

# amazon.com's Journey to the Cloud

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AWS Summit  
June 10, 2001

1995 - 2010





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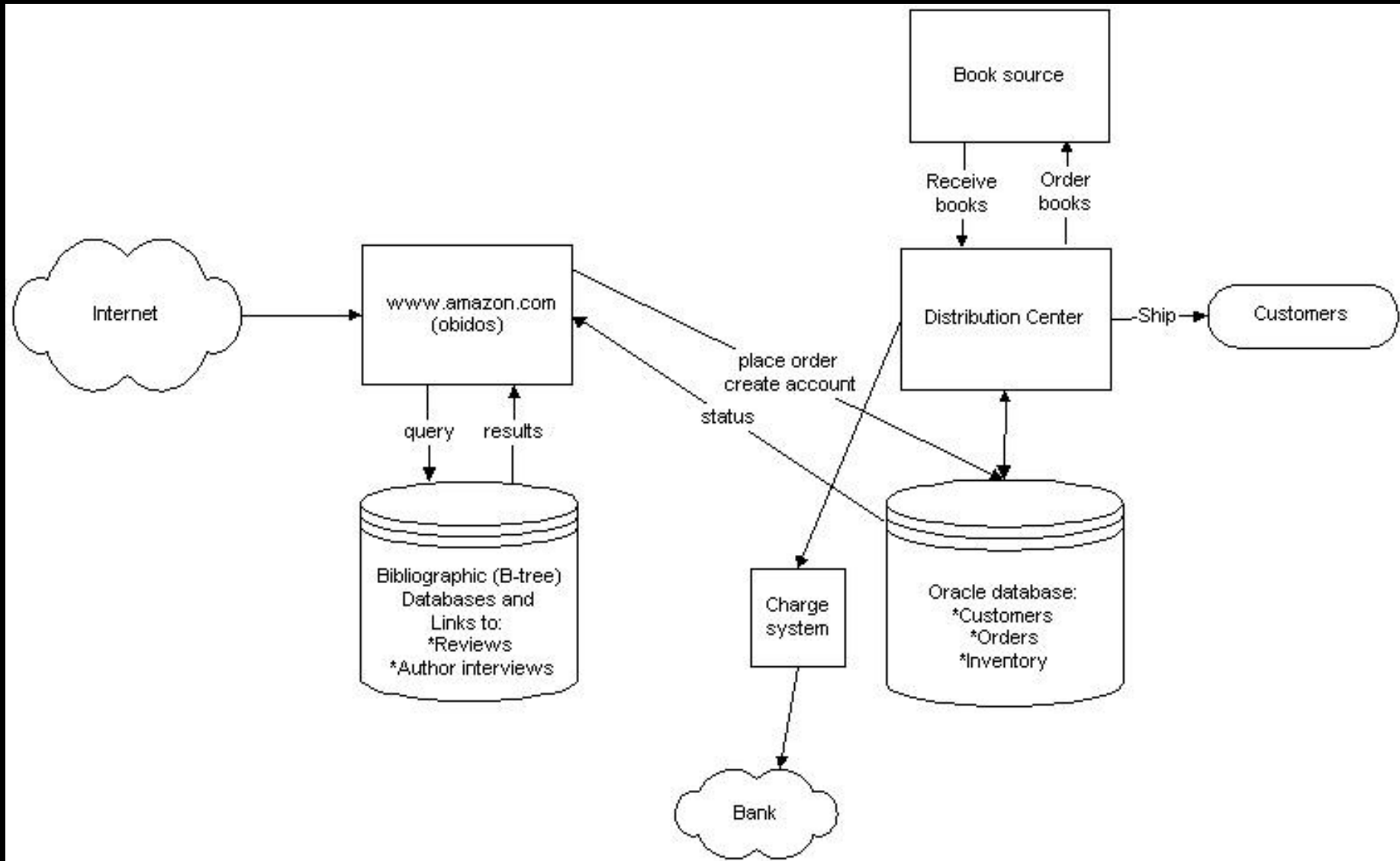
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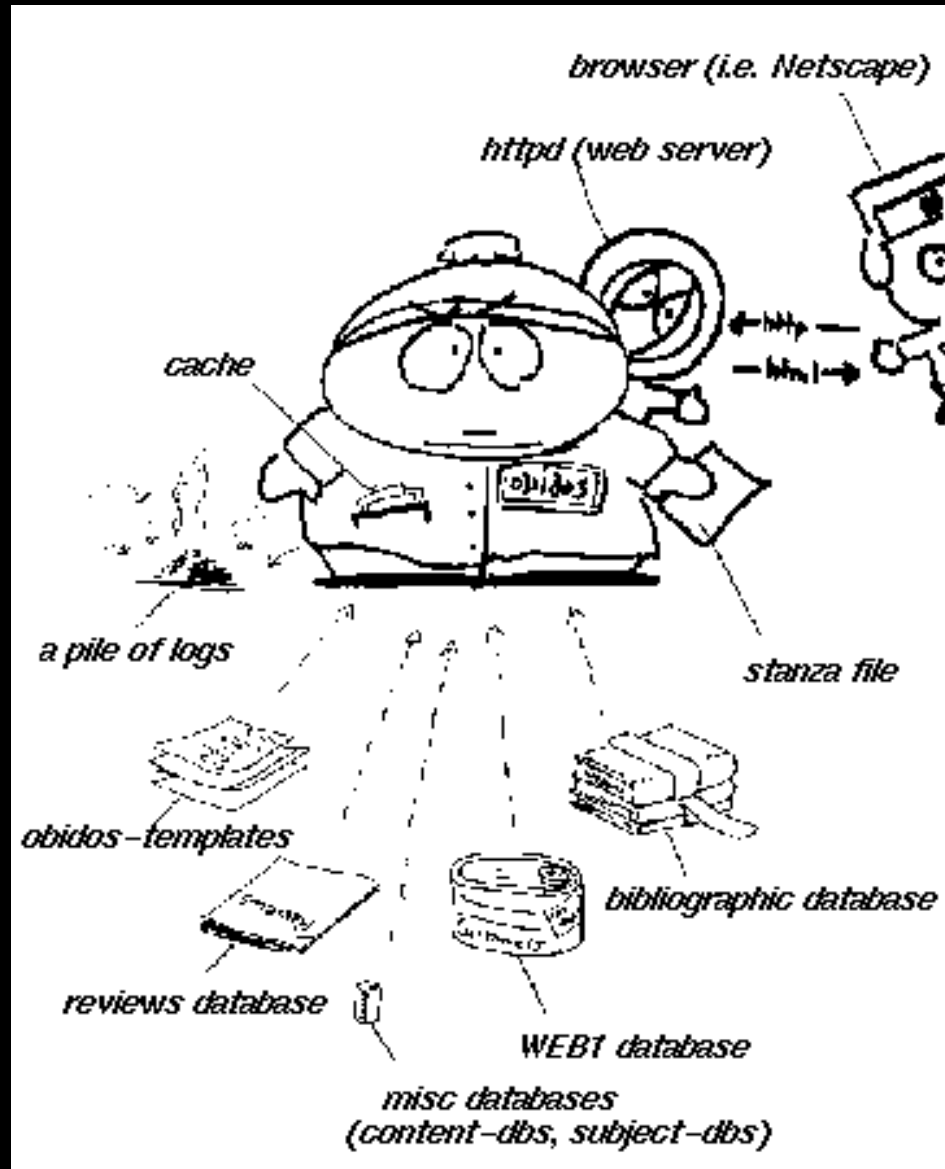
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1995 1996 **1997** 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

