

CAR WG LC comments

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CAR WG Last Call Issues

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CAR WG Last Call

CAR-WGLC-RTG-DIR-Review-1

Link: https://mailarchive.ietf.org/arch/msg/idr/OX_q_e09ejtb0NZQ25smUrklwmQ/

Reviewer: Ben Niven-Jenkins

Review result: Has Issues

Email Text :

I have been selected to do a routing directorate “early” review of this draft.
<https://datatracker.ietf.org/doc/draft-ietf-mpls-rfc3107bis/>

The routing directorate will, on request from the working group chair, perform an “early” review of a draft before it is submitted for publication to the IESG. The early review can be performed at any time during the draft’s lifetime as a working group document. The purpose of the early review depends on the stage that the document has reached.

For more information about the Routing Directorate, please see
<https://wiki.ietf.org/en/group/rtg/RtgDir>

Document: draft-ietf-idr-bgp-car-02

Reviewer: Ben Niven-Jenkins

Review Date: 31 July 2023

Intended Status: Experimental

Summary:

I have some minor concerns about this document that I think should be resolved before it is submitted to the IESG.

Comments:

The document provides lots of details in the main sections and examples in the appendices. I think that is generally ready to be published. The only suggestion I would have is to provide a short overview introducing BGP CAR and color aware routing before leaping into terminology and the details of the BGP CAR SAFI. Expanding the introduction section with an extra paragraph or two would be sufficient.

Discussion:

DJ-R-1: We appreciate your review of the CAR draft. We will add some overview text as you suggest.

<https://mailarchive.ietf.org/arch/msg/idr/ODL4N39sIPOqICJUMo7UITkdCUI/>

CAR-WGLC-CAR-Q1: Logic behind Sections 9 and 10 in CAR-02

Submitter: Susan Hares

Link: https://mailarchive.ietf.org/arch/msg/idr/NU_9yRskrr5Oz7hiRH

Initial email:

Swadesh, DJ, and Ketan:

Would you explain why you add[ed] Section 9 on CAR SRV6 and a new NLRI in section 10?

How does this expand upon Ketan's comments on Intent at the service (e.g. VPN) layer.

<https://mailarchive.ietf.org/arch/msg/idr/hHto6CYV6zWeTju7gHWLH1qRsOA/>

Thank you, Sue

Discussion form after initial Email thread post

DJ-R-1 – response to initial thread

Link: <https://mailarchive.ietf.org/arch/msg/idr/o8I1dOTiLc-ImelfQUij1pQOJk/>

The Prefix NLRI is in Section 10 as it [is] not limited to SRv6 but applies to other cases of distribution of specific IP prefixes; for example, best effort as described there.

This route type and its uses are also applicable to the VPN layer, hence to VPN CAR.

CAR-WGLC-Q1-Issue-1: Motivations for IP Prefix NLRI

- **Moshiko-R-1: (Response to DJ-R1) - Major change in ideology**
 - So far CAR has advocated having Color in the NLRI. Here in the new prefix in Section 10, there is no Color in the NLRI. Which seems like a major change in ideology. Is there any problem with Color in the NLRI that you now want it [Color] in BGP community?
 - **Link:** <https://mailarchive.ietf.org/arch/msg/idr/o8I1dOTiLc-ImelfQUij1pQOJk/>
- **DJ-R-2:** Hello Moshiko, Thank you for your query.
 - **Link:** https://mailarchive.ietf.org/arch/msg/idr/ayRYqImVVro48_AfqYSh4lukBR4/
 - There is no change in the existing specified semantics of the CAR (E, C) NLRI.
 - The IP prefix route type is an extension for the specific case where IP Prefix == intent or color, such as in SRv6 where a locator is assigned for a given intent. Here there is no requirement to have multiple instances of the prefix with different colors, hence no need to have the color in the NLRI.
 - As described in Section 9.1.1 for SRv6, the usage for the IP prefix route to resolve the Service SID via an underlay routed locator prefix or summary route (ref. Section 5 of RFC 9252). This is equivalent to the locator prefix being distributed in IGP Flex-Algo.
 - Being a regular BGP IPv6 route as specified, it follows the exact semantics as RFC 4271 and RFC 2545, allowing IPv6 routing/forwarding and summarization for these prefixes.
 - But by using a distinct CAR SAFI to distribute these transport routes, we avoid overloading of the IPv6 unicast SAFI (2/1) which also carries Internet service routes, as described in Section 9.3. Hope this clarifies.

CAR-WGLC-Q1-Issue-2: Why Add IP Prefix?

