

PACKET OPTICAL AUT



HKNOG September 2018

JUNIPER
NETWORKS

Engineering
Simplicity

MAPPING THE PATHWAY TO PACKET OPTICAL AUTOMATION

That the time has come to automate network

- To manage complexity
- To improve opex
- To reduce provisioning failures / provide consistent operations

We will discuss automation in context of packet optical networks

- Tractable use case for automation
- Technologies required
- Implementation of automation tools

Look at next steps in self driving packet optical networking

WHY AUTOMATE?

Automation has to happen to keep up with speed of network change

Sheer volume of telemetry data

Volume of services exploding

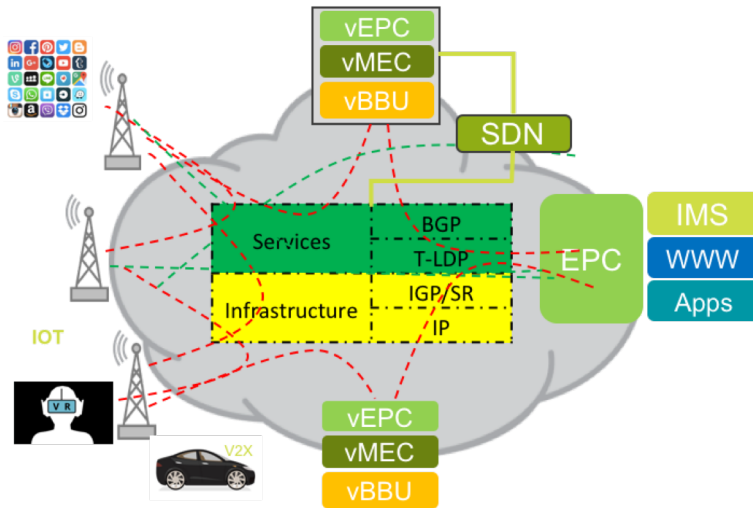
Need for constant tuning to optimize bandwidth utilization / fill rate etc

Desire to remove vendor lock in via open networking to support move to multi domain, multi vendor and multi layer packet optical networks

Using open standards to simplify and make efficient the implementation of automation across multi domain, multi vendor and multi layer packet optical networks

There are optimal approaches available today

NETWORK ARCHITECTURE EVOLUTION



Networks are

- ✓ Application focused
- ✓ Programmable to Orchestrate the Network based on application
- ✓ Operational Simplicity

Current competitive landscape

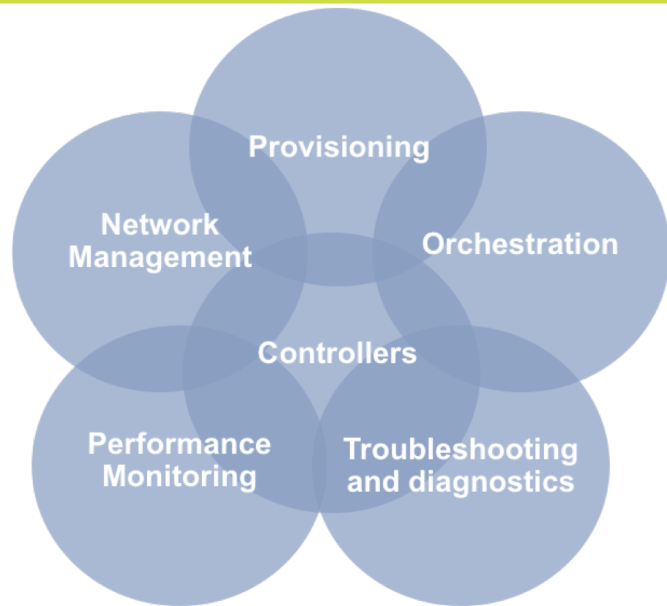
Systems, software designed for cloud migration

