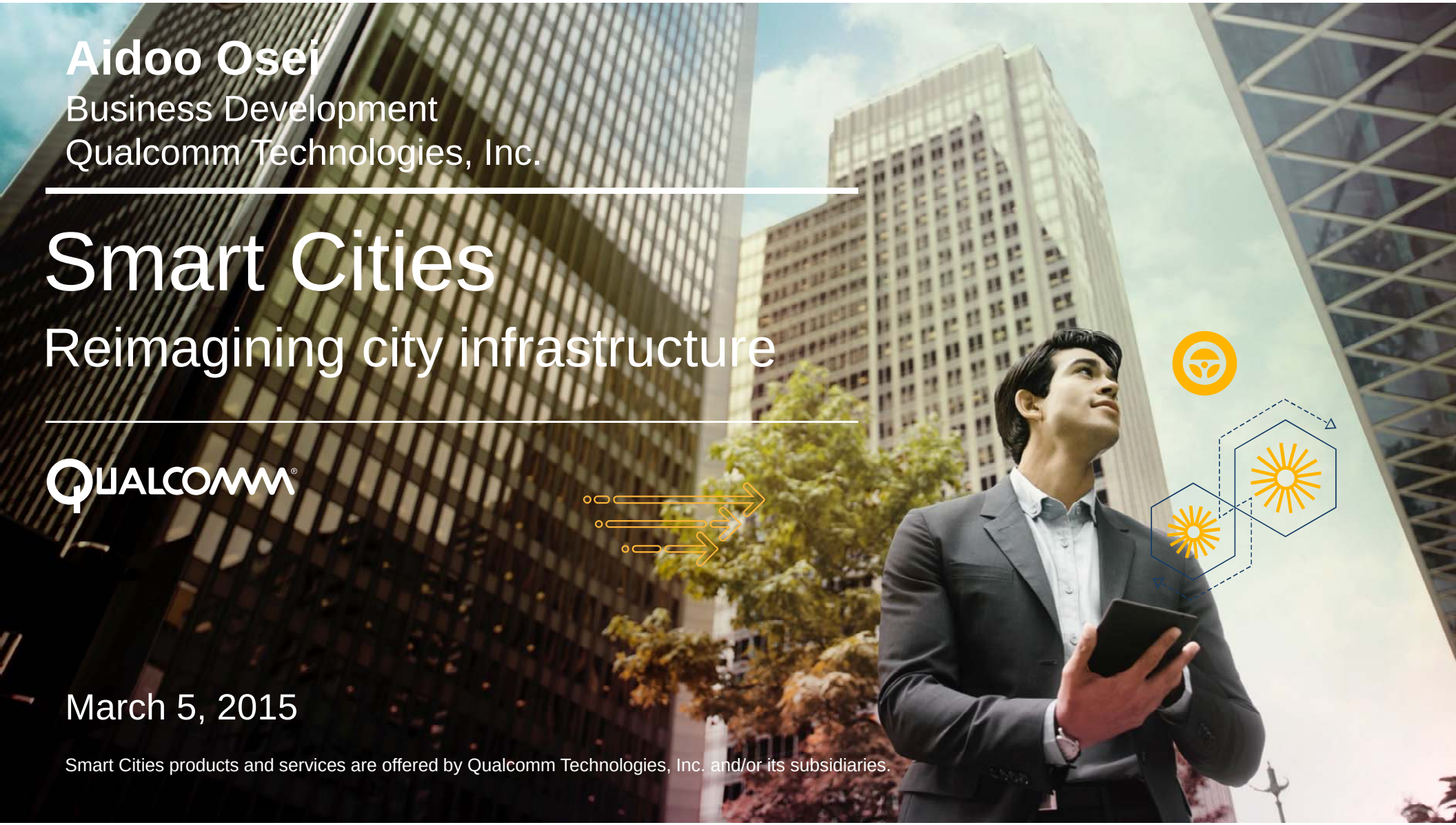
Aidoo Osei
Business Development
Qualcomm Technologies, Inc.

Smart Cities

Reimagining city infrastructure



March 5, 2015

Surge in connected things has already begun

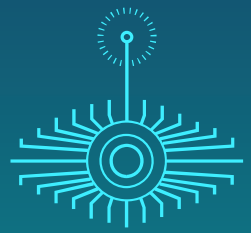
25B

Lights | Smart Meter | PEV | Security Cameras | Smart Grid

Smarter

1000x Anticipated data traffic growth driven by more connection and richer content

More connected



~75% US 18-24 year olds reach for smartphone immediately after waking up

~8B Cumulative[2] smartphone shipments 2014-2018[2]

Driven by powerful technological and generational trends

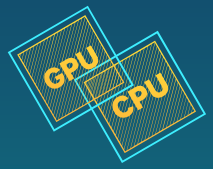
Sources: [1]Machina Research, April '13, IDC Mar '13. 2Gartner June '14

Technologies “Under the Hood”

Key Requirements for IoE Products

Multimedia

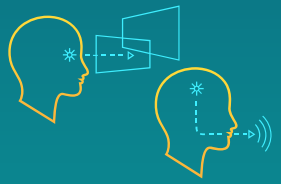
Power Management



GPU & CPU

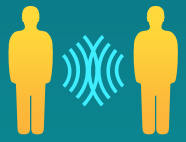
DSP & Sensor Hub

Software/ HLOS



Visual Computing Voice Processing

Wi-Fi/ Bluetooth



Peer to Peer

Position Location

Security

Reimagining City **Infrastructure**

From single-purpose to multi-purpose

Single-purpose: Payphone

- Phone calls
- Emergency services

Multi-purpose: Communication Kiosk

- Free Wi-Fi
- Free Phone Calls
- Emergency Services
- City Services
- Digital Advertising

Single-purpose: Street Lighting

- Lighting

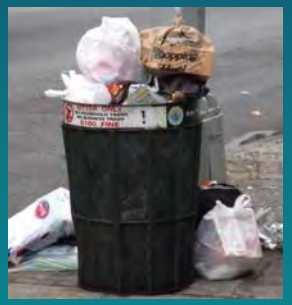
Multi-purpose: "Smart Node"

- Lighting management
- Video feeds
- Wi-Fi hotspot
- Urban intelligence sensors
- Emergency lighting indicators

Reimagining City **Infrastructure**

From single-purpose to multi-purpose

Single-purpose: Trash Can



- Trash collection

Multi-purpose: Connected Waste Station

- Self-compacting trash collections
- Real time status
- Wi-Fi hotspot
- Urban intelligence sensors
- Solar powered

Single-purpose: Parking Meter

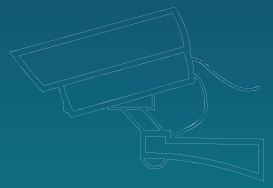
- Revenue generation

Multi-purpose: Smart Meter + Car Detection

- Multiple payment options
- Real-time revenue information
- Vehicle detection
- Solar powered

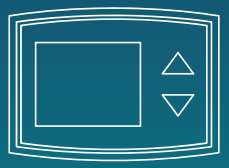
Smart Buildings

Connectivity solutions to increase efficiencies, revenues and cost savings



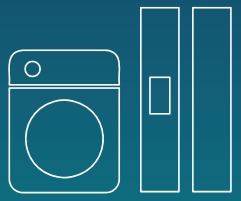
Security

Remote monitoring of building facilities and residents for increased peace of mind.



