Version: 4.3
Date of last modification: June 22nd, 2021

Update in the treatment policy for BGP and Route Servers communities in IX.br

This document presents the policy for the use of communities and Route Servers in IX.br PTTs / IXPs, which aims to provide a brief and technical description of the functionalities. For a detailed and educational description, please check the documents available at http://www.ix.br/doc/ or https://cursoseventos.nic.br/ .

The features described in this document are related to Version 2.0 of Route Servers existing in IX.br locations. Check the available documents where we will have published the version currently in use in each location, as the implementation will not be done in a single action, but gradually.

At the end of this document and in the area of documents available on the IX.br website, the Communities Table will be presented to facilitate consultation and use.

Some features of Version 2.0 of Route Servers:

- eBGP add-path to mitigate path hidden (rfc7947), being a more optimized and modern option, but not all routers connected to IX.br support (Active in São Paulo for 2 years).
- Multi-rib to mitigate path hidden (rfc7947) for devices that do not support eBGP add-path (Active in São Paulo for 2 years).
- Flexible Multi and Single Bird, we can migrate (upgrade) from one architecture to another with just one command.
- Transparency to communities and MED (active in all locations).
- New features via communities
    - RTT-based filtering.
        - Possibility to filter / prepend RTT-based ads to each neighbor's next-hop. Many ASNs are transported via layer2 to the IXPs, and for many participants, the idea of being in an IXP is to maintain the local flow and with high quality, and it may not be interesting to be directly connected (1 AS-PATH), but to have an extremely high RTT to reach this router. Communities allow not to advertise or prepend to routers with RTT greater than Xms or unknowns, to ensure quality in return traffic and to filter / handle the ads we receive, to ensure quality in outgoing traffic.
    - Packet-loss based filtering.
        - Possibility to filter / prepend ads based on packet loss for each neighbor's next-hop. Many ASNs do not adequately manage capacity, and end up using the links to the maximum, inserting packet-loss and quality loss for the other participants. Communities allow not to advertise or prepend to routers with packet loss greater

than X% or unknown, to ensure quality in return traffic and to filter / handle the ads we receive, to ensure quality in outgoing traffic.

- Location Filtering
  - Does not advertise for the specified Location, XXX being the location code. (see note in the Communities table at the end of the document)
- Never via Route Server
  - Field informed by ASNs in PeeringDB, explicitly stating that they do not want their ASN to participate in Route Servers, and we will honor this by checking and discarding at the entrance.
- Filters by RIRs
  - Allowing you to not advertise or advertise only to certain RIRs.
- Filters for Brazil
  - Allowing not to advertise or advertise only to Brazilian ASNs.
- Filters via IRR
  - Enabling the use of IRR effectively, more details below.
- Graceful shutdown
  - We are honoring the RFC8326 graceful shutdown community, already active in São Paulo.

CommunitiesInformational

- Source ASN
  - Identification of the ASN that generated the ads. eg 26162:**64496**

- IXP of origin
  - Identification of the IXP that generated the ads. eg 26162:**65011**

- ASN - RTT RTT
  - identification for the next-hop ASN that generated the ads, being marked a community for the group / range for standard, extended, and large community. eg 26162: 64661, rt: 26162:64661, and 26162:660:1 (7ms). Available options:
    - 0.001ms <= 10ms
    - 10.001ms <= 50ms
    - 50.001ms <= 100ms
    - 100.001ms <= 150ms
    - 150.001ms <= 200ms
    - 200.001ms <= 250ms
    - > 250.001ms
    - unknown

- RTT will be measured all day, and we will consider the average over 60% of the best results, with the measurement window being every 3 hours and measurements every 15 minutes. In principle, the settings of the Route Servers will be updated every 8 hours.

- ASN - LOSS
  - Packet-loss identification for the next-hop ASN that generated the ads, being marked a community for the group / range for standard, extended, and large community. eg 26162: 64671, rt: 26162:64671, and 26162:670:1 (1%). Available options:
    - = 0%
    - 0,001% <= 2%
    - 2,001% <= 10%
    - 10,001 <= 99,999%
    - unknown / unreachable

  Note: LOSS will be measured 5 times a day, and we will consider the average over 60% of the best results, being that the measurement window will be between 7 pm and 11 pm, the time with the greatest flow in the IXP.

