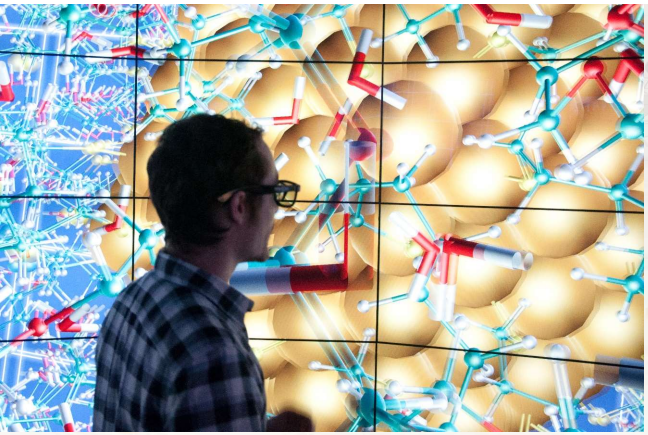
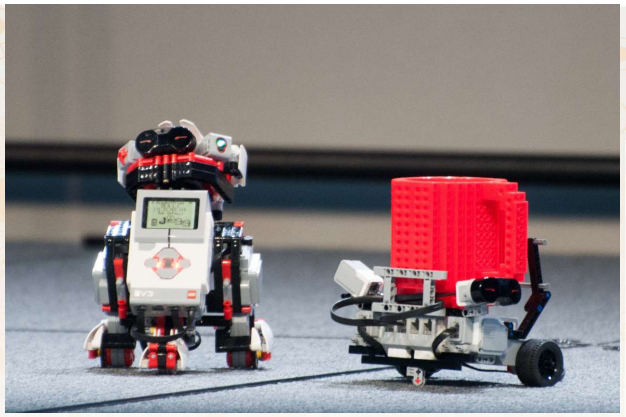
2017 CPS Workshop

Challenges and Opportunities for Bringing Smart Services to Underserved Urban Communities

Glenn.Ricart@us-ignite.org

September 8, 2017





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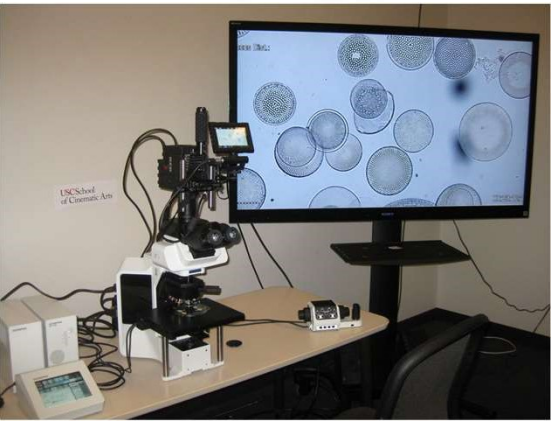
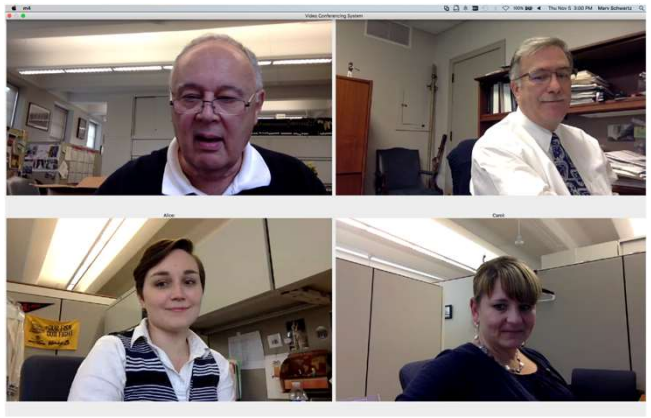
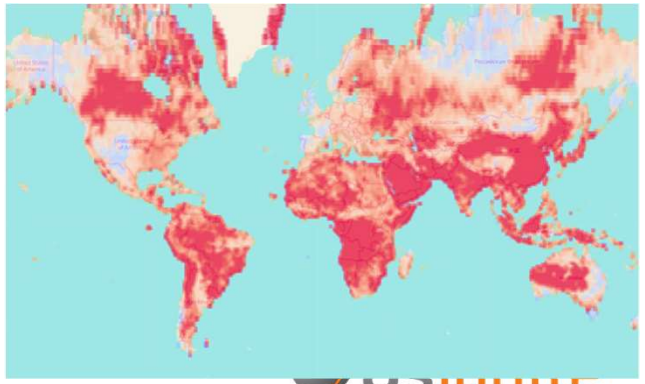
Next-gen applications and services leveraging advanced networking technologies in smart and connected communities

