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The Most Effective Ways to Maximize the Value of Simulation

Sharon Rosenberg

An Industry Bedtime Story …

Once upon a time there was an industry in trouble

- Infinite scenario space, full of edge-cases and unknown scenarios
- No way to track progress and define project completion
- High-cost of failure
- Milestones were missed, projects were cancelled

Fortunately, a secret treasure was discovered - virtual testing

- Cheap, scalable, controllable, reproducible, and accurate

The winds of hope were blowing

But it still was not enough since no one was able to create 10M scenarios

- And the industry went into a dark period called the “validation crisis”

As we all know, this industry is of course …

- The chip design industry ☺

And as we all know, it lived “happily ever after …”

Use a Standard Language & Methodology

- A standard language is your safest path
  - Multiple tool vendors will support your scenario investment
- Provides the freedom to select the best-in-class solution
- A standard fuels collaboration at both the team and company levels
  - Allows sharing scenarios, requirements, and expertise with existing or future partners
- Delivers benefits for vendors
  - Facilitates building solutions that will serve larger segments of the industry
  - Enables collaboration with other vendors

OSC2.0
ASAM

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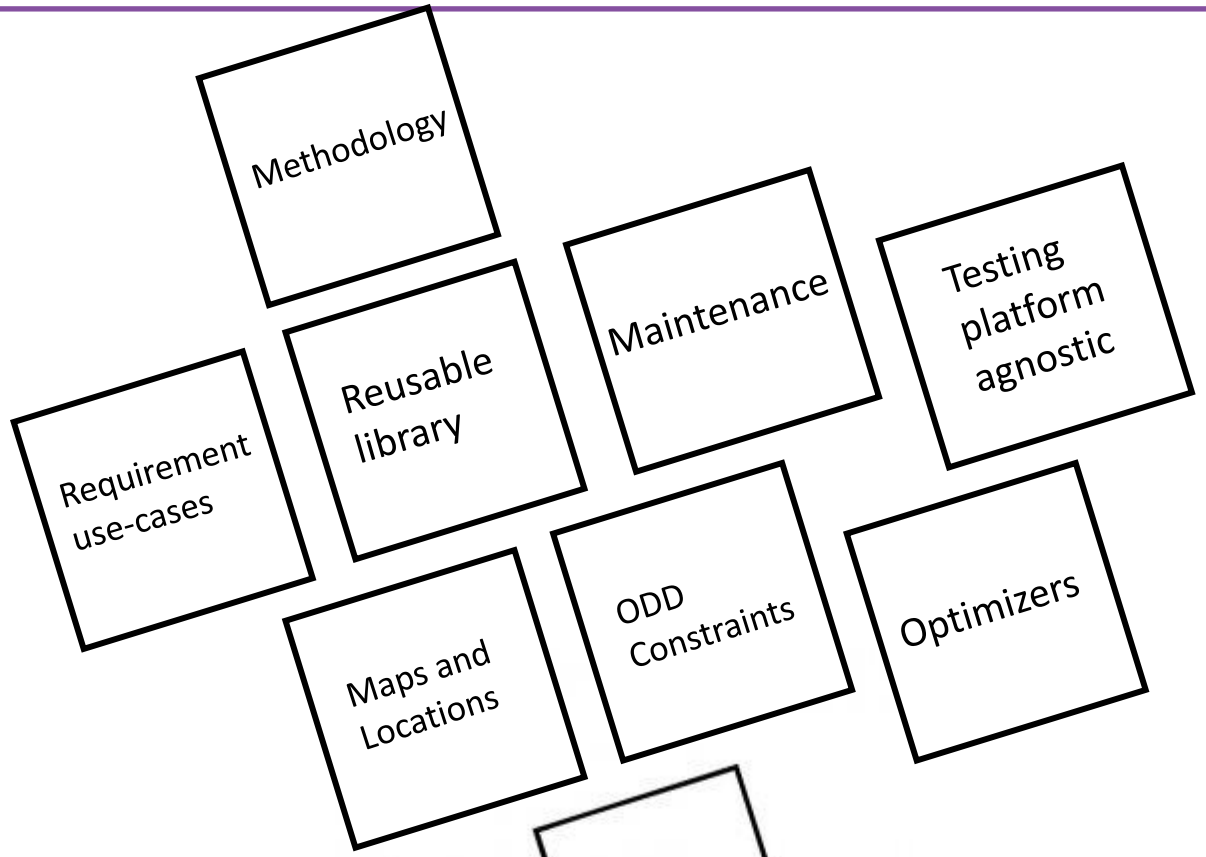
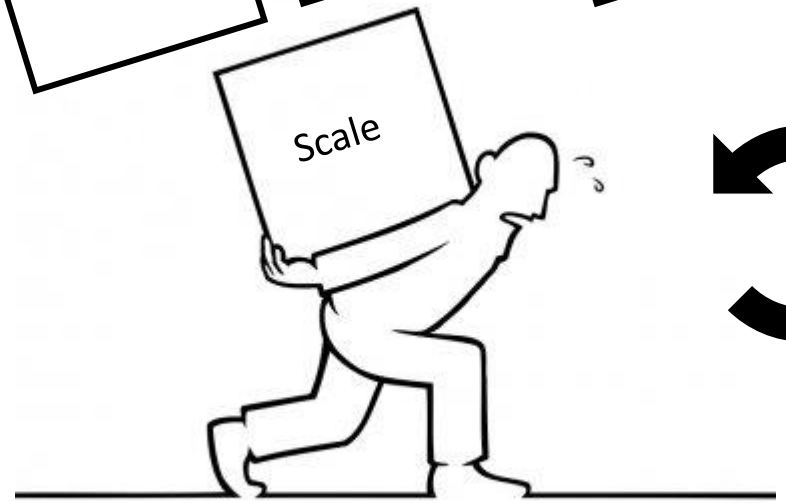
Use Proper Automation for Meaningful Scale



