

# Framework for Temporal Tunnel Services (TTS)

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# Temporal LSP Tunnel

- Existing LSP tunnel
  - Set up an LSP tunnel, assuming it up and use resources such as bandwidth forever until down

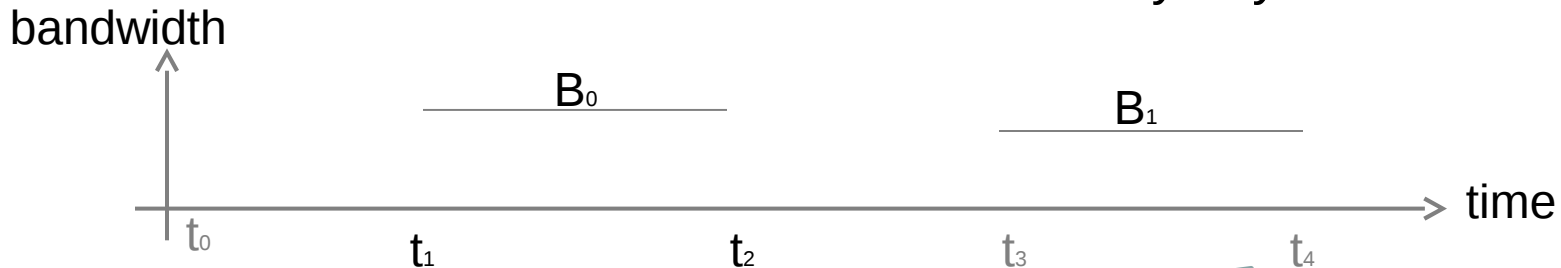


- Temporal LSP tunnel

**Temporal LSP:** LSP with time intervals, using resources and carrying traffic only in each of the intervals

e.g., a TE LSP from time  $t_1$  to  $t_2$ ,

another TE LSP from time  $t_3$  to  $t_4$  every day

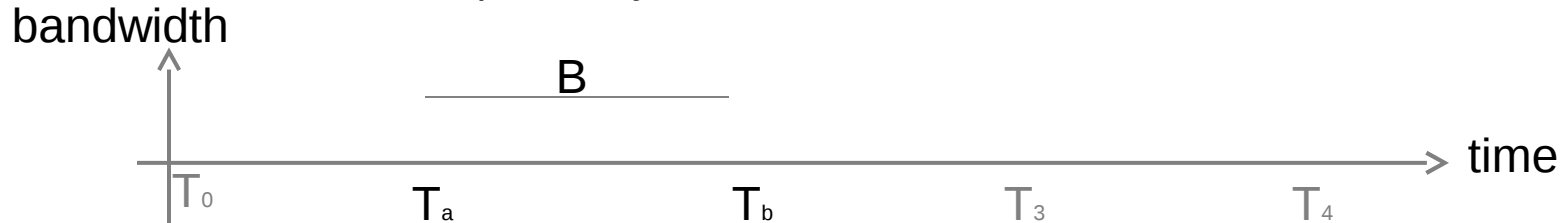


Book LSP in advance in time intervals, Service calendaring, scheduling

# Operations Overview

**Simple time interval**  $[T_a, T_b]$ : time period from  $T_a$  to  $T_b$

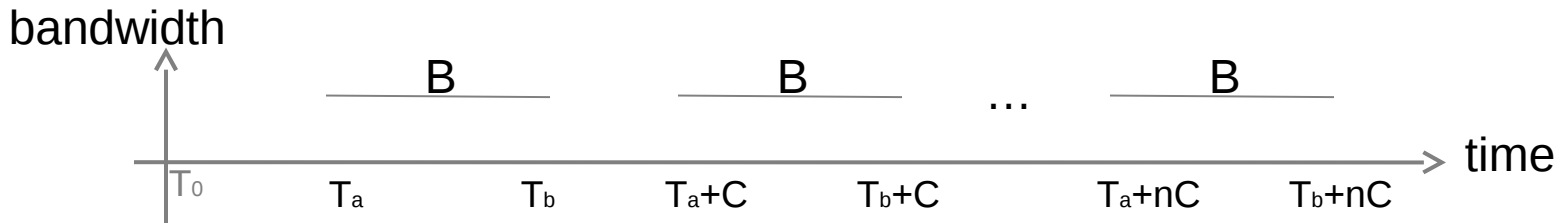
- LSP with  $[T_a, T_b]$ 
  - path satisfying the constraints from  $T_a$  to  $T_b$  is computed
  - LSP is set up to carry traffic from  $T_a$  to  $T_b$



