March’ 21

Design a converged fibre enabled 5G-ready network

STLescope

Tech Talk Series

Part 3

Network creation – opportunity landscape

1 **Network creation – opportunity landscape**

2 Role of network design

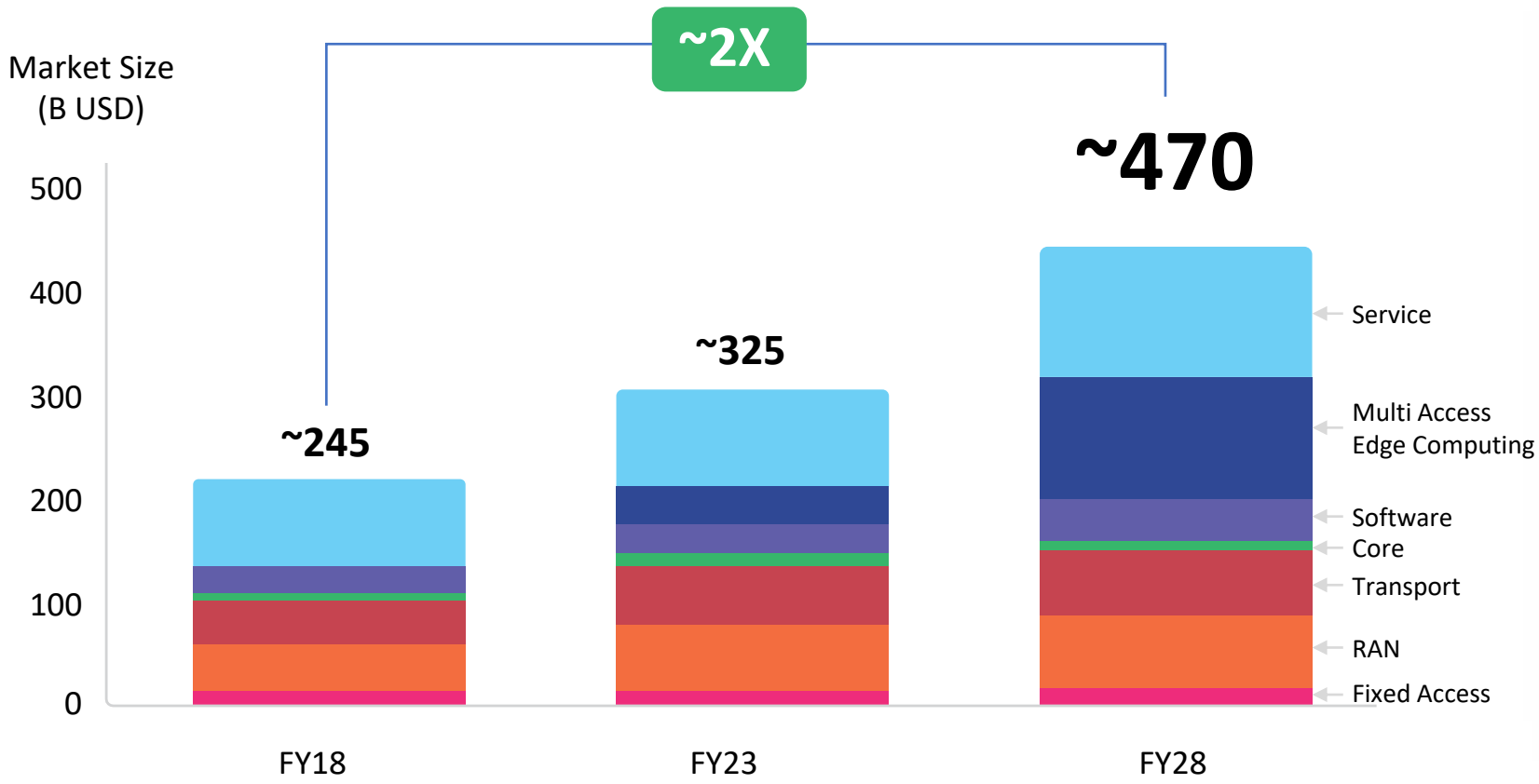
3 Converged edge network

4 Key challenges in the current network design

5 STL way of designing a converged edge network

Network creation outlook is buoyant

Network spends are likely to double



Driving Factors

- Global 5G roll-out over next 8-10 years
- Growing FTTx penetration
- Transition to cloud and software defined networks
- Acceptance of Open standards

Source: Reports from Gartner, MarketsAndMarkets, Ovum, Dell'Oro (Switch/Router split); IDC, Bain analysis

And we are seeing acceleration in network investments

Network Creators are Investing Heavily…

Telecom Operators

May 2020

China mobile to invest **$14 Bn** in building digital infrastructure enabling faster 5G Connectivity

May 2020

BT to invest **$12 Bn** in building 5G and next generation full fibre broadband across the UK

March 2020

Verizon to invest **$18.5 Bn** to accelerate its 5G plans globally

June 2020

Airtel to double its fixed line penetration in next three years

Cloud Companies

May 2020

Microsoft to invest **$15 Bn** to accelerate digital transformation in Italy including its first data centre region

March 2020

Google to invest **$10 Bn** in US offices and data centres in 2020

Sets aside a **$10 billion** for India

Citizen Networks

Indian Govt. *aims to provide* ***5,00,000 FTTH connections*** *by Sept 2020 (part of BharatNet)*

FCC, US *launched* ***rural digital opportunity fund worth $20 bn.***

… and Attracting Billions

July '20

SilverLake, Vista Equity Partners, General Atlantic, KKR, TPG, Catterton, ADIA, Mubadala, Intel Capital, Qualcomm ventures → Jio

Jio platforms has raised **$20.2 Bn** capital from global financial & strategic investors incl. Google & Facebook

