



Lessons Learned

Air Force Network Integration Center

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UNCLASSIFIED

- **Problem Statement**
- **Background**
- **ERP Performance Study Lessons Learned**
- **AFNIC Network Validation Service Offerings**
- **Software Developers Forum Wiki**

Multiple organizations are involved with the delivery of mission critical enterprise capabilities:

- 1. Application PMO**
- 2. DISA & GCSS Computing Services**
- 3. DISA Network Services**
- 4. AFSPC NOSCs**
- 5. Base-level client operations & AFECMO**

These independent organization activities cause disjointed execution of:

- 1. *Capacity planning***
- 2. *Escalation procedures***
- 3. *Change control***
- 4. *Help desk***

Resulting in:

- 1. *An incongruent End-to-End transactional path architecture***
- 2. *Inability to create a accurate application performance baselines on the Operational Network***

Impacting users with:

- 1. Long response time due to bottlenecks**
- 2. Unclear service level expectations**
- 3. Frequent outages from uncoordinated changes**
- 4. Long restoral times when diagnosis involves multiple organizations**

**SAF A6/CIO/CTO sponsored an AFNIC led End-to-End
Network Performance Test using ECSS**

Testing was conducted from May –July 2011

- 1. Detailed description of End-to-End transactional path is necessary**
- 2. Establish an independent performance baseline for both application and network**
- 3. Application performance should be measured across the entire transactional path**
- 4. Client/Application communications directly impact end-user response time**
- 5. Configuration Management is the key to optimal performance and availability
(14 anomalies within a 12 month period)**

Lesson Learned: Detailed description of End-to-End transactional path is necessary

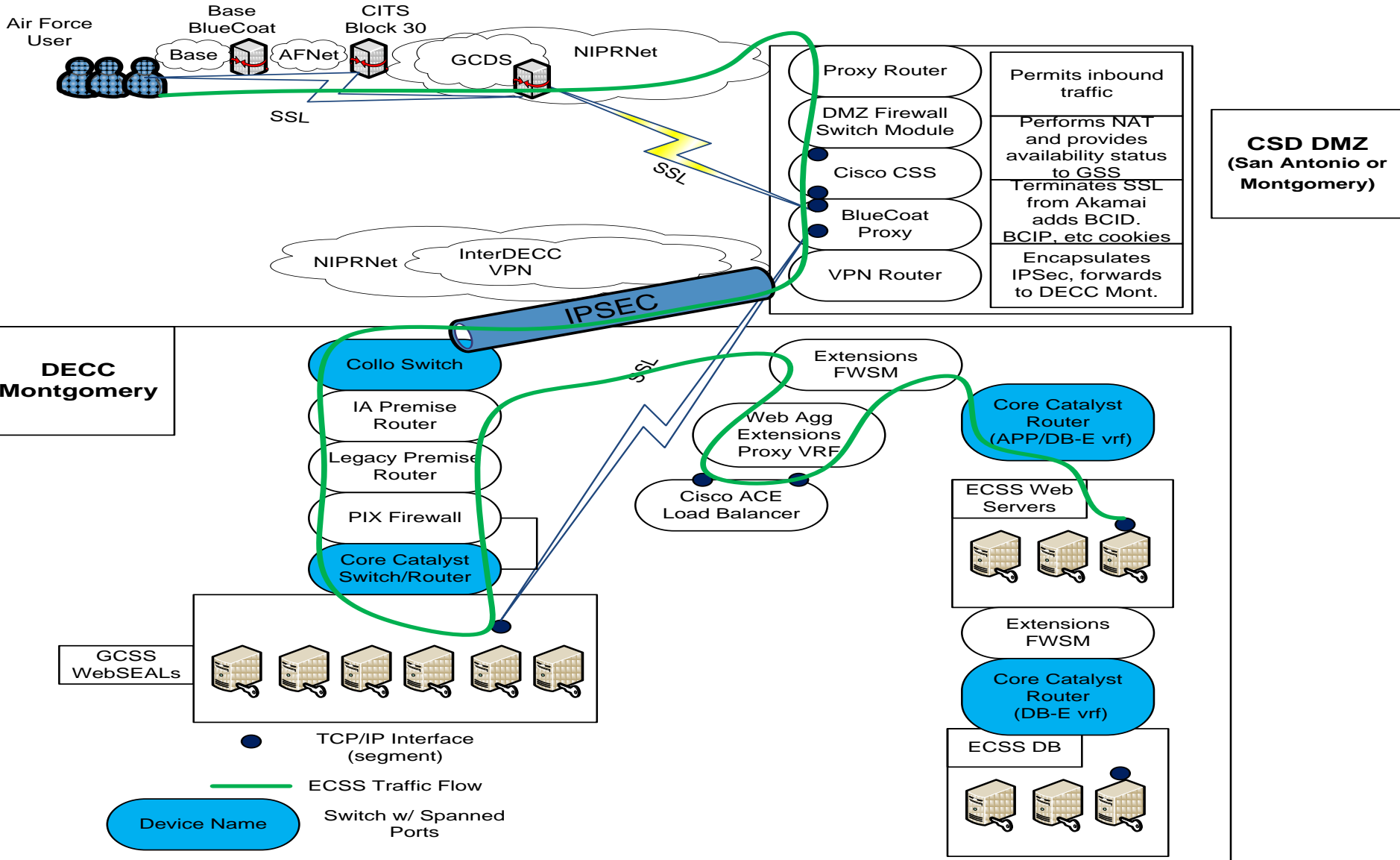
Recommendations:

Program Office

- **Request End-to-End transactional path architecture in the SLA from service providers**

AFNet

- **Provide program offices with a detailed architecture of all major AF infrastructure components within the application's transactional path**



Lesson Learned: Independent performance baselines for the application and network are critical to resolving operational issues

Recommendations:

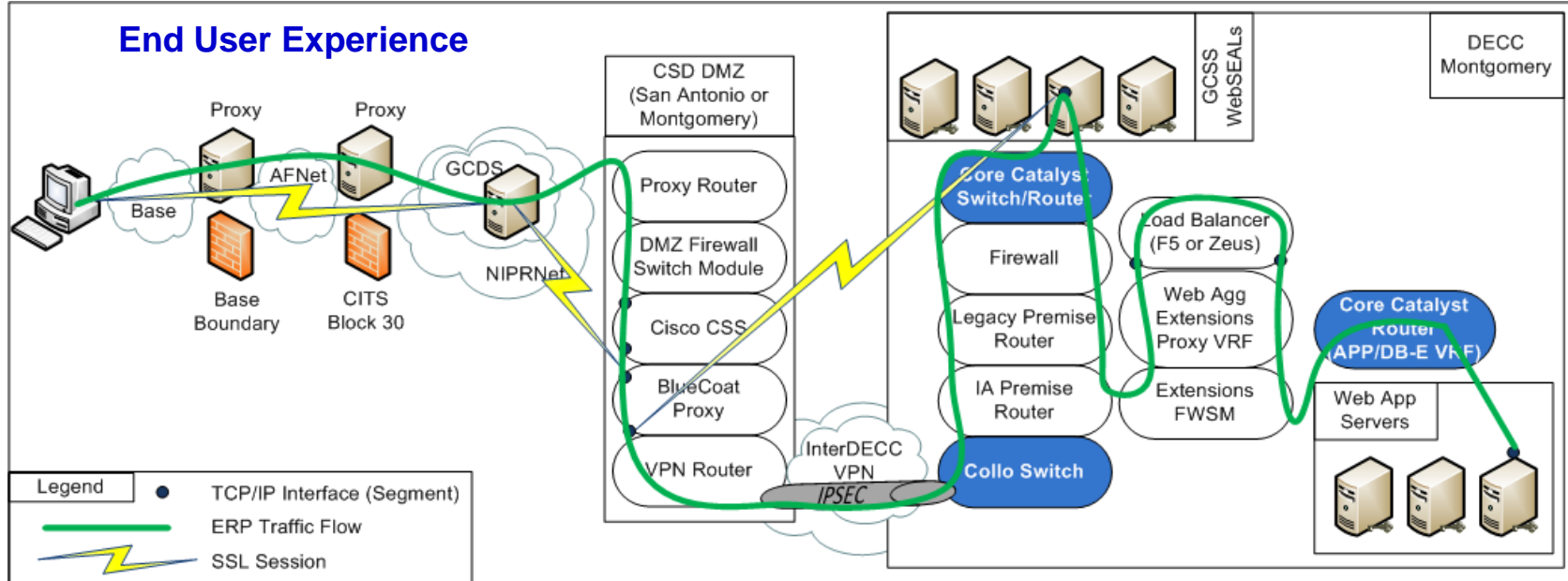
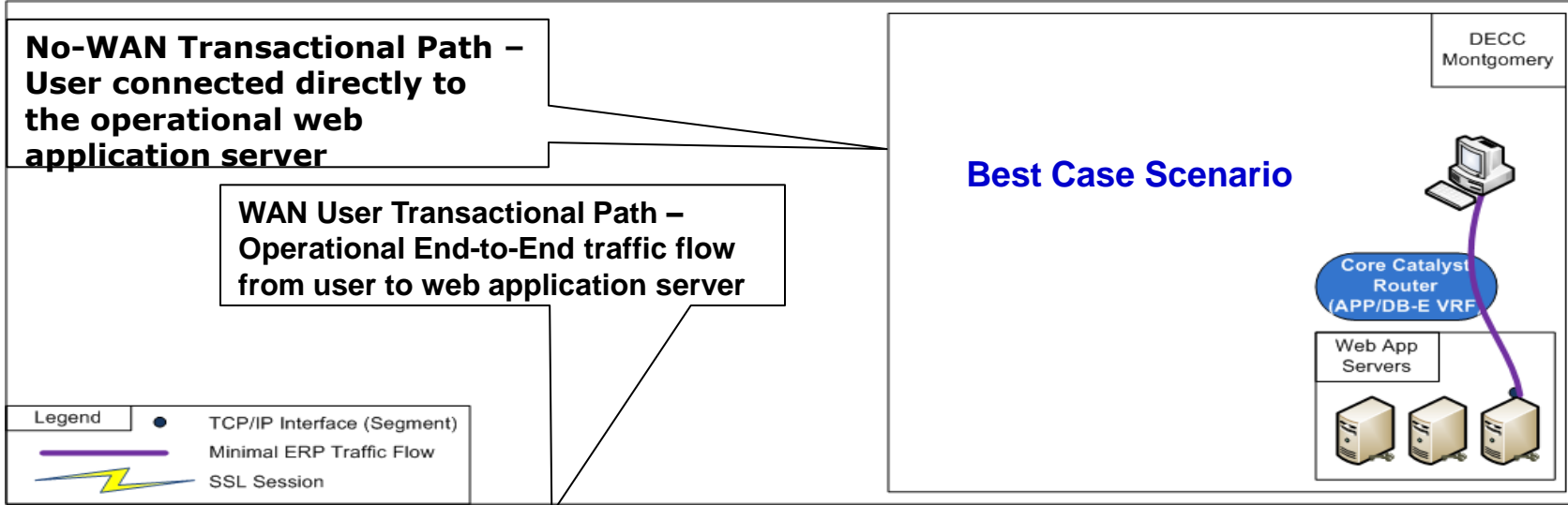
Program Office

