

# MA35D1 Application Processor

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# Arm® Dual Cortex-A35 + Arm® Cortex-M4 + TSI

- **Main processor**
  - Arm® Cortex-A35 (64-bit) Dual Core processor (target at 1GHz)
  - 32 KB I/D Cache + 512 KB L2 Cache
  - Arm® NEON Engine
  - Armv8-A® TrustZone
- **Trusted Security Island (TSI)**
  - Secure Processor
  - Key Store Management
  - Crypto Engine
  - Certification
- **Real Time Processor (RTP)**
  - Arm® ARM Cortex-M4 processor (Target at 200MHz)
  - Floating Point Unit (FPU)
  - 128 KB SRAM for M4 dedicated usage
  - 512KB share DRAM memory

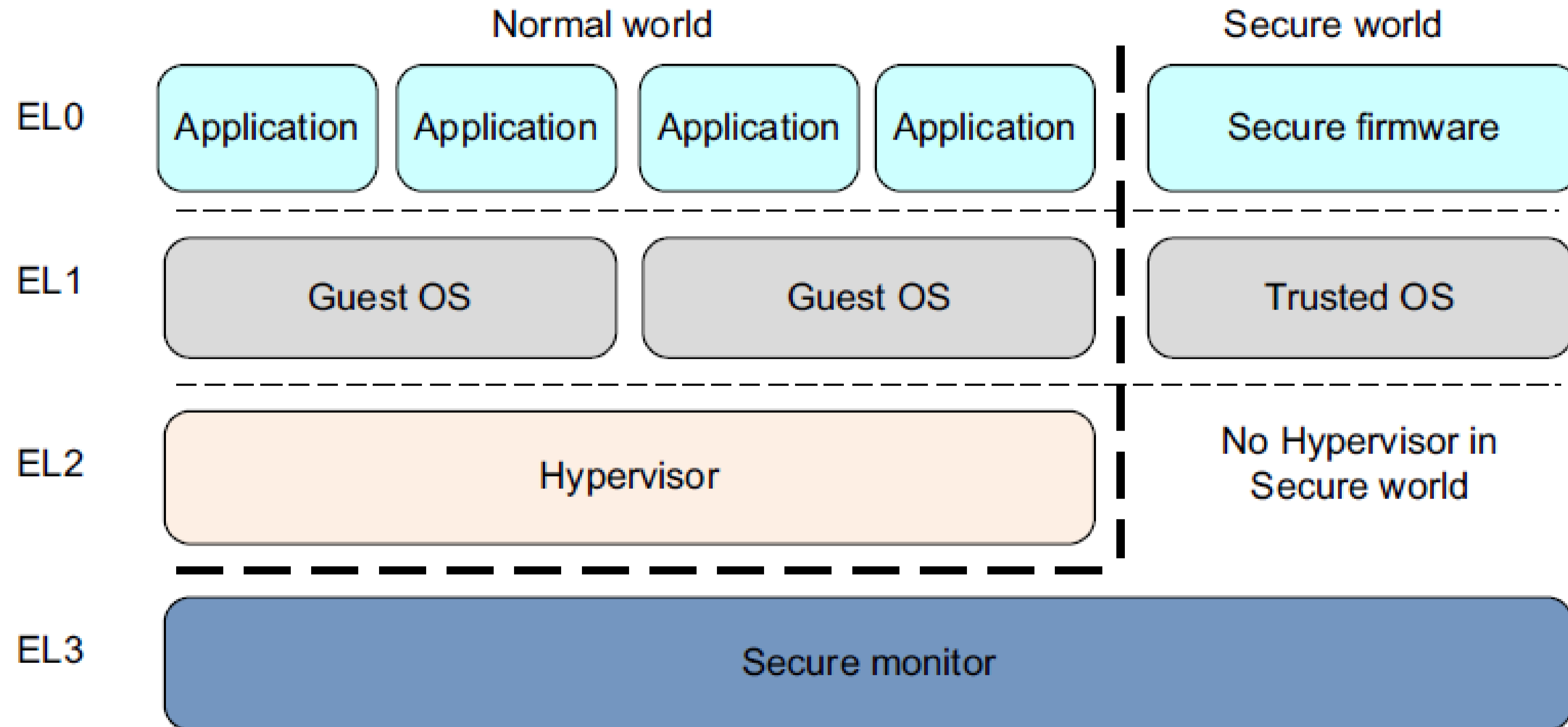
# Instruction Architecture

- **AArch64**
  - Execution using 64-bit wide general-purpose registers
  - Execute A64 instruction set
  - Privilege level is determined by the Exception level
- **AArch32**
  - Execution using 32-bit wide general-purpose registers
  - Execute either the A32 (called ARM in earlier versions of the architecture) or the T32 (Thumb) instruction set
  - Retains the ARMv7 definitions of privilege

