



GSC | 22
MONTREUX, SWITZERLAND



TIA Update & Overview

Telecommunications Industry Association

David Bain, VP Standards

GSC-22, Montreux, CH

26-27 March 2019



430+

Members

ICT manufacturers and suppliers,
network operators and service enablers,
distributors and system integrators

3,609

Standards Developed

9

Standards Engineering
Committees

US technical position for the international committee to
support 5 technologies through US Technical Advisory
Groups" (13 groups total /TAGs covering 5 technologies)

TIA by the Numbers

~2M

Workers Employed
Worldwide

107

Working Groups

2,500

Individuals Engaged
Across Communities

\$3T

Contributed to the
World Economy by
TIA Members

70%

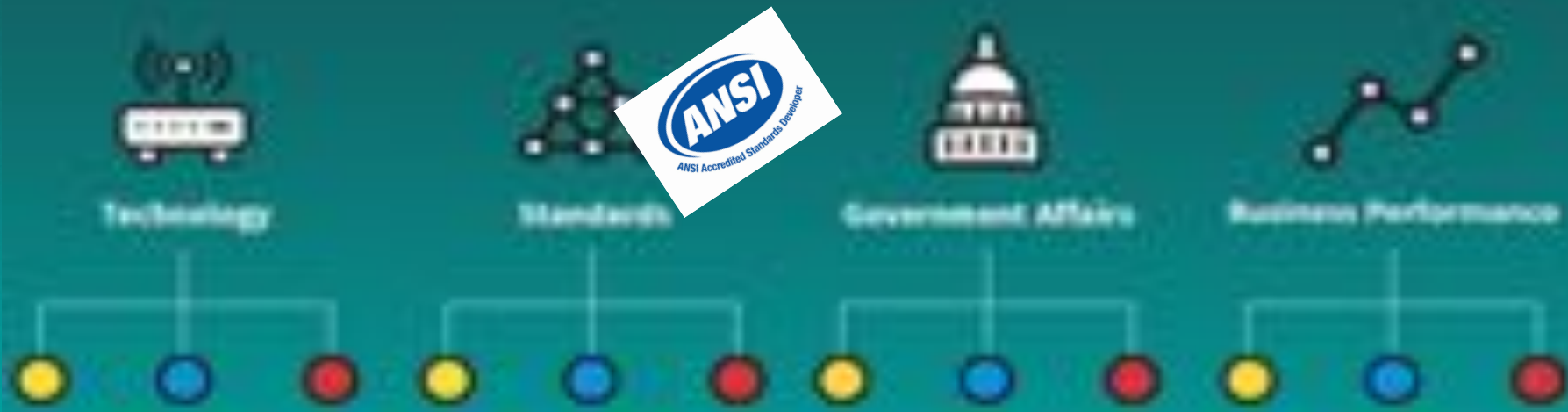
of TIA Member Companies
are Small-to-Medium Size
Businesses with < \$10
Million in Revenue



Convening and Enabling Communities of Interest

At TIA we bring together and facilitate numerous communities of interest within four key verticals: Technology, Standards, Government Affairs and Business Performance.

Within these many communities, TIA advances strategic **programs**, **products** and **services** to tackle unique challenges the ICT industry faces. The solutions these communities drive provide tangible value to our members that enhance their bottom line.



What to Certify...

