A10 Networks // Performance by Design //

AX Series

World Leading Application Delivery Controllers

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Corporate Backgrounder

- **Lee Chen (founder) co-founder Foundry Network**
  - 4th largest switch vendor in the world – IPO $8.7 Billion
  - Known for High Speed, Backbone switching
  - Co-founder of Centillion
- **Founded in 2004**
  - EX Series – Bandwidth Management
  - ID Sentrie – Network Identity Management
- **AX Launched in 2007**
  - New platform ACOS – designed from the ground up
  - 4 AX customers in 2007
  - 200+ customers in 2008
  - 500+ Customer by the end of 2009

A10 Locations

- **180 employees - Globally**
- **North America**
  - San Jose CA HQ
  - Regional offices across USA
- **EMEA**
  - 10 Employees – March 2010
  - 20 Employees- December 2010
  - Den Haag, NL EMEA HQ
  - Regional offices, London, Paris & Munich
- **APAC**
  - Regional offices, Japan, China & Korea

What Do We Do?

- **Optimize Business Application Delivery and Performance**
- **Medium-Large Scale Enterprise**
- **Telco's/Carriers/ISP's**
- **Currently the Absolute Price / Performance Leader in ADC market**
  - 1st & 2nd Fastest "Super Computer ADC" in the world
  - Only 64bit ADC solution in the world
  - All platforms delivering SSMP from day one in a Compact Form
    - (Scalable Symmetric Multi- Processing)
    - 400+ Customers and Growing

What are A10 networks USP's?

- **Superior System Design & Architecture**
  - Scalable Symmetrical Multi Processing
  - Decoupled CPU's
  - Shared Memory
  - 32B & 64Bit
  - Feature Rich
  - Performance Rich
- **Licensing Model**
  - All Features Included
  - Full Performance Included
- **Support & Development Capability**
  - Full support for all features
  - Rapid Feature Development

Superior System Design & Architecture

SSL Acceleration Module – SSL Processing

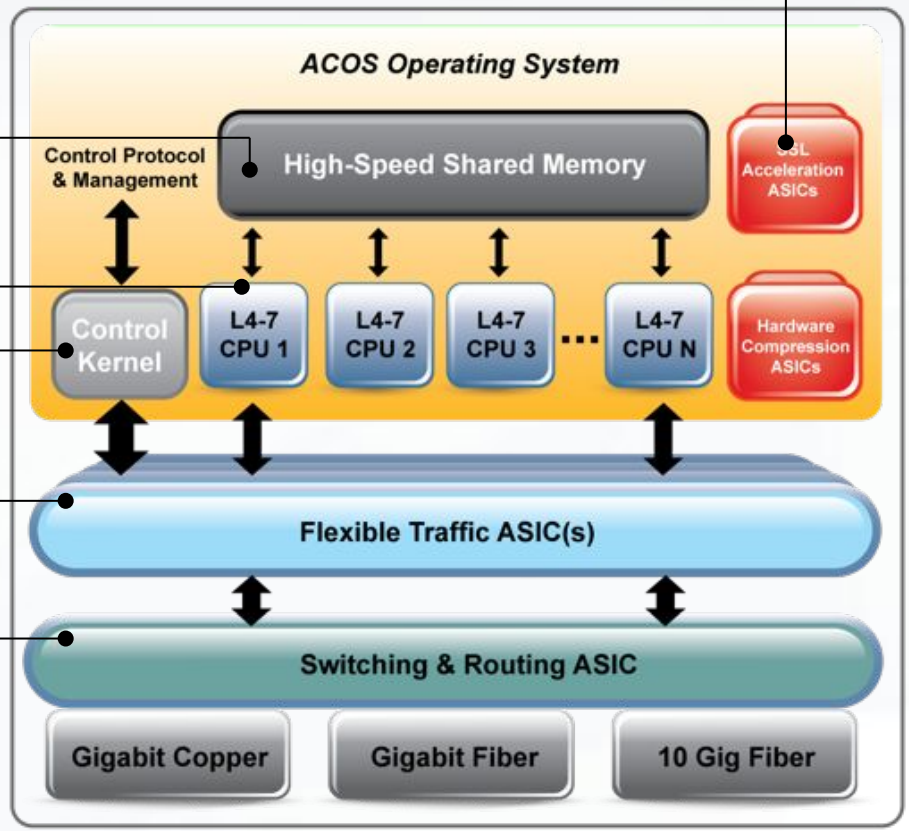
Application Memory – Session Tables, Buffer Memory, Application Data

L4-7 CPUs – L4-7 Processing, Security

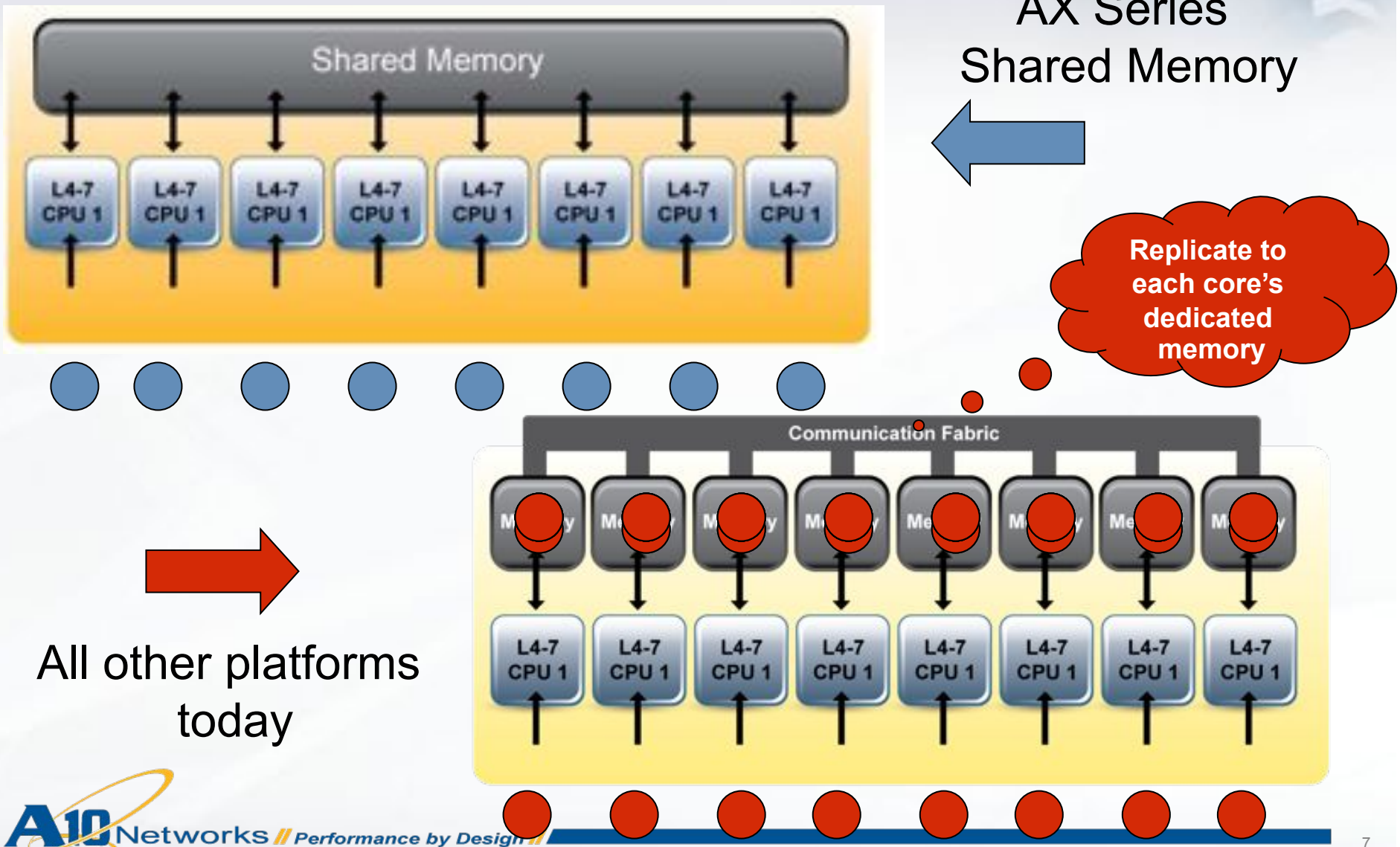
Control Kernel – CLI, GUI, Management Tasks and Health Checking

Flexible Traffic ASIC (FTA) –
Distributes Traffic Across L4-7 CPUs, Efficient Network I/O, DDoS

Switching & Routing ASIC –
L2 & L3 Processing and Security



Superior System Design & Architecture



Maximizes Memory

- **Shared Memory**
  - One copy of each item kept in memory, for example
    - OS uses 64 MB of RAM, Total AX Memory Usage = 64MB RAM
    - Cached Objects, 10 x 0.5 MB, Total AX Memory Usage = 5 MB
    - Total 69 MB of RAM used

- **Without Shared Memory**
  - Multiple copies of each item kept in each cores memory, for example 32 cores
    - OS uses 64 MB of RAM per core, Total Memory Usage = 2048 MB RAM
    - Cached Objects, 10 x 0.5 MB per core, Total Memory Usage = 160 MB
    - Total 2208 MB of RAM used

- **Total system memory is reduced dramatically by the non-shared memory architecture**

So What?

