

패킷엔진 로드밸런서 PacketNgin Loadbalancer

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- 패킷엔진 로드밸런서
- 성능

로드밸런서 개념

로드밸런서의 필요성

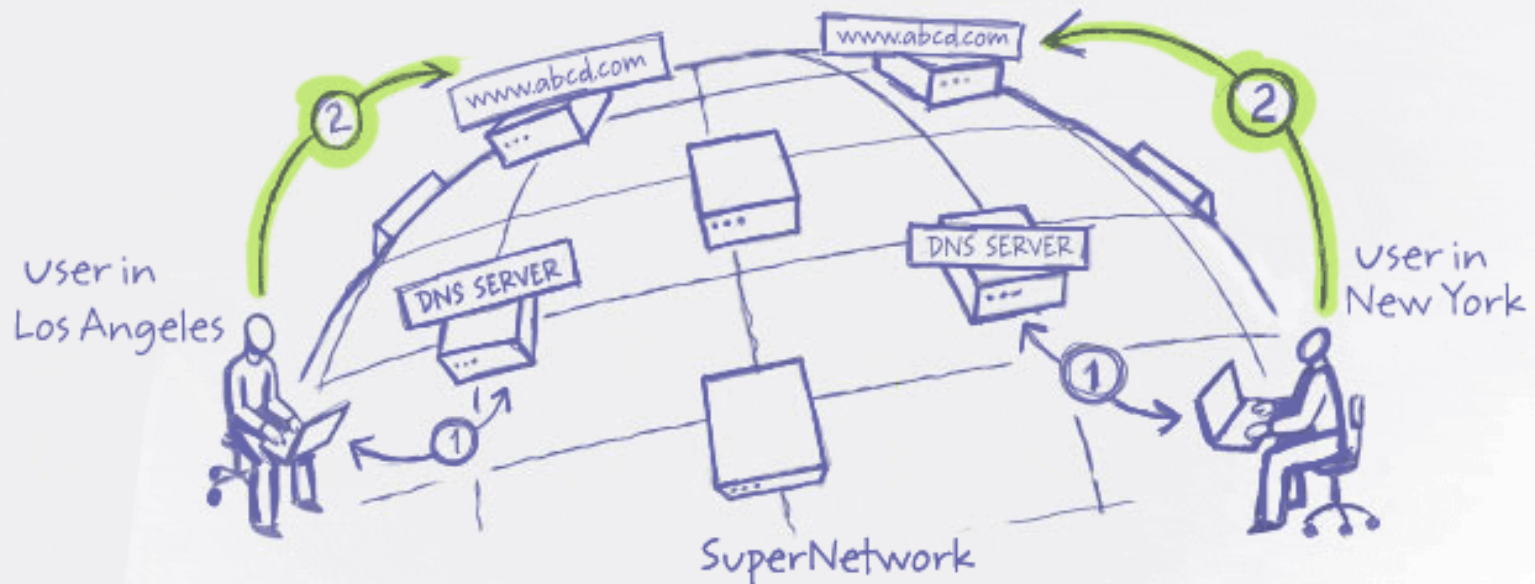
- naver.com의 IP 주소는?
 - 202.131.30.11
 - 202.131.30.12
 - 125.209.222.141
 - 125.209.222.142
- 네이버 서버의 개수는?
 - 전체 서버: 수만대 (naver.com, www.naver.com, DB, ...)
 - naver.com의 서버의 개수: 수십
- 4개의 IP => 수십 서버

Source: http://naver_diary.blog.me/150045722834

로드밸런서 개념

Global Scale Load Balancing (1/3)

- a) User types in `www.abcd.com`.
- b) PEER 1's DNS servers directs user to the closest web server.
- c) User experiences a faster connection to your site.

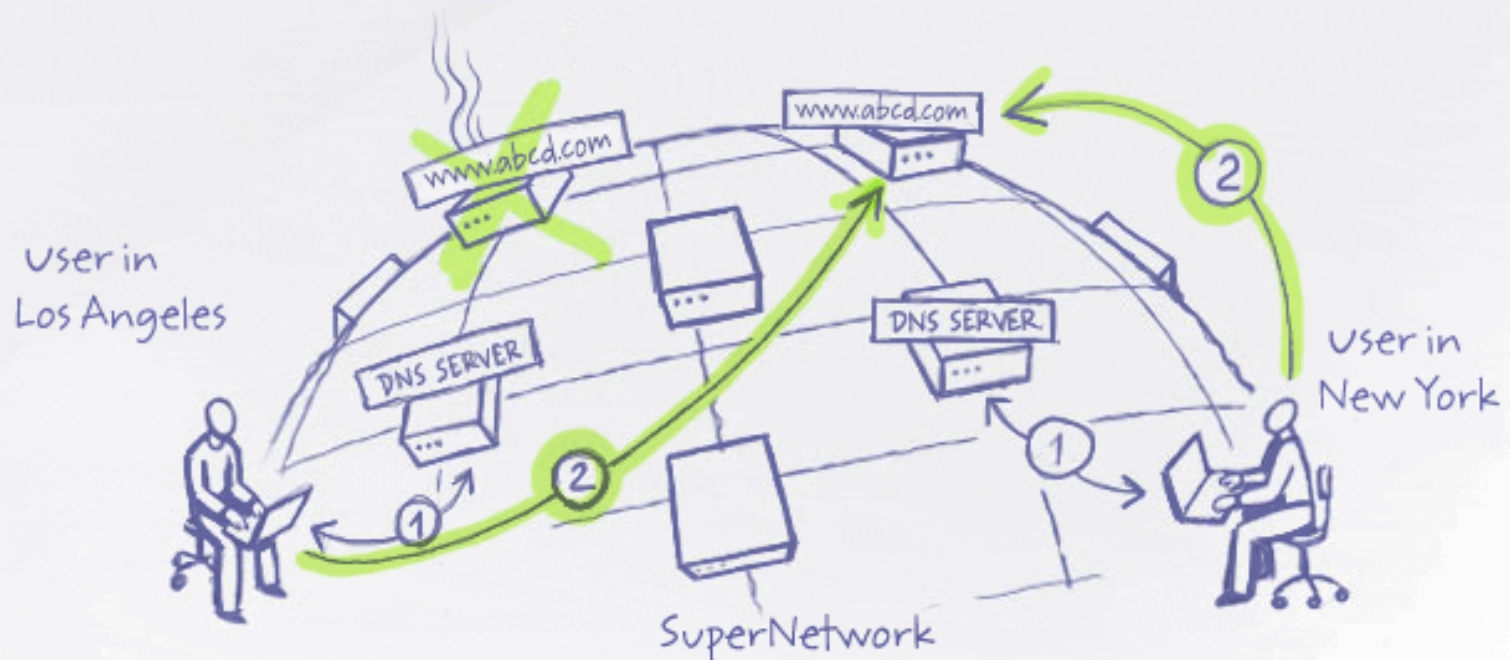


Source: <http://www.peer1.com/whitepaper/global-load-balancing-growing-company>

로드밸런서 개념

Global Scale Load Balancing (2/3)

If closest web server fails, user will be re-directed to another server



Source: <http://www.peer1.com/whitepaper/global-load-balancing-growing-company>

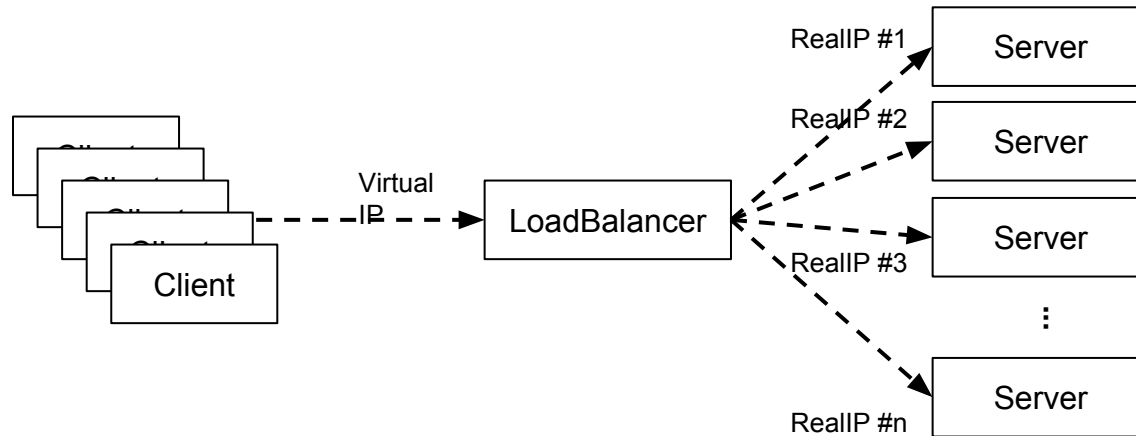
로드밸런서 개념

Global Scale Load Balancing (3/3)

