Peering Analysis with Genie Networks

Application Note

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Application Background

As the internet activity continues to expand, ISPs across the globe are looking for economical ways to optimize their operations. Each ISP needs to find its own way to function in the Internet Peering Ecosystem. Having a suitable peering policy with peering business model is important for an ISP to maximize business opportunities or to minimize operation costs. A successful peering relationship should have an improved network performance while lowering operation costs or creating revenue for ISPs.

Genie's solutions generate different types of peering analysis reports to assist ISPs with evaluating the suitable peering candidates and subsequently optimizing the peering relationship through traffic engineering and network planning. With BGP routing information, Genie's solutions can target a specific autonomous system (AS) to carry out the relevant traffic and cost analysis as required and provide quantitative results for fair evaluation.

Internet Peering Ecosystem

Internet Peering describes a business relationship among ISPs in which companies reciprocally provide internet access to each other's customers. Due to the difference in business and network scales, ISPs have developed various business relationships as to how they interconnect their networks and hence the 'Internet Peering Ecosystem'. Each internet (geopolitical) region typically includes Tier 1 ISPs, Tier 2 ISPs, Content Provider and Enterprises, and Large-scale Network Savvy Content Providers.

Tier 1 ISPs Peering – Full Mesh Peering

A Tier 1 ISP has access to all the routing tables in the regional internet solely through peering relationships. In an interconnect region, Tier 1 ISPs usually have a full mesh peering relationship with other Tier 1 ISPs and therefore are generally not interested in peering with the rest of the players (i.e., Restrictive Peering Policy) who can potentially be paying customers to Tier 1 ISPs. This 'no-peering relationship' largely differentiates Tier 1 ISPs from other service providers.

Tier 2 ISPs Peering – Open Peering Policy

Tier 2 ISPs are the ones who purchase and resell transit within an internet region. As Tier 2 ISPs resell transit for business, they would actively look for opportunities to increase the number of peering they have to reduce their own transit costs.

Content Provider and Enterprise Peering – Purchaser

As the main focuses for content provider and enterprise players are to provide and create content to customers and users, they usually do not operate networks or sell transit and hence always buy transit from ISPs – No Peering Policy.

Large-scale Network Savvy Content Providers

Large Scale Network Savvy Content Providers purchase transit but have also adopted peering as a strategy to lower their traffic expenses owing to their large traffic volume. This not only reduces transit costs but also gives large content providers greater control over routing to improve traffic performance hence improving end-user experience. Content Delivery Network Players have an Open Peering Policy like Tier 2 ISPs and peer with various ISPs aiming to deliver services from a place closer to the eyeballs by storing cached web objects at the edge of network.

Free Peering VS Paid Peering

For Free Peering relationship to be established, the traffic volume exchanged needs to be roughly balanced for both parties to make sense financially (the not-to-exceed-ration is around 2:1). In contrast, Paid Peering is a business model developed between Large Scale Network Savvy Content Providers and ISPs in which physical peering is established but is priced the same way as transits.

Peering Policies

Within each Internet Peering Ecosystem, various peering policies have been developed for different business needs. As the internet develops over time, service providers have also extended their peering policies from one to another. This is summarized in the diagram below：

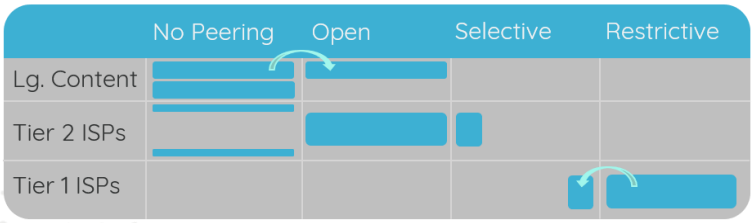

Figure 1: Various peering policies vs. Service Providers

Peering Analysis

Peering Evaluation – Selective Peering

Tier 1 ISPs may receive hundreds of peering requests each year and thus require an easy solution to analyze the traffic to or from the requesting network. GenieATM supports Tier 1 ISPs by generating the required reports and creating a set of filters to examine the traffic exchanged with the specific ASN. Tier 1 ISPs can then make decisions about their peering requests based on these reports.

