

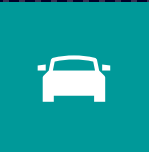




Siemens PAVE360

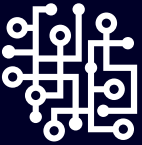
Automotive system development using accelerated pre-silicon simulation environment

Decisions made today have very long-term consequences, the SDV needs a new development methodology

Traditional vehicle challenges

-  **Longevity**
HW lifetime >15 years
-  **Field updates**
SW updates & feature upgrades for >7 years
-  **Long development cycle**
HW specification ready
~3 years before production

...will only get worse thanks to...



Complexity of SDV
Hyper competitive
Shorter design cycles

...meaning..



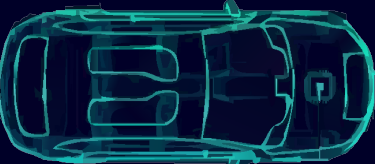
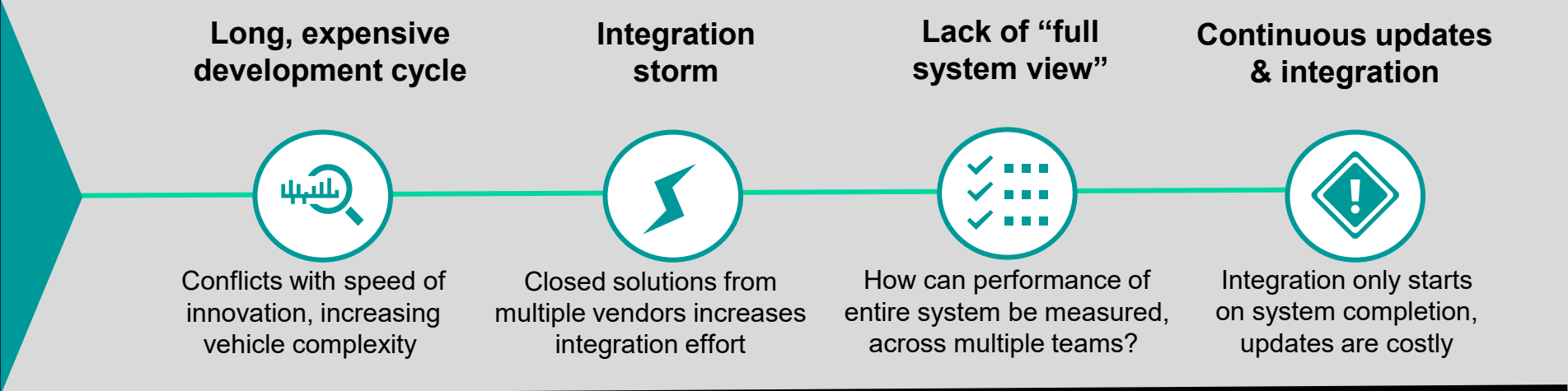
It **takes years** for new physical hardware

....too late for SW development

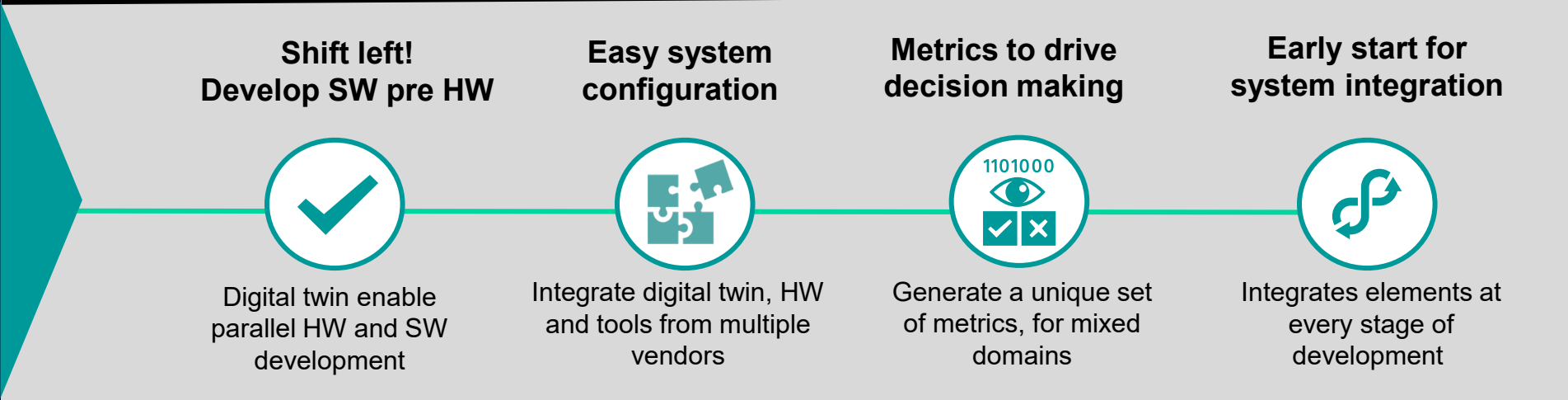
Regardless of whether they are developing a semiconductor, ECU or even full vehicle architectures, automotive players face the same challenges



