SEVENTH FRAMEWORK PROGRAMME

Project Number: FP7-ICT-2007-1 216863

Project Title: Building the Future Optical Network in Europe (BONE)

CEC Deliverable Number: FP7-ICT-216863/IBBT/O/PU/D00.1

Contractual Date of Deliverabl: 31/03/08

Actual Date of Delivery: 31/03/08

Title of Deliverable: D00.1 : Project presentation

Workpackage contributing to the Deliverable: WP00 : Project management

Nature of the Deliverable O (Other)

Dissemination level of Deliverable PU (Public)

Editors: IBBT / Peter Van Daele

Abstract:

This deliverable groups 3 presentations of the BONE-project: a 2-page project fact sheet, also used for the overview brochure compiled by the EU Commission, a short project presentations and a more detailed project presentations. These presentations will be updated during the course of the project.

Keyword list:
Project presentation

Disclaimer

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1. Executive Summary :

This deliverable groups 3 presentations of the BONE-project: a 2-page project fact sheet, also used for the overview brochure compiled by the EU Commission, a short project presentations and a more detailed project presentations. These presentations will be updated during the course of the project.

2. Project Fact sheet

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Building the Future Optical Network in Europe

The BONE-project validates the results of the ePhoton/ONe NoE by stimulating a more intensified collaboration, exchange of researchers and building on Virtual Centres of Excellence that can serve European industry with education & training, research tools & testlabs and pave the way to new technologies & architectures.

At A Glance: *BONE*

Building the Future Optical Network in Europe

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Partners: IBBT (B), TUW (A), FPMs (B), Fraunhofer (D), TUB (D), UDE (D), UST-IKR (D), COM (DK), CTTC (E), TID (E), UAM (E), UC3M (E), UPC (E), UPCT (E), UPVLC (E), UVIGO (E), FT (F), GET (F), AIT (GR), ICCS/NTUA (GR), RACTI (GR), UOA (GR), UOP (GR), BME (H), FER (HR), CORITEL (I), FUB (I), ISCOM (I), POLIMI (I), POLITO (I), SSSUP (I), DEIS - UNIBO (I), UNIMORE (I), UNIROMA1 (I), TELENOR (N), TUE (NL), IT (P), AGH (PL), PUT (PL), HUAWEI (S), KTH (S), Bilkent (TR), UNIROMA3 (I), ORC (UK), UCAM (UK), UCL (UK), UESSEX (UK), USWAN (UK), Ericsson (UK)

Duration: 01-2008 – 12-2010
Total Cost: *€ 4 793 853.60*
EC Contribution: *€ 3 752 800.00*

Contract Number: INFSO-ICT-*216863*

Main Objectives

The BONE-network brings together 49 laboratories and research institutes from al over Europe in a close networking infrastructure, built on the foundations laid down by the FP6 ePhoton/ONe Network and represents the research activities within Europe in the field of Optical Networks. The core activity of the BONE-project is the stimulation of intensified collaboration, exchange of researchers and integration of activities and know-how into and amongst partners. Through the establishment of Virtual Centres of Excellence, the BONE-project looks into the future and builds and supports the final "Network of the Future" through education & training, research tools & testlabs on new technologies & architectures.

BONE is about integration, networking and creating mutual awareness to structure and disseminate the EU research on Optical Networking

The leading-edge position of European Research in the field and, consequently, of European industry, could be threatened by returning to an uncoordinated and scattered approach to optical networking research. BONE consolidates the process, supported during FP6, of integration and reorganization of research efforts across European academic and industrial groups in FP7 through:

- Building Virtual Centres of Excellence that cover specific issues in the field of Optical Networking that can serve to European industry with education & training, research tools & testlabs and pave the way to development of new technologies & architectures.
- Reaching out, including and linking to research activities in national programmes, or programmes outside Europe.
- Stimulating an intensified collaboration, exchange of researchers between the research groups involved and active in the field
- Disseminating the expertise and know-how of these European Research groups to a broader audience, both R&D oriented as well as industry- and decision maker oriented.

