# Three BMP Statistics Drafts, One Shared Problem

When many instances, VRFs or EVIs, share one BMP session, no standard counter reports per instance.

`draft-saum-grow-bmp-afi-safi-evpn-08`

`draft-smc-grow-bmp-route-change-stats-03`

`draft-dikshit-grow-bmp-rd-scoped-rib-stats-03`

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# The Next Level of BMP Statistics

From per address family counters to per routing instance counters

## Today a BMP counter stops at the address family.

## Draft 1 first carried a per instance key, in August 2025.

Per instance means per VRF or EVI. When many instances ride one BMP session, an address family count cannot say which one changed. The scope key is the field inside a counter that names the instance: the EVI RD in Draft 1, a general RD in Draft

| Draft | What it counts | Scope key | Stat Data shape |
|---|---|---|---|
| 1. afi-safi-evpn-08 (Nov 2026) | EVPN routes, leaked routes, multihomed ESs and EVIs, aliased paths, in five RIB views | whole router, or one EVI (RD) | Type, Subtype, [RD], Gauge |
| 2. route-change-stats-03 (Nov 2026) | routes whose attribute a routing policy changed, per attribute | peer and AFI/SAFI | AFI, SAFI, NUM, then NUM pairs of Attribute Type and Gauge |
| 3. rd-scoped-rib-stats-03 (Nov 2026) | no counter of its own; a shared format for counters scoped to one routing instance | one routing instance (RD), any family | Family, Subtype, AFI, SAFI, RD, Gauge |

# The Baseline: RFC 7854 and RFC 9972

How a BMP counter is carried today

**Concept**

- **A Statistics Report is a list of TLVs:** Stat Type, Stat Length, Stat Data.
- **RFC 7854** defined per peer counters. **RFC 9972** (May 2026) added per AFI/SAFI counters: 2 octet AFI, 1 octet SAFI, 64 bit Gauge.
- **One receive rule keeps old collectors working:** a receiver MUST ignore a Stat Type it does not recognize.
- **RFC 9972 also set a transition pattern:** Types 7 and 9 moved to 18 and 19, and sending both is RECOMMENDED so older collectors keep their view.

**Example**

```
Statistics Report, peer P1

Stat Type   = per AFI/SAFI routes
              in Adj-RIB-In
Stat Length = 11
AFI  = 1   (IPv4)
SAFI = 1   (unicast)
Gauge = 812,000

A collector that does not know this
Stat Type skips 4 + 11 octets and
reads the next TLV.
```

Registry observation: IANA Types 24 and 25 were a temporary allocation for an earlier revision of the document that became RFC 9972. The RFC does not define them, and the temporary entry expired on 18 October 2026.

# The One Shared Problem: One Level Finer

From per AFI/SAFI counters to per routing instance counters

| Router | Peer | AFI/SAFI | Instance |
|---|---|---|---|
| base | RFC 7854 | RFC 9972, today | these 3 drafts |

**Concept**

- **Each step to the right makes a counter more specific.** RFC 7854 and RFC 9972 stop at AFI/SAFI.
- **As the collector of this telemetry, the next question follows:** which VRF, EVI, or MVPN instance changed?
- **The answer needs an instance key** inside the Stat Data, unless the BMP session already implies it.
- **Two GROW drafts carry instance context today, by different means:** Draft 1 puts an RD in the per EVI counter; draft-zhuang-grow-bmp-enhancement-for-vrf-loc-rib tags each route with its remote VRF.

**Example**

```
Route reflector RR1, one BMP session

EVPN routes, per AFI/SAFI
  Monday 30,000    Tuesday 36,000

Which tenant added 6,000 routes?

             Monday   Tuesday
Tenant A     10,000    10,000
Tenant B     10,000    16,000
Tenant C     10,000    10,000

Only a per instance counter shows
that the growth is in Tenant B.
```

# A Route Distinguisher Is Not Always a Tenant

What the instance key identifies depends on how it is assigned

**Concept**

- **An RD makes a route unique.** It is not a reliable name for an EVI or a tenant.
- **RD and EVI are not one to one.** One EVI on N VTEPs gets N auto derived RDs; and an IP-VRF and a MAC-VRF on one VTEP can share one RD, separated only by EVPN route type.
- **The per peer header names the instance only on a per VRF session.** On a shared session many RDs are multiplexed, so Draft 1 puts an 8 octet RD inside the per EVI counter (Section 2.2.2).