Automotive Challenge



PAVE360 digital twin delivers



That's why Siemens, Arm and ecosystems partners are working together To "shift-left" the SDV

SIEMENS

Shift the SDV left with **PAVE360** accelerated pre-silicon development environment

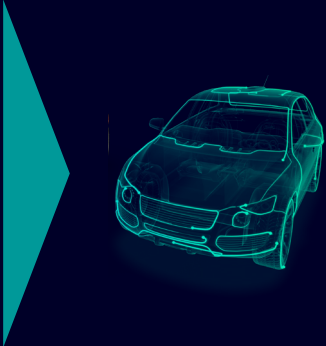
arm

Uses PAVE360 to enable developers to access the new **Arm Cortex-A720AE** pre-hardware

aws

Hosts PAVE360 to provide **unprecedented simulation speeds** on the cloud for the Cortex-A720AE

First partners are developing software for the SDV and the Arm Cortex-A720AE today, with PAVE360



BlackBerry QNX, Elektrobit, sensory, TATA TECHNOLOGIES, TIER IV

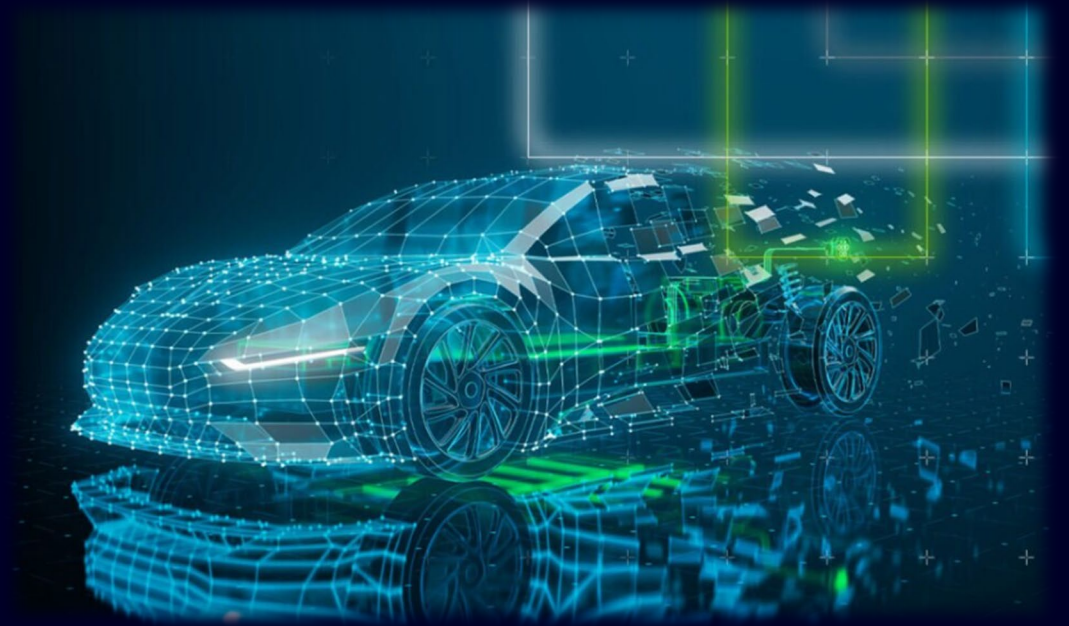
Arm's ecosystem support for virtual prototyping Siemens provide first Arm A720 AE CPU support

arm

“ Today, in a series of industry firsts, Arm and our ecosystem are unveiling the latest Arm Automotive Enhanced (AE) processors alongside new virtual platforms, all made available to the industry from day one to accelerate automotive development cycles by up to two years.”

