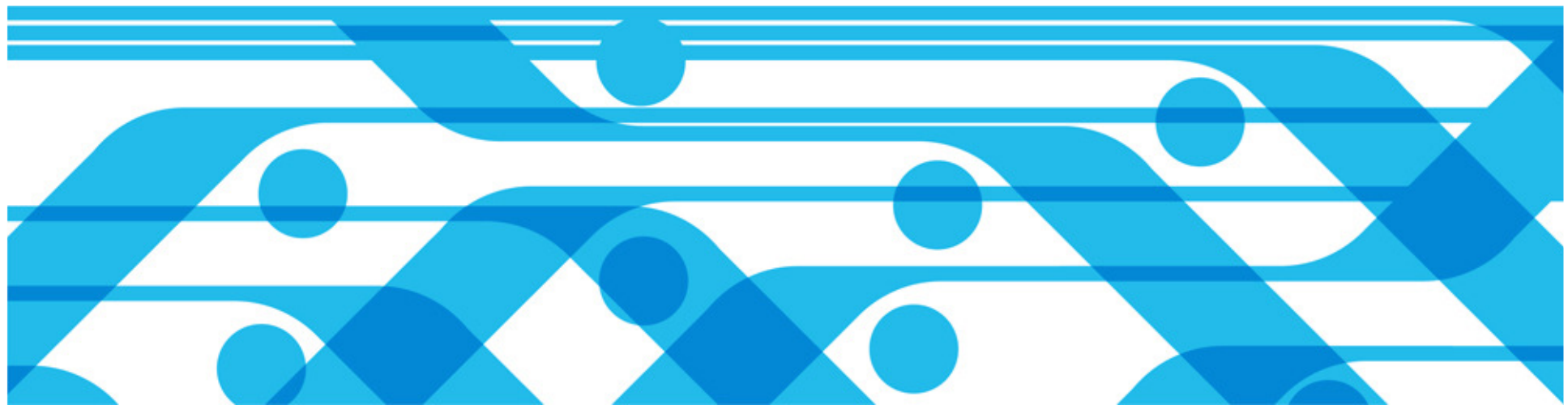# Fit for Purpose Infrastructure

Remco Kroes

September 15th 2010

'When to use which system?'

'It depends….'

Anticipate a changing environment

Fit for Purpose

*It depends on trade-offs of many factors:*

- Designs decisions involve trade-offs
  - Cost
  - Availability
  - Throughput
  - Simplicity
  - Flexibility
  - Functionality
  - Quality of Service

- Designs are different because needs are different

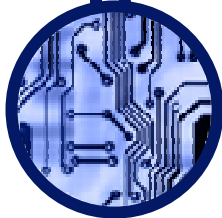- Designs are different because workloads are different

Anticipate a changing environment

It depends on needs & workloads:

Different needs
and priorities

A wide range
of workloads
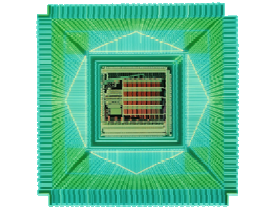
Smarter Systems in a Dynamic Infrastructure

Anticipate a changing
environment

A Dynamic Infrastructure for a Smarter Planet

IBM.

IBM's smarter planet vision

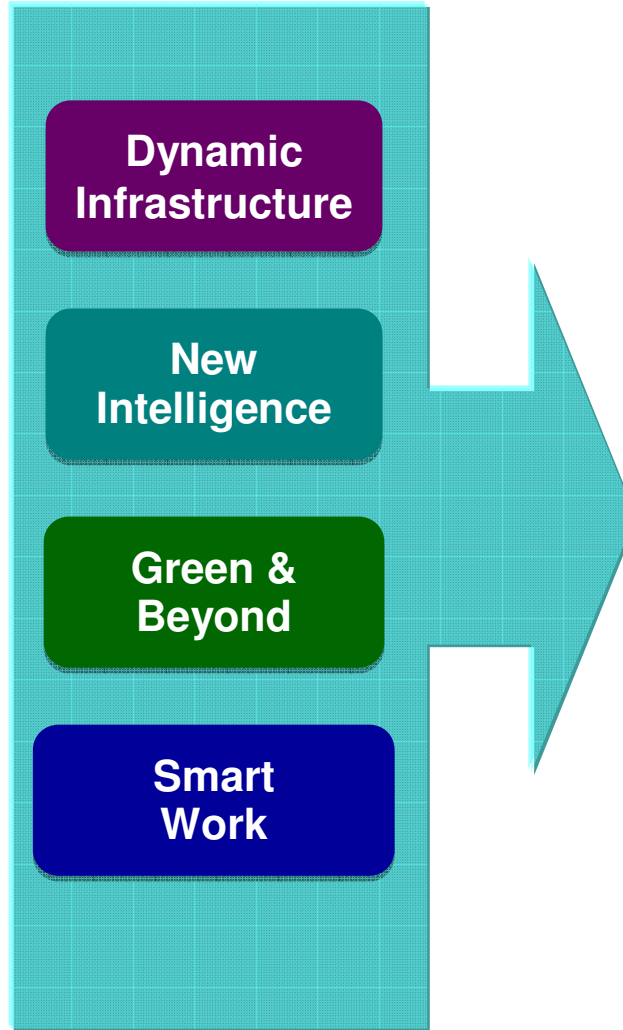let's build a smarter planet
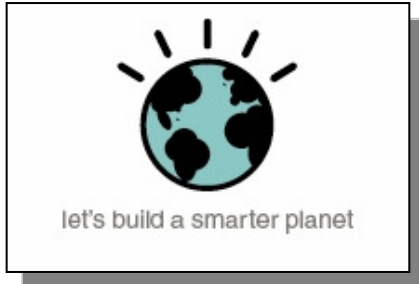
The world has become flatter and smaller. Now it must become smarter.