Technical Approach

The BONE-proposal proposes to solidify the current e-Photon/ONe network and has the objective to provide a limited number of Virtual Centres of Excellence on specific issues:

- VCE Network Technologies and Engineering
- VCE Services and Applications
- VCE Access networks
- VCE Optical switching systems
- VCE Transmission techniques
- VCE In-building Networks

These Virtual Centres of Excellence group, align and (re-)structure the research activities of the BONE-partners involved in such a way that a coherent solution and service can be offered to BONE internal and external partners and projects.

Hot and multidisciplinary topics and issues are handled and looked at through a limited number of Topical Projects which each have a limited duration.

These Topical Projects are either horizontal projects which make use of the expertise available at different Virtual Centres of Excellence or tackle specific issues to fill in specific needs or gaps in the expertise of the Virtual Centres of Excellence.

- TP Service aware optical network architectures
- TP MPLS, GMPLS and routing
- TP Optical communication networks in support of user mobility and networks in motion
- TP Edge-to-core adaptation for hybrid networks
- TP Optical Interconnects
- TP Alternatives for multi-layer networking with cross-layer optimization
- TP Physical Impairments constrain based routing in packet switching networks

Some of the activities within the BONE project are defined to support the general working of the project or centralise the dissemination & teaching activities.

- WP01: Dissemination & Outreach
- WP02: Teaching
- WP03: Electronic Communication Aid

As training and dissemination of the expertise and know-how of the BONE-Virtual Centres of Excellence and the results of the Topical Projects is essential and set as one of the major goals of the network, these activities will be taken care of in a centralised and coordinated activity.

Key Issues

- Strengthening of the European Research on Optical Networking through integration and collaboration amongst the different research groups involved in the Virtual Centres of Excellence.
- Definition of specific technical objectives for each of the Virtual Centres of Excellence.
- Establish contacts and links to national programmes and projects outside the FP7-framework to exchange information, expertise and jointly work towards definition of solutions for critical issues in optical networking.
- Organisation of workshops specifically targeting the dissemination of the BONE-know-how to non-R&D participants, i.e. industrial representatives & policy makers. These workshops will explain both the available expertise and support that BONE is offering through its Virtual Centres of Excellence as well as results obtained on hot issues through its Topical Projects.

Expected Impact

The network as a whole will clearly have an impact on the reinforcement of the European leadership in wired and wireless networks, not on an industrial level as defined in the “expected Impact” but on academic level.

However, due to the fact that academic research is mainly running ahead of the industrial needs and the implementations, also an impact on the European industry might be expected. These expectations are strengthened by the fact that the BONE network clearly envisages teaching and education, to under-graduates but also towards master courses that will be of use of key people at industry. Education is the first step in making people, in industry, aware of new trends and evolutions in the field.

The BONE network also comprises several, selected research groups from industry (equipment manufacturers, operators, …) which clearly exhibits the interest from industry in the network and clearly tightens the links between industry and the research activities in Europe.

3. BONE – Short Project presentation

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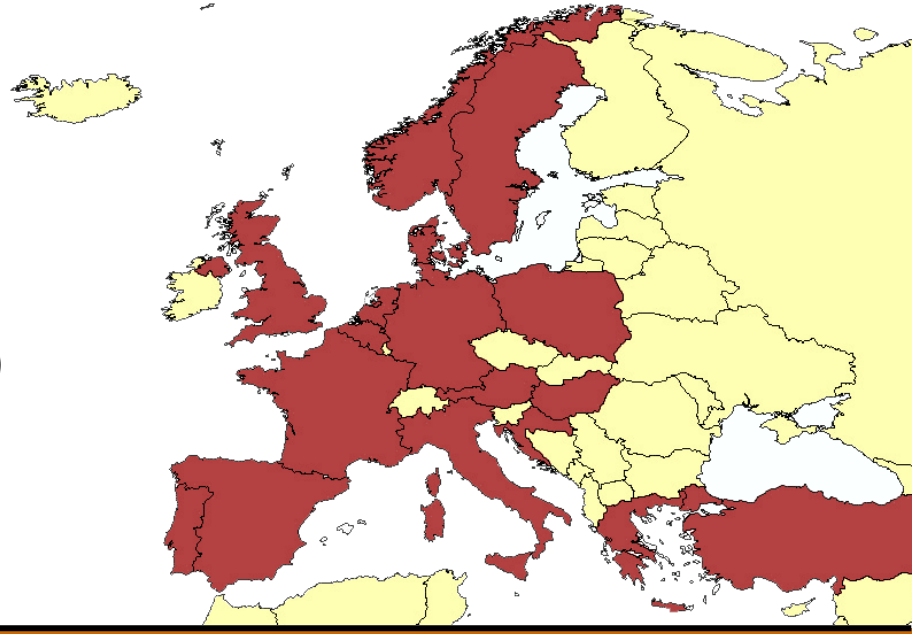
BONE