- ASN - GEO / RIR
  - Identification of the ASN that originated the announcement by RIR (right-most). eg 26162: 64684, rt: 26162 64684, and 26162:680:4 (ASN allocated by RIPE). Available options:
    - Afrinic
    - Apnic

        - Arin
        - Lacnic
        - Ripe
        - Brazil / NIC.br

Filtering Communities

- **Protection of IXPs and our participants**
    - Prefixes pertaining to use in IX.br IXPs
    - Re-sending back the routes we announced to the participant.
    - If they are routes not originated by BGP.
    - If the AS-PATH is less than 1 or greater than 64 ASNs.
    - If the participant is making announcements containing the IXP ASN.
    - If the ad's ASN is not the same as that of the participant connected to the IXP.
    - If the next-hop is different from the participant connected with us (we do not accept next-hop rewrite).

  In the above cases, we discard unmarked ads or further analysis.

- Blackhole
    - We accept blackhole ads for:
        - IPv4 / 32 and IPv6 / 128 prefixes.
        - We will have two modes of operations that will be used:
            - Ads originated by Brazilian ASN and validated against whois.
            - Stubs ads, being Brazilian ASN and IX.br participant, in this case it will only be possible to make BH for ASN prefixes directly connected to IXP. eg ASN 64496 is connected and announcing a BH of a prefix belonging to ASN 64496.
        - After implementation, and validation, we will be thinking about the possibility of extending the BH to the other (non-Brazilian) ASNs, if the results of using BHs are positive.

    - When we receive and accept the ad following the requirements above, the route server will:
        - Change the next-hop of the ad by pointing to a well-known MAC and IP in IXP, where we will discard the stream.
        - Add a community stating that it is a BH confirmed by Route Servers. eg 26162:666

➔ To ensure that BH is efficient and works as expected, participants must accept IPv4 / 32 and IPv6 / 128 prefixes, announced by Route Servers when we have community 26162: 666 (or extended or large) confirming to be a BH valid.

- Origin validation of thead
    - Whois(BR)
        - For Brazilian ASNs, we will validate the ads using the whois data from Registro.br. The file published daily by Registro.br, available via FTP, is used as a data source. An

ASN will be considered Brazilian, as long as it is listed in the file, as well as valid IP blocks for an ASN, as long as they are listed in the file and associated with the ASN.

- IRR
  - For all ASNs, IRR validation for AS-SETs informed in PeeringDB will be done. The participant can inform:
    - AS-SET without specifying the source database.
    - AS-SET @ SOURCE or SOURCE :: AS-SET (preferred), where SOURCE is the repository where you keep the IRR records you want to be consulted. eg RADB::AS-SET (https://github.com/peeringdb/peeringdb/issues/151)
    - Multiple values must be separated by ",".
    - Supported sources: afrinic, apnic, arin, jpirr, lacnic, level3, nttcom, radb, ripe and tc.

- RPKI
  - For all ASNs, RPKI validation will be performed.

- Whois (RIRs)
  - For all ASNs, validation will be done using public whois data from the RIRs (Afrinic, APNIC, ARIN, LACNIC, and RIPE).

➔ For source validations for WHOIS and RPKI we will use communities informing the ad as valid, invalid or unknown.
➔ For source validations for IRR we will use communities informing the advertisement as a prefix present in AS-SET or prefix not present in AS-SET.

Good practice validations

- Prefix length We will
  - add an informative community that the size of the announced prefix is not allowed by IXP. eg 26162:65190

- Bogons
  - *Prefixes*
    - Prefixes that should not be advertised on the Internet. eg 26162:65191
  - *ASNs*
    - ASNs that should not be in use on the Internet. eg 26162:65192

- Transit free
  - Tiers-1, which should not be seen as transient ASNs, this usually indicates routing errors or fat fingers. eg 26162:65193

- Never via RS
  - Field informed by ASNs in PeeringDB, explicitly saying, that they do not participate in Route Servers. Eg 26162:65194

- IXP prefixes IXPs prefixes
  - in PeeringDB, these prefixes should not be a router on the internet, and with that we will explicitly discard them. Eg 26162:65195

➔ For the validation of good practices, the ads will be marked and discarded.

