

# IGP for Temporal Links

draft-chen-lsr-tl-00

Huaimo Chen, Aijun Wang, Gyan S. Mishra,  
Zhenqiang Li, Yanhe Fan, Xufeng Liu, Lei Liu

IETF 117

# Overview

- Temporal Link Cost Functions
  - Example Network with Temporal Links
  - Periodic Cost Function
  - Change in Given Periods
- Extensions to IGP

# Introduction

- Cost of link is normally constant such as  $C_0$

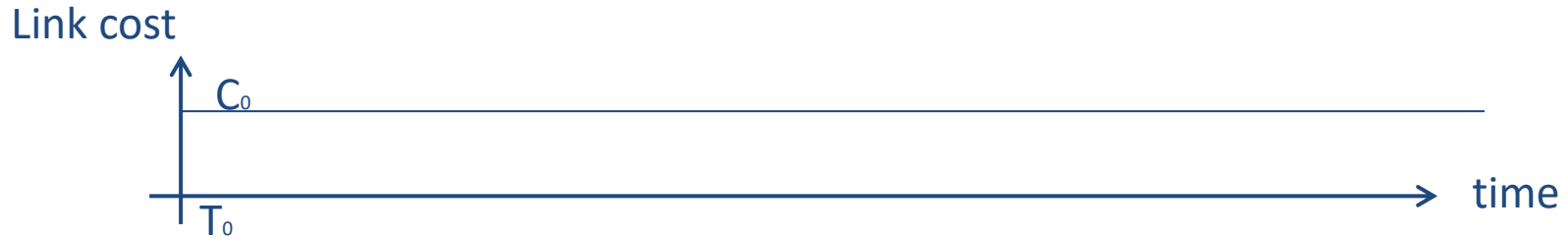


Figure 1. Link cost is constant

- Link whose cost is function of time, called temporal link

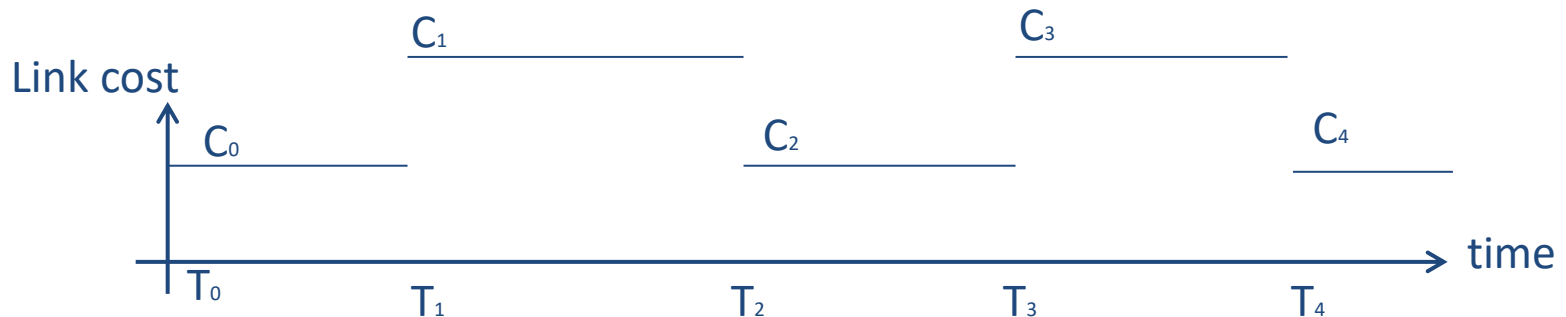


Figure 2. Link cost is a function of time

# Example Network

A satellite moves around the earth in its orbit once in a period.

E.g., a star link satellite (e.g.,  $S_c$ ) moves around the earth once every 95 minutes (i.e., 5,700 seconds). During this period, the satellite (e.g.,  $S_c$ ) can see or have link from it to a node (e.g., A) on the earth in a time interval such as ~400 seconds.

