LONG-LIFE GPS-SOLAR-ENV-BHV LOGGER

Debut® NANO

Powered by *INTELINK* ®

CONTENTS

NANO: Measurement & Specifications

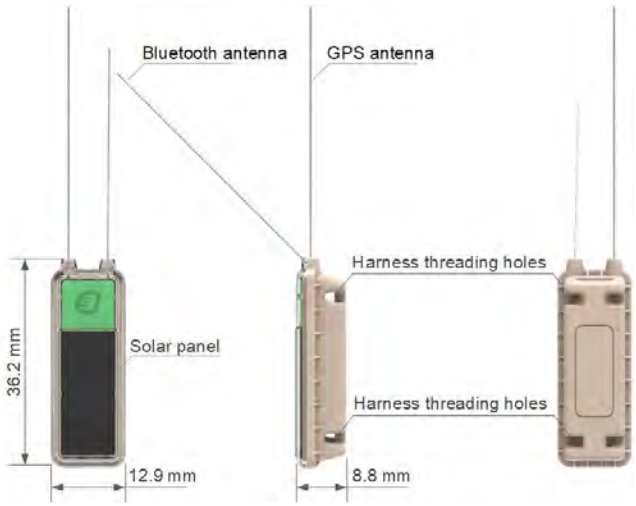
Dimensions: 36.2 mm × 12.9 mm × 8.8 mm
(antenna not included)

Weight: 3.7 g

Antenna: Titanium alloy

Housing: ASA injection molding
(strong and water proof, with
multiple harness threading holes)

Note:
This model can use epoxy resin
sealing to lower the weight to 2.7g.
See examples at Page 8.

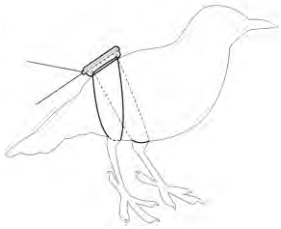


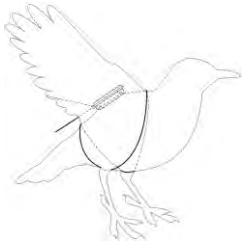
Sensor	GPS, accelerometer, light intensity, temperature, battery voltage
GPS Module	GPS precision: CEP (50%) 5m Maximum update rate: 10 Hz
Working Intervals	Programmable (via webpage datacenter or App)
Transmission	Transmission method: INTELINK based on Bluetooth 5.0 Maximum uplink/downlink speed: 1 Mbps/1 Mbps Output power: 8 dBm
Power Supply	• Battery: 30 mAh Lipo • Recharge: Solar panel (30% efficiency)
Data Storage	• Flash memory: 16 MB • Regular data storage: 460 days at default settings (1h GPS, 1h ENV and 30min BHV) • BOOST data storage: 280,000 pieces • Acceleration data storage: 28,700 pieces
Operational Environment	• Working temperature: -20°C ~ 60°C • Waterproof: IP 68
Life-Span	3 years
Firmware Upgrade	Over the air (OTA) by INTELINK

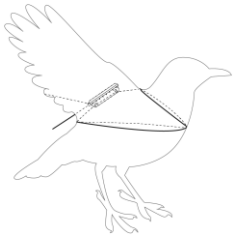
NANO: Attachment Methods

NANO is typically deployed on back or waist. The common accessories include:

- 1.5mm UHMWPE tape
- Aluminum rings for binding harness （optional）
- 4.5mm neoprene pad for elevation (so that thick feathers will not cover the solar panel)

