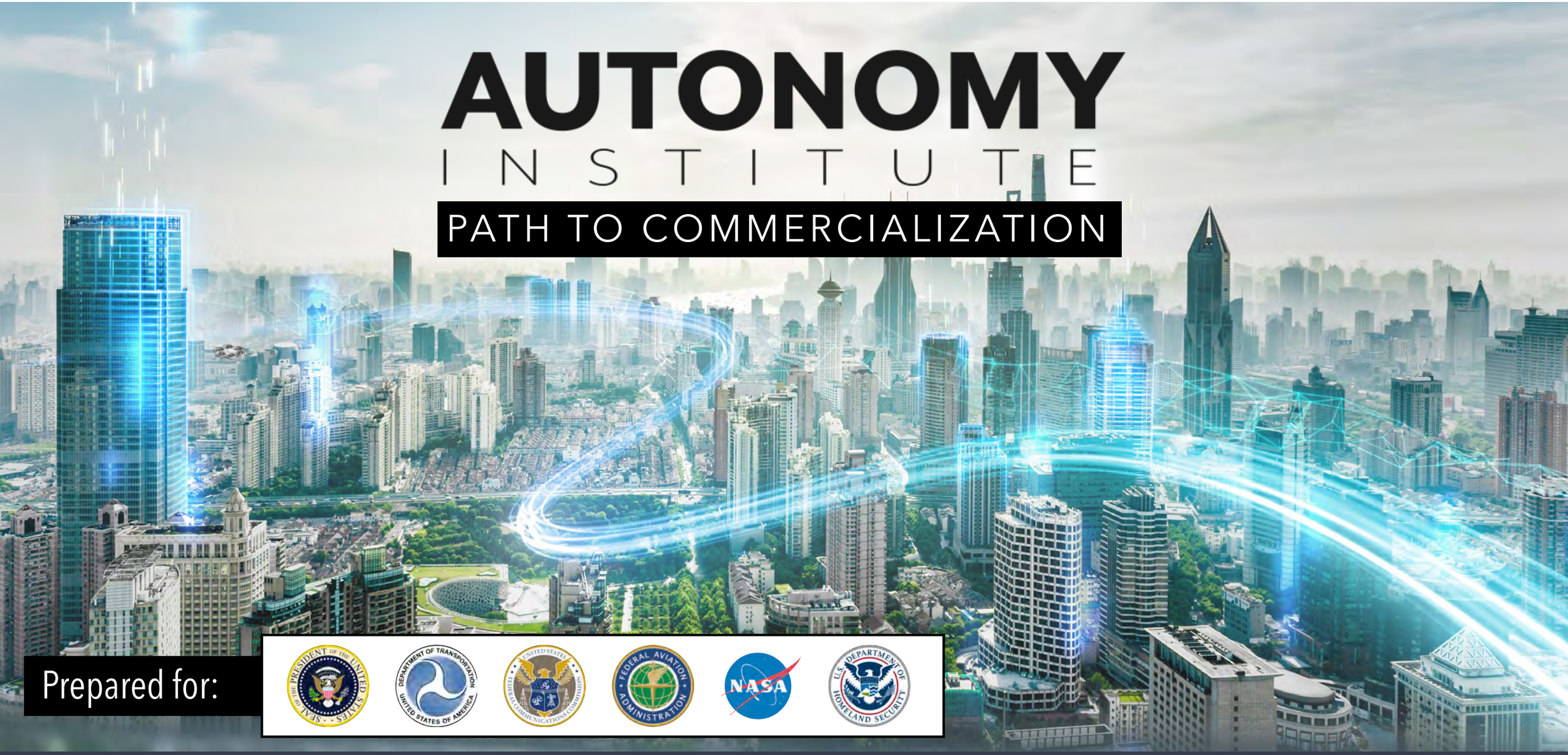
AUTONOMY INSTITUTE

PATH TO COMMERCIALIZATION



Prepared for:

Creating Intelligent Highways and Byways for the Digital and Autonomous World

PATH TO COMMERCE - INTELLIGENT AND AUTONOMOUS INFRASTRUCTURE

AUTONOMY INSTITUTE

ENTITIES

AUTONOMY INSTITUTE

Industry

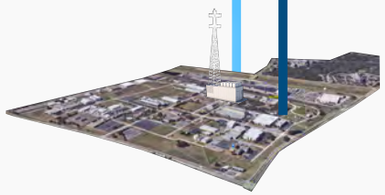
Ford, GM, WAYMO, TOYOTA, FedEx, UPS, nuro, UBER, Kodiak, GUSS, STARSKYROBOTICS, ATRIUS

Government

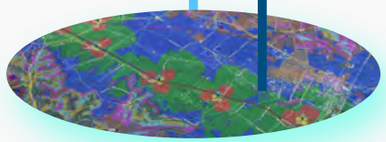
ARMY FUTURES COMMAND, DARPA, U.S. ARMY, U.S. Department of Transportation, NASA, NOAA

University Collaboration

AUTONOMOUS INFRASTRUCTURE

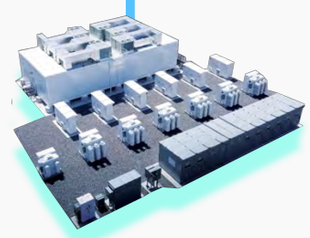


Autonomous Infrastructure Labs



Autonomous Mobility Zones

Autonomous Mobility City Regions



Resilient Microgrid

AUTONOMY OPERATIONS

The Autonomous Systems Operation Command Center

"Autonomy Commerce Act"

U.S. DEPARTMENT OF AUTONOMY

Autonomy Requires New Operations

Foundation Depends on "Path to Commerce"

INTELLIGENT INFRASTRUCTURE WILL DRIVE THE 21ST CENTURY

AUTONOMY INSTITUTE

Millions of New Jobs

Billions in Growth

National Leadership

PUBLIC INFRASTRUCTURE NETWORK NODE ADDRESS NATIONAL PRIORITIES

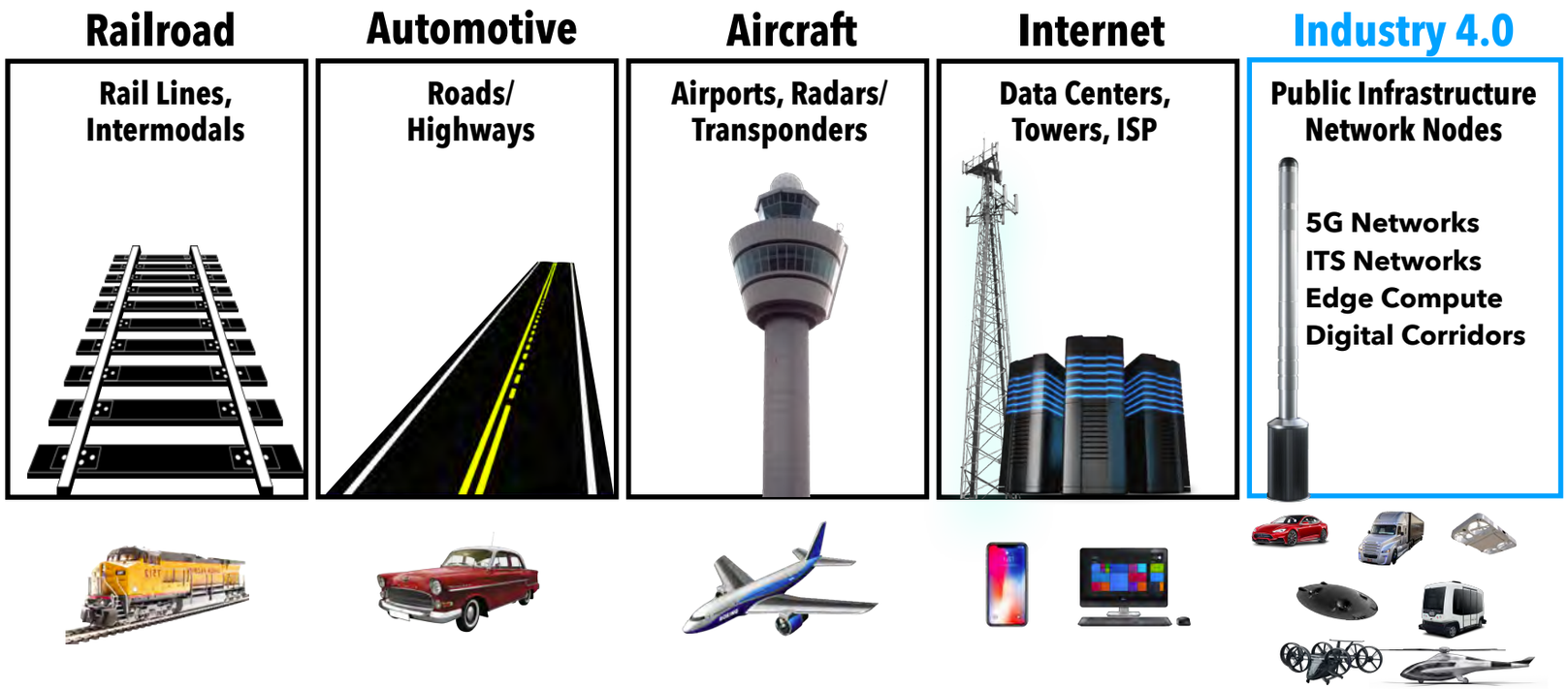
Secure 5G | **Broadband For ALL** | **Optimized Mobility** | **Health & Safety** | **Intelligent Cities** | **Resilient GRID** | **National Security**

