

Lavelle Networks

Mission

Rapid service deployment in datacenters by
converged ToR switching & L3-L7 network functions

ToR switching = Top of Rack Switching

L3-L7 Network Functions = Load Balancing, Security, Application Delivery Controller (ADC), Routing

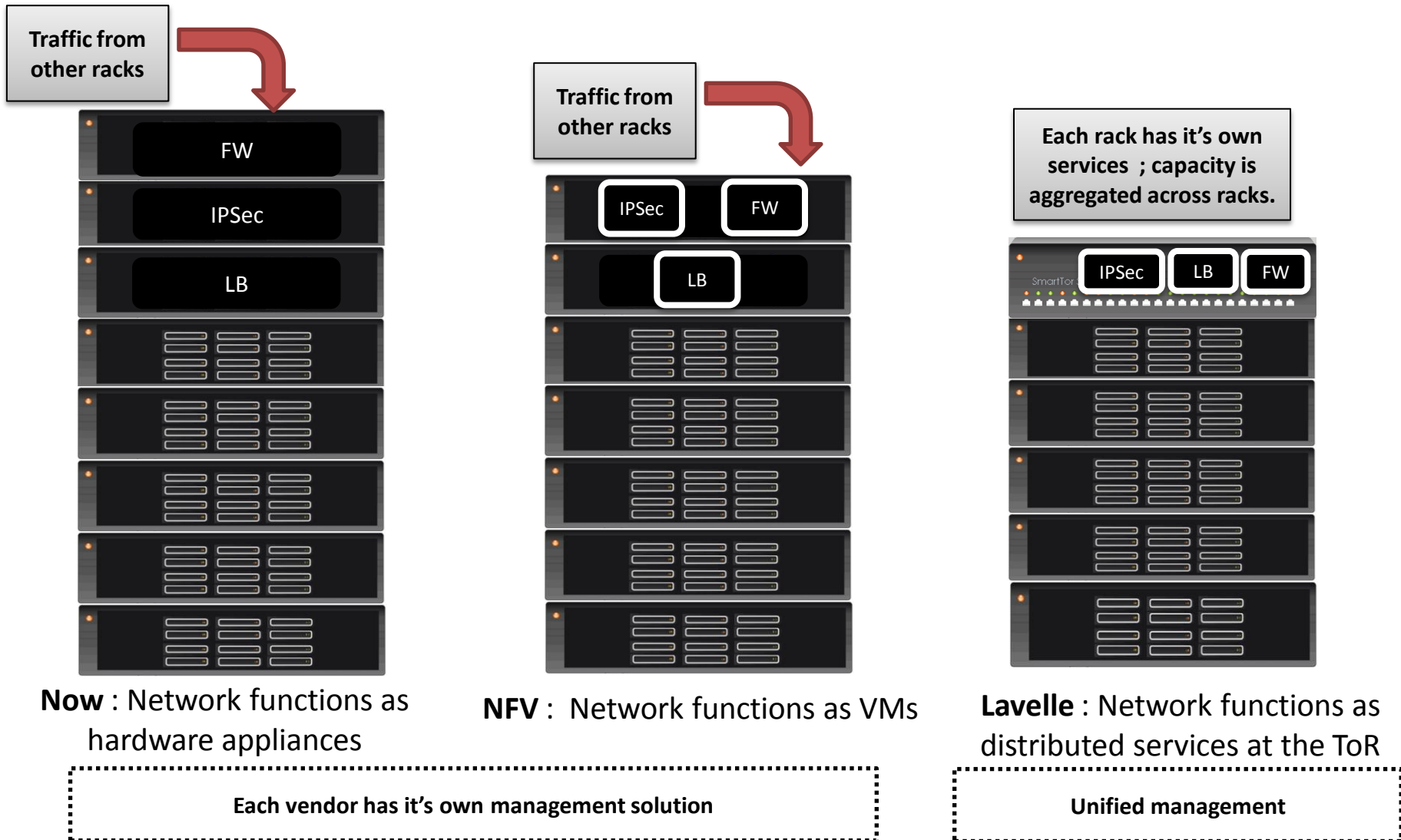
Current Problems

- Legacy network infrastructure high on Capex, slow on service performance & hard to manage
- New bare metal/SDN switching solutions silo'ed, do not integrate with L4-L7 application services
 - Load balancing, Security, Routing deployed in isolation
- Challenges impacting time to market for web-scale, Telco/IaaS & Enterprise customers
 - Reduce service time2market to below 12mo (current best 18mo)

