# ANIMA DNS-SD compatible services auto configuration

draft-eckert-anima-grasp-dnssd-02
draft-eckert-anima-services-dns-autoconfig-00

IETF111 July 2021

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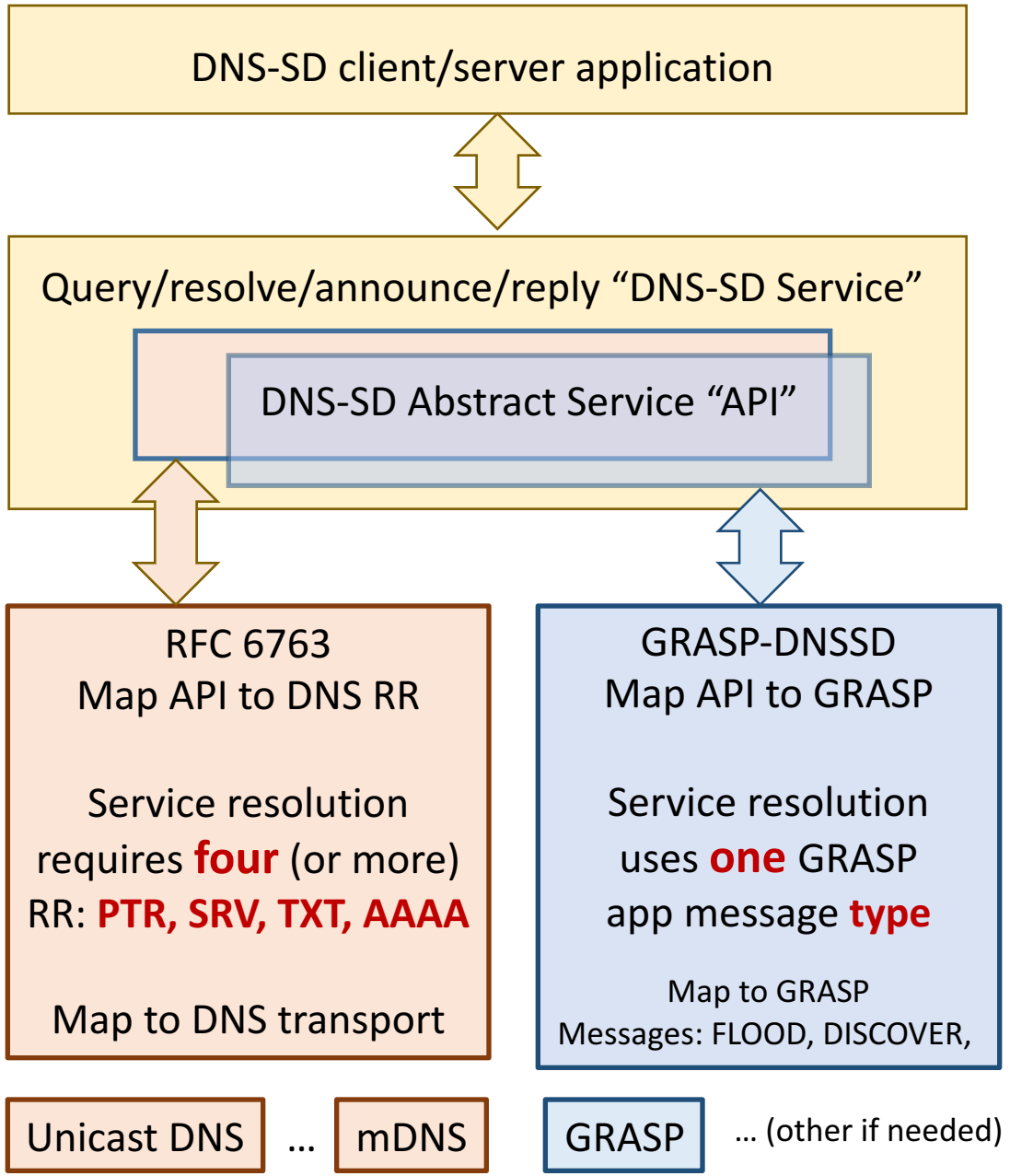
# Background

