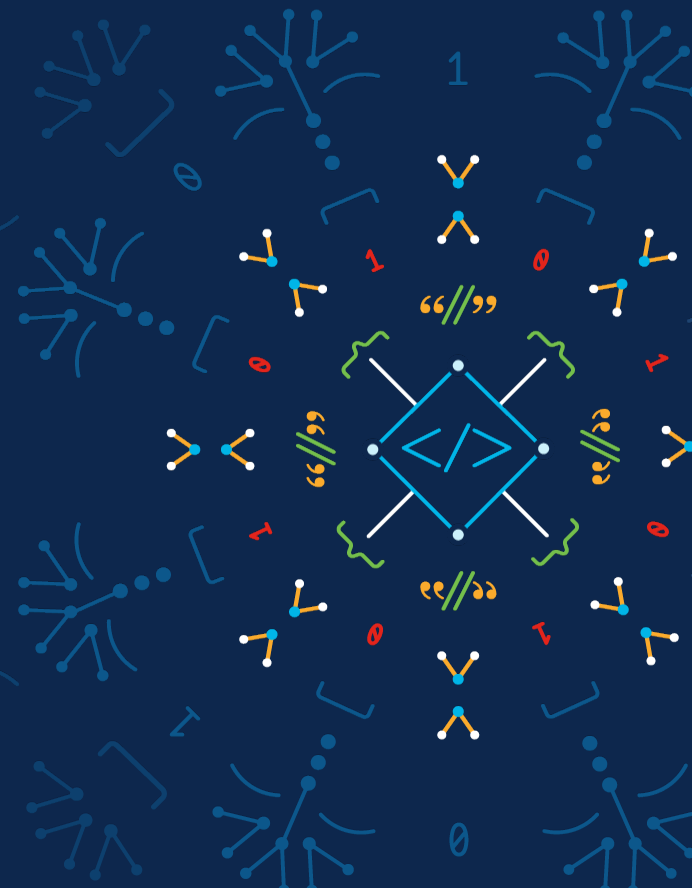


# Achieving Automation, Sustainability, and Performance

**Yes! You Can Have it All !**

Saumya Dubey, Customer Success Specialist

May 2023



Saumya Dubey

Customer Success Specialist  
Automation

- I love to work on products and ideas around tech
- Travelling and Surfing is something I really enjoy
- Sustainability – Environmental Impact has been on my mind



# Agenda

- Automation Use cases
- Performance & Sustainability Impact analysis
- Architecture and Design



Solution ?

# 1. Zero Touch Provisioning (ZTP)

# Why Zero Touch Provisioning ?

Onsite Activities	Onsite Work-time (mins)	Driving Time(mins)	Avg Driving Speed (km/hr)	Km per tuck Roll	Avg CO2/Km in Kg	Avg CO2 per activity in Kg
Site Survey and CPE installation						
Site Survey	30	40	65	43	0.12	5.2
CPE Installation	60	40	65	43	0.12	5.2
	90	80				10.4
Service Restoration on Site						
Service Restoration	75	40	65	43	0.12	5.2 5.2
Average Field Interventions /Month	2000					
					Avg CO2 emissions in Kg/month	<b>10410</b>



Reference: <https://blogs.cisco.com/sp/go-greener-with-network-automation>

# Why Zero Touch Provisioning ?

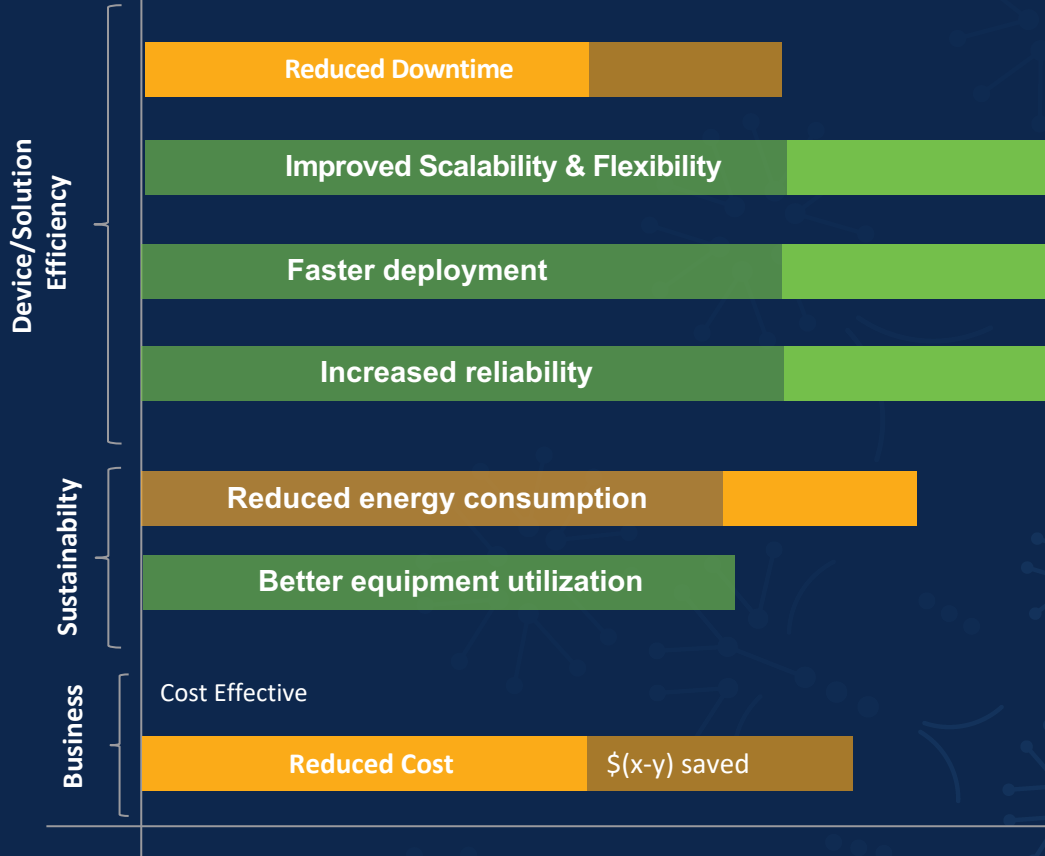
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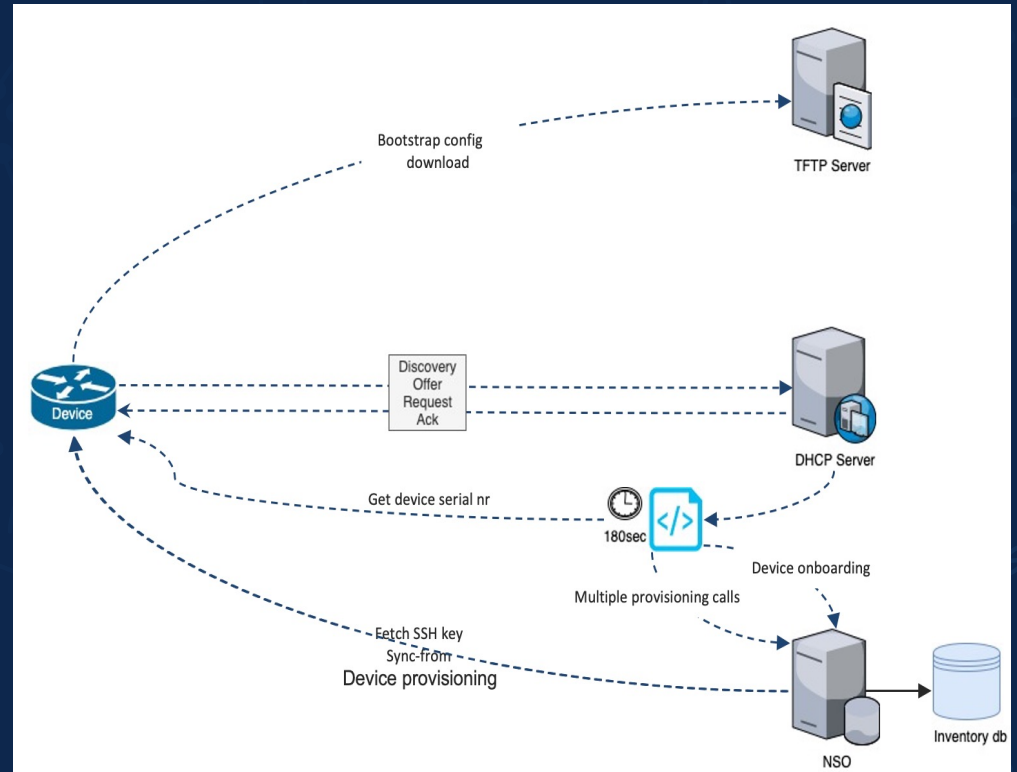
# Zero Touch Provisioning (ZTP) Solution Impact





