

O'REILLY*

Velocity

Web Performance
and Operations

🌐 London, England

📅 2-4 October 2012

EUROPE

Building a Faster
and Stronger Web

Reaching China with Your Website & Cloud Application: The Hard Truth

Presented by Jerry Miller, VP of Technology

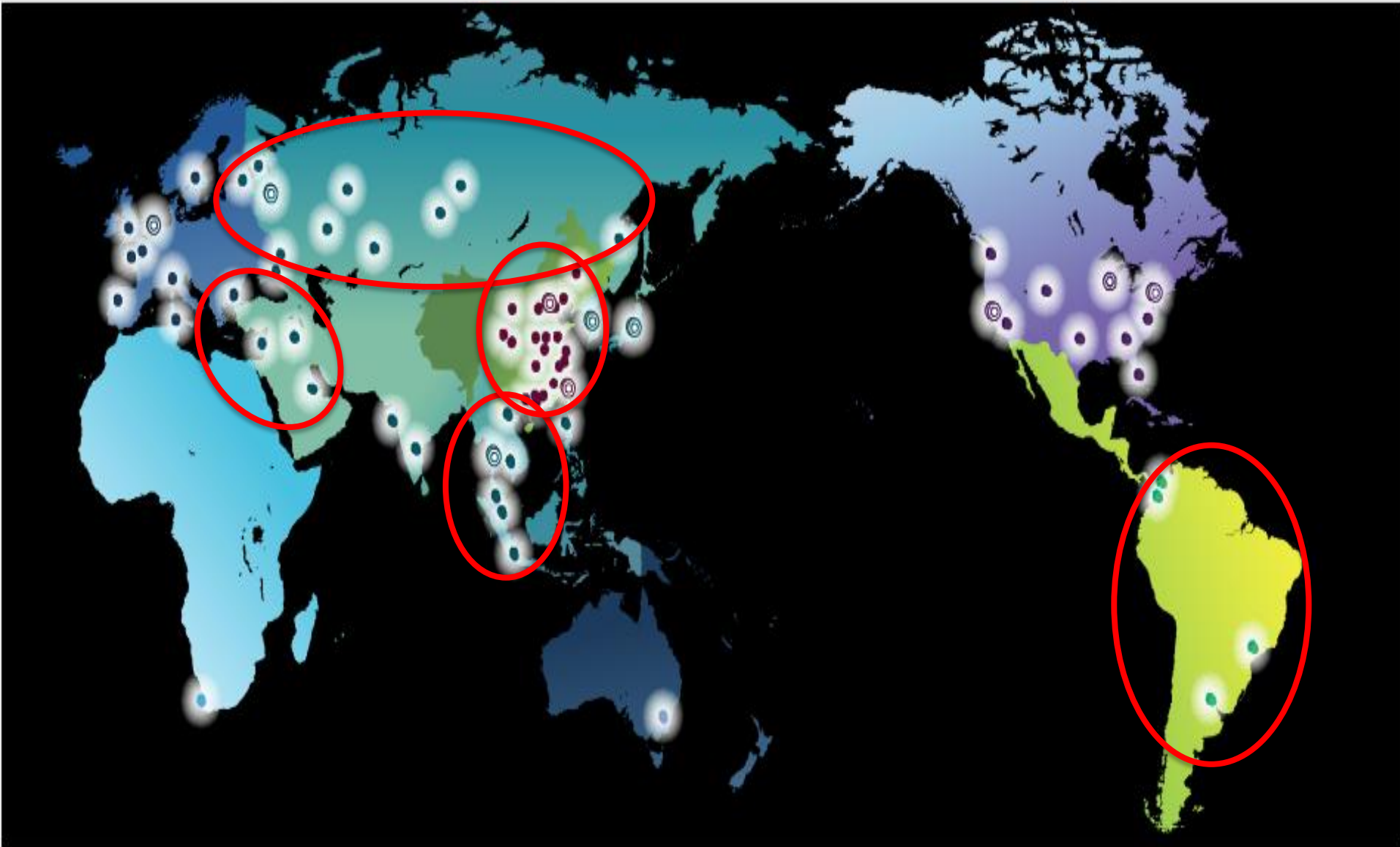
Jerry.Miller@cdnetworks.com

01

CDNetworks

- The Global Cloud Acceleration Network
- Transforming the Internet into a secure high performing application delivery network
- Trusted partners in local markets
- ***Experts on extending into global markets***

Over 100 POPs Spread Globally



Over 24 POPs in China



解决方案

行业用户

公司

技术支持

全球站点

联系我们



网络性能套件

动态加速

静态加速

视频加速

云存储

云DNS

云负载均衡

统计后台

动态加速

- ✓ In China since 2006 : Local people with strong relationships
- ✓ CDNetworks has its own POPs, Office, NOC, HW, SW in China
- ✓ Experts on the Great Firewall, regulations, and licensing
- ✓ Experts on Web and Application Performance

Sample China Customers



HISTORIC FUTURES
the future is history



www.mobstudio.com



NET-A-PORTER.COM



AGENDA

1. China : The Opportunity
2. Network Latency
3. Peering : Why It Matters
4. Some Data
5. Navigating Regulations
6. Case Studies

BRIC – Key Growth Markets

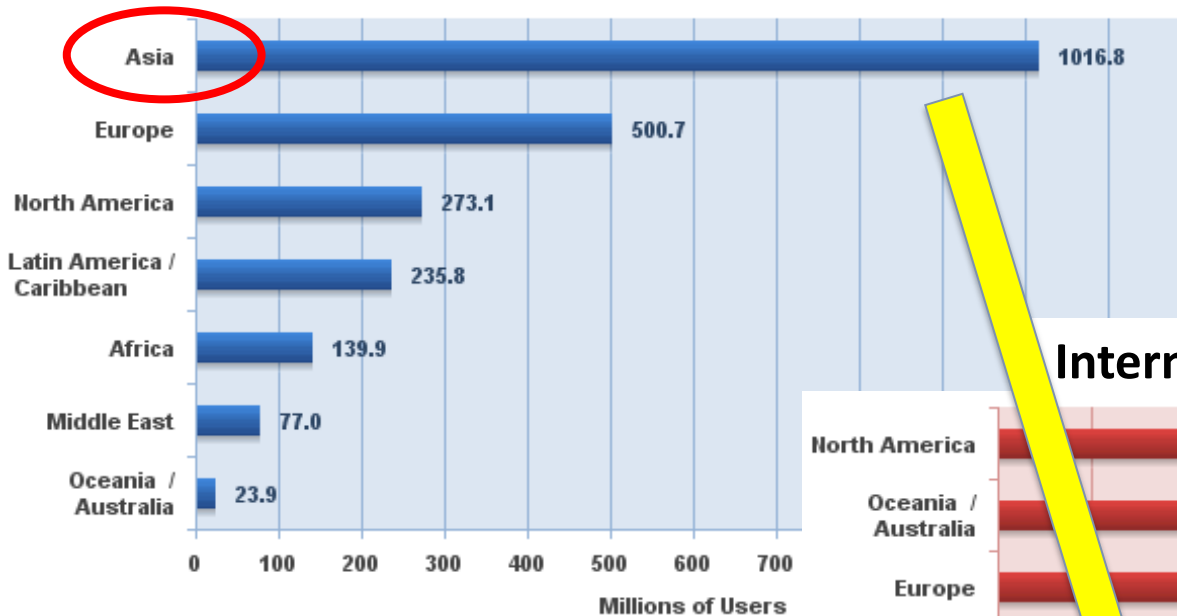
Internet Penetration and Users by Country



