V350 win the SDN Idol@ONS award in ONS 2013
Agenda

- Centec Product Introduction: Silicon & V350
- V350 Product Details
- V350 Case Studies
**FULL Lineup from Access to Core**

### 25G/50G/100G
- **Core**
  - CTC9032
    - Taurus
    - 6.4T
    - 14nm

### 10G/25G
- **Aggregation**
  - CTC8096
    - GoldenGate
    - 1.2T
    - 32nm
  - CTC8196
    - GoldenGate2
    - 3.2T
    - 14nm

### Value 10G
- **Multi-Giga Aggregation**
  - CTC7048
    - DUET
    - 640Gbps
    - 32nm
  - CTC7148
    - DUET2
    - 640Gbps
    - 32nm

### 1G/2.5G
- **Multi-Giga Access**
  - CTC5160
    - GreatBelt
    - 120Gbps
    - 45nm
  - CTC5120
    - Rama
    - 40Gbps
    - 45nm
  - CTC5236
    - TsingMa
    - 360G
    - 28nm

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GreatBelt Series Overview

- High feature, high performance IP/Ethernet switching silicon with L2~L4 processing capability.

- Competitive alternative with strong differentiation

- Key Features
  - 120Gbps packet processing capability
  - 128K MAC/64K IP LPM
  - Ethernet bridging, IPv4, IPv6 routing, MPLS/MPLS-TP switching, MPLS-TP OAM, SyncE, 1588, L2/L3 VPNs, NAT, ACL/QoS/H-QoS processing, DCB features (PFC, ETC, QCN, etc), CAPWAP, security features, etc.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Application</th>
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<tbody>
<tr>
<td>CTC5160</td>
<td>Access/Aggregation platform for Carrier Ethernet and Packet Transport</td>
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</table>
CTC5160- Differentiations

- Focus on Enterprise and Data Center Market

- Competitive features with large table
  - Support Cut-Through Forwarding
  - Support DCB/CAPWAP for converged network
  - Leading SDN support with up to 64K Exact Match Flows
  - Support NAT64 / IVI for IPv6 Transition

- Versatile Applications
  - Support 48GE + 4x10GE + 2x20G stacking
  - Support Horizontal Virtual Stacking via CloudStacking™
  - Support Connect to any 10GE switch for Chassis Applications

- Lower Power for Fan-less Design
CTC5160 - New Data Center Features

- **Low Latency**
  - Cut Through

- **Lossless Ethernet**
  - 802.1Qbb PFC (Priority Flow Control)
  - 802.1Qaz ETS (Enhanced Transmission Selection)
  - 802.1Qau QCN (Quantized Congestion Notification)
  - Data Center TCP

- **Virtualization**
  - 802.1Qbg VEPA (Virtual Ethernet Port Aggregation)
  - 802.1Qbh Port Extender

- **Layer 2 Scalability**
  - TRILL/SPB

- **Convergence**
  - FCoE
CTC5160 - SDN Innovations

- App-oriented flow table with optimization for most popular applications
- Large flow tables (up to 32K)
- Up to 16K per-flow counters and 8K per-flow meters
- Programmable multiple flow processing stages

Programmable flow processing
  - Programmable flow table size and width
  - Programmable match fields
  - Programmable actions
Centec OpenFlow Solution Highlights

- **Switching Silicon**
  - CTC5160: Ethernet switching silicon competitive for OpenFlow, high density 1G
  - GoldenGate: High density 10GE silicon with OpenFlow optimized design

- **Turnkey Solutions**
  - V350 System purposely built for data center ToR switch, base on CTC5160
  - support OF1.3, tunnels etc
  - Source code (Open vSwitch & SDK) available to customers
  - Support ODM business model
V350 Series is built on Centec's CTC5160 silicon, integrating the open source Open vSwitch and Centec's SDK to provide a complete system solution.

