Enabling Integrated City Operations

Tivoli Netcool at the heart of the Smarter City

PulseANZ 2010

Meet the people who can help advance your infrastructure

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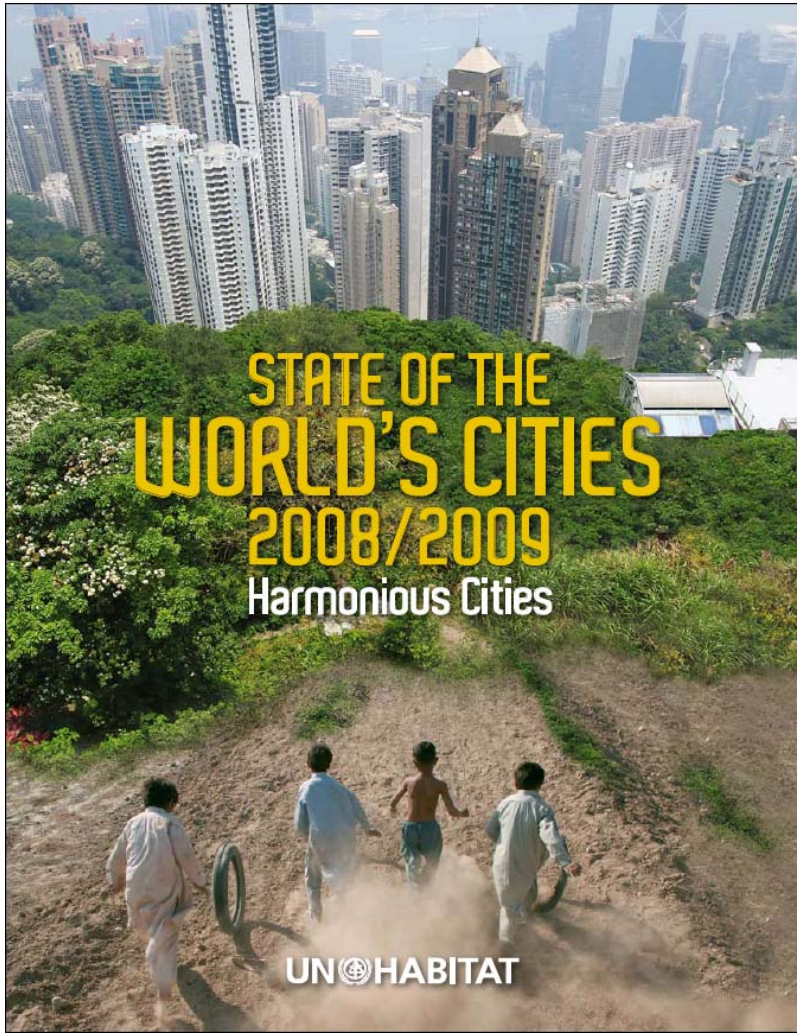
What is the future of cities



- 3.4Bn people will live in cities by 2050
- Nearly all growth will be through expanding existing urban areas
- Some governments will try to manage urban growth by encouraging satellite cities based on existing smaller towns
- Urban growth is putting huge stress on:
  - Clean water supplies
  - Reliable power delivery
  - Efficient transport
  - Sewage and waste disposal
- Administrative pressures include:
  - Government mandates
  - Budget limitations
  - "Carbon" controls and limits
- But if done right, cities offer humans a richer and healthier life

Different Cities

- Expanding or Contracting
  - Not all cities are expected to grow, some, particularly in the West, are shrinking because of the flight to the suburbs and dormitory towns.
- *Dirigiste* or *laissez faire*
  - This cultural difference will shape the smarter city architecture. Will the mayor and administration seek to control the day to day running of the city or will they be limited to encouraging cooperation between devolved agencies
- Open information or “need to know”
  - Another cultural difference that will shape architectures. Is the city committed to sharing its information with its citizens (sensitive personal and security data excepted) or is the culture one where information is automatically kept from those who cannot provide a reason for knowing it.
- Life enhancing or penny pinching
  - Is the primary driver for improving the city infrastructure to enhance the “livability” of the city, or is the primary driver to cut costs and hence be able to cut taxes

The Smarter City solution must be tailored to the political and cultural realities of the target customer, there is no one size fits all solution.

