Bibliography


[7] IEEE, Standard for Information Technology- Telecommunications and Information Exchange Between Systems- Local and Metropolitan Area Networks- Specific Requirements


Appendix A

Conference and paper contributions from thesis


Appendix B

Equation reference

Table B.1: Refined MILP model equation reference

<table>
<thead>
<tr>
<th>Equation</th>
<th>Sections defined</th>
<th>Type</th>
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<tr>
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<td>Splitter cost</td>
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<td>5.1.8</td>
<td>ONU cost</td>
</tr>
<tr>
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<td>5.1.2, 5.1.4</td>
<td>Fiber costs between CO and SP</td>
</tr>
<tr>
<td>(5.66)</td>
<td>5.1.2, 5.1.4</td>
<td>Fiber costs between SP and ONU</td>
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<td>(5.67)</td>
<td>5.1.5</td>
<td>Coverage of ONUs</td>
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<td>5.1.4</td>
<td>Total splitters used</td>
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<tr>
<td>(5.69)</td>
<td>5.1.4</td>
<td>Total COs used</td>
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<td>5.1.4</td>
<td>Maximum number of COs</td>
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<td>5.1.4</td>
<td>At least one CO</td>
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<td>(5.72)</td>
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<td>Used SP must connect to CO</td>
</tr>
<tr>
<td>(5.73)</td>
<td>5.1.5</td>
<td>Used ONU must connect to SP</td>
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<td>(5.74)</td>
<td>5.1.4</td>
<td>CO is used if link to it exists</td>
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<td>5.1.3</td>
<td>SP is used if link to it exists</td>
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<td>(5.76)</td>
<td>5.1.2, 5.1.3</td>
<td>Edges of used paths marked used</td>
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<td>5.1.3</td>
<td>Maximum ONUs per SP</td>
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<td>SP of only one type</td>
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<tr>
<td>(5.80)</td>
<td>5.1.6</td>
<td>Sets minimum CO-ONU distance</td>
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<tr>
<td>(5.81)</td>
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<td>Sets maximum CO-ONU distance</td>
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<td>Activates distance constraints</td>
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<td>ONU EOS - enable correct $\lambda$</td>
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<td>ONU EOS - only one segment active</td>
</tr>
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<td>5.1.8</td>
<td>SP EOS - only one segment active</td>
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<td>(5.97)</td>
<td>5.1.8</td>
<td>ONU EOS - convex combination</td>
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<tr>
<td>(5.98)</td>
<td>5.1.8</td>
<td>SP EOS - convex combination</td>
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Appendix C

Dijkstra’s Algorithm

Algorithm C.1 Dijkstra’s algorithm

1: $Graph \leftarrow$ map
2: $source \leftarrow$ source vertex

3: procedure $DIJKSTRA(Graph, source)$
4: \hspace{1em} for all vertices $v$ in $Graph$ do
5: \hspace{1.5em} $D(v) \leftarrow \infty$ \hspace{.5em} $\triangleright$ Distance map vector
6: \hspace{1.5em} $P(v) \leftarrow$ undefined \hspace{.5em} $\triangleright$ Previous map vector
7: \hspace{1em} end for

8: $D(source) \leftarrow 0$
9: $N \leftarrow$ set of all vertices in $Graph$
10: \hspace{1em} while $N \neq \emptyset$ do
11: \hspace{1.5em} $s \leftarrow$ vertex $\in N$, $\text{MIN}(D) = D(s)$ \hspace{.5em} $\triangleright$ Vertex with minimum distance
12: \hspace{1.5em} delete $s$ from $N$
13: \hspace{1.5em} if $D(s) = \infty$ then
14: \hspace{2em} break \hspace{.5em} $\triangleright$ All neighbours explored
15: \hspace{1.5em} end if
16: \hspace{1em} end while
Algorithm C.2 Dijkstra’s algorithm (continued)

16: for all neighbours \( v \) of \( s \) do
17: \( a \leftarrow D(s) + \text{DISTANCEBETWEEN}(v, s) \)
18: if \( a < D(v) \) then
19: \( D(v) \leftarrow a \)
20: \( P(v) \leftarrow s \)
21: end if
22: end for
23: end while
24: return \( D, P \)
25: end procedure

26: function \( \text{MIN}(v) \)
27: \( \text{min} = \infty \)
28: for all elements \( i \) in \( v \) do \( \triangleright \) Get minimum of vector
29: \( \text{if } i < \text{min} \text{ then} \)
30: \( \text{min} \leftarrow i \)
31: end if
32: end for
33: return \( \text{min} \)
34: end function

35: function \( \text{DISTANCEBETWEEN}(v_1, v_2) \)
36: return \( \|v_2 - v_1\| \) \( \triangleright \) Euclidean distance between vertices
37: end function
Appendix D

Branch and Bound algorithm

Algorithm D.1 General branch and bound
1: $S \leftarrow$ candidate solutions
2: calculate bounds $S_{\text{LOW}}$ and $S_{\text{UP}}$
3: function BRANCHBOUND($S$)
4: while $(S \neq \emptyset)$ and $(S_{\text{LOW}} \neq S_{\text{UP}})$ do
5: split $S$ into sets $S_1, S_2, \ldots$ \hspace{1cm} $\triangleright$ Branch
6: for all sets $S_i$ do
7: calculate bounds $\ell_i$ and $u_i$ for $S_i$ \hspace{1cm} $\triangleright$ Bound
8: if $(\ell_i > S_{\text{UP}})$ or $(u_i < S_{\text{LOW}})$ then
9: discard $S_i$ \hspace{1cm} $\triangleright$ Prune
10: else
11: $S_{\text{UP}} \leftarrow \min(S_{\text{UP}}, u_i)$
12: $S_{\text{LOW}} \leftarrow \max(S_{\text{LOW}}, \ell_i)$
13: call BRANCHBOUND($S_i$) \hspace{1cm} $\triangleright$ Recursively
14: end if
15: end for
16: end while
17: return $S_{\text{LOW}}$ and $S_{\text{UP}}$
18: end function