



Private Networks & Digital Transformation

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Use-cases and Industrial Applications of Private 5G

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**TSDSI
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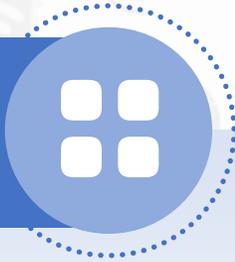
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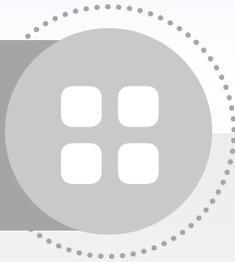
What will we cover today

Definition



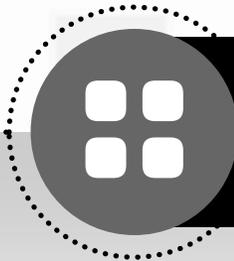
Define a Private Network
Different types
Deployment Strategies

Challenges



Spectrum related
Roaming related
Other issues

Use-cases



Industry Verticals
Horizontal use-cases
Realizing Benefits

Call to Action

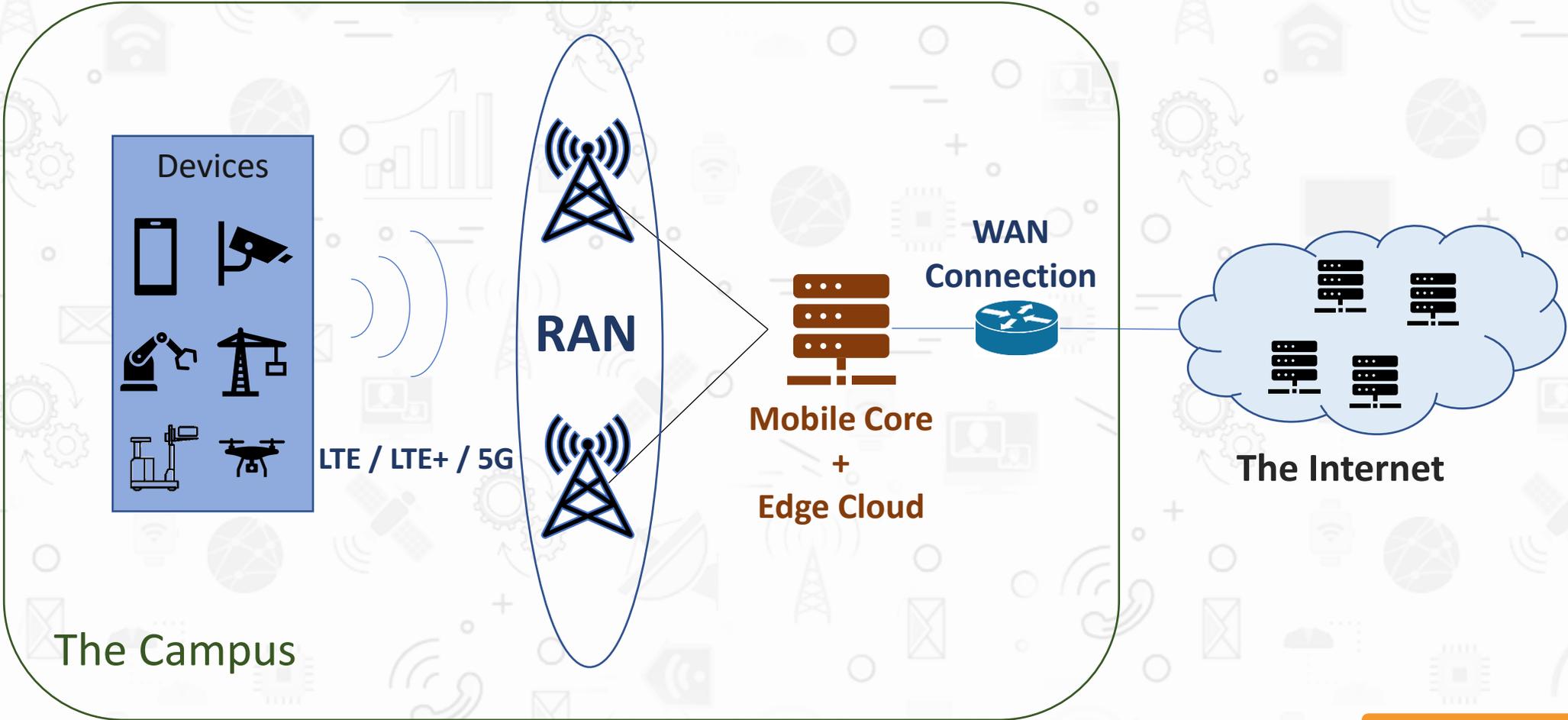


What can the industry do?
What can TSDSI do?