- Pros
 - Global Scale Loadbalancing의 거의 유일한 Solution
- Cons
 - Client Cache
 - google.com - 1.7일
 - naver.com - 0.7일
 - Server의 상태 문제
 - 정확성의 문제

로드밸런서 개념

Level 4 Load Balancing (1/5)



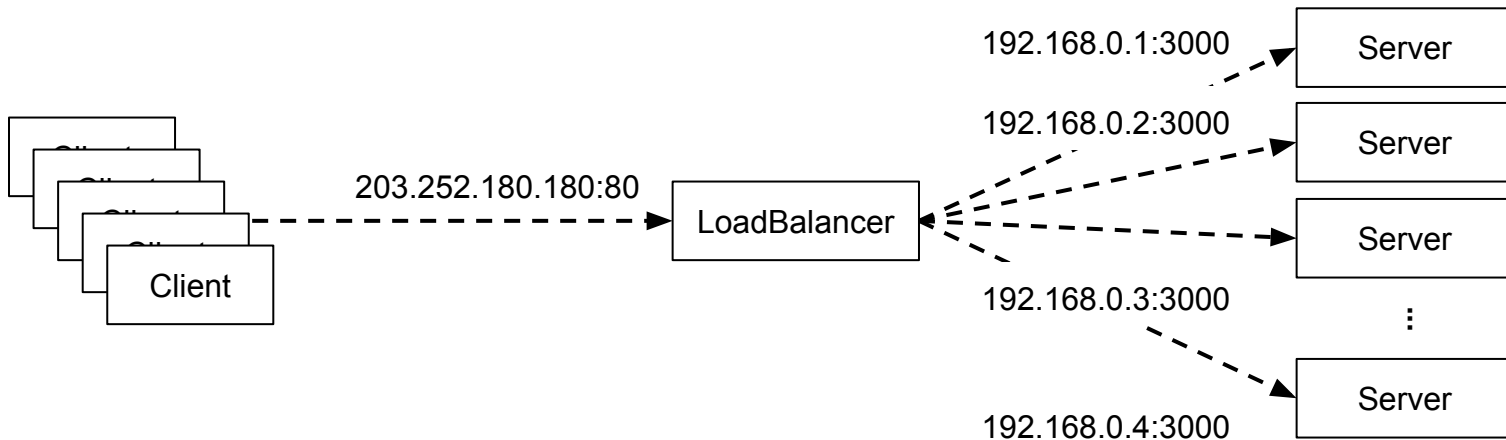
로드밸런서 개념

Level 4 Load Balancing (2/5)

- Load Balancing Methods
 - NAT
 - SNAT
 - Direct-Routing
 - Tunneling
- Scheduling Algorithms
 - Round-Robin
 - Least-Connection
 - Hashing
 - Shortest Expected Delay
 - Never Queue

로드밸런서 개념

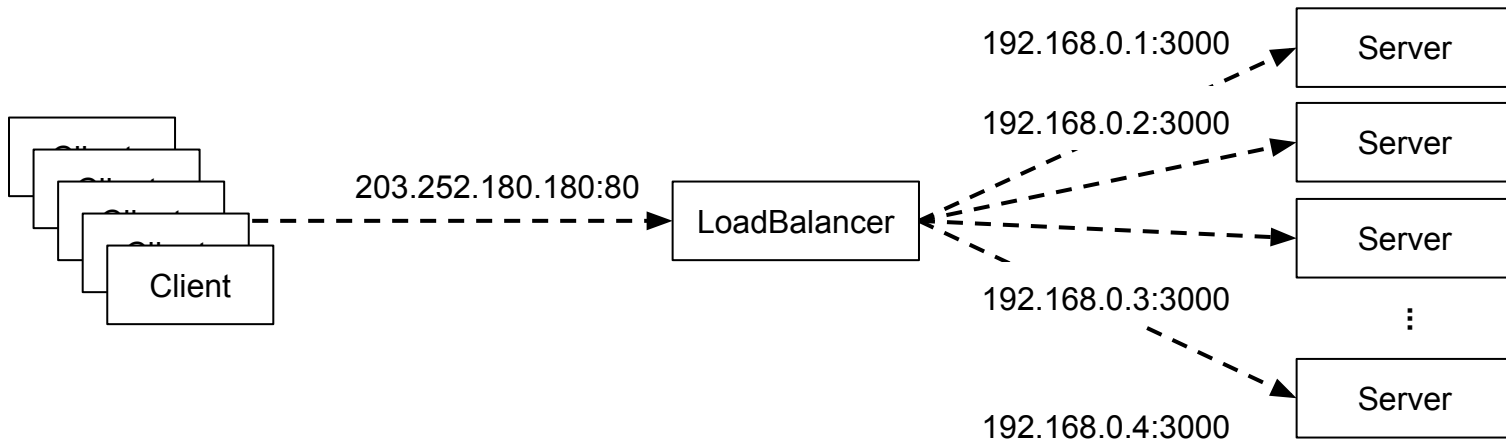
Level 4 Load Balancing (3/5)



- NAT - Request
 - Destination IP address - Real-Server
 - Destination Port - Real-Server
- NAT - Response
 - Source IP address - LoadBalancer
 - Source Port - LoadBalancer

로드밸런서 개념

Level 4 Load Balancing (4/5)



- Round-Robin - Request

- 192.168.0.**1**:3000 -> 192.168.0.**2**:3000 ->
192.168.0.**3**:3000 -> 192.168.0.**4**:3000 ->
192.168.0.**1**:3000 -> ...

로드밸런서 개념

Level 4 Load Balancing (5/5)

- Load Balancing Methods
 - NAT
 - SNAT
 - Direct-Routing
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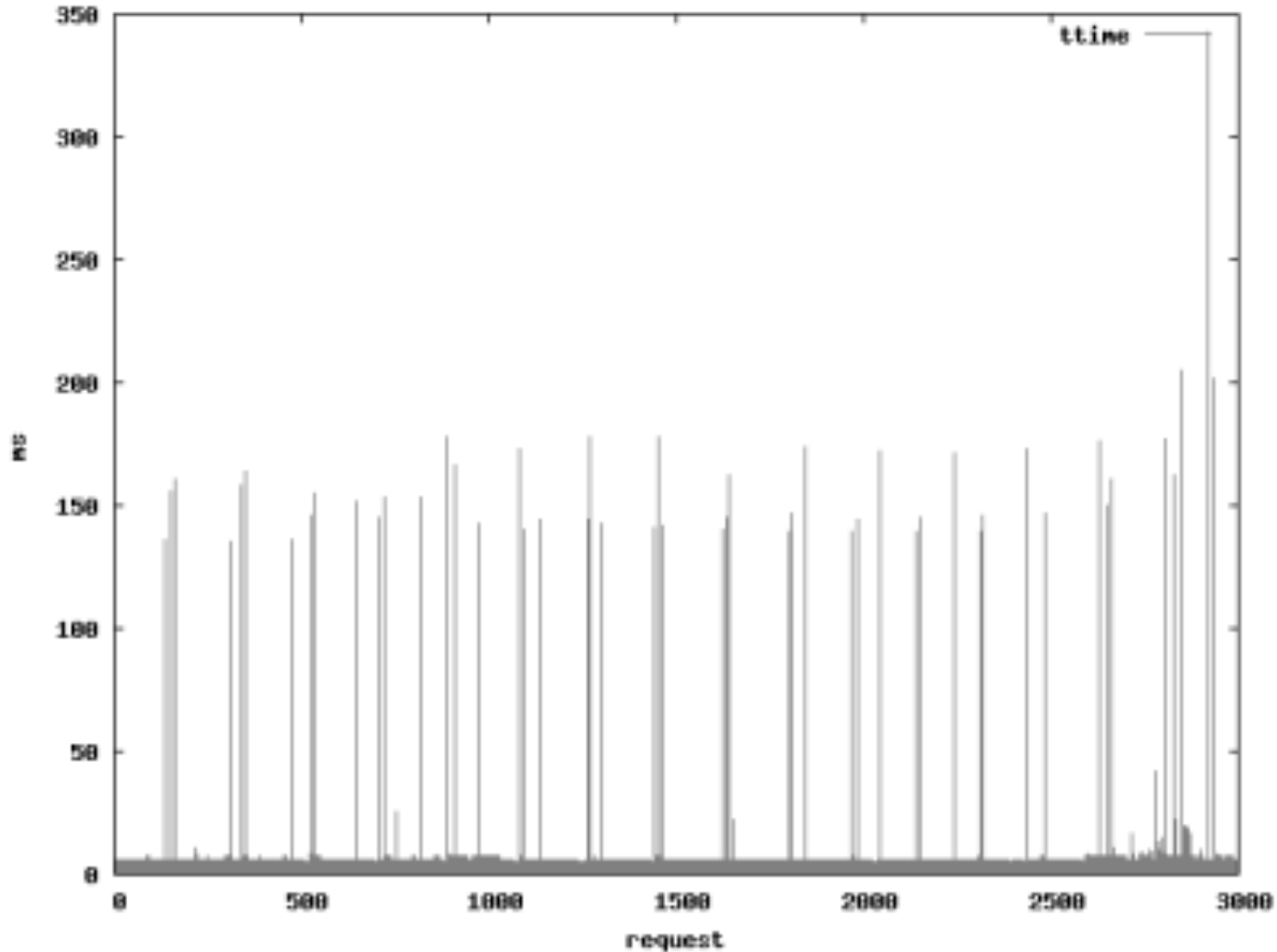
오픈소스 로드밸런서 (1/2)

