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INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Internet protocol aspects – Architecture, access, network
capabilities and resource management

Customizable IP networks (CIP): Framework for the requirements and capabilities related to the customization of IP service networks by customers

Recommendation ITU-T Y.1292

ITU-T Y-SERIES RECOMMENDATIONS

GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

GLOBAL INFORMATION INFRASTRUCTURE

General	Y.100–Y.199
Services, applications and middleware	Y.200–Y.299
Network aspects	Y.300–Y.399
Interfaces and protocols	Y.400–Y.499
Numbering, addressing and naming	Y.500–Y.599
Operation, administration and maintenance	Y.600–Y.699
Security	Y.700–Y.799
Performances	Y.800–Y.899

INTERNET PROTOCOL ASPECTS

General	Y.1000–Y.1099
Services and applications	Y.1100–Y.1199
Architecture, access, network capabilities and resource management	Y.1200–Y.1299
Transport	Y.1300–Y.1399
Interworking	Y.1400–Y.1499
Quality of service and network performance	Y.1500–Y.1599
Signalling	Y.1600–Y.1699
Operation, administration and maintenance	Y.1700–Y.1799
Charging	Y.1800–Y.1899

NEXT GENERATION NETWORKS

Frameworks and functional architecture models	Y.2000–Y.2099
Quality of Service and performance	Y.2100–Y.2199
Service aspects: Service capabilities and service architecture	Y.2200–Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250–Y.2299
Numbering, naming and addressing	Y.2300–Y.2399
Network management	Y.2400–Y.2499
Network control architectures and protocols	Y.2500–Y.2599
Security	Y.2700–Y.2799
Generalized mobility	Y.2800–Y.2899

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

Recommendation ITU-T Y.1292

Customizable IP networks (CIP): Framework for the requirements and capabilities related to the customization of IP service networks by customers

Summary

Recommendation ITU-T Y.1292 describes the framework for requirements and capabilities to enable the customization of IP networks and related IP service and IP transfer capability to meet the customer's needs. Such a framework includes the service requirements and functional requirements and capabilities as well as the architectural considerations.

In addition, this Recommendation identifies the application scenarios and service procedures applicable to the context of customization using the capabilities made available to and/or performed by the customer of IP services.

Source

Recommendation ITU-T Y.1292 was approved on 12 September 2008 by ITU-T Study Group 13 (2005-2008) under Recommendation ITU-T A.8 procedures.

FOREWORD

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CONTENTS

Page

1	Scope	1
2	References.....	1
3	Terms and Definitions	2
3.1	Terms defined elsewhere	2
3.2	Terms defined in this Recommendation.....	2
4	Abbreviations and acronyms	3
5	Conventions	4
6	Overview	4
6.1	Service aspects.....	4
6.2	General customization model	4
6.3	Service level agreements (SLAs)	5
6.4	Menu-based network customization capabilities.....	6
6.5	Customer expectations.....	7
6.6	Network capability requirements	7
7	Functional capabilities.....	8
7.1	Overview	8
7.2	Naming, addressing and identification capabilities	8
7.3	End-user grouping capability	9
7.4	Application clustering capability.....	9
7.5	Information navigation and query capabilities	9
7.6	Auto-discovery and auto-configuration capabilities	9
7.7	Information access control and security capabilities.....	10
7.8	End-to-end transparency capability	10
7.9	Connection configuration capability	11
7.10	Routing and forwarding control capabilities	11
7.11	Alternative path selection and multi-homing capabilities	12
7.12	Mobility control and management capabilities	12
7.13	Traffic measurement and usage parameter control capabilities	13
7.14	SLA negotiation capabilities	13
7.15	End-to-end QoS provision and priority assignment capabilities.....	13
7.16	Information storage and directory processing capabilities.....	13
7.17	Segment OAM and end-to-end OAM capabilities	14
7.18	Virtual private network configuration capability	14
7.19	Billing and charging capabilities	14
7.20	Client/server management and agent management capabilities.....	15
8	Security considerations.....	15

