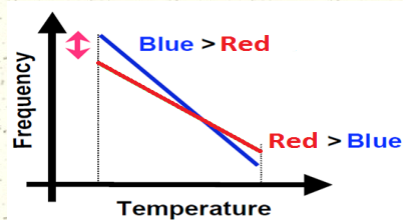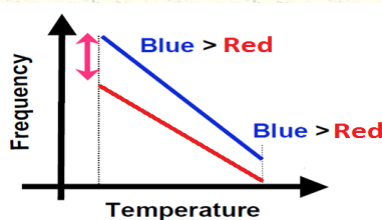# Physical Unclonable Function -- RO PUF: Reliability

Cybersecurity Specialization
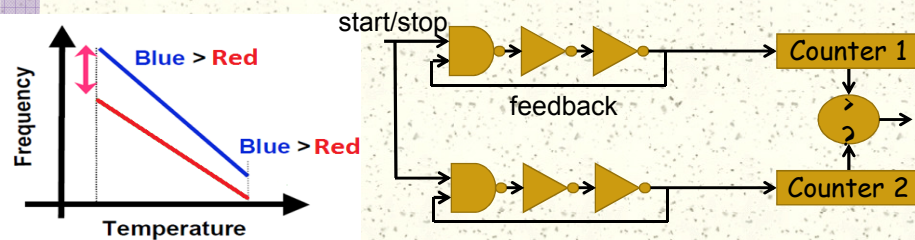-- Hardware Security

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Why Reliability?

- Application requirement: bit cannot flip!
- Why PUF bits may change?
  - Environmental variation (temperature, voltage, humidity, etc.)
  - Circuit aging
  - Measurement error
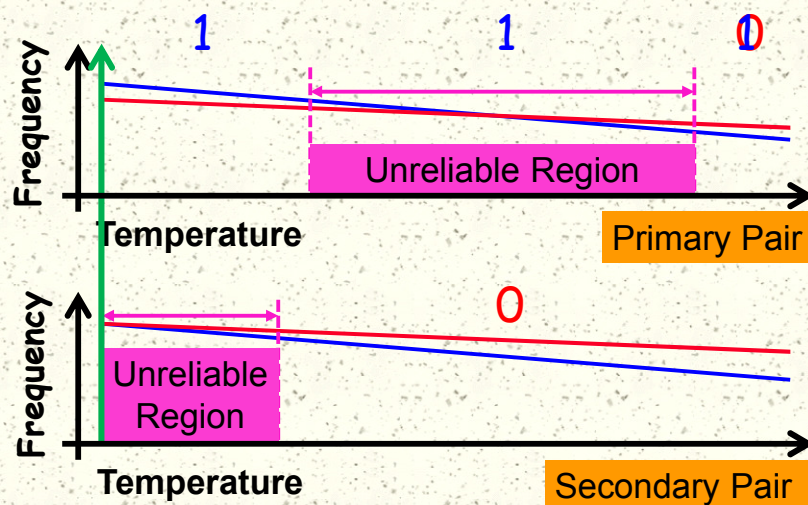
Making PUF Data Reliable

⌗ Reliability is determined by the delay or frequency gap between the RO pair.
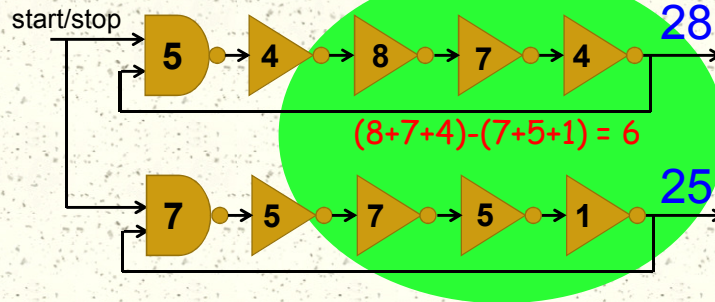
→increase the delay/frequency gap

⌗ Use large threshold for RO pair selection
⌗ Enlarge the selection pool (1-out-of-k)
⌗ Error correction coding
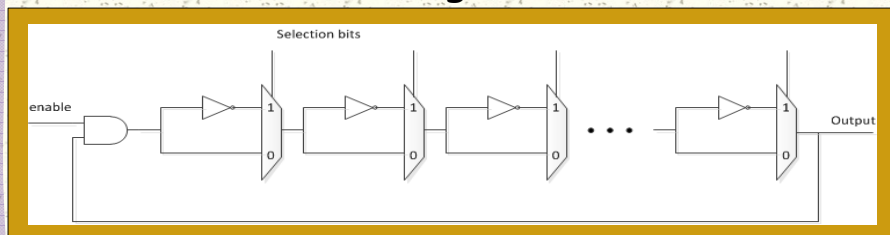

Temperature Aware Cooperation

Inverters in RO: All or Partial?

start/stop

5 → 4 → 8 → 7 → 4   28

(8+7+4)-(7+5+1) = 6

7 → 5 → 7 → 5 → 1   25

RO1 is 28-25 = 3 units of time slower than RO2. This delay difference determines the reliability of this PUF bit or whether this pair will be used at all on this chip.

Configurable RO PUF

⌗ Architecture: configuration vector

Selection bits

enable ... Output

⌗ Concept: a highly flexible RO PUF
- Configuring at inverter level, not RO level
- Post silicon configuration

Both increase the delay gap between RO pair!