Open hardware / whitebox best of breed

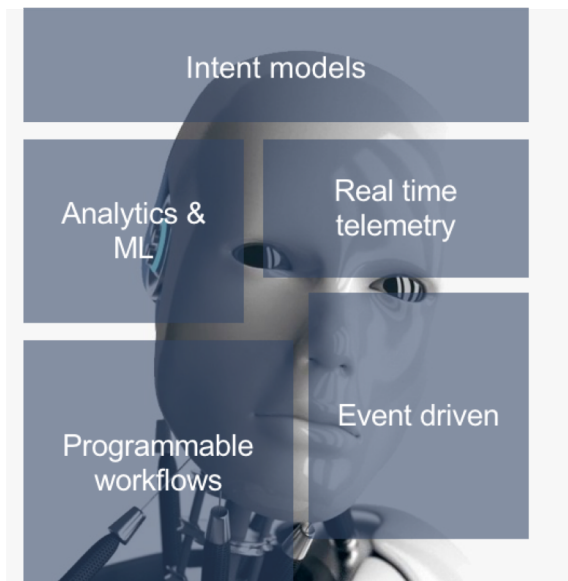
Ability to disaggregate key functions

Rich open API's enabling network programmability

PROVISIONED NETWORK → SELF-DRIVING NETWORK

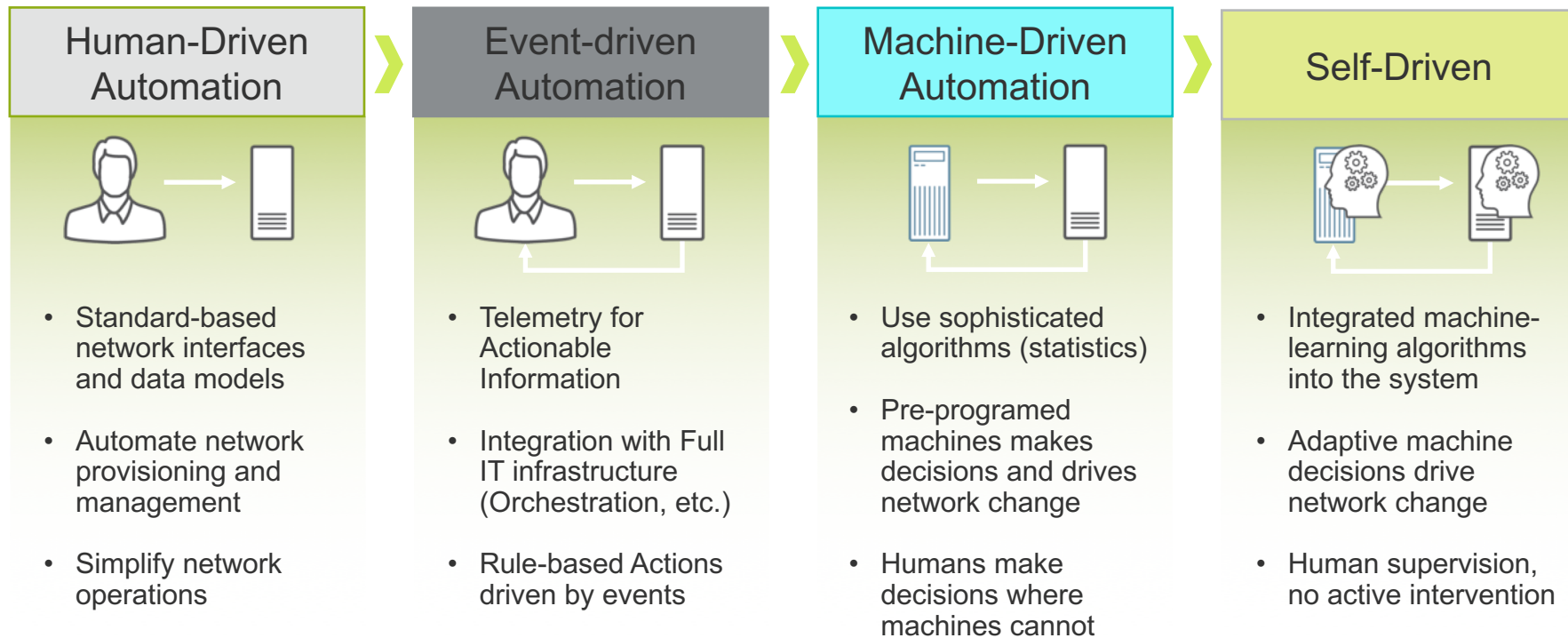


From network management applications...