	Page
Appendix I – Service procedures and applications scenarios	17
I.1 Customizable personal directory services	17
I.2 Customizable access control services.....	20
I.3 Customizable end-to-end QoS services.....	23
I.4 End-user customizable location monitoring services	26
I.5 Customizable home networking services	29
I.6 Client networking services with QoS and security.....	31
Appendix II – Example of functional architecture and service creation scenario for end- user customizable VPN services.....	34
Bibliography.....	36

Introduction

Recommendation ITU-T Y.1292 describes the framework for requirements and capabilities to enable the customization of IP networks and related IP service and IP transfer capability to meet the customer's needs (see Recommendations ITU-T Y.1001 and ITU-T Y.1241).

The framework provided in this Recommendation includes an architectural model, high-level service requirements and functional capabilities. In addition, this Recommendation identifies the application scenarios and service procedures applicable to the context of customization using the capabilities made available to and/or performed by the customer of IP services.

In general, customization refers to the degree of manageability or controllability as exercised by the customer via a suitable agent. Such agent-based architecture is based on principles similar to those described in Recommendations ITU-T X.160 and ITU-T Y.130.

Recommendation ITU-T Y.1292

Customizable IP networks (CIP): Framework for the requirements and capabilities related to the customization of IP service networks by customers

1 Scope

This Recommendation covers the following:

- General overview and description of concepts related to the customization of IP services and related IP network aspects.
- General model of a customizable IP network from the end user's perspective.
- Definition of and requirements for the service capabilities offered to an end user for customization purposes.
- Functional capabilities that can be controlled by the end user of a customizable IP network.

In addition, Appendix I provides a description of application scenarios and service procedures used by the end user of a customizable IP network.

Note that the scope is restricted to IP networks when IP layer networks as defined in [ITU-T G.809] and operation within the NGN transport stratum as defined in [ITU-T Y.2011] are considered.

The detailed mechanisms for supporting the capabilities of a customizable IP network are not covered by the scope of this Recommendation.

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 G.809] Recommendation ITU-T G.809 (2003), *Functional architecture of connectionless layer networks*.
<<http://www.itu.int/rec/T-REC-G.809>>
- [ITU-T M.60] Recommendation ITU-T M.60 (1993), *Maintenance terminology and definitions*.
<<http://www.itu.int/rec/T-REC-M.60>>
- [ITU-T M.3050.x] Recommendations ITU-T M.3050.x-series (2007), *Enhanced Telecom Operations Map (eTOM)*.
<<http://www.itu.int/rec/T-REC-M>>
- [ITU-T M.3060] Recommendation ITU-T M.3060/Y.2401 (2006), *Principles for the Management of Next Generation Networks*.
<<http://www.itu.int/rec/T-REC-M.3060>>
- [ITU-T Y.1001] Recommendation ITU-T Y.1001 (2000), *IP framework – A framework for convergence of telecommunications network and IP network technologies*.
<<http://www.itu.int/rec/T-REC-Y.1001>>

- [ITU-T Y.1241] Recommendation ITU-T Y.1241 (2001), *Support of IP-based services using IP transfer capabilities*.
<<http://www.itu.int/rec/T-REC-Y.1241>>
- [ITU-T Y.1311] Recommendation ITU-T Y.1311 (2002), *Network-based VPNs – Generic architecture and service requirements*.
<<http://www.itu.int/rec/T-REC-Y.1311>>
- [ITU-T Y.1711] Recommendation ITU-T Y.1711 (2004), *Operation & Maintenance mechanism for MPLS networks*.
<<http://www.itu.int/rec/T-REC-Y.1711>>
- [ITU-T Y.2011] Recommendation ITU-T Y.2011 (2004), *General principles and general reference model for Next Generation Networks*.
<<http://www.itu.int/rec/T-REC-Y.2011>>

3 Terms and definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 customer [ITU-T M.3050.x]: The customer buys products and services from the enterprise or receives free offers or services. A customer may be a person or a business.