Four major 'Smart Themes'

- Dynamic Infrastructure
- New Intelligence
- Green & Beyond
- Smart Work

Dynamic Infrastructure

IMPROVE SERVICE
REDUCE COST
MANAGE RISK

Dynamic Infrastructure
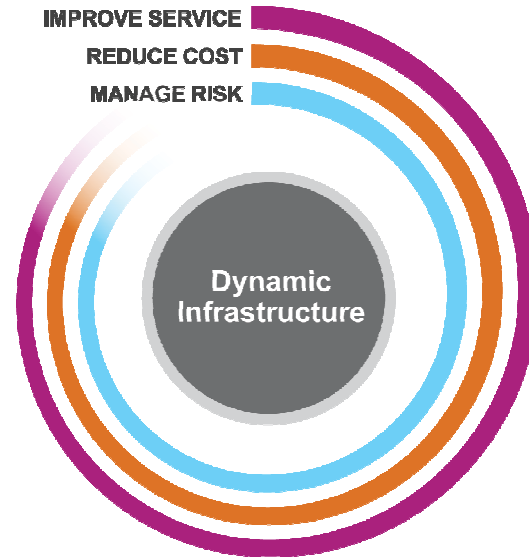
How do I create an **infrastructure that drives down cost**, *is* **intelligent and secure**, *and* **is just as dynamic as today's business climate** *?*

Anticipate a changing environment

5

Building a Dynamic Infrastructure…

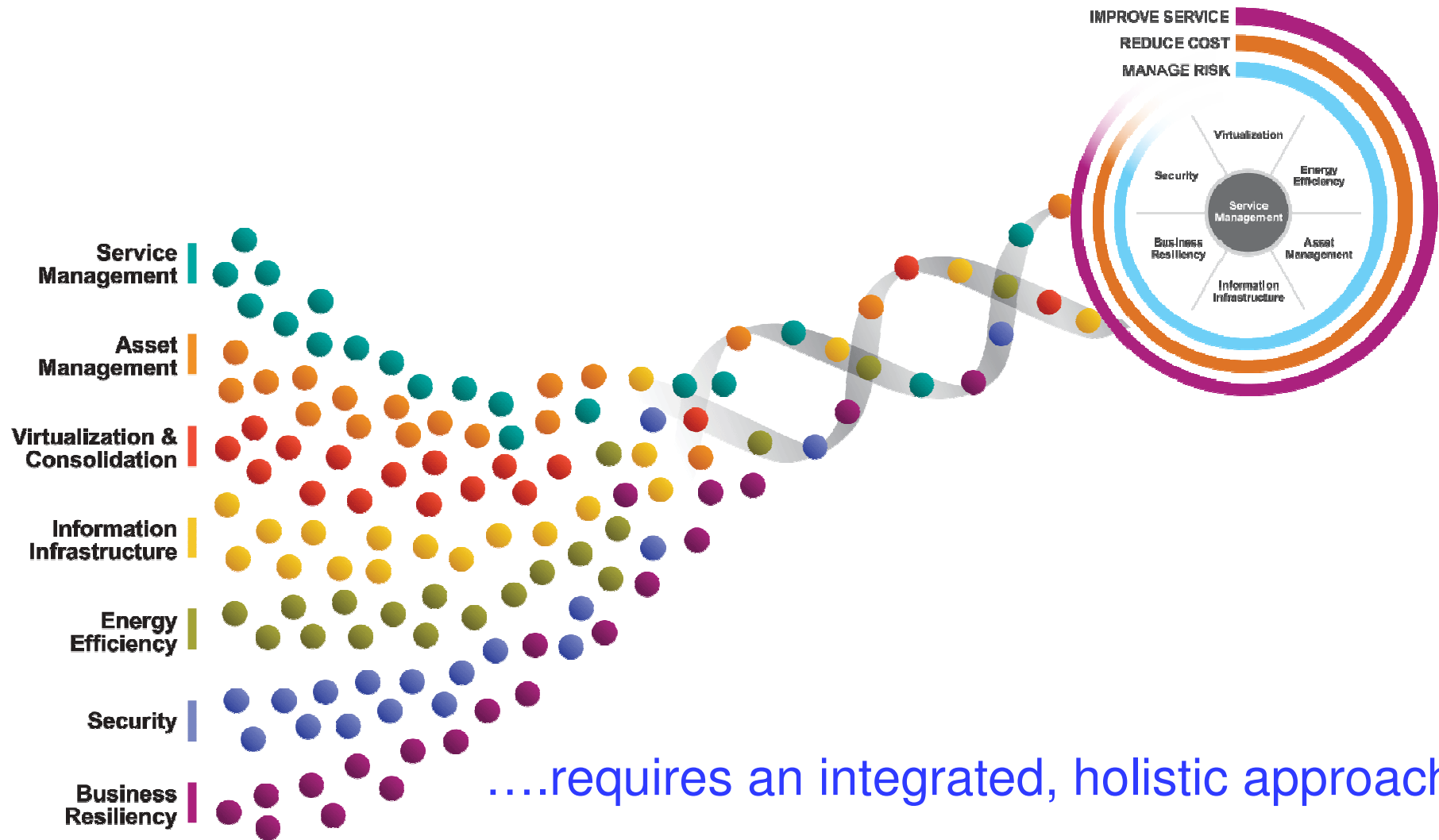….requires an integrated, holistic approach and Smarter Systems as the base building blocks.