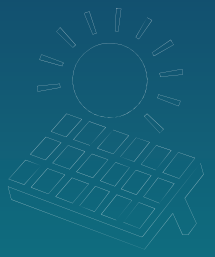
Heating / Cooling

Monitor HVAC usage and optimize usage per current weather conditions and power rates.



Appliances

Enable interoperability between appliances for advanced home automation.



Power / Solar

Monitor and optimize energy production & consumption in real-time.

Commercial Real Estate

Personalization

Technology: Bluetooth Smart Beacons

Benefits: Provides indoor context for app users

Examples: Museums, Sporting Areas, Shopping Malls

Digital Engagement

Technology: Augmented Reality

Benefits: Drives digital + physical engagement

Examples: Gaming/Shopping | Malls, Commercial Mixed Use

Commercial Real Estate

Transportation

Technology: Cellular, Wi-Fi, BLE Telematics

Benefits: Facilitate vehicle / bicycle sharing

Examples: Private campus, residential program

EV Fleet Management

Technology: Halo Wireless EV

Benefits: Hassle-free charging

Examples: Residential, Commercial, Office Park

BURNHAM-MOORES
CENTER FOR REAL ESTATE
UNIVERSITY OF SAN DIEGO

A special thanks to our sponsors:

Presenting Sponsor

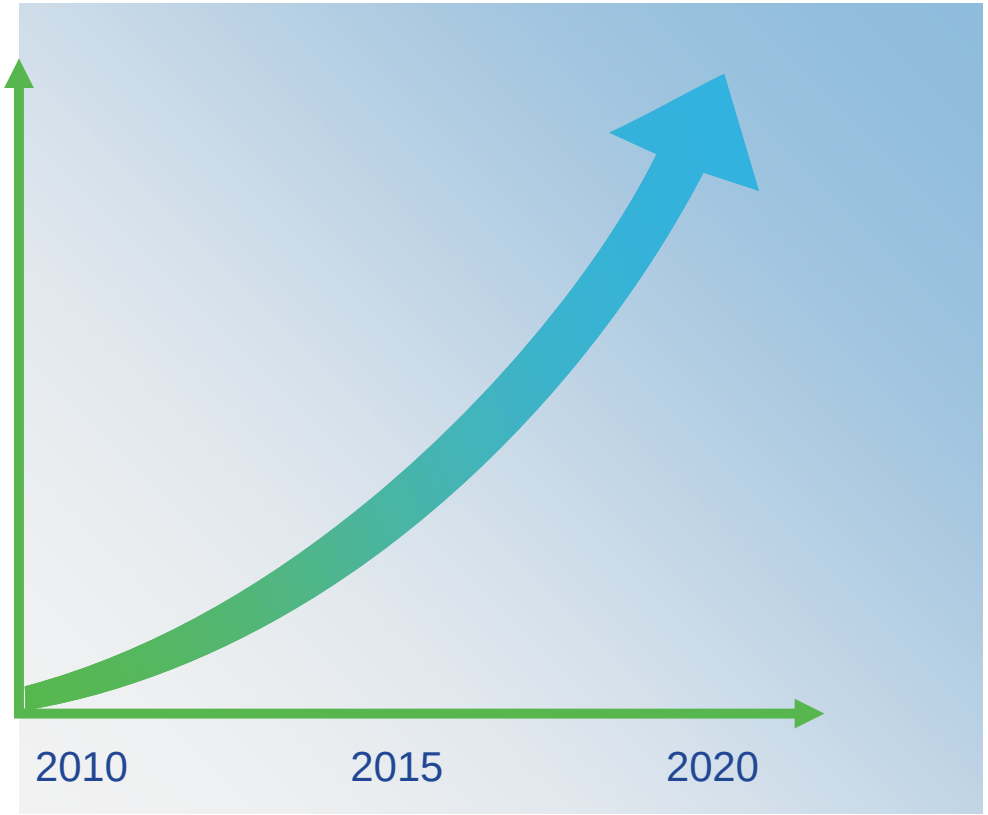
Corporate Sponsors

Breakfast Sponsors

Media Sponsor

Era of Exponential Digitalization

Explosion of Growth on the Internet		
Connections		
7.3B	18.2B	50B
Data		
3ZB	10ZB	40ZB
Applications		
10.7B	182.7B	???