People

Designers
Engineers
Installers
Integrators
Testers



Auditors / Organizations



Buildings / Campus



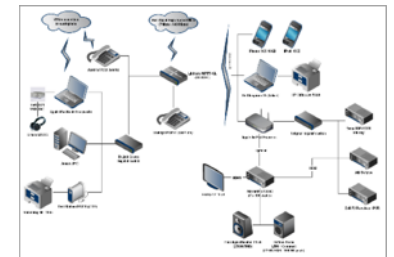
Processes



Networks



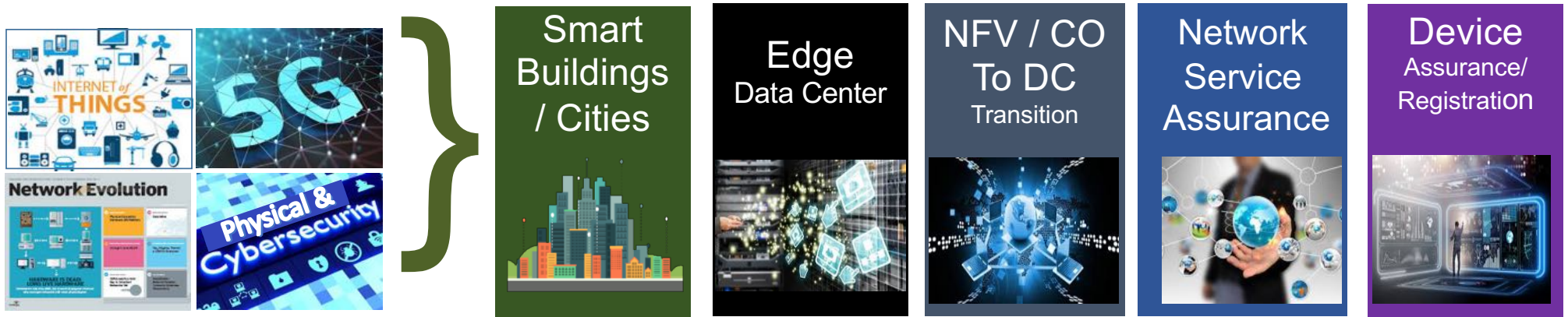
Components



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TIA's Program's Roadmap



Core Competency: **Network Infrastructure, Connectivity, Quality**



- [TR-8](#) | Mobile and Personal Private Radio Standards
- [TR-14](#) | Structural Standards for Communication
- [TR-34](#) | Satellite Equipment & Systems
- [TR-41](#) | Performance and Accessibility Communications
- [TR-42](#) | Telecommunications Cabling Systems
- [TR-45](#) | Mobile and Point-to-Point Communications Stds
- [TR-48](#) | Vehicular Telematics
- [TR-50](#) | M2M - Smart Device Communications
- [TR-51](#) | Smart Utility Networks

**Definition
Benchmark
TL9000 QM
QF / TIA Tools
Assurance
Certification
Registration
Sustainability**

**Communities
Of Interest**



Edge Data Centers



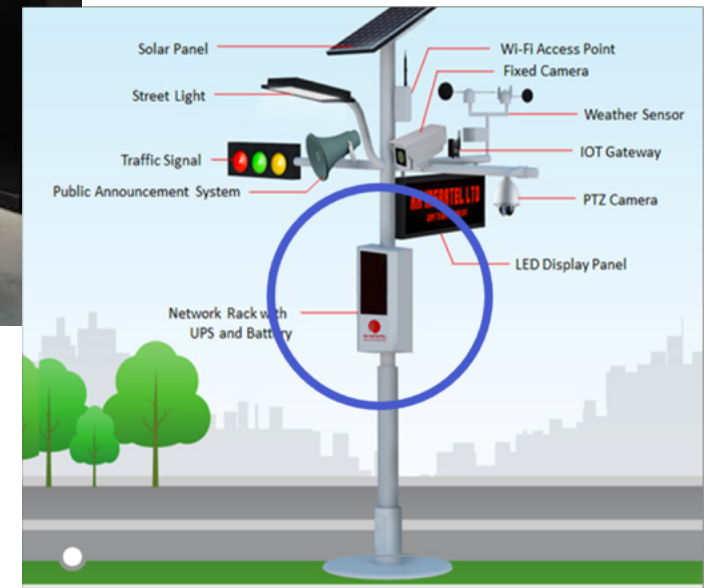
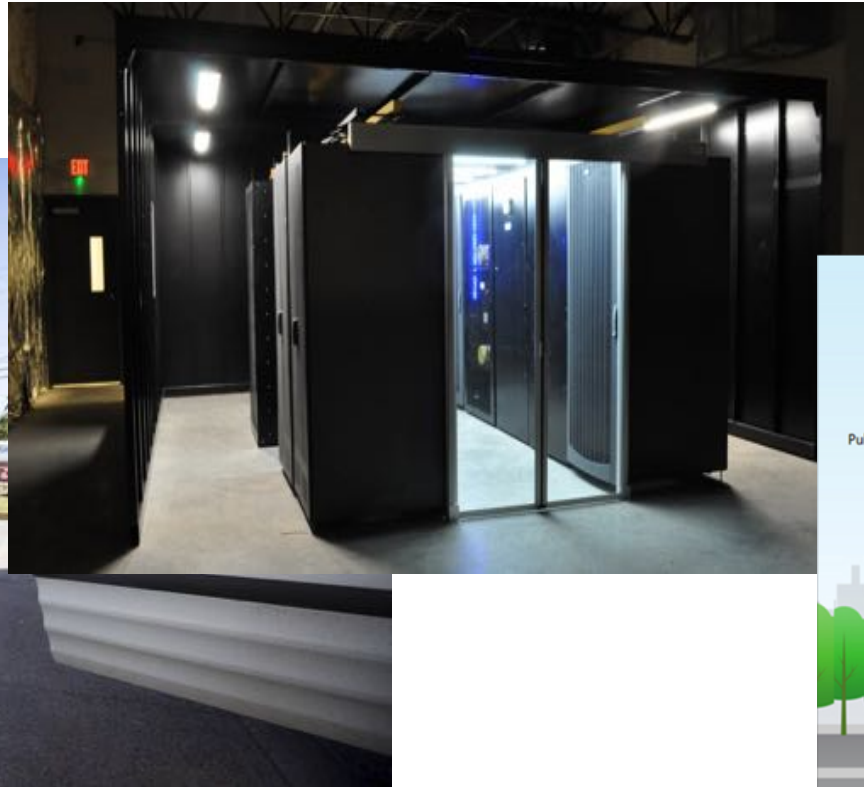
IoT, AIoT
Industry 4.0
Buildings
Towers
Corners
CO's
Shelters
Cabinets

