



# Spica Mobility Core

*(A Cloud Native 5G Packet Core and UE/RAN Emulator for Private 5G Network)*

## Path To Private 5G

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Spica Systems  
San Jose, California

# Enterprise(Private) 5G Network

- ✓ 5G promises to deliver faster download speeds, lower latency and higher capacity, Table Below.

Table 1. Data Speeds for 3G, 4G and 5G.

Network Type	Average Download Speeds	Peak Download Speeds	Theoretical Download Speeds
3G	8 Mbps	~20 Mbps	42 Mbps
4G	32.5 Mbps	90+ Mbps	300 Mbps
5G	130Mbps-240 Mbps	599 Mbps+	10-50 Gbps

Table 2. Comparison of 3G/4G and 5G latency times [1].

Network Type	Milliseconds (ms)
3G Network	60 ms (Typical)
4G Network	50 ms (Typical)
5G Network	1 ms (theoretical)

- ✓ A mobile private 5G network, as the name suggests, is a local area network that utilizes 5G technology as its communication medium to build and create a 'private' network.
- ✓ A private network that is created for an organization is expected to carry all the features of 5G public networks, including the reduced latency and higher speeds .

# Problem

Adoption of Private 5G has been slow because enterprises aren't equipped with the right tools to design, test and manage a cost efficient Private 5G network with adequate reliability, security and manageability.

**Private 5G Networks** provide the high performance and low latency requirements required for **reliable secure private networks** and **edge computing** use cases:

**50X  
Speed**

**1000X  
Capacity**

**< 10X  
Latency**

- **Mission critical apps** requiring strict data isolation, security & privacy
- **Service to service communications** outside range of public networks
- **Massive machine-type communications** (mMTC) to operate smart grids, industrial automation, remote surgeries, autonomous vehicles
- **Differentiated 5G services** such as network automation, analytics and slicing for blending AI & IoT at smart facilities

Source: [Private 5G: Its use in enterprises faces challenges](#), Network World



# Target Industry Segments

- **Utilities**
- **Oil and Gas**
- **Water/Wastewater Departments**
- **Mining Operations**
- **Universities & R&D Labs**
- **Defense & Other Federal Government Agencies**