Anticipate a changing environment

Especially in light of today's challenges

IBM

41% of data center managers claim their data centers will max out their energy capacity within one to two years

80% of digital data is now unstructured and requires greater effort to transform it into usable intelligence

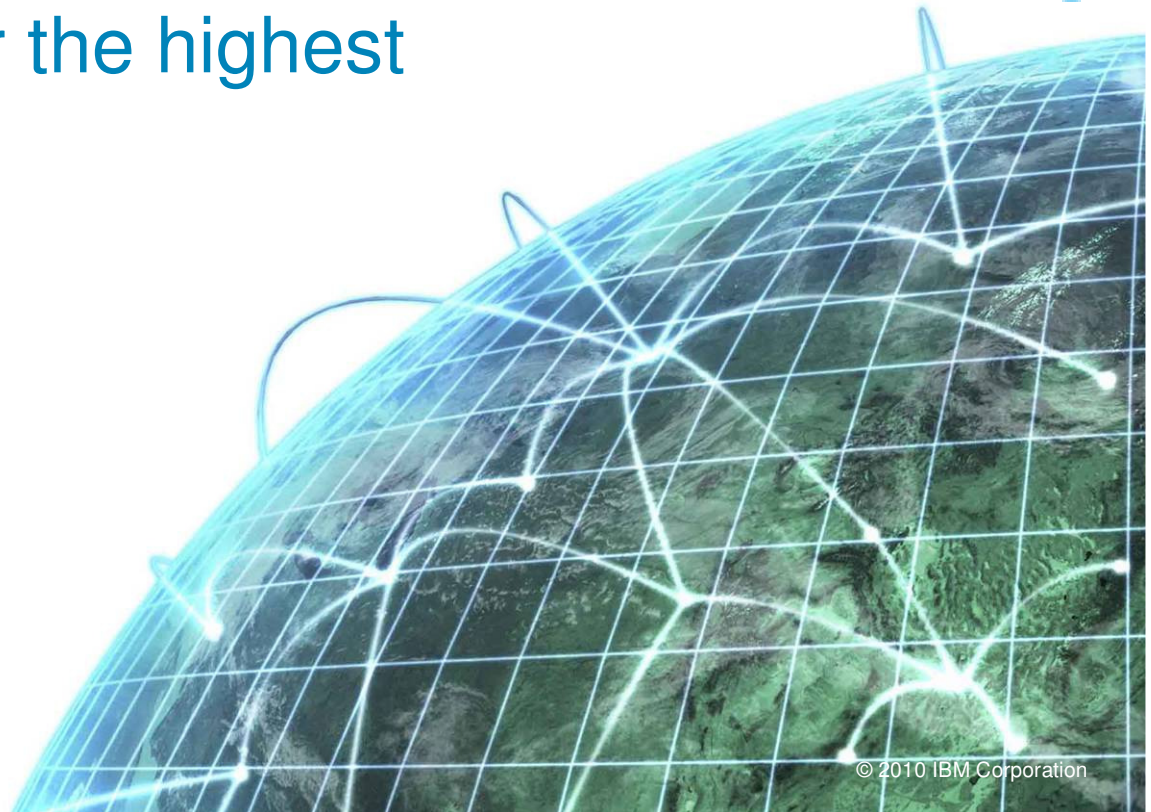Processor power doubles every 18 months, but up to **85%** of this power often sits idle

We need Smarter Systems for a Smarter Planet

Intentionally designing integrated systems

that redefine performance and optimize

resources to deliver the highest

possible value.