- GSLB
 - BIND, ...
- Application Level Load Balancer (Level 7)
 - HAProxy
 - NginX
- Network Level Load Balancer (Level 4)
 - Linux Virtual Servers (IPVS)

오픈소스 로드밸런서 (2/2)

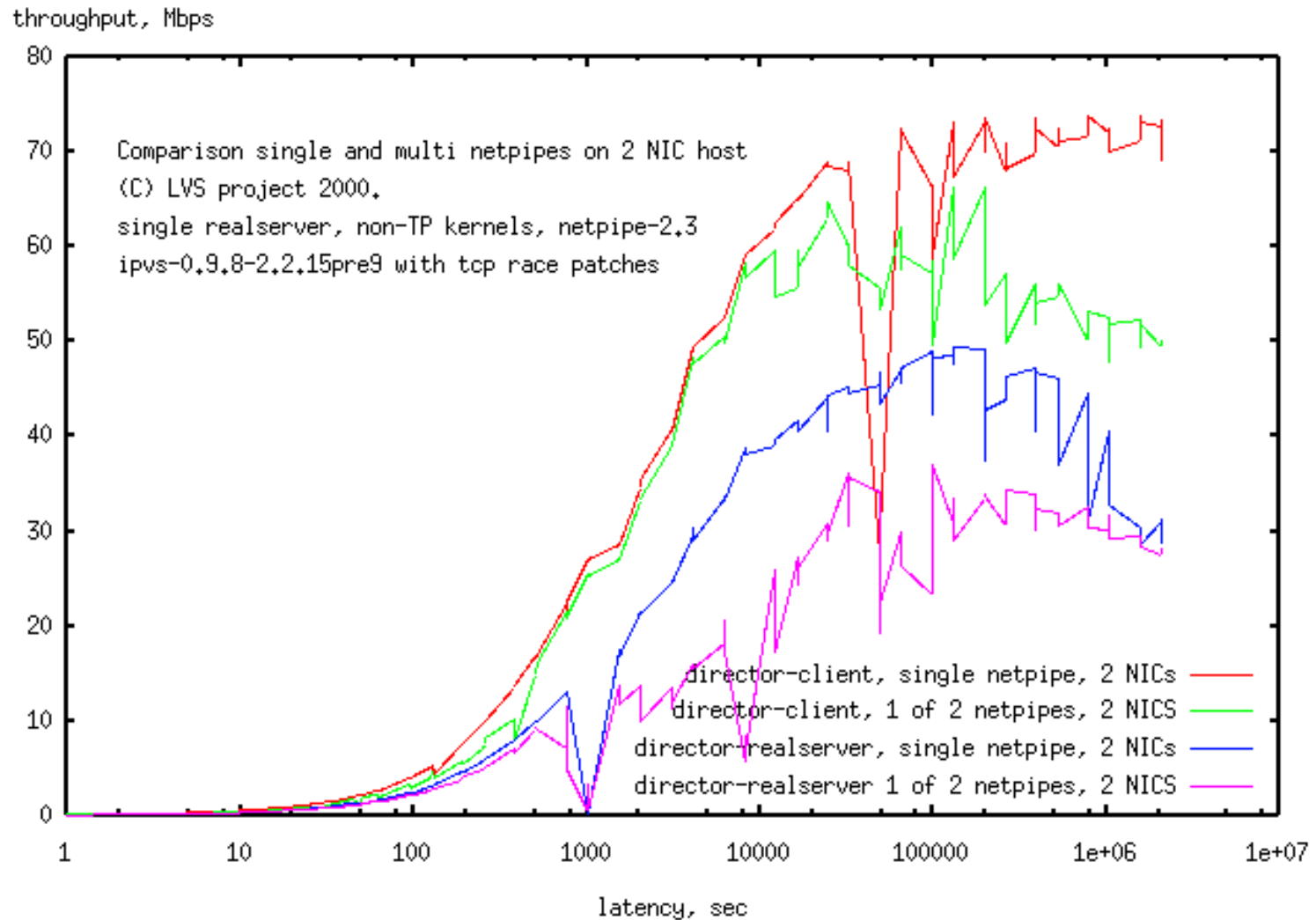
- Application Level Load Balancer (Level 7)
 - Pros
 - 사용하기 쉬움 -> 순수 User Space Application
 - Web 환경에 최적화
 - Cons
 - Failover
 - Performance
- Network Level Load Balancer (Level 4)
 - Pros
 - Failover -> Active - Passive mode
 - Performance
 - Cons
 - 사용하기 어려움 -> Kernel module 설정 등

Why New One? (1/5)

