



Security Requirements Document

NetStreaming

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Introduction

This document describes the security requirements for the "NetStreaming" project. It provides a detailed description of: (I) social and organizational model, while capturing security requirements and automated analysis results;

Social and organizational models

This section provides a detailed description of the socio-technical security requirements models from different views (*Social*, *Information*, *Authorization*) and then presents the list of *security requirements* derived from them.

The *Social view* represents stakeholders as intentional and social entities, representing their goals and important information in terms of documents, together with their interactions with other actors to achieve these goals and to exchange information. Stakeholders express constraints over their interactions in terms of *security needs*. The *Information view* represents the informational content of stakeholders' documents, showing how information and documents are interconnected, as well as how they are composed respectively. The *Authorization view* represents which stakeholders own what information, and captures the flow of permissions or prohibitions from one stakeholder to another. The modelling of authorizations expresses other *security needs* related to the way information is to be manipulated.

The section ends with the list of *security requirements* for the system to be expressed in terms of *social commitments*, namely promises with contractual validity stakeholders make to one another. The security requirements are derived automatically once the modelling is done and the designer has captured the security needs expressed by stakeholders. Whenever a security need is expressed over an interaction from one stakeholder to the other, a commitment on the opposite direction is expected from the second stakeholder to satisfy the security need.

Social View

The social view shows the involved stakeholders, which are represented as *roles* and *agents*. Agents refer to actual participants (stakeholders) known when modelling the NetStreaming project, whereas roles are a generalisation (abstraction) of agents. To capture the connection between roles and agents, the *play* relation is used to express the fact that certain agents play certain roles.

Stakeholders have goals to achieve and they make use of different information to achieve these goals. They interact with one another mainly by *delegating goals* and *exchanging information*. Information is represented by means of documents, which actors manipulate to achieve their goals.

Social View Diagram

Figure 1 presents the graphical representation of the social view (a larger picture is shown in appendix A).

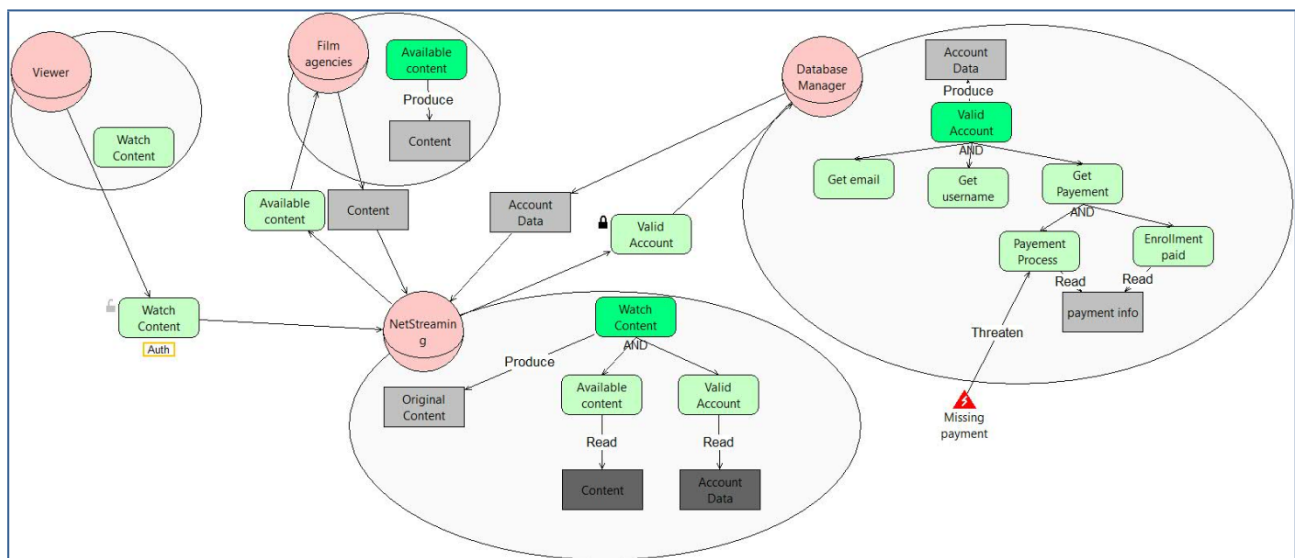


Figure 1 - Social View for the NetStreaming project

Stakeholders

This section describes the stakeholders identified in the NetStreaming project. Stakeholders are represented as roles or agents.