3.1.2 IP service [ITU-T Y.1001]: A data transmission service in which the data that is transferred across the interface between the user and provider is in the form of IP (Internet protocol) packets (sometimes called datagrams).

NOTE – The IP (network) service includes the service provided using the IP transfer capability.

3.1.3 IP transfer capability [ITU-T Y.1241]: IP transfer capability is defined as the set of network capabilities provided by the IP layer. It may be characterized by the traffic contract as well as the performance attributes supported by the control and management functions of the underlying protocol layers.

3.1.4 service level agreement [ITU-T Y.1241]: Service level agreement (SLA) is a negotiated agreement between a customer and the service provider regarding the levels of service characteristics and associated set of metrics. The content of an SLA varies depending on the service offering and includes the attributes required for the negotiated agreement.

3.1.5 end user (user) [ITU-T M.3050.x]: The end user is the actual user of the products or services offered by the enterprise. The end user consumes the product or service.

NOTE – Typically, the (end) user is a person or a machine delegated by a customer to use the services and/or facilities of a telecommunication network.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 customize: This involves ensuring the suitability to the individual requirements of a customer.

3.2.2 customizable: This refers to the capability of being customized.

3.2.3 customizable IP network (CIP): This is an IP network that is capable of being customized in accordance with and by the capabilities specified within this Recommendation.

3.2.4 customization: This refers to the result of being customized.

3.2.5 manageable: This refers to the capability of being managed.

3.2.6 manageability: This pertains to the characteristic of being manageable.

3.2.7 CIP provider: The provider using a customizable IP network.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAA	Authentication, Authorization and Accounting
CBR	Constant Bit Rate
CDR	Charging Data Record
CIP	Customizable Internet Protocol network
CIPA	Customizable Internet Protocol network Agent
CoS	Class of Service
CPE	Customer Premises Equipment
C-Plane	Control Plane
DIB	Directory Information Base
DNS	Domain Name Service
eTOM	Enhanced Telecom Operations Map
FTP	File Transfer Protocol
HTTP	HyperText Transfer Protocol
IP	Internet Protocol
M-Plane	Management Plane
MPLS	Multi-Protocol Label Switching
P2P	Point-to-Point
P2MP	Point-to-Multipoint
PABX	Private Automatic Branch Exchange
PDA	Personal Digital Assistant
PKI	Public Key Infrastructure
QoS	Quality of Service
QUA	Quality of Service User Agent
RFID	Radio Frequency Identifier
RGW	Residential Gateway
SIP	Session Initiation Protocol
SLA	Service Level Agreement
SLS	Service Level Specification
SOAP	Simple Object Access Protocol
UNI	User-to-Network Interface
U-Plane	User Plane
UPC	Usage Parameter Control



URI	Uniform Resource Identifier
URL	Uniform Resource Locator
VBR	Variable Bit Rate
VNF	Virtual Networking Function
VPN	Virtual Private Network
VTR	Video Tape Recorder
XML	eXtensible Markup Language

5 Conventions

In this Recommendation, words such as manage and control (and derivatives thereof) are used in the general English dictionary sense rather than in the specific sense of the M-series or Q-series Recommendations. When specific usage in the sense of the M-series or Q-series Recommendations is required, specific indications are made.

6 Overview

6.1 Service aspects

The main objective of a CIP network is to provide customers with the ability to manage and control certain aspects of the IP service they have subscribed to and the related IP network technology facilitating the IP service.

A certain degree of autonomy on the part of the customer and/or individual end user (within the customer organization) is desirable. For example, a customer will find it advantageous to be able to:

- Select the set of end users, which may be human, terminal equipment or applications permitted to use the IP service within the given customer organization.
- Create and customize services and network configurations (e.g., virtual private networks (VPNs)) with the relevant network resources provided by the customizable IP (CIP) provider to the customer.
- Select, control and/or manage various features of the services. For example, the customer can negotiate the service level agreements (SLAs) offered by the CIP provider related to QoS and network performance objectives, as well as the security requirements and capabilities.

In general, various degrees or levels of customization capabilities can be offered to the customer depending on the level of sophistication of the available customization capabilities.