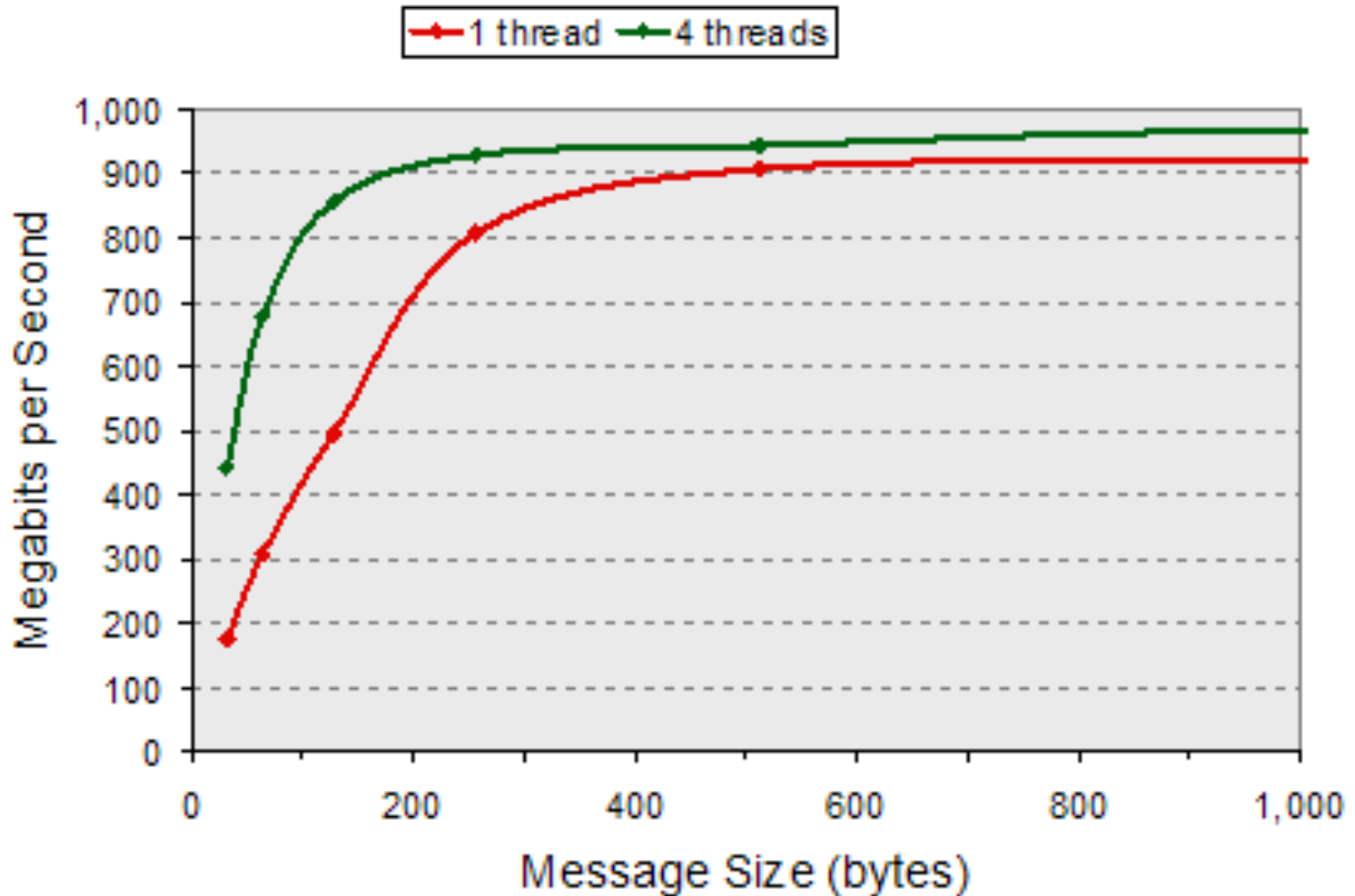


Source: <https://applications/>

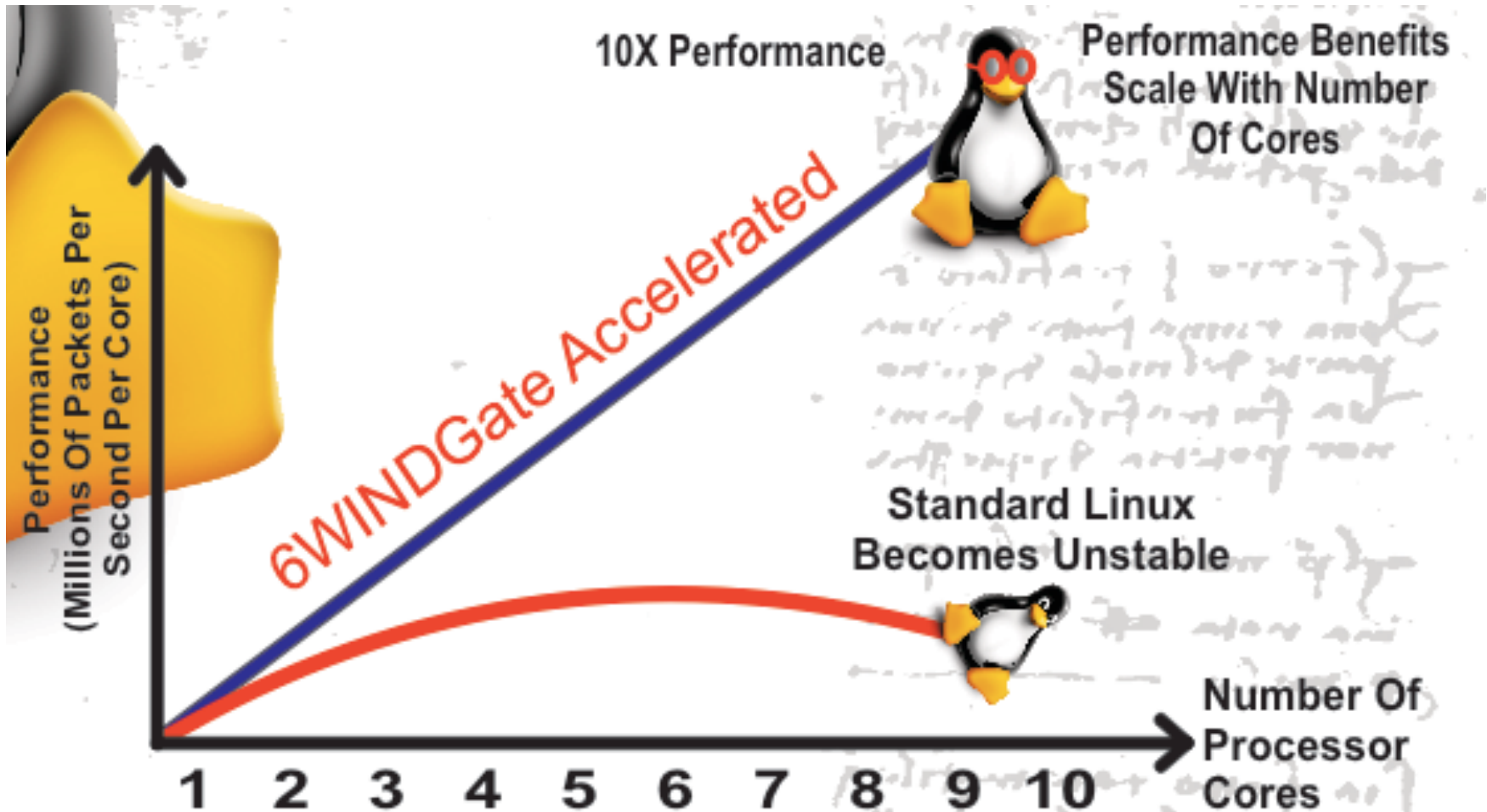
Why New One? (2/5)



Why New One? (3/5)

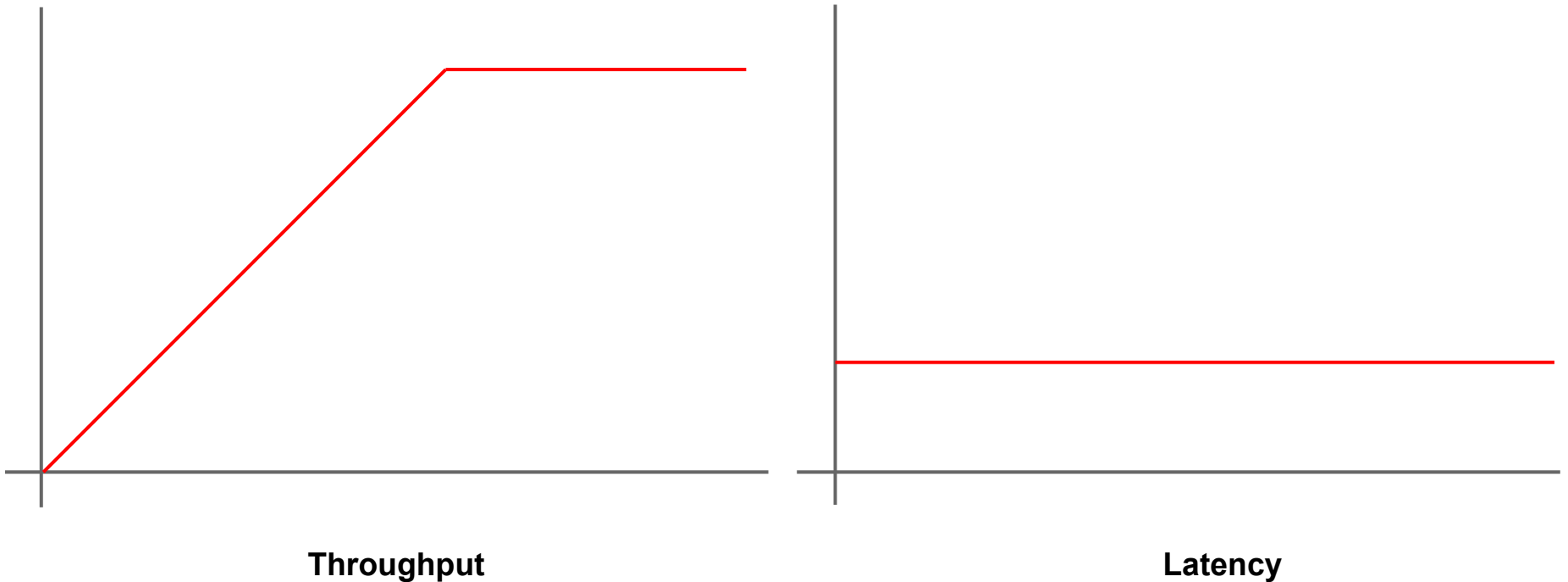


Why New One? (4/5)



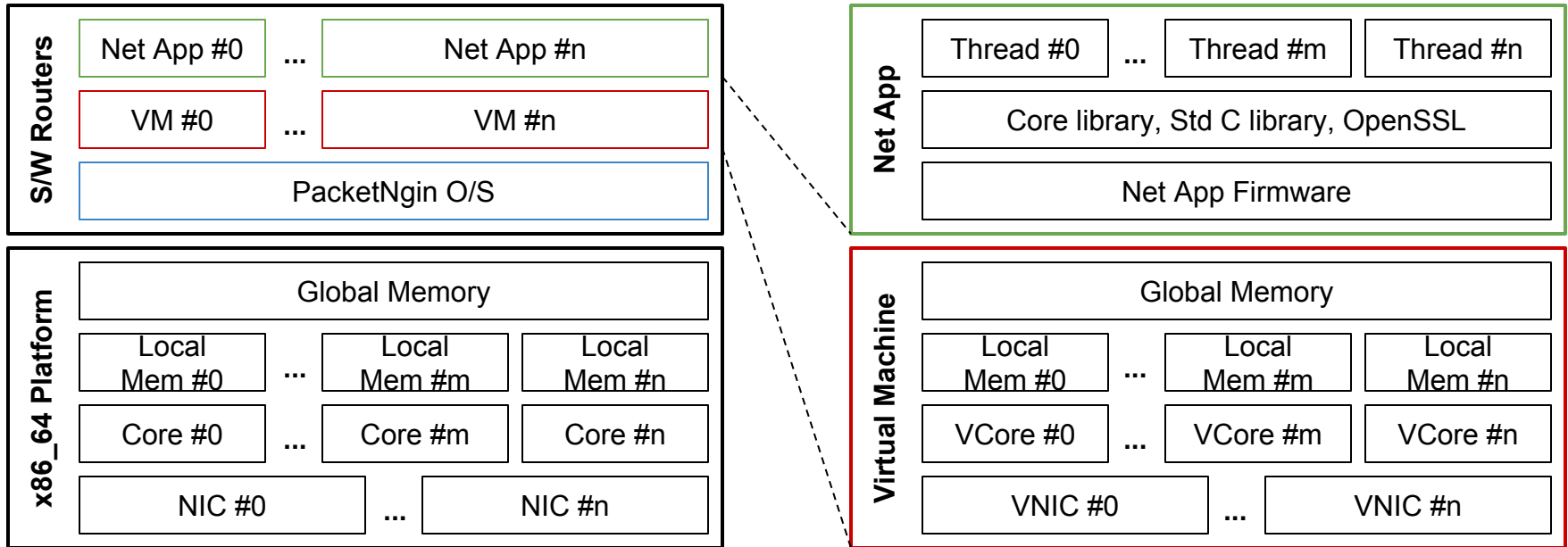
Source: <http://ithuman.tistory.com/entry/6wind-gateway-%EC%86%94%EB%A3%A8%EC%85%98>