# First real data center

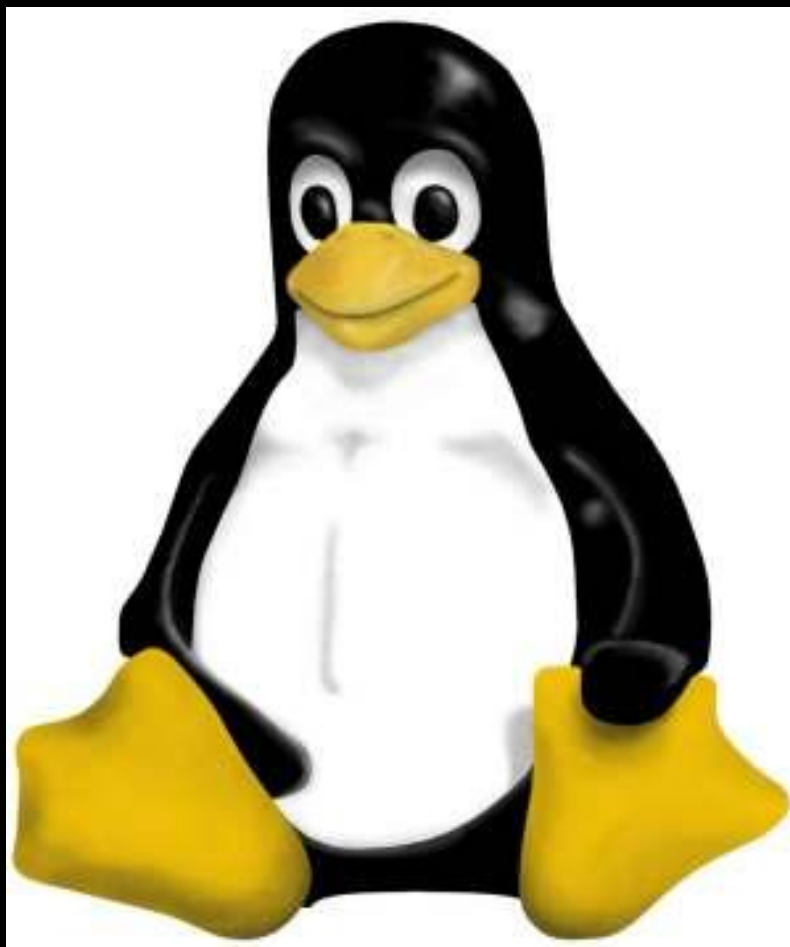




# Distribution Center Isolation







1995 1996 1997 1998 1999 2000 **2001** 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

“We have 50 million lines of C++ code. No, it's more than that now. I don't know what it is anymore. It was 50 million last Christmas, nine months ago, and was expanding at 8 million lines a quarter. The expansion rate was increasing as well. Ouch.”

*Amazon SDE, internal blog post  
September 2004*

Decouple  
Service Oriented Architecture  
Scale Horizontally  
Increase Speed of Execution  
Develop Iteratively  
Seek Simplicity





amazon  
web services™



# What could we do with just S3?



## Frequently Bought Together



+



+



**Price For All Three: \$30.04**



Add all three to Cart

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## Theatrical Release Information

**US Theatrical Release Date:** May 4, 2007

**MPAA:** **PG-13** Rated PG-13 for sequences of intense action violence.

**Production Company:** Columbia Pictures, Marvel Enterprises, Laura Ziskin Productions, Columbia Pictures Industries

**USA Box Office:** \$337 Million

**Worldwide Box Office:** \$885 Million

**Budget Estimate:** \$258 Million

**Also Known As:** 3 / Spider-Man 3: The IMAX Experience

**Filming Locations:** 5th Street, Downtown, Los Angeles, California, USA | Alexandria Hotel, Los Angeles, California, USA | Brooklyn, New York City, New York, USA | Bryant Park, Manhattan, New York City, New York, USA | Chicago, Illinois, USA | City Hall Park, Manhattan, New York City, New York, USA | Cleveland, Ohio, USA | Columbia University - Broadway & 116th Street, Manhattan, New York City, New York, USA | Forest Hills, Queens, New York City, New York, USA | Hudson County, New Jersey, USA | Ivar Theatre - 1605 N. Ivar Avenue, Hollywood, Los Angeles, California, USA | Kew Gardens, Queens, New York City, New York, USA | Los Angeles, California, USA | New York City, New York, USA | Queens, New York City, New York, USA

