Webinar on
EU-US collaboration for Digital Communities

Wednesday, May 9th, 2018
The event is free of charge
Registration is required

ICT Policy, Research and Innovation for a Smart Society

PICASSO has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 687874.

EU-US collaboration for Digital Communities

Objectives

- The **webinar** will discuss and refine policy recommendations designed to uncover opportunities for EU/US ICT collaboration on making best use of ICT technologies and services in fostering digital communities - specifically those related to three technological domains: 5G networks; Big Data; and the Internet of Things/Cyber-physical systems (IoT/CPS).
- The focus is on **digital communities** and the ways EU and US technological communities can work together to foster the development and implementation of innovative models of social integration in order to address societal and practical challenges facing digital communities regarding mobility, security and territorial monitoring, health and well-being, energy efficiency and environmental sustainability. The interactive discussion will incorporate results from the PICASSO technical domains (5G networks, Big Data, IoT) as well as policy insights relating to Data Protection & Privacy, Security, Standardization, and Spectrum.

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Digital Communities and opportunities for EU-US ICT collaboration

Agenda – Wednesday, 9 May 2018 – 17:00 - 18:30 (UTC)

- **PICASSO Welcome and purpose of the call**
  Maarten Botterman, PICASSO Policy Expert Group Chairman
- **Introduction to EU-US policy issues relating to Digital Communities**
  Maarten Botterman, GNKS Consult
  Jonathan Cave, GNKS Consult and University of Warwick
  Glenn Ricart, US Ignite

Participatory discussion: current status and expected development in EU and US

- **Three domains focus - 5G, Big Data, IoT/CPS**
  PICASSO 5G Networks Expert Group
  PICASSO Big Data Expert Group
  PICASSO IoT/CPS Expert Group
- **Preliminary conclusions (Briefing Document validation)**

Participatory discussion: Focus per domain on contributions to issues affecting digital communities in the context of EU-US ICT R&I collaboration

Project in brief

> **Coordination and Support Action**, funded by the European Commission/DG CONNECT

> **Duration:** January 1, 2016 - June 30, 2018

> **Target groups:** industry, government and civil society actors involved with ICT research and innovation development and policy

> **Target regions:** European Union, United States of America

> **Key Message:** ICT research and innovation (R&I) collaboration between the EU and the US can help it to reflect socioeconomic and technological realities and to improve the contributions of ICT development and policy to enhancing economic growth and reconciling industrial needs with societal objectives.

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EU-US ICT collaboration

PICASSO priorities at the heart of EU policy orientations

"On its Strategy to create a Digital Single Market and digitise European industry, the European Commission focuses on accelerate standard setting and related enabling technologies, such as 5G, cloud computing, internet of things, data technologies and cybersecurity."

Andrus Ansip , Vice-President EC for Digital Single Market
Günther Oettinger, Commissioner for Digital Economy and Society

PICASSO focusses on synergies between ICT *policies* and ICT *technologies* to:

> reinforce EU-US collaboration in pre-competitive ICT R&I in key enabling technologies with the greatest promise in meeting societal challenges: **5G Networks, Big Data and Internet of Things (focus on Cyber Physical Systems)**

> support EU-US ICT policy dialogue by creating a forum for discussion and contributing to policy debate regarding **privacy, security, internet governance, interoperability and ethics**.

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Expert Groups

3 Technology Groups
Strategic ICT Technology areas linked to Societal Challenges

5G Networks | **Big Data** | **IoT/CPS**

Synergies between policy and technology groups

1 Horizontal Group
On ICT Policy linked to key ICT technology areas

Policy issues:
Privacy and data protection | Security | Standards and Interoperability | Spectrum …

+25 Experts in total across all groups

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How to Participate

An Overview of the Adobe Connect System

Margot Bezzi
Project Manager
Agency for the Promotion of the European Research, Italy

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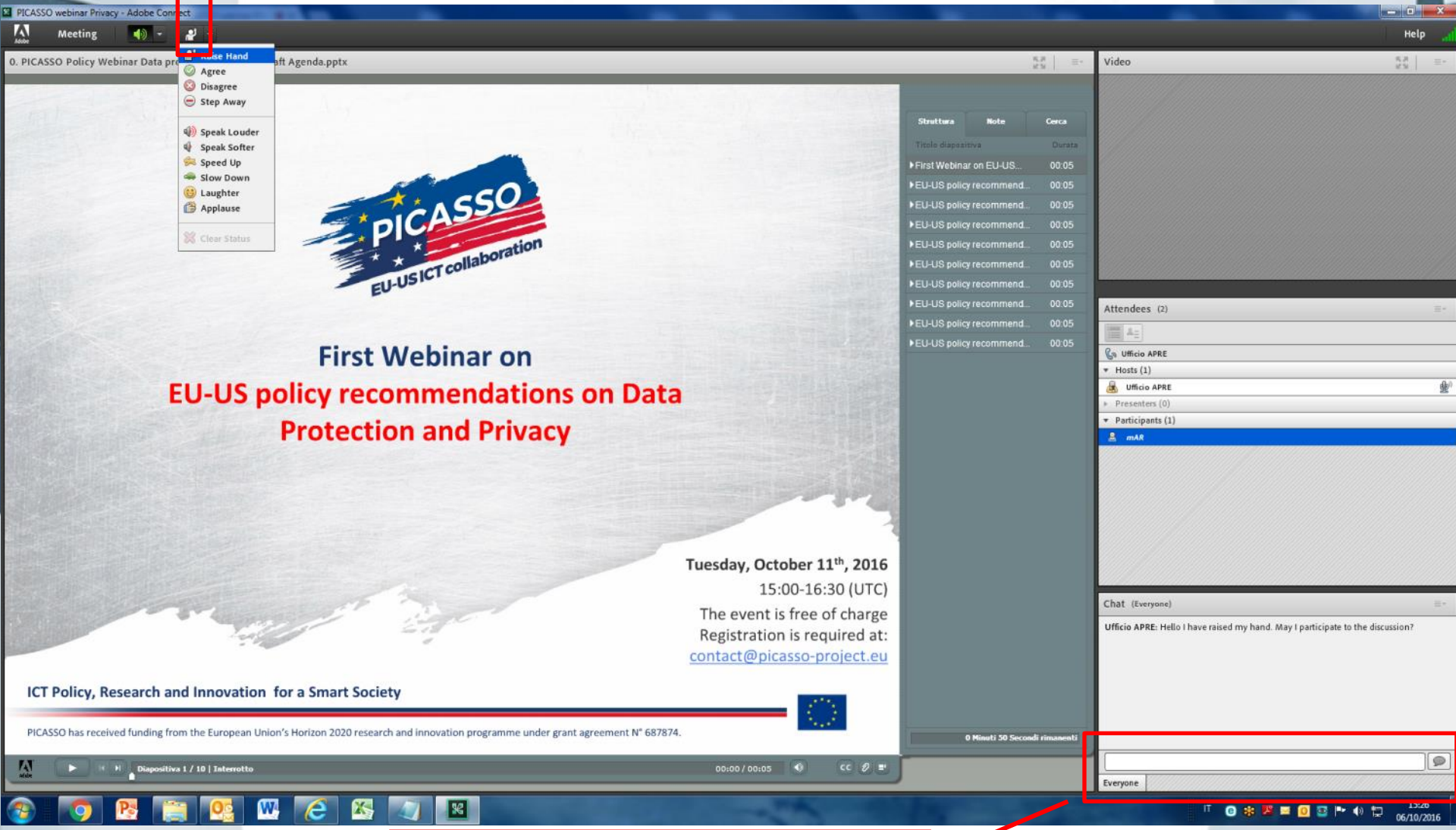
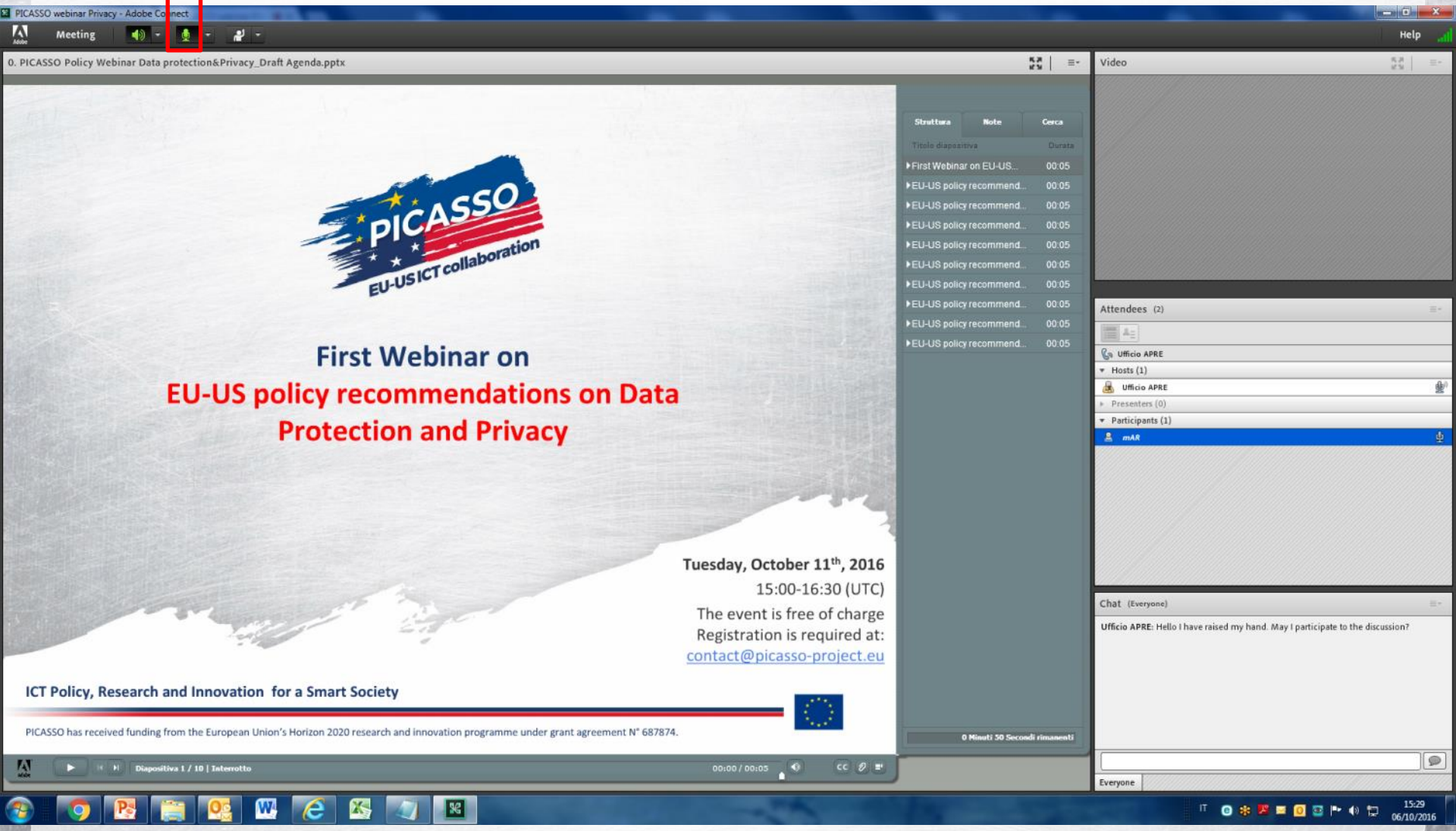
If you want to contribute to the discussion, you can raise your hand.
The Host will receive your request and allow you to talk.