Why New One? (5/5)



패킷엔진 O/S

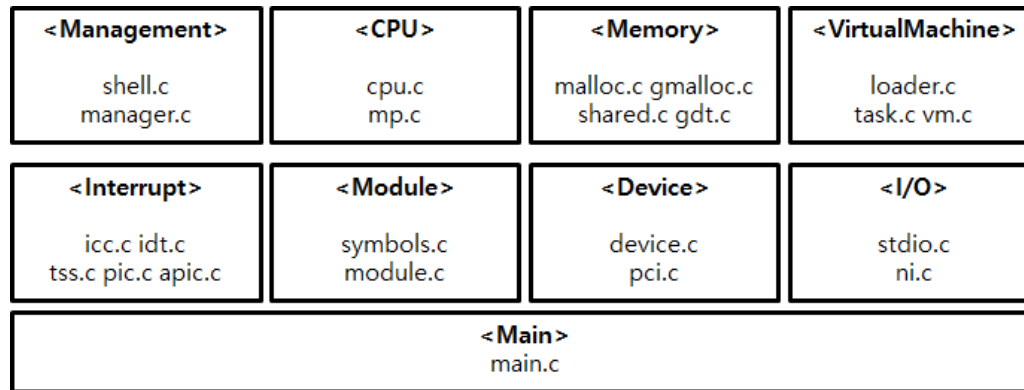
개념



- 네트워크 어플리케이션을 구동하기 위한 O/S
- 실시간성을 지원하는 가상 머신 생성
- From scratch (Boot loader, Kernel, SDK, ...)

패킷엔진 O/S

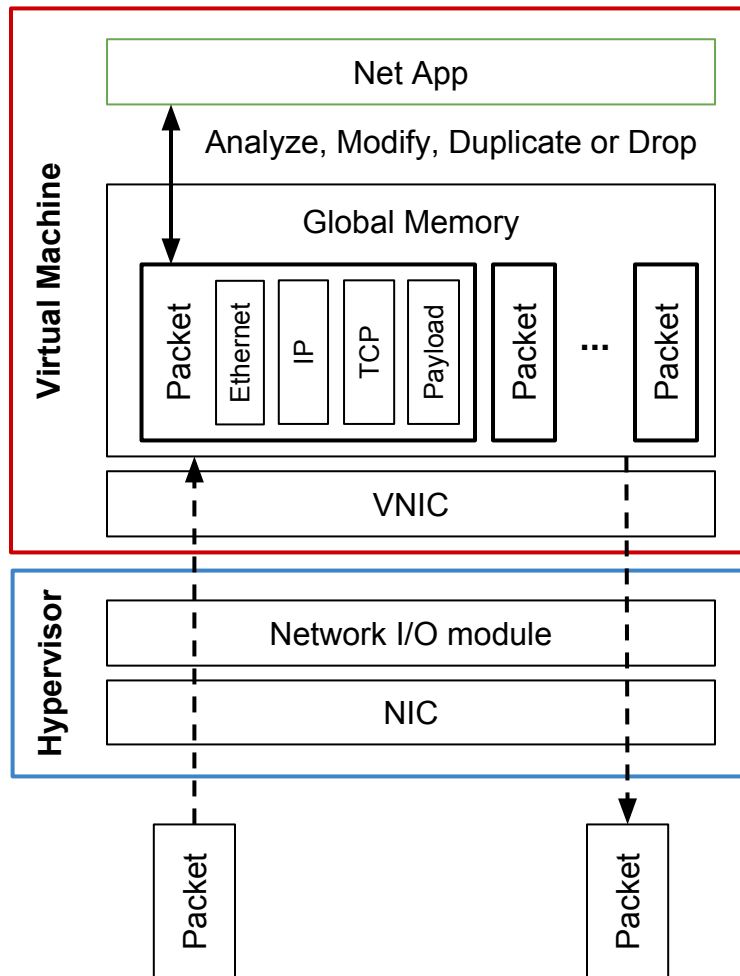
내부 구조



- O/S 관리, CPU 관리, 메모리 관리
 - 가상 머신 관리, 인터럽트 관리
 - Kernel 모듈 관리, 장치 관리, I/O 관리
-
- PacketNgin is a Real-Time O/S and a Hypervisor

패킷엔진 O/S

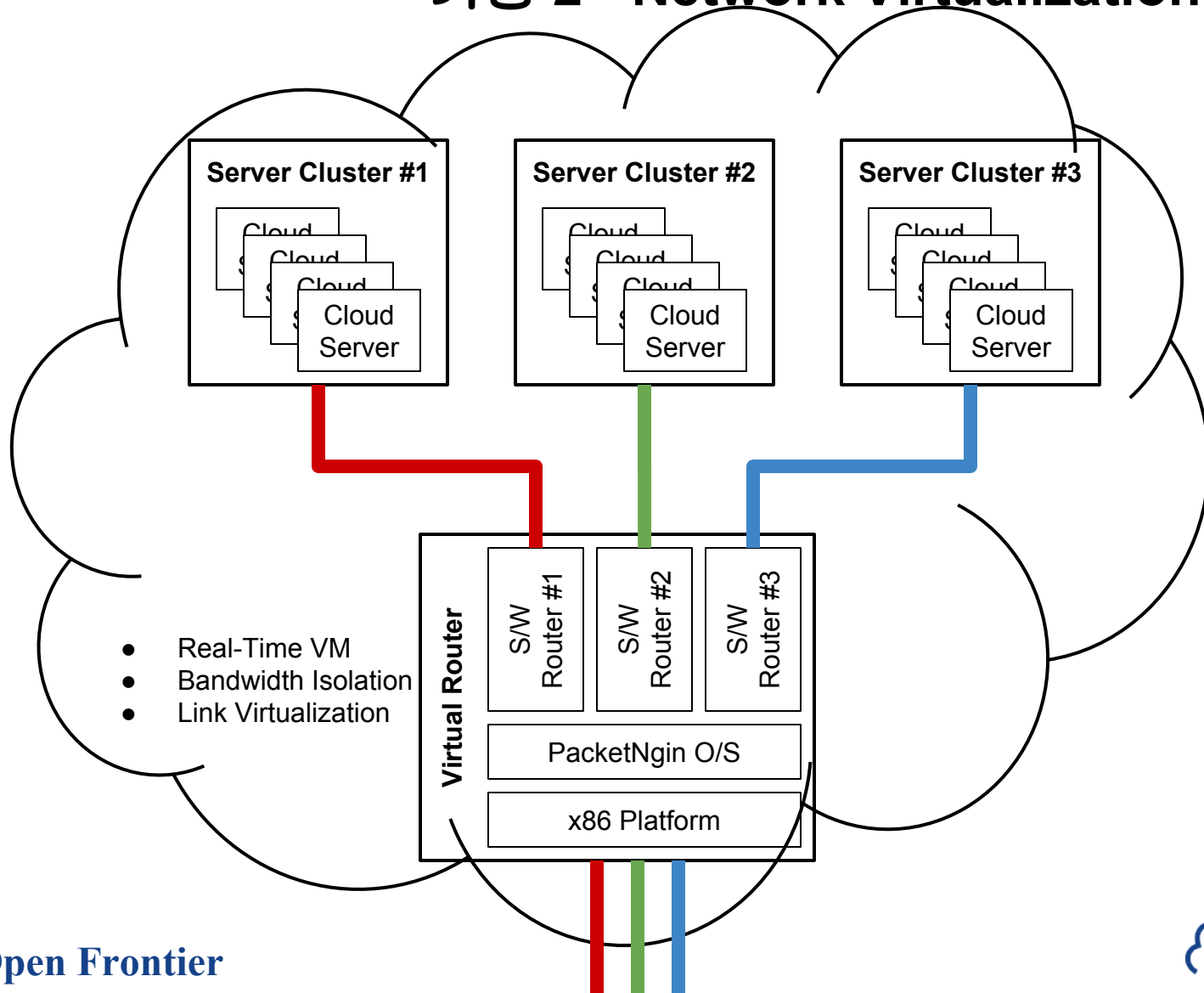
기능 1 - Deep Packet Inspection



- 네트워크의 패킷 (Level 2)을 네트워크 어플리케이션으로 바로 전달
- 네트워크 어플리케이션은 Level 2 ~ Level 7을 한번에 접근할 수 있음
- 패킷을 분석, 수정, 복제, 삭제할 수 있음