In particular, identified roles are: *Viewer*, *Database Manager*, *Film agencies* and *NetStreaming* (Figure 1). Table 1 summarise the stakeholders.

Role	Description	Mission	Purpose
Viewer	Any people that paid for the enrollement to watch Movies, series or shows.	Watch content from one platform.	Watch content from Netstreaming
Database Manager	Place where all the content and viewer information will be stored.	Keep data secured and intact, to provide content to the website.	Keep the streaming service working to deliver content to it's viewer
Film agencies	Any agencies that owns the right of movies, shows or series.	Provide content to NetStreaming.	Let viewers have a wide variety of content to watch.
NetStreaming	NetStreaming is a video streaming platform that lets viewers have access to a big collection of content such as movies, series or shows.	Provide content to their viewers	Provide high quality and fast content to the viewers.

Table 1 - Roles in the NetStreaming project.

In the NetStreaming project there are no plays relationships taking place for the given agents/roles.

Stakeholders' documents

Stakeholders have documents they possess or exchange with others to achieve their goals. Documents are represented within the rationale of the role/agent (Figure 1).

In the NetStreaming project (Figure 1) we have:

- **Database Manager** has documents *Account Data* and *payment info*.
- **Film agencies** has document *Content*.
- **NetStreaming** has document *Original Content*. Moreover it has document *Content* provided by *Film agencies* and document *Account Data* provided by *Database Manager*.

Table 2 summarises stakeholders' documents for the NetStreaming project.

Agent/Role	Document	Description
Database Manager	Account Data	Data of the viewers
	payment info	Information to see if the user has paid the enrollment fee
Film agencies	Content	Content from film agencies
NetStreaming	Content	Content from film agencies

	Account Data	
	Original Content	Content from NetStreaming

Table 2 - Stakeholders' documents in the NetStreaming project

Stakeholders' documents and goals

Stakeholders' documents are linked to their goals: they read (make) documents to achieve their goals, they modify documents while achieving their goals, and they may produce documents from achieving their goals.

In the NetStreaming project (Figure 1) stakeholders' documents and goals are related as follows:

- **Database Manager** reads document *payment info* to achieve goal *Enrollment paid*, reads document *payment info* to achieve goal *Payment Process* and produces document *Account Data* to achieve goal *Valid Account*.
- **Film agencies** produces document *Content* to achieve goal *Available content*.
- **NetStreaming** reads document *Content* to achieve goal *Available content*, produces document *Original Content* to achieve goal *Watch Content* and reads document *Account Data* to achieve goal *Valid Account*.

Table 3 summarises goal-document relations for all stakeholders in the NetStreaming project.

Agent/Role	Goal	Document	Relation
Database Manager	Enrollment paid	payment info	Read
	Payment Process	payment info	Read
	Valid Account	Account Data	Produce
Film agencies	Available content	Content	Produce
NetStreaming	Available content	Content	Read
	Watch Content	Original Content	Produce
	Valid Account	Account Data	Read

Table 3 - Relation of stakeholders' documents to their goals

Goal Refinement

Stakeholders have goals to achieve. Goals are represented within the rationale (round compartment attached to the role/agent, see Figure 1) of the role/agent representing the stakeholder. They achieve their goals by further refining them into finer-grained goals (subgoals) by means of AND/OR-decompositions. AND-decompositions structurally refine a goal into multiple subgoals (all AND subgoals need to be achieved for the goal to be achieved), while OR-decompositions represent alternative ways for achieving a goal (at least one of the subgoals in the OR-decomposition needs to be achieved for the goal to be achieved).

In the NetStreaming project (Figure 1) we have:

- **Viewer** has to achieve goal *Watch Content*.

