NOVA Protocol Specification v1.0

Overview

NOVA (Next Object Versatile Architecture) is a modern data interchange format designed to be both human-readable (NOVA-T) and machine-efficient (NOVA-B). It improves upon JSON by adding binary encoding, new data types, canonicalization, and integrated benchmarking.

Supported Data Types

NOVA supports: Null, Boolean, Integer, BigInt, Float, NaN, Infinity, String, Binary, Date, Array, Object, Anchor, and Reference.

Example (NOVA-T)

A sample NOVA-T object demonstrating all features.

```
{
  id: 1n,
  name: "Teerdev Ragudu",
  created: @date"2025-10-26T12:00:00Z",
  verified: true,
  notes: "Welcome to NOVA protocol",
  data: b64"YWJjMTIz",
  nested: &n1 { a: 1, b: 2 },
  reference: *n1,
  values: [10, 20, NaN, +Infinity, -Infinity,],
}
```

Binary Encoding (NOVA-B)

NOVA-B is a compact binary encoding using tags for each data type. It supports efficient serialization and deterministic ordering.

```
Tag | Type | Description
0x00 | Null | null
0x01 / 0x02 | Boolean | false / true
0x03 | Int8 | Small integer
0x04 | Int32 | Larger integer
0x05 | Float64 | Floating point
0x06 | BigInt | Variable length
0x07 | String | UTF-8 text
0x08 | Binary | Raw bytes
0x09 | Date | Milliseconds since epoch
0x0A | Array | Start of array
0x0B | Object | Start of object
0x0F | End | End of container
```

Encoding / Decoding (JavaScript)

NOVA provides easy encoding/decoding APIs for Node.js.

```
import { encodeNova, decodeNova } from "nova-js";
import { encodeNovaBinary, decodeNovaBinary } from "nova-js";
const obj = { name: "Nova", version: 1.0, date: new Date() };
```

```
const text = encodeNova(obj);
const bin = encodeNovaBinary(obj);
console.log(decodeNovaBinary(bin));
```

Built-in Benchmarking

Each NOVA response can emit timing and size headers for performance tracking.

```
Server-Timing: total;dur=1.23, cpuU;dur=0.85, bytes;desc="640"
X-NOVA-Format: NOVA-B
X-Payload-Bytes: 640
```

Canonicalization Rules

NOVA enforces deterministic order for signing and hashing: 1. Object keys sorted lexicographically. 2. Numeric normalization. 3. Consistent string escaping. 4. Identical binary/text behavior.

Summary

NOVA bridges human-readability and binary performance. It’s the natural evolution of JSON for high-speed APIs, IoT, and data pipelines.