

Powering Mobile Network Security with Virtualized Security Gateway



Disaggregate and distribute
Mobile Security Gateways

Mar 12, 2024





Karim MCHIRKI

VP of Product Management,
6WIND

As VP of Product Management, Karim is leading the 6WIND product roadmap definition and is helping the product committee, in accordance with the company business strategy, in cultivating product vision and enriching the product solutions

Company Profile

6WIND is a **global networking software company**, with Headquarters in Paris, France, Singapore and in Santa Clara California USA.

We are specialized in delivering **high performance and secure networking software solutions** to support customers with new applications for **5G, IoT and SD-WAN**.

We deliver **Virtualized, Cloudified and Secure** network solutions that offer the **lowest TCO** in the market with **best cost-performance functionality ratio**.

6WIND's leading edge solutions are used by CSPs, MNOs, NHPs, Cloud Providers, Datacenters, and Enterprises around the world.



Experience



Customers



Deployments



Green-Tech


Meeting Our Customers' Challenges



Best-in-Class Virtualized Network Solutions

High Performance 


 Scalability

Virtualization 

 Innovation

Sustainability 

 Cost Reduction



6WIND VSR
(Virtual Service Routers)

- ❑ High Performance virtualized service routers
- ❑ Optimized for COTS servers
- ❑ Deployed as PNF, VNF or CNF
- ❑ Private and Public clouds
- ❑ Wide variety of networking and security services
- ❑ Optimized HW resource usage (Efficiency and Sustainability)

6WIND Virtual Service Router Product Family

**6WIND VSR
(Virtual Service Routers)**

- ❑ High Performance virtualized service routers
- ❑ Optimized for COTS servers (x86 and arm)
- ❑ Deployed as PNF, VNF or CNF
- ❑ Private and Public clouds
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- ❑ Optimized HW resource usage (Efficiency and Sustainability)

- 6WIND Virtual Provider Edge Router
- 6WIND Virtual Security Gateway Router
- 6WIND Virtual Cell Site Router
- 6WIND Virtual CG-NAT Router
- 6WIND Virtual Border Router
- 6WIND Virtual CPE router
- 6WIND Virtual FW Router
- 6WIND Virtual BNG/AGF Router
- 6WIND User Plane Function



Higher Performance

- Optimized for multicore Processors
- Linear Scalable performance
- Lockless implementation for High performance and low latency.



Lower Cost

- Optimized resource usage
- Automation - Simple operations
- Hardware agnostic
- Runs on COTS servers

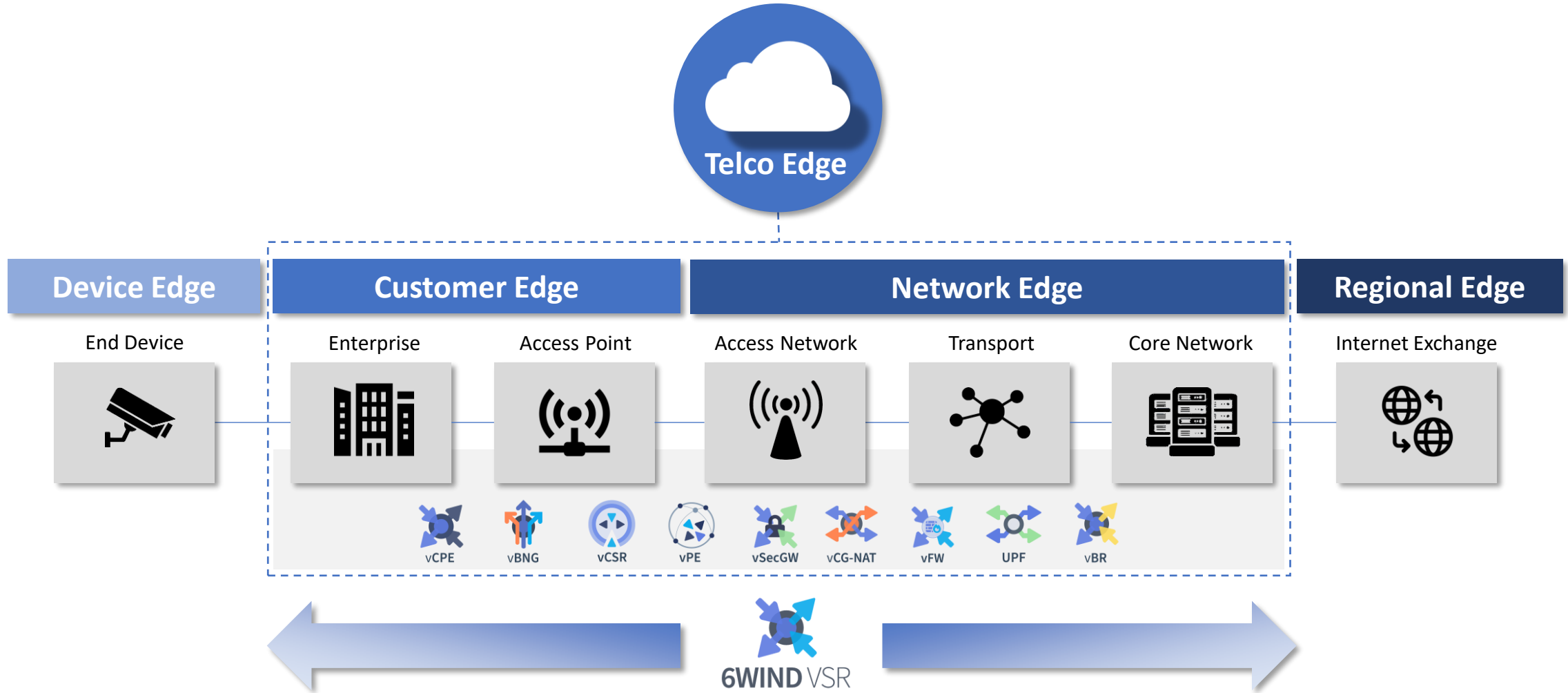


Rapid Service Innovation

- Software based solutions
- Easy feature enhancements
- Faster build new services
- TTM & Competitiveness

Pave the way for the Edge transformation

Network Virtualization and Cloudification



Performance, Agility, flexibility and Efficiency



5G: The need for Security



EU Security

Access Network Security

Core Network Security

Application Network Security

5G Security : Cybersecurity of 5G - EU Toolbox Measures

EU 5G Cybersecurity policy



5G: a new technology

While 3G made mobile internet possible and 4G allowed mobile broadband, 5G is expected to become the connectivity infrastructure that will pave the way for new products and services and affect all sectors of society. Benefits will include the following.