- **[Jeff Haas two Response] to DJ-R-2 – Clarifying IP-Prefix**
 - **Jeff-R1:**
<https://mailarchive.ietf.org/arch/msg/idr/xTpg9qBDRJM7EmAB64E6wjScd-Q/>
 - **Jeff-R2** https://mailarchive.ietf.org/arch/msg/idr/P4hCavFklsH5zQ5y4kMOc4_Xrck/
 - **DJ-Jeff-R1 (DJ-R-4):**
<https://mailarchive.ietf.org/arch/msg/idr/lmqA2VSozVemjx8l0WAol37mXCM/>
 - **DJ-Jeff-R2 (DJ-R-5)** <https://mailarchive.ietf.org/arch/msg/idr/4k8TOj-ag4NmNQm7bAafIkeJNtk/>
 - **Jeff's R1 text:**
 - Per Sue's request, I'll be doing another top to bottom review of the -car draft and then after that re-doing the comparative analysis between the two. I'll be getting to the new additions to -car later on, but this thread provides an opportunity to ask a targeted clarifying question:
 - DJ's text from DJ-R2: "The IP prefix route type is an extension for the specific case where IP Prefix == intent or color, such as in SRv6 where a locator is assigned for a given intent. Here there is no requirement to have multiple instances of the prefix with different colors, hence no need to have the color in the NLRI."
 - This point is understood. Did the authors consider simply designating a targeted color, say 0 on the existing type 1, to avoid creating a new type for the NLRI? Compare vs. the best effort transport-class in the more recent -ct work.
 - **DJ-Jeff-R1-P1:** There are of course multiple options when it comes to encoding.
 - **Jeff-R2-P1:** As we have been discussion for many months.
 - **DJ-Jeff-R1-P2:** As specified in RFC 9256, Color is a non-zero value.
 - **Jeff-R2-P2:** This partly why I offered zero as an example.
 - **DJ-Jeff-R1-P3:** As specified in RFC 9252, steering for a routed SID does not rely on Color-EC. Resolution over best effort paths do not rely on Color-EC.
 - **Jeff-R2-P3:** Understood.
 - **DJ-Jeff-R1-P4:** It did not seem necessary to overload the Color value 0 and redefine all the existing semantics.
 - **Jeff-R3-P4 Similarly understood.**
 - **DJ-Jeff-R1-P5:** The use of a separate route-type is cleaner and allows consistency with existing steering/resolution semantics for service routes. A separate route type for IP prefix also provides a clear distinction for the behavior of this route.
- **Jeff-R3-P 5:** think where I have a level of remaining discomfort is the applicability of the LCM and color extended communities. In the case of the color extended community, we already have a more general sense of how that applies for route types such as BGP-LU. I think it's reasonable to consider this new type as having largely the same existing semantics.
 - **DJ-Jeff-R2-P1:** Yes. This is described in Section 2.5 and elaborated in other sections.
- **Jeff-R3-P6:** LCM, however, was previously introduced to handle the type 1 semantics where the intent color present in the NLRI required a local override based on crossing color

domains. It signals that intent resolution is to proceed over the LCM value rather than the NLRI tag color.

- **DJ-Jeff-R2-P2:** Yes. Usage described in Section 2.9.3 and 2.10.
- **Jeff-R3-P7:** The documentation in section 10 beings by pointing out that "color is not essential", and then provides some use cases. It then moves to "color is still useful" situations.
 - **DJ-Jeff-R2-P3:** To be precise, it says color is not essential to distinguish the route (as I've also clarified in this thread); but it is useful as an indicator of the NLRI color for other purposes as listed in the section.
- **Jeff-R3-P8:** When LCM is present, this new type is - I believe - functionally equivalent to the type 1 -car NLRI. Correct?
 - **DJ-Jeff-R2:** Yes. The LCM-EC usage (as well as Color-EC) is the same for both route types, as described/referenced in Section 10.
- **Jeff-P9:** If so, it might be worth some text recommending that when color is semantically important to use type 1. If not, some additional text covering how they are functionally or semantically different than type 1 entries would be helpful.
 - **DJ-Jeff-R2:** We used the approach of describing when the IP prefix route is applicable. But we can try to add clarifying text.

CAR-WGLC-Q1-Issue-3 – Clarity of Support for IP Prefix in AFI/SAFI Section 10 + No Implementations

- **Kaliraj-R-1 response to DJ – Clarity on AFI/SAFI Support + Section 10**
 - few meta comments, and a couple questions follow.
 - **link:** <https://mailarchive.ietf.org/arch/msg/idr/UUmdgjl6XzZsS7SZZMuFzvShgXI/>
 - **[Kaliraj-R1-Part1]** regarding DJ's comment:
 - This route type and it's uses are also applicable to the VPN layer, hence to VPN CAR. Traditional IP prefix advertisement, such as BGP IPv6 or BGP-LU (<https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car-02#section-10>)
 - So, CAR is subsuming other BGP families (VPN, IPv6-Unicast, LU) into itself? But without specifying clearly how the business logic of those families will work inside CAR. All procedures specified in car draft are for E,C NLRI.
 - **[DJ-R-3 response to Kaliraj-R-1]:** here is no change in scope compared to previous versions of the CAR draft. Since there is a new route-type, it's applicability is specified where necessary. For instance, it does apply to the PE-CE peering similar to the (E,C) route, hence it's specified as above.
 - Link for DJ-R-3: <https://mailarchive.ietf.org/arch/msg/idr/ZEQyDYc0nSI9PR8KAs2v1J12Pkl/>
 - **[Kaliraj-R1-Part2]:** There is no clarity on whether CAR is a Service family or Transport family, or the procedures thereof. e.g., VPN-CAR (<https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car-02#section-10.2>) has no procedures specified.
 - **[DJ-R-3 response to Kaliraj-R1-Part 2]:** The VPN CAR semantics and procedures are same as already specified in section 8, this section is just specifying the new route-type. But we can explicitly state it too. The use-case as before is to establish an intent-aware path across multiple domains over which service routes (and traffic) can be steered over. These paths can extend not just PE-PE but also extend to customer networks. This is described in the problem statement draft:

- **[Kaliraj-R1-Part3]:** Also, like Moshiko points out below, there is confusion on whether Color should be in the NLRI or not.
 - See <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car-02#section-2.9.2>
 - And <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car-02#section-10.1>
 - Sec 10.1, removed Color from Type 2 NLRI, and is left with no Distinguisher to avoid path-hiding in path-selection pinch points.
 - **[DJ-R3-response to Kaliraj-R1-Part3]:** I've responded to Moshiko's message. But to reiterate,
 - The IP prefix route type is an extension for the specific case where IP Prefix == intent or color, such as in SRv6 where a locator DR# is assigned for a given intent.
 - Here there is no requirement to have multiple instances of the prefix with different colors, hence no need to have the color in the NLRI
- **[Kalirja-R1-Part4]:** Meta comments:
 - Things seem to be done in a hurry, and got added ad-hoc, with the original problem of intent-driven service mapping lost.
 - I think there is not enough clarity in the document that we can do a more detailed review wrt Part 3 questions. But we're trying.
 - **[DJ-R3-response to Kaliraj-R1-Part4]:** Discussion on comment on the number of CT revisions versus CAR.
 - **[Editor note:** The details this comment have been since the WG LC specifically requested no comparisons.]
- **[Kaliraj-R1-Part5]:** Also, as per the Implementation report:
 - <https://wiki.ietf.org/group/idr/implementations/draft-ietf-idr-bgp-car>
 - Following constructs have no implementation: VPN CAR, Type 2 Prefix Route-type, LCM EC
 - **[DJ-R3 response to Kaliraj-R1-Part5]:**
 - [Editor's comment – I did not find an item that directly responded to this comment. I may have missed it.]
- **[Kaliraj-R1-Part6]:** Meta comment: These things bring me to ask the following questions for the WG, to save everyone's time:
 - Are we rushing towards a LC for a completely new set of extensions in car-02 with no/incomplete procedures?
 - Should we go back to the drawing board, and reset the LC (for CAR only)?
 - Do we really want a family that subsumes other existing families (VPN, IPv4-Unicast, IPv6-Unicast, LU)? [Are we] considering the security implications and filtering problems that come with it? There is no walled garden anymore.
 - **[Editor's comment:** The walled garden issue is further discussed in Issue-4 on security.]
 - **[DJ-R3-response:** I've tried to respond to technical comments. It's worth restating that the semantics and procedures used by the CAR SAFI are consistently aligned with existing SAFIs such as BGP-LU and BGP IPv6, and the draft has described the specific extensions as needed.
 - **[Editor's comment:** DJ's comments on changes in the CT document were removed. The forum rules prohibited comparisons.]

- **Robert-R-1: [Reply to Kaliraj]:** Please elaborate how CAR "subsumes other existing families (VPN, IPv4-Unicast, IPv6-Unicast, LU)"? Having color marking applicable to next hop(s) does not make any absorption of service address families which happen to use such next hop(s).
 - **Link:**
https://mailarchive.ietf.org/arch/msg/idr/UuNDOE8nGK_fIRP5g_LbUgCs7Ok/
- **Natrajan (nats-R-1): [Reply to Robert-R-1]** We have specific AIs from the WG chairs to elaborate on the new extensions and new NLRI types that have been introduced in CAR on 7/7/2023. There are specific email threads addressed by the workgroup chairs towards me (Nats) to reply towards the same. We will inform you once we are done with that.
 - In the meantime [your comment: "Having color marking applicable to next hop(s) does not make any absorption of service address families which happen to use such next hop(s)."]
 - I am unable to understand the context in which you are making the above statement. Could you please clarify?
 - Could you point to sections in the CAR draft (like Kaliraj did in his email), so that we can understand your statement? If you are not pointing to anything in the CAR draft, it would be difficult to reply
 - **Link:** https://mailarchive.ietf.org/arch/msg/idr/g_2MDTiB_bPQb0gg6rH8-f8PA3w/

CAR-WGLC-Q1-Issue-4: Security Concerns on AFI/SAFI

- **[Kaliraj-R1-Part7 (repeated here): Meta questions]**
 - Do we really want a family that subsumes other existing families (VPN, IPv4-Unicast, IPv6-Unicast, LU)? [Are we] considering the security implications and filtering problems that come with it? There is no walled garden anymore.
- **[DJ-R3-response relating to security in Kaliraj-Part-6]**
 - "[Are we] considering the security implications and filtering problems that come with it? There is no walled garden anymore."
 - DJ states: You have it in reverse. CAR SAFI being a separate SAFI, precludes the need to overload existing SAFIs such as BGP IPv6 that carry internet prefixes with transport routes. (See section 9.3).

CAR-WGLC-Q1-Issue-5 – Lack of Clarity for Procedures in sections 8-10

Sue-R-2: (part-1) – Lack of Clarity on AFI/SAFI support

Link: https://mailarchive.ietf.org/arch/msg/idr/YpbOiWdz0qE_KvRCbJG-Z5X2i4U/

Would it be valid to restate your reason for the CAR AFI/SAFI as: "The CAR SAFI is intended to update the BGP transport functions in BGP-LU (applicable to just MPLS) for new transports (such as SRv6). It maintains the exact flat routing semantics of BGP-LU/IP without any need for VPN-like import."

DJ-R-6: Sure – that would be fine.

