Smart ORL: The Future of Smart and Sustainable Cities

Charles A. Ramdatt, P.E., AICP
Chris Castro, LEED GA, CPB
Why?

• City of Orlando’s Executive Leadership Direction
  – Use Affordable & Emerging Technologies on a Continuing Basis to be -
    • A Great Place to Visit, Live, Work, Play, Raise a Family, Ensure Good Environmental Stewardship, Attract the Creative Class and Promote Economic Development
  – Earn & Retain “Smart City” Branding
  – Pursue Regional Partnerships
“Our vision is to become the most environmentally friendly, socially inclusive, technology-enabled, and economically vibrant city in the Southeast...and one of the most sustainable cities in the U.S.”

– Mayor Buddy Dyer, City of Orlando
Governments are beginning to question what the future of our cities will look like in 5, 10, or 20 years from today...
Disruption can happen very fast...

Easter morning 1900: 5th Ave, New York City. Spot the automobile.

Source: US National Archives.
Easter morning 1913: 5th Ave, New York City. Spot the horse.

Source: George Grantham Bain Collection.
Smart ORL Leadership Team

• Orlando Smart Cities Steering Committee
  – Charles Ramdatt, Director of Smart Cities & Special Projects – Convener
  – Chris Castro, Director of Sustainability
  – Richard Howard, Director of Public Works
  – Rosa Akhtarkhavari, Chief Information Officer
  – Matt Broffman, Director of Innovation
  – David Dunn, Fleet & Facilities Division Manager
The Drivers of Smart Cities

• Growing urbanization
• Growing stress
• Inadequate infrastructure
• Growing economic competition
• Growing expectations
• Rapidly improving technology capabilities
• Rapidly declining technology costs
The Barriers to Smart Cities

- Lack of citizen/stakeholder engagement
- “Siloed” & piecemeal implementations
- Lack of financing
- Lack of ICT know-how
- Lack of integrated services
- Lack of a smart city visionary
Actions of a Smart City – Per Smart Cities Council

• A Smart City uses information and communications technology (ICT) to enhance its livability, workability and sustainability in 3 ways
  – It collects information about itself through sensors, other devices and existing systems
  – It communicates that data using wired or wireless networks
  – It “crunches” (analyzes) that data to understand, predict, adjust, deploy resources, and advise its stakeholders about what’s happening
# Traditional Cities vs Smart Cities

<table>
<thead>
<tr>
<th>The Problem</th>
<th>The Smart City Solution</th>
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</thead>
<tbody>
<tr>
<td><strong>Planning</strong></td>
<td>Coordinated and holistic Resources are shared</td>
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<tr>
<td>Ad hoc and decentralized</td>
<td>Cost savings are fully realized Investments are scalable</td>
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<tr>
<td>Cost savings aren’t realized</td>
<td>Improved city planning and forecasting</td>
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<td>Limited potential for scalability of investment</td>
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<td><strong>Infrastructure</strong></td>
<td>Optimized with cutting-edge technology</td>
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<tr>
<td>Runs inefficiently</td>
<td>Saves money and resources</td>
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<td>Costs more money and resources to run</td>
<td>Improved service-level agreements</td>
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<td></td>
<td>Built on open standards</td>
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<tr>
<td><strong>System operators</strong></td>
<td>Enjoy real-time reporting on infrastructure conditions</td>
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<tr>
<td>Guess at infrastructure conditions</td>
<td>Predict and prevent problems</td>
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<tr>
<td>React to problems</td>
<td>Deploy resources more efficiently</td>
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<tr>
<td>Can’t deploy resources efficiently to address problems</td>
<td>Automate maintenance</td>
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<tr>
<td></td>
<td>Save money</td>
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<tr>
<td><strong>ICT Investments</strong></td>
<td>Centrally planned</td>
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<tr>
<td>Piecemeal and siloed</td>
<td>Deployed across city departments and projects</td>
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<tr>
<td>Deliver suboptimal benefit</td>
<td>Deliver optimal benefit</td>
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<tr>
<td>Don’t realize economies of scale</td>
<td>Provide maximum value and savings</td>
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## TRADITIONAL CITIES VS SMART CITIES

