IBM System z Technology Summit

Getting your Arms around the Cloud

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2011

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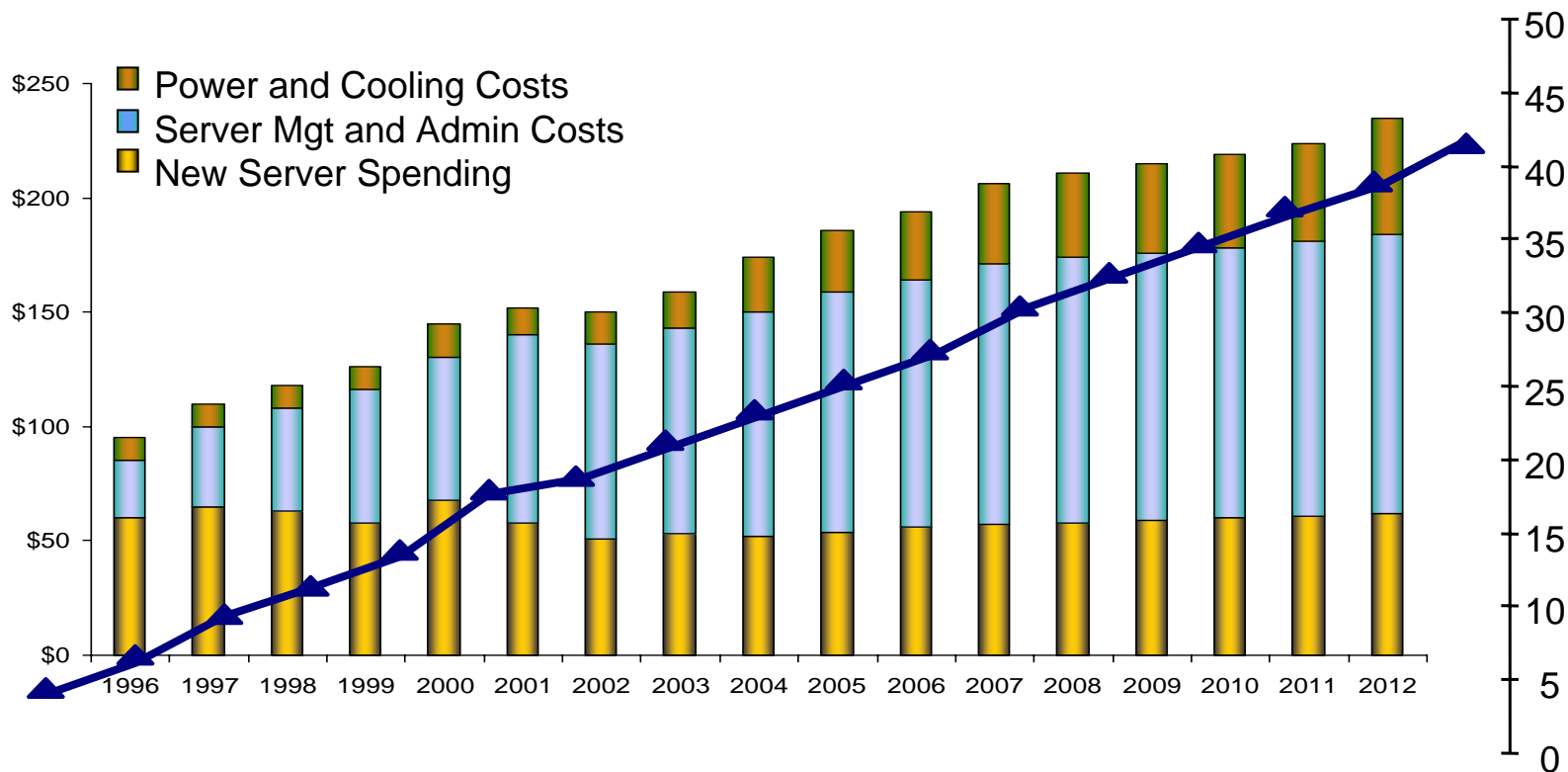NOTHING CONTAINED IN THIS PRESENTATION IS INTENDED TO, OR SHALL HAVE THE EFFECT OF:

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Annual Operating Costs Are Out Of Control

Worldwide IT Spending on Servers, Power, Cooling and Management/Administration

IDC, 2008

Businesses face challenges today

- Lost business opportunity because IT too slow to react. Lack of agility

- Long deployment timelines for new systems (weeks/months+)

- Many people involved in the process, high cost & complexity

- Many steps are manual and prone to error

- Huge up front investment for new infrastructure

- Server sprawl

- Low utilization

- Costly compliance, auditing, and security patching

Worldwide IT Spending on Servers, Power, Cooling and Management/Administration
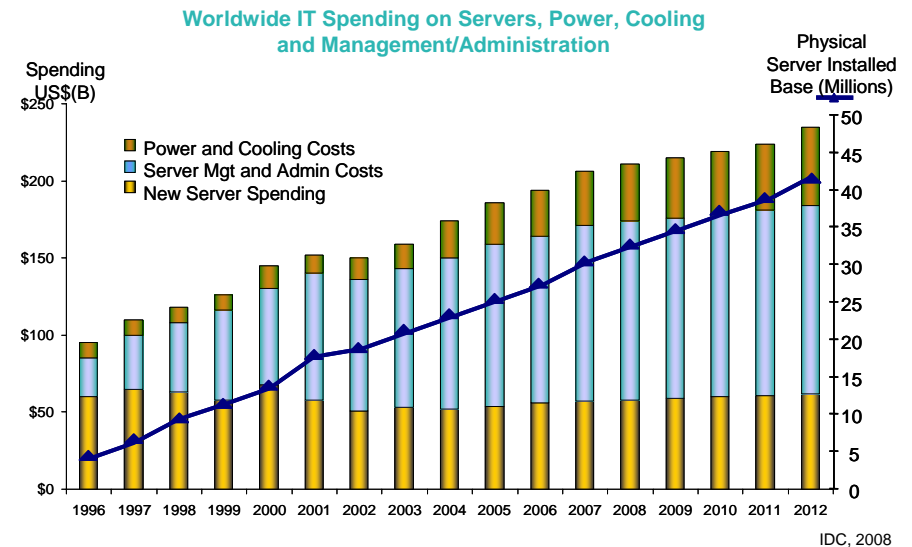
Spending US$(B)

Physical Server Installed Base (Millions)

- Power and Cooling Costs
- Server Mgt and Admin Costs
- New Server Spending

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

IDC, 2008

What Is The Solution?

- **Reinvent the data center to build a more dynamic infrastructure**
  - Take Cost Out
    - Virtualization and consolidation

  - Reduce Energy Consumption
    - Green Data Center

  - Simplified Administration - Request Driven Provisioning
    - Automatic self service

Provide private cloud services to the enterprise
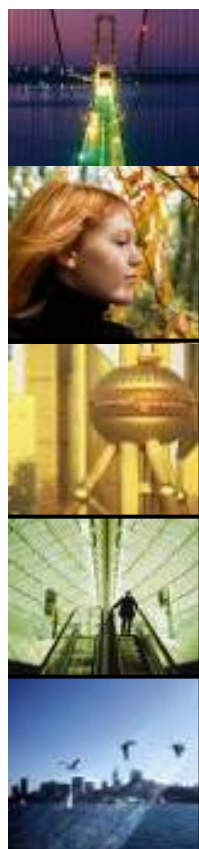
	2008 CEO Directions	CIO Implications
HUNGRY FOR CHANGE	*83% expect substantial change in the next three years*	**Flexible, adaptable, extendible systems to support business model changes**
INNOVATIVE BEYOND CUSTOMER IMAGINATION	*76% see opportunity in more informed and collaborative customers*	**Collaboration & social networking to improve idea/information sharing**
GLOBALLY INTEGRATED	*75% are actively entering new markets*	**Embrace emerging technologies**
DISRUPTIVE BY NATURE	*69% are planning some type of business model innovation over the next three years*	**Manage increasing risk**
GENUINE, NOT JUST GENEROUS	*69% believe rising customer expectations of corporate social responsibility will positively impact their business*	**Deliver on Green IT**

Cloud computing can be a critical part of the enterprise transformation

Cloud computing is about enabling the end user to help themselves

A user experience and a business model

- Standardized offerings
- Rapidly provisioned
- Flexibly priced
- Ease of access

An infrastructure management and services delivery method

- Virtualized resources
- Managed as a single large resource
- Delivering services with elastic scaling

Similar to Banking ATMs and Retail Point of Sale, Cloud is Driven by:

- Self-Service *(consumer behavior)*
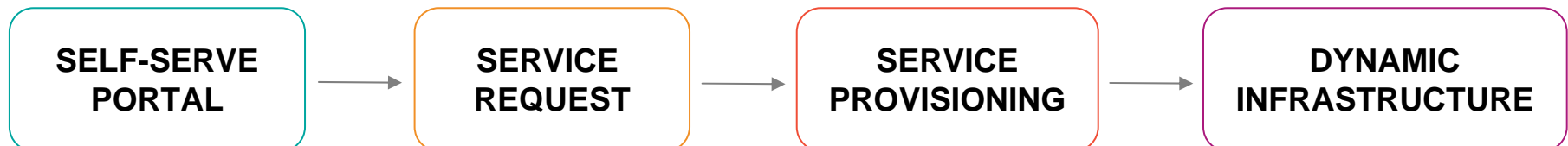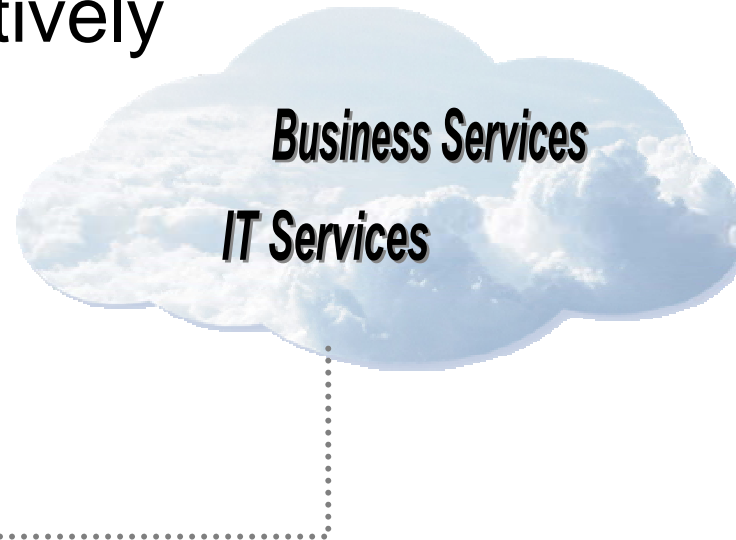- Economies of scale
- Technology advancement

Banking

IT

Retail

Cloud Computing - Strategic View

"Self-service" plus standardization drives lower costs and unlocks productivity for delivering workloads more effectively