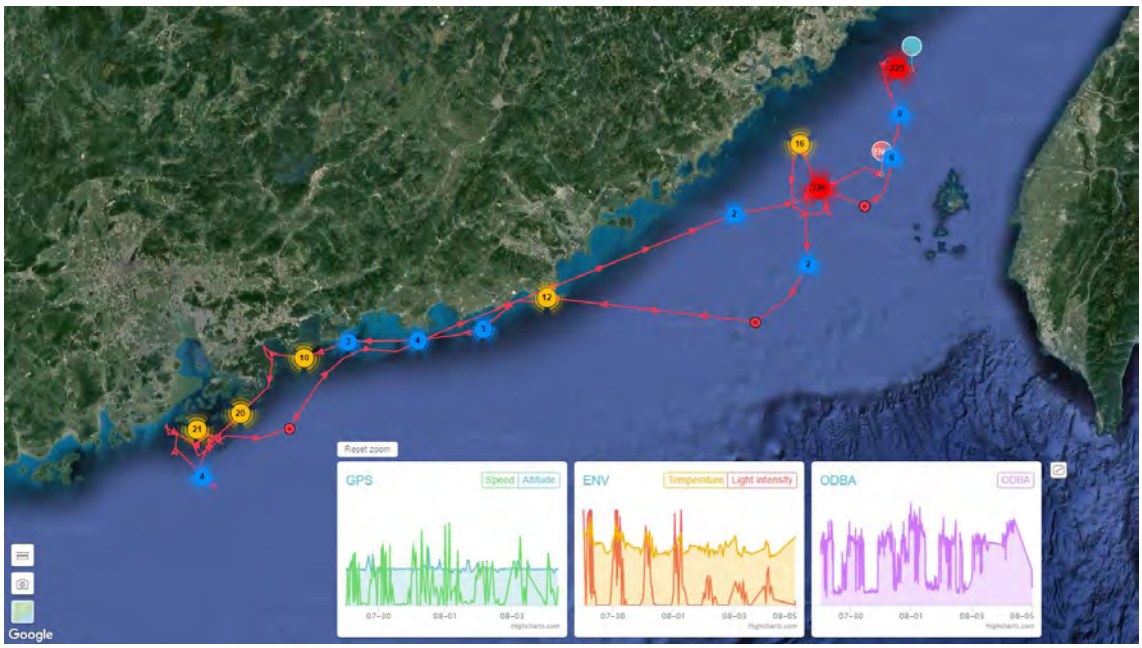






NANO: Data Samples

With a high-efficiency solar unit, NANO is capable of collecting hundreds of GPS data per day. The screenshot below shows 7-day GPS track recorded by a NANO on a tern, along the southeast Asia coast during mid summer. The small charts below shows how the flying speed, altitude, light intensity, temperature, and activity index fluctuated during this period.

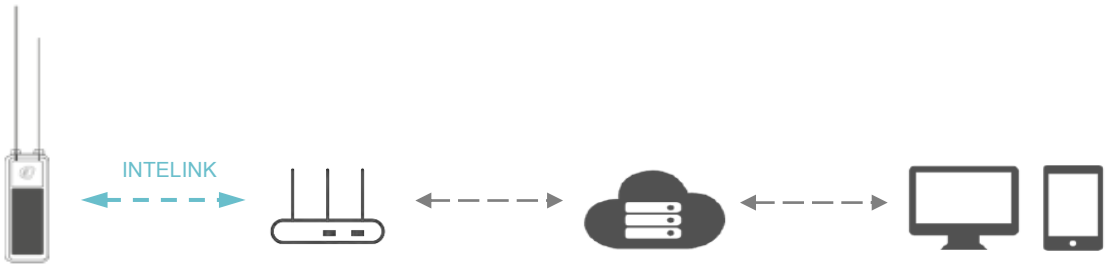


Below shows the complete migration journey of a tern tracked by a NANO during 11 months (over 70,000 GPS locations).

INTELINK: Ubiquitous Networking

INTELINK® is short for intelligent linking. It is a patented communication technology developed based on Bluetooth, featuring long distance and super-low power consumption.

Powered by INTELINK, NANO is able to establish connection directly with ordinary smart phones and other Debut series products, enabling many more functions and generating new data types from the interaction among different devices.



Debut NANO | Gateway | Cloud Server | Webpage / App account

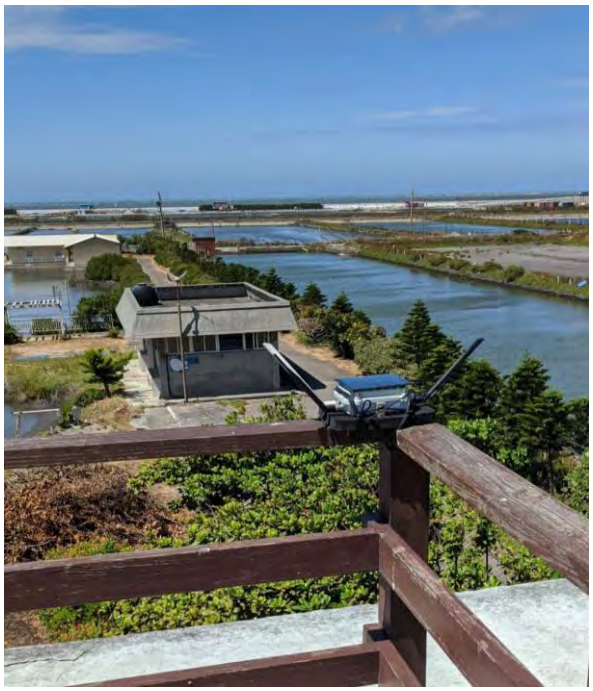
(For selection of the gateway products, see page 9.)