- **Database Manager** has to achieve goal *Valid Account*. To achieve *Valid Account*, Database Manager should achieve goal *Get email*, goal *Get username* and goal *Get Payment status* To achieve *Get Payment status*, Database Manager should achieve goal *Payment Process* and goal *Enrollment paid*
- **Film agencies** has to achieve goal *Available content*.
- **NetStreaming** has to achieve goal *Watch Content*. To achieve *Watch Content*, NetStreaming should achieve goal *Valid Account* and goal *Available content*

Table 4 summarises the goals of each agent/role in the NetStreaming project and how they are decomposed, when applicable.

Agent/Role	Goal	Dec. Type	Subgoals
Viewer	Watch Content	-	
Database Manager	Valid Account	AND	Get email
			Get username
			Get Payment status
Film agencies	Available content	-	
NetStreaming	Watch Content	AND	Valid Account
			Available content

Table 4 - Goal Decompositions

Goal Contributions

Goals can contribute one to another. A contribution identifies the impact the fulfilment of one goal has on the fulfilment of another goal. This impact can be either positive or negative, and is represented with "++" and "--" respectively. Positive contribution means that the achievement of a goal also achieves the other goal. Negative contribution means that the achievement of a goal inhibits the achievement of another goal.

In the NetStreaming project there are no contribution relations taking place for the given agents/roles.

Stakeholders Interactions

This section describes stakeholders' interactions, providing insights on whom they interact with to fulfil their desired objectives, as well as which are the stakeholders that rely on them to fulfil their respective goals. This kind of interaction is carried out by means of *goal delegations*.

To achieve their goals stakeholders might need specific information. If they do not possess this information, they may ask other stakeholders to provide them documents. *Document transmission* is used to capture this interaction.

Goal Delegations

Stakeholders interact with others to achieve some of their goals by means of goal delegations. Goal delegations are graphically represented as a relation that starts from a delegator actor to a delegatee actor (following the direction of the arrow), having a rounded corner rectangle representing the goal being delegated. Security needs are graphically specified as labels that appear below the delegated goal (Figure 1).

The following description enlists all the delegations from one role/agent to the others. When applicable, security needs expressed over the delegations are enumerated.

In the NetStreaming project (Figure 1), we have the following goal delegations:

- **Viewer** delegates goal *Watch Content* to **NetStreaming**.
The following security needs apply to this delegation:
Authentication: delegatee.
- **NetStreaming** delegates goal *Available content* to **Film agencies**.
- **NetStreaming** delegates goal *Valid Account* to **Database Manager**.
The following security needs apply to this delegation:
Availability: 100.0 and Trustworthiness.

Table 5 summarises *goal delegations*, together with the eventual *security needs* when applicable, and eventual description respectively.

Delegator	Goal	Delegatee	Security Needs	Delegation Description
Viewer	Watch Content	NetStreaming	Authentication: delegatee	
NetStreaming	Available content	Film agencies		
	Valid Account	Database Manager	Availability: 100.0 Trustworthiness	

Table 5 - Goal Delegations and Security Needs

Document Transmission

Stakeholders exchange information by means of documents with other stakeholders. The following description enlists all the transmission from one role/agent representing the stakeholder, to other roles/agents. *Document transmission* is represented as an arrow from the transmitter to the receiver, with a rectangle representing the document. The security needs expressed over the transmission are described, if applicable. Security needs are specified with the help of labels that appear below the document being transmitted.

In the NetStreaming project (Figure 1), we have the following *document transmissions*:

- **Database Manager** transmit document *Account Data* to **NetStreaming**.
- **Film agencies** transmit document *Content* to **NetStreaming**.

Table 6 summarises the *document transmissions* for the NetStreaming project.

