

# *Smart Community Operating System and Connectivity for Delivering Community Services to Urban Underserved*

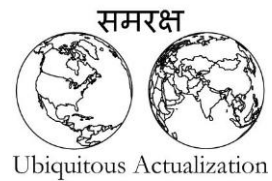
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The *Samraksh* Company



# Drawing from a Smart Connected Community Effort...

## Smart Columbus

Confluence of Civic, Research & Startup Cultures

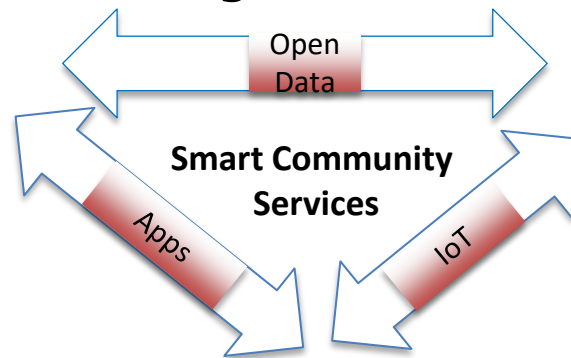
- Winner \$40M DoT Smart City Challenge
- \$10 M Vulcan Inc.
- \$367M & growing investment of local partners
- \$93M for research (largely from OSU)

### Paving the Way Through Radical Collaboration



# Underlying Concept for Community Services

Open data environment, network access, and analytics are at the core of delivering diverse neighborhood services



CoGo trip data

– bike paths, provisions, activity lvl



On-board Wi-Fi

- producing 4.7TB per month



# Linden Residential District

Linden:

Low income

Declining  
homeownership

Limited mobility  
options

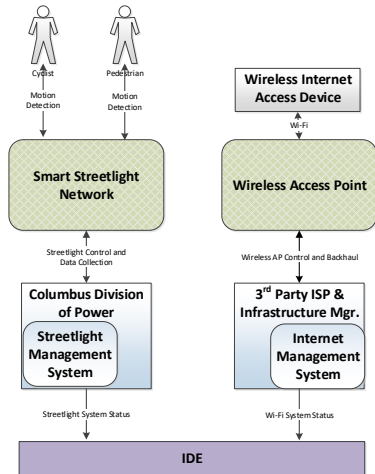
Safety, food  
desert issues

Highest infant  
mortality rate in  
country





# Services under Development for Linden



**Smart Street Lighting**



**Mobility Assistance for People with Cognitive Disabilities**



**Pedestrian Collision Avoidance**



**Common Payment System**



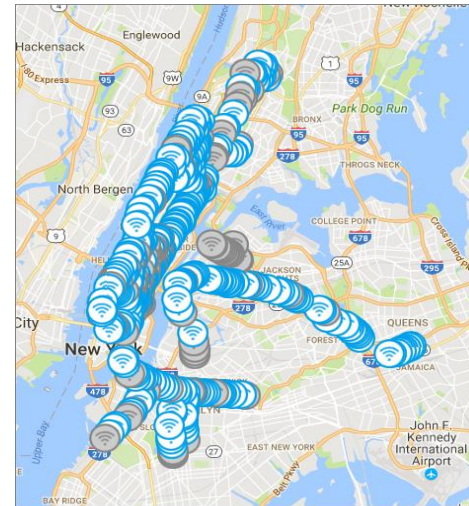
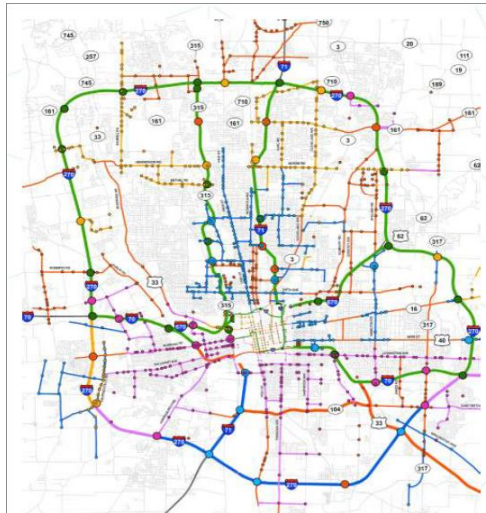
**Multi-Modal Trip Planning Application**



**Smart Mobility Hubs**

# Connectivity Infrastructure Gap in Linden

- Fiber infrastructure is insufficient for coverage (of, e.g., Smart Street Lights/Wi-Fi APs)



- End-users have limited access to broadband/mobile data, for cost and other reasons
- Willingness to provide subsidized connectivity exists assuming there is a cost-effective deployment, operations, and sustainability model

# Addressing the Gap for Coverage of Wide Areas

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- New 'software defined network' architecture for edge network
  - separation of data and control plan
  - control based on regular global state acquisition} NOT!
- Cost-effectively connectivity elements:
  - leverage emerging technologies: LoRa, NB-IoT, LTE-M, WiGig...
  - support heterogeneous links:
    - eschew complex gateways, link virtualization provides a basis
  - decouple edge network from core network:
    - traffic-aware, potentially application-specific, networking
    - leverage Link Virtualization

# Addressing the Gap (II): Deeply Embedded Smart Apps

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- Allow community service apps to compute closer to the devices and users in edge network
- Traffic learning would additionally be used to further optimize the app computation in-network
  - ⇒ research in resource-efficient learning
- Open data needs reprogrammable edge computing and networking
  - ⇒ principled decomposition across cloud, edge server, & device