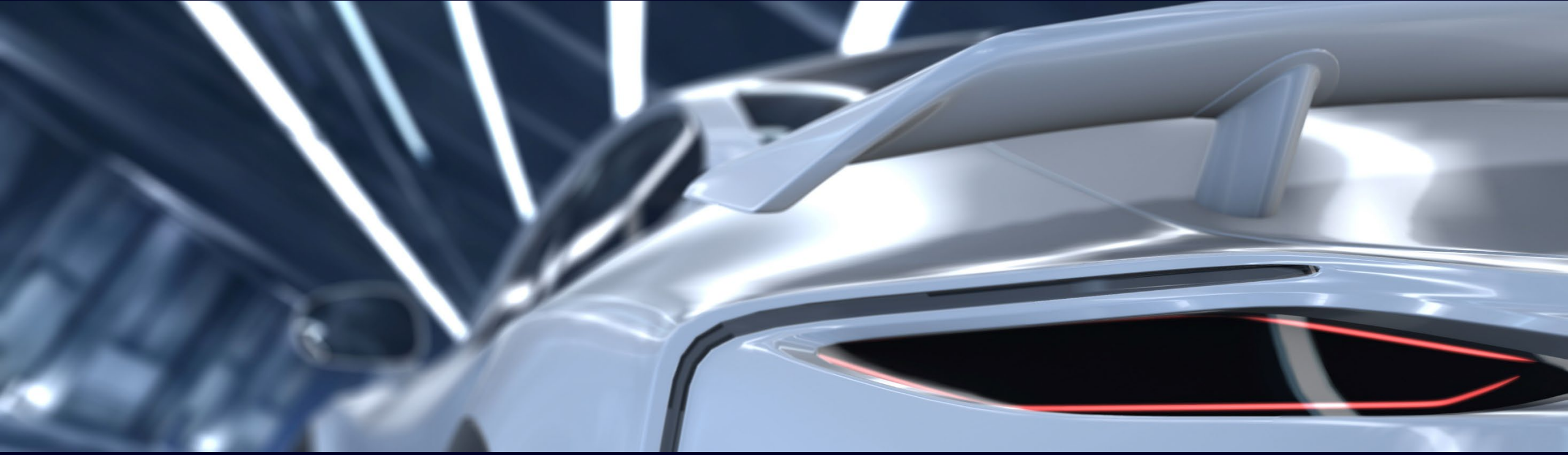


# Siemens PAVE360

## Automotive system development using accelerated pre-silicon simulation environment



SIEMENS

# 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

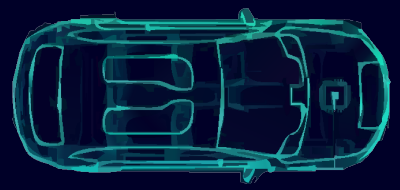


SIEMENS

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

**Automotive**
Challenge

| Long, expensive development cycle | Integration storm | Lack of “full system view” | Continuous updates & integration |
|---|---|---|---|
| Conflicts with speed of innovation, increasing vehicle complexity | Closed solutions from multiple vendors increases integration effort | How can performance of entire system be measured, across multiple teams? | Integration only starts on system completion, updates are costly |



**PAVE360**
digital twin
delivers

| Shift left! Develop SW pre HW | Easy system configuration | Metrics to drive decision making | Early start for system integration |
|---|---|---|---|
| Digital twin enable parallel HW and SW development | Integrate digital twin, HW and tools from multiple vendors | Generate a unique set of metrics, for mixed domains | Integrates elements at every stage of development |