SIEMENS

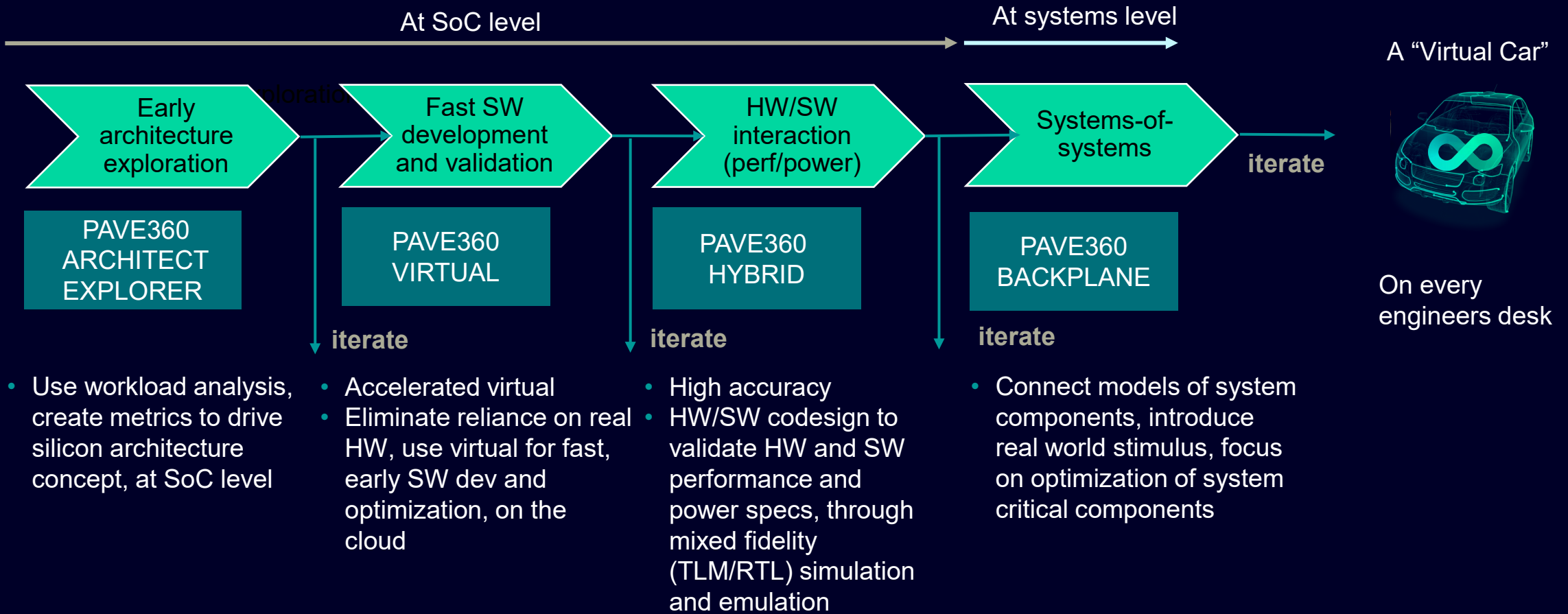
“Our partnership with Arm, supporting an accelerated simulation environment with Cortex-A720 AE CPU, is helping to address automotive industry challenges by reducing time-to-market for SDV software through the availability of accelerated automotive platforms well ahead of silicon.”



