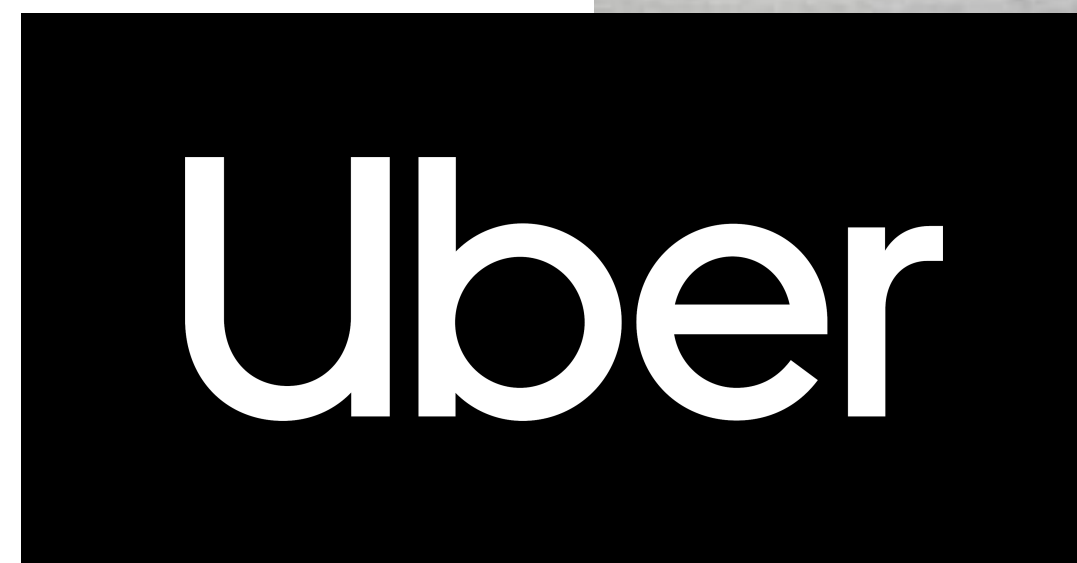


OpenScenario 2.0 requirements discussion

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High-level requirements

General requirements overview

User stories

Leveraging a common scenario model

- 1) As an **AV developer** company I want to **share** with other companies scenarios I built to test my tech
- 2) As an **AV developer** company I want to **search, review and reuse** scenarios built by other companies
- 3) As a **test engineer** working for an AV development company I want to **build and run tests as closely as possible** to tests other developers at other companies are running
- 4) As an **auditor/regulator** I want to **understand** how AV developers are testing their products
- 5) As a **safety consultant** I want to **recommend** to my clients specific scenarios and conditions to test
- 6) As a **member of the public** I want to gain confidence in autonomous driving technologies so I want to learn more details about **how these products are tested**



