

Texas State University CIEDAR Projects & Labs



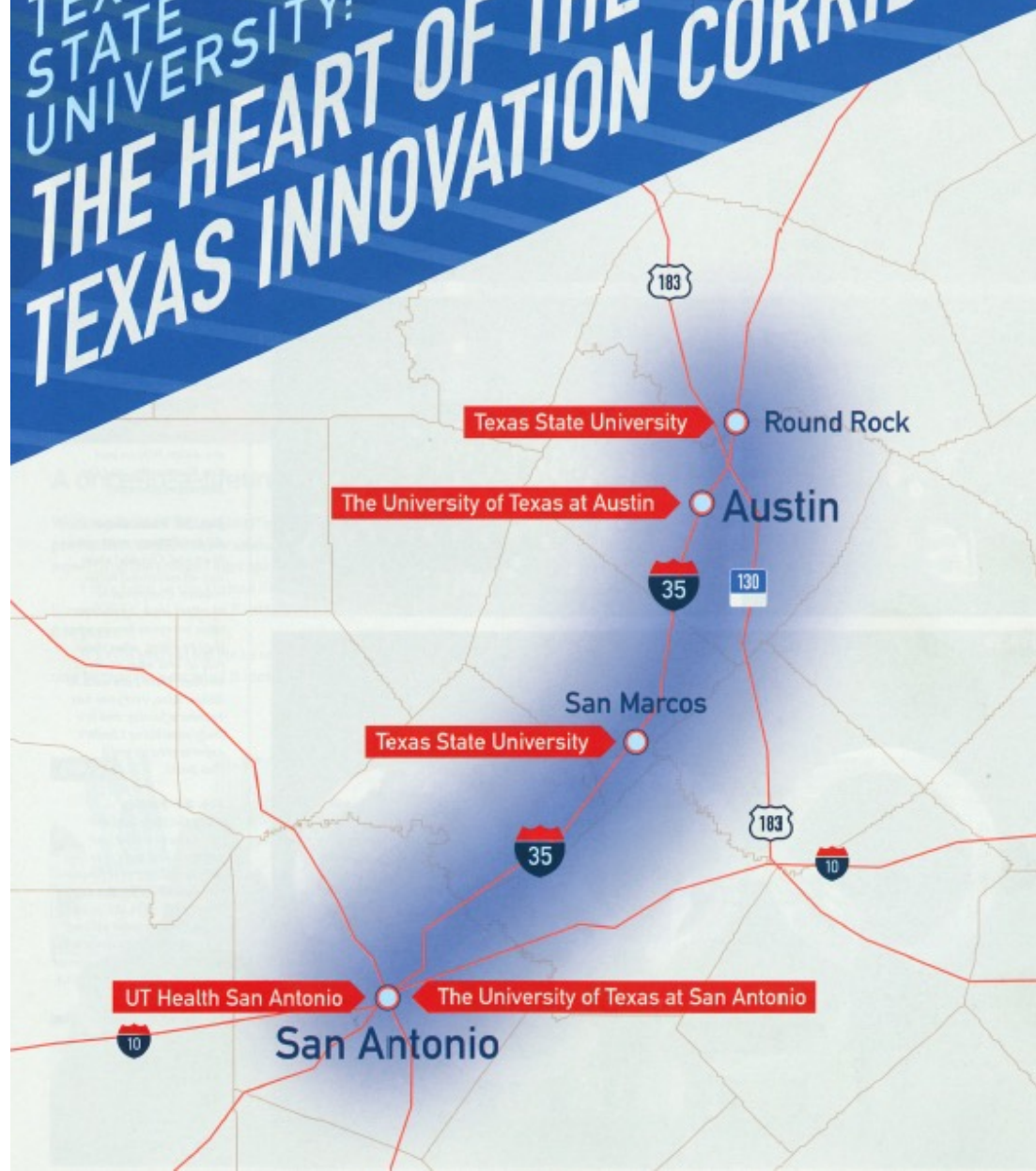
The rising STAR of Texas

Texas State University

- 4th largest university in Texas, 1,800 faculty, 40,000 students, over 5,100 acres of land housing two campuses and multiple research labs.
- 50% of our students are ethnic minorities;
 - 10-year Hispanic Serving Institution (HSI), 35% Hispanic population.



TEXAS STATE UNIVERSITY: THE HEART OF THE TEXAS INNOVATION CORRIDOR



TEXAS
STATE
UNIVERSITY

The rising STAR of Texas

TXST CIEDAR Locations

- Round Rock Campus – 100 acres
- San Marcos Campus – 500 acres
- STAR Park – 100 acres
- Freeman Ranch – 4,200 acres
- Muller Ranch – 160 acres
- ALERRT Center – 65 acres

Grand Total 5,125 acres

TXST CIEDAR Vision

- Connected Infrastructure for Education, Demonstration, and Applied Research (CIEDAR).
- The creation of fourteen (14) living labs in 1,000 acres with a focus on 9 verticals in partnership with industry to accelerate ***digitalization, decentralization, and decarbonization*** of industry.

TXST CIEDAR Mission

- The study of technologies with application to the lifecycle monitoring of infrastructure assets.
 - Validation of existing technologies
 - Evaluation of emerging technologies
 - Development of new technologies
- The multidisciplinary study of technologies with application to infrastructure.
 - project teams may include engineering (civil electrical, industrial, manufacturing, mechanical), physics, chemistry, geography, mathematics, computer science, business, design, biology, psychology, communications and many others.

TXST CIEDAR Key Benefits

- Each lab is a R&D marketplace of solutions solving real life problems.
- Our faculty and students deliver world-class solutions at a 50% less in labor cost. All Intellectual Property licensing have been pre-set at super affordable rates.
- Buyers and Sellers get to work together quickly and efficiently to find practical and affordable answers to pressing challenges.
- Deploying the solutions within TXST real state grounds and/or at any of the Cities and Utilities members.

