SMART RURAL AREAS AS AN EXAMPLE OF SMART ECOSYSTEMS
THE PROJECT “DIGITAL VILAGES”

Together with two test regions in Rhineland-Palatinate – the municipality of Betzdorf in Altenkirchen County as well as the municipalities of Eisenberg and Göllheim in Donnersberg County – Fraunhofer IESE will perform research in the next two years and work on solutions for combining the potential that exists primarily in the areas of mobility and logistics with smart technology in a way that is profitable for all stakeholders.

To realize these goals, existing systems must interact and be aligned with each other:

- When regional retail businesses get together and, with the help of mobile citizens, are able to deliver food and goods on the day of the order,
- when elderly people and disabled people receive support from their fellow citizens to go shopping, visit the doctor, or do their daily tasks,
- when commuters can take along and deliver packages without noticeable extra effort on their daily routes to work or on the way home,

It becomes clear that a small miracle is happening unseen: Software helps to create a network among mobility and logistics systems; services from different areas are combined and add great value for everyone involved. The complex aggregation and integration of a wide variety of systems is the subject of research at Fraunhofer IESE, under the term “Smart Ecosystems”.

The test regions now provide the real basis for evaluating and testing visions and ideas.

Duration: 2015 - 2017
Funded by: Ministry of the Interior, for Sport and Infrastructure of the State of Rhineland-Palatinate
Partners: Municipality of Betzdorf, Municipalities of Eisenberg and Göllheim, Rhineland-Palatinate Development Agency
Further information: www.digitale-doerfer.de
In Rhineland-Palatinate, 50% of the population live in communities with fewer than 7000 inhabitants.

In the context of its research program “Smart Rural Areas”, Fraunhofer IESE has therefore teamed up with the Ministry of the Interior, for Sport and Infrastructure of the State of Rhineland-Palatinate and the Rhineland-Palatinate Development Agency to launch the project “Digital Villages”. In close collaboration with citizens and companies, ideas are being studied and actual solutions are being implemented in two test regions. The (software-)technical implementation is done by Fraunhofer IESE in the context of so-called “Smart Ecosystems”. This means that the next generation of software systems is already coming to rural regions today to make them fit for the future.

JOINING FORCES

In comparison to cities, large areas must be covered in rural regions to supply services to a comparatively small number of people. This can be seen in all areas of life: in medical care, in mobility, in logistics, or in local supply. The approaches proposed for Smart Cities can therefore not simply be used as is. This is where digitalization comes into play: It is expected to create cost-efficient, individual, and very flexible alternatives to the mass supply found in the cities.

Let’s take local public transportation: In rural areas, acceptable services can only be maintained with great effort. The situation is similar in logistics, where package delivery to rural areas leads to very high costs per package, which in reality are unfeasible. In the long term, it will no longer be possible to fund all these individual silos by themselves. The answer lies in intersectoral services offering cross-domain solutions.
And if the benefit is only this big, we will take part!

Adolf Kauth, Mayor of Eisenberg
IT’S THE NUMBERS THAT COUNT

From journey planners to the reservation of means of transport, software interfaces and Cloud-based services continue to build ever more bridges between a great variety of domains. This makes it possible, for instance, to adapt package deliveries to the timetables and routes of local public transportation systems. And new ecosystems and business models emerge that work across company or industry boundaries. Companies that still hesitate today to join this digital transformation increasingly run the risk of being left behind economically when the markets change ever more strongly in the future.

However, interfaces alone are not enough – existing systems that have sometimes evolved over the course of decades do not lose their inflexibility so easily and have a hard time competing with much more flexible solutions. This is where innovation is needed: Carpool services and citizen logistics services are already showing today how existing services can be re-thought. In the context of the project “Digital Villages”, for example, new systems are being developed that will offer people and packages shared rides on individual routes instead of having large, almost empty buses circle on fixed routes and sending delivery vehicles including drivers to small villages to drop off merely a handful of packages. This granularity enables flexible adaptation to customer needs in real time. This is a crucial cost advantage and makes such solutions feasible in rural areas despite the low population density.

THE POWER OF SMALL THINGS

Composing complex tasks flexibly from many small parts instead of developing large and inflexible monolithic systems is one of the great opportunities. However, this is not only restricted to the people in the crowd. Under the keyword “Internet of Things”, even the tiniest devices, sensors, and everyday objects are given more and more intelligence and become part of a network. One example of this in the context of the project “Digital Villages” is the development of a “Smart Bag”. A simple bag gets its own software intelligence and is connected with other things and the Internet. This allows the bag to do such things as automatically detecting packages that are placed into it and informing its owner via smartphone about all the necessary information, such as recipient and deliv-
SMART ECOSYSTEMS – MORE THAN THE SUM OF THE PARTS

This trend towards seamless integration can be found in all domains – from Industry 4.0 to Smart Farming. Networks are created that encompass more and more people and things and form a self-organizing system, which in its combination can offer a seemingly endless range of services. When such a web of things, systems, and services replaces simple interfaces, “Smart Ecosystems” are born. And the heavyweight special systems developed top-down are replaced by a flexible network of many different elements that can dynamically adapt to the requirements of the customers and of the market.

For a long time, such a web of things and services appeared to be too complex to master it with guaranteeable qualities. Smart Ecosystems now provide the necessary technology for resolving the conflict between high flexibility and guaranteeable quality. Simulation processes that are unique worldwide allow efficient development of even the most complex ecosystems. Modern architectures allow flexible networking among devices, things, people, and services across company and industry boundaries. Award-winning data usage control processes allow data to be used intensively without the need to jeopardize privacy. And a unique “system police” continuously monitors the ecosystem in order to be able to ensure its safety and reliability at all times. With these and many other unrivaled innovations of Fraunhofer IESE, the land of the future is being created in the “Digital Villages”. “Smart Ecosystems” are the basis of the new generation of systems that will lead our society to a form of digitalization that we can rely on. Safely and securely.

Mario Trapp
SMART ECOSYSTEMS
Fraunhofer Institute for Experimental Software Engineering IESE

Software is a part of our lives. Embedded into everyday equipment, into living and working environments or modern means of transportation, countless processors and controllers make our lives simpler, safer, and more pleasant. We help organizations to develop software systems that are dependable in every aspect, and empirically validate the necessary processes, methods, and techniques, emphasizing engineering-style principles such as measurability and transparency.

Fraunhofer IESE in Kaiserslautern is one of the worldwide leading research institutes in the area of software and systems engineering methods. A major portion of the products offered by its customers is defined by software. These products range from automotive and transportation systems via automation and plant engineering, energy management, information systems, and health care to software systems for the public sector. The institute’s software and systems engineering approaches are scalable, which makes Fraunhofer IESE a competent technology partner for organizations of any size from small companies to major corporations.

Under the leadership of Prof. Peter Liggesmeyer and Prof. Dieter Rombach, the contributions of Fraunhofer IESE have been a major boost to the emerging IT hub Kaiserslautern for twenty years now. In the Fraunhofer Information and Communication Technology Group, the institute is cooperating with other Fraunhofer institutes to develop trend-setting key technologies for the future.

Fraunhofer IESE is one of 68 institutes and research units of the Fraunhofer-Gesellschaft. Together they have a major impact on shaping applied research in Europe and contribute to Germany’s competitiveness in international markets.