The Role of  in Smart Sustainable Cities

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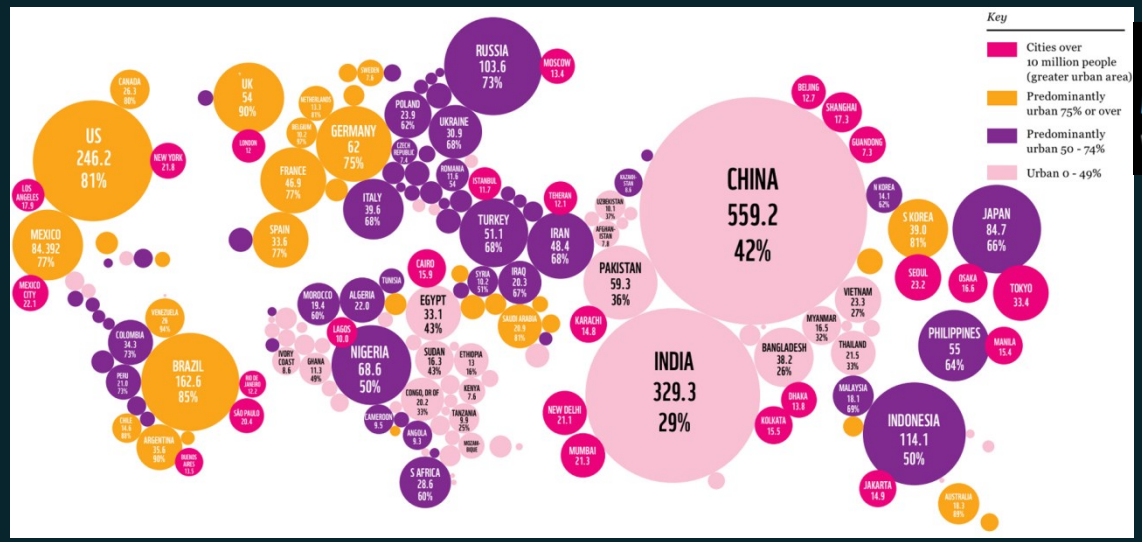
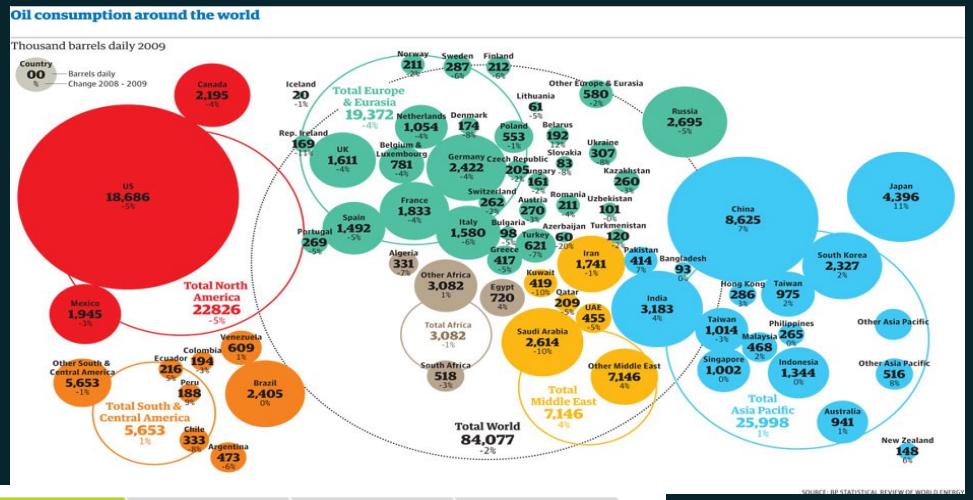
Sekhar N. Kondepudi Ph.D.
Associate Professor
Smart Buildings & Smart Cities
National University of Singapore