TXST CIEDAR Smart Living Labs

- CIEDAR is exploring partnerships with industry to develop 14 smart living labs in 9 sectors populated by its expert faculty and students:

Connected Infrastructure, Education, Demonstration, and Applied Research

Smart Utilities

(Grid management, full monitoring, control and management of all assets)

Smart Buildings

(positive energy buildings, embedded sensors throughout, BIM, BAS, BAM)

Smart Energy

(energy storage & batteries, electric vehicles, microgrids, micro generation)

Smart Water/Wastewater

(water & waste treatment, recycling, desalination, conservation, safety)

Smart Cities

(streetlights, traffic lights, public safety, parking, recycling, etc.)

Smart Mobility

(roads, bridges, tunnels, connected vehicles, autonomous vehicles)

Networks (5G, 4G , PLTE, IoT, LPWA, LoRaWAN, LoRA, 6lowPAN, Extended Wi-Fi)

Sensors (wearables, printable, embedded, nano, micro, waterproof, ingestible, others)

Data / Software (AI / ML, Blockchain, Databases, Cloud, Cybersecurity, Autonomous X)

TXST CIEDAR Members



INTERNET | ELECTRIC | HOME



Planning to onboard another 20 new members in the coming months. Cities, Utilities, Enterprises.

TXST CIEDAR Industry Advisory Board



Dave Anderson
President & CEO



Richard Soley
Executive Director



Gabriel Reyna
Managing Partner



Jason Giulietti
President



Al Berkeley
Chairman



Mike Krusee
Board Member



Curtis Rodgers
Principal



Current and Potential Member Relationships

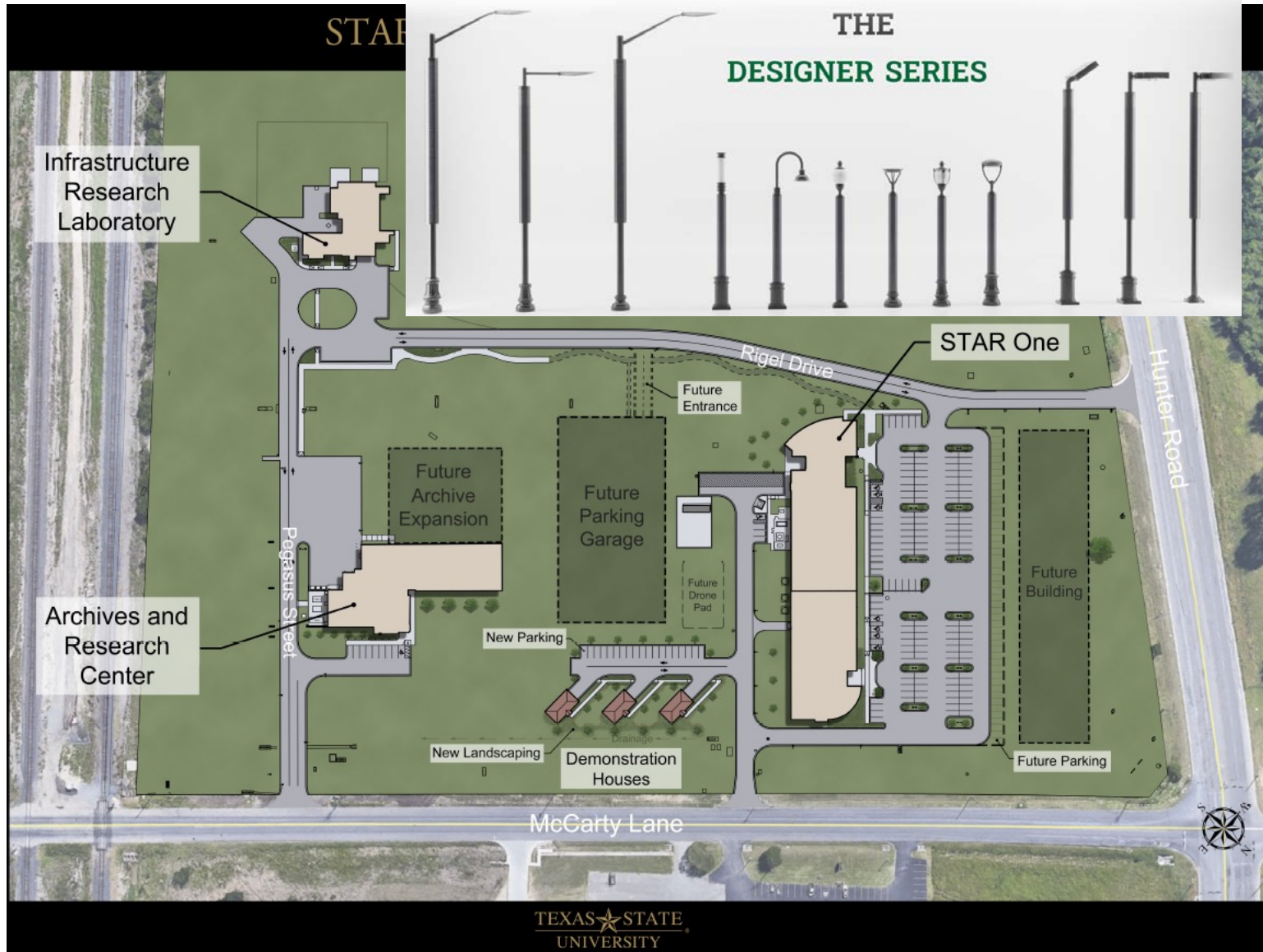


The rising STAR of Texas

TXST CIEDAR Key Projects

- Stand Up Smart Networks Lab at STAR Park - OPEN
 - Private LTE/5G 900 MHz licensed research network testbed buildout reaching all facilities.
 - Wirepas 900 MHz unlicensed research network testbed buildout reaching all facilities.
 - LoRAWAN 900 MHz / 2.4 GHz unlicensed research network testbed buildout reaching all facilities.
 - Wi-SUN 900 MHz unlicensed research network testbed buildout reaching all facilities.
 - Wi-Fi 6 / 4G / 5G on our Smart Street Lights across our Smart City Lab.
 - CBRS 3.55 – 3.7 GHz research network testbed buildout reaching all facilities.
 - 10/100 Gbps fiber research network testbed buildout reaching all facilities.
- Smart Cities Lab at STAR Park- Smart LED / Solar Powered / Energy Storage Street Lights with Wi-Fi / 4G / 5G cells and Optical, Noise, Air Quality, Humidity, Temperature, and Flood sensors - OPEN
- NOC/SOC Training Lab at STAR Park (173) - OPEN
- Smart Building & Infrastructure Lab at STAR Park – OPEN
- Sensors Lab – Opens in Q1
- Big Data and Software Lab – Opens in Q1
- Smart Commercialization Lab – Opens in Q4
- 64 MW and 160-acres Solar PV Farm testbed and Smart Energy & Utilities Lab 15, 000 sq ft at Muller Ranch – RFP in Q1 2023
- Smart Mobility Lab at Freeman Ranch, SMTX Airport, and HWY I35 and 130 - Planning
 - 500-acre smart mobility track testbed buildout
 - 100 miles round trip CAV Shuttle System from RRTX <-> SMTX
 - Drone Power Line and tower Inspection testbed buildout by Q3 2022 at SMTX Airport
 - Drone Commercial Packages Delivery testbed buildout by Q3 2022 at SMTX Airport
 - Drone People Transport testbed buildout by Q3 2022 at SMTX Airport
 - VTOL testing and VTOL Pod development and testing at SMTX Airport
- Workforce Housing competition followed by testbed and Smart Homes Labs at STAR Park - Planning
- Smart public safety testbed + Smart XReality Lab at ALERRT Center - Planning

