

How Do We Build Community Trust in Technology?

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A nighttime photograph of a cityscape. In the upper half, several tall buildings are illuminated with blue and white lights, their windows glowing. In the lower half, a curved, multi-level walkway or staircase is visible, illuminated with warm yellow and orange lights. The overall scene is a vibrant, modern urban environment.

Agenda

- Smart Cities
- Dependability & Trustability
- What methods do we need?

Instrumented urban systems are widespread ... real-time, real-world data contain **information about patterns of behavior**

Operational / Transactional



- Toll collection only - disconnected operational data
- Transaction data from the management of payments
- Little automated use is made of real-time traffic data

Insights



- More granular charging, by location
- Analysis of traffic patterns to manage city congestion.
- Modeling traffic to predict and manage entire system

System wide control



- Dynamic and congestion based pricing
- Route planning and advice, shippers, concrete haulers, limo companies, theatres, taxis etc
- City-wide, dynamic traffic optimization

These instrumented systems enable **new approaches to urban infrastructure services ...**

Intelligent Transportation Systems

- Integrated Fare Management
- Road Usage Charging
- Traffic Information Management
- Electric Vehicles

Public Safety

- Intelligent Surveillance
- Integrated Emergency Services
- "Weatherproofing"
- Micro-Weather Forecasting

Water Management

- Smart metering
- Network instrumentation
- Combined Sewage Overflow

Energy Management

- Network Monitoring & Stability
- Smart Grid – Demand Management
- Intelligent Building Management
- Automated Meter Management

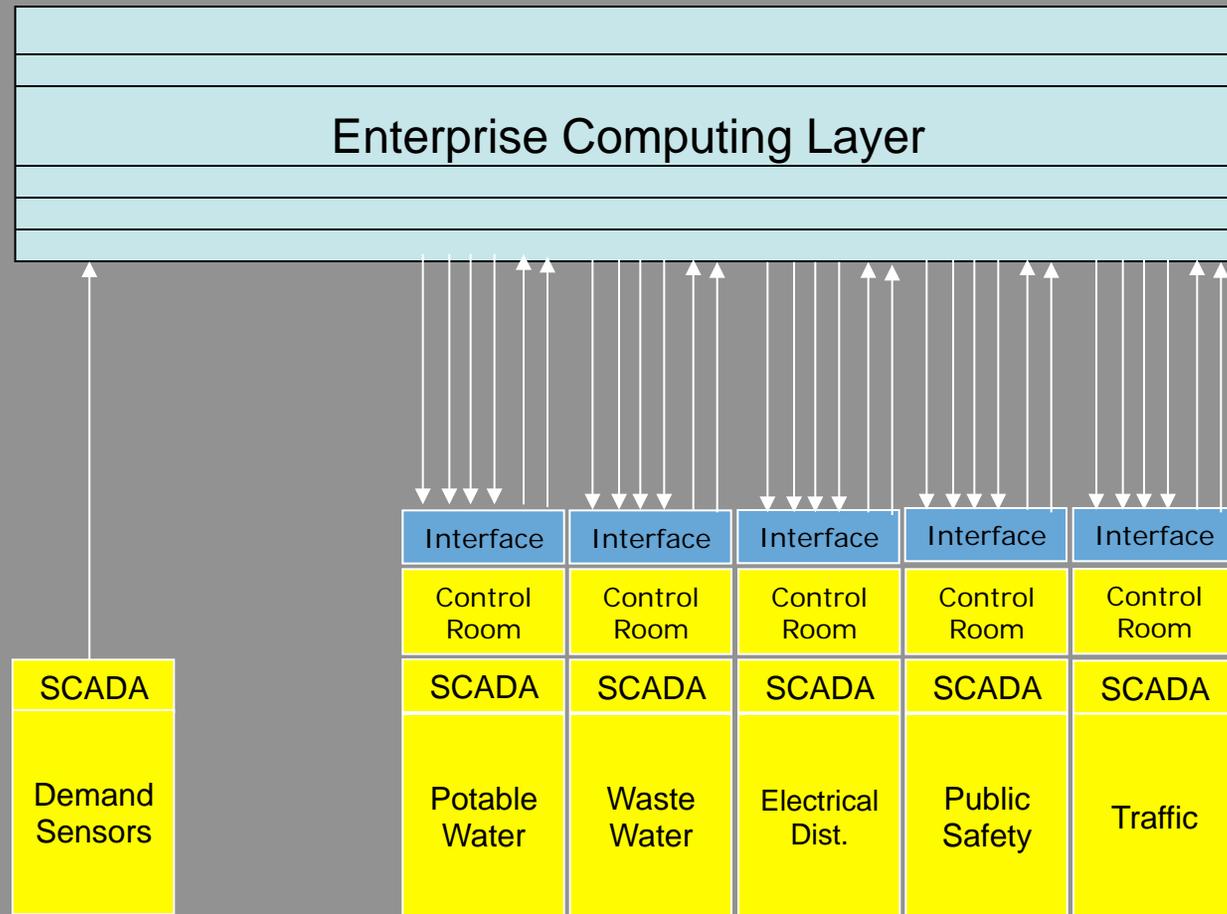
Integrated Building Management

- Integrated control systems
- Property Performance Management
- Building to Grid

Environmental Management

- City-wide Measurements
- KPI's, scorecards
- CO₂ Management

...so we are concerned with the *dynamic* interactions of human activities with a system of engineering systems



... so we are concerned with human activities with

interactions on engineering systems.

