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Agent Trust Negotiation: Capability, Delegation, and Provenance Binding for AI Agents

draft-somoza-dmsc-atn-agent-trust-negotiation-00

Abstract

This document defines the Agent Trust Negotiation (ATN) protocol. ATN sits above whatever mechanism is used to discover an agent identity and answers questions that discovery alone cannot: what is the agent permitted to do, under whose authority, with what provenance, and how do two agents reach a verifiable working agreement.

ATN binds four artifacts to a discovered agent identity:

1. A Capability Manifest expressing what the agent is willing to do, under what conditions, and with what constraints.

2. A Delegation Chain proving authorized principal scope and revocation paths.

3. A Provenance Attestation proving build-time and runtime integrity.

4. A Session Receipt produced at handshake completion, recording the negotiated scope.

ATN defines the handshake state machine that consumes these artifacts to produce a mutually verified, scope-bounded agent session, and a session receipt suitable for transparency log inclusion.

ATN is discovery-agnostic. The default binding identifies agents as HTTP resources and uses a per-origin well-known URI to bootstrap discovery. A DNS-based binding is also specified for the cross-organizational case. Other bindings can plug into the same abstract interface. ATN composes with existing discovery proposals including AID, DNS-AID, and ANS v2.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

This Internet-Draft will expire on 30 November 2026.

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1. Introduction

Agent-to-agent discovery work in progress at the IETF and adjacent venues, including AID [AID], DNS-AID [DNS-AID], and ANS v2 [ANSv2], addresses how to locate an agent's endpoint and verify its cryptographic identity. These efforts answer two questions: _where is the agent_ and _who is the agent_.

They do not answer the questions that arise immediately after:

* What is the agent permitted to do, and under what constraints?

* Under whose authority is the agent operating?

* What is the provenance of the agent's software, model, and configuration?

* How do two agents reach a mutually verifiable working agreement before any task begins?

* What evidence remains after the session ends, and how is it audited?

This document defines the Agent Trust Negotiation (ATN) protocol to address these gaps. ATN is the layer above discovery. It assumes the discovery layer has located an endpoint and authenticated an identity through one of the existing mechanisms. ATN then negotiates the trust relationship.

The design has four parts:

1. Four structured artifacts (Capability Manifest, Delegation Chain, Provenance Attestation, Session Receipt) that bind to an agent identity regardless of how that identity was discovered.

2. A handshake protocol over HTTPS that exchanges and verifies the artifacts between two agents.

3. A capability intersection algorithm that yields the negotiated session scope.

4. A receipt format suitable for SCITT-style transparency log inclusion.

ATN deliberately does not introduce a new discovery mechanism. It builds on existing work and adds the negotiation layer that the agent ecosystem lacks.

1.1. Scope

In scope:

* Format and semantics of the four ATN artifacts.
* The Agent Trust Handshake (ATH) state machine.
* Capability intersection algebra.
* An abstract discovery binding interface and two concrete bindings (HTTP-Resource and DNS).
* IANA registrations for ATN-specific identifiers.

Out of scope:

* Discovery of the agent itself (use [AID], [DNS-AID], [ANSv2], or equivalent).
* Endpoint authentication (delegated to the discovery layer).
* Application protocol (delegated to MCP, A2A, OpenAPI, or equivalent).
* In-organization service-to-service identity (see [SPIFFE]).
* Reputation distribution.
* Behavioral attestation.

1.2. Non-Goals

* ATN does NOT define a new DNS record type.
* ATN does NOT replace any existing discovery proposal.
* ATN does NOT introduce a centralized trust authority.
* ATN does NOT enforce policy. It produces verifiable evidence of declared and negotiated policy that downstream systems can audit.

1.3. Choice of Venue

ATN's choice of IETF as the venue follows from its dependencies. The discovery substrate options include DNS [RFC4033] and SVCB [RFC9460], both IETF standards, as well as HTTP [RFC9110]. The attestation architecture is RATS [RFC9334]. The transparency log is SCITT. The signature format is JWS [RFC7515]. The mutual authentication transport is TLS [RFC8446]. The authorization frameworks ATN composes with are OAuth [RFC6749] and GNAP [RFC9635].

ATN is the composition of IETF primitives into a peer-to-peer agent trust handshake. Standardizing the composition in any other venue would fork the primitive stack and create alignment problems. The natural home for the composition is the same venue that standardized the primitives.

1.4. Lineage and Changes from Prior Drafts

This document is a renaming of draft-somoza-atn-agent-trust-negotiation. The earlier name was used for the -00 and -01 revisions submitted in May 2026. This revision adopts the DMSC working group naming convention (draft-somoza-dmsc-*) for alignment with the DMSC suite and to facilitate auto-archiving of DMSC-related documents. The technical content is unchanged from draft-somoza-atn-agent-trust-negotiation-01.

The substantive technical changes that were introduced in draft-somoza-atn-agent-trust-negotiation-01 (relative to -00) are preserved in this document and are summarized below for readers arriving via the new name:

1. The four artifacts are repositioned as the normative core of ATN, independent of any specific discovery substrate. The original framing of ATN as sitting above DNS-based discovery is replaced with a discovery-agnostic framing.

2. A new HTTP-Resource Binding is specified as the default, using a per-origin well-known URI [RFC8615] to bootstrap discovery to a signed Index Document. See Section 4.2.

3. The DNS Binding is reduced to a thin TXT record that announces ATN support at an origin. It no longer carries per-agent records and no longer carries integrity hints. See Section 4.3.

4. The SVCB ParamKey registrations atn and atn-digest proposed in the original -00 are withdrawn. SVCB ParamKeys are not the appropriate mechanism for pointing at a separate document at another URL. See Section 4.3.3.

5. The JWS signature requirement on the Index Document is MUST regardless of DNSSEC posture. The Index Document needs offline-verifiable provenance for cached, mirrored, and SCITT-published copies. See Section 4.2.6.

6. The Introduction’s claim that "Recent IETF work has converged on DNS-based discovery for AI agents" was removed. The discovery landscape includes multiple proposals at multiple venues; no convergence has occurred.

2. Conventions and Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2.1. Terminology

Agent An automated software entity that initiates network interactions on behalf of, or with delegated authority from, a principal, without per-interaction human authorization.

Initiator The agent that opens the trust handshake.

Responder The agent that answers the trust handshake.

Origin As defined in [RFC9110]. The scheme/host/port tuple that anchors one or more agents in the HTTP-Resource Binding.

Capability Manifest A signed JSON [RFC8259] document declaring what an agent is willing to do, under what conditions, and with what constraints.

Delegation Chain A signed sequence of authorization statements binding the agent to a principal, with explicit scope, time bounds, and revocation pointers.

Provenance Attestation A signed document proving build-time and runtime characteristics of the agent.

Session Receipt A signed record produced at handshake completion, summarizing the negotiated scope and identities, suitable for transparency log inclusion.

Negotiated Scope The intersection of two agents’ capability sets,

time windows, authorization scopes, and operational constraints, as determined by the handshake.

Index Document The JWS-signed JSON document fetched during HTTP-Resource Binding discovery, listing agents at an origin and origin-level capabilities.

3. Architecture Overview

ATN defines four roles:

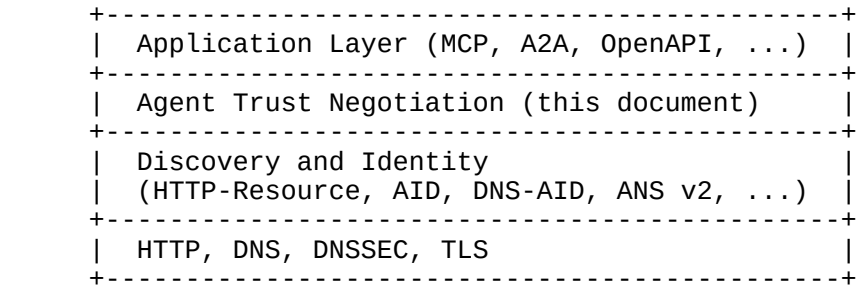
1. Agent Operator: publishes the discovery records and the ATN artifacts.