## Product Details

**Actors:** [Tobey Maguire](#), [Kirsten Dunst](#), [James Franco](#), [Thomas Haden Church](#), [Topher Grace](#)

**Format:** Closed-captioned, Color, Widescreen, NTSC

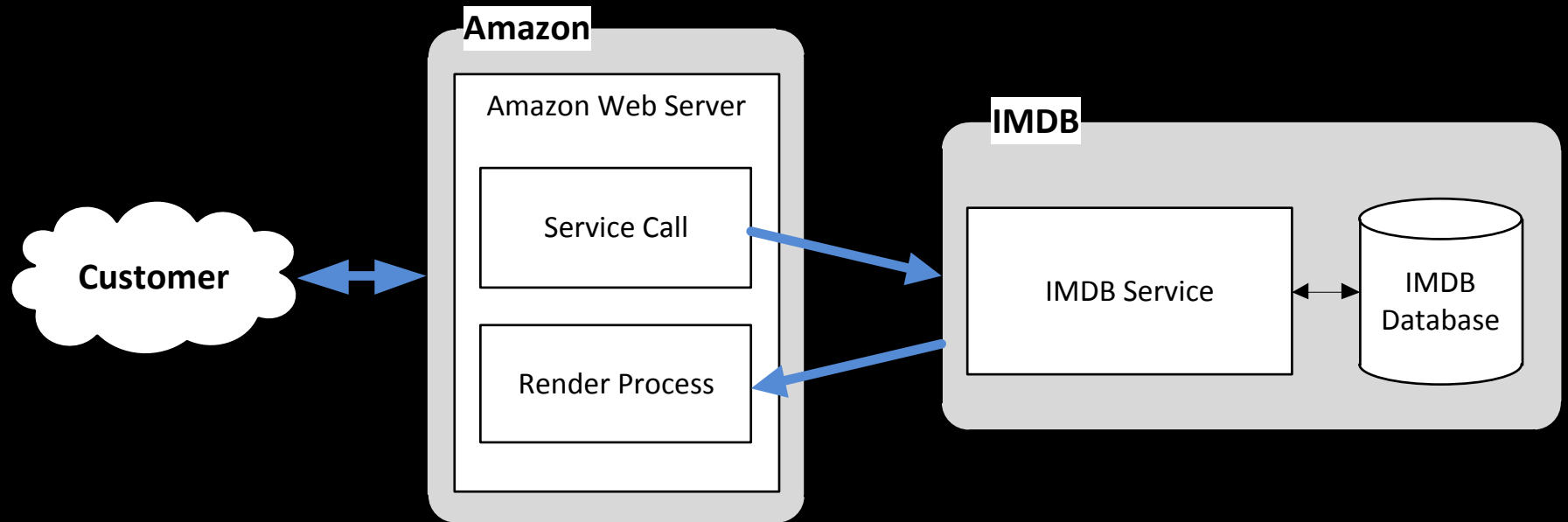
**Language:** English, Spanish

**Subtitles:** Spanish

**Region:** Region 1 encoding (US and Canada only)

**PLEASE NOTE:** Some Region 1 DVDs may contain **Regional Coding Enhancement** (RCE). Some, but not all, of our international customers have had

# IMDB Widget Architecture



# The Problem

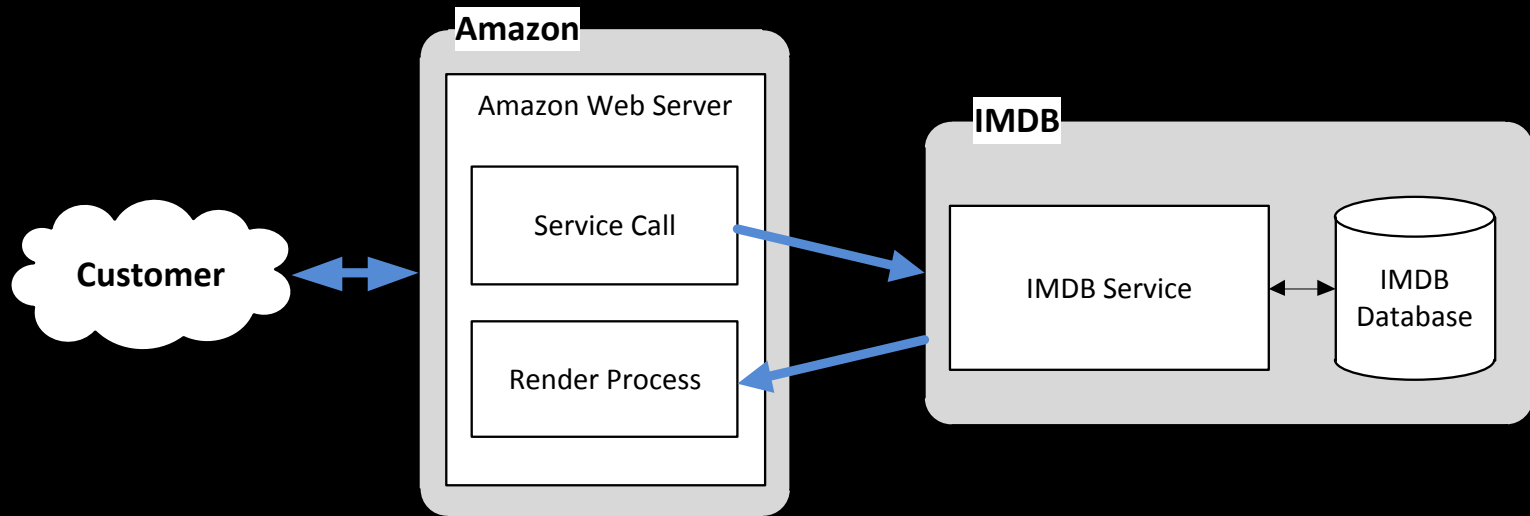
- Release process is coupled
- Stringent runtime latency requirements
- Service integration issues

