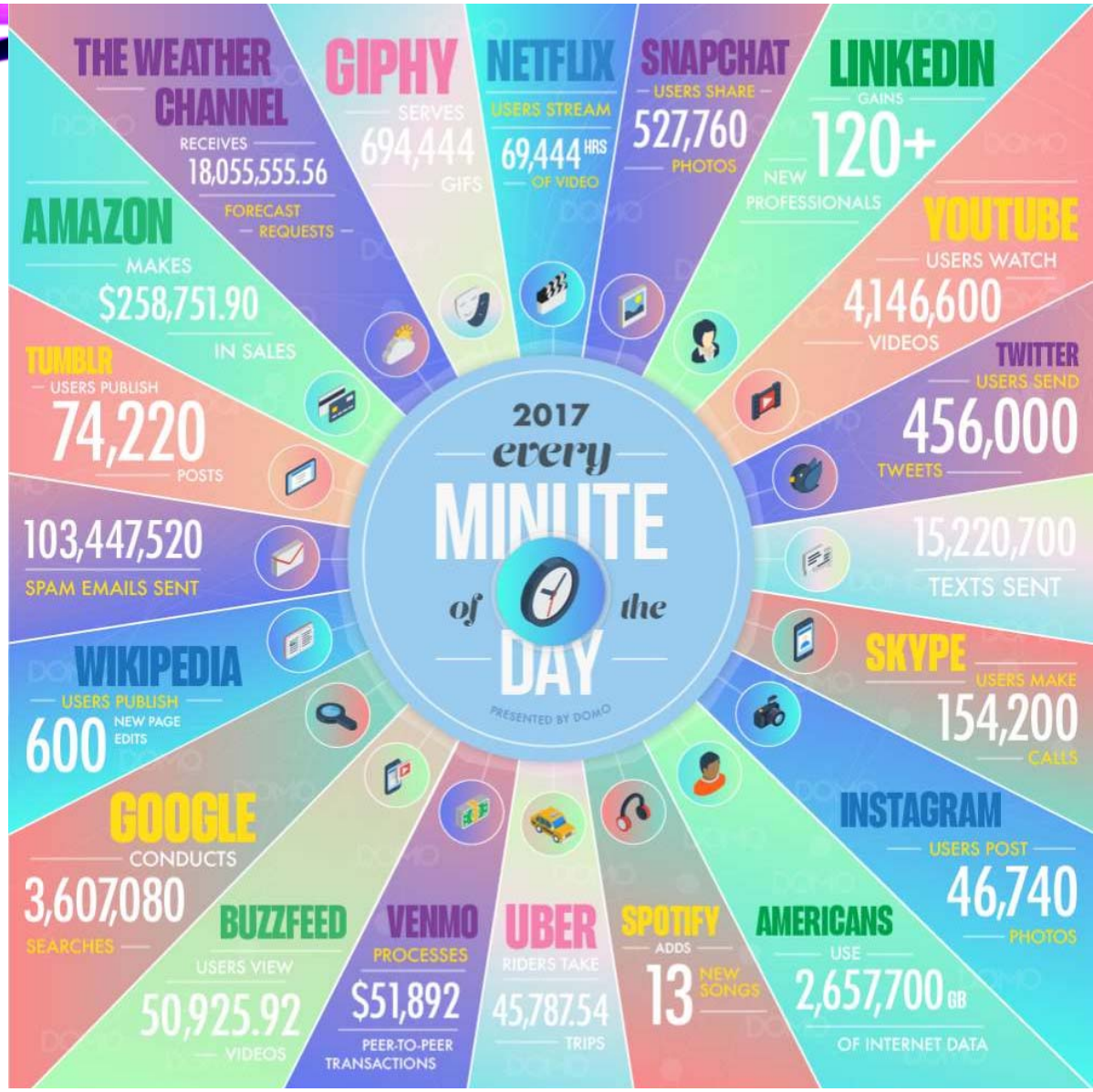
POWERING DIGITAL TRANSFORMATION IN SMART CITIES: THE ROLE OF SMART BUILDINGS

Limor Schafman, Director, Smart Buildings Program
Telecommunications Industry Association

2018 BICSI MEA Conference
April 18, 2018

- 2.5 Q bytes of data/day
- 90% of all data today was created in the past 2 years
- Depending on what you do daily, contributing 2-13.5 GB/SIM/day
- Consuming 34 GB Data/Day



A SNOWFLAKE ON THE ICEBERG

- Monthly mobile data usage with surge to 98.34 GB/SIM by 2025
- Netflix Q3 207, 140 Hrs of viewing/day; 1B hours/week. With 109M viewers. Viewership estimated to grow to 140M to 230M by 2025.
- Twitch eSports viewers watched 475.5 million hours streaming video (2017), an average of over 79 million Hrs/mo - Viewership growing 12%/yr
- Robotic surgeries: Compound annual growth rate of 13.5%/year; 4,000 locations conducted 750K surgeries in 2016. Over year with 3M since 2000
- Autonomous Vehicles: 4,000 GB/Hour of Driving

FIRST STEPS TOWARD A SMART CITY

1. Energy
   - Smart Grid
   - Lighting – multi-sensor LEDs
2. Sustainability
   - Sewage (sensors)
   - Garbage management
3. Operations Services
4. Transportation
   - Public transportation tracking
   - Parking
5. Infrastructure
   - Gigabit Cities
   - Small Cells
6. Open Source Data

SMART COMMUNITY HIGHLIGHTS

- Seoul, Korea – Government funded ambitious smart city program
  - Declared the use of oneM2M platform as common IoT enablement framework
  - Tablet and cell phone for every elderly person for immediate contact
  - 1 gigabyte/second up and down speeds
- Vienna, Austria and other regions - Renewable energy focused
  - 300,000 solar panels by 2020,
  - Has the world's largest biomass plant,
  - Offers over 90 percent of residents convenient public transportation
- Boston, MA, USA - Governance, public management
  - Well thought out small cell deployment process and installing fiber network (Verizon)
  - Ranked top 10 in education, business ecosystems, internet speed, and perception of smartness
  - Pilot program with road sensors, lighting, connected cameras for traffic monitoring
- Amsterdam, The Netherlands – Citizen participation and government digitization
  - Renewable energy key focus – electric garbage trucks, solar paneled bus stops, billboards, and lights, energy efficient roofing insulation, automatically dimming light switches, smart meters, ultra-low energy LED lights

SMART COMMUNITY HIGHLIGHTS (CONT.)

