The complexity of IT in a hospital

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The complexity of IT in a hospital

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Brief presentation of Clínica Girona

Clínica Girona is a private, medium size hospital in the heart of Girona, which is part of SISCAT (the public healthcare system of Catalonia)

Clínica Girona in numbers

Brief presentation of Clínica Girona

- **114** hospitalization beds distributed in **5** hospitalization floors, **9.900** hospitalizations per year
- Surgical area with **8** operating rooms, **14.800** surgical interventions per year
- Emergency area with **7** rooms, **25.200** attendees per year
- Intensive care unit with **6** beds
- Dialysis unit, **26.800** dialysis sessions per year
- Rehabilitation unit, **40.700** rehabilitation sessions
- **20** doctor's offices, **73.800** visits per year
- Computed Tomography
- Nuclear medicine unit
- **4** Magnetic Resonance machines with one vertical machine
- Laboratory
- Radiology unit with **3** CRs, orthopantomography, **3** echographs, Dental CT, mammography device, densitometry device, **46.000** radiological studies per year
- **400** professionals
- **250** doctors in our medical directory
- More than **80** years of history

Clínica Girona group

Brief presentation of Clínica Girona

Over the years, it has become the axis of a group of companies that, based on the foundational philosophy, is the majority property of the professionals who carry out their activity at the Clinic or the specific units integrated.

As IT service, we support many of the group companies. Some of his members are the following:

- Anatomia patològica i Citologia Clínica Girona
  Pathological anatomy and cytology
- Centre d'Anàlisis Clínica Girona
  Clinical analyzes
- CETIR - Clínica Girona (Medicina Nuclear)
  Nuclear medicine
- Hemodinàmica Cardíaca Clínica Girona
  Cardiac Hemodynamics
- Proves Funcionals Digestives Clínica Girona
  Digestive functional tests
- Ressonància Girona
  Magnetic resonance
- TAC Girona
  Computed Tomography
- Unitat de Diagnòstic Prenatal Clínica Girona
  Prenatal Diagnosis
- Unitat de Reproducció Humana i Diagnòstic Genètic de Clínica Girona
  Human Reproduction and Genetic Diagnosis
- Unitat de Son Clínica Girona
  Treatment of sleep problems

The future of Clínica Girona

Brief presentation of Clínica Girona

- Recently we started the construction of a new hospital
- planned transfer by the end of 2020 – beginning of 2021
- Multiplies by 3 the current surface
- Investment of more than 50 million euros
- It will be an opportunity and a challenge for the IT service

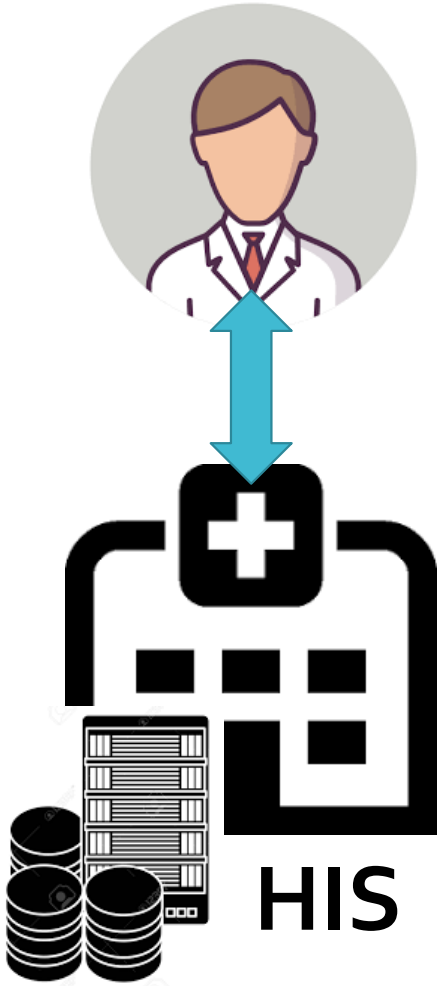
Who acts in the hospital theater?

There are many people that interact with the hospital, some of them more known than others.

Practically all these people interact with the hospital information systems in one way or another.

In this section I will explain who are these people and how interact with the information systems of the hospital.

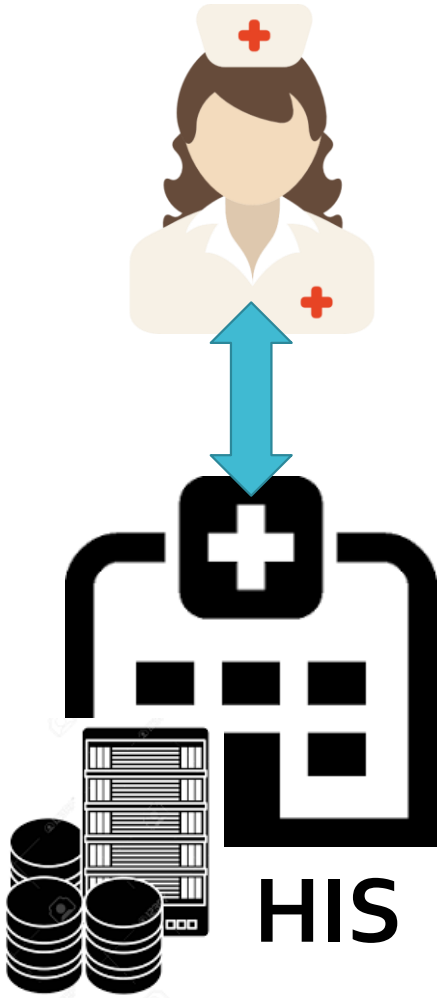
Who acts in the hospital theater?