INTELINK for Data Relay

The data collected by NANOs can be downloaded by gateways via INTELINK, manually or automatically.

Anyone who has an smart phone can scan for NANOs nearby, and download the data stored on them. The data will be uploaded automatically and safely to the cloud server through the phone's network connection (cellular or Wi-Fi).

You can also deploy a gateway at a fixed spot in the field to scan for NANOs continuously and unattended. Once connected, the gateway will download data from the NANO and upload data automatically via cellular network.



INTELINK for Breeding & Nest-Usage Research

Place a gateway near the nest, and it will record the time when a NANO enters or exits its communication zone. This provides valuable data revealing the nest-usage and parenting strategy for breeding research.

INTELINK for Raw Acceleration Data

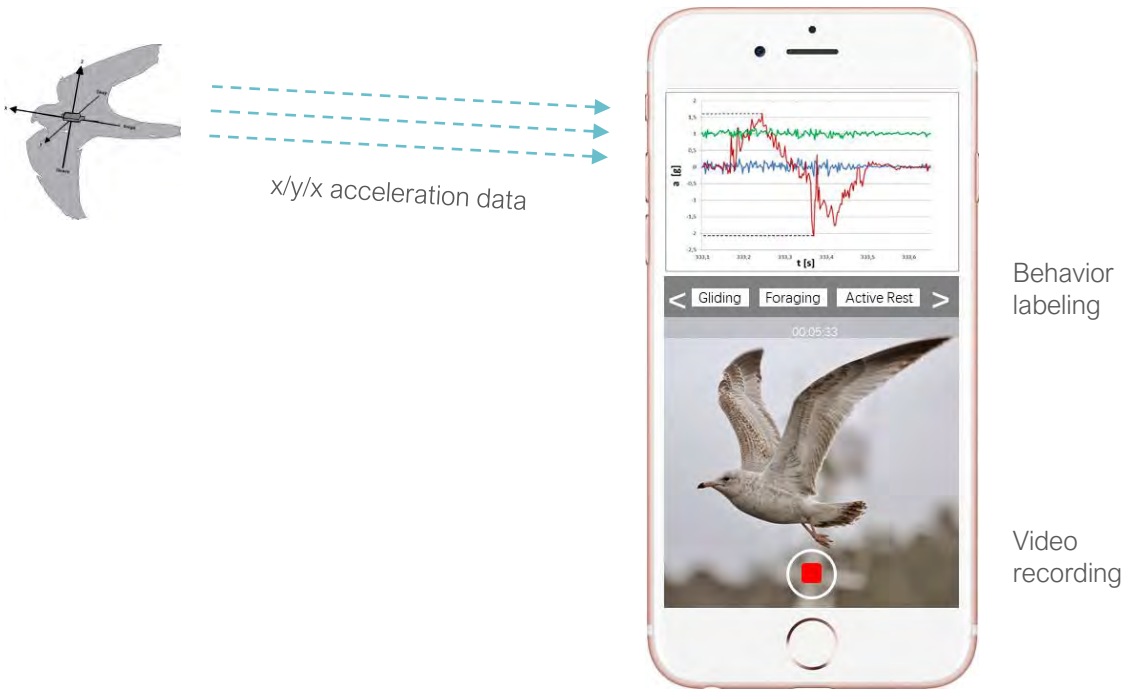
NANO is able to collect raw x/y/x acceleration data for behavioral research, especially when the data can be combined with GPS, environmental data, and individual activity rhythm under precise timestamps.

With INTELINK, you can not only download raw x/y/x acceleration data from the device (which is usually discontinuous as to avoid occupying too much memory space), but also obtain real-time and non-stop data by connection between the NANO and a gateway.

INTELINK for In-Situ Behavior Modeling

When obtaining real-time raw acceleration as described, you can also mark the data with behavior tags on Debut App.

As illustrated below, INTELINK enables you to receive real-time x/y/z acceleration data from the NANO that is connected with your phone, and Debut App will visualize the data simultaneously on the phone screen, and at the same time record videos with the phone's camera. As you watching the birds holding your phone, you can tap to add the behavior tags to "mark" the data in real-time. Data, video, and behavior tags you add will be combined under the precise timestamps and saves in your phone for later analysis and verification.



With the help of Druid's AniAct® behavior algorithm platform, the user will be able to generate x/y/z acceleration-based behavior algorithm for different species.

