



# arm

## Advanced IP solutions enabling the autonomous driving revolution

Chris Turner | Director, Emerging Technology  
& Strategy, Embedded & Automotive | Arm

# Agenda

Autonomous vehicles

Heterogeneous processing

Arm IP in driving systems

Safety and security

# Connected autonomous vehicles

## Cloud



Machine Intelligence  
Big data

## Communication



5G cellular  
V2X

## Processing



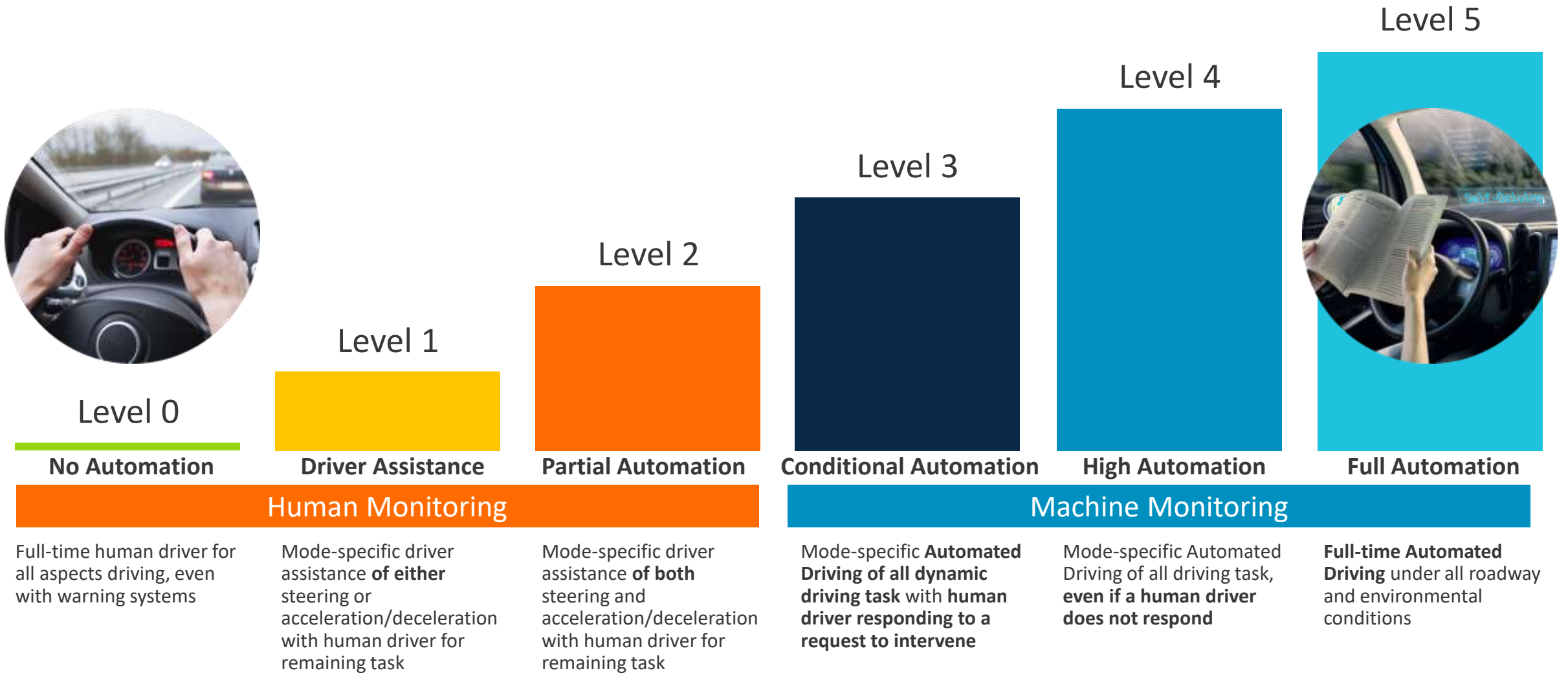
System on Chip  
Software

