ETSI TR 103 077 V1.1.1 (2002-11)
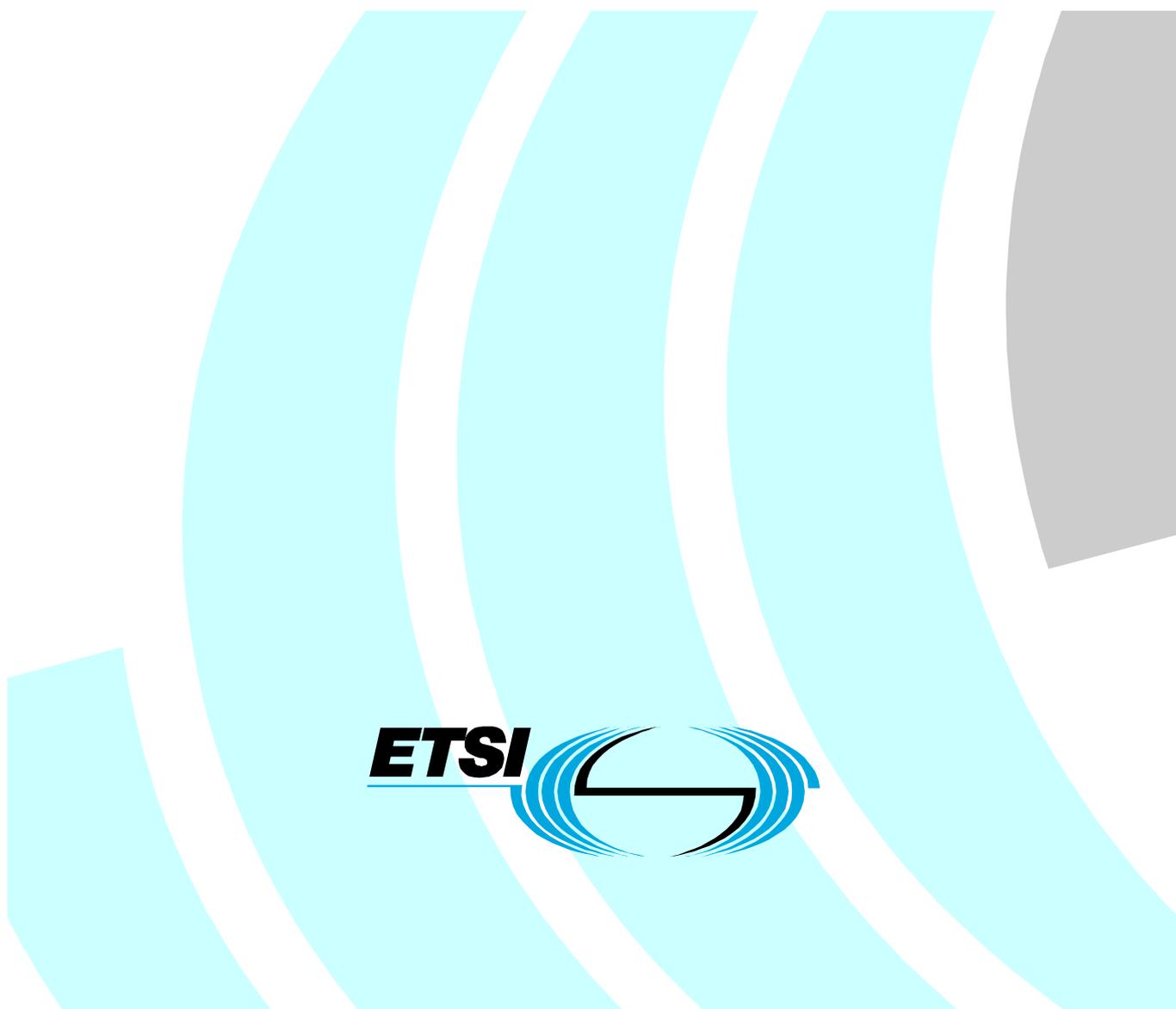
Technical Report

Universal Communications Identifier (UCI);
Maximizing the usability of UCI based systems

Reference

DTR/HF-00036

Keywords

ID, UCI

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or
perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF).
In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive
within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.
Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, send your comment to:
editor@etsi.org

Copyright Notification

ETSI

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Human Factors (HF).

Introduction

The need for a single identifier to cover a range of communications services has long been acknowledged and many proposals, albeit less ambitious than the Universal Communications Identifier (UCI), have been defined and even field-trialled. No approach so far could be described as an unqualified success and, almost, without exception, that lack of success has been due in some measure to usability issues. In the past these systems have either been too difficult to use or so intrusive and time consuming that users perceived insufficient benefit to encourage them to take up these services. People now tend to communicate more often and using a wider range of methods (e.g. mobile phones and several email accounts) and hence the need for services to manage personal communications has increased.

The approach to specifying the Universal Communications Identifier UCI has been different from any other. Firstly, it is a truly universal identifier covering ALL communications services (including email) not just telecommunications services. Secondly, the UCI has been defined with continual reference to a precise set of user requirements (see annex B) relating to the management of personal communications. This approach is described in EG 201 940 [1]. To achieve its full potential the UCI needs to operate within an architecture capable of supporting the concept of personal control of communication and this is described in EG 202 067 [2].

With the advent of new architectures and services, users can define precisely under what circumstances and with whom they are prepared to communicate. One of the biggest selling points of the UCI system is the capability of increasing the user's control over their communications, incoming and outgoing. With an increase in the capability to specify customized communications management comes an inevitable increase in complexity of the user interface to implement and oversee that capability.

The purpose of the present document is to build on the work done in [1] and [2] and to define and analyse the user tasks inherent in implementing a UCI based communications architecture and to highlight usability issues. Future guidelines will then use the analysis included in the present document, taking the defined task elements, applying usability best practice and recommending areas for usability guidelines where appropriate. Adoption of these recommendations will mean that the chances of successful implementation and uptake of UCI based communications will be maximized.

1   Scope

The present document will expand on the issues relating to usability already identified in the following two documents, EG 201 940 [1] and EG 202 067 [2], which identified the critical importance of the usability issues associated with Universal Communications Identifier (UCI) systems.

The present document identifies usability best practice relating to communication services and then considers the implications of applying such best practice to the user tasks necessary for implementation of UCI based services whilst still meeting the relevant User Requirements defined in EG 201 940 [1] (and summarized in annex B). The present document suggests which of these issues are suitable for expansion into guidelines. Other areas which require further investigation, before guidelines are produced, are highlighted in the relevant clause of the present document.

Further illustration of some of the usability issues associated with UCI is raised in annex A. Annex A takes the 6 scenarios that are contained in EG 202 067 [2] and uses them to highlight potential usability issues associated with UCI. Issues raised in annex A are discussed further in the body of this present document.

It is intended that the present document together with the future guidelines, will provide information and guidance for:

- terminal and service designers (telecommunications and IT);

- service providers (telecommunication and IT);

- designers of external tools (e.g. calendar, address book) that may be used in a UCI context;

- user groups;

- other Technical Committees within ETSI.

2   References

For the purposes of this Technical Report, the following references apply:

[1]   ETSI EG 201 940: "Human Factors (HF); User Identification solutions in converging networks".

[2]   ETSI EG 202 067: "Universal Communications Identifier (UCI); System framework".

[3]   ETSI EG 202 116: "Human Factors (HF); Guidelines for ICT products and services; "Design for All"".

[4]   "Interview: Ben Shneiderman and Allison Druin", Elizabeth Dykstra-Erickson, pp. 59 to 65, interactions, Volume 7, Issue 2, March-April 2000, ACM Press, New York, NY, USA (see http://portal.acm.org/citation.cfm?doid=330678.330808).

[5]   "Technics and Civilization", Lewis Mumford; June 1984, Peter Smith Pub; ISBN: 0844661155.

[6]   Nielsen, J. (1994): "Heuristic evaluation", In Nielsen, J., and Mack, R.L. (Eds.), Usability Inspection Methods, John Wiley and Sons, New York, NY (see http://www.useit.com/jakob/inspectbook.html).

[7]   Sullivan, Louis H: "The tall office building artistically considered", Lippincott's Magazine, March 1896 (see http://www.njit.edu/Library/archlib/pub-domain/sullivan-1896-tall-bldg.html).

[8]   Marcus, Aaron: "Metaphors and user interfaces in the 21st Century"; pp. 7 to 10, interactions, Volume 9, Issue 2, March 2002, ACM Press, New York, NY, USA (see http://portal.acm.org/citation.cfm?id=505103.505107&coll=portal&dl=ACM&idx=J373&part=magazine&WantType=Magazines&title=interactions).

[9]   ETSI ETR 170 (Edition 1): "Human Factors (HF); Generic user control procedures for telecommunication terminals and services".

[10]   ISO 9241-11 (1998): "Ergonomic requirements for office work with visual display terminals (VDTs); Part 11: Guidance on usability".

[11]   ITU-T Recommendation E.123: "Notation for national and international telephone numbers, e-mail addresses and Web addresses".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following terms and definitions apply:

accessibility: ensuring that all sectors of the community have equal access to communications and online information

address book: entity that contains a number of records describing potential contacts of the UCI user

log: entity that contains a number of records that describe instances of an activity

> NOTE: The log is usually named after the activity that its records describe e.g. an "incoming communications log" contains a list of the communications that a UCI user has received.

Personal User Agent (PUA): functional entity (probably implemented as a software object) with a one-to-one relationship to a specific UCI

> NOTE: It stores or has access to information on all of a person's communication services and their service identifiers (e.g. telephone numbers, email addresses, etc.).

PUA base-profile: subset of its PUA profile which contains rules and settings that are always active

PUA profile: total set of rules and settings relating to a specific UCI

PUA sub-profile: named subset of the rules and settings of its PUA profile defined to suit the user in a specific situation

PUA user: person or role to which a UCI, and hence a PUA, is assigned

PUA administrator: person who defines PUA profiles with settings and rules

> NOTE: This could be the same person as the UCI/PUA user.

PUA provider: company that provides the PUA and associated services

rule: statement that can be interpreted by the PUA to produce one or more actions

> NOTE: The action taken will be dependant on a number of factors including user settings and external events.

Service Agent (SA): functional entity that is linked to a communication service (or network)

> NOTE: It would typically be provided by a network or service provider. An SA is the link between the UCI and networks and services. It participates in communication with PUAs, other SAs and its own network/service and would be specially trusted by PUAs following successful registration.

template: set of rules and settings considered appropriate for commonly encountered uses

> NOTE: The use of the template is usually reflected in the name of the template e.g. a "working from home" template contains rules and settings appropriate for typical home-working usage.

UCI user: See PUA user definition.

3.2   Abbreviations

For the purposes of the present document, the following abbreviations apply:

AI   Artificial Intelligence
CLI   Calling Line Identity
GSM   Global System for Mobile communication
GPS   Global Positioning System
ID   Identifier
IP   Internet Protocol
ISDN   Integrated Services Digital Network
IT   Information Technology
ITU   International Telecommunications Union
PSTN   Public Switched Telephone Network
PUA   Personal User Agent
SA   Service Agent
SC   System Capability
SIM   Subscriber Identification Module
UCI   Universal Communications Identifier

4   Background

Implementation of UCI systems as proposed in [1] and [2] overcomes the many limitations that arise from the use of the current identifiers in today's communications systems. When the UCI is used within a supporting network architecture it will:

- support the fundamental generic user requirements for communication (see annex B);

- identify the user not the terminal or service;

- avoid the need to have many different identifiers for a range of different communications services;

- provide the potential for verifying the true identity of the originator or recipient of a communication;

- remain unchanged when moving to a different service provider or service type;

- provide a common environment for the management and control of all personal communications irrespective of service type (as opposed to a range of different control mechanisms that are service specific);

- allow user profiles to be set up to provide comprehensive management of outgoing and incoming communications.

In a UCI system, every user has at least one UCI each with an associated Personal User Agent (PUA). For every service used, the user has an associated Service Agent (SA). This is described below.

4.1 The Universal Communications Identifier (UCI)

The UCI is a single, unique identifier for a user. It consists of an alphanumeric part, a numeric part and an additional information field (not directly seen by communicants). It is only the numeric part of the UCI that is unique and hence it is this that uniquely identifies the user. The UCI would be allocated by a trusted authority and be stable, i.e. it would not change over time even with a change of service provider.

E.g. John Smith[8837460633789]<a6;f1;d234;k78>

Some of the key characteristics of the UCI are:

- it is a unique identifier for a person, role or organization;

- it allows a "user-friendly" name to be used as a label which describes the originator and/or recipient of a communication;

- it allows important additional information to be available to anybody using it such as preferred language, acceptable languages, whether business/personal, label authenticity or alias, etc.;

- it allows the originator or recipient of a communication to claim authenticity for their identifier;

- where it is particularly important to claim authenticity, additional procedures can be invoked to make sure that it is not another person using the terminal and thus not the person it seems to be;

- it is independent of services and networks;

- it is independent of service providers.

4.2 The Personal User Agent (PUA)

A PUA is an entity external to the main communication networks and with a one-to-one relationship to a specific UCI. It stores, or has access to, information on all of a user's communication services and their service identifiers (e.g. telephone numbers, email addresses, etc.). The PUA also stores, or has access to, current status and personal preferences information in relation to all communications services. These preferences (or user profile) would consist of access, filtering and redirection rules which could operate on a wide range of factors including:

- the identity (UCI) of people attempting to communicate with the user or with whom the user is trying to communicate;

- the date and time when communication is attempted;

- the location of the user;

- the urgency of the communication;

- whether the originator of a communication has a business or a personal status;

- the user's preferences for how they wish to be reached (which services and which terminals) or how they wish to contact others.

The operation of these rules can permit a very high degree of control over the user's communications. EG 201 940 [1] gives some scenarios illustrating the potential power and flexibility of UCI-based communication. Further, more detailed, examples and scenarios are given in EG 202 067 [2]. These scenarios are also included in the current document (see annex A). In the present document scenarios have been analysed from a usability perspective.

4.3 The Service Agent (SA)

An SA is an interface between a PUA and a communication service (or network). It would typically be provided by a network or service provider. An SA is the link between the main UCI system and networks and services. It communicates with PUAs, other SAs and its own network/service and would be specially trusted by PUAs following successful registration.

4.4 The UCI in operation
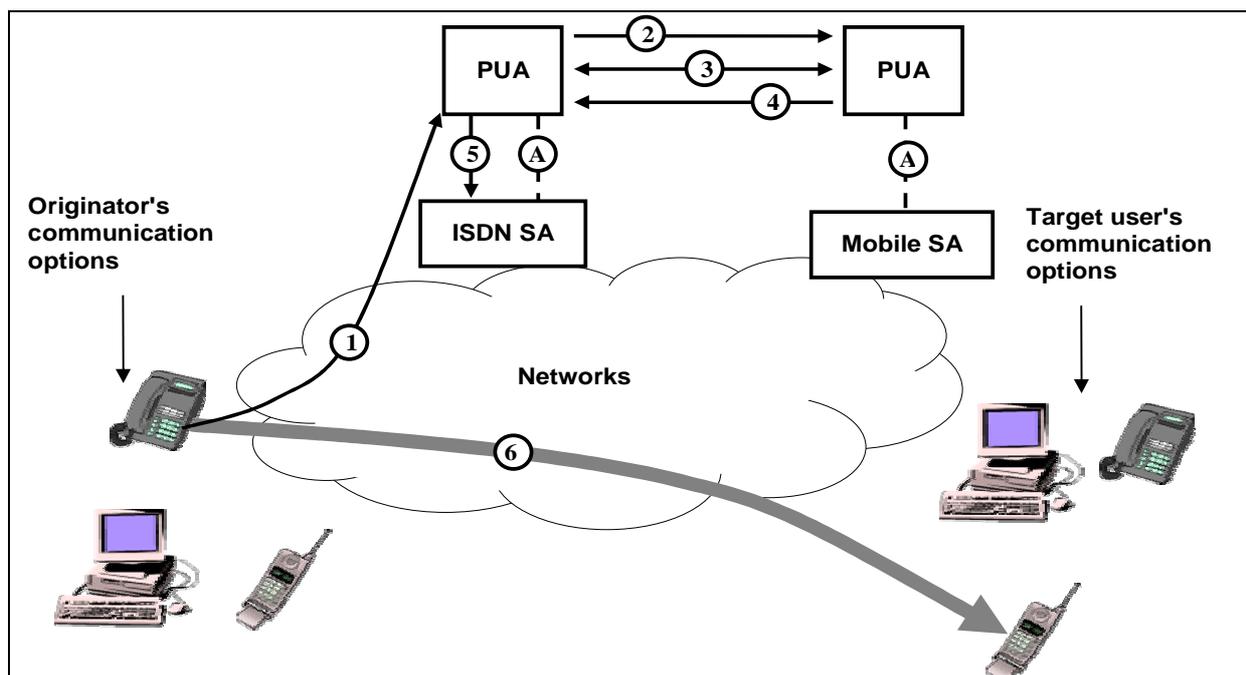
NOTE: The originator requests a voice call to the target user:

    A) Each PUA exchanges information with the SAs of it's user's networks/services before, during and after communication attempts take place. The target user's PUA knows that the user's mobile phone is able to receive voice calls.

    1) The originating user enters the UCI of the target user.

    2) The originating PUA makes a request to the PUA of the target user.

    3) The PUAs negotiate communication options if necessary.

    4) The target user's PUA takes account of it's user's preferences and proposes the user's mobile phone to receive the call.

    5) The originator's PUA instructs the originator's network to set-up the call.

    6) A voice call between the originator's ISDN phone and the target user's mobile phone is established.

