



How can the unspecified be validated?

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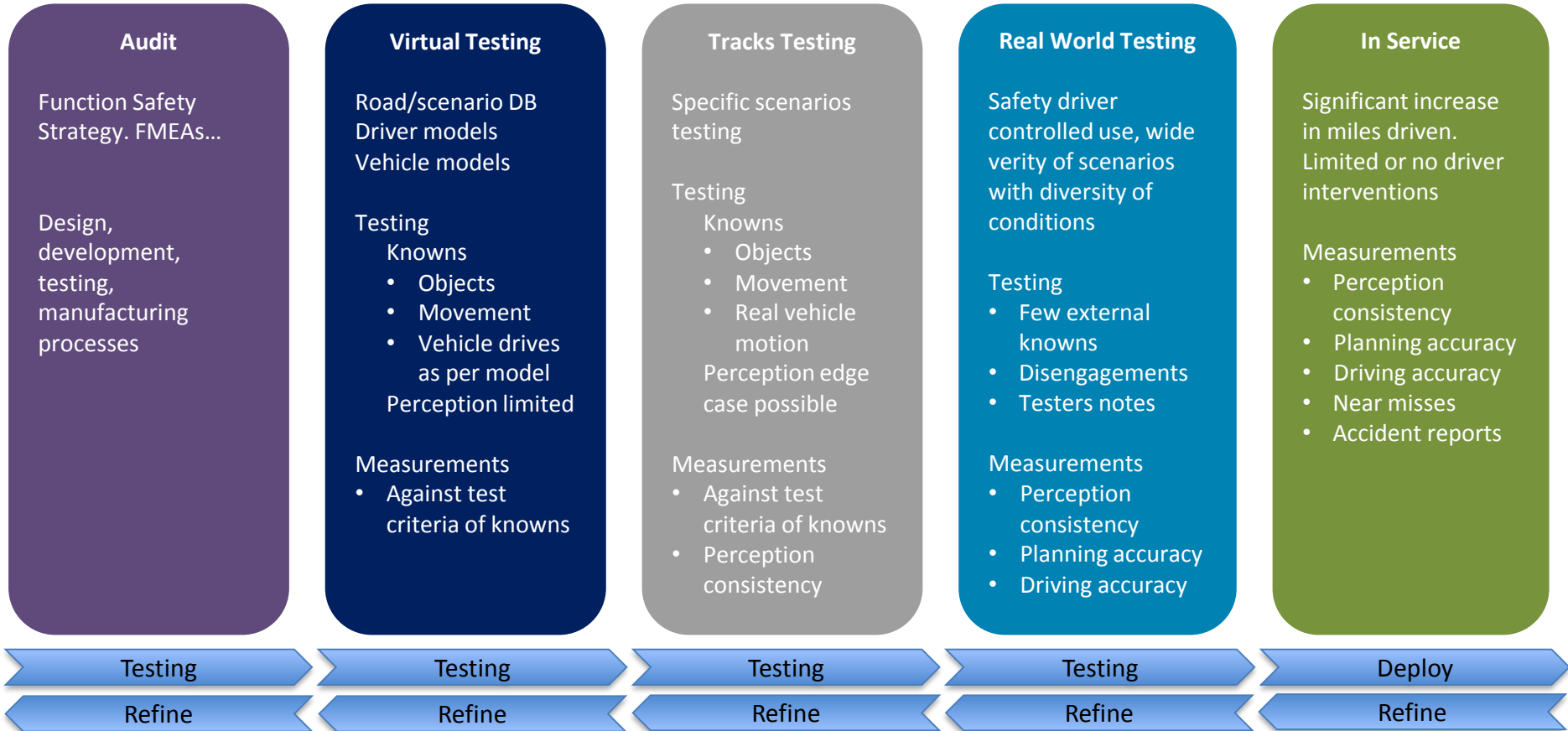
International Regulation



- **VMAD** – UN-ECEs WP.29 Validation Methods for Automated Driving
 - Supported by NHTSA, Canada, Japan, UK, EU, Korea, OICA...
 - Mandated to devise validation methods to achieve
“.. shall not cause any traffic accidents resulting in injury or death that are reasonably foreseeable and preventable..”
 - Automated Lane Keeping (ALKS) could become a prototype and is expected to complete March 2020
- **Design Processes** – many groups working on updating design processes for AV development
 - SOTIF, UL4600, BSI, Self Assessment packs
 - The V diagram is broken, how do we check that everything is covered?
- **Acceptable Risk** – Who should take responsibility for defining acceptable risk?
 - Driving is not zero risk
 - How should traffic flow be balanced with accident risk



Multi Tier Validation





First Step– A Measure of Safety

- **Implementation agnostic** – The measurement system should be outcome based and not impose a design on the developers of the AV.
- **Open standard** – The measurement system must be an open standard that all OEMs can work with
- **Extendable** – The number of potentially unsafe driving scenarios is unlimited and so any measurement system must be able to be extended to account for new incidents.
- **Efficient** – The time taken for an OEM to react to an incident (understand – fix – validate) may need to be weeks or months but not years. Estimates for testing by public roads driving have suggested 1 billion miles would be needed. This is neither practical or desirable.
- **High fidelity** – Recording accidents is not sufficient, as humans we learn from near misses where accidents are avoided by drivers taking evasive action or the luck of timing.
- **Continuous** – Safety needs to be measured by all vehicles both in development and deployment.
- **Objectivity** – Measured data must provide clear guidance to decision making so that assessments are objective and fair to all.