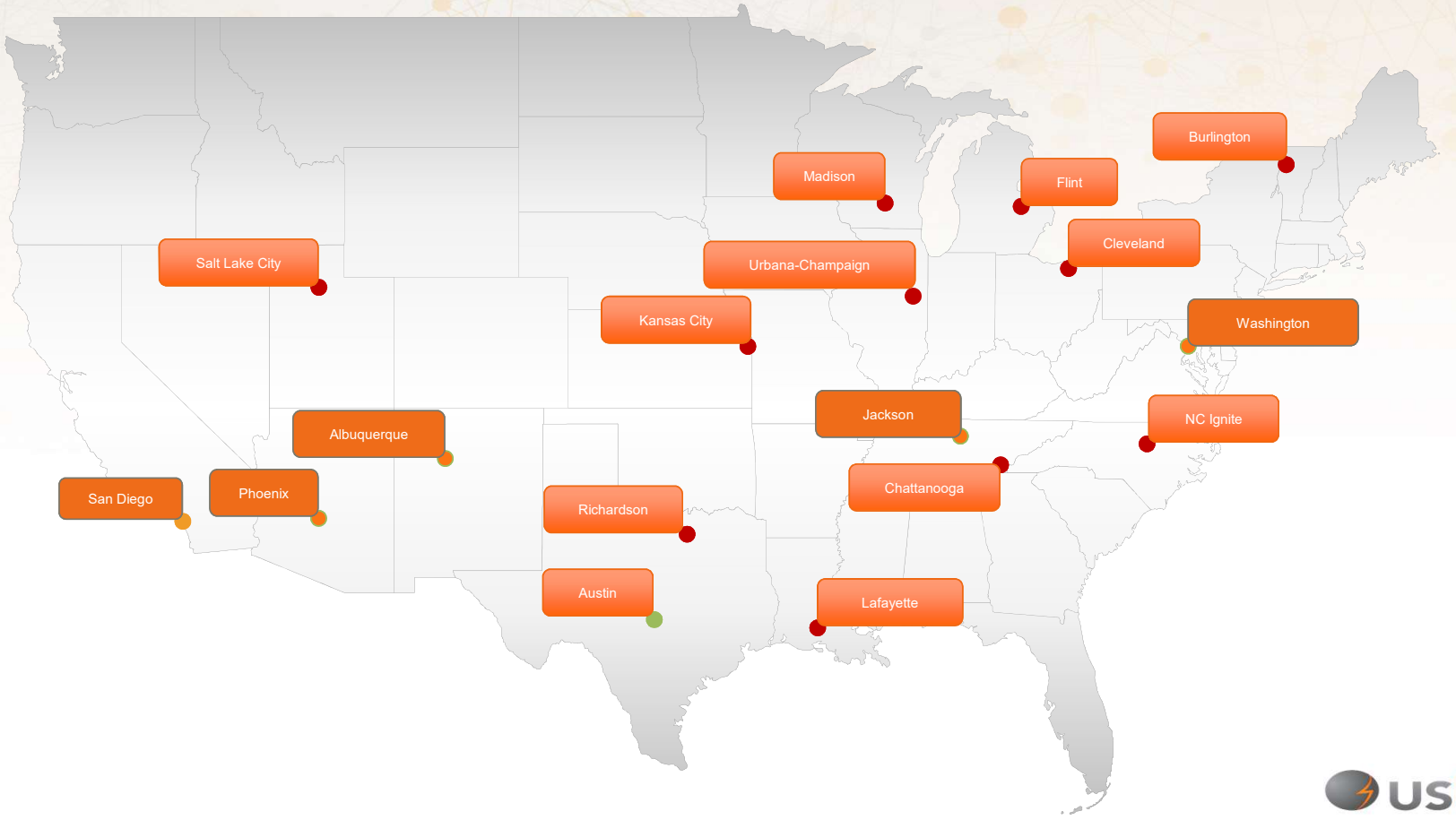






SMART GIGABIT COMMUNITIES

Connected Smart Communities



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THE SGC PROGRAM

Enabling Smart and Connected Communities

EXPERTISE

Community, Subject, Technical, Policy

FRAMEWORKS

Smart Community, Infrastructure, Grants

MEMBERSHIP

SGCs, Projects, Groups, Multi-Sector Leaders

TECHNOLOGY

Next Gen Networks, DTS

APPS

100+ Gigabit Apps and Services

EDUCATION

