新岸线
NUFRONT

EUHT

Enhanced Ultra High Throughput-5th Generation

Nufront（Beijing）Technology Group Co., Ltd.

CONTENTS

Company Introduction

Focus on IC, Wireless Communication Technology R&D

Beijing,Shanghai, Guangzhou and Shenzhen Offices

1000 Employees, >70% Master's Degree

Founded in 2004, Nufront is a high-tech private enterprise dedicated to the research and development of core technologies such as next-generation wireless communication systems and IC chip design. It has more than 400 patented technologies. The company is headquartered in Beijing and has branches in Guangzhou, Shanghai and Shenzhen.
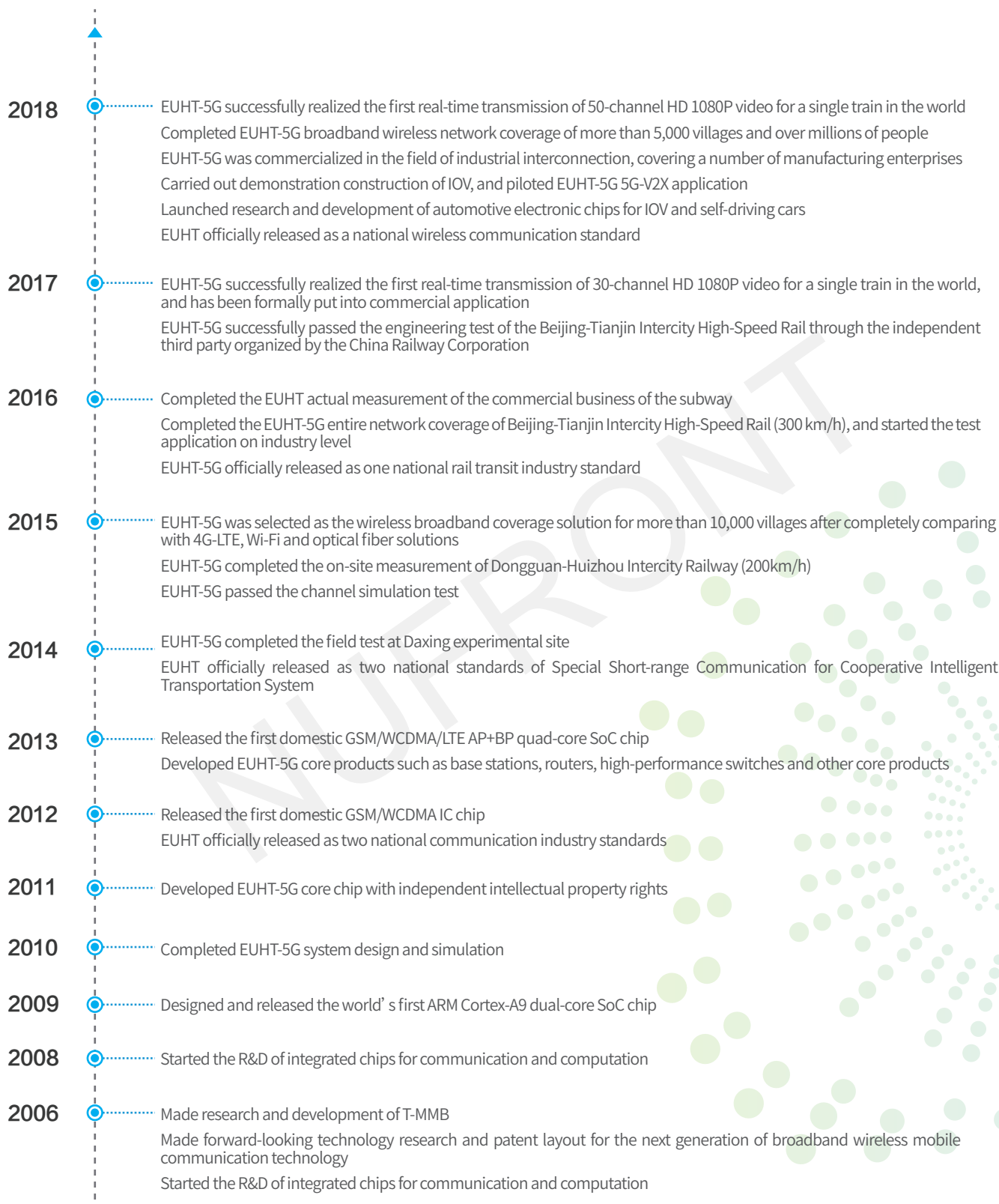
Nufront set the goal and original intention of "targeting and breaking through the world's technical problems", relying on the "depending on persistence, relying on patience, relying on oneself, and dare to be the first in the world" spirit, and finally grinding a sword for ten years.

Nufront has the world's leading wireless broadband communication technology EUHT-5G(Enhanced Ultra High Throughput-5th Generation), which is the first to solve the problem of global wireless mobile communication with high reliability, low latency, ultra-broadband and large capacity. It has the full set of EUHT core patents, chips, software and products. EUHT-5G products have been widely applied in intelligent high-speed rail, smart metro, industrial interconnection, IOV (5G-V2X), wireless video surveillance and wide-area broadband coverage etc,.

