ICT Infrastructures for Rural Areas

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TOC

- Rural Areas development and ICT
- C@R Project
- Future Research Activities

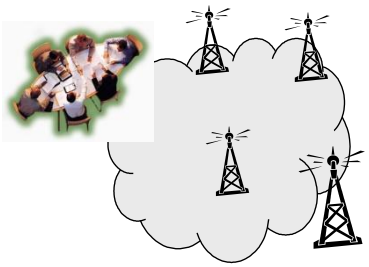
Rural Areas development and ICT

- Rural and remote regions areas count with 60% of EU population and 90% of EU Territory.
- EU has failed on Lisbon strategy objectives because we were not able to bring more capacities to our ICT research. Our diversity is a barrier more than an opportunity.
- Due to business model, regulatory or technical reasons there is still a great number of Digital Disadvantaged individuals and communities.
- Future Internet Researchers and related experiments are not able to try new concepts in rural areas and remote areas.

C@R:Introduction

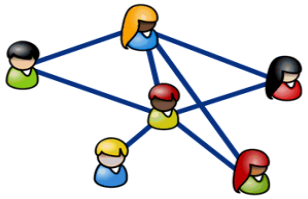
C@R aims Rural Sustainable development
Providing CWE environments

Traditional & Emerging Scenarios



Network deals with Contents & Services

Different Business Models



A CWE domain where Users, Apps & Machines Cooperate

Service Providers Service Architecture

RLLs with CWE Domains & CDS

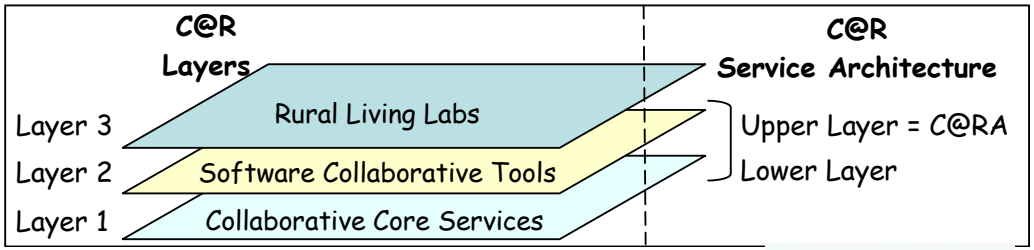
C@R - Overall Objectives

- C@R promotes collaborative working environments to foster innovation and enable rural development
- C@R is innovation- and collaboration-oriented response to remove the barriers of rural development
- C@R uses living labs methodology as a way to engage rural constituency in RTD activities and as process for experimenting on ICT-based collaborative value chain innovations
- Several C@R living labs aim to establish environments for business incubation