- Adopt Proper Automation to reach scale and robustness

Automotive imbalance



*1M

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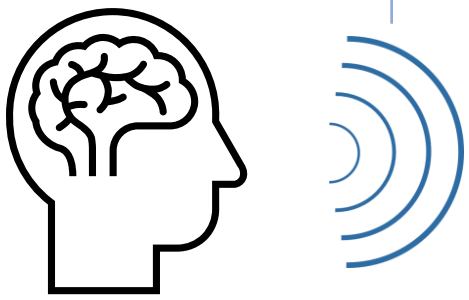
Use Proper Automation for Meaningful Scale

OpenSCENARIO2.0
Is the language to specify
High-level scenario to the
machine



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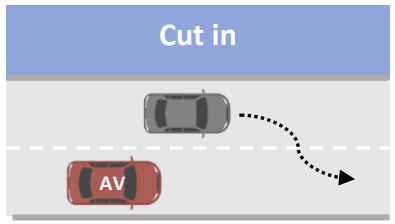
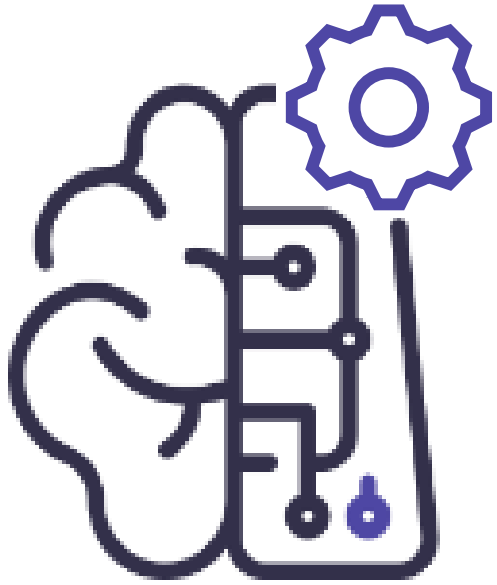
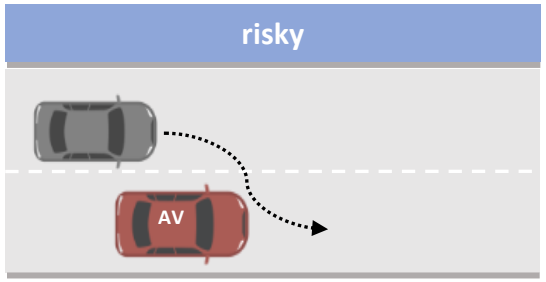
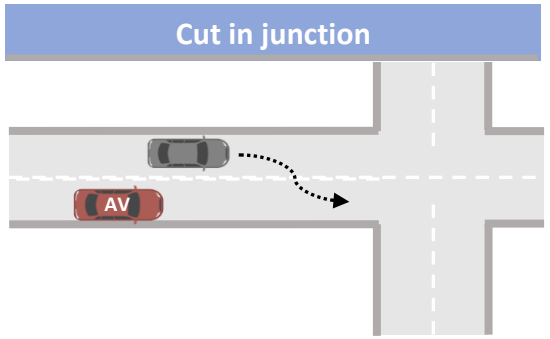
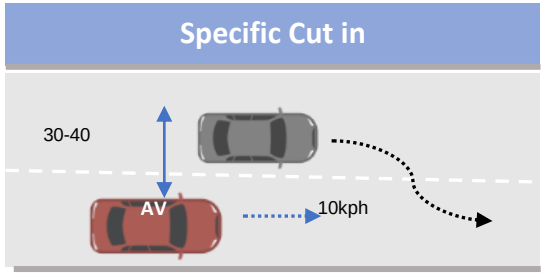




