



# Application Acceleration and Content Delivery Services

What they will and won't do for your application

Web Operations Summit

Tim Knudsen

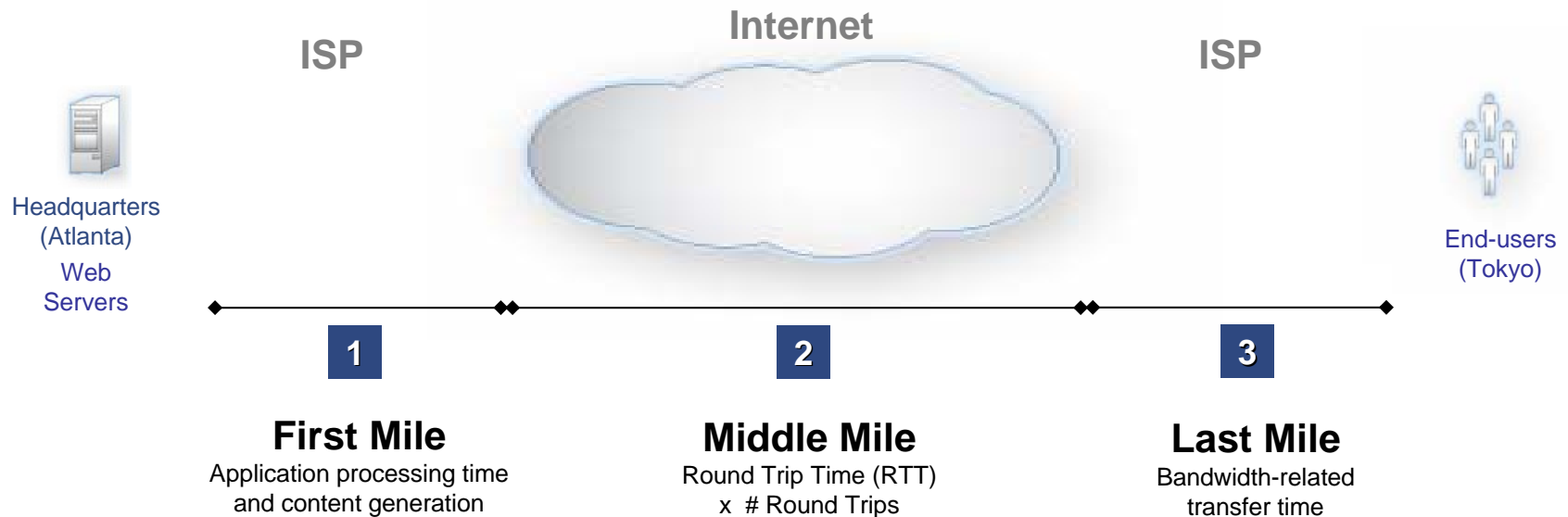
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# Overview

- Understanding Web Application Performance over the Internet
  - Internet Download Time Equation
  - The Internet Performance Bottleneck
- Acceleration and CDN Service Technologies Overview
- ADN v. CDN Comparison
- Case Studies – ADN Impact on Different Application Types
  - Distance Induced Latency
  - 30% Packet Loss and Congestion
  - 100% dynamic SSL
- Conclusion

