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Seminar Talks, Titles, and Organizational Information FS 2018
Seminar: Communication Systems 11 (ComSys)

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 S. Rafati, B. Rodrigues, Eder Scheid, and Dr. C. Schmitt.

Intro **Outlining the Seminar's Scope and Distribution of Talk Topics**
February 22, 2018 ..... Corinna Schmitt

Talk 1: **"Requirements and Challenges for Blockchain Governance"**
March 22, 2013 ..... *Supervisor: Bruno Rodrigues*

Talk 2: **"SLAs and Smart Contracts: A Feasibility Study"**
March 29, 2018 ..... *Supervisor: Eder Scheid*

Talk 3: **"Network Neutrality Laws: The Swiss Case Study"**
April 12, 2018 ..... *Supervisor: Eder Scheid*

Talk 4: **"Interconnecting Things Using the Constrained Application Protocol"**
April 19, 2018 ..... *Supervisor: Corinna Schmitt*

Talk 5: **"Advanced Message Queuing Protocol as a Communication Protocol Standard for IoT"**
April 26, 2018 ..... *Supervisor: Corinna Schmitt*

Talk 6: **"Introduction to IoT Use Cases With an Evaluation of Integration Possibilities with Blockchains"**
May 3, 2018 ..... *Supervisor: Sina Rafati*

Talk 7: **"An Overview of Emerging Wireless Communication Systems in 5G"**
May 17, 2018 ..... *Supervisor: Sina Rafati*

Talk 8: **"Overview and Use Cases of Blockchain Interoperability"**
May 24, 2018 ..... *Supervisor: Bruno Rodrigues*

Talk 9: **"Commonalities of Network Function Virtualization, Blockchains, and Smart Contracts"**
May 31, 2018 ..... *Supervisor: Eder Scheid*

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1. 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 pages (1 student), 16 pages (2 students), or 20 pages (3 students), excluding the title page and ToC of the LaTeX template, is due on ***March 15, 2018***. 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 ***April 26, 2018***, 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 Daniel Dönni at doenni@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 ***May 31, 2018***. Failures to do so will result in the assignment of an unsuccessful mark.

In 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 for 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 to be handed in to the supervisor.
- Last week of term — the final camera-ready version of the report has to be with the supervisor.

2. Talk Information

The talk will last 30 min (one speaker) to 45 min (2 or 3 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 possible questions will be taken and the 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 organized, 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.

3. 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 10, 16, or 24 pages (see above, 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 45 minutes presentation on the seminar topic based on slides.
- Moderating a 45 minutes discussion, stating a minimum of three self-prepared 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, thus, a medical certificate has to be provided.
- 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.

4. 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.

5. 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.

6. Further Information — LaTeX Template URL

For any type of further information, please sent an e-mail to the supervisor (rafati@ifi.uzh.ch, rodrigues@ifi.uzh.ch, scheid@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/ and select the seminar section.

7. 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.

Requirements and Challenges for Blockchain Governance

NN

March 22, 2013

Seminar: Communication Systems, Talk No. 1

Governance as defined by the United Nations [1], is the process of decision-making and the process by which decisions are implemented (or not implemented) by a governing entity. For most people, the word "governance" reminds the centralized geopolitical models which use laws, regulations and norms to organize a society. Governance can be implemented in different levels (e.g., family governance, company governance, nation governance) and every community has some form of governance with its rules whether written formally or implicity understood by its members. Blockchains, however, allows individuals and communities to redesign their interactions in politics, business and society at large, with an unprecedented process of disintermediation [2]. For the first time in history, communities can now reach consensus and coordination at global level through cryptographically verified peer-to-peer procedures in order to provide governance services in a more efficient and decentralized way, without the intermediation of a third party. However, it is not yet clear what the potential applications are and how the governance process will be.

In this talk, students shall provide an overview on current challenges of blockchain governance (e.g., as listed in [3]), clarifying which mechanisms/techniques could be used to enforce, monitor and measure [1] in a decentralized, blockchain-based, governance. As of today, blockchain governance is mostly done off-chain via mailing lists and community-based forums to reach an agreement on its functioning [4, 5]. Also, students shall compare and discuss how a blockchain-based governance could be implemented in a existing service or application done via a centralized governance (e.g., government). In summary, an overview of the subject shall be provided with an example in the end comparing how it would apply in constrast to an existing service.