PE Investment

Feb 2020

KKR

KKR in partnership with Telecom Italia to invest **$7-8 Bn** in Open Fibre deal

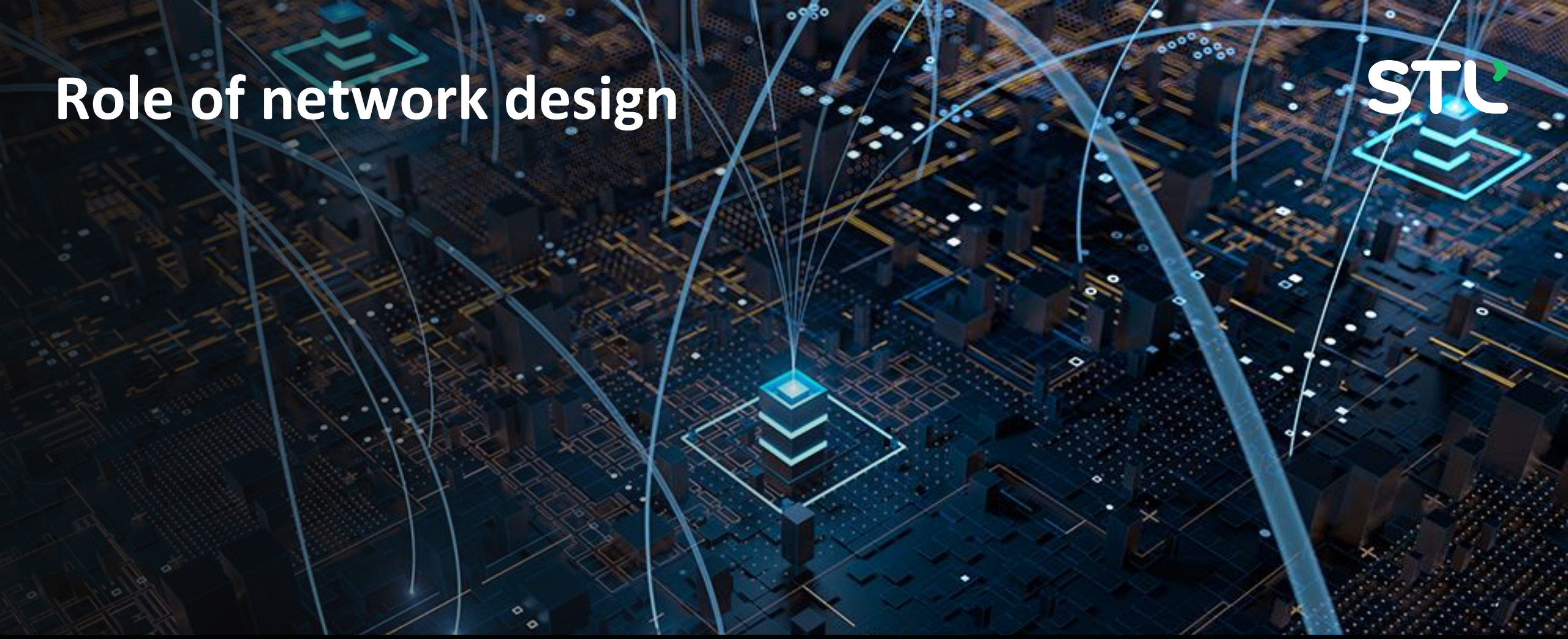
Feb 2020

EQT

EQT in partnership with OMERS to invest **$4 Bn** to acquire a fibre optic internet access company in Germany

Source: Telecom lead

Role of network design



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Network design has a pivotal role to play

It is the most intellectual step in the network creation cycle

Converged Edge Network

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5G use cases demand a Converged Edge Network

Drivers

Enhanced mobile broadband

- Gigabytes in a second
- Immersive reality
- eSports

Fixed wireline and wireless

- Last-mile technology for fixed and mobile broadband access
- Tower Fiberisation
- High speed broadband for all

Massive Internet of Things

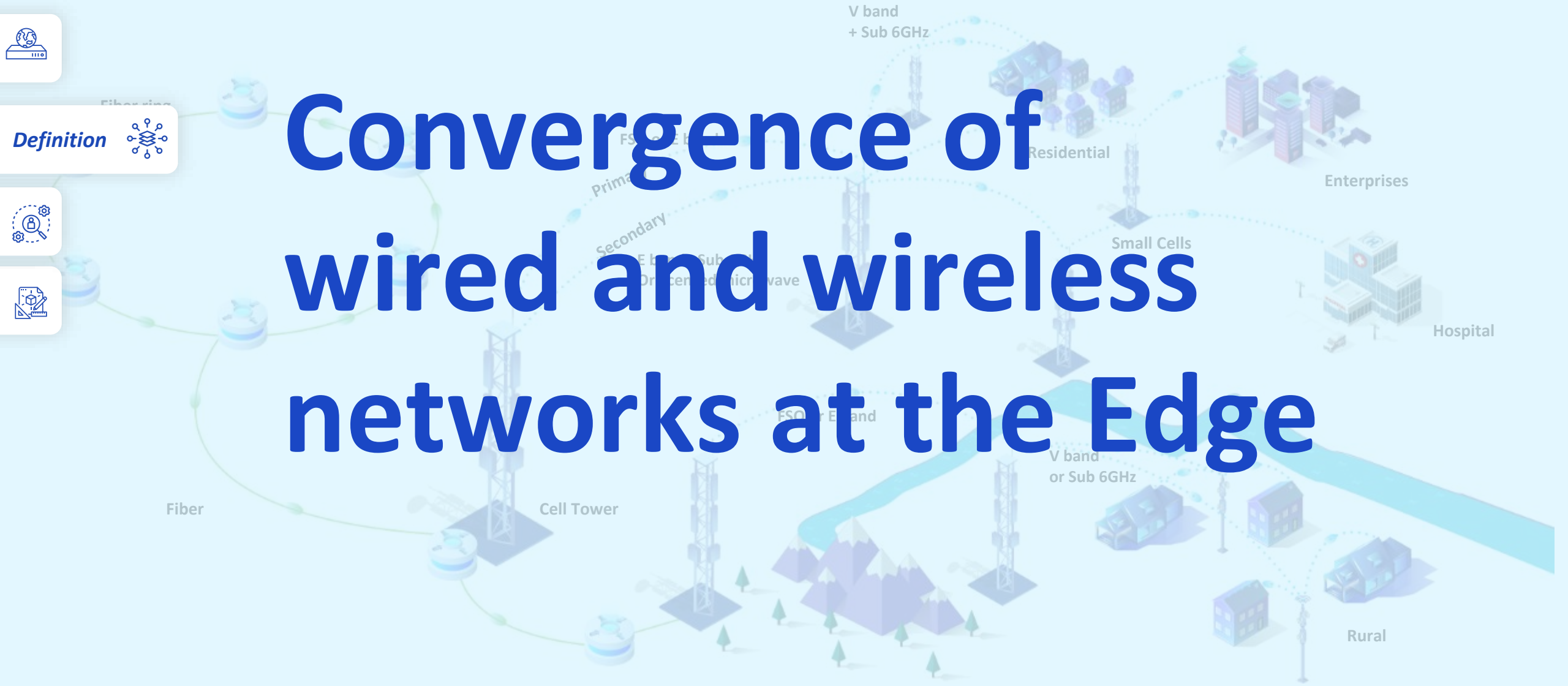
- Smart cities, homes and buildings
- Multiple vertical industries
- Wearables

Ultra-reliable, low- latency communications

- Autonomous driving
- Industrial and vehicular automation
- Remote Surgery

What is a Converged Edge Network ?

