



Welcome to the fifth METR workshop. Today, we will talk about vehicle operations.

Agenda

- Overview
- Vehicle Operations
 - Basic Filtering
 - Awareness of Other Users
 - Vehicle Type/Usage Regulations
 - Road Type/Usage Regulations
 - METR – Level of Detail for Rules
 - Types of Filtering
 - Operation Restrictions
 - Downloading Traffic Control Device Specifications
 - Detection of New Traffic Control Device Deployment
- Next Steps

26 October 2021

2

After our overview, we'll dive directly into a series of discussion topics covering the variety of issues shown here.

Acknowledgements

Small group has started structuring the problem

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Standards Process

- ISO/TC 204/WG 19
 - Drafting Team

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26 October 2021

3

It is important to acknowledge that the materials developed to date represents a team effort. While there is a core editing group, as shown in the upper left, the concepts presented within this presentation already reflect valuable inputs from the review team shown on the right. In addition, the overall document is being prepared under the auspices of ISO/TC 204/WG 19, and especially its METR Drafting Team.

Ground Rules

- METR is very complex and involves many disciplines
- Workshops are based on this structure and designed to receive feedback
- If you have comments, please voice your concerns
 - Verbally (and concisely) during discussion slides (marked with  icon)
 - Using chat window
 - Using discussion forum (<https://github.com/ISO-TC204/iso24315p1/discussions>)

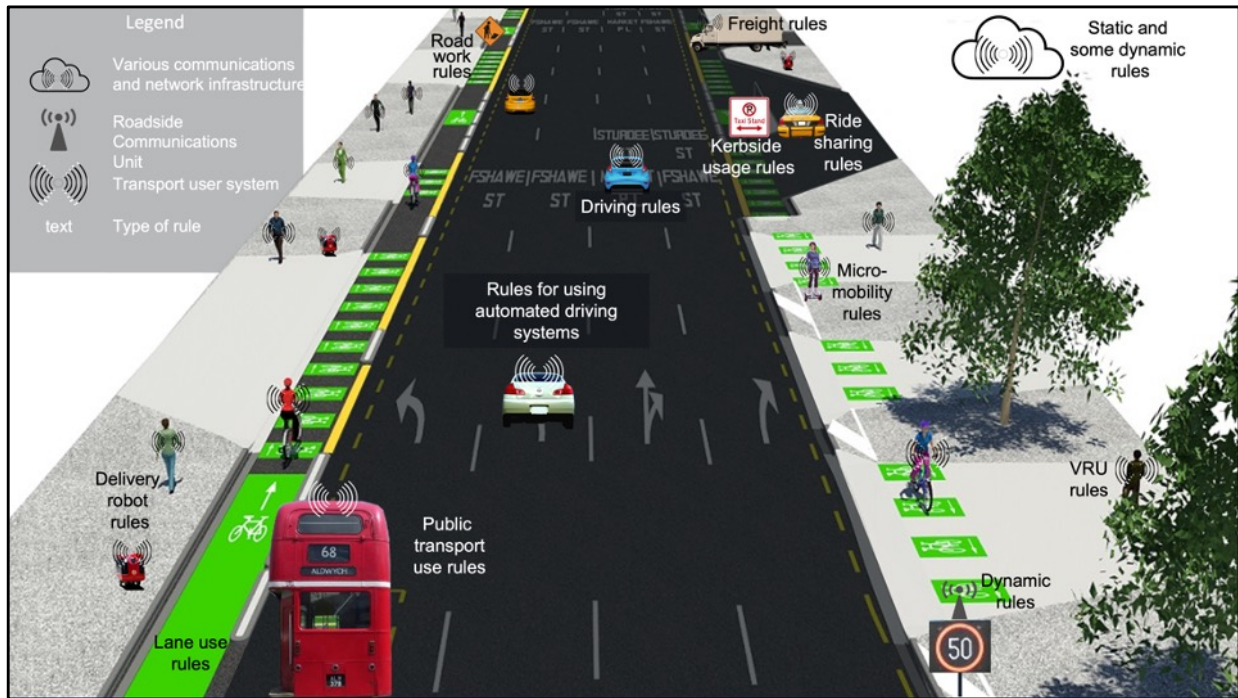
26 October 2021

4

Before we begin, it is useful for everyone to understand the ground rules of our conversation. The development of the ConOps is intended to be a cooperative effort that reflects the input from stakeholders from different perspectives. To facilitate this process, the development team has prepared the workshops to gain feedback from stakeholders – but your feedback does not have to be limited to the topics presented.

