1918
TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY

Testimise projekteerimine

Laborid

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Laborid

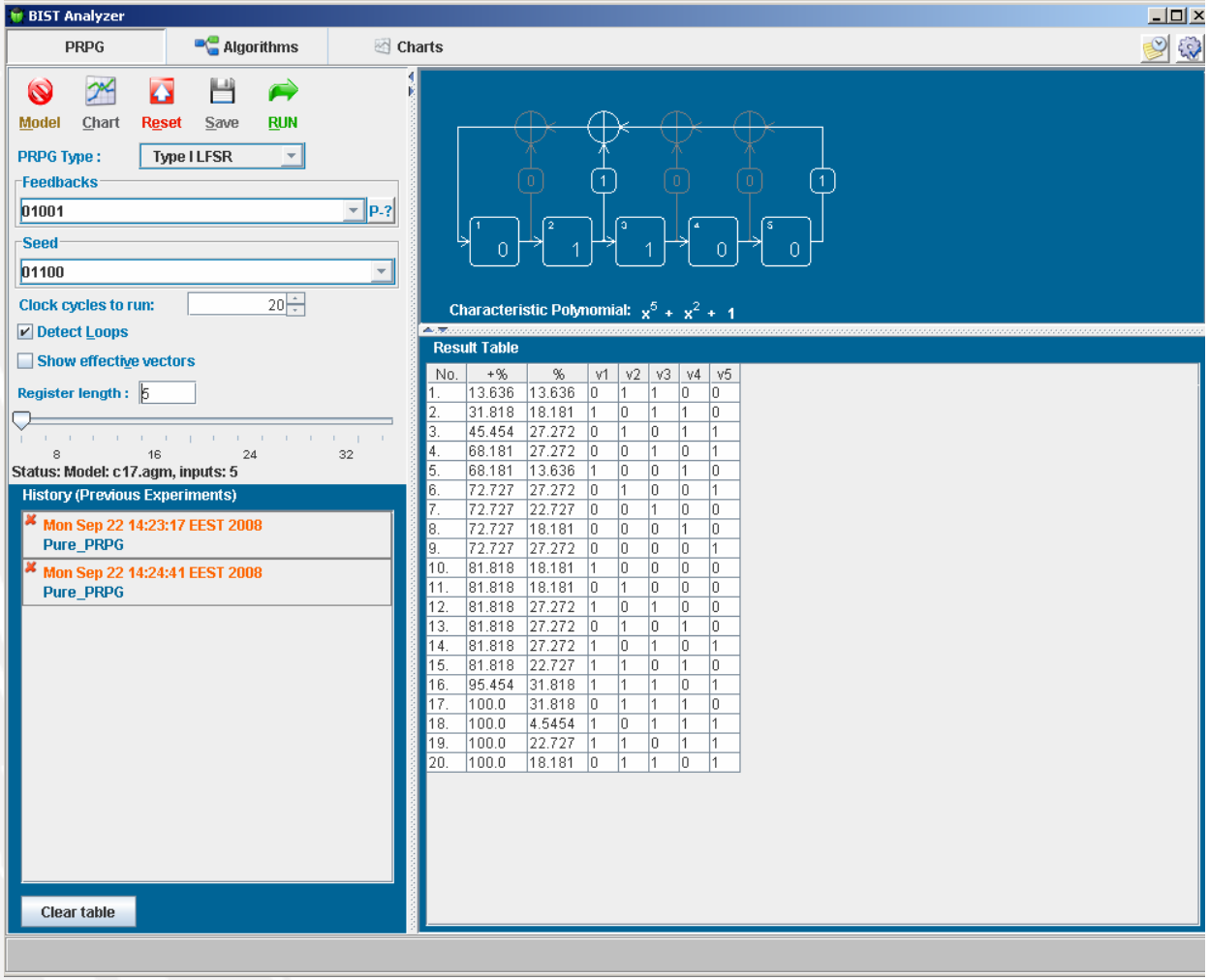
BISTA
- **1.Understanding BIST (6. nädal)**
- **2.BIST Optimizatsion (10. nädal)**

Trainer 1149
- **3.Understanding Boundary Scan (14. nädal)**

Cadence BISTA Turbotester
- **Kursuse töö (eksam)**

BISTA (Built-in Self Test Analyser)

