Automation of Transit within a City.

A QUICK DISCUSSION ON THE IMPACT OF CONNECTED AND AUTONOMOUS VEHICLES ON AN URBAN ENVIRONMENT

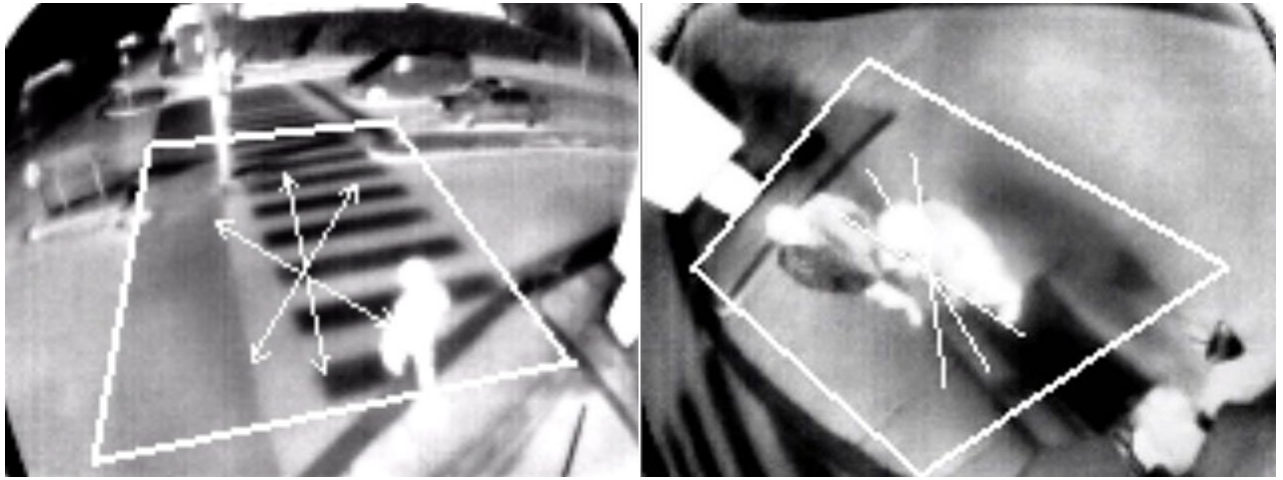
Preparing a City for “dumb” Autonomous Vehicles

- “Dumb” AV’s cannot operate ***safely*** in conjunction with human-operated vehicles without information from infrastructure e.g. sensors and traffic signals and even other vehicles (V2V communication)
- Cities must have infrastructure in place to provide this information to dumb AV’s (V2I communication)
- This infrastructure is required for safe rollout in nascent stages of AV technology, but still an integral foundation of mature “Smart” AV’s

Preparing a City for “Dumb” AV’s: Infrastructure

- Some form of network connectivity infrastructure e.g. Fiber, Radio, Cellular (4G/5G) is usually already in place
- **Sensors** and **modern traffic controllers** will likely be the required additions
- Low-latency communication is vital to dumb AV’s in the world with manually-operated vehicles and pedestrians
- Infrastructure location: “In the ground” or “on the pole”?
- Cities are in control of infrastructure buildout and will progress at their own rates

