Introduction to Dynamic Infrastructure

By Alan G. Labouseur

MARIST SCHOOL OF COMPUTER SCIENCE & MATHEMATICS

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IBM

MODULE TWO

THE 7 PILLARS OF DI

Introduction to Dynamic Infrastructure

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Contents

Remarks

Welcome, everybody, to week two. I hope all is well with your access and understanding of iLearn so far.

Those were nice discussions about the various outcomes of spinning the Dynamic Infrastructure wheel. (And it's an interesting tool/curiosity/gimmick from IBM.)

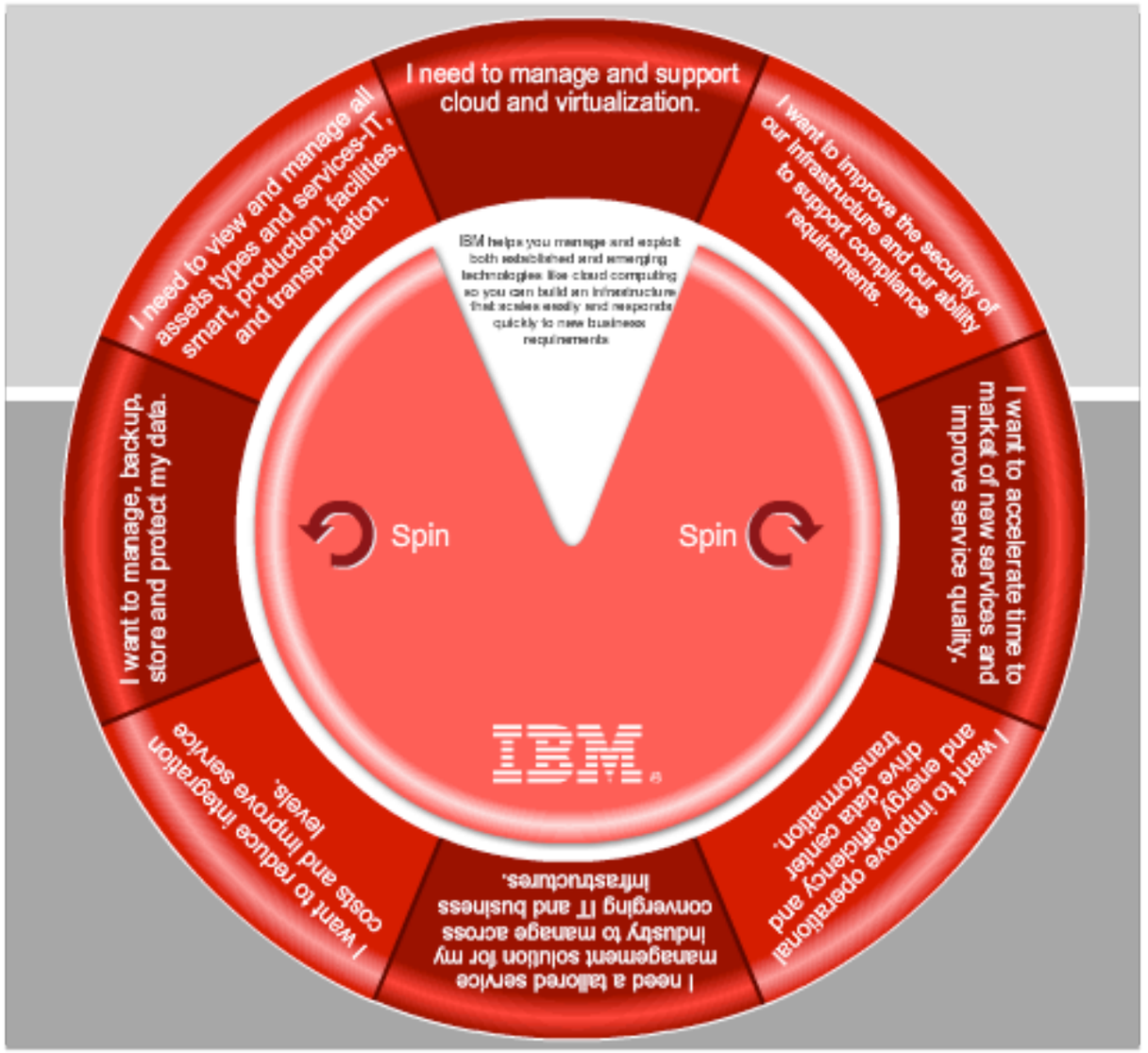
Now that you've seen a selection of individual aspects of DI via the wheel, let's take a look at the whole thing from a "10,000 feet" view.

Review

Let's review. When last we checked in, our heros were just recovering from some scary course policies and background material on the nature of . . .

- Hardware - the "bare metal" semiconductor chips that make up today's computers
- Software - programs that run on the bare metal hardware that make possible the magic of compupting
- Platforms - defined support structures where software lives
- Operating Systems - systems software that talks to the bare metal hardware and supports application programs
- Applications - end-user software that actually gets things done, like playing Zork and writing e-mail
- Networking - connecting two or more computers to form an internet.
- Storage - primary (memory), secondary (disk), and tertiary (removable) places to keep your data
- Enterprise Systems Management - the care and feeding of the totality of a businesses IT systems and policies

And then there was... the wheel!



Introduction to Dynamic Infrastructure

So what, exactly, is Dynamic Infrastructure? Is it . . .

- Autonomic Computing?
- On-Demand Computing or On-Demand Services?
  - Can we make use of our In-Demand skills if this is an On-Demand world?
- Something else?
  - Robotic, self-reconfiguring highways and byways?
- Something that might help you and me make the Earth a Smarter Planet™?

Well... it's many of those things, and more. Let's back up.

Our world is getting **more flat** and **more small**.

- **Flatter** because of global integration
- Through interconnected communications and commerce, it's becoming **smaller**.
- Technology . . .
  - brings enterprises closer to their customers.
  - shrinks decision windows so capable executives can drive iteration and innovation faster than their competitors.

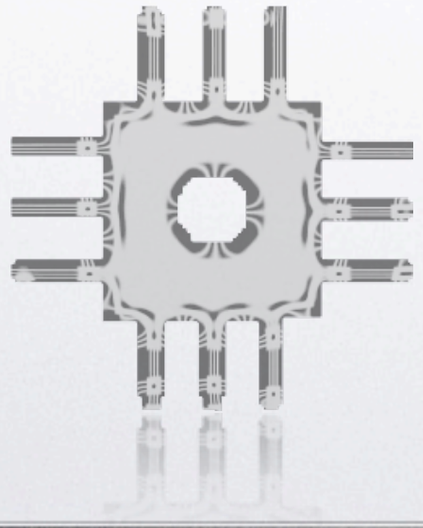
We are in the midst of other **evolutionary changes** (and challenges) as well.

Introduction to Dynamic Infrastructure

Our world is becoming **more instrumented** too.

We now have the ability to measure, sense and see the exact condition of everything.

- Currently, there are . . .
  - 1 billion transistors per human, each costing about 1/10 of a millionth of a cent.
  - 30 billion RFID tags embedded into our daily life, communicating across entire ecosystems.
- Nearly one-half of all sensors in transportation, facilities, and production equipment are smart sensors.
- Remote monitoring devices that track patients' vital signs could reduce U.S. healthcare by billions of dollars.



Introduction to Dynamic Infrastructure

It's **more connected** now. People, systems, and objects now communicate and interact with each other in entirely new ways.

- We are heading toward 1 trillion connected objects comprising an "Internet of things".
- There are nearly four billion mobile phone subscribers worldwide.
- One third of the world's population will be on the web by 2011.
- More than half of U.S. households regularly shop online, and 43% of Americans say they would use phones to make purchases.

And **more intelligent**. We respond to changes quickly, accurately, and securely, getting better results by predicting and optimizing for future events.

- Every day, 15 petabytes of new information are generated – more than 8 times the information in all U.S. libraries.
- The amount of digital information generated each day is 350 times that housed in all U.S. university research libraries. And this is increasing.
- An average company of 1,000 employees spends $5.3 million a year to find information stored on its servers.

Introduction to Dynamic Infrastructure

FLAT + SMALL +
INSTRUMENTED +
CONNECTED + INTELLIGENT =

Introduction to Dynamic Infrastructure

What are we in for?

This new world in brings with it many challenges:

- Higher service expectations
  - Internet-savvy consumers and employees expect 24x7 access to quality services.
- Rising cost pressures
  - Staggering levels of complexity and inefficiency drive up cost and stifle innovation.
- New risks and threats
  - The connected, collaborative world is also a more vulnerable world.

and many requirements for survival:

- Breakthrough productivity
  - Almost any person, object, or service can become digitally aware and connected creating new possibilities for change.
- Accelerated value creation
  - More adaptive capabilities like cloud computing create new opportunities.
- Increased velocity
  - The faster pace of business and society demands a more responsive, agile infrastructure.