# The Solution

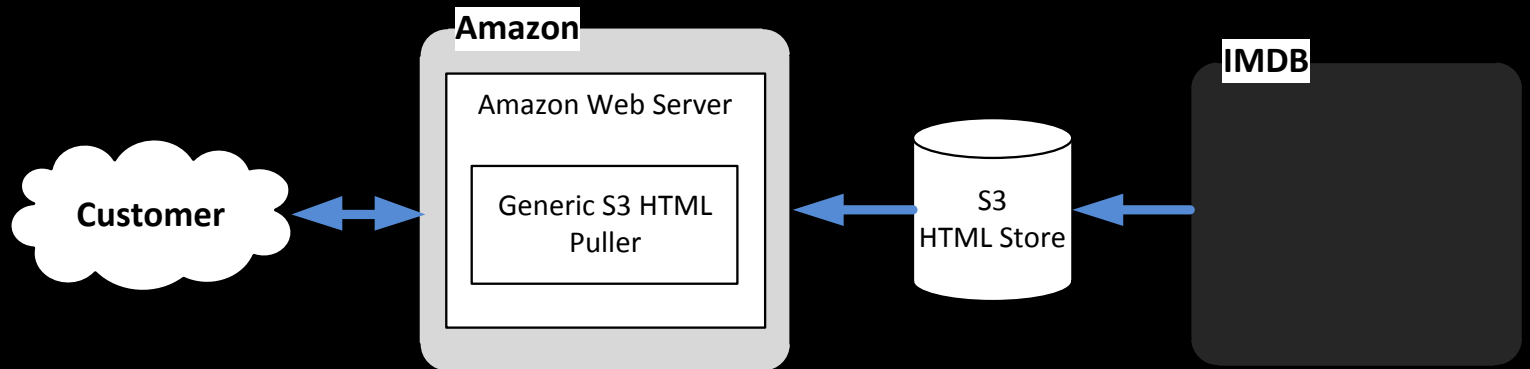
- Use S3 as a service
- Store raw HTML for the feature in S3



# Before



# After



# Results

- Reduced page latency
- Reduced web server CPU utilization
- Improved availability through reduced dependencies
- Simplified release model
- AJAX readiness

# What about a more complex case?



## Sample Data > Amazon CA Gateway [\(Edit | Delete\)](#)

*www.amazon.ca*

### Performance

from  in the

First Byte (p50):



The onLoad Event (p50):



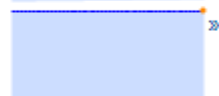
CXA ATF (p50):








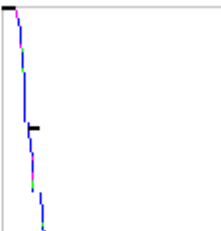


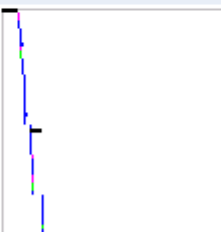



Total Load (p50):



Number of runs (count):



### Recent Executions [\(Find more... | Run | 1-click Run\)](#)

Start Time	Location	Load Time	Status	Show: <input checked="" type="checkbox"/>	Screenshots <input checked="" type="checkbox"/>	MiniGantt <input checked="" type="checkbox"/>
2011-06-07 09:08:50 GMT	Seattle, USA	2.038s	Successful			
2011-06-07 09:08:49 GMT	Virginia, USA	1.265s	Successful			
2011-06-07 08:39:29 GMT	Virginia, USA	1.325s	Successful			
2011-06-07 08:39:29 GMT	Seattle, USA	1.553s	Successful			

### Configuration

This job is running  Firefox 3.5.5 on RHEL5

#### Parameters

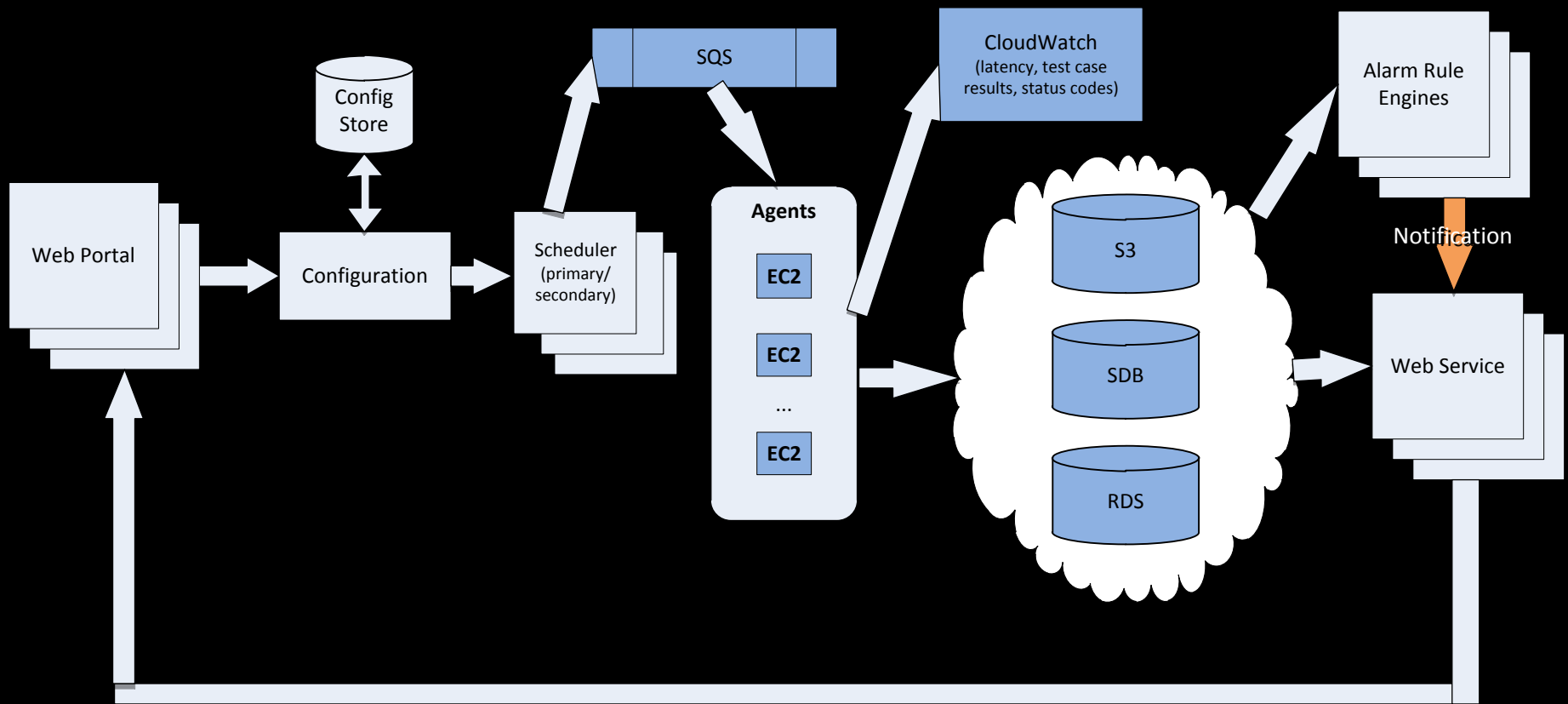
- URL: *www.amazon.ca*
- Window size (w x h): 1280 x 10024
- ATF Threshold:  $x = \infty$ ,  $y = \infty$

