# Cloud Computing meets the IBM smarter planet.

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@IBMSanMateo

San Mateo IBM Innovation Center
January 27 2010

# Innovation Centers: *THINK globally, support locally*

**46** Worldwide, state-of-the-art facilities and virtual portal to help:

➢ **Business Partners Learn, Enable, Market, Collaborate,** and **Sell their solution**

➢ **IT Professionals and Students build their skills**

Waltham
Dublin
Paris
Stuttgart
San Mateo
Shanghai
Bangalore
Sao Paolo
Johannesburg
Sydney

**Physical Centers**

**Virtual Center**

Access to **physical** and **virtual capabilities** including:

* One-to-one **guidance** from building to selling your solution

* Technical and Sales **Education** and **Content**

* Development life cycle **consulting**

* Multi-product **integration** activities including proofs of concept, validations, scalability testing

* Latest hardware and software lab **environments** and development tools

* **Marketing** and **Sales** Connections

# IBM today: enterprise-level transaction systems
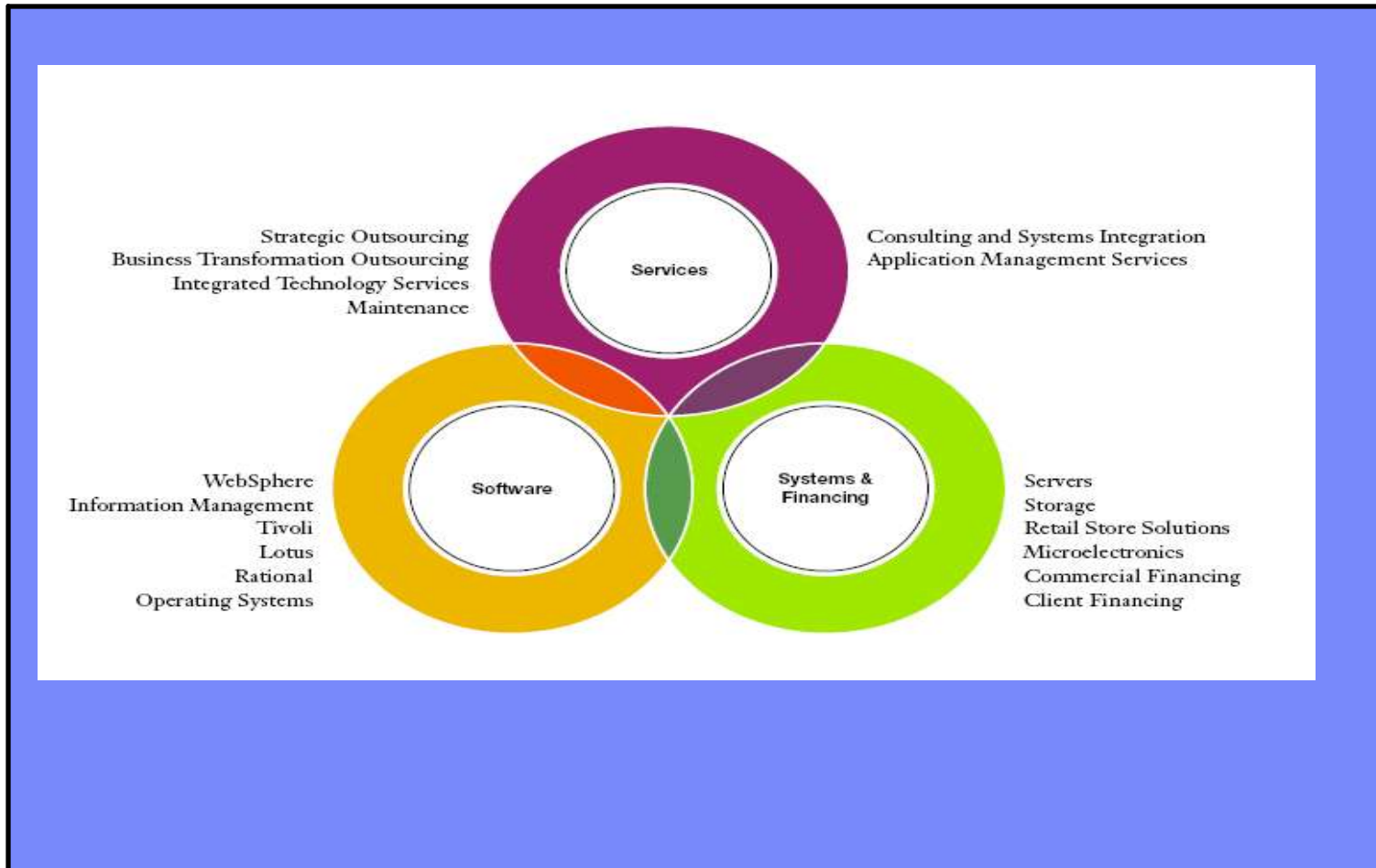
# IBM Research

## 3000 researchers around the world

- San Jose, CA, U.S.A.
- Delhi and Bangalore, India
- Austin, TX, U.S.A.
- Yamato, Japan
- Beijing, China
- NY and MA, U.S.A.
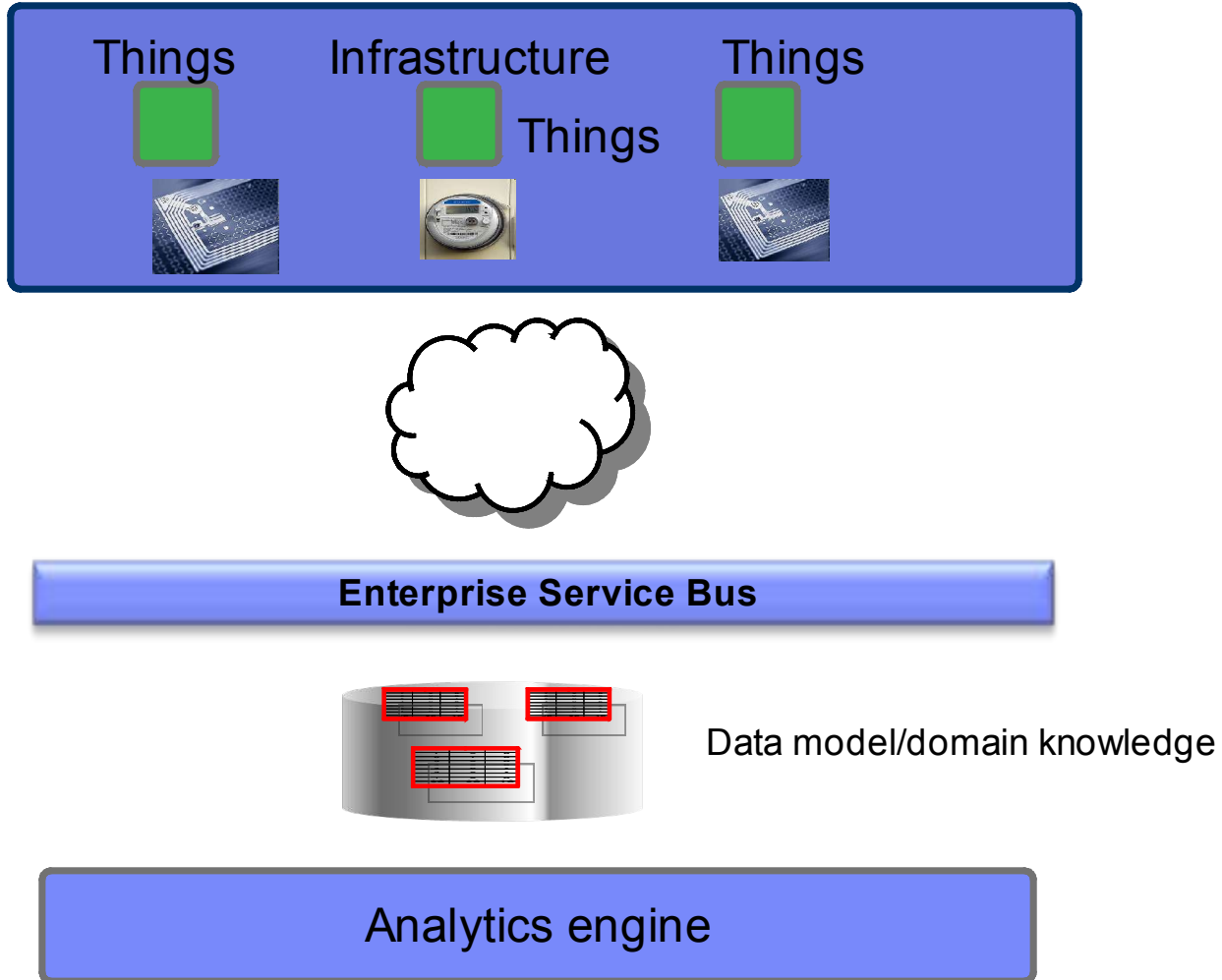- Haifa, Israel
- Rüeschlikon, Switzerland



IBM Almaden Research Center

# The smarter planet and the modernization of the global infrastructure

- **The Global Infrastructure is becoming digitized**

  – Water, electricity, oil, highways, cities, food, health care …

- **Digital sensors are replacing analog meters**

# The view from 10 000 meters

Things          Infrastructure          Things

Things

Enterprise Service Bus

Data model/domain knowledge

Analytics engine

# IBM smarter planet focal areas



| Retail | Intelligence | Change | Banking | Telecom |
| Energy | Traffic | Food | Infrastructure | Buildings |
| Oil | Healthcare | Cities | Water | Public safety |