- Work already published around IETF100/IETF101, presentend to ANIMA, DNS-SD.
- Author let it expire due to dependencies, priorities
  - Needed to finish ANIMA charter round 1 work (8 RFC, 420 pages, published May 2021).
- Now reviving the work, adding new co-authors, only minor textual improvements (more work to come)
- Editorial change:
  - draft-eckert-anima-noc-autoconfig changed to draft-eckert-anima-services-dns-autoconfig after discussion with Ignas – term NOC not commonly the correct term in some networks

# DNS-SD “service” API

- No explicit IETF specification ?
  - Maybe this is a good work item too.
  - But many concrete, OS APIs.
- Ideally would like API to be able to choose whether to use RFC6763 or GRASP-DNSSD (or both).
  - Some concrete API may be too explicit, asking user to even select transport (mDNS, Unicast).
- May not be 100% match
  - Some unicast name related functions not possible (TBD)
  - Some extensions very useful and only easily possible with GRASPs approach
    - Flooding allows to introduce “distance” as service selection parameter (DNS-SD only has priority/wight, independent of distance to service instance – based on unicast DNS).



# DNS-SD compatible GRASP objectives (CDDL):

```
objective-name   //= SRV.<rfc6335-service-name>
objective-name   //= NAME.<hostname>    …..... If we ever need them
service-element  =  {
       ?( &(private:0)      => any), ..... Non-standardized extensions
       ?( &(msg-type:1      => msg-type
       ?( &(service:2)      => tstr),..... Service Name (“printer“)
       *( &(instance:3)     => tstr),..... Instance Name („my-kitchen-printer“)
       ?( &(domain:4)       => tstr),..... Empty = ANI/ACP (like .local), else VRF name
       ?( &(priority:5)     => 0..65535 ),..... As in DNS-SD
       ?( &(weight:6)       => 0..65535 ),..... As in DNS-SD
       *( &(kvpairs:7)      => { *(tstr: any) },.. Key Value pairs – as in DNS-SD
       ?( &(range:8)        => 0..255 ),..... For distance based service selection
       *( &(clocator:9)     => clocator),..... GRASP locators with context indicator (“VRF”)
      }

  clocator = [ context, locator-option ] ..... Permit locators to be in data plane
  context = tstr ..... Empty: ACP, „0“ = „VRF0“, else name of VRF
  locator-option = <unchanged> ..... from GRASP specification – IPv4/IPv6addr/port

  msg-type = &( describe: 0, describe-request:1, enumerate:2, enumerate-request:3 ).
```

# The End
# … until there is more interest...

- Why, how ?

# Autonomic Conrol Plane (ACP, RFC8994)

ACP is an autonomically built, hop-by-hop IPsec encrypted IPv6 “VRF-lite” across all router/switches (nodes) in a network

Runs even when nothing is configured or anything else is broken (not mis-configurabl by operator/SDN controllers).

Primarily intended for OAM, automated network management, M2M communications.

