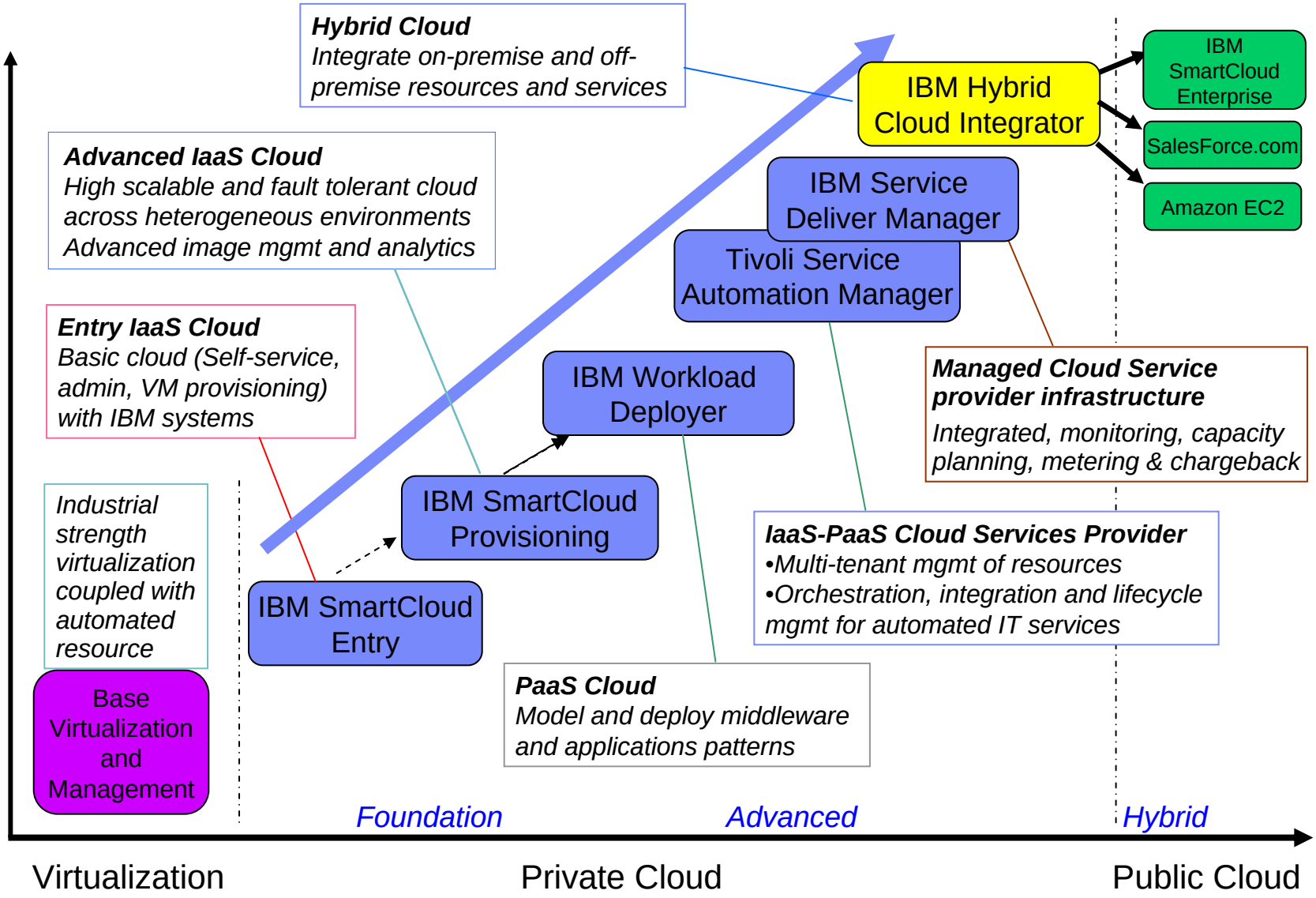
- Maximize resource utilization by identifying additional workload that the infrastructure can support.
- Forward planning of resource usage by Identifying resource constraints amount of resources needed in the future



CPU: can host up to 22 new VMs
RAM: can host up to 37 new VMs
Storage no more then 19 new VMs. -> Constraint

