FOUNDRY NETWORKS

Layer 4-7 Server Load Balancing

Security, High-Availability and Scalability of Web and Application Servers

Foundry Overview

World Headquarters
San Jose, California

- Mission:

  Performance, High Availability, & Feature Leadership for Multilayer Switching (L2, L3, L4-7)

- Total Worldwide Customers: 6,000+
- Product & Corporate Awards: 50+

5th Consecutive Year of Net Profitability

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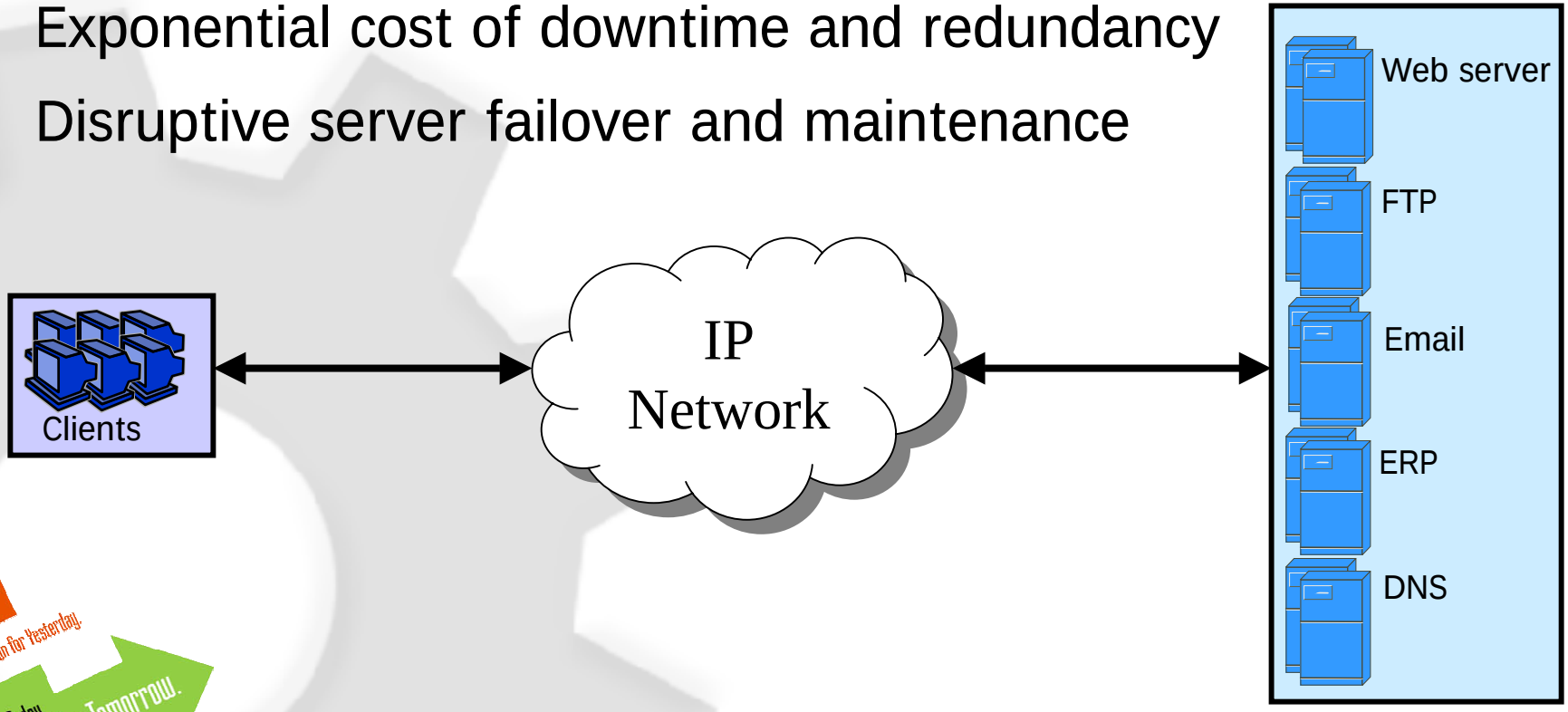
Agenda

- Need for Load Balancing
- Load Balancing Technology
- Load Balancing Applications
- Benefits of Load Balancing
- Foundry Layer 4-7 Overview

Server Farm Challenge - #1

Poor Availability and Manageability

- Proliferation of IP applications complicates manageability and decreases availability
- Exponential cost of downtime and redundancy
- Disruptive server failover and maintenance



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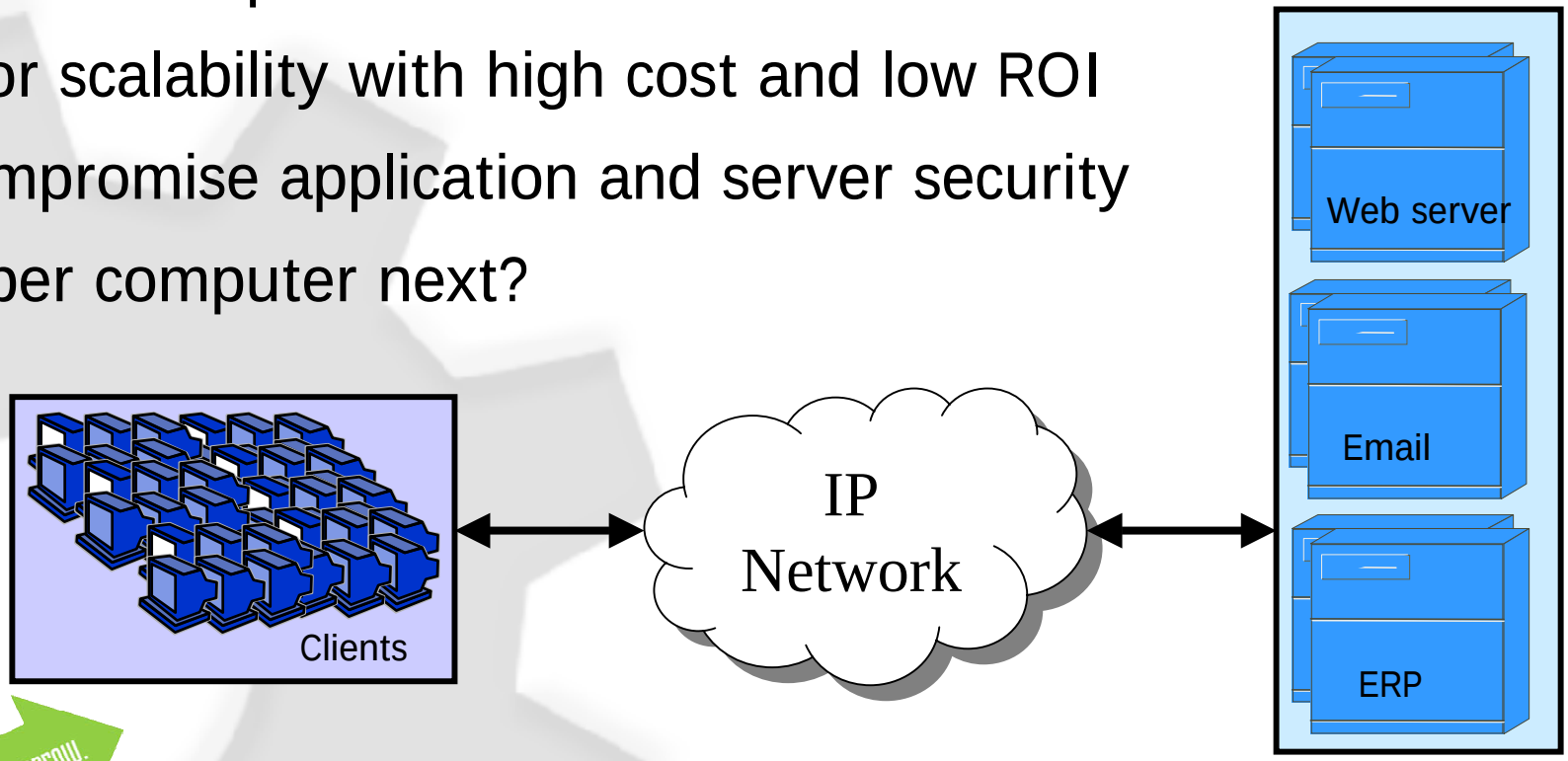
Server Farm Challenge - #2

Scalability Requires Bigger Servers

- Replace installed servers with larger and expensive ones
- Stranded capital in redundant servers
- Poor scalability with high cost and low ROI
- Compromise application and server security
- Super computer next?



