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Key Scenarios and Implications for WINNER II

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Abstract:

This document provides an update of the WINNER scenarios described in WINNER phase I, considering the latest developments in research in terms of user needs, services, wireless market and industry trends. This document aims at to identify and characterise relevant scenarios needed for system simulations and evaluate the implications for WINNER system mainly on technical and economical aspects.

Keyword list:

WINNER, scenario, key scenario, deployment scenarios, scenario elements, applications, services, economic, business, technical aspects, models, environment, mobility.

Disclaimer:

Executive Summary

In the previous phase of WINNER, an extensive research was done in the scope of WINNER's scenarios and service classification through the analysis of the different inputs linked to the usage scenarios. A preliminary economic and business framework was also started in that WINNER's phase [WIN1D14].

The goal of this document is to identify the most relevant scenarios in scope of the WINNER, chosen as key scenarios for proof-of-concept and defined by WINNER II CGs.

An overview of the different WINNER scenarios and their relationships is provided in chapter 2 in order to get a clear understanding of the term "scenario". A continued discussion from WINNER phase I in scope of the service and traffic characterisation was performed according to the latest trends in the wireless industry. Each evaluation scenario was characterised in terms of used services, traffic characteristics, user density, distribution and mobility modelling, and linked with the physical deployment and test scenarios defined by the CGs.

The evaluation scenarios are prioritised in terms of the typical usage cases with relevance for WINNER evaluation in terms of the system requirements and design.

An extension of the economic impact framework started in phase I is analysed at service level rather than taking into account the value chain for the different players or actors involved. A preliminary analysis of the technical implications of wireless ecosystems is provided in order to evaluate the flexibility and configurability of WINNER system upon different deployment scenarios, i.e. network providers, service providers, contents providers and other actors in the business models.

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List of Acronyms and Abbreviations

3G	Third Generation
3GPP	Third Generation Partnership Project
AIE	Air Interface Evolution
BS	Base Station
CDMA	Code Division Multiple Access
CG	Concept Group
DSL	Digital Subscriber Line
EV-DO	Evolution-Data Only
GERAN	GSM/Edge Radio Access Network
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HSDPA	High-Speed Downlink Packet Access
HSUPA	High-Speed Uplink Packet Access
IEEE	Institute of Electrical and Electronics Engineers
ITU	International Telecommunication Union
LA	Local Area
LAN	Local Area Network
LOS	Line of sight
LTE	Long Term Evolution
MA	Metropolitan Area
MAN	Metropolitan Area Network
MIM	Mobile Instant Messaging
MMS	Multimedia Messaging
NLOS	Non-LOS
NRT	Non-RT
OFDM	Orthogonal Frequency-Division Multiplexing
RN	Relay Node
RT	Real Time
SCG	Simulation Coordination Group
TD-CDMA	Time Division-CDMA
UMTS	Universal Mobile Telecommunications System
UT	User Terminal
WA	Wide Area
WAN	Wide Area Network
WiFi	Wireless Fidelity
WiMAX	World Interoperability for Microwave Access
WLAN	Wireless LAN
WMAN	Wireless MAN
WWAN	Wireless WAN
WP	Work Package

1. Introduction

In WINNER phase I, WP1 proposed an original methodology to determine the requirements for WINNER future applications, which was developed for deliverable D1.1. Many inputs linked to usage scenarios such as user groups, user motivations, external reference scenarios and scenario's elements were analysed and consolidated. A small group of generic applications and service classes was proposed. Each service class was described with their main user requirements. Moreover, some traffic models were updated and preliminary analyses on business and economic aspects have been proposed.

Key user groups have been identified and their main motivations for using mobile communications were described. For all these motivations, scenario elements have been extracted. First they were grouped by generic application type and later, a synthesis of this selection leads to the preliminary list of service classes. Moreover, exemplary scripts have been derived, by regrouping the scenario elements around one day in the life of a person or a location.

Deliverable D1.2 [WIN1D12] describes traffic models which cover all major needs identified for WINNER future applications and service classes.

Deliverable D1.3 [WIN1D13] provided the final usage scenarios after refinement work where feedback from other groups and internal iteration has been taken into account. Moreover, it introduced a preliminary part on business and economic analyses linked to the new requirements.

Finally, the document D1.4 [WIN1D14] gives the final view of WP1 on service classes, traffic models, and business analysis. It also gives guidelines to discriminate the characteristics of the service classes.

This document takes as a starting point the scenarios, service classes and related applications derived for the WINNER system in the above-mentioned previous work.

These scenarios, service classes and applications are here refined to comply with the evolving WINNER system. Earlier work derived service requirements for the service classes in terms of tolerable delays, mobility characteristics, download times, duration, and so forth. These requirements are primarily focused in user requirements and location/environment requirements, and not in technology.

This document translates these user requirements into the framework of the evaluation scenarios defined in the concept groups [WIN2D6131]. Quantitative values and specific models are provided as input for system-level simulations.

2. Overview of WINNER scenarios: definitions and relationship

This section provides an overview of the scenario methodology adopted for the design of the WINNER system. The WINNER system design adopts a user-centric approach. As a consequence, the relevant services derived from this user-centric approach have been used to form service classes that encompass groups of important and innovative applications. The service class formation was based on an approach that takes into account the technical aspects of these applications (e.g. download times, tolerable delays, security, QoS, and mobility requirements) as well as the contextual aspect of the applications. These service classes were also formed taking into account the user behaviour that was described by user scenarios. The focal point for describing the user scenarios was the assumption that communication technologies have become an integral part of life. Such assumption allows the exam to the WINNER technology in a broader context and targeting its final users. This is particularly important in order to give an approximate estimate of the required initial investments for the system's deployment.

By defining user and usage scenarios, the requirements of the WINNER users were brought to the same level as the technological requirements for the system design. This way models for predicting the acceptance and penetration in the market of the WINNER technology can be made.

The WINNER system is designed to support cellular and short-range type of communications. That means that the services offered by the WINNER system will depend on time, location, terminal, cost and user. The relaying concept is developed within WINNER to increase the coverage range as well as support higher data rates services. These services (see chapter 3) can be further described by identifying location scenarios. Location scenarios can be correlated to deployment scenarios, where both the user and technology characteristics will be considered together. For describing the unrestrained amount of traffic in a location scenario at a given moment of time we define traffic load scenarios. The traffic load scenarios can help to obtain an approximate of the expected network load in a given location and the nature of the traffic.

Based on the user, usage and location scenarios, key scenarios can be defined. The key scenarios will focus on challenging requirements, e.g. when the defined service classes can be delivered only by the technological innovations of the WINNER system. Figure 2.1 and Figure 2.2 show the scenario relationships and the scenario selection methodology, respectively.

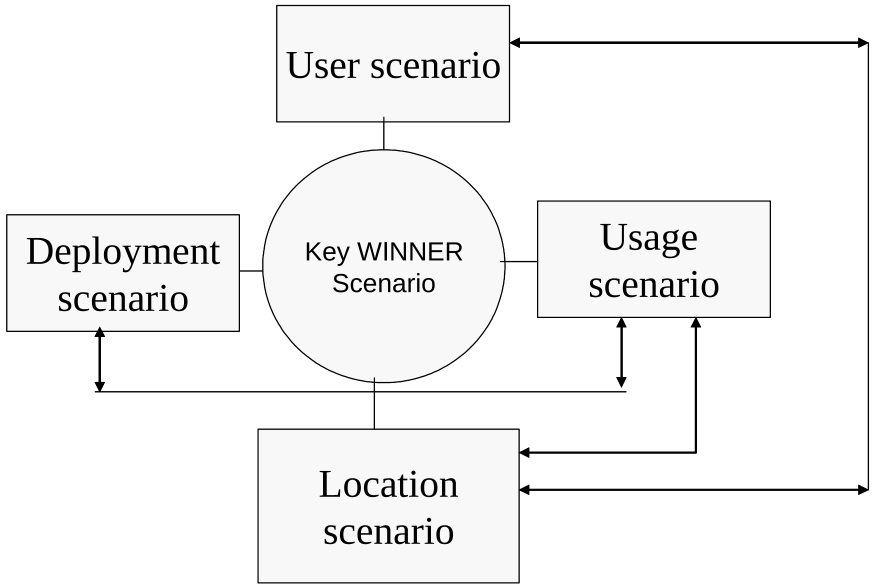

Figure 2.1: Scenario relationships

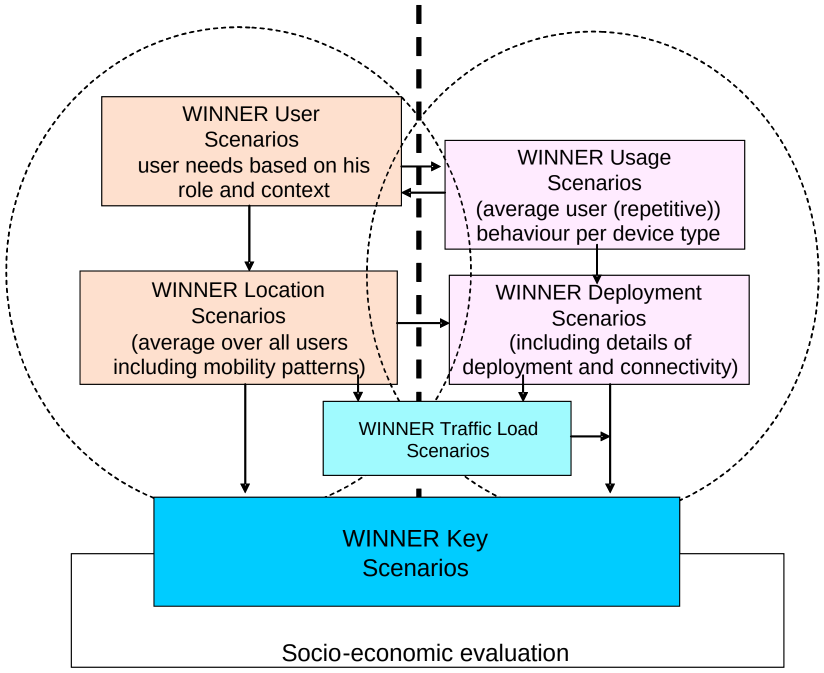

Figure 2.2: Scenario selection

2.1 Scenario

The single term “scenario” is used as a generic term to describe information and interaction between different involved parties and objects, their environment, their objectives, actions and events.

A scenario can be expressed in many ways, for example in textual narratives or storyboards, etc.

In contrast to this generic term, the terms “user scenario”, “usage scenario”, “location scenario”, “traffic load scenario”, and “deployment scenarios” have dedicated definitions which are briefly described in the following.

2.2 User scenario

User scenarios merely reflect what the user wants to do, where, when and why. These are based only on the new user requirements for future systems without references to the technology.

Basic human factors (e.g. age, income, lifestyle, integration of work and personal life) characterize the general perspective of a user. However, a user scenario describes the user and his/her preferences in particular roles and contexts with particular demands on wireless communication services.