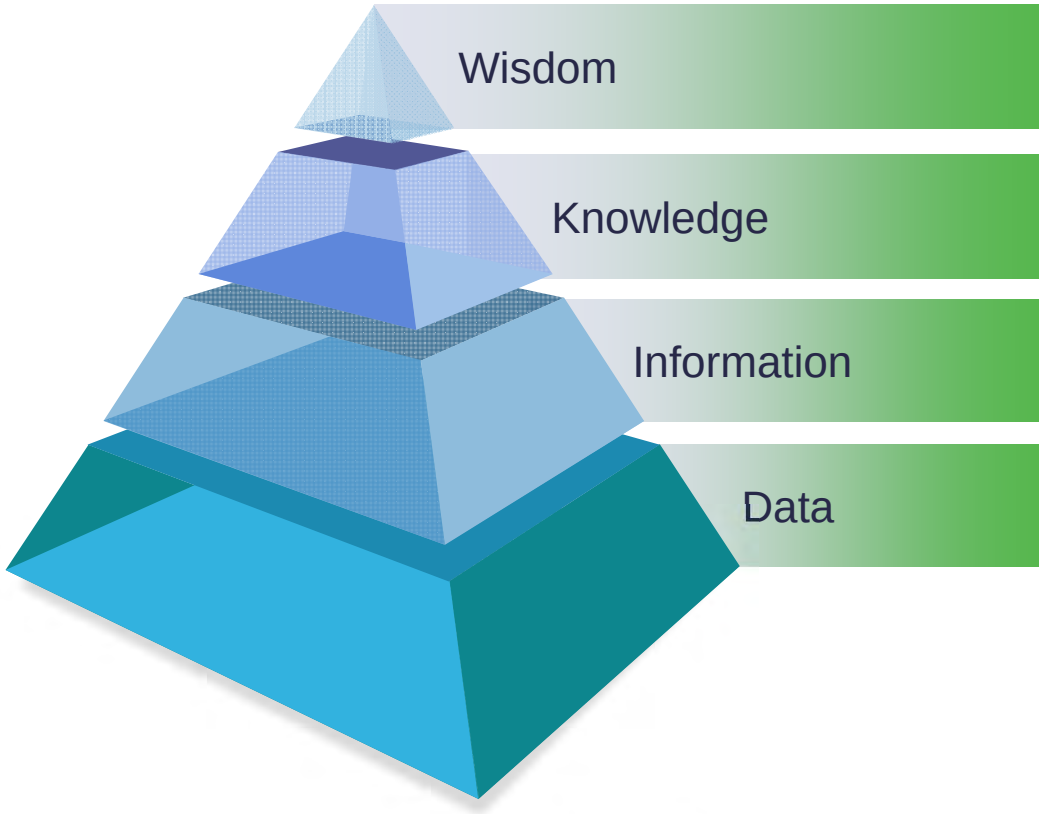


Transforming Data into Actionable Intelligence

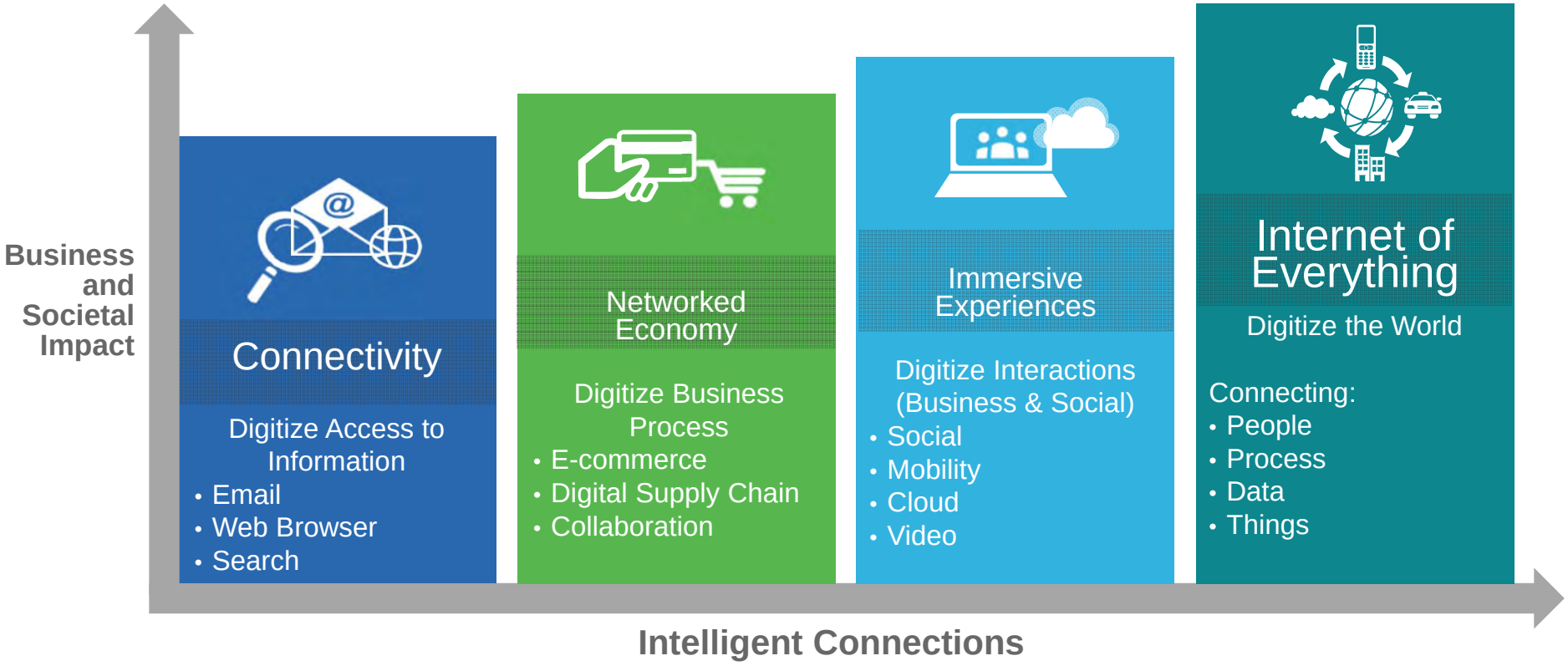
End-to-End Analytics
from the Edge to the Data Center

