



Our experience developing a terminology server

“Consumer driven innovation”

26-10-2012

Javier Fernández

ITServer Project manager

j.fernandez@indizen.com

The beginning



Joining together **domain knowledge** with **technical knowledge**

Our initial goal

The screenshot displays a software interface for clinical data modeling, organized into three main vertical panels:

- Information model:** Contains two sub-sections:
 - Classes:** A collection of UI components including an input field, buttons for 'Sección' and 'Subsección', a list icon, a form icon, 'radio' and 'checkbox' controls, and a 'Texto' label.
 - Catalogs:** A list of categories: 'Schemas/Templates', 'Objets/Archetypes', and 'Detailed clinical models'.
- Document:** A central workspace with tabs for 'Design', 'View', 'Validation', and 'Models'. It shows a document structure with fields for 'Organization' (containing 'Patient'), 'Title: EHR', 'Cataloguing', and 'Links: patient ehr'. Below this, a sub-panel with 'Design' and 'Help' tabs shows a specific element: 'Allergies' with the description 'Different allergies of the patient' and an 'Allergy' input field.
- Terminology:** A panel for managing terminology elements. It includes:
 - Properties:** Fields for 'Element title' (Elemento), 'Tooltip' (Descripción emergente del elemento), 'Tag' (Allergy), 'Value', 'Size' (30), and 'Taxonomy'. There are red circular indicators next to the Tag and Value fields, and a search icon and a close icon (X) next to the Taxonomy field. An 'Autocomplete' checkbox is also present.
 - Borrar elemento:** A button to delete the selected element.
 - Repository:** A section for managing the terminology repository.

Our initial goal



Market



The beginning

1st step → Snomed CT Browser

Snomed CT

Browser

Descriptions Hierarchy

Search: Cholecystitis Search Begins with Show inactives

S	DT	SCTID	Description
<input type="checkbox"/>	DC	[817317017]	Cholecystitis (disorder)
<input type="checkbox"/>	DC	[783680010]	Cholecystitis glandularis proliferans (disorder)
<input type="checkbox"/>	DC	[748665019]	Cholecystitis without calculus (disorder)
<input type="checkbox"/>	PI	[127173011]	Cholecystitis
<input type="checkbox"/>	PI	[77262010]	Cholecystitis glandularis proliferans
<input type="checkbox"/>	PI	[33615015]	Cholecystitis without calculus

Details

Concept

[76581006] Cholecystitis (disorder)

Fully Specified Name

[817317017] Cholecystitis (disorder)

Preferred term

[127173011] Cholecystitis

Synonyms

Hierarchy Relationships Selection list Postcoordination

See complete taxonomy

- [2463935015] Disorder of gallbladder (disorder)
 - [817317017] **Cholecystitis (disorder)**
- [823819012] Cholangitis (disorder)
 - [817317017] **Cholecystitis (disorder)**

SNOMED CT is too big. Let's create subsets

The image displays two windows from the SNOMED CT software interface. The left window, titled "Subconjuntos", is used for creating and managing subsets. It shows the following details for a subset named "neumonía prueba 2":

- Autor:** Javier Fernández Valencia
- Nombre:** neumonía prueba 2
- Tipo:** Descripción de dominio
- Idioma:** es--Español
- Dominio:** 0
- Dominio del contexto:** 0
- Notas:** (Empty text area)

The right window, titled "Taxonomía", displays a hierarchical tree structure. The "Arbol jerárquico" shows a path from "neumonitis (trastorno)" to "neumonía (trastorno)", which includes "neumonía gangrenosa (trastorno)", "neumonía corinebacteriana de los potrillos (trastorno)", and "neumonía catarral (trastorno)". Below this, the "Jerarquía del miembro" section shows the hierarchy for the member "neumonía gangrenosa (trastorno)", including its parent "neumonía (trastorno)" and its child "gangrena pulmonar (trastorno)".

Well...but I want something interoperable

UI interface showing a hierarchical tree of medical terms and a table of selected terms.