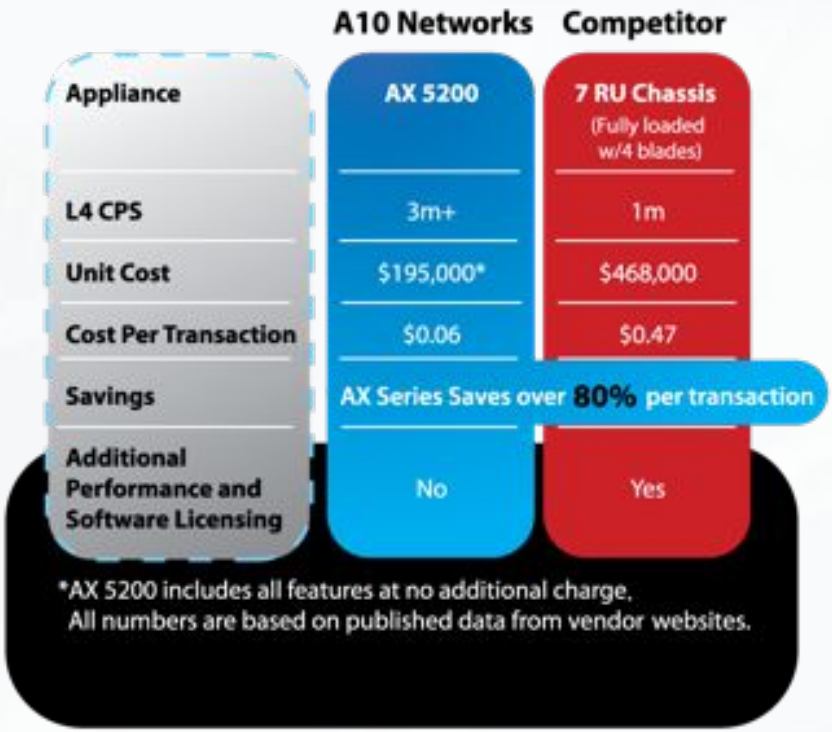
- **Highly Efficient Advanced Core Operating System (ACOS)**
  - Memory, processing & I/O efficiency
  - More user connections per unit
  - Faster application access

- **Best Combination of Software and Hardware**
  - Hardware off-load and acceleration
  - Less Servers, Rack Space, Power, Cooling, Server Licenses
  - Reduced Operating Costs

- **Scalable Symmetrical Multi-Processing (SSMP)**
  - Highest industry performance
  - Maximum headroom for growth (No forklift Upgrades).

Efficiency

Dramatic Savings per transaction – 80%



Superior Performance per Watt – Over 10x

4412

- Maximum Power Consumption: Only 680 Watts

*Transaction cost does not include ongoing operating costs

Data Center Efficiency

AX 5200

7 RU Chassis

* Estimated

What Licensing Model?

- **Layer 4 and Layer 7 Application Acceleration**
  - SSL ASIC
  - RAM caching – static or dynamic
  - HTTP compression
- **aFleX L7 TCL scripting for deep packet inspection**
- **GSLB – Global Server Load Balancing**
- **Advanced NAT options**
- **DNS Application Layer Firewall**
- **Operates in Layer 2/Layer 3 simultaneously**
- **aXAPI REST based XML API for custom management**
- **Virtualized management**
  - Role-Based and Partition-Based Management
  - Seamless Management for Multiple Devices
- **IPv4 and IPv6 load balancing and management**
- **Full web interface or industry standard command line interface**

AX Series

So What?

- **Optimization Features Included**
  - Offload processor intensive tasks to AX
  - Offering either:
    - Less Servers, Rack Space, Power, Cooling, Server licenses **(reduced operating costs)**
      - OR
    - More customers, connections, orders with the same equipment **(reduced capital expenditure for growth)**

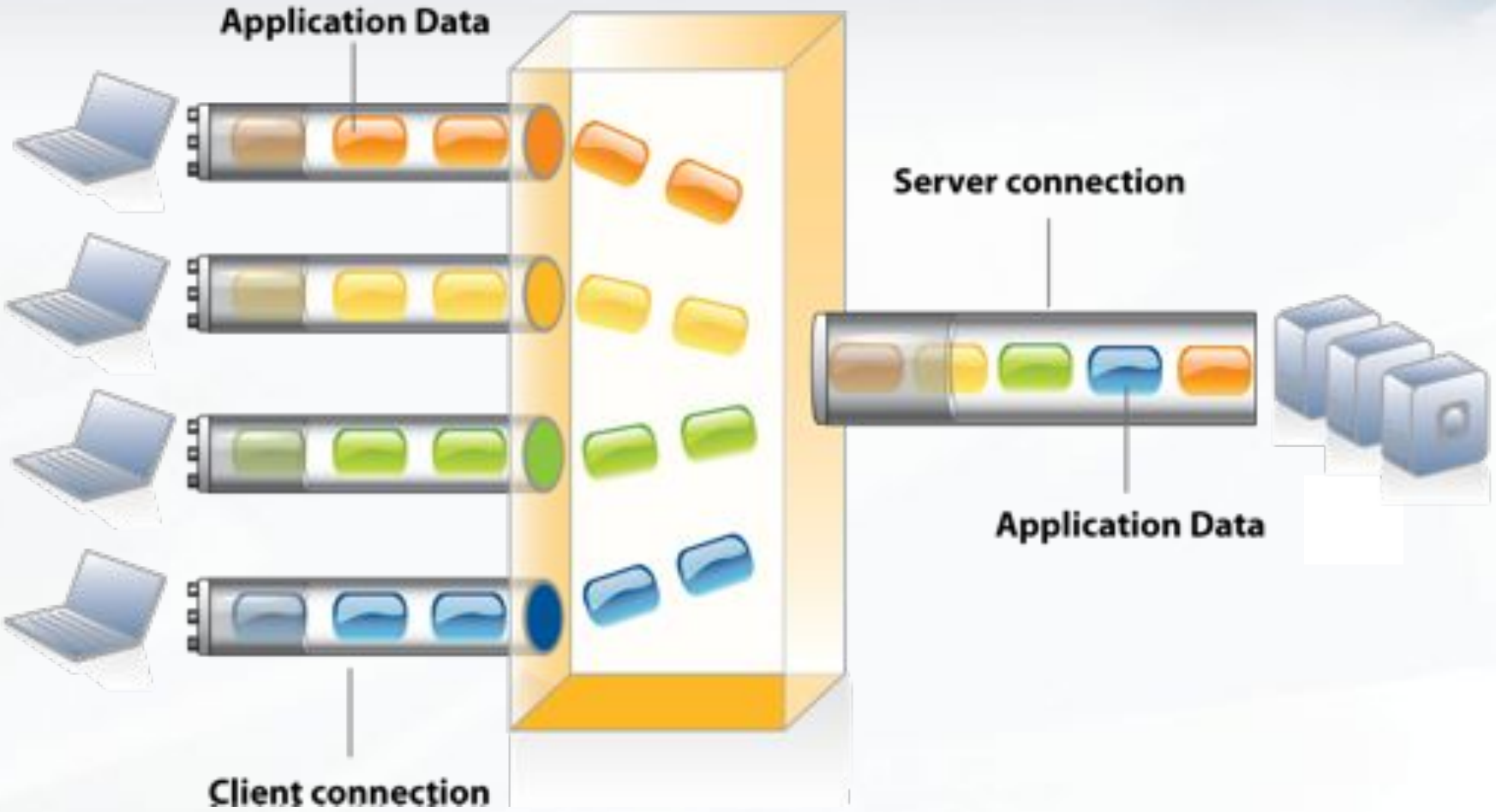
ACOS

- **Global Server Load balancing Included**
  - Provide Automated DR switchover between Data Centres/Offices **(reduced downtime)**
  - Better utilize DR equipment for active active Data Centres **(reduced capital expenditure for growth)**

SSMP

- **Full performance of AX unit included**
  - Reduced capital expenditure at project start

TCP Connection Reuse



So What?