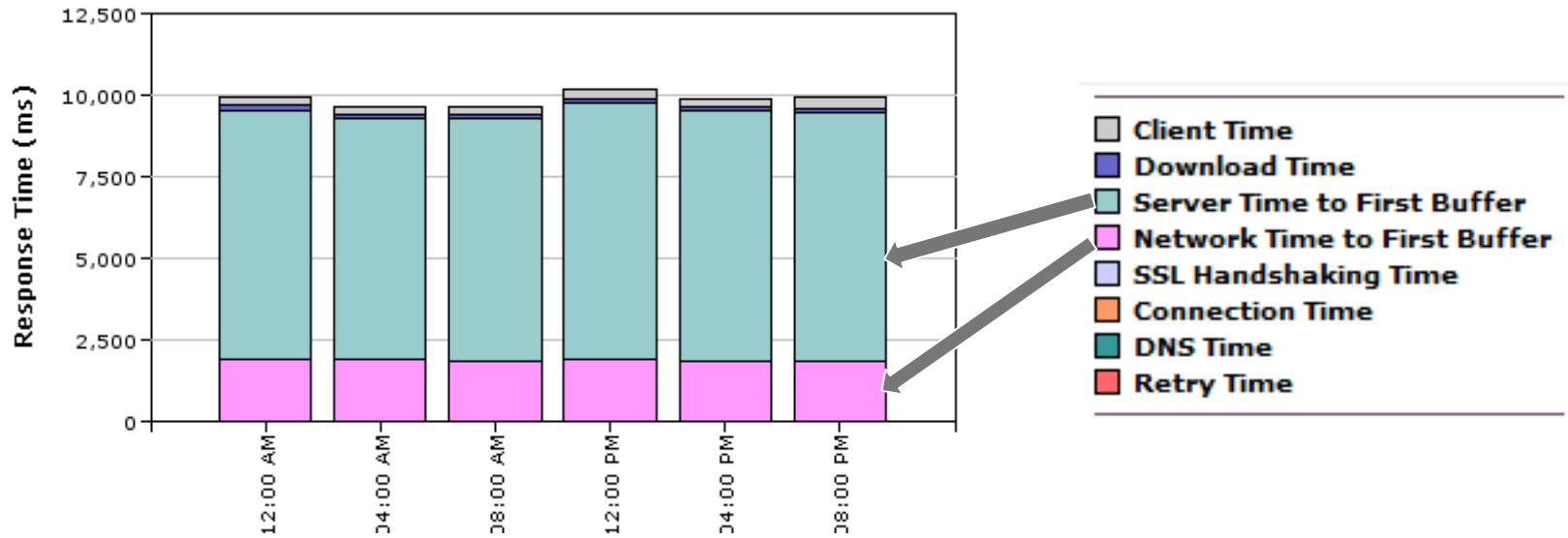
- **Create and document baselines of the “no-WAN” User and WAN User response times**

