



**ThingPark Enterprise SaaS
Extended Data Storage API
Export Archive Format**



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VERSIONS

Version	Date	Author	Details
8.1.9	2026-10-02	Actility	Initial version

WHAT'S NEW

New/Enhanced Functionalities	For More Information, See...	Release

REFERENCE DOCUMENTS

Documents	Author

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ACRONYMS AND DEFINITIONS

Acronyms	Definitions
ABP	Activation By Personalization
ADR	Adaptive Data Rate
AES	Advanced Encryption Standard
AS	Application Server
BPM	Business Process Management
BSS	Billing Support Systems
CSP	Communication Service Provider
DC	Duty Cycle
End Device	A sensor or actuator
ESP	Estimated Signal Power
ETSI	European Telecommunications Standards Institute
HAN	Home Area Network
HSM	Hardware Security Module
IaaS	Infrastructure As A Service
IEC	International Electrotechnical Commission
IoT	Internet of Things
ISM	Industrial Scientific Medical
GSCL	Gateway Service Capability Layer
GTM	Go To Market
KPI	Key Performance Indicator
LC	Logical Channel
LoRaWAN [®]	Long Range Wide Area NW
LPWAN	Low Power Wide Area Network
LRC	Long Range Controller
LRR	Long Range Relay
MAC	Media Access Control

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Acronyms	Definitions
M2M	Machine-2-Machine
MTBF	Mean Time Before Failure
NAT	Network Address Translation
NW	Network
NSCL	Network Service Capability Layer. Also called RMS.
OBIX	Open Building Information Exchange
OSS	Operations Support Systems
OTA	Over The Air
PER	Packet Error Rate
PKI	Public Key Infrastructure
POC	Proof Of Concept
REST	Representational State Transfer
RF	Radio Frequency
RIT	Receiver Initiated Transmit
RSSI	Received Signal Strength Indicator
SaaS	Software as a Service
SF	Spreading Factor
SLRC	Secured LRC (VPN Concentrator)
SMP	System Management Platform
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SNR	Signal to Noise Ratio
SSH	Secure SHell
SSO	Single Sign On
TLS	Transport Layer Security
TWA	ThingPark Wireless Application
UNB	Ultra Narrow Band
VM	Virtual Machine

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Acronyms	Definitions
VPN	Virtual Private Network
WS	Web Service

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1 SCOPE

This document describes the format and content of the archive downloaded through the ThingPark Enterprise Extended Data Storage API. It defines the properties of the device uplink and downlink frame reports included in the exported file.

Extended Data Storage allows ThingPark Enterprise SaaS subscribers to retain device uplink and downlink frame history for an extended period and export this historical data through the Device Manager API.

Depending on the retention period configured for the subscription, device frame history can be retained for up to 3, 6 or 12 months.

The archive consists of a JSON Lines (JSONL) file compressed with gzip. Each line is a standalone JSON document containing either an uplink frame report or a downlink frame report.

Section 3 describes the uplink documents, and Section 4 describes the downlink documents. These sections define the exported properties, their cardinalities and their meanings, and provide examples.

This capability complements the shorter-term frame history available through the Wireless Logger. Exported historical data can be used for troubleshooting, data recovery or further analysis.

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2 THINGPARK SOLUTION OVERVIEW

The ThingPark set consists of four main key components:

- ThingPark Wireless – Core network and OSS
- ThingPark OS
- ThingPark X
- ThingPark Enterprise

The ThingPark platform is a **modular solution** enabling Network Operators to:

- Deploy LPWANs based on LoRaWAN® or LTE with **ThingPark Wireless**.
- Manage, activate and monetize IoT bundles (device, connectivity and application) with **ThingPark OS**.
- Provide value-added data layer services, such as protocol drivers and storage with **ThingPark X**.

ThingPark OSS acts as the central System Management Platform (SMP), enabling all other ThingPark platform modules with base capabilities such as subscriber management, centralized authentication and access rights, and workflow management.

ThingPark Enterprise is an Internet of Things (IoT) platform that manages private LoRaWAN® Networks. The ThingPark Enterprise edition is used by companies to support their specific business.