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Consequences of Current Approaches

- High risk of network and application downtime
- Business growth limited by server size
- Wasted capital and resources on redundant capacity
- Poor application performance, availability and security

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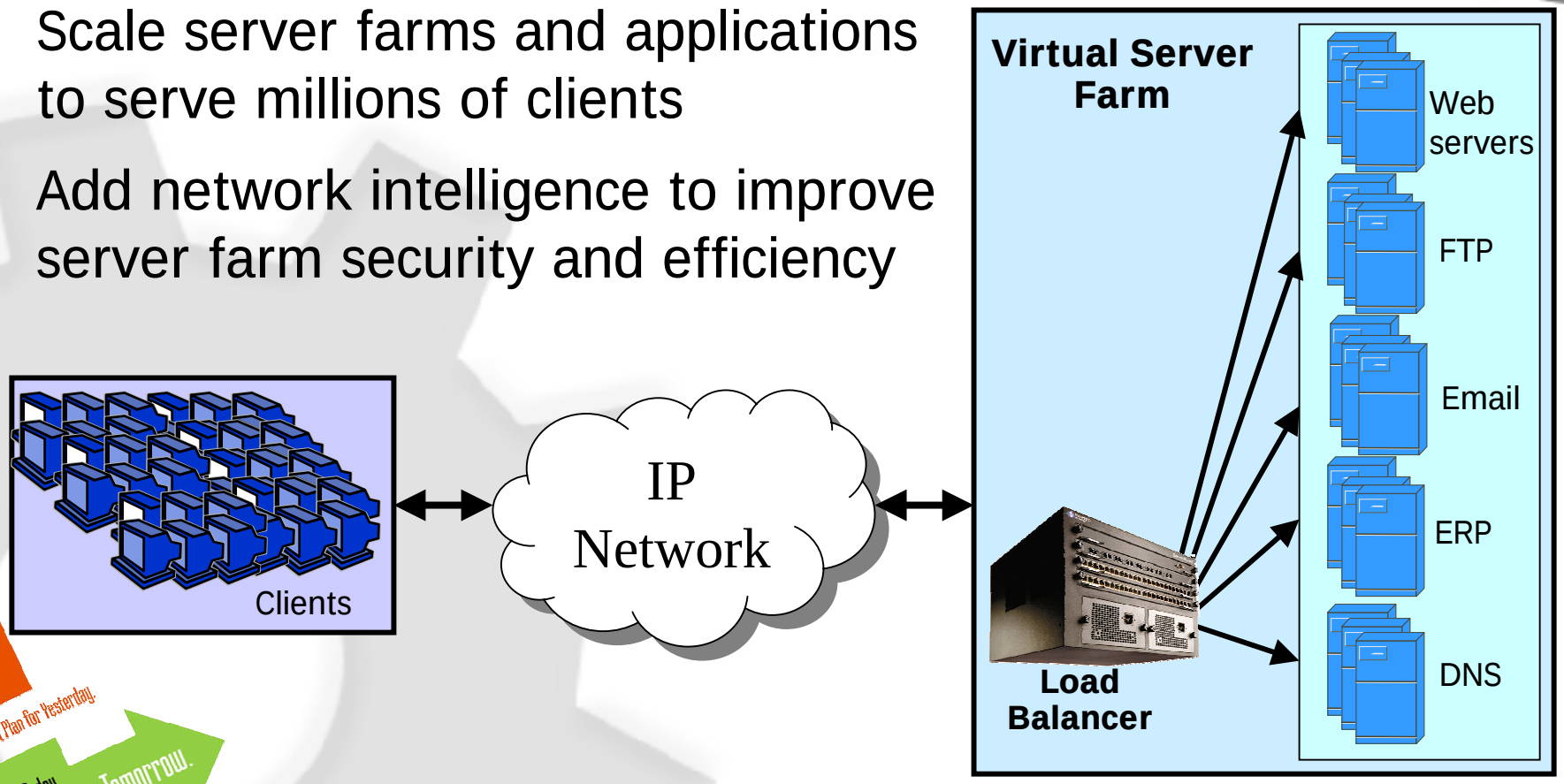
Load Balancing Solution

- Leverage multiple commodity servers to create unlimited virtual capacity
- Scale server farms and applications to serve millions of clients
- Add network intelligence to improve server farm security and efficiency



Benefits of Load Balancing

- All servers utilized to maximum (ROI $$$)
- Ability to transparently add servers on-demand
- Full redundancy and transparency during failures
- Maximum application up time and massive scalability
- Superior service response time and performance

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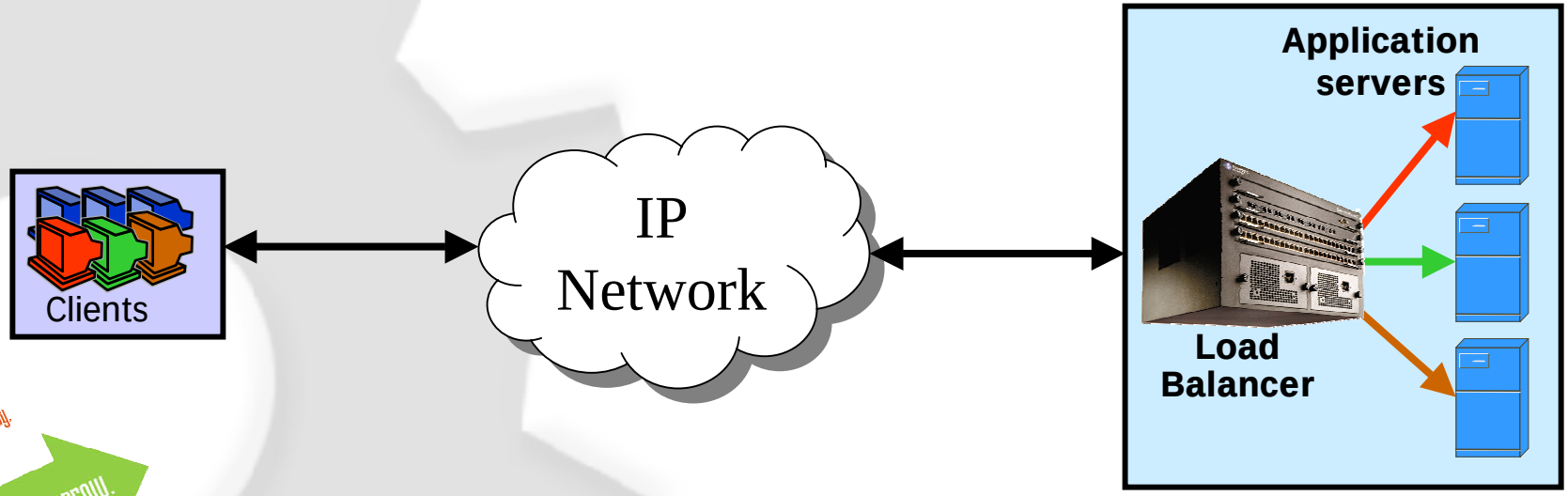
Load Balancing Overview

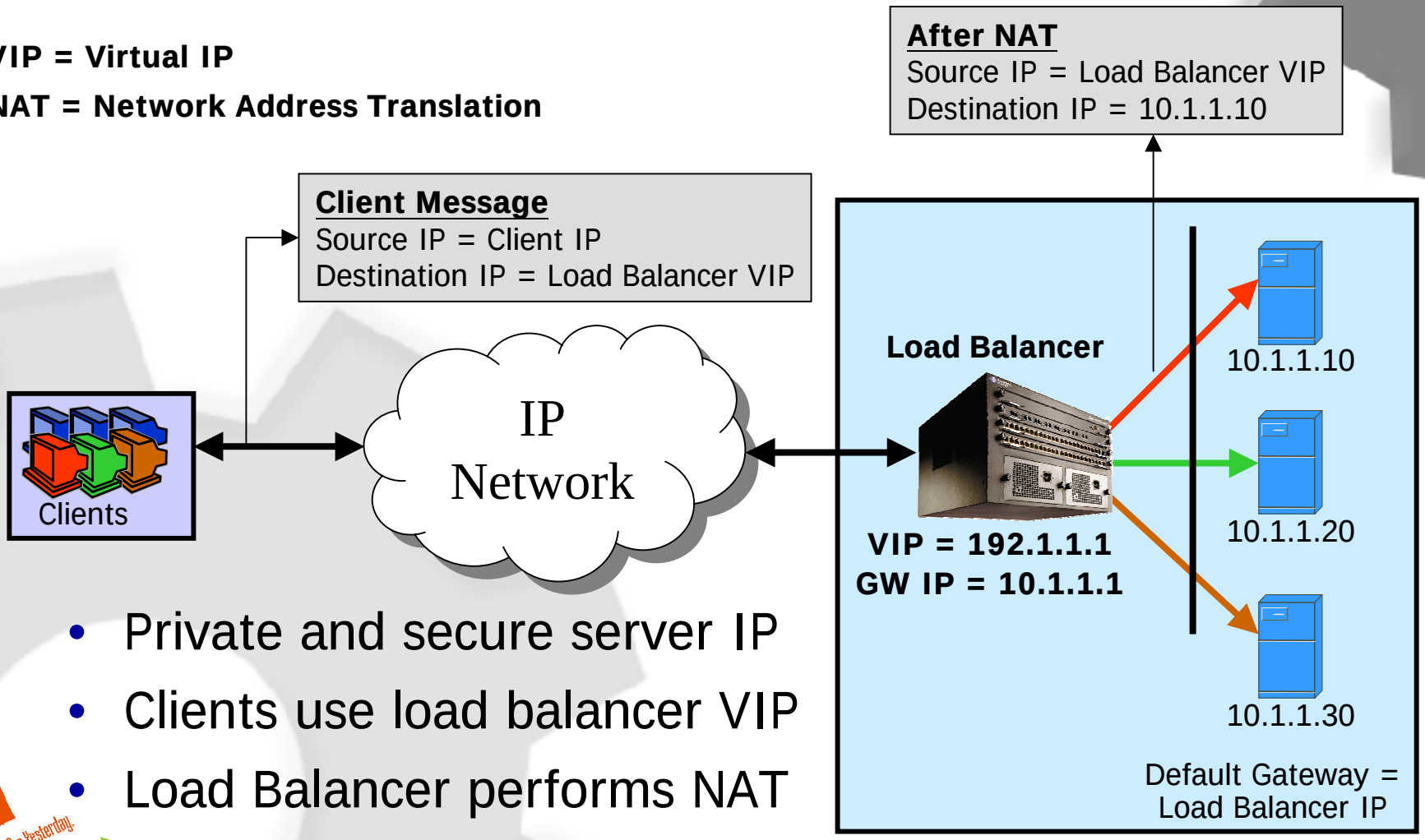
- Load Balancer receives all client requests
- Selects “best” server using real-time health and performance information
- Utilizes all available servers simultaneously
- Intelligently distributes load among servers