References

[1] United Nations. What is Good Governance? Online: https://www.unescap.org/sites/default/files/good-governance.pdf Accessed: 12.01.2018

[2] Atzori, Marcella. "Blockchain technology and decentralized governance: Is the state still necessary?." (2015).

[3] M. Faher and S. Cariou. Blockchain Governance Initiative - A proposal for the Blockchain Standardisation Workshop. (2017).

[4] Reijers, Wessel, Fiachra O'Brolcháin, and Paul Haynes. "Governance in Blockchain Technologies & Social Contract Theories." Ledger 1 (2016): 134-151.

[5] Yermack, David. "Corporate governance and blockchains." Review of Finance 21.1 (2017): 7-31.

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

SLAs and Smart Contracts: A Feasibility Study

NN

March 29, 2018

Seminar: Communication Systems, Talk No. 2

Service Level Agreements (SLAs) [1] describe the requirements that Service Providers (SPs) must meet when delivering a specific service to users. For example, in cloud computing an SLA can describe that a database server shall be 99.99% of the time available, or that the response time between the client and the service must not exceed 10ms. SLAs are contracts between an SP and a client, specifying measurable metrics and parameters to be fulfilled. Furthermore, these SLAs should be written (e.g., using the WSLA framework [2]), agreed by both parties, and then monitored to ensure that the SP is complying with what was agreed. However, when the customer is experiencing a weak service or sense that the agreed SLAs are not being satisfied, the customer must contact the SP to explain the issue and be reimbursed if there was a violation of the SLA. In contrast, Smart Contracts (SCs) leverage the blockchain to provide contracts that are programmed to execute immutable agreements between two parties that do not necessarily trust each other [3]. This untrusted parties can be the case of a cloud SP and a customer, where SCs define the SLAs agreed by the involved parties, if there is a violation of an SLA, the SC can automatically detect and reimburse the customer accordingly, or if there is no violation, pay the SP with the agreed price of the service.

The goal of this seminar topic is to provide a feasibility study of the writing of SLAs using Smart Contracts. Thus, students must research about which cryptocurrencies support Smart Contract, which are the current methods of specifying SLAs, and if it is better (in what context) to use Smart Contracts or current SLAs management methods to manage SLAs.

References

[1] S. Mubeen, S. A. Asadollah, A. V. Papadopoulos, M. Ashjaei, H. Pei-Breivold, and M. Behnam. Management of service level agreements for cloud services in Iot: A systematic mapping study. IEEE Access, PP(99):1–1, 2017.

[2] A. Keller and H. Ludwig. The wsla framework: Specifying and monitoring service level agreements for web services. J. Netw. Syst. Manage., 11(1):57–81, Mar. 2003.

[3] M. Alharby and A. van Moorsel. Blockchain-based smart contracts: A systematic mapping study. CoRR, abs/1710.06372, 2017.

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

Network Neutrality Laws: The Swiss Case Study

NN

April 12, 2018

Seminar: Communication Systems, Talk No. 3

The Net Neutrality topic is not recent, being discussed since the 1990s when the Federal Communications Commission (FCC) of the United States declared that Internet Service Providers (ISPs) provide a public service [1]. However, its discussion between service providers and clients has grown more intense over the past years due to its negative effects on the general (non-technical) community. In December 2017, the FCC removed the Net Neutrality Laws in the United States [2]. This removal of laws means that companies are not anymore prohibited from charging extra for the access to specific content or service, e.g., Netflix or Youtube, to reduce its clients' Internet connection speed if they have downloaded more than a threshold of gigabytes, or to throttle the connection speed of Peer-to-Peer (P2P) applications. These actions, among others, hurt the principles of the Net Neutrality [3], hinder the access to content by users, and promote the segregation on the Internet.

The goal of this seminar topic is to research on the Net Neutrality topic, providing an overview of the laws and regulations using Switzerland as a case study. Furthermore, a discussion comparing the Net Neutrality laws in Switzerland and the laws in different countries can also be conducted.

References

[1] P. Maille, G. Simon, and B. Tuffin. Toward a net neutrality debate that conforms to the 2010s. IEEE Communications Magazine, 54(3):94–99, March 2016.

[2] C. Kang. F.C.C. Repeals Net Neutrality Rules. Online, December 2017. Available at https://www.nytimes.com/2017/12/14/technology/net-neutrality-repeal-vote.html Accessed 09 January, 2018.

