

# Enterprise Challenges in Global IPv6 Implementation

*Fred Wettling – Bechtel Fellow*



# A WORLD OF EXPERIENCE OVER 111 YEARS



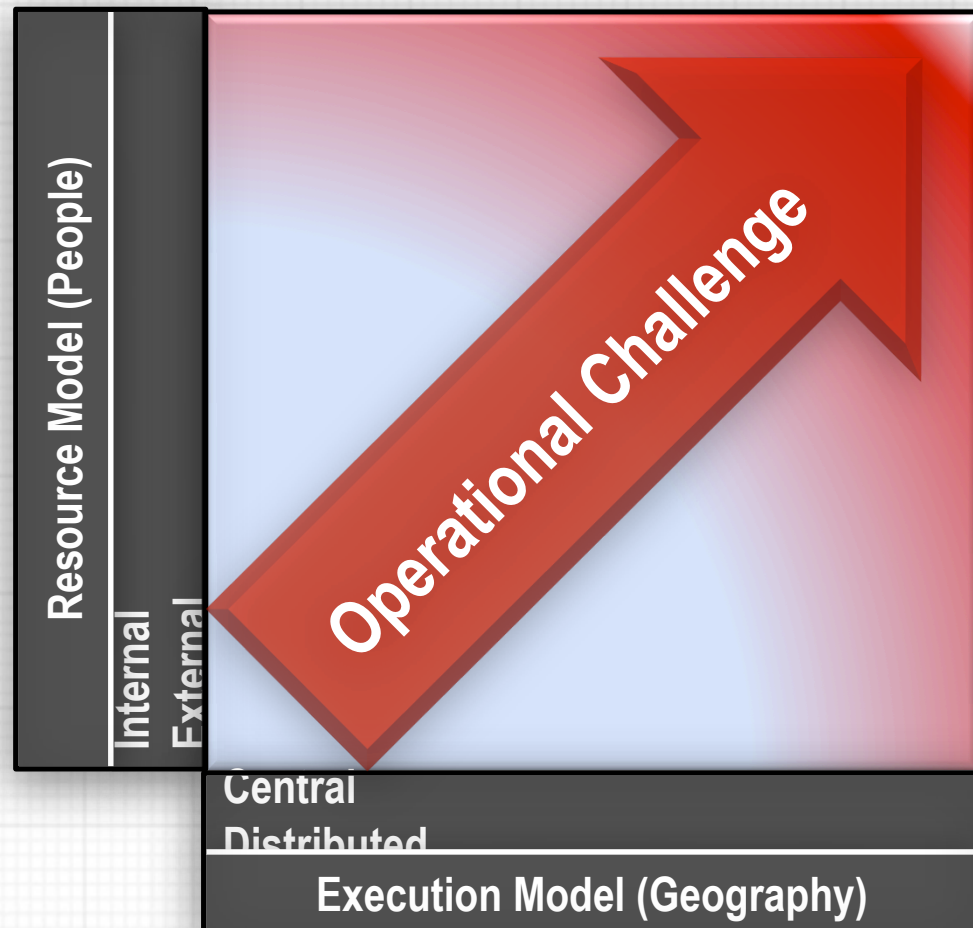
## Bechtel expertise in every major building sector

- Power generation
- Oil, gas, chemicals, and pipelines
- Airports, ports, bridges, highways, and rail systems
- Government facilities management and environmental cleanup
- Mining and metals
- Industrial facilities
- Communications



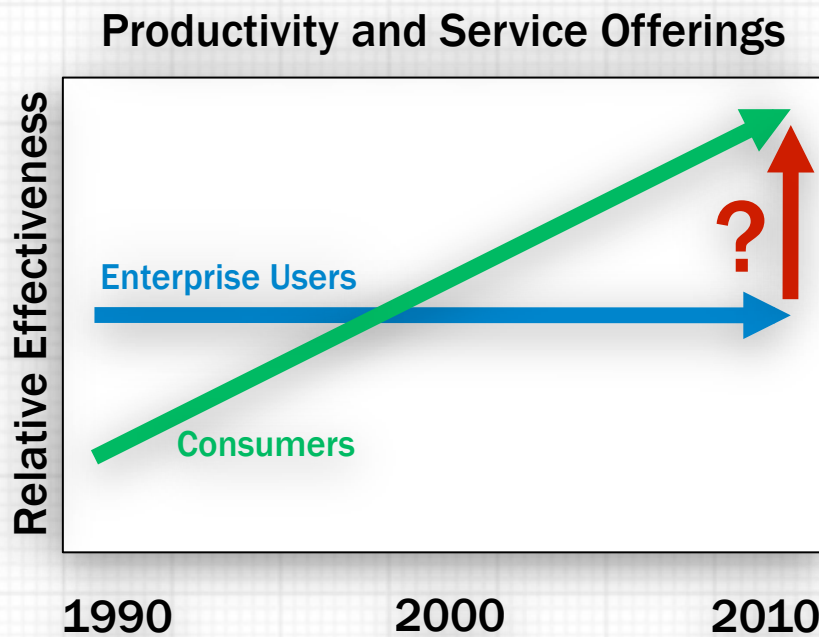
# Business Changes & Challenges

Businesses are  
evolving to be  
more complex  
and distributed





# Enterprise Users vs. Consumers



- Growing gap between consumer and enterprise adoption of emerging technologies and their relative effectiveness
- We have opportunities to capitalize on emerging technologies and paradigms that deliver new meaningful services to our business
- The challenge is how to learn from the consumer-developed services and technologies and incorporate those to our enterprise environments

