Celtic-Plus
Smart Connected World

Project Achievements

SASER-Siegfried

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Partners:

2NS - Second Nature Security Oy, Finland
Coriant R&D GmbH, Germany
Ekinops, France
EXFO Oy, Finland
FH Potsdam, IDL-Interaction Design Lab, Germany
Fraunhofer AISEC, Germany
Fraunhofer Gesellschaft Heinrich Hertz Institut (HHI), Germany
Institut Mines Télécom, France
Keopsys, France
Konrad-Zuse-Institut Berlin (ZIB), Germany
Leibniz-Rechenzentrum der Bayerischen Akademie der Wissenschaften, Germany
Mikkelin Puhelin Oy, Finland
Nokia, Germany
Orange SA, France
Photline Technologies SA, France
Ruhr Universität Bochum, Germany
Stonesoft, A McAfee Group Company, Finland
Technical University Munich, Germany
Technical University of Denmark, Denmark
Technische Universität Dortmund, Germany
Universität Kassel, Germany
Universität Tübingen, Germany
Universität Würzburg, Germany
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www.celticplus.eu/project-saser-siegfried

Safe and Secure European Routing

SASER-SIEGFRIEDs main objective was the analysis and the development of a secure and cost-efficient network architecture. This architecture includes new promising technologies like network virtualization and software defined networking. The considered use case was a future mobile network based on a lower-layer transport network.

Main focus

The project goal was to mitigate security vulnerabilities of today's IP-layer networks and to propose a new architecture for secure and cost-efficient networks for the time frame 2020. The following activities were accomplished to achieve this objective:

Firstly, data transmission should be downscaled as far as possible to lower network layers (physical layer and data layer) to reduce the need of IP routers, which were considered as critical to security. On one hand, this should be realized by adopting technologies such as network virtualization and software defined networking, and on the other hand, by efficient resilience mechanisms, based on flexible and highly available optical systems.

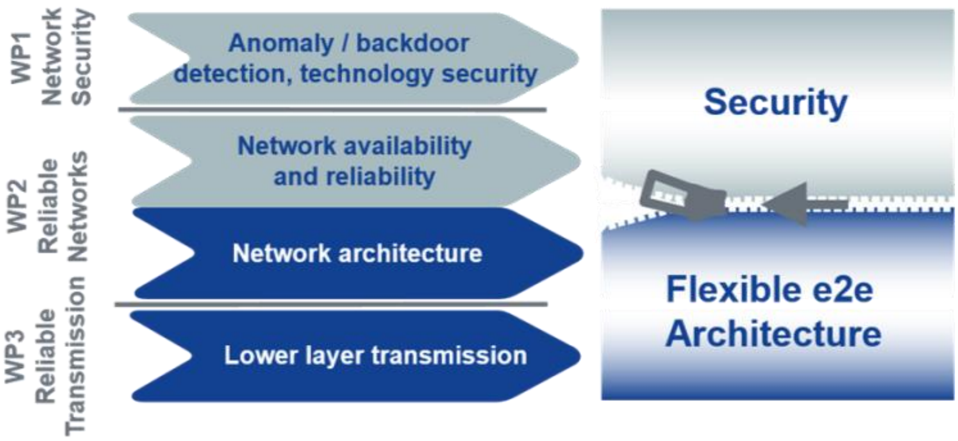
Secondly, security mechanisms for future networks should be designed, based on an analysis of remaining security problems in the IP layer (for example: backdoor and anomaly detection).

Thirdly, the developed technology should be analyzed in the use case of a future mobile network.

Approach

In three work packages the SASER-SIEGFRIED partners worked jointly on the mentioned project goals:

In WP 1, "Network Security", the protection of networks against external and internal attacks were investigated (e.g. backdoor and anomaly detection) and appropriate methods to secure networks were developed. The focus was on the analysis of threats and security requirements of the newly defined network architecture evaluated in WP 2. In WP 2, "Reliable Networks", a new architecture and operational concepts of highly secure and reliable transport networks were developed and evaluated. This included the analysis of system requirements, system constraints and new technologies like network virtualization and software defined networking. Additionally, resilience mechanisms, identification of system limitations and implementation of proof of concepts were part



of WP 2. In WP 3, "Safe and secure networks by reliable transport technology", the focus was on the investigation of a reliable transmission technology as a physical basis for the realization of safe and secure telecommunication networks. An important aspect was to avoid electronic signal processing by optically bypassing the routers. That required a layer 1 with the capability to realize long reach, with high tolerance to distortions and with high flexibility especially concerning the granularity of bandwidth. Therefore, flexible and tolerant modulation schemes were investigated which were demonstrated in a field trial.

Achieved results

During the project, many excellent results were achieved. Three major highlights to mention were joint implementations of partners from different countries and work packages realized as proof of concepts or as a field trial:

- Adaptive Monitoring and Management of Security Events with SDN

  In a live operator network the user traffic was monitored. When an "anomaly" was detected an SDN switch was configured to reroute the suspicious traffic to a full intrusion detection system for deeper analysis. This analysis was complemented by raw data visualization for detecting false positives and negatives.

  The demo was setup by all Finnish partners, TU Munich, Leibniz Supercomputing Center and Nokia.

- SDN-Based Security Enforcement in Mobile Networks using VNFs

  The demonstration showed a security appliance, which detects malware infections using its user plane agent located between mobile SDN-based Serving Gateways (SGW) and Packet Data Network Gateways (PGW). The security appliance, the SDN GW controller and GW appliances were automatically setup by a cloud application manager in an OpenStack cloud environment.

  Different versions of this demonstrator were shown during e.g. the Mobile World Congress 2014, SIGCOMM 2014, and Globecom 2015.

  Besides Nokia and BISDN, Fraunhofer AISEC contributed to the SDN security and T-Labs provided their cloud environment.

- World Record Flexi-rate Field Trial

  In a field trial in the Orange optical transport network between Lyon and Marseille in France four world records were broken. Orange, Coriant, Ekinops, Keopsys, and Socionext successfully demonstrated the highest ever C-band transmission capacity using 24 x 1 Tbps/DP-16QAM (i.e. 24 Tbps), 32 x 1 Tbps/DP-32QAM (i.e. 32 Tbps), and 32 x 1.2 Tbps/DP-64QAM (i.e. 38.4 Tbps) modulation formats in a "live" networking environment. The companies also achieved a record-setting transmission reach of 762 kilometers in the same live environment, more than twice the distance of any previous field records for 32QAM, and the first ever regional transmission for 64QAM.

In addition to these major highlights, a very high number of more than 250 scientific presentations, journals, and conference contributions (80 – 90 % of those related to highly technical levels and with peer-review selection processes for contributions) proved the quality of the project results. 7 standardization contributions were submitted, 24 IPRs generated and 6 press releases (incl. 1 interview) published.

Impact

The implementation of 34 different demonstrators influenced the development / improvement of 9 products and showed the high business impact by transferring the results to business lines of the industry partners. On the other side, 57 supervised master and PhD thesis contributed to the great research results.

Additionally, the first time in such a project, 4 open source software contributions were developed and are available on different webpages:

- POCO: Framework for Pareto-Optimal Controller Placement: https://github.com/lsinfo3/poco
- OFCProbe: OpenFlow Controller Benchmark: https://github.com/lsinfo3/ofcprobe
- TableVisor: https://github.com/lsinfo3/TableVisor
- xdpd: eXtensible OpenFlow datapath daemon http://xdpd.org/

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