Smart Cities Lab



THE DESIGNER SERIES



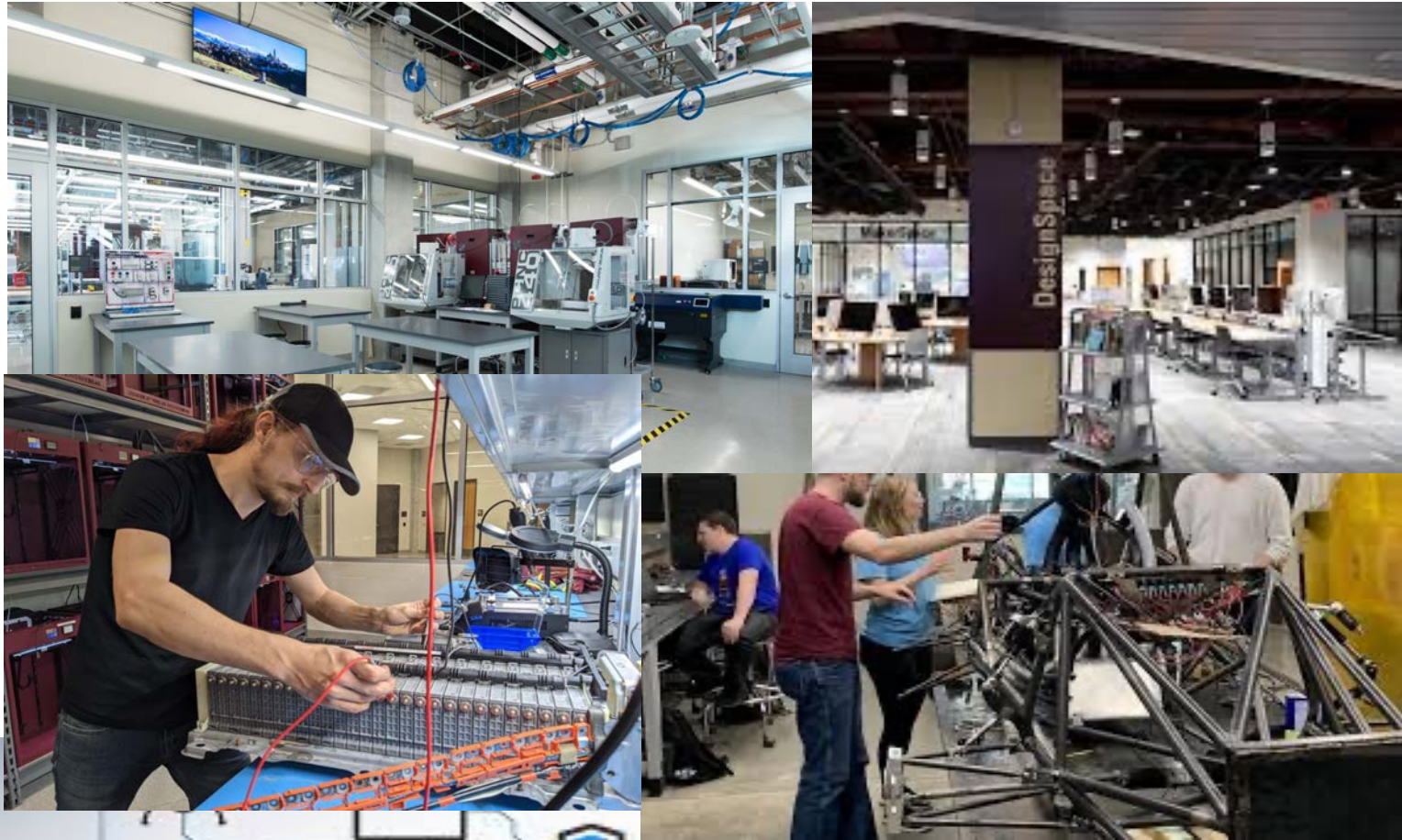
Smart Buildings & Infrastructure Lab



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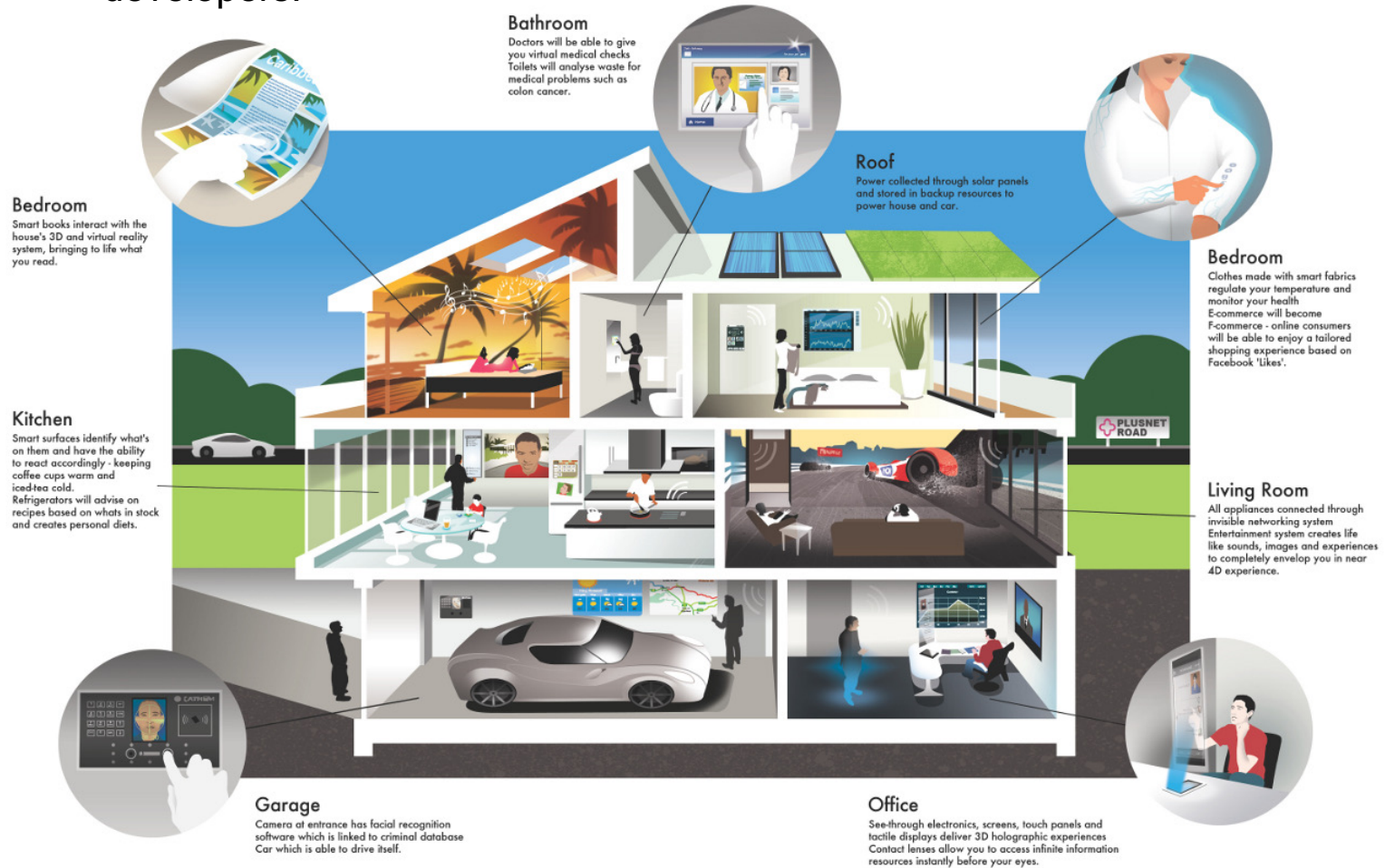
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Advanced Prototyping Lab



