

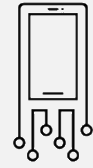
Welcome!

The webinar will begin in just a moment. If you have any questions, please use the raise hand or chat function.

There will be an open discussion at the end of the presentation.



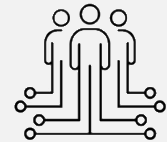
# The evolution and benefits of IoT, SDN, and Edge Computing



**APPLICATION  
TRANSFORMATION**



**IT  
TRANSFORMATION**



**WORKFORCE  
TRANSFORMATION**

# IoT AND EDGE COMPUTING

## Emerging Technologies

- ~ 10 – 22 Billion Smart devices by 2020 – 2025
- ~ Smart devices generate 500 ZB / year
- ~ Edge computing market will reach \$3.24 billion by 2025



Community presentation



**Bas Evers**

Director Emerging Technologies  
Radiant Digital

Bas Evers is a director of system engineering and software architecture at Radiant Digital, where he creates a vision for emerging technologies such as 5G, IoT, SDN, and Edge Computing.

Since 2001, Bas has been a pioneer and early adopter in the world of IoT, combining hardware, software and digital art into smart advertising, PoS & PoP, and retail displays.



## INTRODUCTION

- ~ 10 – 22 Billion Smart devices 2020 - 2025 [1]
- ~ Smart devices generate 500 ZB / year [2]
- ~ Tactile Internet the next evolution of the IoT
- ~ The global edge computing market will reach \$3.24 billion by 2025 [3]
- ~ IoT big data streams are transmitted to the cloud in high volume and at fast velocity, it's necessary to design an efficient data processing architecture to explore the valuable information in real time
- ~ User privacy remains a challenge; in order to obtain services and benefits, users should share their sensed data with IoT service providers, and these sensed data may contain users' personal information. It's critical to design a data sharing framework so that users can acquire IoT services while their privacy is guaranteed

[POLL #1]

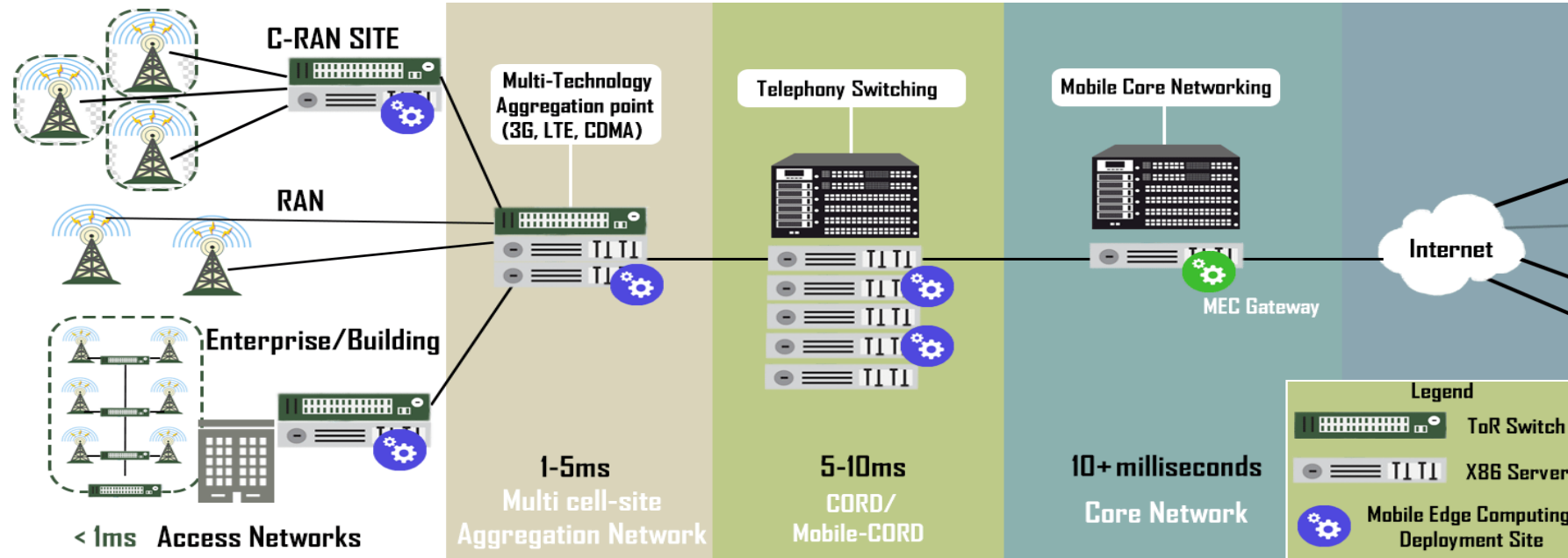
# POLL RESULTS FROM Q4 2019 – FOR COMPARISON