5G Will Not
Happen
Without Edge
Computing



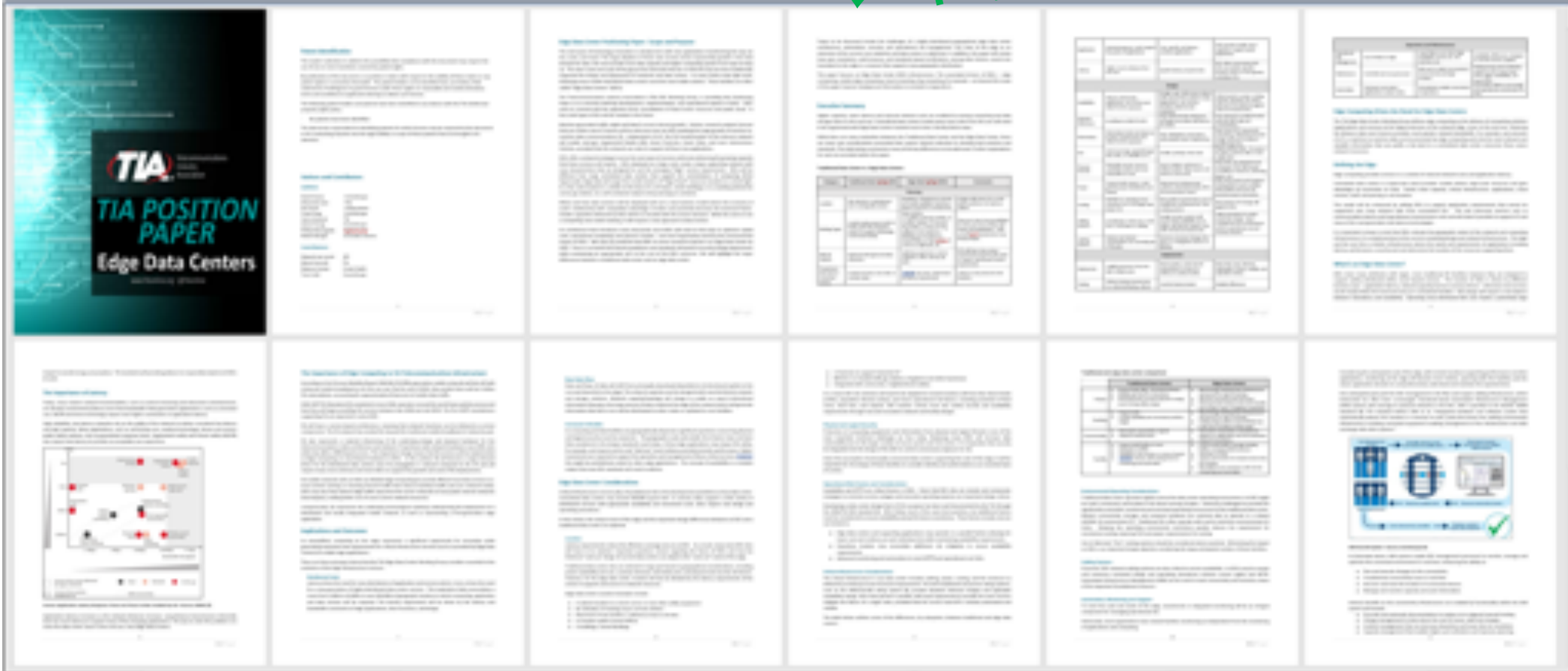
Edge Data Centers

In Buildings
Mailbox
Light Pole

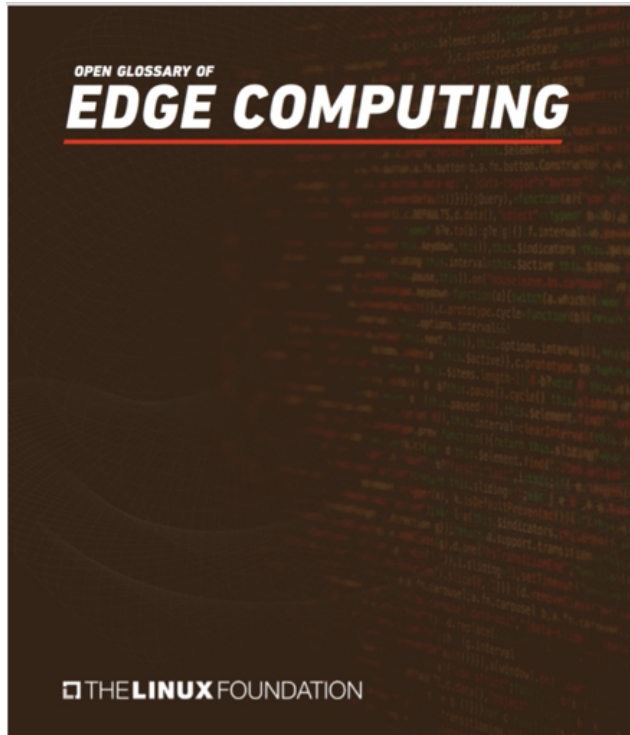


Position Paper Edge Data Centers

✓ Paper Released 10-10-18



Glossary The Linux Foundation



Edge Cloud

Cloud-like capabilities located at the infrastructure edge, including from the user perspective access to elastically-allocated compute, data storage and network resources. Often operated as a seamless extension of a centralized public or private cloud, constructed from micro data centers deployed at the infrastructure edge.