Source: pharma7cee.com, "How Do We Spend our Time Online?" May 2012

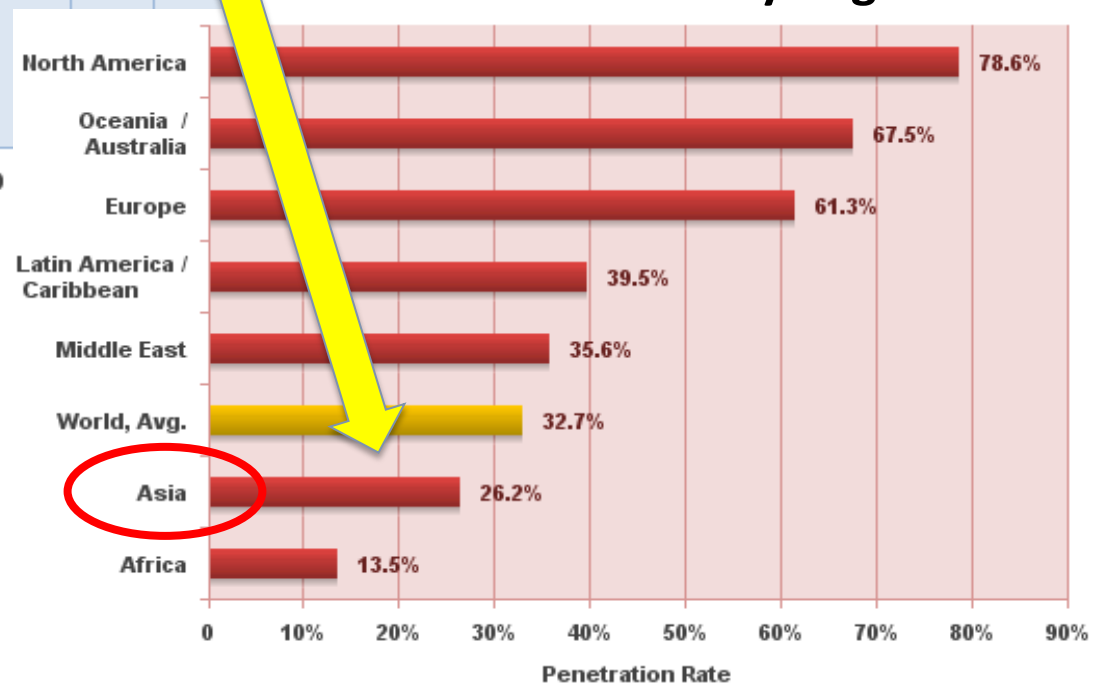
Emerging Markets

Internet Users by Region



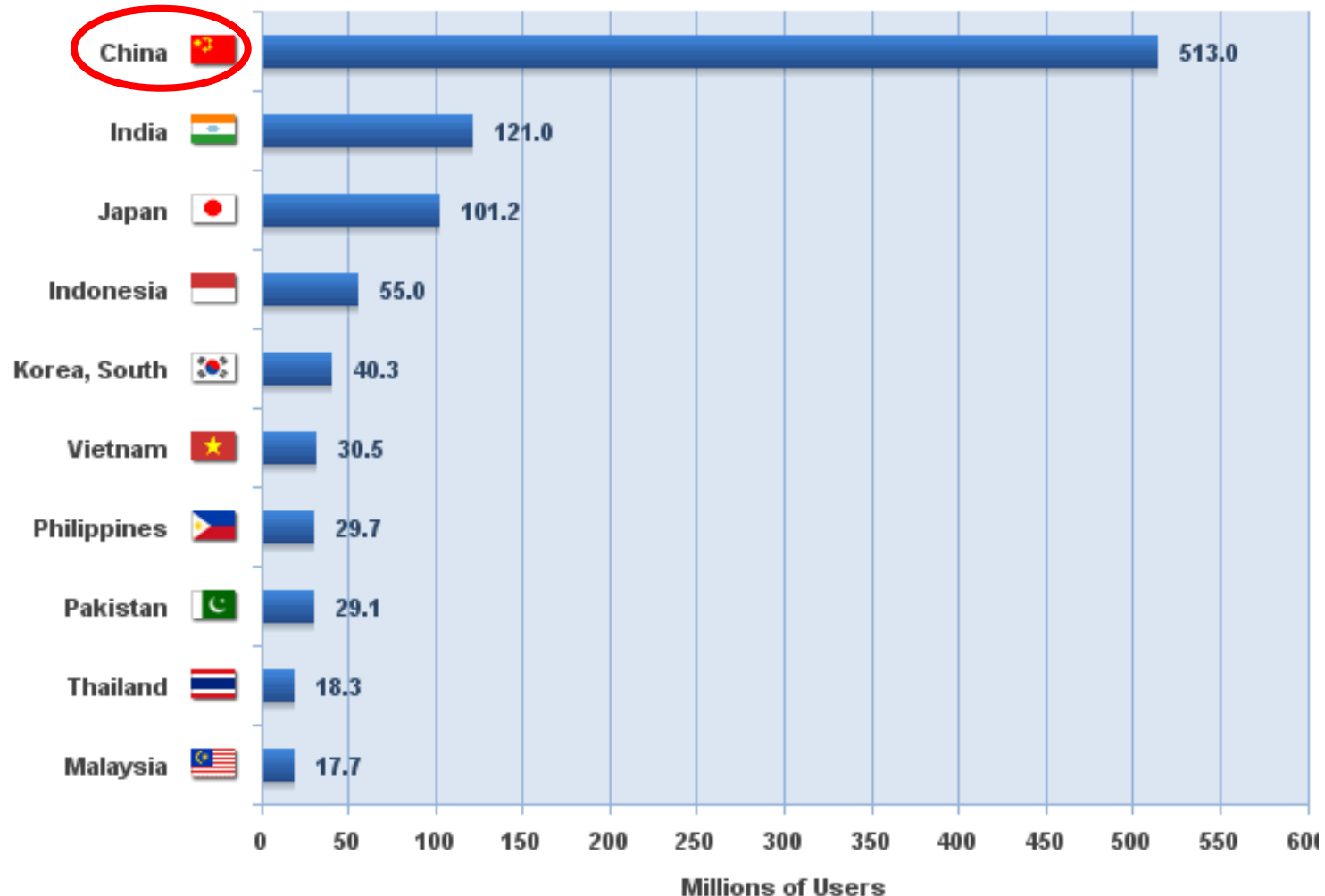
**Lots of room
for growth**

Internet Penetration by Region



China – Dominant Asian Market

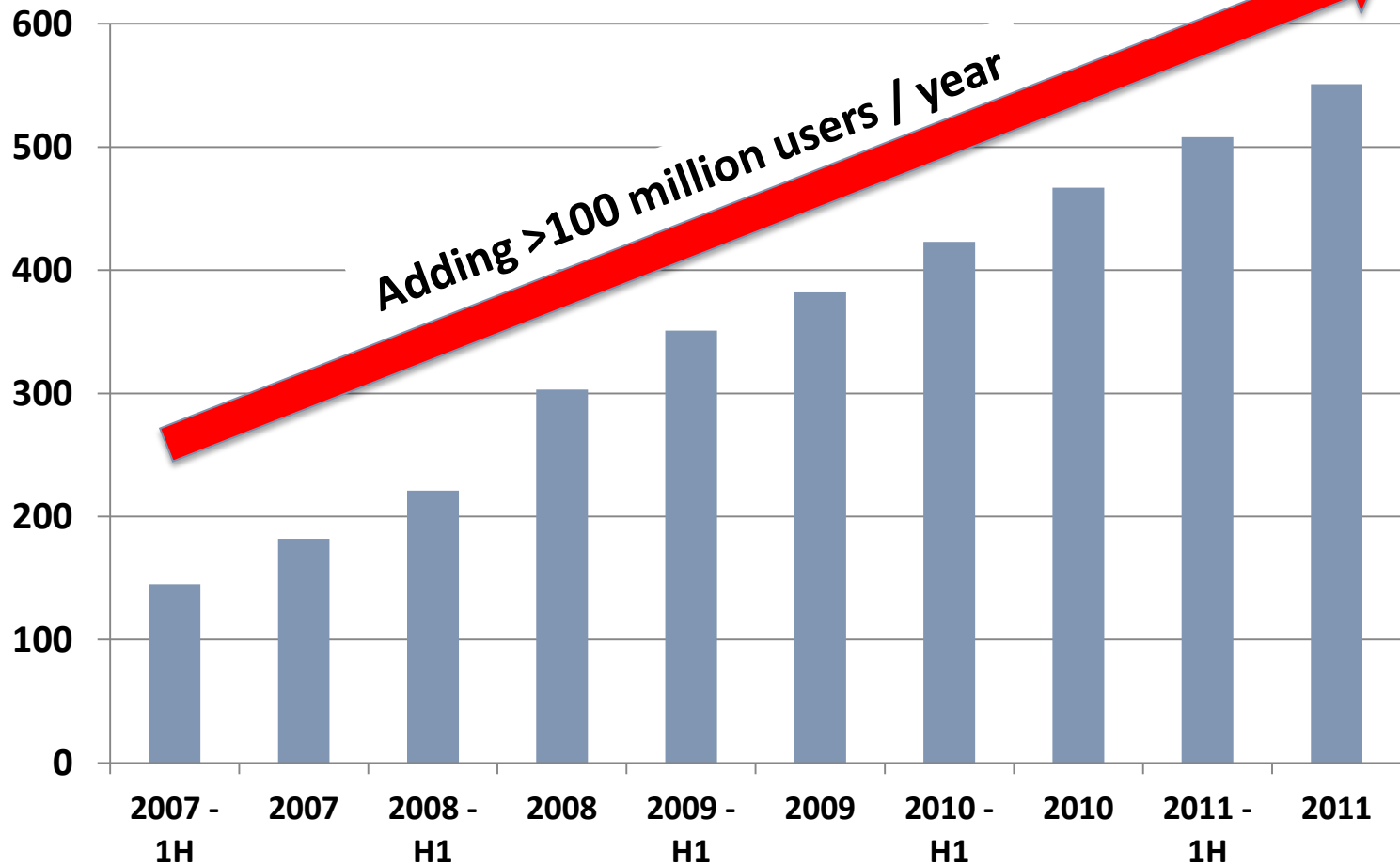
Top Internet countries in Asia, 4Q2011



Source: Internet World Stats – www.internetworldstats.com/stats3.htm
Copyright : 2012, Miniwatts Marketing Group

...And Growing Fast

China Internet Users

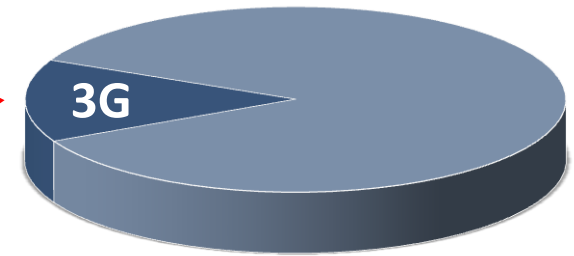


Source: www.resonancechina.com/2011/07/28/total-chinese-internet-users-to-reach-551mm-by-2012

Still Lots of Slow Connections

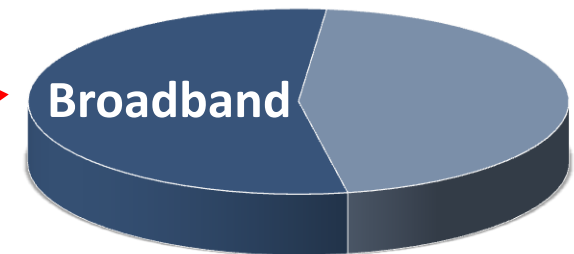
- Over 1 billion mobile subscriptions

- BUT, only 144 million are 3G



- Over 284 million fixed line subscribers

- BUT, only 155 million are broadband



→ **Fast sites/apps are critical with slow connections**

Slower Sites Lose Revenue

- Compuware study across 150 million page views:
 - Page view time from 2 sec to 4 sec = **8% abandonment**
 - Page view time from 2 sec to 6 sec = **25% abandonment**
- Aberdeen Group in 2008 study:
 - 1-second response delay = **11% fewer page views**
7% fewer conversions
- Equation Research in 2009 study:
 - **58% of mobile users** expect sites to download as fast as home PC
 - **88% of consumers** are less likely to return to a site after a bad experience

Sources: Compuware, "Why Web Performance Matters,"
Aberdeen Group, "The Performance of Web Applications," and
Equation Research, "Why the Mobile Web is Disappointing End-Users"

Slower Sites Lose Revenue

Current

Revenue per year:
\$18,000,000

Monthly Unique Visitors: 400,000



Average Order Value: \$75



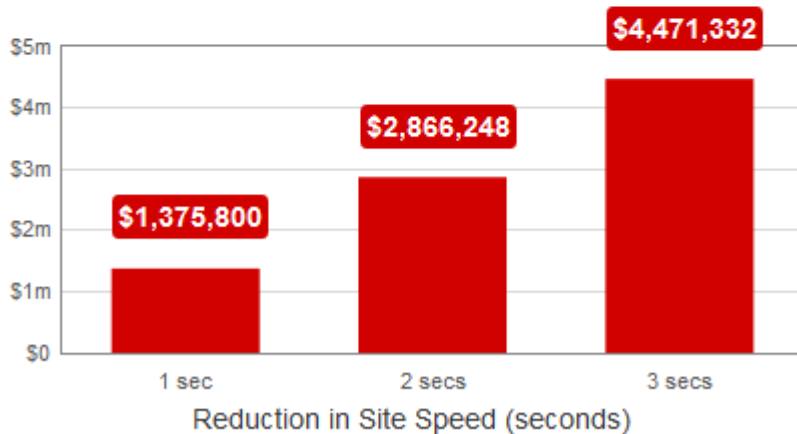
Conversion Rate: 5%



Site Speed: 10 seconds



Estimated Revenue Gain



Tools to correlate
slowness with lost
revenue

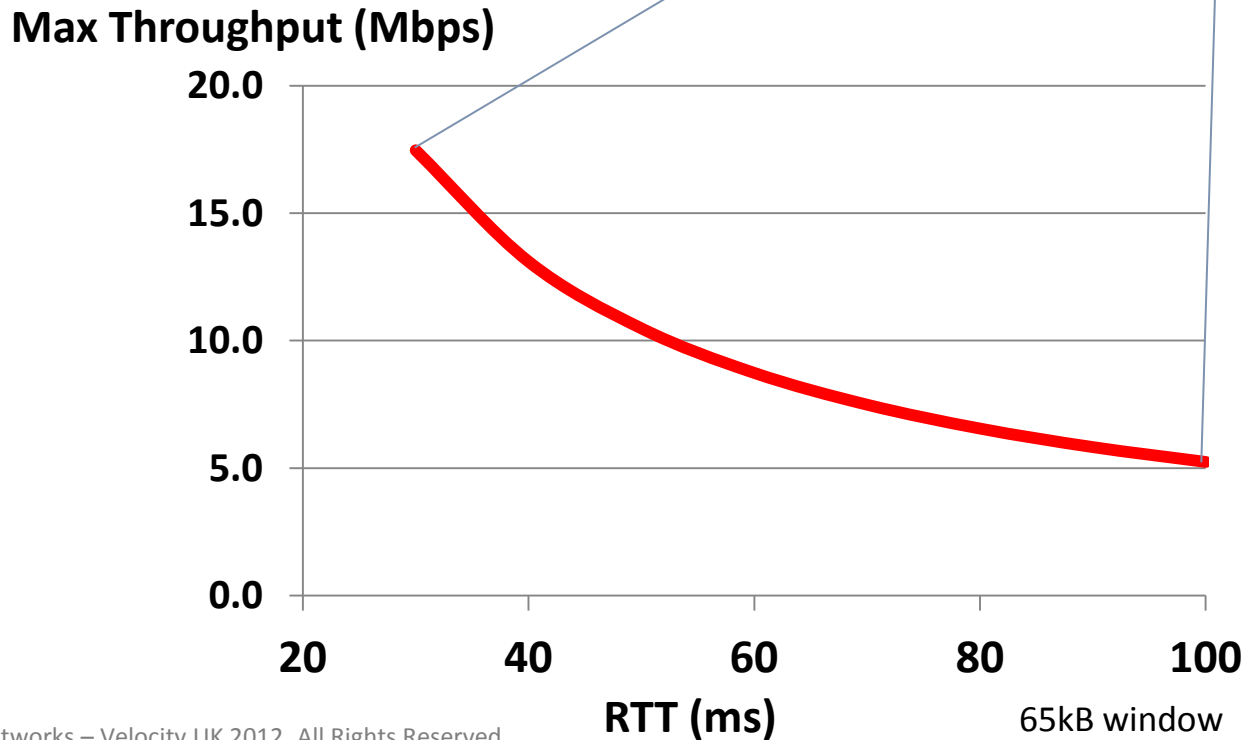
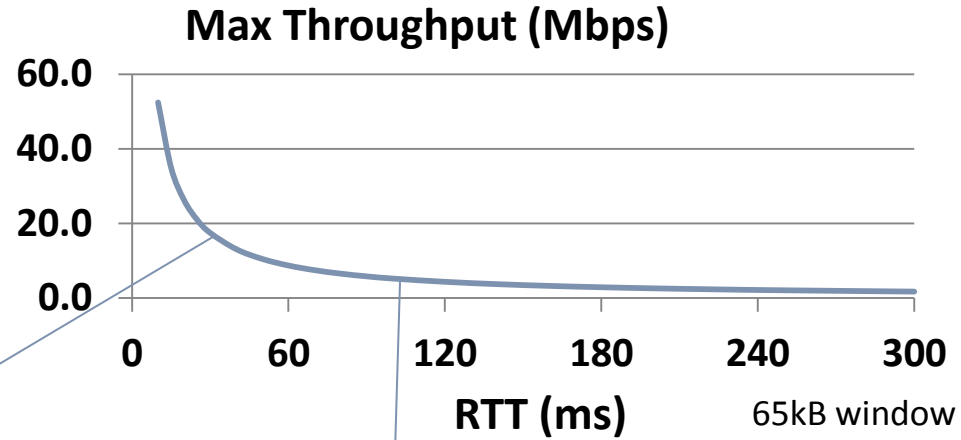
e.g., tool from Tagman
(e-commerce)

02

Network Latency

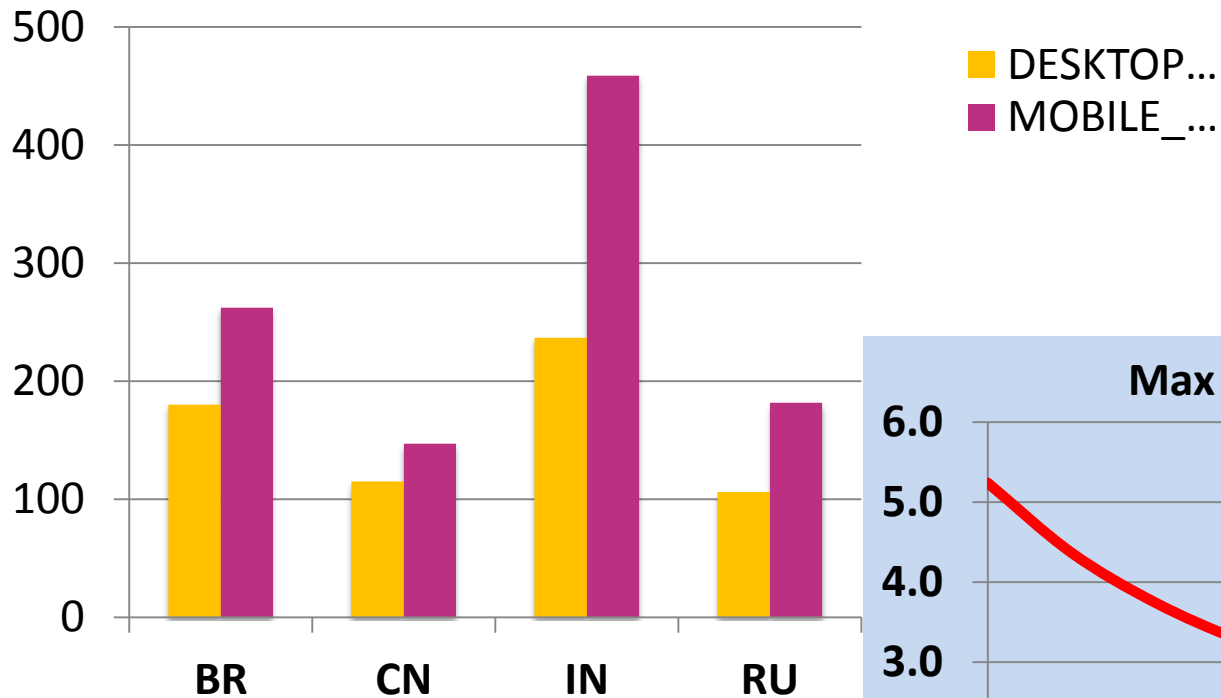
TCP Math

$$\text{Throughput} \propto \frac{1}{RTT \sqrt{\text{pkt loss}}}$$

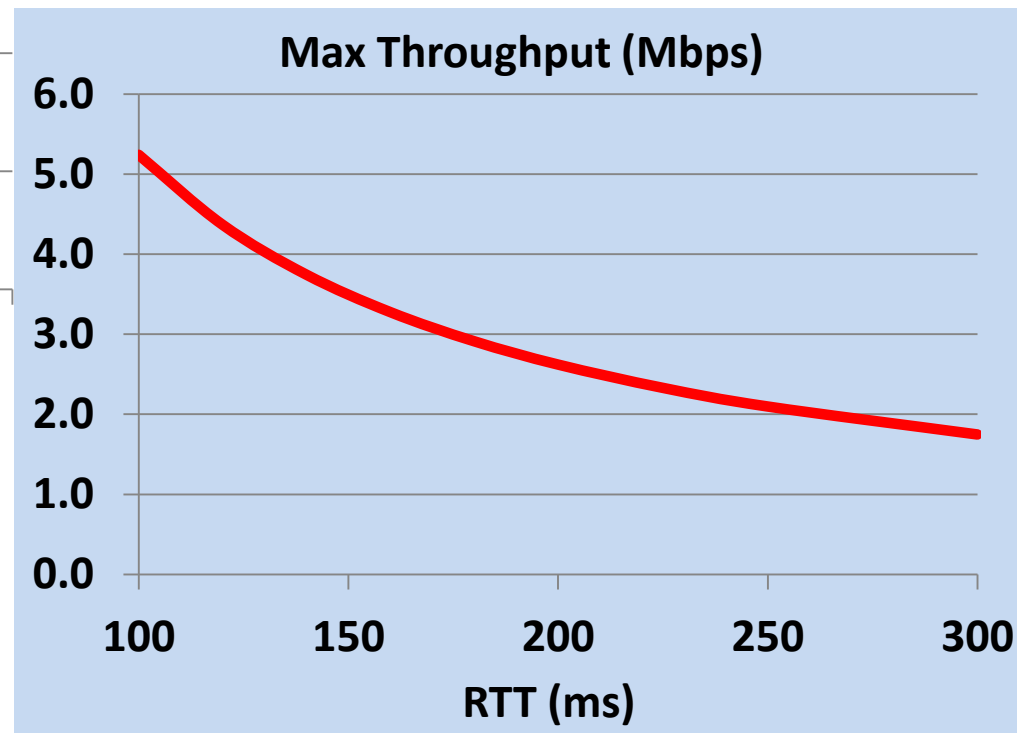


30ms → 100ms
70% reduction!