*“With a browser and Internet connection the world is open...”  
and by the way...*

*“Nobody goes to school to learn search on Google...”*





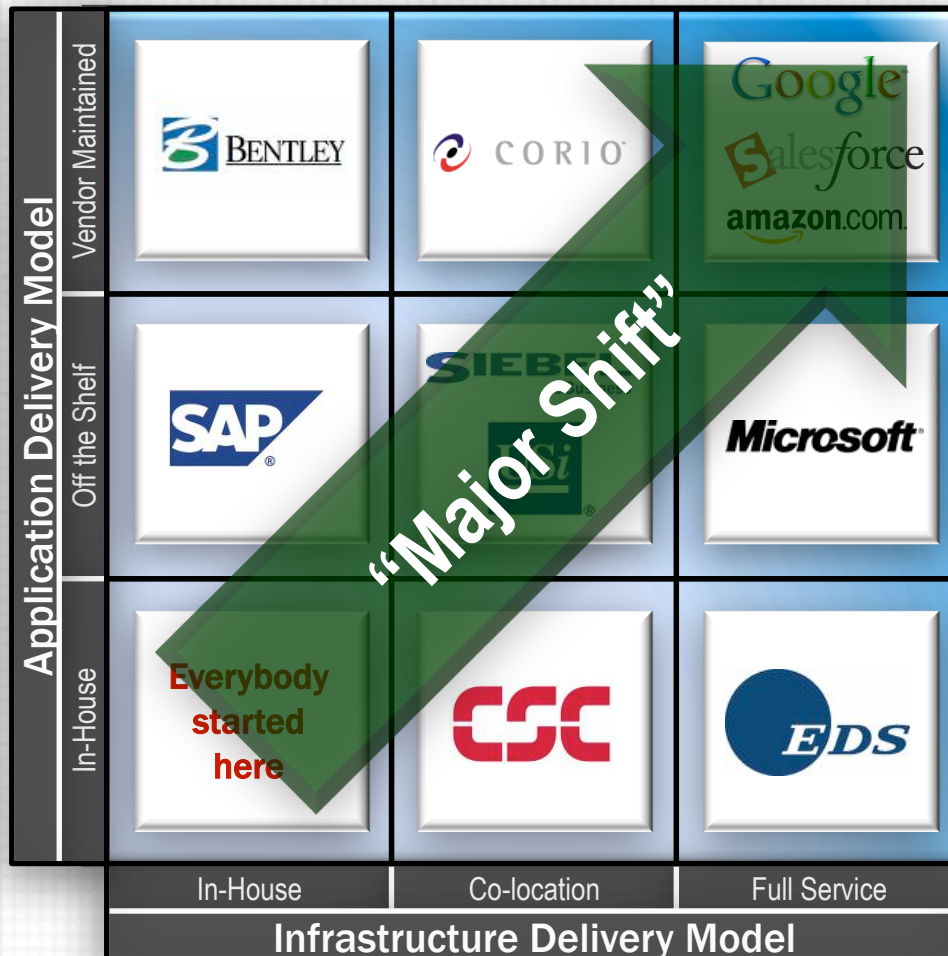
# The Service Matrix

Application Delivery Model	Infrastructure Delivery Model		
	In-House	Co-location	Full Service
	Vendor Maintained		
	Off the Shelf		
In-House	Traditional Mainframe Apps.	Time Share	Application Hosting
Off the Shelf	Common ERP Model	Initial ASP	Advanced ASP
Vendor Maintained	Outsourced Dev. & Maint.	Initial "SaaS" (Adv. ASP)	SaaS

- The emergence of SaaS brings a model that can be applicable to small, medium, and large organizations
- The ASP model could not find a compelling economy of scale model to be accepted by the enterprise customers base
- IT product and service providers have evolved to be a broad-based solutions service provider



# The Service Matrix “Opportunity”



- The emergence of SaaS vendors have filled business needs and created reusable generic business solutions
- Many industries have not taken advantage of SaaS
- To bring SaaS-like services to our projects, we will have to become our own SaaS provider and possibly integrate with other SaaS providers



# Thinking Strategically



## Assessment of Drivers

- IPv6 is coming
- Broad Competence Needed
- Planned vs. Reactive Transition
- Foundation for Innovation