Load Balancing Fundamentals

VIP = Virtual IP

NAT = Network Address Translation



- Private and secure server IP
- Clients use load balancer VIP
- Load Balancer performs NAT

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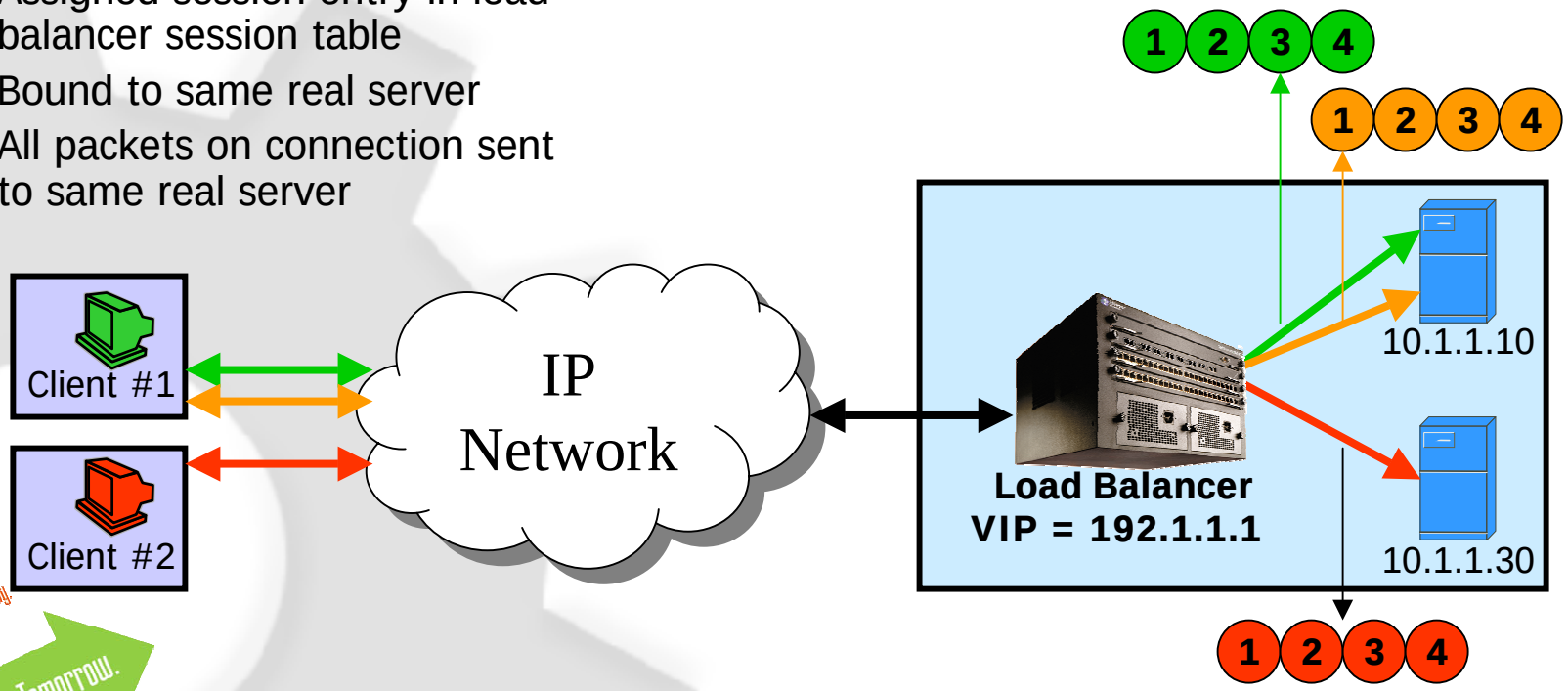
Stateful Load Balancing

- Load balancer identifies session boundaries
- For duration of session, each client connection is
  - Assigned session entry in load balancer session table
  - Bound to same real server
  - All packets on connection sent to same real server

Session Table

Src. IP	Dest. IP	Src. Port	Dst. Port	Server
188.1.1.100	192.1.1.1	100	80	RS1
188.1.1.100	192.1.1.1	101	80	RS2
188.1.1.101	192.1.1.1	200	80	RS1



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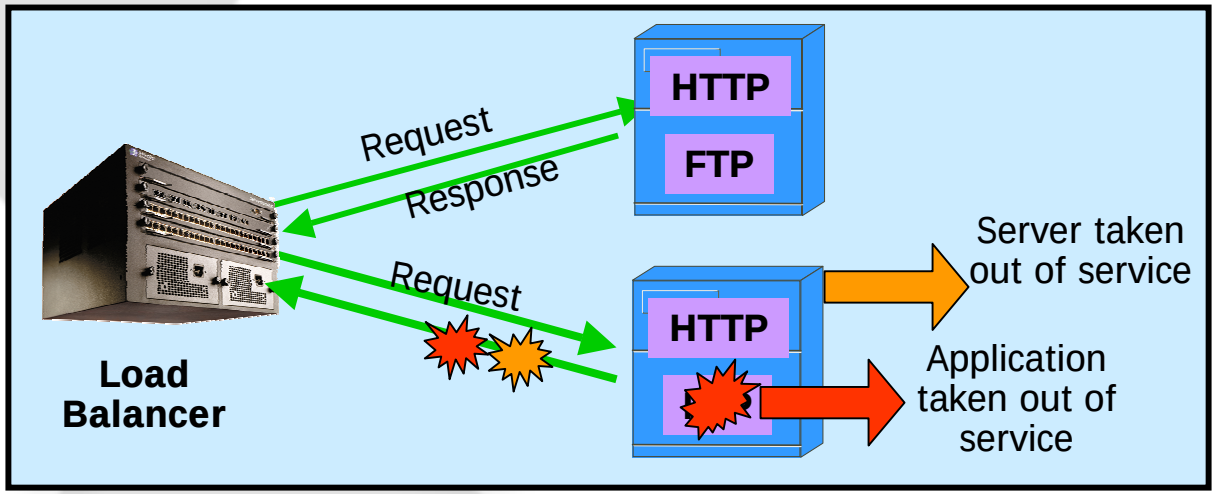
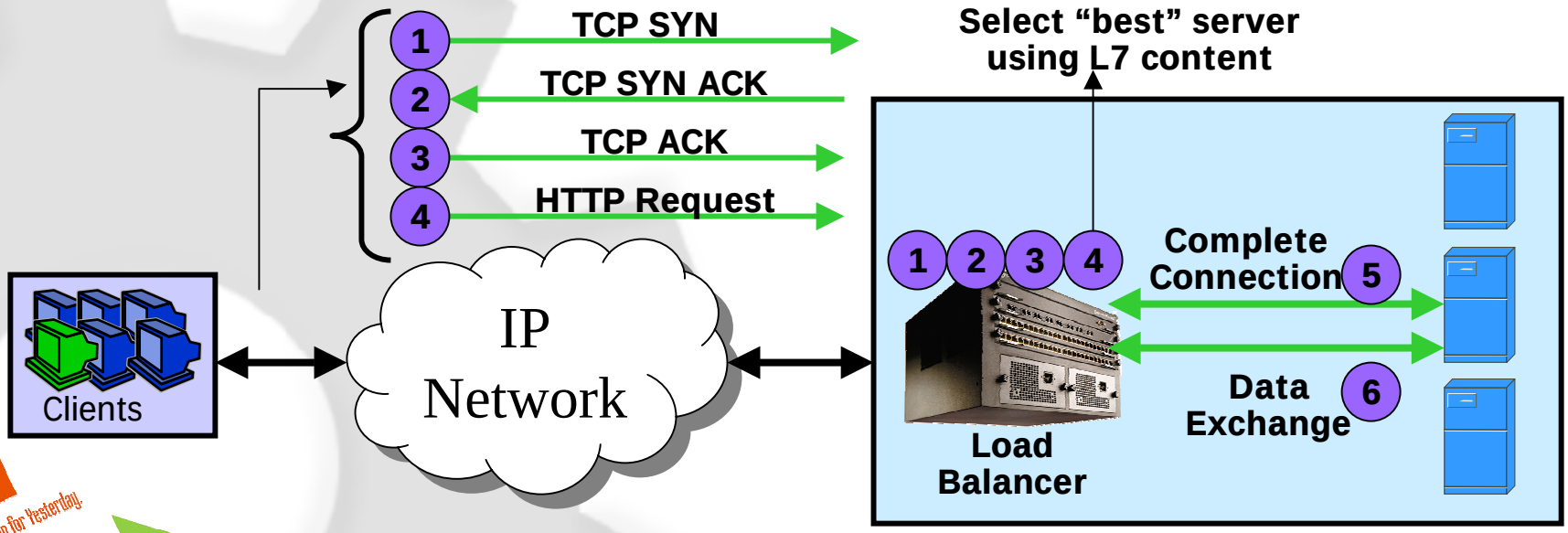
Application and Server Health Checking

- Periodic health check requests sent to server
- Servers and applications removed when checks fail
- Health checks customizable
  - Layer 2/3 (ARP, Ping)
  - Layer 4 (TCP connections and UDP messages)
  - Layer 7 (HTTP, Application Specific, SSL, Scripted)



