

COST Grant workplan

I. ACTION PROFILE

Domain: Information & Communication Technologies

Action no. and title: IC1104 Random Network Coding and Designs over GF(q)

Chair: Dr. Marcus Greferath

START date: 26/04/2012

END date: 25/04/2016

Number of signatories: 24

Number of non-COST members: 0

Number of COST country entities (institutes, etc.) currently participating: 42

Number of non-COST entities (institutes, etc.) currently participating: 0

Number of MC Members: 39

Working Groups with numbers, titles and approximate number of members:

WG 1: Bounds on the size of network codes, No. of members: 25

WG 2: Development of encoding and decoding schemes, No. of members: 19

WG 3: Cryptographic aspects, No. of members: 16

WG 4: Construction of network codes and Grassmannian codes, No. of members: 32

WG 5: Foundational aspects, No. of members: 28

II. DETAILED BUDGET

(1) MEETINGS

Management Committee Meetings

Location: Belgium, Ghent

Date: 20/09/2013

Total number of participants expected: 30

Number of participants to be reimbursed: 30

Travel costs: 21000 (700 per participant)

Organisational support: 4500 Euro (*collocation with five WGs*)

Location: France, Bordeaux

Date: 20/06/2014

Total number of participants expected: 30

Number of participants to be reimbursed: 30

Travel costs: 28500 Euro (950 per participant)

Organisational support: 4600 Euro (*collocation with a workshop*)

Working Group Meetings

WG no. and title: 1. Bounds on the size of network codes

Location: Belgium, Ghent

Date: 18/09/2013, 1 day

Number of participants to be reimbursed: 5

Travel costs: 3.500 Euro (700 Euro/participant)

Organisational support: 0 Euro

(Comment: Event collocated with the first MC meeting – here only additional costs listed.)

WG no. and title: 2. Development of encoding and decoding schemes

Location: Belgium, Ghent

Date: 19/09/2013, 1 day

Number of participants to be reimbursed: 5

Travel costs: 3.500 Euro (700 Euro/participant)

Organisational support: 0 Euro

(Comment: Event collocated with the first MC meeting – here only additional costs listed.)

WG no. and title: 3. Cryptographic aspects

Location: Belgium, Ghent

Date: 20/09/2013, 1 day

Number of participants to be reimbursed: 5

Travel costs: 3.500 Euro (700 Euro/participant)

Organisational support: 0 Euro

(Comment: Event collocated with the first MC meeting – here only additional costs listed.)

WG no. and title: 4. Construction of network codes and Grassmannian codes

Location: Belgium, Ghent

Date: 18/09/2013, 1 day

Number of participants to be reimbursed: 5

Travel costs: 3.500 Euro (700 Euro/participant)

Organisational support: 0 Euro

(Comment: Event collocated with the first MC meeting – here only additional costs listed.)

WG no. and title: 5. Foundational aspects

Location: Belgium, Ghent

Date: 19/09/2013, 1 day

Number of participants to be reimbursed: 5

Travel costs: 3.500 Euro (700 Euro/participant)

Organisational support: 0 Euro

(Comment: Event collocated with the first MC meeting – here only additional costs listed.)

Workshops and Conferences

Title: Algebra, Codes and Networks

Location: France, Bordeaux

Date: 16/06/2014 – 20/06/2014, 5 days

Total number of participants expected: 80

Number of participants to be reimbursed: 24

Travel costs: 22.500 Euro (900 Euro/participant)

Organisational support: 0 Euro

(Comment: Event collocated with the second MC meeting – here only additional costs listed.)

(Repeat as many times as needed)

(2) SHORT TERM SCIENTIFIC MISSIONS (STSMs)

Number: 10

Cost: 19.000 Euro

(3) TRAINING SCHOOLS

Location: Estonia, Tallin

Date: 12/05/2014 – 16/05/2014, 5 days

Number of Trainees to be reimbursed: 24

Trainees Grants: 12000 (500 Euro per trainee)

Number of Trainers to be reimbursed: 2

Travel costs: 2.400 Euro (1.200 per trainer)

Organisational support: 2.400 Euro

(4) PUBLICATIONS, DISSEMINATION, OUTREACH, WEBSITE

Title: Action Web-page

Cost: 1.500 Euro

**(5) Other Expenses Related to Scientific Activities (OERSA)
(e.g. bank charges)**

n/a

III. WORK PLAN

(1) OBJECTIVES

According to the Memorandum of Understanding and the first year's Work and Budget Plan, we established 5 Working Groups in the first year of the grant. We did this based on a natural grouping of research projects in the theory and practice of network coding.

These Working Groups are nowadays up and running, and they have met for a first general Working Group meeting in Barcelona in February 2013. Intensive collaboration in and between exponents of these groups has started already earlier and showed fruitful results during a meeting in Ascona (Switzerland), where a majority of members of this Action was present.

WG1/4: In terms of mathematical progress, one of the most important results of this Action during its first year, was the discovery of the existence of the $(13,3,1)$ Steiner System over $GF(2)$. As the next more difficult project, we would like to mention that existence of the putative $(7,3,1)$ Steiner System has been neither proved nor disproved yet. It needs to be emphasized, that the “smaller” problem has in fact turned out to be the harder one. It will be a question of continued efforts to solve this research question during the upcoming years of this Action.