- E-HEALTH**
 - Remote health monitoring, patients' records and smart diagnosis
 - Utilising robots to help surgeons and improve medical outcomes
- SMART ENERGY GRIDS**
 - Highly efficient power lines and fewer outages on a smaller scale
 - Easier deployments with a lower environmental impact
- FACTORIES OF THE FUTURE**
 - Better control over time-sensitive internal processes
 - Remote control access to warehouse machinery
- MEDIA & ENTERTAINMENT**
 - An amplified viewing experience, such as virtual reality
 - Ultra fast high-bandwidth applications such as video streaming
- MOBILITY**
 - Enabling connected and automated mobility with the goal of zero accidents
 - Enabling connectivity in all modes of transport

Europe is the most advanced region in the deployment of large-scale 5G trials in vertical industries (in which close to €1 billion had been invested by the end of 2020), including for 5G transport corridors. By the end of 2020, 5G services were available in 500 European cities.

Cybersecurity of 5G: an imperative precondition

5G networks are the future backbone of our increasingly digitalised economies and societies. Billions of connected objects and systems are concerned, including those used in critical sectors such as energy, transport, banking and health, as well as those used in industrial control systems that carry sensitive information and that support safety systems. Ensuring the cybersecurity and resilience of 5G networks is therefore essential.

At the same time, due to a less centralised architecture, smart computing power at the edge, the need for more antennas and increased dependency on software, 5G networks offer more potential entry points for attackers.

EU toolbox conclusions: key measures

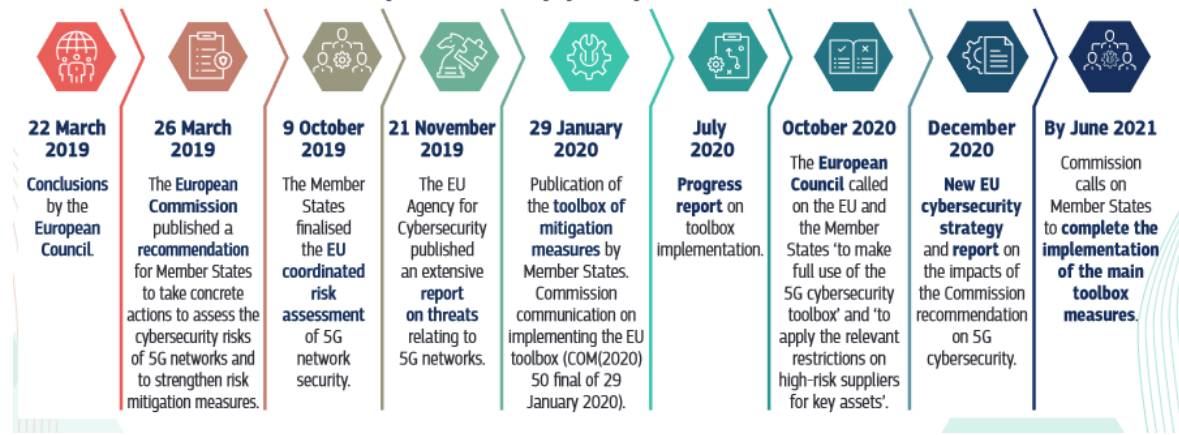
Member States should have measures in place and powers to mitigate risks. In particular they should:

- strengthen **security requirements for mobile network operators**;
- assess the risk profile of suppliers; apply relevant **restrictions for suppliers considered as high risk**, including necessary exclusions for key assets;
- ensure that each operator has an appropriate **multi-vendor strategy to avoid or limit any major dependency** on a single supplier and avoid dependency on suppliers considered to be high risk.

The **European Commission**, together with Member States, should take measures to:

- maintain a **diverse and sustainable 5G supply chain** in order to avoid long-term dependency, including by:
 - making full use of the existing EU tools and instruments (foreign and direct investment screening, trade defence instruments, competition),
 - further strengthening EU capacities in the 5G and post-5G technologies by using relevant EU programmes and funding;
- facilitate coordination between Member States regarding **standardisation** to achieve specific security objectives and develop relevant EU-wide **certification schemes**.

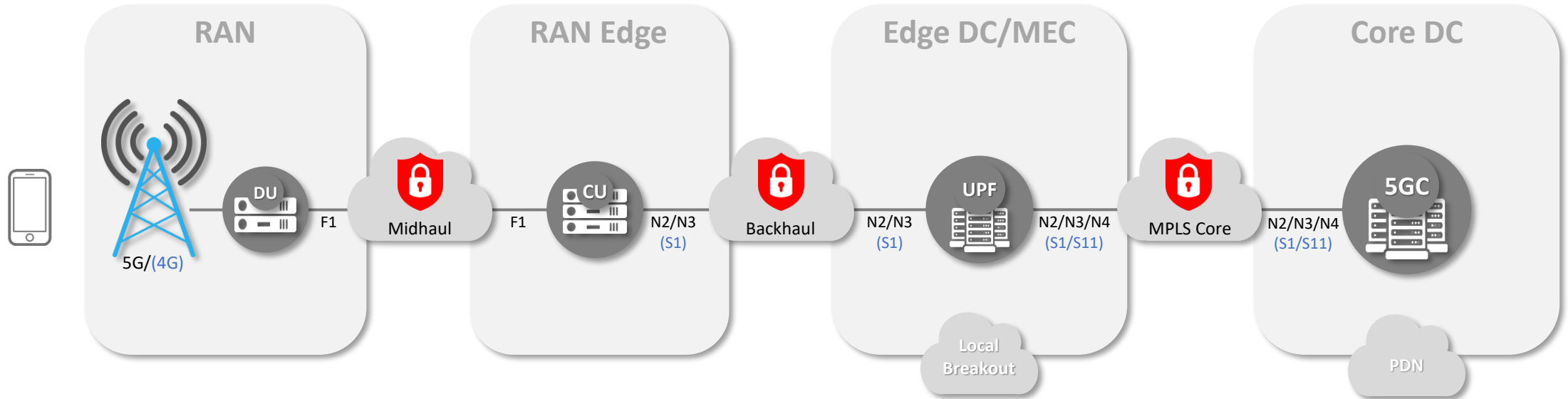
Timeline of the EU 5G cybersecurity policy



Source: <https://ec.europa.eu/newsroom/dae/redirection/document/64577>

Security in Mobile Networks

From Access to Core network



E2E security requirements



Security for 5G systems

IPsec ESP & IKEv2 as a requirement

9.2 Security mechanisms for the N2 interface

N2 is the reference point between the AMF and the 5G-AN. It is used, among other things, to carry NAS signalling traffic between the UE and the AMF over 3GPP and non-3GPP accesses.

