Topic #3 – Software Branch Testing

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Topic #3 – Software Branch Testing

- What Is Software Branch Testing?
- Why Do We Need Branch Testing?
- How To Conduct Branch Testing?
- Branch Testing Example
- Branch Testing Coverage

TOPIC #3 – SOFTWARE BRACH TESTING

What is software branch testing?

Definition:

Software branch testing is one white-box test strategy and method. Engineers use this method to design test cases and data to validate each branch in the program flow graph of a given program's source codes.

Its test focuses:	**Every branch in a program flow graph**
Test model:	**Program flow graph model**
Limitation:	**Each Boolean condition is treated as a simple decision node with both "T" and "F" branches.**

Why Do We Need Branch Testing?

- **Software programs consist of many logic decisions (in Boolean expressions)**

- **Incorrect implementations of logic decisions lead to software errors**

- **The program code coverage is not enough to reach to the decision coverage (or the branch coverage)**

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How to Conduct Software Branch Testing?

Step #1: Come out a program flow graph as a test model for a given program (i.e. a function in C++/Java).

Step #2: Identify predicate nodes in a program flow graph

Step #3: Create a branch table including all branches

Step #4: Identify one independent executable path to cover one or more branches in the program flow graph from the starting node to the end node.

Step #5: Continue Step #4 until to cover all branches in the branch table in Step #3.

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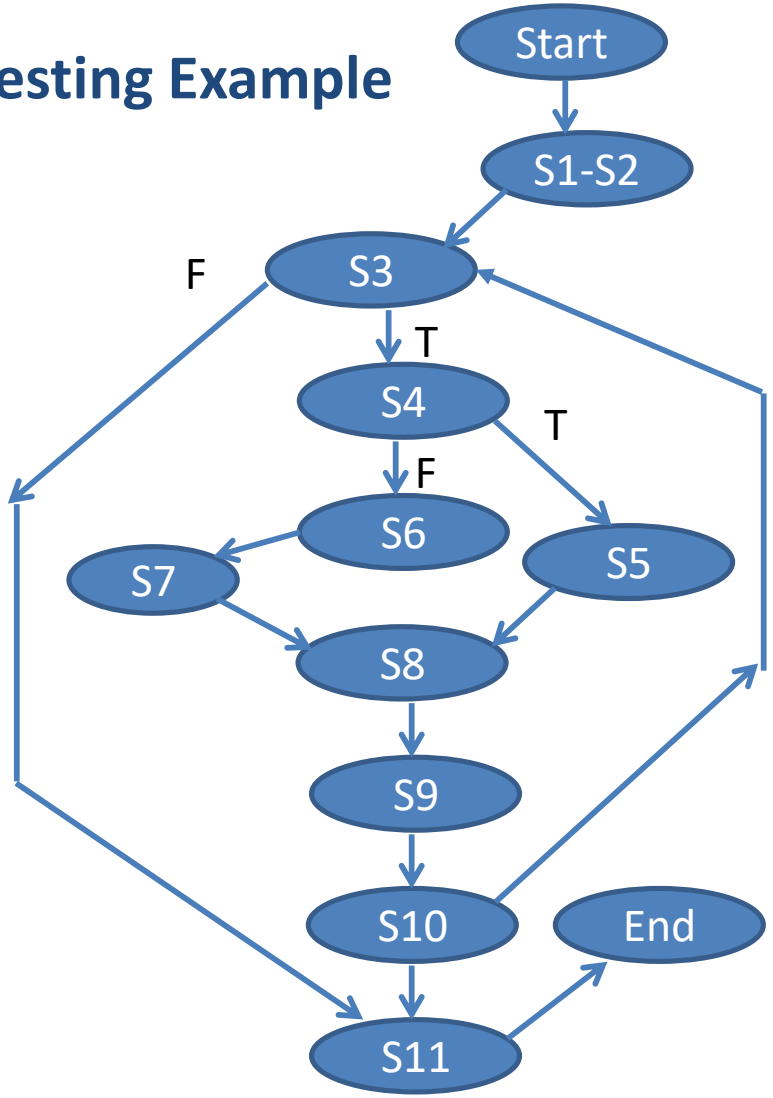
Software Branch Testing Example

Step #1: Create Program Flow Graph

```
/*  Branch Testing Example*/
      declare Length as integer
      declare Count as integer
S1      READ Length;
S2      READ Count;

S3      WHILE (Count <= 6) LOOP
S4        IF (Length >= 100) THEN
S5          Length = Length - 2;
S6        ELSE
S7          Length = Count * Length;
S8        END IF
S9        Count = Count + 1;
S10   END LOOP;
S11   PRINT Length;
```