Transmitter	Document	Receiver	Security Needs	Transmission Descr.
Database Manager	Account Data	NetStreaming		
Film agencies	Content	NetStreaming		Content from film agencies

Table 6 - Document Transmissions and Security Needs

Organisational Constraints

Apart from the security needs actors specify over their interactions, there are others, which are dictated either by the organisation, business rules and regulations, or law. In this section we enlist these constraints, together with the security requirements derived from them. Currently, the language supports these organisational constraints: *Separation of Duties (SoD)* and *Binding of Duties (BoD)*. Graphically we represent these constraints using a similar notation to that used in workflows, as a circle with the *unequal* sign within and as a circle with the *equals* sign within, respectively. The relations are symmetric, and as such they do not have any arrows pointed to the concepts they relate (being these roles or goals).

In the NetStreaming project there are no organisational constraints specified.

Events

Table 7 represents all the events modeled in the project NetStreaming together with the set of elements each event threatens. Additionally, for each reported event a textual description is provided.

Event name	Threatened elements	Description
Missing payment	Goal: Payment Process	

Table 7 - Events

Information View

The information view gives a structured representation of the information and documents in the NetStreaming project. It shows what is the informational content of the documents represented in the social view. Information is represented by one or more documents (*tangible by*), and the same document can make tangible multiple information entities. Moreover, the information view considers composite documents (information) capturing these by means of *part of* relations.

Information View Diagram

Figure 2 presents the graphical representation of the information view (a larger picture is shown in appendix A).

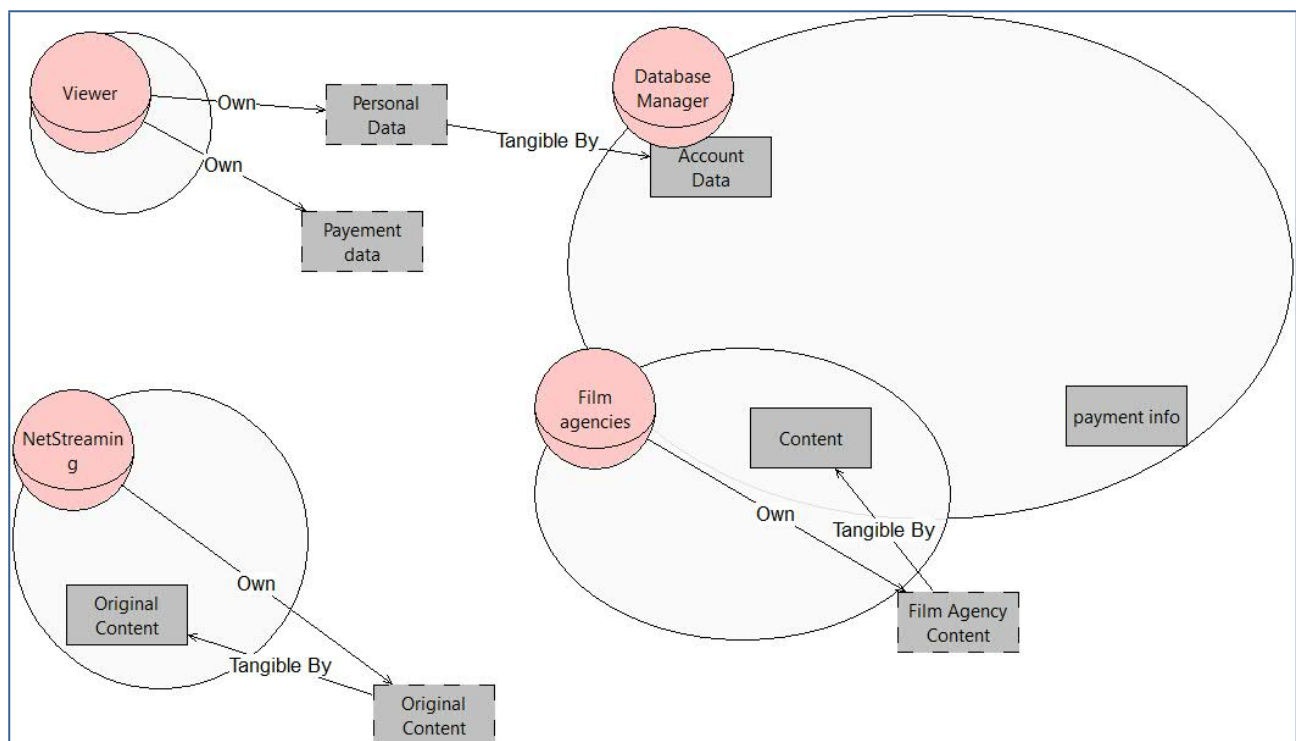


Figure 2 - Information View for the NetStreaming project

Modelling Ownership

The information view represents also who are the *owners* of the information that is being manipulated through the documents that represent them in the social view.