- **Connection Reuse <u>Included</u>**
  - Reduce TCP Session handling load on servers
  - Average server CPU load reduction = 30%
  - Offering either:
    - 30% Less Servers, Rack Space, Power, Cooling, Server licenses **(reduced operating costs)**
      - OR
    - 30% More customers, connections, orders with the same equipment **(reduced capital expenditure for growth)**

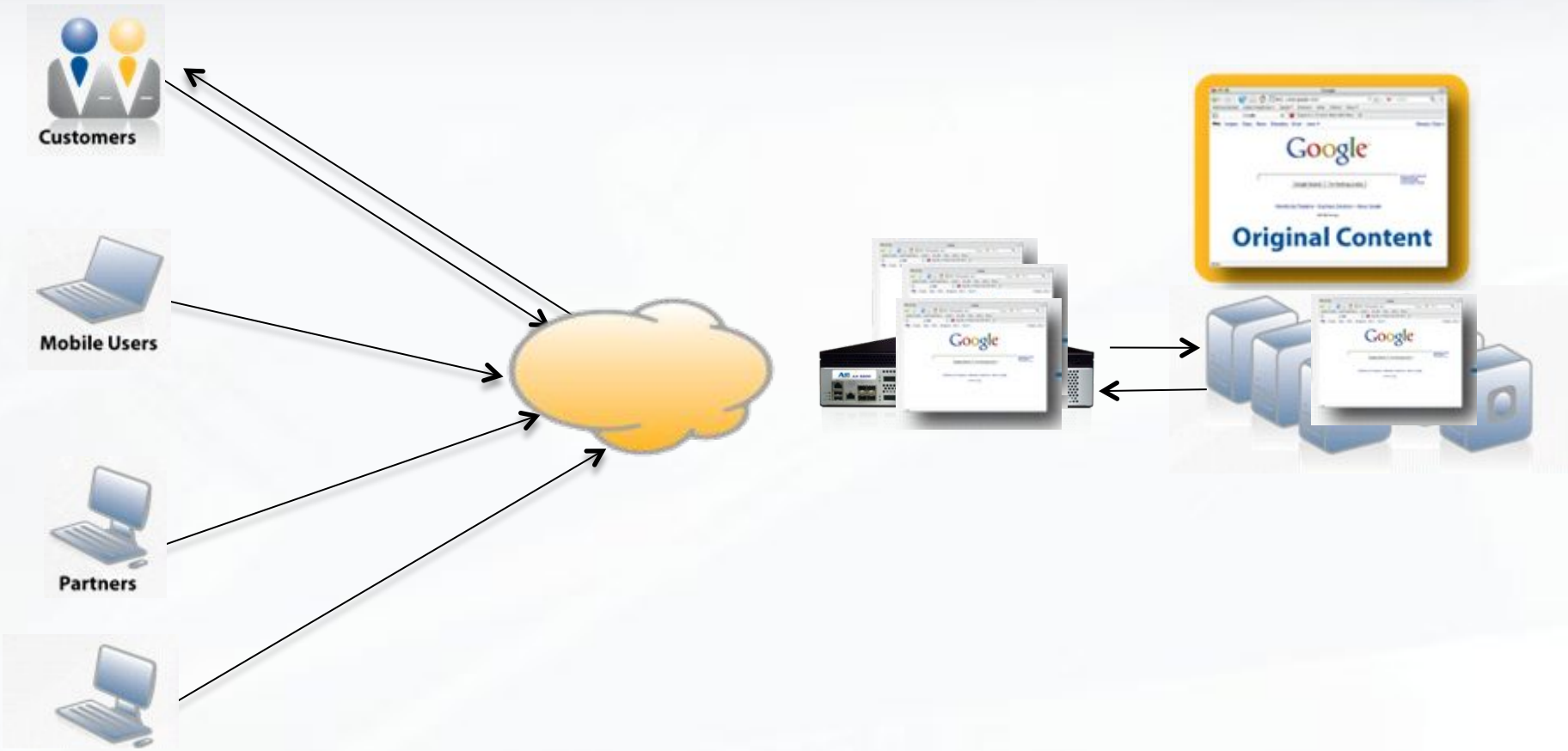
Compression

- HTTP & HTTPS
- Compatible with all modern day web browsers
- Reduce the amount of data and being sent to the client
- Offload compression from the servers
- Especially beneficial for remote/mobile workforce or customers

So What?

- **Compression <u>Included</u>**
  - Reduce the amount of data to each user by average of 60%
  - Faster page loads
  - Reduction in bandwidth requirements
  - Offering either:
    - 60% Less bandwidth **(reduced operating costs)**
      - OR
    - 60% More customer requests and downloads with the same bandwidth **(reduced capital expenditure for growth)**

Static and Dynamic Caching



So What?

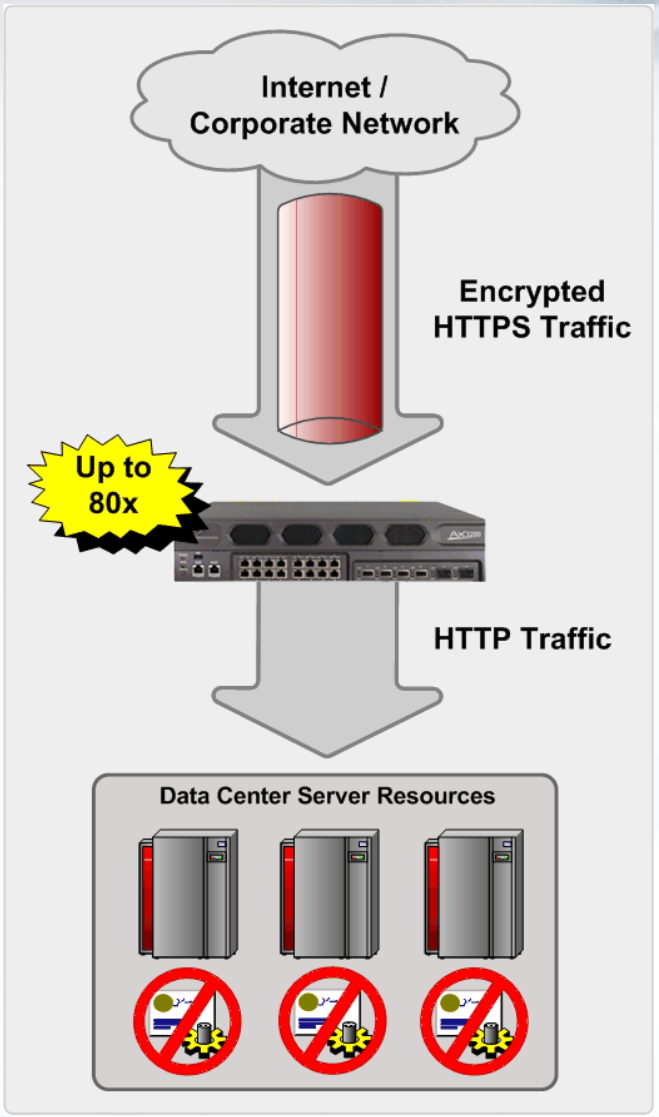
- **RAM Caching <u>Included</u>**
  - Reduce content serving load on servers for commonly used objects
  - Faster page loads as content served from AX RAM and not server disk
  - Average server CPU load reduction = 10%
  - Offering either:
    - 10% Less Servers, Rack Space, Power, Cooling, Server licenses **(reduced operating costs)**
      - OR
    - 10% More customers, connections, orders with the same equipment **(reduced capital expenditure for growth)**

ACOS

SSMP

High Performance SSL Acceleration

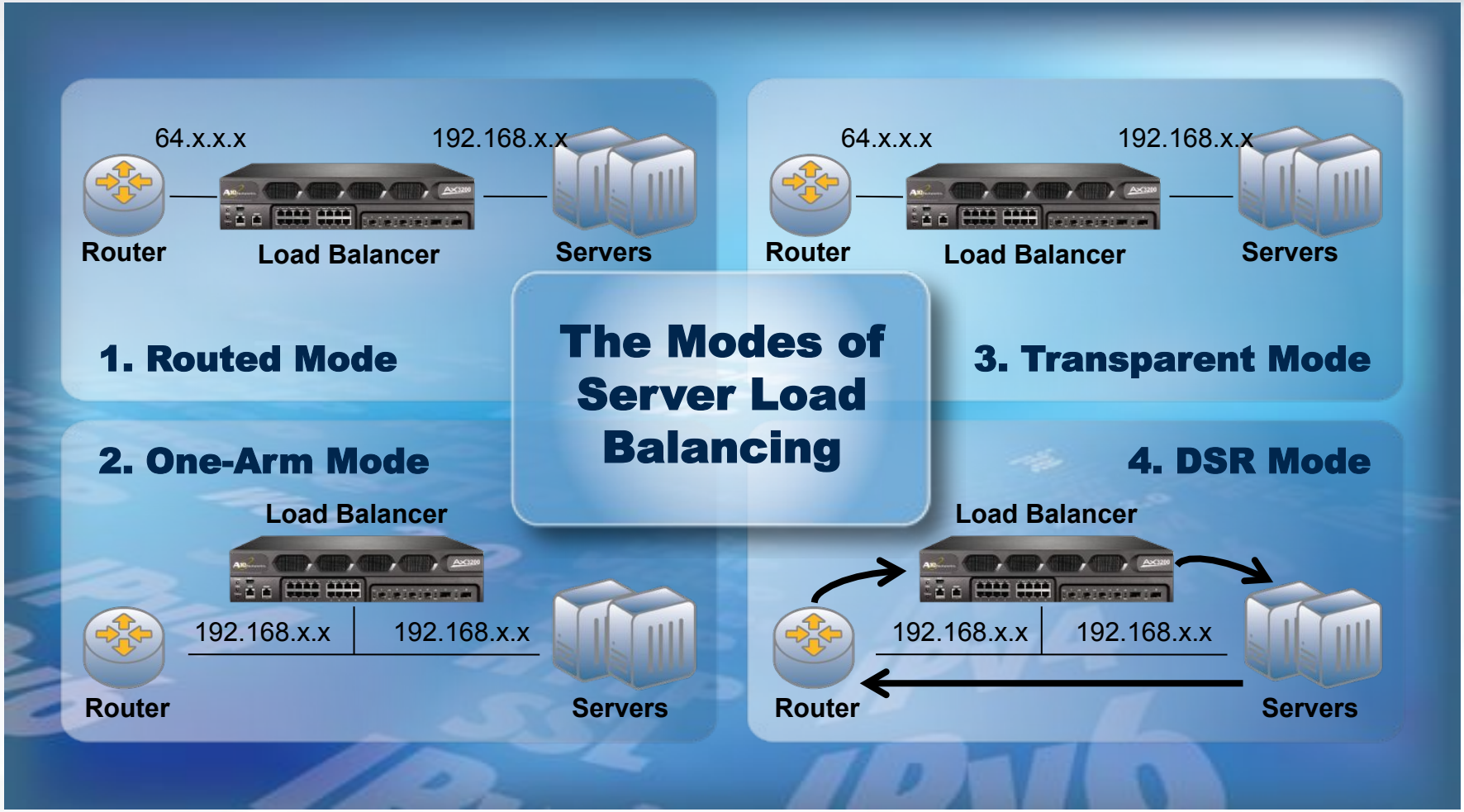
- Hardware based SSL Processing
  - SSL session terminated on AX in Hardware
  - Sent to servers either in the clear (HTTP) or re-encrypted (HTTPS)
  - Ability to reduce cipher spec on back end
- Central Certificate Management
  - Server certificates stored on AX instead of each server
  - Simplify certificate management



So What?