The transport of control plane data over N2 shall be integrity, confidentiality and replay-protected.

In order to protect the N2 reference point, it is required to implement IPsec ESP and IKEv2 certificates-based authentication as specified in sub-clause 9.1.2 of the present document. IPsec is mandatory to implement on the gNB and the ng-eNB. On the core network side, a SEG may be used to terminate the IPsec tunnel.

9.3 Security requirements and procedures on N3

N3 is the reference point between the 5G-AN and UPF. It is used to carry user plane data from the UE to the UPF.

The transport of user data over N3 shall be integrity, confidentiality and replay-protected.

In order to protect the traffic on the N3 reference point, it is required to implement IPsec ESP and IKEv2 certificate-based authentication as specified in sub-clause 9.1.2 of the present document with confidentiality, integrity and replay protection. IPsec is mandatory to implement on the gNB and the ng-eNB. On the core network side, a SEG may be used to terminate the IPsec tunnel.



9.1.2 Implementation requirements

IPsec ESP implementation shall be done according to RFC 4303 [4] as profiled by TS 33.210 [3]. For IPsec implementation, tunnel mode is mandatory to support while transport mode is optional.

IKEv2 certificate-based authentication implementation shall be done according to TS 33.310 [5]. The certificates shall be supported according to the profile described by TS 33.310 [5]. IKEv2 shall be supported conforming to the IKEv2 profile described in TS 33.310 [5].

9.4 Security mechanisms for the Xn interface

Xn is the interface connecting NG-RAN nodes. It consists of Xn-C and Xn-U. Xn-C is used to carry signalling and Xn-U user plane data.

The transport of control plane data and user data over Xn shall be integrity, confidentiality and replay-protected.

In order to protect the traffic on the Xn reference point, it is required to implement IPsec ESP and IKEv2 certificate-based authentication as specified in sub-clause 9.1.2 of the present document with confidentiality, integrity and replay protection. IPsec shall be supported on the gNB and ng-eNB.

9.8.2 Security mechanisms for the F1 interface

The F1 interface connects the gNB-CU to the gNB-DU. It consists of the F1-C for control plane and the F1-U for the user plane. The security mechanisms for the F1 interface connecting the IAB-node to the IAB-donor-CU are detailed in clause M.3.3 of this document.

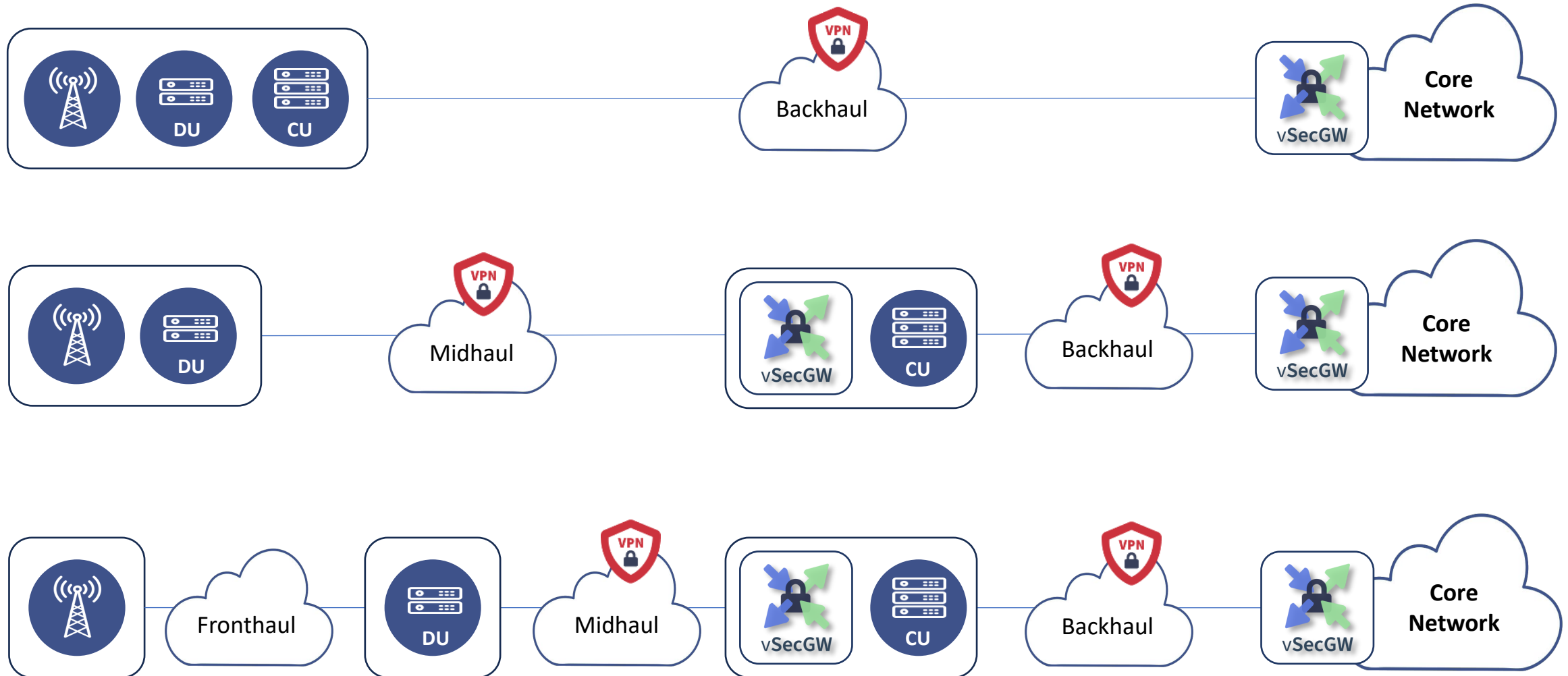
In order to protect the traffic on the F1-U interface, IPsec ESP and IKEv2 certificates-based authentication shall be supported as specified in sub-clause 9.1.2 of the present document with confidentiality, integrity and replay protection.

