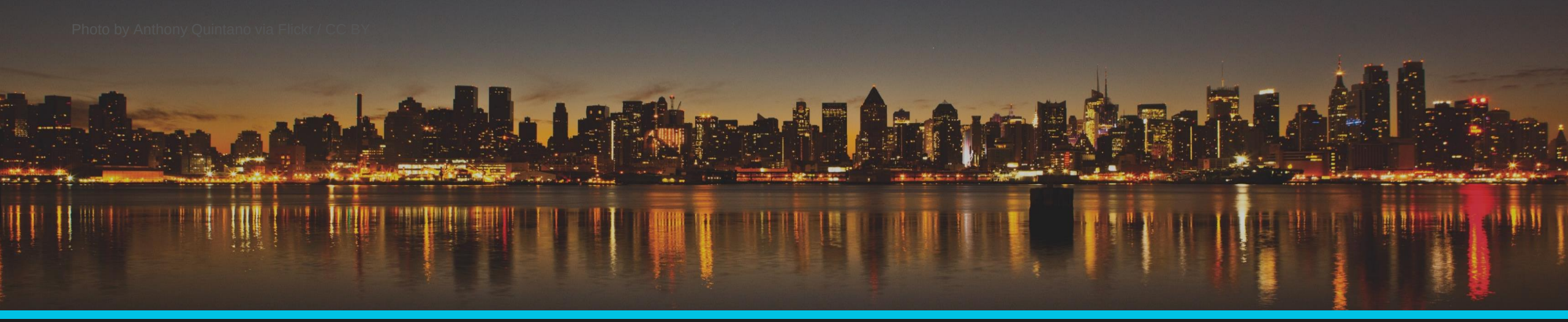
PASSAIC COUNTY, NEW JERSEY

Michael Lysicatos, Assistant Director
Passaic County Department of Planning and Economic Development

GLOBAL CITY TEAM CHALLENGE SUPER ACTION CLUSTER SUMMIT
February 1 – 2, 2017 I *Portland, Oregon*



GLOBAL CITY TEAMS CHALLENGE

Smart and Accessible Transportation Hub

Services to Persons with Special Needs Requiring Minimal New Infrastructure

Portland, OR
February 1, 2017

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Smart and Accessible Transportation Hub

Leads: Zhigang Zhu (CUNY) and Jie Gong (Rutgers)

Local Gov. Partner: Michael Lysicatos (Passaic County NJ)

Project Overview

Services to Persons With Special Needs

- Beacon system that communicates real-time conditions and “turn-by-turn” direction for pedestrians accessing transit hubs that have sight impairment or other cognitive disabilities
- Utilizes 3-D modeling to accurately model the build environment in and around the transit station used to convey direction through Bluetooth technology
- Sensors can detect crowds and congestion to redirect users to easier access points in real-time

Connected Corridor Imitative

- Utilize smart lighting and other sensor technology to relay real-time conditions
- Adaptive Signal Control System(s)
- Create digital platform to share information on coordinated transportation services, local attractions and services, historic sites and the Great Falls National Historical Park, and real-time conditions
- Develop system that is scalable and can plug into different data management systems as well as communication systems such as public Wi-Fi

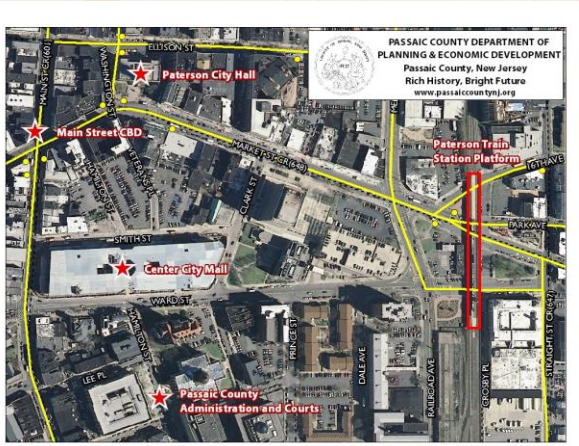
Impact/Benefits
Services to Persons With Special Needs

Challenges

- Various transportation hubs (including NJ Transit stations) in Passaic County hard to navigate
- Mega transit stations in NYC area a challenge for everyone