# Automating devices rollout using NSO

- Multivendor / Multi-Model support for Service Chaining
- Automatic Onboarding to NSO with Day1&2 Services Configuration (L3VPN, Voice)
- Centralized and automated system configuration.
- Automated Post /Pre-Checks (BGP, OSPF, MPLS, LDP, Health Checks, Connectivity, NTP, IP Routing Table Validation)



## 2. Automated Power Management

Average monthly electricity wholesale prices in selected countries in the European Union (EU) from January 2020 to June 2023

# POWER CONSUMPTION

## DATA CENTER / ACCESS POINT / DEVICE?

### Measure

### Analyze

### Recommend

### Implement

Internet traffic: 16.9

Colombia 73

Argentina 124

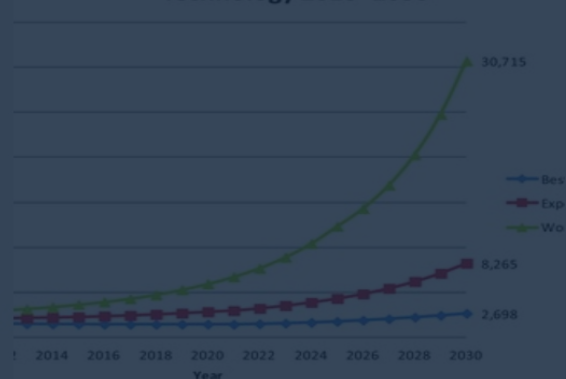
Egypt 153

250

156

286

### Electricity footprint (TWh) of Communication Technology 2010–2030

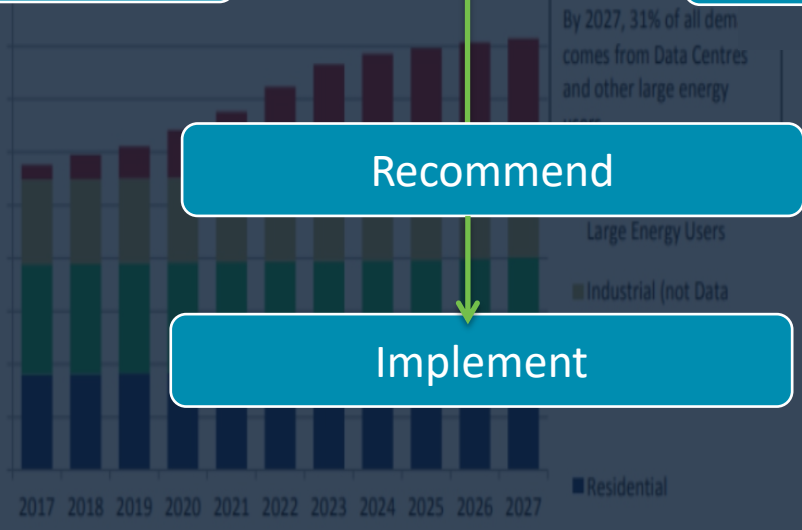


### Modelling the power consumption and trade-offs of virtualised cloud radio access networks

Road S. Alhamalma<sup>1</sup>, H.S. Al-Rawashdy<sup>1\*</sup>

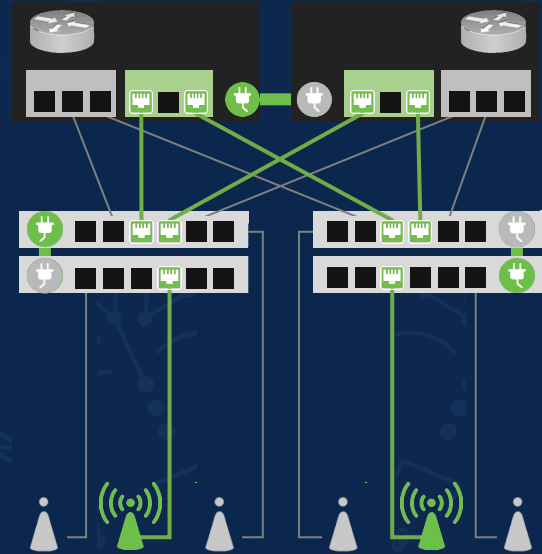
**Abstract:** In large-scale computing centres, the advancement of knowledge in regard to the predicted power consumption and control of base stations that run virtual machines (VMs) could improve the capacity planning and reduced the energy efficiency (EE) in 5G networks. Mobile operators and equipment suppliers are providing increasingly small reference models (RM) [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [38], [39], [40], [41], [42], [43], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83], [84], [85], [86], [87], [88], [89], [90], [91], [92], [93], [94], [95], [96], [97], [98], [99], [100].

**1 Introduction**  
There is the need to provide at least two times higher spectral and energy efficiency (EE) in 5G networks. Mobile operators and equipment suppliers are providing increasingly small reference models (RM) [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [38], [39], [40], [41], [42], [43], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83], [84], [85], [86], [87], [88], [89], [90], [91], [92], [93], [94], [95], [96], [97], [98], [99], [100].



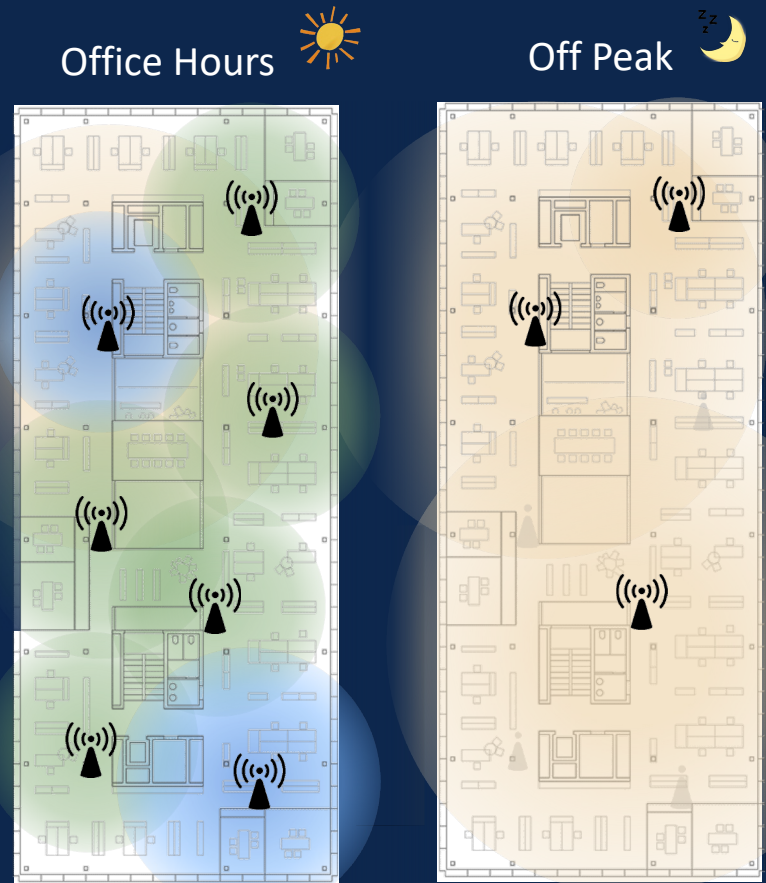
# Energy Proportional Networks

- To meet stringent application SLAs, today's network remains fully powered
- Network Controllers can predict upcoming demand and can selectively depower capacity while maintaining all SLAs



# Access Point (AP) Selective Depowering

Power down APs /adjust frequencies to meet demand







## MEASURE

### Device



Location: Stockholm

ASR1k

Role: Edge

Power usage : 1770 W

Co2 emission: 1575 CO2e

Infrastructure : Data Center

Power usage: 17k W

Co2 emission

(extrapolated) : 7k CO2e









### Recommend

**SELECTIVE DEPOWERING OF INTF BASED ON TIME (P0) :**

Device: details: {},

**TRAFFIC POLICY (P1):**  
[Device: details: {Prioritize links }],

**MIGRATION (consider):** [Device: details: {}],

### Implementation

- ### Impact
- ✓ Low Energy Consumption
  - ✓ \$\$ Saved
  - ✓ Reduced CO2 Emission
  - ✓ Efficient Network

