Westsächsische Hochschule Zwickau (WHZ), University of Applied Sciences

Address: Dr.-Friedrichs-Ring 2A, 08056 Zwickau

Phone: +49 (0) 375 536 0

Name: Markus Lamprecht

Phone: +49 (0) 375 1322

Mail: Markus.Lamprecht@fh-zwickau.de

Project Advisor Name: Prof. Dr. Anke Häber

Project Advisor Mail: Anke.Haeber@fh-zwickau.de

People involved (within last three years): 3

Markus Lamprecht, Thomas Nitzsche, Alexander Apel

Project name:

“Communication Infrastructure for eHealth (CommIT Health)”

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1 Motivation

1.1 The healthcare system in Germany

In the Federal Republic of Germany, a social security system based on the solidarity principle, which is largely funded through social security contributions and a small portion of tax revenues, is established. Every citizen in Germany is a subject to insurance contributions in a national or private health insurance. The availability of health services (regulation and mandatory services) in public health insurance is regulated on the so-called principle of benefits in kind that covers 90% of health services. In Germany, in the year 2008 a total of 263 billion euros were spent on health. Since the year 1996 (until 2008), expenditure has risen steadily by 35%. The rising expenditure on health force policy to establish laws and regulations which, on the one hand support to the goal for the reduction in the costs of healthcare provider and on the other hand strive for the intercommunication of different healthcare provider. In contrary the demographic ageing causes an increasingly number of elderly persons over 60 years with a growing number of treated cases and thus requires higher health spendings.

The reduction in costs can only be made if the individual healthcare provider in different institutions (ambulatory, stationary, rehabilitation) work more closely together. Thus, the effective use of time, personnel resources and costs and also the increased coordination of treatment processes and information flows is possible. Duplicate examinations or treatment to avoid errors due to missing information, for example.

To ensure an optimum data exchange between areas and to avoid unnecessary costs, an increased need with regard to the integration of different software products is very important. At the e-health laboratory there were delivered preliminary works involving the ability for interconnections of the different systems and ways of data exchange and business process support.

The term eHealth is available for all aspects of electronic communication and electronic data exchange with regard to health, such as electronic Health Card, Health Professional Card and

integrated care. All healthcare service providers (ranging from the patient to the doctor's office, hospital and pharmacy to nursing homes) are involved. The constant delays in eHealth projects (electronic patient record, electronic Health Card) shows that at this level both technical and management problems are insufficient. Likewise there are no sufficient business models behind the developed prototypes. For this reason, several professors at the WHZ deal with the optimization of management aspects and technical aspects in healthcare.

1.2 Problems and goals

The healthcare system in Germany is characterized by continuous variations. There currently exist major challenges for institutions and users. In ensuring the cooperation of information technology facilities, three main problems are identified. Based on these problems individually necessary objectives can be derived.

Problem 1:

It is not sufficiently known which workflows for data exchanges between various institutions are necessary to implement information technology best.

Aim 1: The aim is to identify the processes in the institutions under economic and organizational aspects.

Aim 2: The aim is to define the necessary workflows between devices in general and to model them.

Aim 3: The aim is to identify incoming data and message formats.

Problem 2:

It is not sufficiently known how a standard connectivity of the different information systems can be achieved through an integration platform.

Aim 1: The aim is to present all the standards for use in the institutions and the respective departments.

Aim 2: The aim is to identify the necessary technologies and standards for data exchange.

Problem 3:

It is not sufficiently known how the corresponding interfaces are technically practical to implement.

Aim 1: The aim is to evaluate existing interfaces of information systems in terms of their coupling ability.

Aim 2: The aim is to design an interface concept for the integration of information systems of institutions.

Aim 3: The aim is to integrate information systems with each other based on a selected workflow.

1.3 The eHealth laboratory of the WHZ

Possible measures and preliminary work for solving the problems and implement the objectives can be achieved by the eHealth laboratory. The eHealth Laboratory Zwickau is located at the computer science division, Westsächsische Hochschule Zwickau (WHZ), University of Applied Sciences. There are a collection of specific software products of healthcare institutions installed. The following products can be identified as used systems:

- Integration platform Ensemble (InterSystems GmbH),
- Hospital information system MCC (MEIERHOFER AG) und i.s.h.med (Siemens Medical Solutions),
- Surgery information system DOCconcept (DOCexpert GmbH) und TurboMed (TurboMed EDV GmbH),
- Patient Administration System IS-H (SAP AG),

- Coding system ID DIACOS (ID GmbH),
- Plus various subsystems of the stationary and ambulatory sector (emergency services, digital archiv, pharmacy, nursing) and mobile devices (physical, simulation).

In each case the systems are installed according to their area of operation and in certain areas of the eHealth laboratory. The figure illustrates the implemented prevention, treatment and care (stationary, ambulatory).

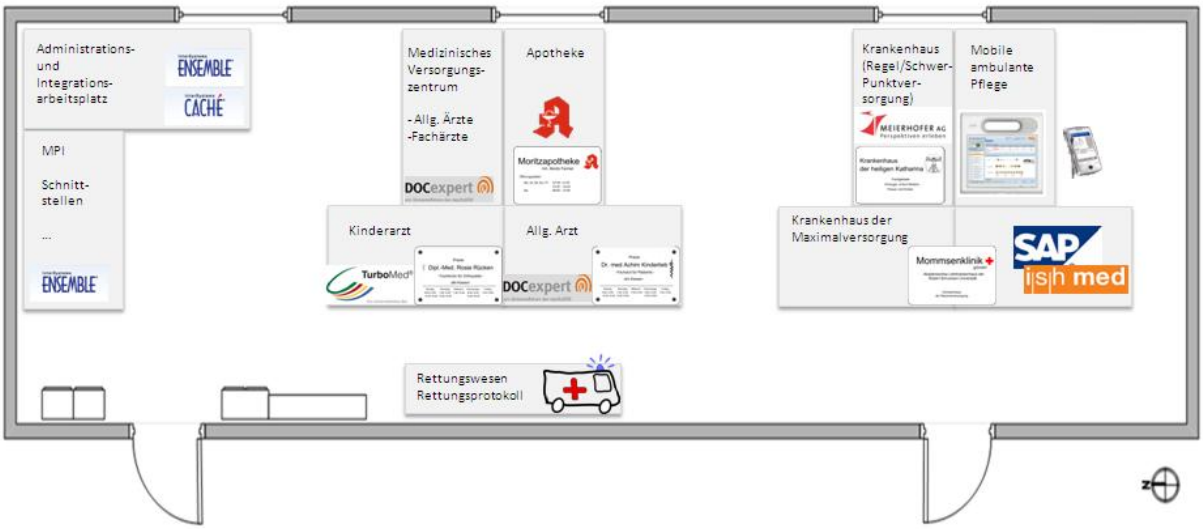


Image: schema of the eHealth laboratory

The aim of the laboratory is in making various healthcare systems available for students, for teaching and for projects. On twelve working places the students can work with various software products and implement further developments and scenarios. In the case of any questions or problems contact persons of the computer science division and from the software manufacturers are available.

