

FET Coordination Action Workshop

26 & 27 October 2010
Brussels

Report



... **Future and Emerging Technologies**
Proactive



European Commission
Information Society and Media

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Executive Summary

This report contains the main conclusions of a workshop held in October 2010 in Brussels involving representatives from Coordination Actions (CAs) linked to Proactive Initiatives of Future and Emerging Technologies (FET) Proactive. Such CAs are linked to specific topics and communities and play a crucial role in supporting communities through structuring them, providing a forum for discussion, identifying new research challenges and setting out research roadmaps and taking joint actions in areas such as education and supporting collaboration with groups outside Europe. The practice of complementing research projects, clustered in Proactive Initiatives, with CAs has been part of the FET practice since Framework Programme 5 but it was introduced on a wider scale in FP7. As the first FP7 projects are now coming to an end, it is time to take stock and share experiences on the most effective way to achieve the objectives of a CA, as well as possible pitfalls, and share this knowledge with CAs that are recently established or about to start.

CAs play a key role in the research funded by FET as they are able to provide a structuring effect and community support that creates an added value to the research projects, making the whole greater than the sum of the parts of a Proactive. A number of key issues within research policy, such as identifying research challenges and new research topics, supporting young researchers and creating contacts with high-tech SMEs, are to a large extent dealt with by CAs, making them on the one side a key factor to realize existing objectives, but also an important partner when discussing new directions.

The CAs represented at the meeting were PERADA, ASSYST, COBRA, CSN, AWARE, ZEROPOWER, QUIET, HC2 and Eternals (see Annex I for descriptions). Some of these, such as PERADA and ASSYST, have been running for a number of years. Others such as ZEROPOWER and COBRA are about to start, and some, such as HC2, are new but are building on the experience of an earlier project.

For any CA it is important to analyze what the actual needs of a specific scientific community are, and adapting the objectives and activities of the CA accordingly. Much can be learned through interaction with people who have experience with this type of project. At the same time it is crucial to have a connection with scientists in the community who are able to identify those issues where the CAs activities are most appropriate. It is also crucial to extend a CA beyond the projects that are directly funded by FET, by making links to other scientists in Europe and the rest of the world.

The main conclusions of this report are

- For **dissemination** activities, there is a need to aim for professionalism, for example by employing a professional website designer or a science writer to produce articles for various media (magazines, web). Also, CAs need to have a dissemination strategy taking into account different target groups, ranging from FET project participants to scientists in the field and to private and public sector stakeholders.
- The creation of a roadmap is a group process, which has benefits for a scientific community but often not for individual researchers. The type of roadmap needs to be adapted to the nature of the topic it addresses, and new media can support the efficient creation of a roadmap.

- Many CAs organise **workshops** and other scientific meetings. While they tend to work well with the scientific community, the successes in making contacts with **public and private sectors** have been fluctuating.
- On the topic of **international collaboration**, although there are positive examples, there is a clear scope in most CAs for extending such activities, e.g. by creating contacts with scientific communities outside Europe (e.g. in China), and mapping out the structure of the scientific community worldwide within specific topics.

1. Introduction

This report contains the main conclusions of a workshop held in October 2010 in Brussels involving representatives from Coordination Actions (CAs) linked to Proactive Initiatives of Future and Emerging Technologies (FET) Proactive. Such CAs are linked to specific topics and communities and play a crucial role in supporting communities through structuring them, providing a forum for discussion, identifying new research challenges and setting out research roadmaps and taking joint actions in areas such as education and supporting collaboration with groups outside Europe.

The aim of the meeting was to exchange views between the CAs and FET staff members in order to create a basis for best practice amongst such projects and help to identify opportunities beyond the current activities and communities.