2. Agent: the runtime entity, in either Initiator or Responder mode at any moment.

3. Principal: the human, organization, or other agent that authorized the agent through the Delegation Chain.

4. Witness: an optional third party that can pre-verify ATN artifacts and publish endorsements (e.g., via SCITT [SCITT]).

ATN layers above discovery:



The handshake order is:

1. Discovery: Initiator resolves the Responder’s identity via the active discovery binding (HTTP-Resource, DNS, or other).

2. Artifact fetch: Initiator retrieves the four ATN artifacts referenced by the Index Document.

3. Handshake: Initiator opens the ATN handshake. Both parties exchange artifacts and verify signatures.

4. Negotiation: Both parties compute the capability intersection.

5. Receipt: Both parties produce a signed Session Receipt covering the negotiated scope.

6. Session: Application traffic proceeds within the negotiated scope.

The ATN core protocol operates on the four artifacts. How the Initiator obtained the Responder's identity and how that identity binds to the four artifacts are specified by a binding (see Section 4). The handshake makes no assumptions about the binding beyond the abstract interface.

4. Discovery Binding Framework

ATN is discovery-agnostic. The four artifacts and the handshake are the normative core; the binding to a discovery substrate is a separable concern. This document specifies two concrete bindings: HTTP-Resource Binding (the default, in Section 4.2) and DNS Binding (optional, in Section 4.3). Other bindings can be specified by future documents using the abstract interface below.

4.1. Abstract Binding Interface

A binding provides two operations:

1. Resolve(identifier) -> IndexDocumentURL: given an agent or origin identifier in the binding's namespace, return the URL at which the Index Document can be fetched.

2. Integrity(identifier) -> IntegrityProof: return any integrity proof the binding provides for the resolution (e.g., DNSSEC signatures for a DNS binding). Bindings MAY return a null proof if no binding-level integrity is provided; the JWS signature on the Index Document remains mandatory in that case (see Section 4.2.6).

A binding is conformant if it provides these two operations and if the resolved Index Document, when fetched and JWS-verified, contains the claimed identifier.

4.2. HTTP-Resource Binding (Default)

This is the default binding for HTTP-native agents. It identifies agents as HTTP resources and uses a per-origin well-known URI [RFC8615] to bootstrap discovery.

4.2.1. Origin Discovery

For an origin https://example.com, the Index Document is fetched from:

https://example.com/.well-known/atn

This URI is registered in Section 17 per [RFC8615].

4.2.2. Agent Identification

An agent is identified by an HTTPS URL of the form:

https://{origin}/{path}

The agent URL is the canonical identifier in the HTTP-Resource Binding. Agents at the same origin share one Index Document.

4.2.3. Per-Agent Resources

A GET on the agent URL returns a JSON object containing the agent's Capability Manifest, Delegation Chain, and Provenance Attestation, or URLs from which each can be fetched. The agent URL MAY also serve as the handshake endpoint for the Initiator.

4.2.4. Operational Properties

The HTTP-Resource Binding has the following properties relevant to operational deployments:

* Many agents share one origin and one set of DNS records.
* Creating, modifying, or removing an agent requires no DNS changes.
* Web infrastructure (caching, load balancing, CDN) handles scale.
* Agent lookups do not generate per-agent DNS queries.

4.2.5. Index Document Structure

The Index Document at /.well-known/atn is a JSON object with the following structure:

```
{
  "v": "atn1",
  "origin": "https://example.com",
  "issued_at": "2026-05-15T10:00:00Z",
  "not_after": "2026-08-15T10:00:00Z",
  "origin_capabilities": { "...": "see Capability Manifest" },
  "agents": [
    {
      "id": "https://example.com/agents/alice",
      "manifest_url": "https://example.com/alice/cap.jws",
      "delegation_url": "https://example.com/alice/del.jws",
      "provenance_url": "https://example.com/alice/prov.jws",
      "handshake_endpoint": "https://example.com/alice/hs",
      "key": { "...": "JWK per RFC 7517" }
    }
  ],
  "witness_pointers": [
    "https://scitt.example.org/entries/a1b2c3..."
  ]
}
```

Implementations MAY embed any of the artifact URLs above as inline objects instead.

4.2.6. Index Document JWS Signature Requirements

The Index Document MUST be signed as a JWS [RFC7515] using JSON Flattened Serialization. The signature is computed over the canonicalized JSON object. The signing key MUST be discoverable by the verifier through a trust anchor recognized by the verifier.

The JWS signature requirement is MUST regardless of whether DNSSEC covers the origin’s DNS records and regardless of whether the Index Document was fetched over TLS. The Index Document is an artifact that needs to be verifiable offline by parties that did not perform the original fetch, including SCITT transparency services and audit consumers reconstructing sessions long after the original TLS connection has closed.

4.3. DNS Binding (Optional)

This is an optional binding for cross-organizational discovery, where the verifier knows only a domain and needs to locate the ATN-supporting origin.

4.3.1. TXT Record

A TXT record at _atn.{domain} announces ATN support:

```
_atn.example.com.  3600  IN  TXT  "v=atn1; origin=https://example.com"
```

The TXT record MUST contain v=atn1 and SHOULD contain an origin key. If origin is absent, the origin is https://{domain}.

The TXT record carries no integrity hints, no per-agent records, and no Index Document content. Its sole purpose is to announce that the origin supports ATN and, optionally, which origin to use.

4.3.2. DNSSEC

DNSSEC validation of the TXT record [RFC4033] is RECOMMENDED. JWS signing of the resolved Index Document remains MUST regardless of DNSSEC posture (see Section 4.2.6).

4.3.3. Withdrawal of -00 SVCB ParamKey Registrations

The SVCB ParamKey registrations atn and atn-digest proposed in draft-somoza-atn-agent-trust-negotiation-00 are withdrawn. SVCB ParamKeys [RFC9460] are designed to convey service-connection hints (such as alpn, port, and ech), not to point at a separate document at another URL. Pointing at the Index Document from DNS is handled instead by the thin TXT record in Section 4.3.1.

4.4. Other Bindings

Other bindings (URI-based out-of-band, registry-based, embodied-agent-specific) can be specified by future documents using the abstract binding interface in Section 4.1. Such bindings are out of scope for this document.

5. Capability Manifest

The Capability Manifest declares what the agent is willing to do under what conditions. It is a JSON object signed as a JWS.

5.1. Capability Object Structure

Each capability is a structured object with explicit dimensions covering identification, semantics, scope, and operational bounds. The design borrows from the action-resource-condition pattern of established authorization frameworks, the schema-binding pattern of W3C Verifiable Credentials, and the attenuation principle of capability-based security research.

Field	Required	Description
id	Yes	Capability identifier from the IANA registry, or a vendor-specific identifier.
schema	Yes	URI plus SHA-256 digest of the formal capability definition.
actions	Yes	List of action verbs scoped to the capability's schema vocabulary.
resources	Yes	List of resource patterns the capability applies to.
conditions	No	Runtime constraints: rate limits, data residency, time windows, size limits.
effects	Yes	One of: none, read_only, idempotent, mutating.
external_calls	Yes	One of: forbidden, listed_only, free. Whether the capability may call out.
sub_invocations	Yes	One of: forbidden, same_scope, fresh_handshake_required. Sub-agent rules.
persistence	Yes	One of: none, session_only, durable. Whether state survives the session.
resource_bounds	Yes	Hard ceilings: max_tokens, max_duration_seconds, max_cost_usd.
preconditions	No	Counterparty requirements that must hold before the capability is exercised.