Next Gen Networking, Apps, Tutorials,

PRESS

International visibility, Marketing

CONFERENCES

Opportunities, Workshops, Summit, Seminars

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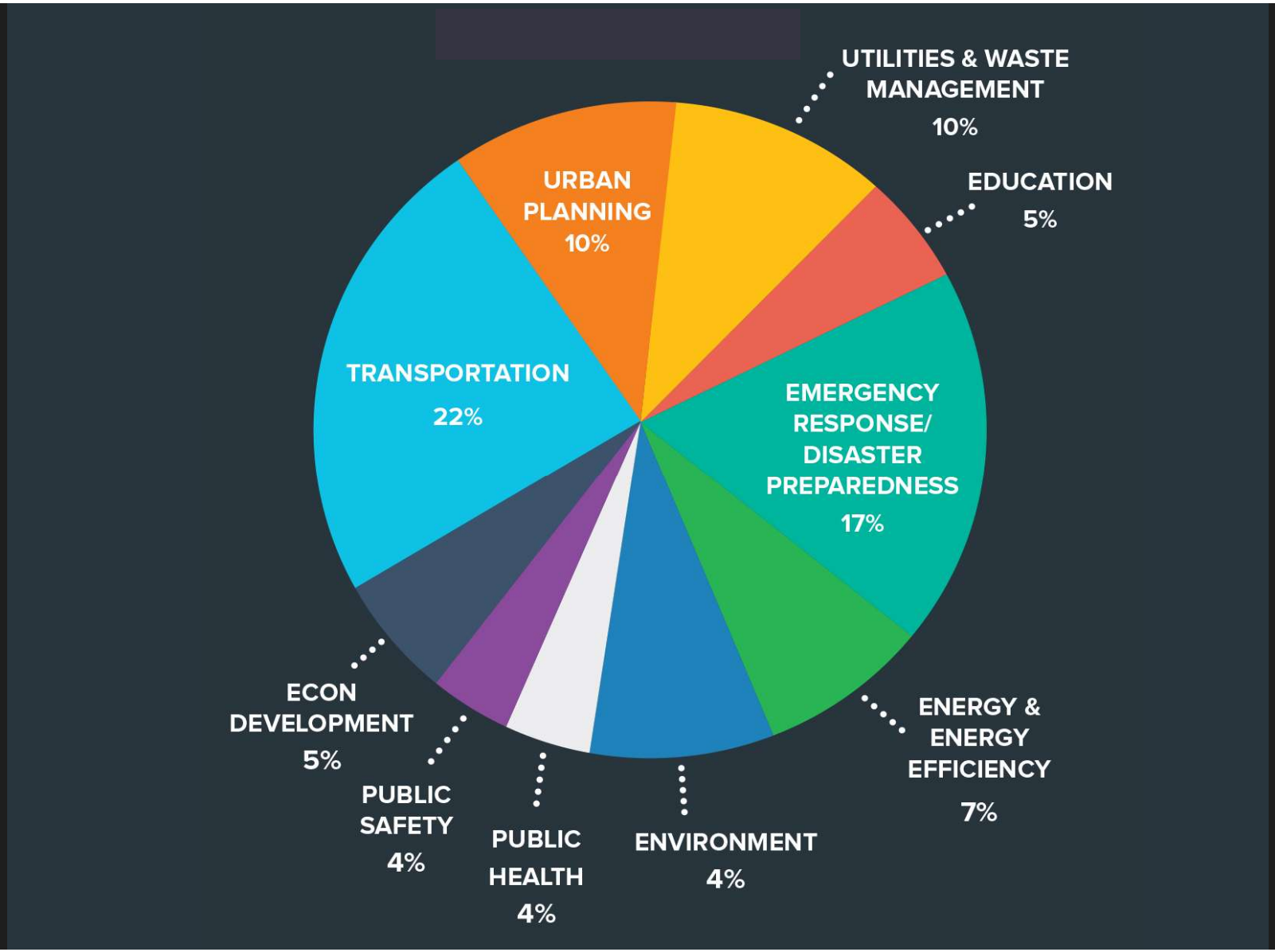
UTILITIES & WASTE MANAGEMENT
10%
EDUCATION
5%
URBAN PLANNING
10%
TRANSPORTATION
22%
EMERGENCY RESPONSE/ DISASTER PREPAREDNESS
17%
ECON DEVELOPMENT
5%
ENERGY & ENERGY EFFICIENCY
7%
PUBLIC SAFETY
4%
PUBLIC HEALTH
4%
ENVIRONMENT
4%

