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

Next Generation Networks – Frameworks and functional architecture models

Functional requirements and architecture for the next generation network multimedia communication centre service

Recommendation ITU-T Y.2023

International Telecommunication Union

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Recommendation ITU-T Y.2023

Functional requirements and architecture for the next generation network multimedia communication centre service

Summary

The multimedia communication centre (MCC) provides a set of advanced services beyond traditional communication services. The MCC enables a service provider to deliver communication services to individual and enterprise customers. The objective of Recommendation ITU-T Y.2023 is to identify and describe the functional requirements, architecture and key procedures of the MCC.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Y.2023	2012-04-22	13

Keywords

Functional architecture, master agent, MCC service, mobile agent, multimedia communication centre (MCC), NGN, RTWG, subagent.

FOREWORD

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1 Scope

This Recommendation, based on [ITU-T Y.2012], covers extended features in order to support applications and services for the multimedia communication centre (MCC).

This Recommendation describes functional requirements, architecture, and entities of the MCC in order to support next generation network (NGN) service requirements and capabilities.

This Recommendation covers:

– support of requirements and capabilities defined in [ITU-T Y.2216] from an architectural viewpoint;

– functional requirements of the NGN architecture to support applications and services of the MCC;

– functional architecture, entities extensions, and procedures for applications and services of the MCC.

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 Y.2012] Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of next generation networks.*

[ITU-T Y.2216] Recommendation ITU-T Y.2216 (2010), *NGN capability requirements to support the multimedia communication centre service.*

[ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN release 1*.

[ITU-T Y.2702] Recommendation ITU-T Y.2702 (2008), *Authentication and authorization requirements for NGN release 1*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 customer [b-ITU-T M.3050.1]: The customer buys products and services from the enterprise or receives free offers or services. A customer may be a person or a business.

NOTE – In the MCC service, the customers can experience advanced customer services offered by enterprises by communicating through the NGN.

3.1.2 enterprise [ITU-T Y.2216]: The enterprise is responsible for delivering products and services to the customer.

NOTE – In MCC service by using the multimedia communication centre capabilities provided by NGN, each enterprise can provide its own advanced customer services, such as business consultation, sale promotion, etc.

3.1.3 MCC agent [ITU-T Y.2216]: An MCC agent is an NGN end-user who acts as an enterprise's agent in the MCC service. The MCC agent uses an NGN terminal to communicate with customers and perform communication control operations, such as holding or transferring communications, etc.

3.1.4 MCC applications [ITU-T Y.2216]: MCC applications are a set of applications provided and deployed by an enterprise in order to support its MCC service offer to its customers.

NOTE – The MCC applications organize and manage the mechanisms set and controlled by each enterprise in the MCC service. For example, the mechanisms can allow policy control of communication requests queuing, and management of media resources, etc. MCC applications interact with NGN entities to provide MCC service to customers.

3.1.5 MCC service [ITU-T Y.2216]: A service that enables customers to have multimedia communications through the NGN with enterprises by multiple means and that provides advanced features for the customer-enterprise interaction.

NOTE – The multiple means can be multimedia conversational communications, web and application collaboration, content push and sharing, etc. Advanced features include enhanced communication control, communication queuing, etc.

3.1.6 service enabler [b-ITU-T Y.2240]: A function or closely related set of functions made available over one or more well-defined interfaces to other consuming software applications.

NOTE – In the MCC, a service enabler refers to certain types of service capabilities that can be invoked by MCC functions and resides outside of the MCC (e.g., location server function, presence server function).

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 master agent: A type of multimedia communication centre (MCC) agent which creates agents and manages the created agents accordingly.

3.2.2 mobile agent: A type of multimedia communication centre (MCC) agent which provides the MCC service in a mobile way. The mobile agent usually installs agent software on the mobile terminal (e.g., smartphone).

3.2.3 real-time web communication gateway: A Web gateway that enables message conversion and real-time media stream transcoding through Internet for a mobile multimedia communication centre (MCC) agent.

3.2.4 sub-agent: A type of multimedia communication centre (MCC) agent which is created by a master agent. The sub-agent and the master agent work together for providing the MCC service to customers.

3.2.5 supervisor: A type of multimedia communication centre (MCC) agent which provides the MCC service to MCC customers and monitors other MCC agents.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ANI Application Network Interface

API Application Programming Interface

AS Application Server

BGW	Border Gateway
BSS	Business Support System
COLLF	Collaboration Function
CONF	Conference Function
CPE	Customer Premises Equipment
CRM	Customer Relationship Management
CSCF	Call Session Control Function
CTIF	Communication Telephony Integration Function
DB	Data Base
DTMF	Dual Tone Multi Frequency
HTTP	Hypertext Transfer Protocol
ID	Identifier
IM	Instant Message
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IVR	Interactive Voice Response
IVVR	Interactive Voice and Video Response
LAN	Local Area Network
LCSF	Location Server Function
LSF	Location Service Function
MCC	Multimedia Communication Centre
MCDF	Multimedia Call Distribution Function
MGCF	Media Gateway Control Function
MGW	Media Gateway
MLP	Mobile Location Protocol
MMRF	MCC Media Resource Function
MSC	Mobile Switching Centre
NGN	Next Generation Network
NMS	Network Management System
NNI	Network to Network Interface
OA	Office Automation
OAM	Operations, Administration and Maintenance
OCF	Overload Control Function
OSS	Operation Support System
PSF	Presence Server Function
RWCG	Real-time Web Communication Gateway
SCMF	Software Control Management Function

SDP Session Description Protocol

SIMPLE SIP for Instant Messaging and Presence Leveraging Extensions

SIP Session Initiation Protocol

SOAP Simple Object Access Protocol

SSF Service Support Function

TDM Time-division multiplexing

TTS Text to Speech

UNI User to Network Interface

URI Uniform Resource Identifier

USBF Unified Service Broker Function

VLR Visitor Location Register

WSF Web-enabled Service Function

XDM XML Document Management

5 Conventions

In this Recommendation:

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

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

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. These terms are 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.

6 Overview of the MCC in the NGN

Based on the MCC requirements specified in [ITU-T Y.2216], the MCC provides a set of capabilities for offering intelligent, context-aware MCC services to customers and facilitates agile and flexible development of communication centre applications.

In addition to the MCC requirements specified in [ITU-T Y.2216], this Recommendation also includes additional capabilities supported by the MCC. There are two sets of capabilities specified in this Recommendation:

- MCC service-related capabilities:
  - communication request queuing;
  - communication control operations for MCC agents;
  - management operations for supervisors;
  - charging;
  - quality of Service;
  - MCC agent management;
  - video sharing between an MCC agent and customers;

- video conferencing;
- web and application collaboration handling;
- user context information;
- communication congestion handling;
- mobile agent;
- master agent and sub-agent.

• MCC capabilities related to NGNs:
- MCC application support;
- communication request queuing;
- communication request distribution;
- communication control operations for MCC agents;
- MCC agent's terminal management;
- web and application collaboration handling;
- communication congestion handling;
- MCC media resource management.

Figure 1 shows the impacts of the MCC on the NGN architecture [ITU-T Y.2012]. Functions "MCC application and service support" and "MCC service control" are new functions introduced for the support of the MCC service, while functions "Service user profile", "Media resource management" and "Communication control" are functions of the NGN which are modified when the MCC service is supported. These functions are required to support the above-listed capabilities related to support of the MCC.

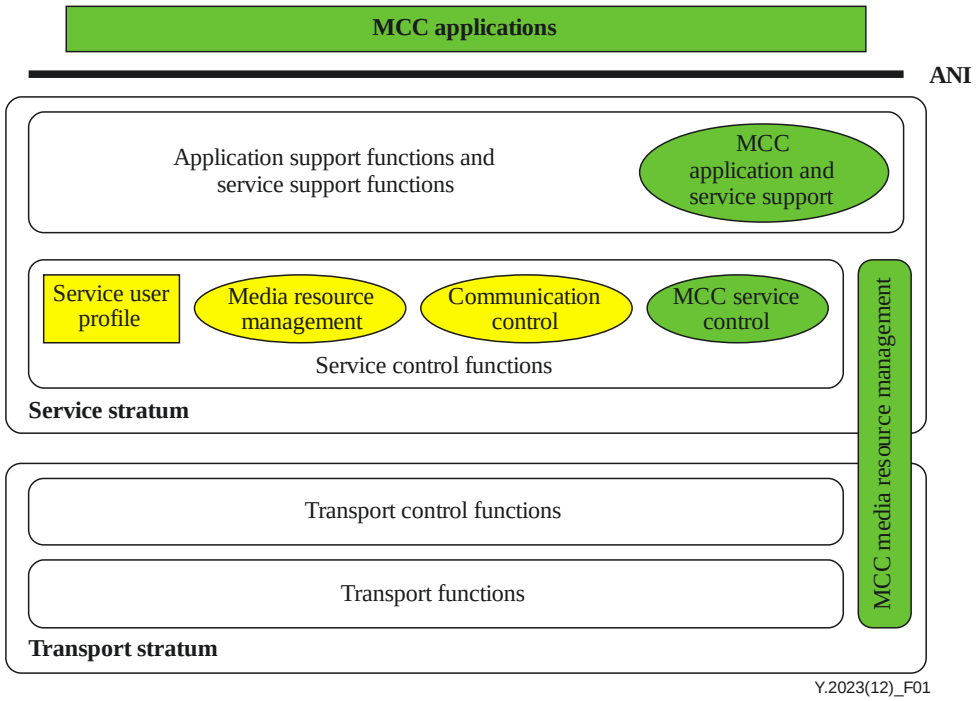

Figure 1 – Support of the MCC in the NGN

In the "MCC applications" layer above the application network interface (ANI), specific MCC service logics and applications are provided by invoking MCC service capabilities in the NGN, including automatic applications (e.g., interactive voice response (IVR)) and manual applications (e.g., agent-based services). In order to support the MCC services specified in [ITU-T Y.2216],

some relevant capabilities are also included in "MCC applications" layer, including presence capability, location capability and web-enabled capability.

In the NGN service stratum, two specific groups of functions are needed for the support of the MCC: MCC application support functions and service support functions, and MCC service control functions. Besides, some other existing functions defined in the NGN [ITU-T Y.2012] are also modified, including the functions related to the service-user profile, media resource management and communication control.

– The MCC application support functions and service support functions include functions which can be invoked by the "MCC applications" layer, using the ANI reference point. Supported functions include communication request queuing and communication request distribution, which can be invoked by other functions and which can receive service responses from other functions;
– The MCC service control functions include service control and call session control functions required for support of the MCC services;
– Other NGN functions, including functions related to the service user profile, media resource management, and communication control, need to be enhanced in order to support MCC services accordingly.

7 Functional requirements for support of the MCC service

7.1 Unified service capabilities broker for the MCC

In order to provide intelligent and customized MCC services, multiple functions have to invoke various different types of service enablers residing outside of the MCC, such as the location server function (LCSF) and the presence server function (PSF). Since these different types of service capability have different application programming interfaces (APIs), the complexity of MCC functions invoking these service capabilities is increased since each MCC function needs to maintain the knowledge of multiple different and various APIs.

In order to simplify the use of different services capabilities and to focus on the service logic implementation, the MCC architecture is required to support the following functional requirement:

1) The MCC architecture is required to support unified service capabilities broking.

7.2 Agent and sub-agent management

In the MCC, agents can register to the MCC platform and specify their skills. When providing MCC services to customers, one agent can be occupied by one or several customers simultaneously, especially in text-based chat scenarios.

In order to enhance the capability of agents to provide MCC services to customers, with an appropriate quality of experience, the MCC architecture is required to support the following functional requirement:

1) The MCC architecture is required to provide functions that allow MCC agents to create sub-agents which can co-work with the master agent (creator agent) in a group. In this case, the agent works as the master agent which can manage and monitor the sub-agents.

7.3 Supporting mobile agents with a real-time web communication capability

The MCC supports the access of multimedia mobile agents which can provide MCC services in real-time using web communication tools. In order to support such a mobile agent with real-time web communication capabilities, a mobile agent component in the mobile terminal and a real-time web communication gateway (RWCG) in the network are required to be supported.

In order to support mobile agents with a real-time web communication capability, the MCC architecture has the following functional requirements:

– The mobile agent component is required to acquire the communication address of the RWCG from a web server which stores the RWCG address.

– The mobile agent component is required to establish a connection with the corresponding RWCG which is acquired by the mobile agent component on its start-up for multimedia call handling.

– The RWCG is required to support two-way real-time multimedia communications through the connection established with the mobile agent component.