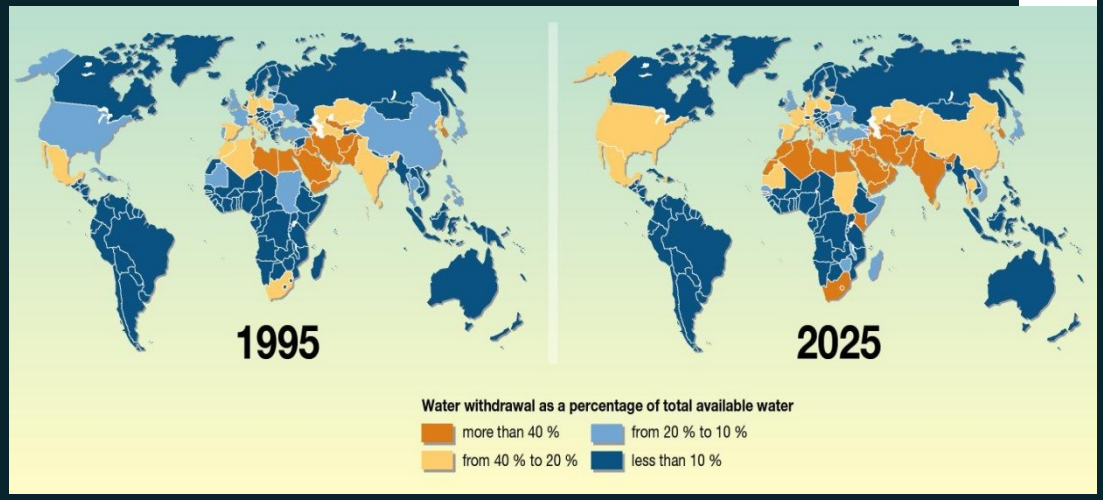
Agenda

Population, Energy & Water



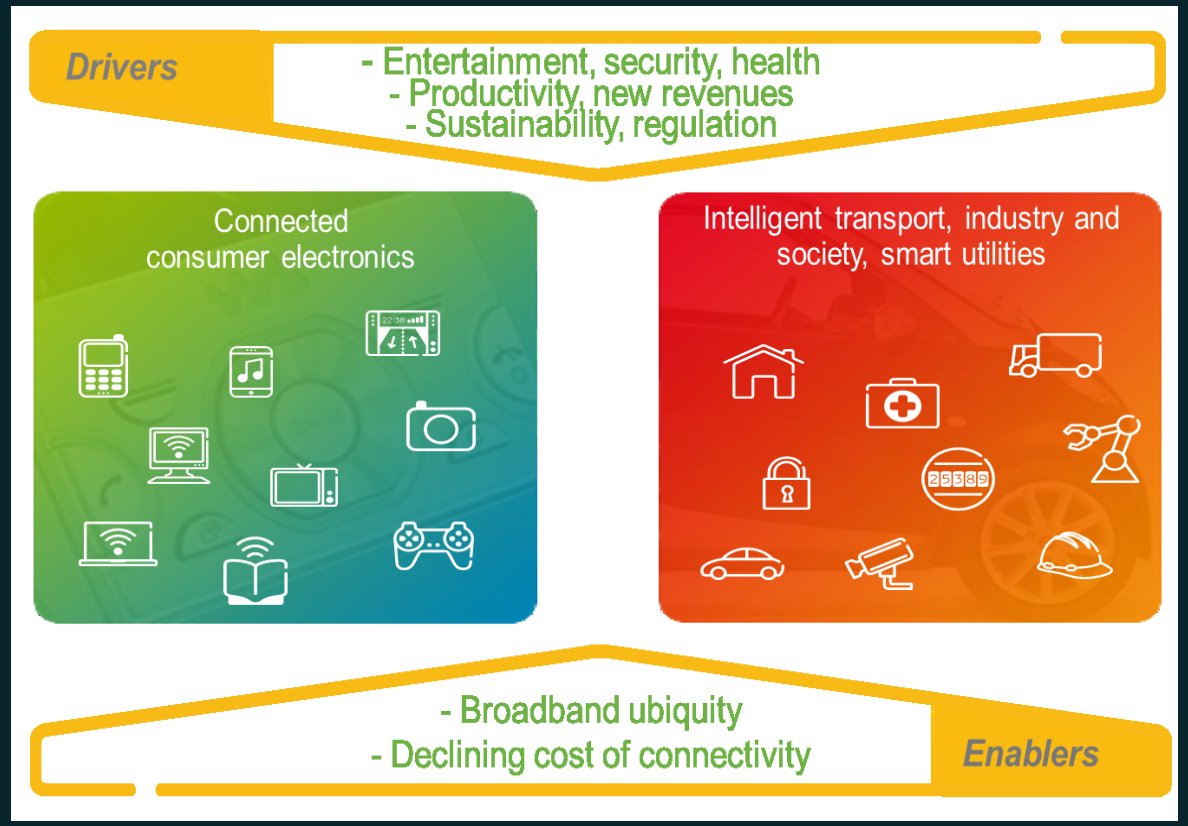
ENERGY

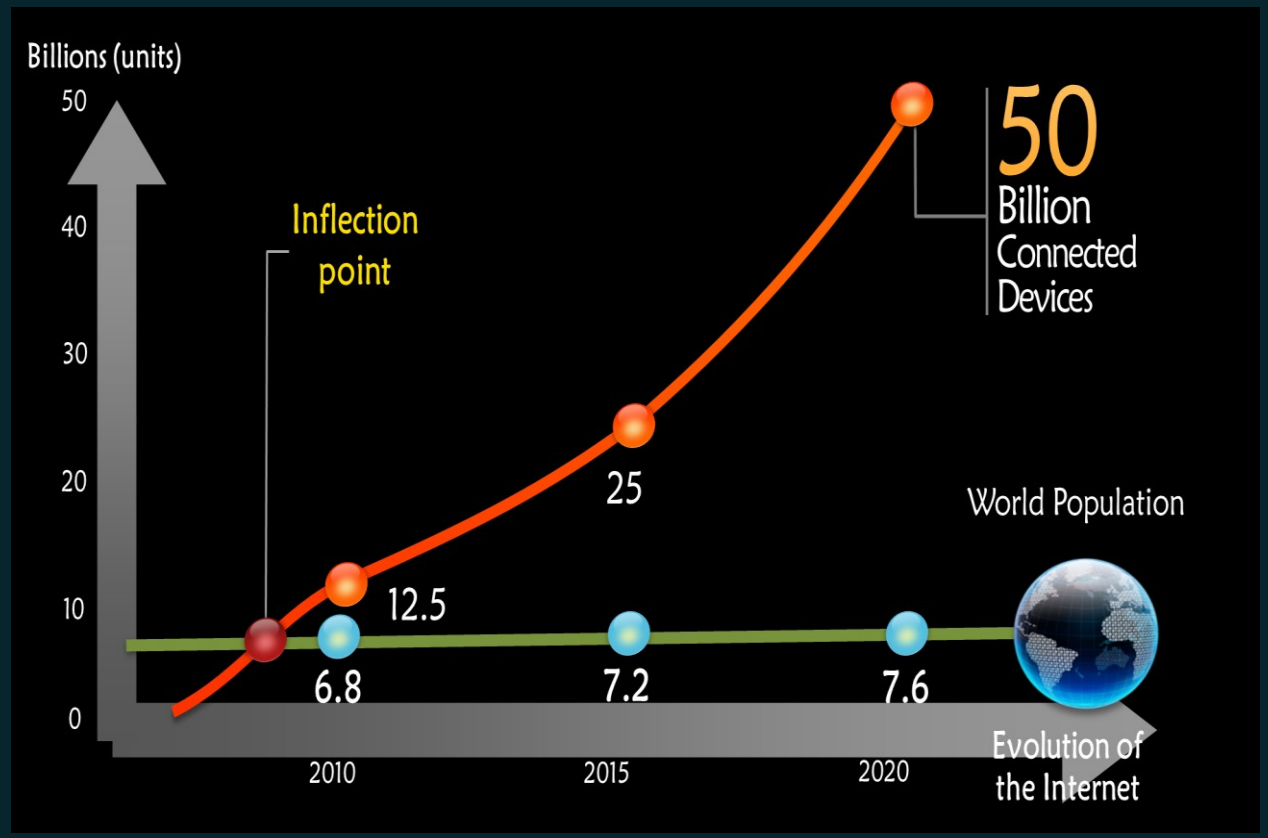




Scope of ICT Today - Pervasive

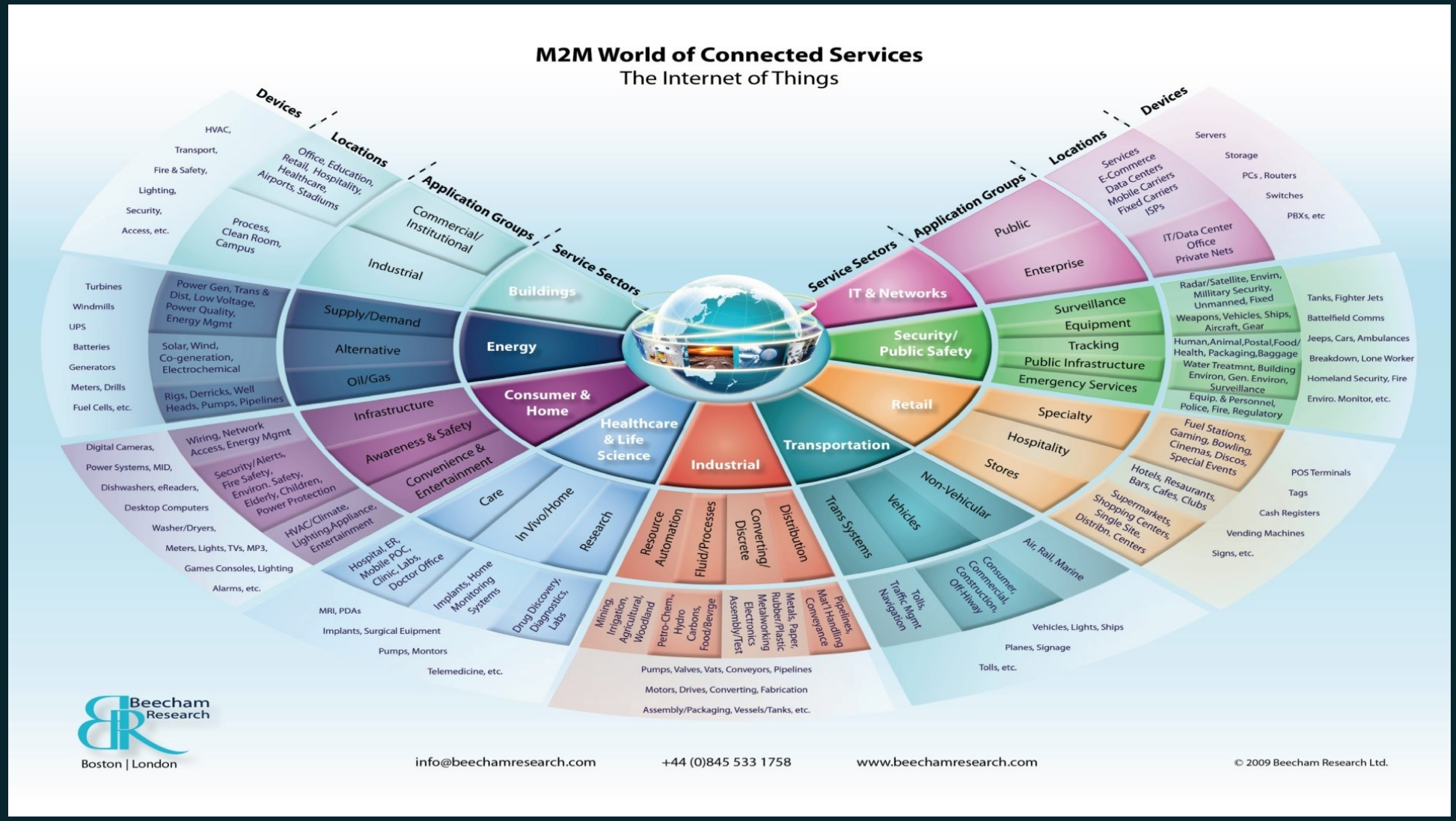
Everything Will be Connected





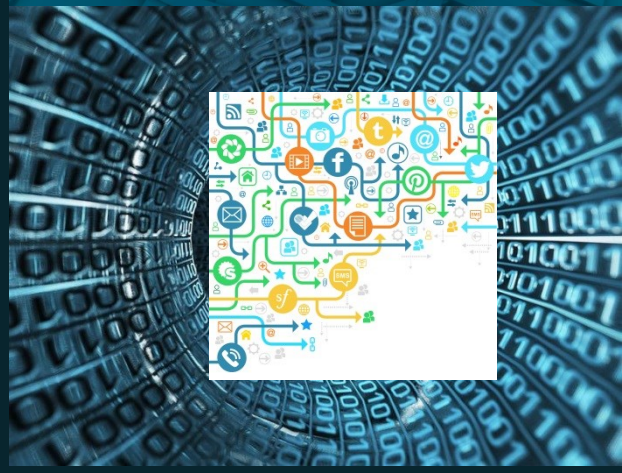
Source - CISCO

Internet of Things



