

## SIP# 251 Round 2

**Title:** Hybrid Routing in Next Generation IP Networks

**Acronym:** HYBRID

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** Integration of Technologies

**Type of project:** R&D project, including technology demonstration (large scale)

**Summary:** Communications networks have evolved from Circuit-switched and hop-by-hop routed systems into hybrid data/optical networks using the Internet as a common backbone carrying narrow- and broad-band traffic offered by a multitude of access networks. This data/optical backbone is built around a multi-technology/multi-protocol routing architecture which runs the IP protocols in a collapsed IP stack where ATM and SONET/SDH have been replaced by the suite of Generalized Multiprotocol Label Switching (GMPLS) protocols. A further evolution referred to as "IP over Photons" or "All IP - All Optical" is expected where redundant intermediate layers will be eliminated to run IP directly on top of optical cross-connects (OXCs) with the expectation of achieving savings on operation expenditures (OPEX) and capital expenditures (CAPEX). "IP over Photons" has been stalled by the immaturity in the control and data plane technologies leading to complex and time-consuming manual network planning and configurations which require a group of "layer experts" to operate and maintain a hybrid data/optical network. By making the status of each link and node of a data/optical network visible to a common control, GMPLS protocols have opened the way for automated operation and management allowing the different layers of an IP stack to be managed by a single network operator. GMPLS protocols provide the potential to make more efficient use of the IP backbone by having network management techniques such as Traffic Engineering (TE) and Network Engineering (NE), once the preserve of telecommunications, to be reinvented and deployed to effect different Quality of Service (QoS) requirements in the IP networks. NE moves bandwidth to where the traffic is offered to the network while TE moves traffic to where the bandwidth is available to achieve QoS agreements between the current and expected traffic and the available resources. However, several issues need to be resolved before TE and NE are effectively deployed in emerging and next generation IP networks. These include (1) the identification of QoS requirements of the different network layer interfaces of the emerging and next generation IP stack (2) the mapping of these QoS requirements into QoS routing mechanisms and network control strategies and (3) the deployment of these mechanisms and strategies within and beyond an Internet domain's boundaries to maximize the engineering and economic efficiency. Building upon different frameworks and research fields, this project revisits the issue of Traffic and Network Engineering (TE and NE) to present and evaluate the performance of different QoS routing mechanisms and network control strategies when deployed at different network layer interfaces of a hybrid data/optical network where an IP over MPLS network is layered above an MPLambdaS/Fiber infrastructure. These include mechanisms and strategies to be deployed at the IP/MPLS, MPLS/MPLambdaS and MPLambdaS/Fiber network layer interfaces. The main contributions of this thesis are threefold. First we propose and compare the performance of hybrid routing approaches to be deployed in IP/MPLS networks by combining connectionless routing mechanisms used by classical IGP protocols and the connection oriented routing approach borrowed from MPLS. Second, we present QoS routing mechanisms and network control strategies to be deployed at the MPLS/MPLambdaS network layer interface with a focus on contention-aware routing and inter-layer visibility to improve multi-layer optimality and resilience. Finally, we build upon Fiber transmission characteristics to propose QoS routing mechanisms where the routing in the MPLS and MPLambdaS layers is conducted by Photonic characteristics of the Fiber such as the availability of the physical link and its failure risk group probability.

**Expertise offered:** - Network planning and modelling - Performance evaluation using simulation and emulation - Testbed Experimentation on different African research and education networks.

**Previous FP involvement:** None

**Consortium status:** Stellenbosch University (SUN), University of Kinshasa (UNIKIN), Telecommunication Systems Laboratory/KTH (KTH), Transportation Informatics, Alpen Adria University Klagenfurt (Austria), Dares Salam Institute of Technology (DIT),

**Expertise sought:** SUN (Modelling, planning and performance evaluation), KTH (testbed demonstration+Optical networking), UNIKIN (Modelling and planning), Klagenfurt (Wireless Communication), and DIT (testbed demonstration)

**Related projects:** None

## **SIP# 252 Round 2**

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**Theme:** Information and communication technologies

