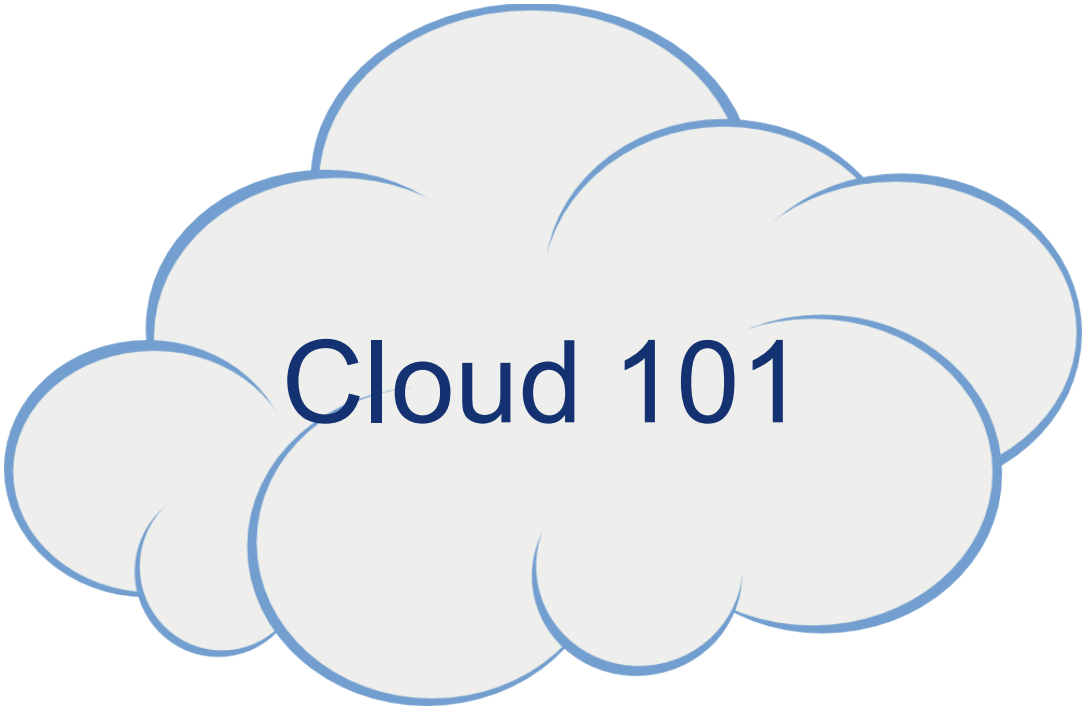


ISC Cloud First Program
Lunchtime Learning

March 23, 2017

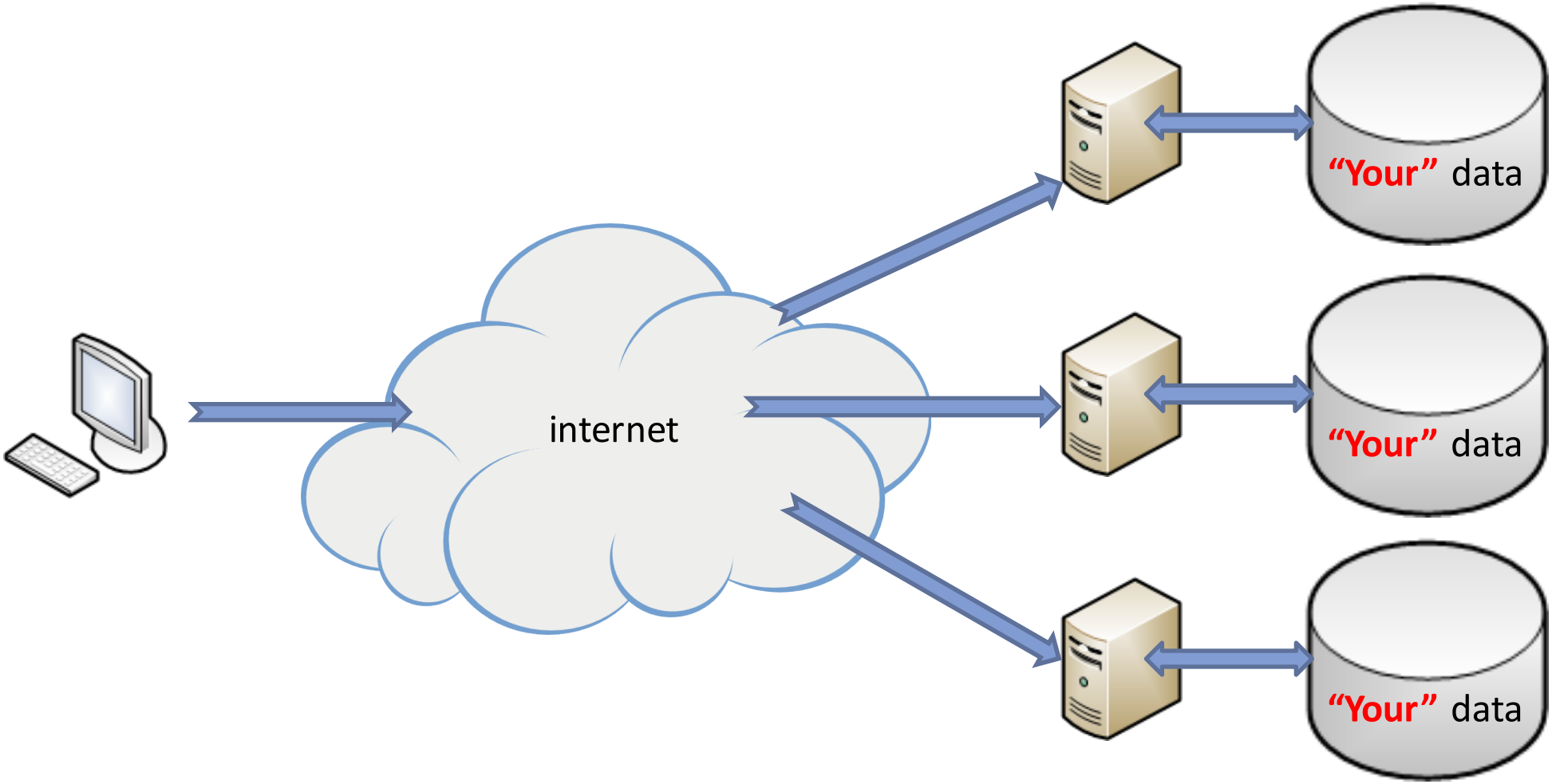
Contents

- What is the cloud
- How did it come into existence
- Types of cloud service
- Advantages and Challenges
- ISC's Cloud First Program

“The Cloud”?

- Gmail, G+, Android
- Constant Contact / Mail Chimp
- Doodle
- SalesForce.com
- Box / Dropbox / Crashplan
- Facebook
- Office 365, Azure
- Amazon Web Services

Services provided through the internet



“The Cloud”?