# IBM Industry Frameworks

- **IBM Banking Industry Framework**

- **IBM Chemical and Petroleum Industry Framework**

- **IBM Industry Frameworks for Government**

- **IBM Health Integration Framework**

- **IBM Insurance Process Acceleration Framework**

- **IBM Product Development Integration Framework**

- **IBM Retail Integration Framework**

- **IBM Service Provider Delivery Environment**

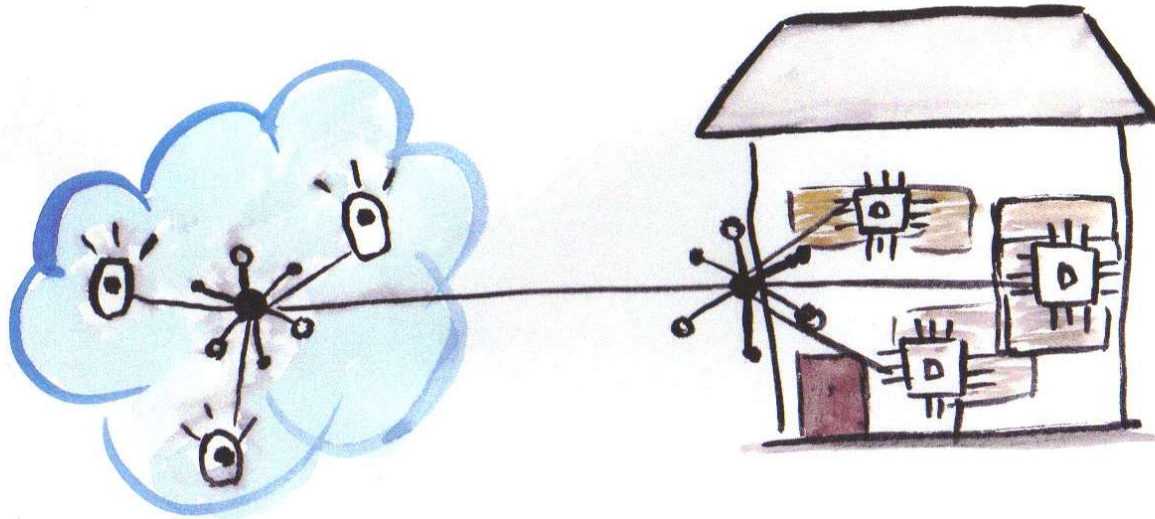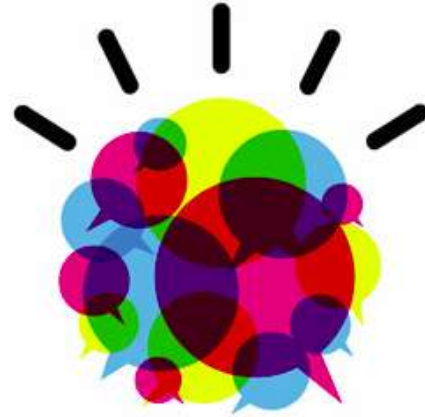- **IBM Solution Architecture for Energy and Utilities Framework**
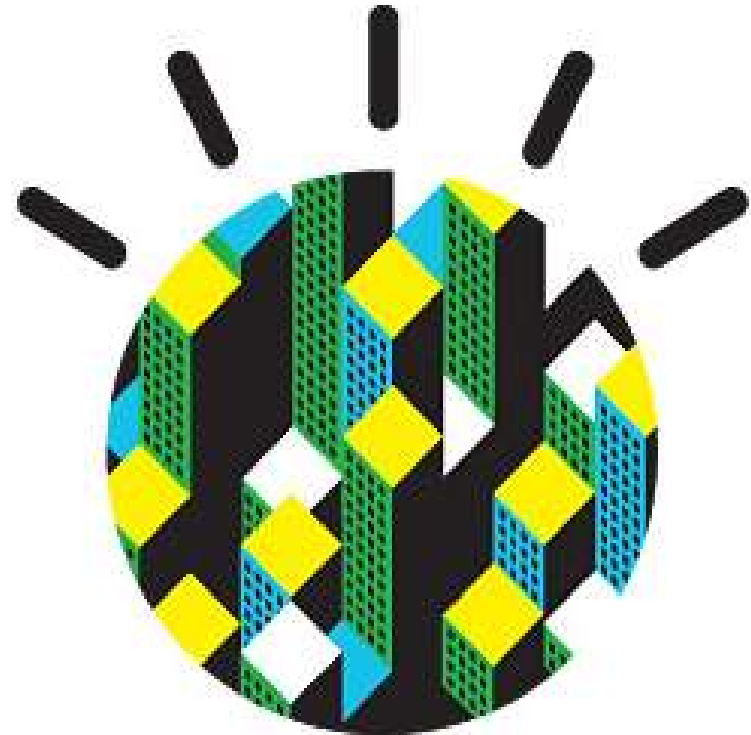
# instrumented
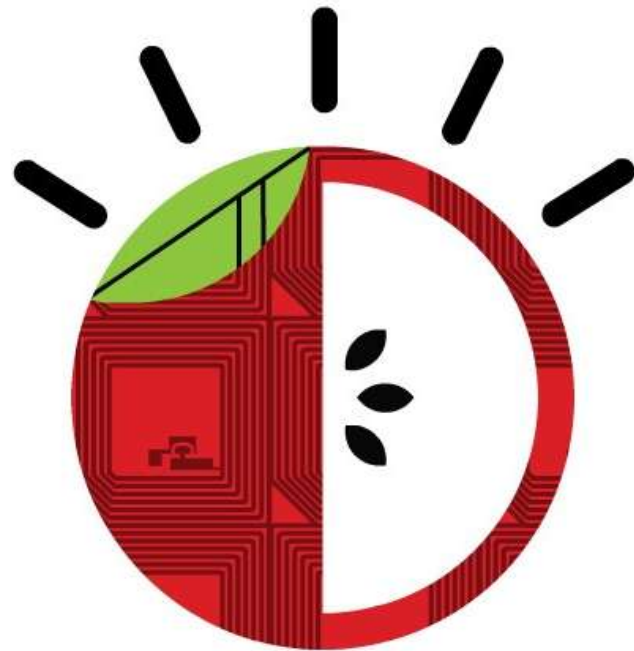
# Sensors everywhere

- **Some estimated current prizes:**

- **Remote Control 4 Channels: $48**

- **Door / Window Sensor $44**

- **Remote On/Off Switch with measuring Consumption (per channel/lamp) $43**

- **Remote Dimmer / On/Off with measuring Consumption (per channel/la $43**

- **Wireless Thermostat $190**

- **Temperature/light intensity Sensor $52**

- **Temperature / humidity Sensor $61**

- **Air Quality Sensor $180-190**

- **Ability to view remotely: web cam with integrated encoder and $233**

- **Shaspa bridge needed to connect and control about $250,**

- **ROI:**
  - Depends on energy costs
  - "A 500 Euro investment for the smarter heating controller saves me about 200 Euro per year".

# The Cloud: backend to the smarter planet

# interconnected

IBM

# ESB in smarter healthcare

**Healthcare Integration and Interoperability**

Healthcare Provider Solutions

Business Partners

Health Integration Framework

Smart SOA

Governance

Enterprise Service Bus
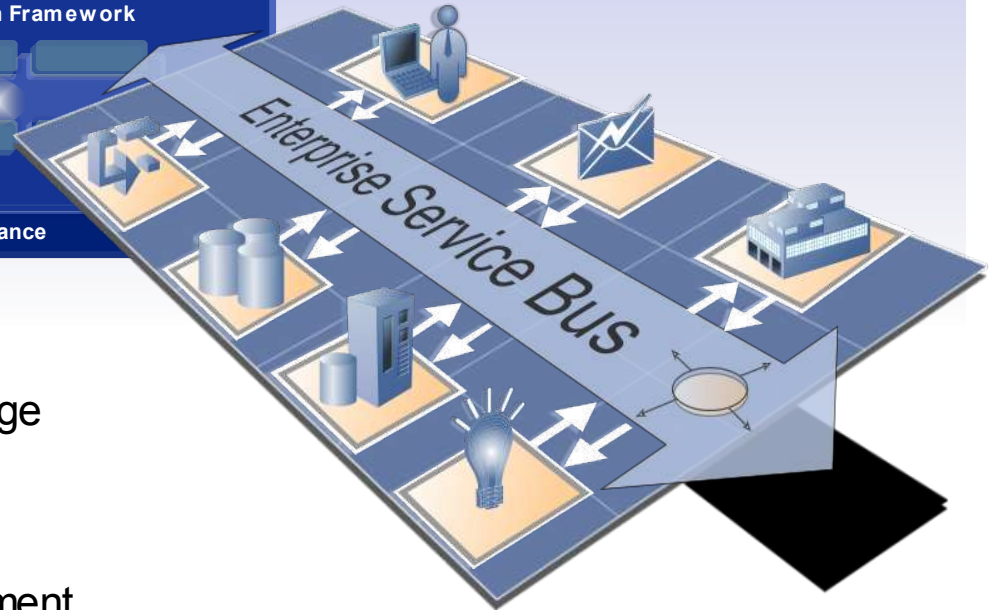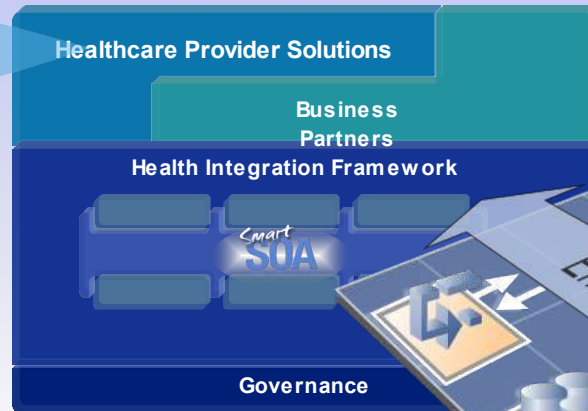
**Solution**

- High performance integration and exchange of clinical, business, and administrative information across the healthcare organization.
- Compliant with HL7 V2, V3 Clinical Document Architecture, Continuity of Care Record.
- Routing and transformation services.

# ESB and data transformation

*Processing Information with all the business rules and usage mechanisms intact…*

## BINARY

```
0001111001001001101001 01
001001001001001000001111
010100101010110010010100
1001001001000101001 01001
0010101010101001001 1100
0101000100100010010010 01
001001001010100100101010
010001001001001001001 001
1100010100101010101 01010
100100101010010010001001
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001000100101001010101 001
01010100101011001010000 0
0000011110010010010101
11001001001010101001 0101
01101111
```

## TABLE

| Make | Model | PKG | Extended_Features |
|------|-------|-----|-------------------|
| Ford | Prefect | 34890 | 2984782q, 93847920, 3438084 |
| Ford | Prefect | 34890 | 2984782q, 93847920, 3438084 |
| Ford | Prefect | 34890 | 2984782q, 93847920, 3438084 |
| Ford | Prefect | 34890 | 2984782q, 93847920, 3438084 |
| Ford | Prefect | 34890 | 2984782q, 93847920, 3438084 |
| Ford | Prefect | 34890 | 2984782q, 93847920, 3438084 |