Specific topics included:

- How to create R&D agendas and how to promote them within and beyond the FET research community
- The best approaches to involve/motivate scientists for involvement in CA activities
- How to identify opportunities for international collaboration and trigger them, and how to support existing collaborations
- The best way to communicate with the community involved and with other communities
- How to optimise the impact of a CA; how to make sure it serves the researchers

The practice of complementing research projects, clustered in Proactive Initiatives, with CAs has been part of the FET practice since Framework Programme 5 but it was introduced on a wider scale in FP7. As the first FP7 projects are now coming to an end, it is time to take stock and share experiences on the most effective way to achieve the objectives of a CA, as well as possible pitfalls, and share this knowledge with CAs that are recently established or about to start.

For any CA it is important to analyze what the actual needs of a specific scientific community are, and to adapt the objectives and activities of the CA accordingly. Also, much can be learned through interaction with people who have experience with this type of project. At the same time it is crucial to have a connection with scientists in the community who are able to identify those issues where the CAs activities are most appropriate. It is also crucial to extend a CA beyond the projects that are directly funded by FET by making links to other scientists in Europe and the rest of the world.

This report aims to draw some conclusions, based on the discussions at the meeting, on the best way to achieve this.

2. Discussion on CA related themes

The meeting started with a plenary discussion, including a presentation from each CA. After this discussion it was decided to explore two topics in more depth, namely building a roadmap and new media.

2.1 General discussion

Dissemination is clearly a role for a CA and building a website is often the first step towards a dissemination strategy. Several people warned against the trap of having the website produced by a PhD student or someone who does this as a hobby, as this can easily lead to a dull website which does not attract visitors. It is better to contract a professional to make a well-designed website. The effort of updating this website (for example regularly updating the news section) is a substantial amount of work, but unavoidable since a simple message announcing an event which has already passed can immediately give visitors the feeling that the website is not being maintained or will have nothing to offer.

One point of discussion was the way a **roadmap** should be built. It was seen as key that this task should extend beyond sharing position papers, and should foster a discussion leading to shared views on research in the middle and long term, and creating visions based on the developments in the area. This topic was also chosen for a break-out session which is described later in this report.

Another challenge for CAs is attracting participation in **scientific meetings**. Workshops or conferences organized by a CA typically have to make a trade-off between aiming at a high level topic (which concerns more people, but has the danger of becoming abstract and not attracting interest), or taking up a specific topic (which can more easily attract people, but from a smaller target group). Inviting for peer-reviewed papers is seen as a good way to attract interest.

Many projects reported the difficulty of making contacts with the **public and private sectors**. At the same time, the ability to make contacts outside the scientific community is an added value of CAs over other types of community efforts such as conferences. The ASSYST project gave as an example the ability to reach out to the political level and policy makers that could have an interest in their field, although also in this case creating those contacts is a difficult process.

In typical **multi-disciplinary** areas a CA can play a role in supporting the educational curriculum and the careers of young researchers. It can also create venues for publication or discussion where those are not yet provided by existing conferences.

On the issue of **international collaboration**, many CAs face a challenge in defining activities which help to establish contacts between communities inside and outside Europe, and creating joint results such as shared roadmaps or topics that could be considered for joint funding (i.e. partially within Europe and partially outside). A positive example in this context is the Capo Caccia Cognitive Neuromorphic Engineering workshops organized by CSN (see <http://capocaccia.ethz.ch/capo/wiki/2011>).

Any continuing activities which are funded by the CA run the risk of discontinuation after the lifetime of the CA. Designing mechanisms that are sustainable and will not come to an abrupt end is something that should be considered as early as possible.

2.2 Discussion on New Media

One group focussed on the topic of new media (ranging from relatively old mechanisms such as email up to the newest in social networks). The following list gives an overview:

- **Email** is quite effective as a basic communication tool, but using it to feed frequent information updates or group discussions can easily cause irritation as it can end up being seen as spam.
- **Twitter** is seen by the group as useful for events (e.g. during a conference if one learns to use hash-tags), even if they may become a channel for petty complaints that nobody would make in front of an audience. For day-to-day business it is not so useful, especially because it isn't appealing for low-frequency messages.
- Social networking sites can be an easy way to get around this, as information updates and discussion can be hidden behind an event or discussion. They also create the possibility of finding new people based on their profile or interests, paving the way for new collaborations, and result in social network graph which is a valuable resource.
 - **Facebook** is the most well known of these, however the image of Facebook doesn't match the research community well, and it has privacy issues.
 - **LinkedIn** is somewhat like Facebook, but has a more professional image. While it may be a better match, it is rather centred around industry and recruitment rather than academia.
 - **Academia** (<http://www.academia.edu/>) is aimed at, well, academia, allowing researchers to make a profile and connect to similar people.
- Tools that allow for sharing technical info can be a great support to the community, and a particular aspect is sharing weblinks. This can be supported through tools such as **delicious** and **CiteULike**.
- Some new media are taking this a step further and look at innovative ways to evaluate research papers or online articles. Examples are **faculty of 1000** (<http://facultyof1000.com/>) and **Scholarpedia** (<http://www.scholarpedia.org/>).
- **FlashMeeting** provides an alternative way of virtual communication, enabling for example replays and searching of meetings (see <http://flashmeeting.open.ac.uk/home.html>).
- **Blogs** can be a great way to publicize information, but tend to be ignored if they are written by regular people, while some celebrity bloggers develop a huge following. This makes it less suitable for CAs.

- Media such as (possibly TED style) videos or PodCasts can be used to share presentations, and collecting/hosting them can be a CA activity.
- Tools such as **fouresquare** are able to keep track of people's geographic location. However, events may be an easier point of orientation, as they tend to be the typical centre of community activity.

A key conclusion of the meeting was that new media should be seen in the context of a dissemination and interaction strategy. They can achieve important objectives such as creating a workspace, creating a social graph, information exchange, and the ability to make new contacts. As such, it should start with the question what should be communicated, and by/to which target group. For this purpose it was seen that target groups can be classified in four broad categories: communication with the project, communication between FET projects, communication with a wider scientific community within the technical topic, and communication to a wider audience (other scientific areas, science journalists, policy-makers, general public, etc.).

In the first case, many projects use a shared workspace or other tool for interaction, exchanging documents, planning meetings, and so forth. This is a special case as the project can agree on this and then force participants to adapt this tool. It was reported that for various interesting and effective tools there was a certain resistance at the start of the project, but created good results once the number of participants had reached a critical mass.

In the second case, there can be a need to be more persuasive, or accept that the entire community is only reached through a combination of media. Using an existing tool for gathering info or sharing profiles will, for example, typically include a certain percentage of participants and exclude others who are not interested in joining. This can also be aimed for through the CA website, however it is a challenge to get people to come back (as many will typically register once to look around, and then not return). Creating a website that constantly draws people back requires a substantial and sustained effort.

There was in this case a general consensus that CAs should not aim to develop such tools by themselves. Since many are available, and new ones being created and improved constantly, it can't be justified to spend CA resources on a general tool (e.g. regular social networking functionality). This however does not include tools that are specific to CA activity and which are not available elsewhere (such as for creating a research roadmap).

The third case (communicating to a wider scientific community) is the most difficult case as there is no widely accepted tool to handle this type of interaction. As it is crucial for a CA to reach out to people outside FET projects, the most sensible strategy at this moment is to use various media, hoping to cover as much as possible of the wider community. This has to be planned taking into account the required resources for each type of medium.

The last case is mostly dissemination and involves little interaction, and hence can be addressed through more well-known methods which only push information such as newsletters, magazines written by science journalists, exhibitions, youtube videos, etc.

2.3 Discussion on Roadmapping

A second group focussed on the topic of research roadmaps. Three specific questions were discussed, namely who the roadmap is for, what it should contain, and how to create it.

Defining scope: who are the target groups

The original motivation from FET for creating roadmaps is to identify future research challenges and with that support the development of new research topics, which can be taken up by FET, other parts of the ICT programme, or other funding bodies. Such documents have often played a role by influencing the work programme, especially if they succeed in outlining new research opportunities for FET and showing how new research efforts can built on and strengthen particular European strengths and knowledge.