## What is the current level of IoT deployment in your own organization?

- Are you fully deployed (~25%)
- Are you currently rolling it out (~30%)
- Are you in the planning stage (~40%)
- Nothing planned at this time (~5%)

# WHY EDGE COMPUTING

- ~ Improved Latency
- ~ Increased Real Time Performance
- ~ Better Scalable



# MOTIVATING FACTORS FOR USING EDGE COMPUTING



## Preserve Privacy

Data captured by IoT devices can contain sensitive or private information, e.g., GPS data, streams from cameras, or microphones



## Reduce Latency

The power and flexibility of Cloud computing has enabled many scenarios that were impossible before.



## Be Robust To Connectivity Issues

Designing applications to run part of the computation directly on the Edge not only reduces latency, but potentially ensures that applications are not disrupted in case of limited or intermittent network connectivity.



## SDN & IOT TRANSFORMATION

With the rapid development of mobile Internet and the Internet of Things, 5G services have presented diversified features. 3GPP has defined four 5G application use -cases:

- ~ eMBB (Enhanced Mobile Broadband)
- ~ uRLLC (Ultra Reliable Low Latency Communication)
- ~ mMTC (Massive Machine Type Communication)



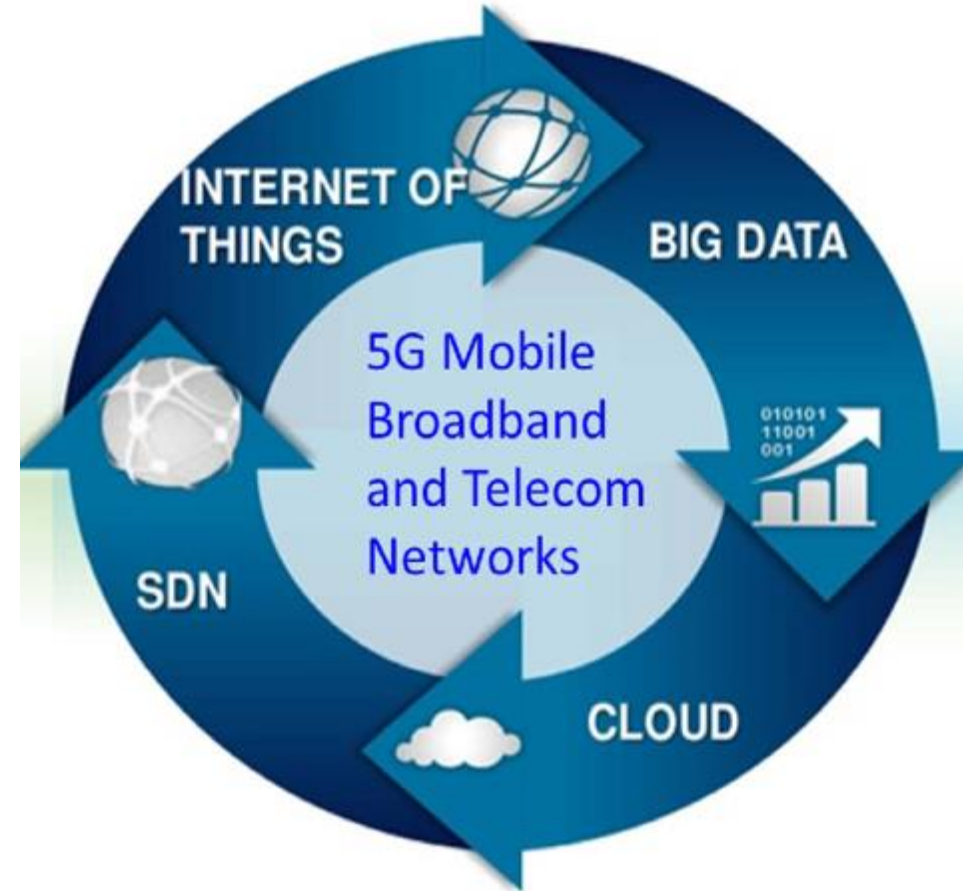
# IOT EDGE COMPUTING & SDN

## SDN enables IoT

- Joe Byrne at Freescale, says: “There’s not a dependency, but SDN can be beneficial for IoT.”

