Introduction to Nostr for Bitcoin Developers

A Decentralized Protocol for Censorship-Resistant Communication

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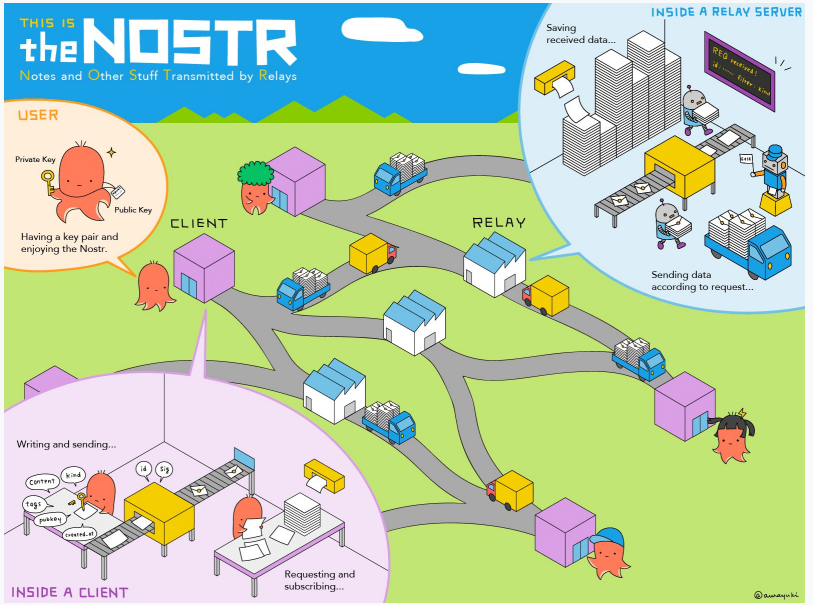
Shytypes

What is Nostr?

- A decentralized protocol for sending and receiving signed messages
- Stands for Notes and Other Stuff Transmitted by Relays
- Built on simple JSON messages, signed with private keys
- Uses WebSockets for communication between clients and relays
- No central server or company — anyone can run a relay
- Identities are cryptographic (`private key` → `public key` → `npub` ⇄ `NIP-05 username`)
- Extensible through NIPs (Nostr Improvement Proposals)
- Resistant to censorship, manipulation, and deplatforming

> ⓘ Note
>
> All data is represented as signed events (notes, DMs, zaps, etc.)



https://github.com/nostr-protocol/nostr

Why Nostr? (NOSTR vs Conventional Social Media)

Feature	Nostr	Conventional Social Media
Ownership	User owns keys and content	Platform owns user data
Censorship Resistance	Decentralized, no central authority	Centralized moderation and bans
Interoperability	Any client can access the same data	Walled gardens, closed platforms
Account Creation	No signup, just a keypair	Requires email/phone verification
Identity	Based on public keys	Based on platform accounts
Data Storage	Distributed via relays	Stored on company servers
Monetization	Native Lightning support (zaps)	Ads, data sales
Protocol Openness	Fully open and extensible via NIPs	Proprietary APIs and features
Client Freedom	Use or build any client	Forced to use official apps
Relay Control	Users can choose or run their own	No control over platform servers

> ⚠ Caution
>
> Social media platforms are centralized, controlled by companies, and often censor content, banning user accounts that don't yield to their politically influenced policies.

https://pixabay.com/illustrations/social-media-internet-security-1679307/

Core Concepts

- Events: the basic unit of data (text, metadata, actions)
  - Examples:
    - Text notes
    - Metadata updates
    - Encrypted messages
    - Follows and reactions
- Clients: apps that create and read events
  - Examples:
    - Damus (iOS)
    - Amethyst (Android)
    - Snort (Web)
    - Coracle (Web)
- Relays: servers that broadcast and store events
  - Examples:
    - relay.damus.io
    - nostr.wine
    - relay.snort.social
- NIPs: Nostr Improvement Proposals to standardize features
  - Examples:
    - NIP-01: Event formats
    - NIP-05: Human-readable names
    - NIP-07: Signing via browser extensions

How to Get Started

- Generate a keypair: pubkey = identity, privkey = signing
- Choose a client:
  - Mobile: Damus (https://damus.io), Amethyst (https://amethyst.social)
  - Web: Iris (https://iris.to), Snort (https://snort.social)
- Post your first event (usually a `kind:1` note)
- Add relays in your client config

🔑 Nostr Key Tools (https://njump.me/)

