Empowered by Innovation NEC

ProgrammableFlow Networking

The Simple Solution for Complex Networks

NEC Corporation of America
www.necam.com

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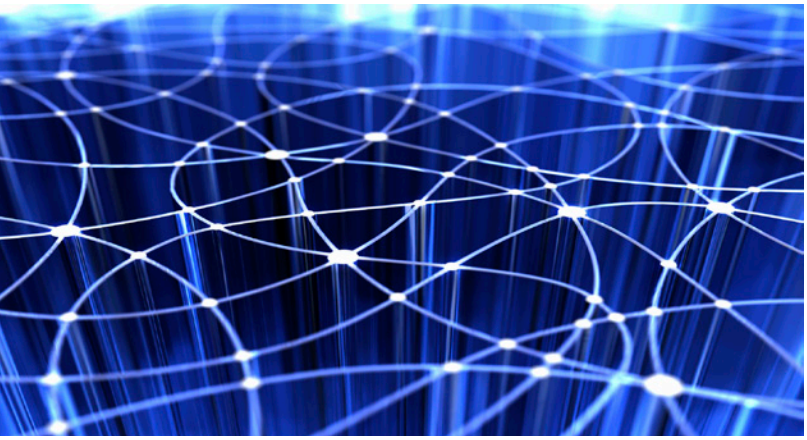
Virtualized Network Infrastructure for the Cloud



At a Glance

- Virtualized, high performance data center network
- Reduces operation costs by reduced network complexity
- Improves IT efficiency through ease of use
- Speeds deployment of new services
- Assures network policy adherence and eases monitoring
- Provides investment protection

Networking Challenges in the Cloud

In today's data center and cloud environment, new business demands and new innovations in compute infrastructure have increased the strains on data center networks.

Economies of scale and improvements in governance are driving demand for IT infrastructure that can handle a variety of workloads. But building networks that enable these benefits is a challenge. Current network equipment lacks flexibility and responsiveness to dynamic business demands, making it difficult to provision and even harder to manage the multitenant networks that cloud services require.

"Network complexity has grown to a point beyond reasonable. ProgrammableFlow provides an automated means of network self-repair, and gives us the single pane of management and control we have long sought."

Eric Miller, CEO of Genesis Hosting Solutions

ProgrammableFlow: Creating a Cloud-Ready Network

Simple

Complex, inflexible network configurations are a feature belonging to past decades with ProgrammableFlow. ProgrammableFlow centralizes control of the network, eliminates the need for distributed protocols such as Spanning Tree. ProgrammableFlow streamlines data center management through greater levels of automation while driving down operational costs and time to deliver business services.

Scalable

In an environment where business requirements are constantly changing, planning for capacity has never been harder. ProgrammableFlow makes scaling out of network resources as easy as scaling out virtualized servers. ProgrammableFlow scales from a single rack integrated into an existing network to an entire data center, all managed from a central console.

Fast

ProgrammableFlow automatically monitors and intelligently distributes network traffic across multiple paths. Paths are managed according to custom defined policies and continuously updated based on network resources and traffic conditions. Any path between any two devices can be used, enabling more efficient use of network resources and multiplying the available bandwidth within the network.

Open

ProgrammableFlow leverages the OpenFlow protocol to create Software-Defined Network (SDN) virtualization, giving NEC customers freedom of choice. By separating network control from switch hardware, organizations can make infrastructure investment decisions independently from the network features they want to support.

ProgrammableFlow PF5240 Switch: Award-Winning High Performance

ProgrammableFlow switch is a powerful, hybrid, multi-layer switch that can integrate into a legacy environment, or fully function with OpenFlow-enabled benefits behind NEC's ProgrammableFlow Controller.

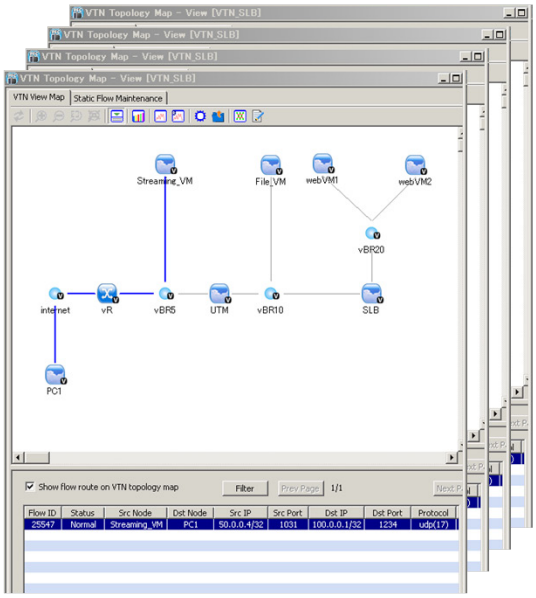
- **High Performance** - 48 ports of gigabit and 4 ports of ten gigabit per second connectivity in compact 1U form factor with 176Gbps fully non blocking switching capacity.
- **Data Center Class OpenFlow Support** – NEC's PF-OS Agent provides line-rate control over network flows. With 160,000 flow table entries supported, customers can define and control network polices at scale.
- **Any Topology** - ProgrammableFlow networks can be deployed in any network topology, increasing network resiliency and capacity.
- **Greener, Easier Operation** - Flow based networking enables organizations to migrate data traffic dynamically for maintenance and power savings.

