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# TP/0: Time Definition Protocol
# draft-wang-tp-definition-00

## Abstract

This document introduces the Time Protocol (TP) family, a conceptual framework for representing and manipulating time in AI systems. The TP family is organized into four layers: perception, direction, copy, and emergence. This document defines the terminology, the layer structure, and the relationships between layers. It does not specify wire protocols or message formats; it provides a conceptual foundation for future protocol designs and implementations.

## Status of This Memo

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

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This Internet-Draft will expire on August 22, 2026.



## Table of Contents

## 1. Introduction

This document introduces the Time Protocol (TP) family, a conceptual framework for representing and manipulating time in AI systems. As AI systems become more sophisticated, the need for a standardized way to handle time—not just as a physical quantity but as a cognitive dimension—becomes increasingly important.

The TP family is organized into four layers, each addressing a fundamental aspect of how time can be experienced, directed, copied, and evolved. This layered architecture provides a common language and structure for researchers, developers, and protocol designers working on time-related problems in AI.

Section 2 defines terminology used throughout the TP family.
Section 3 describes the four-layer architecture.
Section 4 lists the conceptual members of the TP family.
Section 5 specifies the relationships between layers.
Section 6 provides protocol identification information.

This document is a conceptual framework only. It does not define wire formats, message syntax, or interoperability requirements. Its purpose is to establish a common foundation for future work.

## 2. 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.

This document defines the following terms:

Time Protocol (TP): A family of conceptual frameworks for time representation in AI systems, consisting of four layers defined in Section 3.

Time: In the context of this framework, time is defined as cognitive events per physical unit, organized in a direction. This definition emphasizes the experiential and directional nature of time in cognitive systems, as opposed to physical time which is uniform and linear.

TP family: All frameworks, specifications, and implementations that follow the four-layer structure defined in this document.

TP/n: A specific layer in the TP family, where n is a number from 0 to 4.

## 3. Four-Layer Architecture

### 3.1. Design Principles

The TP architecture is guided by the following principles:

1. Composability: Layers can be implemented independently or in combination, depending on the needs of specific applications.

2. Minimality: The four layers represent the minimal set needed to capture the essential dimensions of time in cognitive systems.

3. Extensibility: New layers or sub-layers can be defined in the future while maintaining compatibility with this foundational structure.

4. Implementation Independence: The framework does not prescribe how layers must be implemented; it only defines what each layer addresses.

### 3.2. Layer 0: Time Definition Layer

Layer 0 defines the core concepts of time and the structure of the TP family. This document constitutes the specification for Layer 0. It provides the foundational definitions upon which all other layers depend.

### 3.3. Layer 1: Time Perception Layer

Layer 1 addresses the density of time perception—how time can be experienced as moving slower or faster. This layer is concerned with mechanisms for modulating the rate at which cognitive events are processed. The specification for Layer 1 is a separate document (TP/1).

### 3.4. Layer 2: Time Direction Layer

Layer 2 addresses the direction of time flow—how futures can define presents rather than presents defining futures. This layer is concerned with goal-directed behavior and intentionality. The specification for Layer 2 is a separate document (TP/2).

### 3.5. Layer 3: Time Copy Layer

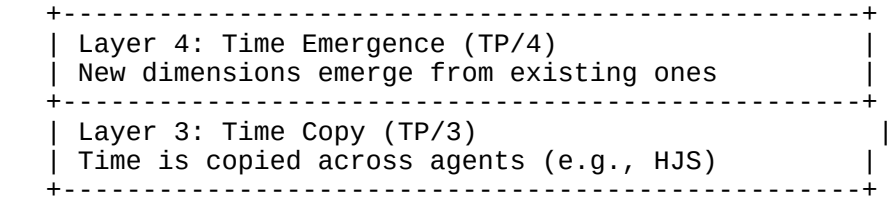
Layer 3 addresses the copying of time across multiple agents—how decision-making time can be replicated while preserving accountability. This layer is concerned with delegation, distribution, and responsibility. The specification for Layer 3 is a separate document (TP/3).