- Systems connecting to a network were diagrammed with a ‘cloud’ shape
- Services offered through ‘the internet’ are ‘cloud’ services
- Any vendor providing services using the internet now has a ‘cloud’ service or offering
- Broadly 3 classes of services are recognized
  - Infrastructure as a service – IaaS
  - Platform as a service – PaaS
  - Software as a service – SaaS

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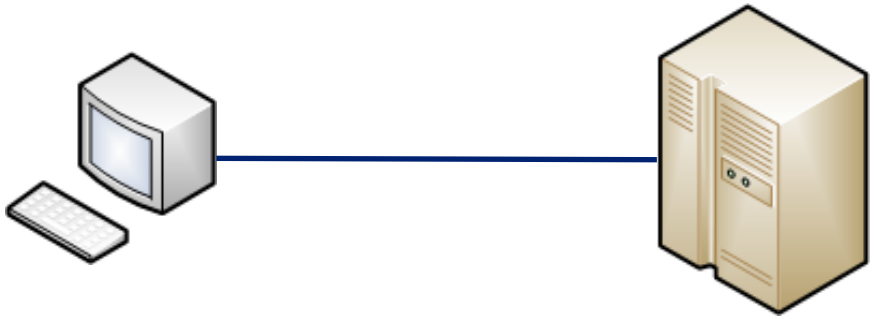

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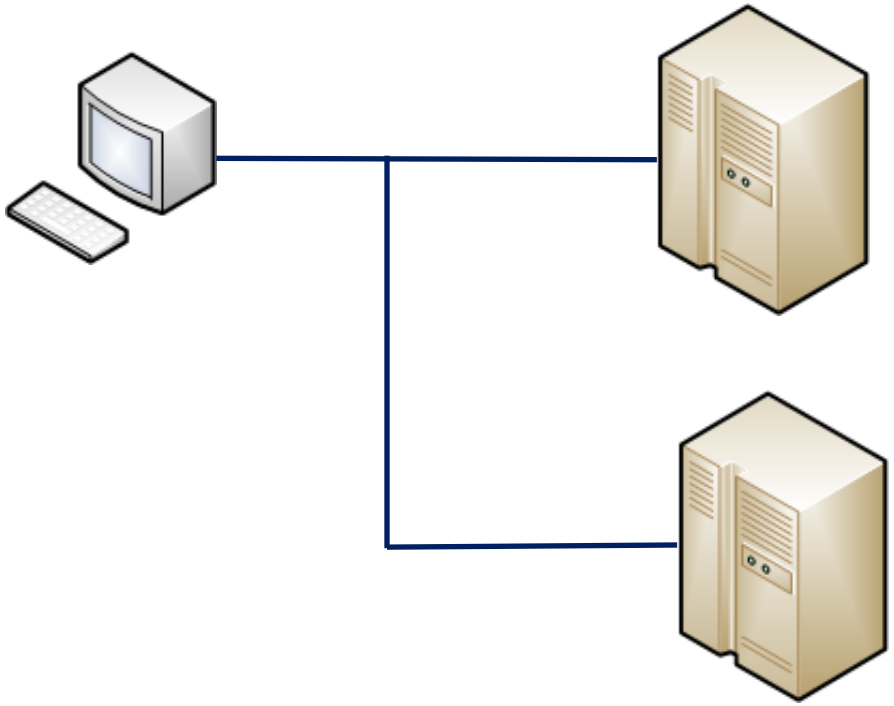

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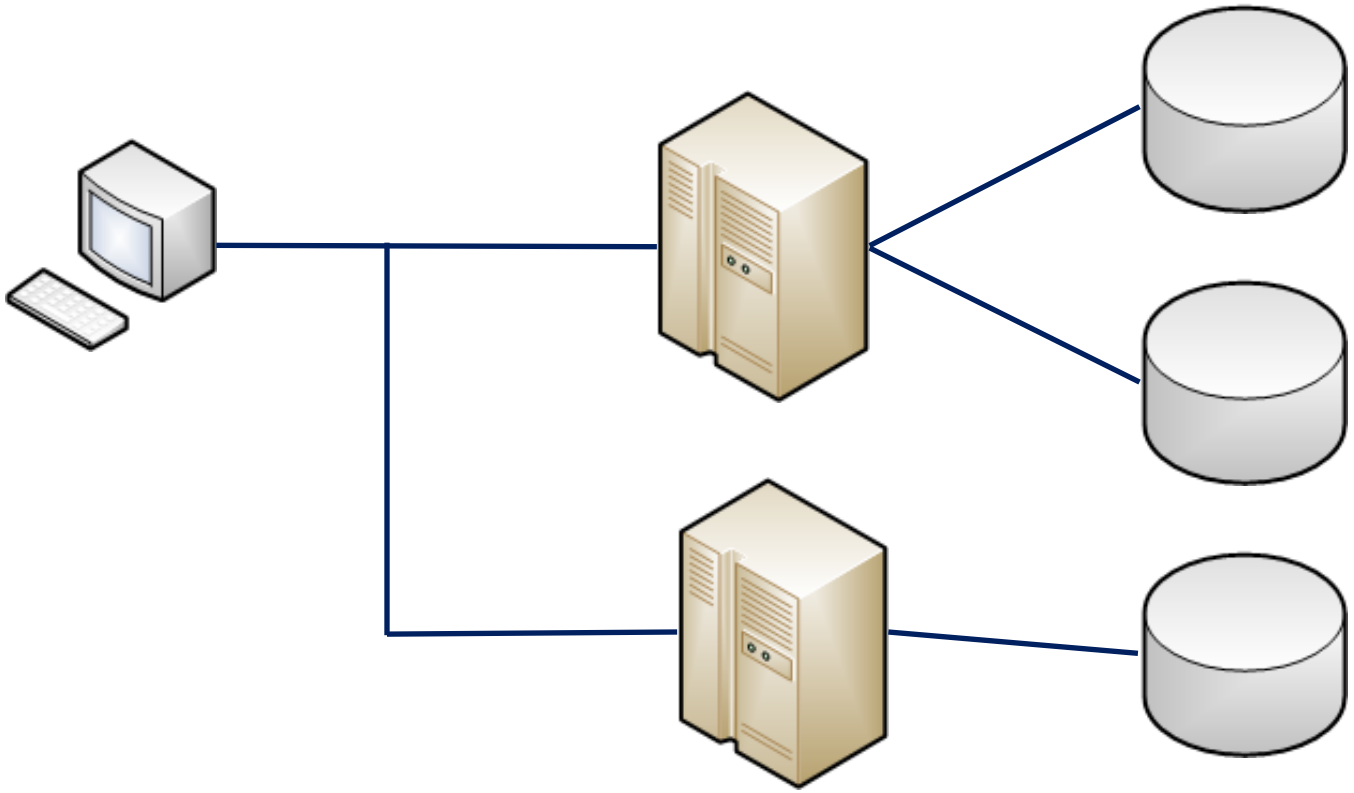