**Recurrent time interval**  $[T_a, T_b]$  repeats  $n$  times with repeat cycle  $C$

$[T_a, T_b], [T_a+C, T_b+C], [T_a+2C, T_b+2C], \dots, [T_a+nC, T_b+nC]$

- LSP with “[ $T_a, T_b$ ] repeats  $n$  times with repeat cycle  $C$ ”
  - path satisfying the constraints in each of  $(n+1)$  time intervals
  - LSP is set up to carry traffic in each of  $(n+1)$  intervals

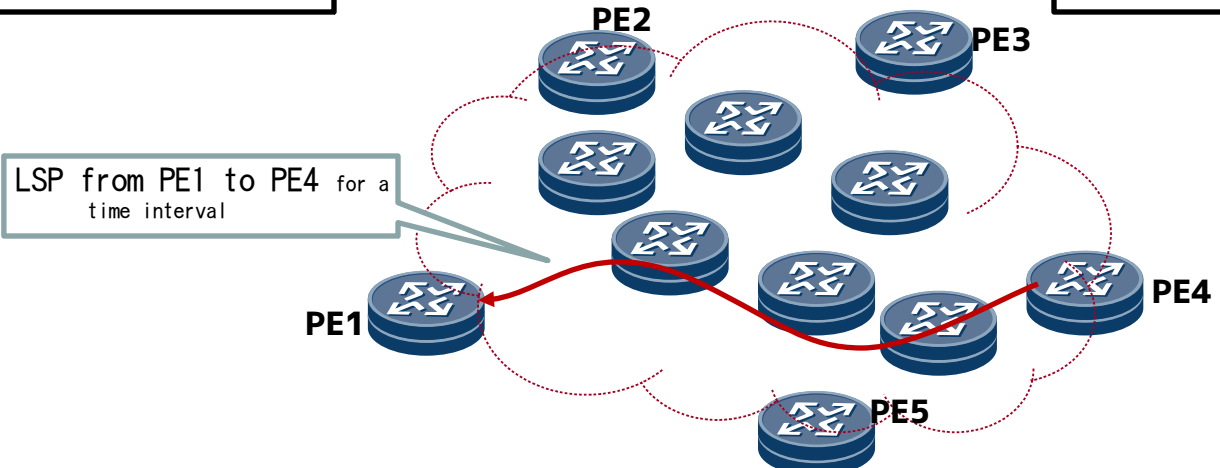
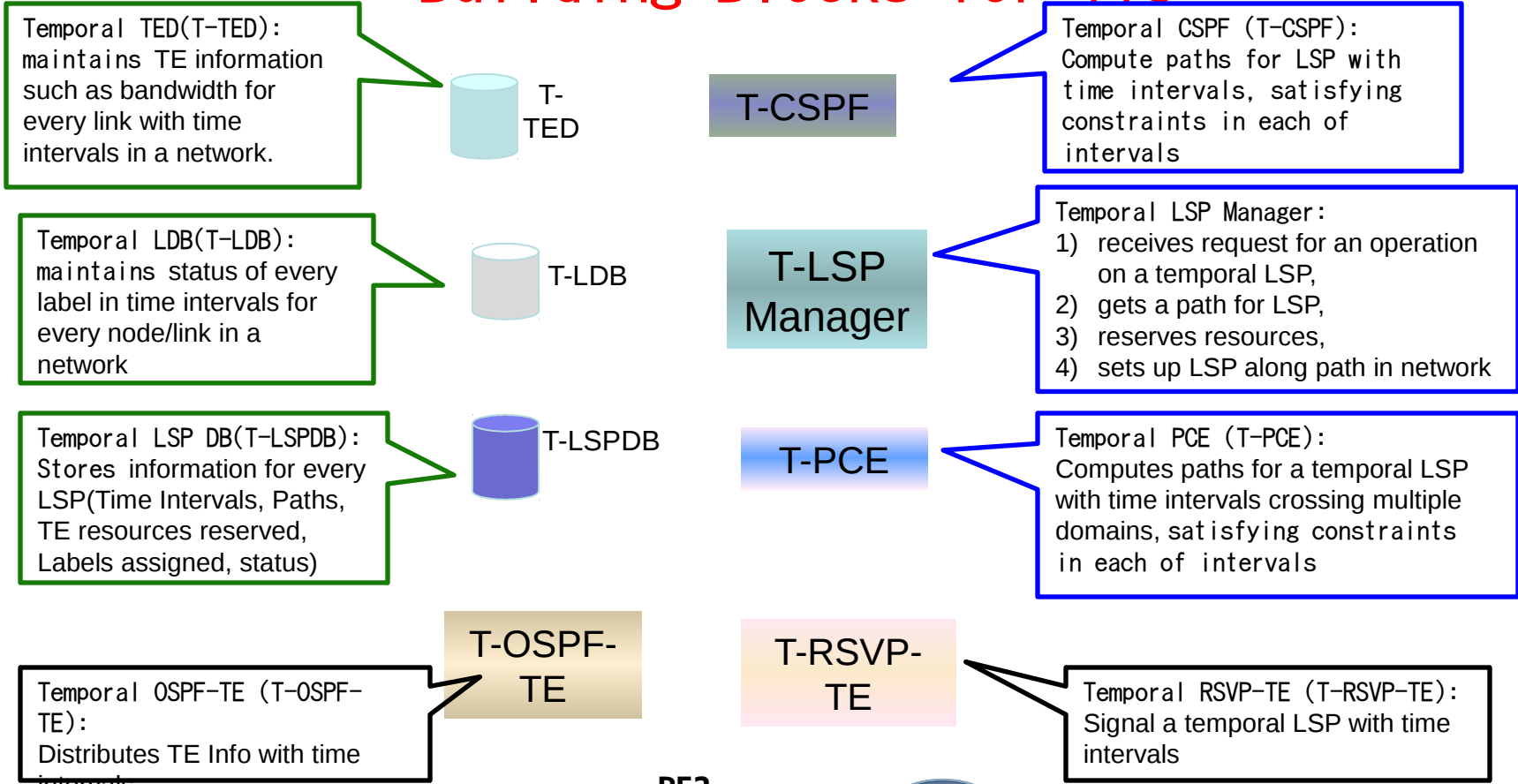