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<th>Problem</th>
<th>Smart City Solution</th>
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<tr>
<td><strong>Citizen engagement</strong></td>
<td>• Complete and singular online presence</td>
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<td>• Limited, scattered online connection to citizens</td>
<td>• Citizens can easily find and use services</td>
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<tr>
<td>• Citizens can’t make optimal use of city services (or easily find them)</td>
<td>• Citizens can participate in smart city initiatives</td>
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<tr>
<td><strong>Sharing data</strong></td>
<td>• Two-way communications between government and people</td>
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<td>• Departments and functions are siloed</td>
<td>• Specialized services focused on the individual citizen</td>
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<td>• Departments rarely share data and collaborate on initiatives</td>
<td>• Citizens can both contribute to and access real-time intelligent city data and offer apps that use the data</td>
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<tr>
<td></td>
<td>• Departments and functions are integrated and/or shared</td>
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<td>• Data is shared between departments and better correlated with other data services through open standards</td>
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<td>• Results are improved</td>
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<td>• Costs are cut</td>
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### The Smart Cities Framework

**Technology Enablers**

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<thead>
<tr>
<th>Instrumentation and Control</th>
<th>Built Environment</th>
<th>Energy</th>
<th>Telecommunications</th>
<th>Transportation</th>
<th>Water and Wastewater</th>
<th>Health and Human Service</th>
<th>Public Safety</th>
<th>Payments and Finance</th>
<th>Waste Management</th>
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<td>Connectivity</td>
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<td>Interoperability</td>
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<td>Security and Privacy</td>
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<td>Data Management</td>
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<td>Computing Resources</td>
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<td>Analytics</td>
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Community & Digital Inclusion

• Stakeholders must be identified and continuously engaged.

• These include
  – Business Community
  – Residents
  – Local, Regional, State & Federal Public & Private Sector Groups as well as Non-Profits
  – Vulnerable & Under-served Groups
Information Communications Technology (ICT)

- ICT is a foundational element for IOT and a Smart City
- Orlando already has an extensive fiber-optic network
  - Internally
    - Transportation
    - Public Safety
  - Regional Partners
    - CFX
    - FDOT
    - FTE
- Current network need
  - Inventory/mapping
  - Master Planning
  - Improvement
    - Redundancy
    - Physical security
    - Cyber security
    - Interconnection
Some Local Guiding Elements

- Green Works Orlando
- “How Shall We Grow”
- Beyond Traffic 2045
- Mean Streets/Dangerous By Design
- World’s Largest Tourist Destination
- World’s Largest Rental Car Market
- US DOT Smart City Challenge
- MetroLab Network
Some Previous & Current Smart Cities Projects in Orlando

- TravTek In-vehicle Navigation
- ITS (traffic signal priority, AVL, etc.)
- Open Data
- Smart Parking Meters
- Garage Modernization
- Smart Buildings
- Distributed Generation (solar)
- Electric Vehicles
- IRIS and City-wide Surveillance
- Water Monitoring
- Smart Policing Predictive Analysis
- EDIS Route Optimization
- Special Event Management
Smart Public Safety

- OPD Body cameras and audio recorders
- 178 IRIS cameras throughout the City to improve public safety
- Emergency signal priority for Traffic lights
- Computer Aided Dispatch (CAD) to improve response time
Smart Public Safety

- **Opticomm™ IR emitter** sends a secure, encoded priority request to the intersection.
- **Opticomm™ detector** receives IR signal and relays the request to Opticomm™ phase selector.
- **Opticomm™ Multimode phase selector** validates request from IR detector or GPS receiver, and alerts the traffic control system which requests a green traffic signal.
- **As vehicle enters radio range,** Opticomm™ GPS intersection equipment relays the request to Opticomm™ phase selector.
- **Opticomm™ GPS vehicle equipment** transmits vehicle speed, direction and turn signal status to GPS intersection equipment.

Use Central Management Software (CMS) to update system configuration, collect data and generate reports.
SOLID WASTE
Smart Waste Management

• **GOAL: Become Zero Waste by 2040**
  
  • Weekly recycling collection schedule
  
  • Expanding recycling and food waste collection in Downtown core.
  