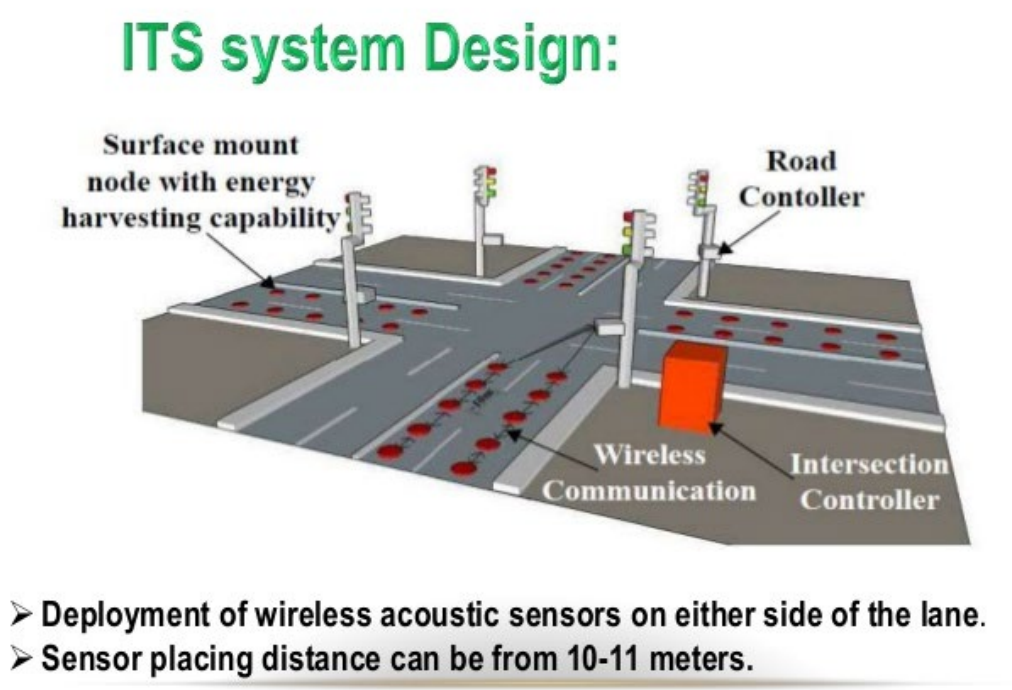
Traffic Control and Sensors



Left – Wavetronix SmartSensor an “intelligent” radar capable of seeing and identifying high priority traffic.

Right - The FLIR TrafiOne using thermal imaging and Wi-Fi technology to adapt traffic signals.