- Tokyo, Japan – Renewable energy, and smart transportation
  - Zero carbon emissions smart town outside of Toyko, completely powered by renewables (with Panasonic, Tokyo Gas, Accenture)
  - Created homes with integrated solar panels, storage batteries, and energy efficient appliances connected to a smart grid
  - Tokyo's rail system "smartly" handles over 100 train lines which transports 14 billion passengers; smart parking
- Paris, France – Green and Renewable energy;
  - Largely through transportation including rentable bikes and soon electric cars
  - Government digitization
- London, England – Innovative tech
  - Made the most of WiFi ubiquity, tech startup innovation, transportation, smart parking
- San Francisco, CA – Transportation, Ecosystem
  - Smart grid deployment and electric and smart transportation

HOW CITIES USUALLY FUNCTION

City Infrastructure Technologies

Urban Sector	Technologies / Concepts	Objectives
Transportation	Multi-modal integration via ICT applications and models On-demand digitally enabled transportation Design for biking and walking Electrification of motorized transportation Autonomous vehicles	Save time Comfort or productivity Low-cost mobility and universal access Reduced operating expenses to transportation providers Zero emissions, collisions, fatalities Noise reduction Lifestyles Tailored solutions for the underserved, disabled, and elderly
Energy	Distributed renewables Co-generation District heating and cooling Low-cost energy storage Smart-grids, micro-grids Energy-efficient lighting Advanced HVAC systems	Energy efficiency Zero air pollution Low noise Synergistic resource management with water and transportation Increased resilience against climate change and natural disasters
Building and Housing	New construction technologies and designs Life-course design and optimization Sensing and actuation for real-time space management Adaptive space design Financing, codes, and standards conducive to innovation	Affordable housing Healthy living and working environments Inexpensive innovation and entrepreneurial space Thermal comfort Increased resilience
Water	Integrated water systems design and management Local recycling Water efficiency via smart metering Re-use in buildings and districts	Active ecosystem integration Smart integration of water, sanitation, flood control, agriculture, and the environment as a system Increased resilience

Data Enabled Pilot Projects

Focus Area	Program descriptions
Reducing Air Pollution	Some basic tools have been developed associated with the emerging *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC),*[54] developed under the recent agreement known as the *Compact of Mayors.*[55]
Eliminating Deaths and Serious Injuries on the City's Streets	Data and analysis offer cities means to reduce the dangers of automobile-based transportation systems. Often referred to as Vision Zero, the idea can be summed up as, "when a child runs after a bouncing ball into a residential street and a speeding car strikes and kills him, the Vision Zero philosophy maintains [that] the death shouldn't be seen as an unavoidable tragedy but as the result of an error of road design or behavioral reinforcement, or both."[56] • San Francisco, New York City, Los Angeles, Washington, D.C. – Vision Zero[57] • Los Angeles – High Injury Network and Safe Routes to School[58]
Fire Prevention	The New York Fire Department (NYFD) started using data mining and predictive analytics to determine which buildings are most likely to erupt in a major fire. Roughly 60 different factors have been built into an algorithm that assigns each of the inspect-able buildings with a risk score. The risk score now determines the order of inspection, as opposed to a process that returns to previously inspected buildings randomly or based on safety priorities.[59]
Street Services	The city of Los Angeles is currently in the process of adding Global Positioning Systems, sensors, and cameras to their street sweepers. This will allow the city to open streets for parking more quickly, track water usage, tune or change routes to real-time priorities, and track coverage to make sure street sweeping is complete.[60]
Recycling	The city of Los Angeles is rolling out a franchise-management system to integrate private waste companies into the cities' system of service calls, data tracking, and billing to work together to deliver yard waste services to multi-unit dwellings and commercial locations.[61]
Load-Balancing of Street Systems	A number of apps have been published that let drivers and passengers identify shortest routes over city streets. Cities are sharing real-time data with these apps, and receiving reports from them, in an effort to optimize the use and management of city streets. • Country wide – Waze • Denver, Los Angeles – CitySight[62]

Source: President's Council of Advisors To Science & Technology: Report to the President: Technology and the Future of Smart Cities (February, 2016)

A CONFLUENCE OF ISSUES

The Smart Community

- Need for Quick ROI (single/local issue focus) vs. Overarching Strategy
- Budget
- Governmental policies
  - Supportive Policies, Regulations and Incentives
  - Lengthy and expensive licensing and procurement
- Lack of Accepted Guidelines and Standards
  - Isolated Systems
  - Individuated Networks
  - Silos of Data (if any)
- Project and Product Scalability
- Prototype Projects
- Technology Understanding
  - Incomplete knowledge of possible solutions
  - IT vs. OT
  - Trained Personnel
- Desire to Attract and Retain People
- Security & Privacy
- Public Safety
- Where Do We Start

The Building Microcosm

- Long term application vs. Need for Quick ROI
  - Broaden the strategy and see opportunity as strategic
- CAPEX/OPEX
- Lack of Accepted Guidelines and Standards
  - Isolated Systems
  - Individuated Networks
  - Silos of Data (if any)
- Technology Understanding
  - Incomplete knowledge of possible solutions
  - IT vs. OT
  - Trained Personnel
- One-off Buildings and Campuses
- Desire to Attract and Retain People
- Security & Privacy
- Public Safety
- Where Do We Start


Smart Buildings
are a
Microcosm
of Smart Cities

DELOITTE'S THE EDGE (AMSTERDAM, 2015)

- Highest BREEAM accreditation score ever for an office building—98.36 percent
- 430K sq./ft. 2,500 works, 1,000 spaces; ¼ of the building is a place to meet (hot desking)
- 28,000 sensors
- LED panels powered by PoE (made especially by Philips Lighting). The panels packed with sensors—motion, light, temperature, humidity, infrared—creates a "digital ceiling" that wires the building like a neural net.
- 15-story atrium at heart:
  - Mesh panels between each floor let stale office air spill into open space, where it rises and is exhaled through the roof, creating a loop of natural ventilation.
  - Slight heat variations and air currents make it feel like the outdoors.
  - Natural light pervades even on a stormy day.
- Every workspace is within 7 meters (23 feet) of a window.
- Solar panels produce more energy than building uses.
- Central app that tracks you, guides and preps space for you. Find colleagues. Manage schedule including exercise.
- Workspaces are based on your schedule: sitting desk, standing desk, work booth, meeting room, balcony seat, or "concentration room."
- Wherever you go, the app knows your preferences for light and temperature, and it tweaks the environment accordingly.