Introduction to Dynamic Infrastructure

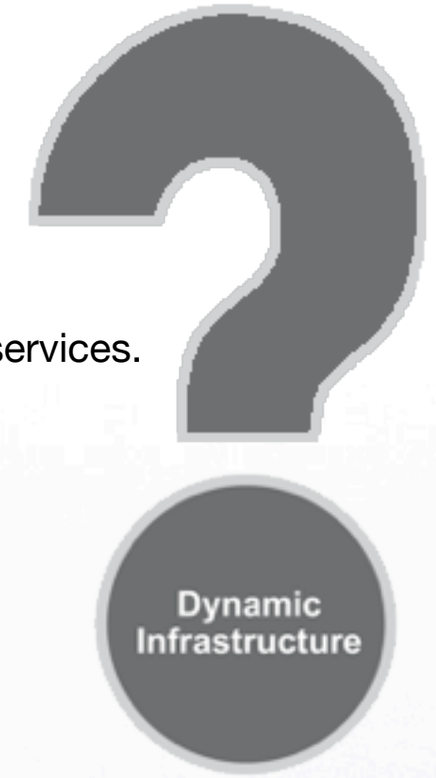
What do we need to do?

Improve Service

- Ensure the high-availability and quality of existing services
- Meet new customer expectations for real-time, dynamic, access to innovative new services.

Reduce Costs

- Contain operational costs and complexity,
- Achieve breakthrough productivity gains through virtualization, optimization, energy stewardship, and flexible sourcing.



Manage Risk

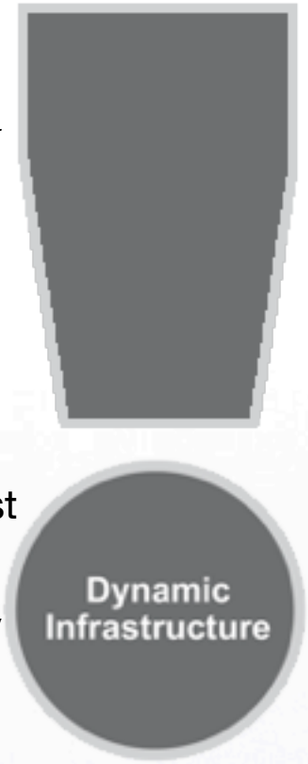
- Address current security, resiliency, and compliance challenges.
- Prepare for new risks posed by an even **more connected**, **more instrumented**, **more collaborative** world.

Introduction to Dynamic Infrastructure

How are we going to do all of those things?

Introduction to Dynamic Infrastructure

If we **think different**, we can embark on an an evolutionary process, **not** rip and replace. We are in the throes of evolutionary changes, so we need an **evolutionary approach** to . . .

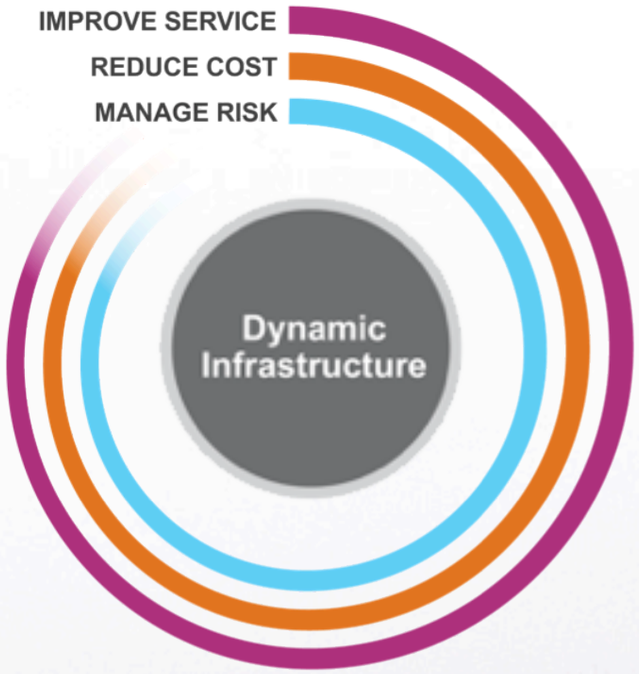


- address current operational challenges to free up resources for new investments.
  - by integrating virtualization, energy efficiency, standardization and automation to free up operational budget for new investment.
  - This includes working to automate as much functionality as possible to free up not just financial resources, but human capital as well.
- converge business and IT infrastructure to work in concert, achieving greater productivity and value.
  - Instrumenting physical infrastructure resources enables more dynamic measurement, allocation, and management to support innovation, transformation and differentiation.
  - This transforms assets into services through common processes and systems that improve preventive and predictive maintenance.
- utilize alternative approaches, like cloud computing, to deliver new services with agility and speed.
  - Companies committed to this quickly realize benefits by leveraging a blended strategy for acquiring services and delivering information.
  - From an organizational perspective, cloud computing delivers services for consumer and business needs in a simplified way, providing unbounded scale and differentiated quality of service to foster rapid innovation and decision making.

Introduction to Dynamic Infrastructure

Answering our question, Dynamic Infrastructure . . .

- enables visibility, control, and automation across all business and IT assets.
- transforms assets into higher value services.
- is highly optimized to achieve more with less.
- addresses the information challenge.
- leverages flexible sourcing like clouds.
- manages and mitigates risks.



Overall, Dynamic Infrastructure **allows you to deliver superior business and IT services** with **agility and speed**. You do this by improving service, reducing costs, and managing risks.

Introduction to Dynamic Infrastructure

Improve Service with . . .

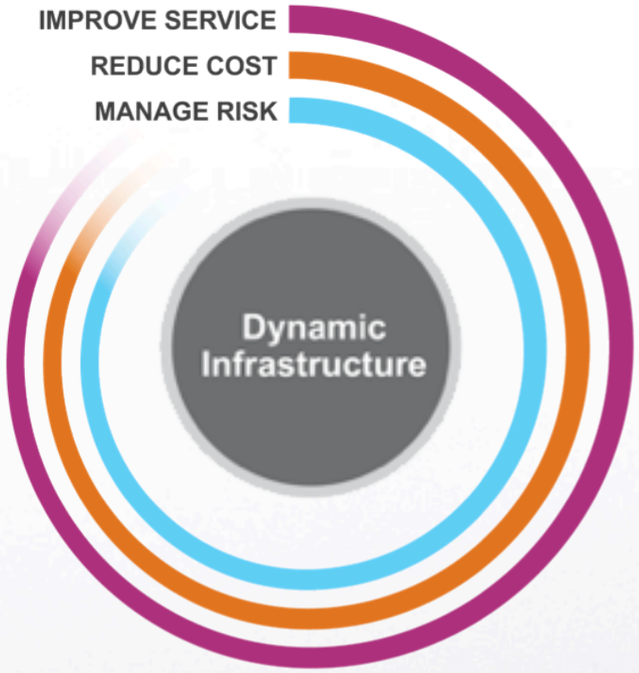
- cloud based services and solutions.
- service management industry solutions.
- application management and hosting.

Reduce Costs with . . .

- energy efficient servers, storage, and facilities.
- virtualization and consolidation.
- effective information infrastructure.
- standardization and automation.

Manage Risk with . . .

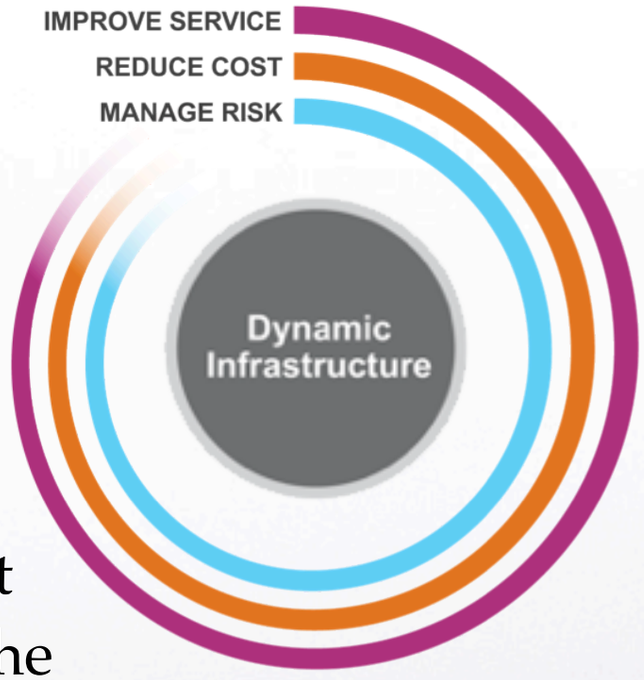
- pervasive and preventive security solutions.
- global resiliency and security centers.
- comprehensive resiliency solutions.
- compliance and long- term information retention policies.



