The Smart City Building Blocks & Their Synergy with Smart Villages

Invited Talk

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ARI

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What is a Smart City

- There is no single consensus definition of a smart city, but there is some agreement that a smart city is one in which information and communication technology (ICT) facilitates improved insight into and control over the various systems that affect the lives of residents.

Picture from: http://politic365.com/2017/09/01/smart-cities-require-smart-planning-policy-to-benefit-communities/

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Smart City

A **smart city** is an urban development vision to integrate information and communication technology (ICT) and Internet of Things (IoT) technology in a secure fashion to manage a city's assets.

To be fully "smart," a city must be "connected."

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Building Blocks of a Smart City

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Range of Deployments in Smart Cities

Cities across the world are deploying technology to gather data trying to become cleaner, reduce traffic, and improve urban life. Starting with energy management, to disaster preparedness, to public safety, to parking spot assistance, to paying bills online, to facilitate emergency vehicle movement, and much more.

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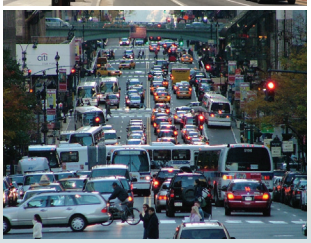
Elements of a Smart City



A neighborhood in a smart city:

- A smart traffic crossing sensitive to traffic volume
- Synchronized traffic lights for smooth flow
- Emergency vehicle priority access

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Optical based traffic signal preemption system for emergency and transit vehicles

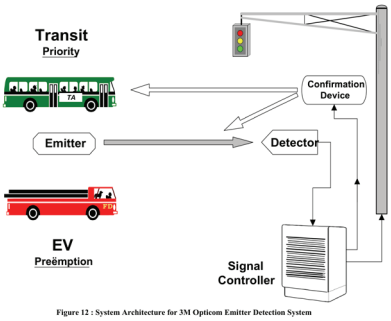
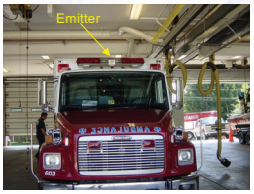


Figure 12 : System Architecture for 3M Opticom Emitter Detection System



https://vtechworks.lib.vt.edu/bitstream/handle/10919/31319/ThesisFinalVersion.pdf?sequence=1

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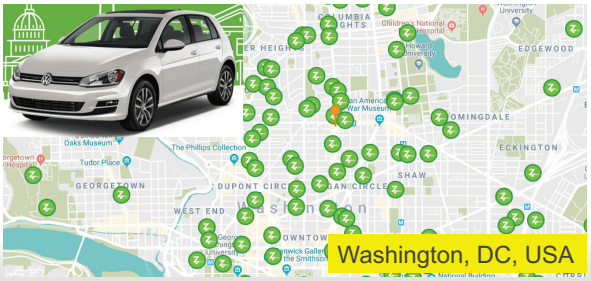
Connected Transportation

- Connected vehicles and travelers will be able to share data with all sorts of equipment, and be able to procure mobility as a service, whenever wherever.



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Vancouver Can Do This

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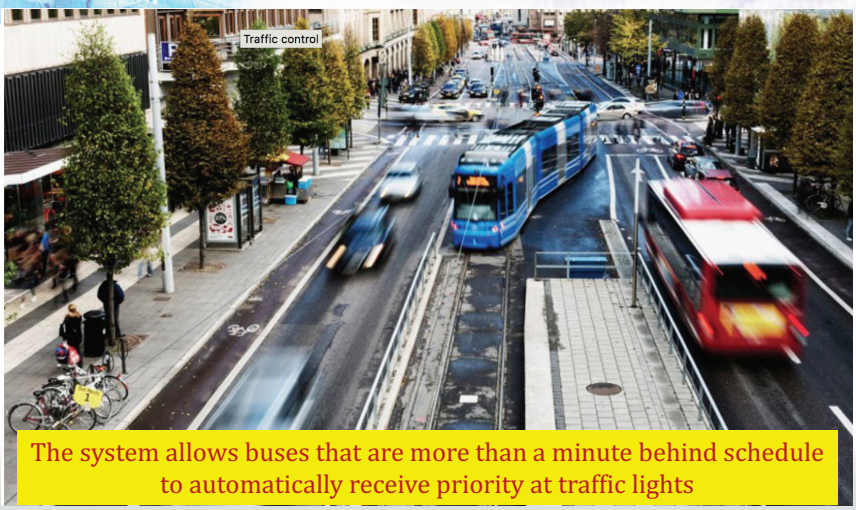
Stockholm City Traffic Management