DELOITTE'S THE EDGE

- Data tracked, analyzed and used: How edge and employees interact, when coffee supplies run out; shut down building sections if no employees.
- Lockers serve as home base for the day. Find a locker with a green light, flash a badge, and it's yours.
- Access control: A camera snaps a photo of the license plate, matches it with a persons employment record, and raises the gate.
- Behind each ceiling tile is a massive coil of thin blue piping that delivers water to and from the building's subterranean water storage for radiant heating and cooling.
- Ethernet data communications infr
- Thermal energy system: 400 feet deep in the aquifer beneath the building, where it sits, insulated, until winter, when it's sucked back out for heating. Precision controls throughout the building.
- A coming app upgrade will boost efficiency further by suggesting desk locations to employees based on their temperature preferences and meeting locations throughout the day.
- Security bots. And cleaning bots that work with staff to clean the most trafficked parts of the building.
- Workout gym captures your energy and cycles it back to the building.
- Bathrooms track usage so cleaning crew knows when items run out.



DELOITTE'S THE EDGE

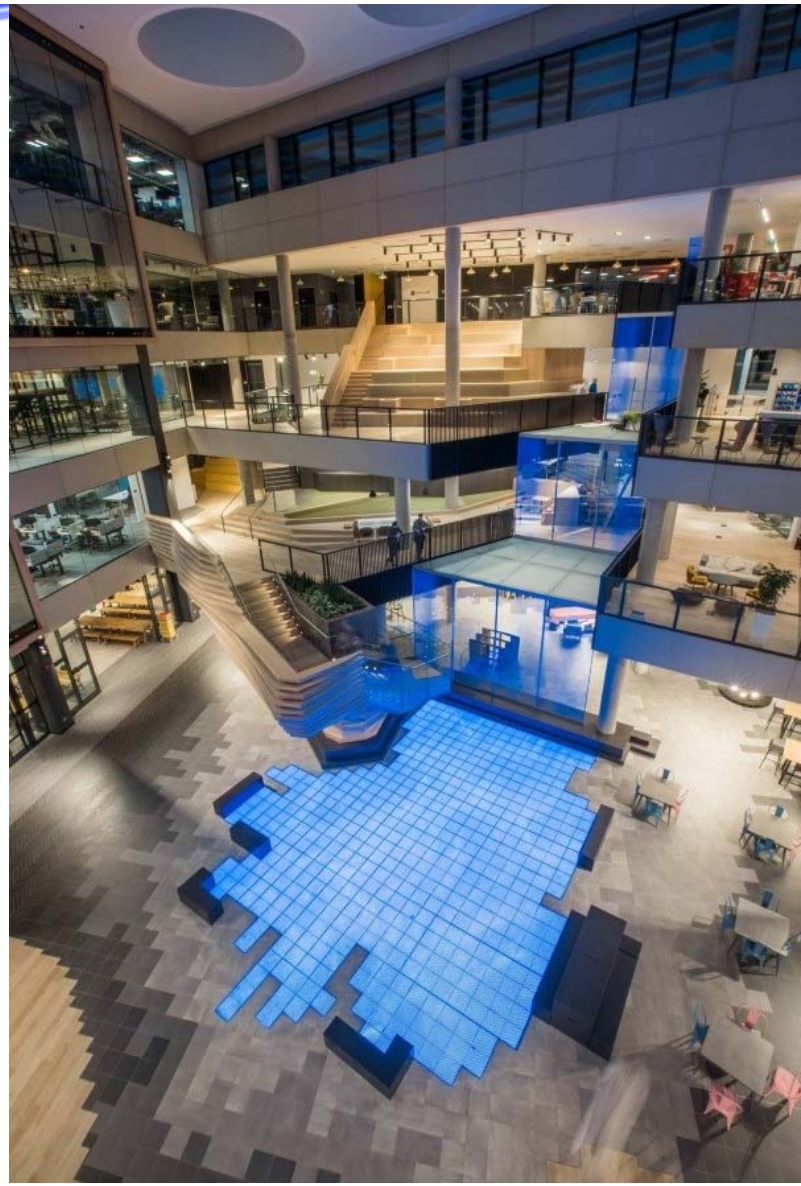
ACCENTURE'S THE DOCK (DUBLIN - SILICON DOCKS, 2017)

- 60K sq./ft.
- 200 staff Multi-disciplinary R&D and incubation hub
- 10,000 sensors 1M data points/day
- Connected to centralized Accenture owned IoT platform, to manage and navigate space, and collaborate with colleagues.
- Lux sensors detect sunlight and gradually adjust light levels to match body's circadian rhythms
- Analytics software monitors the ongoing performance of the air conditioning systems. The data generated allows facilities managers to observe long-term energy performance and detect potentially costly future problems.
- Infrared sensors in waste receptacles inform cleaning staff of rubbish levels to improve the efficiency of waste management.
- Location services software helps find people, places and things within the building
- Highly designed facility for staff interaction and individual focus

SCENES FROM THE DOCK

ONE MICROSOFT PLACE
(DUBLIN, 2018)

- 34K sq. m., 134M Euro,
- 3,000 seats for data scientists, AI bot builders, mixed reality game developers, sales and marketing who work in open layout “neighborhoods” each designed to reflect 150 nationalities.
- Green: collected rainwater used in building; greens grown on roof used in café food; bee hives for harvesting honey
- DreamSpace: Education and Innovation hub
- Yoga pod, a gym, several relaxation areas, play area, nail bar