SIEMENS

# 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

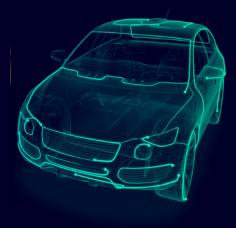
arm

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

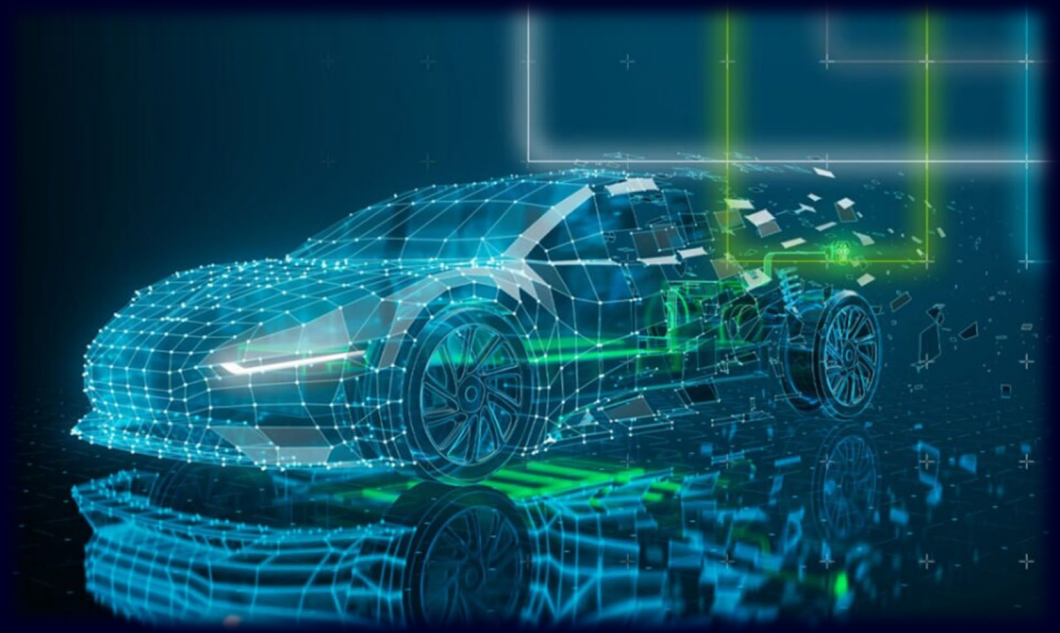
# Arm's ecosystem support for virtual prototyping
# Siemens provide first Arm A720 AE CPU support

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

At SoC level

At systems level

Early architecture exploration

Fast SW development and validation

HW/SW interaction (perf/power)

Systems-of-systems

iterate

A “Virtual Car”