**Example**

```
EVPN VXLAN fabric
RD = <VTEP loopback>:<VNI>

EVI 10100 on three VTEPs
  10.0.0.1:10100
  10.0.0.2:10100
  10.0.0.3:10100

One EVI, three RDs, three counters
```

| BMP session topology | Does the per peer header identify the instance? |
|---|---|
| One session per VRF (PE to CE) | Yes. The Peer Distinguisher is the VRF. |
| Shared route reflector session (data center, campus) | No. The key must be in the Stat Data. |

# Where the Collector Sits

Direct VTEP sessions versus a route reflector session

**Direct VTEP or per VRF sessions**

```
Direct, PE Local-RIB

  VTEP1 --BMP--+
  VTEP2 --BMP--+--> Collector
  VTEP3 --BMP--+

  each PE exports Local-RIB
  one EVI = one local RD
  per-RD count = per-EVI
```

**Route reflector or route server**

```
Via route reflector/server

  VTEP1 --+
  VTEP2 --+-> RR --BMP--> Collector
  VTEP3 --+      (Adj-RIB-In)

  one EVI on 3 VTEPs = 3 RDs
  RR has no EVI-to-RT state
  per-RD slice only; per-EVI
  total needs the Route Target
```

Direct case: one EVI is one local RD, so a per-RD count is already per-EVI. Route reflector case: one EVI arrives under several per VTEP RDs, and the reflector has no EVI to Route Target mapping, so a per-RD counter is one slice per VTEP and the per-EVI total has to be rebuilt by Route Target.

# Draft 1: EVPN RIB Statistics

draft-saum-grow-bmp-afi-safi-evpn-08

- **Concept:** count the routes of one address family (EVPN, AFI 25, SAFI 70) at every point a route passes through a router, both for the whole router and for each EVI.
- **Inside the Stat Data,** Stats Type selects what is counted: EVPN routes, leaked routes, multihomed ESs, multihomed EVIs, aliased paths. Stats Subtype is the EVPN route type, 1 to 11.
- **Eleven Stat Types** cover five RIB views at two scopes, plus one global information type:

| RIB view | Whole router | Per EVI (with RD) |
|---|---|---|
| Adj-RIB-In, before inbound policy | TBD_01 | TBD_07 |
| Adj-RIB-In, after inbound policy | TBD_02 | TBD_08 |
| Loc-RIB | TBD_03 | TBD_09 |
| Adj-RIB-Out, before outbound policy | TBD_04 | TBD_10 |
| Adj-RIB-Out, after outbound policy | TBD_05 | TBD_11 |
| ES, EVI, and aliased path information | TBD_06 | not defined |

# Draft 1: Wire Format and Worked Example

draft-saum-grow-bmp-afi-safi-evpn-08, Sections 2.2.2 and 2.3

**Concept**

- **Per EVI counters now use the RD-Scoped Statistics Container of Draft 3,** with Family = EVPN. One shared format across both drafts (Section 2.2.2).
- **Subtype carries the EVPN route type;** AFI and SAFI are 25 and 70; the RD is the source EVI's RD.
- **Whole router counters keep the RFC 9972 format,** without an RD (Section 2.1.2).
- **Receive rule:** ignore an unknown Family or Stat Type, skip that Stat Data, and keep parsing.
- **Companion mechanism:** the Remote VRF Information TLV of draft-zhuang says which instance a route came from; this counter says how many.

**Example**

```
Per EVI Stat Data = the container
  Family    1 octet   (EVPN)
  Subtype   1 octet   (route type)
  AFI       2 octets  (25)
  SAFI      1 octet   (70)
  RD        8 octets
  Gauge     8 octets
```

```
Worked example (Section 2.3)
  Stat Type = TBD_09 (Loc-RIB, per EVI)
  Family=2 Subtype=5 AFI=25 SAFI=70
  RD=65001:100  Gauge=42

Meaning: 42 IP Prefix routes in Loc-RIB
for the EVI with RD 65001:100
```

# Draft 2: Route Change Statistics

draft-smc-grow-bmp-route-change-stats-03

## Concept

- **Count how many routes a routing policy changed,** broken down by which attribute it changed.
- **Per peer and per AFI/SAFI,** for any address family. Policy impact becomes visible without logging in to each router.
- **Two Stat Types:** TBD_01 for inbound policy (post policy Adj-RIB-In), TBD_02 for outbound policy (post policy Adj-RIB-Out).
- **Counting rules (Section 4.1):** an attribute that policy did not change MUST NOT be reported; routes rejected by policy are not counted; for local routes the peer is the local router.