Source: <https://www.arm.com/markets/automotive>

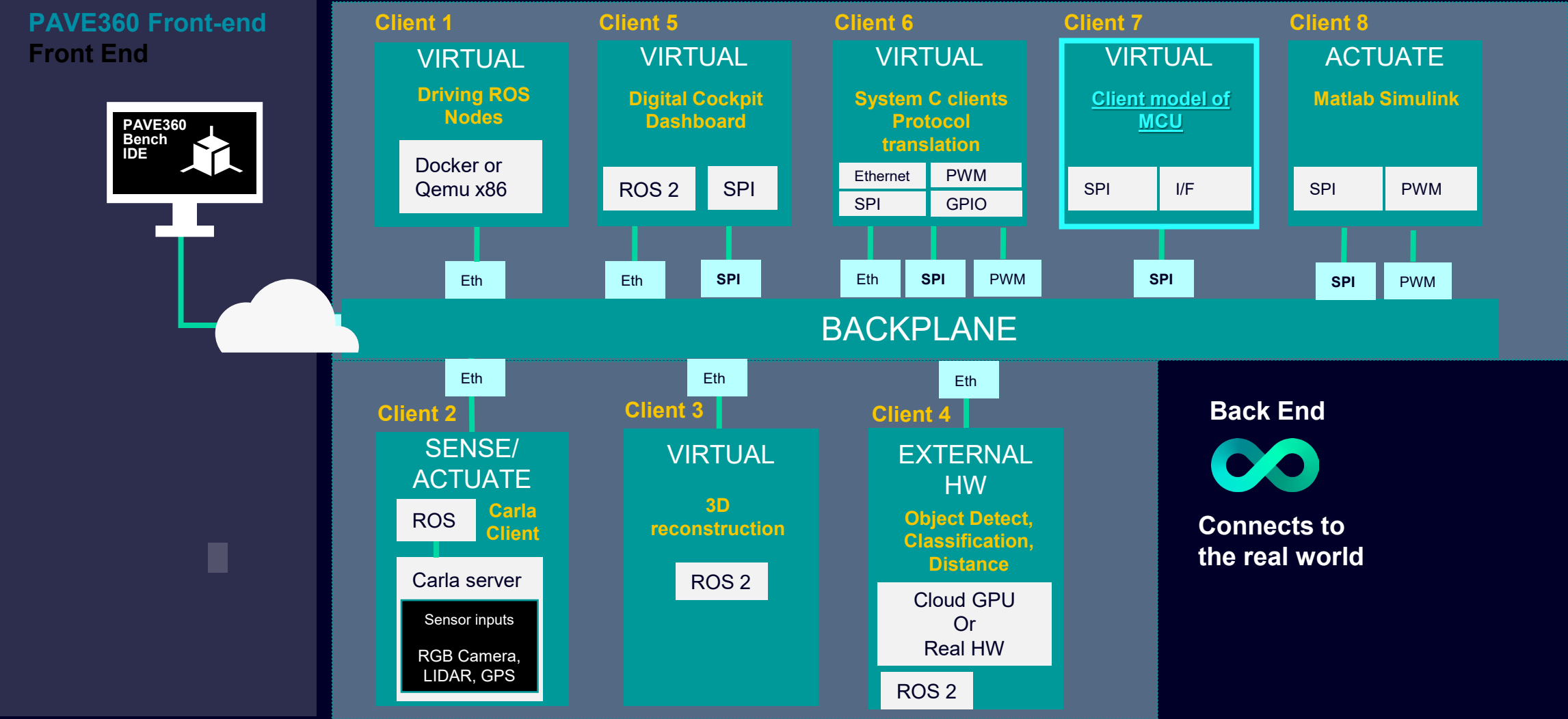
Shift Left methodology, a digital twin that grows with your design

Pre-silicon digital twin 

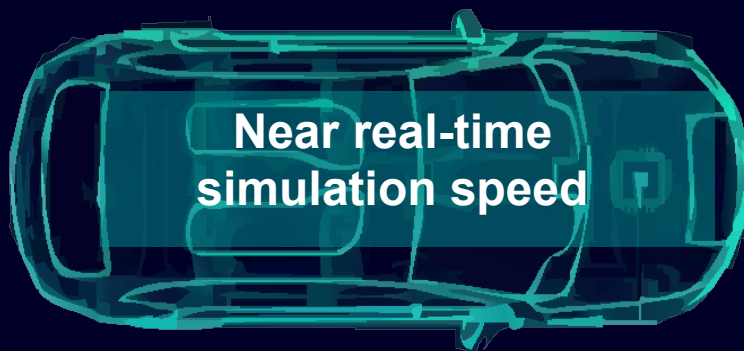
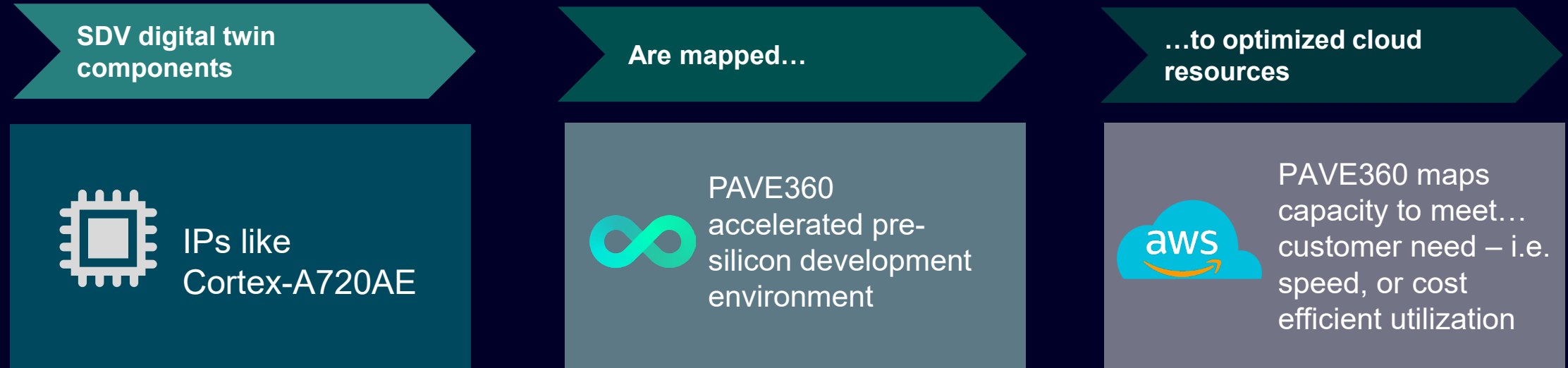