Automation







This is a cut in scenario. Create:

- *An aggressive scenario*
- *A scenario next to a junction*
- *A cut in with specific distance and relative speed*

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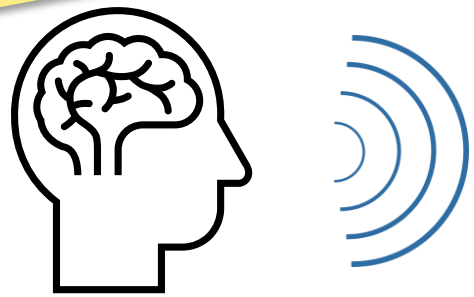
Use Proper Automation for Meaningful Scale

- Adopt Proper Automation to reach scale and robustness



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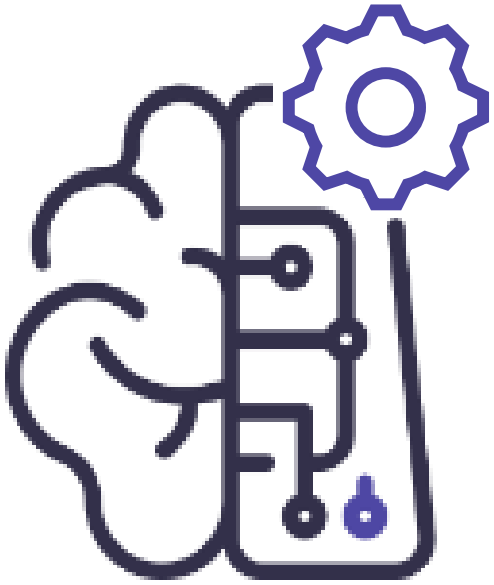
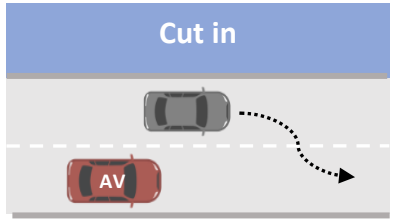
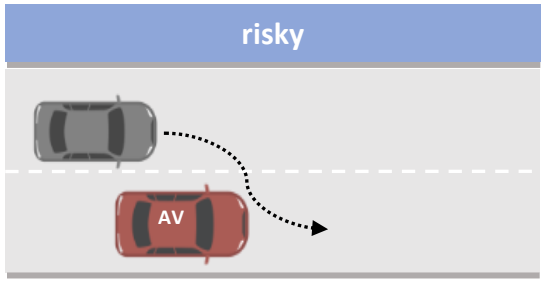
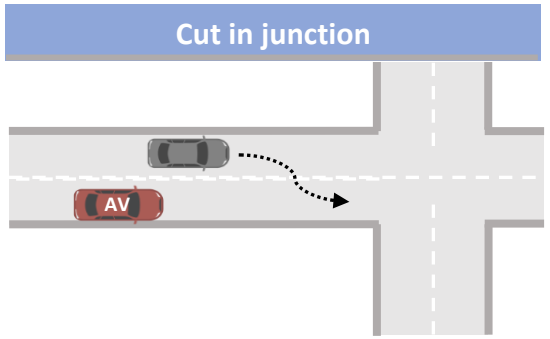
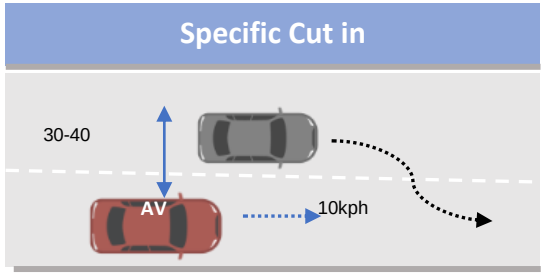