[3] T. Wu. Network neutrality, broadband discrimination. J. on Telecomm. & High Tech. L., 2:141, June 2003.

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

Interconnecting Things Using the Constrained Application Protocol

NN

April 19, 2018

Seminar: Communication Systems, Talk No. 4

Today more and more stakeholders want to connect different devices with each other or connect their device to special infrastructure and services. This is the typical paradigm for the Internet of Things (IoT) combined with the idea of Machine-to-machine (M2M) communication. The connection wishes rises different questions, such as “How should I connect devices?”, “What standards exist?”, How can I transfer my data?” Well documented and manifold solutions (e.g., DTLS connection, VPNs) are in place looking on resourceful devices such as notebooks and servers. This is not the case when looking on constrained devices, such as wearables and smartphones or event more constrained ones like sensor devices. In order to overcome this a special protocol, namely the Constrained Application Protocol (CoAP) was developed and standardized under RFC 7252. It is a specialized web transfer protocol for use with constrained nodes and constrained networks in the Internet of Things. The protocol is designed for machine-to-machine (M2M) applications such as smart energy and building automation

The task of this seminar topic is to explain the why connectivity is challenging in constrained devices, and why at all the stakeholders wish such connectivity. CoAP needs to be introduced in detail as the standard including a handsome example to show how CoAP can be applied. Further it needs to be argumented in which way CoAP is different to other well known options (e.g., Message Queuing Telemetry Transport (MQTT) [3,4]), as well as answering the question “Why are we forced to use CoAP?”.

References

[1] CoAP - Homepage: http://coap.technology/; last visit Feb14, 2018

[2] Z. Shelby, K. Hartke, C. Bormann: The Constrained Application Protocol (CoAP), RFC 7252, IETF, Fermont, CA, U.S.A., June 2014

[3] MQTT and CoAP, IoT Protocols, https://www.eclipse.org/community/eclipse_newsletter/2014/february/article2.php, last visit Feb 14, 2018

[4] Message Queuing Telemetry Transport, http://mqtt.org/, last visit Feb 14, 2018

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

Advanced Message Queuing Protocol as a Communication Protocol Standard for IoT

NN

April 26, 2018

Seminar: Communication Systems, Talk No. 5

Nowadays manifold devices communicate with each other build the Internet of Things (IoT). In order to establish any communication, which might be efficient at the same time, communication protocol standards are needed. For the IoT landscape different once are in place depending on their intended purpose [1].

In this seminar topic the Advanced Message Queuing Protocol (AMQP) as one known standard for data protocols in the area of IoT will be investigated [2, 3]. It is an open standard application layer protocol for message-oriented middleware. Its benefits are in message orientation design, queuing, routing (including point-to-point and publish-and-subscribe), reliability and security. The standard needs to be described in detail and compared to other standards in this area such as CoAP (Constrained Application Protocol), MQTT (Message Queuing Telemetry Transport), and XMPP (Extensible Messaging and Presence Protocol). Finally, highlighting the requirements to the networks/devices using AMQP, as well as its advantages and disadvantages for IoT networks.

References

[1] IoT Standards and Protocols, https://www.postscapes.com/internet-of-things-protocols/, last visit Feb 14, 2018

[2] Advanced Message Queuing Protocol (AMQP), https://www.amqp.org/, last visit Feb.14, 2018

[3] S. Aiyagari, M. Arrott, M. Atwell, J. Brome, Al. Conway, R. Godfrey, R. Greig, P. Hintjens, J. O'Hara, M. Radestock, A. Richardson, M. Ritchie, S. Sadjadi, R. Schloming, S. Shaw, M. Sustrik, C. Trieloff, K. van der Riet, S. Vinoski: AMQP- Advanced Message Queuing Protocol - Protocol Specification, https://www.rabbitmq.com/resources/specs/amqp0-9-1.pdf, last visit Feb. 14, 2018

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

Introduction to IoT Use Cases With an Evaluation of Integration Possibilities with Blockchains

NN

May 3, 2018

Seminar: Communication Systems, Talk No. 6

Using Internet, human connectivity with world is moving towards "anytime anywhere anyone connected to anything" connectivity. With the emergence of advanced technologies like IoT, people get into a "connected" mode to the things around them. Through IoT, real world things are now a part of the Internet, seamlessly combining physical and digital world. Development of IoT boosts connectivity and increases the popularity of mobile communications. These systems support large range of applications such as in smart agriculture, smart healthcare, smart governance, smart mobility, with contradicting requirements and integrated components [1], [2].