NOTE 1 – When the customer is an organization, several end users of this organization can be connected to the CIP network. In particular, several end users can be connected to the CIP network using the same UNI (user-to-network interface) as defined and provided by the CIP provider, i.e., at the interface deemed to demarcate the end of the CIP provider's jurisdiction and the beginning of the end user's jurisdiction, and within the scope of the customer in question.

NOTE 2 – This Recommendation follows the general principles established in [ITU-T Y.1311], as applicable, although the scope is not restricted to VPN situations.

6.2 General customization model

Figure 1 illustrates the customization model applicable to a CIP network.

Acting on behalf of its own organization and/or on behalf of the end users within the customer organization, the customer interacts with the CIP provider to achieve the desired customizations. The customer interacts with the CIP provider through the CIP agent.

The customer may also delegate some customization responsibilities to its end users within the bounds of the privilege allocated to such end users. This is indicated by the broken arrows.

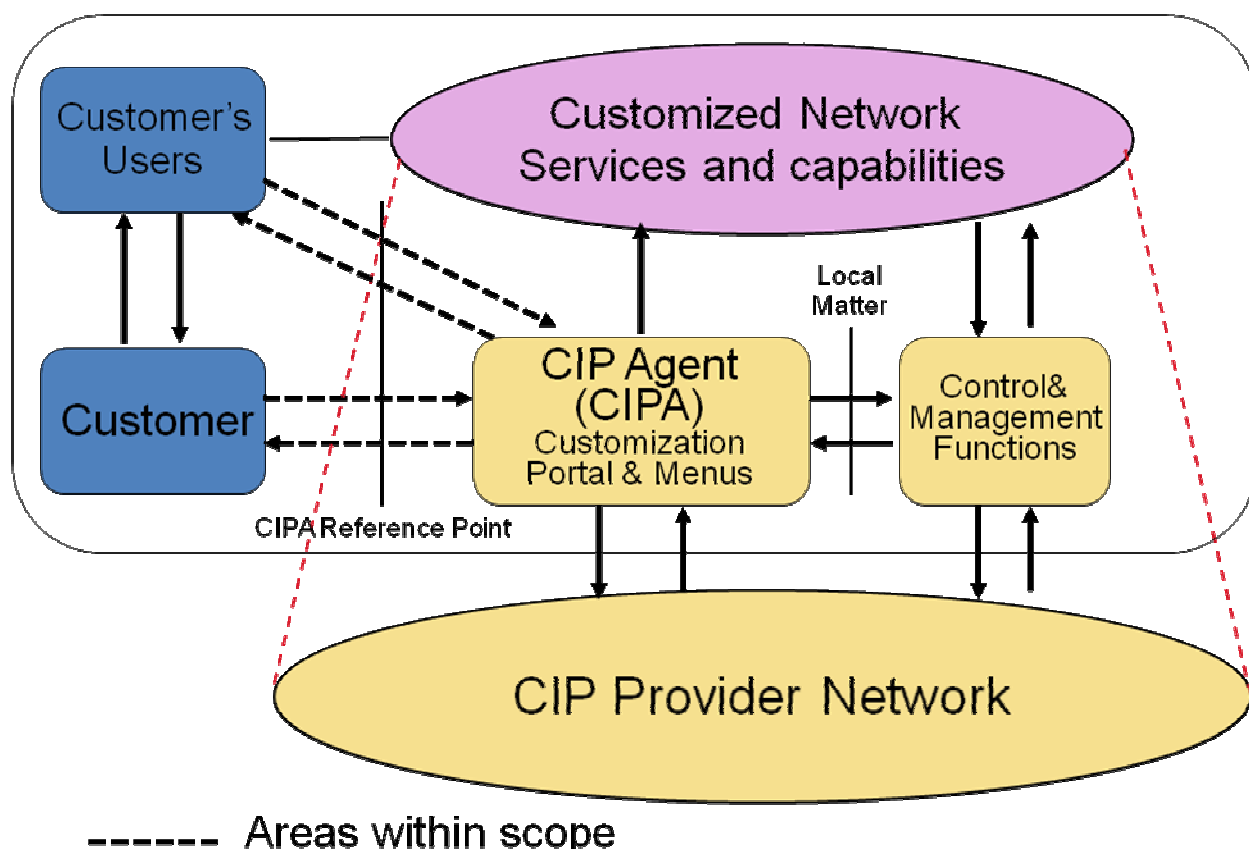


Figure 1 – General customization model

The agent concept shown in Figure 1 is similar to the principles described in [b-ITU-T X.160] and [b-ITU-T Y.130].

The control and management functions used by the CIP agent may consist of a number of appropriate systems, such as the following:

- Systems based on the NGN management principles specified in [ITU-T M.3060].
- Systems based on the eTOM business framework specified in [ITU-T M.3050.x].

The linkage between the CIP agent and such systems is out of scope of this Recommendation and may be subject to local considerations as described in [b-ITU-T X.160].

6.3 Service level agreements (SLAs)

The CIP provider supplies its customers (and related end users) with IP network connectivity services based on the negotiated SLAs [ITU-T Y.1241]. An SLA specifies the customer/end user requirements that the CIP provider is committed to.

An SLA defines the level of the quality of services to be provided, setting performance objectives to be achieved by the CIP provider. It also defines the procedures and reports that must be provided to track and ensure compliance with the negotiated SLA.

For given types of applications requiring more than best-effort types of SLA, the customer (and related end users) can optionally negotiate SLAs with performance requirements such as bandwidth, delay and loss performance.

An SLA can ensure the performance and availability of the CIP network to the customer and its end users. Reliability and availability are the key objectives that the CIP provider may have to fulfil in order to support a negotiated SLA. The capabilities defined in a given negotiated SLA may be activated on demand (as a result of an end user's request) or provided at the subscription time. Depending on the SLA negotiated with the customer, the CIP provider may have to control and manage the corresponding resources in the underlying CIP network.