MOBILITY REQUIRED **ROADS**, INDUSTRY 4.0 REQUIRES **PINNS**

INDUSTRY 4.0 - IS DRIVING NATIONAL **INFRASTRUCTURE BUILDOUT**

AUTONOMY INSTITUTE

Investment in a 21st-century Intelligent & Autonomous Infrastructure is among the **highest priorities.** This will stimulate **economic expansion, job growth, national security, and resilience**.



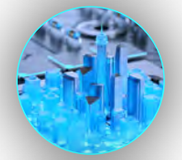
Benefits include:

- Bridging Digital & Physical
- 5G Networks
- Edge Computing
- Intelligent Transportation Systems
- Intelligent City Services
- National E-GPS Service
- Rural broadband
- Fully autonomous systems

DIGITAL EDGE INFRASTRUCTURE WILL DRIVE THE 21ST - CENTURY

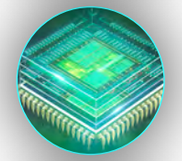
INVESTING IN THE NEXT CENTURY OF TECHNOLOGIES IMPACTING DUAL USE APPLICATIONS

Artificial Intelligent



Active Digital Twin

3D Printing & Materials



Quantum Computing

Edge Computing

Resilient Energy

Bioinformatics

Wireless Networking

Internet of Everything

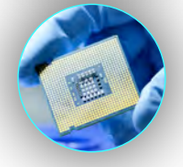
Data Exchanges/Ledgers

Intelligent Cities

Advanced Robotics

Autonomous Systems

Security & Data Exchanges

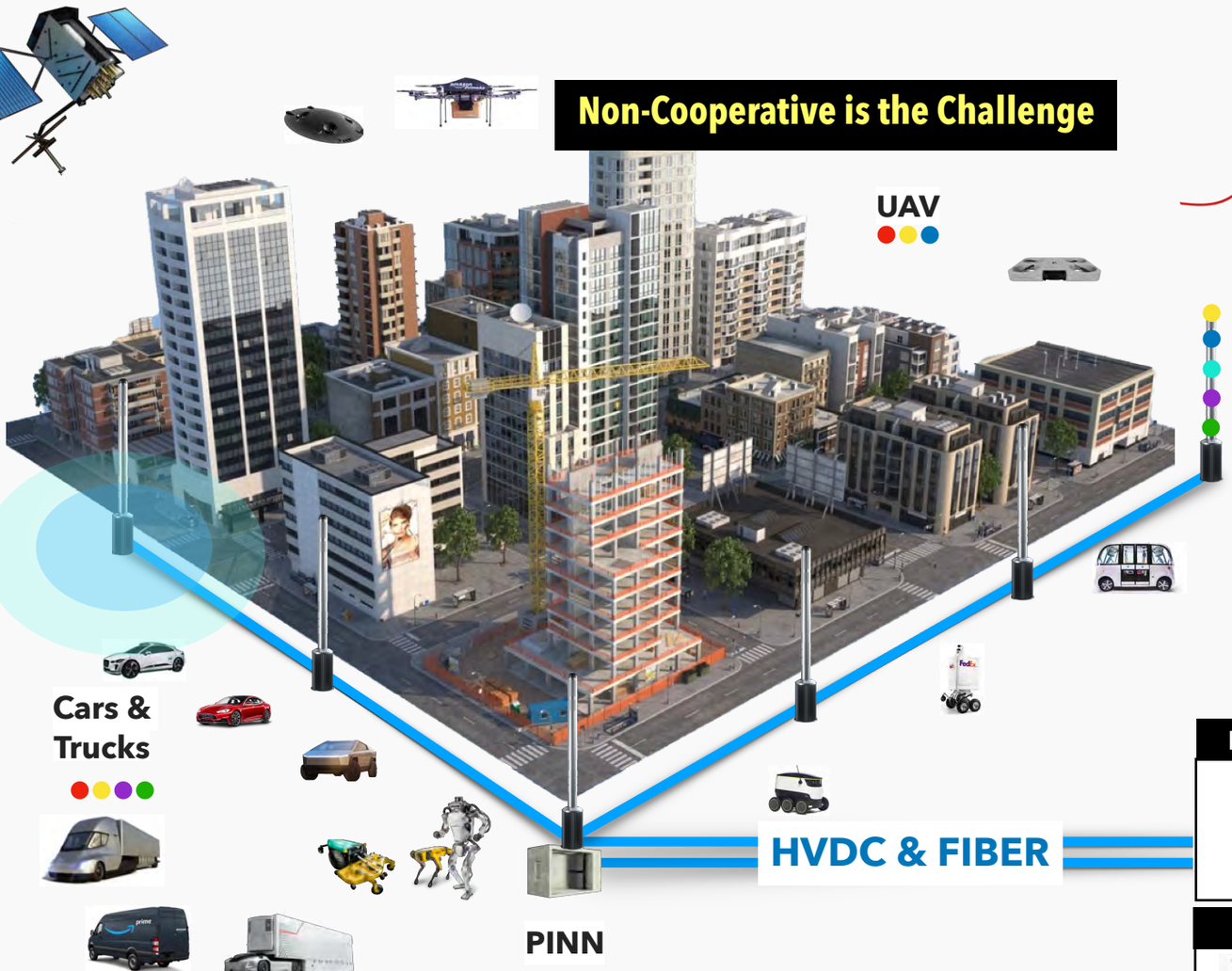


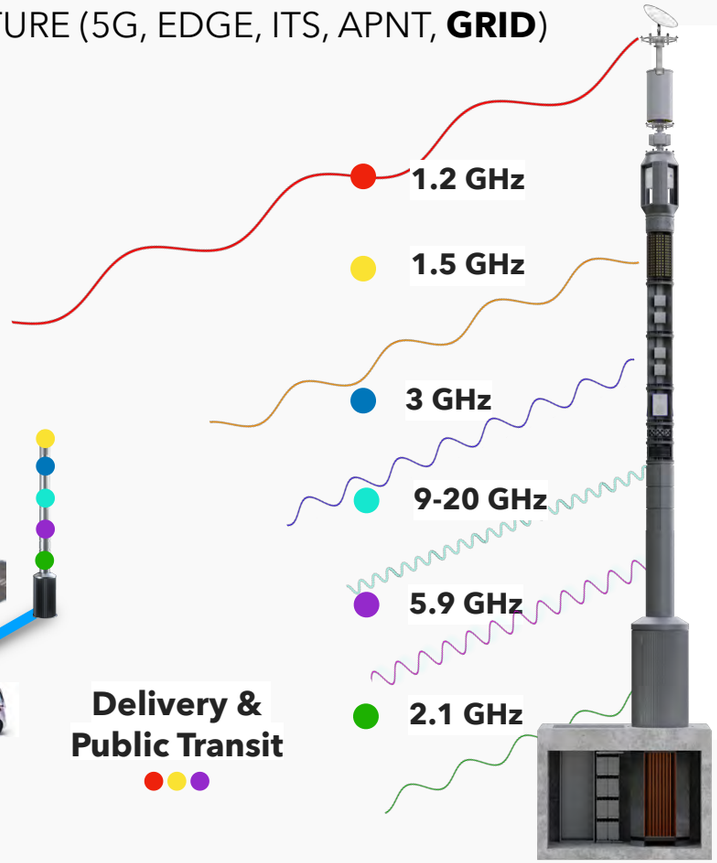
Semiconductors/Micro

AUTONOMY
INSTITUTE

DOT SHOULD LEAD NATIONAL DIGITAL EDGE INFRASTRUCTURE

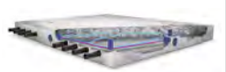
UNIFIED INTELLIGENT & AUTONOMOUS CITY INFRASTRUCTURE (5G, EDGE, ITS, APNT, **GRID**)