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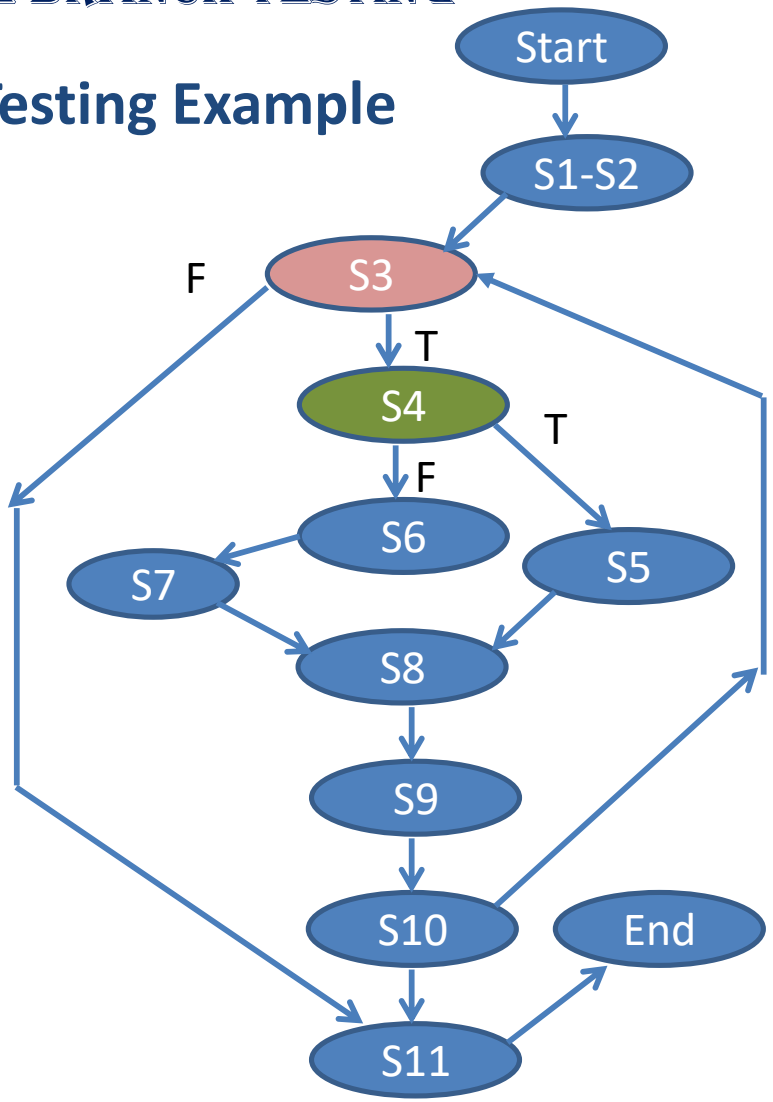
Software Branch Testing Example

Step #2: Create Decision Table

Predicate Node	Decision	Possible Outcome
S3	Count <= 6	T
		F
S4	Length >= 100	T
		F



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Software Branch Testing Example