# The Problem

- The system has lots of moving parts
- It must run in an external data center
- It must scale up quickly
- Development team is two people

# The Solution

- Use as many AWS services as possible



# Results

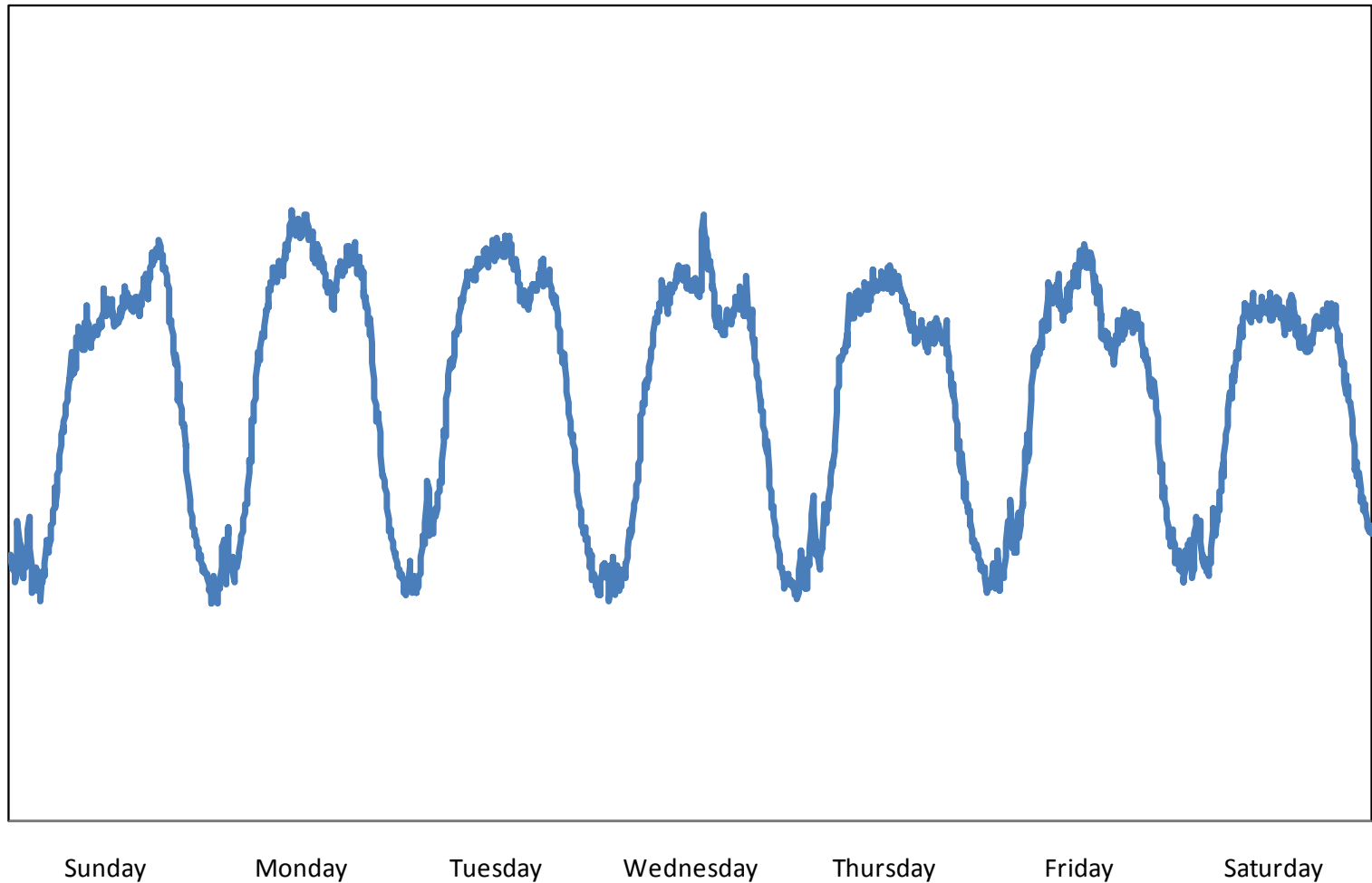
- Launched without having to negotiate any new datacenter co-lo presence
- True external performance metrics
- We can test site features in development that have not yet launched
- The system scales horizontally to large amounts of traffic