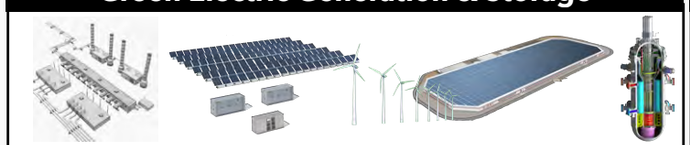




DIGITAL EDGE SOLUTIONS

- Wireless
- Transportation
- Computing
- Smart City
- Electric
- Government

HScale Data Centers	Micro Data Centers	Smart Duct	FIBER
			

Green Electric Generation & Storage	HVDC	Microgrids
		

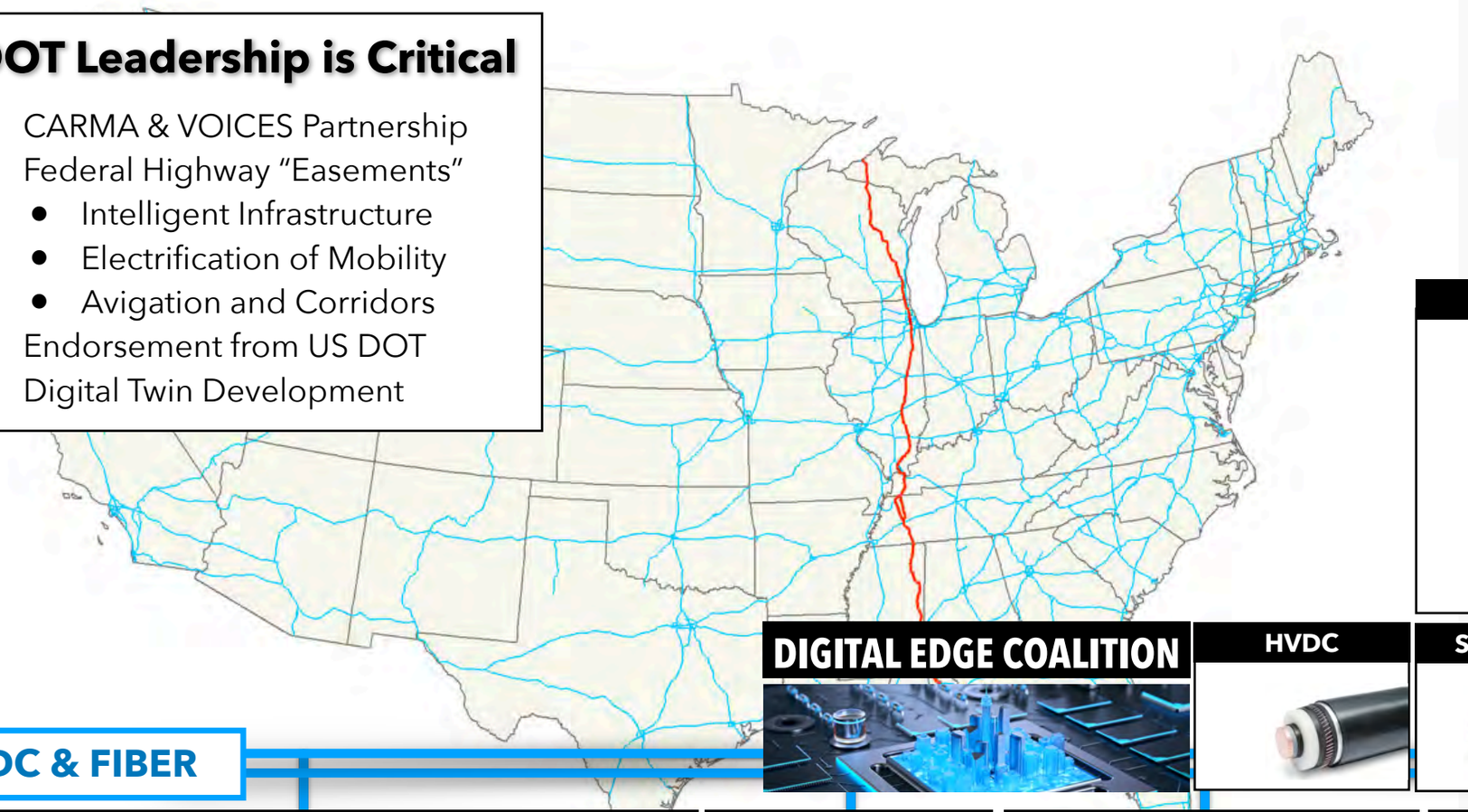
RESILIENT SYSTEMS ARE CRITICAL FOR INTELLIGENT CITIES

LEADERSHIP FOR NATIONAL DIGITAL EDGE INFRASTRUCTURE

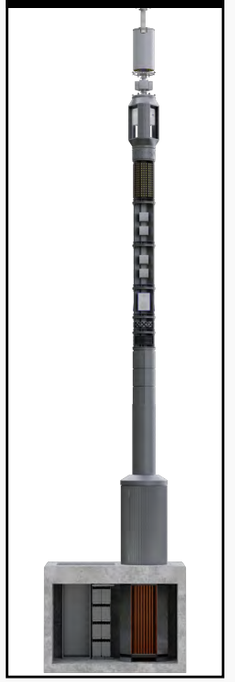
STATE SUPPORT FOR UNIFIED INTELLIGENT INFRASTRUCTURE (BROADBAND, 5G, EDGE, ITS, APNT, **GRID**)

DOT Leadership is Critical

- CARMA & VOICES Partnership
- Federal Highway "Easements"
  - Intelligent Infrastructure
  - Electrification of Mobility
  - Avigation and Corridors
- Endorsement from US DOT
- Digital Twin Development



PINN



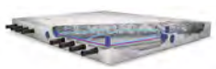
Charging Stations

DIGITAL EDGE COALITION

HVDC

Smart Duct

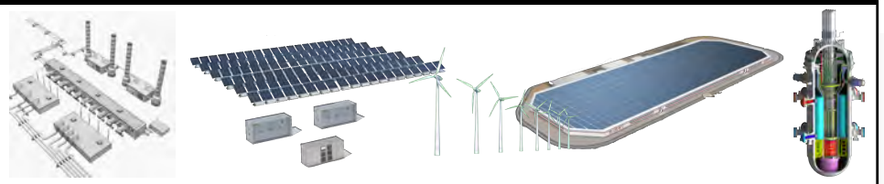
Smart Pave



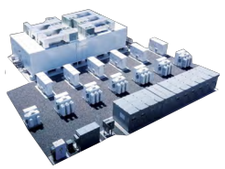
FIBER

HVDC & FIBER

Green Electric Generation & Storage



Microgrids



Hyper-scale Data Centers

Micro Data Centers

Macro Towers

TSUNAMI OF TECHNOLOGY **BLIGHT** COMING TO OUR **CITIES**!

