

With ARTEMIS and the European Commission both devoting efforts to building smart cities, **Horizon 2020 Projects** speaks to the Arrowhead project on implementing collaborative automation technology

Targeting smart cities

Given the challenges facing the urban environment in Europe today (from energy provision, service delivery and transport networks), policy makers are looking to innovative technologies as a means of making European cities more efficient and liveable. As such, the smart cities concept continues to gain traction. By developing innovative solutions, it is hoped that air quality can be improved, road congestion reduced and the consumption of energy lowered.

The European Commission is looking to advance the subject under the European Innovation Platform of Smart Cities and Communities (EIP-SCC) – recently launching a strategic implementation plan. The plan, implemented from January as part of Horizon 2020, includes a focus on sustainable urban mobility, sustainable districts and the built environment, and integrated infrastructures and processes across energy, ICT and transport.

Receiving funding as an ARTEMIS Innovation Pilot Project, ARROWHEAD also aims to contribute to overcoming these societal challenges that cities face. Launched during March 2013 for a duration of four years, it seeks to enable collaborative automation for five application verticals, namely production (manufacturing, process, energy), smart buildings and infrastructures, electromobility and virtual market of energy.

What are the ambitions of the Arrowhead project and its progress so far?

The vision is to enable collaborative automation to help overcome societal challenges, including the use of energy and environmental issues, e.g. carbon dioxide gases and sustaining water supply, etc. We are going to demonstrate progress in that direction and to fulfil this big vision we need to overcome two challenges.

There are two disparate systems today – water and electricity, and we have no clue how they can talk to each other from a technology point of view. How to enable different systems to interact, and by that, create this collaborative automation, that's a grand challenge.

To what extent do you see there being significant competition from the United States and Asia?

Europe is already leading continents regarding automation, I think we can state with confidence, and this project is further supporting development of that leadership. Another angle is that being as big as we are, we have 78 partners, this enables an initial snowball effect in development. We expect to create momentum so we can say that Europe is taking the lead. We can already see examples of that, since we have already been contacted by organisations and initiatives in the United

States and Australia on these types of technologies. There is not yet any clear communication with Asia, but I expect that when we start communicating and there is research coming from Arrowhead, we will see more correspondence.

How important do you view standards for pushing forward and implementing the smart cities concept?

You can think of standards as those that written down and voted for, and those that actually become *de facto*. Already there are many standards related to water distribution, electricity distribution, etc.; all these standards are individual. This is one of the big hurdles – the market saying we want you to use this particular standard. So one of the issues Arrowhead is addressing is how to integrate with legacy systems. This is an extremely important aspect of creating something that is cross-domain interoperable.

This is part of our efforts and some of the technologies we are addressing are already standardised. Instead of, say, 300 different standards for automation in cities, we need to decrease this to five or ten and then we need to create the capabilities of going inbetween. We need the systems to be able to automatically recognise that we all speak different languages and then translate the communication regardless of if someone is talking XMPP or KAWA/COWA, for example; these are just some of the protocols that are around.

How much interest have European cities expressed in your work so far?

There are two cities that are members of the project at present. We are looking at issues that cities have responsibilities for, e.g. streetlights. Cities are very open and they are owners of big buildings; they face the costs of ownership and energy costs.



A city is an interesting concept... what is a city? Groups of houses, yes, but there's also a governance, politicians, residents, companies producing things there, and there is also subsystems for distribution – water, electricity, sewage systems, etc. There are so many stakeholders that it's hard to say when the city is saying 'yes, we want to participate'.

One of the things that we are addressing in the demonstrations is what a city could be like. If you take my city of Luleå in Sweden, there are many tunnels, a transport infrastructure, electricity and water supply, sewage pumping – there is not just one company running all that. There is a multitude of stakeholders and suppliers doing specific tasks which can be described as a mini micro-city structure. Part of the project is addressing these different stakeholders and how they can exchange information in a simple way.

If you consider the stakeholders at the conference today, they have a production system, a planning system, etc., and you can be sure they don't have the same system and they all configure differently. How do you bring the information between all these stakeholders? Some are buying, some are delivering, and how can we start to say yes this is a well-functioning society working together.

How conceivable is the project that it could be scaled down so smaller urban areas across Europe could deploy this technology and reap similar benefits?

The intention is that there should be no limits. We are looking for interoperability among almost any device providing service (though there is probably going to be a scale – there are things which we don't know). If you take the standard system of how you build automation systems today, the largest ones include around 100,000 measuring activation points. There does seem to be some type of limit on current technology on how the systems can be built, meaning you can handle a small city, but not a big city. However, many of those limits are taken away with the approach that Arrowhead is developing, based on the service-orientated architecture.

I can't answer how big can we go, but certainly we can start from the smaller ones and go bigger, that's for sure. What's the upward limit? There will be a limit for different places, for example, how big a system you can actually manage. Big data is one thing, but what happens if you have ten million units or devices providing 50 million services, how do you manage them 24/7? Many of these systems should run 24/7, 365.

We hope to initiate a way of thinking where as many possible stakeholders say 'ok, this sounds like a good idea', and we then create the *de facto* way of thinking when developing large automation systems.

HORIZON 2020

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