You can also contribute via Chat.
The Host will monitor it and address your questions.

Before speaking, make sure your microphone is enabled (in green). If needed, adjust the microphone's volume.



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Opportunities related to Digital Communities for EU-US ICT collaboration:

Scoping the issue

Maarten Botterman & Jonathan Cave
PICASSO ICT Policy Expert Group

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Why “Digital Communities”?

- Digital communities will continue to evolve, via:
  - progressive digitisation of existing communities,
  - intentional creation of explicitly digital communities and
  - emergence of new communities from the development, deployment and use of digital services.

- Our aim is to establish a framework for the consideration of issues related to digital communities as they affect opportunities for future EU/US ICT-orientated research collaborations, specifically in the technological domains associated with 5G networks, Big Data, and IoT/CPS

What are “Digital Communities”

“Digital Communities are where people come together to learn, share and collaborate to build digital solutions to common problems and challenges, or where they interact via digital platforms to tackle shared problems and challenges or simply to live together in ways that may create their own 'digital challenges'”.

Where do they come from?

- Digital communities are *possible* when people are in close proximity
- They are *desirable or likely* when people share values, face common problems and/or have complementary viewpoints and capabilities
- But
  - Proximity is not limited to geographic closeness
  - Making digital communities possible does not mean they will form
  - Connectivity and community are not the same
  - Communities have an ethical as well as societal, cultural and functional dimensions

Privacy aspects

- These attract intense attention around the world
- The way to tackle this is under policy debate between US and EU, triggered by the EU GDPR and the US Cloud Act
- People are increasingly aware and concerned, in response to GDPR implementation and even more following the Facebook/Cambridge Analytics case and related instances
- Increased digitisation and big data analytics make it possible to relate more data to persons than in the past
- Growing recognition of the need to build in privacy from the outset when developing infrastructures, services and applications

Security

Experience has fostered increased awareness of the need for

- security of devices
- making relevant parties accountable for security measures even when they are not directly affected by security breaches (misuse of facilities)
- Enabling security by default in a way that allows specific local solutions to be developed

Standardisation

- The generic nature of much ICT leads to use of the same devices
  - for many different applications
  - more often in different sectors
- These “crossovers” argue for a networked (as opposed to a federated or hierarchical) structure of standardisation!
- Standards need to serve:
  - Scalability
  - Interoperability
  - Build-in privacy sensitivity
  - Security of access and use

Spectrum

The increased demands for spectrum require:

- Using higher frequencies
- More efficient use of existing resources e.g. by means of Dynamic Spectrum Access (DSA) techniques
- Multiple input multiple output (MIMO) space diversity
- Use of TV white space and other spectral domains

5G networks and Digital Communities

- 5G networks will further increase connectivity for
  - Massive applications and
  - Critical applications
- There is a danger of new digital divides, as with "broadband" availability
  - More scalable, thus local initiatives relatively more impactful
  - Positive action (regulations, stimulations, transparency) needed

Big Data and Digital Communities

- Data analytics can facilitate community governance
- Routine (esp. locally critical) services can benefit from automation
- Dependability is a particular challenge for data-driven critical systems
- Facilitation of awareness: “data objectivation”
- Data analytics can be used to facilitate transparency and accountability (explicability)

IoT/CPS and Digital Communities

- IoT is a massive enabler of services in any community (IoT devices together form Cyber Physical Systems aimed at a specific purpose)
- Connectivity is key … and increasingly available
- Scalability is standard, and standardisation will help to deploy IoT “things” in different sectors
- Sharing of devices as a “cloud” of IoT for Communities
- Security is key – otherwise solutions will not be sustainable

Opportunities related to Digital Communities for EU-US ICT collaboration:

US perspectives

Glenn Ricart
US Ignite
PICASSO ICT Policy Expert Group

PICASSO has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 687874.

US Comments

Glenn.Ricart@us-ignite.org

09 May 2018

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Digital Communities

“Digital Communities are where people come together to learn, share and collaborate to build digital solutions to common problems and challenges”.

What are Communities?

