
INNOVATION & TECHNOLOGY
SUMMIT
2017

Smart Gigabit Communities

UT Dallas 2017 Innovation & Technology Summit

May 16, 2017

Welcome

Mike Skelton

Director

Mayor's Office of International Business

Richardson Economic Development Partnership

Program Agenda

- Mike Skelton
  - US Ignite Smart Gigabit Communities Program
  - Richardson US Ignite Initiative
- Gi Vania
  - Richardson GENI Infrastructure
- Mike Skelton
  - Gigabit Application Challenge –”Smart Gigabit Campus”
  - Richardson Community Challenge /Winners
- Dr. Don Hicks,
  - What’s Next?
- Q&A

Mission, Focus, Goals

- **usignite Launch:** January 2011 (NSF project)
- **Mission:** foster the creation of next-generation Internet applications that provide transformative public benefit (that stimulate the deployment of broadband fiber and wireless networks nationwide).
- **Areas of Focus:**

  Healthcare **Education/Workforce** **Public Safety**
  Transportation **Advanced Manufacturing** **Energy**

- **5 year Goals**

  60 applications
  200 community testbeds participating

SUSTAINABLE ECOSYSTEM OF SMART APPLICATIONS

- **Common locavore infrastructure**
- **Applications adapted to the locavore infrastructure**
- **Organizational and technical capabilities bolstered**
- **Best practices shared across ecosystems**

This project will assemble and jump-start a growing and sustainable ecosystem of smart gigabit city test-beds and corresponding applications delivering important new advances in healthcare, education, public safety, and other national priority areas. These advances will leverage advanced Internet concepts developed by prior NSF research programs that are not yet available on today's commercial Internet. In doing so, the project will open up new economic development opportunities in the participating cities.

usignite

Richardson Community

usignite Initiative

Richardson, Texas
Economic Development Partnership

UT Dallas

Richardson Community

usignite Initiative

- Richardson Economic Development & the University of Texas at Dallas partnership
  - Signed MOU in April 2013
  - Became the 12th U.S. city to join US Ignite (20 now)
  - Setting up newly arrive GENI rack to connect to GENI Network (Global Environment for Network Innovations)
  - Three US Ignite grants awarded
  - 5 DFW Area application research projects (4 at UT Dallas)

GIGABIT APPS BEING DEVELOPED LOCALLY

- **"Geo-Located Allergen Sensing Platform" – GASP**

  PI: Dr. David Lary, UT Dallas
  - Mapping air quality
  - Cooperating with Chattanooga, Tennessee; University of Chicago; Argonnne National Labs

- **"Industrial Cloud Robotics across SDN"**

  PI: Drs. Andreas Fumagalli & Co-PI: Don Hicks, UT Dallas
  - Demonstrated remotely controlled milling machine in Tokyo, Japan, Richardson, Texas and Southwest Research Institute (SwRI) Smart Cities 2016 (Austin, TX) & 2016 IP+Optical Network Conference, Yokohama, Japan

- **"Remote Physical Therapy with Haptic Feedback"**

  PI: Prof. Prabhakaran Balakrishnan, UT Dallas Test Site: Dallas Veterans Hospital

- **Remote Surgery with the Da Vinci Surgical System**

  PI: Dr. Prabhakaran Balakrishnan, UT Dallas
  - Institutional Partner: UT Southwestern, Dallas, TX

UTD "Smart Campus"

Infrastructure & Resources

Gi Vania

Director, Enterprise Architecture

Office of Information Technology

UT Dallas

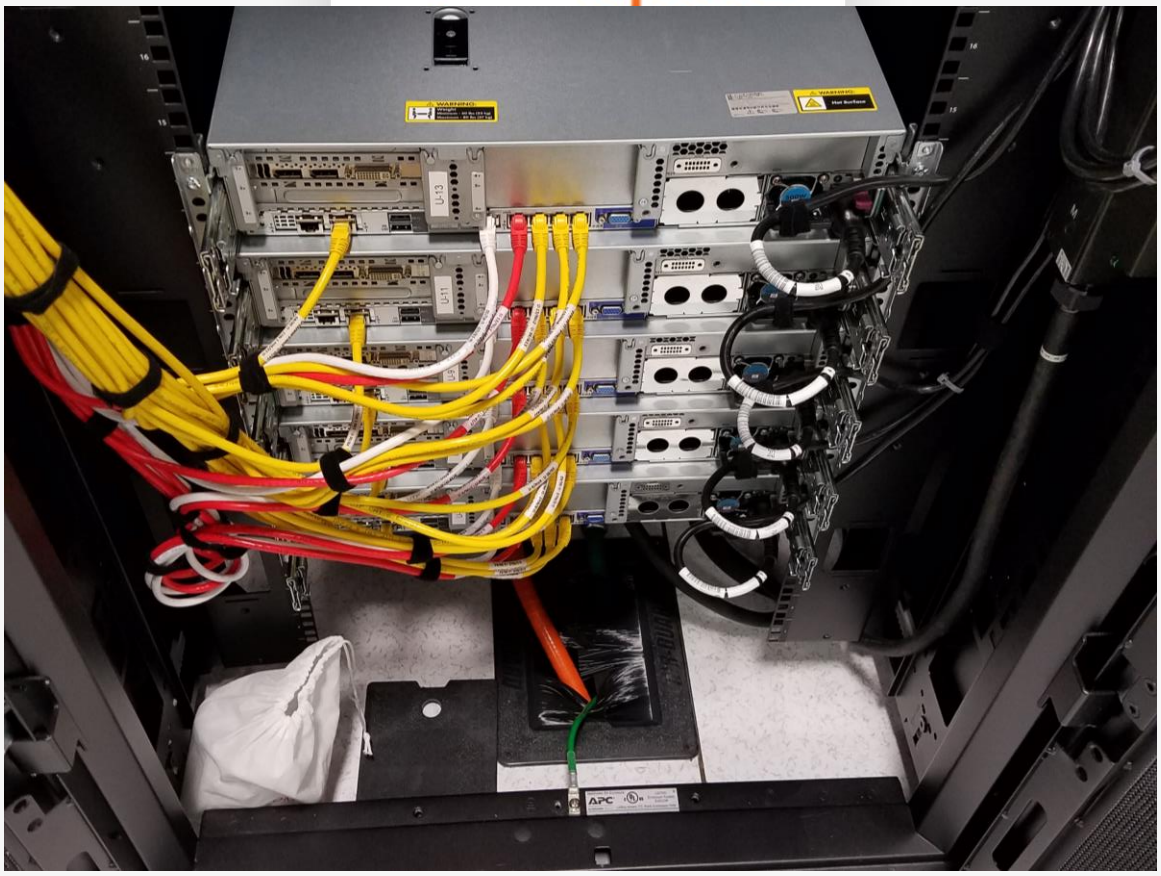
UTD "Smart Campus"