On every engineers desk

PAVE360 ARCHITECT EXPLORER

PAVE360 VIRTUAL

PAVE360 HYBRID

PAVE360 BACKPLANE

iterate

iterate

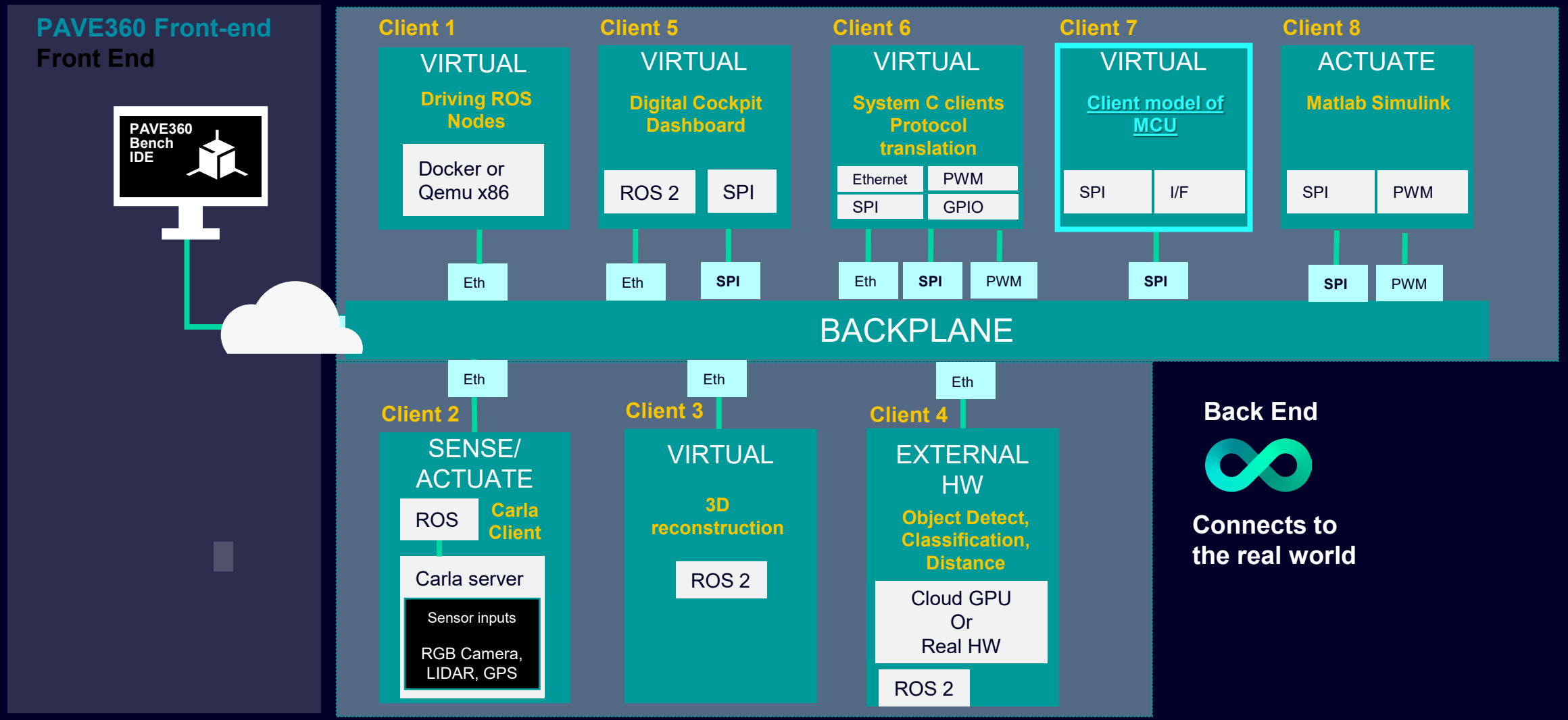
iterate

- Use workload analysis, create metrics to drive silicon architecture concept, at SoC level
- Accelerated virtual
- Eliminate reliance on real HW, use virtual for fast, early SW dev and optimization, on the cloud
- High accuracy
- HW/SW codesign to validate HW and SW performance and power specs, through mixed fidelity (TLM/RTL) simulation and emulation
- Connect models of system components, introduce real world stimulus, focus on optimization of system critical components



SIEMENS

# Customer Success Story: Major APAC Tier 2 Silicon Vendor
# Validate new concepts for next gen MCUs in real world context



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# Accelerated pre-silicon SW simulation development environment

**SDV digital twin components**

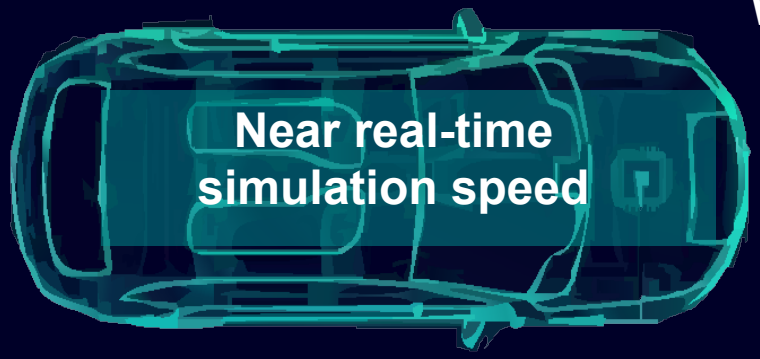
IPs like Cortex-A720AE

**Are mapped…**

PAVE360 accelerated pre-silicon development environment

**…to optimized cloud resources**

PAVE360 maps capacity to meet… customer need – i.e. speed, or cost efficient utilization




## 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



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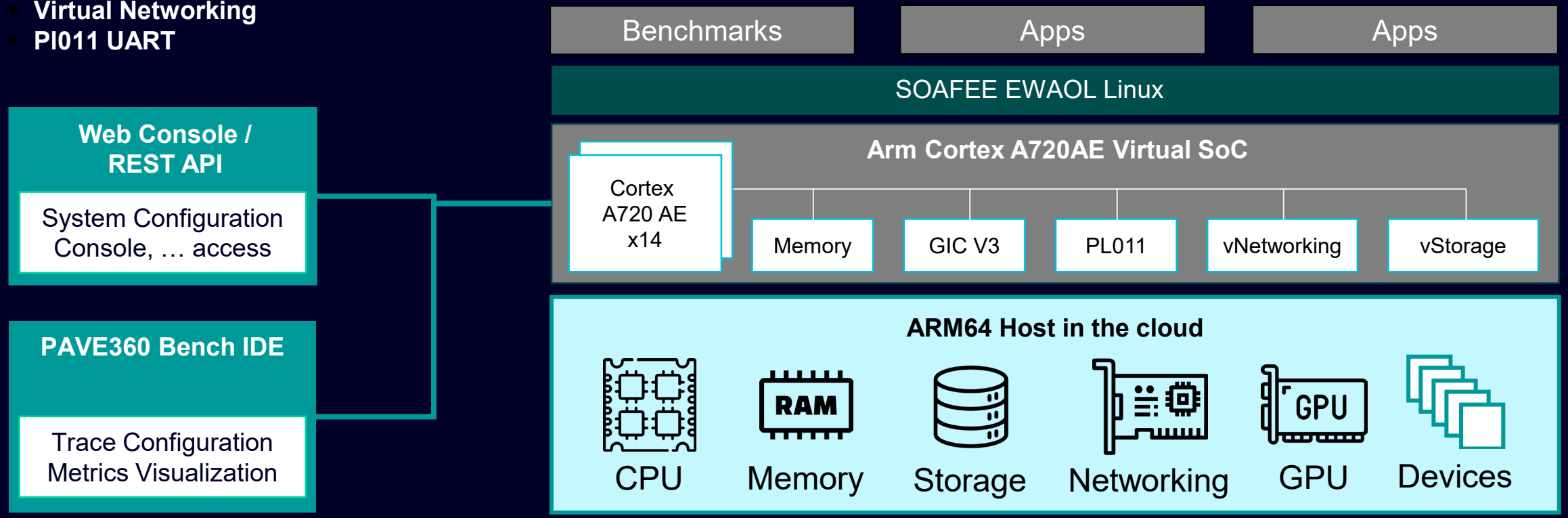
# Accelerated pre-silicon development environment Early Access Release
# Arm Cortex-A720 AE Virtual SoC model

