Next Generation Disaggregated Open Broadband Network Gateway (OpenBNG)

Babu Peddu - Product Marketing Manager, Switch & Fabric Group, Intel Corporation

Andy Furnell - Technical Lead for TIP Fixed Broadband Project Group - Meta

Ayman Hamza - Senior IP Broadband Solution Architect – Vodafone

Alexander Jeffries - Founder, CEO - APS Networks

Presenters

Babu Peddu
Product Marketing Manager,
Switch & Fabric Group

Andy Furnell
Technical Lead for TIP Fixed
Broadband Project Group

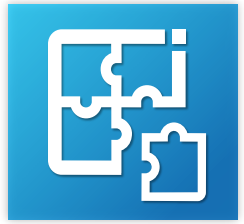
Ayman Hamza
Senior IP Broadband
Solution Architect

Alexander Jeffries
Founder, CEO

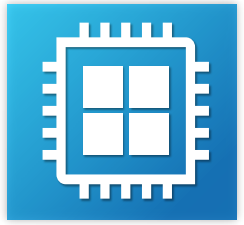
Agenda

- IP fixed broadband network challenges (Intel)
  - Fully programmable broadband networks
  - Intel® Intelligent Fabric (IFP) architecture
- Introduction to TIP (Meta)
  - Introduction to the TIP fixed broadband PG
  - Background to the OpenBNG Project
- What OpenBNG means to operator（Vodafone)
  - The problems that OpenBNG solves
  - OpenBNG solutions for operators
  - OpenBNG business benefits
- Next Generation Disaggregated OpenBNG (APS Networks)
- Conclusion/call to action TIP Event (Intel)

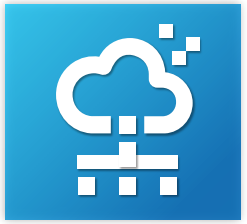
Key Take-Aways



Networks are moving towards software

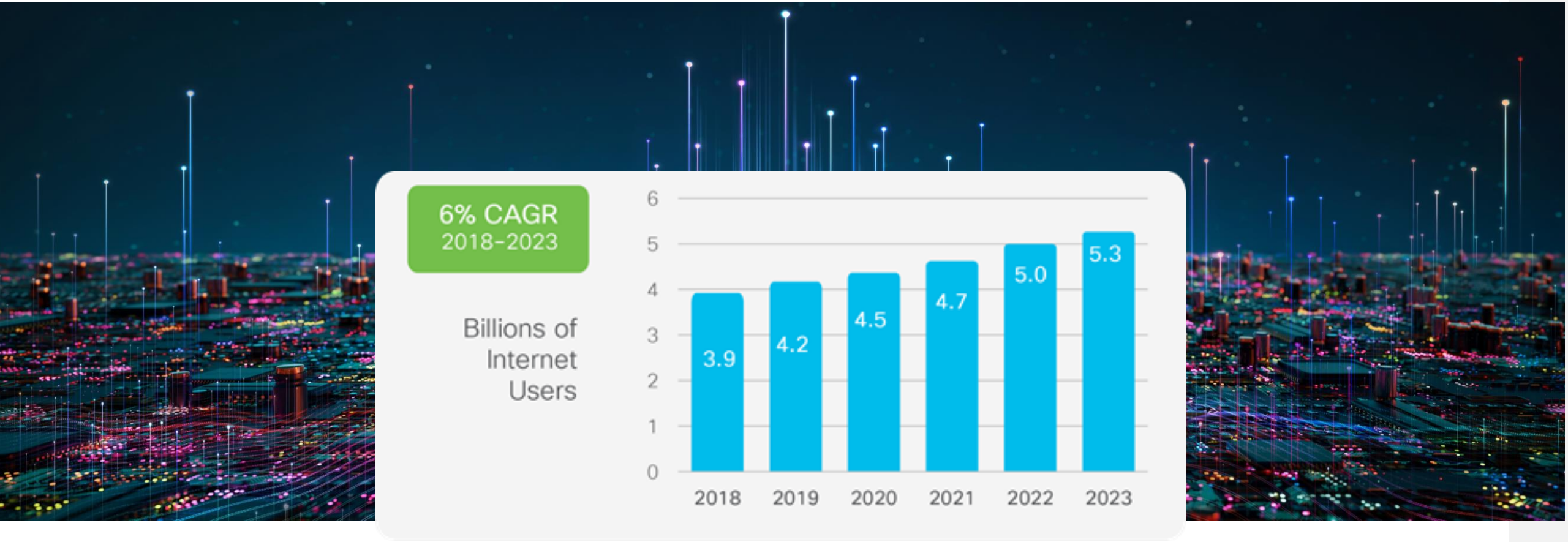


Edge is transforming and automating every industry



Intel's Network & Edge Group was purposefully created to deliver fully-programmable networks

Intel has the right vision, technology, to partner with customers and help build next-generation programmable networks



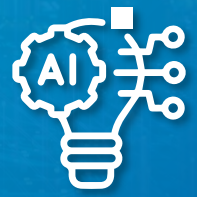
Global Internet user growth

Source: Cisco Annual Internet Report, 2018-2023

Seismic shifts

Proliferation of Programmable Networks

+



Arrival of the Intelligent Edge

IP Fixed Broadband Networking Challenges

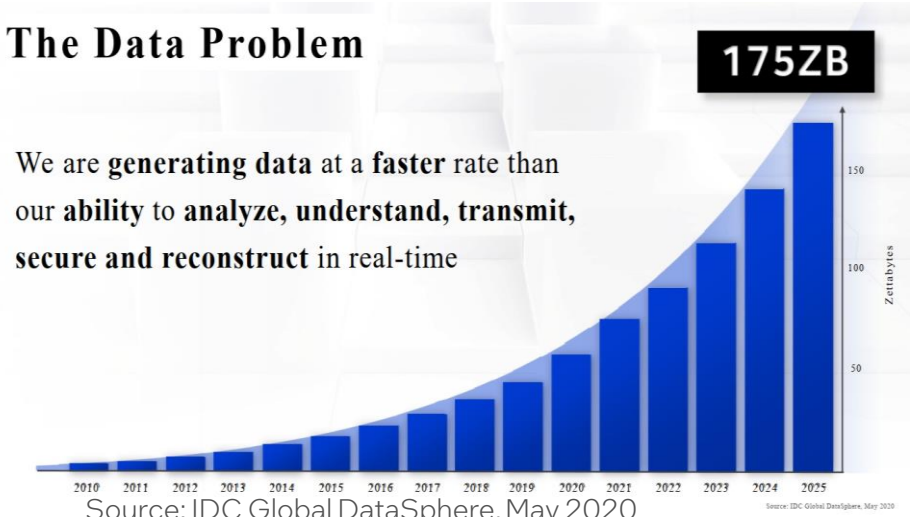
Smart-homes, Work-from-home, high resolution multimedia require more bandwidth

Increasing adoption of IoT, Urbanization and Smart devices

Operational challenges of root causing network slowdowns

Telcos are moving to Cloud-native architectures with container-based processing, orchestration and automation

