



LPM in Clickhouse

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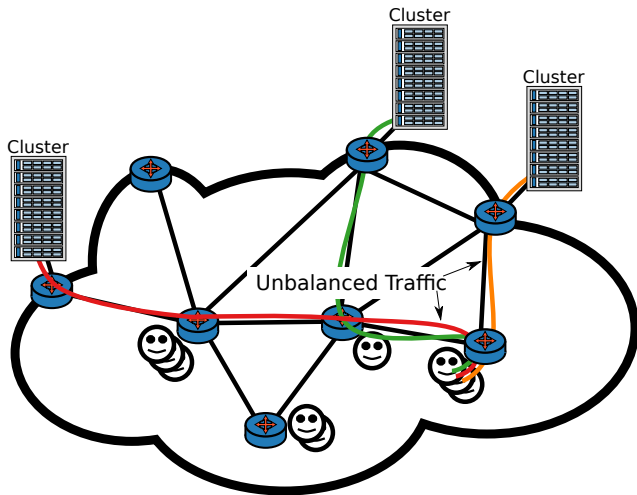
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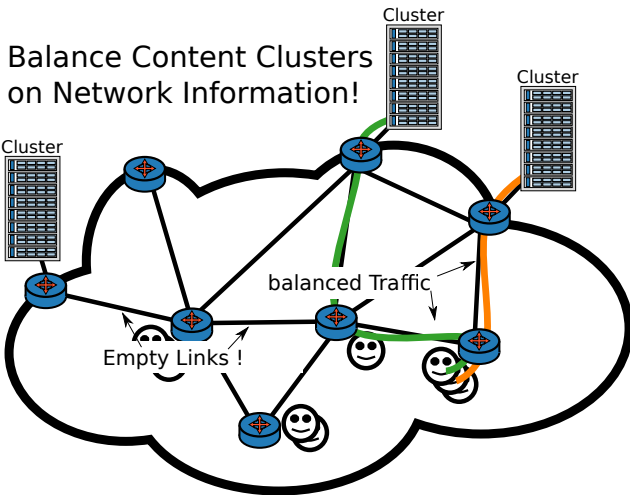


3 years ago we set out to do Traffinc Engineering...





... and we succeeded this year ...





... but data is just crying for analytics

>3k entities @ 130M entires per hour

Topology

>200 Tables @ 70M entires per hour

BGP

>1k Nodes @ 2M per hour

Telemetry

>2k Nodes @ 2.3B per hour

Netflow

>100 Nodes @ 1.5B per hour

DNS

Pre-Processing

Speed-up 2.5

Dual E5-2680 (12C), 512G RAM

180M per hour

Clickhouse

Speed-up 4

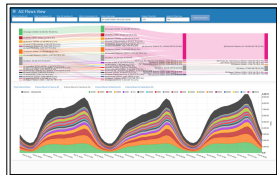
3x Dual E5-2680 (12C), 512G RAM, 10T
Single cluster, no failover

2M per hour

Frontend

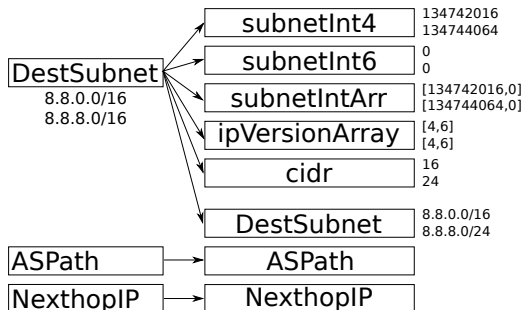
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E5-1650 (6C), 128G RAM, 150G
Single Server, no failover