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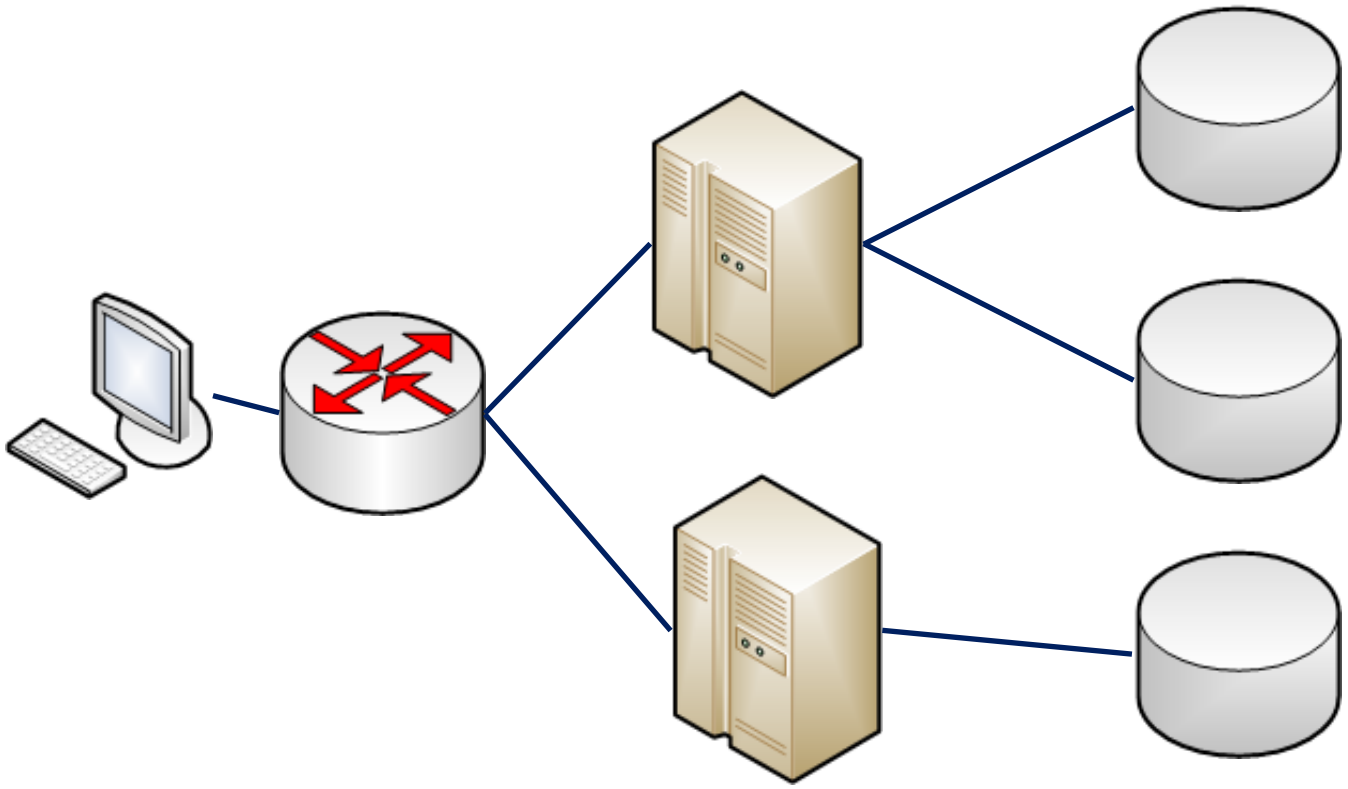

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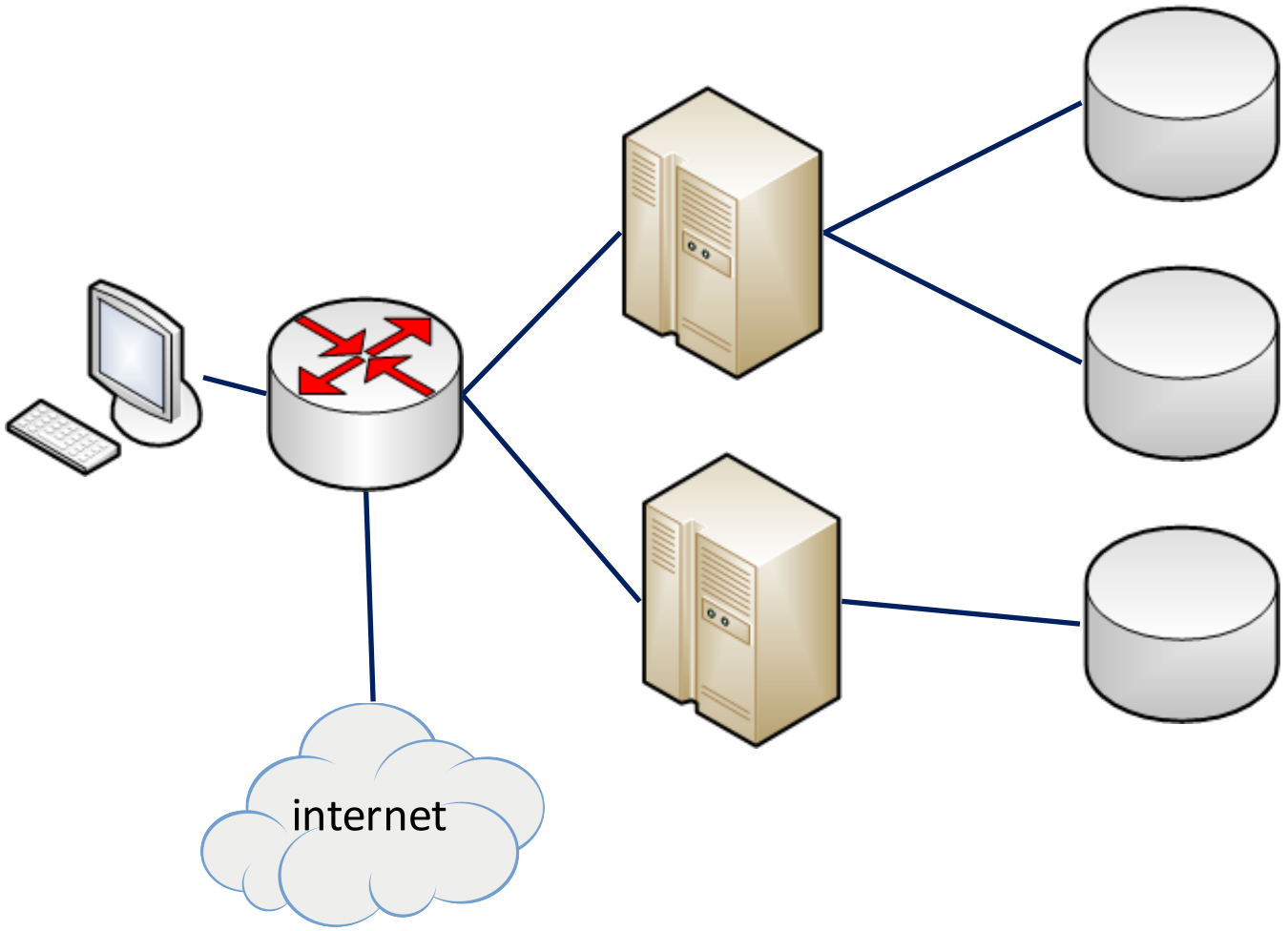

