

# Task analysis and application services for client relationship management in national level information sharing for social care

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## Abstract

Use of confidential client information in health and social services requires client relationship by legislation. Approaches for verifying this relationship between care provider and client vary between different countries: in some cases, access logs are analyzed and in other cases, access to information is determined based on the existence and proof of client relationship. We present an approach of client relationship management from national project for social services IT in Finland. The approach is based on analysis of client relationship and case management tasks of users and information systems, and use of application services and system roles which support dynamic access management with client relationship as one of key constituents for access to information. The traditional user rights and access management is not the key area of this article.

**Keywords:** access management, social care, SOA, interoperability, client relationship

## Introduction

Client information management in social services is a wide concept for management of client information: the creation, storing, reading, editing and deleting of client information. Security and confidentiality aspects must be considered in all these activities.

Integrated care, the integration of health and social services, is a worldwide trend and it is increasingly pursued [1]. The aim of integrated care is to support information flows between social services and health care and in this manner increase collaboration and integrate the client pathways and care provision [1]. The Finnish legislation for social and healthcare provision includes 41 service areas of responsibility from which 15 include significant cooperation between social care and healthcare [2]. Information exchange within and between health and social service organizations should be supported with electronic patient and client records together with the relevant rights of data access which need to be defined and codified systematically. Among the necessary prerequisites for information sharing are the models of rights to data access which are based on national legislation.

Social services in Finland include 22 service commissions related to social care and social work including Substance abuse care, Child welfare, Income support, Adoption counseling and Services for immigrants, among others. Social services in Finland are currently somewhat separated from health care, but increasing need for integrated care has been stated as central future goal, and political decisions have been made on their integrated organization model. Consequently, national infrastructure in healthcare which has been specified and built for national information exchange has been seen as a useful basis for information sharing also within social services, in addition to interfaces between health and social services.

The national project for social services information technology in Finland (Tikesos, 2008-2011) was a major national effort to promote the use of IT in social services and discover new solutions especially from the social services perspective. The main emphasis of the

project was to improve the compatibility and interoperability of client documentation and information systems, based on the information needs of social services provision. Plans and interoperability specifications were laid out which aim at setting up a national client data repository (KanSa archive) for social services information sharing and long-term preservation [3]. One central part of the project was the specification of necessary access management rules and requirements for both national services and local or regional client information systems (CISs). This part of the Tikesos project created specifications for strong user authentication, authorization and digital signatures, consent management, availability of records based on the legislative rights of professionals, services and key data elements for national level access control, and support for client relationship management to support access control decisions. Most of the infrastructure work was based on work performed for healthcare national infrastructure, but the work was guided by requirements and needs for information services in social services in particular.

In this paper, we describe one part of the access management framework for national-level social services information sharing: the management of client relationships. This relationship must be verified for accessing client information according to the national legislation. The work is based on analysis of processes and tasks related to client record access [6], and specification of application services using a service-oriented approach [7,8] which supports the flexibility of implementation in different organizations and deployment projects.

For the sake of clarity, we must make a clear distinction between the customership and the client relationship. Customership in social services from the viewpoint of client information processing is usually generated when the first information concerning the client is recorded but customership can also start e.g. through an administrative decision. From the case management perspective this new information usually in the form of a client documentation starts a new case or restarts an old case. The term client relationship management should also not be confused with Customer Relationship Management (CRM). Customer relationship management

(CRM) is a system for organizing, automating and synchronizing sales, marketing, customer service, and technical support with current and future customers of a company [4]. Also the term case management relates to the services and the client information processing in this client case. Consequently the term client relationship management relates to the use of client information related to the current case of the client and to the rights of the service provider personnel processing the information of this client. The person accessing or processing client information must have a reason for it (work task based link to the case) and client relationship management will not allow access without this. Hence the client relationship management activates the user rights of a service provider or a professional in a given case.

The basic user rights for a person are granted by the role and responsibilities of the person with methods such as Role-Based Access Control (RBAC) [5]. In this article we will not go into the deeper level of this part of user rights management.

## Materials and methods

According to the national plans and strategies, all social service provider organizations in Finland will be using the national repository for social service client information through their respective systems such as social service CISs or case management systems. Shared platform services for connectivity and different aspects of information sharing and security are part of the architectural blueprint. Information sharing requires consistent specifications for access management to ensure privacy, security, confidentiality and accountability. Unified specifications for both national-level IT services as well as regional or local client information systems are needed for this purpose. The client relationship specifications state requirements and solution guidelines for both of these aspects.