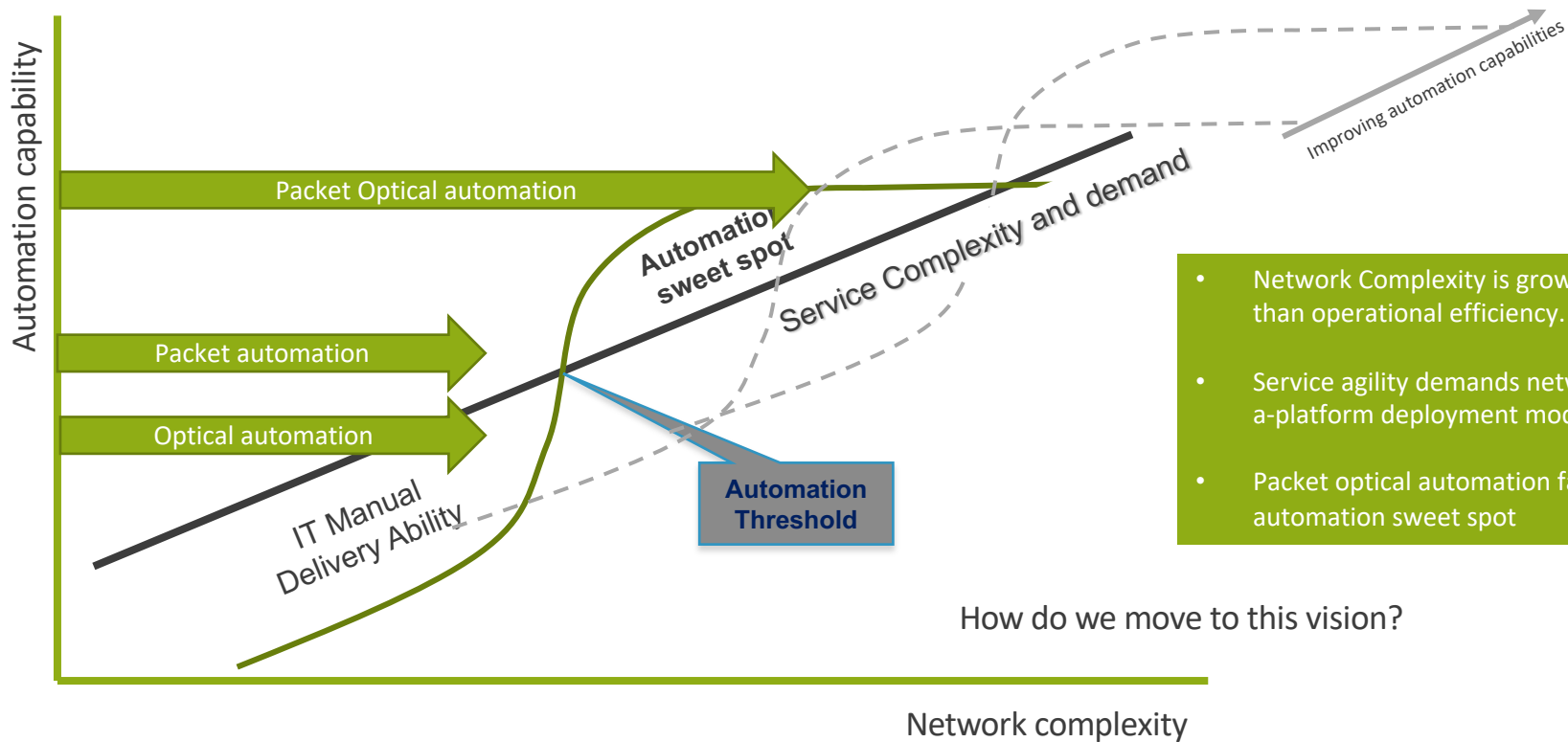


...into Network Robots

THE SELF DRIVING NETWORK



EMBRACE A STRATEGY OF AUTOMATION



- Network Complexity is growing faster than operational efficiency.
- Service agility demands network-as-a-platform deployment model.
- Packet optical automation falls in automation sweet spot

How do we move to this vision?