The owners for the different information in the NetStreaming project are summarised in Table 8.

Agent/Role	Information	Description
Viewer	Personal Data	
	Payment data	
Film agencies	Film Agency Content	
NetStreaming	Original Content	Made from NetStreaming

Table 8 - Information owners

Representation of Information

Information is represented (*made tangible by*) by documents, which stakeholders have and exchange.

The documents stakeholders in the NetStreaming project (Figure 2) have and exchange with one another contain the information as summarised in Table 9:

Information	Document	Description
Film Agency Content	Content	
Original Content	Original Content	
Personal Data	Account Data	

Table 9 - Representation of Information through Documents

Structure of Information and Documents

Documents (information) are composed of other documents (information). Composition of documents (information) is captured through *part of* relations. This gives us an idea of how information and/or documents in the NetStreaming project are structured.

In the NetStreaming project there are no composite documents or information.

Authorization View

The authorization view shows the permissions or prohibitions flow from a stakeholder to another, that is, the authorizations stakeholders grant or deny to others about information, specifying the operations the others can and must perform over the information. Apart from granting authority on performing operations, a higher authority can be granted, that of further authorising other actors (i.e. authorization transferability)

Authorizations start from the information owner. Therefore, in the authorization view, ownership is preserved and inherited from the information view.

Authorization View Diagram

Figure 3 presents the graphical representation of the Authorization view.

