CODEPOINT Nali-100 Tag User Manual

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CODEPOINT Nali-100 Tag

Product Features

Nali-100 is a low power, credit card size, indoor and outdoor location device. Nali-100 can be used as an enterprise asset tracking device, an employee safety badge or a student card with emergency button. Nali-100 uses for low power wide area network (LPWAN) protocols like LoRaWAN to provide seamless and reliable campus wide coverage. Nali-100 is designed for high security, long battery life and seamless indoor/outdoor location. User can set the frequency of location reports from once per minute to once per month through App. LoRaWAN is a popular LPWAN and provides large area coverage at low operating cost. LoRaWAN protocol is highly secured communication and use two layers of cryptography:

- A unique 128-bit Network Session Key shared between the end-device and network server
- A unique 128-bit Application Session Key (AppSKey) shared end-to-end at the application level

AES algorithms are used to provide authentication and integrity of packets to the network server and end-to-end encryption to the application server. By providing these two levels, it becomes possible to implement multi-tenant shared networks without the network operator having visibility of the user’s payload data. The keys can be Activated by Personalization (ABP) on the production line or during commissioning or can be Over-The-Air Activated (OTAA) in the field.

Product Applications

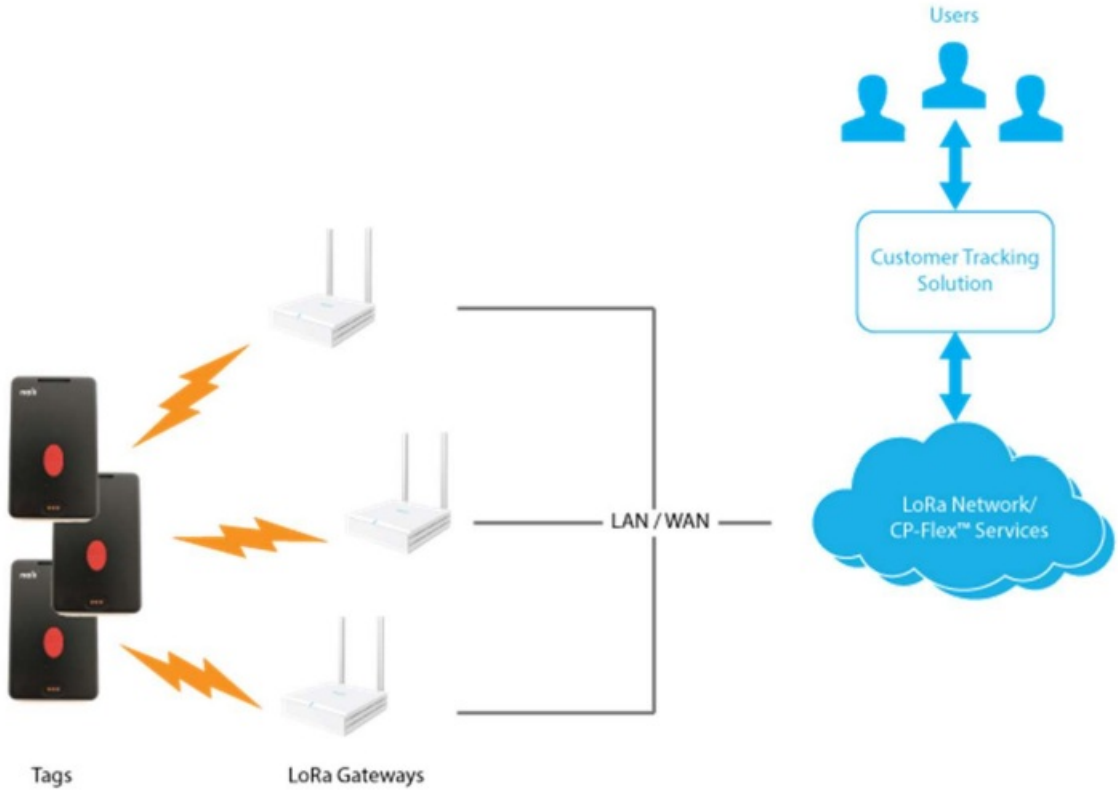
- Hotel Staff Safety Management
- Student and Employee Safety Tag
- Retirement Home, Hospital, Government Agency Safety Tag
- Vehicle Activity Tracking
- Enterprise Asset Tracking and Warehouse Asset Management