Living labs wiki: http://www.ami-communities.eu/wiki/C@R

Public website: http://www.c-rural.eu/

Collaboration Platform



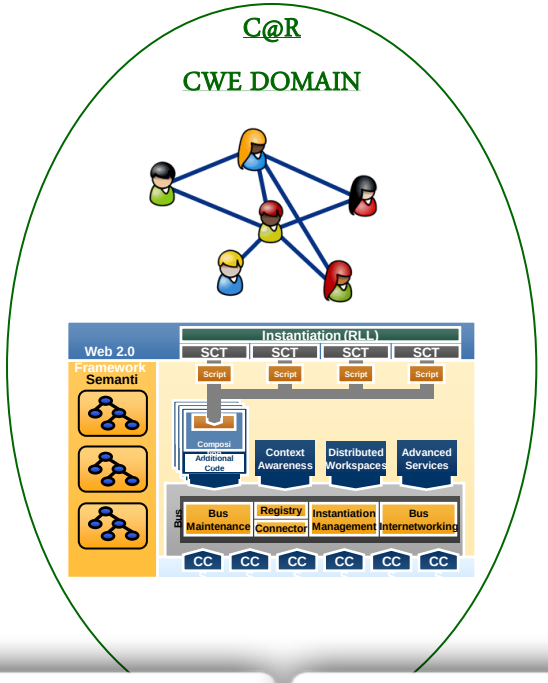
User Driven Value chain Innovation

C@R Architecture

CWE Domain
StakeHolders
Users, Admin

Basic Resources
Capacities
Enablers

RLL Collaborative
Distributed
Situations



CONTROL PLANE

C@R BUS

Signaling

Centralized

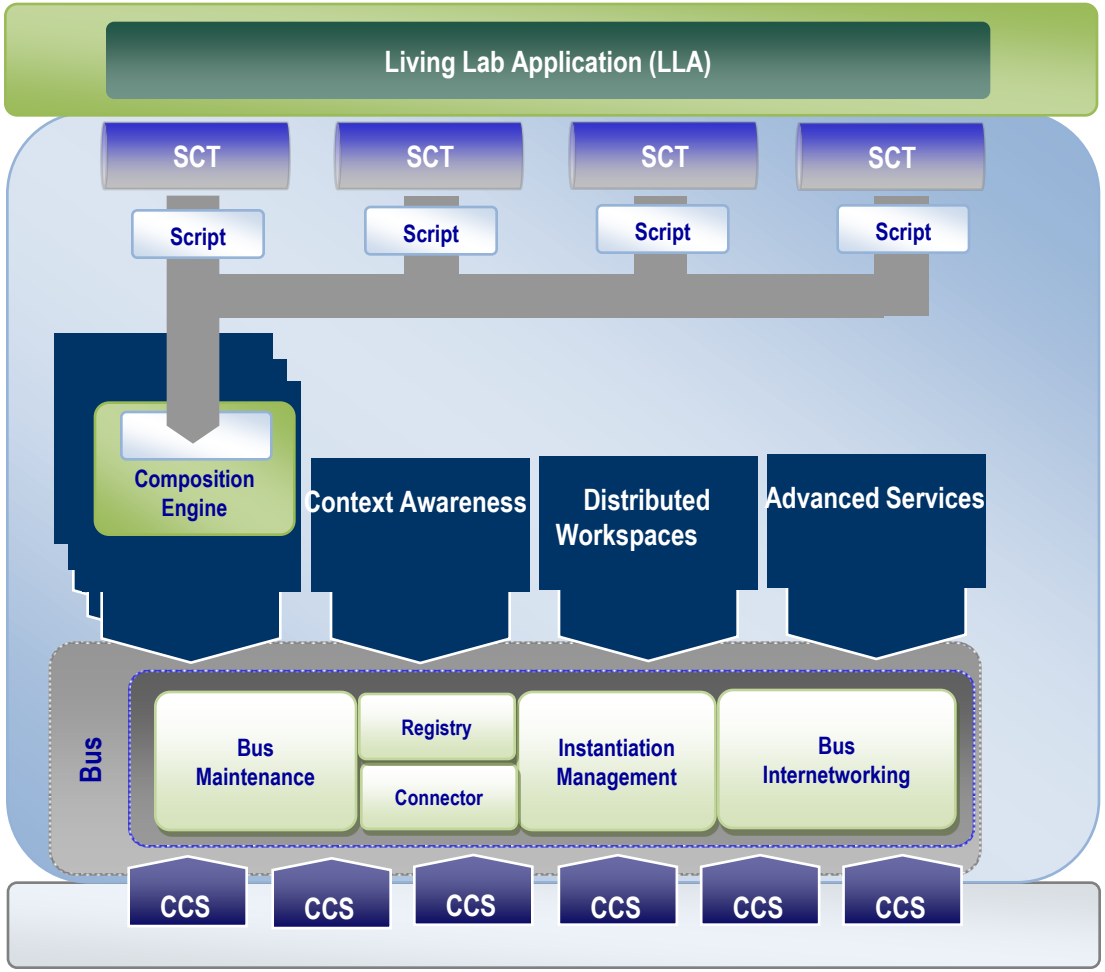
DATA PLANE

Extended User

Communications

Distributed (P2P)

OSOA reference architecture



- Multilayer architecture design
- Different aggregation levels of business functionality
  - Collaborative Core Services
  - Software Collaboration Tools
  - Orchestration Capabilities
  - Living Lab Applications
- Control BUS to centrally deal with component registration and brokerage