How “Smart” are Cities Today

Limited sharing of data across city functions

Process sharing (implemented by at least 10% of cities):

- Emergency Response and Public Safety
- Justice
- Health
- Welfare
- Education
- Collections

Information sharing (implemented by at least 10% of cities):

- Financial – expenses, receipts, depreciable assets
- Supervised People – school children, incarcerated/paroled/ restricted/charged individuals, workforce, volunteer auxiliaries (NIEM)
- GIS
- Public Relationship Management – Economic Development, Tourism Development, How Tos, Call Center, City Website

Very few instances of “real time” sharing of data

What makes a city smarter?

Instrumented

- Smart Meters, distribution networks (electricity, water, gas)
- Building Management Systems
- Infrastructure sensors
- Traffic and transit sensors
- Public safety systems
- Citizens can also be “instrumented” through Web 2.0 applications, Twitter, SMS etc.

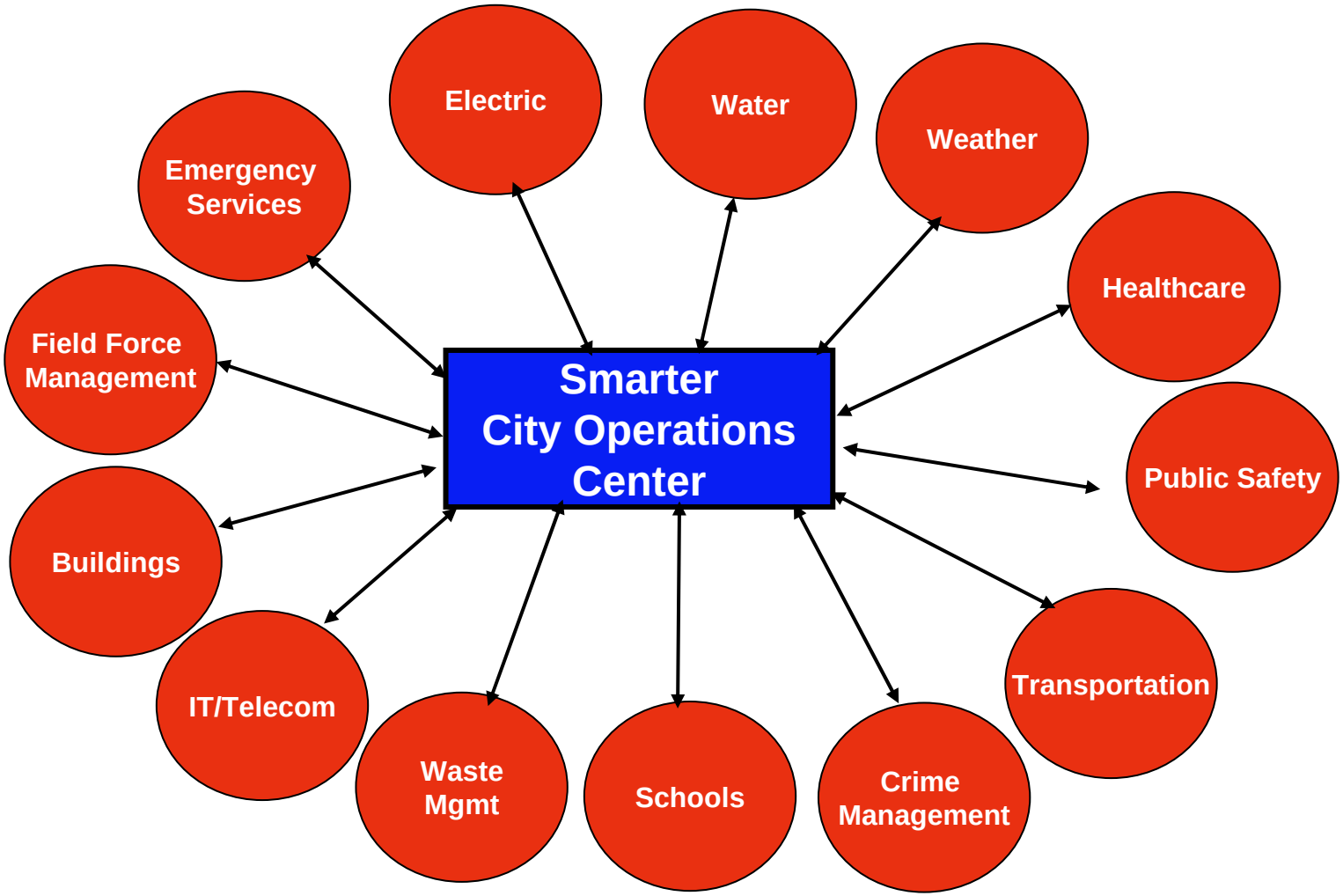
Interconnected

- 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

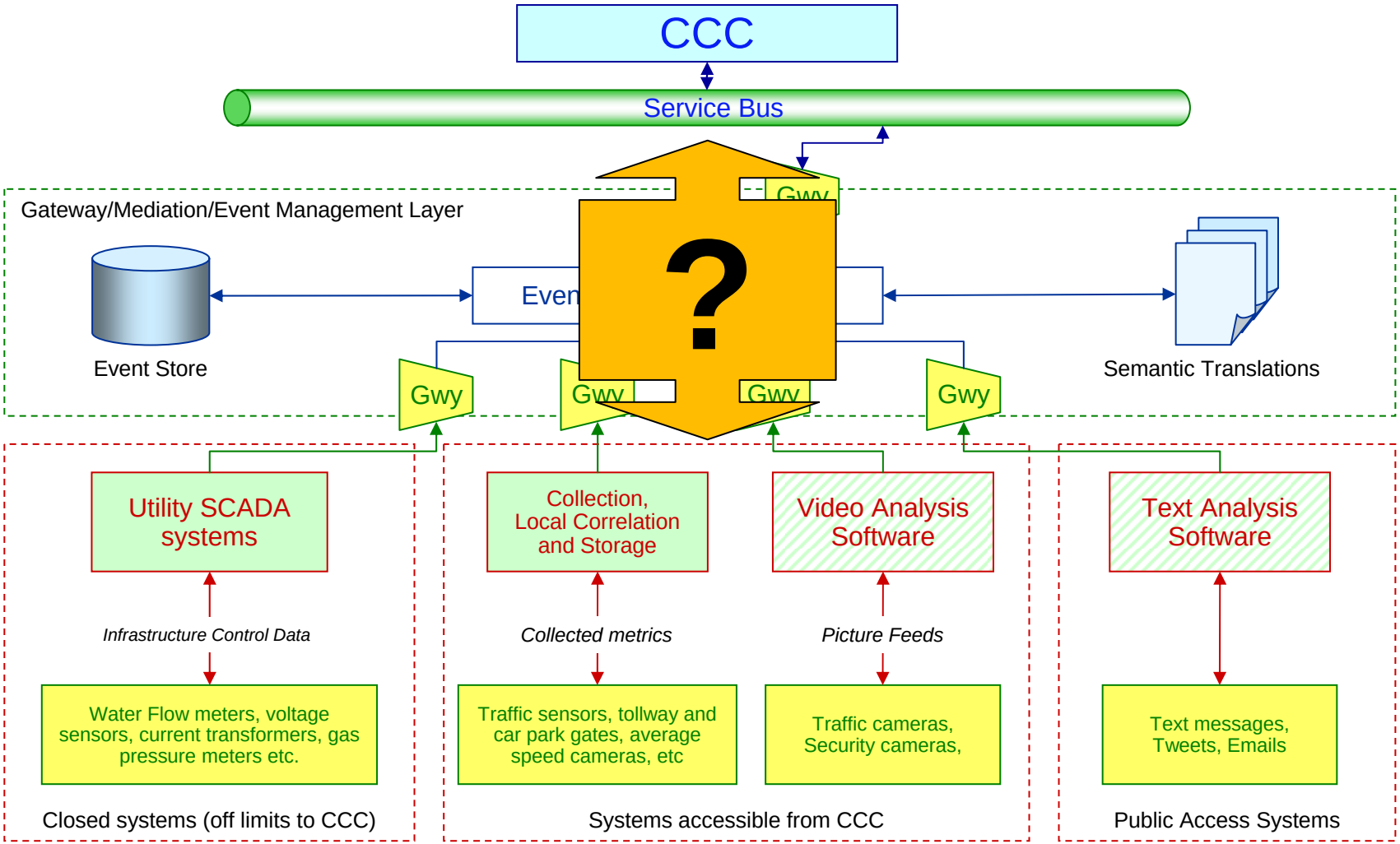
Smarter City Operations Center System Context



