
# Integrated Project on Interaction and Presence in Urban Environments

FP6-2004-IST-4-27571

ipcity.eu

## Periodic Activity Report

Project Phase 3

Deliverable D1.10


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# Abstract

The periodic activity report is submitted after each reporting period as defined by Article 6 of the contract (once per year for IPs). It is based on relevant information from Annex I of the contract.

This periodic activity report covers phase 3 of the IPCity project, i.e. the months 25-36. It consists of a publishable project executive summary, describes the main objectives of the project comparing them to the state of the art and summarizes the specific objectives, achievements and problems of the project within the third project phase individually for each work package as well as from a management point of view. If further high-lights other important project-related aspects and finishes with an overview of the recent dissemination activities.

# 1 Publishable Executive Summary

**IPCity**

Integrated Project on Interaction and Presence in Urban Environments


IPCity explores new technologies to enable interactive cross-media experiences in urban environments.

Mixed Reality technologies are used to enhance the user's real environment by virtual objects creating a highly dynamic interactive environment featuring more experimental and intuitive forms of interaction with digital information.

Application areas include but are not limited to urban planning, large-scale events, pervasive games, and digital storytelling.

## Research Activities

### Cross-Reality Presence and Experience

The original contribution of IPCity to research on presence and interaction in mixed reality environments is that it studies the relationship between presence and user experience in real settings, focusing on how users actively construct and co-construct this experience through connecting activities in the digital/virtual space with activities in the real/physical environment. The main attention point is on users' purposeful activities in MR environments – how they collaborate, dynamically enact ('dramatic presence'), and map activities and events. Our research focuses on complex 'Mixed Realities' that emerge from the combination of multiple displays and spaces, including the most interesting element of MR, the real world. We argue that presence research that is meaningful for MR needs a broader conceptual framework, which encompasses traditional perceptual elements of Presence, but has an emphasis on Social Presence, affordances, beliefs and longitudinal effects. We also make a shift of attention away from psycho-physiological studies coming from a laboratory experiment tradition, towards an ecological-cultural approach that is applicable in real world situations and relies on ethnographic rather than fully controlled methods. The concept map and methodology we are devoping is shaped by insights from urban studies and grounded and evaluated in empirical studies in four showcases.

### Cross-Reality Authoring and Interaction Tools

Mixed reality systems require a coherent development approach which encompasses tools to simplify technical development and those to support content creation. From a development perspective this area of work focuses on: cross-platform device access, platform independent user interfaces and interaction prototyping. Tools to support content creation are also being developed. In the third phase of the project we have continuously improved technologies we developed previously. Further, we started to work on inegration of the various technologies into a coherent whole for use within the showcases and other projects.

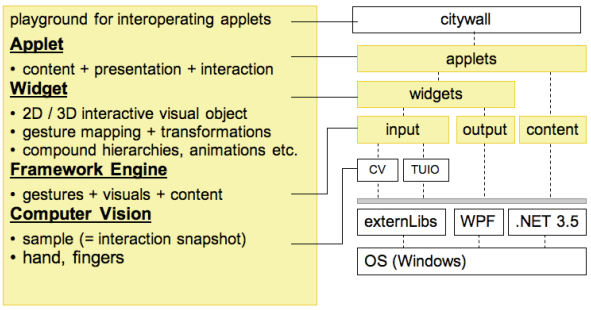
**Improving the Color Table tool, i.e. flows now automatically start as soon as streets are in the scene**


**Using the authoring and orchestration tool (AuthOr) now used extensively i.e. within the TimeWarp showcase**


**MapLens in use with a paper map**

**UrbanSketcher improvements, i.e. 2D Menu overlay for tool selection**

**MMC development: the Field sketcher map and media view**




**Towards the completion of the Multi-Touch Display framework**

## Next Generation Mixed Reality Infrastructure

Mixed reality (MR) infrastructure is focusing on basic research of mobile devices and their specifics to realize MR applications in urban environments. Mobile settings in this context can vary in scale between light-weight systems such as smart phones or sub-notebooks, and semi-stationary devices such as high-end equipment in the MR tent.

The work on infrastructure explores a range of issues including the suitability of different mobile devices, challenges in enabling AR on these devices, the creation of suitable MR content and the integration and fusion of available mobile tracking technologies.


**Design of the MR tent environment**

**UMPC based mobile MR system**

## Application Areas

### Showcase 1: Urban Renewal

Mixed reality presents an ideal way for urban planners and architects to envision proposed changes on-site. Research in this work package focuses on developing technology prototypes that allow urban planning teams to create visual scenes and soundscapes, mesh these scenes with representations of the real environment, as well as debate, change, and annotate these configurations. This showcase will also explore the complexity of urban situations by working alongside real life urban renewal projects.

**Urban Renewal Showcase: Collaborative creation of MR scenes**

### Showcase 2: Environmental Awareness

In this the third year this showcase's focus was changed from large-scale events to address a new brief of environmental awareness. The aim is to introduce environmental awareness in urban activities as a strategic application area and as a creative laboratory for mixed reality application and research on presence, experience and engagement in urban spaces. The focus change meant re-design of the CityWall and MapLens demonstrators to address the new brief, create a new versions of the demonstrators and carry out new rounds of field trials.

**Re-designed Environmental Awareness showcase demonstrators: CityWall and MapLens**

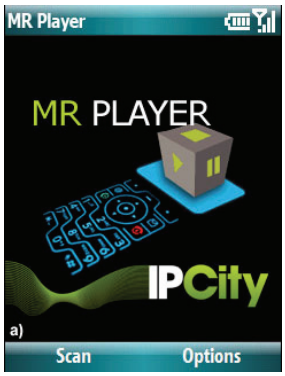
## Showcase 3: TimeWarp

TimeWarp is an outdoor Mixed Reality game that allows the palyer to travel through time in the city of cologne. The story of the game is about some fictitious historical characters which are trapped in different time periods. Two players have to rescue together these little elves by solving challenges which are situated at different locations in the city. For this reason, the players are equipped with a handheld mobile device and a information and map tool. Both applications run on Ultra-Mobile PCs (UMPC).

**Player with mobile devices**

## Showcase 4: City Tales

Starting Phase III after the takeover by the new partner the Work Package 9 was refocused to concentrate on story-telling in mixed reality environments. The new focus yielded a number of new investigations and developments. A number of research prototypes for mobile mixed reality clients, user interfaces and a complete server system to organise location based mixed reality content have been developed or customized, based on work in the research work packages.




**MR-Player retrieves server based mixed reality content based on tracking**


**Walking Explorer let's experience location based informaiton on the spot**


**Wall Blogging application to place and retrieve 3D content elements**

## Further Information

IPCity is partially funded by the European Commission as part of the sixth framework (FP6-2004-IST-4-27571).

For further information regarding the IPCity project please visit the project web site at:
**ipcity.eu**

If you have any questions, do not hesitate to send an email to:
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## Dissemination

During the year 2008, members of the project have organised two scientific workshops at leading conferences and participated and made presentations in 22 scientific conferences and workshops around the world. As a result of these workshops one special issue of a journal has been published and another will be published towards the end of 2009. Project members have also won two best paper awards at prestigious conferences. Altogether 11 workshops, demonstrations and field trials together with showcase stakeholders and end-users have been conducted in the showcases. Five journal publications, 11 conference papers and 10 workshop papers and posters have been published. The main emphasis in publication during the year has been in forums for human computer interaction (HCI) and Mixed Reality. The novel 3D version of the CityWall interface got a very large audience in the Internet. The major dissemination event for 2008 was IPCity participation in the European City of Science Exhibition in Paris, 14-16.11. 2008 (http://www.villeeuropeennedessciences.fr/index.htm), where MR-Tent with tools and CityWall were exhibited. There were several thousand visitors, and several hundred of them were active participants, including a number of very young children. The interest in the IPCity web site continued at a healthy level.

# 2 Project Objectives and Major Achievements during the Reporting Period

## 2.1 Overview of general project objectives and relation to state-of-the-art

### 2.1.1 Detailed scientific and technological objectives

Presence is essentially the feeling of being in a real or virtual environment, although research has also explored other media such a film, television and books. At its most broad level sense of presence is the feeling of "being somewhere", where that experience is real enough to give the person a true sense of being at a given location and possibly with others. As a result such a wide definition has encouraged a lively debate and consequently many different approaches being adopted.

The emergence of mixed reality interfaces, since the mid nineties, has opened up new areas of presence research. While virtual reality (VR) refers to the experience of users who are immersed in a virtual computer generated world, mixed reality attempts to mix virtuality (virtual objects or worlds) with the physical world. Researchers have considered a wide range of mixed reality interfaces, from augmented reality to augmented virtuality. Augmented reality (AR) can be implemented using a range of strategies, ranging from where the user´s view is augmented (e.g. with a see-through head-mounted display, HMD) or augmenting a physical object (e.g. embedding devices in physical objects), through to augmenting the physical environment surrounding, users and objects (e.g. by projecting images and record remotely). In general people associated mixed reality with the first approach, this naturally leads to a lack of understanding. However, augmented virtuality (AV) at the other end of the spectrum refers to augmenting a virtual world with information obtained from the real world (e.g. haptic interfaces etc.). Mixed reality interfaces represent a new area for presence research which will no doubt result in the emergence of new theories, measurement methods and applications. One of the central aspects of this new medium is the addition of virtual objects to real world environments.

The IPCity project intends to investigate mixed reality in real settings, i.e., away from laboratories and in real life situations, where the physical, social and cultural environment are constantly changing. This is achieved by focusing on challenging and original showcases that are based around urban life and social gatherings such as: large scale events, urban renewal, urban exploration ("time warp"), and city tales. These address, in distinctive ways various dimensions of presence that have surfaced in research e.g. physical presence (including immersion, engagement and involvement) and social presence (feeling of being present with others).

The approach within IPCity extends current research on presence and interaction in mixed reality with three types of contributions that are explained in this section: 1) new MR technologies and applications, 2) extending the understanding of presence and ways to support it (conceptual and instrumental contribution), 3) developing ways to investigate presence and experience for MR (methodological contribution).

**Mixed reality technologies and applications.** In order for MR technologies to evolve to a point where they can be used outside laboratories requires a number of objectives to be met:

- **An environment for MR interaction prototyping,** supporting easy creation and evaluation of new interaction mechanisms.
- **Achieving device abstraction and independency** through flexible and adaptable interfaces. A user interface description language allowing for platform and device independent user interface definitions.

- **Developing a platform and toolkit for cross reality content authoring**. Efficient and manageable tools for cross reality content creation accommodating different production models and workflows, (e.g. also tools for end user-content creation).
- **Configurable infrastructures** covering the widest range from wearable equipment to tangible computing environments. Supporting real life situations with a wide choice of MR tools from head worn displays to tangible environments to support group work.
- **Semi-stationary outdoor mixed reality environment**. We envision a semi-stationary (or semi-portable) structure for outdoor use, that exploits the features of the surrounding physical environment.

**Conceptual and instrumental contributions**. The original contribution of IPCity to research on presence and interaction is that it studies the relationship between presence and user experience in real settings, focusing on how users actively construct and co-construct this experience through connecting activities in the digital/virtual space with activities in the real/physical environment. The main attention point is on users' purposeful activities in MR environments – how they collaborate, dynamically enact ('dramatic presence'), and map activities and events.

Our particular conceptual attention points are also shaped by insights from urban studies on salient features of the material environment that contribute to the experience of presence on the one hand, are resources for constructing and co-constructing this experience on the other hand:

- *Spatial aspects* - MR technologies can be used for changing the scale of virtual objects, hence immersiveness, for making invisible objects (borders, archaeology, infrastructure) visible;
- *Temporal aspects* - such as for example making traces of the past visible, envisioning future development or the evolution of an event;
- *Mobility* - urban rhythms play a large role in experiencing a city, such as differences between day and night as well as flow and movement (of people, traffic);
- *Ambience* – includes all forms of sensations and imaginations about the environment surrounding the person resulting in a ‚sense of place and culture';
- *Material aspects* - contribute to the *engaging* the capacity of objects to absorb people's attention, thereby increasing their engagement with each other and the world and they are sources of 'reality' and 'haptic directness'.
- MR technologies and the focus on user activity and experience also require to extend our understanding of how these are supported by interface mechanisms. Our hypothesis is that virtual components modify the experience of the 'here and now' in subtle ways rather than altering it radically. Our main aim is to find out how technologies can be used to support interesting and relevant modifications of the 'here and now'. This necessitates a redefinition of the concept of directness, immersion, and reality on the one hand. It directs attention to:
- *Awareness cues* – cues about social interactions, communication, and activity in an MR environment;
- *Content* – used for building a visual scene or for story-telling can be informative, expressive, based on rules and constraints and is crucial for the experience of presence;
- *Multimodality* – involving all the senses through dynamic representations, the inclusion of sound, and particular representational techniques (fuzziness, abstraction).

**Methodological contribution**. IPCity develops an approach to investigating presence in real life settings which combines common methods like presence questionnaires with techniques for use in the field such as: participatory workshops, ethnographic observation, interaction analysis, and usablity tests. Qualitative and quantitative methods will be integrated to account for cognitive and socio-cultural aspects in particular combining:

- spatial and social presence questionnaires , with the emphasis on understanding aspects which relate to mixed reality and how this can be used to inform the design process
- interaction analysis based on video recordings and interface interaction logs
- mobile experiments which may use methods such as video recording, in-situ interviews etc, in order to understand more about the experience of end users.
- Interviews examining specific areas as defined by prior findings e.g. technical issues or to explore wider aspects of place and presence.

### 2.1.2 Comparison to the state-of-the-art in MR technologies

Mixed Reality aims at enhancing a user's perception of the real world combining mobile computing using wearable computer set-ups, MR can create a 3D information space that lives around the user. The main technological aim of IPCity is to move high-quality MR a step further from labs to real settings. This requires innovation at several levels and therefore going beyond the state of the art:

- Development environments as reliable and efficient toolkits for prototyping applications are missing and needed to develop and test in short time frames diverse applications,
- Authoring environments as cross reality content production environments have not yet been addressed and need to support advanced features as device independence and different production models
- Infrastructures and platforms need to support a wide range of mixed reality approaches from wearable to semi-stationary environments.

Mobile AR is typically implemented using wearable computers, head mounted displays, resulting in heavy and complicated equipment. Moreover, the capacity and quality of such systems is limited by the performance of wearable computers and the infrastructure that is available outdoors or in a mobile setting. For example, high quality tracking is normally unavailable outdoors, since commercial systems require AC power and are stationary. Moreover, previous research systems for mobile AR have only used rudimentary collaboration features for fully mobile users, since it is significantly more difficult to build collaborative applications if no assumptions can be made about location, size, and other parameters of the user group.

We envision to build high quality collaborative mixed reality systems as portable (not only wearable) environments for small groups to larger communities. The systems will diverse approaches to AR (not only head mounted displays) providing also embodied interaction and tangible interfaces. It will also rely on projection based AR for unencumbered access to the system for a rapidly changing user groups. To our knowledge, our notion of semi-stationary environments (for example a MR-Tent) is the first attempt to build a portable MR system. It is a carefully designed compromise between quality and mobility. Also the idea of building a semi-permanent structure to house the technology that can be set up, used and disassembled within a day has not been explored by previous work. All systems documented in the literature either aim at single-user fully wearable solutions, or stationary high quality environments.