Business Services
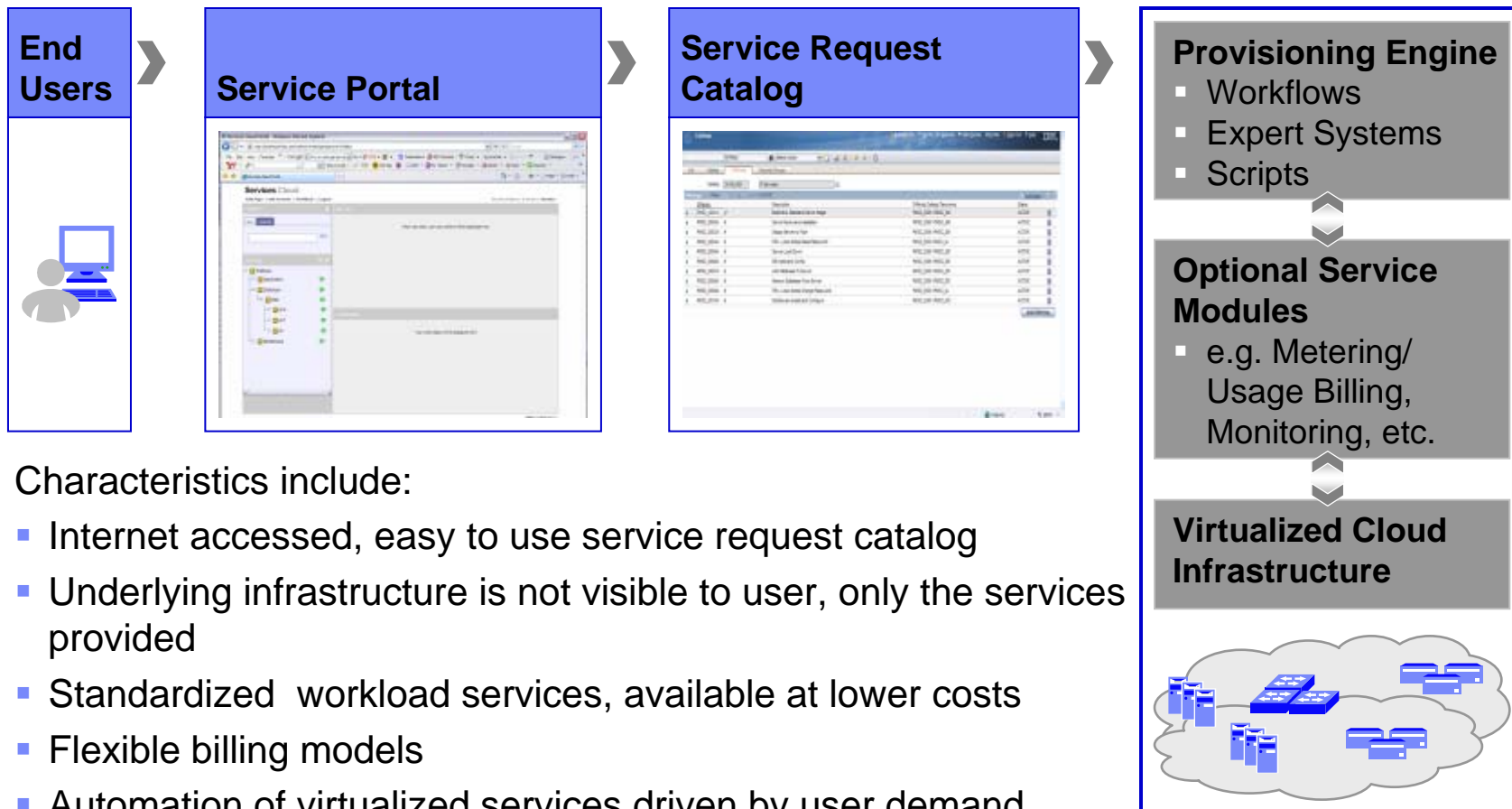
IT Services

SELF-SERVE PORTAL	→	SERVICE REQUEST	→	SERVICE PROVISIONING	→	DYNAMIC INFRASTRUCTURE

An effective cloud computing deployment is highly optimized to achieve more with less....

CLOUD COMPUTING

VIRTUALIZATION **+** STANDARDIZATION **+** AUTOMATION **=** Reduced Cost / Increased Flexibility
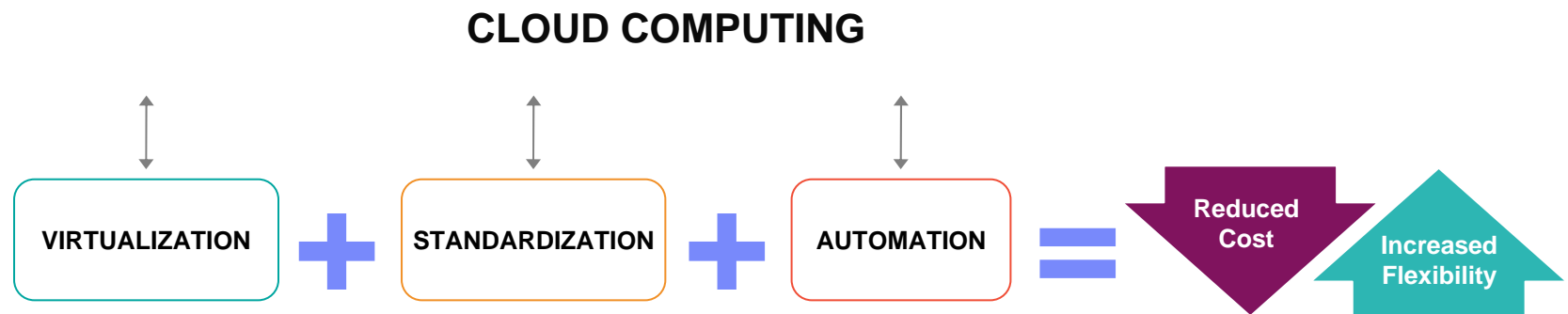
...leveraging virtualization, standardization and automation to free up operational budget for new investment.

How does cloud computing work?

End Users	Service Portal	Service Request Catalog	Provisioning Engine

Provisioning Engine
- Workflows
- Expert Systems
- Scripts

Optional Service Modules
- e.g. Metering/ Usage Billing, Monitoring, etc.

Virtualized Cloud Infrastructure
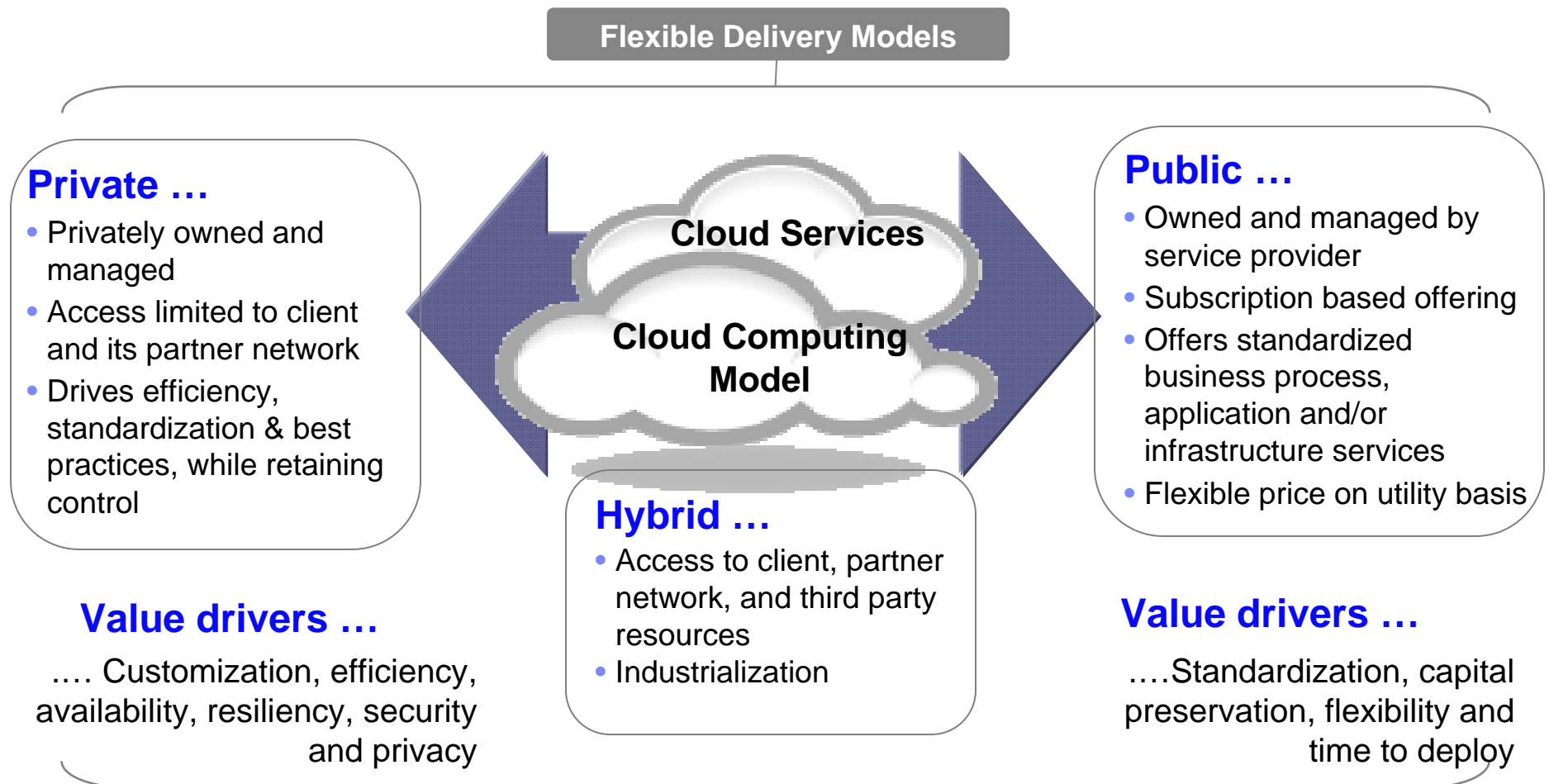
Characteristics include:

- Internet accessed, easy to use service request catalog
- Underlying infrastructure is not visible to user, only the services provided
- Standardized workload services, available at lower costs
- Flexible billing models
- Automation of virtualized services driven by user demand
- Seemingly endless resources

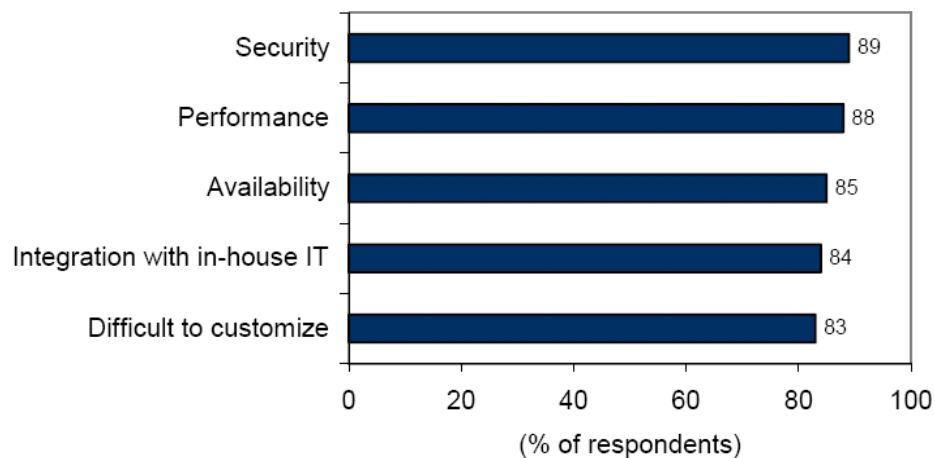# There are multiple delivery models for cloud

Flexible Delivery Models

Cloud Services

Cloud Computing Model

Private …
- Privately owned and managed
- Access limited to client and its partner network
- Drives efficiency, standardization & best practices, while retaining control

Hybrid …
- Access to client, partner network, and third party resources
- Industrialization

Public …
- Owned and managed by service provider
- Subscription based offering
- Offers standardized business process, application and/or infrastructure services
- Flexible price on utility basis

Value drivers …

.… Customization, efficiency, availability, resiliency, security and privacy

Value drivers …

.…Standardization, capital preservation, flexibility and time to deploy

System z and private cloud computing
The right answer for the large enterprise

Enterprises must overcome obstacles to adopt cloud computing …

Cloud Computing Implementation Challenges Described as "Significant"

Challenge	% of respondents
Security	89
Performance	88
Availability	85
Integration with in-house IT	84
Difficult to customize	83

(% of respondents)

Note: Multiple responses were allowed.

