

# Expand cellular IoT coverage with iBasis IoT connectivity

A part of Mobile World Congress experience

**iBASIS**

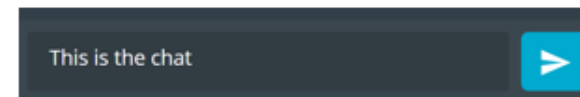
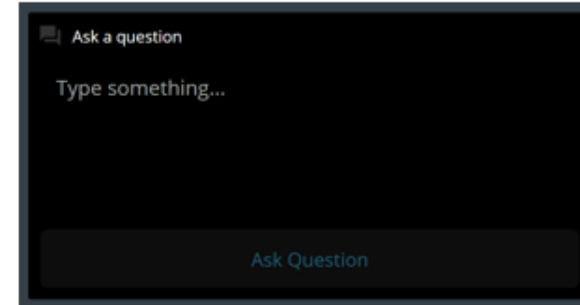
POWERED BY TOFANE



**NORDIC**  
SEMICONDUCTOR

# PRACTICALITIES

- Duration: ~45 mins + ~ 15 min Q&A
- Questions are encouraged!
  - Please type questions in the top of the right sidebar
  - All questions are anonymous
  - Try to keep them relevant to the topic
  - We will answer towards the end
- The chat is not anonymous, and do not use for questions
- Go to DevZone if you have more questions
- A recording of the webinar will be available together with the presentation at [webinars.nordicsemi.com](https://webinars.nordicsemi.com)



# Welcome & Agenda

- Practicalities
- Introduction to the Speakers
- nRF9160 SiP
- iBASIS Global Connectivity with eSIM
- LPWA Network Coverage with PSM/eDRX
- Dev Kit Connectivity Experience
- Moving from Development to Production
- nRF9160 and Thingy:91 with iBASIS eSIM
- Q&A and Closing
  - Help and technical support
  - Program for Mobile World Congress 2021.



**SPEAKER**

**Bjørn Kvaale**

Product Marketing Engineer  
Nordic Semiconductor



**SPEAKER**

**Freek Smouter**

Senior Product Manager iBASIS



**SPEAKER**

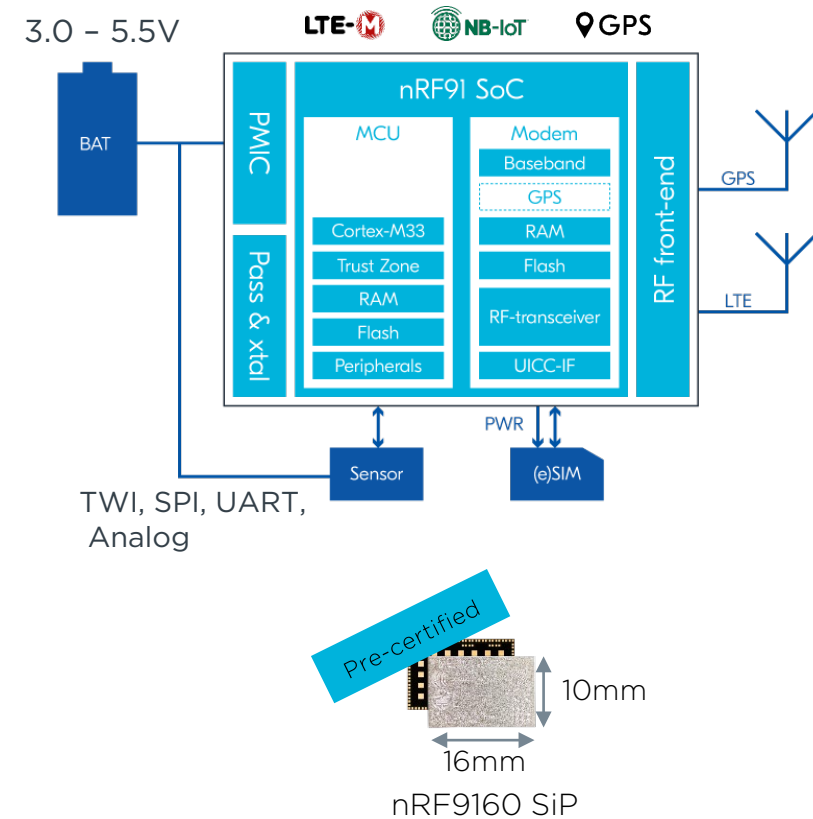
**Paul Tommassen**

Principal Architect, Innovation  
Technology, iBASIS

# nRF9160 SiP

# nRF9160 SiP– Voids Cellular Modules

- Based on Nordic Dual Core SoC:
  - Arm® Cortex® M33 MCU for the user application
    - 1 MB Flash, 256 kB RAM, TrustZone®, CryptoCell 310
  - 3.0 V – 5.5 V operation, -40°C to 85°C
- Multiband LTE-M/NB-IoT modem with **GPS**
- Small** form factor - includes PMIC, RF FEM, passives and crystals
- Ultra Low Power** – Avg. 18µA @ 81.92s eDRX
  - PSM floor current: 2,7µA
- Extensive open-source nRF Connect SDK
- nRF91 Development kits and prototype platform
  - Open reference design files available (Altium)