	Change in Baseline	
No-WAN	X	
WAN	X	X
Change Agent	Application	Network

AFNet

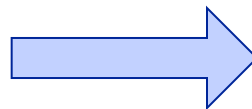
- **Create and document baselines for network latency across the End-to-End transactional path**
 - **End-to-End = AF user locations to AF hosting locations**





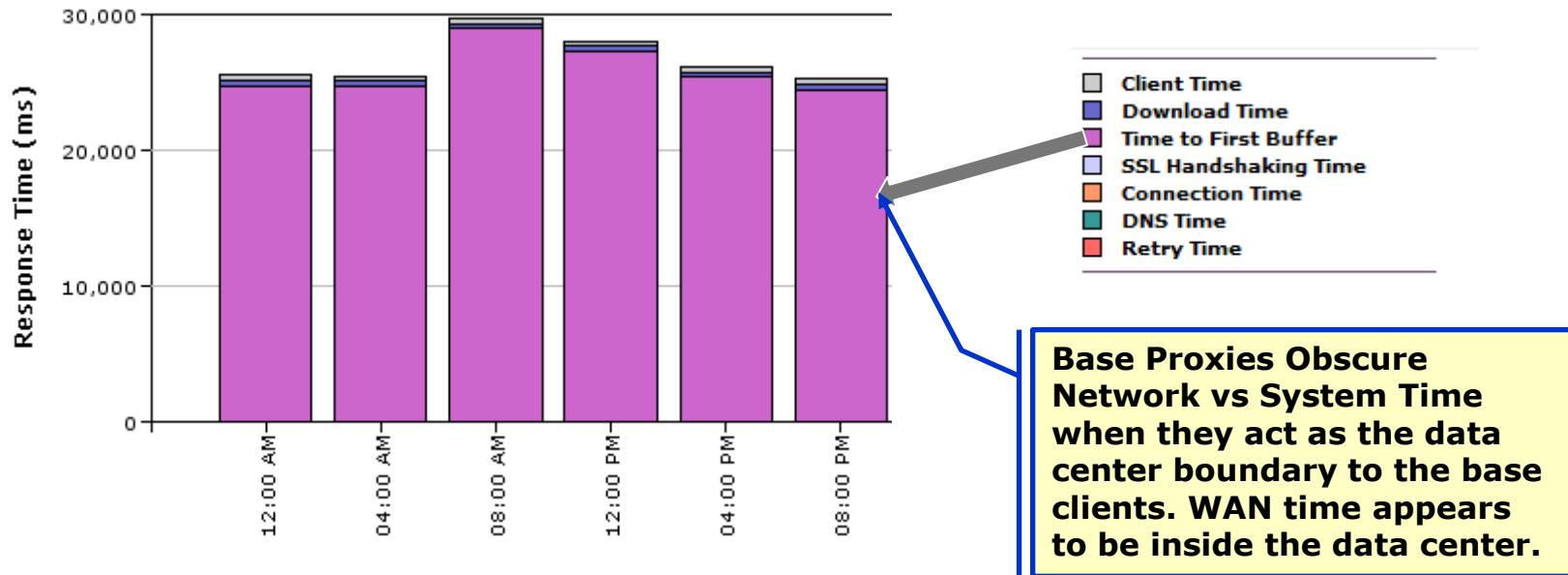
• Each 4 hour summary is the average of 16 user sessions each with 95 browser-based requests