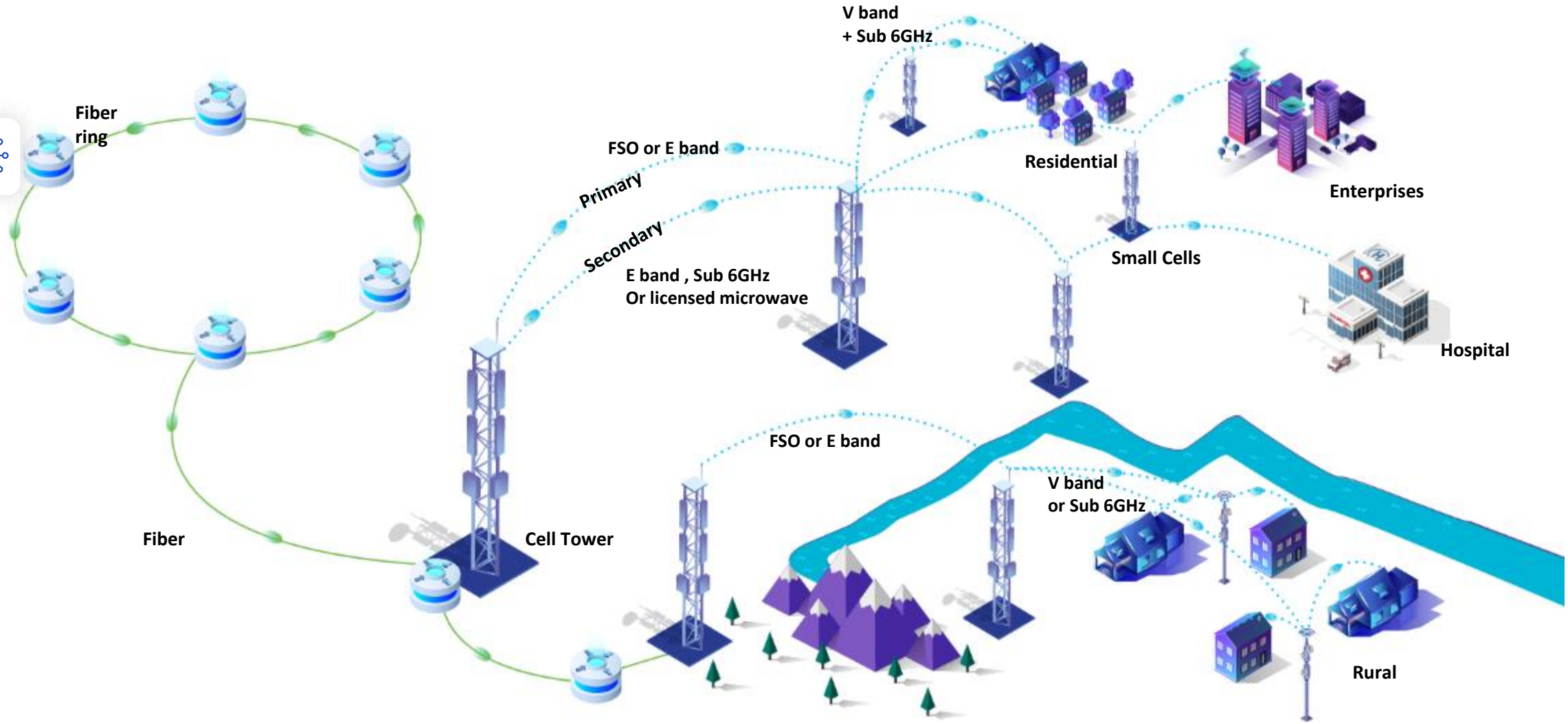
Definition



Convergence of wired and wireless networks at the Edge

How will a “Converged Edge Network” look like?

Definition



Characteristics of a Converged Edge Network

Characteristics

Close to the Edge
EDGE

Seamless Wired & Wireless
CONVERGED

Enhanced Experience
COMPUTE

Agile, Scalable, Agnostic
DISAGGREGATED

At the Edge

Optical & **Radio**

Connectivity & **Compute**

Hardware & **Software**

What world expects from a Converged Edge Network

Design Considerations

All kind of digital networks
Converged at edge

IoT

5G

Data Centre

Enterprise

FTTH

Requires **optimal mix** of design considerations

SCALE

LATENCY

AGILITY

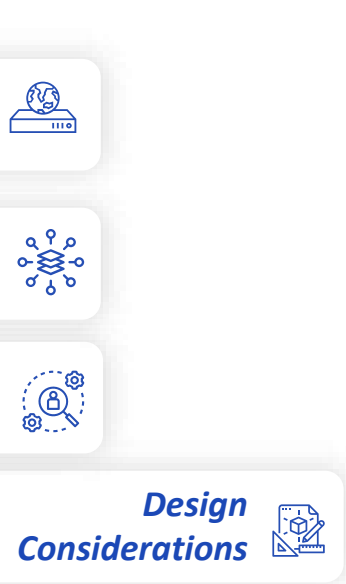
UPTIME

COST PER GB

EXPERIENCE

SLAUCE optimization is the key to a Converged Edge Network

Design Considerations



PARAMETER	5G	FTTH	Enterprise	Data Centre	IoT
SCALE	●	○	○	○	○
LATENCY	○	○	○	●	○
AGILITY	○	○	●	●	○
UPTIME	○	○	○	●	○
COST PER GB	●	●	○	○	●
EXPERIENCE	○	○	●	●	○

Degree of Importance ○ ○ ○ ○ ●

Digital Mega trends are shaping the future of DATA NETWORKS

Tech Talk

Key challenges in the current network design

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SLAUCE is key, but design challenges need to be solved