## IoT drives SDN

- Stu Bailey, founder and CTO at Infoblox, says, “The Internet of Things is a major driver for SDN. If you just have a lot of things, then the most important inhibitor is complexity. The only material that we have to combat an increasing complexity in IT systems is software. There won’t be an Internet of Things without software-defined networks.”



# HISTORY SDN

## Telephony

### Inband signaling

Data and control information send over the same channel  
(insecure)

### Rotary Dial System (1891)

### Touch-Tone (Bell Labs 1984)



# HISTORY SDN

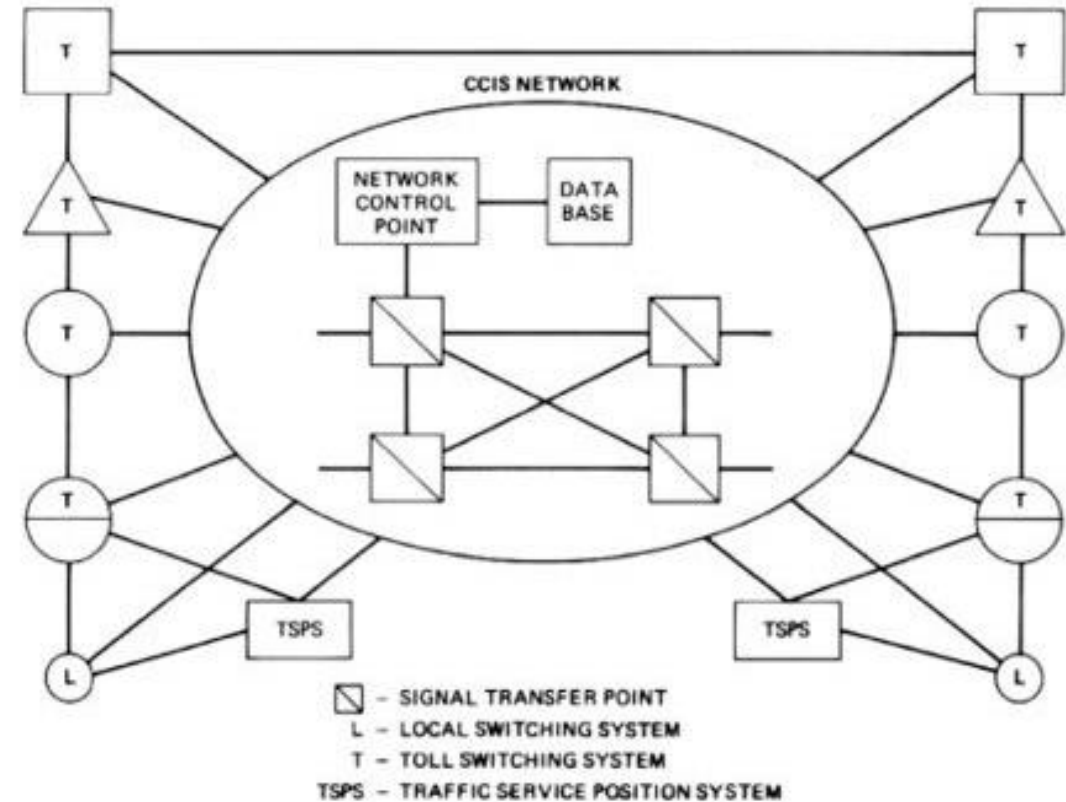
## Central Network Control

### Network Control Point (1980's)

### Separation of data and control signals

### Enabling Services

- ~ Alternative Billing Services (ABS)
- ~ Private Virtual Networks (PVN)
- ~ SMS
- ~ Follow Me
- ~ 800 numbers
- ~ Calling Cards