Introduction to Dynamic Infrastructure

That's a lot to digest. Let's pause for a moment of reflection.

(Time passes.)



These are admirable ideas, aspiring to . . .

- Improve Service
- Reduce Costs
- Manage Risk

... and we've read about the building blocks for each.

How about an example? A case study? No. We'll have that later. For now, let's look at a chart that spells out some of the steps one company took in evolving to a Dynamic Infrastructure and the benefits they realized.

Dynamic Infrastructure Case Study: IBM

IBM IT Transformation

- From 2002 through 2007, IBM's own IT investments delivered a cumulative benefit yield of approximately $4 billion. For every dollar invested, we saw a $4 cumulative benefit.

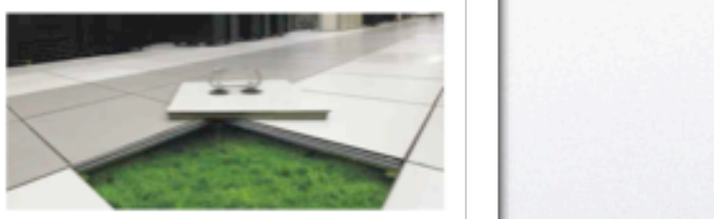
	1997	Today
CIOs	128	1
Host data centers	155	7
Web hosting centers	80	5
Network	31	1
Applications	15,000	4,700

Data Center Efficiencies Achieved

- Consolidation and virtualization - thousands of servers onto approximately 30 IBM System z™ mainframes.
- Additional virtualization leveraging System p, System x and storage across enterprise.
- Substantial savings being achieved in multiple dimensions: energy, software and system management and support costs.

Project Big Green

- The virtualized environment will use 80% less energy and 85% less floor space.
- 2X existing capacity, no increase in consumption or impact by 2010.



Cloud-enabled on demand IT delivery solution

- Self-service for 3,000 IBM researchers across 8 countries.
- Real time integration of information and business services.

Evolving to a Dynamic Infrastructure

The rest of this course focuses on how we as technology leaders can help our companies evolve a Dynamic Infrastructure.

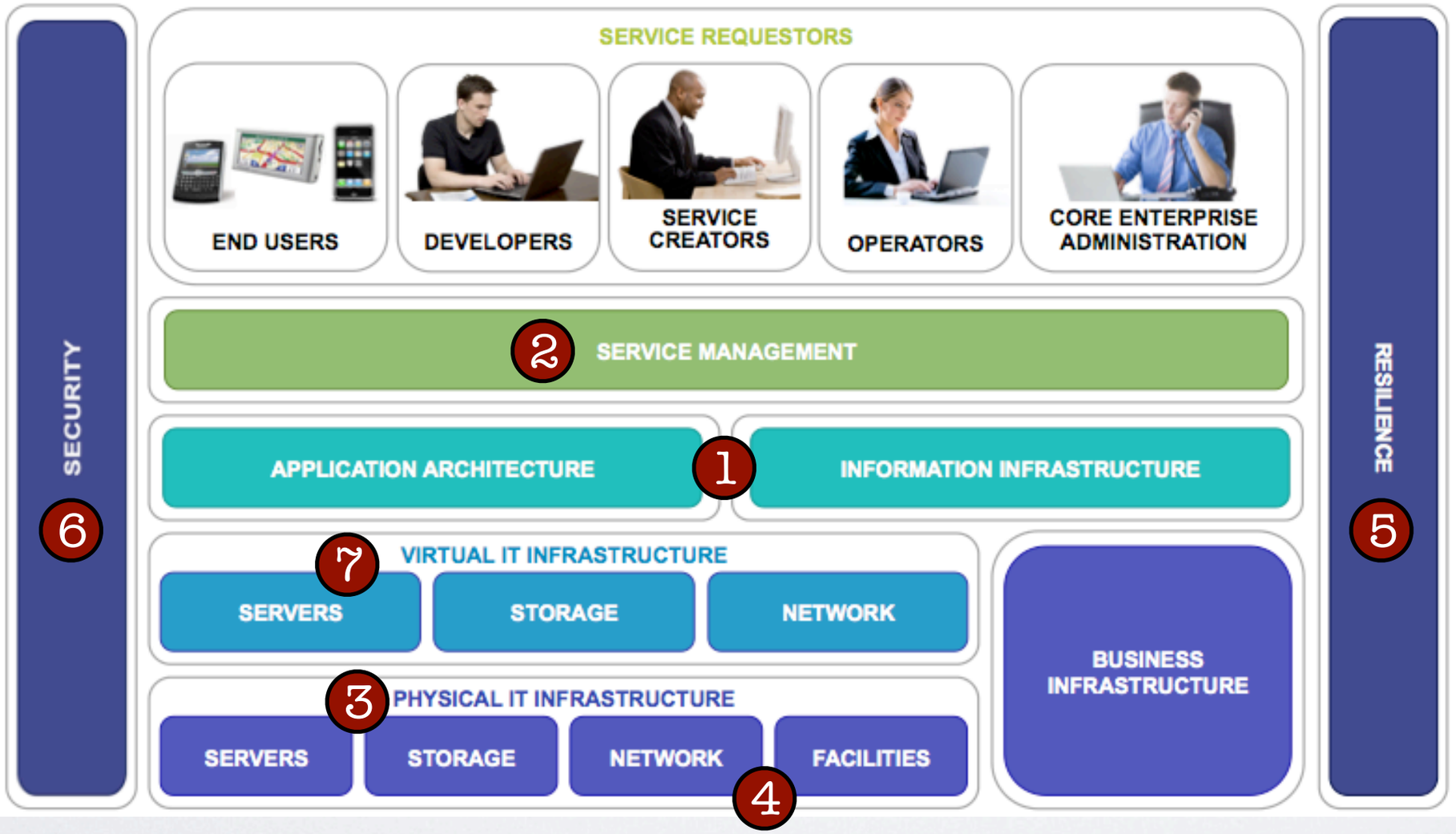
We now know what we're trying to do:

- Improve Service with cloud based services and solutions, service management industry solutions, and application management and hosting.
- Reduce Costs with energy efficient servers, storage, and facilities, virtualization and consolidation, effective information infrastructure, and standardization and automation.
- Manage Risk with pervasive and preventive security solutions, global resiliency and security centers, comprehensive resiliency solutions, compliance and long- term information retention policies.

and conceptually how we're going to do it.

To actually build a Dynamic Infrastructure we need to look at those 007 specific pillars of technology that form the DI foundation. But before we focus on DI's individual pillars, let's look at the overall architecture and how they relate.

Evolving to a Dynamic Infrastructure



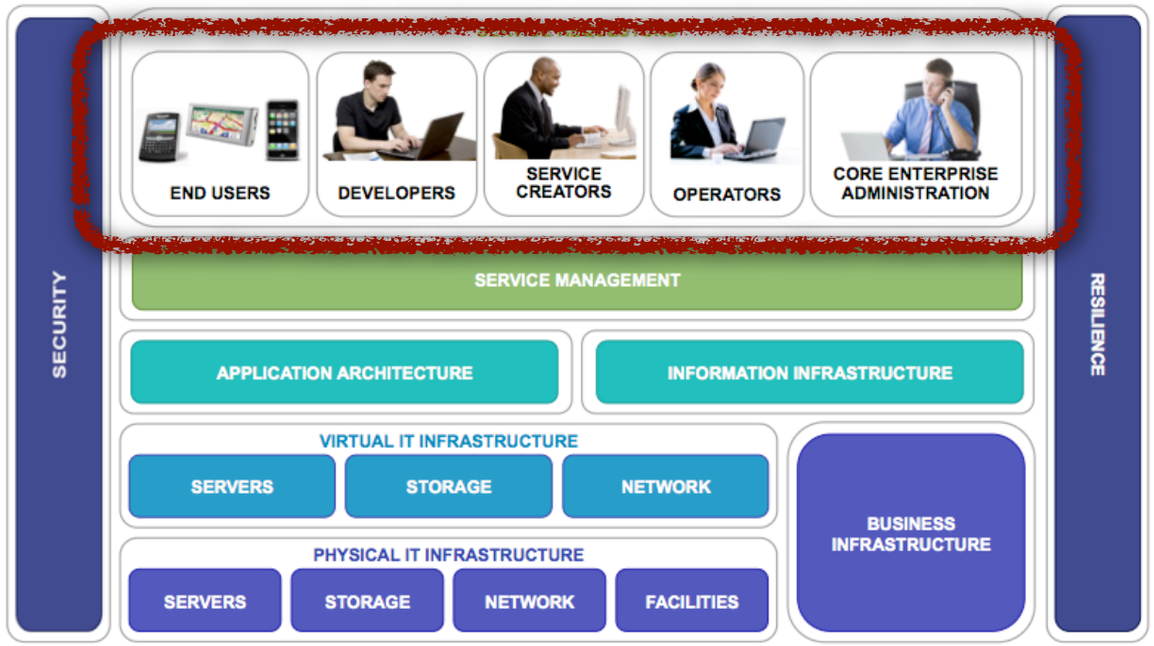
DI pillars

1. Information Infrastructure
2. Service Management
3. Asset Management
4. Energy Efficiency
5. Business Resiliency
6. Security
7. Virtualization

Evolving to a Dynamic Infrastructure

Let's take a closer look.