Roadmaps can provide an overview of the state of the art in an area, and define grand challenges. As they justify why a research area is being funded, they play an increasingly large role for researchers and research communities. They are also used in communication with funding agencies at national level, and hence play a role in aligning research policy in the European Research Area.

If FET would not require a roadmap, would one still be created? The discussion concluded it is of interest to senior people in projects and to the CA as a whole, but not necessarily to individual researchers. The shaping of future research is essentially a collective activity, and as such is not a personal accomplishment. Also the main reading audience is the participants who are writing the document and funding agencies, which another reason why it doesn't play a big role in achieving personal recognition.

However there was a consensus that the building of a roadmap is important as a part of community building, even if the participants themselves are only secondary as a target audience. Many researchers are mainly interested in their individual specific field, which narrows their vision on research. The process of building a roadmap which covers both short and long term research widens this vision.

Contents, level, time horizon and timeline

A key conclusion of the discussion was that a distinction needs to be made between a **research agenda**, which consists of major research challenges, and a more specific **roadmap**, which also includes a description of the state of the art and a timeline of developments that are generally expected to happen. (It was observed that a good description of the state of the art can also be published.)

There are different types of research areas, and each has distinct possibilities or difficulties to set out research challenges. Some areas have clear technical goals; others have wider challenges that are not easily translated into concrete goals. There was a general agreement that this is easier for specific research areas, and harder for cross-disciplinary areas which may only be able to define goals at an abstract level.

The group also felt that roadmaps need to be structured, for example by assessing and classifying the impact of new topics between near term, mid term and long term. In fact, there is a broader question of how far a roadmap is developed. The first stage for a roadmap is identifying new

research topics, and classifying them into different types. A second stage is to fit these topics into a structure and identifying interdependencies, hence creating an implementation strategy. A final stage is to attach a specific timeline, creating an overall view of when specific developments are expected to happen and what they will lead to. An example of a roadmap that was developed up to the third stage is the ITRS roadmap (International Technology Roadmap for Semiconductors, see <http://www.itrs.net/>). There was a feeling that if a roadmap can be taken to the final stage (as is the case with ITRS) it is probably not a typical FET topic, as only down-stream topics can be planned in such detail.

The terminology of a "*roadmap*" is not ideal, since (1) it suggests a very specific and well laid out development path which is not usual in FET, (2) it doesn't reflect the need to motivate *why* research should move in a particular direction, and (3) it also doesn't reflect the dynamic nature of the research topics a community identifies as most relevant.

How to develop, maintain and disseminate

As a general best practice, roadmaps should be a living document, possibly passed on between consecutive CAs. They should not only describe research topics, but also identify main objectives, and motivate why research should move towards particular (often vague) directions. It is crucial for policy-makers to be able to motivate why a particular direction is taken.

The CA representatives felt that having access to other/previous roadmaps or roadmap building experiences would be very fruitful for their current activities. At the same time, having access to dozens of roadmaps would be a challenge in terms of identifying what is relevant and worth studying.

The following points were raised in the practical development of a roadmap:

- At the beginning of a CA, the basis of the roadmap can be created through literature review and mapping of the state of the art. This is relatively easy to motivate on the basis of publication output.
- From month six onwards, an online consultation process can start, aiming for a wide coverage and involving researchers from all levels. Using personal contacts is crucial at this stage, and the process should not be too intimidating.
- Several workshops should be organised to consider grand challenges; usually driven by work package leaders. In some cases it can be beneficial to start with a large workshop to gather info and continue with a more detailed discussion in smaller groups (by invitation). Afterwards, a larger group (advisory board) should review the results for consensus-building.
- This can be facilitated by organising networking sessions at workshops and conferences (including ICT Conference and FET Conference), by creating project working groups around key issues, or two-day lock-in consultations by invitations with key players, a representative from FET and with a rapporteur.
- A Scientific Board should be able to make assessment/review contributions.

