Universal Clipboard Sync – Hackathon Problem Statement

1. Overview

Users today work across multiple devices and operating systems such as Windows, Linux, and Android. These devices are often connected to different networks (home Wi-Fi, mobile data, office networks), making local-only or LAN-based clipboard sharing insufficient.

The **Universal Clipboard Sync** challenge requires participants to build a **network-based, cross-platform clipboard synchronization system** that works reliably **across the internet**, independent of device location or network.

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2. Core Problem

Design and implement a clipboard synchronization system that:

- Captures clipboard content on one device
- Securely synchronizes it to other paired devices
- Works across different operating systems
- Works across different networks (not limited to the same Wi-Fi or LAN)
- Propagates clipboard updates in real time or near real time

Local-only, same-network-only, or Bluetooth-based solutions do not satisfy the problem requirements.

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3. Mandatory Network Requirement

The system must support clipboard synchronization **over the internet**, meaning:

- Paired devices may be on completely different networks
- NAT traversal and real-world network conditions must be handled
- A signaling mechanism is required for device discovery and connection
- **Peer-to-peer communication is required for device-to-device data transfer**

Centralized servers **may only be used** for:

- Signaling
- Device presence
- Authentication

Clipboard data must be transferred directly between devices and must not be routed through or stored on central servers.

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4. Functional Requirements

Clipboard Sync

- Detect clipboard changes on each device
- Near real-time propagation between devices

Cross-Platform Support

- Must work across at least two different operating systems
  (e.g., Windows ↔ Android, Linux ↔ Windows)

Device Pairing

- Devices must be securely paired before any clipboard data is shared
- Pairing must work across different device types and networks

Multi-Device Support

- A user may have multiple devices paired at the same time
- Clipboard updates must propagate to all active paired devices

Offline Handling

- If a device is offline, clipboard updates must be **queued locally**
- Queued clipboard data must be synchronized automatically when the device reconnects
- Offline behavior must not result in data loss or inconsistent state

Conflict Handling

- The system must clearly define how simultaneous clipboard updates are resolved

User Control

Users must be able to:

- View paired devices
- Remove / unpair devices
- Enable or disable clipboard syncing

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5. Product-Level Capabilities (Required)

The solution must expose user-facing capabilities that allow users to:

- See all paired devices and their basic status (e.g., online/offline or reachable/unreachable)
- Add a new device through a secure pairing flow

- View and reuse previously synchronized clipboard items
- Configure basic preferences such as device name and data types synced

The exact interface and interaction design are left to the team.

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6. Security & Privacy Requirements

- All communication must be encrypted
- Only paired devices may exchange clipboard data
- **No clipboard data should be stored on central servers**
- All clipboard data sharing must occur **directly between devices**
- Local storage of clipboard history must be fully under user control

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7. Constraints

- Must function over real-world internet conditions
- Must not rely on proprietary OS-level clipboard synchronization services
- Must respect OS-level permission and security models
- Must be demonstrable during the hackathon

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8. Evaluation Focus

Judges will specifically evaluate:

- Whether clipboard synchronization works across **different networks**

- Understanding of the Problem Statement
- Judges can ask about any of the part of your problem statement
- Correct and secure use of **peer-to-peer communication**
- Handling of offline devices and reconnection
- Stability under network changes
- Overall system design and clarity of technical trade-offs

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9. Expected Outcome

By the end of the hackathon, teams will present a **real-world universal clipboard system** that works across operating systems, devices, and networks demonstrating practical distributed systems engineering rather than local-only syncing.