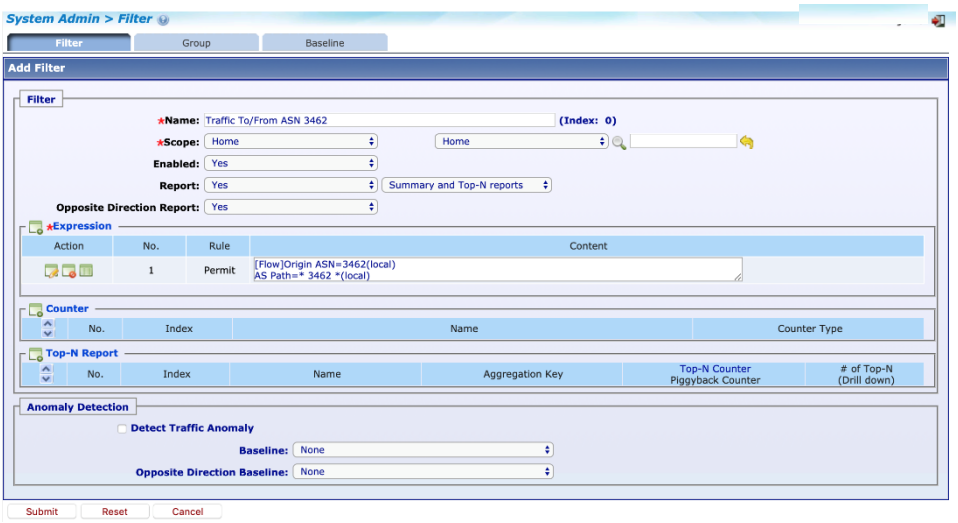

Figure 2: Filter configuration for a Peer ASN Top-N analysis

Figure 2 shows how a filter is created for a specific AS to obtain the respective traffic information using GenieATM. A report is then generated to display all the traffic information coming From/Thru and the amount of traffic going To/Thru that specific AS. Such information is particularly useful when evaluating a potential peering candidate. Traffic distribution of From and To the AS should be approximately balanced and not exceeding 2:1 for the AS to be a suitable peering partner.

Peering Evaluation - Open Policy

For ISPs wishing to peer with as many other ISPs as possible, it is important for them to carry out qualitative and quantitative analyses to ensure the peering relationship will be effective both financially and technically. GenieATM provides a proficient tool for ISPs to identify and evaluate a suitable new peering candidate.

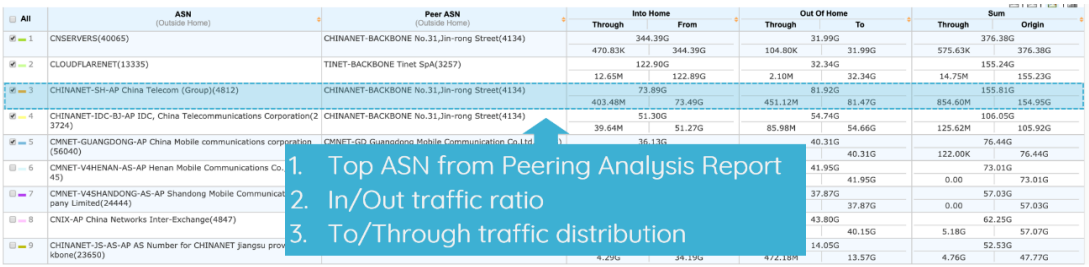

Figure 3: Top-N traffic report of peer for To and Thru traffic analysis

Firstly, using Top-N reports to generate peering analysis reports and identify the Top ASN with the most traffic volume. Next, find an ASN and compare the In/Out traffic ratio to see if the exchanged traffic volume is approximately balanced for both parties. An ISP would consider peering with another only when the exchanged traffic volume is similar both ways. Finally, compare the To/Through traffic distribution to check how much of the traffic is originated from the potential peer.

GenieATM can generate a Top-N report using the filter configuration to show the traffic distribution from this specific AS. If most of the traffic is originated from that AS (To traffic) or evenly comes from several other ASs (Thru traffic), then this AS would be the suitable peering candidate. Conversely, if most of the traffic is Thru traffic coming from another AS, then this other AS may be considered as a more suitable candidate to peer with.

