METR
OVERVIEW
KENNETH VAUGHN
JIM MAROUSEK
6 July 2021
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Overview

- Problem statement
- Vision
  - Scope
  - Other considerations
- Motivating factors

PROBLEM STATEMENT
6 July 2021
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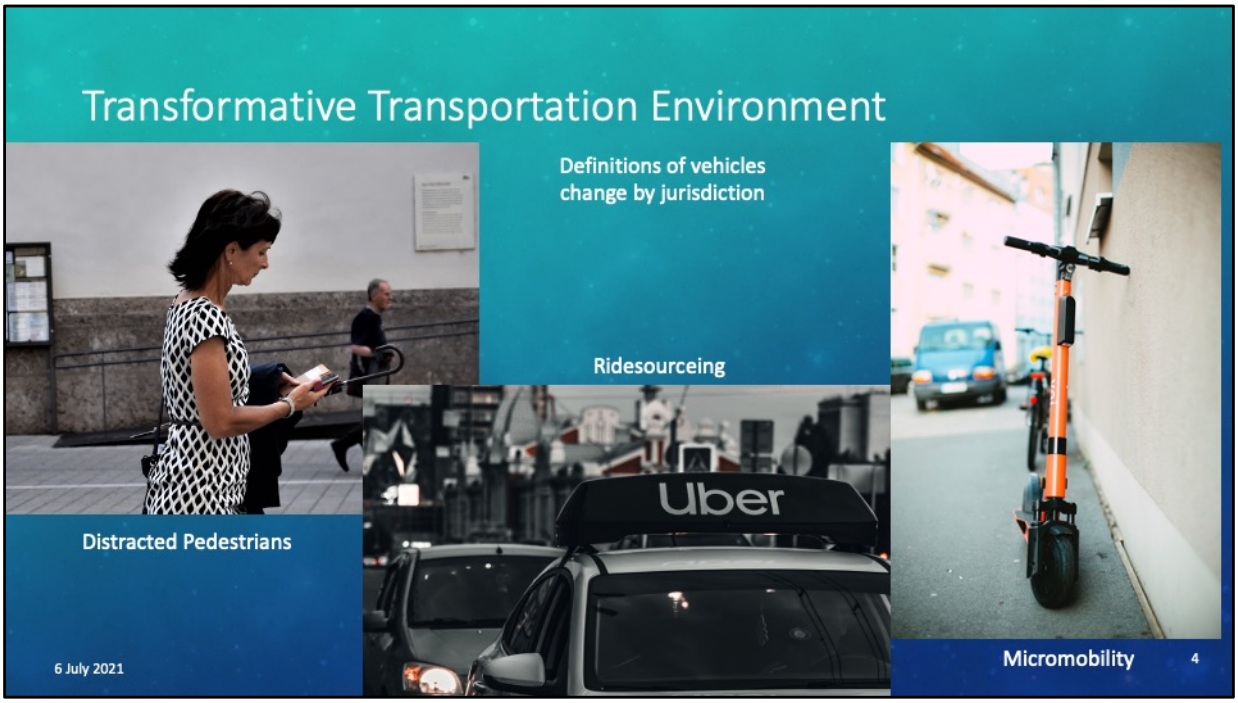
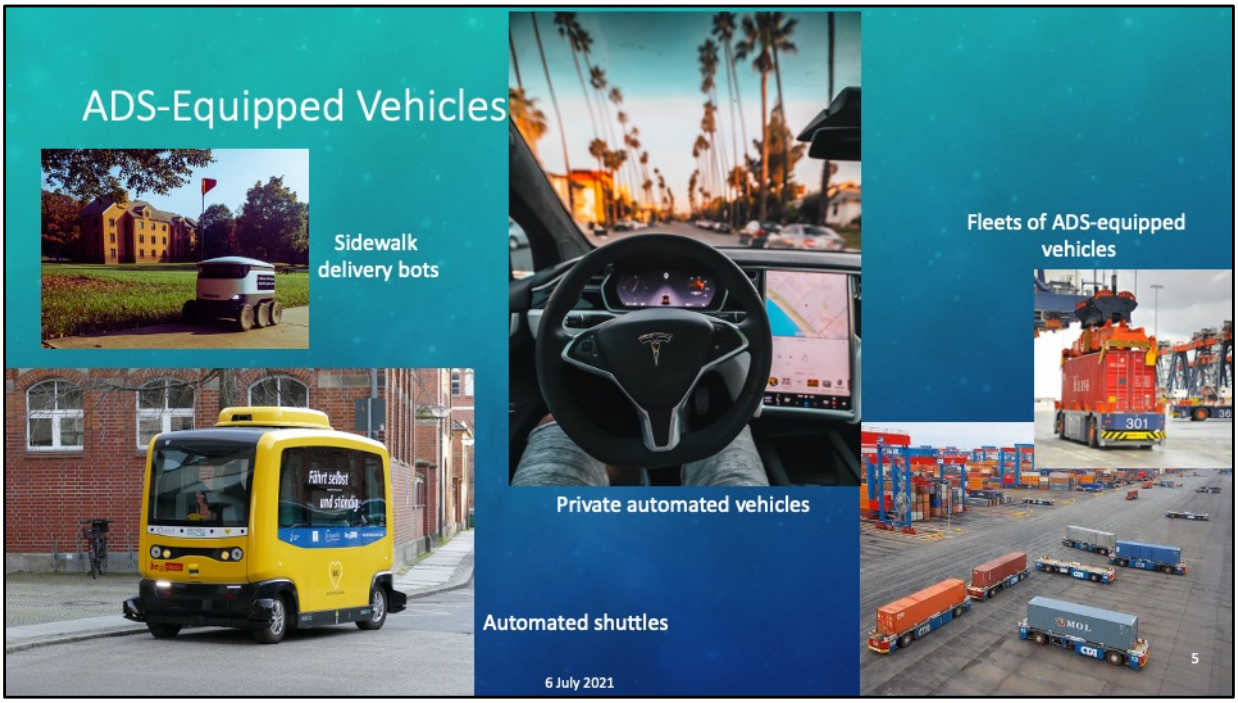


We live in a transformative age for transportation. Increasingly, we are seeing pedestrians equipped (and often distracted by) smartphones, new modes of personal travel, such as e-scooters, an increase in the use of delivery services through the advancement of technologies that match drivers and travellers, and the introduction of automated vehicles whether they might be designed for personal travel, shared travel, or delivery of goods. Each of these changes in the transportation environment results in the need for new regulations, often all being applied within the same travel space.