Average RTT (in ms)



This is for traffic going through a CDN!



Source: Cedexis raw data, Sept. 2012

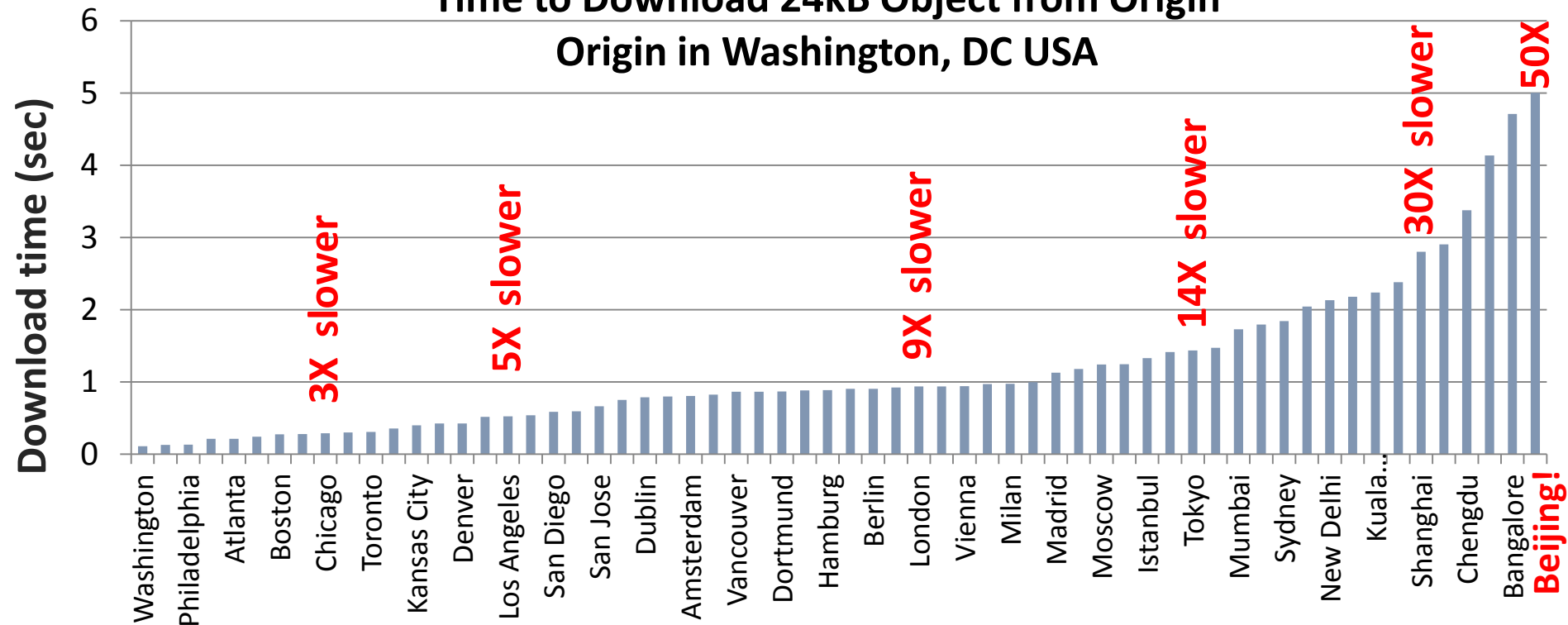
Latency

“Site performance degrades as distance increases”

= More distance → Higher latency → Longer RTT

→ Slower download → Slower page load

Time to Download 24kB Object from Origin
Origin in Washington, DC USA

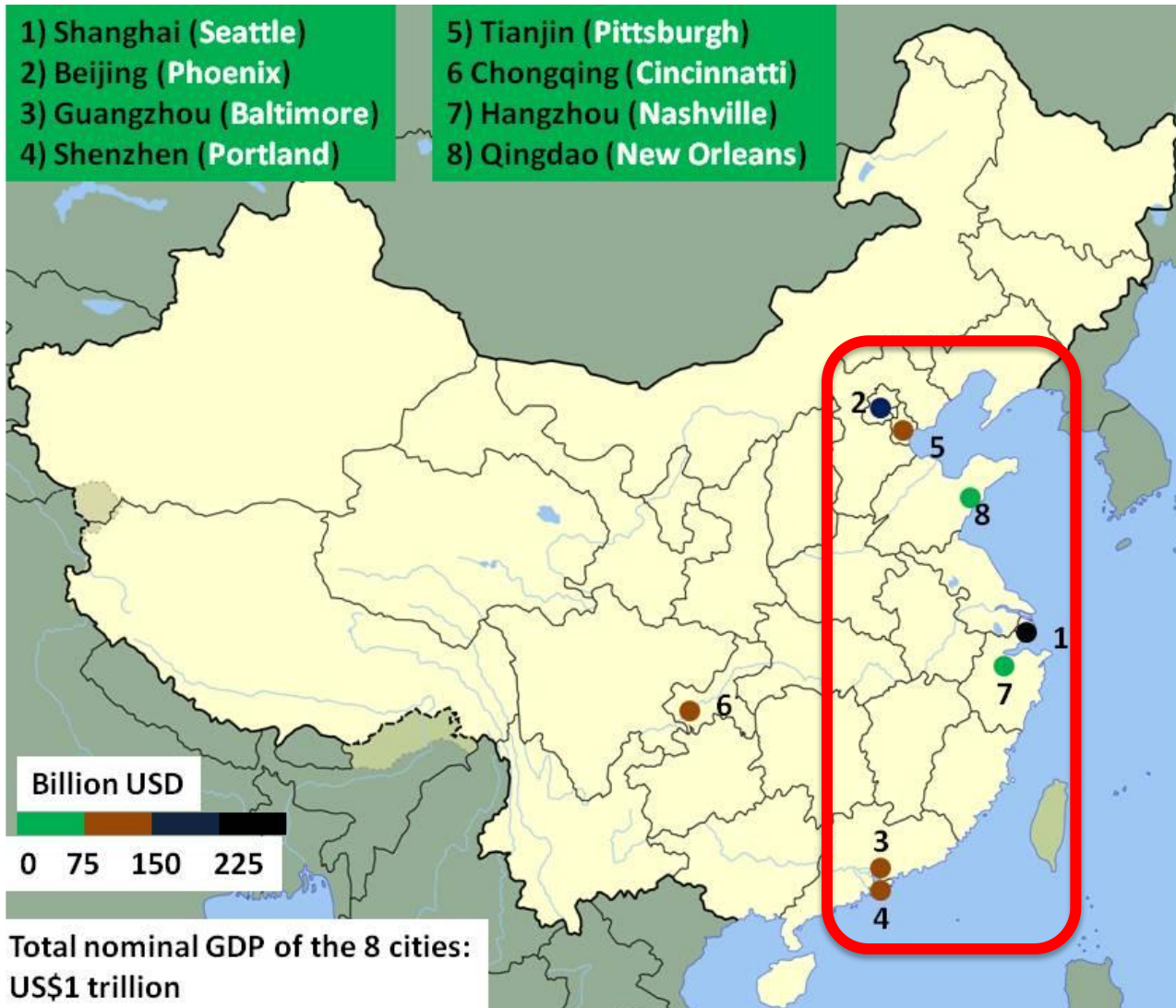


Source: Compuware Gomez backbone agents

China Geography



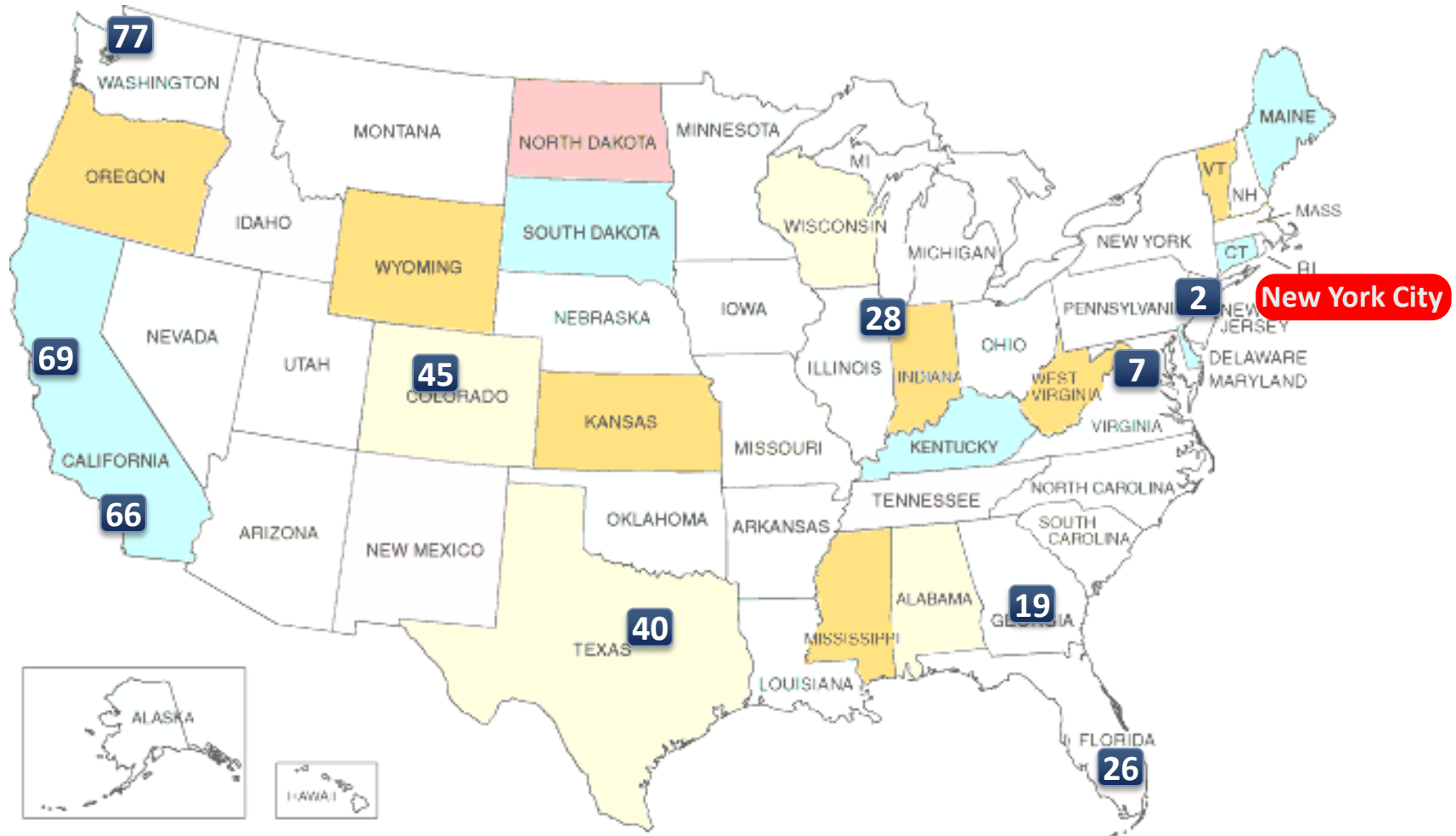
Major Cities in China



Source: National Bureau of Statistics, IHS Global Insight, China SignPost™ 2009

In-Country Latency (USA)