The goal of the client relationship management work in the Tikesos project was to ensure that only those professionals who provide services (or assess the need for services) to the client have access to confidential client

information. Such requirement is stated in general legislation for information protection in Finland, but its enforcement in information systems can be realized in different ways. For this purpose, the activities and processes related to client information management were analyzed. Since national process descriptions for social services [6] do not contain detailed operations for client record access, we used a more detailed level of task description [9] to identify fine-grained information processing tasks which are related to access control decisions. Furthermore, client-specific case management rules of social services provision were considered. Similar analysis and specification methods have been previously used for the specification of service events for healthcare EPR management [10] and citizen-oriented eBooking and healthcare scheduling operations [11]. One of the aims was also to validate the use of these methods in social services. In addition, existing access control models from healthcare [e.g. 12,13,14] as well as a reference architecture work for access control from the SOLEA project [15] were studied and partially used as a basis for the client relationship management solutions.

The goals, requirements and process descriptions related to client record access in social services were analyzed using a four-level approach for process and activity modeling [9]. It includes 1) overview level, 2) process level, 3) activity level and 4) action and tools level. In addition we used document analysis of the following central national specifications related to client information management: 1) requirements and information system specifications of the national client data repository for social services, 2) social service process models [6] and 3) healthcare national EPR archive specifications for care relationship management. This document analysis produced the list of activities and tasks related to the management of client record access management. The initial results from the Tikesos project were refined in a dedicated project in 2012, in parallel with refined case management specifications for social services client record management. The requirements, tasks, activities and proposed solutions were also reviewed by experts from the National Institute for Health and Welfare. The constructive results reported in this paper

include the identification and analysis of tasks in client relationship management, focusing on action and task levels of process modeling [9]. These tasks and other requirements are mapped to functional application services following service-oriented architecture (SOA) specification and design techniques [7, 8]. This approach promotes the flexibility, modularity and reuse of the solutions through the possibility of providing open interfaces to support gradual and incremental migration paths in different settings. SOA approach also promotes system independence by focusing on interfaces between services provided by interrelated systems. In addition to the results reported in this paper, shared concept models, rules and lifecycle, the set of detailed requirements and required information content for client relationship management were specified.

The main requirements for client relationship management included the automation of client relationship inference based on process information. Tens of rules were specified which could be used to automate the access, when there is an active client case being handled by the professional. Client relationship was specified as a key to both information access and creation of new client information. In addition, static organizational and system roles given to the professional, patient consent and legislative rights of a professional acting as an official authority are key elements in access control decisions. While these aspects could be represented using mathematical formulas, the specification work described these aspects using lists and free text for the sake of understandability for the users and developers. In this work, we do not consider details of static user or organizational roles or consent management, but focus on the management and verification of client relationship. This aspect verifies the reasons why a person (professional) is processing information of a given client.

## Results

### *Identification of tasks and operations*

There were ten detailed core tasks or operations which were identified for the client relationship (CR) management in relation to access control. These core tasks were related to ten more generic tasks of information retrieval and viewing by the users which are part of activities in different social care processes. In addition, nine tasks were specified for controlling the client relationship in situations where the organizer of care is acquiring services from an external service provider. All 29 tasks were specified using a structured description template including the primary need, the trigger event, participants, preconditions, description, exceptions, postconditions, inputs, outputs, automation potential and additional information. This analysis provides a reference model to define actors, information and tools used, and constraints applied for each task. Many operations should be automated based on existing information on client processes in client information systems and some operations and tasks require user input. In some operations, both modes may be needed. (Tables 1, 2 and 3)

Rules for CR inference are mostly based on case management and process information related to active cases of a client. In addition, basic CR management and communication operations between systems are among the core operations (see Table 1).

Core operations are related to client information retrieval and viewing tasks which usually are simple client information processing tasks by system users (see Table 2). They rely on functionality which is mainly connected to the use of the national client data repository through local systems. In addition to basic client selection, client case and the client service portfolio (based on service planning) are key "routes" to client information access.