Images:
Lady with smartphone - https://unsplash.com/photos/RyOKNPFF61A
Uber - https://unsplash.com/photos/Gk3apXDUZiI
Scooter - https://www.pexels.com/photo/black-and-orange-electric-scooter-3671151/



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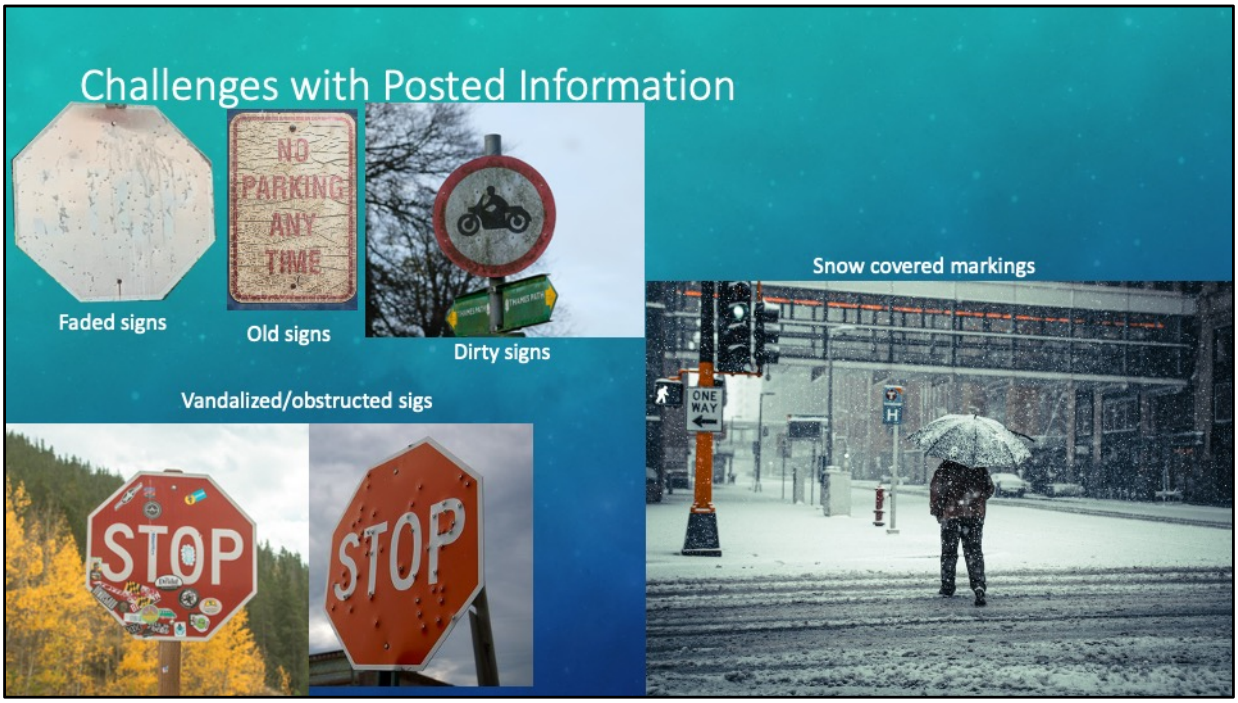
Sidewalk Delivery - https://unsplash.com/photos/gteH4r8SSqM
Tesla Steering Wheel - https://unsplash.com/photos/Ddjl0Cicdr4
Shuttle - https://pixabay.com/photos/vehicle-autonomous-4759347/
Freight - https://img.directindustry.com/images_di/photo-g/16156-13566023.webp
Freight Zoomed out - https://img.directindustry.com/images_di/photo-mg/16156-13566021.webp



In general, it is the responsibility of the driver to understand posted information; however, this is often easier said than achieved. Posted information can become obscured, dirty, faded, or covered with snow. Any of these anomalies can inhibit both human and automated systems from properly understanding the intent of the posted information.

Faded Sign - Pic by Ken Vaughn
No Parking - https://unsplash.com/photos/LGQFvBQkuNk
Motorcycle - https://unsplash.com/photos/t2Lsl9URbPY
Stop Stickers - https://unsplash.com/photos/BE-0j6f5SnU
Stop bullets - https://www.flickr.com/photos/mwichary/2831542077
Snowy Street - https://unsplash.com/photos/HX73apcFYts

Further, the amount of signing needed can become overwhelming for a human or machine to process. Signs can also present confusing or apparently contradictory information. Finally, some areas might nt have posted signs or markings at all. If automated vehicles are to safely operate with humans, there need to be clear rules on how the automated vehicles will behave within each environment.

FDNY – Courtesy of J Booth
Complex - https://unsplash.com/photos/lZ6Dc0I225E
Potential Contradictions - https://unsplash.com/photos/80k1Wr9kEYY
Primitive Road - https://unsplash.com/photos/V12_AmFAINg