**Focus Area:** Integration of Technologies

**Type of project:** R&D project (small scale)

**Summary:** Building upon different frameworks and research fields, this project revisits the issue of Traffic and Network Engineering (TE and NE) to present and evaluate the performance of different QoS routing mechanisms and network control strategies when deployed at different network layer interfaces of a hybrid data/optical network where an IP over MPLS network is layered above an MPLambdaS/Fiber infrastructure. These include mechanisms and strategies to be deployed at the IP/MPLS, MPLS/MPLambdaS and MPLambdaS/Fiber network layer interfaces. The main contributions of this project are threefold. First we propose and compare the performance of hybrid routing approaches to be deployed in IP/MPLS networks by combining connectionless routing mechanisms used by classical IGP protocols and the connection oriented routing approach borrowed from MPLS. Second, we present QoS routing mechanisms and network control strategies to be deployed at the MPLS/MPLambdaS network layer interface with a focus on contention-aware routing and inter-layer visibility to improve multi-layer optimality and resilience. Finally, we build upon Fiber transmission characteristics to propose QoS routing mechanisms where the routing in the MPLS and MPLambdaS layers is conducted by Photonic characteristics of the Fiber such as the availability of the physical link and its failure risk group probability.

**Expertise offered:** 1. Network modeling 2. Network performance evaluation using simulation and emulation 3. Testbed experimentation on different African NRENS in collaboration with the UbuntuNet Alliance

**Previous FP involvement:** None

**Consortium status:** Royal Institute of Technology/Sweden, Dares Salam Institute of Technology, Stellenbosch University, University of Kinshasa

**Expertise sought:** Network modelling, Performance evaluation using simulation and emulation, Testbed implementation on different African research and education networks

**Related projects:** None

**SIP# 254 Round 2**

**Title:** Health

**Acronym:** TBA

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** Applications Research

**Type of project:** R&D project, including technology demonstration (large scale)

**Summary:** TBA

**Expertise offered:** TBA

**Previous FP involvement:** Yes

**Details of previous FP involvement:** Through SAP Research world-wide

**Consortium status:** Only SAP Research - CEC Pretoria at this stage

**Expertise sought:** To be advised

**Related projects:** FP6

**SIP# 255 Round 2**

**Title:** SMME

**Acronym:** TBA

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** Integration of Technologies

**Type of project:** R&D project, including technology demonstration (large scale)

**Summary:** TBA

**Expertise offered:** TBA

**Previous FP involvement:** Yes

**Details of previous FP involvement:** Through SAP Research world wide

**Consortium status:** Currently only SAP Research CEC Pretoria

**Expertise sought:** To be advised

**Related projects:** FP6

**SIP# 256 Round 2**

**Title:** Education

**Acronym:** TBA

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** Integration of Technologies

**Type of project:** R&D project, including technology demonstration (large scale)

**Summary:** TBA

**Expertise offered:** TBA

**Previous FP involvement:** Yes

**Details of previous FP involvement:** Through SAP Reserach world wide

**Consortium status:** Only SAP CEC Research Pretoria

**Expertise sought:** TBA

**Related projects:** FP6

## **SIP# 257 Round 2**

**Title:** FP7 Project Development for ICT

**Acronym:** PF7-PD-ICT

**Submitted by:**

DeWet Naude

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**Theme:** Information and communication technologies

**Focus Area:** Integration of Technologies

**Type of project:** Implementation support to FP7s

**Summary:** PCA (Pty) Ltd is positioned to facilitate one or more of the following: - Lobby appropriate governmental and societal entities in South Africa and other developing countries - Link South-African role players with European role players - Identify and activate local consortium partners - Initiate, administer and manage consortium agreements - Facilitate inter-disciplinary/organisational projects in terms of conceptualisation, definition, scoping, planning, management and support processes - Project life cycle management (plans, milestones, schedules, deliverables, quality, financial admin, budget etc.)

