Smarter City Vision

An opportunity to think and act in new ways

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Smarter Planet is about a continuing transformation enabled by some important technology and societal changes:

**Instrumented**
We can measure, sense and see the condition of practically everything.

**Interconnected**
People, systems and objects can communicate and interact with each other in entirely new ways.

**Intelligent**
We can analyze and derive insight from larger and more diverse sources of information, to predict and respond better to change.
Sensors are being embedded across entire ecosystems – supply chains, healthcare networks, cities, natural systems.

We will be able to sense, measure and see the condition of everything.
In 2001, there were 60 million transistors for every human on the planet...

...in 2010 there will be 1 billion per human...

...each costing 1/10 millionth of a cent.

In 2005 there were 1.3 billion RFID tags in circulation...

...in 2010 there will be 33 billion.
People, systems and objects are communicating and interacting with each other in entirely new ways.

Cars, appliances, cameras, roadways, pipelines…even pharmaceuticals and livestock.
An estimated 2 billion people will be on the Web by 2011...

...and a trillion connected objects – cars, appliances, cameras, roadways, pipelines – will comprise the "Internet of Things."
Worldwide mobile telephone subscriptions reached 3.3 billion in 2007 and more than 4 billion by the end of 2008.

In the fourth quarter of 2007, in the USA, texts exceeded voice calls for the first time.

One billion camera phones were sold in 2007, up from 450 million in 2006.

More Smartphones than PCs will be bought in 2010-11.

3G+ devices growing 30% annually.
The amount of information produced by the interaction of all those things will be unprecedented.

Analyzed effectively, it can provide important new insights on different timescales.
Every day, 15 petabytes of new information are being generated. This is 8x more than the information in all U.S. libraries.

Scientists are working to prevent influenza pandemics by modeling the viruses with a supercomputer that can operate at one petaflop, or one quadrillion operations per second.

New analytics enable high-resolution weather forecasts for areas as fine as 1 to 2 square kilometers.
New computing models handle the proliferation of end-user devices, sensors and actuators and connect them with back-end systems...

.........while advanced analytics turn these new mountains of data into intelligence and insight...

.........which is translated into action, making our systems, processes and infrastructures more efficient, productive and responsive.
Why Cities?
2007 was the first year in which more than half the world was living in cities.

By 2050 it will be 70%.

Every minute for the next 20 years, 30 people will leave rural India for urban India.

They will need 500 new cities.

Our Smarter Planet will be built by the cities of the world.
Cities are **centers of growth**, and the keys to connectivity and competitiveness.

Cites play increasingly large roles in:
- Creating wealth
- Enhancing social development
- Attracting investment
- Harnessing human and technology resources to create productivity and competitiveness gains

Some cities outpace entire countries in economic output:

New York, LA, Chicago, Boston and Philadelphia – together, the fourth largest economy in the world.

Sao Paolo and Bangkok each have 10% of their respective country’s total population, but account for 40% of GDP.
The pace of urbanization is unprecedented...

Urban population is projected to nearly double from 3.3B (2007) to 6.4B (2050)

Asia’s urban areas will grow by more than 100,000 people a day

Figure I.1 Urban and Rural populations of the world, 1950-2050
…and growth is stressing every piece of our infrastructure

**Energy**

In the near term we’ll need to extract more oil and natural gas than ever before. Projections show energy consumption increasing by 50% in the next 25 years.

**Food**

820 million people around the world are undernourished. Yet 50% of the food we produce is wasted between field and fork.

**Water**

In the last 100 years global water usage has increased at twice the rate of population growth. Today, one in five people still lacks clean drinking water.
The city is a microcosm of the major challenges and opportunities facing the planet today—intensified and accelerated.
A Smarter City connects physical, digital, social and business infrastructures to leverage collective intelligence and abilities.

Benefits? Optimizations and integration to reduce costs of service operation, cut emissions, reduce wastage of time, energy, and materials, improve public safety, enable pursuit of sustainable prosperity.

How? Gather data on service consumption or the behavior of individuals, crowds, vehicles, etc. Make more data available, faster, to city systems. Apply analytics and optimization. Deliver insight in “ever more near real time”.