Example: Paterson Station/Smart Corridor

- Long elevated rail station spans 2 major roadways
- 1-mile corridor which is the focus of a safety grant Multiple multi-lane street crossings to and from
- Poor wayfinding and state of good repair
- Many vital services located in and around the Paterson station with little geared towards persons with special needs
- Most frequented transit stop for these persons



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Impact/Benefits
Connected Corridor Initiative

Challenges

- Transportation services rarely coordinated efficiently with little real-time assessment of conditions for users
- Antiquated infrastructure incapable of interoperability without major upgrade costs

Example: Paterson Station/Smart Corridor

- Train/bus/taxi transfers very inefficient
- Street lighting in constant disrepair with costly repairs
- Signage and information sources not readily accessible in multiple language and individuals with cognitive disabilities
- Major traffic congestion due to signal coordination

“Public transportation is the platform for independent travel for many people with the ability to access and navigate its facilities and services. With the assistance of navigation aids like the one proposed by the Rutgers-CUNY team, many people will be able to travel with greater confidence, while others may be able to travel independently for the first time. ”

Ed Hoff, Director of ADA Compliance
Office of Civil Rights and Diversity Program, NJ Transit

NJ TRANSIT
The Way To Go.

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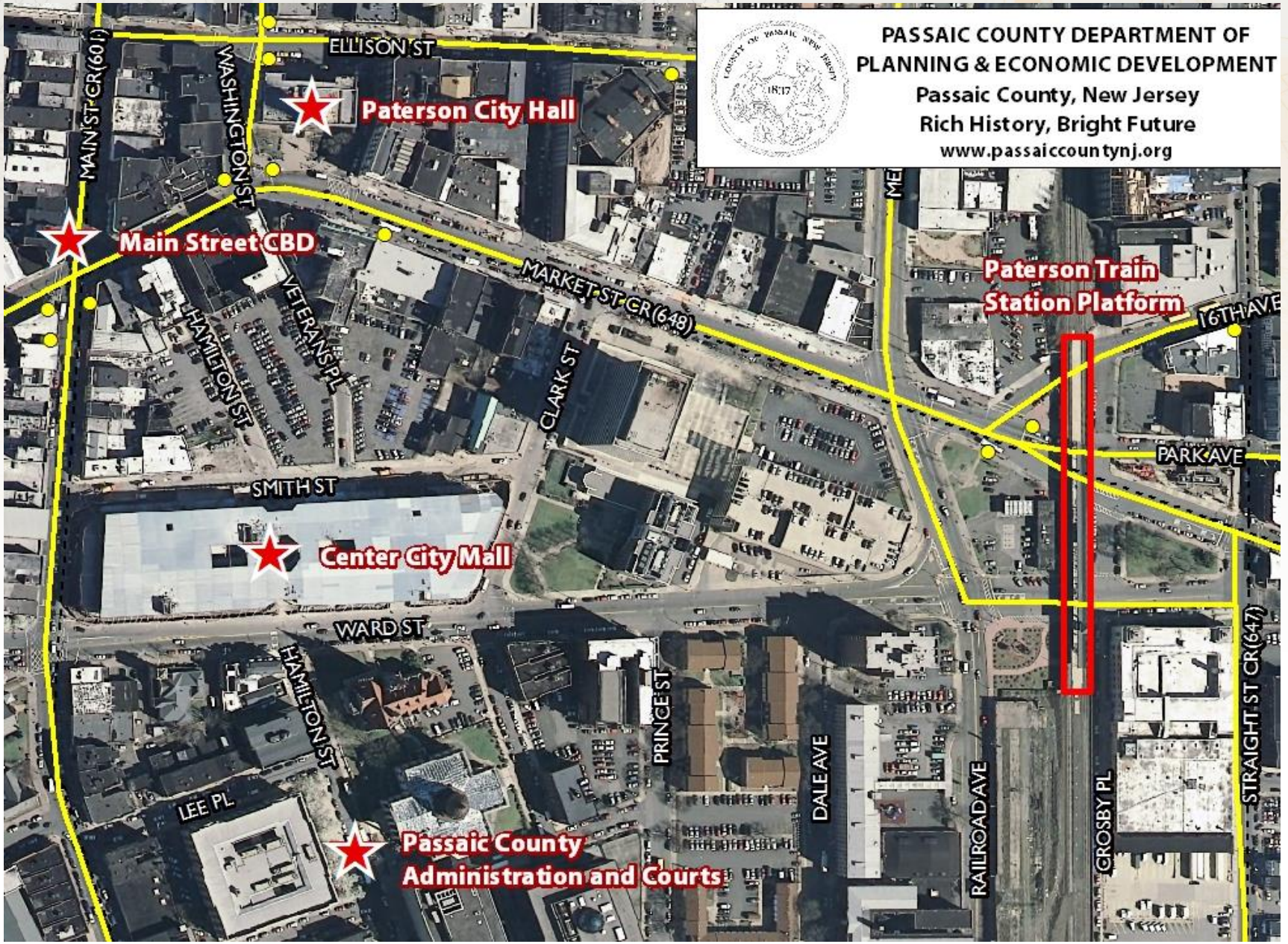
PASSAIC COUNTY DEPARTMENT OF
PLANNING & ECONOMIC DEVELOPMENT
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Paterson City Hall
Main Street CBD
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Center City Mall
Passaic County
Administration and Courts
ELLISON ST
MAIN ST CR(601)
WASHINGTON ST
MARKET ST CR(648)
VETERANS PL
HAMILTON ST
CLARK ST
6TH AVE
PARK AVE
SMITH ST
WARD ST
HAMILTON ST
PRINCE ST
DALE AVE
RAILROAD AVE
CROSBY PL
STRAIGHT ST CR(647)
LEE PL