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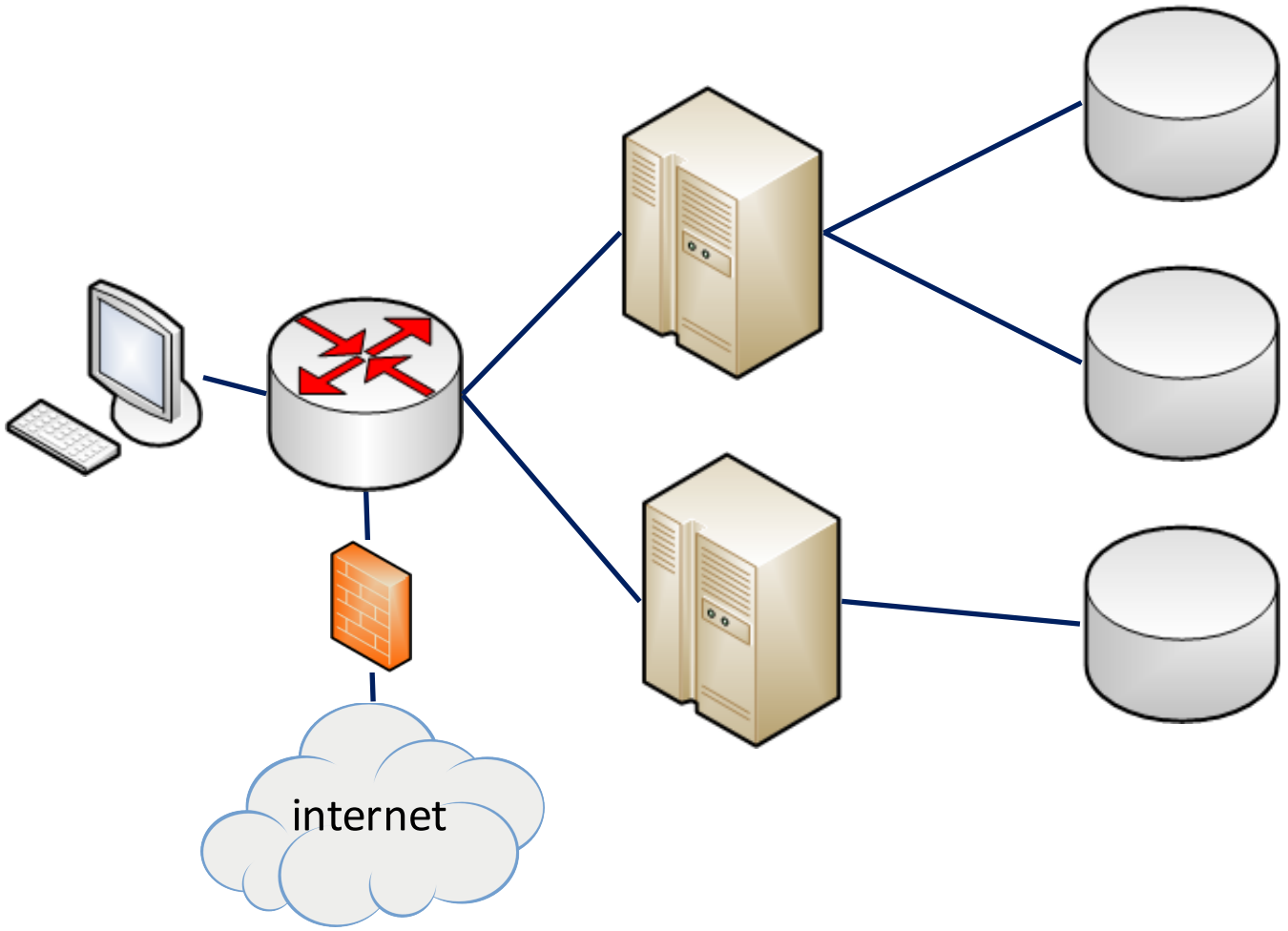

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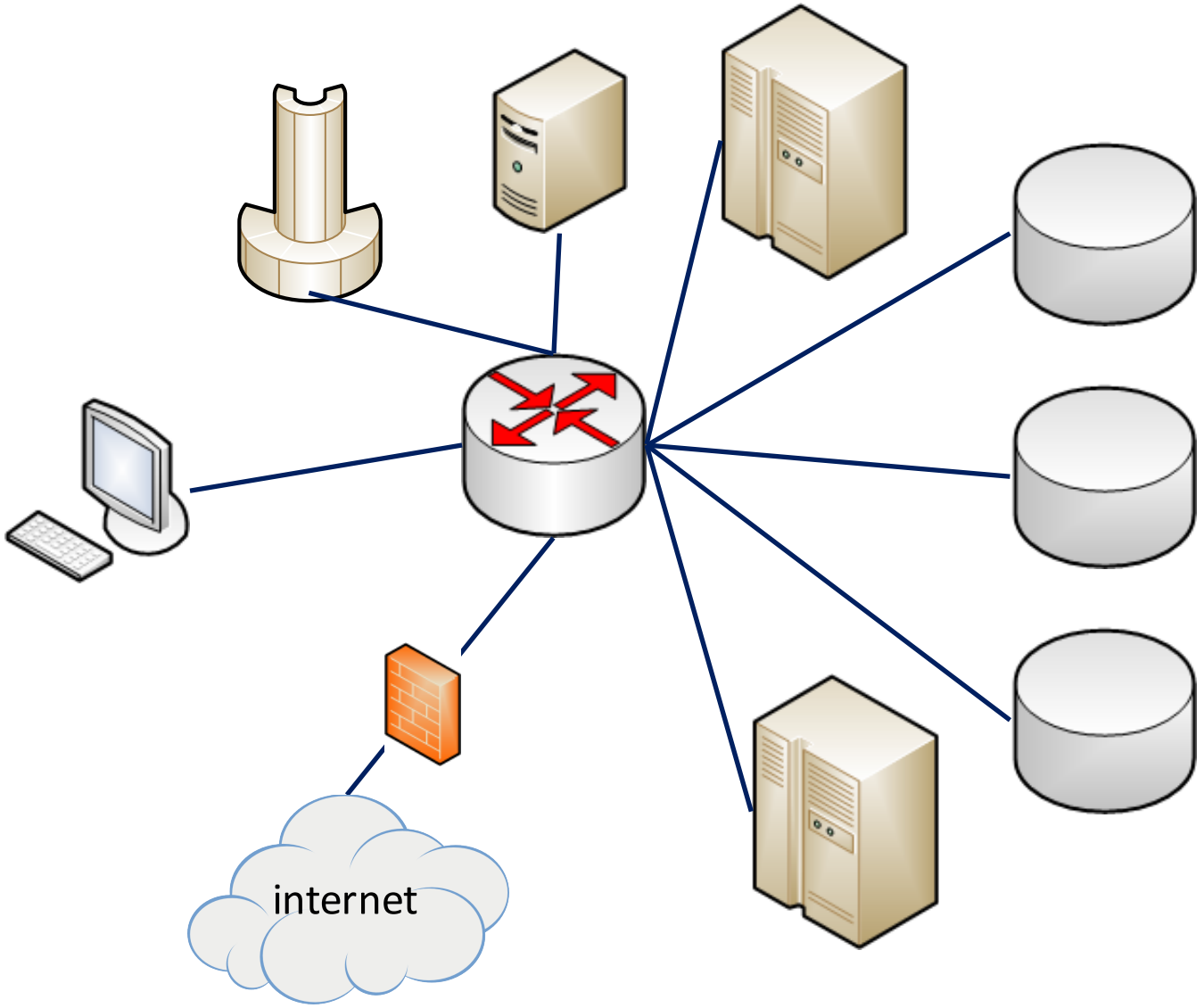