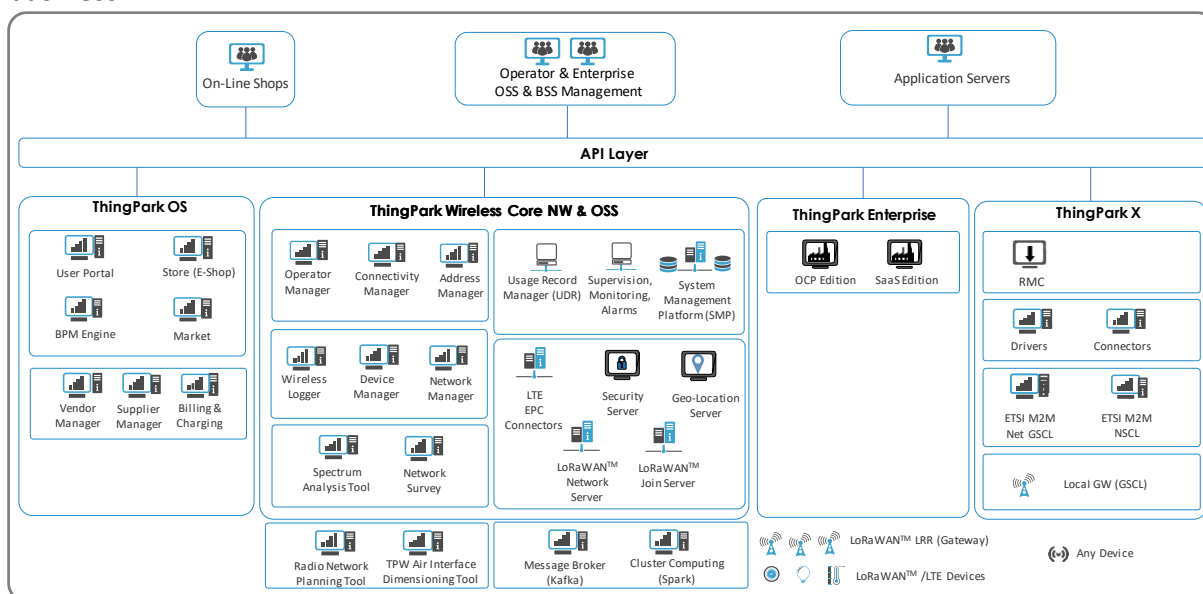


Figure 1 – ThingPark Solution Architecture Description High Level Product Illustration

Please note that the modules above may be representing a physical server, a function, a service or a business support layer as part of the overall ThingPark solution and not necessarily a physical HW server

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3 UPLINK FRAME REPORT

3.1 EUI_uplink Document

Always provided as a **JSON** document. Following conventions are used to express property cardinalities:

- 1: The property is always provided,
- 0..1: The property is optional, and the condition is detailed in the "Definition" column,
- Empty: Property is never provided.

Cardinality is expressed in two columns:

- Join means a Join-Request,
- Data means a Data Uplink, with MAC commands and/or an applicative payload.

Property	Cardinality		Definition
	Join	Data	
DevEUI	1	1	Device EUI. <u>Syntax</u> : STRING (Hexadecimal representation in upper case)
Time	1	1	Uplink frame timestamp as reported by the LRR. <u>Syntax</u> : STRING (ISO date/time representation)
LrcTime	1	1	Timestamp of uplink processing in LRC. <u>Syntax</u> : STRING (ISO date/time representation)
UplinkCounter	1	1	Total number of uplink frames received for this device since the device was provisioned on the LRC. <u>Syntax</u> : NUMBER (Unsigned integer)
FCntUp		1	LoRaWAN® FCntUp . <u>Syntax</u> : NUMBER: 16 or 32 bits LoRaWAN® counter (see LoRaWAN® specs) since the last device reset to factory settings detected by the LRC.
UplinkSize		1	Applicative payload size (Byte) for this frame. <u>Syntax</u> : NUMBER (Unsigned integer)
BestLRR	0..1	0..1	LRR ID of LRR with the highest SNR after the 250ms deduplication window. If the uplink frame is routed via a LoRaWAN relay: virtual LRR ID allocated to the relay by the LRC. <u>Syntax</u> : STRING (Hexadecimal string in upper case)