Increasing network CAPEX and OPEX investment for service providers



Source: IDC Global DataSphere, May 2020

Networks need to get smarter while increasing bandwidth

VISION: Intel® Intelligent Fabric

End-to-End Co-Optimizations

Photonics Integration

Resilience, Optimization, Adaptability

OPTICAL MODULES

High-bandwidth connectivity at 100G, 400G and beyond

ETHERNET SWITCH

P4-programmable scale-out fabric with uncompromising performance

ETHERNET IPUs and NETWORK ADAPTERS

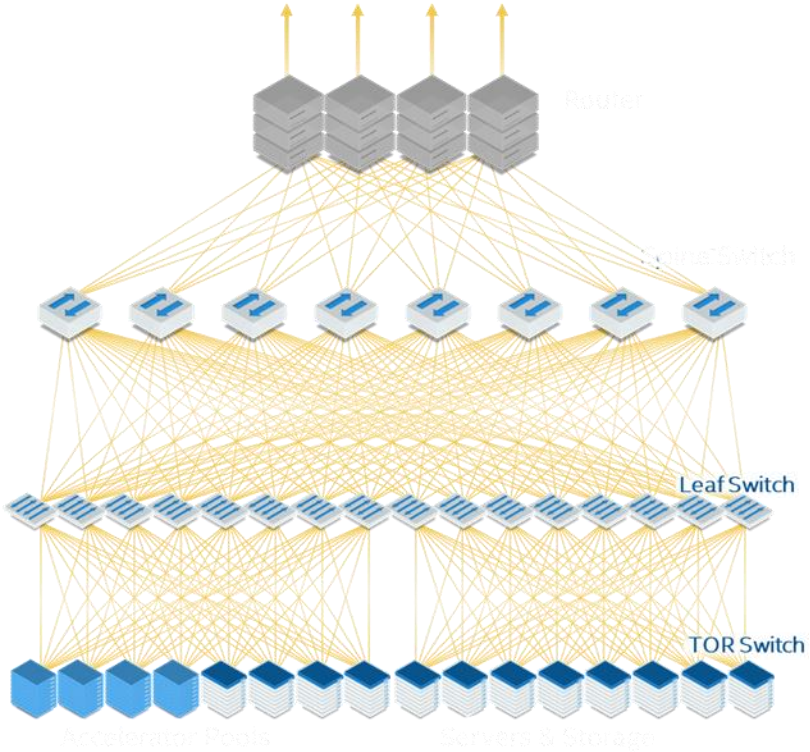
Programmable infrastructure acceleration for demanding data movement

CPUs & xPUs

Fabric-enabled endpoints aligned to accelerators & software pipelines

Resiliency and Optimization

Improved Density, Power and Cost



Intel Portfolio

intel. Si PHOTONICS

intel. TOFINO

intel. IPU

intel. ETHERNET

intel. XEON

intel. AGILEX

intel. eASIC

habana

Xe

Industry Standards

P4 ipdk Infrastructure Programmer Development Kit SONiC SPDK eBPF DPDK

Intel® Intelligent Fabric Key Benefit Vectors

INTELLIGENCE

- Fully Customizable P4-Programmable Pipeline
- Intelligent Packet Processing for Accelerating AI/ML Workloads
- Expandable Table and Buffer Sizes with Intel® FPGAs

PERFORMANCE

- 6.4/12.8/25.6 Tbps Total Throughput
- 112G/56G SerDes for High Speed and Easy Migration
- High-speed Intel® Silicon Photonics
- Power-optimized Hyperscaler Use Cases for Intel® Tofino™ Intelligent Fabric Processors

VISIBILITY & CONTROL

- Enhanced Congestion Control
- Identify Delays or Hotspots with Real-time In-band Network Telemetry (INT)
- Analyze Packet Flows with Intel® Deep Insight Network Analytics Software
- Increase INT Data Available with Intel® IPUs and Intel® Ethernet Network Adapters

Intel® Tofino™ Intelligent Fabric Processors

Tofino (16nm)

- 1.8 to 6.4 Tbps
- 25G SerDes

Tofino 2 (7nm)

- 4.8 to 12.8 Tbps
- Modular Chip Design
- 56G SerDes

Tofino 3 (6nm)

- 6.4 to 25.6 Tbps
- Modular Chip Design
- 112G/56G SerDes

Status: In Production — In Production — Future

Intelligence

- P4 Programmable
- AI/ML Acceleration
- Highly-Secure

Performance

- Up to 25.6 Tbps throughput
- 112G/56G SerDes
- Power-Optimized Use-Cases

Visibility and Control

- Edge-to-cloud real-time telemetry
- Enhanced congestion control
- Self-healing network capabilities

Programmability, Performance, and Power Efficiency at the Same Time

Intel delivers full programmability without compromise on performance or power consumption when compared to fixed-function alternatives.

Intel® Intelligent Fabric Processors (IFPs):

Improved performance each generation

Higher performance

Improved power optimization each generation

Lower power consumption

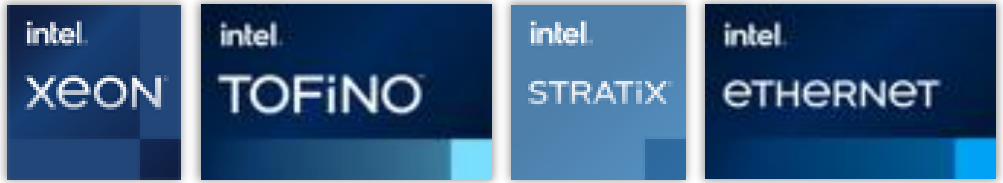
For workloads and configurations visit www.Intel.com/PerformanceIndex. Results may vary.

Intel's OpenBNG solutions

- Different architectures, types, locations and models drive need for different technical solutions

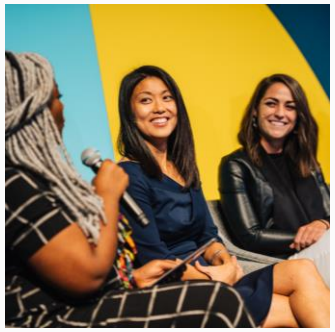
Architectures	Types	Locations	Resiliency Models
BNG + router, BNG + router + enterprise PE, Multi-Service BNG	Aggregation + Service BNG, Service-only BNG	Maximum, medium, reduced	Standalone, Clustered, Leaf-Spine

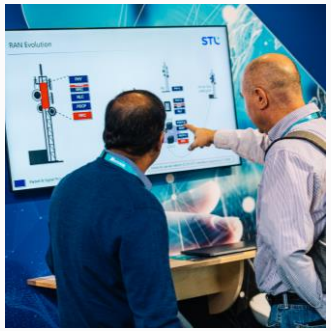
- Intel's fully programmable solutions enable all the different architectures, types, locations and models



TIP OpenBNG - Founding Operators

- Vodafone
- BT (British Telecom)
- Telefonica
- Deutsche Telekom
- TIM (Telecom Italia)





WHAT IS TIP?

The Telecom Infra Project (TIP) is a global community of companies and organizations working together to accelerate the development and deployment of open, disaggregated, and standards-based technology solutions that deliver the high quality connectivity that the world needs – now and in the decades to come.

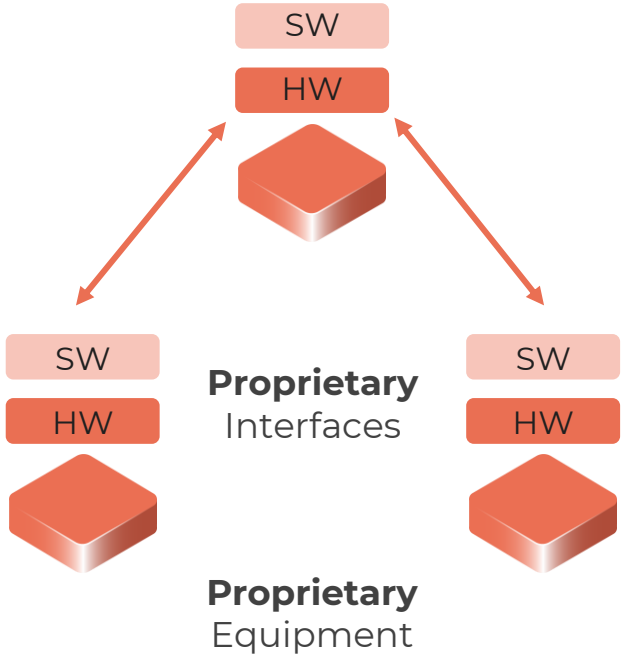
Together We Build, Test & Deploy.

