

ETSI TS 103 874-2 V1.1.1 (2024-09)



DECT-2020 New Radio (NR); Access Profile Part 2; Smart Metering, City and Buildings

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Digital Enhanced Cordless Telecommunications (DECT).

The present document is part 2 of a multi-part deliverable covering access profile using DECT-2020 New Radio (NR) technology, as identified below:

Part 1: "Overview";

Part 2: "Smart Metering, City and Buildings";

Part 3: "IPv6 Profile".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document specifies the access profile requirements and recommendations of smart metering, city and buildings as well as any other similarly applicable use case for the DECT-2020 New Radio (NR).

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are necessary for the application of the present document.

- [1] [ETSI TS 103 636-1 \(V1.5.1\)](#): "DECT-2020 New Radio (NR); Part 1: Overview; Release 1".
- [2] [ETSI TS 103 636-2 \(V1.5.1\)](#): "DECT-2020 New Radio (NR); Part 2: Radio Reception and transmission requirements; Release 1".
- [3] [ETSI TS 103 636-3 \(V1.5.1\)](#): "DECT-2020 New Radio (NR); Part 3: Physical layer; Release 1".
- [4] [ETSI TS 103 636-4 \(V1.5.1\)](#): "DECT-2020 New Radio (NR); Part 4: MAC layer; Release 1".
- [5] [ETSI TS 103 636-5 \(V1.5.1\)](#): "DECT-2020 New Radio (NR); Part 5: DLC and Convergence layers; Release 1".

2.2 Informative references

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The following referenced documents are not necessary for the application of the present document, but they assist the user with regard to a particular subject area.

- [i.1] ETSI TR 103 943: "System Reference document (SRdoc); DECT-2020 NR technology operating in frequency bands below 6 GHz".

3 Definition of terms, symbols, and abbreviations

3.1 Terms

Void.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TS 103 636-1 [1] and the following apply.

NOTE: An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in ETSI TS 103 636-1 [1].

CVG	Convergence (layer)
DLC	Data Link Control (layer)
FO	Frame Offset
FT	Fixed Terminal (operational mode)
HARQ	Hybrid Automatic Repeat reQuest
IE	Information Element
IPv6	Internet Protocol version 6
LAN	Local Area Network
M	Mandatory (requirement)
MAC	Medium Access Control (layer)
MCS	Modulation and Coding Scheme
O	Optional (requirement)
PHY	PHYsical (layer)
PDU	Protocol Data Unit
PT	Portable Terminal (operational mode)
RACH	Random Access CHannel
RD	Radio Device
RSSI	Received Signal Strength Indicator
SFN	System Frame Number
SI	Segmentation Indication
SNR	Signal to Noise Ratio
TBS	Transport Block Size

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4 Use Case Descriptions

4.1 General

The present document defines a generic access profile that can be used in multiple different use cases with a basic assumption of large number of devices and need for multi-hop mesh networking topology. The following clauses define a set of use cases recognized by TC DECT [i.1] but the use of this access profile is not necessarily limited to these.

4.2 Examples of use cases

4.2.1 Smart Electricity Metering

Electricity metering refers to electronic devices installed in buildings to record the consumption of electricity and report it to a backed system for monitoring and billing purposes.

4.2.2 Smart City Applications/Smart Street Lighting

Smart city applications are about collecting environmental sensor data and controlling some of the infrastructure devices, from which streetlights are considered.

Smart Street lighting is about controlling the use of the lights in efficient manner. The control may be autonomous and not only based on measuring how dark it is but also the movements of the people and/or vehicles. Streetlights may also provide information on the condition of the lights, e.g. the light bulbs/LEDs. Similarly, the streetlights may also be equipped to do various environmental sensing like air quality measurements and/or route the data of other devices for monitoring purposes.

4.2.3 Smart Building Applications

Smart building is a concept of various applications that consider energy efficiency, space optimization, environment quality and functionality.

4.2.4 Smart Emergency Lighting

Smart emergency lighting is about features for supporting the set up and maintenance of the emergency lighting. For example, the backup battery's (which is used in case mains power is cut) charging status and whether the light bulb/LED is broken is reported to a monitoring system, removing the need for site audits and manual checks. Further smart lighting can be used to provide additional guidance to the people in case of emergency.

4.3 Characteristics of the use cases

4.3.1 Physical location

The smart building and emergency lighting are mostly confined on premises of larger buildings, where the radio signals often face high path loss and strong fading caused by the concrete walls and floors. Further, buildings with modern selective glass windows and concrete and steel structure wall have very significant signal attenuation from outdoors, as well as many buildings' underground floors use vital support area for different functions operating in building, such as parking, warehouse, cleaning, personal locker rooms, etc.

However, some of the use cases like lighting and emergency lighting are associated with locally open spaces like rooms and corridors.

A typical intended use of electricity metering is the consumption at buildings in urban and suburban areas, wherein the physical distance between the electricity meters varies heavily. The metering devices may be grouped in the same space of a block house e.g. in basements and other technical rooms with concrete walls. On the other hand, the distance between the buildings may be hundreds of meters. In suburban areas, smart meters are typically per household.

The street lighting is mostly intended for outdoor conditions with less path fading. The distance between the lights mostly expected to be limited to some tens of meters.

4.3.2 Topology

The topology assumption of each use case supported by this profile is assumed to be based on mesh, as the number of devices for a network may be relatively high and the traffic characteristics allow multi-hop networking. Most of the use cases are at least partly confined to buildings causing strong fading conditions. Mesh topology with flexible number of multi-hops allows routing of data through the buildings. In addition, utilization of wireless technology with star network topology increases needs for extremely high link budget solutions, with limited data rate and network building and planning efforts for covering any coverage holes.

