**Boundary Value Analysis (BVA) and Equivalence Partitioning (EP)**

**Boundary Value Analysis (BVA)** and **Equivalence Partitioning (EP)** are two widely used test design techniques in software testing. They help reduce the number of test cases while maintaining effective coverage.

**1. Equivalence Partitioning (EP)**

**Definition:**  
Equivalence Partitioning is a technique in which input values are divided into groups (partitions) that should be treated the same by the system. The idea is that if one value in a partition works correctly, the others are also expected to work.

**Key Points:**

* Reduces the number of test cases.
* Divides input values into valid and invalid partitions.
* A representative value is chosen from each partition for testing.

**Example of Equivalence Partitioning**

Suppose an application accepts user age between **18 and 60** (inclusive).

* **Valid Partition:** 18 to 60 → (Choose values like 25, 40, 55)
* **Invalid Partitions:**
  + Below 18 (e.g., 10, 15)
  + Above 60 (e.g., 65, 70)

Instead of testing all possible values, we select **one representative value from each partition** to test.

**2. Boundary Value Analysis (BVA)**

**Definition:**  
Boundary Value Analysis focuses on testing the edges (boundaries) of input values, as errors often occur at these points.

**Key Points:**

* Tests values at the **minimum**, **maximum**, and **just outside** valid boundaries.
* Identifies edge-case defects that might be missed by equivalence partitioning.

**Example of Boundary Value Analysis**

For the same age validation scenario (**18 to 60**), boundary values to test would be:

* **Lower boundary:** 17 (**invalid**), 18 (**valid**)
* **Upper boundary:** 60 (**valid**), 61 (**invalid**)
* **Middle value (optional):** 39

**Comparison of EP and BVA:**

| **Aspect** | **Equivalence Partitioning (EP)** | **Boundary Value Analysis (BVA)** |
| --- | --- | --- |
| **Purpose** | Divides inputs into valid and invalid groups | Tests values at the edges of input boundaries |
| **Number of Test Cases** | Fewer test cases | More test cases focused on critical points |
| **Example Input Range** | Age: 18–60 → Test 25, 40, 55 | Test 17, 18, 60, 61 |

**Conclusion**

* **Equivalence Partitioning** helps reduce redundant test cases by selecting representative values.
* **Boundary Value Analysis** ensures that edge cases (where defects are most likely) are tested.
* Using **both techniques together** improves test coverage while keeping the number of test cases manageable.