INTEL ECO-TECHNOLOGY PROGRAM

Over the next decade, Intel technology empowers everyone to care for the planet

Urban Sustainability & Personal Energy Management
January 18, 2011

INTEL IS THE LARGEST VOLUNTARY PURCHASER OF "GREEN" POWER IN THE U.S., ACCORDING TO THE U.S. EPA

INTEL RECYCLED 80% OF
OUR SOLID WASTE IN 2009

36 BILLION GALLONS OF WATER HAVE BEEN SAVED
SINCE 1998 AS A RESULT OF OUR CONSERVATION INVESTMENTS

TODAY, INTEL IS HARNESSING OVER
2.8 MILLION WATTS OF SOLAR POWER

TECHNOLOGY FOR THE ENVIRONMENT

Drive Computing to
Be More
Energy Efficient

~2%
Opportunity

Use Computing to Improve
Energy Savings Outside
Information and
Communications Technology

98%
The Big Opportunity

THE COMPUTE CONTINUUM & THE ENVIRONMENT

Servers / Cloud

Information & Communications Technology is essential to solving environmental problems

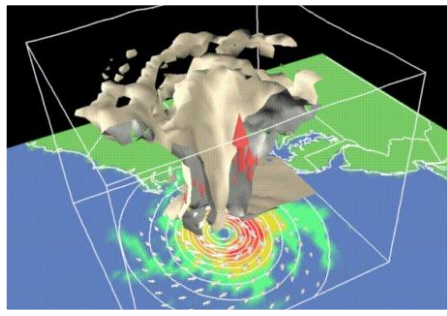**Desktops**   **Laptops**   **Netbooks**   **Personal Devices**   **Smartphones**   **Smart TVs**   **Embedded**

GLOBAL ENVIRONMENTAL OPPORTUNITIES

Computing power limits the accuracy of climate & weather prediction
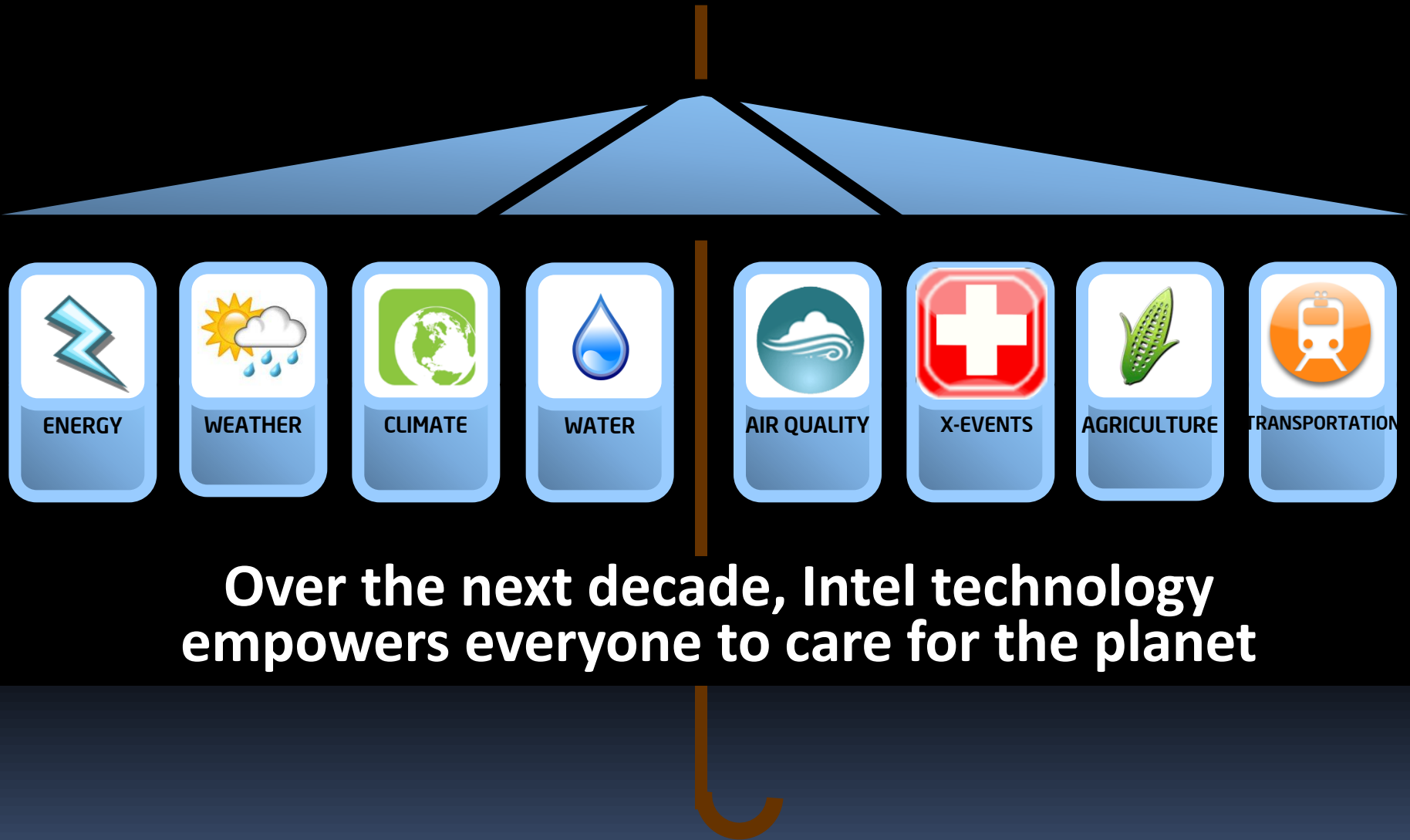
2/3^{rds} of the world's population will face water stress by 2025