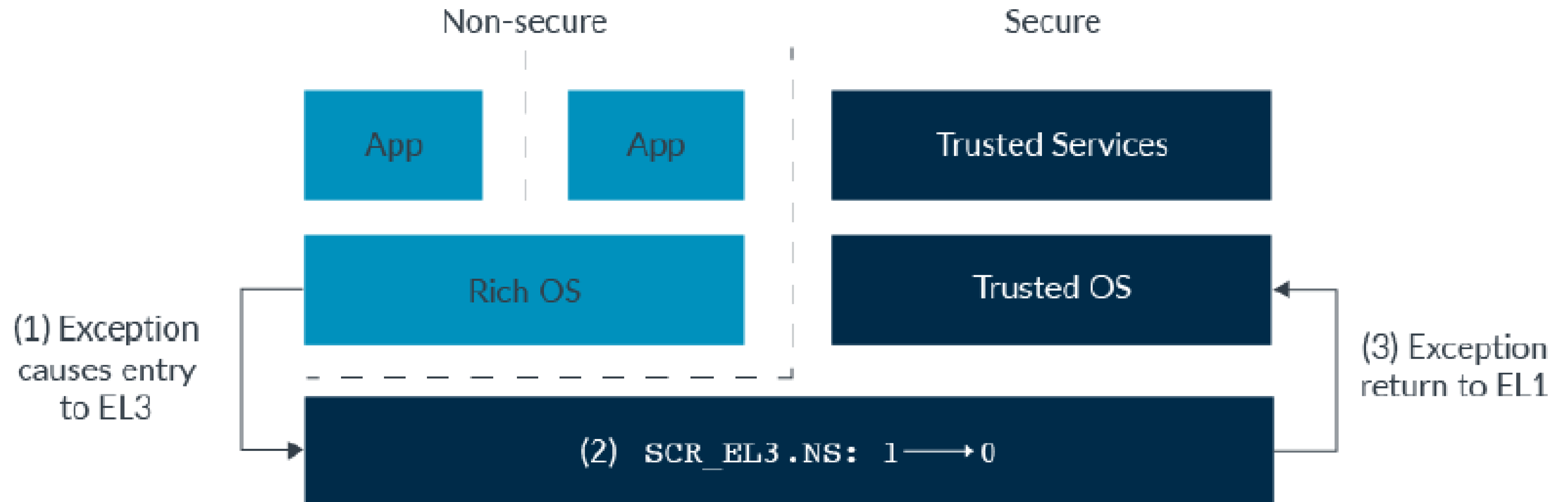
# Exception Levels

- **Exception occurs at one of four Exception levels**
  - **EL0** Normal user applications
  - **EL1** Operating system kernel typically described as *privileged*
  - **EL2** Hypervisor
  - **EL3** Low-level firmware, including the Secure Monitor

