IETF 119 – 6lo

Path-Aware Semantic Addressing (PASA) for Low power and Lossy Networks

~~draft-ietf-6lo-path-aware-semantic-addressing-03~~

draft-ietf-6lo-path-aware-semantic-addressing-04

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IETF 119 – Brisbane

Since IETF 118

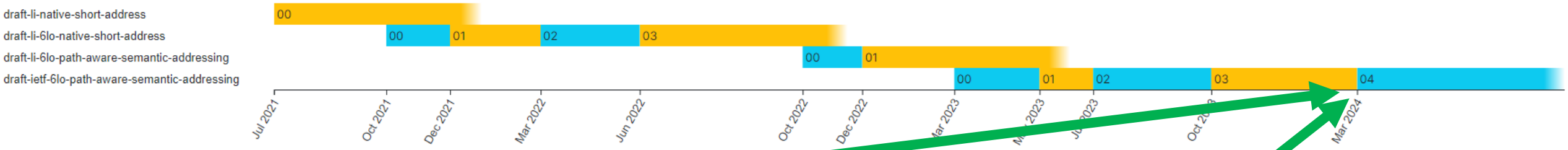
Path-Aware Semantic Addressing (PASA) for Low power and Lossy Networks

draft-ietf-6lo-path-aware-semantic-addressing-04

Status | IESG evaluation record | IESG writeups | Email expansions | History

Versions:

00 | 01 | 02 | 03 | 04



Submitted: February 19, 2024 under the rules in RFC 8179.

Holder contact name	Director of licensing
Holder contact email	licensing@huawei.com
Holder contact info	

III. IETF Document or Other Contribution to Which this IPR Disclosure Relates

Internet-Draft:	draft-ietf-6lo-path-aware-semantic-addressing ("Path-Aware Semantic Addressing (PASA) for Low power and Lossy Networks")
Revisions:	03

IV. Disclosure of Patent Information

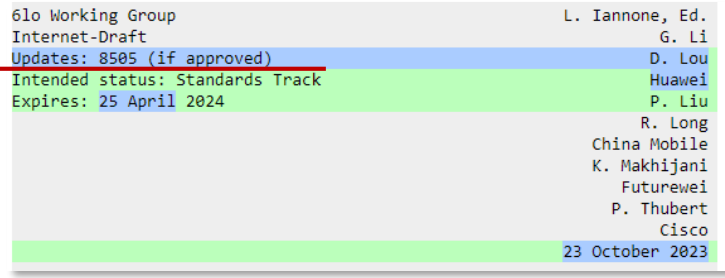
i.e., patents or patent applications required to be disclosed by RFC 8179

A. For granted patents or published pending patent applications, please provide the following information:

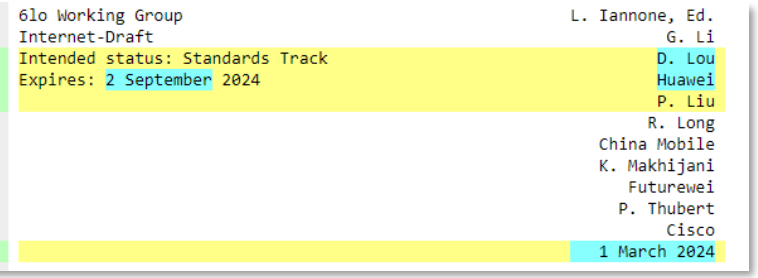
Patent, Serial, Publication, Registration, or Application/File number(s)	Number: CN202110763620 Inventor: Delei Yu Title: ADDRESS ASSIGNMENT METHOD, NODE DETERMINING METHOD AND APPARATUS, AND STORAGE MEDIUM Date: 2021-07-06

draft-ietf-6lo-path-aware-semantic-address-04.txt
March 2024
Main changes: Adapt text to GAAO

Document Structure



6lo Working Group L. Iannone, Ed.
Internet-Draft G. Li
Updates: 8505 (if approved) D. Lou
Intended status: Standards Track Huawei
Expires: 25 April 2024 P. Liu
R. Long
China Mobile
K. Makhijani
Futurewei
P. Thubert
Cisco
23 October 2023



