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SERIES Q: SWITCHING AND SIGNALLING

Service modelling: Evolution to the use of object oriented techniques

ITU-T Q-series Recommendations – Supplement 29

(Formerly CCITT Recommendations)

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Supplement 29 to ITU-T Q-series Recommendations

Service modelling: Evolution to the use of object oriented techniques

Summary

This Supplement compares different types of methodologies for service modelling to determine their suitability in relation to protocol development for IN in the IN CS-4 time-frame. It also investigates the evolution from SIB based techniques and considers different technologies such as APIs.

This Supplement supplements the information contained within Recommendation Q.65.

Rational

The purpose of this Supplement is to provide a discussion of service modelling aspects related to IN CS-4.

Source

Supplement 29 to ITU-T Q-series Recommendations was prepared by ITU-T Study Group 11 (1997-2000) and approved under the WTSC Resolution 5 procedure on 3 December 1999.

FOREWORD

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

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NOTE

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Service modelling: Evolution to the use of object oriented techniques

1 Scope of service modelling for IN CS-4

The purpose of this Supplement is:

- to identify and compare different methodologies for service modelling;
- to determine the suitability of the identified methodologies for service modelling, in particular, with respect to:
 - service management: data modelling;
 - service logic purposes: dynamic service model (behaviour of service logic);
 - description of the relationship between the data model and the dynamic service model.
- to determine the suitability of the identified methodologies for protocol development, in particular, with respect to:
 - the support of stepwise refinement from service and network capabilities to protocol level both for the data model and the dynamic service model;
 - the ability to incorporate the existing protocol into the model defined with the used methodology.
- to investigate the migration aspects of service modelling, in particular, with respect to:
 - the evolution from the SIB-based service modelling methodology to the methodologies used for IN CS-4.
- to decide on the scope of service modelling for IN CS-4;
- to decide on the methodology to be applied for service modelling in IN CS-4.

1.1 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Supplement. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Supplement 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 and supplements is regularly published.

- ITU-T Recommendations Q.122x series, *IN CS-2 Recommendations*.
- ITU-T Recommendation Q.1223 (1997), *Global functional plane for intelligent network capability set 2*.
- ITU-T Recommendation Z.100 (1999), *Specification and description language (SDL)*.

2 Definitions and abbreviations

2.1 Abbreviations

This Supplement uses the following abbreviations:

API	Application Programming Interface
GFP	Global Functional Plane
INCM	IN Conceptual Model
ODP	Open Distributed Processing
OMT	Object Modelling Technique
SDL	Specification Description Language
SQL	Structured Query Language
STD	State Transition Diagrams
TINA	Telecommunication Information Networking Architecture

2.2 Definitions

This Supplement defines the following terms:

2.2.1 API: an API is essentially a set of operations (or methods) that can be invoked on a component, each of which causes the component to exhibit behavioural functionality. Each operation is specified syntactically as an identifier which identifies the operation being invoked, and parameters which affect the behaviour of the component in some way.

2.2.2 API Call: an API call is equivalent with the term "operation" and is sometimes interchangeably used in the description of an API (above). Effectively an API is made up of a number of individual API calls.

3 Requirements for IN CS-4 service modelling

This clause looks at the requirements that are seen to be important for modelling techniques and methodologies used for IN service modelling, they are:

- **Stepwise refinement** from service (features) to protocol level should be supported.
- Support for various mechanisms of **transparency**. These include:
 - *Technology transparency:* the modelling of IN services should not be dependent on the technology used, e.g. the type of network, operation system or programming language. An important type of transparency in the context of IN CS-4 service modelling is network technology transparency. The objective of IN CS-4 is the integration of a number of network technologies, including connection oriented type of networks (e.g. PSTN, IMT-2000) and connectionless types of networks (e.g. IP-based networks, data networks). Some of the services targeted in IN CS-4 will probably be specific to one network technology, others will require interworking between different network technologies, or their behaviour will depend on the technology the service is invoked from. One could think of a service with user interaction, which can be invoked by B-ISDN as well as mobile network users, or of a multimedia conference service over different network technologies. IN could be an integrated architecture for the services on multiple network technologies. It should be investigated to what extent network technology transparency can be achieved.

- *Access* transparency: masking differences in data representation and invocation mechanisms (i.e. providing multiple mappings of the information contents of IN protocol exchanges to programming APIs).
 - *Failure* transparency: masking, from an object, the failure and possible recovery of objects (including itself).
 - *Migration* transparency: masking, from an object, the ability of a system to change the location of interfaces to that object.
 - *Relocation* transparency: masking relocation of an object interface from other interfaces bound to it.
 - *Replication* transparency: masking use of a group of mutually behaviourally compatible objects to support an interface.
- **Service extensibility:** it should be possible to support additions to the IN service functionality by extending the existing service models and existing service components.
 - **Service scalability:** it should be possible to accommodate and allow to scale the service capabilities in terms of the number of users, the number of nodes, the number of administrative domains, etc.
 - **Service version handling:** service-modelling techniques should facilitate the concurrent use of multiple versions of service models and service components.
 - **Service reusability:** it should be possible to reuse the models of an IN service (capability) during the specification of another IN service, rather than starting the modelling from scratch even in case of overlapping functionality. The same applies to the software components that implement the specification.
 - **Operation, administration and maintenance:** the methodologies and modelling techniques should support flexibility when it comes to functionality and data model changes during operation, administration and maintenance. For example, functionality changes that occur during maintenance should be easily reflected in the model of the IN service.
 - **Reduction of service conflict:** the methodologies and modelling techniques should reduce the risks of service interactions.
 - **Flexible service modification/customization:** the network providers and service providers should be able to differentiate and customize services to meet specific market needs.
The Users should be able to customize the services to some extent to meet their personal needs. In the short term it will be limited to data customization and selection from a list of predefined features. In the longer term service packaging might be provided as well.
 - **Support for a multi-stakeholder environment:** the IN CS-4 service capability modelling should be able to take into account the respective roles of the different stakeholders involved in the service provisioning (retailer, operator, content provider, etc.).

3.1 Service modelling

One of the goals of OO modelling is to allow the service developer and designers to share the same model of Service Logic. In order to achieve this goal the modelling technique should hide all platform details from the user but at the same time allow the service developer to translate the behaviour model into the suitable execution form. In order to meet those requirements it is proposed that the behaviour modelling technique be represented in the notation which is programming language, operating system and database independent. The use of data-less SDLs and State Transition Diagrams is thus proposed to represent pure behaviour of an abstract class.