SECURITY & OPERATIONAL ISSUES

Carriers

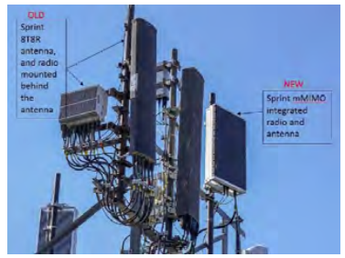
4G 5G CBRS Private RAN
Fiber Backhaul IoT Services

Transportation

Intelligent Transportation
Systems CV2X Radars
Cameras Lidar Beacons
APNT

Computing

Edge Computing Cloud
Vendors Integrators App
Developers New Services



Government

EMS Networks Public
Safety Environmental
Sensors APNT

Smart City

RF Sensors Cameras
Environmental Safety

Electric

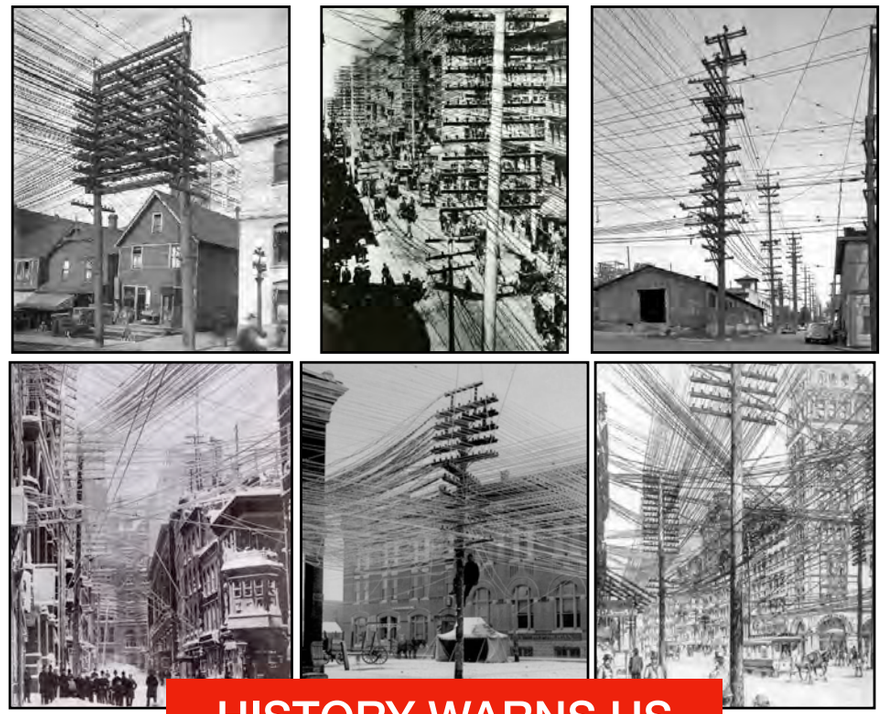
Energy Resilience
Transformers Energy Storage
EMP Hardening

AUTONOMY
INSTITUTE

THE PROBLEM:

AUTONOMY INSTITUTE

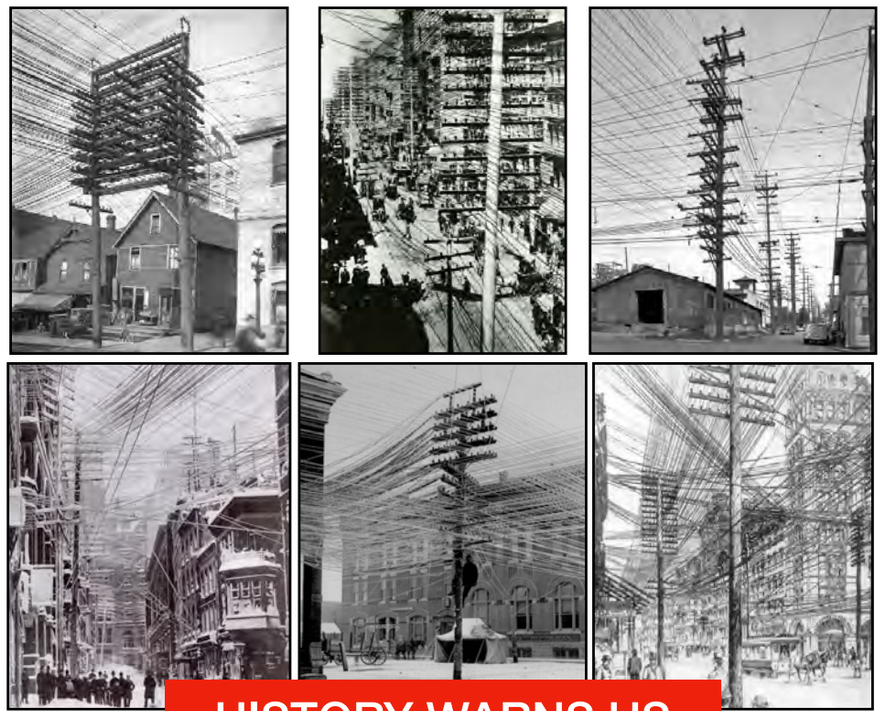
- The United States desires the benefits of autonomy, 5G, and Industry 4.0, but local governments lack the resources to create the next generation of “Intelligent Infrastructure”.
- Private industry requires Intelligent Infrastructure but lacks the ability to coordinate at scale with government, community, and other industry players.
- Despite massive opportunity, local governments and private companies cannot cross the chasm. *A unifying organization, platform, and playbook is required.*



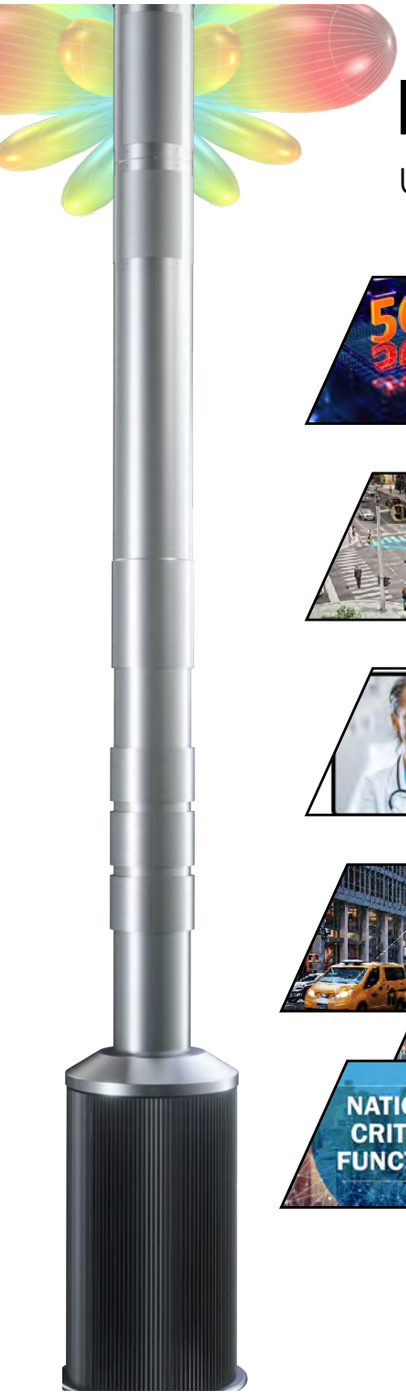
“We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before.”
Klaus Schwab, WEF Executive Chairman

NEW INFRASTRUCTURE IS **REQUIRED** TO SUPPORT INDUSTRY 4.0

AUTONOMY INSTITUTE



The **Tsunami** of Technology **Blight** Coming to Your **City**!



DIGITAL EDGE ADDRESSES OVER 10 NATIONAL PRIORITIES

UNIFIED INTELLIGENT & AUTONOMOUS CITY INFRASTRUCTURE (5G, EDGE, ITS, APNT, GRID)

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- 5G Deployments
- Rural Broadband
- Intelligent Transportation Systems
- Retail/Business
- Telemedicine
- Edge Computing
- Connected Corridors
- Intelligent City Services
- National Security

21ST - CENTURY INFRASTRUCTURE

10 NATIONAL PRIORITY

NATIONAL STRATEGY TO SECURE 5G — **5G**

Presidential Executive Order on Streamlining and Expediting Requests to Locate Broadband Facilities in Rural America — **Broadband**

STRATEGY for the DEPARTMENT OF DEFENSE POSITIONING, NAVIGATION AND TIMING (PNT) ENTERPRISE [UNCLASSIFED VERSION] CLEARED For Open Publication Aug 15, 2019 — **APNT**

THE NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN: 2019 UPDATE — **AI**

Ensuring American Leadership in Automated Vehicle Technologies
Automated Vehicles 4.0 — **Autonomy**

PINNS **ELIMINATE THE DIGITAL DIVIDE** AND ENABLES INDUSTRY 4.0

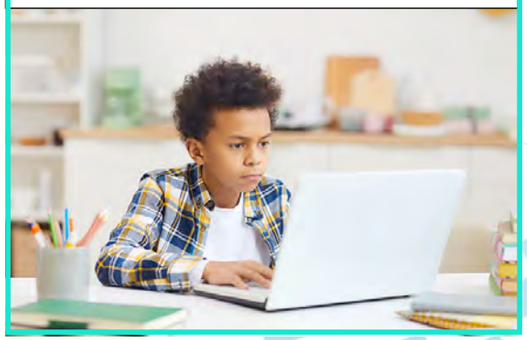
AUTONOMY INSTITUTE

DATA AS UTILITY

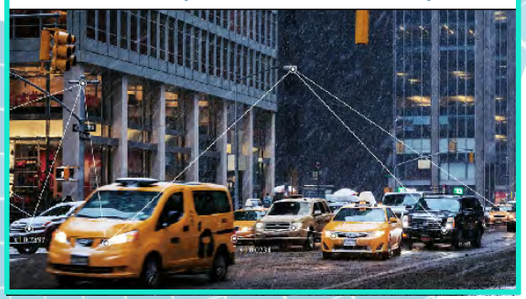
SOLVING SOCIAL ISSUES / CREATING A BETTER FUTURE