- *Innovation districts*
- *Cities*
- *Metropolitan areas*
- *Counties*
- *States*
- *Tribes*

Broadband in the United States (2016)

%. of Population Has access to

92.3%	25Mbps/3Mbps fixed
90.8%	50Mbps/5Mbps fixed
85.3%	25Mbps/3Mbps fixed + 10Mbps/3Mbps cellular

89.8% in evaluated urban areas
61.0% in evaluated rural areas

Federal Communications Commission, 2018 BROADBAND DEPLOYMENT REPORT, FCC 10-18-10A1,
2 February 2018

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To and Through Community Anchor Institutions

Community anchor = school, library, health clinic, community college

U.S. National Broadband Plan called for all anchors to have gigabit connectivity by the year 2020

95% of the US population is in the same zip code as a community anchor

Fixed wireless and/or TV Whitespace could cover the rest of the distance and can connect 80% of rural America

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Digital Town Square

Local Interconnect

Local-traffic-only high-performance in-community exchange point
10-100 Gbps exchange between gigabit-class access networks
Ultimate hot potato routing

Local Edge Compute and Storage

Shared local resources for as-needed applications and services
Remote management of sensors, robotics, VR

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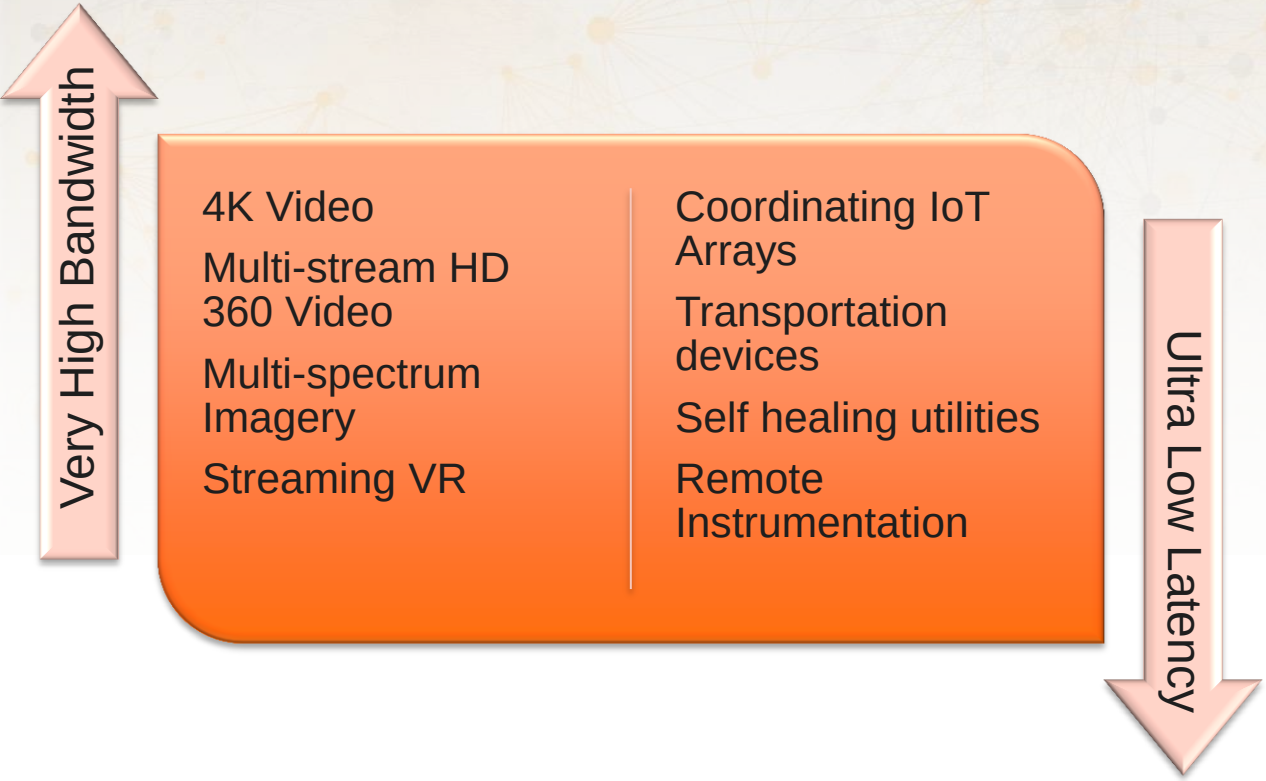
Characteristic Trends



Real World Examples

- Infrastructure Monitoring
  - BW – Data to Edge
  - L – Pinpoint event
- Language Learning
  - BW – Video/Audio to Edge
  - L – Feedback at event
- STEM Instrumentation
  - BW – 4k video
  - L - Responsiveness

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Fortunately, We Know a Lot about Advanced Cyberinfrastructure

High performance computing addresses smart community needs

- Big Data
- Machine Learning
- Real-time Image Analysis
- Managing Connected Vehicles in Motion
- Information Fusion
- Predicting and Positioning Community Resources
  - public safety, transportation, medical, etc.

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Smart Community Advanced Cyberinfrastructure: Networking

We also know a lot about high performance networking

Smart and Connected Community Networking:

- Heavily localized
- What happens in Vegas …
- IoT and cyber-physical systems have immediate **local** impact
- but often need millisecond-class response (streaming VR)
- Usually divided between multiple ISPs and local carriers
- Google Fiber, AT&T Gigapower, Comcast Gigabit, etc.
  - are only gigabit within their **local** access network