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			Only when the best LRR belongs to the <u>serving</u> network.
Chain	0..1	0..1	The best antenna ID of the best LRR: highest SNR after the 250ms deduplication window. <u>Syntax</u>: NUMBER (Unsigned integer) Only when the best LRR belongs to the <u>serving</u> network. Not set when the uplink frame is routed via a LoRaWAN relay.
Channel	1	1	Identifier of the radio channel use to receive the frame (string). <u>Syntax</u>: STRING ("LC1" . . "LC16")
Spfact	1	1	LoRa modulation: Uplink Spreading Factor (SF). LoRa-E modulation: Uplink Data Rate (DR). <u>Syntax</u>: NUMBER (7 . . 12)
DevLrrCnt	1	1	LoRaWAN® GwCnt (number of BS that received the signal). NOTE: always 1 for fNS (no deduplication window on the fNS). <u>Syntax</u> : NUMBER (Integer)
LrrLAT	0..1	0..1	BS location (BestLRR or BestGWID). <u>Syntax</u>: NUMBER (Float) Only when the information has been configured or retrieved from the GPS. Not set when the uplink frame is routed via a LoRaWAN relay.
LrrLON	0..1	0..1	BS location (BestLRR or BestGWID). <u>Syntax</u>: NUMBER (Float) Only when the information has been configured or retrieved from the GPS. Not set when the uplink frame is routed via a LoRaWAN relay.
InstantPER		1	Instantaneous PER without consideration for LRRs. <u>Syntax</u>: NUMBER (Float)
MeanPER		1	Average PER without consideration for LRRs. <u>Syntax</u>: NUMBER (Float)
LastLRRs/LRRptr	1..10	1..10	List of base stations that receive the packet (up to 10 are reported and ordered by ESP). <u>Syntax</u>: List of <LRRptr>
LastLRRs/LRRptr/LRRid	0..1	0..1	If the uplink frame is routed via a LoRaWAN relay: virtual LRR ID allocated to the relay by the LRC.

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			<u>Syntax</u>: STRING (Hexadecimal string in upper case) Only when the LRR belongs to the <u>serving</u> network.
LastLRRs/LRRptr/RSSI	1	1	<u>Syntax</u>: NUMBER (Float)
LastLRRs/LRRptr/SNR	1	1	<u>Syntax</u>: NUMBER (Float)
LastLRRs/LRRptr/ESP	1	1	<u>Syntax</u>: NUMBER (Float)
LastLRRs/LRRptr/InstantPER		0..1	<u>Syntax</u>: NUMBER (Float) Only when the LRR belongs to the <u>serving</u> network.
LastLRRs/LRRptr/ISMband	1	1	ISM band of the GW NOTE for SNS with passive roaming: ISMband is the ISM band of the RF Region selected by the LRC based on RFRegion and RFParamSetID fields received in BE messages <u>Syntax</u>: STRING (Enumerate) The following strings are supported: "eu868", "eu433", "cn779", "as923", "kr920", "sg920", "tw920", "us915", "au915", "cn470", "in865", "ru864"
LastLRRs/LRRptr/RFRegion	1	1	RF Region ID of the GW NOTE for SNS with passive roaming: RFRegion is the RF Region ID of the RF Region selected by the LRC based on RFRegion and RFParamSetID fields received in BE messages <u>Syntax</u>: STRING
LastLRRs/LRRptr/Chain	0..1	0..1	The best antenna ID of the LRR: highest SNR. <u>Syntax</u>: NUMBER (Unsigned integer) Only when the LRR belongs to the <u>serving</u> network. Not set when the uplink frame is routed via a LoRaWAN relay.
LastLRRs/LRRptr/Chains	0..3	0..3	List of antenna chains (up to 3 are reported). <u>Syntax</u>: List of <ChainPtr> Only when the LRR belongs to the <u>serving</u> network . Not set when the uplink frame is routed via a LoRaWAN relay.
LastLRRs/LRRptr/Chains/ChainPtr/Chain	1	1	Antenna ID <u>Syntax</u>: NUMBER (Integer)
LastLRRs/LRRptr/Chains/ChainPtr/Time	1	1	<u>Syntax</u>: STRING (ISO date/time)
LastLRRs/LRRptr/Chains/	0..1	0..1	<u>Syntax</u>: STRING ("GPS_RADIO")

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ChainPtr/Time@Type			Only when Time is a fine timestamp.
LastLRRs/LRRptr/Chains/ ChainPtr/Time@Ns	0..1	0..1	<u>Syntax</u> : NUMBER (Integer) Only when @Type is "GPS_RADIO".
ADRbit		0..1	ADR control bit received in the uplink frame. <u>Syntax</u> : NUMBER (0 . . 1) Only when the value is not 0.
ADRAckReq		0..1	ADR acknowledgment request bit. <u>Syntax</u> : NUMBER (0 . . 1) Only when the value is not 0.
AckRequested		0..1	ACK requested indicator (Boolean). <u>Syntax</u> : NUMBER (0 . . 1) Only when the value is not 0.
FPort		0..1	LoRa Fport. <u>Syntax</u> : NUMBER (0 . . 224) Only when present in the LoRaWAN® frame.
MType	1	1	LoRaWAN® MType. <u>Syntax</u> : NUMBER (0 . . 8)
airtime	1	1	Airtime. <u>Syntax</u> : FLOAT (in second)
DevAddr	1	1	Device ADDR. <u>Syntax</u> : STRING (Hexadecimal string in upper case)
payload_hex		0..1	Decoded LoRaWAN® applicative payload in hexa ASCII format IMPORTANT: For ABP devices, when the AppSKey is unknown and for OTAA device, when an ASTK is used, the payload cannot be decoded and is therefore provided encoded. See <code>PayloadEncryption</code> attribute. <u>Syntax</u> : STRING (Hexadecimal string) Only when the LoRaWAN® frame contains an applicative payload.
mic_hex	1	1	MIC in hexa ASCII format.

