

Wavelength-Native Signaling Protocol (WNSP) v1.0

1. Overview

The Wavelength-Native Signaling Protocol (WNSP) is a lightweight optical signaling standard for MesgNexusOS.

It encodes textual messages into a sequence of **wavelength_nm** values across the visible spectrum and packages them into discrete **frames**. These frames can be rendered as flashes of light (screen, LED, etc.) and decoded via camera or photodiode, then reconstructed back into text.

WNSP is designed to be:

- **Physics-based**: The core symbol is wavelength_nm, not perceived color.
- **Device-agnostic**: Independent of screen brand, gamma, or white balance.
- **Accessible**: Works for color-blind users; humans do not need to see the color.
- **Mesh-ready**: Suitable as a signaling layer for offline, optical mesh networking.
- **Extensible**: Can evolve to support smart cities, IoT, and civilizational signaling.

2. Alphabet and Wavelength Mapping

WNSP v1.0 defines a base alphabet of **26 letters** (A–Z):

- Each letter has:
 - A **hex color** (for basic visualization and UI).
 - A **wavelength_nm** value, evenly spaced across the visible spectrum from ~380 nm to ~740 nm.

The exact mapping is defined in ``/src/protocol/wavelengthMap.ts``.

Example (conceptual):

- A → 380 nm (violet)
- M → ~567–582 nm (greenish-yellow)
- Z → 740 nm (deep red)

The **wavelength_nm** is the canonical representation; the hex color is illustrative.

3. Frames

The core unit of transmission is the **WNSP Frame**:

```
```ts
```

```
type WnspFrame = {
 sync: number; // sync pattern identifier
 wavelengthNm: number; // encoded symbol wavelength
```

```
intensityLevel: number; // discrete level, e.g. 0–7
checksum: number; // simple checksum for error
detection
payloadBit: 0 | 1; // a single bit carried in this frame
timestampMs: number; // local timestamp when frame
was created
};
```