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Seminar Talks, Titles, and Organizational Information HS 2016
Seminar: Internet Economics 11 (IntEco)

This seminar will be lead by Prof. Dr. B. Stiller. Topics will be presented, prepared, and discussed by students during this spring term, supported by Dr. T. Bocek, L. Kristiana, A. Lareida, P. Poullie, B. Rodrigues, and Dr. C. Schmitt.

Intro **Outlining the Seminar's Scope and Distribution of Talk Topics**
September 22, 2016 ..... NN

Talk 1: **"Economic Benefits of Automated Vehicle System"**
October 13, 2016 ..... *Supervisor:* Lisa Kristiana

Talk 2: **"Economics of Radio Towers"**
October 20, 2016 ..... *Supervisor:* Andri Lareida

Talk 3: **"Techniques and Strategies for Improving Network Energy Efficiency"**
October 27, 2016 ..... *Supervisor:* Bruno Rodrigues

Talk 4: **"Comparing Blockchains"**
November 3, 2016 ..... *Supervisor:* Thomas Bocek

Talk 5: **"Emerging Pricing Models for Cloud Services"**
November 10, 2016 ..... *Supervisor:* Patrick Poullie

Talk 6: **"Social and Economical Impact of New Swiss Law on Observation of Post and Telecommunication Traffic"**
November 17, 2016 ..... *Supervisor:* Andri Lareida

Talk 7: **"The Breaching of Cloud SLAs: Why it Happens and How to Prove it"**
November 24, 2016 ..... *Supervisor:* Patrick Poullie

Talk 8: **"Microtransactions with the Lightning Network"**
December 1, 2016..... *Supervisor:* Thomas Bocek

Talk 9: **"Economical Impacts of SDN and NFV for Telecom Operators"**
December 8, 2016..... *Supervisor:* Bruno Rodrigues

Talk 10: **"Challenges in 5G: Social, Technology, and Economic Perspectives"**
December 15, 2016..... *Supervisor:* Lisa Kristiana

Talk 11: **"Comparison of IoT Business Models" OR "Bartering and Trading"**
December 22, 2016..... *Supervisor:* Corinna Schmitt

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EFMD EQUIS ACCREDITED

Procedure — Mandatory Dates and Deadlines

All written seminar reports and talks will be prepared by one/two/three students as a supervised home work — the preferred form of working in a seminar is a single student's seminar. A draft version of the presentation slides structure is prepared until latest ***a week in advance of the talk date***. This includes a proposed set of slides and a written information of which topics will be addressed and which may not be addressed. An initial Table of Content (ToC) in the LaTeX layout is required to be completed for this first step, forming a good structural basis anyway. Furthermore, a bi-lateral meeting of app. 45 min will be set between the presenter and the supervisor to discuss the draft ToC.

In addition, the preparation of the written seminar report draft with a minimum of 10-12 pages (1 student), 16-18 pages (2 students), or 20-24 pages (3 students), excluding the title page and ToC of the LaTeX template) is due on ***October 6, 2016***. It shall include an almost complete summary in written form, a full ToC, a full structure of sections, a list of more detailed bullet points, and all literature read and used until now. It needs to be handed in by all students to the respective supervisor as a PDF file. A personal or mail-based feedback with an annotated PDF file of the draft will be returned to the student at a later stage.

The corrected and final versions of this report (covering a single homogenous work addressing the seminar topic clearly) have to be prepared until the end of the second month of the term, latest at ***November 17, 2016***, for a final review, however, earlier final versions are encouraged. This will allow for a final iteration between the supervisor and the group of students. The finalized electronic version in LaTeX, mandatory following the style guidelines provided, and a PDF is to be sent by e-mail to Corinna Schmitt at schmitt@ifi.uzh.ch, Sina Rafati at rafati@ifi.uzh.ch, ***and*** the respective supervisor.

The very final camera-ready version of the report (PDF and all LaTeX sources and pictures) and the finalized slide set (Power Point, PDF) for the talk given have to be mailed latest to the supervisor by ***December 15, 2016***. Failures to do so will result in the assignment of an unsuccessful mark.

