SDN and ForCES based optimal network topology discovery

IETF 94, Yokohama, Japan (remote)
Monday 02 November 2015

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Motivation

- Efficient topology discovery for SDN
  - What more can you ask?

- Need:
  - Immediate notification upon a change
  - Low overhead

- Example Distributed solutions:
  - LLDP
  - ARP
  - NDP
Where in SDN does this fits?

Application Plane

Service

Network Service Abstraction Layer (NSAL)

Service

App

Control Abstraction Layer (CAL)

Control Plane

Forwarding Plane

Network Device

Device and Resource Abstraction Layer (DAL)

Management Plane

App

Service

Management Abstraction Layer (MAL)

MP Southbound Interface

CP Southbound Interface

App Service

Service Interface
So(lution)

- Leverage normal LLDP operation
  - Devices already know how, why replicate?
- Abstract (DAL) info and collect on controller
- ForCES as the glue
  - Model
    - Topology Information
    - LLDP Control parameters
  - Protocol
    - Extract topology information on demand per device
    - Events for local topology change
Benefits

• No overhead (primarily on CPSI)
  - No need for an LLDP packets to run around in circles (e.g. in OpenFlow topology discovery)

• Immediate response
  - Each LLDP update immediately creates an event

• No change to reinvent the wheel
  - Device already knows LLDP
  - Although the software will need to know ForCES!

• Not limited to LLDP
  - Can use same concept for other discovery protocols
Results

- Average time to discover new switch (from LLDP packet) and recompute topology: **12ms**
  - 90% less than OpenFlow-based solution (~100ms)

Experiment Caveats:
- Performed on 3 virtual machines on a x86 Intel Celeron B830
- Packet capture code is based on libpcap
- Few switches

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Backup Slide

<dataTypeDef>
  <name>LLDP_Info</name>
  <synopsis>Struct containing all usable info for discovery process</synopsis>
  <struct>
    <component componentID="1">
      <name>Neighbors</name>
      <synopsis>neighbors info</synopsis>
      <typeRef>Neighbors_entry</typeRef>
    </component>
  </struct>
</dataTypeDef>

evento eventID="2">
  <name>UpdateMap</name>
  <synopsis>Inform that new nodes are available for the datapath</synopsis>
  <eventTarget>
    <eventField>Map</eventField>
  </eventTarget>
  <eventChanged/>
  <eventReport>
    <eventField>Map</eventField>
    <eventSubscript>Neighbors</eventSubscript>
  </eventReport>
</evento>