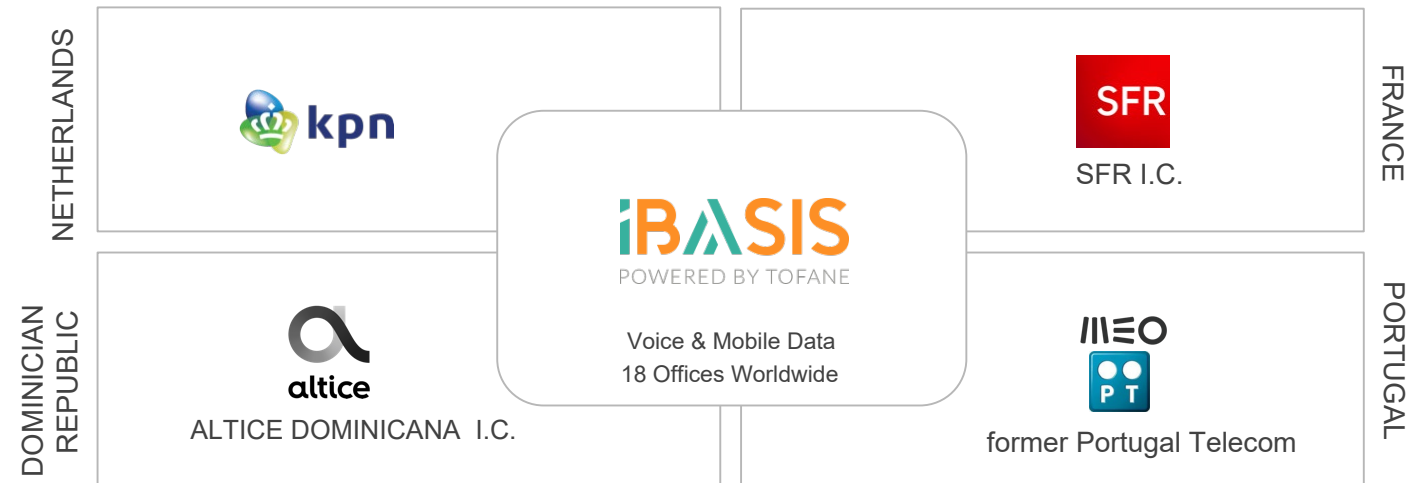
# iBASIS

## Global Connectivity with eSIM

## WHO IS iBASIS? ONE OF THE WORLD'S LARGEST INTERNATIONAL CARRIERS



- Founded in 1996
- \$1+ Billion in Revenues
- Global IPX for Mobile Operators
- Reaching over 700 LTE Destinations
- 1,000+ customers
- 300 direct MNO interconnects
- Global sales force
- Global support
- 18 regional offices



CONSOLIDATION OF THE INTERNATIONAL CARRIER BUSINESS OF MAJOR OPERATORS

3 Core Businesses: Voice Mobile IoT



How can I focus on product development and customer acquisition, and not on multiple connectivity providers?

How do I prevent getting locked into a single telecom provider?

How do I control the customer experience ?





A single eSIM can be installed in all devices regardless of deployed location

The device can be programmed remotely with operator credentials when it is turned on



As the need arises, the device can be re-programmed remotely with a different set of operator credentials

This is an 'Open', unlocked eSIM



Standardized by the GSM Association

iBASIS' position in the mobile ecosystem – 3<sup>rd</sup> largest IP Exchange (IPX) – the operators are our customers

Exclusively eSIM – based on GSMA standards – not proprietary multi-IMSI or roaming only

Global access via multiple operators for reliable connectivity – even for coverage gaps in a single country



## WHAT iBASIS PROVIDES ENTERPRISES FOR THEIR IoT SOLUTIONS



Global CellularIoT  
Connectivity with  
Regional Break Outs



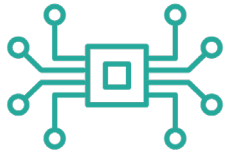
MNO Partnerships  
with strict adherence to  
MNO Regulations



eSIM Technology



Security  
Including a Global Private  
Secure Network



RESTful API



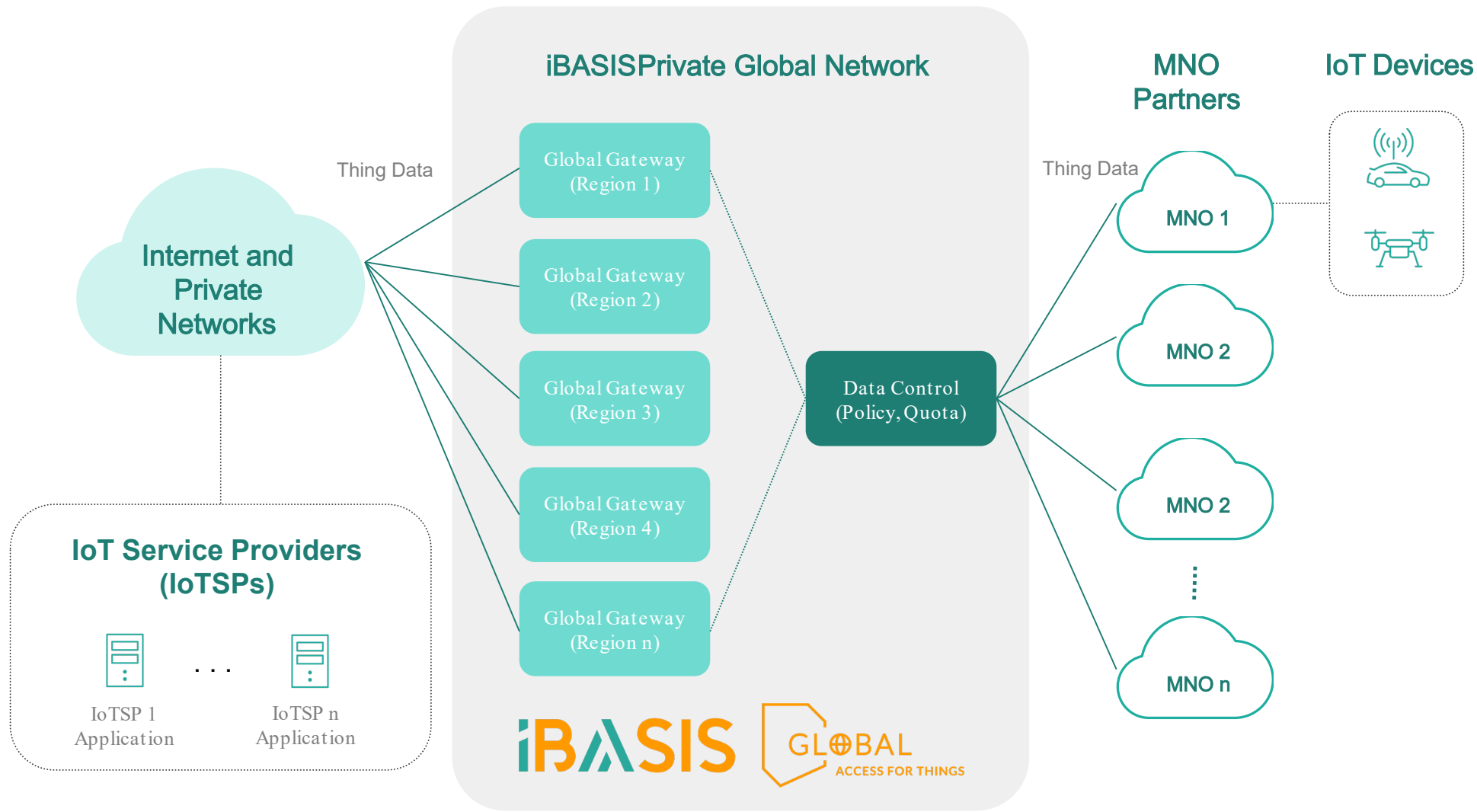
Sophisticated Rules  
Engine for Network  
Selection