See also: [Cloud Computing](#)

Edge Computing

The delivery of computing capabilities to the logical extremes of a network in order to improve the performance, operating cost and reliability of applications and services. By shortening the distance between devices and the cloud resources that serve them, and also reducing network hops, edge computing mitigates the latency and bandwidth constraints of today's Internet, ushering in new classes of applications. In practical terms, this means distributing new resources and software stacks along the path between today's centralized data centers and the increasingly large number of devices in the field, concentrated, in particular, but not exclusively, in close proximity to the last mile network, on both the infrastructure and device sides.

See also: [Infrastructure Edge](#)

Edge Data Center

A data center which is capable of being deployed as close as possible to the edge of the network, in comparison to traditional centralized data centers. Capable of performing the same functions as centralized data centers although at smaller scale individually. Because of the unique constraints created by highly-distributed physical locations, edge data centers often adopt autonomous operation, multi-tenancy, distributed and local resiliency and open standards. Edge refers to the location at which these data centers are typically deployed. Their scale can be defined as micro, ranging from 50 to 150 kW of capacity. Multiple edge data centers may interconnect to provide capacity enhancement, failure mitigation and workload migration within the local area, operating as a virtual data center.

See also: [Virtual Data Center](#)

Edge Meet Me Room

An area within an edge data center where tenants and telecommunications providers can interconnect with each other and other edge data centers in the same fashion as they would in a traditional meet me room environment, except at the edge.

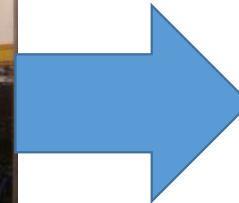
See also: [Interconnection](#)



Paper: Traditional vs. Edge

	Traditional Data Center	Edge Data Center
Power	<ul style="list-style-type: none"> ○ Purpose-built utility / site electrical feeds ○ Multiple grid feed for redundancy ○ Diesel generators provide long-term energy source during utility outage 	<ul style="list-style-type: none"> ○ May leverage existing power infrastructure repurposed for edge computing ○ May lack redundant power grid feed ○ Diesel generator backup may not be feasible due to space, noise, or pollution restrictions
Cooling	<ul style="list-style-type: none"> ○ Purpose-built ○ Cooling capability and redundancy built by design 	<ul style="list-style-type: none"> ○ May leverage existing power infrastructure repurposed for edge computing ○ Cooling design options may be limited due to the size or location of data center
Connectivity	<ul style="list-style-type: none"> ○ Redundant connectivity is typical ○ Design for performance 	<ul style="list-style-type: none"> ○ Redundant connectivity is desirable but depends on applications and site restrictions ○ Design for low latency
Facility	<ul style="list-style-type: none"> ○ Purpose-built facility or room ○ Dedicated or MTDC ○ Flexibility in site location, to reduce hazards ○ Typically manned, with varying levels of monitoring and automation 	<ul style="list-style-type: none"> ○ Purpose-built facility, leverage existing facility, or purpose-built enclosure ○ Dedicated or MTDC ○ Latency and location of compute needs drive EDC location ○ More likely to be unmanned, with remote monitoring and automation

Central Office to Data Center



Type/ Location

- ✓ 3X3 proposed model for 9 solutions
- ✓ Small pods to full rooms

Fire Protection

- ✓ Equip not NEBS "Level 1": Fire Suppression may be required inside the Pod/Container
- ✓ Equip NEBS "Level 1": No Fire Suppression needed


Power

- ✓ AC or DC Power
- ✓ Existing DC plant/New DC Plant/UPS
- ✓ AC only Outside

HVAC

- ✓ Heat Dissipation driven but there is no requirement for separate HVAC
- ✓ If Fire Suppression is required, isolation of local area is required in case of suppression discharge

Paper NFV/CO to DC Transition



TIA Position Paper

Authors and Contributors

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Executive Summary

Next generation network evolution with the roll-out of 5G will require a significant evolution of the traditional central office to function more like a data center. To succeed, local operators need to assess delivery of critical services to understand and plan requirements, conduct cost modeling, build a business case, and identify the right mix of equipment and services. This paper provides a framework for operators to understand and plan requirements, conduct cost modeling, build a business case, and identify the right mix of equipment and services. This paper provides a framework for operators to understand and plan requirements, conduct cost modeling, build a business case, and identify the right mix of equipment and services. This paper provides a framework for operators to understand and plan requirements, conduct cost modeling, build a business case, and identify the right mix of equipment and services.