Traffic Signals and Control Centers



Standard Intelligent Traffic System Design

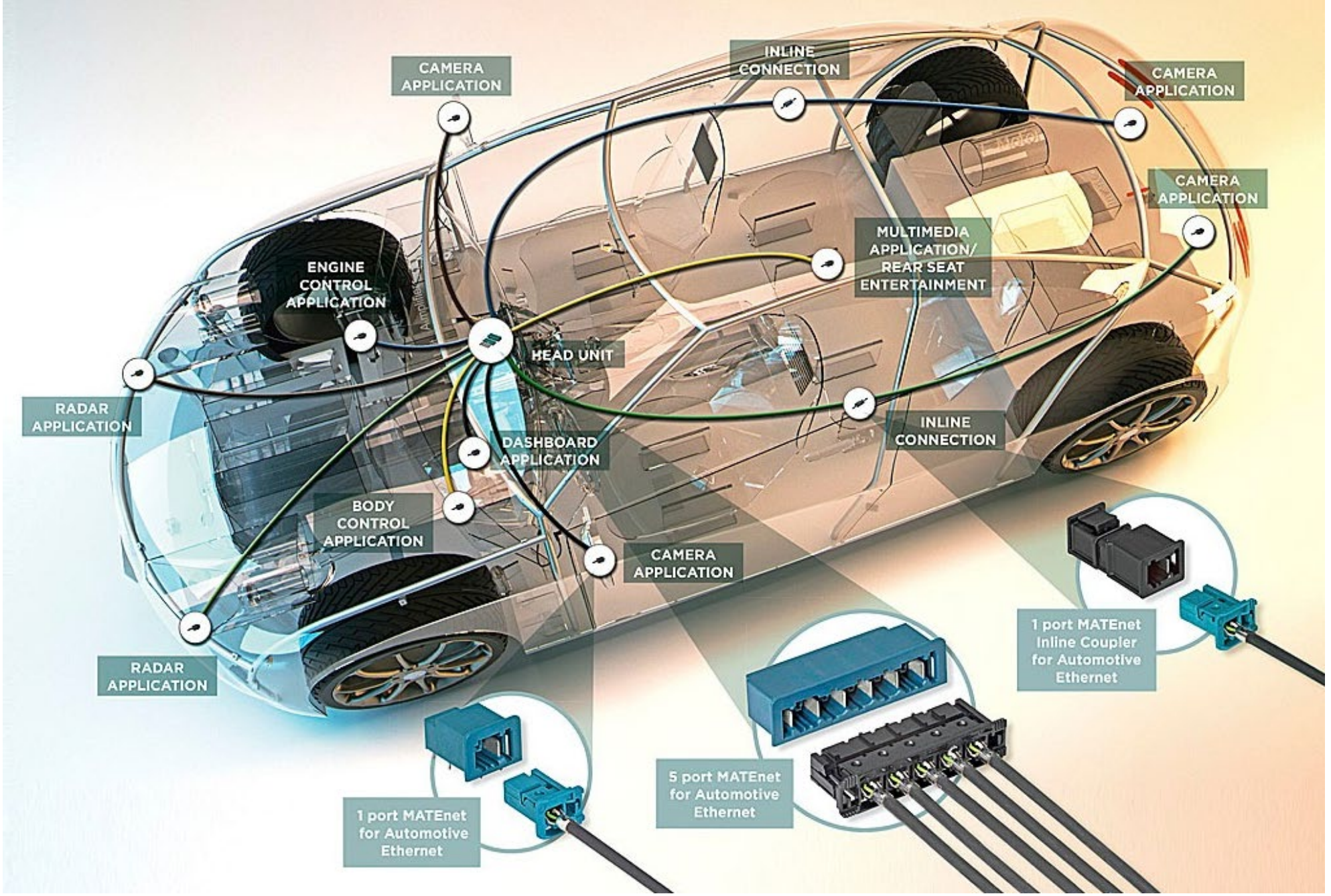
Traffic Control Center

Tokyo Traffic Control Center

Connected Autonomous Vehicles

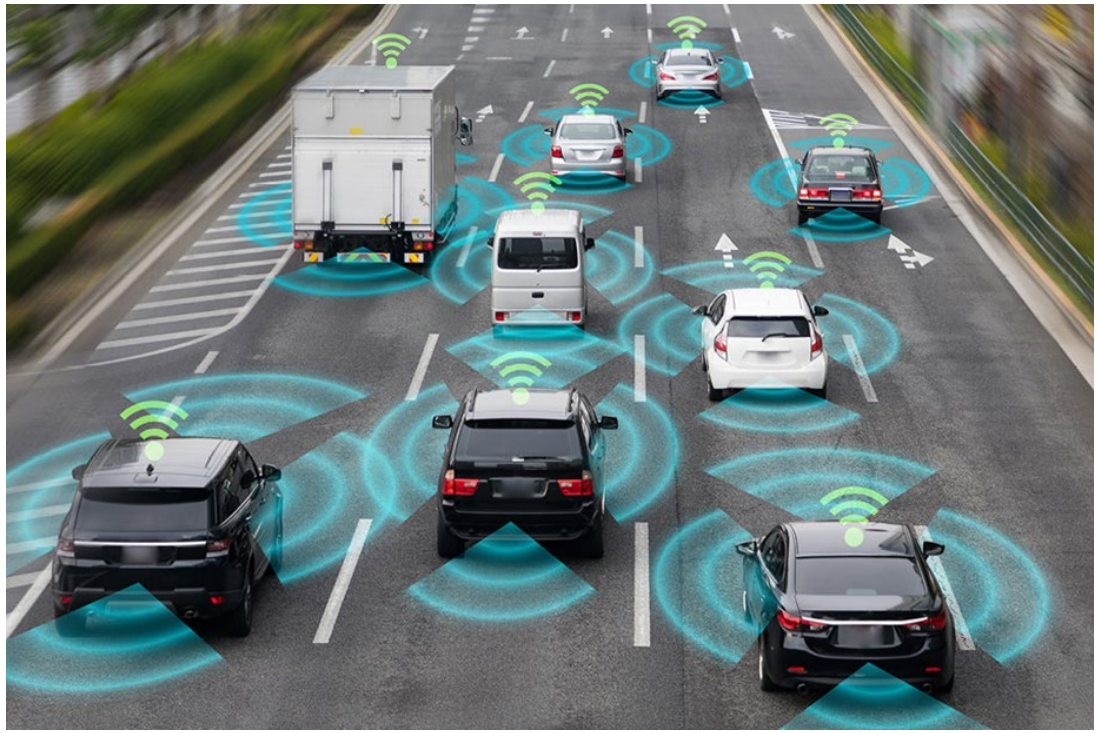
"Today's connected car has the computing power of 20 modern PCs, features about 100 million lines of code, and processes up to 25 gigabytes of data per hour."
- McKinsey Global Institute

The shift in the way we developed automotive technology from yesterday's vehicle to tomorrow's is in now designing vehicles to connect to the outside world and to improve the user experience.


CAMERA APPLICATION
INLINE CONNECTION
CAMERA APPLICATION
CAMERA APPLICATION
MULTIMEDIA APPLICATION/ REAR SEAT ENTERTAINMENT
ENGINE CONTROL APPLICATION
HEAD UNIT
RADAR APPLICATION
DASHBOARD APPLICATION
INLINE CONNECTION
BODY CONTROL APPLICATION
CAMERA APPLICATION
RADAR APPLICATION
1 port MATEnet Inline Coupler for Automotive Ethernet
5 port MATEnet for Automotive Ethernet
1 port MATEnet for Automotive Ethernet

The “Smart” Autonomous Vehicle is the Connected Autonomous Vehicle

- A Smart Autonomous Vehicle will need near latency free communication :
  - between nearly every vehicle around it
  - the roadway
  - the infrastructure on the road
  - off vehicle systems such as navigation.