Link: https://mailarchive.ietf.org/arch/msg/idr/jc2kkkKNGoP439aWISOa94kX_1w/

- **Kaliraj-R-1 comment on DJ-Response-2:**

https://mailarchive.ietf.org/arch/msg/idr/8i2mWlg3YTxyY4RN1zjcD0_pXyGQ/

- **[Kaliraj-R-1]:** Here you seem to agree with Sue that families using CAR SAFI are at transport-layer. But then, you go on to say:
 - DJ-quoted: “BGP CAR can be enabled between PE-CE. To advertise the customer’s CAR routes between PEs, VPN CAR is required.”
- **[Kaliraj-R-1]:** Do you see this usage of CAR and VPN-CAR families as a transport-layer of service-layer usage?
- **[Kaliraj-R-1]:** Also, section 8 or 10 lack procedures on how this usage interacts with existing AFI/SAFIs (e.g., 1/1 or 1/128) that are deployed today on PE-CE or PE-PE sessions?
- **[Kaliraj-R-1]:** How would you state your reason for the CAR VPN AFI/SAFI? (This AFI/SAFI contains a spot for the RDs) see section 10.2. Why support RD?
- **Sue-R-2: (part-2):** How would you state your reason for the CAR VPN AFI/SAFI? (This AFI/SAFI contains a spot for the RDs) see section 10.2. Why support RD?
 - **DJ-R-6:** As stated below and for the use-cases in draft-hr-spring-intentaware-routing-using-color-02, BGP CAR can be enabled between PE-CE. To advertise the customer’s CAR routes between PEs, VPN CAR is required. The semantics are as per RFC 4364, the RD uniquely distinguishes CAR routes from different customers (VRFs).
 - **DJ-R-3:** This is already described in section 8 of the CAR draft. It’s not new, was present in earlier revisions and discussed during adoption.
- **Sue-R-2 (part-3):** You have two NLRI types: Color-Aware Route NLRI, IP-Prefix NLRI. The color-aware route NLRI Intent (E,C) has been discussed for 2 years in IDR and SPRING. The concept of Intent has been defined in the IRTF. The IP-Prefix NLRI is new.
 - **DJ-R-3:** It may be new in the draft but semantically its same as an BGP IPv4/BGP IPv6/LU IP prefix. Hence not a new behavior.
 - **DJ-R-3:** The key difference is operational – as the CAR SAFI enables a clear separation between transport routes and service routes by not overloading the SAFIs that also carry service routes such as SAFI 1 or 4 - as already stated in Section 9.3.
- **Sue-R-2 (part-4)** You state: “The IP prefix route type is an extension for the specific case where IP Prefix == intent or color, such as in SRv6 where a locator is assigned for a given intent. Here there is no requirement to have multiple instances of the prefix with different colors.
 - (For WG Note: Jeff Haas already asked about whether the color = 0 would have been useful.
 - https://mailarchive.ietf.org/arch/msg/idr/P4hCavFklsH5zQ5y4kMOc4_Xrck/
 - <https://mailarchive.ietf.org/arch/msg/idr/xTpg9qBDRJM7EmAB64E6wjScd-Q/>
 - **DJ-R-2:** I have responded to Jeff. Please let me know if you have any additional concerns.

CAR-WGLC-Q1-Issue-6: Relationship among multiple drafts related to SRV6

- **Sue-R-2 (part-5):** draft-wang-idr-cpr-02 gives some deployment insights from a set of operators and vendors. Did insights from this draft cause you to add the IP-Prefix? If so, which insights or customer deployments?

- **DJ-R-2:** Not at all. The precedence for distributing SRv6 locator prefixes in routing is well established in IGP (IGP Flex-Algo - RFC 9350) and BGP (<https://datatracker.ietf.org/doc/draft-agrawal-spring-srv6-mpls-interworking/>)
 - **DJ-R-2:** It is a natural outcome of the definition of the routed SID (<https://datatracker.ietf.org/doc/html/rfc8986#name-sid-reachability>) and its usage for steering is described in RFC 9252 (<https://www.rfc-editor.org/rfc/rfc9252.html#name-bgp-based-l3-service-over-s>)
 - **DJ-R-2:** BGP CAR just follows the established model. This was one of the use-cases for defining a route-type.
- **Sue-R-2 (part-6):** Thanks for helping the WG understand the intent of your design.
 - DJ-R-2: DR# Hope the above clarifications are helpful.

CAR-WGLC-Q1-Issue-7 – Using CAR SAFI and CAR VPN SAFI for transport

- Robert Raszuk: Comment 2 on CAR/SAFI
- Link: https://mailarchive.ietf.org/arch/msg/idr/gKBY651k2da_3qtNNhWExrqfnoA/
- Text: address to Kaliraj & Sue:
 - **Robert-R2-P1:** As I mentioned in my note my understanding is that CAR routes augment transport so [these routes] are exclusive to next hop's color marking. You still need SAFI 1/1 and 1/128 or 2/1 and CAR SAFI would be just carrying colored next hops for those service SAFIs. And CAR will not in any form or shape replace those. Interaction between services SAFIs and CAR SAFI is via next hop resolution.
 - [Editor's comment (to Robert)]
 - CAR SAFI – per section 2.9 is 1/83 or 2/83 paragraph
 - Has 2 forms:
 - CAR NLRI (color, prefix, options)
 - IP Prefix (prefix, color, options)
 - Use: augments transport
 - CAR VPN SAFI: Per section 8 does not indicate which AFIs it is valid for.
 - Has two forms
 - CAR IP prefix (color, prefix, options)
 - IP Prefix (prefix, color, options)
 - **Robert-R2-P12:** That is why I asked in the former note where your assumption came from. Your quotes to some lines of the CAR draft are simply out of context as you need to put them into overall CAR intention and keep in mind that CAR is only transport augmentation.
 - [Editors comment]
 - If CAR is only: transport function, then why does the encoding matter:
 - It appears the IP Prefix has taken over the CT function.