In order to protect the traffic on the F1-C interface, IPsec ESP and IKEv2 certificates-based authentication shall be supported as specified in sub-clause 9.1.2 of the present document with confidentiality, integrity and replay protection.

IPsec is mandatory to implement on the gNB-DU and on the gNB-CU. On the gNB-CU side, a SEG may be used to terminate the IPsec tunnel.

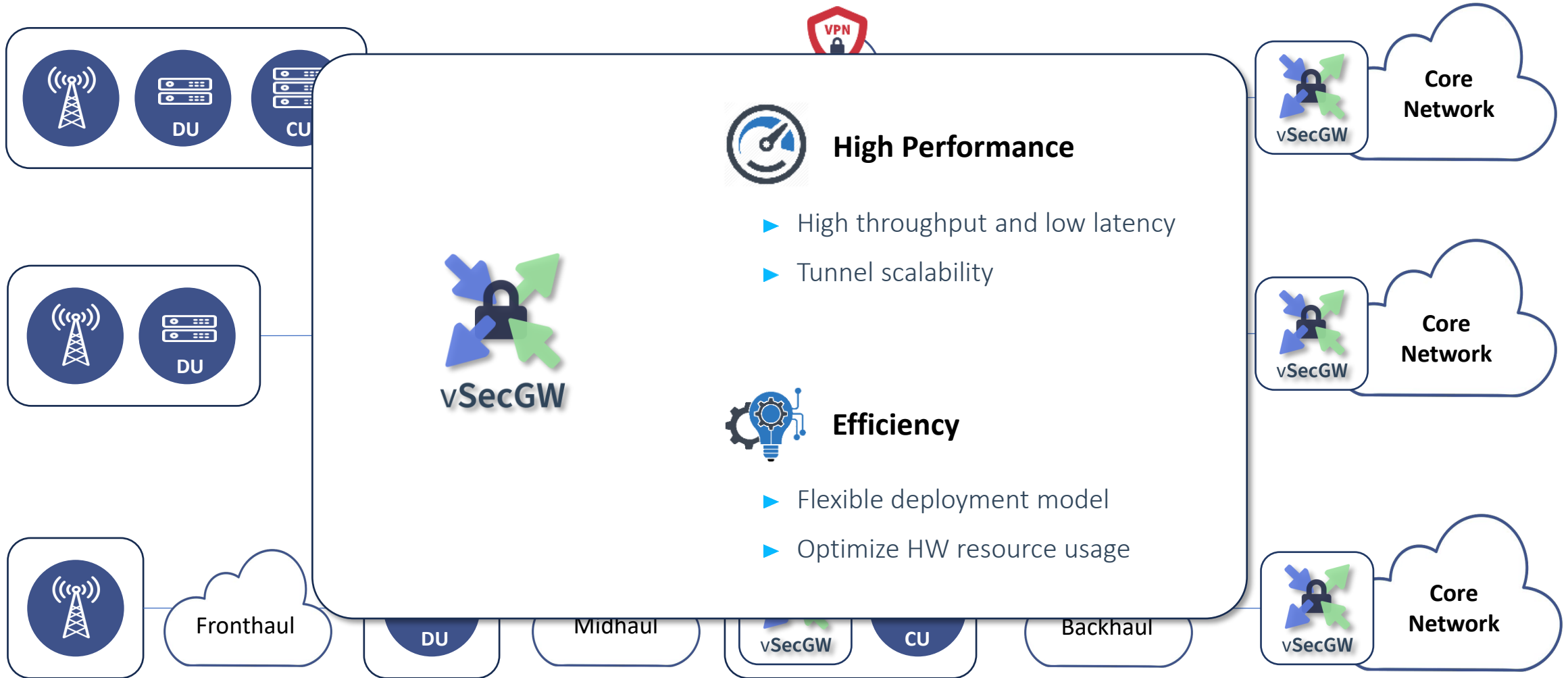
6WIND vSecGW : Securing Mobile Networks

Deployment options



6WIND vSecGW : Securing Mobile Networks

Deployment options





Forwarding and IPsec Performance

Demo Lab : Leveraging Intel's Power base

INTEL® NETWORK BUILDERS PARTNER
A Global Ecosystem Driving the Next Wave of Digital Innovation in the Network

intel.

3rd Gen Intel Xeon Scalable Processor (Ice Lake)
Optimized for an outstanding HPC and AI experience

- Higher memory bandwidth: 8 DDR4 channels & 3200MT/s
- Better performance per core via new architecture
- Faster I/O with PCIe Gen 4
- Supporting exascale storage with up to 6TB
- Security Innovations

4th Gen Intel® Xeon® Scalable Processors: Accelerated for Network and Edge

- New Integrated IP Accelerators
- Intel® Quick Assist Technology
- Intel® Data Streaming Accelerator
- Intel® Dynamic Load Balancer
- Intel® In-Memory Analytics Accelerator
- Intel® Advanced Matrix Extensions (AMX)
- Accelerated Analytics Accelerator (AAA)
- Intel® Advanced Vector Extensions for vRAN
- Enhanced Intel® Software Guard Extensions
- Intel® Xeon® processor
- Intel® Xeon® CPU Max Series
- Intel® Agilex™ FPGAs
- Intel® Data Center GPU Max Series
- Intel® Data Center GPU Flex Series
- Intel® Ethernet Intel® EPU