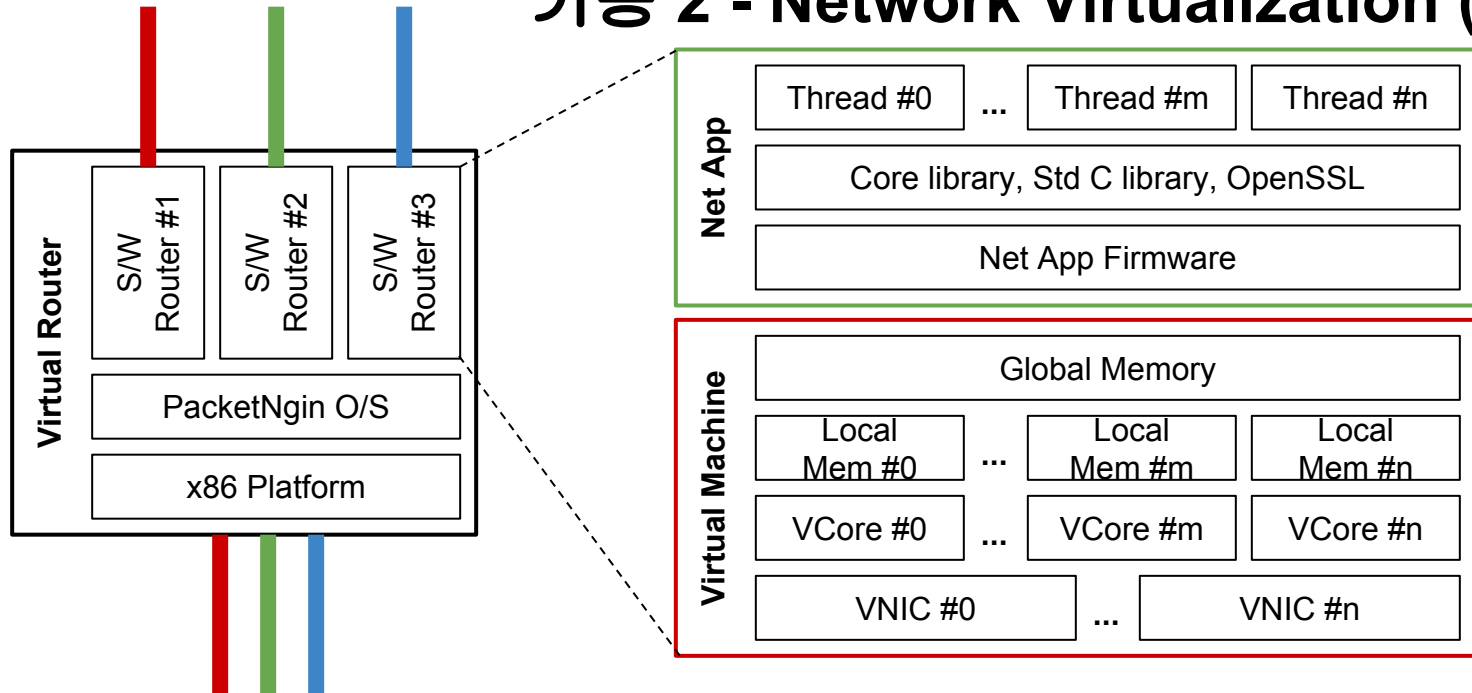
패킷엔진 O/S

기능 2 - Network Virtualization (1/2)



패킷엔진 O/S

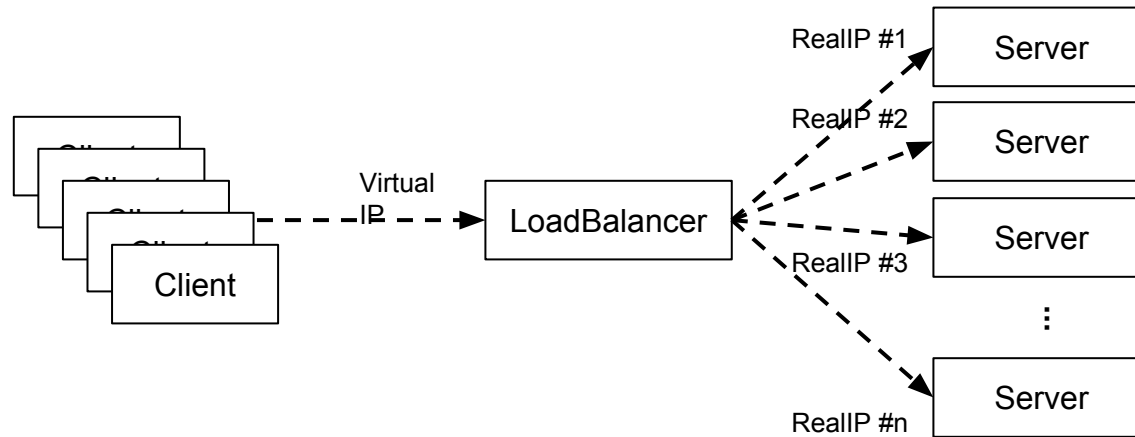
기능 2 - Network Virtualization (1/2)



- 실시간성을 지원하는 가상 머신
- RTVM (Real-Time Virtual Machine)
 - 독점적으로 할당된 CPU, 메모리 자원
 - 독점적으로 할당된 네트워크 MAC 주소, I/O 버퍼, 대역폭
- 가상화된 링크 (hop-by-hop or tunnel)

패킷엔진 로드밸런서

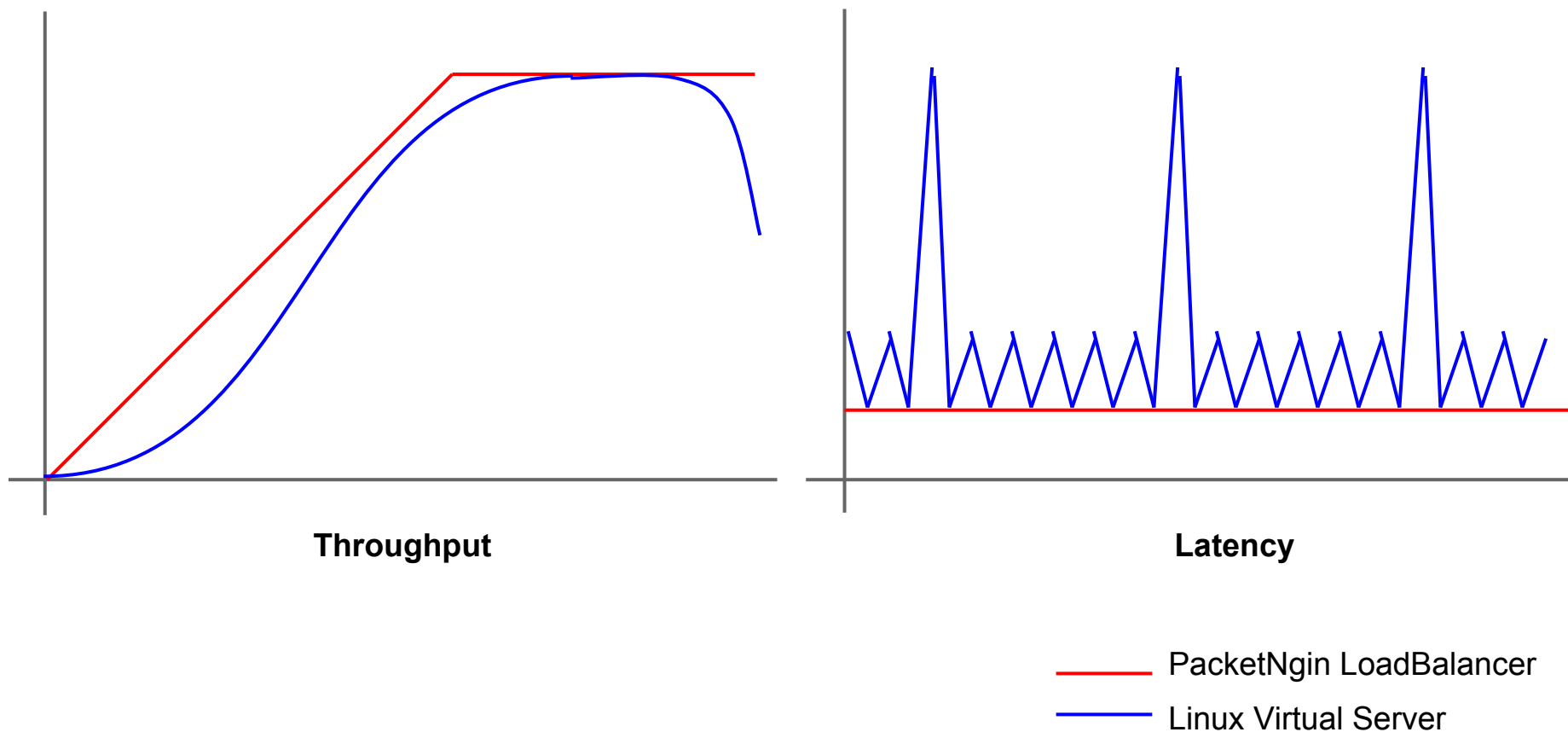
현재 구현 상태, 기능 목표



- Load Balancing Methods
 - NAT, SNAT, DR, Tunneling
- Scheduling Algorithms
 - Round-Robin, Least-Connection, Hashing,
 - Shortest Expected Delay, Never Queue
- Failover
 - Watchdog, TCP Session Recover

