Smarter Cities

How cities can lead the way into a prosperous and sustainable future

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In 2007, for the first time in history, the majority of the world’s population—3.3 billion people—lived in cities.

By 2050, city dwellers are expected to make up 70% of Earth’s total population, or 6.4 billion people.

**Time to act**

Cities - more than states, provinces or even nations - will increasingly serve as the crucibles where the success or failure of our planet is determined.
Significant and interrelated challenges for cities put leadership under pressure to act

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Significant and interrelated challenges for cities put leadership under pressure to act

- **Transport**
  - Transportation is one of the primary consumers of energy demand

- **Energy**
  - Energy is the reason for a substantial part of all water withdrawals

- **People**
  - Water quality affects the health of citizens

- **Water**
  - Industry accounts for a large proportion of water withdrawals

- **Business**
  - Greater commerce increase use of transport infrastructure

- **Communication**
  - The degree of ICT adoption affects the attractiveness of a city’s business environment

- **Human capital determines speed of ICT adoption**

Source IBM IBVA - A Vision for Smarter Cities | April 2009
Let's build a smarter planet: Smarter Cities

Why intelligent cities? Why now?

**TECHNOLOGICAL**
- Convergence of pervasive digital networks, cheap sensors, cheap analytics
- There are over 4 billion mobile cellular subscribers in the world today (60% penetration)
- Location-based services and social networking continue to grow in capability and popularity
- IT has made it possible for global enterprises to operate anywhere in the world

**SOCIAL/DEMOGRAPHIC**
- At the end of 2008, 50% of the world population lived in a city
- Urban population will almost double between 2010-50 (to 6.4B!)
- 18 countries in the world with contracting populations (in 2050, 44)
- Asia will become 50% urban in next 15 years
- Rapid urbanization is creating high stresses for many Asian cities, in turn driving the construction of hundreds of new cities

**ENVIRONMENTAL**
- Drive for cities to cut carbon emissions and increase the energy they get from renewable sources
- There will be 1.2 billion cars on the road by 2015 (~1 car/6 people)
- 95% of the world's cities still dump raw sewage into their waters

**ECONOMIC**
- The top 100 urban agglomerations currently account for 25% of worldwide GDP
- Developed world has underinvested in its cities; the developing world needs new urban infrastructure ($41T needed by 2030)
- Rise of “new” cities (MASDAR, New Songho City, GIFT, KAEC, etc.)
- Global financial crisis is spurring government stimulus, creating new jobs

Source: Various; IBM MI Analysis
Something meaningful is happening.

The world is **SMALLER.**

The world is **FLATTER.**

The world is about to get a whole lot **SMARTER.**

*Computational power is being put into things we wouldn’t recognize as computers. Indeed, almost anything—any person, any object, any process or any service, for any organization, large or small—can become digitally aware and networked.*
Let's build a smarter planet: Smarter Cities

...because smart technology and intelligence is being infused our cities become more

**Instrumented**
- Smart Meters, distribution networks (electricity, water, gas)
- Building Management Systems
- Infrastructure sensors
- Traffic and transit sensors
- Public safety systems

**Interconnected**
- Heavily networked environments – fiber, wireless, buildings, open spaces, public environments
- Networked sensors, sensor platforms, concentrators
- Enterprise Service Bus
- City taxonomy

**Intelligent**
- Lots of data – how to get value from it?
- Real-time analysis of sensor data streams
- “Enterprise-view” visibility of the city in action
- Behavioral modeling of physical, natural, and people systems
- Cross-tower optimization of resource utilization
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**Smarter transportation**
An opportunity to cut traffic by as much as 20%:
Cities can infuse intelligence into their entire transportation system, improving drivers’ commutes, giving better information to city planners, increasing the productivity of businesses and raising citizens’ quality of life.

**Smarter energy and utilities**
An opportunity to reduce energy use by up to 15%:
By providing real-time information about the flow of energy, an intelligent utility system helps citizens and utilities make smarter, more responsible choices about the way they buy, sell and manage electricity.

**Smarter healthcare**
An opportunity to lower the cost of therapy by as much as 90%:
A smarter healthcare system forges partnerships and makes better use of data in order to deliver excellent care, predict and prevent disease and empower people to make smarter choices.

**Smarter public safety**
Because up to 45% of a city’s budget goes to public safety: A smarter city uses advanced technologies and community-based approaches to anticipate and prevent—not just respond to—crimes and emergencies.

**Smarter education**
An opportunity to nurture our most valuable resource:
Smarter cities take a systemic view of their education systems, evaluating students in multiple dimensions and equipping them to perform better both inside and outside traditional classroom environments.

