Cybersecurity for Automotive, AV, CV, and Transportation

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Hackers Remotely Control a Jeep on the Highway

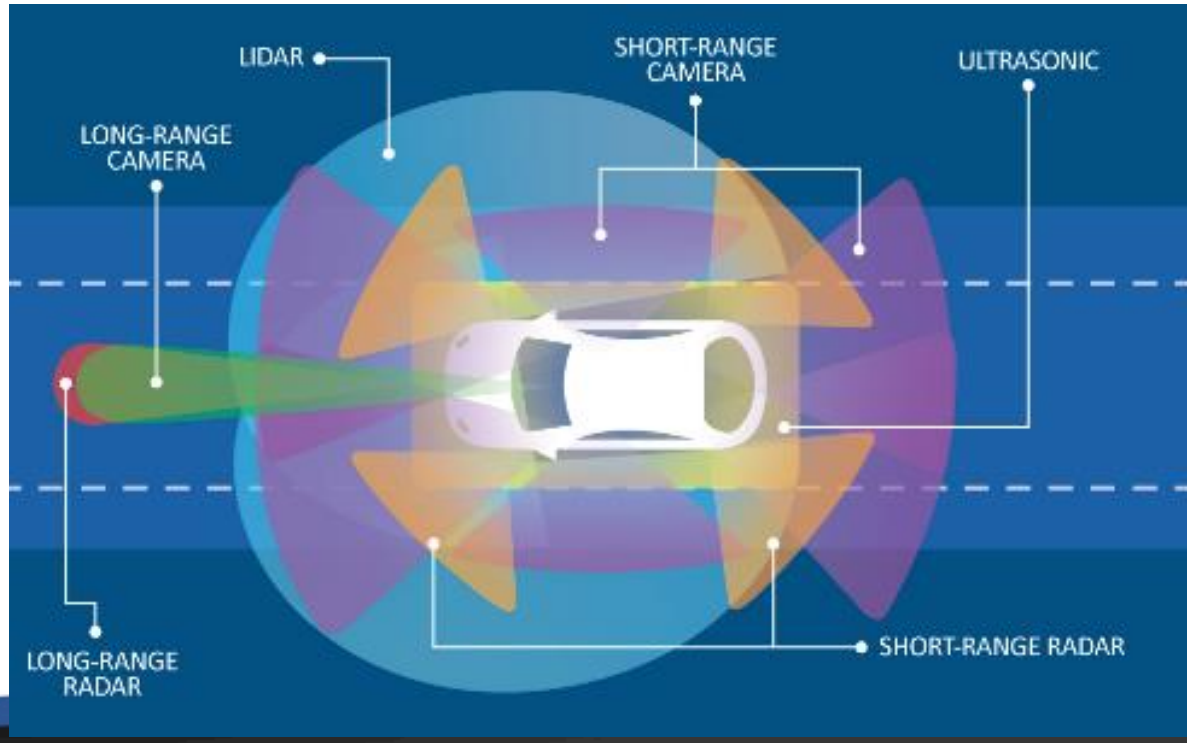
Image Source: Wired Magazine

- Found vulnerability in cellular services
- Pushed a malicious firmware update
- Sent arbitrary CAN messages to control vehicle