Table 1

Every dimension uses a controlled vocabulary registered with IANA (see Section 17). Vendor-specific identifiers under the x- prefix are permitted for non-standard capabilities and MUST carry a schema reference.

5.2. Schema Binding

The schema field binds the capability identifier to a formal definition. Two implementations resolving the same id to different schema.digest values MUST treat the capabilities as semantically distinct, even if the identifier matches. This eliminates the silent-divergence problem that opaque scope strings created in OAuth deployments.

The schema document SHOULD define:

1. The semantic meaning of the capability identifier.

2. The permitted values in actions.

3. The format and semantics of resources patterns.

4. Any capability-specific extensions to conditions.

Schema documents are versioned. A capability MAY pin a specific schema version via the digest.

5.3. Structure

```
{
  "v": "atn-capability-1",
  "agent_id": "<stable-identifier>",
  "issued_at": "2026-05-15T10:00:00Z",
  "valid_until": "2026-08-15T10:00:00Z",
  "capabilities": [
    {
      "id": "data-read",
      "schema": {
        "url": "https://example.com/atn/data-read-v1.json",
        "digest": "sha256:b4c5d6..."
      },
      "actions": ["read", "list"],
      "resources": [
        "dataset:public/*",
        "dataset:internal/research/*"
      ],
      "conditions": {
        "rate_limit": "1000/min",
```

```
          "data_residency": ["us", "eu"],
          "time_window": "09:00-17:00 UTC",
          "max_response_size_bytes": 10485760
        },
        "effects": "read_only",
        "external_calls": "forbidden",
        "sub_invocations": "forbidden",
        "persistence": "none",
        "resource_bounds": {
          "max_tokens": 100000,
          "max_duration_seconds": 1800,
          "max_cost_usd": 0.50
        },
        "preconditions": {
          "counterparty_provenance": "required",
          "counterparty_delegation": "required",
          "transport": "tls1.3"
        }
      },
      {
        "id": "task-execute",
        "schema": {
          "url": "https://example.com/atn/task-execute-v1.json",
          "digest": "sha256:c5d6e7..."
        },
        "actions": ["execute"],
        "resources": [
          "task:summarize",
          "task:translate",
          "task:classify"
        ],
        "conditions": {
          "max_session_minutes": 30
        },
        "effects": "idempotent",
        "external_calls": "listed_only",
        "sub_invocations": "same_scope",
        "persistence": "session_only",
        "resource_bounds": {
          "max_tokens": 500000,
          "max_duration_seconds": 1800,
          "max_cost_usd": 2.00
        },
        "preconditions": {
          "human_approval": "required",
          "approval_token_issuer": "https://approvals.example.com"
        }
      }
```

```
    ],
    "refusals": [
      {
        "category": "financial_transactions",
        "scope": "all"
      },
      {
        "category": "data_write",
        "scope": "external_systems"
      }
    ]
  }
```

5.4. Dimension Semantics

effects declares the consequence of exercising the capability:

* none: no observable consequence (introspection only).

* read_only: data is read; no state changes.

* idempotent: state may change but repeated execution is equivalent to single execution.

* mutating: state changes, and the change is not idempotent.

external_calls declares whether the capability may initiate calls outside the agent's own scope:

* forbidden: no external calls.

* listed_only: external calls are permitted only to destinations listed in the schema or conditions.

* free: any external call is permitted, bounded only by resource_bounds.

sub_invocations declares the rules for invoking other agents:

* forbidden: this capability does not invoke other agents.

* same_scope: sub-invocations inherit the present session's negotiated scope.

* fresh_handshake_required: every sub-invocation requires a separate ATN handshake with the sub-agent.

persistence declares state survivability:

* none: no state persists beyond a single request.

* session_only: state persists for the session lifetime, then is discarded.

* durable: state persists beyond the session; the agent MUST disclose retention policy in its schema.

resource_bounds declares hard ceilings on the negotiated scope. Conforming implementations MUST terminate the session when any bound is exceeded. The protocol specifies the contract; runtime enforcement is the implementation's responsibility, consistent with the enforcement posture described in the Security Considerations.

5.5. Key Properties

* The manifest is a declaration of willingness, not an enforcement primitive. Violations are auditable through the Session Receipt and transparency log.

* The valid_until field forces rotation. Manifests without expiry MUST be rejected.

* refusals are first-class. Explicit "will not" claims provide auditable accountability if violated.

* Capability id values from the IANA registry have stable semantics; vendor-specific identifiers under x- MUST carry a schema reference.

* Capabilities are deny-by-default. The negotiated session scope contains only what both parties explicitly offered.

5.6. Refusal Semantics

Refusals are a deliberate inversion of conventional capability advertisement. Most existing proposals describe what an agent CAN do. ATN requires agents to also describe what they explicitly WILL NOT do. This produces auditable behavioral contracts: a recorded refusal that is subsequently violated is direct evidence of misbehavior.

6. Delegation Chain

The Delegation Chain proves the agent operates under authorized principal scope, with explicit time bounds and revocation paths.

6.1. Structure

```
{
  "v": "atn-delegation-1",
  "agent_id": "<stable-identifier>",
  "chain": [
    {
      "issuer": "did:example:organization-root",
      "subject": "did:example:department-ops",
      "scope": ["agent.deploy", "agent.delegate"],
      "issued_at": "2026-01-01T00:00:00Z",
      "valid_until": "2027-01-01T00:00:00Z",
      "revocation": "https://example.com/atn/rev/dept-ops",
      "signature": "<JWS>"
    },
    {
      "issuer": "did:example:department-ops",
      "subject": "agent:<stable-identifier>",
      "scope": [
        "data-read",
        "task-execute:summarize",
        "task-execute:translate"
      ],
      "issued_at": "2026-05-01T00:00:00Z",
      "valid_until": "2026-08-01T00:00:00Z",
      "revocation": "https://example.com/atn/rev/agent",
      "signature": "<JWS>"
    }
  ]
}
```

6.2. Verification

A relying party MUST:

1. Verify each link’s signature against the issuer’s published key.

2. Verify each link’s scope is a subset of the parent link’s scope.

3. Verify all links are within their valid_until window.

4. Optionally poll revocation endpoints with rate-limited caching.

5. Verify the leaf subject matches the agent’s stable identifier from discovery.

If any check fails, the agent MUST NOT be trusted for any capability beyond the verifiable subset.

7. Provenance Attestation

The Provenance Attestation proves build-time and runtime characteristics of the agent.

7.1. Structure

```
{
  "v": "atn-provenance-1",
  "agent_id": "<stable-identifier>",
  "build": {
    "predicateType": "https://slsa.dev/provenance/v1",
    "predicate": { "...": "in-toto SLSA provenance" }
  },
  "model": {
    "model_id": "example-vendor/llm-v1.2.3",
    "model_version_sha256": "9f8e7d6c5b4a...",
    "system_prompt_sha256": "1a2b3c4d5e6f..."
  },
  "runtime": {
    "evidence_type": "RATS",
    "evidence": { "...": "RFC 9334 evidence" },
    "verifier": "https://verifier.example.com/rats"
  },
  "issued_at": "2026-05-15T08:00:00Z",
  "valid_until": "2026-05-15T20:00:00Z"
}
```

7.2. Properties

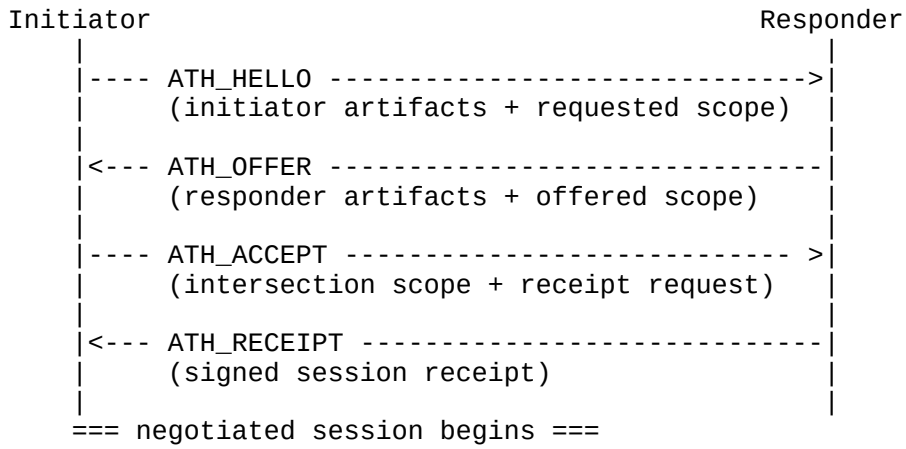
* The Provenance Attestation links three independent supply chains: software build (SLSA, in-toto [IN-TOTO]), model identity (cryptographic hash of weights or version anchor), and runtime environment (RATS evidence [RFC9334]).