**HW:**
- **Arm Cortex A720 AE x14**
- **GIC V3**
- **Memory**
- **Virtual Storage**
- **Virtual Networking**
- **PI011 UART**

**SW:**
- SOAFEE EWAOL Linux
- TFLite + Benchmarks

SOAFEE

**Tools:**
- PAVE360 Bench IDE for Metrics & Analysis



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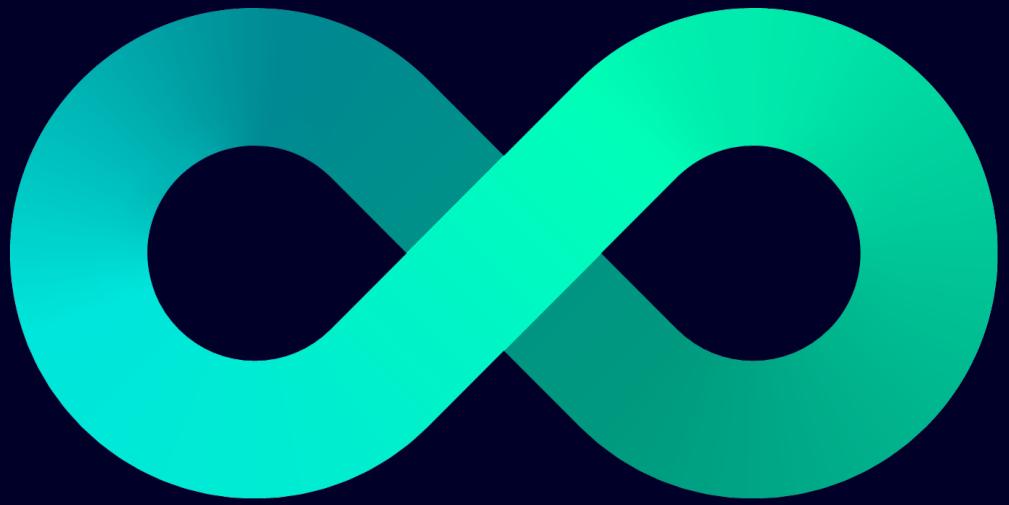

