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## Establishing a mobile blog system in a distance education environment

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**Abstract:** Distance-learning programs often encounter problems with student motivation and performance. In the Virtual Studies of Computer Science (ViSCoS) program, these problems stem partly from lack of learning community. Furthermore, distance learning is not always location- and time-agnostic. ViSCoS Mobile is an m-learning extension to ViSCoS that frees students to study anywhere and anytime. We present the first design, implementation and evaluation of a mobile blog system Advanced Postman for ViSCoS. Preliminary testing of the system indicated that moblogs can be used successfully as a reporting tool on a programming project course. The results are applicable to any distance-learning program.

**Keywords:** blogs; mobile blogs; moblogs; Virtual Studies of Computer Science; ViSCoS; mobile learning; distance learning; ubiquitous learning.

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## 1 Introduction

Market for distance education has been growing rapidly for the past years (Newman et al., 2002). Department of Computer Science and Statistics at University of Joensuu started ViSCoS distance-learning program in 2000 to address the demand for university level computer science studies at high schools by offering basic studies of computer science. Since 2004, ViSCoS studies have been available for virtually anyone in Finland via collaboration effort with the Continuing Education Centre of the University of Joensuu. In 2006, ViSCoS English was launched with an aim to expand ViSCoS studies outside Finnish borders.

As in any online distance-learning program, students in ViSCoS take control of their own studies by setting their own schedule of when to study and when to take the examination. The time is therefore not restricted unlike it often is in contact-learning settings. Thanks to the possibilities and wide coverage of the internet, location is nearly an unrestricted element in ViSCoS as well, allowing students to study not only at home, but also from any other location having appropriate computer hardware, software (i.e., a web browser) and a connection to the internet. However, the location of computer can set restraints; if a student is able to use a computer only at school, computer laboratory opening hours effectively limit the time available for studying. To overcome the restraints set by stationary computer machinery, portable mobile devices can be used to enable a true time- and location-agnostic learning experience in a distance education program such as ViSCoS. Technical infrastructure is well established as nearly every student owns a mobile device these days and some even have several of them. *ViSCoS Mobile* is a mobile learning concept developed to free ViSCoS students to study anywhere and any time. It consists of three development threads that must be activated to establish ViSCoS courses in a mobile environment, namely content adaptation, onboard programming, and student support services. We recognised that one of the applications in student support services is a mobile blog service through which students are able to reflect their learning and communicate with each other, for example. Our paper considers the design, implementation and usage scenarios of *mobile blogs*, or *moblogs*, from the distance education point of view. This work represents the first steps of a process towards full-scale moblog utilisation in the ViSCoS program.

In Section 2, we examine closer the ViSCoS program and its ViSCoS Mobile extension to understand the background, motivation and requirements for using mobile blogs in a distance-learning environment. Section 3 introduces moblogs, and describes the current possibilities and technologies for establishing a mobile blogging system. Section 4 presents implementation of Advanced Postman, a moblog solution that extends and adapts existing solutions to suit better for an online distance-learning environment. In Section 5, we evaluate Advanced Postman through preliminary usage test and reflections on usability and technical issues. Section 6 concludes our findings and proposes research actions for the future.

## 2 ViSCoS and its mobile extension

*ViSCoS* (<http://cs.joensuu.fi/viscos/>) is a distance-learning program at University of Joensuu in which first-year computer science courses are taught to students via the internet. The target length of the ViSCoS program is 1.5 years (or three semesters),

but individual performance of each student may vary. Courses available in the ViSCoS curriculum in 2006 are presented in Table 1. Credits earned from each course are presented in standard European Credit Transfer and Accumulation System (ECTS) units. Semester column states the semester on which the course is usually taken. For example, II means the second semester.

**Table 1** ViSCoS curriculum

<i>Course</i>	<i>Credits</i>	<i>Semester</i>
Introduction to Information and Communication Technology (ICT) and Computing	2 ECTS	I
Programming I	3 ECTS	I
Programming II	4 ECTS	II
Research fields of Computer Science	2 ECTS	II
Programming Project	4 ECTS	II
Discrete Structures	5 ECTS	III
Hardware, Computer Architecture and Operating Systems	3 ECTS	III
Introduction to the Ethics of Computing	2 ECTS	Any
<i>Total</i>	<i>25 ECTS</i>	

Learning computer science in ViSCoS relies heavily on independent studying, as is the case with most distance education programs. ViSCoS courses are provided via Moodle Digital Learning Environment (DLE, see <http://www.moodle.org>). There are neither traditional lectures nor any other contact teaching, except arbitrary summer schools and seminars. ViSCoS does not provide synchronous online lectures, which are sometimes featured in distance-learning programs. Students must, therefore, study the material on their own and then do exercises for practising the learnt theory. Instructors, who are competent university teachers, evaluate returned exercises and give appropriate feedback. Furthermore, students are encouraged to consult instructors and other students if they encounter difficulties while studying. Examinations are taken remotely. ViSCoS program has several partner institutions such as upper secondary schools, adult education centres and universities, which arrange examinations simultaneously on an agreed schedule. Questions for examinations are prepared by the course instructors, whose responsibility is also to correct the returned answers.

