TMap

Condition Coverage Type:
Decision Points

Lesson Objectives

- Understand Decision Point
- To know the variations in it
- Understand each design technique in detail
- Analysis of variations with examples

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8.1 Decision Points

- Definition:
  - A decision point is a composition of one or more conditions which defines the conditions for the various possibilities in the subsequent behavior of the system
  - Ex: IF A < B AND C < D THEN…
  - Here statements ‘A < B’ and ‘C < D’ are the conditions and the resultant IF statement is the decision point

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8.2 Variations in Decision Points

- Condition Coverage
- Decision Coverage
- Condition/Decision Coverage
- Multiple Condition Coverage
- Modified Condition/Decision Coverage

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8.2 Variations in Decision Point

8.2.1 Condition Coverage

- The possible outcomes ("Where" or "false") of any condition shall be tested at least once
- Ex: To test the decision point –

  IF number of books > 8 OR sum >= 100 THEN

  extra Discount
- The conditions here are
  - Number of books > 8
  - Sum >= 100

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8.2 Variations in Decision Point

8.2.1 Condition Coverage

	Number of books > 8	Sum >= 100	Outcome
TS1	1	0	1(extra discount)
TS2	0	1	1(extra discount)

This condition is one time “true” and onetime “false”

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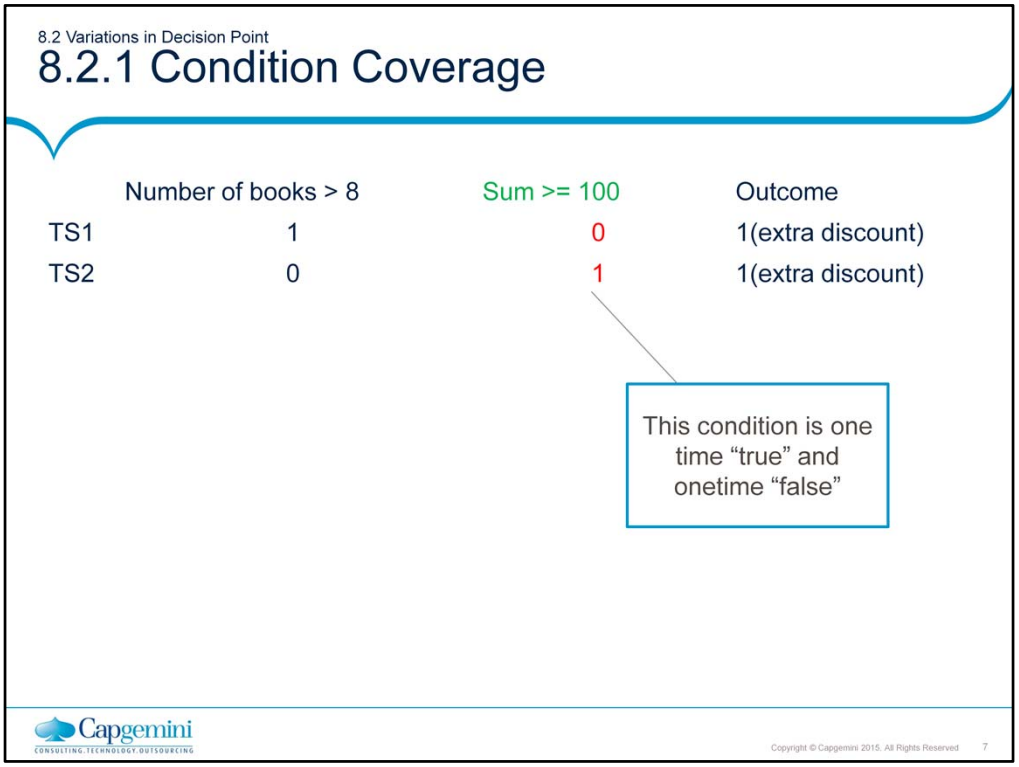
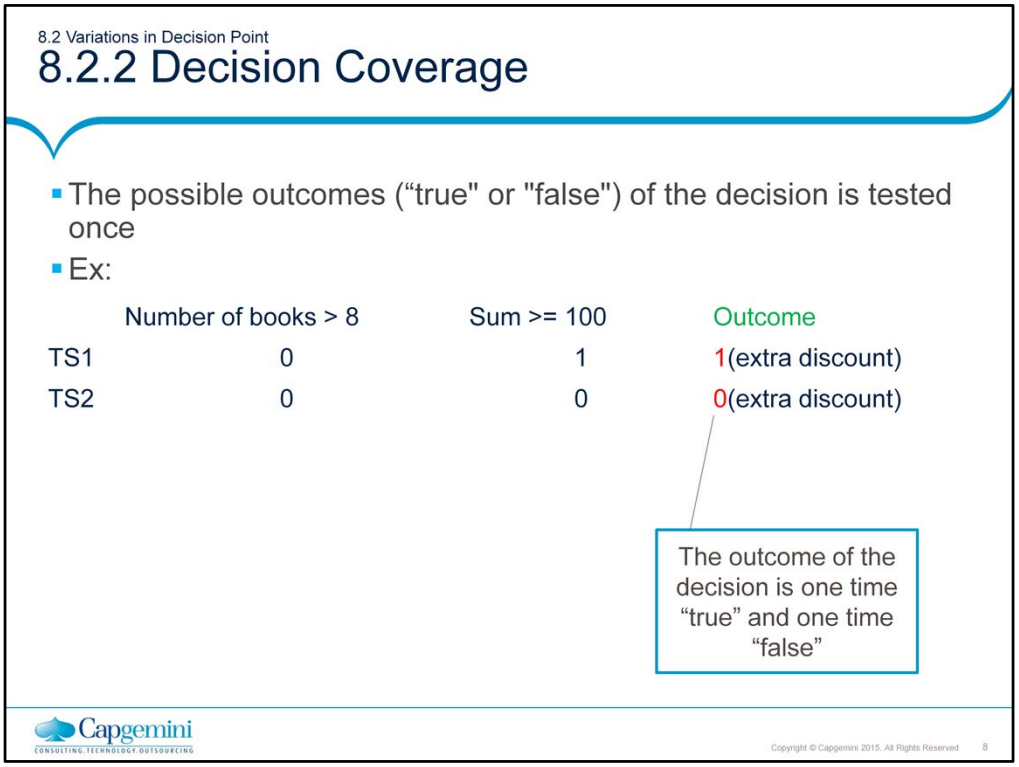