KEY CHALLENGES	NETWORK IMPACT
1 DISINTEGRATED APPROACH	Design gap among different layers
2 INCREMENTAL PLANNING	Inadequate resource dimensioning
3 MULTI PHYSICAL LAYER	Inefficient resource utilization
4 EXECUTION CONSTRAINED PLANNING	Unoptimized Planning
5 POOR NETWORK INVENTORY DATABASE	Unoptimized usage of existing asset

STL way of designing a Converged Edge Network

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Solving network design challenges

STL way of network design - iCORE

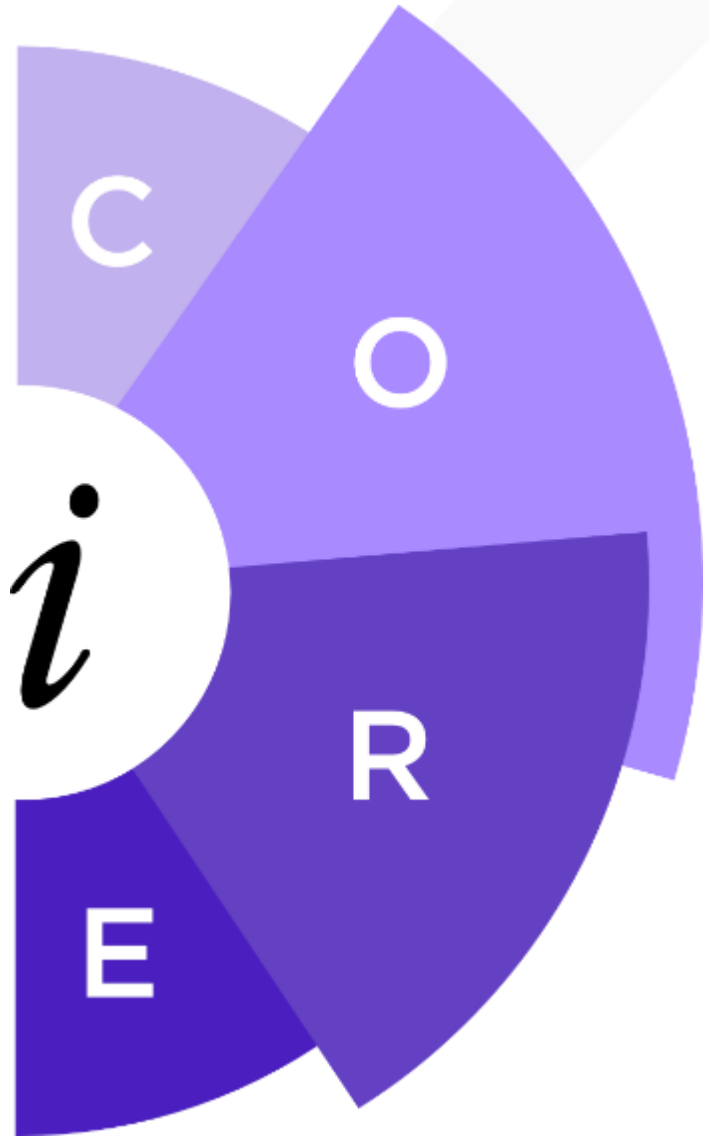
I Integrated

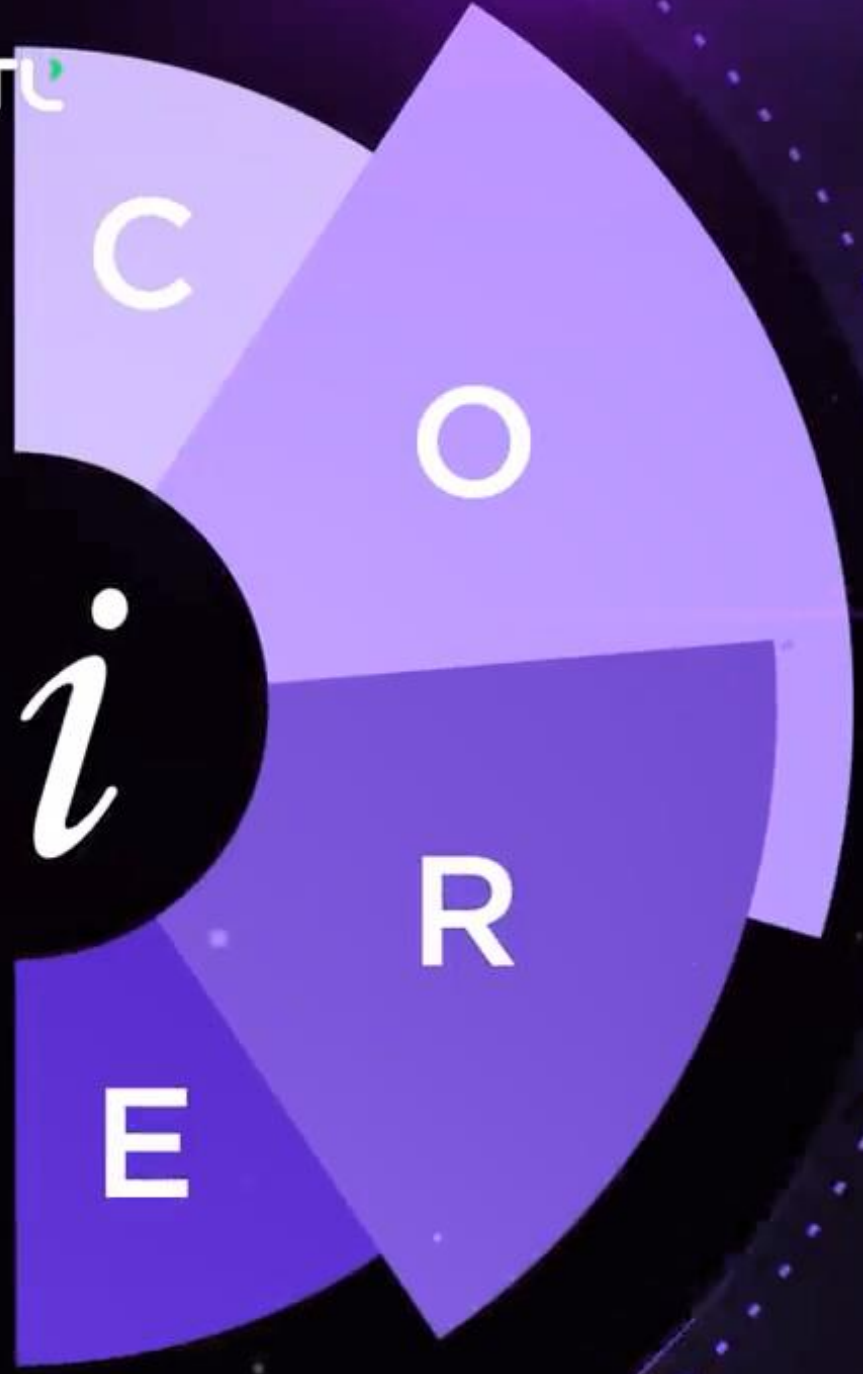
C Centralized Planning

O One Backbone