Paterson Train Station
Passaic County
New Jersey
Current Conditions

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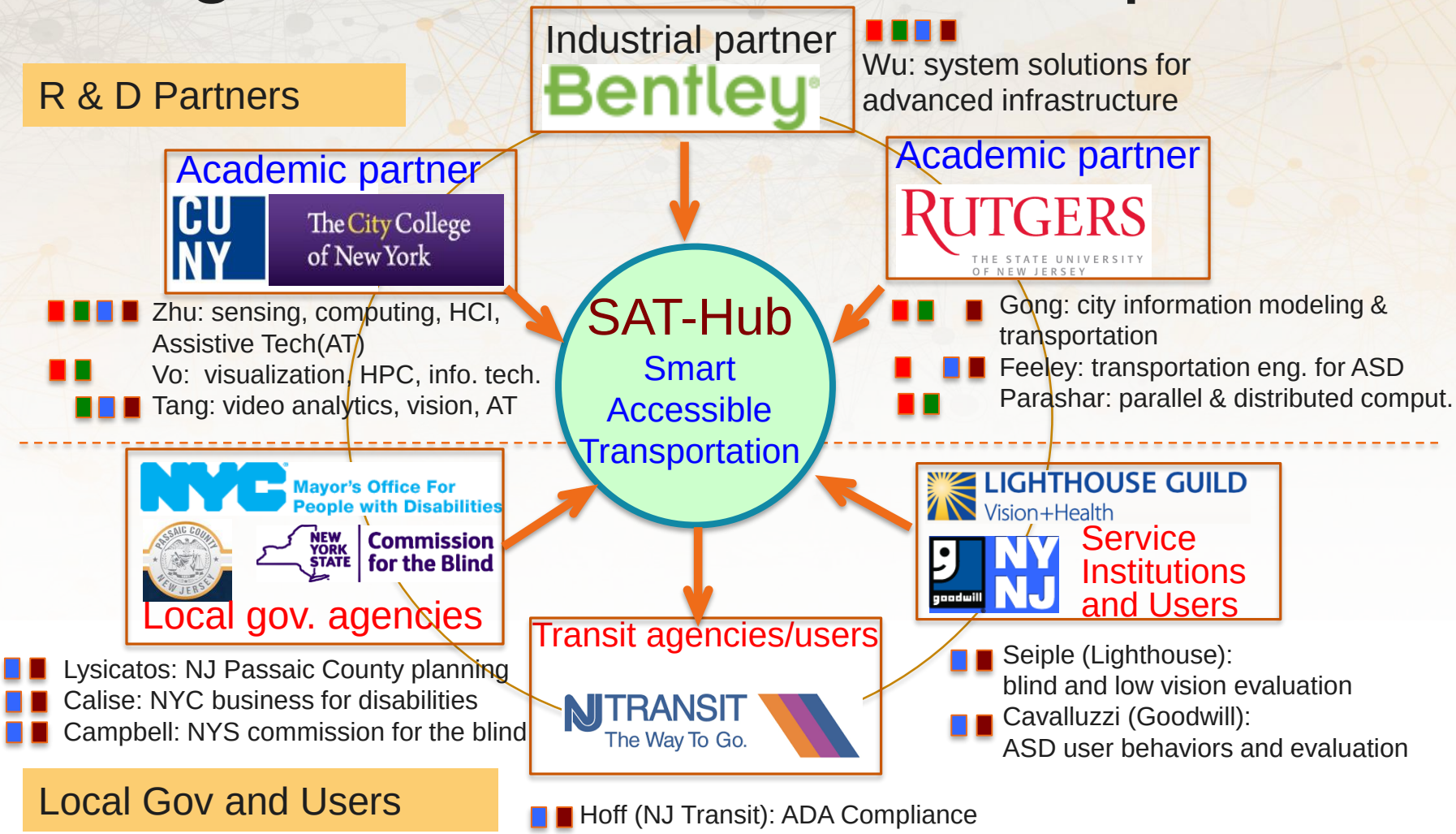
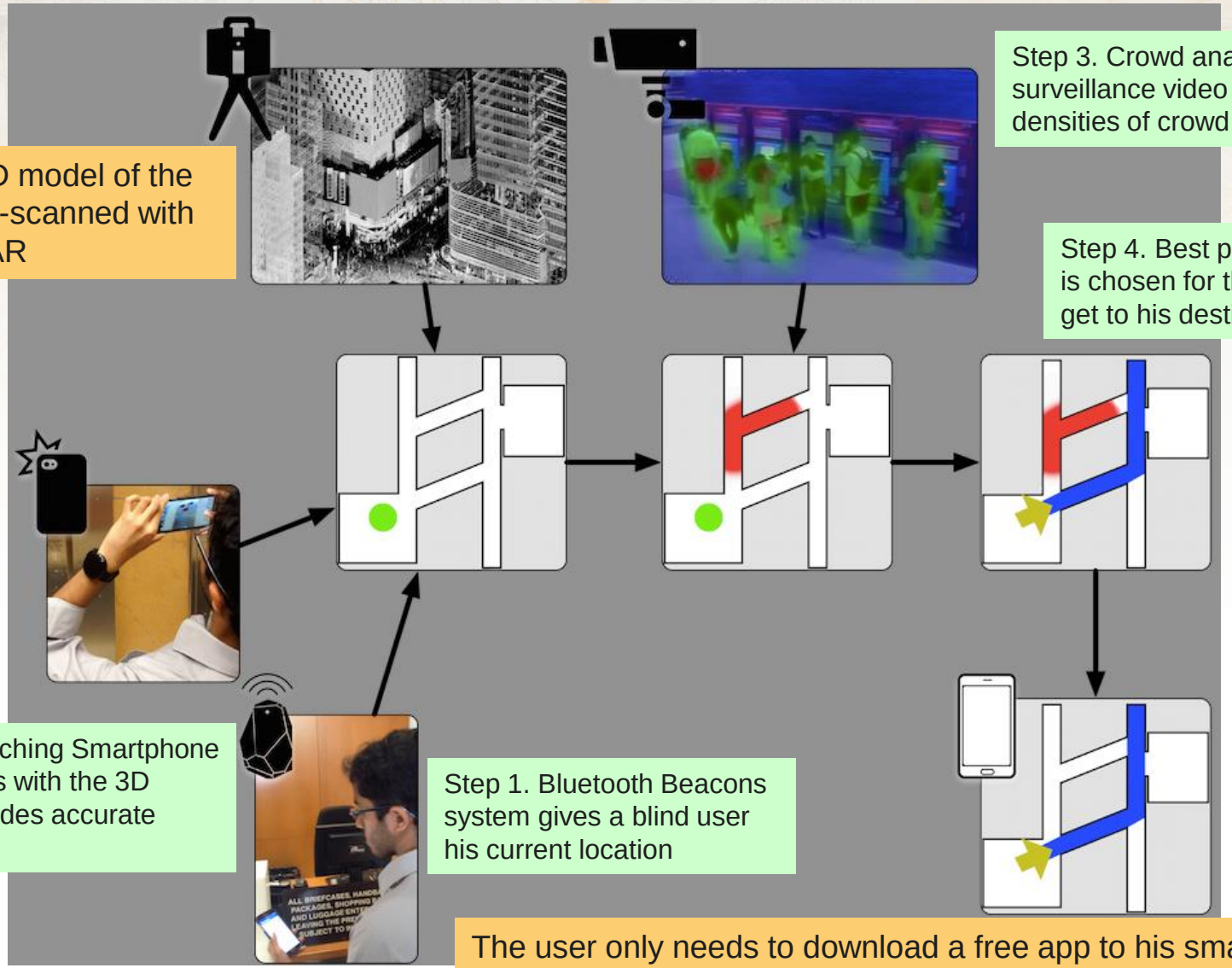
Organization Roles and Expertise



