Active Nets Technology Transfer through High-Performance Network Devices

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Agenda

- Our Mission
- Technology Transfer
- Challenges and Solution
- Our Works
- New Targets
- Summary

Our Mission

- Developing enabling mechanisms for the AN technology transition and Knowledge transfer
- Finding good industry relevance research and technologies and incorporating them into future products
- Deploying commercial high performance network devices to construct a programmable AN platform
  - Supporting customizable network intelligences
  - Supporting excellent AN-specific research projects
  - Addressing AN and optical networking issues

1st Expl: Collaboration with a Major Carrier

- A major Carrier is interested in some aspects of the research and technologies incubated by the AN community ☺
- The main value is to role out new services – and fast

- Unfortunately - the current market condition slowed down the interest (great direction – but no money now) ☹

2nd : AN Collaboration: CeNTIE – CSRIO- Nortel

Center for Networking Technologies for Information Economy (CeNTIE) - a CSIRO-led consortium including Nortel Networks, Amcom Telecommunications, the UNSW, UTS and the WA Interactive Virtual Environments Centre (IVEC).
www.centie.net

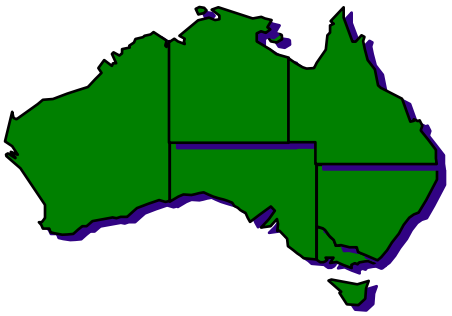
Tele-Health Focus Group

- Royal Australian College of Surgeons
- Medic Vision
- University of Sydney
- NSW Health
- Royal Prince Alfred
- Interactive Virtual Environment Centre (IVEC).
- Centre for Medical and Surgical Skills (CTEC).

Media Systems Focus Group

- Fox Studios
- Animal Logic
- GMD
- Ambience
- Film Industry Broadband Resource Enterprise (FIBRE)
- WAM!NET
- Australian Broadcasting Corporation (ABC)
- ScreenWest

CeNTIE in Sydney



CSIRO NML

EPPING Station

CSIRO Macquarie Uni

CSIRO Marsfield

CSIRO North Ryde

Fujitsu

Crows Nest

PPI Cluster

ABC Gore Hill

RNS hospital

Fox Studios

PPI Cluster

State Rail ???

UTS

ABC Ultimo

ECTECH

Australian Technology Park (AC3)

Redfern Station

Uni Syd

UNSW

Core CeNTIE Nodes

Core CeNTIE Network

Possible extensions

Challenge 1: Infinite Bandwidth

Why this change the playground?

- **3-4 orders of magnitudes bandwidth growth in many dimensions**
  - Core – Optical bandwidth - (155mbps ! 1Tbps)
  - LAN – (10mbps ! 10Gbps)
  - Access – Cable, DSL, 3G – (28kbps! 10mbps, 1.5mbps, 384kbps)
- **Silicon Wire-speed routing**
- **How to benefit from these valuable resources? For example: streaming media on the net?**
  - Peer to Peer – driving bandwidth
  - Streaming video, multicast, video is coming
  - Web traffic will be minor (streaming is constant)

Challenge 2: Programmable Networking

- **The streaming media demand & the infinite bandwidth drives the need for programmability and dynamic services on the net**

- **Need programmability on commercial devices to address this challenge since software based routers cannot address it adequately.**

- **However, unlike Linux routers and software based routers, software cannot be added to the data plane**
  - Data plane : Wire speed silicon forwarding, multi Gigabit
  - Control plane :
    - Can't see the data in wire speed.
    - Can dynamically modify the silicon knobs