R Re-Use Existing Infra

E Everything Survey





PRESENTING STL *i*CORE

A network design approach for designing

VERY COMPETENT NETWORKS OF FUTURE

Tech Talk

Integrated design across all 3 layers

I *Integrated*

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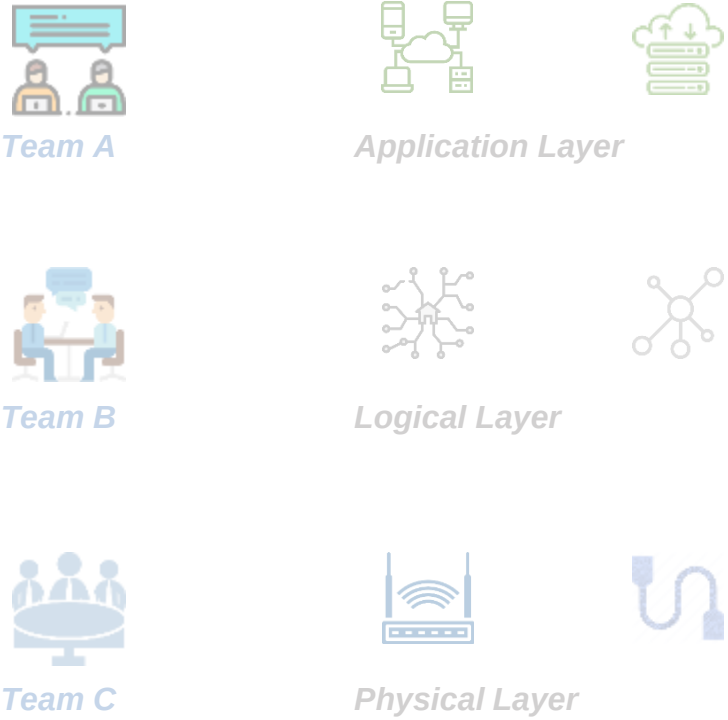
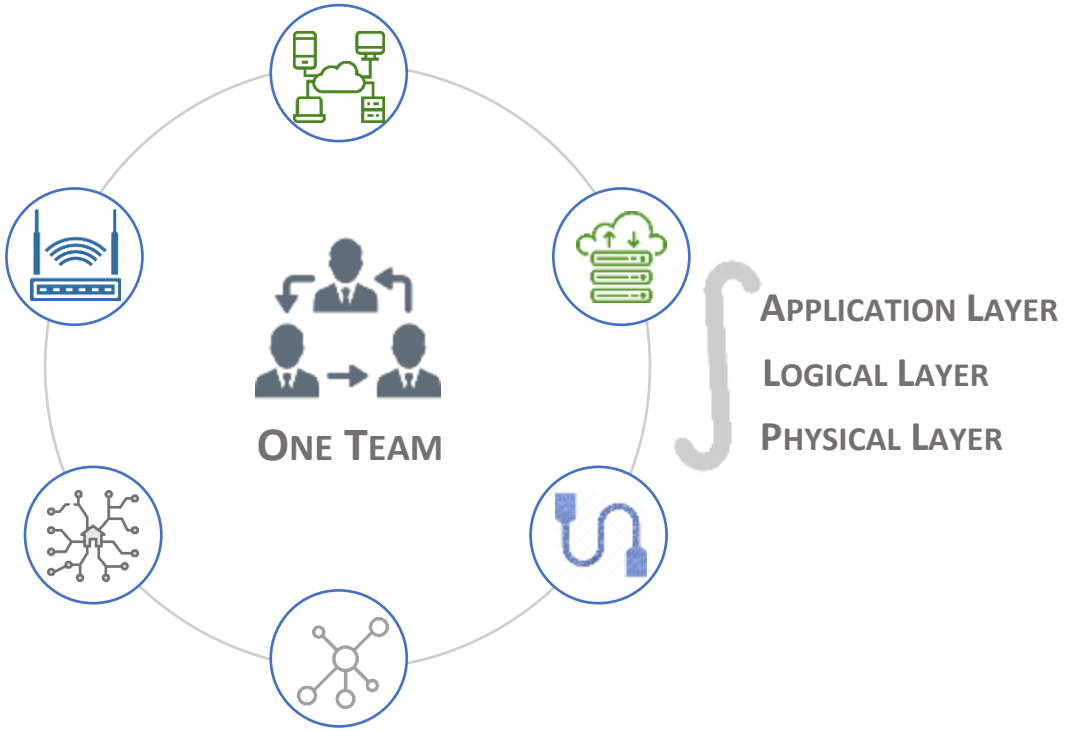
Disaggregated approach..



E2E Integrated Play across 3 layers...



Centralized network planning

Transition from decentralized

I

C *Centralized Planning*

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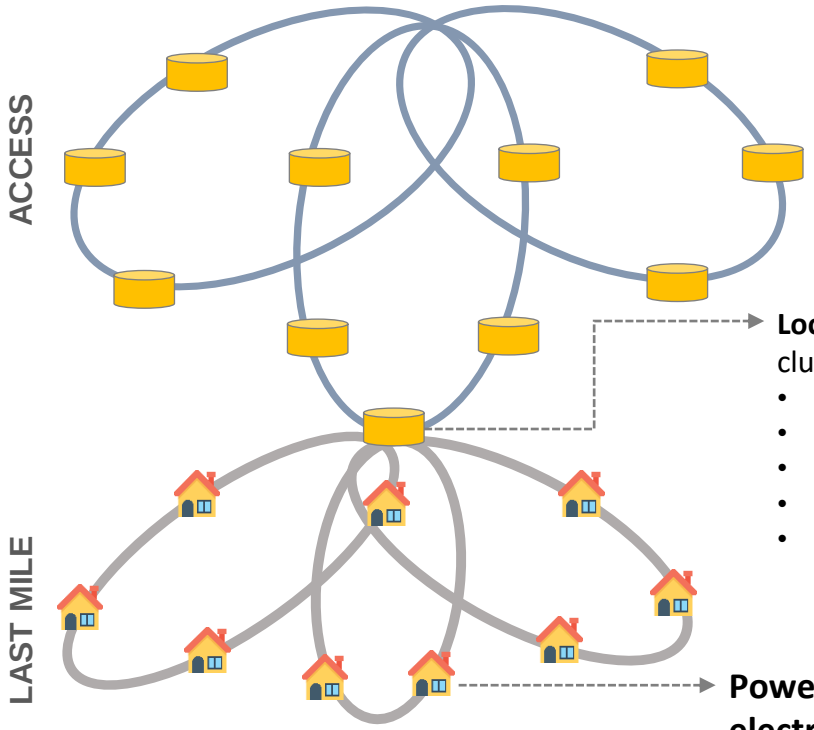
Decentralized network planning