What will people see from a City Operations Centre

- City employees at the hub of the city
  - Geo map showing present incidents
  - Event list of present incidents
  - Geo map of traffic, road congestion, public transport status
  - Score card of traffic, road congestion, public transport status
  - Score card on all currently active City Directives
  - Overview of all KPI's for city functions with drill down
- Control Rooms at Utilities
  - Normal SCADA and similar visualisations
  - Alerts screen of incidents at related utilities (power outages at water for example)
  - Geo display of city events
  - Geo display of traffic and other road status (for those controlling the engineering workforce)
  - Instant display of City Directive issued to department
  - Instant display of work request from another department
  - Fast access to City Directive documentation
- Back Offices in City Departments
  - Normal work order and similar displays for the department
  - Instant display of City Directive issued to department
  - Instant display of work request from another department
  - Fast access to City Directive documentation
  - Display of event summaries between departments
- The General Public
  - SMS messages informing of major city disruptions and public safety issues
  - Tweets informing of activities in the city that might affect the enjoyment of life in the city (positively as well as negatively!)
  - Access to a web page similar to that provided by ISP's summarising city performance (Initially, more ambitious interface below)
  - Geo map of traffic, road congestion, public transport status
  - See the start of an interactive relationship with the city through a "smart portal"

Inputs and References to City Operations Centre



Different Types of Events

Triggers - events generated by something happening.

- Fire or smoke alarms going off
- IT systems going down
- Intrusion detectors going off
- Circuit breakers activated
- Natural events picked up by sensor such as earth tremors

Threshold events - measurements have moved outside the normal range

- Over/under temperature alarms
- High/Low Water levels
- Air quality/Water purity breaching environmental standards
- Excessive Power consumption

Complex events - system generated, events and measures from multiple systems

Manually entered events.

- Severe weather warnings
- Crime reports, especially concentrations of low level street crime
- Hue and cry reports - escaped felons on run, missing persons, abductions
- Fires, especially ones involving chemicals or generating large amounts of smoke
- Homeland Security code changes
- Road traffic incidents – accidents, congestion, unusual loads
- Upcoming events – rock concerts, road races, Xmas lights
- Planned work that could disrupt city such as water main repair
- Reports from the public that may duplicate a sensor generated event, e.g a fire reported both by a passer-by and by the automatic fire alarm

Requirements of an event

Unique Event Identification from a combination of:

- ID of the sender (system and/or human)
- Organization sending the event
- Serial Number within sending system
- Timestamp of event creation

Information to allow recipients to define and prioritize their actions in response to the event

- Urgency – how rapidly the recipient(s) should respond to the alert
- Severity – the level of threat to life and property
- Certainty – a probability ranging from 100%, the event has been observed, to 0%, the event is now not expected to occur.
- Effective time (for events that will happen in the future)
- Expected Duration (for events which are not going to be fixed immediately)
- Recommended or mandated actions

