

Smart Buildings: Powering Digital Transformation in an IoT World

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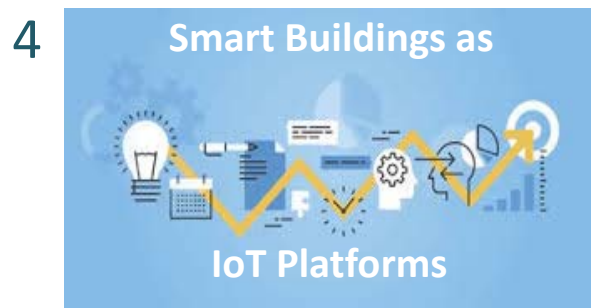


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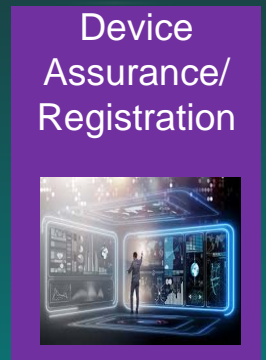
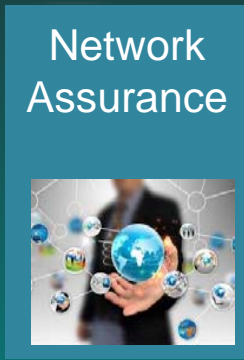
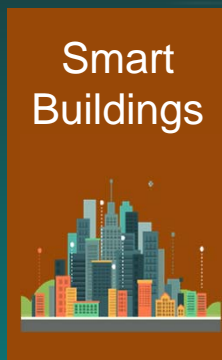
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Today's Agenda



TIA's IoT Ready Infrastructure 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
Tools
Assurance
Certification
Registration
Sustainability



Why Smart Buildings?

Advent of 5G

Digital Transformation of **how** we Live, Work and Play

Ground shaking changings in **the environment** of
where we Live, Work and Play



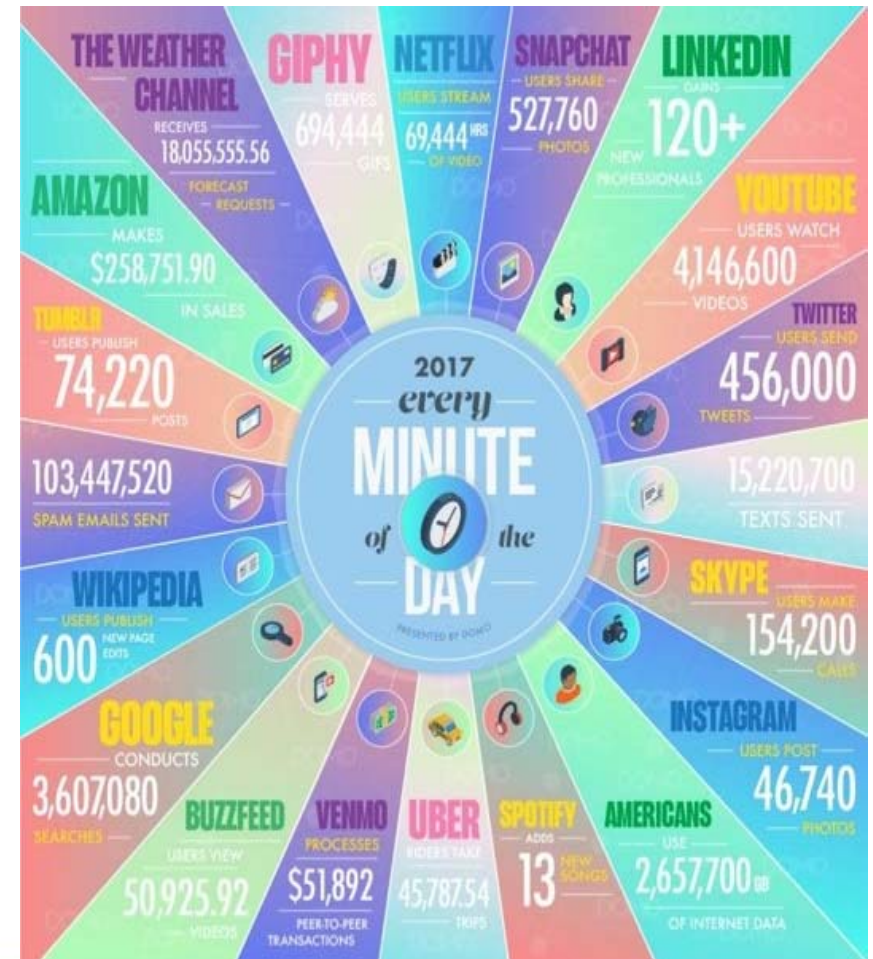
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Daily Digital Data Dose