## Attribute Types (Section 4.1)

```
BGP path attributes
  0x0001 Local Preference
  0x0002 AS Path
  0x0003 MED
  0x0004 Community
  0x0005 Extended Community
  0x0006 Large Community
  0x0007 Origin
  0x0008 Next Hop
  0x0009 ESI
  0x000A AIGP
  0x000B Prefix SID
```

```
QoS and forwarding attributes
  0x000C DSCP            0x0010 QoS Local ID
  0x000D VPN Peer ID     0x0011 Traffic Index
  0x000E Preferred Value 0x0012 MPLS EXP
  0x000F IP Precedence
0x0013 to 0xFFFF: vendor specific
```

# Draft 2: Wire Format and Worked Example

draft-smc-grow-bmp-route-change-stats-03, Sections 4.3 and 5

**Concept**

- **Stat Data:** AFI, SAFI, NUM, then NUM pairs of Attribute Type and Gauge. One TLV reports every changed attribute for one peer and AFI/SAFI.
- **Two views of one event, "policy changed this route":** draft-wang-grow-bmp-policy-preview reports each change before commit; Draft 2 counts changes after commit. Proposal: one Attribute Type registry for both.
- **Route Event Logging** (draft-ietf-grow-bmp-rel) explains a single event; Draft 2 counts many. Both help in the same troubleshooting session.
- **Open item:** state the receive rule for unknown Attribute Types explicitly, as Drafts 1 and 3 do for their selectors.

**Example**

```
Worked example (Section 4.3)
Peer P1, IPv4 unicast

Stat Type   = TBD_02 (outbound policy)
Stat Length = 24
AFI = 1   SAFI = 1   NUM = 2
  0x0001 Local Preference  Gauge 128
  0x0004 Community         Gauge  47

Meaning: outbound policy changed
Local Preference on 128 routes and
Community on 47 routes, since the
counters were last reset.
```

# Draft 3: One Container for Instance Scoped Counters

draft-dikshit-grow-bmp-rd-scoped-rib-stats-03

**Concept**

- **Separate the scope key from the meaning of the count.** The container carries the key; a Family profile defines what is counted.
- **Family selects the profile** (L3VPN, EVPN, MVPN). Subtype values are defined by that profile, not by Draft 3.
- **AFI and SAFI stay in the data** so one Family can cover both VPN-IPv4 and VPN-IPv6.
- **Draft 3 requests no Stat Types.** Each profile requests its own and points to this format.
- **Whole router counters** keep the RFC 9972 format, without an RD (Section 4).

**Example**

```
Container (Section 3.1)
  Family      1 octet
  Subtype     1 octet
  AFI         2 octets
  SAFI        1 octet
  RD          8 octets
  Gauge       8 octets
```

```
Family registry (Section 3.2)
  0            Reserved
  1            L3VPN
  2            EVPN
  3            MVPN
  4 to 127     Standards Action
  128 to 254   First Come First Served
  255          Reserved
```

# The Container on the Wire

Where it sits, and two examples

**Positioning**

```
BMP Statistics Report (RFC 7854)
  Per-Peer Header
    peer, RIB view, Peer Distinguisher
  Stat TLV
    Stat Type   which counter
    Stat Len    21
    Stat Data = the container
      Family Subtype AFI SAFI RD Gauge
```

**Examples**

```
EVPN, per EVI, Local-RIB
  Family=2 Subtype=5 AFI=25 SAFI=70
  RD=65001:100  Gauge=42
  = 42 type-5 routes in EVI 65001:100
```

```
L3VPN, one VRF, IPv4 and IPv6
  Family=1 Subtype=0 AFI=1 SAFI=128
  RD=65001:100  Gauge=500   VPN-IPv4
  Family=1 Subtype=0 AFI=2 SAFI=128
  RD=65001:100  Gauge=120   VPN-IPv6
  one Family; AFI picks v4 or v6
```

The container is always the Stat Data of a Stat TLV. The Stat Type names the counter; the Per-Peer Header gives the peer and the RIB view. On a shared route reflector session the Peer Distinguisher is zero, so the RD inside the container names the instance.