Bare-metal/SDN/NFV Challenges

- No contextual steering of traffic from switches to service VMs
- No performance management for compute intensive applications like SSL
- Limited orchestration capabilities for routing, ADC & security VMs with bare metal switching
- Complexity in setup, configuration & troubleshooting

Technology Evolution with Lavelle



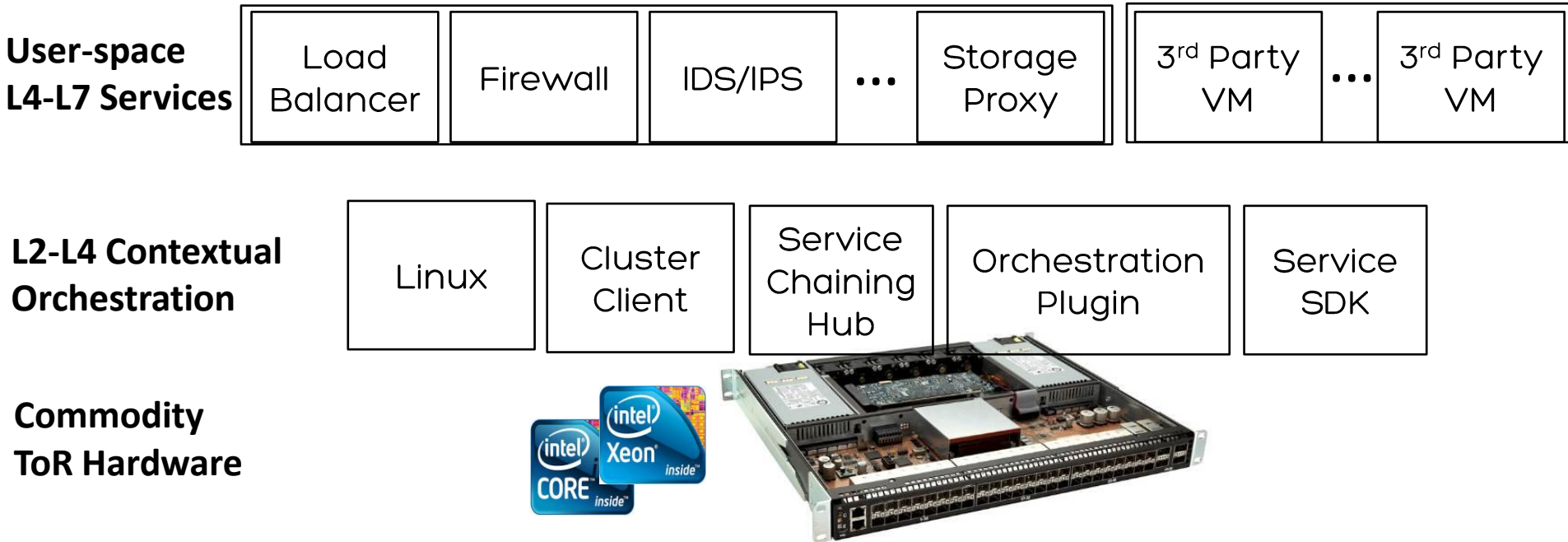
Lavelle Technology

- ToR switch OS service delivery platform:
 - Contextual steering of traffic to L4-L7 service VMs
 - Real-time offload of compute intensive services to servers in the rack
 - OpenStack based service chaining of network functions across 3rd party & native applications
- No custom hardware
- Transparent insertion of existing virtual network functions