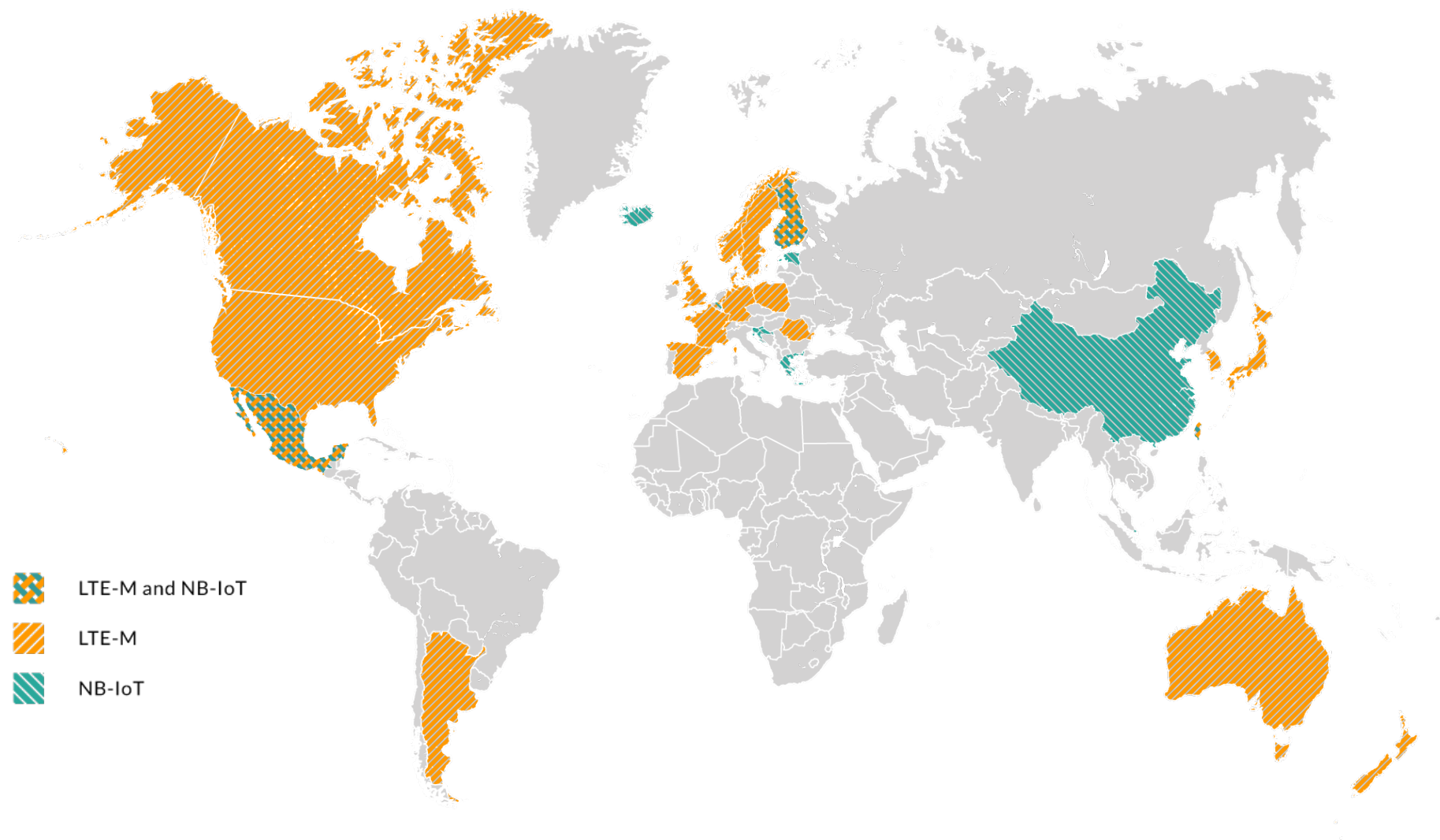
Single IoT Management  
Platform

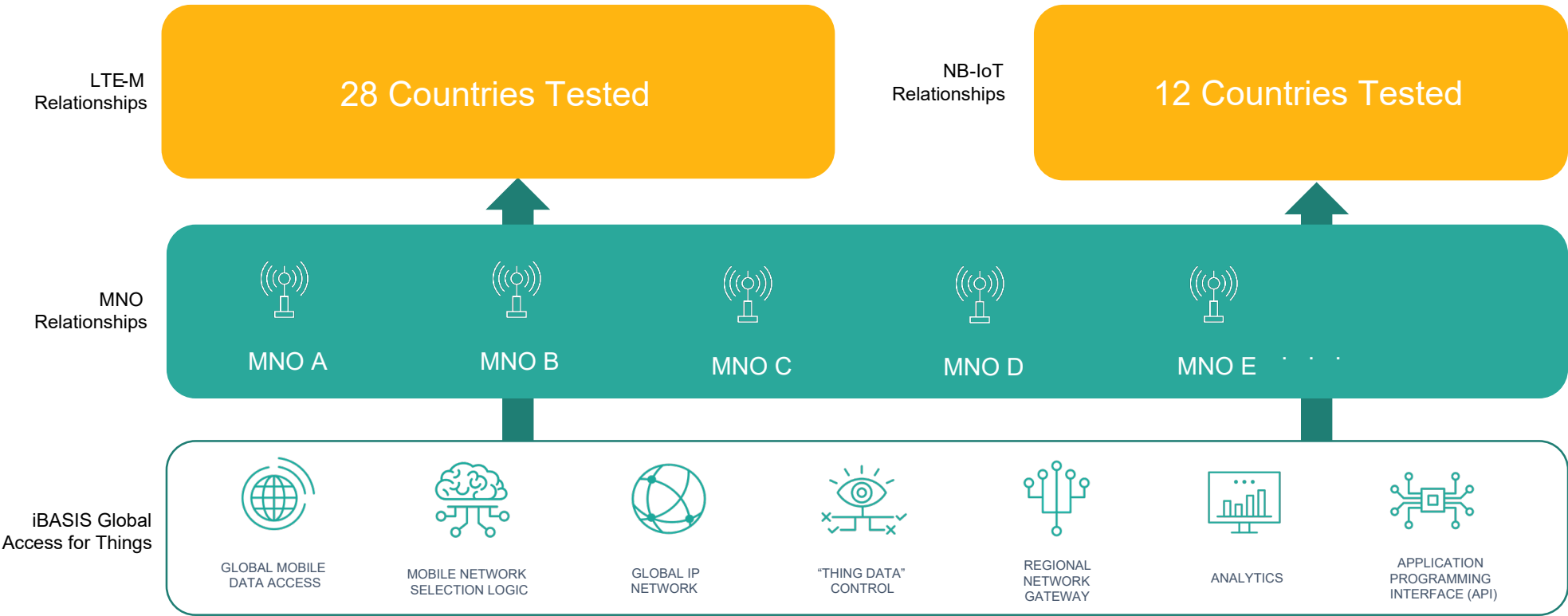


Single Bill and  
24/7/365 Support



# LPWA Network Coverage with PSM/eDRX







## iBASIS eSIM national coverage update



## iBASIS NETWORK COVERAGE DETAILS:

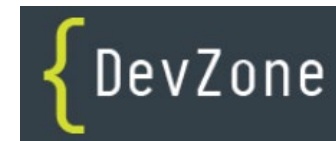
Country	Test Location	Band		LTE-M Result	Feature Supported LTE-M	NB IoT Result	Feature Supported NB IoT
		LTE-M	NB-IoT				
Argentina	Buenos Aires	4		Available**	N/A	N/A	N/A
Australia	Sydney	28		Available	PSM+eDRX	N/A	N/A
Austria	Vienna	3		Available	PSM	N/A	N/A
Belgium	Brussels	20	20	Available	PSM+eDRX	Available	PSM+eDRX
Canada	Montreal	12		Available	PSM	N/A	N/A
	Toronto			Available	N/A	N/A	N/A
				Available	N/A	N/A	N/A
China	Beijing		8	N/A	N/A	Available**	N/A
Croatia	Zagreb		20	N/A	N/A	Available	PSM+eDRX
Denmark	Copenhagen	20		Available	PSM	N/A	N/A
				Available	PSM	N/A	N/A
Estonia	Tallinn		20	N/A	N/A	Available	PSM
Finland	Helsinki	3	20	Available	PSM+eDRX	Available	PSM+eDRX
France	Paris	20		Available	PSM	N/A	N/A
Germany	Munich, Nuremberg	3		Available	PSM	N/A	N/A
Greece	Athens		20	N/A	N/A	Available**	N/A
Iceland	Reykjavik		28	N/A	N/A	Available	PSM
Japan	Osaka	8		Available	PSM+eDRX	N/A	N/A
Latvia	Riga		20	Available	PSM	N/A	N/A
Liechtenstein	Vaduz	3		Available	PSM+eDRX	N/A	N/A
Luxembourg	Luxembourg	20		Available	PSM+eDRX	N/A	N/A
Mexico	Mexico City	4		Available	N/A	N/A	N/A
		4,5	5	Available	PSM+eDRX	Available	PSM+eDRX
Netherlands	The Hague	20		Available	PSM+eDRX	N/A	N/A
New Zealand	Auckland	28		Available	PSM	N/A	N/A
Norway	Oslo, Trondheim	20		Available	PSM	N/A	N/A
Poland	Warsaw	20		Available**	N/A	N/A	N/A
Portugal	Lisbon	20		Available**	N/A	N/A	N/A
Romania	Bucharest	3		Available**	N/A	N/A	N/A
Singapore	Singapore	3	8	Available	PSM+eDRX	Available	PSM+eDRX