The same process can be reapplied to this other AS to generate Top-N reports for further examination of the traffic distribution. This both simplifies and quantifies the traffic evaluation process. GenieATM provides abundant analyses allowing ISPs to choose the right peering partners efficiently, which is imperative for ISPs with an open peering policy.

Peering Evaluation - Restrictive Policy

For ISPs with a restrictive peering policy (mostly Tier 1 ISPs), the focus of peering analysis is to enhance network performance through network planning and traffic engineering - i.e. peering optimization.

Various BGP policies can be applied to build the preferred AS path/BGP route to decide how traffic arrives and leaves an AS in order to utilize ISP's network resources. GenieATM provides reports with detailed BGP attributes information that will be useful when configuring and applying BGP policies. BGP policies can be applied to set MED (Multi-Exit Discriminator) or AS Padding to load-balance inbound traffic from an AS. For the outbound traffic, BGP policies are used to favor one peer interface over another for routes from specific ASNs and can be achieved by setting Local Preference given that both interfaces have access to the same ASN.

GenieATM monitors the traffic load of interfaces of Neighbor/Sub-networks and generates various reports with different filter configurations (e.g. Prefix, Origin ASN, Peer ASN, AS Path, etc.) to breakdown BGP attribute traffic at an interface. This can be examined by creating a Filter to show the Origin ASN traffic distribution as well as creating a filter to show the Peer ASN traffic distribution of the specific ASN in order to find a specific peer to offload traffic to. GenieATM gives accurate traffic volume in the Top-N reports which can be used as reference to determine precisely how much traffic to be offloaded from the congested routes and the effect on the new route. The distribution of traffic can be evenly allocated to avoid over-offloading traffic from one to another.

Reports can also be generated to show the top talkers/listeners that are reached via a specific peer and based on traffic analysis, may potentially peer with that AS directly. GenieATM assists ISPs with offloading traffic from expensive or unstable peers through traffic engineering to ensure network operations and optimize network performance.

Cost Analysis

Direct peering with another AS would require some upfront fixed cost and equipment investments. Once the potential peering candidate is identified, further evaluation is therefore required to ensure the cost and investment needed to establish a new peer is justified in the long run.

GenieATM provides the essential traffic information for carrying out the peering cost analysis. By using Filters and rule-based reporting feature on GenieATM, a specific ASN of an ISP can be targeted to generate a Top-N report with traffic statistics. The potential savings with the new peering can be calculated using peering fixed costs and the generated traffic information. An example of how potential monthly cost saving could be calculated is shown in Figure 4 below.