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			<u>Syntax</u> : STRING (Hexadecimal string)
rawMacCommands		0..1	Decoded Hex ASCII dump of the LoRaWAN® MAC option or LoRaWAN® MAC payload (port=0). <u>Syntax</u> : STRING (Hexadecimal string) Only when the LoRaWAN® frame contains a MAC command.
CustomerID	1	1	Customer ID (as provided when the Device has been provisioned). <u>Syntax</u> : STRING
CustomerData	1	1	JSON customer data: ■ "loc": administrative location (OPTIONAL) ○ "lat" (latitude) and "lon" (longitude) sub-properties. ■ "alr": application layer (OPTIONAL) ○ "pro" (product) and "ver" (version) sub-properties. ■ "tags": array of tag names (OPTIONAL) ■ "doms": array of domains (OPTIONAL) ○ "n" (domain name) and "g" (domain group name) sub-properties. ■ "name": device name (OPTIONAL) ■ "lrrID": LRR ID of the BS if the device is a BS RF probe (OPTIONAL) ■ "rfProbe": true if the device is a BS RF probe (OPTIONAL) <u>Sample</u>: <pre>{ "loc": { "lat": "43.58081", "lon": "1.4421667" }, "alr": { "pro": "STL", "ver": "1" }, "tags": ["tag1", "tag2"], "doms": [{ "n": "France/Paris", "g": "Site" }, { "n": "Location", "g": "Vertical" }], "name": "My device name" }</pre>

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			<u>Syntax</u> : JSON document
BaseStationData	0..1	0..1	JSON base station data of the best LRR: ■ "doms": array of domains (OPTIONAL) ○ "n" (domain name) and "g" (domain group name) sub-properties. ■ "name": base station name (OPTIONAL) <u>Sample</u>: <pre>{ "doms": [{ "n": "France/Paris", "g": "Site" }, { "n": "Network", "g": "Vertical" }], "name": "My base station name" }</pre> <u>Syntax</u>: JSON document Only if domains are configured and if the best GW is local. Not set when the uplink frame is routed via a LoRaWAN relay.
macRequestPresent	1	0..1	TRUE when the packet is a JOIN-request message, or when the packet contains at least a MAC request (FPort=0 or FOpts), otherwise FALSE. <u>Syntax</u>: NUMBER (0 . . 1) Only when the value is not 0.
macResponsePresent		0..1	TRUE when the packet contains at least a MAC response (FPort=0 or FOpts), otherwise FALSE. <u>Syntax</u>: NUMBER (0 . . 1) Only when the value is not 0.
ISMband	1	1	ISM band of the best GW (BestLRR or BestGWID). NOTE for SNS with passive roaming: ISMband is the ISM band of the RF Region selected by the LRC based on RFRegion and RFParamSetID fields received in BE messages. <u>Syntax</u>: STRING: The following string are supported: "eu868", "eu433", "cn779", "as923", "kr920", "sg920", "tw920", "us915", "au915", "cn470", "in865", "ru864"
AsID		0..1	List of Application Server Routing Profiles that received the uplink frame.

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			<u>Syntax</u>: STRING (Comma-separated list of strings) Only when the AS is activated.
TxPower	0..1	1	Conductive power or EIRP depending on ISMBand and LoRaWAN® version of the device in dBm. Computed by the LRC based on transmitter power sent to the device through a LinkADDRReq and validated by the device through a LinkADRAns. If no LinkADRAns have been yet validated by the device, the device boot parameter will be used instead. <u>Syntax</u>: NUMBER (Float) Only when a first UL has been received.
NbTrans	0..1	1	NbTrans computed by the LRC, sent to the device through a LinkADDRReq and validated by the device through a LinkADRAns. If no LinkADRAns have been yet validated by the device, the device boot parameter will be used instead. <u>Syntax</u>: NUMBER (Unsigned Integer) Only when a first UL has been received.
DynamicClass	0..1	1	LoRaWAN® class currently used by the Device: 'A', 'B' or 'C' <u>Syntax</u>: STRING (Enumerate) Only when a first UL has been received.
Frequency	0..1	1	Frequency in MHz of the radio channel used to receive the frame <u>Syntax</u>: NUMBER (Float) Only when a first UL has been received.
DriverCfg	0..1	0..1	Metadata for Driver selection. Opaque information not processed by the LRC and transparently provided on LRC-OSS interface. When defined at both Device level and Device Profile level, the Device level information has precedence over Device Profile level information. Example : <pre>"DriverCfg": { "mod": { "pId": "abeeway", "mId": "lorawan-relay", "ver": "1" }, "app": {</pre>