Figure 1: Simplified overview of UCI operation

5 Usability principles

5.1 Usability

Usability will be a critical success factor for the user interacting with the PUA. The usability quality standard Usability ISO 9241-11 [10] defines usability as the "Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". In the UCI context, "product" can be taken to include every aspect of UCI e.g. the terminal user interface, the applications running on terminals (or the PUA) and the services that the users access. The terms used in the ISO definition can be further expanded as:

- Effectiveness: Accuracy and completeness with which users achieve specified goals.

- Efficiency: Resources expended in relation to the accuracy and completeness with which users achieve goals.

- Satisfaction: Freedom from discomfort, and positive attitudes towards the use of the product.

- Context of use: Users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used.

The following clauses use this terminology and show how it is applicable to UCI systems. Each clause will highlight issues of particular relevance to UCI. The clauses are organized according to Jacob Nielsen's 10 Usability Heuristics [6]:

- Visibility of system status: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

- Match between system and the real world: The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

- User control and freedom: Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

- Consistency and standards: Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

- Error prevention: Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

- Recognition rather than recall: Make objects, actions, and options visible: The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

- Flexibility and efficiency of use: Accelerators, unseen by the novice user, may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

- Aesthetic and minimalist design: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

- Help users recognize, diagnose, and recover from errors: Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

- Help and documentation: Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

A more complete and general set of Usability Guidelines can be found in EG 202 116 [3].

5.2   Visibility of system status

5.2.1   Presentation of feedback and status information

When the output medium is a visible display it is possible to give continuous information on the current system state. However, there may be circumstances when the display of some other information is more important than the state information and the state display may be removed.

Where the output medium is an audio device, continuous presentation of the state of the interface will frequently not be practical. It will however be practical when the user is unable to interact further with the system until that state changes (other than to abandon the waiting state by some action). An example of such a situation is where the user is awaiting the connection of a real-time communication, where a status indication such as a "ring-tone" is very appropriate. In other circumstances the user must be informed once that the state has changed and the user's memory is relied upon to ensure that the user is continuously aware of the current system state.

Where the system cannot respond to a user as quickly as the user might expect, or when the length of time to respond is very long, there will be a need to provide feedback to the user so that they are given confidence that the system is responding correctly and that it has not failed. System response time is discussed in clause 5.2.2.

Users may wish to customize the amount and type of feedback that they receive.

5.2.2   System response time

Response time is the time taken for the system to respond to the users' inputs or commands. Users will have expectations about these response times according to their perception of what activities are being undertaken by the system and how long such activities should take. Where the actual system response times match user expectations, users will be unlikely to experience difficulties. Where the system response times exceed the users' expectations (or are very long), consideration will need to be given to provision of a form of feedback that reassures the user. The above implies that it would be valuable to set correct expectations in users where tasks may involve long delays.

Table 1 is taken from EG 202 116 [3] and illustrates a range of possible system response times in telephony systems. System response time recommendations appropriate for UCI systems will be presented in future guidelines.

Table 1: Recommended response times

User activity/task	Time	Telecommunications examples
Reaction to key actuation	0,1s	Audible or tactile confirmation of successful key actuation. LED signal as a status check. Displaying an entered character on a visual display. Switching on a loudspeaker, microphone. Switching through a connection.
Display of short and simple guidance information that can be taken at a glance	0,5 s	User prompts. Error messages. Reception of a system's ready status, e.g. dial tone on lifting handset. Information on single or two line displays, e.g. display texts for telephone applications. Paging through a list or menu on a line display. Paging through a telephone directory or notepad. Displaying document headings when paging through a document file. Calling up a menu, displaying the following menu.
Display of large amount of complex information that needs to be read	1,0 s	Opening a document in an activated program. Displaying the next page in the document. Displaying a document section selected by means of scroll bars. Calling up a complex operating field or dialogue box. Terminating a program.
Simple inquiries	2,0 s	Activating a service or program with a function key, menu item or icon Ringing tone and busy tone after dialling. Status interrogation, e.g. services on an ISDN feature telephone. Reaction after insertion of a chip card. Making up a page. Manipulating graphics. Calling up a specific page in a long document.
Complex inquiries	5,0 s	Identification at a terminal. Opening a document, including activation of associated processing program. Making up an entire document. Interrogating a database.
Program loading and execution	up to 15,0 s	Resuming a defined work status. Loading long programs. Executing complex programs. Automatic layout processing performed on long documents (more than 10 pages), e.g. dictionary-based syntax checks, teletex to telex format conversion, word searches, search and replace operations.

5.3 Match between system and the real world

5.3.1 There is always a model

In presenting feedback and status information to users and in providing methods for users to control the underlying systems, the language and graphics used will reflect some form of model. This is the case even if system designers have not explicitly considered the model that their user interface presents to the user. In order for users to operate a system effectively, it is desirable that the user interface reflects the user's model of the underlying tasks. For UCI there are two major groups of tasks:

- communicating - e.g. the making and receiving of communications;

- managing communications - e.g. the setting of communication preferences and rules.

Previous research has shown that the vast majority of users have very limited and inaccurate models of how basic telephony works (see ETR 170 [9], p. 10). It is probable that users' models for other forms of communication such as email are also very inadequate representations of the real task domains. As users have limited experience of managing their existing communications and because the methods for managing communications varies significantly according to the type of communications and networks/applications the existence of some common model for the management of communications activities is even less likely to exist.

It is necessary to design PUAs taking account of the context of use e.g. types of user, tasks, equipment and the physical and social environments. The PUA Administrator will need a great deal more information to control the behaviour of a group of several users than the individual with simple communication management needs. This implies that it will not be possible to have a single user interface that will encompass the needs of the full range of UCI users and the full range of the different tasks associated with UCI systems.

5.3.2 Using the user's vocabulary

As UCI has a global scope, the user interfaces will need to be localized for the language of the different national groups of users. However, whatever language is used, it is important to use a vocabulary within that language which is familiar and acceptable to the user. Only then will it be possible to effectively describe the various concepts that are needed to control the UCI environment in terms that are meaningful to the user.

E.g. error messages such as "Error 231 - communication failure" should be avoided as users will not know what "Error 231" means.

Different groups of users may require the same concepts described in different terms according to their experience and understanding. For example, for PUA Administrator may wish to see the rules that control how a user's communications behave as "rule" objects, whereas the ordinary user may only be aware of these rules in terms of the communication outcomes that they require.

5.3.3 User interface models and metaphors

With existing communications systems, users have poor models of how systems will behave. There is no reason to believe that the situation will be inherently better for UCI systems. Because of this there is a need for the system to present, through its user interface, a model that will allow the user to perform the necessary tasks. The design of the user interface can then be used to help to build and reinforce the appropriate models in users' minds. The use of metaphor, where objects and activities in the task domain are represented by objects and activities in some more familiar domain, is a common way to help users to understand unfamiliar task domains. The most commonly experienced user interface metaphor in IT is the "desktop metaphor" where the binary files and directories are represented as icons that look like paper "documents" and "folders" that are used in the physical world to contain such documents.

Future guidelines will suggest potential models and metaphors that can support key UCI related tasks. As the PUA acts on behalf of users to help them in managing their communications, user models based on the concept of a "personal assistant" will be considered. User interfaces that use the metaphor of an assistant are predicted to be the next major trend in the evolution of UIs by Aaron Marcus [8]. Ben Schneiderman [4] warns of the dangers of "animism", where the user is fooled into believing that the system will behave like the person that it is pretending to be:

"First, it's a deception to portray the machine as a person. The suggestion that people are machines or that machines are people is counterproductive; it misleads designers and deceives the users. The design of effective interfaces is not necessarily based on human-human interaction; it's often a misleading design strategy. This was emphatically illustrated in Louis Mumford's 1934 book, Techniques in Civilization [5], which talked about the obstacle of animism. "Most technologies went through an early stage where the anthropomorphic model was used as a design principle and misled the designers. Once we get past that, we can move on to more effective design."

Future guidelines will take into account that animism carries the potential danger of users having false expectations of system capabilities whilst recognizing the "fun" and potentially engaging aspects that animism can bring (e.g. the use of cartoon characters that appeal to children and encourage their participation).

Users with different experiences in using computers will all need to use their UCI and the associated functions of the PUA effectively. This may require a range of alternative user control options to be available:

- Some users will have no experience in using computers. These users may require the PUA provider to set up the PUA for them and also possibly perform modifications whenever they desire. Such support would allow these users to get the benefits of UCIs/PUAs without having to directly manage PUAs themselves.

- Other users will have some experience in using computers and they may want to set up the PUA by using a "wizard" (an "intelligent" application) which guides them by explaining and proposing a set of the most common types of profiles/sub-profiles that are most likely to suit the user.

- Users who have significant experience in using computers would require the option to configure their PUA profile to an exact specification (within the standard system constraints).

- Users with disabilities will also wish to control their PUA. Methods that allow people with different disabilities to control their PUA need to be provided.

5.4 User control and freedom

It is important that users always feel that they are in control of the system and not that the system is controlling them. However, this should not be an excuse to get the users to do things that can perfectly well be done by the system - users also need to feel that they are performing the minimum amount of operations to complete a task and not having to do things that the system is perfectly able to do itself. As part of the task of maintaining user control, users need to be given ways to stop performing tasks that they no longer wish to complete and also be given the chance to reverse operations that they subsequently realize they should not have done.

There are many instances where the user will wish to, or need to, exit from some state of the system. Three specific cases are where:

- the user has performed some unintended action (where some form of "undo" facility will be useful);

- the delays in the system will be longer than the user is willing to wait (where an "escape" mechanism will be needed);

- the user has requested (and possibly started to prepare for) a system action and then decides that they do not wish to complete their request (where an "abort" type of function will be required).

Specific instances of where these exit mechanisms may be required and recommendations for appropriate solutions to them will be the subject of future guidelines.

As well as support for "undo" functions, support for users handling different versions of their PUA profile set-up will need to be considered. Such a facility might include PUA providers retrieving previous versions of the PUA profile on the users' behalf.

5.5   Consistency and standards

5.5.1   Why consistency?

With UCI systems, users may make use of a number of terminals or applications of the same type in different circumstances e.g. a home telephone and a mobile telephone; or an email application at work and a different one at home. Within each particular type of terminal or application users will expect to see significant consistency. So, for example, in an email application users would expect the term for delivering an email to always be the same and not "send" in one application and "post" in another. Similarly, users will expect icons used in applications of the same type to look recognizably similar.

One prerequisite of UCI systems is that the user may wish to control their communications from a number of different types of terminal, accessing communication facilities across a number of different types of access technologies. The implications of this broad range of methods of access and control is that users will be exposed to a very wide range of different types of user interface. Each terminal is likely to have its own inherent user interface style determined by its inherent characteristics e.g. telephone devices are well suited to voice-based interfaces, whereas complex graphical presentation is more appropriate to large-scale graphical displays.

With different terminals and interface styles there is a serious risk that users will have to cope with radically different presentations of the same tasks on the different devices. Users will want to experience the maximum level of predictability and consistency despite the wide range of different potential user interface types. This implies that the underlying way in which the task is performed must have significant similarities even when the form in which the user dialogue is presented to the user may be very different. A solution to this dilemma is the creation of a set of generic control procedures for key tasks that are independent of the form in which the user interface is presented to the user. Consistency of terminology is also an important element of defining generic control procedures.

5.5.2   Generic control procedures

5.5.2.1   The concept of the "generic control procedure"

In telephony it has been found that users need to be able to make, receive and terminate calls with minimum training and without making errors, especially for voice communications (telephony), but preferably irrespective of the communication media. Similar requirements apply for the wider range of tasks that are inherent in UCI systems.

Some major advantages of the definition of generic control procedures are that they:

- encourage the definition of a "minimum" user interface;

- reinforce learning;

- reduce the barriers to the adoption of different terminal types to suit different types of communication;

- maximize the probability that users will cope when faced with a new terminal with which they are not familiar;

- will aid users when migrating from one PUA provider to another.

Although the detail of presentation across different interface styles will inevitably be different, it is possible to mitigate confusion and unfamiliarity by having inherent consistency in the underlying form of the procedures that users perform. This can be done by creating "generic control procedures" for the most commonly executed procedures that users experience. To be effective these "generic control procedures" must achieve the following objectives:

- inform users about the current state of the system with which they are interacting;

- ensure that users know that their commands or control operations have been correctly registered;

- ensure that users are aware of the range of options available to them at each point in the control procedure;

- inform users about the resultant state of the system after the actions resulting from their commands and control operations have happened.

With such information being provided irrespective of the method of interacting with the system, users will experience familiarity and predictability.

In EG 202 116 [3] the following set of twelve guidance rules were developed from the requirements of the proposed concept, research literature and from good human factors working practises. It is not the intention that these rules should be mandatory, in the development of any set of user procedures, but they will be taken into account when future guidelines defining any generic control procedures are produced.

Table 2: Twelve general rules for user control procedures

1	A user procedure comprises a sequence of user control actions and equipment display indications targeted to enable completion of a user's task or sub-task.
2	Every control action requires a clear indication of the status of the system and of the control before the action, and a clear indication (feedback) of the change in status of the control and the system after the action.
3	A user control action is necessary to initiate and complete any task or sub-task. A single action may complete one task and initiate a new task, if the action is explicit in both tasks. Similarly, a single action may complete a number of nested or parallel tasks, if the action and the corresponding indication explicitly confirms the multiple effect.
4	Any change of status of the system (terminal, network, remote terminal) that affects the user's interaction with the system needs to be indicated to the user. Interruptions to a user's task that are initiated by the system (including a remote user's actions) should accommodate the current task, and facilitate the user's choice over the available options.
5	All indications to the user whether static or transitory, need to be appropriate, discriminable, comprehensible and timely, within the range of physical and mental capabilities of the possible user population (with due reference to people with various impairments).
6	All control actions required to operate the system need to be within the range of the physical and mental capabilities of the possible user population (with due reference to people with various impairments).
7	No indication, control action or status of the system should threaten the physical or mental well-being of the possible user population.
8	Any procedure necessary to complete a task (or sub-task) should be concise, consistent, comprehensible and complete; commensurate with minimum user errors and congruent with targeted user preference levels.
9	Any set of procedures which relate to a set of tasks (or sub-tasks) need to demonstrate the qualities of consistency, flexibility, compatibility, self-explanation and user task orientation, to support the user's modelling or comprehension of the tasks and the system.
10	All procedures should support a simple and comprehensive error recovery strategy to enable the user to backtrack and/or exit from erroneous control actions. As far as possible, error recovery should not be penalized by any loss of data or of the communication path.
11	New procedures should be tested by a representative sample of people drawn from the possible user population (with reference to people with various impairments) and evaluated against previously established criteria of usability.
12	Disregard any or all of the above rules in the interests of developing user control procedures and user interfaces which have a proven higher level of usability.

5.5.2.2   The format of the "generic control procedure"

For critical parts of the operation of UCI systems it will be desirable to develop some generic control procedures and to embed these procedures in standards and guidelines. These generic procedures can be documented in many ways, but the way currently proposed within ETSI documents (and the method to be adopted for future guidelines) is illustrated below (for the example of a basic telephony call set-up). Firstly there is a state diagram (see figure 2) that illustrates the key system states that are of significance to the user.
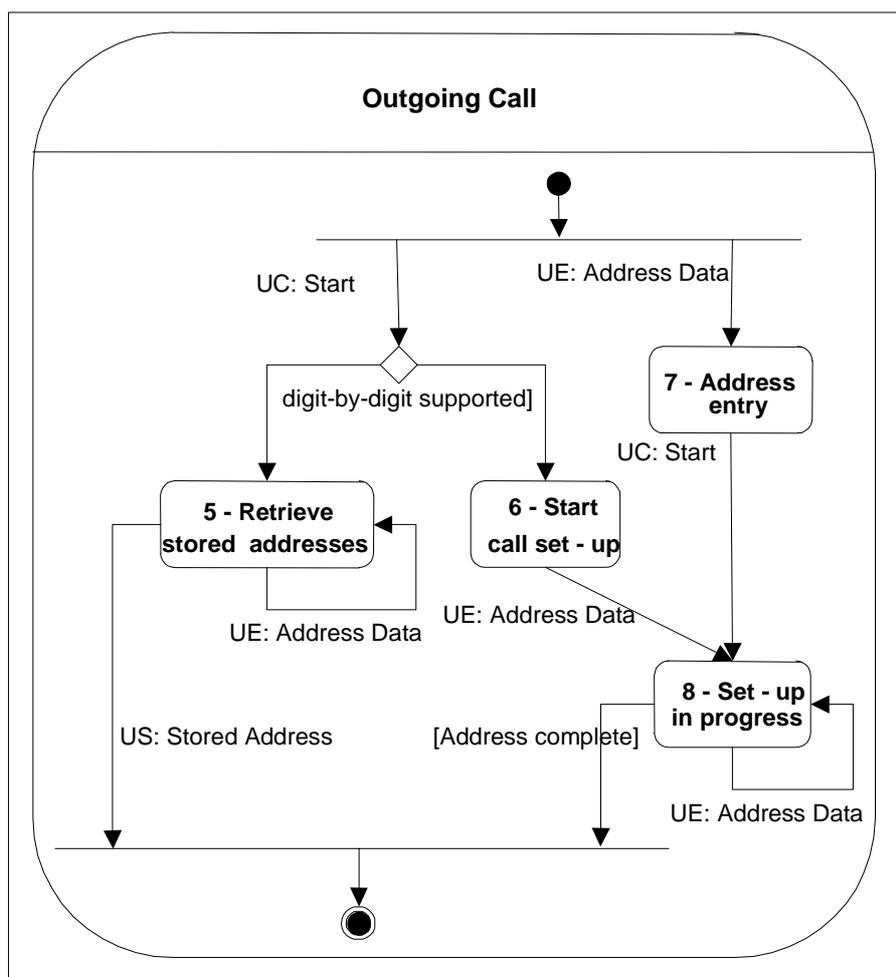
Outgoing Call

Figure 2: Outgoing Call state diagram

For each state in the state diagram a separate diagram shows the important prompts and feedback that are needed to keep the user aware of:

- the current state of the terminal and the remote system (e.g. the communications network);

- what action they need to take next;

- or what choice of actions they have available to them.