Thieves Break Into Vehicle by Hacking Keyless Technology

Automated Vehicles

- Inherit vulnerabilities from traditional autos
- Reliant on sensors

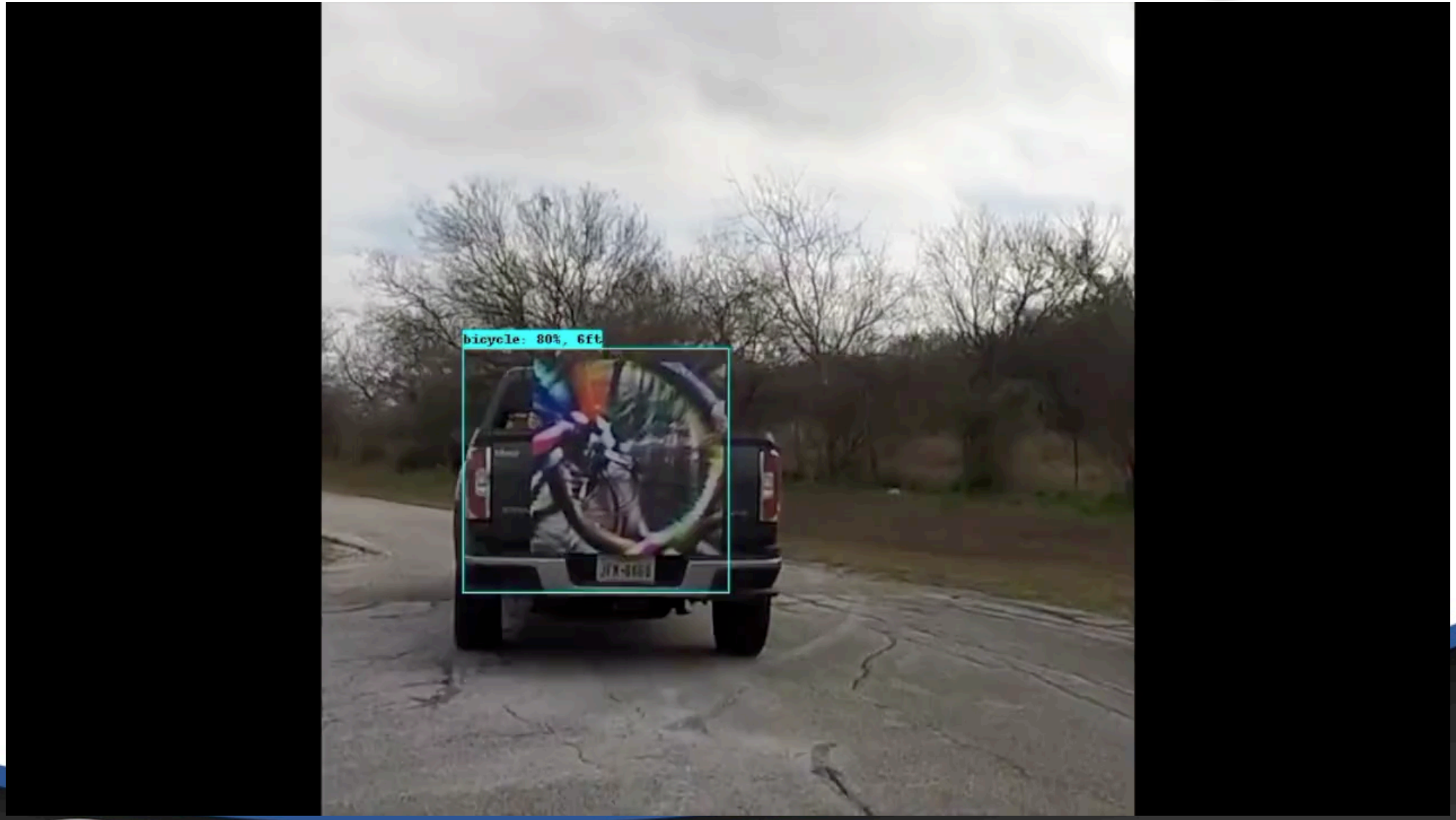


Researchers hack self driving car by putting stickers on street signs

May need to add digital identifier.

Source: autoblog.com

Adversarial Learning



Automated Driving Security

- GPS
- Radar
- Ultrasonic
- LIDAR

Connected Vehicles (CV)

- CV produce a lot of data:
  - How will DOTs process vast amount of data?
  - Edge computing with feedback from central server.

Not currently feasible to send all data to central server.

Connected Vehicles

- How will integrity be maintained?
  - Issues with this approach have been presented on.
  - Certificate Authority must enforce revocation when flagged.

Source: https://www.abc.net.au/

Green Lights Forever

https://www.slideshare.net/o1066391/green-lights-forever

- Remotely controlled traffic signals.
- Able to trip flashing reds.
- Access to all lights that shared the network.