Smarter systems are optimized for the
needs and the workloads

of the world we live in today

The needs
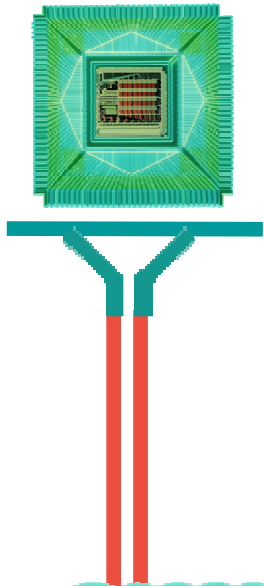
Empower the workforce

Manage risk, security and compliance

Deliver operational efficiency & business agility

Reduce the cost and complexity of managing data

Discover insights and optimize processes – in real time.

Achieve the business performance and scale required

Efficiency & Effectiveness

The Agile Organization

Insights & Action

The Empowered Workforce

Managing Risk

The workloads

Shared Data & Work Q
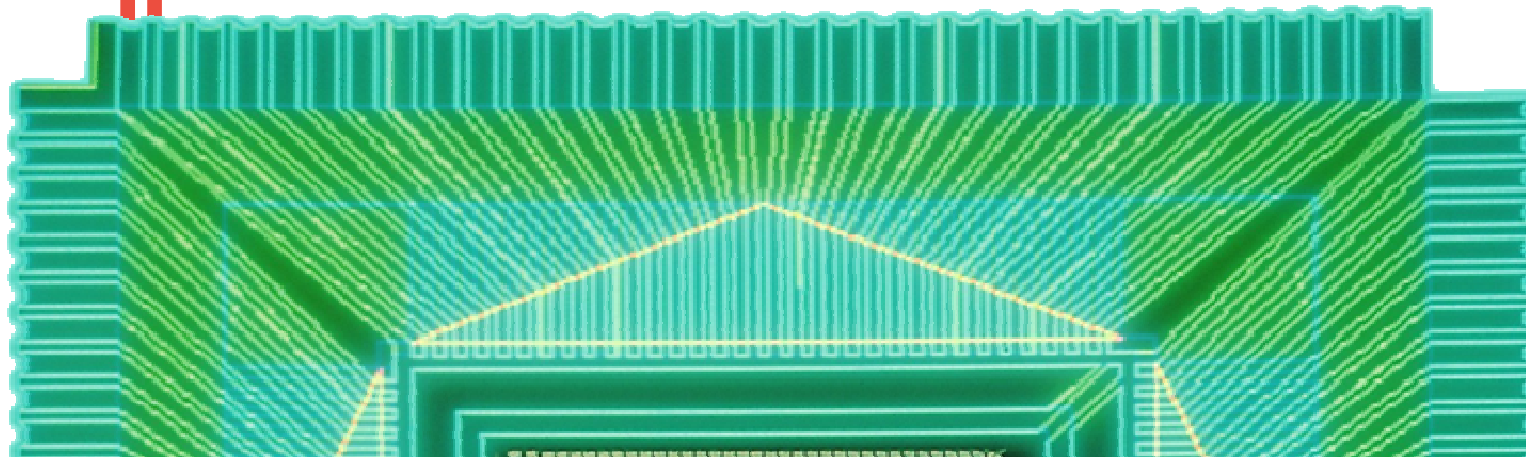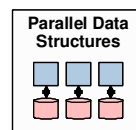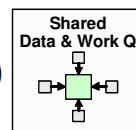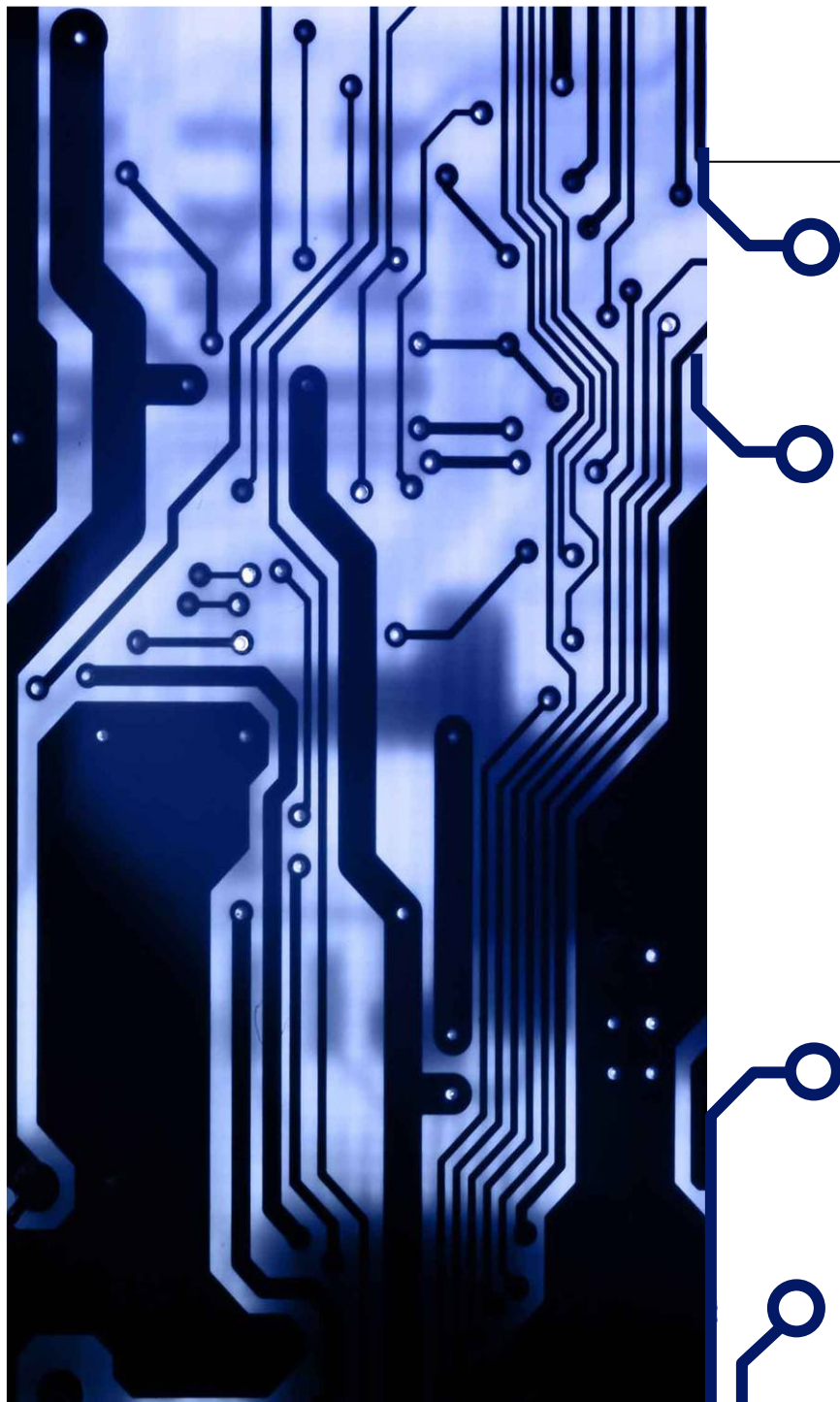
Parallel Data Structures