- At the top lies the multiple user communities that the DI must support. Each community has it's own requirements and interfaces. In the past we could expect a specific type of connection. Today these user communities are using new and different interfaces. The infrastructure must dynamically adapt to them.
- Supporting users requires a well-managed service management layer. This combination of technology and processes ensure that the changes in the infrastructure are consistent and meet the needs of each user community.



- The application architecture connects the users to the data they need to perform their tasks.
- Connecting all of this is a cohesive Information Infrastructure which provides data to each requester in a timely manner. This infrastructure must manage the plethora of data that is growing in every business.
- Supporting everything requires servers, storage devices, network devices... all virtualized to the infrastructure to ensure the highest possible utilization. Additionally, fully-instrumented and managed facilities infrastructure ensures that the resources are properly used.
- Security is pervasive throughout, ensuring resources and information are getting to the right people at the right time. It also allows companies to enforce the business, local, regional, national and international rules and laws.
- The architecture also relies on a resilience infrastructure that ensures a consistent timely user experience for each user community.

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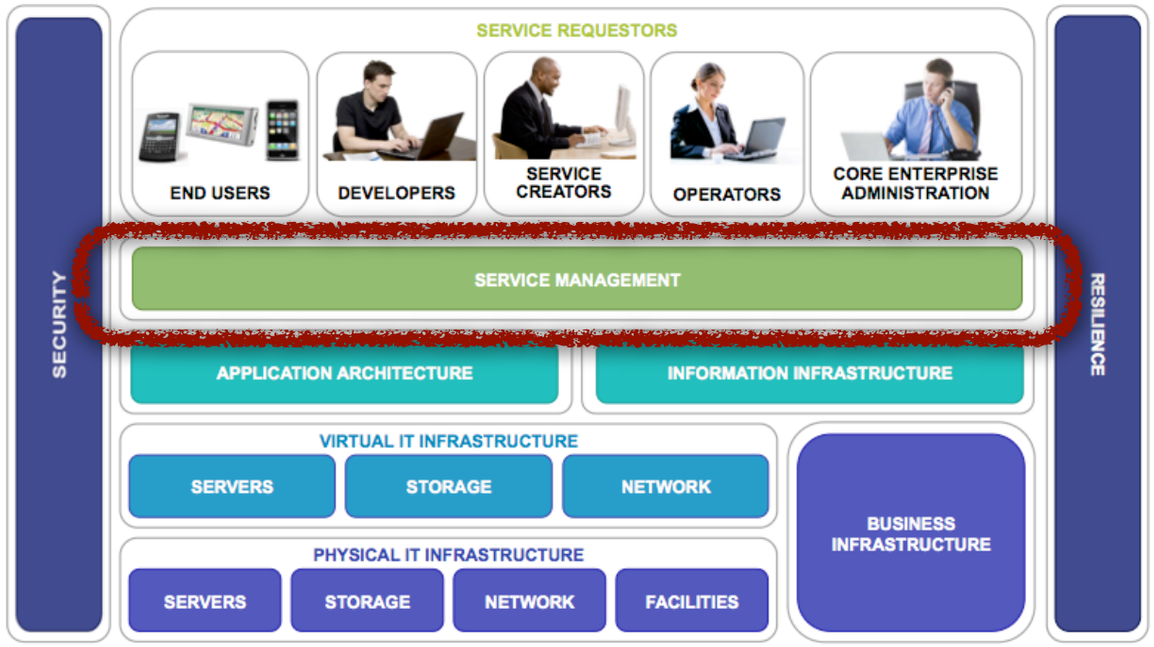

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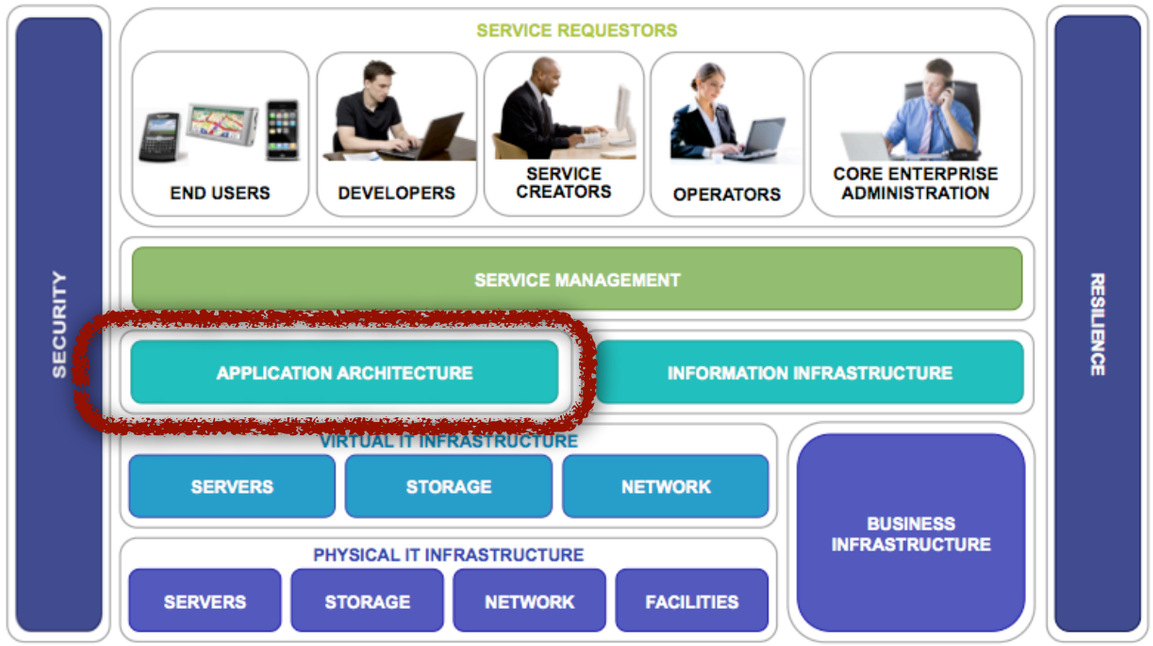

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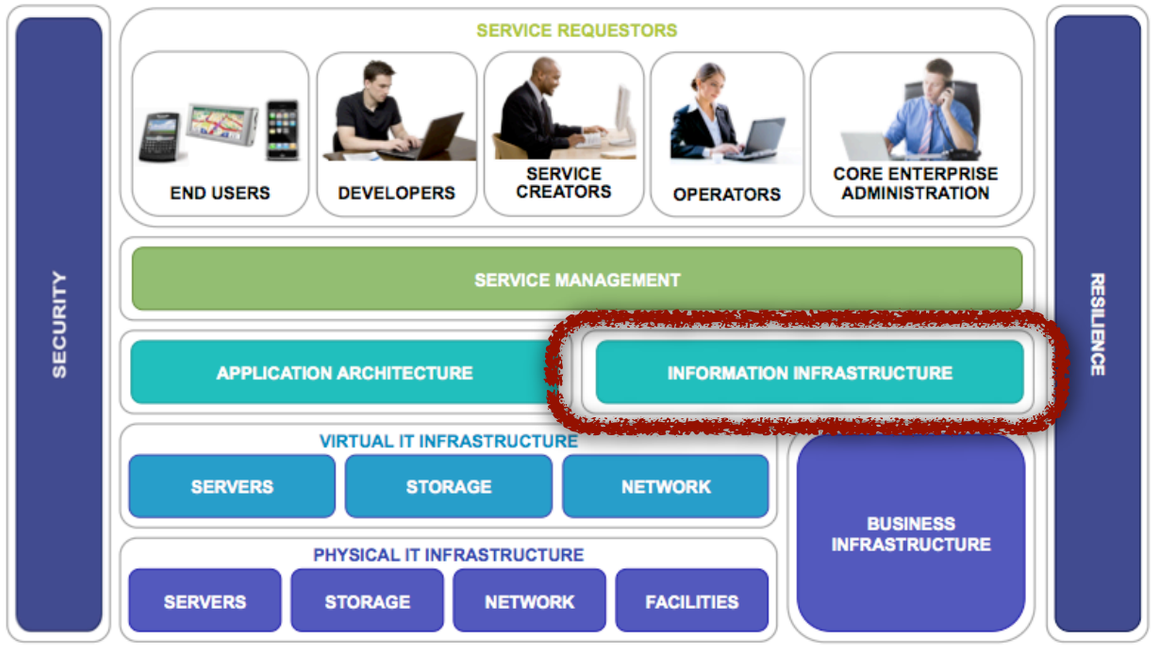