SMART BUILDING 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%


Experience
Expense

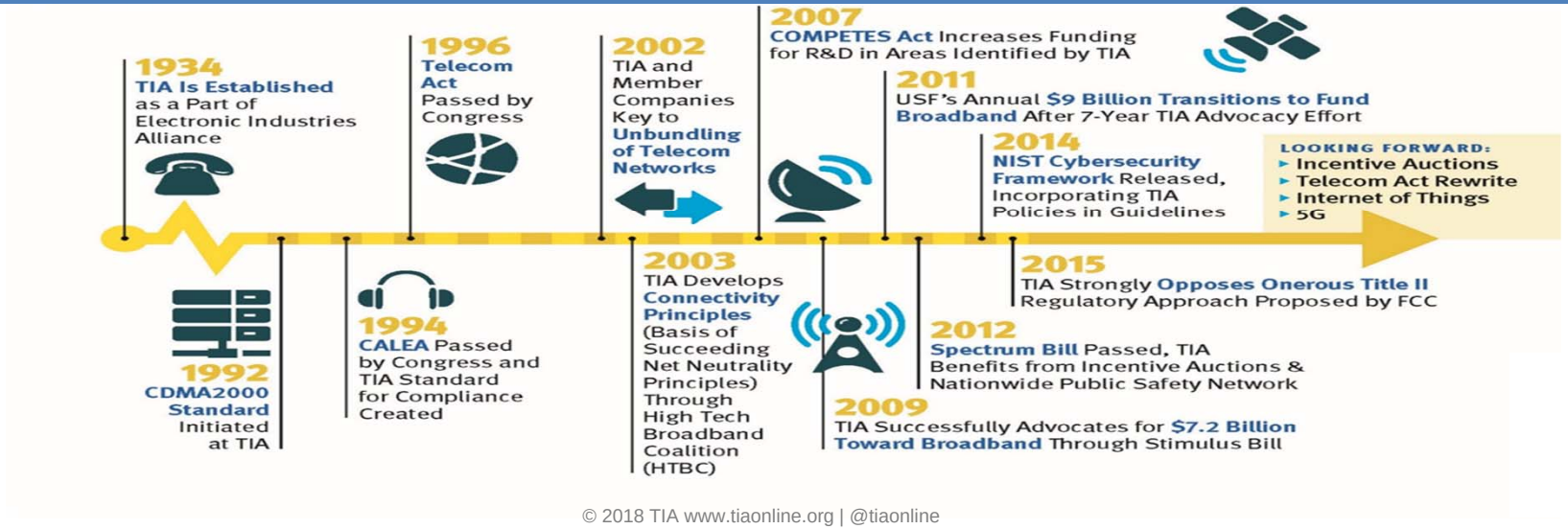
Smart Buildings Program & Working Group

Limor Schafman, Director

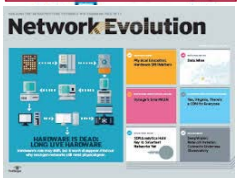
TIA's Roadmap

Starts with our Foundation since the 1930's as the leading ICT Standards Body

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



TIA'S NETWORK OF THE FUTURE®



Smart Buildings

Edge
Data Center

NFV

Network Assurance

Device Assurance

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

- TR-8 I Mobile and Personal Private Radio Standards
- TR-14 I Structural Standards for Communication
- TR-30 I Multi-Media Access, Protocols and Interfaces
- TR-34 I Satellite Equipment & Systems
- TR-41 I Performance and Accessibility Communications
- TR-42 I Telecommunications Cabling Systems
- TR-45 I Mobile and Point-to-Point Communications Stds
- TR-48 I Vehicular Telematics
- TR-50 I M2M - Smart Device Communications
- TR-51 I Smart Utility Networks

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

Communities Of Interest

TIA's Foundation in Smart Buildings

SMART BUILDINGS

TIA MEMBER COMMUNITIES

Technology
- Smart Buildings WG
- Edge Data Centers Working Group
- Infrastructure Assurance- NFV
- Device Assurance
- Classification WG
- Device Registration

Standards
- TR 14 Structural Standards for Towers
- TR 8 Public Safety Standards
- TR 42 Building Cabling Standards
- TIA-942 Data Centers
- One M2M Consortium
- IEC Smart Cities Systems Tech Advisory Group (TAG)
- IEC SEG 9 Smart Buildings
- TL9000

Advocacy
- Broadband Infrastructure Policies
- Cybersecurity Committee
- IoT Policy Working Group
- Public Safety Policies
- Standard IPR

Business
- TIA NOW Documentaries
- Smart Cities Maturity Model Research
- Workshops & Webinars
- Sustainability Assessment
- Customer Experience

TIA BUILDINGS STANDARDS

- **TR-42** - Structured Cabling Infrastructure Standards:
  - Intelligent building
  - Fiber and coax cabling
  - ANSI/TIA-862-B
  - Multi-tenant, healthcare, places of assembly
- **TR-45** - CDMA 200 FEMTO & PICO Cells
- **TR-14** - Towers and Rooftop Cell
- **TR-51** - Smart Metering (on site bldg.) Smart Utility Methods
- **IEC JTC1/SC25** – Home Building Automation
- **IEC TC 46, 76, 86** – Cabling Fiber Structured Cabling
- **TR-8** – First Responder Radio


BUILDINGS
ARE
CITIES

MOVING BEYOND EFFICIENT BUILDING MANAGEMENT

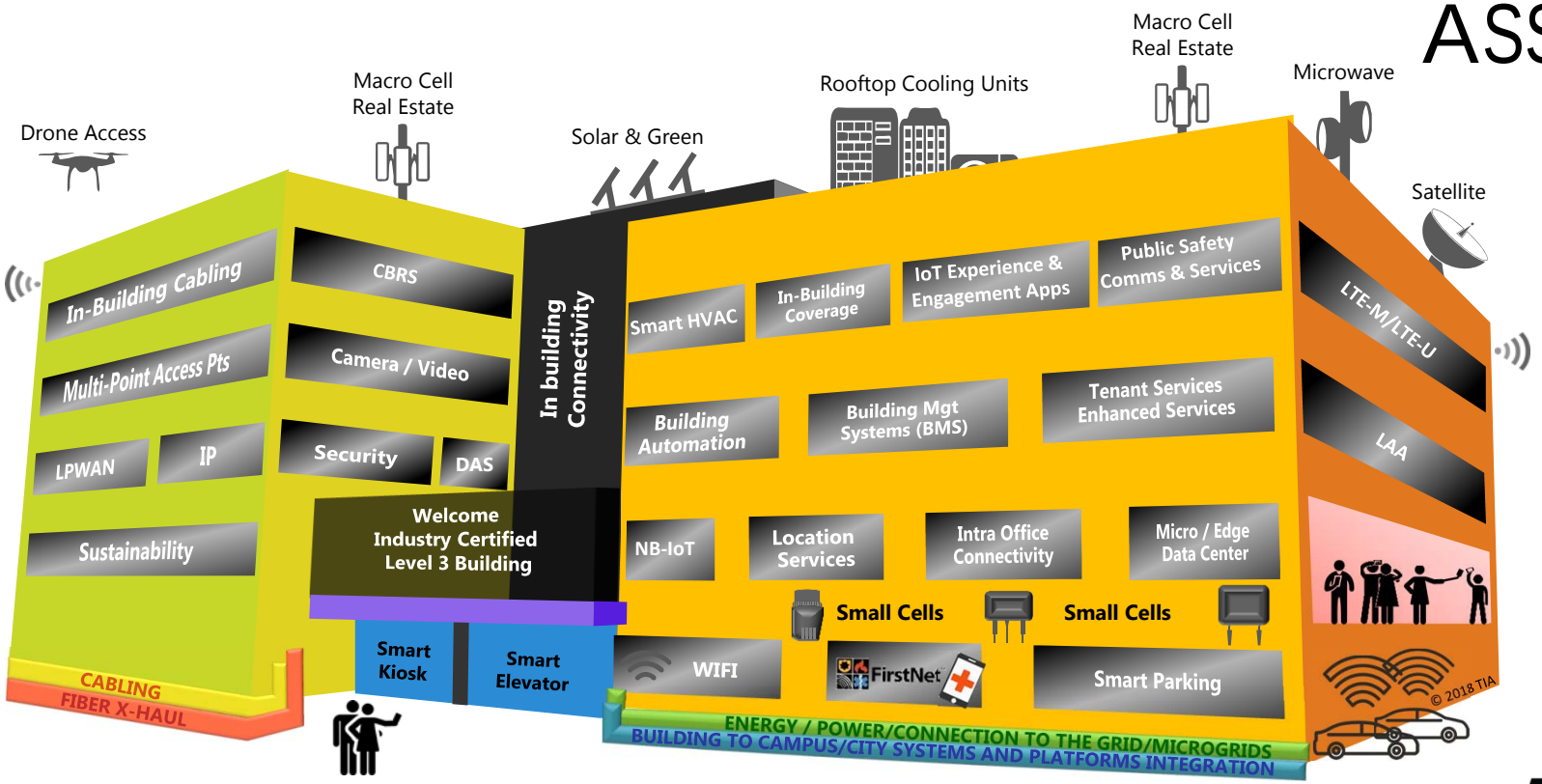
- HVAC
- Building Management
- Water
- Energy
- Elevators
- Security
- Cameras
- Fire & Safety
- Building Access
- Lighting

