
Voice Peering: Interworking SIP and BGP

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Agenda

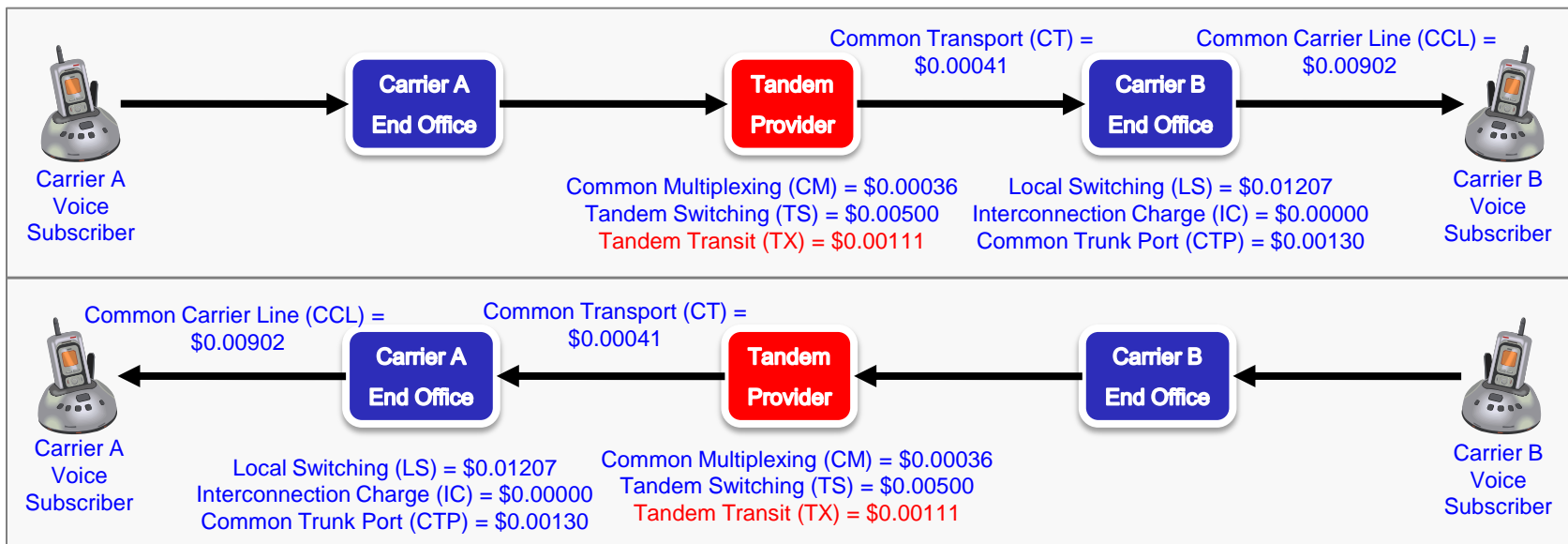
- The value behind voice peering.
- Voice peering architecture.
- Things to keep an eye on.
- Tools to help.

Value Behind Voice Peering

- Traditional voice traffic exchange is clouded by complex billing rules.
- For key voice partners: why expend energy on inefficient rating, billing, collections, and revenue assurance processes that result in no net revenues?
- Voice peering interconnects using Session Initiation Protocol (SIP) and External Border Gateway Protocol (EBGP) remove unnecessary transit costs where it makes sense for longer-term business needs.

Why: Convoluted Billing Rules

- In a traditional voice interconnect, significant time and effort is expended to collect and rate call detail records, then bill and collect from voice carriers.
- Typical example of balanced traffic for intrastate long distance voice calls*:



Carrier A bills Carrier B: $CM + TS + CT + LS + IC + CTP + CCL = \0.02816 / minute

Carrier B bills Carrier A: $CM + TS + CT + LS + IC + CTP + CCL = \0.02816 / minute