Our Solution: Programmable Services

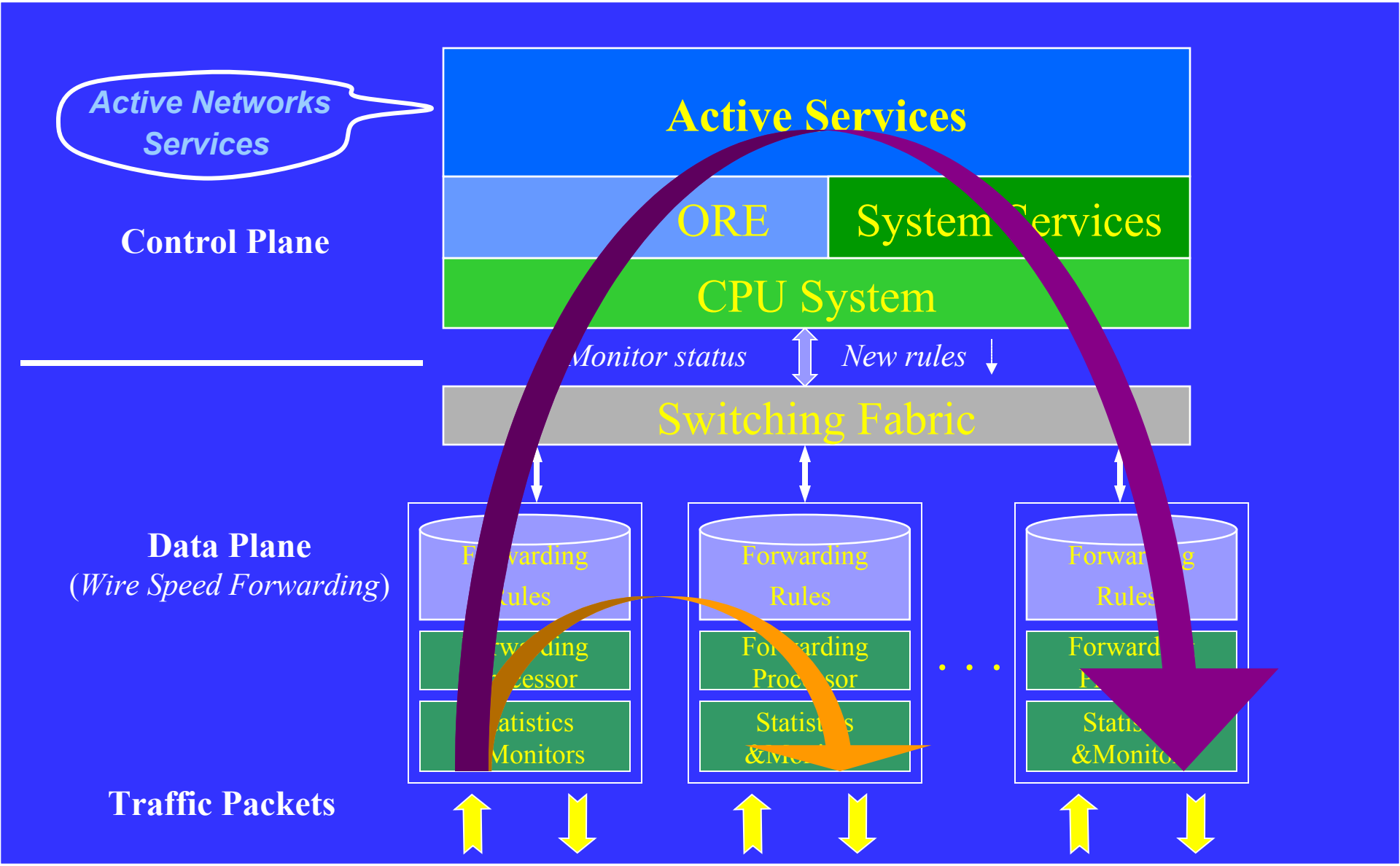
- **Service-enablement will prove most effective where "impedance mismatches" occur in the network**
  - Optical vs. Wireline (3-4 oom)
  - Wireline vs. wire-less (3-4 oom)
  - Secure vs. non-secure
  - Customer-premises vs. Content-provider-land (3-4 oom)
  - SLA (x) vs. SLA (y)
  - Resource-constrained vs. unwashed unlimited computing
- **A service-enabled box can wear multiple hat**