During the day, the user will have different roles, e.g., business, private, and sports; in each of these roles, he/she might react differently. For example, being a business person, his/her preferences will be to get information as soon as possible, regardless of the price; when in a private role, price might play an important role: messages/information requests will be treated according to their value; large attachments and music/video download can wait, while family information (‘community’) will be forwarded to all family members immediately.

Context refers to the practical and social aspects of the environment that influence the user's behaviour related to his use of wireless communication services. Each role defines itself within a social context, i.e. depends on the surrounding people and the people with whom (wireless) communication takes place. Also the physical location of the user is referred to as his individual location context. Also the user's context typically changes frequently over the day.

Therefore the combination of basic human factors and preferences with different roles and contexts results in a large range of possible user scenarios.

Particular roles and contexts typically correlate with different preferred device types (e.g. high-end device while on business, small device while on private travel) and with locations.

A user scenario describes the needs and behaviour of *one* user in a *particular* role and context. This typically includes a mixture of applications and services.

Typical user scenarios were in [WIN1D11, WIN1D12, WIN1D13].

2.3 Usage scenario

A usage scenario describes the average behaviour of a single user while using a particular generic application or service, taking into account technological conditions and constraints as far as the user is immediately aware of. This refers in particular to the type of device that he/she is using and his/her knowledge about the connectivity he/she can expect.

This means that for a particular generic application of *one individual* user scenario these technological conditions and constraints are taken into account and the behaviour is *averaged over time*.

Usage scenarios can be prioritised according to different metrics – e.g. profitability, frequentness, or requirements for the radio access system.

2.4 Location scenario

The location scenario reflects the average behaviour of a *group of users* in a *particular location context*. This encompasses aspects like their mobility patterns and distribution in space, as well as the type and relative mix of services used.

It is therefore based on combining the relevant user and usage scenarios for a particular location context.

Possible location scenarios include: airport, railway station, tourist city centre, industrial terrains, suburban home, open plan office, school, shopping mall, sports centre, car, train, etc.

2.5 Traffic load scenario

While the location scenario describes the *relative* user distribution and use of different services for a particular location context, the traffic load scenarios further augments this into the *absolute traffic load* experienced. Therefore user density information is required.

Traffic load scenarios (TLS) are used to describe the unrestrained end user traffic and the corresponding behaviour of the network. TLS therefore refer to the expected nature of the traffic offered to the network, not the actual traffic characteristics over the air interface. No impediment to the build up of traffic is considered in the description of the TLS in this document.

2.6 Deployment scenario

Deployment scenario comprises relevant features of the environment where the WINNER system is to be deployed (e.g. building density and height, user density, mobility, etc.), and associated physical deployment characteristics used for the technical solution provided by WINNER (like antennas position, number sectors per BS, frequency, bandwidth, duplexing, physical layer mode, cell layout, etc.) [WIN2D6131]. Furthermore the available alternative radio access technologies (and assumptions related to their ownership, service offering, and type of co-operation) within the considered area are part of the deployment scenario summarises key questions addressed and results obtained by the different scenario types.

The key characteristics of the locations are: physical characteristics of the place, such as building height, building density, their distribution, etc[1].

Table 2.1: Summary of Considered Scenario Types

	Key Question	Applicable for	Averaging	Results
User Scenario	Which services are needed by a user in a particular role and context?	Single user	Instantaneous examples	Services per user type, role and context
Usage Scenario	How is a particular service typically used?	Single service and device type	Averaged over time	Typical usage conditions of a service
Location Scenario	Which service mix and usage pattern results for a user population in a particular location context?	Single location	Averaged over time and users	Service mix, mobility, user distribution
Traffic Load Scenario	Which user distribution, density, and absolute traffic load are generated in a location scenario?	Single location	Averaged over time and users	User density, traffic load
Deployment Scenario	Which technical solutions are deployed in a particular location scenario?	Single location	Averaged over time and users	Deployment parameters

[1] These characteristics are valid for the deployment and location scenarios. The difference is that the deployment scenario refers to the availability and adoption of the technology in that particular area, while the location scenario refers to the presence of a potential user of this technology. The connection is that if a location scenario is characterised by high user density it would mean that it can become a good deployment scenario driver.

2.7 Key scenario

The term "key scenario" can have different connotations. One might e.g. refer to key scenarios for scenarios which are most relevant for future business cases, or to such which are most challenging for radio access system design. In our context, key scenarios refer to the evaluation scenarios defined by the WINNER II concept groups [WIN2D6131]. These scenarios have been chosen such that a proof-of-concept can be achieved especially in scenarios that will be prevailing in the first deployment phase of WINNER systems. They span different physical layer modes and parameterisation of the WINNER system and focus on challenges in system requirements and system design [WIN2D6131].

This deliverable adds further discussion and parameterisation to these evaluation scenarios in the area of service and traffic characteristics, as well as user behaviour. Typical usage cases in each evaluation scenarios shall be prioritized, i.e. the most used/common applications will be focused upon and based on the location and deployment assumptions an appropriate behaviour of the user population will be derived, including service mix, traffic load, user distribution, density, and mobility.

3. Services and generic applications

Service is a generic term and can be defined as a generic set of applications that have similar characteristics; this is a set of functions and facilities offered to users by a provider (service provider). Different services can be provided by the same network element and identical services can be provided by different network elements. The applications interact directly with users and are characterised by service attributes and also by traffic and communications characteristics. The word "application" is used as a generic term to represent the set of features, combining communication and document processing, in which end users may perform operations.

As a consequence, an application is an instance of a service with specific characteristics. The most common service/applications characteristics will be presented: service characteristics; traffic characteristics; communication characteristics. These characteristics are not specific for WINNER but apply to all wireless systems. The next tables are based in deliverables [WIN1D11] and [WIND12].

3.1 Service characteristics

The service characteristics, for each service class, are explained in the following:

Delivery requirements: RT (real time) – the processing of information returns a result so rapidly that the interaction appears to be instantaneous; or NRT (non-RT).

Directionality: This characteristic intends to identify the nature of the communication and its direction. Three classes are identified: one-way – point-to-point (uplink or downlink); two-way – bidirectional (uplink and downlink); multi-way – point to multi-point, multi-point to multi-point or multi-point to point.

Symmetry of the connection: the characteristic "symmetry" permits the grouping of applications according to symmetry in the uplink/downlink data rate. The two classes are: symmetric or asymmetric and the respective asymmetry factor (UL for upload and DL for download).

Number of parties that interact in the communication: one-to-one, 1 – 1, one-to-many, 1 – m, or multi-party, multi.

Table 3.1: Service characteristics

Service class	Examples of applications	Service characteristics				
		Delivery requirements	Directionality	Symmetry/Asymmetry	Asymmetry factor	Nb. of parties
Real-time collaboration and interactive gaming	Videoconference	RT	Multi-way	Symmetric/asymmetric	1UL – 1DL	multi
	Navigation systems	RT		Symmetric	N/A	N/A
	Real-time gaming	RT		Asymmetric	26UL – 1000DL	1 – 1, 1 – m
	Tele-presence	RT	Two-way	Symmetric	N/A	N/A

	Tele-teaching	RT	Multi-way	Symmetric/Asymmetric	1UL – 1DL/low	1 – 1, 1 – m
	Tele-working	RT	Two-way	Symmetric	1UL – 1DL	1 – 1
Geographic real-time datacast	Real-time video streaming	RT	Multi-way	Asymmetric	N/A	N/A
	Collaborative work	RT		Symmetric	1UL – 1DL	1 – 1, 1 – m
	Traffic information/urban guidance	NRT/RT		Asymmetric	5UL – 1e3DL	1 – m
Geographic interactive multimedia broadcast	Video broadcasting/streaming	NRT/RT	Multi-way	Asymmetric	N/A	N/A
	Localised map download	NRT			N/A	N/A
Geographic datacast	Localised datacast/beacons	NRT	Multi-way	N/A	N/A	N/A
	Audio streaming	RT		Asymmetric	4UL – 100DL	1 – 1, 1 – m
	Assistance in travel	NRT/RT			5UL – 1e3DL	1 – 1
	Tourist information	RT			4UL – 100DL	1 – m
Short control messages and signalling	Alarms	RT	One-way	Asymmetric	N/A	N/A
	Remote/voice control	RT			N/A	N/A
	Sensors	RT			N/A	N/A
Simple interactive applications	Presence driven transfer	NRT/RT	Two-way	Asymmetric	N/A	N/A
	Interactive geographical maps	NRT			N/A	N/A
	Mobile video surveillance	RT			5UL – 0.001DL	1 – 1
Interactive ultra high multimedia	High quality video conference	RT	Multi-way	Symmetric/asymmetric	1UL – 1DL	multi
	Collaborative work	RT		Symmetric	1UL – 1DL	1 – 1, 1 – m
Interactive high multimedia	Rich data call	RT	Multi-way	Symmetric/Asymmetric	1UL – 1DL	1 – 1
	Robot security	RT		Asymmetric	N/A	N/A
Simple telephony and messaging	Voice telephony	RT	Two-way	Symmetric	1UL – 1DL	1 – 1, 1 – m
	Instant messages (SMS)	NRT		Asymmetric	4UL – 100DL	1 – 1
Data and media telephony	Audio streaming	RT	Two-way	Asymmetric	4UL – 100DL	1 – 1, 1 – m
	Video telephony (medium quality)	RT		Symmetric	1UL – 1DL	1 – 1

	Multiplayer games	RT	Multi-way	Asymmetric	26UL – 1000DL	1 – 1, 1 – m
Rich data and media telephony	High quality video telephony	RT	Two-way	Symmetric/asymmetric	1UL – 1DL	1 – 1
	Standard data call	RT		Symmetric	1UL – 1DL	1 – 1, 1 - m
LAN access and file service	Database and file system server	NRT	Two-way	Asymmetric	4UL – 1DL	1 – 1
File exchange	Data file transfer (FTP)	RT	Two-way	Asymmetric	4UL – 1DL	1 – 1
	Video download/upload	NRT	One-way	Asymmetric	N/A	N/A
	Peer-to-peer file sharing					
Multimedia messaging	Messaging (data/voice/media)	NRT	Two-way	Asymmetric	4UL – 100DL	1 – 1
	Authentication (m-payment, m-ticket, m-wallet, …)	NRT/RT	One-way		N/A	N/A
	Multimedia mail	NRT/RT			N/A	N/A
Lightweight browsing	Access to corporate database	NRT	Two-way	Asymmetric	N/A	N/A
	Multimedia web browsing	RT			1UL – 5DL	1 – 1
	E-banking	RT			4UL – 100DL	1 – m
	E-commerce	RT			4UL – 100DL	1 – m
Video streaming	Video streaming (normal)	RT	One-way	Asymmetric	N/A	N/A
	Micro movies (including video clips)	RT			26UL – 1000DL	1 – m
High quality video streaming	Video streaming (archival)	RT	One-way	Asymmetric	N/A	N/A

3.2 Traffic characteristics

Traffic characteristics reflect the way the packets flow from the sender to the receiver through the communication channel in a top-level view, the most important are:

Average duration of connections refers to the connection holding time; this is the time that it takes from the beginning of the connection to its end.