The workshops are generally structured to present a topic and then gain feedback. Participants are welcome to voice their concerns during the workshop presentations, either verbally or using the chat window, but we request that verbal feedback is made when we are on discussion slides. We also recognize that our workshops are time limited and comments should be kept fairly concise. If major topics of discussion arise we can schedule additional meetings to focus on specific points, as needed. We have also established a discussion forum on the Github site to promote off-line conversations and encourage everyone to use the facility,

After we complete the workshops, we expect to prepare a draft ConOps early next year, and there will be ample opportunity for additional comments on the document once distributed.



METR is intended to support all transport user systems. This includes: vehicle systems (e.g., automated driving systems and driver support systems), sidewalk delivery robots, and other devices such as smartphones used by pedestrians and perhaps units on-board micromobility devices (e.g., e-scooter interfaces)

The information provided to these users would potentially include all rules related to using the transport facilities, such as (from top and proceeding clockwise) any special rules for freight delivery or for the operation of heavy vehicles, kerbside usage rules (e.g., bus stop, taxi stand), ride sharing rules (e.g., what forms of ride sharing are allowed), micromobility rules (e.g., are e-scooters allowed in cycle lanes), VRU rules (e.g., is the sidewalk closed to pedestrians), dynamic rules (e.g., variable speed limits, lane control signals), public transport use rules (e.g., does my ticket qualify me for a transfer, what are the fare zones), lane use rules (e.g., bike only, bus only, HOV-2), delivery robot rules (e.g., what is the maximum speed for a delivery robot for this sidewalk), road work rules (e.g., speed limit for the work zone). METR is intended to be flexible enough to address all of the transport rules, these are just a few examples that demonstrate the breadth of the effort.

Importantly, in order to cover all rules, the scope must include rules that can change

or be imposed in a dynamic fashion. For example, temporary lane closures due to unplanned incidents and signal timing information need to be considered and handled in a trustworthy way, even when long-range communications may not be available. Thus, the full scope of METR will likely need to rely on both cloud based delivery mechanisms as well as local broadcast of exceptional data.

Basic Filtering

Do vehicles need METR to filter regulations (e.g., by type of user) to reduce the amount of data sent over the air? For example, do micromobility users need to be aware of all regulations for other types of users?



26 October 2021 6

The rules conveyed by METR are likely to be rather extensive. Do micromobility users need all of the rules for automobiles? Should METR support a way to minimize the download of rules to those needed by the particular user system type?

Radio Waves - https://cdn.pixabay.com/photo/2014/03/25/16/27/radio-297183_960_720.png

Car - <http://www.pngall.com/wp-content/uploads/2016/03/Subaru-Free-PNG-Image.png>

Segway - <https://i2.wp.com/clipset.20minutos.es/wp-content/uploads/2016/06/Segway-miniPRO-mujer-640x480.jpg?resize=640%2C480>

60 - https://en.wikipedia.org/wiki/Prohibitory_traffic_sign#/media/File:Zeichen_274-60_-_Zulässige_Höchstgeschwindigkeit,_StVO_2017.svg

20 -

https://upload.wikimedia.org/wikipedia/commons/thumb/b/b3/Mauritius_Road_Signs_-_Prohibitory_Sign_-_Speed_limit_20.svg/1024px-Mauritius_Road_Signs_-_Prohibitory_Sign_-_Speed_limit_20.svg.png

? - https://pngimg.com/uploads/question_mark/question_mark_PNG34.png

Awareness of Other Users

- What regulations might a class of user need to be aware of in relation to other types of users? For example, does a micromobility user need to be aware that pedestrians or automated footway delivery drones are allowed?



26 October 2021 7

Even though a micromobility vehicle might not need to know the detailed rules related to other vehicle/user types; should it at least be aware of the other types of vehicles/users that it may encounter? Are there any other exceptional data that user systems need to be aware of regarding other users?

Segway - <https://i2.wp.com/clipset.20minutos.es/wp-content/uploads/2016/06/Segway-miniPRO-mujer-640x480.jpg?resize=640%2C480>

? - https://pngimg.com/uploads/question_mark/question_mark_PNG34.png

Moonwalk - <http://4.bp.blogspot.com/>

9_bDIjDGioE/U5DZUpUMnEI/AAAAAAAAAsk/xNKmJqNdVZM/s1600/mmoonwalk.gif

Sidewalk Drone - <https://grendz.com/wp-content/uploads/2017/07/zmp-15015021768n4kg.jpg>

Check -

https://cdn.wikimg.net/en/strategywiki/images/thumb/e/e9/Check_mark.svg/1200px-Check_mark.svg.png

No -

https://upload.wikimedia.org/wikipedia/commons/thumb/d/d5/No_sign.svg/1200px-No_sign.svg.png

Vehicle Type/Usage Regulations

- What information does a vehicle need to determine the regulations to which it must conform?

e-scooter ? moped ? motorcycle
 personal part-time ? commercial

26 October 2021 8

In order for an ITS user system to conform to defined rules, the user system needs to be sufficiently self-aware to know how to classify itself. For example, does a particular rule apply to my two wheeled vehicle with a moderate sized engine that might be used part time for delivery purposes? What characteristics about a vehicle need to be known for a vehicle to classify itself?