From the very beginning until today, ViSCoS project has been a target for research. FOrmative DEvelopment Model (FODEM) founded by Suhonen (2005) was used to develop the ViSCoS program. FODEM is a lightweight development method for DLEs, useful particularly in sparse learning communities. Several other research papers concerning ViSCoS have also been published, e.g., Haataja et al. (2001), Sutinen and Torvinen (2003) and Laine et al. (2005). Furthermore, ViSCoS project has had an effect on development and evaluation of several learning tools such as Woven Stories by Gerdt et al. (2001), Ethicsar by Jetsu et al. (2004) and Jeliot by Moreno et al. (2004). Student feedback and performance figures are gathered continuously. Captured data has been processed further by means of data mining in order to detect and prevent potential dropouts, for instance in the work of Hämäläinen et al. (2006). The aim of all the research centred around the ViSCoS project is to enhance the course material, tools and methods to facilitate a better distance-learning experience.

Despite many research projects, there still remain many issues to be solved in ViSCoS. Probably, the most difficult and serious of them is the high rate of dropouts, particularly on programming courses (see Torvinen, 2004). Part of the dropouts can be explained by the fact that many new students do not know what programming is and they simply attend the course to find out. After learning that programming requires a specific way of thinking, they decide to drop out. Ongoing data mining research attempts to tackle the problem of dropouts. Furthermore, course materials are continuously enhanced according to the feedback gathered from students. Every year some improvements have been made, but nevertheless it seems that achieving 100% success is impossible as there will always be some students who drop out for one reason or another. Currently, part of the research work concentrates on establishing blogging culture in ViSCoS community in order to help students to be more interactive, thus gaining more motivation for success.

Another problem in ViSCoS distance-learning program is lack of communication between students and instructors as well as among students. Although Moodle learning environment offers tools for collaboration, such as forums and chats, it is very hard to motivate students to start using them. Perhaps, it is the characteristics of a Finn that restrain students from being more active. Most of the ViSCoS courses have mechanism for writing and receiving feedback. Students are given the opportunity to write self-evaluations and instructors write personal feedback to these evaluations. Instructors also write comments and feedback for every single exercise submitted by the students. Telephone guidance via ordinary telephone or Skype software has also been used on the Programming Project course. Students have also possibility to chat with instructors via instant messengers. Despite all these communication channels, interaction between instructor and students is far from that of a traditional classroom environment.

Distance is probably the most obvious reason for the aforementioned problems in a distance-learning setting. Nagel et al. (2006) perceived lack of community as the most significant single reason as to why unsuccessful students in online study program abandoned their courses. The same study also suggests that the importance of community is highly appreciated by those who are successful in their online studies. To overcome the challenge of belonging to a community, the effect of distance must be dissolved by means of technology so that students and instructors can feel as part of a classroom community. We propose mobile blogs, or blogs in general, to be used in order to bring the active virtual classroom one step closer. Mobile technologies in the context of learning have been under active research since the appearance of the first mobile phones. The first applications were based on early technological innovations such as SMS messaging and simple voice-based applications. Today, thanks to rapid technological advancement, mobile devices are much more than phones; they are multimedia computers. Prensky (2005) has gathered the capabilities of mobile devices and mapped them with possible usage scenarios in education. Table 2 presents these usage scenarios together with the respective mobile device capabilities. Even more usage scenarios emerge, if one mixes these capabilities together. Eschenbrenner and Nah (2007) have proposed an integrative model in which general uses of mobile technologies, activities supporting general uses and benefits identified from the activities are woven together in table representation. We encourage the reader to have a look at the aforementioned table in order to understand the wide array of possibilities and benefits that are present in m-learning.