Nufront has more than 13 years of IC chip R&D capabilities and experience which is the first company to put forward the concept of "Communication-Computing Integration". It independently developed a full range of wireless communication chip products such as CPU+GPU application processor, 2G/3G/4G baseband processor, Wi-Fi, Bluetooth, RF, high speed AD/DA, high speed PLL,PMIC, and PAs.
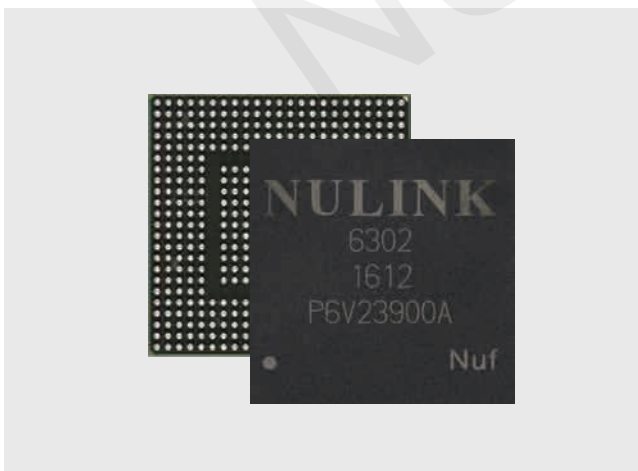
Development History

2018
EUHT-5G successfully realized the first real-time transmission of 50-channel HD 1080P video for a single train in the world
Completed EUHT-5G broadband wireless network coverage of more than 5,000 villages and over millions of people
EUHT-5G was commercialized in the field of industrial interconnection, covering a number of manufacturing enterprises
Carried out demonstration construction of IOV, and piloted EUHT-5G 5G-V2X application
Launched research and development of automotive electronic chips for IOV and self-driving cars
EUHT officially released as a national wireless communication standard

2017
EUHT-5G successfully realized the first real-time transmission of 30-channel HD 1080P video for a single train in the world, and has been formally put into commercial application
EUHT-5G successfully passed the engineering test of the Beijing-Tianjin Intercity High-Speed Rail through the independent third party organized by the China Railway Corporation

2016
Completed the EUHT actual measurement of the commercial business of the subway
Completed the EUHT-5G entire network coverage of Beijing-Tianjin Intercity High-Speed Rail (300 km/h), and started the test application on industry level
EUHT-5G officially released as one national rail transit industry standard

2015
EUHT-5G was selected as the wireless broadband coverage solution for more than 10,000 villages after completely comparing with 4G-LTE, Wi-Fi and optical fiber solutions
EUHT-5G completed the on-site measurement of Dongguan-Huizhou Intercity Railway (200km/h)
EUHT-5G passed the channel simulation test

2014
EUHT-5G completed the field test at Daxing experimental site
EUHT officially released as two national standards of Special Short-range Communication for Cooperative Intelligent Transportation System

2013
Released the first domestic GSM/WCDMA/LTE AP+BP quad-core SoC chip
Developed EUHT-5G core products such as base stations, routers, high-performance switches and other core products

2012
Released the first domestic GSM/WCDMA IC chip
EUHT officially released as two national communication industry standards

2011
Developed EUHT-5G core chip with independent intellectual property rights

2010
Completed EUHT-5G system design and simulation

2009
Designed and released the world's first ARM Cortex-A9 dual-core SoC chip

2008
Started the R&D of integrated chips for communication and computation

2006
Made research and development of T-MMB
Made forward-looking technology research and patent layout for the next generation of broadband wireless mobile communication technology
Started the R&D of integrated chips for communication and computation

EUHT-5G Overview

EUHT-5G (Enhanced Ultra High Throughput-5th Generation) is an ultra high speed wireless communication system designed to meet the requirements of high reliability, low latency and high speed moving of future mobile communication systems. At the beginning of the design, EUHT-5G takes into account the diversity of application scenarios. The system design is simple, flexible and efficient, with high reliability, high speed moving, high spectrum efficiency, low latency, low retransmission, low networking cost, precise positioning, precise calculation and fine control.

Technology Comparison

Items	EUHT-5G	Wi-Fi(802.11ac)	4G LTE	3GPP 5G (R15,eMBB)	3GPP 5G (R16,URLLC)
Industrialization level	Large-scale industrialization	Large-scale industrialization	Large-scale industrialization	Ready to commercialize	Not known
Networking cost	Low	Low	High	Very high	Very high
Coverage distance	2km	<200m	800m(cellular networking)	FR1(Sub 6GHz),less than 4G LTE，FR2(28 GHz) ,<200m	Less than 4G LTE
Moving speed	Support high-speed railway moving speed, at 500km/h, still remain high performance	Support walking speed, over 20km/h, performance drops sharply	Support highway moving speed, over 160km/h, performance drops sharply	Support highway moving speed, over 160km/h, performance drops sharply	FR1(Sub 6GHz), similar to 4G LTE FR2(28 GHz) , not support high speed moving
Handover reliability under high-speed moving	>99.999%(measured at 300km/h speed in Beijing-Tianjin Intercity High Speed Rail line)	Not support	90%-95%	Similar to 4G LTE	Request close to 100%
Transmission reliability	Industrial level, 0.3×10^{-5} (measured in Beijing Metro Line 15)	Consumer level, No explicit requirements	Consumer level,1×10^{-3}	Consumer level,1×10^{-3}	Industrial level, 1×10^{-5}
Air interface delay	<1ms	No explicit requirements	No explicit requirements	No explicit requirements	Request 1ms
End-to-end delay	4.2ms(measured in Guangzhou Metro Line 14)	20ms-50ms	50ms-100ms	20ms	Request less than 5ms
Terminal experience datarate	400Mbps	200Mbps	30Mbps	150Mbps	Similar to 4G LTE
Base station datarate	2.0Gbps	N/A	150Mbps	3.0Gbps	Similar to 4G LTE

Comparison conclusions:

(1)EUHT-5G is the world's only industrial-level wireless communication technology that meets the performance requirements of 5G technology (R15\R16) and has been applied in large-scale industrial applications in many fields.