Doctors

- Many different specialties
- Many different services (hospitalization, emergencies, dialysis…)
- Every specialty and service have their IT needs
- Very different profiles of users, and in some cases poor experience in IT
- Different types of link with the hospital (with labor contract, external, public)
- In some cases the use is sporadic and difficult the training in IT resources
- Use IT at a healthcare level and at a private level
- More than 200 doctors

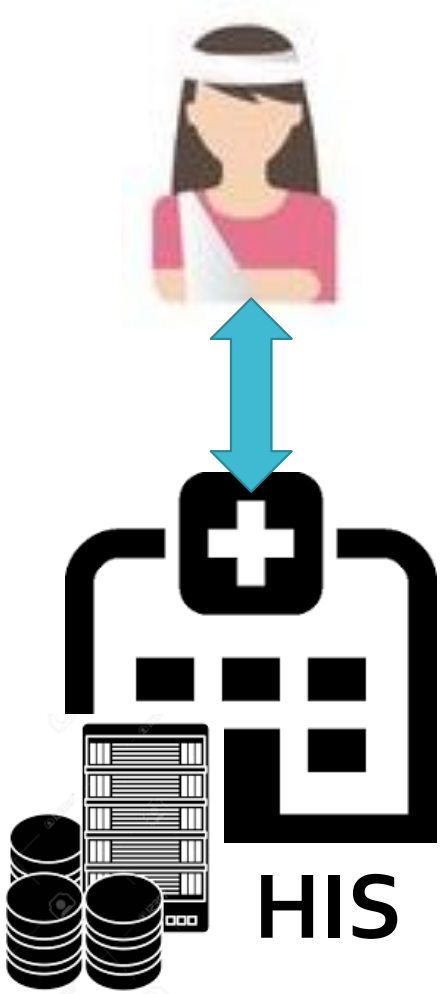
Who acts in the hospital theater?



Nurses

- Many different services (hospitalization, emergencies, dialysis…)
- Every service have their IT needs
- Very different profiles of users, and in some cases poor experience in IT
- In some cases the contracts made are for a short period of time and difficult the training in IT resources
- special schedules to cover all work shifts in all services and plants
- More than 150 nurses

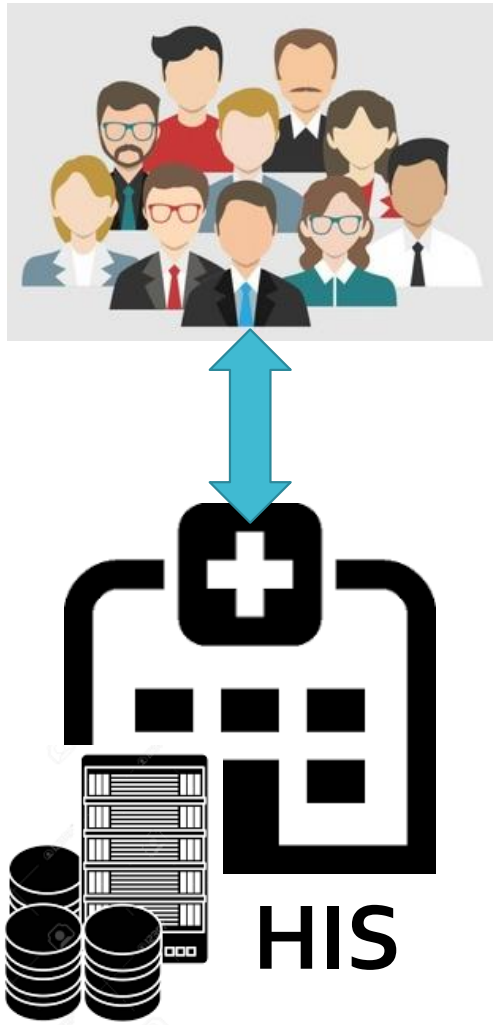
Who acts in the hospital theater?



Patients

- Many different kinds of diseases
- Patients of all ages
- Some of them have to come to the hospital very often and stay many hours
- Some require to take with him electronic devices to make studies
- They interact with the hospital in many ways, giving their data, receiving studies, reports, asking for appointments.
- Not always provide correct data (old people, disoriented) or the administrative don't understand it correctly, so we need mechanisms for correcting this data (duplicated patients in the system, wrong personal data…)
- Often the patients don't have patience