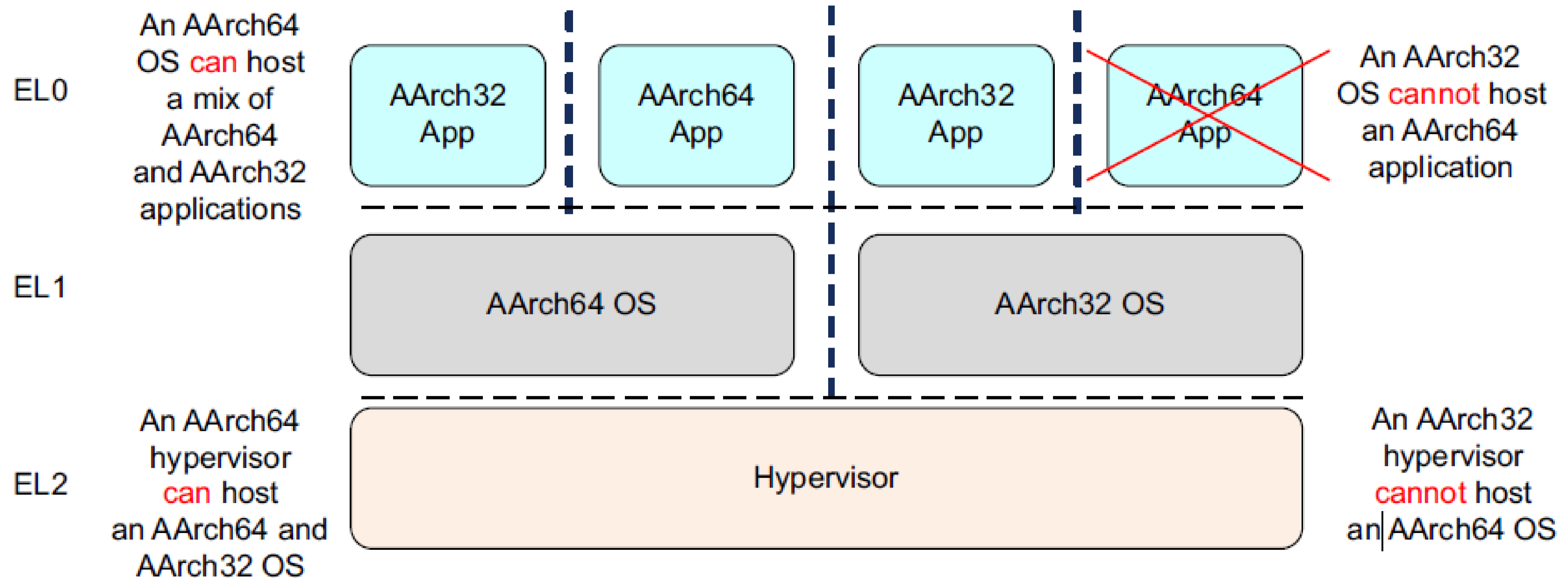
# Exception Levels



# Moving Between Security States



# AArch32 and AArch64



# Power Consumption

## CoreMark Running, CA35@1GHz

| Power Group | Test Result  |          |          |                  |            |          |          | Note  |
|-------------|--------------|----------|----------|------------------|------------|----------|----------|---|
|             | Current (mA) |          |          | Input voltage(V) | Power (mW) |          |          |   |
|             | TA = -40℃    | TA = 25℃ | TA = 85℃ |                  | TA = -40℃  | TA = 25℃ | TA = 85℃ |   |
|             |              |          |          |                  |            |          |          | Condition: All IP be turn ON, CA35x2 & M4 run CoreMark<br>CPU@1GHz<br>DDR@533MHz<br>HCLK= M4_CLK=180MHZ<br>TSI_CLK=144MHz |
| 1           | 92.26        | 98.00    | 141.00   | 1.2              | 110.71     | 117.60   | 169.20   | (IVDD_CORE, IVDD_PLL[1:0], IAVDDL_PLL[3:0])   |
| 2           | 340.00       | 361.00   | 473.00   | 1.29             | 438.60     | 465.69   | 610.17   | (IVDD_CPU)  |
| 3           | 7.19         | 1.80     | 1.58     | 3.3              | 23.73      | 5.94     | 5.21     | (IVDDIO[9:0])   |
| 4           | 25.69        | 25.60    | 25.40    | 2.5              | 64.23      | 64.00    | 63.50    | (IVDD_OTP, IMVDD_DPHYPLL)   |
| 5           | 2.05         | 2.00     | 1.98     | 3.3              | 6.77       | 6.60     | 6.53     | (IAVDDH_PLL[1:0])   |
| 6           | 0.44         | 0.30     | 0.29     | 3.3              | 1.46       | 0.99     | 0.97     | (IAVDD, IAVDD33_ADC0, IAVDD_EADC0, IVDD_HSUSB[1:0])   |
| 7           | 18.05        | 18.40    | 23.80    | 1.35             | 24.37      | 24.84    | 32.13    | (IMVDD)   |
|             | Total        |          |          |                  | 669.86     | 685.66   | 887.72   |   |