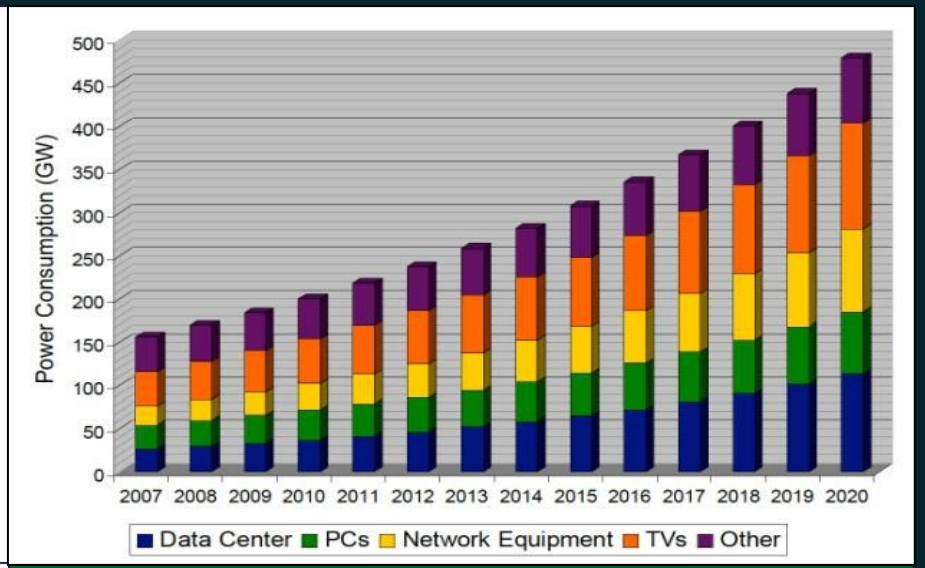
BIG DATA

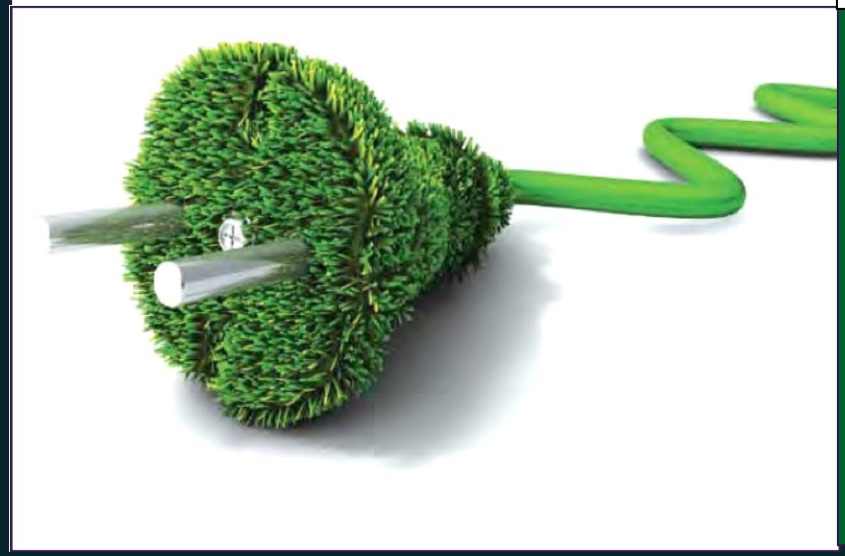
- Every day, the world creates 2.5 Quintillion (a Billion Billion) bytes of data
- 90 % of all the Data today has been created in the last 2 years (2011-2012)
- In the 11 years between 2009 and 2020, the size of the "Digital Universe" will increase 44 fold. That's a 41% increase in capacity every year.