2 Solution commIT Health

2.1 What is the name of application?

The amount of all prototypical applications, which identifies the solution, is called “CommIT Health”. Concerning this the various problems in eHealth will be identified and using this technical infrastructure these problems will be prototypically solved.

2.2 When did you first deploy your solution?

The solution was first deployed in 2008 and is used for educational purposes at the university of applied sciences WHZ. It will be continued frequently and added with new elements in every new project.

2.3 Provide a description of the solution/application

- What is the solution’s primary function and purpose?

The primary function is the maintainance of a digital communication between the various healthcare providers by selected examples and scenarios.

- What is the overall system architecture?

Based on InterSystems Ensemble, the various information systems in healthcare and developed prototypes will be connected to InterSystems Ensemble. In order to do this different interfaces can be realized in the form of adapters and will be implemented in different subsystems. To support advanced business processes and scenarios BPEL modeling business rules are deployed.

- What programming languages/development environments were used?

Besides Caché Script various languages, including Java, C + + or Python as well as proprietary interface server languages are used. This will involve programming environments such as Eclipse, MS Visual Studio or smaller individual programming environments from the open source area are.

2.4 What InterSystems' product(s) did you use to create your solution?

For the implementation of the solution we are using InterSystems Caché and InterSystems Ensemble. It would be interesting if more comprehensive and decisive analysis of the various files and databases could be possible. For this purpose, the use of InterSystems DeepSee is appropriate.

2.5 How does the solution take advantage of InterSystems' technology?

The "commIT Health" is in the shape of a modular construction system. The technology InterSystems Ensemble ensures this modular principles in the form of a kit in a very simple way. The main element for the implementation of the various components is always the ensemble production. Each project is implemented in its own production.

Basically any production is characterized by the elements Business Service, Business Process, Business Operation. In each Production several more elements from Ensemble are used. On the one hand the integration platform Ensemble is principally used in integration projects for message transformation using DTL transformations and business rules. In process-oriented integration scenarios BPEL modeling is utilized additionally. On the other hand the technologies CachéServerPages/ZEN and for the evaluation ZEN-Reports/Dashboards are deployed in respect of graphical information retrieval and data manipulation.

2.6 What benefits does the solution deliver?

The infrastructure is applied in education for projects, research projects and final papers. The following Test assignments will be examined:

- Semantic interoperability in the use of electronic health card: linking the standard CDA and xDT using a terminology-/integration server.
- Integration of hospitals and nursing facilities in the eHealth infrastructure: technical and organizational requirements, implementation scenarios (such as MPI), role of staff.
- Intersectoral care in the own region: technical requirements and management strategies for the corporate care of patients by different types of institutions, especially through the use of clinical pathways, enhanced communication between Medical Care Center (MCC) and Hospital (KH), electronic regulations.
- Business management aspects and derivation of an IT strategy when mapping the geriatric patient care process (one example is the implementation of the expert standard "discharge management in nursing")
- Emergency care: concepts and technology in the test of electronic health card and Health Professional Card
- Further development of software and hardware solutions in the field of healthcare

The infrastructure is also of interest to managers (nursing and hospitalization) and medical informatics in education. This makes it possible to convey the core issues in the eHealth much clearer. In addition the developed infrastructure is placed at the disposal of hospitals, care institutions and stakeholders in the region for demonstration purposes and as test environment.

The functions of the infrastructure solution “Commit Health“ aimed at different economic and organizational aspects. Depending on the results of the implemented prototypical application several advantages are identified. To take one example, the offered Production MVZ KH below ensures an inter-sectoral data exchange with patient identification and delivery of documents between the inpatients in hospitals and the outpatients in medical care centers (ambulatory treatment in German healthcare).

This results in several improvements, such as the reduction of costs through prompt provision of medical data together with the loss of mail items, improvement of the quality of unique data mapping without multiple manual entries of patient data, increase productivity through support of digitally imaged clinical pathways and processes.

2.7 What are the most innovative aspects of the solution?

- How has your solution creatively addressed the needs of your user base?

The work contributes to making a living cooperation with various manufacturers and healthcare facilities (hospitals, doctors' offices, nursing homes) is possible. For example, the Red Cross Hospital Chemnitz-Rabenstein, which also has InterSystems technology already asked several times and presented possible topics, which were then implemented in a prototype project work by students. Also, new themes are being developed continuously and discussed. It is here you may as well be working with a partner in the region.

In collaboration with other health care facilities that do not have software products of InterSystems, the project results and the functionality of the prototype implementations are presented. Another way is to show how the prototype can be implemented later. The facilities need to make development in their IT infrastructure themselves.

Moreover, the resulting middleware should be used in an AAL project (see Chapter 3).

- What other new technologies does it use?

Service-oriented approaches have been used in individual projects as a relatively new technology. For this purpose Web Services are deployed to connect to external systems (like SAP i.s.h.med) by using the SOAP adapter within Ensemble.

2.8 The various Productions

The prototypes which are developed in projects, research projects and final papers are implemented in the form of Productions. All developed prototypes are illustrated by at least one practical scenario and are stored in a reference environment in the eHealth laboratory for demonstration purposes.