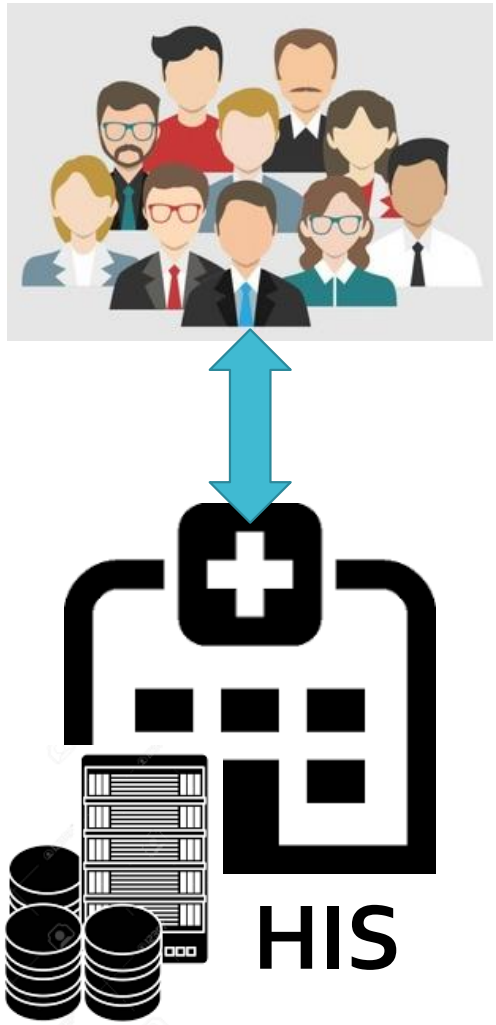
Who acts in the hospital theater?



Other Staff

- Admissions - plan hospital admissions and rooms, receive patients and formalize documentation
- Administratives - Charge expenses to patients, invoice, collect, emit proof documents, take personal information in some departments, make appointments, register other data relative to the assistance…
- Maintenance - Solves the incidents related to installations reported by the other hospital staff
- Nursing assistants - Support the tasks of the nurses and are in charge of some patient care
- IT service. Attends incidents, maintain the IT infrastructure, implements new functionalities and projects, teach employees, attends information needs…

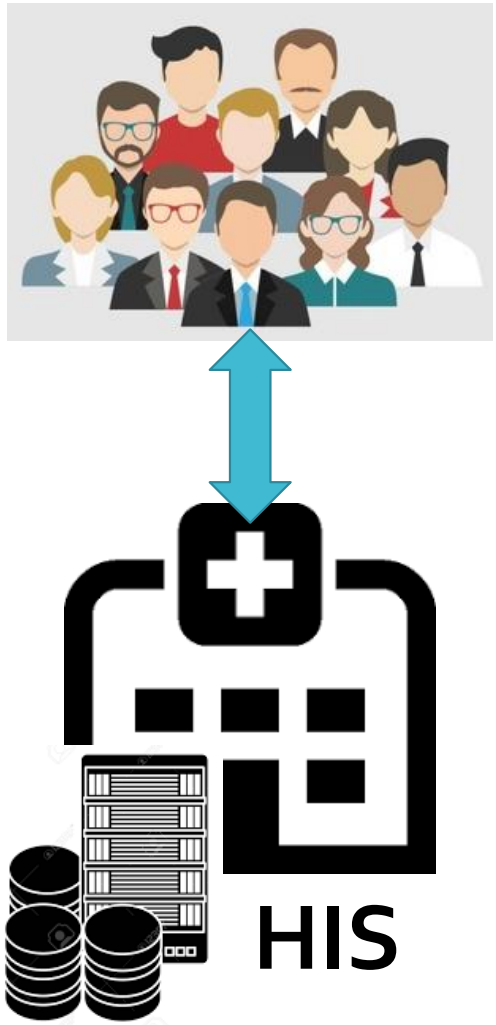
Who acts in the hospital theater?



Other Staff

- Management - Take strategy and everyday decisions, many times based on the information extracted from the information system.
- Security
- Receptionists - guide the patients, companions or visitors where they want to go
- Financial - Takes care about the financial situation of the company, pays the nominees, the suppliers, check the income transfers…
- Accountants - Maintain the accounting up to date.
- Quality and customer service staff - attends the incidences of patients, watch for the quality of the medical attention.
- Purchases and logistics - Control stocks and place orders to suppliers

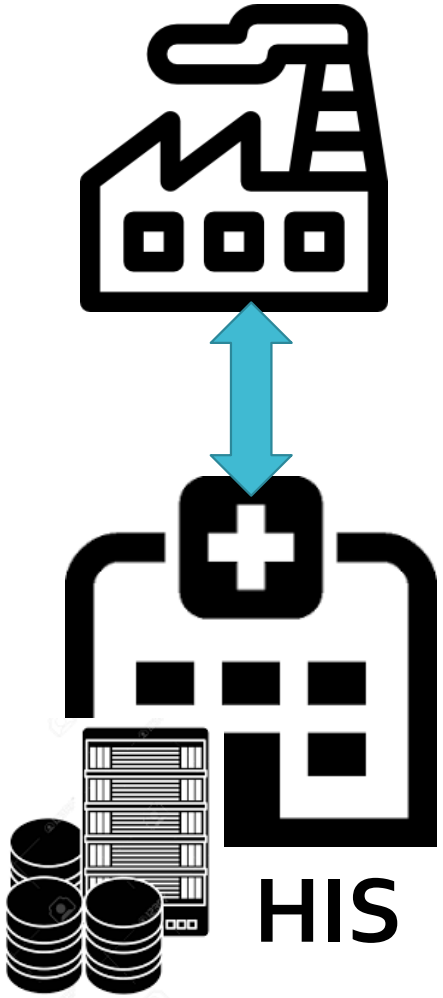
Who acts in the hospital theater?