- **SSL Offload <u>Included</u>**
  - Reduce encryption CPU load from servers
  - One certificate required rater than one certificate per server = **reduced certificate cost**
  - Ability to manipulate data at AX = reduction in server/application re configuration = **reduced operating cost**
  - Average server CPU load reduction = **80%**
  - Offering either:
    - 80% Less Servers, Rack Space, Power, Cooling, Server licenses **(reduced operating costs)**
      - OR
    - 80% More customers, connections, orders with the same equipment **(reduced capital expenditure for growth)**

Deployment Considerations



Products

AX Series Appliances

Enterprise Class Systems

32-bit

AX 1000
Throughput: 4 Gb

64-bit

AX 2500
Throughput: 10 Gb

AX 3000-GC
Throughput: 24 Gb

AX 2600-GC
Throughput: 18 Gb

Carrier Class Systems

32-bit

AX 2200
Throughput: 7.4 Gb

AX 3200
Throughput: 8.7 Gb

64-bit

AX 5100
Throughput: 40 Gb

AX 5200
Throughput: 40 Gb

AX Series Enterprise Class Performance Chart

	AX 1000	AX 2500	AX 2600	AX 3000
Application Throughput	4 Gb	10 Gb	18 Gb	22 Gb
Layer 4 CPS	153,000	300,000	355,000	440,000
Layer 7 RPS (unlimited CR)	275,000	700,000	740,000	800,000
DDoS Protection (SYN Flood) SYN/Sec	1 million	2.1 million	2.3 million	2.6 million
SSL CPS	5,500	7,900	11,000	11,000
SSL TPS (10 transactions/conn)	18,000	57,000	85,000	85,000
SSL Bulk Throughput	1.2 Gb	1.2 Gb	2 Gb	2 Gb

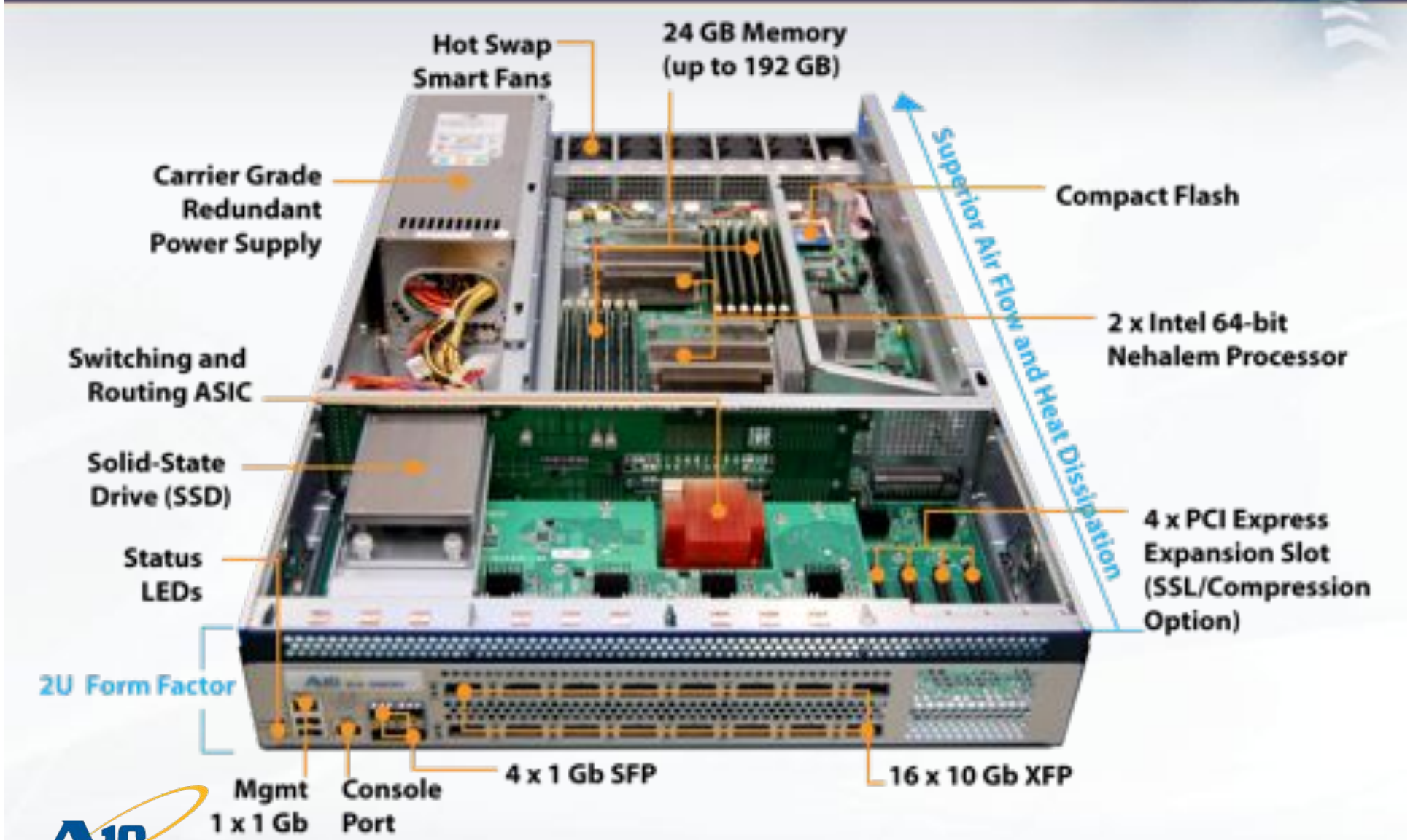
AX Series Carrier Class Performance Chart

AX Series

	AX 2200	AX 3200	AX 5100	AX 5200
Application Throughput	7.4 Gb	8.7 Gb	40 Gb	40 Gb
Layer 4 CPS	302,000	541,000	2,000,000	3,020,000
Layer 7 RPS (unlimited CR)	750,000	1,507,000	1,400,000	3,200,000
DDoS Protection (SYN Flood) SYN/Sec	5.6 million*	9.24 million*	50 million*	50 million*
SSL CPS	16,000	29,000	Option	Option
SSL TPS (10 transactions/conn)	45,000	90,000	Option	Option
SSL Bulk Throughput	1.3 Gb	2 Gb	Option	Option

*** 0% CPU utilization**

AX 5200 Hardware Overview



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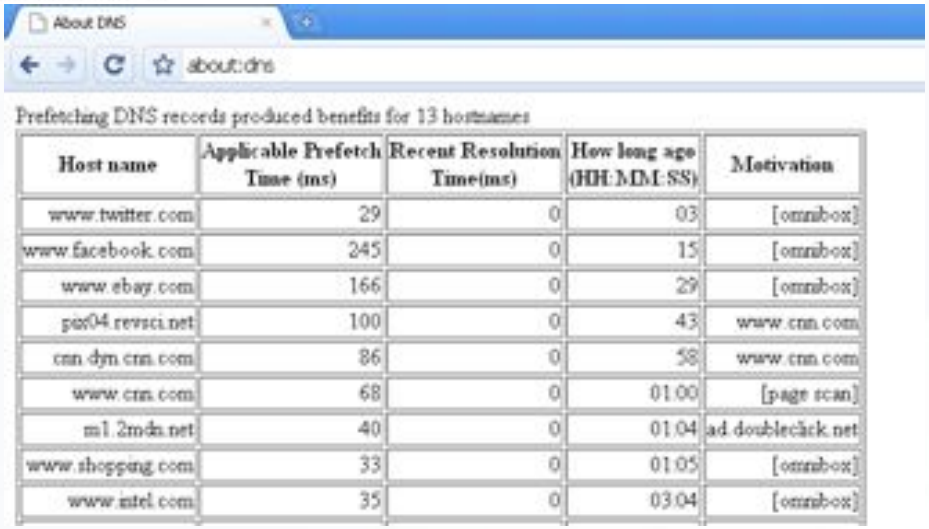
AX Series DNS Application Firewall