Source: https://www.eecs.umich.edu/

What's next?

- Identify:
  - Know your assets, legal obligations, and **your risks**.
  - Risk assessment is the first step.
- Protect:
  - Use locks. Require passwords. Provide training.
  - Don't use #2 key
- Detect:
  - Anomalies. Monitor systems and networks.
- Respond:
  - Develop response plan, what will you do when an incident is detected?
- Recover:
  - How will you recover from an incident?

Source: nist.gov

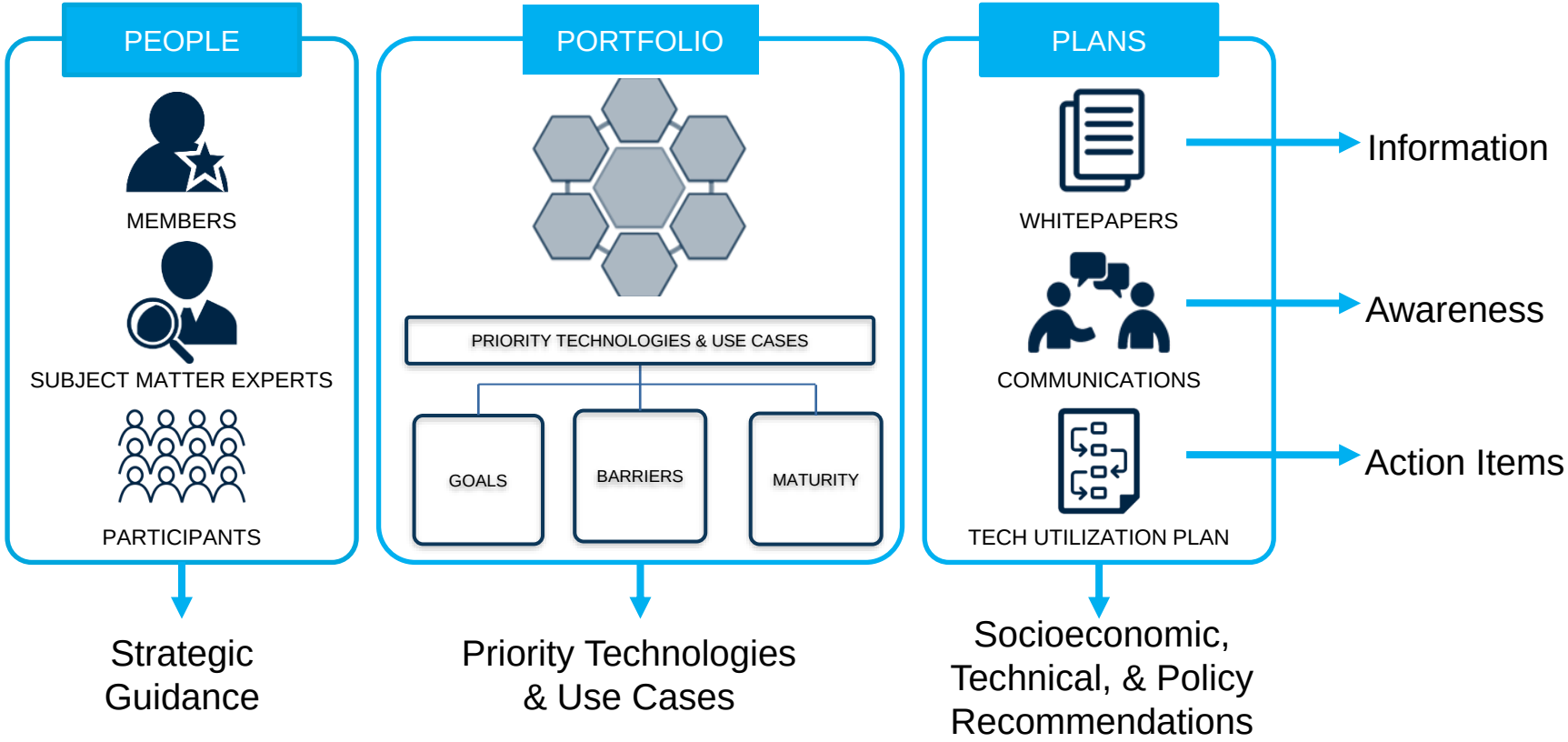
Questions?