TIA Position Paper

Introduction

Information and communications technology (ICT) equipment is deployed in the Central Office (CO) or Public Exchange (PX) central office (CO) in an office at a facility, to serve subscribers' needs and business. This is done on what is called a rack-top. The central office has switching equipment that can switch calls locally or to long distance central office offices to establish long-distance calls between subscribers. These facilities also typically host other services, such as public safety, emergency services, and other services that are critical to the community. This paper provides a framework for operators to understand and plan requirements, conduct cost modeling, build a business case, and identify the right mix of equipment and services. This paper provides a framework for operators to understand and plan requirements, conduct cost modeling, build a business case, and identify the right mix of equipment and services.

TIA Position Paper

Fundamental Aspects of Central Office Revitalization Strategy

When looking to update central office, considerations must be given to the state of the existing network and the needs for the new equipment for local operation and the ability to perform a higher performance environment. The performance requirements include capacity, reliability, and latency. The equipment requirements include the number of equipment racks, power, and cooling. These considerations can affect the overall operational expenses needed to run the network.

Fundamental aspects to consider in any central office revitalization strategy include applicable code compliance, fire protection, heating, ventilation, air conditioning, electrical power, and equipment cooling. Equipment options are based on type and location of the central office and include details for selection.

Throughout the paper, these concepts are identified by (TIA), electrical power, and fire protection considerations. This paper is not a full cost model or a complete, detailed central office revitalization strategy. This paper is not a full cost model or a complete, detailed central office revitalization strategy. This paper is not a full cost model or a complete, detailed central office revitalization strategy.

Specific Considerations for Small, Medium, and Large Scale Central Office Revitalizations

The small scale central office revitalization strategy and the protection are dependent on the applicable codes for that location and may differ from one location to another. Generally, for small scale revitalizations, there is less focus on changing the existing environment, and more focus on upgrading small equipment in existing facilities.

For medium scale central office revitalization, power generation may vary based on the code and location of the central office. The equipment requirements may vary in complexity, which power generation and cooling requirements may be more complex for both a small and medium scale central office revitalization. However, a strategic analysis of the central office is required to ensure that there is sufficient capacity to serve on the potential upgrade additional power and cooling load.

The paper does not define requirements for large scale central office. Generally, large scale revitalizations will require additional data center facilities.

TIA Position Paper

Conclusion

The central office is a critical component of the network and is essential for the delivery of services to subscribers. This paper provides a framework for operators to understand and plan requirements, conduct cost modeling, build a business case, and identify the right mix of equipment and services. This paper provides a framework for operators to understand and plan requirements, conduct cost modeling, build a business case, and identify the right mix of equipment and services.

TIA Position Paper

References

1. TIA-606-B Telecommunications Termination and Distribution Standard for Open-Ended Systems (OSDs) and Closed-Ended Systems (CESDs) (2011)

2. TIA-606-C Telecommunications Termination and Distribution Standard for Open-Ended Systems (OSDs) and Closed-Ended Systems (CESDs) (2013)

3. TIA-606-D Telecommunications Termination and Distribution Standard for Open-Ended Systems (OSDs) and Closed-Ended Systems (CESDs) (2015)

4. TIA-606-E Telecommunications Termination and Distribution Standard for Open-Ended Systems (OSDs) and Closed-Ended Systems (CESDs) (2017)

5. TIA-606-F Telecommunications Termination and Distribution Standard for Open-Ended Systems (OSDs) and Closed-Ended Systems (CESDs) (2019)

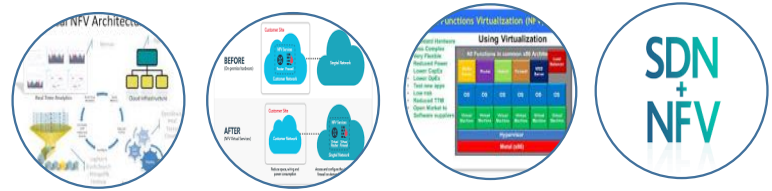
TIA Position Paper

Appendix A

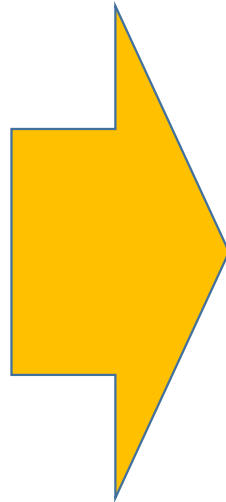
Appendix A provides a detailed list of equipment and services that are required for a central office revitalization. This appendix is not included in this paper.



