



SENDATE-FICUS

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Secure networking for a data center cloud in Europe - Flexible infrastructure for data center communication providing unique security

SENDATE-FICUS is one of the five sub-projects of the Celtic Plus umbrella project SENDATE. The objective of SENDATE-FICUS is to evolve today's high performance networks into robust, even more efficient, flexible and dynamic, secure, converged communication networks with simple and fast service provisioning and maintenance.

Main focus

The subproject focusses on the increase of the flexibility and scalability of the network infrastructure. Special attention is given to network security and stability which have to be ensured—despite higher requirements and therefore more complex systems.

Transmission paths change dynamically and accordingly network connections have to be switched dynamically. It is necessary to adapt the capacity of the connections flexibly and the networks must be able to be reconfigured in shortest time, without endangering their security and stability. This physical layer flexibility then needs to be leveraged in higher network layers by joint balanced optimization. Approaches will be investigated which ensure data

security on the physical layer.

Future communication networks have to be highly flexible, which implies fast automatic control and management. Network reconfiguration will occur so fast that a manual supervision and control will become impossible. Therefore, methods have to be found which inherently ensure the stability and security of the network.

Approach

The general approach is to build on successful communications systems developed in recent years or even just under development by Coriant and evolve them into more efficient and secure solutions. This can be achieved by combining Coriant's broad experience in communication networks with the deep knowledge of specialists from research institutions and smaller companies throughout Germany and Europe.

Security and reliability in programmable optical networks, which connect data centers and therefore need fast and flexible reconfiguration, are investigated. Appropriate methods for guaranteeing security and reliability will be developed. To ensure secure communication adaptive coherent



receivers for quantum communication with machine learning algorithms are investigated. Concerning secure transmit and receive techniques SENDATE-FICUS investigates adaptive pre-compensation techniques designed to compensate imperfections of dynamically switched integrated components and to simultaneously encrypt the transmitted signal. Concerning flexible network infrastructure, the research topics are elastic transport networks and multi-layer control. Flexible transmission is expected to offer high granularity (with demonstration in a field trial), flexible and robust reconfiguration on the bit transmission layer, increased reliability of dynamic optical networks by intelligent transient suppression, direct-detection system design for short reach interconnects and heterogeneous data-center network orchestration.

Main results

The most important overall result of SENDATE-FICUS will be a holistic concept of a flexible infrastructure for communication networks with unique security and stability.

In future optical networks reconfiguration will occur so fast that a manual monitoring and control will become impossible. Therefore, methods will be developed which inherently ensure the stability and

security of the optical network and its elements by distinguishing between regular, uncritical reconfiguration requests and stability and security compromising actions. Cryptographic methods to ensure secure communication will be elaborated. Furthermore, in order to make best use of available resources and enhance the security level beyond standard bit cypher encryption, adaptive pre-compensation used for compensation of imperfections of dynamically switched integrated components will be combined with encryption of the transmitted signal. On the receiving end, signal demodulation and decoding by means of flexibly configurable receivers will be combined with signal decryption.

Existing approaches for scalable data transmission will be extended in order to meet the surging requirements with respect to flexibility and low latency. The flexible, scalable methods are suitable for intra data center communication as well as inter data center communication. Adaptive methods for changing transmission capacity on the fly will be designed, allowing to optimally adjust to changing transmission medium characteristics and time varying traffic patterns. Furthermore, fast and robust reconfiguration of networks taking into account accumulated signal impairments and the used components will be enabled.

Impact

New technologies like Network Functions Virtualization, the unification of IT and telecommunication worlds and applying new security concepts to future networks will bring new opportunities for the German, Swedish and European industry. Europe has a strong position and comprehensive knowledge in the areas of security, cellular networks and transport networks. This will be leveraged and reinforced when adopting the new architectures. The investigation and realization of the new concepts and the resulting highly efficient and secure future networks will lead to a significant advantage for Germany, Sweden and Europe and will boost development of all affected industries. This is not restricted to the telecommunication and IT sectors, but covers also "verticals", such as Industry 4.0, machinery construction, automotive and pharmaceutical industry, to name only a few. In addition, socio-economic advantages affecting all citizens can be expected, like improvements in the areas of e-commerce, e-health, telecommuting etc. Last but not least, a leading position of German, Swedish and European companies is necessary to ensure the public's trust in communication networks in general.

About Celtic-Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new „Smart Connected World“ paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the inter-governmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies

or universities and research organizations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

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