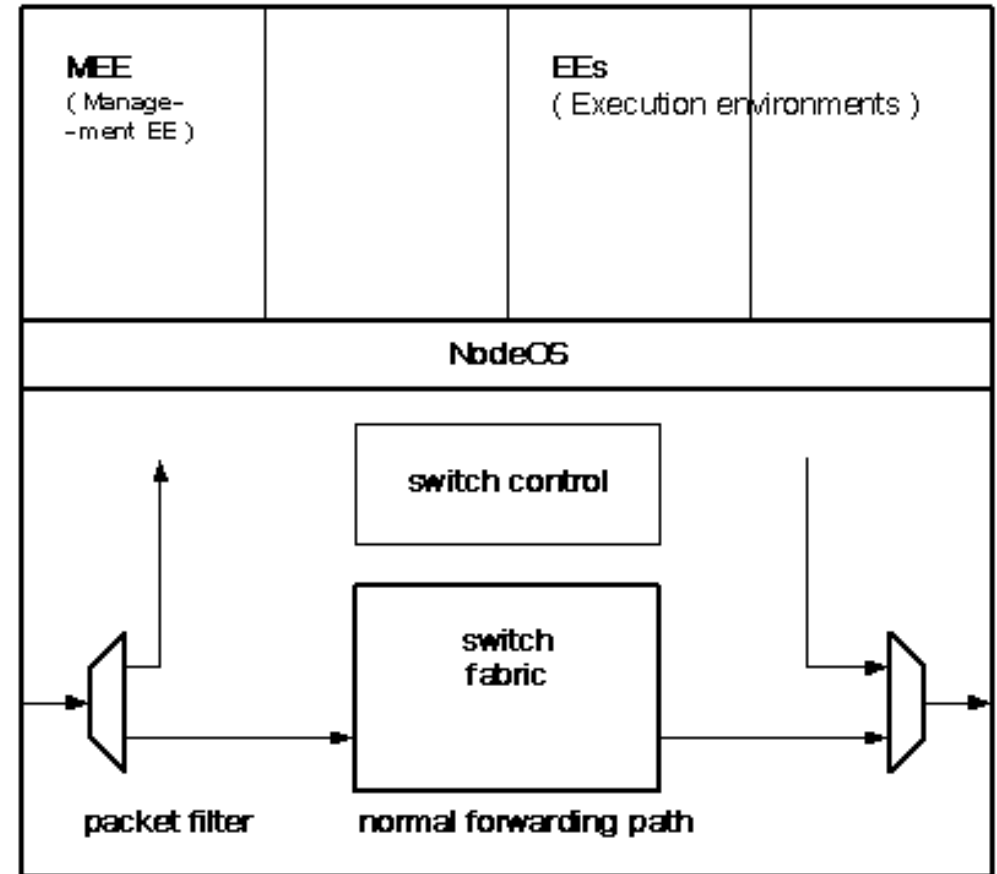
# HISTORY SDN

## Programmability In Networks

### Active Networks (1990's)

An active network is a network in which the nodes are programmed to perform custom operations on the messages that pass through the node.