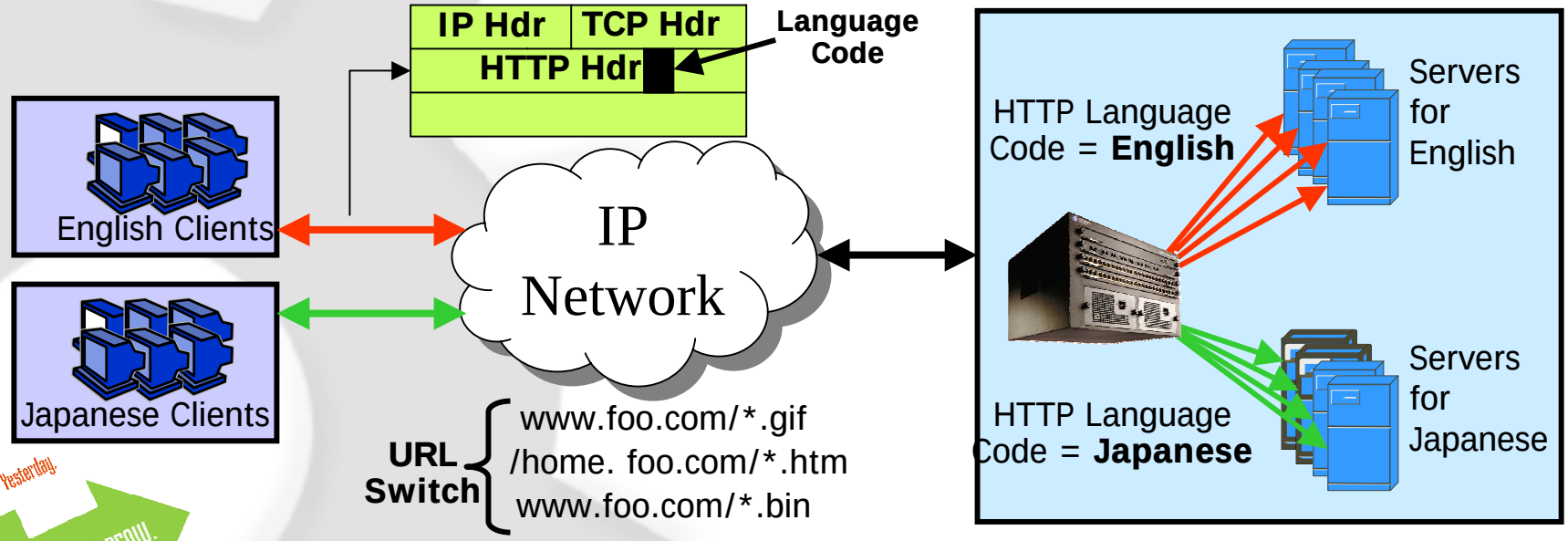
Delayed Binding Concept & Benefits

- Load balancer delays server-side connection
- Server selection based on “content” of client data packets
  - URL, Session ID, Cookie
- Optimal server utilization and highest availability



Layer-7 Content Switching

- Avoid replicating content and applications on all servers
- Increase overall server utilization and response time
- Use URL and HTTP hdr content to select “best” servers
  - URL full, prefix and suffix match
  - Browser type, device type and language code



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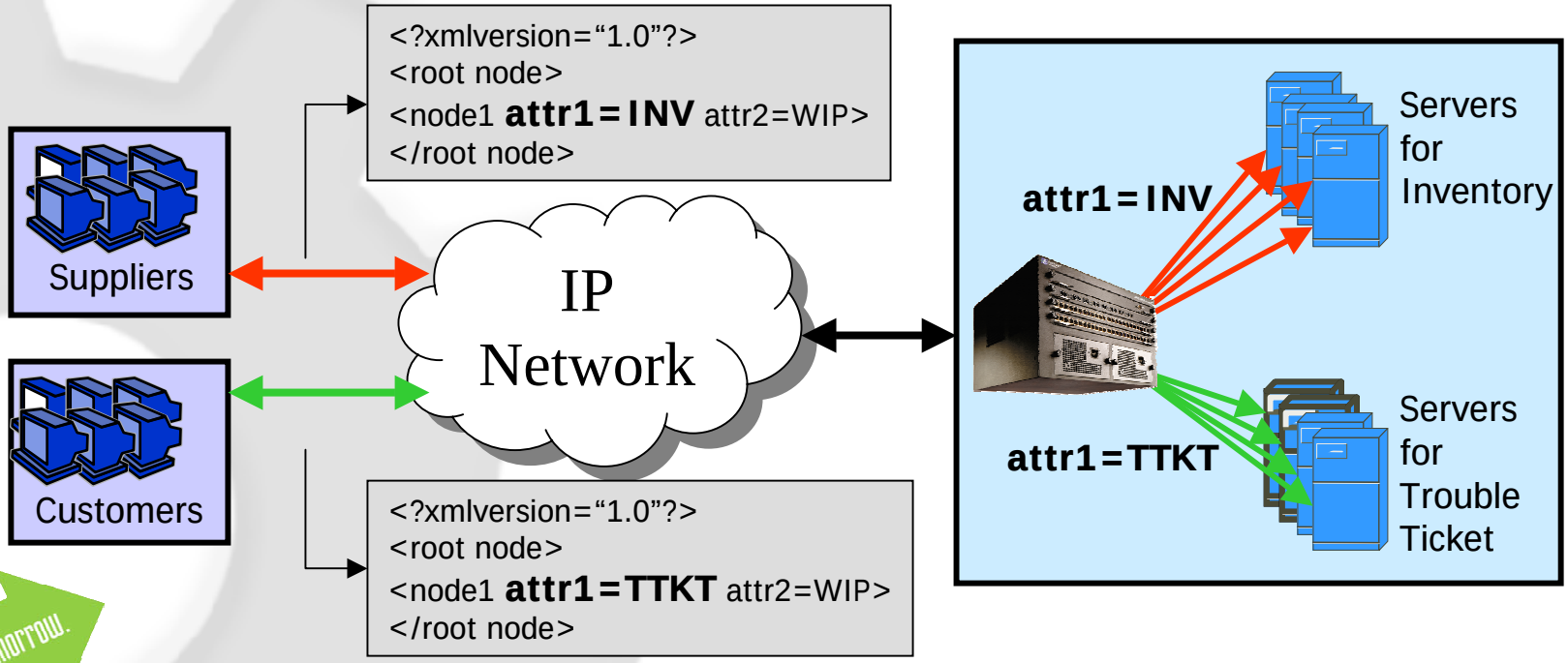
Layer-7 XML Tag Switching

- Load balance to “right” server cluster using XML tags
- Optimize application performance for partners, suppliers and customers over extranet
- Extend load balancing to any XML-based application



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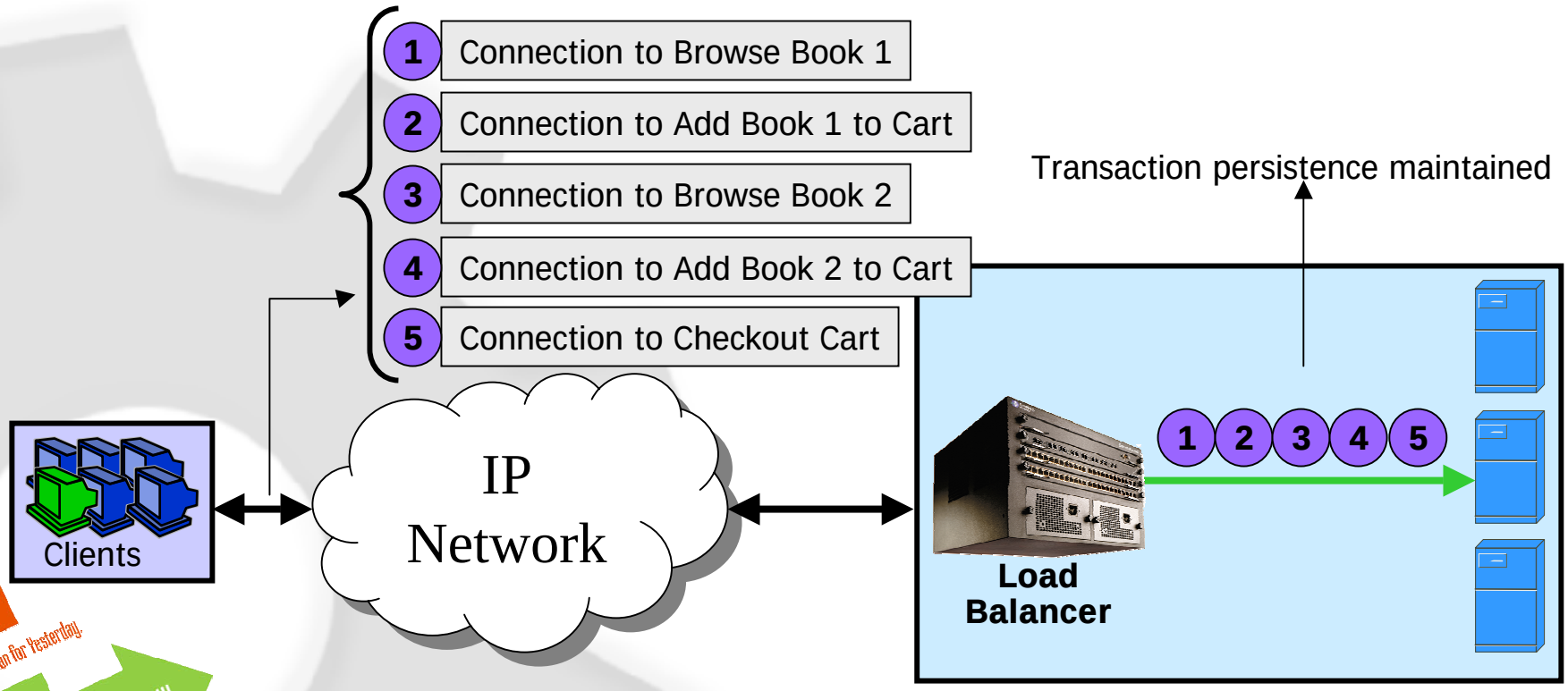
Session Persistence Concept & Benefits

- Transaction spans multiple TCP or UDP connections
- Requires same server to handle all connections
- Load balancing at the “transaction” boundaries