Over the past 30 years, the number of natural disasters has increased 400%

DRIVE INTEL TECHNOLOGIES INTO THE SOLUTIONS

ECO TECHNOLOGY INNOVATION PROGRAM

ENERGY   WEATHER   CLIMATE   WATER   AIR QUALITY   X-EVENTS   AGRICULTURE   TRANSPORTATION

Over the next decade, Intel technology empowers everyone to care for the planet

INTEL'S ENERGY VISION

Intel technology makes energy personal

Information on your personal energy usage is readily available

Energy services are available as easily as cable services

Managing your energy at work is as easy as managing it at home

Personal weather forecasting lets your energy system plan for your energy needs

Your home energy is "plug & play", from appliances to local generation & storage

Open standards have created competition, reduced costs & an innovative ecosystem

INTEL BRINGS

Trusted brand

Drive to open industry standards

Technologies spanning a wide range of applications

COMPARISON WITH PERSONAL COMPUTING

CUSTOMER MESSAGING:
PERSONAL COMPUTING EMPOWERS THE CONSUMER

30 YEARS AGO...COMPUTING WAS FAR LESS PERSONAL

Far Away From Users
Not Easily Accessible
Professionals Did It

TODAY...COMPUTING IS ALWAYS AT OUR FINGERTIPS

Everywhere We Go
Part of Our Lives
Everyone Does It

EMPOWERING ENERGY CONSUMERS

- Use technology to inform consumers and change their behavior

- Residential consumers will reduce their energy consumption by up to 15% with real time feedback on their usage[1]

- You could reduce commercial building energy consumption an additional 12% by providing occupants information on their energy usage[2]

1."In-Home Display Units: An Evolving Market," Energy Insights, IDC
2.PAE Consulting Engineers, study from Oregon Sustainability Center

SMARTER HOMES

PROVIDING ENERGY CONSUMERS WITH CHOICE

Desktop & Net-Top PCs

Laptop, Netbooks, & Mobile Internet Devices

In-Home Displays

Internet TVs

Empower consumers by making energy "personal"

CONSUMERS WANT SMART HOMES

Intel Based HEMS will enable:

- Smart homes that connect to utilities' smart grid
- Smart homes that evolve with consumers over time
- The integration of the Internet with energy, home security, health, home control, and many "smart home" applications