Main (technical) innovations

- Decoupled building blocks (all accessible via Web Service interfaces)
  - CCS - implemented as reusable software components that encapsulate distinctive core functionality
  - SCT - comprising aggregated functionality, which can be integrated into a final RLL application, but is of such a degree of independence to be usable for various applications even across different Living Labs
  - OC - providing collaborative functions and libraries that are used by composed SCTs. Collaborative situations involve atomic functions from different OCs such as Messages Broadcasting, Shared Display, Videoconference systems, etc.
  - LLA cover end user interactions (via a User Interface)
- Service enablement - Integrated system of loosely coupled services (OSOA principle) based on a language-neutral programming model
- Interoperability and integration - Architecture built upon well defined standards avoiding proprietary concepts
- Component brokerage - Control BUS
  - Central instance to deal with component registration and brokerage
  - Enabling of component reusability across Living Lab borders
  - A resource broker, where signaling information about resources is exchanged, enabling the system to search for resources, managing their interconnection and supporting collaboration among different CWEs
  - Uniforming middleware designed for CCS component harmonization, homogenization and adaptation to standards
  - Easy scalability thanks to the support of multidomains concept (domains, subdomains hierarchy)
- Reference framework for individual Rural Living Lab flavored implementations that reflect local specifics as a result of the contextual "engineering target point"
  - Variety of slightly different implementations of the same concepts
  - Adjustability of C@R OSOA - ability to fit into completely different scenarios and use cases that originated from dedicated requirements
- Resource saving security model for distributed systems

C@R user involvement

Seven RLL (Rural Living Labs):

1. Rural Living Lab in Turku (Finland)
2. Rural living Lab in Soria (Spain)
3. Infopreneurs in Sekhukhune/Northern Drakensberg Area (South Africa)
4. Rural enterprise incubator in the Frascati Area (Italy)
5. Living Lab on open community (Hungary)
6. Living Lab on Collaborative governance (Czech Republic)
7. Living Lab on Collaborative Fishery in Cudillero, Asturias (Spain)

Rural Living Labs created impacts on business and rural development, through changing the rural innovation system and influencing policies

Innovation at Sekhukhune RLL

Sekhukhune RLL interventions increases the operational excellence of small and micro enterprises by to the point efficiency and effectiveness gains:

- establishment of economies of scale that overcomes the problem of critical size
- bridging 2nd and 1st economy gaps that cause inaccessibility of profitable markets
- reduction of transactional costs caused by remoteness, bad infrastructure and limited resources,
- employment of entrepreneurs providing ICT services that haven't been accessible in rural areas so far

Christina Marule, Spaza Shop Owner

Ishmael Adams, Infopreneur

The Use Case of Virtual Buying Cooperatives

- The ordering system creates an uninterupted value chain from the informal shops to formal large retailers
- It increases the buying power of informal shops and creates an efficient integration into formal logistic networks
- It provides data on economic transactions which were formerly invisible
- It thus provides the basis for micro credits or other important services supporting socio-economic development

Hansie du Plessis, Sasko Bakeries

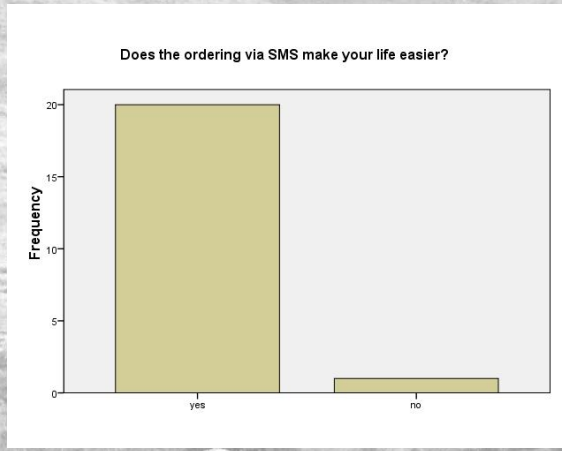
Impact Assessment at Sekhukhune- Examples

