



Technology Implications of an Instrumented Planet

presented at
IFIP WG 10.4 Workshop on Challenges and Directions
in Dependability

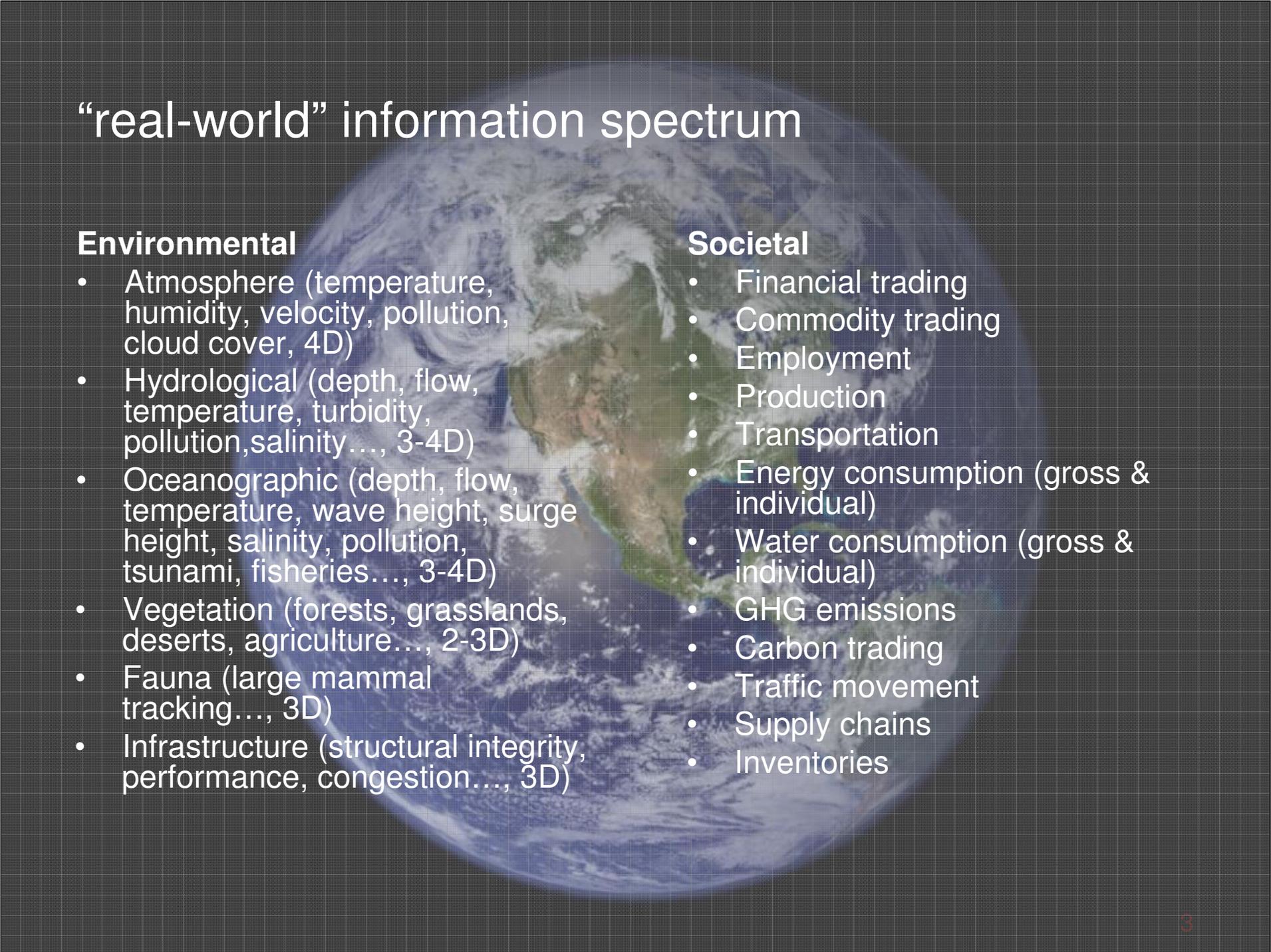
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June 2008

Background

- Global Technology Outlook 2007
 - “Real World Aware”, IBM Research
- Intelligent Transportation Systems Business
- Energy & Environment Initiatives