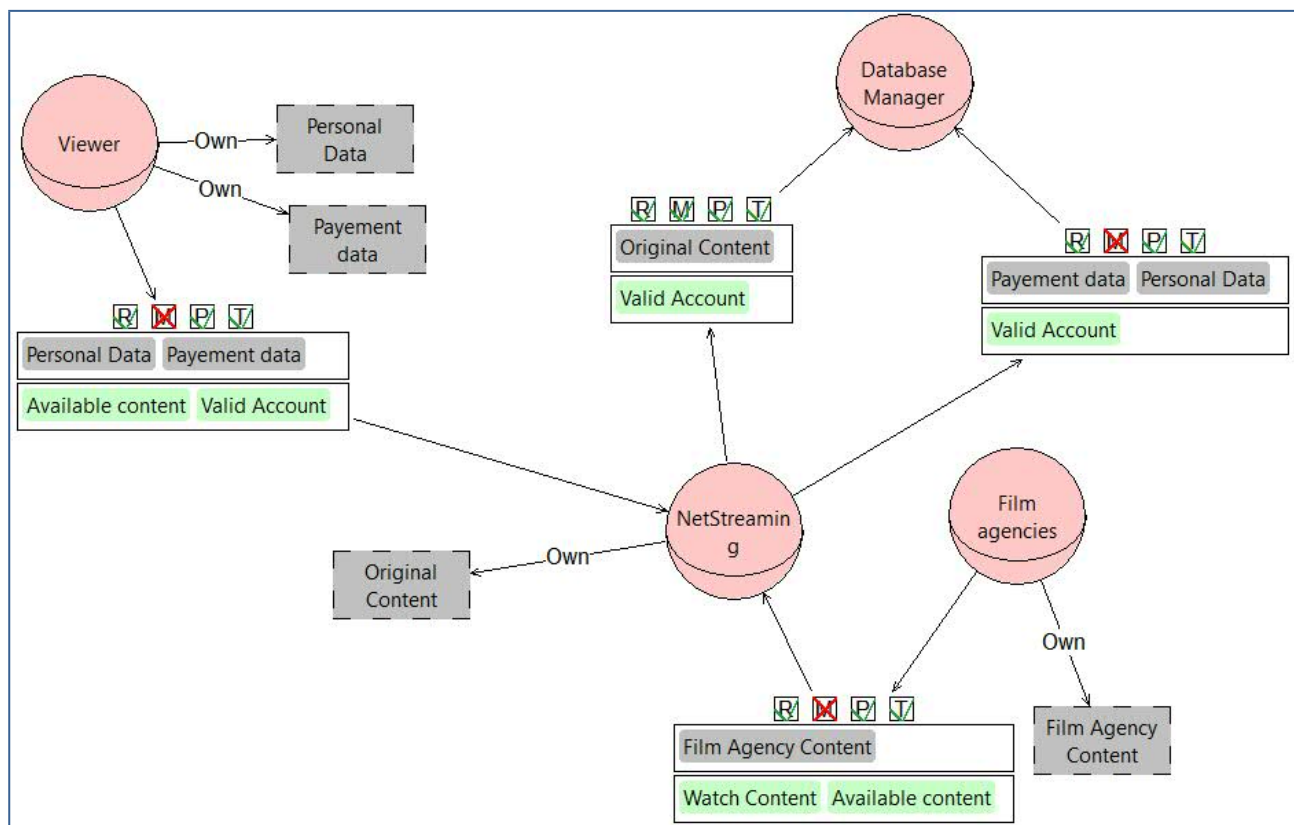


Figure 3 - Authorization View for the NetStreaming project

Authorization Flow

In this section are described for each role/agent, the authorizations it passes to others and what authorizations it receives from other roles/agents. In the NetStreaming project (Figure 3) the authorizations for each role/agent are:

- **Role Viewer:**
 - **Viewer** authorises *NetStreaming* to *read, produce and transmit* and prohibits to *modify* information *Personal Data* and *Payment data*, in the scope of goals *Available content* and *Valid Account*, passing the right to further authorising other actors.
- **Role Database Manager:**
 - **Database Manager** is authorised by *Database Manager* to *read, modify, produce and transmit* information *Original Content*, in the scope of goal *Valid Account*, having the right to further authorising other actors, and is authorised by *Database Manager* to *read, produce and transmit* and prohibits to *modify* information *Payment data* and *Personal Data*, in the scope of goal *Valid Account*, having the right to further authorising other actors.
- **Role Film agencies:**
 - **Film agencies** authorises *NetStreaming* to *read, produce and transmit* and prohibits to *modify* information *Film Agency Content*, in the scope of goals *Watch Content* and *Available content*, passing the right to further authorising other actors.
- **Role NetStreaming:**
 - **NetStreaming** authorises *Database Manager* to *read, modify, produce and transmit* information *Original Content*, in the scope of goal *Valid Account*, passing the right to further authorising other actors, and authorises *Database Manager* to *read, produce and transmit* and prohibits to *modify* information *Payment data* and *Personal Data*, in the scope of goal *Valid Account*, passing the right to further authorising other actorsss.
 - **NetStreaming** is authorised by *NetStreaming* to *read, produce and transmit* and prohibited to *modify* information *Personal Data* and *Payment data*, in the scope of goal *Available content* and *Valid Account*, having the right to further authorising other actors, and is authorised by *NetStreaming* to *read, produce and transmit* and prohibited to *modify* information *Film Agency Content*, in the scope of goal *Watch Content* and *Available content*, having the right to further authorising other actors.

Security Requirements

This section provides the list of security requirements derived for the NetStreaming project.

The list of security requirements shows the roles/agents that are *responsible* to satisfy them, so that stakeholders know what they have to bring about in order to satisfy the corresponding security needs. Security requirements also include the authorizations granted by stakeholders to other stakeholders.

Security needs are expressed mainly over goal delegations, document provisions and authorizations. Therefore, the list of security requirements is derived from every type of security need. Moreover, the organisational constraints specify further *needs* over roles and goal, leading to the generation of other security requirements.

Finally, the *requester* actors are represented to capture the actors requiring certain security needs to be brought about.