Notice that the outcome of the test case doesn’t matter
In this type we test only that possible outcome of a condition is tested



Notice that the value for the condition doesn’t matter
This test type tests only for the end decision to be true and false
Foe decision coverage only two test situations are needed per decision point

8.2 Variations in Decision Point

8.2.3 Condition Decision Coverage

- The possible outcomes (“true" or "false") of each condition and of the decision are tested at least once
- Ex

	Number of books > 8	Sum >= 100	Outcome
TS1	1	1	1(extra discount)
TS2	0	0	0

The conditions are one time true and one time false

The outcome of the decision is one time “true” and one time “false”

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8.2 Variations in Decision Point

8.2.4 Multiple Coverage

- All possible combinations of results of conditions in a decision (so the full coverage decision table) are tested at least once
- Ex:

	Number of books > 8	Sum >= 100	Outcome
TS1	1	1	1(extra discount)
TS2	0	0	0
TS3	1	0	1(extra discount)
TS4	0	1	1(extra discount)

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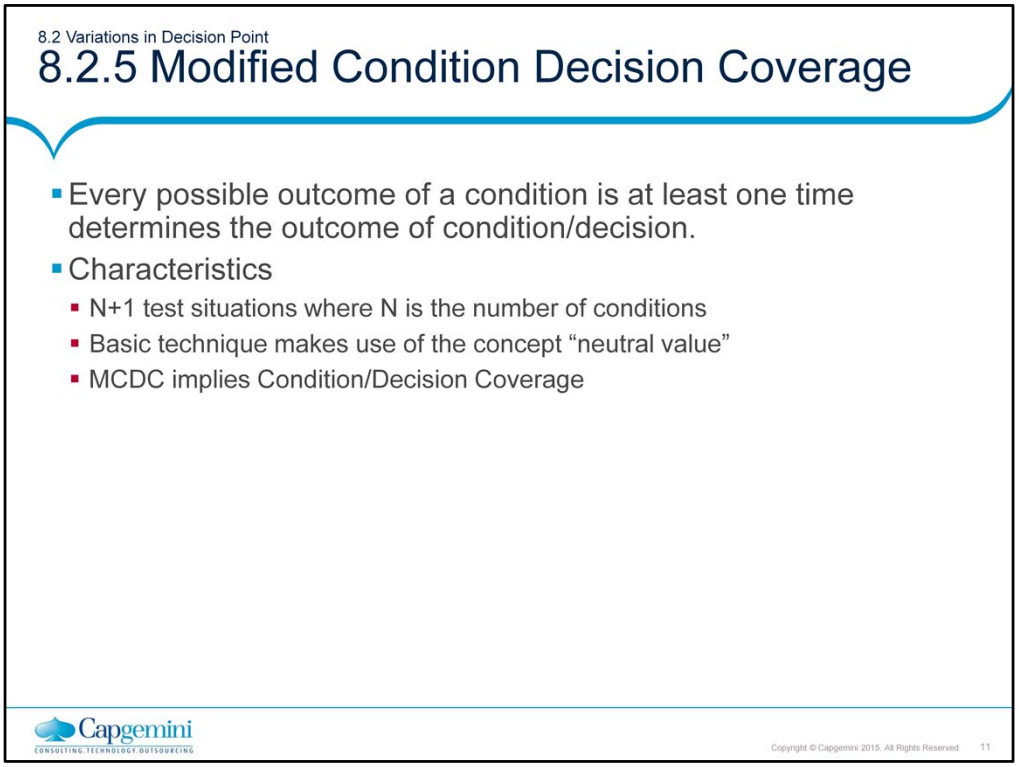

Neutral value is that truth value which retains the value of the outcome according to the determinant condition (determinant value)
Ex: If A and B are two conditions
Lets apply a AND operation on these conditions and consider A to be the determinant condition
Then

A	B	A AND B
1	-	1
0	-	0

The value for B that makes the above truth table correct is the Neutral value.

Note: B value can be 0 or 1 in the second case of the above truth table.
But since Neutral value is a singular value, we opt 1 which is common in both the cases

Therefore the Neutral value of an AND operation is 1
Similarly the Neutral value of an OR operation is 0

8.2.5 MCDC

8.2.5.1 Example MCDC

Lets consider the following decision point for the analysis of MCDC

IF (type of car = delivery van AND first use >=1 July 2010) OR
entrepreneur = no
THEN tax liable

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8.2.5 MCDC

8.2.5.2 6 Steps Plan

- Make a table with 3 columns
  - The identifying column with decision
  - The TRUE column
  - The FALSE column
- Add one row for each condition in the decision
- Enter a dot in column 2 and 3 for each condition in the decision
- Fill the columns 2 and 3 with the determinant values in a diagonal
- Fill the remaining dots in column 2 and 3 with a neutral value
- Cancel double appearances of test situations

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8.2.5 MCDC

8.2.5.3 Step 1

- Make the table with 3 columns
  - The identifying column with decision
  - The TRUE column
  - The FALSE column

(A AND B) OR C	1	0

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8.2.5 MCDC

8.2.5.4 Step 2

- Add rows equal to the number of conditions

(A AND B) OR C	1	0
type of car = delivery van		
first use >=1 July 2010		
entrepreneur = no		

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8.2.5 MCDC

8.2.5.5 Step 3

- Enter a dot in column 2 and 3 for each condition in the decision

(A AND B) OR C	1	0
type of car = delivery van	. . .	. . .
first use >=1 July 2010	. . .	. . .
entrepreneur = no	. . .	. . .

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8.2.5 MCDC

8.2.5.6 Step 4

- Fill the column 2 and 3 with the determinant values in a diagonal

(A AND B) OR C	1	0
type of car = delivery van	**1** . .	**0** . .
first use >=1 July 2010	. **1** .	. **0** .
entrepreneur = no	. . **1**	. . **0**

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The determinant value is denoted with an underline

8.2.5 MCDC

8.2.5.7 Step 5

- Fill the remaining dots in column 2 and 3 with a neutral value

(A AND B) OR C	1	0
type of car = delivery van	**1** 1 0	**0** 1 0
first use >=1 July 2010	1 **1** 0	1 **0** 0
entrepreneur = no	? ? **1**	? ? **0**

- Which neutral values to put here?

