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CLOUD COMPUTING AND MOBILITY AS THE MAIN TRENDS IN UNIFIED COMMUNICATIONS

The essence of communication is intention.
Werner Erhard

Introduction

Over the last 20 years globalization and the dynamic development of communications technologies have revolutionized everyday communication between companies and their customers, business partners and employees. Various communication modes and tools have come into use. Geographically dispersed organizations have been formed, where virtual teams work, often based in various parts of the world, meeting hardly ever or not at all. It has been noted that good communication involves not only disseminating information or resolving current problems. In order to unlock the potential of modern communications, companies have to use diverse technologies and systems integrating all their contact channels [Zdro13].

Nowadays, Unified Communications (UC) systems change the way people communicate for both business purposes and in private lives. A mere computer and Internet access permit effective communication. However, a unified interface, access to all channels, such as chat, telephone and video, file transfer, access to email and voicemail, desktop sharing, calendars, contact lists and tasks shared from any location with Internet access create new opportunities. Unified Communications allows for using a wide range of communications functions which facilitate the execution of everyday business tasks and, at the same time, give a chance to focus on the content of communication rather than a method of providing it [www7].

The developments in Unified Communications solutions enable mobile technologies, video conferencing and social networks to be used for business purposes. Other trends that can be observed include corporate migration towards integrated communications solutions provided by a single vendor and the development of virtualization technologies and cloud computing [Mars13]. However, organizations lack knowledge on the availability of a unified teleinformatics solution that enables truly effective communication. The aim of the paper is to analyze the latest trends in UC&C solutions for business and the benefits of their implementation.

Unified Communications

Unified Communications, also called integrated communications, has many definitions. A unified communications system is a set of communication services and solutions bundled, sold and delivered together as one single compact solution. UC enables the use of voice, data, Internet, video and other communication services through an integrated product or system, which is developed by a single vendor or in collaboration with supported partners [www9].

Gartner defines unified communications products (equipment, software and services) as those that facilitate the interactive use of multiple enterprise communications methods. It can include control, management and integration of these methods. UC products integrate communications channels (media), networks and systems, as well as IT business applications and, in some cases, consumer applications and devices [www8].

A UC system is a combination of hardware, software, network and other related solutions. A unified communications system is primarily designed to eliminate the need for buying and managing several communications technologies to collaborate and exchange information within an organization or among workers. Enterprise-class UC exhibits and provides most of the major real-time (voice and video) and near real-time (text, e-mail, fax) communication systems necessary for business productivity and operations [www9].

UC keeps workgroups connected enabling collaboration and streamlined business processes. It helps employees become more productive and work smarter by simplifying their communications process and by giving them easy access to the information they need and to advanced applications [www2]. The main advantage of this technology is its capability to provide a consistent unified interface and user experience over multiple devices and various media.

The major benefits to be gained by using the UC technologies include [www7]:

- improved communication and collaboration within a company as well as with its business partners and customers,
- a well-organized and unified flow of information within a company,
- flexibility resulting from mobile access,
- elimination of unnecessary business trips and costs of telecommunication services.

UC systems are used in numerous sectors of the economy, such as medicine, finance, construction and automotive industries, petroleum mining, science and education. Each market requires specific solutions, e.g. medical imaging combined with a long-distance image transfer, wireless image transfer in the construction industry or integration with e-learning applications.

The next generation communications applications integrate collaboration tools into business processes, thus exceeding the scope of the traditional UC solutions. Modern communications solutions – Collaboration − not only transform an employee workplace consisting of one graphical interface but also create a communications platform for all the parties of a business process: employees, suppliers and consumers [www6]. UC&C (Unified Communications and Collaboration) describes the combination of communications and collaboration technologies. Effective communication by itself does not suffice in business any longer. It is also necessary to collaborate remotely, exchanging information and sharing materials. Collaboration features include presence and working with colleagues on the same documents at the same time (Figure 1).

