



Graviton



graviton

The Sensory Networks™ Company

Lee Center for Advanced Networking, CalTech

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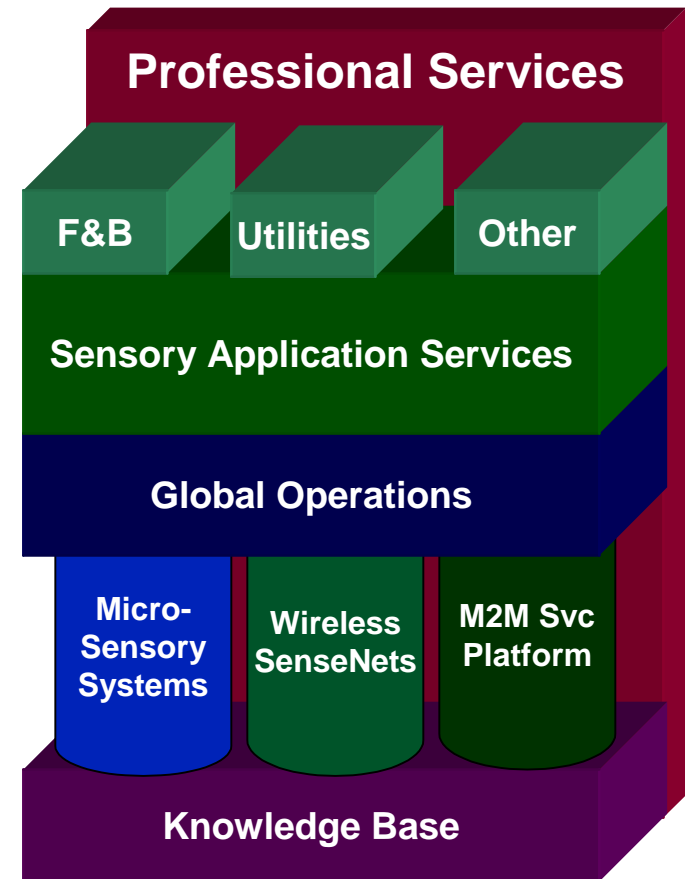
Market Economy	PC Economy ('80s)	Network Economy ('90s)	M2M Sensing Economy (2000+)
Key Driver	Inexpensive Transistors	Inexpensive Bandwidth	Inexpensive Networked Sensors
Governing Law	Moore's Law	Metcalfe's Law	Saffo's Law?
Type of Content	Text	Multimedia	Metadata
Topology	Single User (PC)	Multiple Users on Interoperable Networks	Multiple Interoperable Sensor Networks to Physical Environment
Amount of Information	More than mainframe era	More than PC era	More than Internet Era
Interface	Operating System	Browser	Anything
Market Leaders	Intel, Microsoft, DELL	Cisco, AOL, Sun	Graviton NTT DoCoMo, ??



Graviton Summary

- **Two Year Old Company Based in La Jolla, CA**
 - Founded by Michael Nova, MD, and Bruce Warmack (ORNL)
 - Exclusive licensee MEMS Microcantilever & wireless technology
 - Investors: KPCB, In-Q-Tel, Omron, Sun, Siemens, Qualcomm...
 - Sol Trujillo, CEO
- **Developing Sensory Networks & Services**
 - Helping reduce the cost of business operations
 - Enabling efficient large-scale control of devices and processes
 - Helping conserve resources

- **Innovation**
 - MicroSensory Systems
 - Wireless SenseNets
 - M2M Multi-Services Platform
- **Integration**
 - Traditional & MEMS sensors
 - Legacy & web systems
- **Initial Markets**
 - Food & Beverage
 - Utilities



- **Superior Price / Performance**

- Size, power, sensitivity

- **Multi-Target Platform**

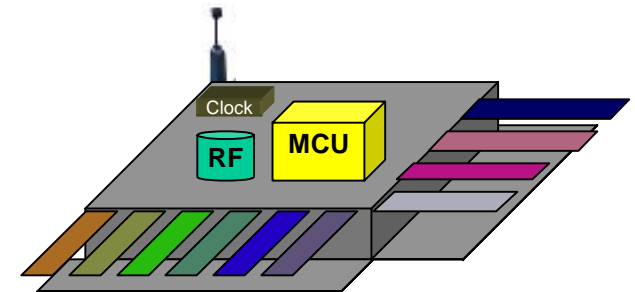
- Arrays of dozens or hundreds of sensors supported

