Security in IoT for Smart Grids (Forskerprosjekt - IKTPLUSS)

Application Number: ES552845 Project Number: 0

Applicant

Project Owner

Institution / company (Norwegian name)	University of Oslo
Faculty	Faculty of Mathematics and Natural Sciences
Institute	Department of Informatics
Department	
Address	PO box 1080 Blindern
Postal code	0316
City	Oslo
Country	Norway
E-mail	stian@unik.no
Website	http://ifi.uio.no
Enterprise number	971523425

eAdministration

Project administrator

First name	Stian
Last name	Løvold
Date of birth	110353
Personal number	**********
Gender	Male
Position/title	Director of UNIK
Phone	64844705
E-mail	stian@unik.no
Confirmation	✔ The application has been approved by the

Project Owner

Project manager

First name	Josef
Last name	Noll
Date of birth	290660
Personal number	**********
Gender	Male
Institution / company (Norwegian name)	University of Oslo
Faculty	Faculty of Mathematics and Natural Sciences
Institute	Department of Informatics
Department	
Address	PO box 1080 Blindern
Postal code	0316
City	Oslo
Country	Norway
Position/title	Prof
Academic degree	Dr
Preferred language	English
Phone	90838066
E-mail	jnoll@ifi.uio.no

Project info

Project title

Project title	Security in IoT for Smart Grids
Project title (alternative language)	Sikkerhet for Tingenes Internett

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Primary and secondary objectives of the project

Primary and secondary objectives	The IoTSec project aims at becoming the start-up of a research cluster in security for IoT, industrially applied by members of the NCE Smart. The project will create and consolidate the security framework for IoT, address specific areas of research, and create the basis for growth through future scientific and industrial projects in the domain. The following objectives have been identified to drive the research towards a cluster of projects for secure IoT-powered critical infrastructures: 1) Extend the IoTSec project to a research cluster to include at least 14 Professors/Senior IoTSec Security in IoT for Smart Grids 1Researchers, 15 PhD/PostDocs, 30 Master students and create international visibility with at least 12 projects and memberships in 5 networks/clusters. 2) Tailor the research towards an operational Security Centre for Smart grids at the NCE Smart, supported by at least 15 companies and identified as an International Centre of Excellence.

Project summary

Project summary	IoTSec aims at creating a robust research team being a top international player for security in the Internet of Things with special focus on Smart Grid infrastructures. Academic partners being UiO, Simula Research, UNIK, NR, HiG have established a close collaboration with Smart Innovation Østfold, eSmartSystems, Fredrikstad Energi, EB Nett, and Movation to extend the IoTSec project into an outstanding cluster of projects for impact driven research. The expected outcome is foreseen along four axes being (i) the robustness of the research cluster with a total of 14 Professors/senior researchers and 15 PhDs, (ii) the scientific outcome with more than 12 journal articles, 25 conference papers and 9 workshops, (iii) a cluster of at least 12 national and international projects, and (iv) the industrial impact with the creation of the industrial security centre for Smart Grid, based on the framework and the security models developed through the cluster. The envisaged focus areas for the research address system description, security modelling, evaluation and industrial applicability. The system description is driven by the requirements of applications, the measurability of security, and the threat modelling based on anomaly and attack detection. The expected outcome is a semantic description of the infrastructure, services, privacy and security functionality as well as attack surface. Components of IoT security models focus on adaptive security models being privacy-aware. Through semantic modelling we will address formal methods for semantic provability of system of systems. The application-driven system versus goal analysis will be driven by a Multi-Metrics approach, taking into account security usability and the human/technology interface.