Examples of these diagrams, for the above Outgoing Call state diagram (see figure 2), are shown in figure 3.

5 – Start call set-up
P: **Enter Address**
CF: Start Selected
TSF: Current Teleservice

6 – Address entry
P: Select start
CF: **Cumulative address display**
TSF: Current Teleservice

7 – Setup in progress
P: -
CF: **Cumulative address display**
TSF: Current Teleservice

8 – Setup complete
P: -
CF: -
TSF: **Current Teleservice**
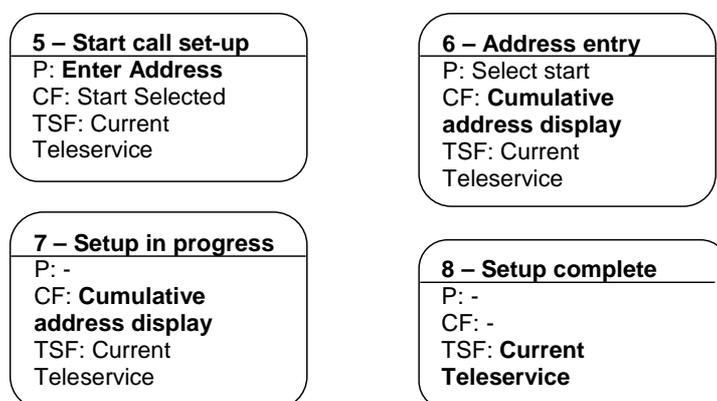
Figure 3: Indications for each state

The following key shows the meaning of the acronyms used in figure 3:

- P: Prompt for user action;

- CF: Feedback on the result of a control action;

- TSF: Current Teleservice feedback;

- NSF: Current network status feedback.

Similar generic control procedures for UCI may be required for the following.

5.5.2.3   Input

For generic control procedures it will be necessary to describe user input in ways that are independent of the different types of input devices (e.g. voice input, discrete physical buttons, on-screen buttons, menus, icons). It is thus important to distinguish generic patterns of user input. The following patterns should suffice:

- discrete data entry - numeric (e.g. entering a telephone number);

- discrete data entry - alphanumeric (e.g. entering a name);

- operation of a discrete action "control" (e.g. button);

- selection of a single item from a menu of choices (e.g. an on-screen menu, a spoken list of options a "radio button");

- selection of a number of items from a list of items (e.g. on-screen check boxes).

5.5.2.4   Display of information

Information display in the context of generic procedures covers display across all modalities. For example:

- on-screen information (e.g. prompts and feedback messages);

- spoken information (e.g. information messages and warnings);

- audible non-spoken information (e.g. tones to indicate network states).

In order to accommodate people with a wide range of abilities and disabilities, it is best to provide the information display across more than one human modality. Simultaneous presentation across different modalities both reinforces the communication of the information and also accommodates the user needs when they can temporarily not access one of the display modalities (e.g. using sound as well as display of information will be beneficial to car drivers who are unable to look at the display of a terminal whilst driving).

Information display includes the provision of status and feedback information. Methods by which this type of information may be provided are described in clause 5.2.

5.6   Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Although many parts of this present document and future guidelines will present elements that will contribute to an appropriate user interface design, the issue of careful user interface design to eliminate problems occurring is outside the scope of what can be covered in a document like the present document. Further good assistance to help in the achievement of good user interface design can be found in EG 202 116 [3].

An important aspect in the prevention of user "errors" is the reduction of unnecessary complexity.

5.7   Recognition rather than recall

As many UCI owners will probably not be managing their PUAs everyday, they will need systems that minimize the problem of memory load. Users will not want to have to enter information manually in their PUA profile manager. They will expect much of this information to be automatically retrieved in other applications and used transparently in the PUA profile manager. Users will expect to choose among relevant alternatives in a menu rather than type data in manually.

In UCI systems, the principle that objects, actions, and options should be made visible to the user has serious implications. Whereas it is straightforward to apply this principle to graphical user interfaces, the implications of this principle become more difficult in voice input output dialogues. In such dialogues there will need to be a trade-off between providing "visibility" of all of the possible user options by means of voice menus and the number and length of such menus. Efficiency of the user dialogue would be enhanced by allowing the user to speak commands rather than make choices from menus, but at the expense of the visibility of the range of potential commands that the system will accept. Future guidelines will propose some solutions to critical areas of user dialogues where the "recognition rather than recall" principle can and cannot be applied. In many instances, solutions to the dilemma will arise from making the range of possible options retrievable rather than directly visible.

5.8   Flexibility and efficiency of use

5.8.1   Why flexibility and efficiency?

With UCI systems there will be many procedures, such as initiating a communication, that will be very frequently repeated. In order to provide maximum flexibility for users to perform the full range of variants of a task that they require, it may be necessary to have multi-step dialogues. However, in order to avoid continually having to step through each step for the common variants of the task, users will wish to have shortcut methods to perform the tasks. Factors that will enable such shortcut methods to be provided include:

- simple activation actions e.g. lifting a telephone handset can cause a stored digit string to be dialled;

- the provision of default values for every user changeable setting e.g. the default communication service for UCI communications from a telephone may be telephony.

The use of templates needs to be examined as a way to provide a high degree of flexibility and also to make it very efficient for users to efficiently manage potentially sophisticated PUA behaviour. Templates may be of particular benefit in the initial configuration of PUA profiles.

5.8.2   Defaults

The provision of commonly acceptable defaults is one method that will allow the user to adopt shortcut methods to perform actions that have many settable parameters associated with them. Examples of such defaults could include the assignment of default communication services to devices and applications so that:

- when a UCI is selected on a mobile phone and a send button is pressed the telephony service is used if the user has not selected an alternative;

- when a message is composed and sent to a UCI from an application, email is chosen as the default service unless the user has specified fax or some other service.

As the choice of default values may in some cases be a very subjective matter, consideration will need to be taken as to when and where the user is able to specify what default value they prefer.

5.9   Aesthetic and minimalist design

The aesthetics of design will never be a matter for standardization. However, careful task analysis of the tasks needed in UCI based systems, together with skilful user interface design, can lead to a user interface that has an aesthetically pleasing feel to it because of its inherent fitness for purpose (the "form follows function" aesthetic first proposed by Louis Sullivan [7] and adopted by the European Bauhaus movement). The application of some of the principles and recommendations in this present document and in future guidelines will contribute to the creation of this aesthetic.

5.10 Help users recognize, diagnose, and recover from errors

Nielsen [6] states that "error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution". In the UCI domain the nature of the error messages and the type of corrective action proposed will need to be very different when presented to an ordinary UCI user and when presented to a corporate PUA Administrator.

5.11 Help and documentation

It is expected that the typical UCI user will neither wish to have, nor be offered, training in basic communication with UCIs. Assistance on dealing with the less common or more complex aspects of UCI usage could be provided by means such as online "Help" systems and third party person-to-person assistance.

In contrast, it is likely and desirable that corporate PUA Administrators would be offered training to perform the wide range of potentially complex tasks associated with the administration of the UCI environment of multiple users. Typically, the support offered would include the provision of comprehensive online and paper manuals.

6 Presentation of the UCI elements

6.1 Background

There is little opportunity with current communications systems to display to the recipient of a communication any information relating to the sender of an incoming communication. The only examples commonly in use are those of CLI in the PSTN and GSM mobiles, and emails. In the first two cases a calling number identifier is delivered to the terminal. This can be displayed as a number or, on most terminals, a local address book enables a "look-up" and consequent name presentation. Such a system is of limited use. The user must make assumptions about who is going to call them before programming the "phonebook" and, even then, if the person in the phonebook communicates from a different terminal then the name will not be displayed.

In the case of emails the "meaningfulness" of the "from" indication is dependent on the form chosen by the sender. Again there may be some form address book "look-up", but the same constraints apply. In essence, an email address may tell the receiver who the sender is but it may not.

6.2 The UCI system

6.2.1 Labels

Presentation of UCI labels in a UCI system is more powerful than processes currently in use because user-friendly labels are passed to the recipient during communication set-up. But the impact of this new power and functionality will need to be carefully considered and basic control procedures defined if users are not to become overwhelmed. Users will need to manage the labels that are being received or displayed and make decisions about updating these labels when they change. User involvement should be minimized without removing "control".

The numerical part of a UCI is, to all intents and purposes, constant and will not change with time. The label that is delivered with it, however, is not constant and could even be different for every communication.

A sender of a communication will allow one of the following label types to be delivered to the recipient's PUA:

1) Anonymous - No label delivered, UCI number is not delivered.

2) Alias - A label is delivered, UCI number is delivered, additional info field indicates "not authentic".

3) Authentic - An authentic label is delivered, UCI number is delivered, additional information field indicates "authentic".

Information passed from the recipient's PUA to the recipient's terminal will be determined by the user's preferences and the technical limitations.

The recipient can therefore receive two different label types (or no label).

In their address books, users may have UCIs with one of the above types of user-supplied label or with no user-supplied label. Where users have entered UCI numbers themselves, they will have no UCI owner-supplied label and no additional information field.

This mixture of label types (and no labels) could be difficult to manage and inevitably it will be necessary to allow the user the capability of assigning personalized labels to each UCI. These personalized labels are intended for display on all of the user's terminals instead of the label provided with the UCI. They are an addition to and not a replacement for the information in the supplied UCI.

A further complication arises when the sender sends a label different to that currently stored in the recipient's address book. This could be done for a large variety of reasons, name change on marriage, recently acquired nickname, new role in company etc. Clearly recipients will wish to be informed if a received label is different from that stored and to make decisions on whether or not to change address book entries. It is useful to view the problem in the form of a table that itemizes the different situations that can occur. Table 3 summarizes the possible permutations of label originally supplied (and stored), the user's preference for what they wish to be displayed, and the new label received for the same UCI number.

Table 3: Various possibilities for received communications labels

Supplied and currently stored	User preference for display	Supplied in new communication
Authentic	Authentic	New Authentic
Authentic	Personalized Label	New Authentic
Alias	Alias	Authentic
Alias	Personalized Label	Authentic
Alias	Alias	New Alias*
Alias	Personalized Label	New Alias*
Authentic	Authentic	Alias
Authentic	Personalized Label	Alias
Numeric	Personalized Label	Authentic
Numeric	Personalized Label	Alias
NOTE: * Some users could change aliases regularly.		

For each situation it will be necessary to consider:

- whether the user should be notified;

- what should be the new entry in the PUA address book;

- what should be displayed to the user in the event of future communications.

Future guidelines will suggest ways in which these various situations should be handled.

6.2.2   UCI number

Users, as a rule, will have no interest in the UCI number associated with an incoming communication. There will no need to display it unless specially requested by the user.

6.2.3 Additional information

Additional information field data will be of most use when setting up an outgoing communication and will therefore be available through the address book. Examples of such information would be:

- preferred language;

- services available;

- privacy rating;

- UCI user's picture;

- information related to a user's impairments.

It may be necessary, however, for some additional information field data to be presented to the recipient with the label when an incoming communication is offered. Future guidelines will consider this in more detail but examples of such information could be:

- whether the label is an authentic name or an alias;

- security rating;

- corporate or personal;

- UCI user's picture;

- additional naming information (e.g. "known by" name).

6.3 The effect of terminal and connection technology on presentation

How a user is able to interact with their PUA and with other users will be determined by the capabilities of the terminal and the communication technology in use. The availability of features such as screens and microphones will determine the user's potential ability using certain modalities. The quality of those features will further effect capability (e.g. small or large screens). The user's ability to interact will be further constrained by the ability of the communication channel to support the required interaction. It is impossible to describe all the levels of capability and, in particular, how those capabilities will change in the future. For the moment it may be convenient to consider how current terminals and communication channels effect presentation and group them accordingly. Future guidelines will examine the effect of these capabilities and make appropriate recommendations relating to how different information should be presented to the user. Below are shown some of the possible terminal types, together with an indication of the relevant characteristics associated with those types.

6.3.1 Terminals

- PC based communication:

  - Unlimited text;

  - High resolution - large area graphics;

  - Sound;

  - Speech;

  - Usability issues:

    - Just because a PC is on the user may not necessarily be there. How do we ensure that the PUA knows the relationship between terminal accessibility and personal accessibility (keyboard activity time out etc.).

- Interactive television:

  - Unlimited text;

  - Large area graphics;

  - Sound;

  - Speech;

  - Usability issues:

    - Input always broadband but output can be ADSL or 56k dial-up. This will influence the UI significantly;

    - Medium not suited for text input - select and enter more appropriate.

- PDA:

  - Limited text;

  - High resolution - small area graphics;

  - Limited sound;

  - Usability issues:

    - Typically a "point at" type of input -limited character input.

- WAP mobile:

  - Limited text;

  - Limited graphics;

  - Sound;

  - Speech;

  - Usability issues:

    - Menu select based interface with limited choice (typically 4) per "page";

    - Text input on all but a small scale can be tedious.

- GSM mobile:

  - Very limited text;

  - Very limited predefined graphics;

  - Sound;

  - Speech;

  - Usability issues;

    - Text input on all but a small scale can be tedious.

- Fixed telephone with display:

  - Very limited text;

  - Sound;

  - Speech;

  - Usability issues:

    - Text input on all but a small scale can be tedious (if possible);

    - How to use what will inevitably be a very limited display in the optimum way (smooth scroll, chunked scroll, etc.).

- Fixed telephone with no display:

  - Sound;

  - Speech;

  - Usability issues:

    - How can the identity of a potential caller be presented for a communication be offered to a user on the PSTN with a telephone with no display but still allow acceptance or alternative action.

6.3.2   Channel

The effectiveness of a given communication channel is effected by many factors. These include:

- Interface device e.g. ISDN TA, Dial-up modem, cable modem;

- Services e.g. voice, data;

- Service provider interface e.g. server types, storage capabilities;

- Communication network e.g. PSTN, ISDN, IP Network.

Usability Issues:

- The above channel attributes will have a major influence on factors such as:

  - Availability e.g. dial up, always on;

  - Speed of interaction e.g. low bit rate versus broadband;

  - Reliance on local or PUA based processing/storage.

6.4   Presentation of UCI on paper

Inevitably, it will often be necessary to pass on UCIs via paper. The most obvious examples will be with business cards and paper based advertisements. In addition, individuals will often wish to pass on contact details in verbal or written form for a friend's or acquaintance's paper address book. The use of UCIs on business cards and advertisements (and paper address books) offers the possibility of a less "cluttered" presentation, as only one identifier has to be given. It also removes confusion about what service to use under what circumstances. One downside could be that the UCI number may be unstructured and contain no inherent location or tariff information (unlike an E164 telephone number). Another problem is that the recipient of the paper based UCI could have no idea over what service (or services) communication is possible. For instance, if the recipient has no fax machine, any attempt to use the UCI for sending a fax would probably result in the use of email and therefore it could be less immediate than the sender intended.

There are therefore three issues to be considered:

- How to show that the identifier presented is a UCI;

- How the UCI elements should be presented. Recommendations for the presentation of E164 telephone numbers on paper have been produced by the ITU-T Recommendation E.123 [11]. Any guidelines produced for the presentation of UCI numbers will need to take such recommendations into account;

- Propose what other indications and information should be presented.

6.4.1   Indicating the presence of a UCI

Consideration needs to be given as to what abbreviations or symbols might be necessary to indicate the presence of a UCI.

6.4.2   UCI elements for presentation

- Label element:

  - Presentation of this element would be optional (equivalent information might well appear elsewhere on the business card). The reader could clearly not ascribe authenticity or non-authenticity to such a label and would have to assume "alias" status.

- Number element:

  - Presentation of this element is essential. With a normal business card, users will be familiar with the E164 based telephone number which offers clues as to charging rates and location (international and national). The UCI number could be (as far as the user is concerned) an unstructured continuous string of an, as yet, undetermined number of digits (but at least 10).

- Additional information field:

  - This element would not normally be presented on paper. Exceptions could include "service available" information which could be presented in a user friendly format (see clause 6.4.3.1).

6.4.3   Other information

6.4.3.1   Services available

The recipient of a paper based UCI might benefit from an immediate and simple representation of what services are available (as it may help the originator to decide the most effective type of communication to request). The most obvious way to do this will be to use universally accepted icons or abbreviations representing each available service. The form of such icons will be will be the subject of future guidelines. The limitation of this approach is that, over time, the range of services presented may diverge from those actually available.

6.4.3.2   Charging information

It may be thought necessary to indicate the level of charging which the sender should expect. At the very least it might be necessary to consider how to indicate:

  - free communication;

  - mobile rate;

  - premium or international rate communication.

The charging that users experience may well also be a function of the type of communication that they request.

6.4.3.3   Location information

The only clue to location on a UCI business card will be an address and in many, if not most circumstances this will be sufficient. But there are occasions where the card holder may be located in a different area to the address on the card. How or whether location information should be provided will be the subject of future guidelines.

7   Management of the PUA profile

7.1   Introduction

For UCI-based communication to achieve its design goals, all communication must be handled in a manner that reflects the UCI user's requirements (see annex B). EG 201 940 [1] has identified the PUA as the entity responsible for taking incoming and outgoing communication requests and handling them in accordance with users' requirements. In order that the PUA can act in accordance with the UCI user's requirements the PUA must:

- have details of the UCI user's communication preferences - expressed in terms of rules and settings;

- have an understanding of the status of the UCI user's current environment - by having knowledge of the "state" of the UCI user's environment (including the state of their various communications services).

The collection of all of these rules and settings are referred to as the PUA profile. In order that users can effectively manage their requirements, the information in their PUA profiles may be sub-divided into sub-profiles that relate to specific situations in which users find themselves (e.g. "at work", "travelling"). To help UCI users set-up and manage their PUA profiles effectively, "templates" that contain typical rules and settings can be used to aid the setting-up of profiles and sub-profiles.