**Table 2** Usage scenarios for mobile devices in education

<i>Mobile device capability</i>	<i>Usage scenarios in education</i>
Voice	Language training, voice recognition (authentication), voice lectures, voice-activated services
Short text messages (SMS)	Reminders, motivator messages, polls, games, quizzes, news, training for exam
Graphic display	Reading text, flash cards, pictures, comics, animation (with sound), 3D content, holograms
Downloadable programs	New educational software can be downloaded and used; possibilities are limitless
Internet browser	Browse web content, use dictionary, thesaurus, encyclopaedia, and gather material (text, image, video) with search engines
Camera	Data collection, documentation, visual journalism, remote-operated observations
Global Positioning System (GPS)	Learn about locations, orientation, treasure hunting games, research tool especially in geography
Video	Television journalism, creative movie-making, educational clips

Source: Prensky (2005)

*ViSCoS Mobile* as a concept was first introduced by Laine et al. (2005). The goal of ViSCoS Mobile is to develop necessary mobile learning environment and learning tools, which can be used by ViSCoS students to learn via mobile devices, thus enriching the learning experience. Mobile technology is a double-edged sword. On the one hand, it offers high portability, instant access, flexible solutions and affordable price. On the other hand, however, small screen and lack of proper input method makes usability of mobile devices very poor when compared with desktop or laptop computers. According to Smith (2003), unstable data storage and security of personal information are also issues affecting the design of the ViSCoS Mobile. Contents of the ViSCoS courses are not optimised for mobile phones and even though the HTML content is theoretically readable by any web browser, presentation of large HTML structures on a small screen is very frustrating to browse. To overcome the challenges set by the mobile device restraints in Mobile ViSCoS, three development threads have been established: *content adaptation*, *onboard programming*, and *student support services*. Content adaptation thread attempts to discover and develop the best method to adapt learning material and tools for mobile devices. Programming is an essential part of ViSCoS curriculum and the thread of onboard programming is set to find a way to learn and practise programming effectively on a mobile device. Details of the first two development threads are explained in detail by Laine et al. (2005).

The third development thread of ViSCoS Mobile concerns student support services, which are aimed to assist students in the studying process as well as to provide attractive learning tools for them in order to enrich their learning experiences. One of the main challenges to support services in ViSCoS Mobile is to motivate students to study from a tiny screen. The usage of mobile technologies alone can be a good motivator at least for the technologically oriented students (Attewell, 2005; Perry, 2003). However, it is clear that additional services are required to boost the motivation and to create and support a new kind of learning community: a mobile learning community. The student support services may include reminders, calendar and other information helping everyday life of

an online student. Space- and time-agnostic queries, quizzes and even examinations are also possible to be organised with current mobile technologies. Internet telephony and conversation tools on mobile devices offer instant interaction between members of the learning community, thus creating a stronger atmosphere of togetherness. One of the most promising technologies for student support services is a mobile blog in which students are able to reflect their learning and discuss with peers from any location at any time. We discuss mobile blogs and their possible uses in detail in the following sections.

### **3 Moblogs: technology and usage**

Mobile blogs, or moblogs, are part of social software (e.g., Anderson, 2006; Tepper, 2003). Others include wikis, instant messengers, discussion forums and social network services. Social software users interact with each other either in peer-to-peer fashion or as part of a larger online community. The idea behind using social software in education is to boost collaboration and interaction between the students. This is particularly important in distance education where interaction mostly occurs between instructors and students only. Mobile blog is a good example of using modern technology in student support service in distance education. In this section, we present general information on moblogs, their usage in education, and current technologies used in mobile blog systems.

#### *3.1 Moblogs in education*

While usage of ordinary blogs have been under a vast number of research projects (see Du and Wagner, 2005; Richardson, 2004; Mortensen and Walker, 2002; Placing et al., 2005), mobile blogging has not been a popular topic, particularly in the education field. A recent study conducted by Berth (2006) introduced moblogging to high school students as a tool of reflection, resulting to the statement: "when students communicate through mobile media, social knowledge is produced which in turn require reflectiveness to be exercised". Berth also noticed that students prefer to send images to moblog than share them by MMS technology. Beale (2005) presented a SmartBlog tool for mobile blogging and discovered that it supports the immediate, ad hoc nature of mobile learning experiences more effectively. Experiences of another project, Remote Authoring of Mobile Blogs for Learning Environments (RAMBLE), reported by Trafford (2005), have shown that mobile blogs are very useful to support personal reflections in an educational setting. In addition to these examples, mobile blogs have also been used in language education (Fischer, 2005).

One might argue that blogging distracts students from the actual learning. It is, therefore, imperative that educational practice of blogging is clearly defined before introducing blogs to students. Farrell (2003) has distinguished several ways to use blogs in education. Table 3 presents Farrell's findings together with our additions and examples. The first column describes the application of the blog while the second and third columns present the roles of teacher and student, respectively, on the particular scenario. Some of these usage scenarios can be used simultaneously; for example, course homepage and linkdump can co-exist in one blog. As mobile blogs are essentially similar to ordinary blogs, this information can be applied to educational moblogging.