## Sensing & Actuation



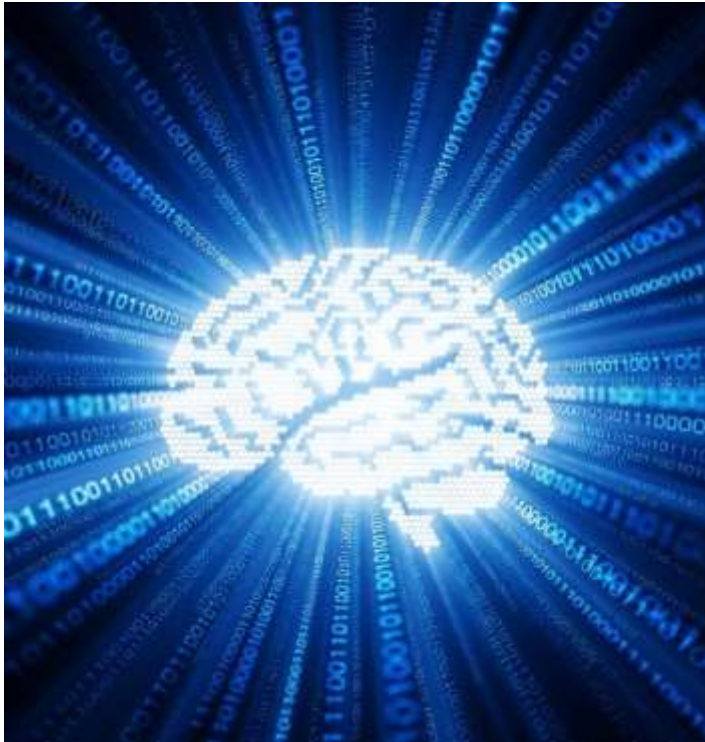
Computer Vision  
Radar, Lidar

# Autonomous driving

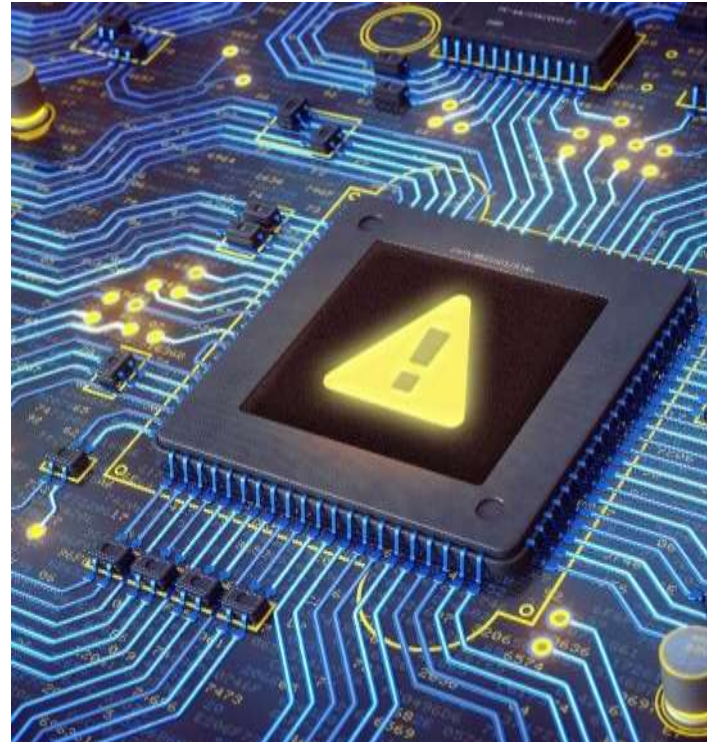


# Where are the challenges?

Complex and demanding compute requirements



High-integrity functional safety requirements



Multiple security issues and data privacy



# Total automotive computing from Arm

## Computer Vision

- Sensing and perceiving the driving scene
- Sensor fusion with radar, lidar etc.