**Approval to Proceed: Oct-04.  
Project started Jan-05**





# IPv6 Deployment Strategy

## Develop Sustainable IPv6 Competence

- Foundation First – Dual-stack
- Broad deployment of expected successes
- Ensure nothing breaks (crashes / security)
- IPv6 in new IT installations
- Innovate, exploit, expand
- *Insert IPv6 into existing change processes*
- *Avoid temporary fixes where possible*



## Challenge 1: Get Smart / Stay Smart

### Goal: Start off right

- Plan
- Training
- Labs
- Addressing
- Awareness

### Challenges

- Change
- ROI vs. strategic move
- Continued visibility





# Deployment Metrics



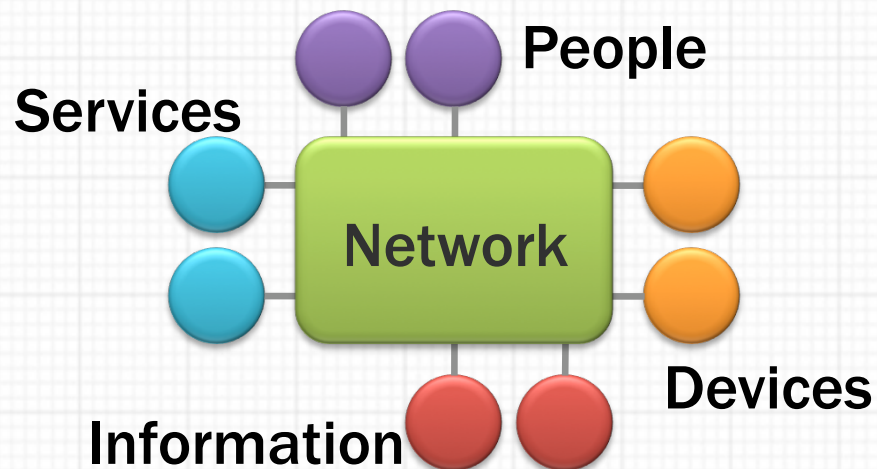
## Goal: Move IPv6 packets

- Network – LAN ports dual-stack
- Network – WAN links dual-stack
- Services – DNS
- Host Operating Systems
- Applications verified (won't fail)
- Applications – dual-stack

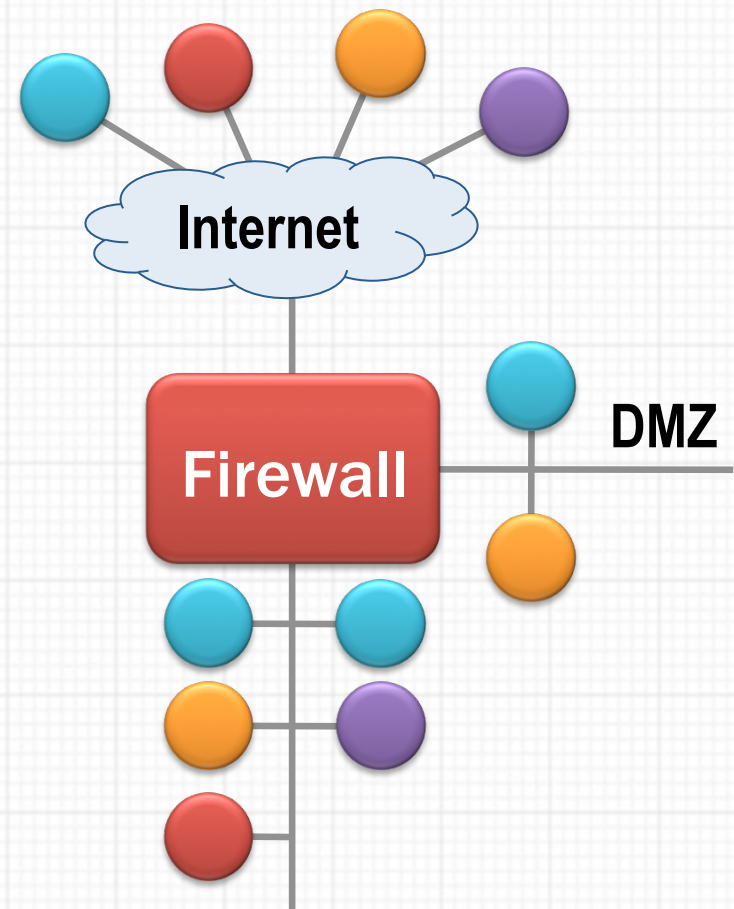




# Where to Start: Six Connection Paradigms



1. Internal to Internal
2. Internal to DMZ
3. External to DMZ
4. Internal to External
5. External to Internal
6. External to External



## Challenge 2: External Roadblocks

### Not IPv6 capable WHEN Needed

- Dual-stack carrier services to CPE, DNS over IPv6, DHCPv6, VoIP call manager, proxy servers, server virtualization management.

