Threats in critical applications

Soft errors

Radiating alpha particles

The system was tested, how is this possible?!!!

Transfer of energy

Output

0 → 1 transition

0     1 transition

We only used it for 2 months, why is it not working anymore?!!!

Expensive space equipment

Aging

0 → 1 transition

Voltage

Time

new

2 months
FRRAry: Flexible Reliability Reconfigurable Array

- High reliability configuration
- Moderate reliability configuration
- Low reliability configuration

Soft error mitigation with flexible redundancy

Efficient application mapping

- ALU & logic
- Multiplication
- Register
- Memory

Various functionality

Area Reliability

- Single triplicate

Time Circuit delay degradation

Reliability

Area-reliability Trade-off tuning

Meet timing requirements

Increase lifespan of device

Mitigate aging effect with swapping

Local and global swapping

Switch count Routability

Better switch combinations yield better routability

Topology

A B C D E

FRRAry: Flexible Reliability Reconfigurable Array