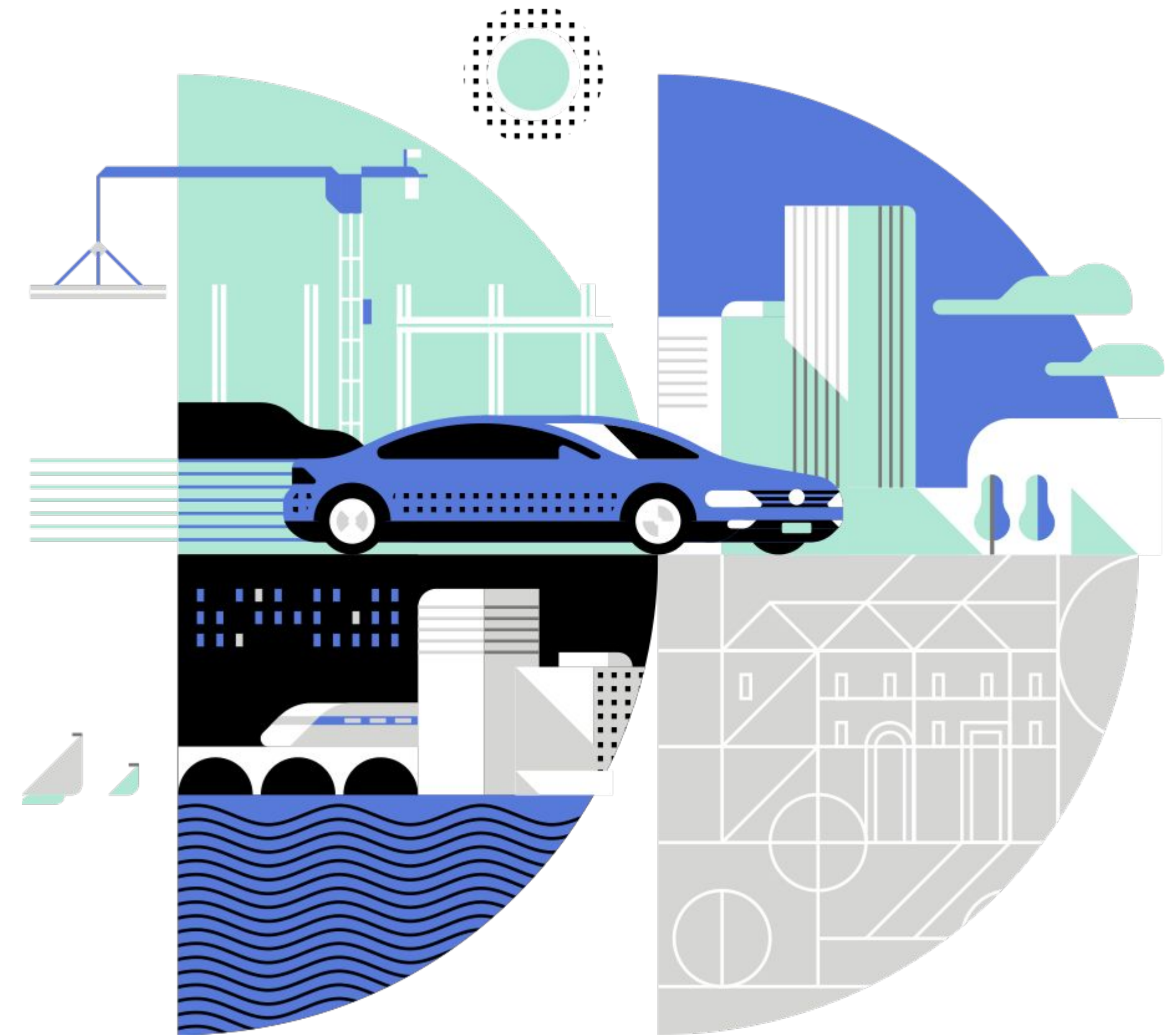
High level requirements

Emphasis on reusability and simplicity

1 - Implementation agnostic

1-1 - The ideal solution will specify a **data format** that works across multiple **compute platforms**, with the minimum amount of information to fully reconstruct the scenario and measure its result in a **different simulation environment**.

1-2 - The model should **strip down any implementation-specific parameters**, and use units that are universally understood (e.g. metric) to **define position, speed, acceleration, geometry** and any other variable that is relevant to the scenario **definition and result**.



High level requirements

Emphasis on reusability and simplicity

2 - Extensible

2-1 - The format should also account and allow for including unencrypted **rich media** that may accompany scenario descriptions and results, such as video streams, images and potentially lidar/radar feeds (using industry standard formats like .jpeg, .mpeg or .mov, or provider specific like velodyne, etc.)

2-2 - Since these media are not implementation agnostic they should be optional and serve the purpose of **providing context, enabling training ML algorithms or easily review of results**. As such the inclusion of these media artifacts should not be a requirement to enable scenario translation and extraction needed across parties.

2-3 - These files should be **wrapped and referenced independently of the scenario description**, so if a user decides to forego using rich media they can still build and use the scenario definition and test results.

2-4 - Scenarios should be able to be digitally signed for the purpose of **integrity check and non-repudiation**.

High level requirements

Emphasis on reusability and simplicity

3 - Traceability and version control

3-1 - Both the **results as well as the definition** should be versioned in such a way that the results can be traced to a specific version of the scenario definition.

3-2 - The scenario definition should be **distinguishable from earlier or newer versions** of the same scenario.

3-3 - Whether using timestamps, serial identifiers or something else there needs to be an unequivocal way to tell the difference between the test results for the same scenario as well as **which software version the results belong to**.

3-4 - The format should allow for the **same scenario to keep its unique identifier along many changes**, even if these changes have been made by multiple parties, except when the scenario author saves it with a different identifier on purpose to fork it out of the original scenario.

High level requirements

Emphasis on reusability and simplicity

4 - Forward compatible

4-1 - The file format should be **simple enough that it can accommodate more information in newer versions** of the standard without crippling the existing data that may exist in older files created with a previous version of the standard format.