Why does TIP exist?

CHALLENGES: Lack of Flexibility & Innovation; Vendor “Lock-in”

FROM

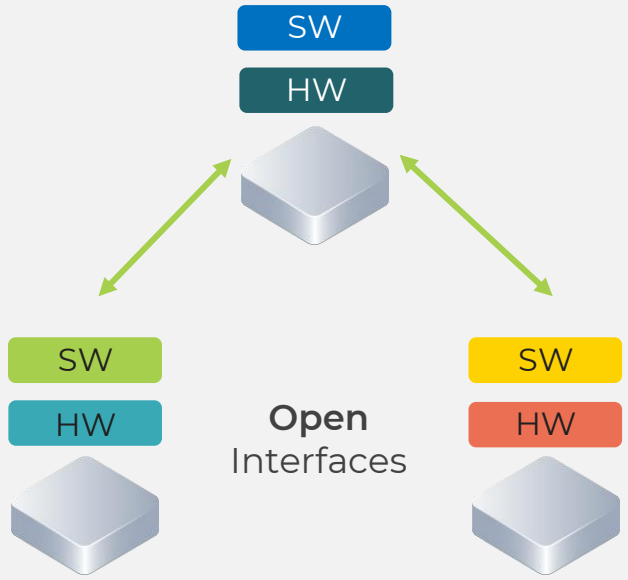
Single-vendor, fully integrated networks



SOLUTION: Open, Disaggregated Networks

TO

Multi-vendor, open, disaggregated networks

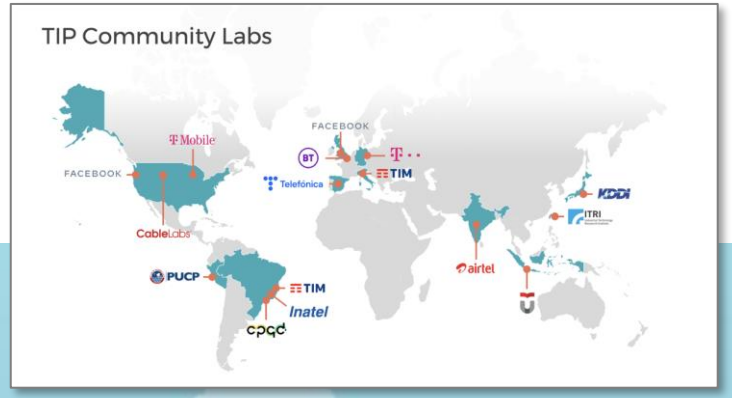


New supplier business models

Accelerate innovation in connectivity

Improve network economics

How does TIP Work?



0. TIP members collaborate to develop technical requirements

1. Suppliers submit their response to the technical requirements

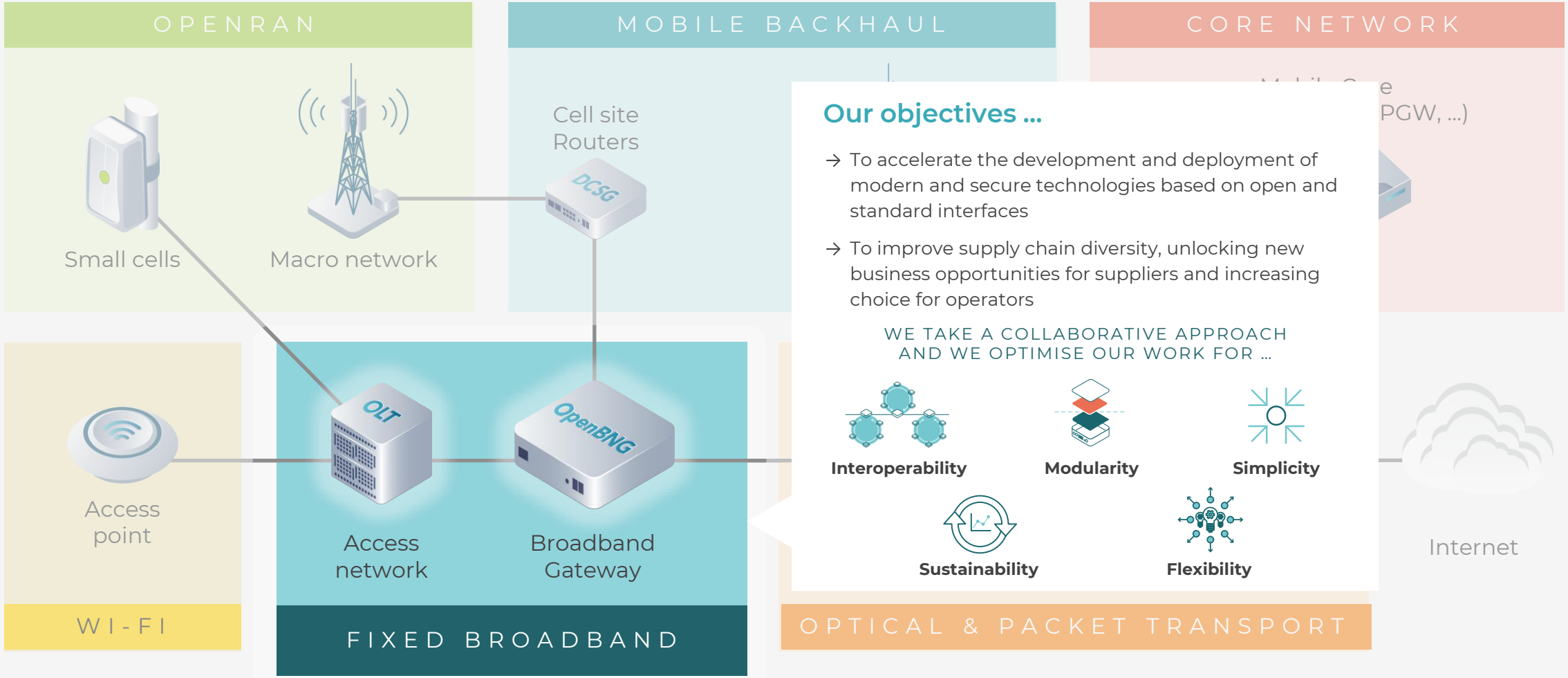
Compliant products are eligible to be listed on TIP exchange website