Storage is a constraint

Multiple entry points for implementing Private and Hybrid Clouds



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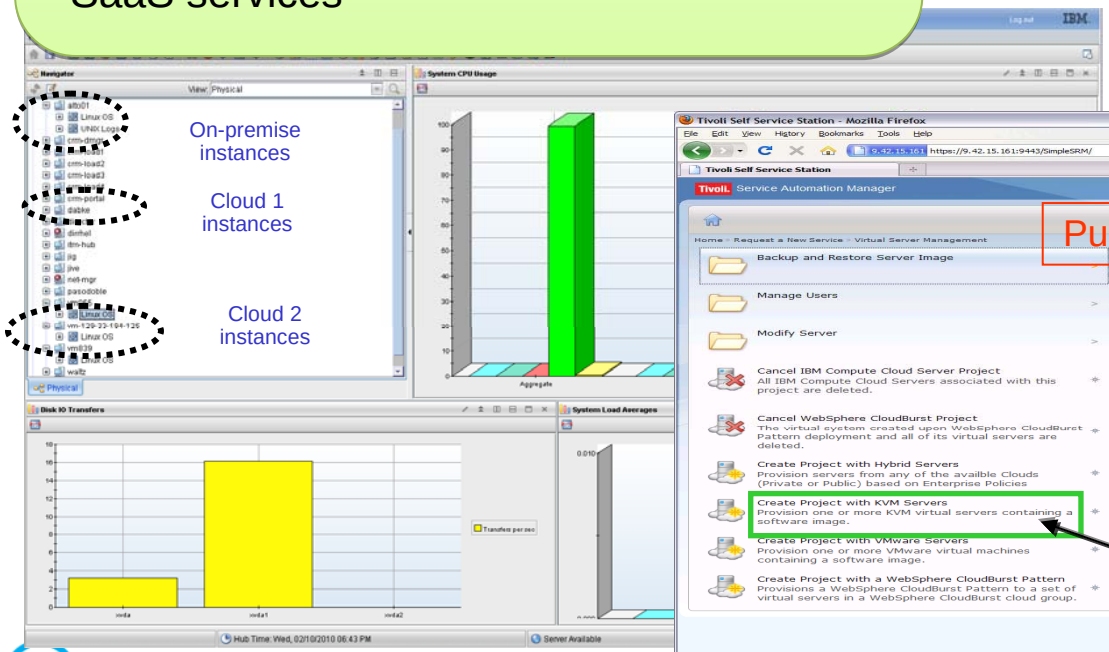
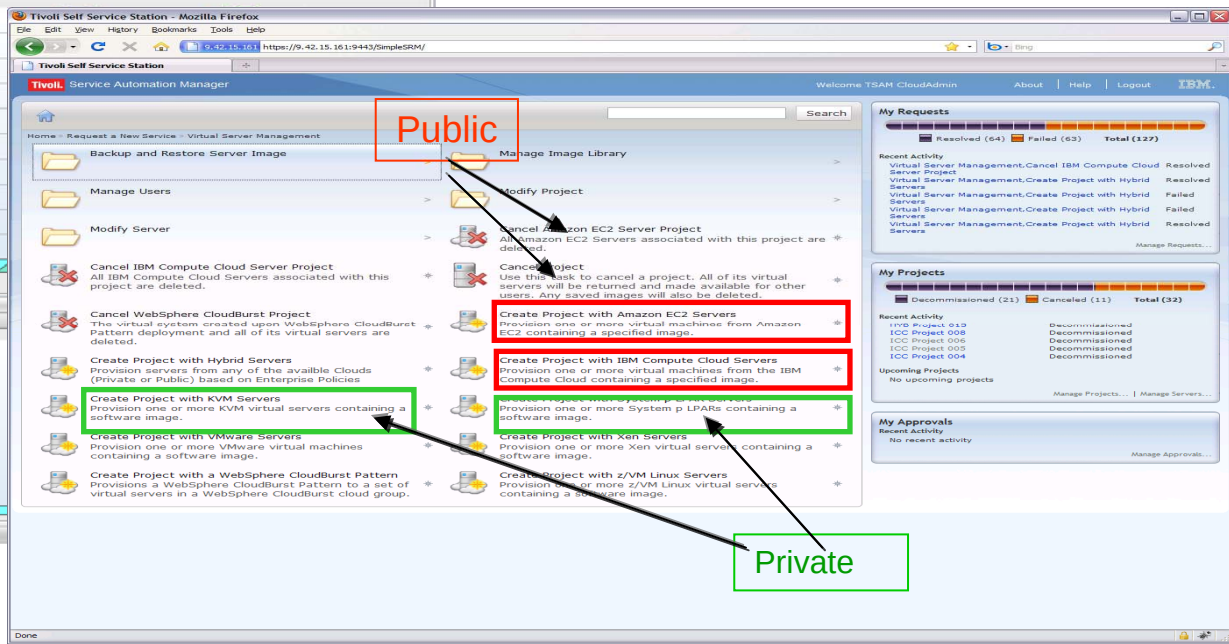
Hybrid Cloud – integrating on premise and off premise resources

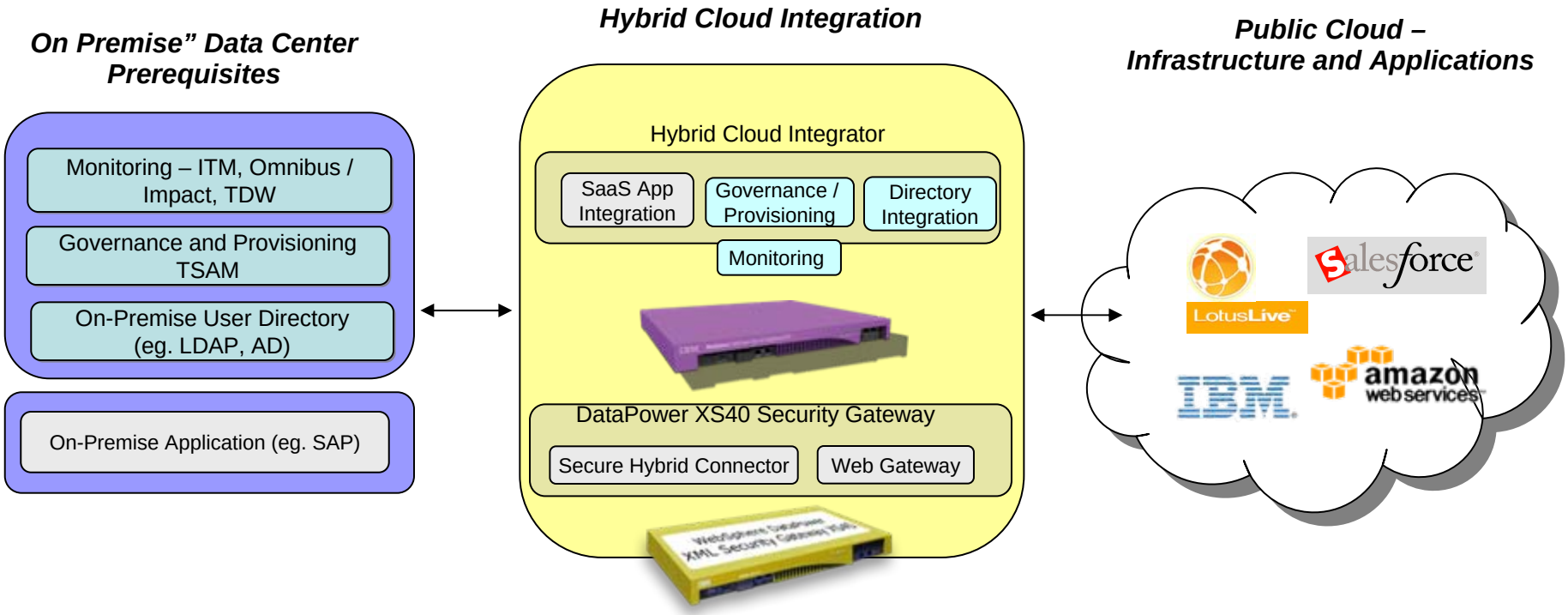
- Deploy off-premise resources using existing on-premise service automation
- Monitoring and managing off-premise resources using an existing ITM
- Scale out to off-premise resources in case of peaks
- Use and integrate with externally provided SaaS services

- Single point of control for the deployment and monitoring of on and off - premise resources.
- Leverage public cloud to manage workload peaks while keeping the same control of on–premise clouds