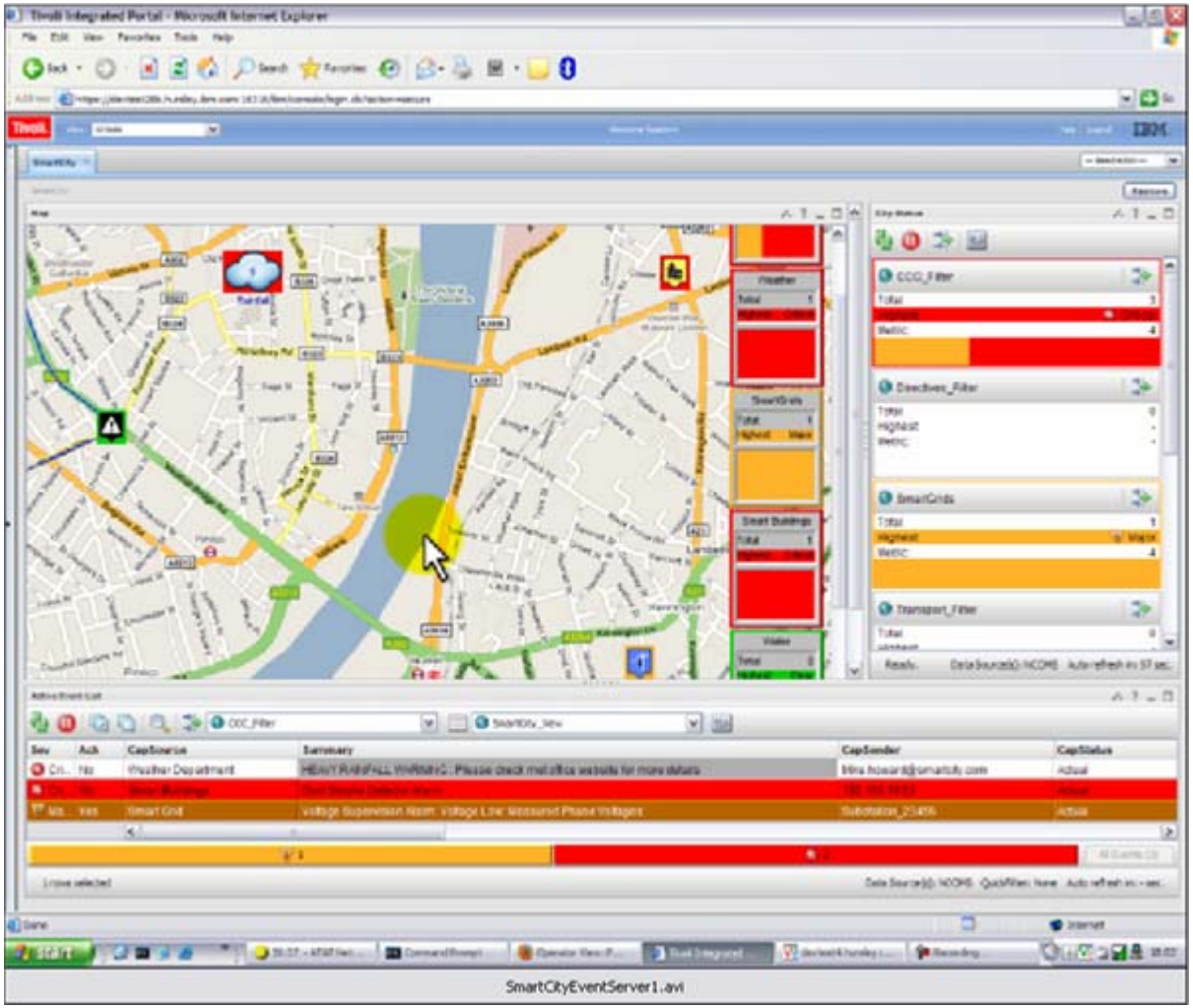
Information to allow the event to be correlated with others

- Reference to a semantic model
- Reference to an affected location

Human readable textual descriptions

- Summary description
- Location Description
- Activity Description

Can the Telco “NOC” concept work in a city?



Common Alerting Protocol

The common alerting protocol (CAP) provides an open, non-proprietary digital message format for various types of alerts and notifications.

CAP provides the following capabilities:

- flexible geographic targeting using latitude/longitude shapes and other geospatial representations in three dimensions;
- multilingual and multi-audience messaging;
- phased and delayed effective times and expirations;
- enhanced message update and cancellation features;
- template support for framing complete and effective warning messages;
- compatible with digital encryption and signature capability; and
- facility for digital images and audio.