Social Nets and ESCOs

INTERNET

Utility

Security and Other SPs
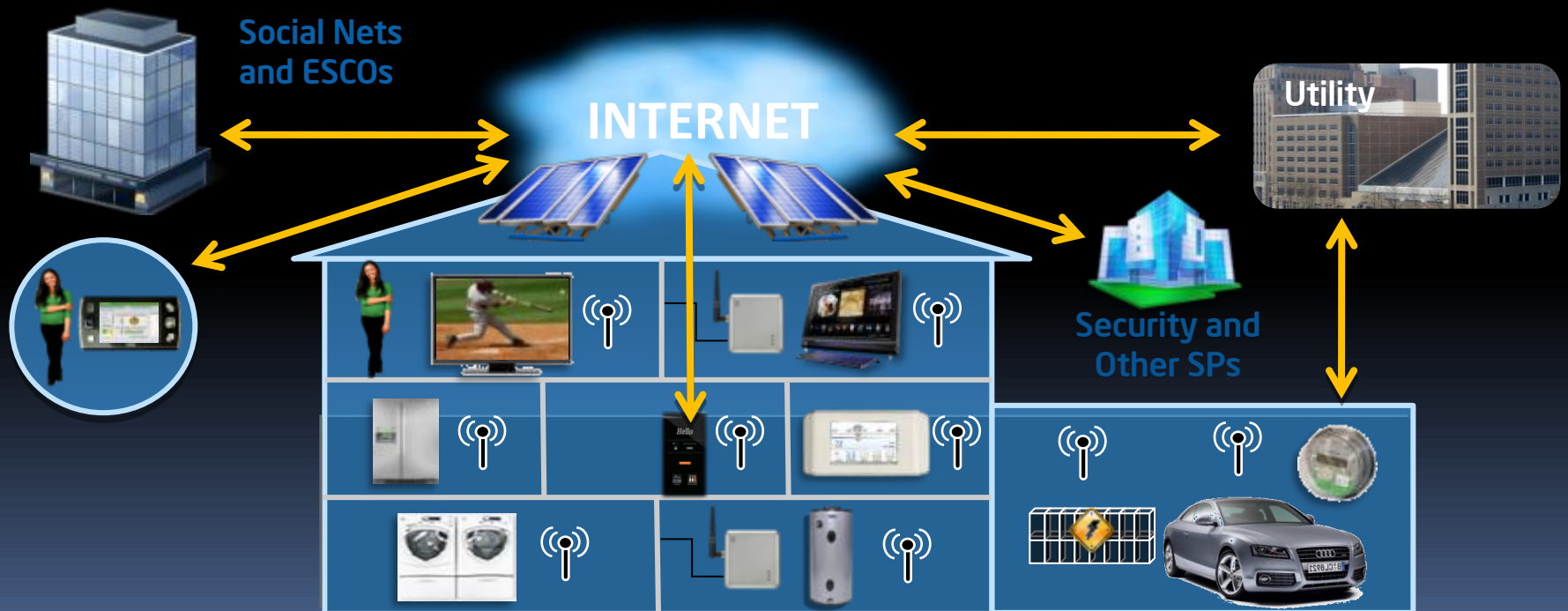
CONSUMERS WANT PRIVACY & CONTROL