There is some existing work (for example, in the MIT tangible media group) on AR or tangible interfaces for architectural design. The recently concluded ATELIER IST project, in which

some of the consortium members participated, while experimenting with such interfaces in support of architectural design, did not explore 3D AR or mobile computing directly. The ARTHUR IST project implements 3D AR for architecture and urban planning but is limited to a round table scenario. The 3DMURALE IST and ARCHEOGUIDE IST projects use augmented reality for reconstruction and presentation of ancient architecture in Europe. While our project is also grounded in the long tradition of architecture and archaeological reconstruction, this tradition - unlike urban renewal - does not require interactive modification of the presented artifacts.

We will also investigate the participation of mobile AR users and the possibilities of connecting their activities to those in the semi-stationary environments. The mobile users we envision will either be specialist "scouts" with high-end mobile AR equipment providing mobility in the surroundings, or ordinary citizens, using low-end devices primarily for informal browsing and interaction. Both types of interaction are technologically relatively new approaches, and have not been used in the context of architectural design. The MARS project carried out by the computer science department at Columbia University investigates collaborative user interfaces for indoor and outdoor AR, but is mainly focused on text-based annotations and does not allow for a sophisticated visualization of construction plans. The *Tinmith-Metro* project at the Wearable Computer Laboratory, University of South Australia, allows viewing and construction of 3D graphical models in an outdoor environment but relies on a single high-end user interface. The types of user interfaces and interactions in IPCity will thus be subject of novel research.

Furthermore, we will develop important enabling technology for MR, in particular displays and tracking methods. Several prototypes of light weight HMDs will be developed and evaluated during the project. More robust tracking will be developed by fusing several complementary technologies and further developing selected technologies – mainly computer vision based methods.

Handheld devices seem to be a superior alternative for AR - especially for untrained users in unconstrained and non-supervised environments. They are more robust than HMDs and due to the advent of mobile phones and PDAs users are comfortable operating them. Even before the success of the smartphones as mass-marketed items, pioneering projects started using small displays for custom see-through devices. Amselem’s work and Fitzmaurice’s Chameleon used small tethered LCD displays for location based information. Rekimoto’s NaviCam used color-coded stickers to track objects in the environment. Due to the tethered trackers in these early works, the degree of mobility was rather limited. mPARD is a variant using analogue wireless video transmission to replace tethers.

The Transvision project by Sony CSL introduced handheld AR devices for a shared space. Researchers at HITLab later improved this concept with a better user interface and an optical tracking solution re-using the camera needed for video see-through.

From 2000 on, PDAs with wireless networking were considered suitable for thin-client solutions outsourcing computationally intensive tasks such as rendering, tracking and application to a nearby workstation. The Batportal used non-mixed 3D graphics using VNC, while the AR-PDA project used digital image streaming from and to an application server. Shibata’s work aims at load balancing between client and server - the weaker the client, the more tasks are outsourced to a server. ULTRA uses PDA for augmenting “snapshot” still images.

In 2003 Wagner ported ARToolKit to Windows CE and consequently developed the first fully self-contained PDA AR application. This platform was used in a peer to peer game in the approach by Rekimoto and Nagao. Meanwhile Möhring et al. targeted a Symbian smartphone for mobile AR. The scarce processing power of the target platform allowed only a very coarse estimation of the object’s pose on the screen. Later Henrysson ported ARToolKit to the Symbian platform and created a two-player AR game on current-generation smartphones. Several of these projects involve collaborative applications, but not for larger users group.

We are not aware of any alternative solutions that work in both daylight and nighttime, and achieve the same performance as our implementation. Technologies from Apple and Microsoft provide similar tools with the difference that the first is not on such a moveable scale (from small to large) and is affected by light, and the second does not integrate already existing technologies, such as yahoo search, twitter, IM, google maps to name a few.

**References**

Amselem, D., A window on shared virtual environments. Presence, Vol. 4, No. 2, pp. 130-145, 1995

Fitzmaurice, G. W. Situated Information Spaces and Spatially Aware Palmtop Computers. Communications of the ACM, Vol.36, Nr.7, pp 38-49, 1993

Gausemeier, J., Fruend, J., Matysczok, C., Bruederlin, B., Beier, D., Development of a real time image based object recognition method for mobile AR-devices, Proceedings of 2nd international conference on Computer graphics, Virtual Reality, visualisation and interaction in Africa, pp. 133-139, 2003

Henrysson, A., Billinghurst, M., Ollila, M. Face to Face Collaborative AR on Mobile Phones. International Symposium on Augmented and Mixed Reality (ISMAR'05), pp. 80-89, 2005

Ingram, D., Newman, J., Augmented Reality in a Wide Area Sentient Environment, Proceedings of the 2nd IEEE and ACM International Symposium on Augmented Reality (ISAR 2001), p. 77, New York, USA, 2001

Kato H., M. Billinghurst: Marker Tracking and HMD Calibration for a Video-based Augmented Reality Conferencing System. Proc. 2nd IEE International Workshop on Augmented Reality (IWAR 99), 1999.

Makri, A., Arsenijevic, D., Weidenhausen, J., Eschler, P., Stricker, D., Machui, O., Fernandes, C., Maria, S., Voss, G., Ioannidis N., ULTRA: An Augmented Reality System for Handheld Platforms, Targeting Industrial Maintenance Applications, Proceedings of 11 th International Conference on Virtual Systems and Multimedia (VSMM'05), Ghent, Belgium, 2005

Moehring, M., Lessig, C. and Bimber, O., Video See-Through AR on Consumer Cell Phones, International Symposium on Augmented and Mixed Reality (ISMAR'04), pp. 252-253, 2004

Mogilev, D., Kiyokawa, K., Billinghurst, M., Pair, J., AR Pad: an interface for face-to-face AR collaboration, CHI '02 extended abstracts on Human factors in computer systems, pp. 654-655, 2002

Regenbrecht, H.T., Specht, R., A Mobile Passive Augmented Reality Device – mPARD. Proceedings o ISAR, pp. 81-84, Munich, Germany, 2000

Rekimoto, J., Nagao, K. The World through the Computer: Computer Augmented Interaction with Real World Environments, User Interface Software and Technology (UIST '95), pp. 29-38, 1995

Rekimoto, J., TransVision: A Hand-held Augmented Reality System for Collaborative Design, Proceedings of Virtual Systems and Multi-Media (VSMM '96), pp. 18-20, Gifu, Japan, 1996

Shibata, F., Mobile Computing Laboratory, Department of Computer Science, Ritsumeikan University, Japan, http://www.mclab.ics.ritsumei.ac.jp/research.html

Wagner, D., Schmalstieg, D., First steps towards handheld augmented reality, Proceedings of the 7th International Symposium on Wearable Computers (ISWC'2003), pp. 127-137, NY, USA, 2003

### 2.1.3 Comparison to the state-of-the-art in multi-touch display

The main features of the multi-touch display technology developed in IPCity are 1) enabling the user to collect and view location specific media, also from other users, 2) assisting in

taking grasp an area, supporting designers and architects in the initial design phase and 3) supporting collaboration and sketching. In this section we will briefly introduce some aspects of multi-touch systems that are similar to CityWall technologically or conceptually.

Previously the social dimension of large display use has been studied in tabletop, ambient and large display research. Tabletop displays have been used primarily in collaborative workspaces. Research has presented new kinds of collaborative touch-based interaction techniques that also support multi-hand use (Morris et al. 2006, Rogers et al. 2004, Wu & Balakrishnan 2003). Ambient displays do not usually involve direct interaction on their surface as they have been developed to investigate the ways in which displays can be situated in physical settings, representing movements of people in a space, displaying information that requires only peripheral attention, and increasing awareness of other users (Skog et al. 2004, Vogel & Balakrishnan 2003, Wisneski et al. 1998).

The settings of large multi-user wall display research have ranged from collaborative workspaces in office environments to more public settings such as schools. A study on BlueBoard, a touch-screen display that can identify its users, highlighted the benefits of visible physical actions facilitating learning from others, difficulties in developing turn-taking practices, and supporting ways to collaborate without necessitating anyone taking a leader role (Russel et al. 2002). While CityWall does not identify its users, as a system it does readily support turn-taking and collaboration. A study on eyeCanvas, an interactive single user public display and bulletin board installed in a gallery café, highlighted the richness that messages containing not just plain text but also user contributed pictures and sketches can have and discussed ways to better enable 'conversations' (Churchill et al. 2006).

Another system, Dynamo, was installed in a school as a multi-user public display for multimedia sharing. This system supported the use of private content with dedicated spaces on the screen for personal purposes. During the user study various use patterns evolved, including ways to draw other people's attention through "upsizing" one's pictures, and staging video performances in the display (Brignull et al. 2004). We found similar activities in our user studies with the enactment of performative roles, upstaging, upsizing etc.

Furthering the integration of multiple devices, a system such as iRoom (http://iwork.stanford.edu/) operates as a meeting, research and work space, combining large displays, wireless/multimodal I/O and mobile devices such as handheld PCs. Unfortunately it falls prey to the necessity for a 'wizard user' that is needed for solving problems and conflicts caused by the setup of changing multiple devices. This is one of the pitfalls of connecting many devices to a system and needs to be considered when integrating private data and devices.

Another problem with dealing with private data has been encountered with Braccetto (http://www.hxi.org.au/). This large-scale multi-touch system can be used both as a tabletop and as a vertical display, making this a very flexible system where groups can video-conference, as well as file share and problem-solve simultaneously. The system is designed for use by groups working in emergency situations like fires and floods. However, due to strict government security policies users can work only with limited access to restricted information at any one time. This makes the system as a portable environment—one of its aims—cumbersome to use, and stalls the immediacy of team work.

Initially the main challenge was to support interactions for any user without special skills or previous knowledge. The setup first created was similar to HoloWall (Matshushita et al. 2003), which allowed us to place all the equipment indoors out of the public space and use a normal safety glass as a screen. The first CityWall installed in public space in May 2007 was especially suitable for navigation of media such as photos. This setup was found to be engaging for the users (Peltonen et al. 2007) and acted as a stage to perform in the public (Peltonen et al. 2008).

Although engaging as an interface, the first CityWall installation had it's limitations: in field studies we found that users do not process actual information on the wall but are instead just fascinated by the novel interface it provides. To overcome these limitations (for more details,

see Morrison et al. 2008) and to address the new brief of environmental awareness a new user interface and application model supporting manipulating of 3D objects was designed

**References**

Brignull, H., Izadi, S., Fitzpatrick, G., Rogers, Y., and Rodden, T. The introduction of a shared interactive surface into a communal space. In Proc. CSCW 2004, ACM Press (2004), New York, 49–58.

Churchill, E. and Nelson, L. Interactive Community Bulletin Boards as Conversational Hubs and Sites for Playful Visual Reparteee, Annual Hawaii International Conference on System Sciences, 2007. HICSS 2007. 40th Volume, Issue Jan. 2007 Page(s):76–76.

Matsushita, N. and Rekimoto, J. HoloWall: designing a finger, hand, body, and object sensitive wall. In *Proc. UIST 2003*, ACM Press (2003), New York, 159–168.

Morris, M.R., Huang, A., Paepcke, A., Winograd, T. Cooperative gestures: multi-user gestural interactions for co-located groupware. In Proc. CHI 2006, ACM Press (2006), New York, 1201–1210.

Morrison, A., Jacucci, G., Peltonen, P. (2008). CityWall: Limitations of a Multi-Touch Environment. Public and Private Displays workshop (PPD'08), AVI 2008: the International Working Conference on Advanced Visual Interfaces. Naples, May, 2008.

Peltonen, P., Kurvinen, E., Salovaara, A., Jacucci, G., Ilmonen, T., Evans, J., Oulasvirta, A., Saarikko, P. (2008). "It's mine, don't touch": Interactions at a large multitouch display in a city Center. In Proc. of the SIGCHI conference on human factors in computing systems (CHI'08), ACM Press, New York, pp. 1285-1294.

Peltonen, P., Salovaara, A., Jacucci, G., Ilmonen, T., Ardito, C., Saarikko, P., Batra, V. (2007). Extending large-scale event participation with user-created mobile media on a public display. In Proc. of the 6th international conference on Mobile and ubiquitous multimedia (MUM2007), pp.131-138.

Rogers, Y., Hazlewood, W., Blevis, E. and Lim, Y.-K. Finger talk: collaborative decision-making using talk and fingertip interaction around a tabletop display. In Proc. CHI 2004, ACM Press (2004), New York, 1271–1274.

Russell, D.M., Drews, D. and Sue, A. Social Aspects of Using Large Public Interactive Displays for Collaboration. In Proc. UbiComp 2002, Lecture Notes in Computer Science 2498, Springer (2002), Berlin, 229–236.

Skog, T., Ljungblad, S. and Holmquist, L.E. Between aesthetics and utility: designing ambient information visualizations. In Proc. InfoVis 2003, IEEE Computer Society (2003), New York, 233–240.

Vogel, D. and Balakrishnan, R. Interactive public ambient displays: transitioning from implicit to explicit, public to personal, interaction with multiple users. In Proc. UIST 2004, ACM Press (2004), New York, 137–146.

Wisneski, C., Ishii, H., Dahley, A., Gorbet, M., Brave, S., Ullmer, B., Yarin, P. Ambient displays: turning architectural space into an interface between people and digital information. In Proc. CoBuild 1998, Lecture Notes in Computer Science 1370, Springer (1998), Berlin, 22–33.

Wu, M. and Balakrishnan, R. Multi-finger and whole hand gestural interaction techniques for multi-user tabletop displays. In Proc. UIST 2003, ACM Press (2003), New York, 193–202.

### 2.1.4 Comparison to the state-of-the-art in presence research

Presence research focuses on the dimension of subjective perception, analyzing the ways in which an individual's experiencing is mediated by technology, distinguishing between "first order mediated experience" (when experience is mediated only by the human senses) and "second order" mediated experience (when experience is also mediated through technologies). Presence as a second order mediated experience has been articulated in a

variety of dimensions: spatial presence or presence in a physical space (e.g. perceptual immersion, sense of being there), sensory presence (perceptual realism), engagement (involvement) and social presence (including co-presence). Presence research has considered primarily traditional media as mediating systems. In Presence I, projects have focused on virtual reality, 3D imaging, haptics and robotics. The MEC project: Measurement, Effects, Conditions IST-2001-37661 investigated the role of presence experiences in media-based learning processes with regard to educational hyper text and VR/multimedia systems. In the project POEMS (Perceptually Oriented Ego — Motion Simulation), a VR set-up is explored that allows for convincing simulation of ego-motions without actually moving the observer, by combining auditory, visual, and vibrational cues. Other projects aimed at enhancing virtual environments with novel camera technologies to achieve a system that displays photo-realistic 3D images, one example includes BENOGO, Being There - Without Going IST-2001-39184. TDIS IST-2001-38862 investigated a Three-Dimensional Imaging System based on integral photography for precise simulation of 3d perception and enhancement of the telepresence effect (TDIS). Presence I projects have also addressed haptics and robotics. For example Touch-Hapsys - Towards a Touching Presence, investigated haptic and multimodal illusions to realize presence through perceptual tricks allowing circumvention of current limitations in haptic actuator technology. With an artificial intelligence approach, ADAPT IST 2001-37173 was aimed at realizing an artificial system capable of building internal representations. With another take on robotics the IST-2001-38873 project PELOTE investigated the teleoperations of Mobile Robots. PeLote proposed a system for teleoperation, where the operator is a human supervising many remote entities from a distance and the entities are working in cooperation in the same environment.