- In addition, only 5% of this data being created is structured and the remaining 95% is largely unstructured, or at best semi-structured.
- Sources of this data : Sensors, social media posts, pictures posted, videos posted, comments, transactions, GPS data etc.



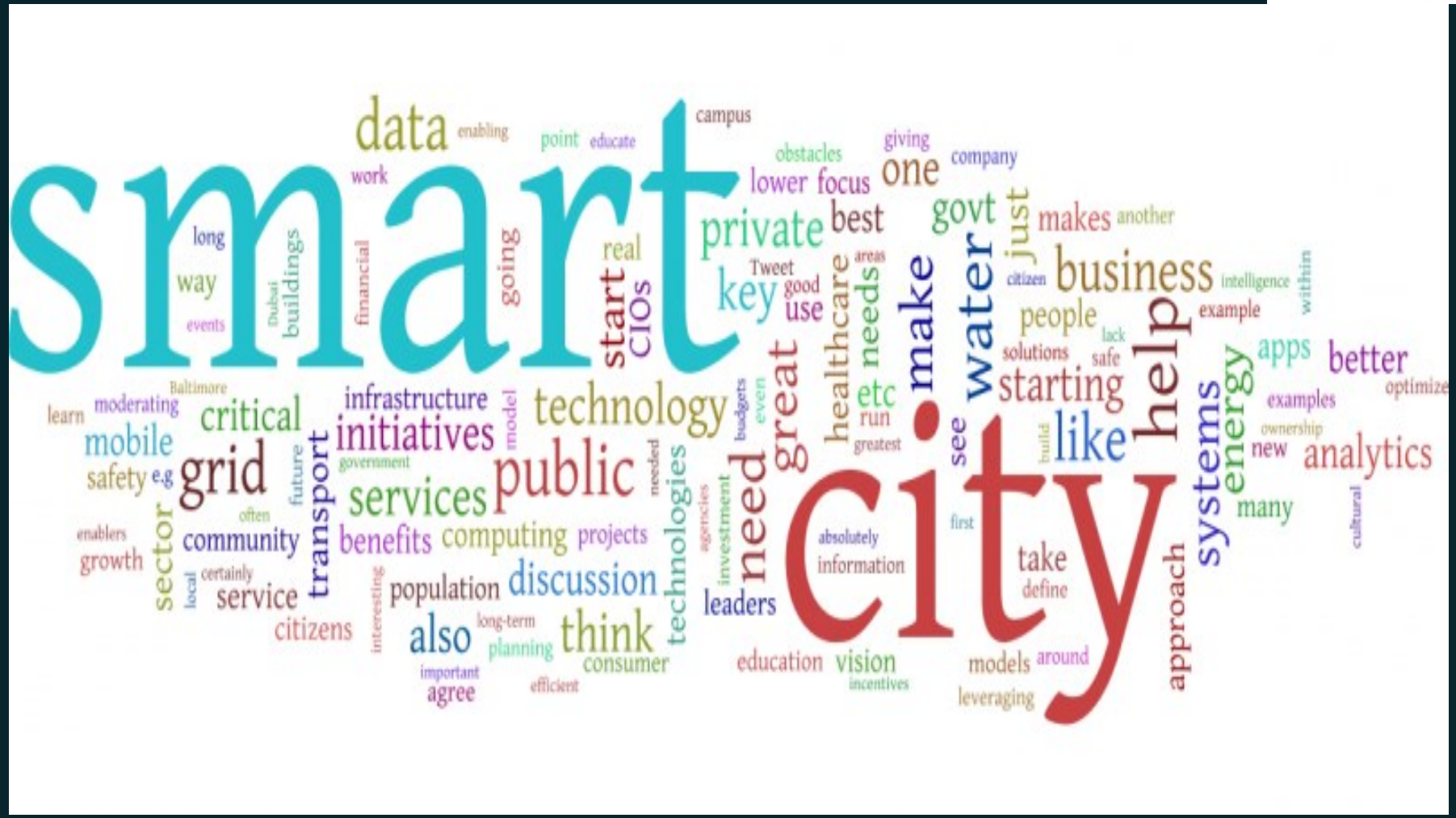
The Little Book of BIG DATA (2012), Norleen Burlingame