TRADITIONAL METHOD:
Direct Load Control

Consumer abdicates control in exchange for incentives

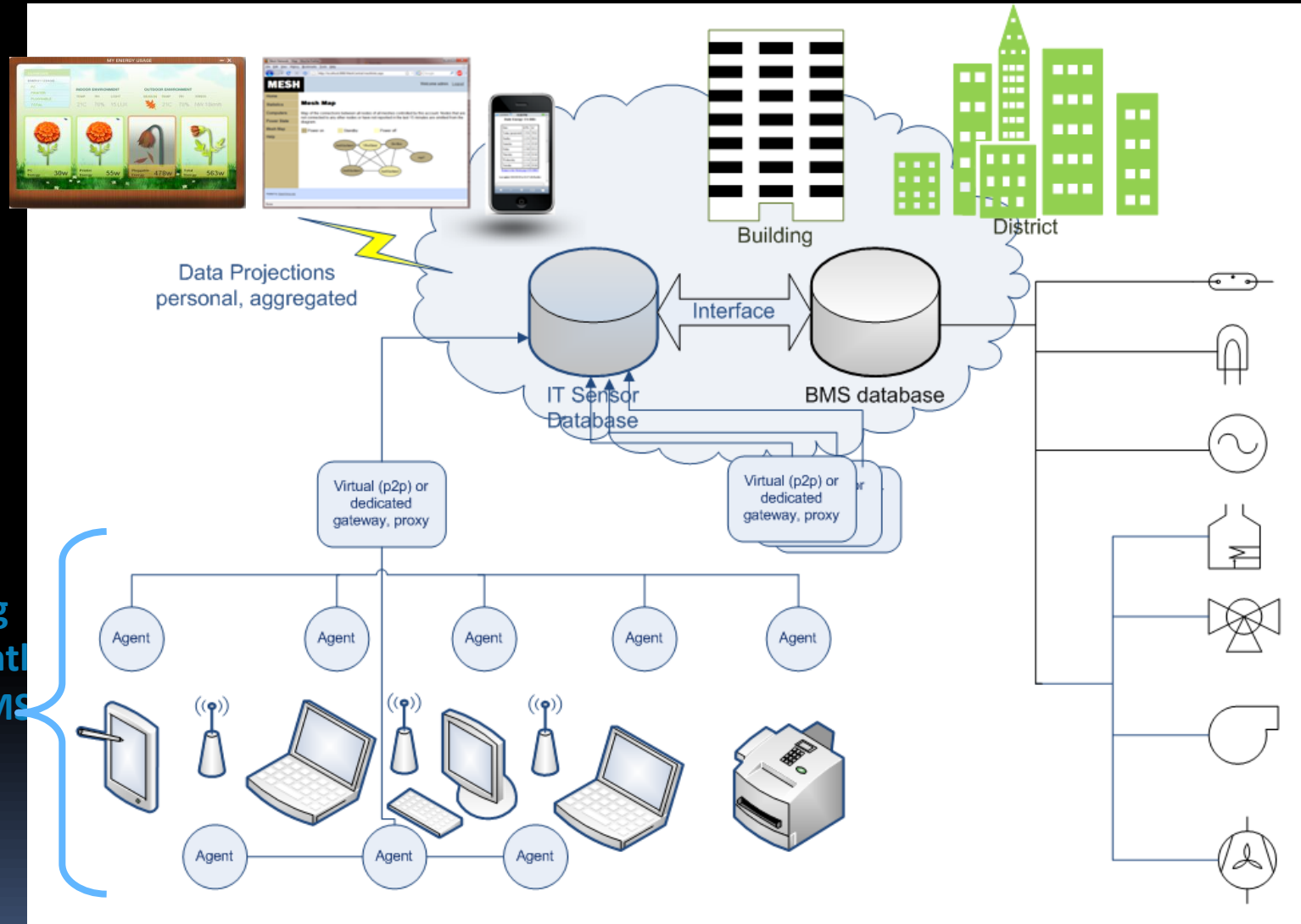## HEMS METHOD:
Distributed Intelligence

HEMS provides energy visibility, "set and forget" convenience, privacy, and control of personal environment