# Power Consumption

## Dataflow running, CA35@1GHz

| Power Group | Test Result  |           |           |                   |            |           |           | Note  |
|-------------|--------------|-----------|-----------|-------------------|------------|-----------|-----------|---|
|             | Current (mA) |           |           | Input voltage (V) | Power (mW) |           |           |   |
|             | TA = -40°C   | TA = 25°C | TA = 85°C |                   | TA = -40°C | TA = 25°C | TA = 85°C |   |
|             |              |           |           |                   |            |           |           | Test code, Data_Flow_no_HMI.bin<br>Condition:CA35-0 run dataflow without HMI display<br>CA35-1, DRAM R/W access<br>USBH & USBD idle, EON engine not be compiled yet<br>CA35@1GHZ<br>DDR@533MHz<br>HCLK= M4_CLK=180MHZ |
| 1           | 373.00       | 396       | 464.0     | 1.2               | 447.60     | 475.20    | 556.80    | (IVDD_CORE, IVDD_PLL[1:0], IAVDDL_PLL[3:0])   |
| 2           | 54.00        | 58        | 163.0     | 1.29              | 69.66      | 74.82     | 210.27    | (IVDD_CPU)  |
| 3           | 5.00         | 20        | 16.8      | 3.3               | 16.50      | 66.00     | 55.44     | (IVDDIO[9:0])   |
| 4           | 25.00        | 25        | 25.0      | 2.5               | 62.50      | 62.50     | 62.50     | (IVDD_OTP, IMVDD_DPHYPLL)   |
| 5           | 2.50         | 2.5       | 2.5       | 3.3               | 8.25       | 8.25      | 8.25      | (IAVDDH_PLL[1:0])   |
| 6           | 11.80        | 11.8      | 11.8      | 3.3               | 38.94      | 38.94     | 38.94     | (IAVDD, IAVDD33_ADC0, IAVDD_EADC0, IVDD_HSUSB[1:0])   |
| 7           | 100.00       | 100       | 100.1     | 1.35              | 135.00     | 135.00    | 135.14    | (IMVDD)   |
|             | Total        |           |           |                   | 778.45     | 860.71    | 1067.34   |   |