Automation









- Proper automation is needed for logical or abstract scenarios
- Reminder:
  - Logical scenarios: limited to literal ranges constraints
  - Abstract scenarios: allow any kind of constraints on any attribute. Much more accurate and expressive
  - Its impossible to convert an abstract scenario into a finite set of logical scenarios

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Finding the Unknowns Using Constrained-Random

Proven to be the only way to move forward

- Allows diversity, unknown exploration and productivity

Random mixes

Of random scenarios

Smart Agents

Combining smart agents with random planned traffic

Infinity minus

everything is possible

Real-life random

How do you inject street random into virtual platforms?

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Projects Need to be Managed – Use metrics

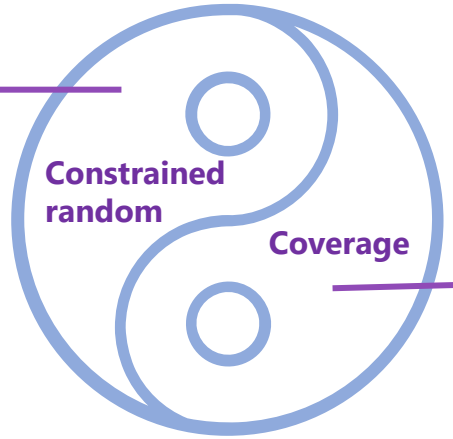
- Fundamental questions
  - What are your goals? Where are you versus the goals?
  - Are the scenarios really meeting their intent?
  - Are you done with the overall project?
  - Are you wasting simulation cycles on redundant scenarios?

Dashboard for process management

- OSC2 provides language to precisely describe measurable goals
  - Can be used to track goals or simply record KPIs at specific times for analysis
  - Scenarios, ODD, projects and any other goals can be captured in coverage

Chaos

- Unknowns
- Surprise
- Unexpected



Order

- Planned
- An organized map of the risk dimensions
- Gradable objective goals
- Data Driven Reports from actual executed data
- Milestones