# What about amazon.com web servers?

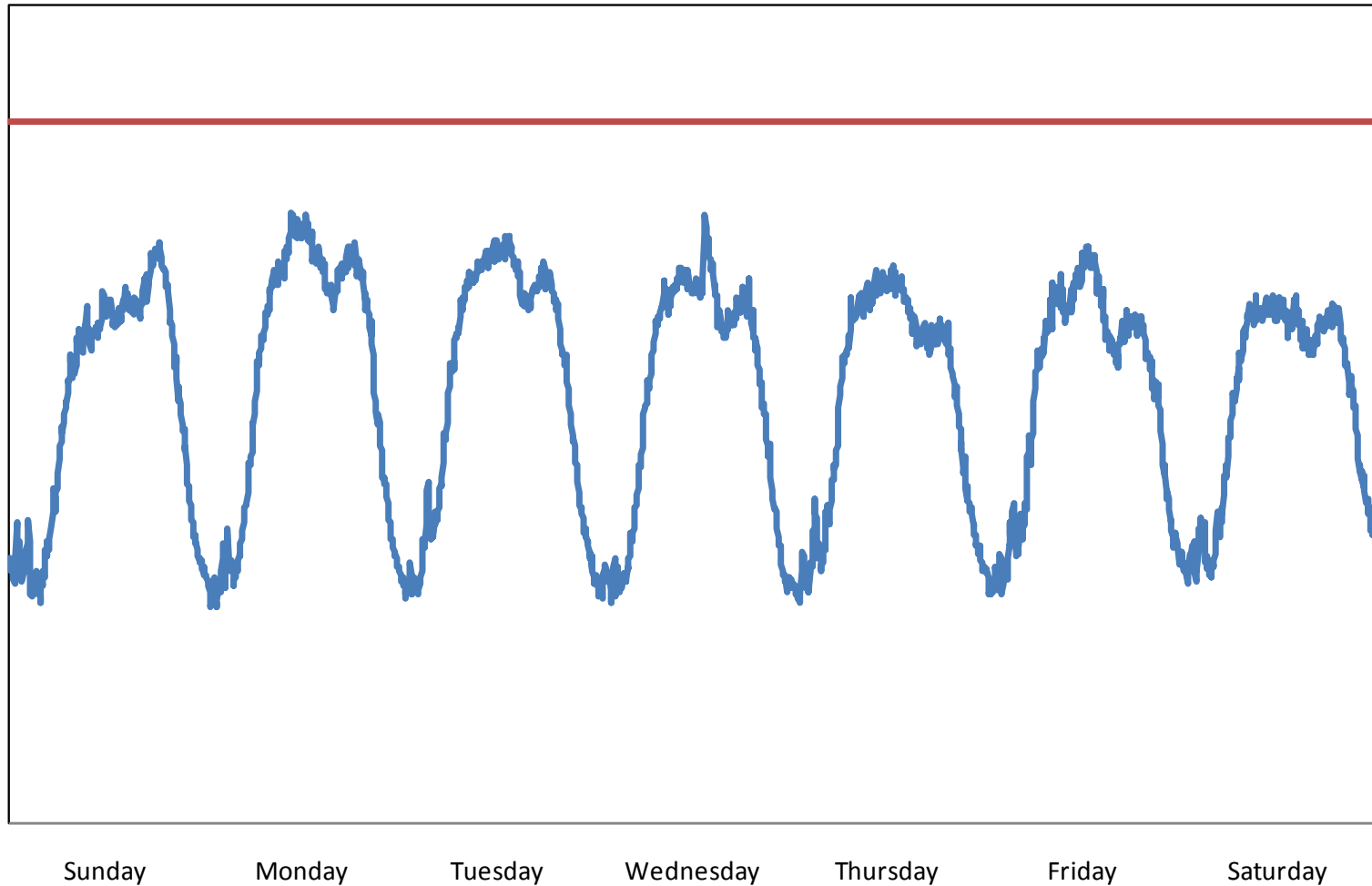




## Typical Weekly Traffic to amazon.com



## Typical Weekly Traffic to amazon.com



Sunday

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

1995

1996

1997

1998

1999

2000

2001

2002

2003

2004

2005