**Table 3** Uses for blogs in education

<i>Application</i>	<i>Teacher's role</i>	<i>Student's role</i>
Standard web page	Teacher maintains the course web page as a blog; it is easier to update than ordinary web page. Blog can for example include schedules, notifications, rules and links to resources	Students read the blog regularly in order to keep updated
Linkdump	Teacher adds interesting and relevant links to blog	Student visits the links in order to receive deeper understanding of the matter at hand. In addition to studying the linked resources, student can send comments on them
Discussion and debate	Teacher harnesses a blog to foster in-class discourse between the students	Student uses the blog to post new discussion topics and/or comment on existing topic
Problem solving	Teacher may act as part of the problem-solving process, but does not directly contribute to the solutions	Students use blogs as a tool solve problems through discourse with their fellow students. This kind of usage could be seen for example on a programming course
Seminar publications	Teacher uses blog to organise intensive seminars	Student posts weekly summaries of course readings and have active discussion about the topics
Learning diary	Teacher merely observes students' own blogs and uses them as part of course evaluation	Student writes her own reflective blog during the course. Contents of the blog can vary, but should be connected to the subject of the course
Reporting tool	Teacher observes and comments on reports made by the students. Contents of blogs can be used as evaluation criteria	Students report regularly their progress for example on a programming project course
Administrative blog	Teachers are writing blogs in order to enrich the communication between themselves and institutions	Students do not participate

Source: Farrell (2003)

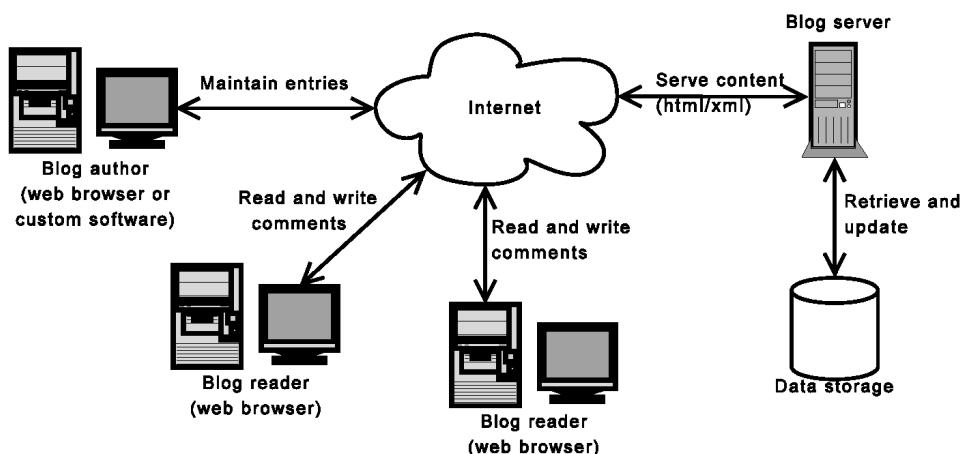
As new features are added to mobile devices, they become more versatile in terms of usage scenarios. Pictures, audio and video are already conventional media for blogging. From newer technology, an integrated GPS navigator can be used to add geographical information to moblog entries (Gross and Kleppe, 2005). RFID reader embedded on a mobile device has already been used by Cheng et al. (2005) to capture context-sensitive information of places and everyday objects in order to pass this information into mobile blogs. This kind of information can, for example, help people with common interest to find each other, thus establishing relationships in a virtual community. While technological innovations enable novel ways of blogging, there are several factors that can hinder the adoption process. For example, the cost of data transmission, lack of support from operator's side, poor image quality and difficulty of use are problems that one must overcome before mobile blogging can be efficiently harnessed as an educational tool.

In their paper, Low and O'Connell (2006) established the *four R scenario* (i.e., Record, Relate, Recall and Reinterpret) for mobile learning and considered moblogging as an example activity. The paper also proposed guidelines for designing and implementing m-learning activities at a very general level, but it did not cover the decisions and procedures required for establishing a mobile blog system. A study conducted by Chung (2005) investigated mobile blog usage for Chinese language education in a distance-learning context, making use of a closed commercial moblog service called 12wap. Restrictions of commercial blog services are discussed in the next section. Our literature review did not yield results concerning research on moblogs in computer science distance education or design and implementation of moblog systems. Results of the literature review, however, suggest that mobile blogging could work in the field of Computer Science as well. After all, computer science students, being particularly interested in new gadgets, are likely to adopt new technologies rapidly. Before we are able to verify that, a flexible moblog system must be designed and implemented for distance education purposes.