NSO

Cisco Crosswork Network Automation

# Surfer's App Journey



Recommendations

Improve Surfer performance

Sustainable Recommendation



# Surfer's App Journey



Recommendations

Improve Surfer performance

Sustainable Recommendation



# 3. Network Virtualization

# Why have a cloud network setup in SP ?



Utilization



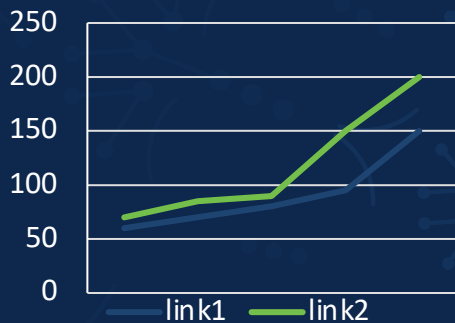
Utilization



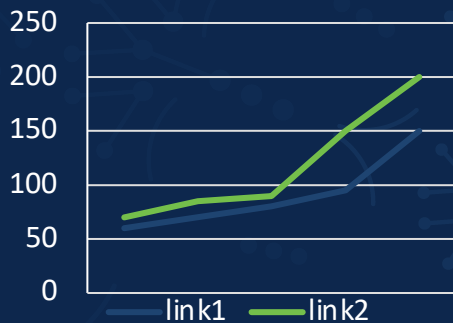
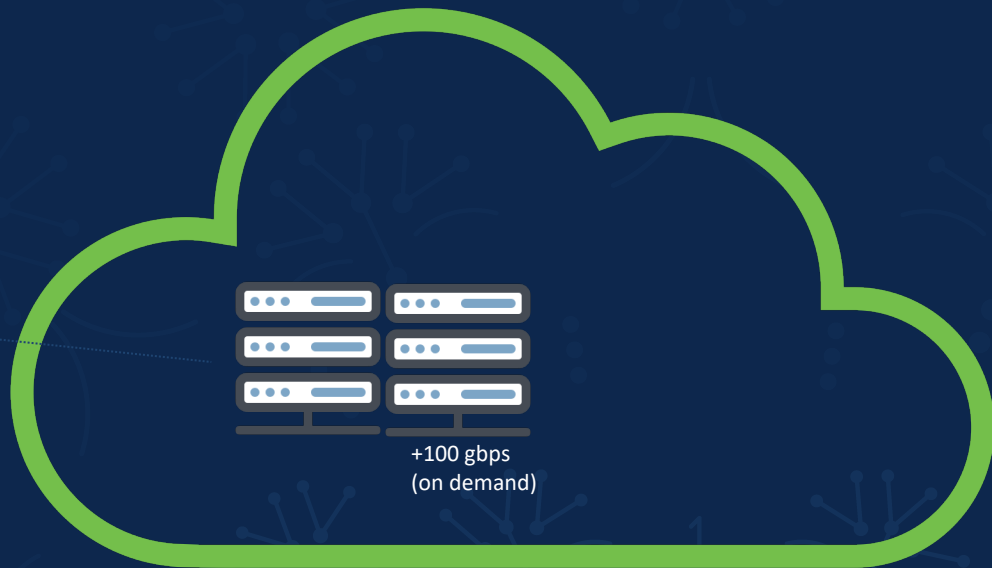
Fixed capacity: 100 gbps



# Why have a cloud network setup in SP ?

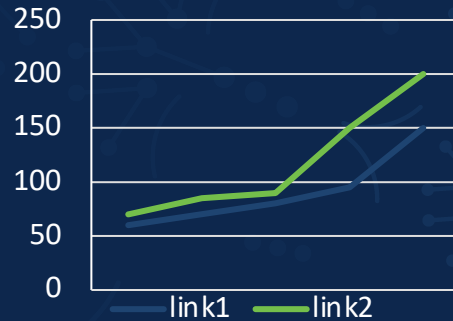
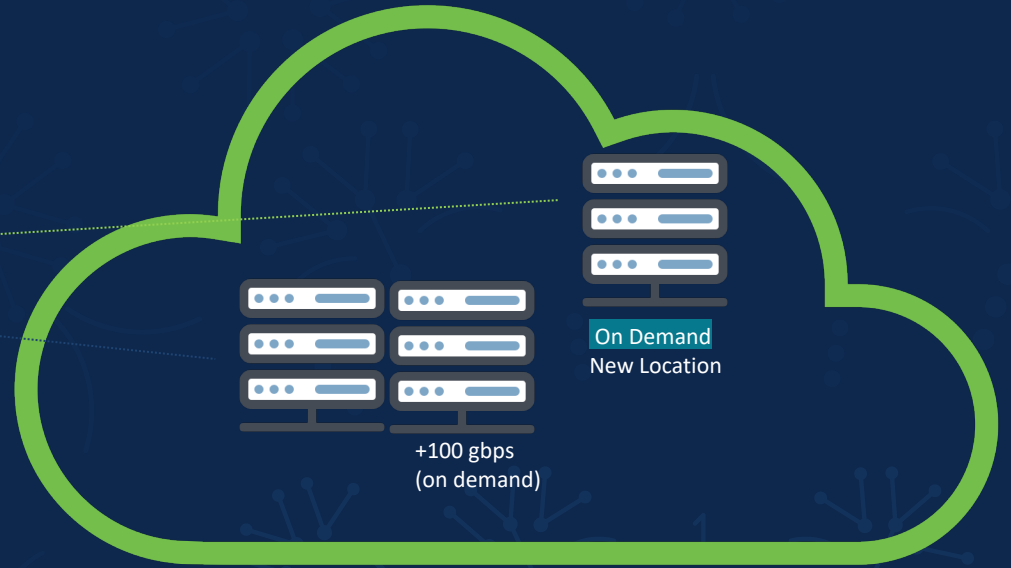