**Expertise offered:** Project processes - development, planning and implementation, integration, specifically in the developing economy/societal development project fields

**Previous FP involvement:** None

**Consortium status:** None

**Expertise sought:** Content-specific partners related to specific calls

**Related projects:** None

## **SIP# 261 Round 2**

**Title:** African Geo Information Researcher Network

**Acronym:** AGIRN

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** Applications Research

**Type of project:** Thematic network on specific research questions

**Summary:** Our research has shown that Africa has a fragile but vibrant geoinformation industry that is producing some of the information needed for use in decision-making. In some instances the work that is being done on the continent is of an international standard and requires recognition. Furthermore, the decision makers need to be made aware of what geoinformation is available so that it can be more effectively used in the development of policies, strategies and in the implementation of development programmes. One of the ways that this can be successfully done is by establishing a web portal. The web portal can be used to communicate the work being done in the geoinformation industry on the continent to decision makers and planners in Africa and across the world. These portals involve the active collection of research material on the geoinformation industry that is stored and then "pushed" or disseminated to stakeholders. The Africa Geo Information Researcher Network (AGIRN) ([www.agirn.org](http://www.agirn.org)) is such a portal that we are now launching and would like develop further in collaboration with EuroGI institutions and practitioners. One of the primary intentions of AGIRN is to share knowledge on geo information in Africa with as wide an audience as possible. This will include the sourcing and dissemination of research articles on different themes and focus areas, highlighting news items in the geoinformation industry and keeping people informed about developments and events happening on the continent. An important part of AGIRN will be to create a network of geoinformation practitioners and institutions in Africa that will be able to facilitate access to spatial information. It is hoped that AGIRN will also play a facilitation role in providing access to geoinformation on countries across the continent. It is believed that by playing these roles, AGIRN will contribute to developing the geoinformation industry in Africa and facilitating the use of geoinformation for the development of the continent.

**Expertise offered:** Geoinformation and environmental network of institutions and practitioners across Africa

**Previous FP involvement:** None

**Consortium status:** EIS Africa and HSRC with support from EuroGI

**Expertise sought:** Links to EuroGI initiatives, including INSPIRE initiative

**Related projects:** None

## **SIP# 291 Round 2**

**Title:** System Architecture for AGIS Application Development

**Acronym:** SAAGISAD

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** Applications Research

**Type of project:** R&D project (small scale)

**Summary:** the aim of the project is educate and train the personnel responsible for the infrastructure and application development for the Agricultural Georeferenced Information System (AGIS [www.agis.agric.za](http://www.agis.agric.za)) in best ICT practice with regards to : 1) ITIL and ISO20000 2) System Architecture 3) Requirements management  
**MOTIVATION :** To enable key IT personnel responsible for system, technology and infrastructure of the AGIS website to align long term strategy with best practice AND the system development according to ISO20000

**Expertise offered:** JAVA web developers x 2 GIS Analyst x 2 GIS Specialist x 2 Database Administrator (Solaris/Informix) x 1 IT Manager x 1 IS Manager x 1

**Previous FP involvement:** None

**Consortium status:** potentially Sweden re: Telelogic

**Expertise sought:** ISO20000 training, possible use of Telelogic software in design and architecture

**Related projects:** South African national R&D programmes

## **SIP# 293 Round 2**

**Title:** TMC demonstration in South Africa

**Acronym:** TMCDEMO

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** Applications Research

**Type of project:** R&D project, including technology demonstration (large scale)

**Summary:** The quality of traffic and public transport information in South Africa is limited. Generally, information is only broadcasted every 15 minutes on the radio. Integrated systems do not exist and there is no guarantee with regards to the quality of the information. In Europe, traffic data provision has been standardised. Governments and or related institutions collect and verify information. The information is translated into a standard digital form and distributed. The distributed information is available real-time. Road users, traffic operators, public transport operators and service providers use the same information. This has led to improved traffic flows, improved public transport and more accurate and up to date information to the users. Systems that are used to distribute information are for example TMC radios, variable message signs and navigation systems.