6lo Working Group L. Iannone, Ed.
Internet-Draft G. Li
Intended status: Standards Track D. Lou
Expires: 2 September 2024 Huawei
P. Liu
R. Long
China Mobile
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Futurewei
P. Thubert
Cisco
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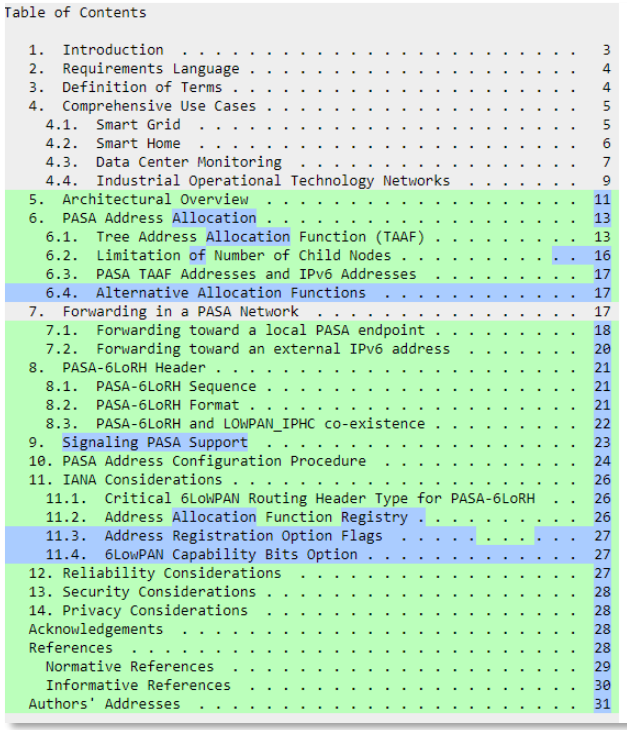

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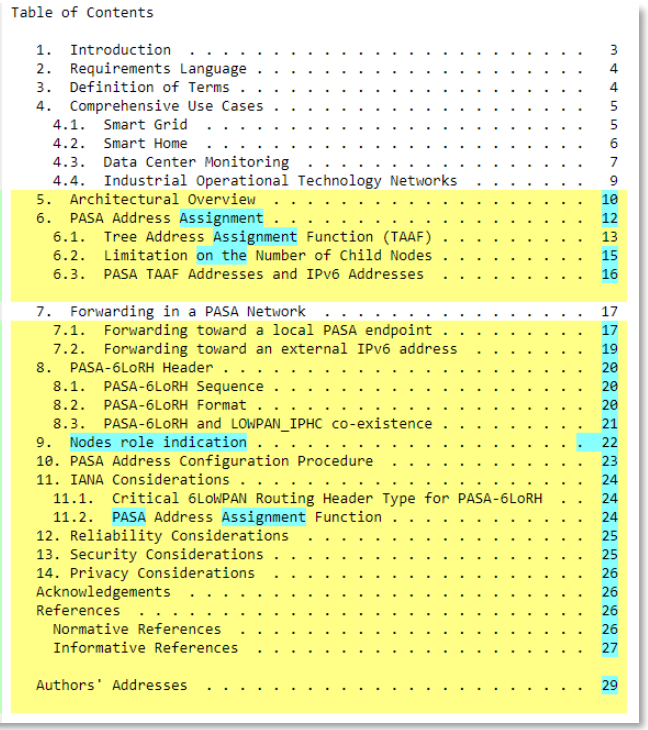
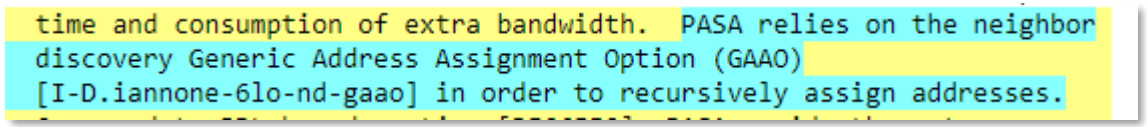


Table of Contents



time and consumption of extra bandwidth. PASA relies on the neighbor discovery Generic Address Assignment Option (GAAO) [I-D.iannone-6lo-nd-gaao] in order to recursively assign addresses.