## COPYBOOK

```
01      TP-API-CB.
03      TP-AGAPI-CB.
05      TP-AGAPI-REQUEST        PIC X(40).
   88   TP-AGAPI-INITIALIZE-REQUEST
                VALUE 'INITIALIZE-MAPPING'.
   88   TP-AGAPI-PERFORM-MAPPING
                VALUE 'PERFORM-MAPPING'.
   88   TP-AGAPI-FINISH-MAPPING
                VALUE 'FINISH-MAPPING'.
05      TP-AGAPI-VERSION        PIC X(04).
   88   TP-AGAPI-VERSION-VALID    VALUES ARE '0100' '0200'.
   88   TP-AGAPI-VERSION-0100    VALUE  '0100'.
   88   TP-AGAPI-VERSION-0200    VALUE  '0200'.
05      TP-AGAPI-RESPONSE.
   10   TP-AGAPI-RESPONSE-CODE    PIC 9(04) COMP.
   88   TP-AGAPI-ALL-OKAY        VALUE 0.
   88   TP-AGAPI-REQUEST-ERROR    VALUE 1.
   88   TP-AGAPI-INITIALIZE-ERROR   VALUE 2.
   88   TP-AGAPI-MAP-ERROR        VALUE 3.
   88   TP-AGAPI-FINISH-ERROR     VALUE 4.
   88   TP-AGAPI-UNKNOWN-LOOP-ID    VALUE 5.
   88   TP-AGAPI-NO-ALGORITHM     VALUE 6.
   88   TP-AGAPI-NO-PARTNER      VALUES  7 15.
   88   TP-AGAPI-NO-APPLICATION    VALUE 8.
   88   TP-AGAPI-ALGORITHM-IO-ERROR   VALUE 9.
   88   TP-AGAPI-FATAL-GATEWAY-ERROR VALUE 10.
   88   TP-AGAPI-GATEWAY-WRITE-ERROR  VALUE 11.
   88   TP-AGAPI-PARTNER-IO-ERROR   VALUE 12.
   88   TP-AGAPI-BAD-VERSION       VALUE 13.
   88   TP-AGAPI-BAD-NUMERIC-TYPE   VALUE 14.
   88   TP-AGAPI-NO-ALIAS        VALUE 15.
   88   TP-AGAPI-ACCESS-ERROR      VALUE 16.
   10   TP-AGAPI-RESPONSE-MESSAGE   PIC X(80).
05      TP-AGAPI-APPLICATION-ID    PIC X(10).
03
01
```

## CASH RECONCILATION
### 27 files

10029847 - $100,000,000.00
13948589 - $679,495,094.98
13950967 - $588,345,058.00
13950968 - $000,000,000.00
14001321 - $098,957,038.12

AAA: HT4459
AAA: B33566
AAA: C4058G
AAB: 948409
AAB: 874931

## STREAM

OH,257*IN,142*MI,
154*WI,80*MT,
5*ID,8*WY,3*CO,
21*NM,8*AZ,15*UT,
13*NV,4*MN,
48*MO,67*ND,
9*SD,9*KS,27

## PROPRIETARY

DUNS 0123       F046000INV
    for 2 months     120799
12   718-339-1700I43989D-2
120799999-b
003000010000
DUNS 4445      P55590
120799499QR 000004004000

## EBCDIC

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™z@Ã–•¥…™
£@"…@£–
@ÅÂÃÄÉÃ

## DDA Application Updates

<MSG 19934749>
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    <ACCTNUM><"14001321">
<ENDBALANCE><" $098,957,038.12">
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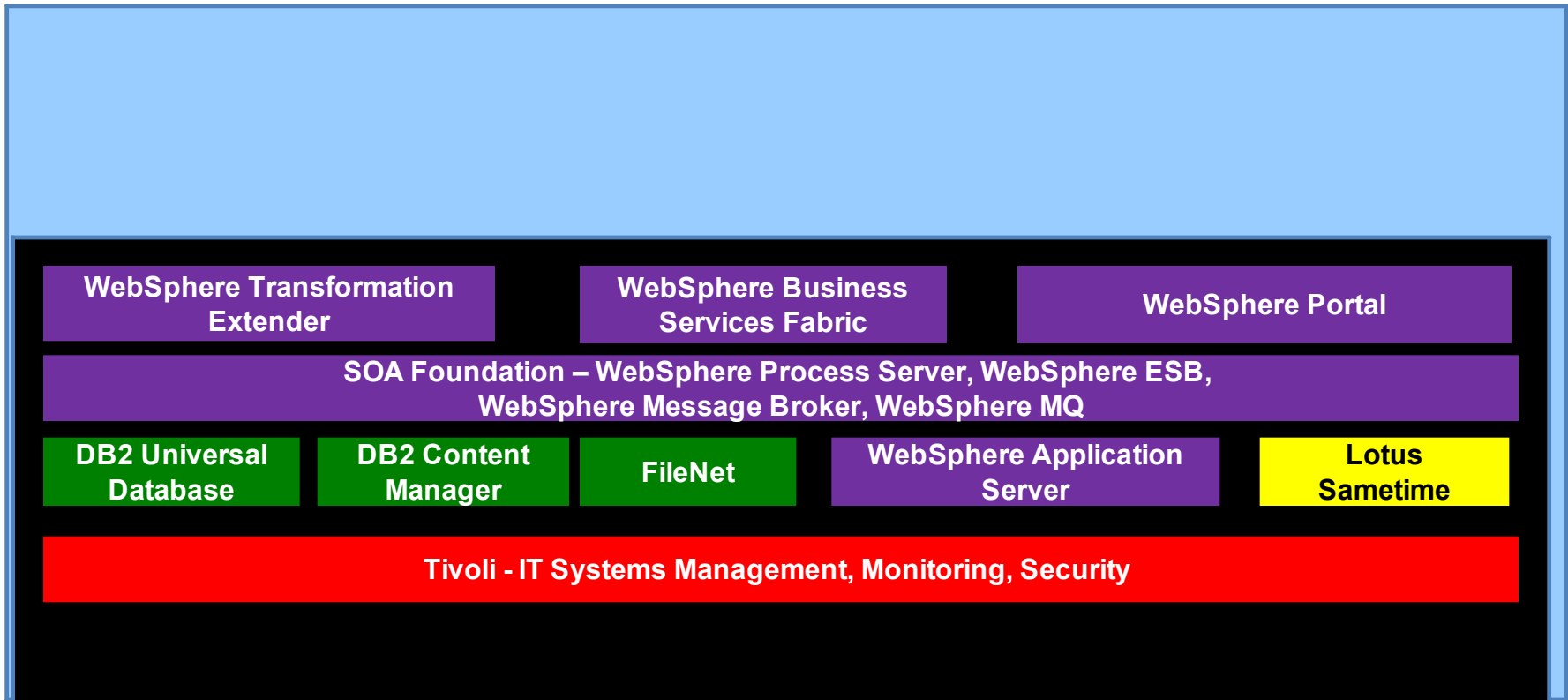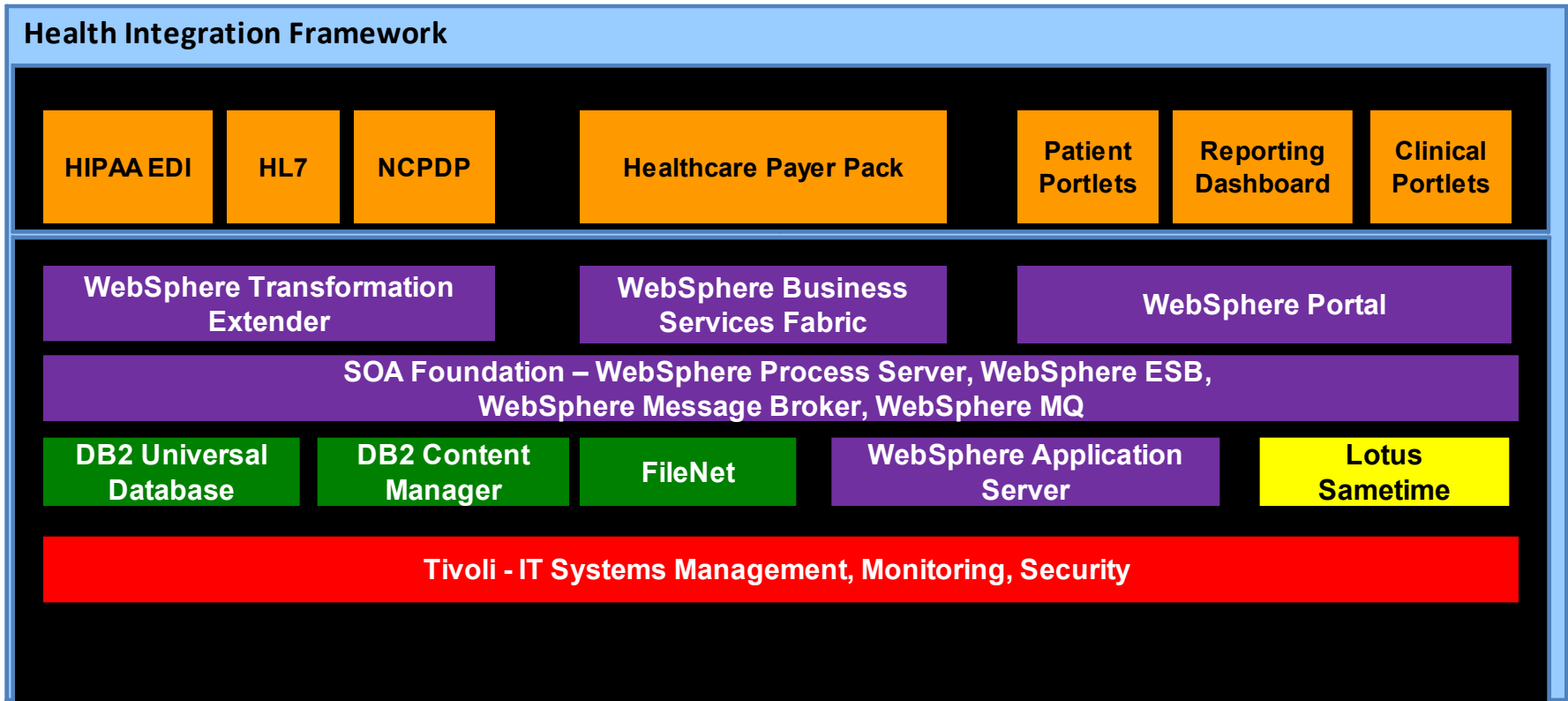<CREDIT><"987463921$928,943.67">
    </ACCTNUM>

</MSG>

**413 msgs**

# IBM Industry Framework base, generic for all

**WebSphere Transformation Extender**

**WebSphere Business Services Fabric**

**WebSphere Portal**

**SOA Foundation – WebSphere Process Server, WebSphere ESB, WebSphere Message Broker, WebSphere MQ**

**DB2 Universal Database**

**DB2 Content Manager**

**FileNet**

**WebSphere Application Server**

**Lotus Sametime**

**Tivoli - IT Systems Management, Monitoring, Security**

# Health Integration Framework

## Health Integration Framework

| HIPAA EDI | HL7 | NCPDP | Healthcare Payer Pack | Patient Portlets | Reporting Dashboard | Clinical Portlets |

**WebSphere Transformation Extender** — **WebSphere Business Services Fabric** — **WebSphere Portal**

**SOA Foundation – WebSphere Process Server, WebSphere ESB, WebSphere Message Broker, WebSphere MQ**

| DB2 Universal Database | DB2 Content Manager | FileNet | WebSphere Application Server | Lotus Sametime |