Other Staff

- Warehouse waiters - Receive goods, store and distribute them to the services
- Pharmaceutics and pharmacy assistant - Buy, store and prepare medication for patients.
- Physiotherapists - take care about physical rehabilitation of patients
- Dieticians - design different diets for patients
- Documentalists - code diseases in standard codifications (CIE9 – CIE10)
- File staff - Manage physical documentation generated by the assistance of the patients (patient's clinical history)
- Human resources - manages contracts, payroll, casualties, CVs

Who acts in the hospital theater?

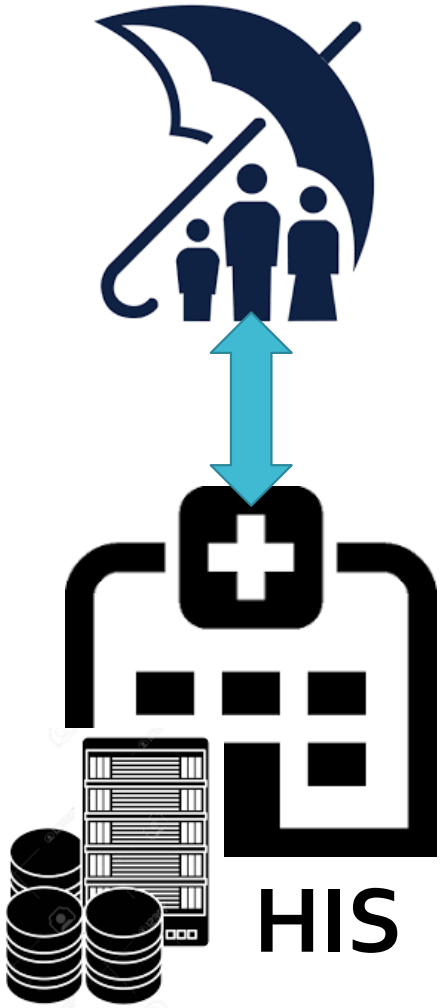


Providers

Pharmaceutics, sanitary and surgical material, equipment…

- Receive orders
- Delivers goods with delivery note
- Send invoices
- Receive payments
- EDI (electronic data interchange)

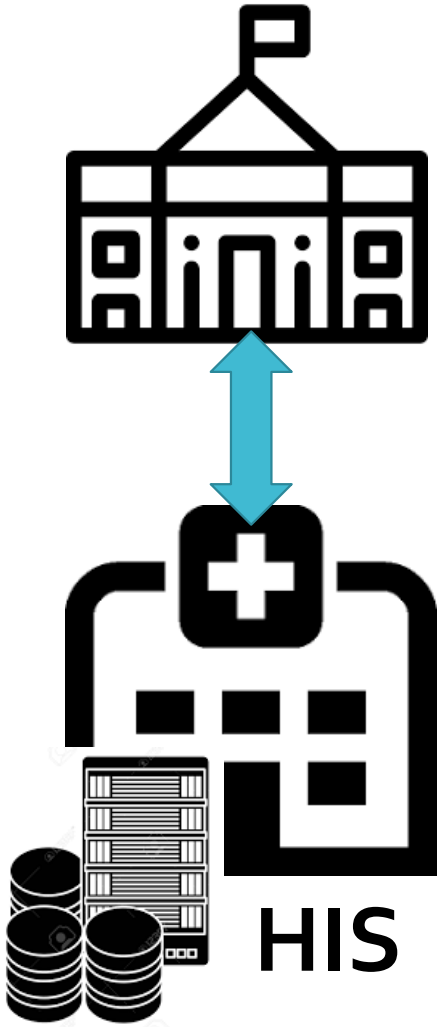
Who acts in the hospital theater?



Insurance companies

- Send authorizations
- Receive hospital invoices and other documentation to justify the costs of the assistance
- In many cases request electronic invoices
- Different channels for communication with the hospitals for registering the health activity reading insured cards (health portals like REDSA, CHIPCARD, or other owned by each insurance company).
- In the case of traffic insurance companies, there is an special portal called TIREA that requires an integration with the HIS.
- In the case of insurance companies that works for the government, you need to send the CMBD (basic minimum set of data) extracted from the HIS in an specific format.

