**Contribution**

**TITLE:** IP Interconnection Routing Outline – Proposed Modifications to Section 4 – Current Aggregate Approach and additional text on route establishment

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**ABSTRACT**

This document provides proposed modifications to the description of currently existing routing data exchange methods in the IP Interconnection Routing Outline Section 4, and a proposed description of routes and route establishment between carriers to be incorporated into the routing discussion or main IP Interconnection draft.

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The following text is proposed to be added before the discussions of routing approaches currently in section 4 and subsequent sections, or otherwise combined into the main IP Interconnection document:

Establishing IP-NNI routes between carriers:

A “route” for exchanging voice traffic over IP facilities is defined by a set of NNI interconnection points in the originating and terminating networks and the IP network path between them. The interconnection points may consist of a single ingress or egress SBC or a logical grouping of SBCs, such as co-located SBCs in a failover or load-sharing arrangement. Each SBC is identified by one or more SIP signaling IP addresses. RTP media IP addresses may or may not be exchanged in advance. The IP network path or paths for SIP signaling and RTP media consists of one or more engineered paths or dynamic paths (not fully specified between PE routers) between the originating and terminating SBCs. The paths may consist of a single dedicated link or Ethernet service – such as 1Gbps or 10Gbps Ethernet between PE routers, multiple dedicated links or Ethernet services in a load-sharing or failover arrangement (for instance with BGP re-routing), a private multi-lateral IP transit network – such as a transport-only IPX, or public Internet connectivity. While NNI routes may use dynamic best-effort IP network paths such as public Internet, the paths are often explicitly specified and engineered to the capacity, QoS, and redundancy/reliability requirements of the NNI traffic flow. The following figures show some examples of IP transport networks connecting two carriers at two locations each, and examples of routes defined across these transport networks to one or several SBCs at each location:





At a given carrier location, there may be any number of dedicated or VPN transport paths to any number of other carriers’ locations terminating on the same local SBC endpoints or different endpoints. Depending on the needs of any give interconnection, any carrier may also use multiple types of transport at a given location to reach different carriers or remote SBC endpoints. Each of these originating SBC or SBC grouping/transport network/terminating SBC or SBC grouping combinations constitutes a separate route for the assignment of traffic to be terminated through the route. It is further possible to create multiple routes across an originating SBC/transport network/terminating SBC path using separate SIP IP addresses and/or SIP port numbers to disambiguate traffic flows. This may be useful if different call types are to be handled differently or require distinct session or bandwidth reservations at the SBC and across the transport network.

The information necessary to establish a route will vary depending on the type of transport path used, but may include the following:

*(common across transport types):*

Geographic location of SBCs

Central office switch CLLI associated with SBCs

Equipment identifiers (SBCs, PE routers, other transport equipment)

Trunk group Identifiers

Session and bandwidth reservations

SBC SIP signaling IP addresses and ports

SBC/media gateway RTP media IP addresses (optional to exchange in some cases)

PE router IP addresses

*(specific to dedicated transport or VPNs over private IP/MPLS):*

Transport circuit or service (such as L2VPN/L3VPN) identifiers

Transport network bandwidth and QoS parameters

Router BGP identifiers

BGP AS numbers

BGP prefix and route information

*(specific to IPsec VPNs over public Internet):*

IPsec VPN tunnel endpoint addresses (tunnel-mode IPsec gateways)

IKE parameters and credentials

Protected traffic addresses or subnets

IPsec (phase 2) parameters

The following text is proposed to update Section 4 – “Aggregate Approach Based on Existing NANP Data Structures” or to be merged with the contents of IPNNI-2014-045R2 and incorporated in this Section 4:

Some service providers are already exchanging voice traffic over IP facilities. This section details how routing for such exchanges has been implemented based on existing industry data in the LERG and NPAC supplemented with the bilateral exchange of information to map LERG and/or NPAC identifiers to IP connection information.

Existing approaches to IP interconnection routing rely on NANP constructs for aggregating telephone numbers into groups and then associating one or more routes (as described above) with the TN group. Common methods of TN group aggregation are, OCNs – alone or in combination with LATA or other geographic groupings, AOCNs, central office switch CLLIs, and central office codes (NPA-NXXs or NPA-NXX-X of a code-sharing block, where it is assumed that inter-carrier routing is performed on NPA-NXX(-X) after LNP correction). LRN is sometimes used as a supplemental aggregation where multiple LRNs assigned to a given central office switch CLLI/central office code are associated with different TN groupings in the NPAC database to segregate routing between the different groupings. A TN group may be tied to a single route or to multiple routes in sequence, load-distribution, or active/standby arrangements as negotiated by the carriers. In a transitional environment, IP interconnection routes may be intermixed with one or more TDM routes in any of these arrangements for terminating one or more TN groups.

When a route is established, the carriers agree, among other characteristics of the traffic to be sent and received, on the TN groupings that will be terminated via the route and how the route relates to other routes that handle the same or overlapping TN groupings. Once established, routing patterns for particular TN groupings are relatively static. Maintenance of the routing information may occur due to explicit notification between carriers, such as when new routes are implemented or TN groupings are to be shifted in bulk between different routes, or implicitly via LERG publication, such as when a new NPA-NXX code is added to an existing switch CLLI with already-established routes between the carriers.