Source: IDC's Enterprise Panel, 2008

…and System z can help.

Virtual – a "share all" approach to system resources for efficiency

Secure - a multi-tenant design point with EAL 5 certification

Available - 24x7x365 operations with zero data loss recovery

Efficient - consuming 80% less energy than distributed solutions

Scale - ability to meet massive demands from users and data

Cloud computing is based on operational efficiency
System z brings differentiated value to the cloud

Economies of scale achieved with less resources, moving parts, and money, while delivering more compute capacity from system resources
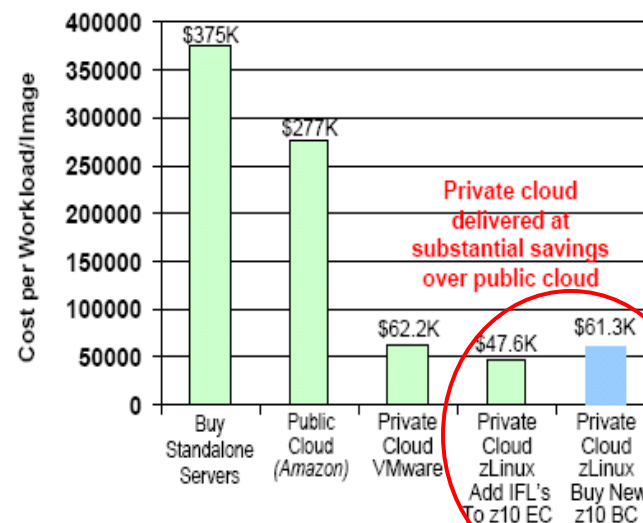
Dramatic Simplification through Virtualization

IBM's Project Big Green System z consolidation results in 60-75% gross cost savings (5 yr TCO)

TCO Reductions with Cloud Computing

IBM found cost comparisons for 100 virtual Linux servers to be cheaper with Private Clouds on z

Unit	Distributed	System z Linux	% Reduction
Software Licenses	26,700	1,800	93%
Ports	31,300	960	97%
Cables	19,500	700	96%
Physical Network Connections	15,700	7,000	55%

Cost Per Image for Linux Workloads (5 Yr TCO)

Cost per Workload/Image

- Buy Standalone Servers: $375K
- Public Cloud (Amazon): $277K
- Private Cloud VMware: $62.2K
- Private Cloud zLinux Add IFL's To z10 EC: $47.6K
- Private Cloud zLinux Buy New z10 BC: $61.3K

Private cloud delivered at substantial savings over public cloud

Do more work with your cloud - use System z

■ Near-linear scalability	up to 900,000+ concurrent users; TBs of data
■ "Mean Time Between Failure"	measured in decades versus months
■ ¼ network equipment costs	virtual and physical connectivity
■ 1/25th floor space	400 sq. ft. versus 10,000 sq. ft
■ 1/20 energy requirement	$32/day versus $600/day
■ 1/5 the administration	< 5 people versus > 25 people
■ Highest average resource utilization	Up to 100% versus < 15%
■ Capacity Management & upgrades	On demand; in hours, not weeks/months
■ Security intrusion points	Reduced by z architecture and # of access pts.
■ Higher concurrent workload	hundreds of applications versus few

Case Study

A Benchmark Comparison

We ran a benchmark to compare how many images can be consolidated in practice

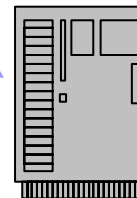**Friendly Bank online banking benchmark**
(WebSphere Application Server)

Intel servers x366
  4 cores @ 3.66 GHz
  12 GB memory

Linux on System z z10-EC
  8 IFL cores @ 4.4 GHz
  64 GB physical memory
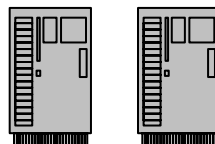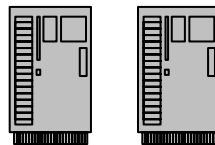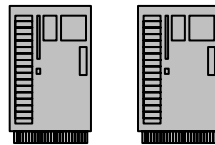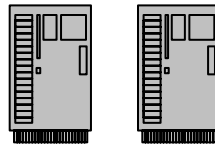
Workload on each one
  5% utilization
  40 ms response time
  4.5 tps

Intel server x3950
  8 cores @ 3.5 GHz
  64 GB physical memory

Consolidate VM images on two different platforms

Each VM image
  4 virtual cores
  1 GB virtual memory

Response Time Comparison

Standalone Server
CPU: 5%
TP: 4.53 trans/sec
RT: .04 sec
TT: .18 sec

Response Time Comparison
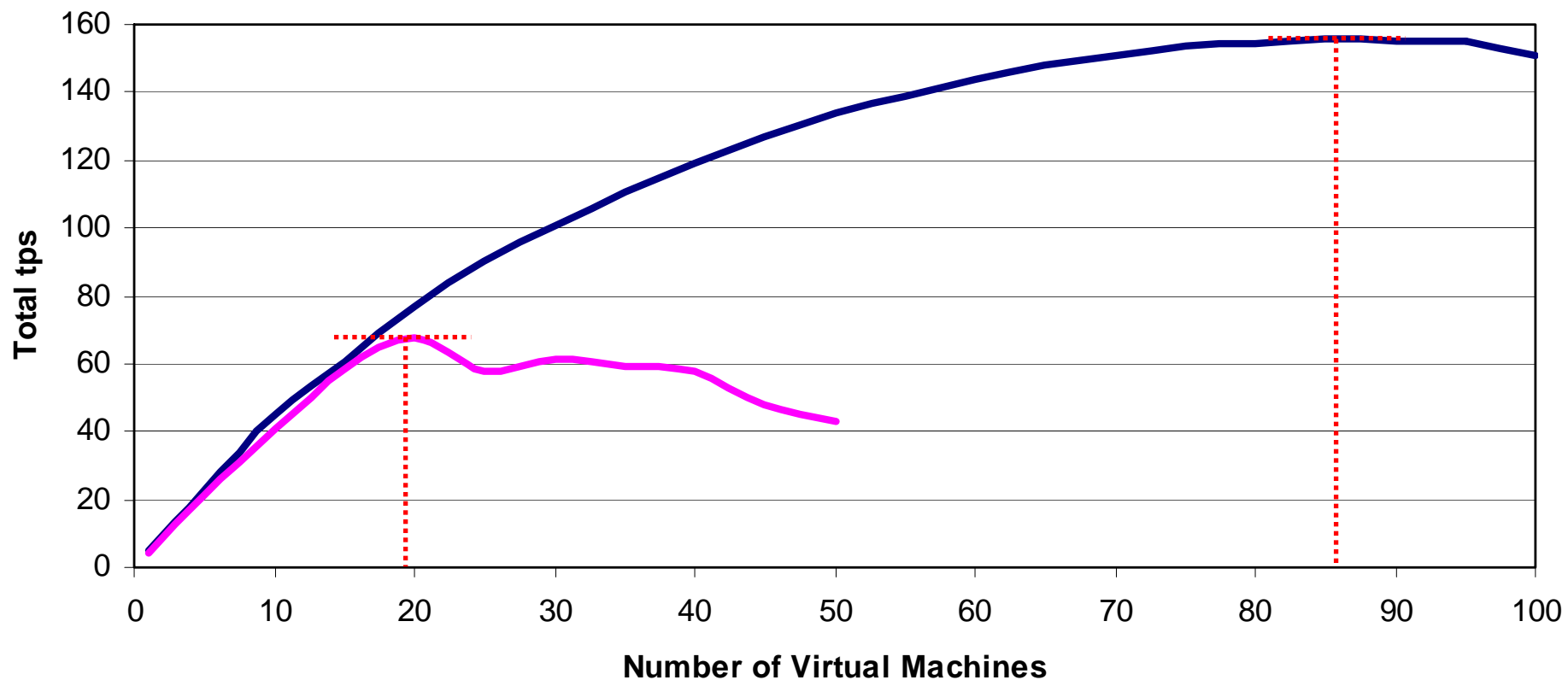
—— z/VM —— x86 Hypervisor

Response Time in Seconds

Number of Virtual Machines
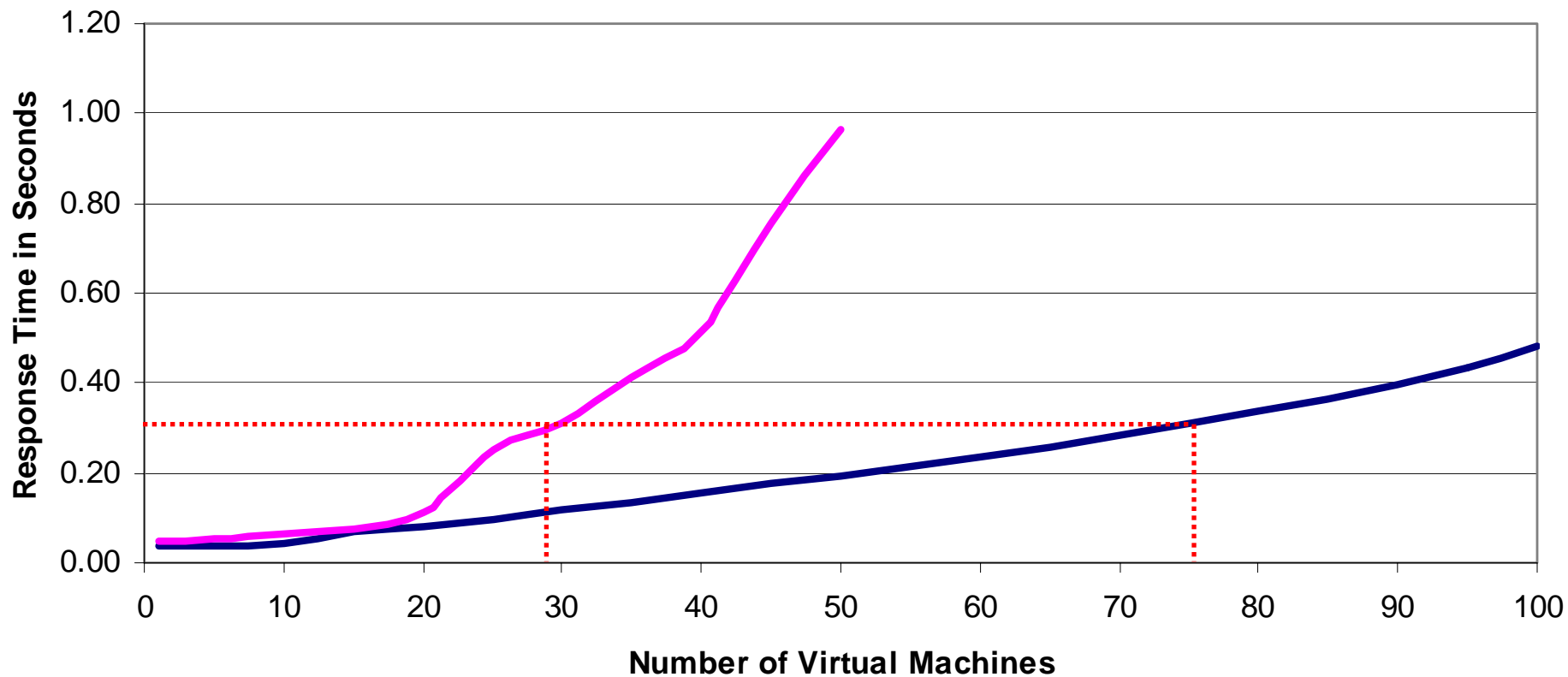
Throughput Comparison