VISION
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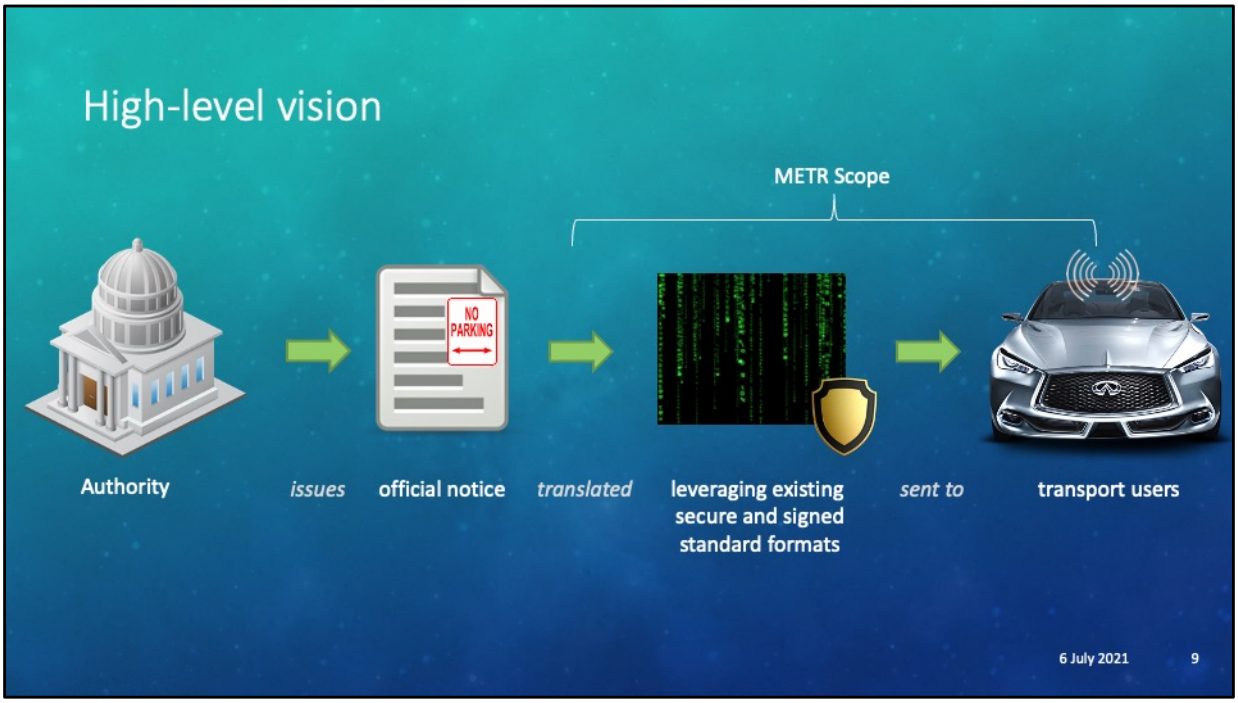
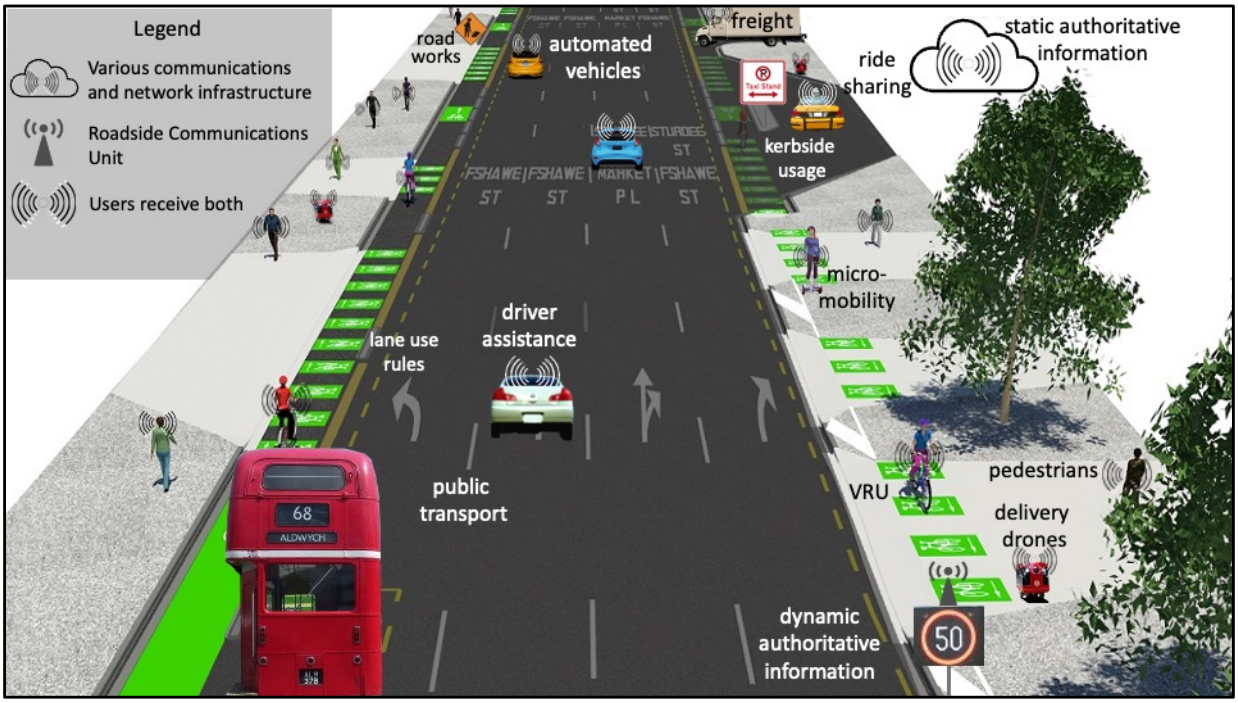


Government Building - https://upload.wikimedia.org/wikipedia/commons/4/47/ICON_Govt_Building.png
Document - http://www.clipartpanda.com/clipart_images/clipart-office-document-60437139
No Parking – https://cdn.pixabay.com/photo/2012/04/13/14/18/no-parking-32578_960_720.png
Matrix - https://upload.wikimedia.org/wikipedia/commons/5/53/The.Matrix.glmatrix.1.png
Shield - http://www.clker.com/clipart-205046.html
Infinity - https://pngimg.com/image/39948
Radio Waves - https://cdn.pixabay.com/photo/2014/03/25/16/27/radio-297183_960_720.png



Streetscape - https://at.govt.nz/media/1973835/nelson-street-phase-2-street-design.jpg
Cloud - PPT Clipart
RCU - https://cdn.pixabay.com/photo/2012/04/15/19/13/tower-34981_960_720.png
Radio Waves - https://cdn.pixabay.com/photo/2014/03/25/16/27/radio-297183_960_720.png
Bus - https://s0.geograph.org.uk/geophotos/01/88/57/1885754_b95c7673.jpg
Road Work Sign - https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf
Truck - https://pngimg.com/uploads/truck/truck_PNG16273.png
Taxi - https://upload.wikimedia.org/wikipedia/commons/4/45/Yellow_Taxi_Ford_Crown_Victoria_(rear).jpg
Taxi Stand - https://commons.wikimedia.org/wiki/Category:Diagrams_of_taxi_stand_road_signs#/media/File:New_Zealand_road_sign_R6-72.1LR.svg
Segway - https://i2.wp.com/clipset.20minutos.es/wp-content/uploads/2016/06/Segway-miniPRO-mujer-640x480.jpg?resize=640%2C480
Sidewalk Drone - https://grendz.com/wp-content/uploads/2017/07/zmp-

15015021768n4kg.jpg
Speed Limit - https://s0.geograph.org.uk/geophotos/03/70/93/3709375_9e239686.jpg
Green Car - https://upload.wikimedia.org/wikipedia/commons/4/43/2001-2003_NISSAN_SKYLINE_V35_rear.jpg
Blue Car - https://static.vecteezy.com/system/resources/previews/000/112/951/original/ford-fiesta-front-rear-view-vector.jpg
Orange Car - https://upload.wikimedia.org/wikipedia/commons/8/8e/Rear_View_-_2013_Ford_Focus_ST_(10062637774).jpg