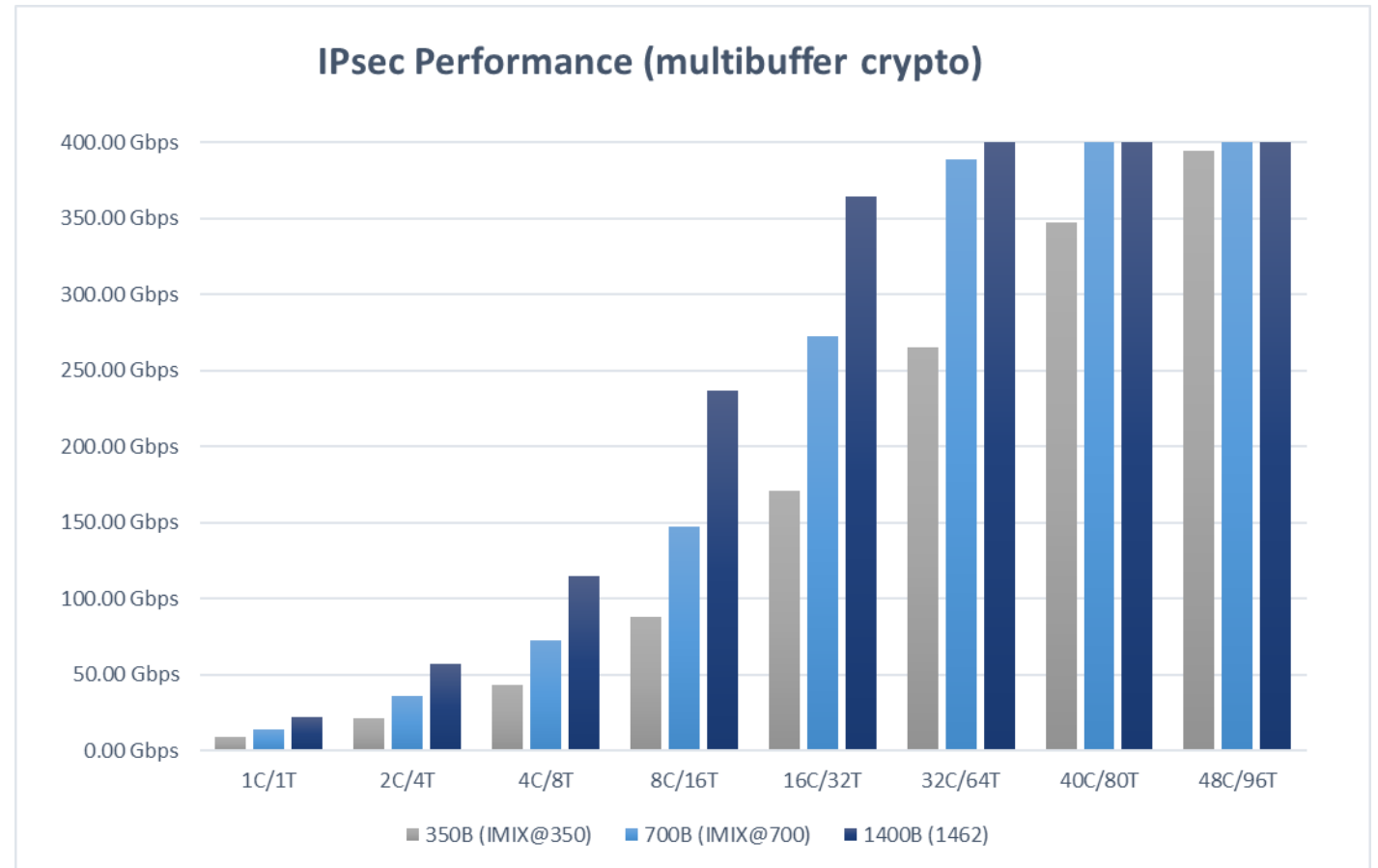
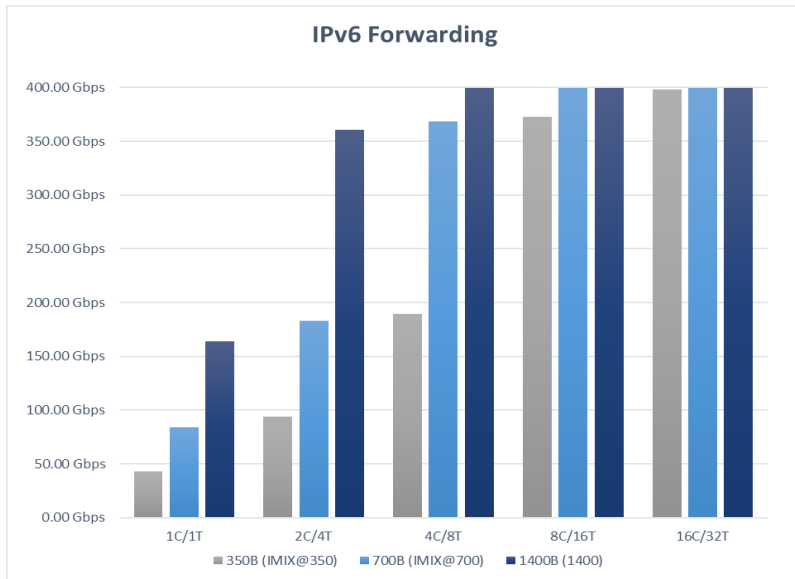
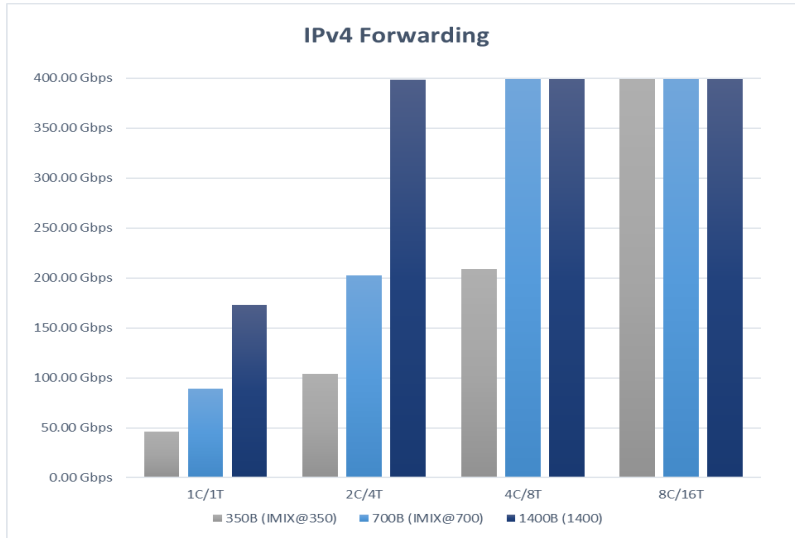
Testbeds