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	Applicability of the security models and modules will be implemented in the security lab hosted by NCE Smart and drives the development of the framework components.
Popular science presentation (written in English)	The leading concept of «Security for the Internet of Things - IoTSec» is to develop, extend and apply security and privacy models for IoT, and apply them to the Smart Grids. Though the potential of digital services is overwhelming, we see security and privacy challenges which need to be addresses. Consider an attacker who stops the water supply of a city by switching of the electricity of the pumps, or a hacker who generates an extra key to your home or car by standing in your vicinity and observes the communication between your wireless key. These kind of threats have happened, and have alerted academia and industry to put the focus on security. We are at the beginning of a new age of business, where dynamic processes and information from sensors systems are the driving forces for business and business collaborations. While today?s Internet-based service world is based on collaborations between entities, the future business will be based on exchange of digital information as a driver for dynamic interaction between entities. Applied to Smart Grid, it means that we will consider a wide range of services being provided to the home, the smart grid supplier and the energy producer. Typical examples of services include the meter reading, the remote control of the home, as well as alarm services and the involvement of children to positively monitor their elderly parents. The power supply grid is vulnerable, both due to varying load, but also due to natural forces like water, ice and storms. Intelligent decisions in the network and at the edge of the network can reduce the vulnerability of the network, and help that basic services like communication are still available. IoTSec will have two main goals, building a robust research team building a robust research team with academic experts in the area and creating the industrial Security Centre for Smart Grid.
Popular science presentation (written in Norwegian)	Internettet og informasjonsteknologien har forandret våre liv i stor grad. Informasjonstilgang og informasjonshåndtering er kjennetegn på dagens suksessrike bedrifter. Utviklingen som har er i gang, er at sensorer, mobiler, biler, vaskemaskiner, varmepumper, lys og alarmer leverer sine data over internett. Dingser som snakker sammen er beskrevet som tingenes internett, eller "Internet of Things (IoT)". Store deler av dataflyten er relatert til strømnett, enten ved at de krever strøm, eller at de rapporter bruken av strøm. Når en rekke dingser er koblet sammen, blir en slik sammenkobling sårbar for angrep. Angrep på vannforsyningen til en by eller duplisering av den trådløse nøkkelen til biler har skjedd, så det er bare fantasien som begrenser hva som kan skje.

Vi er i overgangen til en ny epoke når det gjelder digitalisering av samfunnet og bedrifter. Vi ser også at dynamiske prosesser, autonome systemer og sensorer som styrer alt, er på vei. Sikkerhet og personvern er hovedutfordringer i alle disse anvendelsesområdene. Når det gjelder smarte hus og energifordeling gjennom smarte nett («smart grid»), så kan en samtidig utrulling gir store samfunnsmessige gevinster. Utfordringen er å ha tilstrekkelig sikkerhet og personvern.

Prosjektet IoTSec vil ha hovedfokus på to aspekter: Bringe de beste hodene i akademia sammen for å skape en kunnskapsklynge rundt sikkerhet for tingenes internett, og relatere forskningen til utfordringer som industrien og samfunnet har når det gjelder styring og kontroll av smarte nett. Vi jobber for et industrielt sikkerhetssenter for smarte nett («Smart Grid Security Centre»), som skal ivareta behovet både til industrien og ikke minst til personvernet til hver og en av oss. Vi kommer til å jobbe med semantiske modeller, målbar sikkerhet og personvern og adaptiv sikkerhet, som alle kommer til å bli grunnlaget for det ledende sikkerhetssenteret.

Publication	✔ I understand and accept that the text provided in the fields for "Popular science presentation" will be made publicly available.

Funding scheme

Supplementary info from applicant

Programme / activity	IKTPLUSS
Application type	Forskerprosjekt
Topics	
Other relevant programmes/ activities/projects	
Discipline(s)	ICT, Smart Grid, Information Security, Physical Security, Attack Surface, Measurable Security
If applying for additional funding, specify project number	
Have any related applications been submitted to the Research Council and/or any other public funding scheme	No

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If yes, please provide further
information

Progress plan

Project period

From date	20151001
To date	20200930

Main activities and milestones in the project period (year and quarter)

Milestones throughout the project	From		To	
3 PhD and 2 PostDoc hired	2015	4	2016	2
6 scientific papers submitted	2015	4	2016	3
Establish Collaboration Environment	2015	4	2015	4
Framework established, modules identified	2016	1	2016	2
Security Centre established	2016	1	2016	3
privacy awareness, adaptive security outlined	2016	2	2016	3
Semantics established for infrastr., attack	2016	2	2016	4
1. cycle completed, assessment of models	2016	4	2017	3
workshops performed, roadmaps for modules	2016	4	2017	1
2nd cycle completed, future infrastructure	2017	1	2017	3
future infrastructure semantically described	2017	1	2017	2
industrial feedback on 3rd workshop	2017	1	2017	2
plans for year 3 agreed	2017	2	2017	3
3rd cycle completed, service infrastructures	2018	1	2018	3
plans for year 4 agreed	2018	2	2018	3
4. cycle completed, novel security models	2019	1	2019	3
plans for year 5 agreed	2019	2	2019	3
Project finalised	2020	2	2020	3