# Why have a cloud network setup in SP ?

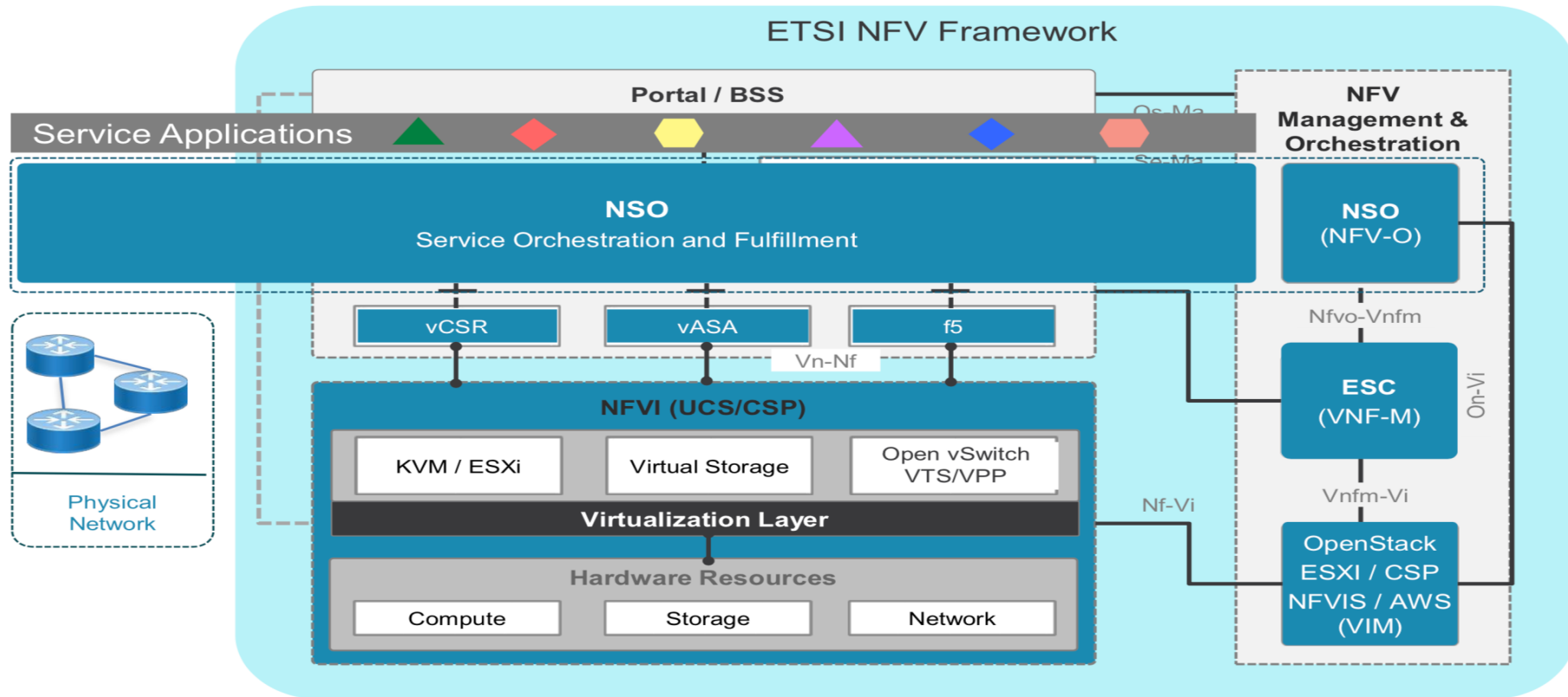




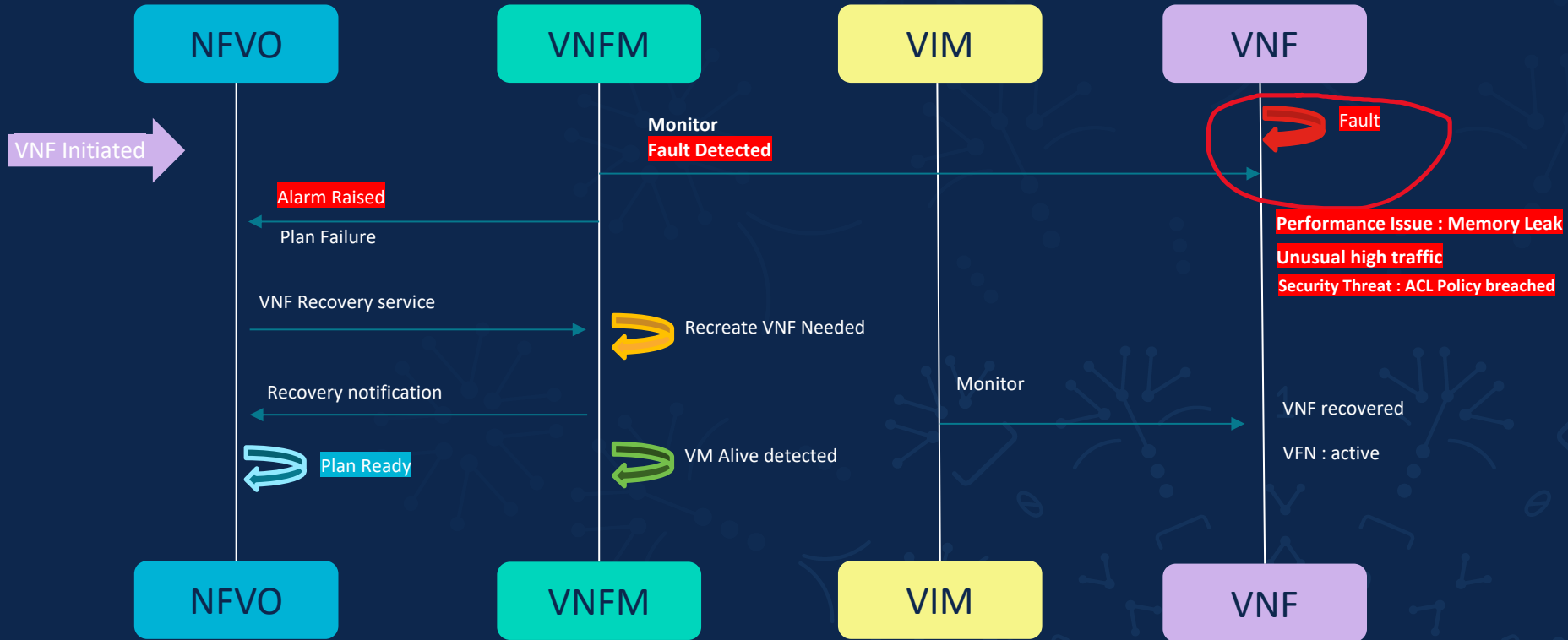
# Why have a cloud network setup in SP ?



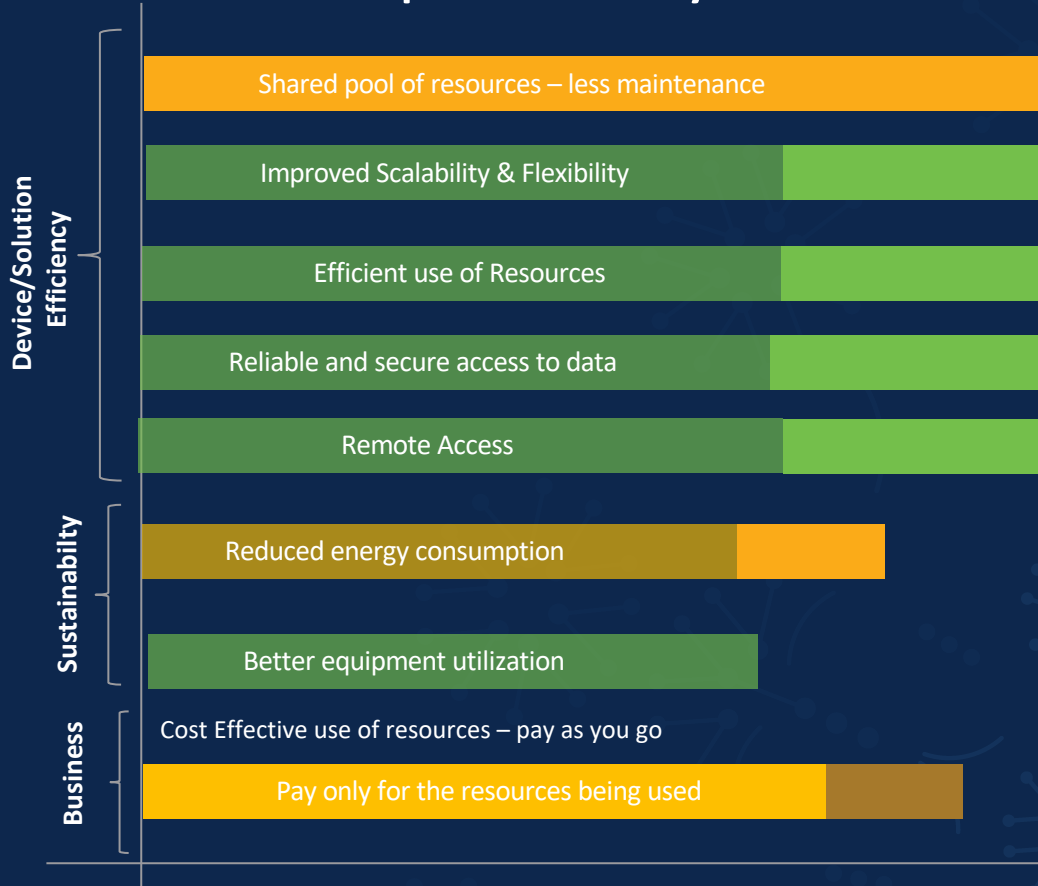
# NFVO Solution Architecture



# NFVO Solution Architecture

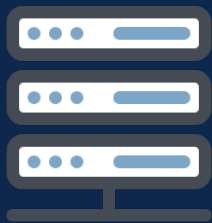


# Potential Impact Analysis



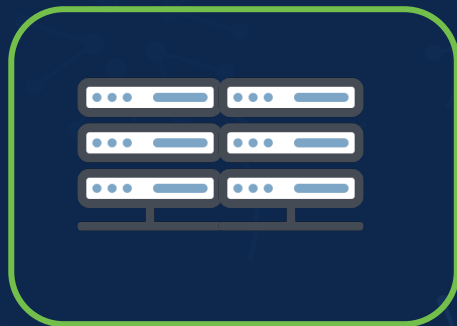
# 4. Containerization

# The network function landscape is changing – Memory Lane



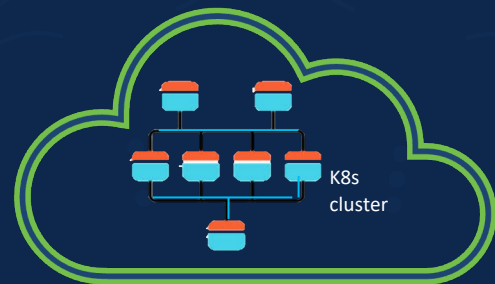
Physical Devices

Physical Network Functions  
(PNFs)