(2)EUHT-5G is the only wireless communication technology in the world that supports both high speed moving, high capacity transmission and industrial-level high reliability and low latency requirements.

EUHT-5G Standardization

2018

Media access control and physical layer specification for high speed WLAN in remote communication and information exchange between systems

Published by SAC

Standard number: GB/T 36454-2018

This standard specifies medium and high speed wireless LAN media access control and physical layer specification, including system reference model, media access control layer structure, media access control layer frame format, media access control layer function, physical layer, etc. This standard is applicable to the design, development and production of medium and high speed WLAN systems.

2016

Real-time video transmission systems between roadside and vehicle for urban rail transit

Published by MOHURD

Standard number: CJ/T500-2016

Based on EUHT technology with roadside and vehicle real-time transmission of more than 20 channels high-definition video, the leading application standard was issued to solve the anti-terrorism inside the car and security blind spots, and to build a unified vehicle communication platform for the next generation of CBTC, PIDS, passenger Internet services, automatic driving, long-distance driving, rail transit industry interconnection and so on.

2014

Special short-range communication for cooperative Intelligent Transportation System

Published by SAC

Standard number: GB/T 31024, 1-2014 (Part I)
Standard number: GB/T 31024, 2-2014 (Part II)

This standard established China's own advantages and technical standards for the next generation of intelligent traffic, with low latency (milliseconds), high reliability (switching success rate of nearly 100%), high-capacity and ultra-high throughput, which is fully beyond domestic and foreign similar technology. Standard for broadband wireless communication system for transportation which will be applied in highways, airports, harbors, waterways and etc. is formulated according to this national standard

2012

High spectrum efficiency and high throughput wireless LAN technical specification

Published by MIIT

Standard number: YD/T 2394.1-2012 (Part I)
**Standard number: YD/T 2394.2-2012 (Part II)**

Established China's independent intellectual property rights of ultra-high-speed wireless LAN standards, the technical system is fully autonomous controlled, with no chip-level back door, much better than 802.11ac and 4G-LTE on algorithm and performance. With better high-speed mobile adaptability, greater data transmission bandwidth, higher spectrum utilization and more stable roaming switching performance, EUHT-5G can support high reliability, high throughput and ultra broadband communications under high speed.

IPR

▼ Domestic Invention Patents：52

▼ PCT International Patents：36
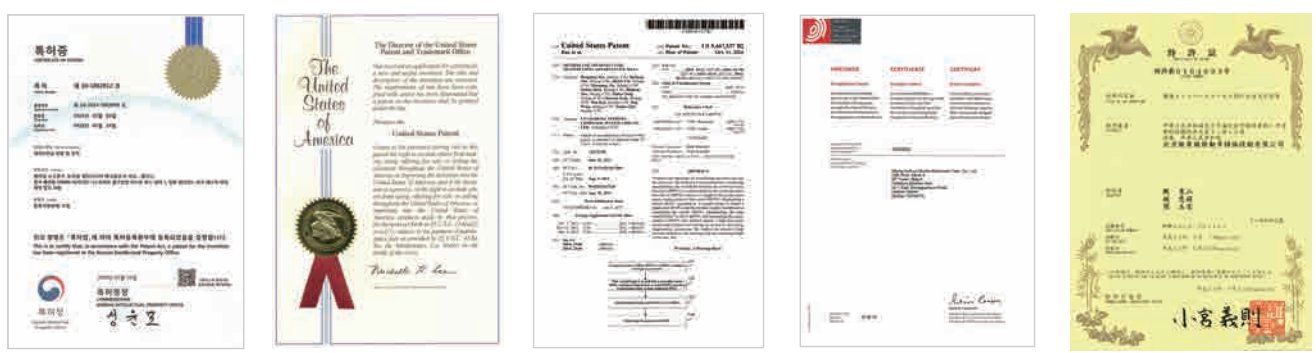
EUHT-5G Intelligent High-Speed Rail Solution

A Introduction

The EUHT-5G Intelligent High-Speed Rail Solution is the world's first 500 Mbps train-to-ground wireless communication system with high reliability, low latency, ultra-broadband, high capacity and precise positioning at 300-500 km/h. EUHT-5G Intelligent High-Speed Rail Solution implements functions such as Internet access service under high speed train movement, train real-time HD video surveillance, CTCS (Chinese Train Control System) control information transmission, and train operation comprehensive status monitoring.