**Tivoli - IT Systems Management, Monitoring, Security**

IBM

# Health Integration Framework

**Partner Solutions**  *Responsive Healthcare*

| **Point of Care** | **Clinical Admin** | **Health Analytics** | **Public Health** | **Remote Health** |
|---|---|---|---|---|
| CIS, Ambulatory, Radiology, HC Portals, CPOE | HIS, Case Mgmt, Electronic Referrals, Chronic Care | Regulatory Reporting, Clinical Decision Support, Quality of Care | Bio surveillance, First Responders, Disease | eLearning, Distance Care, Self Service |

**Health Integration Framework**  *Proven*

| HIPAA EDI | HL7 | NCPDP | Healthcare Payer Pack | Patient Portlets | Reporting Dashboard | Clinical Portlets |
|---|---|---|---|---|---|---|

| WebSphere Transformation Extender | WebSphere Business Services Fabric | WebSphere Portal |
|---|---|---|

**SOA Foundation – WebSphere Process Server, WebSphere ESB, WebSphere Message Broker, WebSphere MQ**

| DB2 Universal Database | DB2 Content Manager | FileNet | WebSphere Application Server | Lotus Sametime |
|---|---|---|---|---|

**Tivoli - IT Systems Management, Monitoring, Security**

IBM

# The solution: SOA-based framework for smarter healthcare



Stakeholders

Healthcare Providers

Pharma /biotech

Health Plans

Academic Centers

Government bodies

Consistent Access

Secure Interoperable environment

SOA-enabled

Laboratory data

Biobank data

Primary care

Disease registries

Hosp. notes

Diagnostic tests

Clinical research data

Rx data

Genetic data

Information

Systems
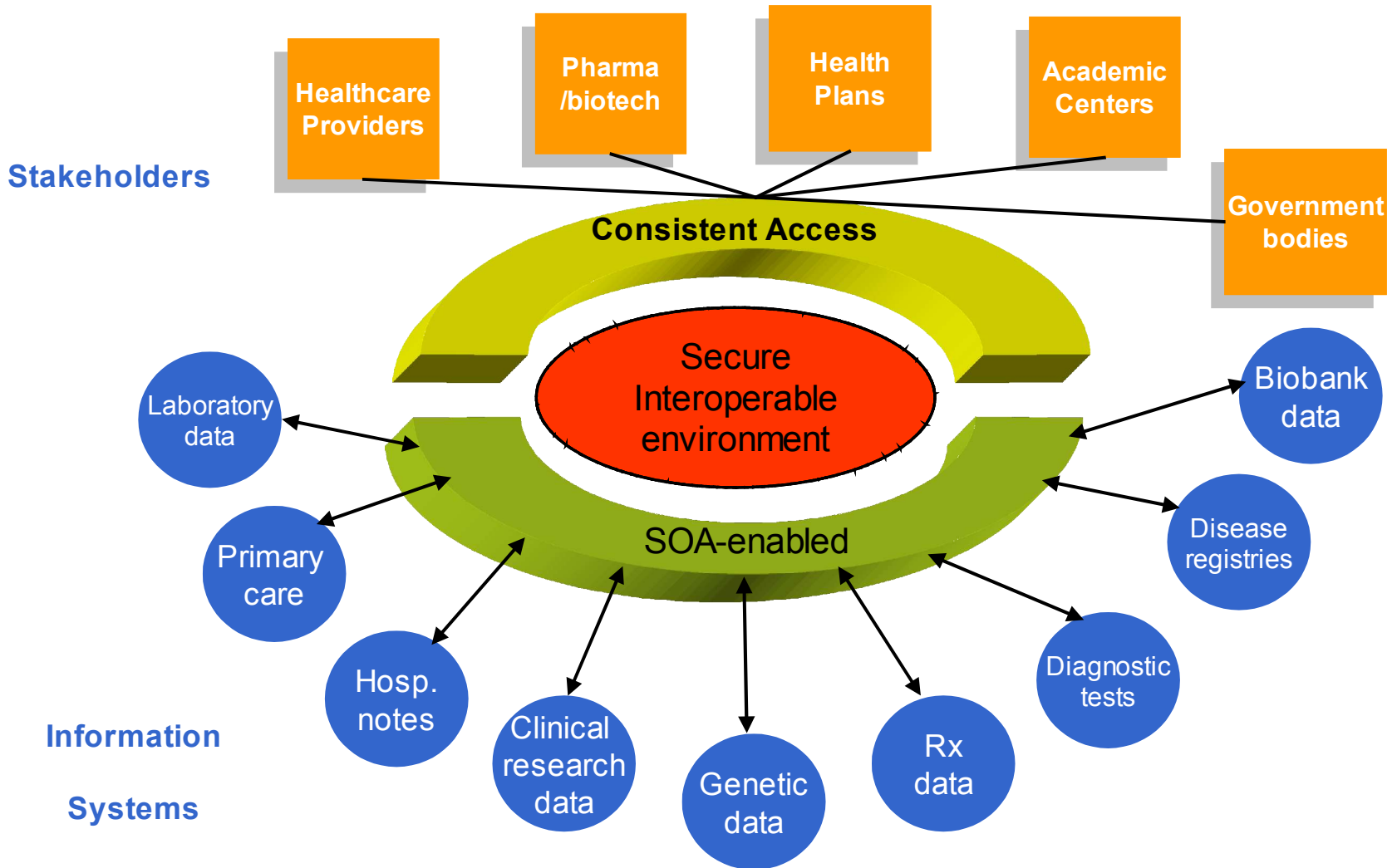
# intelligent

## Data models and Analytics

# Data model: IBM's Tivoli Change and Configuration Management Database (CCMDB)
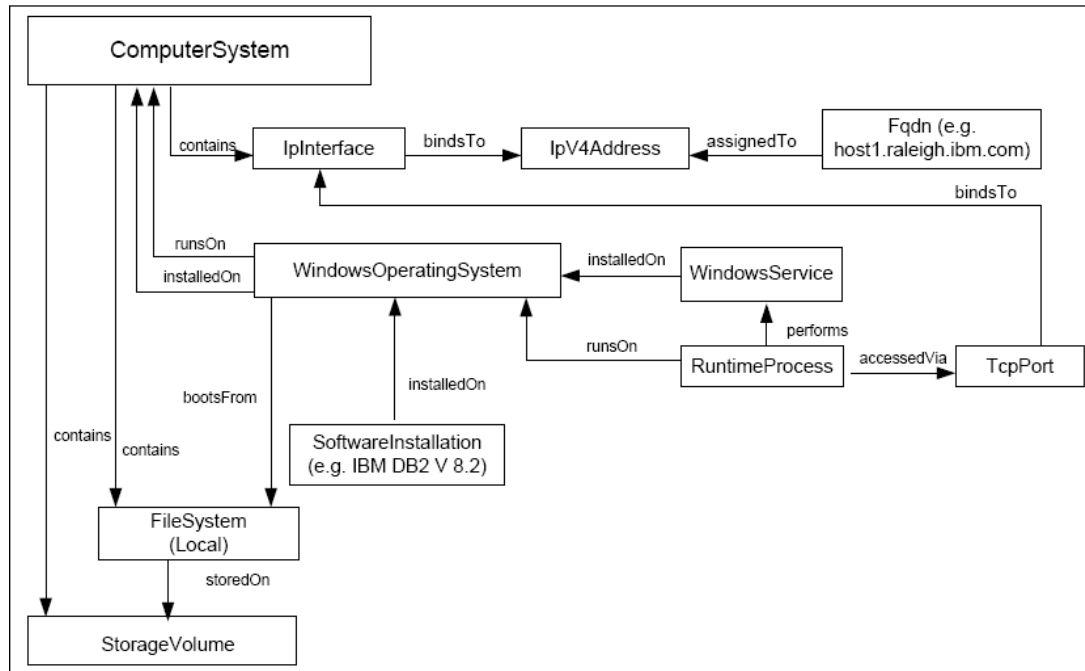
# Analytics: IBM iLog Business Rules
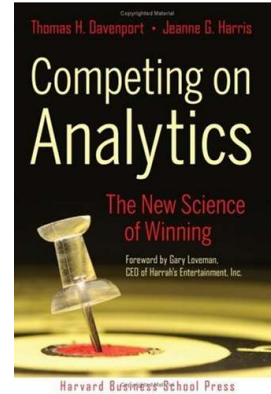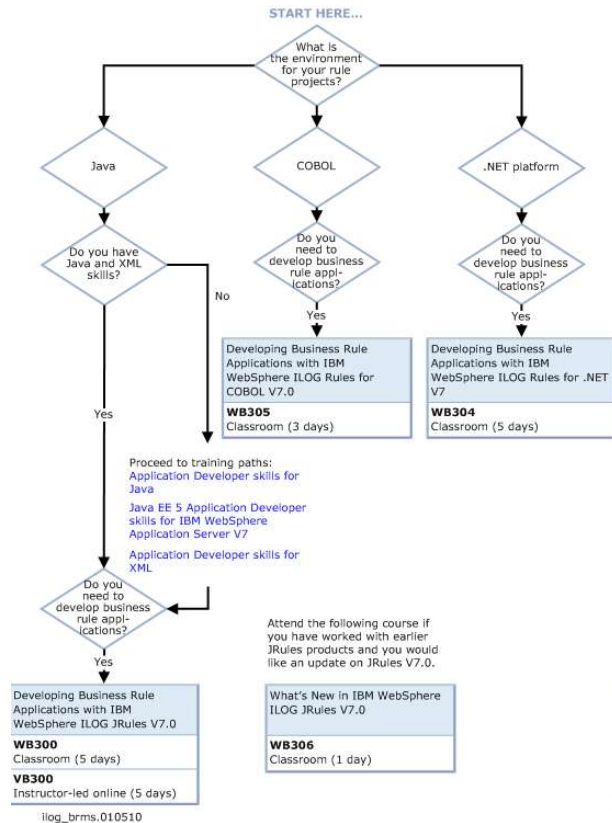


The scorecard identifies:
- Number of diabetic patients meeting the specified criteria
- Percentage of the diabetic population the number represents NCQA target for the measure
- Number of points awarded by NCQA for meeting the benchmark
- Red or green indicator light providing a quick status overview