UC&C integrates real-time communication services such as instant messaging, presence information, audio and video, data collaboration, conferencing, location-based services, unified desktop client, call control and speech recognition with non-real-time communication services such as unified messaging (integrated voicemail, e-mail, SMS and fax). Blogs, social networks and discussion forums are also becoming part of the UC&C platform.

UC&C is not a product, but a framework to define a set of products that provides a consistent unified user interface and user experience across multiple devices and media types. UC&C allows flexible, scalable communication among groups and individuals. UC&C is more about the technologies and collaboration is more about the outcome. The UC&C strategies are always concerned with the outcome.
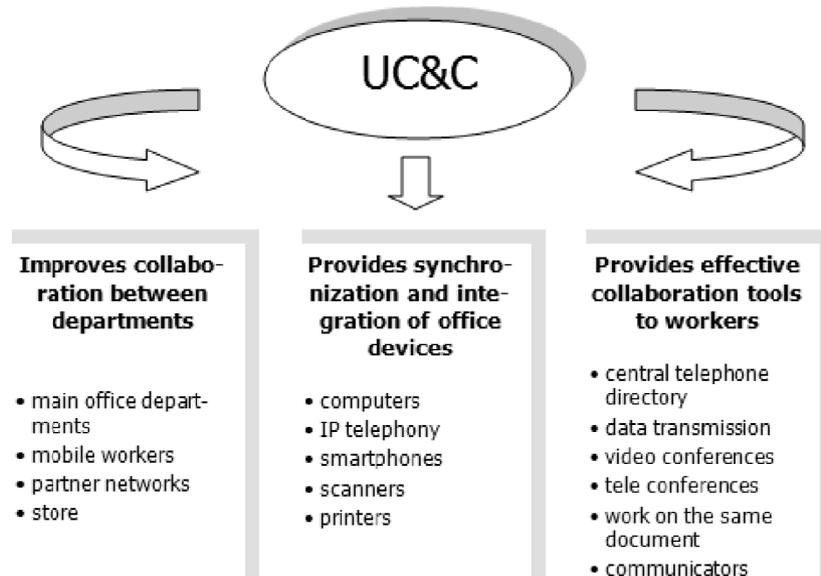
Fig. 1. Unified Communications and Collaboration

Source: Based on [www7].

At present, mobility and cloud computing are playing an increasing role in setting new UC&C trends. Due to the universal access to the mobile Internet it is possible to connect from any place in the world, while cloud enables users to perform more advanced operations directly on the Internet. Mobility combined with cloud computing is changing business. It makes business more immediate, more relevant, and more intelligent [Lope12].

Mobility

Mobile technologies are transforming enterprises, industries and the world. For a young generation of employees and consumers a smartphone is a major tool to communicate with the world. More than 80% workers currently conduct business on mobile devices, including both corporate-owned and "bring your own device" (BYOD) assets [www4]. Mobile workers depend on cellular phones, smartphones or tablets to access information and communicate. These devices require a high-performing corporate wireless network.

With mobile Unified Communications firms realize the benefits of both mobility and UC. By integrating mobility capabilities with traditional telephony, messaging, voice, presence and other business applications, mobile UC provides

businesspeople with the same integrated communications capabilities anywhere (in the office, at home, on the road etc.) and anytime on smartphones and other mobile devices that are fully integrated with the firm's communications and collaboration platform.

Mobile devices paired with UC offer real benefits to people in many roles in an enterprise. It enable workers and groups to work and easily collaborate from disparate locations. UC in conjunction with a mobility solution can increase employee productivity, improve customer service as well as enhance customer and employee satisfaction. Moreover, it can provide a significant return on investment (ROI) through improved workforce productivity [www5].

Research conducted by Frost & Sullivan among 700 American companies shows that they provide their employees with the mobile access to few UC&C applications, the most common being mobile email software and PIM (Personal Information Manager) tools [Bara13]. In Poland, Microsoft Office 365 enjoys popularity.

Cloud Computing

Cloud computing is one of the most efficient delivery models for UC. Cloud services are dynamically entering the ICT market. Cloud computing is a method of providing a set of shared computing resources that include applications, computing, storage, networks, development and development platforms, and business process [Mill12].