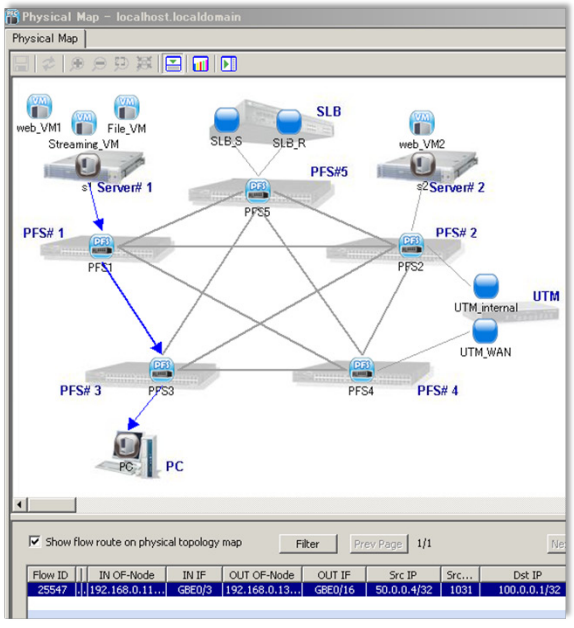
ProgrammableFlow Controller: Unique, Network-Level Virtualization

ProgrammableFlow Controller Software brings the benefits of virtualization to high performance switching. Data center can now deploy, control, monitor, and manage multi-tenant network infrastructure all from a central point.

- **Multi-tenant network virtualization:** NEC's Virtual Tenant Network technology enables administrators to build multi-tenant networks in which virtual machine migration is unfettered, enabling rapid scale-out of new applications, balanced workloads, and higher levels of availability.
- **Reduced network complexity:** ProgrammableFlow's centralized control of the network eliminates the need for distributed protocols such as Spanning Tree, reducing network complexity and unlocking the network capacity unavailable in networks running Spanning Tree.
- **Enhanced Investment Protection:** New network services can be added and extended without changing hardware.

ProgrammableFlow Management Console: Centralized Monitoring for Greater Control





The ProgrammableFlow management console provides an end-to-end view of every network flow from a centralized point of control. Depicted here are the Virtual tenant views and the physical network topology.

Virtual Tenant Network View

- Reduce cost of ownership and Increase IT staff productivity by managing multiple tenants from one console.

Physical Network View

- Increase uptime with topology discovery and flow visualization for performance monitoring and management.

For More Information about ProgrammableFlow please visit www.necam.com/PFlow. PFlow@necam.com 1866.632.3226

Features and Specifications

Features			

ProgrammableFlow Controller Features	OpenFlow Network Control
	• Topology Discovery
	• Policy Based Route Control
	  • shortest hop
	  • flowcount
	  • link weight
		Virtual Networking
		• Virtual Bridging/Routing
		• Physical to Virtual Mapping
		  • MAC/VLAN
		  • Port/VLAN
		  • VLAN
			Custom Filtering/Waypoint Routing
			• Source/Destination MAC
			• VLAN Tag
			• Source/Destination IP Address, DSCP, Protocol
			• Source/Destination TCP Port

Programmable-Flow PF5240 Switch Features	• 48 10/100/1000 ports + 4 1000/10000 ports in compact 1U form factor • Best in class OpenFlow capacity - Flow Entries capabilities of up to 160,000 • High-availability location free networks with hitless fail-over and hot insertion/removal of units, LAG support • L3 capabilities include OSPF,BGP, RIP,VRRP, PIM, MLD • L2 capabilities include STP, RSTP, MSTP, PVST, IGMP, Rate limiting, bandwidth control • Modular design with internal redundant hot–swappable power supplies and fan • Virtual switch instance for running Openflow and distributed protocols on the same equipment		
ProgrammableFlow Management Console	• Physical Network View • Virtual Tenant Network View	• End to End Flow Monitoring • Real time Fault Monitoring	

ProgrammableFlow Switch			UNIVERGE PF5240R-48T4XW	UNIVERGE PF5240F-48T4XW
Maximum switching capacity/Packet Processing			176Gbps/131Mpps	
Network Interface Features	10/100/1000BASE-T		48	
	1000BASE-X	SFP(SX/LX/ZX)	4	
	10GBASE-R	SFP+(SR/LR)		
Redundancy			Internal redundant power supply Hot-swappable	
Input Voltage			AC100V,120V, 220 - 230V, 240V	
Maximum Power Consumption			264W	
Operating Conditions			Temperature 0 to 40ºC, Humidity 20 to 85% Non-condensing	
Dimensions (W×D×H) mm			445×588×44(1U)	
Weight			15kg	
Air Flow			Front to Rear	Rear to Front

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