*NCQA: National Committee for Quality Assurance*

IBM

# Enterprise Health Analytics
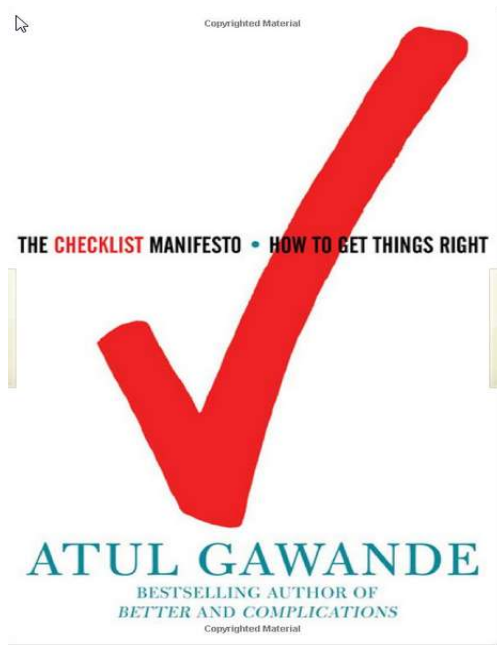## *Solution Overview*
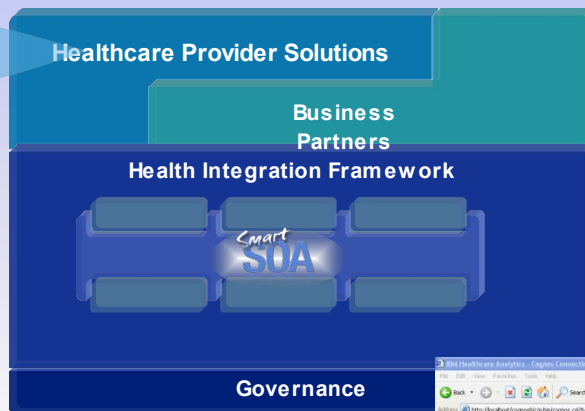
**Business Partners**



## Solution

• Enterprise data warehouse, tools and capabilities to aggregate and analyze data across the healthcare organization to improve clinical and business outcomes and results.

Dashboards for patient safety, quality, research, and operations.
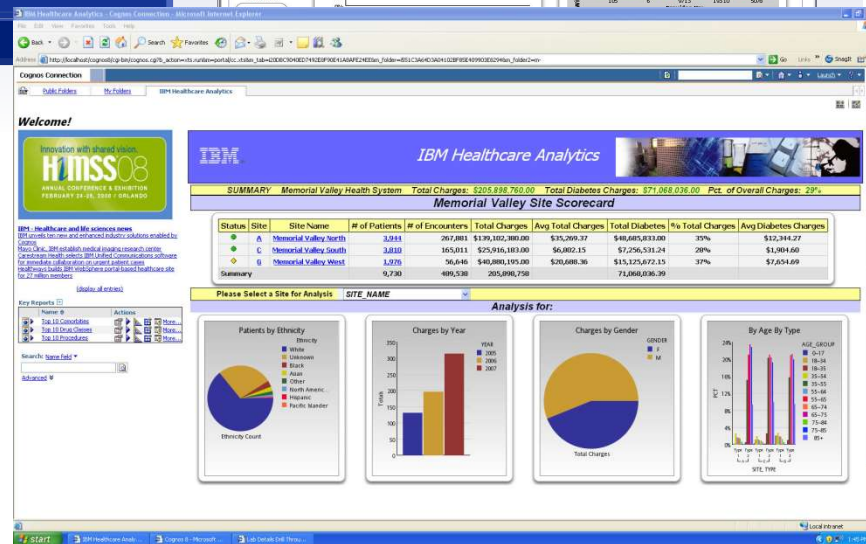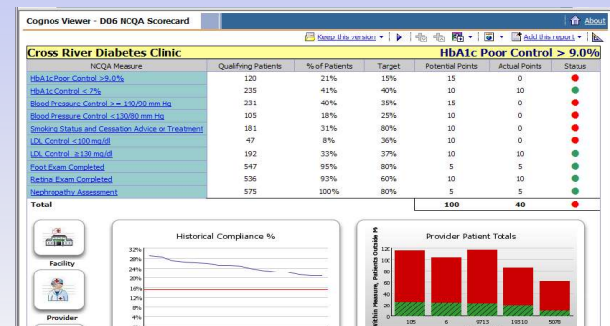
# implementation
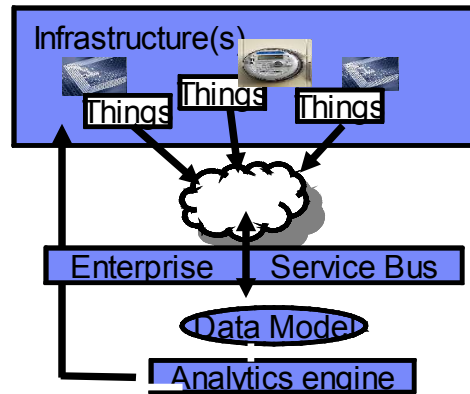
# Enforcing checklists at hospitals

Dr. Peter Pronovost, a critical care specialist at the Johns Hopkins medical center in Baltimore .. borrowed a concept from the aviation industry: a checklist, the kind that pilots use to clear their planes for takeoff.
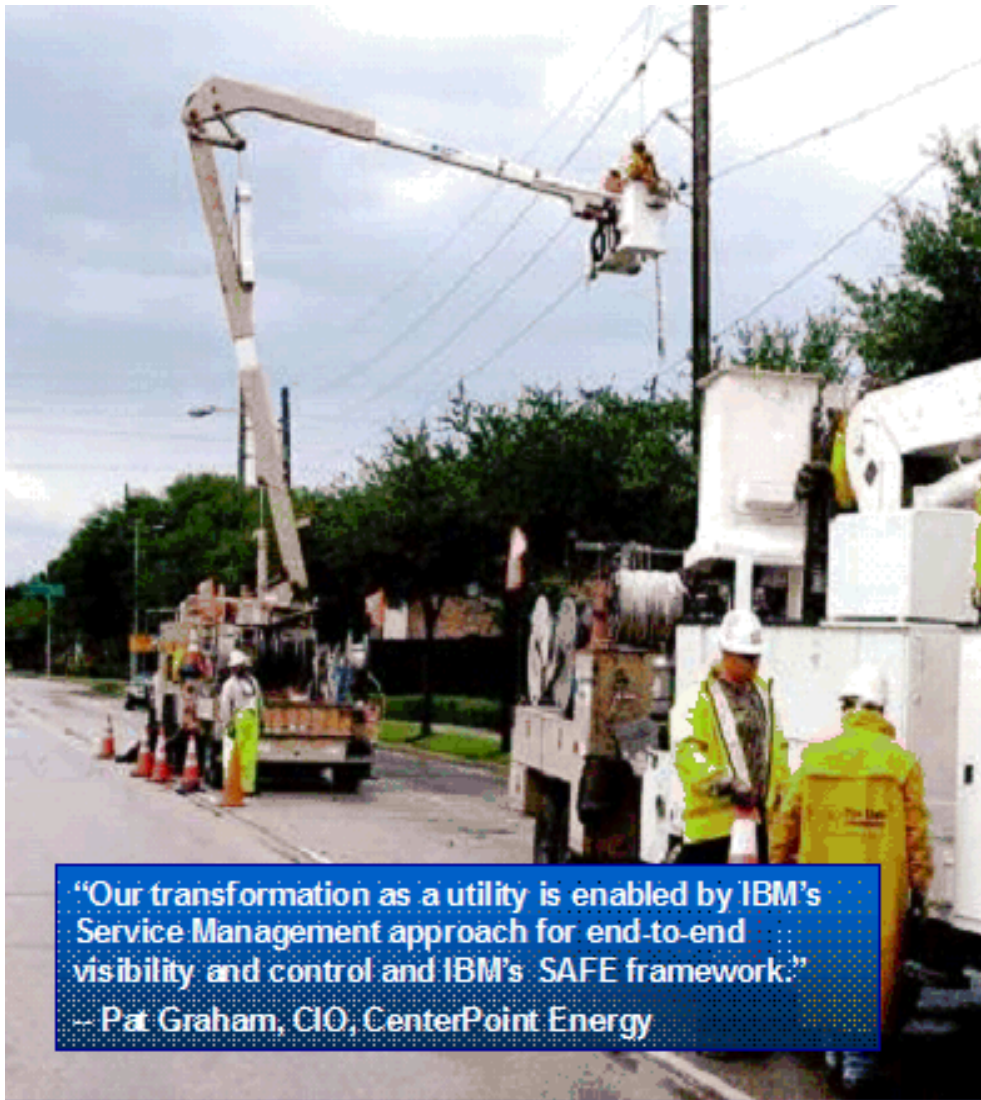
In an experiment Dr. Pronovost used the checklist strategy to attack just one common problem in the I.C.U., infections in patients with central intravenous lines (catheters that deliver medications or fluids directly into a major vein)

http://www.nytimes.com/2009/12/24/books/24book.html

# Enforcing checklists at hospitals

Demo of IBM healthcare system

# Improving service restoration time and reducing truck rolls



**CenterPoint Energy**

## The Business Challenge
- Silos and duplicated solutions for meters, network and IT devices
- Time-consuming manual reports
- Costly triangulation methodology for fault isolation/root-cause analysis

## The IBM Solution
- Comprehensive meter monitoring
- Network management with event correlation across grid and IT
- Integrated executive business dashboards and historical reports

## Benefits of the Solution
- Laid foundation for automated AMI distribution system
- Cut cost of problem determination and root-cause analysis
- Enabled real-time visualization of meter failures, alerts, violations

"Our transformation as a utility is enabled by IBM's Service Management approach for end-to-end visibility and control and IBM's SAFE framework."
— Pat Graham, CIO, CenterPoint Energy

IBM

# Intelligent Utility Networks



- **IBM and its partners will replace Malta's 250,000 utility meters with interactive versions that will allow Malta's electric utility, Enemalta,** to monitor electricity use in real-time and set variable rates that reward customers that cut their power consumption.

- **As part of the $91 million (€70 million) project,** a sensor network will be deployed on the grid  **- along transmission lines, substations and other infrastructure - to provide information that will let the utility more efficiently manage electricity distribution and detect potential problems.**

- **IBM will provide the software that will aggregate and analyze all that data so Enemalta can identify opportunities to reduce costs -** and emissions from Malta's carbon-intensive power plants**.**

- A sensor network will also be installed on the water system for Malta's Water Services Corporation. **"They'll indicate where there is water leakage and provide better information about the water network," says Robert Aguilera, IBM's lead executive for the Malta project, which is set to be completed in 2012.**

# Smarter Oil and Gas fields

- **Today, we can only extract about one-third of the oil in an existing reserve, leaving billions of barrels in reservoirs.** That's unfortunate, since it can cost $100 million to drill a single new well.