Clauses 7.1.1 to 7.1.6 describe the PUA profile, rules and settings in more details.

The usability challenge in relation to the PUA profile is in the effectiveness of its management. Many attempts at semi or fully automated communications management have been made over the last twenty years. The critical factor in almost all cases, and possibly the reason why none has been a complete success, is the lack of attention to the interface between the user and management system. Users have too often seen this interaction with the management system as a time-consuming and intrusive overhead with insufficient benefit for the effort required. If the interaction between user and system fails then the user profile can become "out of sync" with real life circumstances, and the management system can easily become counter productive diverting communications to the wrong location at the wrong time for instance. If this happens the service has failed.

7.2   PUA profile

A PUA profile is the total set of rules and settings relating to a specific UCI.

7.2.1   PUA base-profile

A PUA base-profile is a subset of its PUA profile which contains rules and settings that are always active. For example, a user can decide NEVER to accept anonymous telephone calls. Similarly, a user's physical impairments will not change and therefore should be part of the base-profile.

7.2.2   PUA sub-profile

A PUA sub-profile contains a named subset of the rules and settings of its PUA profile defined to suit the user in a specific situation. For example, if users go to a meeting they can choose a "Meeting" sub-profile, which means that a number of settings and rules that suit a meeting are set (e.g. no real-time voice based communications would be offered).

PUA sub-profiles relate to situations that require fairly predictable but different communications behaviours. Examples of sub-profiles include:

- "at home";

- "driving the car";

- "at a meeting";

- "abroad".

At any one time only a single sub-profile may be active. Users may wish to manually select the sub-profile that they require or PUA rules may specify that the sub-profile should change (or a change should be recommended) when the PUA is notified of external events (e.g., PUA rules may specify that the "driving the car" sub-profile is activated if the PUA detects that the UCI user has attached their mobile telephone to the car hands-free unit). An activation of a sub-profile can be initiated either manually by the user or automatically. An example of manual activation is when the user changes the sub-profile from "at home" to "driving the car". An automatic activation could be triggered by:

- time;

- an accessory (e.g. a mobile phone being placed in a desktop charger causing an automatic divert of incoming calls);

- synchronization with an external application (e.g. a calendar application);

- activity within a service (e.g. an instant message was sent from the user's home PC).

7.2.3   PUA profile creation and modification

It is expected that all UCI users will be provided with a customized PUA profile when they start to use UCIs - they will not need to create one. Users should be able to create sub-profiles and modify their sub-profiles and base-profiles.

To ensure that users do not spend too much time and effort creating and modifying sub-profiles/base-profiles, a variety of different solutions are needed. Solutions including PUA provided pre-configured sub-profiles, templates and simple profile modification tools will be the subject of future guidelines.

7.2.4   Offline PUA profile management

Online PUA profile management is, in many respects, ideal as it ensures that the user is viewing and modifying current data. However, for reasons such as slow networks or high communication costs, users may choose to view and modify an offline version of the PUA profile. There are hazards in working with an offline version as the original information may be outdated and changes may occur whilst modifications are being made. Care will be needed to ensure how current the information is. When the PUA profile is updated with off-line information, consideration needs to be given as to how potential inconsistencies are noticed and communicated to users.

7.2.5   Availability

As well as the need to be able to access the PUA from a variety of different terminals and systems, the user should always be able to access their PUA profile. This implies the need to consider very robust system designs for PUAs.

7.2.6 Usability issues associated with management of PUA profiles

The first major usability challenge is to ensure that the PUA profile reflects the user's real world as far as possible. Users will wish to make changes to their PUA profiles wherever they are and whenever they need to do so. This implies that they may need to do the management tasks from a wide range of terminals. The second major usability challenge is to ensure that users have a familiar environment however they access the PUA. The following approaches will be considered:

- easily selectable sub-profiles which reflect a user's situation at a given time e.g. work, leisure, in car;

- automated updates to the PUA from applications, services and terminals;

- using graphics wherever possible to facilitate the user's understanding of their profile;

- using generic control procedures applicable across all terminals and services.

To make recommendations relating to the above, the profile management domain needs to be understood and in particular the tasks that a user will typically undertake. Clause XX contains an analysis of these tasks.

In order that users do not experience unexpected communication behaviour, they need to be aware of which sub-profile is active. When and how sub-profile status information should be presented to the user will be will be the subject of future guidelines.

As it is crucial for users to be aware of activation of sub-profiles, it is necessary to pay attention to what feedback should be given to the user about any activations. The appropriate level of feedback to the user will need to be dependant on issues such as whether:

- the user is likely to be aware of the activation because of what they did that would cause the activation (e.g. putting a mobile in a desktop charger);

- the user has explicitly said that they do or do not require feedback on a type of activation;

- the user has explicitly said that they do or do not wish to confirm a proposed activation of a sub-profile;

- it is desirable for users to know which sub-profile is active.

In determining how the creation and modification of PUA profiles can be simplified, the following will be the subject of future guidelines:

- the determination of which settings can be assumed to be set to a common value for a given set of users;

- the methods for the creation and modification of templates;

- the scope of application of a template - from a very detailed and comprehensive template for a very specific purpose to much broader templates that would require more user involvement in their definition;

- the issue of whether, and in what way, changes to templates will affect profiles/sub-profiles that were based on these templates.

7.3   Rules

An unconditional rule when applied will cause one or more actions to happen (e.g. divert all communications to voicemail). However, in the PUA environment, the rule will include a conditional statement e.g. "if calls from person A arrive after 10:00 pm send them to my voicemail". In this case the actions will occur only if the specified conditions are met. Rules will always involve PUA profile objects, such as time of day or an address book entry. Outcomes from the rules are usually related to:

- filtering communications;

- diverting communications;

- giving priority to communications;

- activation of PUA sub-profiles;

- deactivation of PUA sub-profiles;

- etc.

7.3.1   Creation and modification of rules

The rules required by the PUA to adequately describe a user's communication environment could often be very complex. Rules will refer to many types of object including terminals, communications services and people and include conditional statements relating these objects. To ensure that users do not spend too much time and effort creating and modifying many rules, a variety of different solutions are needed. Solutions including PUA provided rules, templates and simple rule-building tools will be the subject of future guidelines.

7.3.2   Activation/deactivation of rules

A rule can be active if its PUA sub-profile is activated and be deactivated when the user deactivates the sub-profile. Rules and settings in the PUA base-profile are permanently active.

Users may set rules that need to be automatically activated or deactivated as a result of some change to the state of a terminal or service. In order that rules related to the state of the user's terminal or service are applied correctly, it is essential that state changes related to that terminal or service are communicated to the PUA in an accurate and timely fashion.

7.3.3   Precedence of rules

Users may specify a number of PUA rules, possibly over a long period of time. Where those rules co-exist it will be necessary for the user to, explicitly or implicitly, indicate which of these rules takes precedence over the other.

7.3.4   Rule conflicts and side-effects

When users modify their profiles, there is always a danger that they will accidentally create conflicts and unexpected side-effects. Examples of some of the potential problems are:

- the change would make the user unreachable;

- the specified action does not define the intended outcome for some circumstances;

- the proposed change will inadvertently negate a previous request (as opposed to an explicit negation request).

Similar conflicts may arise when linked PUAs (see clause 12.3) are involved. Future guidelines will give a more comprehensive list of potential problems.

The user will need support from the PUA in preventing or solving such conflicts or side-effects. The PUA could, for example:

- monitor PUA/communication activity to detect abnormal behaviour;

- propose a strategy to correct the problem;

- give users a rollback mechanism to enable them to revert to a situation prior to the occurrence of the problem.

7.3.5   Service/feature interaction

There are an increasing number of services available for users and it is likely that the range of services will continue to grow in the future.

The scope of services that need to be handled is very wide and covers:

- direct UCI related services - e.g. barring of all communications from a specific UCI;

- different basic communications services - e.g. telephony, video, email;

- different technologies underlying the services - e.g. PSTN, GSM;

- supplementary services for the above types of service - e.g. call diversion, call barring;

- 3rd party services running on the above networks - e.g. games, news services.

Note that there are some services and supplementary services that may interfere with each other, for example if users have chosen to divert incoming calls, then they cannot activate some call restriction options and also if users have chosen call restriction, then they cannot activate some call divert options.

Users will require the PUA profile manager to allow the definition of profiles that cover different services in an integrated way. This implies control from a single profile manager, not several different and incompatible ones. This will be possible if the interfaces between the PUA profile manager and the services are well defined, standardized and synchronized.

7.3.6   Rule effectiveness

As users use of UCI progresses, they are likely to acquire a number of rules that were either part of an initial PUA set-up configuration, or subsequently added by the users themselves. As users patterns of communications change over time, these rules may become less relevant or in need of changing (e.g. the groups of people referred to in some of the rules may change over time).

It might prove useful for users to get information on which rules are applied, how often and when. A rule that has never been applied might give an indication that the rule does not reflect the user's intention. Users might, perhaps, decide that they wish to change or correct rules that are not being used or even delete these rules. Deleting unnecessary rules could speed up the time taken to check rules before carrying out various actions.

7.3.7   Usability issues associated with creation and modification of rules

- Reducing the complexity of rule creation/modification.

- Default precedence of rules will be the subject of future guidelines.

- The nature of and solution to various forms of conflict and side-effect will be the subject of future guidelines.

- Different ways in which conflicts should be indicated to the user will be the subject of future guidelines.

- Future guidelines showing how a range of different factors may be expressed in rules will be considered.

- Where no commonly agreed standards for expressing these factors exist, the potential need for new standardized forms of expression will be considered.

7.4   Objects and settings

The outcome of rules in the user's PUA will be dependent on one or more PUA profile objects. These objects will cover many different aspects of UCI communications, including:

- communications objects (communications channels and terminals);

- time;

- accessibility;

- phonebook entries;

- place/activity;

- location;

- PUA profile management user interface settings.

The value of some of these objects (which the user will see as "settings") can be predefined (defaults) and/or set in templates.

Some settings are more or less permanent (defaults) and are preferably defined in a PUA base-profile. Other settings are more suited to a certain situation and it might be relevant to define those settings in the PUA sub-profile corresponding to that kind of situation.

7.4.1   Object descriptions and concepts

In defining the rules in the profile, users will need to describe the various objects involved in the rule definitions. The way in which users conceive many of these objects may be complex. Some of these objects could be described in absolute terms (e.g. Friday 15th February 2002) or in relative terms (e.g. 2 weeks from this Friday). In other cases, there may currently be no generally agreed common standard for expressing such objects (e.g. there is no commonly agreed standard for quality of communication between voice communications and video communications).

Whereas it will be essential to have standardized descriptions of these objects in order that profiles can be migrated from one provider to another, this does not imply that users will need to understand these descriptions. The issue of how to deal with user's concepts of these objects will be the subject of future guidelines.

7.4.2   Usability issues associated with objects and settings

The usability issues can be defined as follows:

- the user needs to understand the complete, and often complex, user profile;

- the user needs to understand the subset of rules (sub-profile) being applied at any given time;

- the user needs to be able to change rule sets to take account of new, different or unforeseen requirements;

- the user needs to understand the implications, subsequent effects etc of any changes (if any).

7.5   User roles

7.5.1   UCI/PUA user

The UCI user is the person or role to which the UCI is assigned. The UCI label identifies the UCI user and the additional information field describes character of that user and the associated UCI. The UCI user is also the PUA user. PUA users will typically be able to modify certain aspects of their PUA profile dependant on the privileges assigned by the PUA administrator.

7.5.2 PUA administrator

The PUA administrator is the person who defines PUA profiles with settings and rules. The PUA administrator can be the PUA user, which is the normal case for a personal PUA. The PUA administrator can also be someone else, for example when a company administers PUAs for employees or when parents administer the PUAs for their children.

Alternatively users may call upon a third party service to administer their PUA profiles either all of the time, or when the administration task is awkward to perform at the current time. This is useful when a person is using a terminal with limited capabilities or simply is not interested in, or sure about, how to perform modifications. People with disabilities and older people might also find a third party useful for managing PUA profiles.

A professional PUA administrator in a company would be expected to perform a very wide range of tasks, many of which might be quite complex. It could be expected that people performing such a role would have experience of technical systems and be trained in PUA administration. In contrast many UCI users cannot be expected to have any specific technical knowledge and experience and may only be required to perform quite simple tasks. Given this wide range of variability, it is likely that the tools provided to these PUA administrators could be significantly different. Future guidelines will attempt to identify where and how such wide diversity can be handled.

Certain important PUA profile administration operations will require special privileges. These operations would require users to authenticate themselves.

7.5.3 Usability issues related to roles

- security/authentication levels;

- experience level of the user/administrator;

- task complexity - multiple users/PUAs to be managed by corporate administrators;

- feedback of profile set-up and modifications to the user (e.g. if done by a 3rd party or separate administrator);

- interaction between 3rd party and person requesting the changes.

7.6 Interaction with other systems

Users may have preferred applications for managing various functions that could be managed by the PUA such as address books (see clause 8) and diary managers. It might be desirable for users to be able to use such applications to manage these functions in a UCI environment. If an environment that allowed the user to utilize such applications was provided, it would encourage market competition and provide users with a broad range of useful services at competitive prices. With such an environment, users would be able to select applications that meet their needs and suit their interface preferences.

The PUA should hold a complete picture of the user's current situation and the state of their communications environment even where the data is distributed across a number of different systems. It is also important that the user should not need to manually re-enter information entered into one application into another application or into the PUA.

Automatic retrieval of information from other systems and the use of such information transparently by the PUA (e.g. the use of presence information related to the status of terminals and services) should lead to more reliable outcomes for the user and less need for user interaction with the PUA. There may be certain circumstances where user confirmation of changes to the PUA profile resulting from information received from an external system are required (e.g. where the external system is not closely related to normal PUA functions).

From time to time, new facilities will be made available to the user as a result of changes to communications services or to facilities provided by the PUA provider. Users will require the ability to access these new facilities in the same familiar way.

7.7 Change of PUA provider

For a variety of reasons (e.g. the provision of a better or cheaper service) users may wish to change their PUA provider. With any such change it would be extremely inconvenient for users to lose the PUA profile rules and settings that they have accumulated over a long period.

When changing PUA provider, users may wish to keep their existing PUA profiles and transfer them to the new PUA provider.

The user will expect that the PUA profile will exhibit the same behaviour when moved to a new PUA provider. Standardization of the way in which PUA profile information is represented would seem to be a promising approach to solving this issue.

7.8   Tools

Every UCI user role will need access to an appropriate range of tools to enable them to carry out the function appropriate to that role. For example ordinary users will need tools to enable them to:

- change the behaviour of their PUA rules;

- look at their communication history;

and corporate PUA administrators may need tools to enable them to:

- add or remove users;

- examine fault logs;

- search through PUA rules.

The requirements related to a number of these tools will be the subject of future guidelines.

In future guidelines the following will be addressed:

- the determination of which settings can be assumed to be set to a common value for a given set of users;

- the methods for the creation and modification of templates;

- the scope of application of a template - from a very detailed and comprehensive template for a very specific purpose to much broader templates that would require more user involvement in their definition;

- the issue of whether, and in what way, changes to templates will affect profiles/sub-profiles that were based on these templates.

7.9   Proximity of control

Users are most likely to focus on those things that are close to them and which they clearly understand. Many of the concepts of PUA control relate to potential communications that may happen some time in the future and are related to communications services that are remote and abstract. Past experience with systems such as UPT has shown that users do not easily remember to focus on these abstract network based behaviours (e.g. UPT users who register at a visited terminal frequently forget to de-register when they leave the location of that visited terminal).

Users are much more likely to focus on those things that are tangible, visible and simple to comprehend. The control settings of a mobile telephone are an example of an environment in which the focus is on things that are tangible and visible (e.g. settings that users can see displayed on an object that they hold in their hands) and simple to comprehend (e.g. the setting changes made on the mobile phone are directly experienced by changes in things such as the volume or silence of the phone's ringer).

7.9.1   Usability issues relating to proximity of control

- It may be possible to link changes in the tangible local environment (e.g. mobile telephone protocols) to activation of certain PUA sub-profiles (e.g. setting a mobile telephone to "silent" or the "meeting" profile would alert the PUA to trigger its "meeting" sub-profile). Future guidelines will consider the feasibility of such links and produce appropriate recommendations.

8   Address book management

8.1   The function of the address book

An address book as part of, or associated with, a PUA is a vital part of UCI communication. It is needed:

- to provide a list of contacts with whom the UCI owner may wish to communicate;

- to give the PUA a source of information upon which its filtering rules can be based.

8.2   Content of the address book

8.2.1   Minimum content address book records

At a minimum, the address book should contain a list of people with their name and contact information stored against each person. The most important piece of contact information in UCI systems is an entry for the contact's UCI. The System Capability SC 2.9 (Maintaining the functionality of network specific services) in EG 202 067 [2] states that "A UCI based system will not render inaccessible the functionality available with an existing network". In the spirit of this service capability it should be possible to have address book entries for contacts that do not have a UCI as people are currently able to do this. Similarly, it should be possible for the UCI owner to record non-UCI contact information that they have about a contact (e.g. their telephone number or their email address) even for those contacts that do have UCIs. These two applications of SC 2.9 lead to the conclusion that an address book record should, as a minimum, have fields for:

a)   name;

b)   UCI (including all its' parts);

c)   other contact identifiers.

8.2.2   Additional content of address book records

Address book records may also contain a number of additional attributes. Some of these attributes may be related to alternative ways of highlighted the address book record. Such attributes could include:

- text characteristics - colour; text weight (e.g. italic, upper-case);

- voice labels;

- associated sounds (e.g. ring signals);

- icons;

- date of last communication.

Future guidelines will consider the ways in which these attributes should be used.