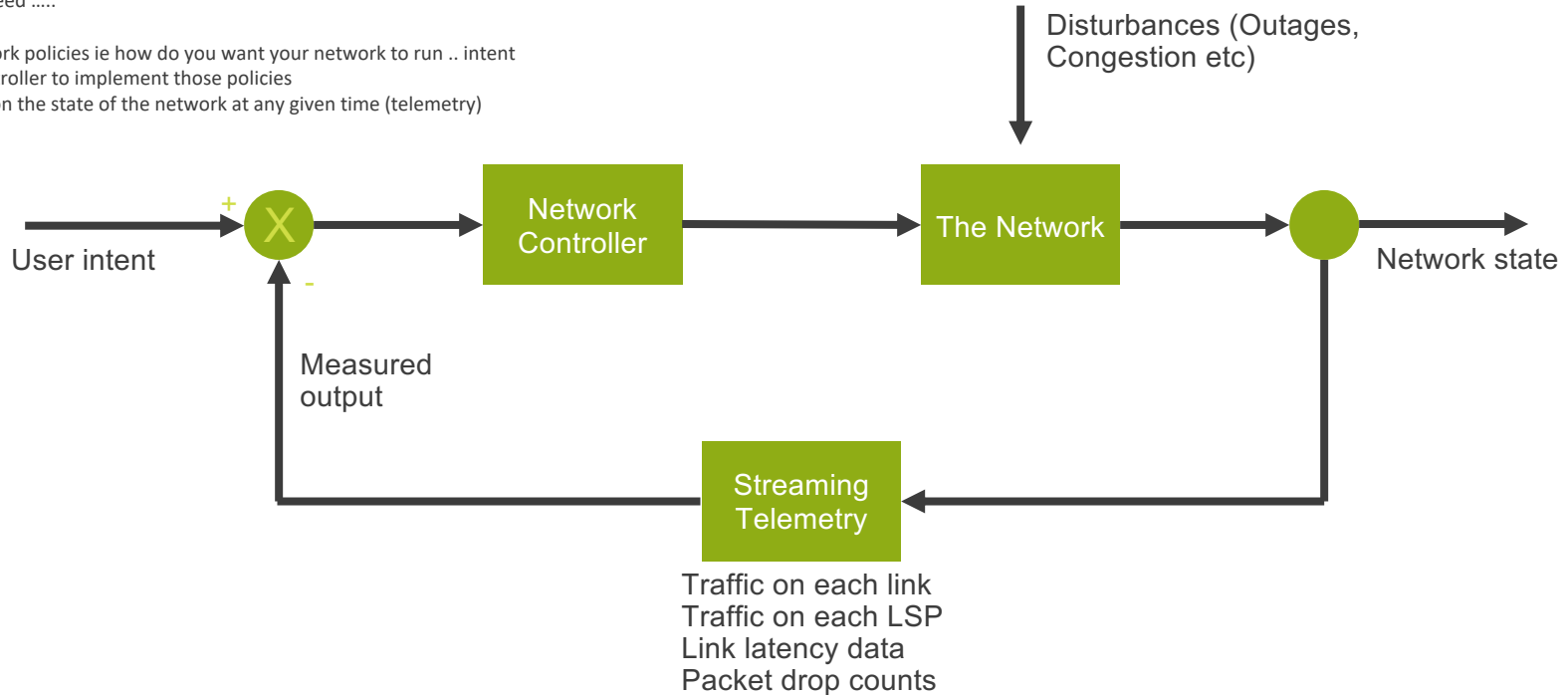
BUILDING A CONTROL LOOP FOR THE SELF DRIVING NETWORK

You need

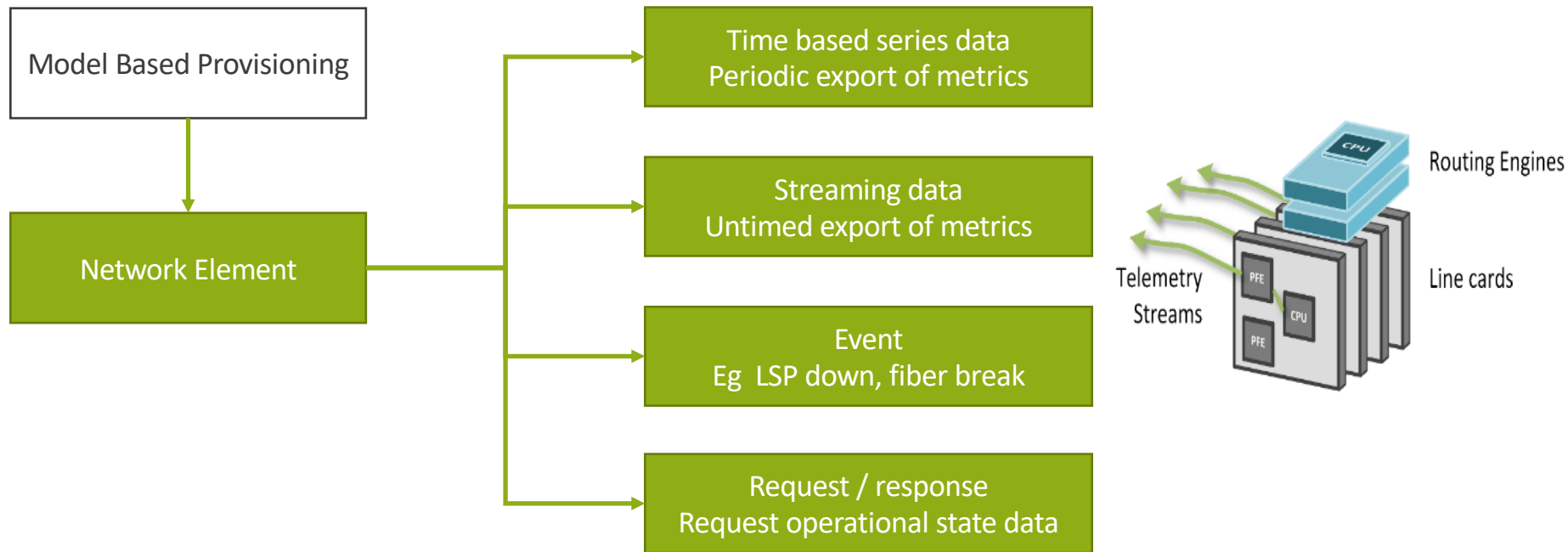
Network policies ie how do you want your network to run .. intent