oom – Order of Magnitude

Our Works

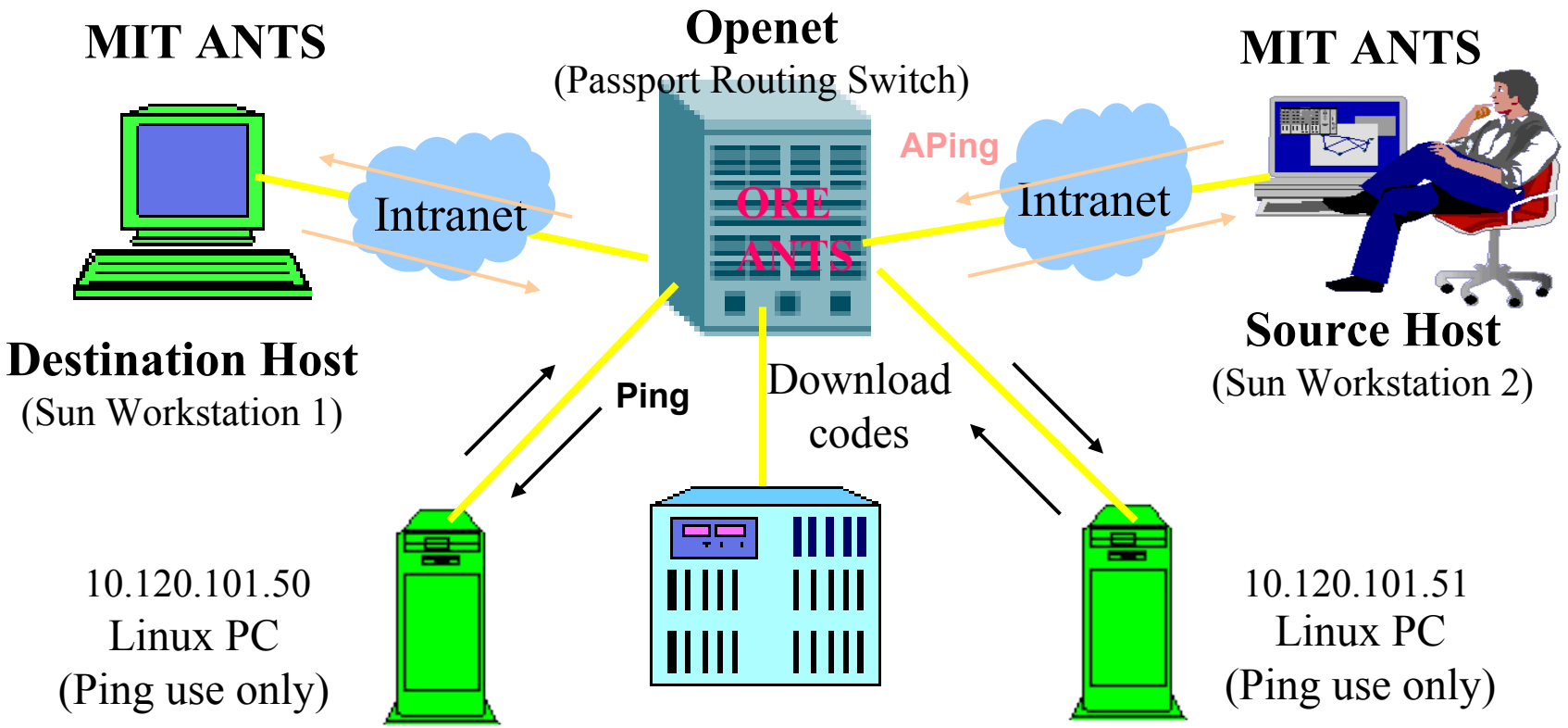
- **We have implemented programmable Gigabit Routing Switch (backplane 256 Gbs)**
- **AN in the control plane (slows down in the data plane)**
- **Capable of dynamic monitoring and modification of silicon knobs**
  - The granularity is streams and not packets
  - Short time granularity (part of apps and not human intervention, keyboard, telnet, cli, snmp)
- **Enabling New Types of intelligence on programmable network device to handle Infinite Bandwidth resources, Wire speed routing capability, and nontrivial Streaming media application.**