8.2.3   Shared address books

There are many circumstances in which two or more people will wish to communicate with the same set of people. Typical examples are members of the same family or employees of the same company. In these circumstances it is very desirable that these people (the shared interest group) can access UCIs contained in a shared address book. One or more of the people in the shared interest group may be given the rights to add to and modify the records in the shared address book. However, entries from the shared address book can be presented to members of the shared interest group as either a separate list of contacts or as contacts that appear as part of their own private set of stored UCIs. Sharing items in a family address book in no way overrides the access privileges assigned to directory records. So the wife in a family will not be able to view records belonging to the husband's company address book unless she has been assigned explicit rights to view these records. Sharing of address book records is illustrated in figure 4.
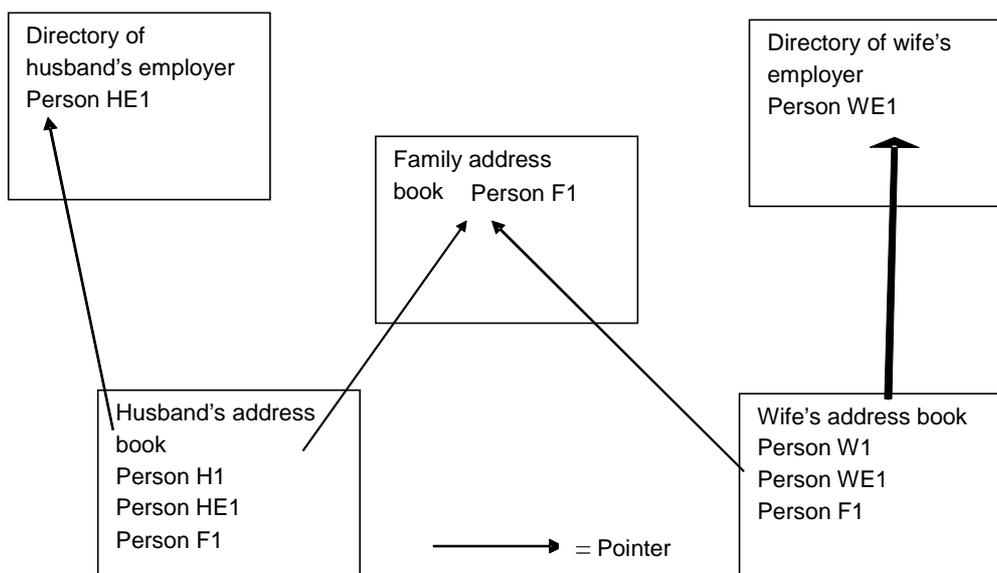
Figure 4: Shared Address Books

8.2.4   Automated housekeeping

Consideration should be given to the provision of a mechanism that reminds users of seldom used entries in their address books. A dialogue that informs the user that a predetermined time has elapsed since the person in the address book contacted the user or was contacted by the user should be considered. This dialogue could offer different ways to deal with such infrequently used records (e.g. deletion of the records).

8.2.5   Synchronization of distributed address books

Address books contained in terminals (or on Smartcards) might be a subset of those in the PUA in terms of:

- the number of records held;

- the number of fields held per record.

The constraints on what is held in a terminal address book will be determined by limitations of storage format in the terminal (restricted number of records and fields) and by user preferences.

Users should be able to express their personal preferences for what gets stored in the terminals - making a selection of which records and which fields.

When address books in terminals and the PUA address books are synchronized, users will not wish to be disturbed by requests to resolve differences in storage capacity and record sizes. The issue of when users should be alerted about issues with their addresses books will be the subject of future guidelines.

8.3   Operations on address books

It is likely that a number of address book record operations will be provided. The following clauses refer to the most common and relevant operations.

8.3.1   Add

There are a number of different ways in which users may wish to have records added to their address books. These include the following:

- The user may wish to manually add a contact (UCI or non-UCI) to the address book by entering all of the data themselves.

- The UCI of someone the user has just replied to may be added automatically to the address book (sometimes referred to in other UCI documents as "UCI capture").

- The PUA may, as a result of certain user behaviours, offer information suggesting additions to the address book. For example, if a number of communications have been made to or received from a contact that is not in the address book, the PUA may ask whether the UCI owner wishes to have that contact added to the address book.

- UCI users will require that the master address book in the PUA is synchronized with all of their terminals (with the PUA information being considered the master version of the data). Where a new contact has been added to a terminal address book, this synchronization should create a new record in the PUA address book. The capabilities, in particular the different storage capacity of each terminal, will need to be taken into account.

- Where the PUA acquires a new UCI, users may wish to be notified and given the opportunity to add this UCI to one or more local terminal address books.

It is expected that all of these methods of adding records to the address book could be quite common. As such, they should be supported in such a way that it is quick and easy for users to make such additions.

Usability issues:

- Where the UCI information in a contact record is incomplete (e.g. a manually entered record containing only the numeric element of the UCI) guidelines are needed on how the contact record can be completed and how the user is notified of the record's completion.

- Guidelines indicating the ways in which various interface specific attributes such as the assignment of a colour, or a special incoming call indication tone for the person or group can be added to contact records will be required.

8.3.2   Remove

UCI users will wish to remove contact records from the address book. There will need to be a balance between ease of deletion and the necessity for safeguards such as confirmation windows. It may be possible, and certainly desirable, to allow recovery/retrieval. Attempts to remove address book records that are referred to by PUA rules or that are members of various lists (e.g. a "white list") will be the subject of future guidelines.

8.3.3   Modify

The modification of address book records is likely to be a frequent operation if these records contain information other than the name and UCI of the contact. Whereas an individual's name is unlikely to change frequently and their UCI would change no more frequently, other information in the address book such as postal addresses or non-UCI communication identifiers could change quite frequently.

Where an amended UCI is detected (e.g. a change in the additional information field) consideration will be needed as to how a modification to the address book could be undertaken automatically but the user kept informed of important changes.

Attempts to modify address book records that are referred to by PUA rules or that are members of various lists (e.g. a "friends" list) will be the subject of future guidelines.

8.3.4   Copy/move entry

Methods for copying (and also moving) UCIs between address books will be the subject of future guidelines. Factors that will be taken into account will include different PUA prompting methods that might suggest such things as the user moving a contact from their personal address book to a family address book if it detects that other members of the UCI user's family also frequently contact the person in the UCI user's address book In looking at these methods, the principle that the user should always have ultimate control will be taken into account (e.g. by allowing the user to turn various prompting options on and off).

8.3.5   Group and arrange

The user may wish to group and arrange address book records. A number of alternative grouping mechanisms may prove acceptable (dependant on the target group of users). These methods include:

- Address book categories - in this method, one or more categories may be assigned as attributes of each contact (e.g. named categories such as "Work", "Friend", "Family").

- Address book sub-sections - in this method the address book is considered as a single entity, but it can contain different sub-sections assigned to different categories.

- Different address books - this is a variant of the address book sub-sections above. In this method it should also be possible to have the same contact in more than one of the address books. Although the user may perceive the address books as separate entities, the danger of multiple conflicting contact records for the same contact must be avoided and will be the subject of future guidelines.

Methods for allowing the user to vary the way in which they control the order of records in the address book(s) will be the subject of future guidelines.

8.3.6   Search

Users will have different knowledge and different strategies when searching for contacts in the address book. Search mechanisms that are likely to be helpful for users include:

- a scrolling list;

- name entry:

  - field search;

  - all fields search;

  - specified fields search;

  - whole word or part word searches;

- group search (where the user can enter or select the name of a group).

For searches beyond the scope of the address book, different search strategies will probably be required to searches made on the address book (e.g. more information about the desired contact would be required from the user to make the search sufficiently specific). Future guidelines will address the issue of how searches across one address book, several address books and the wider universe (e.g. "white pages") can be presented to the user in a clear and simple fashion.

8.3.7   Send

UCI users may wish to send contact records from their address book to other UCI users. Methods for allowing the sending of contact records with minimum user intervention will be the subject of future guidelines.

8.4   Possible indications in the address book

The range of indications that may be contained in a UCI address book is potentially very large. Some users may require quite simple presentations with only a few indications, whereas other user may want every possible range of indication. Indications that might be in an address book/communication log include:

- UCI Label;

- selected additional information;

- icons for the additional information field;

- access to the numeric part of the UCI;

- optional non-UCI fields (e.g. address);

- graphic/Colour UIs (e.g. for grouping);

- terminal specific indications;

- communication channel specific indications;

- memory status;

- assign tones to specific people in the address book;

- assistive technologies;

- hidden entries (secure section);

- service centre numbers automatically given as part of the address book;

- storage of PINs/Access Codes with UCIs.

8.5   Populating the address book

Users who have been contacted by a UCI user may wish to copy that UCI user's contact details into their address book. Users may wish to have assistance from their PUA in determining when and whether to copy UCI details from their communications log (see clause 9) to their address book.

Users may wish to be prompted by their PUA with an option to add the UCI to their address book. Users may not wish to be prompted at all, they may not wish to be prompted after every communication but might prefer to be prompted if they have received a number of communications from he same UCI. Future guidelines will introduce different methods by which users can be given a range of options ranging from completely user-driven copying of UCIs to an address book to sophisticated options such as PUA prompting offering to add frequently contacted UCIs to the address book. In looking at these options, the principle that the user should always have ultimate control will be taken into account (e.g. by allowing the user to turn various options on and off).

Similar methods for copying (and also moving) UCIs between address books will also be the subject of future guidelines. Factors that will be taken into account will include different PUA prompting methods that might suggest such things as the user moving a contact from their personal address book to a family address book if it detects that other members of the UCI user's family also frequently contact the person in the UCI user's address book.

8.6   Usability issues associated with address books

The issue of address book design and management is potentially very large. Within this scope of the present document, there are many issues that need to be addressed, including:

- voice labels assigned to entries for dialling etc. (see clause 8.2.2);

- name order;

- vCard standard;

- set presentation profile (national default);

- synchronization with terminals;

- capture from business cards, etc.;

- automatic entry into the address book;

- a UCI update date should be sent in UCI communication.

9   Log management

User may require a number of different types of logs. These logs may be related to their work (e.g. notification of the amount of time spent communicating with a specific client). Also users may require logs as a means of tracking a series of communications (e.g. identifying the times and dates when a particular person was contacted).

There is likely to be a mandatory requirement for PUAs to have a log of all communications made to or by the UCI user as well as a log of all the changes made to the PUA profile. These would also be available to the UCI user who may or may not choose to use them. PUA profile administrators will also require logs that indicate the various events that may need to be tracked (e.g. the changes that PUA users have made to their profiles). Certain logs (e.g. record of PUA profile changes) may have certain restrictions such as the prevention of individual record modification or deletion.

Users will wish to be able to view their communication records and to perform various other operations on their communication logs. One of the most important functions of communications logs is that they form an important source of UCIs for initiating new communications and for populating the address book. As each communication in the communication log contains a UCI, users may perform several tasks that include:

- view the record and check the UCI of the person that originated or received the communication;

- make another communication to the person that originated or received the communication (using a different type of communication if required);

- copy the UCI information from a communication record in the communication log to their address book.

9.1   Usability issues associated with logs

Usability issues include:

- name order;

- set presentation profile (national default);

- synchronization with terminals;

- automatic copying from communication log to the address book;

- management of increasing size of logs (archiving).

10   Privacy

10.1   The user requirement

Users require that the level of privacy applied to release of an identifier or of access to themselves once that identifier is known, is dependent on the identity of the person or organization attempting to communicate.

10.2   The current situation

Controlling privacy in today's networks is difficult. Currently, release of an identifier through a directory or search service is either completely open (normal) or completely restricted (ex-directory). The user requirement on this issue, however, is far more complex. Typically, even if complete privacy is required, users want some people to be able to access their identifier and not others (e.g. an old friend who has misplaced an address book).

Once a sender's identifier is known then the capability to control incoming communications in current networks is equally limited. Many networks offer some sort of local presentation of the source of an incoming communication such as Calling Line Identity (CLI) facility which helps a user make decisions on the acceptance, or not, of an offered communication but:

- The identification can relate to a terminal not a person.

- It is easy for the sender to use an alias without the recipient knowing, or to use a different, unknown terminal.

- Automatic screening/filtering is not usually available.

- If screening or filtering is available, it is often complex or laborious to set up.

A direct result of the lack of control over privacy is the very high number of people currently opting for an ex-directory (non-listed) service which is probably providing more privacy than is actually required for most users but is basically all there is on offer.

10.3   Access categories

The most popular method of obtaining privacy in telephony is by being non-listed or ex-directory. This means that there is a list of approved senders who have been given the contact number by some means and therefore have unfettered access. All other senders by definition are barred from communicating. But this does not meet the user requirement which necessitates a third, "in-between" category.

A more flexible approach used to be available in some countries whereby a third party, the DQ operator, could take the enquirer's name and offer it to the user. The user could then either allow the number to be released or not. Increasing labour costs and other considerations have rendered this approach impractical but its replacement by an automated system would be an ideal. This has not been possible using current network architectures and capabilities.

10.4   The role of the UCI in customizing privacy

The UCI and its supporting network architecture offer the capability of greatly increased control of privacy for the user, both in terms of search for that owner's UCI and in access to the owner of the UCI once it is known. This is because it enables the recipient of a communication or UCI search request to know who is trying to communicate and to confirm whether it is an AUTHENTIC identity. Because this is known it is then possible move away from the "all or nothing" privacy model described in clause 9.2.

The following system capabilities are then feasible.

UCI Search:

1) Those searching for an unknown UCI can be identified and release of the UCI can be controlled accordingly.

2) The UCI sought can be released "conditionally" (built in time-out, no transfer, etc.).

3) The searcher can be asked to leave a "virtual calling card" (see explanation in clause 3.4).

4) Contact with the "searcher" could be established without releasing the recipient's UCI. A temporary/transient UCI could be released which would "hide" the real UCI until the owner chooses to release it.

5) Since the user's PUA is potentially aware of all the other PUAs it has released its own UCI to, it would be possible to do a selective broadcast when necessary to update address books e.g. change of services available, change of language, change of validity date.

The UCI and the new system architectures will also enable sophisticated filtering of communications to further customize privacy for users.

Incoming communications filter:

1) Access restriction could be directly linked to release of the UCI as a result of searches. E.g.

   - An access time limit or validity date could be applied.

   - Access could be limited to those UCIs that have been given the owner's UCI (no transferring allowed).

2) Access can be dependent on the identity of the sender.

3) Access can be time dependent.

4) Access can be location dependent.

5) An access PIN could be supplied for sender's not possessing their own UCI.

10.5 Two approaches to control of privacy

Two methods of privacy control are possible. Control of UCI release will depend very much on the mechanisms eventually chosen to implement it. Control will be easier with a distributed search mechanism and more difficult with a global centralized mechanism. Filtering of incoming communications is an integral part of the UCI based architecture and will definitely be fully implemented. In practice both approaches to privacy will probably be available to some degree.

10.5.1 Control of UCI release

Release of the UCI through any UCI search service (centralized or distributed) could be controlled, strictly or otherwise, according to rules defined by its owner. To some extent this means that there will be a high degree of complexity associated with release of the UCI but slightly less complexity associated with the filtering of incoming communications.

In a controlled privacy environment, the PUA would be aware of who had been allowed access to the UCI and would amend the incoming communication filter accordingly so that those allowed the UCI were allowed to "pass" the filter. There needs to consideration given to distribution of UCIs on business cards or by word of mouth.

Usability issues:

- Conceptually more difficult for the user to imagine two filter points in the system; one at the search point the other at the incoming comms filter.

- Additional comms management cognitive load for the user.

Other issues:

- The practicality of controlled release will be dependent on the final form of a UCI directory search service. A centralized directory service may make such control impossible.

10.5.2   Control of incoming communications

The other approach is to place most of the filtering capability at the user's PUA. Thus all filtering complexity is associated with the PUA but with little or no filtering at the UCI search stage. The user has only one filter to manage (at the PUA) but the implication is that the user then has to decide whether to be ex-directory or allow to free access to the UCI as.

Usability issues:

- Psychologically, it may be unacceptable for those requiring complete privacy to make an identifier public even if access to that person is restricted or barred at the PUA.

- It may be frustrating for potential senders to obtain a UCI then be unable to communicate. (This may reflect badly on the UCI concept)

- There will be more unsuccessful communication attempts with this approach (inefficient use of the network).

An illustration of the way in which a varying degree of privacy could be provided by a UCI system is summarized in table 4.

Table 4: Privacy controlled by UCI search and by filtering of incoming communications

	Maximum Privacy (non listed)	Customized Privacy	Minimum Privacy

UCI Search	No release of identity through UCI Search
	
	Release of UCI by other means (word of mouth, within other communications, etc.)
		Release of identity can be customized e.g. UCI only available to somebody already in user's address book or subset of it ("White list")
		
		UCI not given to those on a "Black list"
		
		"Grey list" methods:
		    - UCI not given out but searchers allowed to leave virtual calling card (clause 10.6.5);
		    - a temporary (transient) UCI is given which can be used once or given a time out. Can be "upgraded" to true UCI when necessary.
			Open access to UCI through UCI Search.

Outgoing communications Visibility of UCIs	Communication can be sent anonymously if required (label and number withheld from receiver) or as an alias (number withheld)	Communication can be sent anonymously if required (label and number withheld from receiver) or as an alias (number withheld) or as an authentic name with number withheld	Authentic name and number available to recipient for display and storage

Filtering of Incoming Communications	Filtering of calls done by the identity of incoming UCI.
	
	Communications accepted from UCIs or SSIs on a "White list".
	
	All other communications barred ("Black list").
	
	"White list" updated by the user (directly or indirectly)
		Filtering of calls done by identity of incoming UCI.
		
		Communications accepted from listed UCIs or SSIs (A "White list" updated by the user and/or by the PUA to include all authorized recipients of user's UCI.
		
		Communications not accepted from listed UCIs or SSIs ("Black list").
		