A controller to implement those policies

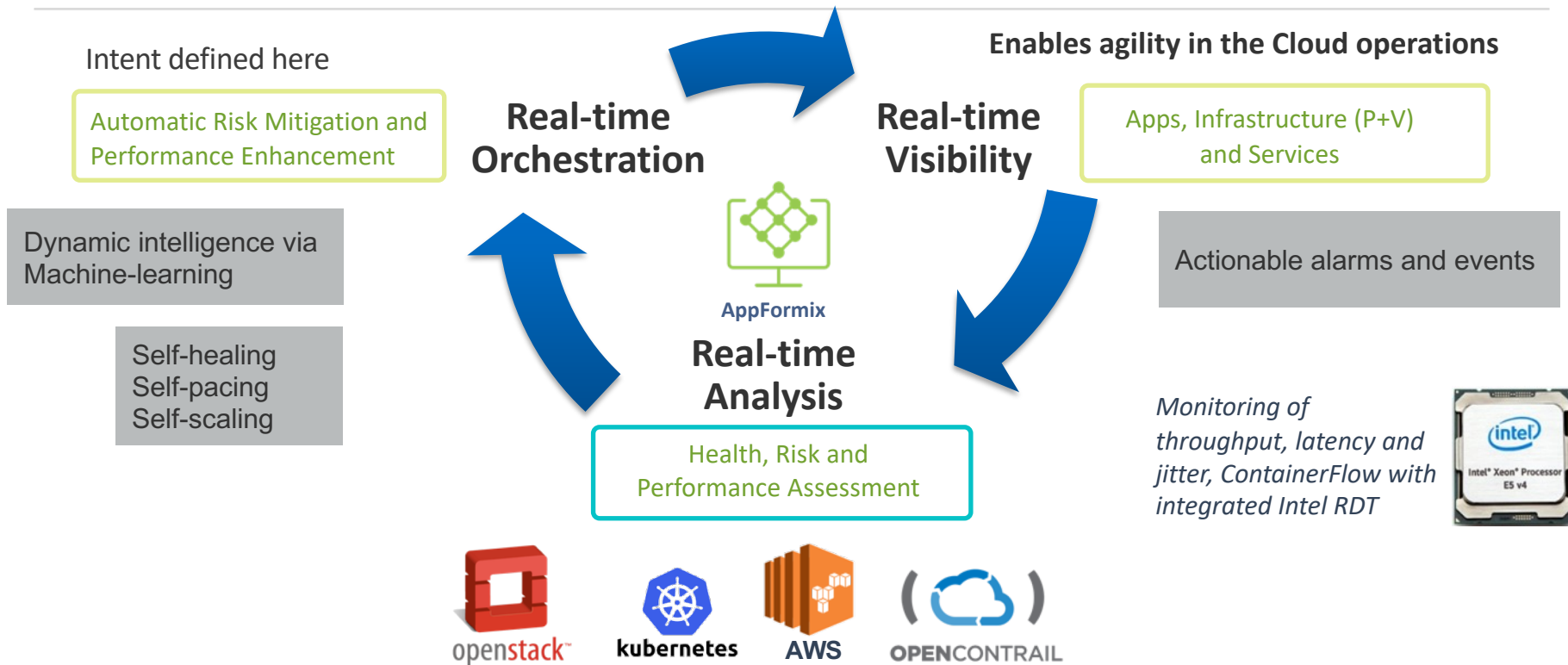
Data on the state of the network at any given time (telemetry)