**Table 1.** Core tasks and operations for client relationship management.

Task / operation	Require user input*	Necessary for automation*
1 Infer CR from client process		X
2 Establish CR manually	X	
3 Select and use existing CR	x	X
4 Refresh CR		X
5 Check validity of existing CR		X
6 Use CR for information access		X
7 Discontinue CR	x	X
8 Create CR document		X
9 Send CR document to client data repository		X
10 Check CR document		X

\*Capital X denotes primary options and lowercase x additional options in relation to automation potential.

**Table 2.** Tasks for client information retrieval and viewing.

Task / operation	Require user input*	Necessary for automation*
11 Select a client in CIS	X	
12 View client information	X	
13 List client-specific cases	X	
14 Select a client case	X	x
15 View case information	X	
16 List client-specific service portfolios	X	
17 Select and view client-specific service portfolio	X	
18 List client documents	X	
19 Retrieve an individual client document	X	x
20 View an individual client document	X	x

\*Capital X denotes primary options and lowercase x additional options in relation to automation potential.

Part of the overall solution of client relationship management was also the specification of solutions for situations where the service organizer (e.g. municipality) acquires services from an external party. For this purpose, client-specific contract service relationship certificates (CSR certificates) have been specified for social (and health) services. Such certificates are typically based on contracts between the service organizer and provider and are used for authorizing the client data access through national IT services. They are real-

ized as documents which are created and transmitted between CISs and the national repository service. However the CSR certificates only allow the service provider personnel access or processing rights to the client information in general. The personnel also need role based user rights and the client relationship with the client: the person needs to be responsible of providing services for the client. Tasks and operations related to CSR certificate management are presented in Table 3.

**Table 3.** Tasks and operations for controlling the client relationship in situations where the organizer of care is acquiring services from an external service provider, using client-specific relationship certificates.

Task / operation	Require user input*	Necessary for automation*
21 Create CSR certificate information between organizations	X	
22 Create a client-specific CSR certificate document		X
23 Use CSR certificate to access data		X
24 List CSR certificates	x	X
25 View a CSR certificate	X	
26 Check validity of a CSR certificate		X
27 Change CSR certificate information	X	
28 Discontinue CSR certificate relationship between organizations	X	
29 Discontinue an expired CSR certificate		X

\*Capital X denotes primary options and lowercase x additional options in relation to automation potential.

#### **Assignment of tasks and operations to services**

The list of operations and tasks was used as a basis in specifying application roles and services which are needed to realize client relationship management in client information systems and national IT services. For each operation or task, possible performers or implementations must be specified. We identified and named 18 application roles or services related to client relationship management using a SOA approach. The identified application services or application roles can be positioned in existing CIs, modular IT services on local or regional level, or as part of national services. The detailed specification of tasks and operations supported this specification. In addition, interoperability and interface needs between different components were identified.

Each service was described in a service catalogue which identified the name, description and main scope of operations. Relationships between fine-grained services as well as services previously identified as part of the national solutions [8] were analyzed using matrices.

Specific services include content producers using which professionals record client information and content consumers which are used for viewing or exporting client information. Content consumers use document list and document retrieval services to access information from the national repository. The client process

is controlled by the process layer, case management or the client information system. Client documents (including documents to transfer CR information) are created and transmitted using dedicated services. The national repository stores documents and delivers them along with document lists for consumers. A citizen eView service using which a client can access some documents is implemented in conjunction with the national repository. Specific services are defined for client relationship formation, short and long-term data storage and relationship checking. There are also specific services for client-specific contract relationship management.

Tables 4-6 summarize the identified core tasks and operations in relation to the 18 identified central application services or application roles for client relationship management. For each task or operation, primary service provider or performer ("P") is specified, as well as the primary clients ("c") who initiate the operation and information sources ("s") whose information is required for the operation. Direct dependencies between service providers and consumers, as well as indirect dependencies between information sources and service providers can be analyzed using the matrices such as Table 4. This description also illustrates and helps clarify design decisions between various participating application services.

Description for client information retrieval and viewing services and functions is presented in Table 5.

Table 6 lists functions in relation to services concerning the management of client-specific contract relationship certificates.

**Table 4.** Application services of client relationship management (rows) in relation to core tasks and operations (columns).