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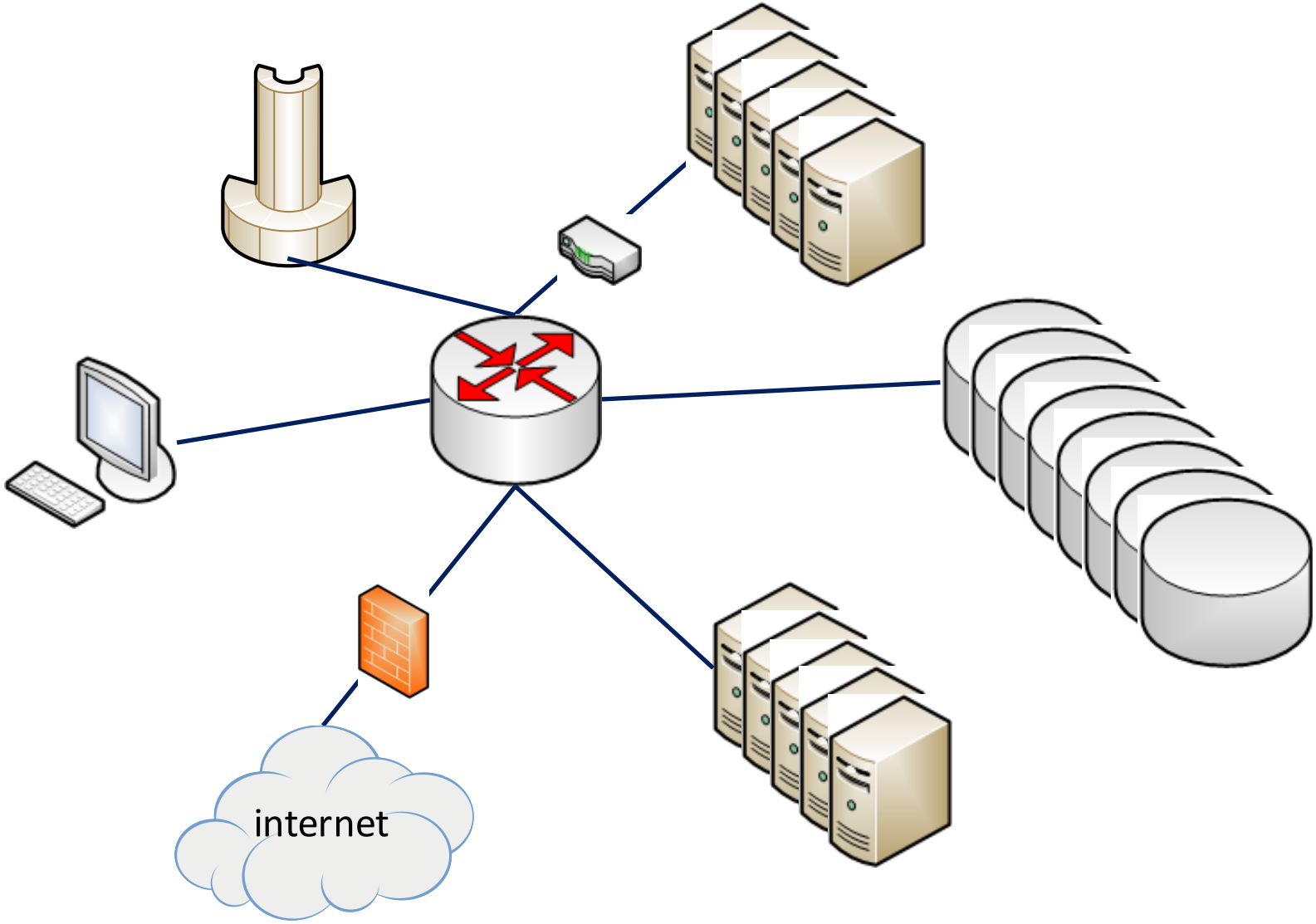

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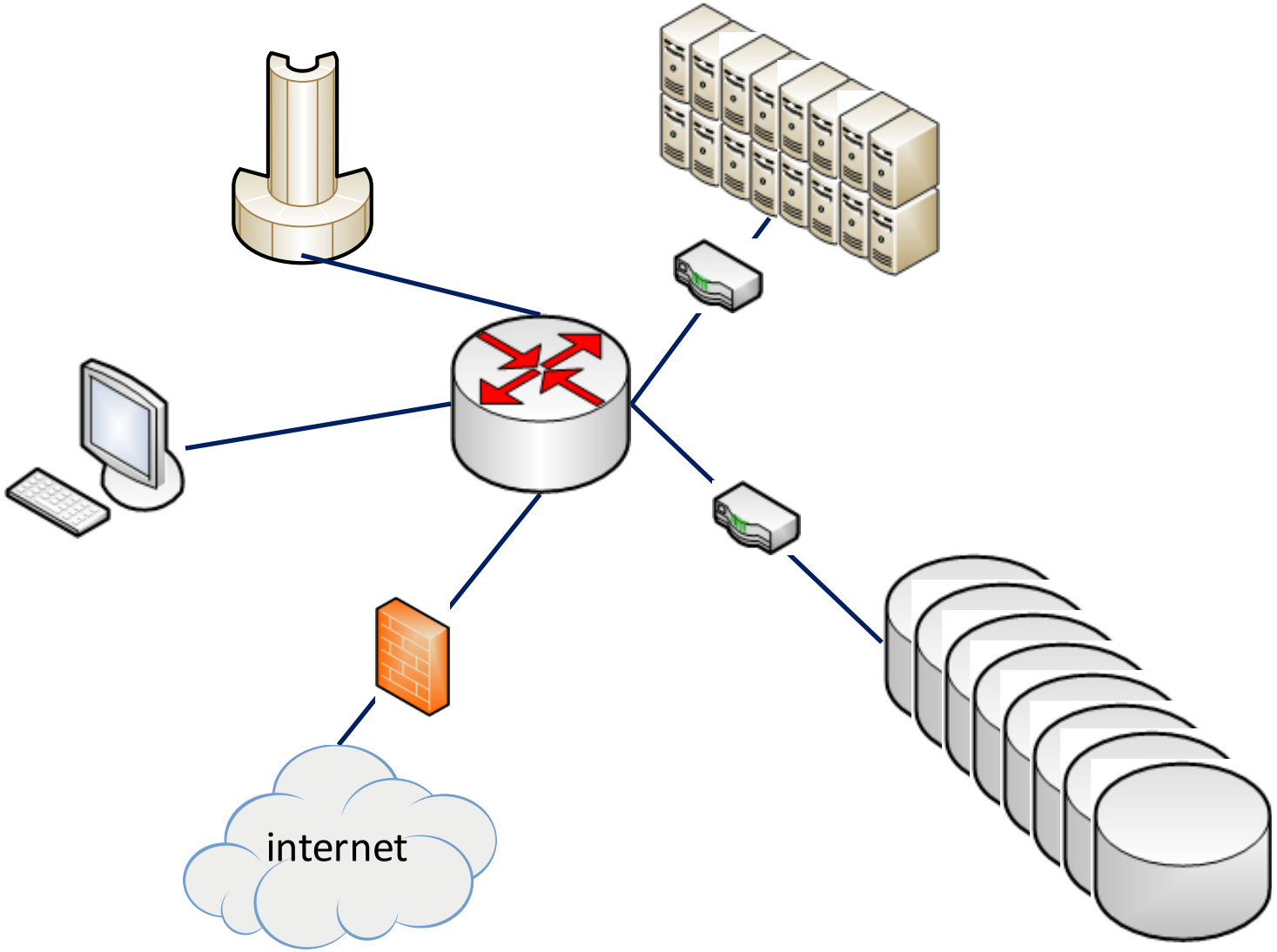