## Mapping

- 360 degree mapping
- Precision navigation

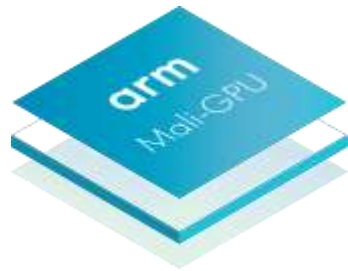
## Machine Learning

- Cognition
- Mission objective

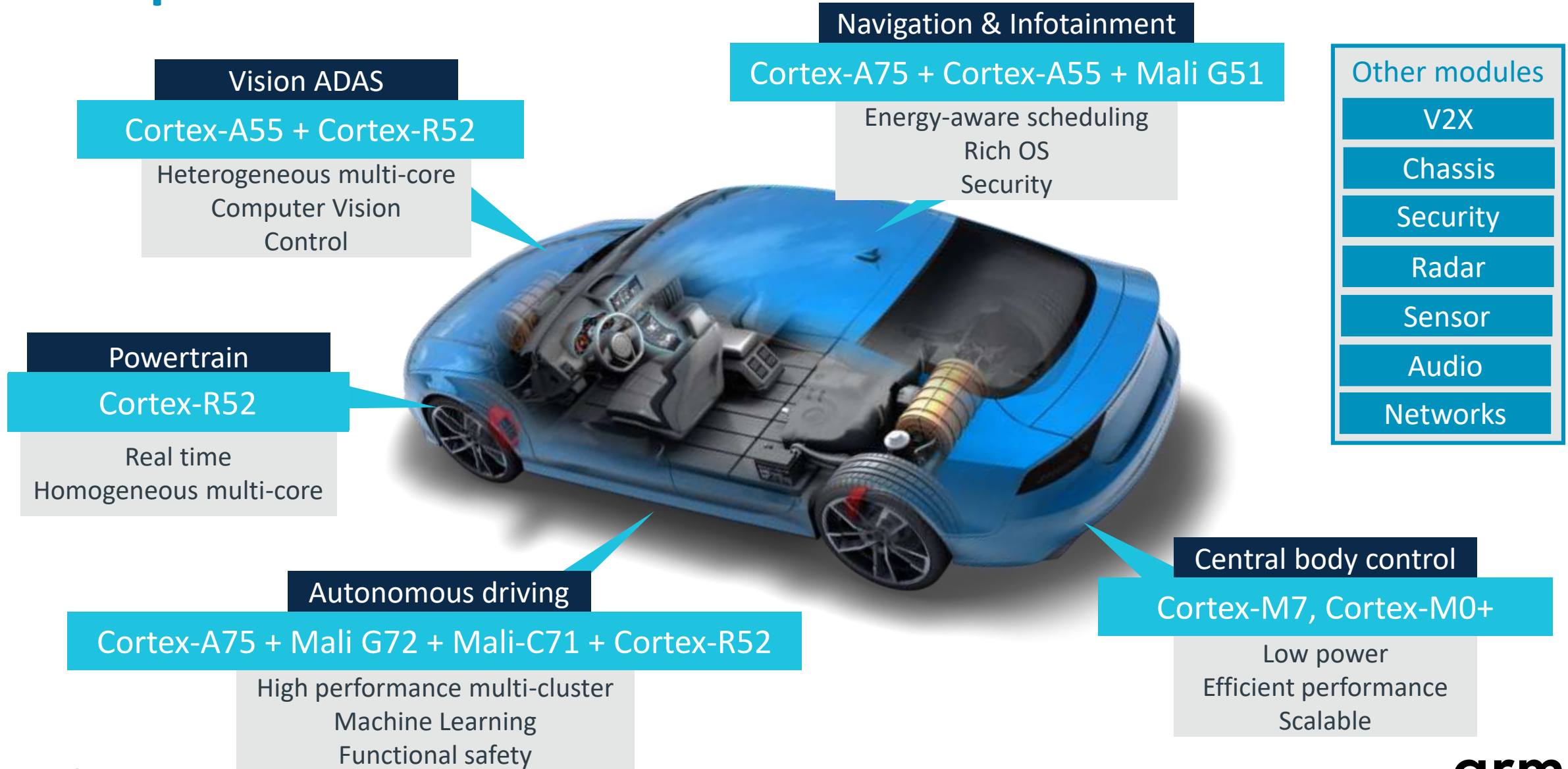
## Decision & Actuation

- Course of action
- Real-time control

Arm Compute Library for fast deployment of CV & ML