Openet

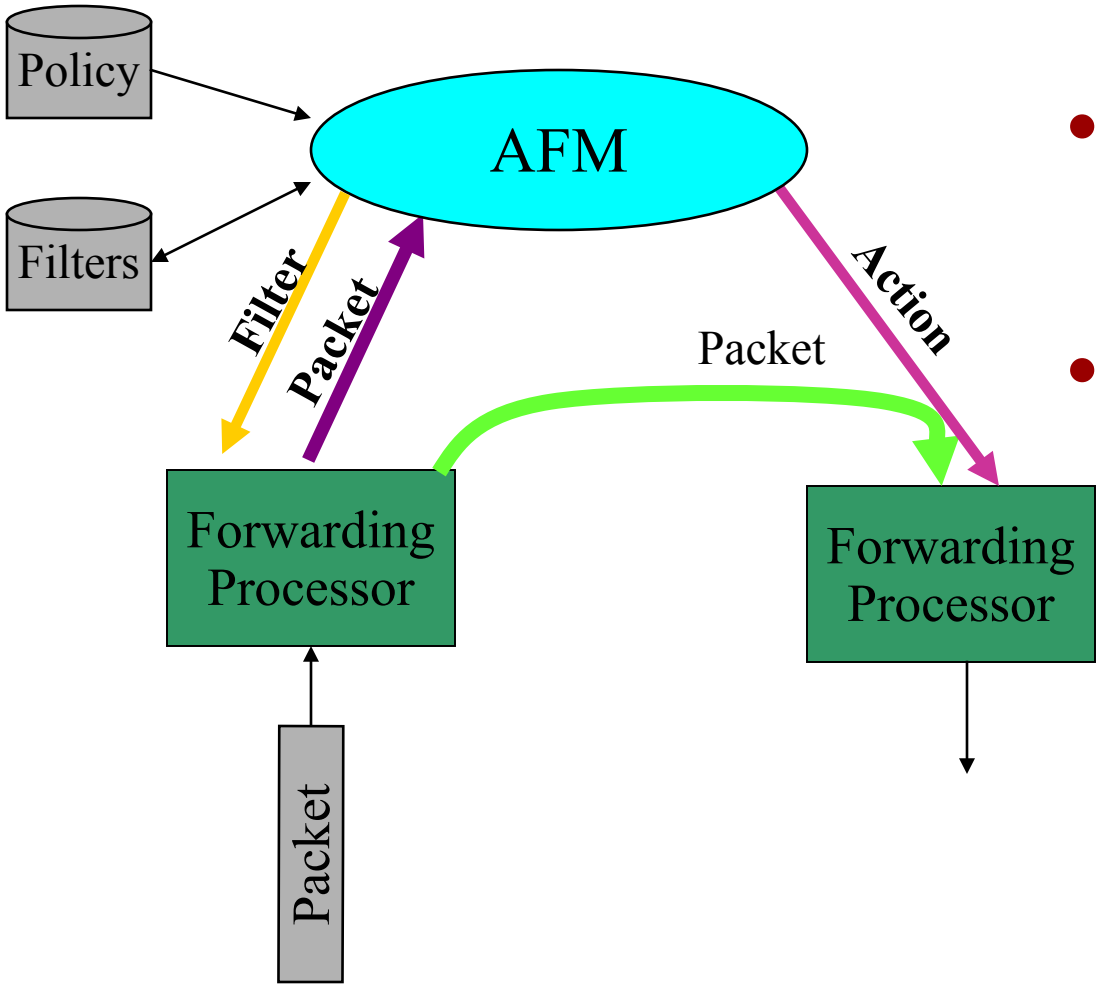

Active Networks Services
Control Plane
Active Services
ORE
System Services
CPU System
Monitor status
New rules
Switching Fabric
Data Plane
(Wire Speed Forwarding)
Forwarding Rules
Forwarding Rules
Forwarding Rules
Statistics &Monitors
Traffic Packets

ANTS on Passport

- Openet on Passport IP routing switch
- ORE ANTS implementation on commercial devices
- Experiments



Active Flow Manipulation



- A key enabling technology of Openet
- Two abstractions
  - Primitive flows
  - Primitive actions
- Customer network services exercise active network control
  - Identifying specific flows
  - Apply actions to alter network behavior in real-time