System Diagram
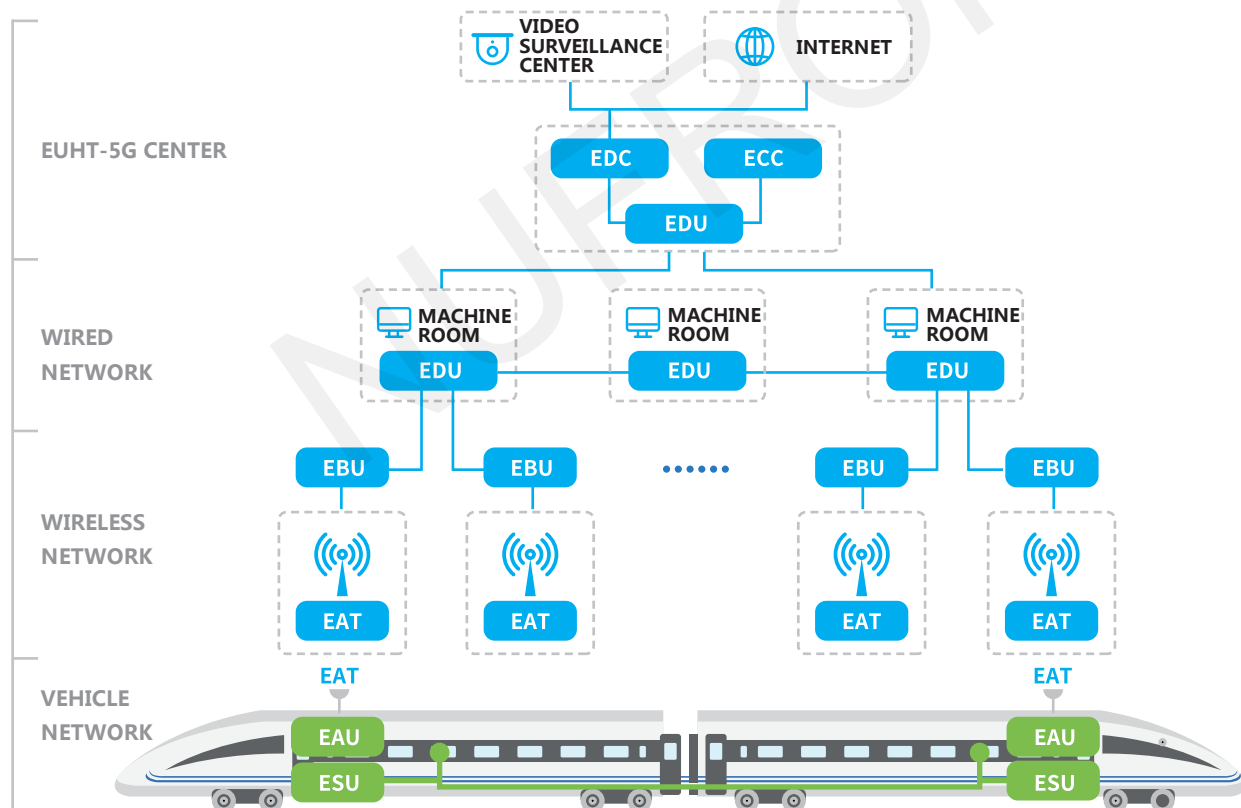
ESU：EUHT-5G Switch Unit
EAU：EUHT-5G Access Unit
EAT：EUHT-5G Antenna
EBU：EUHT-5G Base Unit
EDU：EUHT-5G Data Unit
EDC：EUHT-5G Data Center
ECC：EUHT-5G Control Center

B Industrialization Cases

In January 2017, EUHT-5G was fully built in the Beijing-Tianjin Intercity High-Speed Rail. Since then, the Beijing-Tianjin Intercity High-Speed Rail has become the world's first high-speed railway to achieve ultra-broadband wireless communication, realizing passenger Internet services and HD real-time video security monitoring. At present, the EUHT-5G system has been running stably for more than 2 years in the Harmony bullet trains （300km/h speed） . The Fuxing bullet trains (350km/h speed) will also apply EUHT-5G while developing technology based on EUHT-5G for integrated services and travel service applications.

C Independent Third Party Test: Beijing-Tianjin Intercity High-Speed Rail

Test one: In February 2017, China Academy of Railway Sciences organized independent third-party test

Test two: From May to June 2017, China Railway (CR) and Beijing Jiaotong University successively organized independent third-party test

Test items:

Technical performance of EUHT-5G system (including throughput, handover performance, data transmission delay, network limit performance and anti-jamming capability), PIS (Passenger Information System) and CCTV carrying capacity are also tested by Beijing Jiaotong University.

Test conclusion:

High reliability
handover success rate: 100%
data packet loss rate: < 0.41%

High capacity
average throughput: 150 Mbps

Low latency
average transmission delay: 5-6ms

High-speed adaptability
ultra-broadband data transmission available at 300km/h

EUHT-5G Smart Metro Solution

A   Introduction

The EUHT-5G Smart Metro Solution is the world's first high-reliability and low-latency train-to-ground wireless communication system that supports high-definition CCTV real-time transmission (more than 30 channels of HD1080P video), CBTC (Communication Based Train Control), PIDS (Passenger Information System), passenger Internet access and digital trunking under the complex operation environment of rail transit.

Technical Features

big data analysis
Construct the Metro Industry Internet to realize real-time big data analysis of key equipment of trains

06

CCTV real-time backhaul
Support more than 30 channels HD CCTV real-time backhaul

01

Internet access services
Support broadband mobile Internet access services in trains

05

Key Features

voice and video calls
Support digital trunking, provide vehicle-to-ground dispatch voice calls and live video calls

02

CBTC
Support for Communication Based Train Control (CBTC) with high reliability and low latency transmission

04

PIS
Support Passenger Information Service System (PIS)

03

B Industrialization Cases

In 2017, the EUHT-5G system of Guangzhou Metro Knowledge City branch was online and put into commercial use. It realized the real-time transmission of 30-channel HD video in single train for the first time in the world, carried 1-channel PIS service, and reserved the Wi-Fi bandwidth capacity.