Within the presence community there is a growing criticism of mainstream presence research. Mantovani and Riva (1999) suggest that Gibson's ecological theory of perception would offer a better starting point than the mainstream position presented above. In Gibson's (e.g. 1971) view valid perception is that which allows affordances that make successful actions possible in the environment, and this perception can vary from one person to another and from one moment to next, depending on what actions one needs to initiate. If we accept Gibsonian view, there is no fundamental difference between 'real' and 'artificial' environment – both of them are mediated, we do not perceive either of the 'as such' but always filtered through the purpose of our actions where we are engaged. Based on this perspective, there is a lively debate on cultural and social aspects of presence (e.g. Spagnolli and Gamberini 2005), on users' agency (O'Neill 2005), 'dramatic presence (Dow et al. 2007), and on the role of the physical environment of space and material resources.

Recent advances in mixed reality interfaces call for widening the focus on the mediating systems beyond virtual reality, or the narrow focus of haptics and robotics, towards a multimodal and mixed media approach. As mixed reality environments move nearer to real world settings this provides opportunities to further develop the concept of presence. The 'mixing' of aspects of the immediate surrounding (physical environment) with technological augmentations opens up new forms and experiences of presence. Most of the past "telepresence" research studied the effects of traditional media, teleconferencing systems and virtual environments and application areas such as telemedicine, training, teleconferencing, entertainment (multi player games, MUD etc.). A variety of application areas and emerging technologies remains unexplored. Mixed reality allows users to change and actively shape the configurations of real and virtual layers into an experience – mixing places, (historical) times, staging events, changing social formations and identities. IPCity focuses on novel application areas around urban life and social gathering: large scale events, urban renewal, urban exploration (time warp, city tales). The scenarios developed for these showcases address in distinctive ways the various dimensions of presence indicating novel aspects to be considered, among them:

- the role of users' purposeful activities in achieving presence and the perfornative and expressive aspects of these activities,

- understanding user experience through creating and interweaving events in the real world with the virtual and imagined,
- augmenting presence by giving access to hidden or invisible aspects of a place,
- supporting the perception of an event that is distributed in an area and that is partly (at times) collocated and partly (at times) moderately remote,
- working with temporality – paths, change, the sequence of events,
- understanding the role of materiality/tangible objects in the construction of presence,
- investigating mobility as a specific research issue for urban interfaces
- using MR as interventions in an urban environments. .

IPCity moves beyond the state of the art of presence research also in respect to methodology. Most of the research in presence has been carried out in laboratory settings. Field trials in real setting are new to presence research as also mobile and public applications. This requires devising a new triangulation of research methods combining common methods like presence questionnaires with methods for use in the field such as: participatory workshops, ethnographic observation, quasi experiments, and interaction analysis. Qualitative and quantitative methods will be integrated to account for cognitive and socio-cultural aspects.

**References**

Dow, Steven, Manish Mehta, et al. . Presence and Engagement in an Interactive Drama. CHI 2007, San Jose, California.

Gibson, J.J. *The Ecological Approach to Visual Perception* (1979). Erlbaum, Hilldale, NJ.

Mantovani, G. and Riva, G(1999) "Real" presence: How different ontologies generate different criteria for presence, telepresence, and virtual presence. Presence: Teleoperators and Virtual environments no. 8 vol 5, 538-548.

O'Neill, S.J. Presence, Place and the Virtual Spectacle. PsychNology 3, 2 (2005), 149-161.

Spagnolli, A., Varotto, D. & Mantovani, G. (2003) An ethnographic, action-based approach to human experience in virtual environments. International Journal of Human-Computer Studies 59, 6 (2001), 797-822.

Spagnolli, Anna and Luciano Gamberini. A Place for Presence. Understanding the Human Involvement in Mediated Interactive Environments. PsychNology 3, 1 (2005), 6-15.

## 2.2 Recommendations from previous reviews and take-up measurements

This sub-sections provides a summary of the recommendations from the year 2 review and a brief description of the the take-up measurements of the consortium.

### Overall assessment

- A necessity for more collaboration between WP3 and the showcases WP7, WP8, and WP9 was identified and different facets of presence and interaction in MR as applied in the individual showcases should be analyzed from the perspective of WP3.
    - This closer cooperation was achieved for WP6, WP7, and WP8. A main vehicle for this was the joint publication On Presence in MR, which helped frame the common theoretical approach but also furthered a deeper understanding of the specific characteristics of the different MR applications in a comparative analysis.
- The project should be more precise with respect to the specification of the experiments and the technological elements used. Rather than using the best

technology available there should be a rational attempt to define the optimal requirements for all aspects of the project.

  - The iterative design process followed in IPCity allows to revise earlier design decisions in the light of observations from experiments, but also by taking up recent developments in particular with respect to the hardware. For cost reasons, the project relies on commercial off the shelf technology, which has the positive impliciation that the findings can be readily tranferred to other application domains. Concerning hardware, the ideal specifications do exist in the research community for a long time, based on perceptual considerations. However, corresponding technology meeting these ideal specifications is unavailable and will be for the foreseeable future. Nonetheless, we have made an effort in the past year to also make the difference between conceptually ideal and actually used technology more explicit. Concerning software, the software and user interface designers in the consortium are in good control of the achieved and desired effect, and are making constant improvements. In this area, the usability evaluations are the final determination of the quality.

- Each showcase should clearly define relevant stakeholders and take into account theend users' goals with particular reference to experimental validation.
  - WP6 prepared a more elaborate workshop scenario addressing more specific urban issues. The development was embedded in a participatory design process including several types of stakeholders.
  - WP7 prepared more in-depth field trials for MapLens that emulated real world tasks in an effort to implement, test and evaluate use of the technology 'in-the-wild'. The end-users included general public, early-uptake users and we included stakeholders as users in the evaluation scenario, with environmental awareness researchers and new technology developer/ researchers.
  - WP8 improved the tracking resolution by integrating new technologies to support a better presence experience in particular the spatial presence. The social and temporal presence was further strengthened by a modified game design.
  - WP9 redesigned the showcase scenarios after taking over be the new WP lead. With the selection of the new target region the application scenario and the relevant stakeholder group was extended to general public urban citizens, who are kept together with the common interest in the place of investigation.

## Work plan

- The new showcase in WP7 may not be as bi-directional between end-users and the information system as in the previous version. This would be disappointing and requires some rethinking of the application.
  - WP7 extended the bi-directionality in both of its applications. For MapLens users uploaded photographs of their activities as requirements to complete tasks. As well part of the tasks was to construct a similar environmental task for a further iteration of the prototype. For CityWall we added SMS –in, MMS-in, email as well as tagging images via flickr as with the previous version. Plans to implement MMS Bluetooth and writing input are still under development.

## Management

- Interaction with other FP5 and FP6 projects or other R&D programmes addressing aspects of ERA could be improved e.g. by organization of an inter-iniative workshop with senior level participation.

- IPCity was represented via a presentation outlining the entire project during the PEACH summer school in Dubrovnik. Contributions have also been made to other aspects of PEACH such as the data repository.
- A presentation about IPCity was also given to participants of the Presence 2008 conference in Padua.

### Use and dissemination of knowledge

- The project has evidenced capability of exploitation through the commercialization of the City Wall. The exploitation potential of other project elements should become more evident throughout the next year of the project.
  - Commercialization of results during the lifetime of the project is rather unusual for FET projects. Thus, commercialization of IPCity results remains limited to the CityWall. However, exploitation of other project results to customers, partners, etc. of individual project partners happens through various channels. Please see D1.11 for details.

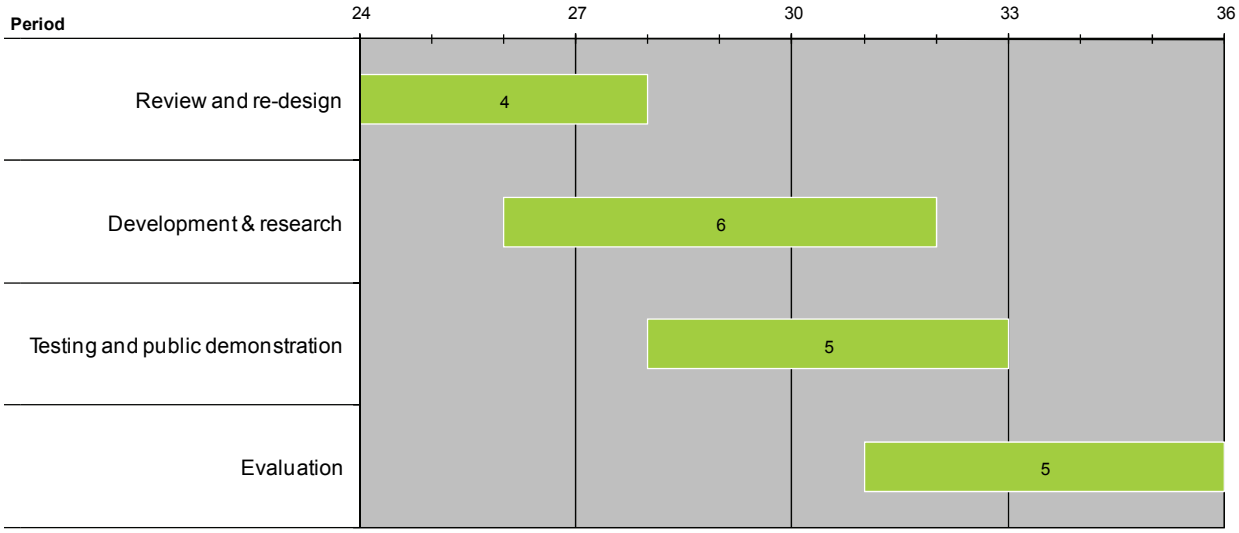
## 2.3 Objectives of the reporting period and main achievements

The general objective for the third 12 months of the project was to modify and improve the research and development based on the feedback and initial evaluation of the early demonstrators realized in year 1 of the project. Our principle approach – using a set of sample applications (the showcases), which are organized as sub-projects and aim to design and develop selected applications within different areas of overall project theme – had proven to be useful for the overall project as it allowed us to experiment in these areas to gain a better understanding of the needs and wishes of citizens, resulting in better overall project results.

In project phase 3, the second sets of prototypes of the services, tools and infrastructure components developed within the research work packages were provided to the showcases, where they were tested and evaluated. This included several research activities, which were provided and applied in showcases for the first time (e.g. interaction prototyping and particular computer vision based mechanisms). Again, feedback was given to the research work packages, which will revise their work plan and adapt or re-design their prototypes accordingly. However, for particular research activities (e.g. computer vision based marker-less tracking), research and development had to be continued in phase 3 before they finally will be applied to the showcase applications. Those developments will be deployed to the showcases in year 4.

In general we sub-divided the month 25-36 into the following periods:

- The analysis and re-design period (25-28, depending on WP)
- The development period (month 27-32, depending on WP)
- The testing and public demonstration period (months 29-35, depending on WP)
- The evaluation period (months 33-36)




The analysis period following the second project phase provided the necessary feedback to the individual showcases and research work packages for the re-design of their prototypes. Similar to the initial requirement phase in years 1 and 2, the re-design was based on requirements relevant for particular showcases on one hand and those applying to several showcases and therefore addressed by one of the research work packages on the other hand. The research work packages re-defined the set of tools, services, and infrastructure components to be used by the showcases. Based on the requirements from the showcases the time-line priorities for their development were updated.

The subsequent development phase considered the re-design and adapted and extended the prototypes according to the needs of the showcase applications. Last year however, two showcases were basically started again from scratch. In Showcase 2 the topic was resplaced by Environmental Awareness. In Showcase 4 the overall topic and goals remained identical (City Tales), but due to the replacement of the principal investigator by a new project partner, the showcase was re-launched in a different way and with different specific goals.

The development phase was followed by a testing period. In the testing and evaluation phases the showcases evaluated their developments as field tests or public demonstrations providing the necessary feedback from outside the consortium for the year 3 evaluation. The research results from the showcases were evaluated by the research work packages to foster bidirectional integration about all work packages. The research work packages further provided trainings on tools and infrastructure components where appropriate.

In preparation of the forthcoming year project review the results of the individual showcases were reviewed. The project's Scientific Board reviewed the showcases and proposed changes to the overall showcase structure and topics were appropriate. Within the research work packages, the results and the future plans were reviewed based on the feedback received from the showcases as well as regarding new general trends and developments in the area of interactive mixed reality environments and presence, which have to be addressed or considered by the project. Based on these reviews the individual work plans for the work packages were adapted or extended.

In detail the main achievements of period 3 of the project were:

- The strengthening of the consortium by replacing the former partner Sony (who had to leave the consortium for internal reasons) by a new partner (Imagination), providing an excellent expertise in the area augmented reality applications and public installations.

- The further integration of the project in other MR and presence related activities on the European level, including but not limited to the close cooperation with other project such as PEACH, PRESENCCIA, IPerG, PASION, CoSPACES, etc. and contributions to appropriate events (e.g. PEACH summer school,). The establishment of a close cooperation with one of the internatially leading MR labs – the HITLAB NZ – by supporting project fundings - bi-national and European (MARCUS project funded as part of the Marie-Curie IRSES programme).
- Training and demonstration events with matured showcase applications. Participation in a major dissemination event directed towards general public (European City of Science exhibition). Increased quality and quantity of scientific publications.
- Further consolidation of the conceptual framework for presence and interaction. In the third year we now have fully developed a new agenda for research on Presence, which is suitable for the domain of Mixed Reality (MR). We argue that while established assumptions and methods of Presence research from VR are applicable to MR experiences, they are not necessarily meaningful or informative. Specifically, a shift of attention is needed away from psycho-physiological studies coming from a laboratory experiment tradition, towards an ecological-cultural approach that is applicable in real world situations and relies on ethnographic rather than fully controlled methods. We have analyzed a series of examples taken from field studies undertaken within the showcases. Our analyis also includes the role of sound, with a focus on how adding sound can enrich the mixed reality experience of users, hence the experience of presence. We also arrived at formulating a set of 'design guidelines' on five topics: making interaction tangible; an experience point of view on different MR set-ups; working with 2D abstractions of 3D environments and objects; MR on mobile devices; enabling the user experience.
- Work package 4 has adapted, redesigned and/or improved eight technologies from year 2 based on the feedback of the showcase and internal developer meetings, including AuthOr, ColorTable, UrbanSketcher, Multi-Touch Display, Mobile Media Collector and MapLens. Especially the Multi-Touch Display is an outstanding technology, which was demonstrated at the European City of Sciences in Paris, France as part of the IPCity exhibit.
- Based on feedback of the showcases and internal developer meetings, the work on Mixed Reality infrastructure components has adapted, redesigned and improved 17 different technologies from previous phases, including Vision Based Localization, HMDB Interfaces and the MR-Tent. Additionally four new technologies were introduced, namely the Dotted Map Tracking, Mobile Map Tracking from natural features, Content Manager and Audio/Video Streaming. Contributions where made to all the four major building blocks: Tracking, Computation, Storage and Mobile AR. Most of the technologies developed are part of the showcase applications.
- The urban renewal prototypes were successfully further developed, enriched with additional functionalities as well as re-designed so as to better support collaborative activities and expressive interactions. A more elaborate workshop scenario addressing more specific urban issues has been prepared. The development was embedded in a participatory process including several types of stakeholders. The urban renewal prototypes were tested and evaluated in two workshops, on of them on site in the MR-Tent. The experimentation with spatial sound was successfully integrated in the workshops.
- WP7 has gone through a total re-design from changing from large-scale events to environmental awareness. In WP7 we have created an environmentally aware location-based game as an evaluation method for our MapLens technology and held three field trials to test the application with two prototypes being developed. We are ahead of schedule with development and deployment. CityWall as a large multi-touch display is still in permanent installation in downtown Helsinki and we developed a new

3D interface to add multiple content and timelines. We worked in tandem with Syke, Ministry for the Environment, Finland on a “Nature as Nice and Nuisance” interactive work as our first prototype. Also a new portable version of CityWall was built, which we exhibited at European City of Sciences (ECS) event as our second prototype with content pertinent to Paris, Grand Palais and MRTent. We had seven conference papers accepted, and two doctoral consortium presentations. Again CityWall received a lot of media attention internationally, in particular with the opening event of its 3D interface. Mutlitouch.fi is expanding as a company, employing more people, has successfully re-applied for financial support from Finland government, and has developed a cell LCD technology with 10 large and 10 small cells being sold (as far a field as Australia) as well as 2 larger projector-based installations.