Browser and DNS Interaction are Changing

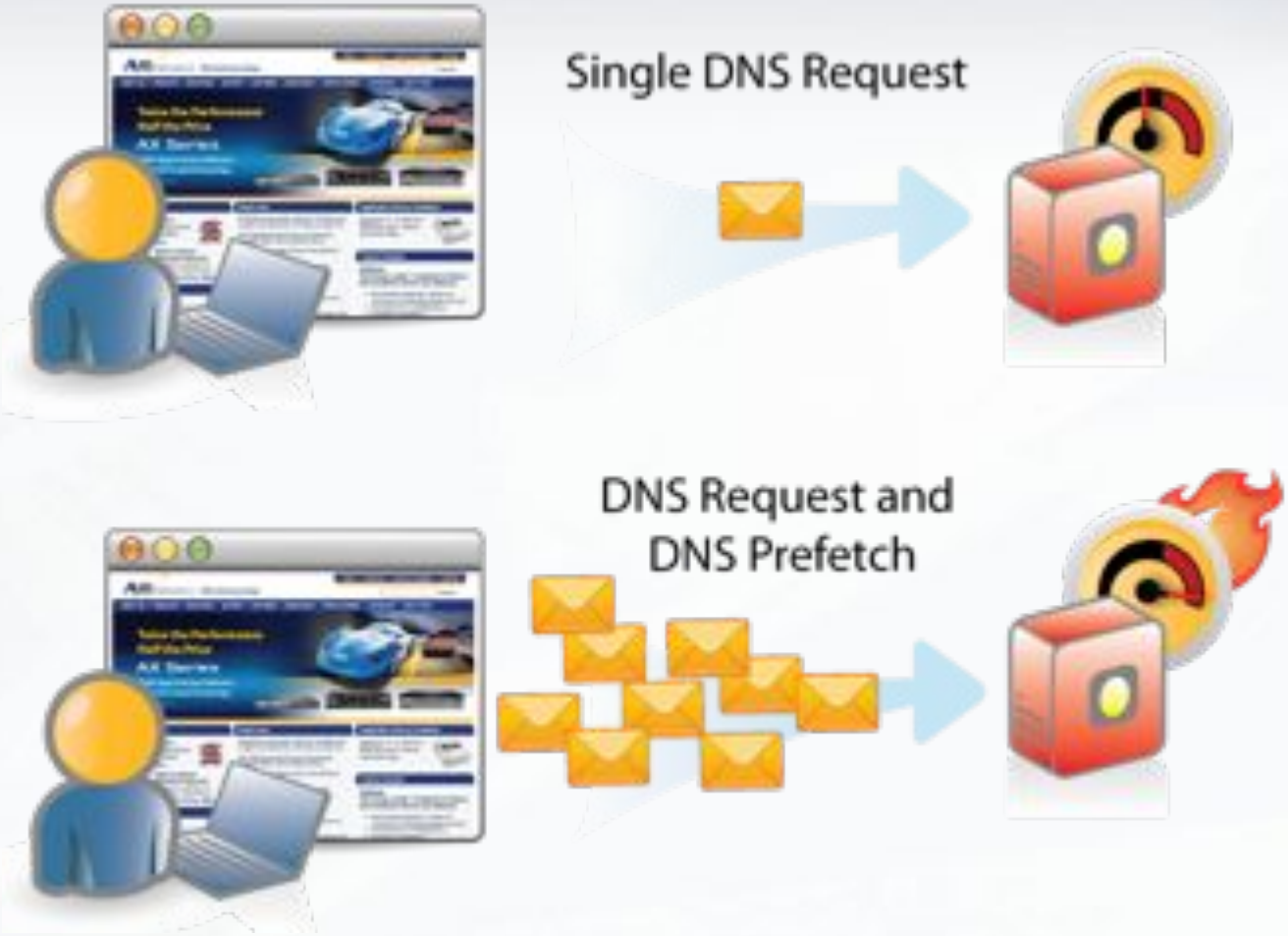
- **Example:**
  - Google Chrome - http://blog.chromium.org/2008/09/dns-prefetching-or-pre-resolving.html

- **DNS pre-fetching**
  DNS pre-fetching stands for Domain Name System pre-fetching. When you visit a webpage, Google Chrome can look up, or pre-fetch, the IP addresses of all links on the webpage. Browsers use the IP address to load a webpage, so by looking up this information in advance, any links you click on the webpage will load faster.



Host name	Applicable Prefetch Time (ms)	Recent Resolution Time(ms)	How long ago (HH:MM:SS)	Motivation
www.twitter.com	29	0	03	[omnibox]
www.facebook.com	245	0	15	[omnibox]
www.ebay.com	166	0	29	[omnibox]
pix04.revsci.net	100	0	43	www.cnn.com
cnn.dyn.cnn.com	86	0	58	www.cnn.com
www.cnn.com	68	0	01:00	[page scan]
m1.2mdn.net	40	0	01:04	ad.doubleclick.net
www.shopping.com	33	0	01:05	[omnibox]
www.intel.com	35	0	03:04	[omnibox]

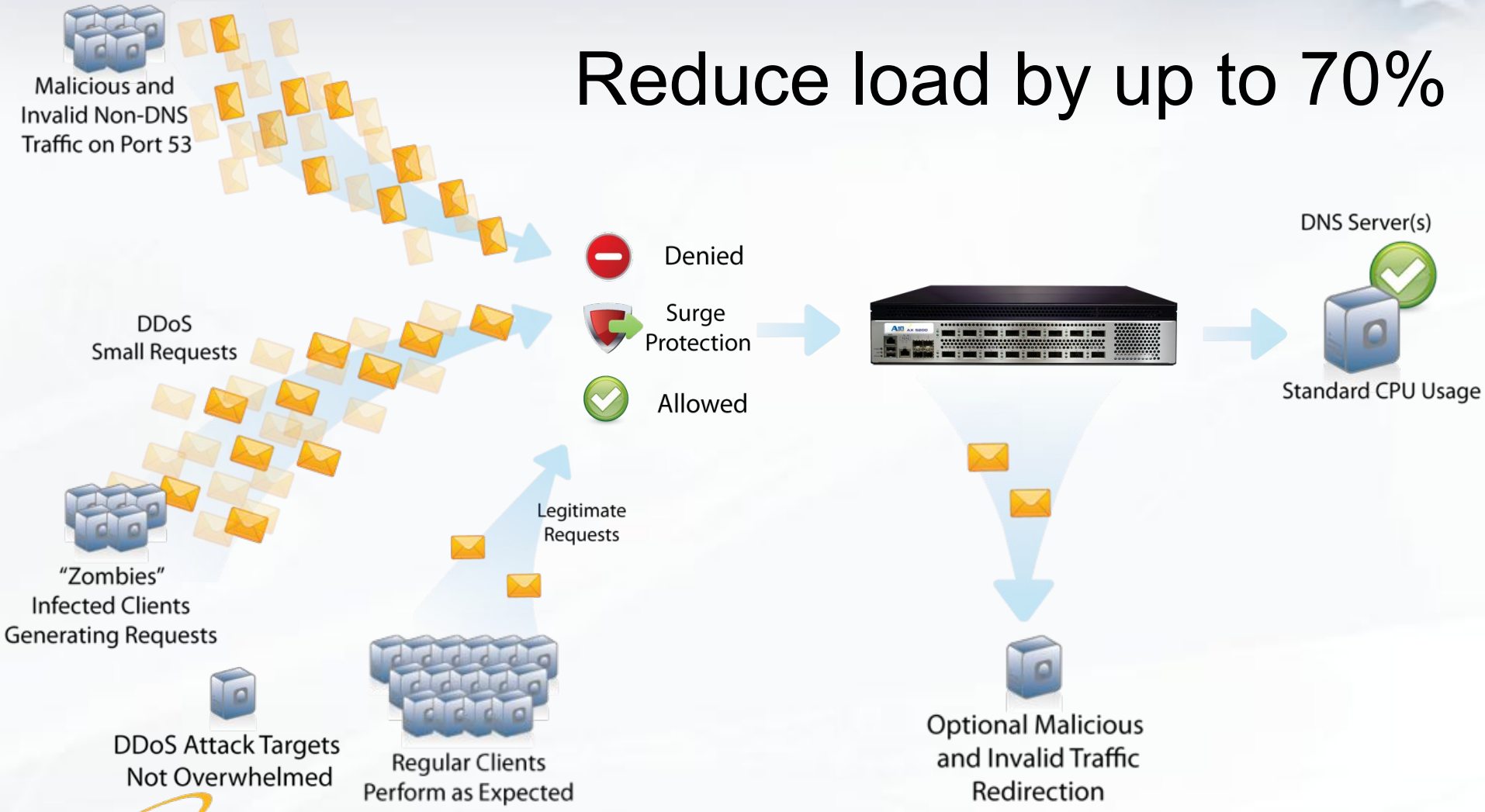
Problem 1: Increased DNS Infrastructure Pressure