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8.2.5.7 MCDC Step 5

Neutral values in case of brackets

- In case of R = (A AND B) OR C, when C is the determinant: the combination (A AND B) should have a neutral value
- Neutral value of OR is ‘0’, so choose A and B that causes the result of (A AND B) = 0
- 3 possibilities
  - 1 0
  - 0 1
  - 0 0

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8.2.5 MCDC

8.2.5.8 Step 6

6. Cancel double appearance of test situations

(A AND B) OR C	1	0
type of car = delivery van	~~1 1 0~~	~~0 1 0~~
first use >=1 July 2010	1 1 0	1 0 0
entrepreneur = no	~~1 0 1~~ ~~0 1 1~~ 0 0 1	~~1 0 0~~ ~~0 1 0~~ 0 0 0

Note: If in step 5 “0 0” had been chosen, you will end up in 5 test situations

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8.3 Test situations written down

Test situation	1 1 0	1 0 1	0 1 0	1 0 0
type of car = delivery van	**Delivery van**	**Delivery van**	**Not delivery van**	**Delivery van**
first use >=1 July 2010	**>= 1 July 2010**	**< 1 July 2010**	**>= 1 July 2010**	**< 1 July 2010**
entrepreneur = no	**yes**	**no**	**yes**	**yes**
Result	Tax Liable	Tax Liable	Not Liable	Not Liable

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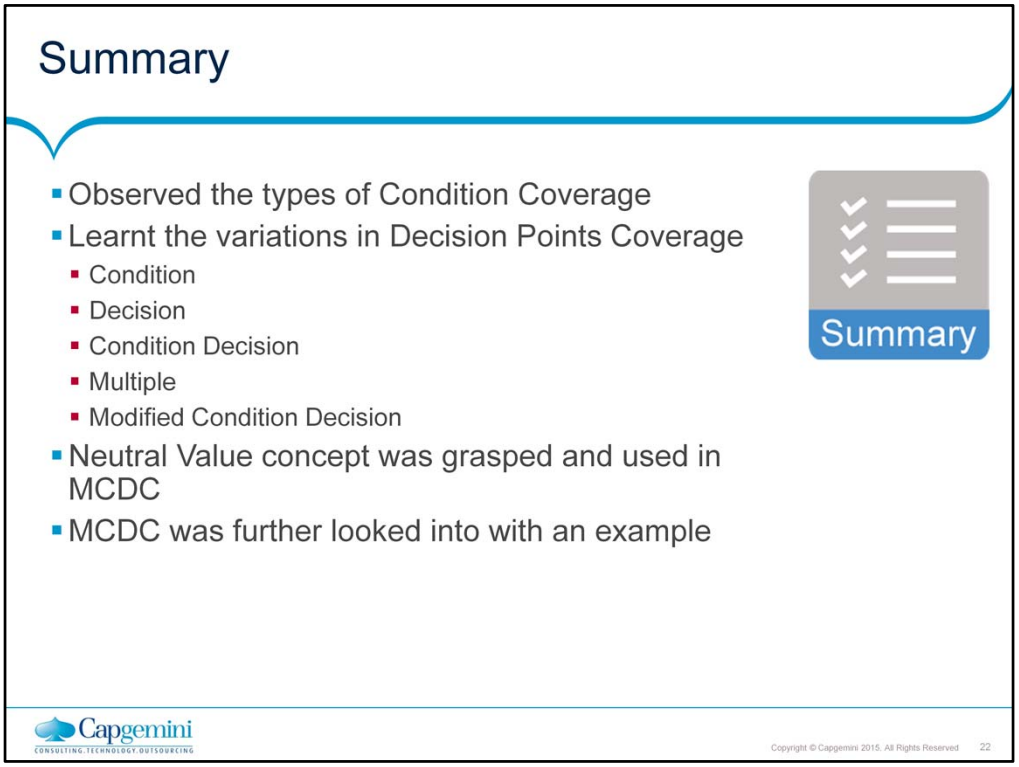

Add the notes here.

Review Question

- The number of test situations possible for Decision Coverage to test a decision point with 3 conditions is _____
- The Coverage Type that has the most depth is
  - Condition Coverage
  - MCDC
  - Multiple Coverage
  - Condition Decision Coverage

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Add the notes here.

References

- URL
- Coverage Techniques
  - https://capgemini.sumtotalsystems.com/sumtotal/app/sys_error.aspx?mode=accessdenied&UserMode=0&ru=/sumtotal/app/management/LMS_ActDetails.aspx%3fUserMode%3d0%26ActivityId%3d151274
- Book
  - Please read pages 602-210 of TMap Next for decision points

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