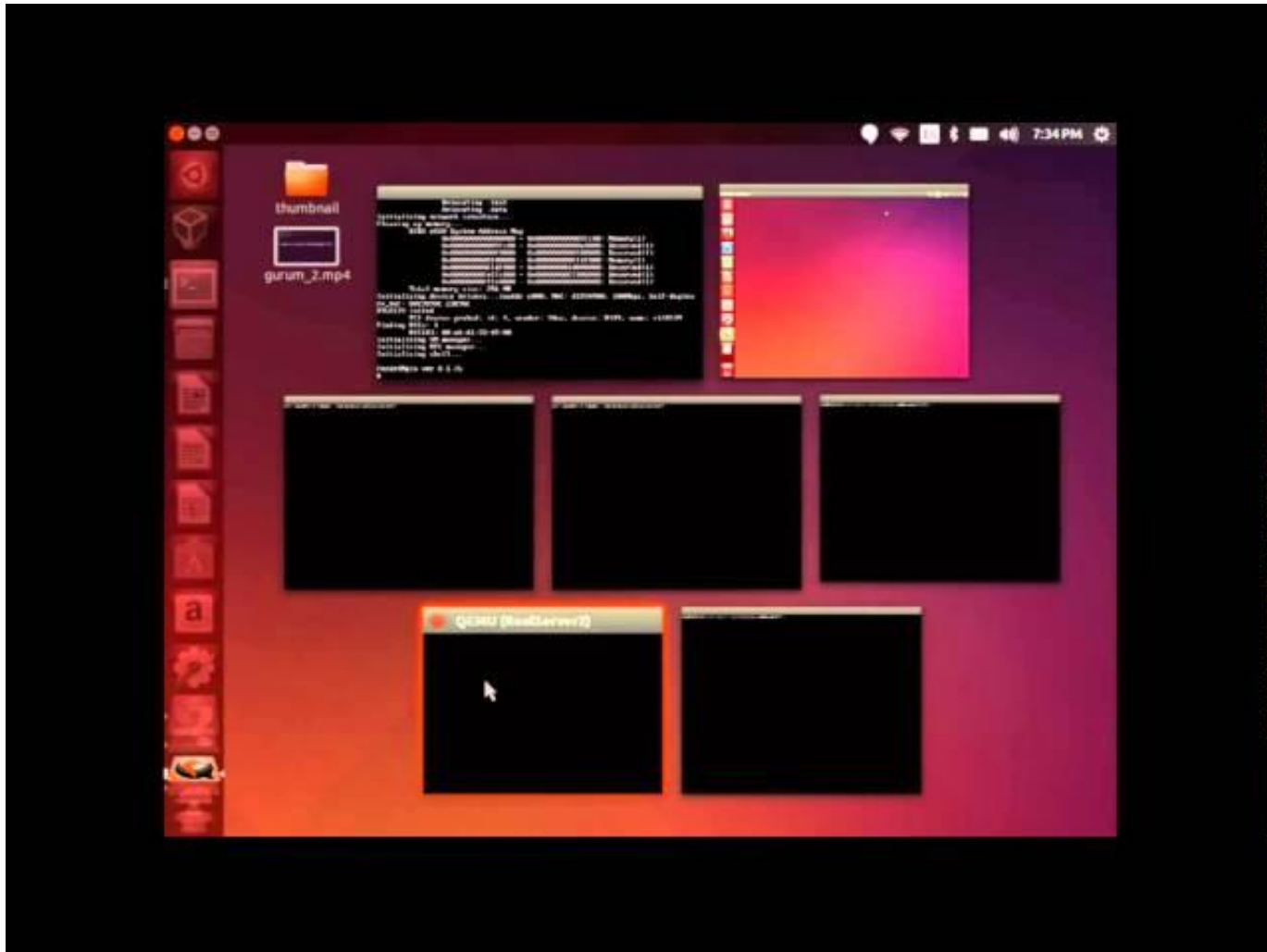
패킷엔진 로드밸런서

성능 목표



패킷엔진 로드벨런서

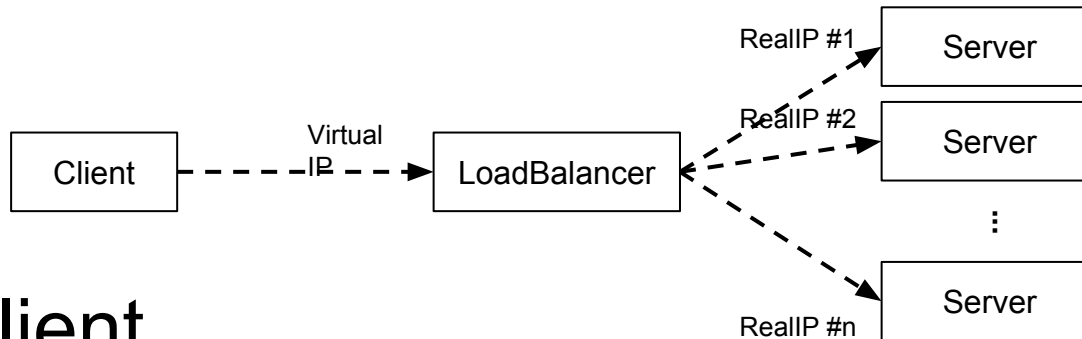
데모



<http://www.youtube.com/watch?v=fz93kZsplel>

성능

Configuration



- Client

- Core i5-4570, 3.7GiB, Ubuntu 14.04
- Broadcom NetXtreme II 5771x/578xx 10/20-Gigabit

- Load Balancer

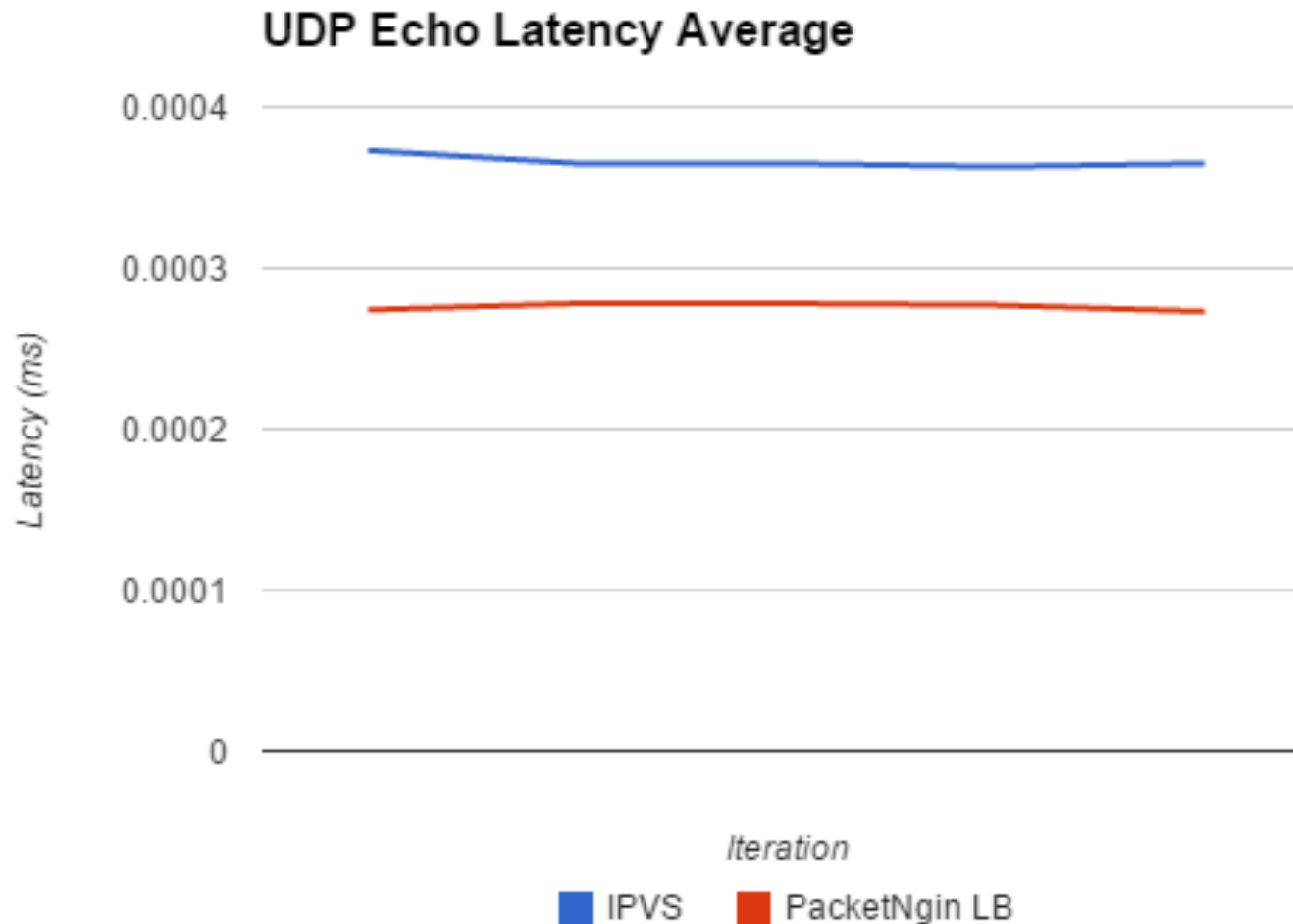
- Core i7-3770, 7.5Gib, RealTek 8111
- Ubuntu 14.04, Kernel 3.13.0-24, IPVS Admin 1.26
- PacketNgin 0.1.79, Loadbalancer 2014-11-04