Virtual Machines

Virtual Network Functions  
(VNFs)

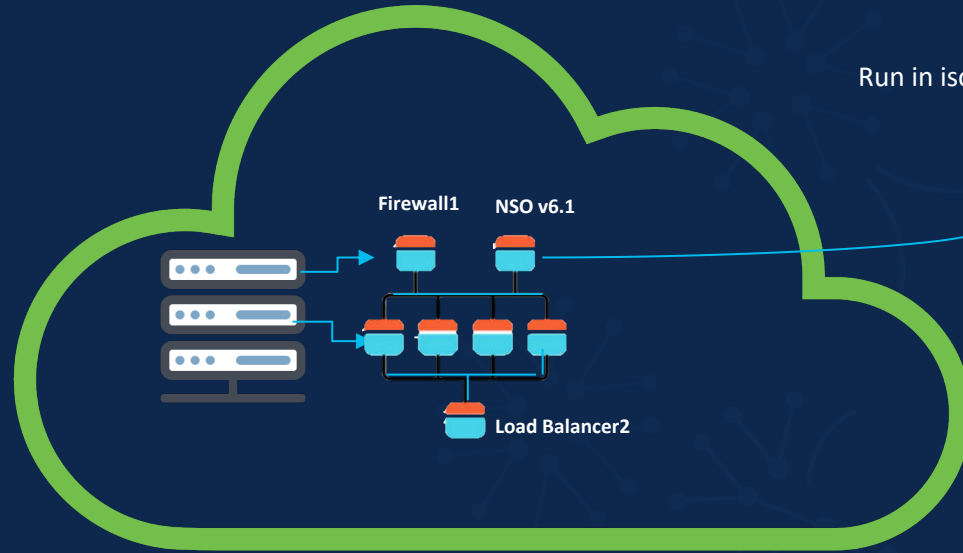


Containers

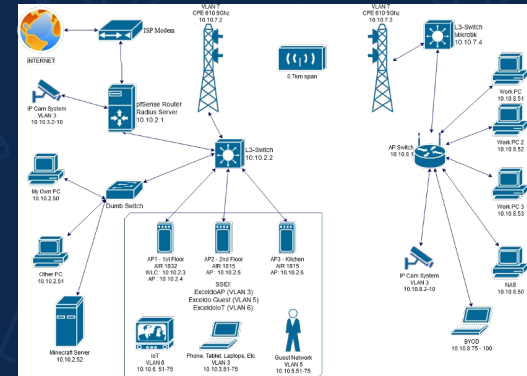
Cloud-Native Network  
Functions (CNFs)

# Why think about containerization of Apps?

Run in isolated user environments.

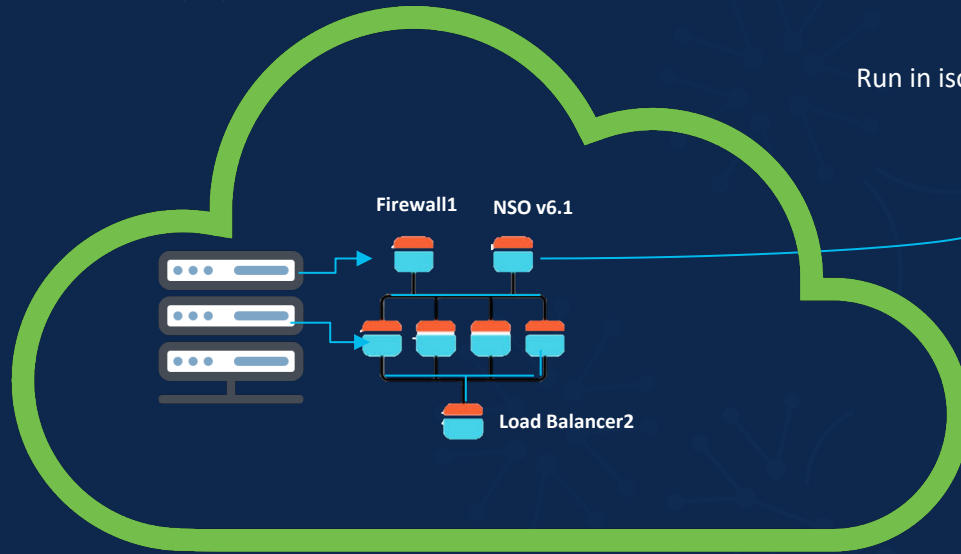


SP

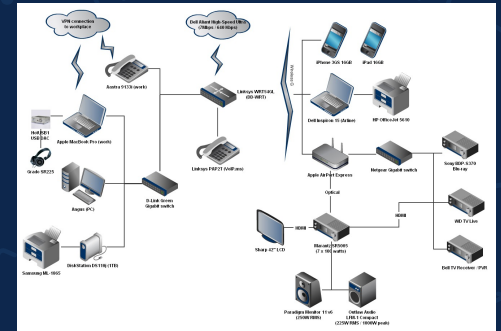


# Why think about containerization of Apps?

Run in isolated user environments.

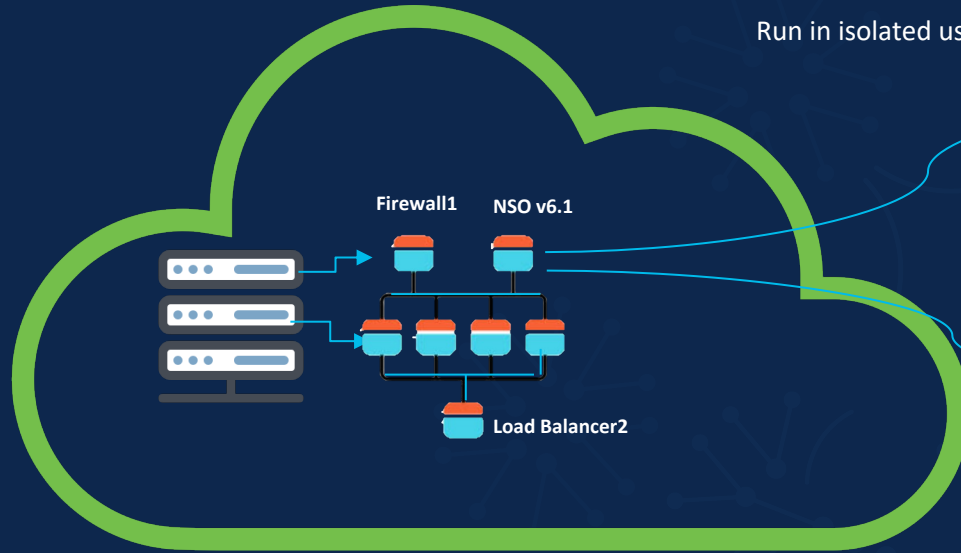


Instructor Training Center

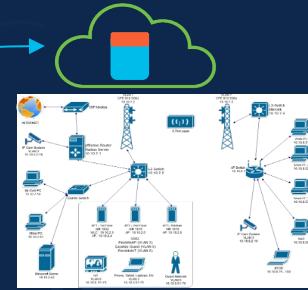




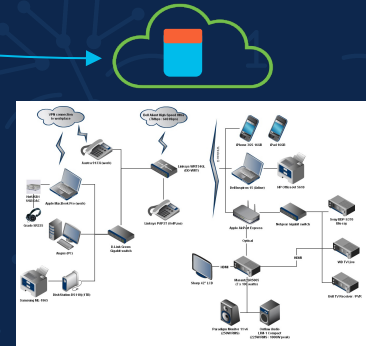
# Why think about containerization of Apps?