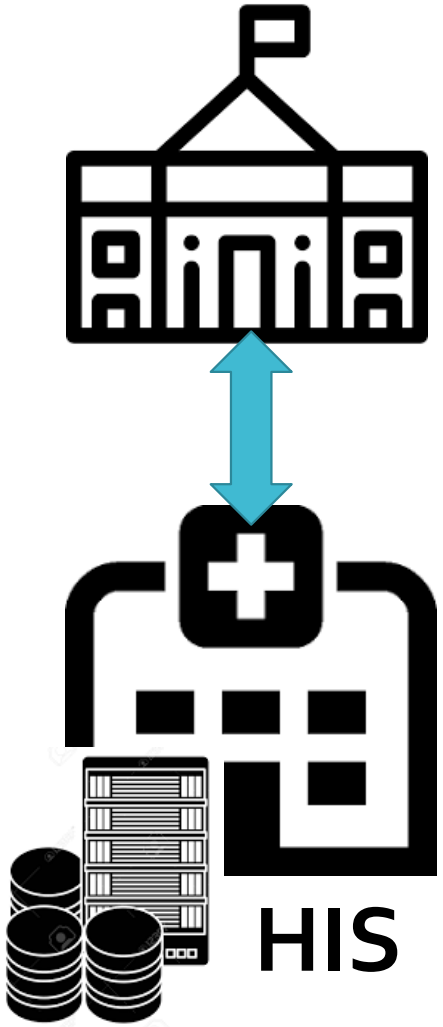
Who acts in the hospital theater?



Government

- Requires the hospitals to send the CMBD (basic minimum set of data) with a web service system, in different scopes (hospitalization, emergencies and visits).
- Requires the hospitals to add to different health IT programs/projects:
  - HC3: Shared clinical history of Catalonia
  - LES: surgical and diagnostic tests waiting lists
  - SIRE: Electronic prescription
  - WIFIS: interchange of electronic messaging between hospitals
  - Health ring - secure communication network
- Special method for billing the activity, changing conditions every year.

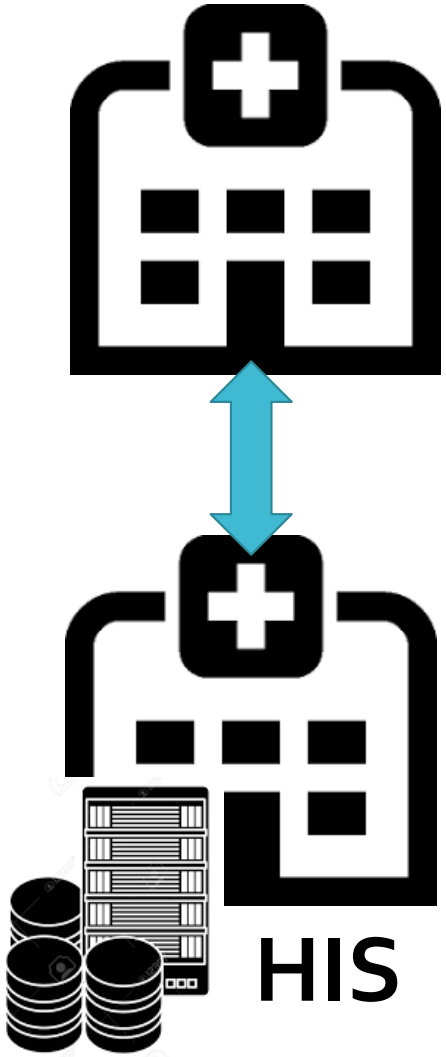
Who acts in the hospital theater?



Government

- MDO: diseases of compulsory declaration. To detect epidemics, outbreaks... as soon as possible.
- SII: Immediate provision of information. To communicate by web services the taxes of the invoices issued and received.
- LOPD/RGPD: Citizens' rights to the protection of their personal data. External audit every two years. Very sensitive data rated with the highest level of protection. You need to ensure the preservation and security of the data, as well as guarantee the rights of access, rectification, cancellation and forgetting.
- Accreditation: Every certain time you need to pass an audit from the public healthcare system of Catalunya to assure a minimum quality standards (similar to an ISO).

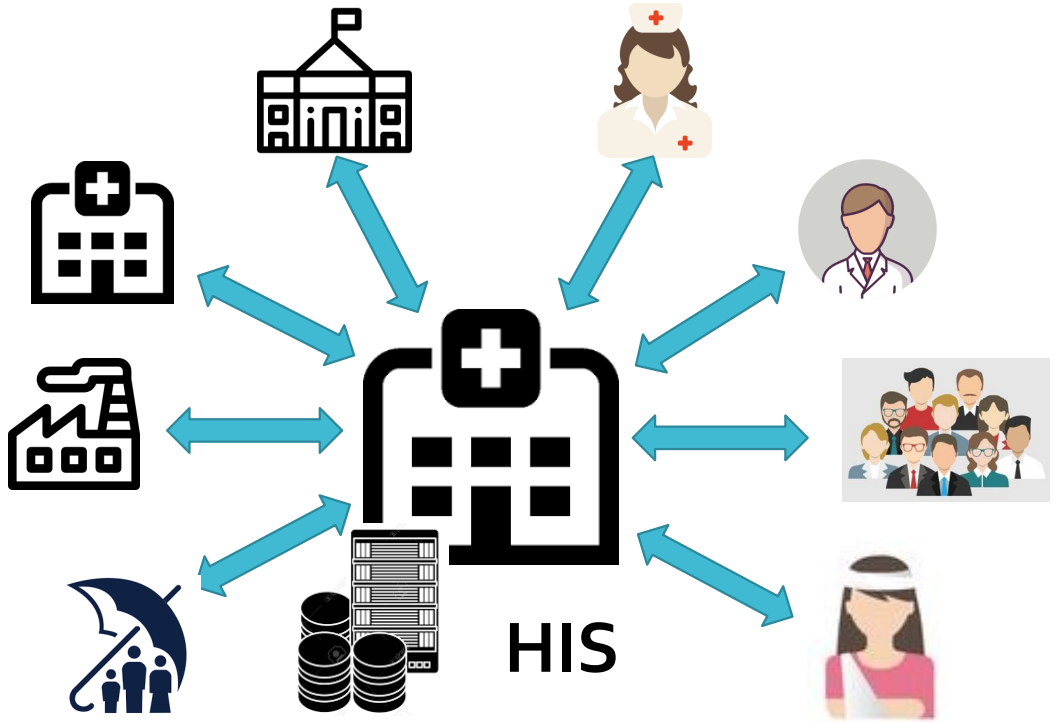
Who acts in the hospital theater?