Dissemination of project results

Dissemination plan	The project will publish at least 5 peer reviewed papers each year, with details presented in tab. 2 of the project plan. The papers will be published through publication channels approved by UHR. Dissemination plan The dissemination plan contains scientific dissemination, industrial dissemination with at least 2 workshops per year, targeted dissemination to invite industry into the Security Centre, and public dissemination through Wiki, articles, and newspapers. During the first year of the project we plan to publish 4 conference papers and 2 journal articles, focussing on how the security modules and the envisaged framework for security. The updates of the dissemination plan will be performed online on the collaborative wiki, and presented in printing in deliverables D0.2 (M12), D0.3 (M24) , M36 and M48. Envisaged journals for publication include the International Journal of Information Security (IJIS), the Journal of Information Systems Security, the IEEE Smart Grid Communications, the Elsevier International Journal of Critical Infrastructure Protection, the IEEE Security and Privacy magazine and the IEEE Smart Grid Communications. Conferences include the International Conference on Critical Infrastructure (CRITIS), the IEEE Security and Privacy and more. Communications to ongoing standardisations activities are planned as technical liaison with CEN and ISO, as well as a close cooperation with the NordForsk, Cyberlab Oy, and the EU H2020 clusters. The project will author two special issues in conjunction with ACM and/or IEEE journals, and the special volume of Cognitive Security for IoT on dynamic measurement of security and metrics. Communication with users The IoTSec project will reach users through various ways: (i) a public collaboration Wiki, holding all technical notes, at http://IoTSec.unik.no; (ii) at least two workshops per year for targeting industrial representatives, and (iii) targeted industrial partners. Two workshops are planned in the first year, focussing on knowledge exchange and harmonisation between research institutes and industry. The expected outcome of the workshops include: (i) a list of challenges

published by our industrial partners, (ii) a presentation of security models and modules, (iii) a framework for applying the security modules and (iv) a technology-readiness assessment of the security models.

During the first year we plan to become member of 4 European Technology Platforms (ETP) and industrial associations.
Updated plans for the follow-up years will be elaborated as part of the workshops, and documented together with the dissemination plans.

Budget

Cost plan (in NOK 1000)

	2015	2016	2017	2018	2019	2020	2021	2022	Sum
Payroll and indirect expenses	875	4886	7536	7166	6741	4301			31505
Procurement of R&D services									0
Equipment									0
Other operating expenses	4	64	195	185	170	92			710
Totals	879	4950	7731	7351	6911	4393			32215

Specification	The IoTSec project has a total budget of NOK 32 215 000. Own contribution from project partners account to NOK 7 295 000. The requested grant from the Research Council of Norway is NOK 24 920 000.
	The project will directly finance 3 PhD positions, and 2 PostDoc positions. 3 additional PhD/Industrial PhD students are linked to the project, as their work is related to the security challenges indicated in the project.
	The amount of 710 kNOK is reserved for international collaboration and other expenses, which is seen as sufficient, taking into consideration that PhD and PostDocs have a an own budget for travel and equipment.
	The inkind contributions from industry accounts to 1400h in addition to the related work of the industrial PhD students.
	Please note that the initial application had an error, as NCE Smart, an industrial research centre, was accounting as an independent research institute. Thus the total amount of industrial contribution has increased.

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Industry is also contributing to a PhD education, increasing the inkind contribution from industry as compared to the original proposal.

