

Connectedness - Software Testing

Paths let us speak about nodes that are connected: this leads to a powerful simplification device that is very important for testers.

Definition:

Nodes n_1 and n_2 are connected if and only if they are in the same path. "Connectedness" is an equivalence relation on the node set of a graph. To see this, we can check the three defining properties of equivalence relations:

- ? Connectedness is reflexive between every node is obviously in a path of length 0 with itself.
- ? Connectedness is symmetric, because if nodes n_1 and n_2 are in a path, then nodes n_2 and n_1 are in the same path.
- ? Connectedness is transitive

Equivalence relations include a partition, therefore we are guaranteed that connectedness defines a partition on the node set of a graph. This permits the definition of components of a graph:

Definition:

A component of a graph is a maximal set of connected nodes. Nodes in the equivalence classes are component of a graph, the classes are maximal due to the transitivity part of the equivalence relation. The graph in figure has two components: $\{n_1, n_2, n_3, n_4, n_5, n_6\}$ and $\{n_7\}$.