It is crucial for companies using cloud computing that the services are available at any time in any location, economical (a user should pay for using the computing power of the cloud, not its availability), scalable to individual needs and that they ensure tight data security.

The cloud model is composed of five essential characteristics, four development models (public, community, private and hybrid) and many service models. The essential characteristics of cloud computing are [HuKH12]:
- on-demand self-service – computing capabilities (such as server resources) can be unilaterally and automatically provisioned without human interaction with a service provider;
- broad network access – services are available over the network through various platforms (PCs, laptops, smartphones, tablets);
- resource pooling – computing resources (processing, memory, storage, network bandwidth) are dynamically assigned and reassigned according to demand and pooled to serve various customers (multitenancy);

- rapid elasticity – capabilities can be provisioned and released, in some cases automatically, to scale with demand;
- measured service – resources usage can be monitored, controlled, optimized and reported.

Everything in cloud computing is offered as a service. Nowadays, there is a wide range of cloud-based service models, encompassing: Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Security as a Service (SaaS), Call Center as a Service (CcaaS) or Unified Communications as a Service (UCaaS).

Unified Communications as a Service (UCaaS) is a model in which a variety of communication and collaboration applications and services are outsourced to a third-party provider and delivered over an IP network, usually the public Internet [www12]. UCaaS solutions include enterprise messaging and presence technology, online meetings, tele- and video-conferencing (Figure 2).

Cloud-based access is making UC available for a wide range of organizations and end users. UCaaS is an important tool for providing high levels of availability as well as flexibility and scalability for core business task. The principal factors driving the demand for UCaaS market are pay per use characteristics of the service and low cost of ownership.

Many companies, especially small and medium businesses, use UCaaS to avoid the financial and operational expenses associated with deploying unified communications solutions on their own [www12].

Fig. 2. The communications forms and tools in UCaaS

Other UCaaS benefits are as follows [www10]:
* faster ways of working, faster communication and collaboration,
* improved time-to-market and reach of services,
* digitized customer and partner co-operation,
* reduction in travel costs up to 90%,
* enhanced attractiveness of company for talented people.

UCaaS is a rapidly growing market. The major players in this market are Cisco, Microsoft, Alcatel-Lucent, Avaya, HP, IBM, CSC, Verizon Communications, Voss, and Polycom.

UC&C Solutions in Practice

The main challenge an organization faces is to choose the right combination of UC&C technologies, features and applications that can best meet its specific business needs. Large corporations, which have divisions and offices all over the world, were the first to use the UC&C solutions since effective communication is crucial for their success or failure. For small and very small organizations, cloud deployment means reducing the break-even point. Although the adoption of cloud solutions is economically sound, small companies still encounter technological barriers.

Over the last few years, the number of Unified Communications systems implemented on the Polish market has been increasing steadily by 20% a year. The trend is expected to continue until 2016, when, according to the IDC report "Polish UC&C and Call Center Market Research Update, 2012", the value of the Polish market will exceed $140 mln [Mejs13].

Various solutions have been implemented by organizations, for example Danone Group and Ministry of Administration and Digitization have implemented the UC&C solution from Integrated Solutions, while PESA Bydgoszcz – OpenScape Unified Communications from Siemens Enterprise Communications Sp. z o.o.

Unified communications and collaboration solutions prove effective wherever communication plays an important role in daily work [Made12]. Organizations can choose from the following options:
* A cloud-based service available via IS/Orange. There are three reasons to choose **Orange Business Services** [www1]:
  - global cloud infrastructure – Orange cloud services are hosted in state-of-the-art cloud-ready data centers to offer customers outstanding worldwide quality of service and security; flexible computing solutions and business together as a service (UCaaS) are available from Europe, the U.S. and

Asia; Orange has also invested in its own data center in Normandy (France) for its customers' own needs; much of organization data meet the strict current standards;

– end-to-end enterprise cloud is guaranteed – Orange is a communications service provider; it knows how to deliver business-critical IT services over the network, with the requisite security and performance guarantees; this includes understanding the impact of delays on real-time applications and how to prevent them; Orange is uniquely able to provide private cloud computing, network, and even the devices to access it, with end-to-end SLAs and the capability to deliver it all globally;

– recognized IT and security expertise – all of Orange cloud services are "secured by design"; they are implemented by security professionals using secure data centers (ISAE 3402 certification), platforms and operations; Orange cloud services are delivered with the highest levels of security; it is important that Orange can even connect to their cloud service partners and deliver their services to organization completely securely and efficiently through private network.