E-scooter - <https://fatdaddy.be/product/apollo-explore/>

Green hybrid - <https://image.made-in-china.com/2f0j00AwuTHneEAFgr/Powerful-Kick-Scooter-Promotional-1000W-Green-Powerful-Electric-Scooter.jpg>

Moped -

https://upload.wikimedia.org/wikipedia/commons/2/2f/Vespa_Primavera_1.jpg

White hybrid - https://1.bp.blogspot.com/-7164SvcSEJw/XtU_Qu23Ckl/AAAAAABOAc/pFZ1KXzcwsQbGgdr8imqnxEFqMZh7WNvACLcBGAsYHQ/s1600/Vespa%2Bfuturista%2B4.jpg

Motorcycle - https://images.1000ps.net/images_bikekat/2018/17-HARLEY-DAVIDSON/9164-Softail_Deluxe_FLDE/011.jpg

Personal - <https://iscooterstore.nl/niu-n-cargo-elektrische-scooter-2/>

Part-time - <https://electrek.co/2019/04/03/deliveroo-renting-electric-mopeds/>
Commercial - https://c1.staticflickr.com/5/4138/4774933884_502fbd8922_b.jpg

Road Type/Usage Regulations

- Does a vehicle need to know the legal definition of road types and usage allowances? For example, how does a vehicle know that a particular facility is a state or county road and thus which regulations apply?



Likewise, in order for a user system to obey all of the rules of the road, it must know what type of road it is travelling upon. Rural roads often have different speed limits than urban roads and some rules might vary based on pavement types or other conditions. What information does a vehicle need to be electronically provided in order to know the type of road it is on and the rules that apply to that type of road?

Unpaved Road - Pic by Ken Vaughn

Clear road in winter - <https://i0.hippopx.com/photos/93/87/739/journey-road-mountain-ice-preview.jpg>

Stone road in Rome - https://cdn.pixabay.com/photo/2017/03/02/00/38/rome-2110082_1280.jpg

Roundabout - <https://www.flickr.com/photos/robinhamman/27117099659>

City street - <https://tumblr.unsplash.com/post/140768273964/cities-a-collection-of-photos-view-all>

Divided carriageway -

https://s0.geograph.org.uk/geophotos/01/26/92/1269255_5360add0.jpg

METR – Level of Detail for Rules

- Does a vehicle need METR to:
 - Convey the specific location(s) for each regulation (e.g., each stop sign, speed limit zone, traffic signal location)?
 - Convey only the specifications about what traffic control devices look like and their meaning
 - Provide both (i.e., for redundancy)
 - Provide both for different types of vehicles (i.e., Car A depends on specific data and Car B recognizes sign types)
 - Provide one or the other depending on the type of regulation (e.g., stop signs can be recognized but specific details for each no parking regulation should be conveyed electronically)?

26 October 2021

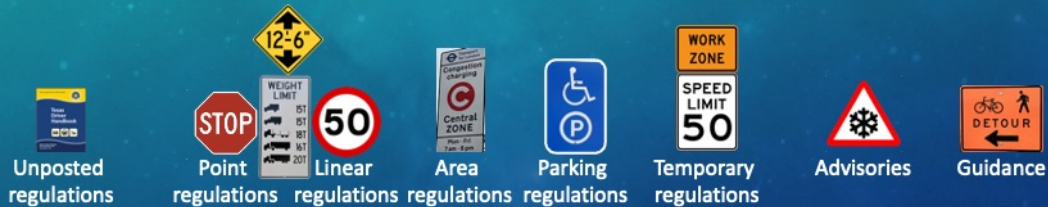
10

We also need to consider the level of details for the METR rules and what a vehicle needs from METR.

Types of Filtering

- What categories of information need to be defined so that a regulatory entity is able to indicate its level of maturity for METR?
- What categories of information might different vehicles need for its operations (e.g., to enable automated driving)?

For example, does METR need to allow filtering on high-level groups of information?



26 October 2021

11

Given the wide variety of users, roads, vehicle types and other aspects; what types of filtering are needed?