REDEFINING SMART BUILDINGS AS NEXT GEN IOT READY

Ensuring that buildings are
Secure, Safe, Sustainable, Reliable, Resilient

- **Building Network**
  - IP, Wireless, Networking, Connectivity, Voice, Video, Data, Safety, Security
- **Information and Intelligence for Building Operators**
  - Integrated, data rich systems and applications that Optimize Operations
- **Tenant Services Oriented**
  - Personal, identifiable. Serving their space, performance, and activity needs.
- **Connected Assets & Components**
  - Sensors, Beacons, Meters, Devices, Smart Devices, BMS, RFID, M2M, Asset Management
- **Energy**
  - Smart grid, smart metering, energy sourcing (solar), management and conservation
- **Revenue Opportunities**
  - All stakeholders in this ecosystem see a positive bottom line

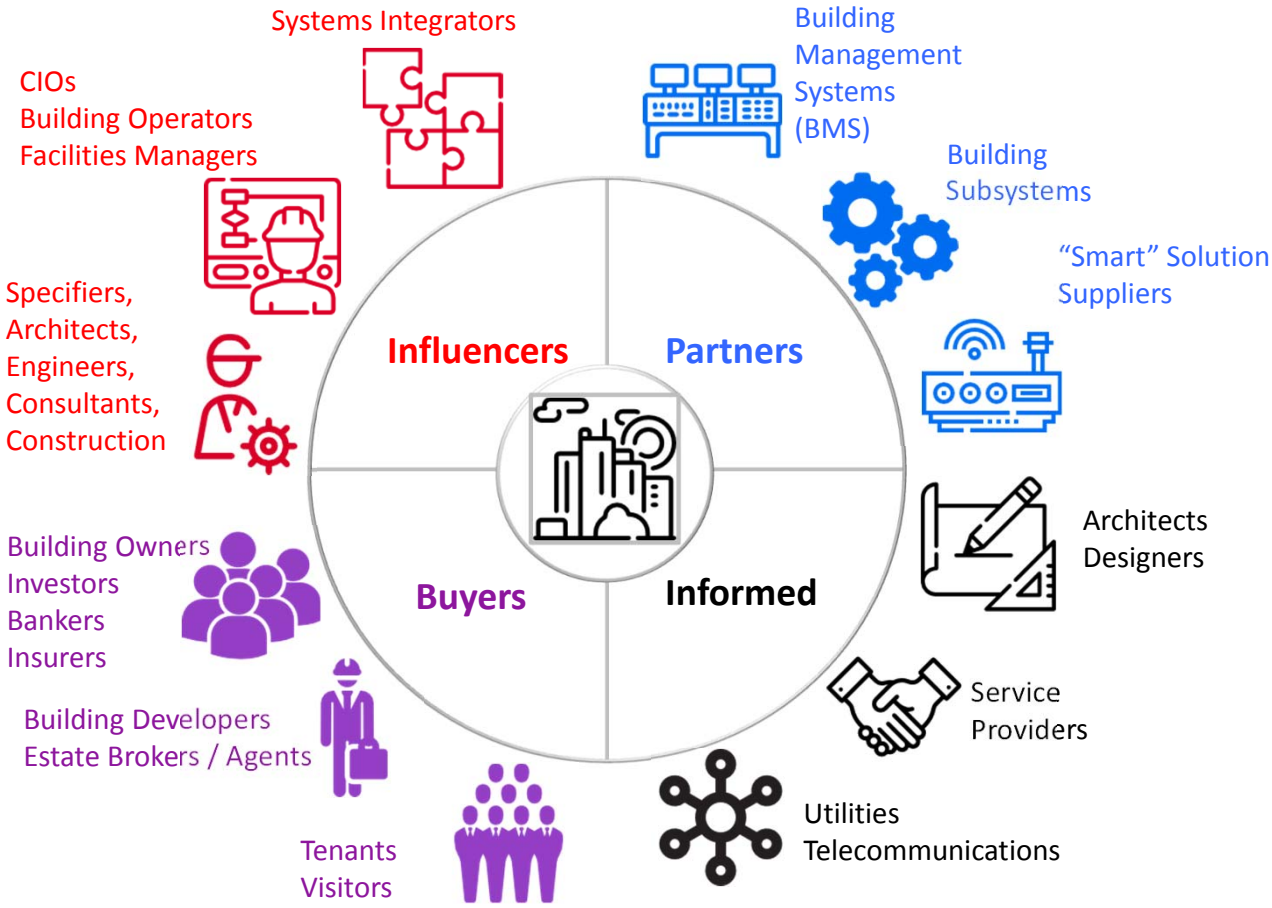
SMART BUILDING AS CONNECTED ASSET



SMART BUILDING STAKEHOLDERS

- Real Property
  - Property Owners
    - Land & Building
  - Developers
  - Architects
  - Banks / Financial Investors
  - Construction
  - Suppliers (for construction)
  - BMS contractors
  - CIOs
  - Property Managers / Operators
  - Facility Operators
  - Real Estate Brokers/Agents
  - Buyers
  - Tenants
- Wireless / Wireline
  - Suppliers / consultants, carriers, DAS, Small Cell, Wi-Fi, Cable, Sat, mmwave
- Environment in which buildings are located
  - Towns, Cities, City Official, Citizens
- People
  - Inbuilding's, employees, residents, visitors, guest, attendees
- Urban/Campus, Energy Micro and Nano Grids / Green Buildings
  - Utilities, local & state gov't; Micro - community level generators; Nano – within a building/home; transactive energy
- Public Safety
  - Systems & Connectivity
- Security
- Insurance