Backbone Latencies from New York City



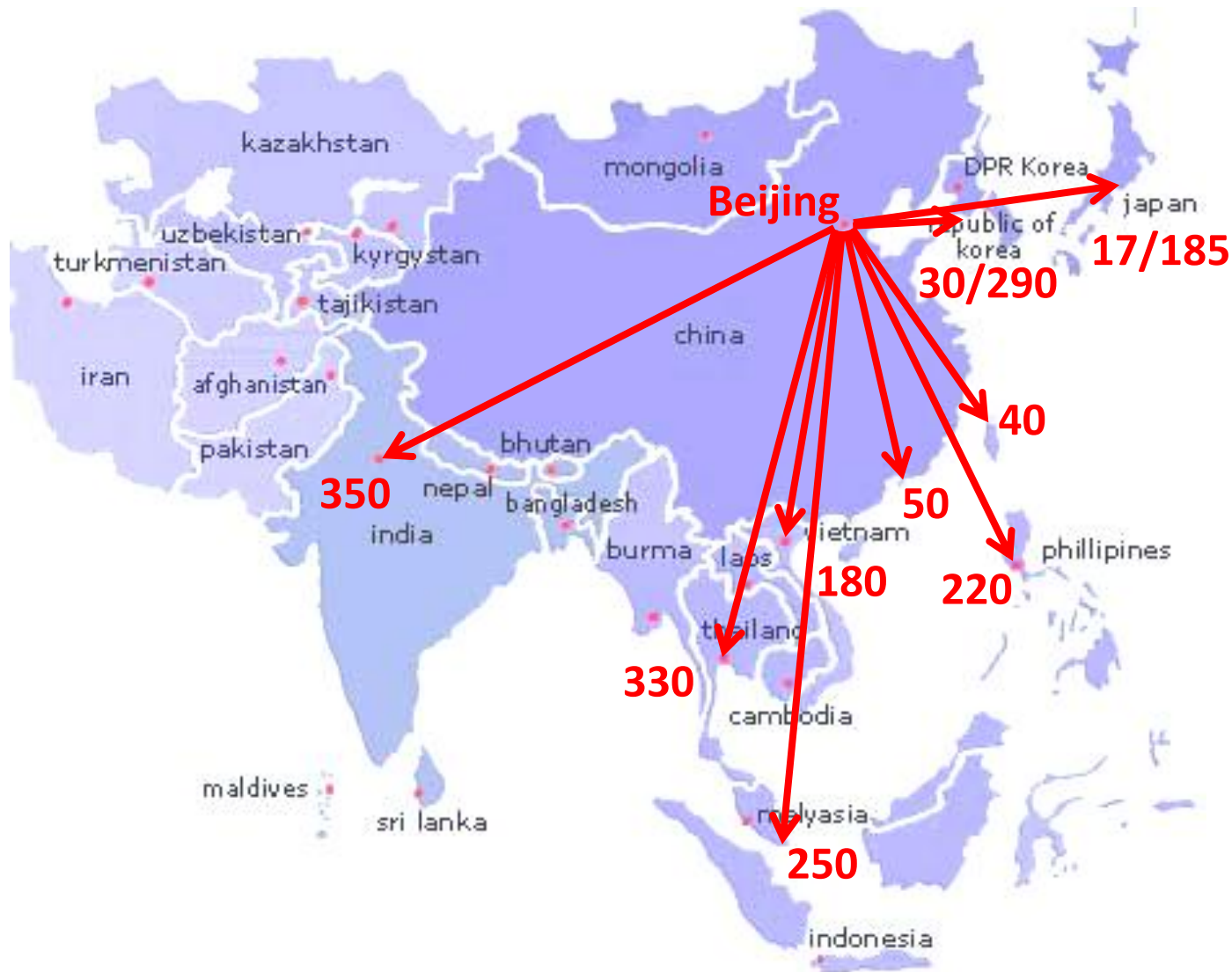
Source: CDNetworks network monitoring POP latencies, Oct 2012

Backbone Latencies from Beijing



Source: CDNetworks network monitoring POP latencies, Oct 2012

International Latencies



Source: CDNetworks network monitoring POP latencies, Oct 2012

03

Peering : Why It Matters

Networks in China



- China Telecom : ~~400~~ ³⁰⁰ million lines (2012)
- China Unicom : ~~380~~ ²²⁰ million lines (2012)
- China Mobile : ~~680~~ ⁶⁰ million users (2012)
- CERNET : >20 million scholars (2006)
- 21 ViaNet
- China Railcom

Excludes 2G subscribers

Source: respective sites



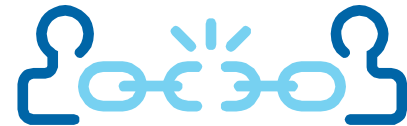
Why should you care about peering?

In a perfect world, everything gets to where it's going

- No loss/QoS/congestion/filtering/deprioritizing/etc.

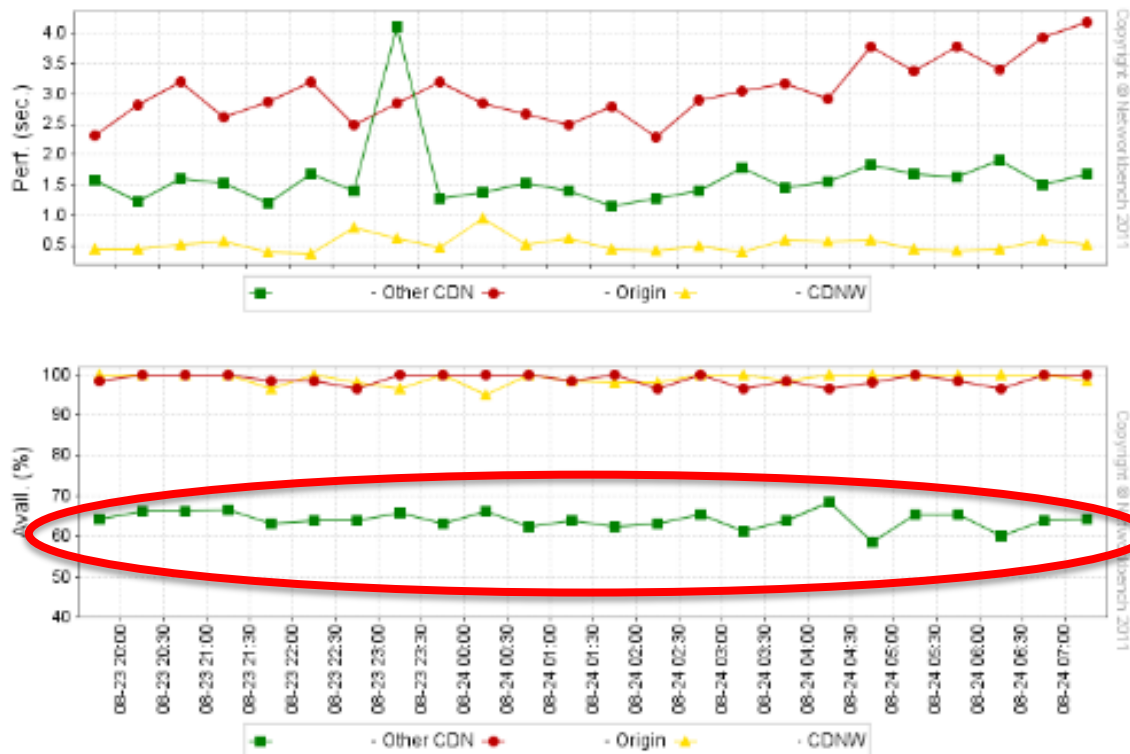
In reality peering matters, especially in China

- Sub-optimal routing = more latency
- Congested links = packet loss
- Different ISP filters = inconsistent results



Poor Peering = Poor Availability

Performance and availability history (08/23/2012 19:45 - 08/24/2012 07:45) [X]



61kB image (cacheable)
Origin in Dallas, USA

CDNetworks
vs. origin
vs. other CDN

**100.0% availability
can not be
assumed for China**

Task name	Data-points	Perf. (sec.)				Avail. (%)					
		Avg.	Best	Worst	Avg.	Best	Worst				
- Other CDN	1362	1.610	08/24 01:45	1.159	08/23 23:15	4.111	64.097	08/24 04:15	68.42	08/24 04:45	58.49
- Origin	1351	3.054	08/24 02:15	2.286	08/24 07:15	4.190	98.743	08/23 20:15	100.00	08/24 06:15	96.43
- CDNW	1348	0.523	08/23 22:15	0.370	08/24 00:15	0.940	99.036	08/23 19:45	100.00	08/24 00:15	94.83

Source: NetworkBench results, Aug. 2012

Congestion Is a Real Problem

PoP	Packet Loss	PoP to PoP								
<u>p0-ty</u> ShanXi	7 Avg 100 Max 0 Min	64 pops % loss <table border="1"><tr><td><u>p6-can</u></td><td>100 %</td></tr><tr><td><u>v0-pkv</u></td><td>100 %</td></tr><tr><td><u>p59-icn</u></td><td>100 %</td></tr><tr><td><u>p1-kul</u></td><td>40 %</td></tr></table> Show All...	<u>p6-can</u>	100 %	<u>v0-pkv</u>	100 %	<u>p59-icn</u>	100 %	<u>p1-kul</u>	40 %
<u>p6-can</u>	100 %									
<u>v0-pkv</u>	100 %									
<u>p59-icn</u>	100 %									
<u>p1-kul</u>	40 %									
<u>p6-can</u> Guangzhou	7 Avg 70 Max 0 Min	64 pops % loss <table border="1"><tr><td><u>p4-icn</u></td><td>70 %</td></tr><tr><td><u>p2-fra</u></td><td>30 %</td></tr><tr><td><u>p1-cpt</u></td><td>30 %</td></tr><tr><td><u>p2-tsn</u></td><td>20 %</td></tr></table> Show All...	<u>p4-icn</u>	70 %	<u>p2-fra</u>	30 %	<u>p1-cpt</u>	30 %	<u>p2-tsn</u>	20 %
<u>p4-icn</u>	70 %									
<u>p2-fra</u>	30 %									
<u>p1-cpt</u>	30 %									
<u>p2-tsn</u>	20 %									

Guangzhou, China
Pskov, Russia
Seoul, South Korea
Kuala Lumpur, Malaysia

Seoul, South Korea
Frankfurt, Germany
Cape Town, South Africa
TianJin, China

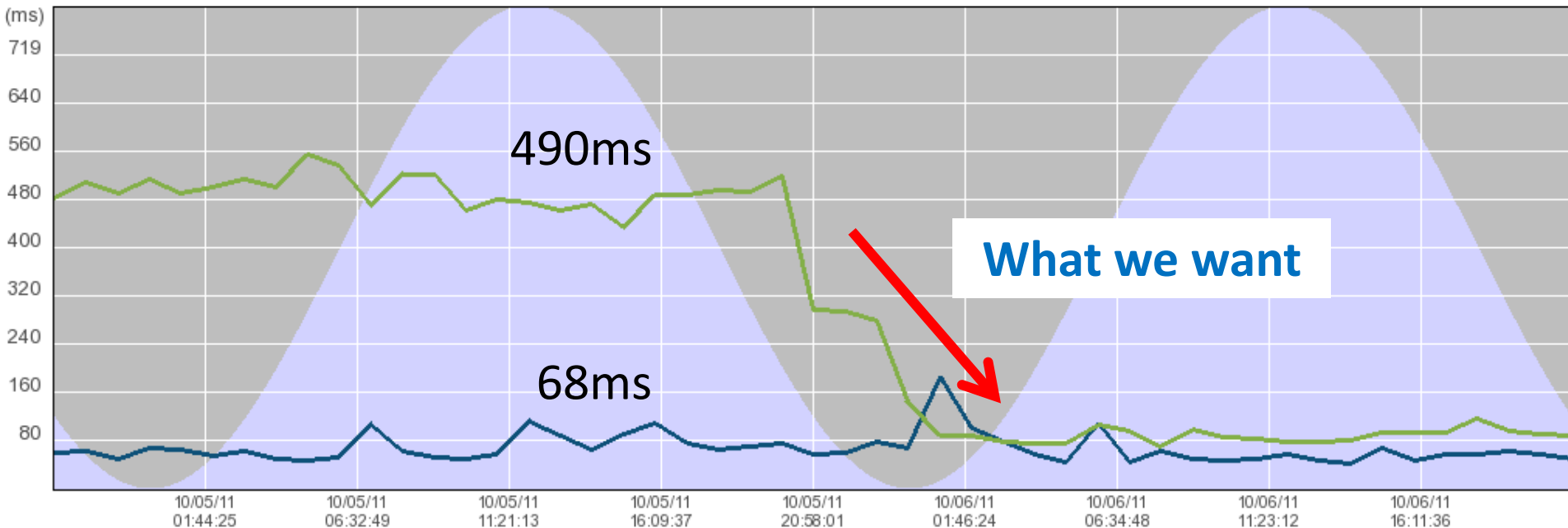
??

Need multiple POPs and smart routing

04 Some Data

Showing Performance Gains

40kB static object before and after adjustment (CNAME change)



TEST	DNS	Connect	SSL	1st Byte	Content	Total	Uptime	UIPs	U/24	Bytes
-CDNW 40KB	14	9	0	17	26	68	99.97%	444	26	39583
-ORIGIN 40KB	72	44	0	49	139	304	99.97%	367	26	39583

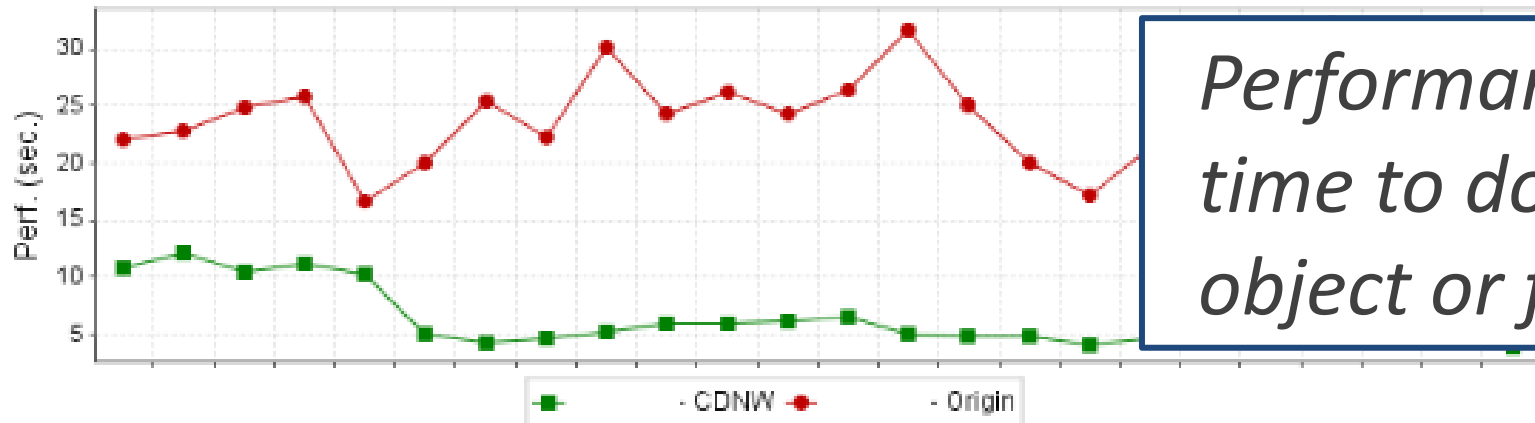


$$\text{Gain \#1} = (\text{old time} - \text{new time}) / (\text{old time}) = (490 - 68) / 490 = \mathbf{86\%}$$