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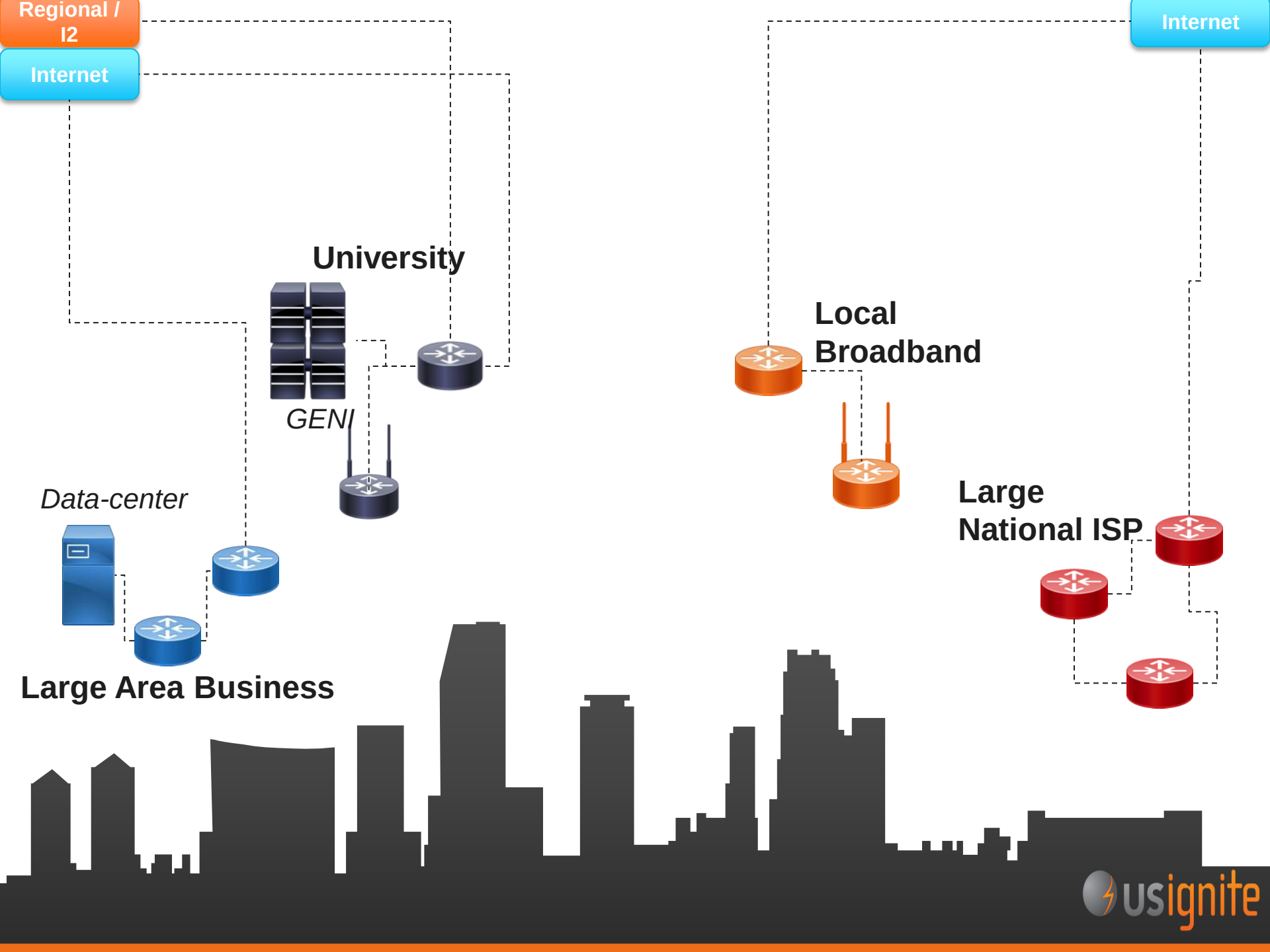
Regional / I2
Internet
Internet
University
GENI
Local Broadband
Data-center
Large National ISP
Large Area Business
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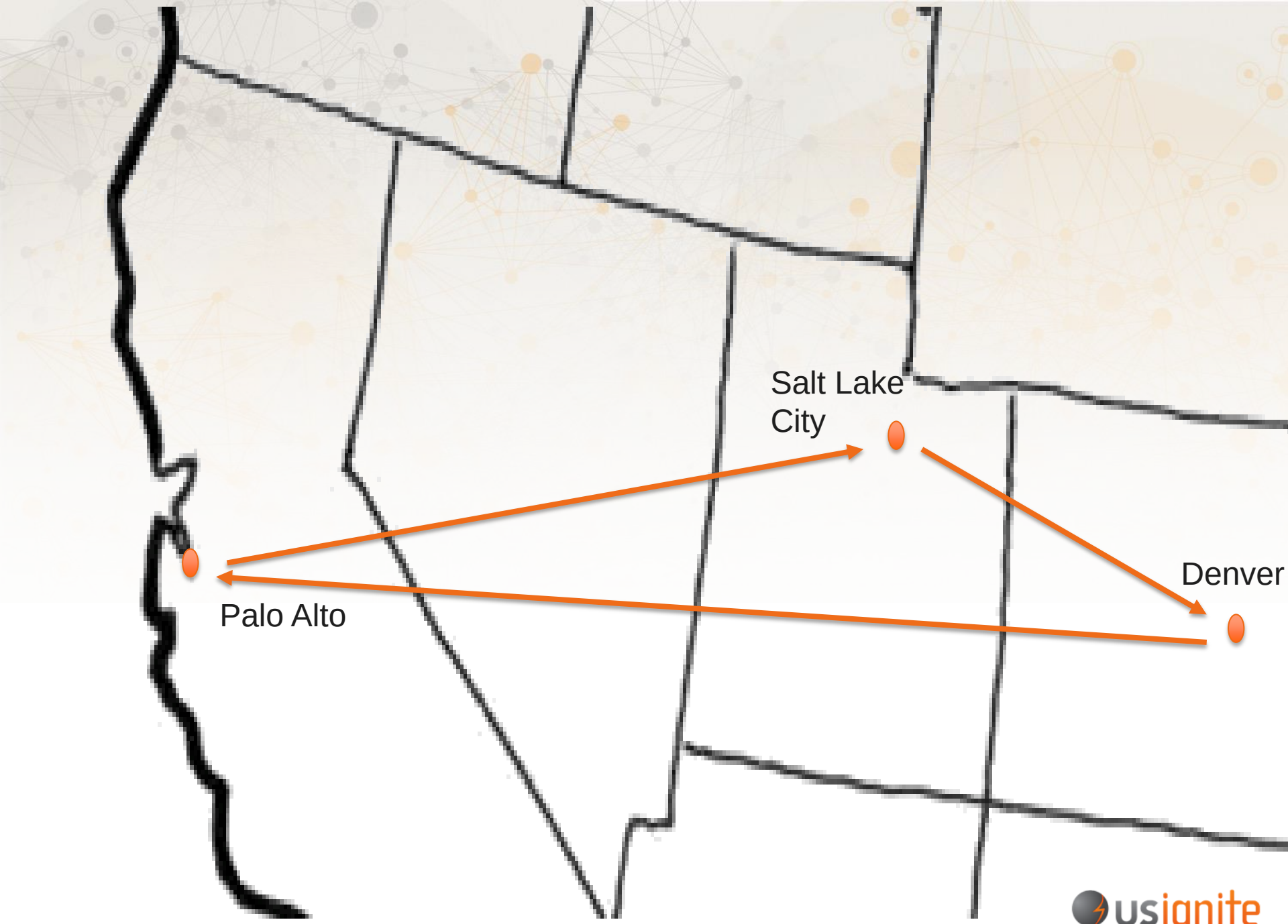
Salt Lake City
Denver
Palo Alto

Digital Town Square Local Interconnect

Local-traffic-only high-performance in-community exchange point
10-100 Gbps exchange between gigabit-class access networks
Ultimate hot potato routing
Settlement-free for local traffic