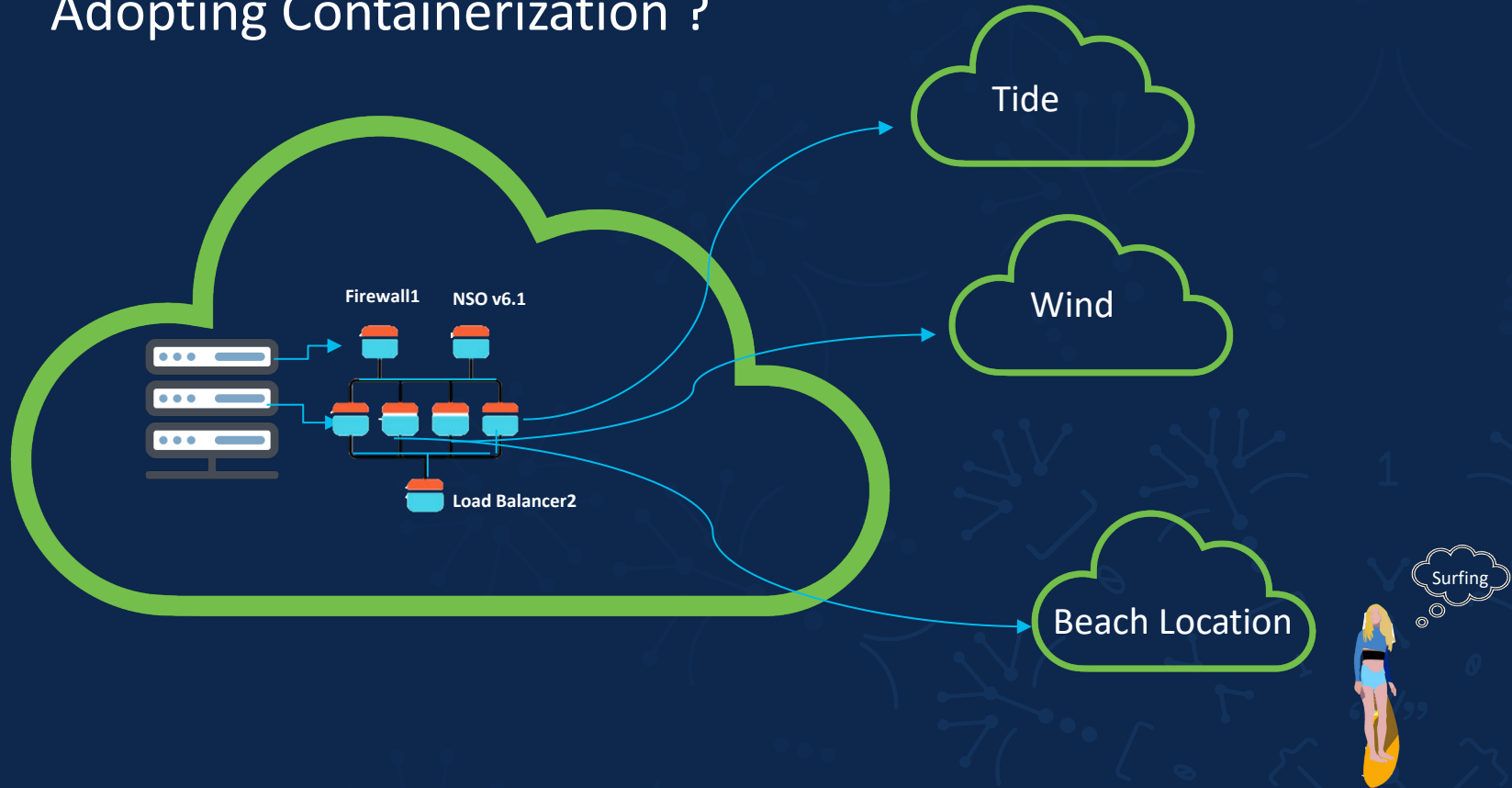
Run in isolated user environments.