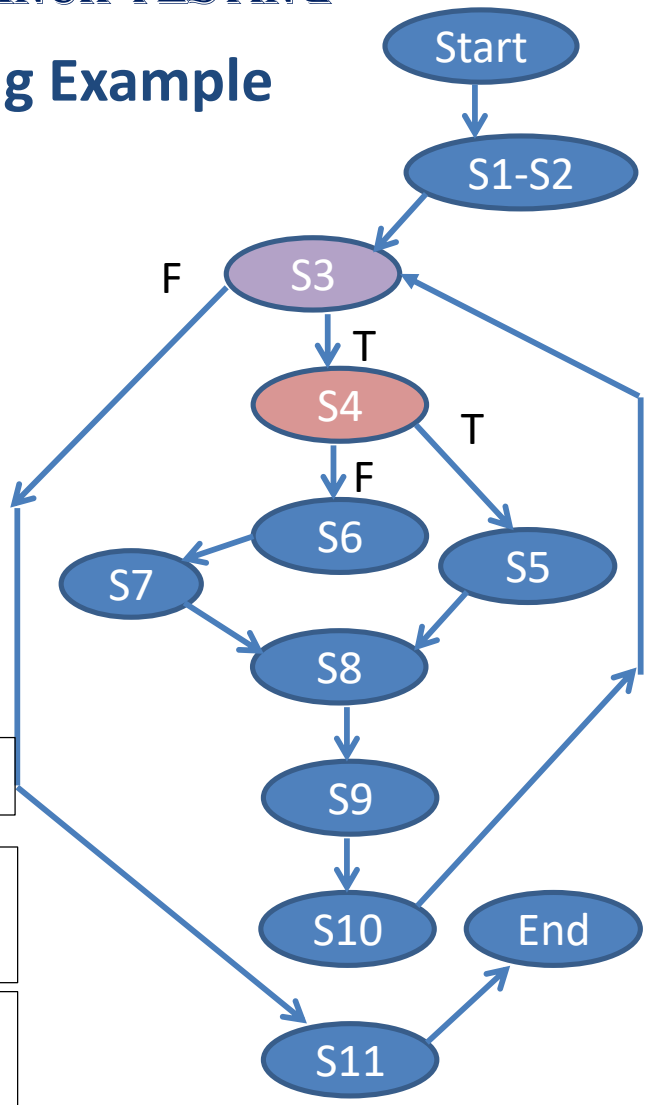
Step #3: Create one Independent Path for each decision's possible outcome.

Predicate Node	Decision	Possible Outcome	Path
S3	Count <= 6	F	P1
		T	P2. P3
S4	Length >= 100	T	P2
		F	P3

P1: Start→S1-S2→S3→S11→End

P2: Start→S1-S2→S3→S4→S5→S8 →S9→S10→S3→S11→End

P3: Start→S1-S2→S3→S4→S6→S7 ->S8 →S9→S10→S3→S11→End



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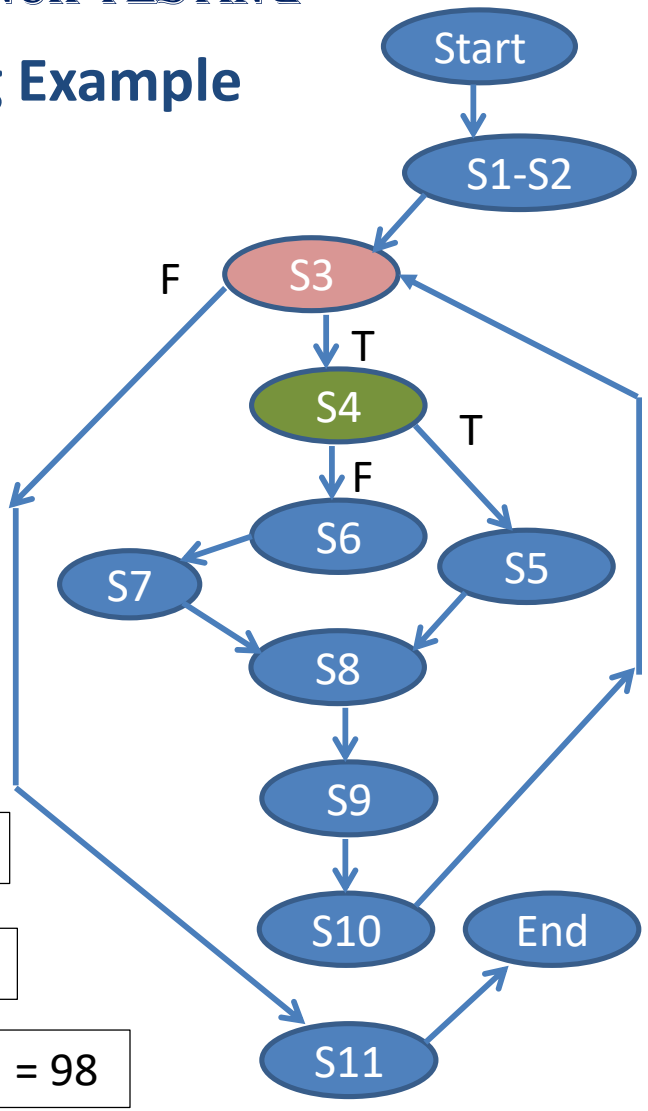
Software Branch Testing Example

Step #3: Create one Independent Path for each decision's possible outcome.

