

TTN Conference 2020



THE THINGS
N E T W O R K
M U N I C H

TTN Conference 2020 in Amsterdam

30.01. -31.01.2020



Announcements

- Global Join Server Announcement by The Things Industries
- The Things (Enterprise) Stack - V3
- Announcing STM32 System on Chip
- Interoperability with Packet Broker
- LoRaWAN from Space

Global Join Server

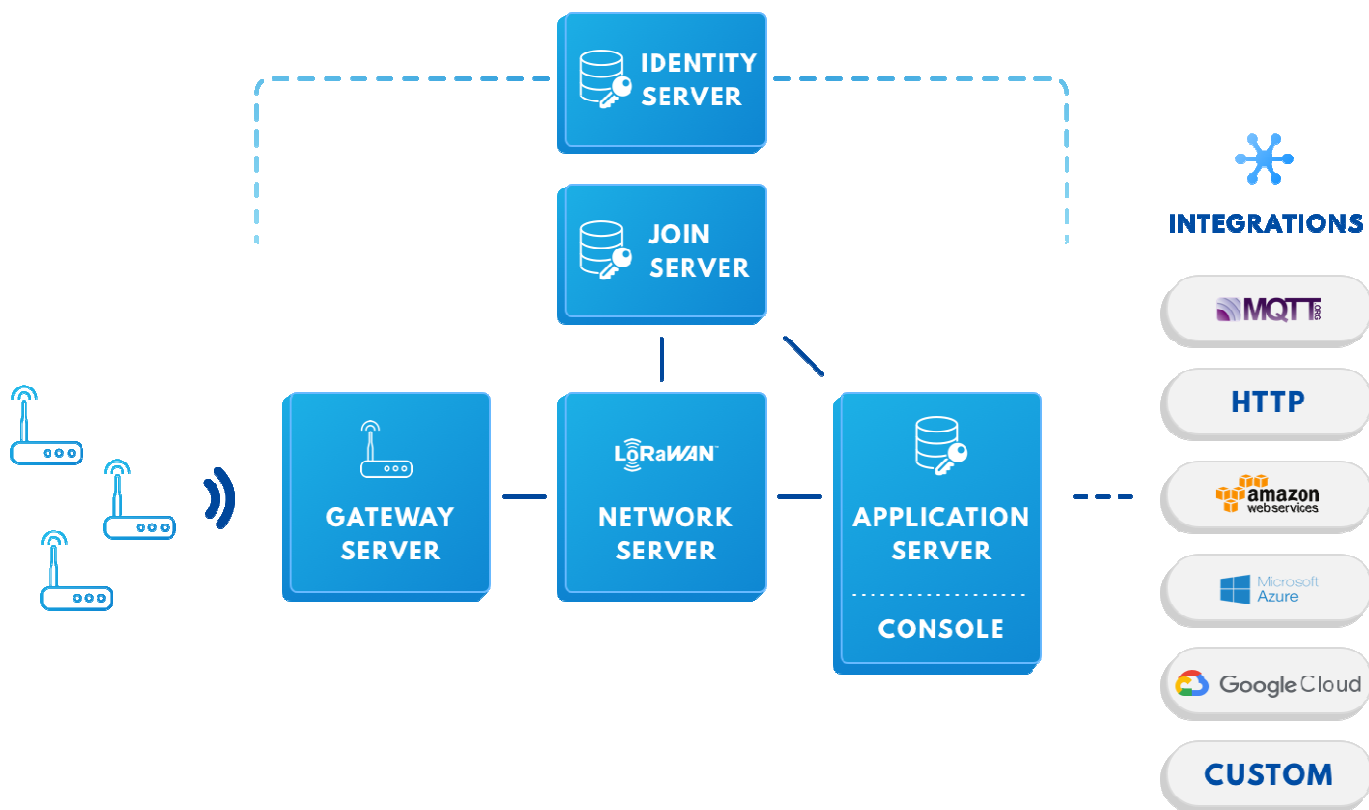


<https://www.youtube.com/watch?v=TJMUWyARYsw&feature=youtu.be>

The Things (Enterprise) Stack - V3

Youtube-Link: <https://www.youtube.com/watch?v=UOnTO5NVWIU&feature=youtu.be>

The Things (Enterprise) Stack - V3



The Things (Enterprise) Stack - V3

- **Identity Server:** stores applications, end devices, gateways, users, organizations, OAuth clients, API keys and collaborators. Also acts as a OAuth 2.0 server with login and consent screens
- **Gateway Server:** maintains connections with gateways supporting the UDP, MQTT, gRPC and Basic Station protocols, forwards uplink traffic to Network Servers, schedules downlink traffic
- **Network Server:** handles LoRaWAN network layer, including MAC commands, regional parameters and adaptive data rate (ADR)
- **Application Server:** handles LoRaWAN application layer, including uplink data decryption and decoding, downlink data encoding and encryption, downlink queuing and hosts an MQTT server for streaming application data, manages HTTP webhooks and pub/sub integrations
- **Join Server:** handles LoRaWAN join flow, including Network and Application Server authentication and session key generation
- **Console:** provides a web interface for managing the components
- **Command-line Interface:** provides a cross-platform interface for managing components through command-line
- Supporting components
 - **Gateway Configuration Server:** generates configuration files for gateways and manages gateway firmware updates
 - **Device Template Converter:** converts data to devices templates for migrating networks and importing vendor-specific data
 - **Device Repository** (in progress): stores devices brands and models, their capabilities, payload formatters and device templates