Im summary:

- A week in advance of your talk — provide your (a) slide set proposed and a (b) ToC of your talk and report to the supervisor.
- 3 weeks after term start — provide a report draft covering (a) a summary in written form, (b) a full ToC determining the full structure of all sections, (c) a list of more detailed bullet points fpr each of those sections and subsections, and (d) all literature read, compiled into the correct bibliographic reference format.
- 9 weeks after term start — the final, complete draft of the seminar report has tobe handed in to the supervisor.
- Last week of term — the final camera-ready version of the report has to be with the supervisor.

1. Talk Information

The talk will last 30 min (one speaker) to 45 min (2 speakers) per presentation. Share the time equally for motivating/summarizing and presenting technical details as well. Do not run over, but do not undercut as well by more than 10% of the time, calculated in minutes.

After the talk and an optional short break, the questions and discussions part will begin and will last for 30-45 minutes. This includes the answering of questions coming from the audience on one hand, and the preparation of three (minimum) or more controversially discussable statements or hypothesis (each on a separate slide) put up by the presenter, on the other hand. It may encompass, *e.g.*, to which extent is the topic presented relevant to equipment providers, do they have to adapt their technologies in place? How will the introduction of the scheme presented make users shift their usage paradigms? Or, is the set of approaches available an opportunity for the new economy, where are their risks? It is highly recommended to read other talk titles and relate questions to them as well.

The talk needs to be backed by a set of slides prepared from the presenter. It shall be well orga-

nized, include a front slide with title, presenter, and outline, and a sum up of the talk after a clear and structured presentation of technical, systematic, and correct details. On average you can assume a 2-3 min talking time per slide, which makes a slide set of app. 18-22 slides necessary. Avoid too much text on the slide, but clearly entitle and identify pictures and graphs on them. Use a font larger than 16 pt in the general case of text.

2. Final Seminar Rating Guidelines

This seminar will not be marked in numerical terms, though, a final success or non-success will be documented. The key for a successful finishing of this seminar will be based completely — without exceptions — on the following criteria:

- Writing the report in the LaTeX template with a length of minimal number of pages (as defined above and excluding the title page and Table of Content) and following those layouting instructions with respect to an abstract, sections, and references.
- In time hand-in of a proposed Table of Content, an initial set of presentation slides, a final slide set.
- In time hand-in of the finalized written report, covering and integrating all supervisor feedback in an appropriate manner and forming a homogenous and topic-dependent work.
- Giving a 35-45 minutes presentation on the seminar topic based on slides.
- Moderating a 30-45 minutes discussion and stating self-prepared a minimum of three discussion topics.
- Showing a significant effort to achieve the seminar's goals as defined in each topic description.
- Compliance with ***all*** deadlines named and stated above.
- To be present in all minus one seminar dates. WK, illness exceptions based on written evidences are excused.
- Following ***all*** of those instructions seen in those 2 pages within sections 1 to 7.
- In case of failures in any of the above items listed a reduction of the seminar's mark between 0.25 and 0.75 points is possible.

3. Background Material

Those bibliographic references as shown in the abstracts of each topic, which are not available publicly or on-line, are provided in paper copy. Further material may be obtained, and this is recommended strongly, in the departmental or UZH libraries.

Note that you must include a bibliographic reference section in your written report including all material used and provided in the talk descriptions. Web-pages and URLs need to be listed with the page title, a possible author, if available, as well as the month/year in which you have accessed the page. Just follow those style guidelines and information necessary for references as provided in the LaTeX template.

4. Publication

This set of these seminar reports will be published in an internal report and will be made available on the web for public use. Therefore, please be aware of all rules of scientific work, where a.o. all references used and cited will be part of the written report, all figures are readable, and the use of language follows a high standard.

The slides of the presentation will be made available as well on the same web page as mentioned above. Therefore, a PowerPoint document (or a PDF only for a different presentation document format) needs to be prepared carefully as well and is to be sent to the e-mail addresses mentioned above.