Finally, it should be possible to flexibly present material at different levels for different audiences. The roadmap should be downloadable and printable, can be linked to videoclips on a website. In general new media can be used both to building and to disseminate a roadmap, see for example the roadmap tool from the PERADA project (see <http://www.perada.eu/research-agenda>).

3. Conclusions

One of the main conclusions of the workshop is that CAs can play crucial role in areas that are not easily covered by research projects, and much knowledge on how to best achieve this has been built up since the start of FP7.

Regarding **dissemination**, there is a need to aim for professionalism, for example by employing a professional website designer, or a science writer to produce articles for various media (magazine, web). There is a general recognition of the fact that science communication is a different job from being a scientist. Also, CAs need to have a dissemination strategy taking into account different target groups, ranging from FET project participants to scientists in the field and to private and public sector stakeholders. New media provide many opportunities to address these groups, but have to be used and combined carefully, and require appropriate investment of resources.

The creation of a **Roadmap** requires careful planning, especially because it is quite different from the type of document that scientists usually create. It has a very specific target group, depends on a group process, but can have a significant impact on individual researchers and communities as a whole. The nature of the document changes depending on the topic (e.g. it is different for multi-disciplinary topics), and the maturity of the field (see for example the different roadmap stages described in this report). Roadmaps need to address not only the *what*, but also *why* a particular research direction is chosen. Many representatives felt their CAs would benefit from exchange of experiences on the optimal approach to roadmap building. Starting with personal meetings and using with personal contacts is crucial, but at the same time the creation of a roadmap can be greatly helped by new media.

Many CAs organise **workshops** and other technical meetings, and several hints were given on how to maximise their success. While they tend to work well with the scientific community, the successes in making contacts with **public and private sectors** have been fluctuating. Whereas some clear successes have been achieved, many CAs find it difficult to attract interest outside the scientific community.

On the topic of **international collaboration**, although there are positive examples, there is a clear scope in most CAs for extending such activities, e.g. by creating contacts with scientific communities outside Europe (e.g. in China), and mapping out the structure of the scientific community worldwide within specific topics.

In general, the participants considered it important to exchange information on best practices in order to increase the impact of individual CAs. The meeting sparked direct bi- or multilateral collaboration ideas between the participants. The participants thought that it would be worthwhile to repeat the exercise in the future.

Annex 1: Participating Coordination Actions

PERADA

Towards Pervasive Adaptation (start date: 1/2/2008)

Coordinator: Ben Paechter (Edinburgh Napier University, UK)

Project manager: Jennifer Willies (Edinburgh Napier University, UK)

Community builder and dissemination: Ingi Helgason (Edinburgh Napier University, UK)

Web-Site: <http://www.perada.eu>

Proactive, projects and members: This CA supports the proactive Pervasive Adaptation, which has 1 IP and 5 STREP projects, and has collected a community of about 650 people.

Research topics addressed: Evolve-able and adaptive pervasive systems, able to permanently adjust, self-manage, evolve and self-organise in order to robustly respond to dynamically changing environments, and networked societies of artefacts that adapt to each other and to changing needs. This also brings new trust, security and privacy challenges to the complex interactions between people, intelligent devices and computers.

Objectives and key activities: the main objectives are to help uniting the communities related to pervasive adaptation; to help to facilitate interaction between projects; and to contribute to build and consolidate a new community for the underlying research.

The activities include community building, for example by making a 'Special Issue' on Pervasive Adaptation in the ACM Transactions, and organising workshops. They also cover dissemination of ideas both internally and externally, for example through the website that has the role of a repository, by a dedicated magazine and a newsletter, and by knowledge transfer to industry.

Other actions are the coordination of the research agenda, through an interactive tool that has produce a book based on ideas collected from researchers, summer schools and academic courses, and finally assessment of the proactive initiative.