- ✓ Performance Benchmarking
- ✓ Boosting Business Agility
- ✓ Enabling innovation

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Performance Benchmarks : Dual Stack (v4/v6) Performance

Pure software performance



Test platform: Intel® Xeon® Gold 6342 CPU @ 2.80GHz
 Pure software performance, with no HW acceleration
 IPsec performance based on AES-GCM
 Line rate performance (400Gbps) using 2 x Intel E810

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Performance Benchmarks : Dual Stack (v4/v6) Performance

Forwarding Performance

IMIX_{350B}	Per Core	46 Gbps
	Line Rate	8 CPU Core
IMIX_{700B}	Per Core	90 Gbps
	Line Rate	4 CPU Core
1400B	Per Core	180 Gbps
	Line Rate	2 CPU Core

IPsec Performance

IMIX_{350B}	Per Core	9 Gbps
	Line Rate	48 CPU Core
IMIX_{700B}	Per Core	14 Gbps
	Line Rate	40 CPU Core
1400B	Per Core	22 Gbps
	Line Rate	32 CPU Core

Test platform: Intel® Xeon® Gold 6342 CPU @ 2.80GHz
Pure software performance, with no HW acceleration
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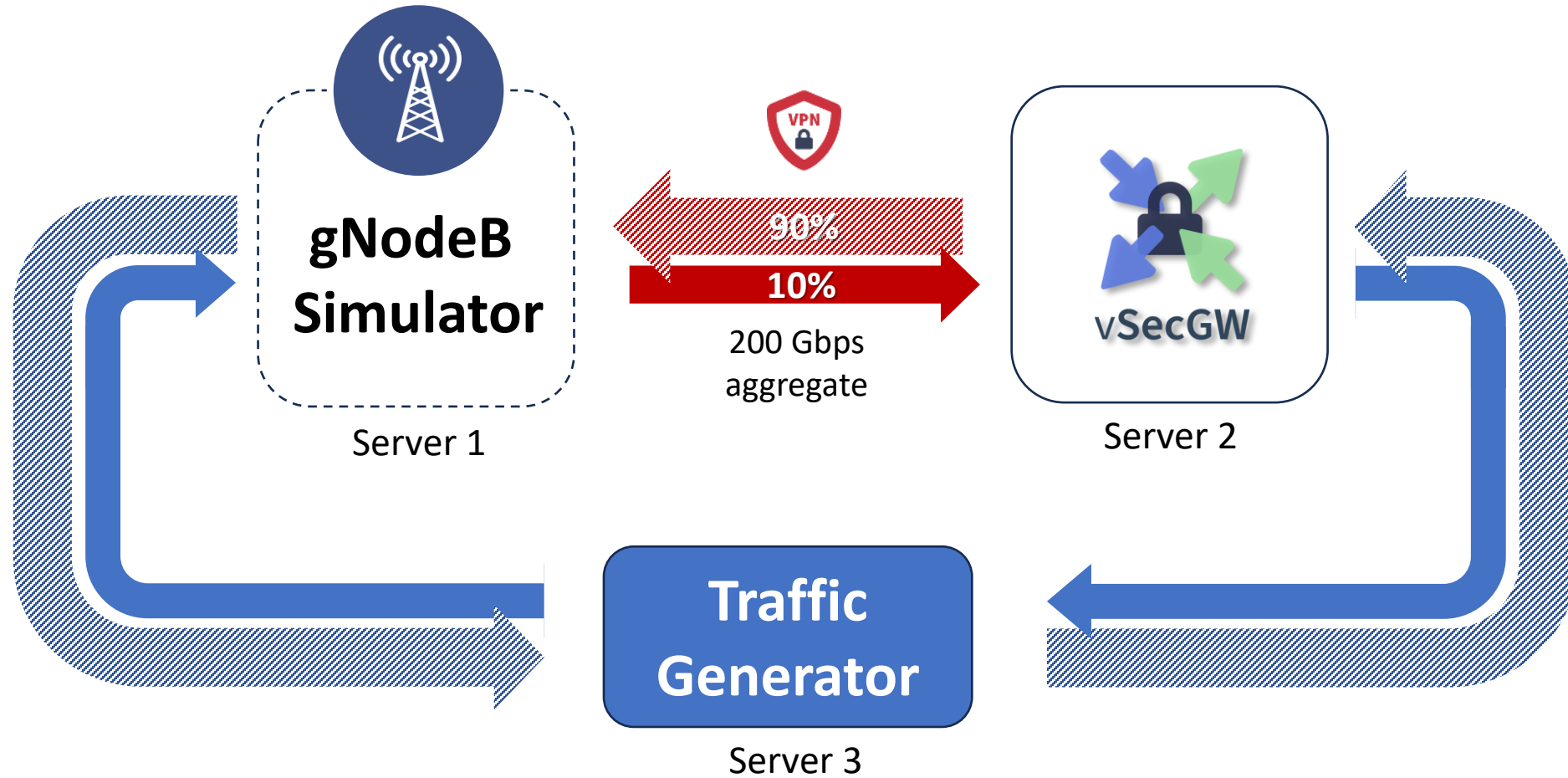
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Mobile Security Gateway

