OSPF Topology-Transparent Zone

Huaimo Chen (huaimochen@huawei.com)
Renwei Li (renweili@huawei.com)
Gregory Cauchie (greg.cauchie@gmail.com)
Ning So (ning.so@tatacommunications.com)
Lei Liu (liulei.kddi@gmail.com)
Alvaro Retana (aretana@cisco.com)
Contents

- Introduction
- Operation Simplified (new)
- Changes to OSPF Protocol
  - LSA Change – I bit
  - TTZ TLV in RI LSA (new)
- Smooth Migration to TTZ (new)
- Next Step
Definition of TTZ

A group of routers and links connecting routers with same TTZ ID
  ➢ which is virtualized as
    • **a group of TTZ edge routers fully connected** or a single router
  ➢ of which routers outside TTZ are NOT aware

Links, routers inside TTZ are NOT advertised to routers outside of TTZ
Operation Simplified: 1 cmd/router

No configuration changes on router outside TTZ

Configurations on router R2:
- router ip ospf 1
- Interface ethernet 0/0
  - ip address 10.10.120.1/24
- Interface ethernet 1/0
  - ip address 10.10.220.1/24

Configurations on router T1:
- router ospf 1
- Interface ethernet 1/0
  - ip address 10.10.120.1/24
- Interface ethernet 2/0
  - ip address 192.168.20.1/24
  - ttz 192.168.100.100

Configurations on router T5:
- router ospf 1
- Interface ethernet 3/0
  - ip address 192.168.30.1/24
- ttz 192.168.100.100

Configure TTZ ID on one interface in TTZ for edge

Configure TTZ ID on internal TTZ router

Will Simplify It More
Contents

- Introduction
- Operation Simplified *(new)*
- Changes to OSPF Protocol
  - LSA Change – I bit
  - TTZ TLV in RI LSA *(new)*
- Smooth Migration to TTZ *(new)*
- Next Step
LSA Change — I bit

1 bit to identify if a link is in TTZ

I = 1: Link is in TTZ
I = 0: Link is not in TTZ

Meaning of “Link Type” of 7 bits is the same as that of “Link Type” of 8 bits.
Router LSA Generated by T1/T5 to inside TTZ

- **LS Type = 1**
- **Link State ID** (T1)
- **Advertising Router** (T1)
- **LS Sequence Number**
- **LS Checksum**
- **Length**
- **Number of Links**

### Header

<table>
<thead>
<tr>
<th>LS Age</th>
<th>Options</th>
<th>LS Type = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Link State ID (T1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advertising Router (T1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS Sequence Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS Checksum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Links</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router Link: T1 to R2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router Link: T1 to T2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router Link: T1 to T4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router Link: T1 to T5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Flags

- **I=0 for Normal Link**
- **I=1 for TTZ link**

---

- **LS Type = 1**
- **Link State ID** (T5)
- **Advertising Router** (T5)
- **LS Sequence Number**
- **LS Checksum**
- **Length**
- **Number of Links**

### Header

<table>
<thead>
<tr>
<th>LS Age</th>
<th>Options</th>
<th>LS Type = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Link State ID (T5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advertising Router (T5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS Sequence Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS Checksum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Links</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router Link: T5 to T1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router Link: T5 to T4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router Link: T5 to T6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router Link: T5 to T9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Flags

- **I=1 for TTZ Link**
- **I=1 for TTZ link**
- **I=1 for TTZ link**
- **I=1 for TTZ link**
- **I=1 for TTZ link**
- **I=1 for TTZ link**

---
Router LSA by T1 for Virtualizing TTZ

<table>
<thead>
<tr>
<th>LS Age</th>
<th>Options</th>
<th>LS Type = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Link State ID (T1)
- Advertising Router (T1)
- LS Sequence Number
- LS Checksum
- Length
- Number of Links

Flags

- Router Link: T1 to R2
- Router Link: T1 to T3
- Router Link: T1 to T4
- Router Link: T1 to T10

Normal Link

Normal Link ("virtual")
Contents

- Introduction
- Operation Simplified (new)
- Changes to OSPF Protocol
  - LSA Change – I bit
    - TTZ TLV in RI LSA (new)
- Smooth Migration to TTZ (new)
- Next Step
TTZ TLV in RI LSA

TLV for Info of TTZ router

E = 1: Edge router of TTZ
E = 0: Internal router of TTZ
TTZ ID: ID of TTZ to which router belongs

TTZ: all routers with same TTZ ID and all TTZ links.
For TTZ edge router, its links connected to other TTZ routers are TTZ links.
For TTZ Internal router, all its links are TTZ links.
RI LSA Generated by T1/T5

TTZ 100

Header

<table>
<thead>
<tr>
<th>LS Age</th>
<th>Options</th>
<th>LS Type = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Advertising Router (T1)

LS Sequence Number

LS Checksum

Length

TTZ TLV

E=1

TTZ ID = 100

E=1 for Edge of TTZ

Header

<table>
<thead>
<tr>
<th>LS Age</th>
<th>Options</th>
<th>LS Type = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Advertising Router (T5)

LS Sequence Number

LS Checksum

Length

TTZ TLV

E=0

TTZ ID = 100

E=0 for Internal router of TTZ
**Router LSA by T1 for Virtualizing TTZ (Same)**

<table>
<thead>
<tr>
<th>LS Age</th>
<th>Options</th>
<th>LS Type = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Link State ID (T1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advertising Router (T1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LS Sequence Number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LS Checksum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length</td>
</tr>
<tr>
<td></td>
<td>Flags</td>
<td>Number of Links</td>
</tr>
<tr>
<td>Router Link: T1 to R2</td>
<td>Normal Link</td>
<td></td>
</tr>
<tr>
<td>Router Link: T1 to T3</td>
<td>Normal Link (“virtual”)</td>
<td></td>
</tr>
<tr>
<td>Router Link: T1 to T4</td>
<td>Normal Link (“virtual”)</td>
<td></td>
</tr>
<tr>
<td>Router Link: T1 to T10</td>
<td>Normal Link</td>
<td></td>
</tr>
</tbody>
</table>
Contents

- Introduction
- Operation Simplified (new)
- Changes to OSPF Protocol
  - LSA Change – I bit
  - TTZ TLV in RI LSA (new)
- Smooth Migration to TTZ (new)
- Next Step
Smooth Migration to TTZ

Migration to TTZ with minimum interruption

1. **Configure TTZ**: routers in TTZ work as normal and prepare for TTZ
2. **Allow router to TTZ** after it is ready for TTZ
3. **Activate TTZ**: all routers in TTZ transfer to work as TTZ routers in ms

---

**Normal link**

**TTZ link**

---

**TTZ link states “viewed” after configure TTZ**

- (LSA with TTZ TLV or LSA with I bit generated and distributed)

2. **Allow it to TTZ after it has a complete TTZ topology as configured**

---

3. **Activate TTZ** after all routers in TTZ are allowed to TTZ.

- (Generate and distribute LSA for virtualizing TTZ. Transfer to TTZ)
Next Step

Welcome comments