In October 2018, EUHT-5G got to the real-time transmission of 50-channel HD video in the same subway test section, far ahead than other international and domestic wireless technologies. Furthermore，the EUHT-5G system was selected as the technical solution for the train-to-ground video transmission for Beijing Metro Line (more than 600km).

Since 2018, the metro groups in many other cities of China like Shenzhen, Chengdu, Wuhan etc., have also actively started to use EUHT-5G technology to improve the intelligence of subway operations.

Customized wireless networking solutions to achieve better network performance based on rail transit needs

EUHT-5G IOV Solution (5G-V2X)

A Introduction

The EUHT-5G IOV Solution is an industrialized system that has realized the practical application of the 5G-V2X concept. It can perfectly realize the interconnection of vehicles-to-vehicles (V2V), vehicles-to-infrastructure (V2I), vehicles-to-pedestrian (V2P), and vehicles-to-network (V2N), and guarantee real-time, serviceability and network ubiquity in terms of functions and performance.

Technical Features

01 National Standard for Intelligent Transportation

02 Handover success rate: >99.999%

03 End-to-end latency: milliseconds

04 Sub-meter level positioning

05 Millisecond response

06 Integration of the location network, IOV and the transportation network

B Industrialization Cases

In August 2018, the EUHT-5G system was built in the Guangzhou-to-Shenzhen expressway which was the world's first ultra high speed intelligent expressway transportation system and the first commercial case to meet C-ITS (Cooperative Intelligent Transportation System). The EUHT-5G system realized real-time video security monitoring and data acquisition of the operating vehicle , road environment, traffic flow, road safety, etc.

In December 2018, Beijing planned to establish an pilot of IOV self-driving car. As a main participant, Nufront will apply EUHT-5G to the basic wireless IOV system to build the communication bridge between self-driving vehicles and other vehicles, surrounding intelligent transportation facilities and control centers.

EUHT-5G Industrial Interconnection Solution

A **Introduction**

"

The first industrial-grade wireless broadband solution that meets uRLLC requirements, ideal for replacing optical fiber and Wi-Fi.

"

The EUHT-5G Industrial Interconnection Solution solves the key issue——the networking. The network equipment of the solution is lightweight, easy to deploy, fast construction, low cost and easy to maintain. It can carry data, video, and Internet of Things at the same time which provides a reliable wireless communication foundation for the goal of intelligent production, flexible manufacturing and intelligent manufacturing.

Technical Features

Ultra-high reliability >99.999%
to ensure that the production equipment is permanently online, and the connection is controllable

Flexible networking and easy to build
factory renovation and upgrade are convenient and feasible, and do not affect the existing production work

Milliseconds end-to-end latency
to guarantee the accuracy of device connection and control

Multi-Frequency support
flexible deployment of different scenarios such as production line, logistics, warehousing, and office

Strong anti-interference ability
to ensure continuous and efficient production

Large number of concurrent connections
one base station can access more than 200 terminal devices

B Industrialization Cases

In June 2018, an industrial equipment manufacturing enterprise realized the interconnection of intelligent equipment such as CNC machine tools and industrial robots by applying the EUHT-5G network. Through big data collection and visual management, the enterprise integrated physical resources and information resources, acquired industrial data in real time, monitored the processing process, and realized real-time sensing, dynamic control and information services of smart devices.

In August 2018, by applying the EUHT-5G network, a large production enterprise integrated industrial systems, computing, big data analysis and induction technology to achieve rapid collection, transmission, processing and resource sharing of production data and warehouse data, timely adjusted production anomalies, improved production efficiency and effectively optimizes industrial production mode.

In December 2018, through the application of the EUHT-5G network, a manufacturing company built a research environment, production environment, process monitoring, finished product comparison, video surveillance and personnel management systems to achieve real-time monitoring and comprehensive management of production environment, process, safety production, personnel management and deployment to ensure product quality and improve production efficiency.

EUHT-5G Wireless Video Surveillance Solution

A Introduction

Single station supports 30 channels of HD video backhaul, which is the best choice for replacing fiber-optic cable and Wi-Fi bridges.

EUHT-5G Wireless Video Surveillance Solution can be widely used in smart cities, airport, dock, scenic area, water conservancy, forest fire prevention, oil field, industrial park, residential area, construction site and other scenarios and areas with video surveillance needs. The solution effectively solves the problems of traditional wired video surveillance technology, such as difficult construction, poor scalability, low flexibility, and difficult maintenance, and at the same time ensures the stability, reliability and security of wireless data.

Technical Features

Strong accessibility
single station can support 30 channels of 1080P video backhual at the same time

High stability
lower packet loss rate (complete outdoor environment) <0.01%, significantly better than Wi-Fi and 3G/4G solutions

Wide coverage
more than 1.5 km distance

High security
perfect channel and content encryption mechanism, perfect terminal identity management mechanism

Low cost
simple system structure, convenient construction, easy deployment, and convenient maintenance