# Internet Download Time Equation



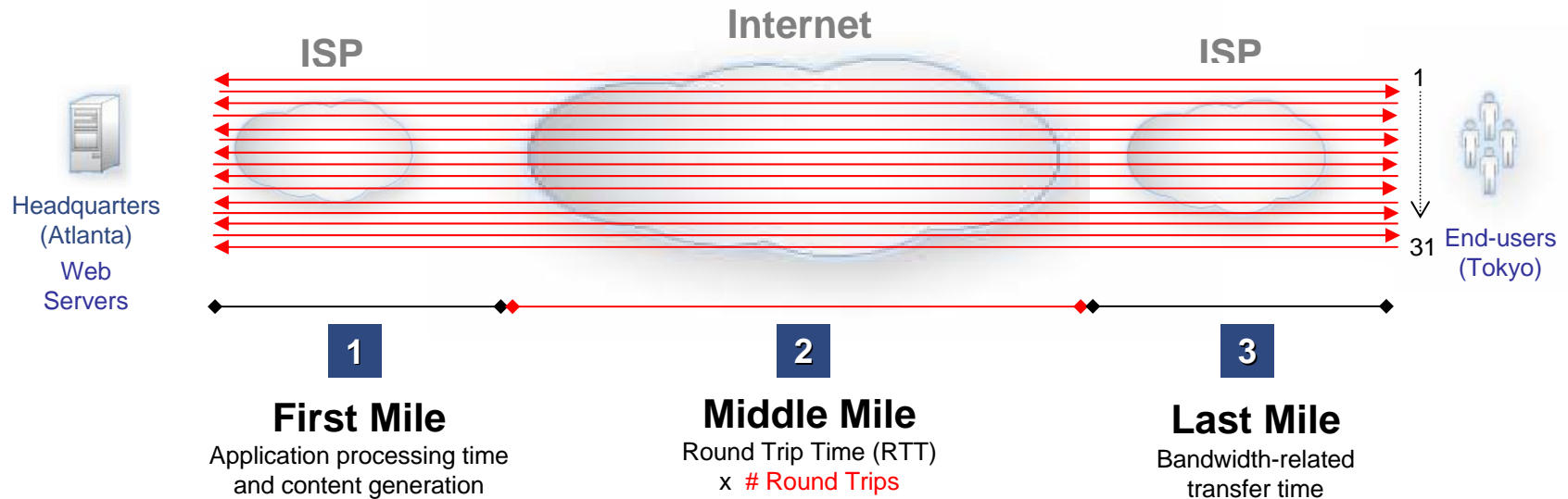
**Page  
Download  
Time  
Equation**

- 1** First Mile +
- 2** Middle Mile +
- 3** Last Mile

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**= Total response time**

# Case Study – From Atlanta to Tokyo; 70K Web page with 25 objects



<b>Page Download Time Equation</b>	<b>1</b>	<b>First Mile +</b>	0.25 seconds
	<b>2</b>	<b>Middle Mile +</b>	<b>6.20 sec(31 round trips x round-trip-time 200ms)</b>
	<b>3</b>	<b>Last Mile</b>	0.10 seconds