- Global mobile population is 3.98B unique users
 - Consuming 34 GB Data/Day
- Depending on what you do daily, contributing 2-13.5 GB/SIM/day
- Monthly mobile data usage with surge to 98.34 GB/SIM by 2025
 - 82% of internet traffic will be IP video by 2021
 - 75% of worldwide video traffic is over mobile
 - 80% of all mobile usage takes place inside a building
 - Intelligent Building Systems and IoT run on data



Redefining SB: Robust IoT Ready

*Ensuring that buildings offer valued services while being
Sustainable, Secure, Safe, Reliable, Resilient*

Building Network

IP, Wireless, Networking, Connectivity, Voice, Video, Data, Safety, Security

Connected Assets & Components

Sensors, Beacons, Meters, Devices, Smart Devices, BMS, RFID, M2M, Asset Management

Operational, Private, Secure Data Lakes and Intelligence

Serving Building Operators

Integrated, data rich systems and applications that Optimize Operations

Serving Tenants and Use Cases

Personal, identifiable. Serving their space, performance, and activity needs

Revenue Opportunities

All stakeholders in this ecosystem receive value and see a positive bottom line



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Smart Buildings Vision



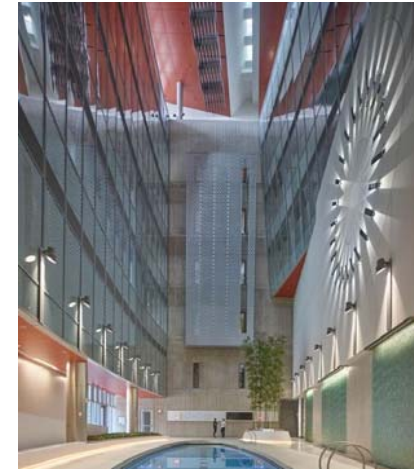
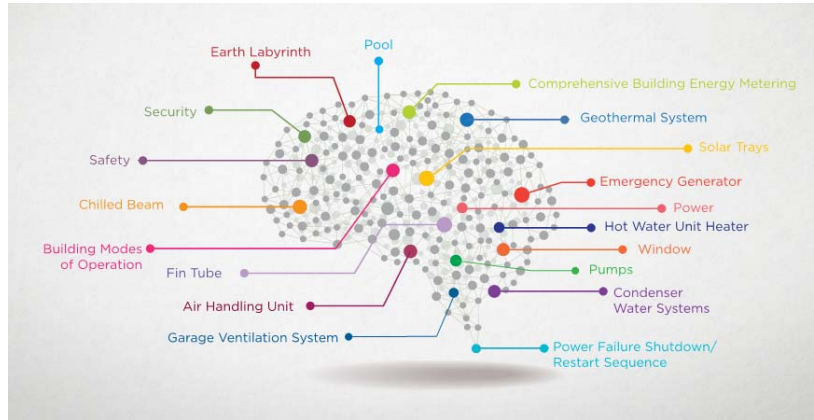
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Deloitte's The Edge (Amsterdam) — The Individualized Experience

