Virtually Aged Sampling DMR
Unifying Circuit Failure Prediction and Detection

Raghuraman Balasubramanian
Karthikeyan Sankaralingam

A gate fails, causes errors

Can we predict the failure?
Virtually Aged Sampling DMR

Virtual Aging

Time (years)

Today

Virtual Age

A gate fails, causes errors
Virtually Aged Sampling DMR

Virtual Aging

Time (years)

Today

Virtual Age

A gate fails, causes errors

Fault Exposure

Applications

Applications
**Virtually Aged Sampling DMR**

**Virtual Aging**

- Time (years)
- Today
- Virtual Age

A gate fails, causes errors

**Fault Exposure**

**Detect Errors**

- Sampling - DMR is active
- Checked Core (Virtually Aged)
- Checker Core

**Applications**
Virtually Aged Sampling DMR

μ-Processor Failure Prediction Technique
Virtually Aged Sampling DMR

µ-Processor Failure Prediction Technique

Comprehensive Coverage
Virtually Aged Sampling DMR

- µ-Processor Failure Prediction Technique
- Comprehensive Coverage
- No Performance Overhead
- Less than 0.7 % Energy Overhead
Virtually Aged Sampling DMR

µ-Processor Failure Prediction Technique

Comprehensive Coverage

No Performance Overhead

Less than 0.7 % Energy Overhead

Today @ 3:30PM Alpha Gamma Rho