Customer Success Story: Major APAC Tier 2 Silicon Vendor

Validate new concepts for next gen MCUs in real world context



Accelerated pre-silicon SW simulation development environment



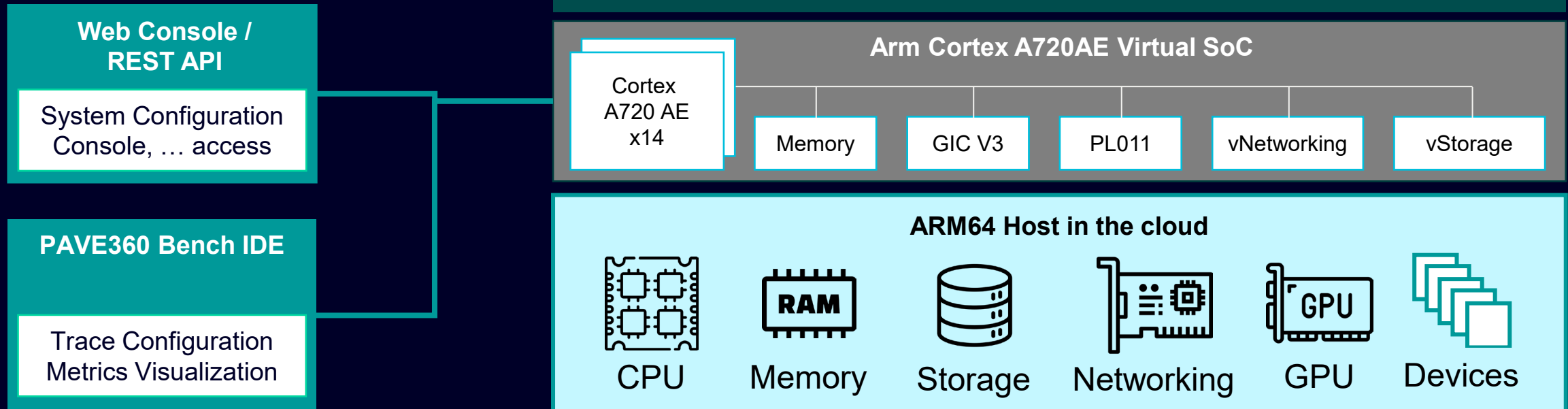
What does this mean for software application developers?

- Embedded environment as close to the target SoC as you'll get
- Native cloud development of complex vehicle software
- In familiar IDE based environment
- Near real-time simulation speed, much faster than traditional methods

Accelerated pre-silicon development environment Early Access Release

Arm Cortex-A720 AE Virtual SoC model

- HW:**
- Arm Cortex A720 AE x14
 - GIC V3
 - Memory
 - Virtual Storage
 - Virtual Networking
 - PI011 UART
- SW:**
- SOAFEE EWAOL Linux
 - TFLite + Benchmarks
- Tools:**
- PAVE360 Bench IDE for Metrics & Analysis





PAVE360

Accelerated pre-silicon
development
environment demo

[Home](#)[Platform](#)[Firmware](#)[Serial Console](#)[Help](#)[Contact Us](#)[Toggle Theme](#)[About & legal information](#)

