

Recommendation

ITU-T Y.4229 (01/2025)

SERIES Y: Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities

Internet of things and smart cities and communities –
Requirements and use cases

Requirements and reference functional model for an Internet of things-based smart forest firefighting system

ITU-T Y-SERIES RECOMMENDATIONS

Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities

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Recommendation ITU-T Y.4229

Requirements and reference functional model for an Internet of things-based smart forest firefighting system

Summary

Recommendation ITU-T Y.4229 introduces a smart forest firefighting system based on the Internet of things (IoT), for which it specifies a reference functional model and requirements. The IoT-based smart forest firefighting system uses IoT and other technologies to realize full time and full space forest environment data perception and provides users with forest firefighting intelligent services before, during and after forest fire occurrence. Recommendation ITU-T Y.4229 aims to guide the design, development and implementation of the IoT-based smart forest firefighting system.

History *

Edition	Recommendation	Approval	Study Group	Unique ID
1.0	ITU-T Y.4229	2025-01-15	20	11.1002/1000/16024

Keywords

Internet of things, reference functional model, requirements, smart forest firefighting, use cases.

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Recommendation ITU-T Y.4229

Requirements and reference functional model for an Internet of things-based smart forest firefighting system

1 Scope

This Recommendation specifies the requirements and a reference functional model for a smart forest-firefighting system based on the Internet of things (IoT).

For the smart forest firefighting system, this Recommendation includes:

- an overview;
- a reference functional model;
- requirements.

Use cases of the IoT-based smart forest firefighting system are provided in Appendix II.

NOTE 1 – The smart forest firefighting system can also be applied to other wildland-firefighting scenarios, such as scrublands, grasslands or rangelands.

NOTE 2 – Unmanned aircraft system (UAS) flight and control requirements lie outside the scope of this Recommendation. Regulation and supervision lie outside the scope of this Recommendation. Any implementation based on this Recommendation should align with regional and national regulations.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [[ITU-T F.743.22](#)] Recommendation ITU-T F.743.22 (2022), *Requirements and architecture of an algorithm-training system for intelligent video surveillance*.
- [[ITU-T F.748.36](#)] Recommendation ITU-T F.748.36 (2024), *Requirements and framework of multi-algorithm scheduling systems*.
- [[ITU-T G.711](#)] Recommendation ITU-T G.711 (1988), *Pulse code modulation (PCM) of voice frequencies*.
- [[ITU-T H.264](#)] Recommendation ITU-T H.264 (V15) (2024), *Advanced video coding for generic audiovisual services*.
- [[ITU-T H.265](#)] Recommendation ITU-T H.265 (V10) (2024), *High efficiency video coding*.
- [[ITU-T T.81](#)] Recommendation ITU-T T.81 (1992), *Information technology – Digital compression and coding of continuous-tone still images – Requirements and guidelines*.
- [[ITU-T Y.4000](#)] Recommendation ITU-T Y.4000/Y.2060 (2012), *Overview of the Internet of things*.
- [[ITU-T Y.4100](#)] Recommendation ITU-T Y.4100/Y.2066 (2014), *Common requirements of the Internet of things*.

- [[ITU-T Y.4101](#)] Recommendation ITU-T Y.4101/Y.2067 (2017), *Common requirements and capabilities of a gateway for Internet of things applications*.
- [[ITU-T Y.4113](#)] Recommendation ITU-T Y.4113 (2016), *Requirements of the network for the Internet of things*.
- [[ITU-T Y.4215](#)] Recommendation ITU-T Y.4215 (2022), *Use cases, requirements and capabilities of unmanned aircraft systems for the Internet of things*.
- [ISO/IEC 15948] ISO/IEC 15948:2004, *Information technology – Computer graphics and image processing – Portable Network Graphics (PNG): Functional specification*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 device [ITU-T Y.4000]: With regard to the Internet of things, this is a piece of equipment with the mandatory capabilities of communication and the optional capabilities of sensing, actuation, data capture, data storage and data processing.

3.1.2 geographical information systems (GIS) [b-ISO 23611-6]: In the strictest sense, a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e., data identified according to their locations.

3.1.3 Internet of things (IoT) [ITU-T Y.4000]: A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

NOTE 1 – Through the exploitation of identification, data capture, processing and communication capabilities, the IoT makes full use of things to offer services to all kinds of applications, whilst ensuring that security and privacy requirements are fulfilled.

NOTE 2 – From a broader perspective, the IoT can be perceived as a vision with technological and societal implications.

3.1.4 IoT area network [ITU-T Y.4113]: A network of devices for the IoT and gateways interconnected through local connections.

3.1.5 satellite network [b-ITU-R V.573-4]: A satellite system or a part of a satellite system, consisting of only one satellite and the cooperating earth stations.

3.1.6 thing [ITU-T Y.4000]: With regard to the Internet of things, this is an object of the physical world (physical things) or the information world (virtual things), which is capable of being identified and integrated into communication networks.

3.1.7 unmanned aircraft system [b-ISO/IEC 22460-2]: Aircraft and its associated elements which are operated with no pilot on board.

3.1.8 wide area network [b-ITU-T Y.4409]: An IP based communication network that covers a wide geographical area including the Internet and accommodates devices and local area networks.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 smart forest firefighting system: A system that uses Internet of things and other technologies to realize full time and full space forest environment data perception and provide users with forest-firefighting intelligent services before, during and after forest fire occurrence.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

2D	two Dimensional
3D	three Dimensional
AI	Artificial Intelligence
CoAP	Constrained Application Protocol
DTLS	Datagram Transport Layer Security
EMC	Electromagnetic Compatibility
GIS	Geographical Information System
GNSS	Global Navigation Satellite System
IAN	IoT Area Network
IoT	Internet of Things
IP	Internet Protocol
JPEG	Joint Photographic Experts Group
O&M	Operation and Maintenance
PNG	Portable Network Graphics
RTP	Real-Time Transport Protocol
RTSP	Real-Time Streaming Protocol
SDG	Sustainable Development Goal
TS	Transport Stream
UAS	Unmanned Aircraft System
UDP	User Datagram Protocol
WAN	Wide Area Network

5 Conventions

In this Recommendation:

- The phrase "is required" indicates a requirement that must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.
- The phrase "is recommended" indicates a requirement that is recommended but which is not absolutely required. Thus, this requirement needs not be present to claim conformance.
- The phrase "can optionally" indicates an optional requirement that is permissible, without implying any sense of being recommended. These terms are not intended to imply that the vendor must include the option in their implementation, nor that the network operator or service provider must enable it if the feature is available. It rather means that the vendor may optionally provide the feature and still claim conformance with the specification.

6 Overview of smart forest firefighting system

Forests occupy one-third of the Earth's land area and play an important role in mitigating climate change, reducing air and noise pollution, providing livelihoods, food and water, and protecting biodiversity. In recent years, the frequent occurrence of forest fires has become a global issue.