CAR-WGLC-Issue-8 - Use of CAR-SAFIs for Services Families

Kaliraj-Response-2:

- Link: https://mailarchive.ietf.org/arch/msg/idr/vxkY99dcOcNoW6-3G0dRzbJH_1U/
- Comment: Text in car-02 draft indicating CAR families usage as Service families:
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car-02#section-8>
 - BGP CAR is enabled between CE1-PE1 and PE2-CE2
 - BGP VPN CAR is enabled between PE1 and PE2

- In above text, CAR is used as Service family between CE-PE, where usually AFI/SAFI 1/1 is used. and VPN-CAR is used as Service family between PEs, where usually AFI/SAFI 1/128 is used
- <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car-02#section-10>
 - “A couple of applicable use-cases:
 - SRv6 locator prefix,
 - Traditional IP prefix advertisement, such as BGP IPv6 or BGP-LU
- Presuming "BGP IPv6" means AFI/SAFI 2/1, this text says CAR Type2 route is used to carry IPv6-Unicast service routes.
- **DJ- Response to Kaliraj-2:**
 - Link: <https://mailarchive.ietf.org/arch/msg/idr/W6Z24OkxXUOcUUZdlq5YG2m7MUK/>
 - Text: : A clarification to your comments below - CAR SAFI is not being used instead of SAFI 1/1.
 - SAFIs 1/1 and 2/1 continue to be used for existing customer service routes and the resulting VPN routes (eg. in SAFI 128) will be steered along the provider network CAR paths as specified in section 3.
 - CAR SAFI can be independently and optionally enabled between CE-PE when a customer is running CAR within their network and have a need to extend it across the provider network. For example, for a CsC or equivalent scenario that needs intent-awareness.
 - There isn't a specific procedure to be described, as the SAFIs are orthogonal to each other. CAR SAFI routes on the PE will be advertised via VPN CAR SAFI as described in Section 8. We can add some more clarifying text if that helps.

Shepherding chair (Susan Hares) action items

- Action item 1 – Confirm the sections above contain the discussions above
- Action item 2 – Draft as experimental will not be sent without:
 - Careful review of “non-implemented sections), and
 - Updated implementation report (if are interested)
- Actions items for issues 1-8 will be added once:
 - Discussion on reasonings for Type 2 (IP Prefix) with the IDR chair team.

CAR-WG LC-Q2: Inter-Domain Intent-Aware Routing: WG LC for CAR and CT

Author: Martin.Horneffer@telekom.de

Link: <https://mailarchive.ietf.org/arch/msg/idr/A3elp1Pf0jsbz2ILwiO8jMQ3VGQ/>

Text of email:

Dear WG,

since the two WG LCs are open atm, and we just had the IETF117 WG meeting two days ago, I would like to share my perspective on the situation.

And let me stress that I don't want to blame anyone, just bemoan the situation. Of course I hope we can make it better next time.

It looks so beautiful: we have a problem statement document, and several proposals for solution. Both CAR and CT have been presented and discussed, both appear to have many proponents. Both seem to solve the basic problem and we can look at the specific pros and cons of the differences, discuss them in all detail and search for the technically best solution.

However one problem remains: time.

- CAR started in 2021.
- CT started in 2020 or 2022, depending on which document you count.
- In 2023 there is no interoperable implementation between some of the major vendors for backbone routers. There are no plans for one. Even here, at the IETF IDR wg, there is no conclusion which way to go to ever get one.

For me this currently means I have to look for a completely different solution. Work with what happens to be available and give up the hope for a clear inter-domain solution for intent-aware routing.

In my eyes, this is a loose-loose-loose situation. Vendor A, vendor B, and operator all miss out on the opportunity to collectively address a problem in a well-defined and efficient manner.

Issues:

- CAR issues:
 - Create a list of operational differences between CAR-02 and CT-12
 - Note on list technical features you will not merge with CT concepts,
 - Note on list technical features you would merge with CT concepts,
- Shepherd's review of -02 verse comments: (TBD)
- Github link for issue: (TBD)
- Github link for change: (TBD)

Resolution of Adoption call Issues

Adoption CAR issues

F3-CAR-Issue-1: BGP-CAR Appendix A.7 Anycast EP Scenario

Submitter: Natrajan Venkataraman [natv@juniper.net]

https://mailarchive.ietf.org/arch/msg/idr/nAj25sX0x_lp09VEqUDSCxmDR_w/

CAR action items:

- Revision of sections in A.7 and B.2 to address any unclear issues regarding ANYCAST. (After all issues are cleared, then the WG should be queried regarding these two sections).
- Discussion of CAR view on the use of color to indicate egress domain visibility.

Resolution:

- CAR github link for issue:
F3-CAR-Issue-1: BGP-CAR Appendix A.7 Anycast EP Scenario
Details: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/1>
- CAR sections changed:
Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/d3169c4d43b74cd46f8adda0065ade8606d6bbb1>
Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/128061677413660c4c562791fb4c6ed684f22ba0>
- Shepherd's Review: (TBD)
- WG LC query for resolution: (not done)

F3-CAR-Issue-2: BGP-CAR Consensus on the need for resolution schemes

Submitter: Natrajan Venkataraman [natv@juniper.net]

Email thread: <https://datatracker.ietf.org/doc/html/draft-dskc-bess-bgp-car-05#appendix-B>

- CAR Sections 1.1 needs indicate that local BGP policy can customize or adjust the route validation (section 2.4), route resolution (2.5), and AIGP (2.6).
- Section 2.10 should cover any issues regarding conflicts caused by local policy.

Resolution:

- CAR github issue link: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/2>
- CAR Sections changed:
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/dd89d5638eef7534c7fb8a4096f7885585e8330d>
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/ba88ab22818d40a7c5ef40ca7a6aaae24ea9fd57>
- Shepherd's review TBD: (link)
- WG LC query for resolution: (not done)

CAR WG Last Call Issues

F3-CAR-Issue-3: Handling of LCM and Extended Communities

Submitter: **Submitter: Natrajan Venkataraman** [natv@juniper.net]

[IDR mail thread]: https://mailarchive.ietf.org/arch/msg/idr/w5ROKVQPtVcI_BTbXfnKpKB4h4k/

Reference: <https://datatracker.ietf.org/doc/html/draft-dskc-bess-bgp-car-05#appendix-B>

Action items:

- Appendix B.2 should be clarified after F3-CAR-Issue-2 has been expanded to include:
 - Sections 1.1 needs indicate that local BGP policy can customize or adjust the route validation (section 2.4), route resolution (2.5), and AIGP (2.6).
 - Section 2.10 should cover any issues regarding conflicts caused by local policy.