UI elements include:

- Show: Preferred term
- Language: English
- Buttons: Save, Undo, Checkmark, Download, Database, Search, Share, Chat (0), Print, Close
- Actions: [Include all children](#), [Remove node](#), [Remove all children](#), Other operations

Tree structure:

- Tree
 - Cholecystitis
 - Cholecystitis without calculus
 - Acute cholecystitis without calculus
 - Chronic cholecystitis without calculus
 - Chronic cholecystitis
 - Calculus of bile duct with chronic cholecystitis
 - Calculus of bile duct with chronic cholecystitis with obstruction
 - Calculus of common bile duct with chronic cholecystitis
 - Calculus of bile duct with chronic cholecystitis without obstruction
 - Chronic cholecystitis with calculus
 - Calculus of gallbladder with cholecystitis
 - Calculus of bile duct with cholecystitis
 - Hyperplastic cholecystitis
 - Acute cholecystitis
 - Angiocholecystitis
 - Pneumocholecystitis
 - Acute and chronic cholecystitis
 - Cholecystitis glandularis proliferans
 - Xanthogranulomatous cholecystitis

My current selection:

<input type="checkbox"/>	DT ↓	Description ↓
<input type="checkbox"/> <td>DC</td> <td>Lung consolidation (disorder)</td>	DC	Lung consolidation (disorder)

Mapset browser

Conjunto de mapeos: [Detalles](#)

Origen: CIE-9-MC

Indice | Clasificación

- 799.01 Asfixia ▲
- 799.02 Hipoxemia ▲
- 799.1 Parada respiratoria ▲
 - Fracaso cardiorespiratorio
 - Paro respiratoria
 - Exclude
 - distress respiratorio:
 - NEOM (786.09)
 - agudo (518.82)
 - del recién nacido (770.89)
 - después de trauma e intervención quirúrgica (518.5)
 - síndrome (del recién nacido) (769)

Destino: SNOMED-CT

<input type="checkbox"/>	CIE ↓	SNOMED ↓	Descriptor ▲
<input type="checkbox"/>	799.01	[66466001]	ahogo (evento)
<input type="checkbox"/>	799.01	[162712007]	al examen: desmayo, asfixia (trastorno)
<input type="checkbox"/>	799.01 E913.9	[274222001]	asfixia accidental (evento)
<input type="checkbox"/>	799.01 E913.0	[269791004]	asfixia accidental en la cama (evento)
<input type="checkbox"/>	799.01 307.9	[248107000]	asfixia autoinducida durante la masturbación (evento)
<input type="checkbox"/>	799.01 987.9	[50363002]	asfixia por gas ambiental tóxico (evento)
<input type="checkbox"/>	799.01 239.89	[242026001]	asfixia por tumores en el perimetro de la pared torácica (evento)
<input type="checkbox"/>	799.01	[1857116013]	asfixia por asfixia de niños (balletas)

Mapeo

Detalles | Clase | Términos

Mapsetid ↓	SCTID ↓	Targetcodes ↓	Mapoption ↓	Mappriority ↓	Mapadvice
100046	162712007	[799.01]	0	0	1
100046	29658002	[799.01]	0	0	2
100046	66466001	[799.01]	0	0	1
100046	271877004	[799.01]	0	0	2
100046	248107000	[799.01 307.9]	0	0	2
100046	50363002	[799.01 987.9]	0	0	2
100046	269791004	[799.01 E913.0]	0	0	2

Referencia destino

Descripciones | Jerarquía | Relaciones

Concepto

[66466001] Asphyxiation (event)

Descripción Completa

[2591216018] ahogo (evento)

Término preferido

[1857116013] ahogo

Sinónimos

Mapsets. Why not edit it?