MORE **DATA** TO THE COMMUNITY

Ubiquitous Broadband: High-speed internet to every home and business. Rural included



Optimized Mobility: Faster and Safer Mobility solutions for everyone. Automated Delivery

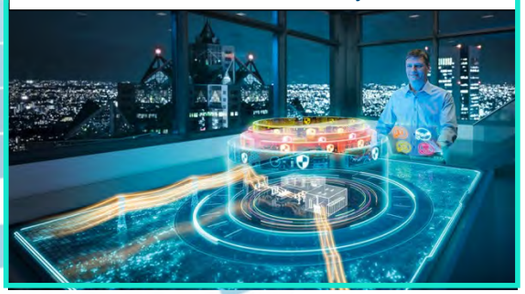


Healthy City, Healthy Life: Effectively Respond to environmental challenges. Protect.

Jobs of the Future: Capture the 21st-century jobs, community, and economic impacts.

Critical Infrastructure Services: Public safety and disaster response services.

The Responsive City: A city that better understands and meets community needs.



PINNS ARE THE 21ST-CENTURY INFRASTRUCTURE SUPPORTING **INDUSTRY 4.0**

UNIFIED INFRASTRUCTURE **STANDARD** FOR EDGE SYSTEMS ENSURING STREAMLINED OPERATIONS AND SECURITY

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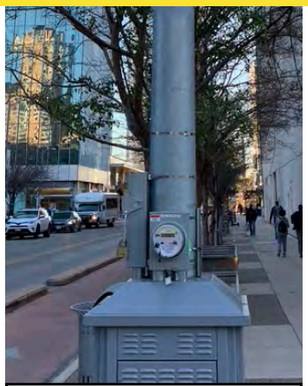
Over **$200 Billion** will be Invested into this Edge Infrastructure.

Sensors



Small Cells

ITS, VRAD, Transformers

1. **COMPUTE**
2. **LATENCY**
3. **SPECTRUM**

PUBLIC
INFRASTRUCTURE
NETWORK
NODES

THREE FOUNDATIONS FOR AN INTELLIGENT CITY

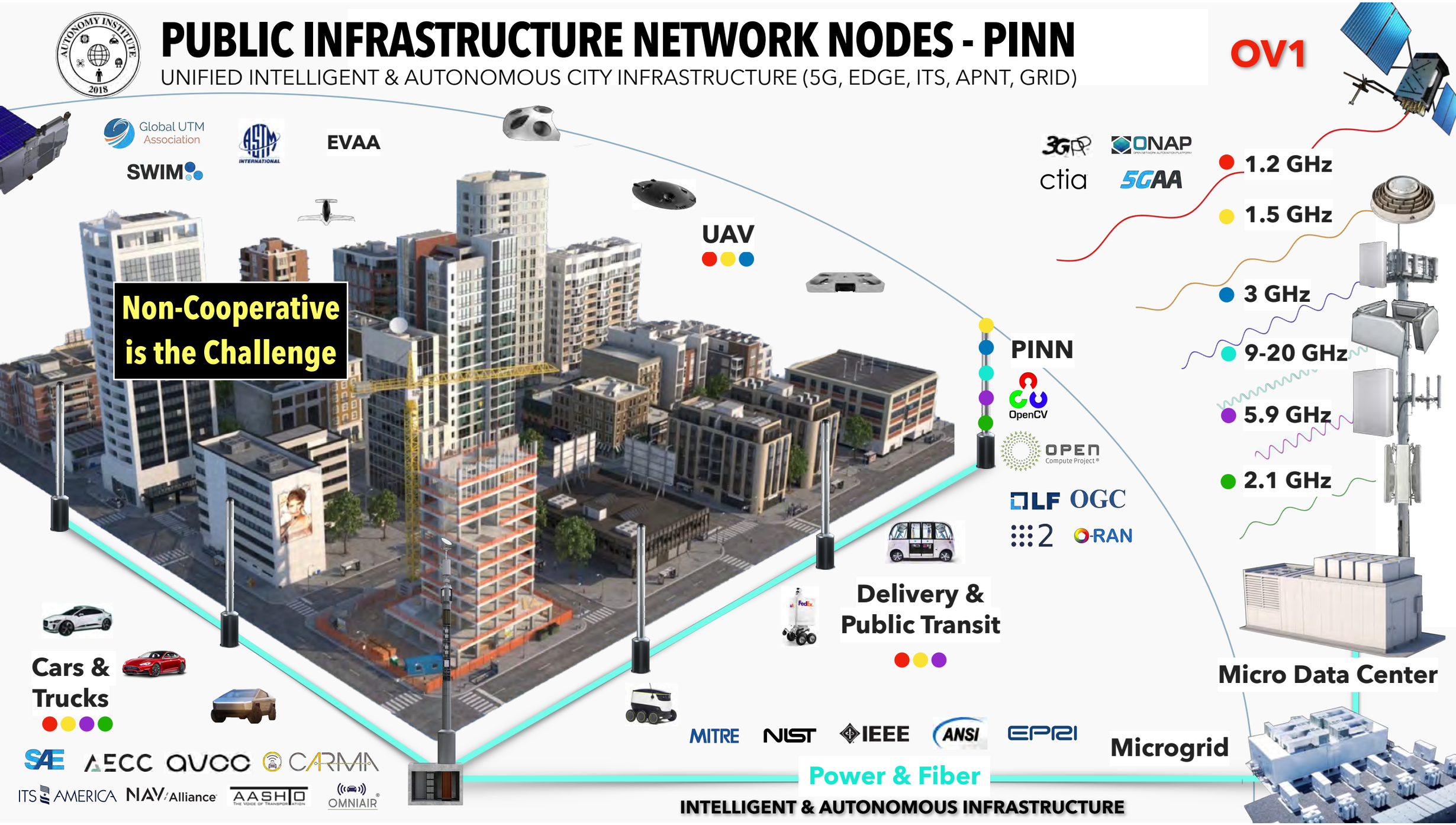
BUILDING INTELLIGENT, CONNECTED, INCLUSIVE, AUTONOMOUS, AND **RESILIENT 21ST CENTURY CITIES**

AUTONOMY
INSTITUTE

PUBLIC INFRASTRUCTURE NETWORK NODES - PINN

UNIFIED INTELLIGENT & AUTONOMOUS CITY INFRASTRUCTURE (5G, EDGE, ITS, APNT, GRID)