Building the Future Optical Network in Europe

FP7-Call 1 - NoE



Project coordinator:
Peter Van Daele (IBBT, Belgium)
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http://www.ict-bone.eu

BONE = 49 partners, 17 countries, 459 researchers ….

BONE Objectives

- Build Virtual Centres of Excellence that cover specific issues in the field of Optical Networking that can serve European industry with education & training, research tools & test labs and pave the way to development of new technologies & architectures.
- Reach out, include and link to research activities in national programmes, or programmes outside Europe.
- Stimulate an intensified collaboration, exchange of researchers between the research groups involved and active in the field
- Disseminate the expertise and know-how of these European Research groups to a broader audience, both R&D oriented as well as industry- and decision maker oriented.

Key message: enable collaboration between European Optical Networking research groups

Why we need BONE?

Given fact: *Europe has a lot of capacity & expertise in Optical Networking but this has remained fragmented and scattered despite RACE, ACTS, FP5, FP6,…*

BONE: **kick start from ePhoton/ONe-results to**

- **create awareness of available expertise**
- **create awareness of national programmes**
- **align expertise and know-how at partners**
- **stimulate exchange of personnel**
- **stimulate mutual involvement in projects**
- **stimulate teaching / educational activities**
- **joint publications & experiments (lab, field trials)**
- **promote research complementarity within EU**
- **…..**

BONE builds on the ePhoton/ONe foundations towards an EU Optical Networking Community

BONE activities

WP11: VCE on Network Technologies and Engineering
WP12: VCE on Services and Applications
WP13: VCE on Access Networks
WP14: VCE on Optical Switching Systems
WP15: VCE on Transmission Techniques
WP16: VCE on In-building Networks

WP21: TP on Service aware optical network architectures
WP22: TP on MPLS, GMPLS and routing
WP23: TP on Optical communication networks in support of user mobility and networks in motion
WP24: TP on edge-to-core adaptation for hybrid networks
WP25: TP on Optical Interconnects
WP26: TP on Alternatives for multi-layer networking with cross-layer optimization
WP27: TP on Physical Impairments constrain based routing in packet switching networks

4. BONE – Extended Project presentation

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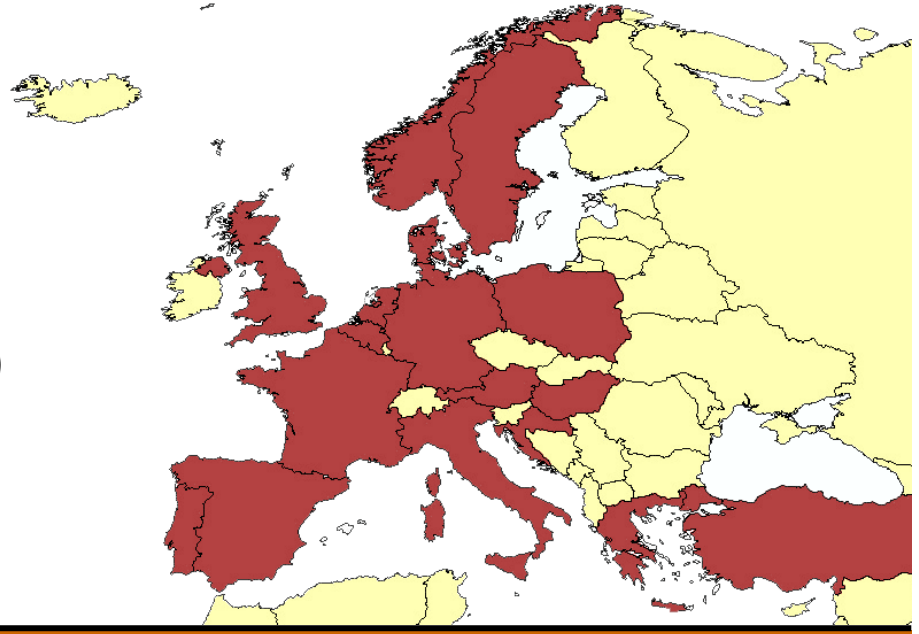
BONE