Standalone Server
CPU: 5%
TP: 4.53 trans/sec
RT: .22 sec
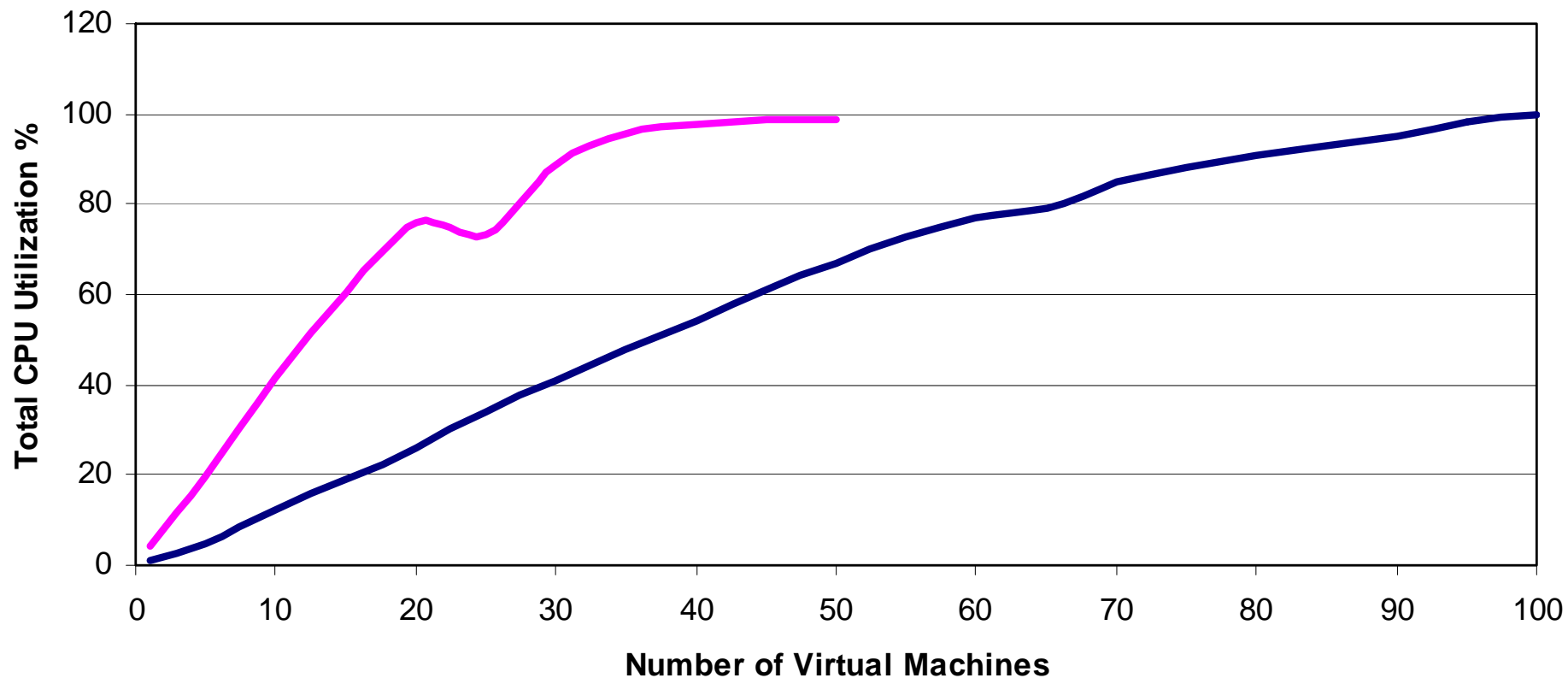TT: .18 sec

Throughput Comparison

z/VM ▬▬ x86 Hypervisor

Y-axis: **Total tps** (0, 20, 40, 60, 80, 100, 120, 140, 160)

X-axis: **Number of Virtual Machines** (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100)

Utilization Comparison

Standalone Server
CPU: 5%
TP: 4.53 trans/sec
RT: .22 sec
TT: .18 sec

Utilization Comparison

z/VM ━━━ x86 Hypervisor

Total CPU Utilization % vs Number of Virtual Machines

Service management in the enterprise
Enabling quality service delivery and business innovation

Visibility:
See your
Business

**Respond faster and
make better decisions**

Control:
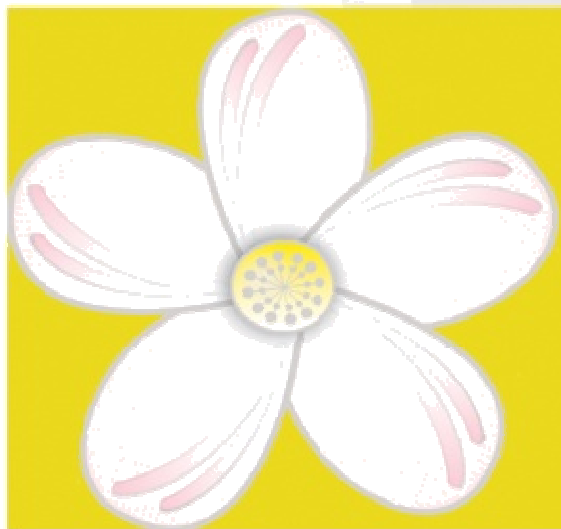*Manage* your
Business

**Manage risk and
compliance**

Automation:
Improve your
Business

**Lower costs and
build agility**

Success Story at

DI COMPETENZA

DAISY-NET

Who is the customer: Status and Company structure

- **Status: cooperative no profit association**

- **Apulian Node of the competency center ICT-SUD, launched with a government funding**

- **Members:**

  - All public universities of Apulia

  - About 40 private companies ICT services provider or ICT services consumer

Industry Development goal

- Innovative organizational paradigm: Digital Business Ecosystem (DBE)
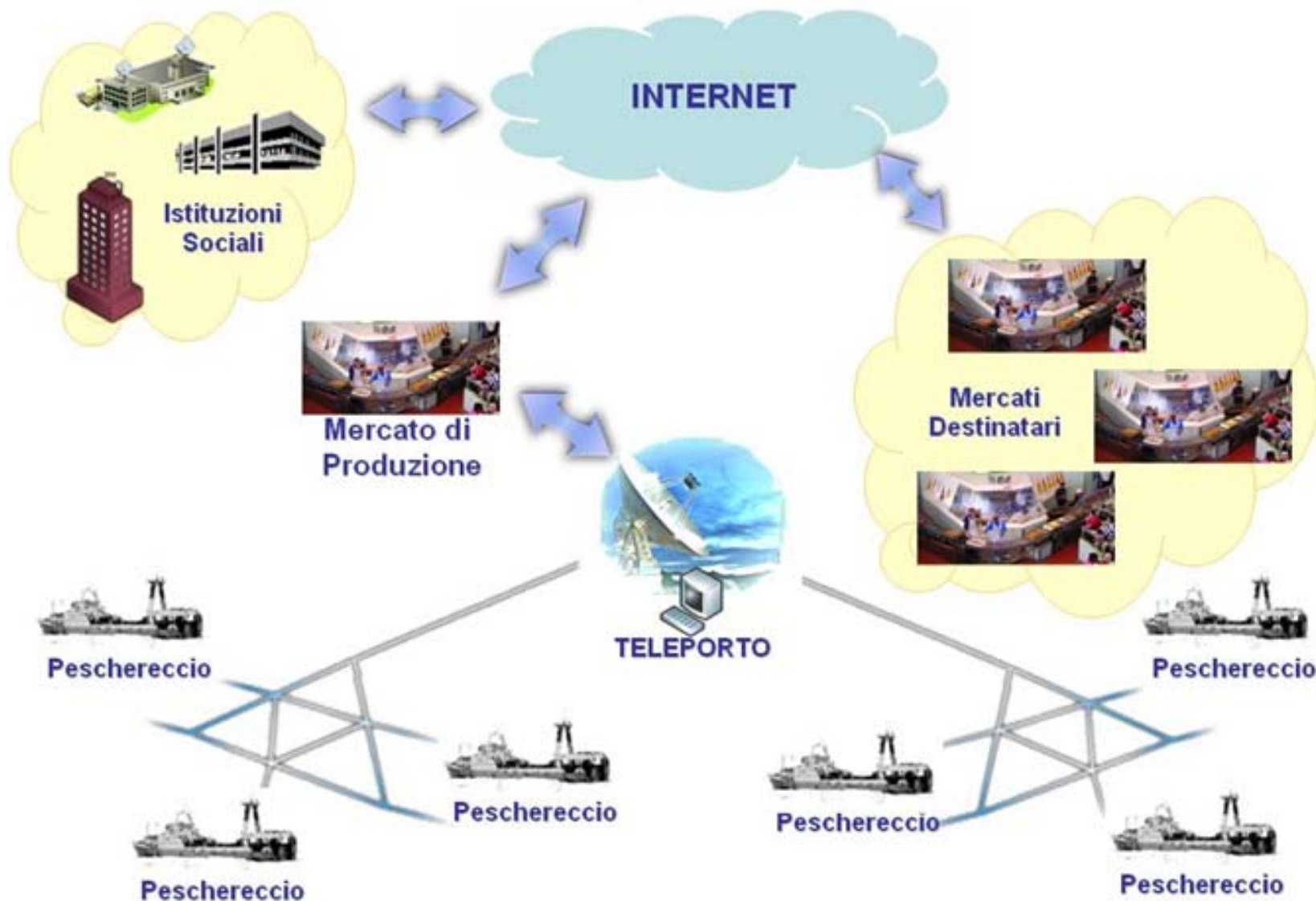
Digital Business Ecosystem
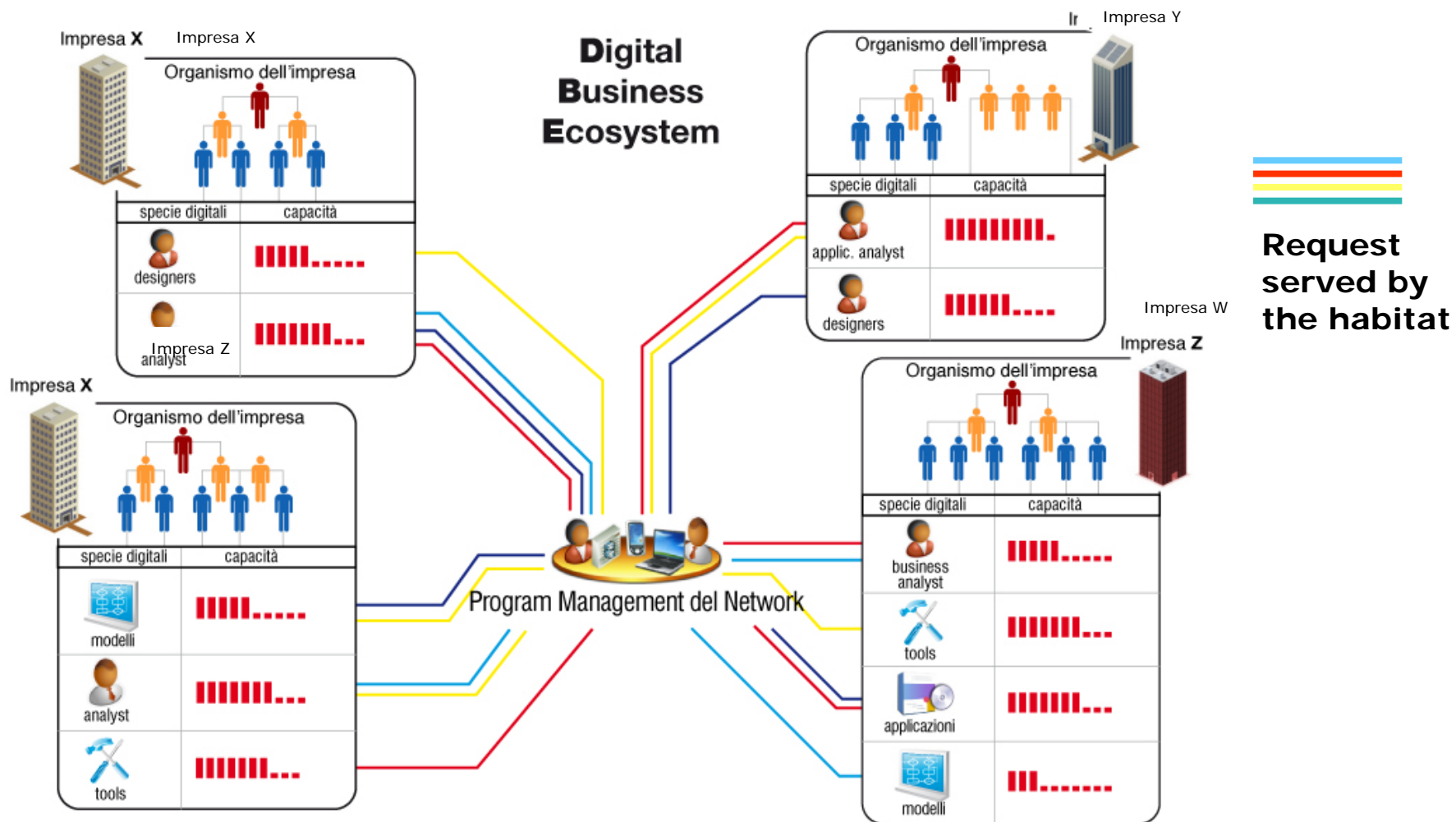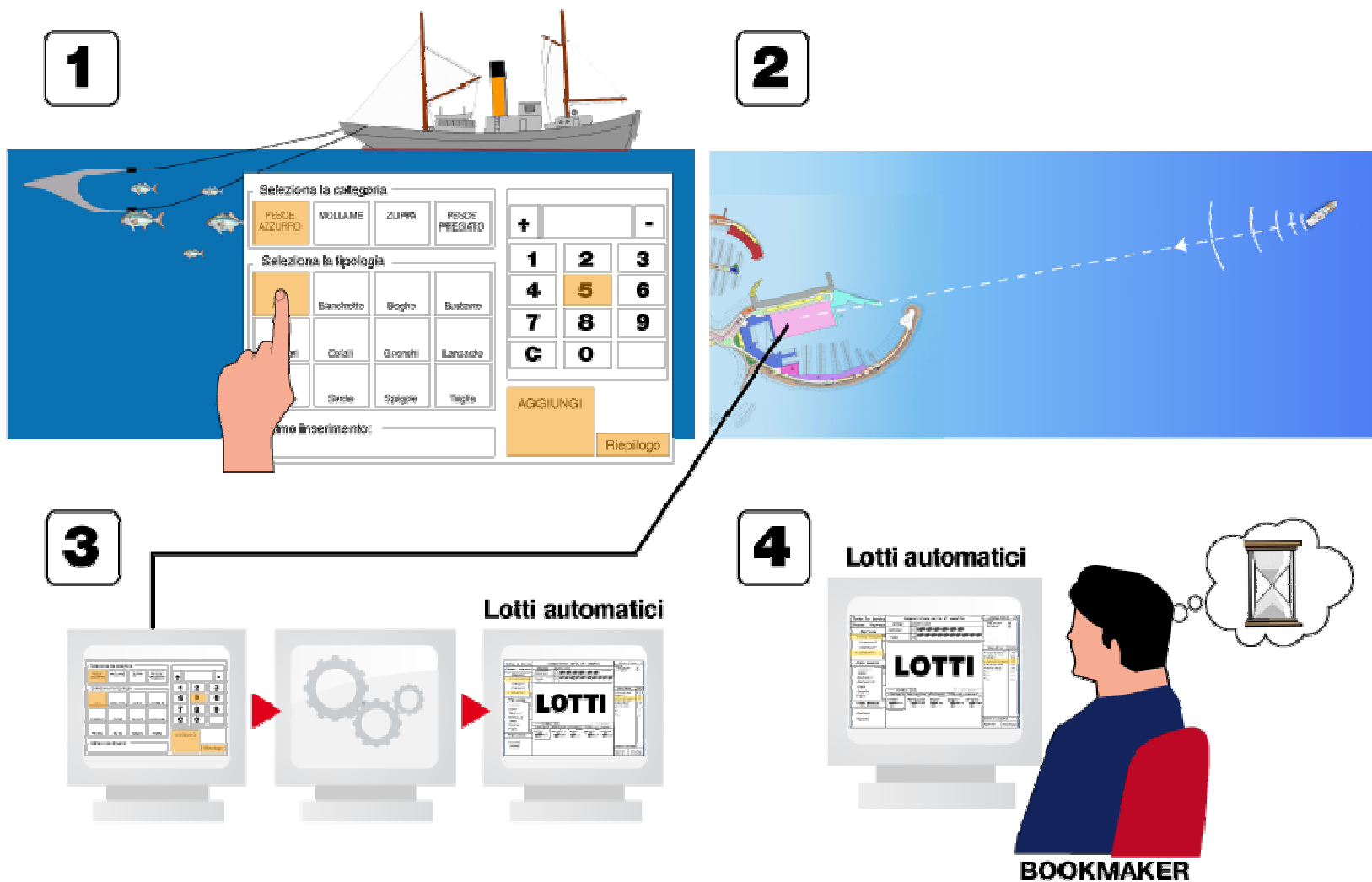
DBE in the Production System …