METR Applicability

- Once received, the receiver can respond appropriately:
  - ADS-equipped vehicles can directly control the vehicle to comply
    - Includes road vehicles and delivery drones
  - Driver assisted vehicles can warn or provide guidance to the driver as deemed appropriate
  - A smartphone app can similarly automate or assist in compliance, for example:
    - Disabling some applications based on local restrictions
    - Providing warnings and advice to users as appropriate

SCOPE
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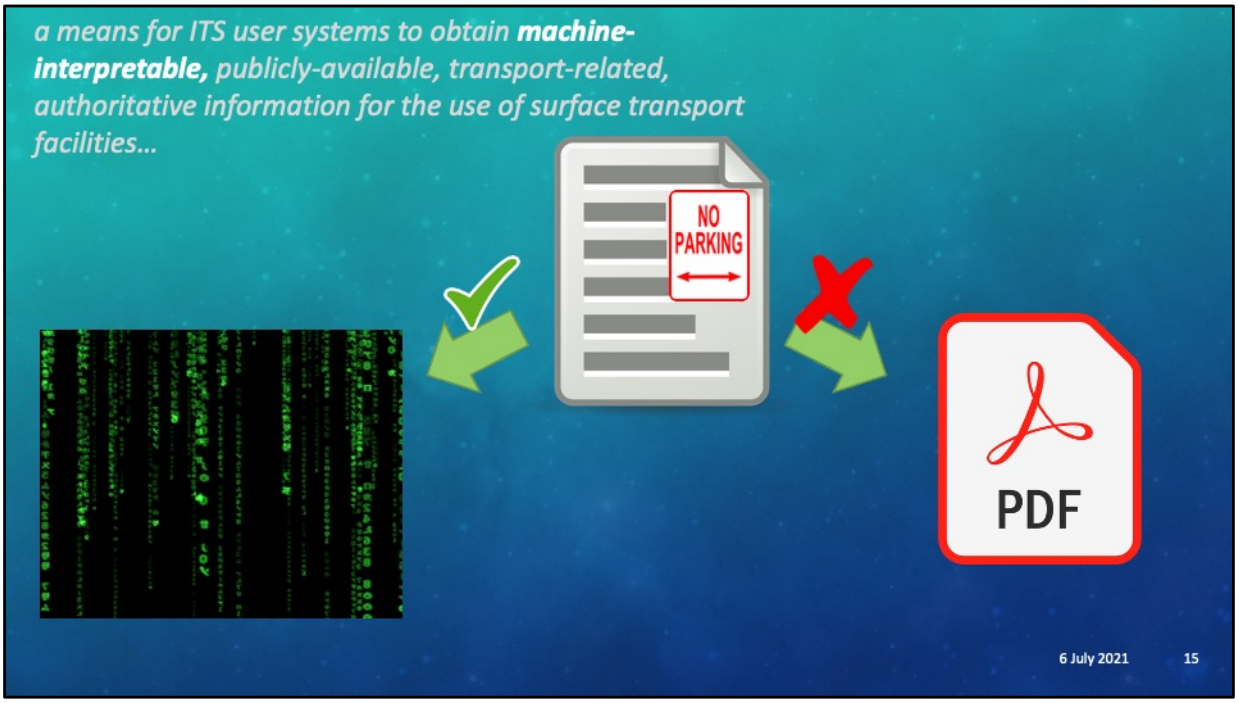
METR

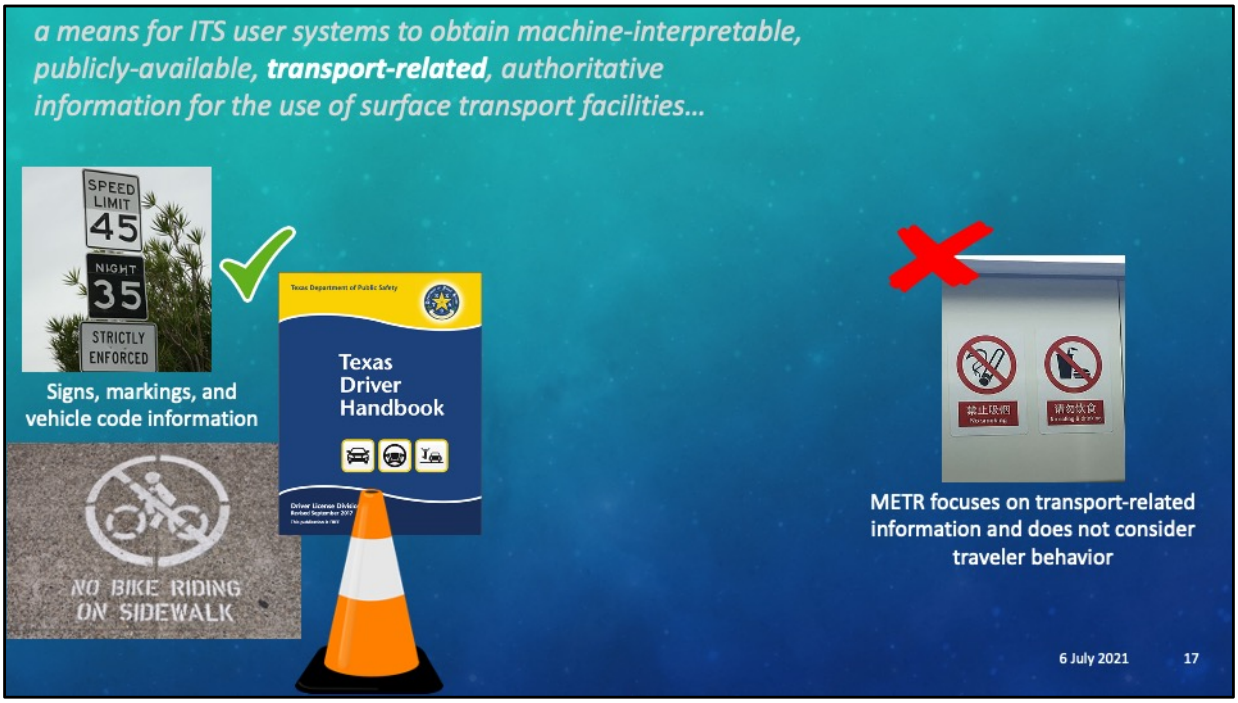
METR provides a means for ITS user systems to obtain machine-interpretable, publicly-available, transport-related, authoritative information for the use of surface transport facilities to better provide safe, efficient, sustainable, comfortable, and equitable transport services.