5. Further Information — LaTeX Template URL

For any type of further information, please sent an e-mail to the supervisor (bocek@ifi.uzh.ch, kristiana@ifi.uzh.ch, lareida@ifi.uzh.ch, poullie@ifi.uzh.ch, rodrigues@ifi.uzh.ch, and schmitt@ifi.uzh.ch) and addressing LaTeX questions to schmitt@ifi.uzh.ch. In case the problem will be solvable via mail it will happen as soon as possible, in all other cases a physical meeting may be arranged bilaterally. The LaTeX seminar template will be available at the following URL: http://www.csg.uzh.ch/teaching/, select the seminar section.

6. Structure and Content of Seminar's Written Report

A written report in an academic environment, which is based in research and well-established research methods, will always cover the following sections, may be in different lengths or other preferences:

Title and Author
Abstract
Table of Content
1. Introduction and Problem Statement
2. Related Work
3. Approach(es)
4. Solutions
5. Evaluations and Discussion
6. Summary and Conclusions
References

While each of those sections may be named individually, they show the key content of the written seminar report required. Please note that this structure determines a recommendation, any changes may be possible, but need to be able to comply with similar compliance measures.

Additionally, the use of references is of utmost importance for academic work. Thus, if you use any references and citations, apply the style of citations as shown on the LaTeX template. A fully copied sentence needs a reference at its end, as well as a sort of summarized key thought of a utilized paper needs to be cited initially when used. Fully copied paragraphs are not acceptable. All references provided in the seminar's task description need to be part of the final written report.

The abstract mentioned above will be in the style of an executive summary, indicating the key aspects and results to be seen in this respective report. It shall not exceed the first page's (cover sheet) length. Page two of the report will include the Table of Content. All additional sections are presented above in principle.

In case of any doubts of this structure or content, get into contact with your assigned supervisor by e-mail right away. Do not wait until the deadline for handing in this work has been reached!

Finally, make sure that you will deliver a single report, which integrates the results, thoughts, and work of you, the set of students working on it. A simple concatenation of two/three separately written parts and independent information collections will not be accepted.

Economic Benefits of Automated Vehicle System

NN

October 13, 2016

Seminar: Internet Economics, Talk No. 1

Automated Vehicle Systems (AVSs) are an important research topic in a strategic solution to the mobility problems that may arise in the coming years [5]. The integration of intelligent and automated features and autonomous functionalities in vehicles will lead to major economic benefits, including reduced fuel consumption [1], [2]. Cost-benefit analyses are still the dominant method for evaluating AVSs and other transport engineering projects [3], however, the human factor in AVSs is also analized in order to fulfill the automated demands [4].

This economic benefits study of AFS shall be provided in the report. An overview of available AVSs technology and what their advantages and drawbacks are. Furthermore, the report will show the current state of development in AVSs and the limitations of AVSs. Finally, the report will indicate some issues that need to be solved in order to apply AVSs

References

[1] Bishop, R., 2000. Intelligent vehicle applications worldwide. IEEE Intelligent Systems and Their Applications, 15(1), pp.78-81.

[2] Manzie, C., Watson, H. and Halgamuge, S., 2007. Fuel economy improvements for urban driving: Hybrid vs. intelligent vehicles. Transportation Research Part C: Emerging Technologies, 15(1), pp.1-16.

[3] Juan, Z., Wu, J. and McDonald, M., 2006. Socio-economic impact assessment of intelligent transport systems. Tsinghua Science & Technology, 11(3), pp.339-350.

[4] Barfield, W. and Dingus, T.A., 2014. Human factors in intelligent transportation systems. Psychology Press.

[5] Psaraftis, H.N., 1995. Dynamic vehicle routing: Status and prospects. annals of Operations Research, 61(1), pp.143-164.

Further reading and search for additional literature is required and recommended strongly!

Economics of Radio Towers

NN

October 20, 2016

Seminar: Internet Economics, Talk No. 2

Mobile networks are an integral part of our private and professional lives. The data delivered over moble networks grows continously and requires constant updating of those networks. The Swiss National Council (Nationalrat) has motioned the Federal Council (Bundesrat) in March 2016 to investigate how regulations on cell tower radiation can be relaxed. An increase of the cell tower radiation levels is controversial as there is little to none scientific proof of longterm effects of such radiation [5][6].