Mobility
moving video surveillance needs to support special scenarios

IPC　　　EUHT-5G Terminal

IPC　　　EUHT-5G Terminal

IPC　　　EUHT-5G Terminal

EUHT-5G Base Station

DVR

Monitor

Point–to–multipoint Connection
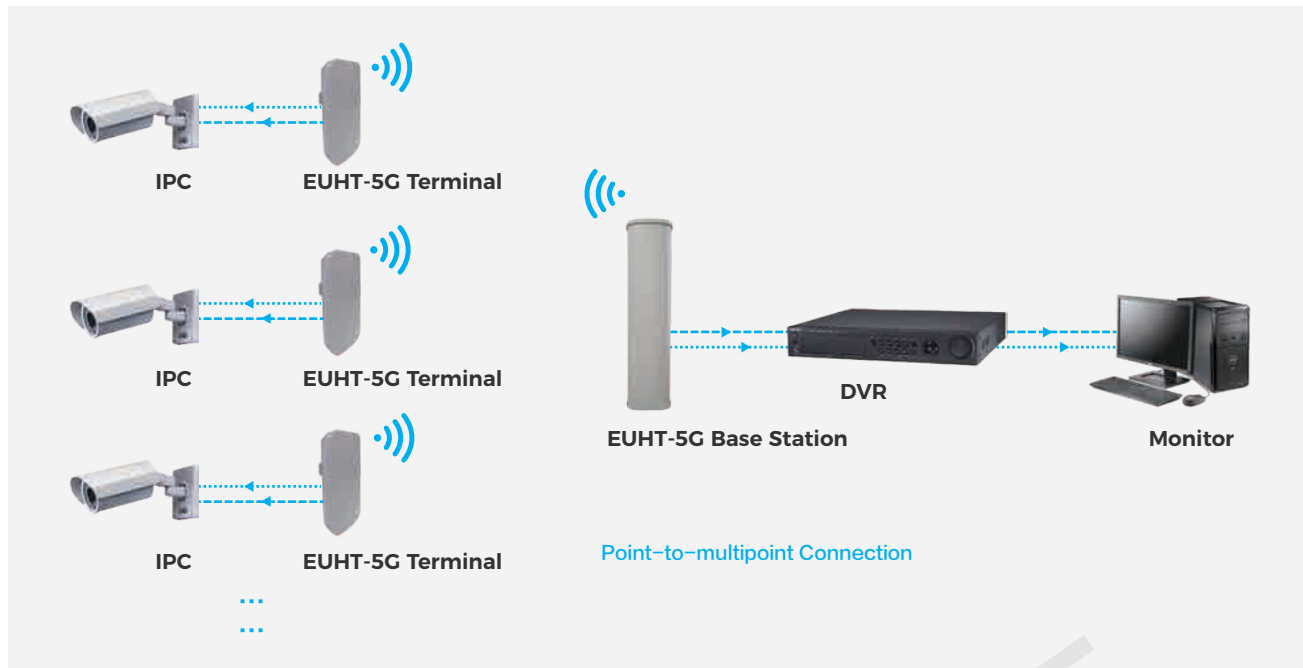
B　**Industrialization Cases**

In May 2016, an industrial park deployed 16 channels of 1080P HD cameras by EUHT-5G to cover key areas and major intersections. The image of each video monitoring point was smoothly and clearly transmitted back to the monitoring center without any pause. For temporary important material areas, monitoring equipment can be deployed and removed at any time.

In October 2017, a residential area using EUHT-5G wireless video surveillance system to deploy 20 channels of 1080P HD cameras for the areas that could not be wired, which greatly improved the security.

EHUT-5G Wide-Area Broadband Coverage Solution ⋯ ⋯

A Introduction

The EUHT-5G Wide-Area Broadband Coverage Solution completely solves the problems of difficult construction, long construction period, difficult maintenance, and high cost of wide-area broadband coverage, and truly achieves "wireless fiber" coverage. For villages away from densely populated areas, no additional cables need to be laid, which is the best solution to solve "the last kilometer" problem .

Technical Features

Short deployment period
A village for an average of 1-2 days

High data rate
5Mbps~10Mbps per terminal

Large coverage area
a central access point can support a distance of 1.5 km

Lower Internet cost
share the same Internet portal, enjoy lower cost

Carrying Network
users can carry the terminal router with them, and access the Internet anytime, anywhere

More supported scenes
support remote irrigation, environmental monitoring, video surveillance and other production scenarios