“real-world” information spectrum



Environmental

- Atmosphere (temperature, humidity, velocity, pollution, cloud cover, 4D)
- Hydrological (depth, flow, temperature, turbidity, pollution, salinity..., 3-4D)
- Oceanographic (depth, flow, temperature, wave height, surge height, salinity, pollution, tsunamis, fisheries..., 3-4D)
- Vegetation (forests, grasslands, deserts, agriculture..., 2-3D)
- Fauna (large mammal tracking..., 3D)
- Infrastructure (structural integrity, performance, congestion..., 3D)

Societal

- Financial trading
- Commodity trading
- Employment
- Production
- Transportation
- Energy consumption (gross & individual)
- Water consumption (gross & individual)
- GHG emissions
- Carbon trading
- Traffic movement
- Supply chains
- Inventories

New Data, New Insight, New Processes

Business Optimization

- Model business processes for optimization
- Apply mathematical optimization techniques
- Optimize assets and processes

Business Process Services

- Event driven SOA processes (i.e. traceability)
- Sense & respond dynamics
- Enterprise application integration
- Align with business strategy

Process Integration

- Extend legacy and enable new business processes
- Monitor business processes
- Provide information to people
- Improve operational logic and business rules

Event Processing & Services

- Complex event processing
- Services such as: Data Aggregation, Geographic information, Identification and Association, Condition, Monitoring, Command and Permission, Persistence

Data Modeling & Integration

- Domain specific information models
- Interoperable information framework
- Integration with legacy data
- Federated data management

Analytics

- Domain specific analytic applications
- Apply and develop mathematical models
- Provide performance dashboards

Process Innovation...

Data Capture & Control

- Move data intelligently
- Execute local commands
- Run distributed operational logic
- Integrate wide range of device

Manage Distributed Device Infrastructure

- Discovery of devices and sensors
- Remote configuration, updating, "no touch"
- Monitoring

New Insight enabling...

... within a "backplane" of Scalability, Security, Privacy & Standards

New Data drives...



IBM Energy and the Environment Blueprint

Applying innovative information technology and services that really matter to businesses, governments, people and the planet

Intelligent Transportation Systems

Measure & improve transportation usage

- Reduce traffic congestion
- Reduce CO2 emissions
- Increase mass transit usage
- Reduce energy usage
- Improve environment



Intelligent Utility Networks

Measure & improve energy mgmt

- Reduce usage, reduce outages
- Improved grid management



Carbon Management Solutions

Measure & reduce carbon emissions

- Strategy
- Customer and product
- Supply chain
- People
- IT strategy
- Property and buildings
- Information
- Recycling
- Waste management
- End of life services



Energy Efficient Technologies and Services

Create & manage efficient IT

- IT facilities infrastructure efficiency
- IT operations efficiency
- Active energy management
- Monitoring and verification of efficiency goals
- Demand-side efficiency



Advanced Water Management

Measure & improve water mgmt

- Flood avoidance
- Weather event management
- Improved water quality
- Reduced water usage



Life On An Instrumented Planet

Sensor & Historical Data

Atmospheric monitors
Satellite imaging
River & Aquifer monitors
Ocean monitors
Energy production
Energy consumption
Water production
Water consumption
Traffic flow
Public Transportation
Public Infrastructure
Supply Chain Operations
Production Operations
Smart Buildings
Smart Infrastructure
Video surveillance
....