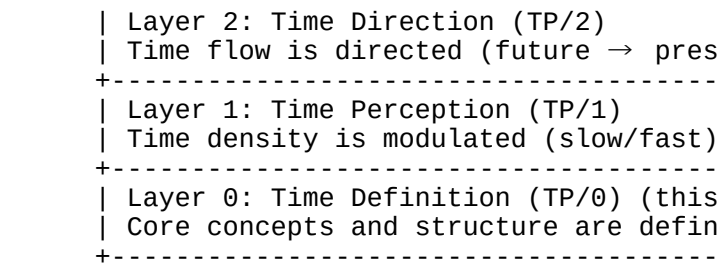
The Human Judgment System (HJS) [HJS] illustrates one possible approach to implementing the concepts of Layer 3, focusing on accountability in AI decision-making.

### 3.6. Layer 4: Time Emergence Layer

Layer 4 addresses the emergence of new time dimensions from existing ones—how sufficiently dense, directed, and copied time can give rise to novel temporal structures. This layer is concerned with creativity, evolution, and novelty. The specification for Layer 4 is a separate document (TP/4).

The layered architecture can be visualized as follows:






## 4. TP Family Members

The TP family consists of the following conceptual layers:

| Layer | Name | Focus | Status |
|---|---|---|---|
| TP/0 | Time Definition Protocol | Core concepts and structure | This document |
| TP/1 | Time Perception Protocol | Modulating time density | To be published |
| TP/2 | Time Direction Protocol | Directing time flow | To be published |
| TP/3 | Time Copy Protocol | Copying time across agents | See [HJS] for an example |
| TP/4 | Time Emergence Protocol | Emergence of new time dimensions | To be published |

All future documents in the TP family SHOULD reference this document as the foundational architecture. References to specific layers SHOULD use the TP/n notation (e.g., "as defined in TP/1").

## 5. Layer Relationships

### 5.1. Conceptual Dependencies

The layers are conceptually hierarchical, with each higher layer building upon the concepts introduced in lower layers:

1. Layer 1 (Perception) depends on the definition of time from Layer 0

2. Layer 2 (Direction) depends on the ability to perceive time (Layer 1)

3. Layer 3 (Copy) depends on the ability to direct time (Layer 2)

4. Layer 4 (Emergence) depends on the ability to copy time (Layer 3)

However, these are conceptual dependencies, not implementation requirements. Concrete implementations are free to combine or omit layers as needed for specific use cases.

### 5.2. HJS as an Example Implementation

The Human Judgment System (HJS) [HJS] illustrates one approach to implementing the concepts of Layer 3. HJS focuses on the accountability aspects of AI decision-making, ensuring that when AI systems make decisions, human judgment can be invoked and responsibility can be traced. HJS serves as a concrete example of how the TP framework can be realized.

HJS is not the only possible implementation of Layer 3; other designs that address time copying in different ways are encouraged and may be documented in future specifications.

### 5.3. Extensibility

The four-layer structure is designed to be extensible. Future work may define additional sub-layers, profiles, or specializations while maintaining compatibility with this foundational framework. Any such extensions SHOULD clearly indicate their relationship to the existing layers.

## 6. Protocol Identification

### 6.1. Domain

Information about the TP family, including all related documents and resources, is available at:

https://time-protocol.org

### 6.2. Protocol Prefix

All TP family documents use the prefix "TP" followed by a layer number (e.g., TP/0, TP/1, TP/2, TP/3, TP/4). This naming convention is intended to facilitate identification and cross-referencing.

## 7. Security Considerations

This document describes a conceptual architectural framework and does not introduce any new security considerations. Security aspects of specific implementations or protocols based on this framework should be addressed in their respective documents. In particular, implementations of Layer 3 (Time Copy) should carefully consider accountability, authorization, and non-repudiation requirements.

## 8. IANA Considerations

This document has no IANA actions. Future specifications in the TP family may request IANA registrations as needed (e.g., for protocol identifiers, port numbers, or media types).

## 9. References

### 9.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

### 9.2. Informative References

[HJS] Wang, Y., "HJS: Human Judgment System for AI Accountability", draft-wang-hjs-accountability-00, February 2026, <https://datatracker.ietf.org/doc/draft-wang-hjs-accountability-00/>.

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