Localized electronics serving small clusters

- Active Infra
- Regular power supply
- Periodic maintenance
- More downtime
- Security required

Powered by localized electronics

DECENTRALIZED to CENTRALIZED

Centralized network planning

- Transition from decentralized

I

C *Centralized Planning*

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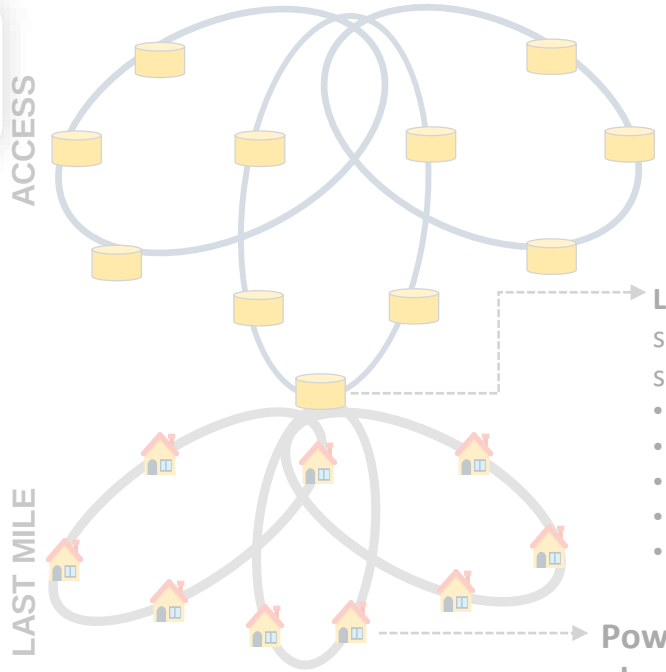
DECENTRALIZED NETWORK PLANNING



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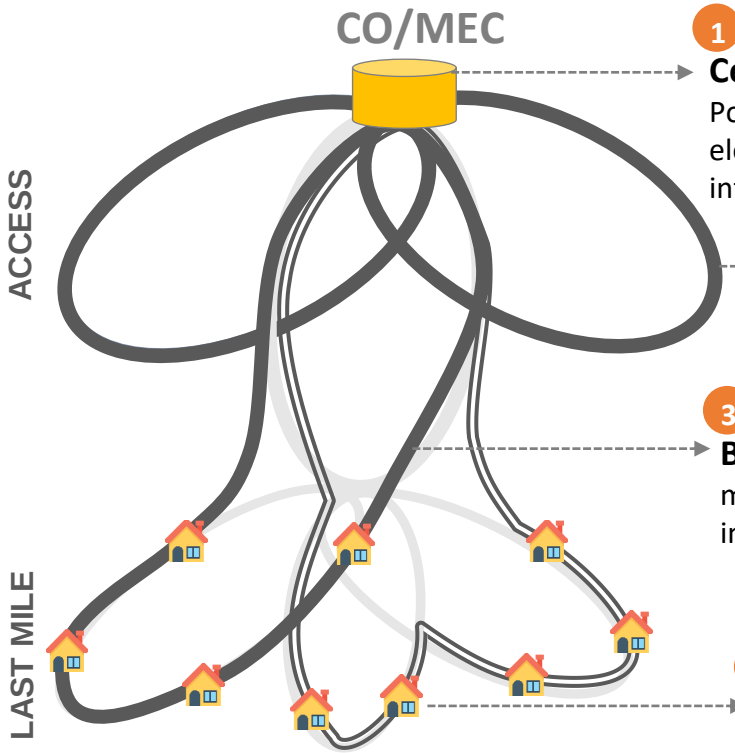
Centralized network planning



1. **Central Office** Powered by high capacity electronics and robust infrastructure
2. **High fiber count cable**
3. **Bigger clusters** serving more end points without any intermediate active infra
4. **Powered by CO**

*CO – Central office

I

C *Centralized Planning*

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E

STL Indirapuram Cluster

A live use case for

Decentralized Vs Centralized

approach

A live example- STL Indirapuram Cluster

Decentralized approach

I

C *Centralized Planning*

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A live example- STL Indirapuram Cluster

Centralized approach

I

C *Centralized Planning*

O

R

E

1 Centralized CO
Serving 3 large clusters
47138 home pass
~27 Kms

Cluster 1
Home pass - 8641

Cluster 2
Home pass - 31233

Cluster 3
Home pass - 7264

Mahagun Mosic
148

Appex Accacia
236

Shipra Reviera
1260

Eastern Heights
315

Himalaya Legend
120

Gaur Green Vista
454

Pragya Kunj
576

Oliver County
868

Shipra Sun City
2400

Windsor & Nova
2544

Overlap 1.9 KMs

Overlap 1.5 KMs

Fibre node along the road
(at every 100 meters)

One integrated physical backbone to cater all digital needs

I
C
O *One Backbone*
R
E

CORE

Applications Layer

Smart Home & Buildings, Industrial Automation

Accident/Disaster/ Smart Healthcare Smart Education

Smart Communication

Smart Transportation

Utilities Environment

Connecting poles, Street lights

Connected Cars

Smart Security & Surveillance

EDGE

Logical Layer

Cloud/DC

IaaS
PaaS
SaaS

Transport

IP/MPLS
DWDM/OTN
SD-Core/SD-Access

Access devices

Router
Switches
OLT/ONT

Future Proof highly scalable Physical layer

High fibre count backbone

Re-use of existing infra for network enhancement

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R *Re-Use Existing Infra*

E

Service Intelligence

- Leverage already laid duct utilities
- Tracking of unused passive infra
- Surveillance of active and passive equipment