Transaction Processing and Database Applications

Business Intelligence, Analytics and HPC

Business Process Management Applications

Web, Collaboration and Infrastructure Applications

Highly Threaded

Small Discrete

Anticipate a changing environment
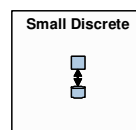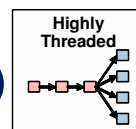
Workloads: basic types and attributes

Type 1

Shared Data & Work Q
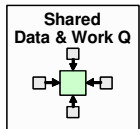
Transaction Processing and Database

High Transaction Rates

High Quality of Service

Scale: Peak Workloads

Resiliency and Security

BI, Analytics and High Performance

Compute or I/O intensive

High memory bandwidth

Floating point

Scale out capable

Type 3

Parallel Data Structures
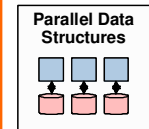
Type 2
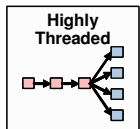
Highly Threaded

Business Applications

SAP WebSphere.

Scale: Highly Threaded

High Quality of Service

Large memory footprint

Responsive infrastructure

Web, Collaboration and Infrastructure

Small Discrete Appl. Instances (Threaded)

Throughput-oriented

Scale out capable

Lower Quality of Service

Type 4

Small Discrete
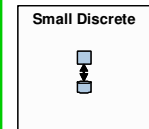
Anticipate a changing environment

Workloads may mix and evolve

- A business service may be comprised of multiple workload types

- The same IT service can have multiple types of workloads based upon usage patterns

- Other non-functional requirements and local factors apply

- Workloads may evolve over time!