8 Functional architecture of the next generation network (NGN) for the support of the MCC service

8.1 MCC functions in the NGN

Figure 2 shows the functions involved in the support of the MCC service by the NGN. This figure is based on Figure 7-1 of [ITU-T Y.2012] and Figure 1.

NOTE 1 – The majority of the functions shown in Figure 2 are explained in [ITU-T Y.2012]. Functions specific to the MCC are described below.

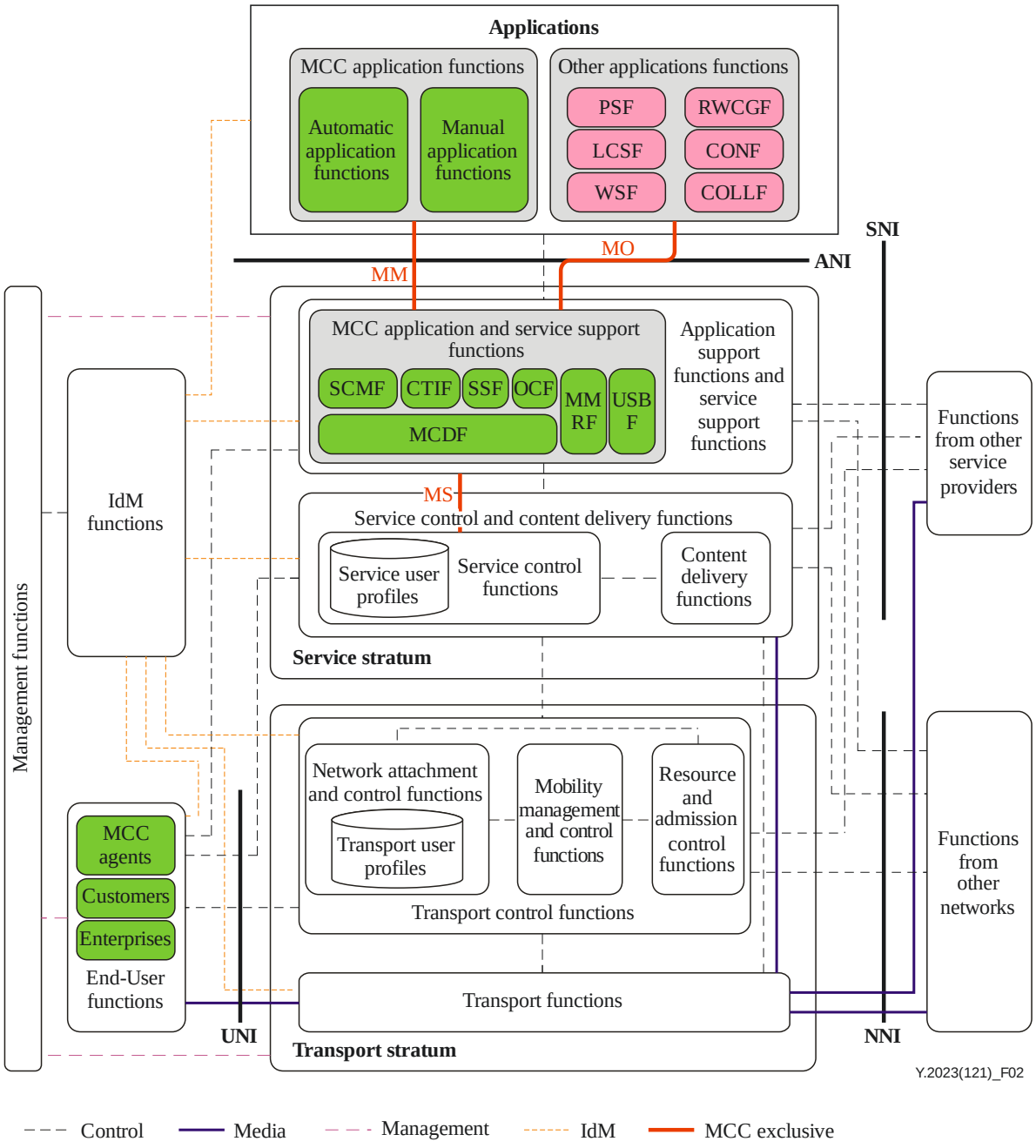

Figure 2 – MCC functions in the NGN

8.2 Logical diagram of the MCC functions

The following figure, based on Figure 2, illustrates the detailed MCC logical architecture and relationships between MCC functions, including the multimedia call distribution function (MCDF), software control management function (SCMF), communication telephony integration function (CTIF), overload control function (OCF), unified service broker function (USBF), service support function (SSF), MCC media resource function (MMRF), MCC application functions, and other application functions. In the architecture, MCC functions are connected by reference points.

In the MCC logical architecture, MCC functions are shown in green while functions in pink are assistant functions providing service support for MCC services. The latter functions are out of the scope of the MCC.

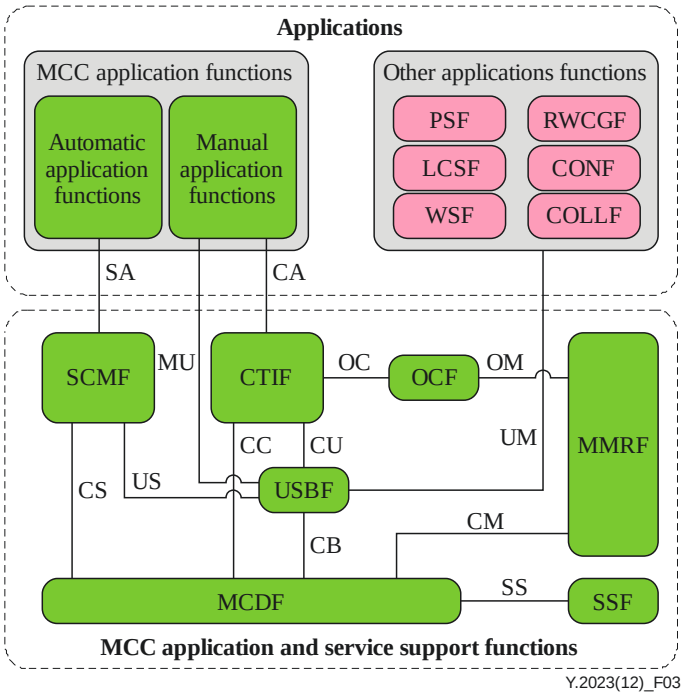

Figure 3 – Logical diagram and reference points in the MCC

In Figure 3, the multimedia call distribution function (MCDF) acts as the core function in the MCC architecture. The MCDF provides call control and call distribution to the software control management function (SCMF) and communication telephony integration function (CTIF), interworks with the unified service broker function (USBF) for acquiring service capabilities from outside of the MCC, and interworks with the MMRF for acquiring multimedia service capabilities. In case the MCDF has to interwork with other MCC functions in other networks, it has to interwork with the service support function (SSF). For example, the MCDF can transfer a call to another MCDF destination through the SSF.

The USBF provides unified and simplified service capabilities broking for MCC functions, including SCMF, CTIF and MCDF. MCC functions can interact with external capabilities through interworking with the USBF.

The SCMF and CTIF receive calls distributed from the MCDF and provide further service logic processing. Then service procedures are forwarded to MCC application functions.

The overload control function (OCF) provides a service overload control function for manual services when the CTIF faces call/session overload, and then the OCF can utilize the MMRF to provide multimedia services for customers when customers face communication centre system overload.

The MMRF provides multimedia services support for both the MCDF and OCF when the CTIF faces call/session overload.

Other application functions include functions such as the presence server function (PSF), the location server function (LCSF), and the web-enabled service function (WSF), all of which are out the scope of the MCC. The complexity of invoking these functions can be adapted by USBF, through which the detailed invoking mechanisms to these functions are transparent to the MCC functions.

8.3 Description of the MCC functional entities

In the "MCC applications" layer, there are two groups of functions. One is the group of MCC application functions which contains MCC-related functions, including:

– automatic application functions;

– manual application functions.

The second group of functions is the "Other Application Functions" which can be invoked by functions in the MCC, including:

– presence service function (PSF);

– location service function (LCSF);

– web-enabled service function (WSF);

– real-time Web communication gateway function (RWCGF);

– conference function (CONF);

– collaboration function (COLLF).

NOTE – The other application functions can also reside in functions from other networks interworking with the NGN through the network-network interface (NNI).

In the service stratum, there are two groups of functions [ITU-T Y.2012]:

– application support functions and service support functions;

– service control and content delivery functions.

In the application support functions and service support functions, the MCC application and service support functions provide the MCC service logic and service control functions, including:

– service control management function (SCMF);

– computer telephone integration function (CTIF);

– service support function (SSF);

– multimedia call distribution function (MCDF);

– unified service broker function (USBF);

– overload control function (OCF);

– MCC media resource function (MMRF).

In the end-user functions, three types of functions are included; they are MCC agents, customers, and enterprises. The details of each function are further explained in this Recommendation.

As shown in Figure 2, some general reference points are introduced, including:

– MS reference point between service control functions and MCC application and service support functions;

– MO reference point between other applications in the application layer and MCC application and service support functions;

– MM reference point between MCC applications in the application layer and MCC application and service support functions.

These reference points are further explained in detail in clause 9.

8.3.1 MCC application functions

MCC application functions provide specific automatic services (e.g., interactive voice response (IVR)) and manual services (e.g., agent-based services) by invoking MCC service capabilities in MCC applications and services support functions through the MM reference point. MCC application functions utilize and maintain each specific call resources, such as voice/video call, chat, fax, and web. MCC application functions can acquire user information, operation log, and configuration data through database.

MCC application functions consist of two types of functions, i.e., automatic application functions and manual application functions:

– automatic application functions contain customized and detailed service logic which provides navigation and services for customers automatically, typically by IVR;

– manual application functions contain customized and detailed service logic which provides navigation and services for customers manually, typically by an MCC agent.

8.3.2 Other application functions

Other application functions in the MCC logical architecture provide further assistance for enhanced and featured MCC services, which can be invoked by MCC functions, including (but not limited to):

– presence service function (PSF) provides presence information of the customers for other MCC entities, such as MCDF, CTIF;

– location service function (LSF) provides location service of the customers for other entities, such as MCDF and CTIF;

– web-enabled service function (WSF) provides web-enabled services to customers using interactive request\response services based on standard protocols, e.g., HTTP;

– real-time web communication gateway function (RWCGF) provides real-time message and media stream transformation for mobile MCC agents;

– conference function (CONF) provides multimedia conference functions for the MCC where one or more MCC agents and one or more customers can communicate in conference mode;

– collaboration function (COLLF) provides collaboration functions for the MCC where MCC agents can provide collaboration applications (e.g., Web collaboration and application collaboration) for MCC customers.

8.3.3 MCC application and service support functions

MCC application and service support functions provide multimedia application support and service support functions for multimedia communication applications. In MCC, the MCC application and service functions support multimedia call queuing and distribution based on customer's context information (including but not limited to presence and location information) retrieved from relevant application functions in other application functions. For location information, it can be retrieved from the location service function (LSF), and for presence information, it can be retrieved from the presence service function (PSF). The MCC can use the presence and/or location information of the customer premises equipment (CPE) from the session description information, (e.g., the session description protocol (SDP)), carried in the call session if the call session initiated by customers contains presence and/or location information directly.

The following functions are included in the MCC application and service support functions:

– Service control model function (SCMF): This function provides support for automatic service for the MCC, such as interactive voice response (IVR) and interactive voice and video response (IVVR).

– Computer telephone integration function (CTIF): This function provides session queuing, agent management, and manual service support for the MCC.

– Service support function (SSF): This function provides multiple multimedia communication centres coordination, call routing and call transfer, such as call distribution to different MCCs. In the case of multiple MCCs, the SSF collaborates with the MCDF and transfers call from the source MCC to a destination MCC based on customer's context information (including but not limited to presence and/or location information) retrieved from the PSF and LCSF.

– Multimedia call distribution functions (MCDF): This function provides capabilities including multimedia call convergence, multimedia protocols adaptation, abstraction of different calls, call control, call queuing, and call routing.

  In contrast to the call session control function (CSCF), the MCDF provides further call control exclusively for the multimedia communication centre when it receives calls routed from the CSCF.

  The MCDF supports multiple media types (e.g., audio, video, text, etc.) in isolated or convergent mode. The MCDF supports multiple protocols adaptation, such as the adaptation from SS7 to SIP.

  The MCDF supports the unified communication model regardless of the concrete call types (e.g., voice\video call, chat, etc.) in the NGN, which allows the MCC not to care about the details of the call in the NGN.