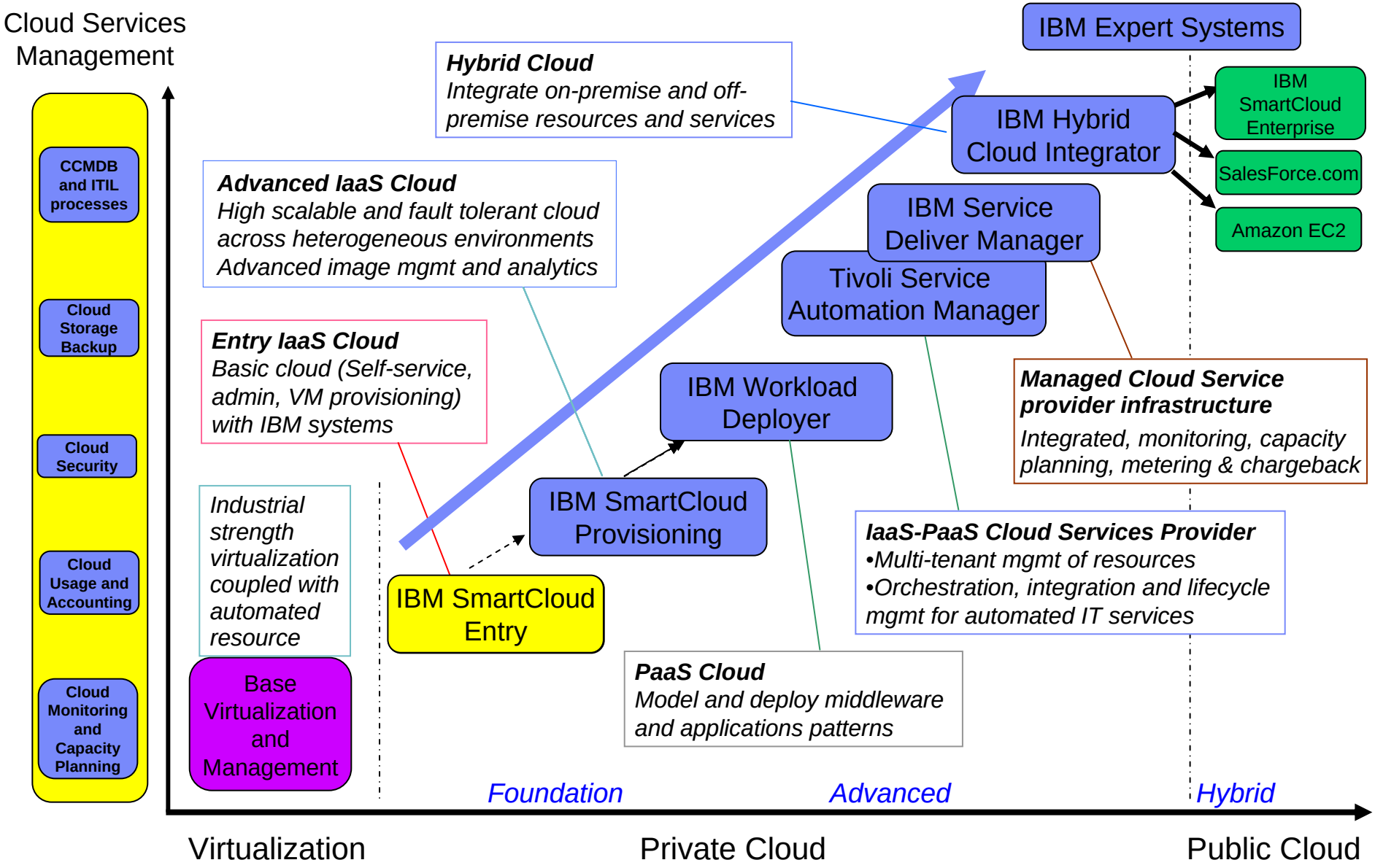


Integrated Hybrid Cloud Solution



- On-Premise Data Center- Client uses on-premise product (ITM, TSAM etc.), installs in data center.
  - Setup also includes any agreement with public cloud vendors - IBM CC, Lotus Live, Amazon
- Hybrid Cloud Integrator
  - Cast Iron for SaaS Application Integration and Directory Integration
  - Tivoli plug-ins with Cast Iron for Monitoring, Governance/Provisioning
  - Optional DataPower XS40 with Secure Hybrid Connector – DMZ deployable security gateway as required
- Hybrid Cloud Integrator Connections: Managed connection between on-premise software and off-premise endpoints

Multiple entry points for implementing Private and Hybrid Clouds



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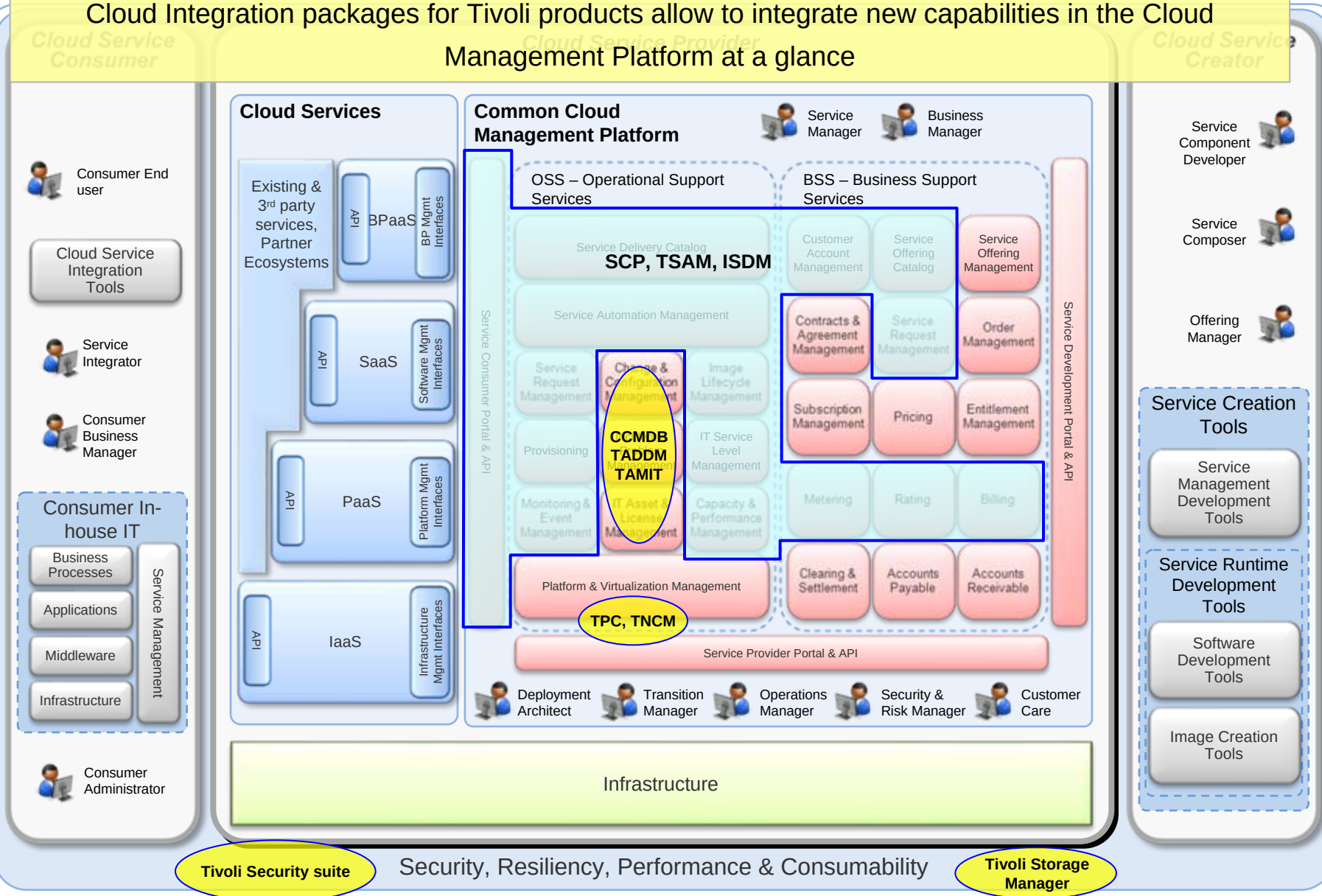
IBM add-on products provide additional Cloud Services Management capabilities