SMART BUILDINGS ECOSYSTEM



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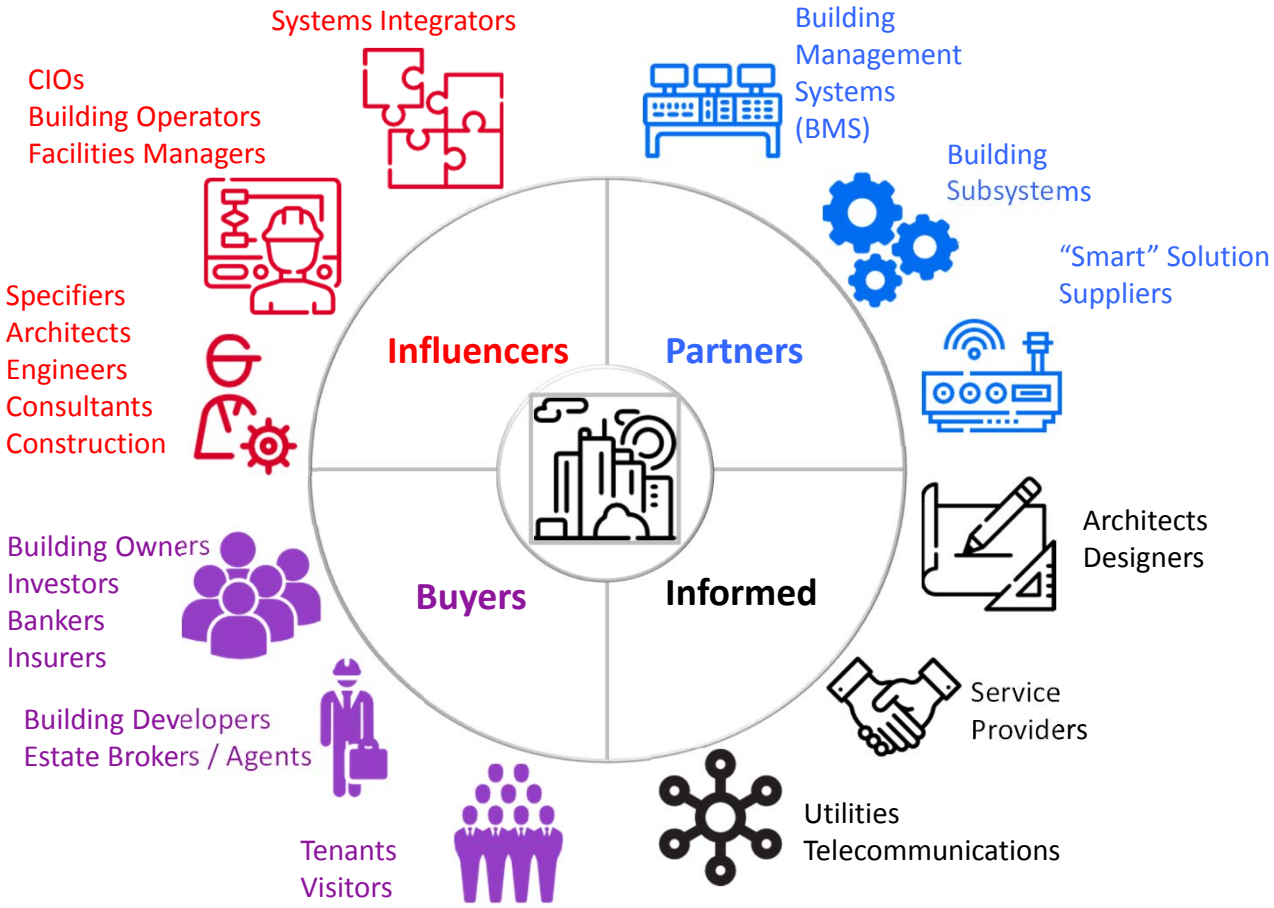
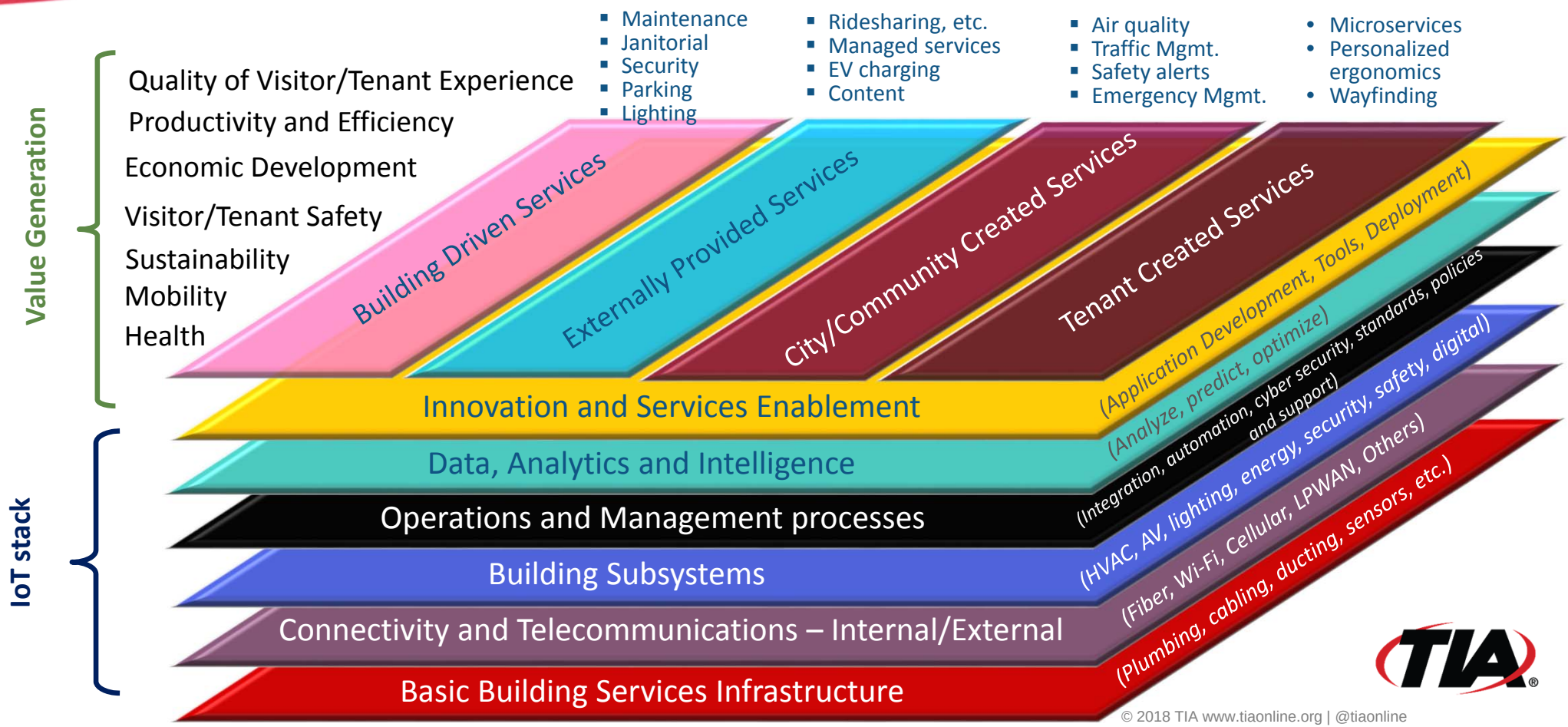