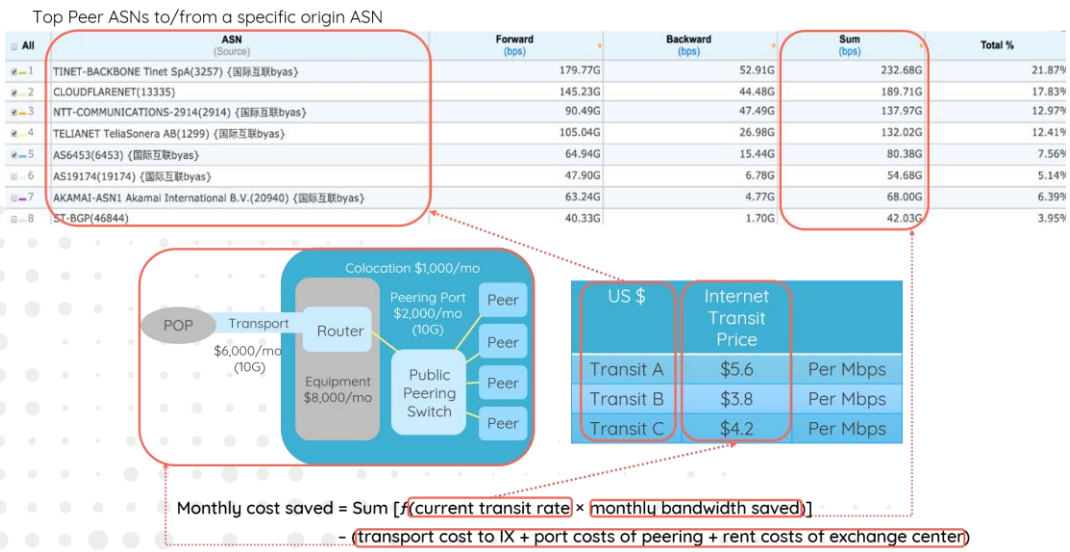

Figure 4: New peer cost analysis and evaluation

The 'monthly cost saved' can be calculated simply by subtracting total peering fixed costs (including transport cost to Internet Exchange, peering port costs, and exchange center rentals) from the current transit costs (transit rate x potential saved traffic volume). The resulted monthly cost saved needs to be equal or greater than zero for the peering relationship to benefit financially. GenieATM gives ISPs a comprehensive solution which quantifies the cost analysis for peering and largely simplifies the decision process.

Peer Monitoring

The stability and reliability of a peer largely affects the quality and security of a network. An unstable peer could consume more network resources than originally planned. GenieATM monitors the peering relationships for ISPs to ensure the performance of existing peers, while offering breakdown reports on peer partners. It also monitors BGP stability via the change in number of BGP messages exchanged. Alerts are generated when a huge, unusual churn of number message updates occur (Figure 5) which usually signifies an unstable peer. GenieATM also provides traffic visibility which can be used to monitor the effect of traffic engineering after offloading traffic from a heavy loaded route.

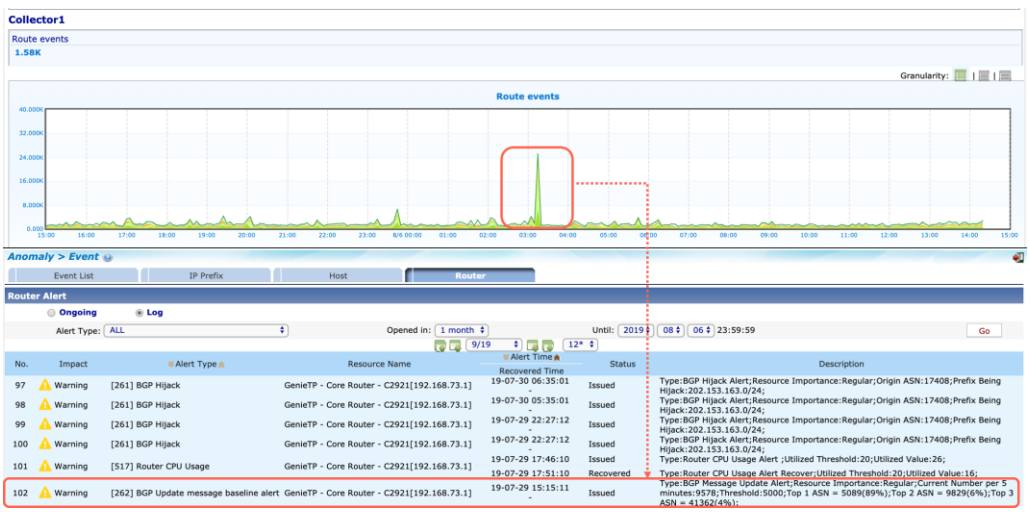

Figure 5: BGP message monitoring and real-time alerts

Peering Analytics

GenieAnalytics uses charts and tables to show the ASes that traffic leaving the home network passes through on the way to its destination. It is useful for understanding the traffic from your network by AS, interface, and geography. The better visualization of the peering traffic can help intuitively identify and validate the peering relationship candidates, as well as verify the peering and transit costs.

For example, by using a Sankey chart (Figure 6) to show the AS paths taken by network traffic, you can clearly see the top paths with multiple AS hops and the quantity of traffic between different hops. In the Sankey chart, AS hops are represented by colored vertical bars. The width of the grey bands between hops is proportional to the quantity of traffic. Hovering the cursor over a vertical bar or a grey band shows the tool tip with the traffic information about the AS hop or the highlighted path.