### Deep Packet Inspection (DPI)



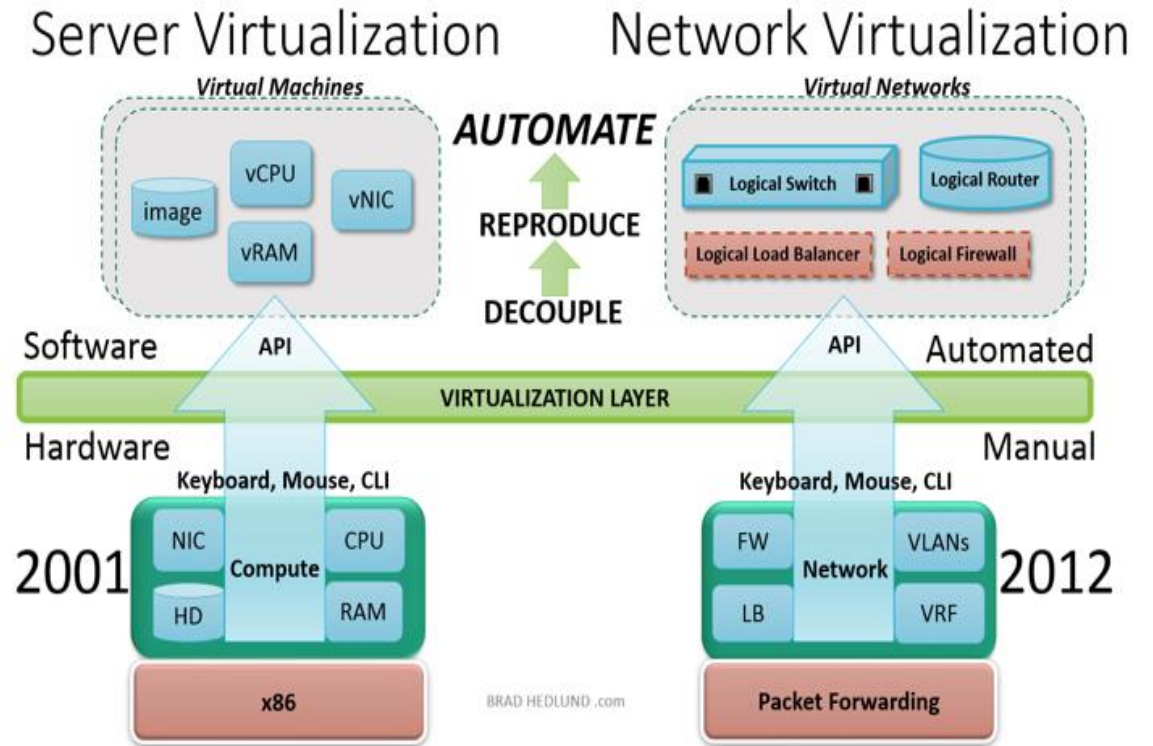
# HISTORY SDN

## NETWORK VIRTUALIZATION

Switchlets, XEN, VINI (1990's)

SDN separates the control and data planes to enable centralized control, allow automation, and to create a programmable network. NFV virtualizes the components of the network and SDN centralizes the control of those components.

[POLL #2]



# POLL RESULTS FROM Q4 2019

## OVERALL EXPERIENCE IS NOT SIMPLE

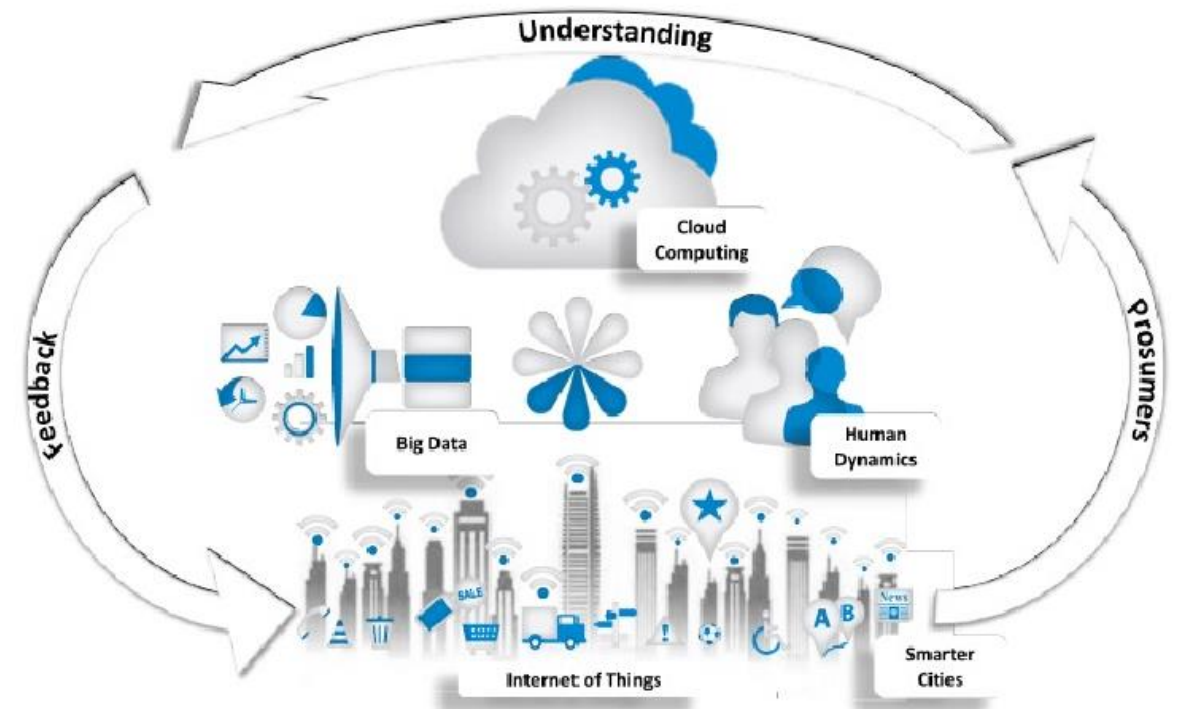
- 30% - High Failure  
Between 50 – 100% projects failed in trail/POC
- 31% - Moderate Failure  
Between 25 – 49% projects failed in trail/POC
- 32% - Low Failure  
Between 1 – 24% projects failed in trail/POC
- 7% - Low Failure  
0% projects failed in trail/POC

