Exploring Agent Naming and Discovery Mechanisms

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Background

- Agents need to interconnect across domains
- Problems:
  - How do agents from different domains find each other?
  - How do we make sure their identities don't conflict?

DNS-Native Agent Naming & Resolution Mechanism

Identity Naming

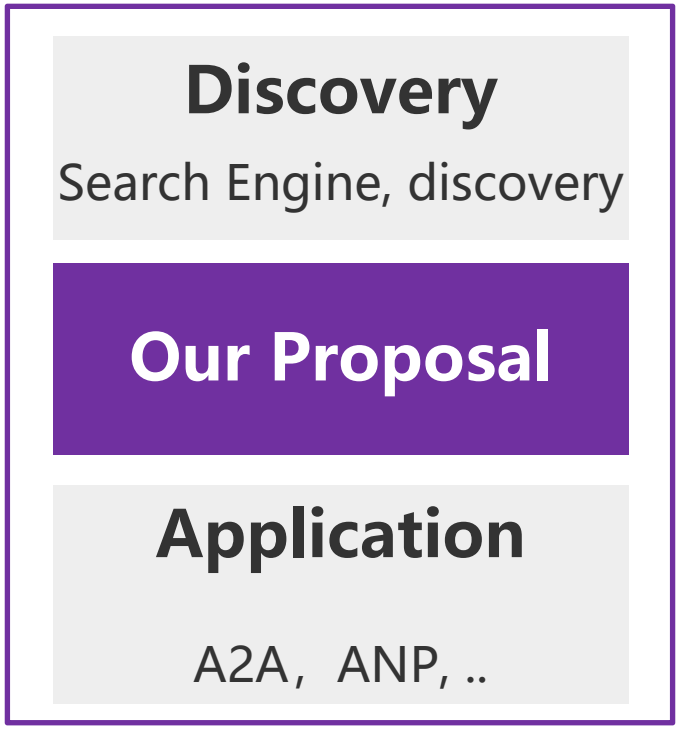
Use domain names as stable identifiers for agents

Trusted resolution， Reuse Infrastructure

Given an agent ID, find its endpoint securely

Basic Support for Discovery Systems

Expose only minimal, stable pointers/indexes for upper-layer discovery systems to reference



acts as a **resolution layer**, between the Discovery layer and Application layer

IETF Draft: draft-cui-dns-native-agent-naming-resolution

DNS Record Design

Three DNS Records

SVCB Main information

- **TargetName** **Port** Agent endpoint
- **key65480** Agent version: v1, v3.2
- **key65481** Agent protocol: a2a, anp
- **ipv4hint** **ipv6hint** Pre-fetched address

A/AAAA Basic Connectivity
for clients that don't support SVCB

TXT External metadata
description

Keep DNS simple and lightweight

SVCB

```
_agent.translator.example.com. IN SVCB 1 (
 agent-v3.example.com.
 alpn=h2 port=443
 ipv4hint=203.0.113.50 ; hints
 ipv6hint=2001:db8::50
 key65480="v3" ; version
 key65481="a2a,anp" ; protocol )
```

A/AAAA

- Default agent endpoint
- (Optional) .well-known JSON mirror of DNS records

TXT

```
_agent.translator.example.com. IN TXT (
 alg=Ed25519; pk=...; sig=...;  ; Optional, record integrity verification
 svcb-digest=...;               ; Optional, record integrity verification
 agent-desc=...; agent-desc-sha256=...; ; Optional, pointing to metadata
 " )
```

Prototype Implementation

- Local DNS Server： CoreDNS @127.0.0.1:15353
- Agent: Python Project
  - translator.example.com
    - [v3], A2A,ANP @127.0.0.1:8081
    - [v2], A2A, @127.0.0.1:8080
  - weather.example.com
    - [v1], A2A,ANP @127.0.0.1:9090
- Client: Python+Bash

```
============================================================
  DN-ANR Demo · DNS-Native Agent Naming & Resolution (v2)
============================================================

  Architecture: Discovery Layer -> [Resolution Layer] -> Connection Layer
                                    ^^^^^^^^^^^^^^^^
                                    This demo focuses here

  [1] View registered Agent info
  [2] DNS resolution (SVCB + TXT)
  [3] Fallback path demo (SVCB -> A/AAAA -> HTTP)
  [4] Version routing demo
  [5] Fetch external descriptor (agent-desc)
  [6] End-to-end: Resolve -> Route -> Call
  [7] Register a new Agent to DNS
  [0] Exit

Choose >
```