  • Established 10+ recycling bins at Lake Eola
  
  • Establishing 20+ bins, including Big Belly Solar Trash Compactors in Spring 2017
  
  • Exploring mandatory recycling policy for all buildings
Smart Waste Management

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ENERGY & GREEN BUILDINGS
GOAL: 100% city-owned buildings are high-performance green buildings

- LEED Silver req. for all new city-owned buildings
  - Built 14 new LEED certified buildings

- $17.5 million municipal bond
  - Retrofitting 55 Buildings (of 550)
    - $2.4 Million annual savings
      - Pay down bond debt
      - Fund future EE investments
Smart Street lighting

• **GOAL:** 100% LED streetlight by 2020

• OUC working to retrofit 20,000+ streetlights to LED
  – 12,480 currently retrofitted

• Exploring test of new “Smart Streetlights” in Downtown
  – LED technology
  – Video surveillance
  – Environmental monitoring
  – Traffic analytics
  – Wi-fi / DAS systems
  – Gun shot detection
GOAL: 100% Renewable Energy by 2030 for Municipal Operations and 2050 for city-wide

- 420 KW solar PV array
- 11 KW SEE Art Orlando array
- 30 KW Reliable Plaza array
- 6 MW Stanton Solar farm
- 400 KW Gardenia Community Solar Farm
- 12 MW Stanton Community Solar Farm
UCF Digital Smart Grid Lab

- $750,000 grant from SIEMENS
- Partnership with SIEMENS, Duke Energy, OUC, and City of Orlando
- Simulation of UCF electric grid
13MW Community Solar Farm – Fall 2017
Expoloring Floatovolatics

• Testing floating solar arrays on Lakes and Retention Ponds
• 35 KW grid-tied system
• Performing research with UCF Biology to understand habitat and water body impacts
TRANSPORTATION
Central Florida’s History of Transportation Innovation: TravTek

Orlando was the pioneer for in-vehicle navigation system R&D
Central Florida’s History of Transportation Innovation

• Lymmo Bus Rapid Transit (BRT) System
  • Late 1990’s
  • First “Pure” BRT Project in the USA
  • Response to Local Access & Mobility Challenge
  • Downtown Development of Regional Impact
  • Funding & Operating Constraints Yielding Innovation
Smart Vehicles

• CNG Hybrid Garbage/Recycling Trucks

• EV’s for City Hall motor pool

• Purchasing EV Motorcycles for OPD

• Deploying 150+ EV charging stations around City
Smart Parking

- Smart On-street Parking Meters
  - Pay remotely via 'ParkMe' app
  - Display available spots in Downtown (500 of 1100 parking spots)

- Smart Parking Garages (coming soon)
  - Integrate vehicle counter and real-time data of parking availability into ParkMe app
US DOT Automated Vehicle Proving Grounds WINNER

- “Central Florida Automated Vehicle Partnership” (CFAVP)
- 1 of 10 teams nation-wide
- R&D for new vehicle technologies, including electric, connected, and autonomous vehicles
- Focus on all modes of travel
- Regional Economic Development
Central Florida Automated Vehicle Partnership
Approach

- **UCF & FPU**
  - Research, Simulation & Emulation

- **FAMU & FSU**
  - Review of Work Performed by Primary University Partners
  - Allow for Minority Institutions’ Participation & Mentoring

- **FTE & FPU**
  - Development of Test Track
  - Closed Environment Testing

- **NASA-KSC**
  - Testing of sensors for extreme environments
  - Closed Environment Testing

- **CFX & FDOT**
  - Freight Vehicle, Infrastructure & Sensor Testing in More Open Environments

- **City of Orlando, UCF & Lynx**
  - Automobile, Freight, Transit & Bike-Ped Vehicle, Infrastructure & Sensor Testing in Open Environments

- **UCF School of Public Administration, FAMU & FSU Law Schools**
  - Public Engagement
  - Policy Development
  - Legislative Coordination
Anticipated Benefits

- US DOT Designation/Certification Agreement & Funding Opportunities
- Coordinated Research
- Safer & More Livable Communities
- Independent Pursuit of Other Opportunities
  - University Research
  - Independent engaging of auto-makers, OEMS & interest groups
  - Promoting and branding of work by subsets of the partnership
  - Engaging & utilization of Central Florida tech companies & talent
  - Economic Development
  - Facilitating a culture of continuing innovation, review and R&D
Lymmo Electric Bus Pilot
DTO Autonomous Electric Shuttle

- EasyMile + Panasonic
- 12 passenger, on-demand, air conditioned shuttle
- 14 hours of continuous operation
- 4 hour charge time (L2)
Smart District:
Creative Village / Downtown UCF / SED
Smart City Hackathon: