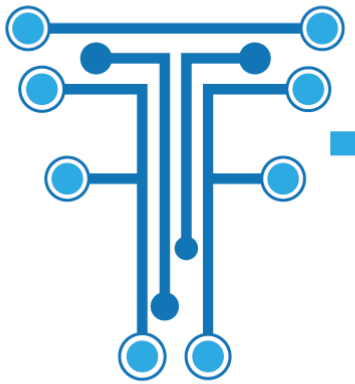

TeraFlow

Secured autonomic traffic management of a Tera of SDN Flows

TMV webinar on "6G KPIs and how to measure them”

September 28, 2022

Daniel King (daniel@olddog.co.uk)

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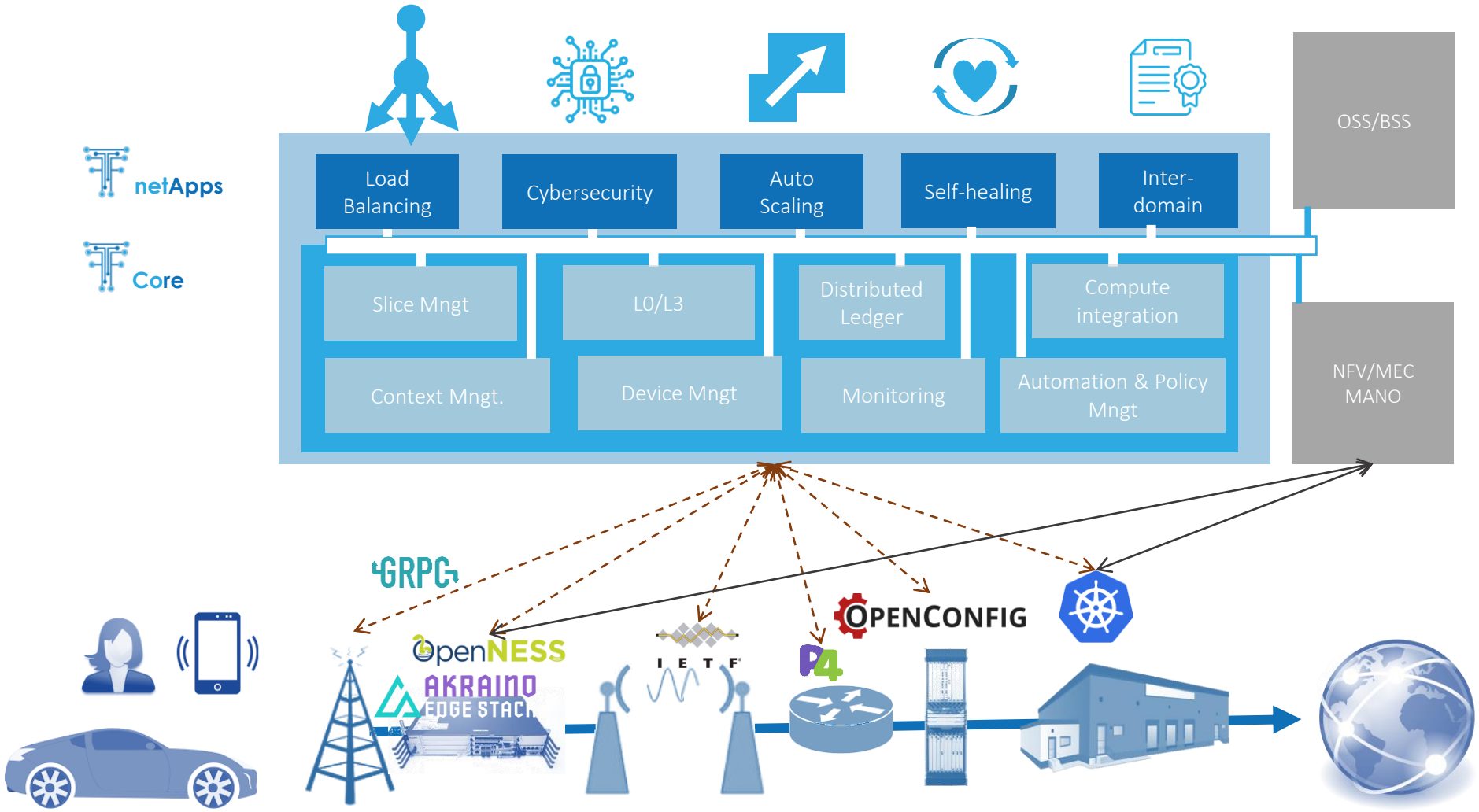
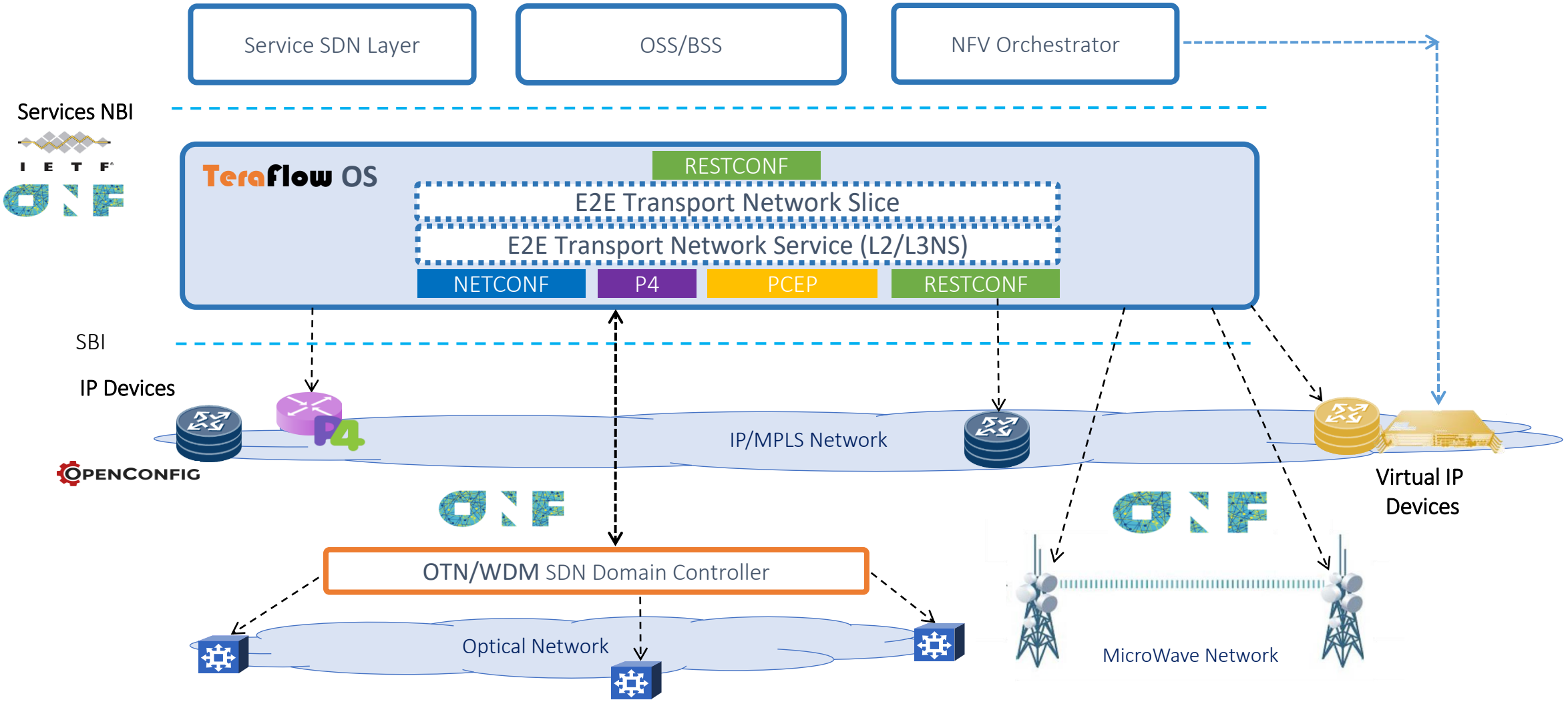
5G PPP

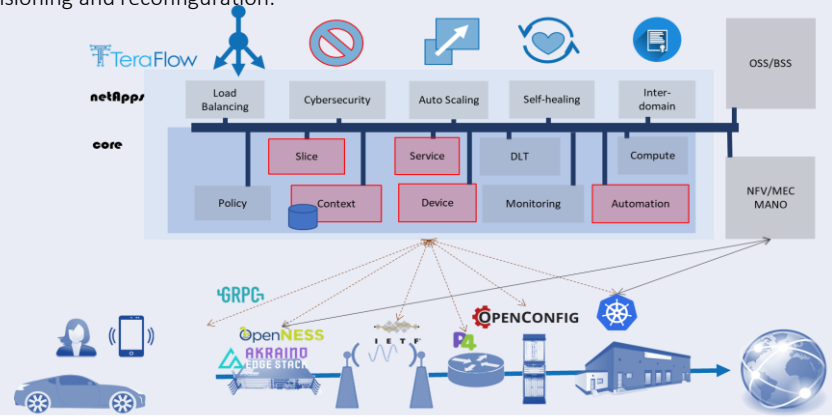
TeraFlow Architecture



UC1: Autonomous network B5G



B5G/6G Autonomous Network KPIs

KPI Family	NS-SLO
Project KPI Name	There two main objectives: to equip the TeraFlow OS with enough function to deal with the programmability of network elements, and to develop agents in the devices to cope with the north bound and south bound interfaces for provisioning and reconfiguration. 
KPI Definition	Network Slice Service Level Objectives (NS-SLO). SLOs can be categorized in to 'Directly Measurable Objectives' or 'Indirectly Measurable Objectives'. Objectives such as guaranteed minimum bandwidth, guaranteed maximum latency, maximum permissible delay variation, maximum permissible packet loss rate, and availability are 'Directly Measurable Objectives'. While 'Indirectly Measurable Objectives' include security, geographical restrictions, maximum occupancy level objectives.
Context/ Use Case	Configuration of Network Slice Service Level Objectives (NS-SLO) for specific application and traffic types.
Project Enhancement / Innovation	Investigate how to define, deploy and manage NS-SLOs, using TeraFlow Monitoring agent to manage and reconfigure network slice based on changing network conditions and application/traffic requirements. Using an ML-based monitoring agent to trigger changes using trending predictor.
Where to measure	Transport Device (virtual and physical), Network Controller and Monitoring Platform.

B5G/6G Autonomous Network KPIs

TeraFlow

KPI Family	**Guaranteed Maximum Latency**
How to measure	Upper bound of network latency when transmitting between two endpoints. The latency is measured in terms of network characteristics (excluding application-level latency).
Influence quantity	
How to evaluate (relative/ absolute)	Metric Name: Type-P-One-way-Delay Metric Parameters • Src, the IP address of a host • Dst, the IP address of a host • T, a time • Tmax, a loss threshold waiting time Metric Units The value of a Type-P-One-way-Delay is either a real number or an undefined (informally, infinite) number of seconds.
Components / Technologies Involved	Use cloud-native distributed architectures. SDN Control Layer with NFV-based functions, dedicated Monitoring component using ECA-based policy management and KPOI templates for services and devices.
Comments - Other relevant information (e.g. Standardisation references)	• "Framework for Use of ECA (Event Condition Action) in Network Self-Management", URL: https://datatracker.ietf.org/doc/draft-bwd-netmod-eca-framework/ • "A YANG Data model for ECA Policy Management", URL: https://datatracker.ietf.org/doc/draft-ietf-netmod-eca-policy/

B5G/6G Autonomous Network KPIs

KPI Family	**Maximum Permissible Delay Variation**
How to measure	Packet delay variation (PDV), the difference in the one-way delay between sequential packets in a flow. This SLO sets a maximum value PDV for packets between two endpoints
Influence quantity	
How to evaluate (relative/ absolute)	Metric name: Type-P-One-way-ipdv Metric parameters • Src, the IP address of a host • Dst, the IP address of a host • T1, a time • T2, a time • L, a packet length in bits. The packets of a Type P packet stream from which the singleton ipdv metric is taken MUST all be of the same length. • F, a selection function defining unambiguously the two packets from the stream selected for the metric. • I1,I2, times which mark that beginning and ending of the interval in which the packet stream from which the singleton measurement is taken occurs. • P, the specification of the packet type, over and above the source and destination addresses
Components / Technologies Involved	Use cloud-native distributed architectures. SDN Control Layer with NFV-based functions, dedicated Monitoring component using ECA-based policy management and KPOI templates for services and devices.
	• "Framework for Use of ECA (Event Condition Action) in Network Self-Management", URL: https://datatracker.ietf.org/doc/draft-bwd-netmod-eca-framework/

B5G/6G Autonomous Network KPIs

KPI Family	Guaranteed Minimum Bandwidth
How to measure	Minimum guaranteed bandwidth between two endpoints at any time. The bandwidth is measured in data rate units of bits per second and is measured unidirectionally.
Influence quantity	
How to evaluate (relative/ absolute)	
Components / Technologies Involved	Use cloud-native distributed architectures. SDN Control Layer with NFV-based functions, dedicated Monitoring component using ECA-based policy management and KPOI templates for services and devices.
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B5G/6G Autonomous Network KPIs

KPI Family	**Maximum Permissible Packet Loss Rate**
How to measure	The ratio of packets dropped to packets transmitted between two endpoints over a period of time.
Influence quantity	
How to evaluate (relative/ absolute)	
Components / Technologies Involved	Use cloud-native distributed architectures. SDN Control Layer with NFV-based functions, dedicated Monitoring component using ECA-based policy management and KPOI templates for services and devices.
Comments - Other relevant information (e.g. Standardisation references)	• "Framework for Use of ECA (Event Condition Action) in Network Self-Management", URL: https://datatracker.ietf.org/doc/draft-bwd-netmod-eca-framework/ • "A YANG Data model for ECA Policy Management", URL: https://datatracker.ietf.org/doc/draft-ietf-netmod-eca-policy/

B5G/6G Autonomous Network KPIs

KPI Family	Availability
How to measure	The ratio of uptime to the sum of uptime and downtime, where uptime is the time the network slice is available in accordance with the SLOs associated with it.
Influence quantity	
How to evaluate (relative/ absolute)	
Components / Technologies Involved	Use cloud-native distributed architectures. SDN Control Layer with NFV-based functions, dedicated Monitoring component using ECA-based policy management and KPOI templates for services and devices.
Comments - Other relevant information (e.g. Standardisation references)	• "Framework for Use of ECA (Event Condition Action) in Network Self-Management", URL: https://datatracker.ietf.org/doc/draft-bwd-netmod-eca-framework/ • "A YANG Data model for ECA Policy Management", URL: https://datatracker.ietf.org/doc/draft-ietf-netmod-eca-policy/

B5G/6G Autonomous Network KPIs

KPI Family	Security
How to measure	A network slice consumer may request that the network applies encryption or other security techniques to traffic flowing between endpoints. Note that the use of security or the violation of this SLO is not directly observable by the network slice consumer and cannot be measured as a quantifiable metric.
Influence quantity	
How to evaluate (relative/ absolute)	Conformance to security constraints: Specific security requests from consumer defined network slices will be mapped to their realization in the underlay networks. It will be required by underlay networks to have capabilities to conform to consumer's requests as some aspects of security may be expressed in SLOs. Network slice controller authentication: Underlying networks need to be protected against the attacks from an adversary NSC as they can destabilize overall network operations. It is particularly critical since a network slice may span across different networks, therefore, NSC should have strong authentication with each those networks. Furthermore, both SBI and NBI need to be secured. o Specific isolation criteria: The nature of conformance to isolation requests means that it should not be possible to attack a network slice service by varying the traffic on other services or slices carried by the same underlay network. In general, isolation is expected to strengthen the network slice security. Data Integrity of a network slice: A consumer wanting to secure their data and keep it private will be responsible for applying appropriate security measures to their traffic and not depending on the network operator that provides the network slice. It is expected that for data integrity, a consumer is responsible for end-to-end encryption of its own traffic.
Components / Technologies Involved	Use cloud-native distributed architectures. SDN Control Layer with NFV-based functions, dedicated Monitoring component using ECA-based policy management and KPOI templates for services and devices.
Comments - Other relevant information (e.g. Standardisation references)	• "Framework for Use of ECA (Event Condition Action) in Network Self-Management", URL: https://datatracker.ietf.org/doc/draft-bwd-netmod-eca-framework/ • "A YANG Data model for ECA Policy Management", URL: https://datatracker.ietf.org/doc/draft-ietf-netmod-eca-policy/

KPI Monitoring Architecture