- User sessions last 10s
 - 8s in host
 - 2s in network



- Browser requests average 105ms ($10s \div 95 \text{ turns}$)
 - 85ms service (server & DB) time
 - 20ms network latency

These local testing results would mislead you to focus on application service time



With a AF/GCSS/DISA WAN

- **User sessions last 30s**
 - 9s in host
 - 19s transitioning the network
 - 0.6s transferring 250KB
- **Browser requests average 300ms**
 - 90ms service (server & DB) time
 - 200ms network latency
 - 400Kbps effective throughput

- **For this case, User responses spend over twice as much time in the network as in the system**
- **Managing page requests is the primary way of reducing response time.**

Lesson Learned: Application performance monitoring needs to be incorporated into development (develop SLAs with hosting/service providers)

Recommendation:

Program Office: Monitoring Requirements need to be documented in SLAs with service providers

- **Identify metrics that may impact application**
 - **End-to-End Latency**
 - **Error Rates**
- **How will the service/application KPPs be measured?**
 - **End user response (Goal/Threshold)**
 - **Availability (Goal/Threshold)**

AFNet: Work with the Program Offices to ensure network impacts have been incorporated into KPPs

Lesson Learned: Client/Application communications directly impact end-user response time

Recommendations:

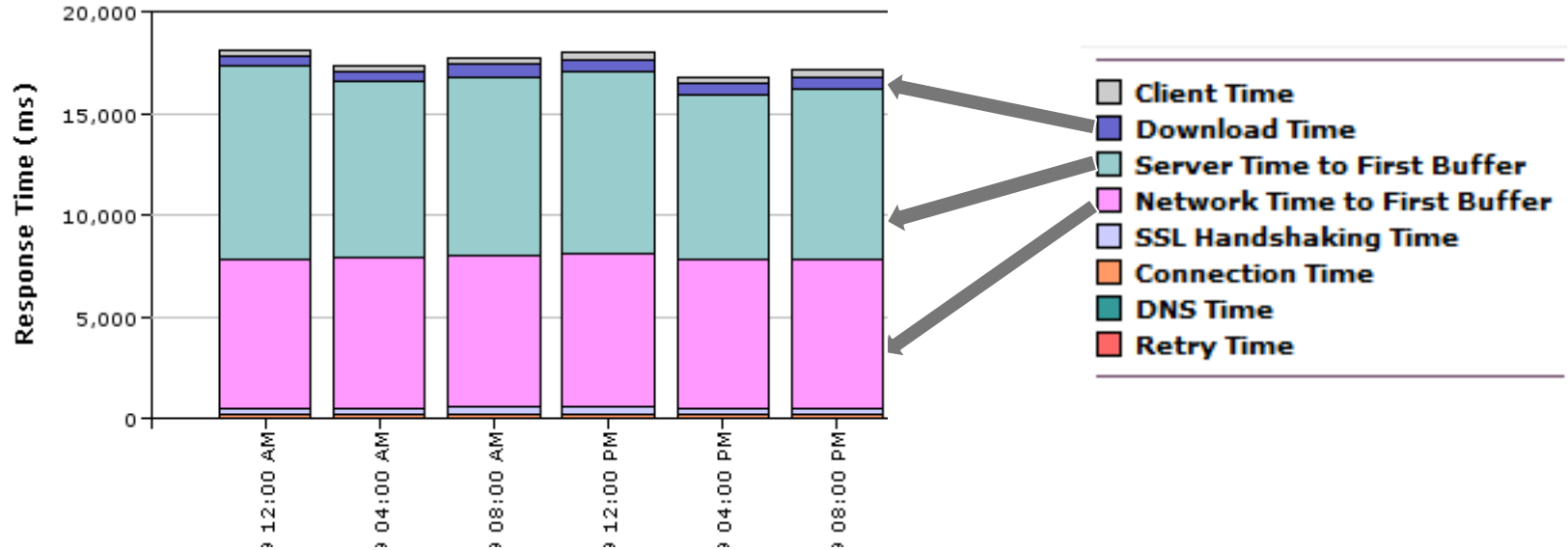
Program Office

- **Download .jar files when they change**
- **Reduce the overall number of transactions**
- **Compress data**