New Targets

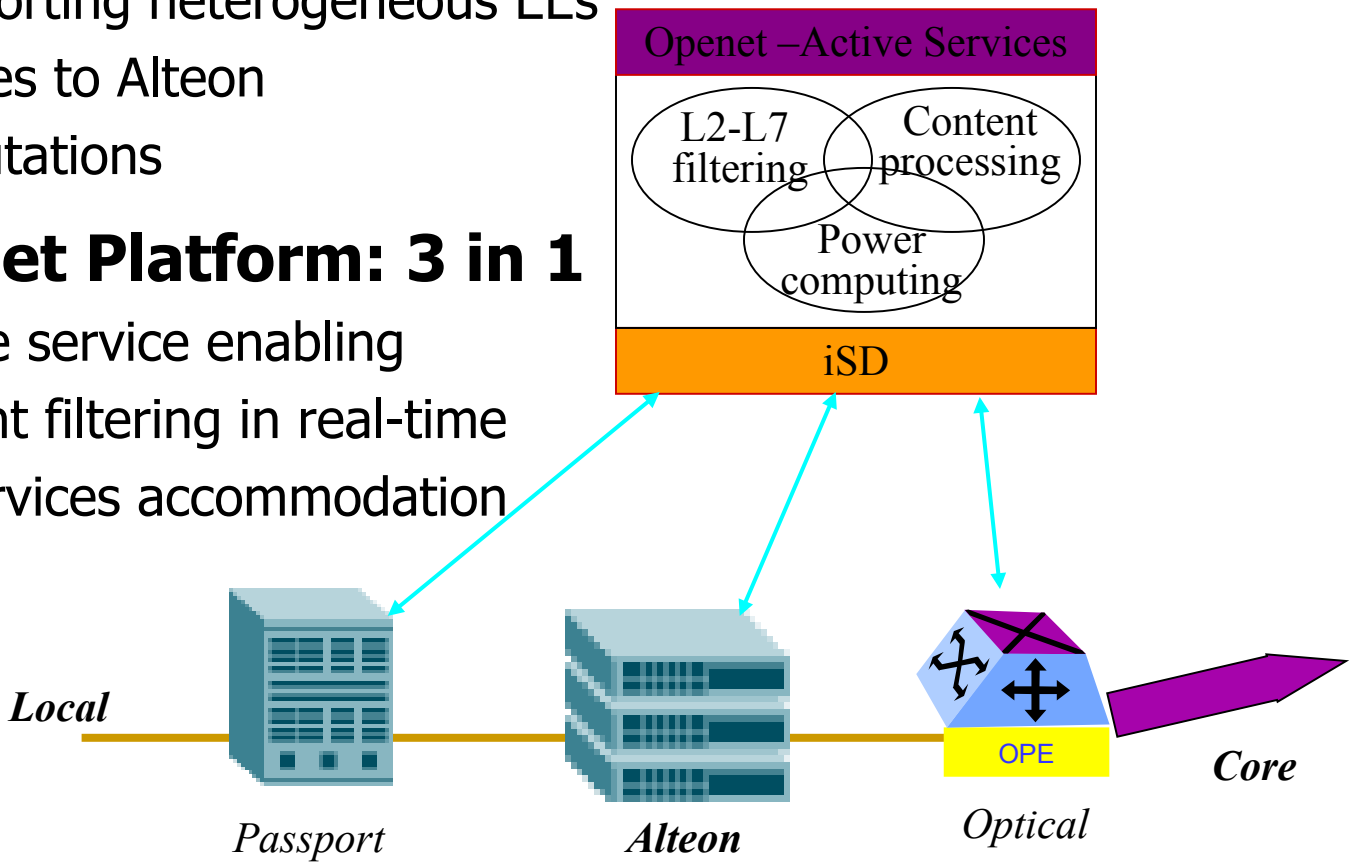
- **Limitations in our past works**
  - L2-L4 filtering
  - limited embedded CPU workhorse
  - Unsecured service deployment
- **Exploring new commercial network hardware**
  - **L2-L7 filtering**
  - Fast content filtering and redirection
  - Strong and extensible CPU capability
  - Secure partitioning hardware and software
  - Supporting heterogeneous EEs
- **New Active Net network platform**
- **Collaboration with UC Berkeley and University of Technology, Sydney (UTS)**

Target 1: Openet on a commercial content switch

- **Openet on Alteon**
  - L2-L7 filtering
  - Fast content filtering and redirection to active services
  - Enhancing and complementing Alteon features
- **Alteon: Our new AN platform on content switch**
  - Multiple processors and ASICs
  - Programmable microcode
  - L2-L4 and application filtering and processing

Target 2: New Active Net Platform

- **iSD: powerful and extensible computational plane**
  - Partitioning hardware and software resources
  - Securely supporting heterogeneous EEs
  - Close interfaces to Alteon
  - Cluster computations
- **New Active Net Platform: 3 in 1**
  - Openet: active service enabling
  - Alteon: content filtering in real-time
  - iSD: active services accommodation



Summary

- **Openet – our Networking Programmability**
- **Commercial network programmable hardware**
  - Alteon: AN platform on an advanced content switch
  - iSD: powerful & extensible computation plane
- **New AN platform: Openet + Alteon + iSD**
- **Enables AN technologies transfer** ☺
- **Need to wait for better economy** ☹