Building the Future Optical Network in Europe

FP7-Call 1 - NoE



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Key message: enable collaboration between European Optical Networking research groups

Measurable success criteria

- Build Virtual Centres of Excellence that cover specific issues in the field of Optical Networking that can serve European industry with education & training, research tools & test labs and pave the way to development of new technologies & architectures

Success will be measured against integration

- **Joint publications**
- **Joint projects (inside & outside BONE)**
- **Joint experiments (lab trials, field tests, ..)**
- **Teaching material**
- **Participation to meetings / conferences**
- **….**

Measurable success criteria

- Reach out, include and link to research activities in national programmes, or programmes outside Europe

Success will be measured against mutual involvement

- **Publications with mutual references**
- **New national projects (relying on BONE expertise)**
- **Joint experiments (lab trials, field tests, ..)**
- **Involvement in education**
- **Involvement of non-EU groups into BONE experiments**
- **Contributions in National FTTx developments and regulation**
- **….**

Measurable success criteria

- Stimulate an intensified collaboration, exchange of researchers between the research groups involved and active in the field

Success will be measured against mutual visits

- **Joint experiments (lab trials, field tests,...)**
- **Mutual visits**
- **Mutual involvement in PhD**
- **Long term visits**
- **….**

Measurable success criteria

- Disseminate the expertise and know-how of these European Research groups to a broader audience, both R&D oriented as well as industry- and decision maker oriented.

Success will be measured against dissemination activities

- **Joint papers / presentations**
- **Papers / Presentations to a broader public**
- **Involvement in conference organisations**
- **BONE-Schools**
- **Industry-oriented workshops**
- **Teaching material / External training activities**
- **Increase awareness of EU research**
- **Bench mark EU research against international programmes**
- **….**

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Given fact: *Europe has a lot of capacity & expertise in Optical Networking but this has remained fragmented and scattered despite RACE, ACTS, FP5, FP6,…*

BONE: **kick start from ePhoton/ONe-results to**

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- **stimulate mutual involvement in projects**
- **stimulate teaching / educational activities**
- **joint publications & experiments (lab, field trials)**
- **promote research complementarity within EU**

Key message: BONE builds on the ePhoton/ONe foundations towards an EU Optical Networking Community

Exploitation plans

BONE does not end with prototype or demo ….

BONE builds an EU Optical Networking Community and will yield:

- ***Coordinated applications for new projects***
- ***Coordination of experiments and lab trails***
- ***Impact on national programmes***
- ***Education of new optical networking professionals***
- ***Contact points for expertise on optical networking***
- ***Awareness (at PhD-level) of available expertise***

Key message: To know you, is to….

WP01 – WP02 – WP03

- WP01 : Dissemination
- WP02 : Teaching
- WP03 : Electronic facilities

- Strong collaboration needed
- Alignment & coordination of activities
- Build on ePhoton/ONe frame & expertise

- Special emphasis on gender-related issues
- Special emphasis in broad dissemination

WP-01
Dissemination & Outreach

Tanya Politi (University of Peloponnese)

Mike O'Mahony (University of Essex)

WP01 Objectives

- To disseminate information concerning the expertise, research and integration activities of the Network of Excellence and spread the excellence to European researchers and their institutions.
- To reach out to the European communities and young researchers and explain the purpose and challenges of optical networking and how the Network of Excellence can support local initiatives in this area.
- To facilitate the integration of a strong collaborative institution framework, to allow expert groups to effectively collaborate within the Network on key topics.
- To extend the roadmap [commenced in e-Photon/ONe] into a focused view (roadmap) of the evolution of photonic networks [within Europe] for telecom and non-telecom applications; and bench mark European research activities against international programmes.