Welcome to Arm® Cortex-A720AE Virtual SoC Reference Platform

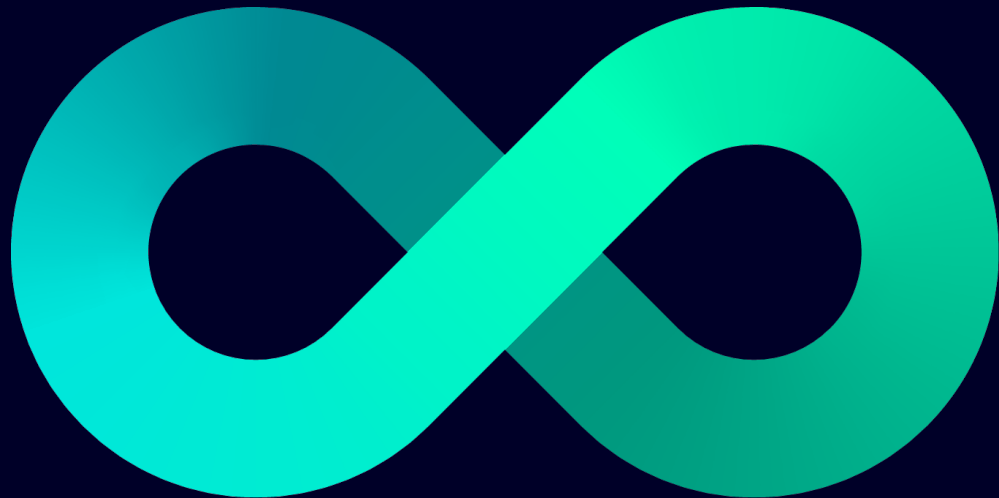
A web interface to bring up supported reference software environments for the Arm Cortex-A720AE Virtual SoC model.

[> Get Platform Details](#)[> Upload Firmware Images](#)[> Connect to Serial Console](#)

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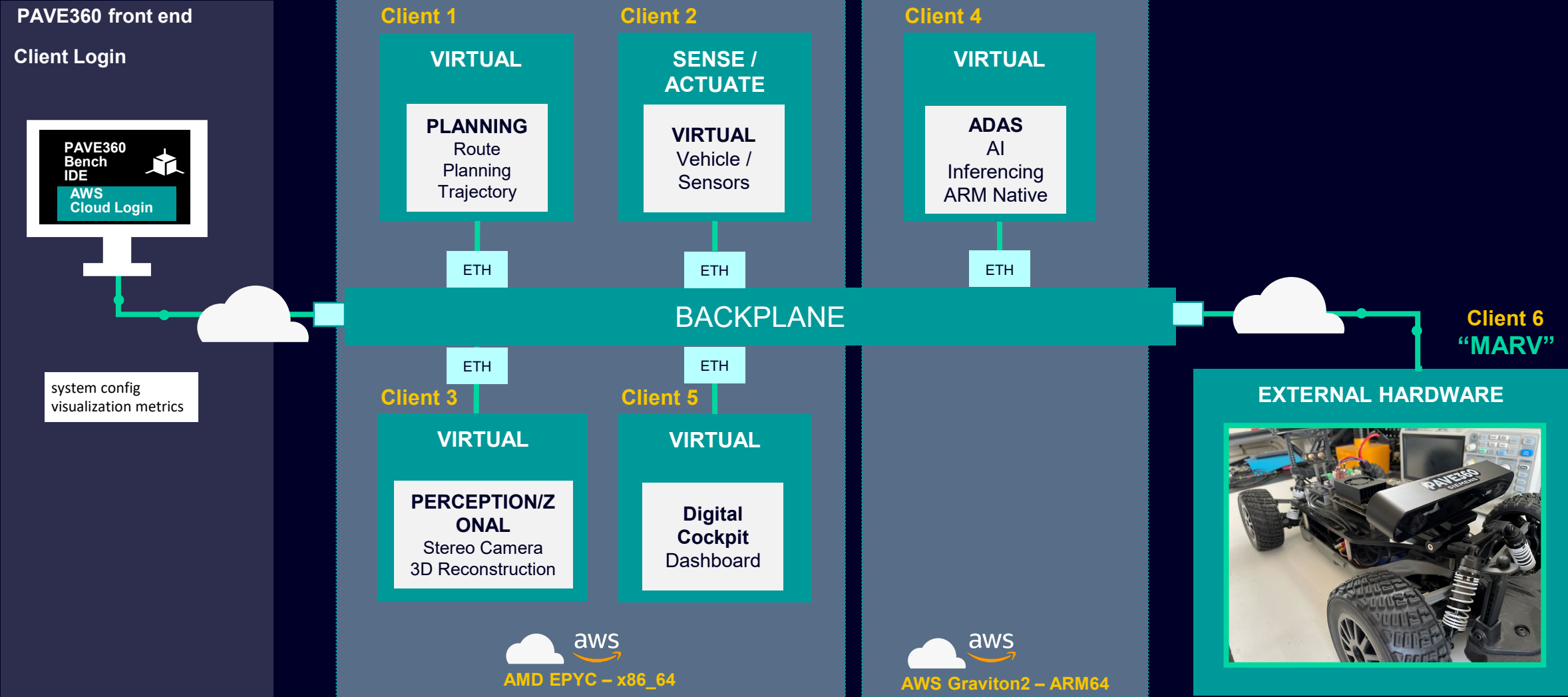