Traffic engineering

- **Graceful shutdown We**
  - honor the graceful shutdown community.
- **not announce to ASN**
  - Do not announce to the specified ASN. eg 65000:64996
- **export only to ASN**
  - Advertises only for the specified ASN. eg 65001:64996
- **add one prepend**
  - Add a prepend when advertising to the specified ASN. eg 64601:64996
- **add two prepend**
  - Add two prepends when advertising to the specified ASN. eg 64602:64996
- **add three prepend**
  - Add three prepends when advertising to the specified ASN. eg 64603:64996
- **not announce to afrinic**
  - Do not advertise for ASNs allocated by Afrinic. eg 65002:0
- **not announce to apnic**
  - Do not advertise for ASNs allocated by APNIC. eg 65002:1
- **not announce to arin**
  - Do not advertise for ASNs allocated by ARIN. eg 65002:2
- **not announce to lacnic**
  - Does not advertise for ASNs allocated by LACNIC. eg 65002:3

- **not announce to ripe**
  - Do not advertise for ASNs allocated by RIPE. eg 65002:4
- **export only to afrinic**
  - Announces for ASNs allocated by Afrinic. eg 65003:0
- **export only to apnicASNs**
  - Advertises forallocated by APNIC. eg 65003:1
- **export only to arin**
  - Advertises for ASNs allocated by ARIN. eg 65003:2
- **export only to lacnicASNs**
  - Announces forallocated by LACNIC. eg 65003:3
- **export only to ripe**
  - Advertises for ASNs allocated by RIPE. eg 65003:4
- **not announce to Brazil**
  - Does not advertise for ASNs allocated by NIC.br. eg 65004:0
- **export only to Brazil**
  - Announces for ASNs allocated by NIC.br. eg 65005:0
- **not announce to IX.br IXP**
  - Does not advertise for the specified Location, XXX being the location code. (see note in the Communities table at the end of the document)
    - eg 65006:65011 => Do not announce prefixes with this community for the other participants of the IXP of São Paulo (011). Communities are transitive and optional attributes, if an ASN not directly connected to IX.br use this community, it can be removed and not reach our RS, and / or we can have cases, where transient ASNs, can add this community, trying to influence the traffic of the participant directly connected to IX.br.
- **not announce to rtt (> | =) Xms**
  - Do not advertise for ASNs with RTT above or equal to Xms. Available options:
    - > 10ms - Does not announce to ASNs that RTT for NH is greater than 10ms.
      - eg 65010:10
    - > 50ms - Does not advertise to ASNs that RTT for NH is greater than 50ms.
      - eg 65010:50
    - > 100ms - Does not advertise to ASNs that RTT for NH is greater than 100ms.
      - eg 65010:100
    - > 150ms - Does not advertise to ASNs that RTT for NH is greater than 150ms.
      - eg 65010:150
    - > 200ms - Does not advertise to ASNs that RTT for NH is greater than 200ms.
      - eg 65010:200

        - > 250ms - Does not advertise to ASNs that RTT for NH is greater than 250ms.
            - eg 65010:250
        - = unknown - Do not advertise to ASNs that RTT for NH is unknown.
            - eg 65010:999

- **one prepend to rtt (> | =) Xms**
    - Prepend ASNs with RTT above or equal to Xms. Available options:
        - > 10ms - Prepends to ASNs that RTT to NH is greater than 10ms.
            - eg 64611:10
        - > 50ms - Prepends to ASNs that RTT to NH is greater than 50ms.
            - eg 64611:50
        - > 100ms - Prepends to ASNs that RTT to NH is greater than 100ms.
            - eg 64611:100
        - > 150ms - Prepends to ASNs that RTT to NH is greater than 150ms.
            - eg 64611:150
        - > 200ms - Prepends to ASNs that RTT to NH is greater than 200ms.
            - eg 64611:200
        - > 250ms - Prepends to ASNs that RTT to NH is greater than 250ms.
            - eg 64611:250
        - = unknown - Prepends to ASNs that RTT to NH is unknown.
            - eg 64611:999