* All three are optional. An agent that publishes only build provenance is more trustworthy than one that publishes none and less trustworthy than one that publishes all three.

* Short valid_until windows are encouraged. The Provenance Attestation is the most time-sensitive artifact.

8. The Agent Trust Handshake (ATH)

8.1. State Machine



All four messages are JSON, signed as JWS, exchanged over HTTPS at the Responder's handshake_endpoint.

8.2. ATH_HELLO

```
{
  "v": "ath1",
  "type": "hello",
  "supported_versions": ["ath1"],
  "initiator": {
    "agent_id": "<initiator-id>",
    "artifacts": {
      "capability": { "url": "...", "digest": "..." },
      "delegation": { "url": "...", "digest": "..." },
      "provenance": { "url": "...", "digest": "..." }
    }
  },
  "requested_scope": {
    "capability_ids": ["data-read"],
    "duration_seconds": 1800,
    "purpose": "summarize_research_corpus"
  },
  "nonce": "<random>",
  "timestamp": "..."
}
```

The requested_scope.capability_ids field carries only the identifiers of the capabilities the Initiator wishes to negotiate. The Responder consults its own Capability Manifest for the structured definitions and computes the intersection (see Section 9).

8.3. ATH_OFFER

The Responder verifies the Initiator’s artifacts, computes the capability intersection, and returns:

```
{
  "v": "ath1",
  "type": "offer",
  "selected_version": "ath1",
  "supported_versions_echo": ["ath1"],
  "responder": {
    "agent_id": "<responder-id>",
    "artifacts": {
      "capability": { "url": "...", "digest": "..." },
      "delegation": { "url": "...", "digest": "..." },
      "provenance": { "url": "...", "digest": "..." }
    }
  },
  "offered_scope": {
    "capabilities": [
      {
        "id": "data-read",
        "schema": {
          "url": "https://example.com/atn/data-read-v1.json",
          "digest": "sha256:b4c5d6..."
        },
        "actions": ["read", "list"],
        "resources": ["dataset:public/*"],
        "conditions": {
          "rate_limit": "500/min",
          "data_residency": ["us"]
        },
        "effects": "read_only",
        "external_calls": "forbidden",
        "sub_invocations": "forbidden",
        "persistence": "none",
        "resource_bounds": {
          "max_tokens": 50000,
          "max_duration_seconds": 1800,
          "max_cost_usd": 0.50
        }
      }
    ],
    "duration_seconds": 1800,
    "purpose": "summarize_research_corpus"
  },
  "nonce": "<random>",
  "in_reply_to_nonce": "<initiator-nonce>",
  "timestamp": "..."
}
```

The offered_scope.capabilities field carries the full structured Capability objects after intersection. Each is the per-dimension intersection of the Initiator's requested capability (resolved from its Capability Manifest) and the Responder's offered version.

8.4. ATH_ACCEPT

If the Initiator agrees with the offered scope:

```
{
  "v": "ath1",
  "type": "accept",
  "agreed_scope": { "...": "matches ATH_OFFER offered_scope" },
  "nonce": "<random>",
  "in_reply_to_nonce": "<responder-nonce>",
  "timestamp": "..."
}
```

If the Initiator disagrees, it MAY send ATH_COUNTER with a revised request, up to a limit (see Section 8.6).

8.5. ATH_RECEIPT

The Responder produces the Session Receipt:

```
{
  "v": "ath1",
  "type": "receipt",
  "session_id": "<uuid>",
  "initiator_id": "<initiator-id>",
  "responder_id": "<responder-id>",
  "agreed_scope": { "...": "the intersection result" },
  "artifact_digests": {
    "initiator_capability": "sha256:...",
    "initiator_delegation": "sha256:...",
    "initiator_provenance": "sha256:...",
    "responder_capability": "sha256:...",
    "responder_delegation": "sha256:...",
    "responder_provenance": "sha256:..."
  },
  "scitt_log_pointer": "https://scitt.example.org/entries/...",
  "issued_at": "...",
  "expires_at": "...",
  "signature": "<JWS by responder>"
}
```

Both parties countersign the receipt and MAY publish it to a SCITT log [SCITT].

8.6. Handshake Limits

* Total handshake round trips MUST NOT exceed 4.
* ATH_COUNTER messages MUST NOT exceed 2 per session.
* The handshake MUST complete within 30 seconds.
* Sessions exceeding agreed_scope.duration_seconds require a new handshake.

9. Capability Intersection Algebra

When two agents present capability sets, the negotiated scope is computed by intersection. The algorithm is specified for interoperability so that conforming implementations produce identical results from identical inputs.

9.1. Identity Rule

A capability c is in the intersection only if all of the following hold:

1. Both Initiator’s requested set and Responder’s offered set include a capability with the same id.
2. Both capabilities reference the same schema.url and schema.digest. Identifiers with diverging schemas MUST be treated as distinct capabilities and excluded from the intersection.
3. Neither party has a matching entry in refusals covering c.

9.2. Per-Dimension Rules

For each capability c that satisfies the identity rule, the intersected capability is computed dimension by dimension as follows.

actions List intersection. If empty, c is dropped.

resources Pattern intersection using longest-prefix match. If empty, c is dropped.

conditions numeric fields (rate_limit, max_response_size_bytes, max_session_minutes) Minimum value of the two. Tighter bound wins.

conditions list fields (data_residency, tasks) List intersection. If empty, c is dropped.

conditions.time_window Time-window intersection. If empty, c is dropped.

effects Most restrictive of the two, where the order from least to most restrictive is mutating, idempotent, read_only, none. Take the lower-impact value.

external_calls Most restrictive of the two, where the order from least to most restrictive is free, listed_only, forbidden. Take the more restrictive value.

sub_invocations Most restrictive of the two, where the order from least to most restrictive is same_scope, fresh_handshake_required, forbidden. Take the more restrictive value.

persistence Most restrictive of the two, where the order from least to most persistent is none, session_only, durable. Take the lower value.

resource_bounds.max_tokens, resource_bounds.max_duration_seconds, resource_bounds.max_cost_usd Minimum value of the two.

preconditions Union. Both parties' preconditions apply to the negotiated capability.

9.3. Refusal Override

If either party's refusals list contains an entry matching capability c by category or by direct id, c is dropped from the intersection regardless of any other dimension. Refusals are absolute.