- **Integrate Sensing, Computing & Communications**

- Unique functionality in a cost-effective package

- **Initial Products**

- Hydrogen and VOC / “E-Nose on a chip”



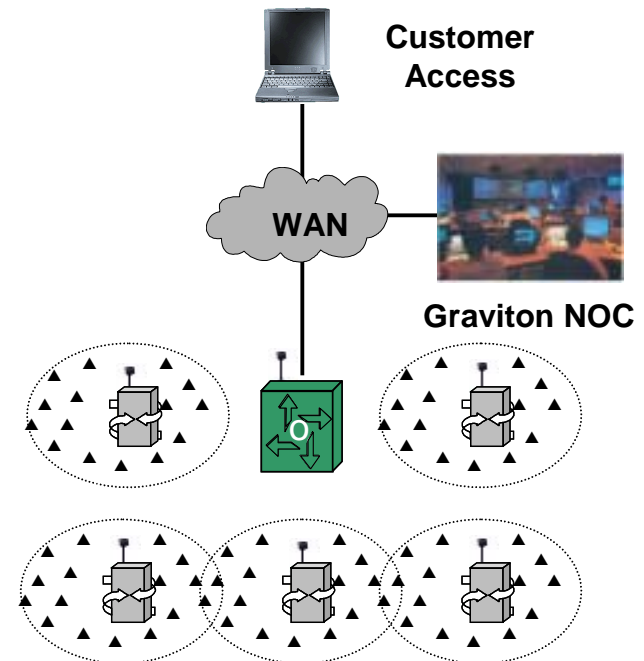
Graviton Integrated MicroSystem

- **Optimized for Sensor Traffic**

- Highly scalable architecture
- Low power DSSS components
- pTDMA, CDMA, FDMA

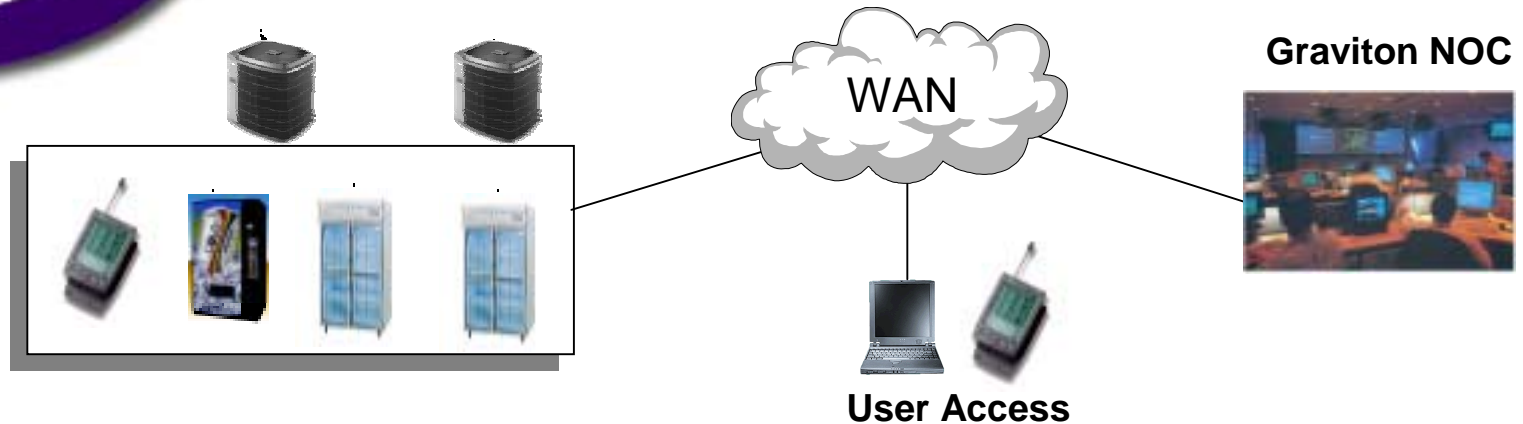
- **Industrial Grade RF**

- Overcomes multipath & other RF interferers
- Very high processing gain
- Target environments include substations, plants, buildings