Network Evolution



- Hardware-centric
- Physical Network Functions
- Vendor-specific Interfaces
- Central Offices
- Manual Configuration
- Hierarchical Network
- Vendor-specific Hardware
- Physical Network



- Software-centric
- Virtual Network Functions
- Open Standard APIs
- Data Centers
- Self-Organizing Networks
- Distributed Cloud
- White Boxes
- Logical Network Slicing

Use Cases Performance Examples

Dense Urban Mobile Broadband (MBB)

User DL data rate: 300 Mbps
DL Traffic density: 750 Gbps/km²
User density: 25,000/km²
Mobility: 0-60 km/h

Robotic Motion Control

E2E latency: 1 ms
Jitter: 1 μ s
Availability: 99.9999%
Traffic density: 1 Tbps/km²
Connection density: 100,000/km²

Intelligent Transport Systems

E2E latency: 10 ms
Jitter: 20 ms
Availability: 99.9999%
Traffic density: 10 Gbps/km²
Connection density: 1,000/km²

Electricity Distribution – High Voltage

E2E latency: 5 ms
Jitter: 1 ms
Availability: 99.9999%
Traffic density: 100 Gbps/km²
Connection density: 1,000/km²

Massive Machine-Type-Communication (MTC)

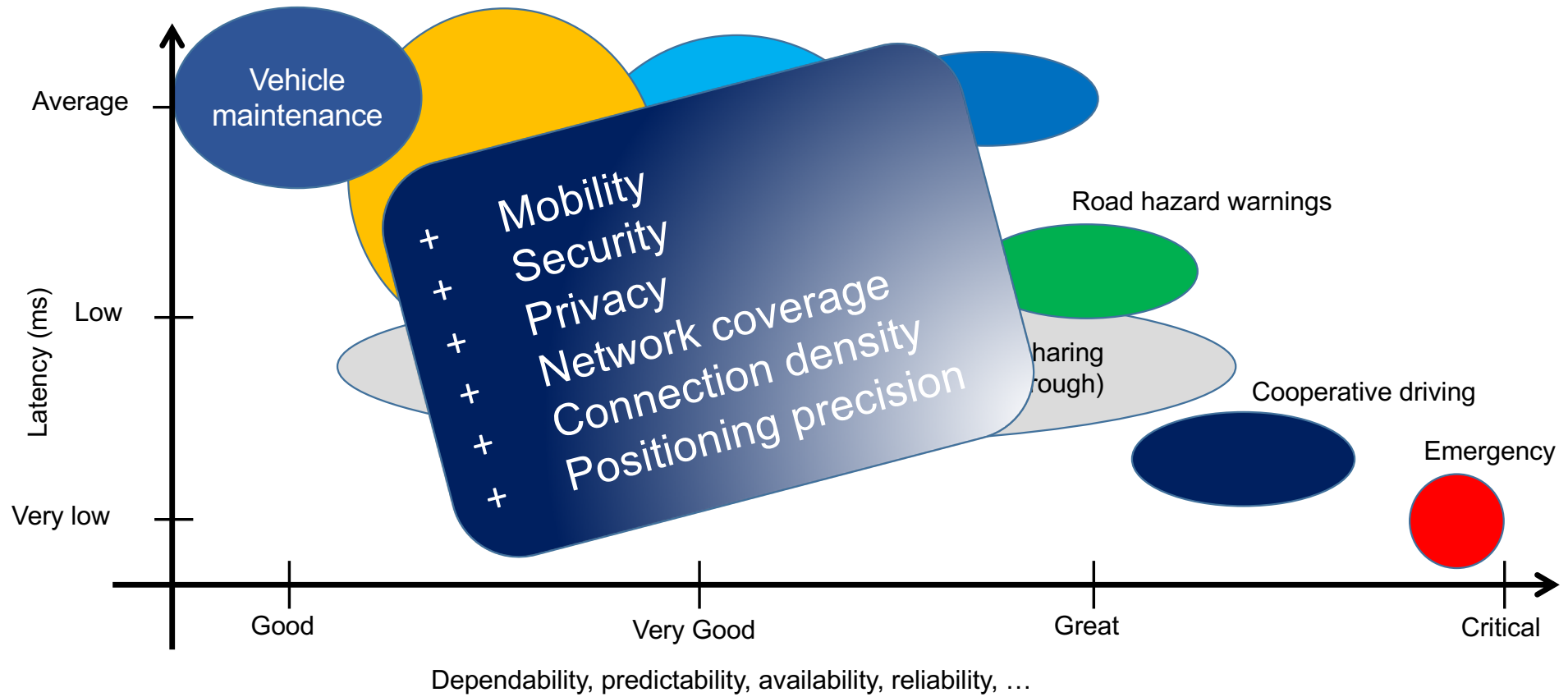
E2E latency: Seconds to hours
Data rate: 1-100 kbps
User density: 200,000/km²
Mobility: 0-500 km/h

Augmented and Virtual Reality

Immersive video: 6 DoF
User DL data rate: 1 Gbps
E2E latency: 7 ms
Motion-to-Photon: 15 ms
Vestibulo-Ocular Reflex: 7 ms

References: 3GPP TS 22.261 V16.3.0 (2018-03)
Enabling Mobile Augmented and Virtual Reality with 5G Networks (Jan 2017)