Demand Sensors

- Water and electric meters
- Traffic sensors
- Cameras
- Ticket sales
- Mobile telephone activity
- Social media buzz
- Weather
- and many more

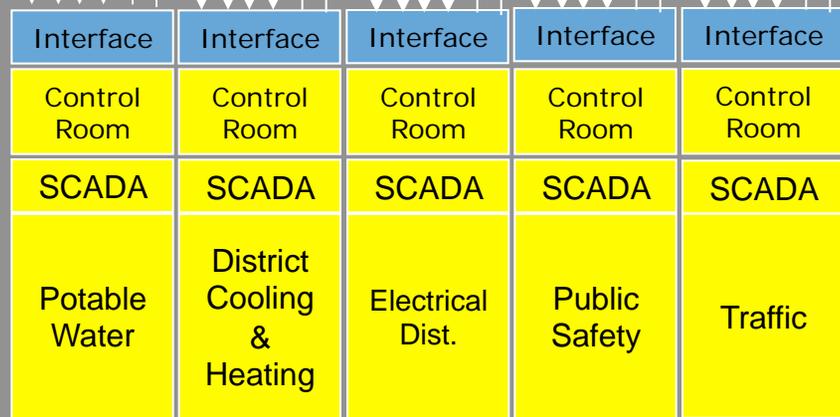
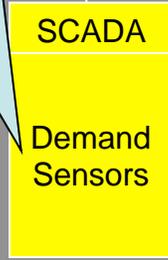
Demand Indicators

- Cf. System Dynamics CLD*
- Past, present, future

Supply Indicators

- Cf. System Dynamics CLD*
- Present, near future
- Projected supply
- Price signals
- Interaction signals
- Other signals ...

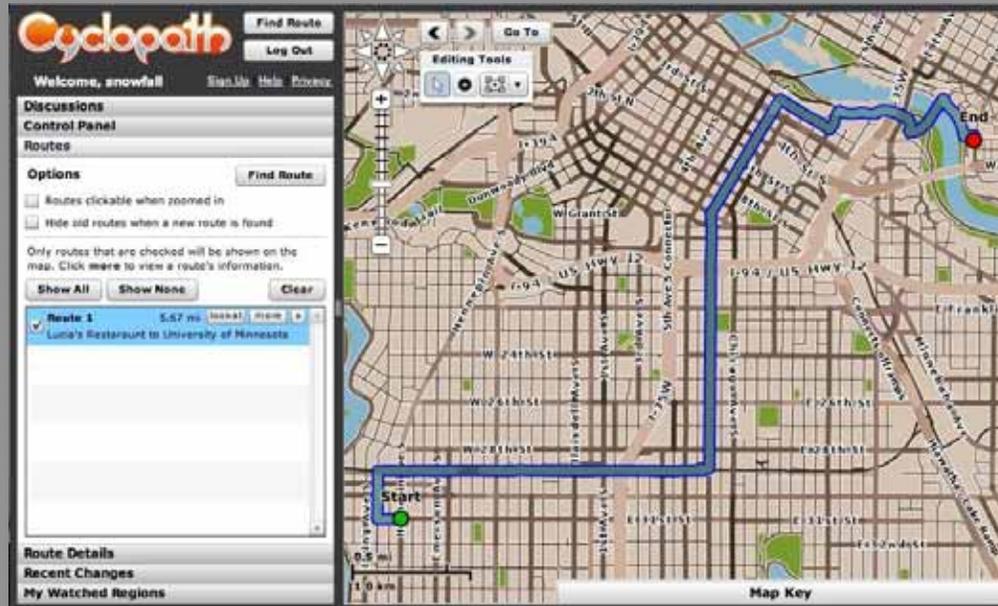
Enterprise Computing Layer



... and dialogue between city and citizens

In their search for increased attractiveness – especially for Internet natives, progressive cities are exploring new approaches to engaging their citizens

- Informing
- Sharing
- Interacting
- Co-producing



Dependability Goals – not just software or hardware correctness, but dependable urban infrastructure services – technical and social issues

1. Do no harm
2. Produce the intended outcomes
3. Resist physical and cyber attacks
4. Enable accessibility, transparency and citizen engagement
5. Provide a shared benefit
6. Preserve citizen privacy

So what can possibly go wrong.....?

- Infrastructure Failures
 - Bus delays
 - Power line down
 - Bridge collapse
 - Water supply contaminated

So what can possibly go wrong.....?

- Infrastructure Failures
 - Bus delays
 - Power line down
 - Bridge collapse
 - Water supply contaminated
- Smart Infrastructure Failures
 - Energy consumption increases
 - False alarm on bridge safety
 - Water pipe caused to explode
 - Vehicles induced to collide
 - Personal Information disclosed

Case study: a California utility company and Smart Meter deployment

How Do We Build Community Trust in Technology?

- SW Engineering
- Systems Engineering
- Urban Infrastructure Simulators
- Operational Management

- Role of Professional Engineers