The supporters argue that the Swiss mobile networks are reaching their limit and that increasing the radiation levels is the best way to improve the networks while it is not harmful to humans [4]. The oponents claim that cell radiation has negative effects on humans and animals and that the problem can also be solved by deploying more antennas [4].

This seminar topic focuses on the cost and benefits of operating more cell towers vs. increasing the raditaion levels of existing towers. The report shall explain the basics of mobile network design and deployment and discuss the associated cost [1] [3]. The report shall also give an overview of the currently avialble research related to effects of cell radiation on the human body [2].

References

[1] V. Chandrasekhar, J. G. Andrews, T. Muharemovic, Z. Shen and A. Gatherer: *Power control in two-tier femtocell networks*, IEEE Transactions on Wireless Communications, Vol. 8, No. 8, PP. 4316-4328, August 2009.

[2] FSM-Swiss Research Foundation for Electricity and Mobile Communication. URL: http://www.emf.ethz.ch/en/knowledge/topics/ last visit: August 5, 2016

[3] B. Gavish and S. Sridhar: *Economic Aspects of Configuring Cellular Networks*, Wireless Netw (1995) 1: 115

[4] Y. Hafner: *Handy-Antennen Sollen Bald Massiv Mehr Strahlen*, SRF, 18.6.3016 URL: http://www.srf.ch/sendungen/kassensturz-espresso/handy-antennen-sollen-bald-massiv-mehr-strahlen-2 last visit: August 5, 2016

[5] H. Bhargav, T.M. Srinivasan, S.Varambally, B.N. Gangadhar, and P. Koka: *Effect of Mobile Phone-Induced Electromagnetic Field on Brain Hemodynamics and Human Stem Cell Functioning: Possible Mechanistic Link to Cancer Risk and Early Diagnostic Value of Electronphotonic Imaging*, Journal of Stem Cells, 10(4), P.287.

[6] Saeid, Sabah Hawar: *Study of the Cell Towers Radiation Levels in Residential Areas*, 2013 International Conference on Electronics and Communication Systems, Rhodes Island, Greece, July 16-19, 2013

Further reading and search for additional literature is required and recommended strongly!

Techniques and Strategies for Improving Network Energy Efficiency

NN

October 27, 2016

Seminar: Internet Economics, Talk No. 3

An explosion of computing devices, stationary and portable, is currently underway. These computing devices include, but are not limited to, smartphones, laptops, tablets, phablets, etc. Demand for these devices is made more acute by social media's rapid evolution, which encourages a need to communicate and be in contact with others. Social applications, which are consumed by the users today, together with other applications and capabilities required by businesses, have grown so much that the amount of power and computing for supporting these applications require dedicated data centers [1].

However, each data center is in itself a large amalgam of physical devices, e.g., computing devices, servers, routers, etc. and virtual devices, e.g., virtual machine, virtual router, virtual switch, etc. Each of these devices consumes real electric power, which given the large size of the data center, is becoming a considerable expense associated with the data center. In this regard, although there is no consensus in the literature with respect to how much electricity the network part consumes in a data center, the available studies indicate numbers that vary between 4% and 22% of the total data center's consumption [2].

In this regard, several functionalities and protocols have been proposed to cope with energy efficiency in networks, ranging from the design of new energy efficient silicon technology to energy aware routing protocols and applications. In this seminar the student shall select one capability in one of the approaches [3,4,5], and describe in details its functioning, characteristics and advantageous conditions of use. Furthermore, the student is encouraged to propose enhancements on the selected capability.

References

[1] Roy et al. "Inside the Social Network's (Datacenter) Network". http://cseweb.ucsd.edu/~snoeren/papers/fb-sigcomm15.pdf

[2] Riekstin et al. "Orchestration of energy efficiency capabilities in networks". http://www.sciencedirect.com/science/article/pii/S1084804515001435

[3] Bolla et al. "Energy Efficiency in the Future Internet: A Survey of Existing Approaches and Trends in Energy-Aware Fixed Network Infrastructures". http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5522467

[4] Bianzino et al. "A Survey of Green Networking Research". http://arxiv.org/pdf/1010.3880.pdf

[5] Orgerie et al. "A Survey on Techniques for Improving the Energy Efficiency of Large Scale Distributed Systems" http://people.irisa.fr/Anne-Cecile.Orgerie/Energy_ACM_Survey.pdf

Further reading and search for additional literature is required and recommended strongly!