# 5G Service Based Architecture

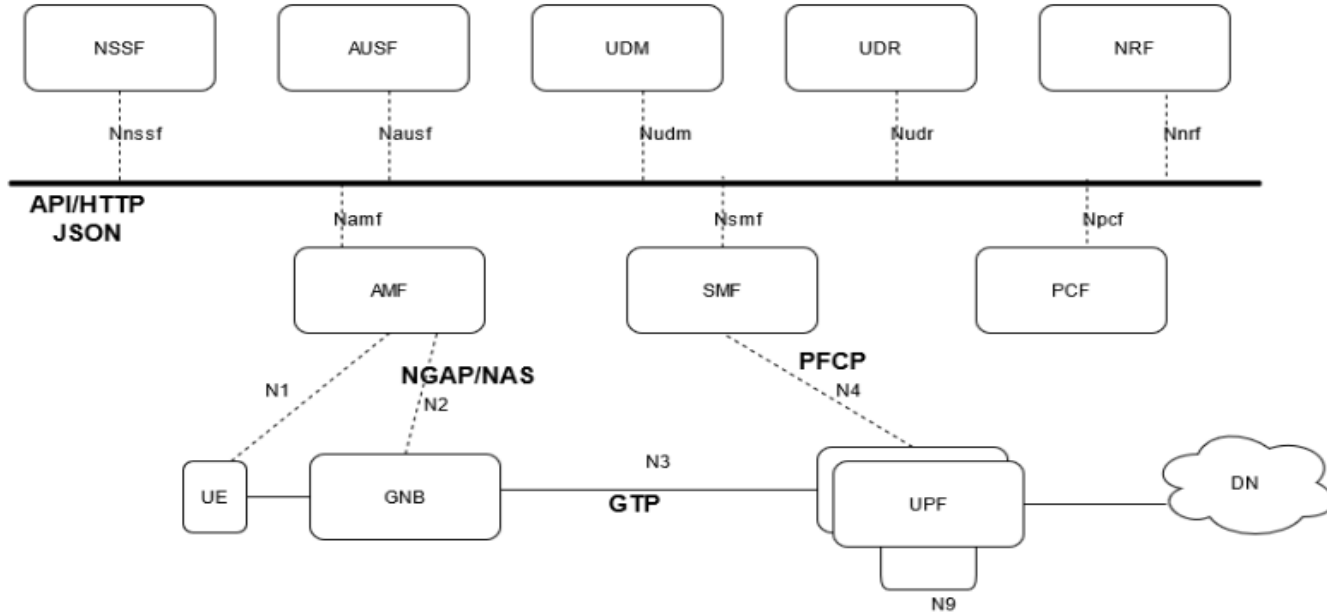


Figure: 5G Service Based Architecture



- ✓ Access & Mobility Functions (AMF).
- ✓ Session Management Function (SMF).
- ✓ User Plane Function (UPF).
- ✓ Policy Control Function (PCF).
- ✓ Authentication Server Function (AUSF).
- ✓ Unified Data Management Function (UDM).
- ✓ Network Exposure Function (NEF).
- ✓ Network Repository Function (NRF).
- ✓ Network Slice Selection Function (NSSF).

# Spica 5G Services & Their Roles

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Spica 5G-Core architecture consists of the following network functions:

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**Authentication Server Function (AUSF):** It acts as an authentication server and performs UE authentication.

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**Access and Mobility Management Function (AMF):** It is responsible for connection management, registration management. It also participates in the authentication and authorization.

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**Network Repository Function (NRF) :** It is responsible for service discovery for the other network functions and maintains the profiles of these instances of the network functions.

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**Network Slice Selection Function (NSSF):** This network function supports the selection of the network functions based on the slice information from a UE. The slice information comes as Network Slice Selection Assignment Information (NSSAI).

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**Policy Control Function (PCF):** This network function provides a policy framework and shares policy rules on the control plane and enforces them. It uses subscription information and the policies configured for the UE and enforces them.

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**Session Management Function (SMF):** It provides session management, UE IP address management, and traffic steering configuration for UPF for proper traffic routing.

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**Unified Data Management (UDM):** It provides authentication and key agreements credentials and subscription management functions.

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**Unified Data Repository (UDR):** It stores the subscription and policy information for a subscriber. This data is accessed by the UDM and the UDR.

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**Userplane Plane Function (UPF):** It provides packet routing and metering, traffic accounting functionality. It operates on rules configured from the SMF.

# Solution: SPICA Private 5G Cloud-Native Platform

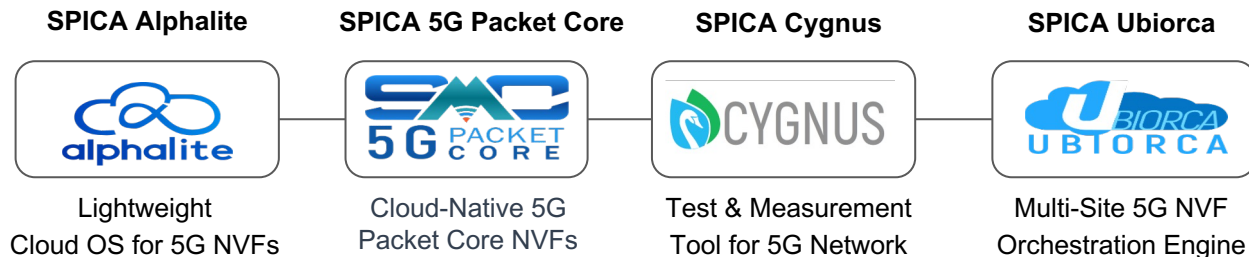
A complete suite of easy-to-use cloud native functions for designing and operating a Private 5G network with ultra-high-reliability and security.

- Lightweight private cloud OS platform for 5G NVFs to run on
- Collection of cloud native 5G virtual network functions (NVFs)
- Purpose-built test & measurement tool for 5G core infrastructure
- Multi-site federation engine for kubernetes managed 5G NVFs

## Key Features

- ✓ 3GPP R15 standards compliance
- ✓ High throughput user plane traffic
- ✓ Network slice selection function
- ✓ Runs in private and public cloud
- ✓ 5G Control & User Plane Monitoring

## SPICA Platform Components





The Proposed Enterprise 5G Solution from Spica Systems is defined to support data connectivity and services enabling deployments to use techniques such as:

**Network Function Virtualization and Software Defined Networking**

**Better Performance - Custom DPDK CNI (Container Network Interface)**

**Separate the User Plane (UP) functions from the Control Plane (CP) functions**

**Independent scalability and flexible deployments**

**Cloud Based Controller/Orchestration Engine or Controller on the Edge**

**High Performant Software**

**Cost Effective**

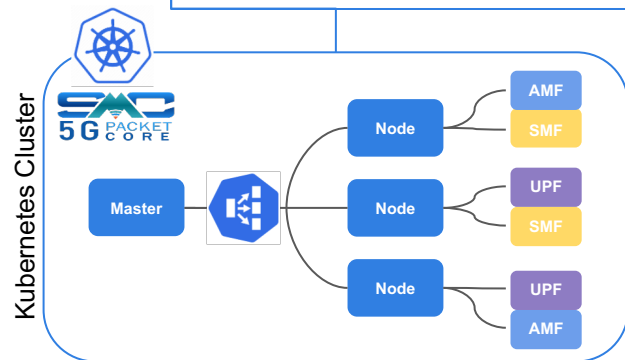
**Smaller Footprint to run on  
Embedded System**

**Excellent Team of Smart  
Engineers**



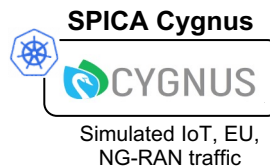
# How It Works - Deployment in Private/Public Cloud

**STEP 1:** Deploy a Private 5G Test Lab



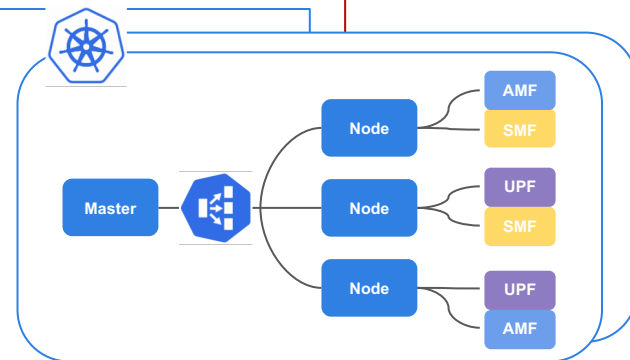
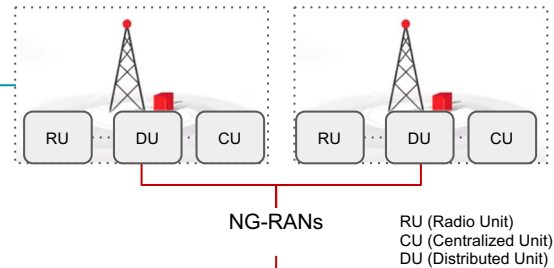
**SPICA Alphalite Lab Cluster(s)  
w/ 5G Packet Core NVF's**

**STEP 2:** Simulate real-world traffic, test performance and advanced features such as analytics, slicing, etc.



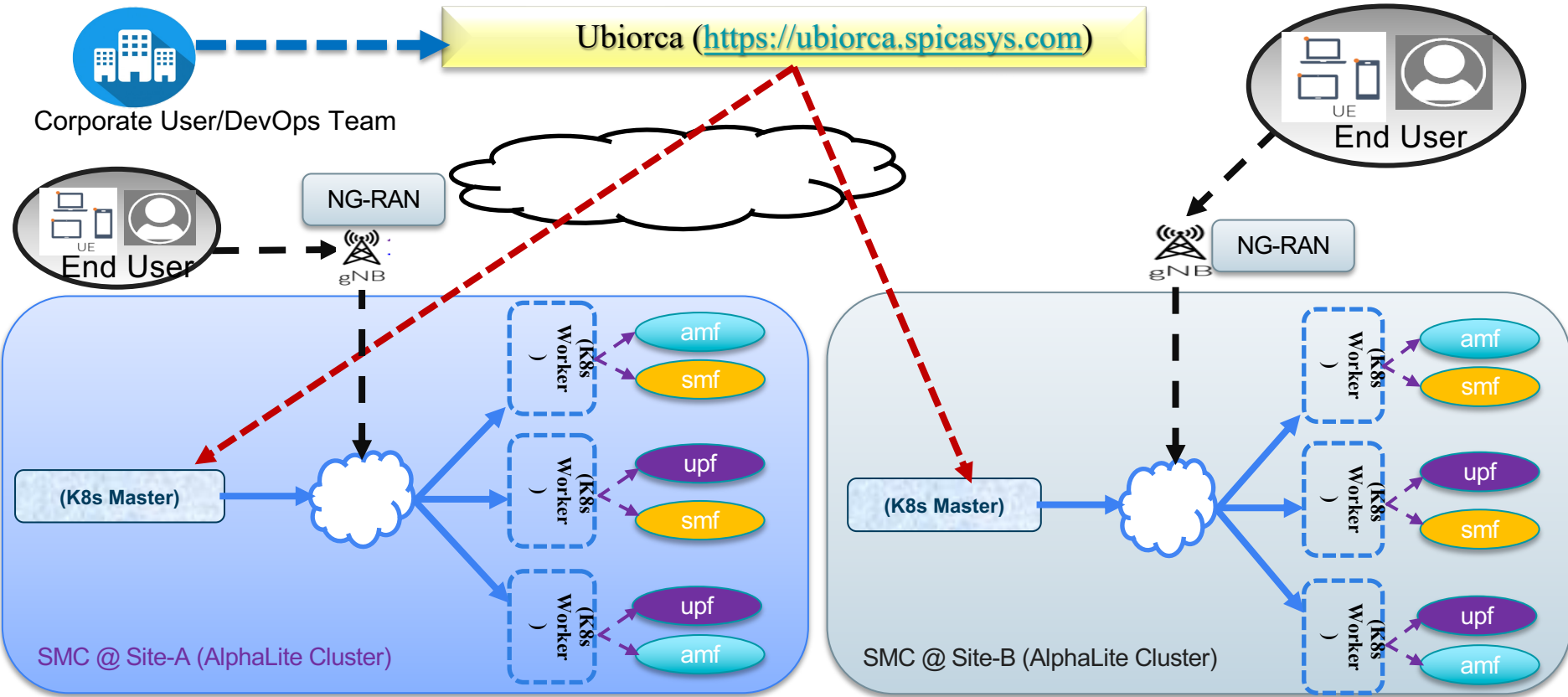
IoT, End-user  
devices (EU)

**STEP 3:** Commission NG-RANs & Production Clusters







**SPICA Alphalite Production  
Clusters**

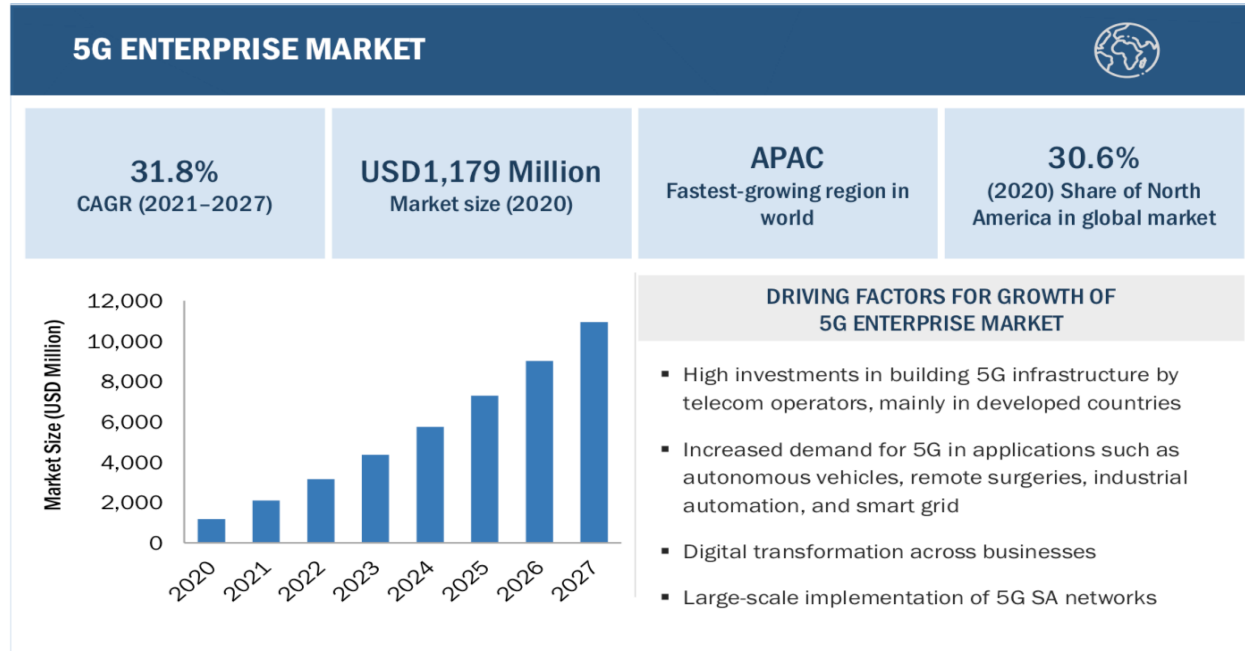
# SMC Multi-Site Deployment in Private/Public Cloud