Robust information database

- Centralized database for passive and active infra deployed
- Extensive use of GIS
- Geo tagging of network resources

Optimize active & passive elements

- Consideration of centralize Vs decentralize planning
- Optimize space and power need by proper assessment
- Less electronics to reduce overall cost

Leveraging existing infra will optimize scale and reduces overall cost

Everything Survey to assess existing network infra

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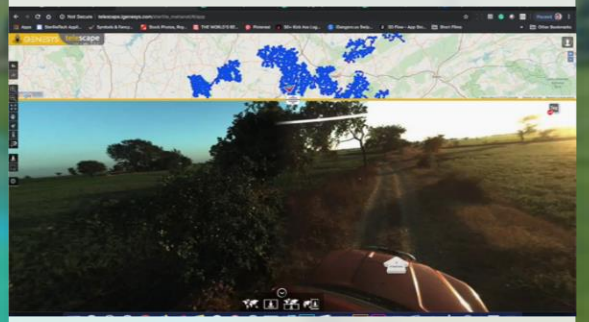
E *Everything Survey*

TECH-ENABLED SURVEY TECHNIQUES

Drone led survey

Street view survey



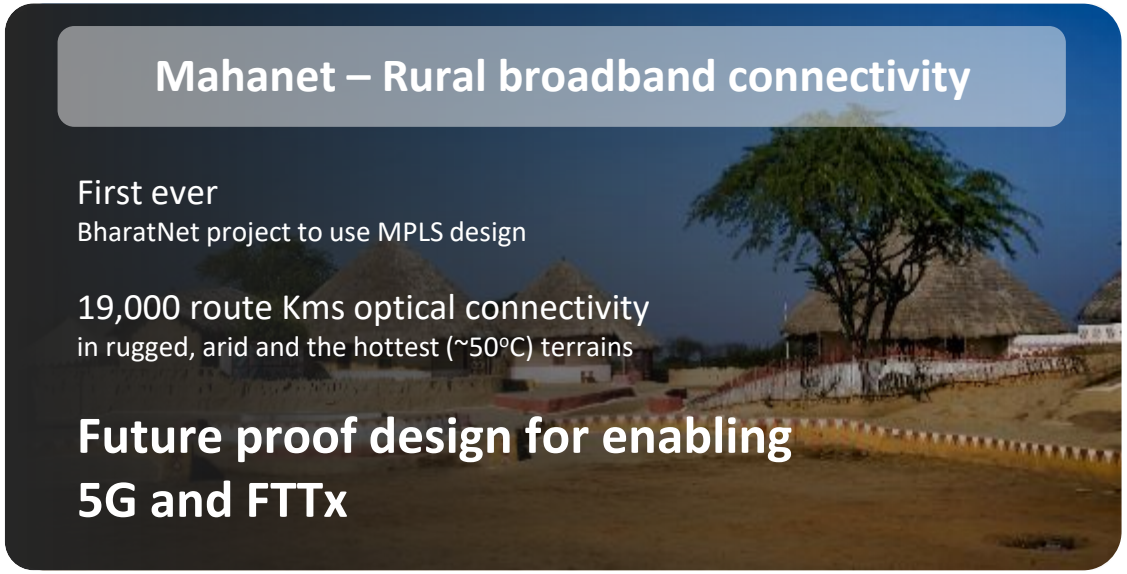
LIDAR survey

Ancillary technologies

Advanced video analytics, Digital measurement tool , Soil strata prediction tools, Iterative design, based on info collected

iCORE in action – Case Studies

Mahanet – Rural broadband connectivity

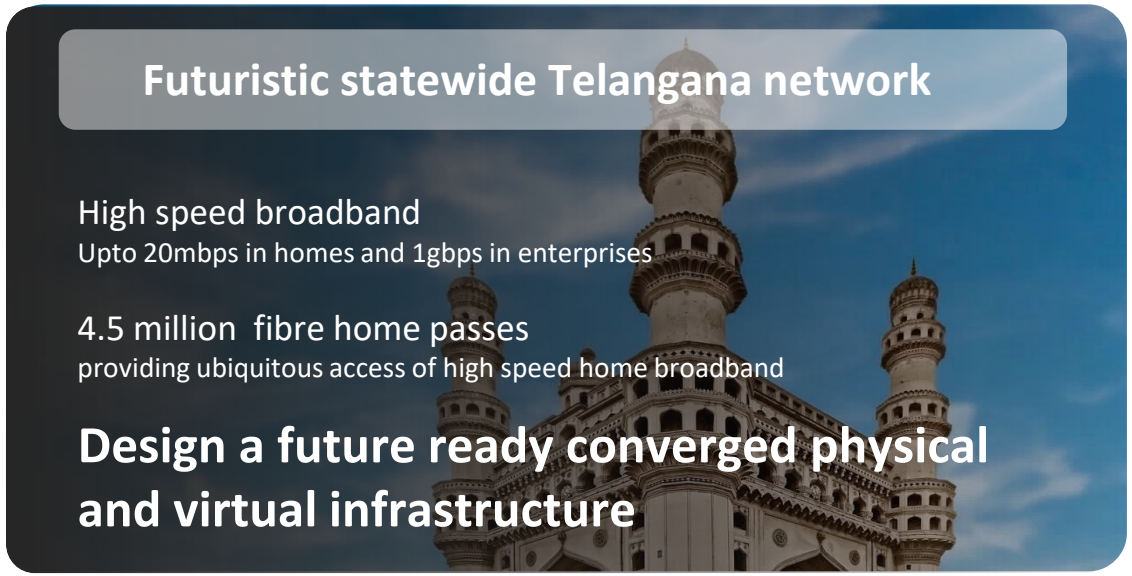


First ever
BharatNet project to use MPLS design

19,000 route Kms optical connectivity
in rugged, arid and the hottest (~50°C) terrains