2. TIP members develop test plans that validate products and solutions against the technical requirements

Collaborative testing in controlled lab environments and TIP badge awards

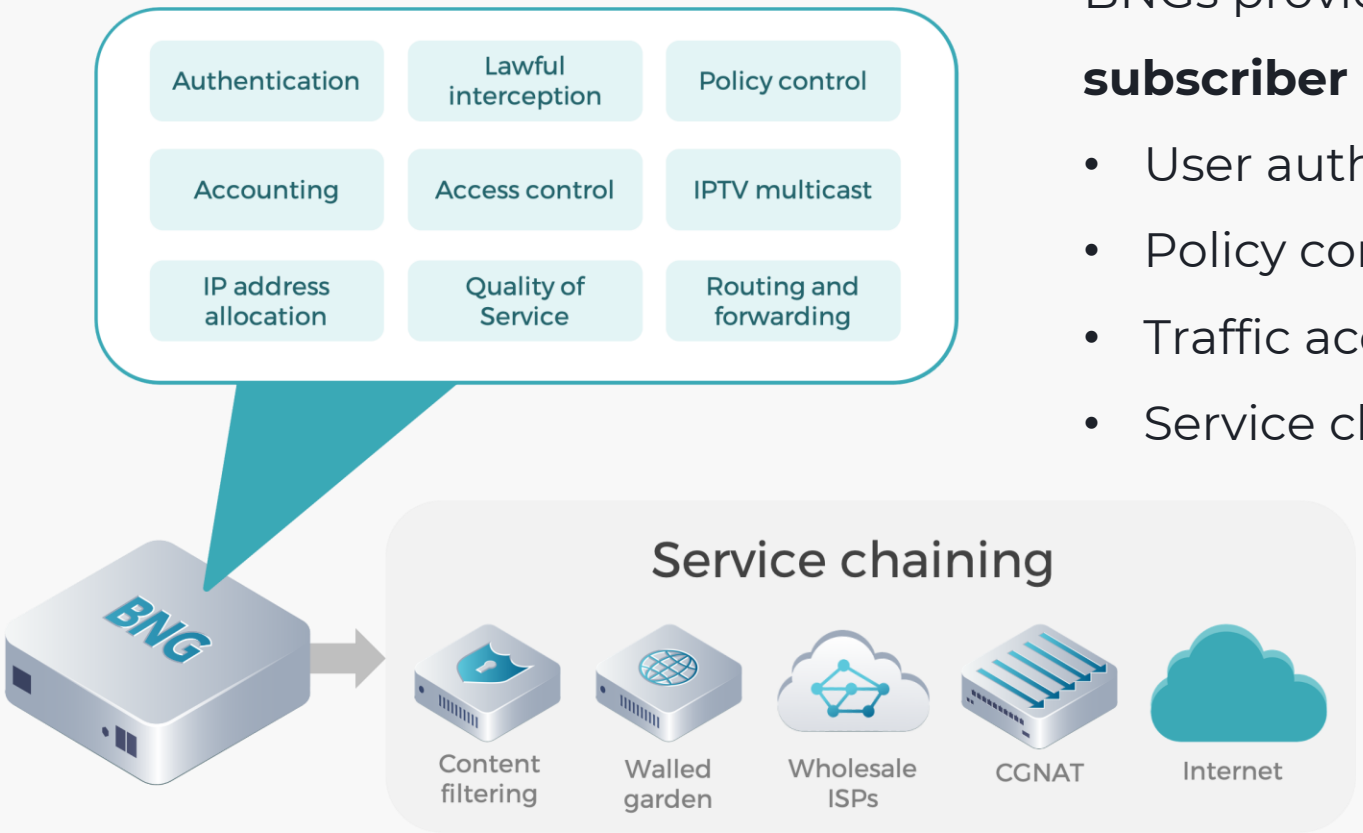
What does TIP do?

TIP members have been working systematically to disaggregate their entire networks…



Recap: What is a BNG?

*The **Broadband Network Gateway** (BNG) is the **focal point** for traffic aggregation in any fixed broadband network.*

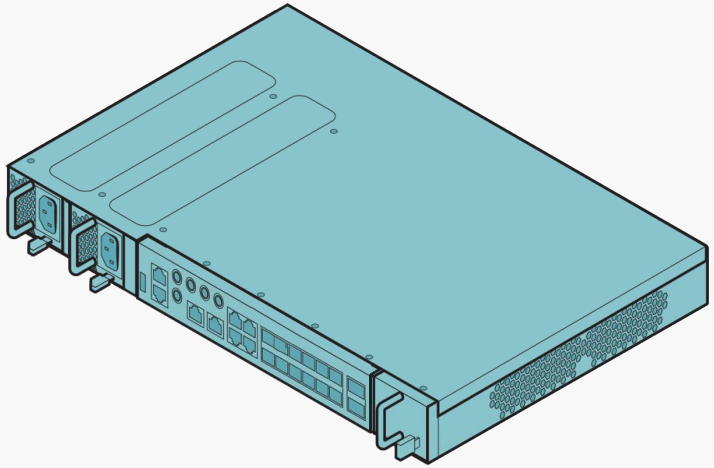


BNGs provide a whole range of **'high touch' subscriber management functions**, including:

- User authentication and accounting
- Policy control and enforcement
- Traffic accounting and lawful interception
- Service chaining and attachment

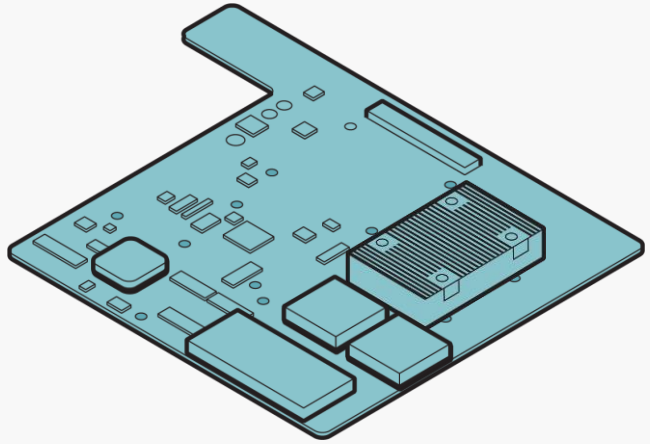
Key characteristics of an open and disaggregated BNG…

Open Hardware



- Whitebox hardware supported by a diverse and global supply chain
- Alignment with common standards such as ONIE, Redfish

Programmable Chipset



- Flexible silicon solutions that provide deep buffers and advanced traffic management capabilities
- Scalable to support telco size deployments

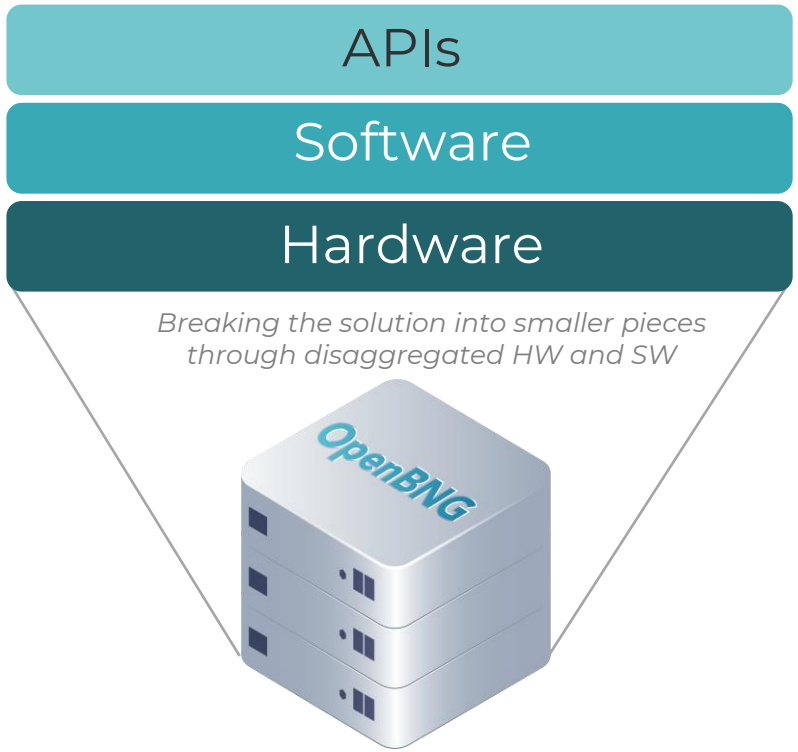
Open Software

- Network Operating Systems that implement BNG, routing and Enterprise SW functions
- Capabilities to meet a variety of different deployment scenarios

The journey so far...