Slovenia	Ljubljana		3	N/A	N/A	Available	PSM
South Korea	Seoul	3		Available	PSM	N/A	N/A
Spain	Madrid	20, 3	20	Available	PSM+eDRX	Available	PSM+eDRX
Sweden	Stockholm	20		Available	PSM	N/A	N/A
				Available	N/A	N/A	N/A
Switzerland	Bern	20		Available	PSM+eDRX	N/A	N/A
Taiwan	Taipei	3	8	Available	PSM+eDRX	Available	PSM+eDRX
UK	London	20		Available**	N/A	N/A	N/A
USA	Dallas, Los Angeles, Washington, Seattle, San Francisco, San Diego, Phoenix, Miami, Houston, Detroit, Hawaii	2		Available	PSM+eDRX	N/A	N/A
	Los Angeles, San Diego, New York	12		Available	N/A	N/A	N/A

\*\*Limited Coverage; N/A= not yet available

NOTE: Data in the above table applies to the default bootstrap profile only.



iBASIS uses in country probes to test networks



Do all networks support PSM/eDRX in the same way?

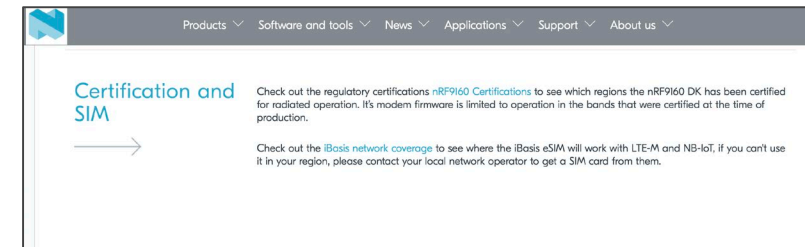
iBASIS has probes deployed in many countries where connectivity is confirmed to many operators

Probes are capable of testing LPWA networks over LTE-M and NB-IoT technologies with configurable

- Timer T3412: Sleep timer
- Timer T3324: Activity timer
- eDRX Cycle

Coverage list is available via Nordic or iBASIS site

<https://www.nordicsemi.com/Software-and-tools/Development-Kits/nRF9160-DK/GetStarted#infotabs>



PSM and eDRX also tested using Thingy:91 and nRF9160 Development Kit (DK)

## WHAT DOES iBASIS TO VALIDATE AND OPERATIONALIZE LPWA (NB-IoT AND LTE-M ) NETWORK COVERAGE



iBASIS follows relevant websites and announcements to detect which Mobile Network Operators (MNOs) launch NB-IoT/LTE-M

iBASIS tries to partner with the MNOs in the relevant countries

- Either by getting access to the profile of the MNO
- Or to get an agreement to roam on the MNOs network with one of the profiles iBASIS already has