**Elastic time interval**  $[T_a, T_b]$  within  $-P$  and  $Q$

**Changes to Time Intervals** on LSP

**Graceful Periods**

# Building Blocks for TTS



# Reference Models for TTS

## Centralized Models

Single Domain Model

Multi Domain Model

## Hybrid Models

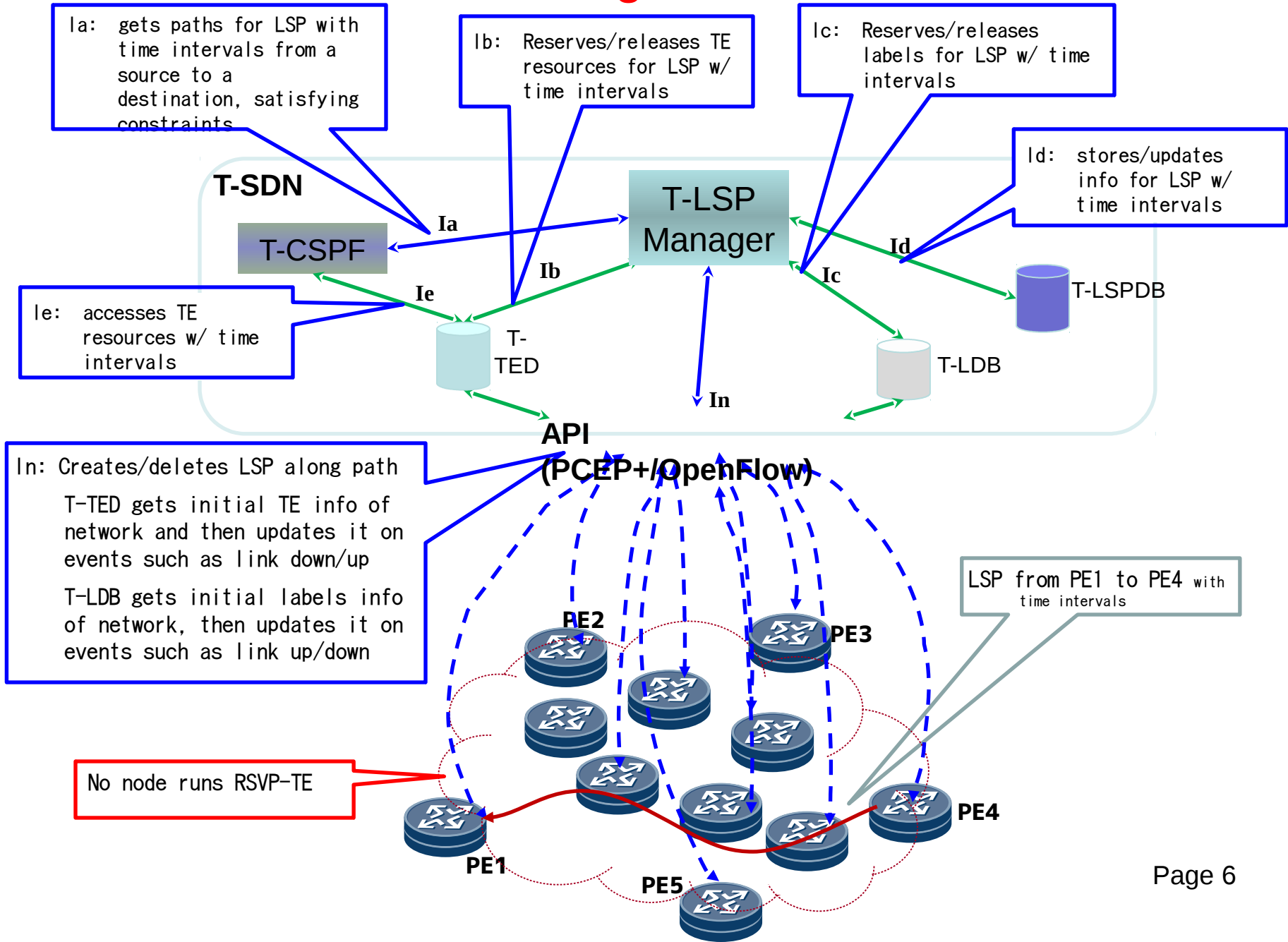
Single Domain Model

Multi Domain Model

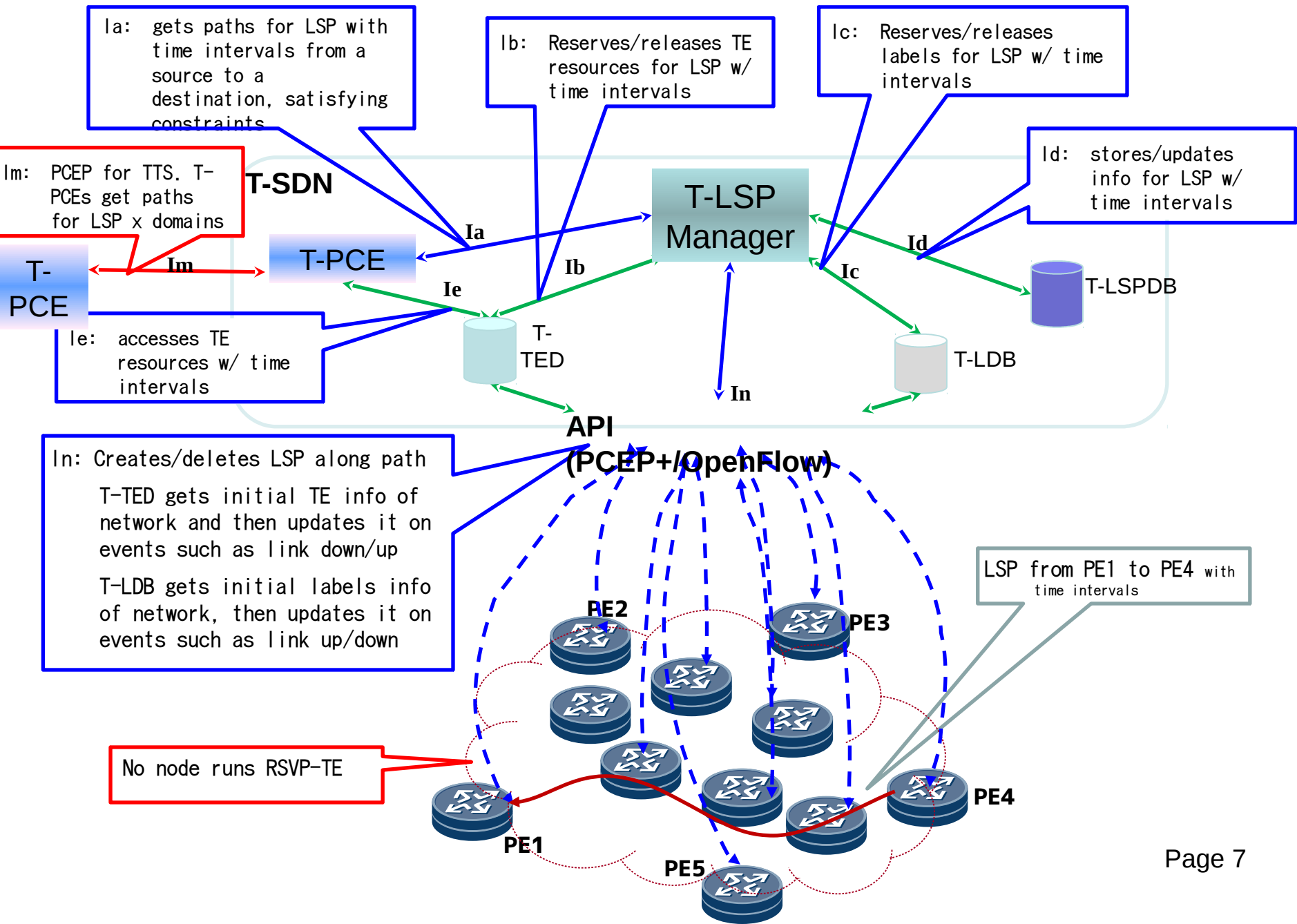
Temporal Stateful PCE