V2X Performance Requirements



Network Service Assurance

Traditional Perception of “failure” is inadequate and needs to change

- Old - Failure is a disruption
- New- Failure is user interruption and could be critical

Data Center 1	99.67% Availability	→	28.8 hours downtime
Data Center 2	99.74% Availability	→	22.7 hours downtime
Data Center 3	99.98% Availability	→	1.6 hours downtime
Data Center 4	99.995% Availability	→	25 Minutes downtime
Telecom today	99.999% Availability	→	5.26 Minutes downtime
5G / Next Gen	99.9999% Availability	→	32 Seconds downtime
5G / Critical needs	100% Availability	→	No downtime

NSA Key Verticals

- Automotive Industry (cars, trucks, buses, subway, city trains, tramways, boats)
- Industry 4.0 (smart factories)
- Healthcare (telemedicine)
- Entertainment (stadium, VR/AR, UHD)
- Real Estate (Smart Buildings)
- Smart Buildings / Smart Cities
- Agriculture (Smart Farming)
- Utility (Smart Grid, Gas)
- Logistics/Distribution
- Retail
- Public Safety
- Education

- Security
- Gaming
- Mining
- Tourism
- Hospitality
- Transportation (Cargo boats, trains)
- Insurance
- Construction
- Government services
- Financial services
- Public long distance transport (inter-city buses, trains, boats, planes)

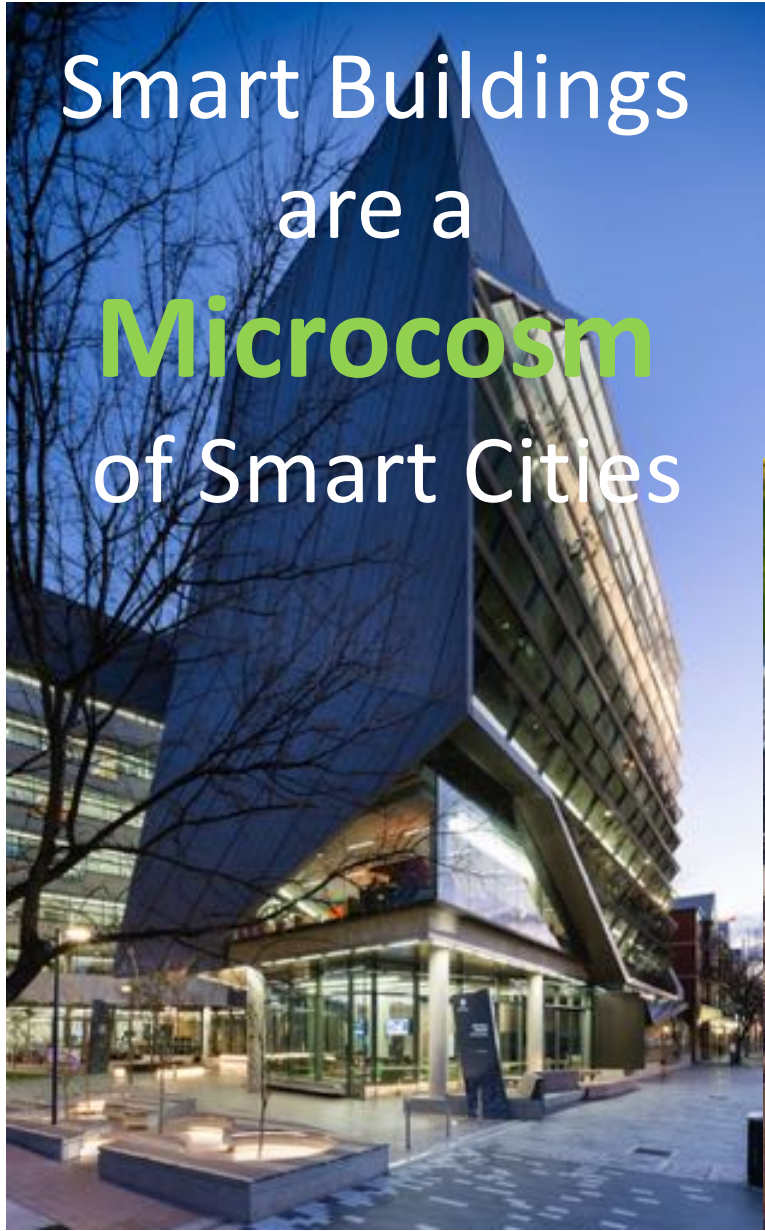
Smart Buildings: Microcosm of Smart Cities



An architectural rendering of a modern, multi-level building interior. The space is characterized by its clean lines and extensive use of glass and light-colored materials. Multiple levels are visible, with people walking on different floors, suggesting a vibrant, active environment. Large trees are planted on various levels, adding a touch of nature to the urban setting. The lighting is warm and inviting, highlighting the architectural details and the movement of people. In the upper right corner, there is a semi-transparent grey box containing the text "Buildings Are Cities".