WP01 Staging a public event

- TA: … '*a high level public lecture will be organised which will address the general public and schoolchildren to explain the role of optics…[…]… an afternoon event that combines demo with explanation . This event will be staged in the local language at a number of partner institutes*

WP01 Booths at events

- BONE will organise 5 booths at different events: ECOC 2008, ECOC 2009, ECOC 2010, ICT 2008, ICT 2009

- The booth organisation concerns: booking the booth, logistics for furniture, layout and PC/plasma screens, rolling BONE presentation and input from other ICT projects

WP01 Roadmap

A ppt presentation that reflects the vision of the NoE

To develop a consolidated view on the BONE we need input from all WPs

- *The first steps (understanding the situation and developing the vision) are already examined in the e2 roadmap*
- *The first milestone for the Roadmap is a request for future vision slides from WP leaders with respect to specific input*
- *The industrial partners should assist in establishing a think tank – to discuss the work being carried out in the NoE and also the roadmap*

WP01 Think Tank

- To create a think tank together with European industry to get specific input of European Networking and Roadmapping issues

- The think tank should ‘meet’ once or twice per year to discuss issues of the NoE

WP-02
Teaching Activities

Branko Mikac (FER)

Kevin Heggarty (ENST Bretagne)

WP02 Objectives

- The main objective of this WP is spreading excellence within and outside the project through the organization and execution of teaching activities based upon a common Master program in Optical Communications and Networks.

Other objectives:

- to offer courses of the Master to students within BONE summer schools;
- to create and improve teaching materials for Master studies with license for open access (slides, support materials and video lessons). All materials will be stored on project web site;
- to support offering of permanent Master teaching
- to encourage other types of knowledge dissemination, stimulating exchange of teaching materials, video lessons, lecturers and students;
- application of advance techniques for spreading knowledge: by video lessons, teleteaching and using learning tools.

  For all the objectives, special attention will be paid to include dissemination towards the New Member States

WP02 - BONE Summer Schools

- Each summer school is related to one of existing Master courses.
- BONE school is dedicated primarly to Master and PhD students of BONE partners, but it is open to others.
- Each student can gain credits (ECTS). Possible activities:
  - lesson hours at school, including teleteaching
  - lab hours and individual work.
- Each student, who wants, will undergo evaluation process.
- ECTS recognition is up to local conditions.
- Participation to schools will be funded by BONE or other funds.

WP02 Common Master

- Common Master in Optical Communications and Networks is mainly based on “virtual” Master Study created within e-Photon/ONe.
- Task Force of WP02 will continue collaborative work in order to improve existing and to create new teaching materials, according to recent advances in photonic technology, new architectures and transmission requirements.
- The long-term goal is to prepare materials for open access on BONE web site. Protection will be based on Creative Commons Public License. Otherwise, materials are for private use.
- Collecting educational tools.
- WP02 will support initiatives for permanent Master study

WP-03
Electronic Communication Tools

Walter Cerroni (UNIBO)

Rosa M. Martin (UPC)

WP03 Objectives

- Set of electronic tools to be provided
  - website
  - mailing lists
  - electronic directory service
  - on-line reporting service
  - click-to-talk VoIP service
  - shared workspace for discussions and document sharing
- Objectives
  - to simplify communications among partner
  - to promote integration
  - to disseminate NoE knowledge-base to the international research community

BONE website

http://www.ict-bone.eu

- Public area
  - dissemination tool for full visibility of NoE activities
  - structure and content provided by WP01
- Private area
  - repository of documents and restricted information
  - structure provided by WP01
  - content provided by all partners

WP Overview

WP11: VCE on Network Technologies and Engineering

- *DEIS/UNIBO – Telenor - …*

WP12: VCE on Services and Applications

- *SSSUP - ….*

WP13: VCE on Access Networks

- *UCL - …*

WP14: VCE on Optical Switching Systems

- *RACTI – COM - …*

WP15: VCE on Transmission Techniques

- *POLITO – ORC - …*

WP16: VCE on In-building Networks

- *TUE - …*

WP-VCE-11
Virtual Centre of Excellence on Network Technologies and Engineering

Franco Callegati (UNIBO, IT)

Evi Zouganeli (Telenor, NO)

WP11 An introduction

Focus

- The main objective of the WP is the integration of the research activities on technologies for alloptical networking in the metro and core networks

Challenges

- *Many of the challenges are similar in the metro and in the core network and can be summarized as*
  - *Protection and restoration;*
  - *Traffic engineering and congestion resolution;*
  - *Control plane for fast resource allocation according to the user needs.*

WP-VCE-12
Virtual Centre of Excellence on Services and Applications

Piero Castoldi (SSSUP, IT)

Luca Valcarenghi (SSSUP, IT)

WP12 An introduction

Future Internet Applications

- Mobile and nomadic (not only wireless) access → session support
- Resident in part in the network domain and in part at the user side (e.g. storage, computing capability, etc) → thin client & grid-enabled network
- Need *customized*, *reliable, secure* and *end-to-end QoS guaranteed* network services → application-to-network interface
- …….