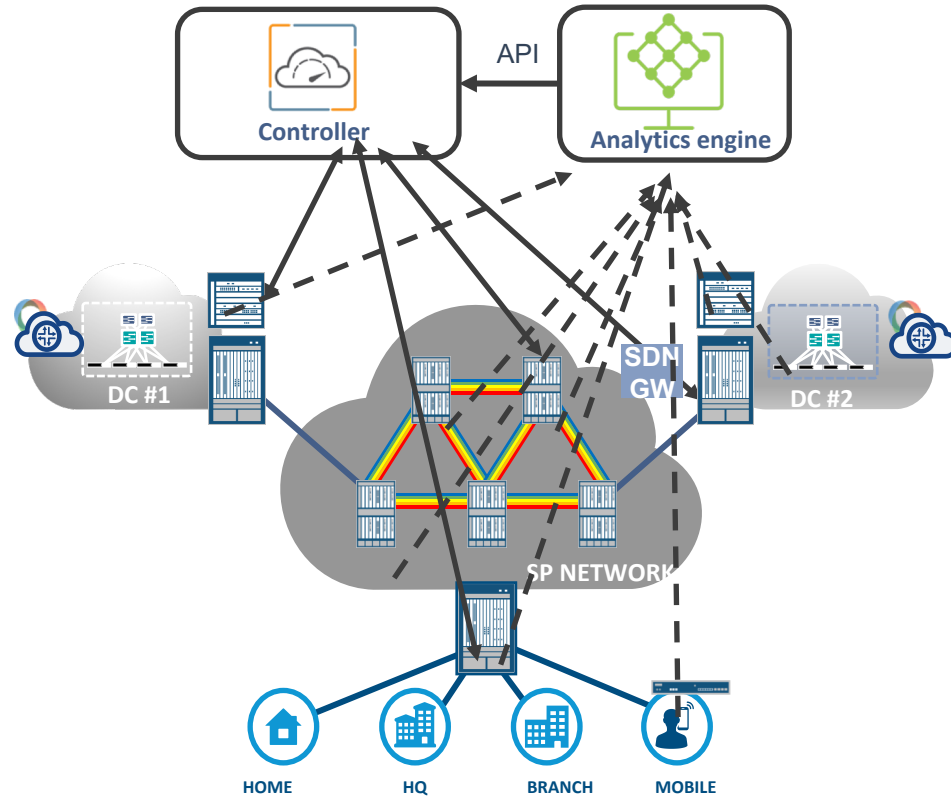
TELEMETRY TYPES



INTENT BASED ANALYTICS



CONTROLLER & ANALYTICS EXAMPLE IN PACKET OPTICAL

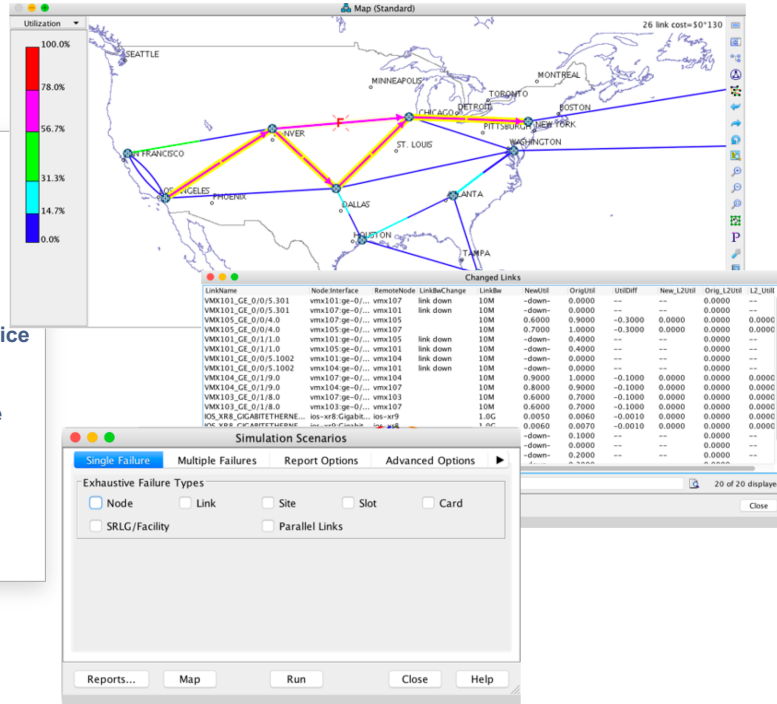


NETWORK SELF HEALING

Resiliency Simulation

FEATURES

- Guard against unnecessary risk
- Ensure network and traffic survivability
 - Examine the effect of device failures on service availability.
 - Study the impact of extensive node, link and facility failure scenarios; perform exhaustive single and double element failures.
 - Protect against worst-case scenarios.



NETWORK RESILIENCE DEMO

<https://www.youtube.com/watch?v=BpuffLZFXRU>

ENABLING MULTI LAYER, MULTI DOMAIN, MULTI VENDOR PACKET OPTICAL SOLUTIONS

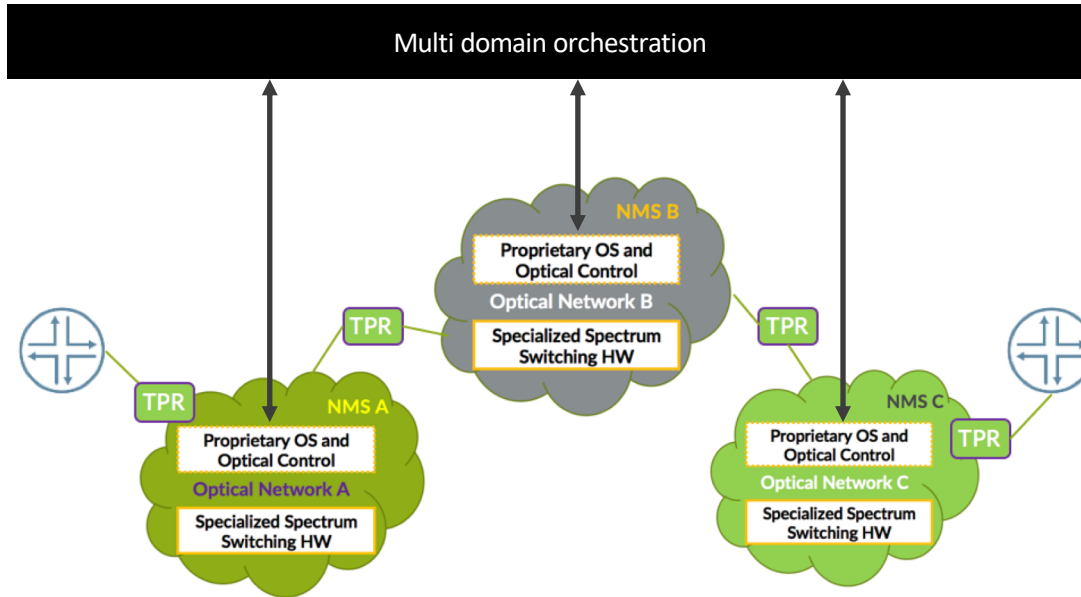
A great deal of work underway in open communities to establish open standard API's