- Scenario Planning
- Decision-Making
- Process Re-Engineering

Creating Bigger and Newer Opp'ys for Cities

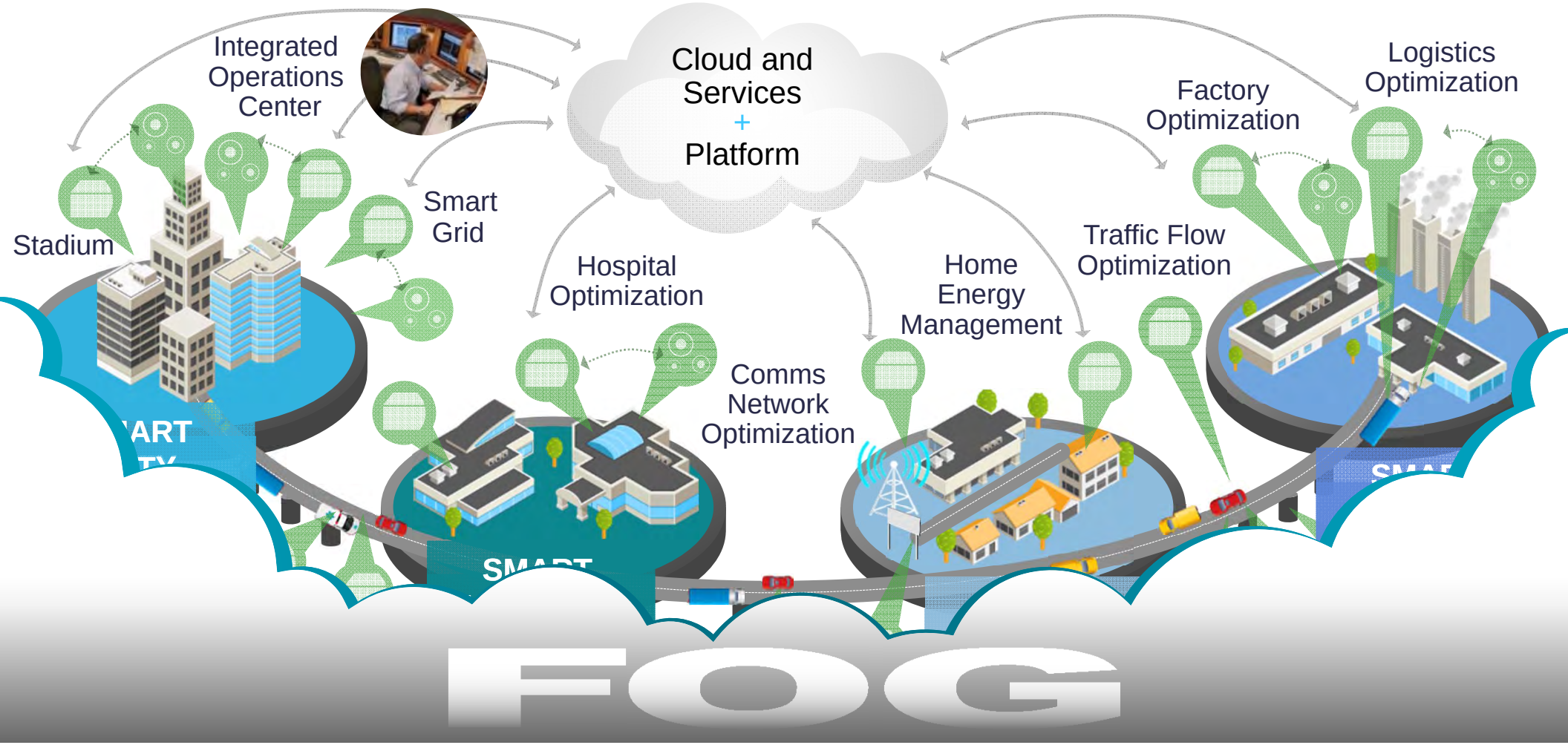


Evolution of the Internet



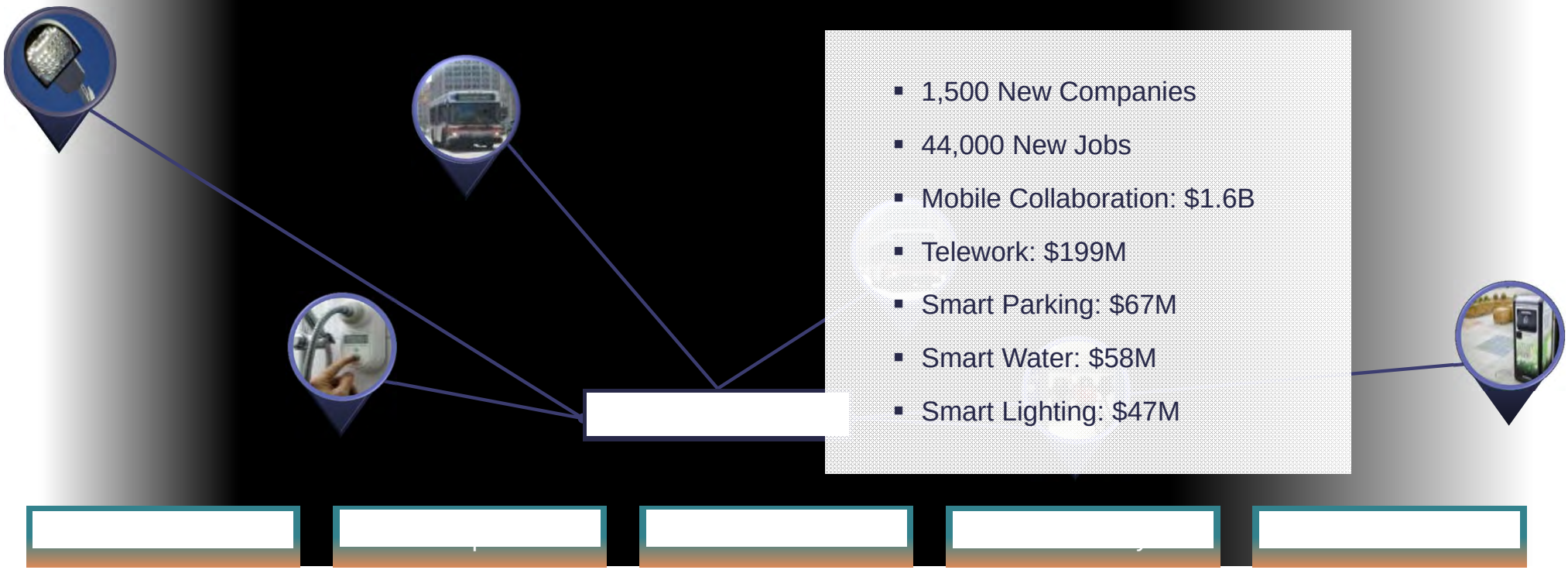
Internet of Everything… 5X – 10X impact of Internet to date

The Digital Overlay:
Connected Over Industry Standard Platforms



Barcelona – Smart City
$3.6B Value Creation

Commission
iCapital Award



- 1,500 New Companies
- 44,000 New Jobs
- Mobile Collaboration: $1.6B
- Telework: $199M
- Smart Parking: $67M
- Smart Water: $58M
- Smart Lighting: $47M

BURNHAM-MOORES
CENTER FOR REAL ESTATE
UNIVERSITY OF SAN DIEGO

A special thanks to our sponsors:

Presenting Sponsor

Corporate Sponsors

Breakfast Sponsors

Media Sponsor

Intel® IoT Solutions for Smart Buildings

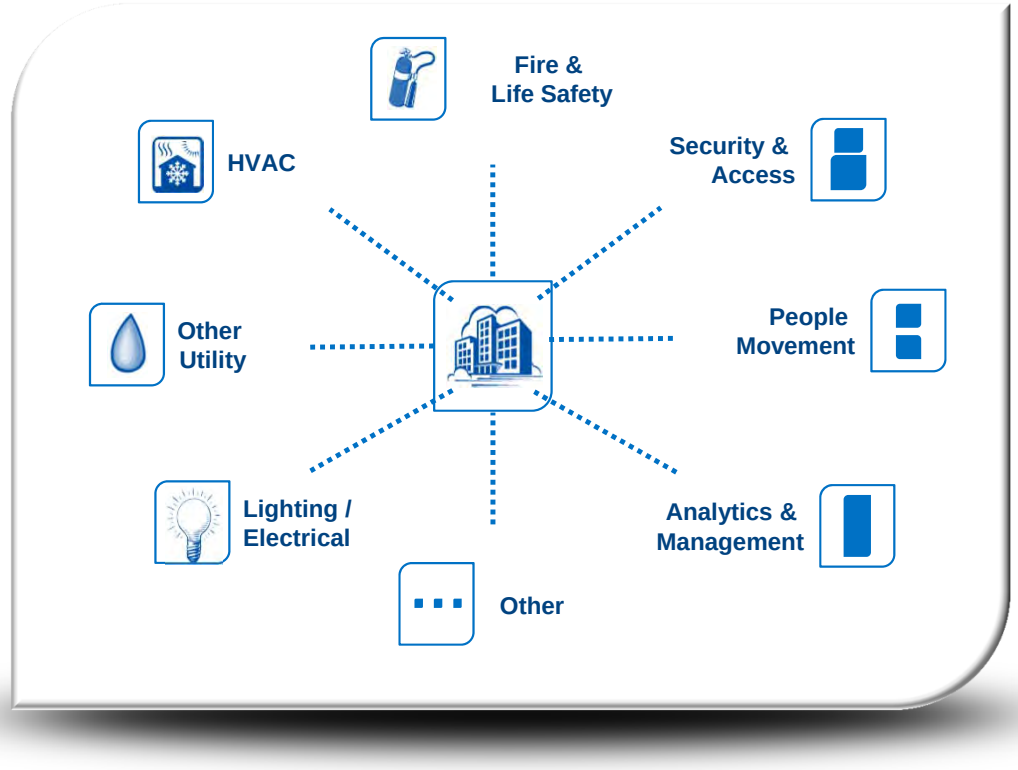
Smart Home and Building Division, Internet of Things Group

Rick Lisa

Smart Buildings

Networked. Intelligent. Adaptable

The Smart Building is an intelligent space that will create the greatest synergies between efficiency, comfort, safety for people and assets



Smart Building Usages

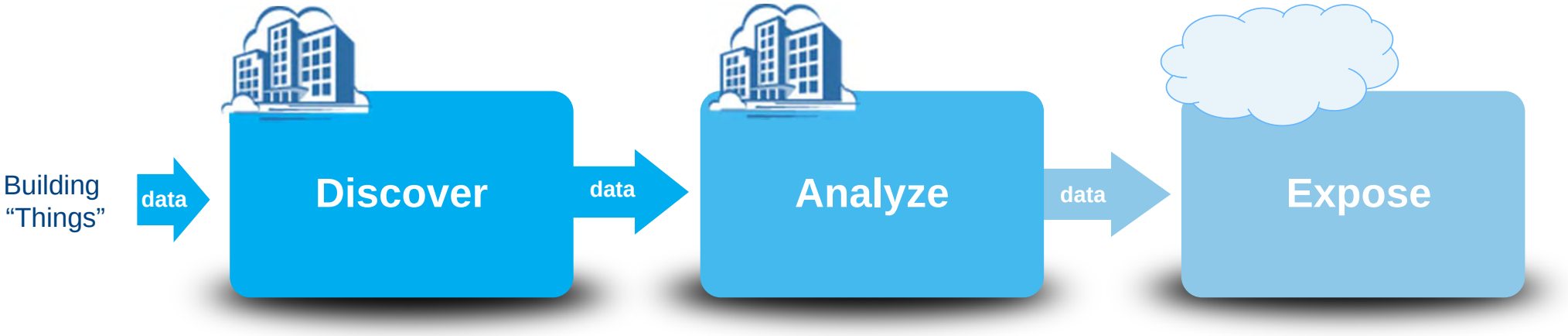
Challenges to Implement Smart Buildings

Larger Goals: Security, Sustainability, Operational Efficiency and Occupant Comfort			
Challenges:			
Operating Costs	**Lack of data visibility into all assets to be managed**	**Un-connected legacy systems with no easy means of data acquisition and finer grain control**	**Lack of compatibility or standards across proprietary systems**

Internet of Things (IoT) will accelerate
IT meeting OT for the Building sector

Intel IOT Products** For Smart Building Solutions

Building Management Systems (BMS) based on Intel® IoT Platform** ***enables*** “Information Technology (**IT**) ***integration*** *with* Operations Technology **(OT**)”



Intel® IOT Gateways
Secure and Scalable
Building IO enabled

Intel® Decision Solutions
Domain specific trend and
predictive analytics tools for
actionable decisions

Intel® Mashery™ API Management
Create, Package and Publish
Data to Solutions

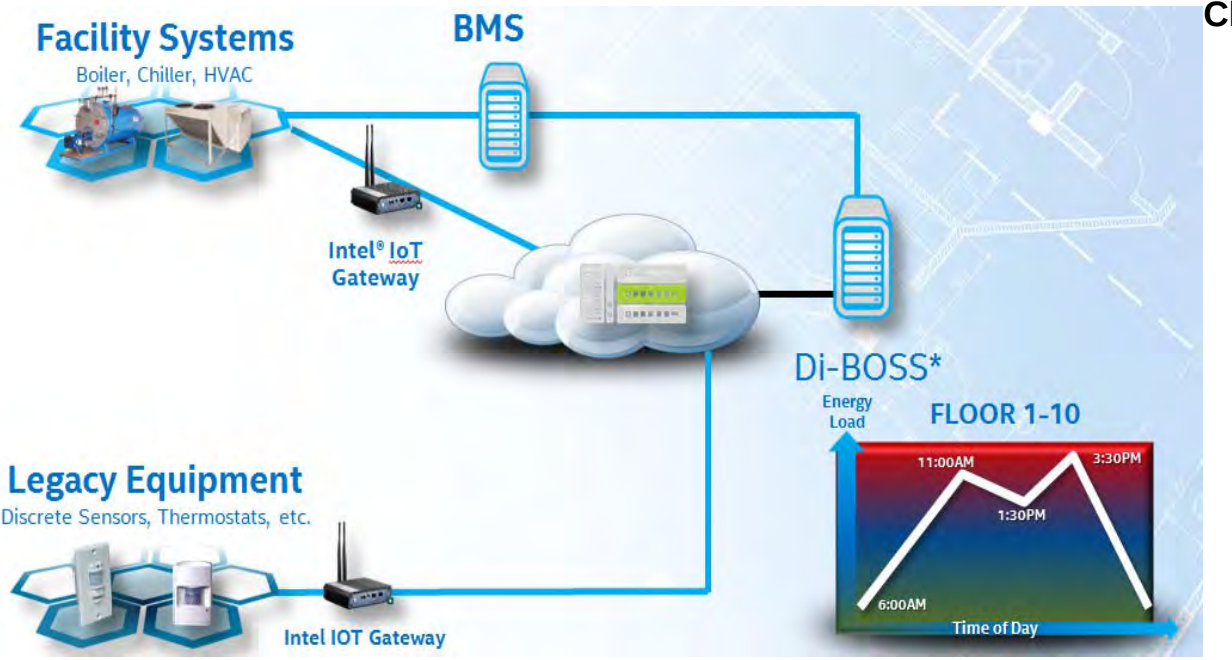
** Intel® Security is *built-into all Products*

*Other names and brands may be claimed as the property of others.

Rudín

Optimizing energy load based on occupancy levels, saved the company $1M per building, per year at $.50 per sq. ft.

Building Management System



Challenges: Need for finer command and control of building systems for operational efficiency

Proprietary BMS

Lacked detailed data

Unconnected legacy systems

Solution Players:

Rudin*: Building Owner for Commercial and Multi-Family

Intel: Intel® IoT Gateway

Front Street (Evolpa): Facility installation

Selex & Columbia University: Building Analytics/Management System (Di-Boss*)

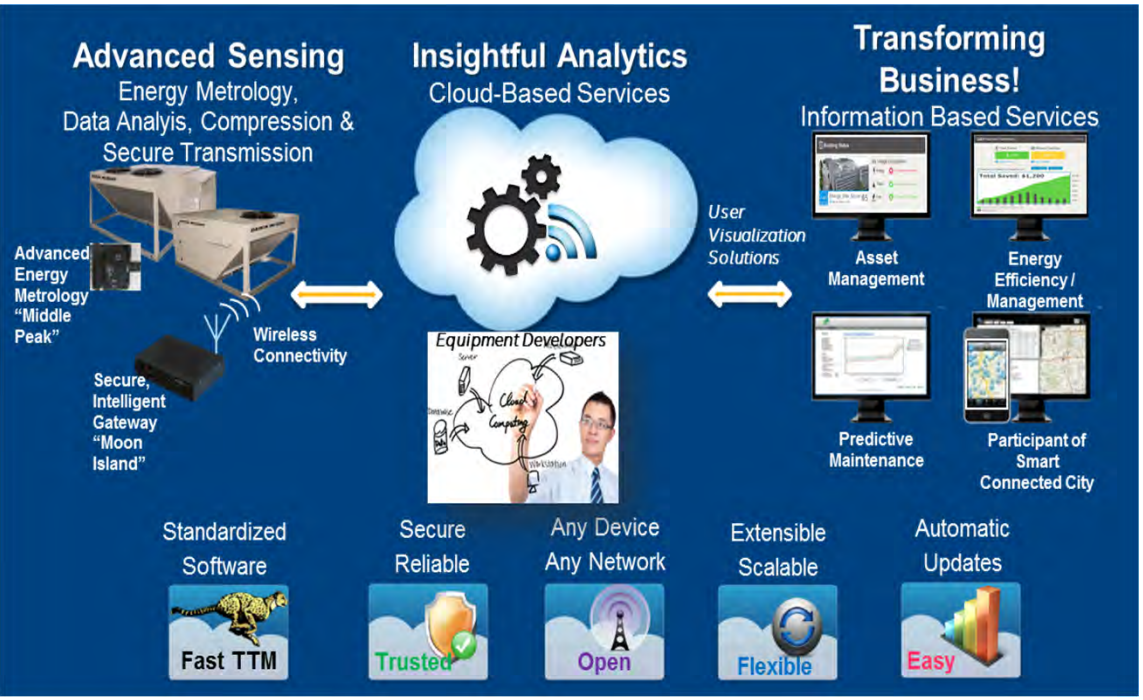
FramTech Solutions Family: Configurator for Gateways

*Other names and brands may be claimed as the property of others.

DAIKIN

HVAC Energy Management System

Demonstrated 15% energy savings year by year in industry studies.



Daikin* envisioned combining accurate energy data with operational state data to enable:

Verification of energy consumed during normal operation and demonstrate 'payback' metrics to existing and prospective customers.

Uncover trending to out of spec operation of subsystem and issue corrective action proposals.

Coordinate multiple connected Rebel HVACs in paid utility demand control programs and corporate peak avoidance programs

Solution Players:

Intel: Intel® IoT Gateway + Intel® Decision Solution: Trend Analytics Software

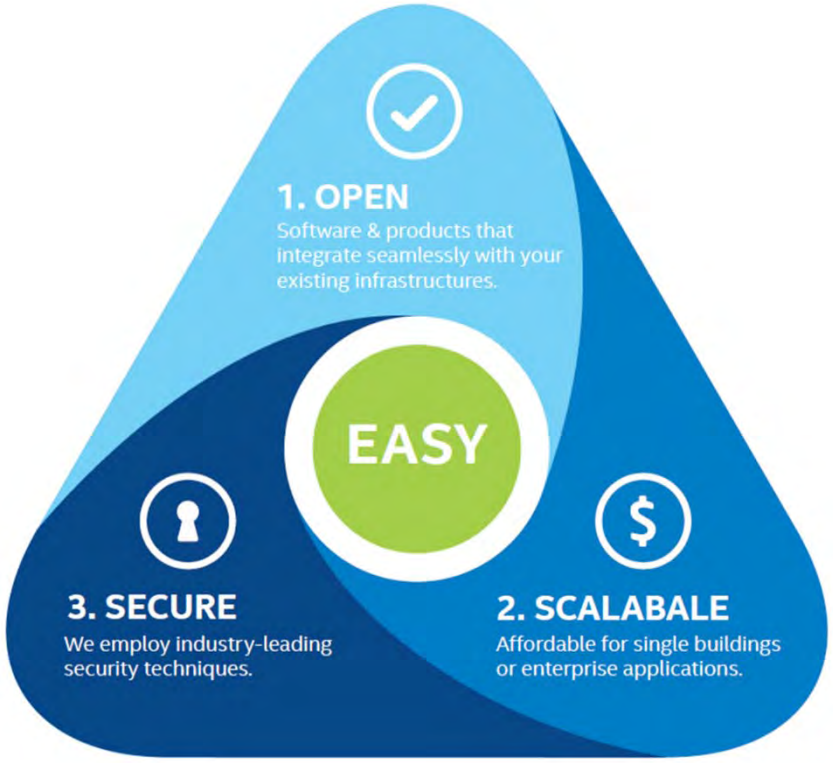
Daikin

*Other names and brands may be claimed as the property of others.

KMC CONTROLS

Building Automation System

First IoT school in the province looking to reduce energy consumption and improve student performance



Challenge:

Giséle-Lalonde School in Orléans, Ontario need a solution to drive energy efficiency and productive environment;

Metering water and natural gas

Benchmarking kilowatt hour (kWh) per student

Actively measuring and managing CO2levels

Tracking occupancy in real time

Solution Players:

BMS: KMC* Controls Comander

Intel/Dell*: Gateway

Sys Integrator: Lar-Mex

www.intel.com/content/dam/www/program/embedded/internet-of-things/blueprints/iot-building-automation-system-blueprint.pdf

*Other names and brands may be claimed as the property of others.

Blueprints and Solutions @ http://intel.com/iot/smartbuilding

BURNHAM-MOORES
CENTER FOR REAL ESTATE
UNIVERSITY OF SAN DIEGO

A special thanks to our sponsors:

Presenting Sponsor

Corporate Sponsors

Breakfast Sponsors

Media Sponsor

Glimpse into the Future

March 2015

Imagination at work.

Future shaped by disruptions

Energy service choices

Technology advances, costs reduced,
Competitive alternative solutions
Disruptive business models

Customers move completely off the grid[1]

[1] www.csiro.au/future-grid-forum

Consumer expectations

Grid resiliency and hardening
New service offerings
Flexibility of cloud based systems

5x Extreme weather events[2]

70% of grid is over 25yrs old[3]

[2] National Oceanic and Atmospheric Administration (NOAA) from Grid Resiliency Report[3]
[3] http://energy.gov/sites/prod/files/2013/08/f2/Grid%20Resiliency%20Report_FINAL.pdf

Growing renewables

Policy: Clean Air Act 111d
Regulatory: CA 33% RPS
Technology: Price and value driven advances

25% Long term demand destruction

Rising stranded asset risk

Empowering people

Significant workforce changes
Consumers expect visibility & control
Information to everyone, everywhere

60% Executives and 40% Engineers retiring[4]

[4] www.pwc.com/en_US/us/power-and-utilities/assets/succession-planning-wrapper-in-the-utilities-industry-final.pdf

Energy Future

Energy service choices

Advanced technology platform
Energy domain driven
Advanced analytics
New services and support
New business models

Consumer expectations

Design driven user experience
Asset Performance Mgmt
Systems that optimize reliability, demand, renewables, load and energy efficiency

Growing renewables

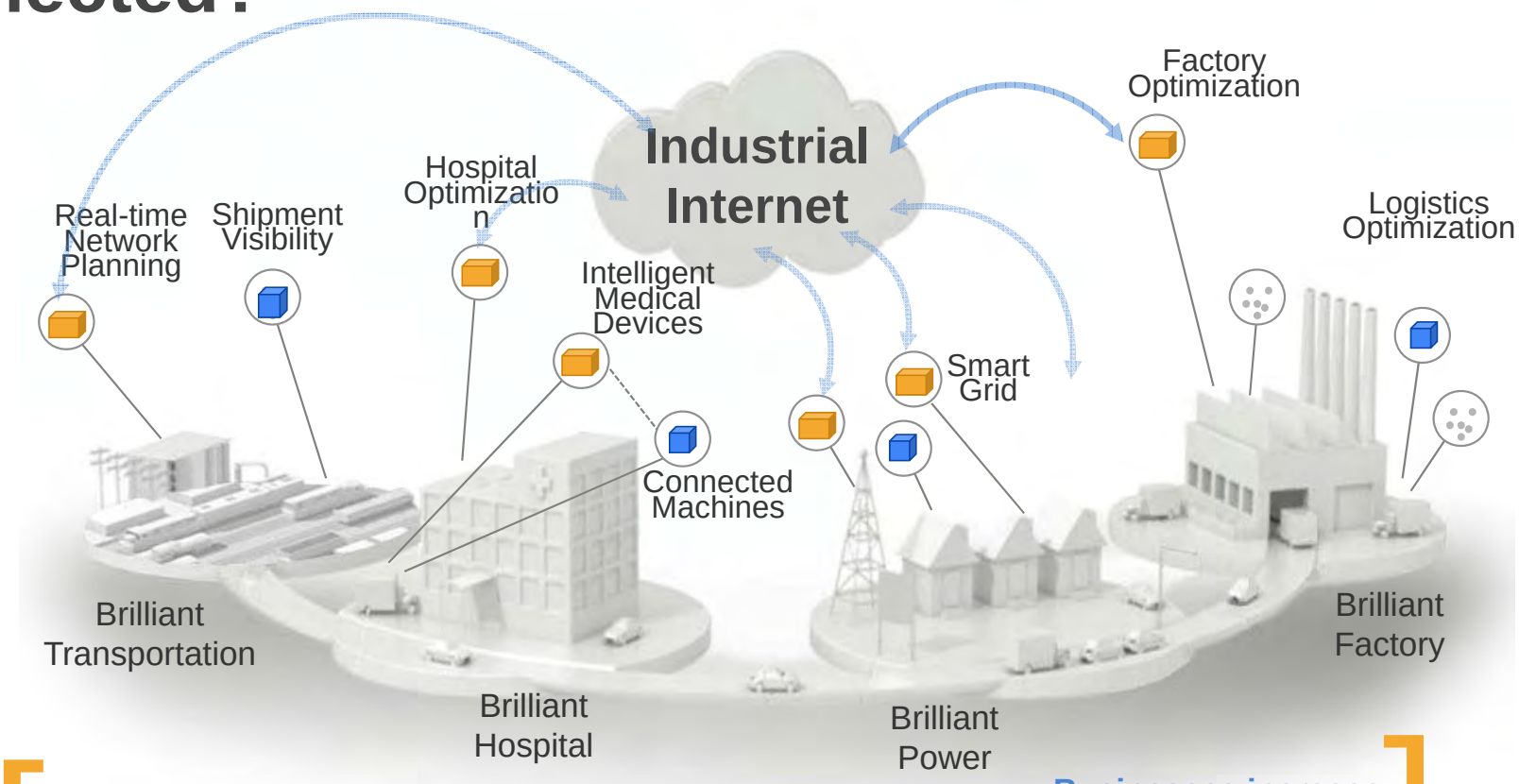
Enable renewables,
Build balance of plant
Integration optimization, control and protection
Help implement policies & influence policymakers

Empowering people

Improve workforce productivity
Enhance user experience
Improve resiliency & hardening
Connect people and information at any place, at any time, on any device

The Industrial Internet

What happens when 50B Machines become connected?