STM32 System on Chip

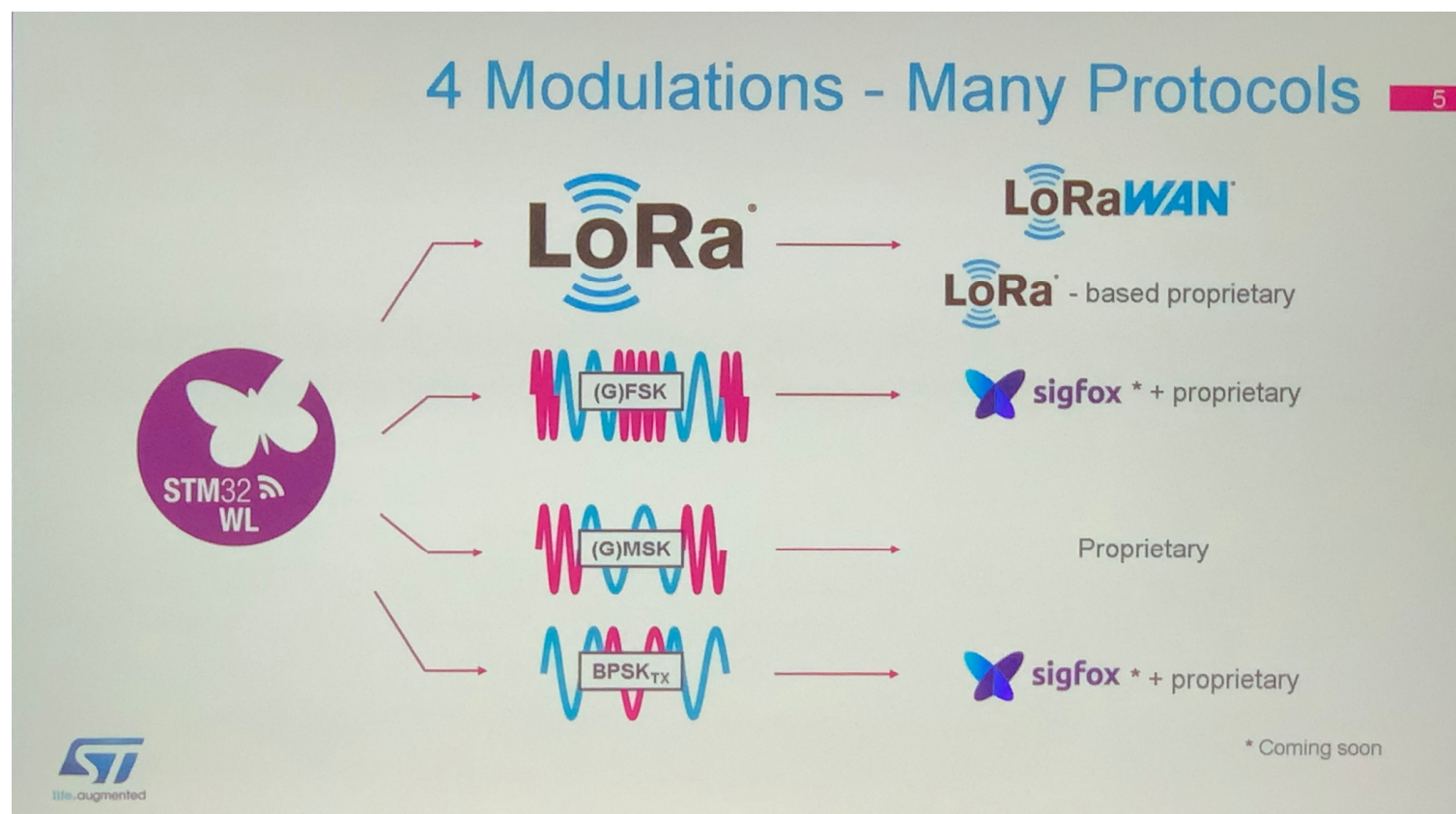


Youtube-Link: <https://www.youtube.com/watch?v=wZJ2SKG8VJ4&feature=youtu.be>

STM32 System on Chip

- Integrates STM32 microcontroller IP and enhanced Semtech radio (based on Semtech SX126x)) on one chip
- Ready to connect to LoRa® and other low-power Wide-Area Networks worldwide
- Supported by ST's rolling 10-year longevity commitment for industrial products
- available in a **5mm x 5mm UFBGA73** package

STM32 System on Chip

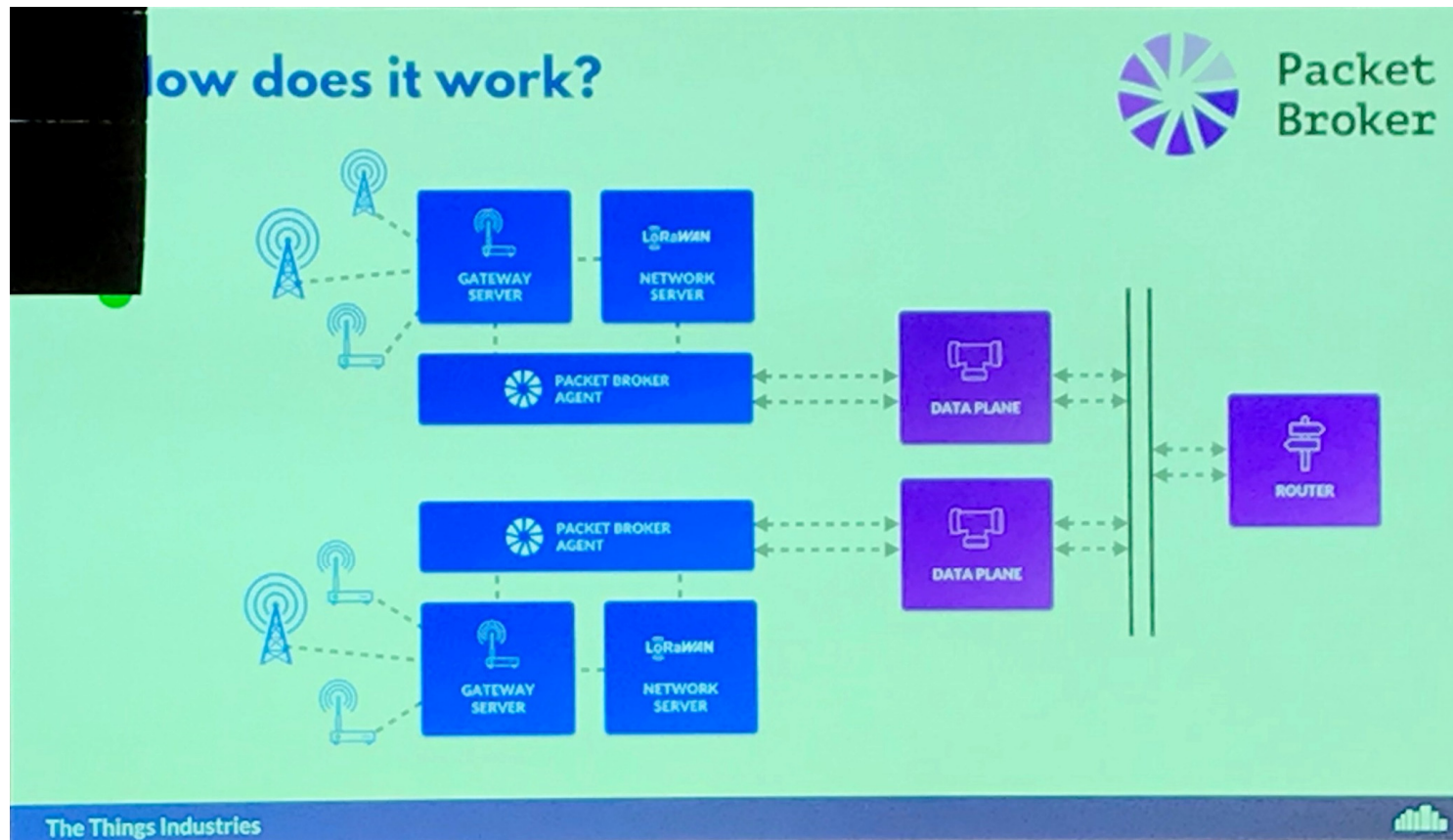


Packet Broker



Youtube-Link: <https://www.youtube.com/watch?v=YeezL6tQ3Qs&feature=youtu.be>

Packet Broker



LoRaWAN from Space



Youtube-Link: <https://www.youtube.com/watch?v=iwocSYupdIQ&feature=youtu.be>

LoRaWAN from Space

- <https://lacuna.space>
- Zirkular polarisiert
- Spezielle Antennen notwendig!



Tiny Machine Learning

- Global Join Server Announcement by The Things Industries
- The Things (Enterprise) Stack - V3
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- LoRaWAN from Space

Tiny Machine Learning

TinyML for All Developers with Edge Impulse

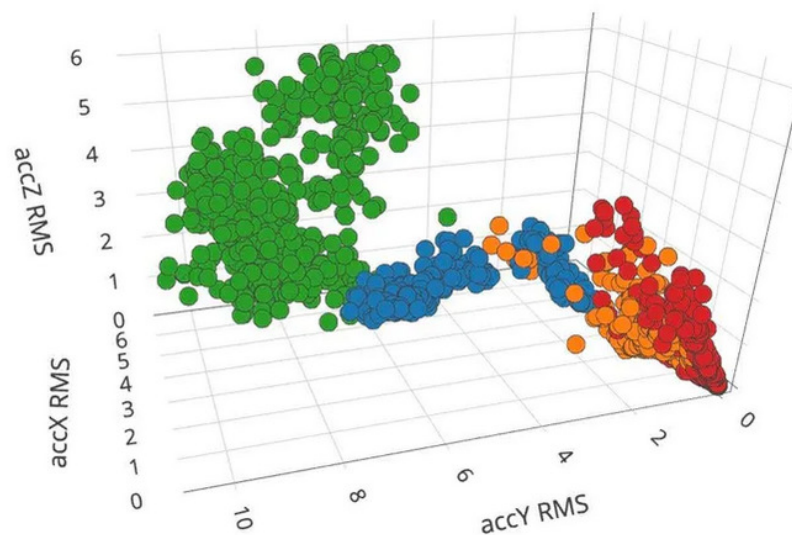
Edge Impulse launches TinyML as a service to enable machine learning for all embedded developers with open source device SDKs.



Sponsored by [Edge Impulse](#)

24 days ago • Machine Learning & AI / Sensors

- push-ups
- walking
- jumping
- standing



Tiny Machine Learning

Sheep activity tracker

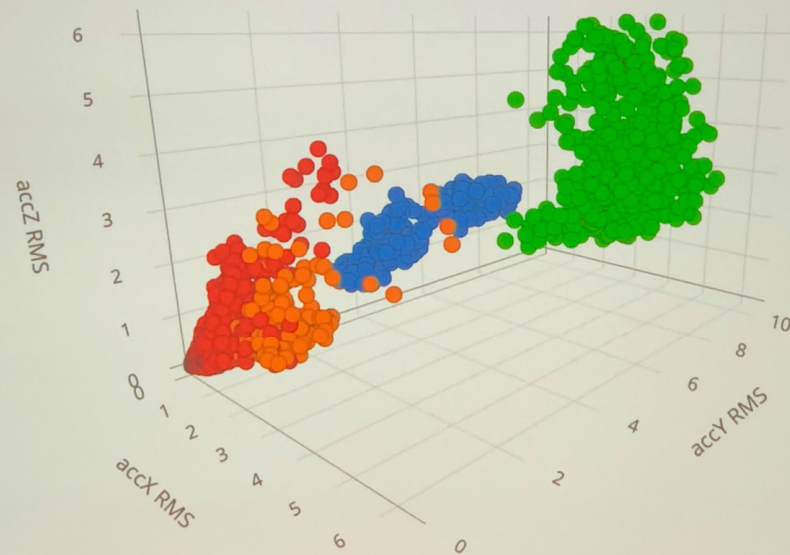


<https://pixabay.com/photos/sheep-curious-look-farm-animal-1922137/>

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Tiny Machine Learning

Extracting features



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Tiny Machine Learning

Training two models



ACCURACY

96.3%



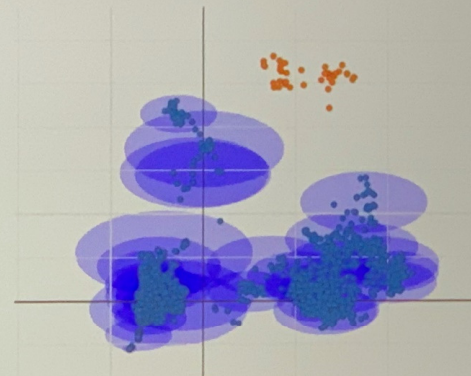
LOSS

0.10



CLASSES

4



Neural network classifier

Anomaly detection

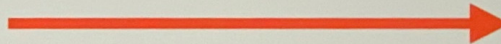
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Tiny Machine Learning

Conclusions back to TTN



Sheep is walking



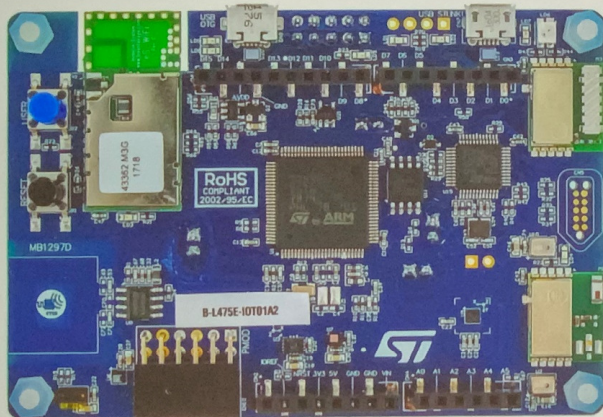
Sample for four seconds
Classify
Result differs? Message.

<https://pixabay.com/photos/sheep-curious-look-farm-animal-1922137/>

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Tiny Machine Learning

Device



80MHz Cortex-M4F processor

128 KiB RAM

SX1276 LoRa radio

Time to analyze 1 second of activity data
(classification + anomaly):

0.008 seconds

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Tiny Machine Learning



LORIX OS

- Reactive and intuitive web interface compatible with PC, smartphone and tablet
- Command line interface equivalent if it's your preferred taste
- Simple choice of the LoRa® forwarder among:
 - Wifx packet-forwarder based on the Semtech packet-forwarder
 - ChirpStack Gateway Bridge
 - LORIOT packet-forwarder
- Management and monitoring of the forwarder to ensure maximum uptime
- Secure and reliable remote system update
- Performance diagnostic and anomaly tracking tools
- <https://www.lorixone.io/de/news/new-lorix-os-release-candidate-ready-testing>

LORIX OS



☰

WIFX LORIXMANAGER

admin ▾

⋮

Dashboard

System

Information

Regional settings

Resources

Update

Logs

Network

LoRa

System | Information

Operating system

Distribution

LORIX OS (Wifx LORIX family products operating system)

Release version

0.4.0-rc (Dürren)
9096b74.dirty

Release date

Kernel

Release notes

License information

Legal notice

```
LORIX OS Wifx LORIX family products operating system
Version: 0.4.0-rc-9096b74.dirty (Dürren)
Date: 21 December 2019, 18:53:07
Machine: lorix-one-25G

System information as of: Sun Dec 22 16:36:52 UTC 2019
System load: 0.00 Memory usage: 75.0%
Usage on /: 0% Local users: 0

You are running the latest version
Last checked the 2019-12-22T15:25:46Z
To check updates run: manager system update check -p

RELEASE NOTE: This is a "release-candidate" release version
Please note that this is NOT considered as a stable
and production ready version. Bugs or instabilities
may occur and should be reported by e-mail to red@wifx.net

lorix-one-0dbb93:~$ sudo manager system info
Password:
SYSTEM INFORMATION
- Serial: fcc23dffffe0dbb93
- Date and time: 2019-12-22 16:37:04.875578693 +0000 UTC m=+0.102110960
- Uptime: 2h18m40s
- Temperature: good
```

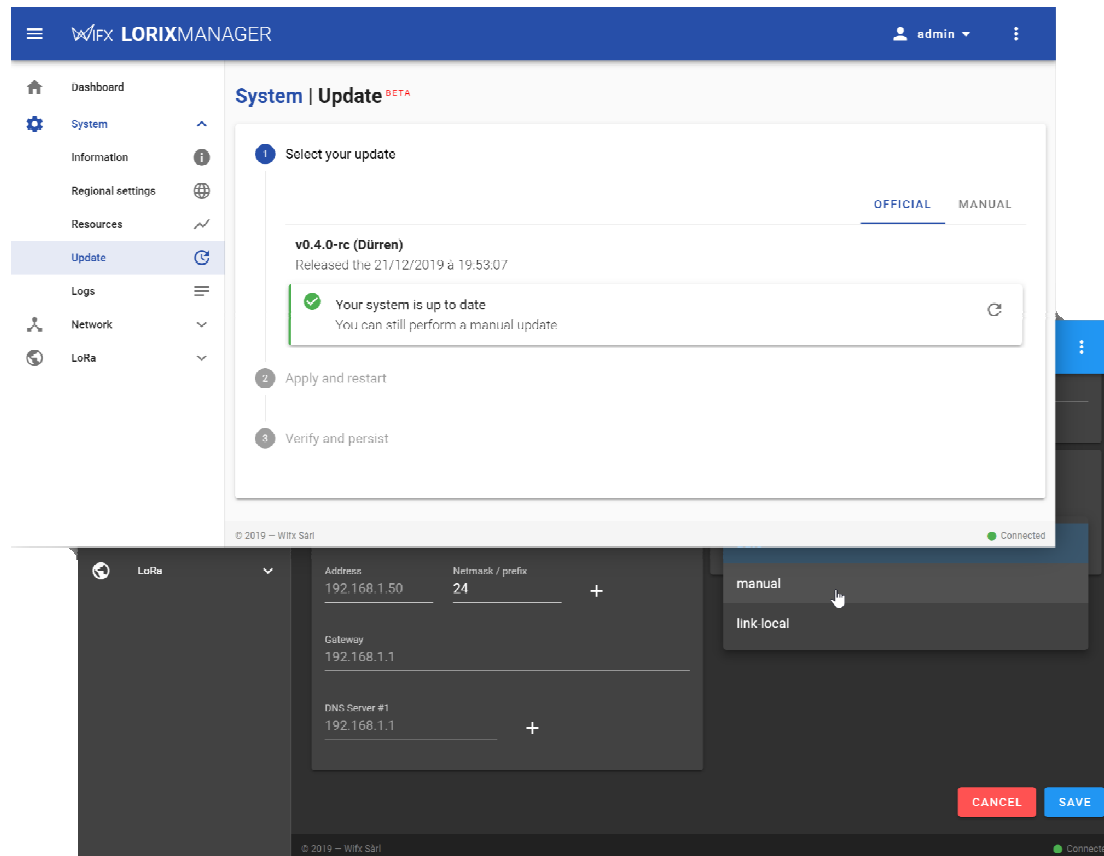
© 2019 – Wifx Sàrl

LORIX OS



The screenshot shows the Lorix Manager web interface. The top navigation bar includes a menu icon, the "WIFX LORIXMANAGER" title, and a user profile "admin". The left sidebar lists navigation options: Dashboard, System, Network, LoRa, Status, and Settings (which is highlighted). The main content area is titled "LoRa | Settings" and displays the "Wifx packet forwarder" configuration. A modal dialog box titled "Change forwarder" is open, showing a list of forwarders: "Wifx packet forwarder" (selected), "ChirpStack Gateway Bridge", and "LORIoT packet forwarder". The dialog has "CANCEL" and "APPLY" buttons. Below the dialog, the status of the forwarder is shown as "Running" with a green dot and a refresh icon. There are also "START", "STOP", and "RESTART" buttons. The footer of the interface shows "© 2019 - Wifx Sàrl" and a "Connected" status indicator.

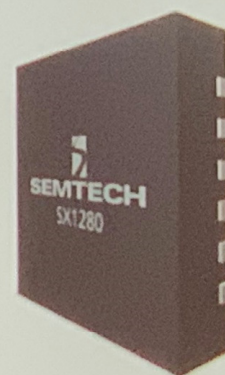
LORIX OS



2.4 GHz LoRaWAN

LoRa 2.4Ghz

Global SKU
but shorter range



THE THINGS
CONFERENCE

SKU = Stock Keeping Unit
= Artikelnummer

2.4 GHz LoRaWAN



2.4 GHz LoRaWAN

LoRa® at 2.4GHz: A Step Toward Autonomous Vessels



The Maritime Ecosystem

- Solution providers from deep sea to satellite
- Manage, supply, service, and own fleets
- 30,000 vessels (~50% of the worldwide fleet)
- 2,200+ locations in >80 countries
- Offshore, bulk, roll on/roll off, container
- Market leaders within oil and gas
- Systems Integrators

Reduce cost of operation through condition monitoring and compliance, while offering third party logistical services at land and sea

TTN Conference Program



THE THINGS CONFERENCE		LoRaWAN	
JANUARY 30		JANUARY 31	
LORAWAN THEATRE	THE THINGS STAGE	LORAWAN THEATRE	THE THINGS STAGE
09:30 GRAND OPENING		09:30 OPENING DAY 2	
10:00 CONDITIONS THAT DRIVE LORAWAN ADOPTION WERNER GIEZEMAN JOHANN STOCKING		10:00 LORA AND LORAWAN MARKET UPDATES ALISTAIR FULTON @aifulton, @aifulton, @aifulton, @aifulton	
10:30 LORAWAN: THE RIGHT CHOICE, THE RIGHT TIME, WHAT'S NEXT? DOMINA WIGDE @dominawigde	DESIGNING SAFE AND THIN PRINTED BATTERIES FOR HIGH VOLUME IOT APPLICATIONS WILHELM KESSEL @wilhelmkesel	10:30 THE FINAL FRONTIER: LORA CONNECTIVITY EVERYWHERE ROB SPIRITIT @robspiritit	SMART CITIES & CONNECTED PLACES CATHERINE MCMAHON @catherinemcma
11:00 Break	WE DON'T LIVE IN AN IDEAL WORLD SO WHY DOES MY DATASHEET? NANU KAMMISCHER @nanukammischer	11:00 2.4GHZ LORA OF THE SEAS STALE PETERSEN @stalepetersen	FMWS AND LORAWAN ULRICH AHLE @ulrichahle
11:30 LORAWAN AND THE IOT: THE PERFECT MATCH OLIVER SELLER @oliversteller	HARDWARE DEVELOPMENT & PCB DESIGN 101 WILHELM KESSEL @wilhelmkesel	11:30 WHY LPWAN SECURITY BELONGS TO THE COMMONS MELANIE RIEBACK @melanierieback	REAL TIME UNCOVERING THE SYMBIOTIC RELATIONSHIP BETWEEN TREES AND THEIR ENVIRONMENT @thebarnard
12:00 THE WORLD'S FIRST LORA-ENABLED SYSTEM-ON-CHIP BENJAMIN GOSSEL @benjamin_gos	CHALLENGES WHEN DELIVERING FULL SERVICE IOT SOLUTIONS @thebarnard	12:00 WHISBLOCK CHAT - EVOLUTION & ADOPTION OF NOVEL TECHNOLOGIES RAY OZZIE @rayozzie	LPWAN IS NOT A RED OCEAN MARKET @thebarnard
12:30 HARDWARE IS SEXY! ZACH SHIRLEY @zachshirley	THE IOT ENABLER HENRY HOGAN @henryhogan	12:30 Break	KEY CONCERNS AND BARRIERS TO DEVELOP SUCCESSFUL IOT PROJECTS AND BERNAL @andbernal
01:00 Break	HOW TO ENSURE LORAWAN OPERATOR LOWEST TOTAL COST OF OWNERSHIP @thebarnard	01:00 LORAWAN: MIXED WITH 5G IS THE PERFECT RECIPE FOR EXTENDING YOUR 5G-CHAIN APPLICATIONS JONATHAN KATE @jonathankate	WHY GO FOR A CUSTOM SPECIFIC HARDWARE? STEFAN ZIMMERMANN @stefanzimmerm
01:30 EVOLUTION OF THE LORAWAN SPECIFICATIONS ALPER YECIN @alperyecin	SUPPLYING MANAGEMENT OF LORAWAN AND IOT SERVICES @thebarnard	01:30 THE INTERNET OF THINGS TO THE INTERNET OF DATA DAVID JAMMONS @davidjammons	CIRCULARLY POLARIZED ANTENNA FOR LORAWAN FROM SPACE AND MORE FABIAN FERRERO @fabianferrero
02:00 PANEL: HUMBLE BEGINNINGS, AMBITIOUS PLANS NICOLAS DORNIN, OLIVER SELLER, FRANCIS SZORZA @nicolasdornin, @oliversteller, @francisszorza	HOW SENSORS CAN INNOVATE ON ENGINEERING AND SERVICE PROCESSES @thebarnard	02:00 LORAWAN STARTUP OPPORTUNITIES & PLACING BIGGER BETS ADAM BENZION @adambenzion	A DEEP DIVE INTO MQTT 5 FLORIAN RAUSCHKE @florianrauscke
02:30 Break	LORAWAN NETWORKS SUSCEPTIBLE TO HACKING: COMMON SECURITY PROGRAMS AND HOW TO PREVENT THEM MICHAEL WICTOR @michaelwictor	02:30 Break	BOSCH AND LORAWAN MAKE CITIES SMART REINER SCHMIDTKE @reinerschmidtke
03:00 Break	REGIONAL PARAMETERS & GLOBAL REGULATIONS DAVE JENDAL @davejendal	03:00 WHISBLOCKS: BUILDING LORA NODES CAN BE AS EASY AS BREA KEVIN XU @kevinxu	REMOVING BLIND SPOTS AND THE NEED TO SIMPLIFY IOT @thebarnard
03:30 TACKLING PROBLEMS WITH CAPITAL, RESOURCES AND COLLABORATION ALEXANDER KOSLOV & WERNER GIEZEMAN @alexanderkoslov, @werner_gieze	USING RIMS AT SCALE STEFAN LINDBERG @stefanlinberg	03:30 INSIGHTS IN AUTOMATED LONG-TERM TESTING OF LORAWAN SENSORS TO REDUCE SCALE-UP RISKS ALEX RABONDI & SCHERER PATER @alexrabondi, @schererpater	OWN TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT SHUYANG ZHOU @shuyangzhou
04:00 IOT FOR CHALLENGING ENVIRONMENTS: ELECTRICAL GRID, REMOTE AREAS AND ANIMALS LUKE MCHETATA @luke_mchetata	LORAWAN TRANSFORMING INDUSTRIES & INNOVATION @thebarnard	04:00 ADDING INTELLIGENCE TO YOUR LORAWAN DEVICES JAN JOHNSON @janjohnson	GET SMARTER ABOUT SMART BUILDINGS RYAN REMILLER @ryanremiller
04:30 FARMBEATS: AI, EDGE & IOT FOR AGRICULTURE RANVEER CHANDRA @ranveerchandra	THE THINGS BEHIND FACILITY MANAGEMENT VICKRAM BHATTARACHARYA @vickrambhatta	04:30 MAKING CONSTRUCTION UTIL CRITICAL INFRASTRUCTURES & CITIES SAFER AND SMARTER @thebarnard	DELIVERING DATA FROM FIELDS ANYWHERE IN THE WORLD @thebarnard
05:00 IN THINGS STAGE: PAVING, INSURANCE SECURITY, DEVICE CLAIMING AND MORE BEAUTIFUL STUFF JOHANN STOCKING @johannstocking	IOT - THE GREAT LPWAN MARATHON RETTING PUECK GLATER @rettpueckglater	05:00 HELPING INDUSTRY TO SET NEW WORLD RECORDS @thebarnard	BE PREPARED - OPEN SOURCE BEE HIVE MONITOR @thebarnard
05:30 CLOSING OF THE FIRST DAY @thebarnard		05:30 CLOSING OF THE THINGS CONFERENCE @thebarnard	

AMSTERDAM | January 30 - 31 2020

LoRaWAN

AMSTERDAM | January 30 - 31 2020



TTN Workshops I



THE THINGS
CONFERENCE

WORKSHOPS

LoRaWAN

JANUARY 30

11:00	BUILDING YOUR LORAWAN NETWORK THE RIGHT WAY ! A PRACTICAL GUIDE TO LORAWAN NETWORK PLANNING Madsine Nordaas RAK WIRELESS	SENSOR INSTALLATION AND ON-BOARDING EASY AS PIE WITH BOSCH PARKING LOT SENSOR Alexander Polachner & Sören Netuschil BOSCH	THE FINAL FRONTIER: LORA CONNECTIVITY EVERYWHERE Thomas Tognare LACUNA SPACE	PARALLEL SESSIONS	12:00
11:30					
12:00	CARRIER-GRADE GATEWAY DESIGN CONSIDERATIONS FOR OPERATORS Ramon Rieck TEXTELIO	ENABLE SECURITY IN MURATA ABZ MODULE WITH TRUSTED OBJECT LIBRARY (TO-PROTECT) Samir Thoun & Michel Thibaut MURATA	WHAT QUESTIONS TO ASK TO SELECT THE IDEAL BATTERY Christophe Ray SAFT		12:30
12:30				SYSTEMS INTEGRATORS VOICING CUSTOMER NEEDS: WHAT IS LACKING FOR FAST, CHEAP AND SUSTAINABLE DELIVERY AT SCALE? Alexander Ouerbach THE THINGS INDUSTRIES, DEUTSCHE BAHN, CAPOEMINI	01:00
01:00	SEMTECH'S CLOUD SERVICES: CREATING A SMOOTH AND STREAMLINED PROCESS FOR LORA-BASED DEVELOPMENT Wolfgang Landwehr SEMTECH	BRIDGING BLE TO LORAWAN - EXTENDING YOUR LPWAN NETWORK TO INCLUDE BLE SENSORS Jens Sussendorf & Dirk Link LAIRD CONNECTIVITY	RADIO PLANNING: SIMULATE LORAWAN GATEWAY COVERAGE Wolfgang Wirth TTN APPELODORN		01:30
01:30				END-TO-END SECURITY USING SECURE ELEMENTS AND THE THINGS INDUSTRIES' JOIN SERVER Julian Dettmer THE THINGS INDUSTRIES & PARTNERS	02:00
02:00	REGULATORY APPROVAL FOR RADIO DEVICES Markus Rader DETECOM	FEATURES AND BENEFITS OF MIKROTIK LORA GATEWAY Daniel Trubelhorn MIKROTIK	ENERGY SOURCING FOR A FUTURE-PROOFED LORAWAN DEVICE Benoit Rappet QDTECH		02:30
02:30				THE THINGS STACK DEEP DIVE HOW TO SET UP YOUR PRIVATE LORAWAN NETWORK SERVER Klaus-Joel Bommert THE THINGS INDUSTRIES	03:00
03:00	AN ENVIRONMENTAL MONITORING LORAWAN SOLUTION FOR THE NON IT CROWD RAK7246 + WISBLOCKS (RAK4600+RAK1901) + TTN + UBIDOTS Madsine Nordaas RAK WIRELESS	IOT MADE (SUPER) SIMPLE WITH AZURE IOT CENTRAL AND IOT PLUG AND PLAY Oliver Böck MICROSOFT	WHAT QUESTIONS TO ASK TO SELECT THE IDEAL BATTERY Christophe Ray SAFT	LORAWAN CERTIFICATION Dirk Huis LORA ALLIANCE	03:30
04:00	DEVELOP YOUR OWN LORAWAN DEVICE BASED ON AN IMST'S ARDUINO PLATFORM AND CONNECT IT TO THE THINGS NETWORK Klaus-Joel Bommert & Jeroen Orkisz IMST	SETTING UP YOUR LORAWAN NETWORK AND CONNECTING TO THE ONDO CLOUD OKDO & ALLTHINGSTALK	ANTENNA TUNING FOR YOUR LORAWAN DEVICE Fabien Fournier UNIVERSITY CÔTE D'AZUR		04:00
04:30					04:30
05:00					05:00