Session Persistence Mechanisms

- Layer 4 TCP connection persistence
  - Source IP & port, Destination IP & port
- UDP session persistence using Layer 3/4
  - Source IP & port, Destination IP & port
  - Inactivity timeout used to age sessions
- Layer 7 Cookie switching
  - Cookie inserted in the HTTP message
  - All requests with same cookie switched to the same server
  - Load balancers can insert cookies when servers do not
- SSL Session ID switching

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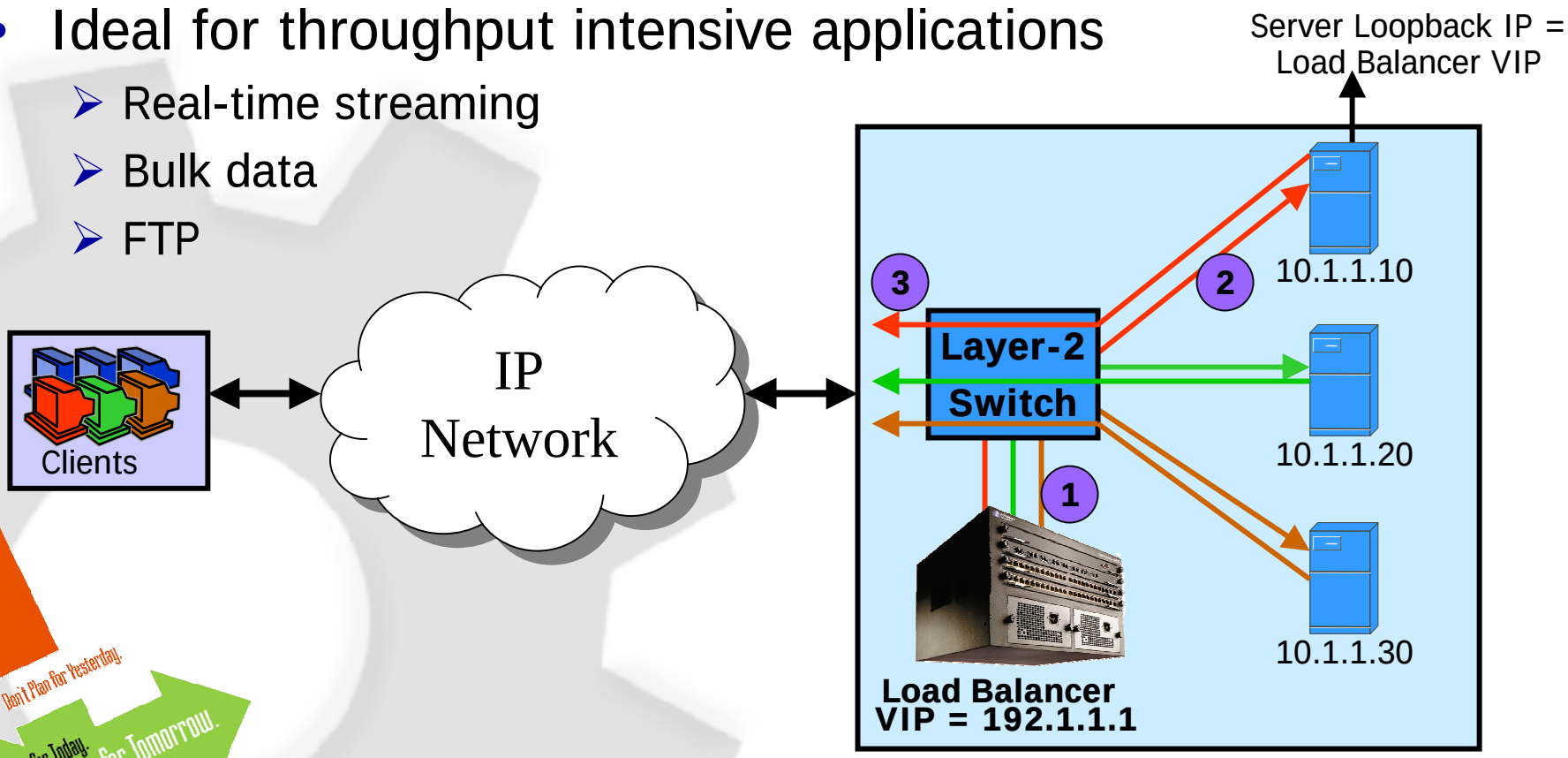
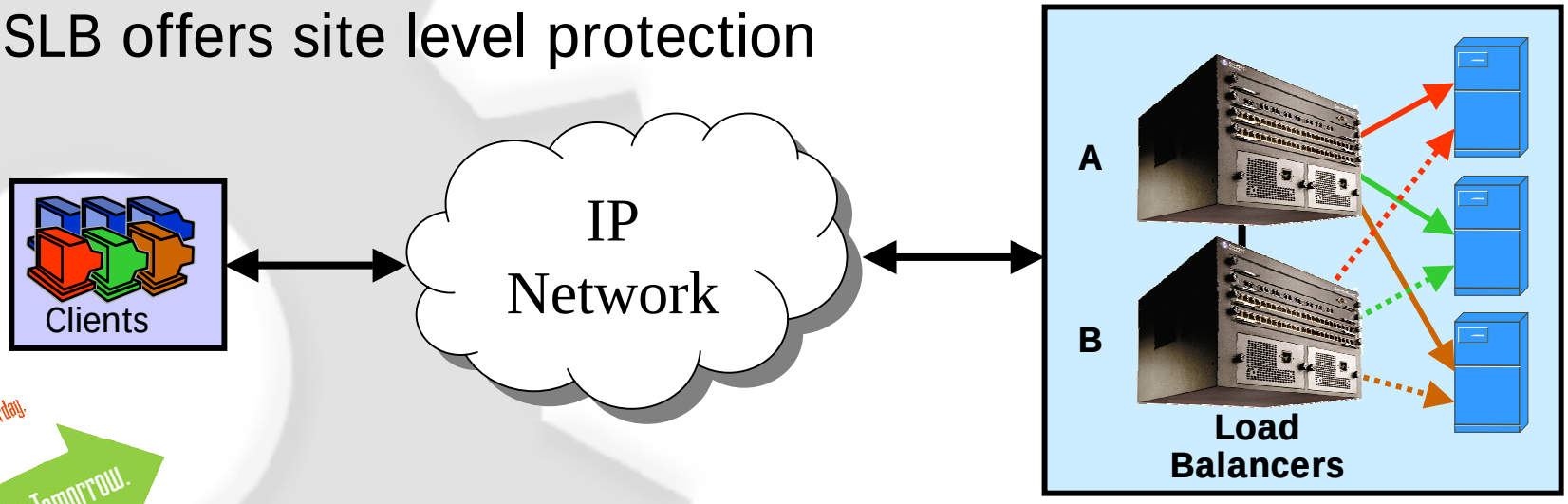
Direct Server Return (DSR) – One Arm

- Reply traffic from server bypasses load balancer
- Load balancer processes only inbound requests
- Ideal for throughput intensive applications
  - Real-time streaming
  - Bulk data
  - FTP



Load Balancer High Availability

- Two modes of high availability
  - Active-Standby (one load balancer as hot standby)
  - Active-Active (load sharing between load balancers)
- Stateful session failover maintains active sessions after failover and improves client performance
- Fully transparent to applications and clients
- GSLB offers site level protection