- **March 2020**
  Work begins
- **October 2020**
  White paper released
- **June 2021**
  Technical requirements complete
- **December 2021**
  Multi-operator RFI
- **Ongoing**
  Test and validation of products

Leveraging open and programmable APIs to manage different HW and SW combinations in the field



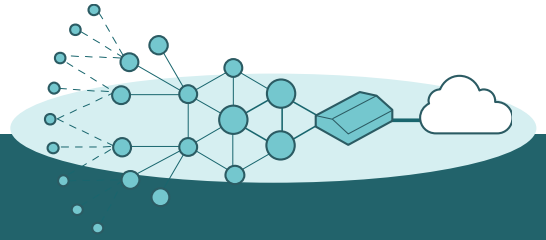
What OpenBNG Means To Operators

Ayman Hamza
Senior IP Broadband Solution Architect

Agenda

- The problems OpenBNG solves
- OpenBNG solution for operators
- OpenBNG business benefits

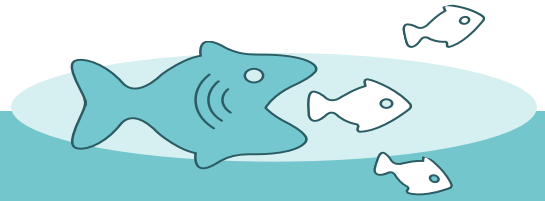
The Problems OpenBNG Solves



Multiple deployment models

- Balance between operational risk vs capacity efficiency vs cost
- Operator architectures are highly diverse

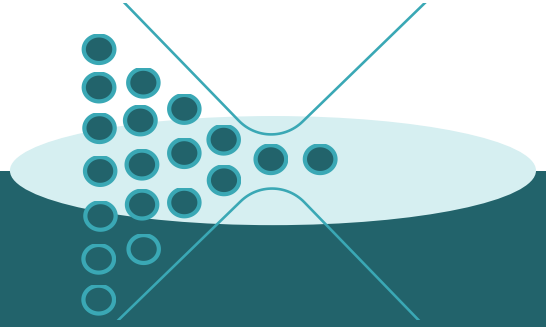
High bar for new entrants



Lack of competition

- Oligopolistic market with few established players
- Lack of open and virtualized solutions

CapEx is high, innovation is slow



Focal point of the network

- BNG frequently the bottleneck of the network
- North-bound integrations to B/OSS inherently complex

Significant vendor lock-in

Complex Operation

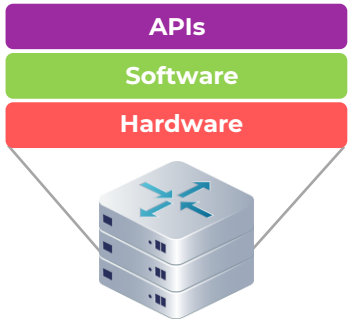
- Slow and costly integration, installation and operation
- Misconfigurations directly impact customer service

Operational risk and costs are high

OpenBNG Solution For Operators

HW & SW Disaggregation

Disaggregated layers

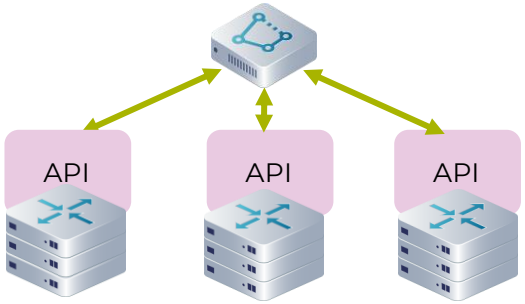


Break the problem into smaller pieces that can be solved in parallel

- **Facilitate the entry of new players**
  - **Increase competition** while reducing total cost of ownership
  - **Speed up innovation** and roadmaps with new players
  - **Easily swap pieces** when better alternatives become available

Openness

Open APIs



Software-Defined Network (SDN), that doesn't require constant human decisions

- **Reduce operational costs**
  - **Automate initial Subscribers & Services provisioning** (ZTP)
  - **Automate network upgrades** (Automated lifecycle Management)

CP & UP Disaggregation

Distribution and CUPS

Software-Defined Network (SDN), that doesn't require constant human decisions

- **CUPS** BBF TR-459i2, optimizing network resources
- **SSS** Per Subscriber's Session UP Selection
- **CP & UP Redundancy**
- **Interoperability** (click the link below)

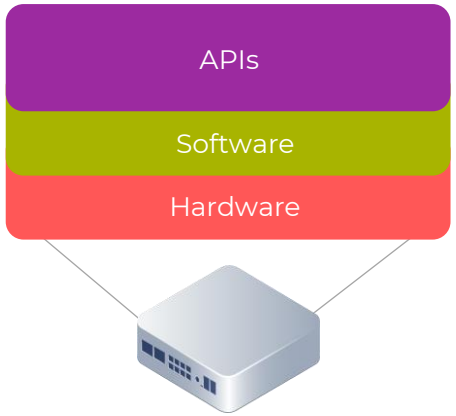
[Vodafone and partners in world first multi-vendor test of new broadband standard]

OpenBNG Business Benefits

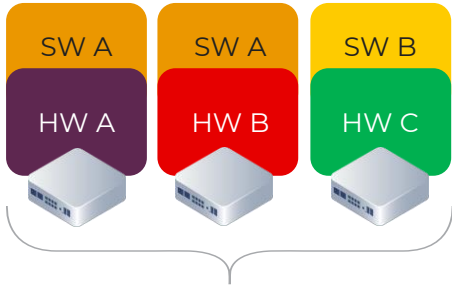
Vodafone believes that **disaggregated, Open, & Modular** technologies are crucial to **accelerate innovation**, **increase freedom**, **increase ARPU**, and **reduce TCO** for Operators.

DISAGGREGATION

Disaggregated layers



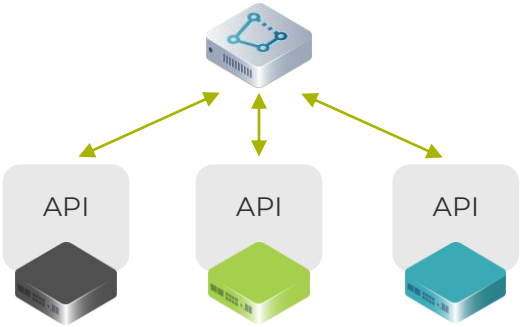
HW and SW mix and match



With different suppliers providing Hardware and Software

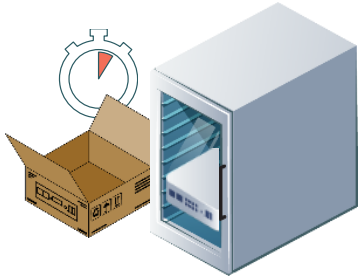
OPENNESS

Open APIs



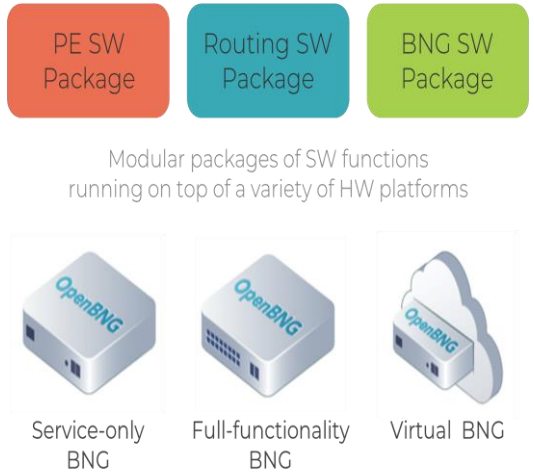
SDN
Software-Defined Network

Faster life-cycle management



ZTP
Faster network upgrades

MODULARITY



Benefits

- Best of breed in HW and SW
- No vendor lock in
- User/operator in control
- Increase flexibility
- Less dependent on vendor roadmaps
- Open APIs
- Wide range of developers
- De-coupling HW and SW lifecycle
- Get the next generation of HW without changing the SW
- Low cost commodity HW