STOP - <https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf>

Weight - <https://www.publicdomainpictures.net/pictures/100000/velka/truck-weight-limit-sign.jpg>

Height -

https://upload.wikimedia.org/wikipedia/commons/thumb/6/6a/MUTCD_W12-2.svg/480px-MUTCD_W12-2.svg.png

50 -

https://upload.wikimedia.org/wikipedia/commons/thumb/7/7b/Mauritius_Road_Signs_-_Prohibitory_Sign_-_Speed_limit_50.svg/600px-Mauritius_Road_Signs_-_Prohibitory_Sign_-_Speed_limit_50.svg.png

Congestion -

http://upload.wikimedia.org/wikipedia/commons/thumb/e/e1/London_CC_12_2012_5045.JPG/145px-London_CC_12_2012_5045.JPG

Parking -

https://upload.wikimedia.org/wikipedia/commons/thumb/3/36/Handicap_parking_sign%2C_canada_2008.jpg/1200px-Handicap_parking_sign%2C_canada_2008.jpg

WZ Speed -

https://upload.wikimedia.org/wikipedia/commons/thumb/4/4f/MUTCD_Sign_Assembly_-_R2-1_with_G20-5aP.svg/515px-MUTCD_Sign_Assembly_-_R2-1_with_G20-5aP.svg.png

Unposted - <http://dps.texas.gov/internetforms/forms/dl-7.pdf>

Advisories-

https://upload.wikimedia.org/wikipedia/commons/thumb/3/38/UK_traffic_sign_554.2.svg/869px-UK_traffic_sign_554.2.svg.png

Guidance - https://c1.staticflickr.com/1/52/177246951_a289e12660_z.jpg?zz=1

Operation Restrictions

- What information does a vehicle need to determine if it is allowed to operate on a facility or within a jurisdiction?
 - Vehicle classification
 - Vehicle dimensional characteristics (e.g., size, weight)
 - Vehicle performance characteristics (e.g., top speed)
 - Vehicle usage (e.g., delivery)
 - Vehicle status (e.g., vehicle occupancy)



26 October 2021

12

What information does a vehicle need to determine its operating areas?

No bicycle sign -

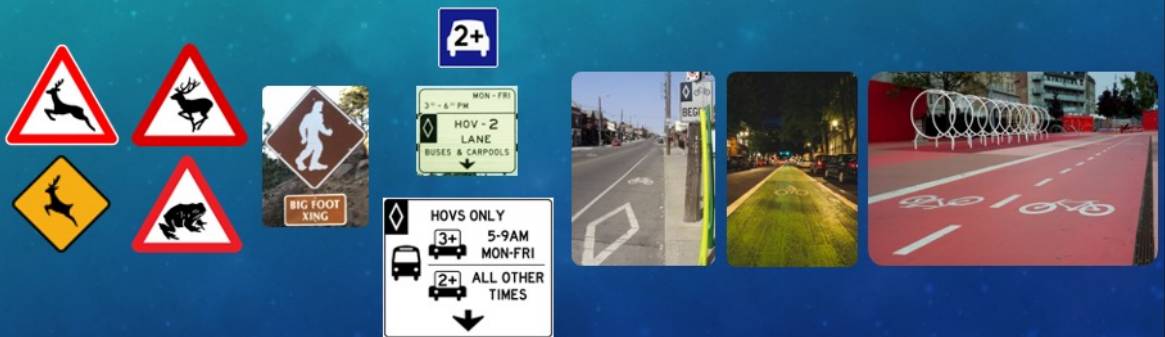
https://upload.wikimedia.org/wikipedia/commons/thumb/c/cd/Ireland_road_sign_RUS_055.svg/1024px-Ireland_road_sign_RUS_055.svg.png

No vehicles sign - https://cdn.pixabay.com/photo/2013/07/13/13/16/no-motor-vehicles-160699_640.png

No segway sign - <https://get.pxhere.com/photo/trail-travel-sign-street-sign-signage-forbidden-traffic-sign-segway-784894.jpg>

Downloading Traffic Control Device Specifications

- To what extent do vehicles need to be able to learn regional conventions for traffic control devices (e.g., colours of specialized lanes, the images of official signs and markings) so that it can detect the devices and properly respond?



26 October 2021

13

Do vehicles need to be able to recognize different traffic control devices, and if so, does METR need to provide the details or should this be left to the OEMs?