# PAVE360

## Accelerated pre-silicon development environment demo



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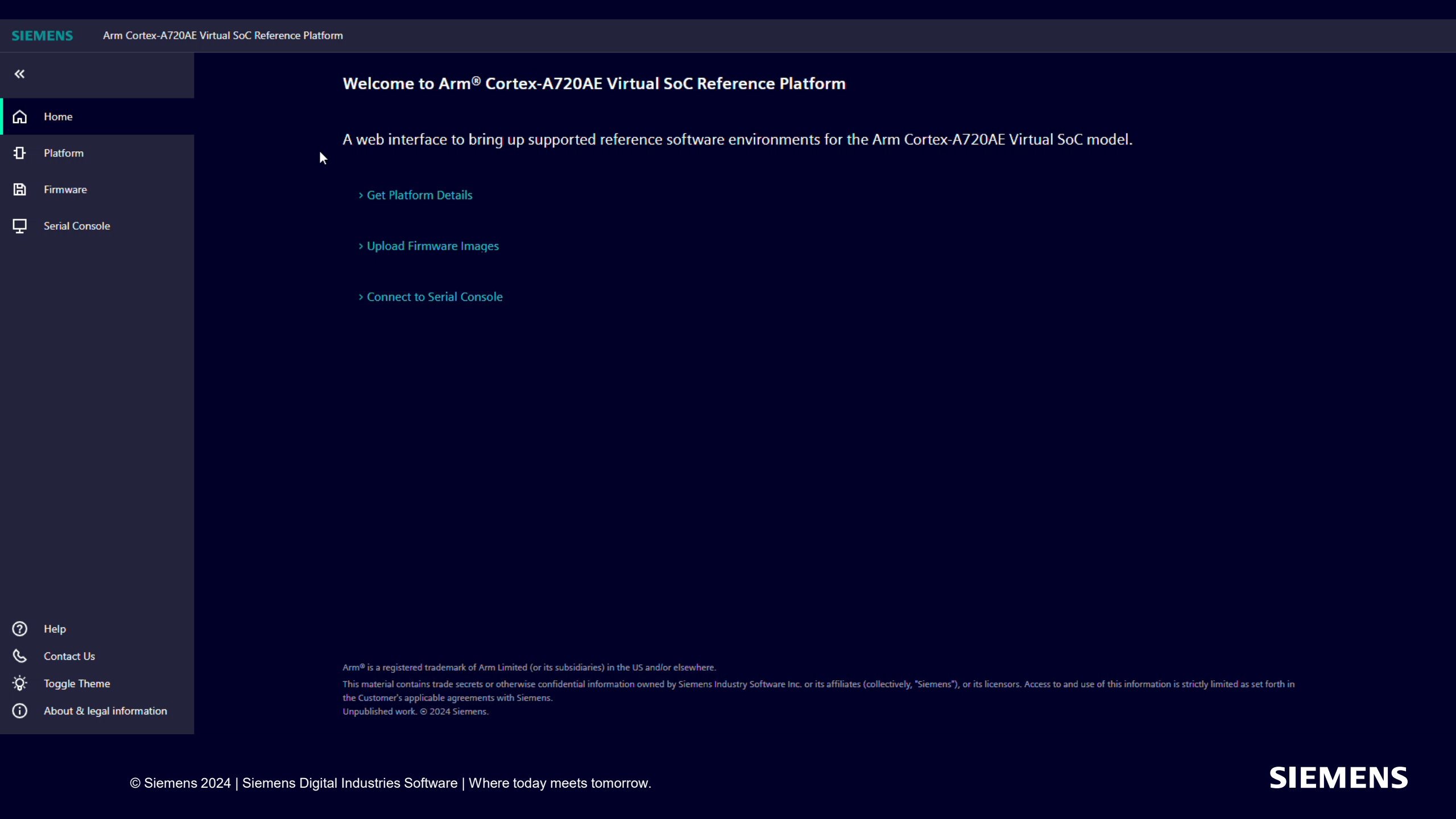




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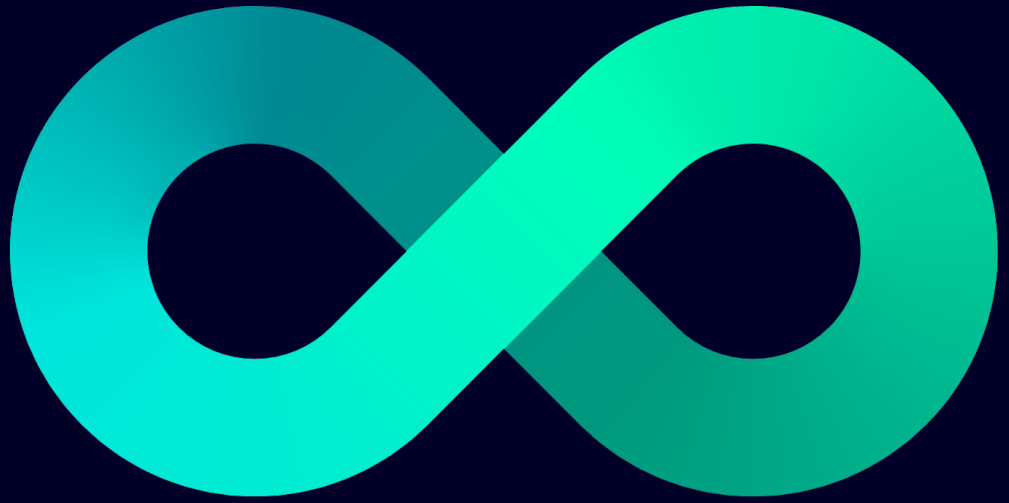