- The first prototype of the TimeWarp game was re-designed according to the design guidelines which were developed after the evaluation of the first user studies. We focused on three aspects of the concept map namely enhancing social, temporal and spatial aspects. Spatial aspects were enhanced by additional audio clues and sound items. A smaller area results in shorter distances and thus in a more continuous game experience. The experience of spatial presence will also be supported by a narrative structure in form of a speaker. A story-telling character was added to guide the players through the environment. The simplification of the interaction scheme is achieved by reducing the interaction controls and by introducing shared user interaction via a cooperative two-player game. The introduction of a cooperative two-player game serves also the interaction with others. The temporal presence is supported by explanatory audio comments and underlying ambient sounds. Furthermore additional virtual 3D objects enhance the temporal presence experience. An improved tracking enables also a better impression of temporal presence. The introduction of a multi-user mechanism and the usage of less obtrusive equipment makes the experience of social presence much better.

  With the joining of the new partner the WP9 based on the achievments previously reached in this work package we restarted the research on mixed reality content delivery to mobile devices. A number of questions were investigated in theory that lead to the development of a series of prototypes that are evaluated. Besides the number of the diverse application prototypes a server-architecture has been implemented that is capable of holding and organizing location based mixed reality content in order to unify the diverse number of clients with their needs using a number of protocols supported. These elements are the key factor for robust content authoring and story creation so important within the City Tales workpackage.

## 2.4 Most important problems and corrective actions undertaken

Due to the delay regarding amendment 2, it had to be withdrawn and combined with the original amendment 3. The combined amendment reflected various consortium changes (from SNS to SONY, adding UCAM DENG through the competitive call, replacing SONY by IMAG), modifications to the cooperation with HITLAB NZ, and measurements to improve the realization of the workplan (increasing money necessary to create and transport the MR tent, additional resources for presence aspects, budget allocation for the European City of Science demonstration and dissemination event (WP6 & WP7), additional travel money for some partners to allow for full dissemination of project results).

The delay in the amendment came along with a delay in the final year 2 cost statement due to missing or wrong documents provided by SONY. This resulted in a delayed processing and by that distribution of the funding, further resulting in resource deficiencies at the new partners UCAM DENG and in particular IMAG as well as UniAK. This problem was finally solved not before the final processing of the cost statement and related money transfer (see also section 4.1 for details).

Further, it was noticed that WP9 activities at IMAG first focused too much on existing non-IPCity technology, neglecting previous work in WP5 and WP4 and necesary MR content.

This issue was discussed during the Cambridge assembly and corrective measures were undertaken afterwards.

# 3 Workpackage Progress of the Period

This section provides an overview of the actions carried out in the reporting period, based on the workpackages which were active or planned to be active during the period.

For each workpackage, the following information is presented:

- Workpackage objectives and starting point of work at beginning of reporting period
- Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, identify contractors involved
- Deviations from the project work program, and corrective actions taken/suggested: identify the nature and the reason for the problem, identify contractors involved
- List of deliverables, including due date and actual/foreseen submission date

## 3.1 WP 2 – Dissemination

### 3.1.1 Objectives and starting point of work

The overall objective of this work package is to ensure maximum dissemination and impact for the results achieved during the project both internally within the project and externally in relation to the scientific community, other stakeholder and information society in general.

The major goal of internal dissemination activities during the third year of the project has been to ensure, that the new partners taken in the project (Cambridge and Imagination), will get all the necessary information to get their work going, and to integrate them into the daily fabric of the project.With respect to external dissemination there has been two goals: to improve and broaden the dissemination towards stakeholders and general public, and to increase the level of scientific publishing.

### 3.1.2 Progress towards objectives

The dissemination strategy has been updated and accepted as an annex to the project handbook (D2.4). Together with the project handbook the dissemination strategy defines communication channels, practices and responsibilities for dissemination activities.

The communication channels and tools developed during the first project year have been in steady use in the project:

- A central document repository (BSCW, administered by FIT) has been intensively in use during the project, and it is a central resource to the project.
- A number of official e-mail distribution lists (general, one for each board, one for each larger work package). The messages sent to these lists are also archived in the BSCW. Besides the official lists, there is a lot of e-mail traffic between individual memebers and ad-hoc groups. The volume of e-mail traffic within the project can be characterized by a personal-level example: the leader of the WP2 received during 2007 about 900 project-related e-mail messages.
- A public website for external and internal distribution (www.ipcity.eu), updated when new information has become available. The website has had 7034 visits and 19 933 page views during 2008.
- An electronic newsletter was published 7 times during the year, containing altogether 91 news items. It was distributed by e-mail inside the project and made available also through the project web site, where it had 561 unique visitors through the year.

Two project-level workshops have been held to discuss about dissemination issues, the first in the general meeting in Graz in April, and the second during the general meeting in Cambridge in September.

Besides the already existing dissemination material the following additional material has been produced or updated to facilitate the publicity work done by partners:

- the IPCity general poster
- the IPCity poster for ECS exhibition
- the IPCity general brochure
- the IPCity brochure for ECS exhibition (versions both in French and in English)

IPCity has participated in the PEACH summer school at Dubrovnik in July 2008 .

### 3.1.3 Deviations from project work program

No major deviations from the original work program have occurred.

### 3.1.4 List of deliverables

| Del. no. | Deliverable name | Date due | Actual / Forecast delivery date | Estimated indicative person-months *) | Used indicative person-months *) | Lead con-tractor |
|---|---|---|---|---|---|---|
| D2.6 | Updated dissemination strategy and knowledge management plan for phase 3 | M27 | M30 | 0.5 | 0.5 | UOulu |
| D2.7 | Report on dissemination, visibility and training activities during Phase 3 | M36 | M36 | 0.5 | 0.5 | UOulu |

### 3.1.5 List of milestones

| Milestone no. | Milestone name | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|
| M2.8 | Knowledge management plan and dissemination strategy updated for phase 3 | M27 | M30 | UOulu |
| M2.9 | Report of the dissemination activities ready | M36 | M36 | UOulu |
| M2.10 | Dissemination strategy and knowledge management for Phase 4 | M39 | M39 | UOulu |

## 3.2 WP 3 – Cross-Reality Presence and Experience

### 3.2.1 Objectives and starting point of work

The overall objectives of this work package are

- to analyze experiences from field trials and presence questionnaires in the four showcases, achieving a deeper understanding of how mixed reality environments influence the experience of presence and how this enables novel forms of social interaction, of exploration and understanding
- to define a conceptual framework in support of designing 'technologies of presence' that inform the design of interface mechanisms in support of presence within the project and guide the integration of these technologies into real world settings.

The research focus in the third year was on

- Analyzing data from field trials in the four showcases, achieving a deeper understanding of how mixed reality environments influence the experience of

presence and how this enables novel forms of social interaction, of exploration and understanding;

- Integrating sound research, including experimentations with sound in field trials, into explorations of mixed reality;
- Developing the IPCity approach to Presence and Interaction in Mixed Reality and describe this approach in a journal paper.

### 3.2.2 Progress towards objectives

Within the framework of WP3 major research activities have been undertaken:

- All showcases carried out field trials, according to the agreed upon evaluation approach (described in the revised version of D3.2). The results of these field trials are presented in D 3.4., as well as in several publications;
- The state-of-the-art of research on presence and interaction in mixed-reality environments has been reviewed and extended;
- Several consortium members (from TUG, TUW, HTT, FIT, UMVL, UOulu) collaborated in writing a paper 'On presence in mixed reality' which was submitted as ful paper to the upcoming RAVE workshop;
- Research into sound and presence was deepened, with results on how adding sound can enrich the mixed reality experience of users, hence the experience of presence .

Our consolidated approach to studying presence and interaction in mixed reality can be summarized as follows:

Our research focuses on complex 'Mixed Realities' that emerge from the combination of multiple displays and spaces, including the most interesting element of MR, the real world. We argue that presence research that is meaningful for MR needs a broader conceptual framework, which encompasses traditional perceptual elements of Presence, but has an emphasis on Social Presence, affordances, beliefs and longitudinal effects.

We argue for and practice a shift of attention away from psycho-physiological studies coming from a laboratory experiment tradition, towards an ecological-cultural approach that is applicable in real world situations and relies on ethnographic rather than fully controlled methods. We are among the first to perform longitudinal social analysis of MR.

Urban renewal is a key issue of our work. We are among the first to design outdoor MR experiences. We have analyzed in-depth three experimental applications developed within IPCity that all are to do with experiencing the city. In the case of *MapLens*, action is in the real environment, while participants orient their task to remote locations and people. In *TimeWarp*, action takes place in an augmented environment, which is carried around by participants in the streets of Cologne. One of the key elements of the experience here is the feeling of connection between the virtual and real gaming elements. In the *MR Tent*, action takes place in the real environment and participants make use of the resources of this environment to construct Mixed Reality scenes. In this complex set-up we can observe the challenges of mapping events and representations within the physical environment to those in the Mixed Reality scenes.

With respect to the question 'what are the implications for our notion of reality and self? Is what we have thought of as reality simply one amongst many parallel realities that we now inhabit?' our approach is: if we accept a Gibsonian view, there is no fundamental difference between the ‚real' and the ‚artificial' environment – both of them are mediated, we do not perceive either of them ‚as such', but always filtered through the purpose of our actions where we are engaged. The origin of our perception is in our actions and purposes rather than in the environment. This means that there is always also a social and cultural dimension of Presence: because our actions.

### 3.2.3 Deviations from project work program

As we had to wait for field trials to be completed and analyzed, the planned internal deliverable on sound research was delayed.

### 3.2.4 List of deliverables

| Del. no. | Deliverable name | Date due | Actual / Forecast delivery date | Estimated indicative person-months *) | Used indicative person-months *) | Lead con-tractor |
|---|---|---|---|---|---|---|
| D3.4 | Improved conceptual framework, research findings from all four showcases regarding presence issues, and guidelines for interface design | M36 | M37 | | | TUW |

*) if available

### 3.2.5 List of milestones

| Milestone no. | Milestone name | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|
| M3.7 | Conceptual framework improved and sound research and plan for the development of sound probes completed | M29 | M35 | TUW |
| M3.5 | Research findings, and guidelines for interface design | M36 | M37 | TUW |

## 3.3 WP 4 – Cross-Reality Interaction and Authoring

### 3.3.1 Objectives and starting point of work

The objectives of the Cross-Reality Interaction and Authoring work package for year 3 were:

- **Interaction Prototyping/Authoring:** A graphical user interface on top of the language describing the interactions will be developed. This will be a major building block together with the language to support easy creation and evaluation of new interaction mechanisms.
- **Authoring and Orchestration Interface:** This tool supports the showcases by augmenting arbitrary maps with 2D information, e.g. text, objects, users. The functionality can be used to author a showcase event as well as orchestrating and monitoring the running event and evaluating an event by playback functionality.
- **Audio / Video Streaming:** Publishing arbitrary audio and video sources to local and remote hosts in an efficient way, while providing a simple interface in order to access a stream. Integrate the streaming into the device abstraction.
- **Augmented Map Table:** Integration with the existing application components Urban Sketcher and Color Table. The map table will present a tangible interface to various elements manipulated in the Urban Sketcher and Color Table, such as drawing planes and placeholder objects.
- **Tangible User Interfaces:** Clarifing design issues related to the collaborative creation of mixed-reality configurations and making use of material and spatial properties in designing both, physical interface, as well as multiple and simultaneous interactions. Developing and applying methods allowing users to rapidly learn, use and understand the interactions with the **ColorTable** to gain a basic understanding of the user's presence related to interaction.
- **MapLens** (augmented maps on mobile devices over paper maps): Development of the mobile client on Symbian OS smartphone in collaboration with HIIT/TUG/CAM. Field trials planned in Fall 2008.

- **Mobile Media Collector:** Design and development of the tool for collecting and browsing location based media using mobile devices. First prototype implementation planned in Fall 2008.
- **UrbanSketcher Interface Streamlining**: UrbanSketcher will also undergo extensive user interface redesign, e.g. usability improvements, strengthening the collaborative properties, enhanced visual and/or audio feedback of user action, or additional functions to handle the assumed ground plane in the MR scene. Additionally developing of sketching/3d modelling tools.
- **Multi-Touch Display:** Set up of an infrared tracking based touch screen with rear projection. Development of a catalogue of gestures to manipulate virtual objects using multiple fingers.

As starting point for this phase we had the second set of demonstrators developed within the last period of the project and for most demonstrators, evaluation results from the showcases using some of the developed demonstrators within their trials. Based on these evaluation results and further discussions between the research work packages and the showcases, we started this period with a four month review and re-design phase, where we decided which tools needed to be further enhanced in means of functionality, stability, accessibility and so on. Additionally, we decided that certain tools, i.e. Audio and Video integration into DEVL first needed a solid technology infrastructure established within WP 5 before work in WP 4 can continue. The results of this phase for each of the tools developed within year 3 are documented within the deliverable D4.3 as sub-sections of each of the tools.

The results were regularly reported to the consortium and the showcases for feedback and improvements.

### 3.3.2 Progress towards objectives

Based on the results of the review and re-design phase we continued working on the following tools from phase II:

- **Interaction Prototyping / Authoring**: The interaction prototyping language and editor technology development, recently named Interactive Bits, continued based on feedback from the showcases.
- Authoring and Orchestration Interface: **AuthOr** development continued based on feedback from the showcases.
- **Augmented Map Table**: The augmented map table system was successfully integrated with the ColorTable and UrbanSketcher systems in two workshops as part of collaboration between TUW / TUG / UCAM.
- **MapLens** (augmented maps on mobile devices over paper maps) was developed using natural feature tracking as part of collaboration between HIIT / OULU / TUG / CAM. Three field trials were conducted, testing the integrated system.
- **UrbanSketcher** Interface Streamlining: The UrbanSketcher user interface was redesigned and a new 2D interface for laser pointer interaction was developed comprising the most common functionalities.
- **Mobile Media Collector (MMC):** Development of the MMC continued following the design in Phase II. The implementation has now reached the prototype 1 phase and will continue after the trials of Fall 2008 to prototype 2 phase.
- **Multi-Touch Display:** An infrared tracking based touch screen with rear projection has been developed that has also been extended to support 3D object manipulation. A language of natural gestures to manipulate virtual objects (both 2D and 3D) using multiple fingers has been created. Display was exhibited at the European City of Sciences in Paris, France and on permanent installation in downtown Helsinki.

### 3.3.3 Deviations from project work program

No major deviations to report.