**= Total response time 6.55 seconds in an un-congested network!**

# Why Poor Performance?

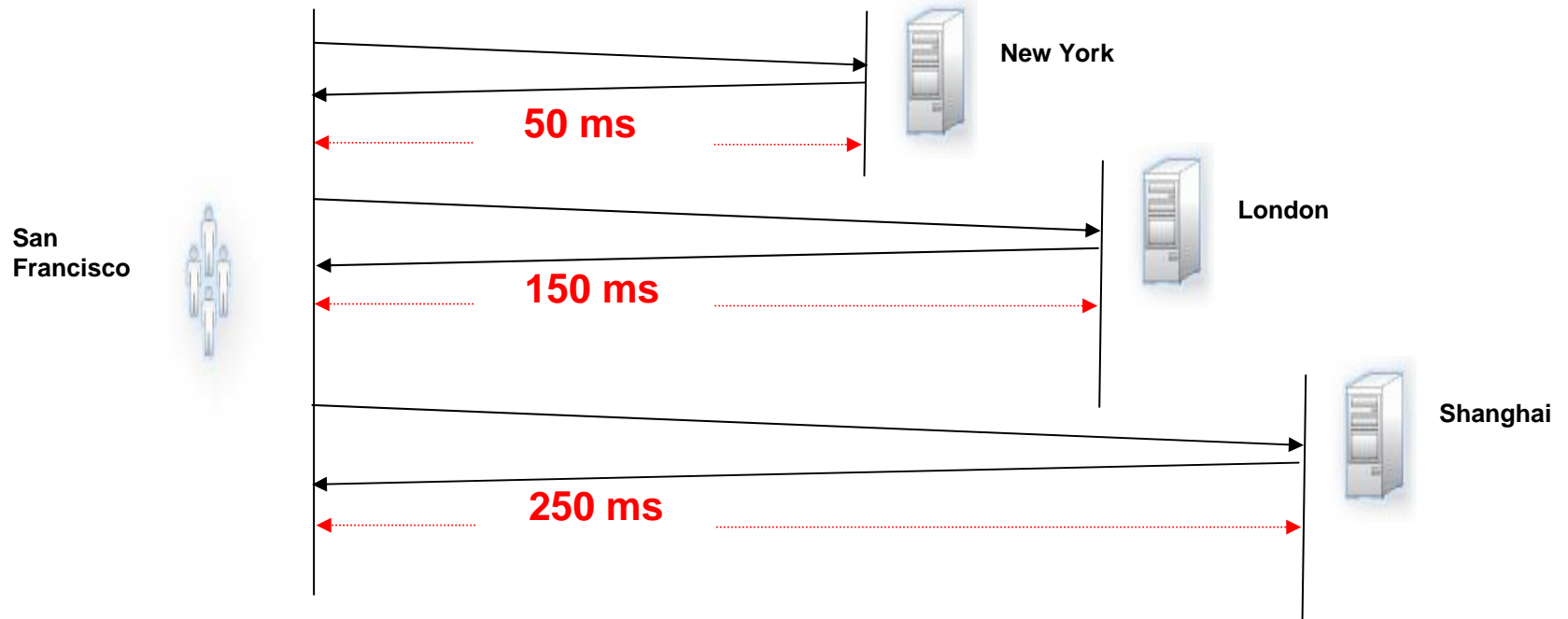
## *First Mile*

- Page generation logic
  - Application logic (Database queries)
  - 3<sup>rd</sup> party calls (Cross-tier/enterprise Web service calls)
  - Page size/Content Generation
- Server processing load
  - TCP Connection Management
  - SSL Termination
  - Compression

# Why Poor Performance?

## *Middle Mile*

### Distance Induced Latency (Distance, speed of light, routing)



# Why Poor Performance?

## *Middle Mile*

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- TCP 'Chattiness' – Round Trip Multipliers
  - 3-Way Handshake
  - TCP Connections
  - TCP "Slow Start"
  - Packet loss and congestion
  
- HTTP Inefficiencies – Round Trip Multipliers
  - Interrelationship with TCP
  - No native compression
  - Object load sequencing in the browser

# Why Poor Performance?

## *Last Mile*

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- End-user Connectivity
  - Internet Connectivity
  - ISP Peering

# Tech Overview – App Delivery Network (ADN) v. Content Delivery Network (CDN)

- Application Delivery Network (ADN)
  - Supports dynamic and static content
  - Focused on accelerating complete application – dynamic + static content
  - Uses a hybrid set of acceleration technologies, including those in appliances
    - TCP optimizations
    - HTTP Compression
    - HTTP Object Pre-fetch
- Content Delivery Network (CDN)
  - Supports only static content
    - Images, documents, software downloads, media downloads
  - Focused on accelerating static file downloads
    - Can be used for a dynamic app, but benefits only static content (images)

# Tech Overview – Application Delivery Network (ADN) Technologies

- First Mile – Server Offload to Increase Processing Resources
  - SSL Offload
  - TCP Connection Optimization
  - HTTP Compression
- Middle Mile – TCP & HTTP Optimizations to Reduce Round Trip Multiplier
  - Persistent Connections
  - Pipelining
  - Window Maximization
  - Packet Loss and Congestion Management
  - Caching
  - Predictive Pre-fetch
  - Route Optimization
- Last Mile – End-user Connection Optimization
  - HTTP 1.1 Conversions