Artificial Intelligence in CAV

- There is no Artificial Intelligence (AI) in any application, including CAV, right now. Nor are the basic building blocks for true AI in place.
- Machine Learning is a rudimentary form of pre-AI that is incorporated into all aspects of Autonomous Vehicles. The vehicles we are discussing are Automated or Self-Driving vehicles not Autonomous in the strictest sense of the word.
- The Ethical and Emotional Intelligence Issue with CAV—
  - Simply put – A CAV has the ethics of those that program it. At least right now. Further, they lack any form of intelligence including emotional intelligence and therefore cannot use subtle cues or information beyond what they are programmed to use.

Types of CAV in Development Right Now

Cities, Suburbs, and Rural Areas in the Age of Connected AV's

- First Adopter – The City. The larger the population, the higher the economic development, the more likely to adopt autonomous vehicle technology without outside factors.
- Close Follower – The Suburbs nearest the metro area of a City will have patch work technology and infrastructure development supporting CAV and operators will need to be aware of supported areas until more progress is made.
- Rural Areas will be the last to adopt CAV. The area's will lack the budget to invest in roadside technology and research has shown rural Americans are most opposed to CAV.

Multi-Modal Transportation

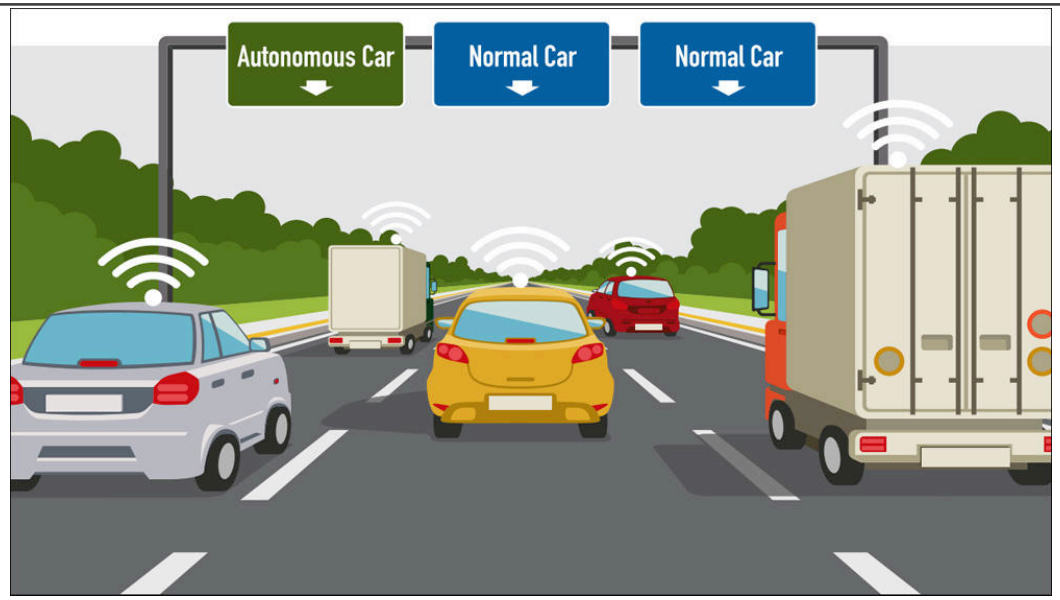
- Connected AV's (CAV's) support and enhance multi-modal transportation plans and services by city planning and economic development teams.

- The right CAV for the job:
  - Personal transportation vehicles e.g. cars
  - Mass public transit vehicles e.g buses
  - Goods transportation vehicles (No passengers) e.g. supply/delivery trucks

A concept for a new multi-modal transit center by Uber which features electric CAV sharing, Cycles, Buses, micro-mobility options such as bikes and scooters, and longer term car rental.

Why do Cities Care

- Improved Safety
- Improved Economic Development
- Reduced traffic and road congestion
- Lower emissions and pollution
- Reduced costs for repair of roadways



What's Next for Cities?

Thank you

Questions?

If you would like to contact me please email at mjbarnett@wichita.gov for questions or general discourse.