Challenges

Opportunities

Bringing Smart Services to Underserved Urban Communities

Challenges	Opportunities
Digital Divide Access Issues	“Beam In” Technology as needed
Digital Access not a Services Priority	Housing First, Digital Access Second
Expensive Cellular Data Plans	They have smart phones; use WiFi
No fixed address or location	Blanketing underserved with free WiFi
Need help turning lives around	AI Assistants constantly around them
Authentication and services coordination	Balance privacy and recognition

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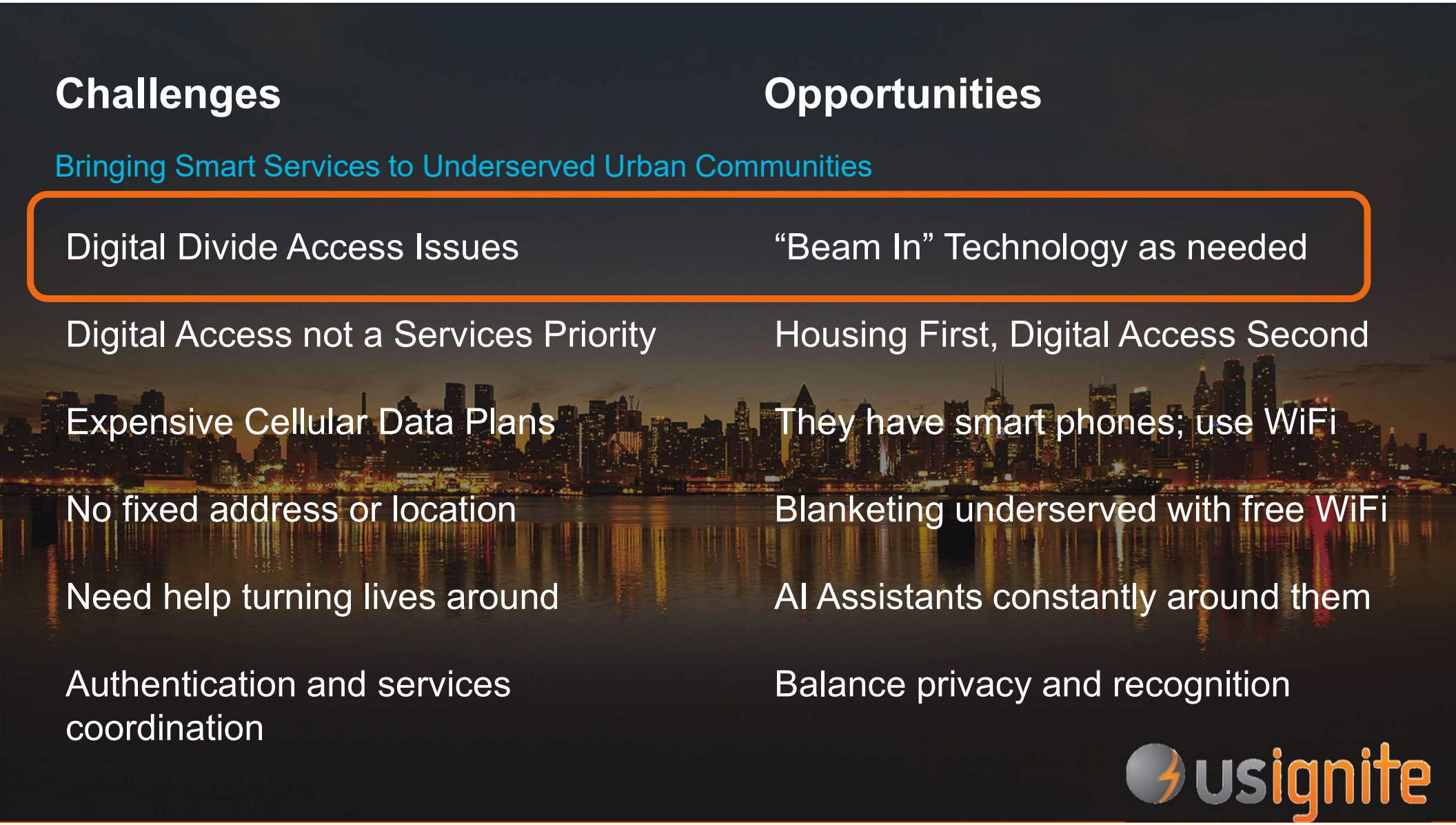
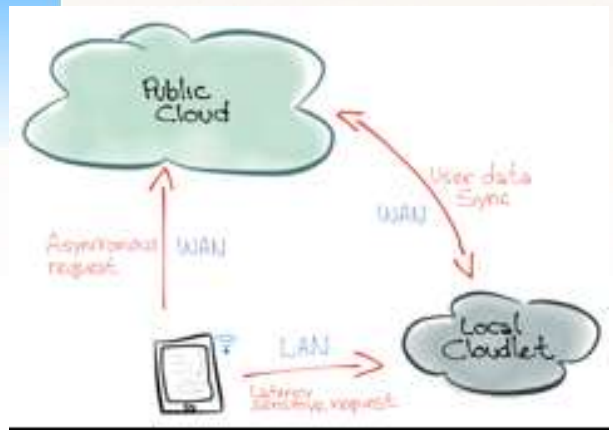