Register a new Agent to DNS

```
Step 4/6: Writing DNS Zone + JSON
──────────────────────────────────────────────────
  [+] Descriptor written: generated/agent-descriptor-weather.json
  [+] Zone file updated: dns/example.com.zone
  [+] Corefile updated: dns/Corefile
  [+] agent-dns.json written
  [+] Registry now has 2 agent(s)

  Zone file records added:
    A:    weather.example.com -> 127.0.0.1
    A:    agent-weather-v1.example.com -> 127.0.0.1
    TXT:  _agent.weather.example.com (TTL 3600)
          v=1;kid=key-weather-01;alg=Ed25519;pk=demo-public-key-placeholder;agent-desc-sha...
    SVCB: prio=1 agent-weather-v1.example.com:9090  (a2a,anp) (TTL 60)

Step 5/6: Reloading CoreDNS
──────────────────────────────────────────────────
  [>] CoreDNS file plugin auto-reloads on zone file change (reload 2s)
  [>] Waiting for reload...
[INFO] plugin/file: Successfully reloaded zone "example.com." in "/Users/dcg/code/DNSDemo/dns/example.com.zone" with 2026031402 SOA serial
  [+] CoreDNS should have reloaded

Step 6/6: Verifying DNS Records
──────────────────────────────────────────────────

  [>] dig @127.0.0.1 -p 15353 weather.example.com A
[INFO] 127.0.0.1:50762 - 57408 "A IN weather.example.com. udp 37 false 512" NOERROR qr,aa,rd 112 0.000230709s
  [+] A record: 127.0.0.1

  [>] dig @127.0.0.1 -p 15353 _agent.weather.example.com TXT
[INFO] 127.0.0.1:61024 - 3693 "TXT IN _agent.weather.example.com. udp 44 false 512" NOERROR qr,aa,rd 250 0.000109708s
  [+] TXT record found
      v=1, kid=key-weather-01
      agent-desc-sha256: LZvNGe19u9X1_CnG9pjOB5RdABkyKK...
```

View Agent info

```
=== View Registered Agents ===

  2 agent(s) in registry:

    [1] translator.example.com
    [2] weather.example.com

[INFO] 127.0.0.1:52794 - 35762 "SVCB IN _agent.translator.example.com. udp 47 false 512" NOERROR qr,aa,rd 301 0.000196417s
[INFO] 127.0.0.1:61367 - 1763 "TXT IN _agent.translator.example.com. udp 47 false 512" NOERROR qr,aa,rd 320 0.000090917s
[INFO] 127.0.0.1:55288 - 24798 "A IN translator.example.com. udp 40 false 512" NOERROR qr,aa,rd 118 0.000077875s
--- translator.example.com ---  (source: DNS)
```

Agent Identity (TXT) - TTL: 3600s

agent_id	translator.example.com
v	1
kid	key-2025-01
alg	Ed25519 (placeholder)
agent-desc	http://localhost:8080/.well-known/agent-descriptor.json
agent-desc-sha256	ZIxM_dmlj9rlKiAVwA8e... (43 chars)

Service Endpoints (SVCB) - TTL: 60s

Priority	Target	Port	Version	Protocols	ipv4hint
1	agent-v3.example.com	8080	v3	a2a, anp	127.0.0.1
2	agent-v2.example.com	8081	v2	a2a	127.0.0.1

Baseline Connectivity (A/AAAA)

```
translator.example.com  ->  127.0.0.1

[INFO] 127.0.0.1:63981 - 26050 "SVCB IN _agent.weather.example.com. udp 44 false 512" NOERROR qr,aa,rd 198 0.000096542s
[INFO] 127.0.0.1:65063 - 1427 "TXT IN _agent.weather.example.com. udp 44 false 512" NOERROR qr,aa,rd 250 0.000065667s
[INFO] 127.0.0.1:50553 - 47646 "A IN weather.example.com. udp 37 false 512" NOERROR qr,aa,rd 112 0.000122791s
--- weather.example.com ---  (source: DNS)
```

DNS Resolution

```
=== DNS Resolution ===

[*] Resolving: translator.example.com

[>] Query: _agent.translator.example.com SVCB @127.0.0.1:15353
[INFO] 127.0.0.1:52733 - 875 "SVCB IN _agent.translator.example.com. udp 47 false 512" NOERROR qr,aa,rd 301 0.000216292s
[+] 2 SVCB records found
    |-- Priority 1: agent-v3.example.com:8080  (a2a, anp) hint=127.0.0.1
    \-- Priority 2: agent-v2.example.com:8081  (a2a) hint=127.0.0.1

[>] Query: _agent.translator.example.com TXT @127.0.0.1:15353
[INFO] 127.0.0.1:62639 - 54154 "TXT IN _agent.translator.example.com. udp 47 false 512" NOERROR qr,aa,rd 320 0.000113792s
[+] TXT record found
    |-- v=1, kid=key-2025-01
    |-- agent-desc: http://localhost:8080/.well-known/agent-descriptor.json
    \-- agent-desc-sha256: ZIxM_dmlj9rlKiAVwA8e...

[+] Resolution method: dns-svcb
```

draft-cui-dns-native-agent-naming-resolution

Welcome Comments & Collaboration

Side Meeting：Mar 16th 10:45-12:15 @Zhejiang

Github

Draft