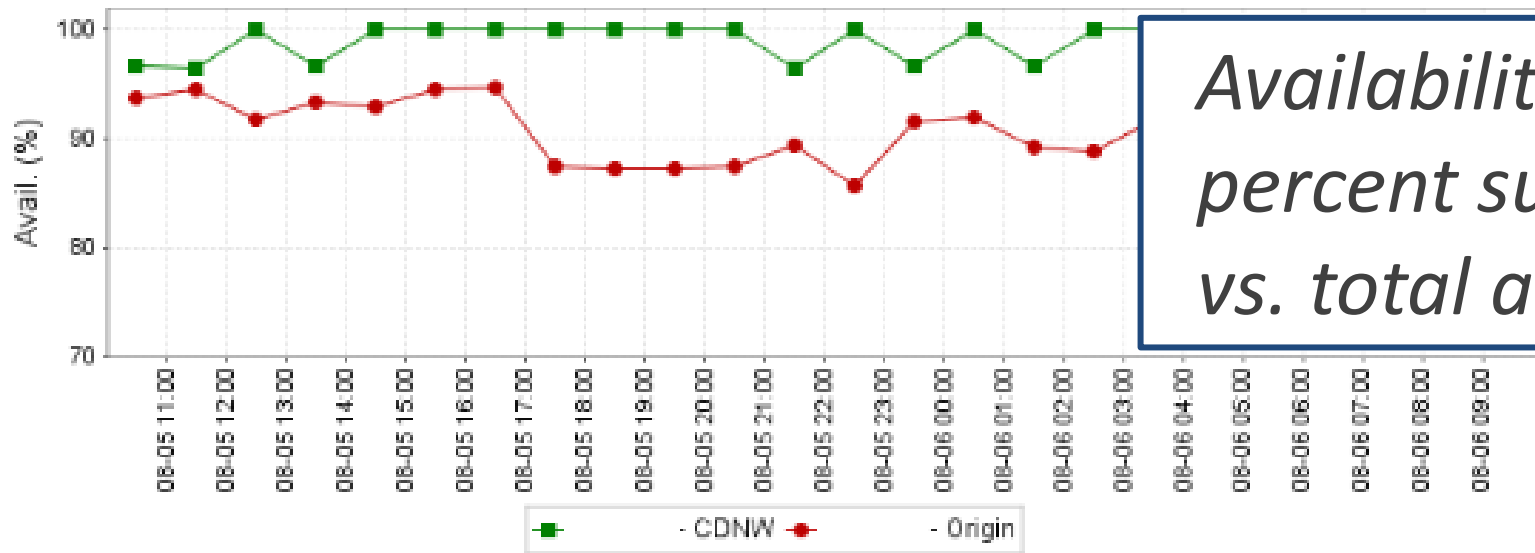
$$\text{Gain \#2} = (\text{old time} - \text{new time}) / (\text{new time}) = (490 - 68) / 68 = \mathbf{621\%}$$

Definitions

Performance and availability history (08/05/2012 10:30 - 08/06/2012 10:30)



*Performance =
time to download
object or full site*



*Availability =
percent successes
vs. total attempts*

Performance Measurements

Feature	Backbone Agent	Last-Mile Agent	Human Testing	Real User Monitoring
Test flexibility	Medium	Medium	High	Low
End user data	No	“Yes”	Yes	Yes
Test points	High	V. High	V. Low	V. High
Consistency	High	Low	Low	High
Ok for trials	Yes	Yes	Yes	No

Backbone agents are used for consistency across multiple tests / dates

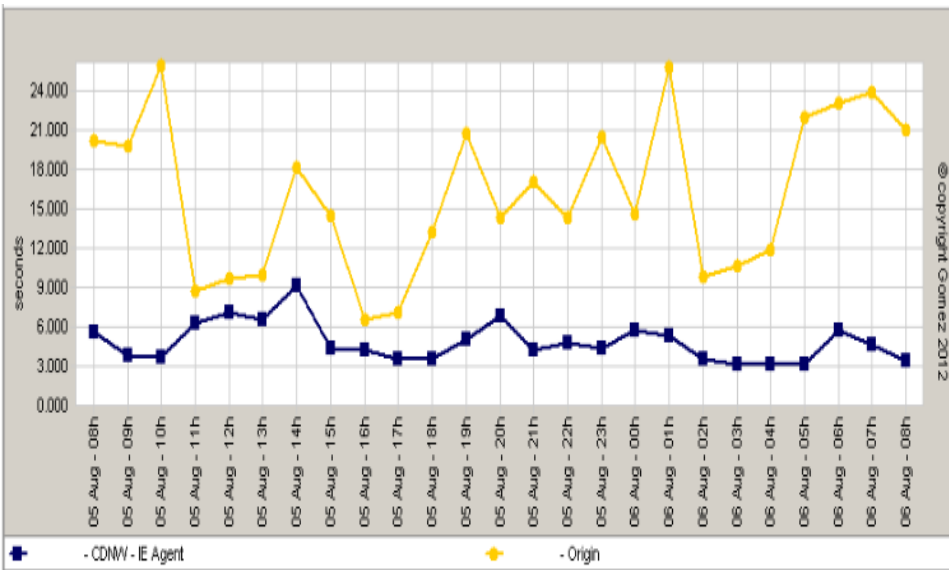
For this Presentation:

- Mostly Network Bench for measurements
 - 70 agents vs. maybe 5
 - all networks vs. CTC and/or CNC



More Agents = Better Simulation

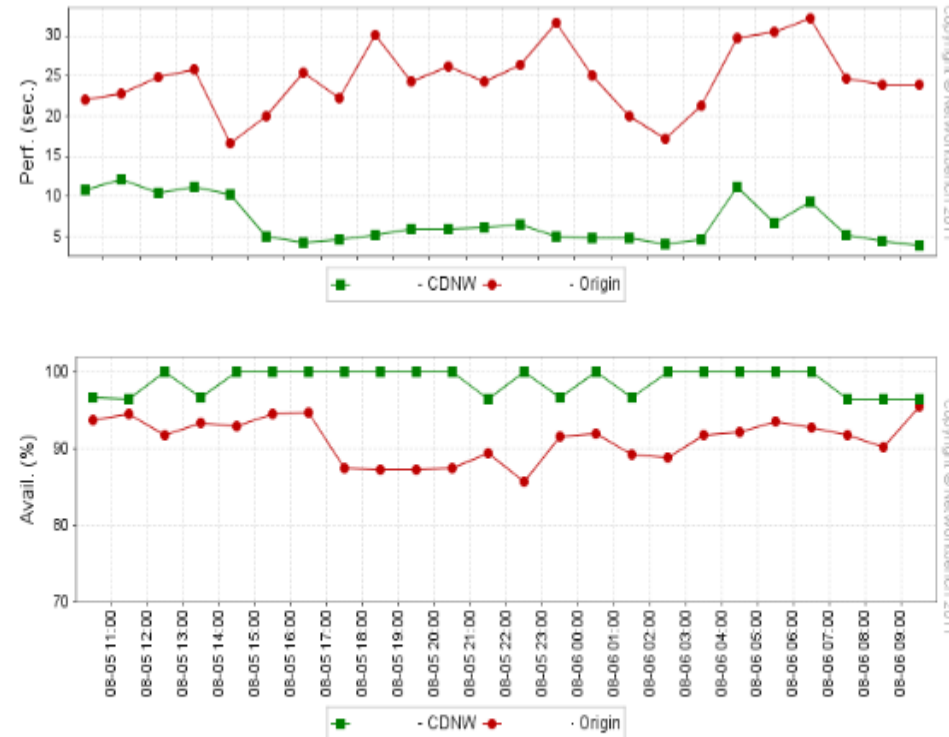
5 agents in China



Data Summary			
Test Name	Avg Response Time (sec)	Availability (%)	Details
- CDNW - IE Agent	4.858	99.59	28 28
- Origin	15.902	99.17	28 28

Performance : 16 sec → 5 sec
Availability : 99.2% → 99.6%

30 agents in China



Task name	Data points	Perf. (sec.)			Avail. (%)						
		Avg.	Best	Worst	Avg.	Best	Worst				
- CDNW	680	6.726	08/05 09:30	3.879	08/05 11:30	12.094	98.676	08/05 12:30	100.00	08/05 11:30	96.43
:- Origin	2638	24.601	08/05 14:30	16.604	08/06 06:30	32.194	91.206	08/06 09:30	95.50	08/05 22:30	85.71

Performance : 25 sec → 7 sec
Availability : 91% → 99%

Lots of Insight into China

29 cities in China with backbone agents



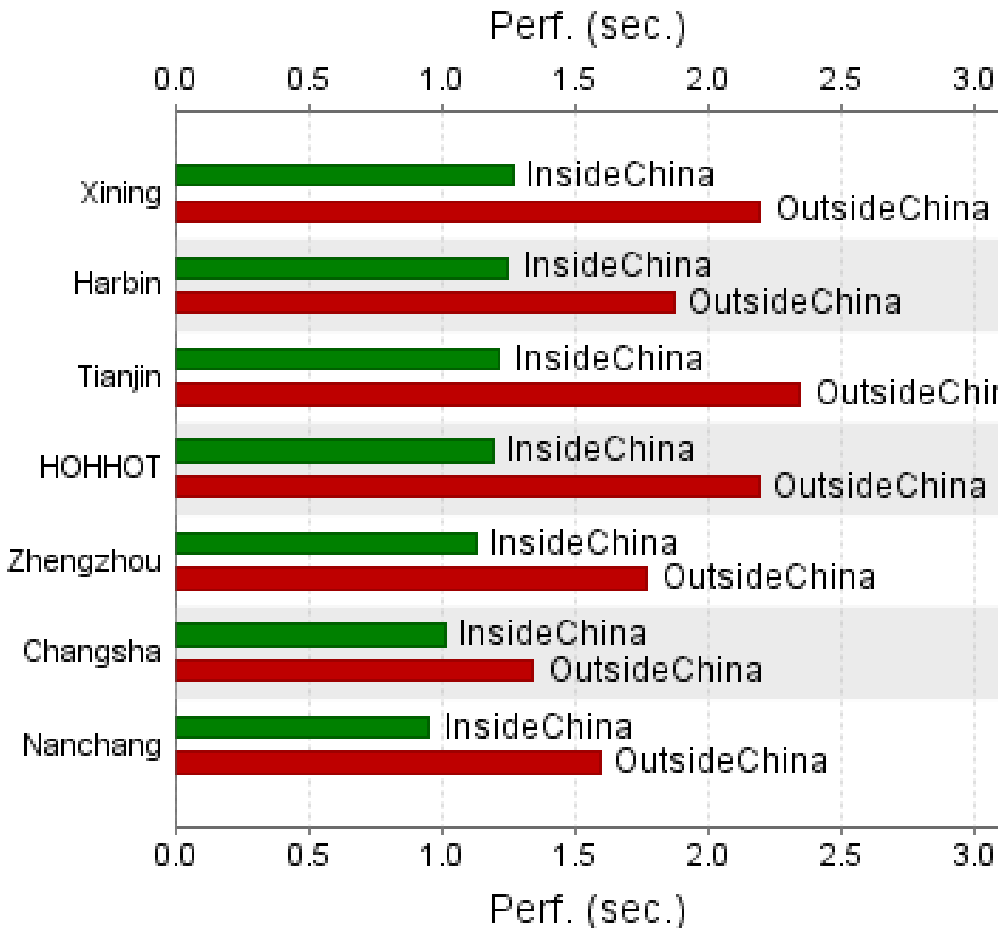
Source: CDNetworks customer results, 2012

Inside vs. Outside GFW



Outside : Hong Kong
Inside : Guangzhou
84 miles apart (<5 ms)

Inside vs. Outside GFW



64kB object download from test agents inside China

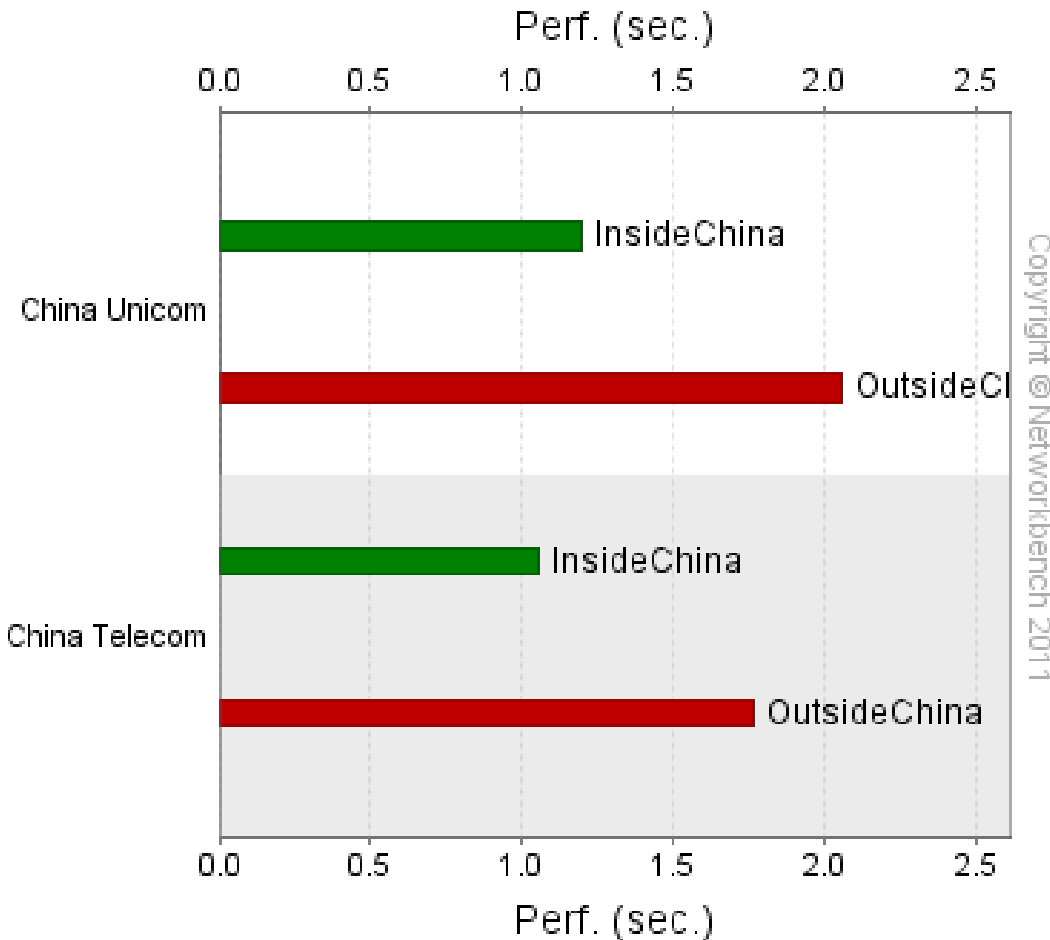
using different origins:

InsideChina = Guangzhou

OutsideChina = Hong Kong

~50% slower download

Inside vs. Outside GFW



64kB object download from test agents inside China

using different origins:

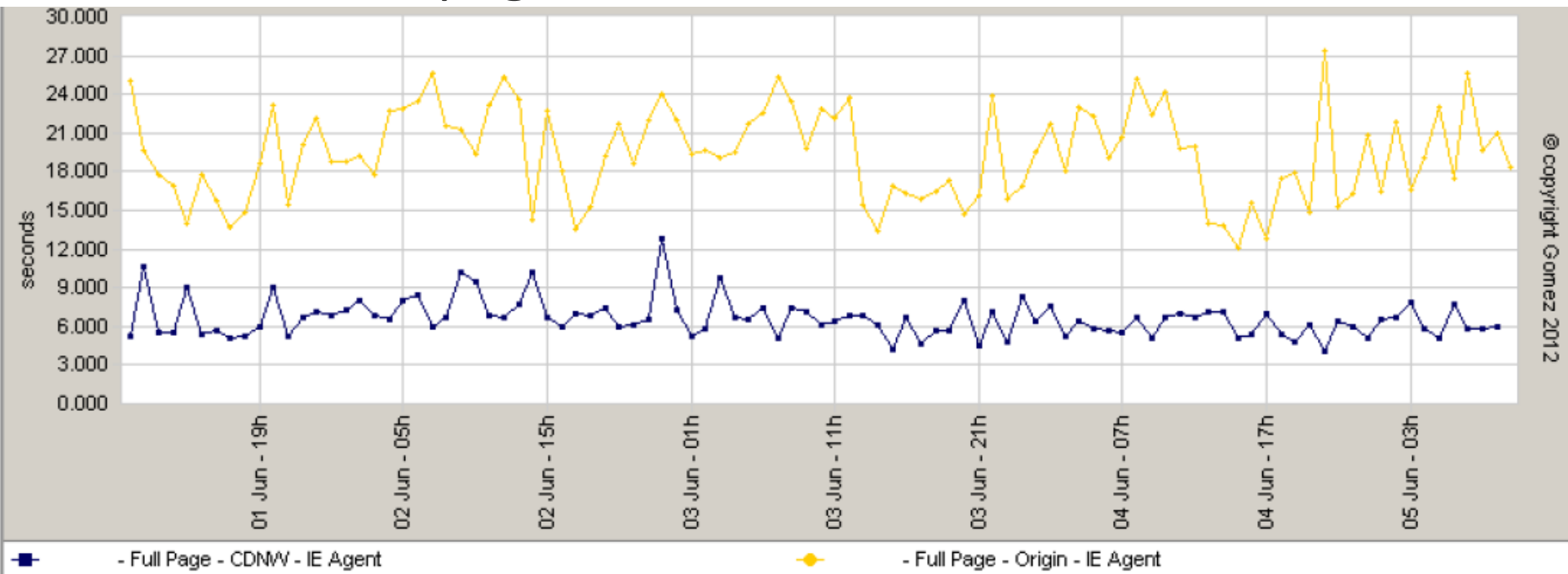
InsideChina = Guangzhou

OutsideChina = Hong Kong


Similar improvement across 2 major ISPs
Other ISPs are peered much worse!

Inside vs. Outside GFW

Full page test vs. CDN outside China

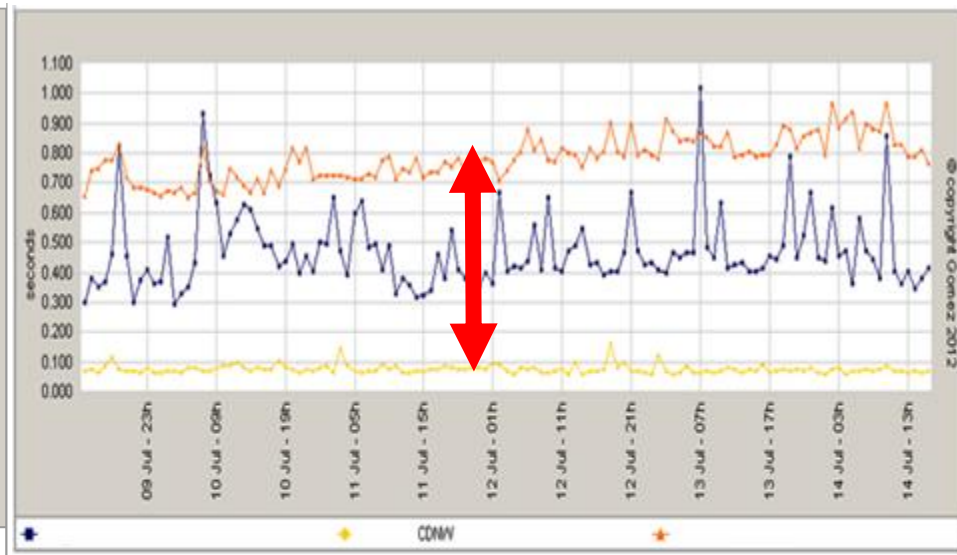
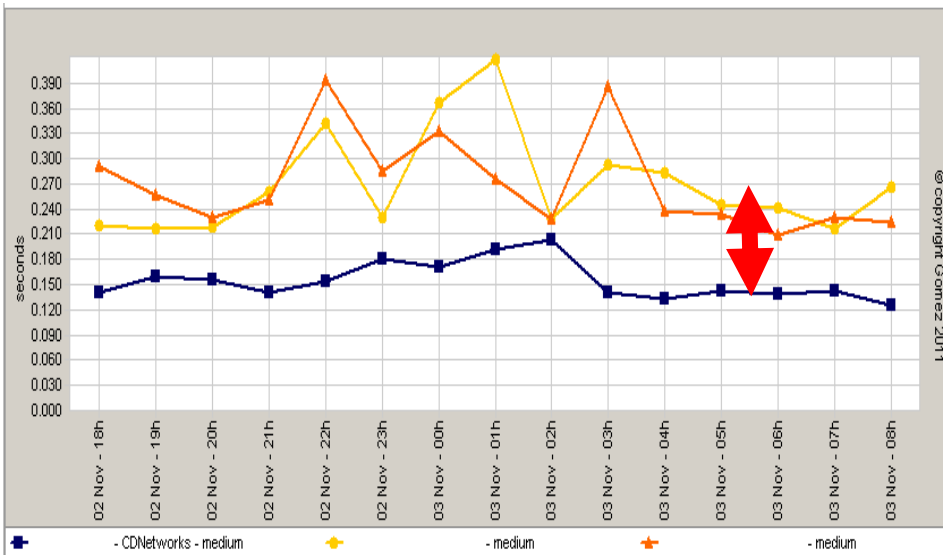


Data Summary

Test Name	Avg Response Time (sec)	Availability (%)	Details
- Full Page - CDNW - IE Agent	6.607	99.78	
- Full Page - Origin - IE Agent	19.449	97.96	

19 to 6.6 seconds → 1/3 of load time

Bigger Disparities Possible



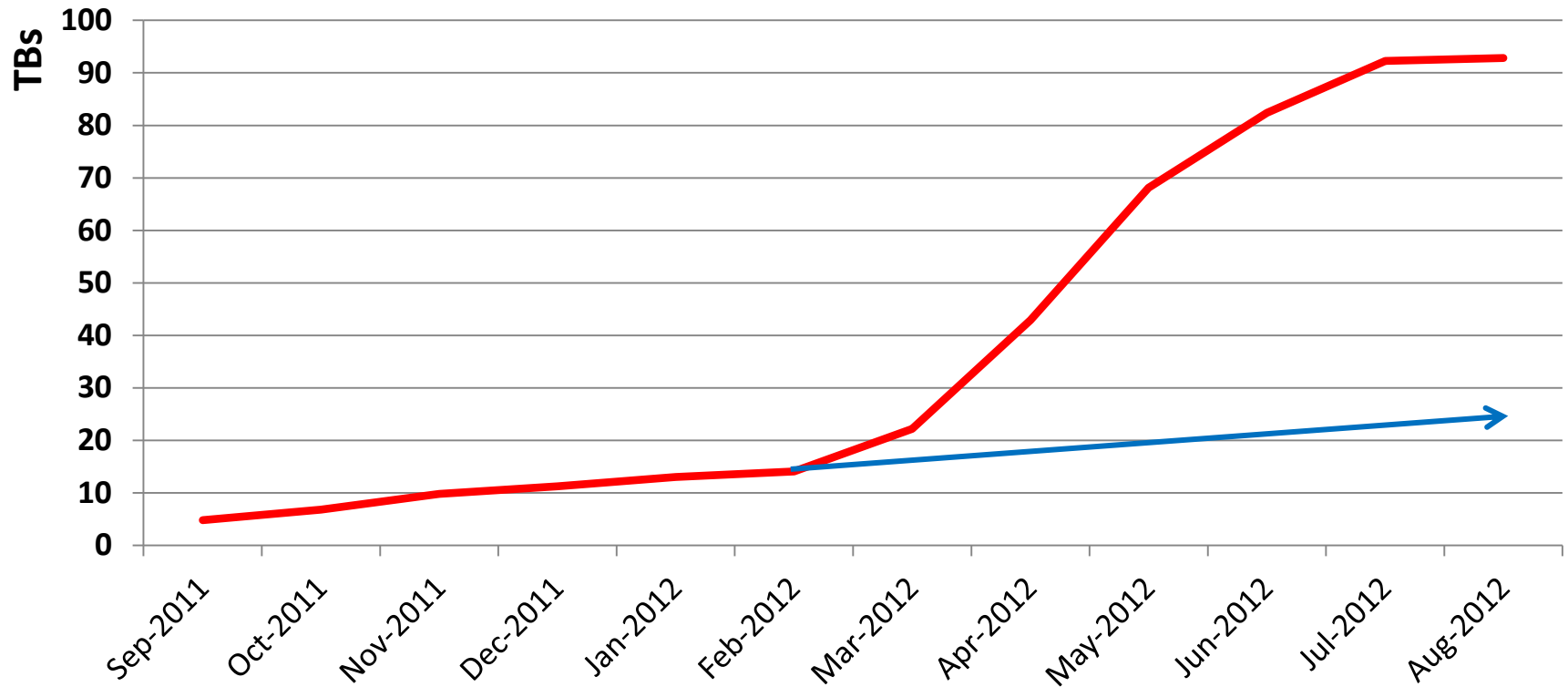
Data Summary				
Test Name	Avg Response Time (sec)	Availability (%)	Details	
- CDNetworks - medium	0.155	99.73		
- medium	0.269	98.26		
- medium	0.271	100.00		

Data Summary				
Test Name	Avg Response Time (sec)	Availability (%)	Details	
- CDNetworks - medium	0.449	99.73		
- medium	0.976	99.98		
- medium	0.767	99.99		