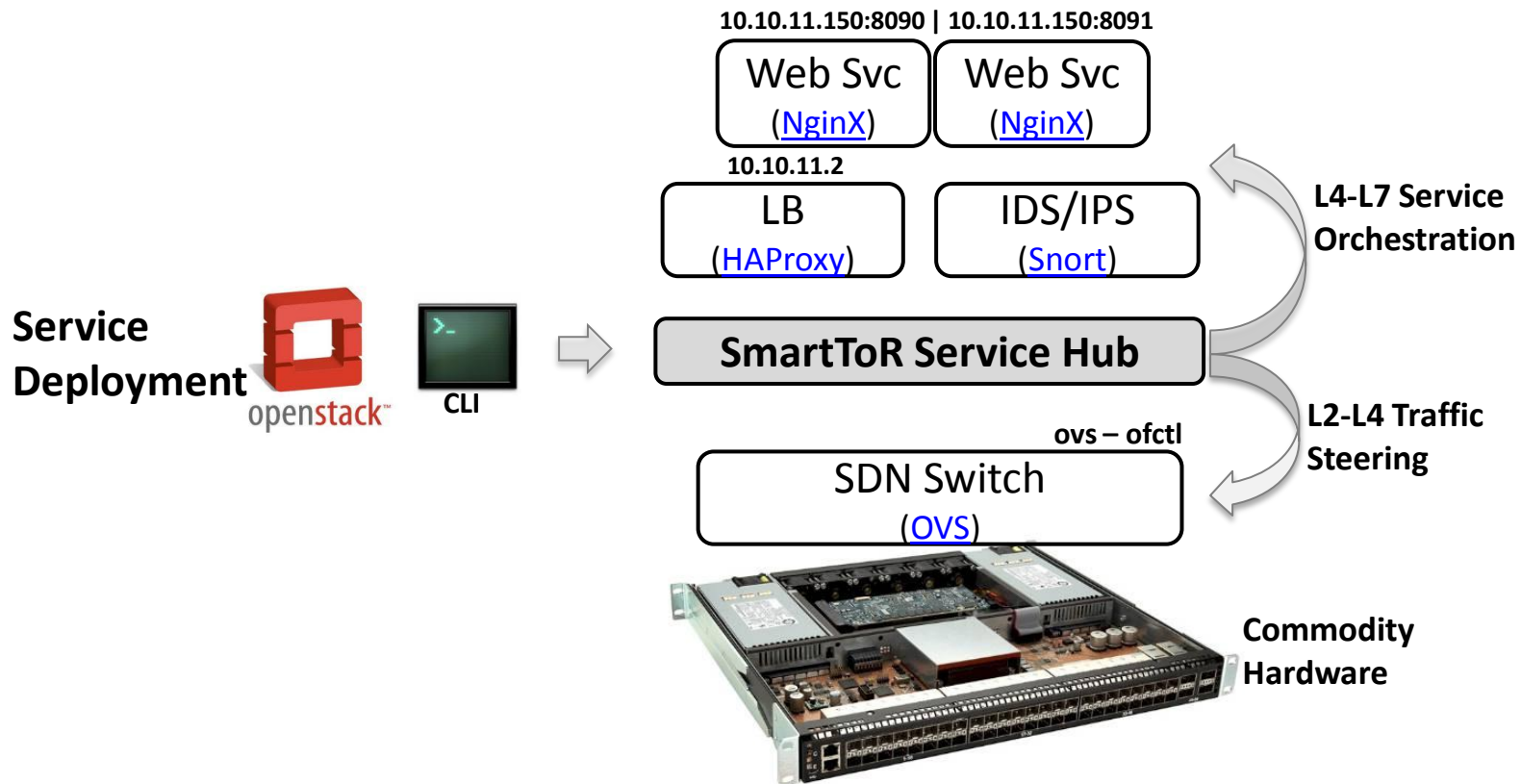
Technology Inflections Leveraged

- Dense cores/ports in commodity servers making bare-metal HW 1/3 of traditional switches
- 40GbE making poll-mode user space network drivers (Intel DPDK) viable over older interrupt-mode kernel drivers (Intel DDIO), opening a new control point to steer traffic
- Mature compute orchestration now available with OpenStack