### 3.3.4 List of deliverables

| Del. no. | Deliverable name | Date due | Actual / Forecast delivery date | Estimated indicative person-months *) | Used indicative person-months *) | Lead con-tractor |
|---|---|---|---|---|---|---|
| D4.3 | Second Prototypes of Interaction Tools | M36 | M36 | | | FIT |

*) if available

### 3.3.5 List of milestones

| Milestone no. | Milestone name | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|
| M4.5 | Design specification of third set of interaction and authoring tools. | M28 | M28 | FIT |
| M4.6 | Evaluation report on third set of interaction and authoring tools. | M36 | M36 | FIT |

## 3.4 WP 5 – Next Generation Mixed Reality Infrastructure

### 3.4.1 Objectives and starting point of work

The objectives of the Cross-Reality Interaction and Authoring work package for year 3 were:

**Component Integration:** Improve exchange of information between component structures leading to enhanced functionality.

- Wireless Mobile Camera for AR-Scouting
- HyperMediaDatabase (HMDB): developing the technology based on the requirements from WP6 and WP7 especially related to MapLens development.
- Illuminate (including the Atelier Infrastructure): minor development to adjust the technology to specific trials. Focus will be on trialling and research.
- Bluetooth Media Dispatcher: minor development to adjust the technology to specific trials. Focus will be on trialling and research. This also includes other technologies we have developed for entering media to HMDB (eMailEntrance and others).
- HMDB: possible additions and modifications to HMDB and/or Atelier Infrastructure to accommodate to the requirements of the Mobile Media Collector (a WP4 tool).
- HMDB Web Interface: Will be constantly improved to match requirements for content storage and retrieval as well as utilise useful upcoming features of the HMDB. The layout will be refined too.
- Muddleware Java API: Is used since a couple of months and regarded as quite stable, however minor bugfixes and improvements will be certainly necessary.
- Sound Application: A configurable software component that processes object coordinates and attendant meta-information and generates network messages that can be fed into existing sound frameworks.

**Interaction table:** A centralized interaction table will act as the main user interface in the MR tent. The existing demonstrator, a table-top display with tangible interfaces, will be further developed and integrated.

**Mobile setups** (handheld mixed reality environments): three different mobile devices (scaled in computing performance) will further be developed: a sub-notebook-based (UMPC-based) approach, a PDA-based approach, a smartphone-based approach. Porting the StudierstubeES framework to SymbianES will address a new target platform.

**Tracking and localization:** Vision-based tracking and localization will further be developed in order to get more precise positioning for outdoor MR applications.

- Map tracking is a new core issue where development will mainly be in the context of mobile devices. Tracking mobile devices over 2D printed artefacts such as maps will be developed to serve as a user interface. Fast, feature-based methods are being investigated to realize this aim. Extensions of these methods to model-based tracking will be used for UMPC type devices for outdoor tracking.
- Test, integration and development of human computer interfaces for the image based localization system on mobile devices. Development of methods for selection of the most likely images to be displayed to the user.
- Development of illumination invariant method for robust tracking of color markers under changing light conditions. Integration of the method into the color table framework.
- Start upon investigation and development of on-line tracking methods suitable to support augmentation in head mounted displays used in urban environments.

Pervasive and Tracking Ubicomp: publishing local and remote geographical, information, streamed (e.g RSS feed of local air quality) and user-generated content from and to pervasive, mobile and permanent installation hosts. Integrating into multi-touch at CityWall..

### 3.4.2 Progress towards objectives

Three technologies, the ‘Mobile Presence Scanner’, ‘CityGML XSG’ and ’Cal3DXSG’ were evaluated and for the time being considered as stable and sufficiently complex to fulfill the current needs of the showcases. These components will be extended on requests of the showcases. All other components of the set of the initial demonstrators for MR infrastructure were continued developing. We furthermore started the development of 4 new components driven by the needs of the different showcases.

An overview as well as a complete description of the progress of each individual technology is given in the deliverable D5.3.

### 3.4.3 Deviations from project work program

No major deviations to report.

### 3.4.4 List of deliverables

| Del. no. | Deliverable name | Date due | Actual / Forecast delivery date | Estimated indicative person-months *) | Used indicative person-months *) | Lead con-tractor |
|---|---|---|---|---|---|---|
| D5.3 | Improved Prototypes of MR Infrastructure | M36 | M36 | | | TUG |

*) if available

### 3.4.5 List of milestones

| Milestone no. | Milestone name | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|
| M5.7 | Re-design of infrastructure prototypes | M27 | M27 | TUG |
| M5.8 | Development of third set of prototypes finished | M31 | M31 | TUG |
| M5.9 | Integration, testing and public | M33 | M33 | TUG |

| | | | | |
|---|---|---|---|---|
| | demonstrations | | | |
| M5.10 | Internal evaluation reporting on infrastructure prototypes | M36 | M36 | TUG |

## 3.5 WP 6 – Showcase 1: Urban Renewal

### 3.5.1 Objectives and starting point of work

The objective of this work package is to introduce mixed reality applications in support of presence into urban renewal projects; more specifically:

- To conduct field work in urban planning environments, involving users and researchers as reflective co-designers, from early exploring practice and visions to field trials with gradually more integrated scenarios and prototypes
- To design an application based on the MR-Tent infrastructure from WP5, equipped with a mixed-media workbench interface, in support of collaborative envisioning (in collaboration with WP5)
- To develop mobile technology for public participation supporting situated content creation
- To evaluate the experiences of field trials with the technologies in real urban planning settings, with special attention to participants' experience of presence and co-presence.

The objectives of Phase III were:

- To further develop the urban renewal prototypes, based on the redesign issues identified in previous field trials
- To plan and carry out a more elaborate participatory workshop with different stakeholders, including citizens, and an extended experimentation protocol
- To implement sound as expressive content as well as part of interaction design on the basis of research done in WP3.

### 3.5.2 Progress towards objectives

After re-designing our first prototypes we in Phase III carried out two participatory workshops, in the context of a real urban planning project in Cergy-Pontoise, Paris.

The first workshop was carried out in Vienna, June 19, 2008, with a student group from UniAK as participants. We used a small setup of urban technologies and experimented with use-cases dealing with urban topics such as time, connectivity and distance. Main issues concerning the complexity of interactions and the amount of functionalities were discussed and identified.

The results of this analysis were used to prepare a second workshop in Cergy-Pontoise in September 2008 in a more elaborate setup of urban renewal technologies, all assembled in the MR-Tent. As participants, we invited different types of stakeholders – urban planners and specialists, members of the municipality and representatives of the local community. The workshop dealt with urban issues such as the identity and the uses of the site, connections and public transportation. Participants were highly incorporated into the preparations; they had received a set of 'cultural probes' in July 2008 and our research team had met them to help them elaborate their vision of the future of the site in the form of a participatory interview. From these visions we extracted two scenarios as well as visual and sound

content. We also prepared four photographic panoramas from different viewpoints and two maps of different scale for the table.

- After each of the workshops, the urban renewal prototypes were successfully further developed, enriched with additional functionalities as well as re-designed so as to better support collaborative activities and expressive interactions.
- A more elaborate workshop scenario addressing more specific urban issues has been prepared. The development was embedded in a participatory process including several types of stakeholders.
- The urban renewal prototypes were tested and evaluated in two workshops, one of them on site in the MR-Tent.
- The experimentation with spatial sound was successfully integrated into the workshops, a library of sound files was created and issues of representation were identified.

### 3.5.3 Deviations from project work program

None

### 3.5.4 List of deliverables

| Del. no. | Deliverable name | Date due | Actual / Forecast delivery date | Estimated indicative person-months *) | Used indicative person-months *) | Lead con-tractor |
|---|---|---|---|---|---|---|
| D6.3 | Second prototype of Urban Renewal applications | M36 | M36 | | | TUW |

*) if available

### 3.5.5 List of milestones

| Milestone no. | Milestone name | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|
| M6.7 | Re-design of Urban Renewal application finished<br>I6.6 (Internal Report): Report on Urban Renewal application re-design | M27 | M27/M30 | TUW |
| M6.7 | Enhanced demonstrations of the Urban Renewal applications finished | M30 | M30 | TUW |
| M6.7 | Analysis of participatory workshops and feedback to technology developers as well as WP3 completed, internal evaluation reporting of the initial Second City application. (contribution to D1.12 – Evaluation Summary Report of Year 3) | M36 | M36 | TUW |

## 3.6 WP 7 – Showcase 2: Environmental Awareness

### 3.6.1 Objectives and starting point of work

The aim is to introduce environmental awareness in urban activities as a strategic application area and as a creative laboratory for mixed reality application and research on presence, experience and engagement in urban spaces. To be more specific, our objectives are:

To develop novel applications of mixed reality interfaces in the case of environmental awareness activities including citizens and visitors as active participants.

Advancing the research on Presence and Engagement and looking at environmental awareness to facilitate spatial distribution, multiplicity and simultaneousness in urban activities.

**Communication Modalities**

We investigate the usefulness of:

A large public display *CityWall* as a means for spectators to interact with general, individual and shared co-authored information/ data visualisation

*Annotated MapLens* for supporting awareness of the impact of mobility choices within the city.

**Enhancing presence and engagement**

The research aims at investigating how to enhance and sustain engagement and therefore presence in Environmental Awareness activities for visitors to urban activities. Promotion of persistent and re-occurring interactions occurs, where for example, participants return to interact with information sensors, such as those that show toxicity levels, over a number of days—bringing with them different potentially toxic substances / surfaces from their home, work and/or social environments. Over time, we add further interactive devices, responders or modalities as signalled by the spectator requests, interests and popularity of use iterating the designs via participant feedback.

Persistent feedback reinforces research opportunities to refine the conceptual framework around presence and engagement, and proffers opportunity to evaluate how presence and engagement can be further supported.

**Addressing Pollution and Mobility and establishing community**

By engaging with the interactive technologies, and sharing information over the modalities and with the emerging community of participants, individuals can then make informed choices and act upon their environment in more responsive and meaningful ways. Collectiveness of activity and co-experience are key components, as is engaging with and identifying pollutants and pollution in order to make overt these hidden aspects of our urban environments.

### 3.6.2 Progress towards objectives

As in years 1 and 2 the demonstrator is divided into three components. In each component there have been advancements leading to the continuation of now two separate applications with their own developing and evaluation road map. The mobile component that was implemented in year one by CoMedia is this year again continued with the Augmented Map Lens. The Contact Wall of year one is again continued as a multi-touch public display CityWall. The Pervasive component is now being integrated into CityWall and MapLens applications. The third application Illuminate has been put on hold as CityWall and MapLens applications have made significant developments, and require focused attention. As well using lighting was in conflict with the altered brief of environmental awareness.

The aim of having three complementary components is to be able to address the user experience in a more comprehensive manner and to address most of the state of the art technologies for this showcase supporting the main aspects of visitors: group co-experience, engagement with an event and/ or a theme, and navigation through space.

TKK has lead the showcase bringing forward and coordinating the work especially with design, development and field trials. Field trials of MapLens (03/2008 & 08/2008) and CityWall in its new location (07/2008) were conducted. Development of both showcases was directed to address the theme of environmental awareness. Development of MapLens continuted as a more integrated solution with other partners, using markeless maps and innovative solution to testing mobile AR in the field. Development of CityWall was focused to support multiple content and multiple time-lines and have an open backend for a more

integrated solution.

In this third year M25-M36 WP7 had to re-design the demonstrators to address a new brief of environmental awareness, create a new version of the demonstrator and carry out new rounds of field trials. The re-design has successfully moved forward the demonstrator with more articulated and substantially more developed mixed reality applications in comparison to year 1, and building from year 2. The current demonstrators follow the plan of having a mobile, and permanent installation, and incorporating the mobile solution into the pervasive component. In all components substantial advancement has been made. The mobile component has moved beyond CoMedia which was already field trialed in year 1 therefore WP7 has moved forward to investigate the augmented MapLens as a new mobile component. Continued development along with field trial development and implementations has further this project to address green and environmental issues. The installation component has concretized in further development of the interaction design of CityWall a large multi-touch urban display, with again extensive field trials. Finally we have integrated the pervasive component into the way we manage field trials (as a pervasive location based game) for our mobile MapLens solution as the prototype development of Illuminate had a first prototype version, and addressed lighting. It was difficult to match this to the environmental awareness brief, and focus on 2 rather than 3 projects was decided upon. Both CityWall and MapLens had ambitious targets and goals to meet, so we needed to be more realistic with what we could achieve at a high standard.

The showcase succeeded in carrying out three extensive MapLens field trials in Helsinki, opened a first prototype of CityWall in Helsinki in October and took data from the summer period with CityWall in its new location (the Cultural Office required we move) and now again with a huge passing public at European City of Sciences.

In MapLens field trials data analysis exposed phenomena that arise uniquely when using AR maps in the wild. We noted on how augmentation affects the way participants use their body and hands, manipulate the mobile device in tandem with the physical map, walk while using, and collaborate. We found that the MapLens solution facilitates place-making by its constant need for referencing to the physical, and in that it also allows for ease of bodily configurations for the group, encourages establishment of common ground, and thereby invites discussion, negotiation and public problem-solving. Its main potential lays not so much in use for navigation but in use as a collaborative tool.

Citywall still operates as a permanent installation in downtown Lassipalatsi, Helsinki and we opened a new 3D version 8th October, with press and outputting a youtube video that grabbed more than ¼ million visits within its first two weeks. http://www.youtube.com/watch?v=IldDrCcZkZY

Citywall continues to attract a lot of attention also in the web. Our site http://citywall.org still receives many contacts, and CityWall is referenced in a variety of important websites, papers and many blogs We still continue to receive requests from all over the world to create similar installations.

The start-up company has begun to commercialise the technology www.multitouch.fi still has three of the researchers that worked in WP7 in the company. The company successfully obtained local Finland funding (TEKES), has successfully negotiated IPR with the University and has sold 10 small multitouch cells, 10 large multitouch cells, and two projector versions. They are expanding to employ more people to deal with the extensive orders for 2009.

### 3.6.3 Deviations from project work program

Ahead with development progress from original plan. Two prototypes of each of the demonstrators have been developed and publically demonstrated and/or field trialed.

We finished development of environmental awareness prototypes ahead of time. We had access to an experienced developer for a shorter period of time than anticipated, so needed also to accelerate and implement prototype development and corresponding design etc in

this phase accordingly We also had a hand-over period in the beginning months with two lots of staff; the old going to the start up company and new ones on a steep learning curve. As our staff was younger and less experienced, our wages cost were lower, but also more training needed to be given by experienced staff. As a consequence of 1) more development and design work done 2) more people in the hand-over phase and 3) more supervision and longer hours needed, we used more person-months and we are further ahead with deliverables in this development phase than anticipated in original plan.