WG2: This working group was in charge of organizing the first Training School of the COST Action. The school was held in Barcelona, Spain, from 4th to 8th of February 2013 at the Universitat Autònoma de Barcelona, being the affiliation of the chair of WG2. The efforts of the WG2 participants during the first year have served to bridge a gap between purely theoretical work and the corresponding practical aspects that need to be faced. In light of this, the following goals will be pursued during the second year experience in interdisciplinary discussions. A preliminary account consists of the following two, but will not be restricted to these:

- (a) Network coding for multimedia delivery,
- (b) Physical layer network coding

WG3: Cryptographers in the project now have a much better appreciation of some of the issues surrounding network coding applications (such as the size of parameters that engineers are considering, and the speeds they operate at). Knowledge of network coding signatures has also been disseminated. Several fruitful projects and collaborations are underway in secure storage, wiretap channels and rank metric coding for cryptography. It is hoped that more collaborations will develop through the contacts made at the COST meetings. More concretely, Working Group 3 will be continuing their study of signature schemes for network coding, rank metric codes and their uses in cryptography and cryptanalysis; applications to wiretap channels, secure distributed storage and information theoretic security; cryptography suitable for large networks (such as wireless sensor networks).

WG5: This working group has currently 28 members from 9 countries. About half of them took part in the first meeting in Barcelona. The different parties in WG5 presented their research and planned the organization of the upcoming WG5 meeting. The collaboration inside WG5 was also deepened by 2 STSM (Kiermaier, Stojakovic) of WG5 members. Based on a recent paper by Gaston, Pujol, and Villanueva, that addresses data storage in different nodes grouped in racks, this Working Group will tackle further concrete problems in connection with distributed storage. A survey article by F. Oggier and also Oggier's keynote delivered at the first Training School in Barcelona will help identifying particular questions to work on in this group. In light of this, progress is expected towards exploitation of other than finite field structures in network coding and storage; furthermore this group will contribute to the field of locally repairable storage codes.

(2) **ACTIVITIES**

- The next larger Working Group meeting will be held at Ghent University in autumn 2013. It was discussed during our meeting in Barcelona, but also in the most recent MC meeting in Bergen, that a particular structure will be chosen for these meetings: Apart from a single keynote, there will be allocated plenty of time and space for short presentations of, say, 10 up to 15 minutes, where current unsolved problems may be tackled in discussions involving the audience. This will also refer to the modeling aspect, particularly as representatives of the more engineering-oriented scholars in this Action have pleaded for such inter-disciplinary working sessions. The MC member Leo Storme will be the organizer of these general Working Group meetings in Ghent from 18.09.2013 till 20.09.2013. In addition to the WG meetings, there will be an MC meeting on the afternoon of September 20th. This event will also be open to non-members of the COST Action.
- Based on the very good experience with the recent Training School in Barcelona, the MC member Vitaly Skachek (Tartu, Estonia) introduced his plan to organize the European School of Information Theory in May 2014. This event will open tailored sections in Network Coding and related areas for Action

IC1104. It will be most applicable to early stage researchers and students, and there will be offered 24 support grants for interested Ph.D. students and early-stage researchers of this Action.

- The MC member Christine Bachoc (Bordeaux, France) will organize – in collaboration with Gilles Zemor – a Workshop on Network Coding in Bordeaux in June 2014. At least 24 participants from the WG in addition to the Management Committee Members are expected to take part. Due to the fact that this conference will enjoy further funding from local sources, it will be open to a larger audience. This will help to improve on general collaboration between members of the Action and the general Information Technology community.
- Short-Term Scientific Missions (STSMs) are at the heart of this Action. After having offered more than 4 of these missions during its first year, it is planned to have more than 10 STSMs in the second year. There will be a clear priority to those STSMs where support of ESR and gender balance will be improved. However we also think that, budget allowing for this, STSMs involving senior members of the Action should be supported. For this reason we have allocated the above number of STSMs.

(3) **OUTPUTS PLANNED FOR YEAR 2**

- Members of Action IC1104 have submitted (published) more than 15 scientific papers to periodicals and conferences during this first year of the Action. We expect that this trend will continue and expect a total of more than 25 contributions in the context of the Action.
- The Action's website (www.network-coding.eu) has been successfully designed by MC member Jens Zumbraegel (Dublin, Ireland). He will be happy to maintain this site also during the upcoming years of the Action. It currently contains public information, but has also established an Intranet which serves as a communication tool between various parties of the Action.
- Conference and Workshop participation will be vastly supported regarding events within this Action. Most of its members however will also present their findings on first class international meetings like ISIT2013, Fq(11): Finite Fields and their Applications, Eurocrypt, and Crypto.
- Action IC1104 will also be represented on the Annual Progress Conference to be held in Kosice, Slovakia in 2014.

COST Grant budget plan

Action no. and title: IC1104 Random Network Coding and Designs over GF(q)

Grant period: 01/08/2013 – 31/07/2014

Allocated budget: 156200

A. SUMMARY BUDGET

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|---|---------------|
| (1) MEETINGS | € 98600 |
| (2) SHORT-TERM SCIENTIFIC MISSIONS | € 19000 |
| (3) TRAINING SCHOOLS | € 16800 |
| (4) PUBLICATIONS, DISSEMINATION, OUTREACH | € 1500 |
| (5) OERSA | € 0 |

B. TOTAL SCIENCE EXPENDITURE (sum of (1) to (5)) **€ 135900**

C. Financial & Scientific Administration and Coordination
(max. of 15% of B.) **€ 20300**

D. TOTAL EXPENDITURE (B+C) **€ 156200**