6.4 Menu-based network customization capabilities

6.4.1 Introduction

The capabilities provided by the CIP provider allow the customers (and even end users within the customer organization) to have different levels of control and management over the relevant network resources of the customizable network. Customer and end-user access to network capabilities are provided by a set of menus (e.g., available via a web portal). Depending on the service contract, such menus can allow the further specification of SLA parameters.

Network capabilities can be negotiated through a menu system that can exhibit individual CIP features related to the network itself and/or services, as well as their combinations. Network features can include storage resources, bandwidth and processing time. Service resources include relevant resources required for the support of distance learning, telecommuting, electronic commerce, telemedicine and online entertainment. Other features, such as controlling/managing a group of end users forming a VPN, are accessible. In addition, some features can relate to associated supported technologies and service architectures such as resources related to databases, secure networks, the Internet or Java.

The detailed mechanisms for the support of customization and related management and/or control mechanisms are out of the scope of this Recommendation.

6.4.2 Levels of resource manageability

One feature of customization is the ability to select the degree of resource manageability required. Table 1 introduces the concept of resource manageability levels. Note that the levels described in Table 1 are only examples of resource manageability levels that can be offered by a CIP provider.

Table 1 – Levels of resource manageability

Level	Description	Features	Remarks
0	No manageability	No monitoring, no resource control	- No mechanism to detect network faults and congestion - No mechanism to control network resources
1	Overall network resource manageability	Overall monitoring, no resource control	- Notify the overall network fault and resource status by CIP provider - No resource control by the customer
2	Group-level resource manageability	Group-level resource monitoring and control	- Notify the group-level network fault and resource status by CIP provider - Customer managing the group-level resources
3	Individual resource manageability	Individual-level resource monitoring and control	- Notify the individual network fault and resource status for end-to-end connectivity - End user managing the end-to-end resources

Manageability level 2 ("group-level resource manageability") corresponds to the case where network resources are to be manageable on the basis of end-user groups. A typical case is VPN where the corresponding network resources are shared between end users.