AFNet

- **Balance AFNet operational mission requirements against simplifying the End-to-End transactional path**

Current Efforts: SAF A6/CTO is leading an effort to simplify the ERP End-to-End transactional path as part of the CEITB Target Baseline



With a Simplified WAN

- User sessions last 18s
 - 9s in host
 - 7.5s transitioning the network
 - 0.6s transferring 250KB
 - Browser requests average 190ms
 - 90ms service (server & DB) time
 - 83ms network latency
 - 400Kbps effective throughput
- ➔
- Even on a streamlined network, user responses spend almost a much time in the network as in the system
 - Reducing the number of page requests may be the easiest way to reduce response time

When a user asked for a page

The page usually asked for pictures, etc. separately, generating multiple network turns.

Page	Component/Request	Component/Request Size (KB)	Total Time (ms)	Breakdown
https://ecssf5p.my....	https://...Link=yes	1.3	206.0	
	https://...=EBSECSS	44.6	145.0	
	https://...ctTag.js	1.7	231.0	
https://ecssf5p.my....	https://..._params=	1.3	108.0	
	https://...ng=UTF-8	44.7	468.0	
	https://...logo.gif	73.8	512.0	
https://ecssf5p.my....	https://...tsession	0.4	76.0	
https://ecssf5p.my....	https://...=getinfo	0.3	150.0	
ConnectServer_Line2...	https://...0SbxyOe0	0.3	67.0	
	https://...0SbxyOe0	9.1	854.0	
	https://...0SbxyOe0	0.3	60.0	
	https://...0SbxyOe0	2.9	684.0	
	https://...0SbxyOe0	0.3	60.0	
	https://...0SbxyOe0	7.0	797.0	
	https://...0SbxyOe0	0.3	60.0	
	https://...0SbxyOe0	0.4	71.0	
	https://...0SbxyOe0	0.3	61.0	
	https://...0SbxyOe0	5.7	222.0	
	https://...0SbxyOe0	0.3	60.0	
	https://...0SbxyOe0	16.1	1149.0	
	https://...0SbxyOe0	0.3	60.0	

- Client Time
- Download Time
- Server Time to First Buffer
- Network Time to First Buffer
- SSL Handshaking Time
- Connection Time
- DNS Time
- Retry Time

User Response time is the sum of the time to download the separate components for the page.

Fewer and smaller components = shorter user response times.

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By OWEN FLETCHER

A brawl broke out on Friday outside the flagship Apple Store in Beijing, as hundreds lined up to buy the company's latest smartphone, the iPhone 4S. Police swooped in to clear the crowd, and Apple halted retail sales of the new phone. WSJ's Angela Yeoh reports.

BEIJING—Apple Inc. said it would temporarily stop selling the iPhone in its five retail stores in China after unruly customers in Beijing led police to seal off a store there and after the newest version of the phone sold out elsewhere.