Task/operation Service	Infer CR from client process*	Establish CR manually*	Select and use existing CR*	Refresh CR*	Check validity of existing CR*	Use CR for information access*	Discontinue CR*	Create CR document*	Send CR document to client data repository*	Check CR document*
Content producer		s						s		s
Content consumer										
Client administrative process controller	c	c	c		c	c	c	c		
Document composition service	c	c			c					
Document transmission service								c	P	c
Client document repository										s
Repository messaging service								c	P	c
CR formation service	P	P		P				c		
CR document creator				P				P	s	
CR information repository	s	s	P	P	s	s	P	s	s	s
CR checking service				c	P	P	c		c	P
Citizen eView service	s	s								
Document list retrieval service	s	s		s	s					
Document retrieval service	s	s		s	s					
CSR certificate repository	s	s	s							
CSR certificate formation service										
CSR certificate checking										
User (professional)		c	c				c			

\*P primary service provider or performer, c primary client, s information source.

**Table 5.** Application services of client relationship management (rows) in relation to tasks and operations for client information retrieval and viewing (columns).

Task/operation Service	Select a client in CIS*	View client information*	List client-specific cases*	Select a client case*	View case information*	List client-specific service portfolios*	Select and view client-specific service portfolio*	List client documents*	Retrieve an individual client document*	View an individual client document*
Content producer										
Content consumer	P	P	P	P	P	P	P		c	
Client administrative process controller	c		c	c		c		c	c	
Document composition service	c			c						P
Document transmission service										
Client document repository	s				s	s	s	s	s	
Repository messaging service										
CR formation service										
CR document creator										
CR information repository	s	s	s			s		s	s	s
CR checking service	s	s	s			s		s	s	s
Citizen eView service		P					c	s	s	
Document list retrieval service								P		s
Document retrieval service	c	s		s					P	P
CSR certificate repository		s	s		s			s	s	
CSR certificate formation service										
CSR certificate checking								s	s	
User (professional)	c	c	c	c	c	c	c	c	c	c

\*P primary service provider or performer, c primary client, s information source.



**Table 6.** Application services of client relationship management in relation to tasks and operations for client-specific contract relationship certificate (CSR certificate) management.

Application services/ Task/operation	Create CSR certificate information between organizations*	Create a client-specific CSR certificate document*	Use CSR certificate to access data*	List CSR certificates*	View a CSR certificate*	Check validity of a CSR certificate*	Change CSR certificate information*	Change CSR certificate information*	Discontinue CSR certificate relationship between organizations*	Discontinue an expired CSR certificate*
Content producer	s	s						s	s	s
Content consumer								c		
Client administrative process controller			c			c				
Document composition service			c							
Document transmission service										
Client document repository						c				p
Repository messaging service										
CR formation service										
CR document creator										
CR information repository			s	s	s					
CR checking service			s	s	s					
Citizen eView service										
Document list retrieval service										
Document retrieval service										
CSR certificate repository	s	s	s	p	s	s		s	p	p
CSR certificate formation service	p	p						p	p	p
CSR certificate checking service		s	p		p	p				c
User (professional)	c			c	c			c	c	

\*P primary service provider or performer, c primary client, s information source.

### Assignment of services to systems

Once the application services for client relationship management had been identified, they were assigned to a "typical setup" of information systems. It would be possible to implement all services as fine-grained SOA services. However, as many implementations will be based on current and legacy client information systems, basic system setups were needed to guide further de-

velopment of solutions. In addition, specific agreement of interfaces of all services was not a feasible goal, until the most necessary and reusable services would have been agreed upon. Despite this, different possibilities to utilize shared services were also considered. Some services could also be shared between health and social care applications connecting to the national services.

Table 7 depicts grouping and location guidelines of different identified services to typical services and systems which were previously specified as primary system types of the national overall systems architecture. The national client information repository (KanSa) will be the main repository also for client relationship information as well as for CRSs. Validity of the client relationship will be checked for all service requests to the national service. Formation of the client relationship by the national rules is the responsibility of applications connecting to the national service, namely the client information systems, national web user interface for the professionals, service(s) for information access to different stakeholder groups such as external authorities, and case management systems. The client information systems have been specified as primary and the

first use channel of the national repository. The web-based professional user interface was planned but final decisions were not made whether or not it will also include functions for creating client information in addition to viewing. Stakeholder information access has not been prioritized to the first phases of the implementation, but has been identified as a necessary but strictly controlled access mechanism in the future. In addition, generic case management systems, possibly complemented with shared services to support the utilization of the national repository and fulfillment of security requirements, have been stated as a potential usage channel. Web UI and case management systems have been suggested especially for small municipalities, private service providers and for those social services which do not necessarily have dedicated CISs.

