Fiber Optic Network as Graph

SP   SP   SP   SP

FDH   FDH

Central Office
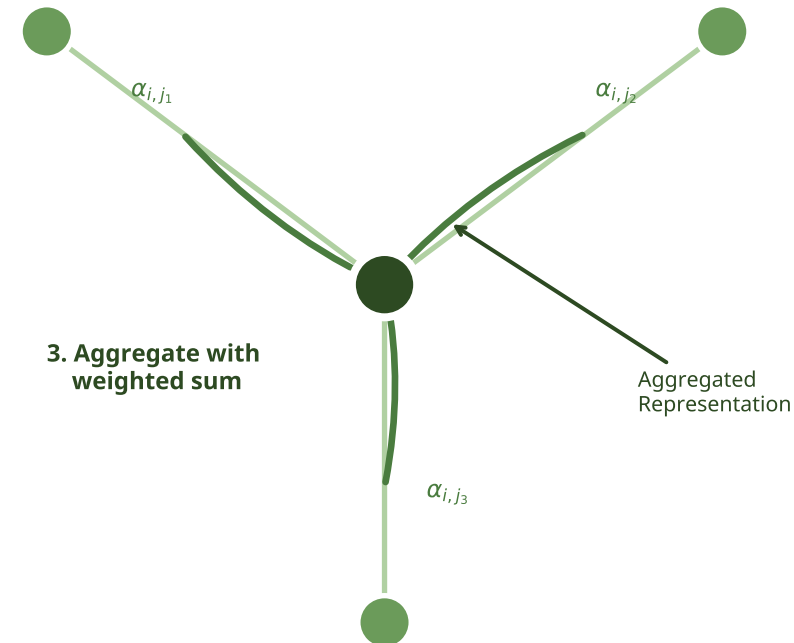
FDH   FDH

SP   SP

■ Central Office
● Fiber Distribution Hub
▲ Splice Point
— Fiber Connection
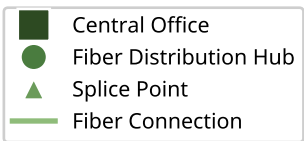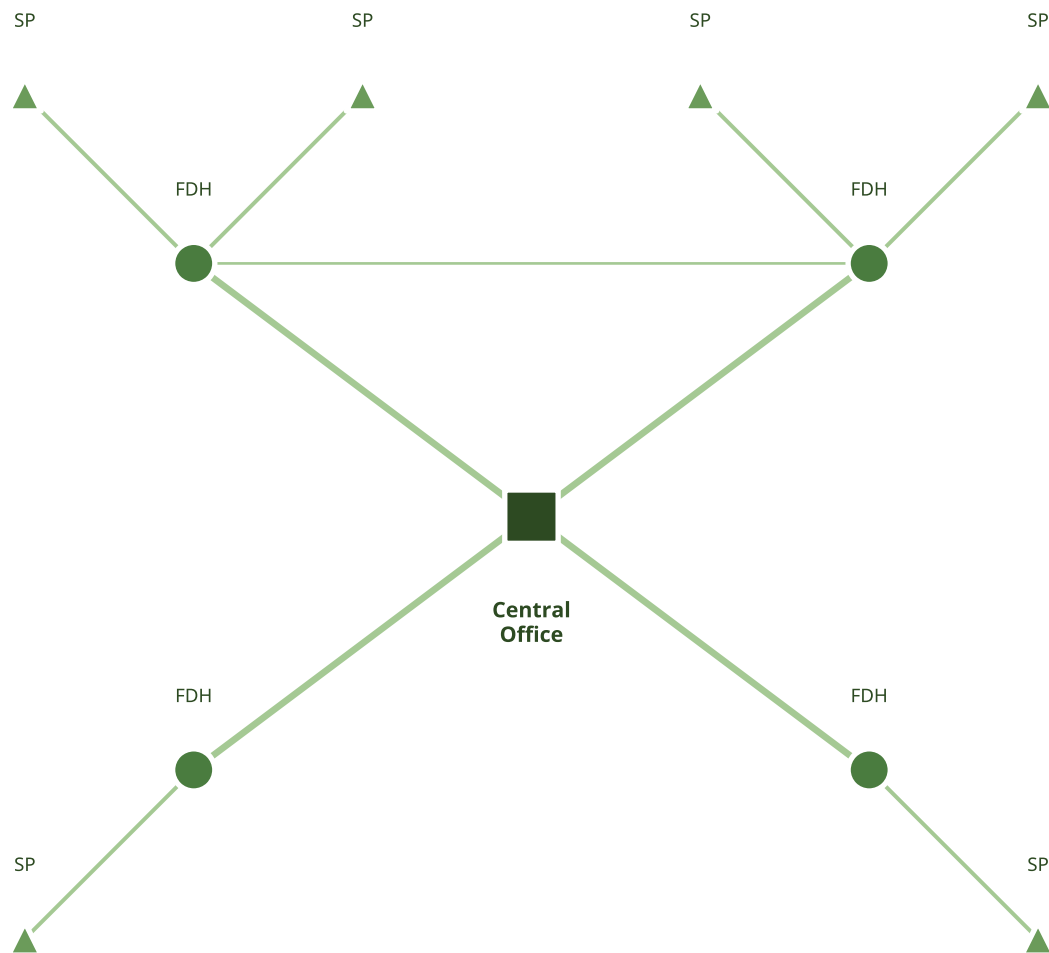
GNN Message Passing Mechanism

1. Collect neighbor features

2. Compute attention weights

α_{i,j_1} α_{i,j_2}

3. Aggregate with weighted sum

Aggregated Representation

α_{i,j_3}

$$h_i^{(l+1)} = \sigma\left(\sum_{j \in \mathcal{N}(i)} \alpha_{ij} W h_j^{(l)}\right)$$