Internet Banking Front-End

Small Discrete

Back-Office Banking + Internet Banking Middle-Tier

Threaded

Core Banking System + General Ledger

Mixed

Data Warehouse

Parallel Data Structures

Anticipate a changing environment

13
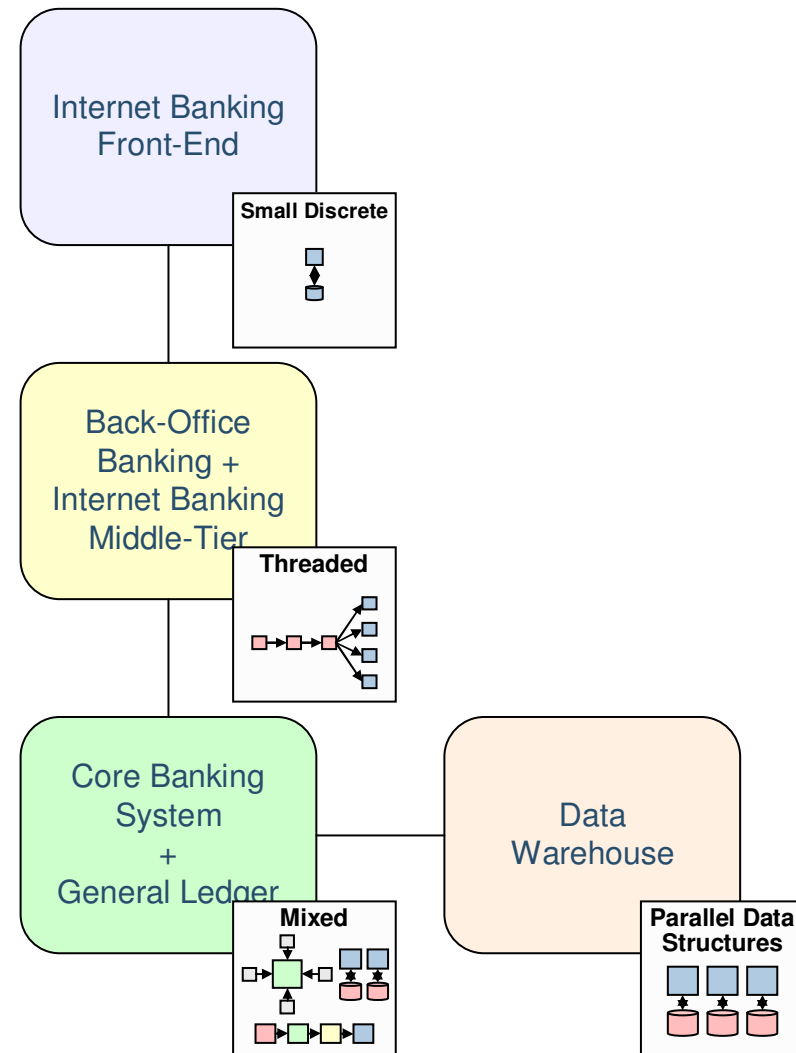
Systems design affects workload processing

IBM.

Workloads consist of:

- Application function, structure & code
- Data Structure and Scale
- Usage patterns
- Service Level Requirements
- Integration of components
- Integration with other workloads

Thread Speed

Fitness:

- Processor Speed – Serial Fitness
- Thread Count – Parallel Fitness
- Cache/Thread – Data Fitness

Low

High

High   High

Low   Low

Thread Count

Server Design

Effective Cache/ Thread

Synchronization and Queuing Contention and Delays

Type 1
Mixed workloads updating shared data or queues

Parallel Hell

Type 2

Type 4
Small discreet applications

Highly threaded applications

Type 3
Parallel data structures with analytics

Parallel Nirvana   **Parallel Purgatory**

Data Traffic Volume and I/O Delays

Anticipate a changing environment

10. **CPU Intensive** – e.g. numerically intensive, etc.

9. **Protocol Serving** – e.g. static HTTP, firewall, etc.