- **Digital Business Ecosystem** **is the group of organizations belonging to a community**

- **The digital species are:**

  - Software components
  - Software applications
  - Telco device
  - Business process
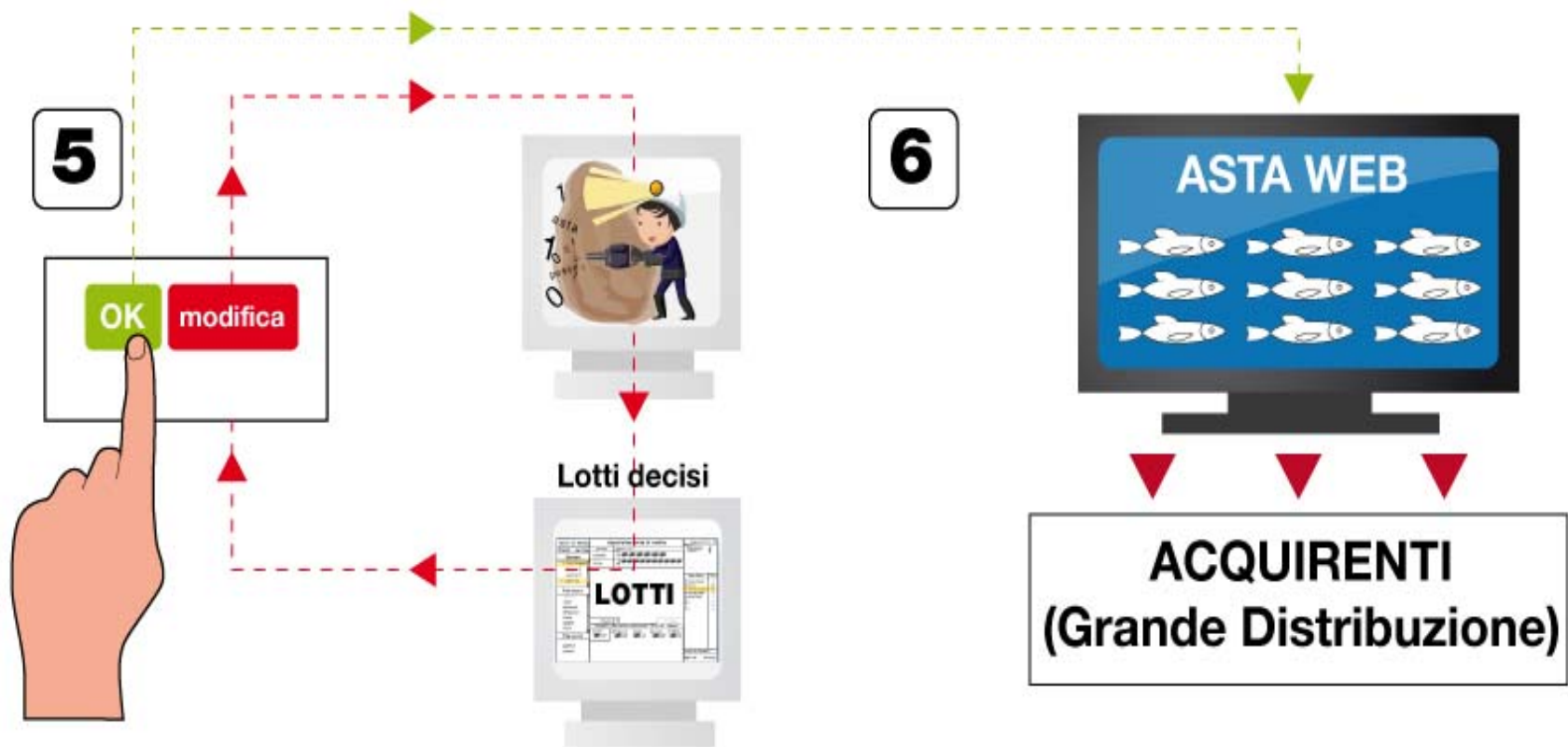 - Educations courses
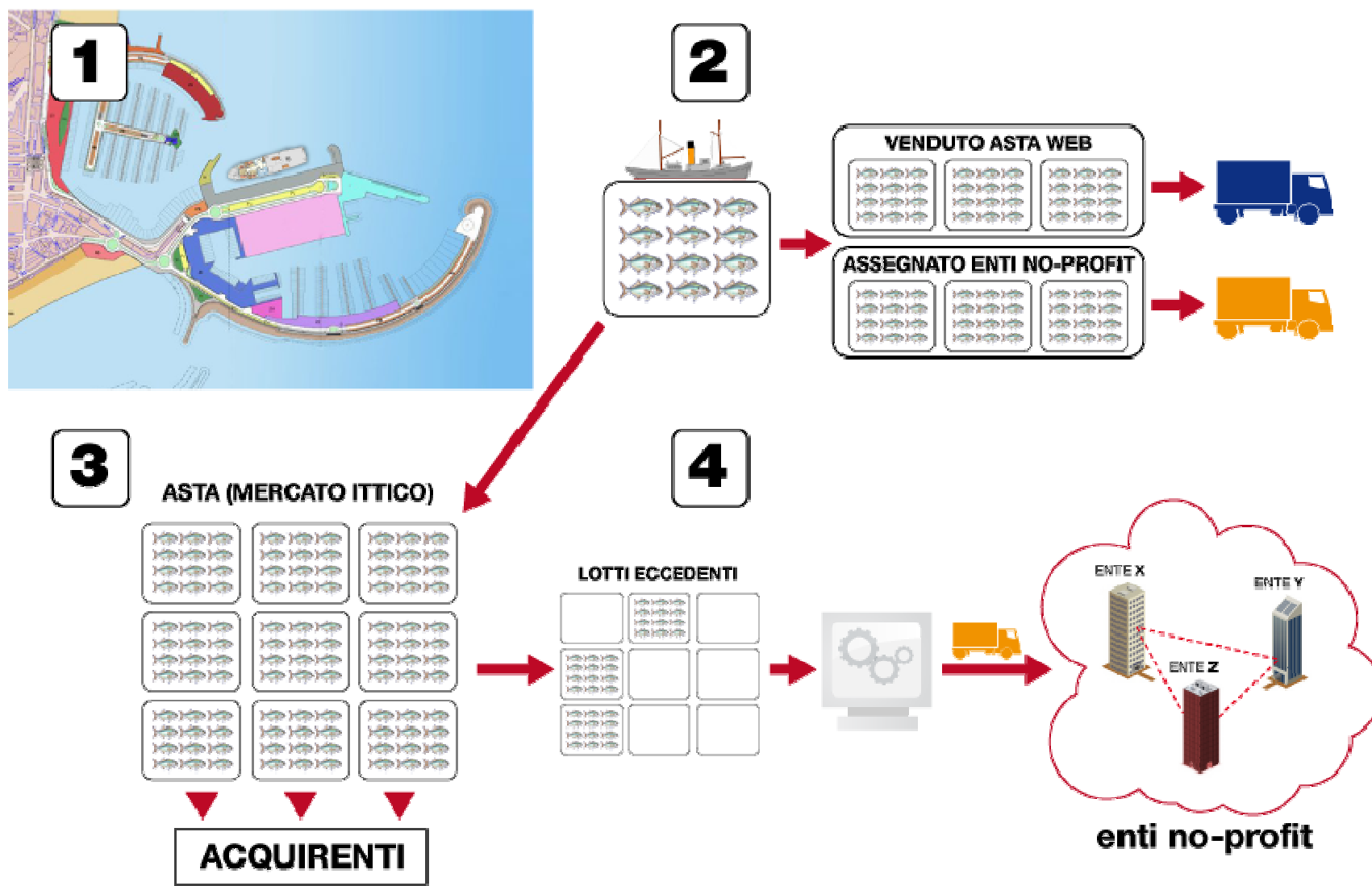 - Skills