Functions

- LoRaWAN class A communication
- BLE signal based indoor and outdoor 3-D positioning
- BLE for provisioning, log download, and firmware updates
- Accelerometer for motion detection
- Real time clock (RTC)
- Rechargeable battery
- Long battery life:
  - 2+ months (reporting 100 locates per day)
  - 24 months+ battery life if reporting position once per day
- Programmable using simple script, start with variety of open-source examples
- 1000+ location message cache when tag is out of network
- Two programmable buttons and two programmable LED indicators
- Water and shock resistant: IP67 compliant
- Size: 86 x 54 x 4.8mm

Mechanical Design

Systems Architecture

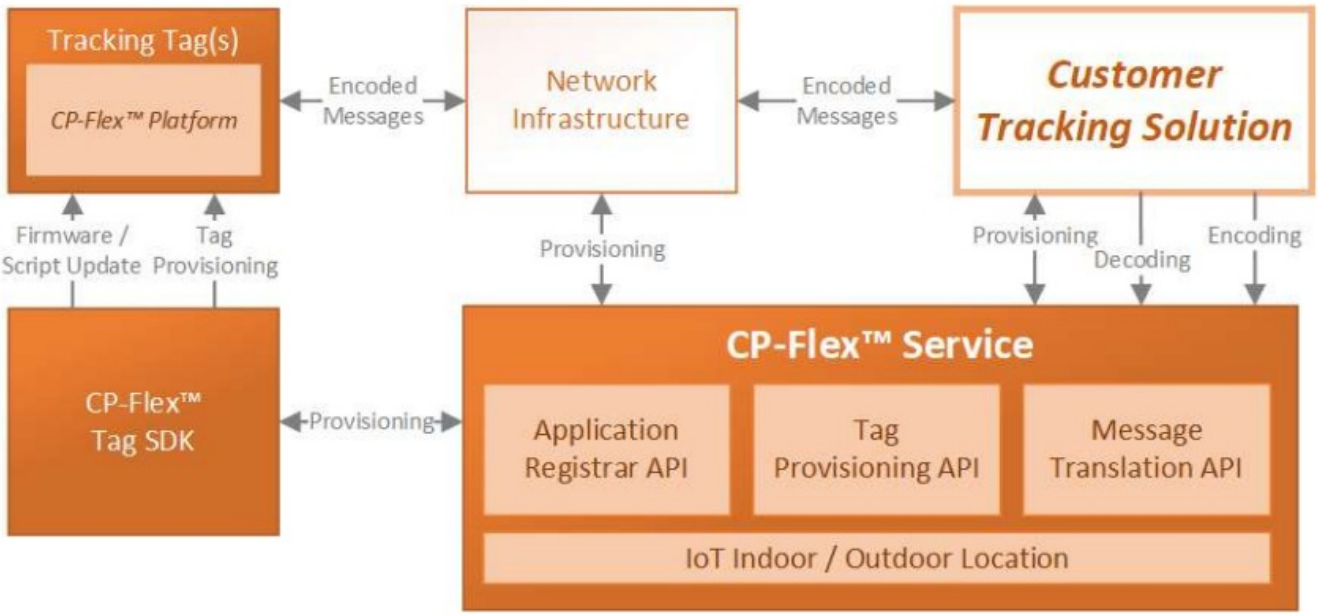


High-Level Solution Architecture

Nali-100 supports a variety of systems implementations supporting both cloud- and enterprisebased deployments. System integrators developing solutions using the Nali-100 tag and related services can work with their preferred LoRaWAN network, readily integrating the additional tag and message translation services through easy-to-use web-services. Nali-100 tags communicate with the customer tracking solution via a deployed LoRaWAN infrastructure (comprising multiple gateways and network management), Messages are encoded to maximize transport efficiency improving the battery life of the tag. Nali-100 CP-Flex cloud services are provided to facilitate message translation, provisioning, and location services.

CP-Flex™ Service

Enhancing, the Nali-100 Tag application flexibility, maximum performance, and long battery life; CP-Flex™ Service provides message translation, indoor/outdoor location, provisioning, and application registration.



- **Message Translation API –** CP-Flex™ messages are encoded to minimize transport data requirements. The Message Translation API enables Customer Tracking Solutions to readily encode and decode messages providing a simple and intuitive JSON based web API for web application developments.
- **Indoor / Outdoor Location –** The Nali-100 tag implements location determination capabilities at its core such that no matter the message content, the most-recent known location and time is always reported. Location data like time stamp are essential metadata and the service infrastructure provides the best estimate of location given measurement data collected by the tag both indoors and outdoors. Indoor location can be further enhanced through probe and survey mechanisms depending on customer requirements.
- **Tag Provisioning API –** simplifies the process of provisioning and managing large-numbers tags by aggregating the tag provisioning process, simplifying the complicated activation and update activities involving multiple services. Solution providers can use the provided Nali-100-Flex™ provisioning tools for Android/iOS or integration the functionality into their own mobile applications.
- **Application Registrar API –** Using the CP-Flex™ SDK, solution providers can develop custom script applications and transport encodings, which are then registered using the Application Registrar API to enable robust message translation and reporting.