Buildings
Are
Cities

Smart Buildings
are a
Microcosm
of Smart Cities



Smart Campus



Smart Neighborhood



Smart City



Smart Buildings Value Proposition



Financial Proposition:

- Reduce Total Cost of Ownership
- Efficiencies
- Monetize Connectivity
- Competitive Advantage

Tenant Proposition:

- Workforce Enhancements
- Safety, Comfort, Satisfaction
- Mobility & Flexibility
- Innovative Solutions

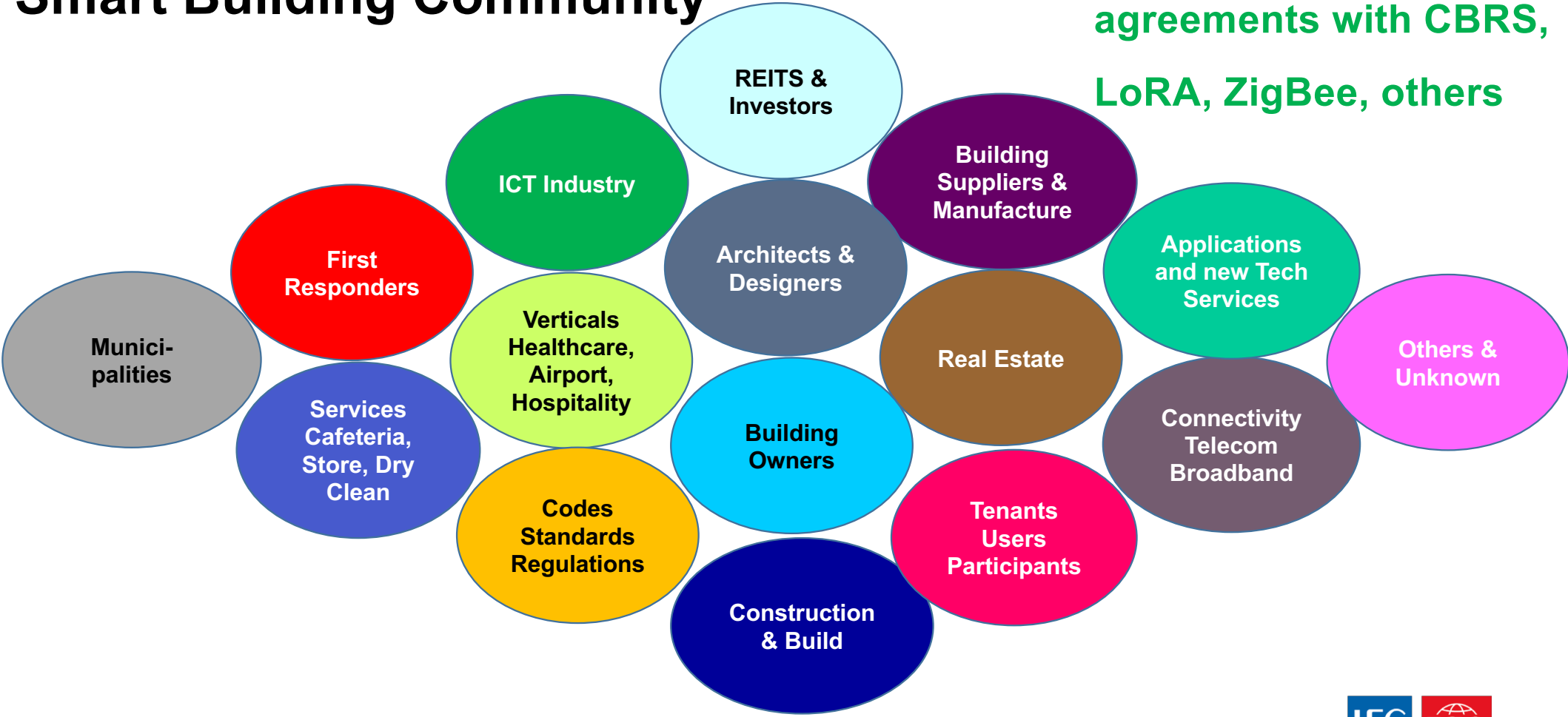
Owner Proposition:

- Optimized Operations
- Business Intelligence, Data, Analytics
- Environmental / Sustainability
- Social Responsibility

Smart Buildings as a Service

- **TIA is Building a New Marketplace**
 - A market shift is required due to tenant's recognition of technology valuations
 - "Proptech" entering every phase of the RE
 - Smart Buildings as a Service
 - Education / leadership are needed
- **Developing a Common Language**
- **Leading the Vision**
- **Leveraging TIA Standards Position**
- **Supporting Smart Environment Ecosystem**
 - Includes smart municipalities; wellness; sustainable and safe environments, both in and outside of buildings (i.e. LEED, WELL, others)

Smart Building Community



✓ Collaboration agreements with CBRs, LoRA, ZigBee, others

Questions

Thank You

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