Latency/delay in a network is the amount of time that one packet takes to travel from its source to destination. The delay is one of the most relevant aspects in QoS performance.

Data rate is the speed of a data transfer process, normally expressed in bits per second or bytes per second. It is a critical measurement when dealing with real time applications such as audio and video files which require high bandwidth and are delay sensitive.

Table 3.2: Traffic characteristics

Service class	Examples of applications	Traffic characteristics		
		Average duration	Data rate	Delay
Real-time collaboration and interactive gaming	Videoconference	30 min	1 – 20 Mbps	<20 ms
	Navigation systems	N/A		
	Real-time gaming	10 – 30 min		
	Tele-presence	N/A		
	Tele-teaching	30 min		
	Tele-working	15 – 50 min		
Geographic real-time datacast	Real-time video streaming	N/A	2 – 5 Mbps	<20 ms
	Collaborative work	15 – 50 min		
	Traffic information/urban guidance	5 – 10 min		
Geographic interactive multimedia broadcast	Video broadcasting/streaming	N/A	2 – 5 Mbps	20 – 100 ms
	Localised map download	N/A		
Geographic datacast	Localised datacast/beacons	N/A	64 – 512 Kbps	100 – 200 ms
	Audio streaming	3 – 60 min		
	Assistance in travel	20 – 360 min		
	Tourist information	10 – 15 min		
Short control messages and signalling	Alarms	N/A	8 – 64 Kbps	20 – 100 ms
	Remote/voice control	N/A		
	Sensors	N/A		
Simple interactive applications	Presence driven transfer	N/A	64 – 512 Kbps	20 – 100 ms
	Interactive geographical maps	N/A		
	Mobile video surveillance	10 – 120 min		
Interactive ultra high multimedia	High quality video conference	30 min	10 – 50 Mbps	20 – 100 ms
	Collaborative work	15 – 50 min		
Interactive high multimedia	Rich data call	5 min	2 – 5 Mbps	20 – 100 ms
	Robot security	N/A		
Simple telephony and	Voice telephony	3 min	8 – 64	100 –

messaging	Instant messages (SMS)	0.1 – 15 min	Kbps	200 ms
Data and media telephony	Audio streaming	3 – 60 min	64 – 512 Kbps	100 – 200 ms
	Video telephony (medium quality)	5 min		
	Multiplayer games	10 – 30 min		
Rich data and media telephony	High quality video telephony	5 min	2-5 Mbps	100 – 200 ms
	Standard data call	3 min		
LAN access and file service	Database and file system server	1 – 5 s	>50 Mbps	100 – 200 ms
File exchange	File data transfer (FTP)	1 – 5 s	>50 Mbps	>200 ms
	Video download/upload	N/A		
	Peer-to-peer file sharing			
Multimedia messaging	Messaging (data/voice/media)	0.1 – 15 min	8 – 64 Kbps	>200 ms
	Authentication (m-payment, m-ticket, m-wallet, …)	N/A		
	Multimedia mail	N/A		
Lightweight browsing	Access to corporate database	1 – 5 s	64 – 512 Kbps	>200 ms
	Multimedia web browsing	1 – 15 min		
	E-banking	5 – 15 min		
	E-commerce	5 min		
Video streaming	Video streaming (normal)	N/A	5 Mbps	>200 ms
	Micro movies (including video clips)	3 – 5 min		
High quality video streaming	Video streaming (archival)	N/A	30 Mbps	>200 ms

3.3 Communication characteristics

The communication parameters are required to specify the minimum requirements in order to establish a suitable communication to run one application at high level. During a communication, specific characteristics have to be ensured, the communication characteristics are:

Burstiness is a source traffic characteristic that is defined as the ratio of the peak and the average bit rates.

Bit error rate (BER) is a non-dimensional variable that expresses service tolerance to uncorrected errors in the bearer service, including non-delivered information. It is calculated as the ratio between bits received with error or omitted, and the overall received bits.

Traffic type: SERR – Service Requested Bit Rate, in this case the bit rate is controlled by the client; SYSA – System Assigned Bit Rate, where the bit rate is under the control of the access system/network according to the available resources.

Table 3.3: Communication characteristics

Service class	Examples of applications	Communication Characteristics		
		Traffic type	Error rate (BER)	Burstiness
Real-time collaboration and interactive gaming	Videoconference	SERR	10^{-6} – 10^{-9}	1 – 5
	Navigation systems			N/A
	Real-time gaming			1 – 30
	Tele-presence			N/A
	Tele-teaching			1 – 5
	Tele-working			1 – 20
Geographic real-time datacast	Real-time video streaming	SERR	10^{-6}	N/A
	Collaborative work			1 – 20
	Traffic information/urban guidance			1 – 5
Geographic interactive multimedia broadcast	Video broadcasting/streaming	SERR	10^{-6}	N/A
	Localised map download			
Geographic datacast	Localised datacast/beacons	SERR	10^{-3} – 10^{-6}	N/A
	Audio streaming			1 – 5
	Assistance in travel			1 – 5
	Tourist information			1 – 20
Short control messages and signalling	Alarms	SERR	10^{-9}	N/A
	Remote/voice control			
	Sensors			
Simple interactive applications	Presence driven transfer	SERR	10^{-6}	N/A
	Interactive geographical maps			N/A
	Mobile video surveillance			1 – 5
Interactive ultra high multimedia	High quality video conference	SERR	10^{-3} – 10^{-6}	1 – 5
	Collaborative work			1 – 20
Interactive high multimedia	Rich data call	SERR	10^{-6}	1 – 5
	Robot security			N/A
Simple telephony and messaging	Voice telephony	SERR	10^{-3} – 10^{-6}	1
	Instant messages (SMS)			1 – 20
Data and media	Audio streaming	SERR	10^{-3} – 10^{-6}	1 – 5

telephony	Video telephony (medium quality)			1 – 5
	Multiplayer games			1 – 30
Rich data and media telephony	High quality video telephony	SERR	$10^{-3} – 10^{-6}$	1 – 5
	Standard data call			1
LAN access and file service	Database and file system server	SYSA	10^{-6}	1 – 50
File exchange	File data transfer (FTP)	SYSA	10^{-6}	1 – 50
	Video download/upload			N/A
	Peer-to-peer file sharing			N/A
Multimedia messaging	Messaging (data/voice/media)	SYSA	$10^{-6} – 10^{-9}$	1 – 20
	Authentication (m-payment, m-ticket, m-wallet, …)			N/A
	Multimedia mail			N/A
Lightweight browsing	Access to corporate database	SERR	10^{-6}	1 – 50
	Multimedia web browsing			1 – 20
	E-banking			1 – 50
	E-commerce			1 – 20
Video streaming	Video streaming (normal)	SERR	10^{-6}	N/A
	Micro movies (including video clips)			1
High quality video streaming	Video streaming (archival)	SERR	10^{-9}	N/A

4. Key scenarios

In this section, the key scenarios are identified taking into account the described inputs for the selection procedure. Key scenarios will be identified according to selection criteria (defined below) and linked to the deployment scenarios.

4.1 Scenario elements and generation methodology

The services provided by the WINNER system shall be available where they are needed by users. Different users' profiles/necessities imply different usage percentages per service/application. The WINNER will need to support a variety of services, with different requirements, and the end-to-end QoS shall be negotiable and controllable. The association of the different scenario elements identifies a certain scenario type. Examples of scenario elements are environment type, cell range, terminal type, user profile, user mobility, user density and related end user applications, see Table 4.1.

Table 4.1: Scenario elements characterisation

Scenario elements						
	Environment type	Cell range	Application type	Terminal type	User density	User profile
Value/parameter	Dense urban Metropolitan Typical urban Bad urban Metropolitan Suburban Rural Indoor small (office/residential/commercial zones) Indoor to outdoor Outdoor to indoor LOS – Stationary feeder LOS – Feeder Rural LOS – Moving networks	In building (pico-cell) (LA) Hotspot (micro-cell) (LA) Rural (macro-cell) (WA) Urban (micro-cell) (LA) Urban (macro-cell) (MA) Umbrella (WA)	See chapter 3	Wearable terminal Palmtop (PDA) Mobile phone Laptop Desktop	Low Medium High	Old Young Business Tourist Sport

4.1.1 Environment type and cell size

The environment type is one of the most important elements in the scenario characterisation and is related with the physical characteristics of the environment and wave propagation properties. Different environment types have been defined within WINNER associated with coverage and cell types. The typical distance range is always a question of data rates required by applications: higher data rates lower distance range; lower data rates, higher distance range.

Local area scenarios (office/residential/commercial) are characterised mainly with low terminal mobility, short-range coverage (pico or micro-cells) with typical distance range of 3 – 100 m (Indoor small office / residential) and 20 – 100 m (Hotspot / Typical urban micro-cell), high density of users and high data rate applications. Metropolitan area scenarios (urban/suburban) normally requires ubiquitous coverage (micro or macro-cells) with typical distance range of 20 – 400 m and are characterised with medium/high traffic density with medium terminal velocity. Wide Area scenarios are characterised by a continuous and ubiquitous coverage (normally macro-cells), medium/high terminal velocity and low rate applications mainly based on voice.

4.1.2 Terminal type

The WINNER system is user-oriented, which enables communication anytime, anywhere with anyone or anything. Different terminal types are envisaged in WINNER evaluation scenarios in order to satisfy end user requirements and taking full part of the available services and applications. The terminal types can be derived from a set of physical characteristics and capabilities such as: user friendly, display size, portability (size and weight), power consumption, maximum transmit power (related with link budget and cell range) The identified terminal types for scenario generation are (cf. Table 4.1): wearable terminal, palmtop (PDA), mobile phone, laptop and desktop.

4.1.3 User density and traffic parameters

User density depends highly on the environment type and can be defined per service/application type. The most demanding applications typically experience coverage limitations. The Table 4.2 characterises the user density and traffic parameters such as number of session attempts and average session duration per environment and typical applications [SCE+05].

Table 4.2: Users density, number of session attempts, and average session duration per environment type

Example of applications	CG	Environment type	User density (users/km^2)[2]	Number of session attempts per day (1/users)	Average session duration $D_{n,m}$ (s)
Voice (CBR) VoIP (ABR) SMS (ABR) MMS (UBR)	LA	Indoor small (residential)/dense urban	26400	5	120
		Indoor small (office)/dense urban	30000	10	150
		Indoor small (residential)/suburban	6600	6	120
	MA	Typical urban	11000	3	100
	WA	Suburban	2000	10	120
		Rural	200	6	120
Video Interactive mobile TV (CBR) Telemedicine (VBR) Streamed video (sports and events) (VBR) IP Web radio (VBR) Video streaming (ABR) M-commerce (ABR) M-banking (ABR) E-mail (UBR)	LA	Indoor small (residential)/dense urban	2640	1	180
		Indoor small (office)/dense urban	15000	1	600
		Indoor small (residential)/suburban	4400	1	180
	MA	Typical urban	1100	1	120
	WA	Suburban	500	1	600
		Rural	50	1	120

Note: CBR – Constant bit rate, VBR – Variable bit rate, ABR – Available bit rate, UBR – Unspecified bit rate.