Infrastructure & Resources

- Campus Network
- Via West Data Center
- GENI Rack
- GENI Network, Internet2, LEARN Network
- OpenFlow, SDN
- Other items we discussed or you want to add. (Gi- use as many slides as you need)

http://instageni.utdallas.edu

Almost ready!! Final Testing by GPO BBN/Raytheon



50 Gbps per server possible!

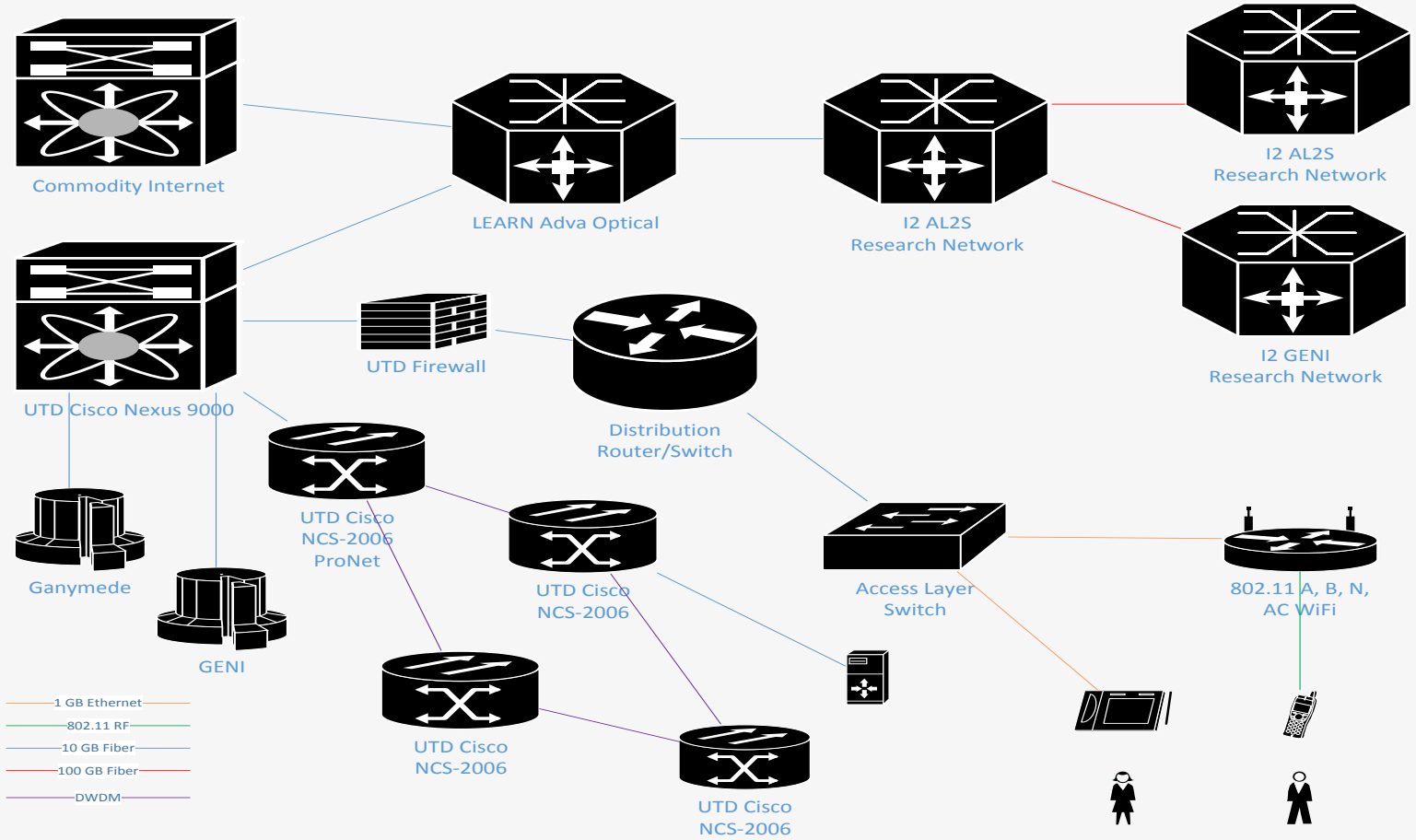
Guaranteed Bandwidth and Latency between GENI sites!

Experiment like never before, making more research possible!