- **two prepend to rtt (> | =) Xms**
    - Makes two prepends to ASNs with RTT above or equal to Xms. Available options:
        - > 10ms - Makes two prepends for ASNs that RTT for NH is greater than 10ms.
            - eg 64612:10
        - > 50ms - Makes two prepends for ASNs that RTT for NH is greater than 50ms.
            - eg 64612:50
        - > 100ms - Makes two prepends for ASNs that RTT for NH is greater than 100ms.
            - eg 64612:100
        - > 150ms - Makes two prepends for ASNs that RTT for NH is greater than 150ms.
            - eg 64612:150
        - > 200ms - Makes two prepends for ASNs that RTT for NH is greater than 200ms.
            - eg 64612:200
        - > 250ms - Makes two prepends for ASNs that RTT for NH is greater than 250ms.
            - eg 64612:250
        - = unknown - Prepend two ASNs that RTT to NH is unknown.
            - eg 64612:999

- **three prepend to rtt (> | =) Xms**
    - Makes three prepends for ASNs with RTT above or equal to Xms. Available options:

        - > 10ms - Makes three prepends for ASNs that RTT for NH is greater than 10ms.
            - eg 64613:10
        - > 50ms - Makes three prepends for ASNs that RTT for NH is greater than 50ms.
            - eg 64613:50
        - > 100ms - Makes three prepends for ASNs that RTT for NH is greater than 100ms.
            - eg 64613:100
        - > 150ms - Makes three prepends for ASNs that RTT for NH is greater than 150ms.
            - eg 64613:150
        - > 200ms - Makes three prepends for ASNs that RTT for NH is greater than 200ms.
            - eg 64613:200
        - > 250ms - Makes three prepends for ASNs that RTT for NH is greater than 250ms.
            - eg 64613:250
        - = unknown - Makes three prepends for ASNs that RTT for NH is unknown.
            - eg 64613:999

- **not announce to loss (> | =) X%**
    - Do not advertise for ASNs with loss (packet loss) above or equal to X%. Available options:
        - > 2% - Does not announce to ASNs that LOSS for NH is greater than 2%.
            - eg 65011:2
        - > 10% - Does not advertise to ASNs that LOSS for NH is greater than 2%.
            - eg 65011:10
        - = unknown - Do not advertise to ASNs that LOSS for NH is unknown / unreachable.
            - eg 65011:999

- **one prepend to loss (> | =) X%**
    - Prepend ASNs with LOSS (packet loss) above or equal to X%. Available options:
        - > 2% - Prepends for ASNs that LOSS for NH is greater than 2%.
            - eg 64621:2
        - > 10% - Prepends to ASNs that LOSS to NH is greater than 10%.
            - eg 64621:10
        - = unknown - Prepend ASNs that LOSS to NH is unknown / unreachable.
            - eg 64621:999

- **two prepend to loss (> | =) X%**
    - Makes two prepends to ASNs with LOSS (packet loss) above or equal to X%. Available options:
        - > 2% - Makes two prepends for ASNs that LOSS for NH is greater than 2%.
            - eg 64622:2
        - > 10% - Makes two prepends for ASNs that LOSS for NH is greater than 10%.
            - eg 64622:10
        - = unknown - Prepend two ASNs that LOSS to NH is unknown / unreachable.
            - eg 64622:999

- **three prepend to loss (> | =) X%**
    - Makes three prepends to ASNs with LOSS (packet loss) above or equal to X%. Available options:
        - > 2% - Makes three prepends for ASNs that LOSS for NH is greater than 2%.
            - eg 64623:2
        - > 10% - Makes three prepends for ASNs that LOSS for NH is greater than 10%.
            - eg 64623:10
        - = unknown - Prepends three ASNs that LOSS to NH is unknown / unreachable.
            - eg 64623:999