3 CDNs testing in US/Europe
Best to worst **±40% or 1.7x**

3 CDNs testing in China
Best to worst **±90% or 10x**

Faster Sites Do Better

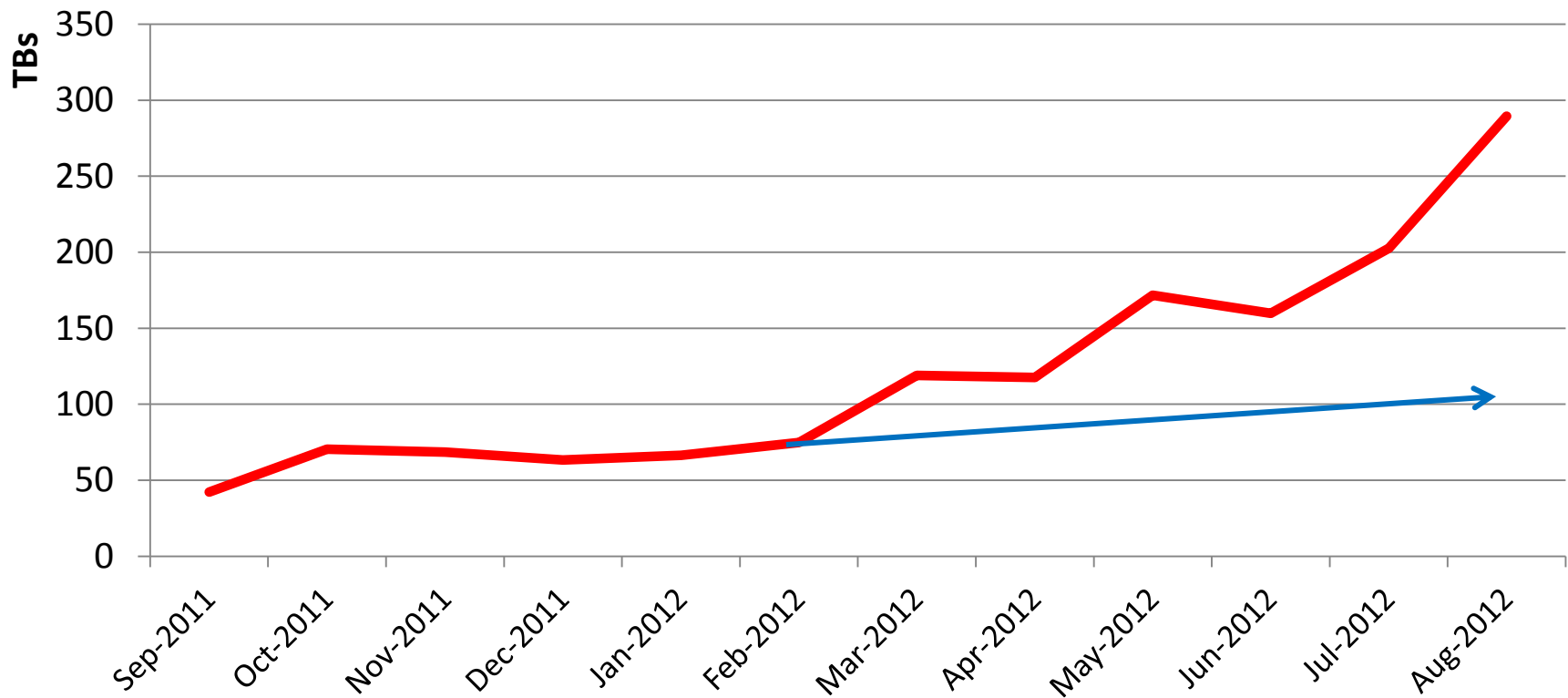


Social Gaming Customer

Go-Live: Feb. 2012

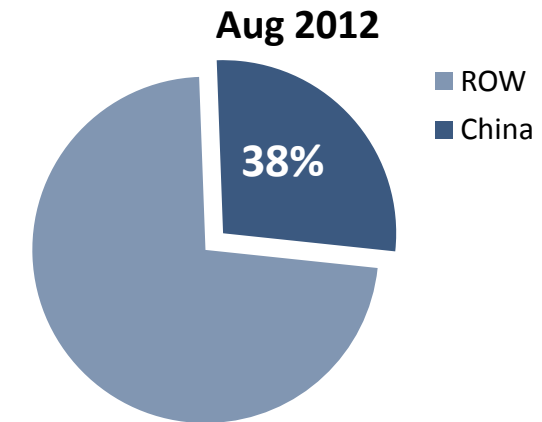
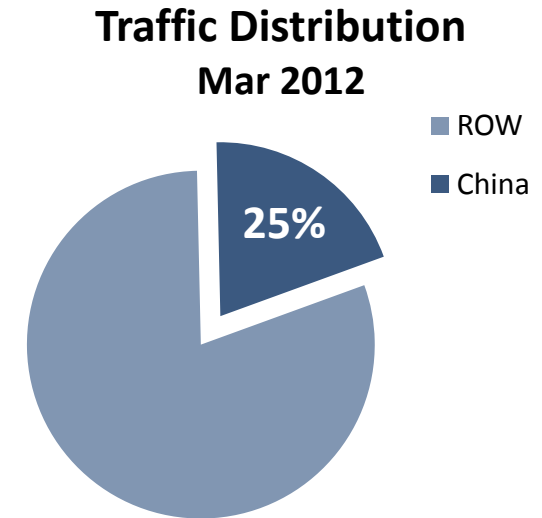
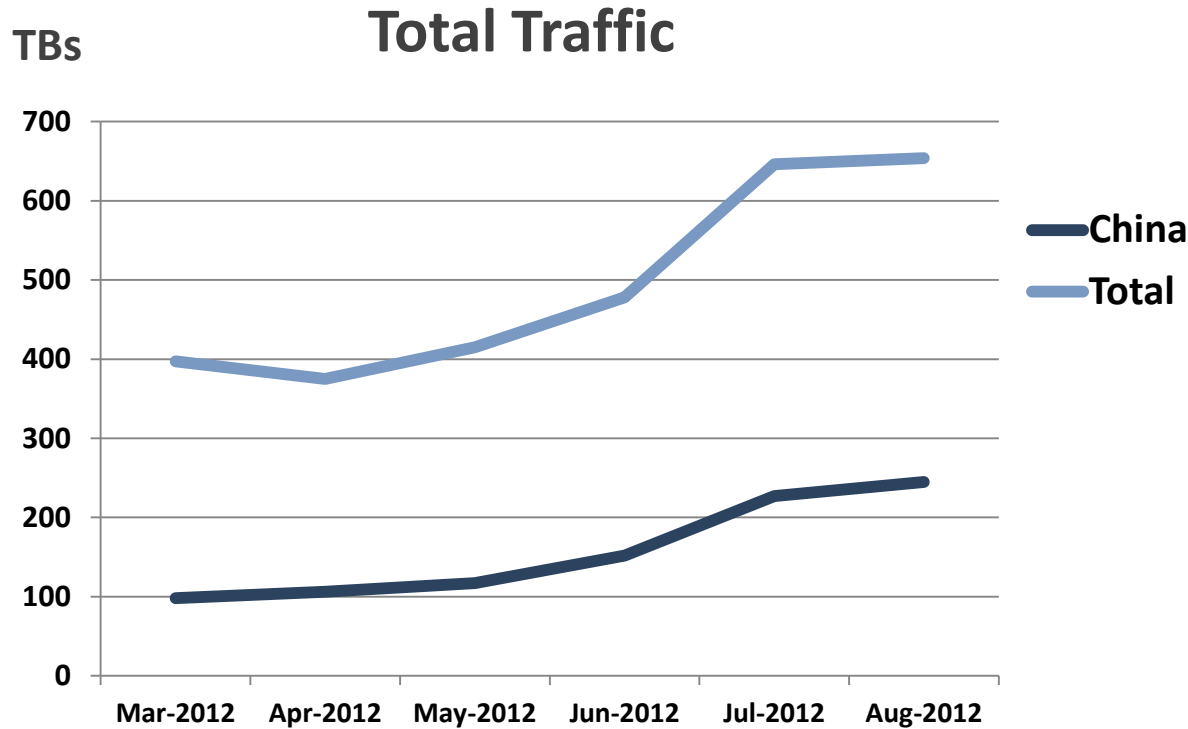
3.7x traffic in 6 months

Faster Sites Do Better - 2



Electronic Manufacturer Customer
Go-Live: Feb. 2012
3X traffic in 6 months

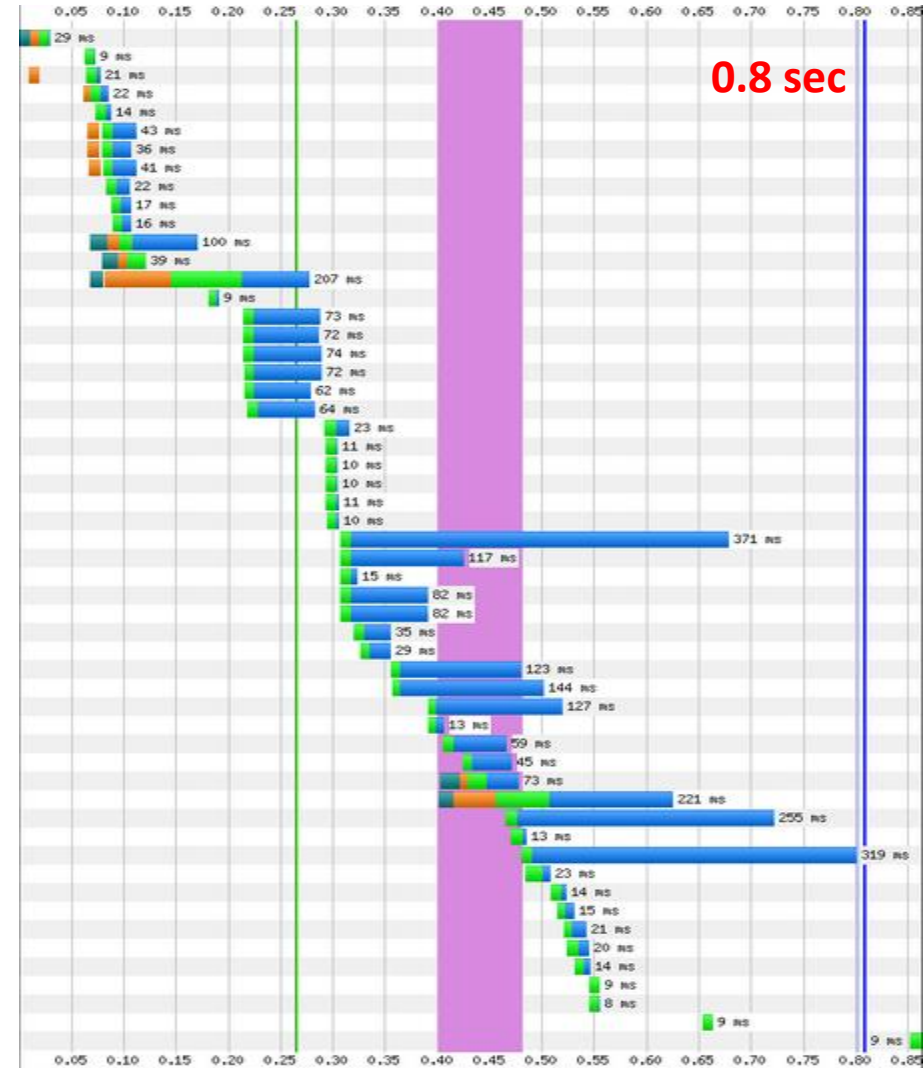
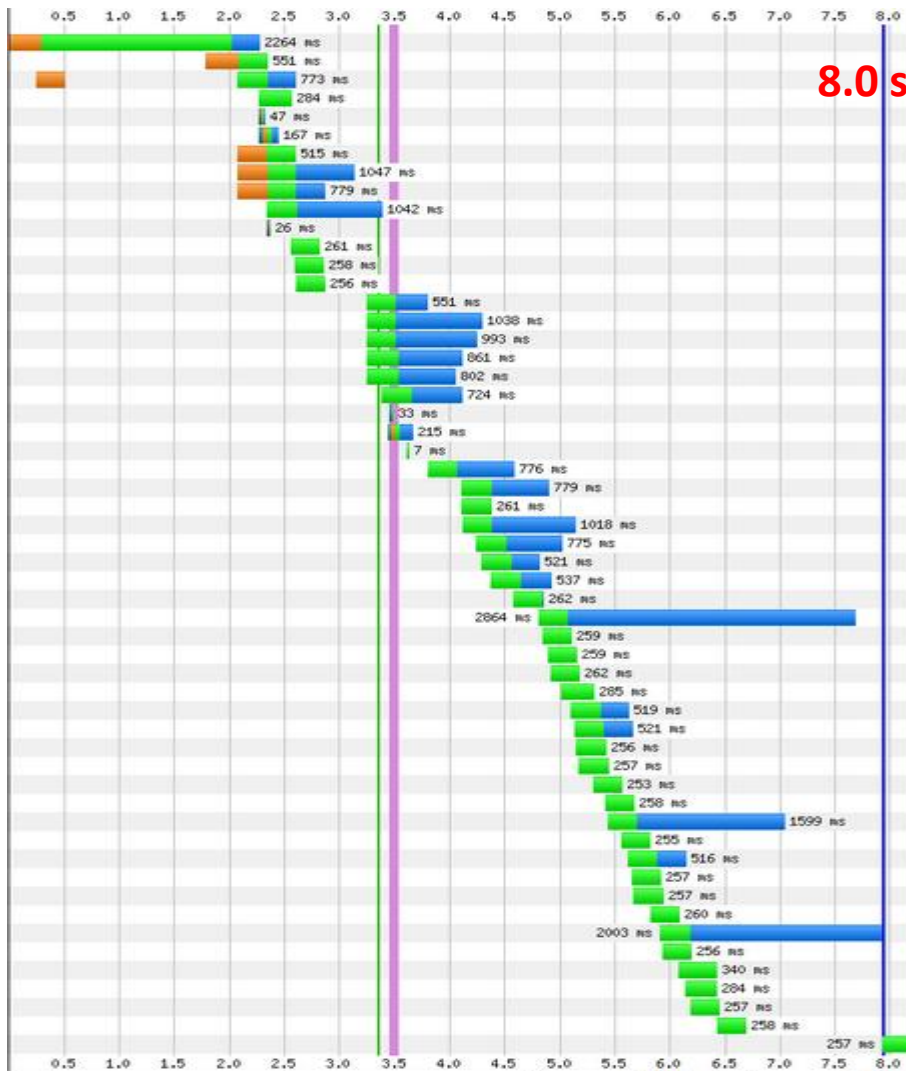
Faster Sites Do Better - 3



Mobile Gaming Customer
2.5X increase in China traffic
13% more traffic from China

Waterfall Comparison

Full page e-commerce site download



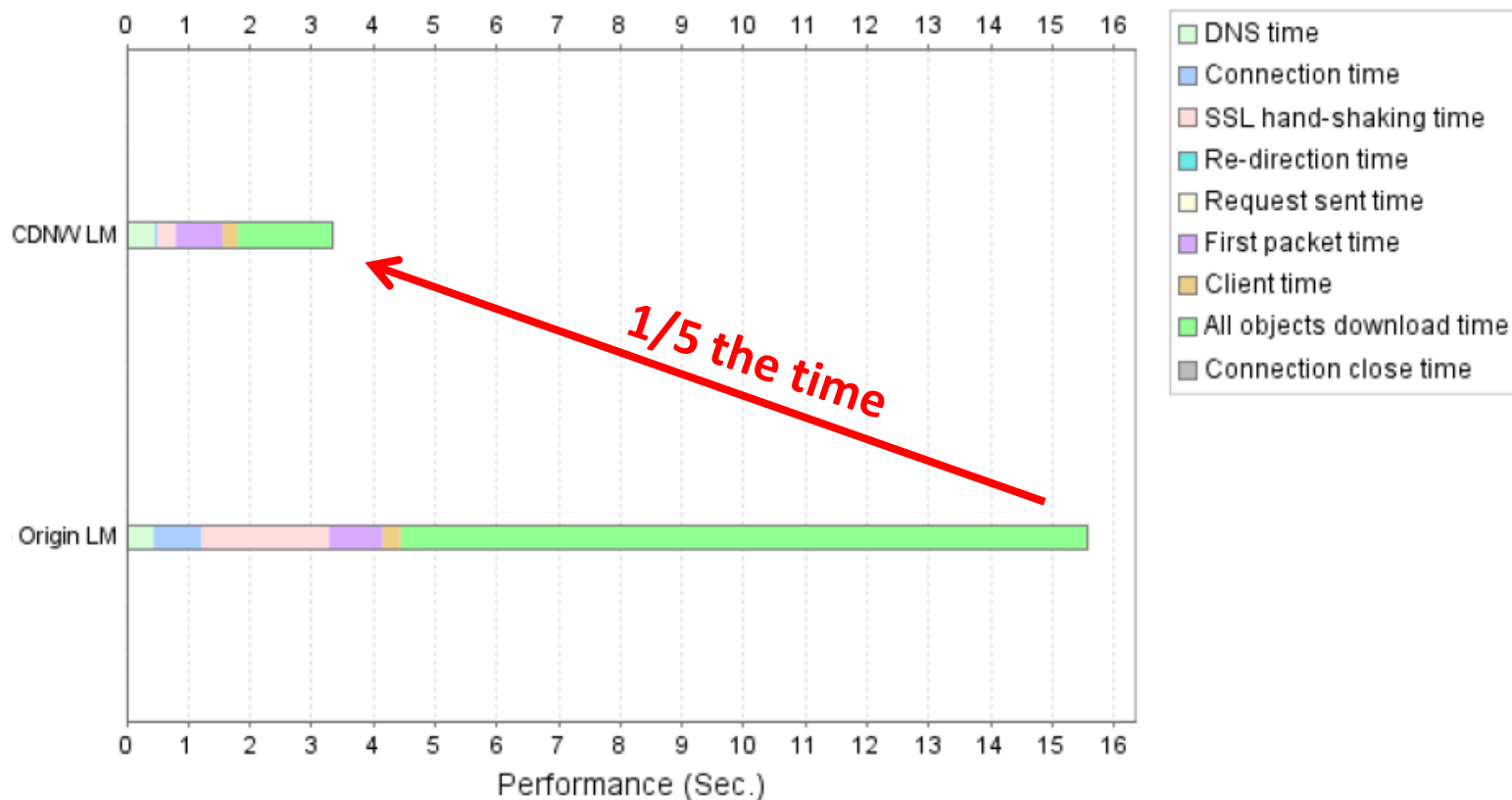
Source: Customer results via Fiddler, Oct 2012

