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GENERAL RECOMMENDATIONS ON TELEPHONE SWITCHING AND SIGNALLING INTELLIGENT NETWORK

INTELLIGENT NETWORK DISTRIBUTED FUNCTIONAL PLANE ARCHITECTURE

ITU-T Recommendation Q.1204

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The 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 Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation Q.1204 was prepared by the ITU-T Study Group XI (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

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

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SUMMARY

This Recommendation defines a general intelligent network (IN) distributed functional plane (DFP) architecture within the overall framework of the IN conceptual model described in Recommendation I.312/Q.1201. As such, this Recommendation provides the basis for developing the Q.12x4 Recommendations to specify the IN DFP for a given capability set x (CS-x).

This Recommendation provides the basis for Q.12x4 Recommendations by:

- defining the IN DFP architecture in terms of groupings of functionality, referred to as functional entities, and the information that flows between functional entities, referred to as relationships;
- identifying study subjects for the modelling of functional entities related to IN-supported call/service logic processing to determine the nature of the relationships between them; and
- providing tools for the modelling of functional entities in a manner consistent with IN objectives, as appropriate for a given CS.

While the IN DFP architecture and modelling tools in this Recommendation have proven extremely useful in processing IN standardization, they do not necessarily represent an ultimate view of IN evolution. As such, this Recommendation represents a current understanding that may require future enhancements as the ultimate view of IN is refined.

Within the Q.120x-Series Recommendations, this Recommendation describes the distribution of global functional plane functionality defined in Recommendation I.329/Q.1203 (i.e. service independent building blocks) in a service and vendor/implementation independent manner. This provides the flexibility to allocate distributed functionality into multiple physical network configurations, as described in Recommendation Q.1205, and to evolve IN from an initial CS (e.g. CS-1) to some future CS-n. It also provides a framework from which IN protocols are specified, as described in Recommendation Q.1208.

Recommendation Q.1204**INTELLIGENT NETWORK DISTRIBUTED FUNCTIONAL
PLANE ARCHITECTURE***(Helsinki, 1993)***1 General**

The requirements and assumptions for the IN distributed functional plane (DFP) architecture are as follows:

- a) The DFP architecture is consistent with the framework defined by the IN conceptual model:
 - it identifies the specific elements and the relationship between them that are necessary to support the objectives of IN;
 - the DFP architecture models the functions to be performed in IN structured networks.
- b) The DFP architecture provides the flexibility to support a large variety of services and facilitates the evolution of IN by organizing the functional capabilities in an open-ended and modular structure to achieve service independence.
- c) The DFP architecture is vendor/implementation independent, thereby providing the flexibility for multiple physical networking configuration and placing no constraints on national network architecture beyond the network and interface standards which will be developed for IN structured networks.
- d) The definition of the DFP architecture initially accommodates service execution capabilities and will accommodate service creation and service and network management capabilities when they become available.

2 Distributed functional plane model

Figure 2-1 identifies the IN DFP model.

2.1 Explanation of diagram**2.1.1 Functional entities**

A functional entity is a unique group of functions in a single location and a subset of the total set of functions required to provide a service. One or more functional entities can be located in the same physical entity. Different functional entities contain different functions, and may also contain one or more of the same functions. In addition, one functional entity cannot be split between two physical entities; the functional entity is mapped entirely within a single physical entity. Finally, duplicate instances of a functional entity can be mapped to different physical entities, though not the same physical entity.

Functional entities are represented by ovals in the functional model diagram.

Functional entities are assigned unique FUNCTIONAL ENTITY IDENTIFIERS (e.g. CCF, for call control function).

Functional entity descriptions do not include utility/housekeeping functions which are not directly involved in providing a service. This explains why there is no functional entity identified to describe the communication between functional entities.

The physical location of a function is not the only criteria for grouping functions into a functional entity. Functional entity grouping criteria should take into consideration all technological and business requirements.