Community table

- **variables**
    - **Rs-asn** - ASN in use on Route Server.
    - **peer-asn** - ASN of the neighbor connected to the route server.
    - **XXX** - XXX is almost equivalent to the origin DDD of the IXP (locality). eg São Paulo = 011. Exceptions:
        - Campina Grande / PB: 183
        - Cascavel / PR: 145

- **table**

Informational			
function	**community**	**extended**	**large**
Origin ASN	rs-asn:peer-asn	(ro | rt): rs-asn:peer-asn	rs-asn : 0: peer-asn
IXP location (XX = DDD)	rs-asn: 65XXX	(ro | rt): rs-asn: 65XXX	rs-asn: 0: 65XXX
ASN - RTT 0.001ms < 10ms	rs-asn: 64661	(ro | rt): rs-asn: 64661	rs-asn:660:1
ASN - RTT 10ms < 50ms	rs-asn: 64662	(ro | rt): rs-asn: 64662	rs-asn: 660:2
ASN - RTT 50ms < 100ms	rs-asn: 64663	(ro | rt): rs-asn: 64663	rs-asn: 660:3
ASN - RTT 100ms < 150ms	rs-asn: 64664	(ro | rt): rs-asn: 64664	rs-asn: 660:4

ASN - RTT 150ms < 200ms	rs-asn:64665	(ro | rt): rs-asn:64665	rs-asn:660:5
ASN - RTT 200ms < 250ms	rs-asn:64666	(ro | rt): rs -asn:64666	rs-asn:660:6
ASN - RTT > 250ms	rs-asn:64667	(ro | rt): rs-asn 64667	rs-asn:660:7
ASN - RTT = unknown	rs-asn:64669	(ro | rt): rs-asn:64669	rs-asn:660:9
ASN - LOSS 0%	rs-asn 64671	(ro | rt): rs-asn:64671	rs-asn:670:1
ASN - LOSS 0.001% < 2%	rs-asn:64672	(ro | rt): rs-asn 64672	rs-asn:670:2
ASN - LOSS < 10%	rs-asn:64673	(ro | rt): rs-asn:64673	rs-asn:670:3
ASN - LOSS > 10%	rs-asn:64674	(ro | rt): rs-asn:64674	rs-asn:670:4
ASN - LOSS = unknown / 100%	rs-asn:64679	(ro | rt): rs-asn:64679	rs-asn:670:9
ASN - Afrinic	rs-asn: 64680	(ro | rt): rs-asn: 64680	rs- asn:680:0
ASN - Apnic	rs-asn: 64681	(ro | rt): rs-asn: 64681	rs-asn:680:1
ASN - Arin	rs-asn: 64682	(ro | rt): rs-asn: 64682	rs-asn:680:2
ASN - Lacnic	rs-asn: 64683	(ro | rt): rs-asn: 64683	rs-asn:680:3
ASN - Ripe	rs-asn: 64684	(ro | rt): rs-asn : 64684	rs-asn:680:4
ASN - Brazil	rs-asn: 64685	(ro | rt): rs-asn: 64685	rs-asn:680:5

Filter			
function	**standard**	**extended**	**large**
BH announce	65535: 666	(ro | rt) : 65535: 666	65535:616:666
Confirmed BH	rs-asn: 666	(ro | rt): rs-asn: 666	rs-asn:616:666
Registro.br invalid	rs-asn: 65110	(ro | rt): rs -asn: 65110	rs-asn: 100: 0
registry.br valid	rs-asn: 65111	(ro | rt): rs-asn: 65111	rs-asn: 100: 1
unknown	record.brrs-asn: 65112	(ro | rt): rs-asn: 65112	rs-asn: 100: 2
IRR - prefix present in AS-SET	rs-asn: 65121	(ro | rt): rs-asn: 65121	rs-asn: 200: 1
IRR - prefix not present i n AS-SET	rs-asn: 65122	(ro | rt): rs-asn: 65122	rs-asn: 200: 2