8. **Skewless OTLP** – e.g. simple and predictable transaction processing
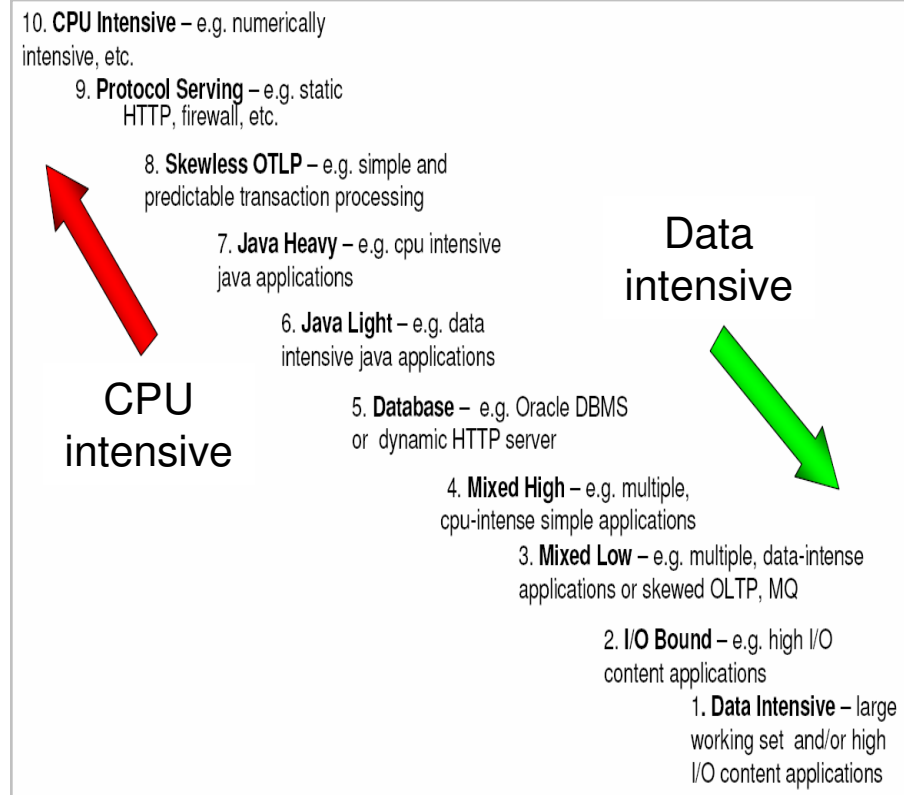
7. **Java Heavy** – e.g. cpu intensive java applications

6. **Java Light** – e.g. data intensive java applications

5. **Database** – e.g. Oracle DBMS or dynamic HTTP server

4. **Mixed High** – e.g. multiple, cpu-intense simple applications

3. **Mixed Low** – e.g. multiple, data-intense applications or skewed OLTP, MQ

2. **I/O Bound** – e.g. high I/O content applications

1. **Data Intensive** – large working set and/or high I/O content applications

Data intensive

CPU intensive

Smarter Systems Architectures (Scale up & Scale out)

System z

POWER

Ensembles

Server Ensemble	Network Ensemble	Storage Ensemble
Ensemble Manager	Ensemble Manager	Ensemble Manager
Virtualization	Virtualization	Virtualization

Email App.

Web App.

Database App.