### 3.6.4 List of deliverables

| Del. no. | Deliverable name | Date due | Actual / Forecast delivery date | Estimated indicative person-months *) | Used indicative person-months *) | Lead con-tractor |
|---|---|---|---|---|---|---|
| D7.3 | First Environmental Awareness Demonstrator | M36 | M36 | | - | TKK |
| D7.4 | Second Environmental Awareness Demonstrator | M42 | M42 | | | TKK |

### 3.6.5 List of milestones

| Milestone no. | Milestone name | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|
| M7.7 | Environmental Awareness re-design finished.<br>I7.5 (Internal Report): Report on Environmental Awareness application re-design | M30 | M30 | TKK |
| M7.8 | Environmental Awareness Events prototypes | M34 | M34 | TKK |
| M7.9 | Internal evaluation reporting Environmental Awareness events prototypes. (contribution to D1.12 – Evaluation Summary Report of Year 3) | M36 | M36 | TKK |
| M7.10 | I7.6 (Internal Report): Report on Environmental Awareness events application re-design includes 2 sets of 2 application prototypes developed. | M36 | M36 | TKK |
| M7.11 | 17.8 Second Environmental Awareness application Prototypes | M42 | M42 | TKK |

## 3.7 WP 8 – Showcase 3: TimeWarp

### 3.7.1 Objectives and starting point of work

The aim of this work package is the development of TimeWarp, a mixed reality game in an urban context that allows users to experience a city in the past, present and future with a large variety of different media channels and interaction devices. The TimeWarp application will incorporate state-of-the-art interaction and communication technologies such as camera cell phones, wearable computing devices and sensors to facilitate a new quality of mixed reality experiences. It will increase the understanding of interaction and collaboration across different mixed reality user interfaces and foster research and innovation for mixed reality entertainment applications.

The objectives for phase III were:

- To advance the infrastructure and gameplay by

  - Providing a more convenient, intuitive and reliable interface
  - Improving the gaming experience to get a more joyful and exciting adventure to reach a stronger identification with the situation and environment and thus enhance the cross-reality presence.

- To develop and evaluate concepts and tools to gain a stronger presence experience by
  - Evaluating different display techniques regarding the influence of the presence experience
  - Supporting and using spatial sound
  - Exploring and applying techniques for advanced visualization

### 3.7.2 Progress towards objectives

During this third phase of TimeWarp we implemented and evaluated the second prototype of the TimeWarp game.The redesign was according to the findings of Phase II. The objectives of the redesign was to advance the infrastructure and gameplay by improving the interface and the gaming experience

This second prototype of TimeWarp was realized as a multi-user game, where two players have to play together. Each player is equipped with a UMPC-based device – the mobile AR system and a information and map tool.

A cross-media mixed-reality user interface based on state-of-the-art mixed reality technology provided by WP5 was realized. Also, an authoring to shape the TimeWarp application was realized using and extending tools provided by WP4.

To measure and evaluate the game play, the usability of the interaction techniques and the sense of presence, we conducted several test runs in August 2008. For that we developed appropriate evaluation methods. This includes an questionnaire for assessing sense of place and presence in mobile MR games.

During these user tests, we gathered data to check precence concepts developed within WP3. For exploration we have used video observations and interviews, and adapted MEC.

TimeWarp study also pointed to the need to consider the nature and types of locations chosen and the effect this will have on place and presence.

### 3.7.3 Deviations from project work program

No major deviations to be reported.

### 3.7.4 List of deliverables

| Del. no. | Deliverable name | Date due | Actual / Forecast delivery date | Estimated indicative person-months *) | Used indicative person-months *) | Lead con-tractor |
|---|---|---|---|---|---|---|
| D8.3 | Second Prototype of TimeWarp application | M36 | M36 | | | FIT |

*) if available

### 3.7.5 List of milestones

| Milestone no. | Milestone name | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|
| M8.8 | Time Warp application re-design finished | M29 | M29 | FIT |
| M8.9 | Second Time Warp prototype | M32 | M32 | FIT |
| M8.10 | ( Internal Report): Report on Time Warp application re-design | M36 | M36 | FIT |

## 3.8 WP 9 – Showcase 4: City Tales

### 3.8.1 Objectives and starting point of work

The WP9 City Tales work package was restarted at the beginning of the reporting period with the joining of the new partner in accordance with the Scientific Management Boards acknowledgement.
The new focus was set on providing mixed reality with an emphasis on a user generated content creation interface that can be used by a wide range of user groups. The aim was to investigate options to let users participate both actively and passively by enabling them to create mixed reality content via very simple user interfaces and probiding technology to browse the these. On the long term our target is to make mixed reality content available to a mass market and by doing so take away the technology based stigmatism in and around mixed reality applications and to provide an alternative forum for urban development.

For Phase III of the project these objectives were set:

- research of story-telling in urban environments
- development of client prototypes on mobile devices
- development of story-telling database infrastructure

### 3.8.2 Progress towards Objectives

- Conducted theoretical investigations on the questions raised during the planning phase.
    - Investigated a number of location based systems in order to learn from other research group experiences.
    - Formulated design goals from the principal questions raised during the theoretical phase.
    - Investigated the problem of awareness of other user's presence in the system.
    - Took technical decisions on the supported data formats.
- Selected a target area for the field studies to be carried out
    - formulated the target investigation area selection criteria
    - conducted together with UniAk an Urban Strategies Workshop to investigate the urban tissue of the selected region
    - working on the formalisation of the collected infromation to act as a base-line to further studies
    - colleced information will act as basis content layer for story creation by user groups
- Technical implementation
    - Second City Database system was developed to support industry standards in a superset of geo-located content management
    - Implemented MR-Player client on mobile phones based on the Studierstube ES framework to retrieve and display mixed reality content based on tracking information
    - Implemented first Walking Explorer prototype to automatically retrieve geo-located information on the spot while walking trough the city

- Implemented Wall Blogging prototype application to let users author and share mixed reality content and attach them to 2D markers placed in the urban environment

## 3.9 Deviations from project work program

The new research objective that was provided by WP9 after the new partner joined and did the reinitialization was finally acknowledged by the beginning of M27 by the review commitee. The technical implementation of the diverse client prototypes took a significant portion of the reporting period, taking also into account the necessity of a strong server architecture that had to be created as it's requirements were formulated from the theoretical investigations. As of these facts currently the evaluation phase of the diverse prototype is starting and preliminary informal studies have to be replaced by documented studies. In the planning of the next planning period we will take this minor delay into account and address the issue of the evaluation.

### 3.9.1 List of deliverables

| Del. no. | Deliverable name | Date due | Actual / Forecast delivery date | Estimated indicative person-months *) | Used indicative person-months *) | Lead con-tractor |
|---|---|---|---|---|---|---|
| D.9.3 | Initial Demonstrator of City Tales II application “Second City” | M36 | M36 | | | IMAG |

### 3.9.2 List of milestones

| Milestone no. | Milestone name | Date due | Actual/Forecast delivery date | Lead contractor |
|---|---|---|---|---|
| M9.8 | Second City application design finished | M28 | M29 | IMAG |
| M9.9 | Second City Prototype | M32 | M34 | IMAG |
| M9.10 | Second City Evaluation | M36 | M39 | IMAG |

# 4 Consortium Management

## 4.1 Consortium Management Tasks

### Achievements

The main achievements on the consortium management level were:

- Preparation of third amendment to the project contract (finally joint with amendment 2) in order to reflect the changes in the consortium and the anticipated changes as presented at the year 2 project review.
- Organization and accomplishment of the regular project meetings
- Organization and accomplishment of the monthly Executive Board meetings
- Organization and accomplishment of three Scientific Board meetings and three Management Board meetings
- Preparation of the year 3 management deliverables (this report, the evaluation summary report (D1.11), the 15-months plan for months 37-51).
- Preparation of the year 3 cost statement.

### Problems

At the start of year 3 the second amendment to the contract (SNS replaced by SONY, UCAM Deng as new project partner as result of the competitive call) was still pending, when the next (third) amendment (replacement of SONY by Imagination) became necessary.

While the original plan was to get the second amendment accepted by the EC befor actually submitting the third amendment, it turned out that due to some misunderstandings between Sony, the coordinator and the EC, additional documents regarding the replacement of SNS by its mother company SONY and according modifications to the second amendment were required. As this would have further delayed the submission of the third amendment, it was decided to withdraw the second amendment and combine it with the third one. This was done in particular to provide some pre-funding to the new partner Imagination as soon as possible.

Due to further delays based on missing or wrong audit certificates by SNS/SONY the final submission and processing of the amendment was further delayed. This also affected the processing of the second cost statement. As a result, not only the new partners (UCAM Deng and Imagination) had problems regarding unexpected necessity of pre-financing all project activities, but also some other partners (in particular UniAK) faced severe financing problems.

Problems were finally settled when the second cost statement had been processed and the second amendment had been accepted by the EC in October 2008. Fortunately implications for the the overall project progress were less severe than expected, resulting in some delays in WP9 only.

## 4.2 Contractors

Wolfgang Broll will be replaced by his colleague Rod McCall as coordinator of the consortium.

The problems faced regarding SNS/SONY are described in detail in the previous sub-section.

There were a couple of changes within the individual project boards:

In the Executive Board the following work package leaders were replaced during year 3 or will be replaced at the time of the year 3 review meeting:

- Wolfgang Broll will be replaced by Rod McCall as WP1 leader at the year 3 review meeting
- Thorsten Fröhlich replaced Jan Ohlenburg as WP4 leader
- Markus Sareika replaced Denis Kalkofen as WP5 leader
- Ann Morrison replaced Giulio Jacucci as WP7 leader
- Anne-Kathrin Braun replaced Iris Herbst as WP8 leader. Anne-Kathrin Braun will be replaced by Richard Wetzel at the year 3 review meeting.
- Sabiha Ghellal will be replaced by Zsolt Szalavari as WP9 leader starting from the year 2 review

In the Scientific Board Dieter Schmalstieg was re-elected as speaker of the board, Jean-Jacques Terrin again was elected as visiting member, and Giulio Jacucci was replaced by Ann Morrison. Rod McCall will replace Wolfgang Broll in year 4.

In the Management Board Michael Gervautz joined as new representative for Imagination, while Sabiha Ghellal left the board when SONY left the project consortium. Rod McCall will join the board as coordinator and representative of FIT (replacing Wolfgang Broll).

## 4.3 Project Timetable and Status

In general, almost all project activities are in line with the original description of work.

A formal deviation within UniAK´s planned PM budget was the shift of person months from WP6 to WP5; in the detailed work plans for months 1 - 24, the development of the MRTent was erroneously allocated to WP6. For the following periods, UniAK will readjust the allocation of PMs between WP5 and WP6.

WP4 and WP5: Some developments originally planned for year 3 had to to be postponed to year 4 due to labor shortage at FIT (see below for details).

WP7: The project timetable contains more iterations and field tirals of the prototypes than originally planned for months 25-42 with the design stages going according to plan and the development phase being acclerated for both Environmental Awareness applications. The original envisaged first prototype implementation was for June with trials for MapLens and then in November with a permanent installation as part of Forces of the Night festival utilising CityWall and Illuminate technology. Instead we had first prototype iteration implementation of MapLens in March with field trials, and second iteration implementation of MapLens in August with extensive field trials. Illuminate as the pervasive technology was placed on hold with the continuation of the pervasive element integrated into the other two applications. Firstly, with the development of a pervasive game as the evaluation methodology for MapLens and secondly with the inclusion of pervasive technologies for user co-creation of content with CityWall (e.g SMS, MMS, email content goes directly to CityWall). CityWall had a first prototype implementation and opening at downtown Helsinki with the opening of its new 3D interface. We invited local press, made a video on the night and outputted to YouTube video. There is a large multitouch community and this video grabbed more than ¼ million visits within its first two weeks. You can see the video visiting http://www.youtube.com/watch?v=IldDrCcZkZY. YouTube added this video to it's recommended pages in week 4, so we gained more visits that week also. We then had a second iteration implementation of CityWall at European City of Sciences exhibition at Le Grand Palais in Paris November, 2008. The event was very popular among Parisians, attracting over 50 000 visitors in a few days. We took extensive field trial data at this event.

As it stands we have developed and field trial-ed the early iteration environmental awareness prototypes earlier than originally planned. We had unforeseen opportunities to showcase the work, and access to an experienced developer for a shorter period of time than anticipated, so we needed to accelerate and implement our prototype iterations and development and corresponding design etc in this phase accordingly. As a consequence, we used more

person-months in this period, as well as more materials budget, but as a positive we have more feedback on the extra implementations, so we can do the fine-tuning of the work for the final prototypes and field trials with more extensive information, feedback and development to hand.

WP9: Realization of 3D content creation was postponed compared to to the original plan. Thus, testing and further development will have to be done in year 4.

### 4.3.1 Deviations from cost or person-months budgets

The tables below shows the actual use of person months by each project partner within the previous working period. It also shows the number of planned person months for this period. Please note, that there actually has never been a specific plan for the 12-months working period. All efforts are calculated from the 18-months plan (using 2/3 of the person months for each work package). While this may be correct in case of linear usage of resources, it may differ from the actual work plan significantly for individual work packages and/or project partners. Thus, even while this table – in our opinion – has some significant shortcomings, we provide it here upon particular request of the reviewers.

| RTD | | TOTAL | Coord. FIT | TUW | TUG | UOulu | UniAk | UMLV | TKK | AAU | UCAM DENG | IMAG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Workpackage 1: Consortium and Project Management | actual | **6.7** | 2.5 | 0.4 | 1.0 | 0.5 | 0.5 | 0.5 | 0.0 | 0.0 | 0.5 | 0.8 |
| | planned | **7.2** | 2.7 | 0.4 | 0.7 | 0.7 | 0.5 | 0.3 | 0.0 | 0.0 | 0.5 | 0.5 |
| Workpackage 2: Dissemination and Knowledge Management | actual | **10.0** | 2.3 | 0.4 | 1.0 | 1.3 | 0.5 | 4.0 | 0.0 | 0.0 | 0.5 | 0.0 |
| | planned | **9.1** | 2.3 | 0.4 | 0.7 | 1.3 | 0.5 | 2.3 | 0.0 | 0.0 | 0.5 | 1.0 |
| Workpackage 3: Cross-Reality Presence and Experience | actual | **27.9** | 3.5 | 10.7 | 0.0 | 2.7 | 0.3 | 4.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| | planned | **25.2** | 3.7 | 8.3 | 0.0 | 2.7 | 0.5 | 3.3 | 6.7 | 0.0 | 0.0 | 0.0 |
| Workpackage 4: Cross-Reality Interaction and Authoring Tools | actual | **26.6** | 5.0 | 5.2 | 3.0 | 12.1 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.3 |
| | planned | **23.2** | 8.0 | 2.5 | 3.3 | 6.7 | 0.0 | 0.0 | 1.3 | 0.0 | 0.7 | 0.7 |
| Workpackage 5: Mixed Reality Infrastructure | actual | **51.7** | 2.0 | 4.6 | 16.5 | 11.6 | 0.9 | 0.0 | 0.0 | 6.6 | 9.5 | 0.7 |
| | planned | **47.3** | 8.0 | 0.9 | 14.7 | 6.7 | 0.3 | 0.0 | 0.0 | 8.7 | 7.3 | 0.7 |
| Workpackage 6: Urban Renewal Showcases | actual | **23.7** | 0.2 | 9.5 | 3.0 | 0.5 | 3.0 | 5.5 | 0.0 | 1.8 | 0.0 | 0.2 |
| | planned | **19.1** | 0.5 | 3.9 | 2.0 | 2.7 | 2.7 | 4.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| Workpackage 7: Environmental Awareness Showcase | actual | **33.9** | 0.2 | 0.2 | 3.0 | 3.0 | 0.1 | 2.0 | 24.9 | 0.0 | 0.5 | 0.0 |
| | planned | **25.2** | 0.5 | 2.8 | 3.3 | 2.7 | 0.5 | 2.7 | 12.0 | 0.0 | 0.7 | 0.0 |
| Workpackage 8: Time Warp Showcase | actual | **15.5** | 11.0 | 0.5 | 0.4 | 0.0 | 0.1 | 1.5 | 0.0 | 0.0 | 0.0 | 2.0 |
| | planned | **22.5** | 11.0 | 2.0 | 0.3 | 0.3 | 0.5 | 1.3 | 0.0 | 0.7 | 0.3 | 6.0 |
| Workpackage 9: City Tales Showcase | actual | **19.6** | 1.6 | 0.2 | 0.4 | 0.1 | 0.4 | 1.5 | 0.0 | 0.0 | 0.0 | 15.4 |
| | planned | **23.9** | 4.7 | 1.7 | 0.3 | 0.3 | 0.5 | 1.3 | 0.0 | 0.7 | 0.3 | 14.0 |
| RTD total | actual | **216.3** | **28.3** | **31.7** | **28.3** | **31.8** | **5.8** | **19.0** | **31.6** | **8.4** | **12.0** | **19.4** |
| | planned | **202.6** | **41.4** | **23.1** | **25.3** | **24.0** | **6.0** | **16.0** | **20.7** | **10.7** | **11.0** | **23.5** |