TTTF

TEXAS TECHNOLOGY TASK FORCE

July 7, 2020

Texas Technology Task Force: Overview



Technology Utilization Plan

>> A strategic document to guide the anticipation and inclusion of advanced technologies for the Texas transportation system and within TxDOT

Emerging Technology Evaluation

Spring 2019

Best Practices & Lessons Learned

Fall 2019 – Spring 2020

Recommendations & Utilization Roadmap

August 2020

Technology Utilization Plan: Phase I

Prioritization

Goal Assessment

Maturity & Readiness

Use Case Mapping

Barrier Assessment

Timelines for Adoption

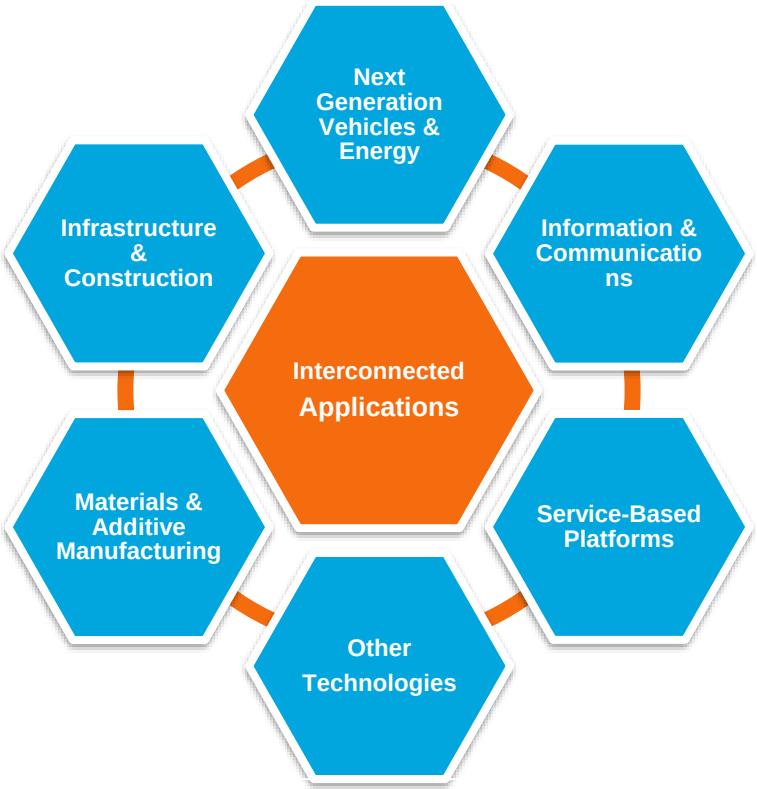
Technology Utilization Plan: Phase I

Next Generation Vehicles & Energy
Automated Vehicles
Connected Vehicles
Electric Vehicles
Unmanned Aerial Vehicles

Infrastructure & Construction
Infrastructure Enhancements
Construction Techniques
Solar Powered Highways

Materials & Additive Manufacturing
Self-Healing Pavements
Nanotechnologies
3D Printing

Other Technologies
Robotics
Virtual/Augmented Reality
Hyperloop



Information & Communications
Cloud Computing
Crowdsourcing
Blockchain
Big Data & Open Data
Cybersecurity
RFID
Cloud & Edge Computing
Data Standards & Interoperability
Machine Learning & AI
Telecommunications

Service-Based Platforms
Mobility on Demand
Micromobility
Transportation Subscription Services
Freight Brokerage
Uber Elevate
Last Mile Delivery