Control Plane, Data Plane all 10 Gbps

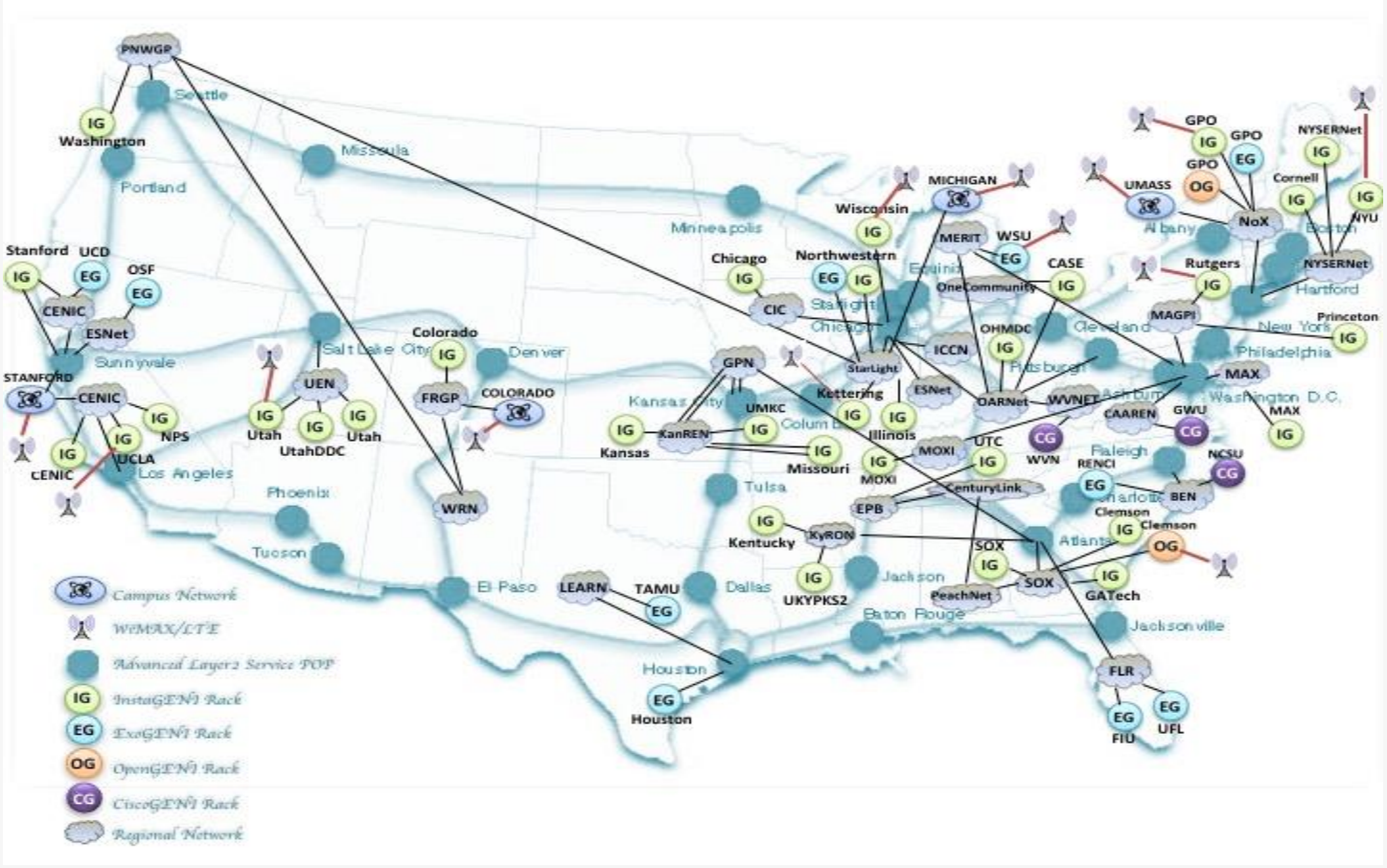
About 40 10 Gbps ports!, Uplinked at layer-2 to I2 AL2S GENI Net!

UTD Campus and Research Networks



http://www.geni.net

GENI Research Networks



UTD HPC Resources

- Ganymede – 400 core, ½ PB, 100GB IB, DDN GPFS high performance parallel filesystem
- GENI Rack 1.0 – Get a Slice, 5 rack mount HP computers + VMs + Software Defined Network + Docker Container capability
- Ol' Stampede -1.0 -10 racks of Old Stampede 1.0, Dell C8000 Series Computers, 400 computers at 16 cores = 6400 cores (we shall see)
- (Fast growing and fast changing environment!)

US Ignite Community Resource

- The GENI rack / GENI Network is a shared resource
  - Internal UT Dallas research and development platform
  - Available to Richardson/DFW community

What is a Gigabit Community?

100% coverage. Every rooftop, household and business, connected. Every entity within the City of Any Town footprint, including businesses, schools, medical facilities, engineering labs, libraries, commercial enterprises, and residents, will have access.

End to end connectivity. Connectivity from backbone to last mile to last 100 feet which enables symmetrical performance; users can send information at the same speed at which they receive it.

Affordable to residents, business and municipality.

Gigabit Community Update

- Gigabit access to every home, every business is a vision
- Few communities in the U.S. are truly a gigabit community
  - Chattanooga, Tennessee one of the first
  - Google Fiber initiative halted
  - AT&T GigaPower - selective markets
- US Ignite funding challenges to create applications to stimulate gigabit access

Richardson Community

Gigabit Application Challenge

- Goal of the challenge:
  - Create two (2) application that take advantage of
    - Gigabit internet bandwidth and/or
    - Low latency
    - Advanced Software Defined Networks - SDN
  - Two winners, $10,000 each

usignite

Challenge Sponsors

SMART GIGABIT COMMUNITY CHALLENGE

RICHARDSON SMART GIGABIT COMMUNITY

APPLICATION CHALLENGE #1

- UT Dallas Smart Gigabit Campus Testbed
  - Set up equipment in selected areas of campus to test capabilities
  - Applications created only need to utilize gigabit bandwidth or low latency at critical (peak) times (emergencies, large spike users, unusually large data, etc.)
- Application ideas utilizing available equipment and infrastructure:
  - Public Safety Video Surveillance*
  - License Plate Recognition*
  - Facial Recognition*
  - Traffic monitoring – suggested ingress and egress routes during peak traffic*
  - Emergency communications network with streaming video*
  - Parking space availability apps