"Smart Fish project" General Overview

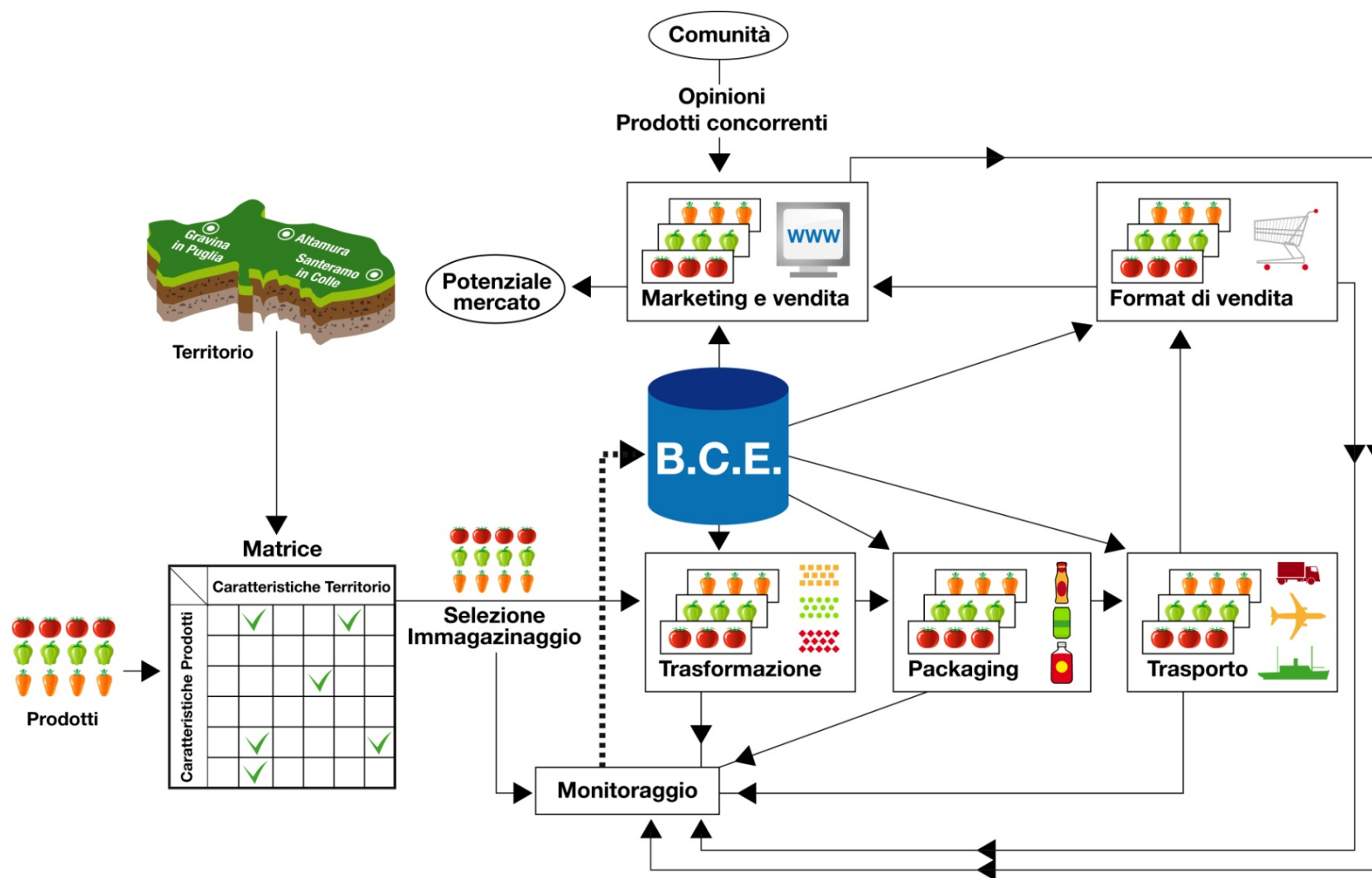# Scenario #1: virtual auction
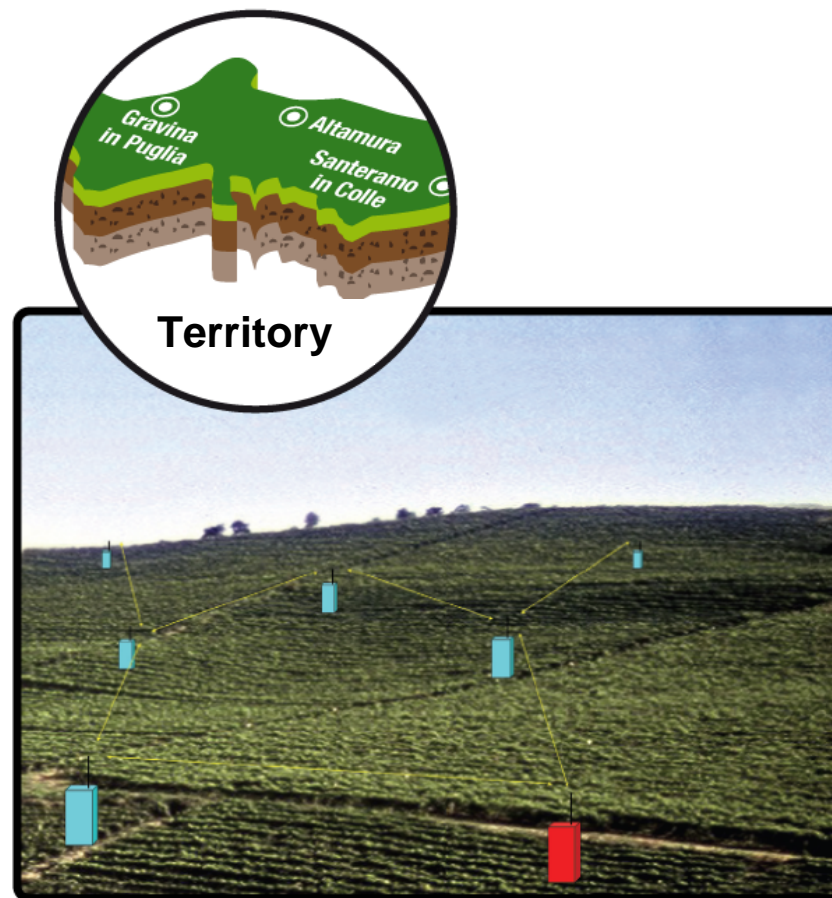
Scenario #1: virtual auction