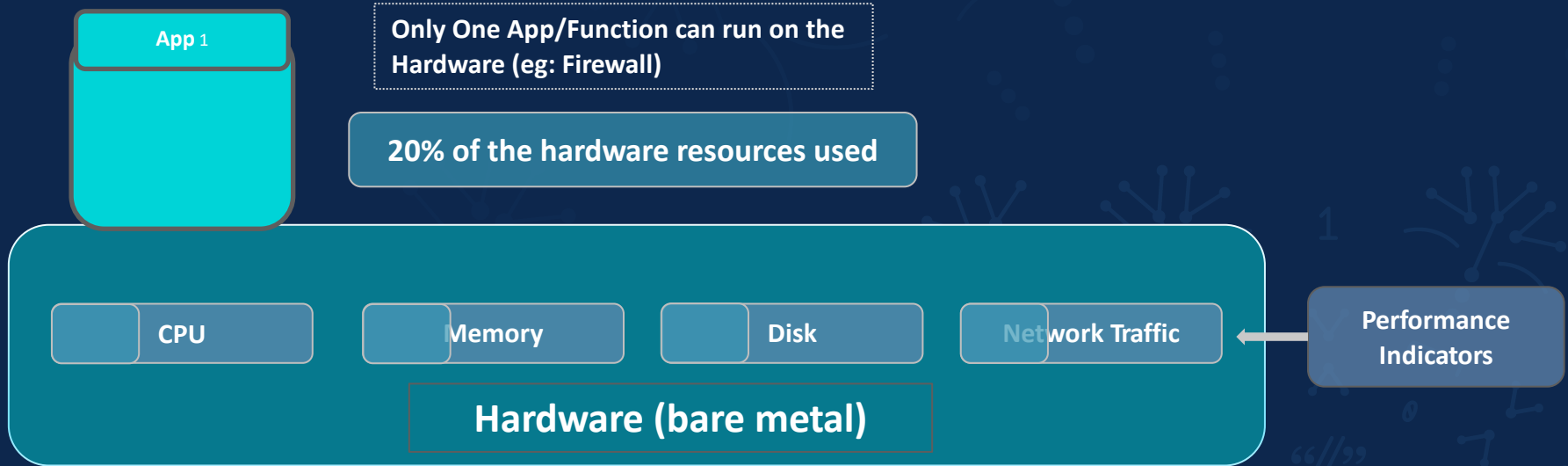
Environment agnostics



# Why Leading Companies Are Adopting Containerization ?

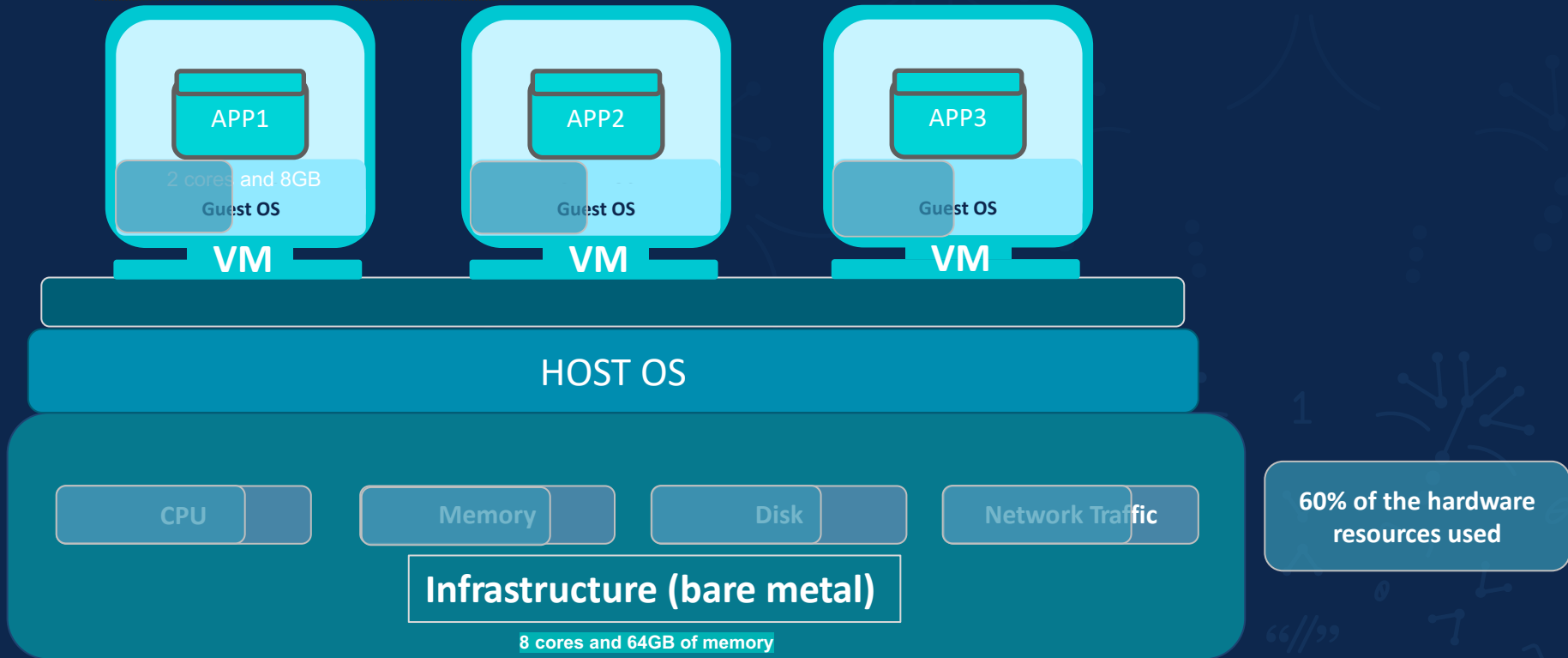


# Memory Lane : Application on Hardware Days ...



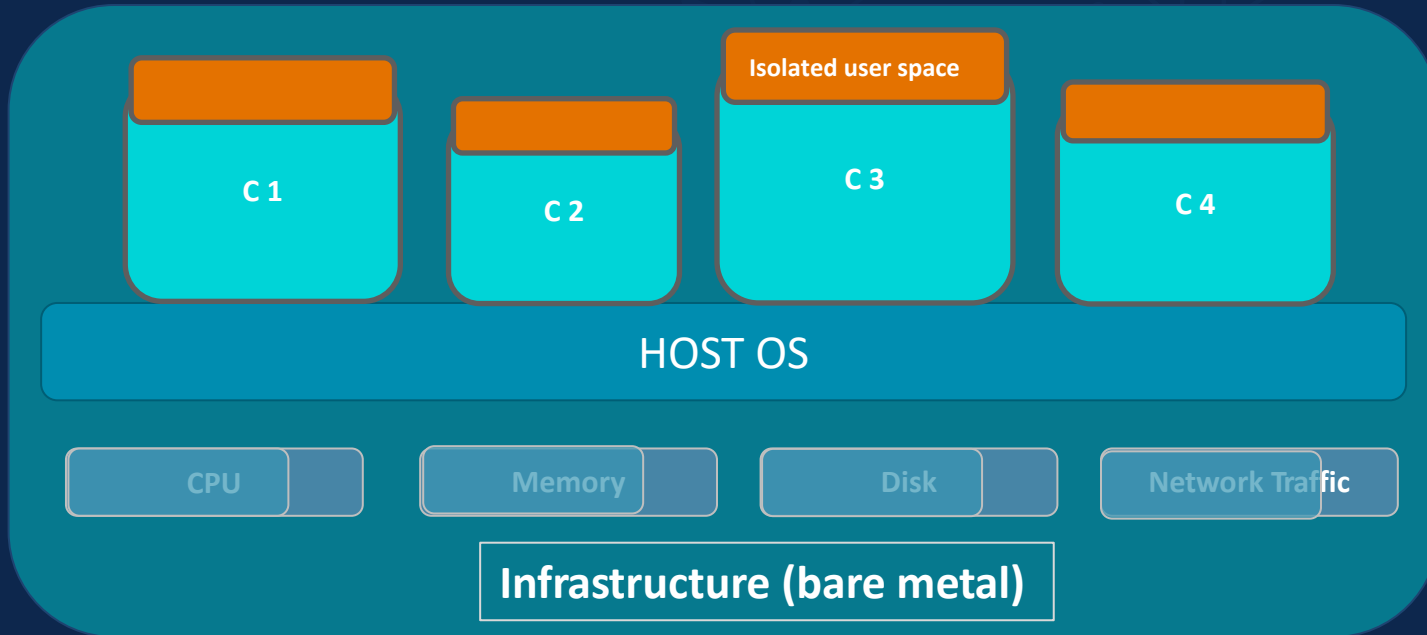
# Memory Lane : Application on Virtual Machine

1 App/Function can run on one VM



# Memory Lane : Containers on BareMetal

The Hardware can now run many Applications/Functions



Containers run as processes with access to the host's kernel

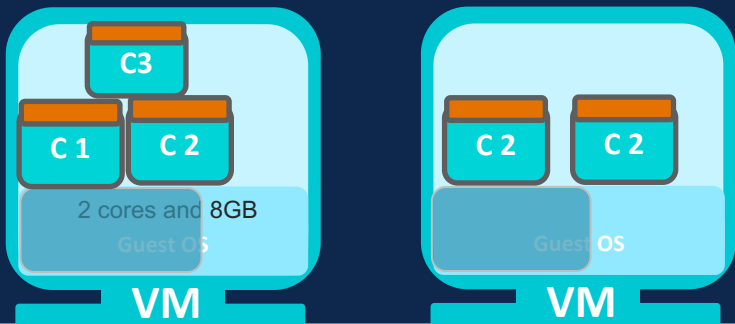
80% of the hardware resources used

# Impact Analysis: Containers



# Memory Lane : Containers on VM

Many App/Function can run on one VM



Use of containers can reduce the number of VMs required to run a given workload



HOST OS

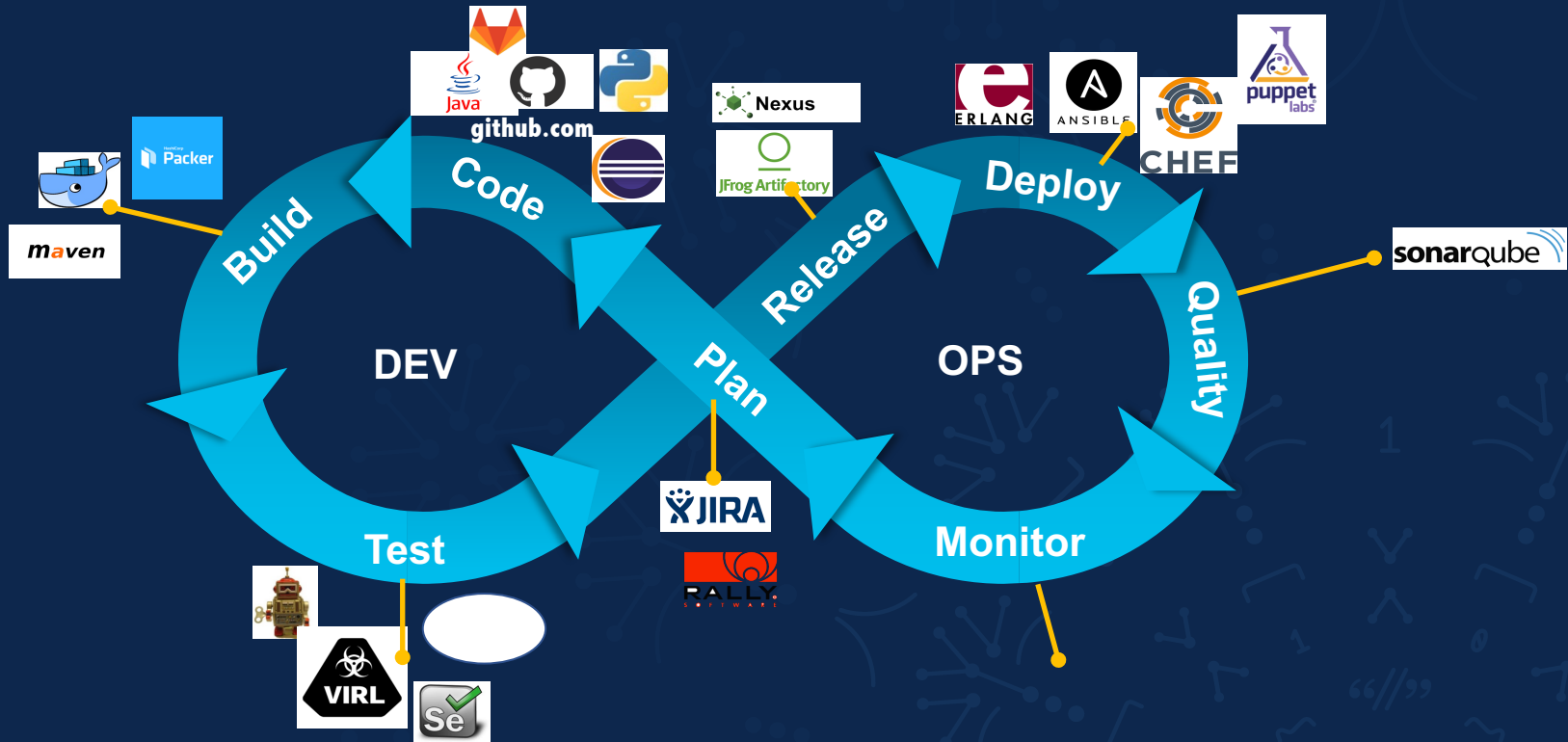


Infrastructure (bare metal)