Problem 2: Distributed DDoS Attacks on DNS Infrastructure

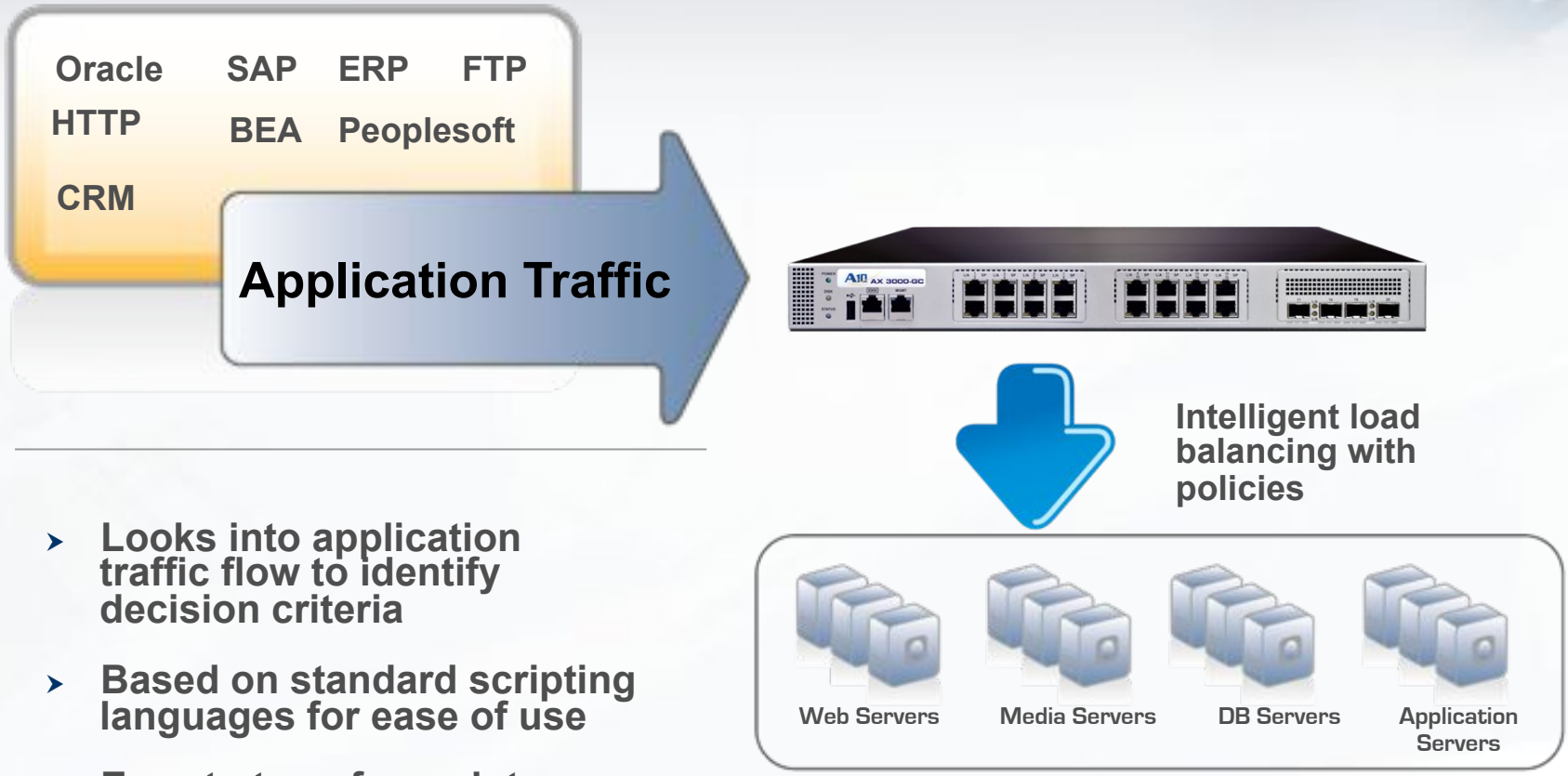
Problem 3: Malicious and Invalid Traffic Hitting DNS Infrastructure

Solution: AX Series DNS Application Firewall



aFleX

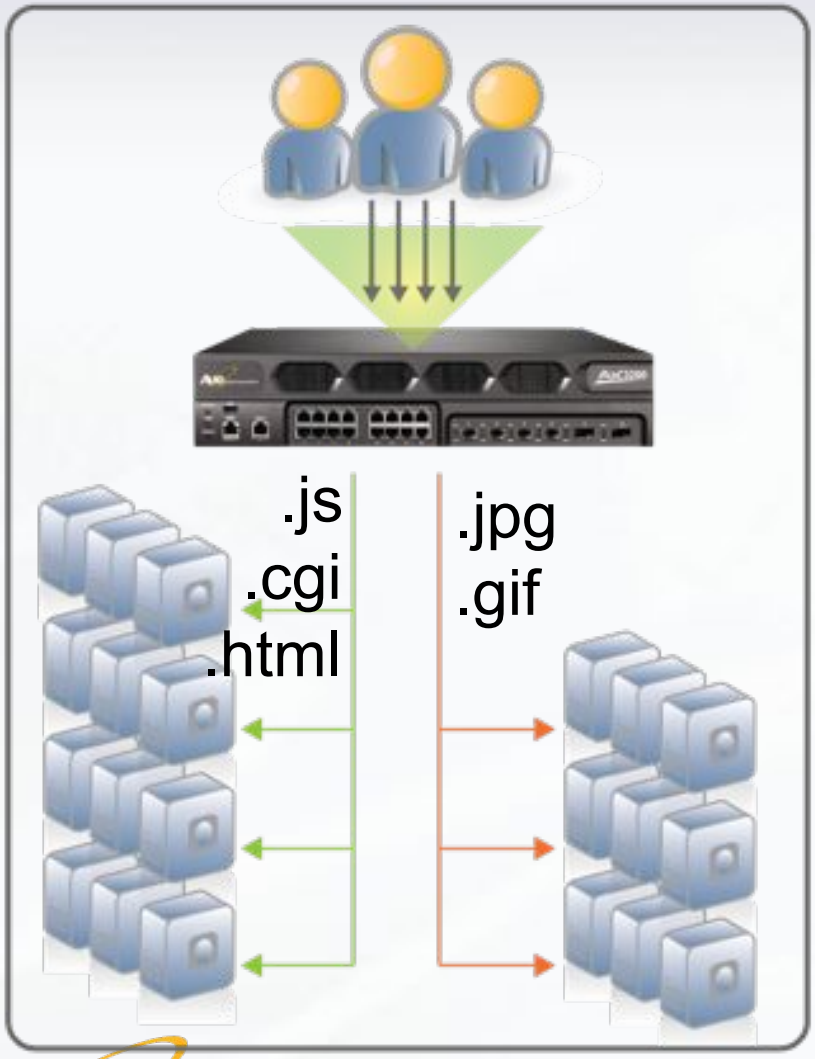
Layer 7 Scripting: aFleX



- Looks into application traffic flow to identify decision criteria
- Based on standard scripting languages for ease of use
- Easy to transfer scripts from other load balancing solutions

Net Effect: flexible management without performance degradation

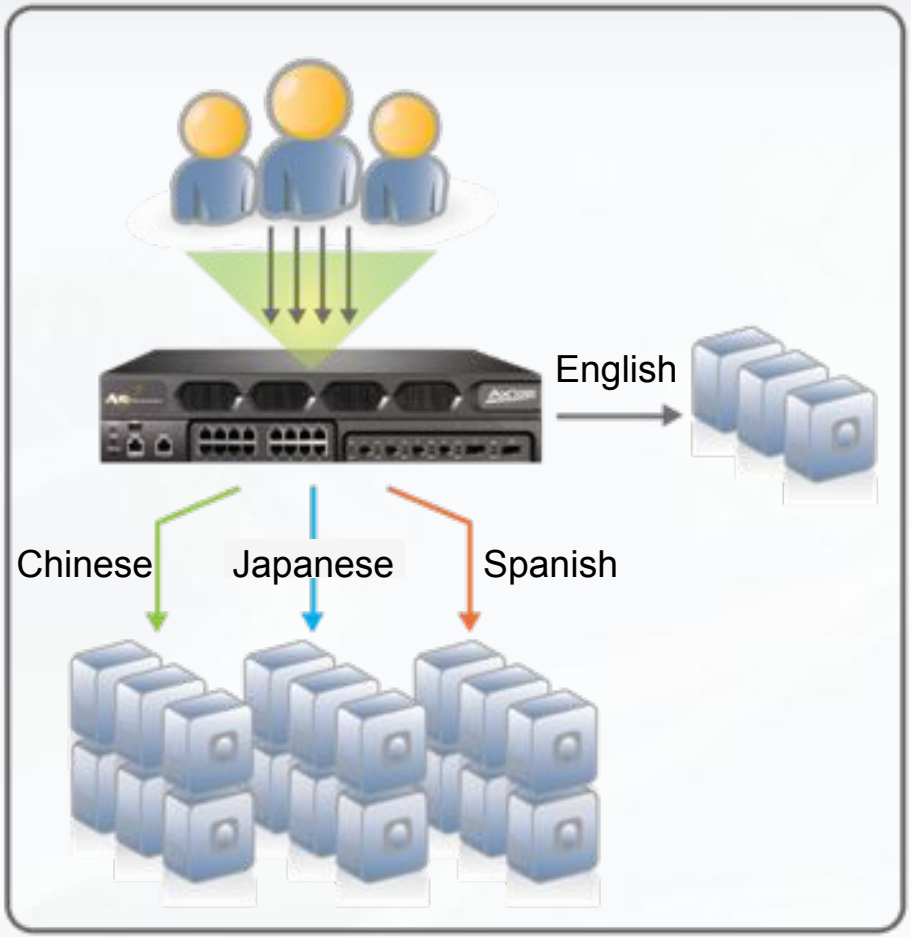
aFleX : Reallocate requests by content type to optimize data center resources