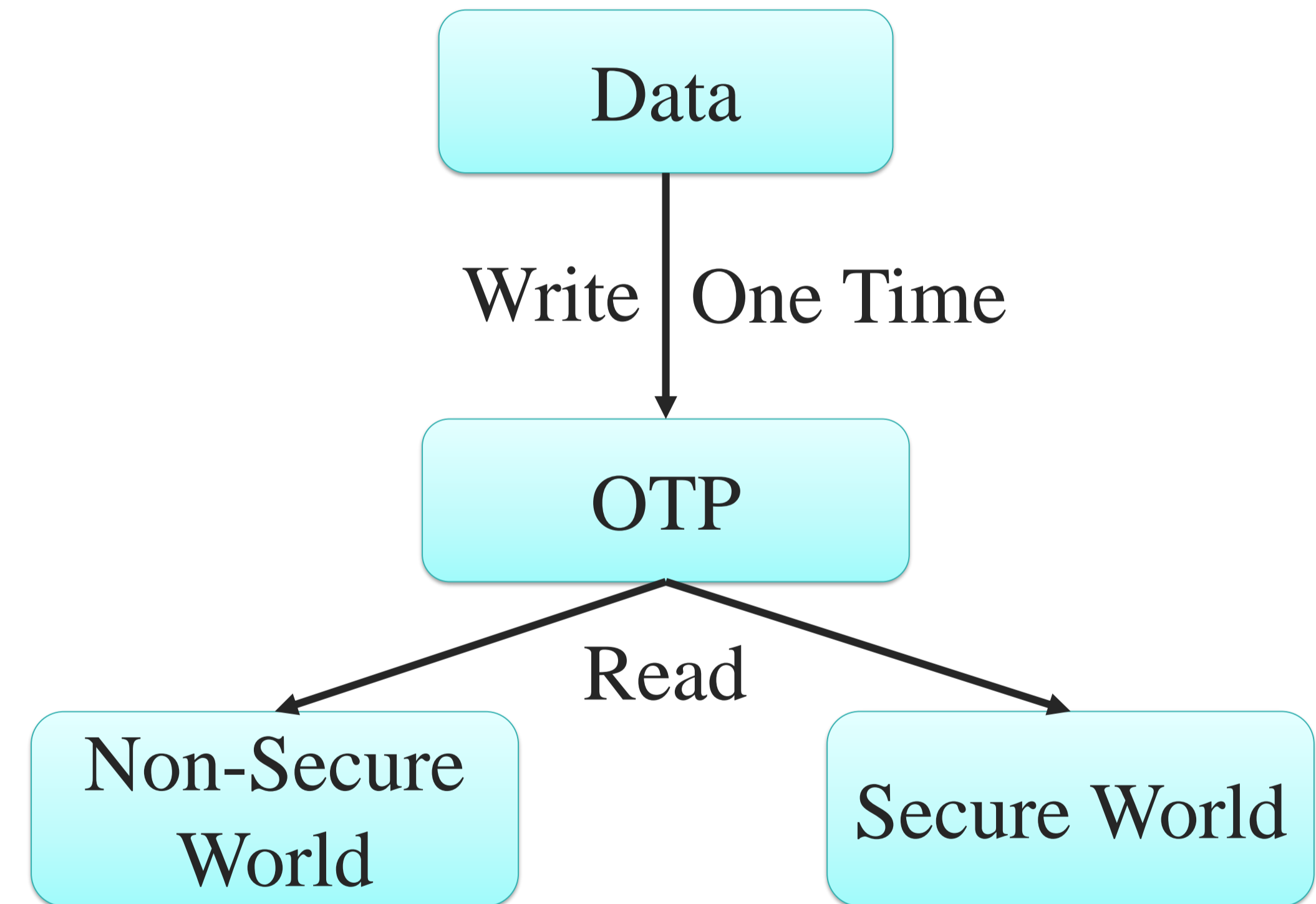
# Power Consumption

## Full HD running + H.264 decoding , CA35@1GHz

| Power Group | Test Result  |          |          |                  |            |          |          | Note  |
|-------------|--------------|----------|----------|------------------|------------|----------|----------|---|
|             | Current (mA) |          |          | Input voltage(V) | Power (mW) |          |          |   |
|             | TA = -40℃    | TA = 25℃ | TA = 85℃ |                  | TA = -40℃  | TA = 25℃ | TA = 85℃ |   |
|             |              |          |          |                  |            |          |          | Test code, Data_Flow_memcpy.bin<br>Condition: CA35-0 run dataflow, display@1080P_H.264DEC@1080P<br>CA35-1, DRAM R/W access<br>CPU@1GHZ<br>DDR@533MHz<br>HCLK= M4_CLK=180MHZ |
| 1           | 779.00       | 834      | 880.00   | 1.2              | 934.80     | 1000.80  | 1056.00  | (IVDD_CORE, IVDD_PLL[1:0], IAVDDL_PLL[3:0])   |
| 2           | 100.00       | 107      | 258.00   | 1.29             | 129.00     | 138.03   | 332.82   | (IVDD_CPU)  |
| 3           | 4.90         | 19.7     | 22.00    | 3.3              | 16.17      | 65.01    | 72.60    | (IVDDIO[9:0])   |
| 4           | 24.30        | 24.3     | 24.30    | 2.5              | 60.75      | 60.75    | 60.75    | (IVDD_OTP, IMVDD_DPHYPLL)   |
| 5           | 3.30         | 3.2      | 3.20     | 3.3              | 10.89      | 10.56    | 10.56    | (IAVDDH_PLL[1:0])   |
| 6           | 12.00        | 11.9     | 12.00    | 3.3              | 39.60      | 39.27    | 39.60    | (IAVDD, IAVDD33_ADC0, IAVDD_EADC0, IVDD_HSUSB[1:0])   |
| 7           | 247.00       | 247      | 247.00   | 1.35             | 333.45     | 333.45   | 333.45   | (IMVDD)   |
|             | Total        |          |          |                  | 1524.66    | 1647.87  | 1905.78  |   |

# OTP Fields

- Debug protection mechanism (DPM)
- Power on Setting
- MAC0/1 Address
- Deployed password
- Secure region general usage (88B)
- Non-secure region general usage (88B)
- Keys



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谢谢

謝謝

Děkuji

Bedankt

Thank you

Kiitos

Merci

Danke

Grazie

ありがとう

감사합니다

Dziękujemy

Obrigado

Спасибо

Gracias

Teşekkür ederim

Cảm ơn