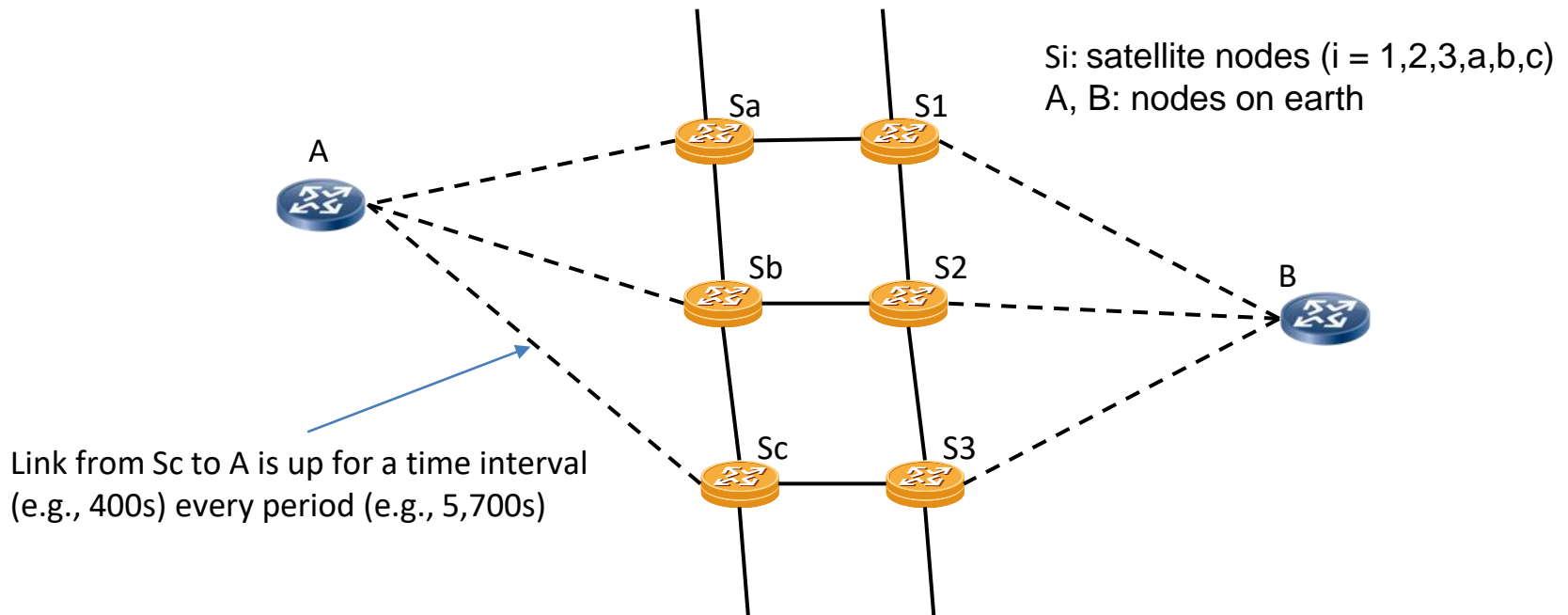


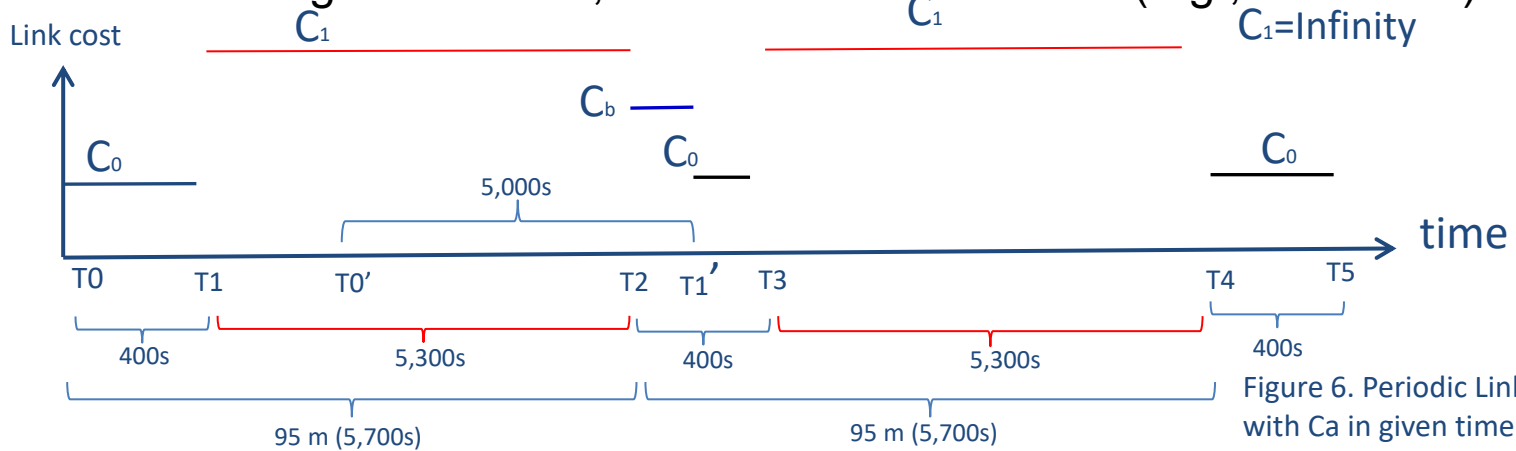
Figure 3. Network with Temporal Links





# Change in Given Interval

The cost of a temporal link is  $C_0$  for a time interval from a given time  $T_0$ , in every time period, and is Infinity for rest of the period except for a given interval. In the given interval, the cost of the link is  $C_b$  (e.g.,  $C_b = 3 * C_0$ ).



When the given interval is 5,000s from given time  $T_0'$ , the cost of link is  $C_b$  from  $T_2$  for  $(T_1' - T_2)$ s,  $C_0$  from  $T_1'$  for  $(T_3 - T_1')$ s and then Infinity for 5,300s.

0	1	2	3
0 1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
Type (TBD3)			
Length			
Start-time (= $T_0'$ )			
Interval-length (= 5,000)			
Cost (= $C_b$ )			

Figure 6B. Fixed Time Interval sub-TLV

Link cost function sub-TLV:

Fixed time interval sub-TLV: Its body contains Start-time, Interval-length, Cost.

The cost of the link is Cost (=  $C_b$ ) from a time indicated by Start-time (=  $T_0'$ ) for a time interval indicated by Interval-length (= 5,000s).

# Extensions to IGP

## ➤ Cost function by combination of Sub-TLVs

Recurrent time interval Sub-TLV, Limited Recurrent time interval Sub-TLV and Fixed time interval Sub-TLV.

## ➤ Distributes cost function configured on link

OSPFv2: in OSPFv2 Extended Link TLV for the link in OSPFv2 Extended Link Opaque LSA

OSPFv3: in Router-Link TLV for the link in OSPFv3 E-Link-LSA

IS-IS: in Extended IS Reachability TLV for the link in LSP

## ➤ Maintains status of each link

cost function sub-TLVs, the down or up state,

**earliest link change time (ELCT)** at which cost of a link will change from C to Infinity or vice versa.

## ➤ Computes paths using costs of links at ELCT before ELCT and builds a next routing/forwarding table (NRT) based on the paths.

## ➤ Uses its NRT as its current RIB/FIB when the time is ELCT, and then finds a new ELCT, computes shortest paths using the costs of links at the new ELCT before the new ELCT and builds a new NRT based on the paths.

# Next Steps

- Welcome comments