## Distributed Model

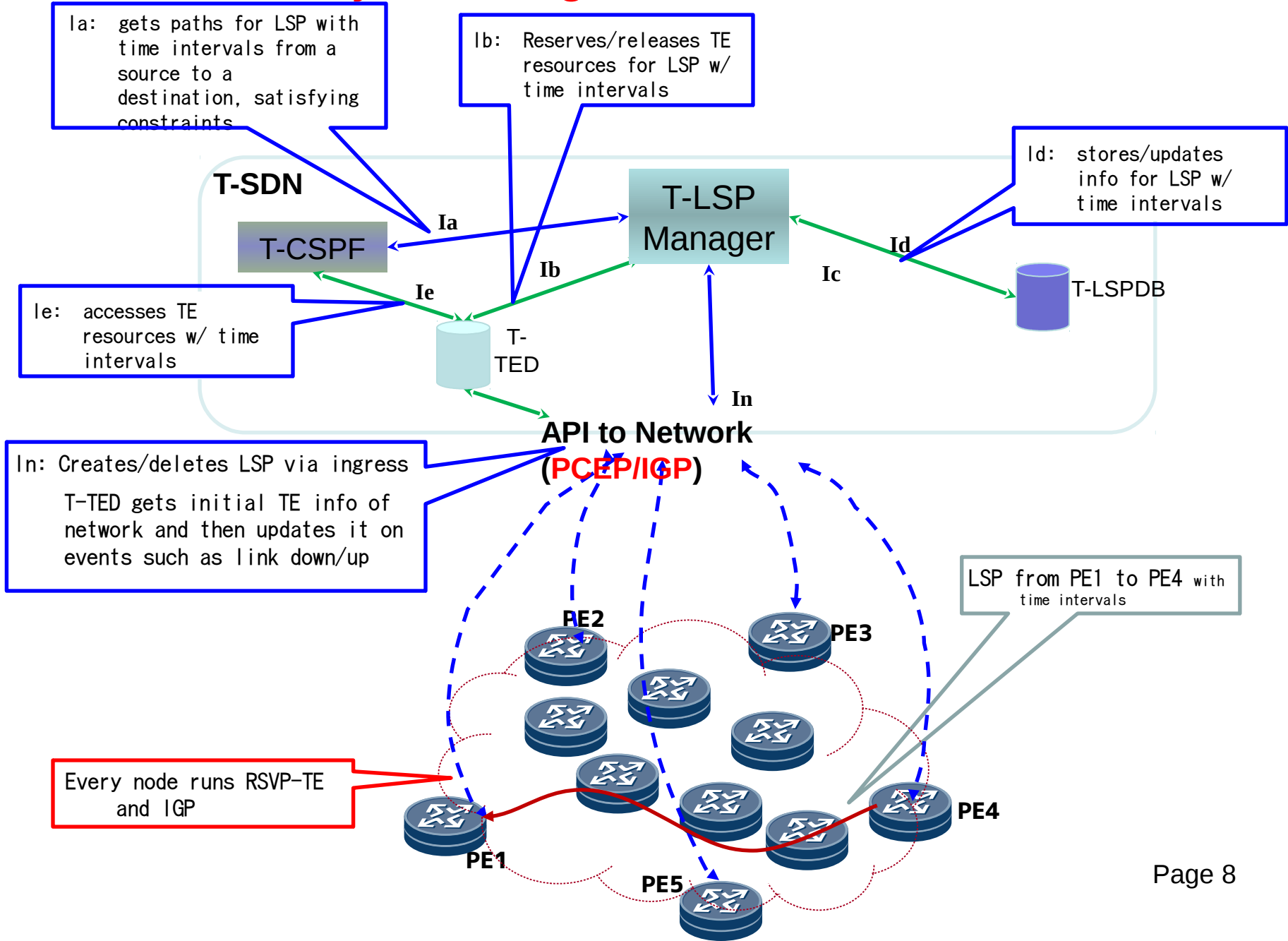
# Centralized Single Domain Model



# Centralized Multi Domain Model