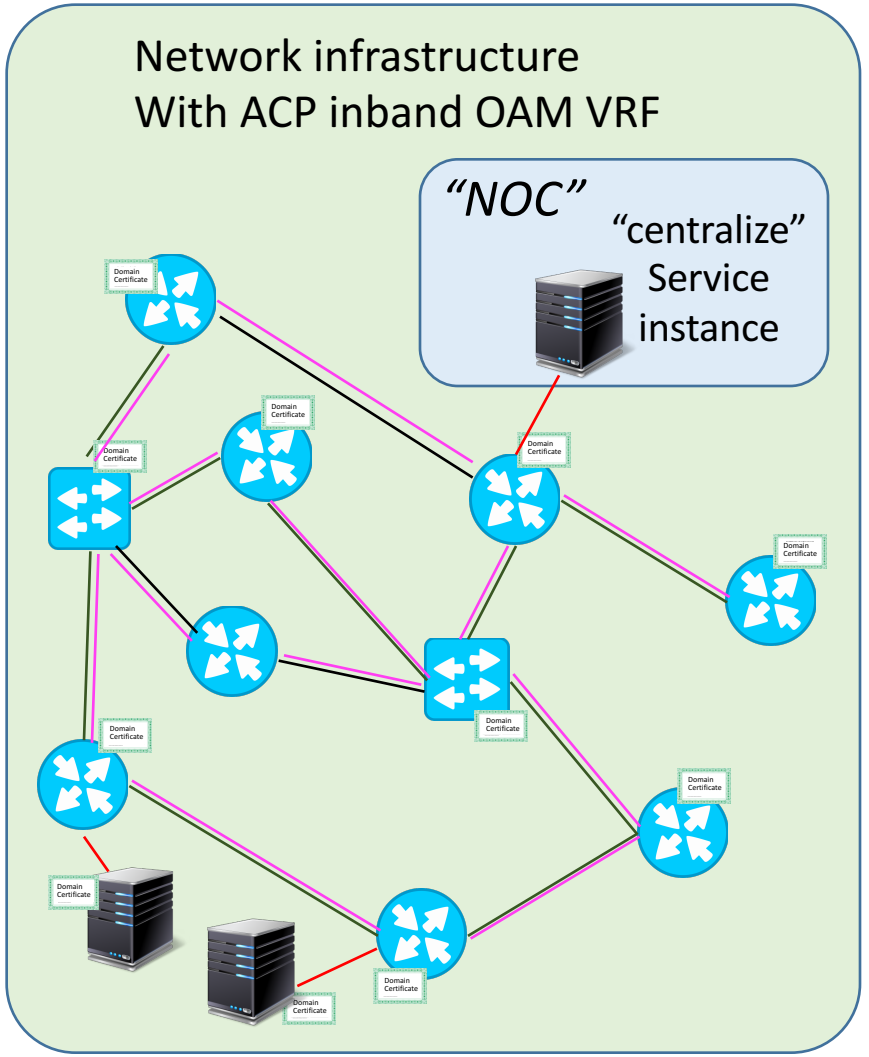
ACP IPv6 address is name of node: Automatically generated during onboarding of node, attached to node ACP certificate.

Therefore no need for other node names (e.g.: DNS name)

BUT: ACP needs service discovery.

Primary services of interest: infrastructure service instances used on many/all nodes to autoconfigure relevant services for nodes themselves and/or network users:

Servers for protocols such as NetConf Zerotouch, TFTP, Diameter, Radius, NTP, PTP, syslog, SNMP trap, DHCP, DNS, Ipfix collector,…



# draft-eckert-anima-services-dns-autoconfig

- Explicitly describes the services to autoconfigure
- NTP, syslog – required for bring-up of network and continuously.
- radius, diameter, tacacs+
  - Servers announce themselves, all ACP nodes autoconfigure themselves to use the “best” server they see via GRASP-DNSSD for authentication of any services across the ACP that require user authentication
- SSHD / NetConf
  - If/when radius and/or diameter servers are discovered, ACP routers start SSHD / NetConf via TLS) and allow user-authentication via radisu/diameter
- Syslog, NTP
  - Servers announce themselves, client autoconfigure NTP, syslog when they see such service announcements
  - These services may benefit from actually interacting in parallel with not only one-best server, but multiple. How do we indicate this (extension of DNS-SD parameters ?)
- Various other… (Ipfix/Netflow, SNMP traps, Yang Push, OAM DNS, ...)