UK Deer - https://cdn.pixabay.com/photo/2013/07/13/13/15/traffic-sign-160673_960_720.png

Italy Deer -

https://upload.wikimedia.org/wikipedia/commons/thumb/5/55/Mauritius_Road_Signs_-_Warning_Sign_-_Wild_animals_crossing.svg/1200px-Mauritius_Road_Signs_-_Warning_Sign_-_Wild_animals_crossing.svg.png

Ireland Deer -

http://upload.wikimedia.org/wikipedia/commons/thumb/7/72/Diamond_road_sign_wild_animals.svg/1024px-Diamond_road_sign_wild_animals.svg.png

Frog -

https://upload.wikimedia.org/wikipedia/commons/thumb/6/6d/UK_traffic_sign_551.1.svg/1159px-UK_traffic_sign_551.1.svg.png

Big Foot - Pic by Ken Vaughn

Germany 2+ - https://de.wikipedia.org/wiki/High-occupancy_vehicle_lane

US Carpool - [https://de.wikipedia.org/wiki/High-occupancy_vehicle_lane#/media/Datei:HOV2+_I270_MD_08_2009_7039_\(detail\).png](https://de.wikipedia.org/wiki/High-occupancy_vehicle_lane#/media/Datei:HOV2+_I270_MD_08_2009_7039_(detail).png)

g

2+3+ - <https://pugetsoundscape.com/2015/04/the-i-5-peak-hour-hov-3-lanes-idea/>

Basic Bile Lane -

https://commons.wikimedia.org/wiki/File:Rogers_Road_Bike_Lane.jpg

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

Detection of New Traffic Control Device Deployment

- What information do vehicles need from METR to coordinate the recognition of a new traffic control device being installed? For example, a stop sign is scheduled to be installed on a particular day, but how does a vehicle know exactly when the sign has been installed.



26 October 2021

14

What details do vehicles need to be able to detect new traffic control devices?

Stop Sign - <https://www.kingsporttn.gov/city-services/public-works/traffic/trafficsignsandmarkings/>
<https://blog.udot.utah.gov/2014/12/>



This completes workshop 5.

Workshop Schedule

Date	Topic
28 September	METR operations
5 October	METR operational structure
12 October	Electronic regulation life cycle
19 October	Electronic regulation conflicts
26 October	Vehicle operations
2 November	Vehicle information needs
9 November	Campus governance
16 November	Campus regulations
23 November	Roadwork and emergency operations
30 November	Multimodal and micromobility operations
7 December	METR deployment: Part 1
14 December	METR deployment: Part 2

26 October 2021 16

We've now completed 5 of our 12 workshops. Our next workshop will focus on vehicle information needs, especially for ADS-equipped vehicles.

Workshop 6 Topics

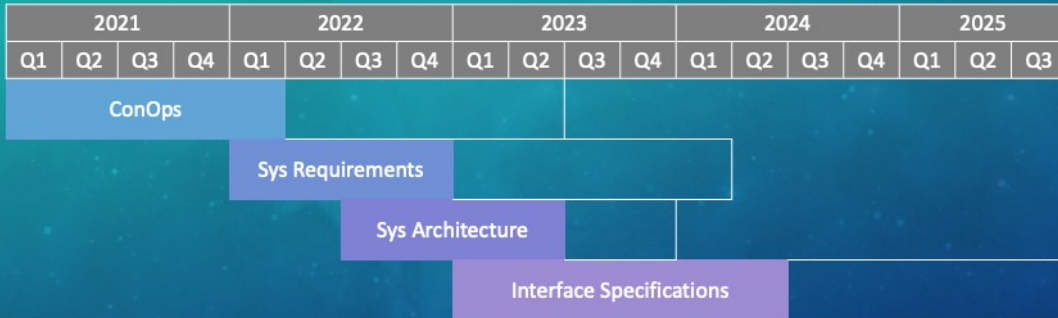
- Vehicle Information Needs
 - Static and Dynamic DDT Boundaries
 - Partial METR Support
 - End of Coverage Scenarios
 - Support Flows

26 October 2021

17

The workshop will focus on the topics shown on this slide

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

26 October 2021

18

As a reminder our current expected timeline is shown here. We hope to have a ConOps draft in early 2022, whereupon it will start the standardization process (of multiple reviews prior to standardization)

More Information

More information and a discussion forum is available at:

<https://iso-tc204.github.io/iso24315p1>



26 October 2021

19

More information about the project and the latest developments will be posted on our GitHub site. This will include a PDF of weekly presentation files to be posted after our meetings each week.

https://upload.wikimedia.org/wikipedia/commons/thumb/2/24/Cartoon_Guy_In_Deep_Thought_Using_A_Computer.svg/1200px-Cartoon_Guy_In_Deep_Thought_Using_A_Computer.svg.png