**Expertise offered:** Experience in TMC, DATEX and transport modelling (to estimate the effects of measures and GIS).

**Previous FP involvement:** Yes

**Consortium status:** UCT collaborates with CSIR and ERTICO

**Expertise sought:** Experienced partners are invited to indicate their interests.

**Related projects:** None

## **SIP# 300 Round 2**

**Title:** Manual Geographical Information Systems solutions for rural development

**Acronym:** MGIS

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** Applications Research

**Type of project:** Networking between organisations in same area

**Summary:** This type of initiative is good for the enhancement of the school system and the youth to be on a higher level of education to compete in the job markets. The main disadvantage is that the application of GIS is computer based and needs factors such as; electricity, computer hardware and software and the relevant training of the educators. We have discovered through our research over the past 2 years that the biggest crisis the Department of Education will face is not just major expenditure on software and hardware but also how to create awareness and enthusiasm of the educators on the subject. With our contribution we are able to focus on poverty eradication and rural development from all ages.

**Expertise offered:** Ms Petersen: Development and support of Earth Science and Observation in the educational sector for the Cape regions. Assisting Universities (lecturers and students with career guidance in Earth Observation) Project management: Education project (Earth Observation in Education) Strategic partnership, promotions, information dissemination, public relation, publicity Council for Geoscience education programme Western, Northern and Eastern Cape regions Geoscience education for educators in conjunction with The Nelson Mandela Metropolitan University, Dept of Science, Mathematics and Technology Education

**Previous FP involvement:** Yes

**Details of previous FP involvement:** FP6 - Environment and global change

**Consortium status:** Searching for potential european partner, SA partners- National Department of Education

**Expertise sought:** Dept of Education has affiliations with this product for the South African market.

**Related projects:** FP6

## SIP# 310 Round 2

**Title:** Quantum Information Processing and Communication

**Acronym:** QIPC

**Submitted by:**

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**Theme:** Information and communication technologies

**Focus Area:** ICT Technology Pillars

**Type of project:** Networking between organisations in same area

**Summary:** Light is an ideal candidate to carry quantum information. Quantum information encoded in single photons or a squeezed state of light is durable because of the weak interaction of light with its environment. On one hand non-classical states of light can be employed in Quantum Key Distribution (QKD) to guarantee secure data transmission between two distant parties. In this context we target methods to establish secure communication between multiple parties. On the other hand optical qubits can serve to process information in Quantum Computing (QC). It has been shown that scalable QC can be performed using single photons, linear optics and single-photon detection. We would like to take a broader view on QC which also may include nonlinear optical elements. However, whether QC with single photons can be realized depends crucially on the capability to produce and detect single photons with high efficiency. Here our aim is to design methods to provide this capability. For this purpose we focus in a first step on realizing single-photon sources by means of colour centres in diamonds. In particular we would like to focus on: Multi-node Quantum Key Distribution for two-partite protocols, Distribution of entanglement via noisy quantum channels, Cryptographic protocols using multipartite entanglement, Creation and Detection of multipartite entanglement, Production of N-V-centres in diamonds, Production of single-photon sources by doping diamonds with atoms other than nitrogen atoms. Single-Photon Emission from N-V-centres in diamonds, Efficient Coupling of light from N-V-centres in optical fibres, Verification of single-photon emission, Methods to increase the efficiency of single-photon sources by post-processing their output using linear and non-linear optics as well as conditioned photo detection.

**Expertise offered:** Traditionally, the quantum research group at the University of KwaZulu-Natal has world class expertise in the theory of open quantum systems. In particular, the group is studying and developing tools to describe analytically and numerically non-markovian properties of open systems. Typically, we look at qubit systems interacting with spin and other random environments. Also, the group is studying relativistic aspects of quantum information theory. On the computational side the group has expertise in the simulation of the dynamics of atoms in double optical lattices with the help of stochastic wave function methods. Thanks to a grant of South African Innovation Fund the group has started an experimental activity in quantum key distribution. Particular efforts are devoted to the development of single photon sources exploiting defects in diamonds and to the implementation of multi-node QKD systems.

**Previous FP involvement:** None

**Consortium status:** The group has collaborations with M. Fannes, Belgium; A. Kastberg, Sweden; A. Messina, Italy; R. Alicki, Poland; L. Diosi, Hungary. We are setting up a formal collaboration with the Centre of Quantum Information at Imperial College, London.

**Expertise sought:** Partners working in theoretical and experimental quantum information processing and communication and in particular in Quantum Cryptography.