Other hospitals and health providers (in many cases companies of the group)

- Send/receive requests of diagnostic tests (radiology, laboratory, pathological anatomy…) or surgical interventions.
- Send/receive results of diagnostic tests, or permit the other hospital to see the results from an own web portal/application.
- To permit the doctors to access the information in other hospitals (VPN, Remote desktops…)
- In many cases we use the HL7 standard to implement an integration between the different programs. In this cases we can share personal data and integrate the results in our HIS, reducing errors due to human factor.

Who acts in the hospital theater?



Different kinds of actors
Many different interfaces
A lot of information requirements

Increase software complexity

The software party

Due to the variety of the actors and their interests and needs, there is no single software that covers all the requirements of a hospital.

In this section I will explain what programs we use and for what purposes.

The software party

HIS (Hospital Information System)

This is the most important software in the Hospital. Meets the objectives of a normal ERP adapted to the operation of a hospital.

We use the HIS of the company Unit4, but there are many HIS in the market, for example from companies like SAP, Costaisa, HP, SAVAC, Nexus/Sysinf…

The software party

HIS (Hospital Information System)

Some of the functions that covers the HIS are the following:

- Patient's electronic clinical history (clinical course, petitions, results, reports, assists, medication, recipes, allergies…)
- Pharmacy management: medical orders, preparation of the medication, distribution, logistics, registering of medical administration.
- Doctors and operating rooms agendas
- Patient's activities management (rehabilitation, dialysis, nursery…)
- Admissions, room availability
- Logistics, orders, delivery notes, warehouse's stocks, goods movements…
- Billing, accounting and finance management
- Interfaces with the governmental administration, providers of complementary tests and other entities

The software party

HIS (Hospital Information System)

When choosing a HIS or other Health software, it is very important to take into account the following aspects:

- Service of the supplier company. The hospital works 24x7.
- Maintenance contract that includes legal changes.
- Completeness. The more services it covers the better is the solution.
- Customization capability. It is very difficult that the evolution of the HIS covers all needs of the hospital, and in many cases this needs are not shared with other hospitals. In our case we can make changes to the standard software and even develop new modules.
- Licensing mode and prices
- Resources consumption to provide the necessary infrastructure.
- Technology used. A solution that evolve with the technology.
- Stability and growth capacity.
- Security of the information.
- Integration capabilities (HL7, DICOM, XML, WebServices, SAML…)

The software party

PACS / RIS

A picture archiving and communication system (PACS) is a medical imaging technology which provides economical storage and convenient access to images from multiple modalities (source machine types). Electronic images and reports are transmitted digitally via PACS.

A radiological information system (RIS) is the core system for the electronic management of imaging departments. The major functions of the RIS can include patient scheduling, resource management, examination performance tracking, examination interpretation, results distribution, and procedure billing. RIS complements HIS (hospital information systems) and PACS (picture archiving and communication system), and is critical to efficient workflow to radiology practices.

The software party

PACS / RIS

We use the PACS/RIS of the company Agfa. Another companies that offer this kind of software are GE, UDIAT, Fujifilm and many others.

The most important features to take into account about a RIS/PACS are the following:

- Capacity on-line and near-line. Its important to assure a rapid access to the most recent images (about 3 years of images). The capacity depends on the number of studies produced per year and the type of this studies
- Integration capacity and protocols supported (DICOM, HL7, Worklists)
- Image viewer and radiological tools included to facilitate the diagnosis and other medical tasks.
- Light clinical viewer. Possibility to execute from HIS
- Service, technology used, price, security, maintenance…

The software party

Departmental programs

There is a variety of departmental programs that covers specific needs that the HIS doesn't cover. Some examples of departmental programs we use in our hospital are the following:

- Nefrolab: specialized in managing and registering of dialysis sessions and specific data related with nephrology patients
- Viewpoint GE: management and reporting of prenatal ultrasound diagnosis
- Gestpath: Integral management of Pathological anatomy and cytology department
- Endotools: Management and reporting of digestive endoscopy, integrated with the endoscopes for the import of the images.
- LabSuite: Clinical analyzes laboratory management
- M4Dsys: Used to manage ophthalmological history
- SAP: we have VPN access to SAP program from ICS (Catalan Health Institute) for the surgical area.