Blockchains are decentralized systems, which provide the possibility for their users to insert their data in this distributed ledger [3]. The data can be accessed by blockchain clients, who obtain blockchain address and, therefore, they can access the informationwith completely distributed and public accessibility. Users can trust the blockchains since they leverage consensus mechanisms to validate and gather transactions in blocks. One of the highly interested emerging use cases of blockchain-based systems in academia and industry are the integration of IoT and blockchain-based approaches. Blockchains are used to keep the record of data produced or captured by IoT sensors in a tamper resistant fashion.

In this Talk, in the first step an introduction to the most recent developed (or proposed) IoT applications will be presented including the detail of design and architecture of those systems. In the next step, evaluation on each use case have to be done regarding the potential integration possibility of those use cases with blockchain-based systems such as Ethereum [4]. Result of the evaluations will be explained to clarify the potential benefits or disadvantages of integrating those IoT-based systems with blockchains.

References

[1] P. Datta and B. Sharma, "A survey on IoT architectures, protocols, security and smart city based applications," 2017 8th International Conference on Computing, Communication and Networking Technologies (ICCCNT), Delhi, 2017, pp. 1-5.

URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8203943&isnumber=8203898

[2] M. S. Mekala and P. Viswanathan, "A Survey: Smart agriculture IoT with cloud computing," 2017 International conference on Microelectronic Devices, Circuits and Systems (ICMDCS), Vellore, 2017, pp. 1-7. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8211551&isnumber=8211527

[3] Blockchain: url:" https://en.wikipedia.org/wiki/Blockchain", Last seen: Feb 6, 2018.

[4] Ethereum: url:" https://www.ethereum.org/", Last seen: Feb 6, 2018.

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

An Overview of Emerging Wireless Communication Systems in 5G

NN

May 17, 2018

Seminar: Communication Systems, Talk No. 7

There is considerable pressure to define the key requirements of 5G, develop 5G standards, and perform technology trials as quickly as possible. Normally, these activities are best done in series but there is a desire to complete these tasks in parallel so that commercial deployments of 5G can begin by 2020. 5G will not be an incremental improvement over its predecessors; it aims to be a revolutionary leap forward in terms of data rates, latency, massive connectivity, network reliability, and energy efficiency. These capabilities are targeted at realizing high-speed connectivity, the Internet of Things, augmented virtual reality, the tactile internet, and so on [1]. The requirements of 5G are expected to be met by new spectrum in the microwave bands (3.3-4.2 GHz), and utilizing large bandwidths available in mm-wave bands, increasing spatial degrees of freedom via large antenna arrays and 3-D MIMO, network densification, and new waveforms that provide scalability and flexibility to meet the varying demands of 5G services. Unlike the one size fits all 4G core networks, the 5G core network must be flexible and adaptable and is expected to simultaneously provide optimized support for the diverse 5G use case categories. In this Talk, an overview on some of the emerging technologies in 5G wireless communications such as Light-Fidelity (LiFi) [2], LoRa [3] and mmWave (e.g., IEEE 802.11 ad and 802.11 ac) [4], [5] will be explained.

References

[1] M. Shafi et al., "5G: A Tutorial Overview of Standards, Trials, Challenges, Deployment, and Practice," in IEEE Journal on Selected Areas in Communications, vol. 35, no. 6, pp. 1201-1221, June 2017.URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7894280&isnumber=7936679:

[2] N. V. R. Kumar, A. Srikanth, A. Singha and B. B. Sam, "Comparison of LIFI and WIFI and study of smart meter-survey," 2017 International Conference on Information Communication and Embedded Systems (ICICES), Chennai, 2017, pp. 1-8,URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8070715&isnumber=8070709

[3] LoRa-Alliance, url:"https://www.lora-alliance.org/", last access: Feb 6, 2018.

[4] What is mmWave and how does it fit into 5G? url:" https://www.rcrwireless.com/20160815/fundamentals/mmwave-5g-tag31-tag99", last access: Feb 6, 2018.

[5] WiGig, url: https://en.wikipedia.org/wiki/Wireless_Gigabit_Alliance, last access: Feb 6, 2018.