4.3.3 Roles

Each device within a use case can have similar role in terms of producing measurement results or e.g. switching the lights on/off and routing data. However, one or some of the devices need to be connected to a gateway which has further connection (e.g. cellular, LAN) to deliver the measurement results to the monitoring backend system or vice versa configuration or control from the backend to the devices. The reliability of the system and the overall system cost or average electricity meter cost can be balanced by adjusting the share of gateways in the network.

4.3.4 Power sources

Electricity meters, streetlights and emergency lights are typically mains powered devices.

Emergency lights need to deal with electricity cut-down situations, so despite of the normal use of the mains power, they are equipped with batteries. A typical regulation requires 90 minutes operation with batteries.

4.3.5 Traffic characteristics

This profile is agnostic on used application data formats. However, the applications may require support of up to 1 500 Bytes of length due to use of IPv6.

The traffic is mostly uplink, while configuration and some control may require downlink messaging. Local routing between RDs is seen lighting use case.

Examples of uplink traffic:

- Periodic or event-based measurement reporting (electricity consumption, environmental measurements in smart building and smart city)

Examples of downlink traffic:

- Configuration and software updates of devices (all use cases)
- Control of devices (lighting, smart building, and smart city applications)

Example of local routing between RDs:

- Local control (street lighting, smart building lighting).

4.3.6 Security

The integrity of the measurement data is highly important in each use case. The measurement, configuration and control data are generally considered private within the wireless communication, although e.g. some smart city data is likely published elsewhere.

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5 Radio Reception and Transmission

5.1 Supported bands

Selection of frequency band, operating channel bandwidth and absolute channel numbers may differ between different regions. At least one band shall be chosen.

When operating at band 1 an RD shall follow the values presented in Table 5.1-1 and follow definitions given in ETSI TS 103 636-2 [2].

Table 5.1-1: Band, bandwidth, and absolute channel numbers

Clause [2]	Name	Value
5.2	Operating band	1
5.3	Operating channel bandwidth	1,728 MHz
5.4.2	Absolute channel numbers	1 657, 1 659, 1 661, 1 663, 1 665, 1 667, 1 669, 1 671, 1 673, 1 675, 1 677

Tables 5.1-2 and 5.1-3: For further Study

When operating at band 4 an RD shall follow the values presented in Table 5.1-4 and follow definitions given in ETSI TS 103 636-2 [2].

Table 5.1-4: Band, bandwidth, and absolute channel numbers

Clause [2]	Name	Value
5.2	Operating band	4
5.3	Operating channel bandwidth	1,728 MHz
5.4.2	Absolute channel numbers	524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546, 548, 550, 552

Tables 5.1-5 to 5.1-8: For further Study

When operating at band 9 an RD shall follow the values presented in Table 5.1-9 and follow definitions given in ETSI TS 103 636-2 [2].

Table 5.1-9: Band, bandwidth, and absolute channel numbers

Clause [2]	Name	Value
5.2	Operating band	9
5.3	Operating channel bandwidth	1,728 MHz
5.4.2	Absolute channel numbers	1 703, 1 705, 1 707, 1 709, 1 711

5.2 Maximum output power

RD may support any of the maximum transmitter outpower class I, class II, class III or class IV.

5.3 RX Gain value

As defined in ETSI TS 103 636-2 [2], Clause B.2.2.

6 Physical layer

6.1 Radio device capabilities

RD shall support following physical layer configuration:

- Maximum number of spatial streams: 1;
- Reception for transmit diversity: 1;
- Subcarrier width scaling - μ : 1;
- Fourier transform scaling - β : 1;
- Supported modulation and coding scheme: as defined clause 6.2;
- Number of HARQ processes: 1 per communication pair;
- When operating in FT mode, an RD shall have capability for at least 4 parallel HARQ processes;
- Soft-buffer size HARQ: 25 344 bytes;

- Codeblock segment size: 2 048 bits.

6.2 Supported MCS and Transport Block Sizes

The RD shall support MCS-0 for one subslot transmissions and MCS-1 for 1 to 8 subslot transmissions, with granularity of one subslot granularity. The transmission length and used modulation shall be selected so that used transport block size does not exceed 2 088 bits.

Table 6.2-1 presents an example transport block size with MCS and transmission lengths.

Table 6.2-1: Transport block sizes example in bits with MCS and transmission length

MCS	TBS/ 1 subslot (bits)	TBS/ 2 subslot (bits)	TBS/ 3 subslot (bits)	TBS/ 4 subslot (bits)	TBS/ 5 subslot (bits)	TBS/ 6 subslot (bits)	TBS/ 7 subslot (bits)	TBS/ 8 subslot (bits)
MCS0	0	-	-	-	-	-	-	-
MCS1	32	296	552	824	1 096	1 352	1 608	1 864

Full description of subslot properties can be read in ETSI TS 103 636-3 [3], clauses 4.4, 4.5 and 5.1.

7 MAC layer

7.1 MAC Configuration Overview

The RD shall support mesh network architecture and indicate its capabilities in the RD capability IE field as defined in clause 7.3.4.3.5.

The RD shall support MAC procedures and data units as depicted in Table 7.1-1 and as defined in clauses 7.2 to 7.4. Use of other MAC procedures and data units may be possible in the implementation but is out of the scope of this profile. The parameter values defined in clauses 7.2 to 7.4 are recommended and subject to be used in the testing. Use of other values may be possible but is outside of the scope of this profile. All the procedures and data units (protocol data units, messages, information elements and their fields, variables and timers) presented in clause 7 refer to those defined in ETSI TS 103 636-4 [4].