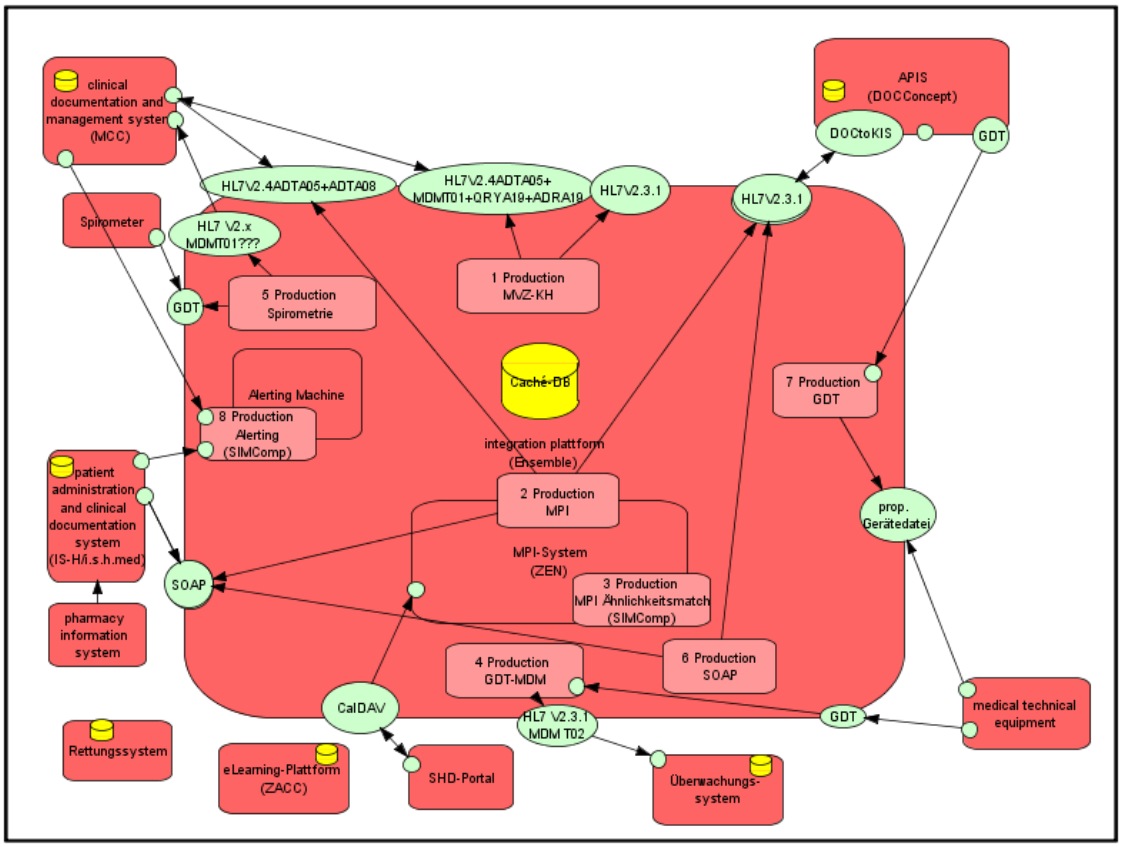
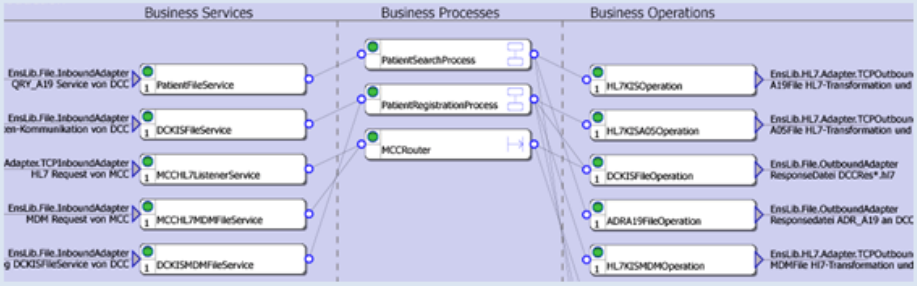


Image: description of the logical layer, according to 3lgm²

For this purpose the introduction of a selection of converted Productions is made in the form of a project description in the next section.

2.8.1 Production MVZ-KH

Project description			
Name	Interface concept for the integration of the hospital information system MCC and surgery information system DOCconcept when used in a collaboration between hospitals and medical center hospital		
Main creator	Thomas Nitzsche (processed in master thesis)		
Problem	Since 2004 there is a new health care provider in the market, medical service centers for ambulatory treatment. These institutions are poorly integrated with the stationary sector. It is not sufficiently known which workflows support data exchange between hospitals and medical service centers and how they have to be implemented by information technology.		
Aims	Definition, modeling and implementing of necessary workflows and integration of both systems based on interfaces.		
Implementation	Systems involved		
	DOCexpert DOCconcept (surgery information system)	InterSystems Ensemble (integration platform)	MEIERHOFER MCC hospital information system)
Used technologies	System interfaces		
	QRY_A19	TCP/FileAdapter	ADR_A19
	ADT_A05	TCP/FileAdapter	(N)ACK_A05
	MDM_T01/(N)ACK_T01	TCP/FileAdapter	MDM_T01/(N)ACK_T01
	communication standards		
	DOCtoKIS-Structure (proprietary)	HL7 V2.4, DOCtoKIS-Structure (proprietary)	HL7 V2.4
Production	The primary function of the production is the mutual identification of patients using the patient demographic data and the transmission of medical reports with the goal of interoperability of the various subsystems and improvement of the processes between the institutions. The converted production ensures three important functions: 1. Admission of a patient in DOCconcept and export of patient data and documents (DCKISFileService, DCKISMDMFileService, patient file service, DCKISFileOperation, ADRA19FileOperation) 2. Admission, transformation and transmission of messages over Ensemble (patient search process, patient registration process, MCCRouter) 3. Receiving and processing of data to MCC and response (MCCHL7ListenerService (MCCHL7MDMFileService, HL7KISOperation, HL7KISA05Operation, HL7KISMDMOperation) The production accesses files stored on shared folders and starts on the basis of rules several business processes and performs routing operations with transformations. 		

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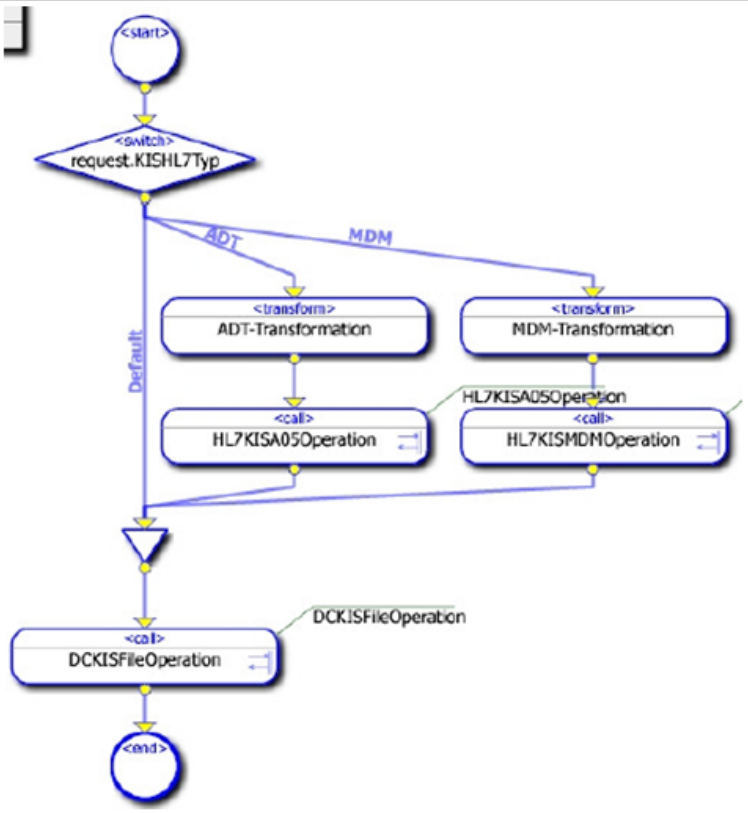
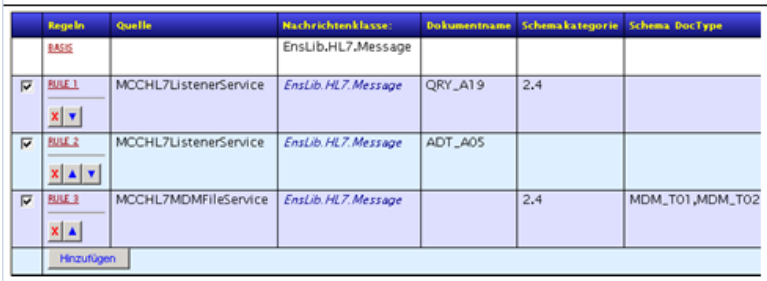