iBASIS brings in a device to test the access

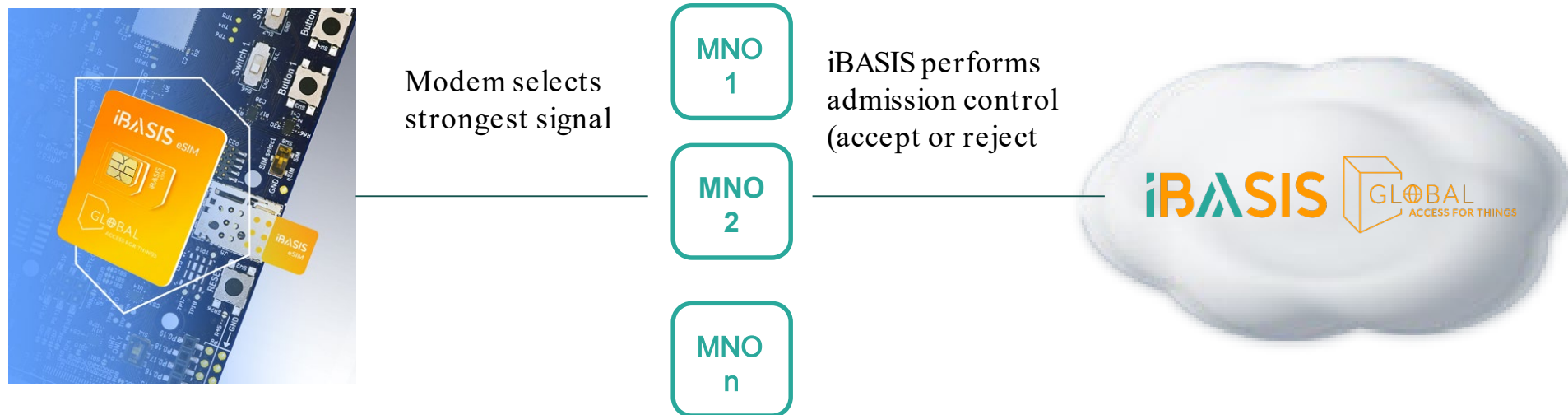
In roaming cases iBASIS checks signaling messages to validate the Radio Access Type that is used

iBASIS has a tool to be able to test LTE-M/NB-IoT access remotely

Coverage availability may change over time

# The Nordic Dev Kit Experience with iBASISeSIM

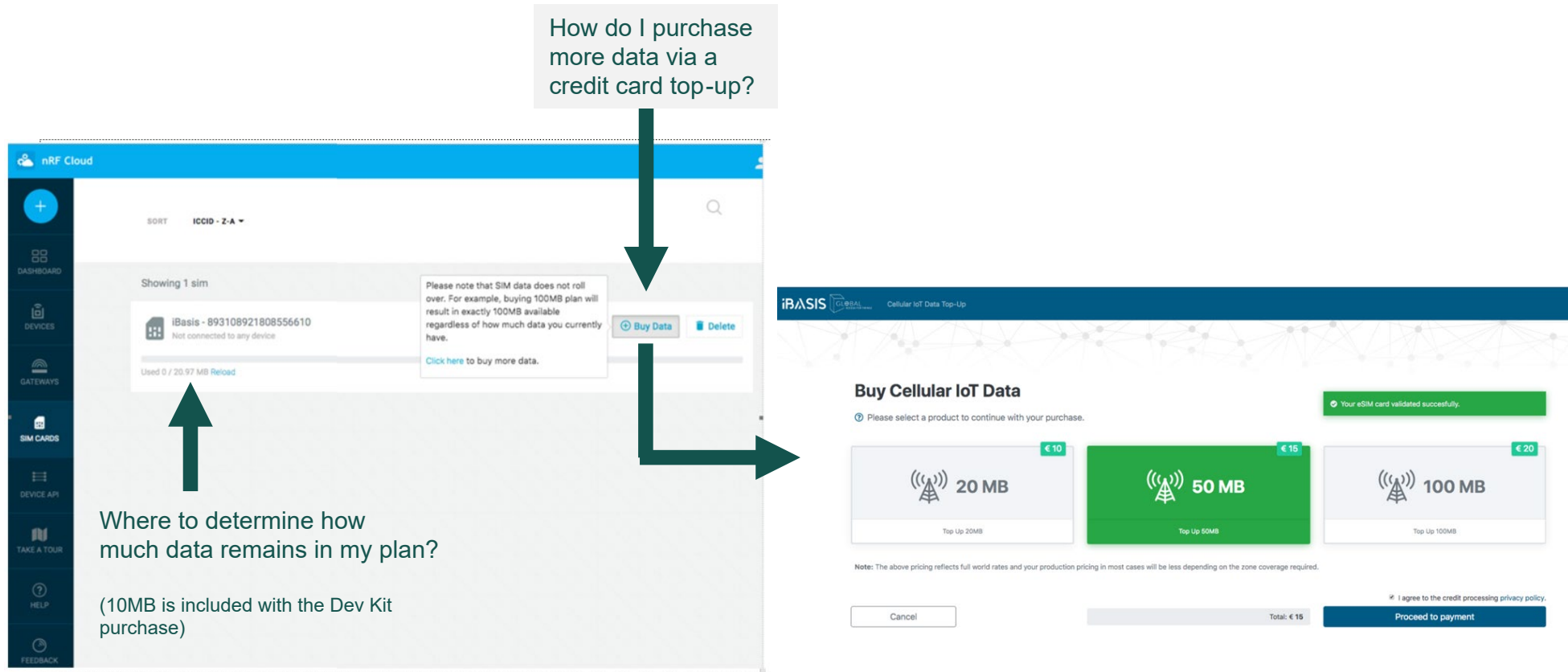
## HOW ARE NETWORKS SELECTED USING MY NORDIC DEV KIT?



Only the iBASIS global roaming profile is used with the Dev Kits  
Additional profiles are made available to production customers via rules engine or API

How do I purchase more data via a credit card top-up?

Where to determine how much data remains in my plan?  
(10MB is included with the Dev Kit purchase)



The screenshot shows the nRF Cloud interface with a sidebar containing links to Dashboard, Devices, Gateways, SIM CARDS, Device API, Take a Tour, Help, and Feedback. The main content area displays 'Showing 1 sim' with details for iBasis - 893108921808556610. It shows 'Used 0 / 20.97 MB' and a 'Reload' link. A 'Buy Data' button is visible. A note states: 'Please note that SIM data does not roll over. For example, buying 100MB plan will result in exactly 100MB available regardless of how much data you currently have. Click here to buy more data.' An arrow points from the 'Buy Data' button to the iBASIS Cellular IoT Data Top-Up page.

**iBASIS Cellular IoT Data Top-Up**

Buy Cellular IoT Data

Please select a product to continue with your purchase.

Your eSIM card validated successfully.

Product	Price
20 MB	€ 10
50 MB	€ 15
100 MB	€ 20

Note: The above pricing reflects full world rates and your production pricing in most cases will be less depending on the zone coverage required.