Furthermore, such algorithm can be loaded back into the device and be conducted on board. Then, the device will automatically compute on the 25Hz or higher frequency acceleration data and send back the result of behavior tags continuously.

By doing so, the users do not have to sacrifice energy balance and pay high data fee bills to obtain the birds' raw acceleration data from the other side of the world, they don't have to process the enormous volume of raw data, they get computed results effortlessly.

This function brings new insight on bird research & conservation by contributing a new dimension of data.

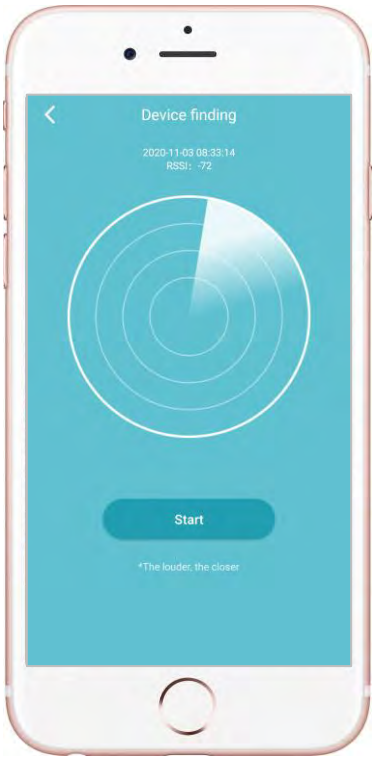
INTELINK for Finding Birds or Devices

With INTELINK technology and Debut App, NANOs and a smart phone will automatically form a beacon system.

When you activate the “Finding Device” function on App, the smart phone will ring if a NANO is detected nearby. The closer the NANO is, the louder the ringing sound will be.

This provides a convenient way to find your birds or lost devices in the field.

When you get close enough to the devices, you also get to download all data stored in it.



INTELINK for Citizen Science Projects

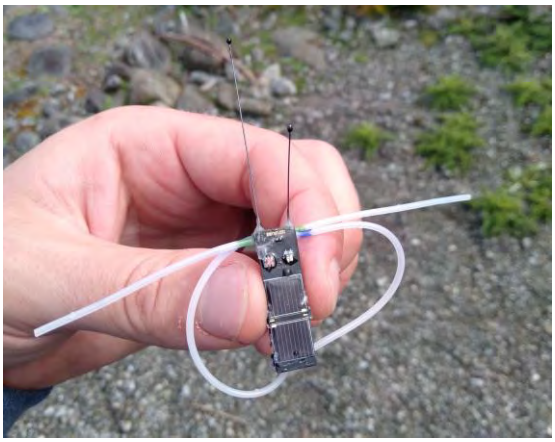
The INTELINK technology enables various interactions between tracking devices on birds and smart phone, which offer some new ways for volunteers or even general public to make their contribution to scientific research or conservation projects.

Here are some potential ways:

- More than 3 billion people own their own smart phone nowadays, thus there're are 3 billions of mobile "gateway". With a simple tap on the App to scan for birds around you, you could contribute unmistakable reports of "seeing" a bird with accurate location and time information. This report will be sent to the researcher of that bird immediately. The researcher can also share it inside the internet community of that species.
- In addition to the report of “seeing”, you can use Debut App to download/upload the data stored in NANO. Imagine how exciting the researcher will be to have his data safely updated by helpers he had never met.
- Advanced users can also contribute behavior tags using the in-situ modeling function based on his/her own knowledge and observation. A shared data-base with different levels of contributions by the most extensive participants of this world would come true eventually.

Annex I: 2.7g Epoxy Resin Sealing Version

The 2.7g version has the same function as the standard 3.7g NANO, only with epoxy-resin sealing instead of the injection molding housing.



Annex II: Gateway Products

The gateway can be an ordinary smart phone with Bluetooth function, or a Debut HUB, QUEST, or TAG. Select the gateway that suit your project to go with NANOs.

Type	Photo	Range (Optimal)	Operation	Description
Phone		200m	Manual	Convenient to use anytime, any where. No extra cost. Potentially a huge receiving network of over 3 billion mobile gateways on the earth.
Phone +QUEST		800m	Manual	USB-sized recharged gadget designed to enhance INTELINK distance of a normal mobile phone
TAG		500m	Manual / Auto	Half-palm sized solar charging gadget that can be hang on anywhere in your garden. Cheap enough to cover every residential region, citizen science in larger scale.
HUB		1500m	Manual / Auto	Router-sized gadget with metal housing, powered by battery, solar or cable, high-resolution scanning, most durable in wildness

(For purchasing details, contact sales@druid.tech)