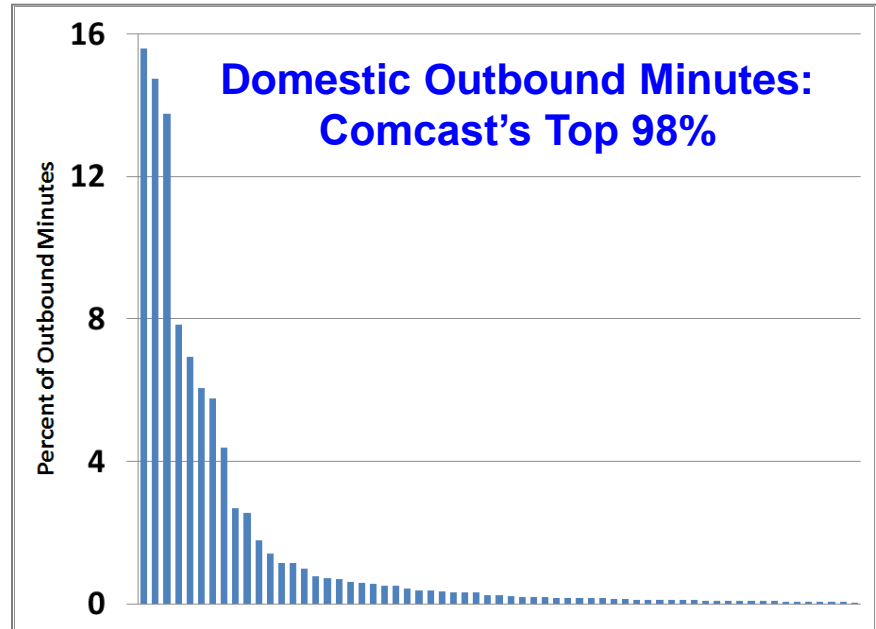
Tandem Provider bills Carrier A and Carrier B for their originated minutes: $TX + TX = \$0.00222$ per two minutes exchanged

- At the end of the day, net money changing hands between two voice providers for balanced traffic is \$0, but transit carrier gets paid for service.