  The MCDF supports call queuing based on CPE's presence and/or location information retrieved from the PSF and/or the LCSF when a call is initiated from a customer to the MCC. The MCDF selects appropriate agents in collaboration with the CTIF for the caller based on the CPE's presence and/or location. For a CPE that does not support presence and/or location service, the MCDF can get the CPE's presence and/or location from core network entities, including the MSC/VLR in a 2G mobile network, or the CSCF in an NGN.

  The MCDF supports real-time feedback to the customer during call queuing, which means that when the MCDF receives a call-related message, it constructs a queuing request based on the message. Then the MCDF checks the current status of target agents based on the queuing request, and judges whether there is any agent available. In the case that there is no agent available, the MCC feeds back the queuing information to the customer by calculating the current queue information based on the current maintained information. If there is an available agent, the MCDF selects one target agent and locks it for the customer.

  If a new call session to the MCDF contains existing session information which can be the call ID or the URL of the CPE, the MCDF processes the new call session as a new attached session to the existing call session. The MCDF then determines the call ID of the new call as the call ID of the existing call session and assigns the new call to the same agent of the existing call session. If the new session requires additional resources, the multimedia communication centre can assign the new call to the same agent that handles the existing call session, but only after applying new resources.

  In a convergent network environment (e.g., fix-mobile convergence), the MCDF supports queuing for multiple call sessions. In this case, when the MCDF receives a call from the CPE, it parses the URI from the session, and checks if there is another call initiated from the same CPE based on the URL. In the affirmative, the MCDF allocates the same call ID for the new call and queues the call according to the call ID. If another existing call has already been established and allocated to a specific agent, the MCDF allocates the new call to the agent accordingly. If the existing call has not been established to a specific agent, the MCDF queues the new call together with the existing call.

– Unified service broker function (USBF): This function provides MCC functions with consistent unified service capabilities broking APIs, thus decreasing the complexity of invoking other external service enablers for MCC functions.

9 Description of reference points

9.1 Reference point description for MCC functions in the NGN

9.1.1 Reference point MM

The MM reference point connects MCC application and service support functions and MCC application functions. The MM reference point is used to invoke service capabilities for MCC-related applications functions including the automatic application function and the manual application function.

9.1.2 Reference point MO

The MO reference point connects MCC application and service support functions and other application functions, such as PSF, LCSF, and WSF. The MO interface is used to request and get the extra services by MCC application and service support functions to provide intelligent and context-awareness for MCC services.

9.1.3 Reference point MS

The MS reference point connects MCC application and service support functions and service control functions in NGN. The MS reference point is used to invoke communication capabilities offered by NGN service control functions. One of the key capabilities is media resource management.

9.2 Reference points description

This clause provides a description of the reference points shown in Figure 3. Detailed procedures for explaining the mechanisms to be supported by these reference points are described in clause 10.

The reference points in Figure 3 are as follows:

– Reference point CS: the MCDF and the SCMF interact using the CS reference point which provides automatic call distribution from the MCDF to the SCMF. When the MCDF receives a call from a customer, it distributes the call to the SCMF, and then the SCMF provides IVR services to the customer;

– Reference point CC: the MCDF and the CTIF interact using the CC reference point which provides manual services. In this aspect, the MCDF provides an abstraction of calls, call control, call queuing and routing;

– Reference point CB: the MCDF and the USBF interact using the CB reference point which provides service capabilities invoking from outside of MCC for the MCDF;

– Reference point CM: the MCDF and the MMRF interact over the CM reference point through which the MCDF can control and request multimedia services for customers;

– Reference point US: the SCMF and the USBF interact over the US reference point which provides invocation of service capabilities from outside of MCC for the SCMF;

– Reference point MU: the USBF and manual application functions interact over the MU reference point which provides invocation of service capabilities from outside the MCC for manual application functions;

– Reference point CU: the USBF and the CTIF interact over reference point CU, which provides invocation of service capabilities from outside the MCC for the CTIF;

– Reference point UM: the USBF and other applications functions interact over the UM reference point where the USBF can get service capabilities and provides service capabilities to MCC functions;
– Reference point SA: the SCMF and automatic application functions interact over the SA reference point which provides IVR services to customers for the SCMF;
– Reference point CA: the CTIF and manual application functions interact over the CA reference point which provides manual services to customers for the CTIF;
– Reference point OC: the CTIF and the OCF interact over the OC reference point which provides overload control services for the CTIF when the CTIF faces call overload;
– Reference point OM: the OCF and the MMRF interact over the OM reference point which provides multimedia service during overload control;
– Reference point SS: the MCDF and the SSF interact over the SS reference point which provides service support for the MCDF.

10 MCC procedures and functional description

This clause provides basic procedures for the MCC service which cover mandatory requirements specified in [ITU-T Y.2216]. These procedures are described in an implementation-independent manner and are thus normative.

10.1 Communication requests queuing and distribution

In the MCC, when the MCDF receives a call from a customer, the MCDF distributes the call to the SCMF which provides automatic service to the customer, e.g., IVR/IVVR. If the customer selects manual services, the MCDF distributes the call to the CTIF which provides further processing, e.g., call queuing or agent finding. In the MCC, the CTIF also provides queue management and agent management functions for the enterprises.

Figure 4 depicts the procedure for queuing and distribution of communication requests.

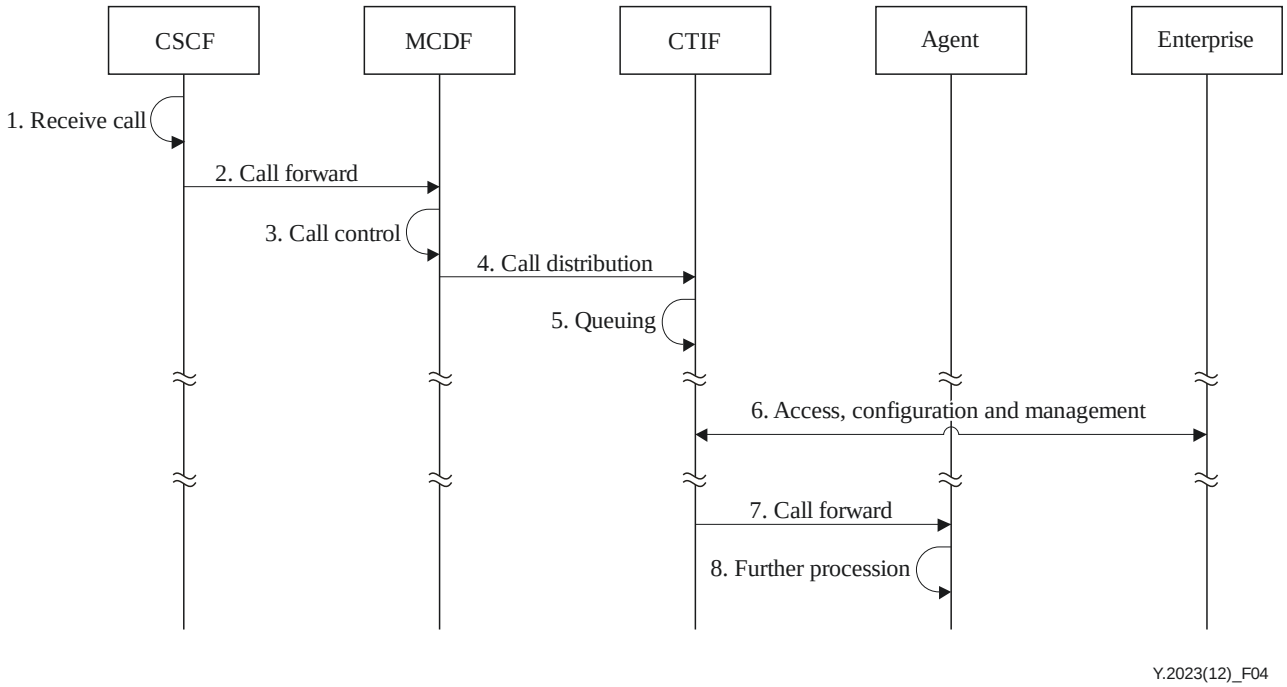

Figure 4 – Queuing and distribution procedure of communication requests

The interactions shown in Figure 4 are as follows:

1) The CSCF receives a call request from NGN end user;
2) The CSCF forwards the call to the MCDF based on call control functional entities, e.g., CSCF;
3) When the MCDF receives a call from the CSCF, it performs functions including protocols adaption, call management, and service triggering;
4) The MCDF distributes the call to the CTIF for further processing based on call control;
5) The CTIF queues the call if there is no agent available at the moment;
6) Enterprises can access queues, and configure and manage them based on the enterprise's policies, if necessary;

   NOTE – The enterprise can access queues and configure and manage queues at any time during the whole process;
7) The CTIF forwards the call to the proper agent for manual processing;
8) The agent performs manual services for customers.

10.2 MCC service initialization

Before providing MCC customers with the MCC service, the MCC needs to follow appropriate procedures to initialize the MCC, including MCC agent initialization.

The following figure depicts the procedure to start the MCC agent initialization.

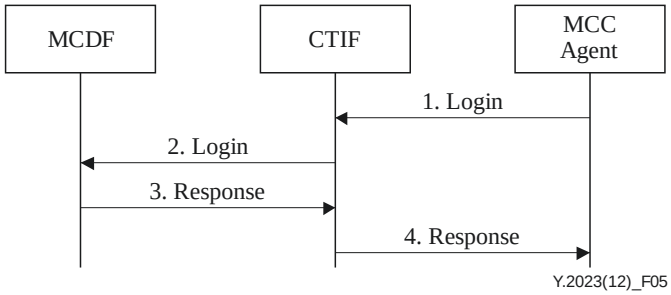

Figure 5 – MCC service initialization procedure

The interactions shown in Figure 5 are as follows:

1) Prior to providing manual services, the MCC agent needs to issue a login request to the CTIF for registration;
2) Upon receiving the login request from the MCC agent, the CTIF forwards the request to the MCDF for further registration;
3) After the login registration is handled by the MCDF, it replies with a response to CTIF for confirmation;
4) Upon receiving a response from the MCDF, the CTIF forwards the response to the MCC agent indicating that the registration has been completed successfully.

10.3 Procedure to use the USBF

In order to provide enhanced and intelligent MCC services, many MCC functions need to invoke external enablers or capabilities. USBF is the function that can facilitate external capabilities invocation by providing a unified interface (e.g., API) to MCC functions and thus shield complexities of external enablers and capabilities.

The following figure depicts the procedure to invoke capabilities through USBF.

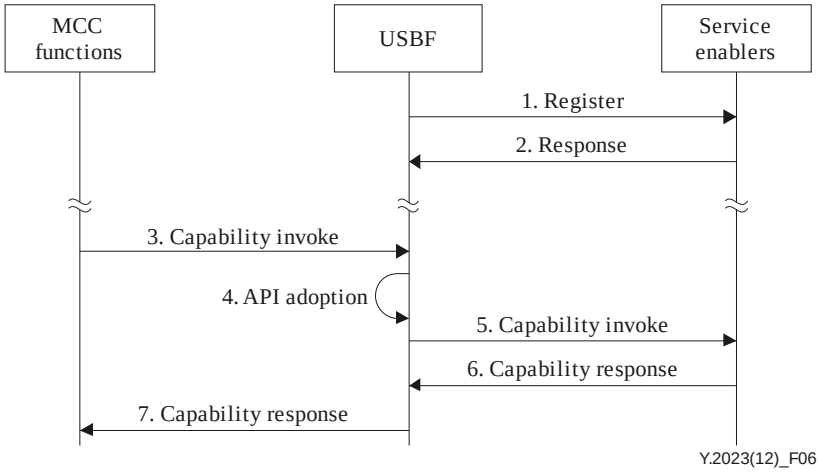

Figure 6 – Procedure to use USBF

The interactions shown in Figure 6 are as follows:

1) The USBF sends a request to other service enablers, including but not limited to PSF, LCSF and WSF (for registration);

2) The target enabler responds with a registration result to the USBF, and the USBF saves the result which contains interface description information of the enablers for further invocation;

3) An MCC function (e.g., CTIF, MCDF, agent, etc.) sends a capability invoke request to the USBF. The request contains the target capability indication and key parameters (e.g., caller ID) which are composed by the MCC functions;

4) On reception of the request, the USBF constructs the interface invocation information based on the information contained in the received request from the MCC function and the target enabler interface description information;

5) The USBF sends a capability invoke to the target-enabler based on the composed information in Step 4;

6) The target-enabler executes the corresponding capability logic and responds with the capability invoke result to the USBF;

7) After receiving the response from the target-enabler, the USBF forwards the response to the MCC function.

10.4 Overload control

Due to random incoming call requests, when receiving a large number of incoming call requests in a short duration, the MCC may face system overload. The MCC should handle overload control and provide MCC services after the release of system overload.

The following figure depicts the procedure related to overload control.