- A converged multimedia communication solution called **OpenTouch**. It's a product of Alcatel-Lucent Enterprise which creates a new conversation experience for employees, partners and customers. With OpenTouch, IT teams can provide lines of business with integrated video and web conferencing-based communications solutions across devices – easily and cost effectively. And they gain all of the benefits of an open Session Initiation Protocol (SIP) architecture and unified management. OpenTouch supplies:

– multi-device – employees can have a single conversation that crosses available devices; they simply use the device that makes the most sense for the context and their location – whether they are on-the-move, telecommuting, at their desk or in a meeting room; switching devices during conversations is transparent and easy; communications become fluid conversations;

– multi-party – conferencing is the most important feature; conference participants can easily come and go during conversations and they can quickly form ad-hoc communities across locations and organizations to meet specific business objectives;

– multimedia – high-definition video, instant messaging (IM) and web conferencing capabilities mean every user enjoys rich communications services without additional investments; employees can stay connected, collaborate and share content more efficiently, and they can move the conversation across media − from IM to ad-hoc video to scheduled video − as it evolves and becomes more in-depth.

- An enterprise-ready unified communications platform **Microsoft Lync**. It connects people everywhere, as part of their everyday productivity experience. Lync is available as a separate application or as a part of Microsoft Office 365 Midsize Business or Enterprise E3. Lync offers features which enable users to [Sien13, Szyb13, www3]:
  - connect with the outside world – Lync federation extends unified communications securely over the Internet to customers, suppliers, and partners using Lync or Skype;
  - stay in touch anywhere – Lync enables users to communicate securely anywhere they have network connectivity, and automatically adapts to network conditions;
  - use the device they want – Lync makes communicating easier with a consistent and familiar experience available on Windows PCs, Windows Phone, iOS, Mac, and Android smartphones; the new immersive Lync app for Windows 8 and Windows RT provides a seamless touch-first experience;
  - communicate in the right way – Lync unifies voice and video calls, Lync Meetings, presence, and IM in one easy-to-use client, making it simple to choose and switch between different forms of communication;
  - take advantage of standards-based HD video – Lync uses open standards including H.264 SVC to provide a high-quality video experience on a wide range of devices;
  - make virtual meetings more effective – see up to five meeting participants simultaneously with new multiparty HD video support; users can choose who to see or let Lync choose for them;
  - easily join meetings – Joining a Lync Meeting requires only a single touch or click on smartphones, tablets, and PCs;
  - extend Lync Meetings outside our organization with browser-based access: The Lync Web App allows PC and Mac users to join a Lync Meeting from a browser and delivers a full online meeting experience including IM, voice, multiparty video, data collaboration and sharing;
  - take notes in OneNote – OneNote share allows users in to create and share OneNote digital meeting notes within Lync Meetings;
  - quickly and intuitively find the best way to communicate – Quick Lync is a menu that appears over a contact in the Lync contact list and shows available communication modes (Table 1).