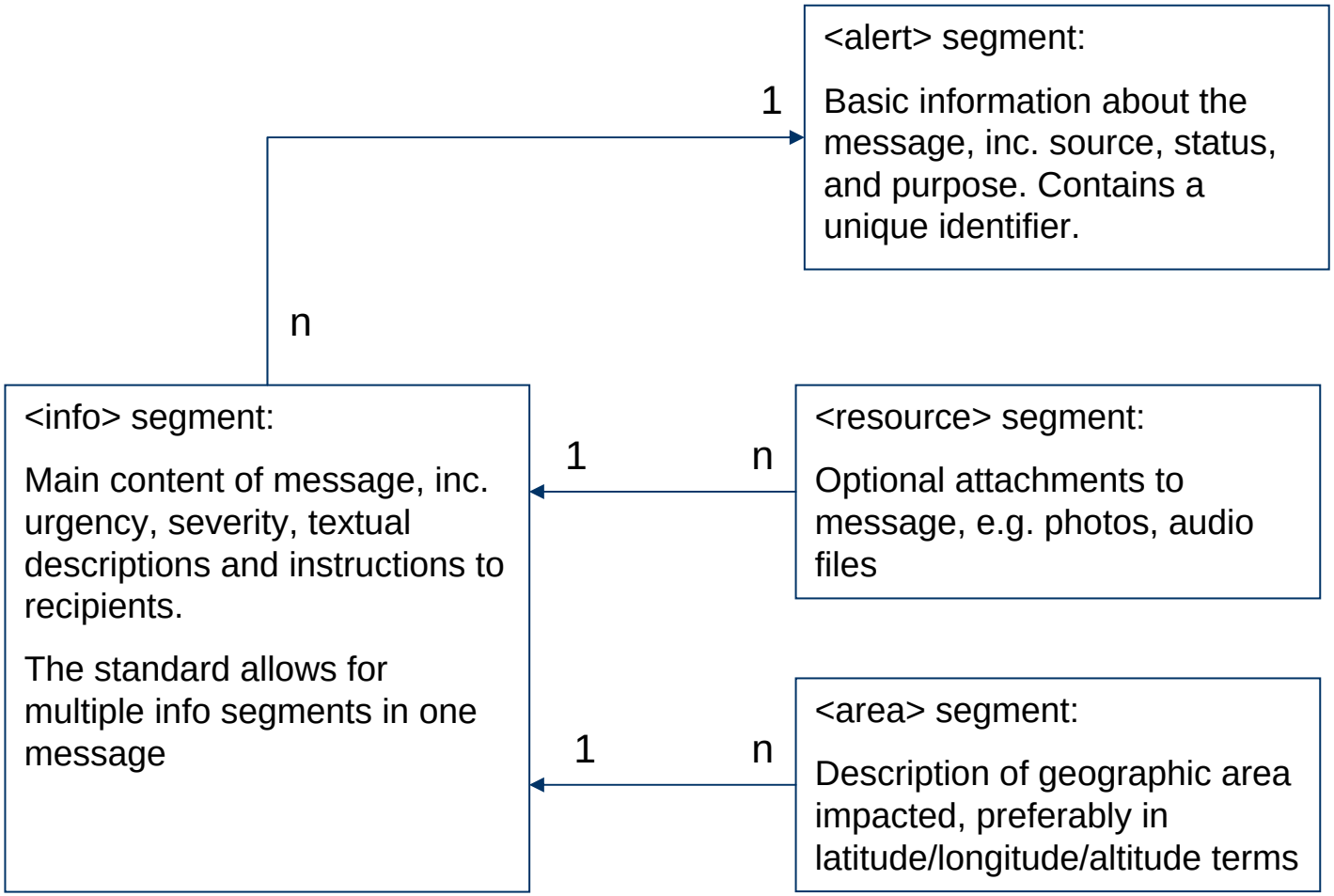
Standards Based:

- ITU-T Rec. X.1303, Sept 2007
- OASIS Common Alerting Protocol, October 2007

Alerts are in XML format but transport is undefined

CAP makes no assumptions about the capabilities and functionality of sending and receiving systems.

