# Model-Based Hyper Scalable Assessment of Automated Vehicle Functions Stefano Marzani, Vera Pchelina



# DSA = Device Solutions Americas

### SAMSUNG



# Samsung in Automotive



Samsung Showcases Latest Award-Winning Semiconductor and Automotive Solutions at Specialized CES Exhibit



Source : Samsung Newsroom

#### Certification

May 13, 2019

#### Press Release



Samsung's Exynos Auto 8890 Powers In-Vehicle Infotainment System in the New Audi A4 and Upcoming Models

May 30, 2019

#### SAMSUNG

## **Global Map**





## **Consistent SoC Strategy**







## Roadmap ADAS/AD

2023	<b>2</b> 02x	202y
Driver Assist Package	Valet Parking Package	Urban Fenced Chauffeur
Safety Package	Commuter Assist Package	Package
Info	Advanced Driver Assist	Advanced Commuter
Package	Package	Package
ADAS	Autonomous	Autonomous
Platform	Platform	Platform
SAMSUND	SAMSUNG	SAMSUNG
EXYTOS AUTO	Exynos Auto	Exyrios Auto
Gen 1 SoC	Gen 2 SoC	Gen 3 SoC
L2 Solution	L3/L4 Solution	L4 Solution

## **A Three-Pillar Solution**

### DRVLINE Metal

SAMSUNG Exynos Auto

Consistent Exynos SoC strategy to meet computational needs of each car line w/ efficient scale out.

Designed for safety applications up to ASIL D.

DRVLINE Liquid

Middleware that operates multiple SoCs as one.

Enables SW development by OEMs and Tier 1s to easily integrate functions. DRVLINE Air

Cloud-based ecosystem w/ seamless integration of "in-car" collected data.

Improved accuracy of ACC, LKA, Road Model, AEB.

## DRVLINE FRAMEWORK. Modular approach

Open and flexible Approach architected to allow third-party Integration



## **DRVLINE Middleware**



- Interprocess Communication Layer synchronizes source and object data.
  - Subscriptions to data sources that are on other SoCs are transparent to modules.
  - Software modules can be distributed across SoCs.
  - Adaptive Autosar and Autosar difficult to use for developers.
  - DRVLINE provides Adaptive Autosar with easy to use IDL and pub/sub mechanism familiar for ROS developers.



## DRVLINE<sup>™</sup> TOOLS SUITE

- Samsung, as part of its Exynos Auto product family, offers its customers a comprehensive toolset to accelerate development, verification and validation.
- The toolchain is optimized for the DRVLINE™ ADAS Framework and currently consists of five components:
  - > simulation framework (DRVLINE™ Sim)
  - > perception development kit (DRVLINE™ Perception Tool)
  - > functions development kit (DRVLINE™ Functions Tool)
  - > data management toolchain (DRVLINE™ Data)
  - > DRVLINE ™ Viewer 2019

These services are available through an online portal, which includes the **DRVLINE™ Dashboard**, showing an overview of continuous improvement (CI/CD/CV), KPIs, and more.





### **Tools Landscape**



## DRVLINE™ V&V Strategy – SiL, HiL, ViL Continuity



## Problems we are solving

- > Rapid prototyping and requirement validation
  - > Stateflow, Automated Driving Toolbox
- > Fast and "inexpensive" verification
  - > Driving Scenario Designer (Automated Driving Toolbox)
- > Automatic code generation
- Address needs of multiple stakeholders with different approaches to development
- Mitigate development dependencies while framework is under active development
- > Our approach:
  - develop a DRVLINE Toolbox for Simulink and distribute / deploy it in containers



## **DRVLINE Toolbox Architecture**





## LDW model using DRVLINE Toolbox



## **DRVLINE Toolbox for verification and validation**

- > DRVLINE SW & infrastructure allows
  - validation at scale using
  - > Headless simulation
  - > Parameterization of driving scenarios
- Smart validation using
  - > Parameter optimization
  - > Data augmentation







## **DRVLINE Toolbox in V&V**



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## **Containerized Model in the Loop**

Developer Workflow

./setup

![](_page_18_Figure_3.jpeg)

### V&V Workflow

![](_page_18_Figure_5.jpeg)

![](_page_18_Picture_6.jpeg)

## Model in the Loop

![](_page_19_Figure_1.jpeg)

![](_page_19_Picture_4.jpeg)

## Software in the Loop

![](_page_20_Figure_1.jpeg)

## Enhanced Model in the Loop

![](_page_21_Figure_1.jpeg)

![](_page_21_Picture_4.jpeg)

### **DRVLINE toolbox example**

![](_page_22_Picture_1.jpeg)

![](_page_22_Picture_3.jpeg)

## Conclusions

> We presented a modern approach & framework to prototype, develop and test Automated Vehicle Functions

*MATLAB, Simulink, Automated Driving Toolbox, Stateflow* can be integrated thru the DRVLINE Toolbox for Simulink
Facilitated development for different stakeholders
Scalability on all stages even for MBD
More efficient testing on early stage of the development

![](_page_23_Picture_3.jpeg)

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![](_page_23_Picture_8.jpeg)

![](_page_24_Picture_0.jpeg)

![](_page_24_Picture_3.jpeg)