Cloud Integration packages for Tivoli products allow to integrate new capabilities in the Cloud Management Platform at a glance



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Topics

- Cloud Architectural view
- Cloud Solutions view
- Cloud Customers view

IBM is working with clients in each of these areas to help them achieve real business value.

Cloud Enabled Data Center

Integrated service management, automation, provisioning, and self service.

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UPMC

perceptive INFORMATICS

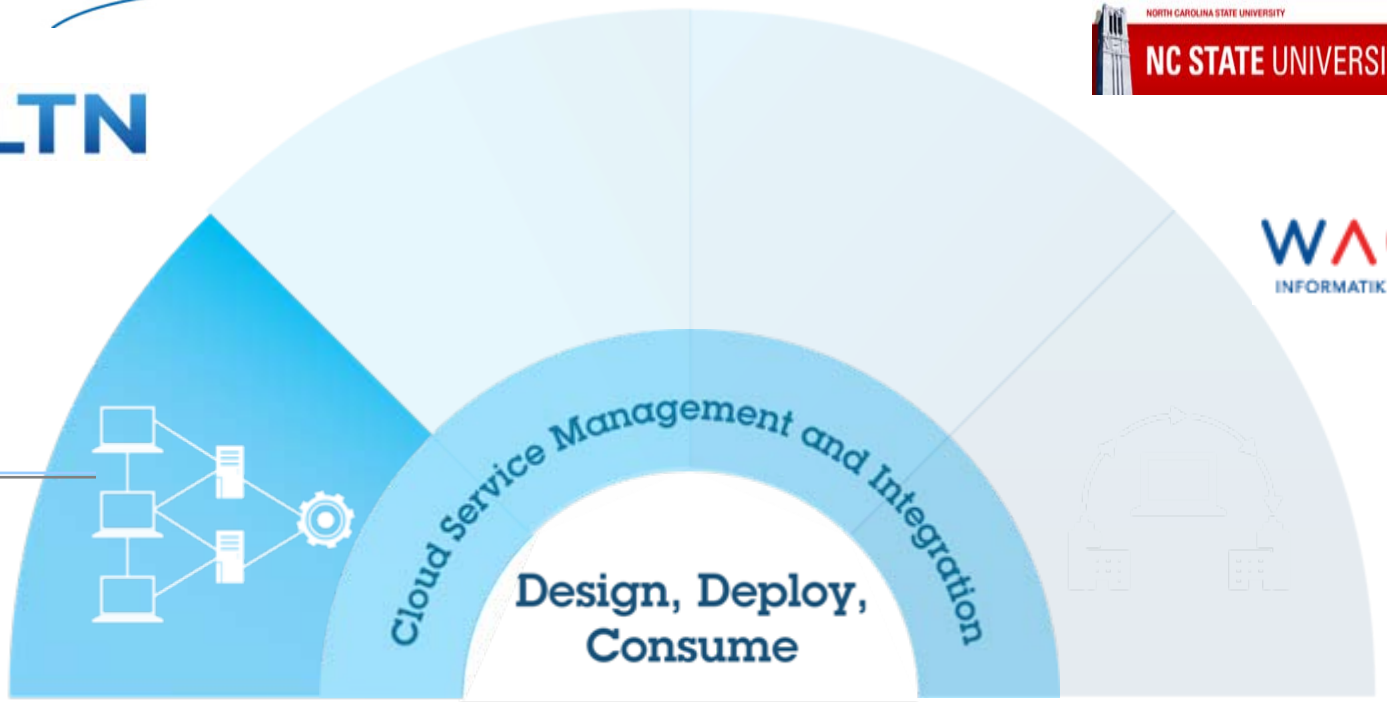
Dutch Cloud

NORTHROP GRUMMAN

NORTH CAROLINA STATE UNIVERSITY
NC STATE UNIVERSITY

SLTN

WAGNER
INFORMATIK DIENSTLEISTUNGEN



Citigroup – IaaS Private Cloud

Our Customer's Business

- Citigroup is a global financial institution offering retail & institutional banking & asset management services with over 200 Million customer accounts in 140 countries.
- 12 Global Datacenters with over 250,000 users.
- 60,000 physical & virtual servers.
- 22 different versions of windows, linux & Unix.
- Development, Test & Production environments ALL considered "Production Quality".
- Platforms: IBM, HP, Solaris, VMWare, RedHat, Microsoft
- Middleware: MS SQL, IIS, Exchange, Websphere & Oracle