More users connection
single base station can support 255 terminals

Easier online trading
support live display of the growth and picking status of agricultural products, greatly increase the sales volume
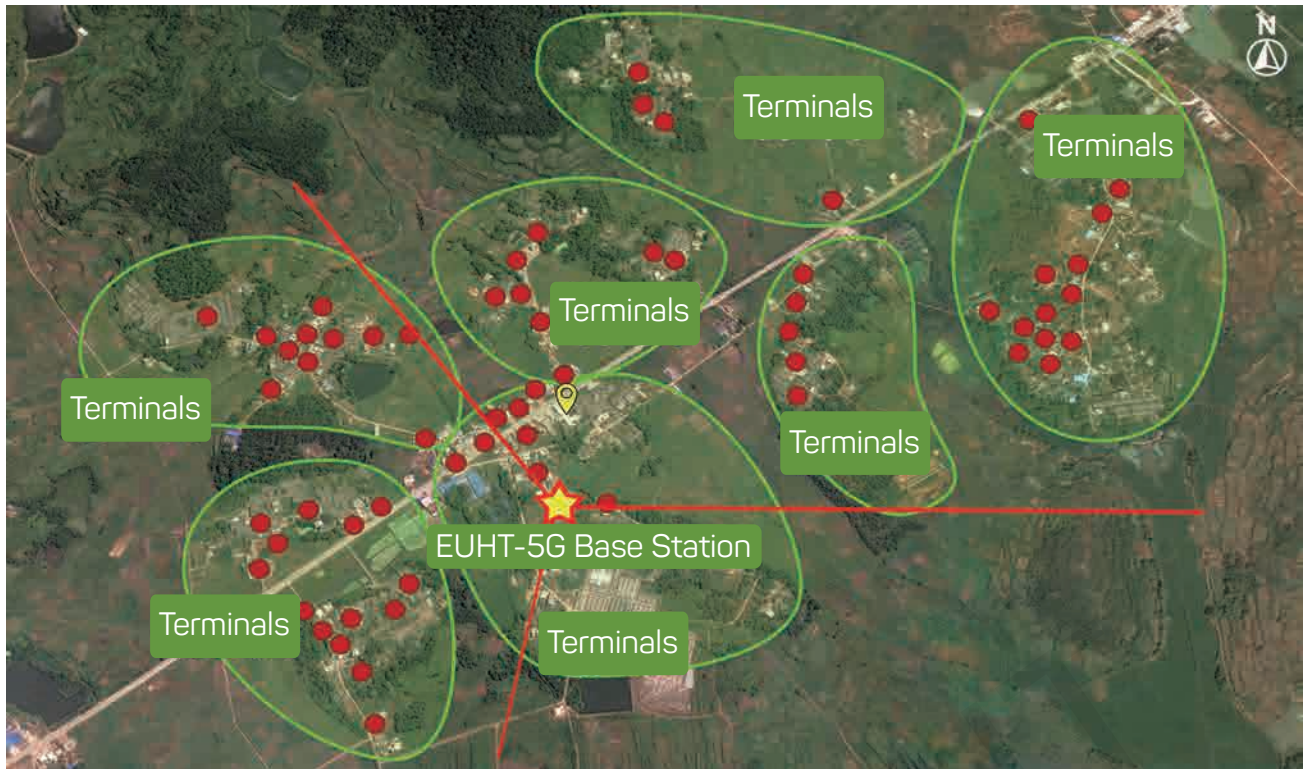
B Industrialization Cases

In 2016, after comprehensive comparison with various technical solutions such as Fiber-To-The-Home, 4G LTE and Wi-Fi, EUHT-5G was finally selected as the solution for rural broadband network construction in three provinces. By the end of 2018, they have completed broadband network coverage of more than 5,000 villages and more than millions of people ,solving the problem of Internet access for farmers in rural areas..

In 2018, the EUHT-5G wireless broadband network has completed pilot construction and operation in more provinces in China.
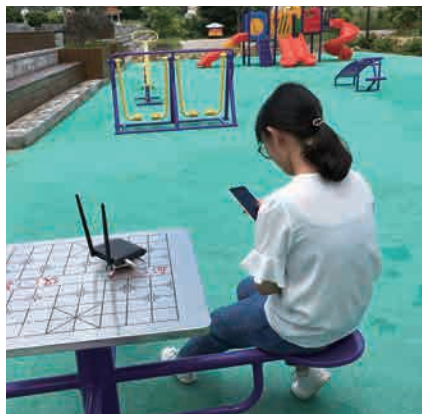
EUHT-5G Core IC

◉ EUHT-5G BASEBAND SoC
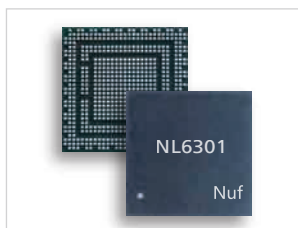
NL6301 EUHT 1.0 Baseband SoC

- Multiple frequency bands, can carry a variety of RF front-end
- 5/10/20/40MHz bandwidth
- 2x2 MIMO
- MCS0~MCS23, MCS56~MCS61 coding mode
- BPSK, QPSK, 16QAM, 64QAM modulation modes
- 7.7Mbps~311Mbps throughput
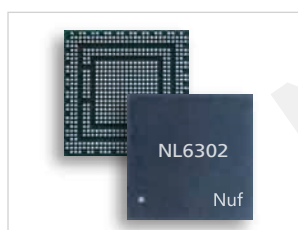
NL6302 EUHT 2.0 Baseband SoC

- Multiple frequency bands, can carry a variety
  of RF front-end
- 2.5/5/10/20/40/80MHz bandwidth
- 4x4MIMO
- MCS0~MCS99 coding mode
- 7.7Mbps~1.7Gbps throughput

◉ EUHT-5G RF IC

NR8816 RF Transceiver

- Frequency: 0.5GHz~1GHz
- Bandwidth: 20/40/80MHz
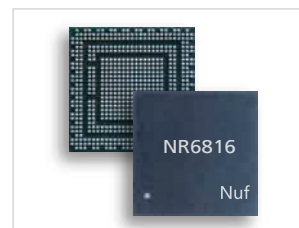
NR6816 RF Transceiver

- Frequency: 3.2GHz~3.8GHz
- Bandwidth: 20/40/80/160/200MHz

NR6821 RF Transceiver

- Frequency: 0.2~2GHz
- Bandwidth: 1/2/4/8/16/20MHz
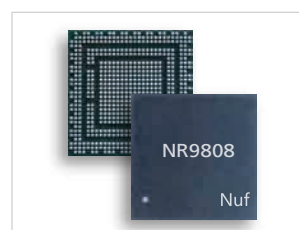
NR9808 RF Transceiver

- Frequency: 5GHz~6GHz
- Bandwidth: 20/40/80MHz

● "STRAIGHT FLUSH" IC

TL7790

AP+BP SoC,(Quad-core Cortex-A7, GSM/WCDMA/FDD-LTE/TDD-LTE)

NS2816

High-performance computing chip(Dual-core Cortex-A9,1.6~2.0GHz,Mali400)