OV1

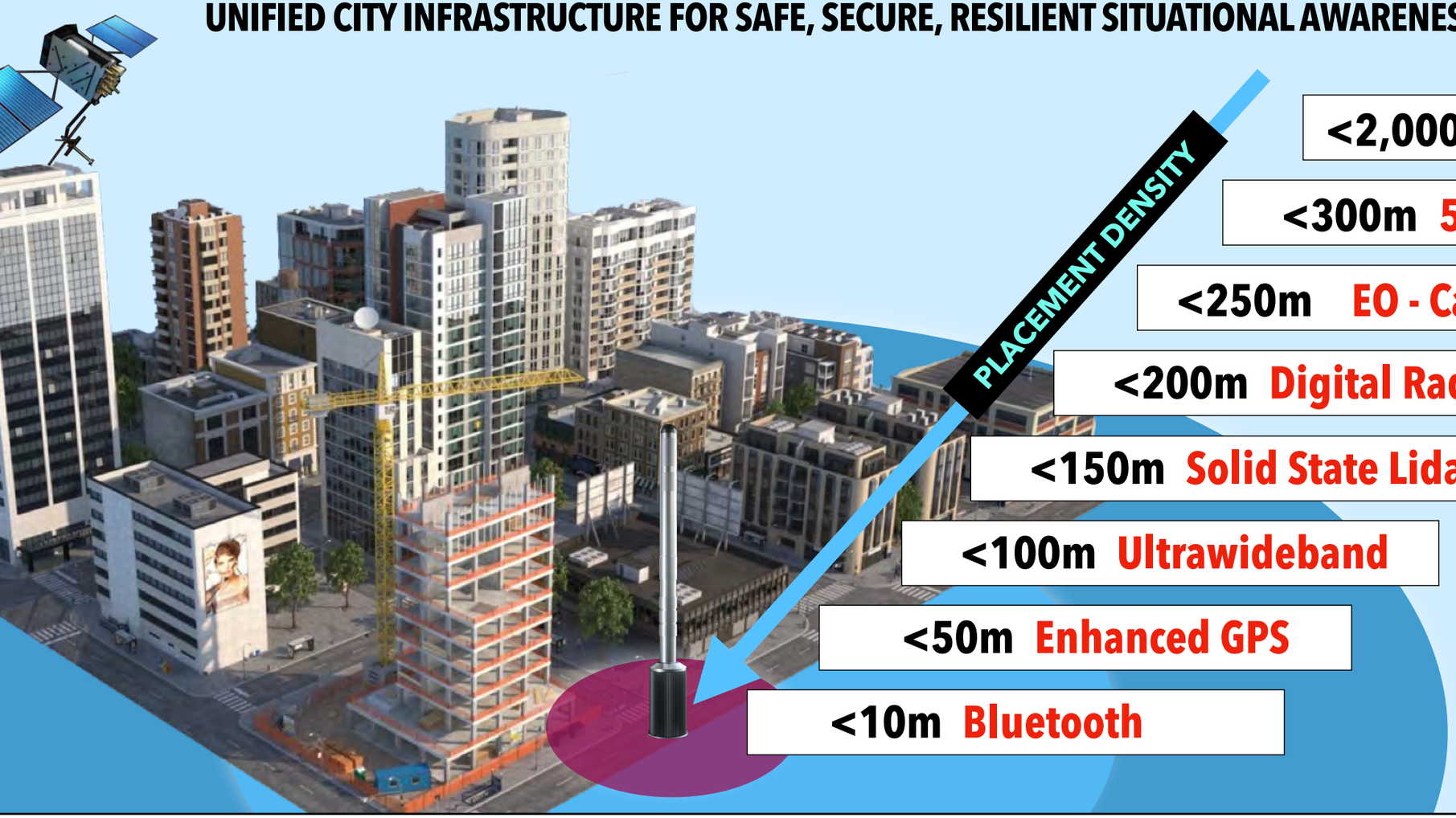


INTELLIGENT & AUTONOMOUS INFRASTRUCTURE

SMART CITIES DEPEND ON INTELLIGENT INFRASTRUCTURE

UNIFIED CITY INFRASTRUCTURE FOR SAFE, SECURE, RESILIENT SITUATIONAL AWARENESS

AUTONOMY INSTITUTE



PLACEMENT DENSITY

- <2,000m LTE - V2X
- <300m 5G - V2X
- <250m EO - Camera
- <200m Digital Radar
- <150m Solid State Lidar
- <100m Ultrawideband
- <50m Enhanced GPS
- <10m Bluetooth

PUBLIC INFRASTRUCTURE NETWORK NODE

EDGE-READY 24/7

SMART CITIES DEPEND ON INTELLIGENT INFRASTRUCTURE

Creating Intelligent Highways and Byways for the Digital and Autonomous World

WHO IS THE AUTONOMY INSTITUTE?

A SEMATECH FOR AUTONOMY AND AI AT THE EDGE

AUTONOMY INSTITUTE

Overview:

- The Autonomy Institute is a 501c3 - Alliance of Government, Industry, and Academia
- Focused on accelerating the “Path to Commerce” for Intelligent and Autonomous Systems
- Creating $100+ of million P3s to address Adoption and Scaling of Systems
- Two major initiatives - Deploying Infrastructure (labs & corridors) and Public Policy

We are going to Drive Financial Funding to support:

- Autonomous Infrastructure Labs and Autonomous Mobility Corridors - 24/7
- Research, Testing, Operations, and Analysis, Driving Petabytes of Data for Decisions
- Legislative Policy and Government Relations - New Legislation Required

AUTONOMOUS SYSTEMS "IMPACTS JUST ABOUT EVERY INDUSTRY

AUTONOMY INSTITUTE

Inspection





Delivery





Air Delivery





Industrial





Mobility





Freight




Urban Air




AUTONOMY INSTITUTE LEADERSHIP AND ADVISORS

AUTONOMY INSTITUTE

Rand Arnold
Executive Director
Autonomy Institute

Karen E. Willcox
Director of Oden Institute
Aerospace Engineering, UT

Marke F. "Hoot" Gibson
Ret. Mj General, CEO of
NUAIR, FAA, Space

John-Paul Clarke
Professor Aerospace,
UT Austin

Dyan Gibbens
CEO Trumbull Unmanned,
Air Force, UAV/UAS

David Bruemmer
Founder of W8less, A-
Motion, 5D Robotics

Phil Kenul
NOAA Rear Admiral (ret)
ASTM F38 Chairman

Brent Skorup
Senior Research Fellow
Mercatus Center

Robert Spalding
Hudson Institute, General
Air Force, Q Networks, NSC

John Cowen
CEO EDJX, Edge Compute
Expert, 6fusion

Karen Lightman
Executive Director Metro21,
Carnegie Mellon

Don Berchoff
CEO of TruWeather,
MetraWeather, NOAA

Sherri Greenberg
Professor at LBJ Public
Affairs, UT Austin

Andrew Carter
CEO and Co-Founder at
ResilienX, SRC

Mark Bigham
DoD Innovation Leaders,
Raytheon, L-3, E-Systems

Admiral Inman
National Policy, MCC, NSA,
CIA, Federal Reserve

Jim Colson
CTO CUBIC, IBM Fellow,
CTO of Watson

Alex Goldberg
Chief Innovation Officer
Texas Military Department

Jungah Lee
CEO Aura, 5G Expert
Samsung, Altiostar

Michael DeKort
CEO Dactle, Integrated and
Complex Systems Expert

Thayne Coffman
DoD AI & Machine Learning,
Sensor Fusion

Robert Hebner
Director fo the UT Austin
CEM

Richard Primeaux
CPO, Industry Executive,
Enterprise software expert

Ted Miller
Founder and CEO of
Crown Castle, 4M

Jeffrey DeCoux
Autonomy Institute
CEO of ATRIUS

James K. "Red" Brown
Major General (ret)
The adjutant general TMD

Brian Dietrich
Texas Executive
Intel Corporation

Todd Humphreys
Professor of Aerospace UT
Austin, APNT Expert

Jeffrey Buchanan
Retired General
Army of the North

David Whitley
CEO Gregory Strategies
Prior TX Secretary of State

Brett Spicer
Government Relations,
Public Safety, Legislative

Paul Workman
Prior State Representative,
Public Policy, Construction

Reed Clay
CEO Crestline, Prior Chief
Operating Officer for Texas

Night Keyes
P3 Executive, General
Counsel

Lloyd Walker
Industry executive, Fortune
500 industrial design

Norm Anderson
President/CEO of CG/LA
Infrastructure, Inc.