The security requirements for the NetStreaming project (Table 10) are:

- **Viewer** requires *NetStreaming delegatee-authentication* , when delegating *Watch Content* to *NetStreaming*.
- **Viewer** requires *NetStreaming* the *non-modification* of information *Personal Data* and *Payment data*, and *need-to-know* of these pieces of informations for the goals *Available content* and *Valid Account*, when authorising *NetStreaming* to *read, produce* and *distribute* *Personal Data* and *Payment data* in the scope of goals *Available content* and *Valid Account*.
- **Film agencies** requires *NetStreaming* the *non-modification* of information *Film Agency Content*, and *need-to-know* of these pieces of information for the goals *Watch Content* and *Available content*, when authorising *NetStreaming* to *read, produce* and *distribute* *Film Agency Content* in the scope of goals *Watch Content* and *Available content*.
- **NetStreaming** requires *Database Manager* an *availability* level of 100.0% and *trustworthiness*, when delegating *Valid Account* to *Database Manager*.
- **NetStreaming** requires *Database Manager* the *non-modification* of information *Payment data* and *Personal Data*, and *need-to-know* of these pieces of informations for the goal *Valid Account*, when authorising *Database Manager* to *read, produce* and *distribute* *Payment data* and *Personal Data* in the scope of goal *Valid Account*.

Responsible	Security Requirement	Requester	Description
Database Manager	availability (Valid Account,100.0%)	NetStreaming	NetStreaming require Database Manager to assure an availability level of 100.0% for goal Valid Account.
	need-to-know (Original Content) (Valid Account)	NetStreaming	NetStreaming requires Database Manager need-to-know of Information Original Content, in the scope of goal Valid Account.
	non-modification (Payment data,Personal	NetStreaming	NetStreaming requires Database Manager non-

NetStreaming	Data)		modification of Information Payment data and Personal Data.
	need-to-know (Payment data,Personal Data) (Valid Account)	NetStreaming	NetStreaming requires Database Manager need-to- know of Information Payment data and Personal Data, in the scope of goal Valid Account.
	delegatee-authentication (delegated(Viewer,NetStr eaming,Watch Content))	Viewer	Viewer require NetStreaming to authenticate in order to achieve goal Watch Content.
	trustworthiness (Database Manager, delegated(NetStreaming, Database Manager,Valid Account))	NetStreaming	Database Manager shall provide proof of trustworthiness for NetStreaming to delegate him goal Valid Account.
	non-modification (Personal Data,Payment data)	Viewer	Viewer requires NetStreaming non- modification of Information Personal Data and Payment data.
	need-to-know (Personal Data,Payment data) (Available content,Valid Account)	Viewer	Viewer requires NetStreaming need-to-know of Information Personal Data and Payment data, in the scope of goal Available content and Valid Account.
	non-modification (Film Agency Content)	Film agencies	Film agencies requires NetStreaming non- modification of Information Film Agency Content.
	need-to-know (Film Agency Content) (Watch Content,Available content)	Film agencies	Film agencies requires NetStreaming need-to-know of Information Film Agency Content, in the scope of goal Watch Content and Available content.

Table 10 - Security Requirements for the NetStreaming Project

Table 11 summarises the authorizations actors in the NetStreaming project grant to one another.

Authorisor Information		Goal	Allowed Operations	Denied Operations	Authorisee	Description
Viewer	Personal Data Payment data	Available content Valid Account	R, P, T	M	NetStreamin g	Transferable authority
Film agencies	Film Agency Content	Watch Content Available content	R, P, T	M	NetStreamin g	Transferable authority



NetStreaming	Original Content	Valid Account	R, M, P, T		Database Manager	Transferable authority
	Payment data Personal Data	Valid Account	R, P, T	M	Database Manager	Transferable authority

Table 11 - Authorizations in the NetStreaming project

Well-formedness Analysis

The purpose of well-formedness analysis is to verify whether the diagram for the project NetStreaming is consistent and valid. A diagram is considered to be consistent if its constituent elements (concepts and relationships) are drawn and interconnected following the semantics of the modelling language (STS-ml in our case). Thus, well-formedness analysis performs post checks to verify compliance with STS-ml semantics for all checks that cannot be performed live over the models.