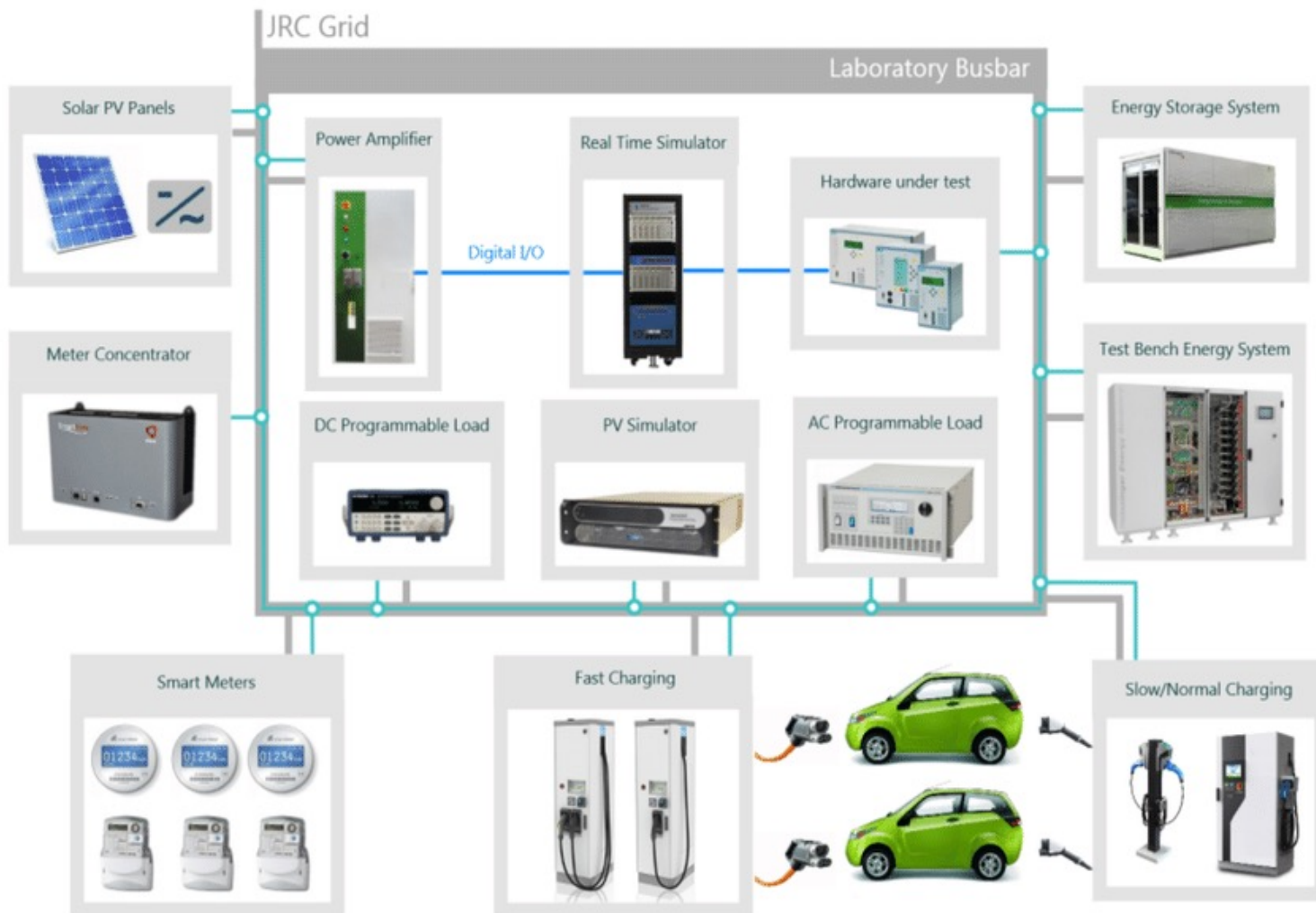
Smart Homes Lab

1,000 square feet, 2 bedroom, 1 or 2 bath, net zero energy, net zero water, design and build cost at or less than \$100 per square foot. 3 winners build at STAR Park models. Deploy region wide with local developers.



Smart Energy Lab

Solar PV, fuel cells, energy storage, EV charging, V2G/V2X, tracking systems, energy management systems (VVO/DRMS/DERMS/VPP), metering, inverters, power electronic components, trading systems, blockchain, AI/ML/Analytics, drones for monitoring, drone recharging, and green hydrogen.



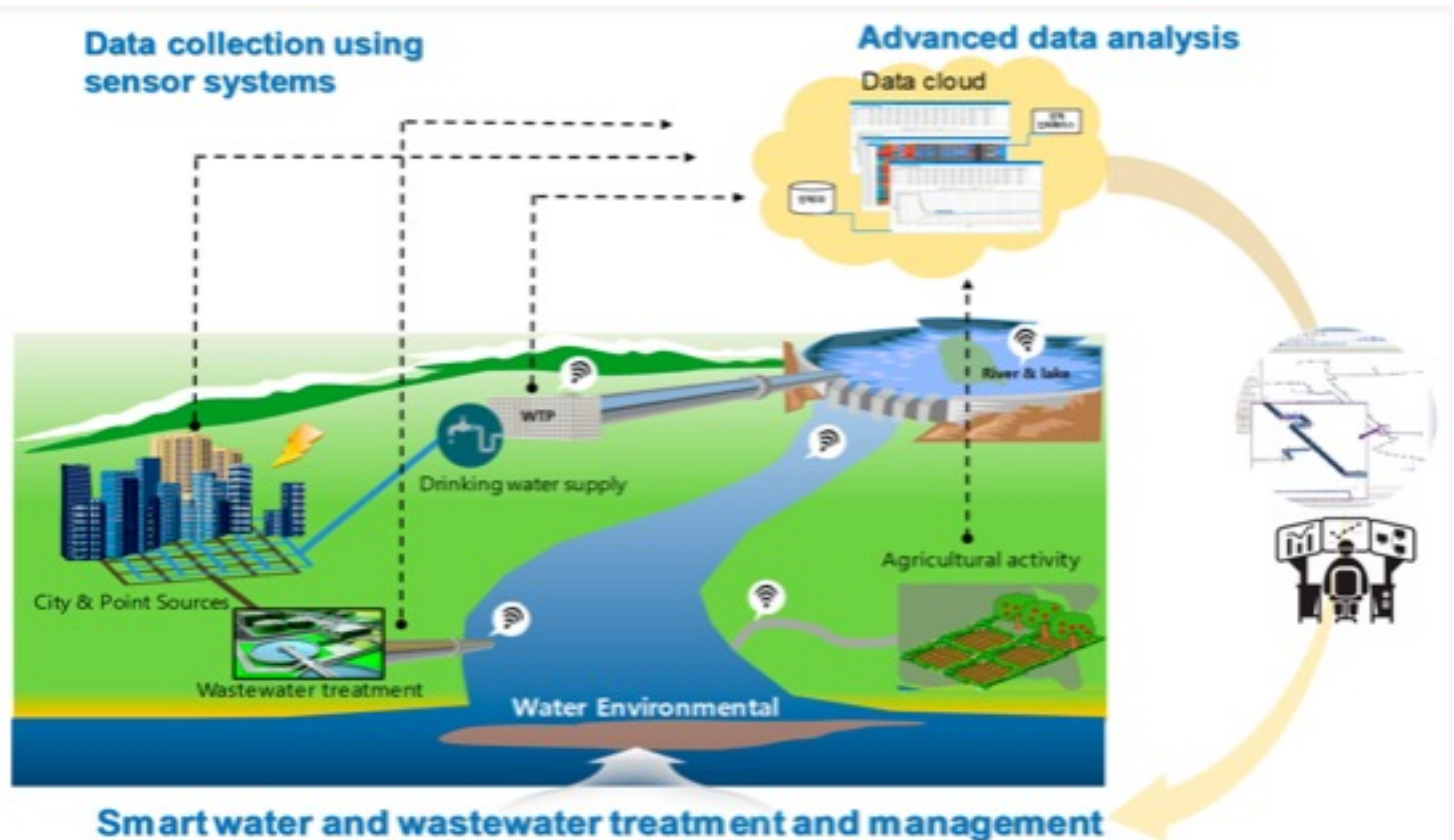
Smart Utilities Lab

Digital Substation, Digital Energy Control Room, Digital Switch yard, Smart grid management (Sub / Transformers / Distribution-Wires, meters, DCS / GMS, OMS / DMS / ADMS, and SCADA / EMS), energy management systems (V2G / CVR / VVO / DR / DER / VPP), control systems (CVR, FDIR, FLISR, Power Factor, Harmonics, Modulation, Power Electronics), Transformers, Reclosures, Switches, Feeders, Tap Changers, Bushings, HV Wires, MV Wires, LV Wires, Cap Banks, energy storage, EV charging, metering, trading systems, blockchain, AI / ML / Analytics, communications networks, cybersecurity.