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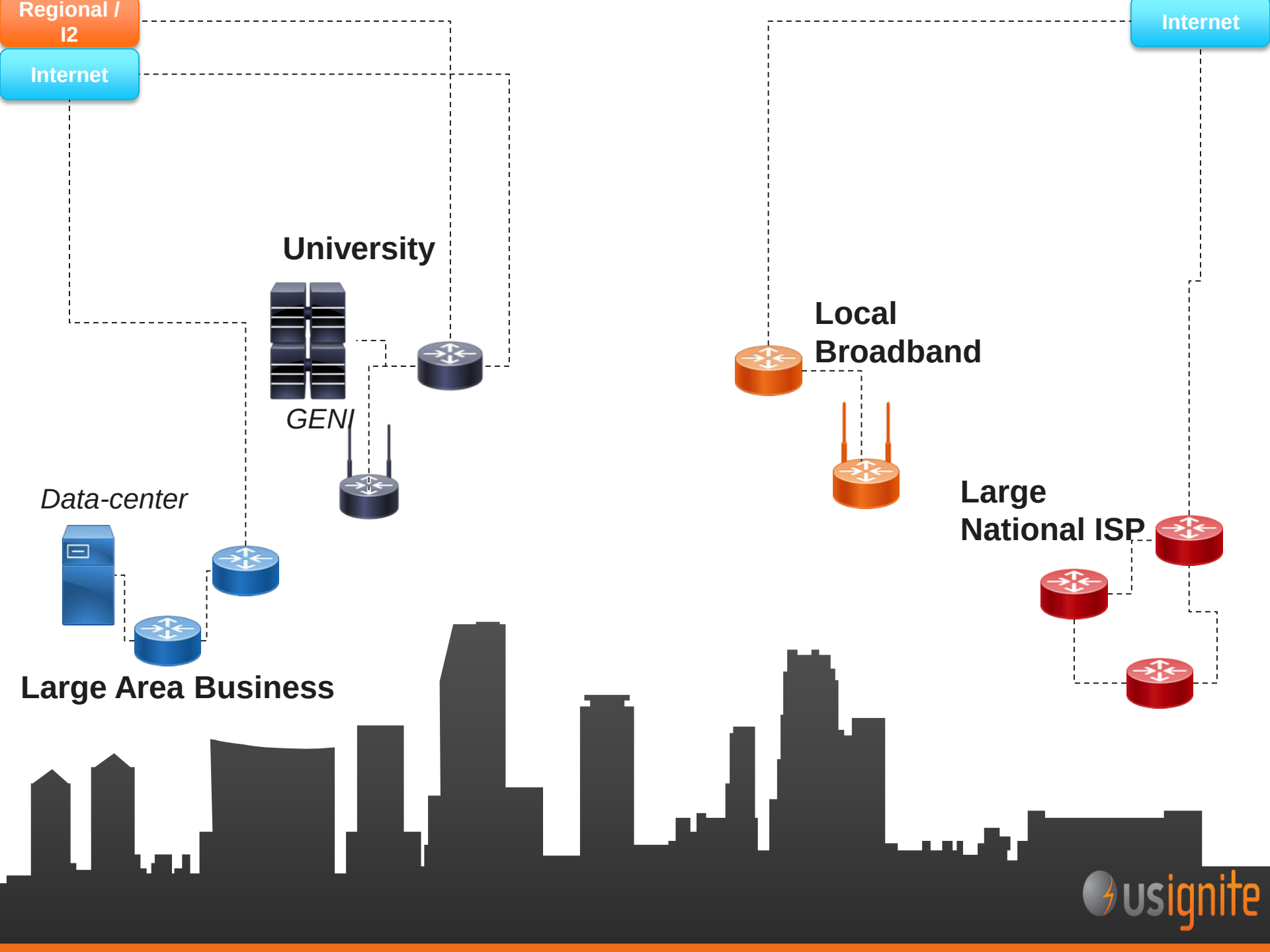
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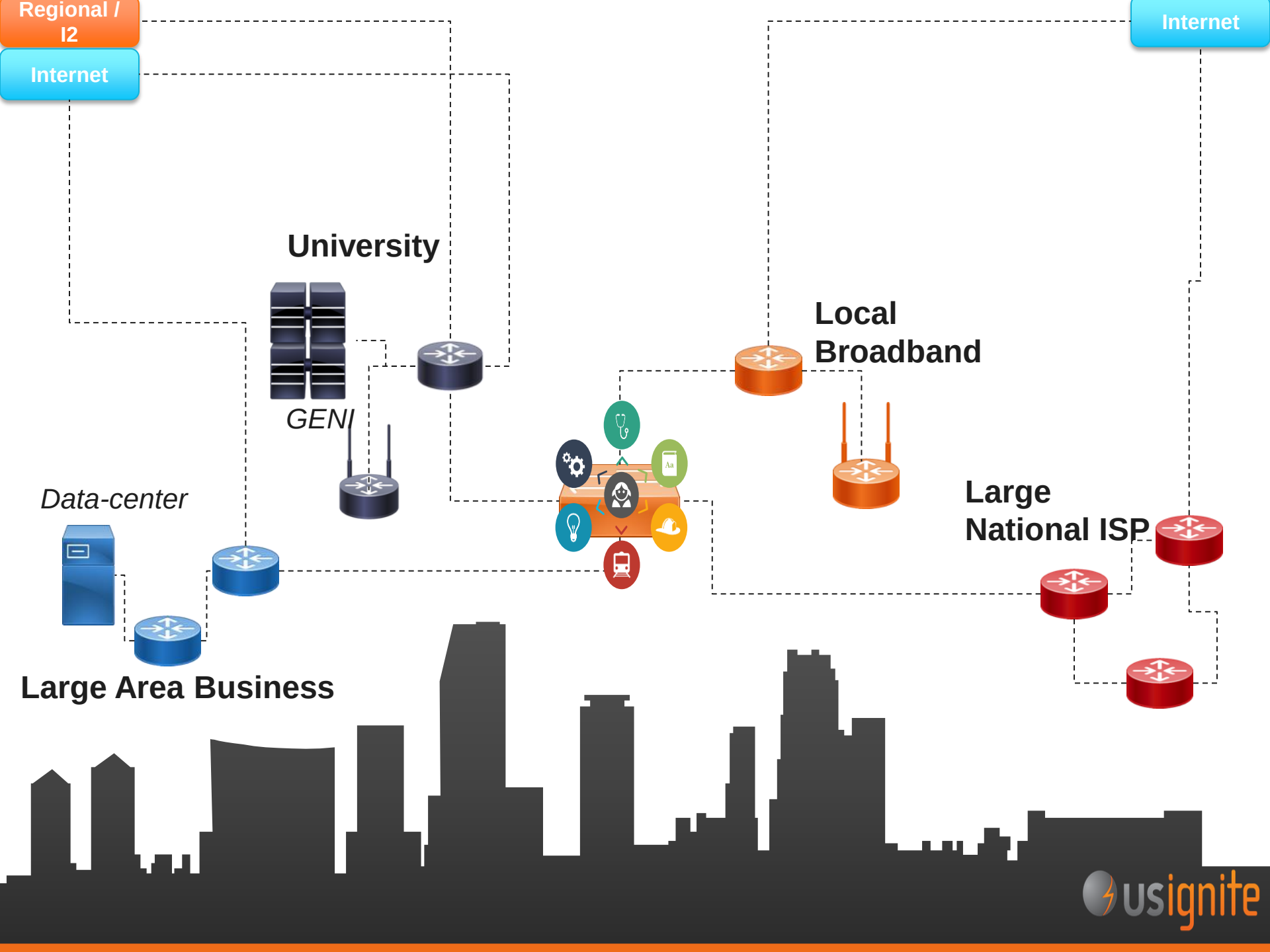
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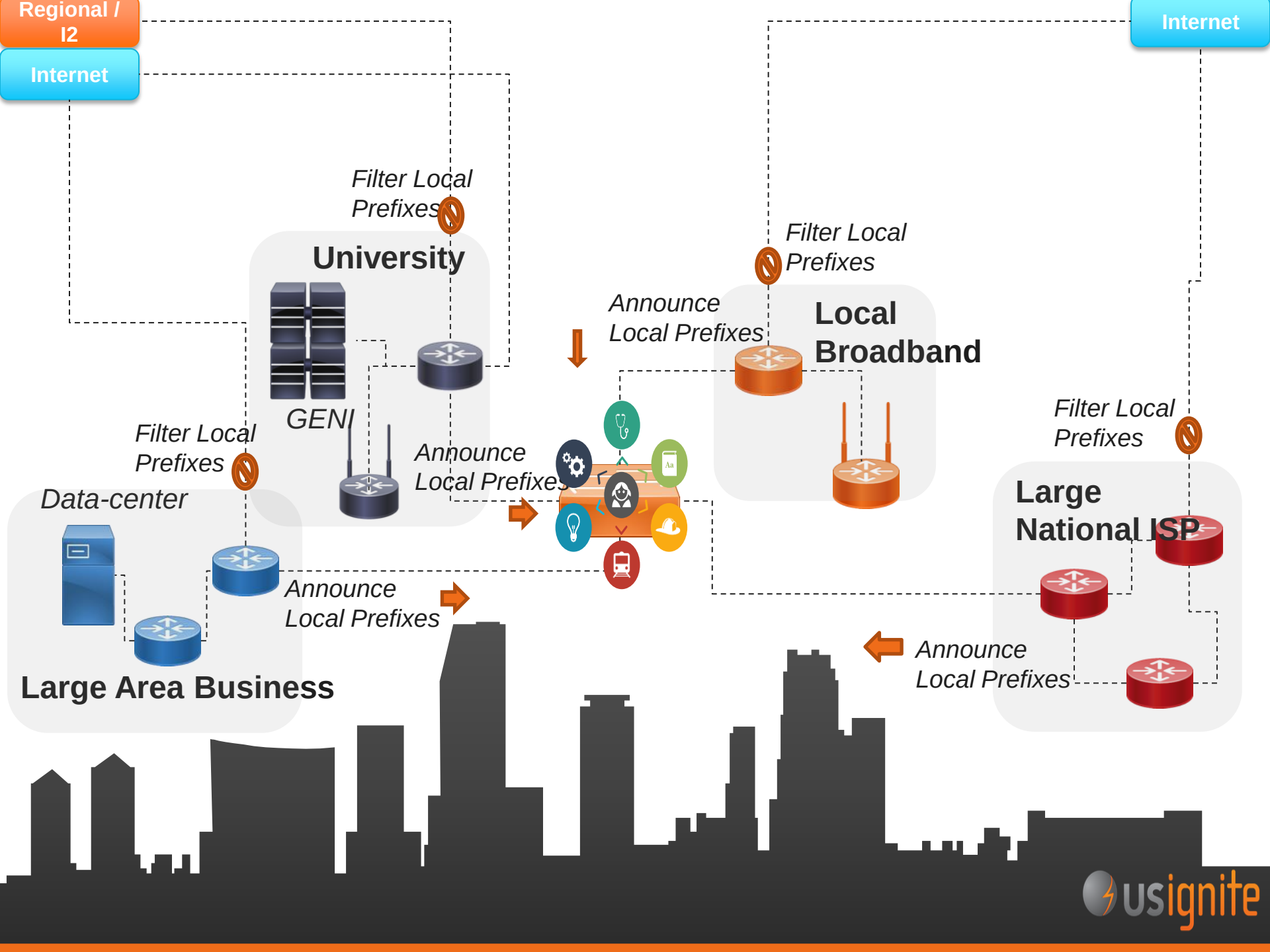
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Local Broadband
Announce Local Prefixes
Filter Local Prefixes
Large National ISP
Data-center
Announce Local Prefixes
Large Area Business
Announce Local Prefixes
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Typical Interconnects