The "Bloomberg" of Earth Systems

Data Acquisition & Management

Modeling, Analytics, Machine Learning

Domain Insights

Business, Public & Private Decision Making

Intelligent Earth Systems Platform

Energy Efficient
Computational
Platform Expertise

Networking & Data
Mgmt
Expertise

Algorithmic
Expertise

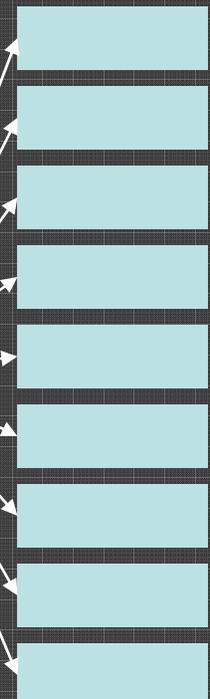
Source
Domain
Expertise

Business
Domain
Expertise

Process
Integration

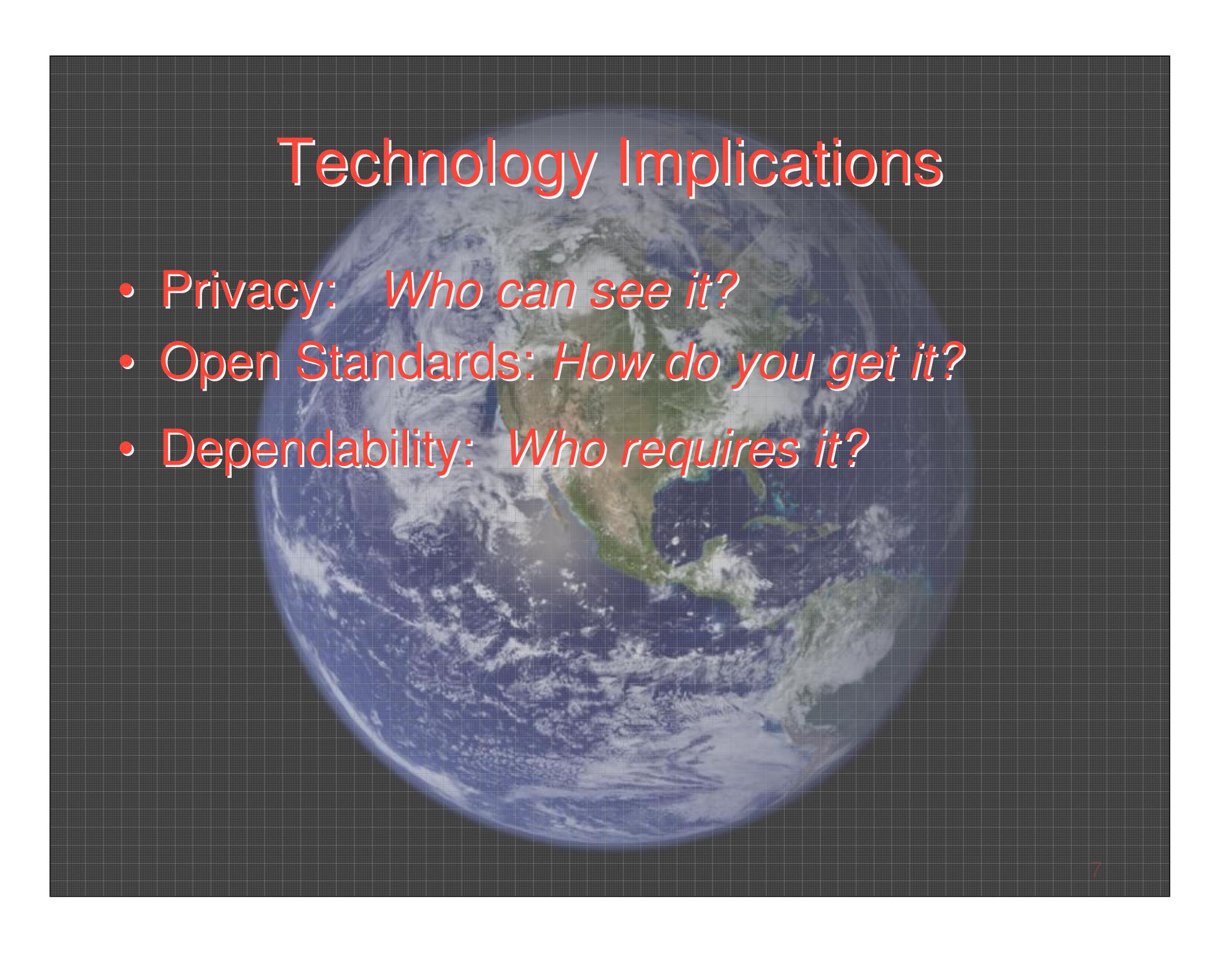
Operational
Processes

Clients



See Bloomberg: <http://www.bloomberg.com/index.html?Intro=intro3>

Technology Implications

A satellite view of Earth showing the Americas, with a grid overlay. The image is centered on North America, showing the United States, Canada, and Mexico. The background is a dark grid pattern.

- Privacy: *Who can see it?*
- Open Standards: *How do you get it?*
- Dependability: *Who requires it?*