This is the first edition of Poster Presentations 2013 from the Faculty of Informatics, at Masaryk University, Brno. The purpose of this booklet is to disseminate work done in this faculty. This booklet and the posters is an output of a poster design course at FI, supported by the Platform for Industrial Cooperation (CZ.1.07/2.4.00/17.0041). The posters presented on the following pages are the work of a group of students and staff members. The students are enrolled for Masters and Doctoral degrees, and the staff members are involved with industry networks in the IT field. Guidance was given through a series of lectures on poster layout and choosing content, using hundreds of poster examples from academic conferences all over the world. Proper selection of descriptive, scientific titles followed, and students started writing their own abstracts. The authors then made a mock-up by hand on full-sized sheets, to free up their creativity. Abstracts, titles and short CVs were checked and proofread. The students then spent time on the final design and content of their posters. The wide variety of layouts, innovative approaches and high quality of content is a result of the dedication and hard work of the poster authors themselves. A competition was staged to evaluate the posters and reward the authors of the two best posters in terms of layout and content. What you see in this book is an example of what can be achieved by a group of creative young people who are passionate about their fields of work and study. For most of them it is their first attempt at producing an academic poster, and as such is commendable. We believe you will find this book stimulating, and that it will provide food for thought. Feel free to contact the authors if you need more information on their research or the progress of their work! Sincere thanks go to my doctoral student Lucia Tokárová for doing an expert job on the graphic design and layout for this book.

**Editorial**

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Modern ("intelligent") buildings are often equipped with BMS – a network of interconnected devices which ensures integrated building operation, control, and monitoring.

The aim of this research is to adapt an existing Complex Event Processing (CEP) framework to process data from intelligent buildings. This will provide building operators with easily understandable outputs that help to optimize building operations and provide early detection of various types of faults. The research problem is that building operators and maintenance staff are easily overwhelmed by large amounts of data and events produced by the BMS. In this way BMS is similar to other fields where CEP is successfully used – network monitoring, credit card fraud detection and algorithmic stock trading.

The expected outcome of this research is to develop a complete system for fault detection and operation analysis of a BMS, using methods and tools based on CEP.

Adam Kučera is a doctoral student at FI MU. He defended his Master’s thesis on Complex event processing in building management systems in 2012. He now continues his research in the field of the management of building systems infrastructure, fault detection in intelligent buildings and analysis of building management data. He also works at the Facility Management department of the University Campus Bohunice as a programmer since 2008. This gives him an opportunity to apply his results directly in everyday use. He intends on completing his degree in 2016.
Introduction

Active users of social media produce large volumes of data on a daily basis. This data could contain patterns and expressions of sentiments which have value to commerce and academics alike.

Many algorithms and methods for analysing social media data exist, but there is not any one platform uniting these tools and services.

Methodology

The solution is a design of a single system with four layers, to integrate all required elements. These layers are the: collection of data from different sources, data management and storage, analytical algorithm usage focused on relevant aspects and visualisation of analytical results and source data.

Conclusion

This paper introduces a design of new component based platform for social media analysis, which can be easily configured for use in academic and also commercial environment in traditional areas of social media analysis. The system was designed on the basis of applied research in cooperation with industrial partners of FI MU.

References

Developing the ICT partners network

Platform for Industrial Cooperation

Project partners:
- IBM Česká republika, spol. s r. o.
- Microsoft s. r. o.
- Red Hat Czech s. r. o.
- JIC, zájmové sdružení právnických osob

This project is co-financed by the European Social Fund and the state budget of the Czech Republic.

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From idea to realisation

The Platform project addresses those requirements by promoting four key activities that are interconnected through the two-phased internship model:

- student projects – team or individual related to curricula or student's interests. Projects are lead by faculty supervisors and consulted by company experts.
- workshops – orientation on technology and business. Works threaten knowledge at the faculty.
- internships at companies – correspond to curricula and student projects. Internships are a second phase, they offer students opportunities to use their knowledge they have gained by participating in first-phase activities.
- start-ups and spin-offs – support for start-ups and spin-offs.