Which Systems? Energy, water, transportation, buildings, public safety, health, education, constituent services.

What? Improve the planning and operation of city systems - and thus the quality of life and work in the city.
All cities benefit from advanced information and communications technologies

**Intelligent Transportation Systems**
- Integrated Fare Management
- Road Usage Charging
- Traffic Information Management

**Public Safety**
- Surveillance Systems
- Emergency Management Integration
- Micro-Weather Forecasting

**Energy Management**
- Network Monitoring and Stability
- Smart Grid – Demand Management
- Intelligent Building Management
- Automated Meter Management

**Telecommunications**
- Fixed and mobile operators
- Media Broadcasters

**Water Management**
- Water purity monitoring
- Water use optimization
- Waste water treatment optimization

**Environmental Management**
- City-wide Measurements
- KPI’s
- Carbon Management
- Scorecards
- Reporting

**All cities benefit from advanced information and communications technologies**
Transportation
Congestion within cities is accelerating at a rapid pace – an increasing issue for more cities and governments.
Chronic traffic congestion creates significant impact to cities and citizens

<table>
<thead>
<tr>
<th>Productivity and Quality of Life</th>
<th>Economic Impact</th>
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<tbody>
<tr>
<td>Americans experienced travel delays of 4.2 Billion Hours in 2007 - equivalent to a week of work per traveler</td>
<td>Gross Regional Product is reduced by up to 10% as a result of transportation congestion</td>
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<th>Fuel and Time Cost</th>
<th>Environmental Impact</th>
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<td>Congestion cost Americans $87 Billion in 2007 - an increase of 50% in the past decade</td>
<td>Prior to the implementation of its congestion pricing program, London traffic and CO2 emissions were 20% higher</td>
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The intersection of the ‘physical’ with the ‘digital’ provides the ability to create a Smarter City.

Measuring, Monitoring, Modeling and Managing

Feedback to user and data source - actions to change behavior

PHYSICAL DOMAIN

DIGITAL DOMAIN

Sensing
Metering

Real Time
Data Integration

Real Time
and Historical
Data

Data Modeling and
Analytics

Visualization and
Decision Support
(Traveler Advice,
Network Response, etc.)

Data Collection
Data Integration
Comparison of historical data, with newly collected data
Data modeling and analytics to create insights from data to feed decision support and actions

Feedback to user and data source - actions to change behavior
The accumulation of real-world data contains valuable information about patterns of behavior.

Operational/ Transactional Insights System wide control

- Toll collection only - disconnected operational data
- Transaction data from the management of payments
- Little automated use is made of real-time traffic data
- More granular charging, by location
- Analysis of traffic patterns to manage city congestion.
- Modeling traffic to predict and manage entire system
- Dynamic and congestion based pricing
- Route planning and advice, shippers, concrete haulers, limo companies, theatres, taxis etc
- City-wide, dynamic traffic optimization
London, Singapore, Stockholm and others are deploying smarter traffic systems.

Stockholm has seen approximately 20 percent less traffic, a 12 percent drop in emissions and a reported 40,000 additional daily users of public transportation.

Cleaner mobility…
Queensland: free flow cashless tolling using transponder and video methods, using business intelligence, demand management, and advanced video algorithms.

...easier traffic...
Embedded intelligence, analytics and optimization are reshaping the “grandfather” of the transportation industry: integration of information, payments, etc. across transportation modes.

...simpler travel
Building Capabilities for Smarter Cities - Transportation

1. Manage Data
   - Management efficiency
   - Return on assets

2. Analyze Patterns
   - Customer loyalty
   - Sales and profit
   - Network awareness

3. Optimize Outcomes
   - Customer satisfaction
   - Incident prevention
   - Reduced network congestion

Integrate assets and information to improve transport operations

Identify impact of changes to customer experience & operations

Predict issues across transportation modes to optimize capacity

Use of Smarter Planet capabilities
“Gentlemen, we have run out of money. Now we must think”
How will you infuse intelligence into your city’s systems to create opportunity, improve quality of life, and compete on a global scale?