Together we can

APS Networks

Next Generation Disaggregated Open Broadband Network Gateway (OpenBNG)

Alexander Jeffries, CEO

30th June 2022

About APS Networks

- Network product company specializing in programmable hardware solutions
- Product design based on security standards
- Intel® Network Builders Winners Circle
- Telecom Infra Project OpenBNG hardware
- Commitment to open frameworks and software
- Members of TIP, ONF, BBF, OCP

Intel® Intelligent Fabric (IFP) and Open BNG architecture

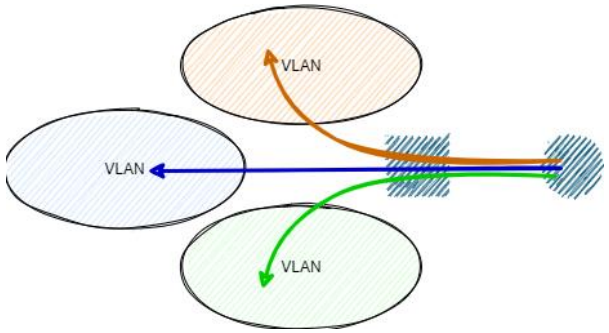
APS2140D from APS Networks

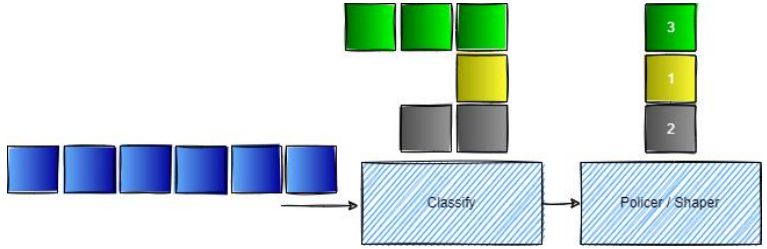
- Fully P4-programmable data plane
- Programmable large buffer memory solution
- Modular design
- BMC controller based on OCP RunBMC framework
- OpenBMC controller software
- Optional PTP module
- Ecological values

Effective Traffic Management

Programmable Control and User Plane

- Customize the L2/L3 functions
- Effective use of internal resources
- Reduce security vectors by only using the required functionality



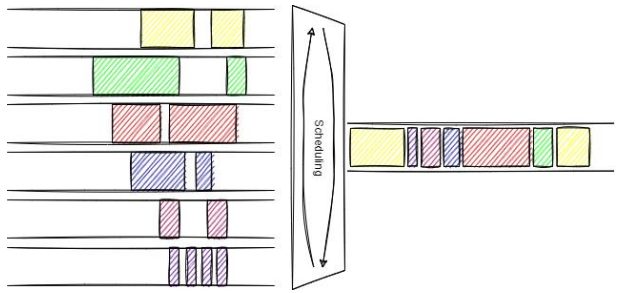


Traffic Management

- Traffic shaping, Policy and Access Control
- Subscriber Management

Quality of Service

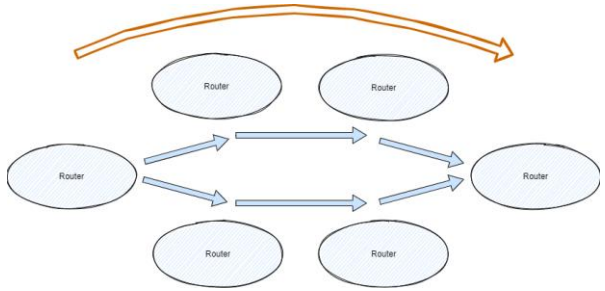
- Multi-layer HQoS with large memory buffer



Super “Scalable” Solutions with enhanced functionality

Time Synchronization Options

- PTP 1588 Time Synchronization
- Time Sensitive Networking
- Deterministic Networking



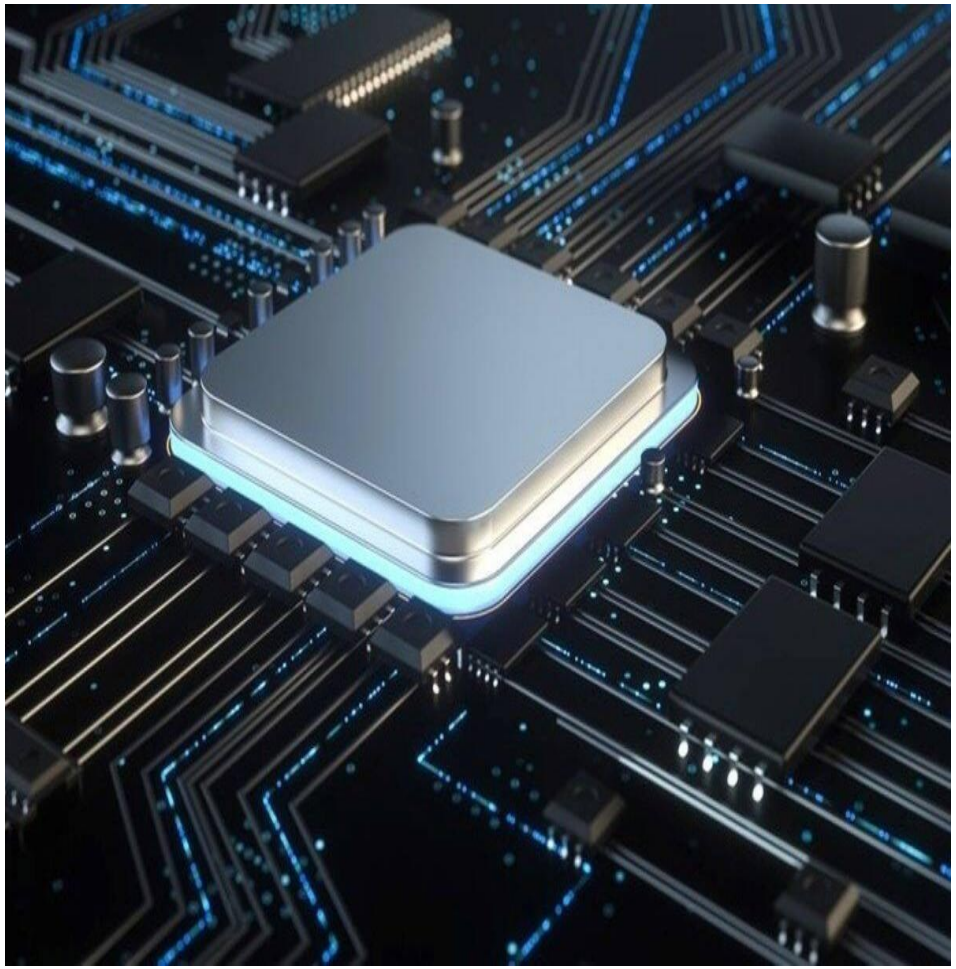
Customizable Packet Forwarding Solutions