9.4. Worked Example

Initiator requests data-read:

* actions: [read, list, search]
* resources: [dataset:public/*, dataset:internal/*]
* conditions.rate_limit: 1000/min
* conditions.data_residency: ["us", "eu", "apac"]
* effects: read_only
* external_calls: listed_only
* resource_bounds.max_cost_usd: 1.00

Responder offers data-read:

* actions: [read, list]
* resources: [dataset:public/*]
* conditions.rate_limit: 500/min
* conditions.data_residency: ["us", "eu"]
* effects: read_only
* external_calls: forbidden
* resource_bounds.max_cost_usd: 0.50

Negotiated intersection (assuming matching schemas):

* actions: [read, list]
* resources: [dataset:public/*]
* conditions.rate_limit: 500/min
* conditions.data_residency: ["us", "eu"]
* effects: read_only
* external_calls: forbidden
* resource_bounds.max_cost_usd: 0.50

If the schemas had diverged, data-read would be dropped entirely with no intersection. If Initiator's refusals included data-read, the capability would be dropped regardless of offer compatibility.

10. Mutual Trust Mode

When both agents are sensitive (for example, two agents acting on behalf of different organizations), the handshake operates in mutual mode:

* Both parties MUST present all four artifacts in ATH_HELLO and ATH_OFFER.
* Both parties MUST verify the counterparty's full chain before proceeding.

* The Session Receipt MUST be countersigned by both parties.

In single-sided mode (for example, when one party is a public service), only the trusted side must present full artifacts. The other side's identity is still verified at the discovery layer, but the trust posture is asymmetric.

11. Version Negotiation and Algorithm Agility

ATN is designed for long-term evolution. Two mechanisms ensure forward compatibility: explicit version negotiation in the handshake and pluggable cryptographic algorithms in artifacts and messages.

11.1. Version Negotiation

The Initiator's ATH_HELLO message advertises every ATN version it supports in a supported_versions field. The Responder's ATH_OFFER selects the highest mutually supported version and echoes it in a selected_version field. All subsequent messages in the session use the selected version.

```
{
  "v": "ath1",
  "type": "hello",
  "supported_versions": ["ath1", "ath2"],
  "initiator": { "...": "..." },
  "requested_scope": { "...": "..." },
  "nonce": "...",
  "timestamp": "..."
}
```

The Responder MUST include the Initiator's supported_versions list in the signed envelope of its ATH_OFFER. This prevents downgrade attacks: an on-path adversary that strips advertised versions from ATH_HELLO would cause the Responder's signature to cover the stripped list, which the Initiator can detect.

If the Initiator and Responder share no common version, the Responder MUST reply with ATH_REJECT carrying error code version_mismatch. The handshake terminates.

11.2. Algorithm Agility

ATN does not pin cryptographic algorithms beyond a minimum set required for v1 interoperability. Implementations MAY use any algorithm registered for JWS [RFC7515] or COSE.

Required for ATN v1 conformance:

1. Ed25519 signatures over JWS-encoded artifacts and handshake messages.

2. SHA-256 for digests bound in artifact references.

Recommended additional algorithms:

1. ECDSA P-256 with SHA-256 for environments with ECDSA-only hardware tokens.

2. ML-DSA (post-quantum signature) for deployments preparing for post-quantum transition.

The Capability Manifest, Delegation Chain, Provenance Attestation, and Session Receipt MAY each be signed with a different algorithm. The JWS header identifies the algorithm. Relying parties MUST reject artifacts signed with algorithms they do not support.

Algorithm identifiers are negotiated implicitly via the JWS alg header on each artifact. Explicit negotiation in ATH_HELLO is NOT REQUIRED for v1 but MAY be added in future versions.

11.3. Post-Quantum Transition

The cryptographic operations in ATN are well-bounded: signature verification of artifacts and handshake messages. There is no key agreement step inside ATN itself; TLS handles channel security. Migration to post-quantum signatures requires only adopting a PQ-capable signature algorithm in JWS, which the IETF JOSE working group is standardizing.

When PQ algorithms are widely deployed, operators SHOULD rotate to a hybrid scheme (classical + PQ) during the transition window, then to PQ-only. ATN’s version negotiation supports introducing a new minor version that prefers PQ signatures without breaking v1 deployments.

12. Compatibility with Existing Discovery Protocols

ATN is designed to coexist with existing discovery proposals without modification. Each proposal can be paired with ATN through either the HTTP-Resource Binding or the DNS Binding, depending on what the proposal provides.

12.1. With AID [AID]

AID's TXT record continues to authenticate the agent endpoint via PKA. The TXT record can be paired with ATN's _atn.{domain} announcement, with the actual artifact references retrieved from the resolved Index Document at /.well-known/atn. ATN consumes the AID-authenticated identity as the input to the handshake.

12.2. With DNS-AID [DNS-AID]

DNS-AID's SVCB records resolve an agent endpoint. ATN composes with DNS-AID by publishing a _atn.{domain} TXT record alongside the DNS-AID record set, with the artifact references retrieved from the resolved Index Document.

12.3. With ANS v2 [ANSv2]

ANS v2's Trust Card concept maps directly to a subset of ATN's Capability Manifest. An ANS v2 deployment can publish an ATN Index Document where the Capability Manifest cross-references the ANS Trust Card.

12.4. Multi-Discovery Tolerance

A single agent zone MAY publish records compatible with multiple discovery proposals simultaneously. ATN binding is independent of which discovery format is used.

13. Relationship to Existing Identity, Authorization, and Attestation Frameworks

A reasonable first question for any new trust protocol is whether existing frameworks suffice. ATN composes several mature primitives and does not reinvent any of them. The contribution is the composition: a peer-to-peer agent handshake with deterministic scope negotiation and an auditable session receipt. This section addresses each adjacent framework and identifies where ATN composes with it.

The analogy that clarifies the relationship: TLS uses asymmetric crypto, symmetric crypto, key exchange, and X.509. TLS is not accused of reinventing those primitives. TLS is the handshake that composes them into a deployable channel-security protocol. ATN occupies the same compositional role for inter-agent trust.

13.1. OAuth 2.0 and GNAP

OAuth 2.0 [RFC6749] and GNAP [RFC9635] authenticate and authorize a Client to access a Resource Server. ATN negotiates a mutual agreement between two autonomous peers.

Structural differences:

1. Asymmetric vs symmetric. OAuth and GNAP define Client and Resource Server roles. ATN defines two peers, each presenting four artifacts. There is no "resource server" in agent-to-agent collaboration.

2. Secret tokens vs publishable artifacts. OAuth bearer tokens are secrets and MUST NOT be logged. ATN artifacts are designed for publication to transparency logs. Opposite security models for the core artifacts.

3. No formal scope intersection. OAuth scopes are evaluated by membership at the Resource Server. ATN specifies a deterministic intersection algorithm.

4. No refusal semantics. OAuth represents grants. ATN represents grants and explicit refusals as first-class signed claims.

Where OAuth and GNAP remain the right tools:

* Inside a trust domain with a central authorization server, OAuth and GNAP issue access tokens to passive resources. ATN is unnecessary.

* Where one party is a passive resource, OAuth-style bearer access fits.

* Human-to-agent delegation, where a human grants an agent access on the human’s behalf, fits GNAP.

ATN composes with OAuth and GNAP. An agent in an ATN session MAY hold OAuth tokens for downstream resource access. ATN governs the inter-agent relationship; OAuth governs subsequent resource calls.

13.2. SPIFFE Workload Identity

SPIFFE [SPIFFE] issues SVIDs (SPIFFE Verifiable Identity Documents) to workloads within a trust domain. SPIFFE Federation supports cross-domain identity through bilaterally exchanged trust bundles.

Structural relationship:

1. SPIFFE provides identity, not authorization, willingness, capability, or provenance.

2. SPIFFE is optimized for intra-organizational deployment. Cross-organizational use requires pre-arranged federation. ATN targets cross-organizational interactions where peers may meet for the first time without prior trust setup.

3. ATN can carry a SPIFFE ID as the stable identifier in its artifacts. The SPIFFE SVID becomes the authentication input; the ATN handshake adds capability, delegation, provenance, and receipt on top.

SPIFFE and ATN compose cleanly. SPIFFE within the trust domain, ATN at the boundary.