# Tech Overview – Content Delivery Network (CDN) Technologies

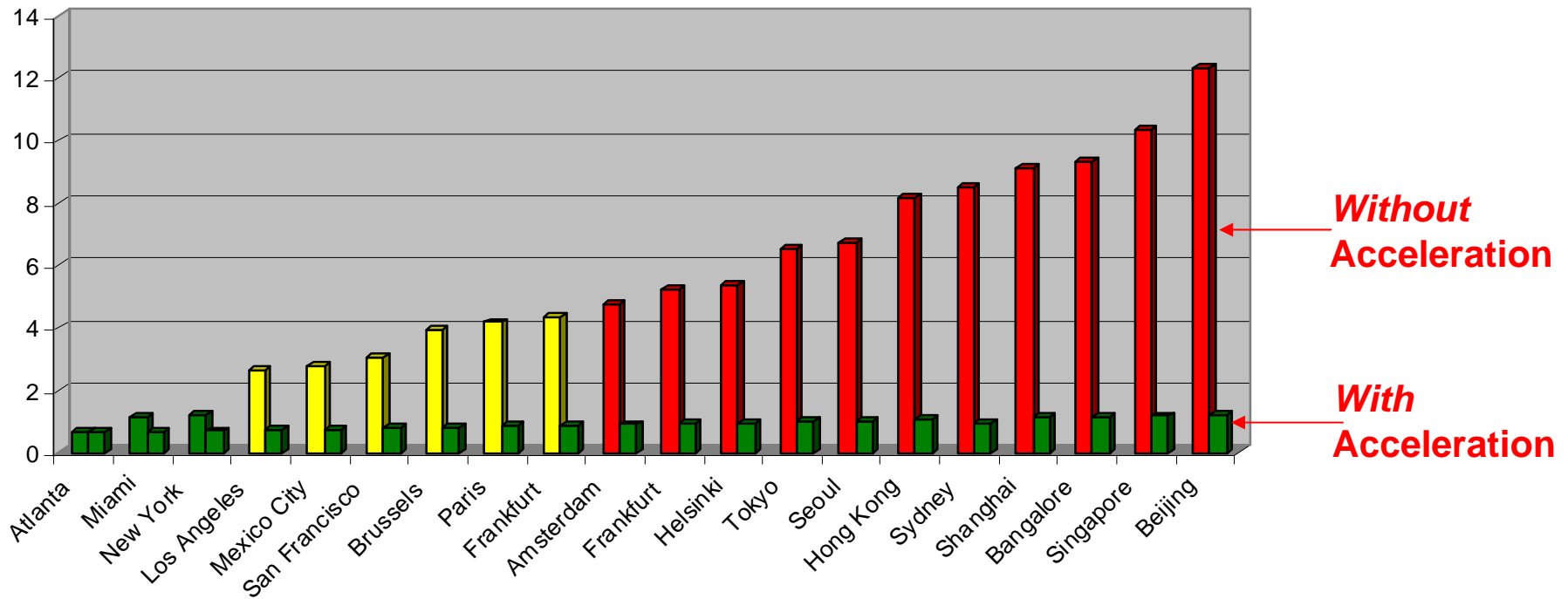
- Key Difference – CDN is focused on Static Content
  - By definition, CDNs don't address round-trip multiplier performance problem
  - Therefore, focused on solving scale, not application performance
- Key Technologies
  - Caching
  - Optimized content upload to mitigate cold-cache

# Comparison – Matching Technology to Need

- **Application Delivery Network (ADN) Services**
  - Need global LAN-like performance for any application end-user
  - Application is mostly or 100% Dynamic
    - If some or much of the application is static, ADN provides more benefit over CDN
  - Serving widely dispersed user-base served from centralized infrastructure
  - Traverse potentially congested or poor routes (China)
  - Dynamic content must be served from origin for compliance
  
- **Content Delivery Network (CDN) Services**
  - Need reliable, on-demand capacity despite highly variable demand
    - Flash crowds, virus updates
  - 100% Static Content
    - If vast majority of app is static, then CDN will still provide benefit
    - Otherwise, go with ADN