- **Put simply, we need smarter oil and gas fields. And that means gathering and managing real-time data from across the entire production stream, in vast quantities.**

- One oil field alone can generate the equivalent of 200 DVDs' worth of data per day. **Making sense of all this information is critical for better decision making—about exploration, production and management.**

- *Smarter exploration* means integrating and processing geophysical and other relevant data to develop 3-D models of reservoirs. **It means finding previously inaccessible oil and gas reserves embedded beneath difficult terrain or the deepest ocean waters.**



Repsol, in partnership with scientists from around the world, is using advanced seismic imaging technology from IBM to reveal oil and gas deposits that traditional imaging techniques can't see.

## Smart Traffic Build on Smart SOA

*City of Stockholm breaks gridlock with a smart road use management system*

**What's Smart**
- New dynamic business model
- Congestion charging
- Technology to optically recognize cars in milliseconds
- Real-time congestion tolling

**Smarter Business Outcomes**
- 25% reduction in traffic
- 40,000 more citizens on public transportation

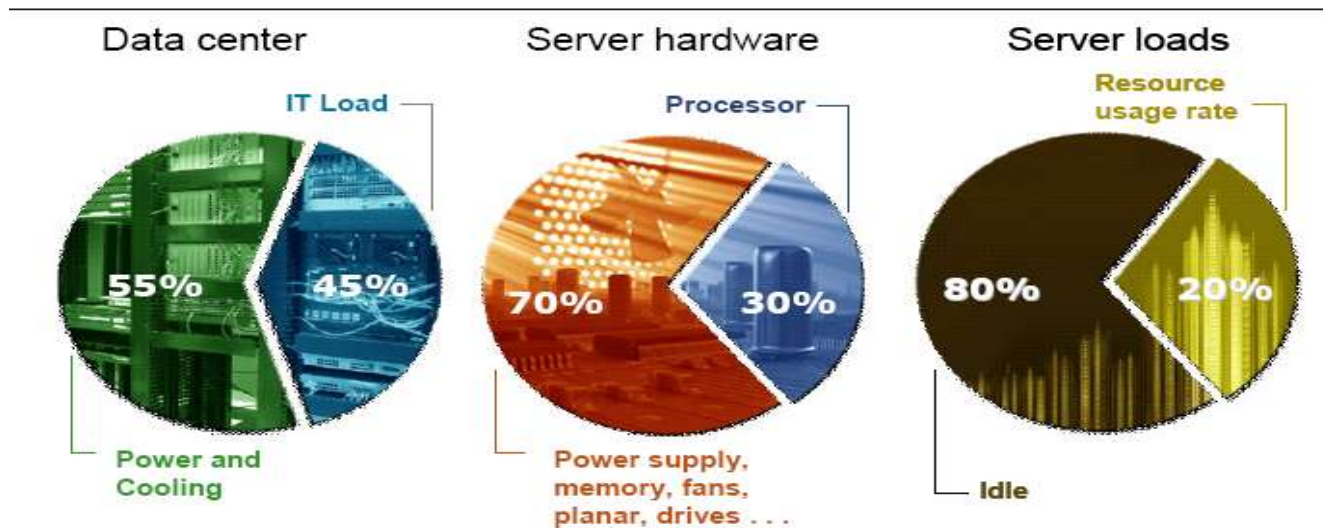*Fact*:  The cost of congestion in the U.S. transportation system nears $200 billion each year.

2009 IBM Corporation

# Smarter buildings

- Instrumented: **Today, many of the systems that constitute a building are managed independently—and many of them are not managed at all for their occupancy, energy use or thermal effect, due to a lack of sensors and monitors that would be needed to do so.**

- Interconnected: A lack of standards for measuring energy use and carbon footprints isolates buildings' systems from each other…

- Intelligent: **…government standards for energy efficiency and incentives for architects, builders, developers and owners, so that savings on future operating costs can go to the people making the upfront investments—can combine with incentives for utilities to achieve a reduction in buildings' demands for energy and water.**
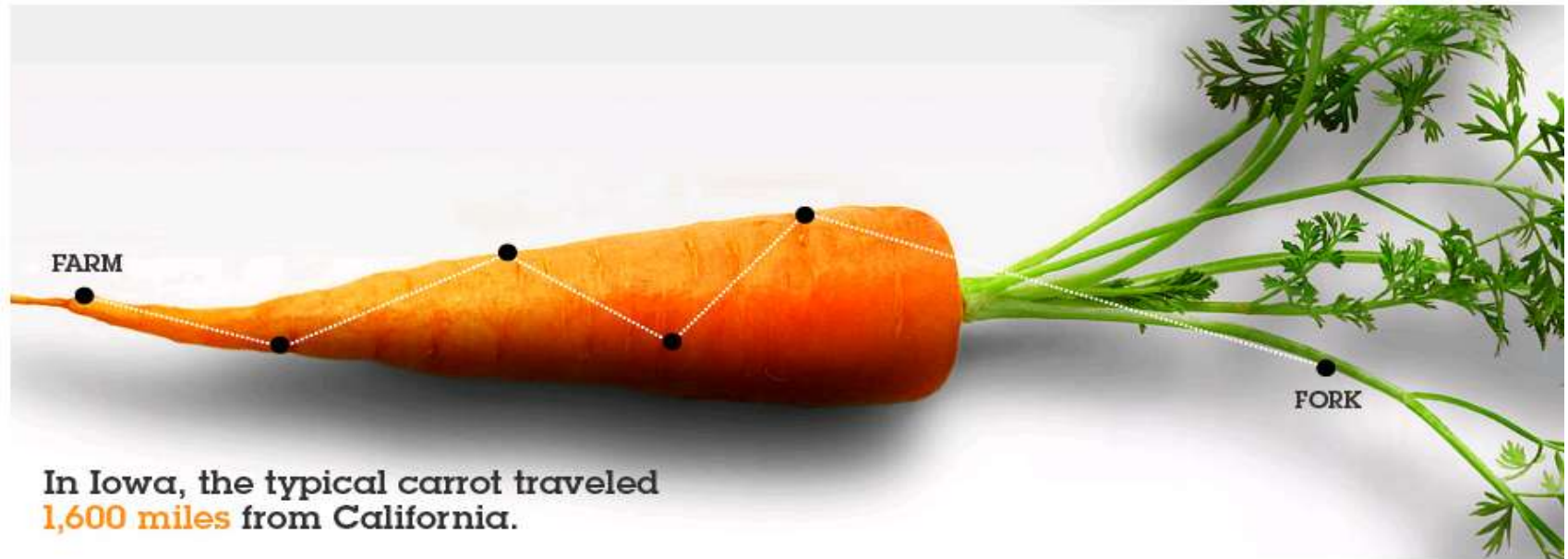
Buildings account for **70%** of current U.S. electricity use.

# Optimize Costs by 'Going Green'

# Food Industry



FARM

FORK

In Iowa, the typical carrot traveled
1,600 miles from California.

**Farm to fork**

The average meal has been through a complex supply chain by the time
it reaches the dinner table.
Dozens of companies are involved in the production of just a single rib eye steak.
In the Canadian Province of Manitoba IBM helped develop full traceability solution…
including beef and pork producers, animal feed ingredient producers, feed
manufacturers, farmers, processing plants, truckers and a retail grocery chain.

# Water Management
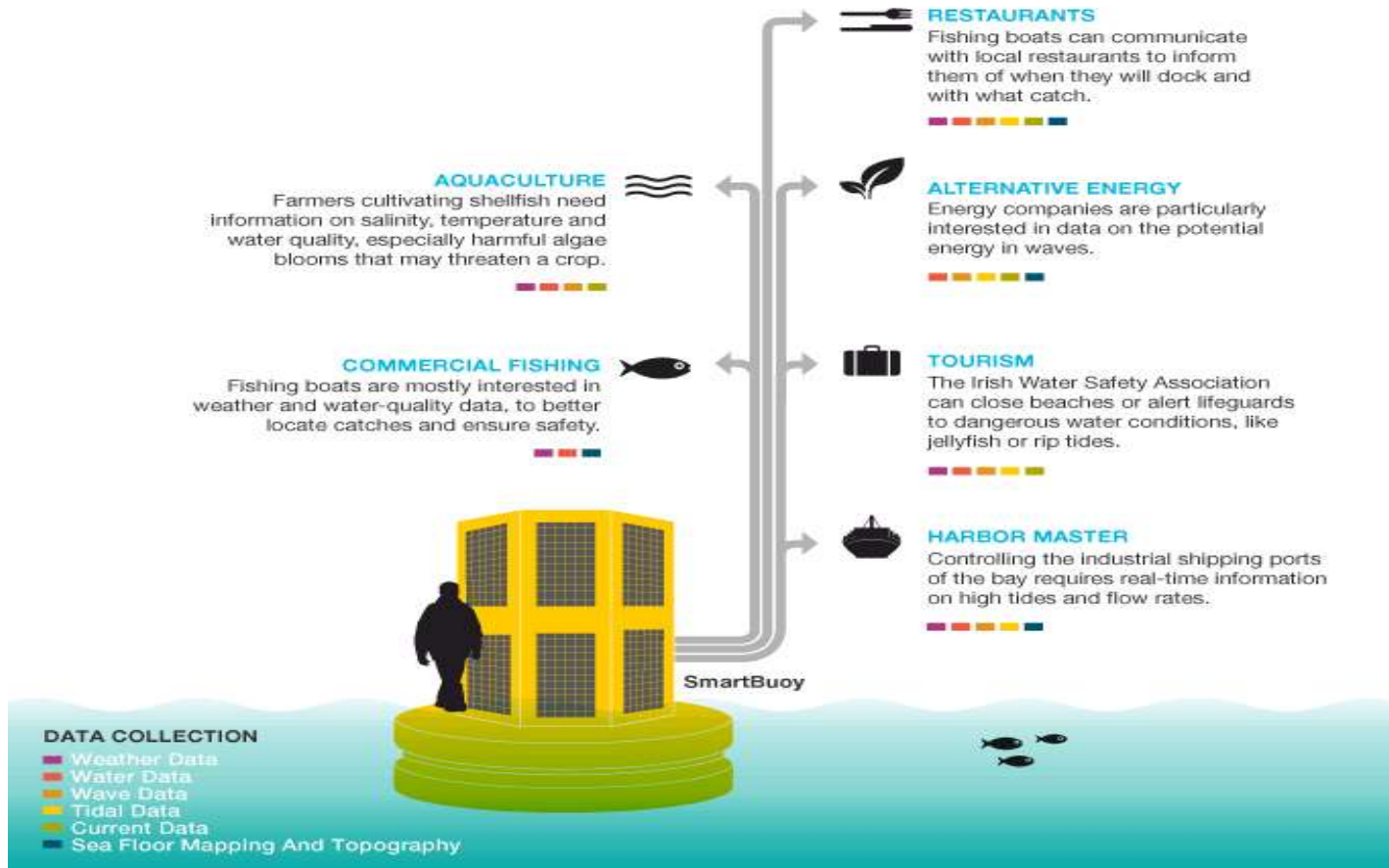
# Quiz

How much water in liters was needed to produce this pair of jeans?