### Not available WHERE Needed

- Dual stack carrier services & internet transit not uniformly available around the globe, Motorola SURFboard SB6120 DOCSIS 3.0 / Euro-DOCSIS 3.0 Cable Modem available around the globe except the US.



## Challenge 2: Roadblock Impact

### Impact

- Forced to implement alternatives
- Defer implementation phases
- Replace products & services





# Bechtel – Running IPv6 TODAY

The screenshot shows the Bechtel website (BecWeb) in Internet Explorer. A pop-up window titled 'About Page - Windows Internet Explorer provided by Bechtel Corporation' is open, displaying the following information:

BecWeb	
BecWeb Portal	
Security Classification:	Bechtel Public, Level 3
Intended Audience:	Bechtel Employees
Content Manager:	Carole DeLozier
Content Author:	Carole DeLozier
Reason for Publication:	Published For Use
Expiration Date:	03-Dec-2008
Date Last Updated:	03-Dec-2007
Server IP Address:	2001:4920:4:7:214:38ff:fe51:63ac
Client IP Address:	2001:4920:a:2:c571:4203:328d:6104

Copyright ©2007 Bechtel Corporation

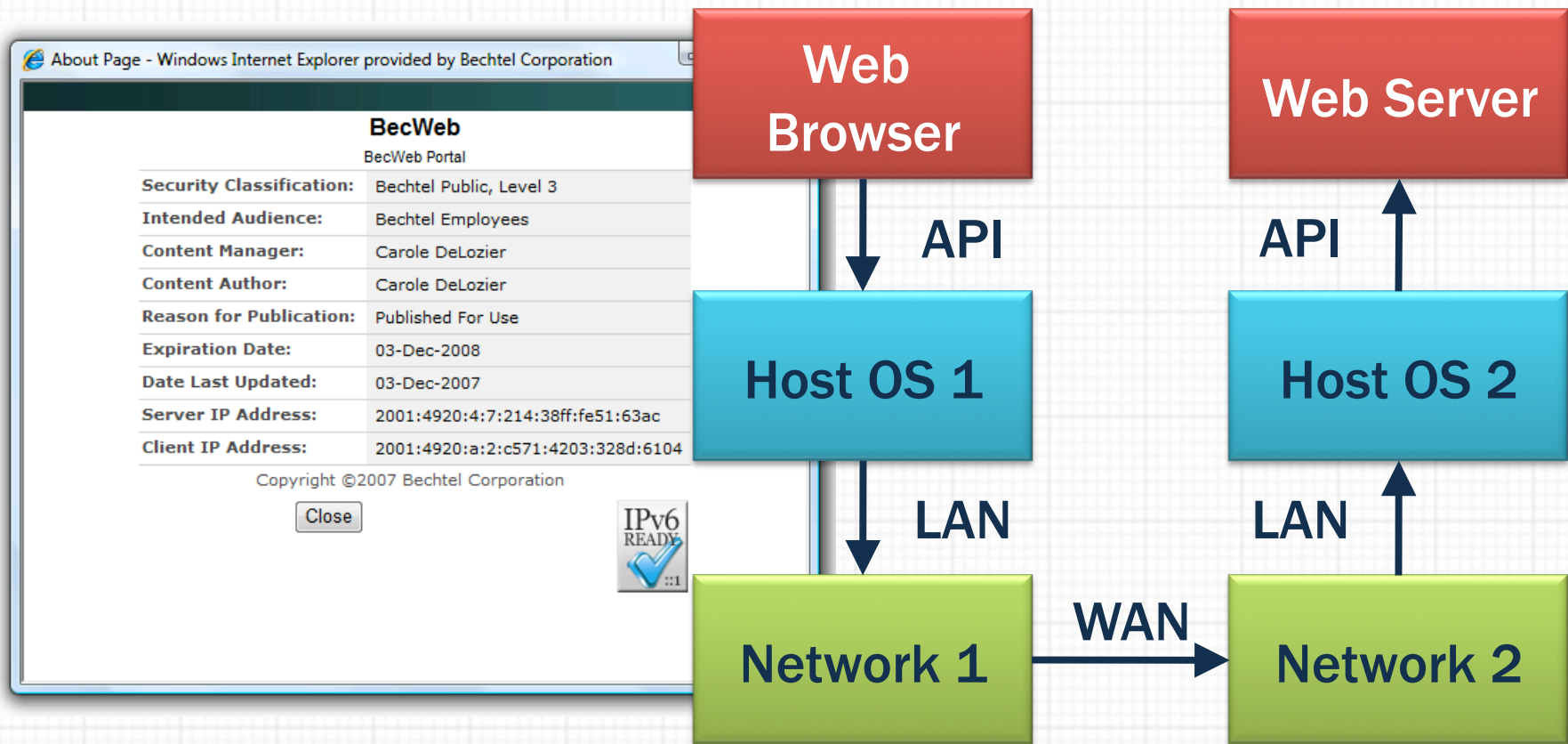
Close

IPv6 READY

End-to-End  
IPv6



# Layers of the End-to-end Model



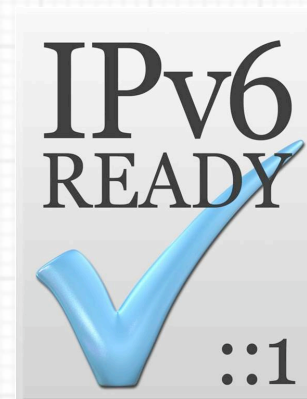
## Mind the Apps

### Guidelines for IPv6 Enabled Applications

- Operating System Configuration
- Development Environment
- Windows Sockets
- Checkv4.exe Utility

### IPv6 Application Checklist and Certification Steps

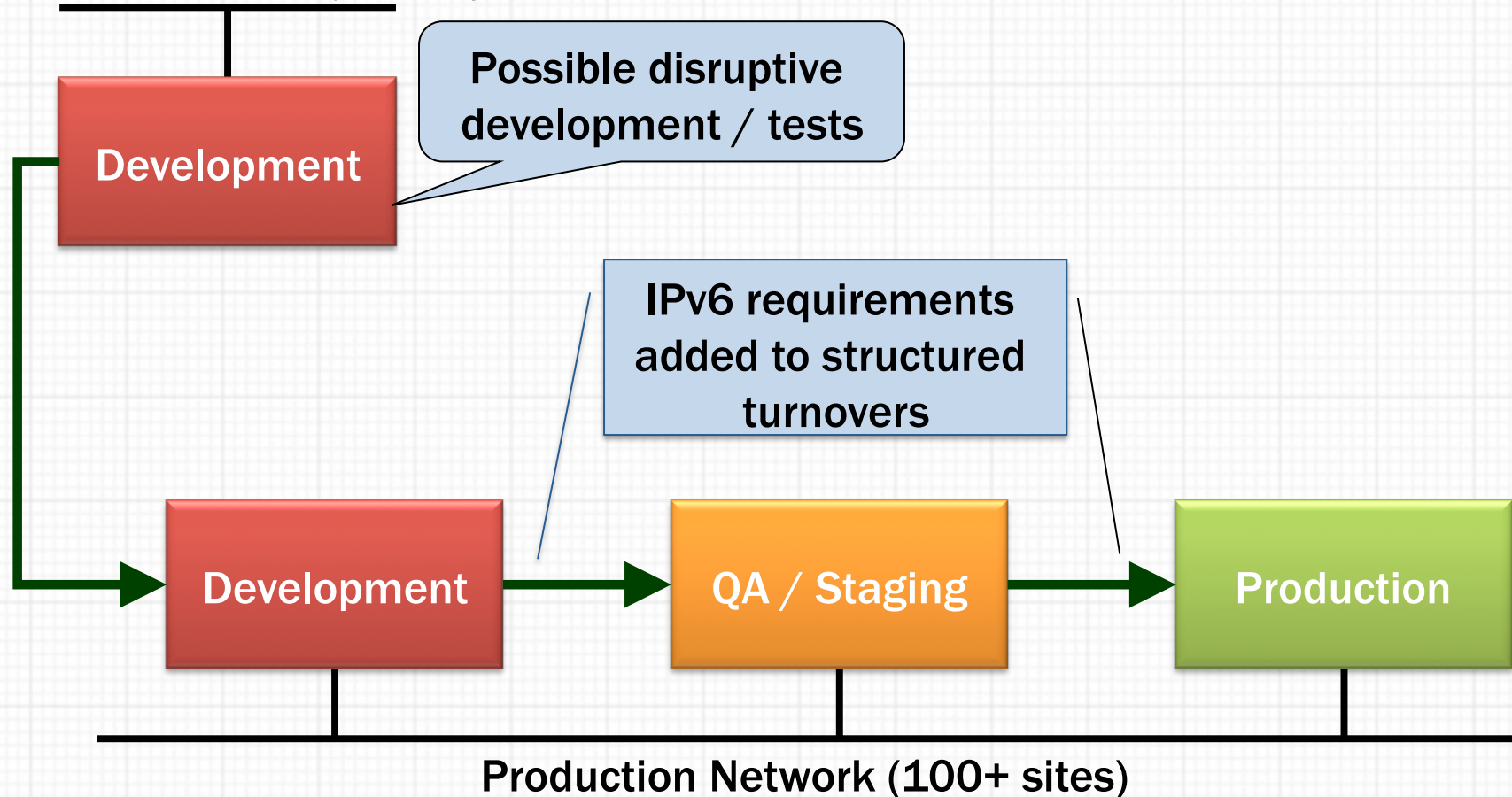
- Storage and manipulations of IP addresses
- Technology
- Use of hardcoded addresses
- User interface with addresses