- OSC2 coverage is a must for managing scale, productivity and robustness

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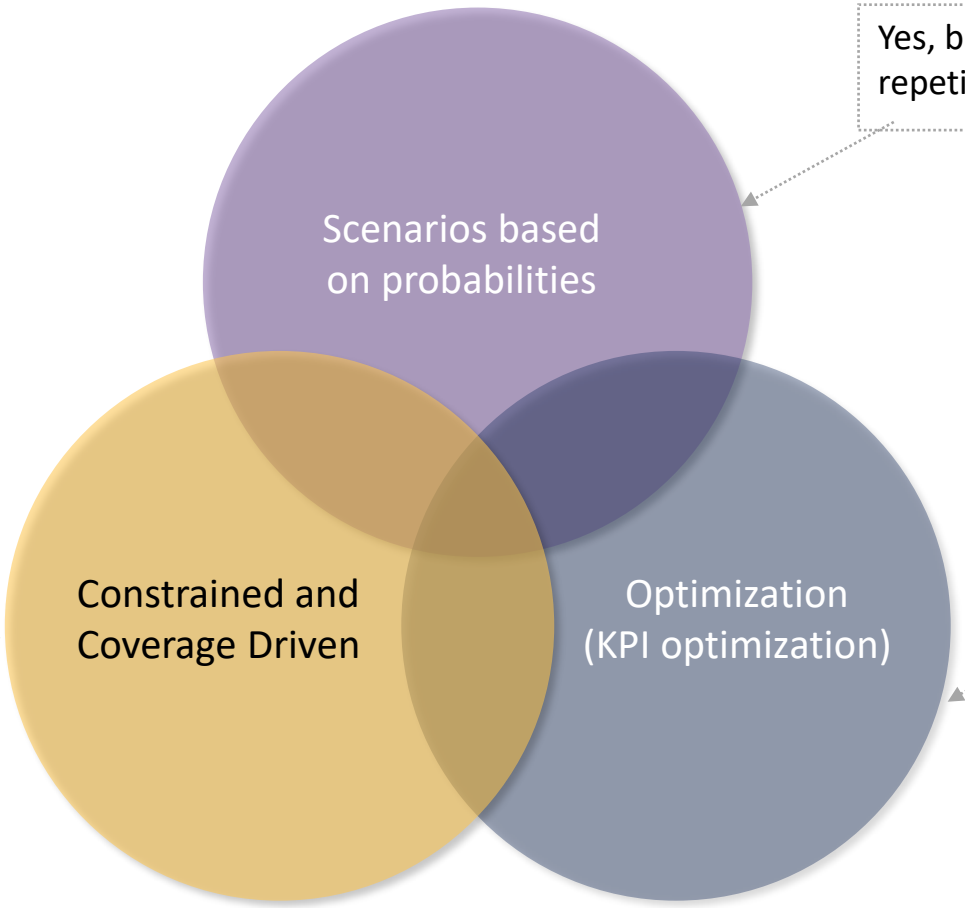
Use Combination and Synergy of Technologies

V&V is a tough problem that requires multiple solutions in conjunction, each for its own strengths

- Use synergy of technologies to solve the tough V&V challenges



Yes, but at some point, repetitive …

Yes, but:
- What about unknowns?
- With SW not every value can be optimized
- Who will implement the optimizer suggested scenarios?

Yes, provides the systematic approach to complement the other technologies

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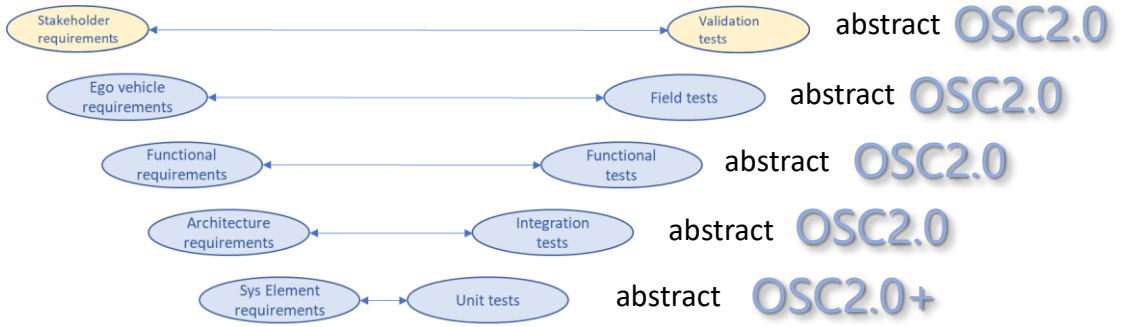
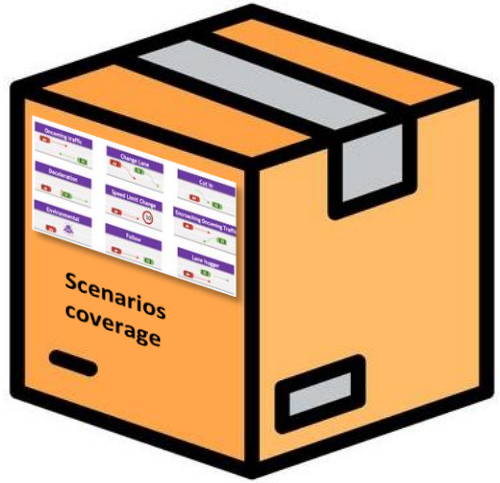
Adopt Reusable Scenarios to Aggregate and Share Expertise