Comparing Blockchains

NN

November 3, 2016

Seminar: Internet Economics, Talk No. 4

In recent years, electronic contracts have gained a lot of attention, especially in the context of the blockchain technology. While public blockchains are considered secure, legally binding under certain circumstances, and without any centralized control, they are applicable to a wide range of application domains, such as smart contracts, public registries, registry of deeds, or virtual organizations. As one of the most prominent blockchain example, the Bitcoin[1] system has reached large public, financial industry-related, and research interest. Another prominent blockchain example, Ethereum[2], which is considered a general approach for smart contracts has taken off too. Nevertheless, various different set of functions, applications, and stakeholders are involved in this smart contract arena, which by itself sees a wider range of advantages, problems, and development chances.

The goal of this seminar report is to find and list other blockchains besides Ethereum and Bitcoin and outline its main features. The list of blockchains is growing and most of the information about those blockchains is either online or in discussion boards. Thus, the challenge will be to find reliable information about those blockchains. Candidate blockchains besides Ethereum and Bitcoin (and few altcoins such as Litecoin) are: Lisk, R3 Corda, IOTA, Eris:DB, Chain Core, Hyper Ledger, Nxt, Stratis, Multichain, BigchainDB, Ripple/Steller, RSK, Openchain, Counterparty, Blockstream. Other relevant blockchains not listed should be added to this list.

References

[1] Satoshi Nakamoto, Bitcoin: A Peer-to-peer Electronic Cash System, http://bitcoin.org/bitcoin.pdf

[2] Gavin Wood, Yellow Paper - "ETHEREUM: A Secure Decentralised Generalised Transaction Ledger", http://gavwood.com/paper.pdf

Further reading and search for additional literature is required and recommended strongly!

Emerging Pricing Models for Cloud Services

NN

November 10, 2016

Seminar: Internet Economics, Talk No. 5

Cloud computing allows for large scale sharing of computing resources in a technically and administratively scalable manner. It is, therefore, quickly adopted by a large number of companies (not limited to the IT sector) also resulting in a high end-user adoption [1]. This seminar topic, therefore, focuses on an important aspect of commercial clouds: pricing schemes.

In particular, it shall be investigated how different major and minor cloud providers price their cloud services. The most important cloud providers to be looked at are Amazon [2], Google [3], and Microsoft [4]. It shall be compared, which service models, e.g. Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), are offered and how they are priced. Most importantly, it shall be investigated, whether flatrate charging schemes or other non-volume based charging models are offered, i.e., where the user does not pay on a per VM basis. If this is the case, these charging models shall be discussed and compared in detail.

The report shall conclude on which cloud provider is most affordable, potentially also taking into account factors of varying performance [5].

References

[1] L. Schubert and K. Jeffery. Advances in Clouds. European Commission, Publications Office of the European Union, Luxembourg, 2012.

[2] Amazon Web Sevices, Inc.: AWS, https://aws.amazon.com, last accessed July 18th, 2016.

[3] Google: Google Cloud Platform, https://cloud.google.com, last accessed July 18th, 2016.

[4] Microsoft: Microsoft Azure, https://azure.microsoft.com/de-de/, last accessed July 18th, 2016.

[5] Philipp Leitner and Jürgen Cito. Patterns in the Chaos—A Study of Performance Variation and Predictability in Public IaaS Clouds. ACM Trans. Internet Technol. 16, 3, Article 15, April 2016.

Further reading and search for additional literature is required and recommended strongly!

Social and Economical Impact of New Swiss Law on Observation of Post and Telecommunication Traffic

NN

November 17, 2016

Seminar: Internet Economics, Talk No. 6

In March 2016 the Swiss parliament has decided a new law regarding the observation of post and telecommunication traffic: "Bundesgesetz betreffend die Überwachung des Post- und Fernmeldeverkehrs (BÜPF)" [1]. The law was subject to heated debate and criticism from oponents who initiated an unsuccessful referendum.