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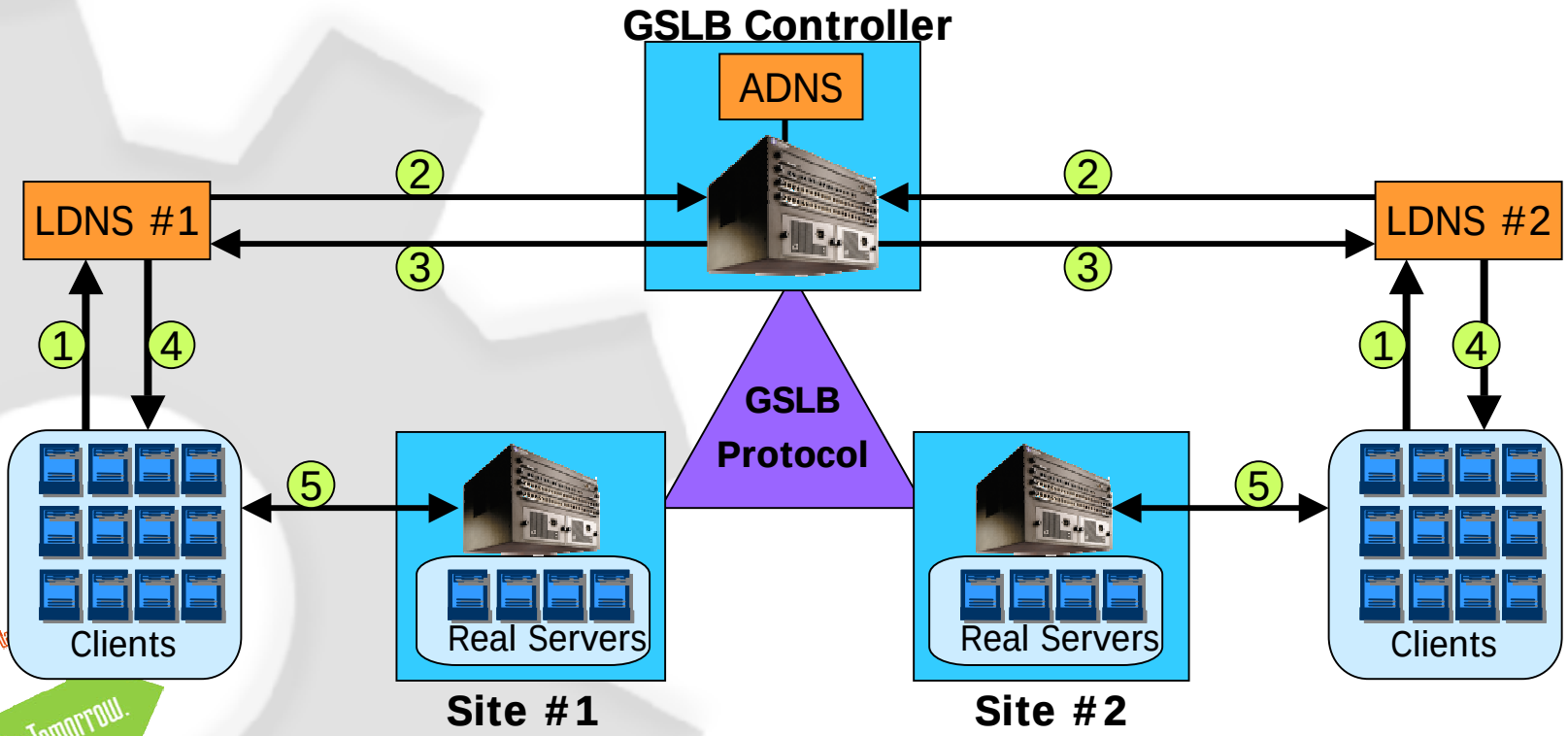
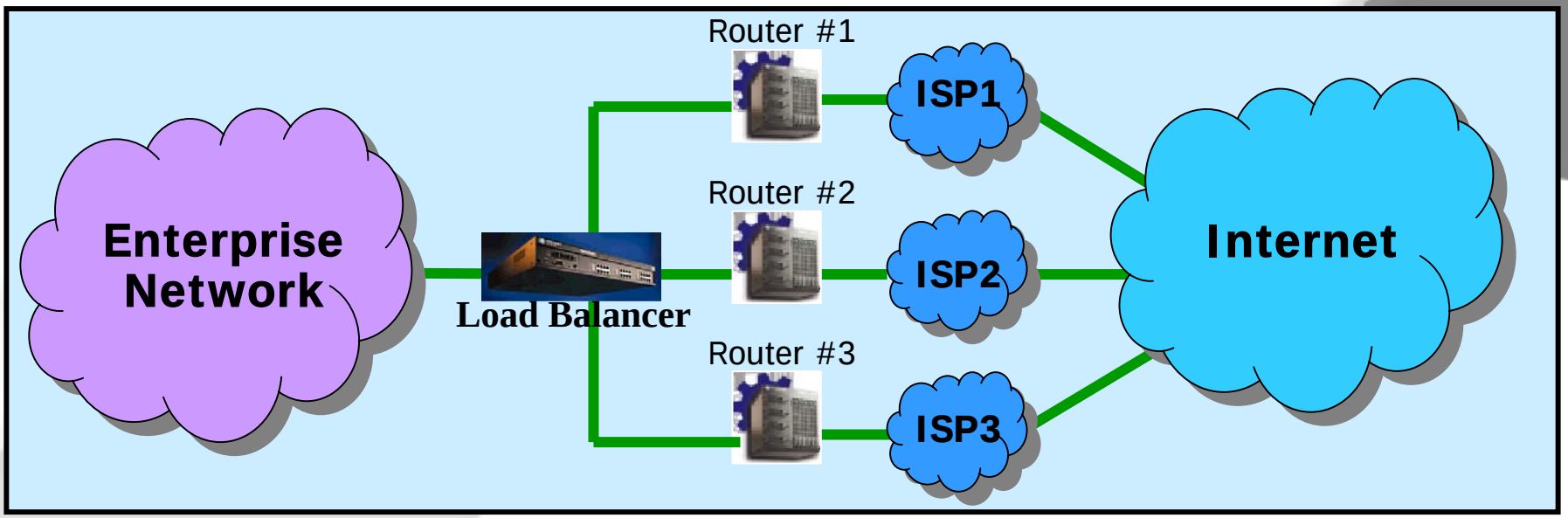
Global Server Load Balancing (GSLB)

- Return IP of best site in DNS responses to clients
- Gather site load information using GSLB protocol
- Deploy scalable GSLB within existing DNS infrastructure



ISP Link Load Balancing (LLB)



- Utilize all available ISP links simultaneously
- Intelligently balance traffic to achieve optimal utilization
- Gain leverage against ISPs for price and service
- Aggregate low-capacity links to create “fat” virtual links

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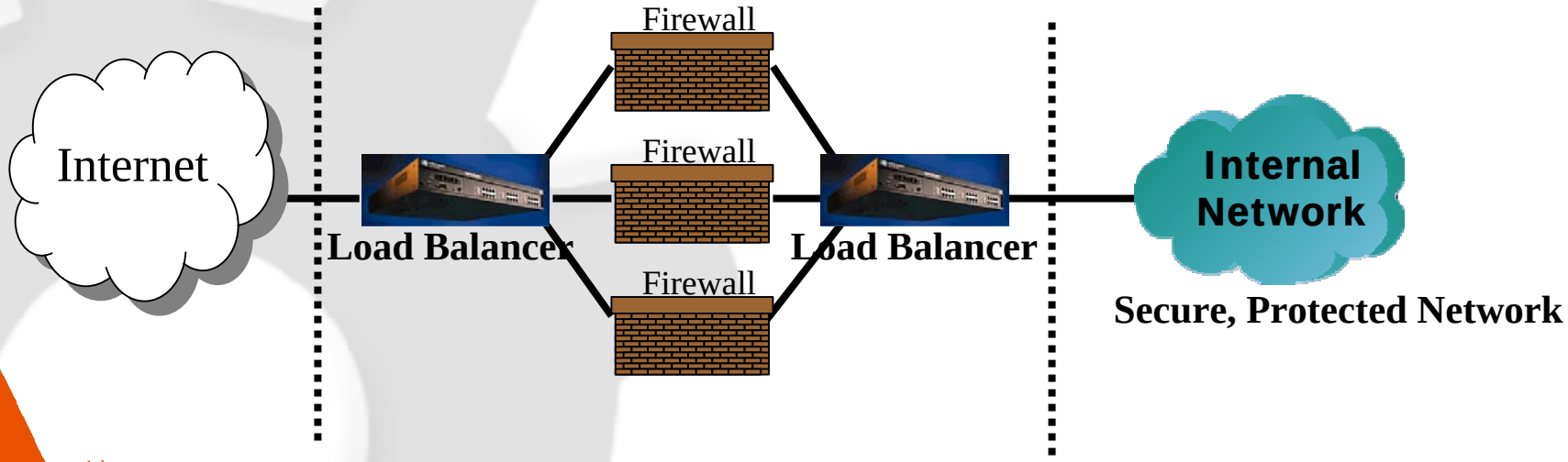
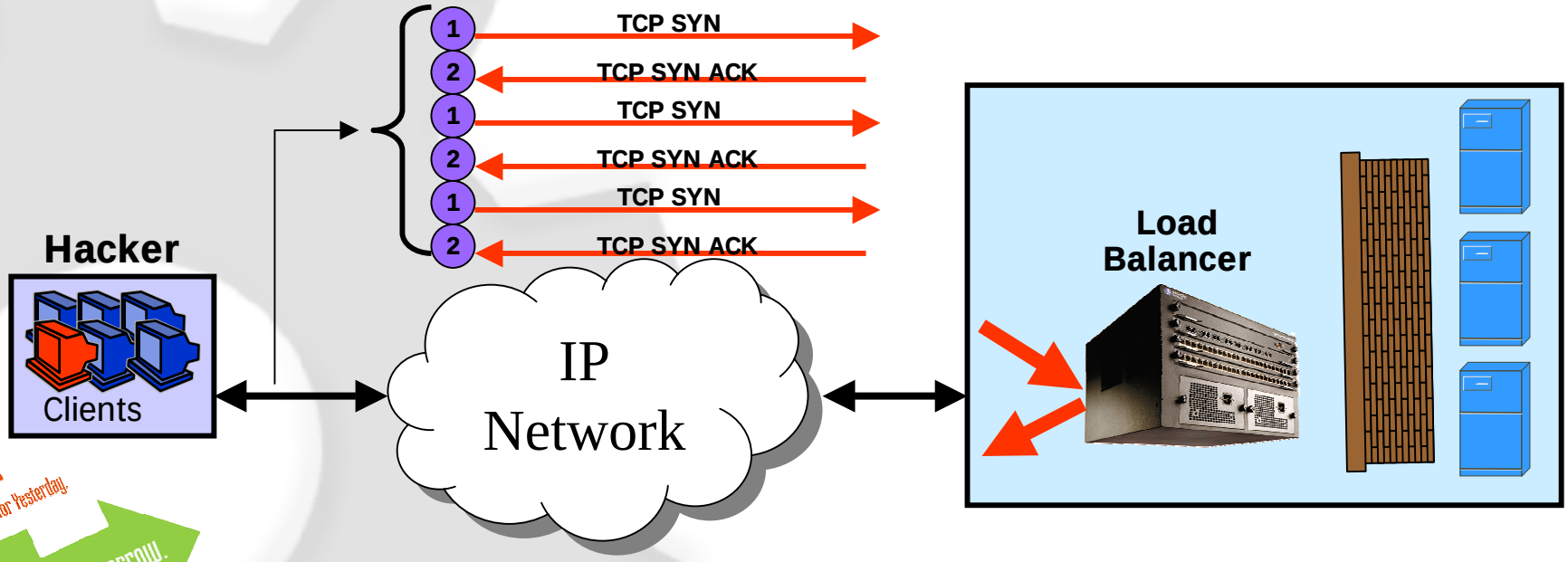
Firewall Load Balancing (FWLB)

- Load balance among firewalls to scale and improve performance
- Transparently failover during firewall failure
- Protect network and servers during firewall outage