- Use a single language for the development process
  - Enable scenario sharing and communication
  - Prevent throwing away scenarios
- OSC2 is user readable and highly expressive
  - Simple and sophisticate scenarios
  - Concrete and abstract scenarios



- OSC2 is the first standard that allows capturing ODDs, test-platforms, models, and maps in reusable V&V packages
  - Traditional V&V packages are map specific and cannot be adjusted
  - OSC2 allows compositions and extensions



Abstract scenarios are needed for all the V-model steps and to enable reuse

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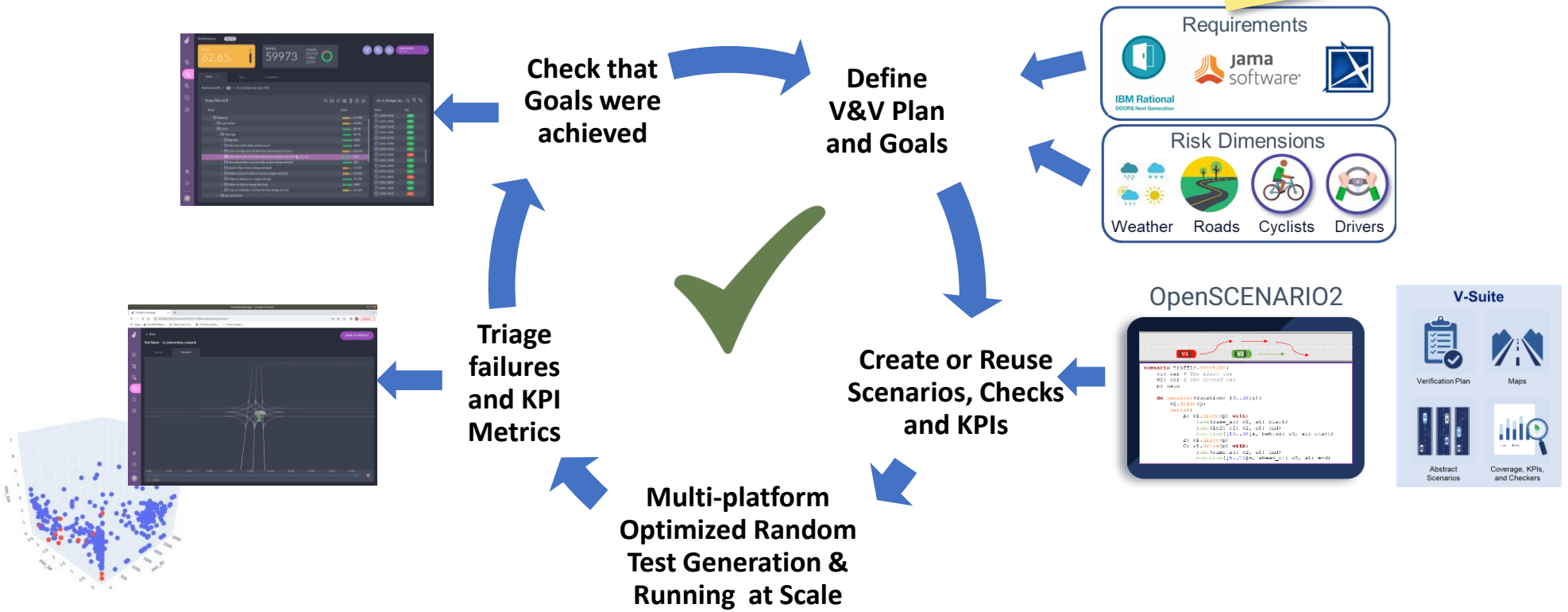
When Should I Move to OSC2?