- Engineered System Design and Integration [Leads: Gong(Rutgers), Wu (Bentley)]
- Computing, Sensing and Info Technology [Leads: Vo(CCNY), Tang(BMCC/CUNY)]
- Human Factors and Accessibility [Leads: Feeley (Rutgers), Zhu(CCNY)]
- Service System Application Knowledge [Leads: Wu(Bentley), Zhu(CCNY)]

Smart and Accessible Transportation Hub Testbed:

Integration of Existing Infrastructure with Video and Mobile Computing



Step 0. 3D model of the hub is pre-scanned with a 3D LiDAR

Step 3. Crowd analysis of surveillance video provides densities of crowd in the hub

Step 4. Best path (blue) is chosen for the user to get to his destination

Step 2. Matching Smartphone cam images with the 3D model provides accurate orientation

Step 1. Bluetooth Beacons system gives a blind user his current location

The user only needs to download a free app to his smartphone

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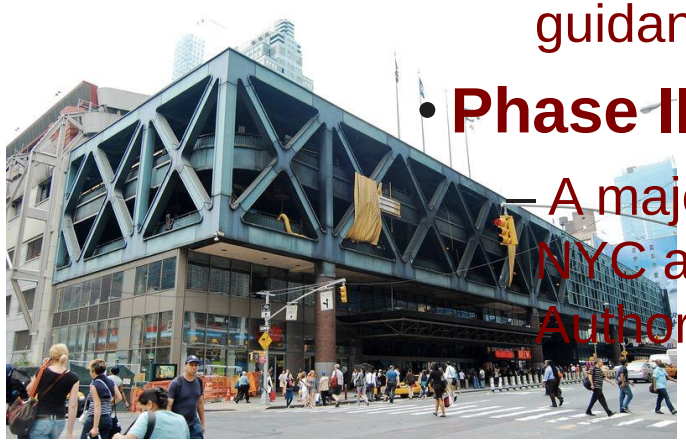
Timeframe for Testbed Evaluation

- **Phase I Pilot/Demo 2017**
  - –A demonstration system around Lighthouse Guild in NYC with indoor, outdoor and a MTA subway station for BVI users navigation guidance.
- **Phase II Deployment 2018:**
  - –A system around Paterson Main Line Station in Passaic County NJ for outdoor/indoor travel guidance.
- **Phase III Deployment 2019:**
  - – A major transportation hub in NYC area (Penn Station or Port Authority Bus Terminal)

66th Street–Lincoln



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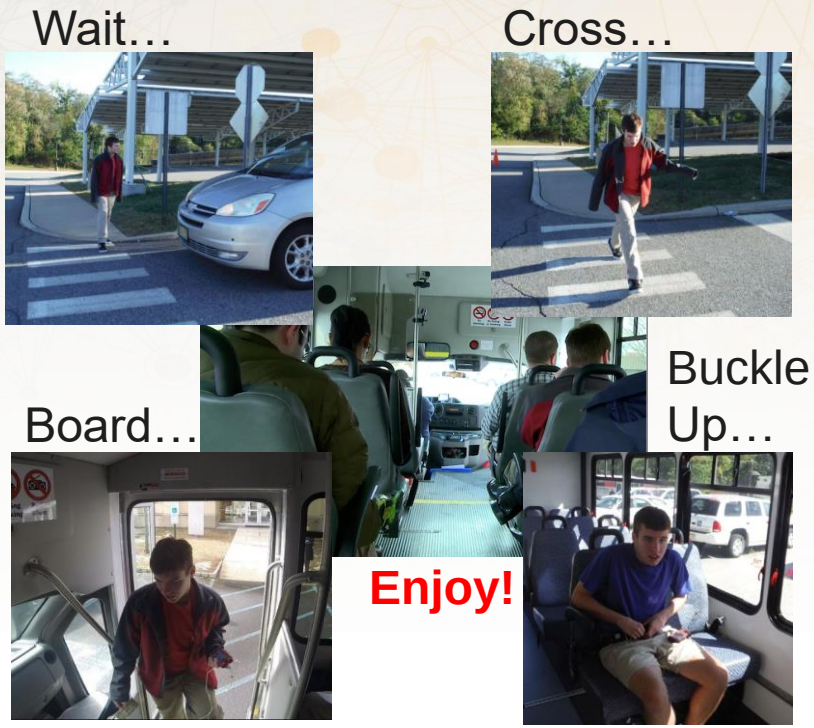
Goals/Metrics Employed