# Water Management



It takes...

| | |
|---|---|
| **10** liters of water to make one sheet of PAPER | **40** liters of water to make one slice of BREAD |
| **70** liters of water to make one APPLE | **80** liters of water per dollar of INDUSTRIAL PRODUCT |
| **91** liters of water to make one pound of PLASTIC | **120** liters of water to make one glass of WINE |
| **140** liters of water to make one cup of COFFEE | **1,300** liters of water to make one kilogram of WHEAT |
| **4,800** liters of water to make one kilogram of PORK | **10,855** liters of water to make one pair of JEANS |
| **15,500** liters of water to make one kilogram of BEEF | **16,600** liters of water to make one kilogram of LEATHER |

# The planet will be instrumented, interconnected, smarter

## *People want it. We can do it.*

# IBM and Cloud Computing

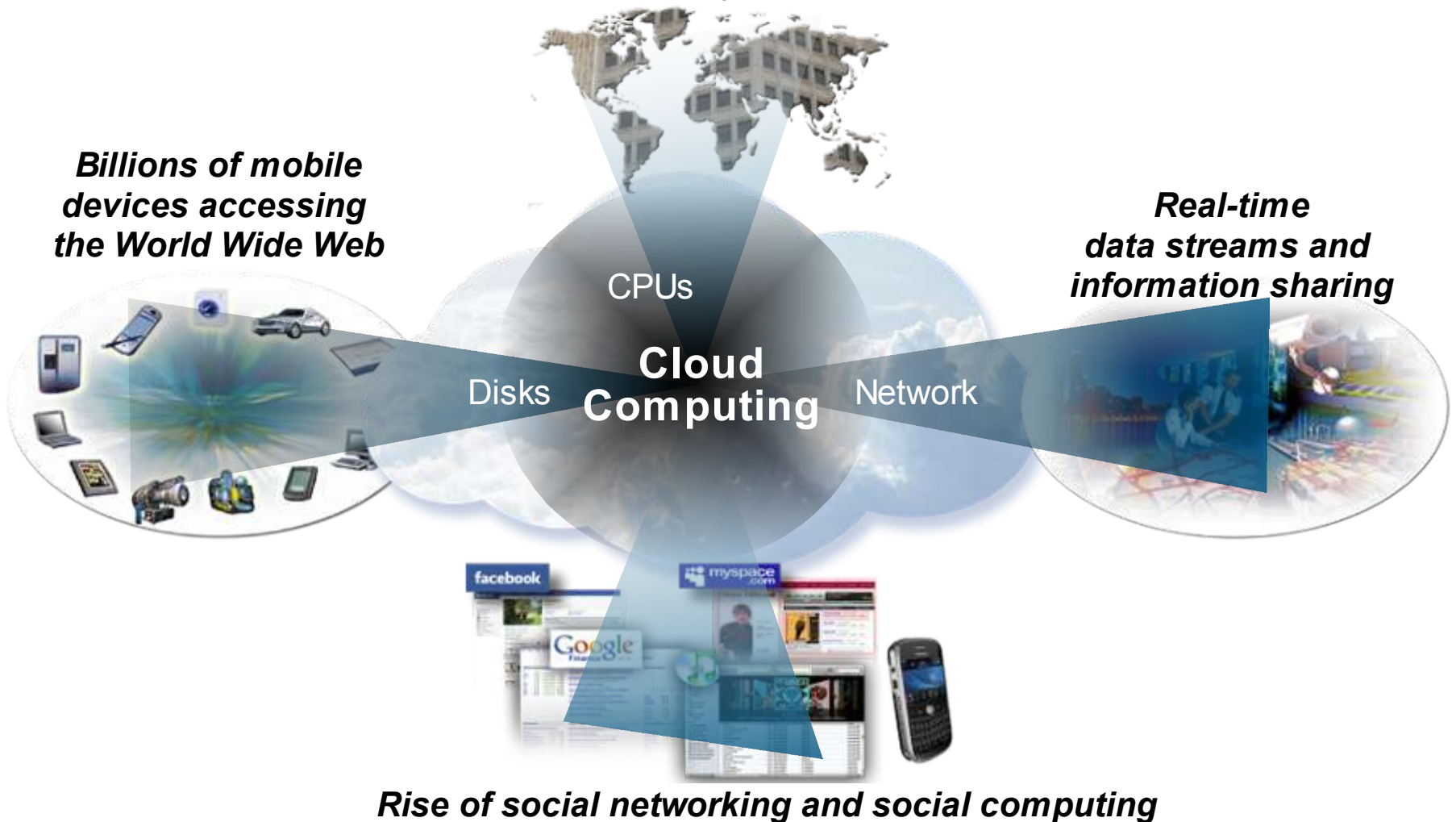How the cloud is changing enterprise computing

# Cloud Computing, an overview in a tweet

**Cloud Computing is not an isolated phenomenon, it is part of a broad sweep of unprecedented technical and social change sweeping the world.**

**http://twitter.com/ibmsanmateo**

IBM
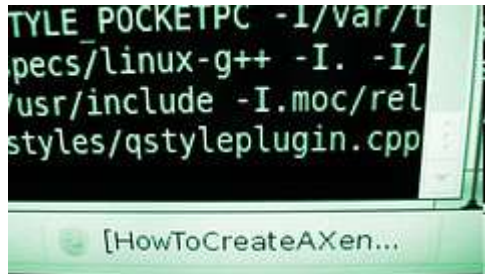
# Cloud Computing, Compute Model for a Smarter Planet
### *Globalization and Globally Available Resources*

**Billions of mobile devices accessing the World Wide Web**

**Real-time data streams and information sharing**

CPUs

**Cloud Computing**

Disks

Network

**Rise of social networking and social computing**

# IBM on Amazon AWS

**The IBM Development AMIs are ready to run in Amazon EC2**

**with Novell® SuSE Linux and the associated IBM products.**

* IBM DB2® Express-C 9.7 32 bit on Linux

* IBM DB2® Express-C 9.7 64 bit on Linux

* IBM Lotus® Forms Turbo on Linux

* IBM Mashup Center v2.0 on Linux NEW!

* IBM WebSphere® Application Server 7.0.0.3 NEW!

* IBM WebSphere® eXtreme Scale v7.0 on Linux

* IBM WebSphere® sMash on Linux

* IBM WebSphere® Portal Server and Lotus Web Content Mgmt Standard Edition

* IBM Informix® Dynamic Server v11.5 on Linux

# The IBM Development and Test Cloud
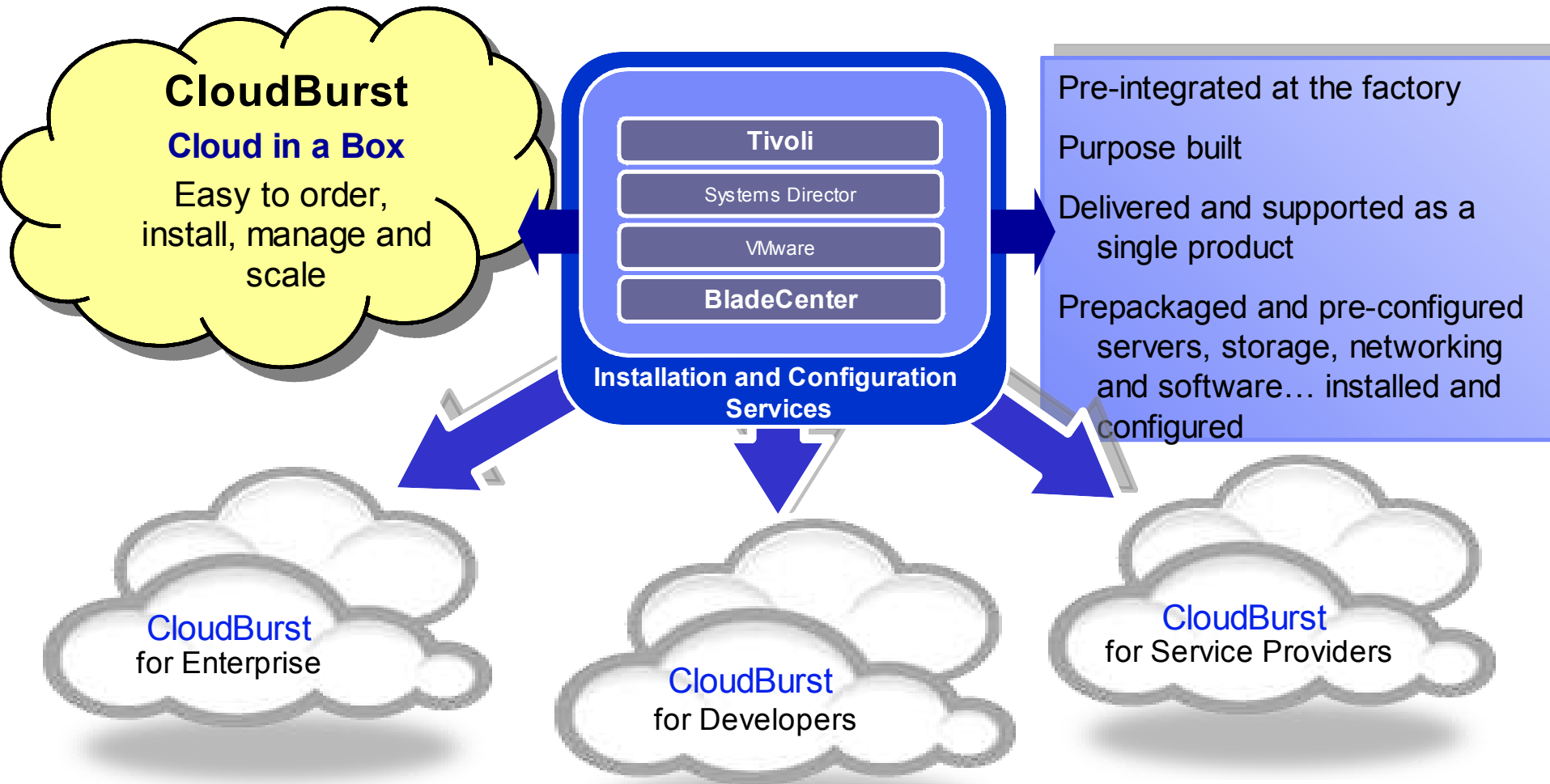
# IBM Smart Analytics Cloud for System z

- **A Smart Analytics Cloud:**

- **Drastically reduces the number of departmental solutions to a single BI environment capable of supporting vast numbers of users across the lines of business.**

- **Introduces a single point of control for meeting departmental business processes, corporate security and compliance standards for easier enforcement of standardization.**