Transparent to the user, splits requests for static images (jpgs and gifs) to a separate caching server tier.

```
when HTTP_REQUEST {
  if { [HTTP::uri] ends_with "jpg" } {
    pool cache

  } elseif { [HTTP::uri] ends_with "gif" } {
    pool cache

  } else {
    pool web
  }
}
```

aFleX : Automatically provide content in the user's language



Automatically displays a Web page based on the user's language, using the language set in the user's browser.

```
when HTTP_REQUEST {

if { [HTTP::header accept-language] contains
"es" } {
    pool Spanish

} elseif { [HTTP::header accept-language]
contains "ja" } {
    pool Japanese

} elseif { [HTTP::header accept-language]
contains "zh" } {
    pool Chinese

} else {

    pool English
  }
}
```

aFleX : Provide easy to remember URLs

Hides the complex directory structure of the backend Web server by using a short and easy to remember URL. Also facilitates a mechanism for fast back end directory changes transparently to the user.

```
when HTTP_REQUEST {

    if { [HTTP::uri] starts_with "/sales" } {

        HTTP::uri "/htdocs/usa/start/dept/
sales"

   } elseif { [HTTP::uri] starts_with "/ship" } {

        HTTP::uri "/htdocs/usa/start/dept/
shipping"
   }
}
```

aFleX : Provide easy way to re-direct URLs

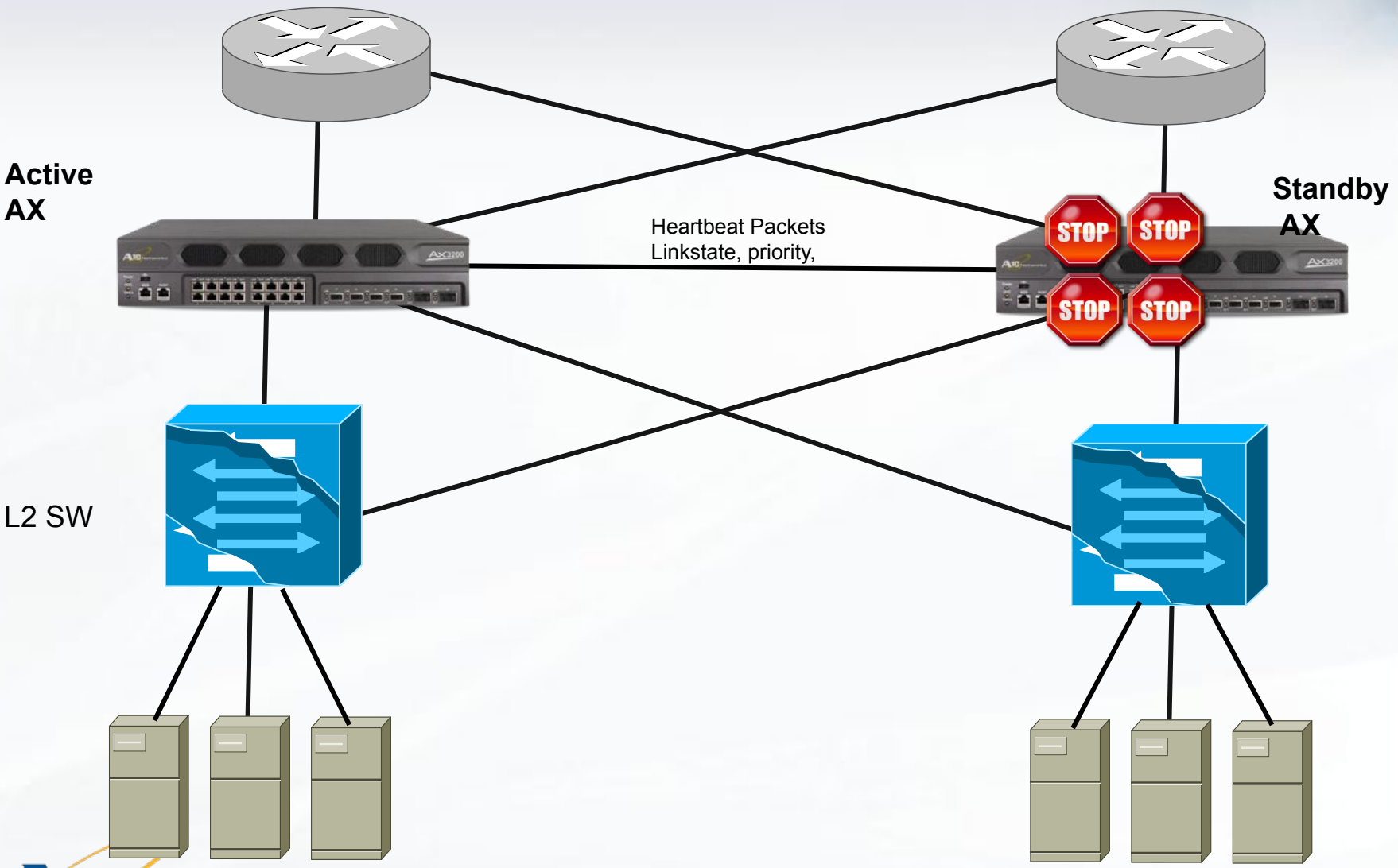
//www.A10networks.com //www.A10networks.com/oss/signup.php

www.A10networks.com
www.A10networks.com/oss/signup.php

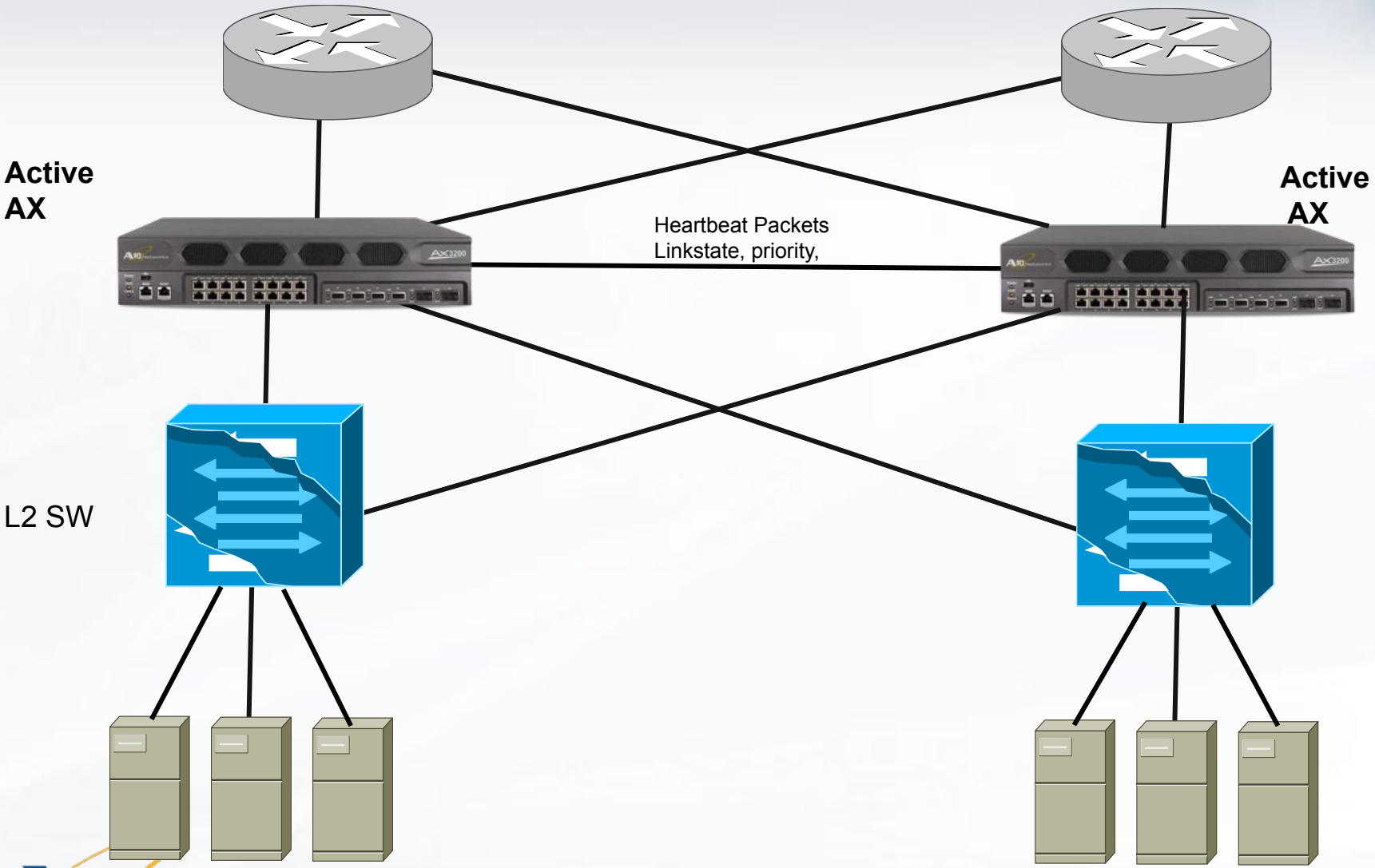
Provides a simple way to provide redirect:
In this example users are redirected from www.A10networks.com to www.A10networks/oss/signup.php

```
when HTTP_REQUEST {

  if { [HTTP::uri] equals "/A10" } {

    HTTP::redirect http://[HTTP::host]/oss/signup.php

    }

}
```

