**Dijkstra's algorithm** is an algorithm for finding the shortest paths between nodes in a graph, which may represent, for example, road networks.

1. Mark all nodes unvisited.
2. Set *tentative distance* for all nodes.
   - 2.1  0 for initial node.
   - 2.2  ∞ for all other nodes.
3. **Select node with lowest *tentative distance***.
4. If it target node, we are done!
5. For every node connected to this node:
   - 5.1 **Calculate new *tentative distance***:

   Current node's distance + path length

   - 5.2 Set if it lower then current *tentative distance*.
6. Mark selected node as visited.
   We no longer consider visited nodes.
7. Go to step 3.

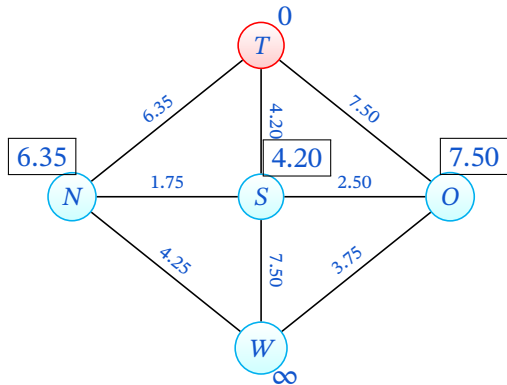Step 1: set initial *tentative distance* for all nodes.
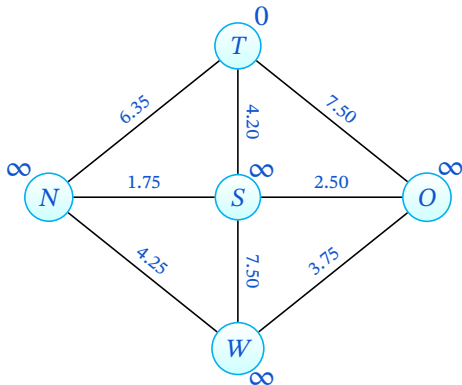
Step 2: select node with lowest *tentative distance* ($T$) and update all connected nodes.
For $S$: $0 + 4.20 = 4.20 < \infty$ - update
For $N$: $0 + 6.35 = 6.35 < \infty$ - update
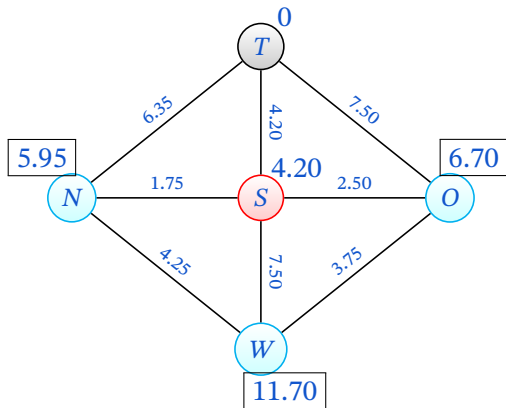For $O$: $0 + 7.50 = 7.50 < \infty$ - update

Step 3: Mark current node ($T$) as visited, select node with lowest *tentative distance* ($S$) and update all connected nodes.
For $N$: $4.20 + 1.75 = 5.95 < 6.35$ - update
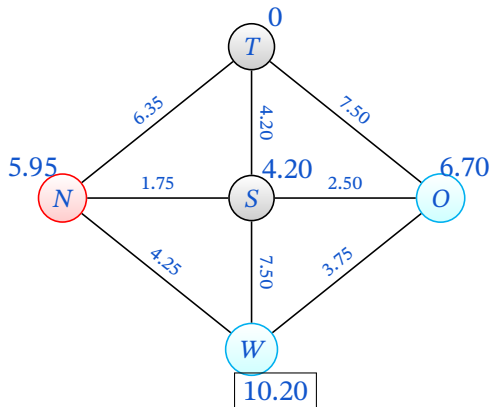For $O$: $4.20 + 2.50 = 6.70 < 7.50$ - update
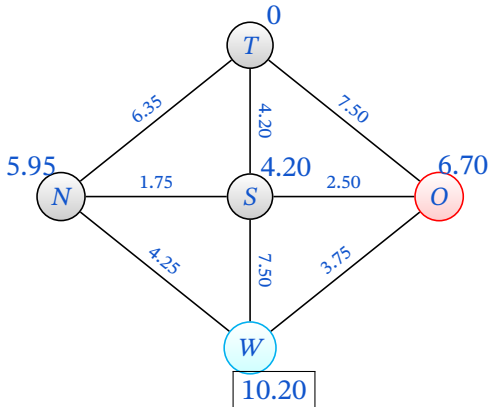For $W$: $4.20 + 7.50 = 11.70 < \infty$ - update

Step 4: Mark current node ($S$) as visited, select node with lowest *tentative distance* ($N$) and update all connected nodes.
For $W$: $5.95 + 4.25 = 10.20 < 11.70$ - update

Step 5: Mark current node ($N$) as visited, select node with lowest *tentative distance* ($O$) and update all connected nodes.
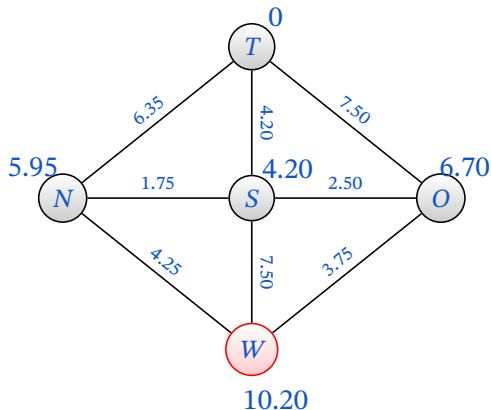For $W$: $6.70 + 3.75 = 10.45 > 10.20$ - **DON'T update**

Step 6: Final node become current ($S$), end of algorithm.
So shortest distance from $T$ to $W$ is 10.20.



Dijkstra's algorithm consider each node *no more then once* and consider every road *no more then once*.

To restore a shortest path, algorithm may be modified: each node needs to remember last current node to update its distance.

If we dod that, then

$T$ is initial node,
$S$ remembers $T$,
$N$ remembers $S$,
$O$ remembers $S$,
$W$ remembers $N$.

Walking back we restore our path: $T - S - N - W$.