Table 1

The main characteristics of the selected UC&C solutions

UC&C solutions	Top features
Orange Business Services (Orange)	• It combines leading unified communications products and applications with real-time services like enterprise telephony, mobility, voice, video and conferencing • With collaborative services that incorporate unified communications, it enhances individual, workgroup and organizational productivity • It is available through a range of flexible service models, including integrated, managed, hosted and UCaaS and with technology from leading vendors like Alcatel, Avaya, Cisco and Microsoft
OpenTouch (Alcatel Lucent Enterpise)	• It offers comprehensive advanced business telephony services, including flexible auto-attendant, group, routing and messaging services • It provides multi-platform support: desk phones, mobile handsets, and PC, tablet and smartphone software clients • It offers easy access to multiparty conferences with audio, video, IM and content sharing • Integrated conferencing capabilities easily accessible from any phone or browser. Shared documents stay within the enterprise premises
Microsoft Lync (Microsoft)	• It allows users to communicate securely and stay connected with colleagues and customers, from virtually wherever they chose to work • Users can switch among devices as they choose based on their needs. It offers familiar and consistent user experience across PC, phone, browser and tablets • It connects millions of people, their communications and the applications they use every day − together. Multiparty HD video conferencing brings life and expression to Lync Meetings • It is a dependable platform for all real-time communications. A single system reduces complexity in Enterprise IT

Source: Based on [www1, www3, www11].

Although Lync is implemented in University of Economics in Katowice (Figure 3), its potential is not exploited.
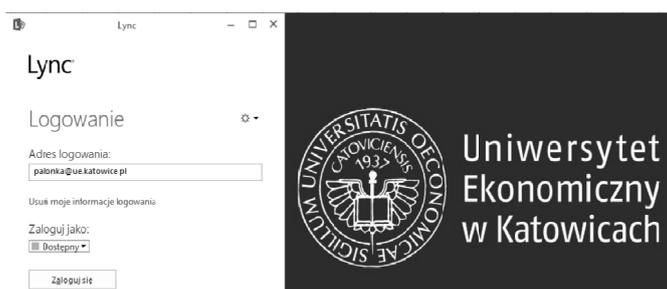

Fig. 3. The Lync sign-in screen at University of Economics in Katowice

The results of the empirical study conducted among 30 students of both undergraduate and graduate programs at the Faculty of Informatics and Communication at University of Economics in Katowice indicate that none of the respondents uses the platform at the university.

Six students use Lync in the companies where they have their internships or the ones they work for (i.e. Wincor-Nixdorf, ING Bank Śląski SA, Sygnity, Hilton Foods, JCommerce). These are big companies consisting of numerous geographically dispersed branches. Two companies have implemented Lync Server 2010, while the others are adopting Lync Server 2013 at present.

In all the companies the Lync platform is used by employees to communicate with one another. Each user has his or her own label in the system (Figure 4).

Fig. 4. A user label

Each user has insight into the availability of other users (Figure 5).

Three companies communicate on the platform with their customers and business partners as well: customers use the corporate telephone numbers from which they are transferred to Lync.
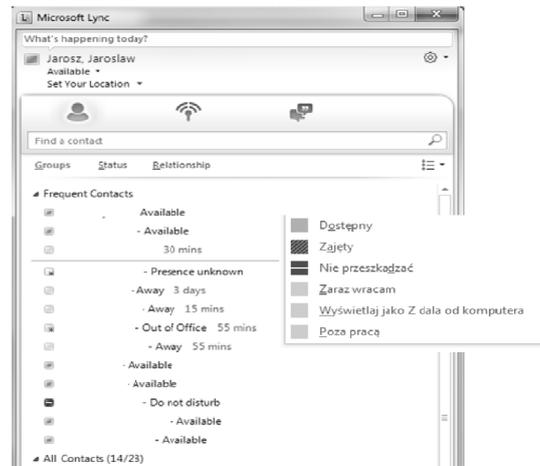
Fig. 5. Users' availability statuses

In all the companies users access the platform via Windows PC (in 2 companies via Windows Phone on Nokia Lumia or HTC telephones and in 1 company, additionally, via iOS, Mac or Android). Communication takes the form of voice, video or instant messaging (chat).
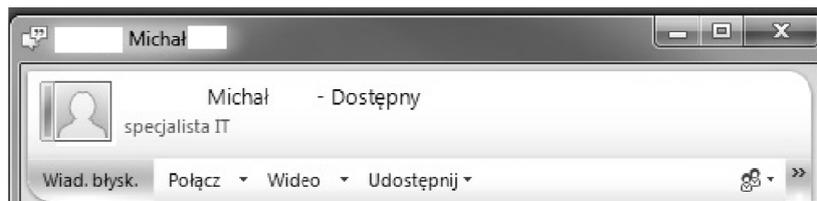