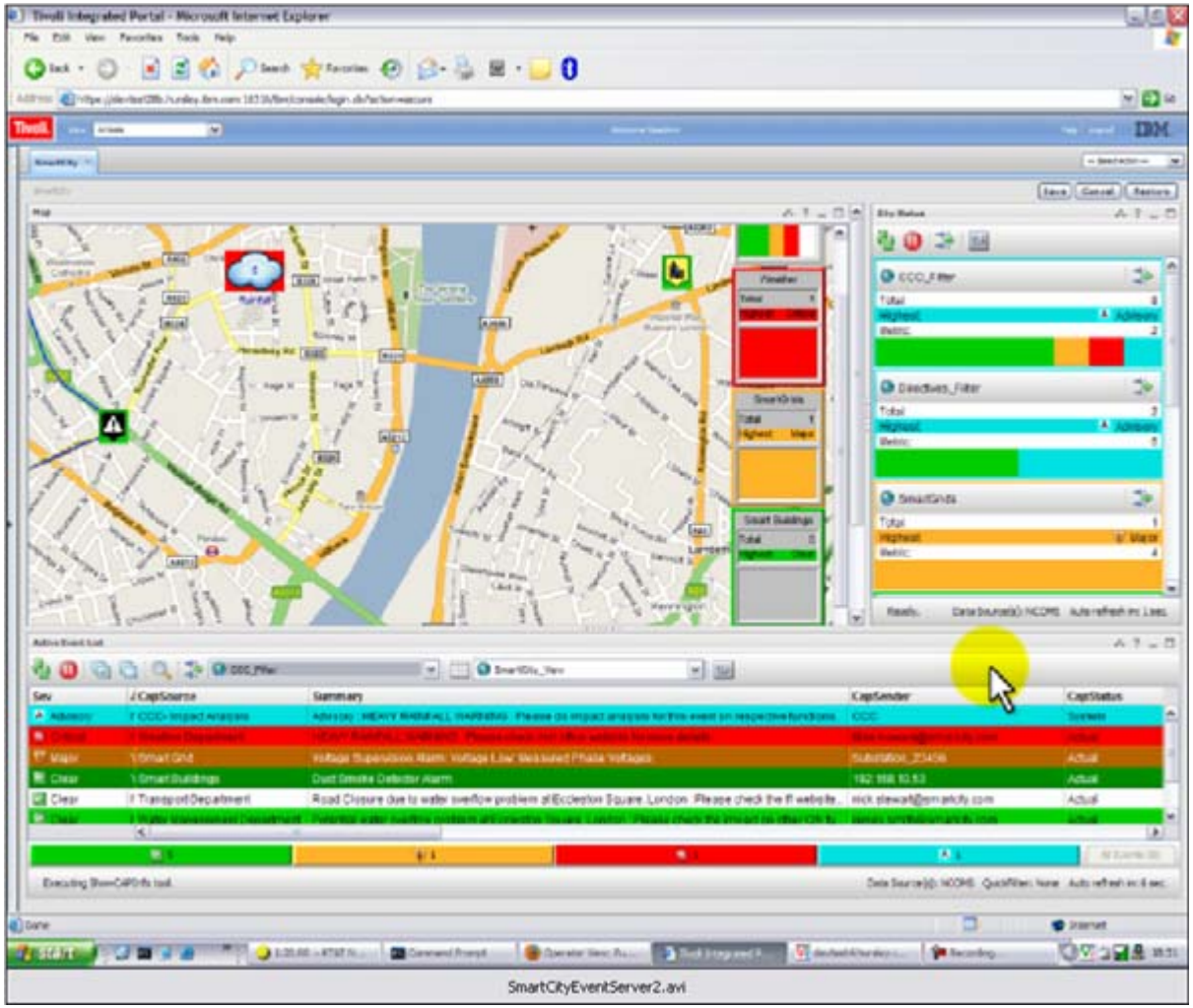
Common Alerting Protocol - Document Object Model