Iterations of compute location



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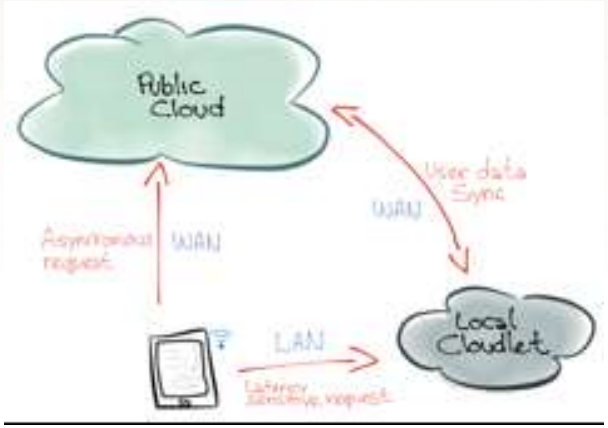
Places for Edges

Edges are Ubiquitous – Nature Abhors a Vacuum – Entropy Wins

Traditional Large National / International Cloud Datacenters
Regional (e.g., state) Clouds
City / Community Edge Cloud
Enterprise Cloud
Neighborhood Cloud
Cloud on a Lightpole
Home-based Cloud
Vehicle-based Cloud
Personal Cloud (e.g., smart phone)

(there are undoubtedly more)

Why: At an edge, economics changes, technology changes, regulations / policy changes, resilience changes, political changes, etc.



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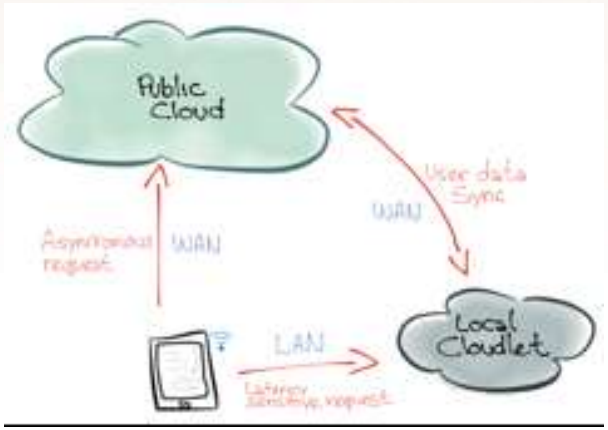

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Community Edge Cloud

Why?