ASSYST

Action for the Science of complex Systems for Socially intelligent ICT (start date: 1/1/2009)

Coordinator: Jeffrey Johnson (The Open University, UK)

Web-Site: <http://www.assystcomplexity.eu>

Proactive and projects: This CA supports the proactive Science of Complex Systems for Socially Intelligent ICT (COSI-ICT), which has 4 IP projects.

Research topics addressed: this CA addresses Complex Systems and Social Intelligence, as well as ICT and Complex Systems as ICT-enabled science and applications. Key issues in this area are theories and engineering principles for such systems, multilevel dynamics and the engineering robust socio-technical-ICT systems.

Objectives and key activities: The CA aims to integrate output of the IPs towards new science and applications, integrating the complex systems community in Europe and connecting them to communities in China, India etc. Another aim is to connect scientists to private and public sectors. Activities are building a roadmap, supporting education and curricula, and organising meeting, workshops and conferences.

In building a roadmap, the project has developed this at the kick-off meeting, through email exchange and at annual meetings. Obtaining input to the roadmap has been a challenge, which has been countered by organising meetings in nice places and pointing out the importance of a roadmap for future funding.

ASSYST has organized conferences (e.g. ECCS), web based courses and summer schools. This has proven to be quite labour-intensive, and making this effort scalable is crucial. Recording all meetings on video has been a positive experience. The Étoile tool has been used for educational material, and the website plays an important role as a repository.

COBRA

Coordination of Bio/Chem-IT Research Activities (start date: 1/12/2010)

Coordinator: Martyn Amos (Manchester Metropolitan University, UK)

Represented by: John S. McCaskill (Ruhr-Universität Bochum, Germany) and Zarka Khan (Manchester Metropolitan University, UK)

Web-Site: <http://www.cobra-project.eu>

(this is a website under construction, for now background information can be found at <http://homepage.ruhr-uni-bochum.de/john.mccaskill/ECCell>)

Proactive and projects: This CA supports the proactive Bio-chemistry based Information Technology (CHEM-IT), which has 3 STREP projects.

Research topics addressed: Bio/chem IT spans emerging research areas such as systems and synthetic biology, artificial cells, chemical information processing, MEMS, nanotechnology and artificial intelligence. In this domain the research is focused on Evolvable, Self-organizing, Self-constructing and Information processing systems. They envision interesting opportunities in engineered intelligent diagnostics and drug delivery systems, artificial tissues, nanotechnology for energy and environmental applications, adaptive bioelectronics and molecular synthesis. These research fields may have a relevant impact on most sectors of our society.

Objectives and key activities: COBRA aims to act as a unifying focus for bio/chem IT, across a range of different research domains. The long-term goal is to place Europe at the cutting edge of international competitiveness in this increasingly significant area. By promoting research,

development and take-up of bio/chem IT, COBRA will consolidate and catalyze a further development of Europe's existing research capabilities in the field.

Activities will include establishing and maintaining a living roadmap document, provide support for innovative, high-quality meetings and exchanges, and establishing high-quality channels of communication (dedicated website with collective intelligence, online networking, email lists and newsletter). It will also create a database of bio/chem IT expertise and skills, encourage industrial engagement, and encourage the involvement of students through the provision of curricula and materials.

CSN

Convergent Science Network of biomimetic and biohybrid systems (start date 1/3/2010)

Coordinator: Paul Verschure (Universitat Pompeu Fabra, Barcelona)

Represented by: Giacomo Indiveri (ETH, Zurich)

Web-Site: <http://www.csnetwork.eu>

Proactive and projects: This CA supports the proactives Bio-ICT Convergence (2 IPs and 5 STREPs) and Brain-Inspired ICT (1 IP and 3 STREPs).

Research topics addressed: *Novel computing paradigms*, derived from the information representation and processing capabilities of biological systems or from the computational interpretation of biological processes, *Biomimetic artefacts*, ad hoc hardware implementations of bio-inspired systems in areas where standard devices do not provide the required performance, *Bidirectional interfaces* between electronic or electro-mechanical systems and living entities, at or close to the cellular level, and *Biohybrid artefacts* involving tightly coupled ICT and biological entities for new forms of computation, sensing, communication or physical actuation or adaptation.