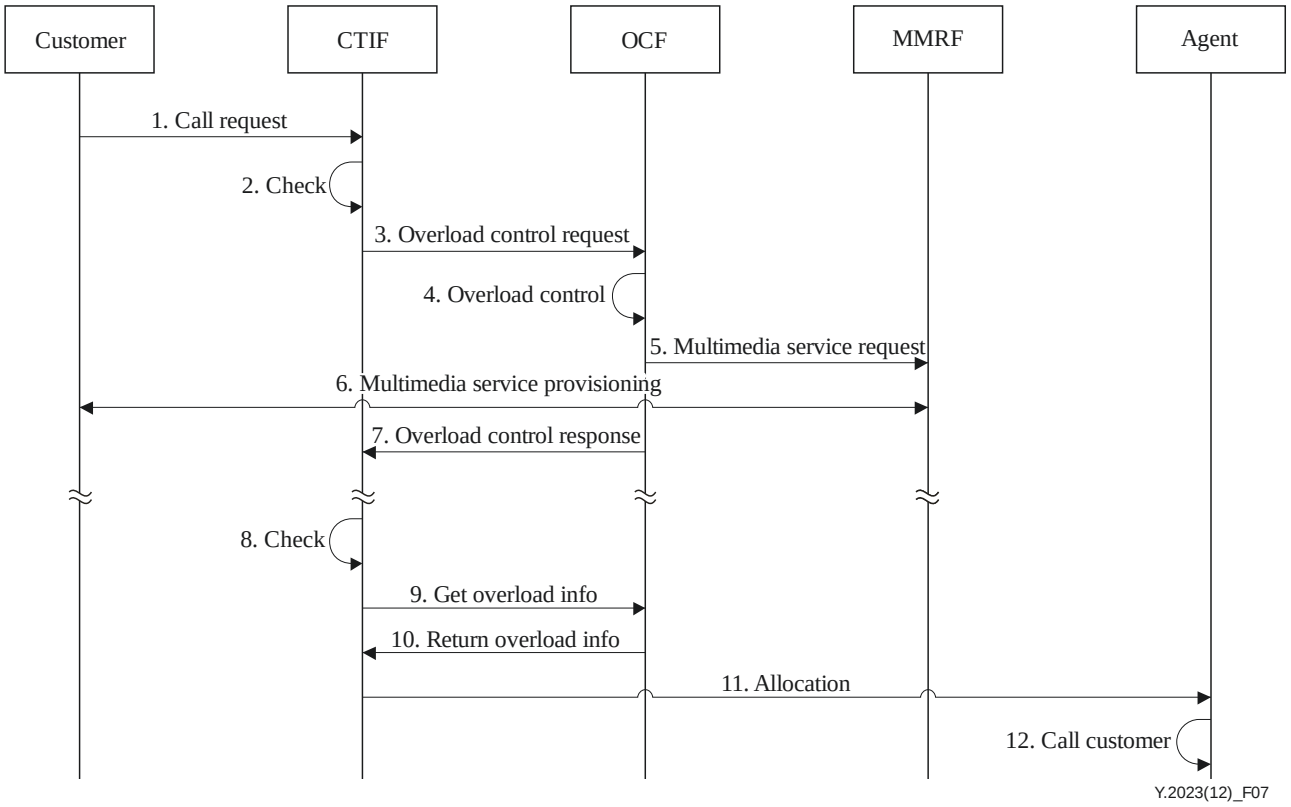

Figure 7 – Overload control procedure

The interactions shown in Figure 7 are as follows:

1) A customer initiates a call request to the CTIF;

2) The CTIF checks the status of agents and progresses to step 3 when the CTIF finds that all agents are in overload state;

3) The CTIF sends an overload control request to the OCF containing the caller's information, which includes the caller ID, call time, etc.;

4) The OCF receives the overload control request from the CTIF, saves the caller's information and processes the request based on the caller's information;

5) The OCF sends a multimedia service request to the MMRF containing the caller's information which indicates the MMRF to indicate system overload information to the caller (e.g., audio, video) or indicates the MMRF to provide a message leaving service to the caller.

6) The MMRF provides multimedia services to the caller based on the indication in Step 5.

7) The OCF sends a response to the CTIF confirming the process of the overload control request is successful.

8) The CTIF checks the status of agents continuously, once the CTIF finds one or more agents are not in overload state, the process the flow progresses into Step 9.

9) The CTIF sends a request to the OCF requesting overload information.

10) The OCF sends a response to the CTIF containing overload information including caller's information and the message leaving indication.

11) The CTIF selects a proper agent and sends caller's information and message leaving indication to the agent.

12) The agent calls the customer and provides multimedia communication call services based on the caller's information and message leaving indication.

10.5 Communication control operations for MCC agents

The MCC agent supports different types of communication control operations during an established call between the MCC agent and a customer. The operations supported by the MCC agent include disconnection, hold, park, transfer and consultation of an established communication between the agent and a customer. The following describes each of these operations.

10.5.1 Disconnection

An agent sends a request to the MCDF through the CTIF to disconnect an established call between the agent and a customer. On reception of the disconnection request, the MCDF releases the connection between the customer and the agent, and releases all resources allocated to the call.

The following figure depicts the procedure for disconnection of an ongoing call.

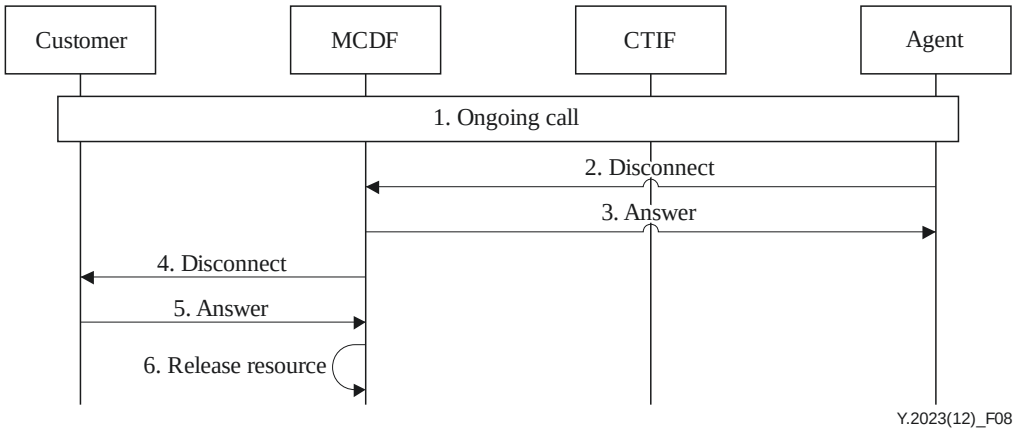

Figure 8 – Disconnection of an ongoing call

The interactions shown in Figure 8 are as follows:

1) An ongoing call exists between the customer and the agent;
2) The agent sends a request to the MCDF asking for disconnection of the ongoing call;
3) On receiving the request for disconnection, the MCDF sends a response with an answer to the agent to release the ongoing call;
4) The MCDF sends a message to the customer to release the ongoing call;
5) The customer responds to the request with an answer;
6) The MCDF releases all relevant resource allocated to the previous ongoing call.

10.5.2 Hold

An agent sends a request to the MCDF through the CTIF to hold an established call between the agent and a customer. On reception of the hold request, the MCDF pauses the connection between the agent and the customer. The MCDF can resume the hold-on call when the agent asks to resume the previous call connection.

The following figure depicts the procedure for holding an ongoing call.

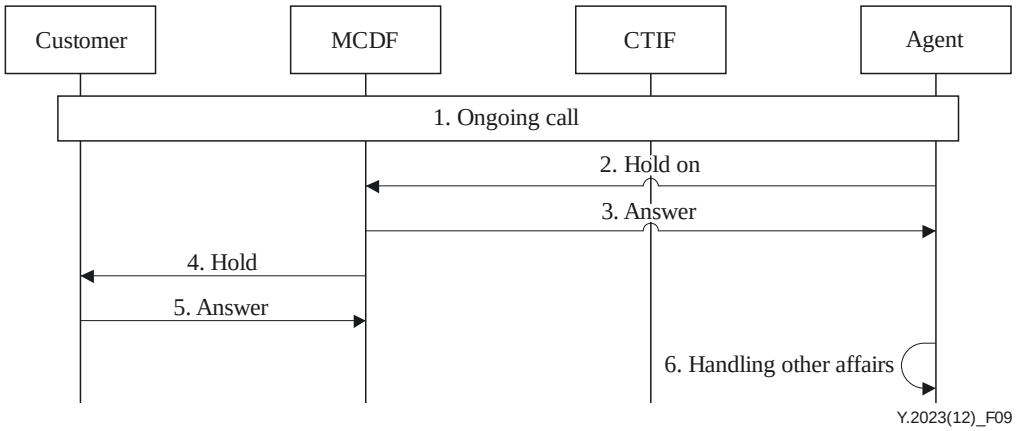

Figure 9 – Holding of an ongoing call

The interactions shown in Figure 9 are as follows:

1) An ongoing call exists between the customer and the agent;
2) The agent sends a request to the MCDF asking for holding on the ongoing call;
3) On receiving the request for holding on the call, the MCDF sends a response with an answer to the agent;
4) The MCDF sends a message to the customer to hold on the call;
5) The customer responds to the request with an answer;
6) The agent handles other affairs during the holding period.

10.5.3 Park

An agent sends a request to the CTIF to hold an established call between the agent and the customer. The CTIF then puts the call into a proper queue waiting for other agents to deal with the call from the customer, and the previous agent will not deal with the customers anymore.

The following figure depicts the procedure for parking an ongoing call.

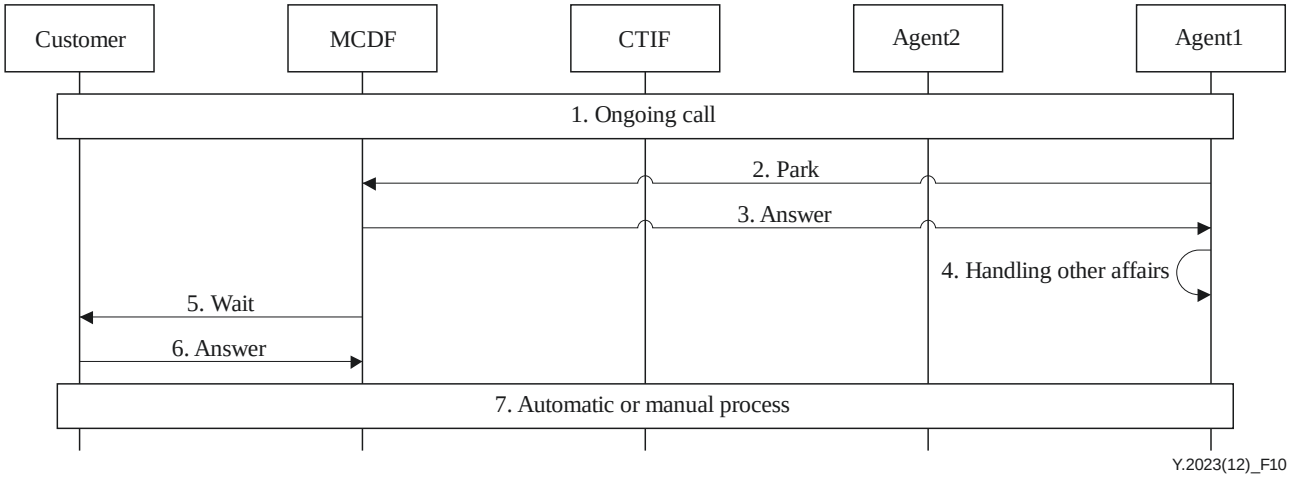

Figure 10 – Parking of an ongoing call

The interactions shown in Figure 10 are as follows:

1) An ongoing call exists between the customer and the agent;
2) The agent sends a request to the MCDF asking for parking the ongoing call;

3) On receiving the request for parking the call, the MCDF sends a response with an answer to the agent;

4) The agent continues to handle other affairs;

5) The MCDF sends a message to the customer notifying that the call will be parked;

6) The customer sends a response message with an answer;

7) The MCDF determines the following procedure. The MCDF may ask the CTIF to re-queue the call and find a proper agent to provide manual service or forward the call to the SCMF, asking for the automatic service.

10.5.4 Transfer

An agent sends a request to the MCDF through the CTIF to transfer an established call between the agent and the customer. On receiving the transfer request, the MCDF decides the destination based on the request (e.g., another agent or SCMF) and connects the destination with the customer. During the process, both the call and service data are transferred to the new call.

The following figure depicts the procedure for transferring an ongoing call.