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```

</a>
</div>
<p class="targetCaption">A brawl broke
out on .....
```

Performance Golden Rule: Only 10-20% of the end user response time is spent downloading the HTML document. The other 80-90% is spent downloading all the components in the page.

- 1. Cache **static** content at the client**
 - **Speeds access for your frequent users**
 - **Use `Cache-Control:max-age=nnn` or `Expires` headers to minimize reloads & update checks**
 - **Focus on image and JAR file caching**
 - **Separate style sheets & scripts to create cache-able "files"**
- 2. Compress **dynamic** content at the data center**
 - **Reduces page "weight" (and user wait) up to 70%**
 - **Use `Content-Encoding:gzip` to ask the client to accept compressed input**
 - **Don't compress images and `.pdf`'s ... it is already done**
 - **Do compress HTML, scripts, and style sheets.**
- 3. Now you can work "inside" the application and DB**

ECSS realized a 35% reduction in end user response time through Caching

**Lesson Learned: Configuration Management is the key to optimal performance and availability
(14 anomalies within a 12 month period)**

Recommendations:

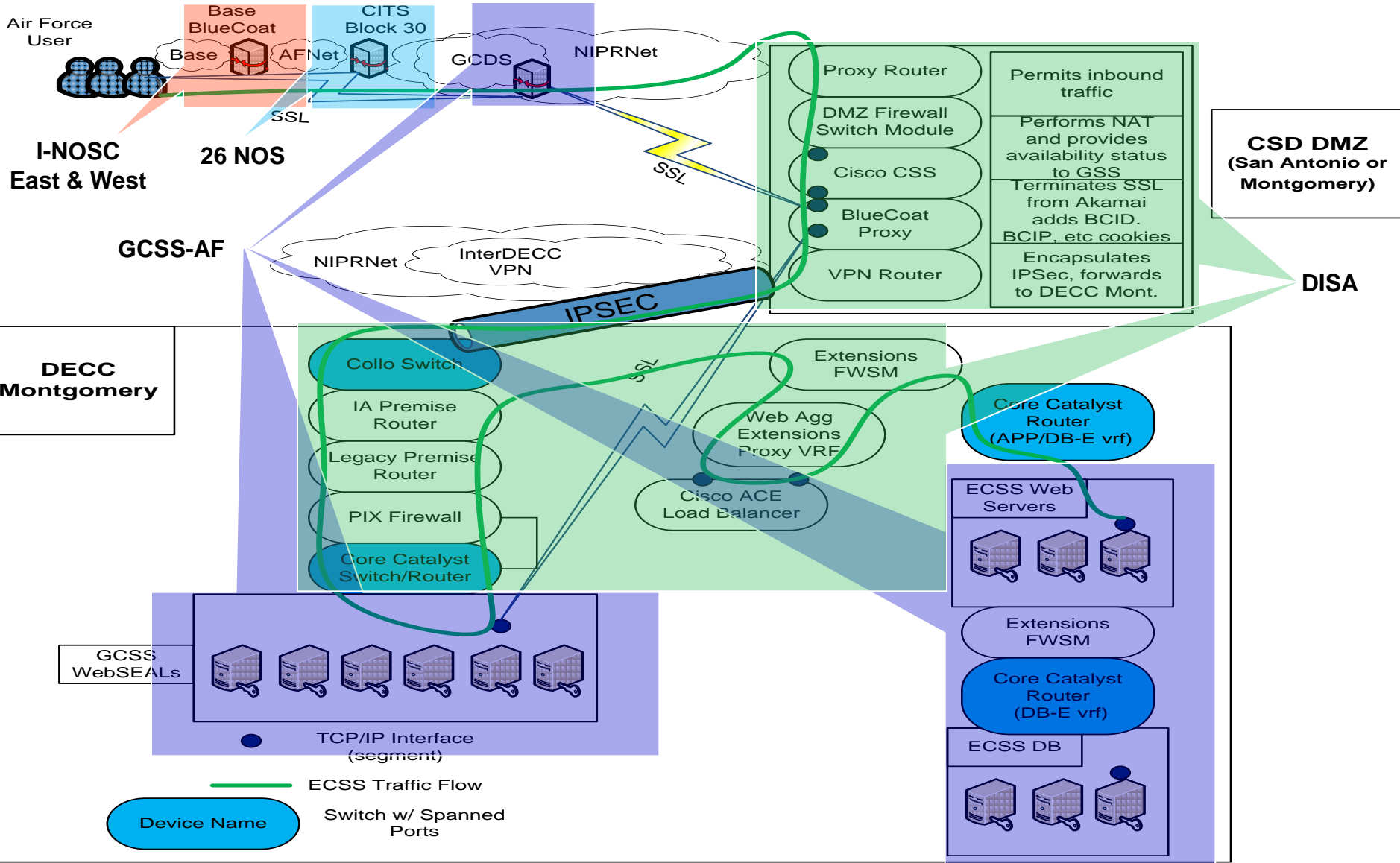
Program Office

- **Establish internal CM plan**
- **Establish external CM plans with service providers**

AFNet

- **Inform program offices of changes**
- **Work with program offices to determine impact to end users**

Current Efforts: SAF Ops Baseline Working Group (AFSPC A6OI) is establishing the "AFNET Approval Process" responsible for overall configuration of the Ops Baseline



Application Performance Management (APM)

- **Provide AF focal point for triage/ troubleshooting efforts supporting the integration of AF systems, applications, and services into the Air Force Network (AFNet), DISA and other AF approved hosting environments**

Dynamic Network Analysis Division

- **Provide performance analysis on developed software**
- **Analyze packet and response time delay**
- **The software must be installed on the operational AFNET or emulated AFNET environment**

Future Application Performance Management Lessons Learned will be posted to a link off the SDF wiki

SDF Wiki link:

https://www.milsuite.mil/wiki/AFNIC_Software_Development_Forum