		For communications from UCIs/SSIs not on "White list " or "Black list" (i.e. a "Grey list"):
		    - communications could be diverted to voice mail.
		    - callers could be asked to leave a virtual calling card.
		
		The PUA could offer selected communications real-time to the user. User would be able to accept, reject, or divert to voicemail.
			Allow all communications dependent on user's availability

10.6   Usability issues associated with privacy

10.6.1   Achieving a desired privacy level

As UCI systems evolve, their architectures will to some extent dictate the complexity of the user interface needed to define, implement and manage privacy. At all stages of that evolution the implications on the user interface need to be considered.

To achieve the desired privacy level each user will need to define relatively complex filtering rules. To make this as easy as possible a new UCI subscriber will, as part of the user profile set up process, require options to easily enable them to achieve this.

10.6.2   A privacy model

Development of a user privacy model could facilitate both the management of a user's own level of privacy and reduce frustration in those trying to gain access. The white/grey/black list approach appears promising:

It may be convenient to describe three categories (or lists) into which people or organizations attempting to communicate with a user would fit.

a) White list

Anybody on this list is allowed access to the user's identifier and access to the user conditional only on any universally applied access rules (e.g. no non-urgent real time voice communications after 2300).

b) Black list

Any entry on this list is a person or organization that the user definitely does not want to communicate with under any circumstances.

c) Grey list

Access might be allowed but subject to special conditions, the supply of further information and/or filtering in addition to any generic access rules. Within the grey list itself, some requiring access might be subject to more stringent requirements than others.

In essence, privacy control is about the compilation, implementation and management of these three lists. The user interfaces designed to accomplish these tasks will be of critical importance and will be inextricably tied to initiation and management of the user profile.

10.6.3 Transfer (UCIs being passed to a third party)

Many users will not want a UCI given to an enquirer to be passed to others.

This has to be dealt with by the recipient's PUA as part of the incoming communications filtering process. In essence, if UCI transfer is to be barred then the PUA must "know" all legitimate holders of the UCI and place them in their white list. Incoming communications from any other UCI/SSI are dealt with according to the privacy level required.

The use of UCIs by non-UCI users will be very difficult to prevent and approaches to address this will be considered in subsequent work.

10.6.4 Feedback of privacy level to the enquirer

Two methods of privacy control have been covered by the present document (restricted UCI release and incoming communications filtering): both have disadvantages. It may be that the most promising approach is to consider a hybrid of the two methods. This is a subject for further investigation but one way forward might be to release UCIs with little or no restriction but with a "privacy" level associated with it, which would effectively manage the user's expectations. This privacy code would be embedded in the additional information field. As an example there could be a five level privacy code.

There is an argument that the level of privacy associated with a UCI should be communicated to the recipient via the additional information field. This would manage expectations of the sender with respect to ease of access and describe what filtering constraints are to be put on their accessibility. The access indications could be:

- You have a transient UCI.

- Limited time access (expiry date).

- Restriction of sender's UCI (no transfers allowed).

- Number of successful communications allowed.

- The UCI holder has set a level of privacy (e.g. no real-time communication) which will affect your ability to access him/her.

Consideration needs to be given as to the optimum means of presentation of such information to avoid the implication of an unsuccessful personal evaluation for the enquirer in the event of a high privacy marking being offered.

10.6.5   UCI searches by "unknown" enquirers

Currently, users can either make their number available through a directory search system or be "ex-directory" or "non-listed" i.e. everybody has access to the identifier or nobody does. Clause 10.3 suggested that many users want a degree of privacy that falls between these two extremes. UCI systems allow this increased control over release of the identifier.

Some users may not wish to allow any unknown person access to their UCI without prior consultation. Historically, the "calling card" was something that could be given to a third party (e.g. a servant) to make an offer of communication to the third party's employer. Typically such a card would contain nothing but the identification details of the potential caller. Ways in which an equivalent method could be used in today's electronic communications environment will be explored.

Management of this process needs careful consideration as there may be many requests to deal with. A celebrity could receive thousands of requests every week.

10.6.6   Withholding a UCI

There are many circumstances where users requiring privacy would not wish to release their UCI such as to a new "date" or when getting product information from a company. Children and teenagers will need higher protection when they participate in chatgroups where the identity and intentions of participants may be suspect.

The provision of transient UCIs could greatly enhance control of privacy. Ways in which transient UCIs can provide users with privacy benefits will be further explored.

10.6.7   Dealing with different roles

Many users will require that communications from one source are handled differently to those from another. For instance, a user may have an amateur "sideline" as a landscape artist and want to leave leaflets in a local gallery. Any UCI on these leaflets is essentially "broadcast" and will be difficult to control. In postal communication, postal box numbers offer an approach to providing control over communication from advertisements. How similar approaches can be taken in the electronic communication domain will be explored further.

11   Security

11.1   Security and UCI

The user expects high security but also easy and fast access to the PUA. But system security and system usability are to some extent inversely related: the more secure the system the less usable it is. For instance to maximize the security of a communication system, users could be required to provide one of a series of "shared secrets" before every transaction. In many circumstances users would find this totally unacceptable. Because of this, it is important that an appropriate level of security is provided for any operation and no more. More security than is necessary increases costs and can contribute to poor system usability. This balance of usability and security will depend on a range of factors that include:

- whether a PUA is a corporate, group, or personal PUA;

- the lifestyle of the person using the UCI.

Most users will have a very unclear understanding of the complexities of security policies. For this reason ordinary users may require assistance when managing their security. In contrast, managers of corporate PUAs may require the ability to take full control over every aspect of UCI security. There may be intermediate requirements such as the need that parents may have to manage aspects of the security of their children's communication. Neither the solutions provided for individuals nor those for corporate PUA managers may be suitable for these cases.

11.2   Security mechanisms

The level of security can be defined by varying the authentication process. Authentication can be controlled in different ways. This can be by:

1) Choice of one or more of a range of alternative authentication schemes, such as:

    -    password;

    -    PIN code;

    -    security token (e.g. random number generating card).

2) Applying restrictions to passwords:

    -    lockout, to prevent password attacks by limiting the number of password failures permitted within a period of time;

    -    password strength (e.g. password length, password not in dictionary);

    -    password expiration (e.g. how often passwords must be changed as well as who may change them).

3) Choice of authentication method, such as:

    -    User Authentication provides access privileges on a per user basis.

    -    Client Authentication allows access from a specific IP address or terminal. The user performs the authentication by successfully meeting an authentication challenge, but it is the client terminal that is granted access.

    -    Session Authentication can be used to authenticate on a per-session basis. The user is challenged for a proper authentication response.

    -    Operation Authentication can be used to authenticate on a per-operation basis. The user is challenged for a proper authentication response.

Future guidelines will discuss the issue of what types of security mechanism might be used in what circumstances.

Consideration needs to be given as to how the user can be given adequate feedback relating to the level of security which currently applies. There will also need indication of any security breaches of their PUA.

11.3   Person-to-person communication

To have trust in communications systems, users require an appropriate level of security to be provided. When necessary, users need an assurance of the integrity of the communication and/or the identity of the person they are communicating with.

The integrity of the underlying communications is a function of the communications platform being used. As such UCI cannot influence the level of this security (although the level of this security should be evident to the user). Therefore the present document confines itself to security issues related to identity. Users may require assurance that an incoming communication is from whom it purports to be. Such assurance requires trust in the systems and service providers but also in the universal appliance of security procedures and registration processes.

Users typically wish to know with a reasonable level of confidence who is attempting to communicate with them so that they can make decisions as to whether to accept the offered communication or not. Verification (being as certain as it possible to be) that the communicating party is who they purport to be will usually only be necessary in a minority of cases involving financial or legal communications.

11.4   The current situation

11.4.1   Authentication

There is no means currently of authenticating the identity of a user wishing offer a communication but some present systems can authenticate the identity of the calling terminal or SIM. In many voice-based cases this is not an issue since the recipient will recognize the voice of the sender or it may not be critical in any case.

Calling Line Identity (CLI) is in common use but only identifies the terminal from which the communication is being sent. Many terminals offer an address book look up service which, with CLI, allows a name to be displayed if it is available from the terminal's (usually limited) address book.

The name element of an email address may accurately represent the true identity of the owner of the email address. On the other hand a person may choose a name which is misleadingly different to their identity. In addition a person may send an email that appears to have been sent by the owner of another email address (masquerading).

11.4.2   Verification

Verification processes are commonly used by financial institutions to ensure the true identity of the user to allow access to private data. Verification consists of the interchange of one or more "shared secrets".

11.5   UCI systems

11.5.1   Registration

There are a number of different ways in which users can be registered with their PUA. Each of these ways has implications for the level of "authenticity" presented to the recipient. Basic different types of registration include:

- Without a "shared secret" e.g. PIN

    Every time a user makes a terminal available (e.g. switches it on) there will need to be a registration process. Registration without a PIN or other shared secret means that the system can infer nothing about the user registering: it could be anybody with access to the terminal. If the label associated with an incoming communication is shown as "authentic" then all the recipient can infer is that the label truly describes the owner of that UCI number but nothing can be inferred about the true identity of the sender.

    Fixed line telephony is a special case of registration as "Switching on" in this case has no relevance.

- With a "shared secret" e.g. PIN

    Users may be required to give a PIN or other shared secret at registration. This is a good indicator that the user registering is the owner of the UCI. But unless registration is required for each and every communication it can never be more than an indicator. For instance, a user could register at a PC and then forget to log off, leaving the terminal for anybody to use. A recipient of an authentic label in this case would know that the label truly represented the owner of the UCI number attempting to communicate and that the there was a good probability of the sender being the owner of the UCI and hence accurately described by the label.

- With a physical token

    Something that the user possesses such as a Smartcard or a mobile telephone may play a part in user authentication (e.g. inserting a Smartcard in a card reader or the PUA communicating a transient code to a mobile telephone).

- With biometric data

  Some biometric devices will be used once at registration. In this case the same constraints apply as using a PIN at registration as above.

  Other biometric devices can provide more or less continuous proof of identity (e.g. continuous iris recognition or the sound of the person's voice in a real-time voice communication). An originator/recipient of an authentic label in this case would know that the label precisely identified the person with whom they were setting up communicating.

11.5.2   Verification

Verification is the result of either:

- a request to the recipient's PUA to issue a challenge to the sender to prove that they are who they claim to be, or

- a request to the sender's PUA to issue a challenge to the recipient to prove that they are the user who the communication is directed at.

In the case of biometric data such as iris or retinal scans the "verified" user may not even be aware of this process. In other cases the user will have to perform a special task such as inputting a shared secret, a random number displayed on a personal smartcard or initiating a biometric measurement. Only in this case, where verification has been requested, can the recipient have any degree of certainty that the authentic label shown accurately describes the sender.

11.6   Usability issues associated with security

11.6.1   Usability and security

System security and system usability are to some extent inversely related: the more secure the system the less usable it is. For instance to maximize the security of a communication system, users could be required to provided one of a series of "shared secrets" before every transaction. Imposing such stringent requirements would have the most serious impact on usability - people would refuse to use the system at all. Because of this it is important that an appropriate level of security is provided and no more. More security than is necessary increases costs and can contribute to poor system usability. The appropriate levels of security will be the subject of future guidelines.

11.6.2   Registration and authenticity

It can be seen in clause 11.5.1 that the concept of an authentic label is far from straightforward and the degree of "authenticity" depends directly on the registration process used. This needs to be communicated to both originator and recipient in some way. Future guidelines will consider various options.

12   Communications session control

The primary role of the UCI is as a means to achieve person-to-person communications. Users use their terminal to enter or retrieve a UCI, which their PUA uses to reach the PUA of the recipient in order to initiate the requested communication. It is important that the tasks associated with the initiation and control of communications using UCI is no more difficult than the equivalent tasks performed without using UCIs.

In order that the requirements of the communication sender and receiver (as expressed in their user profiles) can be met, their PUAs may perform capability negotiation. Factors that may be negotiated include terminal and network type, bandwidth, and QoS. Another thing that could be taken into account are accessibility attributes if either of the parties have specific disabilities. The user with disabilities could choose to define preferred communication in their profile such as audio call, SMS, MMS, email etc.

12.1   Void

12.2   Single PUA

12.2.1   Incoming communications

When UCI users receive calls they will expect to receive a clear identification of the person initiating the communication. Where the incoming communication is from a UCI owner the identification that will be delivered will be the UCI label. For incoming communications the user will expect to be delivered the best indication of the identity of the user. The method by which the identification will be delivered and the nature of that identifications will be the subject of future guidelines.

Users will wish to have a record of incoming communications. They may also wish to refer back to the identity of any person who has previously made an incoming communication. Methods for users to recall the identity from previous communications (e.g. from communications histories and address books) will be the subject of future guidelines.

Where distinctive alerting schemes are available from the service or terminal by which a user is being contacted, a user may wish to have a different alerting signal associated with different groups of users that are defined in their PUA profile (e.g. the alerting signal for "family members" may be different to that for "friends"). Users will need a consistent way to make associations between alerting signals and groups of users in their PUA profile. Future guidelines will make recommendations on how such consistency could be achieved.

Where, as a result of PUA negotiation, the communication is delivered in a different form to that in which it is sent (e.g. because it has been routed via a translation service such as email to SMS), there are a number of usability issues that may occur:

- the resultant communication may be unfeasibly long - and the UCI user will wish to be warned of this and given options for managing this situation (e.g. being able to read email headers and choosing whether to download the body of selected emails);

- there may be an additional cost incurred - and the UCI user will need to know whether they incur this cost and how much the cost may be.

12.2.2   Outgoing communications

When initiating an outgoing communications, users will expect to:

- initiate a communication to any UCI owner or non-UCI owner;

- use any method of communication supported by the terminal that the user is currently using;

- have their identity (the UCI label) presented to the recipient of the communication (whether the recipient is a UCI user or not);

- have a record kept of the communication in their PUA.

When the outgoing communication is a reply to an earlier communication, users will expect to:

- easily reply using the same method as the received communication;

- specify that their reply should be by a different method to the received communication;

- use a method of communication that is available to them (even if not directly supported by the recipient) e.g. if the sender of the original communication only has fax available and the replier can currently only send emails, the PUA could offer the use of an email-to-fax conversion service.

12.3   More than one PUA

In varying circumstances (e.g. when a UCI user has both a personal and a company UCI or in a manager secretary arrangement), PUAs will need to co-operate with other PUAs in the management of one person's communications. The PUA administrator will be concerned that the information passed to another PUA does not breach the PUA administrator's nor the PUA user's privacy requirements.

The information conveyed to other PUAs is a function of the rules stored in each PUA. In order that the privacy requirements referred to above can be met, these requirements must be contained in rules in the UCI user's PUA. Where UCI users have UCIs supplied by a company, the PUA administrator of the company will be responsible for determining the content of any rules that relate to corporate privacy requirements and the UCI users will be responsible for rules that relate to their personal privacy requirements.

In the examples that follow in this clause there is a presumption that a user may be multiply registered at the same terminal. Dependant on the method of registration, a user may be automatically registered when the terminal is activated or the user may need to manually register. Activating a terminal may automatically register a user for more than one UCI - dependant on the potential registered terminals recorded in each UCI personal profile. For manual registration, the user may opt to register the terminal in relation to more than one UCI and, hence, to more than one PUA.

12.3.1   Incoming communications

For incoming communications, the PUA that is initially involved will be dependant on the UCI used by the sender (e.g. if the corporate UCI is used the corporate PUA will be the one that is involved). The PUA that is initially involved may also involve another PUA if such an arrangement has been authorized (e.g. the corporate PUA may negotiate with the user's personal PUA).

An incoming communication could be sent to any one of a UCI user's different roles (UCIs) (e.g. to their business UCI if the originator of the communication was calling the UCI user in a business context). Users would ideally like to know in which of their roles they are being contacted before entering into communication with the originator of the communication.

Where some form of distinctive alerting is available from the service by which the user is being contacted, users would wish to make use of this in distinguishing between communications sent to the user in different roles. A user could thus have one alerting signal sent to them if the incoming communication was directed to their business UCI and another alerting signal sent if they were being contacted on their personal UCI. The methods by which users would wish to make associations between alerting signals and their different UCIs will be the subject of future guidelines. Where distinctive alerting mechanisms are not available, alternative options for conveying which UCI the communication was directed to will be the subject of future guidelines.

If distinctive alerting signals are being used to distinguish between groups of users (see clause 12.2.1) then the use of the same mechanism to distinguish between communications directed to different UCIs might cause complex system interactions and would also be likely to cause confusion for users. Future guidelines will make recommendations on ways in which such difficulties might be approached.

12.3.2   Outgoing communications

When making outgoing communications, the user has to decide in what role they are making the communication. The UCI, and hence the PUA, that is used will depend on which role they choose (e.g. if the user decides that they wish to make a call in their corporate role, they will choose their corporate UCI and hence their corporate PUA). There may be ways related to address book entries and communication histories that assist the user in determining which UCI/PUA will be used.

The PUA chosen has implications for:

- the identity delivered to the recipient - in the form of the UCI label;

- the information delivered in the additional information field;

- the profile, relating to outgoing communications, that is used;

- billing (e.g. how much and to whom).

With multiple PUAs, at any one time and for a specific set of conditions (e.g. what terminal is being used) there should be a default UCI/PUA that is used for outgoing communications. Users will need to take action if they wish to use an alternative UCI/PUA to the current default. The precise details of these defaults and the nature and duration of any overrides will be the subject of future guidelines.

12.3.3   Interchange of data between PUAs associated with the same person

In varying circumstances (e.g. when a UCI user has both a personal and a company UCI or in a manager/secretary arrangement), PUAs associated with the same person will need to exchange information. PUA administrators will be concerned that the information passed to another PUA does not breach the PUA administrator's nor the PUA user's privacy requirements.