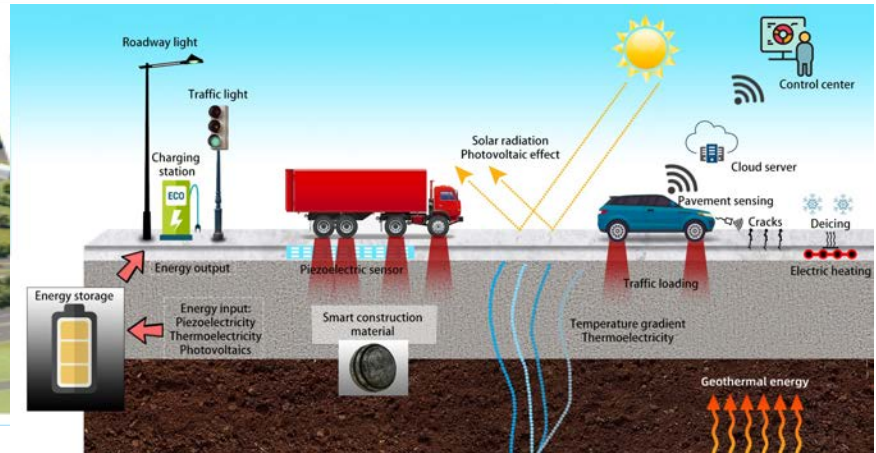


Smart Water & Wastewater Lab

Water Treatment (Surface Water and Groundwater), Wastewater Treatment, Brackish Water Desalination, Potable and Non-potable Water Reuse, SCADA, Data Analysis and Process Optimization, Source Water, Lake and Reservoir Management, Water Collection and Distribution System, Centralized and Decentralized Systems, Stormwater Management, Rainwater Harvesting, Conservation, Safety, AMI, Pre-Pay, Leak Detection, Master Planning, Smart Pumping, Water Quality, Emerging Contaminants and Advanced Treatment, and Water Management NOC (Video Wall).



Smart CAV Lab



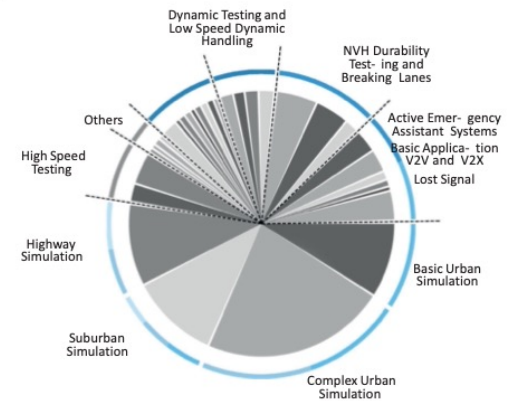
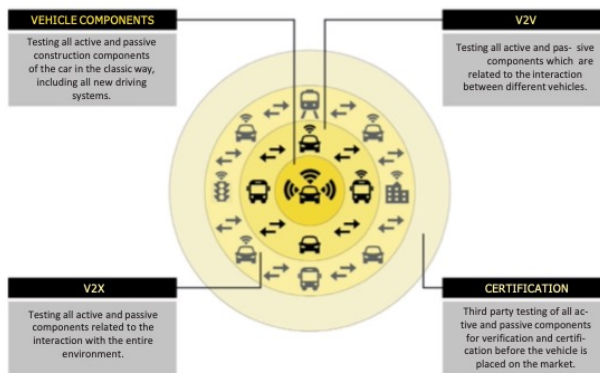
New testing scenarios.

The new testing environments and scenarios will vary significantly from the traditional way of testing.

A shift towards new testing scenarios

In testing of CAV (Connected Autonomous Vehicles) there will be a shift towards new test scenarios. At TILKE we have analyzed these new requirements and come to the following conclusion:

- **Simulation in complex urban environments** will be one of the most important testing fields.
- **Laboratories** and testing in the virtual (digital) environment will become key.
- **Highway simulation** (ramp on, ramp off) will become an important test scenario.
- **Traditional testing** (NVH Durability, Braking) will remain important.
- Active emergency, L.O.S. (loss of signal), V2X and V2V communication are new testing requirements.
- High speed and dynamic testing become less important.