Future Internet Services

- Creation of a complete application via the composition of homogeneous objects, named *services,* defined by resource *virtualization*
- Services should be “wrapped”, should be accessible anywhere and should be seamless
- Will be provided via the “Service plane” (SP), a new functional plane
- ……..

WP12 Objectives

See proposal .. but basically technical positioning aims at

- Investigating architectures for the SP and asses relevant performance
- Defining solutions for partitioning of functions between Data Plane, Control Plane, Management Plane and SP in all network segments
- Defining roadmaps for the evolution of the telecommunication business
- Advance at the *conceptual level* since typically not-interoperable solutions are in development in the area of S&A

Starting points and instruments

- A new center of competence aggregation with respect to e-photon/ONE and e-photon/ONE+
- The highest level of networking abstraction of the entire BONE project
- First to gather competence, then to integrate research efforts …
- To plan JA and achieve research outcomes …

WP-VCE-13
Virtual Centre of Excellence on Access Networks

John Mitchell (UCL)

WP13 Objectives

- Aim to provide a forum for exchange and consolidation of the latest research and development on access systems that use optics to provide true-broadband connections to fixed and mobile users.Different technologies like new TDM-PONs, WDM-PONs, Radio-over-Fibre, Free-Space-Optics or xDSL-over-fibre are being developed and are competing in diverse scenarios.

- With this aim, specific objectives of this WP are:
  - To integrate the research efforts on broadband access in Europe.
  - To establish a benchmarking platform for the different optical access technologies, to provide a series of guidelines for the deployment of most promising and effective access techniques in the different scenarios in Europe.
  - Provide insight into the integration of access technologies to provide operators with cost-effective evolution paths for the introduction of new services.
  - Document and make available to all test-bed and platforms.
  - Contribute to standards in the area, both within Europe and externally.

WP13 Key Research Areas

- Main Topic Areas of WP13
  - Fibre to the Home
  - Free Space Optics
  - Fibre Supported Radio Access
  - Cross Platform Activities.

WP13 Key Research Areas

We consider long-range (>1km) Single mode fibre systems.

Short range and multimode/POF will be in VCE-H (WP16)

We stop here!

WP-VCE-14
Virtual Centre of Excellence on Optical Switching Systems

Kyriakos Vlachos (RACTI/UPATRAS)

Martin N. Petersen & Jakob Buron (COM/DTU)

WP14 Objectives

- Determine research guidelines for Optical in Switching
- Foster deep and lasting collaboration between different R&D groups
- Assess optical switching technology and
- Define new applications of photonic switching in the network of the future.
- Facilitate access to unique experimental facilities

Main tools to be used: Joint Activity proposals that will **involve joint experiments**, **mobility actions**, **joint papers** and preparation of **teaching material**

WP14 Objectives

Work will be organized in two directions :

- System and Networking aspects of optical switching including:
  - New switching paradigms and network architectures
  - Multi-granular, GMPLS switching nodes
  - Switching and network reliability, benchmarking and cost analysis

- Technology aspects and technology evaluation:
  - Review and assessment of current switching -technologies
  - Emerging applications and switching functions
  - New switching devices and essential technology including ring resonators, slow-light generation devices, fibre based switches, photonic crystals and QD-SOAs

WP-VCE-15
Virtual Centre of Excellence on Transmission Techniques

Periklis Petropoulos (ORC)

WP15 Objectives

- **100Gb/s:** Reliable, resilient 100 Gb/s (per channel) Ultra-Dense WDM transmission, backward-compatible with the existing infrastructure
- **Mitigation:** Mitigation of transmission impairments by transmitter, in-line, and/or receiver-based advanced optical or electronic signal processing and coding techniques
- **Monitoring:** Distributed channel and network performance monitoring and overall transmission layer supervision