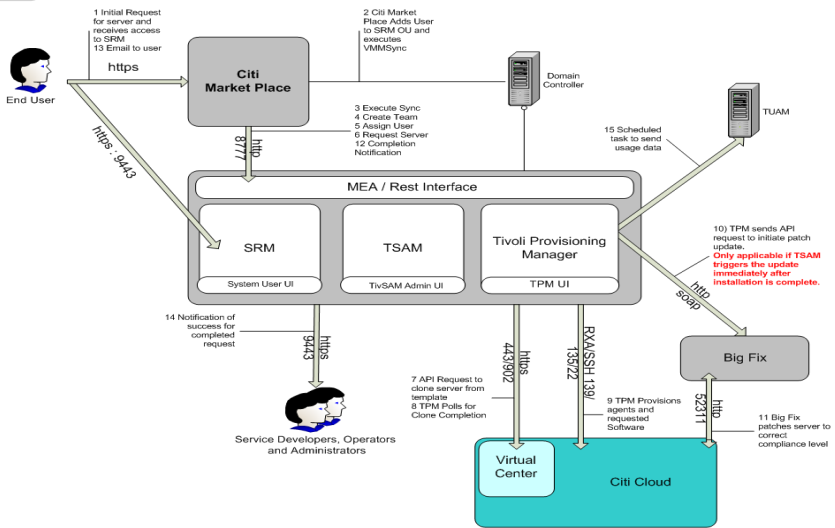
Cloud Business Benefits

- Totally automated server request/provisioning solution
- Rapid service deployment – improving from several weeks to just days or hours.
- Include an internal chargeback system for driving different behaviors of consumption (and releasing unused resources back into the Cloud).
- Formal API's to support interfacing to other products.

The Business Challenges

- Reduce cost through increasing system administrator ration from 10's to 1 to 100's to one.
- Minimize time from server request to server provision
- Utilize Citi's high expertise in virtualization technologies.
- Utilizing Citi Marketplace application for requesting servers.
- Multiple world-wide installations will support 9,000 internal application developers.

What Did We Do?



Dutch Cloud — IaaS & PaaS Public Cloud

Our Customer's Business

- DutchCloud is a leading ISP based in the Netherlands, focused on SME customers in a few key industries (Healthcare, Electronics).
- A Cloud service provider offering a range of Cloud based services from fully managed IaaS through to disaster recovery solutions.
- Customers select DutchCloud for the quality of service delivered and its service assurance.

Cloud Business Benefits

- Rapid deployment of new services in seconds rather than hours. (Deployed 100's of new VM instances in under 5 minutes).
- No/low maintenance, minimised operational administration, and no outages required for upgrades.
- Changing the delivery of DR services from cold-standby (capital intensive) to rapidly deployed (utilisation efficient) and significantly more cost effective for customers and CSPs.

The Business Challenges

- DutchCloud have been looking for some time for a light-weight highly functional solution for core cloud service delivery.
- Current challenges are to improve the delivery of Cloud services in terms of cost, speed, agility, minimised operations and industrial strength solutions
- Scale delivery costs to business volumes.
- Support delivery through a Reseller model.

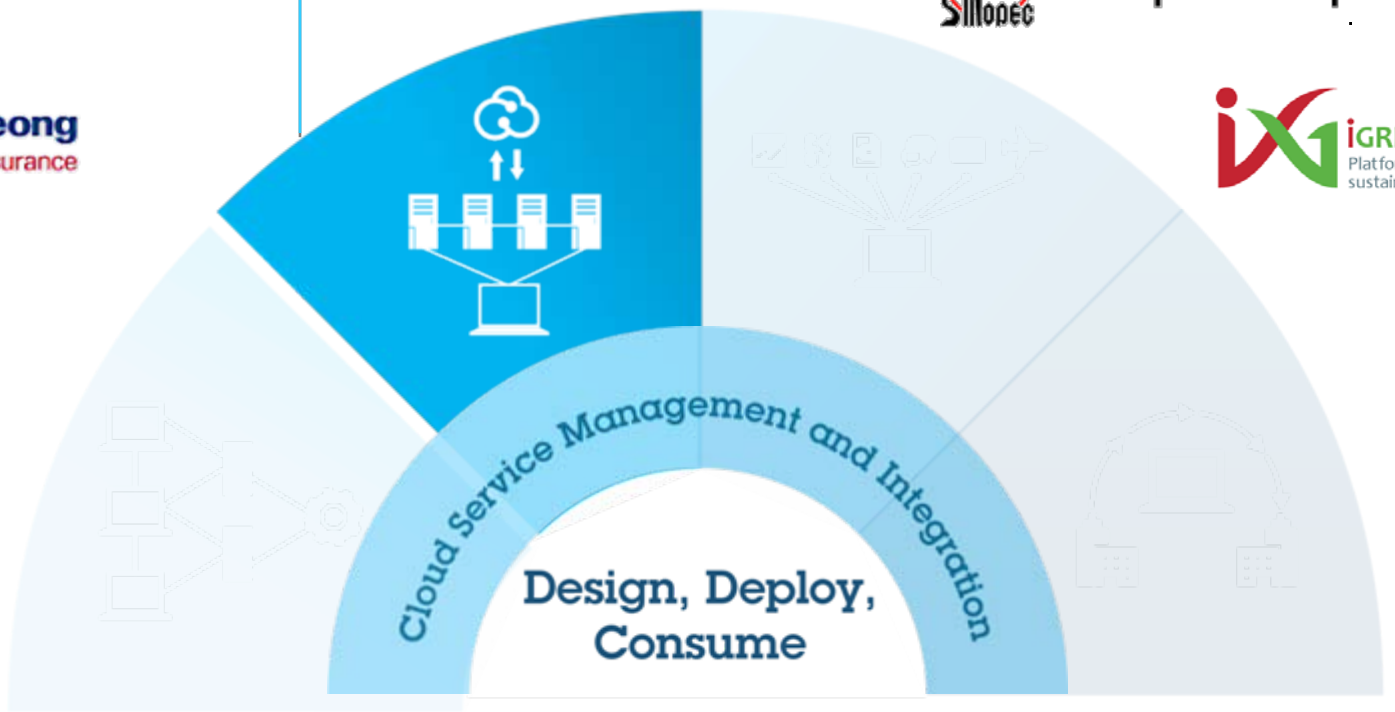
What Did We Do?

- Implementation of IBM SmartCloud Provisioning as the core delivery platform across multiple compute and storage nodes.
- KVM hypervisor delivery for VMs supporting minimised license cost (likely to support a mixed KVM and ESX deployment going forward).
- Customer, management and VLAN separation for multi-tenant isolation at network/presentation layer
- Integration with IBM V7000 Storwize storage and SmartCloud Provisioning to offer customers variable SLAs for storage.