High-level maneuver model

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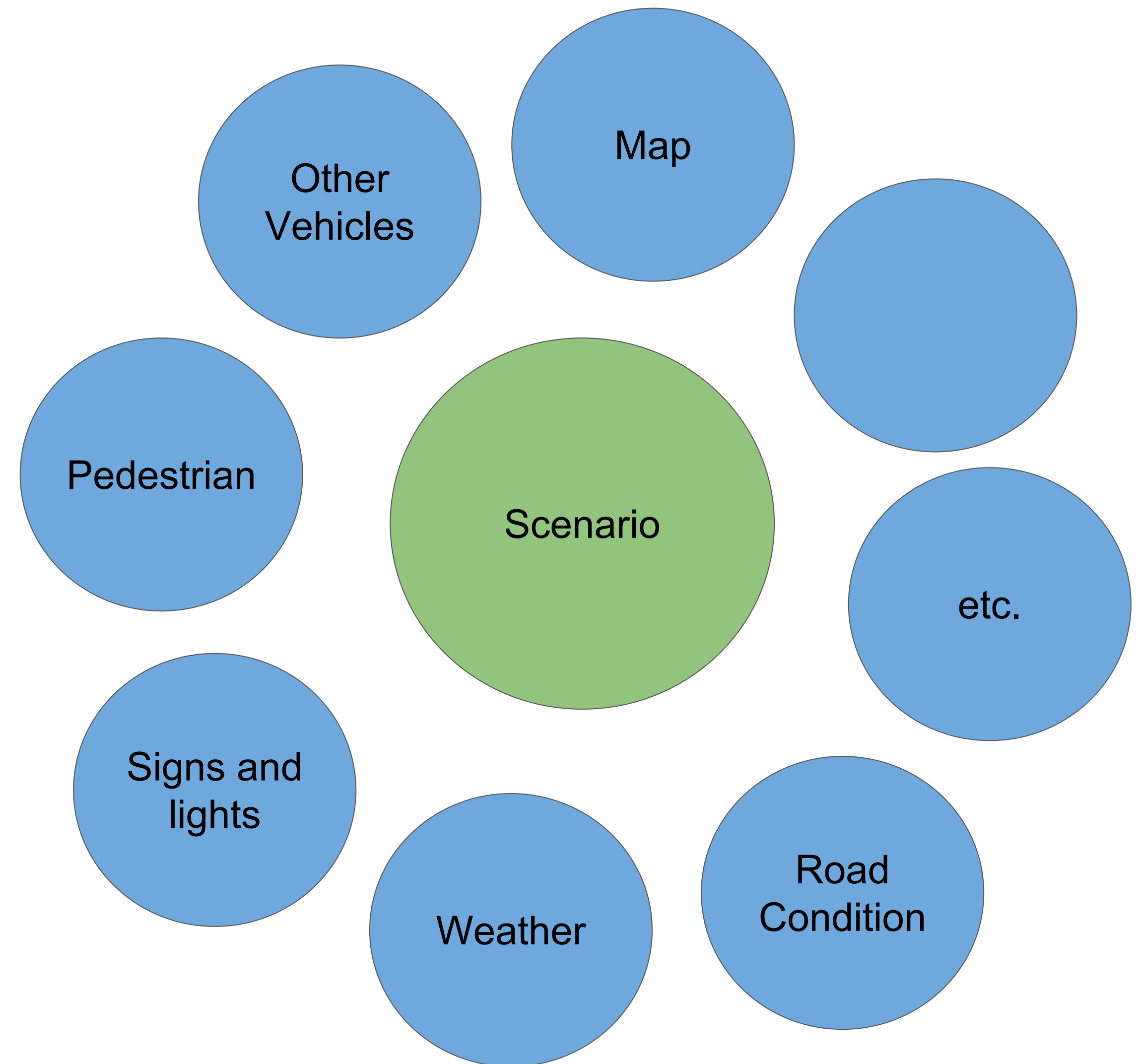
High-level maneuvers

Building blocks

High-level maneuver model should be able to describe a scenario clearly with both human and machine readability.

A well defined scenario should consider different factors that can interact with an autonomous vehicle:

- Map: roads, signs, parking lots, etc. that determine where the AV and others can drive on;
- Actors: anything on or near the road that can interact with the AV;
- Interactions: how other actors can interact with the AV
- Conditions: weather, road condition, etc. anything that can cause the AV to behavior differently



High-level maneuver model

Using classes to represent different categories of factors that define a scenario

Classes describing objects that physically exist in the scenario and their properties

- Maps: roads, lanes, intersection types, etc.
- Objects: moving/static actors placed on the map
- Functional objects: signs, traffic lights, etc. that can control the traffic

Classes describing behaviors, changes, and interactions of any objects

- Trajectories: scheduled movements of actors
- Events: designed movement or interactions that is triggered by other facts

Classes describing parameters that is used to expand the scenario

- Environment: conditions and parameters which will affect actor behavior, e.g. visibility, weather, etc.
- Variations: possible ranges of any factor which make the scenario slightly different

Q&A



Thank you

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The Uber logo, consisting of the word "Uber" in a bold, black, sans-serif font, is centered within a white rectangular box. The box is positioned in the bottom right corner of the slide, overlapping the teal background and the geometric pattern.