- Document does not update RFC 8505 anymore
- Structure remained more or less the same
- Terminology has been updated
- Added reference to GAAO document

Main Content Changes (I)

6.4. Alternative Allocation Functions

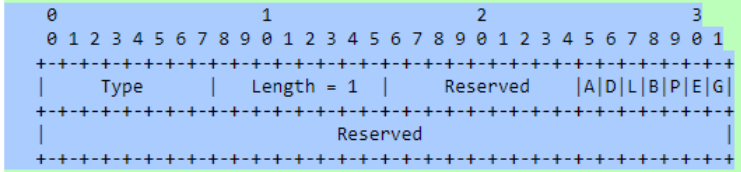
The Allocation Function can be different from the one defined in this specifications, where all nodes know which one to use by configuration (cf. Section 11). The use of one and only one AAF is allowed in a PASA domain and MUST be the same for all nodes. It is RECOMMENDED that implementations support at least the AAF proposed in this document.

Different allocation functions may, for example, leverage on a priori knowledge of the topology in order to optimize the maximum address size and make it smaller. For instance, because the order of address allocation has an impact on the size, the address of children with the largest subtree should be allocated in the first place so to reduce the average address length of the whole subtree. Also, knowing the traffic in advance, or being able to have an estimation, can help to minimize the size of addresses that have a lot of traffic. This kind of optimization can be an option, the specification of optimizations is out of the scope of this document and may be defined in new Allocation Functions to be added to the "Allocation Function Registry" (see Section 11).

- Discussion about alternative address assignment function removed
  - It belongs to GAAO now

9. Signaling PASA Support

PASA Routers and Hosts roles can be assigned similarly to IEEE 802.15.4, which distinguishes between Full-Function Devices (FFD) and Reduced Function Devices (RFD) (cf., [ZigBee]). Such a role is notified using the 6LowPAN Capability Indication Option (6CIO) as defined in [RFC7400] and [RFC8505]. In particular, a PASA Root will set the B-bit to indicate that it is a border router, a PASA Router, will set the L-bit to indicate it is a router. Nodes not setting both B and L bits are considered PASA Nodes. In order for a node to announce that it is PASA capable, a new flag is used in the 6CIO (see also Section 11). A 6LowPAN node that supports this specification MUST set the A flag.



9. Nodes role indication

PASA Routers and Hosts roles can be assigned similarly to IEEE 802.15.4, which distinguishes between Full-Function Devices (FFD) and Reduced Function Devices (RFD) (cf., [ZigBee]). Such a role is notified using the 6LowPAN Capability Indication Option (6CIO) as defined in [RFC7400] and [RFC8505]. In particular, a PASA Root will set the B-bit to indicate that it is a border router, a PASA Router, will set the L-bit to indicate it is a router. Nodes not setting both B and L bits are considered PASA Nodes.

- Before: PASA was using one bit in 6CIO to signal its presence
- Now: PASA uses GAAO no need to modify 6CIO here

Main Content Changes (II)

10. PASA Address Configuration Procedure

[RFC8505] Registration Extensions for IPv6 over 6LowPAN Neighbor Discovery can be further extended to accommodate PASA address configuration. In order for a PASA node to explicitly request an address, the Extended Address Registration Option (EARO) message is used, exploiting on of the reserved bits. The format of the EARO message is shown in Figure 13.

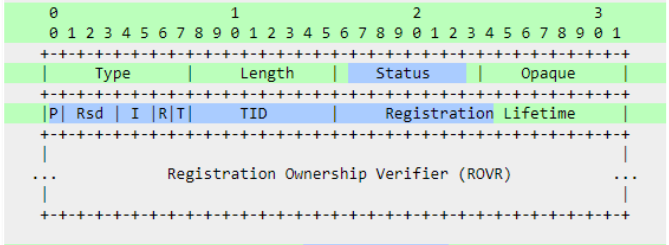


Figure 13: EARO Format.

All the fields in EARO message are defined in [RFC8505], except for bits P, which is allocated by this document (see Section 11) and is defined as follows:

* PASA bit (P): If set, this flag indicates that the registration message is requesting or delivering a PASA address as part of the link-local address registration procedure.

10. PASA Address Configuration Procedure

PASA address configuration leverages on the Generic Address Assignment Option [I-D.iannone-6lo-nd-gaao]. When a PASA node bootstraps, it typically does multicast a Routing Solicitation(RS) and receives one or more unicast Routing Advertisements (RA) messages from potential parents. The node can choose a parent on a "first come first served" basis and send a Neighbor Solicitation (NS) with a GAAO message to request an address to the selected parent (see {FIG:GAAOReq} for an example of such option).