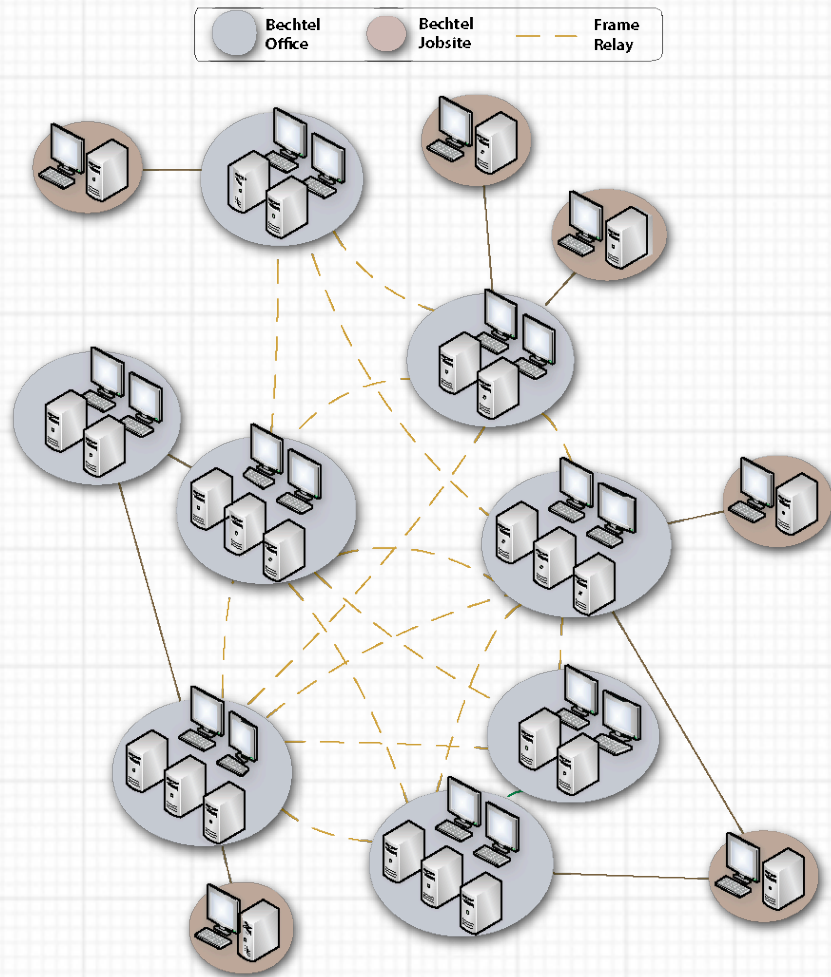


# Transition Success: Know & Use Gatekeepers

Isolated Network (4 sites)



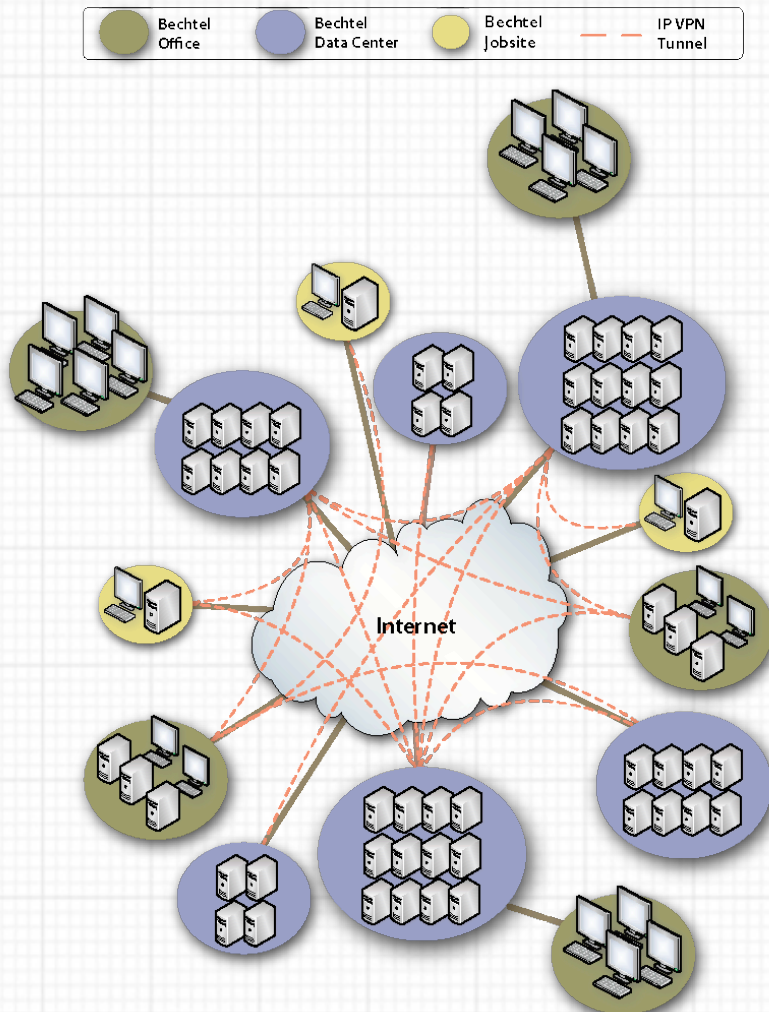
# Distributed Foundation (1998)