*(UT Dallas campus police approval needed to implement)

RICHARDSON SMART GIGABIT COMMUNITY

APPLICATION CHALLENGE #1

Equipment & Applications available to use:

- LED Street Lights
- Smart Grid
- HD Cameras
- WiFi
- Small Cell
- Sensors
- Development Kits
- Arkhos Analyst by IBM i2
- OpenFlow SDN software

RICHARDSON SMART GIGABIT COMMUNITY

APPLICATION CHALLENGE #2

- Application ideas that fall into any of the six **usignite** focus categories:

Healthcare	**Education/Workforce**	**Public Safety**
Transportation	**Advanced Manufacturing**	**Energy**

- Meet the criteria of:
  - Requires gigabit internet bandwidth, or
  - Requires low latency, or
  - Utilizes advanced Software Defined Network (SDN)
  - For examples of these types of applications visit: https://www.us-ignite.org/apps/

SMART GIGABIT COMMUNITIES

APPLICATION CHALLENGE

- **Timeline:**
  - **February 24, 2017** Pitched the "Challenge" to North Texas entrepreneurs, students, university researchers, SMEs
  - **March 31, 2017** 14 Proposals submitted
  - **April 21, 2017** Judges selected Top Five proposals-invited them to pitch their ideas to judges on or before this date
  - **May 11, 2017** Finalists had 30 minutes to pitch their application idea and development plan to a panel of judges.
  - **May 16, 2017** Winners announced **TODAY!**
  - **October 31, 2017** Working prototype / demonstration due

Application Challenge Winners

- Security on the Poles
  - Dr. Prasad Golla, Director/Founder AGGICORP
  - Narender Ramireddy, CTO, SWENSA
- Emotive Virtual Reality Patient System
  - Dr. Marge Zielke, UT Dallas, Director, Center for Modeling and Simulation/Virtual Humans & Synthetic Societies Lab ("Center")
  - Gary Hardee, Associate Director of the Center
  - Djakhangir Zakhidov, research scientist at the Center
  - Lenny Evans, solutions architect at the Center
  - Gautham Suriay Mathialagan, UT Dallas Graduate student
  - Jithin Pradeep, UT Dallas Masters student

What's Next?