Fig. 6. Available modes of communication among users

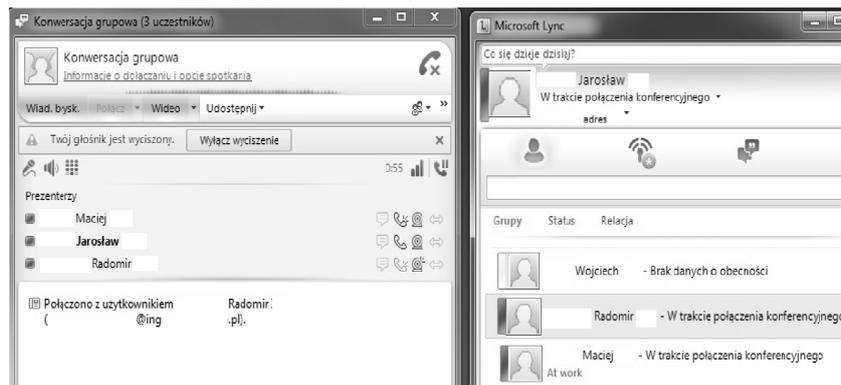Moreover, group conversations are conducted in all the companies (Figure 7).

Fig. 7. Information about the participants of a group conversation

One company uses the online meeting service, which is available after the integration with MS Outlook (Figure 8). The meeting can be joined via a web browser, Lync Attendee (which is seldom used) or Lync communicator.
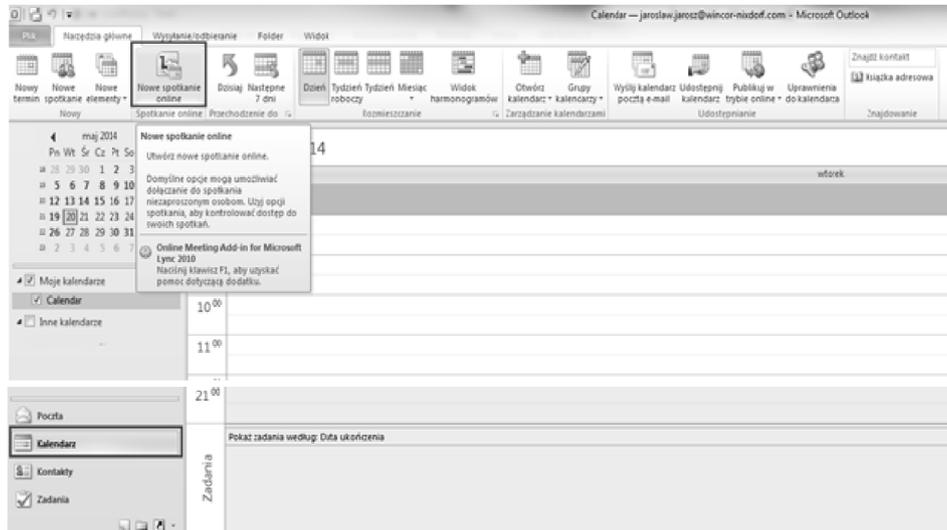

Fig. 8. Scheduling a meeting in MS Outlook

During such a meeting, a user can show his or her desktop, a PowerPoint presentation, a whiteboard which can be drawn on or create a poll (Figure 9). The desktop share feature is used only by the company employees. Sharing it with customers would require the involvement of the IT department and creating a suitable connection (the so called federation).
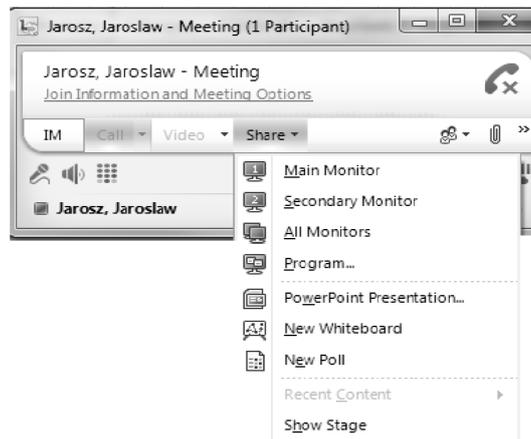