Scenario #2: real auction

"Monica project" General Overview

RFID in the fields

Territory

Trasformation process: ENOCOOP
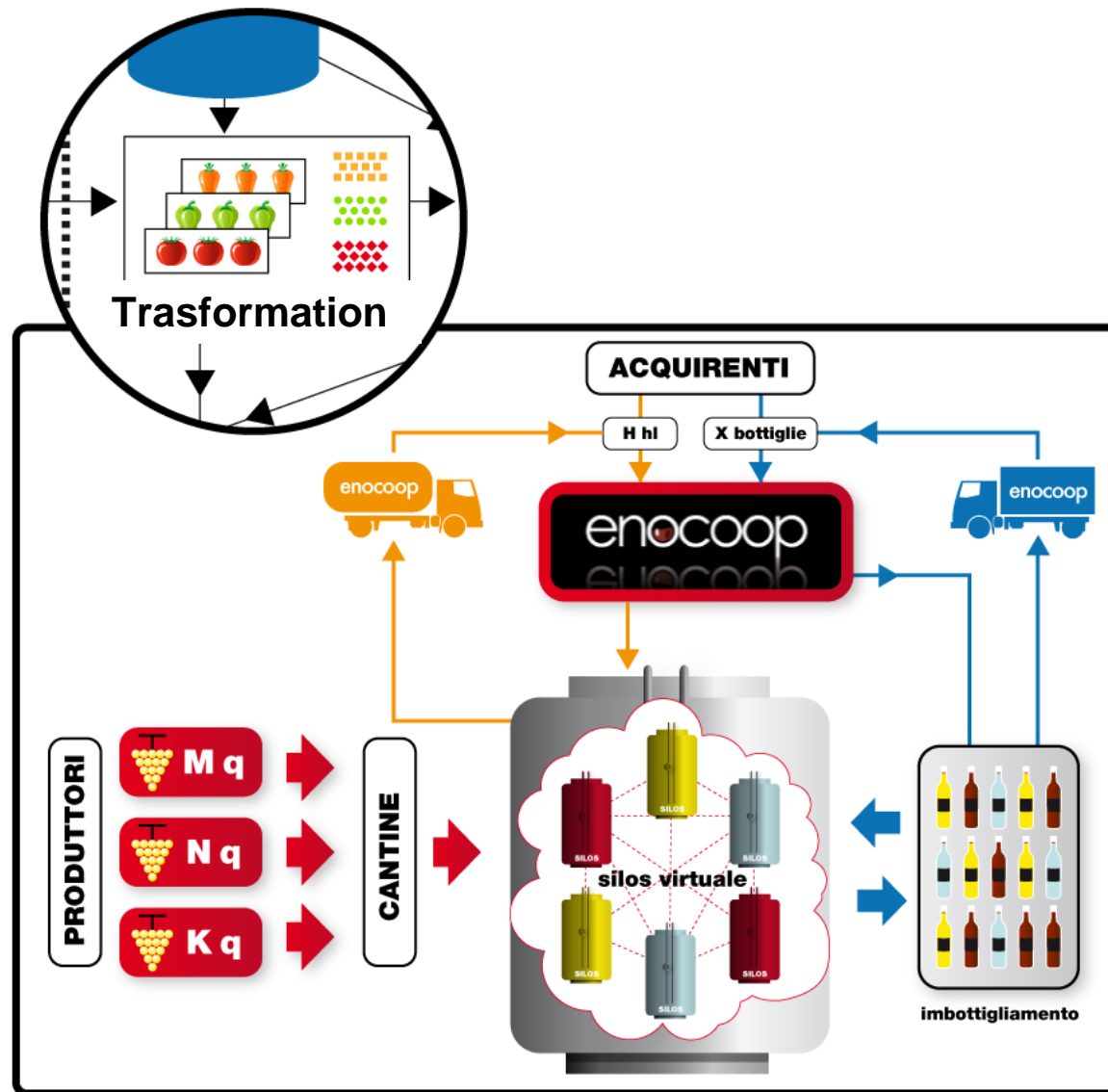
Packaging and warehouse materials check
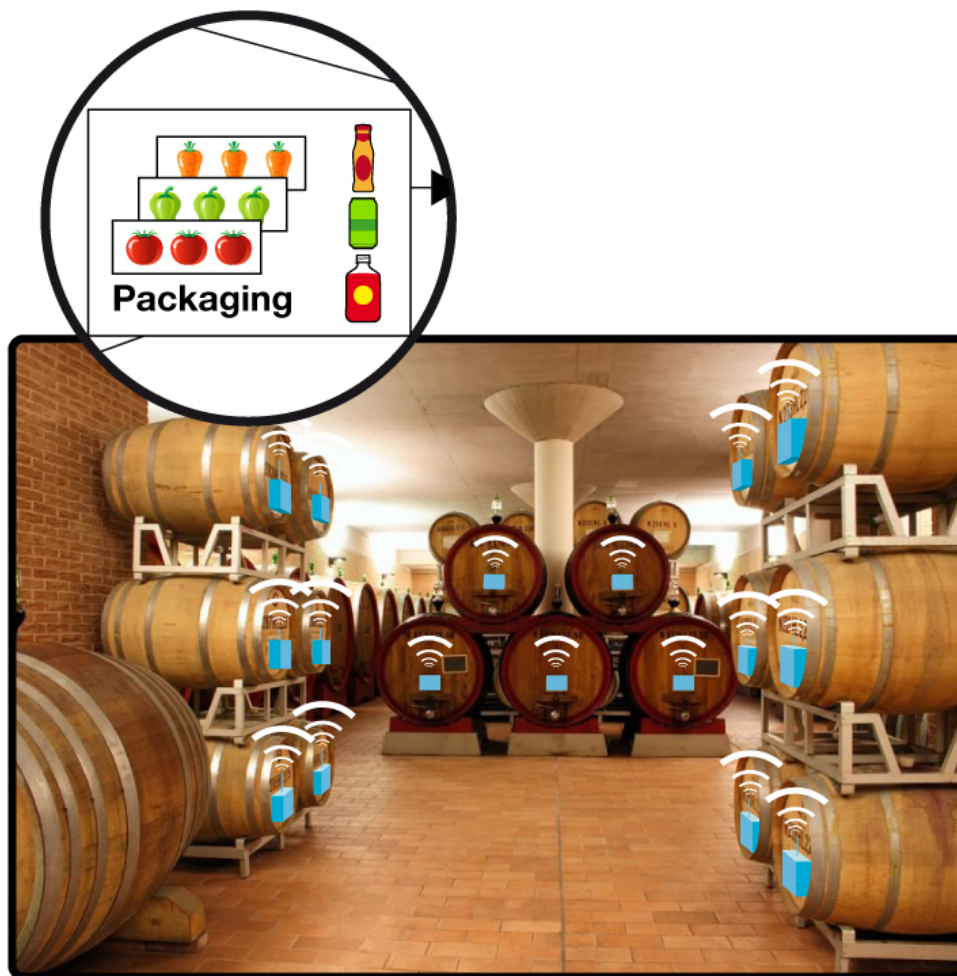
RFID in the trasportation

Trasportation
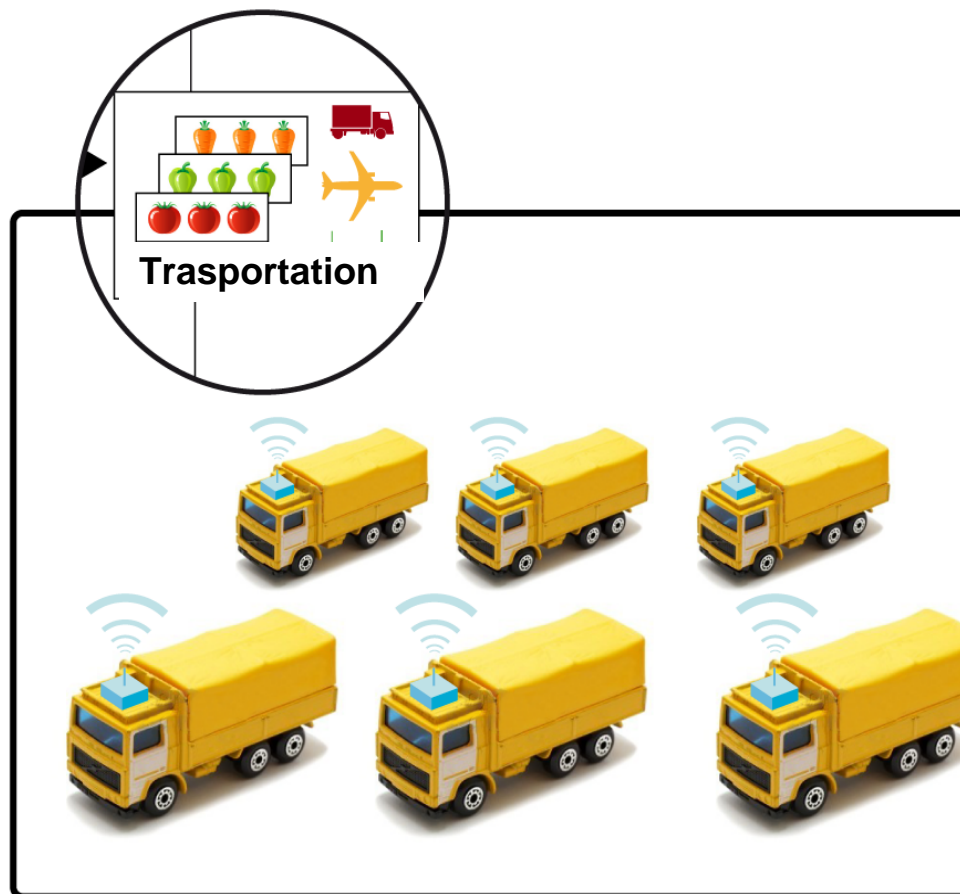
Customer choiced Cloud Computing for the DBE
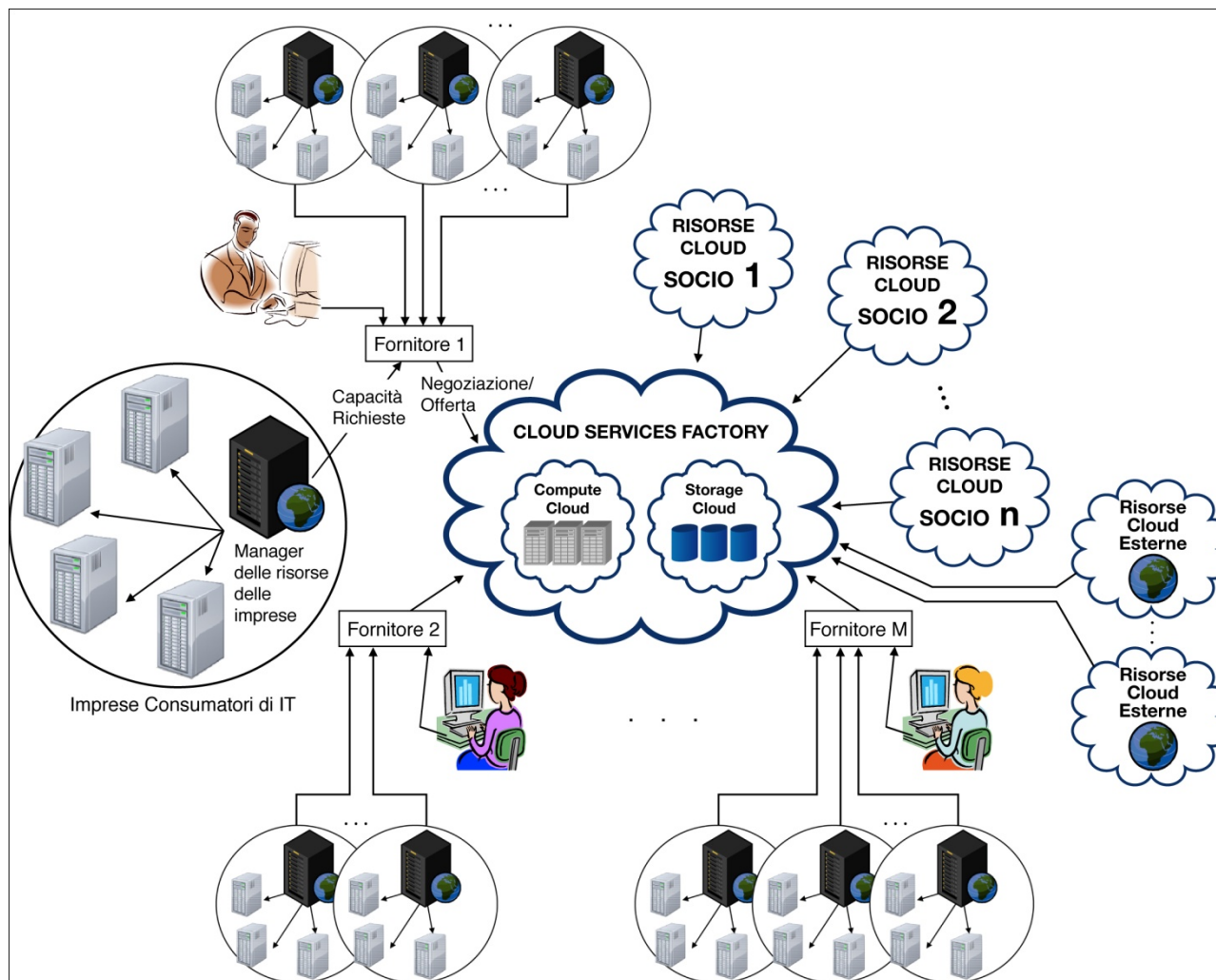
Why Cloud Computing on System z according with the customer

- **Cooperation**. Provide cooparation between enterprises, systems, people from different cultures and differents company or community size

- **Mobility**. People and Systems in communication can move from site to another in the world without any problems, they have only to be in Internet

- **Flexibility**. The needed IT infrastructure can change based on need

- **Skill Sharing**. The complexity and level of technology is trasparent to the final user.

- **Sustainability**. The IT infrastructure costs are sustainable by every company of nay size since are based on the usage of the IT resource utilized.