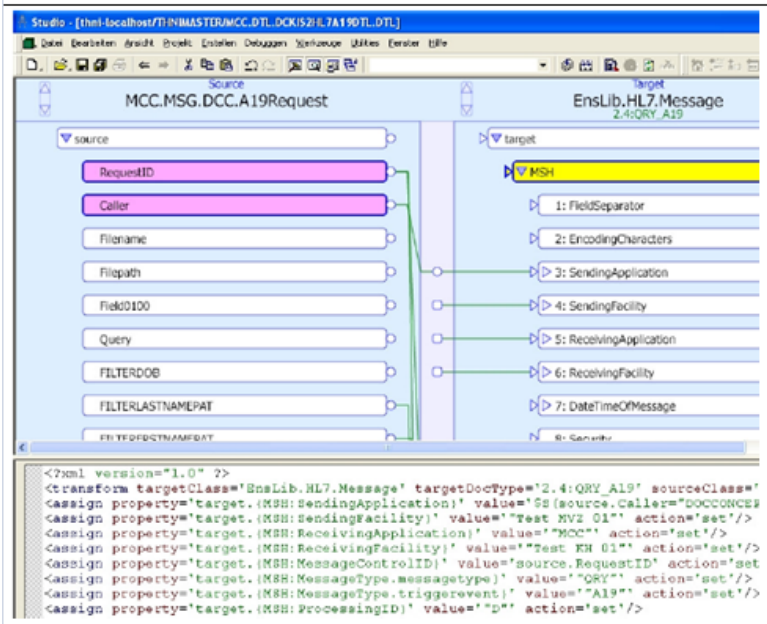
Due to the input of messages from the medical service center in the proprietary DOCtoKIS interface format a data transformation to HL7 V2.4 patient registration process takes place. Depending on the input messages transformations (to ADT_A05 or MDM_T01) are made. The generated output messages are exported in a pre-defined location or passed to the MCC interface directly via socket connection. The medical reports prepared in the systems can therefore circulate freely and the patient data can be synchronized.



	Regeln	Quelle	Nachrichtenklasse:	Dokumentname	Schemakategorie	Schema DocType
	BASIS		EnsLib.HL7.Message			
☑	RULE 1	MCCHL7ListenerService	*EnsLib.HL7.Message*	QRY_A19	2.4	
☑	RULE 2	MCCHL7ListenerService	*EnsLib.HL7.Message*	ADT_A05		
☑	RULE 3	MCCHL7MDMFileService	*EnsLib.HL7.Message*		2.4	MDM_T01,MDM_T02

Hinzufügen

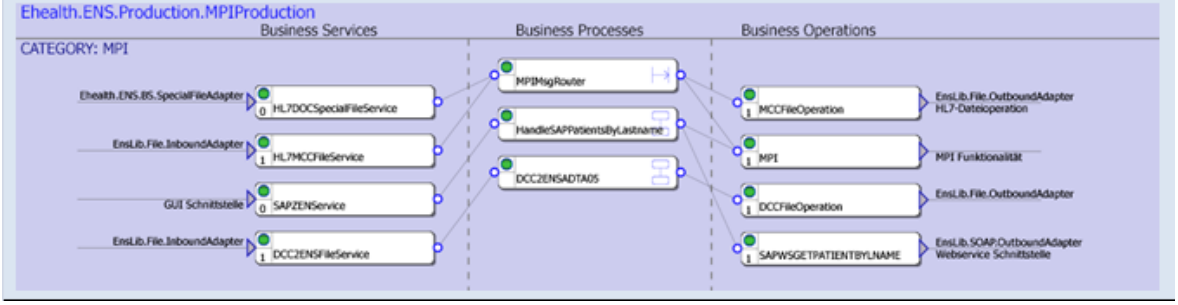
The BP MCCRouter guarantees the distribution of valid input messages to the respective BP and the correct transformation by the rules shown.



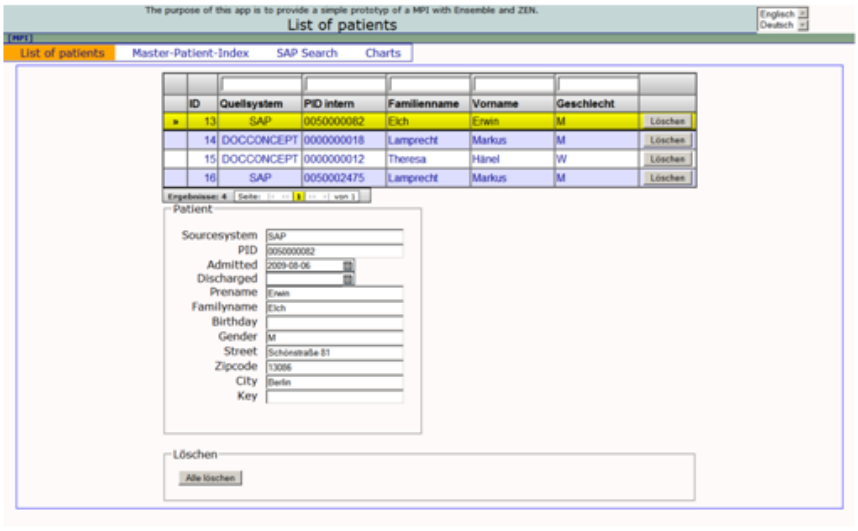
In the picture a proprietary DOCtoKIS schema structure, which will be transferred through a data transformation in a standardized HL7 V2.4 schema of the message type QRY_A19, is shown. To achieve this the DTL-editor provided by Ensemble was used and the resulting XML document was manually adjusted.