- **More effectively uses skilled BI resources to support a common BI delivery tool which can be made available across the enterprise.**

- **Reduces the capital and operating expenses needed to support enterprise wide BI services.**

- **Supports a self service approach to dispensing BI services that reduces the time, resources and costs for delivering BI services to new divisions, departments and users**

- **Supports critical thinking in the enterprise with BI Compentency Center education**

# IBM Smart Business Storage Cloud

- **As data volumes grow and the ability to handle various file formats becomes more complex, supporting efficient and cost-effective access to data can be increasingly difficult, with users experiencing reduced performance and outages.**

- **IBM Smart Business Storage Cloud can help you successfully deploy high-performance, scalable storage-virtualization solution to facilitate growth and innovation at lower operational costs.**
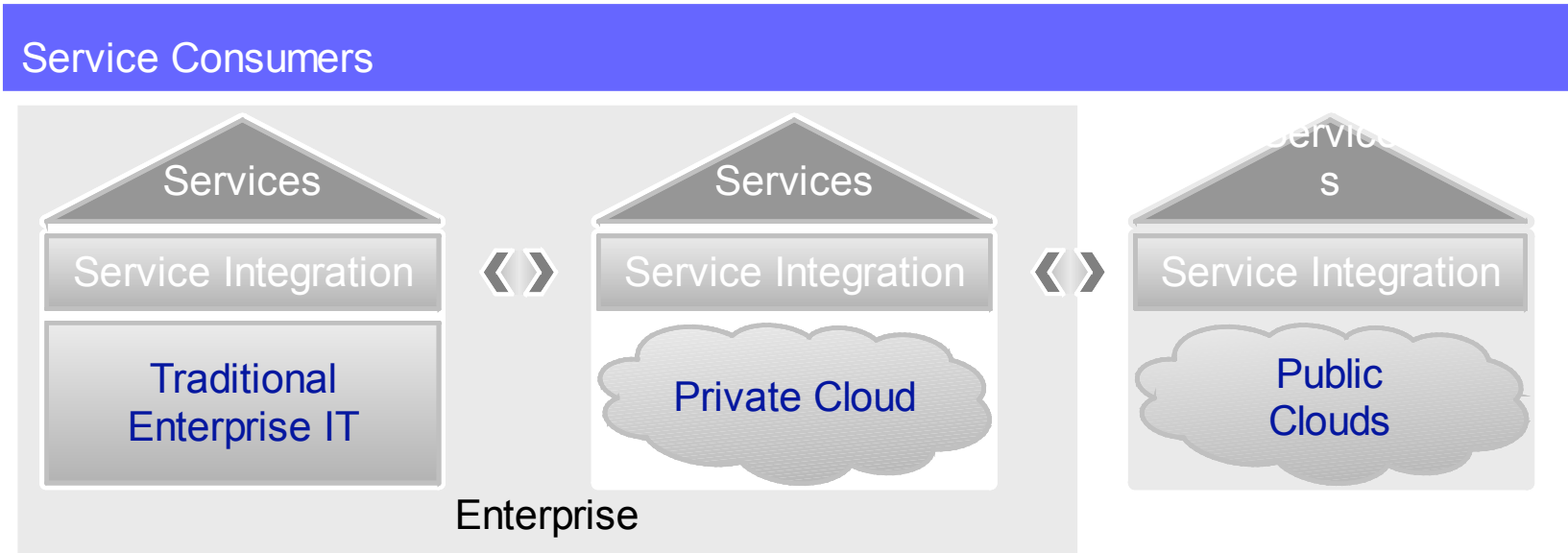
# IBM CloudBurst… Private Cloud Deployment Made Easy

**CloudBurst**

**Cloud in a Box**

Easy to order, install, manage and scale

**Installation and Configuration Services**

- Tivoli
- Systems Director
- VMware
- **BladeCenter**

Pre-integrated at the factory

Purpose built

Delivered and supported as a single product

Prepackaged and pre-configured servers, storage, networking and software… installed and configured

CloudBurst
for Enterprise

CloudBurst
for Developers

CloudBurst
for Service Providers

# Three co-existing delivery models.

Over time, IT workloads will move to Cloud delivery models as applicable for the client.

**Examples:**

## Service Consumers

| Services | Services | Services |
|---|---|---|
| Service Integration | Service Integration | Service Integration |
| Traditional Enterprise IT | Private Cloud | Public Clouds |

Enterprise

- Mission Critical
- Packaged Apps
- High Compliancy

- Test Systems
- Storage Cloud
- Developer Systems

- Variable Storage
- Software as a Service
- Web Hosting

# Get started with Cloud Computing. For the utterly impatient

- Cloud computing promises unlimited disk space for users and applications.

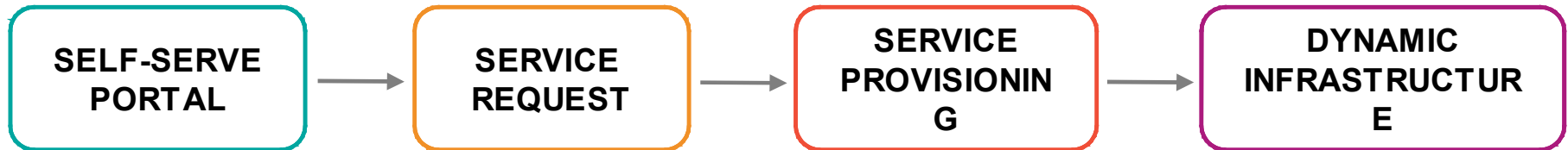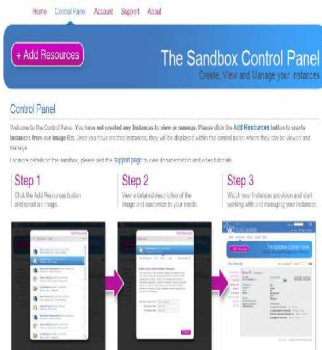- Use Amazon Simplified Storage (S3) as an external disk from PHP Zend

  - **Doug Tidwell IBM developerWorks 9/22/09**

•Where most Cloud users start
•Back up mission-critical applications or databases to  Amazon Simplified Storage System
•Use cloud computing storage as a disaster recovery option

**Contents of bucket** dougtidwell

| Object Name | Size | Media Type | Timestamp | |
|---|---|---|---|---|
| pictures/doug.jpg | 42,486 | image/jpeg | 18 Sep 2009 - 18:10 | Delete |
| pictures/index.html | 47,474 | text/html | 17 Sep 2009 - 22:26 | Delete |
| pictures/index.xml | 37,533 | text/xml | 17 Sep 2009 - 22:26 | Delete |
| style/sheri/style.css | 1,612 | text/css | 19 Sep 2009 - 00:58 | Delete |
| 4 items total | | | | |

# "Self-service" plus standardization drives lower costs and unlocks productivity.



**Business Services**

**IT Services**

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

# Cloud Computing adds value in 5 specific ways

Cloud computing is a new **consumption and delivery model** inspired by consumer Internet services. Cloud computing exhibits the following 5 key characteristics:

### Flexible / Usage-Based Pricing

*"Not only is it pay-by-consumption, but that initial capital investment isn't there." (US, Manufacturing)*

### Elastic Scaling

*"This is very, very attractive in that you can actually purchase a particular amount of demand, and then after you finish with that demand, you can hand it back." (UK, Transportation)*

### Rapid Provisioning

*"In today's world, companies take over each other like there's no tomorrow. Their lead costs are in integrating and making sure they're on the same platform. You have a cost increase but not that huge integration cost. That can be done really quickly." (AU, Manufacturing)*

### Advanced Virtualization

*"That's pretty impressive stuff because you can fine-tune an app by adding another CPU or gig of memory in real time dynamically. That's hot." (US, Hospitality Gaming)*

### Standardized Offerings

*"It is good because I can offer this standardized product across the enterprise as opposed to point solutions. If it's a pure out-of-the-box and non-flexible, that's a huge negative. If it's got that flexibility, that's a substantive positive." (US, Education)*

# In house annual server cost

IBM x3500 2.0GHz  Xeon processor  4 cores with 2Gb memory

| Item | Cost |
|------|------|
| Acquisition Cost | $800 (3 yr loan at 10%) |
| Power | $731 |
| Floor space | $987 |
| Annual server maintenance | $277 |
| Annual connectivity maintenance | $213 |
| Annual disk maintenance | $203 |
| Annual enterprise network | $1024 |
| Annual software maintenance | NA |
| Annual System administrator | NA |
| **Total cost** | **$4235** |

Source: IBM internal study

IBM

# Cloud server cost

Amazon High CPU medium reserved instance w/ 1.7GB memory

| Item | Cost |
|------|------|
| EC2 Cost (Reserved instance) | $980.60 |
| Storage | $432 |
| I/O | $100 |
| Annual software maintenance | NA |
| Annual System administrator | NA |
| **Total cost** | **$1512.60** |

Source: http://aws.amazon.com

# Leveraging public clouds from private clouds

- One interesting approach is the ability to configure fault-tolerant systems and hot backups for disaster recovery.

- A private cloud can be configured and operated with fairly seamless failover to Amazon EC2, for example.

# And now Hybrid clouds…



- **Phase 1: Server consolidation**

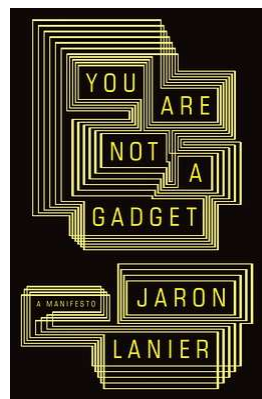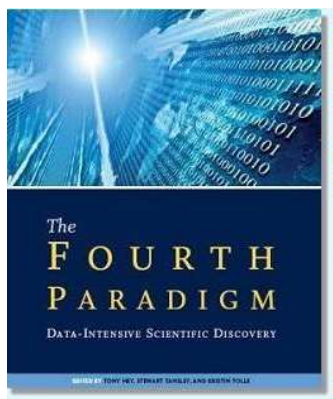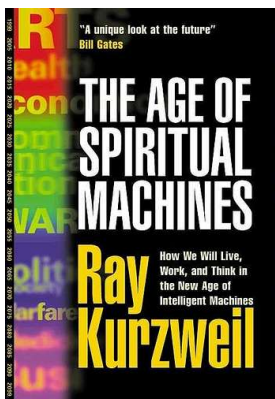  – Public and private clouds

- **Phase 2: Hybrid clouds**

  – Moving workloads on and off premises

  – Moving data center workloads

    • need to use the same hypervisor in both clouds, and the need to match up server chipsets.

    • VMware and other hypervisor vendors have agreed only to create a common "import format," not a neutral runtime format.

# Where do we go from here?

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