- Political support
  - Differentiated economic development in tech
  - Civic resiliency
- Economic reasons
  - Abundant local access bandwidth
  - Expensive upstream bandwidth
  - Space / power may already exist
  - Enough scale to be competitive
- Technical reasons
  - Supports latency down to a few milliseconds
- Social reasons
  - Spans digital divide – can help close

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Community Edge Cloud – Beaming Services

Shared Community Resources – Library-Like Model

Same services delivered throughout the community
Economical because they are only beamed to a limited set of locations at a time
May be scheduled or on demand (up to a limit)
Library-like model (but delivered via local access network very broadly)

Examples of services:

- access to job skill training VR environments
- tourist-friendly mainstreet AR
- hospital-quality home medical monitoring
- music master classes
- learning a less-popular foreign language interactively
- home digital security scan
- digital incident management services
- specialized local digital currency support (e.g., EBT)

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Stakeholders and Engagement

Shared Community Resources – Library-Like Model

Political Leadership
Economic Development Leadership
University Leadership, Faculty, and Students
Local Foundations and Nonprofits
Volunteer Developers (e.g., Code for America)
Large Local Employers
Local Access Carriers
Local ISPs
Homeless Support Organizations
Citizen Groups
Chambers of Commerce
Regulators
Entrepreneurs

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INNOVATION TRIFORCE

Impact Multiplier

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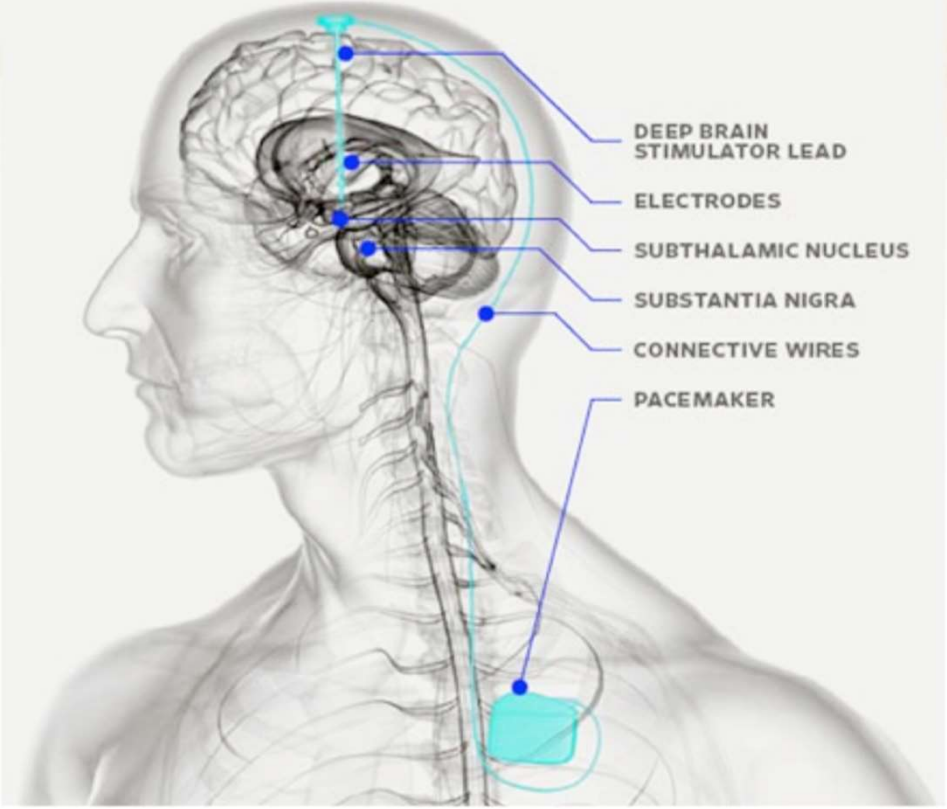
NSF US IGNITE
Remote Management of Deep Brain Stimulation (DBS) Patients
Using Utah Telehealth Network (UTN)

Project Goal

Use computational modeling and high speed network infrastructure to improve access to expert care for patients who live in rural areas.



Wired Magazine, Issue 15.03, March 2007

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Deep Brain Stimulation Overview

Before DBS After DBS

- DBS is an effective therapy for patients with Parkinson‘s disease (PD) or essential tremor (ET).
- Programming DBS devices is a time-consuming process that requires considerable experience and expertise that is generally limited to academic medical centers in big cities.
- Hence, there is a need to improve access to DBS for patients who live in rural areas.