4.1.4 User mobility

User (or terminal) mobility plays an important role as a key scenario element, since system performance is directly affected in terms of radio resource management, traffic handling, location and QoS management. User mobility requirements have also to be taken into account during system design and architecture.

In Table 4.3 the ratio of different mobility categories are presented for each environment type and application.

Table 4.3: Mobility distribution (%) in different environment types

Example of	CG	Environment type	Mobility ratio (%)

[2] These values are different from the ones that can be found in the ITU model (see [SCE+05]) because that values were proposed taking into account UMTS system (2.0 GHz).

applications			0 – 5 km/h	5 – 70 km/h	70 – 100 km/h	100 – 250 km/h	>250 km/h
Voice (CBR) VoIP (ABR) SMS (ABR) MMS (UBR)	LA	Indoor small (residential)/dense urban	90	10	0	0	0
		Indoor small (office)/dense urban	90	10	0	0	0
		Indoor small (residential)/suburban	85	15	0	0	0
	MA	Typical urban	10	70	20	0	0
	WA	Suburban	30	40	20	10	0
		Rural	15	45	20	15	5
Video Interactive mobile TV (CBR) Telemedicine (VBR) Streamed video (sports and events) (VBR) IP Web radio (VBR) Video streaming (ABR) M-commerce (ABR) M-banking (ABR) E-mail (UBR)	LA	Indoor small (residential)/dense urban	95	5	0	0	0
		Indoor small (office)/dense urban	95	5	0	0	0
		Indoor small (residential)/suburban	90	10	0	0	0
	MA	Typical urban	10	70	20	0	0
	WA	Suburban	35	40	25	0	0
		Rural	10	40	35	10	5

Note: CBR – Constant bit rate, VBR – Variable bit rate, ABR – Available bit rate, UBR – Unspecified bit rate.

4.1.5 Mobility models

The purpose of mobility models is to describe typical terminal movement so that performance analysis can be made. Many link and system-level simulators require the knowledge of terminal position in each simulated time step so that the effectiveness of studied techniques such as link adaptation, transmission diversity and beam forming may be evaluated.

Next mobility models are presented for office environment, outdoor to indoor environment, hotspot and vehicular environment.

4.1.5.1 Indoor small (office) environment mobility model

Office environments are characterised by a “boxy” topology, where office rooms are interconnected by corridors. Users will spend most of the time stationary at their desk and when in movement they will go to a particular destination. Destinations can be chosen randomly, using a uniform distribution. Two cases may be considered, concerning the nature of movements: both source and destination are an office room (case 1); either source or destination is a corridor position (cases 2 and 3).

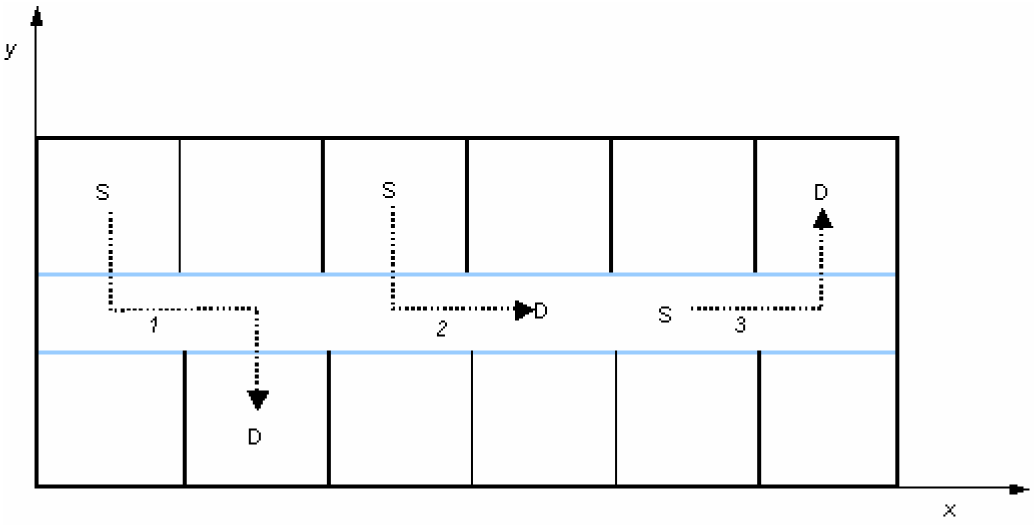

Figure 4.1: Office environment

The next text will only consider case 1 and derive the basic relationships.

The important parameters are the mean ratio of room-situated to corridor-situated mobile terminals, r, average time in office room, T_r, and mobile speed, v_m. Some possible values are presented in Table 4.4 as an example.

Table 4.4: Indoor small (office) environment mobility parameters and possible values

Parameter	Symbol	Typical value
Average ratio of the room to corridor mobile terminals	r	85%
Average stationary time in office room	T_r	30 s
Mobile speed	v_m	1 m/s
Simulation time step		0.005 s
Number of office rooms		40

Considering the equilibrium between office-to-corridor and corridor-to-office flows we have:

$$\frac{r}{T_r} = \frac{(1-r)}{T_c} \tag{4.1}$$

where T_c is the average time in corridor. Using (4.1), the average time in the corridor, T_c, may be expressed in function of the other two:

$$T_c = T_r \frac{(1-r)}{r} \tag{4.2}$$

if the possibility of corridor stops is not modelled. In that case, and since all rooms are equally probable as a destination, the average time in corridor will be a direct function of the average distance between rooms:

$$T_c = \frac{L_r}{v_m} \tag{4.3}$$

If stationary states are allowed in the corridors some relations will be reformulated. Whenever the random destination chosen is a corridor position, T_c will be divided in two parts. Each of these parts will correspond to a separate event in the simulation. The first part representing the walk component T_{cm}, is deterministic in nature given by an equation similar to (4.3), which now includes both office rooms and corridor positions as possible destinations. The second part, T_{cs}, represents the average stationary time in corridor with a value in compliance with (4.2) and (4.3), as follows:

$$T_{cs} = T_c - T_{cm} \quad (4.4)$$

$$T_{cs} = T_r \frac{(1-r)}{r} - \frac{L_r}{v_m} \quad (4.5)$$

In this environment we also need to take into account the way buildings are built, and how they are organized inside. In the next table, some typical values are presented [UMTS30.03]:

Table 4.5: Indoor small (office) environment physical parameters

Area per floor (m^2)	Number of floors	Room dimensions	Log-normal standard deviation (dB)
5000	3	10x10x3 m (room) 100x5x3 m (corridor)	7

4.1.5.2 Hotspot environment mobility model

In WINNER the mobility in a hotspot is modelled as low mobility (3 km/h and stationary) with a high probability of changing the direction of movement (see Figure 4.2). User movements are typically randomly distributed.

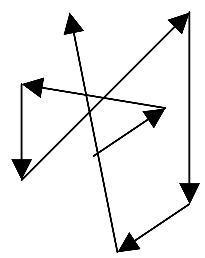

Figure 4.2: Mobility inside Hotspot Area

For simulations the different mobility in the hotspot will only be applied to the additional users created for the hotspot. The users created with the "normal" density function will have the "normal" mobility. The users created, as additional traffic will have the hotspot mobility.

With a speed of 3 km/h and a direction change probability of 100% every meter the users stay (typically) inside an area of 25 m.

With this simple mobility model, the average distance $\langle d \rangle$ travelled by a user can be calculated as follows:

$$\langle d \rangle = v \cdot \Delta t \cdot \sqrt{\frac{\langle t_{Session} \rangle}{\Delta t}} \quad (4.6)$$

where v is the velocity in (m/s) of the user, $\langle t_{Session} \rangle$ is the mean lifetime of a user in seconds and Δt is the mobility update interval in seconds.

4.1.5.3 Outdoor to indoor (dense urban) mobility model

In this environment base stations are placed outdoors but also cover internal building areas. To represent city centres, the Manhattan Model is normally used, which is a rectangular grid of intersecting streets, as shown in Figure 4.3. High, homogeneous squared buildings with small areas, high user density and low mobility (pedestrians) characterise this environment. For simulation purposes, we may consider that each wall of the buildings has 200 m of width and the streets are 30 m wide.

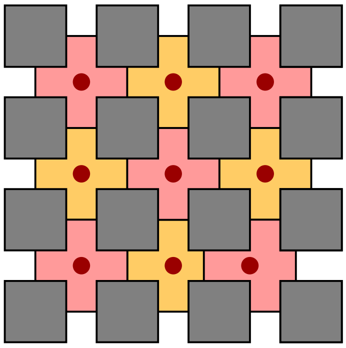

Figure 4.3: City Centre Model

The urban mobility model is highly related to the Manhattan-like structure defined above. In such a structure, mobiles move along streets and may turn across streets with a given probability. The mobile's position is updated every 5 m and speed can change at each position, according to certain probability.

The mobility model is described by the following parameters:

- Mean speed: 3 km/h;
- Minimum speed: 0 km/h;
- Maximum speed: 5 km/h;
- Standard deviation for speed (normal distribution): 0.3 km/h;
- Probability to change speed at position update: 0.2;
- Probability to turn at street crossing: 0.5 (see Figure 4.4).

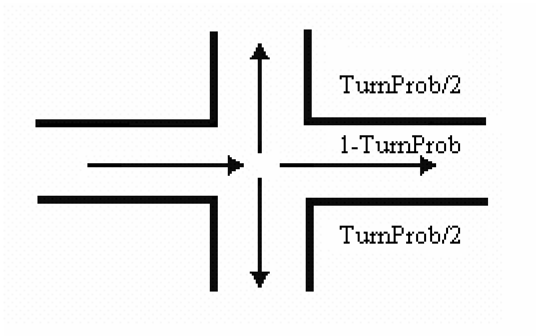

Figure 4.4: Turning probability

Mobiles are uniformly distributed in the street and their direction is randomly chosen (horizontal or vertical direction) at initialisation.

In this environment the physical characteristics may be the following [WIN2D111]:

Table 4.6: Outdoor to indoor mobility model physical environment

	Building penetration loss/standard deviation (dB)	Log-normal standard deviation (dB)	Mobile velocity (km/h)
Outdoor	N/A	7	3
Indoor	15/8	15	3

4.1.5.4 Vehicular environment (typical urban) mobility model

Vehicular environment applies to scenarios in urban and suburban areas outside the city centres where the buildings have nearly uniform height and are characterised by larger cells and higher transmit power.

The vehicular reference mobility model uses a pseudorandom mobility model with semi-direct trajectories. The mobile position gets updated according to the decorrelation length, and direction can change at each position. As a reference example, it can be assumed that the mobile's speed is constant and the mobility model is defined by the following parameters:

- Speed value: 120 km/h;
- Probability to change direction at position update: 0.2;
- Maximal angle for direction update: 45º;
- Decorrelation length: 20 m.