Building Types

- Campuses of all kinds
- Airports
- Office Buildings
- Commercial Buildings
- Government Buildings
- Data centers
- Education/Universities
- Medical/Hospitals
- Cruise Ships
- Industrial and Manufacturing
- Hotels and Hospitality
- Religious
- Warehouses
- Parking / Storage
- Stadiums/Entertainment
- Residential/MDU Properties

SMART BUILDING LAYERED ECOSYSTEM

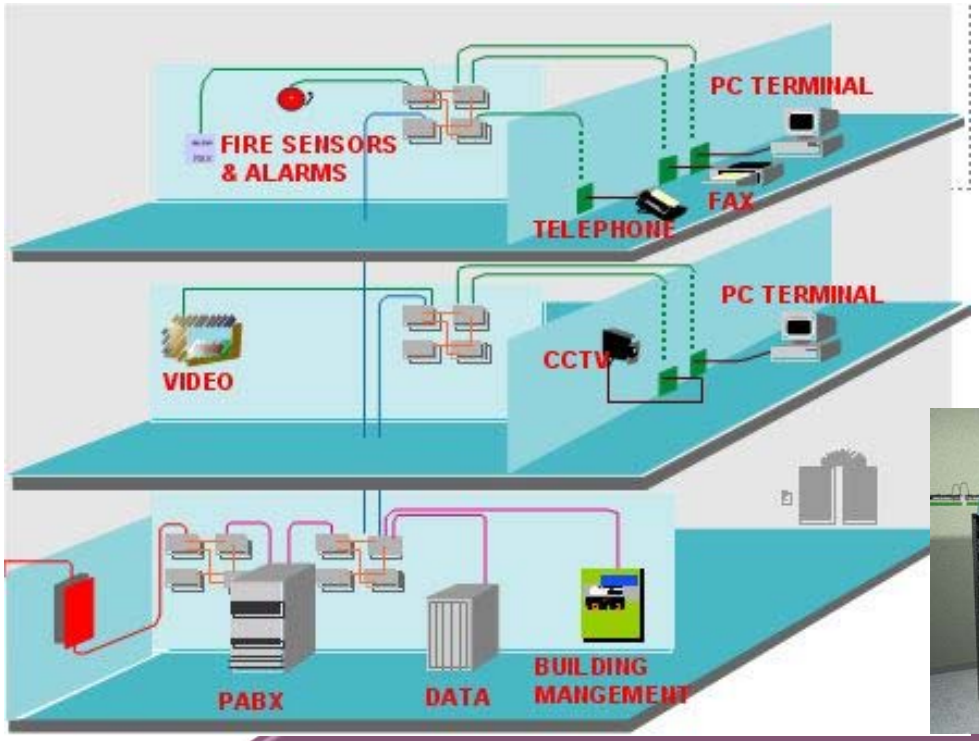


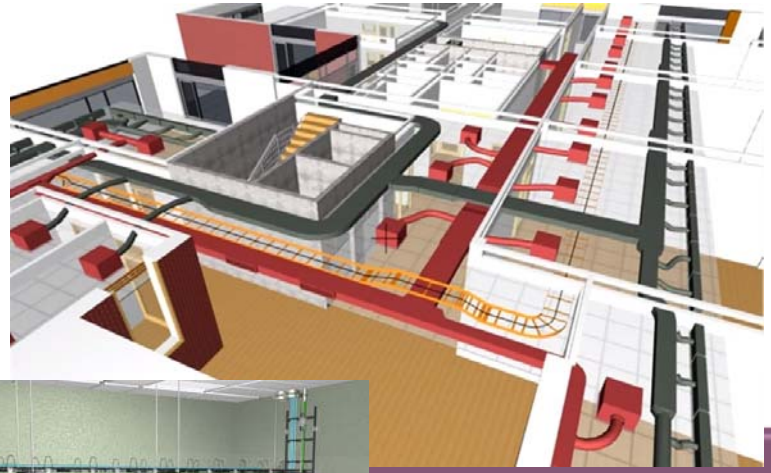
BASIC BUILDING INFRASTRUCTURE

Basic Building Services Infrastructure

(Plumbing, cabling, ducting, sensors, etc.)

CONNECTIVITY & TELECOMMUNICATIONS





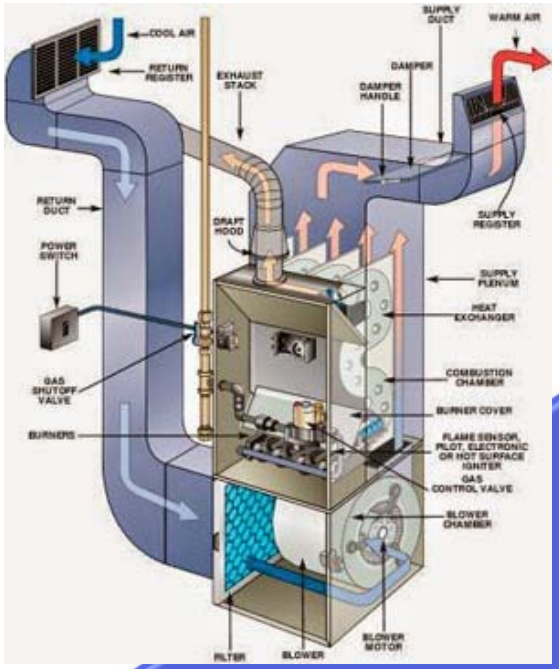
Connectivity and Telecommunications – Internal/External

Basic Building Services Infrastructure

(Fiber, Wi-Fi, Cellular, LPWAN, Others)

(Plumbing, cabling, ducting, sensors, etc.)

BUILDING SUBSYSTEMS



IoT stack

Building Subsystems (HVAC, AV, lighting, energy, security, safety, digital)

Connectivity and Telecommunications – Internal/External (Fiber, Wi-Fi, Cellular, LPWAN, Others)

Basic Building Services Infrastructure (Plumbing, cabling, ducting, sensors, etc.)