The information conveyed to other PUAs is controlled by rules stored in each PUA. In order that the privacy requirements referred to above can be met, these privacy requirements must be contained in rules in the UCI user's PUA. Where UCI users have UCIs supplied by a company, the PUA administrator of the company will be responsible for determining the content of any rules that relate to corporate privacy requirements and the UCI users will be responsible for rules that relate to their own personal privacy requirements. Corporate PUA administrators would require that UCI users are unable to create rules that negate or in any other way compromise corporate privacy requirements.

An example of where the privacy requirements need to be expressed is in handling a situation where a company employee is travelling to meet with a representative of another company. The company privacy requirements might be that when exchanging information with 3rd parties:

- the company wishes to suppress details of who its employees are visiting (to avoid giving commercially sensitive information to potential competitors);

- the company wishes to suppress the precise location of their employee (but is happy to indicate that they are "travelling", "out of the office" or "abroad").

Within the UCI user's corporate calendar application a particular visit to visit a client company might be captured in diary entries such as:

- Monday 15th August, 12:30 - 13:30; Drive to London (Heathrow);

- Monday 15th August, 15:30 - 18:35; BA123 London (Heathrow)-Munich;

- Tuesday 16th August, 09:00 - 13:00; Meeting with Anothercom Marketing Director in Munich;

- Tuesday 16th August, 19:20 - 20:25; BA432 Munich-London (Heathrow);

- Tuesday 16th August, 21:00 - 22:00; Drive Home.

The PUA associated with the UCI user's corporate UCI would be allowed full access to the above information.

The company's privacy requirements would prevent the full diary information shown above being passed to a 3rd party such as another PUA. However, the following information, derived from the above diary entries, would meet those privacy requirements:

- Monday 15th August, 12:30 - 18:35; Travelling;

- Monday 15th August, 18:35 - Tuesday 16th August, 18:20; Abroad;

- Tuesday 16th August 18:20 - 22:00; Travelling.

The corporate privacy rules (set by the corporate PUA administrator) might be that the company will allow diary entries in the modified form shown above to be exported to the PUA associated with the individual's own UCI each time there is a change or addition to the UCI user's calendar application.

As the above example shows, translating from entries in the corporate calendar application to entries that could be exported is a non-trivial exercise. The above example shows that the category "travelling" has, in this case, been interpreted as starting at the beginning of the journey to the airport up to the landing time of the aircraft. This interpretation implies a definition of a "travelling" category that will include a time when the individual will be non-contactable (i.e. whilst airborne). Another company might interpret "travelling" to terminate at the time of the aircraft departure. This interpretation would then necessitate either leaving the flight time as being in an indeterminate category or would necessitate its inclusion as part of the "abroad" category. The other complication has been in interpreting times. The calendar entries were made using local times in the home and destination countries (airline flight times always use this convention and this convention will aid the employee whilst abroad). When exported to another person in the UCI user's own country, it will be necessary to convert all times to local times in the UCI user's home country for these times to be of use to the other PUA.

In order for the above complex translations of diary entries to be successfully achieved, it will be necessary for locations (e.g. Munich) to be identified as "abroad" and for the time-zones of these locations to be understood. This implies either very specialized functionality embedded in PUAs or, that the calendar application is designed with possible translation/export in mind. In this latter case, it would be necessary for all meeting locations to be chosen from a list that contained all possible destinations and their location (country) and time-zone information. Where new locations are required, it would be the responsibility of the UCI user or the PUA administrator to provide the relevant information to allow a new entry to be added to this list of destinations. Many calendar applications do already contain such functionality, so it might be possible for PUAs to have rules such as:

- If *country* IS NOT (home country) THEN *location* = "abroad";

- If *exporting*="yes" THEN *timebase* = <home-time> ELSE *timebase* = <local time>;

- If *exporting*="yes" THEN *visited-person* = <null> ELSE *visited-person* = <visited-person (value)>

to interpret the calendar entries before exporting.

12.3.4   Usability issues associated with multiple PUAs

- How will the user know which UCI (i.e. which PUA) the communication was directed to?

- If distinctive alerting mechanisms are used as a mechanism to distinguish between communications from different groups of users (e.g. "family" and "friends") how could the same mechanism be used to distinguish between communications made to the user's different UCIs?

- What is the current default UCI/PUA for outgoing communications and how is this communicated to the user? (multiple concurrent registrations)

- How does the user change the default to the required UCI/PUA for different types of terminal?

- Reversion from default - when and how should this be specified?

- How interacting or conflicting rules in two rule bases can be dealt with?

13   Other issues

13.1   Internationalization

The problems relating to communications across national boundaries have been well researched and documented. In addition to cross-cultural issues there are pragmatic issues such as taking account of different time zones, languages and terminal character sets.

Current communication systems offer little practical assistance in these areas but a UCI system would enable the sender of a communication to allow for and take account of many of the barriers to successful international communication.

Firstly, the additional information field of the UCI has the potential to describe the language preferences of a UCI owner in some detail. Such information is intended to reside in the address books of all potential communicators or to be delivered as the result of a UCI search. Relevant fields proposed so far include:

- preferred spoken language and competence level;

- preferred written language;

- second languages;

- preferred character set;

- surname/given name order in label;

- whether a Latin alphabet is acceptable.

The originator of a communication would be forewarned about the constraints placed on a forthcoming communication and be able to take appropriate action with respect to automatic or manual translation for instance.

Additionally the two PUAs involved in the negotiation prior to a communication being set up will be aware of the time differences existing between originator and recipient and ensure that any resulting mode of communication was appropriate to each party given the time in their respective time zones.

Future guidelines will indicate how best to define these preferences and how they should be presented in the address book.

13.2   Accessibility

UCI systems offer greatly enhanced possibilities of increasing the accessibility of communications to disabled and elderly people. This increased potential comes from the functionality of both the UCI and the PUA.

The UCI includes, in the additional information field, detailed data concerning the capabilities of its owner. As this data is typically embedded in address book entries it is available to a potential originator of a communication during set up. As a simple example of this in use, a profoundly deaf UCI owner may indicate in their additional information field that only text-based communications will be accepted. This will be immediately apparent to the originator who will not waste time trying to set up a voice-based communication.

The most significant effect on accessibility however will derive from the use of the PUA. The PUA belonging to a disabled or elderly user will be programmed to deal with all types of incoming communication and handle them in an appropriate way. For instance an elderly user who is hard of hearing could ensure that, while roaming, an amplification service was always included in the communication path to enable unrestricted use of **any** terminal.

This area will be the subject of future guidelines.

13.3   Charging and billing

Users may wish to have an indication of the likely charging for any outgoing communications that they make. Users may also wish to understand the cost implications that result from different possible options in their communication handling rules (e.g. if the rule says that calls should be diverted to their mobile phone whilst abroad they should be made aware whether they will bear a share of the cost of incoming communications).

Users may also wish to be aware of other charging and billing issues (e.g. in relation to the use of specialized PUA services).

Annex A:
Scenarios illustrating usability issues

EG 202 067 [2] provided six scenarios which illustrated how the user requirements relating to communications would be addressed by a UCI system and were also carefully chosen to be representative of the "lifestyle" environments within which PUAs and UCIs might operate. The scenarios were then used to derive representative information flows and hence to highlight technical issues. As the current document is focussed on maximizing the usability of UCI systems it is useful to re-examine the scenarios used previously, but this time with a view to highlighting the usability issues.

A.1 Mobile worker scenario

A.1.1 Key UCI capabilities illustrated by this scenario

As well as basic UCI-based communication, this scenario illustrates the following UCI capabilities:

- how information on the current state of the UCI owners communications services is used by the PUA to choose the appropriate communication service and terminal for the incoming communication it is trying to negotiate;

- the way in which the basic UCI communication process is adapted for email in a way that avoids large-scale adaptation of current email delivery mechanisms (e.g. mail servers and the SMTP protocol);

- the way in which the PUA is able to route communications to services that lie outside the scope of UCI, as defined by the present document, in order to have an email translated into a fax and then subsequently delivered.

A.1.2 Scenario description

Two fundamental user requirements of communications are that network boundaries should be invisible to users and that user interfaces should be unified. This scenario illustrates in a simple example how such attributes, delivered by a UCI based communication architecture, enhance the efficiency of a mobile worker.

In this scenario, the character Francois spends half his time in the office and half on the road visiting clients. He has a work mobile phone, at the office he has a fixed phone line and a networked PC.

Table A.1: Mobile worker scenario

Scenario description	Usability issues
Francois spends half his time in the office and half on the road visiting clients. He has a work mobile, a fixed phone line and networked PC at the office.	
An incoming call from a customer Mr. Dubois is routed to his fixed line telephone. The customer wants some advice and is asked to email this particular query as it involves quite complex requirements.	If the communicant is identified by a voice announcement then there should ideally be an opportunity to "manage" the communication before connection (e.g. divert to voicemail, not answer at all). Anonymity should obviously be indicated but what about authenticity? (see clause 6.3)
Francois logs off and goes off in his car to visit other customers. Mr. Dubois sends the email but this is automatically converted into an SMS message and sent to Francois's mobile. The mail requests that any response is in the form of a fax.	What about a very long email? (see clause 12.2.1)
A little later Francois, sitting in his car, has produced a response to Mr. Dubois's query. He uses the address book function to select "Mr Dubois" and then constructs a reply in SMS format. When the send instruction is selected, the display offers the option of sending as SMS (default), email or fax. Francois sends the reply as fax, as requested by his customer.	Converting may be included in the service provided or may be charged separately. Should user be aware? (see clause 12.2.1)

A.2   Home scenario

A.2.1   Key UCI capabilities illustrated by this scenario

As well as basic UCI-based communication this scenario illustrates the following UCI capabilities:

- the PUA's ability to instruct an application to generate an SMS message to alert its user to an incoming email;

- the management of aspects of a PUA profile by its UCI owner;

- preservation of the privacy of UCI owners according to the criteria they set via their PUAs. In this example a technique called a Virtual Calling Card is used;

- the PUA's ability to request distinctive user alerting dependant on the UCI identity of the recipient;

- registration of a UCI owner at a terminal belonging to someone other than the UCI owner.

A.2.2   Scenario description

This scenario illustrates a situation which will be commonplace in a residential environment where more than one person shares a terminal. People will be able to create a user sub-profile which defines the appropriate level of privacy given their circumstances at any given time. Different people in the same dwelling could easily define different levels of privacy. Access to UCI directory listings will also be subject to access rules defined by the UCI owner.

Jenny and Mike Smith live in the same house and each have their own personal UCI/PUA. They have their own mobiles but share a fixed telephone, PC and fax machine.

Table A.2: Home scenario

Scenario description	Usability issues
Jenny and Mike Smith live in the same house and each have their own personal UCI/PUA. They have their own mobiles but share a fixed telephone, PC and fax machine.	
Jenny wants to make a telephone call to her friend Lucy. She presses her own dedicated special identification button on the telephone and then scrolls through her customized address book on the small display. She selects Lucy and presses a "dial" button. Lucy is not available at the moment but a network-based service offers to take a short voice message. Lucy gets an SMS telling her that she has a new voice message.	Selecting a personal identification button - how many? What if there are not any such buttons or not enough? Should there be a PIN - possibly optional? (see clause 11) Selects address book. Three options - Lucy is in local terminal address list - Lucy is not in local list but in PUA master list - Lucy not in either list; needs a "search" Usability issue: how much of this tiered search can or should be hidden from the user? (see clauses 8.2.5 and 8.3.6) What happens with non display terminals? The only option here is a tedious voice menu system or a third party service possibly offered by the PUA provider. (Basically, a real person will access your PUA address book for you, and search if necessary - could be an expensive service to provide). This may be the only option with public access terminals which typically have very limited displays. Service offers a voice messaging service; presumably by recorded announcement. (see clause 6.3) When is the originally chosen identity invalid? After a time out, when a new identity is selected, after communication clear-down? (see clause 11.5.1) Access by PC to PUA. Do we need a standardized icon for the PUA? (see clause 5.5)
Mike is trying to work at home and is fed up with telephone sales calls interrupting him. He accesses his PUA profile management application via the Internet and sets his preferences to only accept calls during the afternoon coming from his work and urgent calls from family and friends. All other calls will be diverted to his voice messaging service for him to review later.	There needs to be a simple override for occasions such as this even a dedicated soft or hard key on the terminal. Could be one of a number of special sub-profiles? What about resetting? System could prompt for a time period. User may want option of being able to eavesdrop on incoming communications (like watching CLI on a terminal with an activated answering machine attached) so that a communication can be "intercepted". (see clause 7.2.2)
In the evening Mike wants to get hold of an old school friend and uses his PC based directory search engine. The directory search determines that his friend has set his UCI Privacy Protection so that an unknown person can leave a "virtual calling card" consisting only of the callers UCI and reason for communication. Mike selects "friend" and "call me back" categories from the available options.	Two levels for "why you want to contact me": for high level of privacy, applicants have to use a menu select ("friend")(no chance of unwanted, upsetting messages). For less privacy a free text an n-character field is offered ("I am an old friend from primary school"). Could be used by PUA for all grey list incoming communications. (see clause 10.6.5)
Eventually his old friend John Fields calls him back in the evening. Mike recognizes his personal ringing tone on an incoming call and sees the name "John Fields" clearly shown on the telephone display - so he takes the call.	Personal ring tones. Selectable, downloadable like mobiles. How to deal with limitations of legacy terminals and interactions with other alerting methods (see clause 12.3.1)
Next day John arrives at Mike and Jenny's and decides to stay overnight at short notice. He wants to call a few people to tell them what he's doing. John puts his Smart Card in the telephone's reader. His own address book is displayed and he makes the required phone calls.	Registration using a Smartcard ? (see clause 11.5.1) Does Smartcard stay in reader throughout interaction? If so there needs to be a reminder to remove. If not how does user "sign off"? (see clause 11.5.1) Would address book be held on Smartcard or simply point to PUA? 8k limit on Smartcard at present (see clause 8.2.5)

A.3   Tennis Club scenario

A.3.1   Key UCI capabilities illustrated by this scenario

As well as basic UCI-based communication, as described in clauses 9 and 10 of the present document, this scenario illustrates the following UCI capabilities:

- the ability of one PUA to form an association with another PUA as a result of the individual having different roles associated with each PUA;

- notification to the user that an incoming communication is associated with a specific role as it has been offered by the PUA assigned to that role;

- the ability of PUAs to associate, by default, one of the user's roles with an outgoing communication as a result of the previous communication being received in relation to that role;

- user entry of the numeric element of a UCI taken from a business card and the user's ability to manually select one of their roles for outgoing communication;

- a person who has no personal UCI, and hence no personal PUA, making outgoing UCI communications using the UCI supplied to him in relation to a role in an organization.

A.3.2　Scenario description

The club PUA is a special case of the corporate PUA where PUAs representing club-role UCIs are "grouped". These role UCIs provide pointers either to an individual's specific terminals or to an individual's UCI. This scenario shows how such an arrangement facilitates the efficient running of a social club and how the privacy of individuals performing club roles.

Table A.3: Tennis Club scenario

Scenario description	Usability issues
The Ipswich Tennis Club has just invested in its own PUA to help manage its communications. Club Secretary Dennis has just finished on the PUA Comms Manager window defining how incoming communications are to be handled. He has assigned 10 names to all the club roles including Fred the membership secretary and Derek the treasurer. Fred and some of the other officials have their own PUAs in which case relevant communications will be simply offered on to those people's PUAs; very little work for Dennis here because contact rules are already defined in the individual's PUA. In other cases people occupying club roles, such as Derek the treasurer, do not have their own PUAs and rules will have to be put into the club PUA. For instance Derek has told Dennis that any calls on a weekday (9 to 5) can go to his work number, evening calls to the club voicemail. This is more time-consuming for Dennis.	How to deal with conflicts between new rules set-up by the Tennis Club and the individual's own rules? (see clause 7.3.4)
New-to-the-area Paul wants to join the Club. He inputs "Ipswich Tennis Club" into his WAP-based directory search engine and receives ten hits back corresponding to the ten club roles. He selects "Membership Secretary" and clicks on "voice". Paul clicks on connect and a call is set up.	How do people who do not have a personal UCI set their own rules or (see above) OK a proposed set? Practicality of club secretary doing all this is arguable. What are other methods of doing this? (see clause 7.5)
Fred calls Paul back to provide some extra information. Despite the fact that the call is made from Fred's home, the UCI label displayed on Paul's telephone display is "Membership Sec, Ipswich Tennis Club" and NOT Fred's personal UCI.	Fred wants to personalize the communication. He may wish to add his name to the default "role only" (see clause 6.2.3)
A local shopkeeper wants to ask the club treasurer why a bill has not been paid and selects "Treasurer, Ipswich Tennis Club" from his mobile address book. This connects him straight to Derek's work telephone.	Organization of address books. How are roles to be organized when mixed with real names? (see clause 8.3.5)

A.4　Multiple role scenario

A.4.1　Key UCI capabilities illustrated by this scenario

As well as basic UCI-based communication, as described in clauses 9 and 10 of the present document, this scenario illustrates the following UCI capabilities:

- the way in which profile synchronization between PUAs associated with different roles can enable a communication associated with one role to be delivered to a terminal supplied by the organization associated with another role;

- the way in which the PUA can use the UCI from a record in the PUA's communication history in the set-up of a subsequent communication using the same or different type of communication service;

- the way in which a PUA can assign a default outgoing UCI identity based upon the UCI that was used to contact the user, and that is now stored in the communication history.

A.4.2   Scenario description

In many circumstances, individuals could be dependent on the communication rules embedded in two or more PUAs each relating to a different environment. It would appear sensible and efficient for those PUAs to share information related to an individual but there are obvious implications for security and privacy. This scenario shows how such an arrangement would appear to a user and what privacy/security capabilities would need to be put in place.