- **On demand:** Software as a Service (SaaS) on demand and Infrastructure as aService (IaaS)

What provides Visibility, Control and Automation

- Tivoli Services Automation Manager

- TSAM WAS component

- Tivoli OMEGAMON

- Tivoli Monitoring for Virtual server

- z/VM

- Linux

- 2 IFL

- Memory

- Network card

z/Solution Editions

Sample workload

Cloud SW

OS

HW

rporation

Solution Edition for Cloud Computing

A service automation and management framework for System z

	Creates…	That delivers …
Solution Edition for Cloud Computing	An infrastructure solution for cloud computing built on Tivoli® & System z	The framework to migrate workloads for rapid adoption of cloud computing benefits

IBM software

Tivoli. software

Visibility   **Control**   **Automation**

IBM hardware

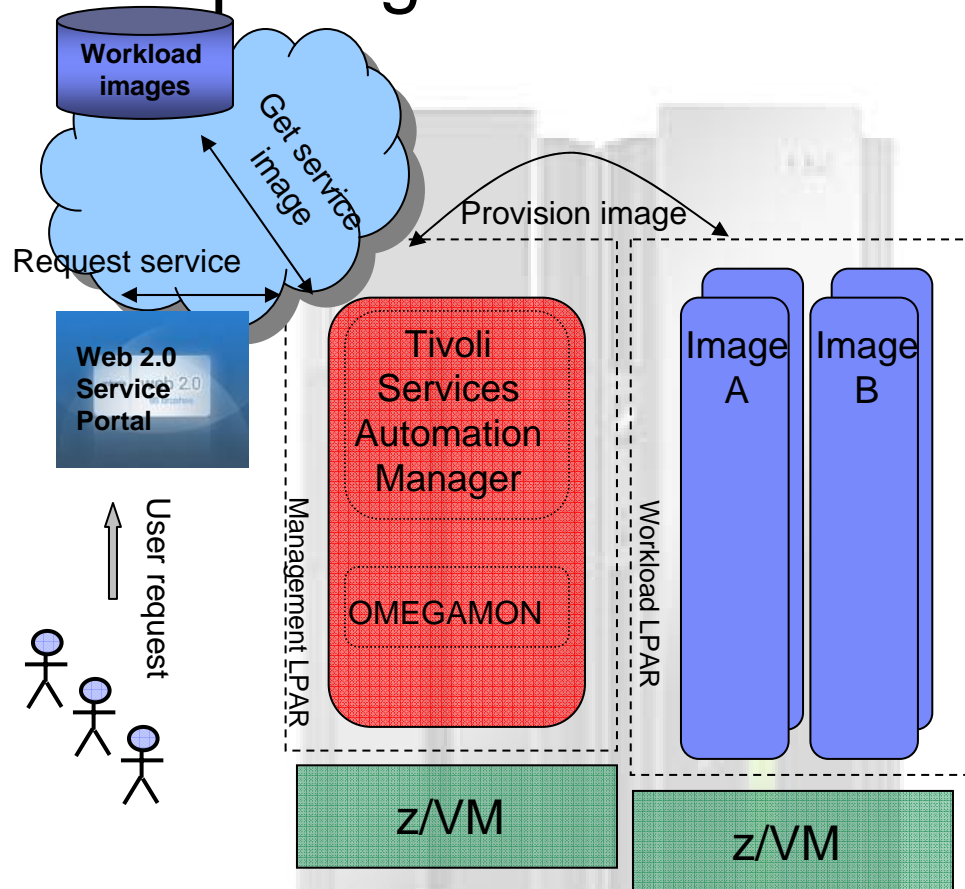*Centralize, Virtualize & Simplify*

IBM Services

- Create an awareness of cloud computing deployment opportunities within the enterprise

- Educate the corporation on cloud computing use cases and management scenarios

- Implement the service automation and management tooling to support cloud workloads

An architecture of the Solution Edition for Cloud Computing

Workload images

Get service image

Request service

Provision image

Web 2.0 Service Portal

User request

Management LPAR

Tivoli Services Automation Manager

OMEGAMON

Workload LPAR

Image A

Image B

z/VM

z/VM

- **Management LPAR provides a "managed from" infrastructure, consisting of Linux (SUSE) guests running TSAM and OMEGAMON**
  - Rapid automation and services lifecycle management for z/VM based Linux cloud services

- **Workload LPAR provides the "managed to" environment, supporting the customer defined cloud images**
  - Supports Linux (SUSE & Redhat) and z/OS® workloads support under z/VM
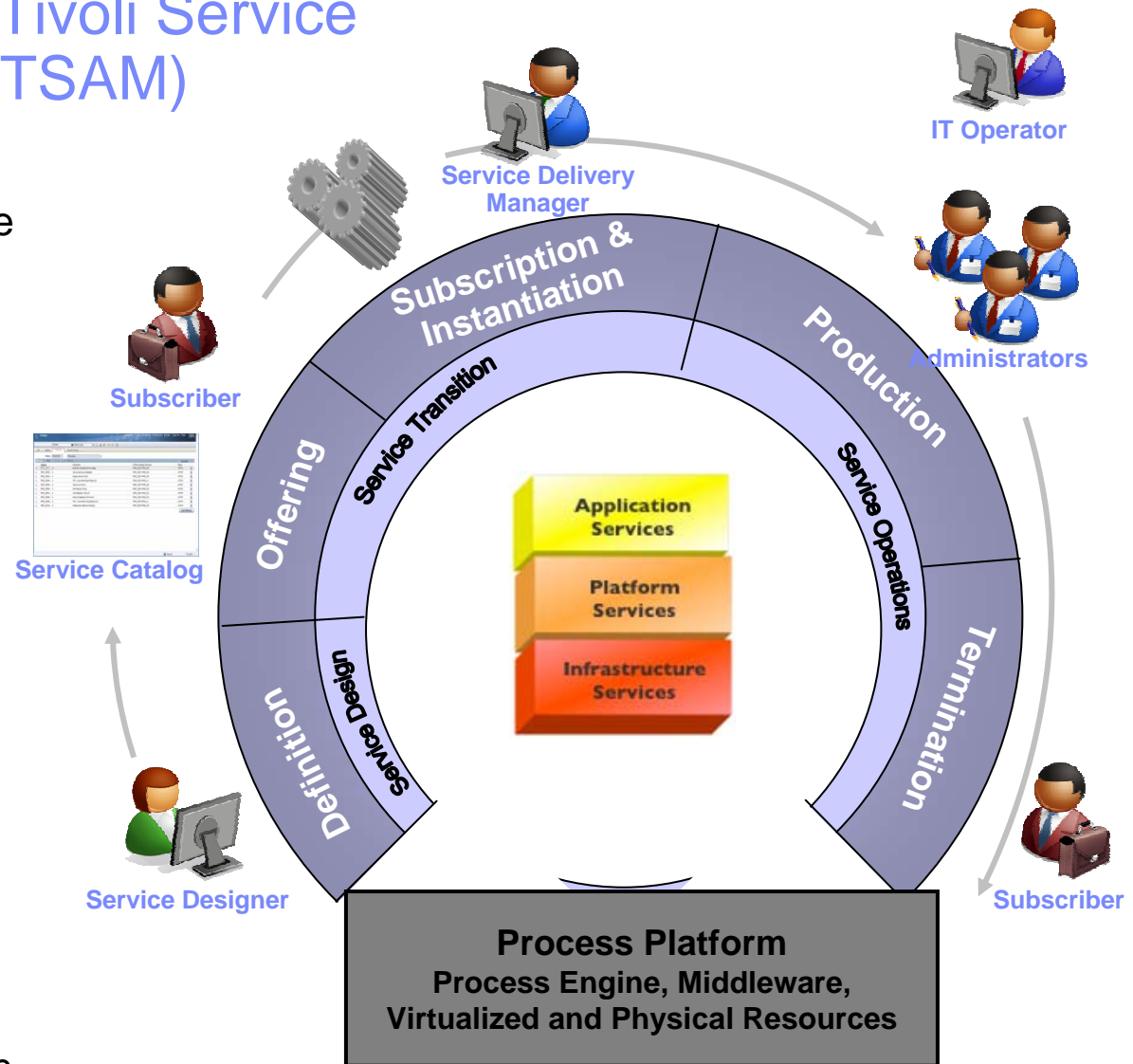 - A sample workload is provided

Supporting cloud with Tivoli Service Automation Manager (TSAM)

Approach:
- Expose IT services to service consumers
- Managed roll-out of cloud services

Capabilities:
- Leverages existing management of virtualized infrastructure
- Definition of service
- Specialized interfaces for service consumers
- Service catalog publishing
- Integrated service request management
- Reservation management
- Application on-boarding
- Provides service consumption data to Tivoli Usage Accounting Manager for chargeback

IT Operator

Service Delivery Manager

Administrators

Subscriber

Subscription & Instantiation

Production

Service Transition

Offering

Service Operations

Service Catalog

Definition

Service Design

Termination

Application Services

Platform Services

Infrastructure Services

Service Designer

Subscriber

Process Platform
Process Engine, Middleware,
Virtualized and Physical Resources

What's next? – the evolution to business service management

- **Customer visited the Rome Tivoli Lab on June 3° and Business Services Management solution have been demoed**

- **Interest in extending Cloud Computing to distributed windows server**

- **Interest in acquiring Tivoli Omnibus for event management**

- **Need ITUAM for accounting/chargeback**

- **Interest in evolving versus the business management to monitor SLA and KPI**
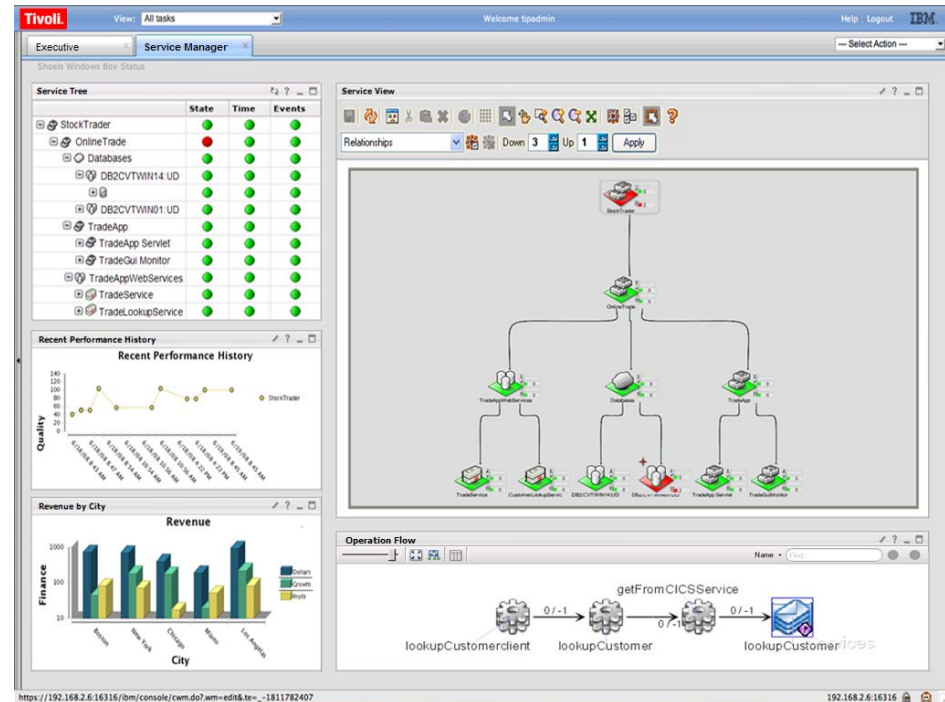
IBM Solution Edition for Cloud Computing

A framework for delivering cloud computing solutions on System z

Delivers a service automation management infrastructure for cloud computing on System z

- Quicker time to value - IBM services creates the private cloud framework on System z at the customer location and provides user training

- Easier implementation - cloud computing management software from Tivoli for automating and maintaining workloads in a cloud

- Greater efficiency - System z with z/VM &Linux provide the foundation to centralize, standardize & virtualize cloud computing workloads

Benefits:

- **Faster ROI**

- **Self service access to mainframe assets**

- **Reduced operations and labor expenses**

- **Internet scale**

- **Rapid provisioning of workloads**

- **Enterprise qualities of service for cloud workloads**

Learn more

: *http://www.ibm.com/systems/z/solutions/editions/cloud/index.html*

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FICON*	InfiniBand*	System x*	z10 EC	
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Geographically Dispersed Parallel Sysplex	POWER*	System z9*	z/OS*	

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Notes:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

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