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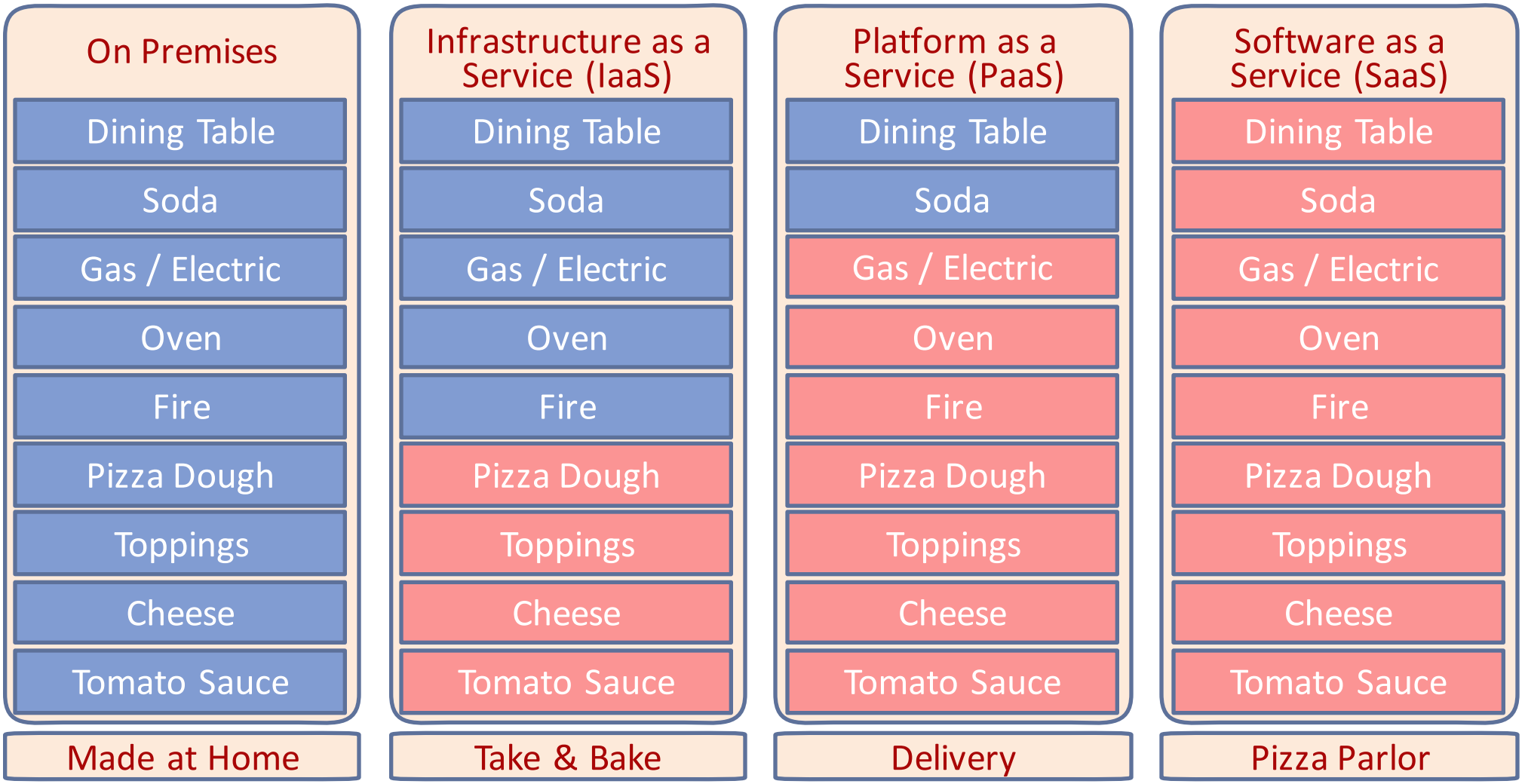
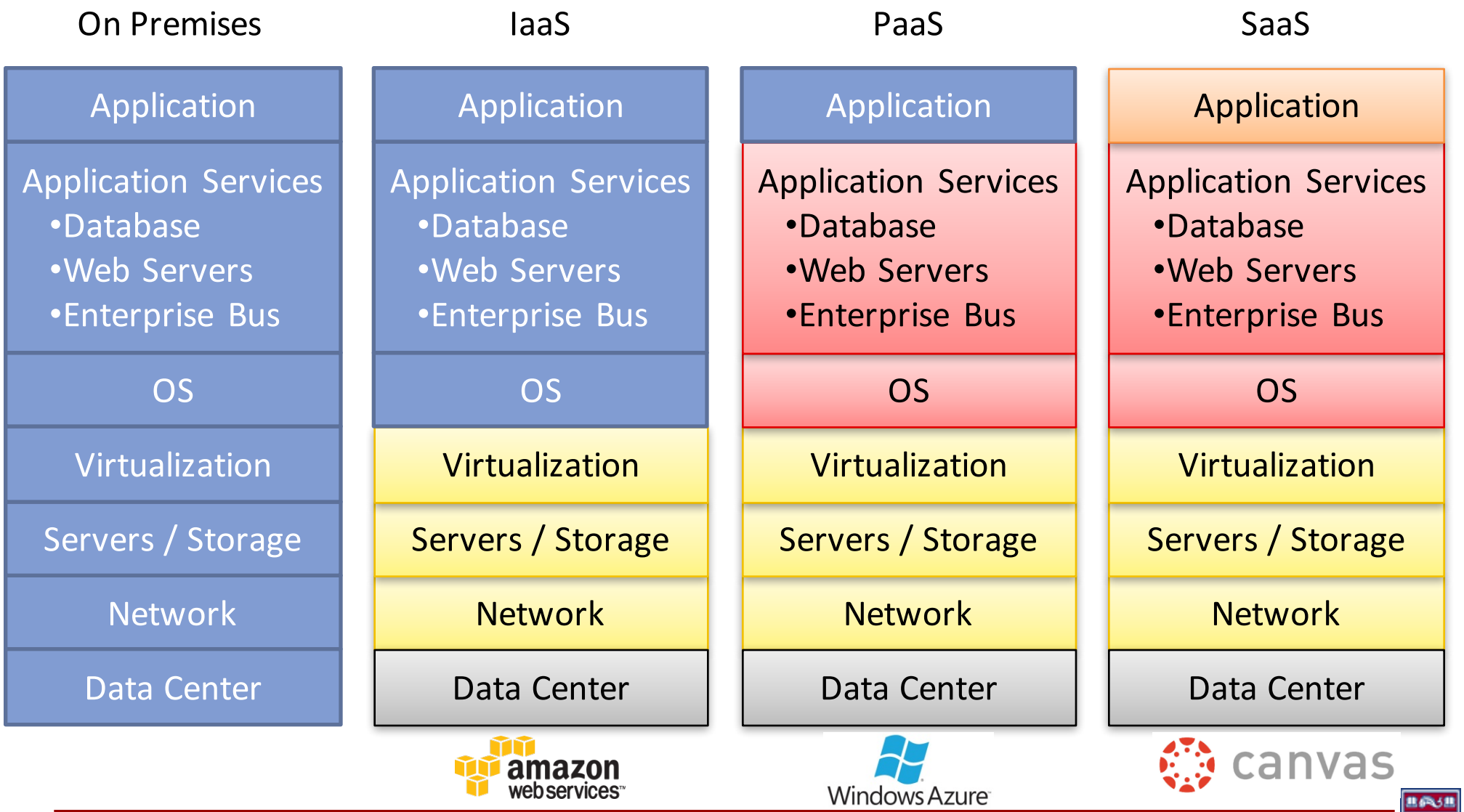
Pizza as a Service *