* Rates for illustrative purposes only

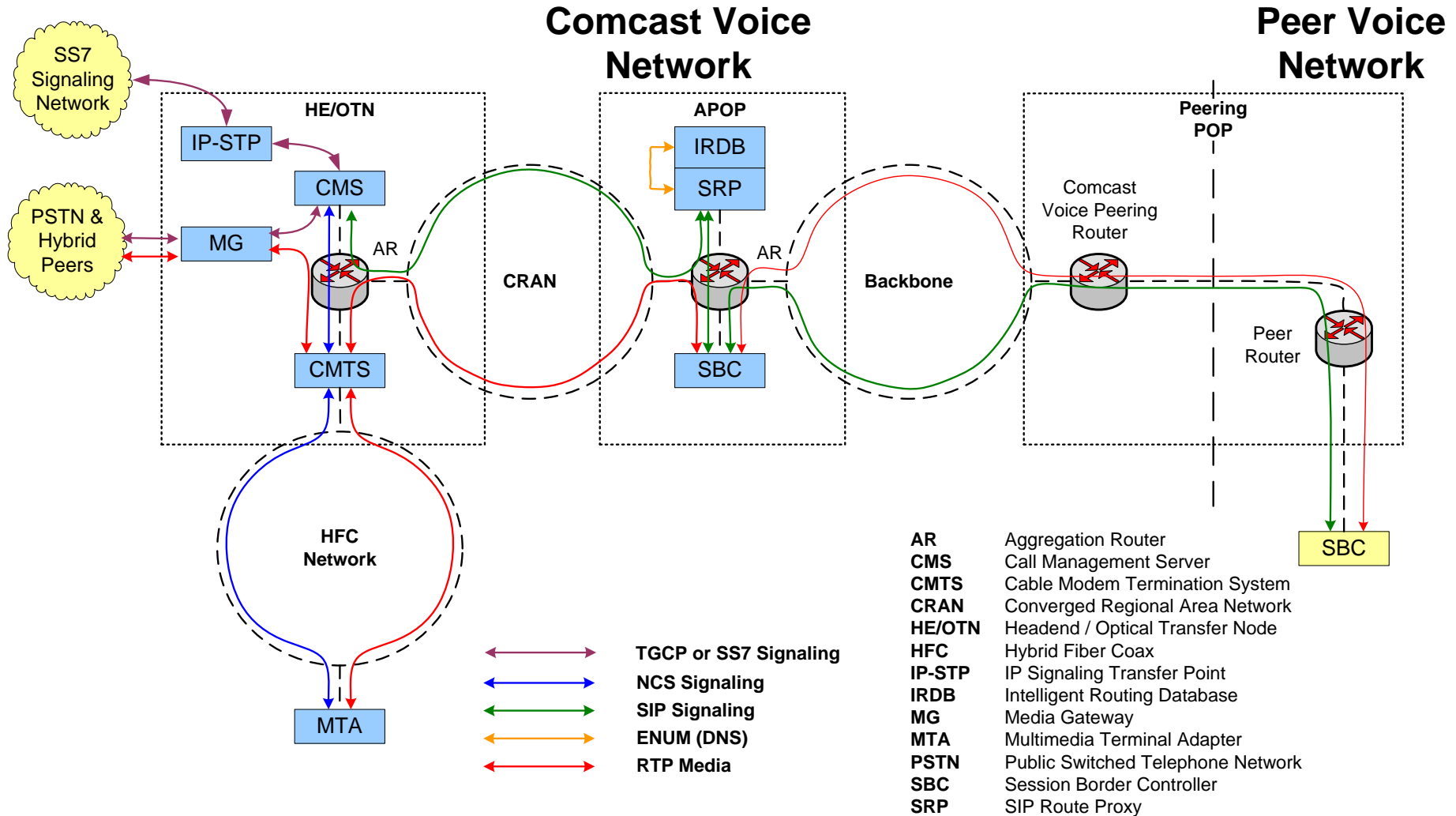
Who: When Voice Peering Makes Sense

- Where does voice traffic go? A very long-tailed distribution.
- In Comcast's case, eight voice providers represent 75% of outbound minutes.
- Focus on top voice providers to maximize savings and efficiency, for example, voice providers that represent the top 75-90% of traffic.
- Requires balanced traffic, peering relationship must be mutually beneficial.
- For voice providers in the long tail, physical interconnect expense out-weighs voice transit savings → better to leverage a voice transit carrier.



% of Outbound Minutes	Cumulative # of Voice Providers
75	8
85	14
97	48
98	63
99	137
100	~ 2,000