In this scenario, the character John Smith has had his own personal UCI for three years. He retired from full time work with Nokia five years ago but now his schedule is just as busy:

- On Tuesdays he does one days consultancy work on a regular basis for systems integration company SmartSys. They have supplied him with a permanently allocated desk on which is a telephone and PC, and provided him with a corporate UCI.

- He works intermittently throughout the year for ETSI, sometimes at home using his own communications equipment and sometimes in Sophia Antipolis where a telephone and PC are supplied plus a corporate UCI.

- He has just been elected a City Councillor in his spare time and the Council have now put an ISDN terminal in his house, loaned him a fax machine and supplied a corporate UCI.

- As if that is not enough he is membership secretary for the local engineering club. They do not supply any communications equipment or services but forward communications to him when appropriate from a club UCI.

Table A.4: Multiple workplace scenario

Scenario description	Usability issues
John Smith has had his own personal UCI for three years. He retired from full time work with Nokia five years ago but now has just as busy a schedule however. On Tuesdays he does one days consultancy work on a regular basis for systems integration company SmartSyS. They have supplied him with a permanently allocated desk on which is a telephone and PC, and provided him with a corporate UCI. He works intermittently throughout the year for ETSI, sometimes at home using his own comms. equipment and sometimes in Sophia Antipolis where a telephone and PC are supplied plus a corporate UCI. He has just been elected a City Councillor in his spare time and the Council have now put an ISDN terminal in his house, loaned him a fax machine and supplied a corporate UCI. As if that is not enough he is membership secretary for the local engineering club. They do not supply any comms but forward communications to him when appropriate from a club UCI.	
So besides his own personal PUA/UCI John's communications are under the control of four other PUAs. John was initially worried that this seemingly complex communications environment would need very high maintenance. For instance he wondered if he would need to tell all the PUAs every time he went away for a few days.	Multiple registrations is fine but what if the user wants to make large number of communications each using a different PUA - how can the complexity of the task be minimized? The user will not want to register and then re-register each time (see clause 11).
John has requested and now been allocated a mobile by SmartSyS (the first mobile he has ever owned). The first evening that he has the mobile it rings while he out working in the garden. A voice announcement tells him that the call has been forwarded from the engineering club and then connects him. It is a prospective member for the engineering club. John is impressed; somehow the club PUA is aware of and routed a call to his new mobile. John promises to call back the enquirer as soon as he returns to his house and has access to the club details on his PC.	Voice announcements could become very long e.g. "from" "forwarded from" "role" "company" "authenticated or not". How can this be managed? (see clause 6.3)
Back in the house John turns on his PC, opens his communications management window and requests communications history details. The call requesting membership details is at the top of the list, being the latest communication. John clicks on this and then selects "return" and "voice call" and from a scroll menu selects "membership secretary, engineering club".	
The call is established and John can now pass over the details on annual fees from his club database.	

A.5   PUA acting as a personal assistant scenario

A.5.1   Key UCI capabilities illustrated by this scenario

As well as basic UCI-based communication, this scenario illustrates the following UCI capabilities:

- the ability of PUAs to exchange selected items from the user schedule information that they hold. This can be used to determine when real-time communication between two or more people can occur;

- the ability of PUAs to alert their users of upcoming scheduled communications;

- the use of the language information contained in UCI additional information fields to determine when specialized services such as translation services may be required;

- the ability of a PUA to locate and utilize external servers to perform specialized tasks associated with a communication (e.g. the use of a translation server to transcribe text to a different language).

A.5.2   Scenario description

In addition to the functionality associated with the corporate PUA, specialized applications could enable the enhancement of current office management applications and supplementary services. This scenario gives an example of one such application.

In this scenario, the main character Pedro works in an advertising company with branches all over the country.

Table A.5: Business Application Scenario

Scenario Description	Usability Issues
Pedro works in an advertising company with branches all over the country.	
Yesterday he received a phone call from a Turkish businessman asking for a proposal. His first task of the day is to discuss this proposed advertising campaign with colleagues. He brings up the communications management page on his PC and selects "conference call" and indicates that the conference is very high priority. The user interface now lets him select several colleagues, some at remote locations, from his address book and against each name he indicates whether their presence is essential or not, and whether a deputy is acceptable.	This will require a very complex User Interface. Could only be done, without a PC, by using a third party. (Usability issues associated with 3rd party applications are outside the scope of the present document)
A few seconds later his PC screen confirms that most of the colleagues he wished to speak to are available in their offices and are about to join him in the conference. In one case a colleague will be on his mobile and in another a deputy will be involved until the actual invitee terminates a phone call.	
The telephone rings and an announcement tells Pedro that the conference is beginning immediately. This is good news; on some other occasions the system has suggested booking a future timeslot to accommodate all required participants.	How would such a procedure be coordinated so that nobody was waiting an inordinate length of time? (Usability issues associated with 3rd party applications are outside the scope of the present document)
After the conference call, Pedro decides to send the proposal to his potential client in Turkey. Pedro selects the name now in his address book ready to send the proposal in the form of an email.	How does he know that the client has access to email? Options are either to indicate capability in additional information field or to assume that PUA will arrange conversion to fax or speech output if not available. (Presentation of additional information field data) (see clause 6.2.3)
However his PC immediately flags up the fact that his contact only reads fluently in French and Turkish (despite speaking Spanish well and reading it a little) and so Pedro decides to get the proposal translated into French before transmission. He could have even opt for an automatic translation system selected by his PUA.	How does a user put in the additional information field that they do not speak a language but can get communications translated? Language specifications will be likely to be quite complex, for instance a user's "preferred" language (for business) may not be their "mother tongue". Providing a means by which users can specify this information will need careful thought. (see clause 6.2.3)

A.6 Corporate scenario

A.6.1 Key UCI capabilities illustrated by this scenario

As well as basic UCI-based communication this scenario illustrates the following UCI capabilities:

- how manager/secretary communications behaviour could be supported using UCIs;

- how PUAs can instruct specialized applications (e.g. a manager/secretary communications controller) to perform tasks without involving human intervention;

- how information on the UCI owner (e.g information such as if they are staying in a hotel) can be used to significantly alter the normal communication behaviour;

- how the PUA can use Presence information (e.g. no access to email service) and command external specialized services (e.g. an email to fax translation server) to determine when it will be necessary to take one form of communication and transform it into a different medium (e.g. forwarding selected emails to a hotel as faxes).

A.6.2   Scenario description

In a corporate or business environment, a corporate PUA would contain the PUAs that represent roles within the group. Such an arrangement would enable the benefits of a UCI and its supporting architecture to be available to organizations typically employing PABXs. Many functions of the PABX would be reproduced by the functionality and interactions of the corporate PUA. This scenario shows how the capability of a UCI based system could augment the organizational efficiency of a traditional manager/secretary relationship.

Table A.6: Corporate scenario

Scenario description	Usability issues
Steve is MD of a large company importing fashion goods and is keen to keep very tight control on his communications so that he can work at maximum efficiency. He wants his secretary Sally to handle the majority of his communications while he is in the office, but he wants all email or phone calls from his wife, Christine, and his boss Albert to go directly to him.	
During the day Steve can get on with his work while Sally handles the day-to-day tasks arising from routine emails and phone calls. Steve gets his wife's email reminding him to get home early and a call from Albert asking him to handle the monthly Management Meeting.	
Towards the end of the day Sally has an incoming call from the organizer of the conference at which Steve will be speaking. Sally realizes that Steve needs to speak to him and is able to click an icon on her PC which switches the call through to Steve.	
Sally uses the Internet to book a hotel for Steve when he goes to participate at the Conference in Vienna. Steve leaves for the meeting and checks in to the hotel.	This is an automatic update of a user profile. The user or their designated agent (Sally) will have to authorize this. (see clause 7.6)
During the next day Steve switches off his mobile during the conference. A call from his wife is directed to voice mail and an SMS message is automatically sent to the mobile to inform him.	
Sally is still getting routine emails and phonecalls. She feels that the email from the Finance Director is important and forwards it to Steve. It is automatically converted to a fax and sent to Steve's hotel as well.	
Steve gets the fax and the email, eventually. Before he rings the Finance Director, he wants to check when he last spoke to him. He opens his communications manager application on his laptop and selects "history" then "Finance Director". A complete summary of communications (e.g. emails and phone calls) (outgoing and incoming) is displayed.	SMS could possibly be used to notify him of the fax waiting. Various options for presentation of log data required. (see clause 9)
Steve knows when he last contacted the Finance Director and decides that they need to speak again. He selects the email concerned and selects "reply" and "-as phone call". In a few seconds his mobile rings and a call is being set up to the Finance Director.	The user interface aspects of this are likely to be that the default "reply" method would be the same as the received communication - with alternatives being made easily available (see clause 12.2.2).

Annex B:
User requirements for communications systems

B.1   Notes relating to the user requirements

B.1.1   Origin of the user requirements

The requirements in this annex are those originally defined in EG 201 940 [1], with minor updates and clarifications.

B.1.2   Assumptions concerning the Universal Communications Identifier

Throughout this annex an assumption has been made that whenever a Universal Communications Identifier (UCI) is referred to, it will be as defined in EG 201 940 [1].

B.1.3   Dependencies and conflicts

It should be noted that some of these user requirements may wholly or in part conflict with other requirements; some support other requirements and some are dependent on other requirements.

B.2   Generic requirements

This annex summarizes the generic user requirements of a modern, ideal communications system. For a more detailed analysis of these requirements and for a description of the system capabilities necessary to support such requirements, see EG 202 067 [2].

B.2.1   Unifying the control of communications

Users, currently, can be faced with many options when wishing to set-up, receive and manage their communications. Typically people may possess a fixed telephone, a mobile telephone, a PC with a home email address, another PC at work, an email address and a fax machine. Each terminal, application and service will have a different identifier, and method of setting up, receiving and managing communications. Each will also have different levels of control (e.g. a user can send an email labelled "urgent" but not make a telephone call similarly labelled) and different methods of storing communication history.

An effective and efficient multi-modal communications system would have a choice of terminals, a single universal identifier and a common method of setting up, receiving and managing communications.

User requirement No UR 1.1

Users require a unified method of, and support for, setting up, receiving and managing communications that is, as far as possible, independent of the terminal(s), application(s) and service(s) used. This would include provision of a single universal identifier covering all services and network types.

B.2.2   Seamless communication across networks and services

The independent development of different networks and services and their historical segregation has tended to make inter-network communication difficult if not impossible. Applications do exist to enable a user to send, for example, an email to a fax machine but typically it involves the user in significant effort. It is currently simpler for an originator to "experiment" until communication is established on one of the available networks than attempt to set up inter-network/inter-service communication.

For example, an originator first uses a fixed telephone to ring the recipient's fixed phone but gets a voice mailbox. The call is urgent so the originator clears down and rings a mobile number. Again there is no answer and this time they leave a message but for added peace of mind they now start up their home PC and send an urgent email to both the recipient's personal email address and their work email address. Altogether this is a time consuming process with unsatisfactory feedback. The use of translation agents (which could be part of the function of a Personal User Agent) within the network (e.g. voice to email, email to voice) would help to overcome this problem.

User requirement No UR 1.2

Users require seamless communication across networks and services.

B.2.3   Increasing the options available to the originator

At the present time, an originator has little control over outgoing communications other than by choice of terminal. In future, the originator may want to specify the level of service required for a particular communication, specify what is to happen if the desired communication cannot be established or assign a priority. As the number of possible options increases, the complexity for the user may increase. The user will need to be allowed to choose their own balance between increasing the options that they control and reducing the complexity that a large number of choices can create.

User requirement No UR 1.3

The originator of a communication requires the ability to indicate to the system particular requirements relating to the outgoing communication.

B.2.4   Increasing the options available to the recipient

With the increasing number of communication options available to users it is becoming important to manage incoming communications effectively. In particular, a user may wish to divert incoming communications from one terminal to another depending on their own geographical location or the time/date. The recipient may also wish for the re-routing of communications to depend on the urgency of the call, who it is from or some other attribute. Geographically determined re-routing of communications could be automated to varying degrees using GSM, GPS, AI techniques, polling, or other forms of presence detection.

User requirement No UR 1.4

The recipient requires the ability to control incoming communications.

B.2.5   Dealing with communications conflicts between originator and recipient

If the originator has specified particular attributes or conditions for a communication and the recipient has specified communication management criteria which conflict with those, then the system entities which represent originator and recipient within the network(s) should negotiate a mutually acceptable solution.

User requirement No UR 1.5

Users require that conflicts between the communication requirements of the originator and the recipient should be resolved, where possible, without their intervention.

B.2.6   Maintaining backward compatibility

Future architectures will provide users with increased control over the sending and receiving of communications. Taking full advantage of this increased functionality will almost certainly require sophisticated user interfaces. However, for the foreseeable future, a large number of terminals (principally telephones) will have limited or no ability to input alpha characters. It is important that these users are still able to use communications systems based on the new architectures, albeit with decreased functionality.

User requirement No UR 1.6 - Maintaining backward compatibility

Users may wish to use basic input devices such as a 12-button numeric keypad to obtain a basic level of service, even when using future architectures.

B.2.7   Trust in the system

Trust in a communications system is clearly dependent on many issues other than technical ones. A user's trust in a communications system will be influenced not only by the security mechanisms within the system but by political and psychological factors as well.

However, trust can be maximized by providing "appropriate" levels of security. A typical user may not be concerned about the integrity of 95 % of their communications and supplying checks and verifications on these would be inefficient with respect to system performance and frustrating for the user. But for the remaining 5 % the user may require these features and needs to have confidence that in these cases appropriate security is in place.

User requirement No UR 1.8 - Trust in the system

To have trust in a communications system, users require an appropriate level of security to be provided and when necessary an assurance of the integrity of the communication and the identity of the person they are communicating with.

B.2.8   Appropriate level of privacy

Privacy is defined as the ability of the user to choose who knows their UCI and under what circumstances and from whom they can accept incoming communications. Users will wish to have the freedom to determine who is able to gain access to their UCI (via such mechanisms as UCI searches). They will also wish to have full control over who is able to communicate with them, when and by what means.

User requirement No UR1.9 - Appropriate level of privacy

Users will require different levels of privacy dependant on their individual needs.

B.3   Human factors requirements

B.3.1   System performance

The effect of system response times on the user perceptions of communication and information systems is well researched and documented. Users have expectations regarding call set up times (post dialling delay), terminal processing times and so on. The network architecture proposed in the present document requires considerable processing to be undertaken before a communication is established and so due consideration will need to be given to ensure that acceptable performance levels are delivered.

User requirement UR 2.1 - System performance

When retrieving information and setting up communications, users require that system response times meet accepted Human Factors recommendations and standards.

B.3.2   Ease of use

Use of the UCI in an advanced communications architecture assumes that users will be provided with enhanced control over their communication environment. Where users are given control, a user interface must be provided. An effective user interface can make controlling the communication environment easy and pleasurable but a poor user interface can mean that users fail to effectively control their environment and that they become frustrated and cease to use the facilities provided. User interfaces supporting the proposed architecture should conform to best practice.

The following areas are highlighted as those in which particular care is needed to ensure that the overall environment is usable:

- Communications set-up.

- Incoming communications information.

- Communications management.

- Directory search strategies.

- Verification.

- Presentation of UCI (on paper).

- Presentation of communications history.

- The communication set-up procedure including:

  - Users manipulation (comparable in feel to today's communication set-up);

  - System performance (comparable in timing to today's communication set-up).

User Requirement No UR 2.2 - Ease of use

All aspects of communication including initiation of a specific communication, access to records, setting up and editing communications configurations should comply with usability best practice and be as intuitive as possible.

B.3.3   Generic control procedures

Standardization of user control procedures can be seen as something which stifles creativity and limits commercial advantage. However, many service providers now agree that defining a base level set of protocols and procedures which are generic to all terminals applications and services increases the usability of the systems and therefore customer acceptance and uptake.

By using such standards, a minimum level of usability can be achieved within and between telecommunication services by the acceptance of well researched minimum user control procedures. The expected format of such procedures would define a minimum sequence of indications and controls necessary to enable the user to make use of a service. The procedures would not define the format or substance of the controls or indications and would not preclude other enhanced procedures from being provided, but they would ensure that a user could access and control a service irrespective of the terminal or network being used.

User requirement UR 2.3 - Generic control procedures

Users will require that the basic protocols and procedures used to set up communications are standardized across terminals, applications and services.

B.3.4   Providing feedback to the user

One of the most important determinants of a usable system is the provision of feedback to the user. The architectures being developed to support the UCI have the potential to provide complex communications configurations to users and it is essential to provide continuous feedback regarding system status and the options available if the user is to exploit the full potential of the system.

User requirement UR 2.4 - Providing feedback to the user

Feedback should be given on status and options available to the user whenever feasible.

B.3.5　Standardization of symbols, icons and pictograms

As users may well interact with the system on a variety of input devices on different applications, it is critical that icons, symbols and pictograms are standardized across terminals, applications and services, and are designed as a coherent, logical set. If this issue is left to market forces there is a danger of a variety of symbols being developed for the same identity, function or action. This could compromise the uptake of the service.

User requirement UR 2.5 - Standardization of symbols, icons and pictograms

Users require a consistent coherent set of symbols relating to UCI usage that can be used across terminals, applications and services.

B.3.6　Accessibility

"All new telecommunication facilities and services should be accessible to all (users)" (Telecommunications Charter COST219). The needs of children, older people and people with disabilities should be taken into account in the design of any new telecommunication equipment or service. Any new architectures should be designed for the widest possible market and the services and applications that use such an architecture should adequately support relevant special terminal functions so that all users can experience end-to-end service.

The use of PUAs in an architecture enables communications to be configured taking any special requirements of a user into consideration.

User Requirement No UR 2.6 - Accessibility

Children, elderly people and disabled users will require access to the full functionality of the system and the design of all users interfaces should take this into account. PUAs should be aware of capabilities of their users and manage communications accordingly.

History

Document history		
V1.1.1	November 2002	Publication