PAVE360

External hardware
demo

PAVE360 Multi Client Cloud Autonomous ADAS Reference Design

System-of-systems with real world stimulus optimized using cloud resources



PAVE360 system-of-system clients in more depth



Explore vision-based 3D detection algorithm for production

Client 1

PLANNING

Route
Planning
Trajectory

Destination route planner and provides steering, acceleration and braking

Client 2

SENSORS / ACTUATORS

CARLA
Simulator
Vehicle /
Sensors

CARLA driving simulator with environment and vehicle with sensors

Client 3

PERCEPTION ZONAL

Stereo Camera
3D Reconstruction

3D detection running in real-time on zonal controller. Without GPU or accelerators.

Client 5

VISUAL

Digital Cockpit
Dashboard

Digital cluster displaying ADAS and vehicle information



AMD EPYC – x86_64

Client 4

PERCEPTION CENTRAL

ADAS
AI Inferencing
Accelerated

3D detection DL model on central ADAS controller.

Deployable to accelerators: NPUs, GPU or CPU. Runs natively on Arm Graviton2.



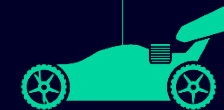
AWS Graviton2 – ARM64

Client 6

EXTERNAL HARDWARE

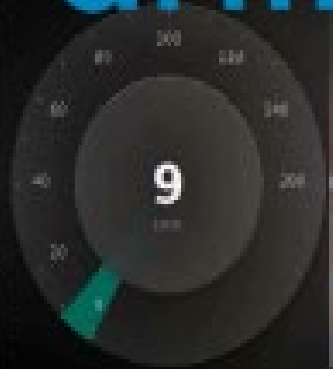


MARV



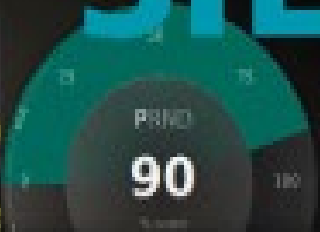
Validate steering, acceleration and braking actuators

arm



Distance(m)
Type: -

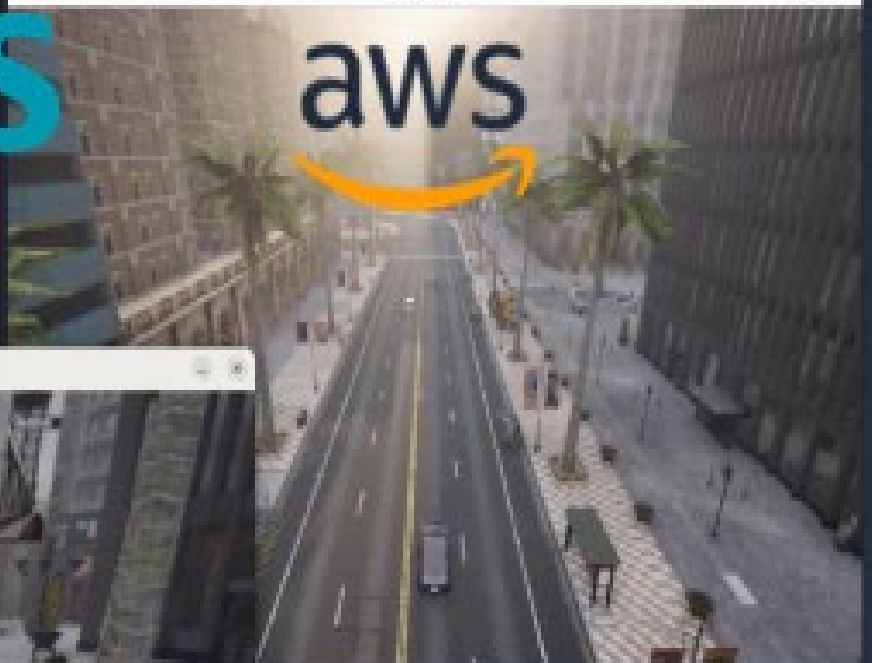
SIEMENS



```

[1780784982.884253760] [rasCafevssInterface]: @100000
Received vehicle status gear=1 velocity=2.500000 steer=0.000
[1780784982.884253760] [rasCafevssInterface]: @100000
Received video frame "left" width=1024 height=768
[1780784982.884253760] [rasCafevssInterface]: @100000
Received vehicle status gear=1 velocity=2.500000 steer=0.000
[1780784982.884253760] [rasCafevssInterface]: @100000
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[1780784982.884253760] [rasCafevssInterface]: @100000
Received vehicle status gear=1 velocity=2.500000 steer=0.000
  
