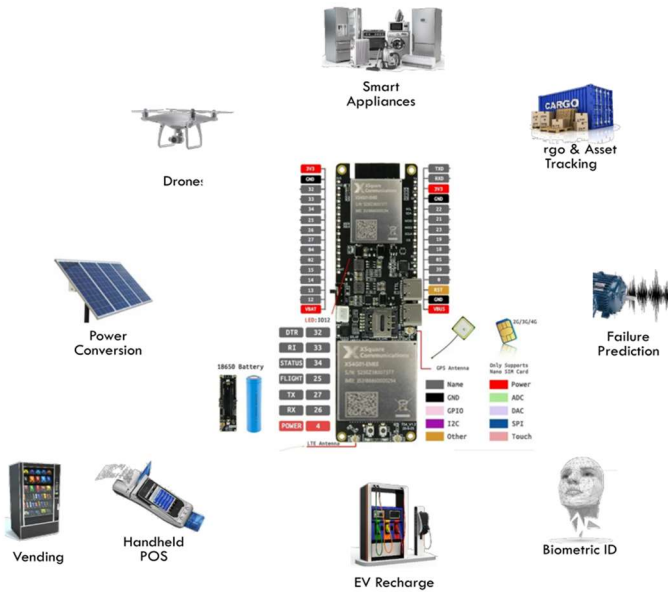


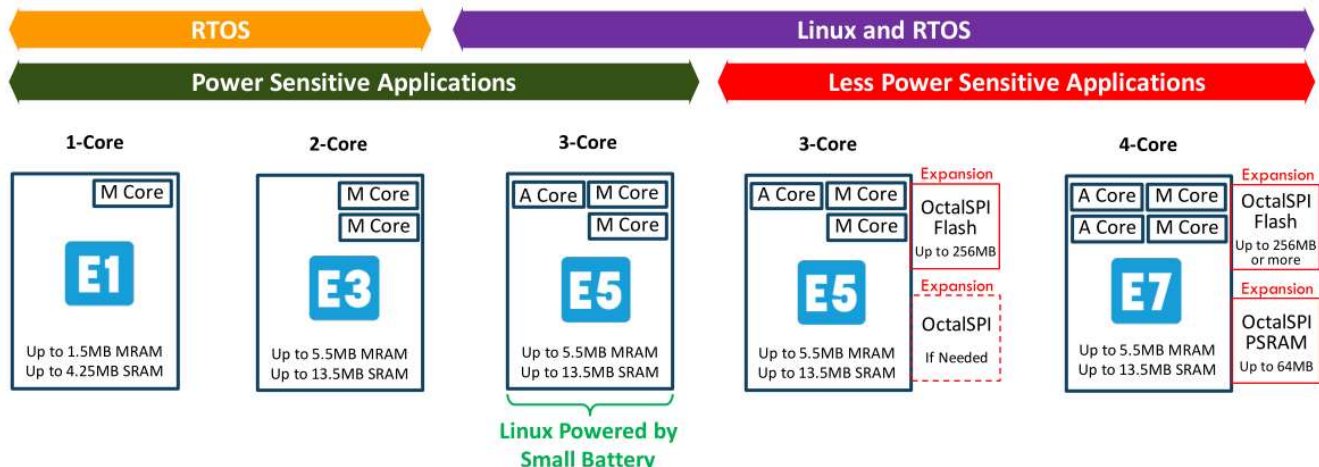
## MCU AI Module solution



- Cortex-M55/A32 CPU core (U55 Neural Processing Unit)
- Helium vector signal processing
- Local machine learning capacity
- Hardware based Root of Trust
  - > Isolated Security Enclave Subsystem, TrustZone expanded to handle multiple CPU cores
  - > Separate dedicated core, mem, crypto HW
- Level of function integration
- Larger more accurate AI models
- Run multiple AI models
- Go to sleep sooner to save battery



Model name	XSAE30A0-E0ML	XSAE50A0-E0ML	XSAE70A0-E0ML
Form factor	LGA 32x25mm	LGA 32x25mm	LGA 32x25mm
SoC	Alif E3	Alif E5	Alif E7
Processor & Graphics	2xM55x2 + 2xU55 2D GPU	1xA32 + 2xM55x2 + 2xU55 2D GPU	2xA32 + 2xM55x2 + 2xU55 2D GPU
AI performance	250 Gops		
Memory	MRAM 1.5~5.5MB SRAM 3.75~13.5 MB	MRAM 5.5MB SRAM 8.25~13.5 MB	MRAM 5.5MB SRAM 13.5 MB
interface	USB 2.0x1 , URx8 , SPI x4 , I2C x4 , MIPI Camera x1 , Audio I2S x4 , MIPI LCM x1		
Connectivity	Ethernet 10/100 x 1 , SDIO V4.1 x 1		