Cancel Total: € 15 Proceed to payment

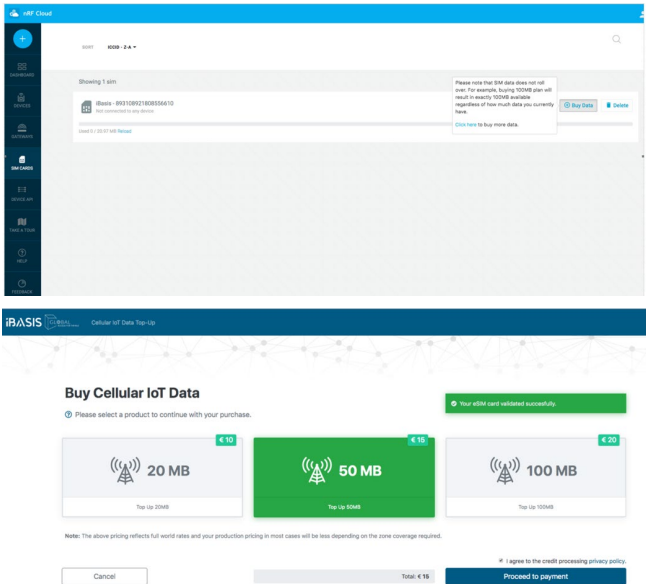
\* I agree to the credit processing privacy policy.

THE NORDIC DEVELOPER EXPERIENCE AND THE NEXT PHASES OF DEVELOPMENT/DEPLOYMENT



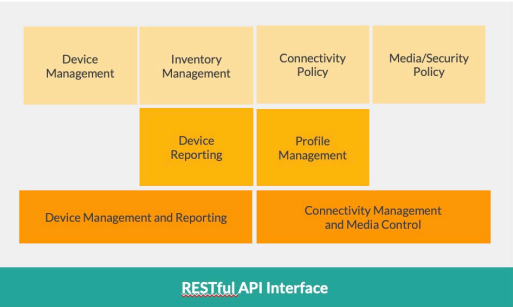
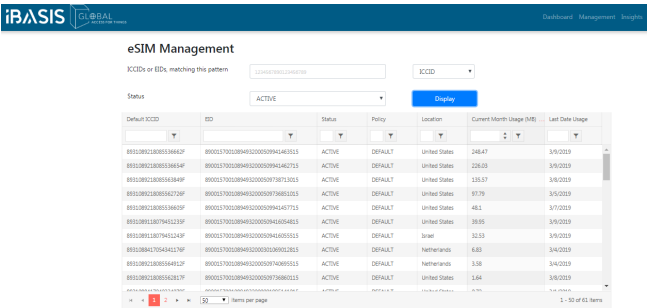
Nordic Development Environment

Viewing my eSIM enabled device usage and top-up link on the nRFCloudSIM Cards screen




Prototyping and Production Connectivity Environment

Viewing my eSIM enabled devices in*Global Access for Things* SIM management with production billing





## Prototyping and Production Connectivity Environment



GLOBAL  
ACCESS FOR THINGS

Dashboard Management Insights

eSIM Management

ICCID

1234567890123456789

ICCID

Status

ACTIVE

Display

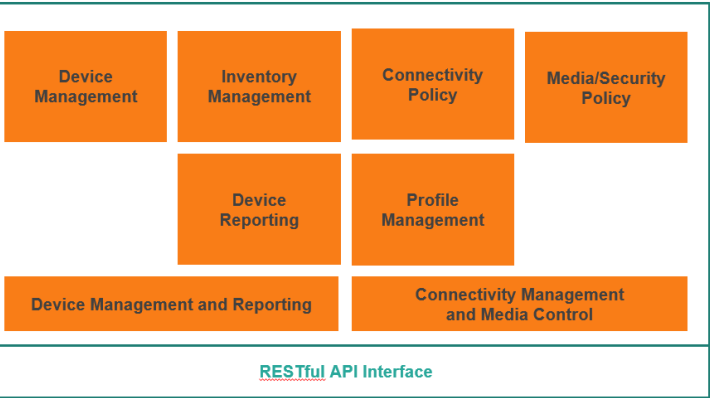
Default ICCID	EID	Status	Policy	Location	Current Month Usage (MB)	Last Date Usage
8931089218085536662F	89001570010894932000509941463515	ACTIVE	DEFAULT	United States	248.47	3/9/2019
8931089218085536654F	89001570010894932000509941462715	ACTIVE	DEFAULT	United States	226.03	3/9/2019
8931089218085563849F	89001570010894932000509738713015	ACTIVE	DEFAULT	United States	135.57	3/8/2019
8931089218085562726F	89001570010894932000509736851015	ACTIVE	DEFAULT	United States	97.79	3/5/2019
8931089218085536605F	89001570010894932000509941457715	ACTIVE	DEFAULT	United States	48.1	3/7/2019
8931089118079451235F	89001570010894932000509416054815	ACTIVE	DEFAULT	United States	39.95	3/9/2019
8931089118079451243F	89001570010894932000509416055515	ACTIVE	DEFAULT	Israel	32.53	3/9/2019
8931088417054341176F	89001570010894932000301069012815	ACTIVE	DEFAULT	Netherlands	6.83	3/4/2019
8931089218085564912F	89001570010894932000509740695515	ACTIVE	DEFAULT	Netherlands	3.58	3/4/2019
8931089218085562817F	89001570010894932000509736860115	ACTIVE	DEFAULT	United States	1.64	3/8/2019