```

aws



```

System: 14.14
OS: Linux
Vehicle: Tesla Roadster
Map: Carla/Mapa/Barcelona
Simulation Year: 2018
Completed Time: 1.200000
  
```

```

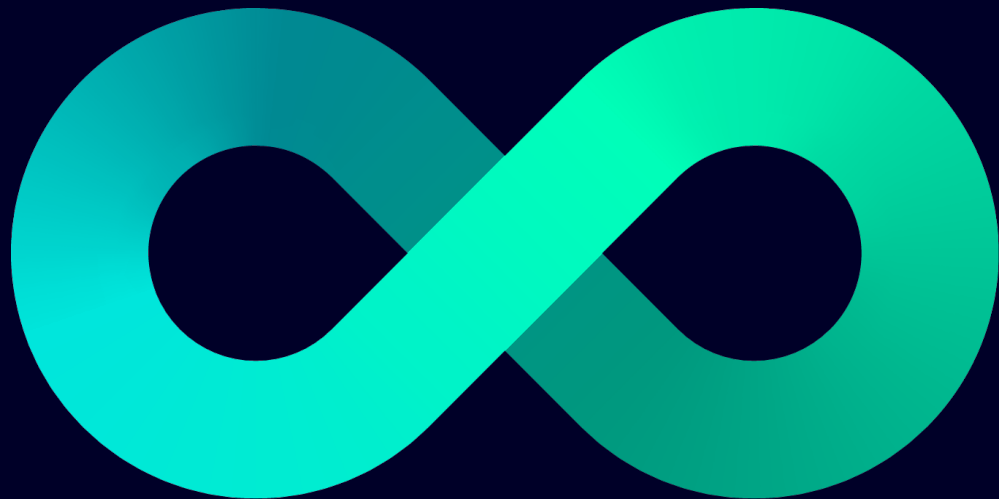
Speed: 25 km/h
Heading: 179.74
Location: (14.17, -44.4)
GPS: (1.000000, 0.000000)
Height:
Trim:
Steer:
Brake:
Reverse:
Hand brake:
Manual:
Fuel:
  
```

```

Collisions:
Number of vehicles: 8
Neighb. vehicles:
- Acura Integra Type S
- Acura Integra Type S
- Acura Integra Type S
- Mercedes-AMG GT
- The Pillbox (1)
- The Pillbox (2)
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```

[1780784982.884253760] [rasCafevssInterface]: @100000
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Received vehicle status gear=1 velocity=2.500000 steer=0.000
  
```



PAVE360

SDV success story



Develop so...

Serial Console

```

root@swael1-~# ./runref.sh
Worked device not found
Model file set to: data/model.tflite
Inference will execute 1 inference(s)
Can't load libOpenCL.so: libOpenCL.so: cannot open shared object file: No such file or directory
Can't load libGLES_mali.so: libGLES_mali.so: cannot open shared object file: No such file or directory
Can't load libmali.so: libmali.so: cannot open shared object file: No such file or directory
Consider to find any OpenCL library.
/home/rao/arcos-devops/gator/annotate/streamline annotate.c/gator_func1540: Warning: Not connected to gator, the applica
tion will run normally but Streamline will not collect annotations. To collect annotations, please verify you are running gator 5
.18 or later and that Streamline is disabled.

Model information:
inputTensorNames[0] = input
outputTensorNames[0] = MobicnetV2/Predictions/Softmax

Inferences are running: 1

Inference times min=998711us max=998711us avg=998711us
Inference time: 1 (1712736642 - 1712736641) seconds
root@swael1-~# ./runref.sh

```

VOICES on arm



Thanks!

Want to find more about
PAVE360?



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