*Albert Barron – IBM – https://www.linkedin.com/pulse/20140730172610-9679881-pizza-as-a-service

The Service Stack



Enablers

- Virtualization
  - Servers
  - Storage
- Increased Capacity
  - System Performance
  - Storage capacity, speed and size
  - Decreased power consumption
- Improved Internet Infrastructure
  - Bandwidth
  - Latency
- Distributed Computing
- Resource Abstraction

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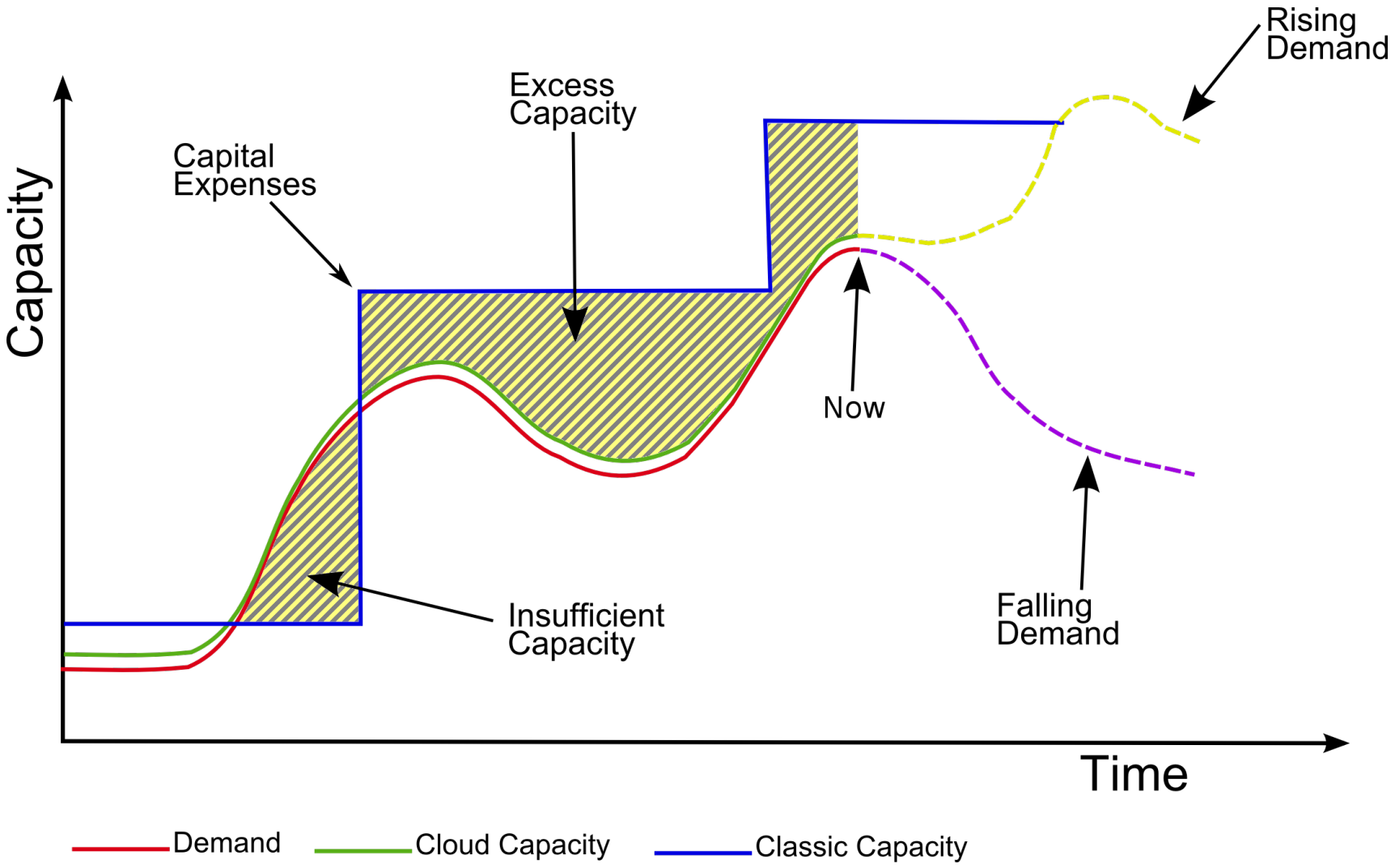
Advantages

- Trade Capital Expense for Operational Expense
- Distributed Architectures made Easy
- Scalability is Built-In
- Decreased 'Time to Market'
- Fail early, Fail often
- Infrastructure Security vs. Application Security