Product Platform: SmartToR

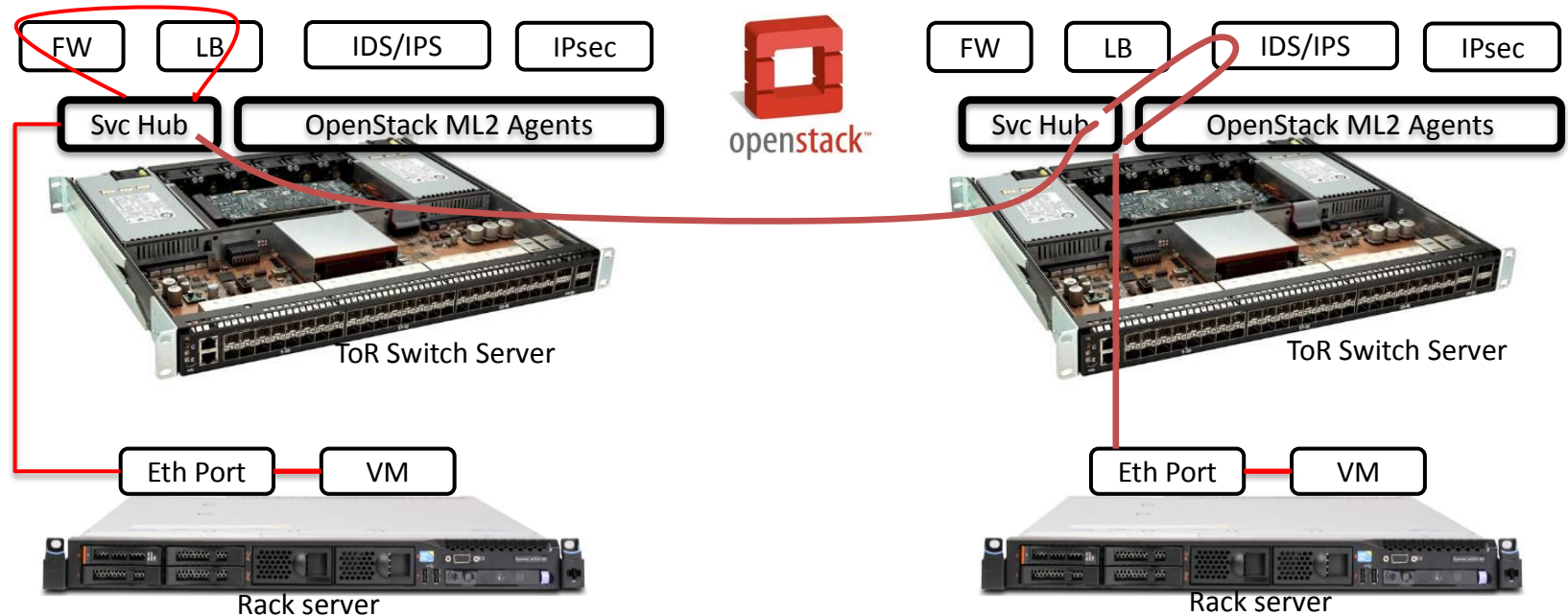


Demonstration Topology



Video: <https://www.youtube.com/watch?v=gzDnDZ4ENeg>

OpenStack based Orchestration



- Service Hub orchestration on SmartToR engages with OpenStack Neutron service chaining to service the steered traffic flows
- Host network orchestration uses Open vSwitch to offload service VMs to rack servers or other ToR switch server

Addressable Market Size

- Market analysis based on [JP Morgan 2014 Networking Outlook](#)
- Addressable market includes only infra impacted by bare-metal deployment
- SmartToR's addressable segments limited to ToR switching, Security, ADC & Routing, other user-defined/3rd party apps excluded in this model
- Bare metal impact projected at 10% in 2014, growing to 30% by 2017
- Continued growth in switch ports & deterioration of port ASP assumed

| Segment | CY14 (\$M) | CY17 (\$M) | CAGR | New CY15 |
|--------------|----------------|----------------|------------|-----------------|
| ToR HW | \$407 | \$1,463 | 53% | \$216.44 |
| ToR SW | \$194 | \$698 | 53% | \$103.34 |
| Security | \$435 | \$1,625 | 55% | \$239.92 |
| ADC | \$128 | \$477 | 55% | \$70.48 |
| Routing | \$65 | \$235 | 53% | \$34.77 |
| Total | \$1,229 | \$4,498 | 54% | \$664.95 |

Competition

| Switch OS / Platform | L4-L7 Applications | Converged Platform |
|---|--|------------------------------------|
| Cumulus Pica8 Pluribus Quagga Big Switch BIRD Zebra XORP | F5 Palo Alto Networks A10 Embrane Pertino Vyatta (Brocade) Vello | VMware NSX Juniper OpenContrail |

Product Development Plan

| Phase | Timeline | Engineering Milestone | Customer Milestone |
|--------------|----------|--|---|
| Sprint-1 | Q1-Q2 | Switching OS L3/L4 FW L4 LB NAT | Professional services engagement, 1-2 web-scale customer(s) with bare-metal switch deployment |
| Sprint-2 | Q3-Q4 | L7 LB (Scripting) IPSec (Encryption/SSL) | Kick-start pilot project, Showcase one L7 service on ToR |
| Sprint-3 | Q5 | 3 rd Party VM (Chaining) Orchestration | Completion of customer pilot, Identify service chains of strategic customer interest |
| Beta Release | Q6-Q8 | Performance engineering Switching OS Optimization QA | Kick-start production engagement with customer, Begin subscription revenues from customer |

Development Resource Planning

| Development Function | Headcount [Q1-Q4] | Headcount [Q5-Q6] |
|-------------------------------------|-------------------|-------------------|
| Switching | 2 | 2 |
| L3/L4 Services | 2 | 2 |
| L7 LB | 4 | 4 |
| IPsec Encryption | 4 | 4 |
| 3 rd Party VM (Chaining) | 2 | 4 |
| Orchestration | 4 | 8 |
| System testing | 1 | 6 |
| Total | 19 | 30 |