Source: redmiva

Target: SNOMED CT



Save



Export



Import mapset



Statistics



Set direct correspondence

Cod redmiva ↓	Desc redmiva ↓	Cod SNOMED CT ↓	Desc SNOMED CT ↓	M ↓
2900	Virus Influenza			NM
3266	Virus Influenza A H5N1			NM
3563	Virus Influenza C	407482004	virus influenza C	M
3576	Virus Influenza A Nuevo AH1N1			NM
2480	Staphylococcus aureus	3092008	Staphylococcus aureus	M
2481	Staphylococcus aureus ATCC 29213			NM
2482	Staphylococcus aureus meticilin resistente			NM
3314	Staphylococcus aureus meticilin sensible			NM
3497	Staphylococcus aureus Serogrupo 0			NM
1842	Neisseria meningitidis	17872004	Neisseria meningitidis	M
1843	Neisseria meningitidis serogrupo A	103479006	Neisseria meningitidis serogrupo A	M
1844	Neisseria meningitidis serogrupo B	103480009	Neisseria meningitidis serogrupo B	M
1845	Neisseria meningitidis serogrupo C	103481008	Neisseria meningitidis serogrupo C	M
3370	Neisseria meningitidis serogrupo Y serotipo 15			NM
3603	Neisseria meningitidis Y/W			NM
1501	Legionella spp.			NM
1519	Legionella pneumophila	80897008	Legionella pneumophila	M
1520	Legionella pneumophila serotipo 1			NM
1521	Legionella pneumophila serotipo 10			NM
1522	Legionella pneumophila serotipo 11			NM

Neisseria meningitidis serogrupo A

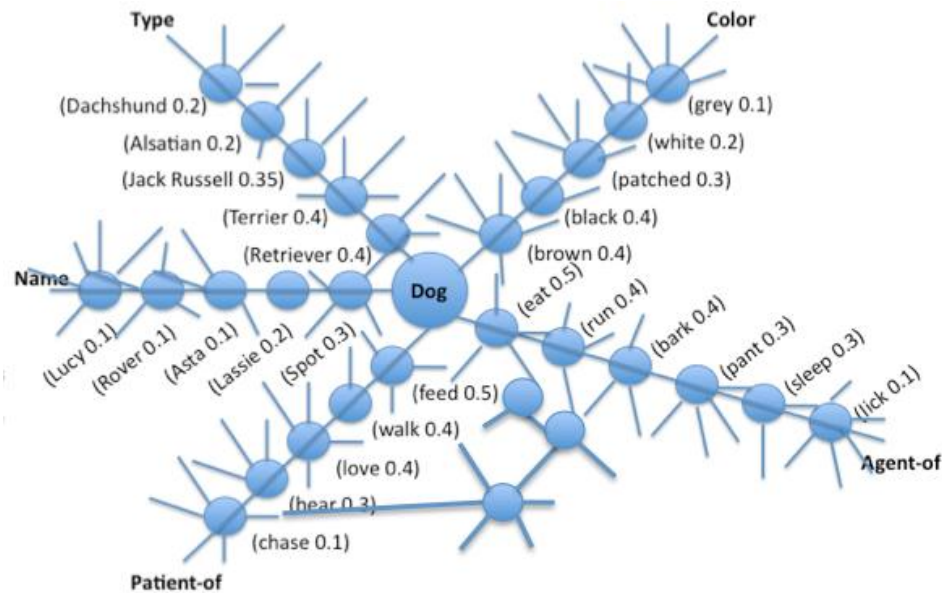
Mapped terms		
Code	Description	
103479006	Neisseria meningitidis serogrupo A	✘

Terminos sugeridos

sel	Code ↓	Description ↓
<input checked="" type="checkbox"/>	103479006	Neisseria meningitidis serogrupo A



NLP Toolkit



Language dependent

Techniques:

- Tokenization
- Lemmatization
- Spelling error detection
- Chunking
- Acronym expansion
- ...

We need human revision:

- Negation
- Certainty
- Subject of information
- Planning stage

What if I want to create a subset with 50K expressions in natural language?

Solution: Batch processes

The screenshot displays a web interface with two main sections: 'Tasks' and 'Services'.

Tasks Section:

- Active tasks:** Task name: setDescriptionsInCSV, Begin date: 06 Mar 2012 15:55.04
- Finished tasks:**
 - Task name: setSnomedElementsInCSV, Begin date: 09 Oct 2012 15:17.37, End date: 09 Oct 2012 15:17.37. Includes 'Download file' and 'Create subset' icons.
 - Task name: setSnomedElementsInCSV, Begin date: 09 Oct 2012 15:14.04, End date: 09 Oct 2012 15:14.04. Includes 'Download file' and 'Create subset' icons.