**Documents**

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Recommendation Q.1204 (03/93)**1**



CCAF	Call control agent function
CCF	Call control function
SCEF	Service creation environment function
SCF	Service control function
SDF	Service data function
SMAF	Service management access function
SMF	Service management function
SRF	Specialised resource function
SSF	Service switching function

NOTES

- 1 The two SSF/CCF have identical functionality and are only shown for some procedures like assist.
2 The definitions of CCAF and CCF are based on corresponding Q.71 ISDN definitions, but may be modified for use in IN.

FIGURE 2-1/Q.1204
IN distributed functional plane model

2.1.2 Relationships

Each interaction between a communicating pair of functional entities in the model is termed an “information flow”. The relationship between any communicating pair of functional entities in the model is defined by a set of information flows.

Functional entity relationships are the lines between functional entities in the functional model diagram.

Relationships may have TYPE identifiers assigned, which uniquely identify specific sets of information flows within the model (e.g. r1, r2, etc.). The same relationship type may occur more than once in a functional model.

If the model does not show a line between functional entities, there is no identified relationship which requires standardization between them.

If a communicating pair of functional entities is located in physically separate entities, the relationship between them defines the information transfer requirements for a protocol between the physical entities.

2.3 Definition of functional entities related to IN service execution

The CCA function (CCAF): The CCAF is the call control agent (CCA) function that provides access for users. It is the interface between user and network call control functions. It

- a) provides for user access, interacting with the user to establish, maintain, modify and release, as required, a call or instance of service;
- b) accesses the service-providing capabilities of the call control function (CCF), using service requests (e.g. setup, transfer, hold, etc.) for the establishment, manipulation and release of a call or instance of service;
- c) receives indications relating to the call or service from the CCF and relays them to the user as required;
- d) maintains call/service state information as perceived by this functional entity.

The CC function (CCF): The CCF is the call control (CC) function in the network that provides call/connection processing and control. It

- a) establishes, manipulates and releases call/connection instances as "requested" by the CCAF;
- b) provides the capability to associate and relate CCAF functional entities that are involved in a particular call and/or connection instance (that may be on SSF requests);
- c) manages the relationship between CCAF functional entities involved in a call (e.g. supervises the overall perspective of the call and/or connection instance);
- d) provides trigger mechanisms to access IN functionality (e.g. passes events to the SSF);
- e) is managed, updated and/or otherwise administered for its IN-related functions (i.e. trigger mechanisms) by a service management function (SMF).

The SS function (SSF): The SSF is the service switching (SS) function, which, associated with the CCF, provides the set of functions required for interaction between the CCF and a service control function (SCF). It

- a) extends the logic of the CCF to include recognition of service control triggers and to interact with the SCF;
- b) manages signalling between the CCF and the SCF;
- c) modifies call/connection processing functions (in the CCF) as required to process requests for IN provided service usage under the control of the SCF;
- d) is managed, updated and/or otherwise administered by an SMF.

The SC function (SCF): The SCF is a function that commands call control functions in the processing of IN provided and/or custom service requests. The SCF may interact with other functional entities to access additional logic or to obtain information (service or user data) required to process a call/service logic instance. It

- a) interfaces and interacts with service switching function/call control function, specialized resource function (SRF) and service data function (SDF) functional entities;
- b) contains the logic and processing capability required to handle IN provided service attempts;
- c) interfaces and interacts with other SCFs, if necessary;
- d) is managed, updated and/or otherwise administered by an SMF.

The SD function (SDF): The SDF contains customer and network data for real time access by the SCF in the execution of an IN provided service. It

- a) interfaces and interacts with SCFs as required;
- b) interfaces and interacts with other SDFs, if necessary;
- c) is managed, updated and/or otherwise administered by an SMF.

NOTE – The SDF contains data relating directly to the provision or operation of IN provided services. Thus it does not necessarily encompass data provided by a third party such as credit information, but may provide access to these data.

The SR function (SRF): The SRF provides the specialized resources required for the execution of IN provided services (e.g. digit receivers, announcements, conference bridges, etc.). It

- a) interfaces and interacts with SCF and SSF (and with the CCF);
- b) is managed, updated and/or otherwise administered by an SMF;
- c) may contain the logic and processing capability to receive/send and convert information received from users;
- d) may contain functionality similar to the CCF to manage bearer connections to the specialized resources.