2.8.2 Production MPI

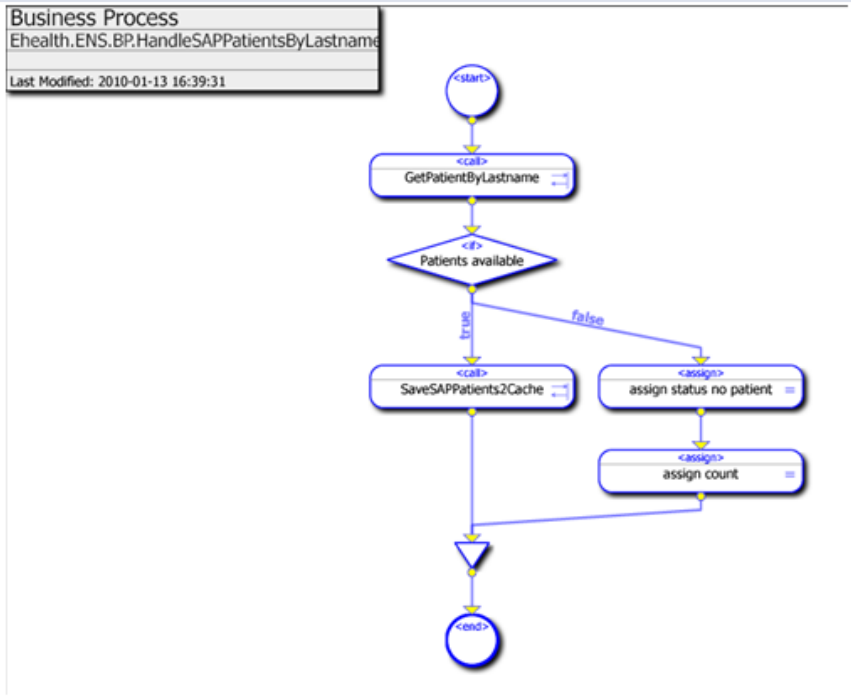
Project description				
Name	Setup a Master-Patient-Index (MPI) in Integrated Care			
Main creator	Markus Lamprecht (processed in diploma thesis)			
Problem	The unique identification of patient records across disparate existing systems can be a problem for communication and for sharing medical data for example in an Electronic Health Record (EHR). Different systems must be communicated together with interfaces to provide interoperability. The Master-Patient-Index component is a solution for the identity problems. How can an integration platform like ensemble maintain the MPI			
Aims	Implementation of a prototypically MPI and the cross-linking with different software for desperate healthcare providers.			
Implementation	System involved			
	InterSystems Ensemble (integration platform)	DOCexpert DOCconcept (surgery information system)	MEIERHOFER MCC (clinical information system)	SAP i.s.h.med (clinical information system)
Used technology	System interfaces			
	TCP/FileAdapter (HL7 Fileservice)		ADT_A01,ADT_A03, ADT_A08	
	TCP/FileAdapter (own Fileservice)	proprietary		
	SOAP Adapter			SAP webservice for
	Communication standards			
	HL7 V2.2, proprietary,	DOCtoKIS-Structure (proprietary)	HL7 V2.2	web service (SOAP)
Production	1. The production processed files from the HL7 ADT message type for different events (admit, discharge, update). DOCconcept and MCC connected with HL7 interface applications (BS HL7DOCSpecialFileService and HL7MCCFileService). 2. Web service requests can be sent to external applications to filter patient data from SOAP messages (BS SAPZenService, BP handleSAPPatientsByLastname). 3. The patient information is read from the HL7 and SOAP messages and stored within a Caché datatable. The table is has a MPI for each patient record. The special business operation (MPI) provides the persistence of patient records.			



Features



ZEN GUI
A web interface shows the MPI table.



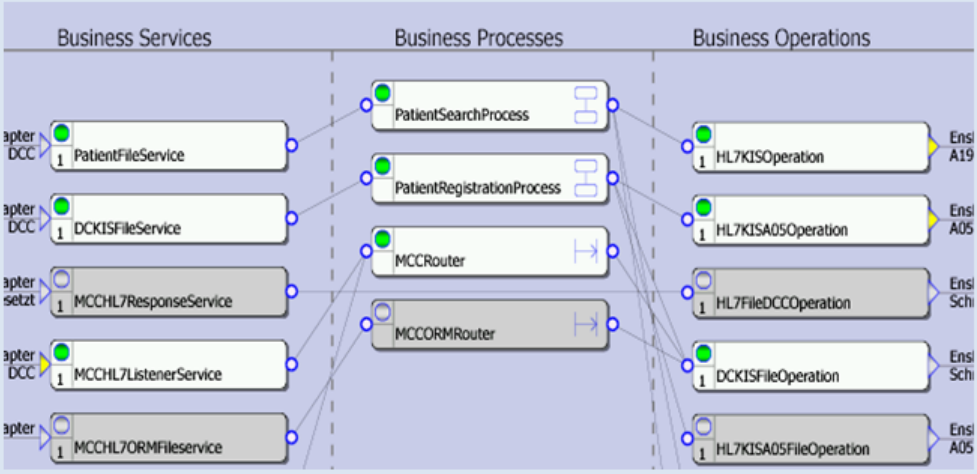
Business Process
The request to the SAP web service and storage of patient data is realized by using a Business Process.

	Regeln	Quelle	Nachrichtenklasse	Dokumentname	Schemakategorie	Schema DocType	Bedingungen	Aktion	Transformieren	Ziel
	BASIS									
☑	RULE 1	HL7MCCFileService	EnsLib.HL7.Message		2.2	ADT_A01		SENDEN		MPI, MCCFILEOPERATION
☑	RULE 2	HL7MCCFileService	EnsLib.HL7.Message		2.2	ADT_A03		SENDEN		MPI, MCCFILEOPERATION
☑	RULE 3	HL7MCCFileService	EnsLib.HL7.Message		2.2	ADT_A08		SENDEN		MPI, MCCFILEOPERATION
☑	RULE 4	HL7DOCSpecialFileService	EnsLib.HL7.Message		2.2	ADT_A05		SENDEN		MPI
☑	RULE 5	MCC_ADT_Import	EnsLib.HL7.Message		2.2			SENDEN		MCCFILEOPERATION

Routing rules
The MPI Message Router provides the forwarding of messages to the associated Business Operations by using routing rules.

2.8.3 Production MPI – Patient identity management

Project description	
Name	Algorithm for merging and duplicate detection of Medical Data Objects in a Master Patient Index
Main creator	Sebastian Thiele (processed in bachelor thesis)
Problem	With the help of a Master Patient Index a unique assignment of patient data from various subsystems or systems of associated healthcare partners to a unique patient entity is possible. Within the meaning of a communication partnership the unique identifier of a individual patient in the external information systems are passed to a target system and there processed. To ensure data consistency and revision capability the individual identifiers of a patient based on certain semantic and mathematical method are meaningfully nedd to be linked together.
Aims	Creating of a prototype that is able to classify and group patient data from different domains at a central location for its resemblance and to ensure the consistency associated with Medical Data Objects. Selected distance and similarity measures must be used. Development of a concept that creates a score from the above results and allows a data classification.
Implementation	Systems involved
	InterSystems Ensemble (integration platform)
Used technologies	System interfaces
	Caché ObjectScript
Production	In the present project there were no Productions used. The integration of the prototypically implementation in the form of a business process in a production is however possible.



Features	
	The prototype uses the Sorted-Neighborhood Algorithm as the solution for the problem. The central point for data analysis is the database table named patient. From the patient attributes such as first name, last name, address an ambiguous key for a self-defined pattern is generated. In the next step a regrouping of the data is held by use of this key. This allows a pre-selection of "probably" similar patients. The examined key width is controllable. The larger the key the higher is the probability that patients are similar to objects. The smaller the key, the greater is sliding window which will be examined in the next step. In the progress a fixed size sliding window is defined which is pushed over the grouped data sets and selects objects for further investigation. In step three of the Sorted-Neighborhood algorithm different similarity and distance measures are applied to the patient objects. A weight which makes a valence like a score must now be assigned to these results. Individually assigned weights are added and thus give a total score for the comparison of two patients objects for example. Now the barrier comes into play. The quotient of the achieved and the possible points is determined (as score). If the point value is within certain limits the comparison is either rejected (no similarity between patients) or acquired (similarity of the two patients) -> Patient objects most likely similar. The studied patients resulting from the aggregate function (similar keys, key width) are mapped to a master ID (ID of the investigated reference patients) and stored in a special unit table (MPI-table).with percentage of the match.