Services Section:

- suggestSNOMEDElements:** It's one of the most popular services. It receives a list of descriptions in natural language and returns a list of suggestions in SNOMED CT® for each description ordered by similarity range.
- generateRelations:** It's a service that receives a sctid list as an input and returns a table in csv format with their definition relationships
- generateDescriptions:** It's a service that receives a sctid list as an input and returns a table in csv format with the following columns: ConceptId, DescriptionId, FSN, DescriptionType and Term.
- generateCrossmapCIEToSNOMED:** It's a service that receives an ICD code list as an input and returns the mapping of these codes with SNOMED CT® codes.
- generateCrossmapSNOMEDToCIE:** It's a service that receives a sctid list as an input and returns the map of these codes with ICD codes.
- generateDescendants:** It's a service that receives one sctid and returns all the descendants of the code using the SNOMED CT® hierarchy.

How can they use the content that has been created?

-REST services

GetSctDescriptionById: Service that returns all the attributes of a particular description

Parameters:
- descriptionid: Description SctId

```
xml:rest/core/getSctDescriptionById/1132518011
json:rest/core/getSctDescriptionById/1132518011
jsonp:rest/core/jsonp/getSctDescriptionById/1132518011
```

GetSctDescriptionsByConceptId: Service that receives a conceptId as an input and return all the attributes of the associated description

Parameters:
- conceptid: Concept SctId

```
xml:rest/core/getSctDescriptionsByConceptId/127496003
json:rest/core/getSctDescriptionsByConceptId/127496003
jsonp:rest/core/jsonp/getSctDescriptionsByConceptId/127496003
```

GetSctConceptById: Service that returns all the attributes of a particular concept

Parameters:
- conceptid: Concept SctId

```
xml:rest/core/getSctConceptById/127496003
json:rest/core/getSctConceptById/127496003
jsonp:rest/core/jsonp/getSctConceptById/127496003
```

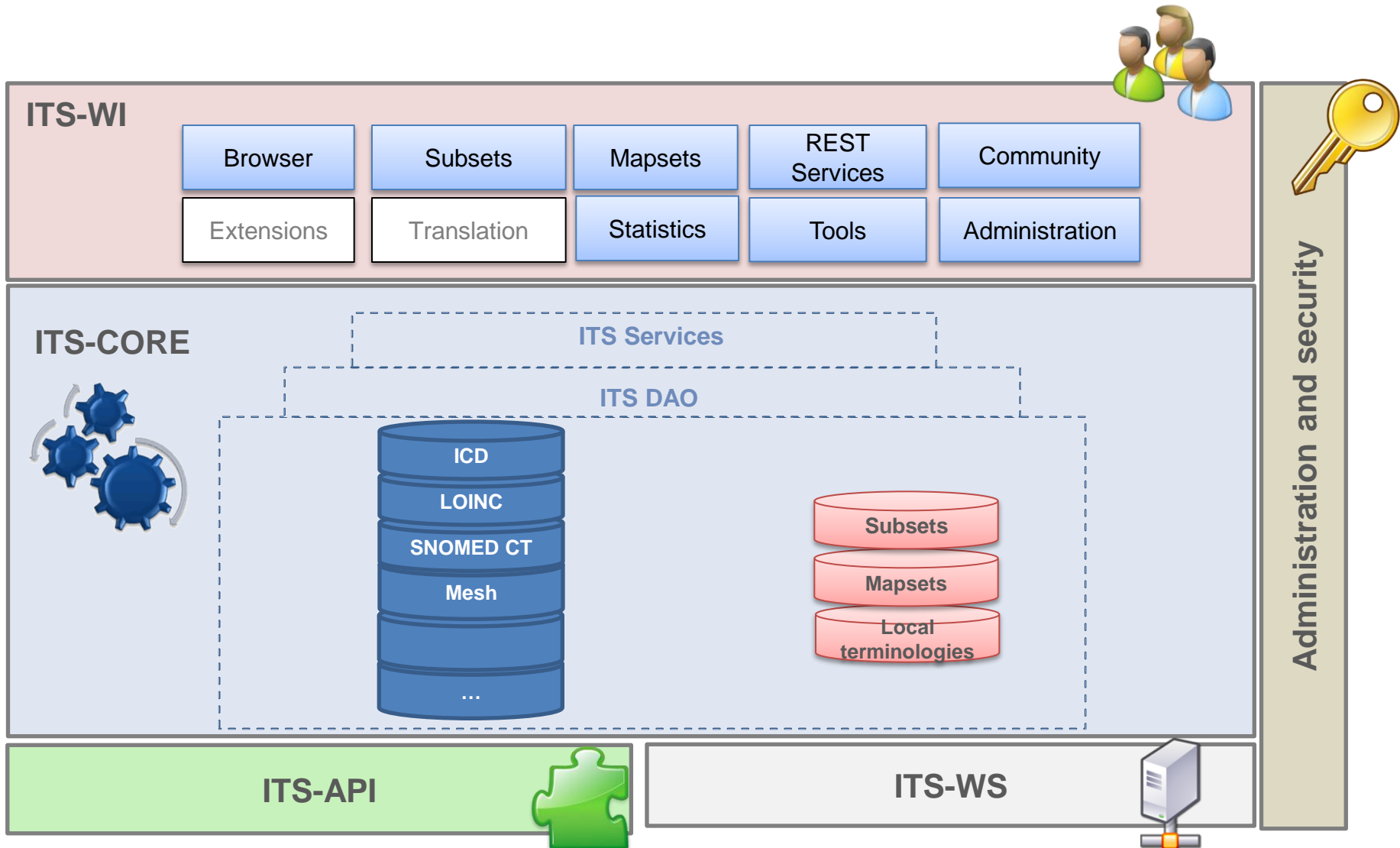
GetSctConceptByDescriptionId: Service that receives a sctid as an input and returns all the attributes of a concept