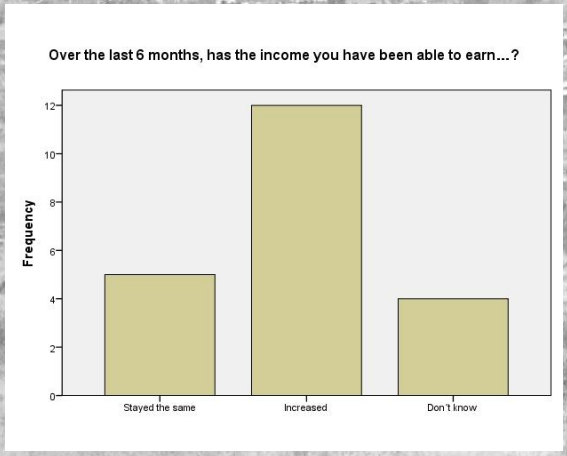
Spaza shop owners

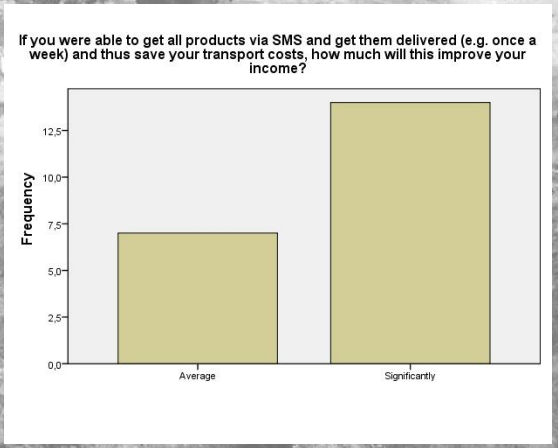
- Overall rating on the added value is positive
- Improvements on SMS usability (1 roundtrip only), network coverage, training and lack of airtime
- Product basket is most relevant to create higher impact

Supplier – Pioneer Foods (Sasko Bakeries)

- SMS ordering is regarded as a promising extension of their business portfolio
- Increased transparency in terms of product order behaviour and route tracing of the drivers
- 2% increase in sales during the real life piloting







C@R Main conclusions

- C@R has demonstrated that there are ways to foster converging processes between rural and urban inhabitants and between research and innovation communities across EU. There should be no more differences and barriers between them
  - EU has a enormous diversity that can be a strength especially in the current economical crisis or a big barrier.
- Common converging processes are to be supported claiming research infrastructures and innovation projects dealing with rural development in the coming years
- Economic growth has to integrate adequate indicators to address global challenges such as climate change, poverty, resource depletion and health
- Rural development is a necessary investment rather than a necessary spent

Future Research Activities

- Information management
- Rural areas requirements for Future Internet

Information management

- Information management in agri-food supply chain networks is complex.
- The role of information is twofold:
  1) For communication between different actors
  2) Control to direct processes in the desired direction. This is not different from other industrial sectors but agri-food has to deal with some specific characteristics that makes it different:

Future Internet for Rural Areas

- Open questions related to Future Internet
  - How can we build a new emerging sustainable experimental facility which takes into account rural and remote areas?
  - How can we extend Innovative network based Research and Experimentation to this people?
  - How can we bring research infrastructures in rural areas, to bind researchers, local SME and end users?
  - Adapting the urban experiences to remote and rural areas.
  - Interconnecting urban experiments to rural and remote FIREs
  - In Crisis or post-Crisis scenario: Bringing R&D&i through FIRE experimentation to rural and remote areas will:
  - Help to fix or promote local SME in cheaper areas.
  - Close the gap between high-tech rural oriented SME, rural and remote communities and specialized researchers (not only from ICT world but also from agricultural, stockbreeding or environmental areas)
  - Help to insert the rural and remote areas in the society of information and thanks to globalization participate in a world wide business.

Main Goals

- To promote a Future Internet Research and Experimentation market in rural and remote areas which in fact will provide a solid advance for integrating rural areas into the Future Internet Research Activities.

- To help create a Rural/Regional Innovation Ecosystem for promoting Future Internet Research and Experimentation in rural and remote areas linking it with current efforts in urban areas, serving as a “gluing agent” between different stakeholders.

Thank you for your attention!

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Back-up Slides

ICT Barriers at Rural Areas

Barrier	Where in C@R	How
Lack of telecom. infrastructures	Policies, Dissemination, and Exploitation	Business models study and influence on governmental policies with emphasis on the affordability issue
	Living Labs methodology: Rural Living Labs	Real use of technology in rural environments
	Technical activities	Promote seamless access to telecom infrastructures
Hard environmental conditions	Living Labs methodology: Rural Living Labs	Real use analysis of devices, interfaces and technologies under hard environmental conditions
	Technical activities	Integration of adequate interfaces, equipment and communication infrastructures
Usability restrictions	Living Labs methodology: Rural Living Labs	Requirements capture in traditional and emergent activities in rural areas Training to help workers using the collaborative services, tools and devices
	Technical activities	Research on multimodal interfaces and devices autonomy Adaptability of multimodal interfaces Seamless access to services and contents
Lack of IST culture	Policies, Dissemination, and Exploitation	Promotion of pro-active policies within the public administration framework (courses, seminaries, advertising campaigns, etc.)
	Living Labs methodology: Rural Living Labs	Requirements capture