<table>
<thead>
<tr>
<th>Models</th>
<th>Port Configuration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V350-48T4X</td>
<td>48 x 10/100/1000M RJ45 4 x 10GE SFP+</td>
<td>▪ Pluggable AC/DC Power Module</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Fixed and Speed Adjustable Fans (Front to Rear airflow)</td>
</tr>
<tr>
<td>V350-8TS12X</td>
<td>- 8x10/100/1000M RJ45, 8x1000 Base-X SFP ports (Combo)</td>
<td>▪ Support RJ45 Console and Eth Management port</td>
</tr>
<tr>
<td></td>
<td>- 12 x 10GE SFP+</td>
<td></td>
</tr>
</tbody>
</table>
Cut through for Low latency

Support N-Flow™ SDN innovation

Support up to 2K wildcard match flows with complete L2-L4 match fields and statistics

Support up to 32K exact match flows (Match fields can be customized)

Wire-speed for all 48x1GE + 4x10GE

Low system power - less than 65W
Support OpenFlow 1.3

Flexible editing

Multiple flow tables

Group Table

Meter Table

Tunnel
  - NVGRE
  - MPLS L2VPN
Centec System Solution Roadmap

2H/2012

1G + 10G

CTC6048
- 48x1G + 4x10G
- 32K MAC / 16K IP
- MPLS / Metro
- 16Kx80 TCAM
- External TCAM Support

E330
- 48x1G + 4x10G
- Product quality switch software

V330
- 48x1G + 4x10G
- OVS 1.5 / OF 1.0
- 2.5K 12-tuple flow
- NVGRE / MPLS tunnel
- Multi-destination
- More editing actions
- Complete Open Source

1H/2013

CTC5160
- 48x1G + 8x10G
- 128K MAC / 64K IP
- MPLS / Metro
- < $100 in cost

E350
- 48x1G + 4x10G
- 8x1G + 12x10G
- 24x10G
- Product quality switch software

V350
- 48x1G + 4x10G
- 8x1G + 12x10G
- Large hash based flow

2H/2013

GoldenGate
- 96 x 10G / 24 x 24G
- 48 x 10G / 4 x 100G
- 256K MAC / 128K IP
- MPLS / Metro
- SDN Innovations

E150
- 4x1G + 2x10G
- Product quality switch software

V150
- 4x1G + 2x10G
- Large hash based flow

1H/2015

E580
- 48x10G + 2x40G + 4x100G
- 48x10G + 6x40G
- 24x40G
- 32x10G + 2x40G
- Product quality switch software
- OpenFlow
- Data Center

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SDN/OpenFlow Technology Roadmap

- V350 Software (Q3/2013)
  - Support OpenFlow V1.3 Spec
  - Contribute to OVS Community include ASIC SDK & adaptation layer

- GoldenGate ASIC (Q4/2014)
  - 720G wire-speed, support 48x10GE + 6x40GE
  - Optimized for WhiteBox market opportunity, cost/power
  - SDN/OpenFlow Innovation
  - L2 over L3 tunnel support: NVGRE, VXLAN, GENEVA, STT
Agenda

- Centec Product Introduction: Silicon & V350
- V350 Product Details
- V350 Case Studies
V350-48T4X Hardware Platform

- RJ45 Serial Port
- Ethernet Port for Mgmt

- Air-Holes

- 48x1GE Copper

- 4 SFP+ Uplink ports

- Fixed and speed-tunable fans

- AC/DC replaceable dual power supply
Product Dimension: Standard 1RU, and the depth is about 350 mm
Downlink Network Ports: 48 x 10/100/1000M RJ45
Uplink Network Ports: 4 x 10GE SFP+

Flash: 2GB(NAND)  RAM: 1GB (Could be extended to 2GB)
CPU: PowerPC P1010 533MHz   OS: Linux
PHY: Vitesse 1G PHY(QSGMII)
Power Consumption: 48GE + 4x10GE < 65W

RJ45 Console port, Ethernet Management Ports
FRU AC or DC dual Power Supply
Fixed FANs with adjustable speed
V350-8TS12X Hardware Platform

- RJ45 Serial Port
- Ethernet Port for Mgmt

Air-Holes

USB

8x1GE Copper

8x1GE SFP (Combo)

12 x 10G SFP+ ports

Fixed and speed-tunable fans

AC/DC replaceable dual power supply
V350-8TS12X Hardware Spec Summary

- **Product Dimension**: Standard 1RU, and the depth is about 310 mm
- **1G Network Ports**: 8 x 10/100/1000M RJ45, 8x1000 Base-X SFP (Combo)
- **10G Network Ports**: 12 x 10GE SFP+
- **Flash**: 2GB(NAND)  **RAM**: 1GB (Could be extended to 2GB)
- **CPU**: PowerPC P1010 533MHz  **OS**: Linux
- **PHY**: Vitesse 1G PHY(QSGMII)
- **Power Consumption**: 8GE + 12x10GE < 47W
- **RJ45 Console port, Ethernet Management Ports**
- **FRU AC or DC** dual Power Supply
- **Fixed FANs with adjustable speed**
V350 Software Architecture