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			<pre> "pId": "abeeway", "mId": "asset-tracker-3", "ver": "1" } } </pre> <u>Syntax</u>: Object (JSON document) Only when defined at Device level or Device Profile level
PayloadEncryption		0..1	Encryption status of reported LoRaWAN applicative payload: 0 (clear), 1 (encrypted) <u>Syntax</u>: NUMBER (0 . . 1) NOTE: No default value for this boolean. Only when the LoRaWAN frame contains an applicative payload.
RFRegion	1	1	RF Region ID of the best GW (BestLRR or BestGWID). NOTE for sNS with passive roaming: RFRegion is the RF Region ID of the RF Region selected by the LRC based on RFRegion and RFParamSetID fields received in BE messages <u>Syntax</u>: STRING
AsReport	1	1	Application report delivery info. <u>Syntax</u>: Object
AsReport/DeliveryID		0..1	Unique ID assigned to the delivery task of the uplink to the application servers. This same ID is also published in EUI_as_report for correlation. <u>Syntax</u>: String HEXA Only when the LoRaWAN frame is reported to the application servers.
AsReport/RoutingProfiles	1	1	List of all routing profiles associated with the device. NOTE: only "leaf" routing profiles are listed. May be empty if no routing profile associated with the device. <u>Syntax</u>: Array
AsReport/RoutingProfiles/ID	1	1	Routing profile ID. <u>Syntax</u>: String
LostUplinks		1	Number of uplink frames lost since the processing of the previous uplink frames for the same device: - When >0: some uplink frames have been lost and the field provides the number of lost uplink frames - When 0: no uplink frames have been lost

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			- When -1: the currently reported uplink frame is late and was wrongly counted in lost uplink frames in a previous uplink frame report <u>Syntax</u>: NUMBER (Signed integer)
--	--	--	--

3.2 Example

```
{
  "EUI_uplink": {
    "DevEUI": "00112233445566778899AABBCCDDEEFF",
    "Time": "2014-04-01T14:19:56.38+02:00",
    "UplinkCounter": 4343434,
    "UplinkSize": 4343434,
    "BestLRR": "08040059",
    "Chain": 0,
    "Channel": "LC2",
    "Spfact": 7,
    "DevLrrCnt": 3,
    "LrrLAT": 45.817394,
    "LrrLON": 4.774556,
    "LastLRRs": {
      "LRRptr": [
        {
          "LRRid": "08040059",
          "RSSI": -33.000000,
          "SNR": 9.750000,
          "ESP": -49.413925,
          "InstantPER": 0.107143,
          "Chain": 0,
          "Chains": {
            "ChainPtr": [
              {
                "Chain": 0,
                "Time": {
                  "Time": "2014-04-01T14:19:56.38+02:00"
                }
              },
              {
                "Chain": 1,
                "Time": {
                  "Time": "2014-04-01T14:19:56.38+02:00"
                }
              }
            ]
          }
        }
      ]
    }
  },
  {
    "LRRid": "33D13A41",
    "RSSI": -33.000000,
    "SNR": 9.750000
  }
],
  "ADRbit": 1,
  "ADRackReq": 0,
  "AckRequested": 0,
  "FPort": 7,
  "MType": 2,
  "airtime": 0.852,
```