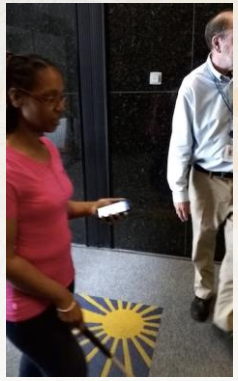
- Key Performance Indicators (KPIs)
  - Average time to find a terminal reduced by ~50%
  - User experience satisfaction increased by ~60%
  - Increase of number of users with special needs ~25%
- Measurement Methods
  - Measure navigation time in minutes over 3-6 month period, compared to baseline.
  - Measure number of people downloading and using the apps
  - Questionnaires to measure user experience in terms of navigation, waiting times, and safety concerns.



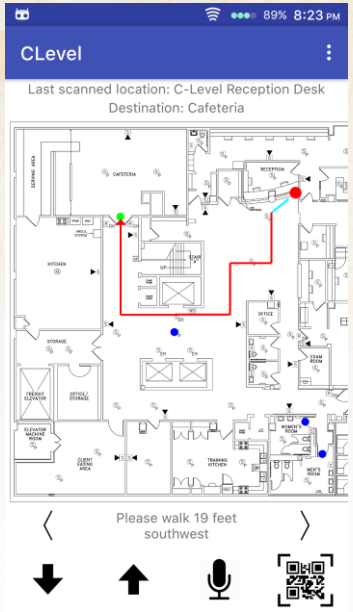
Paratransit Skills Assessment for Adults with Autism Spectrum Disorder (ASD)

Current Status: Demo at Lighthouse

1. LiDAR-Scan-Based 3D Modeling and Segmentation
2. Machine-Learning-Based Crowd Analysis with Surveillance Video
3. Beacon/QR-Based User Localization using a Smartphone