Future proof design for enabling 5G and FTTx

Futuristic statewide Telangana network

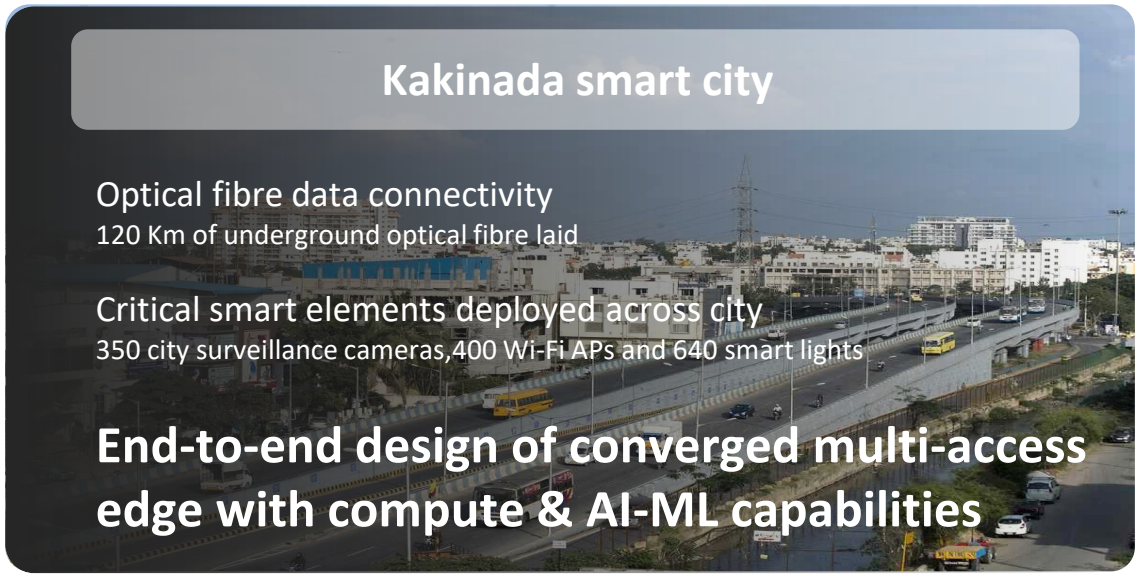


High speed broadband
Upto 20mbps in homes and 1gbps in enterprises

4.5 million fibre home passes
providing ubiquitous access of high speed home broadband

Design a future ready converged physical and virtual infrastructure

Kakinada smart city

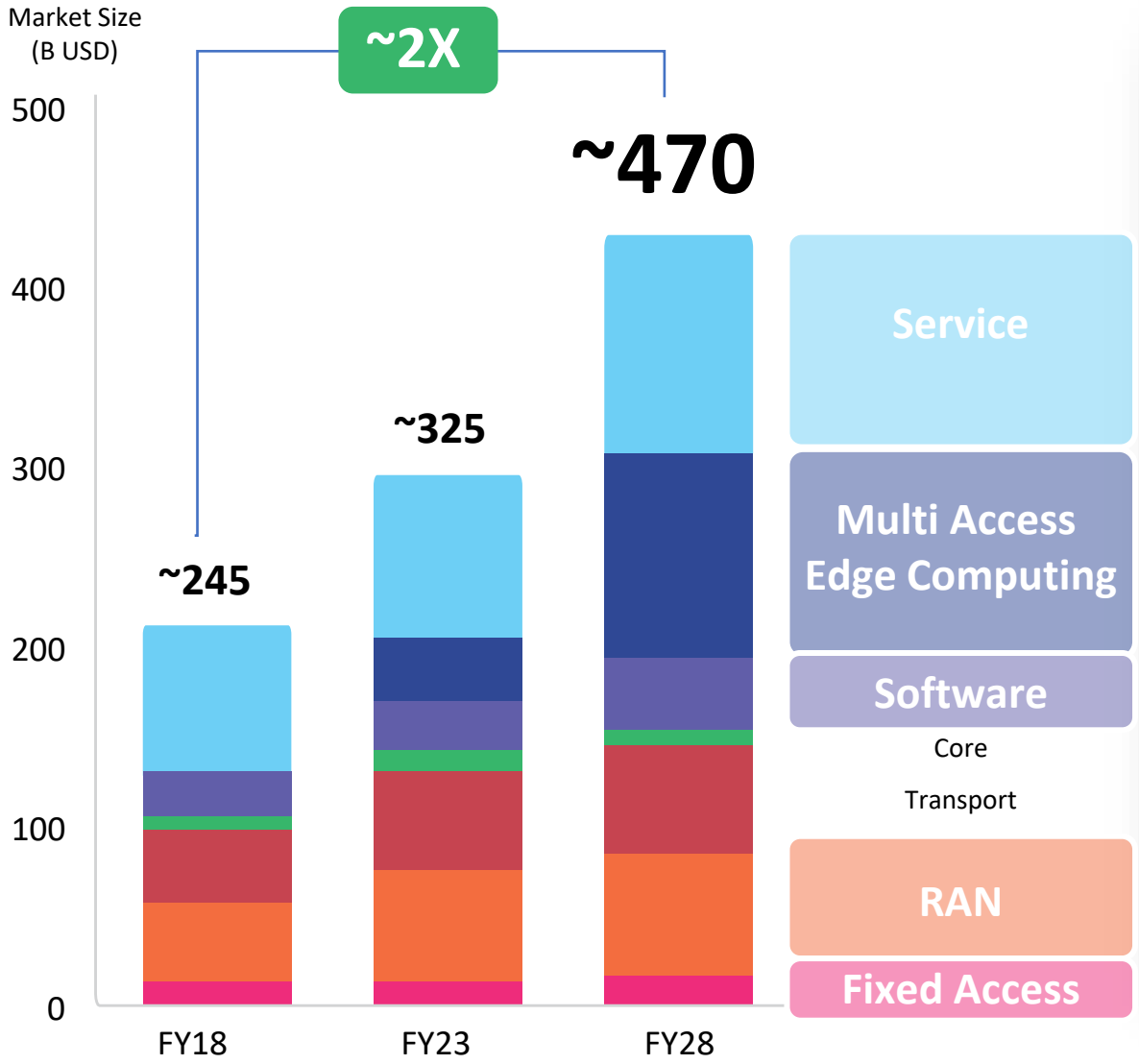


Optical fibre data connectivity
120 Km of underground optical fibre laid

Critical smart elements deployed across city
350 city surveillance cameras,400 Wi-Fi APs and 640 smart lights

End-to-end design of converged multi-access edge with compute & AI-ML capabilities

STL expertise in network services



STL has end to end solutions across the value chain

Design, Build, Manage
Powered by a world class partner ecosystem

Converged Platform for Wireless and Wireline networks

Modern SaaS based platforms
AI-ML enabled solutions

Cloud native, open vRAN solutions

Programmable FTTx and optical connectivity solutions

beyond tomorrow