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LoRaWAN

TTNWorkshops II



THE THINGS
CONFERENCE

WORKSHOPS

LoRaWAN

JANUARY 31

10:30	SETTING UP YOUR LORAWAN NETWORK AND CONNECTING TO THE OKDO CLOUD OKDO & ALLTHINGSTALK	IOT MADE (SUPER) SIMPLE WITH AZURE IOT CENTRAL AND IOT PLUG AND PLAY Gilles Bouché MICROSOFT	ENERGY SOURCING FOR A FUTURE-PROOFED LORAWAN DEVICE Hans-Martin QOITECH <i>Premium Session</i>	PARALLEL SESSIONS	11:00
11:00					11:30
11:30	PUSHING DATA FROM TTN TO INFLUXDB THE EASY WAY David Sherratt INFLUXDATA	ENABLE SECURITY IN MURATA ABZ MODULE WITH TRUSTED OBJECT LIBRARY (TO-PROTECT) Jenssen Thoma & Michel Thibaut MURATA	THE FINAL FRONTIER: LORA CONNECTIVITY EVERYWHERE Nicolas Wilson LACUNA SPACE <i>Premium Session</i>	REALIZING SMART CITIES WITH LORAWAN Alexander Oesperer THE THINGS INDUSTRIES & PARTNERS	12:00
12:00					12:30
12:30	ASSET TRACKING REFERENCE DESIGN KIT WORKSHOP Wilhelm Semtech SEMTECH	SENSOR INSTALLATION AND ON-BOARDING EASY AS PIE WITH BOSCH PARKING LOT SENSOR Alexander Polakowicz & Sven Nilsche BOSCH	THE THINGS INDUSTRIES JOIN SERVER & DEVICE CLAIMING Wilhelm Semtech & Michael Compton THE THINGS INDUSTRIES <i>Premium Session</i>	2.4GHZ LORA Alexander Oesperer THE THINGS INDUSTRIES & PARTNERS	01:00
01:00					01:30
01:30	BUILD A WIRELESS SENSING APPLICATION Koen Wieg SEED	BRIDGING BLE TO LORAWAN - EXTENDING YOUR LPWAN NETWORK TO INCLUDE BLE SENSORS Jens Dunscheit & Eric Lutz LAIRD CONNECTIVITY	SECURE AUTHENTICATION FOR LORAWAN WITH SAMR34+ATCC608A AND THE THINGS INDUSTRIES JOIN SERVER Gregory Goulet MICROCHIP <i>Premium Session</i>	WILHELM SEMTECH, MULTITECH, THE THINGS INDUSTRIES <i>Premium Session</i>	02:00
02:00				LORAWAN & EDUCATION Alex Gredler BIRMINGHAM CITY UNIVERSITY	02:30
02:30	REGULATORY APPROVAL FOR RADIO DEVICES Markus Klotz CETECOM	LORAWAN IN COMBINATION WITH A FULL STACK PYMESH Cristian Ionescu & Ahmed El Mokri PYCOM	CONNECTING TEXTILIC DEVICES TO TTN IN 2 SIMPLE STEPS Marcel Neebich TEXTILIC	THE FUTURE OF THE THINGS NETWORK Wilhelm Semtech, Lorna Gledhill, Corinna Goss THE THINGS NETWORK COMMUNITY	03:00
03:00					03:30
03:30	PAX COUNTER Sébastien Müller THE THINGS NETWORK COMMUNITY	DEPLOYING AN OFFLINE PRIVATE LORAWAN NETWORK Dimitri Couv A&EON	RADIO PLANNING: SIMULATE LORAWAN GATEWAY COVERAGE Hendrik Wieg TTN AFELDOORN		04:00
04:00					04:30

AMSTERDAM | January 30 - 31 2020

LoRaWAN

Quellen

- <https://www.youtube.com/watch?v=TJMUWyARYsw&feature=youtu.be>
#1 - Global Join Server Announcement by The Things Industries
- <https://www.youtube.com/watch?v=UOnTO5NVWlU&feature=youtu.be>
#2 - The Things (Enterprise) Stack – V3
- <https://www.youtube.com/watch?v=wZJ2SKG8VJ4&feature=youtu.be>
#3 - Announcing STM32 System on Chip
- <https://www.youtube.com/watch?v=YeezL6tQ3Qs&feature=youtu.be>
#4 - Interoperability with Packet Broker
- <https://www.youtube.com/watch?v=iwocSYupdIQ&feature=youtu.be>
#5 - LoRaWAN from Space
- <https://www.thethingsnetwork.org/>
- <https://www.lorixone.io/de>
- Eigene Fotos