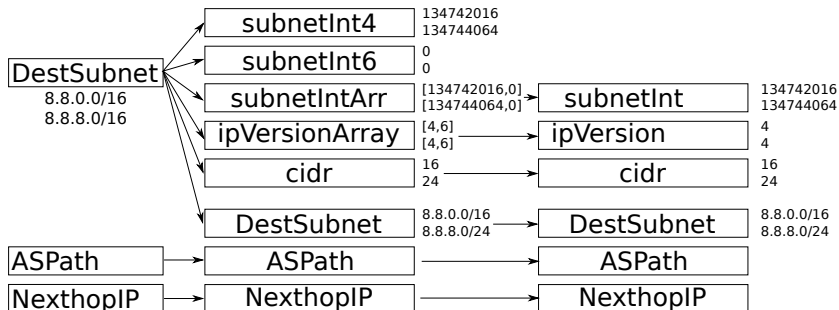


Dealing with Subnets



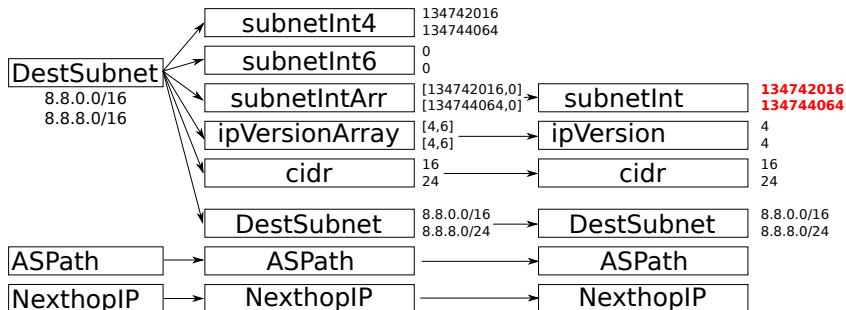


Dealing with Subnets



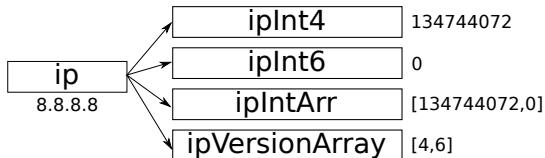


Dealing with Subnets



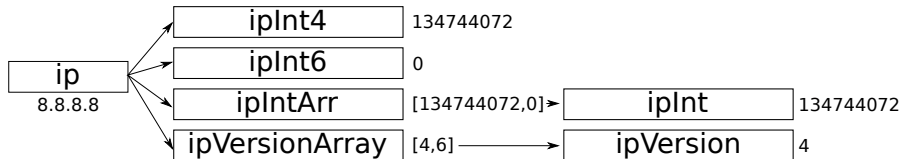


Dealing with IPs



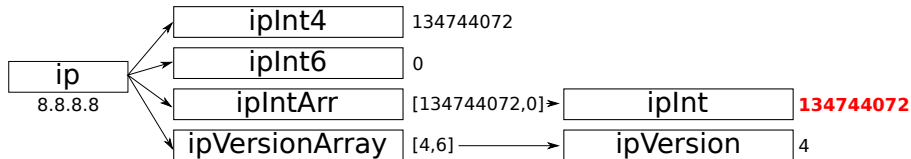


Dealing with IPs





Dealing with IPs





Matching the tables

IP

- IP:134744072, cidr: 32

Subnet

- subnet: 134742016, cidr: 16
- subnet: 134744064, cidr: 24



Matching the tables

Explode IPs for all possible cidrs

- ...
- IP: 134742016 cidr: 15
- IP: 134742016 cidr: 16
- IP: 134742016 cidr: 17
- ...
- IP: 134744064 cidr: 23
- IP: 134744064 cidr: 24
- IP: 134744064 cidr: 25
- ...

Subnet

- subnet: 134742016 cidr: 16
- subnet: 134744064 cidr: 24



Matching the tables

Explode IPs for all possible cidrs

- ...
- IP: 134742016 cidr: 15
- IP: **134742016** cidr: **16**
- IP: 134742016 cidr: 17
- ...
- IP: 134744064 cidr: 23
- IP: **134744064** cidr: **24**
- IP: 134744064 cidr: 25
- ...

Subnet

- subnet: **134742016** cidr: **16**
- subnet: **134744064** cidr: **24**

drawback

Table size of IPs increases

- IPv4: factor 33
- IPv6: factor 65/129



Matching the tables

Explode IPs for all possible cidrs

- ...
- IP: 134742016 cidr: 15
- IP: **134742016** cidr: **16**
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- ...
- IP: 134744064 cidr: 23
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- IP: 134744064 cidr: 25
- ...

Subnet

- subnet: **134742016** cidr: **16**
- subnet: **134744064** cidr: **24**

drawback

Table size of IPs increases

- IPv4: factor 33
- IPv6: factor 65/129

caveat

Join on IP+cidr gives random/all matches Solution:

- Order IP table by cidr desc.
- Use any join
- groupArray fields and take first



Thank you !

<https://groups.google.com/forum/#!topic/clickhouse/o0A9l1mfKOM>
or search the google group for LPM