INDUSTRY 4.0 IS DRIVING INNOVATION, GROWTH, & PROSPERITY

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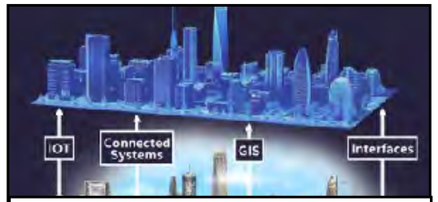
AR / VR

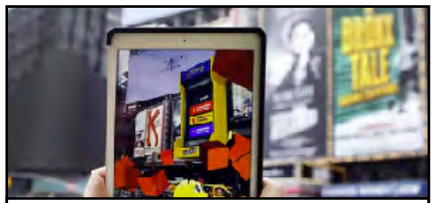

Autonomous Systems



Digital Twin AR


Transportation Safety

5G Communications

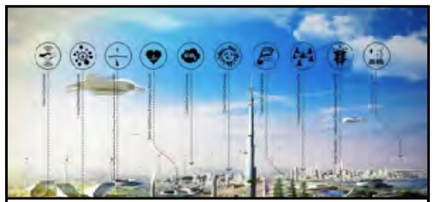

Advertising


Gaming


Autonomous Drone


Traffic Management


Digital Easements


City IoT


Smart City


Health


Precise Navigation


Awareness


Geospatial Grids


Perceptive Navigation


Sensor Fusion


National Security


Precision Navigation

INDUSTRY 4.0 WILL CREATE MILLIONS OF **NEW JOBS**

AUTONOMY INSTITUTE

Artificial Intelligence
Urbanautic Engineers
Sensor Technicians
Automotive Engineers
Perception Engineers
PINN Manufacturing
Computer Science
Hardware Design
Embedded Systems

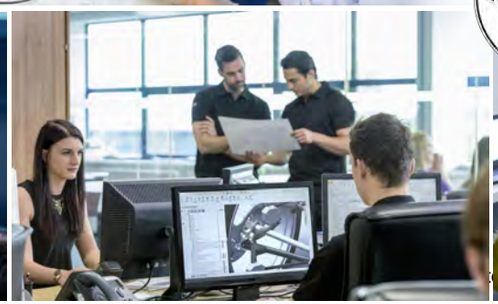
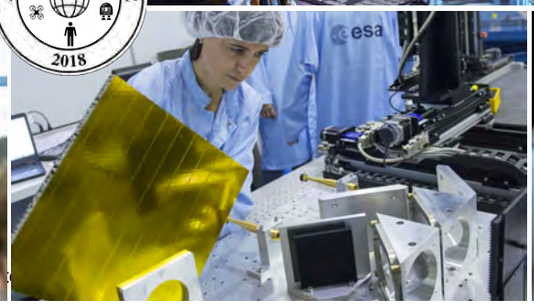
Cybersecurity
Resilient Systems
APNT Engineers
Wireless Networking
System Operations
Public Policy
Edge Computing
Aerospace Engineers
Radar Design

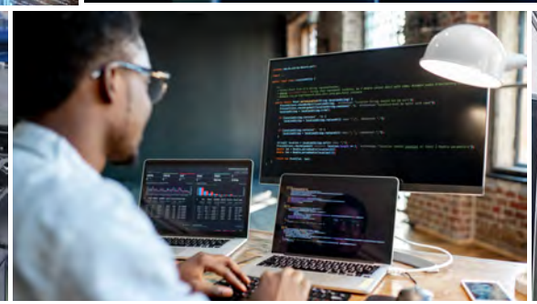
RF Design
Systems Manufacturing
Data Scientists
Thermal Design
PINN Installation
Clean Energy Systems
System Technicians
Urbanautic Policy
Field Service Technician

Field Autonomy Engineer
Autonomous Navigation
Robotics Engineer
Electrical Engineer
Industrial Design
Additive Manufacturing
Semiconductors
Emergency Response
Mechanical Technicians

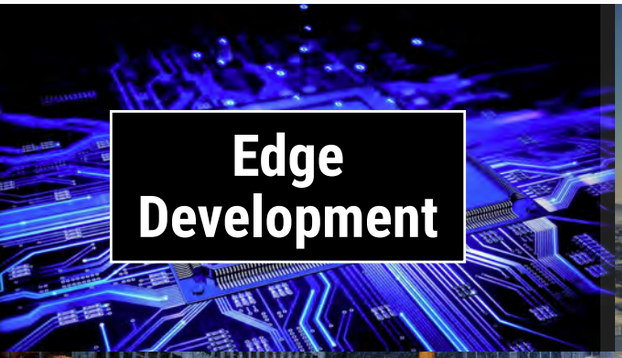


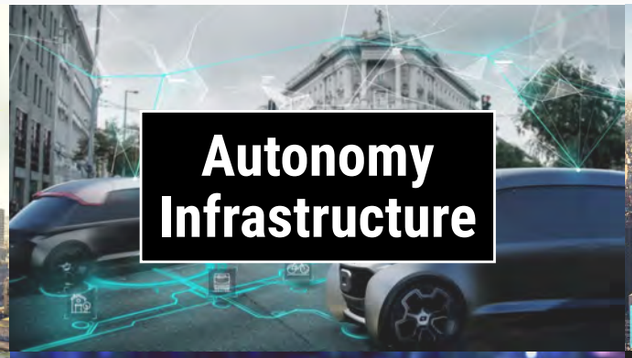


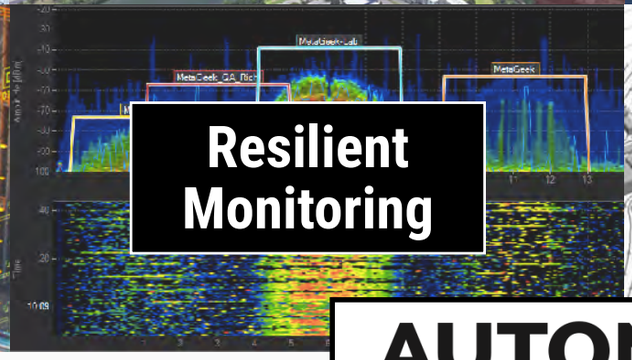




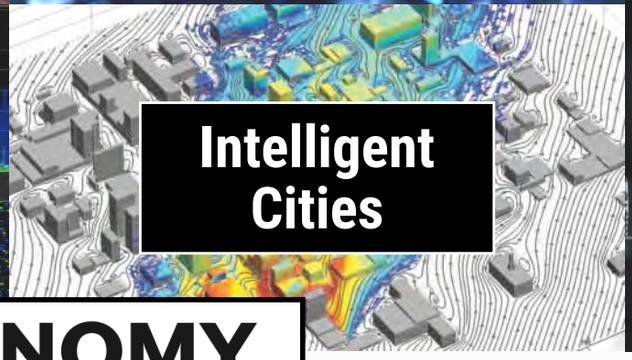


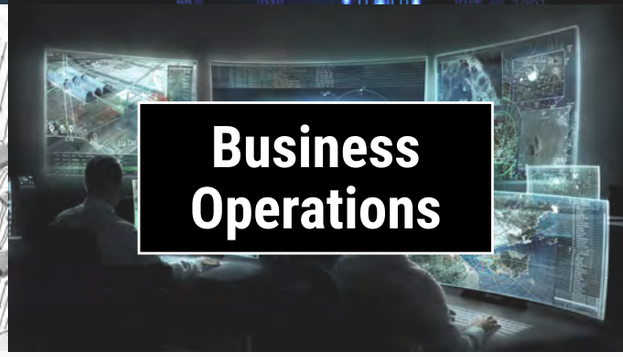

EXECUTING AN **"ALL-UP"** STRATEGY WILL DRIVE MAJOR R&D EFFORTS











AUTONOMY
INSTITUTE

INDUSTRY 4.0 CREATES INDUSTRY, JOBS & PRODUCTIVITY

AUTONOMY INSTITUTE

JOBS/ Research

- Autonomy will create tens of thousands of jobs
- It will drive Research and Development
- Lead the next two decades of innovation

Economic Development

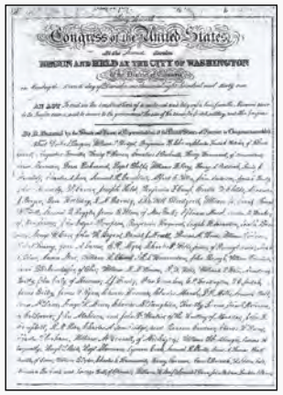
- National buildout of Intelligent Infrastructure
- Autonomous Systems will drive billions in economic impact.
- New revenue from avigation easements and operational use

IMPACT LEADERSHIP

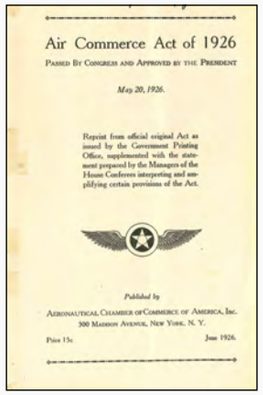
- Attract $100s of millions to Drive the "Path to Commerce"
- First to Deploy Autonomous Infrastructure
- First Autonomous Systems Operations Control Center

What is next? . . . "United States "Autonomy Commerce Act 2021"

1862 Railroad


Congress of the United States
BEGUN AND HELD AT THE CITY OF WASHINGTON

1926 Air


Air Commerce Act of 1926
PASSED BY CONGRESS AND APPROVED BY THE PRESIDENT
May 20, 1926.
Reprint from official original Act as issued by the Government Printing Office, supplemented with the statement prepared by the Managers of the House Conferees interpreting and amplifying certain provisions of the Act.
Published by
AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, Inc.
300 MADISON AVENUE, NEW YORK, N. Y.
Price 15c. June 1926.