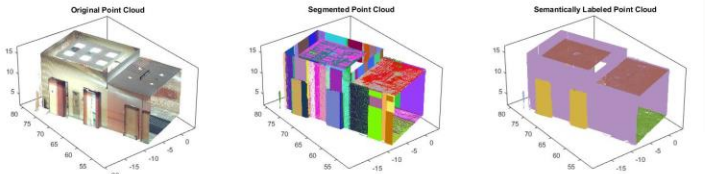
BVI user test



Path planning

Crowd analysis

3D semantic model & elevator detection



3D model of the corridor

User's view of the elevator

3D Model of Facility

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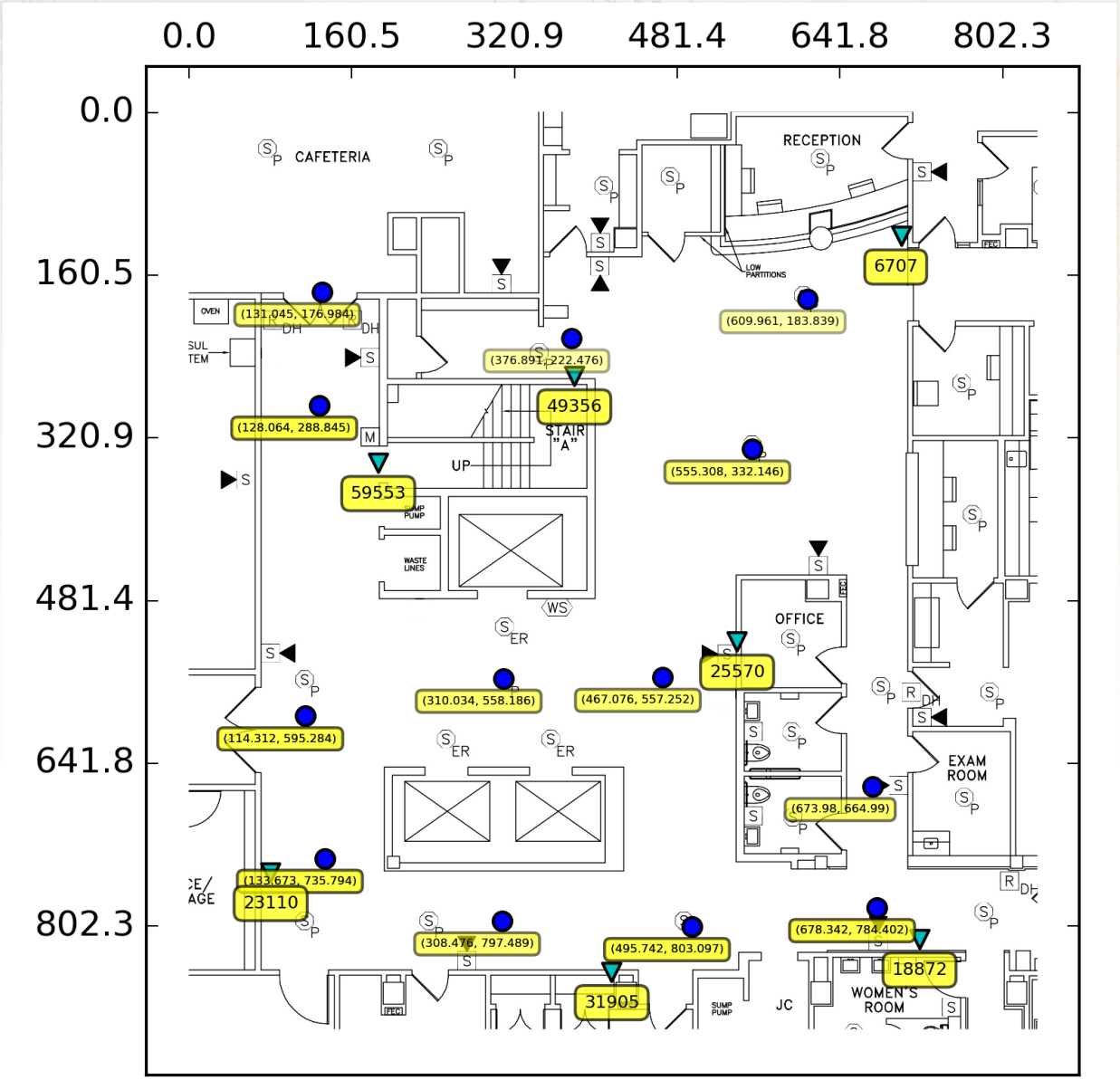

Beacon Deployment

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Current Status: Connected Corridor

1. Several research grants to develop sensor and beacon technology as well as develop data infrastructure
2. Currently beta testing 3-D model and sensor deployment at the Lighthouse Guild
3. Building coalition with the regional MPO and ITS New Jersey
4. Local Safety Program to implement traffic safety improvements funding through the MPO and to be implemented by the County
5. Developing workshop to further engage existing and other stakeholders
6. Implementing ITS / Wi-Fi antenna upgrades to existing signals in Paterson as one pilot imitative through a partnership with the County of Passaic and City of Paterson

Current Sponsors

- DHS SRT (Summer Research Team Program for MSI)
  - –Crowd Analysis (2015), 3D+Crowd+Service (2016)

- NSF EFRI (Emerging Frontiers in Research and Innovations)
  - –Man, Machine and Motor Control (M3C) for Visually Impaired (#EFRI-1137172)

- NSF MRI (Major Research Instrumentation Program)
  - –3D Laser Scanner to Support Multi-Disciplinary Research (#CMMI-1126806)

- NJDOH (NJ Department of Health)
  - –Paratransit Skills Assessment for ASD Individuals

NJ Health
Improving Health Through Leadership and Innovation

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Current Needs

- Research Funding
  - Refine sensor and beacon technologies
  - Platform to run and integrate smart technologies
  - Refine data infrastructure and provide access to additional data
- Equipment / Capital Investments – Test technologies through a series of pilot project in conjunction with dedicated funding avenues and infrastructure investments
  - Test ROI
  - Analyze interoperability of hardware and software options
  - Determine retrofit capabilities on existing infrastructure
- Agency Partnerships
  - Federal and state agencies that will use the project as a test bed for policy framework, data sharing and other permitting issues
  - Fund planning process for the overall coordination effort with local, state and regional partner agencies and technology partners

Thank You

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