OT is virtualized

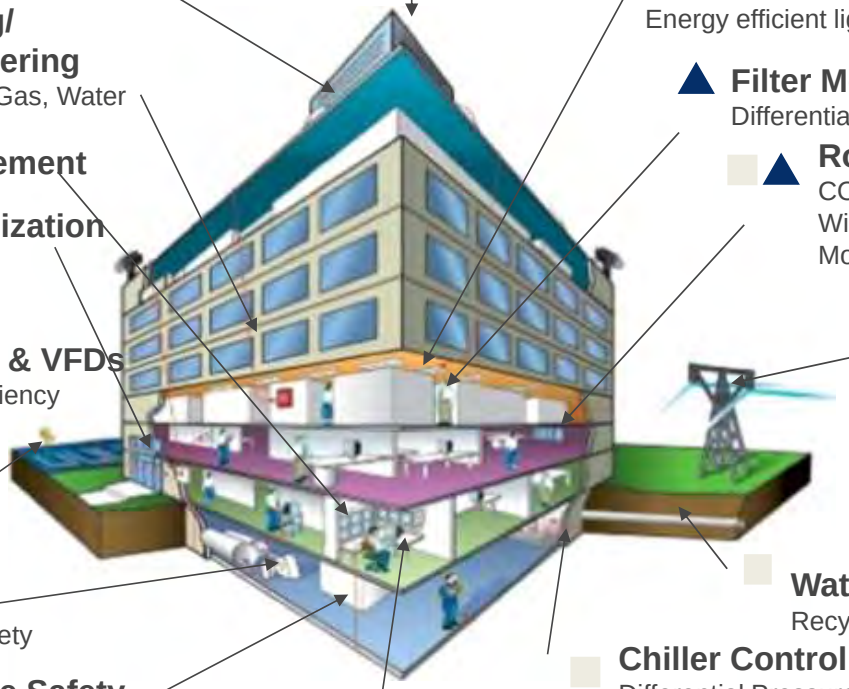
Analytics become predictive

Machines are self healing & automated

Businesses increase productivity

Monitoring and maintenance is mobilized

Smart Buildings



Air Handling Unit
CO_2, Humidity, Temp, Airflow

Metering/ Sub-metering
Electricity, Gas, Water

Facility Management

Building Pressurization
Differential Pressure

Motors & VFDs
High efficiency

Outdoor Lighting
Parking, Street

Boiler Control
Process Control, safety

Security & Fire Safety
Access, video, mass notification

Power Management
Back-up Power Solutions

Indoor Lighting & Controls
Energy efficient lighting

Filter Monitoring
Differential Pressure

Room Monitoring
CO_2, Humidity, Temp, Wireless Remote Monitoring

SmartGrid Integration
Microgrid, renewable energy, on-demand response

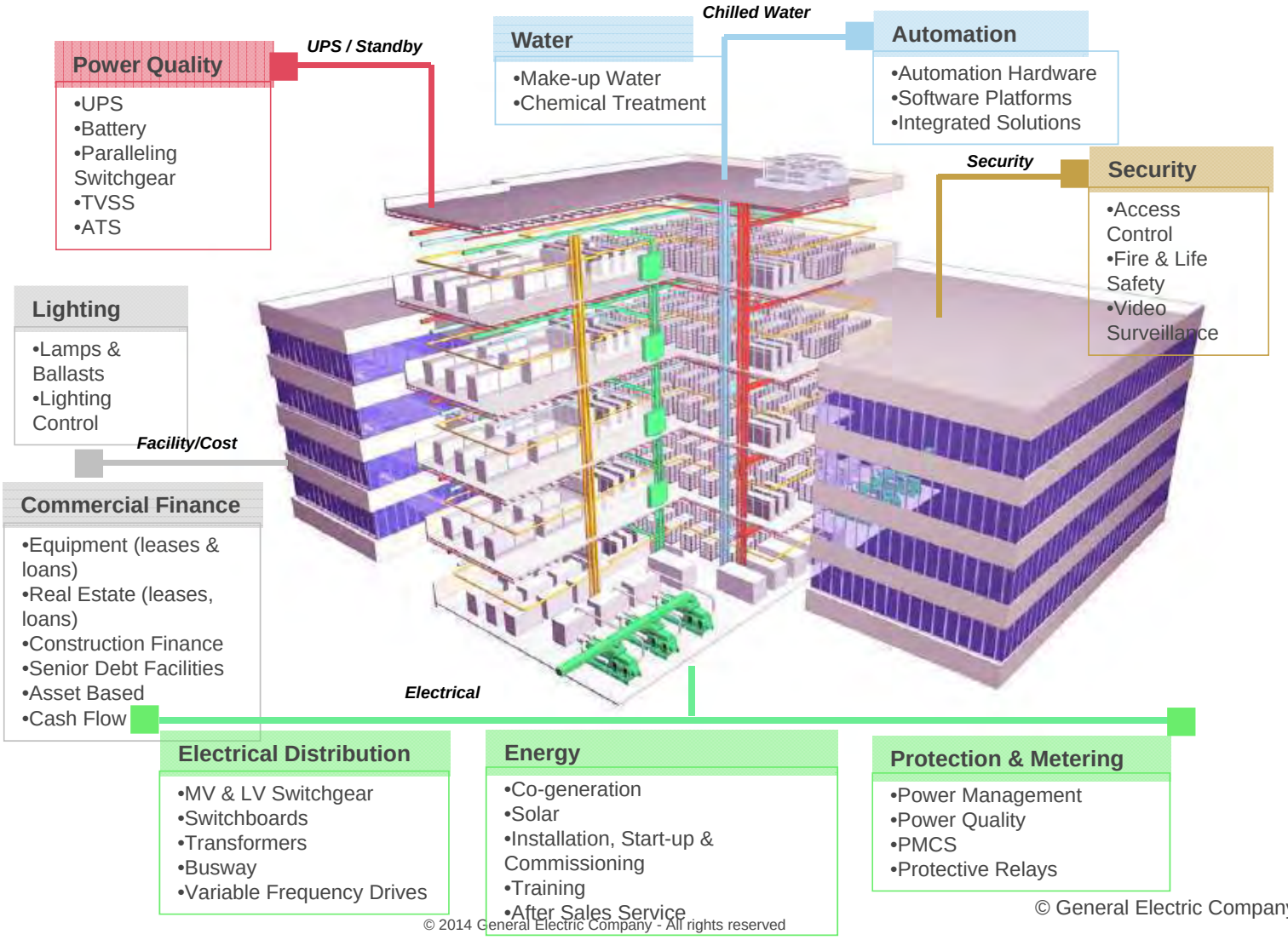
Water Management
Recycle, reuse, treatment

Chiller Control
Differential Pressure, Level, Temp

Energy Management System
Connect, measure, and control all systems with software

Energy Efficiency
Emergency & Safety
Air Quality

Smart Data Centers

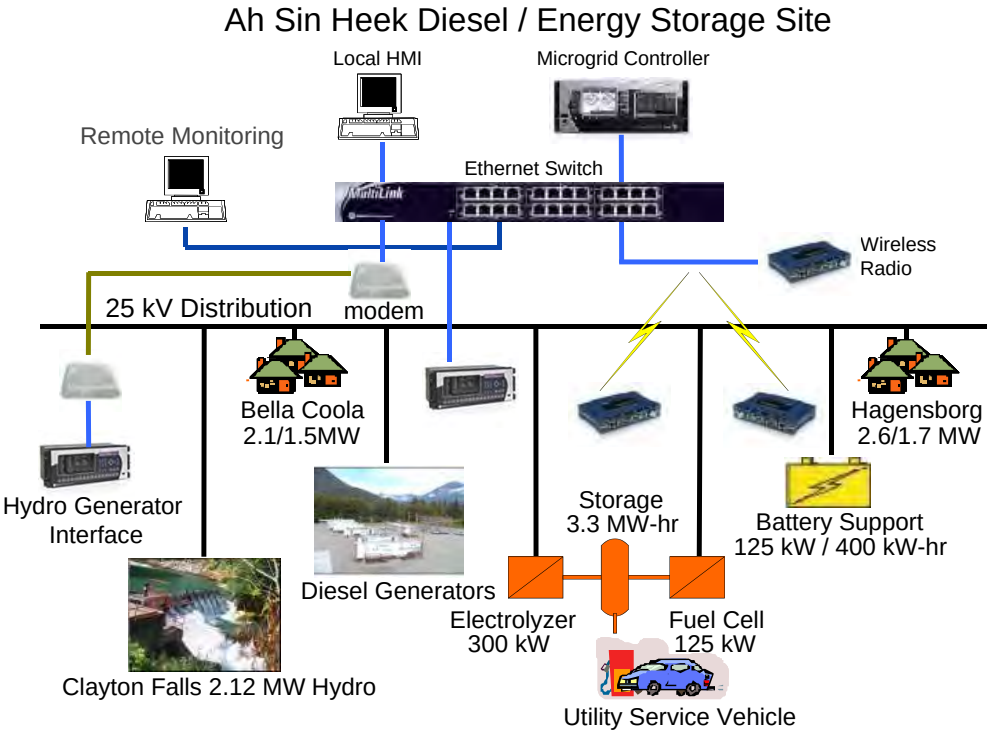


Smart Streetlights

Advancing into a new future driven by technology

- Luminaires can offer much more than light
- Stronger infrastructure
- Better safety
- Building a sustainable energy plan with improved communications capacity

Smart Microgrids



- Centralized Supervisory control to optimize the use of renewables and minimize the use of diesel
- Wireless local area network
- Hydrogen based energy storage system
- Capability to connect, monitor and control the system remotely
- Interfaces to all Microgrid elements

Bella Coola, British Columbia will be demonstrating a clean power solution for remote communities. Its Hydrogen Assisted Renewable Power System will:

- Reduce annual diesel consumption by 200,000 liters
- Lower greenhouse gas emissions by 600 tons annually
- Provide storage for run-of-river power, so the electricity can be used when the community needs it most
- GE's Microgrid Controller will find the most economically efficient way to manage the renewable energy for the community.

Contacts

Cleantech San Diego:	**Jim Waring**, jwaring@cleantechsandiego.org
Realcomm:	**Jim Young**, jyoung@realcomm.com
QUALCOMM:	**Aidoo Osei**, aosei@qti.qualcomm.com
Cisco:	**Gordon Feller**, gofeller@cisco.com **Jim Day**, jiday@cisco.com
Intel:	**Gregg Berkeley**, gregg.berkeley@intel.com **Nick Ong**, nicholas.g.ong@intel.com
GE:	**Deb Tatum**, deb.tatum@ge.com