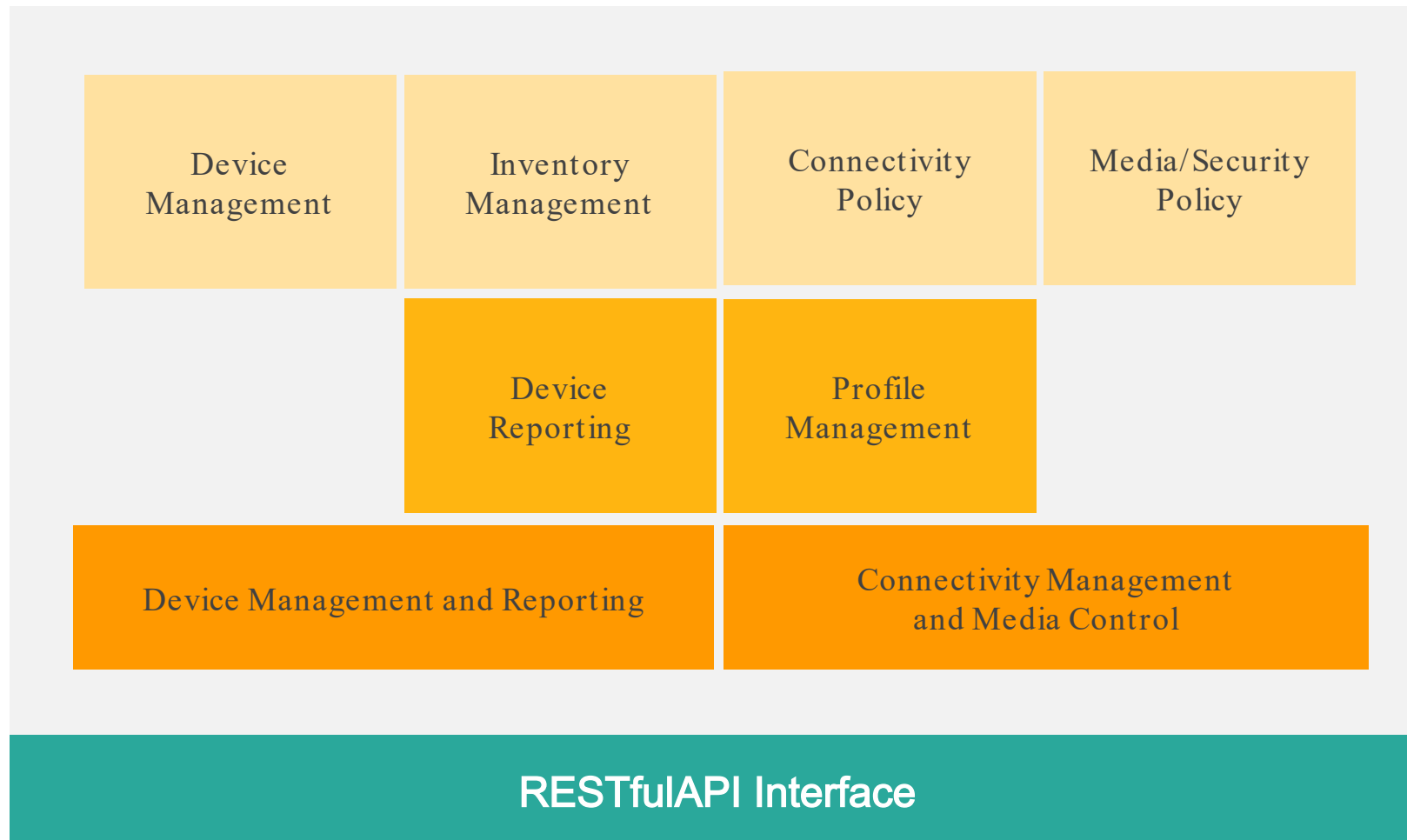
1 2

50 items per page

1 - 50 of 61 items

Viewing my eSIM enabled devices in*Global Access for Things* SIM management with production billing



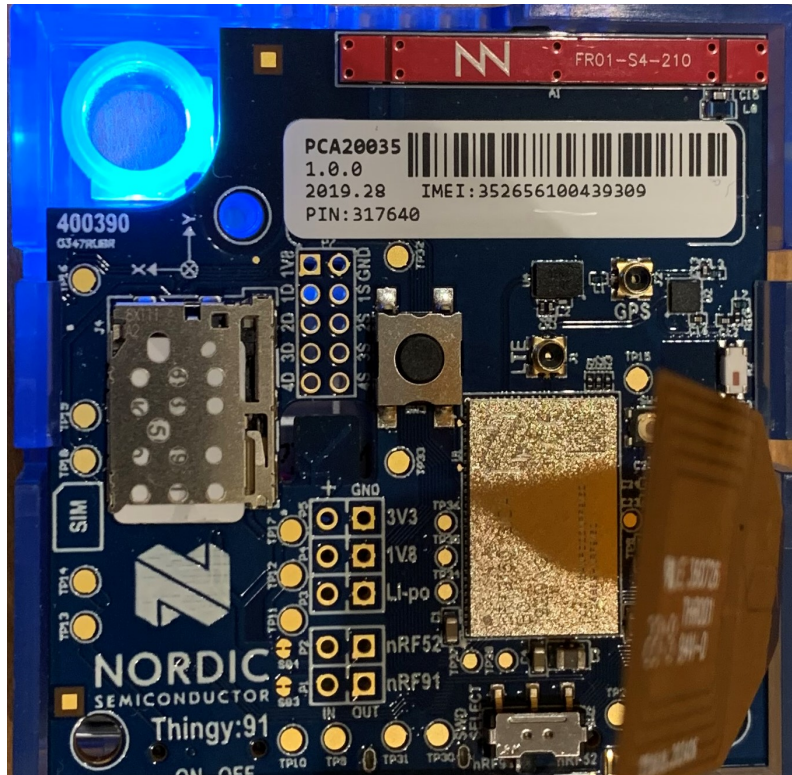


nRF9160 and Thingy:91  
with iBASIS eSIM

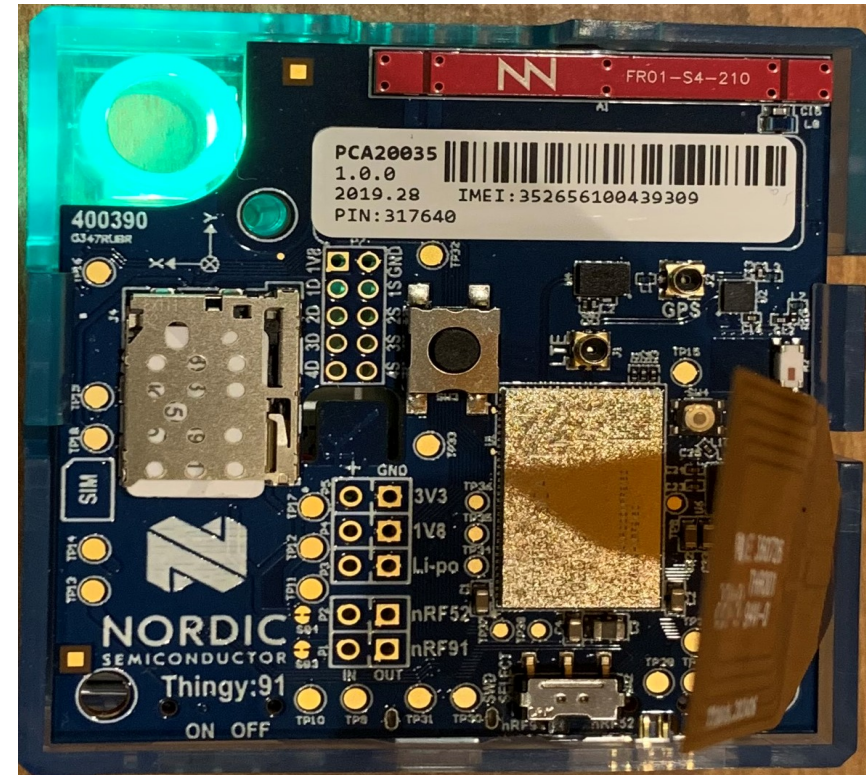
What should I do if I am  
having trouble connecting?