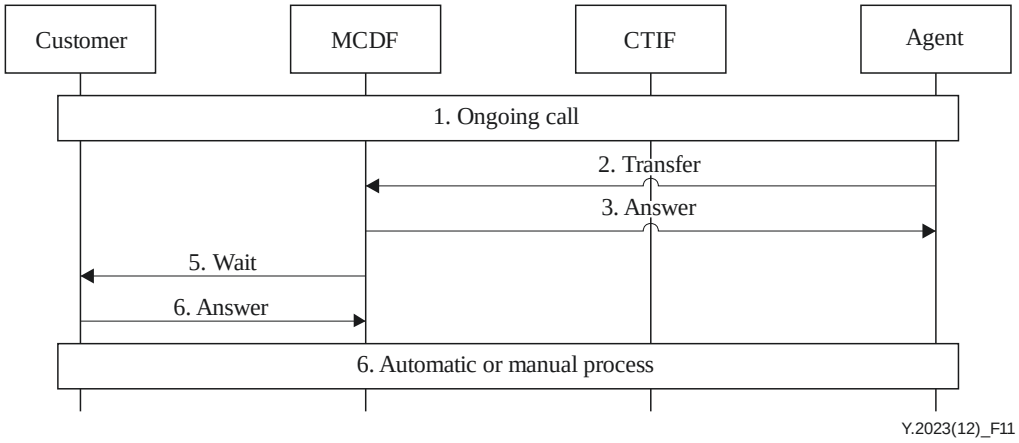

Figure 11 – Transfer of an ongoing call

The interactions shown in Figure 11 are as follows:

1) An ongoing call exists between the customer and the agent;

2) The agent sends a request to the MCDF asking for transferring the ongoing call. An indication of service type (e.g., manual or automatic service) is contained in the request;

3) On receiving the request, the MCDF responses with an answer to the agent;

4) The MCDF sends a message to the customer notifying the call will be transferred

5) The customer sends a response message with an answer;

6) The MCDF determines the following procedure based on the service type contained in step 2. The MCDF may ask the CTIF to re-queue the call and find a proper agent to provide a manual service or forward the call to the SCMF, asking for automatic service.

10.5.5 Consultation

This procedure enables to perform a consultation operation during an ongoing call, including communication with another MCC agent, IVR/IVVR, and any other NGN end users. When the agent performs consultation, he or she holds on the ongoing call first, and then consults with another agent, IVR/IVVR, or other NGN end users. During the consultation, the customer on hold cannot hear or see the agent. After consultation, the agent resumes the previous call and continues the communication with the customer.

The following figure depicts the procedure for consultation during an ongoing call.

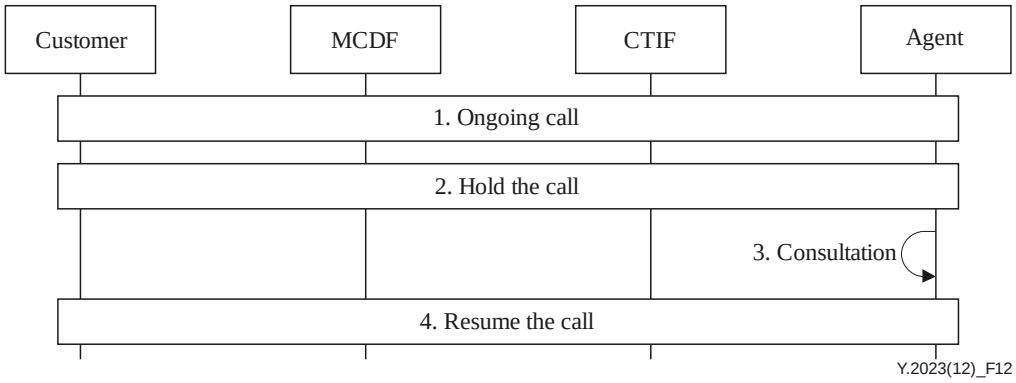

Figure 12 – Consultation during an ongoing call

The interactions shown in Figure 12 are as follows:

1) An ongoing call exists between the customer and the agent;

2) The agent needs consultation and holds the ongoing call, and then the customer cannot hear or see the consultation;

3) The agent starts to consult with others, e.g., other agents, IVR/IVVR, or other NGN end users;

4) After consultation, the agent resumes the previous call and continues the call with the customer.

10.6 Management operations for supervisors

When an MCC agent provides MCC services to customers, the whole process is under the management of MCC supervisors. The supervisors can record, monitor, join, and intercept the communications. Besides, the MCC can also support coaching of MCC agents when the MCC agent provides MCC services to customers. In this case, a separate communication channel between the supervisor and the MCC agent is established and the customer cannot access the communication channel.

10.6.1 Conferencing monitoring

The following figure depicts the procedure for conferencing monitoring.

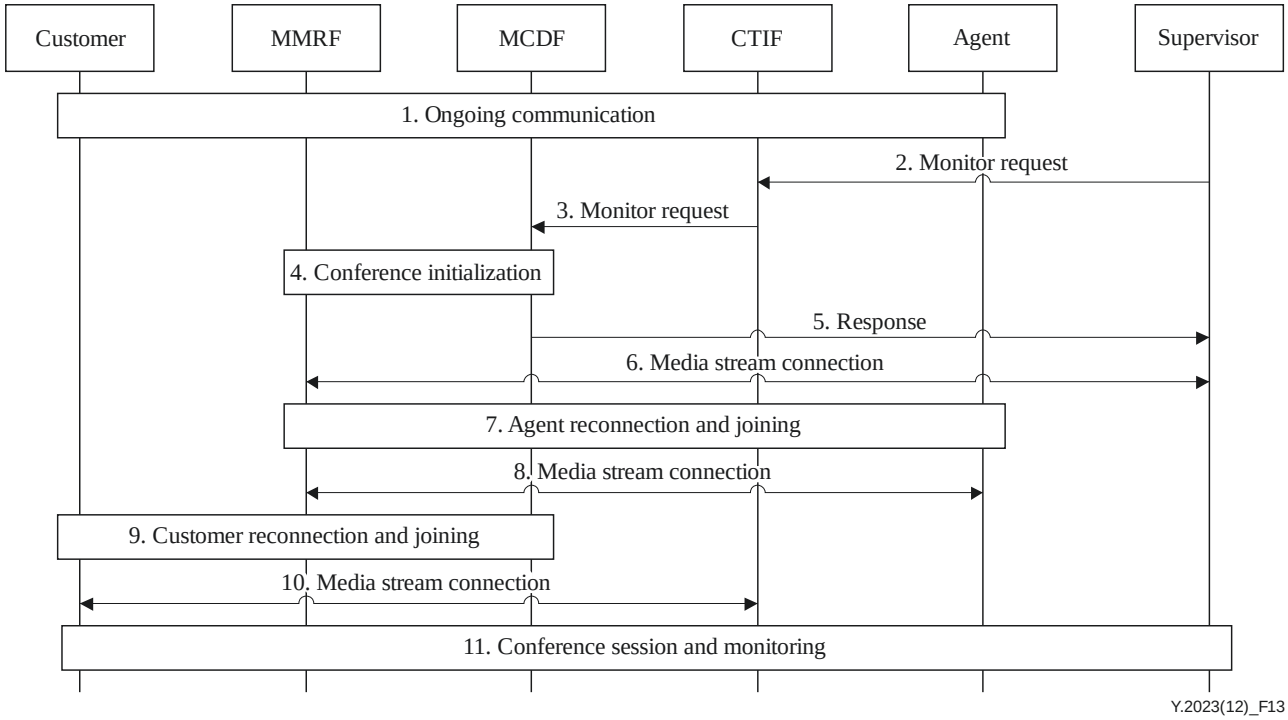

Figure 13 – Conferencing monitoring model

The interactions shown in Figure 13 are as follows:

1) An ongoing communication exists between the customer and the agent;
2) The supervisor initiates a request to the CTIF requesting monitoring of an existing session. The request indicates the target agent, monitoring capabilities, as well as monitoring type;
3) When receiving the request from the monitor, the CTIF forwards the request to the MCDF;
4) A conference is initialized between the MMRF and the MCDF;
5) The MCDF forwards the response to the supervisor;
6) A media stream connection, including audio and video connection, between the supervisor and the MMRF is created;
7) A reconnection between the agent and the conference is established;
8) A media stream connection, including audio and video connection, between the agent and the MMRF is created;
9) A reconnection between the customer and the conference is established;
10) A media stream connection, including audio and video connection, between the customer and the MMRF is created;
11) A conference session connection among the customer, the agent, and the monitor is created and the customer cannot hear or see the existence of the supervisor in the conversation with the agent.

NOTE – During the conference session, monitoring is restricted to hearing or seeing the communication between the customer and the agent. Speaking or interrupting the communication is not possible.

10.6.2 Coaching

The following figure depicts the procedure for supporting coaching in MCC.

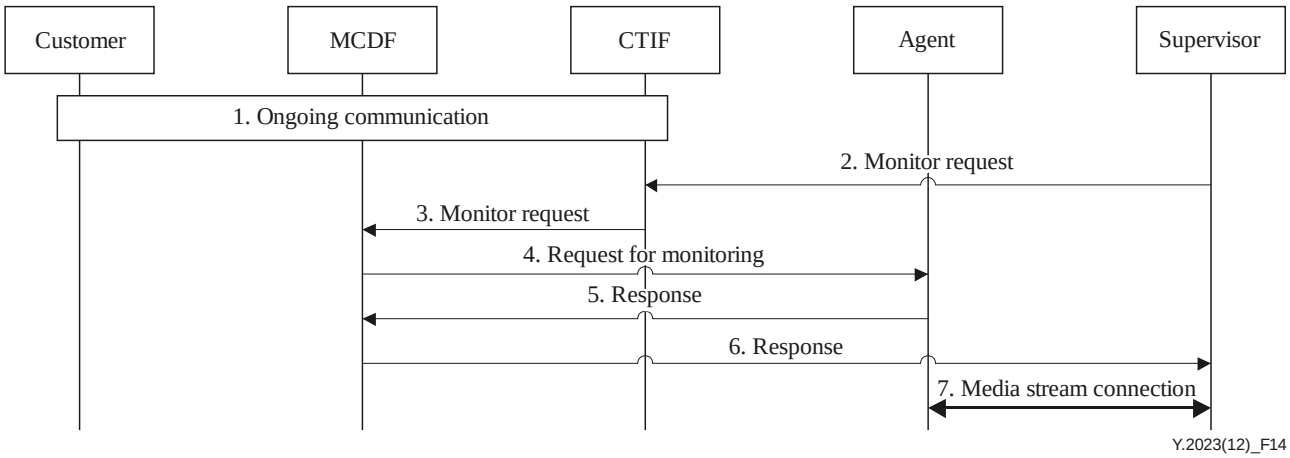

Figure 14 – Coaching

The interactions shown in Figure 14 are as follows:

1) An ongoing communication exists between the customer and the agent;
2) The supervisor sends a request to the CTIF for monitoring the agent, the request contains relevant identity for indicating the target agent;
3) The CTIF forwards the request to the MCDF;
4) Once receiving the monitoring request from the CTIF, the MCDF sends a request for monitoring to the agent;
5) The agent replies to the MCDF with indications of preparation of a new channel with the supervisor, and the response also contains relevant capabilities that the agent supports;
6) The MCDF sends the response received from the agent to the supervisor;
7) A new media stream, including audio and/or video, is created between the agent and the supervisor. The supervisor can monitor and coach the agent based on the new channel.

NOTE – Despite the participation of the supervisor in the session, the customer cannot hear or see the supervisor.

10.7 MCC agent management

In order to support MCC agent management, the MCC supports the following mechanisms:

– Group-based MCC agent management: the MCC provider divides MCC agents into different groups based on their skills and expertise, and assigns different groups with different queuing and management strategies.
– Identity management: the MCC provider assigns the following three types of identity for agents: MCC provider ID, MCC group ID and Agent ID. In the case of a virtual communication centre, a tenant ID is also assigned for each tenant. All of these IDs are correlated.
– Rights management: the MCC provider assigns different agents with different rights for flexible MCC services providing.

– Sub-agent management: the MCC platform receives a request for the creation of sub-agents from MCC agents, and the MCC platform creates an agents group where the creator agent is assigned as the master agent based on the request. The master agent specifies certain strategies for the group, including task scheduling strategies, scheduling strategies, maximum number of sub-agent concurrent tasks, and sub-agent rights. The group includes both the creator agent and sub-agents. The MCC platform correlates the agent group, the master agent and the sub-agent. When the MCC platform receives requests from customers, the MCC provides MCC services based on the agent group.

The following figure depicts the procedure for supporting MCC services by sub-agents.