- Segment Routing (SRv6)
- Subscriber Session Steering

Security Solutions

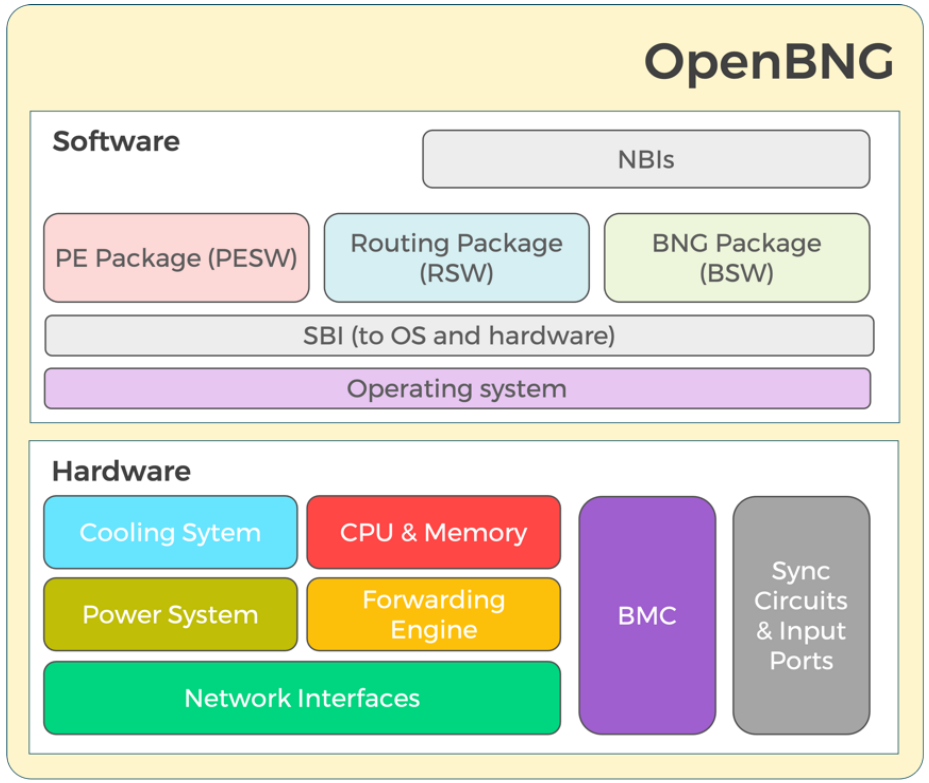
- Netflow / IPFIX
- DDoS Identification
- Deep Packet Inspection

Security from Design to Delivery



- Security by Design
- Designed and manufactured in Europe
- Hardware and software BoMs
- Secure and trusted boot solutions
- Protected firmware
- Secure supply chain management