IS MY THINGY:91 CONNECTED? CHECK THE VISUAL

CONNECTING



CONNECTED



## Data failure

- Typically happens due to network unavailability
- Could be due to network blocking the access
- No support for LTE-M or NB-IoT in that region.

## APN issues

- Incorrect APN configuration on the board
- Correct APN may be required to be configured manually in some cases.

## Card activation issues

Resolved via support ticket.

## Access to SUPL server for AGPS

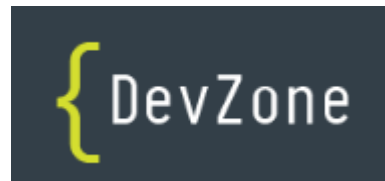
- DNS Network resolution issues to SUPL servers
- Network blocking access to those SUPL servers.
- PSM not enabled.

### Check for coverage list for networks supported by iBASIS eSIMs

- List includes LTE-M and NB-IoT coverage by country and MNO
- Check to make sure if firmware supports LTE-M and NB-IoT
- Check the current setting by executing AT%XSYSTEMMODE?
  - 1,0,x,x is LTE-M and 0,1,x,x is NB-IoT

Reach out to iBASIS at [support@iBASIS.net](mailto:support@iBASIS.net) or via the Nordic FAQ prompt.

Ask Nordic-related questions on the Nordic DevZone




# SNAPSHOT OF PSM/DRX REGISTRATION WITH LTEM

nRF Connect v3.3.2 - LTE Link Monitor

No devices available | Open logfile | Chart | Terminal | Certificate manager


UART | Modem | UICC | LTE | PDN

Signal Strength:  Normal  
Functionality: Normal  
UICC: UICC Init OK  
Pin: no PIN required  
Pin Retries: 3  
Mode: CS/PS mode 2  
Bands: 2-4,8,12-13,20,28  
Current Band: 13

Network Status  
Verizon Wireless  
Search networks

CID Addr  
0: ibasis.iot  
10.160.57.239

Registration: registered, roaming  
MccMnc: 311480  
Operator: Verizon Wireless  
CellID: 15117058  
TAC: 15106  
Show serving station location

Settings  
☒ Automatic requests  
☒ Terminal auto scroll  
Periodic signal quality request 7s  
off  30s  
LocationAPI token  
pk.c748a4d4e6ce0bfd5491dcfb01ba

```
AT+CESQ CR LF
+CESQ: 99,99,255,255,16,41 CR LF
AT+CEDRXDP CR LF
+CEDRXDP: 4,"1001","","" CR LF
OK CR LF
AT+CESQ CR LF
+CESQ: 99,99,255,255,16,41 CR LF
OK CR LF
%CESQ: 41,2,21,3 CR LF
AT+CESQ CR LF
+CESQ: 99,99,255,255,21,41 CR LF
OK CR LF
AT+CEREG? CR LF
+CEREG: 5,5,"3B02","00E6AB02",7,,,"11100000","11100000" CR LF
OK CR LF
AT+COPS=3,2 CR LF
OK CR LF
AT+COPS? CR LF
+COPS: 0,2,"311480",7 CR LF
OK CR LF
AT+XCBAND CR LF
+XCBAND: 13 CR LF
OK CR LF
%CESQ: 34,1,16,2 CR LF
AT+CGDCONT? CR LF
```

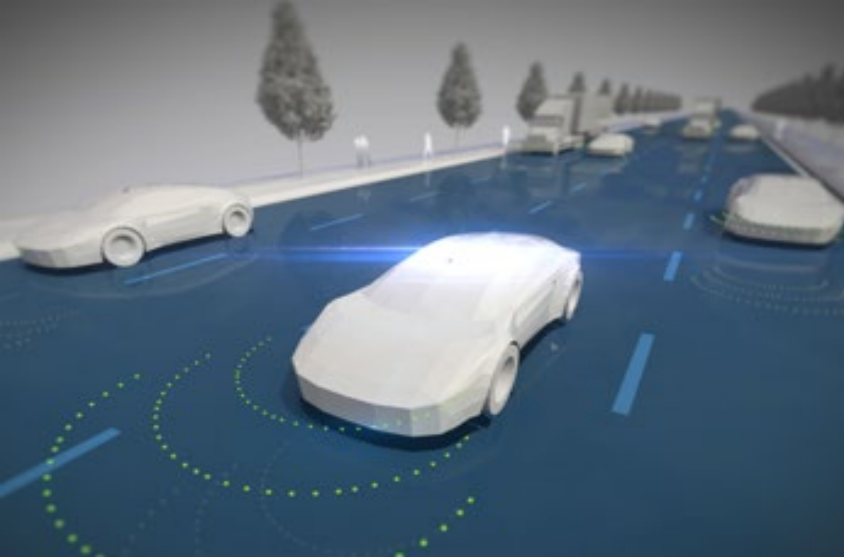
AT+CEREG?

AT AT+CFUN? AT+CFUN=1

Log

18:08:24.431	Error: AT+CEDRXDP? failed: phone failure
18:08:50.850	Modem port is opened
18:08:51.925	Nordic Semiconductor ASA nRF9160-SICA [mfw_nrf9160_1.1.1] SerNr: 352656100439309
18:08:55.864	IMSIIdentity: 204080813502613
18:10:28.044	Error: AT+CEDRXDP? failed: phone failure
18:11:39.689	Serial port error: Writing to COM port (WriteFileEx): Unknown error code 22
18:11:39.689	Error: Writing to COM port (WriteFileEx): Unknown error code 22





YOU MAKE SMART THINGS  
WE CONNECT THEM



Q&A

# Program for Mobile World Congress 2021

Date	Topic
June 28, 10:00 CEST	How to power optimize with the latest features in the nRF9160 <u>SiP</u>
June 29, 09:00 CEST June 29, 18:00 CEST	Expand cellular IoT coverage with <u>lbasis</u> IoT connectivity
June 30, 10:00 CEST	How cloud helps your IoT devices to get location data
July 1, 09:00 CEST July 1, 20:00 CEST	Exciting new features in <u>nRF</u> Connect SDK v1.6

All webinars are available on demand at [webinars.nordicsemi.com](https://webinars.nordicsemi.com)

# Get on it

- #1 Sign up for more webinars at **webinars.nordicsemi.com**
- #2 Get tech support and join our community at **devzone.nordicsemi.com**
- #3 Find out more about our products and services at **nordicsemi.com**