

## Valencia speeds healthcare with connected imaging solution



**Valencia’s Conselleria de Sanitat, a Spanish regional health authority, has pioneered connected imaging over a Cisco Medical-Grade Network**

### Business Challenge

The Health Ministry for the region of Valencia, on Spain’s Mediterranean coast, runs a busy healthcare system serving five million people. It embraces 22 health departments, 27 general hospitals, 25 specialist units and 900 primary care centres. Between 2005 and 2008, the health authority will spend €45 million on a complete modernisation of its information systems. The aims range from increasing backbone capacity to providing higher bandwidth in some centres and connecting others and improved Internet security.

Alfonso Jimenez, Managing Director, Healthcare Services at the Valencia Health Agency, explains: “Working with C2C and Cisco, our system integration programme is creating a hub for all the information systems within the region, creating the foundation for a new generation of services that are harnessing technology to deliver real benefits to patients and to those that treat them.”

The foundation for this wide-ranging transformation, integrating hospital care with primary, outpatient and emergency services, and also with central services and public health, is a high-speed, Cisco network known as ARTERIAS. Launched in 1986 to provide basic IP networking services, the network has evolved into what Cisco terms a Cisco Medical-Grade Network – a converged, IP-based foundation designed to provide the scalable, reliable, secure and high-performance infrastructure needed to deliver ‘connected health’ across the entire healthcare community.

Connected health places the hospital environment within the extended ecosystem of care – from primary care facilities to the pharmacy and outpatient treatments. It is a vision that enables the sharing of timely, accurate information among the right people at the right time – regardless of the source. In doing so, it holds the promise of significant improvements in patient experiences and provider efficiency and effectiveness.

### Executive Summary

#### Customer Name

Valencia Health Ministry

#### Industry

Healthcare

#### Location

Spain

#### Number of Employees

50,000

#### Business Challenge

- Provide wide-area access to radiological and other specialised medical imaging types
- Create electronic patient records (EPR) with access to diagnostic images and medical history
- Ensure conformity with EU regulatory requirements on patient confidentiality

#### Connected Imaging Solution:

- ARTERIAS – an end-to-end network covering entire Valencia healthcare region, using the Cisco Medical-Grade Network (MGN) framework
- High-speed links between local clinics and reference hospitals with image repository
- Innovative imaging platform combining radiology with other diagnostic modalities

#### Business Results:

- Expanded clinical services by extension of digital imaging services
- Enable location-independent image access for authorised users
- Waiting lists cut by easing radiology bottlenecks in public hospitals
- Forecast cost saving of €1 million on departmental imaging license fees
- Secure image access without additional expense for dedicated security product
- Elimination of film costs with digital integration of analogue modalities
- Access to patient images independent of PACS system vendor

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Managing Director, Healthcare Services  
Valencia Health Agency

Among many innovative projects attached to its overall strategic plan (called SISAN), the health authority wished to create a new type of electronic patient record (EPR). These would give physicians an up-to-date clinical history, including treatments and medication, coupled with diagnostic imaging from a wide range of medical specialties including – critically – radiology. The aim was to create a connected imaging solution by making EPRs available to authorised users, not just in hospitals or the specialist units where the images are stored, but also to doctors in local clinics or practices with an ordinary PC with a broadband connection.

One aim was better patient care. By making the new EPRs widely available, the need for repeat hospital visits would be reduced, while outside physicians would have a much clearer picture of the patient's condition. Shortening waiting lists would ease radiology bottlenecks by reducing demand for imaging facilities. Collaboration would also improve diagnoses as groups of specialists viewed images simultaneously from multiple locations.



Another was to reduce costs. Valencia wished to eliminate dedicated networks for reading DICOM images, which are expensive to install and maintain; to realise further network cost savings by integrating other, non-DICOM medical imaging modalities into the DICOM system, and cutting out license payments; and achieve clear productivity gains by storing all medical images, with easier and more efficient access, on their Picture Archive and Communication Systems (PACS).