User space

Kernel

hardware
Debian Linux

- Native Debian system running on top of Switch
- Easy to manage the switch
- Easy to install versatile tools and packages
- Improve DevOps
OpenFlow Features Specification
- Match Field

■ Physical Information
  ▪ Incoming Port

■ Layer 2 information
  ▪ MAC SA/DA
  ▪ VLAN ID
  ▪ VLAN PCP
  ▪ L2 Type

■ Layer 3 & Layer 4 information
  ▪ ARP operation
  ▪ ARP SPA and TPA
  ▪ ICMP type/ICMP code
  ▪ IP SA/DA
  ▪ IP ToS
  ▪ L3 Protocol
  ▪ TCP/UDP Source or Destination Port Number

■ MPLS field
  ▪ MPLS Label/TC
OpenFlow Features Specification
- Actions

- **Forward**
  - All
  - CONTROLLER
  - LOCAL
  - IN_PORT

- **Modify-field**
  - Set VLAN ID
  - Modify source MAC address
  - Modify destination MAC address
  - Modify IPv4 destination address
  - Modify TCP or UDP destination port
  - Set MPLS Label/TC/TTL
OpenFlow Features Specification
- Actions

- Push-Tag/Pop-Tag
  - Push/Pop MPLS label
  - Push/Pop VLAN tags

- GRE Tunnel

- MPLS L2 VPN

- Group

- Set-queue
OpenFlow Features Specification
- Management

- **Controller**
  - Capable to Configure/Delete/Reset the controller linked to on the switch
  - Multiple controllers
  - Verified controller
    - OpenDaylight, Floodlight Controller, NOX Controller, RYU Controller

- **Stats**
  - Per Flow
  - Per Port
  - Per Meter
  - Per Group
V350 Package

- **Hardware**
  - Centec CTC5160 Ethernet Switching Silicon
  - Productized ToR Switch Platform

- **Software**
  - Centec Optimized SDK for OpenFlow
  - Open vSwitch (OVS)

- **Documentation**
  - Product Brief & Data Sheet
  - Product Spec
  - CLI& User Guide
  - Developer Guide
V350 Product Brief
V350 Data Sheet
V350 Specification
V350 Command Line Reference
V350 User Guide
V350 Developer Guide
V350 Release Notes
Agenda

- Centec Product Introduction: Silicon & V350
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- V350 Case Studies
Deployed at both carrier networks in Europe and financial networks in China

Why SDN and white box
  - Traditional TAP device is dedicated, very expensive and operationally complex
  - SDN provides full network visibility and is able to eliminate vendor lock-in
  - Good enough to satisfy many customers
TAP Highlights

- Aggregation of network links and/or span ports

- Filter and load-balance traffic from the 10-Gbps link to multiple 1-Gbps monitoring tool or aggregate multiple 1-Gbps links to 10-Gbps monitoring tools

- Many to Any and Any to Many

- OpenFlow/OPEN APIs
VTEP (Tunnel Gateway)
VTEP (Tunnel Gateway) highlights

- Deployed in cloud providers in China
- Adapted with Cloud orchestrations like OpenStack
- Improved performance and scalability
- Distribute L3 services
Hardware Acceleration by Centec OF switch

- L2 over GRE flows
  - Up to 20K

- GRE tunnel
  - Up to 10K
DDoS security

source of the picture -- http://packetpushers.net/centec-v330-my-kind-of-openflow-switch/
DDoS security - Highlights

- Deployed at Japanese ISP
- Requirement to modify dest IP
- Support priority of flow entries
- Wire-speed performance
Openflow Based Load Balancing
OF Based Load Balance Highlights

- Cooperate with security vendors
- Use Top of Rack (ToR) switch to distribute traffic
- Replicates the functionality in load balance appliances
- Controller handles the control plane operation but switch handles forwarding
  - flexibility
  - low cost
  - high throughput deployments
Load Balance by OpenFlow

- **Match fields**
  - L2 header
  - L3 + L4 header
  - L2 + L3 + L4 header

- **Group table (selective) defined in OF1.1+**
  - Hash algorithms implemented by Silicon