

# GIC600AE<sup>1</sup> Fault Management Unit (FMU)

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<sup>1</sup><https://developer.arm.com/documentation/101206/0000>

# Overview

Differences with GIC600

New Registers

- Global

- Error Records

TF-A Impact

- RAS & SDEI

- Testing

- Options & Challenges

# Differences with GIC600

- ▶ GIC features compatible with GIC600
- ▶ Unit to collect errors (FMU)
- ▶ Duplicated logic in GIC structures
- ▶ ECC in RAMs
- ▶ Store correctable and uncorrectable errors
- ▶ Dedicated bus for error reporting

# FMU Registers

| Offset        | Width          | Description                          |
|---------------|----------------|--------------------------------------|
| $0x000 + 64n$ | $4 \times u64$ | Error Records, Details on next slide |
| 0xE00         | u64            | Error Present, 1 bit for each record |
| 0xEA0         | u32            | Lock, writing key enables a write    |
| 0xEB4         | u32            | Safety Mechanism Enable, on at boot  |
| 0xEC0         | u32            | Error Injection                      |
| 0xF00         | u32            | FMU Idle Status                      |
| 0xFC8         | u32            | Number of Error Records              |

# FMU Error Records

| Offset | Width | Description                                     |
|--------|-------|---|
| 0x00   | u64   | Present: Fault & Recovery Interrupts & Logging  |
| 0x08   | u64   | Control: Fault & Recovery Interrupts & Logging  |
| 0x10   | u64   | Status: Valid, Code, Overflow, Correctable etc. |
| 0x18   | u64   | Unspecified: Probably Read as Zero              |

# RAS & SDEI Integration

- ▶ Define a dispatcher for the GIC600AE FMU
- ▶ Encode Error records as `SDEI_EXPLICIT_EVENT`
- ▶ Dispatch Correctable errors through SDEI
- ▶ Panic on Uncorrectable errors

# TFTF Testing

For each error type

- ▶ Register with SDEI
- ▶ Cause an interrupt w/ Error Injection Reg
- ▶ Handle Error by setting flag
- ▶ Assert flag was set

# Implementation Options & Challenges

- ▶ Correctable Errors
  - ▶ Treat as Uncorrectable?
  - ▶ Dispatch every?
  - ▶ Dispatch on overflow?
- ▶ Report Uncorrectable Errors to BMC/SCP?
- ▶ Disable Safety Mechanism before enable interrupts?