The software party

Specific programs

Other specific programs we use to cover other needs are the following:

- Intersystems ensemble: Integration engine to manage communication with CatSalut for electronic receipt and waiting lists.
- Tecnohospital: management of staff schedules and related incidents
- Easyfactura: CatSalut billing. Very specific billing with a lot of variables and cases.
- SAGE200: management of staff payroll and contracts
- Minerva: document manager.
- Joomla: Intranet of the hospital with internal news, documents and also communication of maintenance incidents.
- SIGNply: handwritten digital signature using tablets and Wacom technology

The software party

Specific programs

- Analyzer: BI based on the data of HIS database
- iVMS-420: Manage security cameras, visualize and playback.
- Remote administration and visualization: Terminal Server, Teamviewer and UltraVNC. Very important to optimize the resources of the IT service, avoiding displacements attending the users in most incidents.

Other programs are not used anymore, but maintained for history reasons, to consult history data. This is a cheaper solution than migrating data to new programs, as long as technology allows it.

The software party

Support programs

Office suites

- Microsoft Office
- Libre Office.

Antivirus and backup

- Symantec Endpoint Protection
- Symantec Backup Exec
- Uranium backup
- HYCU (integrated with Nutanix Platform)
- Nutanix snapshot technology

Virtualization

- AHV (Acropolis Hypervisor)
- Vmware
- Hyper-V

The software party

Support programs

Operating systems

- Microsoft Windows 7
- Microsoft Windows 10
- Microsoft Windows Server 2012
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2003
- Linux

Databases

- Intersystems Cache (HIS and Ensemble)
- Microsoft SQL Server (Tecnohospital, RIS, EasyFactura, Sage200…)
- MySQL (Joomla, Gestpath)
- Oracle (RIS/PACS)

The software party

The hospital works 24x7 and it is very difficult/expensive to locate technical services outside of normal work hours.

So it is very important that the IT department has technical knowledge of the different software to be able to maintain it and in case of an incident, be able to respond as quickly as possible.

This is not easy because of the variety of the programs and software platforms. It is important to maintain a database with the most common incidents and their solutions, based on the experience.

Infrastructure: the software house

Most software requires a server to host the database and other resources. The variety of software makes the number of necessary servers high.

Virtualization technology offered some years ago a breakthrough in the planning and maintenance of infrastructures, with programs such as vmware or Hyper-v among others.

These technologies offer the possibility of providing new servers very easily, as well as having high-availability environments with a cluster of physical servers, allowing virtual machines to continue working if a physical server goes down.

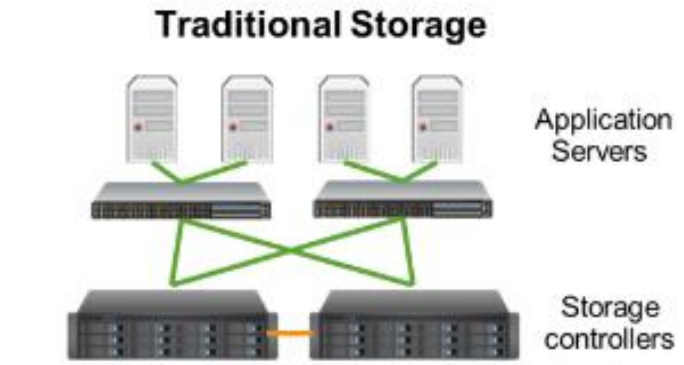
Traditional virtualization environments concentrate the storage of data in a SAN (storage area network), which becomes a potential single point of failure.

Infrastructure: the software house

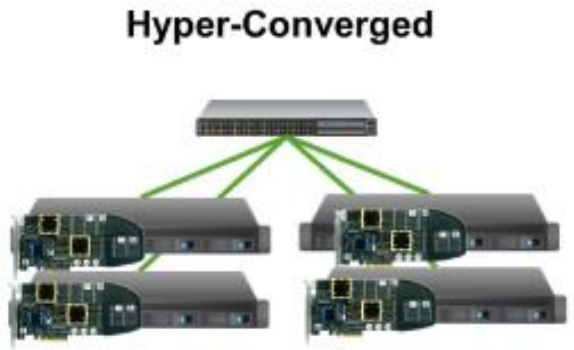
To avoid this single point of failure, few years ago has emerged a new technology trend called Hyper-converged infrastructure (HCI).

HCI is a software-defined IT infrastructure that virtualizes all of the elements of conventional "hardware-defined" systems. HCI includes, at a minimum, virtualized computing (a hypervisor), a virtualised SAN (software-defined storage) and virtualized networking (software-defined networking).

Recently we acquired a Nutanix HCI system to provide the infrastructure for all our servers.