How: Comcast Voice Peering Architecture

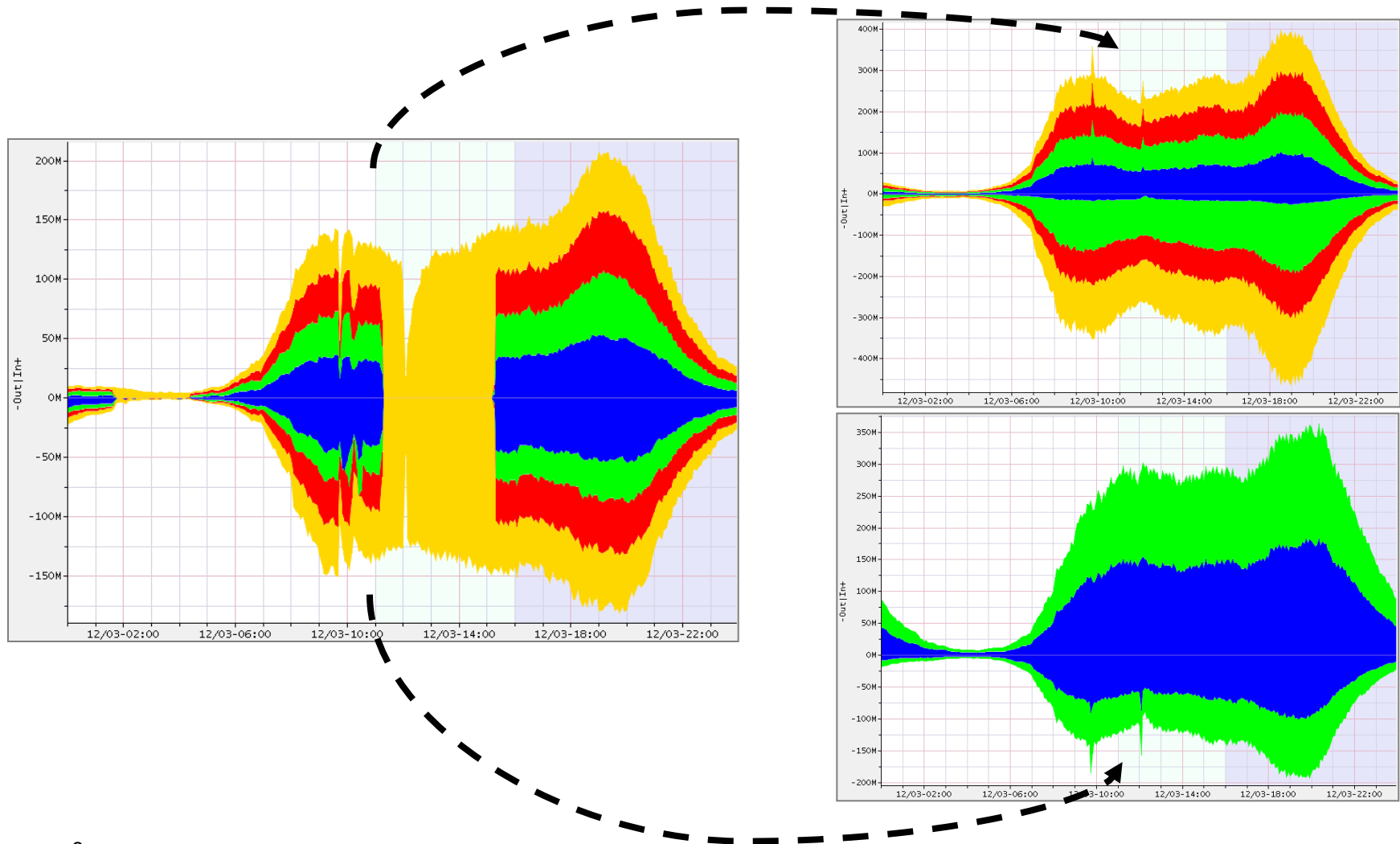


Things to Keep an Eye On: BGP & SIP Interaction

- Important to understand how SIP-layer interacts with IP- and BGP-layers.
- Operationally, voice team and IP team must work together.
- Best solution leverages intelligence at BGP and SIP layer.
 - Leverage site diversity and convergence capabilities with BGP, don't force the to operate like a static path.
 - Advertise all SBC IP addresses across all GE links.
- Use SIP to create intelligent voice route advance solutions, reducing impact during network link outages or BGP convergence.

