國立清華大學
NATIONAL TSING HUA UNIVERSITY

# Network Planning

Data Structures Assignment

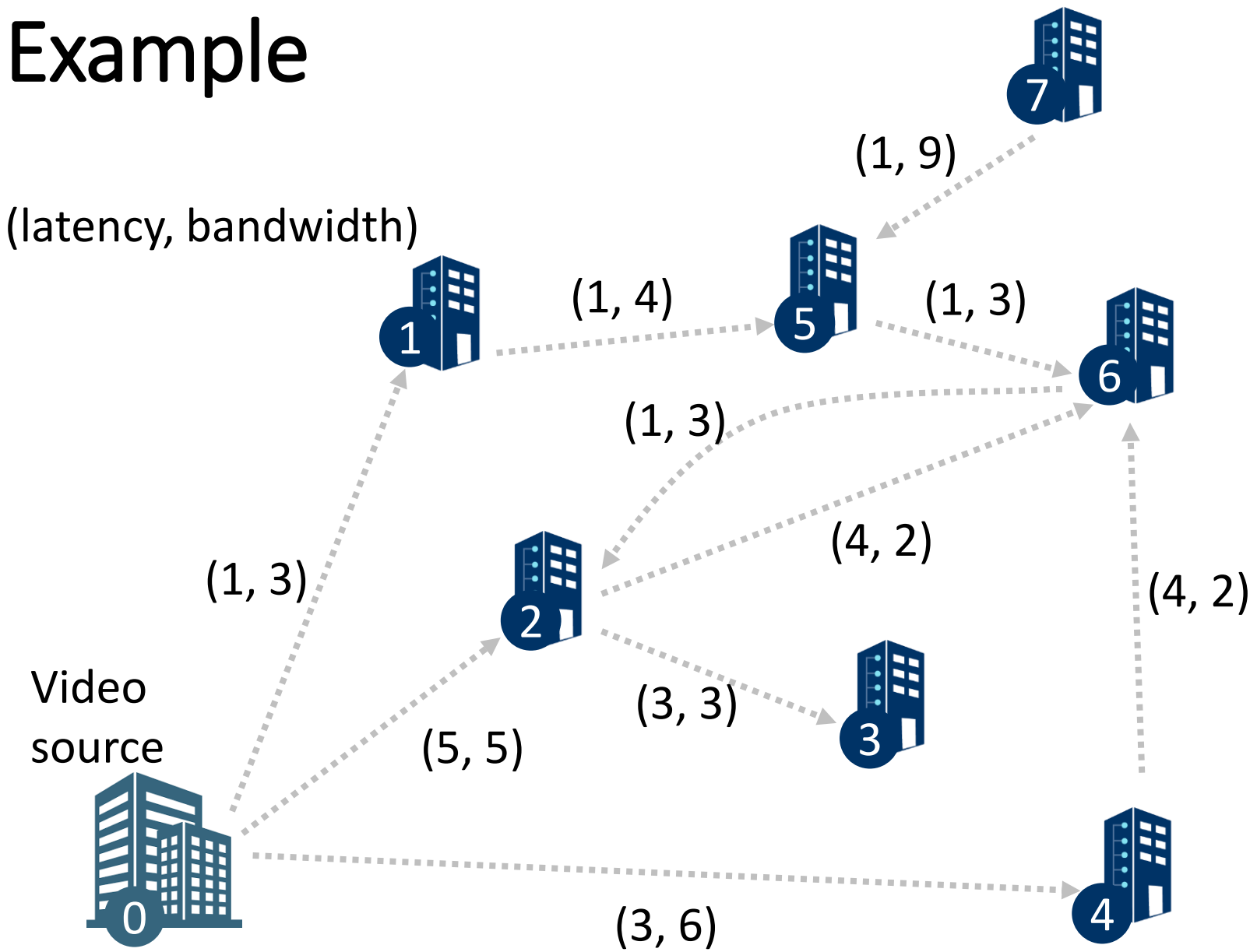
NTHU EE and CS

https://acm.cs.nthu.edu.tw/problem/12252/

# Overview

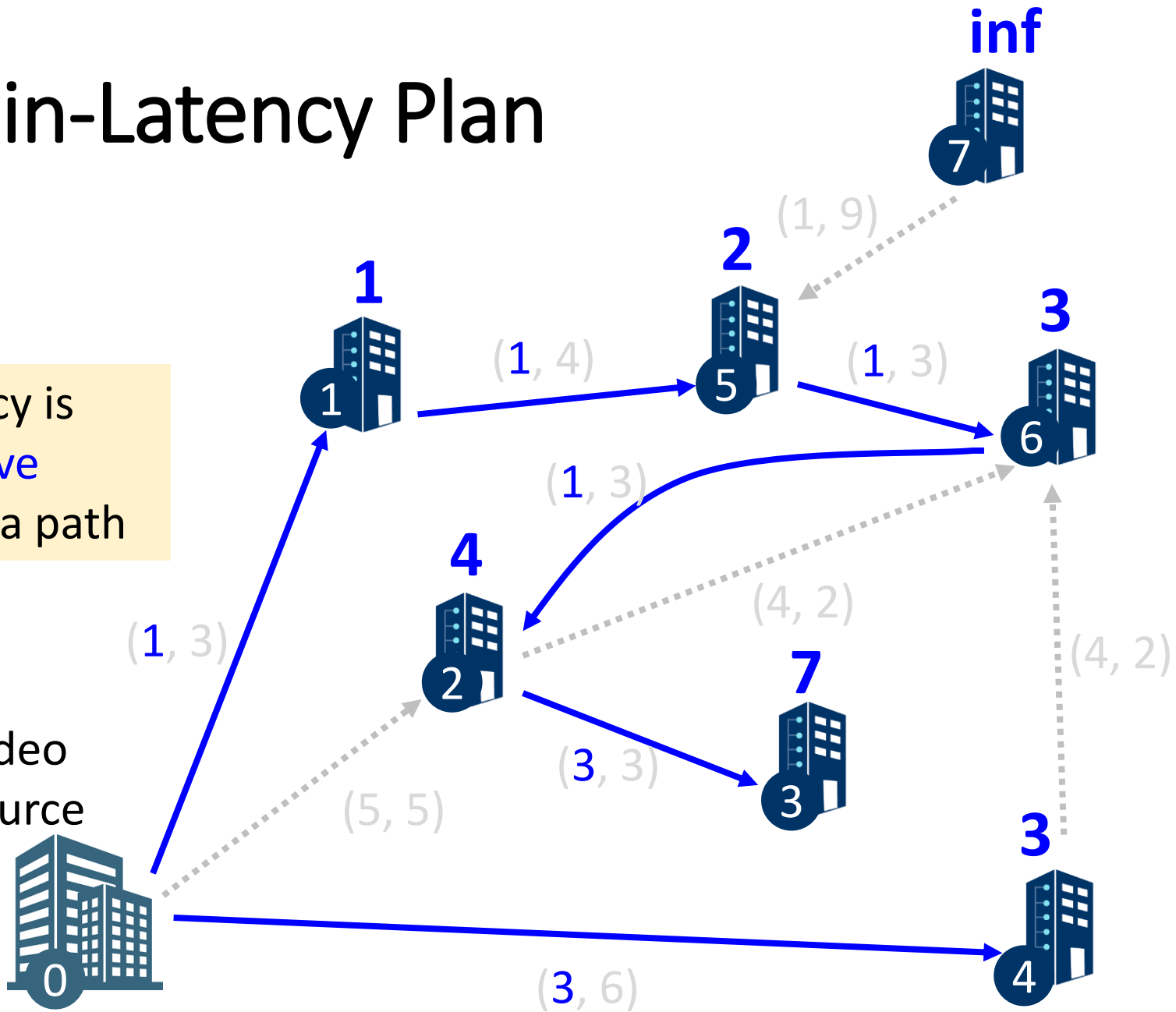
- Given a graph
  - Each node stands for a building
  - Node 0 stands for a video source (e.g., a Netflix server)
  - Each edge stands for a possible connection
  - Each edge is specified by its latency and bandwidth
- Task
  - We wants the network to be a spanning tree
  - Find the minimum-possible latency from the video source to each building
  - Find the maximum-possible bandwidth from the video source to each building

# Example

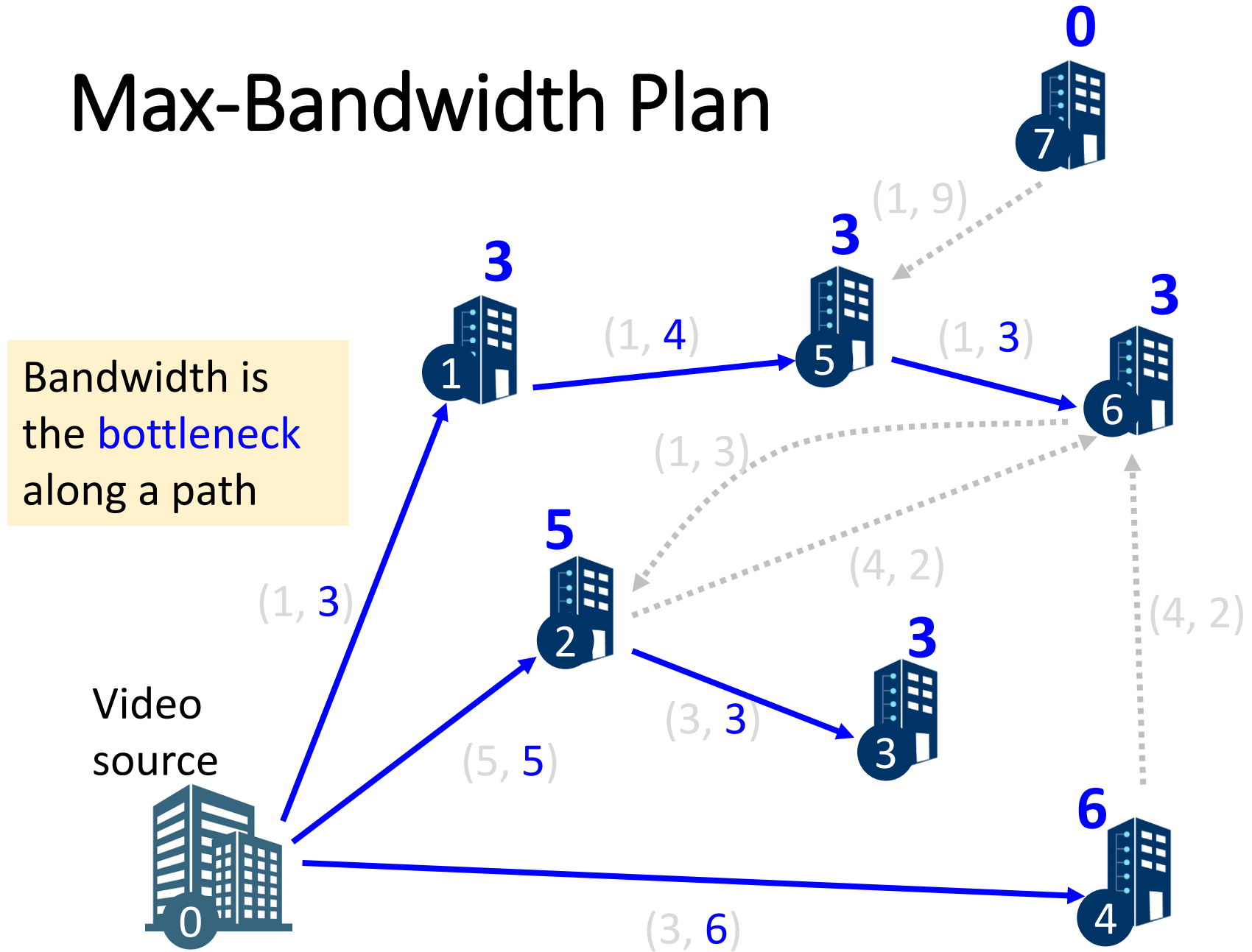

(latency, bandwidth)
7
(1, 9)
1
(1, 4)
5
(1, 3)
6
(1, 3)
(4, 2)
(1, 3)
2
(4, 2)
Video
source
(3, 3)
3
(5, 5)
0
(3, 6)
4

# Min-Latency Plan

Latency is additive along a path



# Max-Bandwidth Plan



# Input

# of buildings (<1000)
e.g., 8 means buildings 0~7

# of candidate connections

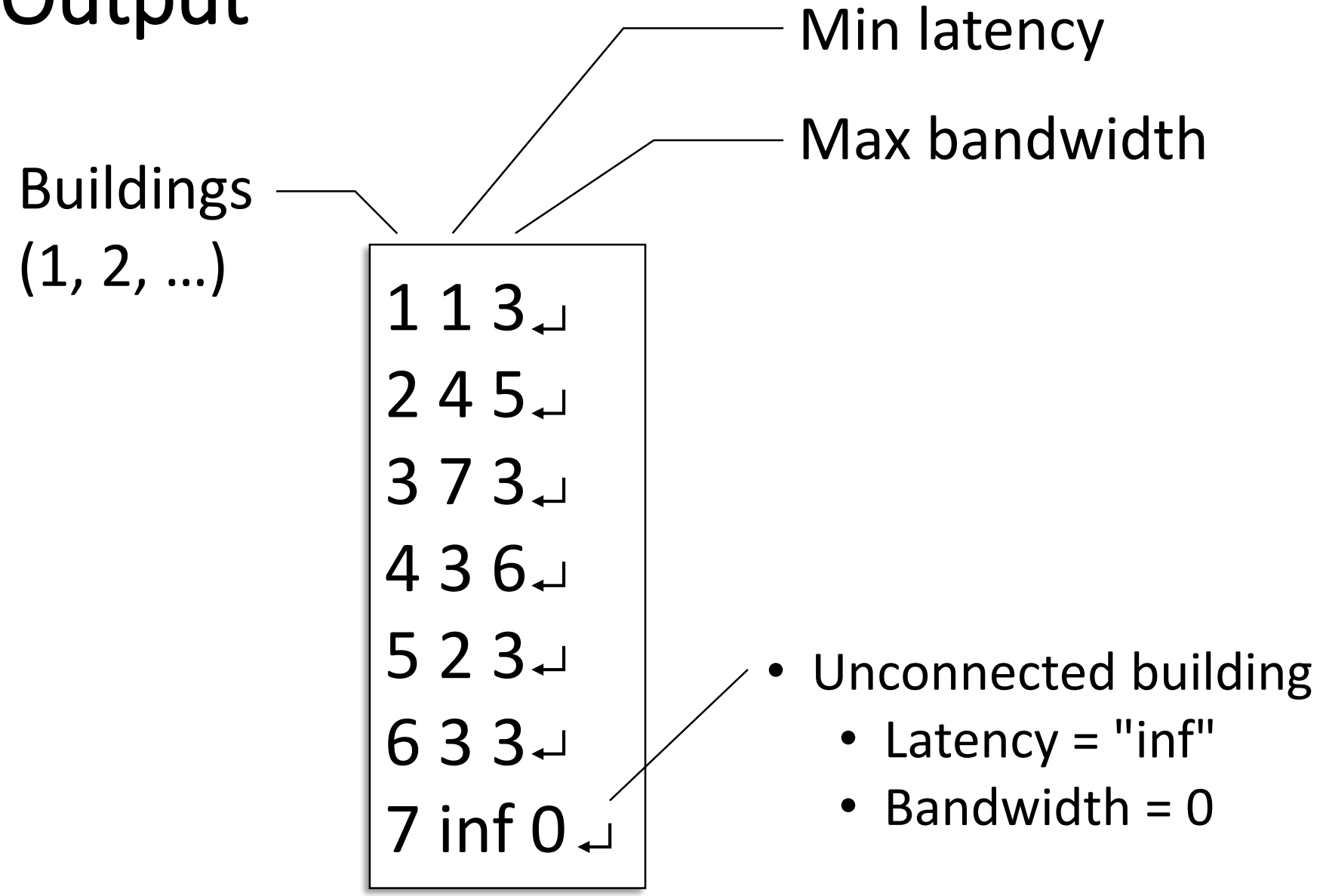
candidate connections
e.g., "7 5 1 9" denotes:


latency = 1
bandwidth = 9

latency is an integer between 1~10
bandwidth is an integer between 1~30

```
8
10
7 5 1 9
0 1 1 3
1 5 1 4
5 6 1 3
6 2 1 3
0 2 5 5
0 4 3 6
2 6 4 2
4 6 4 2
2 3 3 3
```

# Output


Min latency
Max bandwidth
Buildings
(1, 2, …)
1 1 3↵
2 4 5↵
3 7 3↵
4 3 6↵
5 2 3↵
6 3 3↵
7 inf 0↵
• Unconnected building
• Latency = "inf"
• Bandwidth = 0