Objectives and key activities: The main objectives are to carry out an overview developments in the field of biohybrid and biomimetic sciences, to build on current curricula in these fields and develop strategies for post graduate courses, reaching out to the various stakeholders in order to disseminate the project results, organising strategic workshops and conferences, and finally establish an European Association for Biomimetic and Biohybrid Research.

Activities include performing coordinated roadmapping exercises, creating novel training opportunities and developing synergies between existing ones, developing international workshops and conferences, and establishing an electronic resource for publication and dissemination of tools, concepts and methods. Finally the CA will disseminate the field of biomimetic and biohybrid systems towards the different direct and indirect stakeholders including policy makers, industry and the general public.

ETERNALS

Trustworthy Eternal Systems via Evolving Software, Data and Knowledge (start date 1/3/2010)

Coordinator: Alessandro Moschitti (Trento University)

Also represented by: Valérie Issarny (Inria) and Jim Clark (Waterford Institute of Technology)

Web-Site: <http://www.eternals.eu>

Proactive and projects: This CA supports the proactive ICT Forever Yours which has 4 IPs

Research topics addressed: Eternals will create the conditions for mutual awareness and cross-fertilization among the four ICT-Forever Yours (FY) FET projects. These projects concern heterogeneous research fields in the target area of system Eternity: Knowledge, Software and Networked and Secure systems. However, they obviously share similar objectives. In particular, they all try to achieve properties such as adaptation, evolvability and flexibility in order to develop long living and versatile systems, i.e., Eternal Systems. Consequently, this CA identifies three cross-cutting research topics that are of interest for the four ICT-FY FET projects. These are: (i) diversity awareness & management, (ii) time awareness & management, and (iii) self-adaptation & evolution by automatic learning.

Objectives and key activities: Building a cross-fertilization environment for research on eternal systems (providing management and organisational framework to support consultation with top level researchers from the ICT-FY FET communities, who are authoritative experts in the areas of eternal systems, and creating task forces in the three key technical areas), defining roadmaps for upcoming research on eternal systems, building research communities (e.g. through conferences, workshops, consultations and cluster meetings) and disseminating results on Eternal systems (through web portal, newsletters, summer schools, seminars).

HC2

Human Computer Confluence Research in Action (start date 1/10/2010)

Coordinator: Cristina Martin (Starlab, Barcelona)

Represented by: Stephen Dunne (Starlab, Barcelona)

Web-Site: <http://hcsquared.eu/>

Proactive and projects: This CA supports the proactive Human Computer Confluence, which has 2 IPs

Research topics addressed: Human-Computer Confluence studies the emerging symbiotic relation between humans and computing devices can enable radically new forms of sensing, perception, interaction, and understanding. Some key topics are perception and interaction with massive amounts of data, smooth transition from physical to virtual/augmented reality, and new forms of perception and action.

Objective and key activities: to *stimulate, structure, and support* the research community, promoting identity building, to *consolidate research agendas* with special attention to the interdisciplinary aspects of HCC, producing useful visions and roadmaps to support the construction of an HCC ERA-NET, to *enhance the public understanding* of HCC and foster the early contact of

researchers with high-tech SMEs and other industry players, and to establish guidelines for the definition of new *educational curricula* to prepare the next generation of HCC researchers.

Specific actions include summer schools, workshops (in particular in conjunction with major events such as RAVE 2011 Barcelona, FutureBNCI and BEAMING Barcelona), a travel fund, creating dissemination material, interaction with artistic community and roadmap workshops.