IBM is working with clients in each of these areas to help them achieve real business value.

Cloud Platform Services

Pre-built, pre-integrated IT infrastructures tuned to application-specific needs



IaaS & PaaS Private Cloud

Our Customer's Business

- ING is a large world-wide operating financial institution offering clients banking, insurance and asset-management services (HQ in Amsterdam, Netherlands), ~110,000 employees
- ING needs to drive down IT costs dramatically and intensively improve their time to deliver new IT environments to the business
  - ➢ ING is in the process of transforming towards a "new world" IT landscape (besides their legacy "old world" IT), in which they can benefit from the advantage of a private cloud concept.

The Business Challenges

- Predictability of the service delivery process for new IT services. Wide ranges of process delivery.
- Service delivery process tightly coupled with the purchasing process and multiples levels of approvals & reviews.
- End-to-end provisioning times ranging from a few weeks to a few months.
- No clear view on the "state" of a request in the process.
- Very labour intensive delivery, with many manual steps and differences in configurations.
- Difficult to correlate costs to actual usage or business value.

Cloud Business Benefits

- Large efficiency improvement in time and cost to deliver new IT environments.
- Massively improved predictability (regarding time to deliver new environments and future availability of required IT capacity, enabled by reservation).
- Visibility into where resources are allocated to
- Improved customer experience (i.e. quality of service) through standardisation and increased agility.
- Transparent cross-charging ability for provided IT services.

What Did We Do?

- Automated delivery of standardized "stacks" (OS up to app, single VM) and "solutions" (distributed environment, multiple stacks), for development, test, acceptance and production purposes.
- Tivoli Service Automation Manager-based private cloud implementation, management across System p, x86 & Solaris.
- Restructuring of existing IT delivery / mgmt processes & IT landscape to enable large efficiency gain. New processes implemented in TSAM mgmt plans.
- Integration with ING-internal mgmt systems where needed and appropriate (e.g. ING Corporate Directory Server & Identity Mgmt System, agents to integrate with backup & monitoring get deployed & configured automatically).

iGreen – IaaS / PaaS / SaaS Public Cloud

Our Customer's Business

- iGREEN is established to provide Total IT solution and services to Vietnam. Its core businesses comprises of IT outsource and managed services and education.
- Phase 1 is for 3 largest cities (HCM, Hanoi and Danang). Phase 2 of business expansion target to reach out to rest of 64 provinces in Vietnam.
- Key stakeholders are National University (provides people and administration resources as well as education facilities to 6 universities), Long Hau Corporation (a listed company that provide real estate and industrial park data center space) and S-Integrated Management Services (the prominent Data center Design and Built integrator).

The Business Challenges

- iGREEN sees Cloud Computing as a good business model to extend its services and technology to its clients (B2B then B2C) in Vietnam.
- "Green field" deployment of fully managed IT services.
- Implementing a range of IT services in a cost effective way, requiring a flexible business model.
- iGREEN plans to offers a series of SaaS, IaaS and PaaS for their customers.

Cloud Business Benefits

- Rapid deployment and rollout (both scaling up and down as needed) of a multi-service application infrastructure.
- Ability to deliver a range service offerings including IaaS, PaaS, and SaaS. SaaS offering such as eUniversity Application, eAutomotive and facility management are some of the application that iGREEN planned to provide.
- Security segregation of services between tenants at network and presentation levels. Multi-tenant isolation provided at the network layer through VLAN assignment.

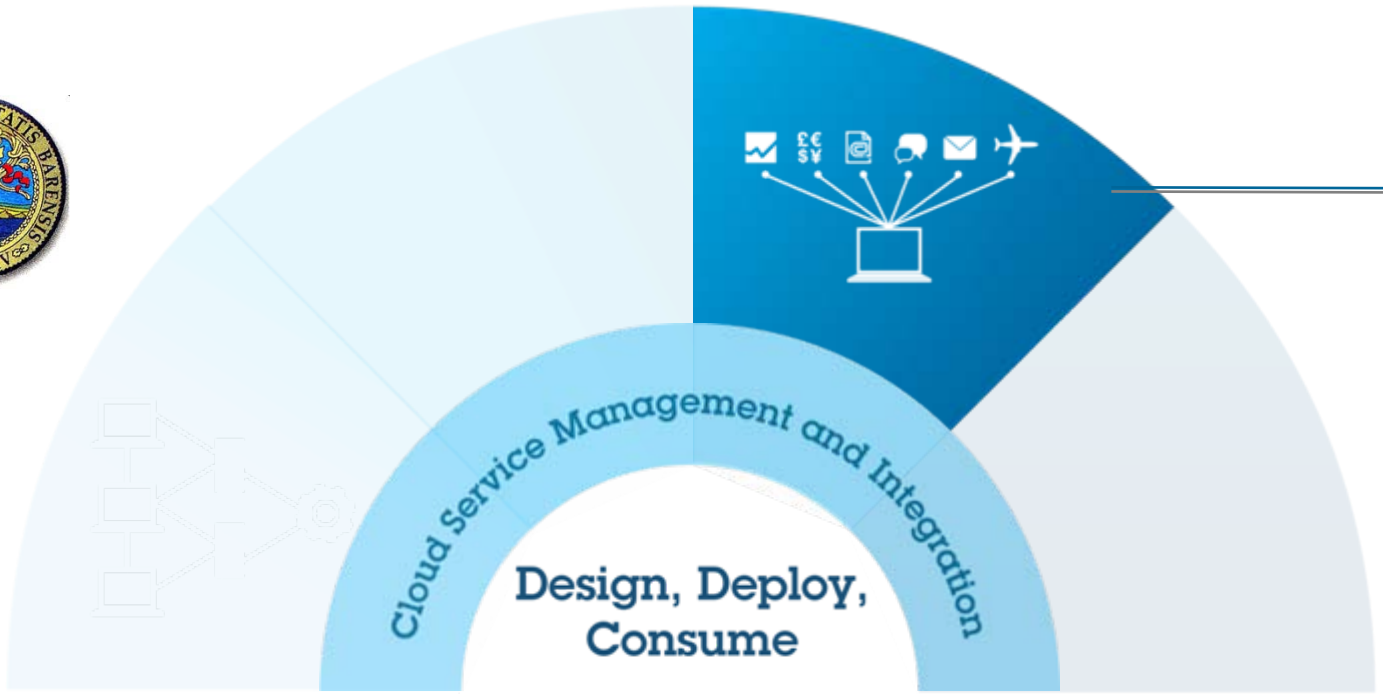
What Did We Do?