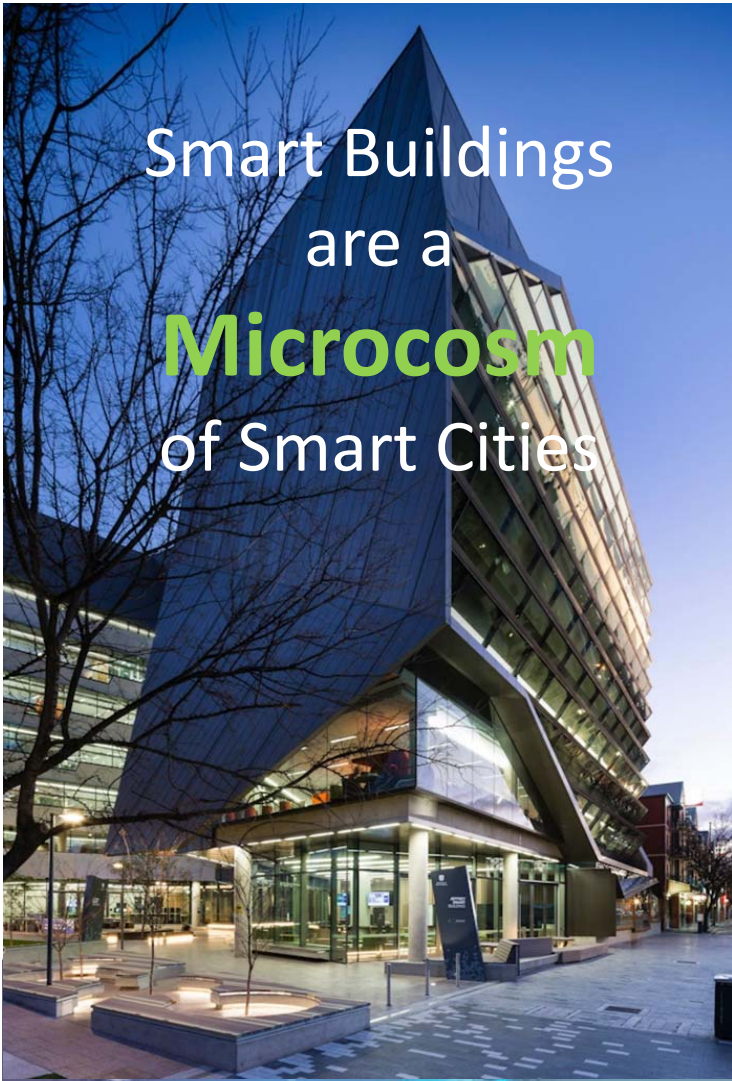


united therapeutics' Unisphere (silver spring, MD) — deep system integration

Smart Buildings Statistics

Can't Optimize What You Cannot Measure

- Edge uses 70% less energy than the average office building
- Ethernet-powered LED lighting system is 80% more efficient than conventional illumination
- HVAC, lighting, and some types of electrical loads, can expect savings 10%-25% savings with a proactive energy-management programs
- Effect a desk to colleague ratio of 1:14 (Hot Desking)
- Personalized control of room temperature can raise productivity by 3%
- Optimized air quality can increase productivity by 11%



Smart Buildings
are a
Microcosm
of Smart Cities



Smart Campus



**Smart Neighborhood /
Smart Community**



Smart City

Market Themes

- About the individual (employee) experience
- Health, wellness, productivity
- Decommoditization of space
- Shift in market from sustainability as area of focus (has permeated the marketplace) to the productive, happy worker, and to resilience
- ROI statistics are showing the impact – much more data needed
- Municipalities/jurisdictions, some lenders, some insurers have made sustainability a function of how they award contracts, give tax credits or building extensions, etc. Can we do the same for smart buildings?
- Smart buildings are considered integral to smart cities
- ICT market growth opportunities in this space – IoT overall and specific building related tech



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What We Learned

- Developers, architects, and ICT agree defining/benchmarking the smart building will help the ecosystem marketplace
- Fragmented market interest in smart buildings – developers still typically resistant, risk averse, cost averse, but seeing tenant demand – they expect connectivity
- Single owner/occupier predominant smart building developer – owner with a vision
- Occasional multi-tenant – market differentiation; possible higher per sq. foot retail
- Most of the global RE firms and some local ones completely on board – still trying to figure it out. We are at the crest of the wave.
- Most A&E and developers have little to no knowledge of communications infrastructure, FirstNet, NG911 - issues, implications, how to solve