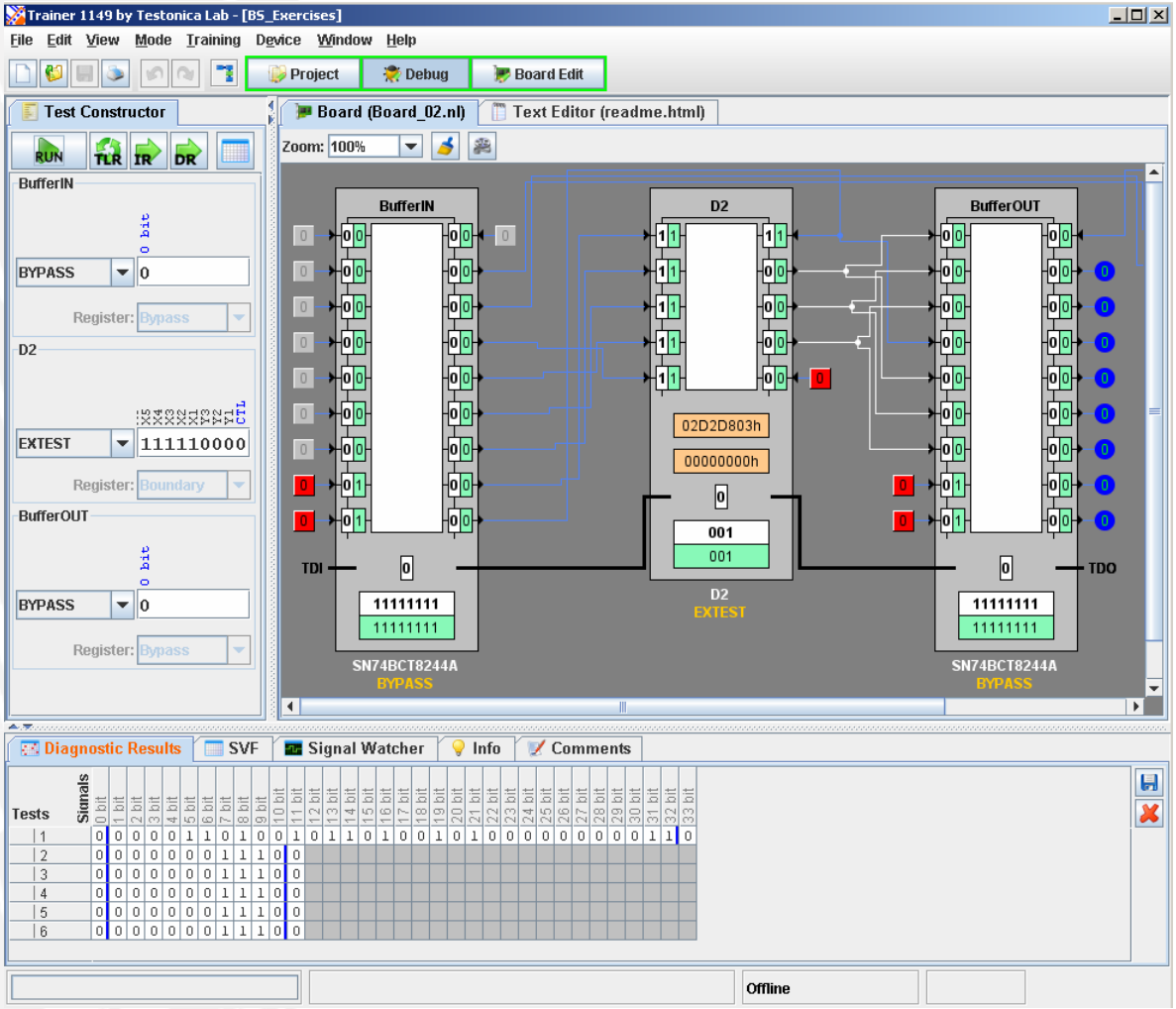
BIST Technique Teaching Tool



No.	+%	%	v1	v2	v3	v4	v5
1.	13.636	13.636	0	1	1	0	0
2.	31.818	18.181	1	0	1	1	0
3.	45.454	27.272	0	1	0	1	1
4.	68.181	27.272	0	0	1	0	1
5.	68.181	13.636	1	0	0	1	0
6.	72.727	27.272	0	1	0	0	1
7.	72.727	22.727	0	0	1	0	0
8.	72.727	18.181	0	0	0	1	0
9.	72.727	27.272	0	0	0	0	1
10.	81.818	18.181	1	0	0	0	0
11.	81.818	18.181	0	1	0	0	0
12.	81.818	27.272	1	0	1	0	0
13.	81.818	27.272	0	1	0	1	0
14.	81.818	27.272	1	0	1	0	1
15.	81.818	22.727	1	1	0	1	0
16.	95.454	31.818	1	1	1	0	1
17.	100.0	31.818	0	1	1	1	0
18.	100.0	4.5454	1	0	1	1	1
19.	100.0	22.727	1	1	0	1	1
20.	100.0	18.181	0	1	1	0	1

Trainer 1149

Boundary Scan Technique Teaching Tool



Uus klassi kasutajate süsteem

http://elrond.tud.ttu.ee/

Kuidas saada kasutajakontot:

- **Et saada klassi kasutajakontot pead ennast juba eelnevalt olema registreerinud meie LDAP baasis. Kasutajakonto loomine toimub üle ÕIS-i (ois.va.ttu.ee → TTÜ üldparooli loomine).**

- **Järgmiseks etapiks on klassi serverisse kasutajakonto loomine. Selleks pöördu webi lehele auth.ttu.ee, logi sisse oma kasutajanime ning parooliga ning kliki lingile "loo klassi kasutaja konto". Kindluse mõttes küsitakse veel korra parooli, mis langeb kokku sisselogimise parooliga ning genereeritakse kasutaja loomise päring. Päringuid töödeldakse perioodiliselt kuid MITTE KOHE pärast päringu sisestamist. Päringu täitmise staatust saab kontrollida webi lehelt auth.ttu.ee.**

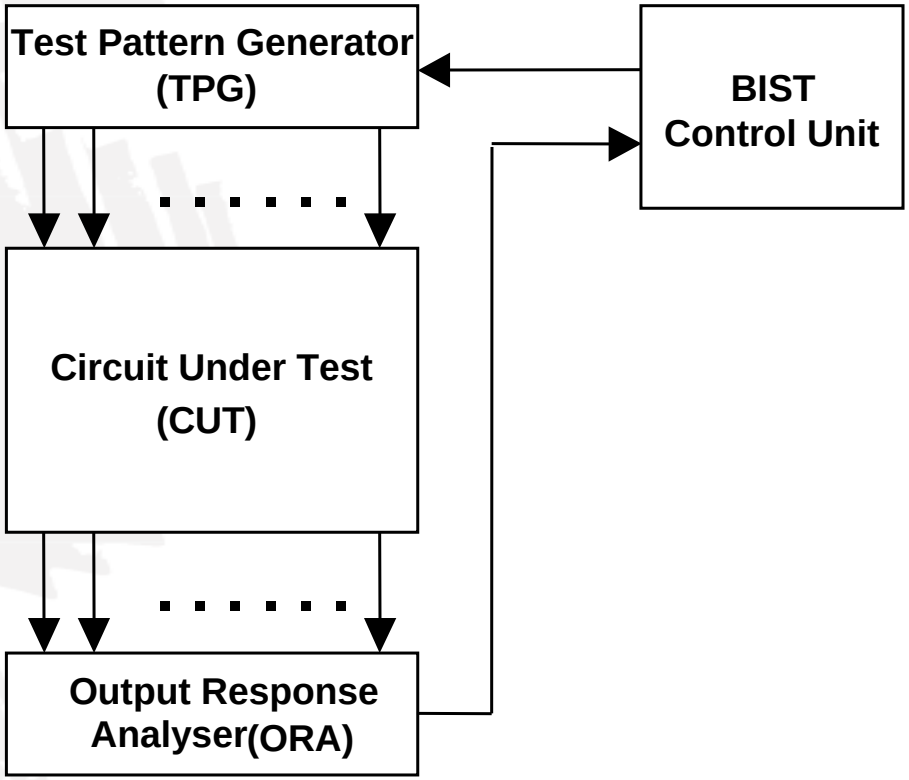
Juhendid arvutite seadmiseks

Esmasel sisselogimisel järgnevad sammud:

1. **vahetada oma shell ümber, selleks anda käsklus konsoolis**
   passwd -r ldap -e
2. **küsitakse parooli ja uue shelli väärtust, uueks shelliks panna: /bin/tcsh**
3. **.cshrc puudumisel kopeerida endale õige, järgneva käsuga**
   cp /home/kasutaja/.cshrc .
4. **Võta maha kommentaarid(e. #) .cshrc failis ridadel:**
   setenv TESTER
   setenv JDK16
5. **logida end arvutist korraks täielikult välja**

BIST (Built In Self Test)

ehk *sisseehitatud isetestimine* on digitaalskeemi (mikroskeemi, plaadi, süsteemi jms) omadus iseennast testida.



Why BIST?

- **Motivations for BIST:**
  - Need for a cost-efficient testing (general motivation)
  - Doubts about the stuck-at fault model
  - Increasing difficulties with TPG (Test Pattern Generation)
  - Growing volume of test pattern data
  - Cost of ATE (Automatic Test Equipment)
  - Test application time
  - Gap between tester and UUT (Unit Under Test) speeds