# Service announcement/discovery for network infrastructure services

- DNS-SD unicast not feasible / ideal
  - Infeasible: No other system to discover DNS-SD servers. We are talking about the root service discovery system in networks.
  - Not ideal: Do not want a limited-redundancy, third arty dependency between service announcer and consumer. Also difficult to autoconfigure a sufficient set of DNS servers on routers/switches (limited functionality nodes).
- Network wide flooding/multicast is great for our purpose
  - Limited number of services, no third party dependency, needed on most/every node anyhow
- mDNS multihop flooding never standardized AFAIK
  - Would also limit message transport to only DNS messages/transactions.
    - And we (ANIMA) wanted something generic/extensible
  - *Past commercial attempts showed challenges building reliable multihop flooding issues using DNS messages themelves to build loop-free flooding*

# GeneRic Autonomic Signaling Protocol (GRASP, RFC8990)

*Only explaining what is relevenat here. GRASP does much more*

- GRASP runs on every ACP node. Can unicast and flood GRASP messages.
  - Loop prevention by GRASP message-id tracking (drop message if already forwarded)
- GRASP messages are CBOR messages
  - Simple GRASP header (message types, e.g.: “FLOOD”)
  - CBOR application specified CBOR payload (application is called “objective”)
  - Message formats (objective parameters) specified in CDDL

# Single services names registry

- Define a DNS-SD GRASP application/objective group for DNS-SD compatible service announcement/discovery
- Want to reuse as much as we can from DNS-SD concepts:
- Services namespace, parameters, semantic
- This started because we started to define our own GRASP services (objectives) IANA registry (IMHO for many cases unnecessarily)
- Instead, draft would result in DNS service names to be reuseable across GRASP
- Example with existing service “est”
  - mDNS: _est._udp.local
  - GRASP: SRV.est
  - When this work becomes RFC, SRV.xxx names would not need to be registered explicitly for GRASP anymore instead, they will have the same semantic as in the DNS service name registry.

## GRASP Objective Names

**Registration Procedure(s)**
Specification Required
**Expert(s)**
Michael Richardson
**Reference**
[RFC8990]
**Available Formats**
csv

| Objective Name | Reference |
|---|---|
| EX0 | [RFC8990] |
| EX1 | [RFC8990] |
| EX2 | [RFC8990] |
| EX3 | [RFC8990] |
| EX4 | [RFC8990] |
| EX5 | [RFC8990] |
| EX6 | [RFC8990] |
| EX7 | [RFC8990] |
| EX8 | [RFC8990] |
| EX9 | [RFC8990] |
| PrefixManager | [RFC8992] |
| PrefixManager.Params | [RFC8992] |
| AN_ACP | [RFC8994] |
| SRV.est | [RFC8994] |
| AN_Proxy | [RFC8995] |
| AN_join_registrar | [RFC8995] |

https://www.iana.org/assignments/grasp-parameters/grasp-parameters.xhtml#objective-names

# Expanding Applicability beyond ACP

- Easily defined to be reuseable for any existing network
  - Work not specified, might be a separate GRASP draft
- GRASP forwarding agent is very simple, limited code
  - Prototype code from Brian Carptenter (python)
    - https://github.com/becarpenter/graspy/blob/master/AskDNSSD2.py
    - https://github.com/becarpenter/graspy/blob/master/GetDNSSD2.py
    - https://github.com/becarpenter/graspy/blob/master/graspy.pdf
- Instead of using (PKI + IPsec secured) ACP, one can define more lightweight options:
  - No new config for operator.
  - E.g.: start GRASP automatically to every node known to be an IGP peer with GRASP over TCP connection
    - Or even TLS with same credentials as used for the IGP (if IGP uses credentials).
  - This is “secure enough”, because the IGP must be secured, as it is the biggest, easy attack vector against a network infrastructure.
  - “Clamshell” ACL protection to limit who can be an IGP neighbor (trusted internal interfaces) is common, and if it is acceptable for IGP, it is also acceptable for GRASP.