- Server

- Core i5-4570, 3.7GiB, RealTek 8111, Ubuntu 14.04

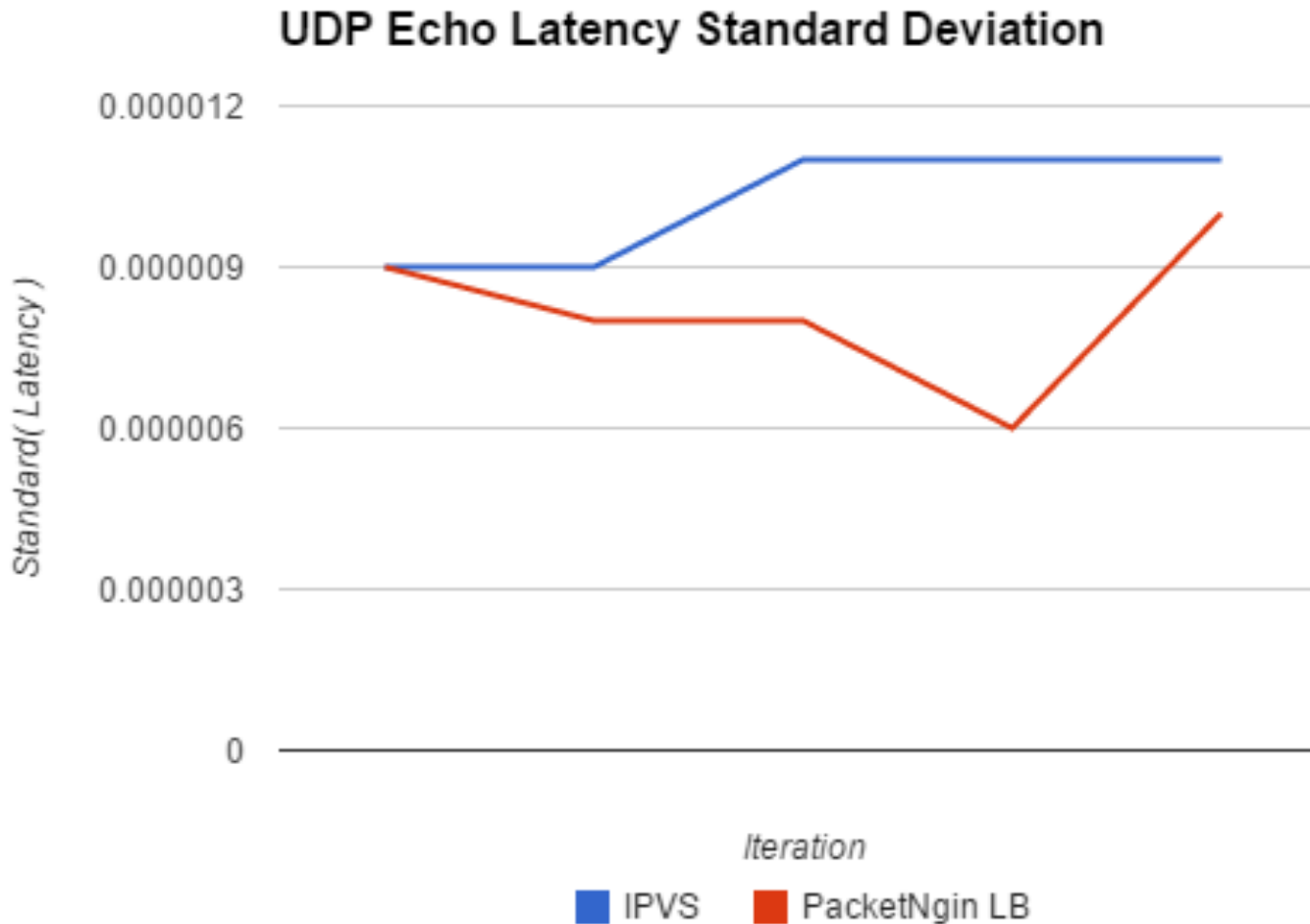
성능

평균 응답시간



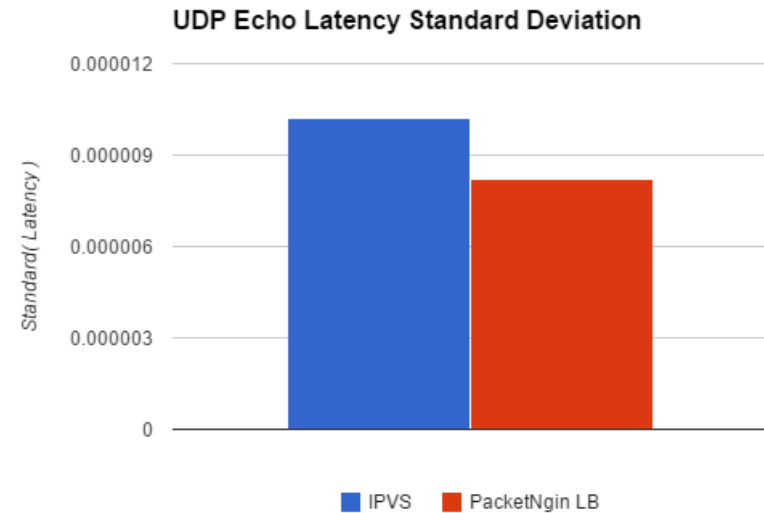
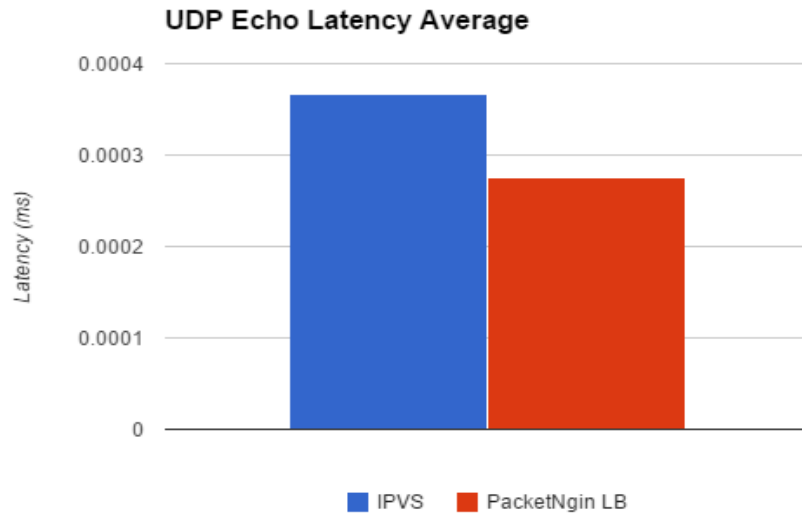
성능

평균 응답시간의 표준 편차



성능

결론



- Linux 대비 1.3배 빠른 응답 시간
- Linux 대비 1.2배 안정적인 성능

Thank You!

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