Resolution of action items:

- CAR github link for issue: Details: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/3>
- CAR sections changed:
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/30067cc68472a9836e9f63a9686a6fde01b44920>
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/8311eb234bb92047883e17046554888f3ee010d4>
- Shepherd's review: TBD
- WG LC query for resolution: TBD

F3-CAR-Issue-4: CAR Routing in Non-Agreeing Color domains for Anycast EPs

Person: Natrajan Venkataraman <natv@juniper.net>

IDR mail link: <https://mailarchive.ietf.org/arch/msg/idr/OOZOBSyjdAYBar8NxvOqo6-5fAc/>

Reference: <https://datatracker.ietf.org/doc/html/draft-dskc-bess-bgp-car-05#appendix-B.3>

Action items:

- Clarify paragraph 2 in Section 10 to include assumptions regarding coordination of shared ANYCAST service used across multiple color domains (This issues links to F3-CAR-Issue-4).
- Link revised paragraph 2 in section 10 to Appendix A.7.
- Revise Appendix A.7 (or create a new) to specifically detail how an ANYCAST Address will operate in non-agree color domains.

Resolution:

- CAR github link for issue: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/4>
- CAR sections changed:
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/e78ba1a119204dd4fbb9e2fdad2625bcf45a7869>
- Shepherd's review: TBD
- WG LC for resolution: TBD

CAR WG Last Call Issues

F3-CAR-Issue-5: BGP Update Packing

Person: Natrajan Venkataraman <natv@juniper.net>

IDR mail link: <https://mailarchive.ietf.org/arch/msg/idr/OOZOBSyjdAYBar8NxvOqo6-5fAc/>

Reference: <https://datatracker.ietf.org/doc/html/draft-dskc-bess-bgp-car-05#appendix-B.3>

CAR action items:

- Section 6 on Scaling needs to be expanded to include:
 - Bytes added to BGP UPDATE message for CAR NLRI with SRv6
 - A single 128-bit SRv6 SID or a stack of 128-bit SRv6 SIDs
 - A transposed portion (refer [I-D.ietf-bess-srv6-services]) of the SRv6 SID that MUST be of size in multiples of one octet and less than 16.
 - Compression allowed due to signal multiple per-prefix encapsulation types & values as part of NLRI. e.g. MPLS Label, SRv6 SID and any other encapsulations.
- Section 2.9.2.3 needs to be upgraded to point to examples in Appendices of carrying single 128-bit SRv6 SID and Stack of SRv6-SIDs. The examples in the appendices should also reference back to scaling in section 6.

Resolution:

- CAR github link for issue: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/5>
 - CAR sections changed:
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/64ea1f26b5452d7895e272f2129da6a2c754d497>
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/d2c518a745514f51dd58e9249e5ac9b719e2e1bf>

Shepherd's review for -02: (TBD)

WG LC query for resolution: (not done)

Adoption WG questions

F3-WG-Issue-1: New Address Families [Shunwan Zhuang]

- Person: Shunwan Zhuang
- IDR mail thread: https://mailarchive.ietf.org/arch/msg/idr/4T3-b4_ckpGu3BwjwuESqpYsoFk/

[Both]: Provide an example of incremental deployment in domains 1, 2, and 3. Suppose that only domains 1 and 3 have been enhanced to CAR technology.

CAR actions:

- Enhance the A.4 example based on lists discussion.
- Provide an illustration of SRv6 data plane (e.g., E2E SRv6 & intra-domain SRv6) based on a sample topology.
- Add additional options and operational considerations that do need to be described. (CAR authors planned in July to include them along with illustrations in the next version of the draft.)

CAR Resolution:

- Shunwan Zhuang Adoption response:
https://mailarchive.ietf.org/arch/msg/idr/1e04SwbhLAmQoL0_WGBxUcCxm-I/
- Github issue: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/6>
- Github change: <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#appendix-A.4>
- Shepherd's review of F3-WG-Issue-1: (TBD)
- Confirmation with Shunwan Zhang: (need link)

F3-WG-Issue-2: Support for SR-v6 (Jingrong Xie) (xiejingron@huawei.com)

[Author] Jingrong Xie [xiejingrong@huawei.com]

IDR mail link: <https://mailarchive.ietf.org/arch/msg/idr/7C7dlvIgZuNNx3rLorC6S24Ta50/>

- CAR Action items:
 - CAR: Provide an illustration of the SRv6 data plane (e.g., E2E SRv6 & Intra-domain SRv6)
 - CAR (DJ): Add additional options and operational considerations.
- Github issue: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/7>
- CAR sections changed
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-9>
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#appendix-C>
- Shepherd's review of -02: (TBD)
- Query of Jingrong Xie for issue: 8/14/2023
 - Link: <https://mailarchive.ietf.org/arch/msg/idr/rOPmma1BWUaBBnvnaKtFOHTQaqE/>
 - Response: <https://mailarchive.ietf.org/arch/msg/idr/Kr9SZ8z-gN8py8b4alkONPi7rLI/>

Shepherd Query to Jingron Xie for closure

- The review email you sent on 7/18/2023
<https://mailarchive.ietf.org/arch/msg/idr/ZTlk3xKtwG1Xw0vkUEFipYmbfLY/>
- Your additional support for draft-ietf-idr-bgp-car-02 on 8/1

- Second query:
<https://mailarchive.ietf.org/arch/msg/idr/eFlvPtDdFWwU2MczU6XwzHape9M/>
<https://mailarchive.ietf.org/arch/msg/idr/rOPmma1BWUaBBnvnaKtFOHTQaqE/>

Response Text from Jingrong Xie on closure:

Link: <https://mailarchive.ietf.org/arch/msg/idr/Kr9SZ8z-gN8py8b4aIkONPi7rLI/>

Hi Sue,

I consider the issues about SRv6 support in CAR are resolved, and the left thing is about wording and phrasing in the shepherding procedure.