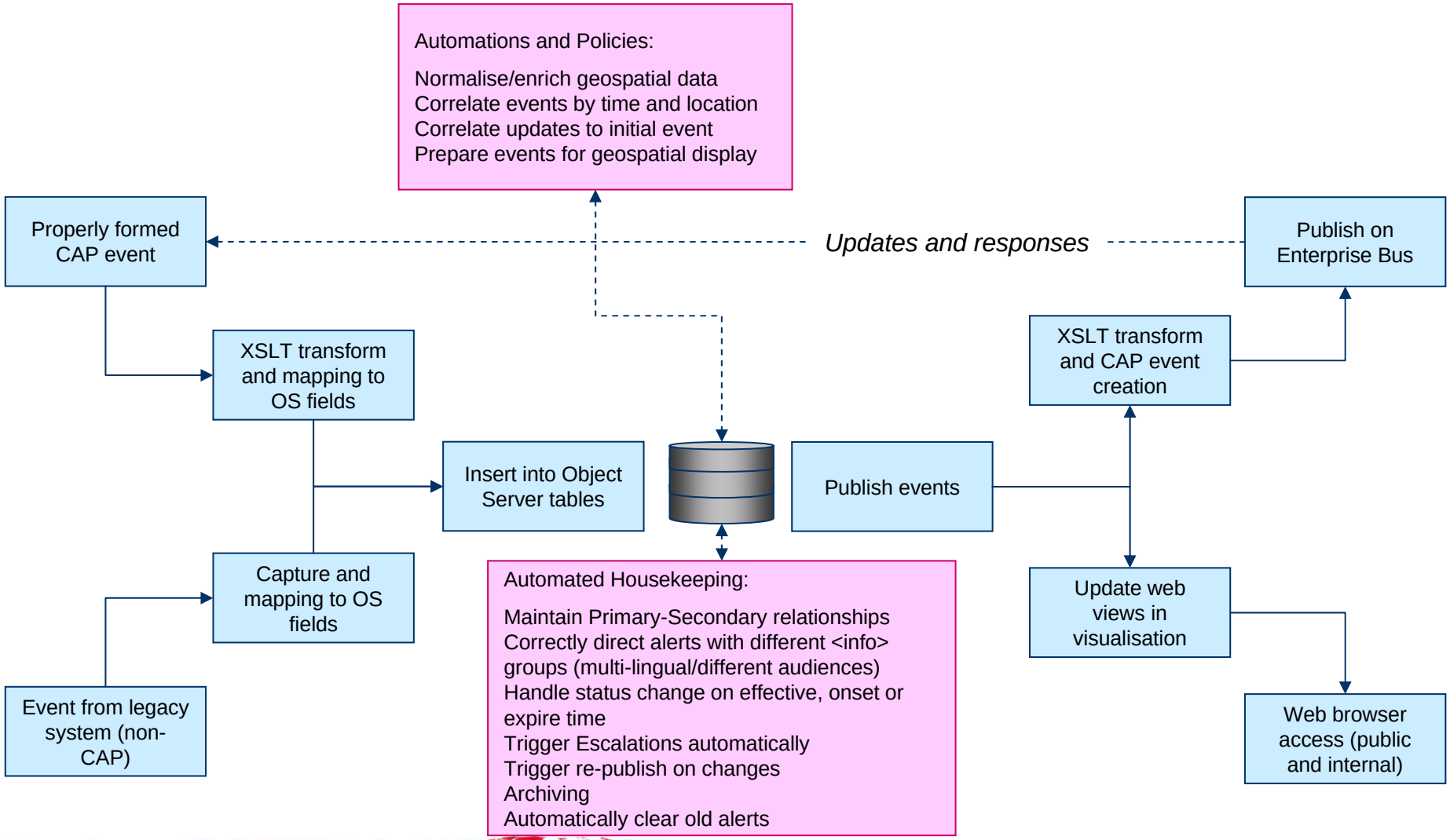
Demo of Integrated City Events

- The City Event Server as a focal point
- Escalating incidents missed by local functions
- Work through of a floodwater disruption (Cross brand SCCC scenario)
  - Weather events
  - Response from water systems
  - Response from other departments (traffic)
  - Sending of directives to control incident
  - Clear and return to normal

Event Management in the Smarter City - Demo



Event Flow Recap



But standardising event flow is only the start of it ……..

- Semantic Normalisation
  - “work order”, “service order”, “service request”, “work requisition”, “change request” …..
  - Asset tag vs Human friendly description
- Semantic Model
  - Cross function dependencies, e.g. traffic lights at intersection of 10th Street and 14th Avenue depend on electrical substation NW1207
  - Logical dependencies, e.g. prediction of storm drain levels depends on availability of current level metrics and availability of detailed weather reports
  - Pre-conditions, e.g. road maintenance cannot start until alternate traffic route is set up and pronounced clear
  - Conditional Directives, e.g. rapid transit must keep running longer if professional sports event goes into overtime
- Optimisation
  - Short term, co-ordination of the city’s response to an incident
  - Medium term, planning changes in the city to minimise disruption
  - Long term, improving the livability of the city through measuring key performance indicators and planning to improve on them

So - what makes a city smarter?

Instrumented

Interconnected

Intelligent

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