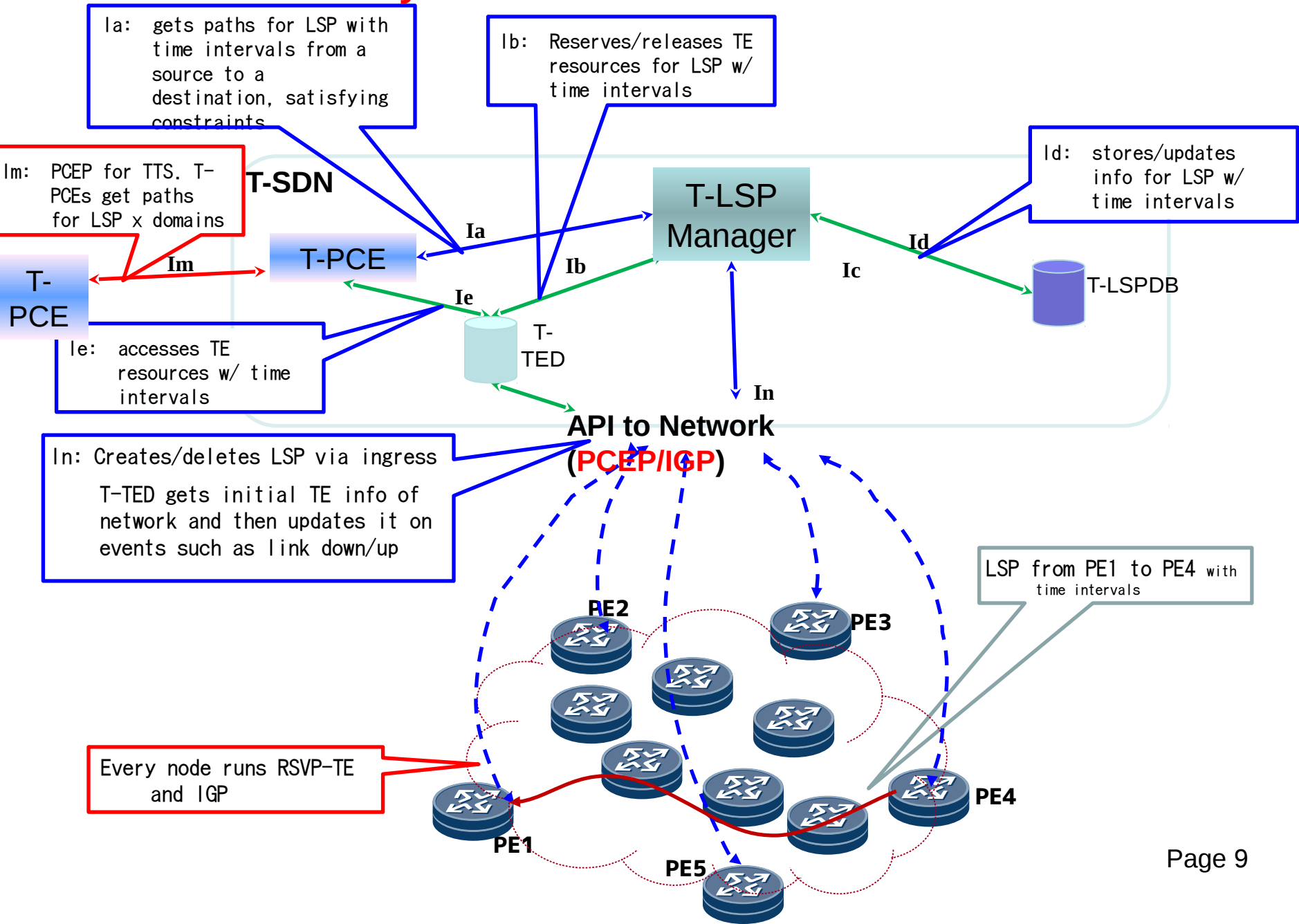


# Hybrid Single Domain Model

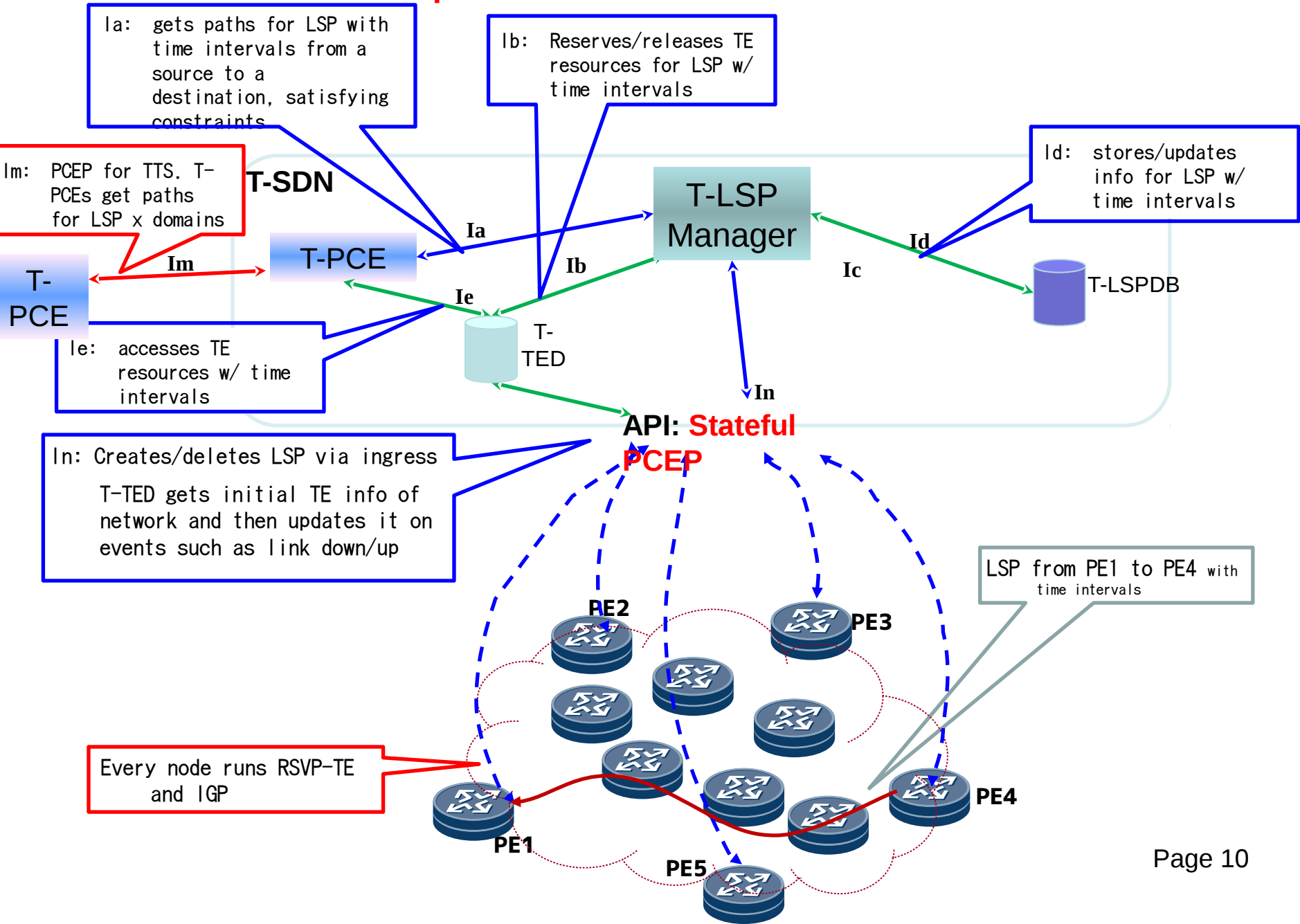




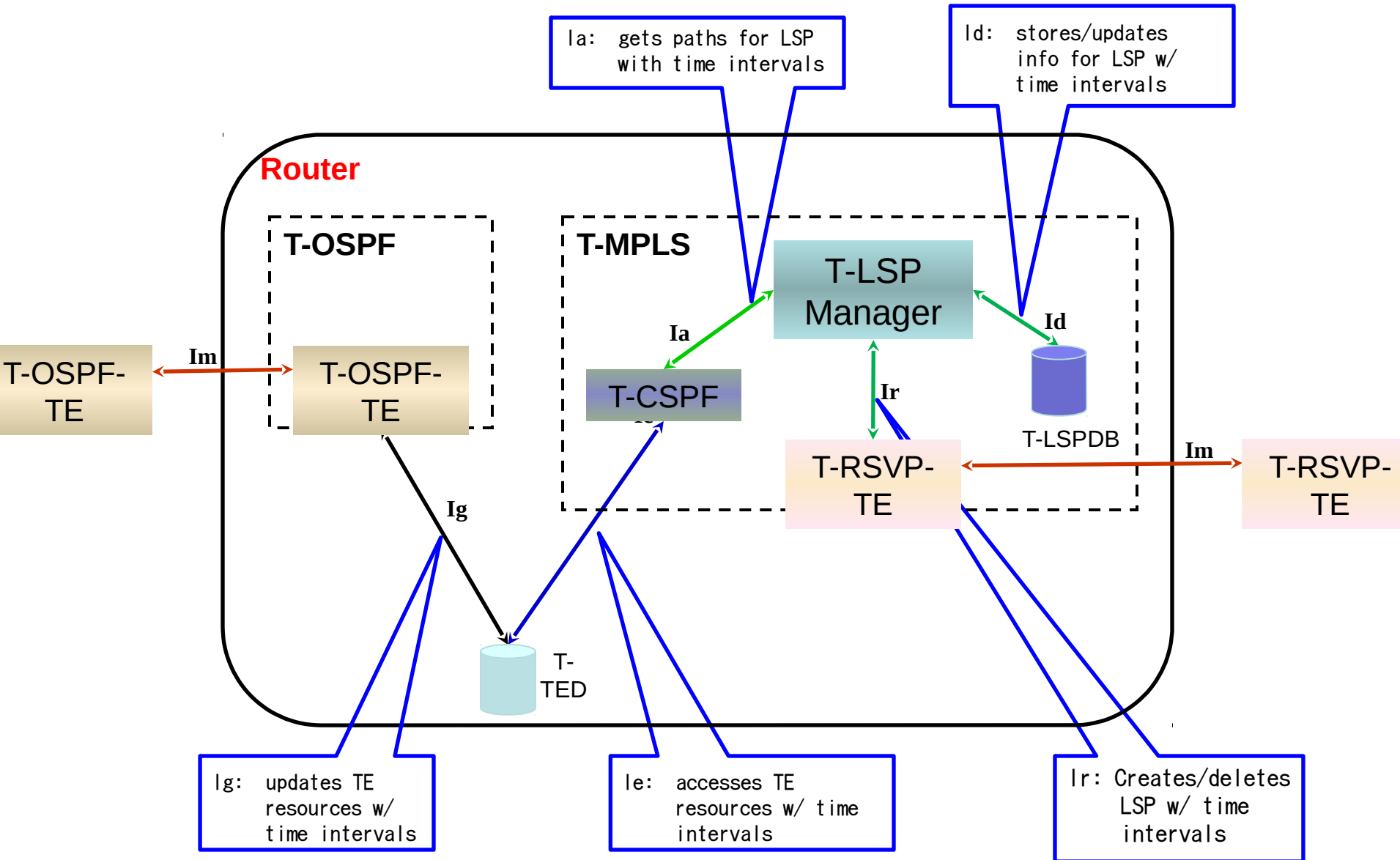
# Hybrid Multi Domain Model



# Temporal Stateful PCE Model



# Distributed Model



# Next Step

- Welcome comments