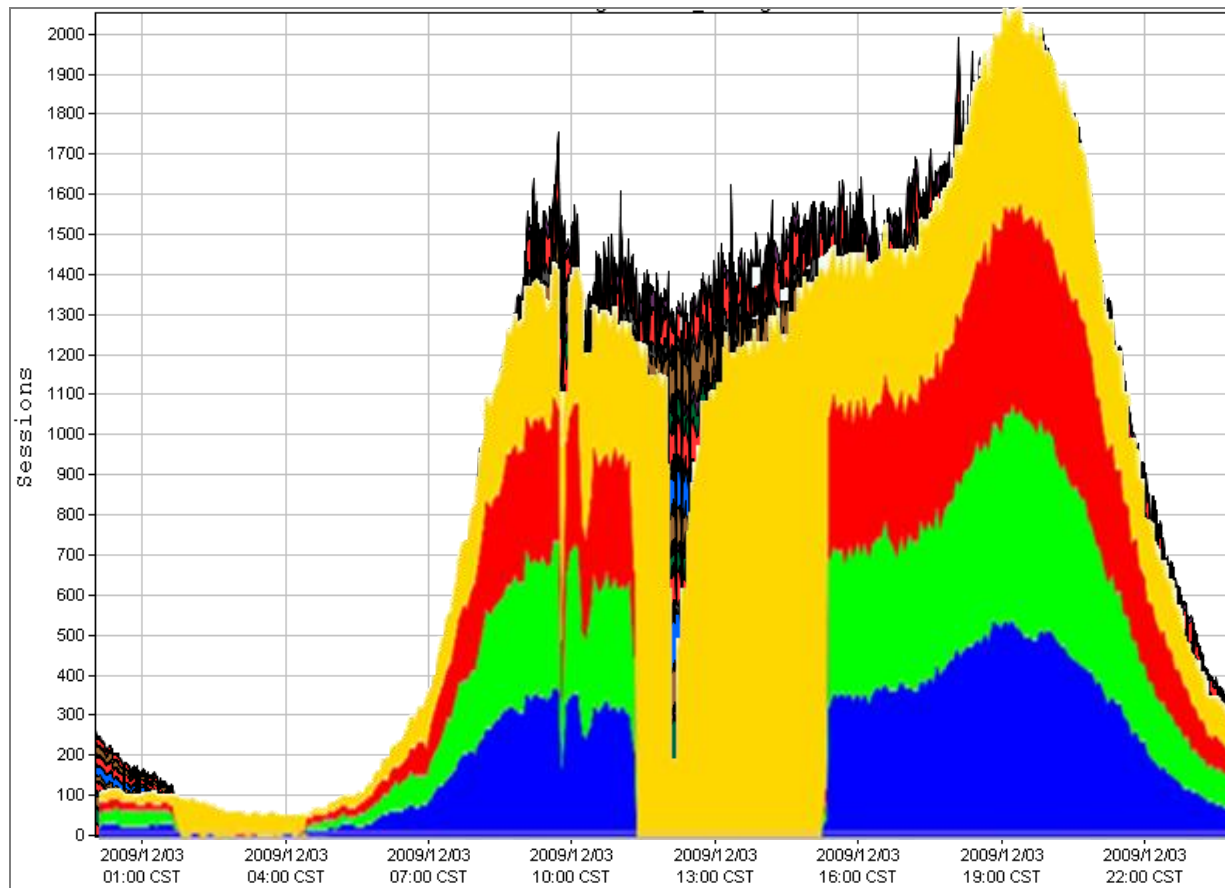
Voice Peering Link Outage

- Gigabit Ethernet voice peering link outage at first peering site, results in temporary IP traffic shift to network links at other peering sites:



Link Outage Impact at SBC

- More importantly, even with voice peering link issues, Session Border Controller (SBC) call session volume remains consistent throughout outage period. Concurrent call sessions for SBCs at first site:



BGP and SIP Timer Relationships

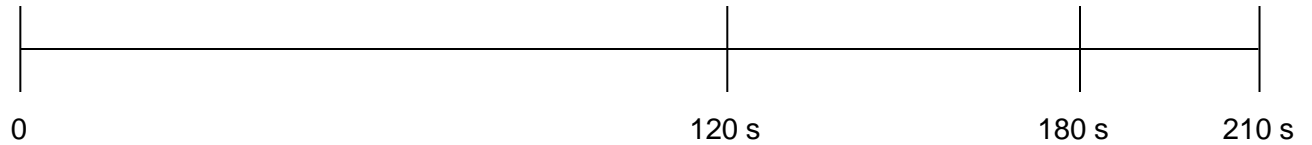
BGP Hello Timer:

Three KEEPALIVEs sent; for link=up, but BGP neighbor=down, route not removed till 180 sec



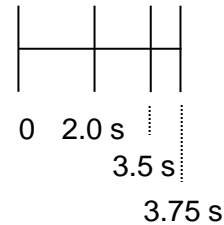
SIP OPTIONS ping:

Three pings sent; for SIP neighbor=up, session agent not removed till 210 sec



SIP INVITE:

Three INVITEs sent, for SIP neighbor=up, route advance occurs after 3.75 sec



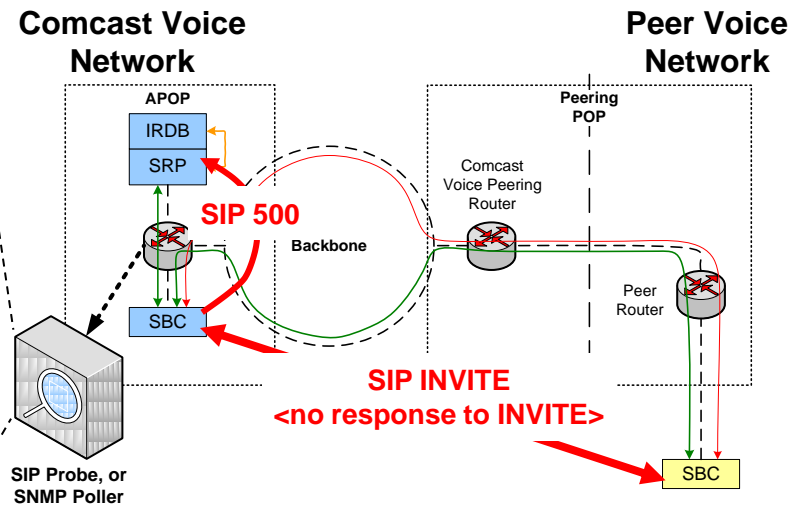
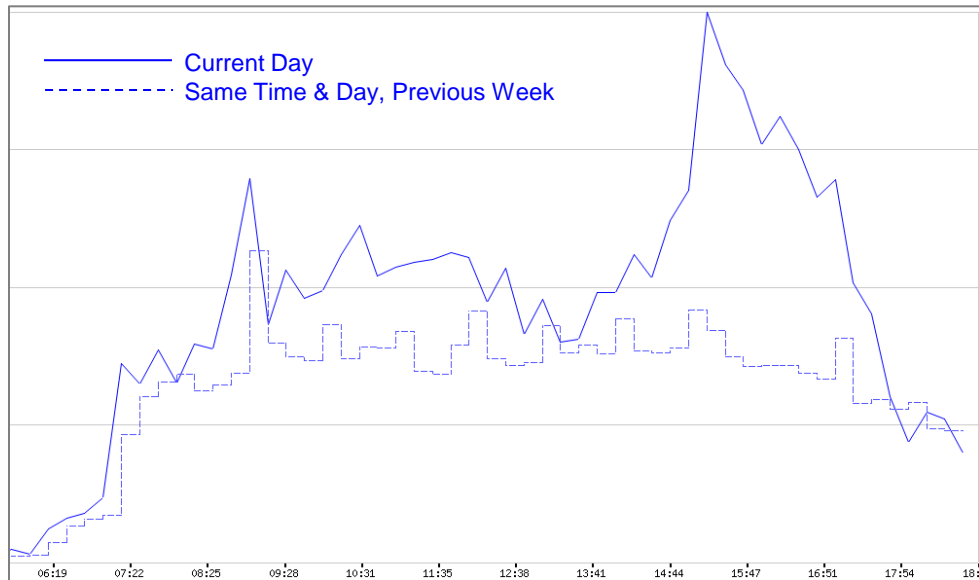
Failure Type	BGP/Router	SIP/SBC	Failover / Customer Experience
BGP Neighbor Offline with Network Link Active	BGP neighbor remains active for 180 seconds	SIP neighbor remains active for 210 seconds following outage, but SIP INVITEs route advance to 2 nd option after no response to SIP INVITE	Active: customers hang-up New calls: set-up through 2 nd option, increase to post dial delay of 3.75 seconds
Network Link Outage or Peering Router down hard	BGP re-converges to next available egress path	SIP neighbor remains active during convergence period, any non-response to SIP INVITE in the first 3.75 seconds results in route advance to 2 nd option	Active: BGP re-convergence typically not noticed, majority of customers do not hang-up New calls: set-up through 2 nd option, potential increase to post dial delay of 3.75 seconds

Tools to Help

- SNMP Pollers

- Trend for same day and time, trigger outage notifications when thresholds exceeded.
- Aggregate by voice peer.
- Correlate between Gbps on router and session counts on SBCs.

- Example: SIP 500 (server failure) error responses are collected and aggregated by voice peer to trend issues, time and day thresholding also applied:



Conclusion: Voice Peering using SIP and BGP

- Why:
 - Establish direct relationships.
 - Reduce voice operating expense.
- How:
 - Evaluate and rank your voice peering opportunities.
 - BGP and SIP teams must work together to design an architecture that leverages both layers.
 - Carrier and site diversity are required.
- Sustain:
 - SNMP polling.
 - Correlate performance data between peering router and SBC.
- Contacts:
 - SIP: Matthew_Christopher@cable.comcast.com and Jeff_Baart@cable.comcast.com
 - BGP: Jason_Phillipon@cable.comcast.com