# Draft 3: How Other Drafts Could Use It

Offered mappings, not requirements (Section 3.3)

**Concept**

- **Two receive rules at two levels:** unknown Stat Type (RFC 9972) and unknown Family (Section 3.1). In both cases the receiver skips that Stat Data and keeps parsing.
- **A Family profile states five things:** its Family value, Subtype use, fixed or variable AFI/SAFI, its Stat Types, and gauge or counter.
- **Draft 1 already uses the container** as Family 2 (Draft 1 Section 2.2.2); draft-zhuang could add Family 1 counters for routes leaked from each remote RD.
- **Disclosure:** per instance counts reveal tenant level detail. Drafts 1 and 3 state this in Security Considerations; Draft 2 covers the related policy disclosure.

**Example**

```
Draft 1 per EVI counter (Family 2)
  Family   = 2      (EVPN)
  Subtype  = 5      (IP Prefix route)
  AFI/SAFI = 25/70
  RD       = 65001:100
  Gauge    = 42
```

```
Older collector, Family 3 unknown
  skip this Stat Data, read next TLV
```

# Shared Building Blocks

Items that apply to all three drafts

| Building block | What it adds | Defined in | Relation to the three drafts |
|---|---|---|---|
| Flags octet | triggered and differential reporting | draft-wang-grow-bmp-bgp-rib-stats-ext | Drafts 1 and 2 propose defining it once, in a shared place |
| Statistics Information TLV | minimum, maximum, average, median next to a gauge | draft-ietf-grow-bmp-stats-informational-tlv (adopted) | applies to every gauge in Drafts 1, 2, and 3 |
| BMP YANG model | configuration and state for BMP | draft-ietf-grow-bmp-yang | RFC 9972, Draft 1, and Draft 2 statistics not yet modeled; Draft 3 plans one generic augmentation |
| Multi instance TLV | BGP instance name as a scope | draft-wu-grow-bmp-multi-instance | a different scope axis; applies to all BMP messages, not only statistics |

> GROW co-chair Paolo Lucente has noted merit in a shared statistics format, the direction of Draft 3.

# Scale and Operational Considerations

Reuse of BMP is cheap to deploy; instance counters multiply

**Concept**

- **Reuse:** no new transport, YANG model, or collector pipeline. A new gauge ships once its Stat Type is allocated. IPFIX or YANG Push would first need schema work.
- **Cost:** per instance counters multiply by instance count, RIB views, and subtypes.
- **RFC 9972 Operational Considerations:** producers SHOULD rate limit and SHOULD let operators choose subsets.
- **The latest revisions add an Operational Considerations section to each draft,** with common text (rate limits, subsets, cardinality).

**Example**

```
One Draft 1 per EVI TLV
  header 4 + Stat Data 18 = 22 octets

Large EVPN route reflector, 5,000 EVIs

  route types  RIB views   per report
       1           1          110 KB
       1           5          550 KB
      11           5         6.05 MB
```

```
Ways to bound the volume
  rate limit the report interval
  let the operator choose EVIs or types
  report only counters that changed
    (triggered or differential Flags)
  smooth bursts with the Statistics
    Information TLV
```

# Status and Questions for the WG

- **The latest revisions are posted and keep every wire format unchanged.** Draft 1 -07, Draft 2 -03, and Draft 3 -02 add Operational Considerations and related clarifications, alongside the earlier worked examples and security text.
- **Coordination so far:** Zhuang and Geng merged a pull request on the VRF Loc-RIB draft in August 2026.
- **Request to the WG:** review of the three drafts by WG members, and a call for adoption if the WG finds the direction right.

**Questions for the WG**

- **1. Shared format:** is the container of Draft 3 the right home for the per EVI counters of Draft 1, and for future instance scoped counters?
- **2. Operational text:** the latest revisions add Operational Considerations (rate limits, subsets, cardinality); is this the right level for the WG?
- **3. Flags octet:** should triggered and differential reporting be defined once, in a shared document, rather than in each draft?

**In the latest revisions, posted 19 Nov**

```
Draft 1  (afi-safi-evpn-08)
  Operational Considerations
  scope and counting clarifications

Draft 2  (route-change-stats-03)
  optional instance-scoped mode
  Operational Considerations

Draft 3  (rd-scoped-rib-stats-03)
  Operational Considerations
  profile guidance for per-family keys
```