- Highly customized, highly distributed office and project centric environment
- Complex security model, difficult to manage
- Required individual, system-specific configurations
- Slow to configure and deploy
- Expensive network, low capacity



# Consolidated Foundation (2003)

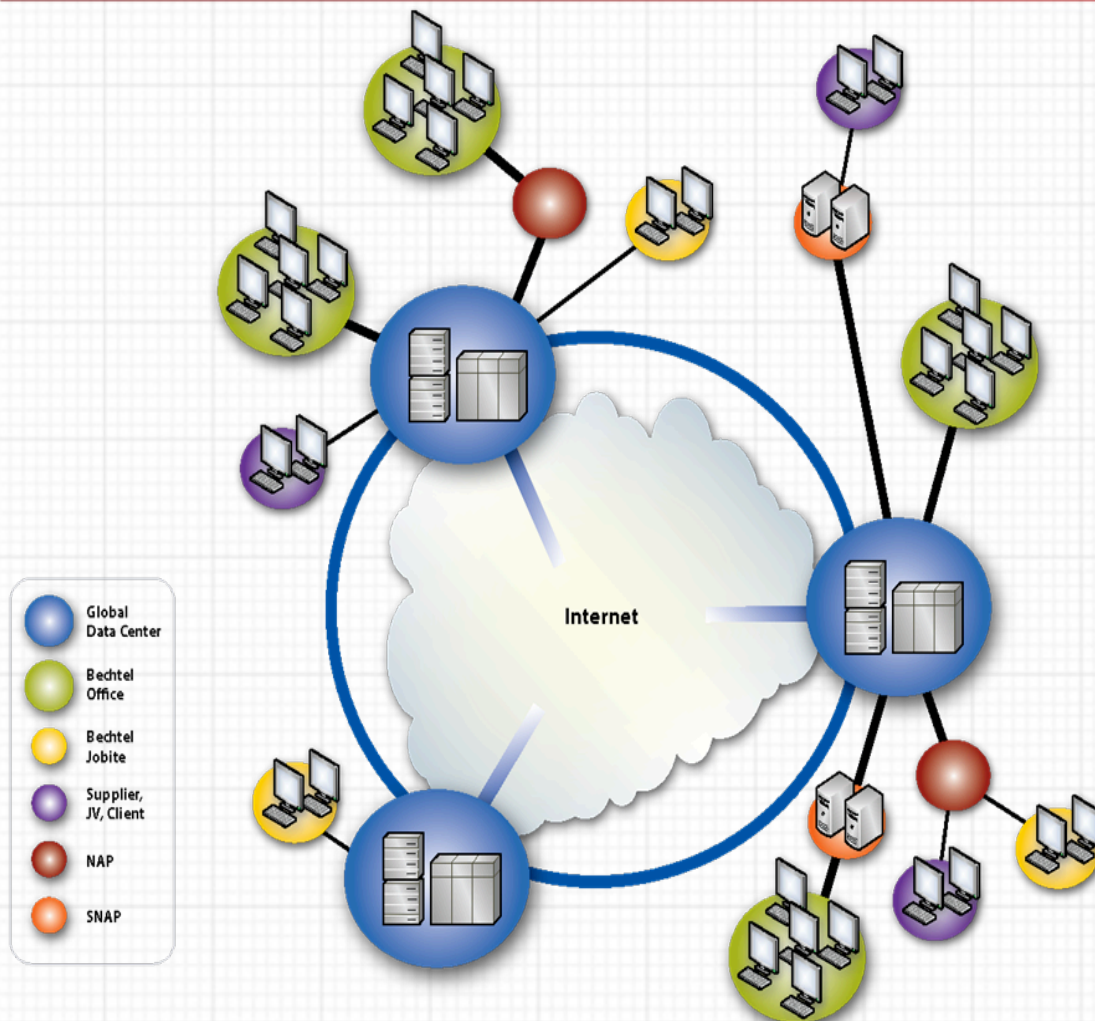


- Data Center consolidation
- Reduced complexity of unique configurations
- Improved effectiveness of security model
- Lowered number of access methods
- Internet used to connect offices and projects globally, reducing cost and improving throughput