The system allows buses that are more than a minute behind schedule to automatically receive priority at traffic lights

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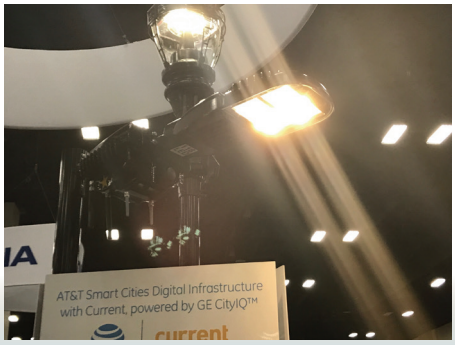
US Deployment: Smart Lamppost with Camera

Camera provides surveillance and locates empty parking spaces



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Smart Trash Can in Baltimore, USA

Reduces the number of times a trash can needs to be emptied.

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Smart Trash Can in Stockholm, Sweden

Regular trash cans need to be emptied 1–3 times per day
Smart ones only need to be emptied four times a week.

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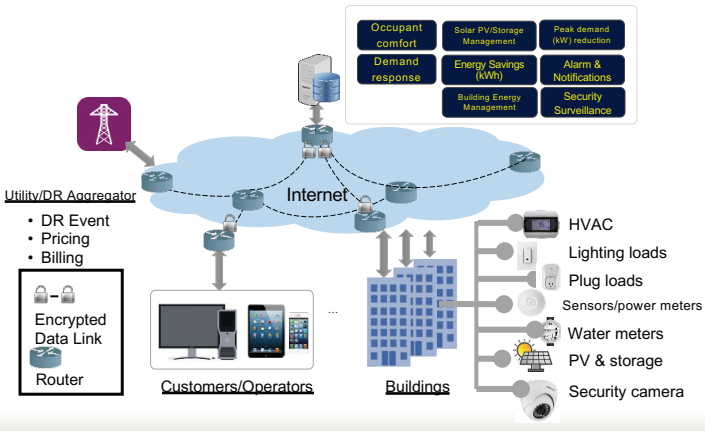
A Building Energy Management Platform