# Competition vs Spica

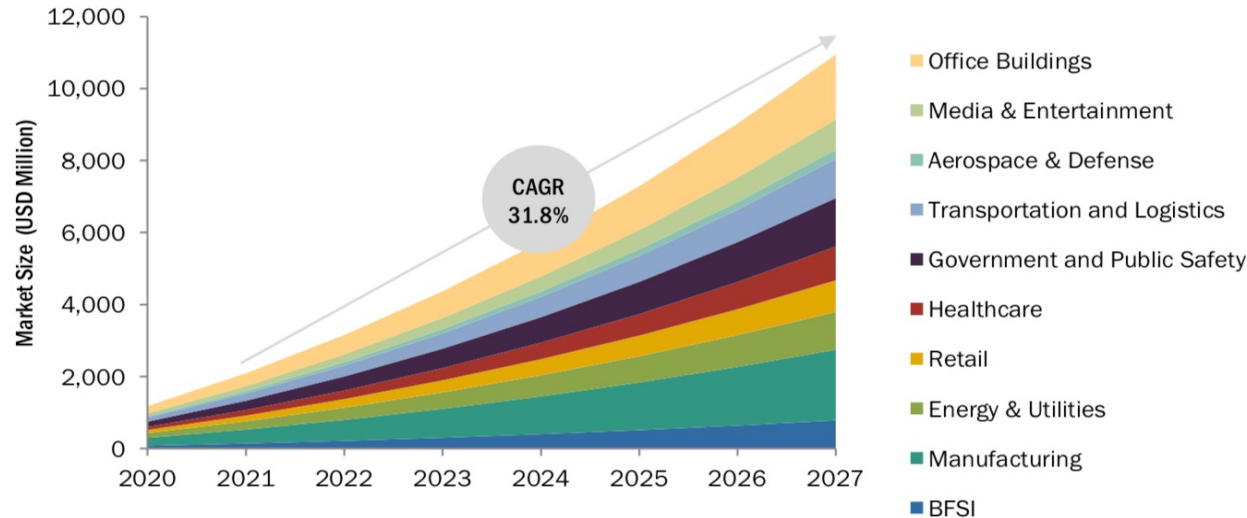
				
Cloud Native	●		●	●
Time to Deployment	DAYS	MONTHS		
User Endpoint (UE) & Radio Access Network (RAN) Simulation	●			
Custom CNI (Container Network Interface for Better Throughput)	●			
5G Network Monitoring, 5G SMS, Anti-Phishing	●			
Control & User Plane Separation (CUPS)	●	●	●	●
Curated Cloud OS for Private 5G Ecosystem	●			