Technology Utilization Plan: Phase I

Autonomous Vehicles

Connected Vehicles

Electric Vehicles

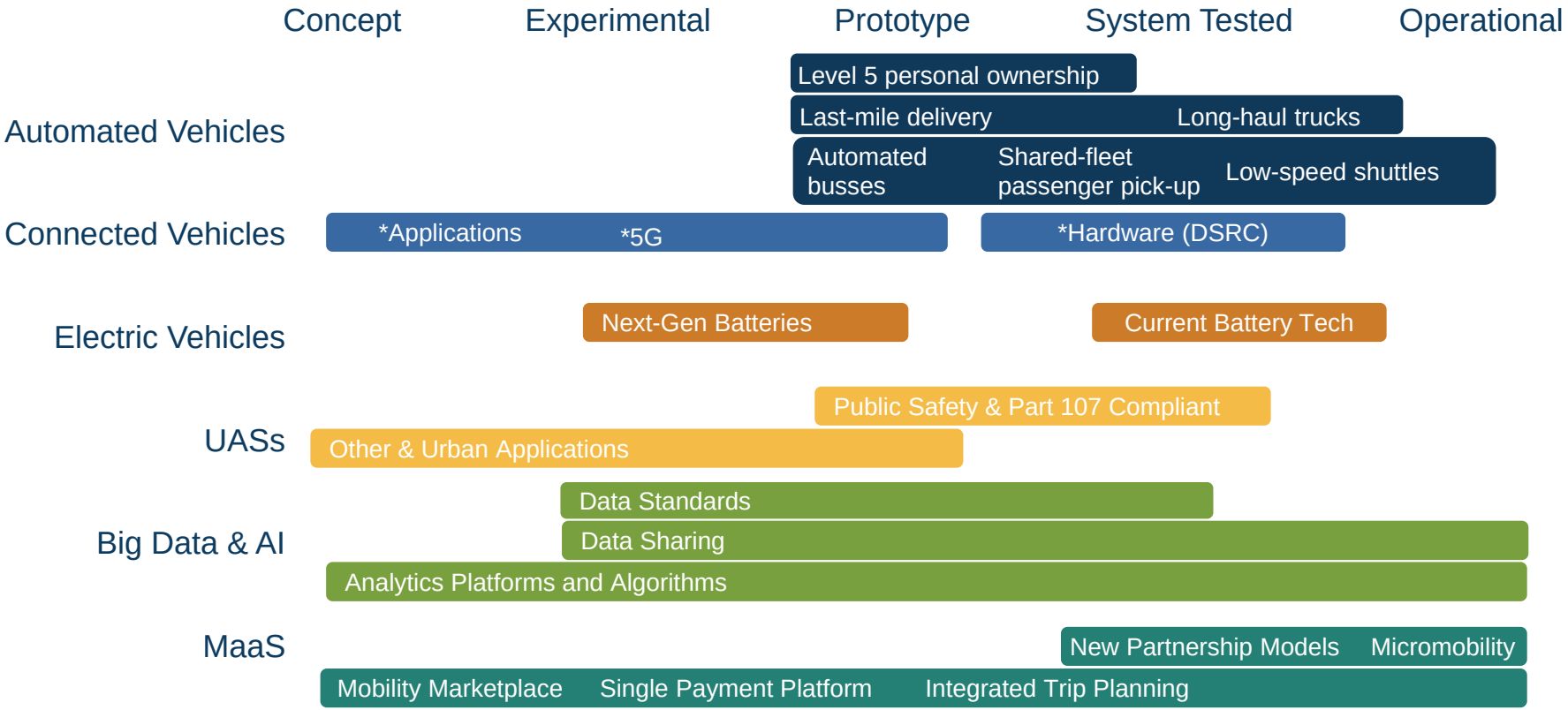
Big & Open Data

Mobility as a Service

Unmanned Aerial Vehicles

Priority Technologies: Phase I(Goal Assessment)