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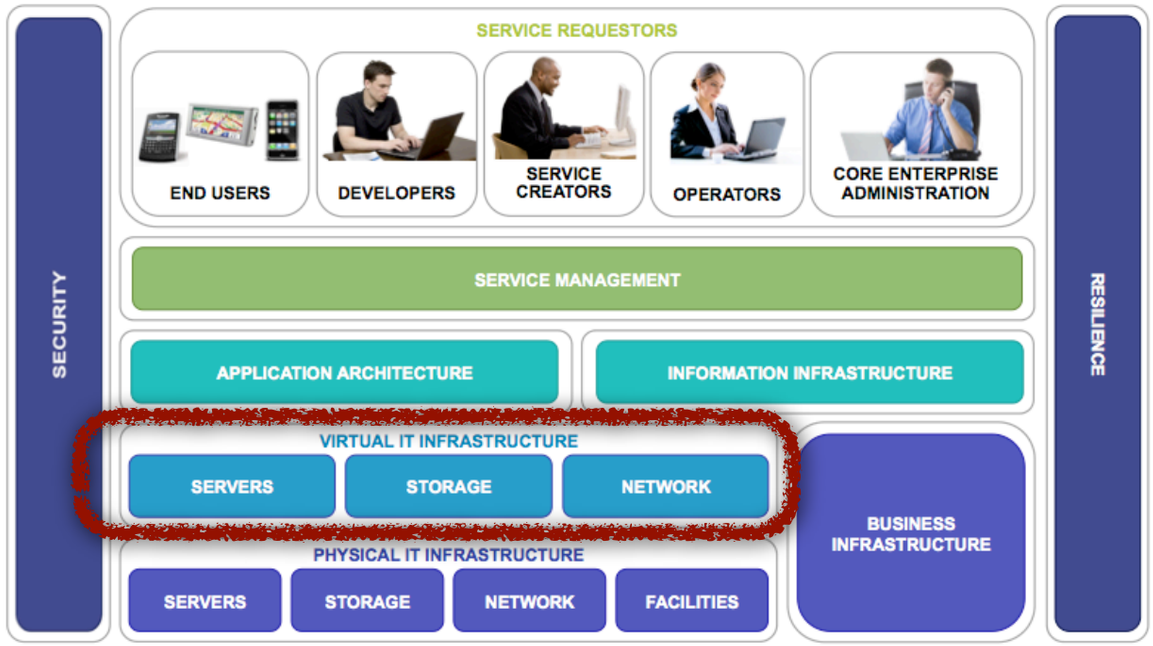

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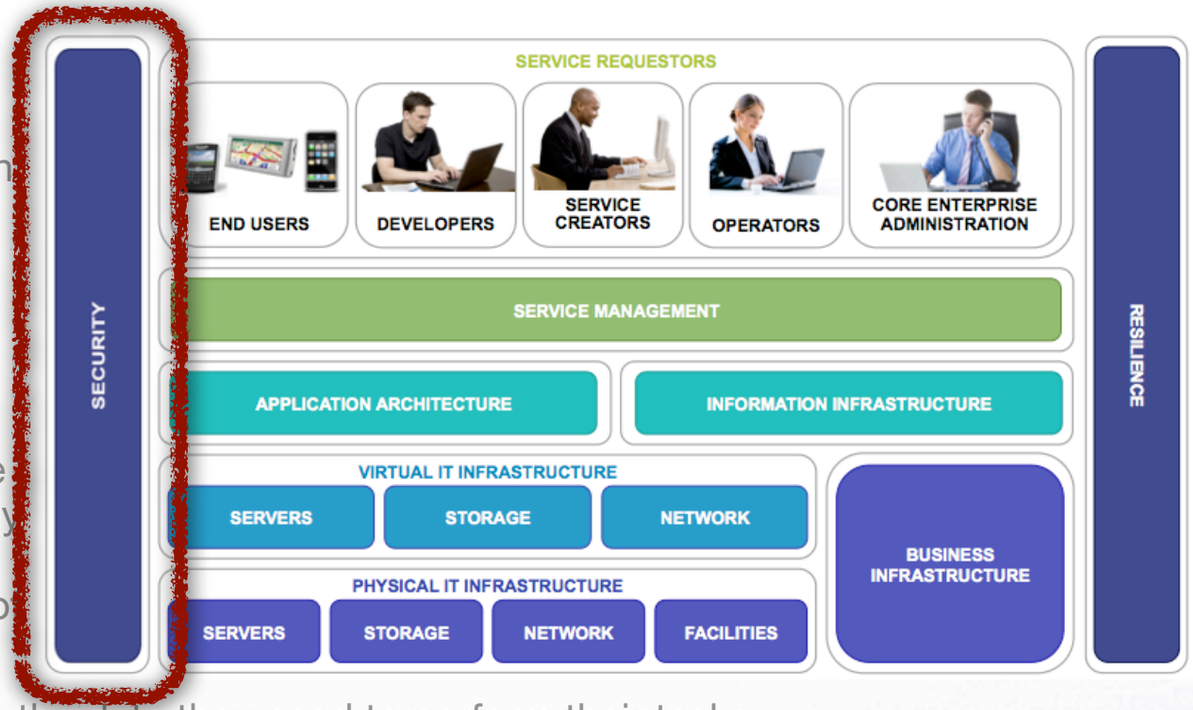

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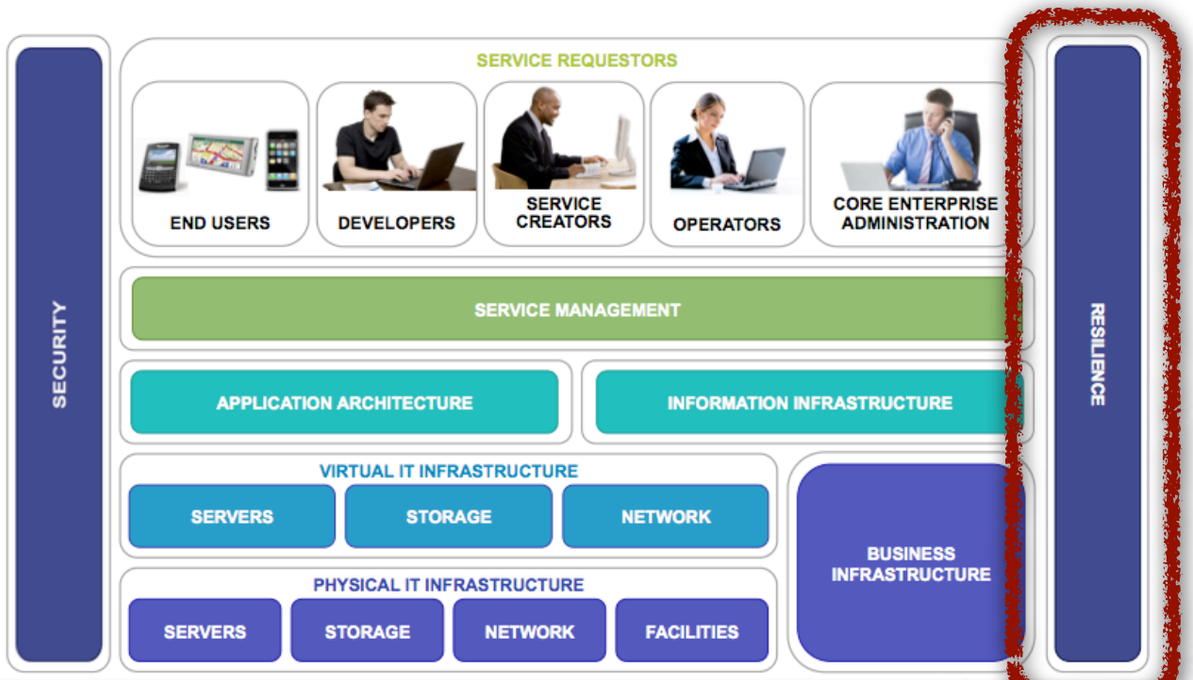