Local gigabit-class ISPs and carriers
Existing advanced networks: universities, large companies
School systems, museums, and other community anchors
City’s own network(s)
Vendors providing smart city services
Regional and state R&E networks
State Departments of Transportation

Not Typical Peering

Typical peering

- Negotiated business model
- Bottlenecks and bandwidth limitations
- Typically done upstream => increased latency

DTS local access interconnect

- Settlement-free in-community local-traffic-only handoff
- Reduces everyone's intercity traffic
- May or may not route on AS number (depending on scope of AS)
- Can preserve differential quality of service across interconnect
  - (with bilateral agreements)

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Digital Town Square Edge Compute and Storage

Take advantage of smart community applications with locality
Sensors, Cyber-physical Systems, Traffic Control
Remote management of sensors, robotics, VR, etc.
Civic resiliency in times of emergency or natural disaster
Millisecond-class responsiveness
Local digital economy
Ideally competitively provided via DTS interconnects
Temporary solution: using university or civic GENI racks +
    GENI network for inter-city connectivity
Longer-term solution: gigabit, millisecond, edge compute and storage

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Digital Town Square: Impact

Smart Community = Edge Computing and Storage + Local Interconnect
Connected Community = DTS interconnected with other DTSes

Result: Smart and Connected Community applications and services

- Millisecond Responsive
- Nearly unconstrained inter-provider connectivity
- Local Resilience
- Leverages locality of many of these applications

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Digital Town Square: Impact

Smart Community = Edge Computing and Storage + Local Interconnect

Connected Community = DTS interconnected with other DTSes

Deploying a DTS Interconnect in 25 Smart Gigabit Communities

- One or more locations per community for reliability
- Using or upgrading existing facilities where they exist
- Deploying Juniper SDN switches where they don’t exist
- A municipal, neutral, or donor network = distributed DTS

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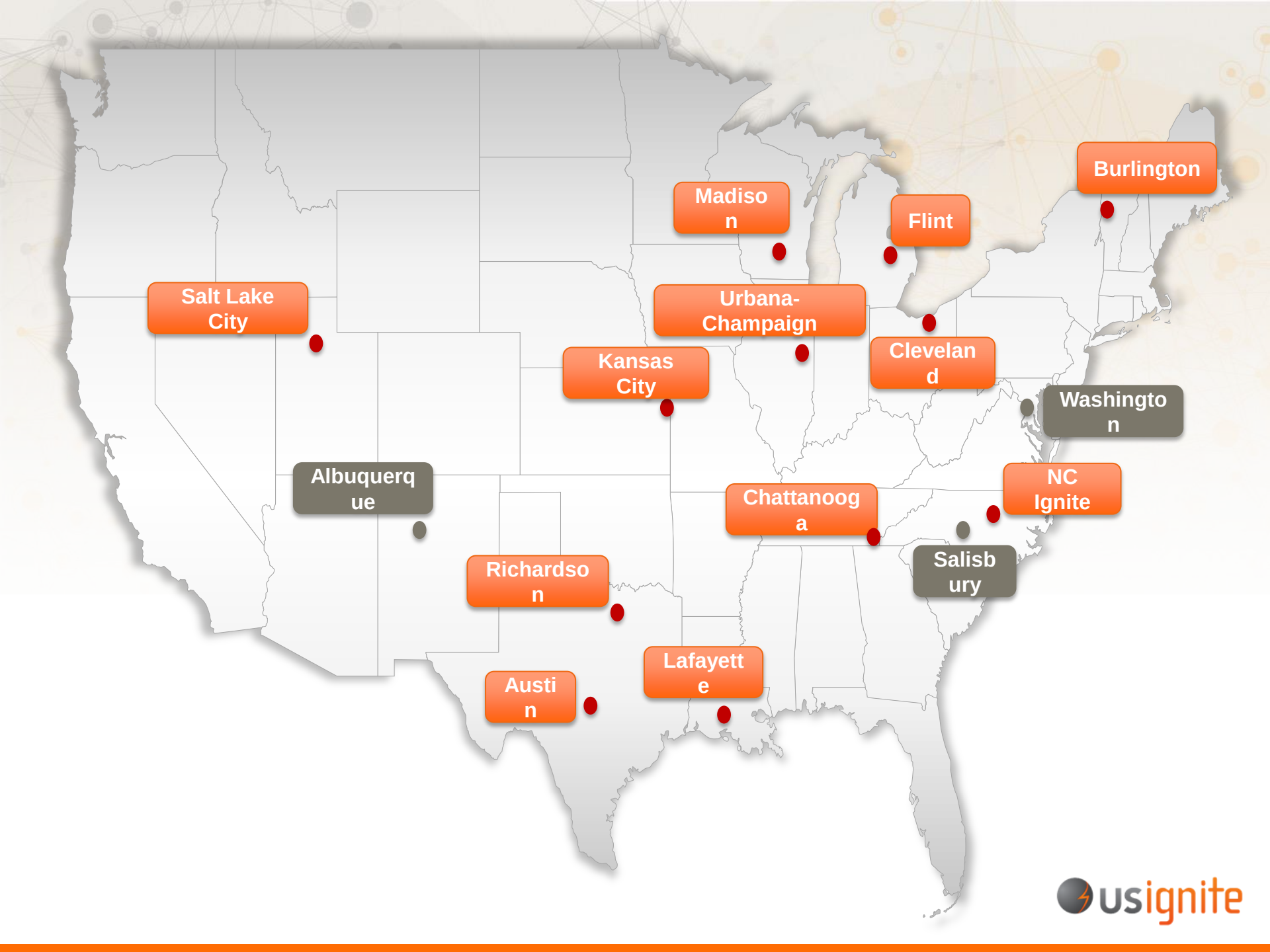
Burlington
Madison
Flint
Salt Lake City
Urbana-Champaign
Cleveland
Kansas City
Washington
Albuquerque
NC Ignite
Chattanooga
Salisbury
Richardson
Lafayette
Austin

01 Gig Providers

Identify all the local gigabit players including dark fiber

02 GENI & Edg

Agreements with edge compute hosts. Understand deployment options

03 Exchange Point

Identify Switch Host

04 Direct Fiber Paths

Build out fiber paths for any networks not already connected through the DTS switch

