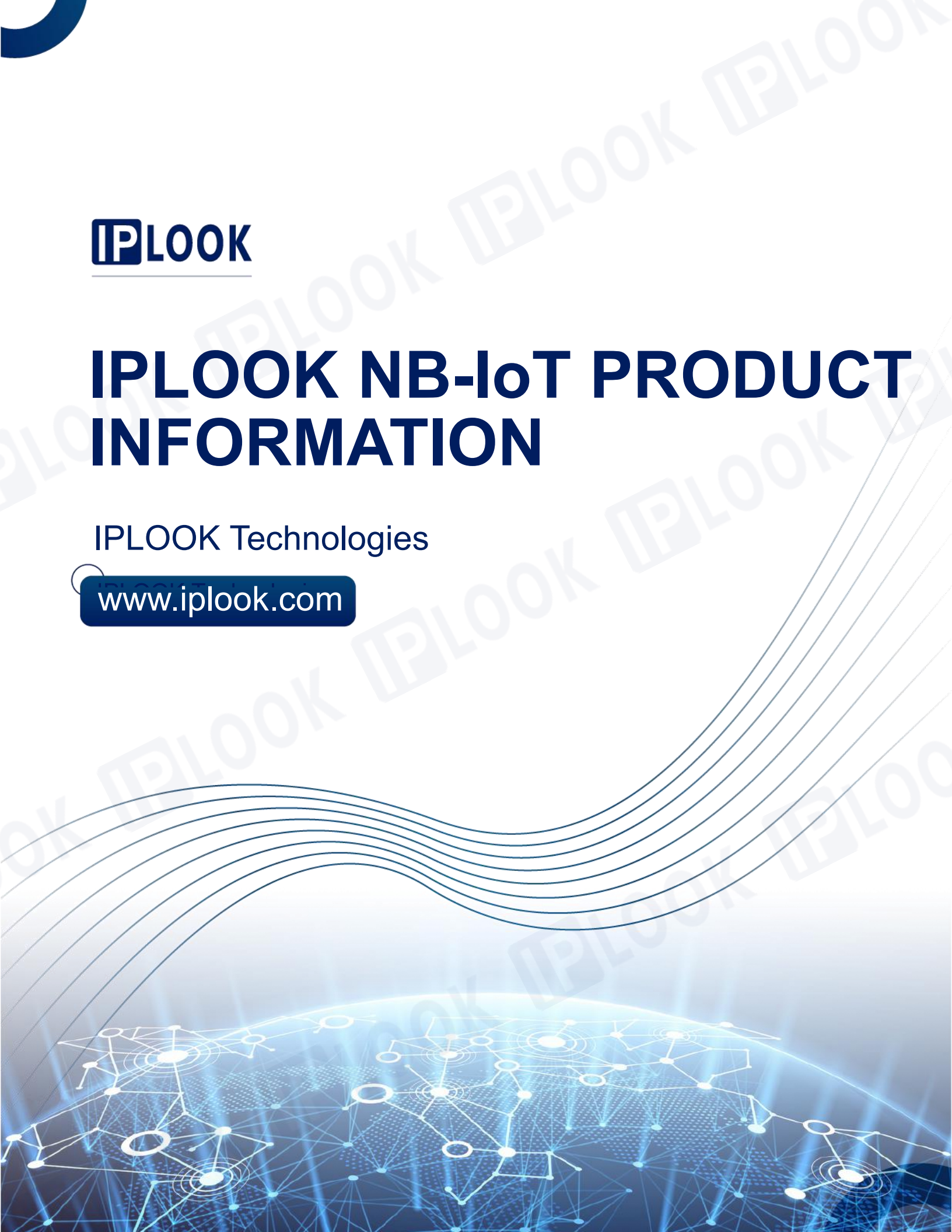




IPLOOK NB-IoT PRODUCT INFORMATION

IPLOOK Technologies

www.iplook.com



Contents

| | |
|--|---|
| 1 Overview..... | 2 |
| 2 Application Scenario..... | 3 |
| 3 IPLOOK's NB-IoT Solution..... | 6 |
| 3.1 Feature Lists..... | 6 |
| 3.2 NB-IoT product strategy..... | 7 |
| 3.2.1 Deployment strategy..... | 7 |
| 3.3 License strategy..... | 8 |
| 3.4 Technological Support for Customers..... | 8 |

1 Overview

The Internet of Things (IoT, Internet of Things) is one of the most important trends in global technology development over the next five years and will bring tremendous business value. Simply put, IoT is the extension of the Internet from people to things, where IoT terminals are equipped with networking and communication capabilities to achieve interoperability through the network. IoT can be used in all aspects of production and life, and its services have different requirements for network transmission speed, which are mainly divided into the following three categories:

1. High rate applications, such as camera surveillance, electronic billboards, etc., which can currently be carried on 3G/4G operators with no other non-3GPP competing technologies.
2. Medium rate applications, such as smart home, POS, wearable and other typical applications. These applications can be carried by enhanced machine type communication (eMTC, enhanced machine type communication) (less than 1Mbit/s), the rate requirements are not very high, power requirements are low.
3. Low-rate applications, such as meter checking applications and low-end vehicles, are predicted to account for 70% of the overall IoT market; these services upload small data several times a day and require low data rates; however, because they are battery-powered, they require low power consumption; some of the meters are located in basements or buried in underground pipelines, which require higher coverage; and the number of these devices is large, such as water, electricity, gas and other meters, so they are more sensitive to cost.