**Smarter government services**
An opportunity to deliver needed services to all citizens:
Increased information sharing and collaboration drives smarter decision-making across government agencies, service providers and other constituents.
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Analytics Landscape

- **Stochastic Optimization**: How can we achieve the best outcome including the effects of variability?
- **Optimization**: How can we achieve the best outcome?
- **Predictive modeling**: What will happen next?
- **Simulation**: What will happen if … ?
- **Forecasting**: What if these trends continue?
- **Alerts**: What actions are needed?
- **Query/drill down**: What exactly is the problem?
- **Ad hoc reporting**: How many, how often, where?
- **Standard Reporting**: What happened?

**Competitive Advantage**

- **Descriptive**
- **Predictive**
- **Prescriptive**

Based on: Competing on Analytics, Davenport and Harris, 2007

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Advanced analytics can identify challenges and potential efficiency gains across all systems.
Smarter public safety: An opportunity to turn data into insight to protect citizens and communities

A smarter city uses advanced technologies and community-based approaches to anticipate and prevent—not just respond to—crimes and emergencies.

**CRIME DATA AGGREGATION**
Put decades worth of crime information at the fingertips of law enforcement officers at all times.

**EMERGENCY MANAGEMENT INTEGRATION**
Connect police, fire departments, ambulance services and other first responders so all are instantly alerted when an emergency takes places.

**SMART SURVEILLANCE SYSTEMS**
Use digital cameras to continuously monitor urban areas and automatically alert authorities when a suspicious event occurs or when a license plate, vehicle or other entity is recognized.
Smarter public safety: Client transformations

The **NYPD Crime Information Warehouse** gives officers mobile access to more than 120 million criminal complaints, arrests and 911 records, as well as 5 million criminal records, parole files and photographs—resulting in a 27% reduction in crime.

The **City of Madrid** has developed a new **Emergency Response Center**, which aggregates emergency call data and instantly alerts the proper authorities, including police, ambulance services and the fire brigade. The city has experienced a 25% reduction in response time as a result of the implementation.
Smarter public safety: Provide real-time information and improve situational awareness across the public safety spectrum

The Innovation:

The crime information warehouse links and analyzes data on virtually all crimes committed in an urban area. Crime fighters have access to this information anywhere, anytime.

Collect
crime data from a variety of sources.

Analyze
the data in real time.

Access
this data anywhere, anytime.

The Benefits:

• Map crime trends as they are developing
• Take proactive measures to prevent anticipated crimes
• Close cases more quickly and at higher rates
• Access reports immediately instead of in weeks or months
New York City Police Department (NYPD)

New York City, case closings are 25% higher than the national average, partly due to the new analytic tools available to investigators. In addition, crime has dropped 20% since 2002 in spite of a decrease of 3,000 officers.

New York City is one of the few cities still reporting declines in violent crimes.

“[The NYPD’s] innovative policing strategies depend on our ability to gather, share and act on information. IBM—its people, partners and technology—have helped us redefine how information can be used to fight crime.”

James Onalfo, Chief Architect and CIO, NYPD

Source: FBI Uniform Crime Reports, IBM Analysis
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Virtual Emergency Response Center
For Every Stage of a Crisis

Plan, Train and Prepare
- Identify critical risks and impacts
- Create and distribute contingency plans, check lists, SOPs
- Identify and map critical infrastructure
- Develop and maintain accurate contact info
- Disseminate intelligence on potential threats
- Train and perform exercises
- Capture lessons learned

Inter-Agency Collaboration
Communication Control

During
- Execute response protocols
- Coordinate multi-agency response
- Request, deploy, track resources

Before
- Track, assess and manage recovery efforts
- Manage volunteers
- Track donations
- Get people back to their lives, work and family
- Support damage estimates and reimbursement requests
- Conduct after-action reviews
- Review and plan for future events

After
Let's build a smarter planet: Smarter Cities

Gauteng Disaster Management Center
GERIS Gauteng Emergency Information Resource Services

Business Challenge

The Gauteng Province is exposed to an array of hazards that can threaten livelihoods and damage critical infrastructures. The Province will also be hosting the 2010 FIFA World Cup Games.

The local government needed a real time Common Operating Picture and interoperability for its command center and officers in the field to prepare for emergencies and support emergency operations.

Project Overview

- **Industry:** Government
- **Solution:** I3 Framework – Virtual Operations Center (VOC) Solution
- **SBS Name:** Public Safety and Security
- **Key Business Processes:** Planning & Preparedness, Incident Management & Collaboration Enterprise Services for State and County Wide Governments
- **Location:** South Africa, Province of Gauteng
- **Facts:** Largest cities Johannesburg and Pretoria, Population 9,688,100
- **System Facts:** 200 concurrent users responsible for Government man-made and natural disaster management.