I am not good at shepherding a document, but I would like to share my suggestions for considering in the following “wording and phrasing” work:

1. Regarding Section 9.1.2 and its illustration:

If section 9.1.2 is considered useful, then the illustration in Appendix C.3 can be rephrased carefully to illustrate BGP CAR (E,C) with non-routed SRv6 Service SID.

If section 9.1.2 is considered not useful, then the illustration in Appendix C.3 can be removed, together with section 9.1.2.

I would prefer the later one, because a non-routed Service SID (VPN) over transport end-to-end BGP Path over intra-area IGP Path is always OK but will cause encaps cost in SRv6.

But I would let the authors and shepherd to decide on this.

2. Regarding Section 9.1.1 and its illustration:

Currently section 9.2 and 9.3 are mainly about 9.1.1 as I understand it, and so do appendix C.1 and C.2 (corresponding to section 9.2.1 and 9.2.2 respectively).

I consider they are OK, and for Appendix C.2 I would have the following update on my understanding, and my further suggestion on “wording and phrasing” work:

----updated understanding on the procedure of appendix C.2----

@E1->121: {(E1.loop,B:C13:121:END::) (B:C11:2:DT4::; 1) } [IPv4-User-Packet]

@121->231: {(121.loop,B:C12:231:END::) } {(E1.loop, B:C11:2:DT4::) (B:C11:2:DT4::; 0) } [IPv4-User-Packet]

@231->E2: {(E1.loop, B:C11:2:DT4::) (B:C11:2:DT4::; 0) } [IPv4-User-Packet]

----Checking the following description currently in appendix C.2, I would suggest that ONLY the packet on wire is illustrated (like above), because the behavior (according to some state like IPv6/SID Table) is more detailed and should have done before the brief text----

@E1: IPv4 VRF V/v => H.Encaps.red <B:C13:121:END::, B:C11:2:DT4::>

@121: My SID table: B:C13:121:END:: => Update DA with B:C11:2:DT4::

@121: IPv6 Table: B:C11::/32 => H.Encaps.red <B:C12:231:END::>

@231: My SID table: B:C12:231:END:: => Update DA with B:C11:2:DT4::

@231: IPv6 Table B:C11:2::/48 => forward via ISISv6 FA path to E2

----Further, I would suggest that the SRH with SL==0 is Popped or deleted, with the following two options for consideration----

----option-1, Divide the service and transport into 2 layers of IPv6 header @E1----

@E1->121: {(E1.loop,B:C13:121:END::)} {(E1.loop, B:C11:2:DT4::)} [IPv4-User-Packet] //Use 2 IPv6 headers to divide the service and transport into 2 layers of encapsulation.

@121->231: {(121.loop,B:C12:231:END::)} {(E1.loop, B:C11:2:DT4::)} [IPv4-User-Packet] //No longer have an SRH from the first step above.

@231->E2: {(E1.loop, B:C11:2:DT4::)} [IPv4-User-Packet]

----option-2, Do POP & Encapsulation @121----

@E1->121: {(E1.loop,B:C13:121:END::)} (B:C11:2:DT4::; 1) } [IPv4-User-Packet]

@121->231: {(121.loop,B:C12:231:END::)} {(E1.loop, B:C11:2:DT4::)} [IPv4-User-Packet] //Pop the SRH with SL==0 and thus no longer have an SRH with SL==0.

@231->E2: {(E1.loop, B:C11:2:DT4::)} [IPv4-User-Packet]

Note in option-2 that, this kind of behavior to pop the SRH with SL==0 together with a further encapsulation, is very similar to the behavior of a Binding SID in Section 4.13 of RFC8986.

Unfortunately it seemed not careful enough in RFC8986 to get this right ---- the pseudo code in section 4.13 of RFC8986 did not pop the SRH with SL==0 when it could. I'd like to bring this to Spring for discussion.

Thanks, Jingrong

F3-WG-Issue-3: Key Operational Differences between CAR and CT drafts (Bruno Decraene)

People: Bruno Decraene and Jeff Haas

IDR mail thread: <https://mailarchive.ietf.org/arch/msg/idr/-N9CncTl8JtwDLmGZEJ1RLqzMSM/>

CAR Action items:

- CAR-1: Based on common example topology add text to draft based on shared ANYCAST service. (Note: overlaps with F3-CAR-Issue-4.)
- CAR-2: In the introduction to section 6, clarify what paradigm is used for scaling in CAR (e.g. indirection and hierarchy). This text should include the following:
 - descriptions of how CAR's paradigms for indirection and hierarchy are used in the network's transport and service topology,
 - how scaling is impacted by NLRI changes are handled in route withdraws, refreshes, and updates.
- CAR-3: Section 2.5 provides two comments on route resolution that need to be clarified:
 - "When multiple resolutions are possible, the default preference should be: IGP Flex-Algo, SR Policy, RSVP-TE, BGP Car, [and] BGP-LU."
 - This description uses the word should which implies that local policy can interfere. This should be clarified.
 - This description does not include the inclusion of LCM or Extended-Color Community or Color in the Tunnel Attribute.
 - "Resolution may be automated using Color-EC as illustrated in Appendix B.2." This comment does not provide a normative set of results for route resolution.
- CAR-4: Should include discussion on impact on anycast endpoints, non-agreeing color-domains.
- CAR-5: Add Discussion on Non-agreeing color-domains for Anycast endpoints to error handling and manageability section (section 10). This issue overlaps with F3-CAR-Issue-4 and F3-Wg-Issue-3a.