# PAVE360

## External hardware demo



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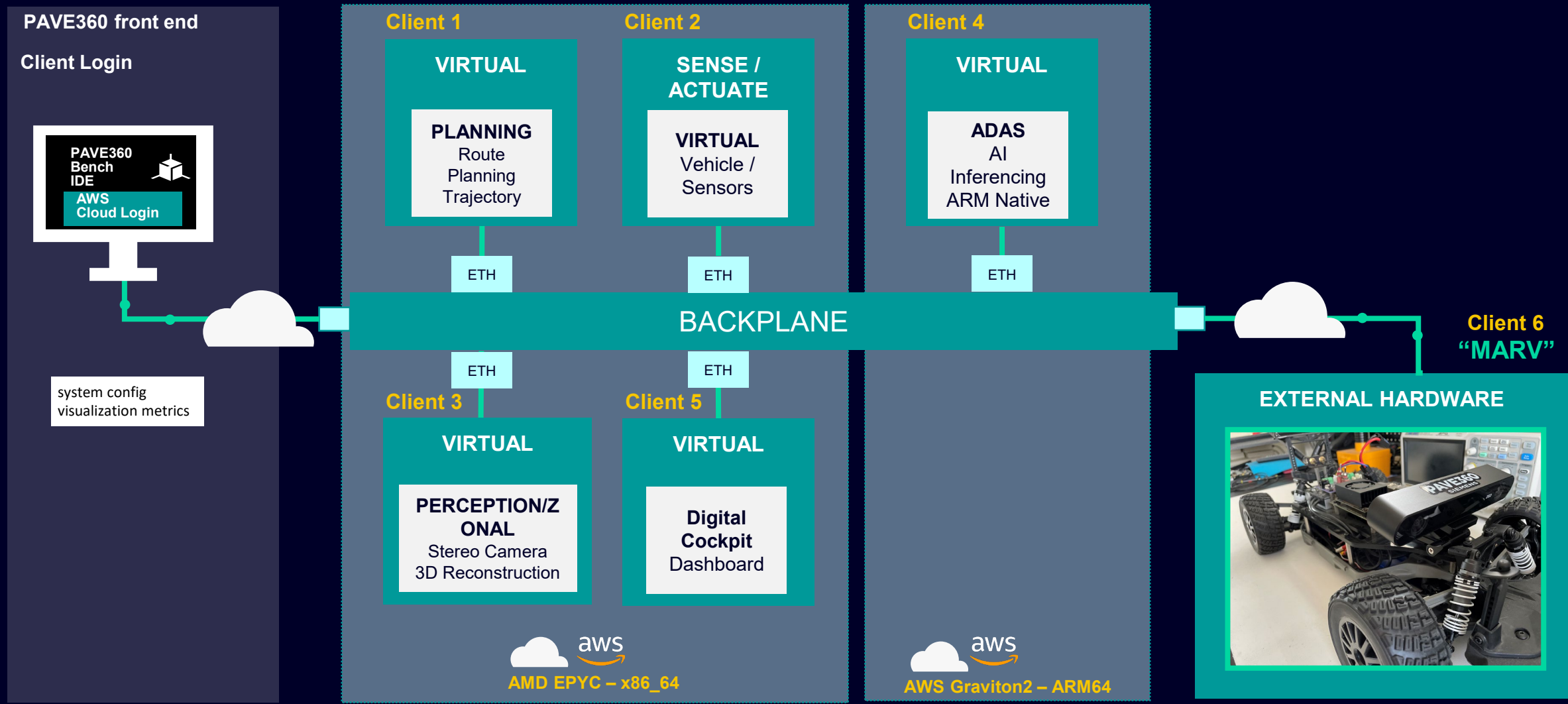
# PAVE360 Multi Client Cloud Autonomous ADAS Reference Design
# System-of-systems with real world stimulus optimized using cloud resources



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# 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