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The Platform for Industrial Cooperation project (PPS) builds on existing cooperation between the faculty and companies in industry. As this cooperation grows, it may become disordered and less effective. The main objective of the project is to advocate a systematic approach focused on four parallel activities, creating the platform that enhances cooperation between the academic and application areas in fields of research, development and education.

The four activities – student projects and workshops prepared with experts from companies, internships and the support for start-ups and spin-offs – are interconnected through the so-called two-phased internship model. By participating in these activities, students become familiar with a particular technology on the intermediate level. To enrich their theoretical knowledge with practical experience, students are encouraged to attend internships at selected companies. For those with an entrepreneurial spirit, a programme to gain knowledge and experience in the area of business and innovation in ICT is prepared.

This approach offers intensive involvement of all parties in common activities creating, besides other benefits, an environment that brings better “resource load” distribution, knowledge transfer, new ideas and attractive opportunities for growth and improvement.

Stanislava Sedláčková is a member of the realisation team of the “Platform for Industrial Cooperation” project at the Faculty of Informatics, MU. Her responsibilities include managing particular project activities and communication with external project partners. She believes that cooperation between faculty and commercial companies improves conditions for professional growth of all participants and may generate notable results in applied research and development.
Distributed Event-driven Monitoring Model for Cloud Datacenters

Daniel Tovarňák, Tomáš Pitner

When monitoring distributed infrastructure, data related to the particular resource are typically produced by multiple distributed producers spread across many individual computing nodes. In order to determine the state and behavior of a resource, all the relevant data must be collected, processed and evaluated without overloading the computing resources and flooding the network. The volume, velocity and variability of monitoring data produced by modern cloud datacentres multiply and there is a need for new approaches since current approaches are insufficient for online monitoring data processing.

The objective of this research is to propose a real-time monitoring architecture utilizing a novel distributed event-driven model. The methodology will involve experimentation and a comparative study with existing approaches. Expected outcomes include improvements in the terms of intrusiveness, network overhead, and throughput with respect to the number of producers, consumers, volume, velocity, and variability of monitoring data.

Daniel Tovarňák is a Ph.D. student at Masaryk University (FI). His research interests include distributed infrastructures (e.g. Cloud and Smart Grid) monitoring, and Complex Event Processing. Daniel is also a member of the Lab of Software Architectures and Information Systems and one of the Technology Platform Leaders in Platform for Industrial Cooperation project. He intends on completing his doctoral degree at the end of 2014.
This project is focused on the Graphical User Interface (GUI) design of an administration system for teachers. A UI is important for teachers to effectively work with IT systems on mobile devices. Some Web-based systems and applications, which are attempting to help teachers with administration do exist, but these systems are not easy to use.

The objective of the project is to produce a mobile (tablet) interface which will enhance the way teachers use IT for administrative purposes. The research problem is that teachers often spend a lot of time on administration instead of teaching or preparing materials for teaching. Data is mostly in paper form and there are problems with lost administrative forms and copying data by hand.

As methodology, teachers will be interviewed as potential customers; a new UI will be designed and finally tested by them. This project will consider one specific educational UI of Czech computer systems. Expected results include an interactive screen design and accompanying video showing selected goals and scenarios.

Lenka Plháková is a Masters student at FI MU. She is interested in graphic design and user interfaces. She is currently working in Celebrio software s.r.o. as a graphic designer. Her Master’s thesis will be about creating a graphical user interface on mobile devices (especially tablets) for primary school teachers. This work is inspired by the Celebrio system, which is an operating system for seniors (running on computers and tablets).
**Implementation of the internship model in ICT area (project at FI MU)**

Jana Bartáková

The main focus of this project is to introduce and expand the concept of internships at commercial partners of the project. The project aims to connect theory and practice and improve student's preparation for practice. The internship model is popular and provides maximum benefits for students, but the process of internship should operate effectively at the Faculty of Informatics at Masaryk University. This model has two phases:

1. **First phase**
   - Students can work on real projects or theses in application area with support of teachers from FI.
   - Students advance knowledge by attending technical workshops, meetings with experts from business and standard curricula lectures.
   - Students have opportunity to meet specialists from companies directly at FI and become familiar with practical applications of theoretical approaches and modern technologies used by companies.
   - Participating in activities of the first phase may help students to determine their own career vision.