RPKI invalid	rs-asn: 65130	(ro | rt): rs-asn: 65130	rs-asn: 300 : 0
RPKI valid	rs-asn: 65131	(ro | rt): rs-asn: 65131	rs-asn: 300: 1
RPKI unknown	rs-asn: 65132	(ro | rt): rs-asn: 65132	rs-asn: 300 : 2
RIRs invalid	rs-asn: 65140	(ro | rt): rs-asn: 65140	rs-asn: 400: 0
RIRs valid	rs-asn: 65141	(ro | rt): rs-asn: 65141	rs-asn: 400 : 1
RIRs unknown	rs-asn: 65142	(ro | rt): rs-asn: 65142	rs-asn: 400: 2
Invalid prefix length	rs-asn: 65190	(ro | rt): rs-asn: 65190	rs-asn: 65190: 0
Bogon prefix	rs-asn: 65191	(ro | rt): rs-asn: 65191	rs-asn: 65191: 0
Bogon asn	rs-asn: 65192	(ro | rt): rs-asn: 65192	rs-asn: 65192: 0
Transit free	rs-asn: 65193	(ro | rt): rs-asn: 65193	rs-asn: 65193: 0
Never via RS	rs-asn: 65194	(ro | rt): rs-asn: 65194	rs-asn : 65194: 0
IXPs prefixes	rs-asn: 65195	(ro | rt): rs-asn: 65195	rs-asn: 65195: 0
ATM / MLPA prefixes	drop inbound		
Resending our routes back			
Source! = BGP			
AS-PATH length			
Drop IXP ASN			
First ASN! = Peer-asn			
next_hop! = Peer-ip			

Traffic engineering			
function	**standard**	**extended**	**large**
not announce to ASN	65000: dest-asn	(ro | rt): 65000: dest-asn	65000: 0: dest-asn
export only to ASN	65001: dest-asn	(ro | rt): 65001 : dest-asn	65001: 0: dest-asn
add one prepend	64601: dest-asn	(ro | rt): 64601: dest-asn	64601: 0: dest-asn

add two prepend	64602: dest-asn	(ro | rt) : 64602: dest-asn	64602: 0: dest-asn
add three prepend	64603: dest-asn	(ro | rt): 64603: dest-asn	64603: 0: dest-asn
graceful shutdown	65535: 0	-	-
do not announce to Afrinic (ASNs)	65002: 0	(ro | rt): 65002: 0	65002: 0: 0
do not announce to Apnic ()	ASNs65002: 1	(ro | rt): 65002: 1	65002: 0: 1
do not announce to Arin ()	ASNs65002: 2	(ro | rt): 65002: 2	65002: 0: 2
from not announce to Lacnic ()	ASNs65002: 3	(ro | rt): 65002: 3	65002: 0: 3
from not announce to Ripe ()	ASNs65002: 4	(ro | rt): 65002: 4	65002: 0: 4
do not announce to Brasil ()	ASNs65002: 5	(ro | rt): 65002: 5	65002: 0: 5
export to Afrinic ()	ASNs65003: 0	(ro | rt): 65003: 0	65003: 0: 0
export to Apnic (ASNs)	65003: 1	(ro | rt): 65003: 1	65003: 0: 1
export to Arin ()	ASNs65003: 2	(ro | rt): 6 5003: 2	65003: 0: 2
export to Lacnic ()	ASNs65003: 3	(ro | rt): 65003: 3	65003: 0: 3
export to Ripe ()	ASNs65003: 4	(ro | rt): 65003: 4	65003 : 0: 4
export to Brasil ()	ASNs65003: 5	(ro | rt): 65003: 5	65003: 0: 5
export to ASN	6500X: PeerASN		
do not announce to IXP	65004: 65XXX	(ro | rt): 65004: 65XXX	65004: 0: 65XXX
do not announce to rtt> 10ms	65010: 10	(ro | rt): 65010: 10	65010: 0: 10
do not announce to rtt> 50ms	65010: 50	(ro | rt): 65010: 50	65010: 0:50
do not announce to rtt> 100ms	65010: 100	(ro | rt): 65010: 100	65010: 0: 100
do not announce to rtt> 150ms	65010: 150	(ro | rt): 65010: 150	65010: 0: 150
do not announce to rtt> 200ms	65010: 200	(ro | rt): 65010: 200	65010: 0: 200
do not announce to rtt> 250ms	65010: 250	(ro | rt): 65010: 250	65010: 0: 250
do not announce to rtt = unknown	65010: 999	(ro | rt): 65010: 999	65010: 0: 999
one prepend to rtt> 10ms	64611: 10	(ro | rt): 64611: 10	64611: 0: 10
one prepend to rtt > 50ms	64611: 50	(ro | rt): 64611: 50	64611: 0: 50