Narrowband IoT or NB-IoT is a wireless communication standard for the Internet of Things (IoT). NB-IoT belongs to the category of low-power wide-area networks (LPWAN), enabling to connect devices that need small amounts of data, low bandwidth, and long battery life. NB-IoT focuses

specifically on indoor coverage, low cost, long battery life, and high connection density. NB-IoT uses a subset of the LTE standard but limits the bandwidth to a single narrow-band of 200kHz. It uses OFDM modulation for downlink communication and SC-FDMA for uplink communications. IoT applications which require more frequent communications will be better served by NB-IoT, which has no duty cycle limitations operating on the licensed spectrum.

| Comparison of NB-IoT Services Process and 4G Business Process | | |
|---|--|---|
| Process | 4G Services | NB-IoT Service |
| PDN Connection Establishment Procedure | Supports multiple PDN connections. | Multi-PDN connections are not supported. |
| Load activation Procedure | Support for proprietary bearer activation Procedure | Proprietary bearer activation processes are not supported. |
| Bearer Update Process / Bearer De-activation Procedure | MME will notify eNodeB to modify or remove E-RAB each time a bearer is updated or deactivated. | MME does not trigger eNodeB to modify or remove E-RAB when bearer is updated or deactivated. |
| Attach/TAU Procedure | Support for common multimode terminal Inter RAT process. | The Inter RAT process for NB-IoT terminals is not supported. |
| Handover Procedure | MME supports the common terminal Handover process | MME does not support the Handover process for NB-IoT terminals between NB-IoT RANs and between NB-IoT RANs and 2G/3G/4G RANs. |

2 Application Scenario

There are 8 common application areas for NB-IoT, known as the 8 classic application areas for NB-IoT:

| | |
|--------------------|---|
| <p>Utilities</p> | <p>Smart meter reading (water, gas, electricity, heat), smart water service (pipe network, leakage, quality control), smart fire extinguisher, fire hydrant. The application of NB-IoT technology in smart water meter has the characteristics of convenient realization, safe and reliable use, user management, from the performance test and analysis results can be seen, the whole system is in good operating condition, stable performance, with a wide range of market application prospects.</p> |
| <p>Health Care</p> | <p>Drug traceability, remote medical monitoring, blood pressure meter, blood glucose meter, care monitoring. As the first NB-IoT health care device, NB-IoT smart blood pressure monitors will also be more widely used and further create a new generation of smart and healthy lifestyles for users.</p> |
| <p>Smart City</p> | <p>Smart streetlights, smart parking, smart city garbage can management, public safety, alarm, smart construction site, city water level monitoring. Traditional parking solutions, whether it is Bluetooth, Wi-Fi, or infrared and other technologies, due to their own power</p> |

| | |
|-------------------------|--|
| | <p>consumption, communication distance, the number of terminals and other reasons, cannot fully meet the city intelligent parking large-scale application scene needs. The application of NB-IoT technology will greatly change this situation.</p> |
| Consumer Electronics | <p>Wearables, bicycles, electric car security, smart luggage, VIP tracking (kids, elderly, pets, vehicle rental), payment/POS.</p> |
| Agricultural Production | <p>Precision planting (environmental parameters: water, temperature, light, medicine, fertilizer), animal husbandry (health, tracking), aquaculture, food safety traceability, urban environment monitoring (water pollution, noise, air quality PM2.5).</p> |
| Logistics and Storage | <p>Asset management, container tracking, warehouse management, fleet management, logistics status, parcel tracking.</p> |
| Intelligent Building | <p>Smart access control, smart smoke detection, fire detection, elevator failure/maintenance.</p> |
| Manufacturing Industry | <p>Intelligent production, equipment condition monitoring; energy facilities, oil and gas monitoring; chemical park monitoring, large rental equipment, predictive maintenance (appliances, machinery, etc.).</p> |

3 IPLOOK's NB-IoT Solution

The basic network architecture of IPLOOK's NB-IoT Solution:

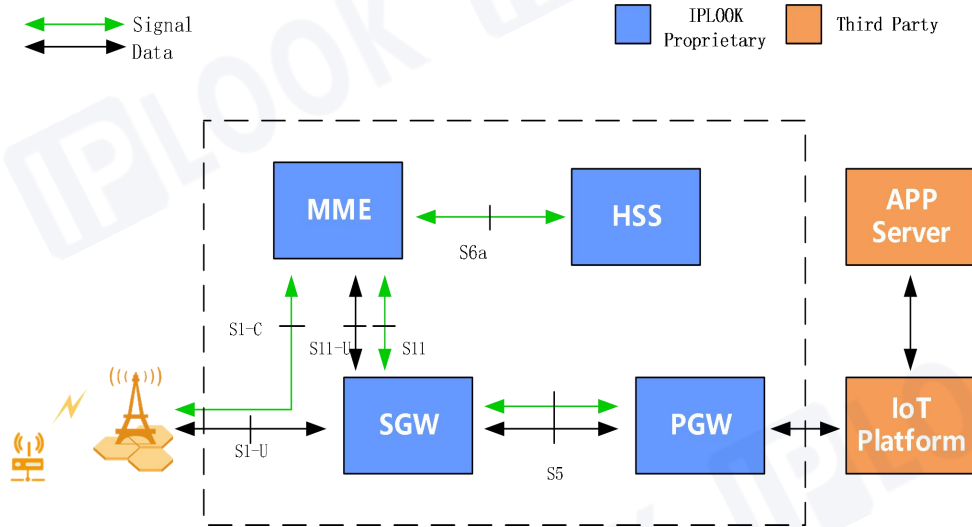


Figure 1 : NB-IoT Solution

Comparison of NB-IoT business processes with traditional 4G business processes

3.1 Feature Lists

Terminals Power Saving Management

- Extended periodic timer
- PSM mode
- NB-IoT eDRX parameter

Data Transmission Optimization

- CP-CIoT for Control Plane Optimization
- UP-CIoT for User Plane Optimization
- Non-IP transmission

3.2 NB-IoT product strategy

3.2.1 Deployment strategy

There are three deployment strategy provide by IPLOOK currently.

3.2.1.1 Compact Deployment

As is shown in the Figure 2 , Compact Deployment integrated almost all the network elements in one IPC (Industrial Personal Computer), including MME, SGW, PGW and HSS. The management and maintenance are much easier than traditional way.



Figure 2: IPC

3.2.1.2 Virtualized Deployment

As is shown in the Figure 3 , virtualized Deployment takes use of general X86 server as the platform. The function can be NFV element and deployed in the data center. Or the network elements can be directly deployed on the X85 server to reduce the CAPEX. In addition, IPLOOK could deploy all the network elements into one server like compact deployment and could also deploy every different network element into different servers, according to custom's personal needs.



Figure 3: X86 Server

3.3 License strategy

- IPLOOK EPC license strategy is mainly based on the Capacity and Throughput Rate for data plant.
- There also some features need license.
 - MME Pool
 - Redundancy Function
 - 3GPP Call Trace
 - Throughput rate accelerate
 - SGW/PGW selection with load balance function

3.4 Technological Support for Customers

IPLOOK Product Support Services offers CT foundation service that perform continuous and reliable maintenance services based on the Service Level Agreements (SLAs) you choose.

IPLOOK CT Foundation Service provide flexible service offering portfolio, which include **Onsite service** to help you maintain a more efficient and stable network environment and improve network productivity, and the **Basic Service** is provided as collaborative solution for your maintenance team or certified IPLOOK partners, to support them maintain a more efficient and stable network environment and improve network productivity.

The Following table shows IPLOOK CT Foundation service coverage:

| Service offerings | IPLOOK CT Foundation Service | | | |
|---|------------------------------|--------|----------------|----------------------|
| | Basic Service | | Onsite Service | |
| | 9x5xNBD | 24x7x4 | 9x5xNBD | 24x7x4 |
| Technical Support Center (TSC) support (E-mail & Hotline) | 24x7 | 24x7 | 24x7 | 24x7 |
| Onsite Support | / | / | 9x5xNBD | 24x7x4 Hour - Arrive |
| Software Support | YES | YES | YES | YES |

Notes:

1. The SLA in this document is for reference only. Service contents and response time may vary by country. For detailed information, please contact an IPLOOK authorized partner or your local IPLOOK sales and service representative.
2. Service delivery is based on commercially reasonable efforts. IPLOOK will select a proper service mode based on the actual situation and the committed SLA to resolve your problems in a timely and effective manner.
3. 24x7x4: Priority 1 calls, four-hour response available 24x7; Priority 2 Next Day, Priority 3 calls, Next Business Day.
4. The service start date and end date should be specified in the respective Purchase Order or contract between you and IPLOOK. If no service start date is listed on the PO/contract, it is defined as below:
 - 1) For a new service order sold together with IPLOOK product, the service starts on the 90th day after the product shipment date from IPLOOK;
 - 2) For a renewal service order, the service start date is the day after the end date of warranty or the previous Service.