- Implementation of IBM SmartCloud Orchestration including ISDM and TSRM modules.
- Delivery of PaaS services (eUniversity application) which is then consumed as a Cloud service in SaaS offering.
- SmartCloud Orchestration will establish the environment consisting of multiple virtual servers including university student management, on-line teaching, digital library, digital archiving, faculty member management, course management.
- iGREEN plans to extend the use of TSRM and additionally CCMDB, TAMIT and Release management for them to manage their business processes (SOP) and IT management.

IBM is working with clients in each of these areas to help them achieve real business value.

Business Solutions on Cloud

Software-as-a-Service delivering IT and process orchestration within and across organizations



University of Pennsylvania Medicine Clinical Research Cloud

Our Customer's Business

- The University of Pennsylvania School of Medicine's Clinical Research Computing Unit is developing a Cloud infrastructure to support secure virtual desktop and compute needs for internal and external investigators.

The Business Challenges

- Ability to deploy an environment quickly in support of a particular medical research project. Current process very manual, labour intensive, and lengthy in timeline.
- Ensuring secure access to the data and applications.
- Complexity in deploying medical applications such as Oracle Clinical.
- Compliance to applicable regulatory policies including: HIPPA, GINA, CMS, FISMA, FDA, and VA. (Effort to establish and maintain compliance).
- No visibility on the costs versus system usage.

Cloud Business Benefits

- Provide investigators with a standard virtual desktop environment that supports secure access to research data.
- Cost effective solution provides greater desktop hardware density and standardization.
- Self service registration for access management and integrated identity management across desktop and server infrastructure.
- Provide detailed usage and accounting to support chargeback to research projects.

What Did We Do?

- Desktop-as-a-service delivery with integration to specialist medical applications, such as Oracle Clinical.
- Implement a Tivoli Service Automation Manager (TSAM) based solution for provisioning and service catalog.
- Integration with Verde's virtual bridges for desktop provisioning, driven thru the TSAM service catalog.
- Server based deployment of medical applications and analytical applications to be used thru the secure desktop.
- Support for KVM and VMware hypervisors.
- IBM hardware using xSeries blades, and XIV storage.

University of Bari - Community Cloud (System Z)

Our Customer's Business

- The University of Bari is one of the leading academic institutes in Southern Italy, with a long track record of supporting the community through its student and research projects.
- The University of Bari is developing cloud-based solutions for southern Italy as part of the Daisy-Net consortium, which includes companies and universities from region Puglia in southern Italy.
- The University of Bari is committed to solving community challenges through technology, providing a test-bed for software, devices, services, laboratories and other technical instrumentation.

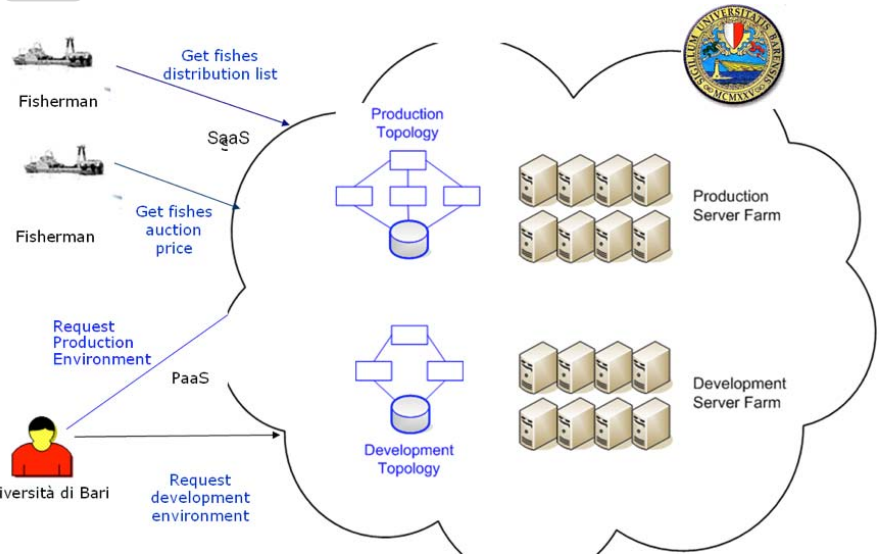
The Business Challenges

- Use IT resources owned by the University, and spread the reach of those resources into the community for social and economic benefit.
- Effectively bringing the power of IT to specific business initiatives where it has previously been unaffordable.
- Explore the application of Cloud based delivery to mainframe computers.
- Explore how cloud computing can change and innovate business models in the community.
  - Starting with the Fishing Industry, and Wine Industry.

Cloud Business Benefits

- Provide increasingly better service to its customers by delivering services more rapidly, consistently and with fewer errors
- Cloud computing project help local business to adopt a new business model;
  - ✓ Local fisherman are able to determine market demand for various types of fishes by accessing the cloud computing-based systems.
- Delivering services through an IBM System z mainframe and cloud computing lowers the barrier to help local businesses to benefit from this technology.
- The cloud solution is built on an IBM System z9 running the Linux operating system, and includes TSAM, ITM/OMEGAMON , Omnibus, TBSM, TADDM from Tivoli software.

What Did We Do?



IBM is working with clients in each of these areas to help them achieve real business value.