### Network Solution

In the radiological world, one of the great obstacles to widening the availability of digital images has been the limitations of the DICOM protocol used to communicate between the imaging modality and the PACS. With five PACS vendors represented in Valencia, each with its own system, the first challenge was to create a single DICOM gateway capable of handling them all. The second was to find a common storage solution for all images – DICOM or non-DICOM, stills or video – with a built-in means to transfer analogue images into the same format for storage and access. The third challenge was to overcome the high sensitivity of the protocol to latency in a Wide Area Network (WAN).

Cisco Systems worked closely with SINAPSIS, the information systems division of the Valencia Health Agency, and a Spanish developer, C2C, on facilitating the integration of C2C's MIO integration software platform over the upgraded regional network. MIO was initially developed as a common DICOM gateway, compatible with any standard

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Jaume Devesa  
CIO, Healthcare Services  
Valencia Health Agency

PACS or Radiology Information System (RIS). It was enhanced to integrate with any imaging modality from other specialties into the DICOM based PACS environment. These included Anatomopathology, Traumatology, Cardiology, Dermatology, Digestive, Gynaecology, Ophthalmology, Otorrhinolaryngology, Pneumology, Urology, and technical imaging procedures used in more than one specialty, such as endoscopy.

One major issue before integration could go ahead was to ensure that Valencia's WAN had enough bandwidth to allow the stable, secure transmission of images. The imaging project was an early priority, so the network requirements of the MIO integration software were a significant factor in determining capacities. Images have high bandwidth requirements, and the sensitivity of DICOM to latency means the protocol easily times out and images may have to be resent automatically three or four times before arriving intact.

A second vital area was security. The Cisco networking framework provides a secure environment – on a proactive rather than a reactive basis – and the ARTERIAS network uses the firewall features of Cisco IOS within the routers to provide secure access across the network and to the Internet. To ensure full compliance with European Union regulatory mandates on data protection in its expanded use of imaging, a further simple but ingenious policy was instituted. Unencrypted images are transmitted separately from any contextual data, which travels through a secure socket tunnel over the Valencia network, until they are reunited only at the point of use. This solution is deemed to satisfy regulatory requirements in full.

Once all parties had verified that network speeds were sufficient, and the security was fully effective, the MIO integration could go ahead. It was a major task. Each of the 27 hospitals had its own PACS platform, variously using products from GE, Agfa, Kodak, Philips and local vendor IRE; each had to be double-checked for smooth operation over the MIO platform. By September 2006, 20 of Valencia's hospitals had successfully completed their individual MIO integrations – with an impressively broad array of devices and imaging modalities already operating successfully over the new platform.

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Miguel Chavarria Díaz  
CIO, Radiology Healthcare Services  
Valencia Health Agency

## **Business Results**

All 900 local clinics on the Valencia network are able to connect with the 20 hospitals in the Valencia network so far enabled for MIO. The connectivity allows quicker, easier access to clinical information. Access to EPRs – including all reports and images – improves the accuracy and speed of diagnosis and the evaluation of treatment options. Similarly, ease of image access enables rapid historic comparisons between current images and older ones in order to gauge the impact of treatment to date.

At the same time, image transfers between primary care and specialist hospitals are improving clinical workflow and enhancing the quality of patient care. Emergency teleneurology examinations can be made at a general hospital to decide whether a patient needs transferring to a specialist unit, for instance. The images are accessed by the specialist unit on the network and evaluated by its experts, reducing the time patients spend at the unit and cutting out needless patient travel between sites. “Image transfers between primary care and specialist hospitals are bringing improvements in clinical workflow and enhancing the quality of patient care,” says Miguel Chavarria Díaz, CIO of the Valencia Health Agency.

Valencia is using the Cisco network to develop several other telemedicine programmes taking advantage of MIO. In the telestroke programme, lives are saved because time is of the essence with stroke-sufferers, as rapid image transfers save vital minutes in mobilising treatment. Other projects based on the successful integration of MIO and the Cisco Medical-Grade Network include electro-cardiology, for effective care management to control ischaemic risk; a telemammography programme to store and analyse 30,000 mammograms collected at screening centres throughout the region; and tele-dermatology, where it is improving communication between primary care and specialist.

In one case, more than 90 percent of dermatology patients received a definitive diagnosis while still in primary care, thus reducing waiting lists and avoiding the need for most patients to visit the skin clinic.