VMware
Virtualization Layer

Intel Architecture

CPU   Memory   Disk   NIC

System x

System x

BladeCenter

iDataplex

Scale Up / SMP Computing

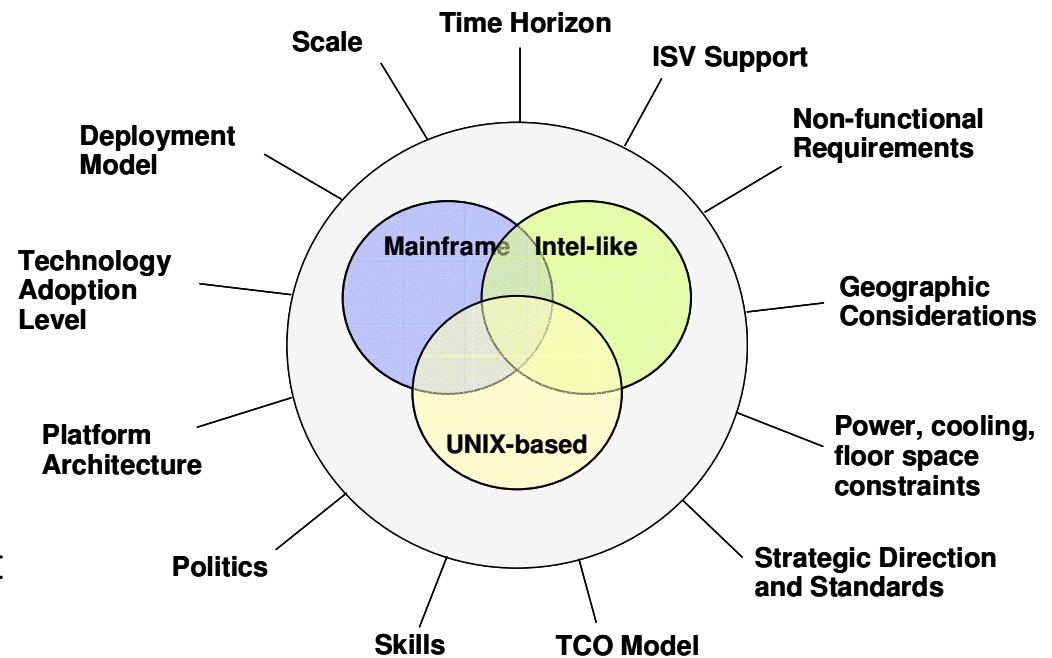**Scale Out / Distributed Computing**

Anticipate a changing environment

15
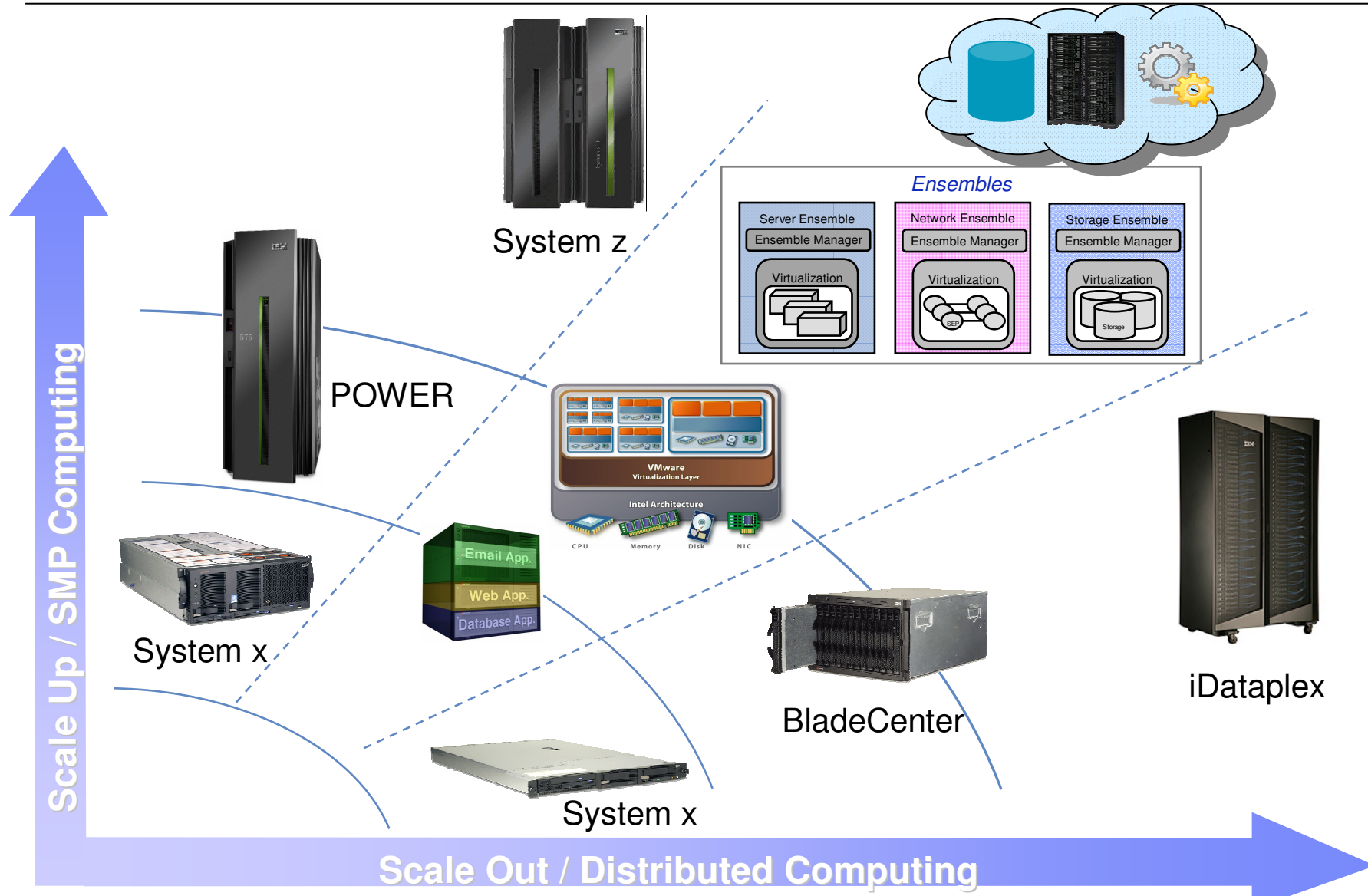
Fit for Purpose Conclusions

- Many factors influence platform selection – a simple matrix does not exist

- Local factors affect platform selection

- Infrastructure size matters

- Each deployment model has its place – virtualize or centralize where possible

- Non-functional requirements are the significant element of platform selection

- An enterprise wide view provides the best optimization opportunity

- Select platforms based upon **workload** requirements not middleware

Scale
Time Horizon
ISV Support
Non-functional Requirements
Deployment Model
Technology Adoption Level
Geographic Considerations
Mainframe
Intel-like
UNIX-based
Power, cooling, floor space constraints
Platform Architecture
Strategic Direction and Standards
Politics
Skills
TCO Model

One size does not fit all!

Fit for Purpose Infrastructure

Remco Kroes

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