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```
"DevAddr": "007E074F",
"CustomerID": "2000003434",
"CustomerData": {
  "loc": {
    "lat": "43.58081",
    "lon": "1.4421667"
  },
  "alr": {
    "pro": "STL",
    "ver": "1"
  },
  "tags": [ "tag1", "tag2" ],
  "doms": [{
    "n": "France/Paris",
    "g": "Site"
  }, {
    "n": "Location",
    "g": "Vertical"
  }],
  "name": "My device name"
},
"BaseStationData": {
  "doms": [{
    "n": "France/Paris",
    "g": "Site"
  }, {
    "n": "Network",
    "g": "Vertical"
  }],
  "name": "My base station name"
},
"LostUplinks": 0
}
```

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4 DOWNLINK FRAME REPORT

4.1 EUI_downlink Document

Always provided as a **JSON** document. Following conventions are used to express property cardinalities:

- 1: The property is always provided,
- 0..1: The property is optional, and the condition is detailed in the "Definition" column,
- Empty: Property is never provided.

Cardinality is expressed in two columns:

- Join means a Join-Request,
- Data means a Data Uplink, with MAC commands and/or an applicative payload.

Property	Cardinality		Definition
	Join	Data	
DevEUI	1	1	Device EUI. <u>Syntax</u> : STRING (Hexadecimal string in upper case)
Time	1	1	Downlink frame timestamp as reported by the LRR. <u>Syntax</u> : STRING (ISO date/time)
LrcTime	1	1	Timestamp of downlink ack processing in LRC. <u>Syntax</u> : STRING (ISO date/time representation)
DownlinkCounter	1	1	Total number of downlink frames received for this device since the device was provisioned on the LRC. <u>Syntax</u> : NUMBER (Unsigned integer)
FCntDn		0..1	LoRaWAN® 1.0 FCntDown <u>Syntax</u> : NUMBER (16 or 32 bits LoRaWAN® counter (see LoRaWAN® specs) since the last device reset to factory settings detected by the LRC). Only applicable to LoRaWAN® 1.0.
DownlinkSize		1	Applicative payload size (Byte) for this frame. <u>Syntax</u> : NUMBER (Unsigned integer)
BestLRR	0..1	0..1	LRR ID of LRR selecting for downlink transmission: ■ For non-static devices, this is the LRR with the highest SNR (when the SF > 9) or the highest ESP (when the SF <= 9) on the last uplink packet .

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			■ For static devices, this is the LRR with the highest average ESP on last uplink packets included in a sliding window. If the downlink frame is routed via a LoRaWAN relay: virtual LRR ID allocated to the relay by the LRC. <u>Syntax</u>: STRING (Hexadecimal string in upper case) Only when the selected gateway belongs to the <u>serving</u> network.
Chain	0..1	0..1	The ID of the antenna used to send the frame. <u>Syntax</u>: NUMBER (Unsigned integer) Only when the selected gateway belongs to a <u>forwarding</u> network. Not set when the downlink frame is routed via a LoRaWAN relay.
Channel	1	0..1	Identifier of the radio channel use to send the frame (string). <u>Syntax</u>: STRING ("LC1" .. "LC16") Roaming: only when exactly one frequency has been reported by the fNS in the XmitDataAns.
Spfact	1	0..1	Downlink SF used <u>Syntax</u>: NUMBER (7 .. 12) Roaming: not reported (this information is not present in the XmitDataAns).
ADRbit		0..1	ADR control bit sent in the downlink frame. <u>Syntax</u>: NUMBER (0 .. 1) Only when the value is not 0.
AckRequested		0..1	ACK requested indicator (Boolean). <u>Syntax</u>: NUMBER (0 .. 1) Only when the value is not 0.
ACKbit		0..1	ACK bit notification. When set to 1 the downlink frame acknowledged an uplink frame previously sent by the device. <u>Syntax</u>: NUMBER (0 .. 1) Only when the value is not 0.
FPort		0..1	LoRaWAN® FPort.

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			<u>Syntax</u>: NUMBER (0 . . 224) Only when present in the LoRaWAN® frame.
MType	1	1	LoRaWAN® MType. <u>Syntax</u>: NUMBER (0 . . 8)
airtime	1	1	Airtime estimated by the LRC. May be changed by the LRR without visibility (if the processing switch to RX2) <u>Syntax</u>: FLOAT (in second)
DevAddr	1	1	Device ADDR. <u>Syntax</u>: STRING (Hexadecimal string in upper case)
payload_hex		0..1	LoRaWAN® applicative payload in hexa ASCII format. <u>Syntax</u>: STRING (Hexadecimal string) Only when the LoRaWAN® frame contains an applicative payload.
mic_hex		1	MIC in hexa ASCII format. <u>Syntax</u>: STRING (Hexadecimal string)