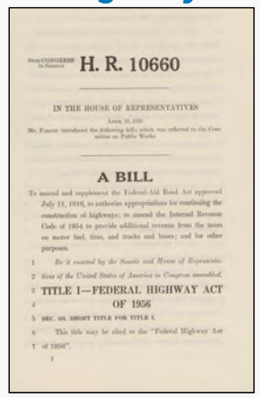
1934 Communications


COMMUNICATIONS ACT OF 1934
TITLE I—GENERAL PROVISIONS

1936 Electric


RURAL ELECTRIFICATION ACT OF 1936
(As Amended Through P.L. 116-94, Enacted December 20, 2019)
TABLE OF CONTENTS
TITLE I—RURAL ELECTRIFICATION

1956 Highway


H. R. 10660
IN THE HOUSE OF REPRESENTATIVES
A BILL
TITLE I—FEDERAL HIGHWAY ACT OF 1956

1964 Urban


Eighty-eighth Congress of the United States of America
AT THE SECOND SESSION
An Act

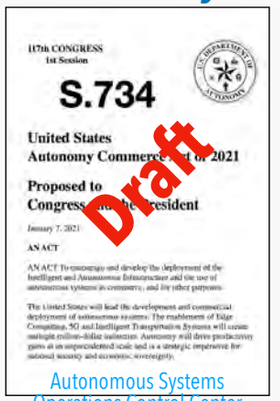
1991 Intermodal


INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991
CONFERENCE REPORT
TO ACCOMPANY
H.R. 2950

1996 Internet


One Hundred Fourth Congress of the United States of America
AT THE SECOND SESSION
An Act

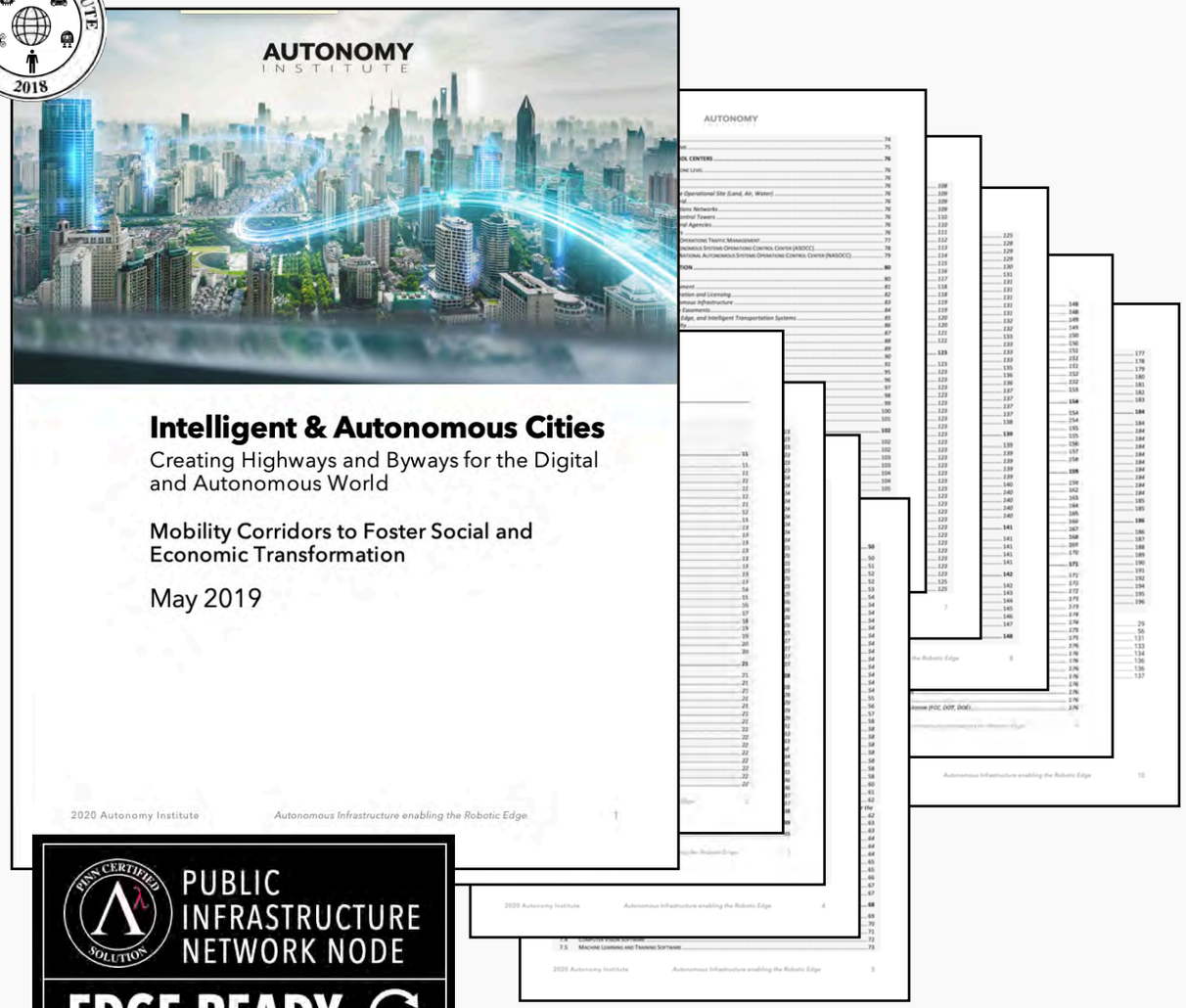
2021 Autonomy


117th CONGRESS
1st Session
S.734
United States Autonomy Commerce Act of 2021
Proposed to Congress by the President
January 7, 2021
AN ACT
Draft

Autonomous Systems Operations Control Center

WE CAN COLLABORATE ON A **NATIONAL PLAN**

AUTONOMY INSTITUTE



PUBLIC INFRASTRUCTURE NETWORK NODE
EDGE-READY 24/7

- **Autonomy Institute Lab - Development & Project Plan**
  - **Autonomous Infrastructure Lab - AIL; Autonomous Mobility Corridor AMC**
    - National AIRE PINN P3 Teaming Agreement Executed
    - Engage in Lab and ASOCC Planning
    - Foundational Easements Identified
    - Grant of Property for the Developoment of an ASOCC
    - Public Works GIS Data for Engineering Study
    - **Engineering Study**
      - Access to Property for XRAY Modeling of Underground
      - Support from TMD to Acquire Fiber Network layourts from Vendors
      - Energy Grid
      - Energy Micro-Grid
      - Define Avigation Easements
      - Support from TMD to Engage Austin Energy Substation
    - **Network, Fiber, RAN, RF Analysis**
      - APNT RF Analysis
      - APNT Network Analysis
      - **Fiber Network**
        - Fiber Resilience (Local, Region, State, Backbone)
      - Carrier RF Analysis
      - CBRS RF Analysis
      - Radar RF Analysis
      - 5.9G ITS RF Analysis
      - RAN for M2M RF Analysis
    - **Project Plan Documents**
      - Property Title Declaration
      - Letter of permission for Right-of-Ways
      - Letter of permission from property Owner
      - Letter of permission from Power Company
      - Urban Planning Review

URBANAUTICS
INTELLIGENT & AUTONOMOUS CITY ENGINEERING

- Community Impact - Letters of support?
- Site Plan
- Official Site Survey
- Utility Survey


AUTONOMY
INSTITUTE
PATH TO COMMERCIALIZATION

INTELLIGENT, AUTONOMOUS, AND ELECTRIFIED INFRASTRUCTURE

UNIFIED **INTELLIGENT INFRASTRUCTURE** FOR ADVANCED SERVICES AND AUTONOMOUS FREIGHT

Texas Department of Transportation

1,000+ PINNs

- M2M Engineered RAN
- Position-as-a-Service
- Situational Awareness
- City Data Exchanges
- Electrification of Mobility
- Active Digital Twin
- Active RF Analytics
- Insurance & Risk Analytics

PINN Clusters

- Broadband
- Intelligent Mobility
- Edge Computing
- Intelligent Sensors
- Smart Grid
- Position & Timing

CARMA

Voices

Microgrids | Data Centers | Smart Ducts | HVDC/Fiber | Charging | Trucking | PODS | Rovers

AUTONOMY INSTITUTE 2018