Sidewalk Delivery - https://unsplash.com/photos/gteH4r8SSqM
Tesla Steering Wheel - https://unsplash.com/photos/Ddjl0Cicdr4
Shuttle - https://pixabay.com/photos/vehicle-autonomous-4759347/
Truck - https://www.allwhitebackground.com/truck-white-background.html
Scooter Phone - https://www.flickr.com/photos/touring_club/50042395383
Driver - https://images.pexels.com/photos/787476/pexels-photo-787476.jpeg?cs=srgb&dl=woman-in-yellow-shirt-driving-a-silver-car-787476.jpg&fm=jpg
Hana Hwy - https://www.flickr.com/photos/daveynin/7258857234



Matrix - https://upload.wikimedia.org/wikipedia/commons/5/53/The.Matrix.glmatrix.1.png
Document - http://www.clipartpanda.com/clipart_images/clipart-office-document-60437139
No Parking – https://cdn.pixabay.com/photo/2012/04/13/14/18/no-parking-32578_960_720.png
Check - https://cdn.pixabay.com/photo/2016/03/31/14/37/check-mark-1292787_1280.png
X - https://upload.wikimedia.org/wikipedia/en/thumb/b/ba/Red_x.svg/1024px-Red_x.svg.png
PDF - https://commons.wikimedia.org/wiki/File:PDF_file_icon.svg

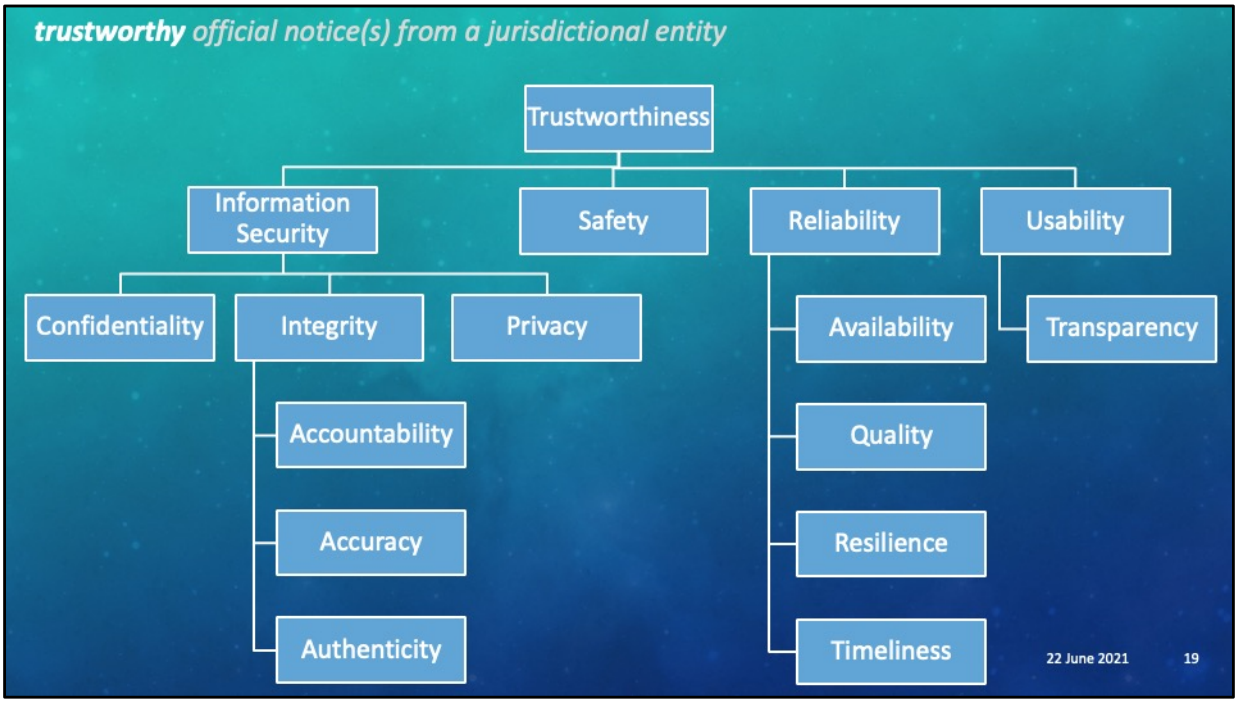
Speed - https://commons.wikimedia.org/wiki/File:Night_speed_limit.jpg
Checkmark - https://pixabay.com/vectors/check-mark-tick-mark-check-correct-1292787/
Texas Driver Handbook - http://dps.texas.gov/internetforms/forms/dl-7.pdf
No Bike - https://pixabay.com/photos/road-marking-no-cycling-sign-usa-4991686/
Cone - https://pixabay.com/vectors/traffic-cone-safety-cone-road-cone-31883/
Restricted Area - https://commons.wikimedia.org/wiki/File:Restricted_Area_Sign.jpg
Bio Hazard - https://www.flickr.com/photos/dionhinchcliffe/3264474269
No - https://pixabay.com/vectors/cross-delete-remove-cancel-abort-296507/



Speed - https://commons.wikimedia.org/wiki/File:Night_speed_limit.jpg
Checkmark - https://pixabay.com/vectors/check-mark-tick-mark-check-correct-1292787/
Texas Driver Handbook - http://dps.texas.gov/internetforms/forms/dl-7.pdf
No Bike - https://pixabay.com/photos/road-marking-no-cycling-sign-usa-4991686/
Cone - https://pixabay.com/vectors/traffic-cone-safety-cone-road-cone-31883/
No - https://pixabay.com/vectors/cross-delete-remove-cancel-abort-296507/
No Food - https://commons.wikimedia.org/wiki/File:No_food_or_drink_and_no_smoking_signs_in_222M1_(20170410191700).jpg

a means for ITS user systems to obtain machine-interpretable, publicly-available, transport-related, ***authoritative information*** *for the use of surface transport facilities…*

authoritative information is defined as:
trustworthy official notice(s) from a jurisdictional entity