Mobiles are uniformly distributed on the map and their directions are randomly chosen.

According to WINNER CGs, the vehicular environment mobility model may be applied in the following scenarios (listed in Table 4.7):

Table 4.7: Harmonised velocities for WINNER applied to vehicular mobility model

CG	Environment type	Mobility (km/h)
Wide Area	Suburban	100
	Urban	50
Metropolitan Area	Urban	50
Local Area	Urban	<5

4.1.5.5 Rural environment mobility model

The mobility model parameters for rural environments are similar to the ones proposed in vehicular environment:

- Speed value: 120 km/h;
- Probability to change direction at position update: 0.2;
- Maximal angle for direction update: 45°;
- Decorrelation length: 20 m.

In this model, mobiles are uniformly distributed on the map and their direction is randomly chosen at initialisation. However, the direction can be changed at each position update according to a given probability. Direction can be changed within a given sector to simulate semi-directed trajectory.

4.1.6 Application usage

In the WINNER context we try to investigate the most suitable applications and services according to the evaluation scenarios and deployment concepts identified in the concept groups taking into account the user and service requirements and degree of mobility mainly. The derivation of ratio applications usage is a hard task since many services exist in the same WINNER deployment scenario. Moreover in wireless multimedia systems such as B3G, each user can generate one or more simultaneous flows belonging to different service classes. Services and applications are balanced according several factors such as:

- Access technology (TDD, FDD);
- Service requirements and associated QoS;
- User equipment : laptop, palmtop, portable phone (capabilities such as battery autonomy, digital image processing, screen dimensions, user friendliness, etc);
- Environment scenario (indoor, outdoor);
- User mobility – e.g. to allow considerations for mobile speed;
- Typical user profile (young, adults, professional, etc.).

Appropriate demand characterization has to reflect the different deployment distributions that are possible for different services/applications, as well as their distinguished downlink/uplink asymmetries.

The approach is firstly to map the different sub-scenarios identified in [JF05] into the deployment scenarios identified in the WINNER context as shown in Table 4.8 . Thus each application usage will be calculated and extrapolated taking into account the figures from the application usage proposal in [JF05]. In Table 4.9 a proposal of the applications usage for each deployment scenario in WINNER is presented.

Table 4.8: WINNER deployment scenarios

CG	Short scenario characterisation	Sub-scenarios [JF05]
LA	Short range coverage, low terminal mobility and high data rates applications	• Home (HOM), rooms, residential • Offices (OFF), buildings not residential • Commercial zones (COM) such as shopping centres, airports, railways, stations, hospitals
MA	Ubiquitous coverage with medium-high traffic density with medium terminal velocity	• Business city centre, (BCC) pedestrian • Offices (OFF), buildings not residential • Urban residential areas (URB) pedestrian
WA	Continuous and ubiquitous coverage, medium–high terminal velocity and low rate applications mainly based on voice applications	• Urban residential areas (URB) pedestrian and vehicular • Industry (IND), large factories areas • Primary roads (ROA) including highways • Trains (TRA)

Table 4.9: Proposal of applications usage (%) for WINNER deployment scenarios

		CG (usage %)		
Service classes	Applications	Local Area	Metropolitan Area	Wide Area
Simple telephony, media telephony, messaging, data and rich data	Voice over IP	24	26	30
	Audio Streaming	3	4	4
	Video-telephony	2	2	2
	HIMM Videoconference, (various purposes)	2	2	2
	Instant Messaging for Multimedia	2	2	1
	Remote Procedure Call	3	2	2
Video streaming	Micro-movies	1	2	3
	Broadband (Videotex (E-Commerce))	4	8	6
	Mobile Video Surveillance	2	2	3
	TV Programme distribution (MPEG2-4)	2	2	0
Real-time collaboration and	Interactive Remote Games	1	1	1

interactive gamming	Mobile Tele-Working	1	3	2
	Collaborative working (& tele-presence)	1	1	2
	Videoconference (Tele-advertising)	1	1	2
	HD Video-telephony (Tele-education)	4	5	5
File exchange	Data (FTP)	9	6	5
	Still Images Communication	6	4	4
	Professional Images	2	1	0
Lightweight browsing	Multimedia (Web Browsing)	14	12	10
	Mobile Portal	4	3	3
	E-newspaper	5	5	5
LAN access and file service	Wireless LAN Interconnection	1	2	1
Geographic datacast	Tourist Information	2	1	1
	Assistance in Travel	1	1	4
	Urban Guidance	1	1	1
Short control messages and signalling	Control Data	1	1	1
	Monitoring	1	0	0
	TOTAL	**100**	**100**	**100**

Table 4.10: Proposal for services usage (%) for WINNER deployment scenarios

	CG (usage %)		
Service classes	Local Area	Metropolitan Area	Wide Area
Simple telephony, media telephony, messaging, data and rich data	36	38	41
Video streaming	9	14	12
Real-time collaboration and interactive gamming	8	11	12
File exchange	17	11	9
Lightweight browsing	23	20	18
LAN access and file service	1	2	1
Geographic datacast	4	3	6
Short control messages and signalling	2	1	1
TOTAL	**100**	**100**	**100**

4.2 Selection of key scenarios for WINNER

In this section, an explanation describing the methodology and criteria for the selection of key scenarios is performed.

4.2.1 Scenario A (related with LA Concept Group)

LA CG main assumptions and implications.

This section provides a brief overview of the main assumptions considered within the scope of the Local Area deployment scenario, as also an insight into some high level relevant implications.

According to [WIN2D6131], where the basic assumptions about the Local Area concept group are presented, the two main environmental settings dominating the LA-related proof-of-concept are the indoor environment and the hotspot areas. In consistency with the scenario definition that was done in WINNER I, the high level scenarios that fall within the scope of LA CG are summarized in the next table:

Table 4.11: High – level LA CG scenarios description

Scenario	Definition	LOS/NLOS	Mob. (km/h)	Distance range (m)
In and around buildings	Indoor small office / residential	LOS/ NLOS	0 – 5	3 – 100
	Indoor to outdoor	NLOS	0 – 5	
Hotspot	Typical urban micro-cell	LOS/ NLOS	0 – 5	20 – 100
	Indoor	LOS	0 – 5	

It is evident from the table above that the user mobility considered within such scripts remains low (0 – 5 km/h) as also is the case with the coverage range (3 – 100 m).

In case of residential services, the main assumption is that the wireless link will be provided through a BS, which will be connected to a backbone network. The residential area is considered to be well isolated from neighbouring BSs, so that intercell interference can be neglected. Therefore, in case of home access, the two main implications as set by the LA CG relate to:

- Deployment of efficient self–organisation schemes in order to create provision for direct communication in P2P mode, between WINNER-capable terminals within the users residency;
- Deficient hand-over between WINNER modes so as to allow for user mobility from one coverage area (home) to another (urban);
- Connectivity provisioning between home BS and WINNER backbone.

Considering now the hotspot related scenario which constitutes the other LA-based proof-of-concept, the main high level assumptions are that the specific mode will be in position of covering larger areas than the ones encompassed in the residential usage, and with the simultaneous presence of more than one BSs, therefore the assumption about limited interference may not be valid. In summary, the main issues that will be addressed within this sub category of deployment scenarios include:

- P2P communication issues (as in the previous case);
- Cooperation schemes between coexisting WINNER BSs.

The following script addresses the aforementioned issues in order to serve as a representative scenario of the LA proof-of-concept:

Main actor: John, male, 18 years old

Location: Urban area (a city of Europe)

Occupation: Student

Date: A day in 2015

1. John is woken up by the ringing on his portable device; he has received a multimedia message (video message), sent to him by the relevant service of his university, informing him about some change in the daily class schedule.
2. Having woke up, he surfs on the Internet using his laptop, while making a voice call to his girlfriend.
3. He turns on the next generation Winner LA BS that he bough yesterday. The new BS detects the other BSs of John's house, as well as neighbouring ones. and all the BSs coordinate with each other to reform the available frequency and optimize the wireless resource usage.
4. Visiting an online music store, he selects some new tunes. The songs are purchased and transferred directly to his online music server.
5. He tries to communicate his roommate that sleeps in the next room, establishing a direct connection with his device.
6. His roommate is not responding so John sends him a short video message.
7. While having his breakfast, John streams TV news on his device.
8. He initiates a voice call (using a VoIP service), while he leaves the house and enters the car to drive to the mall, where he is supposed to meet with a fellow student.
9. During his drive through the city, the VoIP call is continued, and after entering a cafeteria in the mall he decides to terminate this session.
10. The cafeteria offers online menu, so John selects what to order after browsing on the relevant locally available web site.

As it is obvious, the scenario tries to address most of the important aspects involved within typical LA proof-of-concepts, rather than being exhaustive in terms of service usages. The elements of interest regarding the scenario composition are depicted in the following table:

Table 4.12: LA – based scenario

Script Extract	Service Class	User Density	User Mobility	Associated Traffic Model	Environment	Coverage	Implications
he has received a multimedia message	Multimedia messaging	High (residential)	Low (0 – 5 km/h)	File Transfer	Residential	3 – 100 m	Connectivity between BS and WINNER backbone
he surfs the Internet	Lightweight browsing	High (residential)	Low (0 – 5 km/h)	Internet / Browsing	Residential	3 – 100 m	Connectivity between BS and WINNER backbone
while making a voice call to his girlfriend	Simple Telephony and Messaging	High (residential)	Low (0 – 5 km/h)	Conversational	Residential	3 – 100 m	Connectivity between BS and WINNER backbone
he turns on the next generation Winner LA BS…	Short control messages and signalling	High (residential)	Low (0 – 5 km/h)	Signalling	Residential	3 – 100 m	Self-Organization between LA BSs

the BS detects the other BSs of John's house… *all BSs coordinate*							
visiting an online music store *…the songs are purchased*	Lightweight browsing	High (residential)	Low (0 – 5 km/h)	Internet / Browsing	Residential	3 – 100 m	Connectivity between BS and WINNER backbone
and transferred directly to his online music server	File exchange	High (residential)	Low (0 – 5 km/h)	File Transfer	Residential	3 – 100 m	Connectivity between BS and WINNER backbone / self organization between residential WINNER devices
He tries to communicate his roommate …establishing a direct connection with his device.	Simple telephony and messaging	High (residential)	Low (0 – 5 km/h)	Conversational	Residential (P2P mode)	3 – 100 m	P2P communication between WINNER enabled devices
so John sends him a short video message	File exchange	High (residential)	Low (0 – 5 km/h)	File Transfer	Residential (P2P mode)	3 – 100 m	P2P communication between WINNER enabled devices
John streams TV news on his device	Video streaming	High (residential)	Low (0 – 5 km/h)	Video Streaming	Residential	3 – 100 m	Connectivity between BS and WINNER backbone
He initiates a voice call (using a VoIP service), while he leaves the house…During his drive through the city, the VoIP call is continued, and after entering a cafeteria in the mall he decides to terminate this session	Simple telephony and messaging	High (residential) (for as long as the actor is still at home)	Low (0 – 5 km/h) (for as long as the actor is still at home)	Conversational	Residential (for as long as the actor is still at home)	3 – 100 m (for as long as the actor is still at home)	Handover between WINNER modes

The cafeteria offers online menu, so John selects what to order after browsing on the relevant locally available web site	Lightweight browsing	Medium (hotspot)	Low (0-5 km/h)	Internet / Browsing	Hotspot	20 – 100 m	Coordination between co-existing BSs / cooperation between WINNER system modes so as to complement for coverage areas

4.2.2 Scenario B (related with MA Concept Group)

MA CG main assumptions and implications.