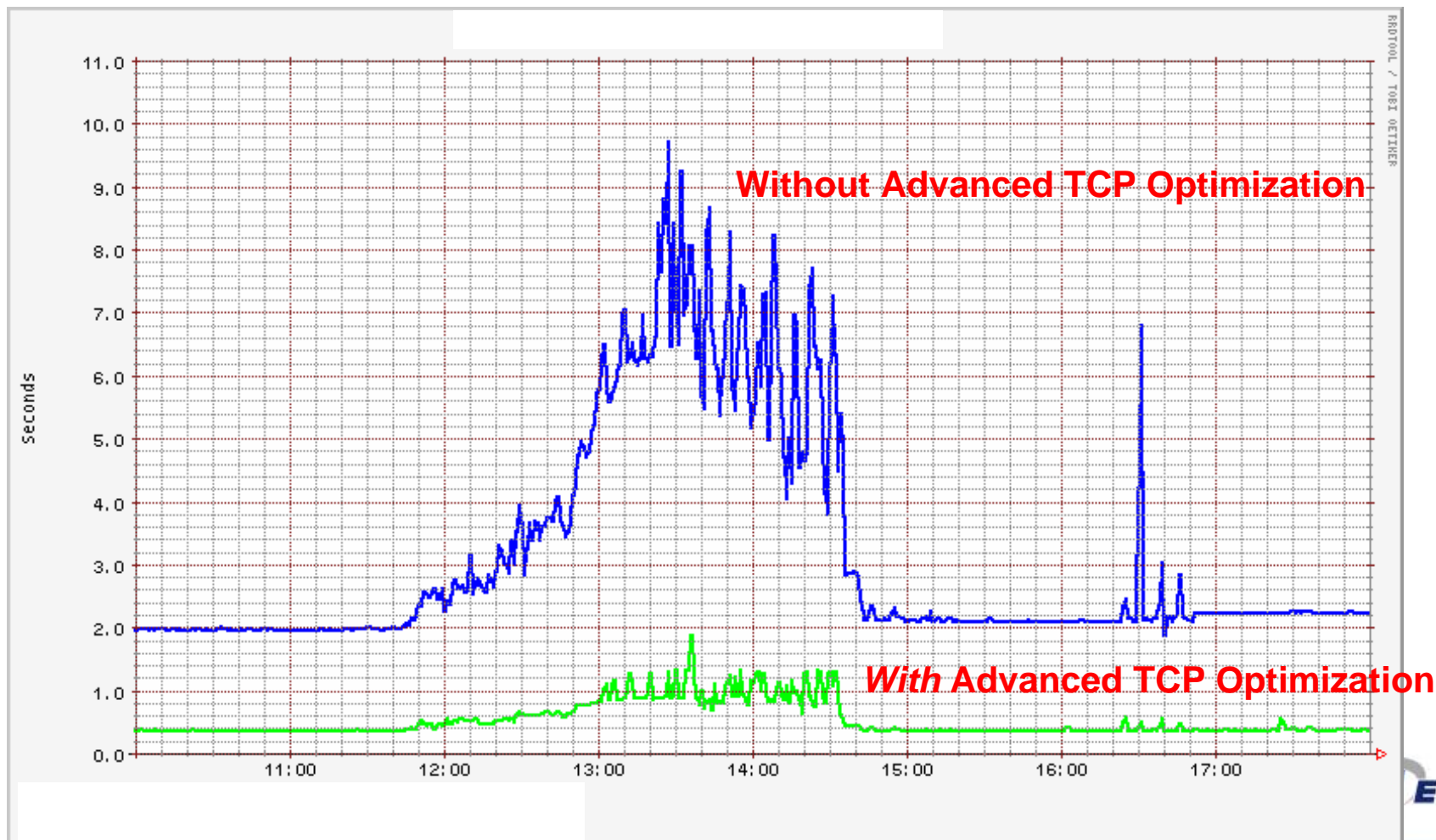
# Case Study – ADN Impact on Distance-Induced Latency for Hybrid App