Post-WG LC Resolution:

- Github issue: Details: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/8>
- Sections changed:
 - Relevant sections:
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-2.5>
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#appendix-A.7>
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-2.10>
- Shepherd's review of -02: (TBD)
- WG LC review of -02:
 - Bruno Decraene:
 - Jeff Haas questions:
 - <https://mailarchive.ietf.org/arch/msg/idr/xTpg9qBDRJM7EmAB64E6wjScd-Q/>
 - https://mailarchive.ietf.org/arch/msg/idr/P4hCavFklsH5zQ5y4kMOc4_Xrck/
- WG query in August:

F3-WG-Issue-4: Intent at Service level [Ketan Talaulikar]

- **Originator:** Ketan Talaulikar:
- **IDR thread link:**
<https://mailarchive.ietf.org/arch/msg/idr/hHto6CYV6zWeTju7gHWLH1qRsOA/>
- Ketan Action items:
 - Ketan: Define an example of a service layer intent versus transport intent.
- CAR action items:
 - CAR: Add a section to discuss how color is implemented in the VPN service layer
 - CAR: Clarify the definition of intent to align with Spring and other IETF/IRTF WGs.

Post-WG LC Resolution:

- Github: Details: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/9>
- Section changed:
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-3>
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-8>
- Shepherd's review of -02: (TBD)
- WG LC review of -02: (TBD)

F3-WG-Issue-5: Technology BGP-CT and CAR are based [upon] and implications [Jeffrey Zhang]

[Jeffrey Zhang]: Whether BGP-CT/CAR are based on VPN or BGP-LU and which one is better to go forward.

[text]: Following section explains the relationship and distinction between SAFI 76 and SAFI 4, SAFI 128.
<https://datatracker.ietf.org/doc/html/draft-kaliraj-idr-bgp-classful-transport-planes-17#section-9>

Email: https://mailarchive.ietf.org/arch/msg/idr/fLSx_Qh9BZJweQd0AQSNx1q7nOk/

Action items for CAR:

- Chair + Jeffrey Zhang: define an example of RD, RTCs, and labels passed by VPN services that might interact with CT and CAR domains.
- CAR: Clarify the interaction with RDs and RTCs by discussing how CAR handles RDs, RTCs, labels and other VPN signaling information that sent to domain with CAR.
- CAR discuss how efficient CAR is domains which do not handle SR-MPLS or VPNs

Post-WG LC Resolution:

- Github: Details: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/10>
- Sections changed for -02:
- Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/276b13bc180fac4b4a708bd14b45198770a5c44a>
- Shepherd's review of -02: (TBD)
- WG LC review of -02: TBD

F3-WG-Issue-6: Benefits of Route Targets [Swadesh Agrawal]

Thread: https://mailarchive.ietf.org/arch/msg/idr/v9f1wKjalFFOBq-3NmtN1Cg_2eQ/

[author]: Swadesh Agrawal

Action items:

- Chair + Keyur Patel + Swadesh Agrawal – Review F3-WG-issues-6 to generalize example for the use of Route Targets
- CAR: Provide normative text and examples for non-agreeing color domains. The normative text may require the authors to add additional text on the lack of support for RTs. The examples should include the topology (similar or exactly like the topology above) with three color domains.

Post-WG-LC Resolution:

- Github issue: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/11>
- Sections changed for -02:
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-2.8>
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-2.9.3>
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#appendix-B.3>
- Shepherd's review of -02:
- WG LC review of -02:

F3-WG-Issue-7: Compatibility of BGP-CT and BGP-CAR to SR-PCE (Shraddha Hegde)

IDR mail thread: <https://mailarchive.ietf.org/arch/msg/idr/zWqlGvaL3zS2NqTsDAAk9L0iH-Q/>

Issue author: Shraddha Hegde <shraddha@juniper.net> Wed, 27 July 2022

Action times:

- CAR: Consider how CAR implements or interoperates with all the constructs in RFC 9256 and RFC9252. CAR: Provide a short section in your document regarding support.
- CAR: Describe the limits of any community, extended community or wide-community regarding color. Describe how any of these limits interact with LCM.

Post-WG LC:

- Github issue: Details: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/12>
- Sections changed for -02:
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-1.2>
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-3>
- Shepherd's review of -02: (TBD)
- WG LC review of changes: (TBD)

F3-WG-Issue-8: Scaling and Expected Route Size

[Robert Raszuk]: posts the following as follow-on to Jeff message sizes, but it is a different thread.

[IDR message thread: <https://mailarchive.ietf.org/arch/msg/idr/v8kkDGmr3ViPIR4UEmOPJbJ8B44/>]

- CAR: Discuss in scale section how CAR scales to:
 - limits in draft-hr-spring-intentaware-routing-using-color-00
 - Jeff Haas' rough route calculation: 1.5 million routes, given 10K update, about 2.5 minutes of convergence
 - Robert's use case: transient route problems every 5-10 sections every 50 seconds

Post-WG LC:

- Github issue: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/issues/13>
- Sections changed for -02:
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#section-6>
 - <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-car#appendix-C>
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/ba5f7e02baca84a776cdb502a93e3a6368f9f9e>
 - Diffs: <https://github.com/ietf-wg-idr/draft-ietf-idr-bgp-car/commit/d2c518a745514f51dd58e9249e5ac9b719e2e1bf>
- Shepherd's review of -02: (tbd)
- WG LC review of -02: (tbd)