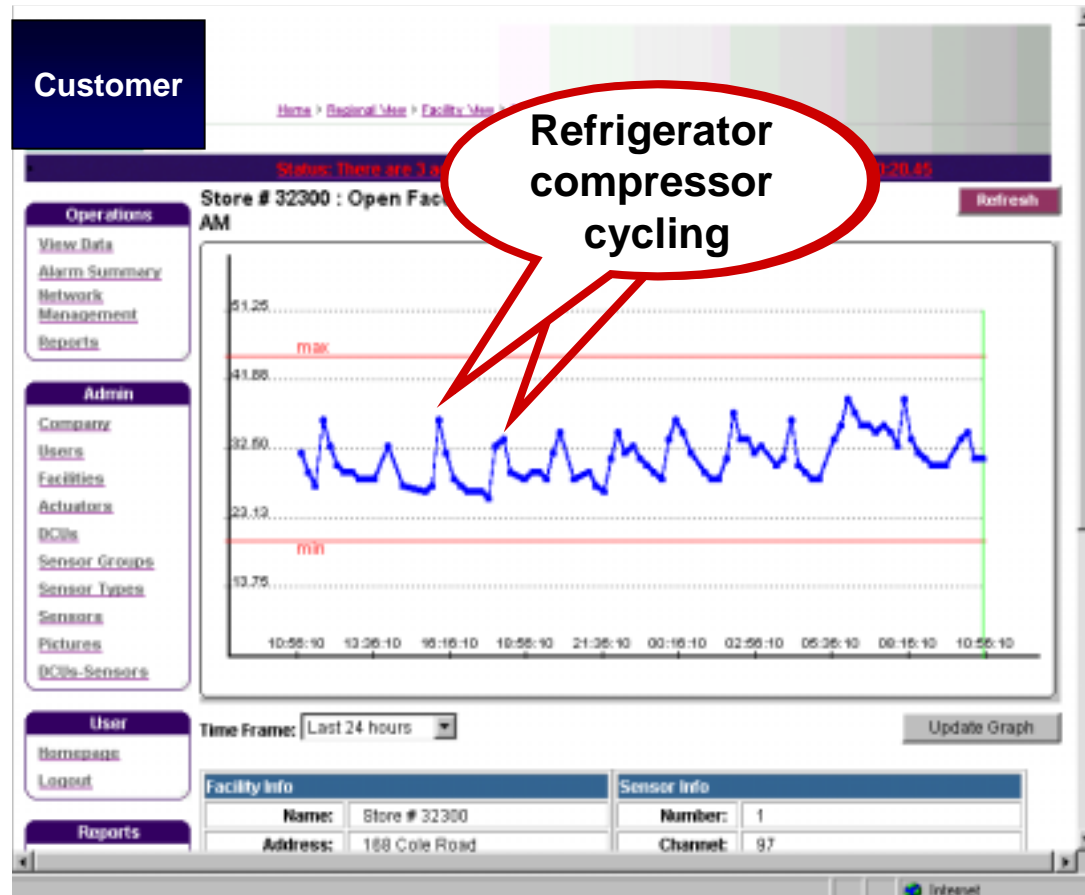
- **Flexible, Standards-Based Platform**
 - Easily extensible, legacy system integration
- **Ultra Scalable Architecture**
 - Millions of networked sensors
 - Diversity of human and machine communications
- **High Degree of Automation**
 - Data access and sensor management
- **Valuable Applications**
 - Vertical services, data mining & predictive algorithms