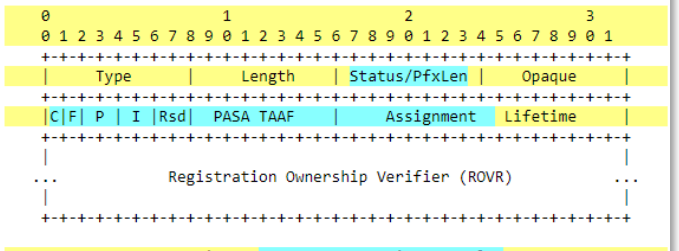


Figure 12: NS GAAO option example.

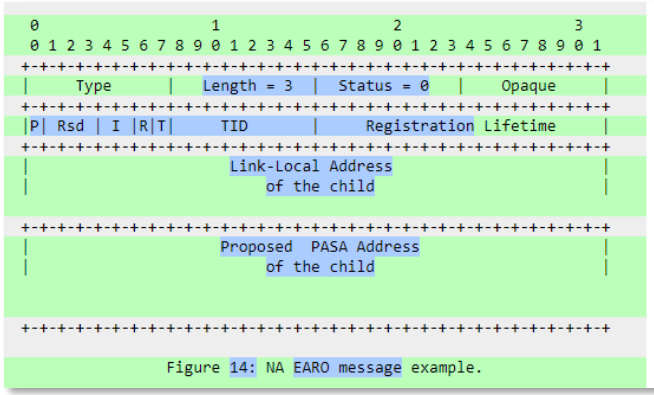


Figure 14: NA EARO message example.

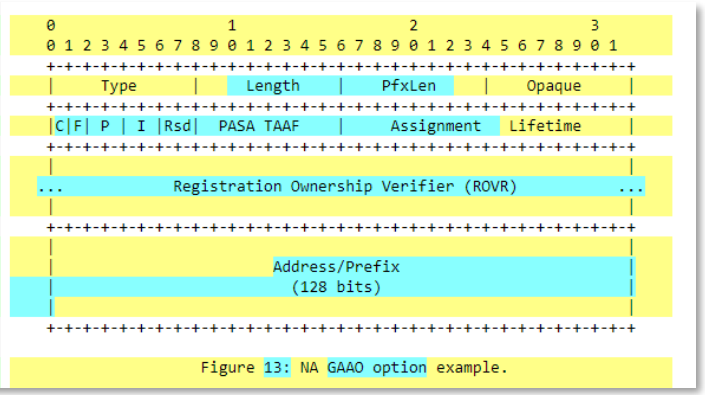
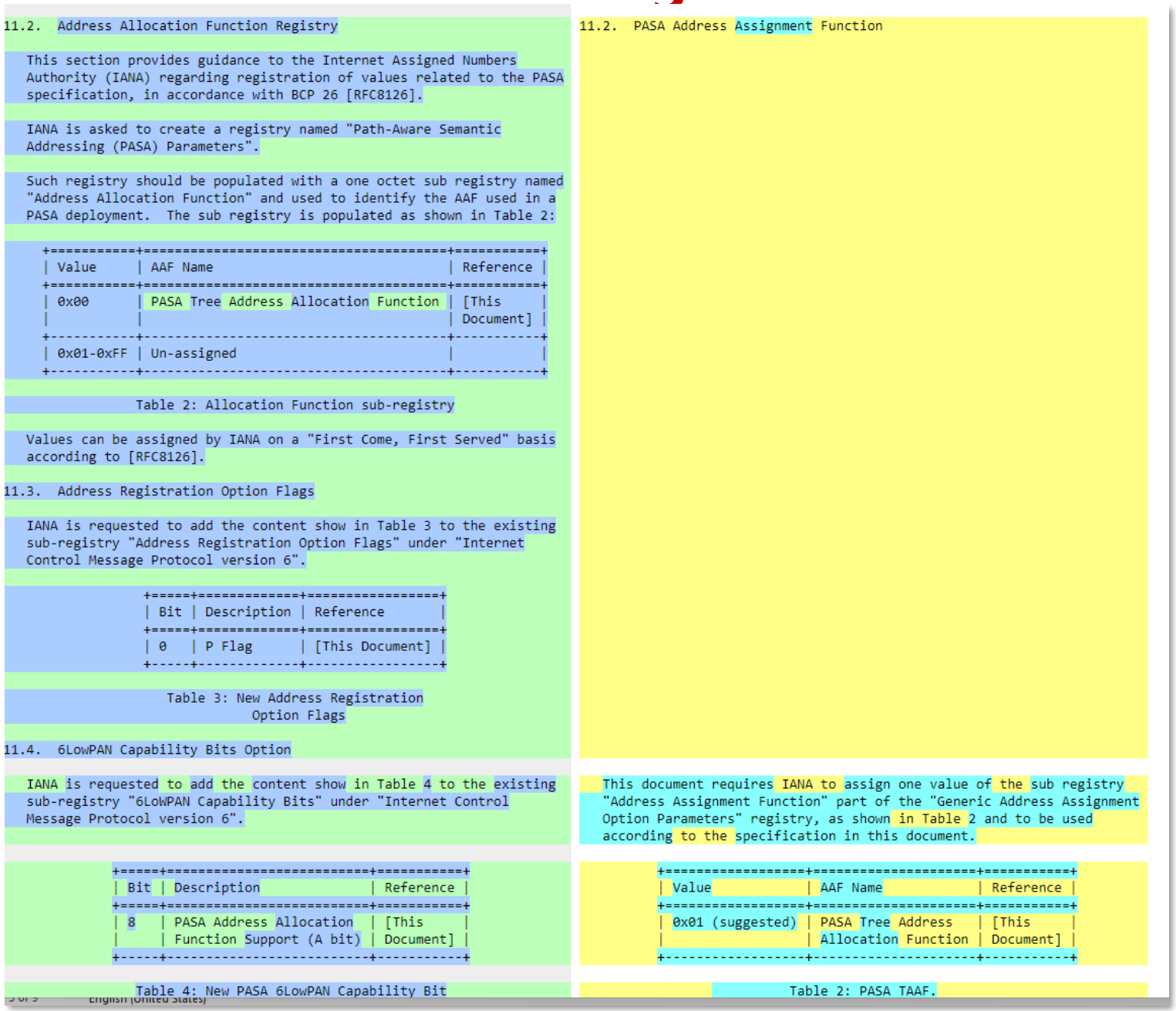