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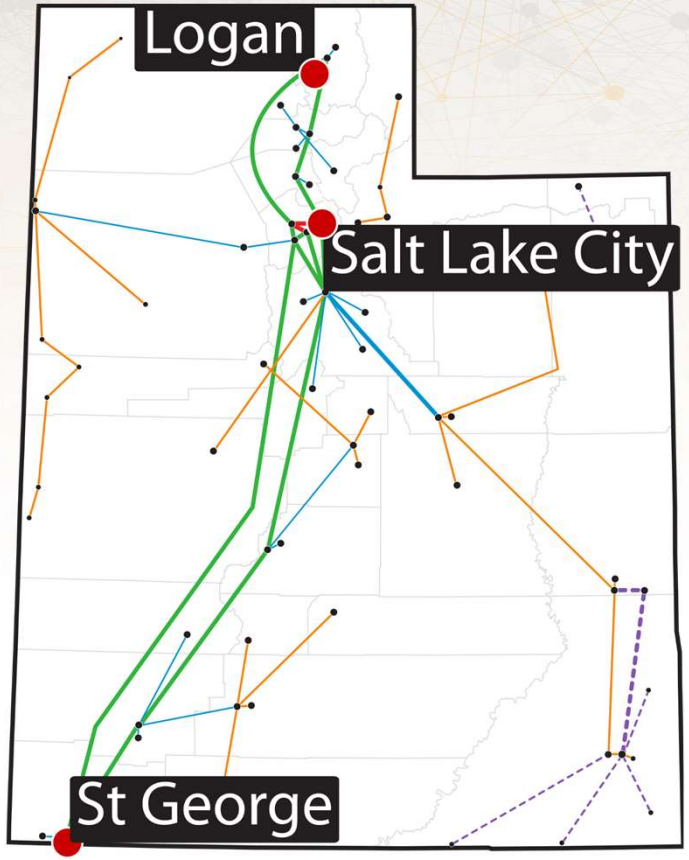
Remote Management of Parkinson‘s Disease Patients



UNIVERSITY OF UTAH HEALTH CARE

Movement Disorder Specialists

SCI

www.sci.utah.edu

Computational Resources
Visualization Experts

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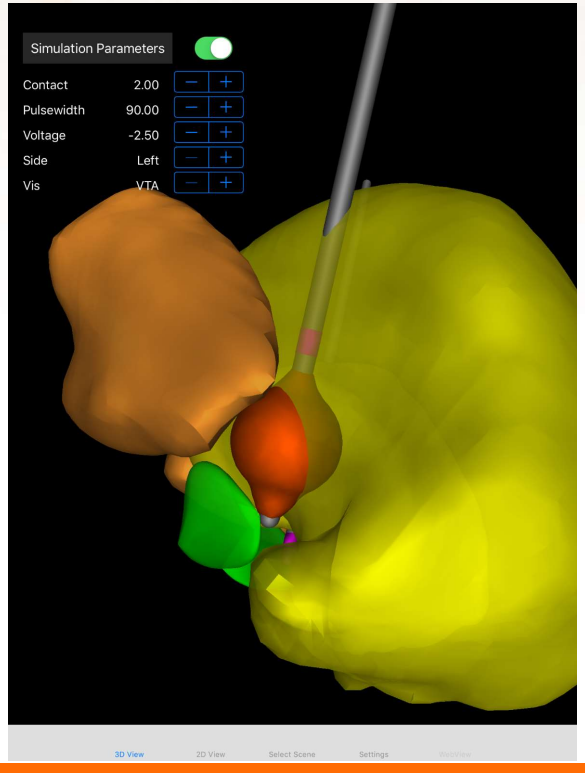
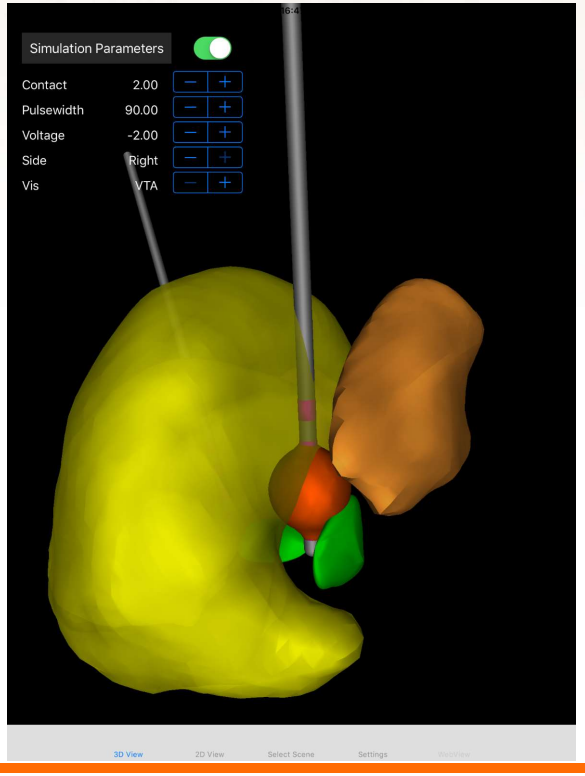
Case study