Define a Private Network

- A Non-Public Network (NPN)
- It is a wireless local area network (WLAN), like a Wi-Fi network, but using the LTE/5G cellular technology
- Confined to a geographic boundary, like a campus, a mine, a factory or a port
- Users and devices are isolated from all nearby networks
- Mostly, not metered for data / voice usage, rather taken as a capex or utility service
- Used by a closed user group – an enterprise, an institution, municipal authority or a society, for a human or machine application.
- Ownership and operations can be achieved through a variety of options
- Need for private networks are generally driven by one or more specific applications or a set of use-cases

Private Network Building Blocks



How do we differentiate Private Networks?

By Spectrum

- Type of spectrum used
 - Licensed / auctioned
 - Unlicensed
 - Allocated
 - Light licensed
- Who owns the spectrum?
 - Mobile operator
 - End user
 - Third party

By Provider

- Who owns / operates the network?
 - Mobile Operator
 - End user
 - Third party
- What is the commercial arrangement?
 - Ownership
 - Lease
 - Service charges

By Application

- Type of premises
 - Enterprise
 - Rural coverage
 - Educational campus
 - Social network
 - Local government
 - Other type
- What is the usage?
 - Broadband coverage & voice
 - Specific enterprise application
 - Public safety
 - Utilities / smart city

Deployment Methodology

Private Cellular Network

Shared Network

- Whole network is shared with a mobile operator
- MNO sets up the RAN and Core
- RAN may be dedicated for the private network, or it could be a network slice
- Devices may be locked within the private network & may be able to roam with the operator network

Shared Core

- MNO or a third-party setup private RAN network
- Core may be shared with an MNO or with other entities
- Optional local UPF to facilitate local break-out
- Core at a data center closer to the premises or at a central cloud, depending on the application needs

Standalone

- The premise has dedicated RAN network
- The core is fully dedicated for this premise, at best shared with other locations of the same organization
- May be setup by MNO or a third party
- The commercial arrangement could be ownership or contractual

Other key considerations

- Key adjacent technologies – Edge cloud or MEC, network slicing, SASE, AI/ML
- Edge provides multiple advantages to the private network
 - Provides a low latency for the applications
 - Local data storage will alleviate security and privacy concerns
 - Local storage & application processing will optimize the backhaul bandwidth requirements
 - Local processing of data will reduce the need for central storage
- Owing to the nature of applications and use-cases run on such a network, automation plays an important role in operations & management – the network needs to be fairly autonomous
- Competes with Wifi-6 in many aspects; however, provides distinct advantages for specific applications requiring very low latency, high density of devices, predictable performance and mobility. In many cases, a Wi-Fi and a cellular network will coexist, serving different applications
- Enterprises will tend to prefer an Open RAN for their private network owing to the flexibility it provides, ease of integration with applications, overall cost of implementation and the vendor diversity it offers

Possible Use Cases

There is no one killer application or one secret sauce. It could vary by industry.

Industry Agnostic

- Video Surveillance
- Environmental monitoring
- Edge based analytics
- Smart warehousing
- Employee Safety

Manufacturing & Mining

- Industrial IoT based automation
- Predictive & preventive maintenance
- Production inspection & quality control
- Industrial Robotics & Cobots
- Remote operations

Stadiums & Venues

- Fan engagement
- Crowd management & safety
- Immersive experience
- Remote production
- Personalized consumption

Horizontal Technology

- AR/VR based applications
- Drone applications
- Mobility related applications
- Video based inspection
- Asset tracking

Mobility & Logistics

- Smart yard management
- Passenger management & safety
- Smart cargo & material handling
- Remote operations
- Prediction & maintenance

Agriculture

- Massive sensor network
- Irrigation & water management
- Optimized & targeted feed
- Localized treatment for weeds
- Geo fencing, safety & security

Use cases beyond businesses

- A mission like Digital India can leverage private 5G networks to extend connectivity to areas where commercial networks find it difficult economically. This will also create rural employment and entrepreneurship opportunities.
- Applications like public safety, smart city etc., where the administration must provide citizen services, can be enabled by using a private network construct.
- Private networks will enable institutions to use technology to enhance facilities provided to users in their campuses, such as universities, hospitals etc.
- Any adhoc setup, like disaster management, religious congregation, fairs, and other gatherings, can use a private network to help cover the event and enhance facilities in the venues.
- Use of Private 5G networks for managing the forests and other protected areas to enable conservation & protection

What can a Private 5G Network do?

For the consumers

- Bring services like banking, education, health etc., to their cell phone, even when they are in remote areas
- Enhance their experiences in places like stadium, hospitals, universities, etc., by creating various human & machine-based services using private networks

For the citizen

- Not to get left-out in the digital divide
- Give broadband access to all citizens, irrespective of their physical location
- Provide safety and other services using technology
- Provide employment opportunity, creating a “digital hub” in their town / village

For an Enterprise

- Achieve better operational environment for their business, enhance efficiency of operations
- Provide better customer experience using high quality Video, AR/VR and segmentation using analytics
- Revenue enhancing opportunities like connected car, hyper-personalized products
- Reduce human risk in operations using robotics, drones, IIoT and so on.

For the Government

- Make *Digital India* dream become true
- Create new employment opportunities in rural, semi-urban and remote areas
- Better utilization of spectrum resources
- Enhance living conditions of citizens in dense urban areas – traffic, utility etc.
- Create a focused public safety network
- Overall, enhance the common minimum lifestyle of people

Key challenges for a private network setup

- Spectrum is a challenge in many countries, and in India. A policy framework for industrial / private network spectrum is needed to ensure that the benefits are realized.
- Device availability is still a challenge as there is no uniformity in allocation of spectrum amongst countries.
- Backhaul is still a challenge in remote areas – availability of a broadband connection or a fiber. LEO satellite communication can solve this problem to a fair extent.
- For the government, ensuring that the security and privacy mandates are implemented in the private networks is a key challenge
- Cost of ownership of private networks and the RoI is a challenge for businesses, till such time the infrastructure and the device costs come down for the selected frequency range.
- Cost vs. benefit against a technology like Wi-Fi 6 / 6e
- Availability of skilled people to design, implement & manage the private networks across the country.
- Application ecosystem shall start adopting the unique value that a private network provides, and enhance their business outcomes

Roaming requirement – Private & Public network

- Many applications of 5G will require that a device, human or machine, transition between private & public networks, and between 5G / Wi-Fi / Satellite networks. Some sample applications are:
 - Integrated supply chain – warehouse to retail store
 - Asset tracking applications
 - Connected vehicles
 - Integrated mobility
 - Connected aircraft / ship
 - A traveling employee, between campuses & while on transit
 - Plus, employees / workers between work & home
- Standards, network systems, device ecosystem, business integration, IT enablement, proper commercial models & regulations – all of these should come together to enable this.
- Technical, commercial and regulatory model for the same is still unclear.

A call to action

Government & the Regulator

- Provide spectrum for private network use
- Policy framework for use of private network, compliance requirements, roaming & interoperability, with minimal approvals and simple governance
- Mandate to municipal bodies to use private networks for public safety, traffic management & other public utilities
- Encourage incentives for network and device manufacturers to achieve scale by reusing designs for India & export, and thus bringing the cost of private networks down
- Alleviate the concerns of various industry bodies by bringing them into the conversation
- Provide a framework for rural broadband by encouraging entrepreneurship within, using private network deployment

The Industry & Businesses

- Work with various industry bodies to find common ground covering regulations, cost & scale of operations, interoperability, device ecosystem etc.
- Encourage software and device development that makes use of private networks to implement industry applications and use-cases
- Look at the bigger picture of “Digital India” and come forward to enable various use of private networks
- Exchange industry best practices to make use-cases popular and reduce implementation difficulties
- Help the government to come out with a policy framework and propose governance methods
- Work with adjacent industries and integrate them for bringing in a connected ecosystem

Role of TSDSI on NPN Standards

- A set of standards for NPN in the Indian context, any adaptation required from the 3GPP draft
- Standards for interoperability and roaming between private & public network. Either create one or work with 3GPP to expedite the same.
- MEC & 5G unified solution for private networks – a deep dive and standardization if needed
- Advice the regulator and the government on building a policy framework for private network adoption

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THANK YOU
Viswanathan Ramaswamy