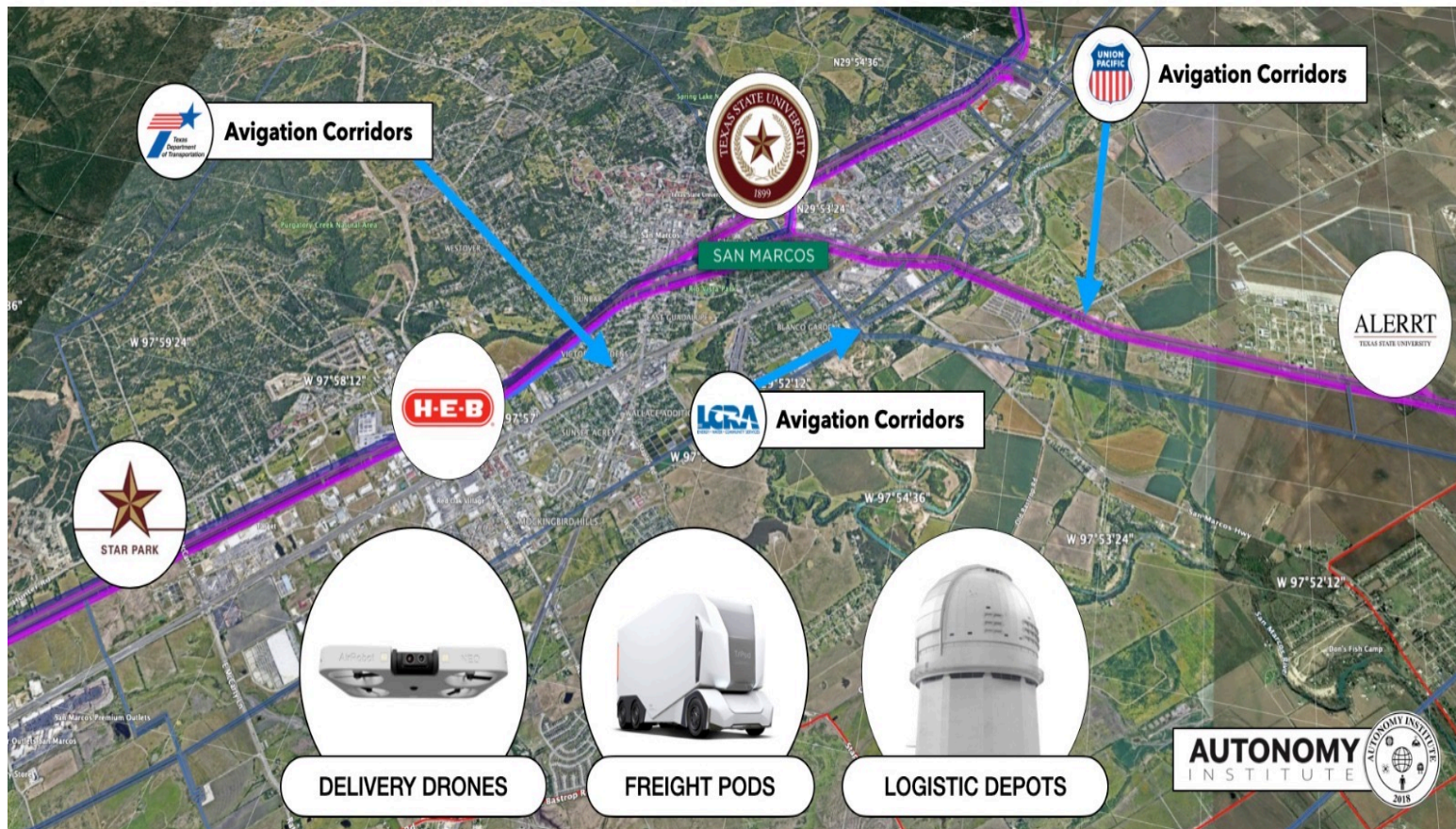


100 miles RR <-> SM CAV Lab

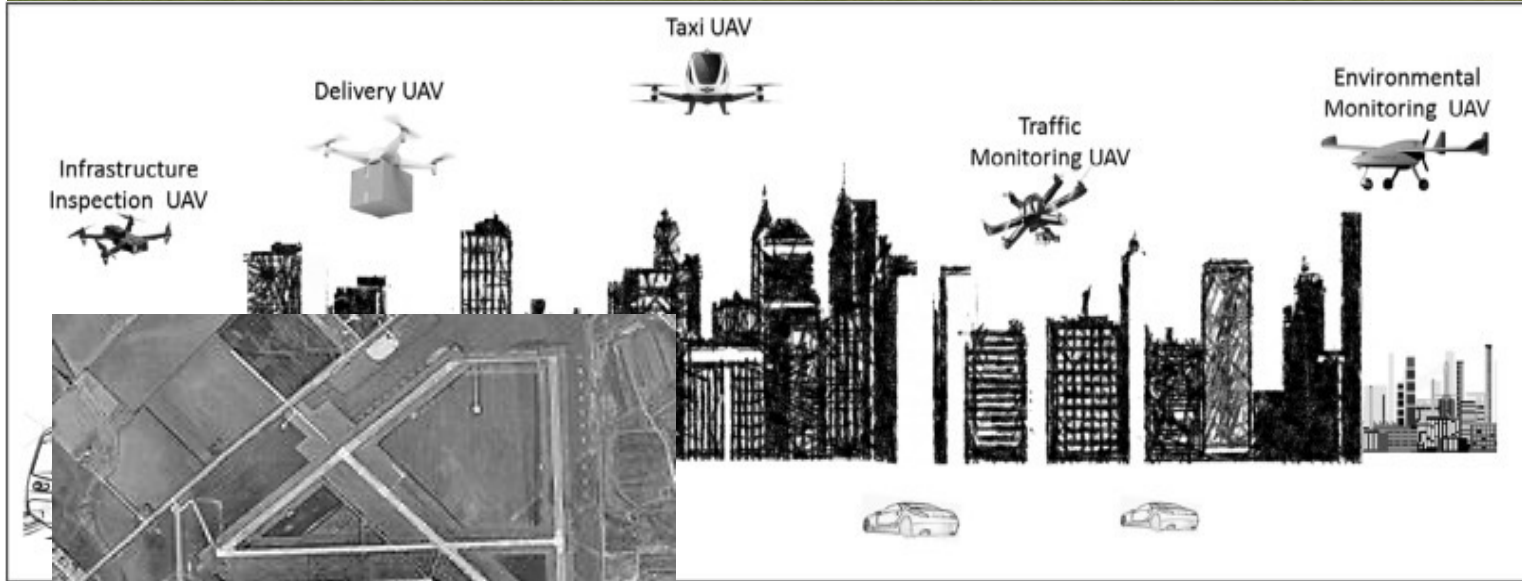


INTELLIGENT AND AUTONOMOUS INFRASTRUCTURE

INTELLIGENT INFRASTRUCTURE & AVIGATION EASEMENTS FOR ADVANCED SERVICES



Smart DRONE/VTOL Lab



New runway and hangar materials, DRONE / VTOL pads and recharge microgrids, drones with sensors, solar PV and energy storage, LED lights and smart buildings.