- Once you decide to move to OSC2, you should start the move without delay
  - Multiple tool vendors offer differing levels of OSC2 support
- Check out Foretellix's proven native engines
  - Unique proposal to make any commercial or homegrown simulator OSC2

- Move ASAP to OSC2
- Multiple engines are needed for the automation pipeline
- Check Foretellix OSC2 native engines



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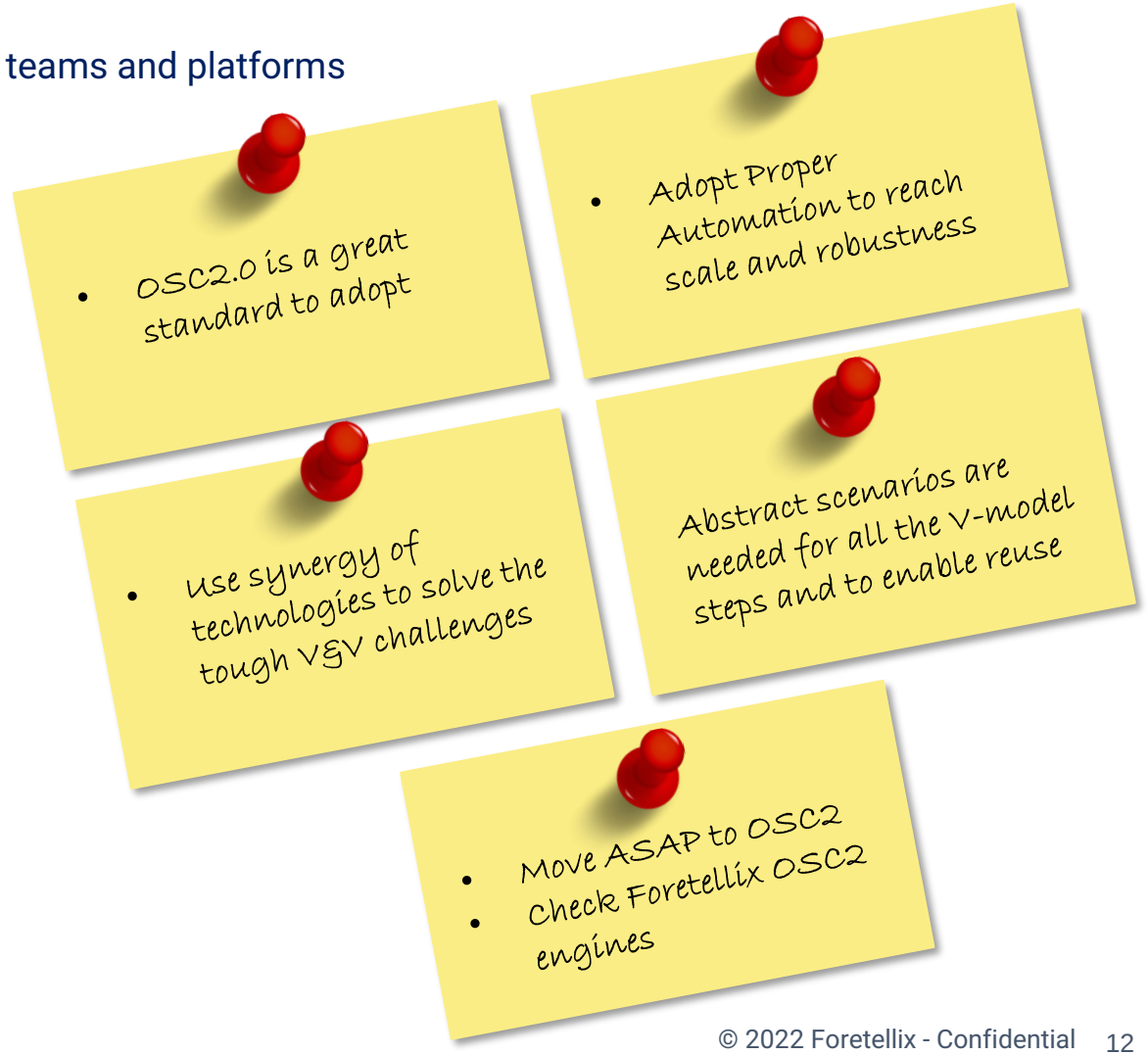
Summary

- OSC2 with proper technologies and methodology fuel virtual testing and SIL
  - Productivity, efficiency and robustness
  - The provided abstraction and accuracy is key for bridging across teams and platforms
  - Offer opportunity for users and vendors of this industry
- It requires upgrading our requirements and V&V processes
- Be an agent of change in your group or team
  - Join ASAM efforts to learn and teach
- For more information talk to us or email info@foretellix.com
- May we all live
  - Thank you ☺



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