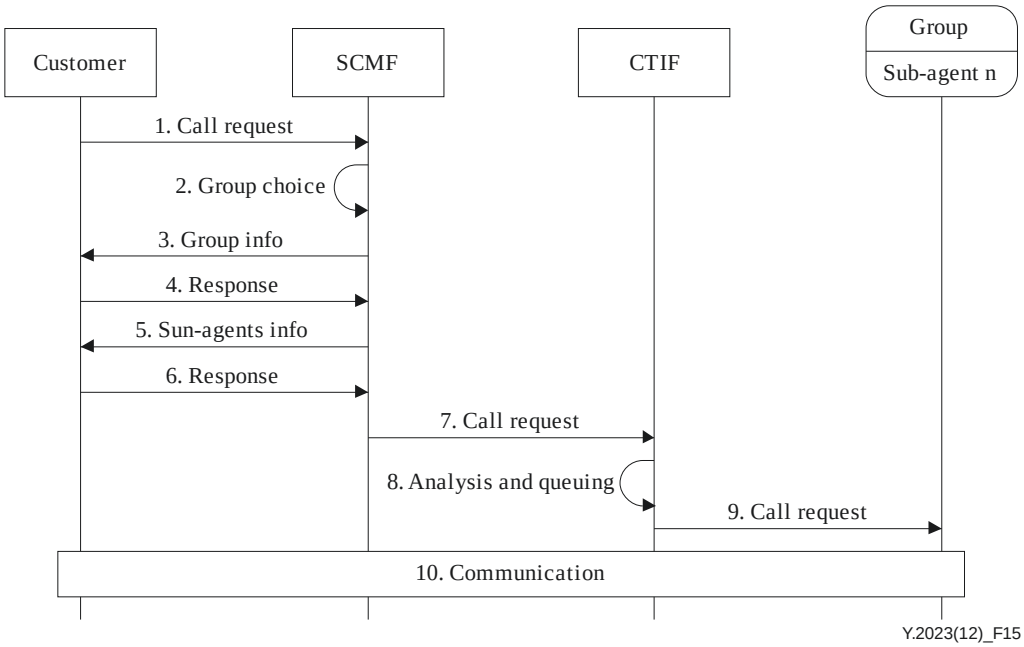

Figure 15 – Sub-agent management

The interactions shown in Figure 15 are as follows:

1) The customer sends a request to the SCMF requesting MCC services, the request contains service requirement description information;

2) The SCMF receives the request from the customer and chooses agent groups according to the service requirement description information;

3) The SCMF replies to the customer with the information of the agent groups which are related to the customer's request; the information contains both group identities and description information;

4) The customer chooses one group and requests the SCMF for detailed information of the chosen group;

5) The SCMF receives the request from the customer and replies to the customer with detailed information of the group corresponding to the customer's request; the information concerns both the master agent and sub-agents;

6) The customer chooses a certain agent, e.g., master agent or sub-agents, and replies with a response containing the chosen information;

7) The SCMF sends the request containing information chosen by the customer to the CTIF;

8) The CTIF verifies the chosen information: if the chosen information contains an agent group identity but not a specific agent, the CTIF checks if the customer is a particular customer (e.g., an old customer of the MCC) of the group with the identity; if affirmative,

the CTIF finds a corresponding agent, and dispatches the request to the agent; or else, the CTIF dispatches the request to the master agent or the sub-agents in the group which are not overloaded. If no agents are available, the request is queued in the group. If the chosen information indicates a specific agent identity, the CTIF dispatches the request to the agent or queues the request in the queue of the agent, accordingly;

9) The agent provides MCC services for the customer, the agent can be master agent or sub-agents in the group.

10.8 Video sharing

In the MCC, when an MCC agent has an ongoing communication, e.g., voice\video call, with a customer, in order to provide better quality of experience, the agent can make use of video sharing supported by the MCC to provide certain video clip sharing between the agent and the customer.

The following figure depicts the procedure for supporting video sharing in the MCC.

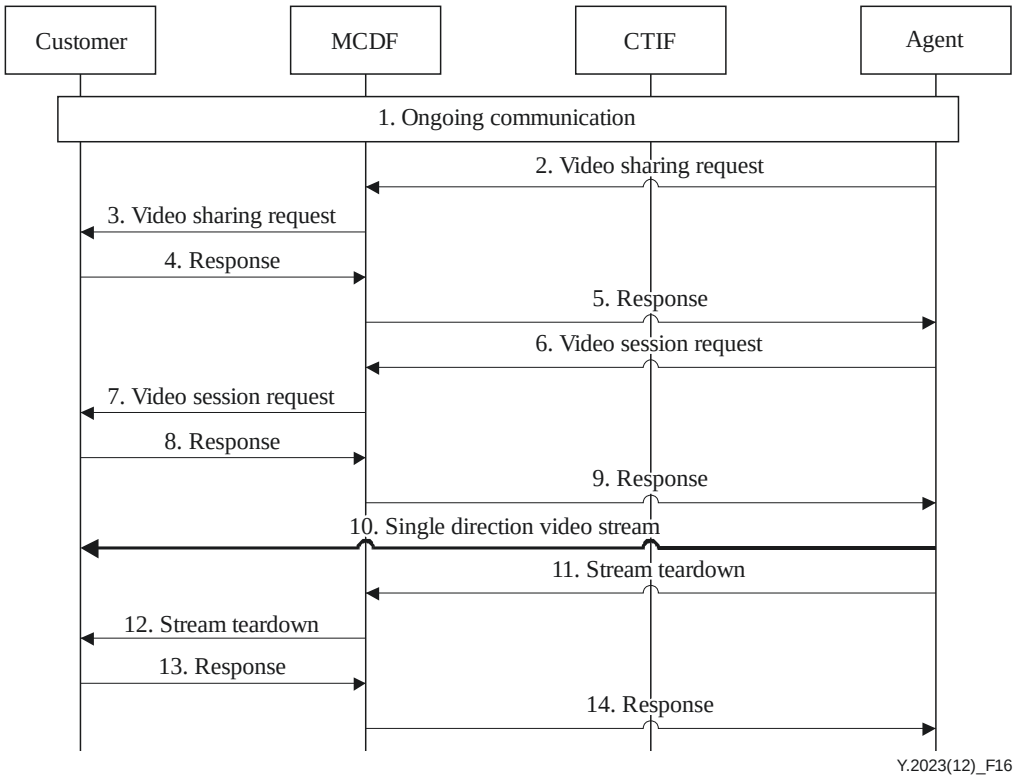

Figure 16 – Video sharing procedure

The interactions shown in Figure 16 are as follows:

1) An ongoing communication, e.g., voice\video call, exists between the customer and the agent;

2) The agent initiates a video sharing request and sends the request to the MCDF, the request contains the capabilities of the agent's terminal;

3) The MCDF forwards the request to the customer;

4) The customer replies to the MCDF, the response contains the capabilities supported by the customer's terminal;

5) The MCDF forwards the response to the agent;

6) The agent sends a request to the MCDF requesting establishment of a new session for video sharing;

7) The MCDF forwards the request to the customer;

8) The customer replies with a response;

9) The MCDF forwards the response to the agent;

10) A single-direction video stream is created between the agent and the customer;

11) When the video ends, the agent sends a request to the MCDF requesting tearing down the video stream connection;

12) The MCDF forwards the request to the customer;

13) The customer replies to the MCDF;

14) The MCDF forwards the response to the agent, the video sharing is closed.

10.9 Video conferencing

In the MCC, MCC agents can organize a video conference for supporting MCC services for customers. During video conferencing, the agent can act as a chair and control the whole process of the video conference. The agent can see all the parties on his/her screen. The agent can also invite other customers or agents into the conferences as well as removing their participation from the conference. Furthermore, the agent can record videos of all or part of the conference.

The following figure depicts the procedure for supporting video conferencing in the MCC.

NOTE – For video conferencing, there are various modes defined according to IMS specifications. The mode for one agent to invite other parties to join a conference is illustrated in this Recommendation.

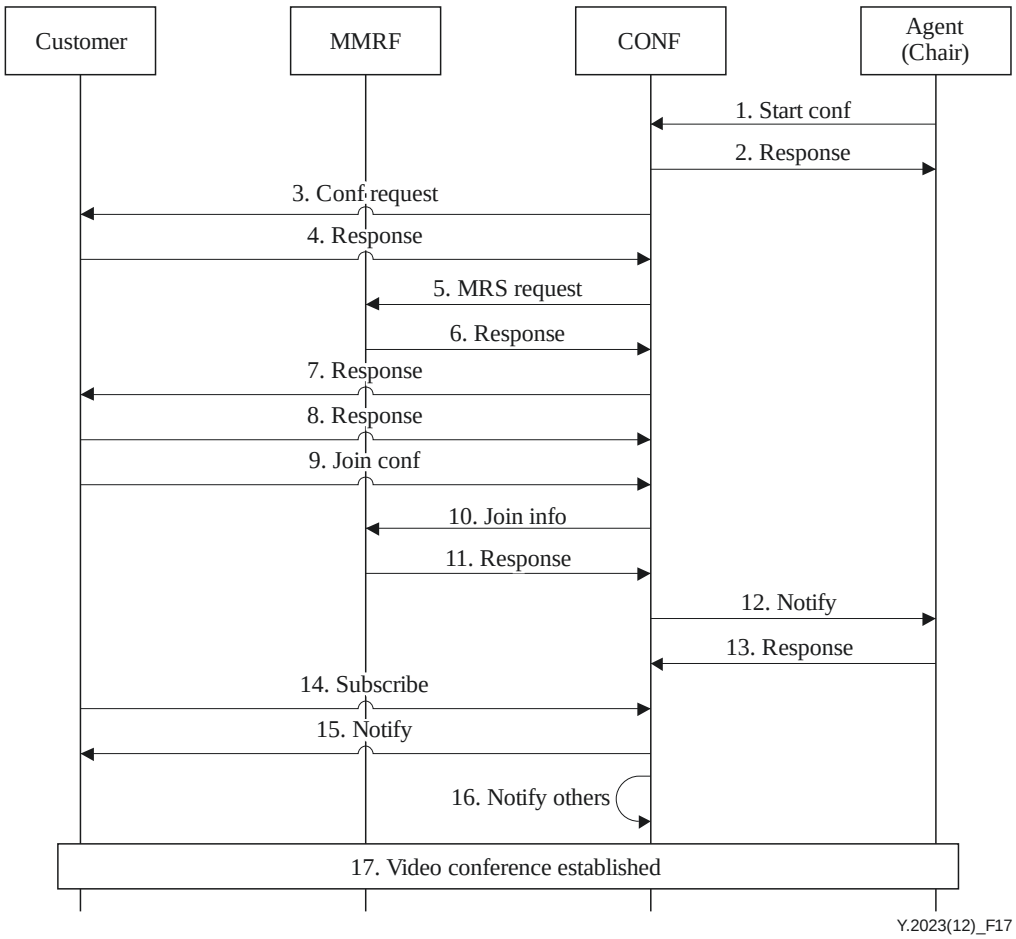

Figure 17 – Video conferencing procedure

The interactions shown in Figure 17 are as follows:

1) An MCC agent sends a request to the CONF requesting the start of a video conference, the request contains target terminal's ID, e.g., SIP URI;
2) The CONF replies with a response;
3) The CONF sends a request to the customer specified in Step 1;
4) The customer replies with a response containing the capabilities it supports;
5) The CONF sends a request to the MMRF for media resource containing the capabilities of the customer;
6) The MMRF replies with a response containing the capabilities determined by the MMRF;
7) The CONF forwards the received response to the customer;
8) The CONF responses the request in Step 3;
9) The customer sends a request to the conference AS requesting to join the conference;
10) The CONF sends a request to the MMRF containing the joining information;
11) The MMRF replies with a response;
12) The CONF notifies the agent with the status of the invited customer;
13) The agent replies with a response;
14) The customer sends a request to the CONF requesting subscribing conference information;
15) The CONF notifies the customer with information on the conference at the moment;
16) The CONF notifies all other participants the information of conference at the moment;
17) The video conference has been established.

10.10 Web and application collaboration

In the MCC, it is recommended to support two types of collaboration: web collaboration and application collaboration. For web collaboration, the collaboration among parties is implemented based on web browser. For application collaboration, the collaboration is implemented by dedicated software, such as IM, file transfer, and whiteboard sharing.

The following figure depicts the procedure for supporting collaboration between the MCC agent and the customer based on the web browser.