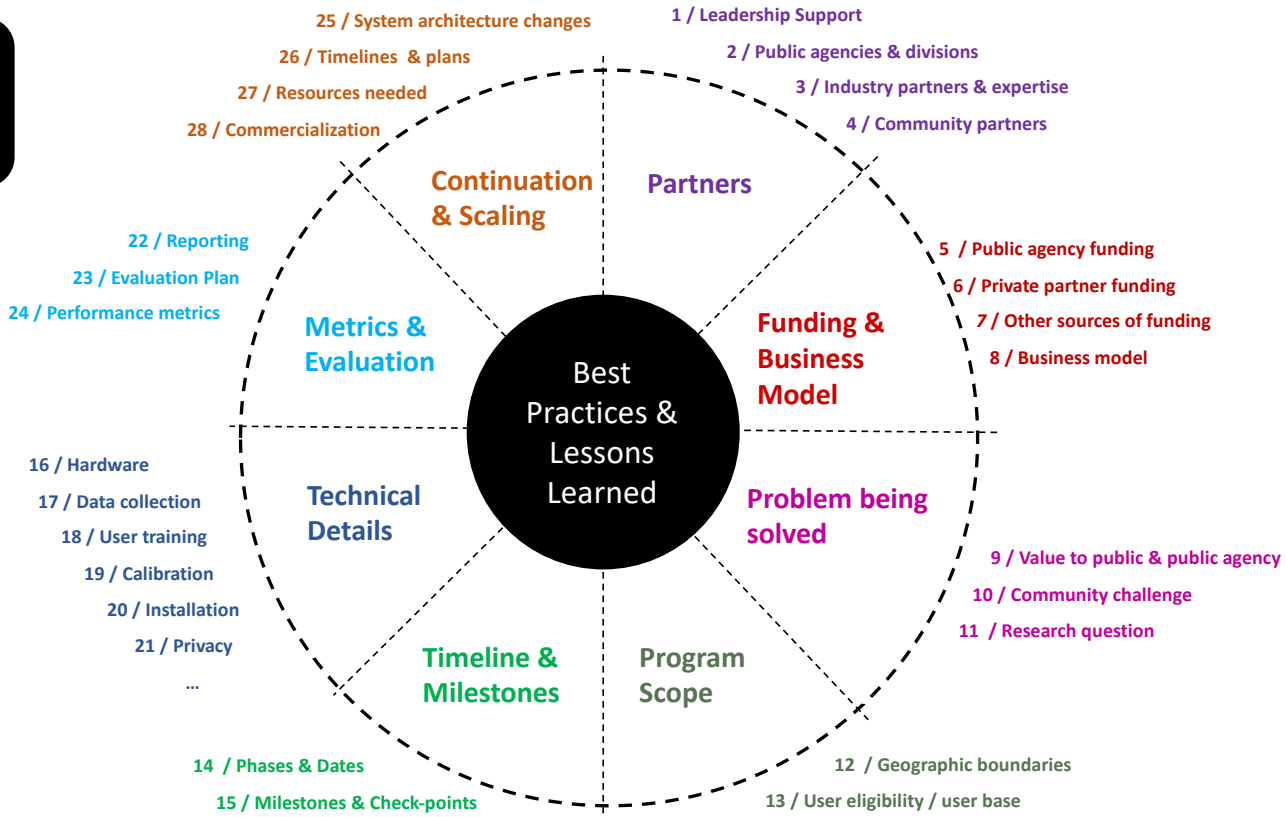
Priority Technologies: Phase I (Technology Maturity)



Technology Utilization Plan: Phase II

Elements of Best Practices & Lessons Leaned for Case Studies & Interviews

- Autonomous Vehicles
- Connected Vehicles
- Electric Vehicles
- Big & Open Data
- Mobility as a Service
- Unmanned Aerial Vehicles



Technology Utilization Plan: Phase III

READINESS INDEX

10 point scale where 1 = least ready & 10 = most ready

GAP ANALYSIS

High Priority
Needs Work
Not Urgent

Legislation	Deployment	Research	Public Education
High Priority	Not Urgent	Needs Work	High Priority

SHORT-TERM	LONG-TERM
• Actions to take by the State to advance technology in the next 1 – 3 year	• Actions to take by the State to advance technology in the 3 years and beyond

Autonomous Vehicles: Readiness Index

READINESS INDEX

7 / 10

GAP ANALYSIS

High Priority
Needs Work
Not Urgent

Legislation	Deployment	Research	Public Education
Needs Work	Needs Work	Needs Work	High Priority