2006

2007

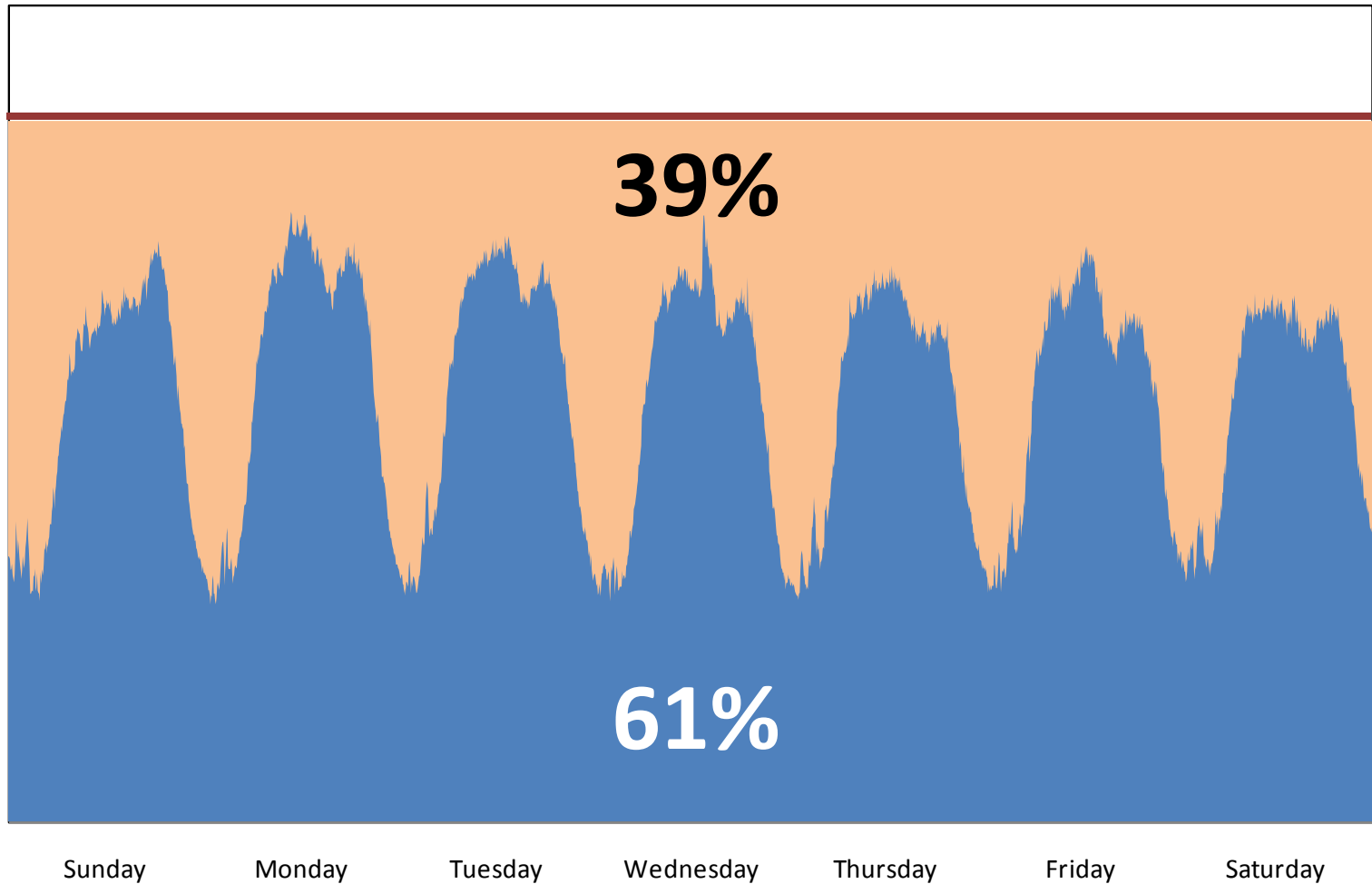
2008

**2009**

2010

2011

## Typical Weekly Traffic to amazon.com



Sunday

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

1995

1996

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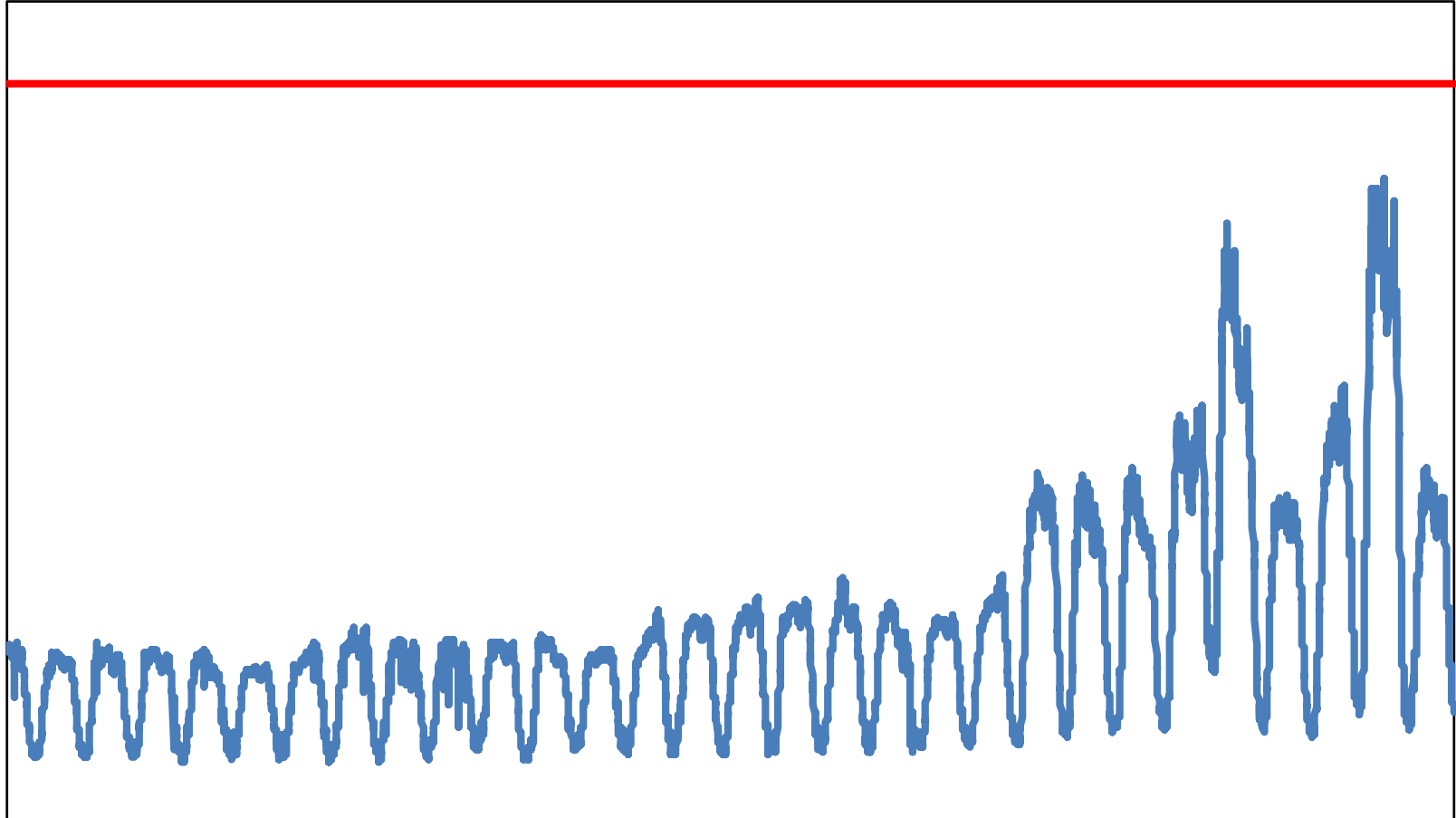
2008