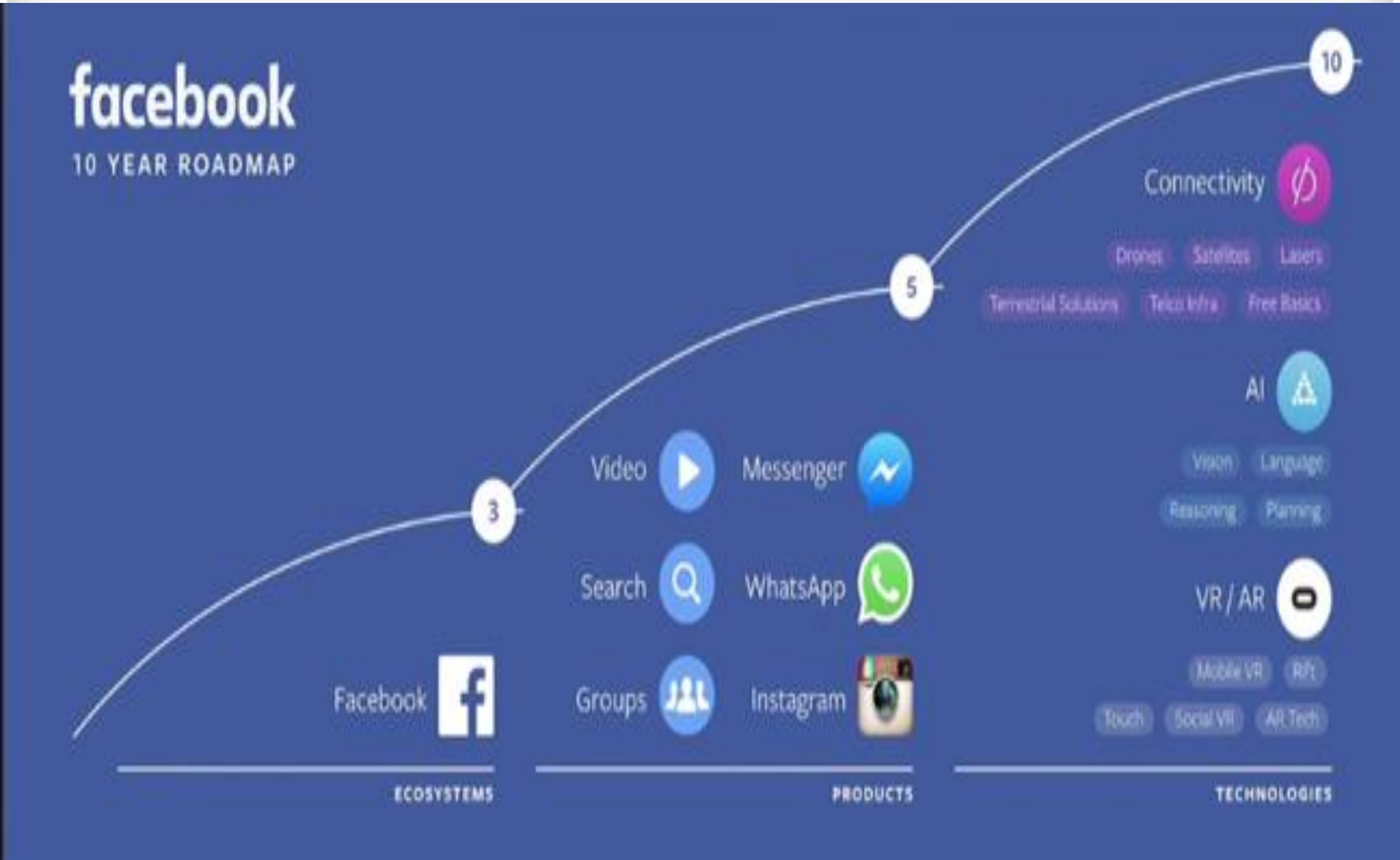
Dr. Donald Hicks

Professor

Political Economy and Public Policy

University of Texas

SCREENS TO LENS



North Texas: Fertile Ground to Incubate A Wireless Ecosystem Revolution

2020

Today DFW Metroplex Hosts Major Global Multinational ICT Producer & User Domains

2017 – DFW #2 in Data Centers (#1 Northern Virginia)

2010s

1999- DFW #2 High-Tech Sector (#1 Silicon Valley)

1995- 1st Streaming multimedia over Internet Broadcast.com - Mark Cuban & Todd Wagner

2000s

1988- 1st Toll Tag (Amtech – David Cook)

1988- 1st Supply chain management software i2 – Sanju Sidhu / Ken Sharma)

1990s

Early 1990s - Richardson recognized as "RFID Hub"

Late 1980s - Telecom Corridor Richardson leads the world into the "Wireless Era"

1985 –1st Video store (Blockbuster Video – Bob Wooley)

1982 – 1st Voice Mail (patent) (VMX, Gordon Matthews)

1980s

1983 - DSP & DLP Sensors (Analog & Digital) TI

1979 – Launched 1-800-FLOWERS) (Jerry Wescott)

1970s

1972 – Launched Distance-learning Industry (Wescott Communications – J. Wescott)

1960s

1968 FCC Carterfone Decision (approved 2-radio connection to AT&T network

1950s

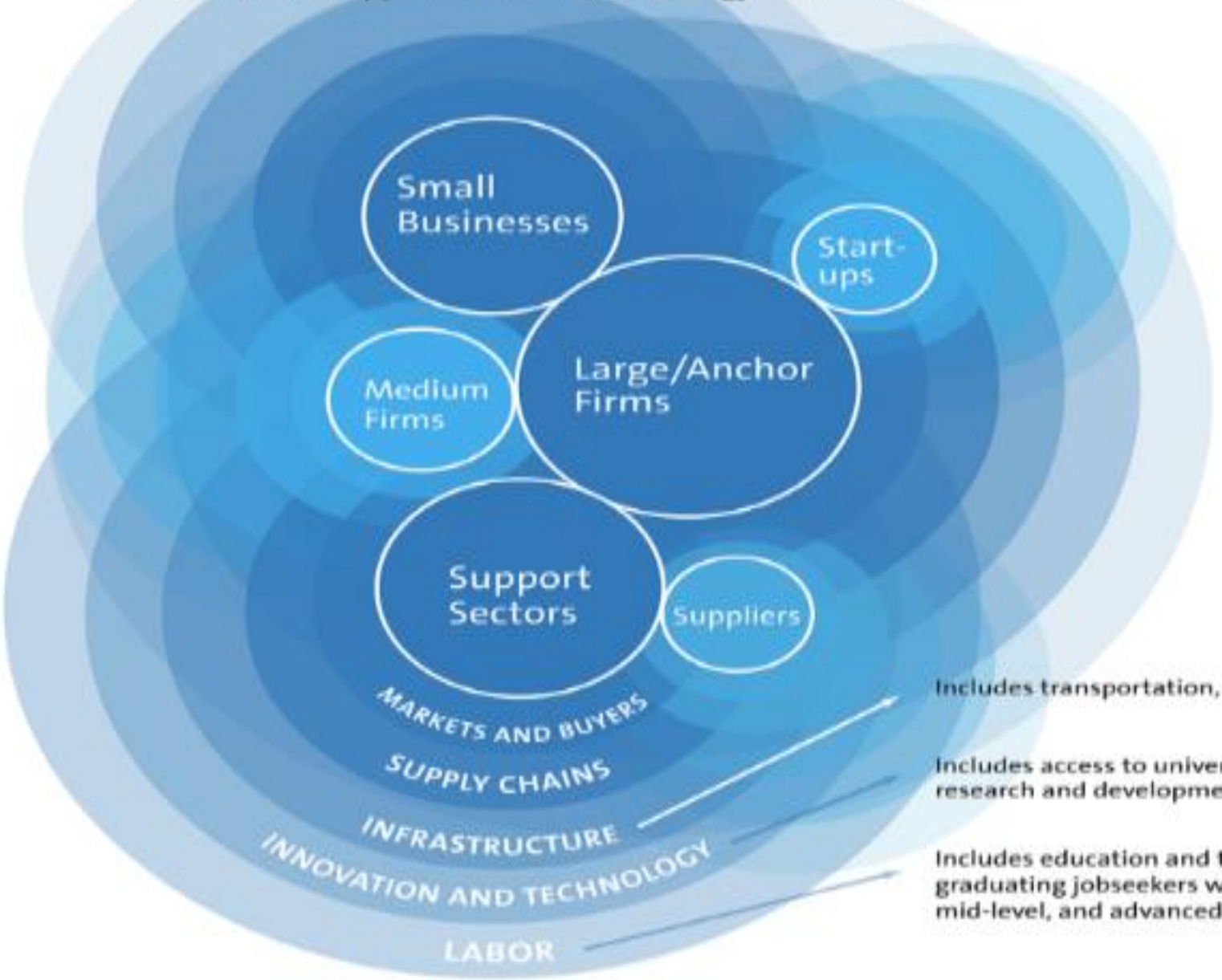
1962 Systems Integration industry launched – EDS – Ross Perot

1954 Microelectronics – Integrated circuit invented here by Texas Instruments

1950 Collins Radio – Builds production facility in Richardson, TX

Industry Cluster

An industry cluster consists of large and small firms in a single industry. Firms in industry clusters benefit from synergies of association related to shared labor, sources of innovation, suppliers, markets, technology, and infrastructure.