lrcRequestedRxDelay	1	1	Requested RX slot by the LRC (RX2 optimization algorithm). May be changed by the LRR without visibility Note: RX1=1000, RX2 > 1000 <u>Syntax</u>: INTEGER (in ms)
rawMacCommands		0..1	Decoded Hex ASCII dump of the LoRaWAN® MAC option or LoRaWAN® MAC payload (port=0)/ <u>Syntax</u>: STRING (Hexadecimal string) Only when the LoRaWAN® frame contains a MAC command.
DeliveryStatus	1	1	Specify if the frame has been provided to the RF component: ■ 1: Sent ■ 0: Failed <u>Syntax</u>: NUMBER (0 . . 1) NOTE: no default value.
DeliveryFailedCause1	1	1	Specify the cause of failure on RX1: ■ 00: No failure cause on RX1 ■ A_x: Class A: Transmission slot busy on RX1 ○ A0: "Radio stopped" ○ A1: "Downlink radio stopped" ○ A3: "Radio busy" ○ A4: "Listen before talk"

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			○ A5: "Radio board error" ○ A6: "Specific Semtech basic station failure cause" ■ Bx: Class A: Too late for RX1 ○ B0: "Too late for RX1" for LRR, "Switched to RX2 by the gateway" for Semtech basic station ■ Cx: Class A: LRC selects RX2 ○ C0: "LRC selected RX2" ■ Dx: Class A: DC or Gateway constraint on RX1 ○ D0: "Duty cycle constraint detected by LRR" ○ DA: "Duty cycle constraint detected by LRC" ○ DB: "Max dwell time constraint detected by the LRC" ○ DE: "DC not allowed by the peering operator" ○ DF: "Wrong NetID" ■ Ex: Class A: Frame discarded from the downlink queue ○ E1: "Queue full" ○ E2: "Invalid FCntDn" ○ E3: "Validity time expired" ○ E4: " Queue reset following a rejoin" <u>Syntax:</u> STRING (Hexadecimal string in upper case)
DeliveryFailedCause2	1	1	Specify the cause of failure on RX2: ■ 00: No failure cause on RX2 ■ Ax: Class A/Class C: Transmission slot busy on RX2 ○ A0: "Radio stopped" ○ A1: "Downlink radio stopped" ○ A3: "Radio busy" ○ A4: "Listen before talk" ○ A5: "Radio board error" ○ A6: "Specific Semtech basic station failure cause" ■ Bx: Class A: Too late for RX2 ○ B0: "Too late for RX2" ■ Dx: Class A/Class C: DC or Gateway constraint on RX2 ○ D0: "Duty cycle constraint detected by LRR" ○ DA: "Duty cycle constraint detected by LRC" ○ DB: "Max dwell time constraint detected by the LRC" ○ DE: "DC not allowed by the peering operator" ○ DF: "Wrong NetID" ■ Ex: Class C: frame expired before transmission ○ E0: "Max delay for Class C" (60 seconds) ■ Fx: Class C: Multicast failure ○ F0: "No matching channel for multicast frequency"

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			<u>Syntax:</u> STRING (Hexadecimal string in upper case)
DeliveryFailedCause3	1	1	Specify the cause of failure on ping slot: ■ 00: No failure cause on ping slot ■ Ax: Class B: Transmission slot busy on ping slot ○ A0: "Radio stopped" ○ A1: "Downlink radio stopped" ○ A2: "Ping slot not available" ○ A3: "Radio busy" ○ A4: "Listen before talk" ○ A5: "Radio board error" ■ Bx: Class B: Too late for ping slot ○ B0: "Too late for ping slot" ■ Dx: Class B: DC or Gateway constraint on ping slot ○ D0: "Duty cycle constraint detected by LRR" ○ D9: "No eligible LRR found because all have been discarded by the LRC" ○ DA: "Duty cycle constraint detected by LRC" ○ DB: "Max dwell time constraint detected by the LRC" ○ DC: "No GPS-synchronized LRR detected by the LRC" ○ DD: "No LRR connected detected by the LRC" ○ DE: "Wrong NetID" ■ Fx: Class B: Multicast failure ○ F0: "No matching channel for multicast frequency" <u>Syntax:</u> STRING (Hexadecimal string in upper case)
CustomerID	1	1	Customer ID (as provided when the Device has been provisioned). <u>Syntax:</u> STRING
macRequestPresent		0..1	TRUE when the packet contains at least a MAC request (FPort=0 or FOpts), otherwise FALSE. <u>Syntax:</u> NUMBER (0 . . 1) Only when the value is not 0.
macResponsePresent	1	0..1	TRUE when the packet is a JOIN-accept message, or when the packet contains at least a MAC response (FPort=0 or FOpts), otherwise FALSE. <u>Syntax:</u> NUMBER (0 . . 1) Only when the value is not 0.
ISMband	1	1	ISM band of the selected GW (BestLRR or BestGWID). The following string are supported:

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			"eu868", "eu433", "cn779", "as923", "kr920", "sg920", "tw920", "us915", "au915", "cn470", "in865", "ru864" NOTE for sNS with passive roaming: ISMBand is the ISM band of the RF Region selected by the LRC based on RFRRegion and RFParamSetID fields received in BE messages. <u>Syntax</u>: STRING (Enumerate)