2. **Second phase**
   - Students go to pre-selected companies where they can use their experience and knowledge gained from first phase of the internship model, and their vision can guide them during the process of setting strategy and goals for their internship. Thus they are able to plan and manage it.

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**Best concept?**

- Whilst company resources are significantly limited, the effect of internships (transfer of knowledge and the overall contribution for all parties) needs to be maximized.
- Internship is not suitable to draw up like “vacation job” but better approach is to plan and managed as a project.
- Goals, time limitations, resources has to be set → student’s vision is the key factor.

**Q: What is in it for me?**

**Benefits**

- Shaping own future
- Establishing contacts
- Enrichment of the theoretical knowledge by experience
- Systematic building and extending knowledge
- Source of potential employees and employers
- Financial support of PPS

This project is co-financed by the European Social Fund and the state budget of the Czech Republic.

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**Platform for Industrial Cooperation**

Platforma průmyslové spolupráce CZ.1.07/2.4.00/17.0041

**Project partners:**

- IBM Česká republika, spol. s r. o.
- Microsoft s. r. o.
- Red Hat Czech s. r. o.
- JIC, zájmové sdružení právnických osob

**Jana Bartáková** is an Internship programme coordinator and Project administrator for the Platform for Industrial Cooperation at the Faculty of Informatics at MU. Jana has been working on this project since July 2011. She participates on a two-phase internship and cooperates with students who want to work at commercial companies. Her primary focus is the co-ordination of activities with Faculty partners to develop the professional growth of students.
Indoor User Localization Using Mobile Devices
Jonáš Ševčík

This research addresses techniques suitable for indoor user localization using mobile devices, without the use of GPS technology. The objective of this research is to design and implement an indoor localization prototype system, with results which are directly usable. The research problem is that GPS signals are weak or absent in closed spaces, and cannot be used reliably to identify locations inside buildings. Several technologies are used as part of the experimental methodology to implement the system. These include Wi-Fi tracking, step detection, dead reckoning, and Sequential Monte Carlo filtering. These technologies were combined and coded in the Java programming language to form the localization system. At this stage the implementation has been done for the Android platform, and could be expanded as future research to include iOS and possibly other platforms. Preliminary results of the prototype system indicate accuracy of 2.3 meters.

Introduction
- Difficult navigation in complex buildings
- Even if equipped with signs
- No direct visibility to GPS satellites
- GPS tracking not possible

Methodology
- Localization system based on [1, 2, 3]
- Consists of three localization techniques
- Techniques merged together for more accurate results

Wi-Fi Localization
- Received Signal Strength fingerprinting
- Used to create a database of APs and their RSS
- Mapped to location coordinates
- Receiver's location estimated from SS maps

Dead Reckoning
- Calculating position using previously determined coordinates advanced by known speed and course
- Position tracking - calculating steps
- Step length estimated using neural network [2]
- Course determined by gyrocompass.

Sequential Monte Carlo Filtering
- Particles evenly spread in probable location determined by RSS fingerprint database
- Particles set to motion by step detection events
- Eliminated particles, which hypothetical motion leads through impassable obstacles
- Results in improvement of location estimation.

Preliminary Results
- Implemented prototype Android application
- Results accurate to 2.3 meters

References

Acknowledgments
Jonáš Ševčík is currently part of the PhD program at Masaryk University. His research is focused on mobile platforms and he is developing a pedestrian navigation system for these devices. Besides doing research and working hard for the university, he likes traveling to Asia and learning foreign languages. If everything goes smoothly, he hopes to establish his own company, which will earn him enough money for early retirement.
Semantically Partitioned Peer to Peer Complex Event Processing Exploiting Information Loss

Filip Nguyen

Scaling event processing is an inherently complex process. The use of distributed architectures in its implementation is a well-known endeavour, but its limits have been identified over time.