aws

**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.

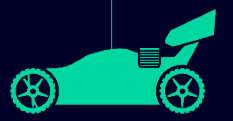
aws

**AWS Graviton2 – ARM64**

**Client 6**

**EXTERNAL HARDWARE**

**MARV**



Validate steering, acceleration and braking actuators



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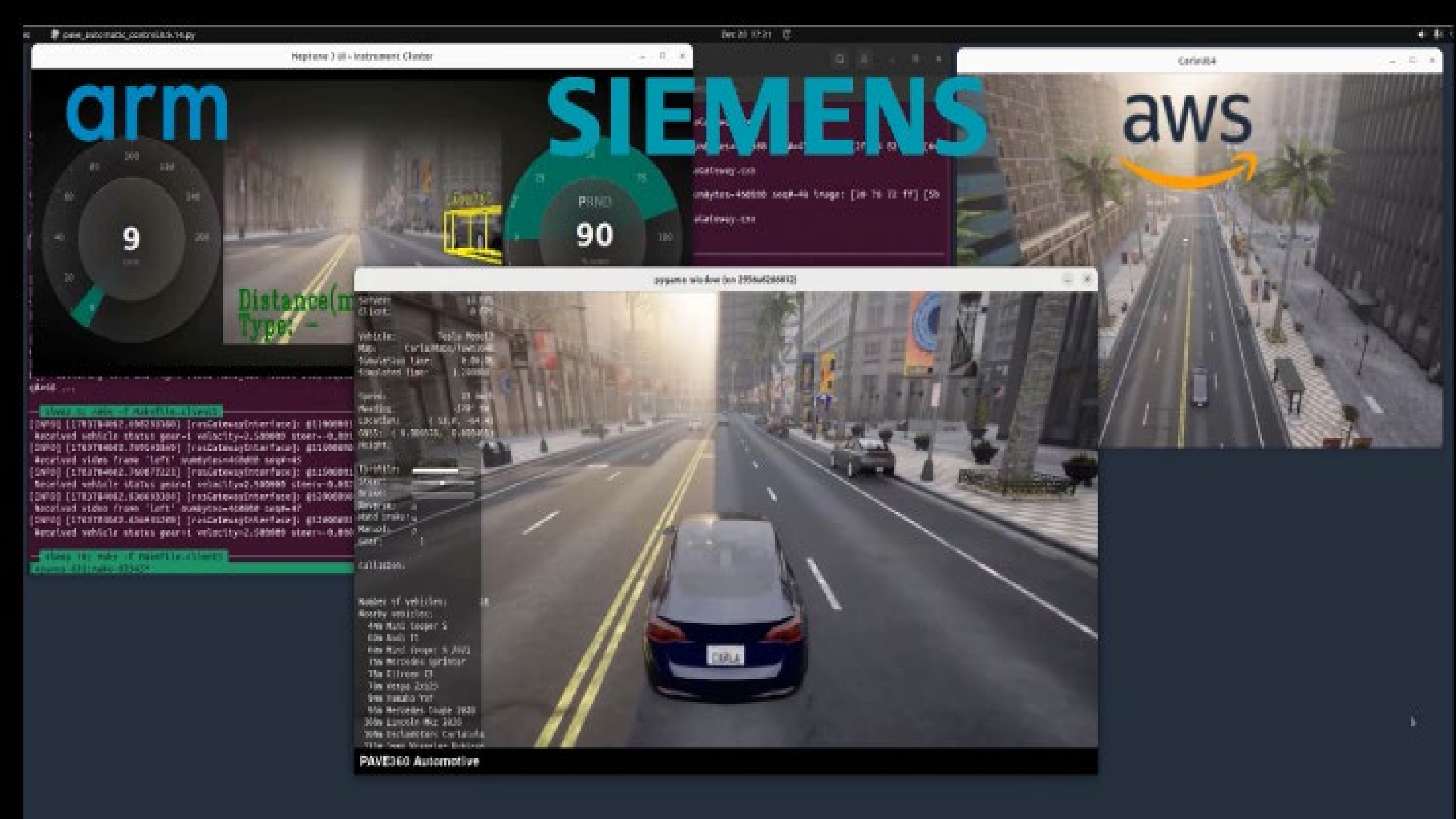
arm
SIEMENS
aws
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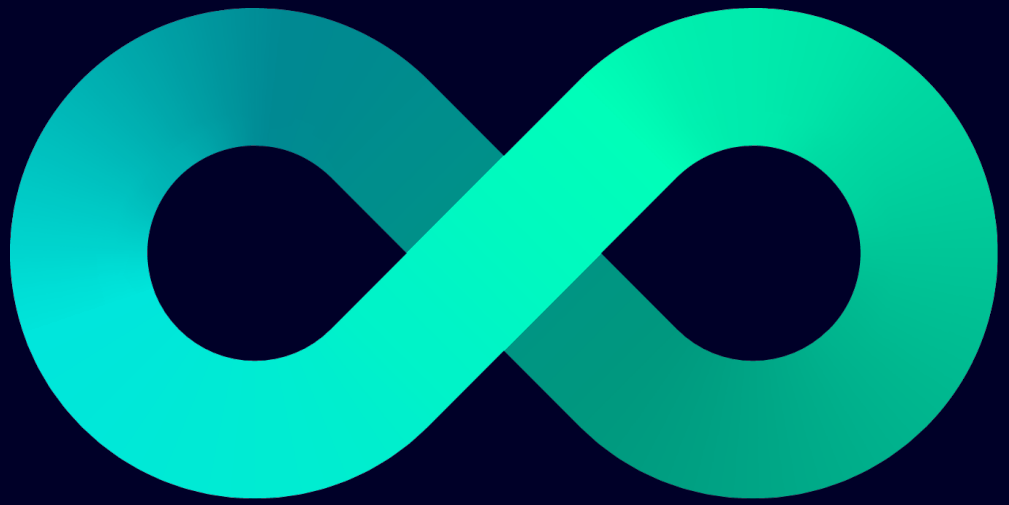
90
Distance(m
Type: -
PAVE360 Automotive