### 3.2 Technological aspects of moblogs

Most blog systems are based on *client-server architecture* where the server part is running on a web-server, such as Apache, which offers a standard HTTP access to the blog system via hypermedia interface. The reader of the blog uses a web browser or some alternative client to access the content on the server. In such a model, the server part is the core of the blogging system and clients merely connect to the server in order to update, read or maintain contents of the blogs. Figure 1 presents the architecture of a typical client-server blog system.

**Figure 1** Client-server blog system architecture



In most cases, moblogging functionality can be attached to ordinary blog system software as a plugin that can handle posts received from a mobile device. This approach is good because moblogging is essentially very similar to blogging, thus it would be a waste of resources to copy the same code to create a separate moblog system. The only thing that is needed for moblogging is a gateway functionality that can receive incoming moblog

entries and direct them to the blogging engine, which in turn handles the entries as ordinary blog posts. There are several technical possibilities for implementing the gateway functionality. However, before that we should be aware of what are the currently available blog systems that can be used as a backbone of the moblog system. As we see it, there are two methods to set up a new blog: by using one of the various blog services or by manually installing and configuring a customisable blog system. Table 4 presents the overview of discovered blog solutions with their supported features and suitability for ViSCoS program. Blog services cover services such as Blogger, LiveJournal and MSN Spaces on which users can create their personal blogs without having to set up the blog system by themselves. Nucleus CMS and WordPress are both open source blog systems, each having a large library of functionality extension plugins. Movable Type is similar to Nucleus CMS and WordPress, but it is based on a commercial license.

**Table 4** Comparison of blog solutions

	<i>Blog services</i>	<i>Nucleus CMS</i>	<i>WordPress</i>	<i>Movable type</i>
Price	Varies greatly	Free	Free	\$39.95–299.95
Support	Support varies much. Paid accounts yield better support	Community support	Community support	No support mentioned in license details
Plugin API	No	Yes	Yes	Yes
Multiple blogs	No	Yes	No	Yes
Multiple users	No	Yes	Yes	Yes
Moblogs	Partly	Yes, by plugin	Yes, by plugin	Yes, by plugin
Extensibility	None	Open source	Open source	None
Server requirements	None	Web-server with PHP and MySQL	Web-server with PHP and MySQL	Web-server, Perl and one of these: MySQL, Berkeley DB, PostgreSQL, SQLite
Blog moderation	No	Yes	Yes	Yes
Posting APIs	Depends on the service	Nucleus, Blogger, MetaWeblog, MovableType	Blogger, MetaWeblog, MovableType	MovableType, Atom, Blogger, MetaWeblog
Finnish language	Mostly not supported	Yes	No	Yes
Applicability for ViSCoS	Not applicable because blog moderation is essential in a virtual classroom. Lack of extensibility is also a disadvantage	Very well applicable	Applicable as soon as multiple blogs supported	Applicable, but pricing is a disadvantage feature is properly

Existing blogging services are too restricted for ViSCoS or any other distance-learning program; they do not offer expandability nor can they be customised. Furthermore, incompleteness of multiuser support on WordPress, and MovableType price tag solidified the decision to use Nucleus CMS as the core blogging system for moblogging on ViSCoS. As for the moblog gateway, we distinguished three methods (gateways) of

posting entries from a mobile device to blog system. First solution is to use e-mail to send a post to a specific e-mail address from which a moblog script could fetch the e-mail, parse it and add it to the blog. Second solution is to use a custom moblogging application on mobile device, which utilises blog system's posting API. Third method is to send new entries with a mobile web browser using blog system's default web interface. Table 5 summarises features of these solutions. Gateways are presented on columns and their respective features are presented on rows.