Parameters:
- descriptionid: Description SctId

```
xml:rest/core/getSctConceptByDescriptionId/1132518011
json:rest/core/getSctConceptByDescriptionId/1132518011
jsonp:rest/core/jsonp/getSctConceptByDescriptionId/1132518011
```

We need standards: **CTS2**

Current architecture



Our sandbox- ClinicalDocs

ClinicalDocs - Hospital de Huascarán

Dr Manuel Robles ▾

Buscar otro paciente



Nombre: Ignacio Suarez Molina
NHC: 11234567800
Fecha nacimiento: 29/12/1985
Sexo: Hombre

Datos Generales del Paciente

Identificación

Episodios

Alertas **2**

Factores de riesgo **1**

Tratamiento **1**

Pendiente **1**

Más... ▾

DOCUMENTOS

Episodio clínico 1234

Fractura de tobillo

PRUEBAS

Microbiología

Laboratorio

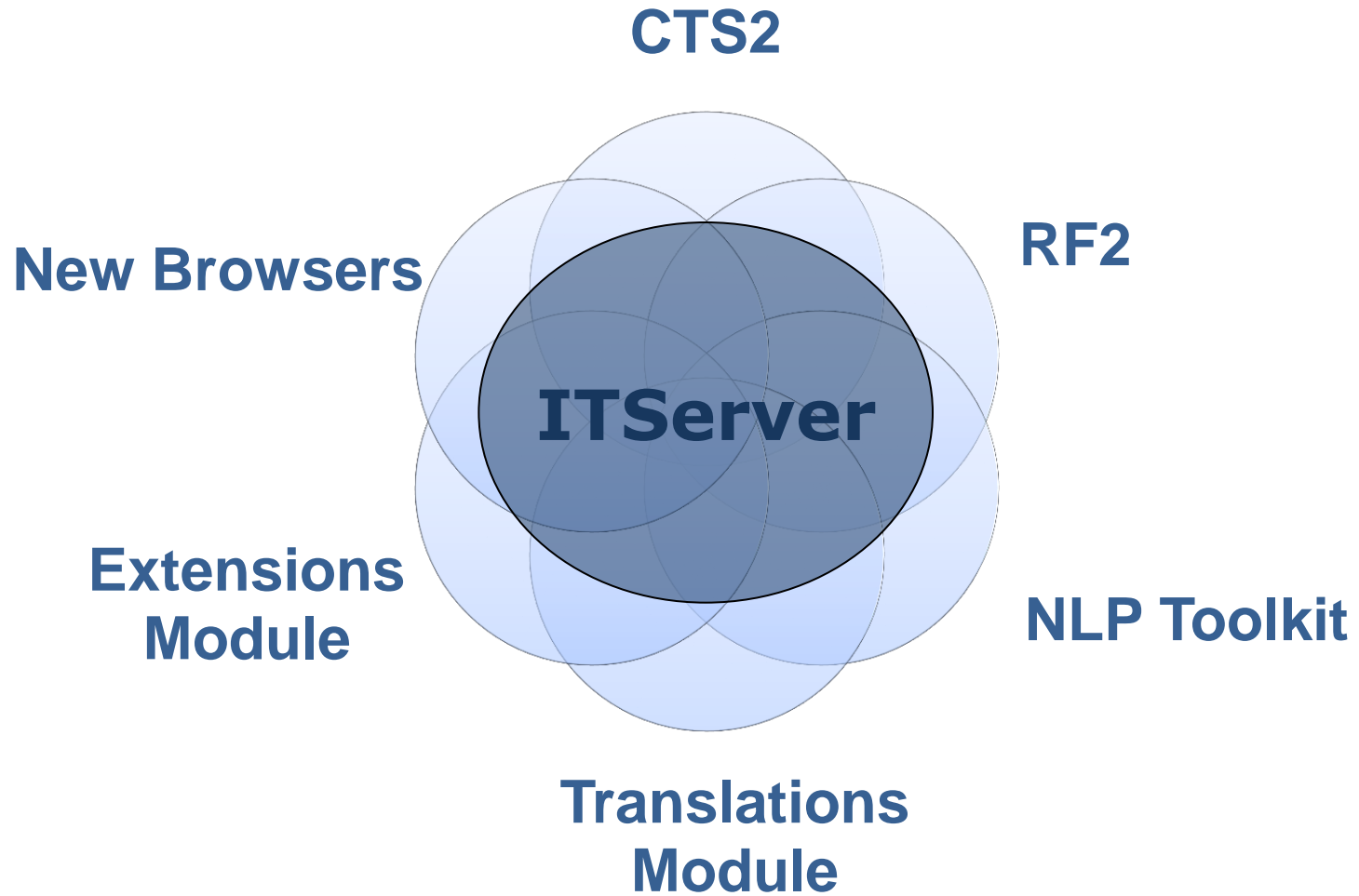
Radiología

[+] Nuevo episodio clínico

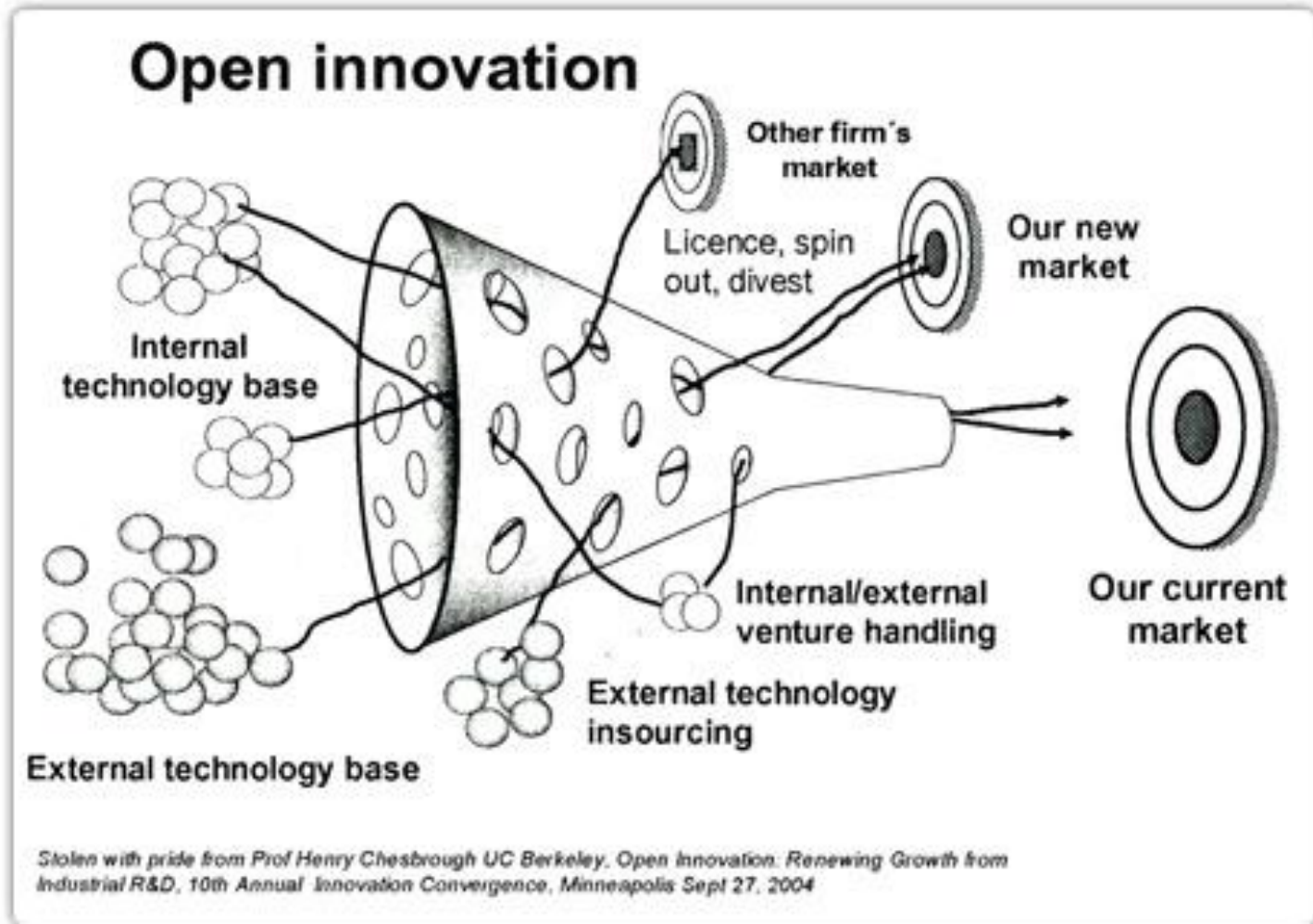
Id	SubId	Descripción	Estado	Fecha	Servicio	Operaciones
1234		Episodio clínico 1234	Cerrado			Operaciones ▾
	2011-1234567	Episodio de atención 2012-1234567	Cerrado	20/02/1999	ORL	Operaciones ▾
	2011-1234568	Otitis media	Cerrado	20/02/1999	ORL	Operaciones ▾
1235		Fractura de tobillo	Abierto			Operaciones ▾
	2012-1234569	Fractura de tobillo	Cerrado	20/02/1999	Urgencias	Operaciones ▾
	2012-1234570	Fractura de tobillo	Abierto	20/02/2000	Traumatología	Operaciones ▾
	2012-1234571	Fractura de tobillo	Abierto	20/02/2000	Radiología	Operaciones ▾

martes, 16 de octubre

Roadmap



Open Innovation



Conclusions

- We have to provide advanced **tools to connect local terminologies and standard terminologies**
- **NLP tools are the key for a smooth transition** between free text and the use of standard terminologies
- The most important part of a terminology server is the services that it provides in order to **guarantee an easy integration for the external systems**
- We need a **scalable environment** that allow us to have fast terminology services (Cloud)
- To create a good terminology server **we need the collaboration of universities and other organizations**

Questions



www.itserver.es

indizen[®]

j.fernandez@indizen.com

C/ Tarragona, 30

28045 Madrid

Spain

Tel. +34 91 535 85 68

www.indizen.com