

CSC373 Worksheet 5 Solution

August 7, 2020

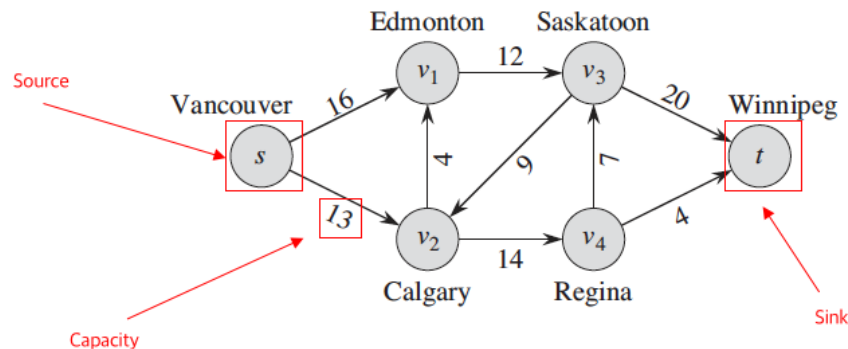
1. Notes

- **Maximum Flow Problem:**

- Is about computing the greatest rate at which we can ship material from the source to the sink without violating any capacity constraints

- **Flow Network:**

- $G = (V, E)$ is a directed graph in which each edge $(u, v) \in E$ has a nonnegative capacity $c(u, v) \geq 0$.
- Two vertices must exist: **source** s and **sink** t
- **path** from source s to vertex v to sink t is represented by $s \rightsquigarrow v \rightsquigarrow t$



- **Capacity:**

- Is a non-negative function $f : V \times V \rightarrow \mathbb{R}_{\geq 0}$
- Has **capacity constraint** where for all $u, v \in V$ $0 \leq f(u, v) \leq c(u, v)$
 - * Means flow cannot be above capacity constraint

- **Flow:**

- Is a real valued function $f : V \times V \rightarrow \mathbb{R}$ in G

- Satisfies **capacity constraint** (i.e for all $u, v \in V$, $0 \leq f(u, v) \leq c(u, v)$)
- Satisfies **flow conservation**

For all $u \in V - \{s, t\}$, we require

$$\sum_{v \in V} f(v, u) = \sum_{v \in V} f(u, v) \tag{1}$$

Means total flow forward is the same as total flow backward