**Table 5** Overview of moblog gateway solutions

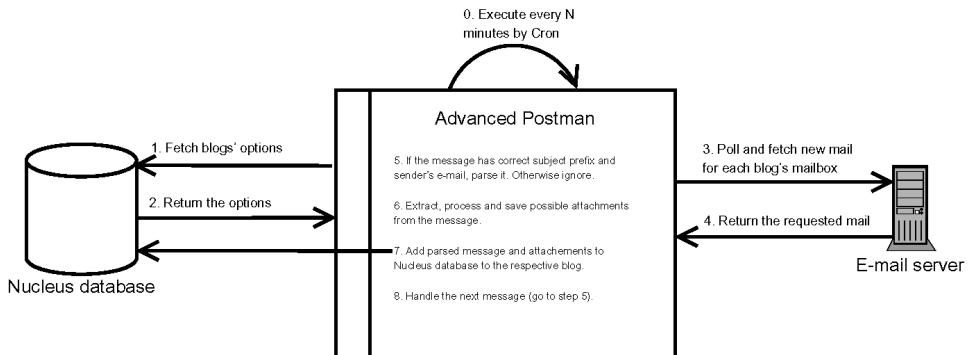
	<i>E-mail</i>	<i>Custom application</i>	<i>Web browser</i>
Price	Free	Depends on license; usually costs some money	Free
Protocol	SMTP	Usually XML-RPC	HTTP
Suitable mobile platforms	Any device and platform that supports e-mail	Depends on the application. Applications are usually platform- and device-specific	Any device and platform that has appropriate web browser
Suitable blog systems	Any system where e-mail posting is enabled	Depends on supported posting APIs. Usually only a subset of all possible posting APIs is supported	Any system providing web interface suitable for mobile web browsers
Message parsing and filtering	Messages can be parsed and different attachments handled in custom fashion (according to the plugin). Filters can be set to reject inappropriate content	Message filtering and parsing is performed by the blog system. Customisation requires changing the core system	Message filtering and parsing is performed by the blog system. Customisation requires changing the core system
Existing software	Mobile e-mail clients are widely available. E-mail posting plugins are available for many blog systems. Some proprietary e-mail clients may limit size of the message	There are some existing applications for blogging, but they are platform-specific or otherwise limited. J2ME devices are not intercompatible	Mobile web browsers are widely available, but not all of them are capable of viewing web interface of blog systems. Cost of connection may also set limits to usage
User identification	Sender field, subject prefix, digital signature	Username and password (are possibly sent unencrypted)	Username and password (are possibly sent unencrypted)
Bandwidth usage	Only bytes for new entry	Only bytes for new entry	Bytes for new entry and other contents of the blog site
Delivery delay	Up to few minutes	Instant	Instant, but accessing the blog system can be slow
Ease of posting	Requires some effort, but using draft messages makes posting fast	Requires some effort	Requires much effort; takes much time, if connection is slow

While it is relatively easy to implement a gateway for a single mobile device, it is very hard to find a gateway solution that would work with every mobile device now and in the future. To cover as many devices as possible, a common feature of mobile devices must be recognised and then build the gateway based on this feature. Such a feature is e-mail as it is present on nearly every mobile device and it is fairly easy to use. E-mail also offers existing infrastructure and protocols for actual gateway implementation. Once the moblog gateway has been configured, one can submit new entries from any mobile device having an e-mail client. Posting by a custom application is a fairly good alternative for e-mail gateway, but currently available products and development tools are vendor- and platform-specific, thus we chose e-mail gateway to be implemented for ViSCoS Mobile.

#### **4 Implementing Advanced Postman**

As discussed in the previous section, we chose Nucleus CMS to be the backbone of the moblog system, and e-mail to be the gateway for submitting blog entries from a mobile device. In search for an existing e-mail gateway solution, PostMan plugin for Nucleus was discovered. By default, PostMan plugin only allows configuration of one e-mail account to retrieve posts for all users of the blog system. It is clear that using only one e-mail account makes moblogging in a multiuser blogging environment inconvenient and difficult. A better option would be to specify an e-mail account for each blog in the system. To achieve this improvement, a modified version of PostMan plugin was created. A new plugin was baptised as *Advanced Postman* to emphasise its origin and enhanced functionality.

The heart of Advanced Postman is a module written in PHP programming language that retrieves e-mails from Post Office Protocol, version 3 (*POP3*) e-mail accounts specified on blogs' options page. The script is timed to run every  $N$  min by task scheduler software. Messages sent to these e-mail accounts must be tagged with a special subject prefix, which can be set on each blog's properties. Legal sender e-mail addresses can also be defined in order to avoid inappropriate mail (such as spam) to appearing in the blog. All messages without correct subject prefix or without correct sender address are ignored. Information of all approved and rejected posts can be stored in log files. It is important to use a dedicated e-mail account to avoid unnecessary fetching of e-mails without proper credentials (spam and irrelevant e-mail). Figure 2 illustrates the architecture of Advanced Postman. The figure shows components of the plugin, and connections between these components and the Nucleus CMS. The numbers depict the sequence in which the actions are taken. The actions are simplified to reduce complexity of the diagram. The process runs repetitively in intervals set in the task scheduler's configuration. On each iteration, the program retrieves options of a blog, fetches new e-mail messages from respective mail servers, parses the messages and adds new entries to the respective blogs provided that entries were authenticated. Successfully processed messages are removed from the mail account if the mail removal flag is enabled in the blog's options. To avoid possible loss of important data, ignored messages must be removed manually.