SMARTER COMMERCIAL BUILDINGS

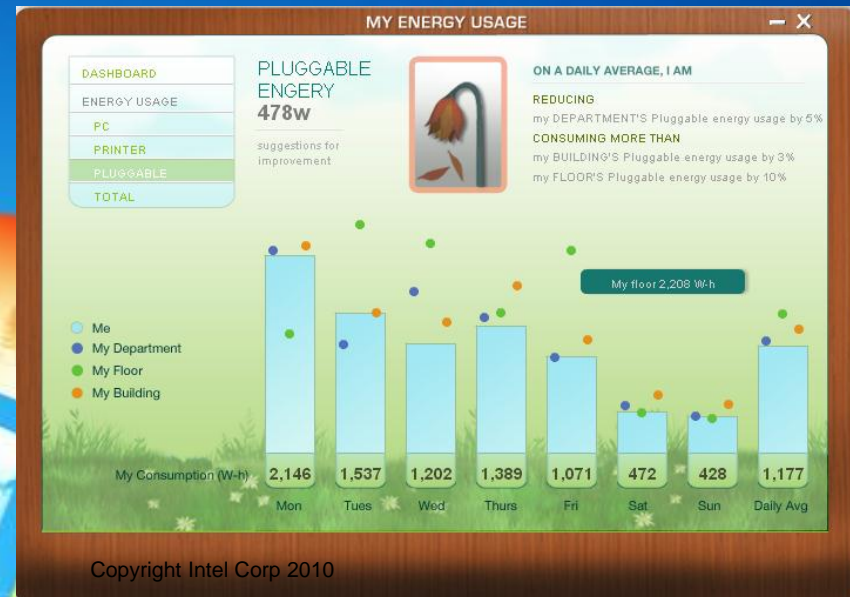# SMART BUILDING TECHNOLOGY ELEMENTS

Occupant plug loads not presently managed by BMS technology

POEM: PERSONAL OFFICE ENERGY MANAGER

Double click reveals global view of Energy consumption using garden metaphor

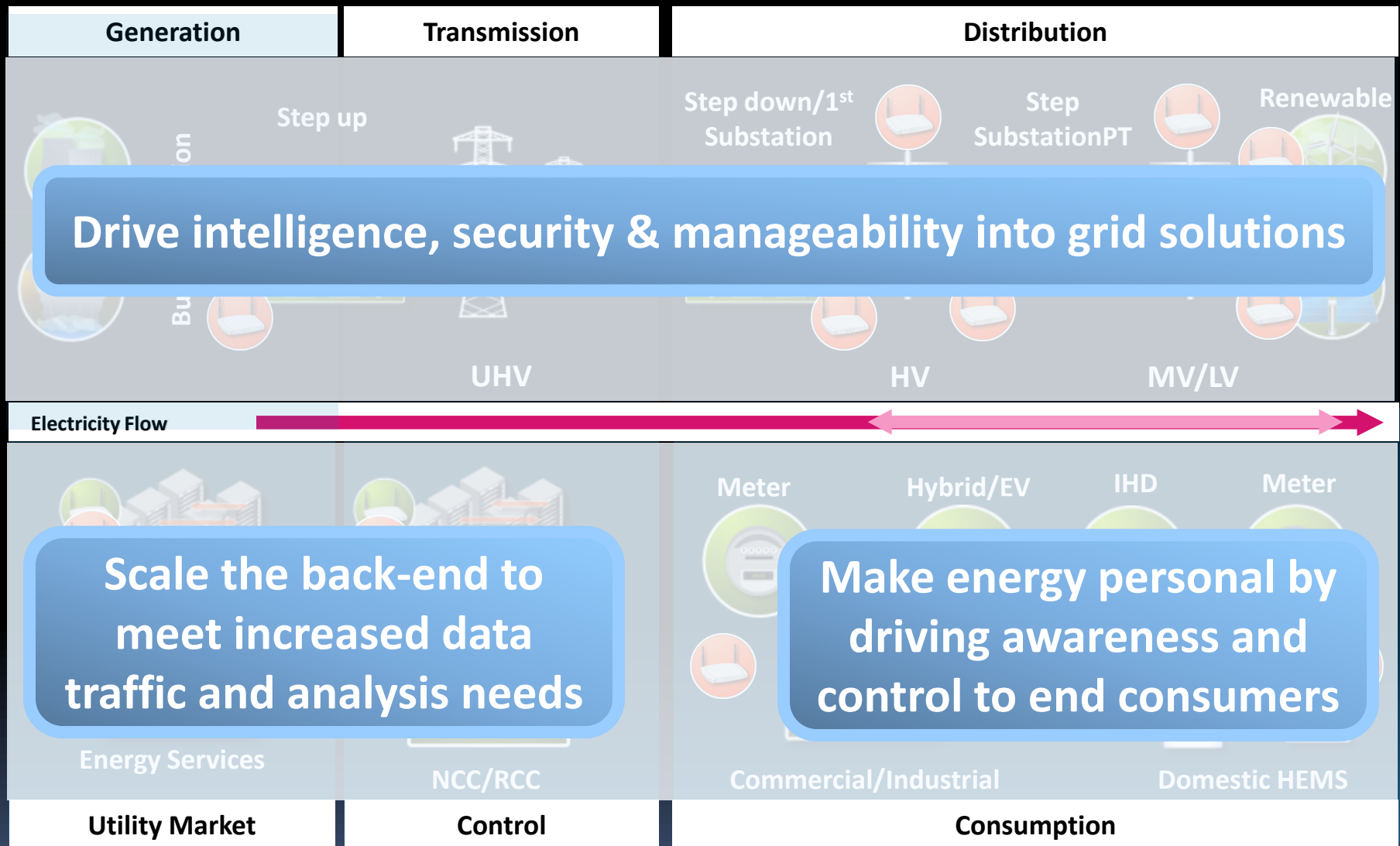Copyright Intel Corp 2010

Copyright Intel Corp 2010

Task bar element signals 'good' or 'bad'

ADD INTELLIGENCE END TO END

ADD INTELLIGENCE END TO END

Generation	Transmission	Distribution

Step up

Step down/1st Substation

Step SubstationPT

Renewable

Drive intelligence, security & manageability into grid solutions

UHV

HV

MV/LV

Electricity Flow

Meter

Hybrid/EV

IHD

Meter

Scale the back-end to meet increased data traffic and analysis needs

Make energy personal by driving awareness and control to end consumers

Energy Services

NCC/RCC

Commercial/Industrial

Domestic HEMS

Utility Market	Control	Consumption

WATER UTILITY INFRASTRUCTURE

- Leaks, drips and theft cost global water utilities ~$14B per year

- Utilities want "neural networks for water"

  sensors, networks, controllers, models, applications & visualization