This new law affects citizens, telecommunication providers, and communication services providers, e.g., messenger services. All these stakeholders are obliged to help the Federal Post and Telecommunications Observation Service [3] by providing Data of their users if requested. According, to [4] the impact of the new law on the telecommunications sector in general is low. However, for small to medium businesses (SMB) the individual impact is possibly high. Authorities believe that this legislature brings improvements in law enforcement, which is highly doubted by the referendum comittee [2]. Furthermore, a study [5] suggests that the reduction of observation activities in Germany did not lead to a decrease in successrate of criminal investigations compared to Switzerland where no reduction was made.

This seminar report will explain the changes made from the old to the new legislature [1]. Based on these differences an analysis of the economical impact of the new law shall be made, with a focus on the impact on SMBs. Furthermore, an evaluation of the benefits of the new law in law enforcement and criminal investigations shall be presented. As many resources are only available in German (some also in French or Italian) students working on this topic should be fluent in German, French, or Italian.

References

[1] *Vorlage der Redaktionskommission für die Schlussabstimmung Bundesgesetz betreffend die Überwachung des Post- und Fernmeldeverkehrs (BÜPF),* March 18, 2016, URL: https://www.parlament.ch/centers/eparl/curia/2013/20130025/Schlussabstimmungstext%201%20NS%20D.pdf last visit: August 5, 2016.

[2] Stop BÜPF: Wi*r stoppen das BÜPF, URL:* https://stopbuepf.ch/, last visit: August 5, 2016

[3] The Federal Authorities of the Swiss Confederation: *Post and Telecommunications Surveillance Service*, URL: https://www.li.admin.ch/en last visit: Auguts 5, 2016

[4] *Bericht Erhebung und Analyse der Kosten der Post- und Fernmeldeüberwachung,*12.6.2012 URL: https://www.li.admin.ch/documents/site/Dt_KPMG-Bericht_ISC-EJPD_FDA-PDA.pdf last visit: Aug 5, 2016

[5] H.J. Albrecht and M. Kilchling: *Schutzlücken durch Wegfall der Vorratsdatenspeicherung? Eine Untersuchung zu Problemen der Gefahrenabwehr und Strafverfolgung bei Fehlen gespeicherter Telekommunikationsverkehrsdaten,* Kriminologische Forschungsberichte aus dem Max-Planck-Institut, Bd. K 160. Duncker & Humblot, Berlin 2012.

Further reading and search for additional literature is required and recommended strongly!

The Breaching of Cloud SLAs: Why it Happens and How to Prove it

NN

November 24, 2016

Seminar: Internet Economics, Talk No. 7

Cloud Computing (CC) is a computing paradigm enabled by the growing connectivity provided by modern communication systems combined with virtualization technology [1]. CC allows customers, such as companies and end-users, to rent computational resources from data centers for many different purposes [2]. Because customers share the rented computational resources (clouds apply statistical multiplexing to increase efficiency and reduce costs [3, 4]) and are connected to them via the Internet, the Quality of Service (QoS) may not be as high as desired by the customer. Because resources are rented, i.e., money is transfered, Service Level Agreements (SLAs) will prescribe the performance the cloud provider has to deliver [5]. However, when the customer feels the contracted QoS is not achieved, this may not be cloud providers fault. In particular, when the customer runs delays sensitive applications the cause of a low QoS may also be the network [6] connecting the customer to the cloud. Therefore, QoS monitoring of the network [7] and the cloud is necessary to certify that the cloud provider achieves the contracted QoS.

This report shall compile and explain cloud monitoring methods. It shall be focused on how the variable of network performance is accounted for and conclude on whether the cloud or the network usually is the cause for perceived low cloud QoS.

References

[1] Lutz Schubert and Keith Jeffery. Advances in Clouds. Expert group report, Publications Office of the European Union, Luxembourg, 2012.

[2] Amazon Web Services, Inc. Amazon EC2 Pricing. https://aws.amazon.com/ec2/pricing/, 2016. Online; accessed January 26th, 2016.