trustworthy official notice(s) from a jurisdictional entity
Trustworthiness
Information Security
Safety
Reliability
Usability
Confidentiality
Integrity
Privacy
Availability
Transparency
Accountability
Quality
Accuracy
Resilience
Authenticity
Timeliness
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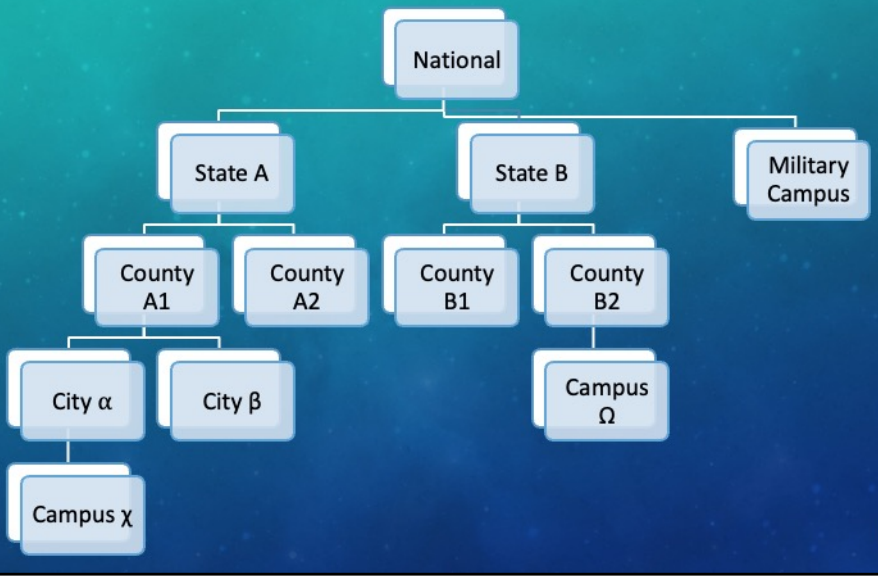
Speed - https://commons.wikimedia.org/wiki/File:Night_speed_limit.jpg
Work Speed - https://www.flickr.com/photos/vadot/49493260283/
Ramp - https://pixabay.com/vectors/ramp-road-speed-traffic-30-mph-30-161172/
Deer - https://www.vectorportal.com/StockVectors/Symbols-and-Signs/WILD-ANIMALS-SIGN/20006.aspx
Detour - https://c1.staticflickr.com/1/52/177246951_a289e12660_z.jpg?zz=1
Green Bike Lane - https://images.pexels.com/photos/3256031/pexels-photo-3256031.jpeg?auto=compress&cs=tinysrgb&dpr=2&h=650&w=940
Red Bike Lane - https://upload.wikimedia.org/wikipedia/commons/e/e7/Red_bikeway_in_Copenhagen%2C_Denmark.jpg

*trustworthy official notice(s) from a **jurisdictional entity***



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Speed - https://commons.wikimedia.org/wiki/File:Night_speed_limit.jpg
Checkmark - https://pixabay.com/vectors/check-mark-tick-mark-check-correct-1292787/
Texas Driver Handbook - http://dps.texas.gov/internetforms/forms/dl-7.pdf
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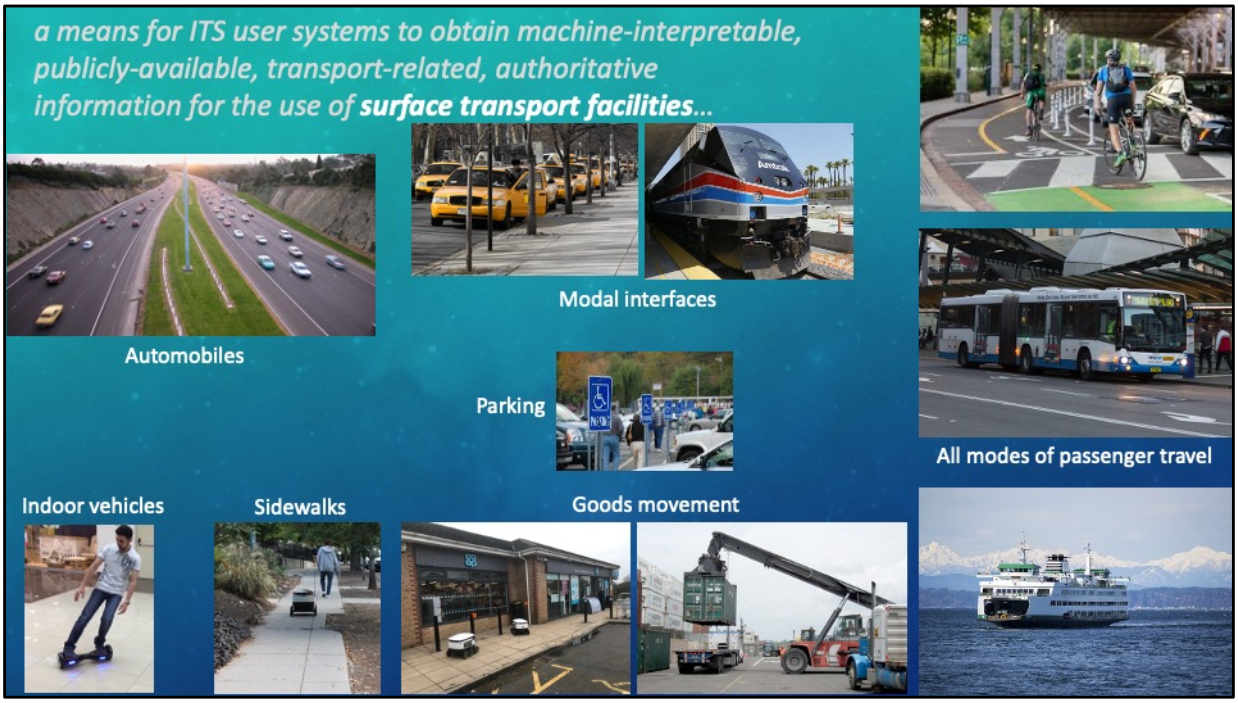
Cone - https://pixabay.com/vectors/traffic-cone-safety-cone-road-cone-31883/
No - https://pixabay.com/vectors/cross-delete-remove-cancel-abort-296507/
MUTCD - https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf
Sign install - https://www.kingsporttn.gov/city-services/public-works/traffic/trafficsignsandmarkings/
Sign map - https://www.clrp.cornell.edu/q-a/118-stop.html



Freeway - https://upload.wikimedia.org/wikipedia/commons/e/e6/Eastern_Freeway_Belford_St.jpg
Bus - https://upload.wikimedia.org/wikipedia/commons/thumb/6/60/Sydney_Buses_(mo_1687)_Custom_Coaches_'CB60'_bodied_Volvo_B12BLEA_at_Railway_Square.jpg/1200px-Sydney_Buses_(mo_1687)_Custom_Coaches_'CB60'_bodied_Volvo_B12BLEA_at_Railway_Square.jpg
Sidewalk delivery - https://www.flickr.com/photos/perspective/37905654532
Coop Delivery - https://commons.wikimedia.org/wiki/File:Co-op_delivery_robots_(50750126396).jpg
Skate - https://www.geagea.xyz/products.aspx?cname=dc+bike+lanes&cid=5&xi=5&xc=23&pr=74.99
Ferry - https://pixabay.com/photos/ferry-seattle-washington-olympic-4562432/
Train - https://upload.wikimedia.org/wikipedia/commons/thumb/7/76/Amtrak_-_GE_P42DC_-_Heritage_Phase_III_Livery.JPG/1280px-Amtrak_-_GE_P42DC_-_Heritage_Phase_III_Livery.JPG

