Cladari: Universal Tagging Architecture

Cladari Universal Tagging Architecture: QR / NFC / RFID / NR Integration Blueprint

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Core Objective:

Design Cladari to support universal tagging standards (QR, NFC, RFID, and NR codes) from day one, enabling seamless interoperability and scaling across commercial and scientific deploymentsup to 10,000+ specimens per enterprise client.

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1. Guiding Principle: One Cladari ID, Many Surfaces

Every plant is issued a unique Cladari ID (UPID), which can be expressed through multiple tagging technologies:

Tag Type	Use Case	Encoding Format	Read Method
QR Code	Low-cost, mobile-friendly	UUID or URL payload	Smartphone, webcam
NFC Tag	Consumer-friendly, lab-grade	NDEF record	Phone, NFC reader
RFID Tag	Bulk scanning in nurseries	EPC/UID	RFID scanner/gun
Numeric (NR)	Printed fallback	Plaintext (e.g. CLD-0001)	Manual or OCR

All tags point to the same Cladari record, allowing for fluid integration across devices and environments.

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2. Architecture Overview

a. Unique Plant Identifier (UPID)

- Format: CLD-PLT-YYYYMMDD-XXXX

- Linked to: genotype, phenotype, history, tag types, and care data

b. Universal Tag Encoder Module

- Generates all formats (QR, NFC, RFID) for a single ID

- Option to print directly or export

- Supports batch generation

c. Reader-Agnostic Backend

- Accepts input from: smartphone cameras, NFC readers, RFID guns, Bluetooth barcode

scanners

- Resolves input ID to correct plant record

- Syncs offline entries once reconnected

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3. Scalable Logging Workflows

For Enterprise (10K+ Specimens):

- Bulk import tools (CSV, scanned batches)

- Cloning & propagation manager to duplicate known data and assign new tags

- Mobile batch scan mode (tap, snap, log)

- Auto-tag print queue integrated with Dymo, Zebra, or Epson label printers

For Individual Growers:

- Lightweight mobile app for NFC/QR logging

- Print-at-home QR/NFC-enabled tags

- Snap-and-log photo recognition (coming phase)

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4. Hardware Compatibility

Supports:

- USB/Serial/Bluetooth barcode + NFC scanners

- Android + iOS devices w/ camera + NFC

- Desktop NFC writers

- RFID handhelds (UHF/RAIN compatible)

- Raspberry Pi scanning stations (nursery deployments)

Future Optionality:

- DNA watermark integration

- Synthetic tag substrates

- RFID-QR combo tags for redundancy

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5. Implementation Steps

a. Airtable Schema Additions

- Fields: Cladari ID, QR Code, NFC UID, RFID EPC, Tag Batch

b. Universal Tag Generator Tool

- Script or UI to generate multi-format tags per Cladari ID

- Print/export options

c. Scanning Interface UI Mockups

- Simple modal for scan match record suggest

- Compatible with web, mobile, or embedded interfaces

Summary

Cladari will launch with a universal tagging system that future-proofs its infrastructure, accommodates enterprise clients, and supports broad adoption across conservation, horticulture, and commercial breeding.

By decoupling data from tag format and enabling multi-format recognition, Cladari becomes the most flexible and scalable provenance engine for living things.

Next Actions:

1. Begin development of Universal Tag Generator Module

2. Update Airtable to reflect tag fields

3. Build mockups for scanning UI

4. Begin sourcing recommended tagging hardware for pilot program