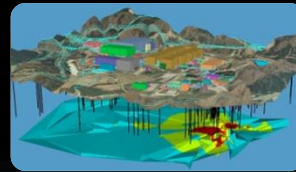- Holy grail for water quality monitoring is general-purpose, in situ, real-time sensing

EMBEDDED DEVICES

SERVERS AND SOFTWARE

APPLICATIONS

Use and quality data

Leak detection

Remote control

Sensors/ Controllers

Modeling & Analytics

Visualization

Metering/ Billing

Operations/ Maintenance

Planning

INTELLIGENT TRANSPORTATION SYSTEMS

- Congestion is impacting mobility, safety, efficiency, and the environment

- Fuel cost and "smart grid" benefits driving demand for electric vehicles

- Millions of people affected daily

OPTIMIZE TRANSPORTATION MODES

ENABLE CONSUMER-FRIENDLY IN-VEHICLE INFORMATION SYSTEMS

INFRASTRUCTURE INCLUDES IT INVESTMENT & "CEMENT"

IT CAN ENABLE

- vehicle-infrastructure integration
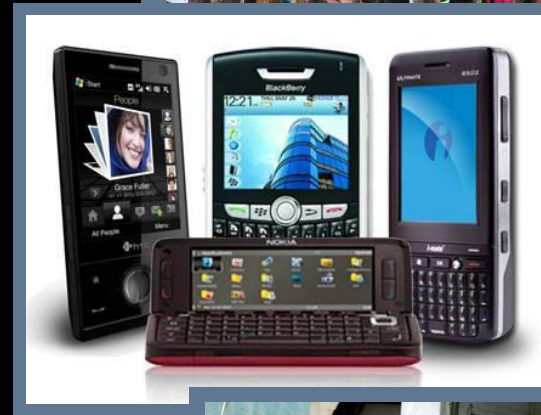- intelligent roadways
- transportation mgmt centers
- and more

PREPARATION FOR DISASTERS

Problem

- In a disaster, people don't know what to do

- Hundreds and potentially millions of people may be affected

Solutions

- Use mobile devices as an information input/output mechanism

- Evolve computing endpoints rich in sensors and context awareness