**Figure 2** Architecture of Advanced Postman

One moblog entry posted by e-mail can consist of several different elements. Usually, these elements are subject, message body and some attachment files. Advanced Postman has been built to process each of these elements separately. The subject field is processed first because it should contain a legal subject prefix that is defined in the blog's options. If the proper subject prefix is not found, the rest of the message is ignored and a new entry is not added to the blog. If the subject prefix and sender of the message are validated, the message body is processed together with the attachments. Advanced Postman separately handles text, images, videos and applications according to MIME type embedded in the header information of the file attachments.

## 5 Analysis of Advanced Postman

After the development of the first prototype version of Advanced Postman was finished, we provided mobile devices and moblog accounts to test users during the Fall of 2006. In this section, we analyse the feedback and experiences gathered during the test. Additionally, we reflect on the technical and usability issues of Advanced Postman. The emphasis of the test was to receive early feedback and experiences of the system usage, rather than to evaluate and validate system's overall feasibility in the context of ViSCoS. More detailed evaluation including suggestions for usage scenarios in ViSCoS is presented by Laine (2007). We intend to evaluate the system's suitability for ViSCoS thoroughly as part of the future research.

### 5.1 The test case

In the usage test, six Finnish students (six males) of a programming project course (not ViSCoS) were given mobile devices to be used for logging software development activity on and off university campus. The students were members of a project team and they were provided a common project moblog in which they posted entries. Finnish language was used in writing the entries because that was the language of the programming project course. The intention of the scenario was to validate functionalities of Advanced Postman as well as to find out how well it can be used in a programming project course as a logging tool. Four of the students were equipped with HP iPAQ 6515hw PDA devices and two were handed Nokia Communicator 9500 smart phones.

The basic properties of both of these devices are similar, but the keyboards are slightly different; in the Nokia Communicator, the keyboard is placed on a larger area, thus making it easier to use. In addition to a built-in keyboard, HP iPAQ has a Stylus pen and a software for recognising hand-written notes. Before launching the test, the students were given written instructions on how to operate the device and the moblog system.

During the three weeks of observation, new messages appeared in the moblog almost daily, excluding weekends. Some exceptions to this rule occurred as a few entries were posted on Saturdays and one even on Sunday. The total number of posted entries was 30 and the average number of messages per day was 2. Weekends were excluded from average calculation and posts from weekends were added to previous Friday because the official project working days were from Monday to Friday. The amounts of entries for the first three weeks of the test were 13, 7 and 10, respectively. Based on these figures, we can conclude that the moblog of this test scenario was used quite evenly throughout the three-week test period. Particularly interesting was the observation that the frequency of posting did not decrease much after the first week's charm of novelty. The reason for this phenomenon is probably the fact that moblog was integrated to their work process, thus students were obligated to write new entries regularly. We noticed that the length of entries slightly increased during the three weeks of moblogging; averages of entry lengths for each week were 37.85, 41.71 and 62.7, respectively. This could be explained by the fact that the students became more familiar with the devices and with moblogging in general. However, we do not know if the students attained internal motivation for moblogging, or if it was just due to the course requirements. Entries consisted mostly of daily activities, events, opinions, suggestions and links to resources. The length of moblog entries varied from 1 to 118 words. The shortest messages were merely used for testing the device configuration. The average length of all entries was 47.03 words and we consider this as a reference value for the future tests. Subject fields of the new entries were excluded from the word count. Only a few entries had comments and those usually consisted of additional data that the author wanted to add to the original entry.

Error log was written by Advanced Postman during the test whenever a message could not be fetched or passed properly. There were only three situations of which traces were written to the error log. In all these situations, the messages were merely test messages and they did not have the required subject field prefixes, which are used by Advanced Postman to authenticate the message. In other words, they were human errors. After the failures at the beginning, none of the test subjects made mistakes in sending anymore. Based on the analysis of the error log, we can conclude that the system worked without errors and the human side was trained fast by the trial-and-error technique.