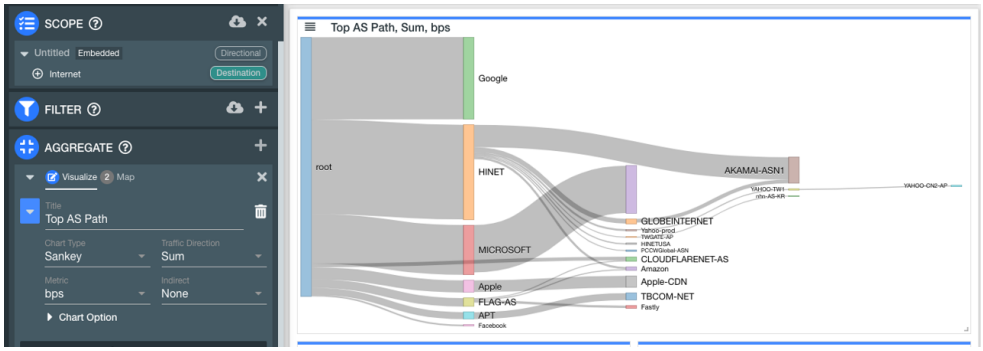

Figure 6: Visualization of peering traffic on a Sankey chart

BGP Correlated Flow Information

GenieAnalytics correlates flow and BGP information for users to perform flexible and sophisticated ad-hoc BGP-related analytics (Figure 7). Enriched flow record fields can be used to enable abundant traffic filtering and aggregation. The enriched data fields include source and destination AS path, BGP community string, BGP next hop IP address, Peer ASN, next hop AS, last hop AS, AS path length, etc.

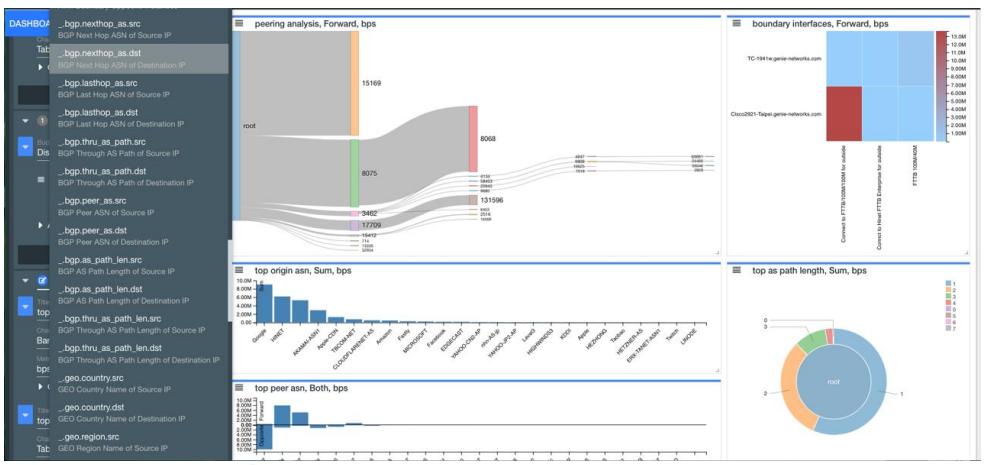

Figure 7: Multi-dimensional ad-hoc BGP-related analytics

Conclusion

Genie's solutions provide ISPs with abundant traffic reports and peering analyses not only to identify the optimal peering partners but also to evaluate the technical and financial benefits of the new peer. Genie's solutions offer user configurable Top-N analytic reports that can be used to conduct various peering analyses to match ISPs with different peering policies. These reports provide a reference for looking for new peering candidate and are useful for cost evaluation, new peer investment justification, and traffic engineering. GenieAnalytics allows users to conduct flexible, multi-dimensional BGP-related ad-hoc analytic queries with intuitive graphical visualizations. In addition to traffic analysis, GenieATM monitors the stability and reliability of the existing peers to ensure the performance of route and network. Together, GenieATM and GenieAnalytics provide ISPs with a complete solution for peering analysis to match a wide range of business needs and give ISPs the key to enhanced network management and network optimization.

About Genie Networks

Genie Networks is a leading provider of network traffic intelligence and security solutions that ensure complete visibility into data traffic trends and instant protection against cyber threats. Our solutions enable customers to optimize the performance, security and cost of their network operations to stay ahead in the ever-changing digital landscape.

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