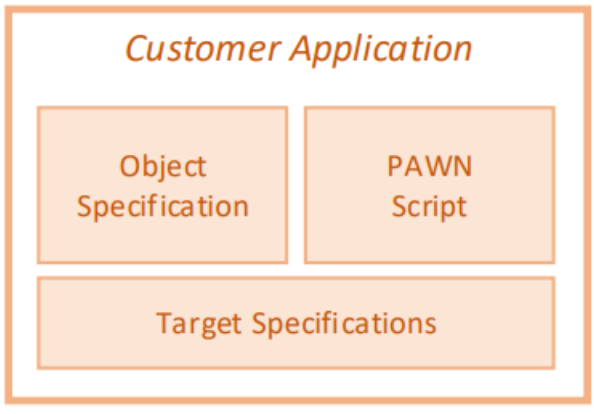
Applications Development

The Nali-100 tag is an easily programmable device designed support a wide variety of applications: whether it be tracking people, animals, or “things”. The Nali-100 CP-Flex™ Platform provides a scripting engine to control the tag’s behavior. All activities in the tag are event driven, simplifying user code focusing on event handling rather than setting up complicated polling and state management.

The platform efficiently manages wake and sleep states, communications, and other functions notifying the script when changes occur. Using the script capabilities, developers have full access to the device’s functions without having to deal with complex embedded firmware.

Customer Application Structure

Tag Customer Applications are comprised of three elements as shown below.



- **Object Specification –** Each application defines an Object Specification file, which defines the key elements, identifies, and encoding mappings. Application developers need only provide those object definitions for which they need to communicate. The specification makes it possible for CP Flex services to properly encode and decode raw message data.
- **PAWN Script –** events within the device are managed within the tag using handlers implemented in PAWN script. PAWN is a highly efficient scripting engine that requires very little overhead to execute user functionality without adversely affecting power consumption.
- **Target Specifications –** Customer applications are targeted to specific tag classes, device hardware revisions and firmware versions. The target specifications enable developers to control, which devices are supported and allowed to run the specified application. This information is stored as part of the application and maintained via Application Registrar API.

Using the CP-Flex™ SDK, customer applications are compiled, validated, and registered with the Application Registrar API prior to uploading onto a Nali-100 Tag. Once registered, the application can be selected during the provisioning process for a particular tag application. Solution providers creating tag applications can start with the base applications provided in the SDK, which demonstrate using the various features and capabilities of the tag.

CP-Flex™ Platform
The platform exposes the device functionality in the following modules. As the device platform matures, these APIs will be periodically updated with new capabilities and features, which will be documented in the SDK.

- **Cache** / **Config –** Save messages and configuration data in either short-term non-volatile memory or long-term data archive. Script can use the caching functionality to store information that is unaffected by power management function.
- **Communication –** Transmit and receive encoded messages supporting application define payloads as well as standard payloads implemented by the Platform. Data may be communicated to other services via LoRa or cached for later download via BLE (as application needs).
- **LEDs** / **Buttons –** Control the behavior and the meaning of the 4 available LEDS and two push buttons. The Nali-100 Tag has two bi-color LEDs and push buttons that recognize short-press, longpress, continuous, and double-press events.
- **Motion Sensing –** Configure and receive motion events. Motion sensor sensitivities and thresholds can be configured to support the detection of a variety of motions including fall detection, crash detection, continuous motion, and no motion.
- **Positioning –** Acquire and report positioning measurement data including BLE observations. The position is calculated by the Nali-100-Flex location service. As required the device may request location reports.
- **Power Manager –** Configure thresholds and monitor power-related events including battery low, power connect, and power disconnect. Script can also control power consumption by enabling and disabling various board functions.
- **RTC Alarms –** Configure UTC-based or relative alarms to control devices behavior over time. Immediate timers can also be defined to manage short-term timeouts, which will expire before the device goes back to sleep.
- **Sensors –** Configure event threshold on available sensors (including tag temperature) to receive updates when the sensor value exceeds some predefined threshold.

FCC Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

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Documents / Resources

	CODEPOINT Nali-100 Tag [pdf] User Manual NALIN100, 2A8JENALIN100, Nali-100 Tag, Nali-100, Tag

References

- Codepoint Technologies