| RTD AC own staff | | TOTAL | Coord. FIT | TUW | TUG | UOulu | UniAk | UMLV | TKK | AAU | UCAM DENG | IMAG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Workpackage 1: Consortium and Project Management | Actual | 3.5 | | 1.4 | 0.30 | 0.50 | 0.30 | | 0 | 0.7 | 0.25 | |
| | Planned | 4.9 | | 1.3 | 2.0 | 0.3 | 0.2 | | 0.0 | 0.7 | 0.3 | |
| Workpackage 2: Dissemination and Knowledge Management | Actual | 2.0 | | 0.0 | 0.0 | 1.0 | 0.2 | | 0.0 | 0.5 | 0.3 | |
| | Planned | 1.9 | | 0.0 | 0.0 | 0.3 | 0.2 | | 0.0 | 1.0 | 0.3 | |
| Workpackage 3: Cross-Reality Presence and Experience | Actual | 2.9 | | 2.4 | 0.0 | 0.5 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| | Planned | 2.0 | | 2.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| Workpackage 4: Cross-Reality Interaction and Authoring Tools | Actual | 2.5 | | 2.5 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| | Planned | 0.9 | | 0.5 | 0.3 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| Workpackage 5: Mixed Reality Infrastructure | Actual | 2.2 | | 0.0 | 0.7 | 0.0 | 0.0 | | 0.0 | 1.5 | 0.0 | |
| | Planned | 1.3 | | 0.0 | 0.7 | 0.0 | 0.0 | | 0.0 | 0.7 | 0.0 | |
| Workpackage 6: Urban Renewal Showcases | Actual | 2.9 | | 1.6 | 0.0 | 0.5 | 0.3 | | 0.0 | 0.5 | 0.0 | |
| | Planned | 2.8 | | 1.2 | 1.3 | 0.0 | 0.3 | | 0.0 | 0.0 | 0.0 | |
| Workpackage 7: Environmental Awareness Showcase | Actual | 2.2 | | 0.2 | 0.0 | 0.0 | 0.0 | | 2.0 | 0.0 | 0.0 | |
| | Planned | 1.0 | | 0.0 | 0.3 | 0.0 | 0.0 | | 0.7 | 0.0 | 0.0 | |
| Workpackage 8: Time Warp Showcase | Actual | 0.3 | | 0.3 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| | Planned | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| Workpackage 9: City Tales Showcase | Actual | 0.2 | | 0.2 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| | Planned | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| RTD AC own staff total | actual | 18.7 | | 8.6 | 1.0 | 2.5 | 0.8 | | 2.0 | 3.2 | 0.6 | |
| | planned | 14.7 | | 5.1 | 4.7 | 0.7 | 0.7 | | 0.7 | 2.3 | 0.7 | |

| DEMONSTRATIONI | | TOTAL | Coord. FIT | TUW | TUG | UOulu | UniAk | UMLV | TKK | AAU | UCAM DENG | IMAG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Workpackage 6: Urban Renewal Showcases | actual | 2.6 | 0.0 | 0.4 | 1.5 | 0.0 | 0.2 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | 2.5 | 0.0 | 0.5 | 0.3 | 0.3 | 0.0 | 0.0 | 0.7 | 0.3 | 0.3 | 0.0 |
| Workpackage 7: Environmental Awareness Showcase | actual | 4.0 | 0.0 | 0.0 | 1.5 | 0.5 | 0.0 | 0.5 | 1.5 | 0.0 | 0.0 | 0.0 |
| | planned | 2.2 | 0.0 | 0.0 | 0.3 | 0.3 | 0.0 | 0.5 | 0.7 | 0.0 | 0.3 | 0.0 |
| Workpackage 8: Time Warp Showcase | actual | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | 1.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.3 | 0.2 |
| Workpackage 9: City Tales Showcase | actual | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | 1.9 | 0.5 | 0.3 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.3 | 0.0 | 0.2 |
| DEMONSTRATION total | actual | 7.1 | 0.5 | 0.4 | 3.0 | 0.5 | 0.2 | 1.0 | 1.5 | 0.0 | 0.0 | 0.0 |
| | planned | 8.1 | 1.0 | 0.9 | 0.7 | 0.7 | 0.0 | 1.6 | 1.3 | 0.7 | 1.0 | 0.3 |

| TRAINING | | TOTAL | Coord. FIT | TUW | TUG | UOulu | UniAk | UMLV | TKK | AAU | UCAM DENG | IMAG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Workpackage 4: Cross-Reality Interaction and Authoring Tools | actual | **0.2** | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | **0.8** | 0.1 | 0.0 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Workpackage 5: Mixed Reality Infrastructure | actual | **1.2** | 0.2 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | **0.8** | 0.1 | 0.0 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Workpackage 6: Urban Renewal Showcases | actual | **1.3** | 0.0 | 0.3 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | **1.3** | 0.0 | 0.3 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
| Workpackage 7: Environmental Awareness Showcase | actual | **0.5** | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | **2.0** | 0.0 | 0.0 | 0.3 | 0.3 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 |
| Workpackage 8: Time Warp Showcase | actual | **0.6** | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | **0.4** | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| Workpackage 9: City Tales Showcase | actual | **0.2** | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | planned | **1.2** | 0.2 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.2 |
| TRAINING total | actual | **4.0** | **1.2** | **0.3** | **2.0** | **0.5** | **0.0** | 0.0 | **0.0** | **0.0** | **0.0** | **0.0** |
| | planned | **6.5** | **0.7** | **0.8** | **1.3** | **1.3** | **0.0** | **0.0** | **1.3** | **0.7** | **0.0** | **0.3** |

| MANAGEMENT | | TOTAL | Coord. FIT | TUW | TUG | UOulu | UniAk | UMLV | TKK | AAU | UCAM DENG | IMAG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Workpackage 1: Consortium and Project Management | actual | **6.0** | 6.0 | | | | | | | | | |
| | planned | **8.0** | 8.0 | | | | | | | | | |
| MANAGEMENT total | actual | 6.0 | 6.0 | | | | | | | | | |
| | planned | 8.0 | 8.0 | | | | | | | | | |

| TOTAL ACTIVITIES | | TOTAL | Coord. FIT | TUW | TUG | UOulu | UniAk | UMLV | TKK | AAU | UCAM DENG | IMAG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total (without AC own staff) | actual | **214.0** | **36.0** | **32.4** | **33.3** | **32.8** | **6.0** | **20.0** | **33.1** | **8.4** | **12.0** | **19.4** |
| | planned | **225.2** | **51.1** | **24.7** | **27.3** | **26.0** | **6.0** | **17.6** | **23.3** | **12.0** | **12.0** | **24.2** |

At FIT the number of PMs used for RTD was significantly lower than planned. This in particular influenced work in the work packages 4, 5 and 9, while work in the other work packages was pretty close to the original estimation. There were two major reasons for the deviations observed. As already reported at the year 2 review, in WP4 the former work package leader Jan Ohlenburg left FIT and was replaced by Thorsten Fröhlich, who also took over FIT's responsibilities in WP5. However, due to a serious disease he was not available during most of year 3. As it was not possible to find another short term replacement, this resulted in a significantly lower activity in WP4 and WP5. While adaptions and extensions to existing tools and infrastructure as required by the showcases (in particular WP8 TimeWarp) still could be delivered, further developments had to be postponed to the final project year. The second reason was the rather slow start of WP9 activities due to the delay of the amendment. In combination with the missing development of new authoring tools (WP4) this resulted in significantly less contributions to WP9 as originally planned. With the WP4 leader recovered meanwhile and two additional researchers having

joined the project, we are convinced that we will catch up during the last 15 months of the project.

At TUG we have more PM available because the planned PM efforts account for one post doc working for the whole project duration. Since our post doc has left the project we have used up the remaining funds for PHD students resulting in more PMs.

At TKK we have finished development of iterations of the environmental awareness prototypes ahead of time, taking up opportunities to showcase the work, and access an experienced developer for a shorter period of time than anticipated. Consequently we needed to accelerate and implement prototype teration development and corresponding design etc in this phase earlier than expected. We have two implementations of the two prototypes integrating the third component (pervasive) into both, with four extensive and one comparative field trial. The orginal time plan had one prototype implementation for each application. As a consequence, we used more person-months in this period than anticipated in our original plan. In 2008 we had a cross-over with two teams running as there was a han-over between the new team and the old team, who left to begin the start-up company *multitouch*. We also started with a new and less-experienced team. The new team needed to spend time familiarising themselves with the project, addressing a new brief of environmental awareness and matching skill levels to tasks. This affected the amount of months needed to get the assigned work done, and while salary levels were lower, PMs were increased to get the work done, and also more experienced supervision was needed. We also needed to address some issues around more durable solutions for both the technical implementation and portable solution for CityWall. We needed to build from scratch both these solutions 1) the technical to suit our new developer—we have a chronic shortage of developers in Finland—and 2) the portable to produce a more lightweight but durable solution. Most of the components from an earlier version were un-usable, broken, or re-purposed to contine maintaining the permanent installation in Helsinki, and/ or were no longer compatible with the strides taken in the development. We also continue development and field trials beyond early initial expectations with MapLens. As well as this, we published our results as we went, to ensure our the publications of our breakthroughs in research kept up with our developments, and all our first-in-the-field results were up-to-date in the highly competitive fields they operate within. Consequently we spent more PMs, as well as more funds on consumable equipment and travel. We asked for extra funds (4K) to cover consumables costs for CityWall.

At **UMLV** major deviations have accured concerning the work effort for WP2 and WP3. The organisation of the Cergy-Pontoise urban renewal workshop in parallel with the summer workshop of Cergy-Pontoise (*les ateliers d'été de Cergy-Pontoise*) has demanded additional efforts concerning organisation: we have organised several presentations with the University of Cergy-Pontoise, the Metropolitain Autority of Cergy-Pontoise and the Ateliers urban planning association as well as the city of Pontoise to present IPCity project and come up with a collaboration scheme. The participation of the IPCity Project within European City of Science program is the second dissemination event that has demanded additional efforts: preparing of the project submission, meetings with the organizing committee and with project partners on exposition content, stand design issues, security issues, city wall and tent deliveries, costs as well as the conception of dissemination trials with special content along with TUW has been some of the activities hat have demanded extra effort. This is why we have used more PMs for WP2 as we have informed the project consorsium in june 2008.
We have at the same time used more PMs than forseen for WP6: this is because the cultural probes sessions, organized in july in Cergy Pontoise, that have not been forseen in the original program, have demanded additional effort as well the following analysis of interviews realized with participants. Moreover the organization of the workshop has been more complicated then the others as the use of the MR-Tent has demanded increased effort.
Moreover, the PM resources allocated to UMLV do not allow us to distribute correctly and totally the personnel effort for internal reasons to our university. In order to entirely carry out this effort in the workpackages and the showcases, we have asked for 8 additional PM for

low cost personnel focused on certain tasks needed for dissemination and the organisation of the field trials. (to be completed)

Also at TUW the preparation for the European City of Science event demanded extra work that had not been foreseen, such as creating a panorama of the Grand Palais and special 2D and 3D content for visitors to work with and some simplifications of interactions. Moreover, preparing participants and content for participatory workshops in WP6 demands considerable more effort than was envisioned. However, this is also an important evaluation result considering the inclusion of heterogenous user groups in experimentations with mixed reality technologies within complex urban projects.

UniAK´s PMs deviations also relate to the showcase WP6. Apart from unexpected additional effort that was needed for implementation and redesign of the MR-Tent, which also caused additional PMs in WP5, we used more PMs for supporting the organization of the workshops and the preparation of the large amounts of 2D content, panoramas and physical maps. Especially logistics concerning MR-Tent transportation and set up was time consuming. Nevertheless we managed to more intensely contribute to WP9, by investigating certain aspects of the urban environment that strongly relate to both of the showcases (WP6.WP9).

In WP9 contribution to WP8 was significantly lower than expected, the integration of us as the new partner to the WP and the delay in the corresponding amendment and by that in the re-start of the revised showcase. Training, demonstration and dissemination activities were delayed to the upcoming period IV of the project as noted in the progress report – due to the nature of the process of joining to an already running project and restarting the work package focus with the joining of the new partner.

