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Networked Streetlighting

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Echelon Overview

- **20 years of innovation**
  - Founded in 1998 by Mike Markkula from Apple
  - CEO - Ken Oshman from ROLM
  - Publicly traded on the NASDAQ under ELON
  - 300 Employees, $$137mm
  - San Jose, CA; offices worldwide
- **Enabling the Smart Grid**
  - Smart metering
  - Building controls
  - Street and area lighting
  - Home control
  - Retail & convenience store automation
  - Transportation
- **Standards based - Lonworks**
  - ISO, IP, IP-852, ANSI

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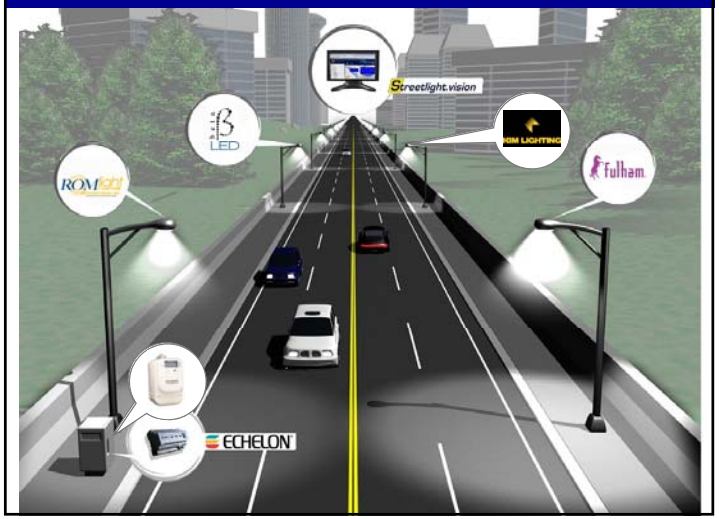
Participants in Today's Demonstration



Partners and Customers

- Existing networked streetlighting systems

Ville de Québec, milton KEYNES, Vannes, Dublin, kœln.de, Saint-Paul Trois-Châteaux, Cork City, York, Mulhouse, Ajuntament de Barcelona

- Leading Industry Players

ROMlight, Fulham, SELC, PHILIPS, RUUD LIGHTING, Streetlight.vision, KIM LIGHTING, SPIE, SECE, TELVENT, ViaBus, INTRON, ECHELON

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Elements of a Streetlight Network

- *i*.LON® SmartServer Segment Controller
  - Standards-based advanced bridge to IP networks
  - Power line network, meter interface, connection to future equipment
  - Powerful segment controller
  - Astronomical Clock, Multiple Scheduler
- Poly Phase NES Sub-Meter
  - Quality & quantity of electricity delivered to the segment
  - Future energy loads
- Extremely reliable power line communications
  - Beta, Fulum, Kim, Romlight
  - Standards-based signaling
  - Use existing city electricity wires for power and communications

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In the Street…
Intelligent Ballasts

- Dimming
  - Increments of 1%
- Automatic failure identification
- Data collection
- Consumed energy
- Lamp burning hours
- Voltage, Current, Ballast Temperature, etc.
- Standard Protocol for Communication
  - Utilizes ANSI/CEA 709.2 global standard
  - Bi-directional communication in real time
- LonWorks is the choice of Philips and many others for street lighting in Europe

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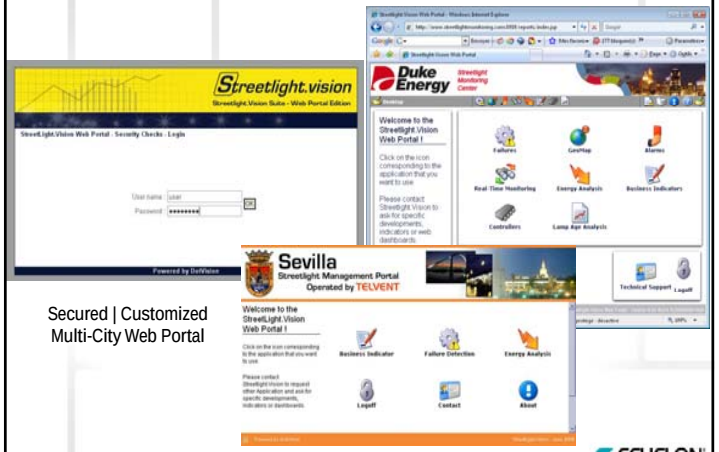
Simple Installation & Ease of Use
Web Portal Centralizes Management



Secured | Customized Multi-City Web Portal

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Benefits of a Networked, Infrastructure Approach

- Environmental
  - Dramatic reductions in energy use
  - Reduced CO_2 emissions
  - Reduced light pollution
  - Beautification
- Cost & quality of maintenance
  - Individual luminaire monitoring
  - Outage detection
  - Early failure monitoring
- Liability, security and safety
  - Real-time status reporting and monitoring
  - 911
  - Historical performance data

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Benefits of a Networked, Infrastructure Approach

- Not limited to single luminaire choice
  - Compatible with future technology
  - Phased approach as existing technology rides the cost curve
  - HPS, LED, Induction, Metal Haloid
- Single, multi-purpose city network
  - Easily add future sensing devices
    - Traffic, environmental, others…
  - Independent of wide-area network choices
  - Implement new services without changing the infrastructure
    - Electric vehicle chargers

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City of Oslo

LONWORKS Based City of Oslo Project Included in Clinton Climate Initiative Best Practices Group

Mercury to HPS
Electronic Ballast
Dimming

10,000 Intelligent Streetlights Save 1440 Tons of CO2 and Reduce Energy Consumption by 70%
34% Maintenance Savings

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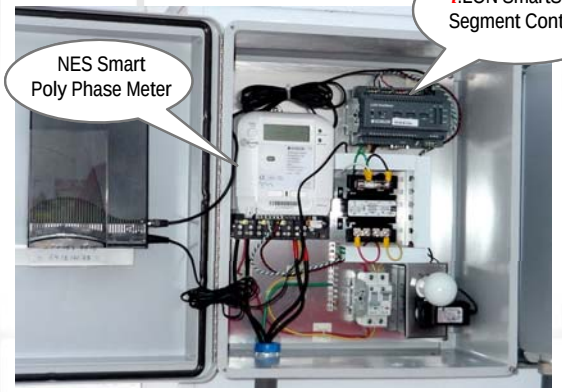
Thank You

Smart Streetlighting Network
Behind the Panel



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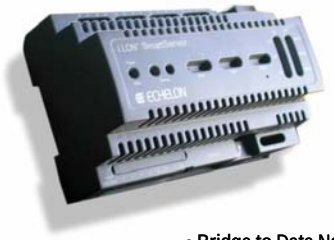
In the Street…

The i.LON Smart Server Segment Controller



- **Local Master Controller**
  - Built-in Astronomical clock & Real-time clock
  - Multiple schedulers
  - Built-in data logging, alarming, HTML Web Server, etc.
  - Built-in I/O (metering inputs, digital, relays)
  - MODBUS extensions for additional data measurement
  - Powerline Interface with signal repeating
- **Bridge to Data Networks**
  - Integrated 10/100 Ethernet port
  - Integrated serial ports for connectivity to GSM/GPRS modems
  - Realtime collection using SOAP/XML protocol
- Remote Commissioning, troubleshooting, & Upgrades
  - No on-site system services required post installation

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