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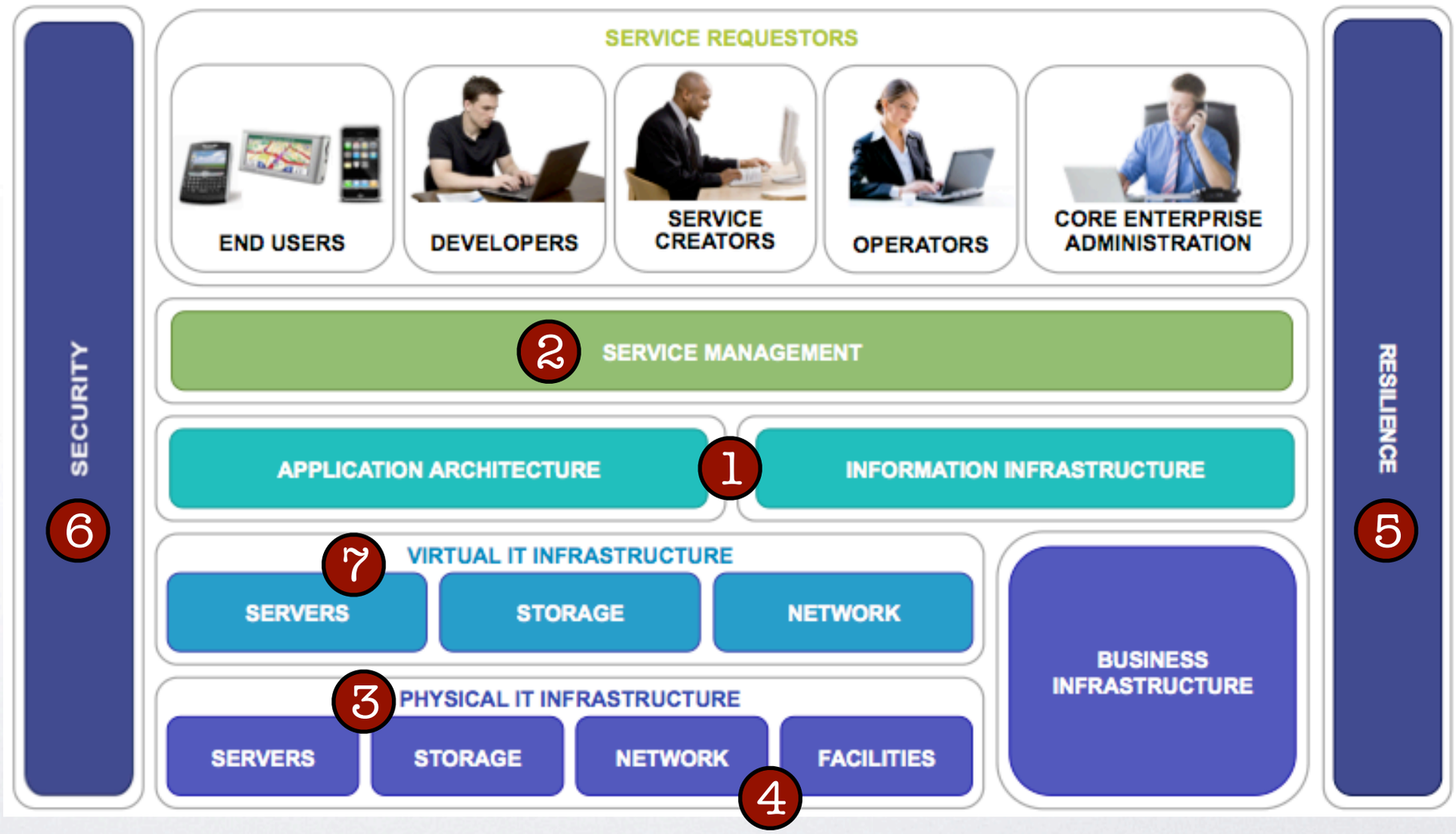
Evolving to a Dynamic Infrastructure

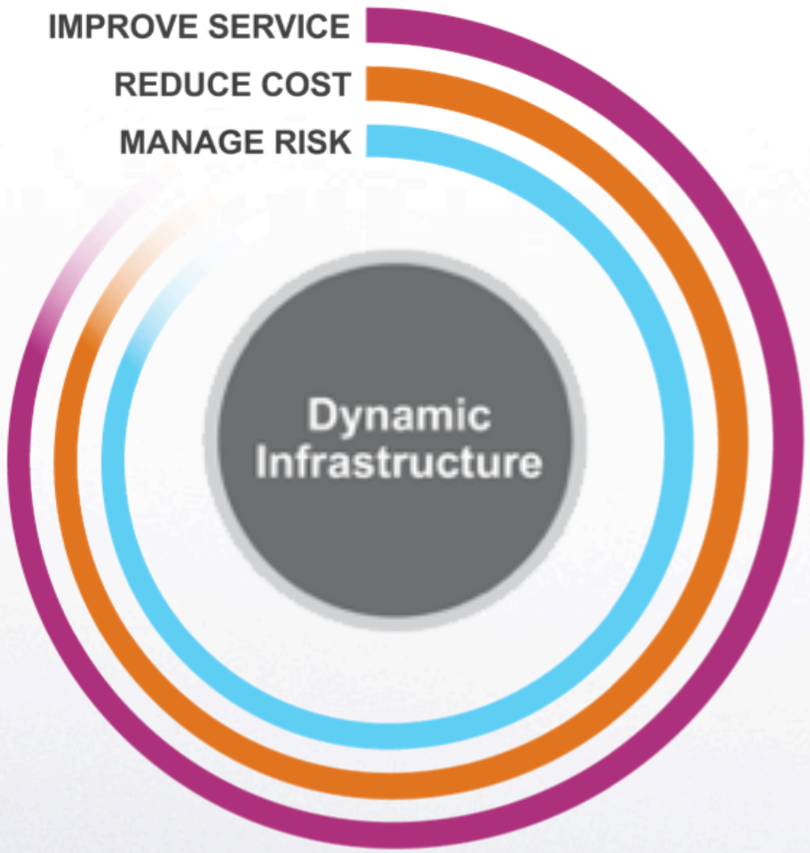
Do you remember the Dynamic Infrastructure pillars?

1. Information Infrastructure
2. Service Management
3. Asset Management
4. Energy Efficiency
5. Business Resiliency
6. Security
7. Virtualization



Evolving to a Dynamic Infrastructure

Do you remember the Dynamic Infrastructure goals?



Improve Service with . . .

- cloud based services and solutions.
- service management industry solutions.
- application management and hosting.

Reduce Costs with . . .

- energy efficient servers, storage, and facilities.
- virtualization and consolidation.
- effective information infrastructure.
- standardization and automation.

Manage Risk with . . .