BUILDING OPERATIONS AND MANAGEMENT

Operations and Management processes

Building Subsystems

Connectivity and Telecommunications – Internal/External

Basic Building Services Infrastructure

(Integration, automation, cyber security, standards, policies and support)

(HVAC, AV, lighting, energy, security, safety, digital)

(Fiber, Wi-Fi, Cellular, LPWAN, Others)

(Plumbing, cabling, ducting, sensors, etc.)

SMART BUILDING LAYERED ECOSYSTEM

Data, Analytics and Intelligence (Analyze, predict, optimize)

Operations and Management processes (Integration, automation, cyber security, standards, policies and support)

Building Subsystems (HVAC, AV, lighting, energy, security, safety, digital)

Connectivity and Telecommunications – Internal/External (Fiber, Wi-Fi, Cellular, LPWAN, Others)

Basic Building Services Infrastructure (Plumbing, cabling, ducting, sensors, etc.)

INNOVATION AND SERVICES

IoT stack

- Innovation and Services Enablement (Application Development, Tools, Deployment)
- Data, Analytics and Intelligence (Analyze, predict, optimize)
- Operations and Management processes (Integration, automation, cyber security, standards, policies and support)
- Building Subsystems (HVAC, AV, lighting, energy, security, safety, digital)
- Connectivity and Telecommunications – Internal/External (Fiber, Wi-Fi, Cellular, LPWAN, Others)
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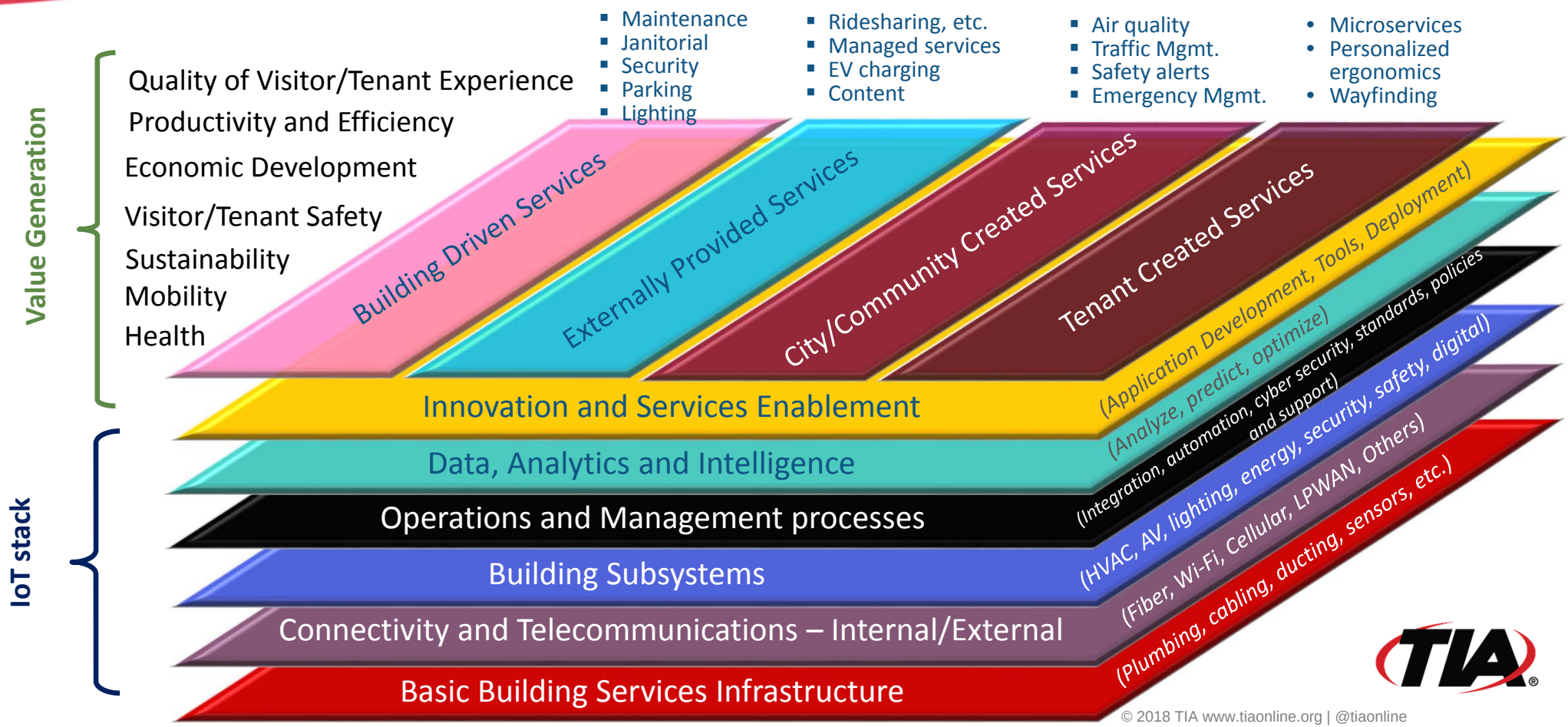
SMART BUILDING LAYERED ECOSYSTEM



“SMART BUILDING COOKBOOK”

The Smart Building Program is creating a resource that develops and aggregates architectures, frameworks, best practices, standards and resources that will assist and guide the design, build and retrofit of Smart Buildings. This cookbook will be designed with different “readers” in mind.

Smart Buildings Cookbook Ingredients

- Levels and Certification /Tools
- oneM2M
- Standards Review / Education and Training
- Network and IoT Security & Privacy
- Getting Buildings X- Tech Ready

THE TIA ASSESSOR

- TIA has merged with the leading ICT supply chain quality assurance community to bring its members a comprehensive, affordable, and efficient sustainability assessment tool based on the renowned TL-9000 standard.

- From Environmental Management to Corporate Social Responsability to economically viable design, the TIA Sustainability Assessor ensures that every step of your supply chain is best in class.

- Based on a maturity model, the TIA Sustainability Assessor is perfect for first-time users or experienced supply chain managers.

IT TAKES A COLLABORATIVE COMMUNITY TO EXECUTE ON THE VISION

SMART BUILDINGS COMMUNITY

JOIN THE TIA SMART BUILDINGS PROGRAM TODAY!

TIA believes that together – TIA members, communications sector companies, real estate sector companies, energy and sustainability sector companies, building management and IoT sector companies, security sector companies, cities and communities, and organization and associations that support these and additional applicable sectors – we can build a Smart Buildings Program that provides financial and other forms of meaningful value to all participating companies and organizations, the broader ecosystem, tenants and clients, and the people that experience these environments.

We welcome your involvement!

Please contact, Limor Schafman, SBP Director at +1.202-270-4110 and lschafman@tiaonline.org

UPCOMING EVENTS

Thursday, June 7 - SBWG Meeting - All Day
http://www.networkofthefuture.org/

THANK YOU

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