**Related projects:** FP6

International bilateral cooperation

South African national R&D programmes

## **SIP# 323 Round 2**

**Title:** User-friendly front end for virtual reality tools based on FOSS

**Acronym:** FreeVRA

**Submitted by:**

Bob (Robert) Day

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**Theme:** Information and communication technologies

**Focus Area:** Applications Research

**Type of project:** R&D project (small scale)

**Summary:** Virtual reality (VR) technology is becoming recognised to have extremely high potential in all aspects of formal and informal education, across all age groups. A good and widely-known example is Google Earth, which is a VR environment that has changed the paradigms. While VR technology is high-end technology, it is now available on PCs. Proprietary VR systems, although still expensive to purchase, are dropping in price. On the other hand, there are already very powerful FOSS-based VR systems available. Work with UNESCO has shown that a significant current limitation to the wider use of VR technology is the lack of an easy-to-use FOSS-based system. The FOSS-based VR systems that are currently available typically require dedicated specialists to use. An easy-to-use system would allow a much more extensive range of people to exploit VR technology, including entrepreneurs, those involved in education, and young people themselves. In the context of the FOSS development process there is something of a chicken and egg conundrum concerning the development of a user-friendly FOSS-based VR system. For typical well-used FOSS applications there is a large global community that develops, maintains and supports the application. For more specialist tools the size of this community may be too small to maintain the momentum required to build and enhance a high-quality tool. This is the case for VR tools. The user base is currently restricted because the FOSS-based systems are difficult to use. Therefore there is not a strong and widely-heard call from the users for a more useable system to be built. A way of breaking out of this fix is required. This proposal aims to stimulate the normal FOSS development process to build a user-friendly front end to one or more existing VR engines.

**Expertise offered:** The expertise that we have includes all aspects of software development, experience in the various stages of the FOSS dev process, and expertise in VR and multimedia technology.

**Previous FP involvement:** None

**Consortium status:** Potential collaborators include: Meraka (FOSSFA); i-kno; Naledi 3D; NZSD; Helsinki University of Technology; Helsinki Institute of Information Technology

**Expertise sought:** None identified at present.

**Related projects:** None

## **SIP# 331 Round 2**

**Title:** Semantic process repository

**Acronym:** SemPros

**Submitted by:**

Aurora Gerber

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**Theme:** Information and communication technologies

**Focus Area:** ICT Technology Pillars

**Type of project:** R&D project (small scale)

**Summary:** Exchanging experiences and sample process models between similar institutions or initiatives could drastically reduce the effort for service and process implementation. This is for instance particularly true for public administrations, where municipalities provide virtually identical services. For example, in Germany the “Virtual Community Geschäftsprozess-Management” (virtual community for business process management - <http://www.fhvr-berlin.de/vc-gpm/>) is based on a repository of process models. Members can provide experiences in form of process models and profit from experiences of other members. A similar approach is the propagation of reference models for processes and organisational structures that can be used and customized. Reference models are abstract models of a domain of interest that represent best practices. Examples of reference models are the IT infrastructure library ITIL and the supply chain operations reference model (SCOR). As administrative organisations—as opposed to companies—do not have to protect a competitive advantage and their processes are based on legal foundations, e-government services are well suited for reference models. While today repositories of (reference) models mainly use textual descriptions (like the above-mentioned VC business process management or the MIT process handbook project - <http://ccs.mit.edu/ph/>) they are hard to quest and only indirectly reusable. Adding semantic metadata to process models would be much more helpful in finding adequate services and reusing the models (instead of their description) – an approach that is widely accepted for semantic web services. This, however, is still an open research issue, in particular as there are no standards for e-government ontologies. The project intends to build up a generic process repository for a particular domain, including the development of a process and domain ontology, a storage component and most important a retrieval component based on semantic information.

**Expertise offered:** Reusable process models Process repositories Process ontologies

**Previous FP involvement:** None

**Consortium status:** In process. Currently formed by Meraka, Unisa and Fachhochschule Nordwestschweiz Hochschule für Wirtschaft. Other partners in Switzerland were contacted already.

**Expertise sought:** Reusable process repositories through intelligent meta-data / ontologies

**Related projects:** None