Includes transportation, utilities, broadband, etc.

Includes access to university and federal lab research and development.

Includes education and training systems graduating jobseekers with skills for entry-level, mid-level, and advanced- level occupations.

TELECOMMUNICATIONS

Dallas–Fort Worth is a crucial U.S. center for telecommunications firms. The bulk of them are located along the "Telecom Corridor" that stretches north of downtown Dallas through its suburbs of Richardson and Plano. The industry's biggest names call the DFW region home, among them the global headquarters for the Fortune 100 ranked AT&T Inc., and the North American headquarters for Ericsson Inc., Alcatel-Lucent and Samsung Telecommunications America. New York-based Verizon Communications maintains a major business unit here employing some 8,000 workers in the area.

CROSSROADS OF COMMUNICATIONS

THE DFW AREA IS A CRUCIAL U.S. CENTER FOR TELECOMMUNICATIONS FIRMS

PHOTO COURTESY OF RICHARDSON

THE TELECOM CORRIDOR

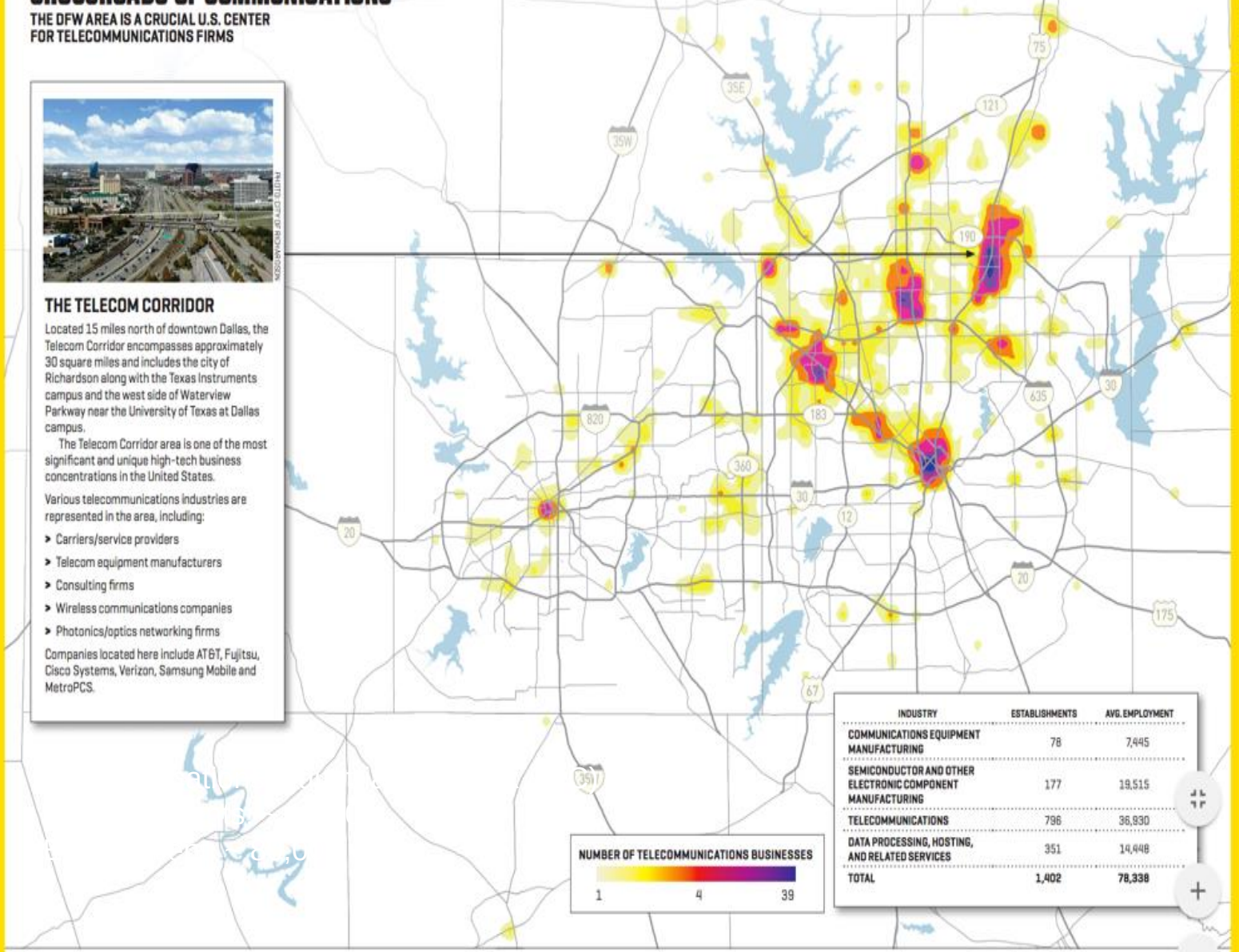
Located 15 miles north of downtown Dallas, the Telecom Corridor encompasses approximately 30 square miles and includes the city of Richardson along with the Texas Instruments campus and the west side of Waterview Parkway near the University of Texas at Dallas campus.

The Telecom Corridor area is one of the most significant and unique high-tech business concentrations in the United States.