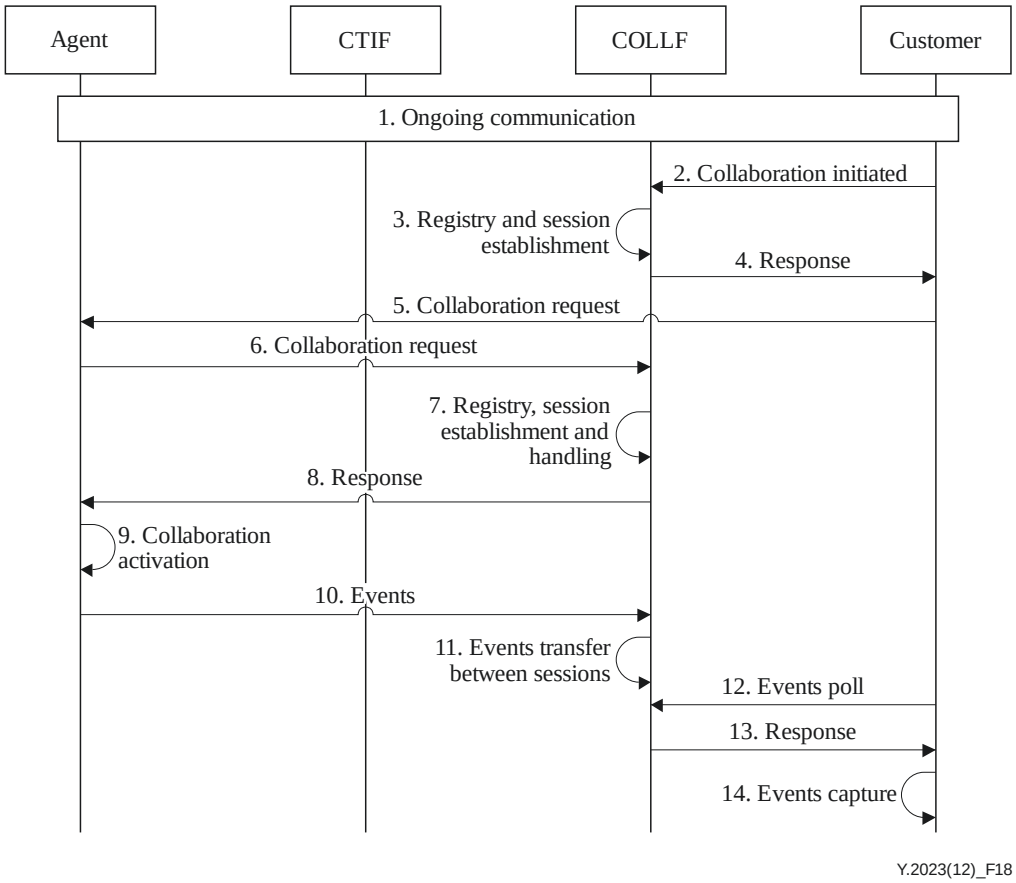

Figure 18 – Web and application collaboration procedure

The interactions shown in Figure 18 are as follows:

1) An ongoing communication connection between the customer and the MCC agent exists;
2) The customer initiates a collaboration request to the COLLF;
3) On receiving the request from the customer, the COLLF performs registry and a session creation for the customer is created;
4) The COLLF replies a response to the customer containing a URI for the MCC agent to start collaboration;
5) The customer sends a request to the MCC agent requesting starting a collaboration, the request contains the URI which is particular to the collaboration session;
6) The agent responds by sending a request with that URI;
7) On receiving the request from the agent, the COLLF performs registry, session creation, and linking between the two sessions;
8) A response is sent by the COLLF to the agent;
9) The agent operates on his/her terminal;
10) The agent sends the events generated by the operations to the COLLF;
11) The COLLF transfers the events between sessions, that is, from the agent's session to the customer's session;
12) The customer polls events from the session in the COLLF;
13) The COLLF responses to the customer with the events;
14) The events are captured by the customer's terminal and the customers can collaborate with the agent.

10.11 User context information adoption

In the MCC, user context information is required for providing enhanced services. The MCC functions using user context information include the MCDF, CTIF and the MCC agent. The following parts describe the procedures using user context information by different functions.

10.11.1 User context information used by the MCDF

When a user initiates a communication request to the MCDF, the MCDF gets the user's context information through the USBF for context information functions, e.g., PSF, LCSF, and distributes the user's requests to relevant call queues.

The following figure depicts the procedure when user context information is used by the MCDF.

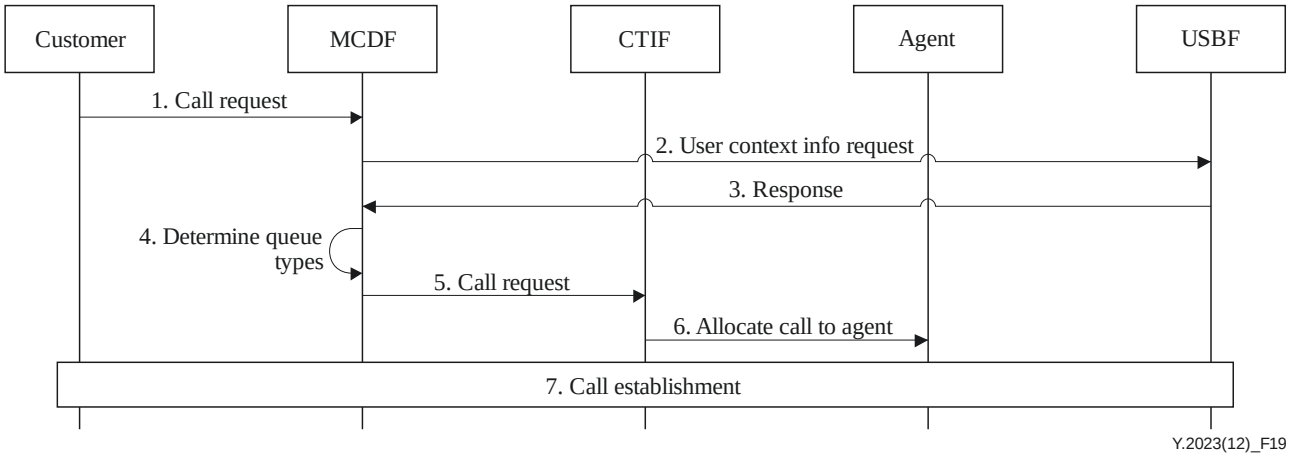

Figure 19 – User context information used by the MCDF procedure

The interactions shown in Figure 19 are as follows:

1) A customer sends a call request to the MCDF requesting the MCC service;
2) When receiving a call from the terminal, the MCDF sends a request to the USBF requesting user context information of the caller;
3) The USBF sends a response to the MCDF containing the caller's user context information;
4) The MCDF determines the queue type based on user context information;
5) The MCDF queues the call and distributes the call to the CTIF;
6) The CTIF allocates the call to a target agent;
7) After receiving a call from the caller, a call is established between the caller and the agent.

10.11.2 User context information used by the agent

When an agent provides multimedia communication services to a caller, he/she can utilize the caller's user context information to provide enhanced services, including customized multimedia services.

The following figure depicts the procedure when user context information is used by an agent for providing a customized multimedia service.

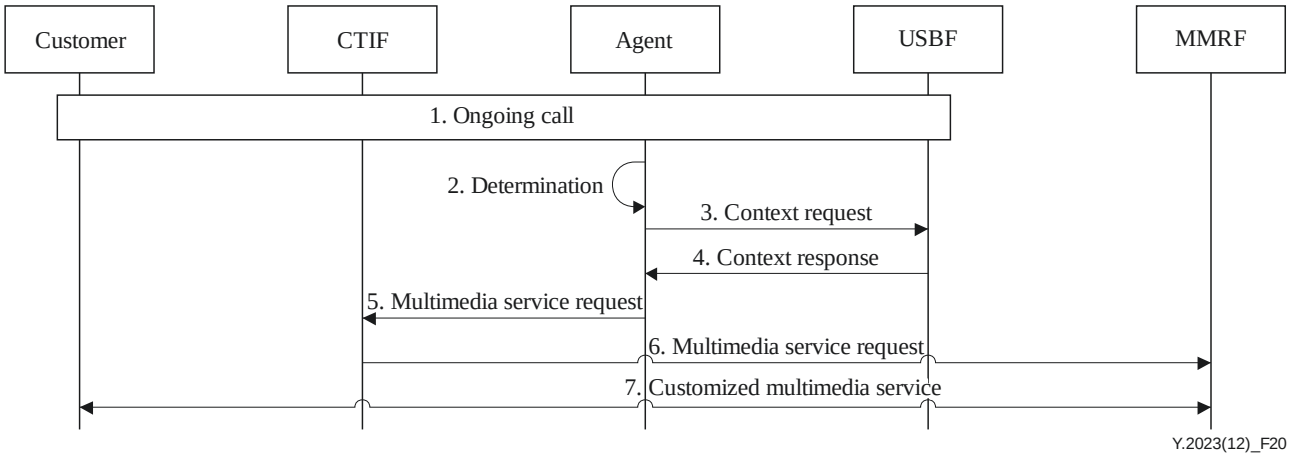

Figure 20 – Procedure when user context information is used by the agent

The interactions shown in Figure 20 are as follows:

1) A call between the customer and the agent is ongoing;

2) The agent has to provide customized multimedia service, e.g., customized music, to the caller based on caller's user context information, including location information, presence information, and caller's subscription information;

3) The agent sends a request to the USBF to get caller's user context information or gets user context information from call signalling information;

4) The USBF sends a response to the agent containing caller's user context information;

5) The agent sends a request to the CTIF asking that customized multimedia service be provided to the caller. The request includes received user context information in Step 4.

6) The CTIF determines the multimedia type based on received user context information from the agent and sends a request to the MMRF requesting that customized multimedia with the determined multimedia type be provided to the caller.

7) The MMRF provides customized multimedia services to the customer.

10.12 Supporting of mobile agents with real-time web communication capability

When a multimedia mobile agent accesses MCC, the mobile agent component in mobile terminal acquires the communication address of the real-time web communication gateway (RWCG) from a web server on its start-up, and establishes a communication connection with the RWCG corresponding to the acquired address to handle two-way real-time communication of multimedia calls. The mobile agent component receives state-indicating messages through the RWCG and completes the mobile agent's state change based on the received state-indicating message.

The following figure depicts the procedure for supporting real-time web communication by mobile agents:

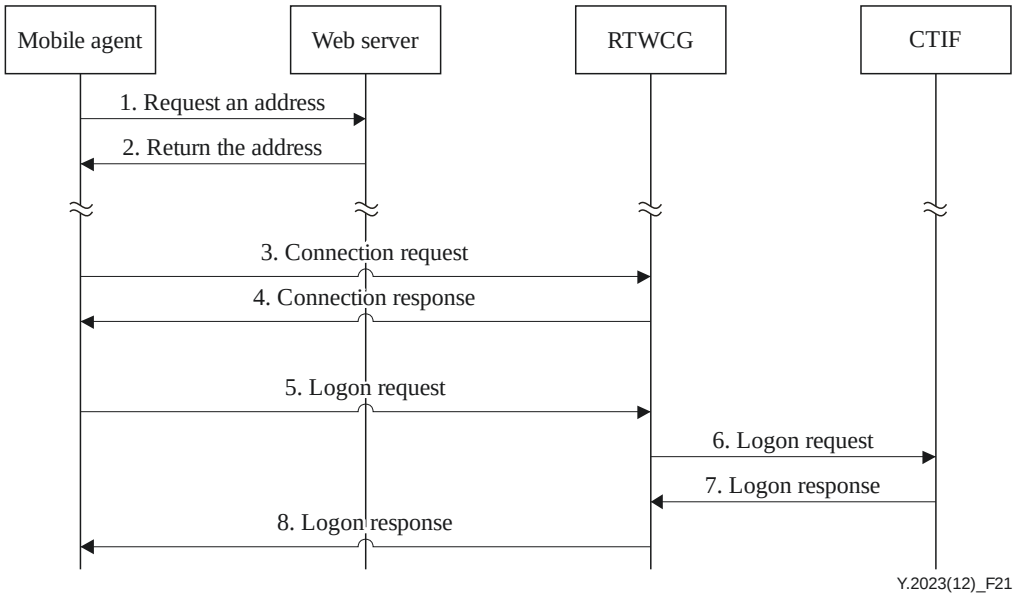

Figure 21 – Procedure for supporting the mobile agent

The detail steps in Figure 21 are as follows:

1) The mobile agent component sends a request to the web server requesting the communication address of the RWCG from the web server when it starts up.
2) The web server returns the communication address to the mobile agent component.
3) The mobile agent component sends a connection request to the RWCG.
4) The RWCG returns a connection response to the mobile agent indicating that the connection has been established.
5) The mobile agent component sends a logon request to the RWCG.
6) The RWCG forwards the logon request which will be converted to CTIF.
7) The CTIF handles the logon request, and returns a logon response to the RWCG.
8) The RWCG forwards the logon response which will be converted to the mobile agent component. A connection between the mobile agent and CTIF is established through the RWCG where service media transcoding and protocols adaption are fulfilled.

