

SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA15127, "Resilient communication services protecting end-user applications from disaster-based failures" (RECODIS).

STSM title: Resilient Network Topology modelling

STSM start and end date: 2019-02-27 to 2019-03-12

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PURPOSE OF THE STSM:

The STSM explores the problems related with Resilient Network Topology modelling. The problem of development a model, methods and metrics that enable quantitative evaluation of electric power and telecommunications infrastructure critical impact on the water supply infrastructure, and to verify the correctness of the approach developed for a real infrastructure example. The task approach is defined and the literature that describes different approaches in network reliability in case of cascade effect in infrastructure failures. The analysis of modelling results, and correlations which causes severe degradation in infrastructure systems are described. The description of the study the effects of different impacts and signal strength in control networks where done as well as testing reliability of data transmission. The assesment of data quality, based on modelling data was done.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

The purpose of the reaserch is to present new mathematical models and new algorithms for data trasmission systems based on new control algorithms and IoT approaches. The reaserch presents the control task for optimal service delivery in all operational conditions. The mathematical model for control of infrastrctre system is analysed for the task solution. The algorithm of optimal control is provided for infrastructure services. The algorithm includes control procedure and interdependency modelling between diverent operation levels in infrastructure. The offered solution proposes the IoT based approach for control task of coordination of smart distribution process and infrastrctre control units with a purpose to assure reliability of the system. The model of infrastrctre interdependency system is defined and the algorithm for power supply control with IoT control approach is presented. Reaserch provides general solution of infrastrctre control soltions in case of cascade outgoes. The control system based on system of system approach in legacy infrastructure interconnections. Automotive control provides possibility to detect problem and offer solution immediately. It is a chance to avoid superfluous charges connected with problem detection, fixation and consequences of the problem. Also the decision making algorithms of control infrastructure are proposed to control in the tasks of optimal service delivery scheduling and routing in geographically distributed supply networks in case of limited avaiiability. The workability of the proposed models and algorithms is moddeled in a specific environment. As an example, a legacy system with real parameters is taken for the optimal energy consumption delivery solution. General algorithm for diagnostics in legacy systems gives possibility to detect the problem immediately, to fix it in some cases without human intervention or inform all other networks about the problem atomatically. Main advantages of using smart control approach in the legacy systems are the possibility to coordinate action of all participants of the complex processes and to realize multi-criteria decision-making in scheduling, energy

delivery routing and cascade outages diagnostic tasks. The results of coordination follows cost reducing, profit increasing, idle time minimization and safety in case of emergency. The general problems of addition power supply solution are proposed in the research, in case, if available resources are not enough for these ser. The complex of mutually co-ordinated models are investigated in the research. The complex of mutually co-ordinated models, are used for achieving goals of customers and experts of power supply process .

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The STSM mission was dedicated to the progressing of the drafting of scientific article. Such article will be submitted to RTU scientific conference **ES2DE19**. The publication related with WG2 - The article "Adaptive data routing for resilient autonomous beeping system" was prepared
Cascade effects in data transmission as mitigation of outage effect was developed.

FUTURE COLLABORATIONS (if applicable)

There is a significant common work as in research, as in academic field is planned between RTU and University of Split. We will work in order to develop Internet of Everything approach, and in education.