Operating Plan

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 |
|--------------------|--------|-------------------------|-------------------|----------------|-----------------------------|--------------|-----------------|------------------------|
| Milestone | Design | Switch OS L3-L4 Svcs | L4-L7 Develop. | L7 LB IPsec | 3 rd Party VM | Perf testing | Beta release | Customer Engagement |
| Cash burn | \$750k | \$900k | \$1,650k | \$1,700k | \$1,900k | \$2,100k | \$2,500k | \$3,500k |
| Cumm. Cash Burn | \$750k | \$1,650k | \$3,300k | \$5,000k | \$6,900k | \$9,000k | \$11,500k | \$15,000k |
| HC | 11 | 15 | 18 | 22 | 26 | 29 | 34 | 41 |

| | | | | | | | | |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Engineering | 10 | 14 | 17 | 19 | 22 | 25 | 27 | 30 |
| IT | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 2 |
| Sales | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 5 |
| Mktg/Allian ce | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 4 |
| PoC Equipment | \$500k | \$500k | \$500k | \$500k | \$500k | \$500k | \$500k | \$500k |

Notes:

- Cost/HC = \$100k/year (assumes India operations)
- PoC equipment involves 1 PoC rack/qtr including ToR server, rack servers & rack opex at a colo

GTM

| | |
|--|---|
| Web-scale [E.g.: Groupon, Google] | <ul style="list-style-type: none">• Leverage rapid penetration of SDN/Bare-metal switching• Insertion strategy based on a bolt-on with existing bare-metal switch OS [like Cumulus]• Upsell performance with Lavelle Switching OS |
| SPs/IaaS [E.g.: Verizon, AT&T] | <ul style="list-style-type: none">• Leverage compute cross-sell with ToR for service VMs• Insertion strategy based on a partnership with server vendor [like Dell] & server VAR for X-selling compute• Ship high performance Lavelle Switch OS with network service stack |
| Enterprises [E.g.: JP Morgan, Thomson Reuters] | <ul style="list-style-type: none">• Leverage increased spend on security• Insertion strategy based on fast deployment of IPSec / encryption (SSL) solution with elastic compute orchestration• Leverage server vendor partnerships from SP GTM |

Revenue Projection

| Year | Targeted Segment | Revenue Projection | Estd. Customer TCO Benefit |
|------|---|--------------------|----------------------------|
| 2015 | <ul style="list-style-type: none"> • Web-scale • Projected 1% share of new deployments • No competition take-out | \$7M | \$17M |
| 2016 | <ul style="list-style-type: none"> • Web-scale, SPs/Telco • Projected 2% share of new deployments • Bare-metal OS competition | \$15M | \$37M |
| 2017 | <ul style="list-style-type: none"> • Web-scale, SPs/Telco, Enterprises • Projected 10% share of new deployments • Bare-metal OS, NSX competition | \$70M | \$170M |

Note:

Conservative estimation of customer TCO benefit includes benefits from software ToR switching (45%), virtualizing L7 network services (15%) and estd. efficiencies in convergence of ToR switching with L4-L7 services (40%)

Lavelle Team

- Team bring unique combination of skills relevant to the problem : Software Defined Networking, Intel DPDK platform, Distributed Systems design, High-performance networking, and Virtualization
 - Worked in companies like Juniper, Microsoft, ARM, NetApp and have previous startup experience
 - in networking, storage & orchestration
 - Experience across development, engineering management, strategy & business development
- Actively engaged with key developers and related open source projects

Why should Lavelle win?

| | We can, They can't | They can, we can't |
|---|---|--|
| Existing TOR Vendors (Cisco, Arista, Juniper) | <ul style="list-style-type: none"> • Cannibalize existing ASIC based Hardware solutions • Direct top Line hit for the incumbents if they take this approach | <ul style="list-style-type: none"> • Drop prices and negate the impact of COTS based TOR solution • Sweeten TOR deals with freebies for services |
| L4-L7 Network Services Vendors (e.g. Palo Alto Networks, F5) | <ul style="list-style-type: none"> • ToR not the primary business, will be entering a new market • Hardware Appliance Top line with take a direct hit | <ul style="list-style-type: none"> • Increase market share in specific NFV services segment given that they are incumbents • Invest in research required for specific services like security |
| NFV Vendors (Startups in NFV space) | <ul style="list-style-type: none"> • NFV Vendors focus is limited to virtualizing network functions | <ul style="list-style-type: none"> • Nothing stops NFV vendors to take this approach |

THANK YOU