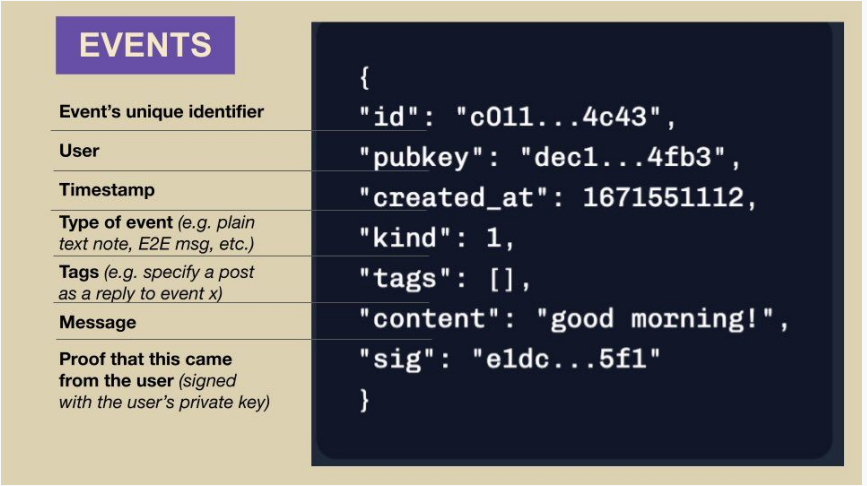
What Are Events?

- Repo : https://github.com/nostr-protocol/nips#event-kinds
- JSON objects signed with your private key
- Basic structure:

```
{
  "id": "...",
  "pubkey": "...",
  "created_at": 1234567890,
  "kind": 1,
  "tags": [],
  "content": "hello nostr!",
  "sig": "..."
}
```

- Kind values:
  - 0: metadata
  - 1: text note
  - 3: contacts
  - 4: encrypted DMs

> Note
>
> * An unsigned Nostr event lacks a valid sig field.
> * Relays reject unsigned events as per NIP-01.
> * The sig proves authorship and is computed over the event id.
> * The id is the SHA-256 hash of a JSON-serialized array:[0, pubkey, created_at, kind, tags, content].
> * Unsigned events are sometimes used temporarily before signing.

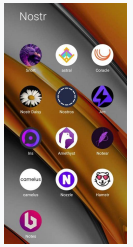


https://seha.cc/nostr-101/

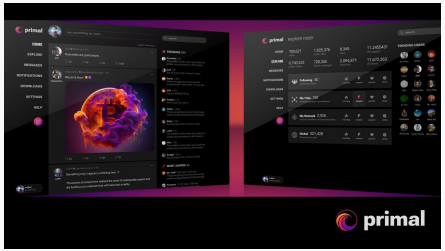
Clients

- Interfaces that interact with Nostr relays
- Generate and manage keypairs (private/public keys)
- Publish signed events (e.g. notes, metadata, contact lists)
- Subscribe to filters and read events from multiple relays
- Handle encrypted DMs via NIP-04
- Render content from tagged events (images, links, zaps)
- Validate and verify event signatures
- Maintain relay connections over WebSocket
- Support NIP-05 for human-readable usernames
- Enable zap requests and LN payments via NIP-57
- Use NIP-07 for browser extension key signing
- Display reposts and threaded replies
- Handle reactions (likes, zaps, reposts)
- Implement Nostr Wallet Connect (NIP-47)
- Examples:
  - Damus (https://damus.io) – iOS
  - Amethyst (https://amethyst.social) – Android
  - Snort (https://snort.social) – Web

> ⓘ Note
>
> Clients are interchangeable thanks to standardized event formats



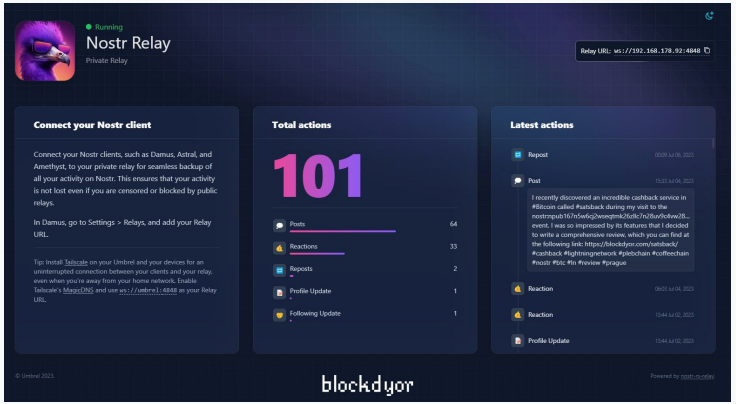
source: https://github.com/nostrdata/clients