Various telecommunications industries are represented in the area, including:

- Carriers/service providers
- Telecom equipment manufacturers
- Consulting firms
- Wireless communications companies
- Photonics/optics networking firms

Companies located here include AT&T, Fujitsu, Cisco Systems, Verizon, Samsung Mobile and MetroPCS.



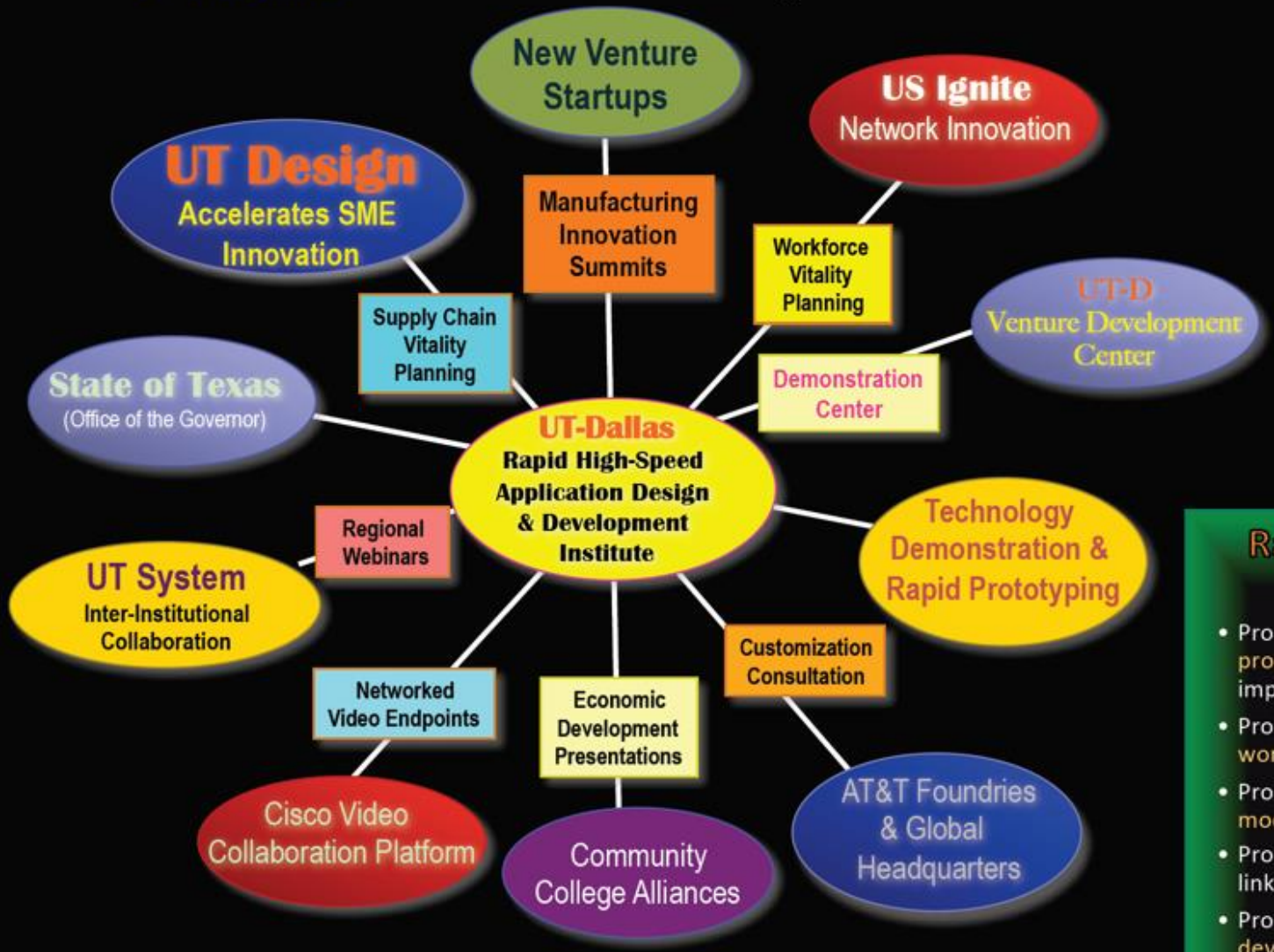
INDUSTRY	ESTABLISHMENTS	AVG. EMPLOYMENT
COMMUNICATIONS EQUIPMENT MANUFACTURING	78	7,445
SEMICONDUCTOR AND OTHER ELECTRONIC COMPONENT MANUFACTURING	177	19,515
TELECOMMUNICATIONS	796	36,930
DATA PROCESSING, HOSTING, AND RELATED SERVICES	351	14,448
TOTAL	1,402	78,338

LEGEND:
OCCUPATION
JOBS | MEDIAN HOURLY EARNINGS

Source: Dallas Regional Chamber (DRC)

BIG DATA Enables the "Adjacent Possible"

UT Dallas Anchors North Texas' Regional Innovation Infrastructure



Rapid Application Development

- Promote networked product & process Innovation & implementation
- Promote supplier base & workforce vitality
- Promote innovative business model development
- Promote advanced development linkages with university R&D labs
- Promote "skill pipeline" development & career opportunities for students

UT Dallas Application Design & Development for Advanced Network Infrastructures

Nationwide Ecosystem for Shared Smart Applications

★ **NSF: "Sustainable Ecosystem of Smart Applications" (SESA) [Partnership with Richardson REDP] [White House Announcement 9-14-15]**

Advanced Manufacturing, Logistics & Sustainment

★ **NSF: "CC*DNI Integration: PROnet: A Programmable Optical Network Prototype Serving the Campus," [Awarded]**

★ **NSF/US Ignite: "Industrial Cloud Robotics across Software-Defined Networks" [Awarded]**