Smart Networks Lab



- Private LTE/5G 900 MHz licensed research network testbed buildout reaching all facilities
- Wirepas 900 MHz unlicensed research network testbed buildout reaching all facilities
- LoRAWAN 900 MHz / 2.4 GHz unlicensed research network testbed buildout reaching all facilities
- Wi-SUN 900 MHz unlicensed research network testbed buildout reaching all facilities
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Big Data and Software Lab

AI/ML

Blockchain

Databases

Embedded Systems

Cloud Computing

Mobile Computing

Cybersecurity

Autonomous Controls

Voice Controls

UX platforms

UI platforms

Programming Languages

Social Media

AR/VR/XR

Digital Twins

GIS, Location Services

Written Equations

Visualization

Control Systems

Energy Management Systems

- **System Software**
- **Application Software**
- **Utilities Software**
- **Computer Security**



Smart Sensors Lab

Pressure

Temperature

Force

Vibration

Motion

Light

Ultrasonic

Smoke

Smell

Color

Gas

Alcohol

CO2

Fluid

Altitude

Humidity

Air Quality

Wearables

Embedded

Nano / Micro

Gesture

Voice

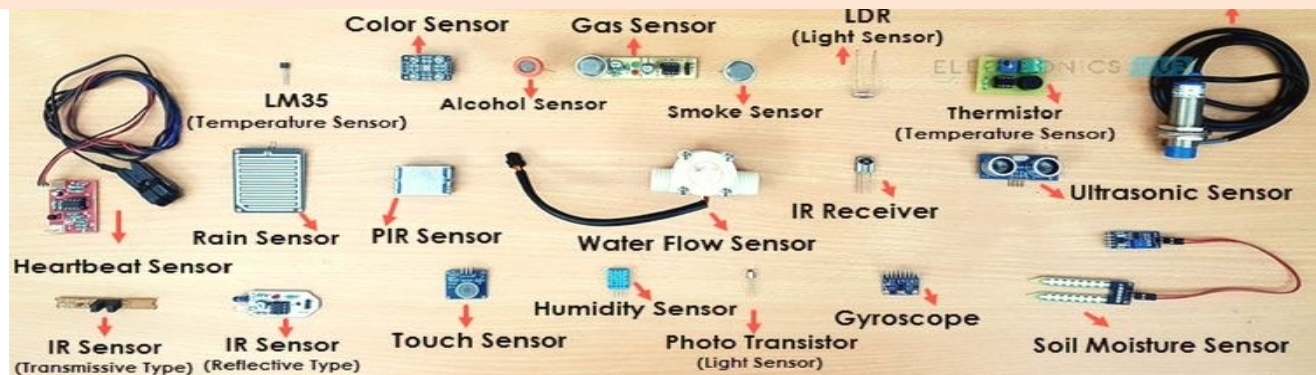
Water Proof

Ingestible

Printable

Location

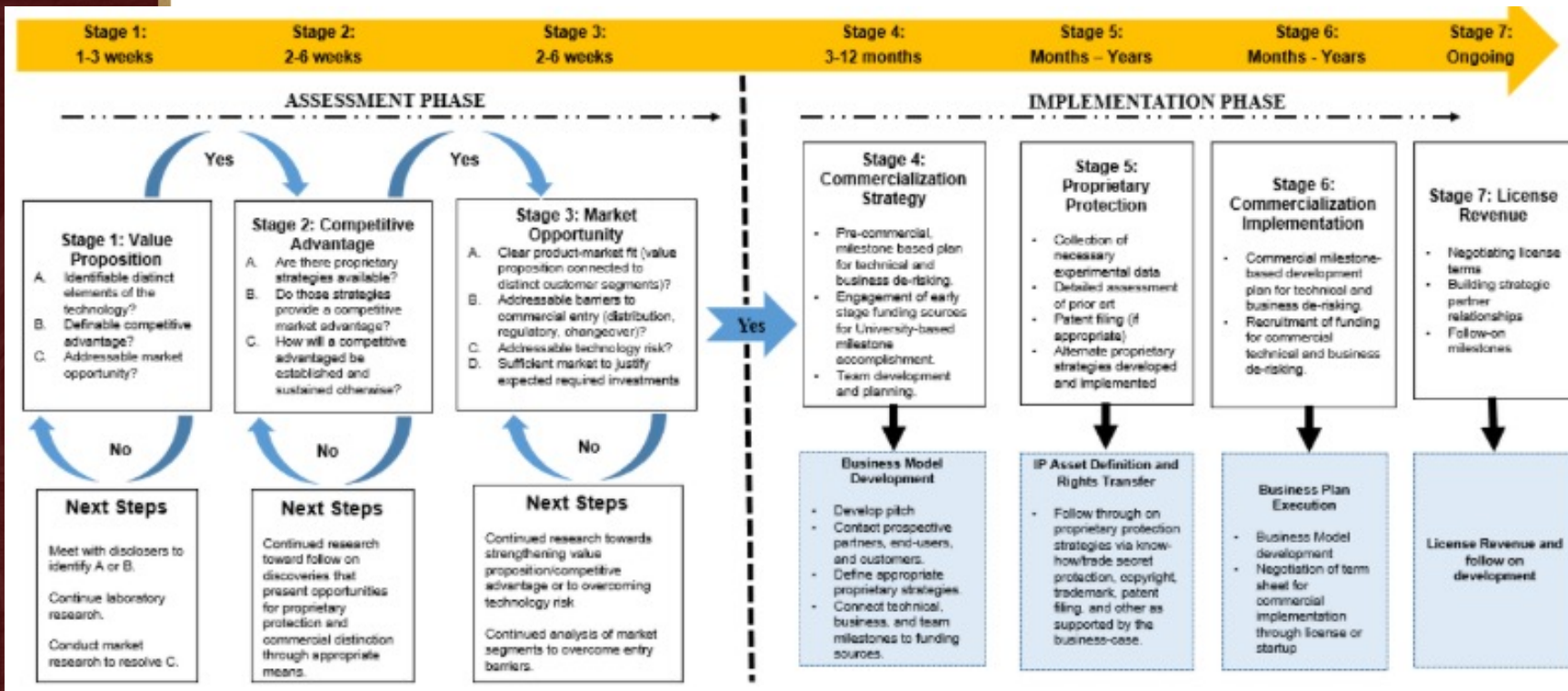
AI/ML



NOC/SOC Training Lab



Smart Commercialization Lab



Problem, Solution, Value Proposition, Competitive Advantage, Market Opportunity, & Size, Business Models, Supply Chain, Partnerships, Proprietary Protections, Go-To-Market Strategy, Implementation Plan, Warranty and Services, Customer Lifecycle Management.

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