PROGRAMMABLE NETWORK SYSTEMS THROUGH SDK
JunosSDK (including JunosVEE), JunosSpaceSDK

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TS-B3: Network Virtualization
FRAMEWORK OF NETWORK VIRTUALIZATION
ITU-T Y.3011

• Design goals
  1) Isolation
  2) Programmability
  3) Performance
  4) Network abstraction
  5) Topology awareness and quick reconfiguration
  6) Management
  7) Mobility
  8) Wireless

DO WE HAVE TO DEVELOP ALONE?
JUNOS CAPABILITIES FOR NETWORK VIRTUALIZATION

OpenFlow Ver1.0
- BigSwitch
- Hinemos
- Beacon
- Trema
- NOX

JUNOS Logical Systems
- RPD

JUNOS SDK version 11.4 prototype
- OFC: OpenFlow Controller
- RPD: Routing Processor Daemon

IP/MPLS for L3VPN/6VPN
- OnDemand
- Network Aware App for Multilayer switching

Connectionless
- (Circuit flow)

Connection oriented

OTN/Packet Transport
- WDM / Fiber

Isolation
On-device Programmability
JUNOS SDK IDE
FOR OPENFLOW SWITCH CODE

On-device Programmability
GICTF INTER CLOUD RESOURCE MODEL, BASIC ALTO ARCHITECTURE

ICSP (CSP) → ALTO Service Discovery → ALTO SD Query/Response

OpenFlow Controller

Routing Protocols
Provisioning Policy
Dynamic Network Information

OpenFlow Switch

OpenFlow protocol (Open signaling)

ALTO Client

ALTO protocol

External Interface

draft-ietf-alto-protocol-10

GICTF : Global InterCloud Technology Forum
ICS : InterCloud System
ALTO : Application Layer Traffic Optimization

Signaling-based Programmability
USE CASE: CALENDAR BANDWIDTH APPLICATION

Bandwidth Calendaring Application

GUI/API ⇔ Scheduler ⇔ Topology

OpenFlow Controller

RT Network Topology & Utilization feed (e.g. Alto)

LIVE DEMO @ CEWC 2011

Signaling-based Programmability
BI-DIRECTIONAL INTERACTION AND PROGRAMMABILITY

THE APPLICATION WORLD

Inform network of desired behavior

THE NETWORK WORLD

Inform application of data intrinsically in the network

Programmable Touch points

User service profile
Enterprise edge
Hypervisor stack

CDN

Billing profile
Business edge service profile
VPN/mobile/security gateways

Touchpoints to extract information or influence behavior. Platforms use touch points. Developers use platforms.
PROGRAMMABILITY FOR NETWORK ABSTRACTION

THE APPLICATION WORLD

Real-time topology understanding (ALTO, BGP-TE)

Steering traffic through optimal paths (PCE)

Selecting specific traffic (OpenFlow)

New touch points: gateways, billing collectors, service appliances, CDN, DPI

THE NETWORK WORLD

Bridge the divide from both sides: Augment and Enable

Web Service API

Orchestration Across Networks

Network APIs

"Omotenashi" for Network users. The heart of Japanese Hospitality
WHAT IS OMOTENASHI?

- The heart of Japanese hospitality.
- The host (Service provider) anticipates the needs of the guests (Users) in advance and offers a pleasant service that guests (Users) don't expect.
- “Omotenashi” has a similar meaning to hospitality in English, but it suggests a deeper part of the human consciousness.
IMPROVING USER EXPERIENCE BY PROGRAMMING THE NETWORK

SOFTWARE DEFINED NETWORKING

Real Problems.
Real Attention.
Real Contribution to User.

PROGRAMMABLE NETWORKING

Bringing together and influence the user experience

Bi-directional interaction between App & Net

JUNOS VEE SDK
JUNOS SPACE SDK
JUNOS SDK

UNLEASH THE POTENTIAL!
Today the two worlds are not interlocked

Application World

Network World
Virtual Engine SDK APIs IN JAVA, C, C++, MORE...

Routing Engines - Control Plane
- Control Applications *built with RE SDK*
- UI Extensions *built with RE SDK*
- Service Broker *(native platform)*
- VEE Manager *(native platform)*

Packet Forwarding Engine - Data Plane
- Service Applications *built with Services SDK*

Service Engines - Services Plane
- Service Applications
- Junos-integrated Application *(built with VE SDK)*
- Other Applications

Virtual Engine Environment - Virtual Plane
- Virtual Engine Guest Systems *(Linux, Windows, Junos, etc.)*
- VEE KVM Hypervisor
- Host Manager *(native platform)*
- Cluster Manager *(native platform)*

Junos Systems

Line card

Appliance

Programmability
SUMMARY

- Further work for developing network virtualization (ITU-T Y.3011)
  1) Isolation
  2) Programmability
  3) Performance
  4) Network abstraction
  5) Topology awareness and quick reconfiguration,
  6) Management, 7) Mobility, 8) Wireless
- Further leveraging the network device and the server device
- Developer ecosystem
  - Shift from vendor driven to developers driven

THE NEW NETWORK MUST OPEN TO SOFTWARE APPS & DEVELOPERS
Thank you!

everywhere

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VEE – high level VIEW

VEE allows non-Junos applications to integrate with Junos-based Platforms

Junos

MGD

RPD

....

VEE Server

JDAF

SDK VMM
Manager

RE

PFE

Juniper
Router

Linux

Embedded
Junos

App-1

App-4

App-5

Windows

SDK VMM
Node

KVM Hypervisor

Linux CentOS

X86 Processing Complex

Junos SDK- JDAF

VM creation information

Mirrored or Inline Data Traffic

App Specific information

Tethered Appliance
Or
Blade Extension
Or
Cloud Instance
Junos VEE long-term vision

Router acting as the central entity - interacting with a distributed set of applications, which are both existing 3rd party apps as well as VE-SDK Apps that run tethered to the router and deployed in the cloud.