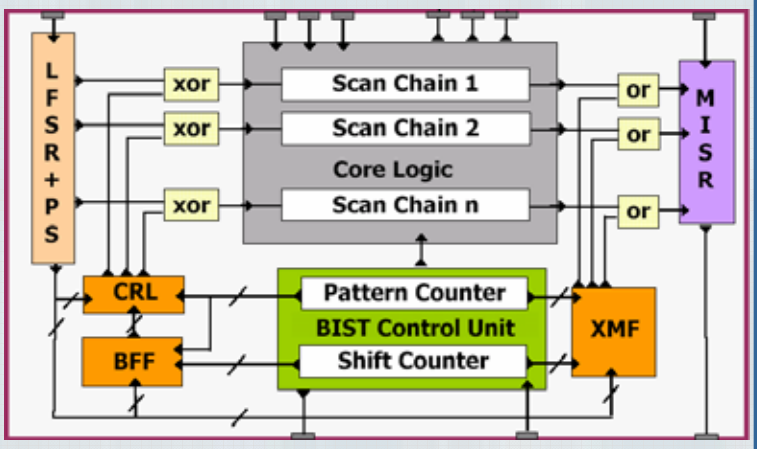
Scalable Deterministic Built-In Self-Test (DLBIST)

- Benefits of DLBIST
  - At-speed (delay) test supported
  - Reduced requirements for automated test equipment (ATE)
  - On-line, in-field and burn-in testing possible
- Still some problems to be solved
  - Knowledge of the core under test (CUT) needed
  - Hardware overhead
  - Computational resources scale poorly with the CUT size
  - Unknown responses (Xs) not allowed

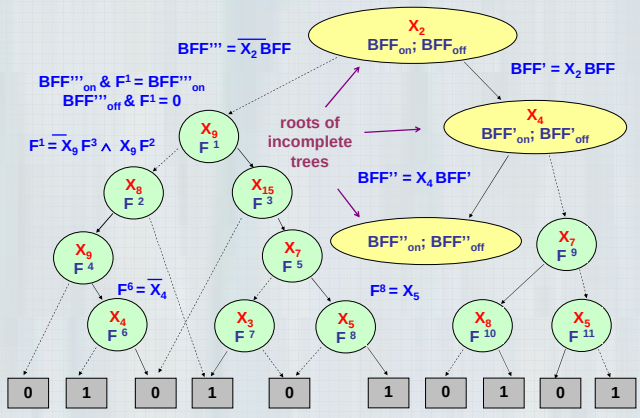
Bit-flipping architecture solves the underlined problems



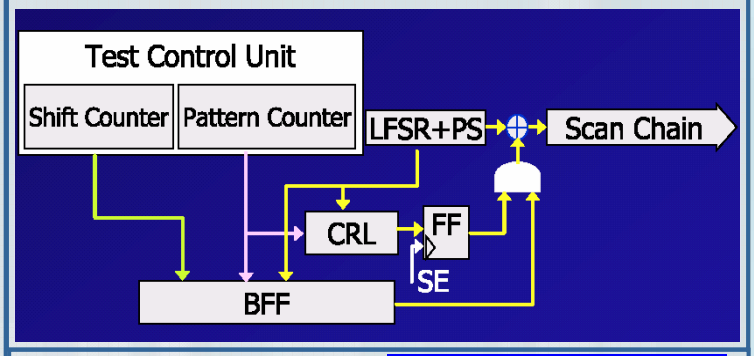
- Scan Chain
  - Chain of memory elements (flip-flops or latches)
- Pattern counter
  - Counts the number of applied test patterns
- Shift counter
  - Counts the number of bits in each test pattern
- Linear feedback shift register (LFSR) + Phase Shifter (PS)
  - Generates a pseudo-random test sequence
- Bit-flipping function (BFF)
  - Embed deterministic cubes into a pseudo-random test sequence
- Correction logic (CRL)
  - Protect useful pseudo-random patterns from being corrupted by the bit-flipping logic
- Multi-input shift register (MISR)
  - Compacts circuits test responses into a signature
- X-masking function (XMF)
  - Masks out unspecified test response bits (Xs) to '1'