Source: www.bemcontrols.com

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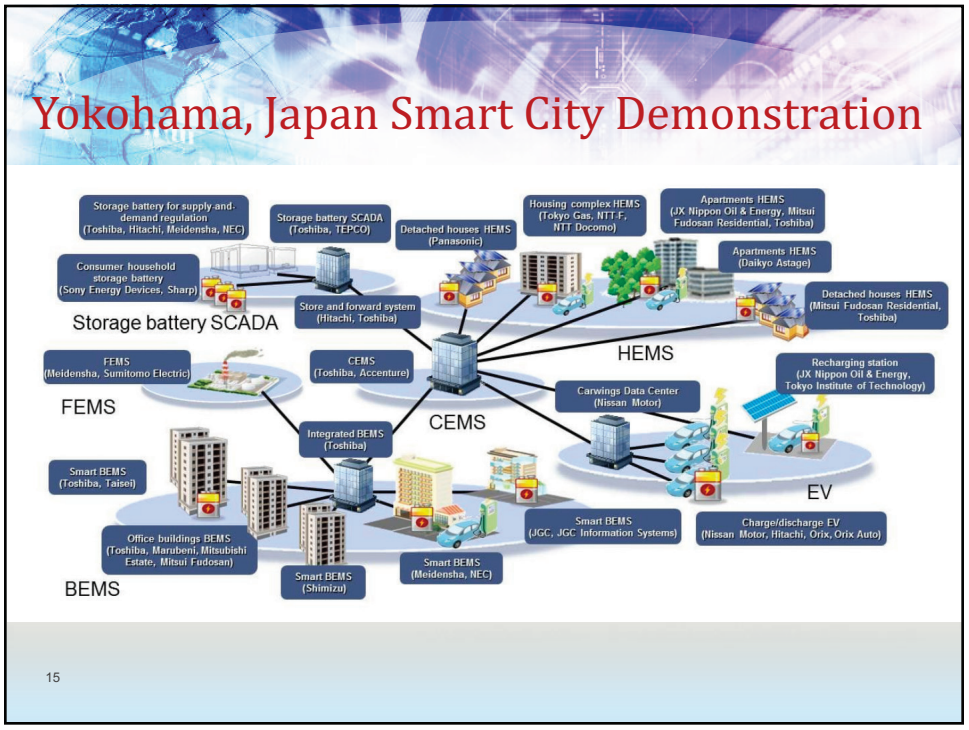
Yokohama, Japan Smart City Demonstration
Storage battery for supply-and-demand regulation (Toshiba, Hitachi, Meidensha, NEC)
Storage battery SCADA (Toshiba, TEPCO)
Detached houses HEMS (Panasonic)
Housing complex HEMS (Tokyo Gas, NTT-F, NTT Docomo)
Apartments HEMS (JX Nippon Oil & Energy, Mitsui Fudosan Residential, Toshiba)
Apartments HEMS (Daikyo Astage)
Consumer household storage battery (Sony Energy Devices, Sharp)
Store and forward system (Hitachi, Toshiba)
Detached houses HEMS (Mitsui Fudosan Residential, Toshiba)
Storage battery SCADA
HEMS
FEMS (Meidensha, Sumitomo Electric)
CEMS (Toshiba, Accenture)
Recharging station (JX Nippon Oil & Energy, Tokyo Institute of Technology)
Carwings Data Center (Nissan Motor)
FEMS
CEMS
Integrated BEMS (Toshiba)
Smart BEMS (Toshiba, Taisei)
EV
Smart BEMS (JGC, JGC Information Systems)
Charge/discharge EV (Nissan Motor, Hitachi, Orix, Orix Auto)
Office buildings BEMS (Toshiba, Marubeni, Mitsubishi Estate, Mitsui Fudosan)
Smart BEMS (Meidensha, NEC)
Smart BEMS (Shimizu)
BEMS
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Smart Cities in India (60)
SMART CITIES
UNDER "SMART CITIES MISSION"
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Smart Cities Map of India
ARABIAN SEA
BAY OF BENGAL
ANDAMAN & NICOBAR ISLANDS (INDIA)
LAKSHADWEEP (INDIA)
LEGEND
International Boundary
State Boundary
Smart City

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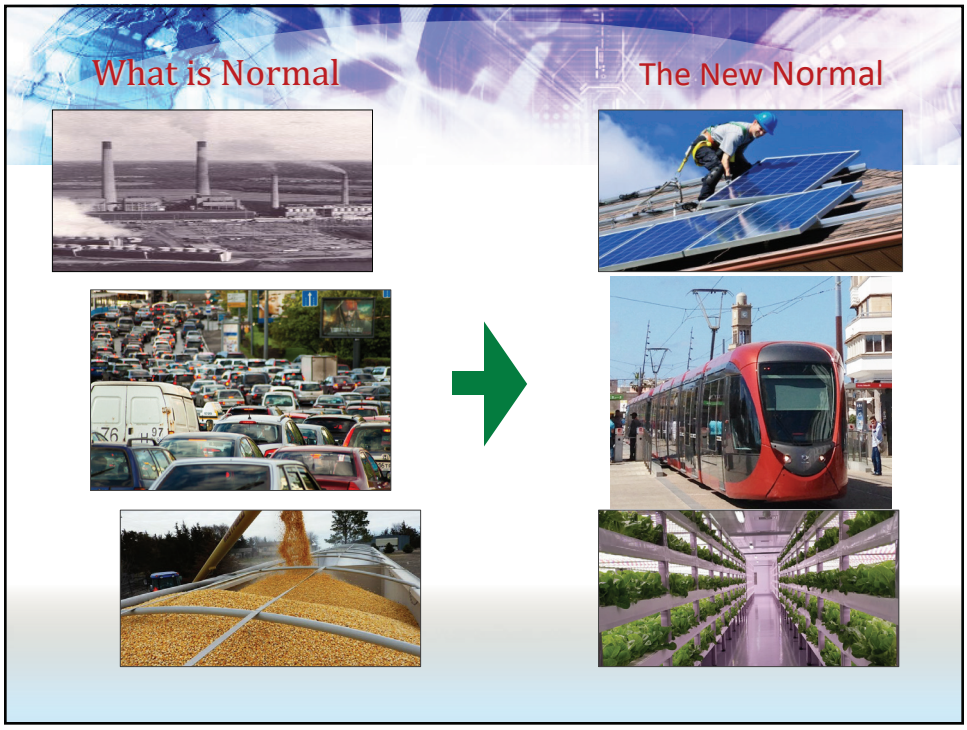
What is Normal
The New Normal