TransmissionSlot	1	1	Slot used for downlink frame transmission: 0 (Unknown), 1 (RX1), 2 (RX2), 3 (Ping Slot) or 4 (RXR) <u>Syntax</u>: NUMBER (Unsigned integer: 0 . . 4)
Frequency	0..1	0..1	Frequency in MHz of the radio channel used to send the frame <u>Syntax</u>: NUMBER (Float) The RX2 frequency is not reported when configured using the <RX2Freq> element in RF Region. Roaming: only when exactly one frequency has been reported by the fNS in the XmitDataAns. Only when a first UL has been received.
DriverCfg		0..1	Metadata for Driver selection. Opaque information not processed by the LRC and transparently provided on LRC-OSS interface. When defined at both Device level and Device Profile level, the Device level information has precedence over Device Profile level information. <u>Syntax</u>: Object (JSON document) Only when defined at Device level or Device Profile level
RFRRegion	1	1	RF Region ID of the best GW (BestLRR or BestGWID). NOTE for sNS with passive roaming: RFRRegion is the RF Region ID of the RF Region selected by the LRC based on RFRRegion and RFParamSetID fields received in BE messages. <u>Syntax</u>: STRING
AsReport		1	Application report delivery info. <u>Syntax</u>: Object
AsReport/DeliveryID		1	Unique ID assigned to the delivery task of the uplink to the application servers. This same ID is also published in EUI_as_report for correlation. <u>Syntax</u>: String HEXA

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AsReport/RoutingProfiles		1	List of all routing profiles selected as target for AS report. NOTE: only "leaf" routing profiles are listed. May be empty if no routing profile associated with the device. <u>Syntax</u>: Array
AsReport/RoutingProfiles/ID		1	Routing profile ID. <u>Syntax</u>: String
CustomerData	0..1	0..1	JSON customer data: ■ "loc": administrative location (OPTIONAL) ○ "lat" (latitude) and "lon" (longitude) sub-properties. ■ "alr": application layer (OPTIONAL) ○ "pro" (product) and "ver" (version) sub-properties. ■ "tags": array of tag names (OPTIONAL) ■ "doms": array of domains (OPTIONAL) ○ "n" (domain name) and "g" (domain group name) sub-properties. ■ "name": device name (OPTIONAL) <u>Sample</u>: <pre>{ "loc": { "lat": "43.58081", "lon": "1.4421667" }, "alr": { "pro": "STL", "ver": "1" }, "tags": ["tag1", "tag2"], "doms": [{ "n": "France/Paris", "g": "Site" }, { "n": "Location", "g": "Vertical" }], "name": "My device name" }</pre> <u>Syntax</u>: JSON document Only if available in table A
BaseStationData	0..1	0..1	JSON base station data of the selected LRR: ■ "doms": array of domains (OPTIONAL)

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		o "n" (domain name) and "g" (domain group name) sub-properties. ■ "name": base station name (OPTIONAL) <u>Sample:</u> <pre>{ "doms": [{ "n": "France/Paris", "g": "Site" }, { "n": "Network", "g": "Vertical" }], "name": "My base station name" }</pre> <u>Syntax:</u> JSON document Only if available in table L and if the selected GW is local. Not set when the uplink frame is routed via a LoRaWAN relay.
--	--	--

4.2 Example

```
{
  "EUI_downlink": {
    "DevEUI": "00112233445566778899AABBCCDDEEFF",
    "Time": "2014-04-01T14:19:56.38+02:00",
    "DownlinkCounter": 4343434,
    "DownlinkSize": 4343434,
    "BestLRR": "08040059",
    "Chain": 0,
    "Channel": "LC2",
    "Spfact": 7,
    "ADRbit": 1,
    "AckRequested": 0,
    "ACKbit": 0,
    "FPort": 7,
    "MType": 2,
    "airtime": 0.852,
    "DevAddr": "007E074F",
    "CustomerID": "2000003434",
    "CustomerData": {
      "loc": {
        "lat": "43.58081",
        "lon": "1.4421667"
      },
      "alr": {
        "pro": "STL",
        "ver": "1"
      },
      "tags": [ "tag1", "tag2" ],
      "doms": [{
        "n": "France/Paris",
        "g": "Site"
      }, {
```

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```
        "n": "Location",
        "g": "Vertical"
    }],
    "name": "My device name"
},
"BaseStationData": {
    "doms": [{
        "n": "France/Paris",
        "g": "Site"
    }, {
        "n": "Network",
        "g": "Vertical"
    }],
    "name": "My base station name"
}
}
```

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