During the oral interviews with the test subjects, we discovered that the input mechanism as well as the large physical size of the devices (compared with ordinary handsets) were mostly criticised. Some students criticised the message delivery delay and that it may cause a person to submit the same message several times. Any missing features or other annoyances of Advanced Postman were not reported by the students. Although the test or the interviews did not reveal any new ideas on how to improve the system or how to use it in ViSCoS, it clearly showed that moblog system based on Nucleus CMS and Advanced Postman can be used as a logging tool on a programming project course. Success of the test prepared us for the next usage evaluation at a genuine ViSCoS context in the future.

### 5.2 Reflections on technical and usability issues

During the testing, performance-related operational limits of Advanced Postman were not discovered. However, suitability of Advanced Postman for large-scale systems is still an open question. From a technical perspective, Advanced Postman does not require much processing power, but data communications must be well established due to the e-mail polling feature; if there are tens of e-mail accounts to poll and each of them host tens of messages, the polling process is likely to be timewise expensive. Support for e-mail protocols other than POP3 has not yet been implemented. Other protocols, however, are fairly easy to add by using available PHP libraries such as PHP Extension and Application Repository (PEAR). Different message encryption schemes are also currently missing and should be developed, if Advanced Postman is to be used to process confidential data. Digital signature technologies such as Pretty Good Privacy (PGP), a software providing cryptographic and authentication tools, are not yet supported, and this could be something to be developed in the future in order to make user authentication even more secure.

Advanced Postman is a fairly usable system, but it has some usability weaknesses. The amount of different options included in Advanced Postman makes configuration of the system quite complex. Once the user learns how to tweak the options, there is no problem, but learning takes time and if the users are not assisted by the administrator or by someone else, they might even give up on it. To improve this aspect of usability, necessity of options of Advanced Postman should be evaluated and user's manual written. Another problem of usability is the delay time in message delivery. This problem cannot be completely removed, but the users can instead be informed about the existence of the delay, thus making the delay more acceptable. Before Advanced Postman is deployed, its usability should be evaluated by a group of ViSCoS students. As a general guideline for moblogging usability, we can conclude that simplicity is the key, but richness of features is also an important aspect.

## 6 Conclusions and future work

Distance learning has become an important branch of education since the past few years and the trend is likely to grow. ViSCoS distance-learning program was developed at Department of Computer Science and Statistics, University of Joensuu, to provide basic-level computer science courses for those who do not live close to universities or who do not have the possibility to enrol to ordinary computer science courses due to other studies or work. As any distance-learning program, ViSCoS has also met problems related to students' motivation and performance. In this paper, we provided an overview of the latest branch of ViSCoS, ViSCoS Mobile, which has a clear focus on bringing ViSCoS studies into mobile devices. One of the three development threads of ViSCoS Mobile is *student support services* and within this thread we recognised the potential of mobile blogs as a learning tool.

Based on literature review, we concluded that blogs have been used successfully in education. Mobile blogs have also been used in educational arena, but not nearly as much as regular blogs. The advantage of using mobile blogs over regular blogs is that the author is able to post new entries spontaneously at any location and at any time. We described standard architecture of blog systems and noticed that the best way to

construct a mobile blog system is to build it upon a regular blog system as an extension module. This extension is called moblog gateway and its purpose is to handle moblog messages submitted from a mobile device. We reviewed existing blog solutions and decided to choose Nucleus CMS as the backbone of the new moblog system. As for the moblog gateway, we constructed Advanced Postman plugin, which supports multiple moblogs each having multiple authors, as this was recognised a key feature for moblogs in distance education setting. After finishing the first prototype, we conducted a test on Advanced Postman moblog usage. Results of the tests suggested that after improvements on usability, Advanced Postman is a highly potential tool for moblogging in distance education courses. Results of this paper can be generally applied to any other distance-learning program where ubiquitous learning has been taken seriously. For distance-learning programs planning to deploy moblogging as a support tool, we recommend to start to use moblogs for reporting and personal reflection. Later, when students are familiar with the technology and are using it regularly, moblogs can be more collaborative, for example in group projects.

In the future, we plan to introduce moblogging to ViSCoS students by attaching it to the curriculum. Actual deployment details have not been planned yet, but moblogs will probably be first used as reporting tools, learning diaries and arenas for discourse. Blogs and moblogs may also be used as part of evaluation, thus good participation pays off at the end of courses. We intend to further run tests on usability of Advanced Postman within the ViSCoS community in order to improve the system. Furthermore, Advanced Postman should be further developed to support different usage scenarios and environments better, including private and corporate use. We recognise that mobile blogs and ViSCoS Mobile in general suit particularly for developing countries where physical cable connections to the internet are rare, distances to schools are long, but mobile technology is advancing fast. It is therefore our future challenge to deploy Advanced Postman to environments where it can offer the maximum support to students.

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