In radiology, patients could be shifted to a private hospital for X-Ray examinations to clear a bottleneck at one of Valencia's public hospitals. Using a PACS-to-PACS integration implemented by MIO as middleware, a daily worklist and schedule was accessed daily by the private clinic. The results were swiftly turned around for storage and use on the public hospital's PACS. Hospital clinicians thus knew exactly which examinations had been performed, immediately, and received reports much sooner than by physical means, optimising preoperative examinations and reducing patient waiting lists.

Another example of improved clinical workflow is the use of the network to obtain paediatric second opinions and schedule outpatient appointments. The programme enables a smaller number of radiologists and paediatricians to carry out the same work, as images are transmitted from community hospitals to the general hospital over the network for a second opinion and, if necessary, schedule an appointment.

The range of imaging modalities and devices integrated with the MIO platform is already too long to list in full. It includes not only radiology, but all the specialised medical colour imaging modalities. Although the five PACS types each use their own DICOM system, they can now work to a common standard. Devices that have been successfully integrated with the platform include microscopes, ultrasound machines, digital cameras, endoscopy cameras, echocardiographs and others. In ophthalmology, at least 15 device types from four vendors are part of the system. In surgery, equipment in the operating rooms is able to display relevant images to help surgeons in real time.

On the cost front, the replacement of some specialist departmental imaging systems by MIO – for instance, in ophthalmology – has already brought savings. In a single hospital, €100,000 a year was saved on licensing fees and a further €20,000 on maintenance. Across the region as a whole, the savings could potentially exceed €1 million a year. Further estimated savings of €250,000 are expected from the extension of the PACS system rather than the purchase of new servers.

For Jaume Devesa, CIO, Healthcare Services at the Valencia Health Agency, the impact of a widely available ERP system promises profound benefits. “The ability to make Electronic Patient Records – including imaging data – available at the point of care is going to have a major impact on the delivery of healthcare. It will improve the quality of diagnosis and the ability to prescribe medicine more safely with better information about a particular patient. People are not yet used to working within a connected healthcare environment, but once we start to bring all information and people together, they will soon wonder how they were ever able to deliver effective healthcare without it.”

### Next Steps

Valencia’s Cisco-based MGN networking infrastructure has already enabled a wide range of benefits, since SISAN itself is much more than just a hospital solution. It is a unified system for public health in Valencia. Within the imaging sphere, 20 hospitals are using a feature of the MIO software to transfer large quantities of analogue images into a compatible digital format, so that they can also be stored on the PACS, and a further five general hospitals are expected to join the 20 already using the solution.

Networked access to unified electronic patient records over the Cisco network will become a reality after the integration of EPRs with the Valencian governments Master Patient Record, known as SIA, again using MIO technology. Also planned is a MultiPACS regional integration spanning the five systems used by the region’s hospitals. This is expected to save more than half the normal integration cost by using MIO as the DICOM gateway, and will ultimately enable all imaging types for all citizens to be stored in and accessed from a single regional PACS repository.

### Technical Implementation

Enabled by the scalable, high-performance Cisco Medical-Grade Network, connected imaging powers the acquisition, processing, and delivery of high-resolution radiology images to clinicians working collaboratively. The three main provincial nodes of the network – at Valencia, Castellón and Alicante – enjoy core bandwidth of 155Mbps. Service is extended at 34Mbps to 22 connection nodes which each cover part of the regional health authority and in turn link to local medical centers at speeds of up to 2Mbps, depending on local needs. Within hospitals, LANs enjoy backbones running at 10Gbps while others run at 1Gbps. Image viewing terminals typically connect to the network at 100Mbps.

The integration of the MIO platform was carried out using the regional government’s Rhapsody™ integration platform, operating over a Solaris platform. Rhapsody™, from Orion Health Company, offers guaranteed delivery of messages, with effective management of the resending process, traceability and auditability. It is flexible and easy to deploy, employing Java to apply a variety of functional adaptations before the actual construction phase, and has proved equally adept at handling common medical formats such as HL7 and DICOM.

### For More Information

For further information visit: [www.cisco.com/go/healthcare](http://www.cisco.com/go/healthcare)





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