



Let's build a smarter planet

# The University of Bari fosters innovation in the cloud

*Building a service-oriented cloud architecture on IBM System z and Linux*

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## Smart is...

### *Bringing Cloud-based IT support into the local community*

The University of Bari is strongly committed to developing cloud-based solutions for communities and businesses in southern Italy. The University needed a platform to facilitate cost-effective, flexible application development. The University leveraged the IBM® System z® Solution Edition for Cloud Computing—a virtualized infrastructure that uses IBM System z, IBM System Storage®, SUSE Linux® Enterprise Server for IBM System z and IBM Tivoli® Service Automation Manager to enable intelligent management of Linux virtual machines.

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The University of Bari is one of southern Italy's premier educational institutions, with 12 faculties offering degrees in a wide range of subjects. Established in 1925, the University has nearly 70,000 students and more than 1,800 teaching staff at its main campuses in Bari, Brindisi and Taranto.

The University is a member of DAISY-net, a consortium of public universities and information and communication technology (ICT) companies in the Puglia region of southern Italy. DAISY-net aims to carry out research and development and provide technology transfer and training to support economic and industrial growth within the region. As part of this mission, DAISY-net wanted to create a highly secure, scalable and flexible architecture for application development and deployment.

## Harnessing cloud computing

The University of Bari decided to host the infrastructure for this new architecture, and became interested in the possibility of creating a cloud computing infrastructure. This would provide very rapid and simple provisioning and management of new development, test and production environments, and enable each environment to scale up or down to meet demand. This level of flexibility would encourage students and other developers to concentrate on application innovation, instead of worrying about infrastructure-related issues.

As the basis for the new cloud infrastructure, the University selected the IBM System z Solution Edition for Cloud Computing. This comprises an IBM System z9® Business Class server with three Integrated Facility for Linux (IFL) processors that can support hundreds of Novell SUSE Linux Enterprise Server virtual machines. Storage is provided by IBM System Storage DS6800 disk systems. The Linux for System z architecture is controlled by IBM Tivoli Service Automation Manager, which automates the key processes around the request, deployment, monitoring and management of standardized virtual server images.





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### Business benefits

- Accelerates the sale and delivery of wine, fish and other cargo to end-customers.
  - Provides real-time information from RFID sensors on variables such as temperature, humidity and whether cargos have been subjected to any shocks or stresses.
  - Integrates sensor, market and GPS data with mainframe systems at the university, private sector and government regulatory agencies.
  - Virtualizes the University Laboratory for students.
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### Creating the cloud platform

Working with teams from IBM Italy and MAUDEN, an IBM Business Partner, the university installed the System z platform and began providing members of DAISY-net with access to core resources such as IBM WebSphere® Process Server and IBM DB2®, which both run in an IBM z/OS® partition. By leveraging a Linux for System z cloud on top of these core platforms, these developers were quickly able to create a wide range of innovative solutions, using service-oriented architecture (SOA) principles to enable rapid development of composite applications by orchestrating existing services and components.

### Bringing ICT into new industries

Most of the development projects focus on exploring new ways of helping communities and small businesses in the Puglia region—especially in areas and industries where ICT has not traditionally penetrated, such as fishing, wine production and local transportation.

The solution that one of the DAISY-net development teams has created for the fishing industry is particularly interesting. It provides a touch-screen solution that fisherman can install in their boats and use to report the size and species of the fish they catch. This information is then automatically shared with potential customers such as local markets, shops and restaurants, who can compete in a live auction while the fishing boat is still out at sea. When the fish has been purchased, the solution shows which customers have bought which fish, so that the fisherman can package it for delivery on the way back to the harbor. As a result, the fishermen obtain the best price for their catch, and customers get the freshest possible fish.

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## Smarter education

## Bringing Cloud-based IT support into the local community

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### Instrumented

Captures humidity, temperature, soil and traffic conditions through a specialized appliance via RFID devices deployed in the appropriate location.