- pervasive and preventive security solutions.
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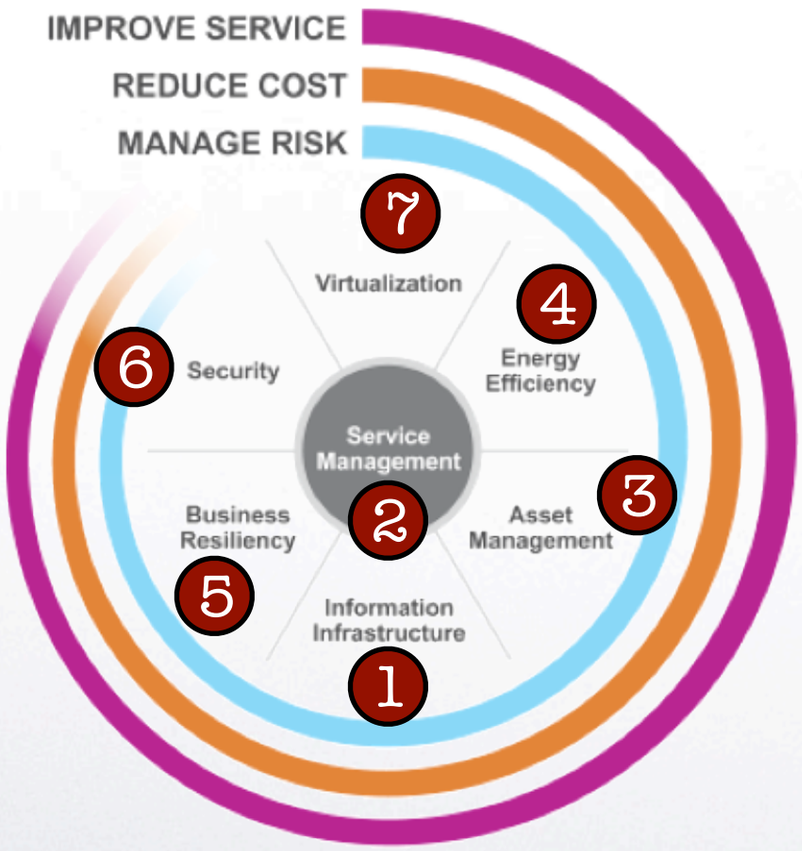
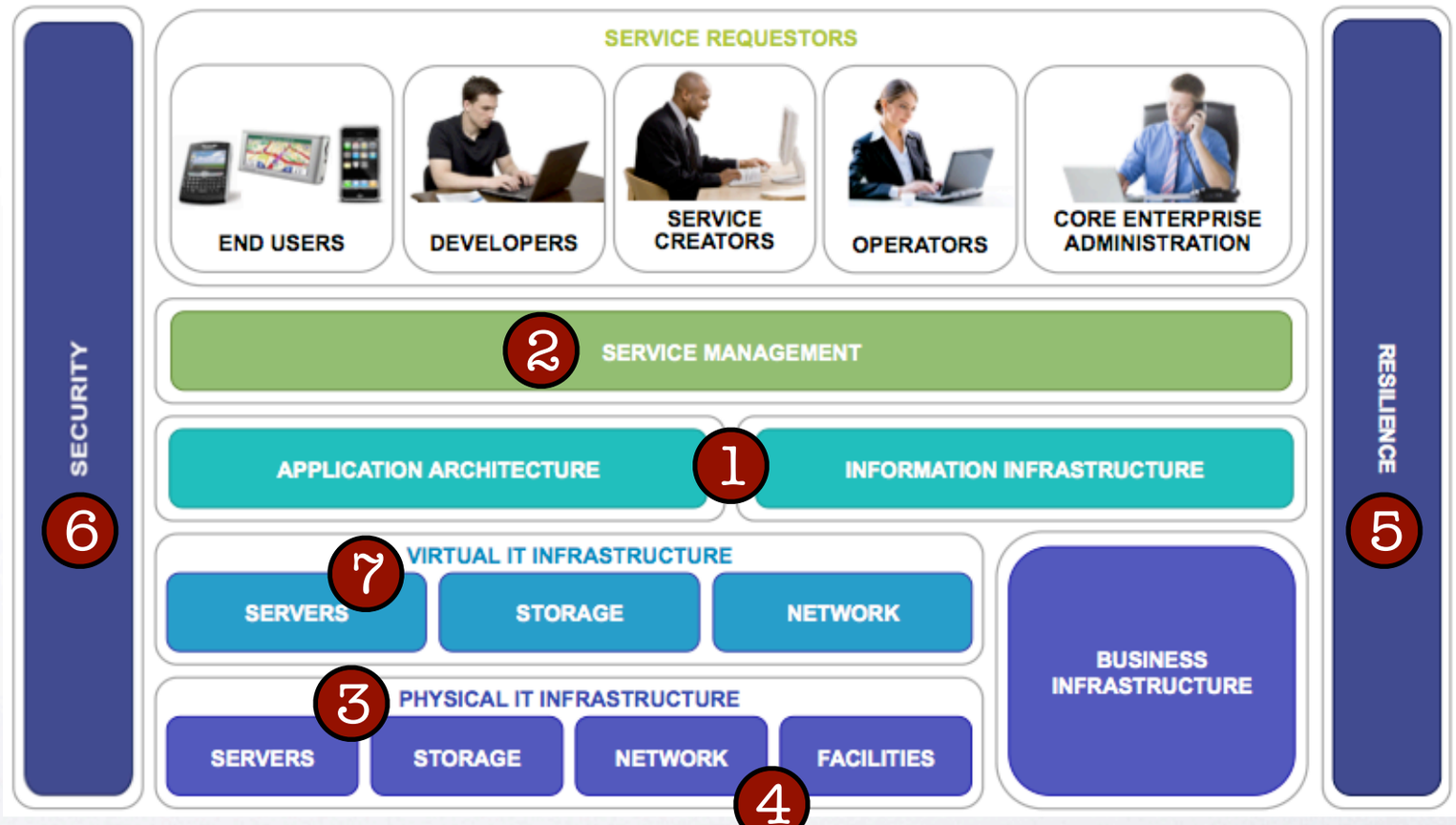
- comprehensive resiliency solutions.
- compliance and long- term information retention policies.

Evolving to a Dynamic Infrastructure

Pillars and Goals: I love it when a plan comes together!





Let's look at each goal and pillar in context.

Evolving to a Dynamic Infrastructure

1. Information Infrastructure
   - Helping businesses achieve information compliance, availability, retention, and security objectives.
   - Today, information has become the lifeline for business sustainability, and firms of all size are searching for practical ways to manage and utilize their information. Without a cohesive information management strategy, organizations will find themselves facing higher IT operational costs and greater exposure to business risk.
2. Service Management
   - Provide visibility, control and automation across all the business and IT assets to deliver higher value services.
   - Siloed management capabilities inhibit the flow of information required to manage a dynamic infrastructure. Service management provides the visibility, control and automation that helps organizations manage across all business and IT assets to deliver higher value services.
3. Asset Management
   - Maximizing the value of critical business and IT assets over their lifecycle with industry tailored asset management solutions.
   - Achieving the highest “return on assets” is a balancing act. Asset managers must optimize four major drivers: achieve highest reliability and lowest cost, within a compliance framework and with limited resource. For example, electric power utilities are moving to “smart meters” – devices that are part of an intelligent two-way communication network between customers on the grid and the central office. These new meters send readings every 15 minutes, allowing customers to control energy usage and enabling the power company to make smart business decisions with respect to newer power plant construction and the reduction of environmental impacts.

Evolving to a Dynamic Infrastructure

4 Energy Efficiency

- Address energy, environment, and sustainability challenges and opportunities across your business and IT infrastructure.
- Optimizing the energy efficiency of the business and IT infrastructure can demonstrate the value in “green.” To meet the needs of the business, a holistic approach is required that encompasses energy management, virtualization, IT and data center facility services, and server and storage products that are designed to be green.

5 Business Resiliency

- Maintaining continuous business and IT operations while rapidly adapting and responding to risks and opportunities.
- Maintaining continuous business operations while rapidly adapting and responding to risks and opportunities has elevated to the C-level suite the need to ensure a resilient and recoverable business environment. An infrastructure that has agility, is resilient to risks, allows the business to respond quickly to demands and meets compliance requirements, ensures not only that the business can continue operations, but helps the Business and IT infrastructure become more integrated and responsive to business needs.

Evolving to a Dynamic Infrastructure

6 Security

- End-to-end industry customized governance, risk management and compliance solutions.
- Globalization has required organizations to take an end-to-end, business-driven, approach to security, compliance and risk management in alignment with an IT governance framework. The vast interconnectivity of resources brings access and collaboration, but also opens additional risks and exposures to loss and theft. An integrated security strategy within a dynamic infrastructure can empower organizations to monitor and quantify security risks to better understand threats and vulnerabilities in terms of business impact, to better respond to security events with security controls that optimize business results, and to better quantify and prioritize t

7 Virtualization

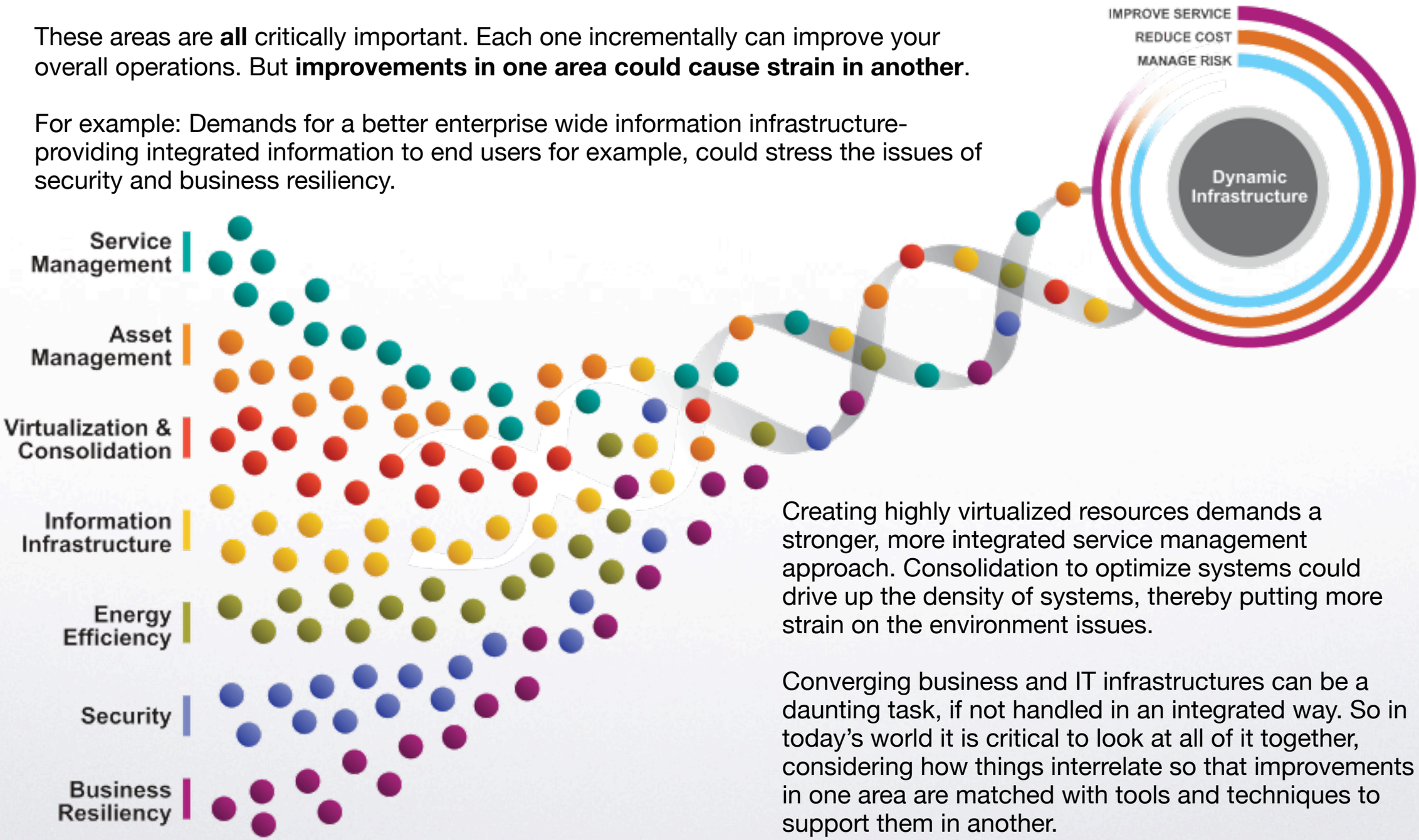
- Leadership virtualization and consolidation solutions that reduce cost, improve asset utilization, and speed provisioning of new services.
- Consolidating resources through virtualization can increase utilization far beyond the inefficient 10-15% utilization often seen in data centers today. Advances in the technology, along with higher degrees of automation, offer more opportunities for consolidation than ever before. Getting to a highly virtualized and shared infrastructure provides a foundation for automated and rapid service delivery with the benefits of economies of scale.