05 Route Local Tra ffic

Configure BGP, AS paths, and route local prefixes laterally

Start Deploying Gigabit Applications

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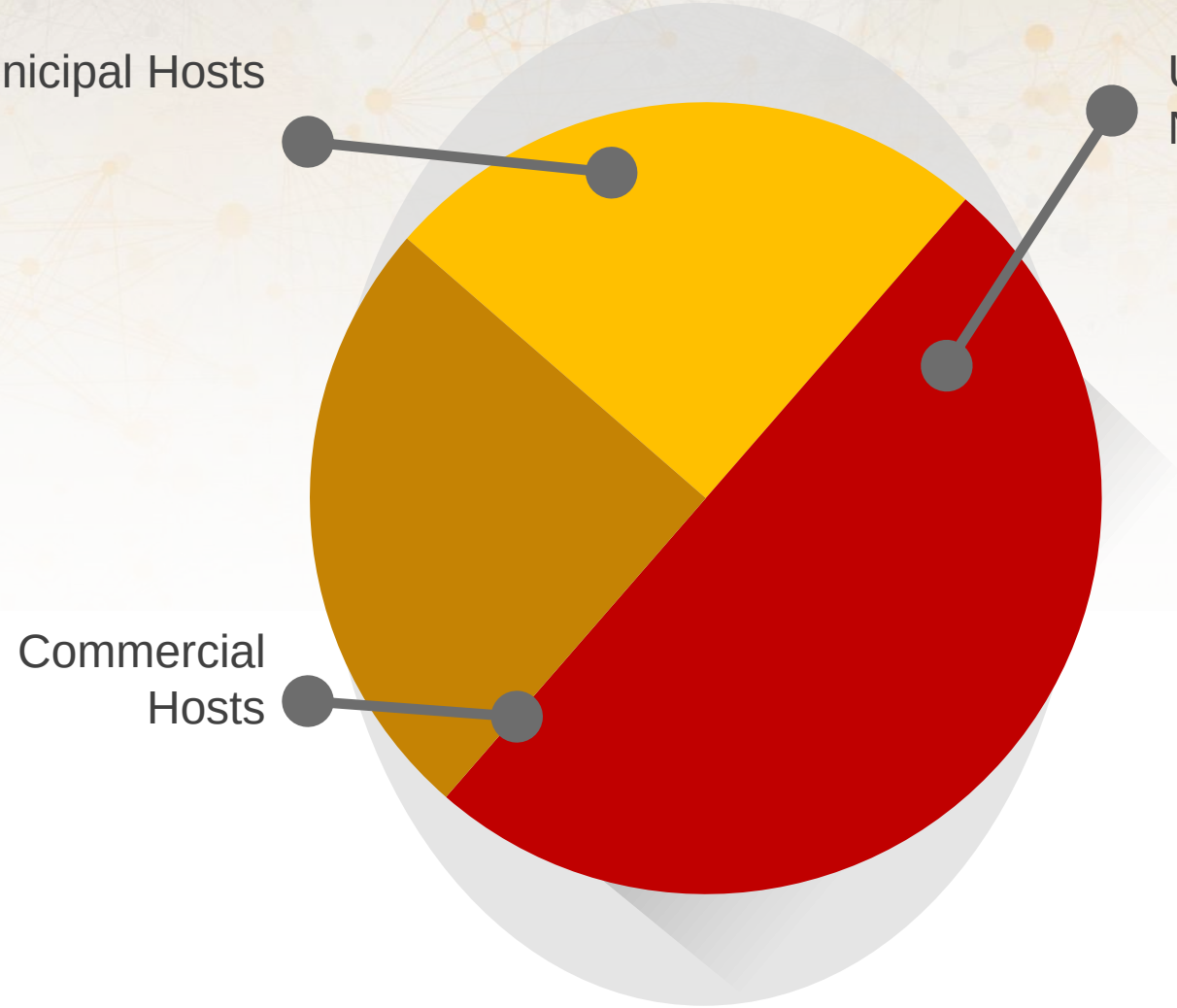
Switch Hosts So Far



- Rack Space
- Power
- Configuration Help
- Security
- Fiber to PoPs
- 2x New Switches

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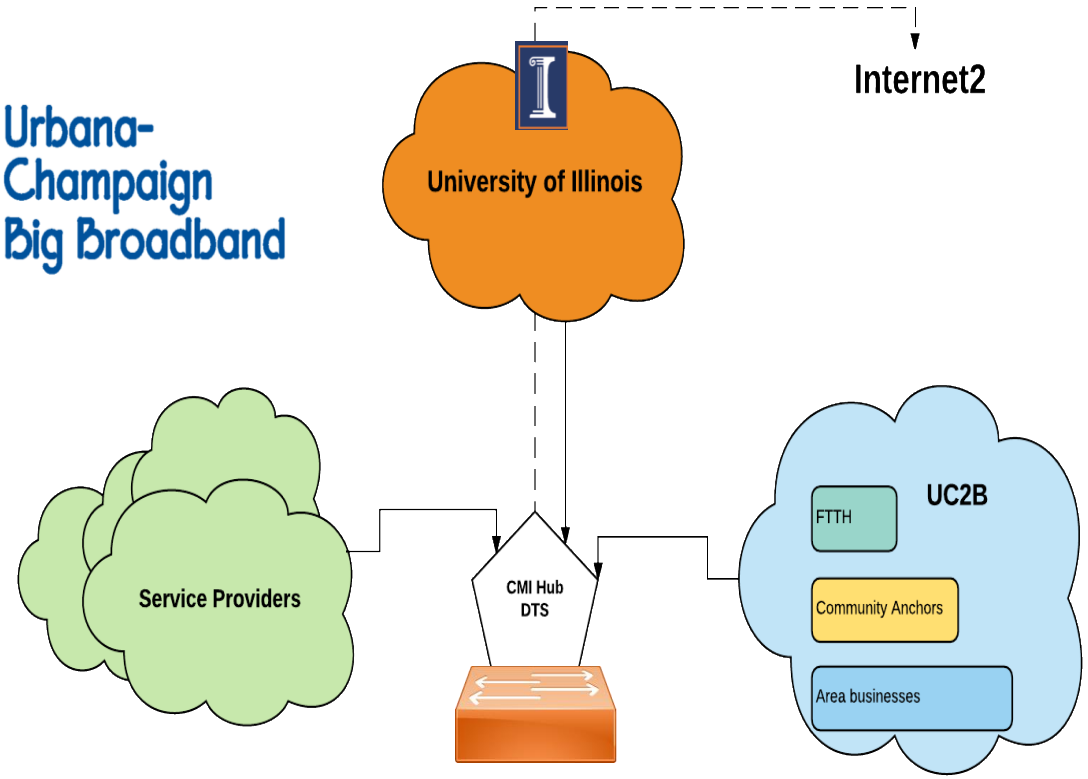
Use Case: Urbana-Champaign, IL