## PROJECT BARCHART and STATUS

| | |
|---|---|
| **Acronym:** | **IPCity** |
| **Contract N°** | **27571** |

| Month / Year | | M25 M26 M27 M28 M29 M30 M31 M32 M33 M34 M35 M36 M37 M38 M39 M40 M41 M42 |
|---|---|---|
| | | 3rd year / 4th year |
| **Workpackage 1:** | **Mangement** | |
| Task 1.14 | Organ. of year two review | |
| Task 1.16 | Coord. of year two review take-up measures | |
| Task 1.17 | Organ. of general project meetings | |
| Task 1.18 | Monthly meetings of the Executive Board | |
| Task 1.19 | Regular meetings of the Scientific Board | |
| Task 1.20 | Prep. annual project progress report (year 3) | |
| Task 1.21 | Prep. evaluation summary report (year 3) | |
| Task 1.22 | Prep. detailed work plan (months 37-51) | |
| Task 1.23 | General reporting | |
| Task 1.24 | Organ. of year 3 review | |
| Task 1.25 | Coord. of year 3 review take-up measures | |
| **Workpackage 2:** | **Dissemination** | |
| Task 2.10 | Improvement of dissemination strategy | |
| Task 2.11 | Dissemination of project results | |
| Task 2.12 | Evaluation of dissemination activities | |
| Task 2.13 | Improvement of dissemination strategy for phase 4 | |
| **Workpackage 3:** | **Cross-Reality Presence and Experience** | |
| Task 3.9 | Formulate guidelines for interface design | |
| Task 3.10 | Redesign of concept map | |
| Task 3.11 | Sound research: interviews and analysis | |
| Task 3.12 | Development of sound probes in participatory design workshops | |
| Task 3.13 | Further testing of conceptual framework in participatory workshops | |
| Task 3.14 | Analysis of the data from workshop and field trials | |
| Task 3.15 | Consolidation of approach regarding ethical and gender issues | |
| Task 3.16 | Consolidation of approach to study presence and interface design based on evaluation results | |
| Task 3.17 | Re-design of research approach | |
| Task 3.18 | Consolidation and further development of research approach | |
| **Workpackage 4:** | **Cross-Reality Interaction and Authoring** | |
| Task 4.8 | Re-design of second set of tools | |
| Task 4.9 | Development of third set of tools | |
| Task 4.10 | Integration in showcase application | |
| Task 4.11 | Evaluation of third set of tools | |
| Task 4.12 | Final re-design of tools | |
| Task 4.13 | Development of final set of tools | |
| **Workpackage 5:** | **Mixed Reality Infrastructure** | |
| Task 5.8 | Re-Design of MR infrastructure prototypes | |
| Task 5.9 | Development of third set of prototypes | |
| Task 5.10 | Integration in showcase application, testing, demo | |
| Task 5.11 | Evaluation period | |
| Task 5.12 | Final re-design and re-planning | |
| Task 5.13 | Final development period | |
| **Workpackage 6:** | **Showcase 1: Urban Renewal** | |
| Task 6.13 | Redesign of Urban Renewal applications | |
| Task 6.15 | Development of new functionalities | |
| Task 6.16 | Negotiations with European cities on workshops | |
| Task 6.17 | Preparing and carrying out final participatory workshops | |
| Task 6.18 | Analysis of fieldwork | |
| Task 6.19 | Final re-design of urban renewal application | |
| Task 6.20 | Development of final urban renewal prototype | |
| **Workpackage 7:** | **Showcase 2: Large-Scale Events** | |
| Task 7.10 | Re-design of WP as Environmental Awareness | |
| Task 7.11 | Development of new version of components | |
| Task 7.12 | Preparation and carrying out of public field trials. | |
| Task 7.13 | Analysis of field trials. | |
| Task 7.14 | Final re-design of Environmental Awareness Prototypes | |
| Task 7.15 | Refinement of Environmental Awareness Prototypes | |
| **Workpackage 8:** | **Showcase 3: TimeWarp** | |
| Task 8.5 | Re-design of TimeWarp application | |
| Task 8.6 | Development of first TimeWarp prototype | |
| Task 8.7 | Testing and public demonstration | |
| Task 8.8 | Evaluation of the first Time Warp prototype | |
| Task 8.9 | Re-design of first TimeWarp prototype | |
| Task 8.10 | Development of the second TimeWarp prototype | |
| **Workpackage 9:** | **Showcase 4: City Tales** | |
| Task 9.11 | Design of "SecondCity" | |
| Task 9.12 | Development of "Second City" application and authoring tools | |
| Task 9.13 | Testing and Public Demonstration of first "Second City" application | |
| Task 9.14 | Evaluation of "Second City" | |
| Task 9.15 | Re-design of "Second City" | |
| Task 9.16 | Development of the integrated "Second City" | |

### 4.3.2 Communication and Meetings

#### Communication Issues

All project-internal communication issues and mechanisms (including emails, documents, meetings, minutes, internal review mechanism, publications, etc.) are set down in detail in the project handbook, which has been updated according to recent requirements. All dissemination issues (including the public web page, the Wiki, and the newsletter) are also dealt with in the dissemination plan.

Communication between the individual project partner has been promoted by the use of 14 email lists tailored to the individual needs of the project structure (one for all people involved in the project, one for each board, one for administrative issues, one for each work package). All email lists are archived and can be browsed through the Internet by any project member.

Further, the BSCW shared workspace system hosted by FIT is used as the main platform for the exchange of documents and software, the collaborative preparation of deliverables and reports, polls regarding specific project issues, etc. It is further used for electronic provision of deliverables to the EC and the project's reviewers.

While the IPCity web server is maintained by UOulu, all partners are required to contribute and especially each work package leader is responsible for updates of WP related information. The IPCity newsletter is used to distribute information not only outside but also inside the project related to the project topics.

#### Meetings

During the third phase of the project (year 3, months 25 - 36) three general project meetings took place: the second review meeting at the University Pompeu Fabra in Barcelona (February 24-26, 2008), the second assembly at TUG in Graz (April 28-29, 2008), and finally the third organized by UCAM DENG in Cambridge (Sep. 29 – Oct. 1, 2008). Beside these meetings, a large number of bilateral and multilateral working meetings and workshops (often including parties from several work packages) took place. Additionally, from Nov. 12-16, 2008 a majority of the IPCity project partners participated in the European City of Science (ECS) exhibition in the Grand Palais in Paris.

There were three meetings of the Scientific Board: one at each general project meeting.

The project's Executive Board met in person at each project meeting. Additionally there were monthly telephone conferences of the Executive Board, checking and coordinating the monthly project progress according to the monthly internal progress report provided by each work package leader based on the input received from the individual work package participants.

Multiple member from the project consortium as well as the whole project were also involved in the RAVE08 workshop, the presence in urban environments workshop at CHI 2008 in Florence, the PEACH summer school in Dubrovnik, and other EC-related presence activities.

#### Co-operations

The project already cooperates with the PRESENCCIA project and the IPerG project. These co-operations are mainly driven by shared partners and/or shared activites. TUG, that also is partner of PRESENCCIA and FIT cooperate with PRESENCCIA in the area of solutions for ubiquitous tracking.

Cooperation with HITLAB NZ and to some extend also to the University of Otago has been established by the exchange of researchers and the acquisition of two new projects fostering the exchange of researchers: MIRACLE – a bi-national project between Germany and New Zealand, involving FIT and HITLAB NZ, and MARCUS, an EC funded IRSES project (Marie-Curie) including the European partners FIT (coordinator), TKK, and TUG, and the NZ

partners HITLAB NZ (University of Canterbury) and the University of Otago. It is further anticipated (as originally planned already two years ago) now to include HITLAB NZ as full IPCity project partner (without EC funding) in the fourth year of IPCity.

TUG cooperates with the WkiVienna project in the development of the interactive 3D reconstruction component, which is part of workpackage 5.

TKK worked with the Natural History Museum, Finland and with SYKE, Finnish Ministry for the Environment to implement both MapLens and CityWall environmental awareness applications as part of WP7.

# 5 Other Issues

None.

# 6 Annex: Plan for Using and Disseminating Knowledge

## 6.1 Exploitable knowledge and its use

The CityWall application has been developed further and it is exploited by a spin-off company. The technological framework and components are matured, are widely used within the project and can in principle be exploited further.

WP3:

- an original conceptual (concept map) and methodological contribution to research on presence and experience in mixed media environments; a conceptual and empirical exploration of sound and presence

WP4:

- A device-independent cross-platform access mechanism, based on DEVAL, OpenTracker and OpenVideo
- Three authoring tools: Interaction Prototyping Tool,AuthOr, and Mobile Media Collector
- Multi-Touch Display

WP5:

- Location aware content management (retrieval, processing, appending) using the Distributed Media Entrance and Management technology and any combination of developed tracking technologies
- Software framework enabling MR on handheld devices, sub-notebook devices or semi-stationary device
- Mobile and stationary Tracking solutions providing more natural approach to tracking maps and real object textures in the environment
- Streaming solutions for bridging audio and video streams across networks enabling live wireless transmissions between remote locations
- MR tent for MR experiences outside the lab

WP6:

- several novel application concepts focussing on stakeholder participation and different forms of representations
- several novel mixed reality concepts: see-through augmentation, real time video augmentation and (static or dynamic) ‚panorama'
- several novel interaction concepts based on tangible user interfaces (ColorTable)

WP7:

- three novel application concepts: Augmented Map Lens (a mobile application with awareness cues and optical markers, updated to add dynamic content to local maps with the ability for users to upload images and content);
- CityWall, (a multi-touch screen installation for groups of visitors and a permanent installation that allows bi-directional input)—now its own expanding start-up company and attracting new clients with 10 large and 10 small cells being sold (as far a field as Australia) as well as 2 larger projector-based installations ; implementation of pervasive technology with these two applications.

WP8:

- novel concepts for sound design in MR outdoor games
- novel concepts for handheld mixed reality interactions
- novel concepts for level design and game elements for MR games in urban environments
- novel concepts for player collaboration in outdoor MR games

WP9:

- two technology probes: a tangible user interface allows content creation for everyone, and a location aware mobile, music based City tour.
- Server-client based automated mobile MR content retrieval system using the MR-Player implementation.
- Location aware server-client based content retrieval and authoring.
- MR wall blogging as communication tool between participants.

## 6.2 Dissemination of knowledge

During the third year the technology developed in the project has has matured, leading to a number of field trials with real users in ambitious and extensive settings. This has led both a number of technology-related publications targeted to specific audiences, and increasing publications based on the results of field trials. Also the theoretical and methodological work has reached the level where it can be evaluated by the Presence research community. The volume and quality of publications has been increasing steadily. Although the major emphasis of the publications has still been on human-computer interaction and mixed reality environments, the scope of publication forums has broadened both towards more specialized technical audiences, and towards the stakeholder communities.

| Planned/actual Dates | Type, name and location | Type of audience | Countries addressed | Size of audience | Partner responsible /involved |
|---|---|---|---|---|---|
| Jan 7-8 2008 | Conference, IEEE 2008 Winter Vision Meetings, Workshop on Application of Computer Vision, Colorado,USA | Research | International | Na | AAU |
| Jan 30-31 2008 | Conference & workshop on mixed reality technologies, urban projects and IPCity at Université de Montreal, School of architecture and institute of environment, Canada | Research | International | Na | UMLV |
| Feb 18-21, 2008 | Conference, ACM Tangible and Embedded Interaction 2008, Bonn, Germany | Research | International | Na | TUW |
| Feb 27 2008 | Conference, Rave¨08, Barcelona, Spain | Research | International | Na | FIT |
| Mar 8-12 2008 | Conference, VR2008, Reno NV USA | Research | International | Na | FIT |
| Mar 8-9 2008 | Conference, IEEE 3DUI 2008, Reno, Nevada USA | Research | International | Na | FIT |
| Apr 5-10 2008 | Conference, CHI 2008, Florence, Italy | Research | International | Na | FIT, TKK, TUG, TUW, UOULU, SONY |
| Apr 15-21 2008 | Visits to UC Berkeley School of Information, Berkeley Institute of Design (BID), Communication between Humans and Interactive Media (CHIMe) Lab of Stanford University, Nokia Research Center (NRC), Palo Alto, California, USA | Research | International | Na | TKK |
| Apr 29 2008 | Field Trial: Map Lens-new prototype for environmental awareness- 5 people | Research | Finland | 5 | TKK |
| May 13 2008 | Presentation of IPCity Project to the Ateliers urban planning association. | General | France | Na | UMLV |

| Planned/actual Dates | Type, name and location | Type of audience | Countries addressed | Size of audience | Partner responsible /involved |
|---|---|---|---|---|---|
| May 28-30, 2008 | Conference, AVI 2008, Napoli, Italy | Research | International | Na | TKK |
| June 3 2008 | Presentation of IPCity project at a CNRS research prospective meeting. | Research | France | Na | UMLV |
| June 19 2008 | Workshop on time, distance and reachability Vienna, Austria | Research | | 8 | UniAK, TUW, TUG, FIT |
| July 1-3, 2008 | Conference, International Conference on Image and Signal Processing, ICISP. | Research | International | | AAU |
| July 2-9 2008 | Video capture of CityWall activity in new location with same interface as a control and comparative use group. Analysis not completed. | Research, General | Finland | Expected 50-200 participants | TKK |
| July 17-18 2008 | Workshop "Managing e-paricipatory knowledge" Bari University, Dept Architecture | Research | International | 25 | UOULU |
| August 07, 10, 17 2008 | Workshop, 3 field trials for Augmented MapLens Helsinki City Centre | Research, General | Finland | Total 37 | TKK, UOULU |
| August 11-15, 2008 | Conference, Siggraph'08, Los Angeles, CA, USA, 2008 | Research, General | International | | FIT |
| Sept 1-5, 2008 | Conference, British HCI conference, Liverpool, UK | Research | International | | TKK, UOULU, UCAM, FIT |
| Sept 02 - 05, 2008 | Conference, MobileHCI08 Amsterdam, The Netherlands | Research | International | | FIT |
| Sept 11-12 2008 | Conference, ShareIT –Shareable Interfaces for Learning Workshop, Brighton, UK | Research | International | Na | TKK |
| September 9, 2008 | Workshop on "Mobiles Spielen" at GI Informatik 2008, München | Research | Germany | Na | FIT |
| September 10 - 12, 2008 | Conference, International Conference on Digital interactive Media in Entertainment and Arts (Athens, Greece,). DIMEA '08 | Research | International | Na | FIT |
| Sept 10-13 2008 | Workshop, Cergy Pontoise Workshop, Paris, France | Research, General | France | 21 | UMLV, TUW, TUG, FIT, UniAK |
| Sep. 2008 | Conference, ACM International Symposium on Mixed and Augmented Reality, (ISMAR'08), Cambridge, UK. | Research | International | Na | FIT, TUG, UCAM |
| Sept 30-4 Oct 2008. | Conference, Participatory Design Conference 2008, Bloomington, IN, USA | Research | International | Na | UOULU |
| Oct 7-9, 2008 | Conference, MindTrek 2008, Tampere, Finland | Research, Industry | International | Na | UOULU |
| October 12, 2008 | Launch of new CityWall environmental awareness prototype downtown Helsinki. Local Press and Ministry for the Environment present. | General | Finland | Na | TKK |
| Oct 14-16 2008 | Event, European City Of Sciences Event Le Grand Palais, Paris, France | Research, General | International | Hundreds of users, thousands of visitors | All |
| Oct 27 – 31, 2008 | Conference, ACM Multimedia 2008, Vancouver, BC, Canada | Research | International | Na | TKK |
| Nov 3-5 2008 | Conference, ACM Futureplay Conference, Toronto, Canada | Research | International | Na | FIT |
| Nov 20 2008 | News (EuroNews), City of science: from satellites to scales http://www.euronews.net/en/article/20/11/2008/city-of-science-from-satellites-to-scales/ Features IPCity demonstrations. | General | International | Na | All |
| Nov 25 2008 | Conference on mixed reality technologies, urban projects and IPCity at Ecole Nationale des Ponts et | Research | France | Na | UMLV |

| Planned/actual Dates | Type, name and location | Type of audience | Countries addressed | Size of audience | Partner responsible /involved |
|---|---|---|---|---|---|
| | Chaussées (Master Amur), 25.11.2008 | | | | |
| Dec 2008 | Conference, International Conference on Pattern Recognition and Computer Vision, Bangkok, Thailand. | Research | International | Na | AAU |
| Dec 5-12, 2008 | Conference, Situated Large Displays Workshop, Australian CHI, OZCHI 2008, Cairns | Research | International | Na | TKK |
| Dec 1 2008 | Presentation of IPCity Project at Academy of fine Arts, Vienna. | Research | Austria | Na | UniAK |
| Various dates | Workshop, TimeWarp Test Köln, Germany | Research, General | | 16 | FIT |
| 2008 | Newsletter, "IPCity Research Project", in Allez Savoir, University of Cergy-Pontoise internal newsletter. | Research | France | Na | UMLV |

## 6.3 Publishable results

As a result of project dissemination activities during 2008 two magazine articles (GBR) and two web magazine articles (France) have been published. Members of the project have participated and made presentations in 25 conferences and workshops around the world. Altogether 11 workshops, demonstrations and field trials together with showcase stakeholders and end-users have been conducted in the showcases. Four journal publications, 18 conference papers and 21 workshop papers and posters have been published. Although the main emphasis in publication during the year has still been in forums for human computer interaction (HCI) and Mixed Reality, the scope has broadened both towards more specialized technical audiences (such as pattern recognition) and towards stakeholder communities (such as participatory design).

# Acknowledgements and Further Information

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*For further information regarding the IPCity project please visit the project web site at:*

*ipcity.eu*