# IOT ECOSYSTEM

In a typical IoT ecosystem, end-user components like smart devices, sensors, third party components are connected to the compute engines or cloud instances through the internet or intranet.

## Modules of the IoT ecosystems:

- ~ Sensing and embedding components
- ~ Connectivity Layer
  - Protocols
  - Gateway
- ~ Analytics Layer
- ~ Data Management Layer
- ~ Edge IT
- ~ End Components





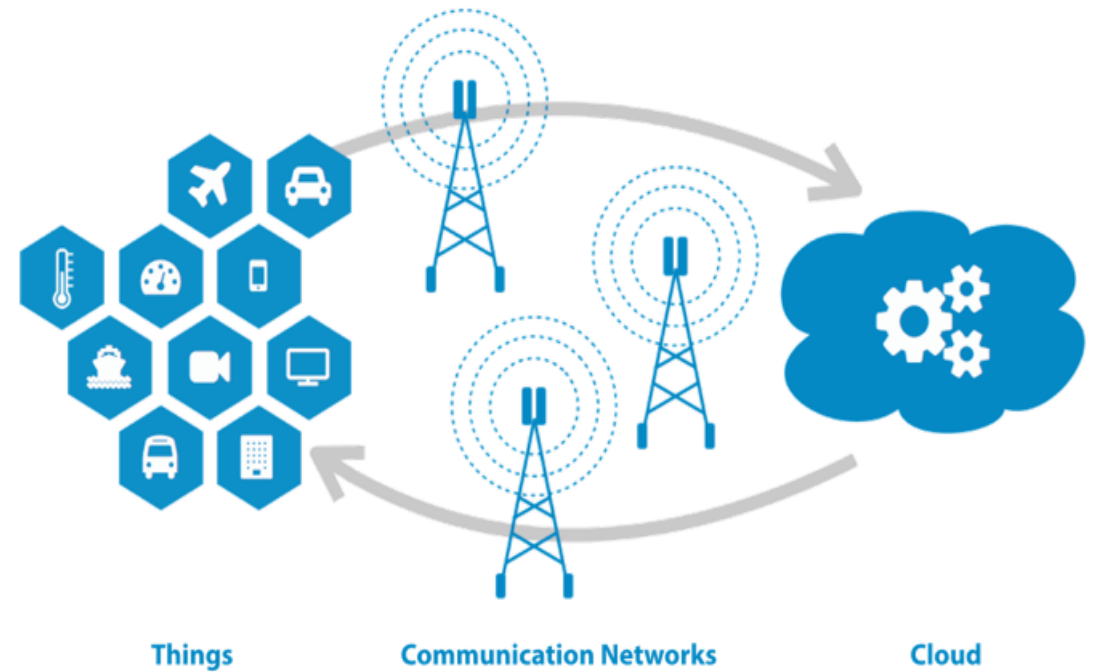
## WHAT IS CLOUD COMPUTING

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet.