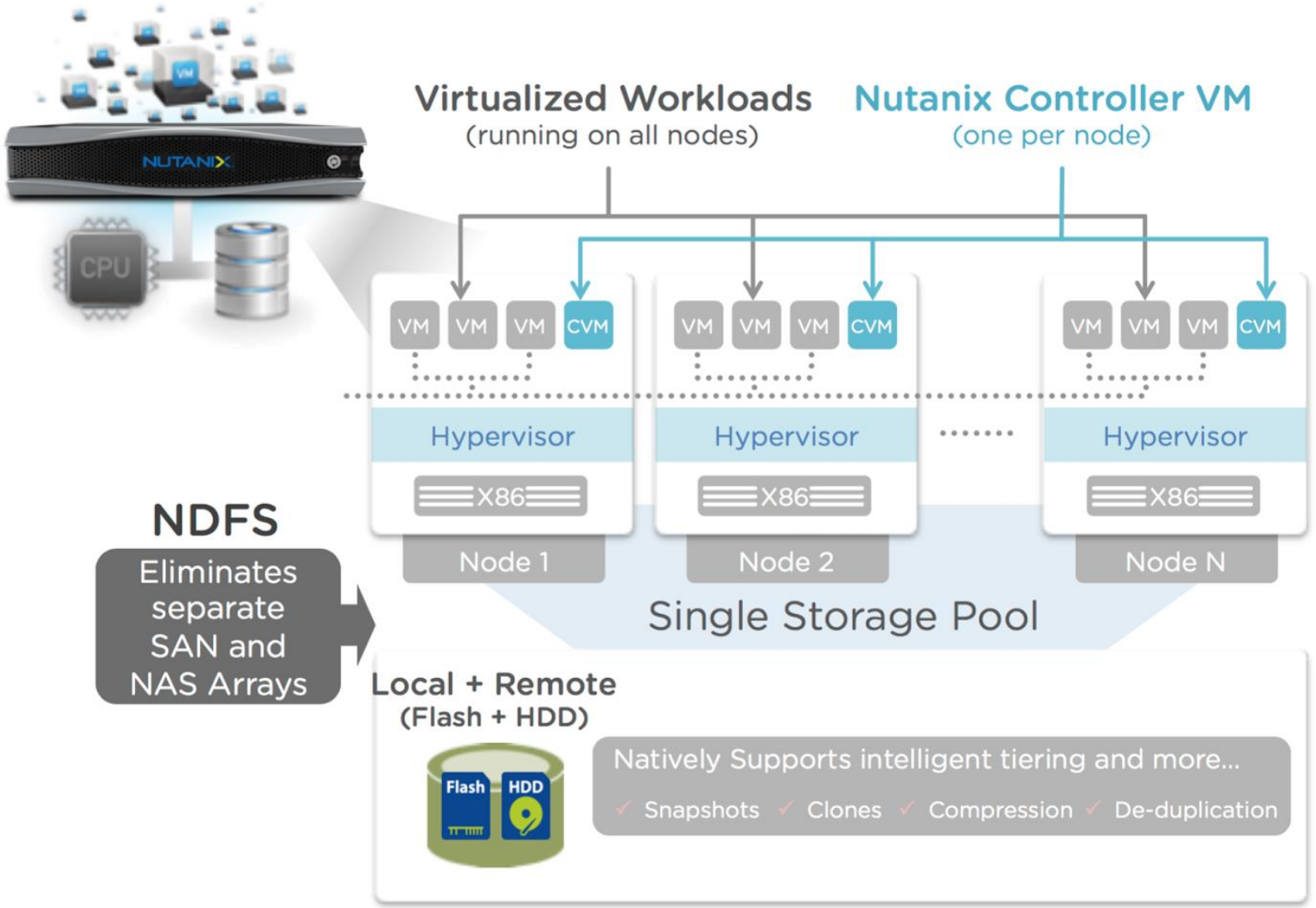


Storage is separate from the application servers



Application Servers share their storage

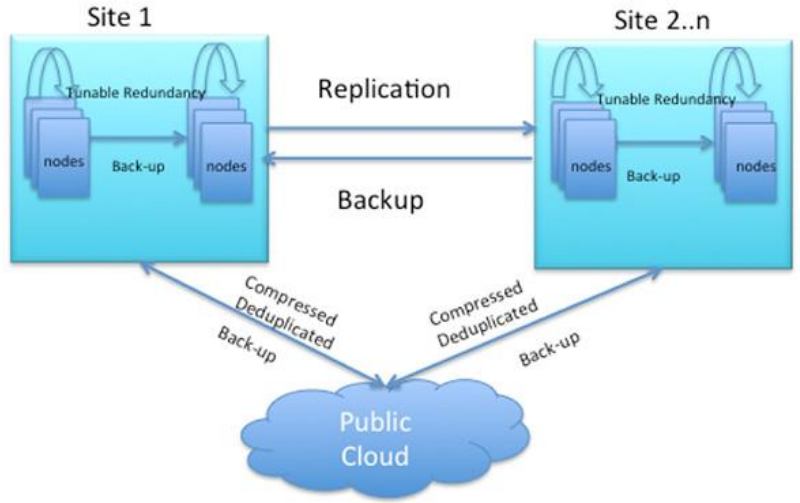
Infrastructure: the software house



Infrastructure: the software house

Some of the advantages of HCI infrastructure are the following:

- There is no single point of failure
- Virtually unlimited growth capacity.
- Adding nodes can grow both in storage capacity and in process capacity.
- Data de-duplication and compression
- Backup integrated.
- Capacity to have all the system replicated in another site/CPD, for a DR (Disaster recovery) environment.



- Easy and quick snapshot and clone creation. It provides test servers for deployment and pre-production in a very easy way, which is very important for the implementation of new deployments in a secure way.

Thank you!

Questions?