Smarter Water: The Role of Information Technology in Sustaining the World’s Water Systems

Sharon L. Nunes, PhD
Vice President Global Government & Smarter Cities
IBM Corporation
World Trends

• By 2050 cities will house ¾ of the world’s population: equivalent to ~world population of 2010
Population growth is stressing every piece of our infrastructure.

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.

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.
Managing & monitoring water systems

By actively monitoring (and managing) built and “natural” systems, decision makers will have more knowledge of how their decisions will influence the environment & impact business.
Managing & monitoring water systems

Linking physical-world assets, resources & infrastructure with the digital world of event processing, business analytics and optimization

The Physical World

The Natural World

Great Neck LIRR Train Station

The Digital World

Control Center
Billing
CRM
Analytics

Transceivers
Gateway
Network

Grids
Asset Management
Systems-level View

The Natural World

The Physical World
Alerts and Events - Generic:

<table>
<thead>
<tr>
<th>Tag_Name</th>
<th>Event</th>
<th>Severity</th>
<th>Start_Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>S01_Megameter</td>
<td>Low_Limit</td>
<td>High</td>
<td>03/07/2010 09:15</td>
</tr>
<tr>
<td>S30_Pump1_flow</td>
<td>Low_Limit</td>
<td>High</td>
<td>02/07/2010 08:21</td>
</tr>
<tr>
<td>S30_Pump2_flow</td>
<td>Low_Limit</td>
<td>High</td>
<td>02/07/2010 08:22</td>
</tr>
<tr>
<td>S14_Armadel_Level</td>
<td>High_Limit</td>
<td>died</td>
<td>01/22/2010 15:42</td>
</tr>
</tbody>
</table>

Historical Data for S10_Johnson_Lake: Last 30 days:

- Graph: Water Level Last 30 Days

Bulletin Board:

- Select Bulletin Type: Water Cycling Maintenance Activities (Default)

Bulletin Message:

- S01_Megameter is to be cycled for 4 hours on 03/06/2010, commencing @ 2am
- Tank Reservoir is to be turned off for 12 hours on 03/03/2010, commencing @ 10am
- The following tanks will be taken offline:
  - S02_Tank_01
  - S02_Tank_02
  - S02_Tank_03
  - S02_Tank_04
Galway Bay: natural water system management
Visualization platform demonstrates value of sharing data

City Recycling
River Quality
Urban Water Loss
Building C02
Understanding
Information
Data from sensors and systems

Visualising Peterborough City Environmental Performance
the changing role of technology......
Pace of Technology Change……

- Radio: 40 years
- Television: 22 years
- Internet: 15 years
- iPod: 5 years
- Facebook: 2 years
- iPhone apps: 1 year

Years to reach 50M users

100M (1B apps)
What role will technology play in accelerating change in the water industry?

Digital data is growing ~2x/year
Technology has transformed consumer power through access to information.

How will environmental markets/industries respond to this opportunity?
Creek Watch: Smarter Water through *citizen science*

- Using mobile devices to capture data
  - participatory data gathering with many users
  - data provides new opportunities for analysis

Collect simple environmental data about waterways

Capture “citizen science” data / photos
- Location (GPS) and time-stamped
- Water level, water flow, trash
- IBM Research developing app in consultation with the California Water Board and volunteer watershed groups

http://www.youtube.com/watch?v=-6KAptDL4
Not just apps, but games and competitions….

Calling all hackers, programmers, water specialists and global problem solvers. Join us on October 21 and 22 for a mad 30-hour rush to solve the world’s water problems by bringing people, water problems and data together. We’ll be connected to 10 other sites around the world running the same event – we’ll be representing Europe. This is an official Random Hacks of Kindness www.rhok.org event (NASA, WB, Google, Microsoft, …).

Education, training, awareness?
Grand Challenges

“Natural” vs “built” environment

City vs rural
Developed vs developing GEOs
“GLOCAL”

Think globally, act locally
“GLOCAL”

Think globally, act locally

Will citizens act locally without a “crisis” to catalyze action???
Act Locally

• Jobs – are rural locations an advantage or a disadvantage?

• Use of cyberinfrastructure for education, training – especially in rural areas where water becomes more and more important
  – Train-and-stay or train-and-leave?
  – Use of games to educate (train?) starting at early age
    • Singapore starts water education (and marketing) before school age

• Economic development
  – Should we talk about economic scarcity vs just scarcity?
  – Energy-water nexus

• Energy-water-environment-food-business (and policy)
  – How do we make this “personal”? (WIN-FM)
Critical Success Factors

• Water leaders need to....
  – view water systems on **system-level** not as multiple, independent entities

  – **enable rapid decision-making**, recognizing the complex, dynamic behaviour of water systems; optimize system to get to end-result (no perfect answer)

  – **routinely** capture information required to manage water resources, and rely less on “one-of” exercises or studies

  – **create a “single version of the truth”** for a given water resource (aquifer, watershed, delta, estuary, etc)

  – use information to build trust, and serve as the foundation for **collaboration**, between agencies

  – enable rational water management decisions based on **shared data**

  – **engage citizens** as advocates and “researchers”

• Modeling and simulation of water systems enables better understanding of scenarios and potential outcomes based on policy and technical decisions.
Our mandate......

- Bringing innovation into the water industry

- Leveraging IT to drive efficiency and to enable collaboration & decision making across domains

- Working smarter with fewer resources – leverage Scientific and Industry Consortia

- Bringing scientific knowledge and insight into the decision-making process

- Making water a “must have” for the current and next generation (aging workforce is a concern)

- Communication and “marketing” ---educate our communities, political leaders and business leaders

- Be visible and active in our local water community
Think globally, act locally

Thank you!

slnunes@us.ibm.com