Taxi - https://www.flickr.com/photos/vogelium/89596604/
Freight - https://pixabay.com/photos/container-port-loading-stacked-2934279/

OTHER CONSIDERATIONS
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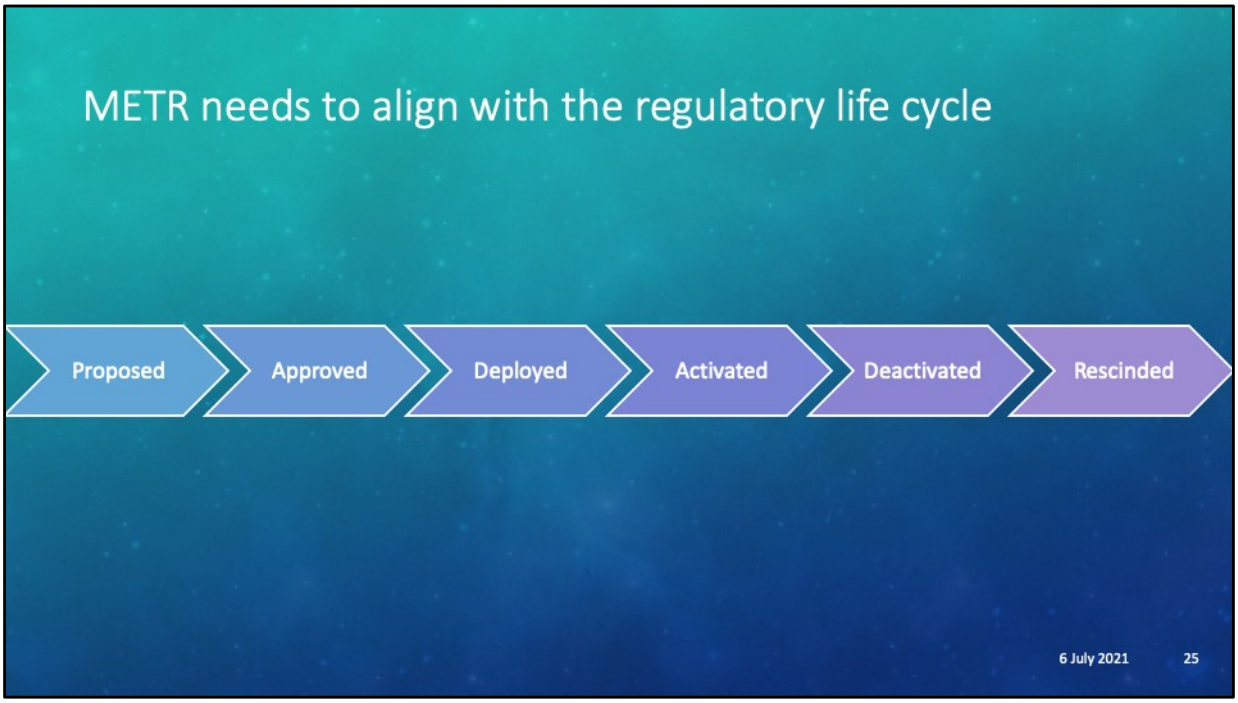
METR needs to align with the regulatory life cycle
Proposed
Approved
Deployed
Activated
Deactivated
Rescinded
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Availability of METR might affect ODD

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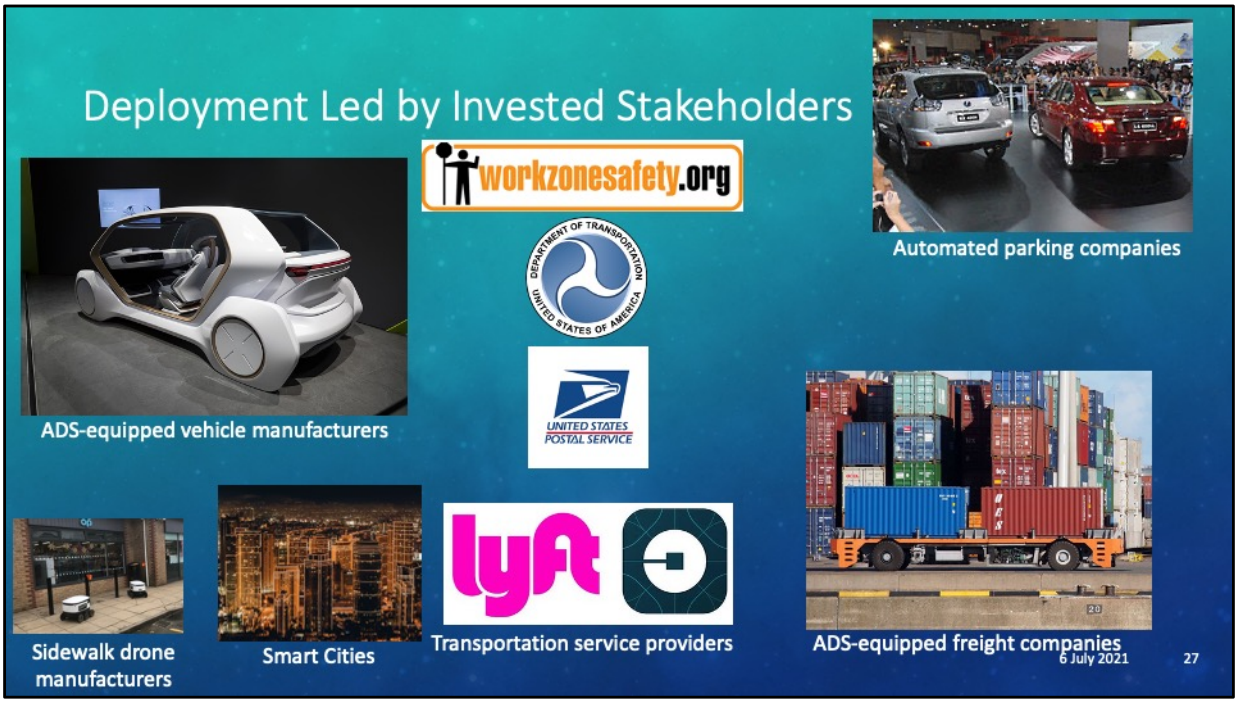
Tesla Steering Wheel - https://unsplash.com/photos/Ddjl0Cicdr4