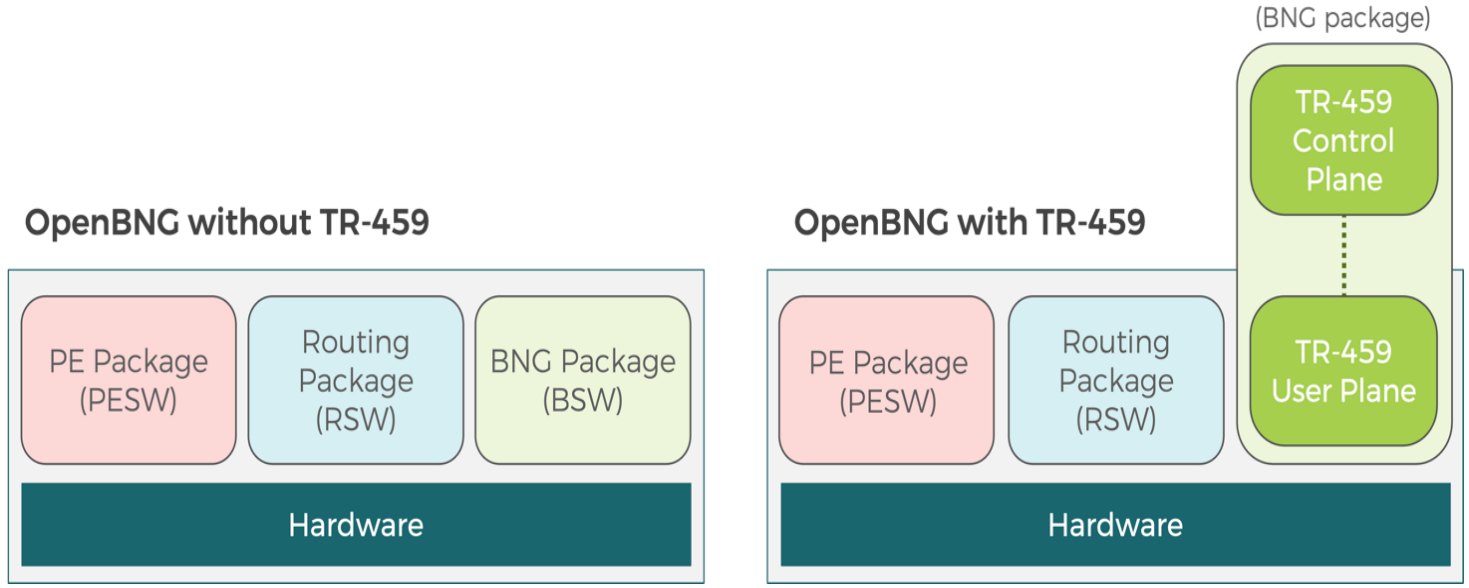
Solution Integration



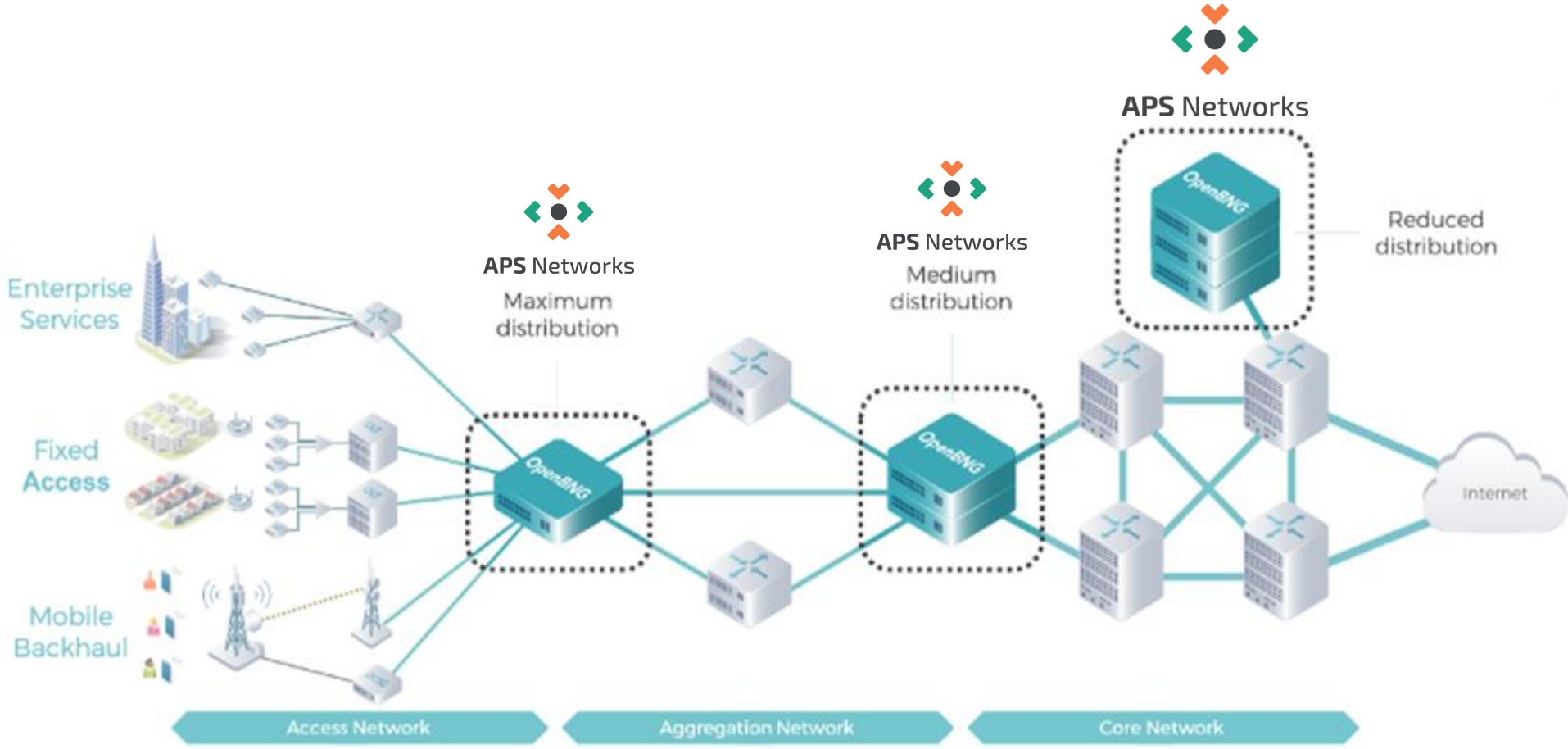
- Integrate with BBF standards
- Hardware & Software Disaggregation

Open Management

- Zero Touch Provisioning
- SDN Control
- Secure Management (eg Redfish®)
- Authentication, Authorization Accounting
- ONIE – Build environment
- Stratum from ONF



APS Network Product Deployment Scenario within the TIP OpenBNG Project



Thank you for your time!

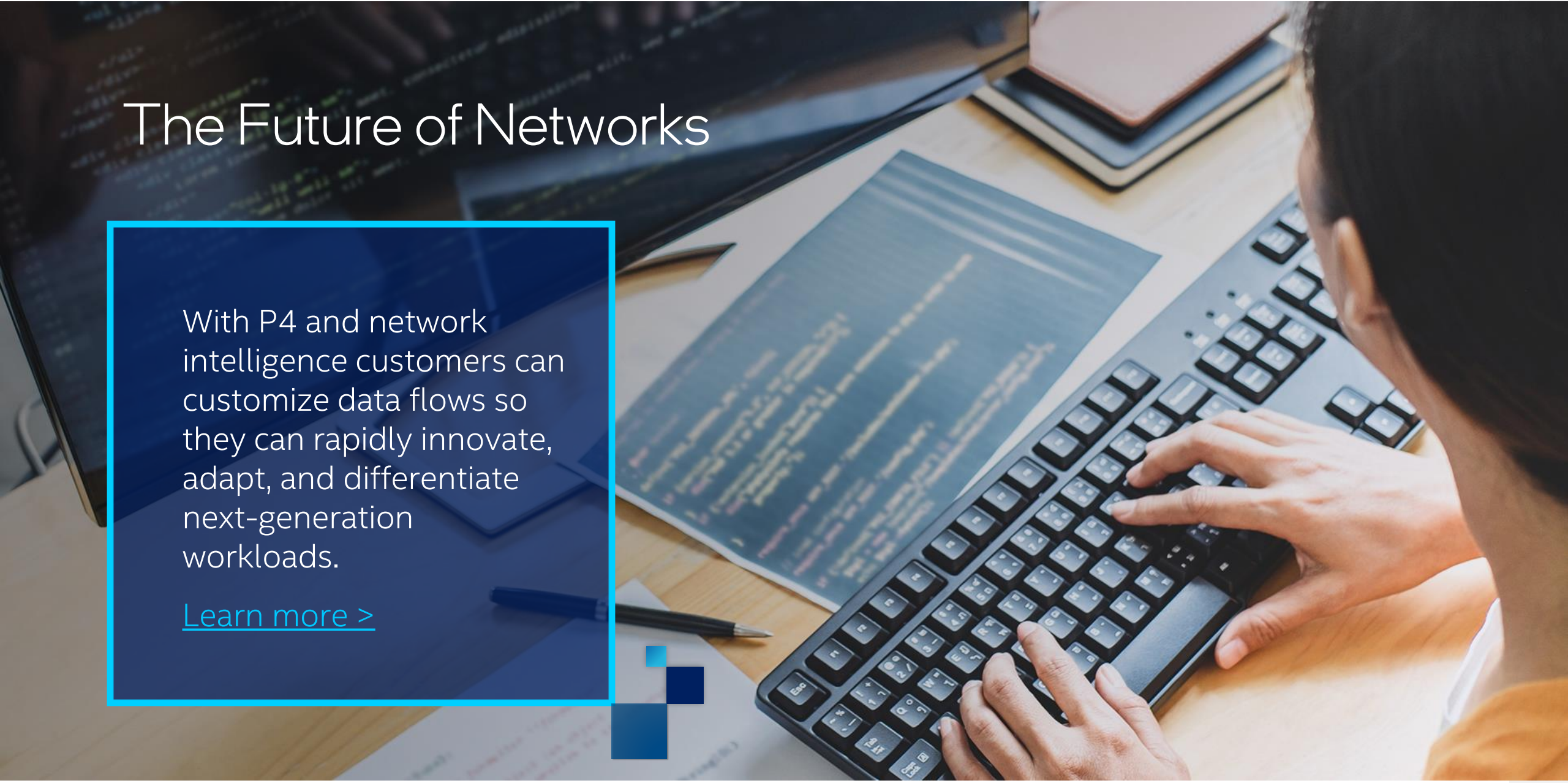
Contact

Alexander Jeffries
Alexander.jeffries@aps-networks.com

enquiries@aps-networks.com

www.aps-networks.com

The Future of Networks



With P4 and network intelligence customers can customize data flows so they can rapidly innovate, adapt, and differentiate next-generation workloads.

Learn more >

Conclusion

- Benefits of P4 Programmability
- Business Benefits
- Call to attend the TIP

Notices and Disclaimers

- Performance varies by use, configuration and other factors. Learn more on the Performance Index site.
- Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.
- Your costs and results may vary.
- Intel technologies may require enabled hardware, software or service activation.
- Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.
-

Questions?

Babu Peddu - Product Marketing Manager, Intel - babu.peddu@intel.com

Andy Furnell - Technical Lead for TIP Fixed Broadband Project Group – Meta - andyfurnell@fb.com

Ayman Hamza - Senior IP Broadband Solution Architect – Vodafone – ayman.hamza@vodafone.com

Alexander Jeffries - Founder, CEO - APS Networks – alexander.jeffries@aps-networks.com

Additional references can be found in the Attachments Tab below your viewer screen.


intel