Summer Intern Showcase 2015
Hello, I am Utkarsh Goel

- Division: PDG
- Department: Foundry Web Experience
- Title: Research Engineer
- Hiring Manager: Moritz Steiner
- School Name: Montana State University
- Graduation: 2017/Computer Science
- Location: San Francisco, CA

How I spent my summer at Akamai:
- Developed techniques to discover middle-boxes inside cellular networks - useful for optimizing backend connections.

Memorable moment from your summer experience:
- Watched MI-6 with the CEO next to me.
Detecting Middle-boxes

- Used Real User Monitoring (RUM) system to gather data.
- Compare latency seen by Ghosts and clients.
- Compare packet loss seen on connections with and without middle-boxes.

- Low latency seen by Akamai.
- High latency seen by clients.
Detecting Middle-boxes using Packet Loss

CDF of TCP Connections

- Bouygues with HTTP Proxy
- Bouygues with no HTTPS Proxy
- France Telecom with HTTP Proxy
- France Telecom with HTTPS Proxy
- SFR with HTTP Proxy
- SFR with no HTTPS Proxy

Packet Loss (%)
Detecting Middle-boxes

Akamai can optimize TCP connection between its servers and middle-boxes

• Feed information into Edgescape?
• High initial congestion window?
• No retransmits for HTTP traffic?
• No retransmits for HTTPS traffic for some ISPs?
Investigating IPv6 Performance

What is IPv6?
• New version of Internet Protocol.
• Proposed in 1994.
• In deployment since last decade.
• Adopted by major mobile carriers such as T-Mobile, Verizon Wireless, Sprint, and AT&T.

Why IPv6?
• IPv4 has 4.3 billion address.
• IPv4 address space exhausted in 2011.
• Need more IP address to support increasing mobile users, Internet of Things, VANETs.
• IPv6 provides $3.4 \times 10^{38}$ addresses - will never run out of address.
Investigating IPv6 Performance

- More than 93% Verizon traffic is over IPv6.
- More than 72% T-Mobile traffic is over IPv6.
- Only 12% AT&T traffic is over IPv6.
- Only 11% of Sprint traffic is over IPv6.

**T-Mobile is IPv6-only for their IPv6-capable devices**
- Uses various types of NATs to support IPv6 connectivity.

**Verizon Wireless, AT&T, and Sprint have dual-stacked their IPv6-capable devices**
- Provide native IPv6-to-IPv6 support.
- Provide native IPv4-to-IPV4 support.
T-Mobile IPv6 Infrastructure

IPv6-only client

NAT46

IPv4 connectivity

IPv6-only client running an IPv4 application

NAT64

IPv4 connectivity

IPv6 network of cellular ISP

IPv6 connectivity

IPv6-only host

IPv4-only host

IPv4 connectivity
T-Mobile IPv6 Performance

Dual-Stacking Akamai content can improve Web performance
AT&T IPv6 Infrastructure
Dual-Stacking Akamai content can improve Web performance
Thank you

Questions?

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