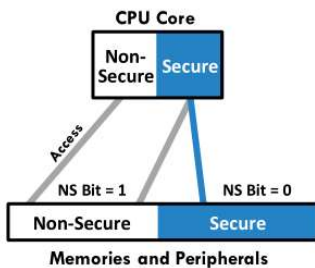


- Powerful E7 for Linux + RTOS. AI/ML accelerated. Low Power. System-on-Modules

- AI/ML Cameras - Ethos-U55 SOM in BOX best speed and power efficiency.
- Solar Power Inverter - DSP efficiency of Cortex-M55 + Helium vector processing
- Barcode/Image Scanners - Symbols resolved fast with Ethos-U55. Large on-die SRAM. MIPI-CSI
- Gas and Electricity Meters - Low Power, Ability to Run Linux and RTOS, Scalability 1 to 4 cores
- Smart Door Locks - Fast and efficient Ethos-U55 for facial ID. Long battery life. Large on-die SRAM
- e-Bike Control System - HMI, sensor fusion, motor control. Secure Enclave. Cell for tracking & GNSS
- Robot Vacuum - Machine vision accelerated by Ethos-U55. Motor control. Linux + RTOS
- Speech Recognition - Ethos-U55 + Low Power in speech-command add-on modules

## BEYOND TrustZone

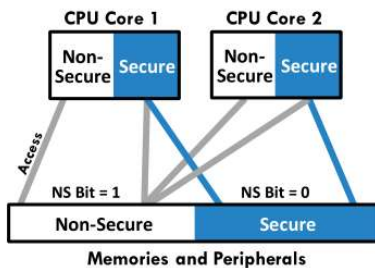
**TrustZone Single Core Security Model**



**No Problem. Traditional TrustZone**

- Individual Secure/Non-Secure application domains
- System tests for Secure/Non-Secure memory and peripheral access

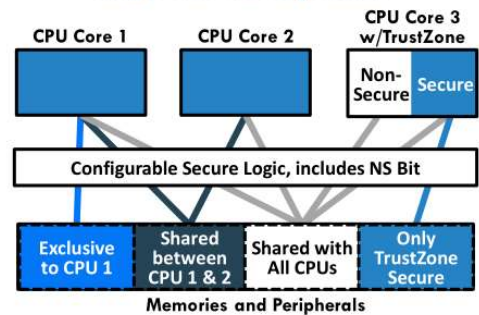
**TrustZone Multi-Core Security Model**



**Problem. No way to allow exclusive Secure domain access to one or the other CPU core!**

- Two CPUs can access the same Secure domain, secrets will be shared.
- Either CPU core can set/reset the NS Bit for all memories & peripherals

**Alif TrustZone Single Core Security Model**



**No Problem. Enables multiple security tiers!**

- Multiple memory & peripheral domains can be defined to serve multiple CPU cores
- Domains can be allocated as exclusive or shared
- Can be configured to honor TrustZone NS Bit across multiple cores for TZ compatibility

## ECOSYSTEM

### Development Environment and Tools

- Major 3<sup>rd</sup> Party IDE tool support with partners
  - IAR EW, ARM DS, ARM/Keil
  - MS Visual Studio+GCC+GDB
- Support for debug interfaces and probes
  - ARM/Keil ULINK, Segger J-Link+Ozone
  - Lauterbach



### Support for AI/ML on Ethos-U55

- ARM NN library and Vela compiler
- Supporting TensorFlow Lite model
- Edge Impulse Supported Projects



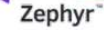
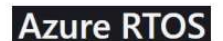
### Alif Device Configurator Tool



- Device configuration tool to define and configure IP to Pin muxing
- Device provisioning development tools used to provision Root of Trust and Sign Software

### Supported OS + Middleware :

- Azure RTOS (ThreadX)
  - Net-X, USB-X, GUI-X
- FreeRTOS
- Zephyr
- Linux OS



### Speech and Sound ID:

- **Sensory:** Natural language processing, KWS, sound ID.
- **DSP Concepts:** Leader in lot audio with "Audio Weaver" for microphone arrays and noise cancellation



### Machine Vision:

- **Plumerai:** People detection, face ID



### Graphics:

- Free and very popular open source embedded graphics library