ICT & GHG

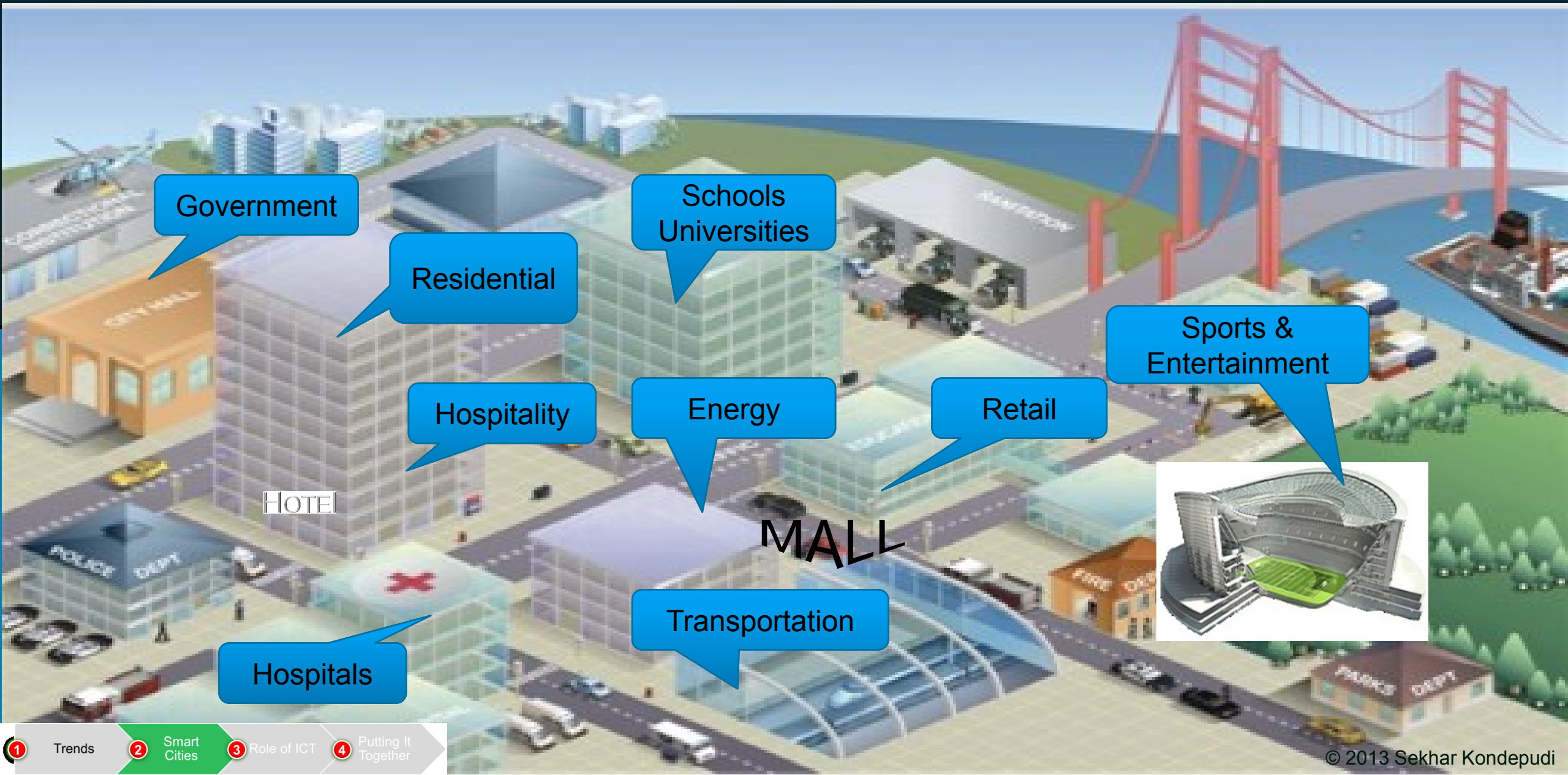




ICT's Greatest Role is in ENABLING Energy Efficiencies in Other Sectors



City / Community = ∑ Buildings



Attributes of a "Smart City"