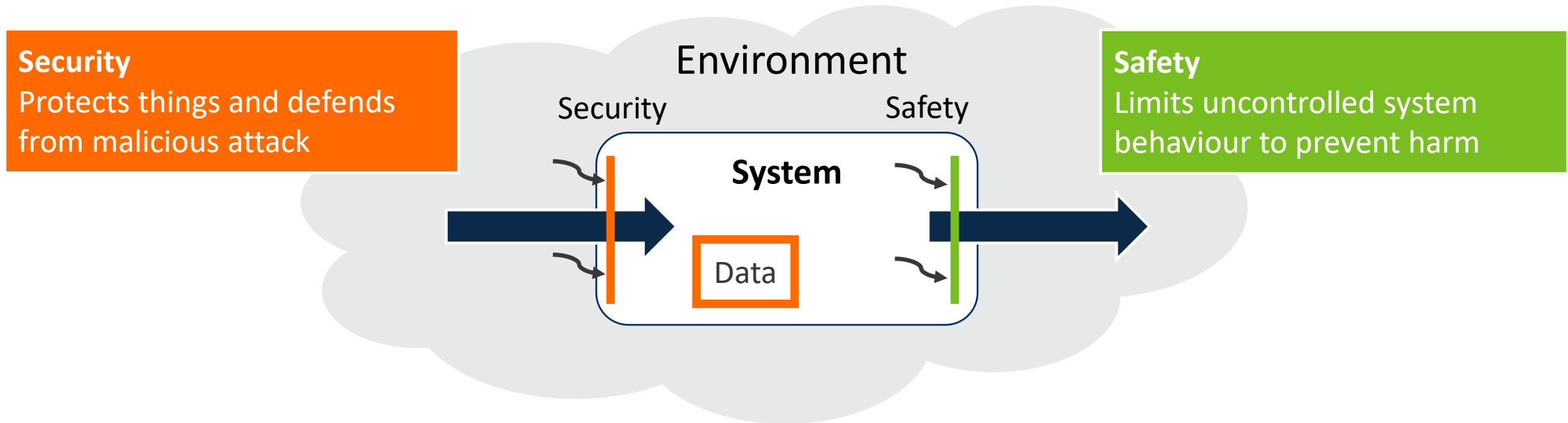
# Arm processors for automotive



# Safety and security

Safety and security are intimately related and some languages don't differentiate:

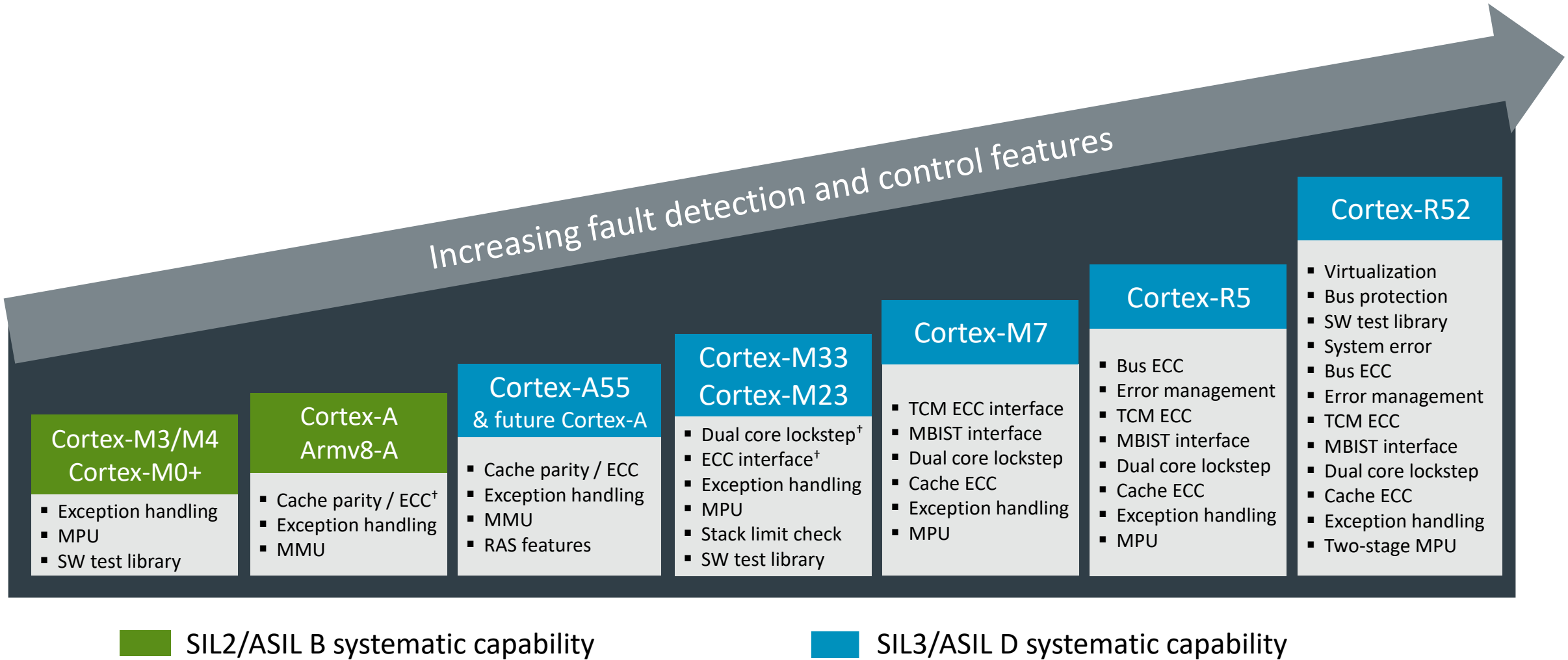
安全, sécurité, Sicherheit, säkerhet, turvallisuus, ...