Veh Manufacturers - https://en.wikipedia.org/wiki/Adient
Feight - https://commons.wikimedia.org/wiki/File:Automated_guided_vehicle_container_mover_at_Port_of_Rotterdam.JPG
Auto Park - https://upload.wikimedia.org/wikipedia/commons/thumb/a/a8/Lexus-LS600hL_self_parking.jpg/250px-Lexus-LS600hL_self_parking.jpg
Coop Delivery - https://commons.wikimedia.org/wiki/File:Co-op_delivery_robots_(50750126396).jpg
Smart City - https://unsplash.com/photos/Khqmo4T-rs0

ROLES AND RESPONSIBILITIES
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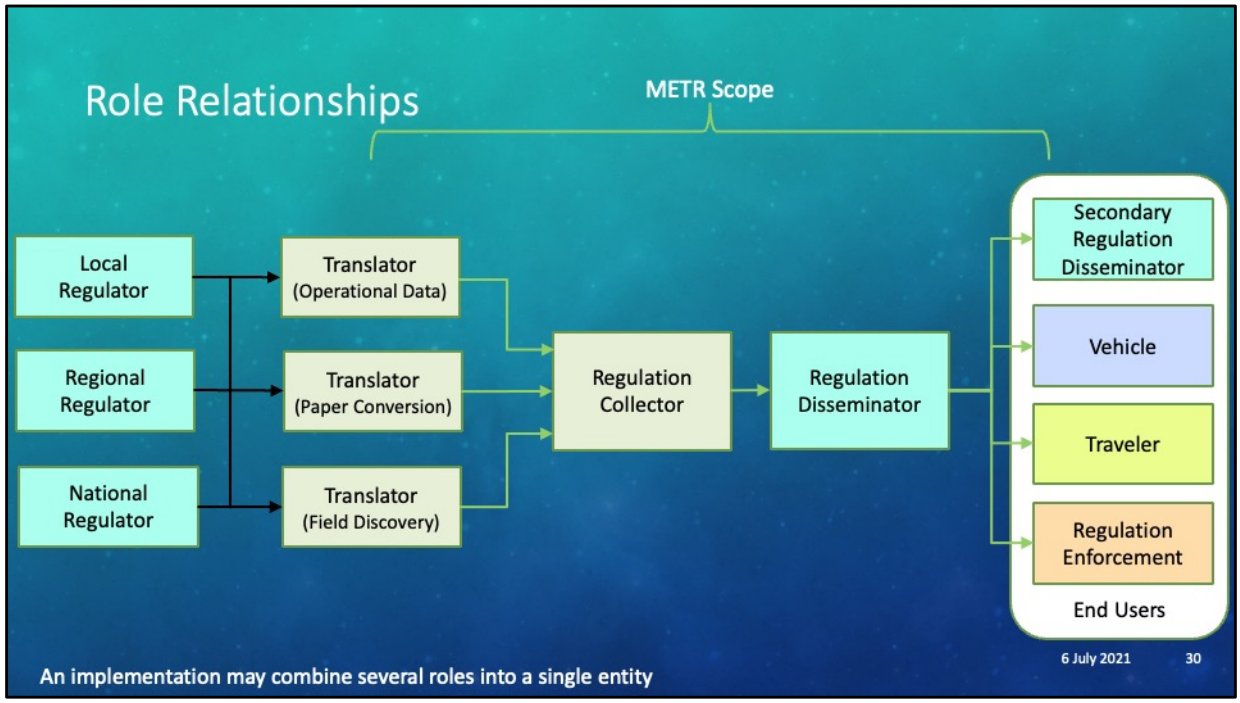
Roles and Responsibilities

Role	Responsibilities
Regulator	Creates, manages, and posts official notices through traditional means
Translator	Converts official notices for a defined scope into the METR format with electronic signature
Collector	Collects official notices from all relevant translators for a defined scope; may package notices for efficient exchange; provides the notices to disseminators
Disseminator	Collects official notices from one or more collectors; may (re)package notices for efficiency; distributes notices to (many) end users
User	Follow the information contained in the official notice

Official notices for a jurisdiction might include:

- Regulations
  - Regulations contained in the vehicle code (e.g., whether e-scooters are allowed in cycle lanes)
  - Regulations established by traffic engineers (e.g., stop signs)
  - Regulations activated as needed (e.g., evacuation orders, road closures)
- Advisories
- Guidance


Role Relationships
METR Scope
Local Regulator
Regional Regulator
National Regulator
Translator (Operational Data)
Translator (Paper Conversion)
Translator (Field Discovery)
Regulation Collector
Regulation Disseminator
Secondary Regulation Disseminator
Vehicle
Traveler
Regulation Enforcement
End Users
An implementation may combine several roles into a single entity
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ROADMAP
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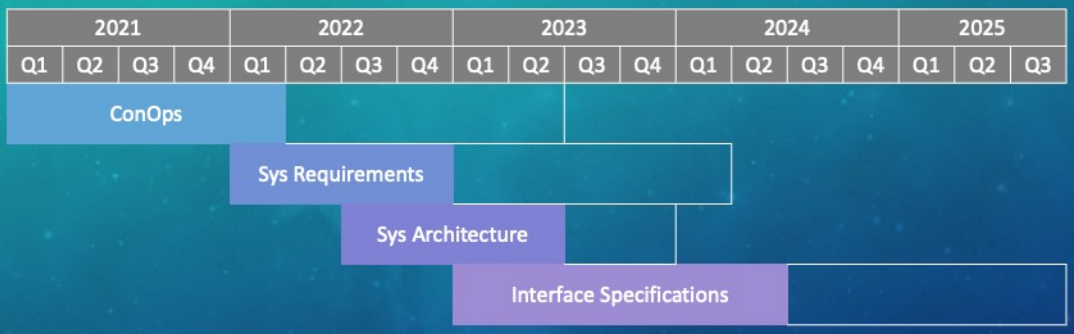
Tentative Schedule



- End of task shown at expected committee draft
- Transparent bar shows standards review and approval process
- System architecture is expected to be online only (i.e., it will use a shorter review process)
- Interface specification are expected to enhance existing standards

METR

- Purpose is to support all transport users, especially ADAS and ADS-equipped vehicles
- Current effort is focused on the operational concept
  - Identify stakeholder needs
  - Build consensus on approach
- Future efforts will extend to design, which will leverage existing standards and specifications, to the extent applicable