2.4 Definition of IN service creation/management related functional entities

service creation environment function (SCEF): This function allows services provided in an intelligent network to be defined, developed, tested and input to SMF. Output of this function would include service logic, service management logic, service data template and service trigger information.

service management access function (SMAF): This function provides an interface between service managers and the SMF.

It allows service managers to manage their services (through access to the SMF).

service management function (SMF): This function allows deployment and provision of IN provided services and allows the support of ongoing operation.

Particularly, for a given service, it allows coordination of different SCF and SDF instances, e.g.:

- billing and statistic information are received from the SCFs, and made available to authorized service managers through the SMAF;
- modifications in service data are distributed in SDFs, and it keeps track of the reference service data values.

The SMF manages, updates and/or administers service related information in SRF, SSF and CCF.

NOTE – The relation between TMN (see Recommendation M.30), SMAF and SMF is for further study.

3 Functional entity call/service logic processing models

3.1 General

IN call/service logic processing encompasses call and connection processing in the SSF/CCF, service logic execution in the SCF, and the use of supporting resources and data in the SRF and SDF, respectively. This subclause describes this IN call/service logic processing in terms of call modelling and modelling of service logic processing.

- Call modelling provides a high-level service and vendor/implementation independent abstraction of IN call and connection processing in the SSF and CCF. This abstraction provides an observable view of SSF/CCF activities and resources to the SCF, enabling the SCF to interact with the SSF in the course of executing service logic.

- The modelling of service logic processing provides an abstraction of SCF activities and resources needed to support this service logic execution, as well as an abstraction of SRF and SDF activities and resources accessible to the SCF.

Since this modelling only provides an observable (i.e. external) view of SSF/CCF, SCF, SRF, and SDF activities and resources, this modelling does not imply an obligation to vendors to implement functional entities into products as a one-to-one mapping of functional entity model components.

3.2 Modelling objectives/criteria

3.2.1 Call modelling objectives/criteria

The general call modelling objectives/criteria are given below. The call model should:

- a) provide a high-level vendor/implementation independent abstraction of call and connection processing that implies:
 - a generic call model supporting all user access technologies under consideration for a given capability set; and
 - uniformity of functions across multiple vendor products;
- b) present an observable view of an SSF/CCF to an SCF;
- c) take into account the existing base of evolvable network technology and the longer term need in its continuing evolution by providing an overall IN call and connection processing structure from which useable, coherent subsets of capabilities, as well as optional capabilities, can be defined as appropriate for a given capability set;
- d) provide a framework for defining the information flows (relationships) between an SSF and an SCF, without any assumptions about the physical implementation or distribution of functions:
 - this implies the need to support one or more concurrent instances of the SCF interacting with an SSF/CCF on a single call attempt (given in item g));
- e) provide a framework for defining triggering requirements;
- f) provide a framework for ensuring correct sequencing of functions within an SSF/CCF; and
- g) provide rules of representing and handling service logic instance interactions to support:
 - multiple concurrent instances of IN service logic on a single call;
 - concurrent instances of IN service logic and non-IN service logic (e.g. existing switch-based features logic) on a single call.

3.2.2 Modelling of service logic processing objectives/criteria

The general objectives/criteria for modelling of service logic processing are given below. This modelling should:

- a) provide a high-level vendor/implementation independent abstraction of service logic processing in the SCF, specialized resources in the SRF, and service data in the SDF that implies uniformity of functions across multiple vendor products;
- b) characterize the capabilities of an SRF and SDF made available to an SCF;
- c) take into account the existing base of evolvable network technology and the longer term need in its continuing evolution by providing an overall IN service logic processing structure from which useable, coherent subsets of capabilities, as well as optional capabilities, can be defined as appropriate for a given capability set;
- d) provide a framework for defining the information flows (relationships) between an SRF and an SCF and between an SDF and an SCF, without any assumptions about the physical implementation or distribution of functions.