**2009**

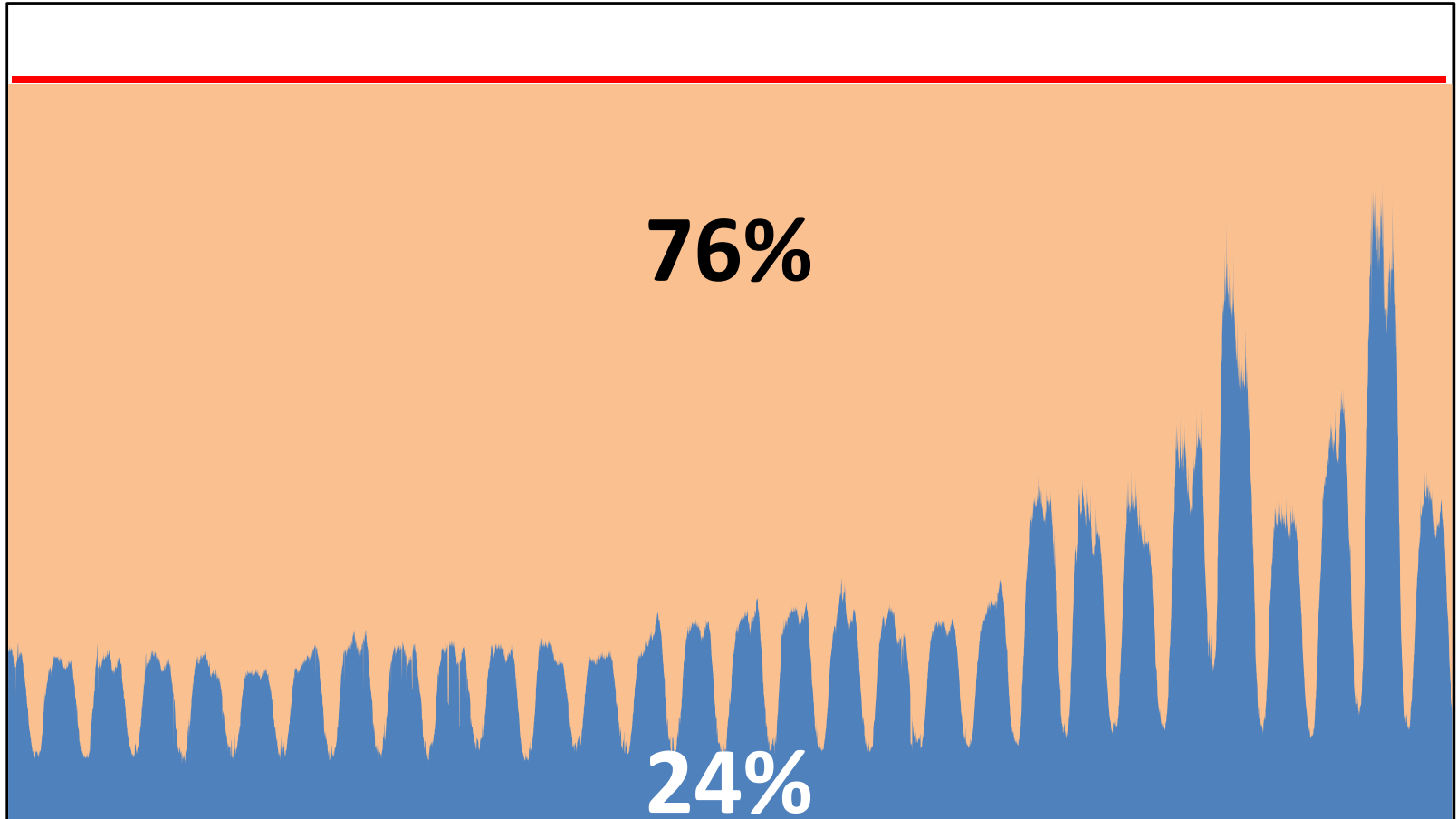
2010

2011

## November Traffic for amazon.com



## November Traffic for amazon.com

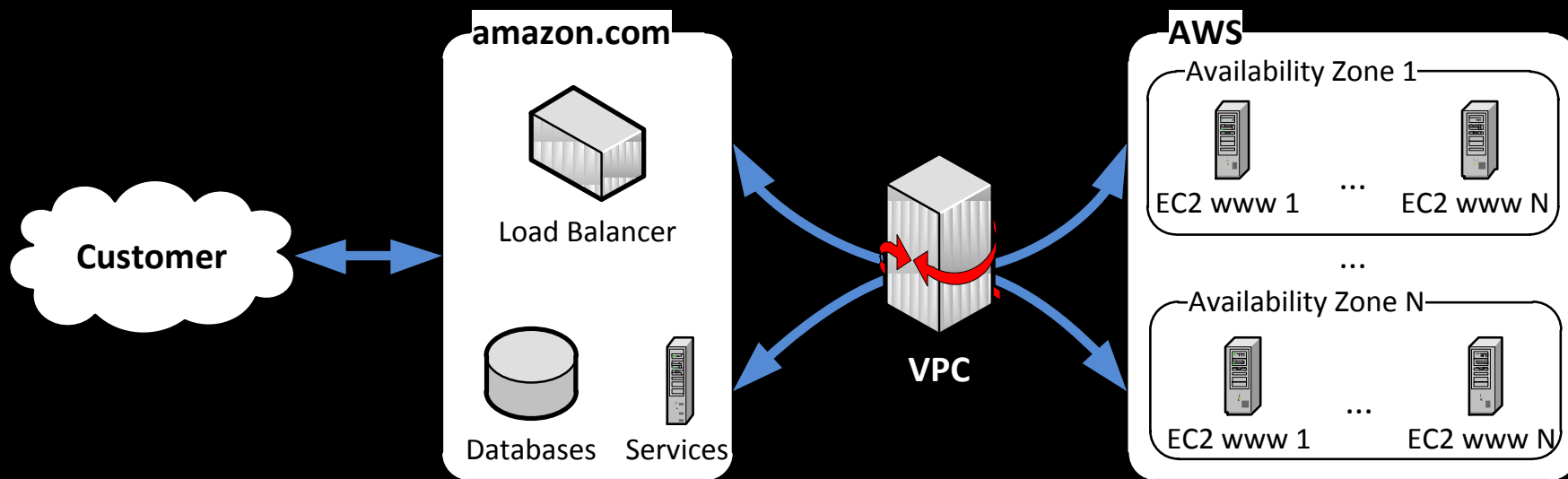


# The Problem

- Retail web site hardware is underutilized
- Load spikes require heroic effort
- Scaling is non-linear

# The Solution

- Migrate the entire [www.amazon.com](http://www.amazon.com) web server fleet to AWS



# November 10, 2010





# Results

- All traffic for [www.amazon.com](http://www.amazon.com) is now served from AWS
- We can dynamically scale the fleet in increments as small as a single host
- Spike loads can be handled with ease

# Lessons learned



# Business Lessons

- No more lease returns!
- Less time spent on capacity planning
- Fewer conversations with finance
- More innovation
- Happier developers
- I get credit for AWS price reductions
- Consider compliance issues and regulations

# Technical Lessons

- Identify reusable components
- Start with simple applications
- Iterate toward your desired end-state
- Engage security early and treat them as partners
- Migrate to the cloud in concert with your other architectural objectives
- The cloud can't cover up sloppy engineering