Dynamic Infrastructure DNA

Dynamic Infrastructure DNA

These areas are **all** critically important. Each one incrementally can improve your overall operations. But **improvements in one area could cause strain in another**.

For example: Demands for a better enterprise wide information infrastructure-providing integrated information to end users for example, could stress the issues of security and business resiliency.

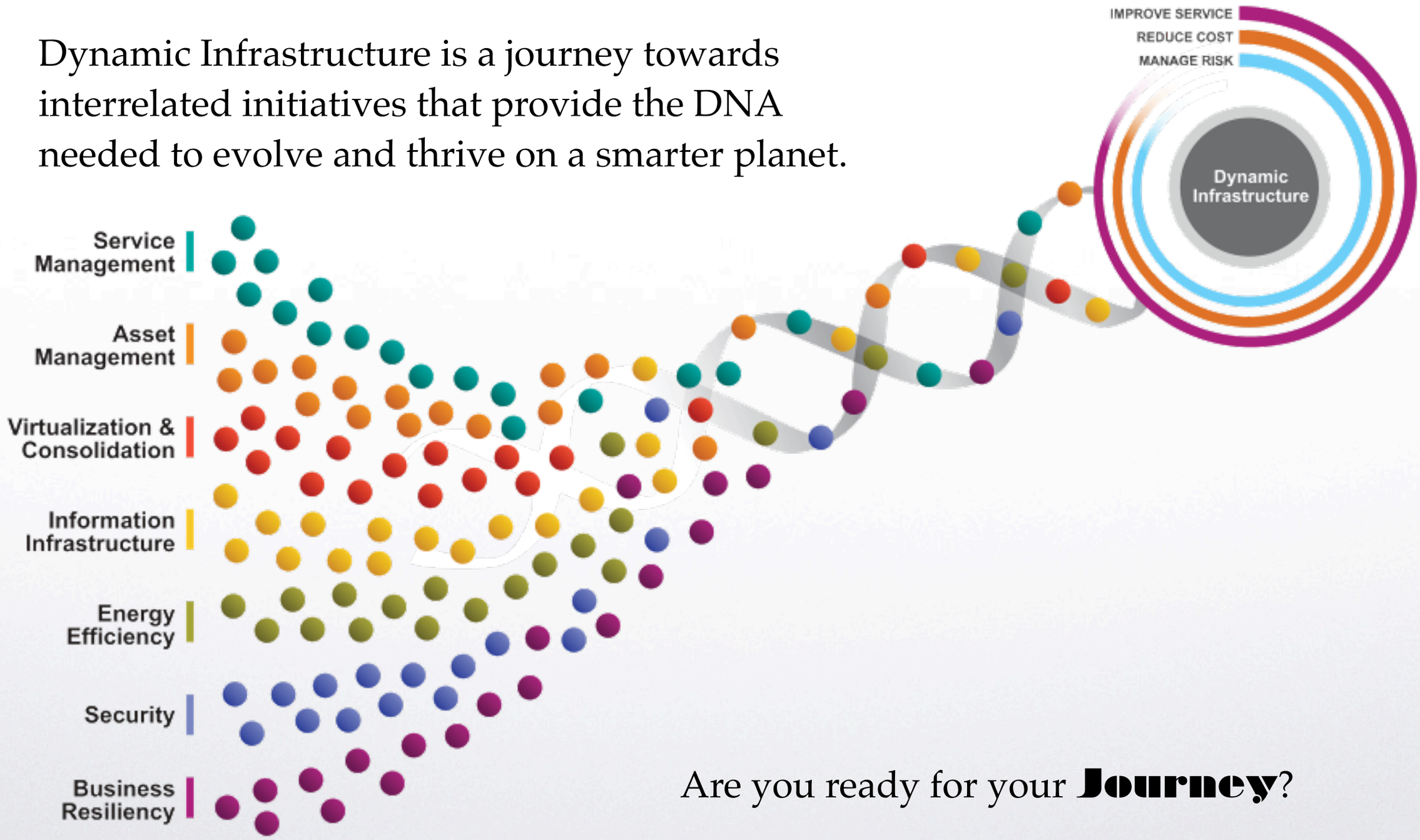


Creating highly virtualized resources demands a stronger, more integrated service management approach. Consolidation to optimize systems could drive up the density of systems, thereby putting more strain on the environment issues.

Converging business and IT infrastructures can be a daunting task, if not handled in an integrated way. So in today's world it is critical to look at all of it together, considering how things interrelate so that improvements in one area are matched with tools and techniques to support them in another.

Dynamic Infrastructure DNA

Dynamic Infrastructure is a journey towards interrelated initiatives that provide the DNA needed to evolve and thrive on a smarter planet.



Are you ready for your **Journey**?

A different sort of wheel.

Required Readings

Websites

- Read through IBM's Dynamic Infrastructure portal: http://www-03.ibm.com/systems/dynamicinfrastructure/ There is a lot of stuff there, but take a thorough look. Specifically, look carefully at the "Benefits and Solutions" section and the areas about how to ...
  - Improve Service
  - Reduce Costs
  - Manage Risk
- On the same web site, click on the "Case Studies" section and thoroughly explore one case study. Then tell us about it in the discussion area.

Optional Research

Research

- Research in the reading websites, then define and describe
  - RTO
  - RPO
  - Downtime cost calculations

Self-test

Introduction to Dynamic Infrastructure

- In what ways is our world becoming more instruments, connected, and intelligent? (pages 8 and 9)
- What challenges do we face in the brave, new world? (page 11)
- How might we address those challenges? (pages 12 and 16)
- What are the seven pillars of DI? (page 20)
- Why does Alan keep writing it as the “007 pillars”? (Because he’s nuts.)
- Why is it critical to consider all seven pillars of DI at once? (page 35) What can go wrong if you don’t?

Discussions

On Dynamic Infrastructure

- What's a better name: "Dynamic Infrastructure" or "Smart Business Infrastructure"? Why?
- Tell us about the case study you read.

More generally...

- What's the difference between information and data? Research this on your own and then discuss.

Remember our discussion expectations and guidelines.

Acknowledgements

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Still more additional material from:

- iStockphoto.com
- Elsewhere and else**when**, but only when the stars are right.

Colophon

This work was authored in Keynote by Alan G. Labouseur in June 2010 from his home in Pleasant Valley, NY.

While Alan was writing this Colophon page his son, Max, climbed a tree in his pajamas. How the tree got into his pajamas we'll never know.

Distractions that made writing go slower:

- The This Week in Startups podcast
- "Sol on Ice" by Titan Raines
- The Blunt Professor blog.

Music that made writing go faster:

- iTunes Genius Mixes: Mainstream Rock, Funk
- Specific artists: Nelson Kole / Galactic / Stanton Moore Trio / The Blues Brothers / Earth, Wind & Fire