A TSP tour has the properties:

- it is a \textit{connected} subgraph of the network

- the degree of every node is 2

The solution of the \textit{Assignment Problem} satisfies the second property, but not always the first. The solution of the \textit{minimum spanning 1-tree} problem satisfies the first property, but not always the second.
1-Tree

A 1-tree is constructed by adding a single edge to a tree.

Note that a tour is a 1-tree:
Minimize $\sum_{i=1}^{n} \sum_{j=1}^{n} d_{ij}X_{ij}$

subject to

$\begin{align*}
\sum_{i=1}^{n} X_{ij} &= 1 \forall j=1,\ldots,n \\
\sum_{j=1}^{n} X_{ij} &= 1 \forall i=1,\ldots,n
\end{align*}$

Assignment constraints

$X \in \mathcal{T}$ = set of all 1-trees

If either the assignment or the 1-tree constraints are relaxed, the resulting problem (which is easy to solve) provides a lower bound on the length of the optimal tour.

- Relaxation of 1-tree constraints
- Relaxation of Assignment constraints