Don't Forget Transactions

Multi-page transaction vs. origin in Singapore

Metrics summary

Time range: 02/12/2012 17:00 - 02/17/2012 17:00



Copyright © Networkbench 2011

Source: CDNetworks customer results, 2012

Comments on Off-Site Content

- Many big hostnames are (still) blocked in China
- If your site depends on them, expect impact

ajax.googleapis.com

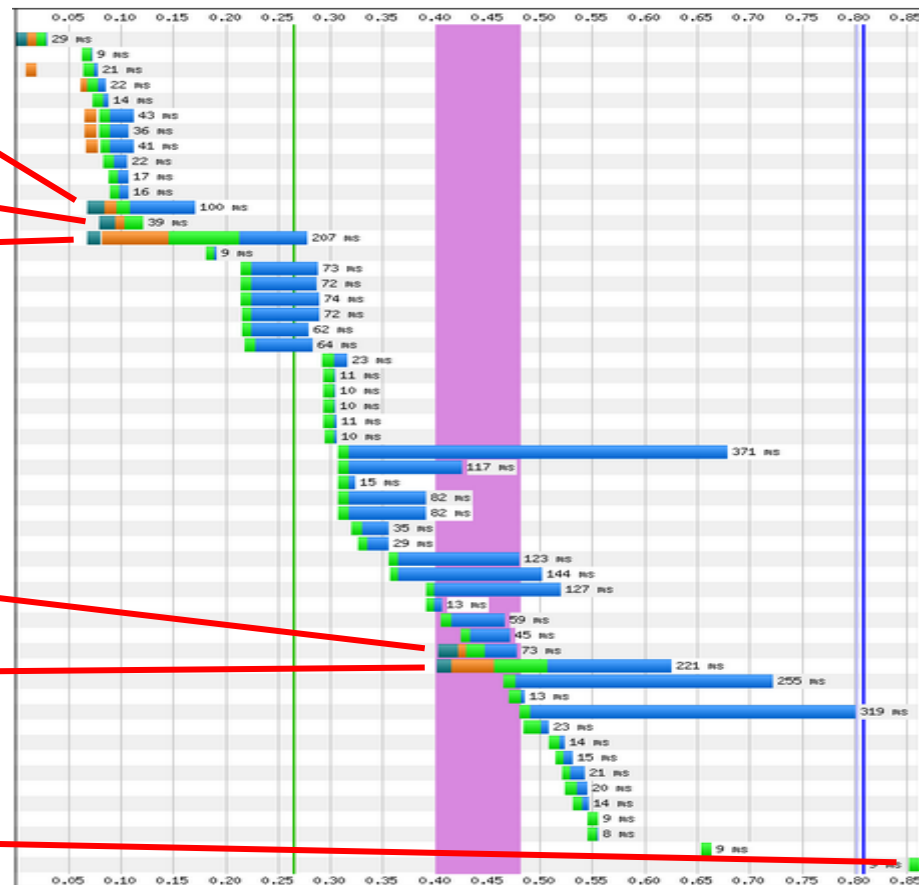
fast.fonts.com

brightcove.com

google-analytics.com

platform.twitter.com

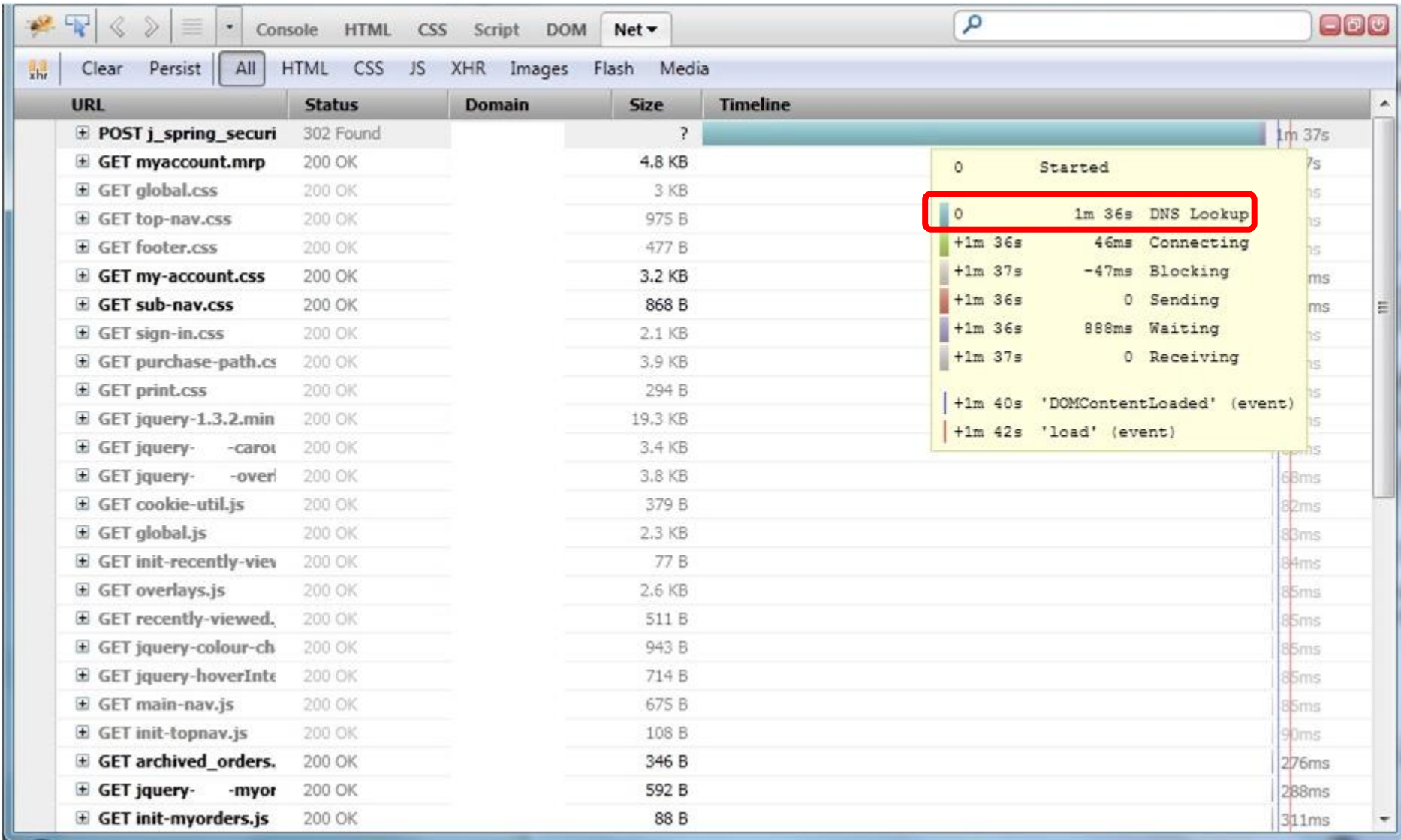
google-analytics.com



0.8 sec

Source: Customer results via Fiddler, Oct 2012

Here's How It Hurts



The screenshot shows the Chrome DevTools Network tab. The main table lists various requests with their URLs, statuses, domains, sizes, and timelines. A red box highlights a specific 'DNS Lookup' event in the timeline of the first request.

URL	Status	Domain	Size	Timeline
POST j_spring_securi	302 Found		?	1m 37s
GET myaccount.mrp	200 OK		4.8 KB	0 Started
GET global.css	200 OK		3 KB	0 1m 36s DNS Lookup
GET top-nav.css	200 OK		975 B	+1m 36s 46ms Connecting
GET footer.css	200 OK		477 B	+1m 37s -47ms Blocking
GET my-account.css	200 OK		3.2 KB	+1m 36s 0 Sending
GET sub-nav.css	200 OK		868 B	+1m 36s 888ms Waiting
GET sign-in.css	200 OK		2.1 KB	+1m 37s 0 Receiving
GET purchase-path.cs	200 OK		3.9 KB	+1m 40s 'DOMContentLoaded' (event)
GET print.css	200 OK		294 B	+1m 42s 'load' (event)
GET jquery-1.3.2.min	200 OK		19.3 KB	
GET jquery- -carot	200 OK		3.4 KB	
GET jquery- -overl	200 OK		3.8 KB	
GET cookie-util.js	200 OK		379 B	
GET global.js	200 OK		2.3 KB	
GET init-recently-view	200 OK		77 B	
GET overlays.js	200 OK		2.6 KB	
GET recently-viewed.	200 OK		511 B	
GET jquery-colour-ch	200 OK		943 B	
GET jquery-hoverInte	200 OK		714 B	
GET main-nav.js	200 OK		675 B	
GET init-topnav.js	200 OK		108 B	
GET archived_orders.	200 OK		346 B	
GET jquery- -myor	200 OK		592 B	
GET init-myorders.js	200 OK		88 B	

Source: Customer results via Firebug, May 2011

05

Navigating Regulations

A Note on Compliance

As a web site, application, or service provider, you should expect to conform to Chinese regulations to reach Chinese users

Of Chinese Internet users,

- **>80%** believe Internet controls are necessary
- **84%** believe the government should do it

Do not expect users to bypass regulations and blocking techniques to reach your content

Source: "Surveying Internet Usage and Impact in Five Chinese Cities," Research Center for Social Development, Chinese Academy of Social Sciences, Nov. 2007

Content Types

Content Type	Risk Level
Adult/pornography	Forbidden
Gambling	Forbidden
Political	Forbidden
Anti-government	Forbidden
Religious	High
User-generated (SNS, BBS, blog, sharing)	High
News	High
Gaming	Medium
Entertainment	Medium
Software	Low
Enterprise	Low
e-Commerce	Low

Includes video/image/doc uploads, blogs, review boards, forums, comments



Why are these problematic?

- Users can use it to upload/discuss problem content

How to stay out of trouble?

- Moderate before posting (automated or manual)
- Likely remove profanity already → add to lexicon

Blocking Mechanisms



Server not found

Firefox can't find the server at www.google.com.

- Check the address for typing errors such as **ww**.example.com instead of **www**.example.com
- If you are unable to load any pages, check your computer's network connection.
- If your computer or network is protected by a firewall or proxy, make sure that Firefox is permitted to access the Web.

Try Again



The connection has timed out

The server at www.fakesite.com is taking too long to respond.

- The site could be temporarily unavailable or too busy. Try again in a few moments.
- If you are unable to load any pages, check your computer's network connection.
- If your computer or network is protected by a firewall or proxy, make sure that Firefox is permitted to access the Web.

Try Again

Block IP, URL, keyword by



DNS hijacking

spooft DNS response



IP blocking

redirect IP to filtering router



TCP reset

RESET connection

Blocks look identical to any other Internet issue

Just a Great Firewall?

Blocks occur at international routers (97%)
and internal routers (3%)

- ⚠ Border router blocking → Great Firewall
- ⚠ Blocking in AS → ISP censorship

Different agencies = different standards

Agent subjectivity = inconsistent blocking



1. Verify no prohibited content
2. Get required licenses
3. Put license numbers on bottom of home page

主办单位：中华人民共和国工业和信息化部 地址：中国北京西长安街13号 邮编：100804

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(浏览本网主页，建议将电脑显示屏的分辨率调为1024*768)

4. Monitor for issues

Bei'An registration

Issued by Beijing office

Blocked – Now What?

- ⚠ Blocks can occur due to mistakes or errors
 - ⚠ Blocks can be subjective (different companies/humans)
 - ⚠ Blocks can be temporary
-
1. Remove any problem material, if any
 2. Talk to your CDN/agent to talk to the ISP (easier)
 3. Talk to the ISP to remove the block (harder)

Licensing – Hire Local Experts

- Hire an expert on regulations, licenses, and ministries
- Prepare and file all licensing applications
- Speak/Read Chinese
- Constant communication with governing bodies
- Monitor content on your behalf
- 24x7 availability for warnings or takedown notices
- In China, relationships are everything; Maintain relationships with governing bodies

License/Registration/Permit	Required?
ICP License 京ICP证合字 030173号	Business-specific
ICP Bei'An Registration 京ICP备05070218号	YES
PSB Bei'An Registration	YES
Industry-specific licenses <ul style="list-style-type: none">• news• BBS• publish• education• medical• pharmacy• cultural• TV	Business-specific

06

Case Studies

The Company

- Leading international investment bank that specializes in online global trading and investment



www.saxobank.com

The Challenge

- Fast transaction times are critical to trading: One second delay can result in lost revenue from incomplete based on out-of-date market information
- Want same customer experience in China that the SaxoTrader platform is known for around the world

The Solution – Dynamic Network Acceleration

- In less than two weeks, Saxo was able to launch SaxoTrader in China
- The company realized revenue gains of millions per day because broken trades were effectively eliminated

The Company

- iOffer connects 8.2 million unique buyers and sellers each month



The Challenge

- Expansion into new markets quickly accounted for over 50% of the site visitors
- Interactive content is dynamic/non-cacheable and served from San Francisco
- Slow download times, contrary to their internal goal of delivering all pages in less than one second

The Solution - Dynamic Web Acceleration

- After just one month, iOffer measured growth of 4.5% in international traffic, 4% in return visits, 3% in page views, and 2.5% in site stickiness
- iOffer was able to boost performance by 200-300% in the challenging regions

The Company

- SEMI is the global industry association serving the manufacturing supply chain for the micro and nano-electronics industries



The Challenge

- Slow download times and site availability in China despite hosting in China and existing CDN
- Reduction in IT staff by 75% and lower IT costs

The Solution - Dynamic Web Acceleration

- Eliminated site outages to get 100% site availability
- Reduced costs by 60%

After China, On to Russia!

Why Russia?

1. Russia is now part of the WTO, cutting import tariffs by ~6%
2. 7th largest online presence with 62 million online, largest in Europe
3. World Bank projects Russia to overtake Germany as the second largest GDP in 2014
4. Many young, tech-savvy consumers, making e-commerce poised for significant growth

42 percent of Russians surveyed : “The more I buy, the happier I feel.”



The screenshot shows the homepage of the website "Russia BEYOND THE HEADLINES". The main title "Russia" is in a large, red, serif font, with "BEYOND THE HEADLINES" in a smaller, black, sans-serif font to its right. Below the title is a navigation bar with red buttons for "POLITICS", "WORLD", "BUSINESS", "SOCIETY", "OPINION", "ARTS & LIVING", "TRAVEL", and "BLOGS". Underneath the navigation bar is a "HOT TOPICS" section with a list of topics: "APEC - KHIMKI ELECTIONS - WTO - PUSSY RIOT - BRICS - SKOLKOVO - WAR OF 1812 - SYRIA". Below this is a breadcrumb trail: "Home » Business". The main article headline is "What to do in an unstable economic climate? Shop!". The article is dated "July 12, 2012" and written by "Nadezhda Petrova, Kommersant-Dengi". The article text reads: "Russian consumers apparently feel no need to save for a rainy day, opting instead to spend their way to happiness."

Russia: 14 POPs; Sample Customers



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LIVEJOURNAL