SHORT-TERM

- Launch a statewide public education campaign with demonstrations
- Create website of pilot tests and deployments within Texas
- Conduct public sentiment surveys

LONG-TERM

- Development of uniform Statewide AV funding mechanism
- Support local infrastructure and innovation projects
- Attract private sector investments
- Partner with State and National level leadership

Connected Vehicles: Final Recommendations

READINESS INDEX

DSRC: 7/10; C-V2X: 4/10

GAP ANALYSIS

High Priority
Needs Work
Not Urgent

Legislation	Deployment	Research	Public Education
High Priority	High Priority	Needs Work	Needs Work

SHORT-TERM

- Observe and plan for expansion on existing TCFC efforts
- Monitor developments and technology advancements between DSRC and Cellular communication, and learning from existing deployments within Texas
- Keep informed on security and data needs

LONG-TERM

- Build a network of connected corridors that offers both DSRC and Cellular communication
- Keep informed on standards and advancing technology so Texas is not behind when a dominant technology is found
- Establish joint funding mechanisms for CAV initiatives

Electric Vehicles: Final Recommendations

READINESS INDEX

8/10

GAP ANALYSIS

- High Priority
- Needs Work
- Not Urgent

Legislation	Deployment	Research	Public Education
High Priority	High Priority	Needs Work	Not Urgent

SHORT-TERM

- Keep informed on national legislation regarding right-of-way charging regulations
- Plan for alternative revenue sources
- Plan to include electricity under the definition of vehicle fuel to maintain funding sources

LONG-TERM

- Keep informed on evolving battery technologies and infrastructure requirements
- Continue planning and adjusting alternative revenue sources
- Ensure major corridors and feeder routes are equipped with operational charging infrastructure

Unmanned Aerial Vehicles: Final Recommendations

READINESS INDEX

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GAP ANALYSIS

Legislation	Deployment	Research	Public Education

SHORT-TERM

- Leverage researchers to identify use cases and map the associated benefits
- Prioritize use cases and work quickly to deploy
- Identify use cases with long term potential
    - This will guide priorities for Legislation, Research, and Public Education

LONG-TERM

- Investigate the broad changes which would come with high levels of adoption
- Develop an airspace management plan, following the example provided by NCDOT
- Develop an understanding of what infrastructure is needed to deploy urban air mobility

Big & Open Data: Final Recommendations

READINESS INDEX

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GAP ANALYSIS

High Priority
Needs Work
Not Urgent

Legislation	Deployment	Research	Public Education
High Priority	Needs Work	Needs Work	High Priority

SHORT-TERM

- Develop and implement a framework and rubric in order to evaluate opportunities to use big data to achieve organizational goals.
- Based off of the implementation of select pilot projects, create an implementation plan to scale those particular use cases along multiple corridors across the state.

LONG-TERM

- Take stock of privacy and security norms and protocols across the agency and develop an intradepartmental task force to develop privacy values, standards, and ultimately a culture of privacy across all programs.

Mobility as a Service: Final Recommendations

READINESS INDEX

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GAP ANALYSIS

- High Priority
- Needs Work
- Not Urgent

Legislation	Deployment	Research	Public Education
Needs Work	Needs Work	High Priority	Needs Work

SHORT-TERM

- Assess current trip planning tools in use by Texas transit agencies.
- Evaluate integrated payment platforms and look for opportunities to coordinate at a statewide level
- Facilitate a working group in to collaborate and share MaaS approaches across the state

LONG-TERM

- Scale resources to transit services for MaaS pilot projects (ex: HoustonConnect)
- Encourage integration of MaaS into local policy objectives and facilitate multimodal planning
- Facilitate urban-rural connections.

Concluding Thoughts & Reflections

- Coordinate with other technology plans, innovative programs, and deployment efforts
- Conduct annual review of technology portfolio, priorities, assessments, and recommendations
- As technologies mature, develop agency readiness guides and track maturity through key performance indicators