# 5G Enterprise Market Growth Trend



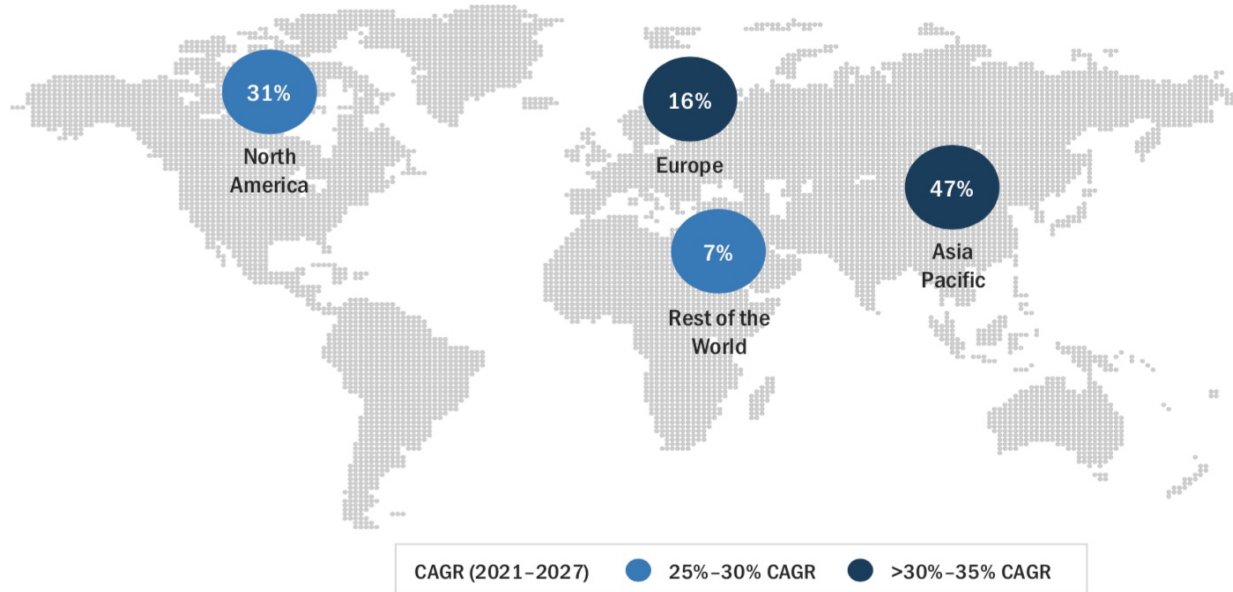
Source: 5G Global Market, Global Forecast to 2027, MARKETSandMARKETS Analysis

# 5G Enterprise Market By Vertical



Source: MarketsandMarkets Analysis

# 5G Enterprise Market By Region



Note: Numbers in the circles denote the market size of the respective region in the 5G enterprise market for 2020, whereas the circle colors denote the CAGR during 2021-2027.

Source: MarketsandMarkets Analysis



# Potential Industrial Sites for Private Wireless

INDUSTRY	SITES
Industrial and Manufacturing	10,710,000
Warehouses	3,300,000
Hospitals and Labs	263,000
Water Utility Players	140,000
Mining	54,000
Transport Venues and Ports	50,000
Power Generation	47,000
Military Bases	10,000
Oil and Gas	8,000

Source: 5G Global Market, Global Forecast to 2027, MARKETSandMARKETS Analysis

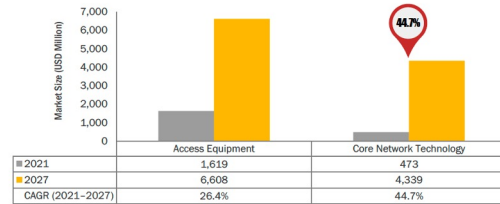
# Opportunity: Private 5G Core Technology Infrastructure

## 5G Software Infrastructure:

- Software-Defined Networks (SDN)
- Network Functions Virtualization (NFV)

### 4.4 5G ENTERPRISE MARKET, BY INFRASTRUCTURE

**FIGURE 23** CORE NETWORK TECHNOLOGY TO EXHIBIT HIGHER CAGR IN 5G ENTERPRISE MARKET DURING FORECAST PERIOD



Source: MarketsandMarkets Analysis

**Market Size: \$4.3B**

**CAGR: 44.7%**

(2021 ⇨ 2027)

Manufacturing, Oil & Gas,  
Utilities, Smart Buildings, Rural  
Areas, etc.

**\$1.32B**

- Universities Campuses (6000)
- Hospital Systems (600)



Multi-building campus

Source: 5G Global Market, Global Forecast to 2027, MARKETSandMARKETS Analysis



# Thank You

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