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SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS,
NEXT-GENERATION NETWORKS, INTERNET OF
THINGS AND SMART CITIES

Next Generation Networks – Service aspects: Service
capabilities and service architecture

Service model of the agriculture information based convergence service

Recommendation ITU-T Y.2245

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For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T Y.2245

Service model of the agriculture information based convergence service

Summary

Agricultural data is the key foundation for smart farm models, in which a wide range of information and communication technology (ICT) such as the Internet of things and big data are converged, to be operated and managed. Given the fact that every single stage in smart farm models from crop growing to selling requires appropriate data, it is crucial to have a well-established service model for data collection and its provision. This service model should gather and process data before providing it for users to enhance their farm business. By convergence of various data collected from each stage of production, the model should ensure higher quality of service. During the production stage, the convergence services are provided to increase crop quality and yield and reduce farm maintenance costs. Recommendation ITU-T Y.2245 provides more details about the service model.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Agricultural information repository, production stage, smart farming.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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Recommendation ITU-T Y.2245

Service model of the agriculture information based convergence service

1 Scope

This Recommendation addresses the service model of the agriculture information based convergence service. The scope of this Recommendation includes:

- Concept and service requirements for agriculture information based convergence service,
- Reference architecture for agriculture information based convergence service,
- Service scenario for agriculture information based convergence service at the production stage.

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 T.135] | Recommendation ITU-T T.135 (2007), <i>User-to-reservation system transactions within T.120 conferences.</i> |
| [ITU-T Y.4450] | Recommendation ITU-T Y.4450/Y.2238 (2015), <i>Overview of Smart Farming based on networks.</i> |
| [ITU-T Y.2244] | Recommendation ITU-T Y.2244 (2019), <i>Service model for the cultivation plan service at the pre-production stage.</i> |
| [ITU-T Y.2701] | Recommendation ITU-T Y.2701 (2007), <i>Security requirements for NGN release 1.</i> |
| [ITU-T Y.3172] | Recommendation ITU-T Y.3172 (2019), <i>Architectural framework for machine learning in future networks including IMT-2020.</i> |
| [ITU-T Y.3600] | Recommendation ITU-T Y.3600 (2015), <i>Big data – Cloud computing based requirements and capabilities.</i> |

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 big data [ITU-T Y.3600]: A paradigm for enabling the collection, storage, management, analysis and visualization, potentially under real-time constraints, of extensive datasets with heterogeneous characteristics.

3.1.2 convergence service [b-ITU-T Y-Sup.3]: A service resulting from service convergence.

NOTE – In this Recommendation, service convergence is realized using content and functional convergence.

3.1.3 content convergence [b-ITU-T Y-Sup.3]: One aspect of the service convergence related to the combination or coordination of contents that are managed by different application service providers.

3.1.4 machine learning [ITU-T Y.3172]: Processes that enable computational systems to understand data and gain knowledge from it without necessarily being explicitly programmed.

3.1.5 service user [ITU-T T.135]: A person, an organization or any intermediate entity using the services provided by a service provider.

NOTE – Service users refer to farmers. Using the service will offer them chances to increase their crop yields, keep their crop growth at a consistent level, boost the efficiency of their equipment, and reduce their operational costs.

3.1.6 smart farming based on networks [ITU-T Y.4450]: A service that uses networks to actualize a convergence service in the agricultural field to attain more efficiency and quality improvement and to cope with various problems.

3.1.7 smart farming service provider [ITU-T Y.4450]: The service role that provides the requested smart farming services, such as providing a portal or consulting based on data gathered from agricultural fields, to requesting users.

NOTE – This Recommendation uses 'service provider' with the same meaning as that of 'smart farming service provider'.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 agriculture information: Information that refers to data used for the operation of smart farms, including raw data to analyse information related to the agro-industry, which becomes the basis of service and the service data, collected during/after the smart farming.

3.2.2 agro-industry: The agricultural activity of an area viewed as an industrial sector of the economy.

3.2.3 data convergence: Data processing that provides meaning to user-oriented customized information created based on the analysis of the relevance of large amounts of data.

NOTE – Service users are provided useful information resulting from data convergence of the overall data related to the agro-industry (e.g., seeding time decided by merging weather data and market data).

3.2.4 data convergence function: A function that provides meaning to user-oriented customized information created based on the analysis of the relevance of large amounts of data such as big data analysis or machine learning.

NOTE – This function should include AAA services.

3.2.5 data management function: A function that enables data collection, storage, management, monitoring, service delivery, and user feedback collection.

3.2.6 distribution data: Data related to the stages from shipment to selling of farm products, including shipments, loaded volume, origin and history, imported and exported volumes, grades, and price fluctuations.

3.2.7 growth data: Data consisting of information gathered from sensors, actuators, and environments that are required to grow and control crops, including data on environment, growth, production volume, and power usage.

3.2.8 information delivery: Sending information with guaranteed compatibility from service providers to service users.

3.2.9 information delivery function: A function to send information from service providers to service users with guaranteed compatibility.

3.2.10 smart farm: Farms that can control the growing environment for crops and livestock automatically and remotely by applying ICT to greenhouse farms, livestock farms, bare ground.

NOTE – This Recommendation focuses on greenhouse farms.

3.2.11 smart farming: The procedure that converges ICT with the overall agricultural process from production, processing, distribution, and consumption.

NOTE – This Recommendation focuses on the production stage of smart farming.

3.2.12 solution: Information to service users to increase their crop yields, keep their crop growth at a consistent level, boost the efficiency of their equipment, and reduce their operational costs, converged from data gathered in the agro-industry, in response to service users inquiry.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAA	Authentication, Authorization and Accounting
AIR	Agricultural Information Repository
CCTV	Closed Circuit Television
CPU	Central Processing Unit
DAS	Direct-attached Storage
DRM	Digital Right Management
DVR	Digital Video Recorder
EMI	Electro-Magnetic Interference
HDD	Hard Disk Drive
ICT	Information and Communication Technology
LED	Light-Emitting Diode
MPEG	Moving Picture Experts Group
OS	Operating System
PC	Personal Computer
RAM	Random Access Memory
UPS	Uninterruptible Power Supply

5 Conventions

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keywords "can optionally," "could" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

In this Recommendation, the words shall, shall not, should, and may sometimes appear, in which case they are to be interpreted, respectively, as is required to, is prohibited from, is recommended, and can optionally. The appearance of such phrases or keywords in an appendix or in material explicitly marked as informative are to be interpreted as having no normative intent.