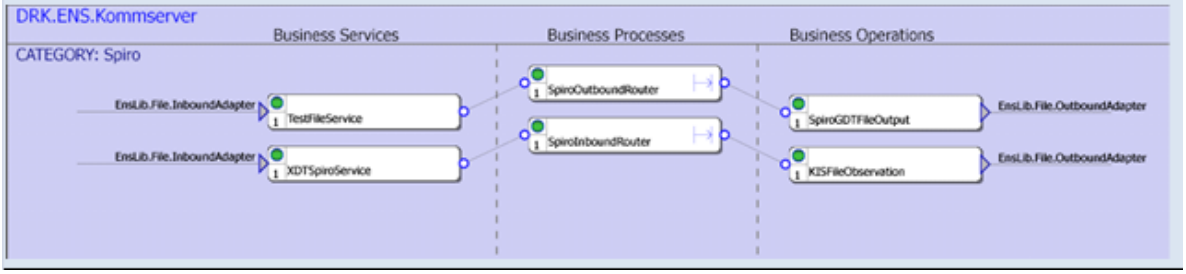
2.8.4 Production GDT-MDM

Project description			
Name	Transformation GDT messages in HL7 MDM_T02 messages		
Main creators (advisor)	Heiko Engelmann, Ronny Schuster, Holger Rüdiger, Tobias Junghänel, Alexander Mitiaev, Sergej Igdirov, (Markus Lamprecht)		
Problem	A vital sensor collects vital data in standardized format named GDT. GDT is the message standard for medical devices. The monitoring system has only an HL7 interface. The system receives the monitoring data for an observation as HL7 messages with the message type MDM_T02 and in the HL7 Version		
Aims	Transformation of a GDT message to a standards-based HL7 message using a communication server.		
Implementation	Systems involved		
	Device with standardized exchange format (vital sensor)	InterSystems Ensemble (integration platform)	Monitoring system with standardized HL7 interface
Used technology	System interfaces		
	GDT interfaces	GDT File Adapter	
		HL7 File Adapter	HL7 interface
	Communication standards		
	GDT messages	HL7 2.3.1 MDM, GDT	HL7 messages (2.3.1)
description	The production takes messages in GDT format (ReadFile business service) and transformed them (GDTMDMRouter) in a standards compliant HL7 format (version 2.3.1). An outbound adapter (HL7FileOperation) saves the transformed messages into a file.		

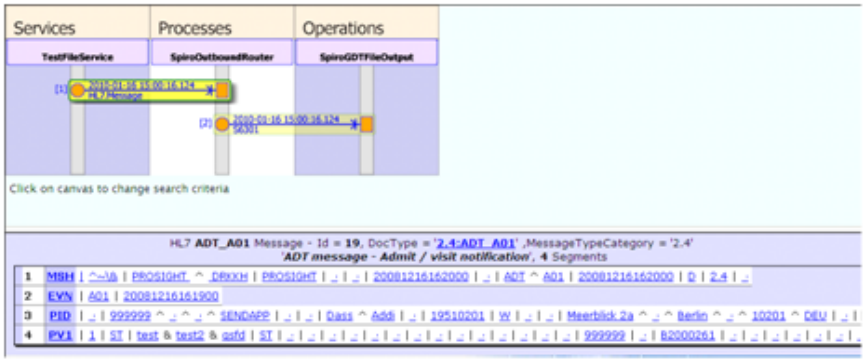
Features	
	**Data transformation** Complex transformations for the mapping of HL7 to GDT with various operations (for-loops, if-statements)

2.8.5 Production Spirometry

project profile			
Name	Involvement of the spirometry in the EDP of a hospital.		
Main creators (advisor)	Tolgonay Scharschekeeva, Stefan Strobel, Till Kodanek, Stefan Steglich, Wilfried Conrad, Christian Schaller, (Markus Lamprecht)		
Problem	The spirometry of a hospital isn't integrated into the electronic data processing. The Hospital information system, which should be coupled with the spirometry, has an HL7 interface. The spirometer has a GDT interface.		
Aims	The electronic patient data from the HIS must be forwarded automatically to the spirometry. Also the update and discard messages must be considered. Furthermore, the collected data in the spirometry should be forwarded to the HIS, to save them for billing. To solve the interface problem a communications servers is used.		
Implementation	Systems involved		
	hospital information system	InterSystems Ensemble (integration platform)	spirometry
Used technologies	System interfaces		
	HL7 interface	HL7 File Adapter	
		GDT File Adapter	GDT interface
	Communication standards		
	HL7 messages (ADT_A01, ADT_A03, ADT_A05, ADT_A08)	GDT, HL7 (2.4)	GDT messages (Typ 6310)
description	The production receives HL7 messages from the HIS with message type ADT_A01 (HL7Fileservice). The HL7 messages are transformed in messages with type GDT 6301 ("transmit data administration"). Furthermore, the messages with message type 6301 ("transmit data about an observation") (XDTSpiroService) are transformed (SpiroOUTRouter) in HL7 messages with message type ORU_R01 ("Unsolicited transmission of an observation message").		



Features

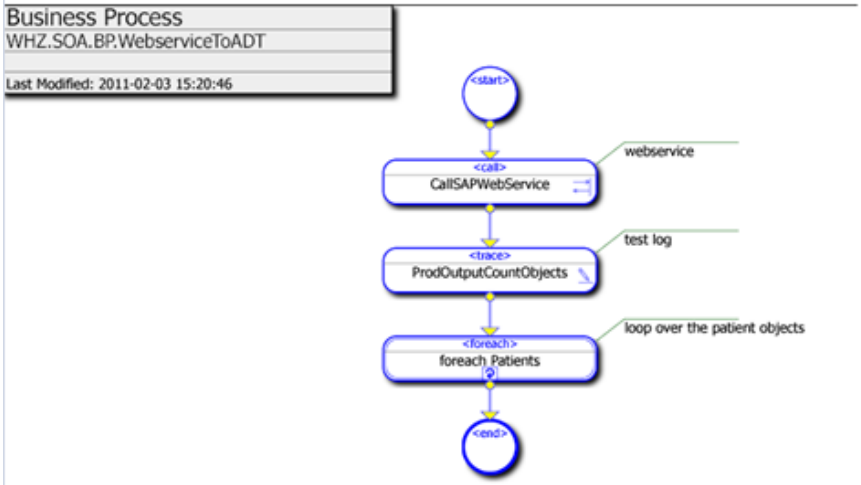


Dat transformation
Transformation of an HL7 message (ADT_A01) in a GDT message (message type 6301).