13.3. Mutual TLS

Mutual TLS [RFC8446] authenticates both endpoints at the transport layer. It establishes that the connection is between two specific certificates.

mTLS provides:

* Endpoint authentication.

* Channel confidentiality and integrity.

mTLS does not provide:

* Capability declaration.

* Delegation expression.

* Provenance evidence.

* Negotiation of scope.

* Auditable agreement record.

ATN runs on top of an mTLS-secured channel where appropriate. mTLS is necessary infrastructure for many ATN deployments. It is not a substitute for the negotiation.

13.4. RATS Remote Attestation

RATS [RFC9334] defines roles (Attester, Verifier, Relying Party, Endorser) and the structure of attestation evidence and results.

RATS provides:

* The architecture for producing and verifying attestation evidence.

RATS does not provide:

* A protocol for combining attestation evidence with authorization or capability negotiation.

* A specification for what to do with verification results in a peer interaction.

ATN consumes RATS evidence as one axis of its Provenance Attestation. The other two axes (build provenance and model identity) come from supply-chain attestation frameworks. RATS is the input; ATN is one specified consumer.

13.5. SCITT Transparency

SCITT [SCITT] defines an append-only transparency log for signed statements with inclusion proofs.

SCITT provides:

* The transparency log infrastructure.

* The signed-statement envelope format.

SCITT does not provide:

* The semantics of what to log for a given application.

* The receipt format that captures an inter-agent agreement.

ATN provides the Session Receipt format that becomes the SCITT statement for an agent interaction. SCITT without ATN is a log waiting for a record format. ATN without SCITT is a receipt waiting for a transparency layer.

13.6. Composition Summary

ATN composes the following primitives per layer:

Concern	Primitive	ATN's Role
Endpoint authentication	mTLS [RFC8446]	Runs above
Workload identity (intra-org)	SPIFFE [SPIFFE]	Consumes SVIDs as stable identifiers
Cross-org identity	HTTP origins [RFC9110], DNS [RFC4033], [AID], [DNS-AID], [ANSv2]	Discovery substrate for ATN artifacts
Delegated authorization to passive resources	OAuth [RFC6749], GNAP [RFC9635]	Composes with, does not replace
Attestation evidence	RATS [RFC9334]	Consumes evidence in Provenance Attestation
Public auditability	SCITT [SCITT]	Provides the receipt format for log entries
Peer-to-peer trust handshake	(none exists)	This document

Table 2

The contribution of ATN is the bottom row. The five rows above are existing work that ATN composes.

13.7. When to Use What

1. Two workloads inside one trust domain coordinating on a task: SPIFFE.

2. A client accessing a resource server with delegated user authorization: OAuth or GNAP.

3. Establishing that you are talking to a specific endpoint: mTLS.

4. Producing tamper-evident proof that some software was built and deployed as claimed: RATS plus supply-chain attestation.

5. Publishing an auditable record of a claim: SCITT.

6. Two autonomous agents from different organizations agreeing to work together with mutually verified capability, authority, provenance, and a signed record of the agreement: ATN.

14. Security Considerations

14.1. Threat Model

ATN assumes:

* Adversaries may publish well-formed but malicious ATN artifacts.

* Adversaries may compromise an agent and continue to present valid pre-compromise artifacts.

* Adversaries may attempt to negotiate scope expansions outside the published Capability Manifest.

* Adversaries may collude across organizational boundaries to construct false Delegation Chains.

14.2. Artifact Authenticity

Every ATN artifact is signed. Signatures MUST be verified against keys bound to the agent’s stable identifier through the active binding. Artifacts whose signatures do not verify, whose valid_until has passed, or whose digests do not match the values in the Index Document MUST be rejected.

14.3. Cross-Binding Consistency

When an agent is reachable through multiple bindings (for example, both HTTP-Resource and DNS), the artifacts served through each binding MUST be identical. Inconsistency across bindings MUST cause the handshake to fail with binding_mismatch.

14.4. Enforcement Posture: Evidence, Not Prevention

A predictable objection to ATN is that auditability is not enforcement. The objection is correct on its terms and misses the layer at which ATN operates. ATN is technical evidence infrastructure. It is not a behavioral enforcement primitive. No protocol layered on top of an autonomous software agent can be one.

An agent that signs a Capability Manifest declaring it will not perform financial transactions, then performs a financial transaction, has cryptographically committed to a refusal it then violated. ATN cannot prevent the violation. ATN produces a Session

Receipt and a published transparency log entry that, combined with the application-layer evidence of the violation, constitute direct cryptographic evidence usable for revocation, contract enforcement, regulatory complaint, and civil action.

The complete trust stack for autonomous agents has four layers:

1. Technical evidence layer (ATN, SCITT, RATS). Provides cryptographic proof of what was claimed and what was agreed.

2. Policy layer (contracts, organizational policy, regulations). Specifies what is permitted.

3. Consequence layer (revocation, financial penalty, legal action, reputational impact). Imposes cost on violation.

4. Operational enforcement layer (sandboxing, capability-based execution, hardware-enforced runtime such as TEEs, gating proxies). Prevents violation at runtime.

ATN is the first layer. It enables the other three. It does not substitute for them.

For high-stakes domains (financial transactions, clinical decision support, control of physical systems), ATN MUST be deployed with operational enforcement (layer 4). Recommended patterns:

1. Run sensitive capabilities inside a TEE that enforces declared bounds at hardware level.

2. Use a gating proxy that enforces the negotiated scope on every outbound call from the agent.

3. Use short session lifetimes with frequent re-attestation.

4. Combine ATN with object-capability execution where the agent runtime denies unauthorized actions by construction, not by policy.

ATN’s contribution is to make violations _expensive and discoverable_, not impossible. The analogy is to TCP checksums: they do not prevent transmission errors, they detect them so the next layer can respond. Trust at Internet scale has always operated this way. SPF does not prevent spoofed email. Certificate transparency does not prevent mis-issuance. They make undetected misbehavior infeasible. ATN does the same for inter-agent agreements.

14.5. Delegation Forgery

Delegation Chains depend on the cryptographic strength of each issuer's signing key. ATN does not specify the identity verification process that issuers use to vouch for subjects. Operators SHOULD use verifiable credentials [W3C-DID] or organizational identity infrastructure with established assurance levels.

14.6. Session Receipt Tampering

Session Receipts are countersigned and publishable to a SCITT log [SCITT]. Tampering after publication is detectable through log inclusion proofs. Operators handling high-value sessions SHOULD publish receipts.

14.7. Replay

Every handshake message includes a nonce and a timestamp. Implementations MUST reject messages with nonces seen within the session and with timestamps outside a configurable skew window (RECOMMENDED 60 seconds).

14.8. Provenance Attestation Limits

Provenance attestations prove what was built and deployed at attestation time. They do not prove the agent is still executing the attested code. Operators SHOULD use short valid_until windows for provenance attestations and refresh through RATS verification [RFC9334].

15. Privacy Considerations

15.1. Per-Agent Lookups

The HTTP-Resource Binding does not generate per-agent DNS queries. Agent lookups occur within a single TLS connection to the origin, limiting on-path observers' visibility into which agents are being discovered.

15.2. DNS Binding Leakage

The DNS Binding's _atn.{domain} TXT lookup leaks the fact that an origin supports ATN to on-path DNS observers. This is a property of the binding, not of the core protocol. Deployments where this leakage is unacceptable SHOULD use the HTTP-Resource Binding directly.

15.3. Negotiation Observability

The handshake exchanges artifacts that may reveal the purpose of the session (purpose field) and the identity of the principal (Delegation Chain). Operators SHOULD treat handshake metadata as sensitive.

15.4. Witness Aggregation

Witnesses and SCITT log operators see the volume and pattern of agent interactions. Operators SHOULD use multiple witnesses to reduce centralized observability.