Predicate Node	Decision	Possible Outcome	Path	T1	T2	T3
S3	Count <= 6	F	P1	X		
		T	P2. P3		X	X
S4	Length >= 100	T	P2		X	
		F	P3			X



T1- Inputs: (Count = 7, Length = 10) Outputs: Length = 10

T2 - Inputs: (Count = 6, Length = 10) Outputs: Length = 60

T3 - Inputs: (Count = 6, Length = 100) Outputs: Length = 98

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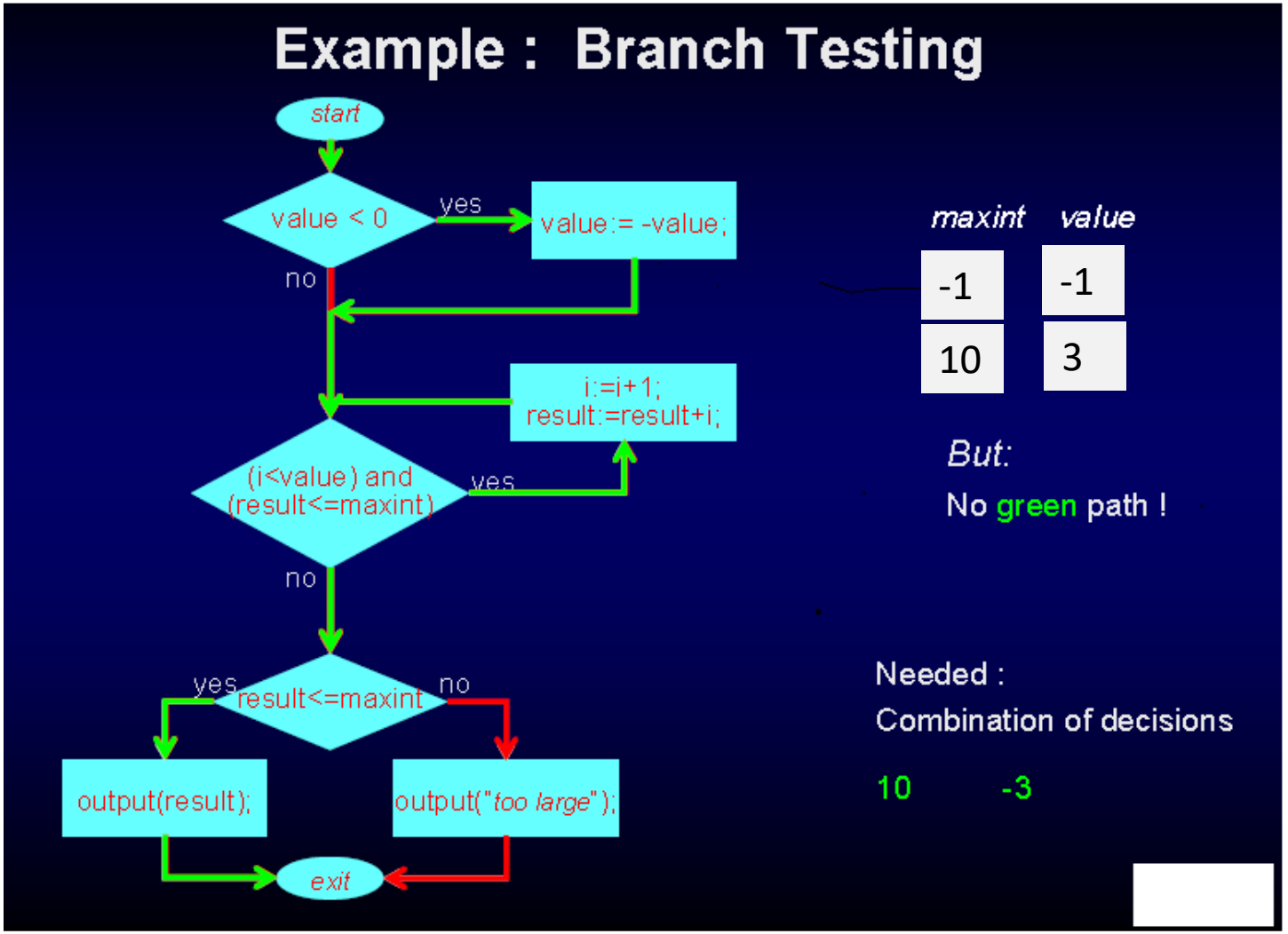

Software Branch Testing Coverage

What has been covered by Branch Testing?

- Cover each predicate node in a program flow graph.

- Cover each branch link (or edge) in a program flow graph.

- Cover each predicate node only in T/F value.

What has not been covered by Branch Testing?

- Diverse combinational cases from a compound Boolean expression