one prepend to rtt> 100ms	64611: 100	(ro | rt): 64611: 100	64611: 0: 100
one prepend to rtt> 150ms	646 11: 150	(ro | rt): 64611: 150	64611: 0: 150
one prepend to rtt> 200ms	64611: 200	(ro | rt): 64611: 200	64611: 0: 200
one prepend to rtt> 250ms	64611: 250	(ro | rt): 64611: 250	64611: 0: 250
one prepend to rtt = unknown	64611: 999	(ro | rt): 64611: 999	64611: 0: 999
two prepend to rtt> 10ms 64612	: 10	(ro | rt) : 64612: 10	64612: 0: 10
two prepend to rtt> 50ms 64612	: 50	(ro | rt): 64612: 50	64612: 0: 50
two prepend to rtt> 100ms 64612	: 100	(ro | rt): 64612: 100	64612: 0: 100
two prepend to rtt> 150ms 64612	: 150	(ro | rt): 64612: 150	64612: 0: 150
two prepend to rtt> 200ms 64612	: 200	(ro | rt): 64612: 200	64612: 0: 200
two prepend to rtt> 250ms 64612	: 250	(ro | rt): 64612: 250	64612: 0: 250
two prepend to rtt = unknown 64612	: 999	(ro | rt): 64612: 999	64612: 0: 999
three prepend to rtt> 10ms	64613: 10	(ro | rt): 64613: 10	64613: 0: 10
three prepend to rtt> 50ms	64613: 50	(ro | rt): 64613: 50	64613: 0: 50
three prepend to rtt> 100ms	64613 : 100	(ro | rt): 64613: 100	64613: 0: 100
three prepend to rtt> 150ms	64613: 150	(ro | rt): 64613: 150	64613: 0: 150
three prepend to rtt> 200ms	64613: 200	(ro | rt): 64613: 200	64613: 0: 200
three prepend to rtt> 250ms	64613: 250	(ro | rt): 64613: 250	64613: 0: 250
three prepend to rtt = unknown	64613: 999	(ro | rt): 64613: 999	64613: 0: 999
do not announce to loss> 2%	65011: 2	(ro | rt): 65011: 2	65011: 0: 2
do not announce to loss> 10%	65011: 10	(ro | rt): 65011: 10	65011: 0: 10
do not announce to loss = unknown	65011: 999	(ro | rt): 65011: 999	65011: 0: 999
one prepend to loss> 2%	64621: 2	(ro | rt): 64621: 2	64621: 0: 2
one prepend to loss> 10%	64621: 10	(ro | rt): 64621: 10	64621: 0: 10
one prepend to loss = unknown	64621: 999	(ro | rt): 64621: 999	64621: 0: 999

two prepend to loss> 2%	64622: 2	(ro | rt): 64622: 2	64622: 0: 2
two prepend to loss> 10%	64622: 10	(ro | rt): 64622: 10	64622: 0: 10
two prepend to loss = unknown	64622: 999	(ro | rt): 64622: 999	64622: 0: 999
three prepend to loss> 2%	64623: 2	(ro | rt): 64623: 2	64623: 0: 2
three prepend to loss> 10%	64623: 10	(ro | rt): 64623: 10	64623: 0: 10
three prepend to loss = unknown	64623: 999	(ro | rt): 64623: 999	64623: 0: 999

References

[1] https://tools.ietf.org/html/rfc7947
[2] https://tools.ietf.org/html/rfc7948
[3] https://tools.ietf.org/html/rfc1997
[4] https://tools.ietf.org/html/rfc1271
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