### Interconnected

Integrates sensor, market and GPS data with mainframe systems at the university, private sector and government regulatory agencies.



### Intelligent

Provides real-time status of transportation logistics and market demand for particular fish and wine products. GPS geo-localization allows transportation companies to make adjustments for routes and deliveries, while fishing companies can begin product auctions while fish are being caught. Winemakers are also able to understand market demand for products, while also being able to ensure environmental quality by monitoring soil isotopes.



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## Solution components:

### Servers

- IBM System z®
- IBM System Storage® DS6800

### Software

- IBM DB2® for z/OS®
- IBM Tivoli® Service Automation Manager
- IBM WebSphere® Process Server
- IBM z/OS
- IBM z/VM®
- Novell SUSE Linux® Enterprise Server

### IBM Business Partner

- MAUDEN
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*“The IBM System z Solution Edition for Cloud Computing eliminates the trouble and expense of buying and managing new infrastructure, making the development of small-scale solutions much more viable. Moreover, as demand for a solution increases, the cloud can simply allocate more resources, so there is no problem with scalability.”*

—Professor Visaggio, full professor of Software Engineering at the University of Bari

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A second DAISY-net application supports local vineyards by providing constant monitoring of soil conditions, which helps to improve the quality of the product. Data from the soil monitors is automatically transmitted to the central application, which runs centrally on the IBM System z server. Isotopic soil monitoring enables wines to be categorized by isotopic characteristics, which determine grape color and taste. The monitoring equipment also provides information about the grapes' origin for an academic research project.

Another solution is already being used in production by a local transport and logistics company. Sensors installed in each of the company's trucks send data to a central monitoring application that runs in the System z cloud. The sensors provide real-time information on variables such as the temperature, humidity and whether the cargo has been subjected to any shocks or stresses. It can also monitor the route taken by the truck. This allows the company to ensure that even the most sensitive cargo can be delivered quickly and in excellent condition.

The University is planning to adapt this solution for other uses—for example, environmental monitoring within data centers. Because the application has been developed in a service-oriented way, it will be relatively easy to reuse its components in other solutions.

The use of such a real-time flexible environment helps make industries in the Puglia region of southern Italy more competitive in local, national and global markets. More solutions like this are planned.

The latest project is the virtualization of the University of Bari's Computer Science labs, which allows students to use educational platforms as services. Students of each course use whatever platform is specified by their teacher, so it is possible to use different platforms in the same laboratory. Moreover, students can access their platform even when they are not in the lab. The use of cloud computing allows teachers to change platforms without changing the underlying infrastructure. Therefore, Cloud Computing allows the continuous improvement of laboratory infrastructure while minimizing the costs.

## Making small-scale solutions viable

The biggest advantage of developing these applications on the System z cloud platform is that it is easy to start small, with trial implementations for just a few users, and very quickly scale up as the technology is adopted more widely.

“In a traditional ICT model, the idea of creating a solution for a small group of fishermen or a local transport company would probably never get off the ground because the initial infrastructure costs would be too high,” explains Professor Visaggio, full professor of Software Engineering at the University of Bari. “The IBM System z Solution Edition for Cloud Computing eliminates the trouble and expense of buying and managing new infrastructure, making the development of small-scale solutions much more viable. Moreover, as demand for a solution increases, the cloud can simply allocate more resources, so there is no problem with scalability.”

“Working with IBM and MAUDEN to create this new cloud infrastructure has already made a huge difference to businesses and communities in southern Italy, and will continue to provide an agile, flexible platform that helps our brightest students and ICT professionals collaborate and express their most innovative ideas.”

### For more information

To learn more about the IBM System z Solution Edition for Cloud Computing, please contact your IBM marketing representative or IBM Business Partner, or visit the following website:

[ibm.com/systems/z/solutions/editions/cloud/](http://ibm.com/systems/z/solutions/editions/cloud/)



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