15.5. Minimum Disclosure

ATN supports minimum-disclosure mode where the Initiator presents only the artifacts required for the requested scope. The Responder MAY request additional artifacts during the handshake, which the Initiator MAY decline (causing the handshake to fail).

15.6. SCITT Publication

Session Receipts published to a SCITT Transparency Service are public by design. Implementations MUST NOT include personal data in Capability Manifests, Delegation Chains, Provenance Attestations, or Session Receipts. Use of opaque identifiers in place of personal identifiers is RECOMMENDED.

16. Operational Considerations

ATN introduces non-trivial latency on session establishment. This section quantifies that cost, explains its operational shape, and identifies deployments where ATN is appropriate and where it is not.

16.1. Session Establishment vs Per-Call Latency

ATN is a session establishment protocol, not a per-request protocol. The handshake establishes a negotiated scope. The scope authorizes many subsequent interactions between the two agents. Per-call latency within an established session is zero added by ATN.

This places ATN in the same operational category as:

1. TLS handshake [RFC8446], amortized over the requests in a connection.

2. OAuth token acquisition [RFC6749], amortized over the token lifetime.

3. BGP session establishment, amortized over hours of routing operation.

The relevant performance question is the cost of establishment and the session lifetime over which it is amortized, not the cost per call.

16.2. Latency Budget

The following budget is informative. Implementations and deployments will vary based on geography, caching, and network conditions. The figures below assume the HTTP-Resource Binding; the DNS Binding adds one DNS lookup on the first connection to an origin.

Component	Cold (no cache)	Warm (cached, pooled)
TLS 1.3 connection to origin	100-200 ms	0 (pooled)
/.well-known/atn HTTPS GET	20-50 ms	0 (cached by digest)
Three artifact fetches (HTTP/2 multiplexed)	50-100 ms	0 (cached by digest)
Signature verifications (4-8 Ed25519)	1-2 ms	1-2 ms
Provenance validation	1-5 ms	1 ms
Two-RTT handshake (HELLO/ OFFER then ACCEPT/RECEIPT)	150-300 ms	150-300 ms
Receipt signing (Ed25519)	<1 ms	<1 ms
Total session establishment	*500-1500 ms*	*150-300 ms*
Per-call within established session	*0 ms added*	*0 ms added*
SCITT log submission	Async, out of path	Async, out of path

Table 3

Recommended performance targets for conforming implementations:

* p50 cold session establishment: <800 ms
* p99 cold session establishment: <2000 ms
* p50 warm session establishment: <250 ms
* p99 warm session establishment: <500 ms

16.3. Optimization Techniques

Implementations SHOULD apply the following optimizations to bring warm-case latency to the recommended targets:

1. Digest-keyed artifact caching. Artifacts are refetched only when the Index Document's published digest changes. Steady-state cache hit rate is typically above 95 percent.
2. HTTP/2 or HTTP/3 multiplexing for parallel artifact fetches.
3. TLS 1.3 session resumption for repeat handshakes with known peers.
4. Connection pooling between sessions to the same peer.
5. Abbreviated re-handshake. A repeat ATH_HELLO MAY reference a prior session's receipt to extend or renew the same scope in a single round trip rather than three.
6. Pre-warming. Agents MAY establish sessions with frequent counterparties before application traffic arrives.
7. Asynchronous SCITT submission. Receipt publication to a transparency log happens after the session begins and MUST NOT block session establishment.
8. RATS attestation result caching for the duration of the result's validity window.

16.4. Session Lifetime

The Session Receipt's expires_at field bounds the session. Within that window, no additional handshake is required for interactions covered by the agreed scope. Implementations SHOULD select session lifetimes that amortize establishment cost while bounding exposure to revocation events.

Typical session lifetimes:

* Short-lived workflows: 5 to 30 minutes

* Sustained collaboration sessions: 1 to 24 hours

* Long-running infrastructure peering: up to 7 days

Session lifetimes longer than 7 days are NOT RECOMMENDED for cross-organizational sessions. The trade-off is between revocation responsiveness and handshake amortization.

16.5. Deployments Where ATN Is Appropriate

1. Multi-step agent collaboration where many calls share a session context.

2. Cross-organizational agent interactions where trust establishment must be verifiable and auditable.

3. Workflows where the cost of trust failure exceeds the cost of establishment latency.

4. Agent ecosystems with workflows already operating in the 100 ms to multi-second range per step.

16.6. Deployments Where ATN Is Not Appropriate

1. Microsecond-scale latency budgets (high-frequency trading, real-time control loops, hardware-in-the-loop systems).

2. Stateless per-message protocols where session continuity is not meaningful.

3. Workflows whose total duration is shorter than the handshake establishment cost.

For these deployments, simpler primitives (mTLS alone, OAuth bearer tokens, or no trust layer at all) may be more appropriate. Operators are encouraged to select the trust layer that matches their latency budget.

17. IANA Considerations

17.1. Withdrawal of -00 SVCB ParamKey Registrations

The SVCB ParamKey registrations atn and atn-digest proposed in draft-somoza-atn-agent-trust-negotiation-00 are withdrawn. No SVCB ParamKey registration is requested by this document. See Section 4.3.3.

17.2. Well-Known URI Registration

IANA is requested to register the following well-known URI per [RFC8615]:

* URI suffix: atn
* Change controller: IETF
* Specification document: this document
* Status: permanent
* Related information: returns the ATN Index Document for the origin (see Section 4.2.1)

17.3. DNS TXT Key Registration

IANA is requested to register the following DNS TXT record key:

* Key: atn
* Format: v=atn1; origin=https://... (semicolon-separated key=value pairs)
* Change controller: IETF
* Specification document: this document

17.4. ATN Capability Registry

Creation of a new registry, "ATN Capabilities," is requested with initial entries:

Name	Description	Reference Schema
data-read	Read access to a data resource	TBD
data-write	Write access to a data resource	TBD
task-execute	Execute a named task	TBD
model-invoke	Invoke a generative model	TBD
agent-delegate	Delegate work to another agent	TBD
payment-init	Initiate a payment flow	TBD
human-relay	Surface a request to a human approver	TBD

Table 4

Registration policy: Specification Required with Designated Expert review. Each registered identifier MUST include a reference to a published capability schema that defines the semantics of actions, resources patterns, and any capability-specific extensions to conditions.

Vendor-specific identifiers prefixed with x- are permitted without IANA registration but MUST carry a schema reference in the capability object.

17.5. ATN Capability Dimension Registries

Four new registries are requested to govern the controlled vocabularies used in capability dimensions:

"ATN Capability Effects":

Name	Description
none	No observable consequence (introspection only).
read_only	Data is read; no state changes.
idempotent	State may change; repeated execution equivalent to single.
mutating	State changes; not idempotent.

Table 5

"ATN External Call Modes":

Name	Description
forbidden	No external calls permitted.
listed_only	External calls permitted only to listed destinations.
free	Any external call permitted within resource_bounds.

Table 6

"ATN Sub-Invocation Modes":

Name	Description
forbidden	No sub-agent invocations.
same_scope	Sub-invocations inherit the present negotiated scope.
fresh_handshake_required	Every sub-invocation requires a separate ATN handshake.

Table 7

"ATN Persistence Modes":

Name	Description
none	No state persists beyond a single request.
session_only	State persists for the session lifetime, then discarded.
durable	State persists beyond the session; retention policy required.

Table 8

Registration policy for all four registries: Specification Required with Designated Expert review. The controlled vocabularies are deliberately small and stable; expansion requires consensus to avoid the semantic-drift problem that affected OAuth scopes.