This section provides a brief overview of the main assumptions considered within the scope of the Metropolitan Area deployment scenario.

In [WIN2D6131] the basic assumptions about the evaluation scenario of the Metropolitan Area CG are presented. Metropolitan Area CG focuses on WINNER system design and proof-of-concept in urban environments and deployment scenarios. The high-level deployment scenarios which can in general be considered under metropolitan area defined in WINNER I are listed in the next table.

Table 4.13: High – level MA CG scenarios description

Name	Coverage	Propagation Conditions	Mobility	Traffic Density (Indicative)
Hotspot/Area	Area wide but non-ubiquitous coverage	*Typical Urban*	0 – 70 km/h	[High]
		Bad Urban		
		Outdoor to Indoor		
		LOS – Stationary Feeder	0 km/h	[High]
Metropolitan	Ubiquitous coverage	*Suburban*	0 – 70 km/h	[Medium]
		Typical Urban		[Medium]/[High]
		Bad urban		
		Outdoor to Indoor		[Low]-[High]
		LOS – Feeder	0 km/h	[Low]/[Medium]

MA CG is targeting the WINNER system design and assessment in urban and metropolitan areas where the user density is high. As the expected throughput requirements per active user are also high, it means that the WINNER system must provide high system capacities in system deployments in these environments. Thus, the WINNER system deployment scenario in these areas is called “High-performance layer for metropolitan areas”.

This deployment scenario provides contiguous coverage in urban areas, and especially in the city centres of large and medium size cities. As the system throughput requirements are high, system throughput enhancing solutions will be prioritised over coverage providing solutions. Based on these requirements, the Metropolitan Area deployment scenario needs to focus on micro cellular deployment scenarios, i.e. in urban environments base stations, access point, and relays are placed clearly below the rooftop level (in suburban deployments the antenna placement can be above rooftop level, but the access point height is roughly the same as in the urban environments, i.e. low). While the micro cellular deployment helps in reaching the system throughput requirements, it is challenging from radio propagation point-of-view.

The requirement for supporting high user density means that MA CG supports outdoor hotspots (Local Area CG is supporting indoor hotspots), use of small cells, applying efficient multi-antenna techniques, or utilizing smart interference mitigation and avoidance schemes in order to provide the high system throughput required.

Basic assumption of Metropolitan Area deployment scenario is that the deployment is realized outdoors. As how to provide indoor coverage with a “semi-contiguous” coverage systems is always a relevant question, outdoor-to-indoor coverage is addressed in metropolitan area deployment scenario. This also tries to answer the important question that how the “outdoor” and “indoor” deployments of the WINNER system should cooperate, so that seamless coverage within the WINNER system is realized.

Main actor: John, male, 18 years old

Location: Urban area (a city of Europe)

Occupation: Student

Date: A day in 2015

1. When John leaves his house and prepares to drive to the shopping mall. He gets in the car without the use of a key, as John’s digital ID, existing in his UT, wirelessly authenticates him to the car security system.
2. His UT sets up the songs playing list to the car’s audio system.
3. The audio system starts downloading the songs from the common wireless song distribution network used by all the big music companies in order to distribute their songs.
4. John’s e-wallet is charged automatically for the songs that he hasn’t already bought listening licenses for.
5. John browses sports news using his UT to check the game result of his favourite football team.
6. The car’s navigation system traces the optimal way to the shopping mall according to the traffic load of the roads.
7. On the way the system identifies a road that is suddenly heavily traffic jammed, probably because of a car accident, so it interrupts the audio system to alert John of the situation.
8. Then it informs John of the best alternative way to the shopping mall.
9. John sends a voice message to inform his friend that he is going to be late.

Table 4.14: MA – based scenario

Script Extract	Service Class	User Density	User Mobility	Associated Traffic Model	Environment	Coverage	Implications
wirelessly authenticates him to the car security system	Multimedia messaging but with a low delay (<1s)	Low (residential)	Low (0 – 5 km/h)	Internet/browsing, File transfer model	Residential	3 – 100 m	P2P communication between WINNER enabled devices
UT sets up the songs playing list to the car’s audio system	Lightweight browsing	Low (residential)	Low (0 – 5 km/h)	Internet/browsing, File transfer model	Residential	3 – 100 m	P2P communication between WINNER enabled

							devices
the audio system starts downloading	Lightweight browsing	Low (residential)	Low (0 – 5 km/h)	Internet/browsing, File transfer model	Residential	3 – 100 m	Connectivity between BS and WINNER backbone
e-wallet is charged automatically	Multimedia messaging	Low (residential)	Low (0 – 5 km/h)	Internet/browsing, File transfer model	Residential	3 – 100 m	Connectivity between BS and WINNER backbone
browses sports news	Lightweight browsing	Low (residential)	Low (0 – 5 km/h)	Internet/browsing, File transfer model	Residential	3 – 100 m	Connectivity between BS and WINNER backbone
car's navigation system traces the optimal way	Simple interactive applications	Medium	Medium (0 – 70 km/h)	Internet/browsing, File transfer model	Urban	50 – 1000 m	Connectivity between BS and WINNER backbone
due to car traffic congestion	Simple telephony and messaging	Medium	Medium (0 – 70 km/h)	Internet/browsing, File transfer model	Urban	50 – 1000 m	Connectivity between BS and WINNER backbone
due to car traffic congestion	Geographic datacast	Medium	Medium (0 – 70 km/h)	Internet/browsing, Interactive activity	Urban	50 – 1000 m	Connectivity between BS and WINNER backbone
voice message	Simple telephony and messaging	Medium	Medium (0 – 70 km/h)	Conversational voice model	Urban	50 – 1000 m	Connectivity between BS and WINNER backbone

4.2.3 Scenario C (related with WA Concept Group)

A key aspect of mobile cellular systems is the ability to make a call, access content, send an e-mail and so on from anywhere. Particularly in Europe GERAN coverage is ubiquitous and there is the expectation of being able to be contactable in any geographic location. WINNER needs to provide this same ubiquitous coverage layer for minimum user data rate (2 Mbit/s) [WIN2D6131]. This base layer will cover rural, suburban and urban areas, providing the umbrella coverage; whilst there will be other deployments (as considered in the Metropolitan and Local Area CGs), providing more targeted, higher data rate coverage.

This scenario is meant to reflect the ubiquitous coverage deployment of WINNER in towns and cities, where it will overlap with deployments considered by the Metropolitan and Local Area CGs. This is foreseen as similar to today's macro-cell deployments. Therefore, this scenario is not described here (see previous section).

The WA scenario describes the relevant characteristics of a selection of environments where a WINNER system might be deployed. "Environment" means here that the description is independent from the technical solution that WINNER provides, but refers only to the external characteristics that cannot be changed by WINNER.

The benchmark technologies for the WA scenario are deployed cellular systems such as GSM/GPRS, cdma2000, UMTS, TD-CDMA, HSDPA/HSUPA and EV-DO. Furthermore, systems about to be standardized or deployed during the course of WINNER II are 3GPP Long Term Evolution (LTE), the evolution of 3GPP2 EV-DO (Revision C or AIE), IEEE 802.16e ("Mobile WiMAX"), IEEE 802.20 and proprietary systems like Flash-OFDM initially developed by the company Flarion. Research results from WINNER may directly feed into the development of some of these technologies (e.g. 3GPP LTE).

Ubiquitous coverage means that users should be able to use mobile communication services whilst on the move. At present only aircraft are exempt from this expectation, therefore for the scenario we assume that users get services provided to cars, buses, trains and so on. The most challenging of these transportation types are high speed trains, which may reach speeds of up to 350 km/h.

This set of assumptions is for the challenging aspect of providing coverage and capacity to high speed train lines. Where relaying is considered as a solution for this case the in-train (RN to UT) deployment is likely to be very similar to the scenarios/solutions for a single-hop deployment (see Local Area scenario). In the WA aspect relaying is important for the communication from the BS to the train. A WA deployment scenario is shown in Figure 4.5.

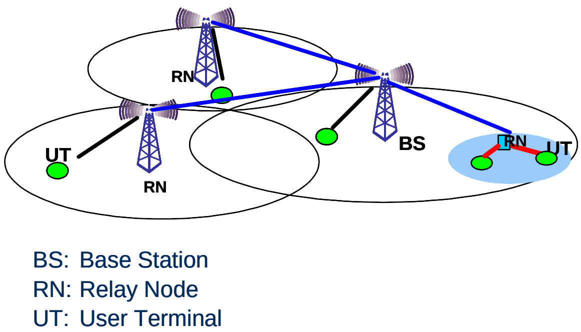

Figure 4.5: WA Deployment Scenario: above roof top, high power, lower user density

The high-level deployment scenarios which can in general be considered under wide area defined in WINNER I are listed in the next table:

Table 4.15: High – level WA CG scenarios description

Name	Coverage	Propagation Conditions	Mobility	Traffic Density (Indicative)
Ubiquitous coverage deployment of WINNER in cities	Ubiquitous coverage	*Suburban*	0 – 70 km/h	[Medium]
		Typical Urban		
		Bad Urban		[Medium]/[High]
		Outdoor to Indoor		[Low]-[High]
		LOS – Stationary Feeder	0 km/h	[Low]/[Medium]
Ubiquitous coverage deployment of WINNER where it will overlap with deployments from Metropolitan and LA CG	Ubiquitous coverage	*Suburban*	0 – 70 km/h	[Medium]
		Typical Urban		[Medium]/[High]
		Bad urban		
		Outdoor to Indoor		[Low]-[High]
		LOS – Feeder	0 km/h	[Low]/[Medium]
Ubiquitous coverage in rural areas	Ubiquitous coverage	*Rural*	0-200 km/h	[Low]
		LOS - Moving Networks (Feeder)	0-300 km/h	[High]

The following script is an example of WA scenario:

Main actor: Dimitra, female, 28 years old

Location: Urban area (a city of Europe)

Occupation: Free lancer

Date: A day in 2015

Dimitra is a free lancer working and is active in business development for IT companies. She needs to have ubiquitous access every day and be able to exchange Emails with proposals, technical offers and multimedia messages. Everyday she wakes up and after the breakfast she goes to her office and authenticates wirelessly with her PDA device. From that she gets her first Emails and she reads the appointments for the day, as well as their status (e.g. confirmed, cancelled, etc.).