Server Farm Security from DoS Attack

- Protect against TCP SYN attacks on server farm
- Conserve resources for complete and valid connections
- Avoid using resources for pending connections
- Deny service to select user-configured source IPs



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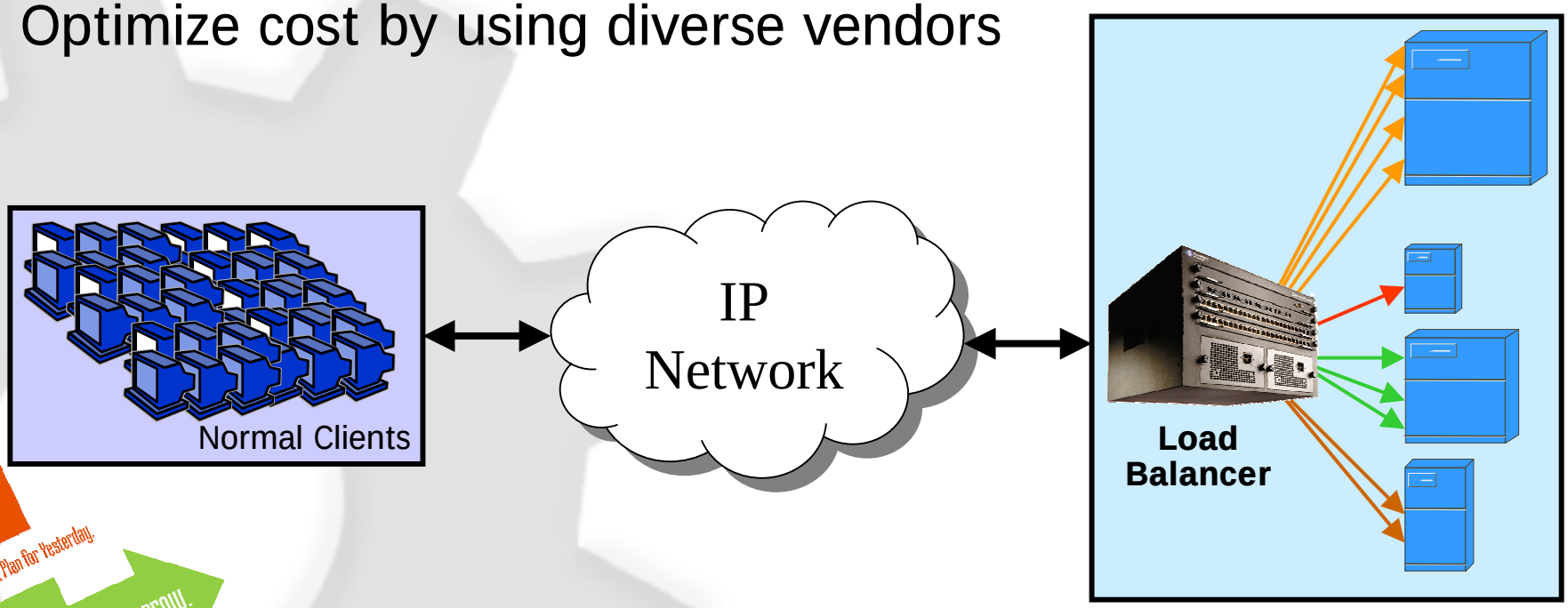
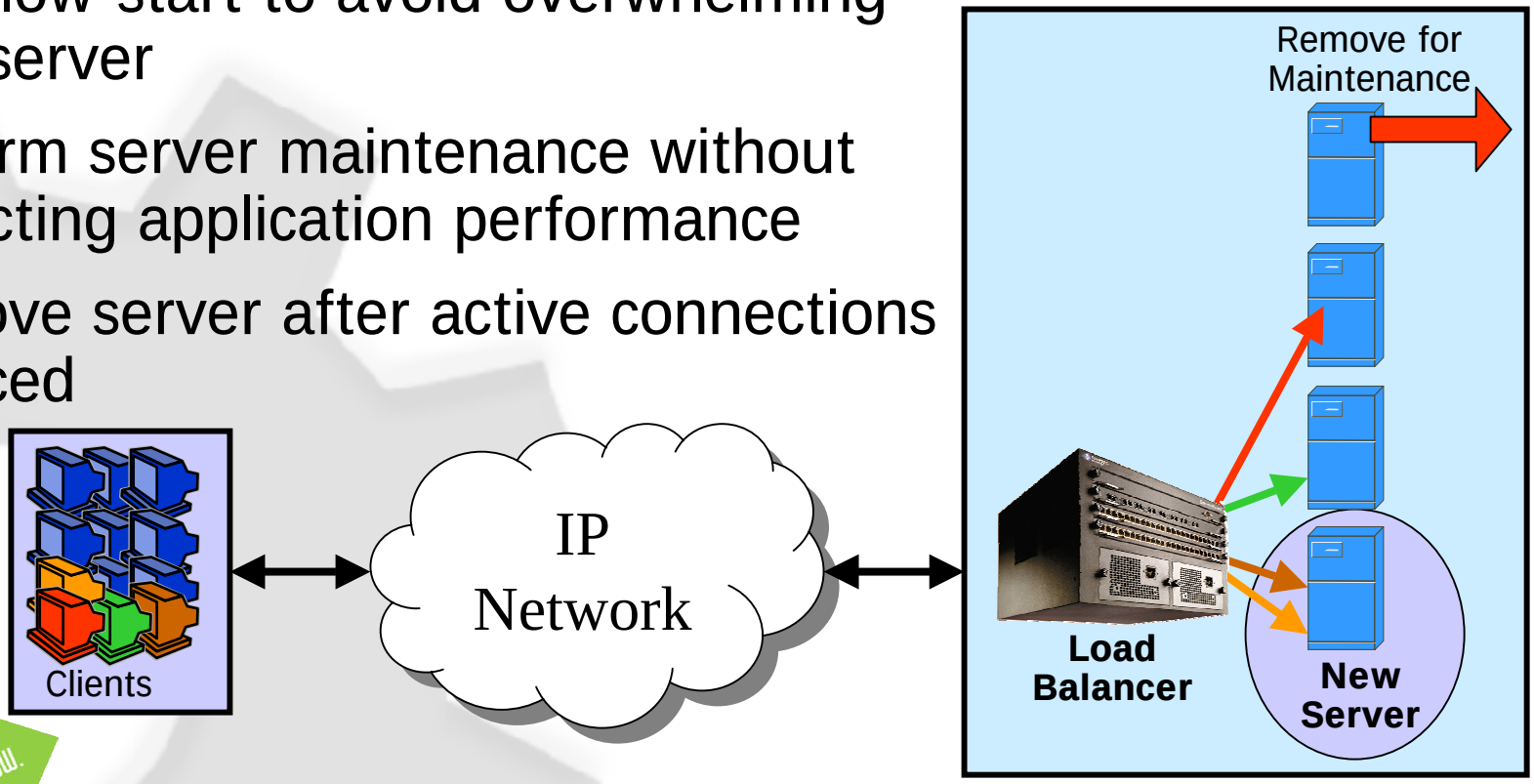
Improve Return on Server Investment

- Use servers of varying capacity and performance
- Distribute load based on server “weight”
- Leverage not replace installed servers
- Optimize cost by using diverse vendors



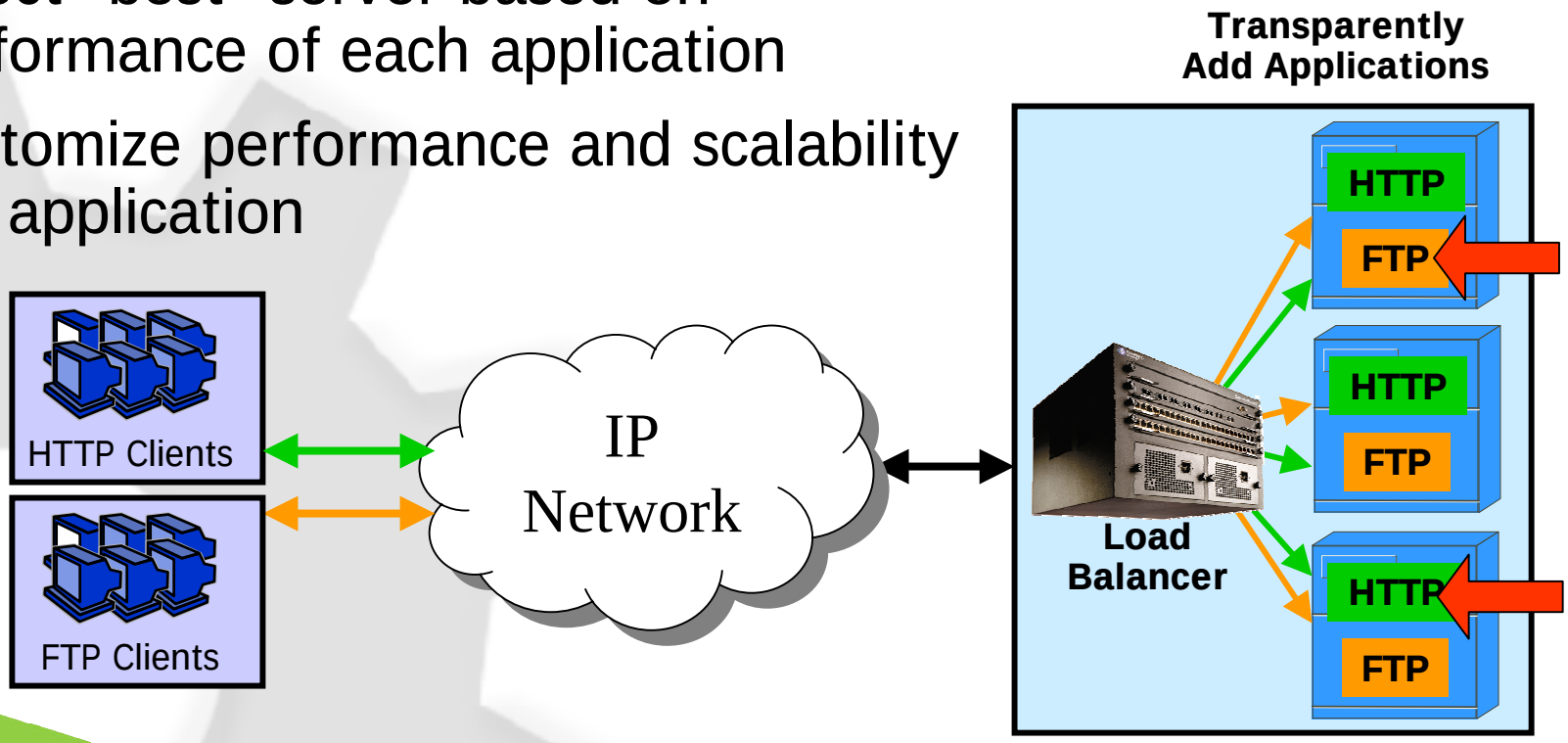
Dynamically Adjust Server Capacity

- Scale server capacity on demand
- Add and remove servers transparently
- Use slow-start to avoid overwhelming new server
- Perform server maintenance without impacting application performance
- Remove server after active connections serviced