- 59 year old patient with tremor-predominant Parkinson‘s disease; bilateral DBS targeting subthalamic nucleus (STN)
- Initial programming session in December 2016
- Both initial relief and long-term treatment outcome were non-satisfying

Initial programming settings (simulation):

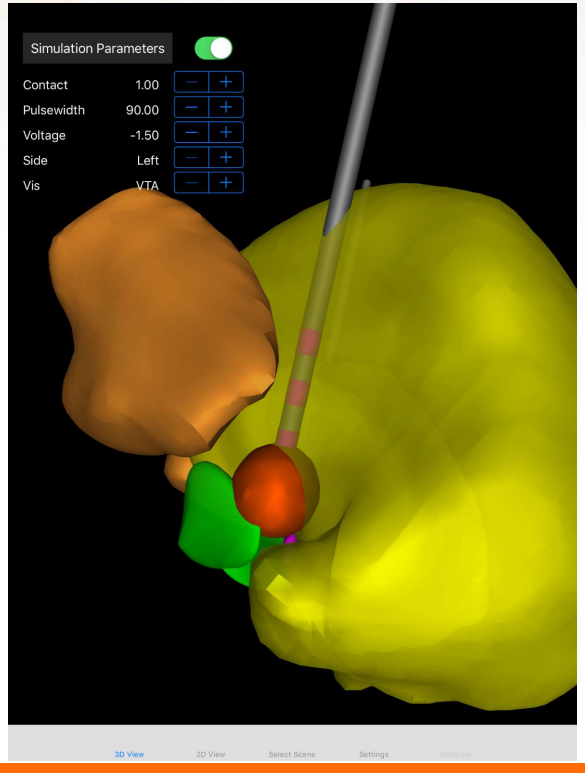


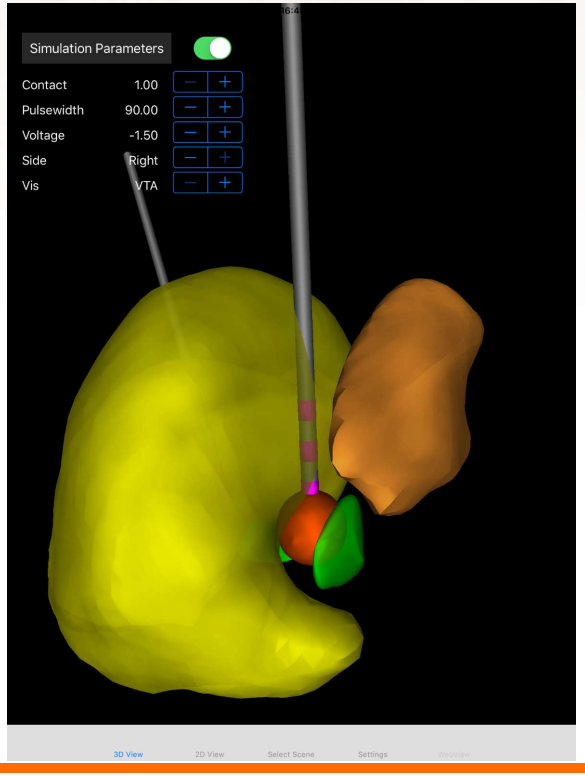


Case study

- In the follow-up visit (May 2017), the iPad-app was used to support the decision making
- The active contact was changed on both sides
- The patient reported immediate symptom improvement
- Long-term relief yet to be determined

New programming settings (simulation):





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