Experiences with ALTO map calculation from network data

Draft-seidel-alto-map-calculation-00

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Hans Seidel

Recap

- Presentation @IETF 93
- Data Collection
  - Information retrieval from data sources
- Data Processing
  - Data aggregation → annotated directed graph data model
- ALTO Network Map Calculation
  - Grouping function to map Endpoints to PIDs
- ALTO Cost Map Calculation
  - Cost functions to calculate costs between PIDs

Challenges in Data Collection

- Older protocol versions
- Differences in protocol interpretation
- Incompatiblies regarding standards

- Example:
  - BGP path attribute „Aggregator“ \w ID=0 and AS=0
  - BGP duplicate prefixes from same neighbor
    - Partially with different next hop attributes
  - Ethernet jumbo frames with IS-IS
  - /160 IPv6 prefix in Netflow

Challenges in Data Processing

- High demand on resources
  - Disk Space (Flow Information)
  - Random Access Memory (IP prefixes, link annotations)
  - CPU (Routing, Flow Analysis)
- Efficient algorithms

- Examples:
  - Processed data:
    - >700k prefixes
    - >800 router, >3000 links
    - Several hundreds MB/min Netflow data
  - ECMP over eBGP
    - Multiple ingress points for same flow

Challenges in Network Map Generation

- Large quantity of data
- Conflicts in prefix assignment
- Large resulting Network Map JSON objects

- Example
  - More than 700k prefixes
  - Prefix assigned to more than one PID
  - Redundancy in Network Map
    - Two adjacent prefixes in same PID

Challenges in Cost Map Calculation

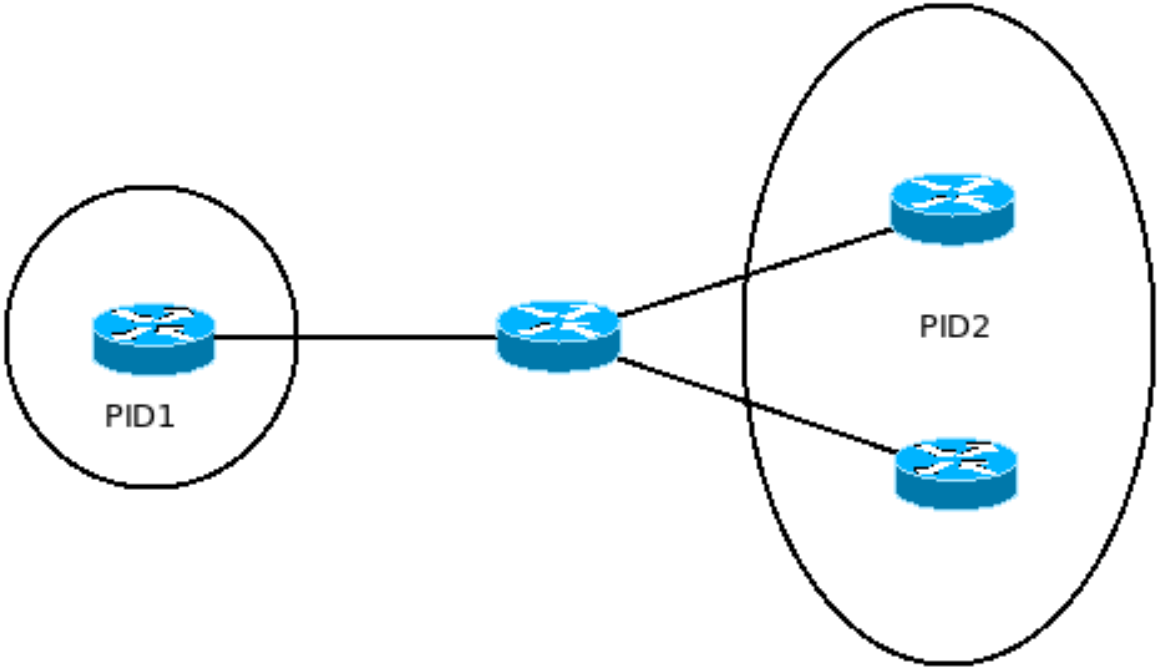
- Processing of large quantities of data
- Conflicts in path cost determination

- Examples:
  - Network with >700k prefixes, >800 router, 3000 links
    - High effort in best path determination
  - Equal cost multipath (ECMP) for endpoint pairs
  - Multi path cost values due to multiple endpoints in PIDs

Backup: Network Map Redundancy

- Two adjacent prefixes in same PID
  - Example: 192.168.1.0/24 and 192.168.0.0/24
  - → 192.168.0.0/23
- Subsequent prefixes in same PID
  - Example: 192.168.0.0/23 and 192.168.1.0/24
  - → 192.168.1.0/24 subnet of 192.168.0.0/23

Backup: Cost Map Multiple Path Costs



Backup: Cost Map ECMP Scenario