Hybrid 70% Dynamic/30% Static Portal  
End-user Performance From Atlanta Origin Server



# Case Study – ADN Impact on Packet Loss for Hybrid

End-user Performance from Tokyo – 30% Packet Loss



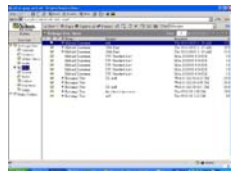
# Case Study – 100% Dynamic, SSL



**Server - San Jose, CA    End-user – London, England**



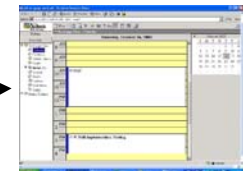
Login to Outlook Web Access (OWA) main page



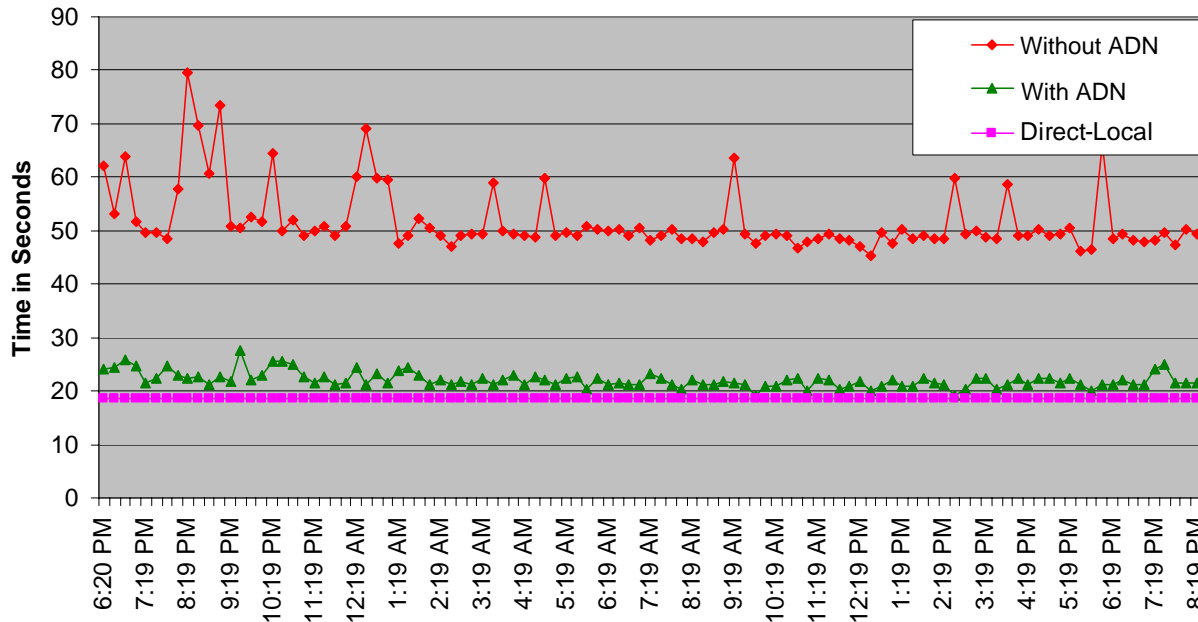
Open a message (this is an HTML message)



Open Contacts main page



Open Calendar main page



## Average Round Trip (s)

London – without ADN	51.73
London – with ADN	22.03
Direct - local	18.5



# Conclusion

- For Mixed or Completely Dynamic Applications – go ADN
  - Provides best overall end-user performance benefits for applications
    - Portals, E-commerce, B2B Trading applications
  - Incorporates broader set of technologies required for application acceleration
- For 100% Static Applications or File Downloads – go CDN
  - Provide on-demand scale for static content delivery
    - Documents, Static sites, Software Downloads, Media Downloads
  - Leverages network capacity for on-demand scalability