UC2B Urbana-Champaign Big Broadband

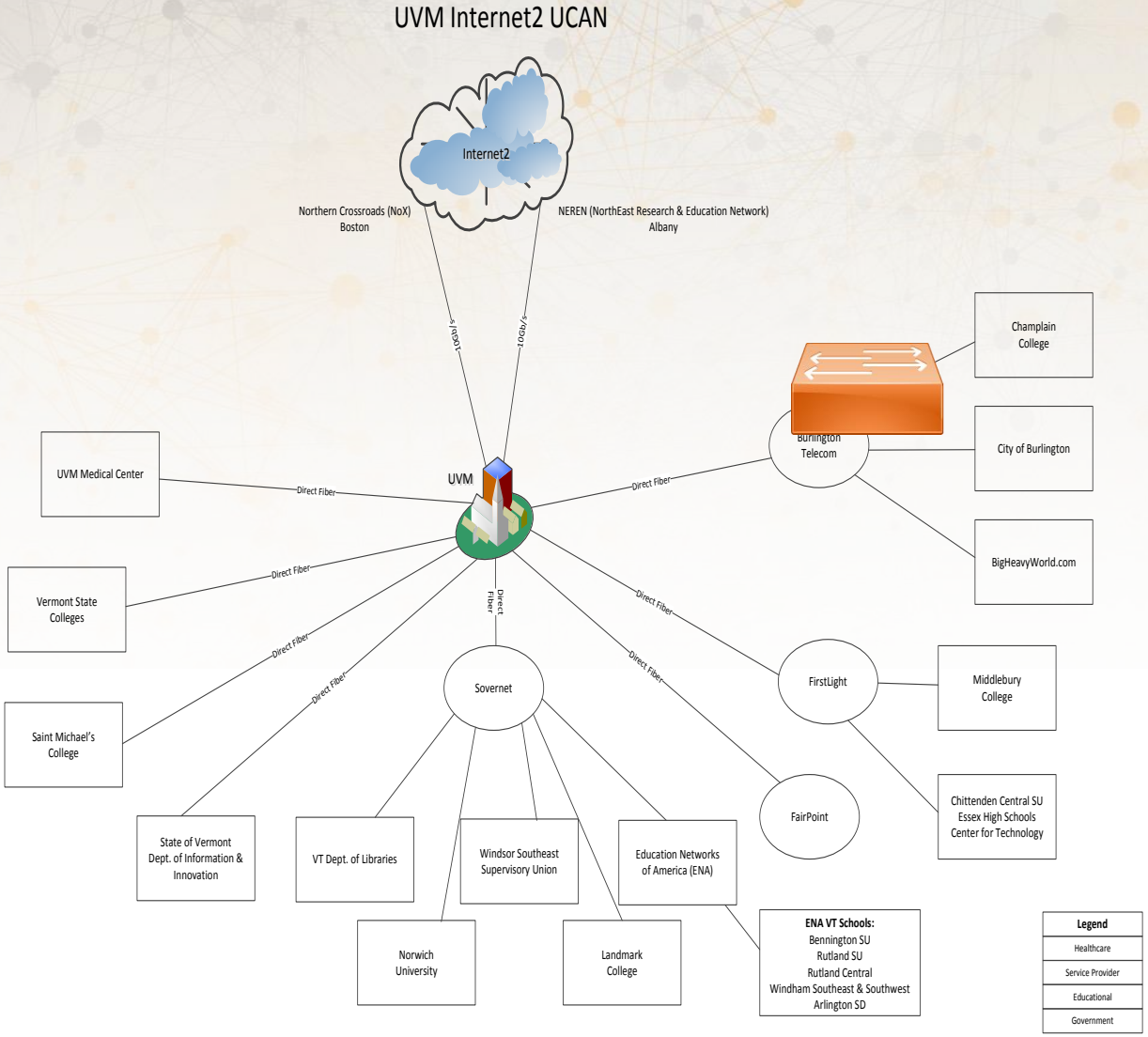


ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

DTS Work @ CMI Hub

- Upgrade Switch to improve Gigabit capacity
- Great existing connectivity
- Connect some additional Service Providers
- Shorten Existing Routes

Use Case: Burlington, Vermont



DTS Work @ Burlington Telecom

- Great existing connectivity
- Shorten Routes
  - Large ISPs
  - Educational Broadband
  - Hospitals

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OUTLOOK AND CONCLUSIONS

Perspectives towards the future

- Communities will shape the future we want to live in. In return, the way they shape up will be co-determined by that is made possible by technologies such as 5G networks, Big Data, and IoT;
- Research questions arising:
  - How to ensure all have access to sufficiently advanced wireless access, and how do we determine what “sufficiently” means?
    - How to make better use of “unregulated space”’;
    - How to make better use of available space through intelligence in communications;
  - Focus on edge computing / cloud sharing;
    - Cloud of data
    - Cloud of IoT devices
    - Secure, privacy supporting, and safe

Perspectives towards the future (2)

- Technology innovation research focus set …
  … and ethical limitations made explicit…
  … by social science research …
  … that includes benefiting from availability of data!

- Needs of communities will not be the same, but are likely to include:
  - Healthcare applications and solutions;
  - Education applications and solutions;
  - Public safety applications and solutions;
- Space needed for experimentation

Preliminary conclusions

- Huge opportunity to learn from practice
  - Innovation is foremost in societal application of new technologies to address issues Communities care about;
  - Fundamental technology innovation needs to be scalable, affordable, and interoperable (at least at the level of addressing and data communication
- Key to take policy challenges into account:
  - from the outset
  - At each level (in the value chain) of service delivery
- Issues (and opportunities) are global, even if not everywhere the same (i.e. local applications from global technologies and services

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Agency for the Promotion of the European Research (APRE), Italy

Honeywell International INC (HON), United States

GNKS Consult BV, (GNKS), The Netherlands

Technische Universitaet Dresden (TUD), Germany

Florida International University, (FIU), United States

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More on Picasso

www.picasso-project.eu

@picasso_ICT

PICASSO – EU/US ICT research, innovation and policy collaboration

EU-US collaboration for Digital Communities

Maarten Botterman's bio

Maarten Botterman
Director of GNKS

- Maarten Botterman is Founder and Director of GNKS, a company known for its policy research on information society issues. He is currently ICANN Board Director, Chairman of the IGF Dynamic Coalition on the Internet of Things, and Chairman of the Supervisory Board of NLnet Foundation. Maarten is information society policy expert, based in the Netherlands, and with a focus on European, US and global information society policy issues like impact of technology on society, global governance, information assurance, e-government, and global internet challenges. He has been involved in Information Security policy, Data protection, Future Internet and Internet Governance, both as policy analyst (RAND, GNKS), and in his Board positions at ICANN, NLnet Foundation and Public Interest Registry. He has been involved in studies and impact assessments around future internet and other ICT policy related studies since 1999.

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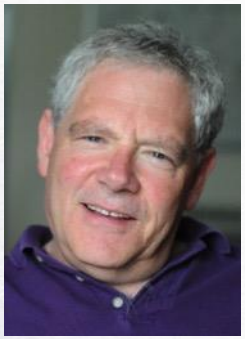
Prof. Dr. J.A.K. Cave's bio



Prof. Dr. J.A.K. Cave
Full Professor at Warwick University, United Kingdom
Economist member of the UK's Regulatory Policy Committee

- **Prof. Dr. J.A.K. Cave** is Professor in Economics at Warwick University. Jonathan Cave holds degrees from Yale (B.Sc.), Cambridge (MA), and Stanford (Ph.D.). In his position as Senior Economist at RAND Europe (up to February 2015), he has led projects on a variety of issues in telecommunications (transition from rate-of-return to price-cap regulation, legal issues arising on the electronic highway, universal service and the Internet), social policy (effects of aging European populations), industrial policy, and government's evolving role (passing on costs of government activity to private parties, market failure in the waste disposal industry, use of government procurement as a tool to spur innovation).

- Many of these projects involved international comparisons and teams spread across different organizations and nations. He is recently appointed as Economist member of the UK's Regulatory Policy Committee.

- Prof. Dr. J.A.K. Cave is member of the EU-US ICT Policy Expert Group in the project PICASSO "ICT Policy, Research and Innovation for a Smart Society: towards new avenues in EU-US ICT collaboration".

EU-US collaboration for Digital Communities

Glenn Ricart's bio

Glenn Ricart
Founder and CTO of US Ignite, USA

- **Dr. Glenn Ricart** is a technologist, businessman, CTO, computer networking and security specialist, and academic / educator. He has worked at the intersection of business, policy, and technology for more than 30 years. Among other accomplishments, he started what might be viewed as the first Internet Service Provider (ISP), has founded or co-founded 3 successful startups, served as EVP and CTO of Novell, and been DARPA's liaison to the Clinton White House. Areas of computer techology interest include: networking, security, wireless, and distributed algorithms. Dr. Ricart's most requested talks are on the future of technology and the application of that future to business or policy.

- Glenn previously served on the boards of the Internet Society, Public Interest Registry, BITNET, CACI, First USA Financial Services, Santa Cruz Operation, and NASULGC. He was inducted into the Internet Hall of Fame in 2013

- Dr. Glenn Ricart is member of the EU-US ICT Policy Expert Group in the project PICASSO "ICT Policy, Research and Innovation for a Smart Society: towards new avenues in EU-US ICT collaboration".