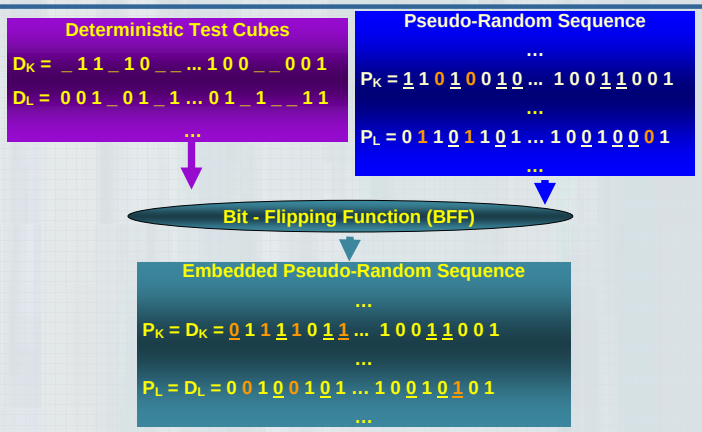
Binary Decision Diagrams (BDDs) used to manipulate and implement the incompletely specified functions BFF, XMF, CRL

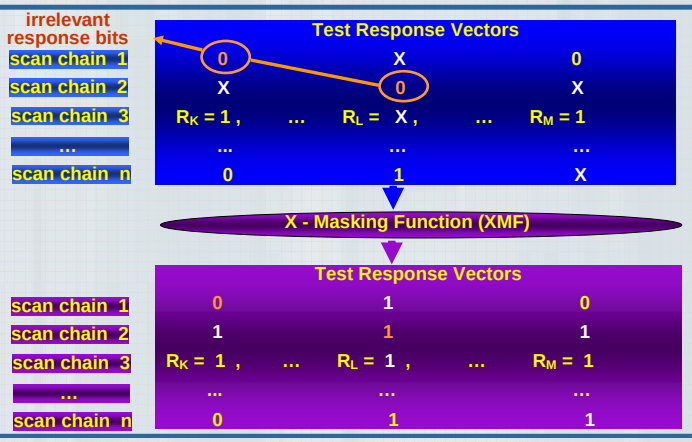
- Basic logic operators very efficiently implemented
- Compact representation and implementation of logic functions

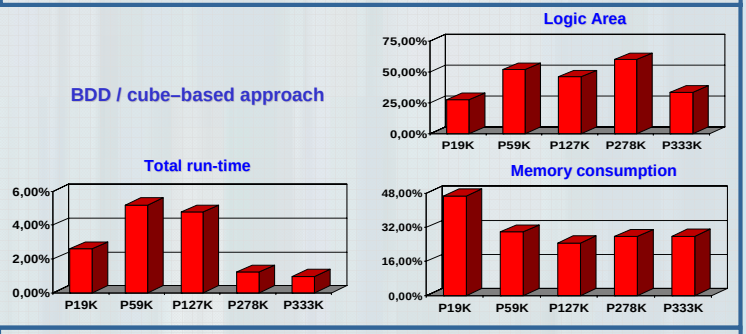


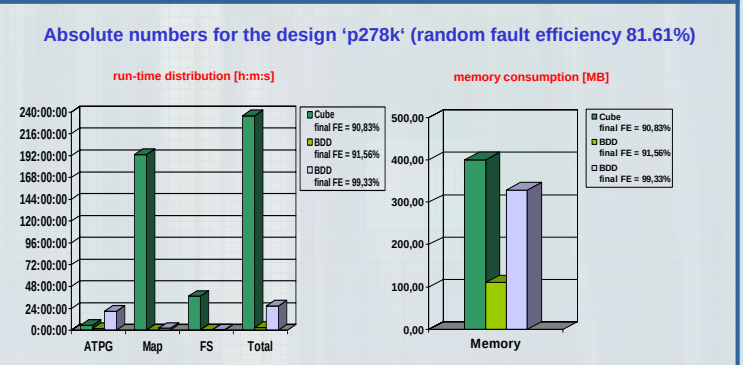
Bit-flipping logic (BFF) and correction logic (CRL)











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