[3] Andrea Arcangeli, Izik Eidus, and Chris Wright. Increasing Memory Density by Using KSM. 2009 Linux Symposium, Vol. 1, pp 19–28, Montreal, QC, Canada, July 2009

[4] Yoav Etsion, Tal Ben-Nun, and Dror G. Feitelson. A Global Scheduling Framework for Virtualization Environments. 2009 IEEE International Symposium on Parallel Distributed Processing, IPDPS 2009, pp 1–8, Rome, Italy, May 2009.

[5] Adriano Galati, Karim Djemame, Martyn Fletcher, Mark Jessop, Michael Weeks, John McAvoy. A WS-Agreement Based SLA Implementation for the CMAC Platform. Economics of Grids, Clouds, Systems, and Services: 11th International Conference, GECON 2014, Cardiff, UK, September, 2014

[6] David D. Clark, Steven Bauer, William Lehr, KC Claffy, Amogh D. Dhamdhere, Bradley Huffaker, and Matthew Luckie. Measurement and Analysis of Internet Interconnection and Congestion. Telecommunications Policy Research Conference, TPRC '14, September 2014.

[7] Jacek Kosiński, Piotr Nawrocki, Dominik Radziszowski, Krzysztof Zieliński, Grzegorz Przybylski, Paweł Wnek. SLA Monitoring and Management Framework for Telecommunication Services. Fourth International Conference on Networking and Services, ICNS 2008, pp.170-175, March 2008.

Further reading and search for additional literature is required and recommended strongly!

Microtransactions with the Lightning Network

NN

December 1, 2016

Seminar: Internet Economics, Talk No. 8

Bitcoin [1] is an open and fully distributed P2P digital currency that is gaining more and more popularity. Bitcoin is independent of any centralized authority and the current market capitalization is 9.2 billion USD [2]. This market capitalization reflects the amount created Bitcoins with the current exchange rate. Transactions can be initiated by any peer and can be transferred to any valid Bitcoin address. The creation of Bitcoins is done by securing transaction by Bitcoin miners. Securing means to solve a crypto puzzle that is difficult to compute. Real money can be exchanged to Bitcoins via centralized exchange sites. Every Bitcoin transactions requires fees to pay for a timely inclusion in the blockchain, which is around 10 - 30 cents. This makes microtransaction unfeasible.

The goal of this seminar report is to describe the idea and its design of the Lightning Network[3], which allows to create microtransactions. It allows instant payments without waiting for block confirmation times. The Lightning Network scales up to billions of transaction per seconds, which is an order of magnitude larger than the current 7 transactions per seconds in the Bitcoin network. The report shall include the details about the architecture and the security aspects.

References

[1] Satoshi Nakamoto, Bitcoin: A Peer-to-peer Electronic Cash System, http://bitcoin.org/bitcoin.pdf

[2] Bitcoin Charts. URL: http://bitcoincharts.com/bitcoin/. Visited on August 2016

[3] Joseph Poon, Thaddeus Dryja, The Bitcoin Lightning Network: Scalable O -Chain Instant Payments, https://lightning.network/lightning-network-paper.pdf

Further reading and search for additional literature is required and recommended strongly!

Economical Impacts of SDN and NFV for Telecom Operators

NN

December 8, 2016

Seminar: Internet Economics, Talk No. 9

Due the pervasive diffusion of broadband access, increasing performance of chipsets and IT hardware, and a widespread availability of open source software, Software-Defined Networking (SDN) and Network Functions Virtualization (NFV) are two main paradigms gaining attention towards the establishment of software-defined infrastructures. While SDN is fundamentally based on decoupling software from hardware, consolidating the control plane so that single software controls multiple data plane elements [1], NFV regards the virtualization of network functions and their dynamic allocation and execution on generic servers [2].

Aligned, SDN and NFV offer agile and programmable network infrastructures toward generic network hardware deployed on open software, in which functions of the centralized control can be performed through virtualized functions and capabilities from NFV [3]. Combined in the cloud infrastructure, SDN and NFV enable operators to extend management capabilities of the data center, increasing both agility and flexibility of the service provisioning whilst the overall OPEX and CAPEX efficiency are increased [4,5].