17.6. ATN Refusal Category Registry

Creation of a new registry, "ATN Refusal Categories," is requested with initial entries:

Name	Description
financial_transactions	Any movement of funds
personal_data	Processing of personal identifiers
weaponization	Use in weapons systems
mass_persuasion	Generation of mass-distributed content
child_safety	Content involving minors
medical_advice	Clinical recommendations
legal_advice	Legal recommendations binding on parties

Table 9

Registration policy: Specification Required with Designated Expert review.

18. References

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Appendix A. Complete Example Flow

This appendix walks through a full ATN handshake between two agents at research.org and publisher.com using the HTTP-Resource Binding.

A.1. Step 1: Origin Discovery

```
GET https://publisher.com/.well-known/atn
```

Returns the JWS-signed Index Document listing the agents at the origin and their artifact URLs.

A.2. Step 2: Index Document Verification

The Initiator verifies the JWS signature on the Index Document against a trust anchor recognized by the verifier. The signature is required regardless of DNSSEC posture.

A.3. Step 3: Artifact Fetch and Verification

The Initiator selects the target agent from the Index Document's agents array and fetches:

* capability.jws
* delegation.jws
* provenance.jws

Verifies each signature, and confirms valid_until is in the future.

A.4. Step 4: ATH_HELLO

The Initiator (research.org agent) sends ATH_HELLO to the Responder's handshake_endpoint:

```
{
  "v": "ath1",
  "type": "hello",
  "supported_versions": ["ath1"],
  "initiator": {
    "agent_id": "https://research.org/agents/initiator",
    "artifacts": { "...": "capability/delegation/provenance refs" }
  },
  "requested_scope": {
    "capability_ids": ["data-read"],
    "duration_seconds": 600,
    "purpose": "academic_research_summarization"
  },
  "nonce": "n-init-001",
  "timestamp": "2026-05-27T14:00:00Z"
}
```

A.5. Step 5: ATH_OFFER

The Responder verifies the Initiator's artifacts, computes the intersection, and returns:


```
{
  "v": "ath1",
  "type": "offer",
  "selected_version": "ath1",
  "supported_versions_echo": ["ath1"],
  "responder": { "...": "responder agent_id and artifact refs" },
  "offered_scope": {
    "capabilities": [
      {
        "id": "data-read",
        "schema": {
          "url": "https://example.com/atn/data-read-v1.json",
          "digest": "sha256:b4c5d6..."
        },
        "actions": ["read", "list"],
        "resources": ["dataset:public/*"],
        "conditions": {
          "rate_limit": "300/min",
          "data_residency": ["us", "eu"]
        },
        "effects": "read_only",
        "external_calls": "forbidden",
        "sub_invocations": "forbidden",
        "persistence": "none",
        "resource_bounds": {
          "max_tokens": 50000,
          "max_duration_seconds": 600,
          "max_cost_usd": 0.30
        }
      }
    ],
    "duration_seconds": 600,
    "purpose": "academic_research_summarization"
  },
  "nonce": "n-resp-001",
  "in_reply_to_nonce": "n-init-001",
  "timestamp": "2026-05-27T14:00:01Z"
}
```


A.6. Step 6: ATH_ACCEPT

```
{
  "v": "ath1",
  "type": "accept",
  "agreed_scope": { "...": "matches ATH_OFFER" },
  "nonce": "n-init-002",
  "in_reply_to_nonce": "n-resp-001",
  "timestamp": "2026-05-27T14:00:02Z"
}
```

A.7. Step 7: ATH_RECEIPT

```
{
  "v": "ath1",
  "type": "receipt",
  "session_id": "5b7c-...",
  "initiator_id": "https://research.org/agents/initiator",
  "responder_id": "https://publisher.com/agents/responder",
  "agreed_scope": { ... },
  "artifact_digests": { ... },
  "scitt_log_pointer": "https://scitt.research.org/entries/789xyz",
  "issued_at": "2026-05-27T14:00:03Z",
  "expires_at": "2026-05-27T14:10:03Z",
  "signature": "<JWS by responder>"
}
```

The Initiator countersigns. The session begins.

A.8. Step 8: Session and Audit

The agents transact within the agreed scope. The Session Receipt is published to SCITT. Any downstream audit can:

1. Retrieve the receipt.
2. Verify all artifact digests against the agents' original publications.
3. Compare actual session traffic (where logged) against the agreed scope.
4. Flag any deviation.

Appendix B. Design Rationale

B.1. Why a Negotiation Layer

Discovery answers "where" and "who." Application protocols (MCP, A2A) answer "how." Nothing in the current stack answers "what may we do together, and what evidence will remain." ATN fills that gap with a two-round-trip handshake.

B.2. Why Four Artifacts

Each artifact answers a distinct question:

* Capability Manifest: what is this agent willing to do?
* Delegation Chain: who authorized it?
* Provenance Attestation: what is it actually running?
* Session Receipt: what did we agree?

Collapsing them into one document obscures the separation of concerns. Splitting further fragments the trust evaluation. Four is the minimum.

B.3. Why Discovery-Agnostic

Discovery proposals for AI agents are still evolving across multiple venues and approaches. Binding ATN tightly to any one discovery substrate would couple the trust layer’s adoption curve to that substrate’s adoption curve. The four artifacts have value regardless of how the agent identity was resolved. Specifying an abstract binding interface, with HTTP-Resource as the default and DNS as one option, lets ATN compose with whatever discovery substrate a deployment uses.

B.4. Why Refusals Are First-Class

Capability advertisement alone creates a moral hazard: agents have an incentive to advertise broadly. Mandatory refusals create symmetric accountability: an agent that explicitly refused a category and then violated the refusal has produced cryptographic evidence against itself.

B.5. Why Intersection Algebra Is Specified

If two implementations compute intersections differently, interoperability fails. The algebra is small, specified, and testable. The cost is one paragraph of spec; the benefit is deterministic handshake outcomes.

B.6. Why SCITT for Receipts

Session Receipts gain value through public auditability. SCITT [SCITT] provides the transparency infrastructure. Receipts published to SCITT cannot be tampered with after the fact without detection.

Appendix C. Implementation Status

This section records the status of known implementations of the protocol defined by this specification at the time of posting of this Internet-Draft, per the guidelines of RFC 7942. The description of implementations in this section is intended to assist the IETF in its decision processes in progressing drafts to RFCs. Note to RFC Editor: this section may be removed prior to final publication.

C.1. ATN Reference Prototype

* Organization: Independent (E. Somoza).

* Implementation Name: atn-prototype.

* Description: A TypeScript prototype that demonstrates the four-message handshake, the capability intersection algebra, Ed25519 signing and verification of artifacts and messages, and the digest-bound artifact reference model.

* License: CC0 1.0 Universal (public domain).

* Maturity: prototype. Not production-ready. Not security-audited.

* Coverage: Capability Manifest types, Delegation Chain types, Provenance Attestation types, Session Receipt, ATH state machine (HELLO, OFFER, ACCEPT, RECEIPT), capability intersection algebra per Section 9, version negotiation with downgrade protection. The .well-known/atn HTTP-Resource Binding and SCITT submission are stubbed in -01 pending implementation alignment.

* Verified behavior: end-to-end handshake between two synthetic agents with mismatched capability constraints produces a signed Session Receipt with negotiated scope exactly matching the algorithm in Section 9. Numeric constraints take minimums, list constraints take intersections, refusals override.

* Repository: https://github.com/e-somoza/atn-prototype

Appendix D. Acknowledgments

This document builds on the substantial work of the agent discovery community, including the authors of AID, DNS-AID, ANS v2, and related proposals. ATN is intended to complement, not compete with, that work.

The author thanks Ben Schwartz and Aijun Wang for substantial review feedback on draft-somoza-atn-agent-trust-negotiation-00 that shaped the architectural changes in this revision: the move to a discovery-agnostic core, the introduction of the HTTP-Resource Binding as the default, the reduction of the DNS Binding to a thin TXT record, and the withdrawal of the proposed SVCB ParamKey registrations.

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