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

Overview and Use Cases of Blockchain Interoperability

NN

May 24, 2018

Seminar: Communication Systems, Talk No. 8

Blockchain provides a trustworthy, decentralized, and publicly available data storage making it an interesting opportunity for organizations to increase business agility and reduce costs by removing intermediaries in distributed applications (i.e., by involving multiple und initially non-trusted stakeholders) [1, 4]. The combined success of the open-source ecosystem, decentralized file-sharing, and public cryptocurrencies has inspired an understanding that decentralized internet protocols can be used to improve socio-economic infrastructure [2] radically. Although there have been many collaborative efforts within the blockchain community, these blockchains have suffered from some drawbacks, including their gross energy inefficiency, reduced or limited performance, and immature governance mechanisms.

An ideal solution is one that allows multiple parallel blockchains to interoperate while retaining their security properties [3]. However, real interoperability will only be achieved if blockchain platforms can interact with or replace the systems that are already in place. Blockchain interoperability means that users can access a wide range of features natively of each chain, without the need to download large blockchain files for each currency that they might want to use. The task of this talk is to overview of blockchain interoperability, introducing and describing reasons why such interaction across chains is necessary and providing use cases [3, 5, 6] to showcase its usefulness.

References

[1] Buterin, Vitalik. "Chain interoperability." (2016). Online: http://www.r3cev.com/s/Chain-Interoperability-8g6f.pdf Accessed: 12.01.2018.

[2] Dilley, Johnny, et al. "Strong Federations: An Interoperable Blockchain Solution to Centralized Third Party Risks." arXiv preprint arXiv:1612.05491 (2016).

[3] Cosmos. "A Network of Distributed Ledgers". White paper. Online: https://github.com/cosmos/cosmos/blob/master/WHITEPAPER.md Accessed: 12.01.2018.

[4] Nigel King and Ross Nicoll. "Chain Interoperability: R3 Viewpoint". Online: http://www.r3cev.com/s/Chain-Interoperability-R3-Viewpoint-2.pdf Accessed: 12.01.2018.

[5] Herdius. "Next Generation Decentralized Blockchain Financial Infrastructure". White paper. Online: https://herdius.com/whitepaper/Herdius%20Lightpaper.pdf Accessed: 12.01.2018.

[6] Blocknet. ”Decentralized Application Platform”. Online> https://blocknet.co/ Accessed: 12.01.2018.

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

Commonalities of Network Function Virtualization, Blockchains, and Smart Contracts

NN

May 31, 2018

Seminar: Communication Systems, Talk No. 9

Network Function Virtualization (NFV) [1] is a recent concept that proposes the use of Commercial-Of-The-Shelf (COTS) hardware to host Virtualized Network Functions (VNFs), such as firewalls, load balancers, and Intrusion Detection Systems (IDSes). With this virtualization approach, VNFs can be deployed in the network infrastructure with minimal effort, which reduces costs and promotes innovation [2]. NFV introduces another concept, the concept of network service chaining [3]. By leveraging chained VNFs, service providers can create personalized network services for their clients, and forward the client's network traffic through them, charging accordingly. Service providers can also dynamically allocate VNFs according to the client's demands. In this model, clients do not need to possess the physical infrastructure and only pay for the resources that their VNFs are using; this business model is called VNFs as a Service (VNFaaS) [4].

A blockchain can be viewed as an append-only distributed ledger; this means that any information can be inserted in the blockchain, but cannot be removed. Every block in the blockchain is created based on the previous block, except for the genesis block. Thus one can not modify a single block without modifying all the previous blocks [5]. Blockchain relies on cryptography to provide security and trust for the system. In parallel, Smart Contracts (SCs) leverage the blockchain to provide contracts that are programmed to execute immutable agreements between two parties that do not necessarily trust each other [6].

The goal of this seminar topic is to research if whether blockchains and smart contracts can be applied within the NFV context or not. If so, how these concepts can be applied, and to what extent? Use-cases can support the answers to these questions.

References

[1] Network Functions Virtualisation (NFV). White Paper, October 2012. Available at https://portal.etsi.org/nfv/nfv_white_paper.pdf Accessed 08 January 2018.

[2] R. Mijumbi, J. Serrat, J. L. Gorricho, N. Bouten, F. D. Turck, and R. Boutaba. Network function virtualization: State-of-the-art and research challenges. IEEE Communications Surveys Tutorials, 18(1):236–262, First-quarter 2016.

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