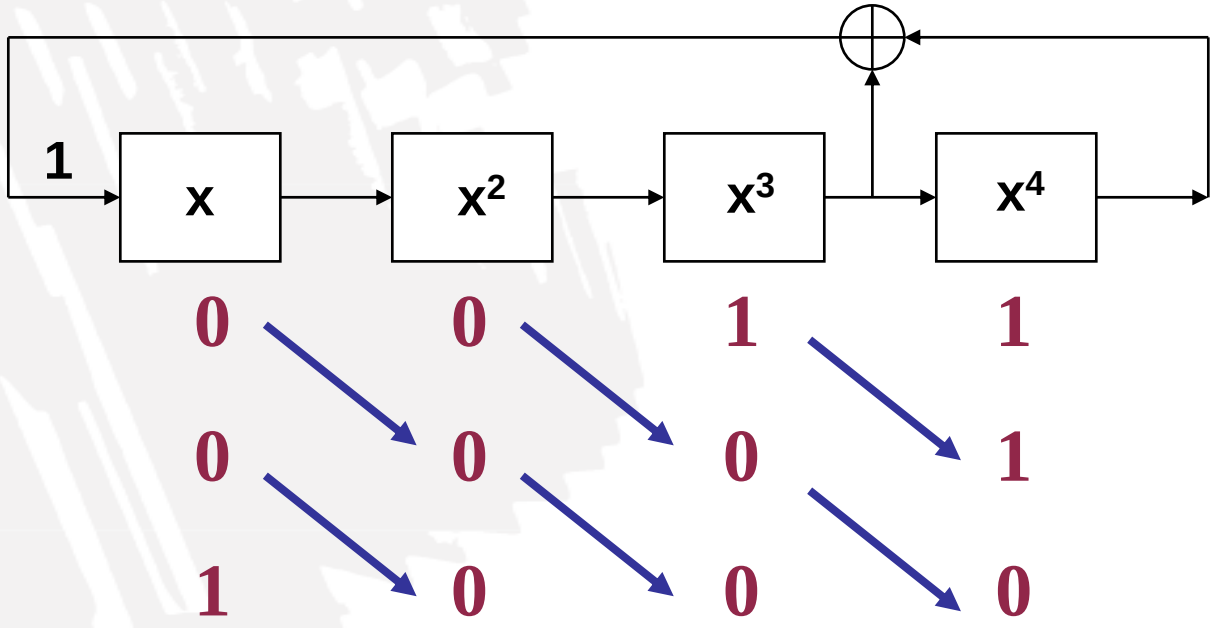
- **Drawbacks of BIST:**
  - Additional pins and silicon area needed
  - Decreased reliability due to increased silicon area
  - Performance impact due to additional circuitry
  - Additional design time and cost

Test Patterns Generator

- Store in ROM – too expensive
- Exhaustive
- Pseudo-exhaustive
- Pseudo-random (LFSR) – Preferred method
- Binary counters – use more hardware than LFSR
- Modified counters
- Test pattern augmentation
  - LFSR combined with a few patterns in ROM
  - Hardware diffracter – generates pattern cluster in neighborhood of pattern stored in ROM

LFSR

LFSR – Linear feedback shift register, hardware that generates pseudo-random pattern sequence



Characteristic Polynomial: $P(x) = 1 + x^3 + x^4$

Properties of Polynomials

- *Irreducible polynomial* – cannot be factored, is divisible only by itself
- Irreducible polynomial of degree *n* is characterized by:
  - An odd number of terms including 1 term
  - Divisibility into $1 + x^k$, where $k = 2^n - 1$
- Any polynomial with all even exponents can be factored and hence is *reducible*
- An irreducible polynomial is *primitive* if it divides the polynomial $1+x^k$ for $k = 2^n - 1$, but not for any smaller positive integer k
- Only *primitive polynomials* of an *n-bit* LFSR can generates maximum possible *unique* patterns $2^n - 1$

Reciprocal Polynomial

The reciprocal polynomial of *P(*X) is defined by:

$$P^{*}(x) = x^{n} \cdot P(1/x)$$

$$X^{a} \Rightarrow X^{n-a}$$

Example:

The reciprocal of polynomial $P(x) = 1 + x + x^3$ is

is $$P^{*}(x) = x^3 \cdot (1 + \frac{1}{x} + \frac{1}{x^3}) = x^3 + x^2 + 1$$

The reciprocal of a primitive polynomial is also primitive

Primitive Polynomials

Number of primitive polynomials of degree *N*

N	No
1	**1**
2	**1**
4	**2**
8	**16**
16	**2048**
32	**67108864**

Table of primitive polynomials up to degree 31

N	**Primitive Polynomials**
1,2,3,4,6,7,15,22	$1 + X + X^n$
5,11, 21, 29	$1 + X^2 + X^n$
10,17,20,25,28,31	$1 + X^3 + X^n$
9	$1 + X^4 + X^n$
23	$1 + X^5 + X^n$
18	$1 + X^7 + X^n$
8	$1 + X^2 + X^3 + X^4 + X^n$
12	$1 + X + X^3 + X^4 + X^n$
13	$1 + X + X^4 + X^6 + X^n$
14, 16	$1 + X + X^3 + X^4 + X^n$