Cost code (in NOK 1000)

	2015	2016	2017	2018	2019	2020	2021	2022	Sum
Trade and industry	420	1996	2311	2206	2101	1471			10505
Independent research institutes	400	1900	2200	2100	2000	1400			10000
Universities and university colleges	59	1054	3220	3045	2810	1522			11710
Other sectors									0
Abroad									0
Totals	879	4950	7731	7351	6911	4393			32215

Funding plan (in NOK 1000)

	2015	2016	2017	2018	2019	2020	2021	2022	Sum
Own financing	222	1186	1715	1632	1539	1001			7295
International funding									0
Public funding									0
Private funding									0
The Research Council	657	3764	6016	5719	5372	3392			24920
Totals	879	4950	7731	7351	6911	4393			32215

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	2015	2016	2017	2018	2019	2020	2021	2022	Sum
Decided by Research Council of Norway	1495	4834	4934	5034	5134	3489			24920
Originally applied from Research Council of Norway	1495	4834	4934	5034	5134	3489			24920

Specification	Industry contributes with a total of 5 295 000 NOK consisting of hours and PhD education. The Universities (HiG, UiO/Ifi) contribute with 500 kNOK each, UiO/UNIK with 1000 kNOK as own contribution to the project. PostDoc and PhD fellows will be filled in after a successful recruitment.

Person for whom a fellowship/position is being sought

First name	Last name	National identity number

Basis for calculation of position

Type of fellowship	From date (yyyymmdd)	To date (yyyymmdd)
Not selected		

	2015	2016	2017	2018	2019	2020	2021	2022
Percentage of full time position								

Documentation for calculation of overseas research grant and visiting researcher grant

Institution / company		Travelling with family	Travel expenses
Location			
Country		**Period**	
		From date (yyyymmdd)	

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To date (yyyymmdd)

Allocations sought from the Research Council (in 1000 NOK)

	2015	2016	2017	2018	2019	2020	2021	2022	Sum
Student fellowships									0
Doctoral fellowships	0	560	1570	1520	1570	780			6000
Post-doctoral fellowships	42	516	1480	1467	1282	713			5500
Grants for visiting researchers	7	38	98	107	100	60			410
Grants for overseas researchers									0
Researcher positions	481	2210	2310	2105	1905	1489			10500
Hourly-based salary including indirect costs	117	413	486	442	442	310			2210
Procurement of R&D services									0
Equipment									0
Other operating expenses	10	27	72	78	73	40			300
From Research Council	657	3764	6016	5719	5372	3392			24920

Partners

Partners under obligation to provide professional or financial resources for the implementation of the project

1

Institution/ company	NORSK REGNESENTRAL
Department/ section	

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Address	Postboks 114 BLINDERN
Postal code	0314
City	OSLO
Country	Norway
Enterprise number	952125001
Contact person	Åsmund Skomedal
Contact tel.	91199001
Contact e-mail	asmund.skomedal@nr.no
Partner's role	Research activity

2

Institution/ company	HØGSKOLEN I GJØVIK
Department/ section	
Address	POSTBOKS 191
Postal code	2802
City	GJØVIK
Country	Norway
Enterprise number	970937668
Contact person	Einar Snekkenes
Contact tel.	98211222
Contact e-mail	einar.snekkenes@hig.no
Partner's role	Financing and Research activity

3

Institution/ company	SMART INNOVATION ØSTFOLD AS
Department/ section	
Address	Håkon Melbergs vei 16
Postal code	1783
City	HALDEN
Country	Norway
Enterprise number	986258191

Security in IoT for Smart Grids (Forskerprosjekt - IKTPLUSS)

Application Number: ES552845 Project Number: 0

Contact person	Dieter Hirdes
Contact tel.	90550268
Contact e-mail	dieter.hirdes@ncesmart.com
Partner's role	Financing and Research activity

4

Institution/ company	ESMART SYSTEMS AS
Department/ section	
Address	Håkon Melbergs vei 16
Postal code	1783
City	HALDEN
Country	Norway
Enterprise number	998927854
Contact person	Erik Åsberg
Contact tel.	91837788
Contact e-mail	erik.aasberg@esmartsystems.com
Partner's role	Financing and Research activity

5

Institution/ company	FREDRIKSTAD ENERGI AS
Department/ section	
Address	Stabburveien 18
Postal code	1617
City	FREDRIKSTAD
Country	Norway
Enterprise number	971644494
Contact person	Vidar Kristoffersen
Contact tel.	
Contact e-mail	vidar.kristoffersen@fen.no
Partner's role	Financing and Research activity

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Security in IoT for Smart Grids (Forskerprosjekt - IKTPLUSS)

Application Number: ES552845 Project Number: 0

Institution/ company	EB NETT AS
Department/ section	
Address	Postboks 7007
Postal code	3007
City	DRAMMEN
Country	Norway
Enterprise number	981915550
Contact person	Otto Andreas Rustand
Contact tel.	90155212
Contact e-mail	Otto.Rustand@eb.no
Partner's role	Financing and Research activity