Fig. 9. Share options during a meeting

The service offers the capability to record the whole meeting (Figure 10), communicate by text and upload attachments. It is also possible to integrate with the OneNote software.
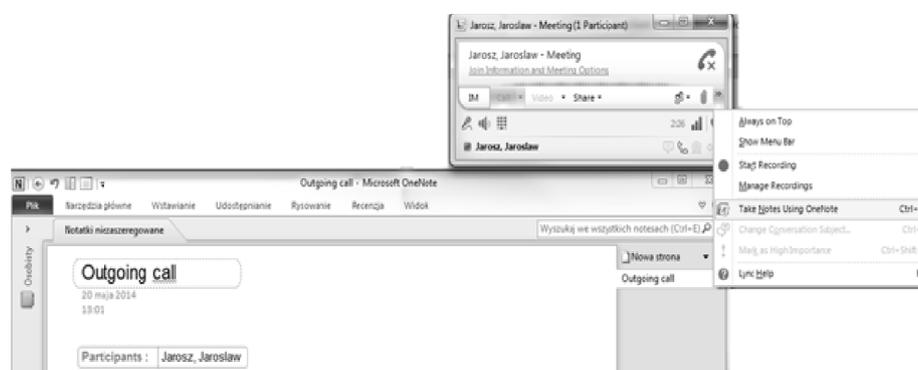

Fig. 10. Recording a meeting

The results of the study demonstrate that Lync, with its extended functionality, is a UC&C platform showing great potential. Unfortunately, it is still only marginally deployed by Polish companies.

Summary

Effective integrated communications involves integrating the real-time and asynchronous communication into business processes of an organization and using the latest communications devices and applications to ensure smooth transition from one to another. Increasingly, the level of functionality required by a user can be achieved regardless of the device (interface) used.

Unified Communications solutions should naturally integrate into an organization's IT environment, operating on its own servers or virtual machines, in its own data centre or "cloud" model. At the same time, they shouldn't bring about an implementation revolution and cause an immediate switch-off of the existing systems and their complete replacement. They should have open interfaces that would enable users to connect with „anything" used in an organization.

The communications system has to evolve to allow prompt and effective solution of problems resulting from the economic globalization, increasing popularity of social media and employee mobility. The UC&C communications tools enable flexible adaptation to current communication needs. Their use is intuitive and quickly becomes employees' second nature. It is possible to access the appropriate communication mode from any device and any location. The transition

between particular communications media – voice, text, www or video is easy and smooth and can be made from one user interface. The content and information is aggregated, filtered and then presented contextually to a user.

Taking into account low market saturation with the UC&C solutions, they are likely to be thriving in the future.

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PRZETWARZANIE W CHMURZE I MOBILNOŚĆ JAKO GŁÓWNE TENDENCJE ZUNIFIKOWANEJ KOMUNIKACJI

Streszczenie

W artykule zaprezentowano nowe trendy w rozwiązaniach zunifikowanej komunikacji i współpracy (UC&C) dla biznesu oraz korzyści wynikające z ich wdrożenia. Dla ich użytkowników systemy UC&C stanowią wygodny sposób kontaktowania się i współpracy, poprawiający komfort pracy pracowników i wpływający na jej efektywność. Obecnie rozwój rozwiązań UC&C zmierza w kierunku wykorzystania technologii mobilnych, wideokonferencji i sieci społecznościowych w biznesie. Jest także zauważalny trend polegający na migracji firm do zintegrowanych rozwiązań komunikacyjnych od jednego dostawcy, jak również rozwój technologii wirtualizacji i cloud computing.