Around 11:00 in the morning she goes in the car and by entering, the mobile phone that constantly synchronizes with the PDA, transfers the location of the venue to the car navigation system that subsequently traces the optimal way. While in the car, the UT is switched on and selects different RATs to connect due to the fact that there are areas where there is no coverage of WINNER systems. The handover is performed seamlessly by the network in the cast that Dimitra downloads an Email or if she has a voice call.

In addition to that, the UT sets up the songs playing list to the car's audio system. Suddenly she receives a voice message that is left in her mailbox, while she had another voice-call. Due to traffic congestion, she is redirected to follow another link. This information is transferred to her UT and the latter updates the car navigation system.

Table 4.16: WA – based scenario

Script Extract	Service Class	User Density	User Mobility	Associated Traffic Model	Environment	Coverage	Implications
authenticates wirelessly with her PDA device	Multimedia messaging but with a low delay (<1s)	Low (residential)	Low (0 – 5 km/h)	Internet/browsing, File transfer model	Residential	3 – 100 m	P2P communication between WINNER enabled devices
car navigation system that subsequently traces the optimal way	Simple interactive applications	Medium	Medium (0 – 70 km/h)	Internet/browsing, File transfer model	Urban	50 – 1000 m	Connectivity between AP and WINNER backbone
UT sets up the songs playing list to the car's audio system	Lightweight browsing	Low (residential)	Low (0 – 5 km/h)	Internet/browsing, File transfer model	Residential	3 – 100 m	P2P communication between WINNER enabled devices
voice message	Simple telephony and	Medium	Medium (0 – 70 km/h)	Conversational voice model	Urban	50 – 1000 m	Connectivity between AP and WINNER

	messaging						backbone
due to car traffic congestion	Geographic datacast	Medium	Medium (0 – 70 km/h)	Internet/browsing, Interactive activity	Urban	50 – 1000 m	Connectivity between AP and WINNER backbone

4.2.4 Summary of Parameters for the Key Scenarios

In this section the main parameters for modelling of services, traffic, and user behaviour for the concept group evaluation scenarios are summarised based on the discussion above and [WIN2D6131].

Table 4.17: Environment specific parameters

	Base coverage urban (WA)	**Microcellular (MA)**	**Indoor (LA)**
Environment characteristics	Two-dimensional without topographic details	Two-dimensional regular grid of buildings ("Manhattan grid")	One floor of a building with regular grid of rooms and corridors, three dimensional
		Number of buildings: 11x11 Building block size: 200x200 m Street width: 30 m	Area per floor: 5000 m^2 Number of rooms: 40 Rooms size: 10x10x3 m Number of floors: 3 Corridor size: 100x5x3 m
User distribution model (at simulation startup)	All users are uniformly distributed in the entire *area*	All users are uniformly distributed in the *streets*	90% of users are uniformly distributed in *rooms* and 10% of users are uniformly distributed in *corridors*
User density (users/km^2) Applications based on voice and instant messaging	**Suburban:** 2000 **Rural:** 200	**Typical urban:** 11000	**Indoor small (residential)/dense urban:** 26400 **Indoor small (office)/dense urban:** 30000 **Indoor small/suburban:** 6600
User density (users/km^2) Other kind of applications	**Suburban:** 500 **Rural:** 50	**Typical urban:** 1100	**Indoor small (residential)/dense urban:** 2640 **Indoor small (office)/dense urban:** 15000 **Indoor small/suburban:** 4400
Simplified service / traffic mix for simulation	19% LAN/Web Access 9% File Transfer 41% Voice 12% Streaming 19% Other	22% LAN/Web Access 11% File Transfer 38% Voice 14% Streaming 15% Other	24% LAN/Web Access 17% File Transfer 36% Voice 9% Streaming 14% Other
Traffic load	64 kbps – 512 kbps (voice – browsing	64 kbps – 512 kbps (voice – browsing)	From 64 kbps (voice) to 5 Mbps (video streaming)

	Base coverage urban (WA)	Microcellular (MA)	Indoor (LA)
Typical device types	• Palmtop • Mobile phone • Wearable terminal	• Laptop • Mobile phone • Wearable terminal • Palmtop	• Laptop • Desktop • Wearable terminal • Mobile phone • Palmtop
User mobility model (class III and IV)	• Fixed and identical speed $\|v\|$ of all UTs • $\|v\| \in \{3, 50, 120$ km/h$\}$ $\angle v = \theta_v \sim U(0^o, 360^o)$	• Fixed and identical speed $\|v\|$ of all UTs • $\|v\| \in \{3, 50$ km/h$\}$ $\angle v$: UTs only move along the streets they are in. Direction is random and both directions are equally probable	• Fixed and identical speed $\|v\|$ of all UTs • $\|v\| \in \{0, 5$ km/h$\}$ $\angle v = \theta_v \sim U(0^o,360^o)$
User mobility model (class I and II)	See section 4.1.5.4 (Vehicular environment (typical urban) mobility model) and section 4.1.5.5 (Rural environment mobility model)	See section 4.1.5.3 (Outdoor to indoor (dense urban) mobility model)	See section 4.1.5.1 (Indoor small (office) environment mobility model) and section 4.1.5.2 (hotspot environment mobility model)
User traffic model (class III)	Single traffic flow per user; Full queue per user. **--- or alternatively ---** Number of data packets of size K bits is drawn from a random distribution for each queue at the beginning of each snapshot. The packets in each queue have a linearly increasing expiration date representing an equidistant arrival time. No new data packets arrive during a snapshot.		
User traffic model (class I and II)	See [WIN1D72]		

5. The impacts of scenarios on economic aspects

The main approach regarding the economic aspects of WINNER II should be a continuation of the work performed in the previous phase, where focus was given on the identification of roles and actors in the business field as also on their relationships, rather than the calculation of cost and revenue flows. It is to be noted here that for this purpose, the relevant diagrams used arrows to indicate money and information flows as is explicitly stated in D.1.4. It is proposed to avoid any implication regarding money flow and consider only relations in a more abstract level (using only solid lines and not arrows indicating any kind of flow). To encompass all possible potential combinations of actor/relation in the value chain, differentiations will be a result of specific instantiations of services, rather than the services themselves.

During WINNER I, a generalized business framework was introduced, in which all potential actors and all potential relationships were identified. The purpose of this generic framework was to encompass all possible potential combinations of actor/relations. This proof-of-concept was supported with specific examples, in the form of domains, which formed a rather high level instantiation of frameworks for the provisioning of various type of services.

5.1 Economic framework

In the first phase of WINNER, there has been an effort to try and identify the relevant aspects incorporated within the business modelling of WINNER services instantiations, see [WIN1D13] and [WIN1D14]. The result of this work was mainly centred on the identification of key players of the economic landscape as also the potential interactions that could be established between them in the context of service provisioning. This approach resulted to the design of a generalized and abstract business framework that depicts a view of the anticipated WINNER business scenery.

As stated before, the approach that was adopted throughout the development of the generalised business framework that was introduced in the previous phase of the project has been based on the identification of as many as possible potential business actors, i.e. participants in the overall value chain for the provisioning of services that are in the scope of the anticipated WINNER platform. Furthermore and once these actors were identified, the next step was to address the issue of their potential interplay within the business landscape both in terms of money and information flow. The process of actors-relationships identifications yielded the so – called generalised business framework that is depicted within the following figure:

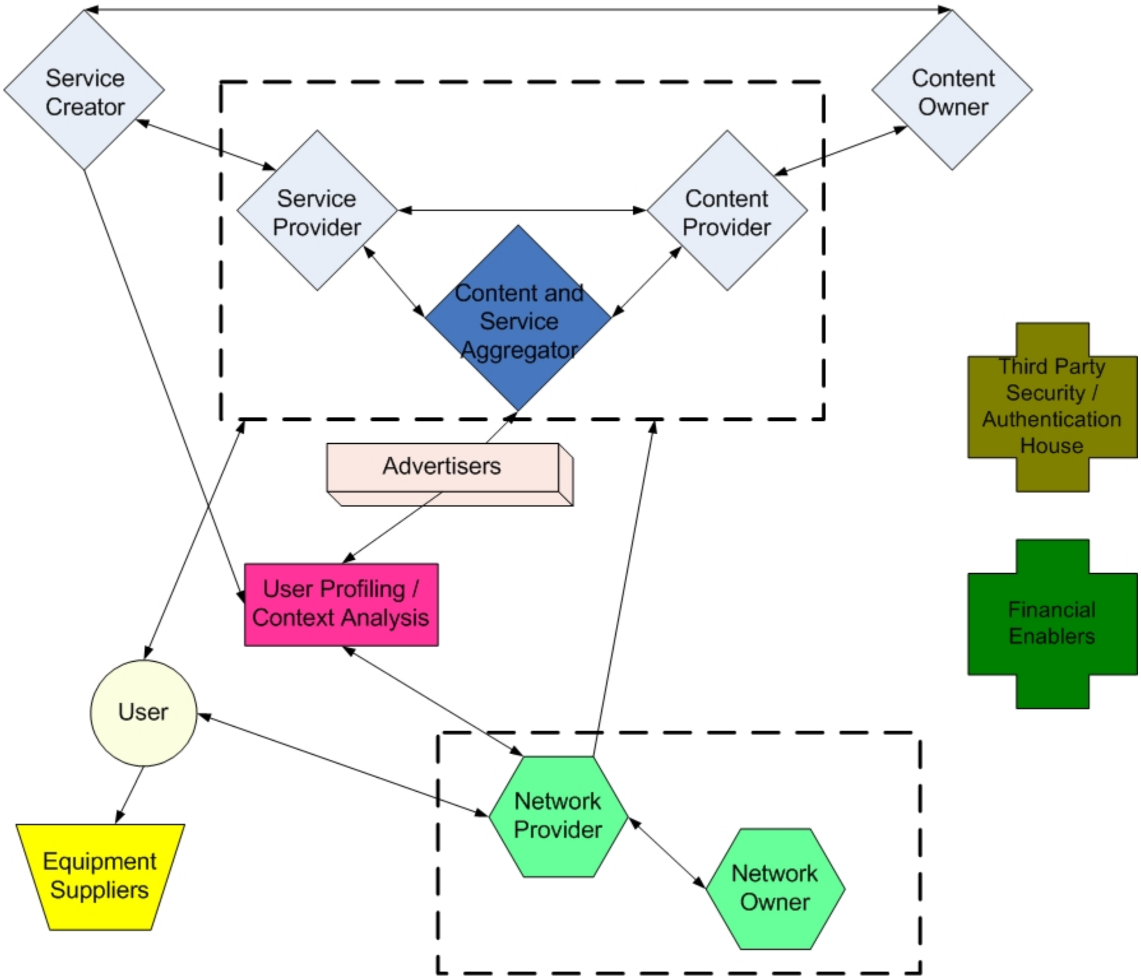

Figure 5.1: Generalised Business Framework

The main usage of this generic framework is to provide the sum of actors – relationships and serve as a versatile basis which will be adopted according to business domains or specific scenarios

It is to be noted that the purpose of the development of this framework was not to serve as an extensive study of all potential business – market aspects, since it is evident that apart from money – information flow there are other types of relationships that may exist between the actors (e.g. trust relationships), nor in any case the list of actors can be considered exhaustive. The approach undertaken in [WIN1D14] which is more thoroughly analysed in this document through more extended scenario examples is to create an abstract (and not quantitative nor qualitative) sketch of the envisioned business aspects that may be incorporated in the provisioning of WINNER – related services.