Most common communities are

- OIF → Transport-API (orchestrator → controller SBI)
- Open ROADM (open line systems, open transponders)
- OpenConfig

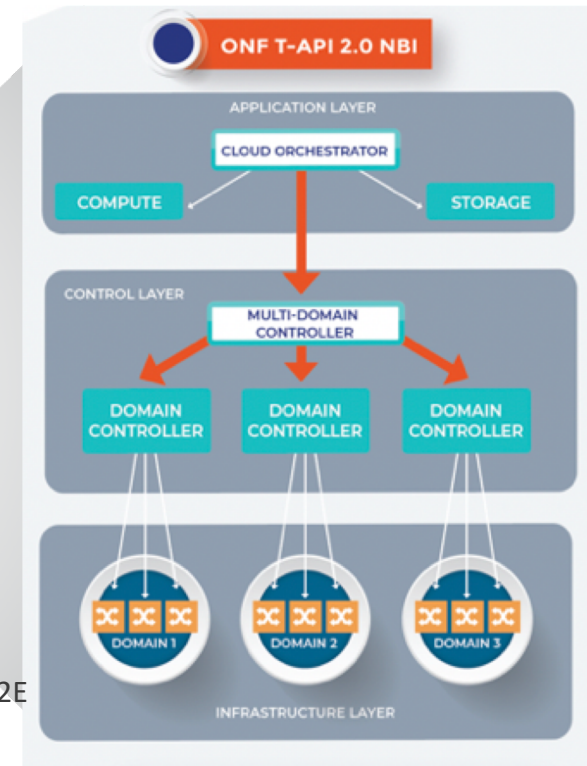
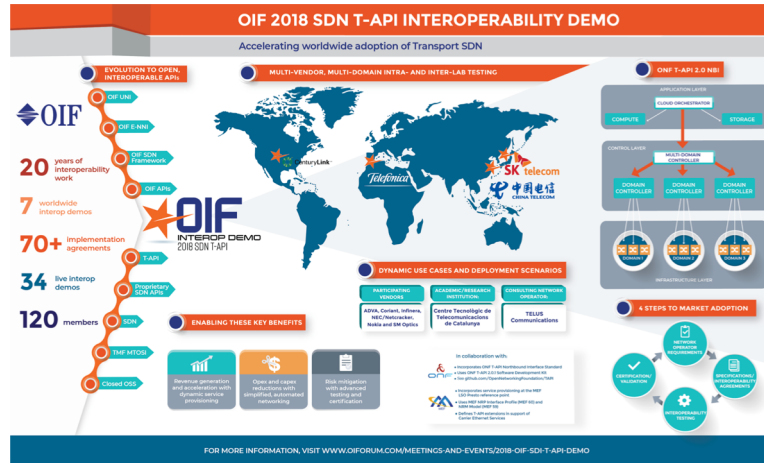
As an example of interoperability of these communities, platforms such as ONOS, Open Daylight leverage open source to offer product

MULTI DOMAIN ORCHESTRATION → TRANSPORT-API



Transport-API: common API data model for southbound orchestration layer → controller transaction

OIF T-API MULTI DOMAIN MULTI VENDOR OPEN STANDARD



T-API standard 2.0 provides standard SBI Orchestrator → controller simplifying E2E multi domain, multi vendor solution development

OPEN ROADM – VERSATILE OPEN STANDARD

Open ROADM – a versatile open standard that goes beyond ROADM network elements

Same device and data models apply to open line systems, SBI, topology exchange etc