6WIND vSecGW : Demo Setup

High-level design

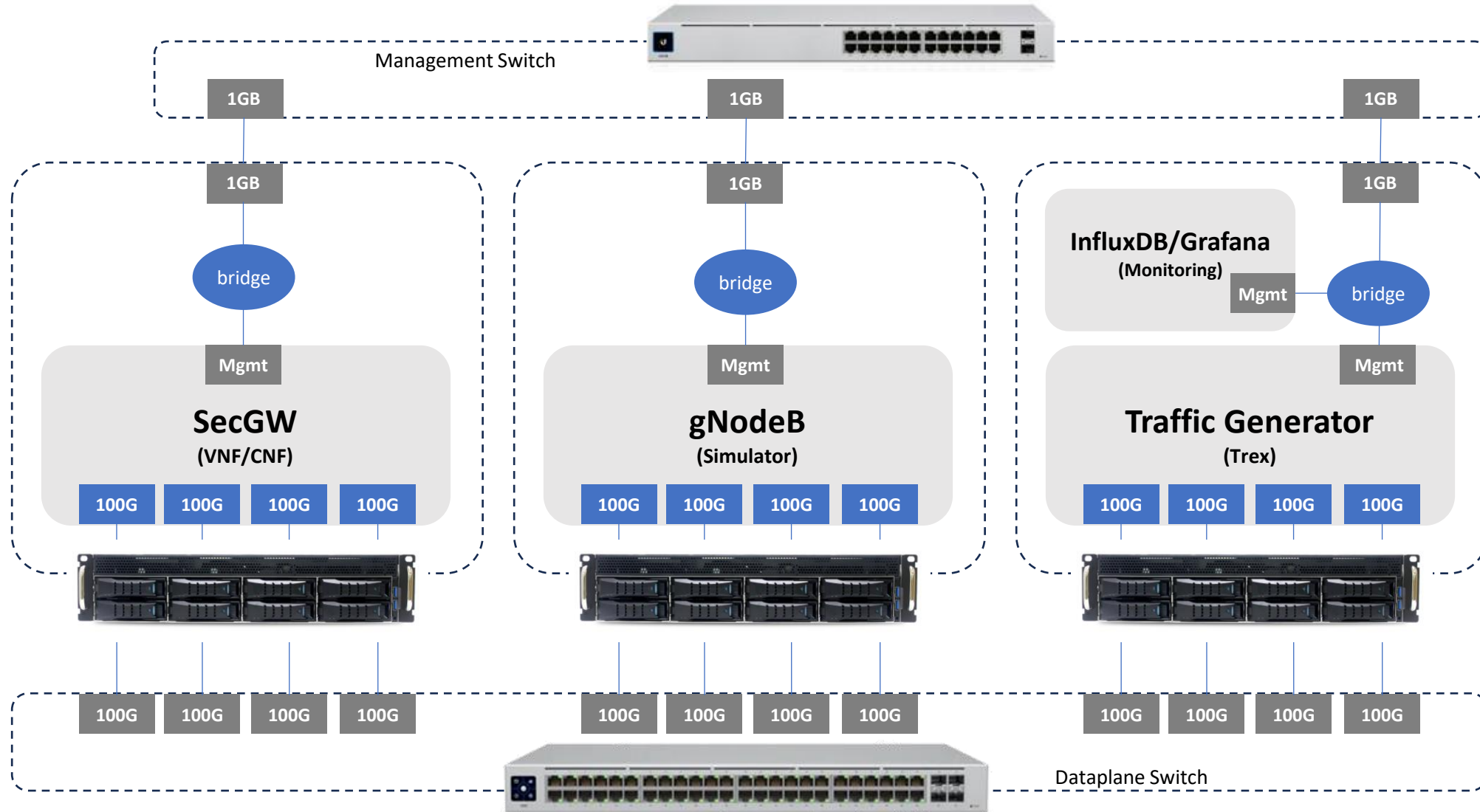


Each server includes:

- 2 x Intel® Xeon® Gold 6342 CPU @ 2.80GHz (24 cores / 48 threads each)
- 2 x Intel® Ethernet Network Adapter E810-2CQDA2 (one dual-port card on each NUMA node)
- 512GB RAM