11 Security considerations

The security requirements for the MCC service are addressed by the security requirements for the NGN in [ITU-T Y.2701] and the authentication and authorization requirements for the NGN in [ITU-T Y.2702]. No additional security requirements have been identified for the MCC service.

Appendix I

Multimedia communication centre layered architecture and deployment principles

(This appendix does not form an integral part of this Recommendation.)

I.1 Multimedia communication centre (MCC) hierarchical deployment principles

I.1.1 General principles

General principles that can be applied to regarding the deployment of the MCC are as follows:

– Extensibility: The basic deployment principle should support system extensibility and can be extended dynamically in real time without affecting procedures running.

– Flexibility: The MCC should also support flexible deployment modes based on different requirements and network environments which can accordingly accommodate requirements for large-scale telecom enterprises, and middle or small-scale enterprises.

– Accessibility: The MCC should also support various heterogeneous types of access for customers (e.g., various legacy network infrastructure and devices), which can protect legacy devices and investment; besides, the multimedia communication centre should also be able to interwork with various other communication systems or services, such as the intelligent network, and the SDP.

– Multimedia support: The MCC should also support constructing multimedia services based on the 3G network or beyond, and should support constructing multimedia services based on multiple networks simultaneously, and provides multimedia services to customers from multiple networks.

I.1.2 Deployment models

This clause covers the following types of deployment for the MCC:

– Deployment model in a non-IMS network;

– Deployment model in an IMS network.

I.1.2.1 Deployment model in a non-IMS network

Figure I.1 illustrates a conceptual deployment model for the non-IMS network.

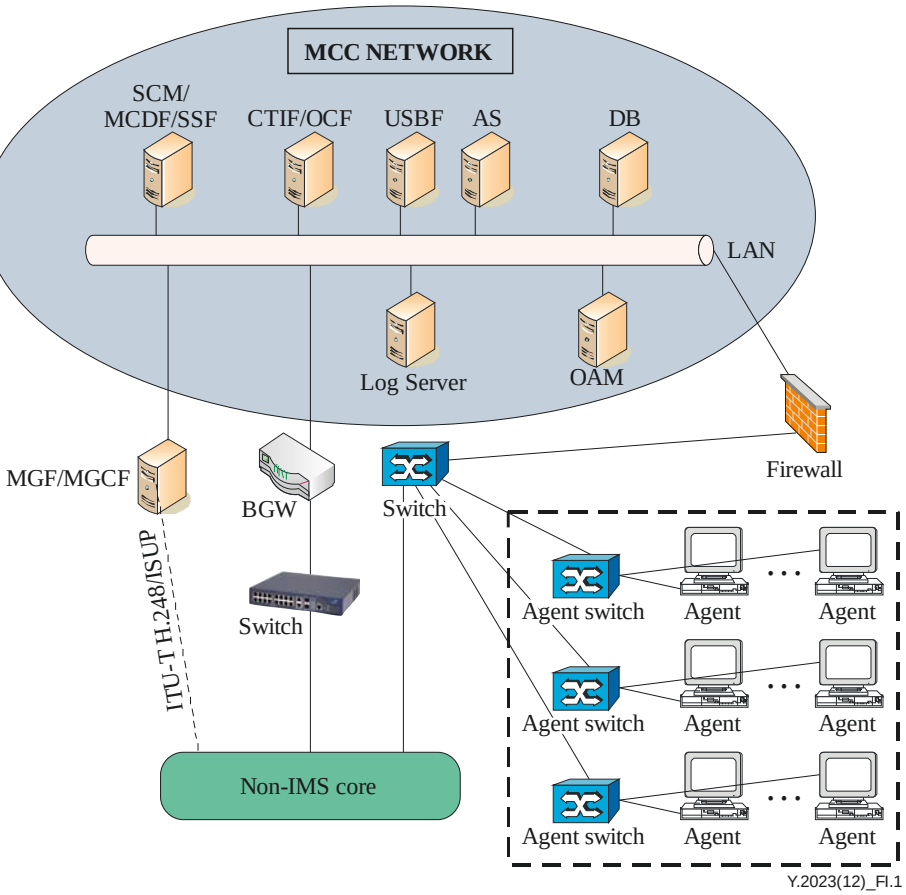

Figure I.1 – Deployment for a non-IMS network

In actual deployment, the SCMF, MCDF, and SSF can physically reside in the same device. The CTIF and OCF can also physically reside in the same device. The AS can include automatic application functions and manual application functions. Besides, the DB, OAM, and log server are also included in the MCC network. All of these functions are connected by LAN and are isolated from outside the network.

As shown in Figure I.1, the MCC network is isolated from other domains by firewalls which are used to protect the MCC network from security attacks.

For the border gateway (BGW), it is deployed between the IP multimedia subsystem (IMS) core and the MCC network. The media gateway (MGW) and media gateway control function (MGCF) are used to provide legacy telecommunication services. Concerning the agents, they are connected to the MCC network through firewalls. For multimedia stream for agent, it is not transmitted through firewalls.

I.1.2.2 Deployment model in an IMS network

The following figure illustrates a conceptual deployment model for an IMS network.

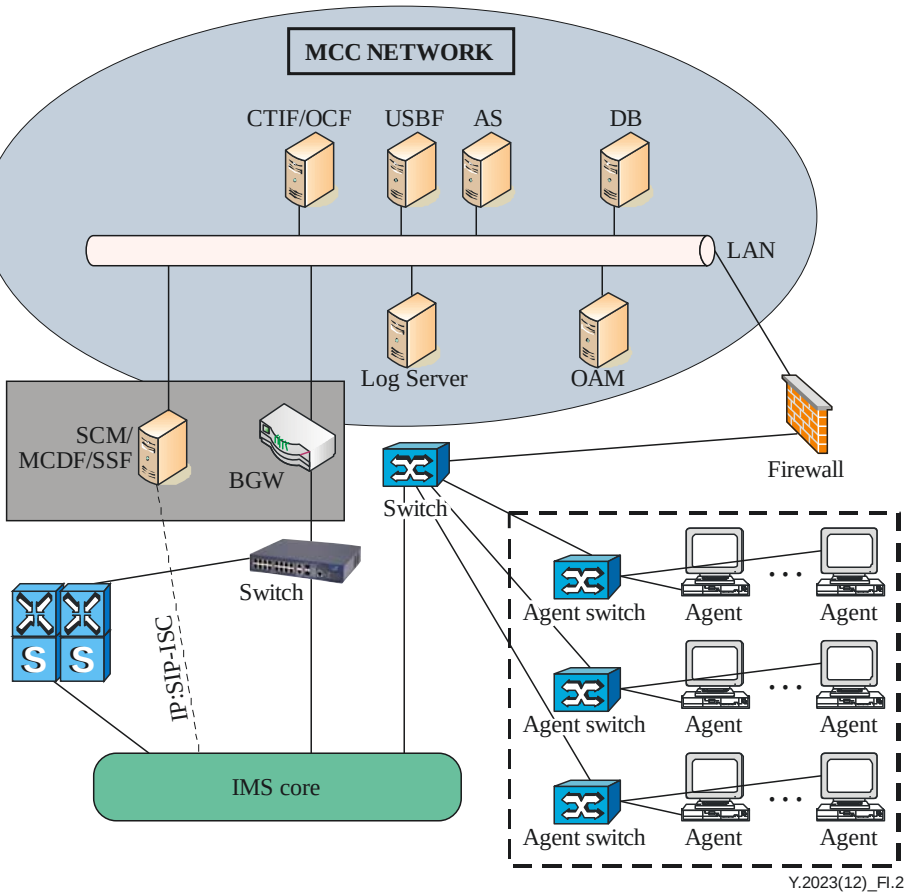

Figure I.2 – Deployment for an IMS network

In actual deployment, the CTIF and OCF can also reside in the same physical device while the AS can include automatic application functions and manual application functions. Besides, the data base (DB), OAM and log server are also included in the MCC network. All of these functions connect to the LAN and are isolated from outside the network.

Additionally, the SCMF, MCDF, and SSF can reside in the same physical device and interact with the IMS core directly based on the Session Initiation Protocol (SIP). As shown in the figure, the MCC network is isolated from other domains by firewalls which are used to protect the MCC network from security attack. For the BGW, it is deployed between the IMS core and the MCC network. Regarding agents, they are connected to the MCC network through the firewall. For multimedia stream for the agent, it is not transmitted through the firewall.

I.2 MCC layered architecture

From the perspective of a layered architecture, and as shown in Figure I.3, the MCC includes three main layers, i.e., access layer, control layer, and application layer. Additionally, a support layer is also included in the layered architecture.

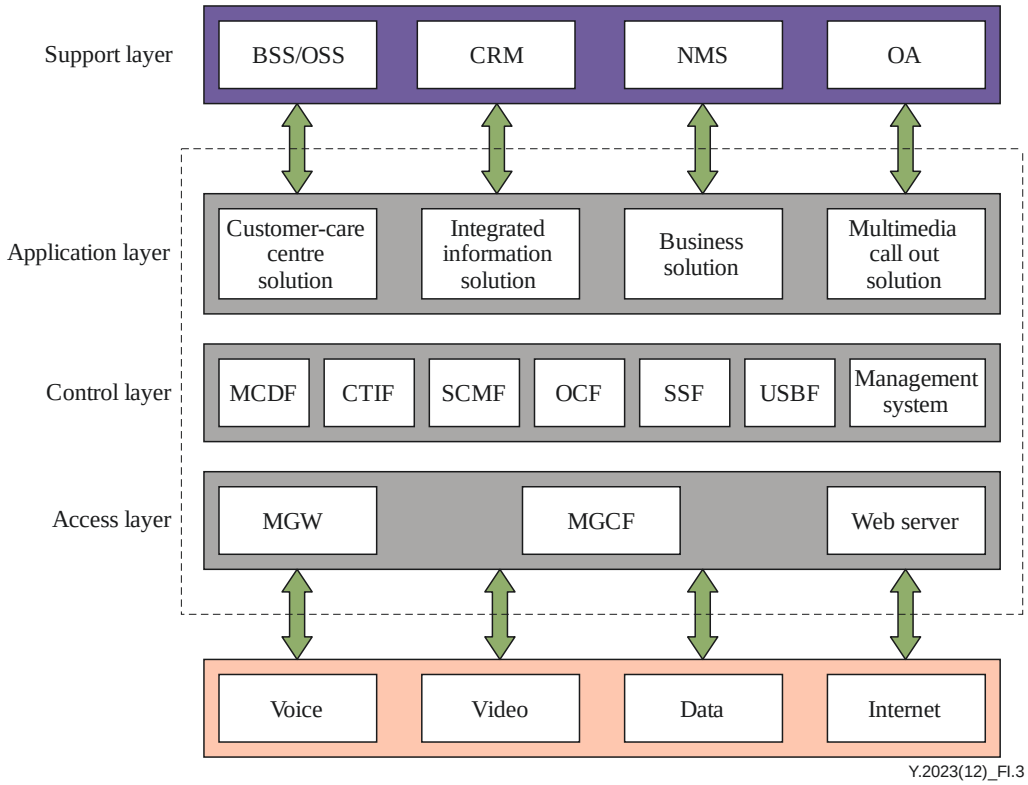

Figure I.3 – MCC layered architecture

The access layer provides MCC customers with various media access channels, including voice, video, and data. The functionalities involved are MGW, MGCF, MMRF and the web server. The MGW and MGCF support traditional time division multiplexing (TDM), voice/fax services, as well as broadband voice/video/fax services. The web server provides internet access services, e.g., chat. Hence, the MCC customers can not only communicate with agents through voice, video and data channels, but also through Internet.

The control layer is the core layer for support of MCC management and service control, including service support, communication control, communication routing, resource management, and user profile management. Key functionalities include MCDF, CTIF, SCMF, OCF, SSF, USBF, and management system. The management system stands for a set of functions, including call-out management, quality inspection management, on-site management, task management, report forms management, work flow management, customer data management, log management, etc.

The application layer provides service solutions based on MCC functionalities and interacts with supporting systems, including BSS/OSS, CRM, NMS, OA, etc. The service solution supported by the application layer includes customer-care centre solution, integrated information solution, business solution, and multimedia call out solution.

The supporting layer in the layered figure usually refers to various applications supporting system on the enterprise side, including BSS/OSS, CRM, NMS, and OA.

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