8 cores and 64GB of memory

hardware resources used less than 4 VMs

# DevOps Race Track





# Automation Use Cases Examples

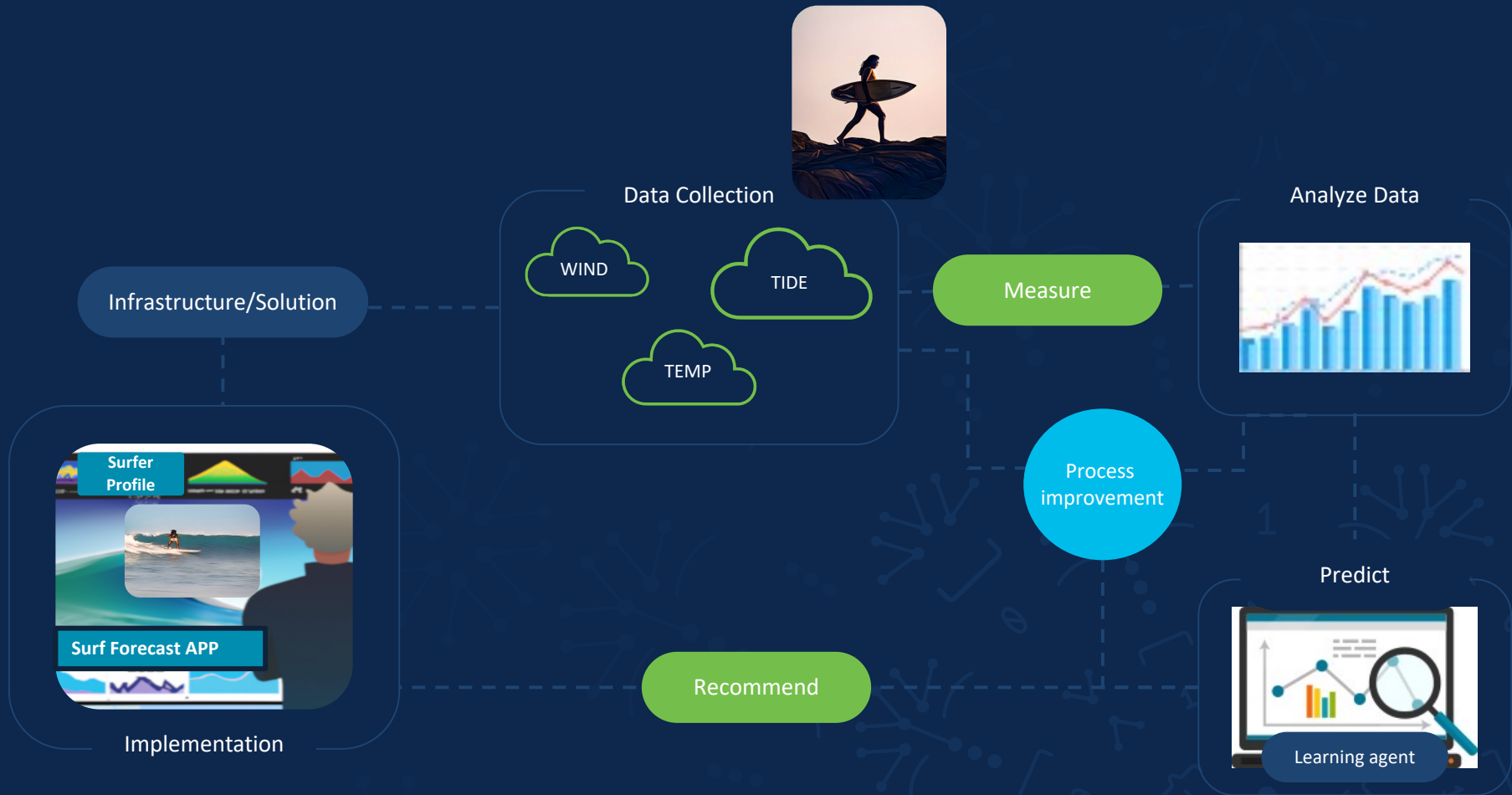
ZERO TOUCH  
PROVISIONING

AUTO CAPACITY  
MANAGEMENT

CELL SITE MIGRATION &  
PROVISIONING

DEVICE & TRAFFIC  
OPTIMIZATION

Your Usecase  
Idea?



Data Collection



Measure

Analyze Data



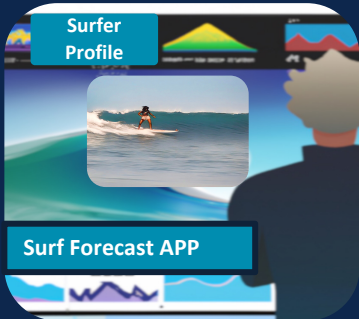
Process improvement

Predict



Recommend

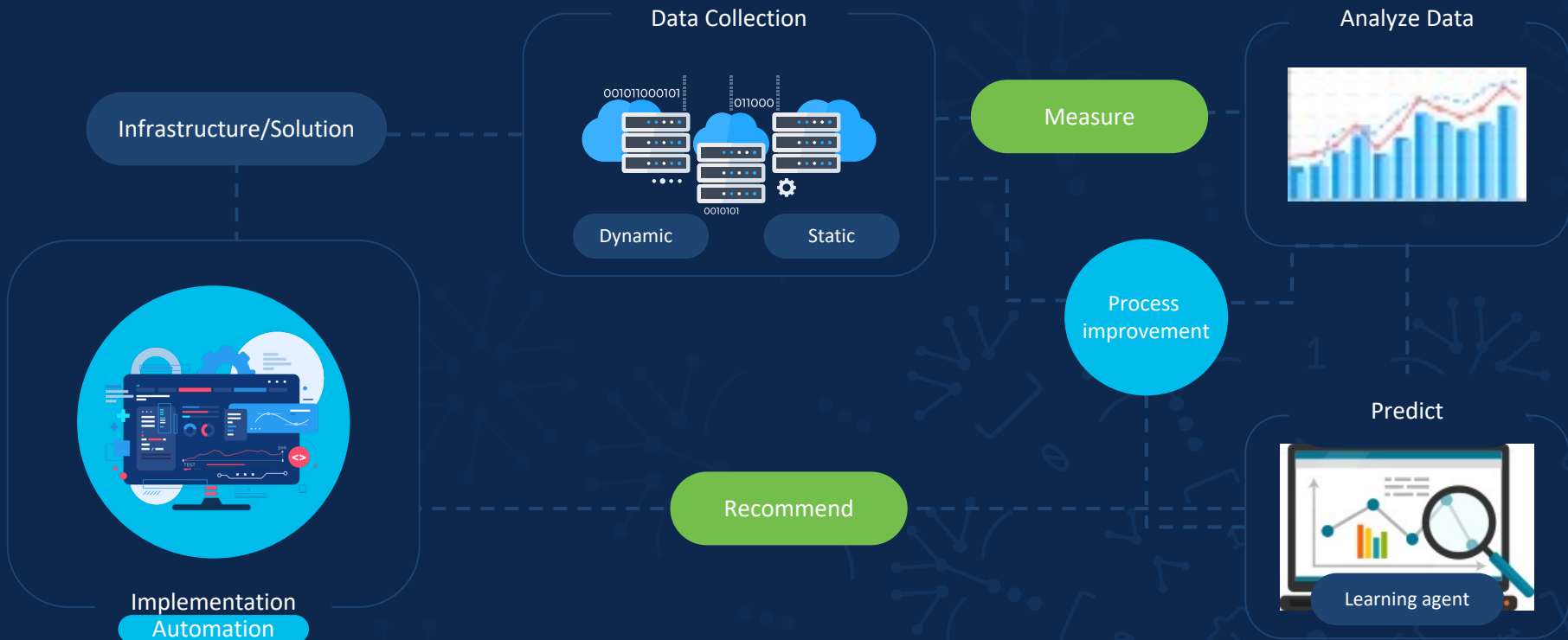
Infrastructure/Solution



Implementation

# Driving Sustainability

## Network Automation Closed Loop Architecture



# Call To Action

1. Are you measuring your Solution/Infrastructure's Sustainability KPI?
2. It's in the design and the details. Along with Performance, include sustainability parameters in your architectural design from day 0
3. Do you want to collaborate with us on ideas?



The bridge to possible