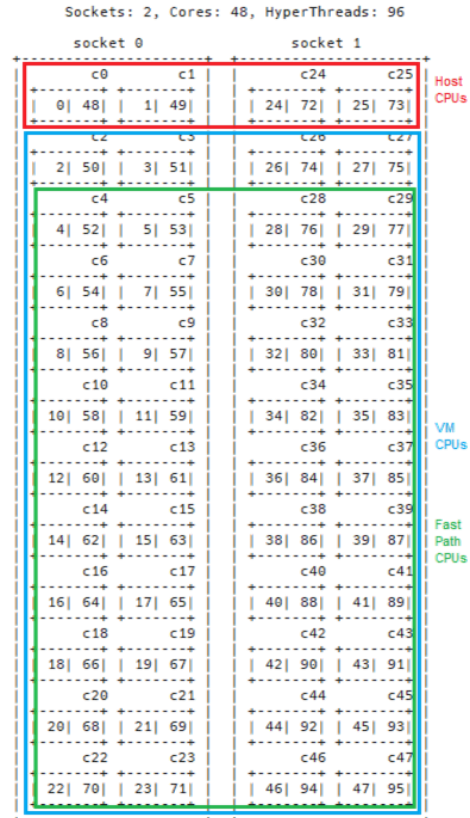
6WIND SecGW : Testbed design

Physical topology

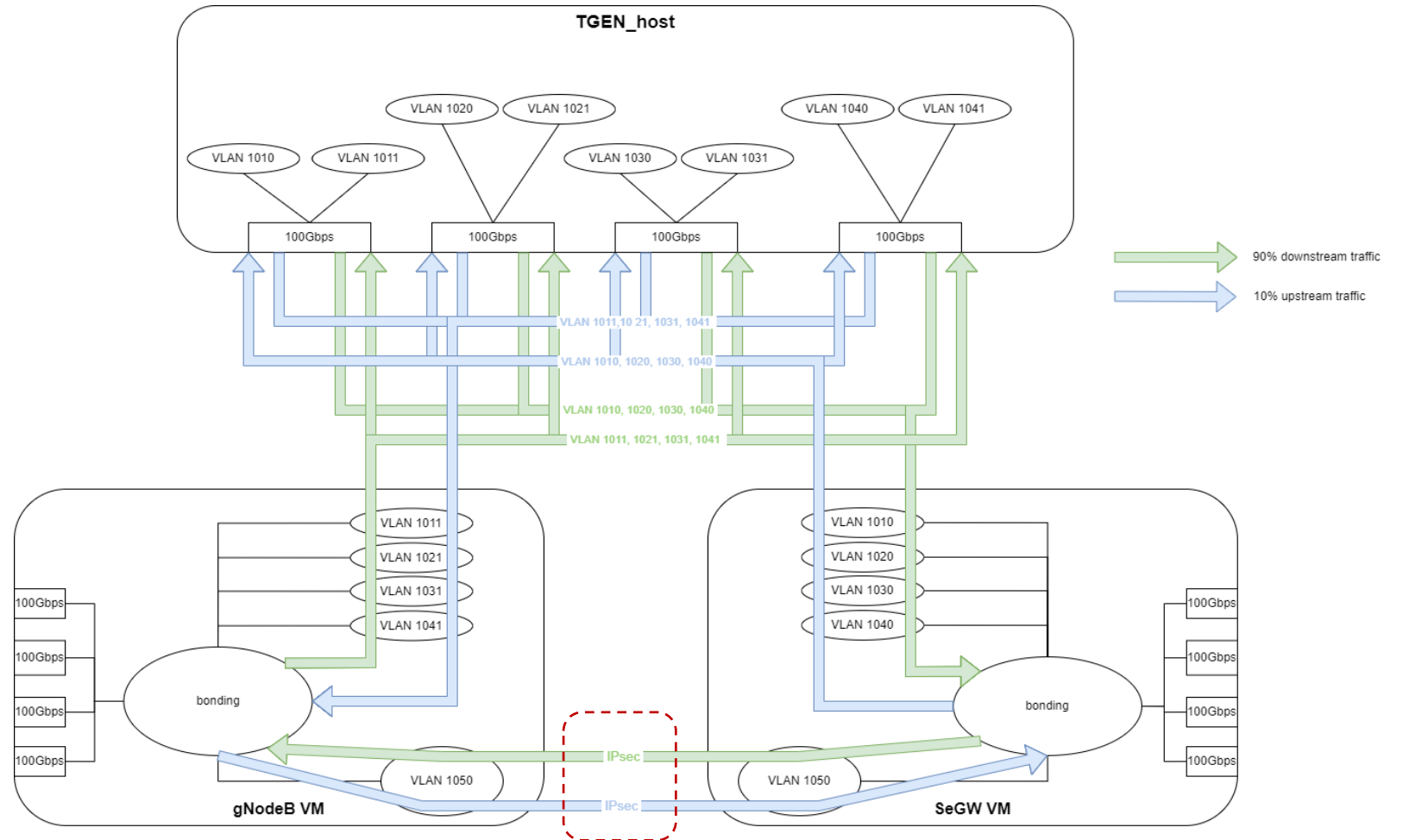


6WIND SecGW : Testbed design

Logical topology



CPU allocation on SeGW-host



6WIND vSecGW : Running the tests

Packet Lengths (Byte)	Downlink	Uplink	Avg. Packet Length
40-79	13%	65%	60
80-159	12%	24%	120
160-319	2%	3%	240
320-639	2%	2%	480
640-1279	2%	2%	960
1280-2559	69%	4%	1500

IMIX traffic profile

```
segw> show ike ike-sa-count vrf untrusted
100000

segw> show ipv4-routes summary vrf trusted
Route Source      Routes      FIB (vrf default)
kernel            100000     100000
connected         4          4
static            1          1
-----
Totals            100005    100005
```

Established IPv4 Routes and IKE SAs

Global Statistics

```
connection : localhost, Port 4501
version    : STL @ v3.02
cpu_util.  : 4.85% @ 48 cores (24 per dual port)
rx_cpu_util. : 0.0% / 0 pps
async_util. : 0% / 41.01 bps
total_cps. : 0 cps
```

```
total_tx_L2 : 194.76 Gbps
total_tx_L1 : 200.26 Gbps
total_rx    : 193.95 Gbps
total_pps   : 34.42 Mpps
drop_rate   : 0 bps
queue_full  : 0 pkts
```

Port Statistics

port	0	1	2	3	total
owner	root	root	root	root	
link	UP	UP	UP	UP	
state	TRANSMITTING	TRANSMITTING	TRANSMITTING	TRANSMITTING	
speed	100 Gb/s	100 Gb/s	100 Gb/s	100 Gb/s	
CPU util.	4.8%	4.8%	4.89%	4.89%	

Tx bps L2	48.69 Gbps	48.69 Gbps	48.69 Gbps	48.69 Gbps	194.76 Gbps
Tx bps L1	50.07 Gbps	50.07 Gbps	50.07 Gbps	50.07 Gbps	200.26 Gbps
Tx pps	8.6 Mpps	8.6 Mpps	8.6 Mpps	8.6 Mpps	34.42 Mpps
Line Util.	50.07 %	50.07 %	50.07 %	50.07 %	

Rx bps	48.87 Gbps	49.16 Gbps	48.11 Gbps	47.81 Gbps	193.95 Gbps
Rx pps	8.51 Mpps	8.57 Mpps	8.55 Mpps	8.65 Mpps	34.28 Mpps

opackets	47882024	47882095	47881999	47882740	191528858
ipackets	47370936	47669046	47583991	48126321	190750294
obytes	33870273544	33870339208	33870269484	33870802264	135481684500
ibytes	33995371000	34196958756	33468059840	33258611068	134919000664
tx-pkts	47.88 Mppts	47.88 Mppts	47.88 Mppts	47.88 Mppts	191.53 Mppts
rx-pkts	47.37 Mppts	47.67 Mppts	47.58 Mppts	48.13 Mppts	190.75 Mppts
tx-bytes	33.87 GB	33.87 GB	33.87 GB	33.87 GB	135.48 GB
rx-bytes	34 GB	34.2 GB	33.47 GB	33.26 GB	134.92 GB

oerrors	0	0	0	0	0
ierrors	0	0	0	0	0

6WIND vSecGW : Performance Monitoring






Take Aways

Why 6WIND vSecGW?

6WIND vSecGW

Efficiently Enable Security in Mobile Networks



vSecGW

- Flexible and Agile deployment
- Fully virtualized (VNF & CNF)
- High Performance and Scalability
- COTS server based
- No HW acceleration required
- Enhanced Power Efficiency
- Lower TCO



- ✓ Private and Public
- ✓ Access Network security
- ✓ MEC security
- ✓ Network Slicing
- ✓ Network sharing (MOCN, MORAN)



x3
Performance



50%
Lower Cost



x3
HW Savings

Assistance

Network Virtualization Journey
Optimizing Network Efficiency
Improving Network Security TCO
Delivering High Performance in the Cloud

Considering Projects

Private Wireless Networks
Multi Access Edge Computing
Open RAN
Virtualization of Network Functions

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vmware READY
TELCO CLOUD

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- 6WIND Virtual FW
- 6WIND User Plane Function

Register for a free evaluation: <https://www.6wind.com/vsr-evaluation>



Thank You!

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