**Table 7.** Location of application services in main application types - X - will be supported/implemented in the system, x - will be implemented as local proxy service in the system, o - can be optionally implemented in the system.

Application Service	Client data repository	Client IS	Web UI of Client Data Repository	Stakeholder access service	Case management system
Content producer		X	o		X
Content consumer		X	X	X	X
Client administrative process controller		X	o		X
Document composition service		X	o		
Document transmission service		X			
Client document repository	X				
Repository messaging service	X	o		o	o
CR formation service		X	X	X	X
CR document creator		X	X	X	X
CR information repository	X	x	x	o	x
CR checking service	X	x	x	o	x
Citizen eView service	X				
Document list retrieval service	X	x	x	x	x
Document retrieval service	X	x	x	x	x
CSR certificate repository	X				
CSR certificate formation service		X	o		o
CSR certificate checking service	X	x	o		o

## Discussion

Relationships between various tasks and application services for client relationship management are quite complex. Prevention of unauthorized use without a client relationship requires interplay and interoperability of various systems and services, as well as clear guidance for users and system implementers.

In addition to client relationship management described in this paper, all client information access will also be logged. The information content required by logs is very close to the information content required to communicate and infer the client relationship. Furthermore, the consent management and legislative information access rights of professionals as authorities have a close connection both to the case management and the client relationship management functionalities. Based on the experience from Tikesos project, it is very much necessary to maintain a unified architectural approach across different access control related aspects in national initiatives, including authentication, access control rules and mechanisms, digital signatures, consent management and client relationship. There are alternative options to implement each of these areas, but without coordination incompatibilities are inevitable.

Social services in Finland are currently somewhat separated from health care, but increasing need for integrated care has been stated as central future goal and a political decision for integrated regional organizer bodies for both health and social services has been reached in 2014. Even though social services have many other cooperation partners in addition to healthcare, strategic goals include unified service system for health and social services [16]. The architectural approach presented in this article was specified for social services sector. However, its main features were compatible with mechanisms and services used in national infrastructure for health services, and can be used as basis for verifying the legislative requirements in other domains as well.

The client relationship management solutions will be included in guidelines of national IT service development for social services in Finland. The national infra-

structure development is gradually proceeding from healthcare to social services. However, changes in national specifications are likely, as models for healthcare and scopes of social service IT solutions keep changing. Plans have been published for the introduction of the national client data repository in 2016 and the prerequisites for its introduction are being built into the client information systems gradually and upfront.

After the specifications for social service client relationship management were published on national level, the model for healthcare patient relationship management was changed for national ICT services. Instead of patient relationship certificate documents (use context of information), it was decided that patient relationship management information is communicated using service event documents which were originally designed for managing encounter information (creation context of information). Ensuring the patient relationship was further enforced on local EPR and patient information systems. Similar changes are expected for the national social service client relationship management solutions. Most considerations for necessary tasks and services for the client relationship management seem to remain valid despite the change in implementation mechanism. A detailed assessment of the impacts of this change, however, is beyond the scope of this paper.

## Conclusions

Consistent access control mechanisms are crucial for national information sharing. Client relationship management is one of the most challenging parts of dynamic access control for health and social care. A key success factor is the support for information processing tasks in everyday workflows. These tasks should be supported in such a way which does not hamper user experience but suffices to prevent the unauthorized use of client information. Automation of client relationship management is possible by tying the client relationship management to case management. Even complex access control requirements can be supported by analyzing client information processing acts and tasks and by using a combination of logical level application services which can be implemented in various participating

systems. Similar requirements are common in health and social care information sharing infrastructures. The tasks and operations together with the application services presented in this article provide a generic blueprint for architectural design of client relationship verification infrastructure. This blueprint can be applied in different access control frameworks in addition to the social care context in which it was developed.

Despite their relationship, it is important to note that the case management and the client relationship management are separate aspects of client information management. Case management gives the context to the information processing, and the client relationship management activates the user the rights to access this context.

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