Maximize Server Utilization with Multiple Applications

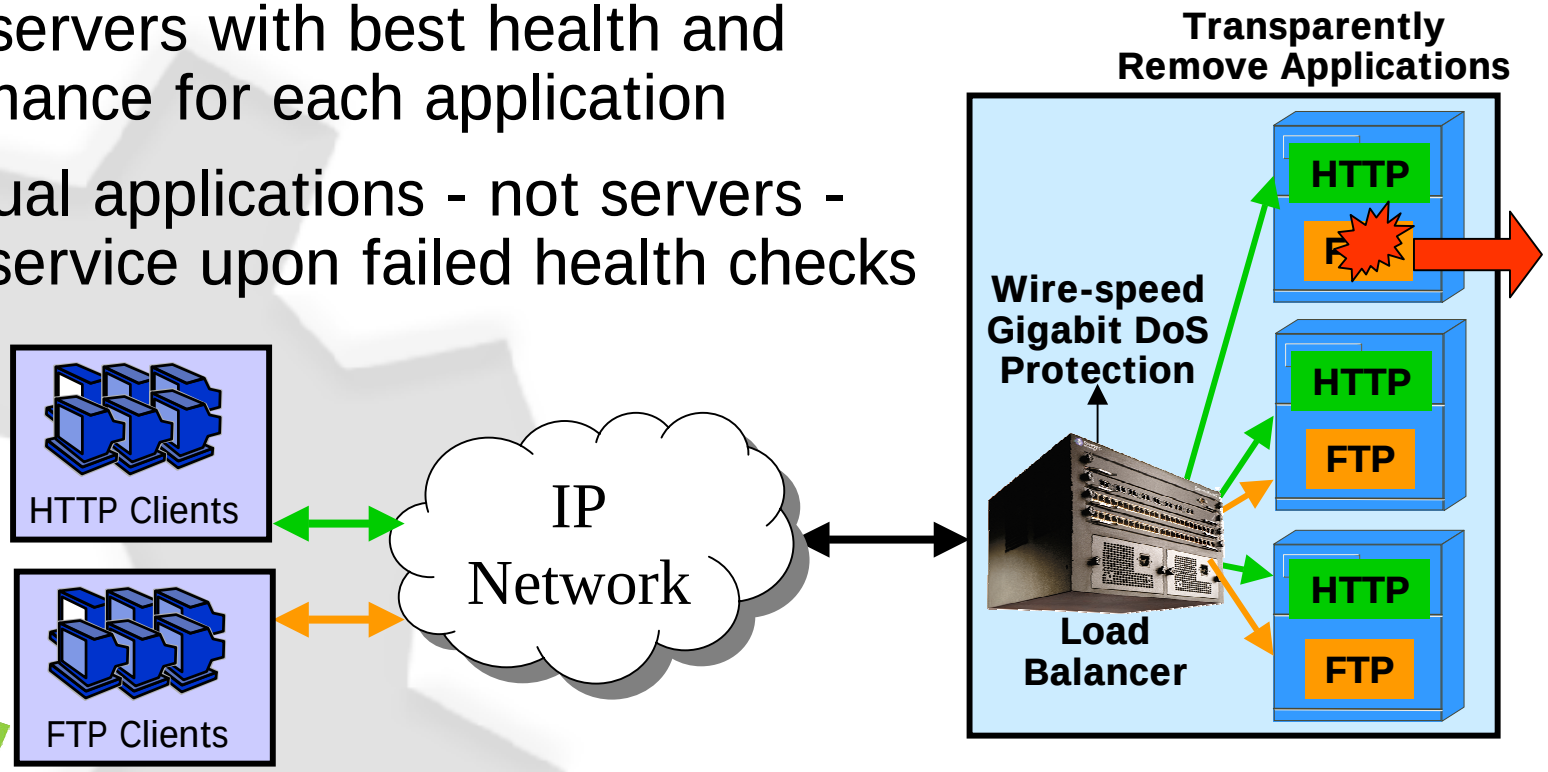
- Deploy multiple applications on each server for maximum utilization
- Select “best” server based on performance of each application
- Customize performance and scalability per application



Always-On Applications

Customizable Application Level Health Checks, High Availability and Security

- Server or application failure simply results in lower capacity
- Health checks for individual applications
- Select servers with best health and performance for each application
- Individual applications - not servers - out of service upon failed health checks



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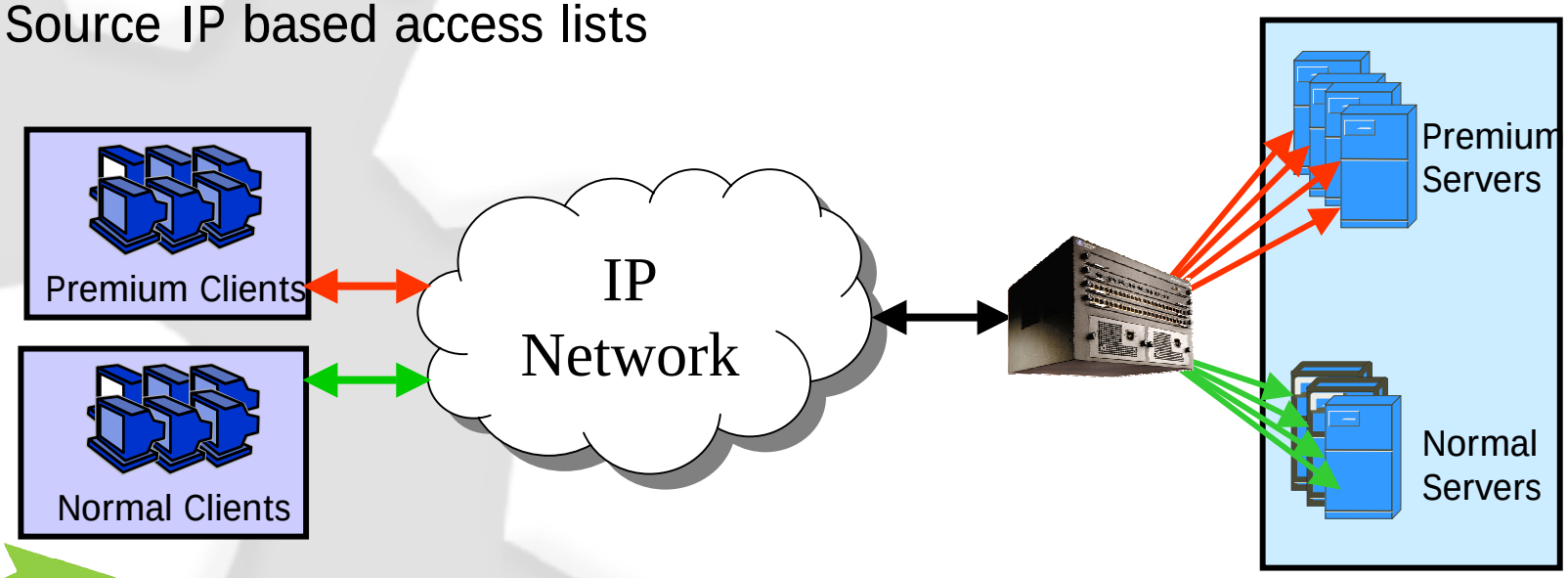
Differentiated Client Services

- Segment clients and offer differentiated service
- Customize performance and response time to meet different customers' needs
- Differentiate clients using
  - Cookies and other layer 7 content
  - Source IP based access lists



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Layer 4-7 Product Approaches

- Purpose-built Layer 4-7 devices
  - Pro: Performance, Functionality and Simplicity
  - Con: A new product to install

Foundry Approach

- Plug-in Layer 4-7 blade for Layer 2-3 switches
  - Pro: Leverage an existing system
  - Con: Complex to understand flows, bottleneck in performance, and lag in functionality

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Meeting a Range of Customer Needs

Relative Performance

12X

6X

2X

1X

Entry Level

Single-purpose device supporting one application in a given deployment

ServerIron XL

Mid Level

Fixed configuration supporting multiple applications on a single device without high cost

ServerIron 100

High Performance

High-density high-performance applications with high scalability

ServerIron 800

ServerIron 400

Relative Price

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Full Suite of Layer 4-7 Applications

- Server Load Balancing
- Global Server Load Balancing
- Firewall Load Balancing
- ISP Link Load Balancing
- Transparent Cache Switching
- IronShield™ Server and Application Security

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Thank You