This seminar shall give a brief introduction into both paradigms, discussing the major challenges and benefits of combining SDN and NFV into a telecom cloud infrastructure scenario. Also, the student should describe through use cases, technical and economic benefits/drawbacks of software-based networking in relation to traditional networking, further describing ideal scenarios for their adoption. Furthermore, as networking will be more intimately related to compute resources, the student is encouraged to quantify/model the impact of SDN and NFV on data center resource consumption.

References

[1] White paper on “Software-Defined Networking: The New Norm for Networks” https://www.opennetworking.org/images/stories/downloads/sdn-resources/white-papers/wp-sdn-newnorm.pdf

[2] White paper on “Network Functions Virtualisation” http://portal.etsi.org/NFV/NFV_White_Paper.pdf

[3] White paper on “OpenFlow-enabled SDN and Network Functions Virtualization” https://www.opennetworking.org/images/stories/downloads/sdn-resources/solution-briefs/sb-sdn-nvf-solution.pdf

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Further reading and search for additional literature is required and recommended strongly!

Challenges in 5G: Social, Technology, and Economic Perspectives

NN

December 15, 2016

Seminar: Internet Economics, Talk No. 10

The fifth generation (5G) mobile communication is an emerging technology for future mobile communication. The investigations of 5G are conducted in many areas such as in technology, economic, and social perspectives. The technology perspective takes into account the complex context of operation and essential requirements [6], [7]. [8]. The economic perspective discusses from the research and innovation activities to infrastructure investments and prospects for early commercial developments [9][10], [11]. The latest social perpective investigates the social acceptability in order to improve the user satisfaction [12], [13].

This seminar report shall provide a brief introduction to 5G and its challenges in prementioned perpectives. Based on the 5G investigations, each perspectives are discussed why and how they are feasible or hardly deployed.

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Further reading and search for additional literature is required and recommended strongly!

Comparison of IoT Business Models

NN

December 22, 2016

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The challenge for the Internet of Things (IoT) stakeholders and the IoT ecosystem is to create value for individuals or business [7]. The value differs for different stakeholders; individuals can perceive value as something that is “improving” their life or bring them new experiences; businesses, preceive value by ROI (return of investment), that is transated in saving company money, directly, either by lowering costs, or indirectly, by improving efficiency of existing resources.

The involvement of many stakeholders in the IoT digital value chain can create rather complicated business models necessary for many IoT applications that in short term limit the impact of IoT technologies and applications [5,6]. IoT brings challenges to the stakeholders in the IoT ecosystem on identifying horizontal needs and opportunities, the management challenge related to internal organizational goals (i.e., matching technology and to the objectives of business developers), and the ways to overcome the market maturity issues for new IoT technologies.

The goal of this seminar topic is three-folded: First, explain the general business model definition presented by the “magic triangle” [1] shown in the figure right providing four dimensions - who, what, how, and value. Second, introduce the Canvas Model [2] to characterize the main key issues for a business model that support answering the categorize from the “magic triangle”. Based on this state how business models changed due to the IoT development compared to traditional settings. Third, compare available IoT Business Model frameworks with each other that are in place starting with [3, 4, 8].

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Further reading and search for additional literature is required and recommended strongly!

Bartering and Trading

NN

December 22, 2016

Seminar: Internet Economics, Talk No. 12

Due to the digitalization a big change in the process of exchanging goods can be observed [5]. Nowadays two processes - bartering and trading - are popular with the same purpose of obtaining required goods or services in mind. The main difference between them is that for trading money is involved to obtain a product where in the case of bartering one product is exchanged for another [1]. Besides this fact there are other important differences between them, especially in the concept used behind. [1]

The goal of this seminar topic is to clearly define the terms bartering and trading in a first step. Next, the concepts behind both should be anaylzed and compared [4]. Afterwards different bartering and trading websites should be selected and their functionalities, requirements, and limits should be compared [2,3]. Finally, the question on “How is bartering and/or trading involved in todays digital world?” should be answered [5].

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Further reading and search for additional literature is required and recommended strongly!