Benefits

- Deploy response capabilities
- Locate resources
- Improve planning capabilities
- Develop training scenarios
- Improve accuracy
- Provide timely decision support
- Develop contingency plans
- Manage field data in real time
Smart Surveillance Systems
Video Analytics Turns Cameras into information sources
Smart Surveillance
Real Time Alerts and Tracking Technology

Motion Detection
Tripwire
Object Removal
Abandoned Object
Smart Surveillance
Examples – Teal Time Alerts

Motion Detection
Tripwire
Object Removal
Camera Move
Smarter transportation: An opportunity to improve the transit experience, reduce congestion and encourage a modal shift among users

Cities can infuse intelligence into their entire transportation system, improving drivers’ commutes, giving better information to city planners, increasing public transportation usage and the productivity of businesses, and raising citizens’ quality of life.

ROAD USER CHARGING
Employ a dynamic toll system based on the flow of vehicles into and out of a city to reduce traffic.

ELECTRONIC FARE MANAGEMENT
Enable rail, bus and road customers to purchase fares via SMS or online and have the fare collected automatically.

TRANSPORTATION INFORMATION MANAGEMENT
Gain real-time traffic prediction and intelligent route planning capabilities.
Smarter transportation: Influence traffic patterns and increase use of public transportation

The Innovation:
A **smart toll system** uses cameras and sensors positioned throughout the city, along with a central computing system that processes vehicle identification data, to charge drivers varying rates depending on the time of day.

Embed transponders in vehicles.

Record license plate numbers, time of day and toll rates.

Process data and charge drivers accordingly.

The Benefits:
- Less traffic
- Lower emissions
- Increased city revenue
- Greater use of public transit
- Increased roadway safety
Smarter transportation: Client transformations

Stockholm implemented an intelligent toll system in the city center, which resulted in 20% less traffic, 40% lower emissions and 40,000 additional users of the public transportation system.

To encourage citizens to use multiple modes of transportation and make it easier to align the cost of transit with its impact on the environment, the Singapore Land Transport Authority implemented fare management with smart cards that can be used to pay for buses, trains, taxis, road-use charging and parking.
City of Stockholm breaks gridlock with a smart road use management system

What’s smart?
- New, dynamic business model
- Congestion charging
- Real-time traffic prediction
- Technology to optically recognize cars in milliseconds
- Real-time congestion tolling

Smarter Business Outcomes
- 25 percent reduction in traffic
- 40,000 more citizens on public transportation
- Less noise pollution and lower carbon emissions

U.S. transportation system annual impact through congested roadways:
- Cost of congestion nears $200 billion
- 4.2 billion lost hours
- 11 billion liters of gasoline
Stockholm Congestion Tax Project - Case Study

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<th>Clearly Measureable Results</th>
<th>25% reduction in traffic entering cordon</th>
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<tr>
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<td>15% reduction in CO₂ emissions</td>
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<td>$120M/yr in revenue to City of Stockholm; payback in 4 years</td>
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<td>Congestion charges will fund transit improvements</td>
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We’ve only just begun to uncover what is possible on a smarter planet.

- The world will continue to become smaller, flatter and smarter. We are moving into the age of the globally integrated and intelligent economy, society and planet.
- There’s no better time to start building a smarter government—one focused on lasting transformation in the industries and systems on which we all depend. And there’s no better time to invest in creating the kind of society we all desire.

Let's work together to drive real progress in our world.
Thank you.
IBM Solutions Portfolio for Cities

Public Safety
- Crime information warehouse
- Emergency response
- Digital surveillance

Intelligent Transportation
- Road user charging
- Fare management
- Transport info management

Government Services
- Citizen-centered design
- Integrated service delivery
- Permits and licenses
- Land registries

Energy & Utilities
- Smart grid
- Building efficiency assessments
- Water management

Telecommunications
- Broadband expansion

Healthcare
- E-medical records
- Home health services
- Payment systems

Education
- Smarter Classroom
- Smart Administration
- Innovation in Research

Government Accountability – Results orientation and Openness

Analytics
- Assessing overall health of the community vs. national indicators
- Establishing goals and priorities

Municipal Dashboards
- Measuring progress against goals
- Identifying improvement areas
Smarter cities roadmap: Starting with your goals and a long-term strategy, select high-value projects that can be managed carefully to produce visible results.
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- Over 95% of top Fortune 1000 companies
- 100% of Global 500 banks

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