ICT Barriers at Rural Areas

Barrier	Where in C@R	How
Difficulties on the introduction of new work methods and technology acceptance	Policies, Dissemination, and Exploitation	- Synergies with rural oriented initiatives or associations to help innovation in the rural world - Technology costs analysis: affordability - Fostering policies and plans for dissemination of the IST in the rural environment
	Living Labs methodology: Rural Living Labs	- Investigation on emerging collaborative domains within the rural environments - Training of the end-users
	Technical activities	- Development of specific collaborative environments in rural areas - Enabling tools allowing workers to easily know and access last technology developments for collaborativeness - Seamless access to applications
Long implantation times	Policies, Dissemination, and Exploitation	- Business models and time to market analysis - Promotion of policies supporting short implantation times (funding, financing)
	Technical activities	- Roadmap for the implantation of the collaborative platform
	Living Labs methodology: Rural Living Labs	- Roadmap for the implantation of the collaborative platform
Lack of common frameworks for collaborativeness	Policies, Dissemination, and Exploitation	- Analysis to elaborate guidelines for collaborative working methods implantation - Networking to facilitate exchange of experience and technology transfer - Development of workshops and congresses in cooperation with associations and initiatives related to e-collaboration to facilitate the exchange of ideas and models regarding collaboration in rural environments
	Living Labs methodology: Rural Living Labs	- Exploring the applications of the open collaborative platform to be developed
	Technical activities	- Influence on standardisation bodies - Open collaborative architecture (OCA) proposal
Heterogeneity: policies, culture aspects, working methodologies	Policies, Dissemination, and Exploitation	- Elaboration on recommendations for reforms establishing common policies on a pan-European scale to support the implantation of collaborative platforms in rural sectors
	Living Labs methodology: Rural Living Labs	- Some RLL will serve to analyse specific barriers and restrictions preventing collaborativeness due to the existence of different regulations - Promotion of joint initiatives between regions belonging to different countries to show the advantages of the use of the Collaborative Platform
	Technical activities	- To provide collaborative environments enabling the creation of virtual communities, not depending on the country, language, particular national regulations, etc.

C@R Conclussions (Architecture)

- One of the key objectives of C@R is the development of a reference architecture reflecting advantageous concepts that overcome a variety of challenges and pain points typical for rural CWEs. Deriving common characteristics of such an architecture turned out to be difficult due to the limited capabilities of end users to reflect on technical needs and due to the differences in target sectors of the 7 Living Labs involved.
- Nevertheless C@R found out overlaps between architectural needs if not between all Living Labs at least between some of them. These overlaps have been translated into several principles (decoupling, open standard compliancy, flexible infrastructure support, service orchestration, interoperability etc.) that drove the architectural design and the flavored implementations in the individual Living Labs.
- The common principles of the reference architecture have been realized exemplary and subsequently validated in terms of added value. Such common principles include the usage of most important standards (e.g. web services, BEPL), component representation (e.g. BPMN), tools (e.g. Intalio Designer), reusable, encapsulated functionality (OC services, CCSs), security models (e.g. AAS) or service brokerage (e.g. BUS). Besides commonalities the flavored implementations in the different Living Labs also showed distinctive differences that reflect the local specifics, e.g. the usage of the sub domain concept in Cudillero (fishing boats) or the limited usage of the BUS in Sekhukhune due to network impediments.
- The full potential of architectural benefits couldn't be leveraged during the lifetime of the project. Nevertheless the validation of architecture implementations in distinctive experiments provided promising results: In particular the C@R reference architecture is capable to facilitate the reuse of collaboration services, concepts and components across design and runtime environments of different CWEs.
- The required degree of flexibility to develop and operate software collaboration tools has been assured through the usage of the most relevant standards in the fields associated to services. Openness and interoperation of CCS components for SCT orchestration coming from different platforms has been showcased. The performance of SCTs using the base components of the architecture is satisfactory and cost and effort required to develop software collaboration tools are competitive.

C@R: Overview and main achievements

- CWE common platform has been designed, deployed and evaluated across Living labs.
- Its results have been promoted through OCA WG, and several dissemination channels. Most of the deliverables are public and available at C@R Website
- LL methodology framework, best practices and lessons learned have been developed, implemented and also promoted through ENoLL and several publications
- Clear evidence about the value and impacts created by C@R living labs who are already functioning as part of the rural innovation infrastructure
- Clear influence on policies in EU regions and at the national level in several countries and dissemination at global level. Convergence process is being promoted through SSRI concept
- Heterogeneous communities exploiting C@R results have been created to be involved in future research projects (more than 22 projects).