QUIE2T

QUantum Information Entanglement-Enabled Technologies (start date 1/2/2010)

Coordinator: Vladimir Buzek (Slovak Academy of Sciences)

Represented by: Carmen Zeques (Institut d'Optique, France)

Web-Site: <http://quope.eu/quie2t>

Proactive and projects: This CA supports the proactive Quantum Information Foundations and Technologies (QI-FT) which has 3 IPs

Research topics addressed: The CA QUIE2T aims at strengthening and advancing the European scientific and technological excellence in the field of Quantum Information Foundations and Technologies (QIFT). Specifically this includes quantum information theory, algorithms and paradigms, entanglement-enabled quantum technologies exploiting several qubits for performing ICT tasks, scalability of quantum processing systems, and long distance quantum communication.

Objective and key activities: the QUIE2T initiative is committed to setting up an ultimately sustainable research architecture and to promoting it at the European level. This architecture will be structured around a set of four Virtual Institutes (VIs), mapped to the major QIPC sub-domains. To guarantee that the expertise and the knowledge gained through the CA activities will be of benefit to the European QIFT community (both academic and industrial), QUIE2T will organize a set of activities. In particular a public web site will be a communication mechanism towards the international QIPC community to present the CA and its Virtual Institutes, and QUIE2T publications will be accessible via this web site. The CA will also organize a set of thematic conferences on a bi-annual basis, targeting especially young researchers. Finally, a dedicated activity will target mainly industries in the field to ensure a strong interaction and involvement.

ZEROPOWER

Co-ordinating Research Efforts Towards Zero-Power ICT (start date 1/1/2011)

Coordinator: Luca Gammaitoni (Perugia University, Italy)

Web-Site: <http://www.zero-power.eu/>

Proactive and projects: This CA supports the proactive Towards Zero-Power ICT (2zeroP) which has 3 STREPs.

Research topics addressed: 2ZeroP aims at new disruptive directions for energy-harvesting technologies at the nanometre and molecular scale, and their integration with low-power ICT into

autonomous nano-scale devices for sensing, processing, actuating and communication. This should result in Foundations of Energy Harvesting at the nano-scale, and Self-powered autonomous nano-scale electronic devices.

Objective and key activities: The main objectives of the CA are the consolidation and visibility of the research community in low-power/energyefficient ICT devices, mapping and surveying of research at European level (and its comparison with other continents), identification of drivers and measures to assess research in ICT-Energy related topics and to assess the potential of results to be taken up in industrial research, coordination of research agendas and development of research roadmaps, bringing together national or regional research programmes or activities, dissemination of scientific knowledge on Energy-ICT related topics, and advancing strategies for international cooperation on themes related to the call.

Some actions are organising workshops, ZEROPOWER sessions at high-level conferences and a Micro Energy Day, setting up a researchers exchange, promotion of exhibitions and showcases.

Annex 2: List of Participants

Name	Project	Project link
CLARK Jim	Eternals	https://www.eternals.eu/
DITTRICH Peter	COBRA	http://www.cobra-project.eu/
DUNNE Stephen	HC2	http://hcsquared.eu/
FAGAS Giorgos	ZEROPOWER	http://www.zero-power.eu/
GAMMAITONI Luca	ZEROPOWER	http://www.zero-power.eu/
HELGASON Ingi	PANORAMA / PERADA	http://www.perada.eu/
INDIVERI Giacomo	CSN	http://www.csnetwork.eu/
ISSARNY Valérie	Eternals	https://www.eternals.eu/
JOHNSON Jeffrey	ASSYST	http://www.assystcomplexity.eu/
KHAN Zarka	COBRA	http://www.cobra-project.eu/
McCASKILL John	COBRA	http://www.cobra-project.eu/
MOSCHITTI Alessandro	Eternals	https://www.eternals.eu/
PAECHTER Ben	PANORAMA / PERADA	http://www.perada.eu/
WILLIES Jennifer	PANORAMA / PERADA	http://www.perada.eu/
ZEQUES Carmen	QUIE2T	http://quope.eu/quie2t

Participants from Commission:

Wolfgang Boch
 Pekka Karp
 Werner Steinhoegl
 Ralph Stübner
 Julian Ellis
 José-Luis Fernández-Villacañas
 Loris Penserini
 Wide Hogenhout