MOBILITY

SUSTAINABILITY

LONGEVITY

SECURITY

RELIABILITY

EFFICIENCY

FLEXIBILITY

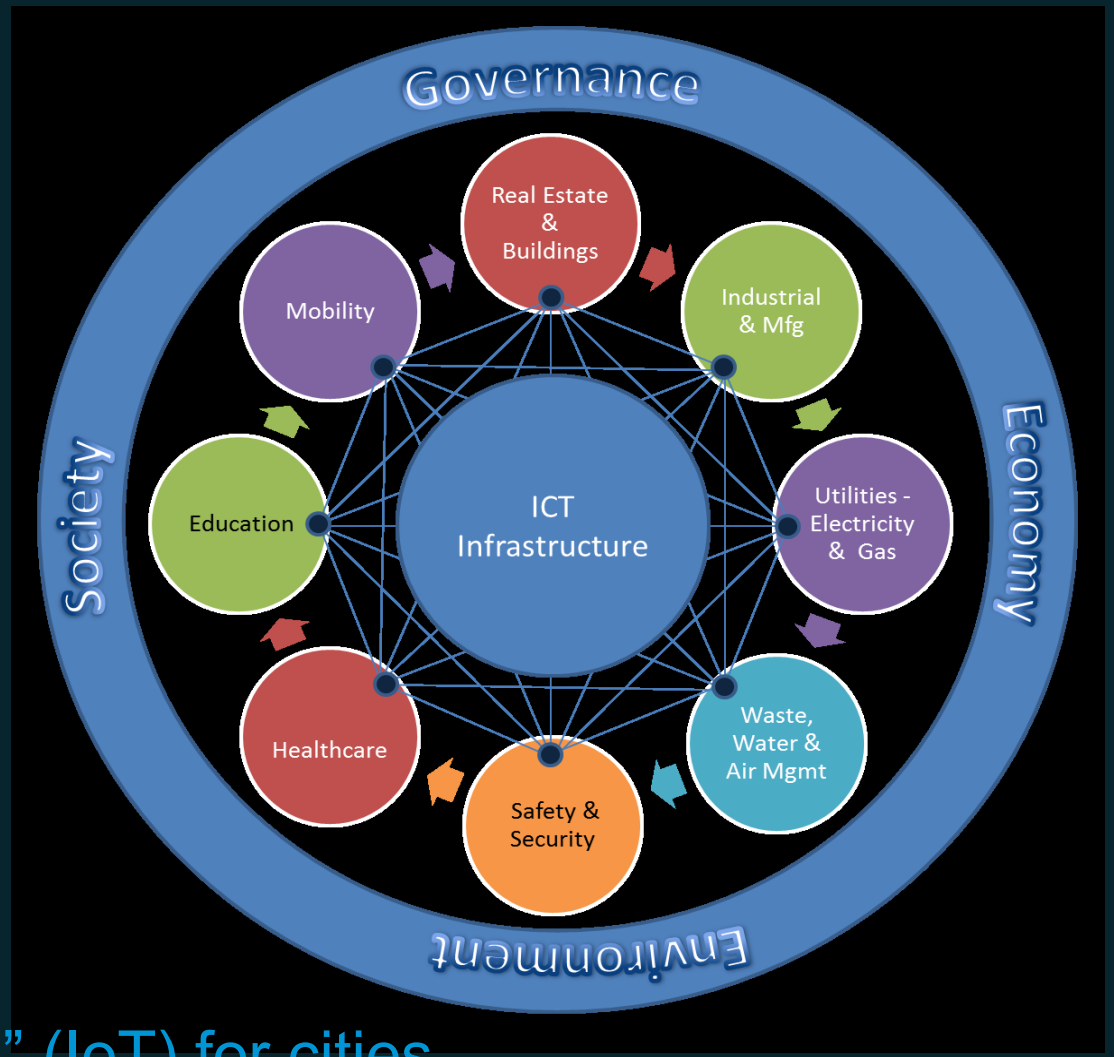
TECHNOLOGY

INTEROPERABILITY

SCALABILITY

Smart Cities as a Network

Smart Cities are well managed, integrated physical and digital infrastructures that provide optimal services in a reliable, cost effective, and sustainable manner while maintaining and improving the quality of life for its citizens.



"Internet of Things" (IoT) for cities

Foundational Aspects

Economy

- Employment
- GDP
- Market – GLocal
- Viability
- Investment
- PPP
- Value Chain
- Risk
- Productivity
- Innovation
- Compensation

Governance

- Regulatory
- Compliance
- Processes
- Structure
- Authority
- Transparency
- Communication
- Dialog
- Policies
- Standards
- Citizen Services

Environment

- Sustainable
- Renewable
- Land Use
- Bio-Diversity
- Water / Air
- Waste
- Workplace

Society

- People
- Culture
- Social Networks
- Tech Savvy
- Demographics
- Quality of Life
- User Experiences
- Equal Access
- End Consumers
- Community Needs
- The City as a Database

'Vertical Infrastructure – What's Missing ?

Real Estate	Industrial	Utilities
Water, Waste & Air	ICT	Mobility
Healthcare	Education	Safety

Some of these infrastructure verticals are "obvious"

What additional verticals should we consider that are missing ?

Real Estate & Buildings

Real Estate & Buildings

- … solutions that turn buildings into living organisms: networked, intelligent, sensitive and adaptable …
- … synergies between energy efficiency, comfort and safety and security ….
- Building as a Network – Integration of Multiple Technologies (HVAC, Lighting, Plug Loads, Fire, Safety, Mobility, Renewable, Storage, Materials, IAQ etc)
- Software – Efficiency, Automation & Control , Analytics & (Big ?) Data Management
- Integration with Smart Grid
- Distributed Energy
- Coexist with Productivity, Efficiency, CSR, Sustainability and GHG reduction goals

Industrial & Manufacturing

Industrial & Mfg

- Data Interoperability
- Sustainable Production
- Zero Emissions
- Plant Optimization
- Networked Sensors
- Cloud Computing
- Intelligent & Integrated Processes
- Factories of the Future

Utilities - Electricity & Gas

Utilities – Electricity & Gas

- Smart Grid – Generation / Distribution
- Smart Meters – Measurement & Integration of smart capabilities
- Wireless Communications
- Analytics & Policies
- Decentralized and Co-generation
- Load Balancing
- Increased Efficiency
- Communications networks— utility-wide voice and data communications networks and services
- Intelligent utility network

Waste, Water & Air Management

Waste, Water & Air Mgmt

- Smart Water
  - New Distribution Approaches for Stable and Continuous Water Supply
  - New Water Purification Technologies
  - Water Treatment / Re-Use / Re-Cycle
  - Wireless Sensors / Smart Metering for Optimal Usage / Analysis
- Smart Air
  - Pollution Sensors – Outdoor Air Quality
- Waste Management
  - Sensors to detect toxicity
  - Improving Efficiency of Waste Collection
  - Auto Sorting / Tracking - Reuse & Recycling
  - Bio-Medical Waste

Mobility

Mobility

- Intelligent Transportation Technologies in the Age of Smart Cities:
- Traffic Management – Monitoring & Routing
- Smart Charging
- Intelligent Public Transit
- Real Time Travel Information
- Transit signal priority
- Centralized fleet vehicle management
- Real Time Linkage to Emissions, Traffic Patterns, Reduced Fuel Consumption

Safety & Security

Safety & Security

- Video Surveillance
- Video Analytics
- Workflow
- Situational Awareness
- Enhanced Emergency Systems
- Natural Disasters
- Intra-Agency Communications

Healthcare

Healthcare

- Smart Hospitals
- Gaining real-time line of sight and responses to individualized health information.
- Smart" Communications – Patient to Clinician
- Intelligent & Efficient Public Health
- Real Time Healthcare including Analytics
- Privacy and protection of patient information
- Home & Remote HealthCare incl. Monitoring
- Health Waste Management
- Electronic Records Management