source: https://www.nobsbitcoin.com/primal-added-search-functionality/

Relays

- Repo [NIP-11 Relay metadata]: https://github.com/nostr-protocol/nips/blob/master/11.md (https://github.com/nostr-protocol/nips/blob/master/11.md)
- Relays are servers that transmit Nostr events between clients.
- They use WebSocket connections to receive and send events.
- Relays are dumb: they don't judge or censor content (by default) but they do perform minimal event validation.
- Events are pushed by clients (`EVENT`) and retrieved via subscriptions (`REQ`).
- Relays can filter, store, or ignore events based on policies.
- Clients can connect to multiple relays simultaneously.
- No central server — anyone can run a relay.
- Examples:
  - `wss://relay.damus.io`
  - `wss://nos.lol`
  - `wss://relay.nostr.band`
  - `wss://nostr.wine`
  - `wss://nostr.mom`
  - `wss://nostr-pub.wellorder.net`



https://apps.umbrel.com/app/nostr-relay

Nostr Wallet Connect (NWC)

- Repo : https://github.com/nostr-protocol/nips/blob/master/47.md
- A protocol for interacting with Lightning wallets via Nostr events
- Lets clients (e.g. apps) request payments or invoices from user's wallet
- Built using regular Nostr events (e.g. `kind:23194` for payment requests)

How It Works

- User links their wallet (e.g. Alby, Mutiny) to a Nostr identity
- App/client sends an event to the wallet's pubkey with payment request
- Wallet responds with invoice or confirms payment

Use Cases

- Tipping content creators
- Pay-to-unlock content
- Microtransactions for access/features

Supported Wallets

- Alby (https://getalby.com)
- Mutiny Wallet (https://mutinywallet.com)
- Zeus (https://zeusln.app) (experimental)

NIPs (Nostr Improvement Proposals)

- Repo : github.com/nostr-protocol/nips (https://github.com/nostr-protocol/nips)
- NIPs = Specs that define how features work in Nostr
- Community-driven; propose new standards
- Examples:
  - NIP-01: Event formats
  - NIP-05: Human-readable names
  - NIP-07: Browser extension signing

NIP-01 Deep Dive

- Repo :https://github.com/nostr-protocol/nips/blob/master/01.md
- Defines core event structure
- Required for client/relay interoperability
- Fields:

```
{
 "id": <32-bytes lowercase hex-encoded sha256 of the serialized event data>,
 "pubkey": <32-bytes lowercase hex-encoded public key of the event creator>,
 "created_at": <unix timestamp in seconds>,
 "kind": <integer between 0 and 65535>,
 "tags": [
   [<arbitrary string>...],
   // ...
 ],
 "content": <arbitrary string>,
 "sig": <64-bytes lowercase hex of the signature of the sha256 hash of the serialized event data,
which is the same as the "id" field>
}
```

Client -> Relay (Request)

- Communication via WebSocket.
- Clients connect to relay endpoints; one WebSocket per relay.
- Client messages (JSON arrays):
  - `["EVENT", <event>]` — publish event
  - `["REQ", <subscription_id>, <filters1>, ...]` — request/subscribe
  - `["CLOSE", <subscription_id>]` — end subscription
- `<subscription_id>`: unique per connection, string, max 64 chars.
- `<filtersX>`: JSON object for filtering (ids, authors, kinds, tags, time range, limit).
- Multiple filters in `REQ` = OR; multiple conditions in filter = AND.

→

←

Relay -> Client (Response)

- Relay messages (JSON arrays):
  - `["EVENT", <subscription_id>, <event>]` — send event to client
  - `["OK", <event_id>, <true|false>, <message>]` — accept/deny event
  - `["EOSE", <subscription_id>]` — end of stored events
  - `["CLOSED", <subscription_id>, <message>]` — server closed subscription
  - `["NOTICE", <message>]` — human-readable message/error
- `EVENT` uses valid subscription IDs only.
- `OK` always replies to `EVENT`, indicates accept/deny.
- `CLOSED` replies to `REQ` if refused or relay

Next Steps

- Try a client and post your first event
- Contribute to:
  - A NOSTR client you like
  - A language impmentation of the NOSTR protocol
    - Rust: https://github.com/rust-nostr/nostr
- Explore the NIPs repo to understand the protocol features
  - https://github.com/nostr-protocol/nips#event-kinds
- Build a client using nostr-tools (https://github.com/nbd-wtf/nostr-tools)
- Host your own relay for full sovereignty
- collection of NOSTR repos => https://github.com/aljazceru/awesome-nostr/blob/main/README.md

Thank you

🟦 🚀 Welcome to censorship-resistant communication

source:
https://sovryn.com/all-things-sovryn/introducing-nostr-a-decentralized-social-network-for-sovereign-individuals