- NASA: "Rapid Prototyping & Delivery of New Data Products Using Big Data, Machine Learning, Aerial Vehicles, Distributed Clouds and Software-Defined Networks"
- NSF: "Digital Subcarrier Optical Networks (DSONs) for Campus Layer-1 Circuit Connectivity"

Health, Wellness, Workforce Training & Environmental Quality

- NSF/US Ignite: "High-Speed Cyber-Learning Platform for First-Responder Institutional Readiness & Response to Infectious Disease"

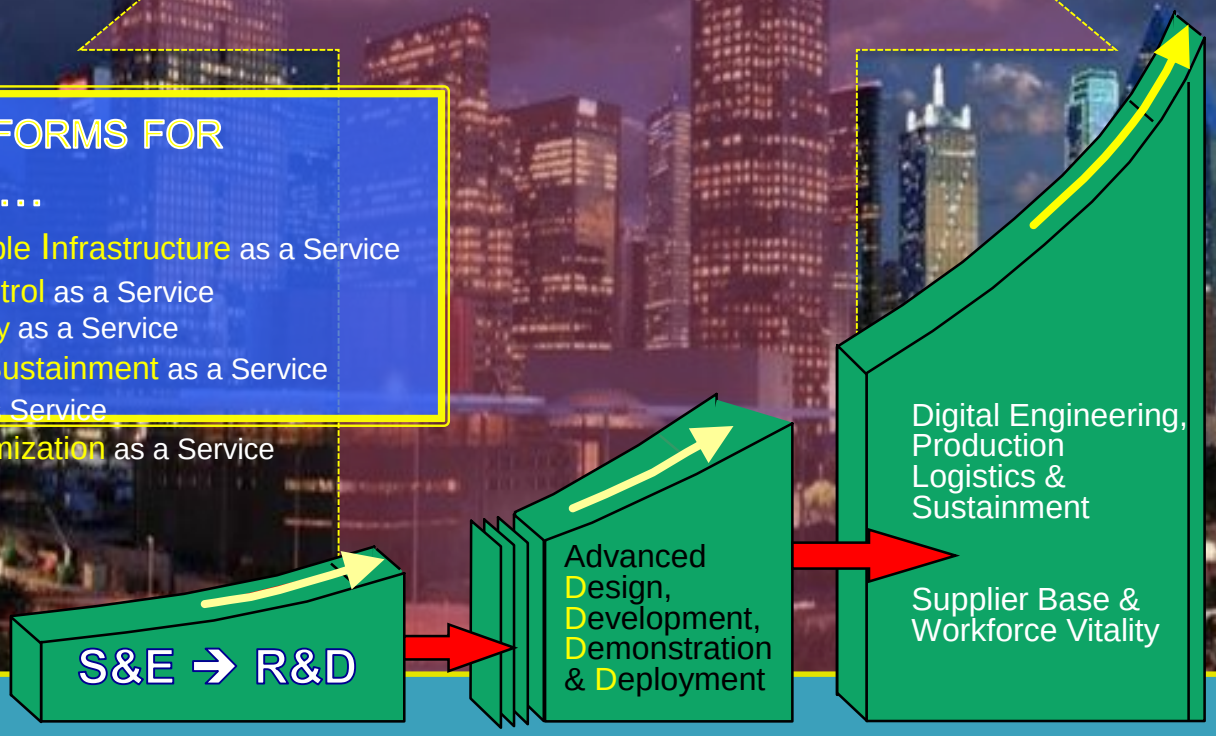
★ **NSF: "Asthma & Allergy City for Health Observation & Optimization" [Awarded]**

Enterprise-to-Ecosystem

Managed Integrated Copper, Fiber & Wireless Applications

Agile Platforms for Delivering…

- Programmable Infrastructure as a Service
- Process Control as a Service
- Cyber Security as a Service
- Logistics & Sustainment as a Service
- IoT & IIOT as Service
- Mass Customization as a Service



Optical Fiber | 2D→3D Real-time | Integration | 5G Wireless | M2M Learning | Supercomputing

DSP/DLP | VR/AR Visualization | Remote Sensing | Logistics & Sustainment | Advanced Materials/Processes

Gigabit-scale Networks | Systems Engineering | "Big Data" Storage & Analytics | Closed-Loop Control

Co-Location → Collaboration

Managed Net-Centric & IoT Applications

AWRC-NTX Leverage Model

21st Century ICT Innovation Value

North Texas ICT Communications Industrial Complex (CIC)

Telecom & Semiconductor OEMs, Tiered Suppliers, Users, Public & Private Sector Producer Services

NSF

usignite

TIA ADVANCING GLOBAL COMMUNICATIONS

AWRC-NTX as an industry-led collaboration among North Texas' industry, university and community partners to deliver on the promise of advanced wireless network infrastructures for the future. We offer a platform for enabling collaborative investment and development relationships, sharing knowledge, leveraging assets, risk-sharing and accelerating speed to market ready solutions.

Advanced Wireless Research Consortium of North Texas

Platforms for Advanced Wireless Research (PAWR)

NSF Proposal – In Progress

The PAWR program aims to support advanced wireless research platforms conceived by the U.S. academic and industrial wireless research community. PAWR will enable experimental exploration of robust new wireless devices, communication techniques, networks, systems, and services that will revolutionize the nation's wireless ecosystem, thereby enhancing broad-band connectivity, leveraging the emerging Internet of Things (IoT), and sustaining US leadership and economic competitiveness for decades to come.

(NSF Program Solicitation NSF 16585)

Adjacent Community Partner Activities

- Research Universities
- Economic Development Organizations
- Community Colleges

Commercial Application Target Domains

- "Smart City" Public Services
- First Responder Safety & Security Services
- Institutional, Community & Mobile Applications
- Personalized Mobility Services
- What's Next?.....


usignite
SMART GIGABIT COMMUNITIES
Thank you!