# Virtualized Foundation (2008)



- “Consumerization” of Bechtel computing environment
- Data Center consolidation to Internet Exchanges
- Simplified, “user-based” security model
- Provides consistent user experience
- Rapidly deployable, easier to configure and manage
- High-capacity globally redundant network enables new project execution models & paradigms



# Our World IS Changing



## “Cloud” Community Model

- Integration and Collaboration
  - e.g. internal & external
- Standards and Interoperability
  - e.g. fully compatible platforms
- Sharing of Resources
  - e.g. utilization of best of in class
- Distributed & Leveraged Enhancements
  - e.g. “open source” for infrastructure

## Security Model

- Internet vs. Intranet Development
  - e.g. “firewall” placement
- Identity Management
  - e.g. authentication & federation
- Data Classification
  - e.g. what can and can not live “on the outside”

## Vendors Operating Model

- Development
  - e.g. suite vs. incremental development/releases
- Operations
  - e.g. global reach for easy upgrade & replication
- Commercial
  - e.g. usage based licensing and pay-per-drink service consumption

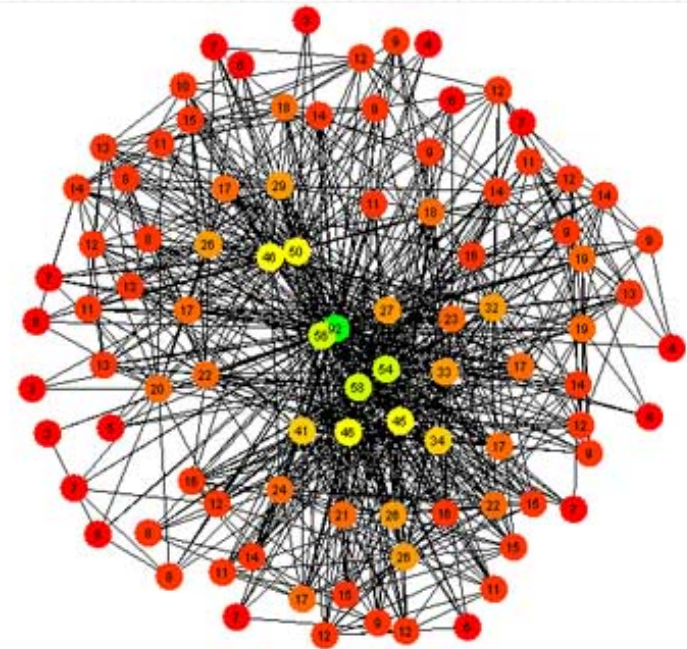




# Future Planning

*You can't move forward without a foundation*

- Dual stack for years
- Move to cloud services
- New IPv6-enabled services
- New dimensions in mobility
- Industrial networking



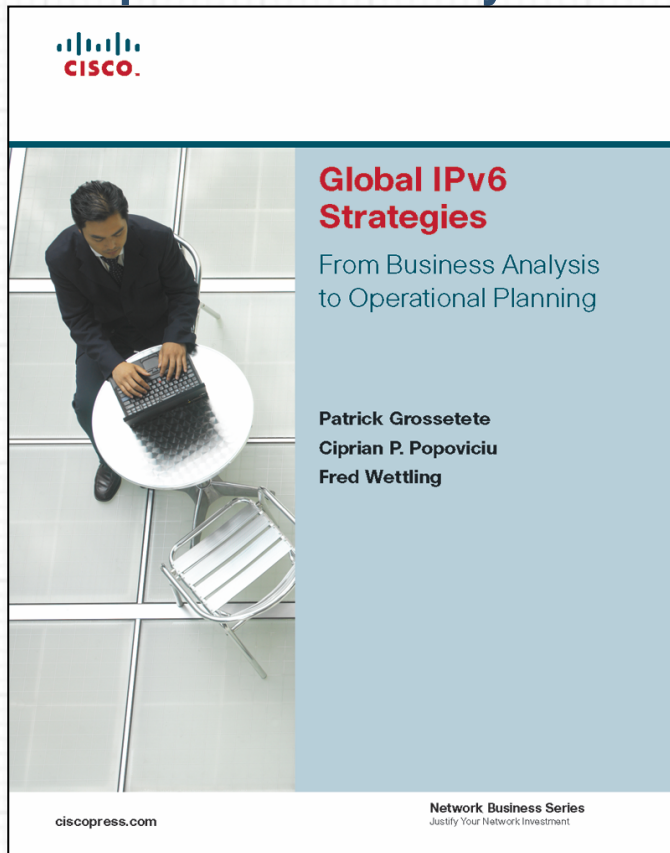
Social Networking map - Grant McCracken





# Contact Information

Book published May-2008



***Don't miss it!***

## ***Global IPv6 Strategies***

- The Business and Economic Importance of IP Communications
- IPv4 or IPv6 – Myths and Realities
- The Economy of an IP Evolution
- IPv6 Adoption Strategies
- Analysis of Business Cases for IPv6
- Planning Your IPv6 Migration

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