7

Institution/ company	MOVATION AS
Department/ section	
Address	Oscars gate 27
Postal code	0352
City	OSLO
Country	Norway
Enterprise number	889497092
Contact person	Bjarne T. Haugen
Contact tel.	40011100
Contact e-mail	bjarne@movation.no
Partner's role	Financing and Research activity

8

Institution/ company	SIMULA RESEARCH LABORATORY AS
Department/ section	
Address	Postboks 134
Postal code	1325
City	LYSAKER

Security in IoT for Smart Grids (Forskerprosjekt - IKTPLUSS)

Application Number: ES552845 Project Number: 0

Country	Norway
Enterprise number	984648855
Contact person	Yan Zhang
Contact tel.	67828200
Contact e-mail	yanzhang@simula.no
Partner's role	Research activity

Attachments

Project description

Filename	IoTSec_ProjectPlan_v18Sep2015_main.pdf
Reference	ES552845_001_1_Prosjektbeskrivelse_20150922

Curriculum vitae (CV) with list of publications

Filename	CV-JosefNoll.pdf
Reference	ES544615_002_2_CV_20150211

Filename	CV_Habtamu_Abie_February_2015.pdf
Reference	ES544615_002_3_CV_20150211

Filename	CV_Ulrika Holmgren2.pdf
Reference	ES544615_002_4_CV_20150211

Filename	CV_Dieter_Hirdes_EN.pdf
Reference	ES544615_002_5_CV_20150211

Filename	CV_Paal_Engelstad.pdf

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Reference	ES544615_002_6_CV_20150211

Filename	CV_Einar_Snekkenes.pdf
Reference	ES544615_002_7_CV_20150211

Filename	CV Bernt Bremdal.pdf
Reference	ES544615_002_8_CV_20150211

Filename	CV-Yan.pdf
Reference	ES544615_002_9_CV_20150211

Filename	CV-Olaf_Owe.pdf
Reference	ES544615_002_10_CV_20150211

Filename	CV-Yan.pdf
Reference	ES544615_002_11_CV_20150211

Grade transcripts (Doctoral and student fellowships)

Filename
Reference

Referees

Filename
Reference

Recommendation and invitation

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Filename	
Reference	

Confirmation from partner(s)

Filename	IoTSec_LoI_NR.pdf
Reference	ES544615_008_1_AktiveSamarbeidspartnere_20150211

Filename	IoTSec_LoI_Einar.pdf
Reference	ES544615_008_2_AktiveSamarbeidspartnere_20150211

Filename	IoTSec_LoI_SMARTIO.pdf
Reference	ES544615_008_3_AktiveSamarbeidspartnere_20150211

Filename	IoTSec_LoI_Fredrikstad_Energi.pdf
Reference	ES544615_008_4_AktiveSamarbeidspartnere_20150211

Filename	EBPS02_EBN-2_3556_001.pdf
Reference	ES544615_008_5_AktiveSamarbeidspartnere_20150211

Filename	IoTSec_LoI_Movation.pdf
Reference	ES544615_008_6_AktiveSamarbeidspartnere_20150211

Filename	IoTSec_LoI_Simula.pdf
Reference	ES544615_008_7_AktiveSamarbeidspartnere_20150211

Filename	LoI eSmart Systems.pdf
Reference	ES544615_008_9_AktiveSamarbeidspartnere_20150211

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Other items

Filename	IoTSec_LoI_UC3M.pdf
Reference	ES544615_010_1_Annet_20150211

Filename	IoTSec_LoI_Nimbeo.pdf
Reference	ES544615_010_2_Annet_20150211

Filename	IoTSec_LoI_University_of_Victoria.pdf
Reference	ES544615_010_3_Annet_20150211

Filename	IoTSec_ProjectPlan_references.pdf
Reference	ES552845_010_4_Annet_20150922

Filename	IoTSec_ProjectPlan_Appendix_A.pdf
Reference	ES552845_010_5_Annet_20150922

Filename	IoTSec_ProjectPlan_Appendix_B.pdf
Reference	ES552845_010_6_Annet_20150922