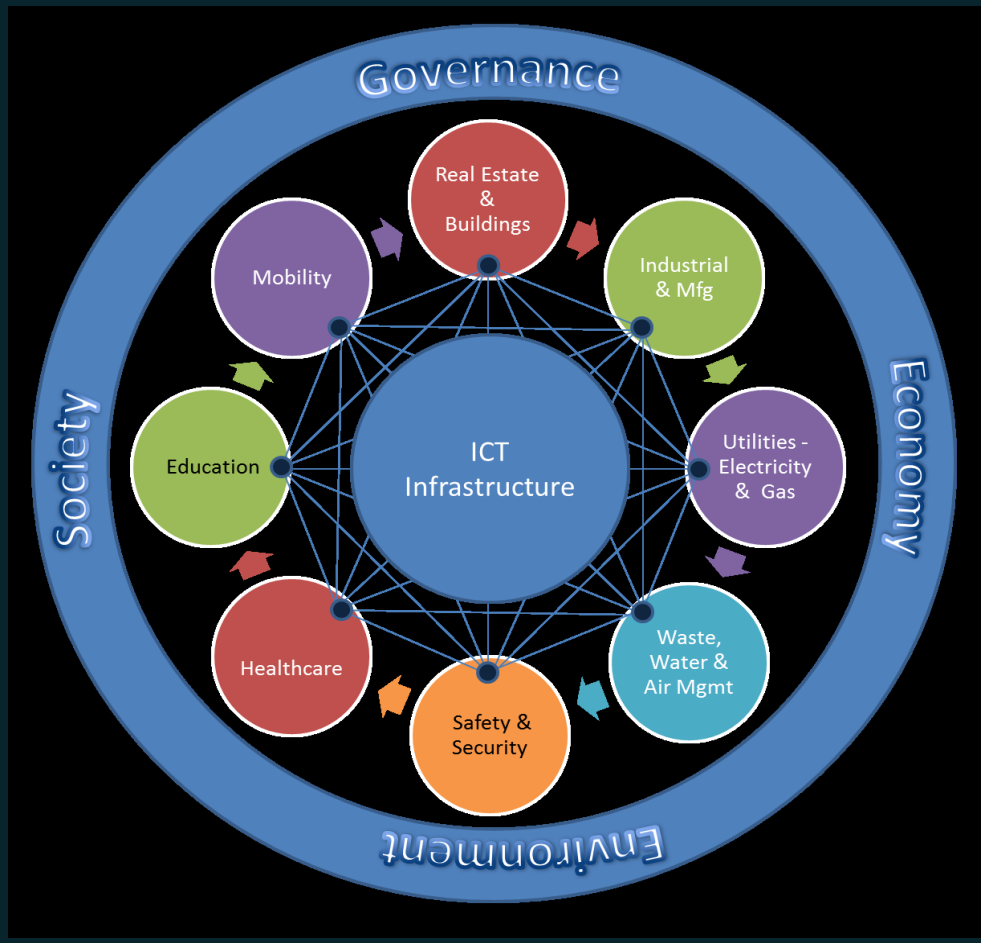
Education

Education

- Flexible learning in an interactive earning environment
- Delivering education through different devices – from televisions to ipods to mobile phones to netbooks – beyond our schools and into homes
- Accessing world class digital content online
- Adaptive learning programs and learning portfolios
- Collaborative technologies and digital learning resources
- A digital learning portfolio including online learning & testing that gives students, teachers and parents an integrated view
- MOOCs

ICT - The City as a Network

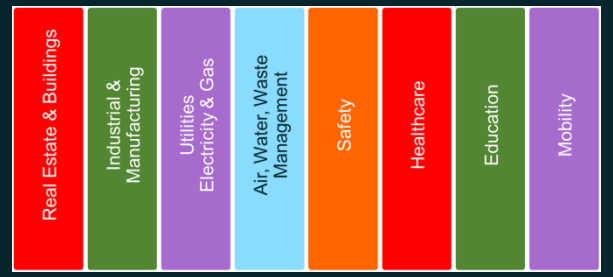
- The multiple systems within a city can be thought of as sub-networks of a larger network ie “System of Systems” or a “network of networks”
- When these sub-systems are integrated with one another, they can be thought of as the “Internet of Things” (IoT) for cities.
- All of these systems comprise of sub-systems, components & devices which have nodes, end points and behave like a network in terms of their end use characteristics and interactivity with other nodes.
- This is completely analogous to an IT or DataCom network



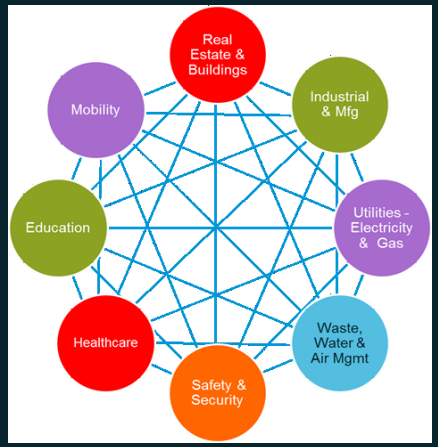
ICT is at the CORE acting as the “NERVE CENTER”

Cross-Vertical Coordination

- A smart city will be constantly tuning itself, honing the individual efficiencies of the different vertical infrastructure operations such as real estate, industry, utilities (energy), water, waste, education, healthcare and mobility.



- However to achieve a higher order of optimization, these very seemingly "independent " vertical infrastructure silos will need to coordinate with each other in order to making living more convenient and comfortable while at the same time balancing the fragile environment.



Smart Water - Energy

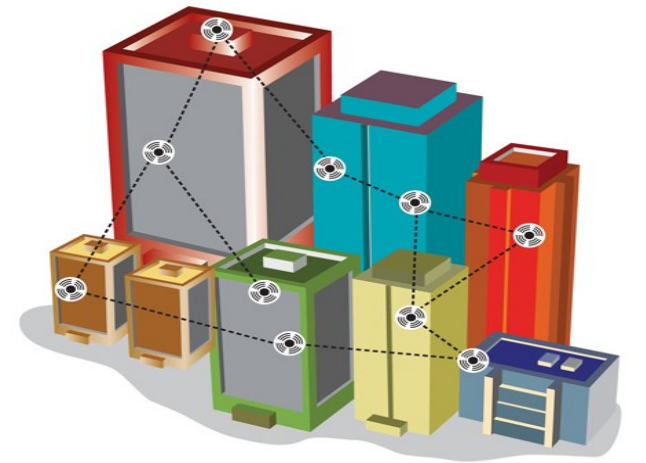
- A smart system which coordinates water availability and price with the use of energy and power
- For example, when actual fresh water is in low supply, making real time decisions to use recycled water OR water from a desalination plant (all of which use power).
- Such optimization / smart decisions can reduce water treatment costs, make power consumption more efficient, and realize a variety of other synergistic effects

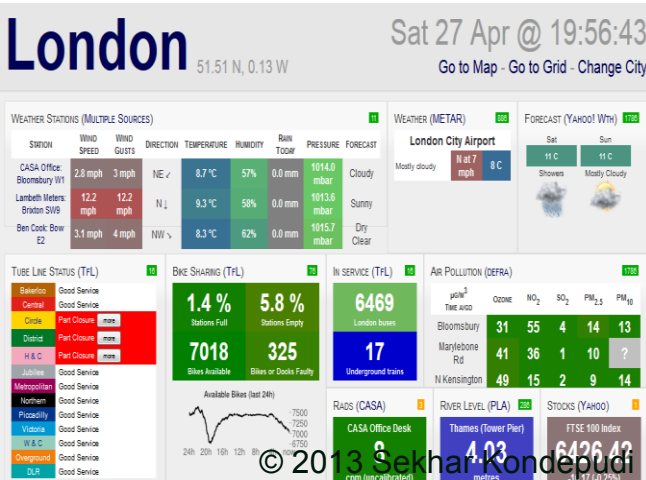
Smart Energy - Buildings

- A Smart System which knows how to “arbitrate” and dispense power to critical areas in the building in the case of a power outage or at high electricity prices
- The ability to intelligently arbitrate according to a preset (or dynamic) priority needs these seeming disparate sub-systems to communicate with another.
- For example, a building has many siloed sub-systems – HVAC, Lighting, Elevators etc and during a power outage, critical areas need to be given higher priority. A Data Center may need to have higher priority within a building compared to a cafeteria and within the cafeteria, refrigerated space for food may have a high priority.