WP-VCE-16
Virtual Centre of Excellence on In-building Networks

Ton Koonen (TUE)

WP16 Objectives

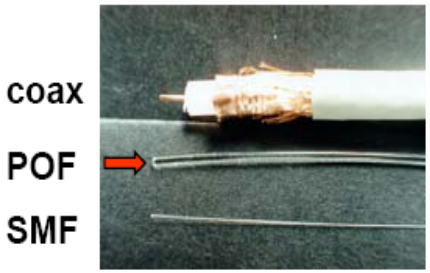
Align the research activities on Architectures and Techniques for Optical In-Building Networks, comprising

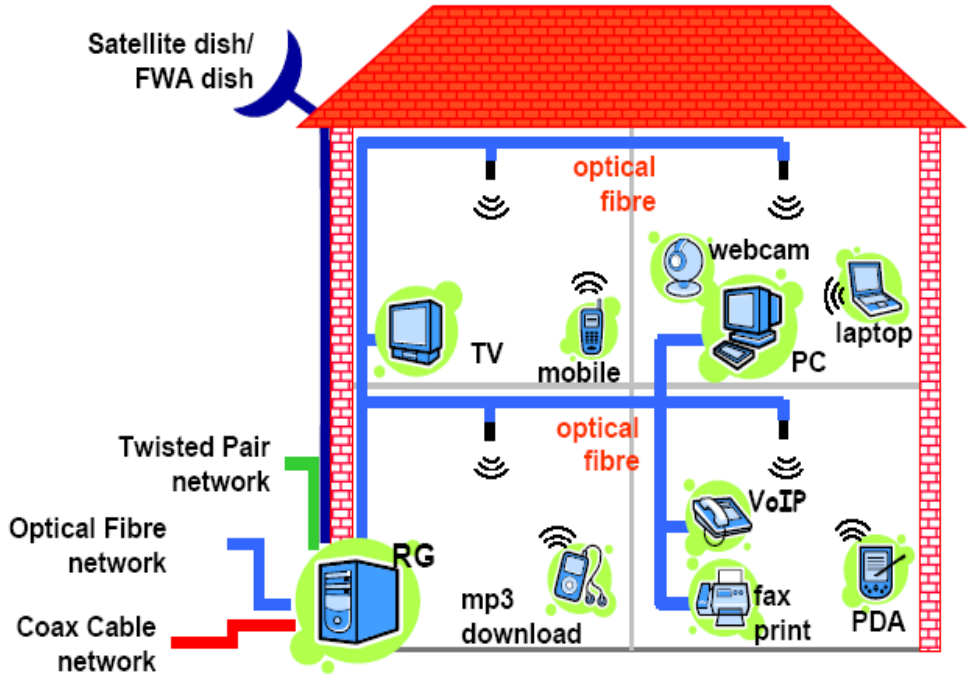
- Co-ordinating and integrating research efforts: by
  - exchanging researchers,
  - joint research and lab experiments,
  - joint publications,
  - …
- Establishing benchmark platforms for different optical in-building technologies
- Providing guidelines for roll-out and deployment of optical in-building networks, incl. migration paths

WP16 Research domain

Converged in-home optical backbone network,

- multiplexing wired & wireless services
- high-capacity data
- radio over fibre
- on SMF, silica MMF, POF
- interfacing with RG
- interfacing with user terminals





WP Overview

WP21: TP on Service aware optical network architectures

- *UEssex – IBBT - …*

WP22: TP on MPLS, GMPLS and routing

- *UC3M – UPC - ….*

WP23: TP on Optical communication networks in support of user mobility and networks in motion

- *AIT - …*

WP24: TP on edge-to-core adaptation for hybrid networks

- *UAM - …*

WP Overview

WP25: TP on Optical Interconnects

- *POLIMI - …*

WP26: TP on Alternatives for multi-layer networking with cross-layer optimization

- *AIT - …*

WP27: TP on Physical Impairments constrain based routing in packet switching networks

- *IT - …*

Many contributions by partners:

BONE-money is seed money for collaboration, awareness creation, and dissemination (e.g. into industry)

BONE Partners Overview