Capgemini
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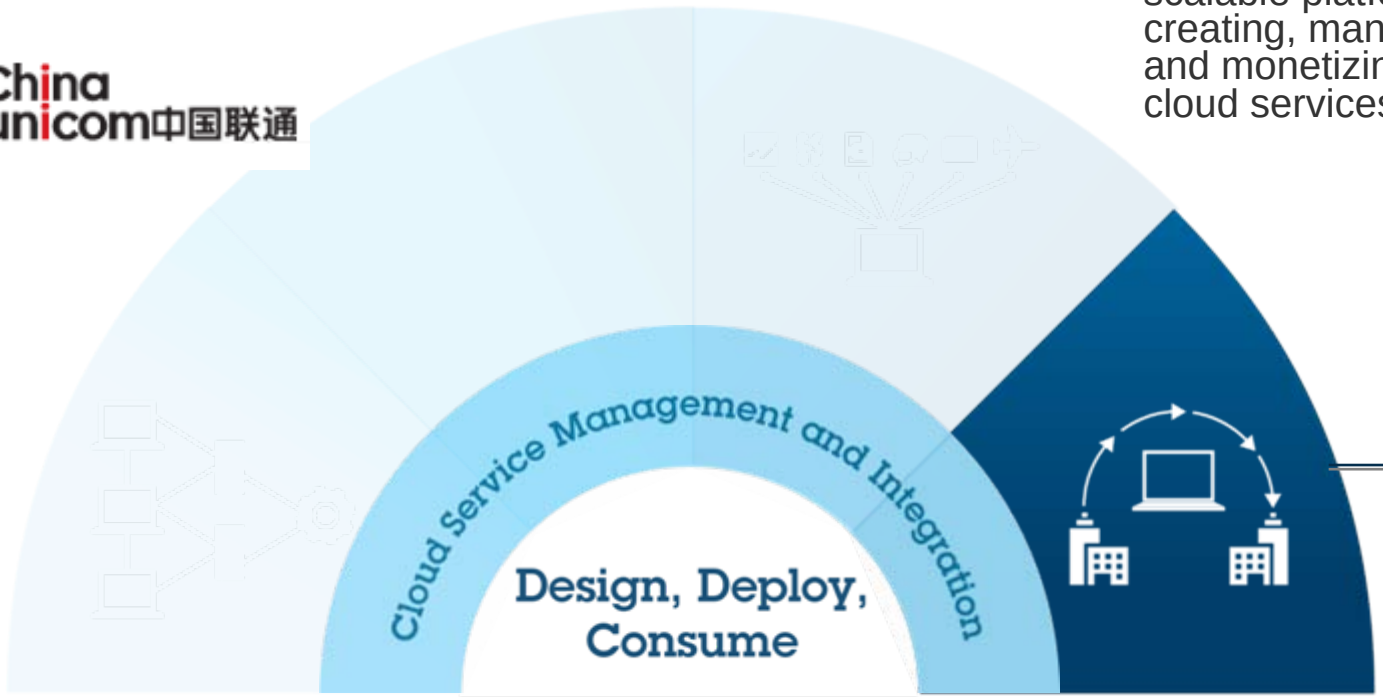
SK telecom

China unicom中国联通

Cloud Service Provider

Advanced, reliable, highly secure and scalable platform for creating, managing, and monetizing cloud services



Development & Test Cloud

Our Customer's Business

- China Unicom provides a wide range of services including nationwide GSM mobile network, long-distance, local calling, data communication, Internet services and IP telephony. The company had 125 million GSM subscribers and 43 million CDMA subscribers. Ranked as the world's third-biggest mobile provider.
- Our customer is branch of Hebei province, which provides application to local government and SMB.

The Business Challenges

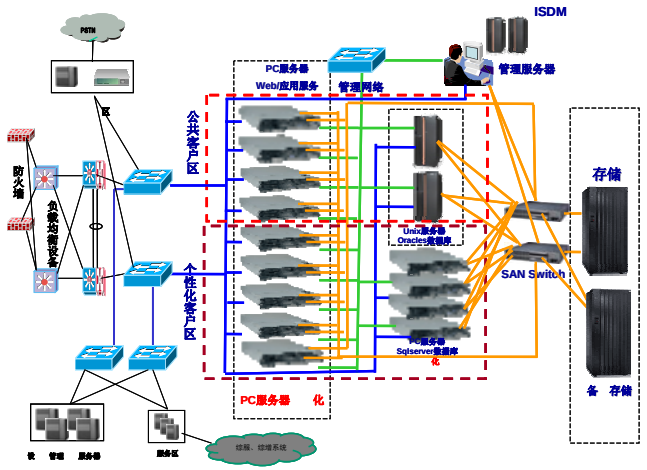
- Slow delivery of application stacks.
- Variation in build quality resulting in additional testing, remediation, and production application bug fixes.
- Low utilisation of x86 hardware.

Cloud Business Benefits

- Automated delivery of standardized "stacks" (OS up to app, single VM) and "application solutions" by intelligent business policies.
- Maximize hardware utilization by fast provisioning instead of hardware clustering.
- Manages hypervisor of VMware and KVM to avoid vendor lock.
- Software provisioning as a service within friendly Web20 UI.
- Extend to monitor existing physical and virtualized hardware, plus Microsoft IIS web server.

What Did We Do?

- 1st IBM Service Delivery Manager (ISDM) in the world.
- Total monitoring of status of health & performance.
- Load balancing provisioning on F5.



SKTelecom – Technology Incubation Public Cloud

Our Customer's Business

- SK Telecom is a unit of SK Holdings, one of South Korea's largest chaebol conglomerates .
- SK Telecom has #1 market share in the domestic wireless market, and #2 market share in the domestic fixed line market.
- SK Telecom has a reputation of technology innovation and leadership.

The Business Challenges

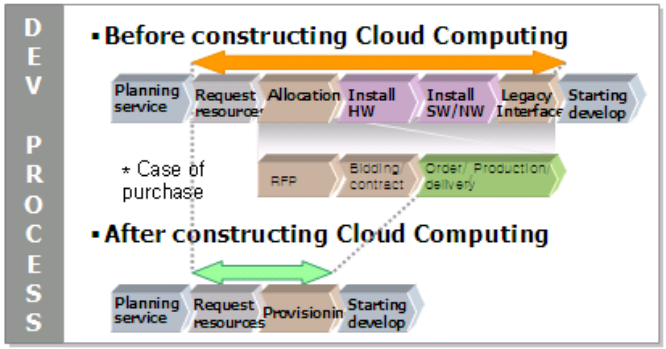
- Business agility to launch new services quickly, for the benefit of subscribers, partners and SKT.
- Provide an environment for business partners and ISVs to develop applications quickly and launch on the SKT network to subscribers.
- New services delivered with partners with faster time to market, creating competitive market advantage.
- Optimized use of IT infrastructure delivering reduction in capital and operational expenses.

Cloud Business Benefits

- Break-thru level of business agility, required to creatively launch new services to the marketplace in a rapidly evolving and maturing environment.
- Extremely rapid IT resource provisioning.
- Higher resource utilisation rates driving better economies of scale.
- Service Management-enabled Cloud Delivery platform to run new WAP services in a workload optimized fashion.

What Did We Do?

- Korean language portal based on API extensions to Tivoli Service Automation Manager.
- Tivoli Provisioning Manager-based Development Platform-as-a-Service offering to allow Business Partners to quickly test, develop, and publish new end-user focused WAP services available on SK Telecom network.



Rethink IT.
Reinvent Business.
Smart, Secure and Ready for Business

Questions ?