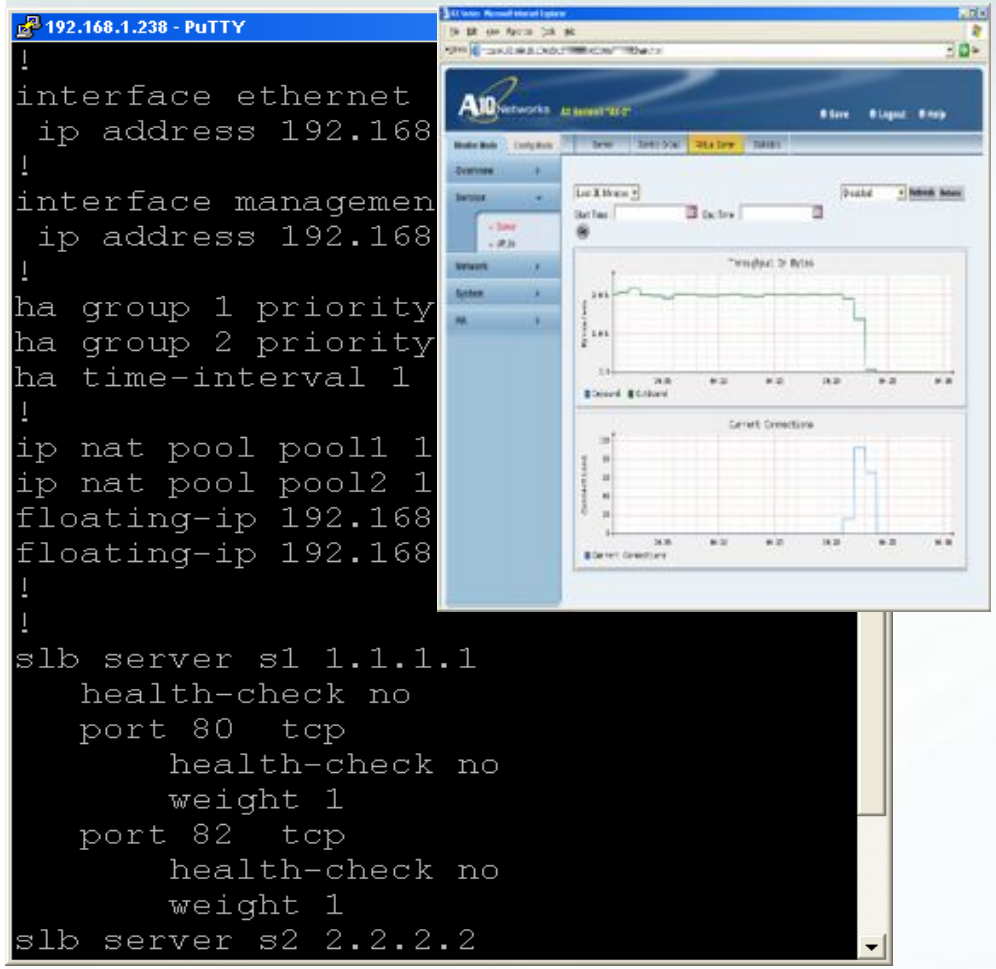
Intelligent HA configuration
Active-Standby



Intelligent HA configuration
Active-Active

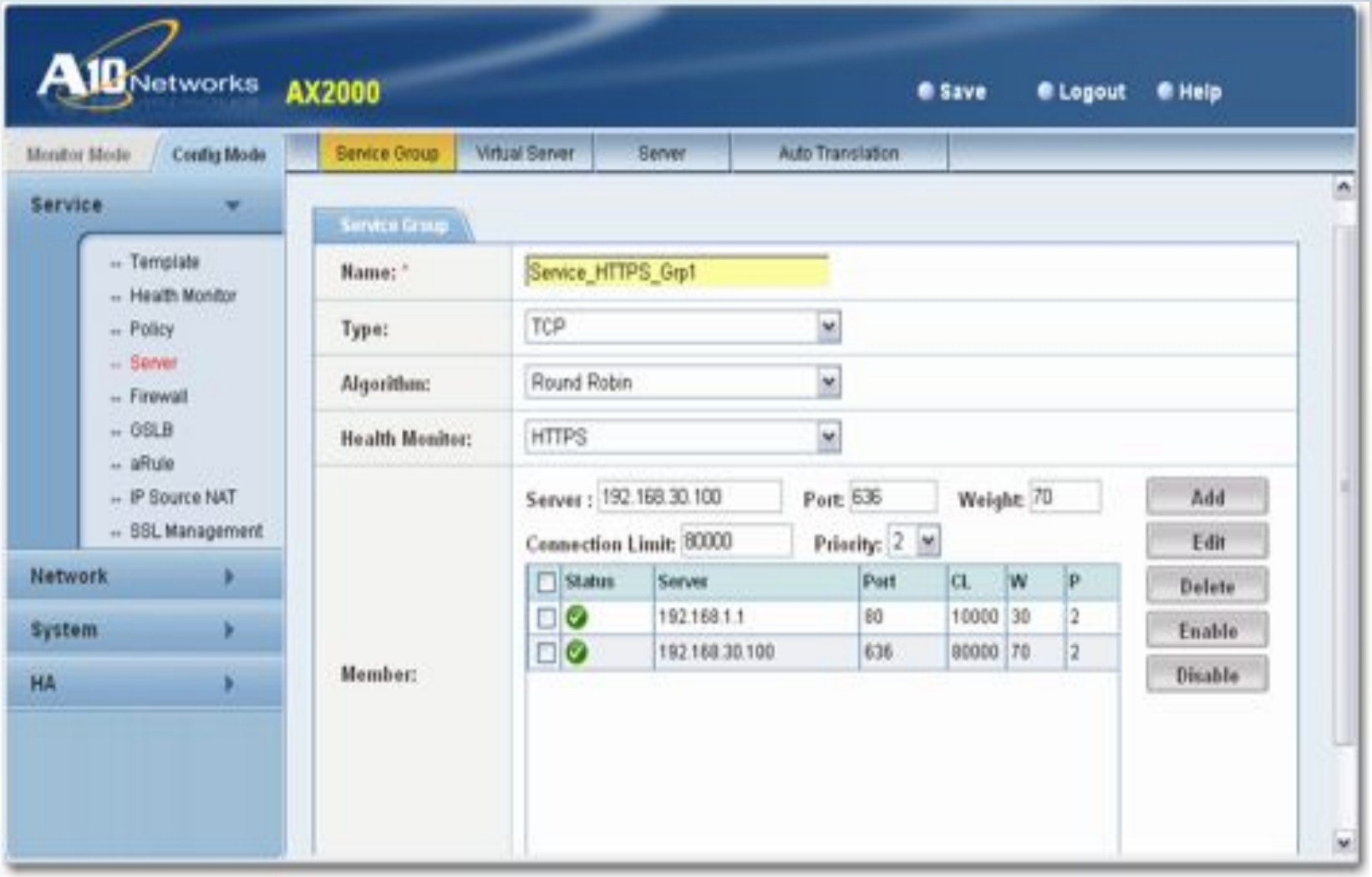


Manageability



- **Flexible Configuration**
  - Cisco Like CLI
  - Simple to use GUI
  - Linux based Control Kernel
- **Powerful External Healthchecks**
  - Python, Perl, TCL, Bash
  - Multi Layer
- **aFleX**
  - TCL based Application Control
- **aXAPI**
  - REST Format
  - Quicker implementation than SOAP
    - Less code
    - Less complex
    - Easier to understand/support

Config mode


A10 Networks
AX2000
Save
Logout
Help
Monitor Mode
Config Mode
Service
Template
Health Monitor
Policy
Server
Firewall
GSLB
aRule
IP Source NAT
SSL Management
Network
System
HA
Service Group
Virtual Server
Server
Auto Translation
Service Group
Name: *
Service_HTTPS_Grp1
Type:
TCP
Algorithm:
Round Robin
Health Monitor:
HTTPS
Member:
Server :
192.168.30.100
Port:
636
Weight:
70
Connection Limit:
80000
Priority:
2
Add
Edit
Delete
Enable
Disable
Status
Server
Port
CL
W
P
192.168.1.1
80
10000
30
2
192.168.30.100
636
80000
70
2

Monitor mode

Virtualized Management - “Shared SLB”

- Each Administrator can see only the allocated SLB resources
- Up to 128 Partitions
- Graceful Shutdown
- Slow Start

Welcome to the New Generation: Don't Be Left Behind

- Higher Performance
- Lower Price
- Better Support