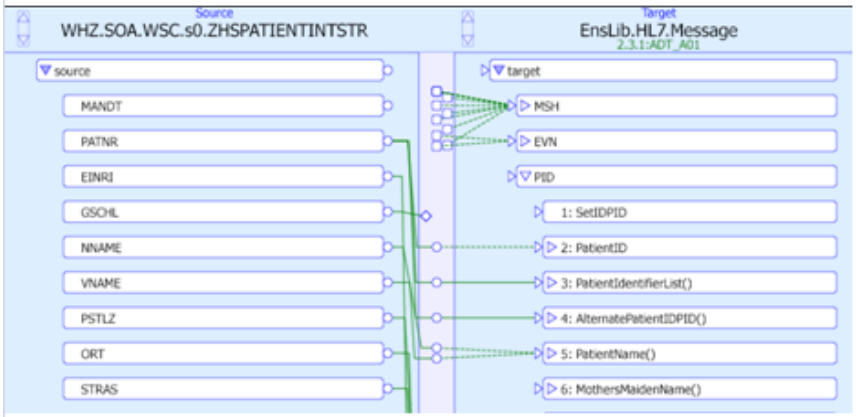
2.8.6 Production SOAP

Project description			
Name	Data transfer between web service and HL7 interface		
Main creators (advisor)	Stephan Boese, Steffen Förster, Thomas Müller, Sebastian Thiele, Sascha Reichmann, Patrick Röser, (Markus Lamprecht)		
Problem	In a patient administration system (SAP IS-H) exist data that can be accessed only with a web service interface. A radiology information system has an HL7 interface and requires the data (ADT data) from the HIS.		
Aims	Access to patient data from the PDMS with the web service interface using a communications server and transformation in HL7 messages of type ADT.		
Implementation	Systems involved		
	patient data management system (PDMS)	InterSystems Ensemble (integration platform)	radiology information system (RIS)
Used technologies	System interfaces		
	SAP web service for patient data	SOAP Adapter	
		HL7 File Adapter	HL7 (ADT_A01)
	Communication standards		
	web service (SOAP)	HL7 ADT,web services	HL7 messages
description	With the test feature of the business process (SAPWSProcess) the call to the business operation (web service) is triggered. The patient data is retrieved and is transformed in HL7 messages with message type ADT. A business operation (HL7OutOperation) stores the transformed messages in a file.		

Features



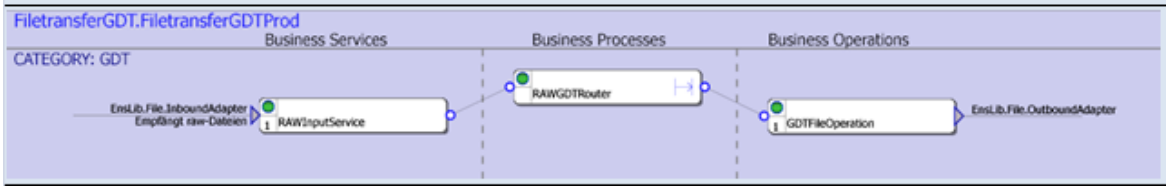
Business Process
The Business Process for the retrieval of patient data (CallSAPWebService) with a For each loop over the patients and transformation for every patient object.



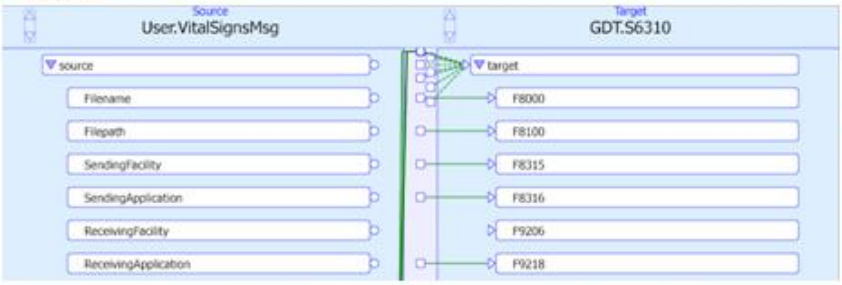
Data transformation
Transformation of the SOAP message into an HL7 data structure.

2.8.7 Production GDT

Project description			
Name	Device communication with different message formats		
Main creators (advisor)	Susi Fischer, Henrik Hofmann, Christian Händschel, Christian Poßögel, Carmen Teich, Jens Walter (Markus Lamprecht)		
Problem	A sensor provides vital signs (blood pressure, pulse) in a proprietary format. A system for evaluation of vital data can only process data in a standardized form (GDT message standard in Germany).		
Aims	Transformation of a proprietary message in a standard compliant message format using a communications server.		
Implementation	Systems involved		
	Device with proprietary exchange formats such as Vital Sensor	InterSystems Ensemble (integration platform)	System for evaluating the data by a standardized interface.
Used technologies	System interfaces		
	proprietary interface	File Adapter	
		GDT File Adapter	GDT Interface
	Communication standards		
	proprietäre Format (Vital Message)	GDT, Vitalsign structure (proprietär)	GDT (Standard für Geräteschnitstellen)
description	The Production receives messages in a proprietary format (GDTInputService) and transformes them (GDTRouter) in a standards compliant GDT format. The transformed messages are stored in a file by the help of an outbound adapter (GDTFileOperation).		



Features



Data Transformations

Complex transformations for the mapping with different computational and string operations

```
<assign property='target.F8402' value='source.ObservationDesc' action='set'/>
<assign property='target.F6200' value='..ReplaceStr(source.ObservationDate,".")' action='set'/>
<assign property='target.F6220' value='"Dies ist ein zweizeiliger"' action='append'/>
<assign property='target.F6220' value='"Befund zur 24h-Blutdruckmessung."' action='append'/>
<assign property='target.F6227' value='"Anmerkung zu einer Langzeit-Blutdruckmessung."' action='append'/>
<assign property='target.F6228' value='"Kurzzusammenfassung 24 h Blutdruckmessung"' action='append'/>
<assign property='target.F6228' value='"----------------------------------------------------"' action='append'/>
<assign property='target.F6228' value='"          Tagphase     Nachtphase    proz. Abfall"' action='append'/>
<assign property='target.F6228' value='"         06:00-22:00  22:00-06:00     Tag/Nacht"' action='append'/>
<assign property='target.F6228' value='"Ps[mmHg]   "_source.SystoleDay_"          "_source.SystoleNight_"
<assign property='target.F6228' value='"Pd[mmHg]    "_source.DiastoleDay_"          "_source.DiastoleNight_"
<assign property='target.F6228' value='"HF[P/min]    "_source.HeartFreqDay_"          "_source.HeartFreqNight_"
<assign property='target.F88410.(1).F8410' value='"SYSMXTG"' action='set'/>
<assign property='target.F88410.(1).F8411' value='"Systole max. Tagphase"' action='set'/>
<assign property='target.F88410.(1).F8420' value='source.SystoleValueMax' action='set'/>
```