C-Store Customer Example

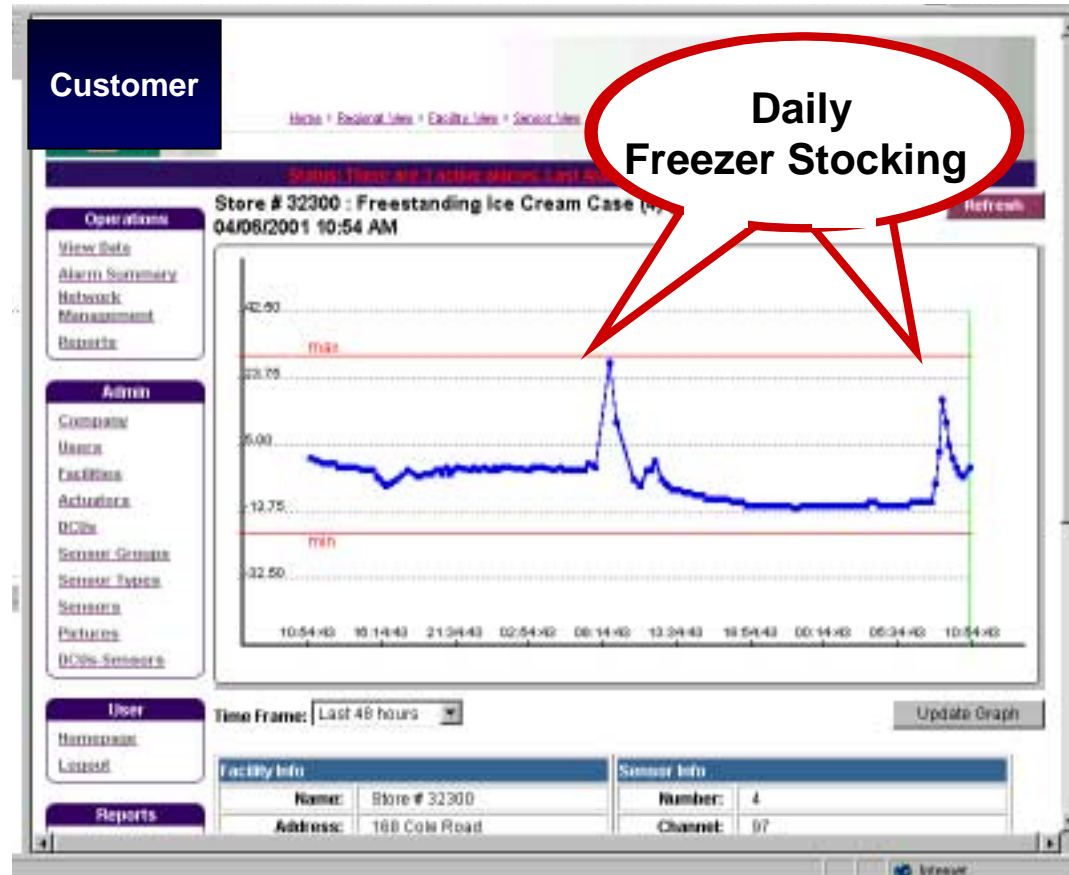


- **Condition Based Monitoring**
 - Refrigeration / freezer monitoring, condiment station, ambient air
- **Strong Need for Additional Services**
 - Fountain beverages, HVAC / AMR, lighting, gas pumps
- **Drivers: Customer Service & Operational Efficiency**
 - Automation allows clerks to focus on customers, improves profitability
 - Centralized control enables operational consistency chain-wide

Non-alarm conditions still provide valuable information



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- **Cola Co.'s Business Problems**
 - Guaranteed quality of beverage (especially non-US)
 - Financial losses from poor calibration, counterfeit syrups
- **Graviton Digital FlowMeter (Patent Pending)**
 - Third party MEMS pressure sensors, orifice-based flow body
 - Closed loop control system for consistent product quality & revenue
 - Temperature, flow rate & viscosity independent
 - Highly accurate, low cost, highly reliable, digital data (network-ready)
- ***Allows Direct Insight Into End User's Product Experience***
 - Nearly every manufacturer shares this need



*Prototype
Flow Meter*

Improved Business Operations

- Monitoring
- Alarming
- Trending
- Analysis
- Response



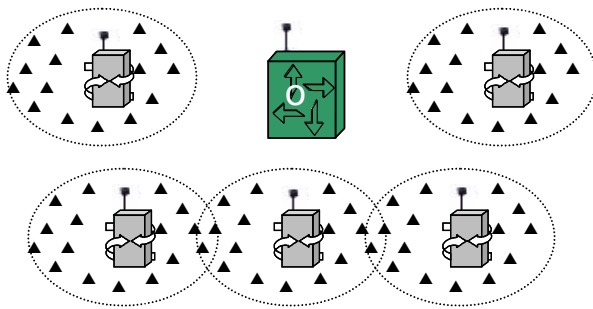
Customer

- Planning Systems
- Physical Operations
- Worldwide Distribution
- Customer Support
- Product Quality



Business & Cost Drivers

- People
- Equipment
- Energy
- Customer / Brand Loyalty



Graviton Sensory Network™

Obstacles to Broad Adoption

- **Market Awareness & Understanding**
 - What sensory networks are, what they enable, ROI
- **Industry Standards**
 - Sensor networking interfaces (IEEE 1451)
 - Non-IP network protocols (Microsoft, Sun, emWare, Echelon...)
 - Wireless LANs (802.11 / HomeRF / HiperLan2)
 - Wireless WANs (WCDMA, GPRS, etc.)
- **Cost-Effective Network Connectivity**
 - Broadband penetration (telemetry 'rides for free')
 - Global 3G WAN deployment (leverage consumer volumes)



Additional Research Required

- **Applications & Customer Benefits / ROI**
- **Distributed Computing / M2M Architectures**
- **Self-Organizing Wireless Networks**
- **MicroSensory Systems**
- **New Power Sources**
- **Privacy Issues**