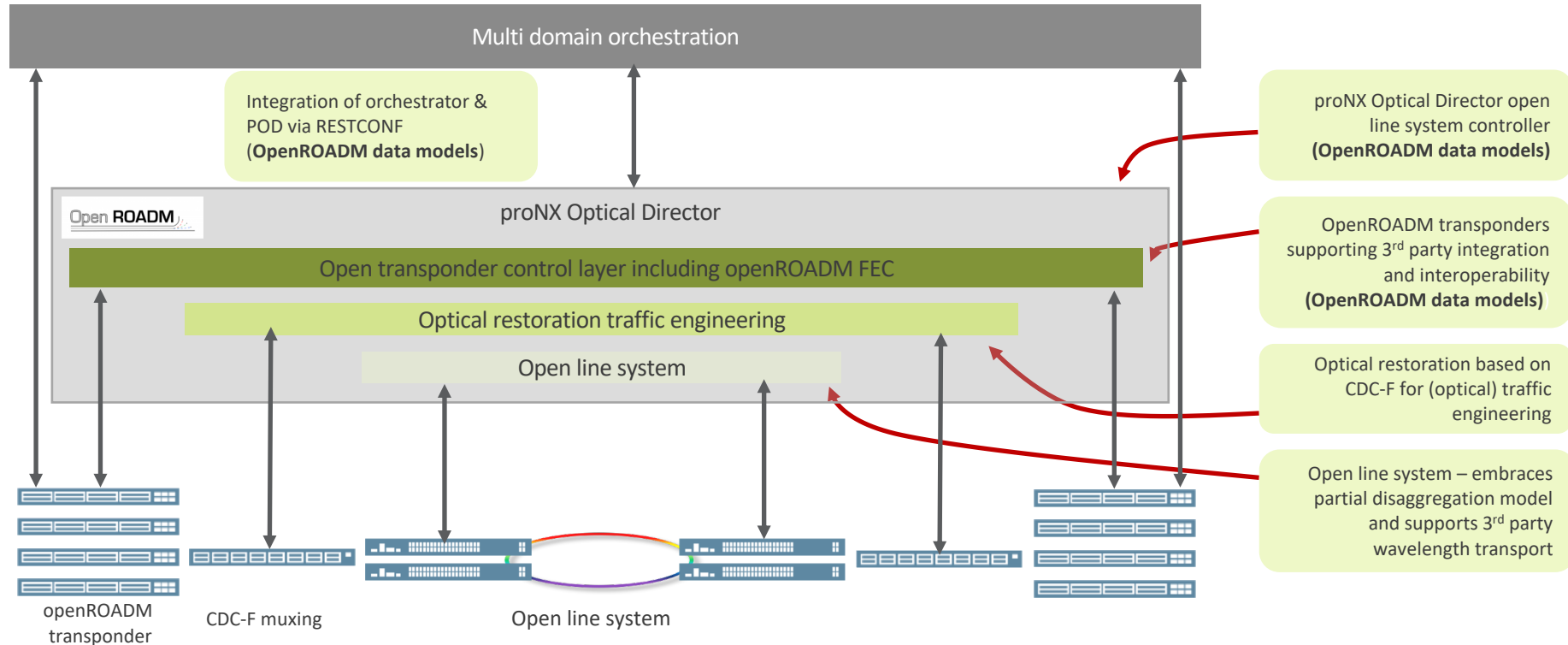
Vibrant ecosystem of supporters with continual development and code submissions

Some use cases

1. Southbound API via RESTCONF
2. Open transponder management and control
3. Open optical line management and control
4. IP – optical controller topology exchange
5. O-FEC to enable line side interoperability

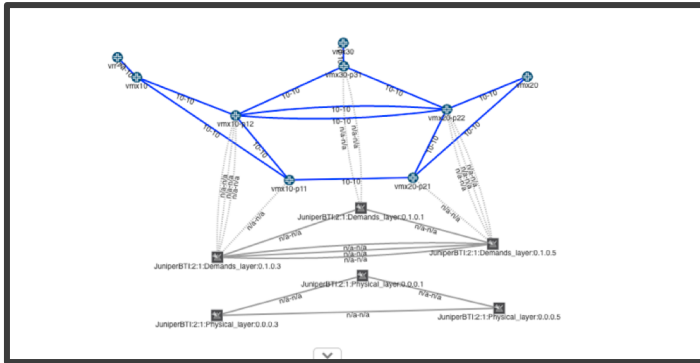


JUNIPER OPEN PACKET OPTICAL SOLUTION



OPENROADM ENABLING OPEN, MULTI-LAYER AUTOMATION

IP controller



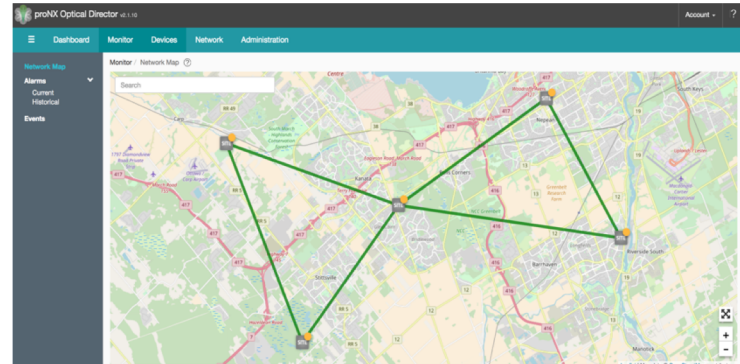
INTEGRATED



/OpenROADM
DATA MODEL

REST / RESTCONF

Optical controller



Multi-layer provisioning, visualization & trouble shooting

Real-time updates and notifications between IP & Optical controllers

OPENROADM RESTCONF SOUTHBOUND API DEMO

Video demo

SUMMARY

Software transformation is enabling multi domain, multi layer, multi vendor automation solutions

Key enabling technologies

- Streaming telemetry
- Analytic tools
- Open software interface standards

We are entering the next era of open packet optical networking