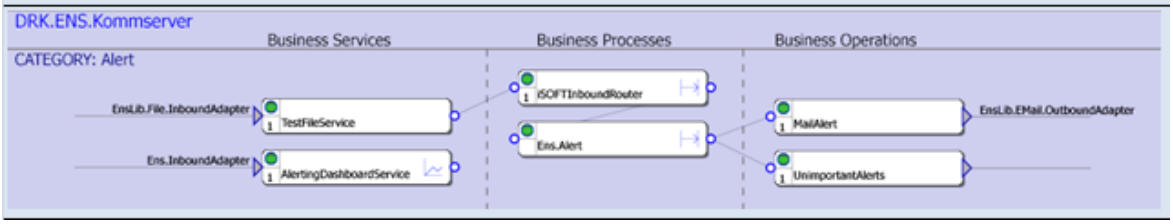
```
Property Systole As %String(MAXLEN = 256, TRUNCATE = 1);

Property SystoleUnit As %String(MAXLEN = 256, TRUNCATE = 1);

Property Diastole As %String(MAXLEN = 256, TRUNCATE = 1);

Property DiastoleUnit As %String(MAXLEN = 256, TRUNCATE = 1);

Property HeartFreq As %String(MAXLEN = 256, TRUNCATE = 1);

Property HeartFreqUnit As %String(MAXLEN = 256, TRUNCATE = 1);

Method ExportToString() As %String
 {
  set str="$"
  set str=str_..PatName_"|"
   Quit str_"$"
 }

Method ImportFromString(str As %String)
 {
     #define StringToList set list=$ZSTL(str,"|")
  set str=$E(str,2,$L(str))
  set str=$E(str,1,$L(str)-1)
  $$$StringToList
  set listkey=0
  set ..PatName=$LI(list,$I(listkey))
 }
```

New message scheme

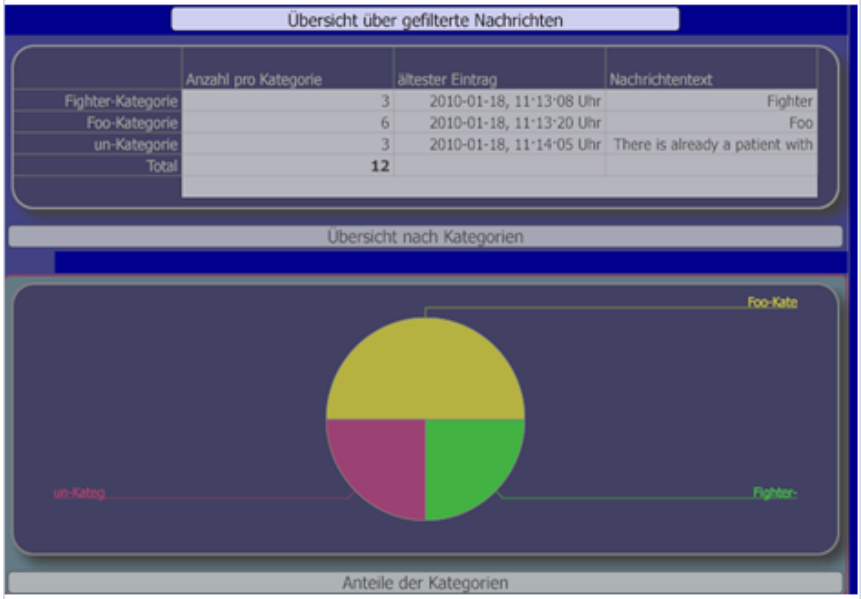
Newly created class as a message schema for the processing of proprietary vital data within Ensemble

2.8.8 Production Alerting

Project description			
Name	Alerting in the hospital		
Main creators (advisor)	Toni Feuchert, Marek Kretzschmar,Robert Lasch,Steve Meier,Ngoc Nguyen Thi Bich, Mathias Schraps, Philipp Winterle, Tony Zänsler, (Markus Lamprecht)		
Problem	Ensemble generatese-mails in various error situations. Due to the significant number the notice of any message can not be realized. There is no categorization, no alarm levels or something like that.		
Aims	The aim is to achieve an optimization of the alert function of the ensemble production. These functions are intended to check which filters and rules can be applied. E-mails should only be generated when there are serious errors. With the help of dashboards categories of errors are introduced and monitored.		
Implementation	Systems involved		
	Different delivery systems that generate	InterSystems Ensemble (integration platform)	e-mail provider
Used technologies	System interfaces		
	File Interface	File Adapter	
		e-mail Adapter	e-mail interface
description	The production takes messages (test file service). If validation errors occur, messages are routed to the Business Process ENS.Alert. According to certain rules in this business process the messages classified as either not important or important and forwarded to the associated business operation (“mail alert” or “UnimportantAlerts”). The Business Operation “mail alert” sent an email to the administrator and the BO “UnimportantAlerts” categorized the messages and stores them for later review. For a better visualization, the administrator can view the news categorized messages in a dashboard.		



Features



Dashboards
The numbers of filtered alert messages are displayed by category with dashboards.

Rule-based message filtering
Based on the error text in the message, the messages are sorted into important and unimportant.

3 Forecast on Ambient Assisted Living (AAL)

Through the demographic development of the population structure in Saxony towards a federal state with the highest age dependency ratios and the continuous increase of the elderly aged 65 years and above to about 2035, it must come to a change in thinking in the healthcare system. It is necessary to help the older citizens as possible and to optimize the provision of health care. Particular attention is devoted to the morbid citizen at home. He wants to live as long as possible in his own home and receive basic accomplishments from a homecare service. In addition he should be relieved by the number of time-consuming and long-distance commitments. It is essential that the elderly at home are helped in everyday life and supported by information technology such as digital medical assistant or IT-supported logistics processes.

The aim of the AAL project which began at WHZ is to create a logistics solution to improve coverage and quality of life of the elderly. The processes of care are currently not sufficiently geared to the needs of the elderly.

Therefore organizational and technical potential for improvements are first shown and implemented by the examples of the communication of vital signs, medication logistics and mobile nursing documentation. The medical supply chain is considered as well as the implementation of selected and defined clinical pathways.

For the domestic elderly it is necessary to provide easy-to-use components especially for acquisition of vital signs and to build a logistics infrastructure. The stated goals are the definition of coordinated and structured process flows and the minimization of existing media disruptions.

For this purpose the following goals can be derived:

Aim 1: Building of an open extendable middleware-based information system architecture for data exchange.

> Aim 1.1: organizational and technical implementation of the scenario “communication of vital signs“ (selection of an age-appropriate capture component for vital signs,

integration in medical supply chain, development of a control component for triggered actions by workflow steps (especially emergency)).

Aim 1.2: organizational and technical implementation of the scenario “medication logistics“ (development of an age-based order requisition system (home system), implementation of the communication of order requests sent to doctors and pharmacies, involvement of the Pickup and Delivery Service).

Aim 1.3: organizational and technical implementation of the scenario “mobile nursing documentation“ (implementation of a mobile capture component in compliance with data protection and legal principles and standards, integration of the nursing information system with the surgery information system and the patient administration system in the hospital).

Aim 2: Integration of the middleware-based information system architecture to a physical reference environment, taking account of all participating institutions.