However, as stated before, the main outcome of this overall process has been the identification of actors and their relationships. This concept was further supported by the instantiation of specific examples that were adjusted to the intricacies of three example domains, namely the traditional mobile telecommunications domain, the broadcast domain and finally the fixed internet domain.

As an extension to already existing work and the results that were established within the business context during phase I of WINNER, this chapter will provide a mapping of the adopted business framework into the key scenarios that are cited in this document. The purpose of this process is to give an overview and some initial estimates on business implications imposed by the service structure as this is envisioned within the anticipated WINNER environment. It is evident from the list that follows that the business – oriented decomposition deviates from the scenario analysis that preceded and focused on the CG – based implications.

For the detailed list of business actors involved as also a short description of their roles, see [WIN1D14].

Throughout the whole scenario, involvement of the actors Equipment Supplier and End User is implied, unless otherwise stated. The decomposition of each scenario element into certain actors is by no means restrictive but rather serves as an initial approach to the business analysis. Other configurations between actors may also be possible.

5.2 Technical implications of wireless ecosystems

In [WIN1D14] a generic business framework was developed in order to describe the ever-changing multitude of possible wireless ecosystems. A key feature of WINNER is the flexibility and configurability to support different ecosystems. Naturally, since WINNER defines technology for wireless radio access only, the discussion will not be on these ecosystems as such, but shall focus on possible technical implications of these business models, that need to be considered within WINNER. In an extension of WINNER I work, the following section will highlight some specific scenarios for ecosystems that might raise such technical implications:

Scenario: The network provider (the “owner” of the subscribers) is different from the network owner (operating the transmission network).

Technical Implications:

- Can extra signalling and measurement reports increase support for such a fragmented ecosystem, e.g. allowing a network provider to specialize in certain service classes and to aggregate dynamically capacity from different network operators?
- Will the spectrum technologies be affected if we do not consider one entity selecting the best solution (from a spectrum point of view) but competing transmission network operators will offer available transmission bandwidths with certain QoS guarantees and the network provider only needs to pick the best? How will the overall system performance be affected by this approach?
- Service level agreements (SLA) between network provider and transmission network owner that is required to ensure service QoS.
- Transparent and common (joint) billing platform is required to process the user calls/sessions independently of the network transmission owner (one single bill to the user).

Scenario: The network owner is a small company or a private man (cf. e.g. hotspots)

Technical Implications:

- Low price, ease of use, self-configurability are key requirements.
- How is the network operator able to manager with traffic load situations? Is it required to handover to an upper cell layer in a different network operator even degrading the service QoS, i.e., from WLAN to UMTS? How the billing process is performed?
- Could the network users be able to connect to the best ISP according the service and contents availability, tariffs promotions, etc. and through different transmission networks operators (XDSL, wireless systems, satellite)?

Scenario: Coverage is provided by several (competing) network operators.

Technical Implications:

- Which technical enablers are required for network-based association and handover algorithms, which for algorithms based on user preferences, which for a combination of both (network detection, association, etc.)?
- UT should be able to rank and select the best network operator according to the user preferences or profile (default network operator, call cost, service availability, etc.) and network measurements reports (signal level, network load, etc.).
- Load sharing and congestion control mechanisms between network operators.
- Inter-system handover policy mechanisms (required networks reports information to user terminal to ensure the QoS of ongoing calls, i.e. coverage, signal quality, network load, service availability, etc.).
- Extra signalling for billing information exchange between operators (CDRs) or in a common billing platform (one single bill to the user).

5.3 Service classes and scenarios classification in the overall value chain

During the previous phase of WINNER project, a lot of emphasis has been put in the consideration of high level issues, something that practically translates to the study and analysis of the various characteristics of current and future mobile services.

In fact, a user-centric point of view that was adopted in WINNER phase I yielded significant results in terms of service categorization in various levels of aggregation, which were based in various services' attributes including traffic, delay and bandwidth constraints, etc.

The main focus of this chapter is to provide an insight into actual market and business aspects of these mobile services, as this is depicted by related surveys and articles. A brief analysis of forecasts (wherever available) and evaluations will follow, based on a short online survey conducted for the purpose of providing an informative feedback regarding the essential market trends as these are being formed in the current landscape of mobile services. Whenever possible, there will be a mapping of the reports cited to the respective WINNER services (or service classes).

One of the first results that can be extracted by a brief overview of the mobile services market status is their proliferation and their ever-growing penetration rate to mobile users. In terms of specific figures, there are surveys[3] predicting a rise of total revenues at 198.4€ billion in 2011, versus 138.4€ billion in 2005, which corresponds to an increase of 43% within 6 years. In a more short term prediction, the relevant mobile services revenues will account for almost 20% of the total mobile operators profits[4]. Eventually, penetration of mobile services is also expected to rise and average revenue per user is expected to have an increase of 20% from 31.3€ in 2005 to 37.5€ in 2011. As will be substantiated through other relevant researches, main driving force behind this market drift is mainly the constant need and usage of voice and messaging services alongside with the great impact of multimedia applications to new generations of users.

Regarding mobile telephony voice services (WINNER service class: Simple Telephony and Messaging), although it still remains among the most popular and widely used services, the predictions regarding the expected operator's incomes which will be based on this class of applications are rather pessimistic, and there is a slow anticipated revenue grow rate of about 4.5% until 2007 in developed markets (Western Europe and North America) (fixed voice revenues are on contrast more likely to present a slight fall of 0.5%). The relevant values are more optimistic in developing markets where the respective grow is estimated in about 16%. Worldwide, profits of mobile voice services are expected to account for about 50% of total voice revenues within the next two years. Another important aspect emphasized by the same research that cites the above numbers is an observed tendency of replacement of fixed voice services by

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[3] http://www.ecommercetimes.com/story/51490.html
[4] http://www.3g.co.uk/PR/Jan2004/6347.htm

mobile ones, with limiting factors of this process mainly being the cost and the reluctance of users of abandoning their fixed lines[5].

On the other hand, messaging services will most likely constitute one of the most promising service sectors in terms of economic impact, since they are expected to will generate two thirds of global services revenues by 2008[6].

A key service that is going to contribute to the widespread of messaging applications is mobile instant messaging (MIM) (WINNER service class: Simple Interactive applications). Reports state that operators, having foreseen this new shift of demand by mobile users towards mobile instant messaging services are in the process of implementing customized solutions for this type of applications in order to establish their position in the overall value chain. The importance of this genre of applications is also emphasized by the joint announcement made by 15 mobile operators worldwide that are about to start implementing interoperable MIM services. The competition is however expected to be rough in the struggle for prevalence in this business area, since other parties are expected to bring in the field already widespread instant messaging applications, such as MSN or Yahoo/AOL messengers. Similar reports further underline the importance of adopting a significant diversification between SMS and MIM, so as to keep these revenue sources as distinct as possible and making the most out of both of them. An overview of the current mobile instant messaging market status in Western Europe reveals a customer base of about 5.8 million users, which is expected to rise to about 34 million by the end of next year[7].

Despite however the constant popularity of SMS and the anticipated widespread of MIM, the MMS (WINNER Service class: Multimedia Messaging) market remains rather constrained and this is mainly attributed to pricing issues, since according to recent surveys MMS remain on average about 4-5 times more expensive than the SMS, discouraging users of making use of the specific services.

One of the most promising areas in terms of expected growth of both users and respective revenues are the services that relate with the concept of entertainment. In total, the entertainment – related services are the second largest revenue generator while they are expected to account for just over a fifth of total revenues in 2008[8].

Trying to break down the group of services encompassed within the concept of user – entertainment, and to make more concrete evaluations regarding impact and penetration rate to mobile customers we see the following:

Among the most promising services are the ones related to mobile music, the main contributing market being the one related to ring tones downloads (WINNER service: File Exchange), while demand for full track downloads (WINNER service class: File Exchange) and streaming audio (WINNER service class: Data and Media Telephony) are also gaining interest[9].

On the other hand, user demand for mobile TV is reported to remain rather modest. In a survey conducted by YankeeGroup, only 11% of participants expressed their interest regarding this service, the lack of popularity being mainly attributed to the high cost (the report provides a relevant cost estimate of 15€ per month)[10].

Predictions related to mobile video (WINNER service classes: Video Streaming and High Quality Video Streaming) are rather ambiguous, since most of the researches point out to some implications related to the growth or relevant services, most importantly the lack of commonly agreed standards and viable business models, the need for content protection and the high price of handheld devices able to support these applications.

Regarding other services outside the area of entertainment, there has been a lot of interest in mobile wallet applications, especially in the US, where according to specific forecasts mobile subscribers using their handheld devices for executing economic transactions will reach 25 millions by 2011. Most important implications in this category include the additional cost incorporated by service providers and security risks.

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[5] http://www.thefeaturearchives.com/topic/Business/Toujours_Voice.html
[6] http://www.3g.co.uk/PR/Jan2004/6347.htm
[7] http://www.iht.com/articles/2006/07/10/business/wireless11.php; www.telecomsinfo.com
[8] http://www.3g.co.uk/PR/Jan2004/6347.htm
[9] http://www.mobilemarketingmagazine.co.uk/stats/index.html
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There has also been optimistic reports regarding the future of mobile Location Based Services (WINNER service class: Real Time Collaboration and Gaming), where the next five years will see an average annual growth rate of 84% is expected. However, according to ITU location information constitutes private data, and all service implementations must take into consideration local legislations that handle the possibility of exploitation of such information.

6. Conclusions

During WINNER phase I, an extensive research in the scope of WINNER's scenarios and service classification was performed through the analysis of the different elements linked to usage scenarios [WIN1D14].

An overview of the different contexts of the WINNER scenarios and their relationships is provided for better understanding to the reader in this deliverable.

The focus of this deliverable is to identify and characterise the most relevant scenarios in scope of the WINNER, selected as key scenarios for proof-of-concept, aligned with CGs. Key scenarios encompass different aspects such as physical layer modes and parameterisation of the WINNER system and focus on challenges in system requirements and system design [WIN2D6131].

Further analysis on the service usage patterns and traffic characterisation was driven for traffic load dimensioning using defined traffic models associated with relevant scenarios characteristics such as user density, user distribution and user mobility. Typical usage cases in the evaluation process shall be prioritised based on the most used applications and key scenario parameters with relevance for WINNER in terms of the system design.

An extension of the economic framework started in phase I is analysed, deriving the implications at service level rather than taking into account the value chain for the different players or actors involved. A preliminary analysis of the technical implications of wireless ecosystems is provided in order to evaluate the flexibility and configurability of WINNER system upon different deployment scenarios, i.e. network providers, service providers, contents providers and other actors in the business models.

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