CapEx vs. OpEx

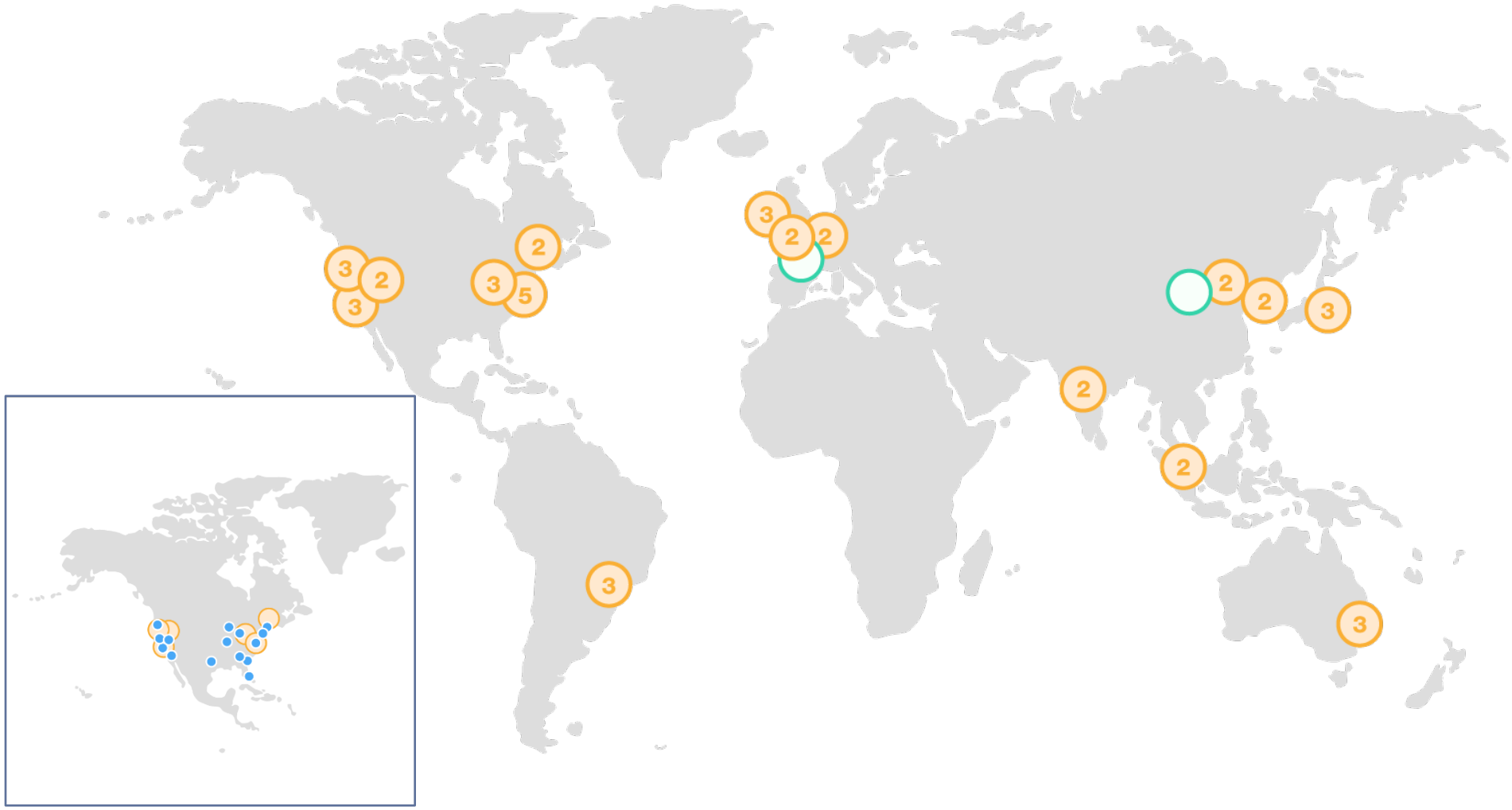


Distributed Architectures

- Distributed Applications require a lot of plumbing
  - Geographically distributed data centers
  - Network connectivity
  - Replication
  - Load Balancing
  - Reliable storage
- Cloud vendors sweat the details
- Leverage scale to distribute costs needed

Distributed Architectures (example)

AWS Global Infrastructure



Scalability is Built-in

- Cloud vendor provides extensive virtualization
  - You never access any physical device
  - No rack and stack, physical restrictions, approval process
- Cloud vendor provides automated provisioning
  - Cloud vendor scale requires extensive automation
  - Monitoring, restart, recreate can all be automated
- Cloud vendor scale provides ‘unlimited’ growth
- Cloud vendor deals with millions of customers
- No need to purchase capital for your most successful case

Decreased 'Time to Market'

- No capital – no procurement
- Most cloud solutions can be used instantly
  - Ample capacity available
- Most are pay as you go, no upfront cost
  - stop paying when you're done
- Allow extensive infrastructures stood up quickly
  - Some allow full automation of application stack
- No 3rd party negotiation
  - Hardware, possibly software

Fail early, Fail often

- No upfront capital investment
- Small scale is inexpensive
- Throw away anything that doesn't work
  - It's all virtual/at vendor anyway
  - No cost once removed
- Try new approaches and see what works
- Bring solutions back on premises
  - Legal, compliance, confidentiality or security requirement
  - Excess capacity

Infrastructure Security vs. Application Security

- Cloud vendors manage security for their services
  - Dedicated staff
  - Generally built securely from the ground up
  - Frequent patches and updates
- Easy to leverage cloud vendor's security

- Bespoke solutions are not part of that 'package'!
  - Use Penn advocated security standards
  - Understand the vendor's service and service levels

Challenges

- Variable Cost
- Development and Operational Paradigm Shift
- Privacy, Legal, Compliance
- Network Considerations
- Fluid space

Variable Cost

- Not always easy to predict
  - No one likes a budget that changes
- Turn off, or remove unused applications/data
- Try to understand your best case and worst case
- Realize that cloud costs are part of your operational costs, forever
- Big data vs. Data Obesity

Development and Operational Paradigm Shift

- Use what was purchased efficiently

  vs

- Build for elasticity
  - Develop for Elastic Infrastructure
  - DevOps takes a greater role
- Rip and Replace
  - Something always fails, just start new instance

Privacy, Legal, Compliance

- NSA
  - Nuff' said
- Strong Contracts and SLAs are paramount
  - Vendor deals with many customers, may not align with Penn's interests
- Use your Local Service Provider

http://www.upenn.edu/oacp/privacy/
http://www.upenn.edu/computing/security/index.php
http://www.upenn.edu/computing/security/cloud/index.php

Network Considerations

- Where is the service located
  - Physics still matter
  - Network topology matters
- Redundancy?
- Does the vendor charge for network ingress and egress to their service?
  - AWS!
- Confidentiality and Encryption

Fluid space

- Fail Early, Fail often!
  - Vendors will fail
    - http://www.wired.com/wiredenterprise/2013/09/nirvanix/
  - Vendors will change services quickly
- Decreased Time to Market!
  - Many startups
    - Consolidation is inevitable
- What's my Exit Process?
  - How fast can we get our own data back?
  - In a format that's usable without the vendor's product/service
- Big data and analytics will change services

Miscellaneous

- Rip and Replace
  - Herd versus Pets
- Cloud is green (http://cloudtimes.org/2012/10/28/how-green-is-cloud-computing-new-study/)
- New capabilities
  - 9-5 computing
  - Pilot light computing
  - DR on ice
- Big Data
- "Free"
  - http://blogs.law.harvard.edu/futureoftheinternet/2012/03/21/meme-patrol-when-something-online-is-free-youre-not-the-customer-youre-the-product/

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Resistance Is Futile!

- The industry is moving rapidly to “IT As A Service”
- We will not have a choice in the future
- Penn is already moving in this direction
- We need to get good at this
- Big cultural change – practice, practice, practice
- Speed, flexibility, agility

ISC's Cloud First Program

- Vision
  - To position Penn for the future of IT systems and services by pursuing a "Cloud First" strategy to accelerate the speed of delivery and to drive more value through technology to the Penn Community.
- Goals
  - Position Penn to thrive in the dramatically changing technological landscape – new learning and education delivery models, research models, security and business on demand.
  - Provide new and innovative ways to deliver IT in support of Penn's mission, while leveraging industry solutions, in a way that provides scalability, agility, efficiency, staff development, and risk management.

ISC's Cloud First Program

- Objectives
  - Increase business application agility, scalability, and effectiveness
  - Improve resource availability for higher value work
  - Leverage currently available technology for greater efficiency
  - Create a more predictable spending profile and total cost of ownership for technology
  - Enable rapid and iterative improvements and replacement of technology

Metrics

- Cloud First: FY17 Q3 – Q4
  - Move 75-100% of test & dev workloads
  - Move 25% of performance environments
  - Move 10% of production environments
  - Migrate 6-8 existing applications

Cloud Resources website

https://www.isc.upenn.edu/cloud-resources

- 250 links to a cloud resources grouped by category:
  - Planning & Strategies – Planning guides and articles from Gartner, EDUCAUSE, Cloud Technology Partners
  - Technical Resources – Application development, integration, agile development practices, infrastructure, security
  - Self-Directed Learning – Cloud training and educational opportunities
  - Peer Institutions – Materials and resources from peer institutions, EDUCAUSE, Internet2
  - Reference – Glossaries, background materials, vendors, etc.

More Cloud 101

- On the Cloud Resources website
  - What is Cloud Computing?
    - 8-part series by Cloud Academy available on YouTube about cloud computing basics, including deployment models, key concepts, service models, common use cases, etc. (no charge)
  - Cloud Computing First Look
    - Course by David Rivers on Lynda.com explaining the essentials of cloud computing as well as an overview of migration and common cloud technologies (no charge for Lynda.com members)
  - Cloud Fundamentals
    - 19-part series produced by IT Pro TV; some knowledge of IT concepts needed (no charge for Amazon Prime Video members)

Resources

- Website
  - https://www.isc.upenn.edu/cloud-first
- Comments can be sent to
  - cloud-first@isc.upenn.edu

Questions