Figure 13: NA GAAO option example.

- No need to define new ND options
  - Now done in GAAO
- Just use GAAO option
  - Examples added to the document

IANA Section’s Changes



11.2. Address Allocation Function Registry

This section provides guidance to the Internet Assigned Numbers Authority (IANA) regarding registration of values related to the PASA specification, in accordance with BCP 26 [RFC8126].

IANA is asked to create a registry named "Path-Aware Semantic Addressing (PASA) Parameters".

Such registry should be populated with a one octet sub registry named "Address Allocation Function" and used to identify the AAF used in a PASA deployment. The sub registry is populated as shown in Table 2:

Value	AAF Name	Reference
0x00	PASA Tree Address Allocation Function	[This Document]
0x01-0xFF	Un-assigned	

Table 2: Allocation Function sub-registry

Values can be assigned by IANA on a "First Come, First Served" basis according to [RFC8126].

11.3. Address Registration Option Flags

IANA is requested to add the content show in Table 3 to the existing sub-registry "Address Registration Option Flags" under "Internet Control Message Protocol version 6".

Bit	Description	Reference
0	P Flag	[This Document]

Table 3: New Address Registration Option Flags

11.4. 6LowPAN Capability Bits Option

IANA is requested to add the content show in Table 4 to the existing sub-registry "6LoWPAN Capability Bits" under "Internet Control Message Protocol version 6".

Bit	Description	Reference
8	PASA Address Allocation Function Support (A bit)	[This Document]

Table 4: New PASA 6LowPAN Capability Bit

11.2. PASA Address Assignment Function

This document requires IANA to assign one value of the sub registry "Address Assignment Function" part of the "Generic Address Assignment Option Parameters" registry, as shown in Table 2 and to be used according to the specification in this document.

Value	AAF Name	Reference
0x01 (suggested)	PASA Tree Address Allocation Function	[This Document]

Table 2: PASA TAAF.

- No need anymore to create an AAF registry
  - Done in GAAO
- No need to allocate bits in EARO
- No need to allocate bits in 6CIO
  - Done in GAAO
- Just request one code point for PASA assignment function in the registry created by GAAO

Next Steps

- **Main technical content not changed in the last revisions!**
  - **Ready to move forward:**
    - **Ask early reviews from other areas + WGLC**
      - (in the meantime progress with GAAO)

THANKS!