Analytics, Informatics & Dashboards

- Wireless Sensor Networks
- Energy & Environmental Data
  - View, Compare, Share
- Analytics
  - Prediction
  - Energy Savings Strategies
  - Operational Optimization
- Real-time Information / “Pulse”





Software Applications For Smart Cities

Smart City Applications

- City Dashboard
- Smart Air & Smart Water
- Smart Waste
- Smart Parking & Traffic
- Smart Utilities
- Smart Lighting
- Smart Noise
- Smart HealthCare
- …..

Smart City & Building “Social” Applications

- Marry “Facebook” type Social Applications to the City Infrastructure

Overarching Themes

ICT is the Core

- Goal is to achieve an economically sustainable urban environment without sacrificing comfort and convenience / quality of life of citizenry.

- ICT is the "great equalizer" (human to human, human to machine and machine to machine) to connect a variety of everyday living services to public infrastructures, such as utilities, mobility and water.

Areas to Focus On

- Foundational Aspects
  - Establish the Foundational Aspects as they relate to the Digital & Physical Infrastructure elements (Economy, Social, Environmental and Governance) – include models for this such a PPP (Public-Private Partnerships) for successful city administration & business models.
- Vertical Infrastructure Areas
  - Focus on the various vertical digital & physical infrastructure components including technology details which make up a smart sustainable city (Buildings, Utilities, Water, etc).
  - Discuss potential new vertical areas as needed –for example, should we look at "Training"
- Use Case Scenarios
  - Identify a series of "use case scenarios" which establish the "interconnected" nature of the Smart Sustainable City to better establish the different "touch points" between the different vertical infrastructures.
  - Include the touch points between the Verticals AND the Foundational Aspects as well.

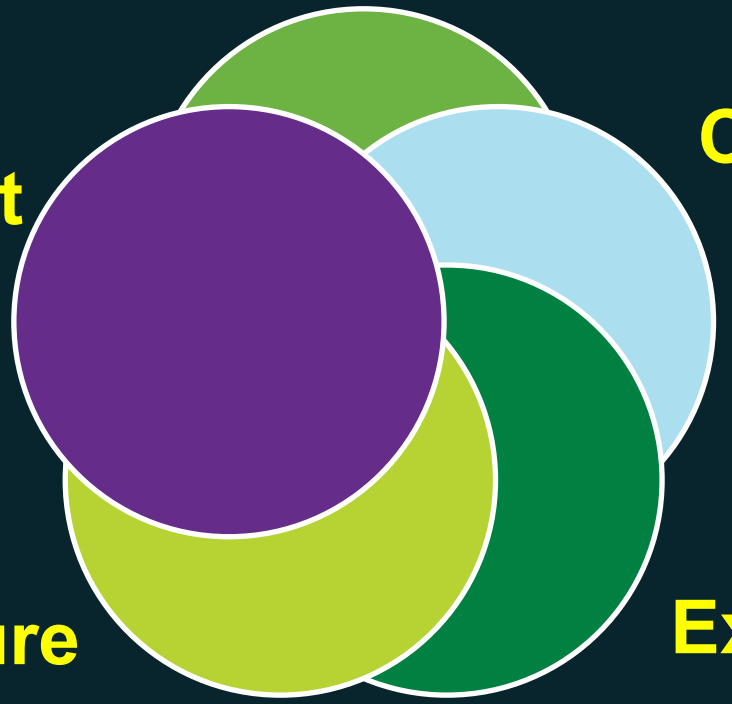
Cities of the Future

Recognizes you and customizes itself based on your preferences

Intelligent

Efficient

Uses hard & soft resources optimally while increasing productivity



Collaborative

Ensures that you stay connected to the right people & the right information in real time

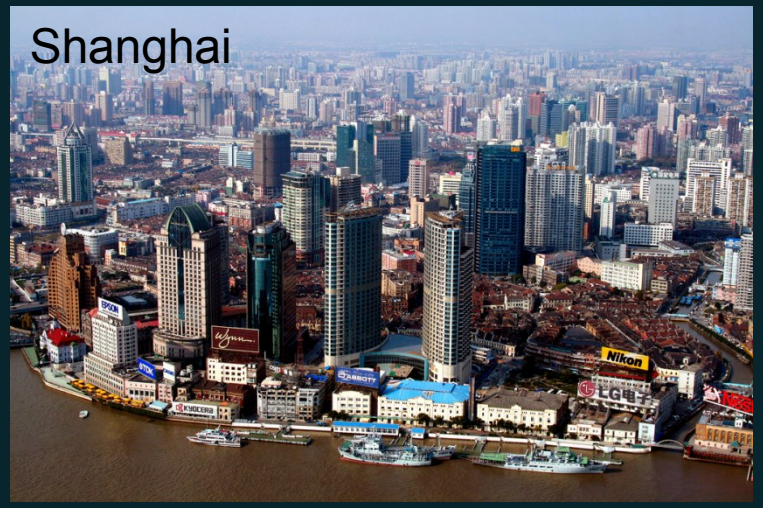
Secure

Assures both information & physical security at all times

Experiential

Delivers goodness in the way you work & live

Construction EUPHORIA
China – Constructing 1 Japan EVERY 3 YEARS



CHINA

Adding 18-20 Billion sq. feet of construction every year

6000 Empire States EVERY YEAR

Year	# Japans
2012	1
2015	2
2018	3
2021	4
2024	5

Thank You

Sekhar Kondepudi Ph.D.
Smart Buildings & Smart Cities
National University of Singapore
sekhar.kondepudi@nus.edu.sg
+65 9856 6472
+65 6601 2819