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IEEE
Smart Cities
Synergy
IEEE
smart village
Power a Village, Empower Community

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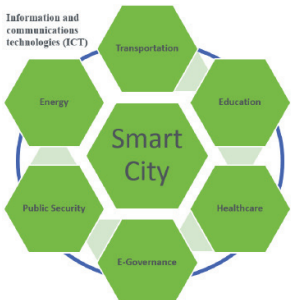
Smart/Connected City

- A smart/connected city is a system of interconnected systems including:
  - **Employment**
  - **Health care**
  - **Retail/entertainment**
  - **Public services**
  - Residences
  - Energy distribution
  - Transportation
- The system of systems is tied together by information and communications technologies (ICT) that transmit and process data about all sorts of activities within the city.



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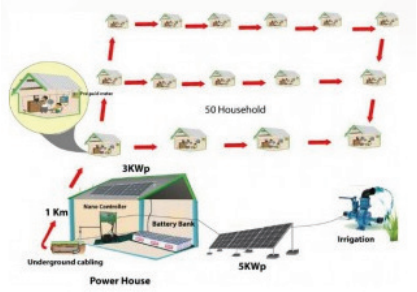
Solar Nanogrid in Bangladesh

ICT-based power meter and bill payment using smart phones



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IEEE smart village™
Power a Village, Empower Community

Introducing Technology

- Enables light after sunset using solar micro-grids
- Illuminates kitchens, schools and clinics
- Lets communities live cleaner, safer, and more prosperous lives
- Stimulates local commerce and builds new enterprises

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IEEE smart village™
Power a Village, Empower Community

Expanding Education

Photo by Paula Bronstein

- Creating a network of engineers, entrepreneurs, and practitioners
- Facilitating ongoing learning and mentorship for continued success
- Innovative Global Classroom helps people around the world access the internet and educational resources

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IEEE Smart Village Success Story
Global Himalayan Expedition, India

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Lingshed Monastery – Ladakh Region, Indian Himalayas – Elevation 12,000 feet.
Founded in 1440 Illuminated with IEEE Smart Village in 2016
Global Himalayan Expedition

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Villagers working with LED Lights

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Loads served by roof-top Solar Photovoltaics

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Locally Driven Initiatives

Source: Grameen Shakti, Bangladesh

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Ownership by Citizens

- **Development of local technicians and entrepreneurs at the grass-roots level:**

  To create local stakeholder for promoting, installing and providing efficient after-sales service of the technologies.

- **Local capacity development and creation of green jobs:**

  Local entrepreneurs, especially women are offered financial and technical assistance to set-up a renewable energy technology business.

Source: Grameen Shakti, Bangladesh

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Life Changing Experience

"The customers love coming to my shop, now that I have bright light . "They can see what they are buying and what I have in stock. And they can watch television and charge mobile phones. My sales have gone up by at least 50%."

Source: Grameen Shakti, Bangladesh

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Children's Library in a Boat with Solar-powered Light

Source: Grameen Shakti, Bangladesh

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Impact of Solar PV in Rural Communities

- Education
- Healthcare
- Retail Business
- Electricity

Some of the experience from the Smart Village can show examples of social interactions which can be transferred to the Smart City and help in community building

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The Connected ~~City~~ Village

A connected ~~city~~ village is one where all relevant ~~city~~ village systems— utilities, transportation, employment, health care, public safety, education, and others—are capable of communicating with each other to allow coordination and reduce waste.

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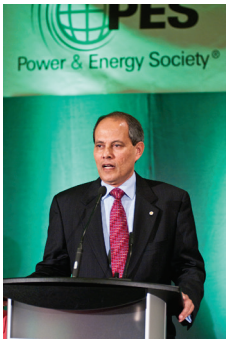

Thank you

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