The objective of this study is to provide a distributed solution to this problem. The most important drawback of the scaling process is the centralized approach of the event processing. Current distributed architectures use filtering on producers or horizontal scaling of parallelizable operators.

The problem is the fundamental method of matching of related events. If two events are from one event set, the whole set must be considered for the processing.

Thus the size of the event set creates a bottleneck.

To overcome this limitation, a semantic partitioning process is proposed, which allows a trade-off between information loss and matching power. The information loss is exploited by partitioning the event set into subsets with least probable correlation among events.

The resulting architecture is completely peer to peer, thus allowing new processing nodes to join the distributed cluster in order to take on an equal load for processing. This will either improve matching capabilities or allow higher throughput.

Filip Nguyen is a JBoss engineer specializing in Java middleware technologies. The main focus of his research is integration technologies and data mining technologies. Filip is an active community member and contributor to several JBoss projects. He is busy with his PhD in applied computer science for the software architecture-oriented laboratory LaSaRIS, and his field is distributed complex event processing. He has published 3 conference papers related to the topic of Java middleware and continues his work toward publishing his on-going results in the area of semantic partitioning for CEP.
Supporting the Process of Learning Mobile Application User Interfaces
Luzia Tokárová, Faculty of Informatics, Masaryk University, Brno, Czech Republic

With the recent expansion of the mobile industry, applications for mobile devices are becoming more complex, empowering people to perform more advanced tasks. However, current mobile user interfaces introduce several challenges, which affect learnability of mobile applications. For example:

- Small screens provide space for displaying high-priority functions and reduce discoverability of advanced features.
- Gesture UIs are engaging and intuitive for simple tasks but not for advanced operations.
- Sessions with mobile applications are short, and variable in the context of use, which affect user attention.
- Solely visual user interfaces without haptic feedback prevent activation of the muscle memory.

The process of learning mobile applications

Learning is a long process. Individuals' needs are changing over time. To achieve the highest levels of expertise, learners should be engaged in deliberate practice to continuously improve their performance. (via [5])

Research question: How to continuously support the process of learning mobile application user interfaces?

Objective

The objective of this research project is to investigate how people learn to use mobile applications, and how can this process be supported in different phases so that they quickly perceive the value of the application, accomplish basic tasks, and gradually learn new features in a natural way.

Methodology & expected results

This study will consist of observation of users' behavior in the context of skill acquisition within mobile user interfaces. Patterns in users' behavior and links between behavior and background information obtained by questionnaire will be investigated. It is anticipated that the study will demonstrate the correlation between learning strategies and personal information about users. The results of this study will aid in creating learning profiles of representative user groups. Further examination of these profiles should lead to the design of support mechanisms that will encourage various types of application learners in the process of continuous learning of mobile applications.

References

[5] Lucia Tokárová, Faculty of Informatics, Masaryk University, Brno, Czech Republic

Supporting the Process of Learning Mobile Application User Interfaces
Luzia Tokárová

With the recent expansion of the mobile industry, applications for mobile devices are becoming more complex, empowering people to perform more advanced tasks. However, current mobile user interfaces introduce several challenges, which affect learnability of mobile applications. The primary objective of this research project is to investigate how people learn to use mobile applications and how this process can be supported. This needs to be done so that people can perceive the value of the application, accomplish basic tasks and gradually learn new features in a natural way.

A pilot study will consist of observation of users' behavior in the context of skill acquisition within mobile user interfaces. Patterns in users' behavior and links between behavior and background information obtained by questionnaire will be investigated. It is anticipated that the study will demonstrate the correlation between learning strategies and personal information about users. The results of this study will aid in creating learning profiles of representative user groups. Further examination of these profiles should lead to the design of support mechanisms that will encourage various types of application learners in the process of continuous learning of mobile applications.

Lucia Tokárová is a doctoral student at Masaryk University, Faculty of Informatics. She is currently enrolled in her second year of the Computer Systems and Technologies program and she intends on completing her degree in 2015. Her research is focused on mobile user experience design, particularly the aspects of continuous learning of mobile application user interfaces. Outside of school, she works as a freelance user interface designer, focused on mobile and web applications.