# PAVE360

## SDV success story



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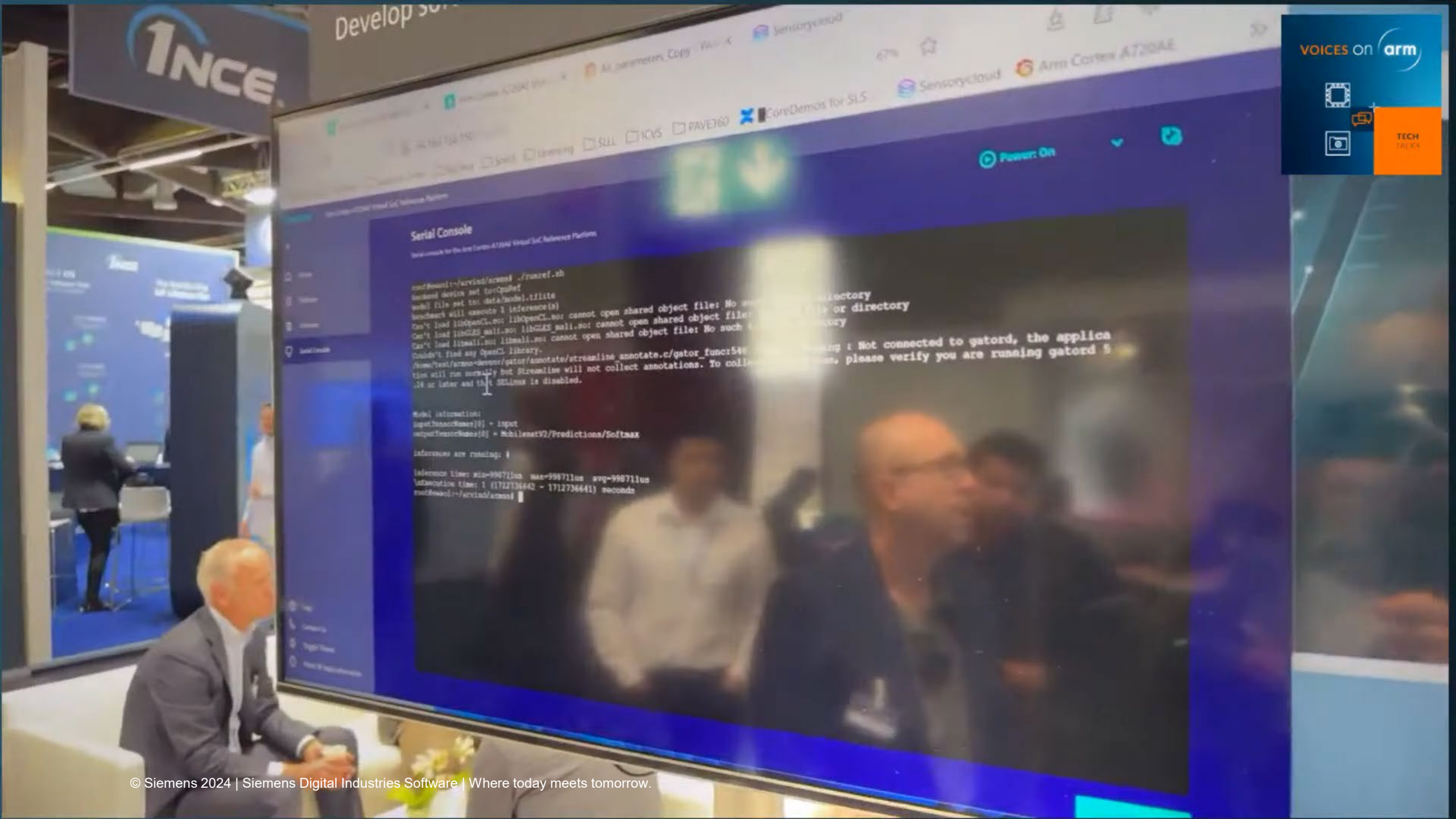

# Thanks!

Want to find more about
**PAVE360?**



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# Disclaimer



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