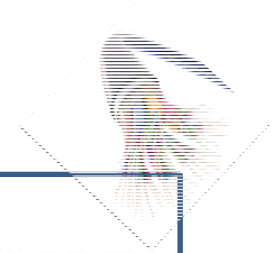


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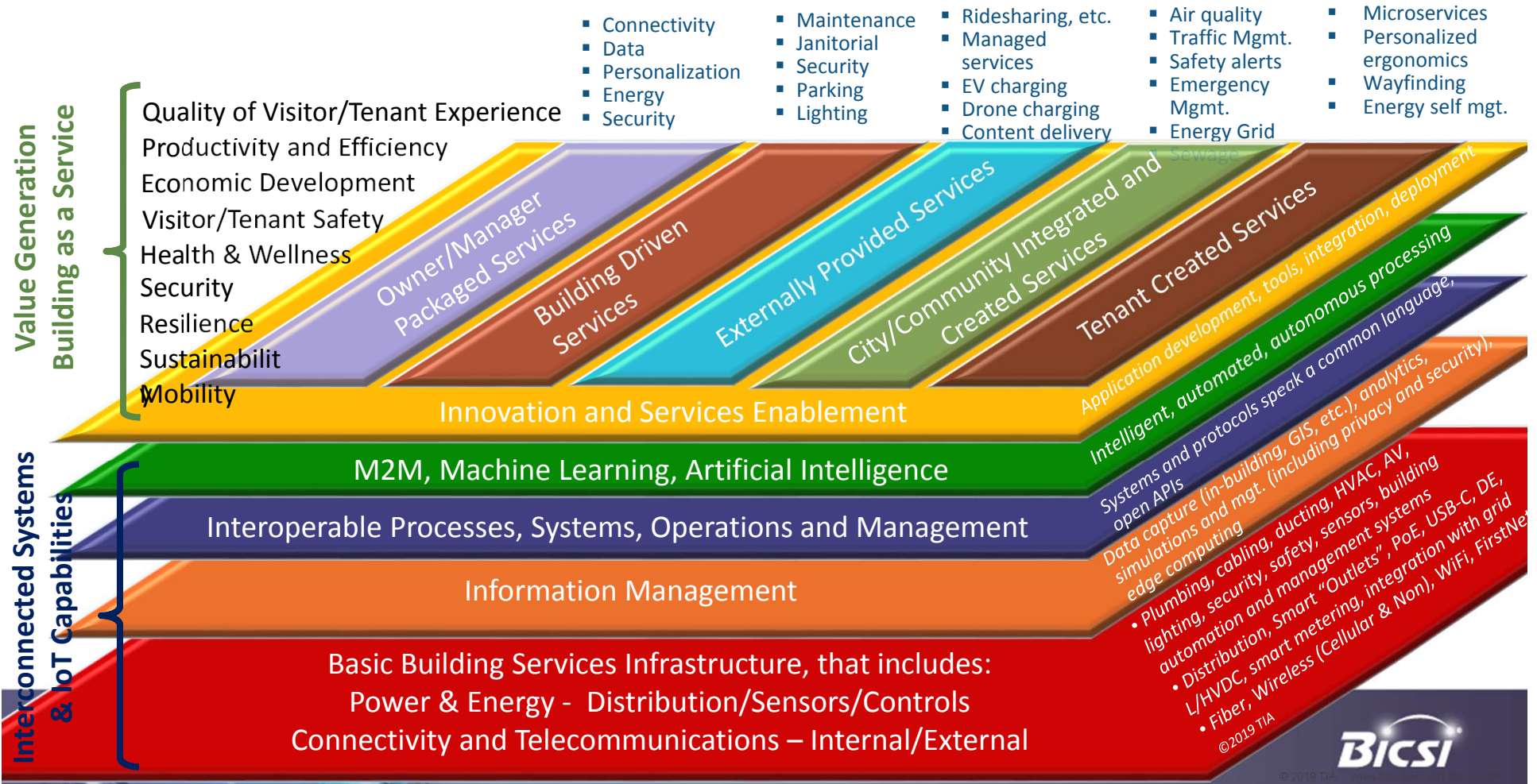


Vision: Standardizing Interoperability



Cellular WAN	WLAN/WPAN	WAN	WAN Fixed	LPWAN, IoT		
<p>GSM</p> <p>2G 3G 4G</p> <p>GRPS EDGE UMTS HSPA HSPA+ LTE</p> <p>small cells</p> <p>3G 4G 5G</p> <p>UNLICENSED</p> <p>Lte 4GVA</p> <p>HSPA+ Advanced HSPA+ HSPA+</p>	<p>Wi Fi</p> <p>COOPERATE</p> <p>Wi Fi lte</p> <p>Bluetooth</p> <p>Bluetooth MESH</p> <p>LoWPAN</p> <p>IPv6-based Low-power Wireless Personal Area Networks</p>	<p>MIMO</p> <p>In-Building DAS</p> <p>Standalone Network</p>	<p>ALLIANCE cbrs</p> <p>OnGo</p> <p>MULTEFIRE</p>	<p>LoRa</p> <p>WEIGHTLESS</p> <p>NB-IoT</p> <p>GENU simply genius</p> <p>lteU LTE-M sigfox</p>		
				Broadband Wireless		
				<p>LFi</p> <p>WiMAX</p>		
		<th>PAN</th>	PAN	<th>BAN</th>	BAN	Other Wireless
		ZigBee	N	<p>EnOcean Self-powered IoT</p> <p>wiSUN ZWAVE</p>		

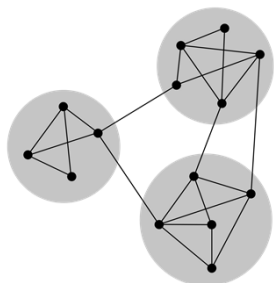
Smart Building as Connected Asset & Integrated Ecosystem



Smart Buildings Program



Defining the Smart Building



Connectivity



Functionality Experience



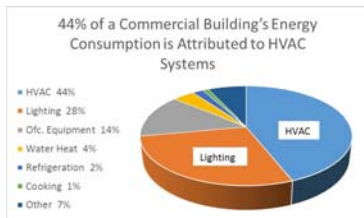
Intelligence And Data



Safety



Security - Cyber & Physical/ Privacy



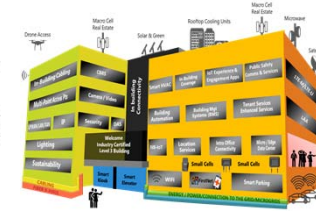
Power & Energy



Resilience



Sensing



Interoperability



Operations

Continued Collaboration...