NS115

Application Processor(Dual-core Cortex-A9, 1.5GHz,Mali400)

TL7619

Baseband Processor(GSM/WCDMA, Dual Modem Platform)

NL6621

Wi-Fi SoC(High-integrated Radio/LNA/PA/AFE/MAC/PHY)

NR6803

Wi-Fi RF Transceiver(Frequency 2.4~2.5GHz, Bandwidth 20/40MHz)

NP688

PMIC&Audio Codec(5 DCDC/16 LDO/Power Management/RTC/Fuel gauge /Watchdog/AUX ADC/Audio codec)
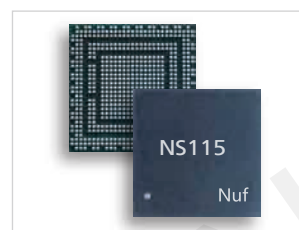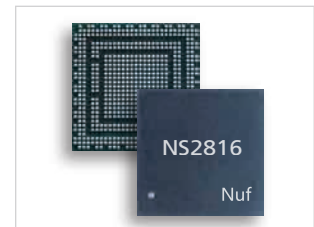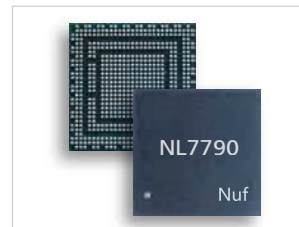
NR6701

PMIC(2 LDO,3 DCDC,Charger and SAR ADC Module)

NR6809

AD/DA(10bit ADC/DAC,160Mbps Sampling Rate)

NR8803

High-speed ADC(12bit ADC、500Mbps Sampling Rate)
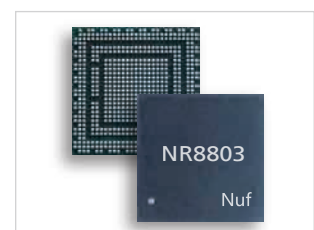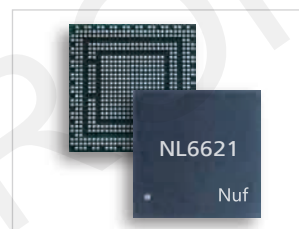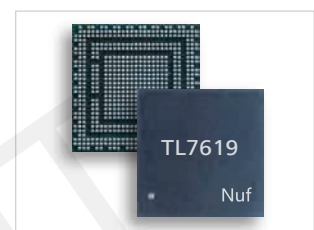
EUHT-5G Core Product

◉ EUHT-5G INTELLIGENT HIGH-SPEED RAIL PRODUCT

- Realize high-speed moving train-to-ground wireless communication, with more than 500km/h speed
- Support frequency 5150MHz~5850MHz, bandwidth 40/80MHz, configurable
- More than 150Mbps average throughtput
- Support 2x2 MIMO

EBU(EUHT-5G Base Unit): NPEC01H-01

EAU(EUHT-5G Access Unit): NPES01H-01

◉ EUHT-5G SMART METRO PRODUCT

- Realize high-speed moving train-to-ground wireless communication, with more than 200km/h speed
- Support frequency 5150MHz~5850MHz, bandwidth 40/80MHz, configurable
- More than 400Mbps average throughtput
- Support 2x2 MIMO and 4x4 MIMO

EBU(EUHT-5G Base Unit): NPEC01S-01/ NPEC01S-02

EAU(EUHT-5G Access Unit): NPES01S-01/ NPES01S-02

ETU(EUHT-5G Timing Unit: NPET01S-01

Portable Testing Unit: NPE2MTB-01

EUHT-5G IOV/INDUSTRIAL INTERCONNECTION/WIDE AREA COVERAGE/ WIRELESS VIDEO SURVEILLANCE/ INDOOR COVERAGE PRODUCT

- High reliability, low latency wireless broadband communication in special scenarios
- Coverage range of 1.5km
- Support 600MHz–800MHz, 5150MHz–5850MHz etc.,multiple frequency
- Bandwidth 20/40/80MHz, configurable
- More than 100Mbps–200Mbps average throughtput

Base Station(600MHz-800MHz)：
NPEC02C-01/ NPEC03C-01

Base Station(5150MHz-5850MHz)：
NPEC01P-01/NPEC02P-01

Router Unit：NPEW03C(600MHz-800MHz)
Terminals：NPEL06P-01(5150MHz-5850MHz)/
NPEL12P-01(600MHz-800MHz)

Terminals：NPEL13P-01(5150MHz-5850MHz)
Indoor Dongle：NPEU01M-01(5150MHz ～ 5850MHz)

NUFRONT Beijing

Address: 16th Floor A Building, SP Tower, Tsinghua Science Park Building 8,No.1 Zhongguancun East Road, Haidian District Beijing
Tel: +86-10-82150688
Fax: +86-10-82150699

NUFRONT Guangzhou

Address: A403-414 13 building, Waihuan East Road 232,Xiaoguwei Street,Panyu District Guangzhou
 Tel: +86-20-39358688
 Fax: +86-020-39356877

NUFRONT Shanghai

Address: 9th Floor, Tiandi Science Plaza, No.958 Zhenbeilu, Shanghai
Tel: +86-21-62188799
Fax: +86-21-62188798

NUFRONT Shenzhen

Address: A406, Tsinghua Unisplendour of Information Port, Songping Mountain New-east Road, Nanshan District Hi-tech Park North District, Shenzhen
Tel: +86-755-26538688
 Fax: +86-755-21676191

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