Both guard against undesirable situations and together form a barrier that protects us and our things



# Functional Safety throughout Arm CPUs



# Complete Arm solution for automotive SoC development

## Solutions built from Arm IP

- Computing capability meets requirements
  - Within power and thermal constraints
- Accelerators
  - Task-specific processing complements mainstream computing
- System IP
  - Interconnect system IP delivering coherency and quality of service required for optimum memory bandwidth
- Software programming environment
  - Managing complexity, ease of use, task separation
- Sub-systems
  - Efficient integration and communication, vehicle-wide



# Mali-GPUs: Enabling tomorrow's technology today

Mali-G72 is Arm's latest high-performance GPU, Mali-G51 provides mid-range efficiency

## Optimised machine learning and computer vision

- Performance and efficiency for autonomous drive
- Face tracking and speech recognition for IVI

## Advanced capabilities

- High fidelity graphics for latest displays
- Augmented reality for applications such as mirror replacement

## Strong ecosystem

- Arm Compute Library for CV & ML
- QNX OS, graphics libraries and Linux drivers for IVI

Arm Mali is #1  
for GPUs shipped



# Image Signal Processing from Arm

## Autonomous drive

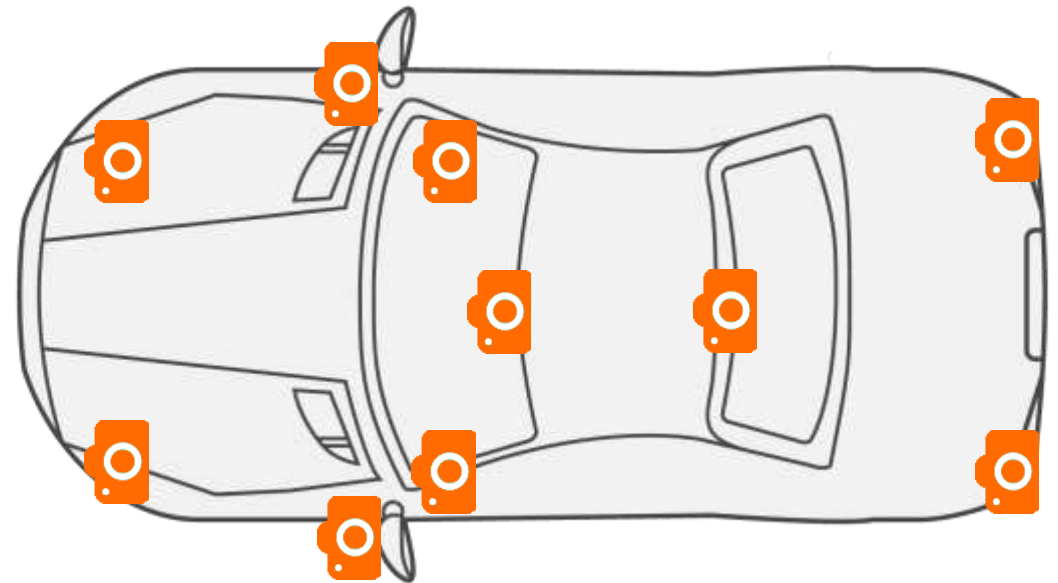
- Ultra-wide dynamic range for lighting extremes
- Simultaneous support for human display and computer vision
- Every pixel reliable with real-time diagnostic capability
- Quad camera capability for cost efficiency

## Cockpit

- Mirror replacement
- 360 surround view
- Road sign recognition
- Driver alertness



Mali-C71 designed for automotive vision



# Arm compiler support for functional safety

## Compiler safety package for software development in safety markets

- Industrial control, automotive, medical, transportation, military and others

### Qualification Kit

- Development process docs
- Safety manual
- Defect report
- Test report



### Extended Maintenance

- Five year commitment
- Technical support
- Critical defect fixes



### Functional Safety Certified

- TÜV SÜD certification
- ISO 26262 (ASIL D)
- IEC 61508 (SIL 3)



## Access to the safety package provided with DS-5 Ultimate and Keil MDK Pro

- Valid DS-5 or MDK support and maintenance entitlement enables extended maintenance
- Compiler installation is an add-on to the standard product installation

# Arm TrustZone and Platform Security Architecture (PSA)

Arm security throughout the SoC



Shifting the economics of security

- Easy and affordable
- Throughout the life-cycle

Endpoint-to-ecosystems security

- Sensors to cloud

Making security deployable at scale

- Throughout the vehicle
- Across the market

# Arm solutions for automotive

- Architecture and performance leadership for the car of the future
- Best performance in tight thermal and space constraints
- Safe and secure with ISO 26262, PSA and Arm TrustZone
- Diverse and competitive supply chain to the automotive industry supported by a rich ecosystem
- Comprehensive economic solutions throughout the vehicle



Thank You!

Danke!

Merci!

谢谢!

ありがとう!

Gracias!

Kiitos!

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