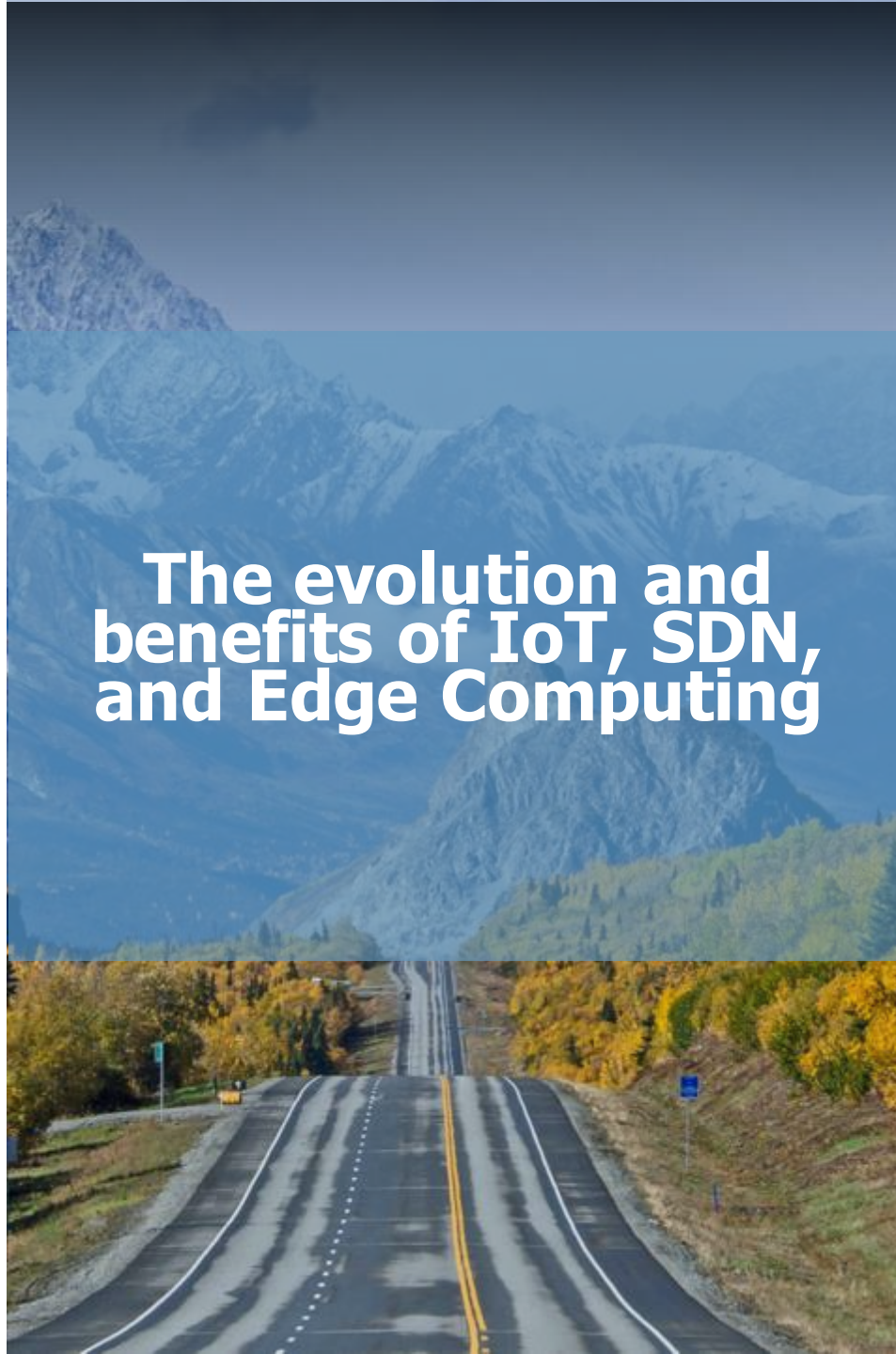
# WHAT IS EDGE COMPUTING

Edge computing is a distributed computing paradigm which brings computation and data storage closer to the location where it is needed, to improve response times and save bandwidth.

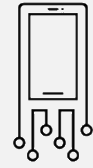


Thank you!

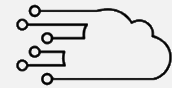
Q&A



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