More details about the performed checks and their purpose can be found in Appendix B.

The Well-formedness Analysis analysis for NetStreaming project didn't find any errors.

Security Analysis

The purpose of security analysis is to verify whether the diagram for the project NetStreaming allows the satisfaction of the specified security needs or not. As a result, for all security needs expressed by stakeholders, it checks in the model whether there is any possibility for the security need to be violated. This analysis takes into account the semantics of STS-ml, defining the behaviour of the different elements represented in the models. The elements' behaviour is defined by propagation rules that consider what concepts and what relationships the specification of a given security need affects. Datalog is used to define the semantics of STS-ml to express facts (things always hold) and rules.

You can find more details about the performed checks in Appendix C.

The Security Analysis analysis for NetStreaming project didn't find any errors.

Appendix A

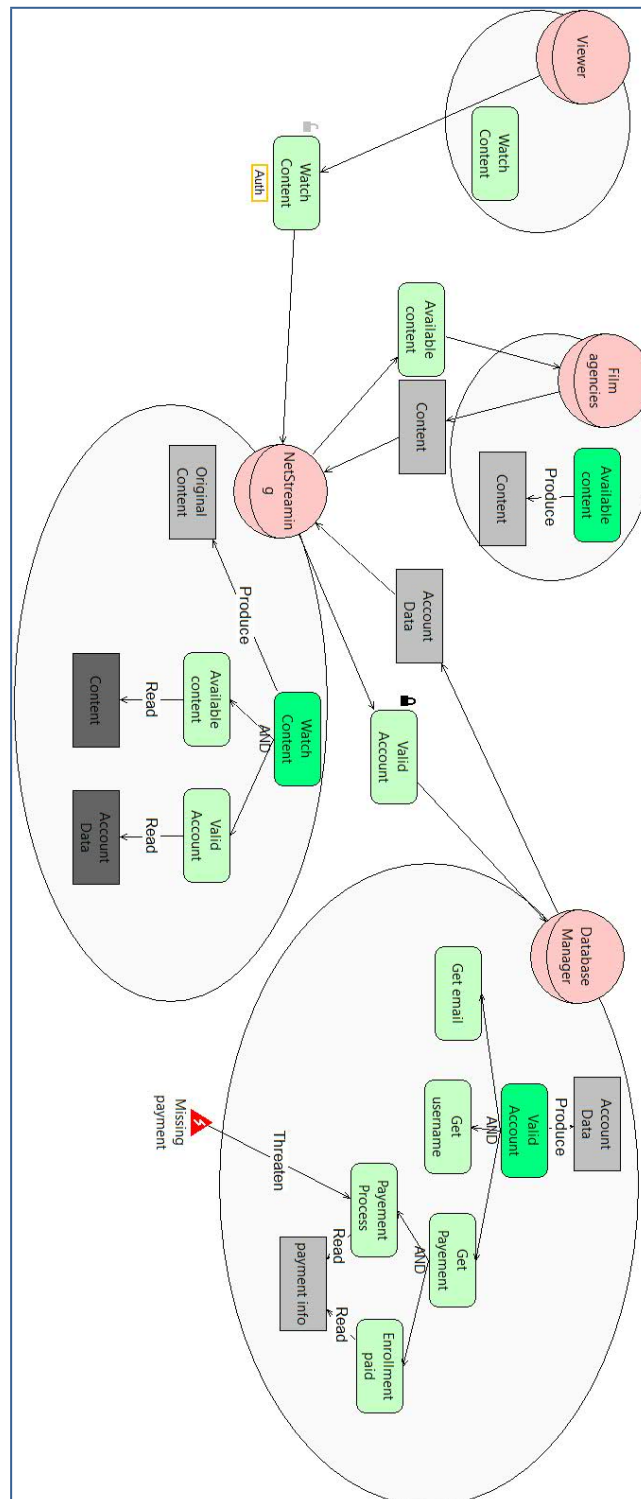


Figure 1 - Social View for the NetStreaming project

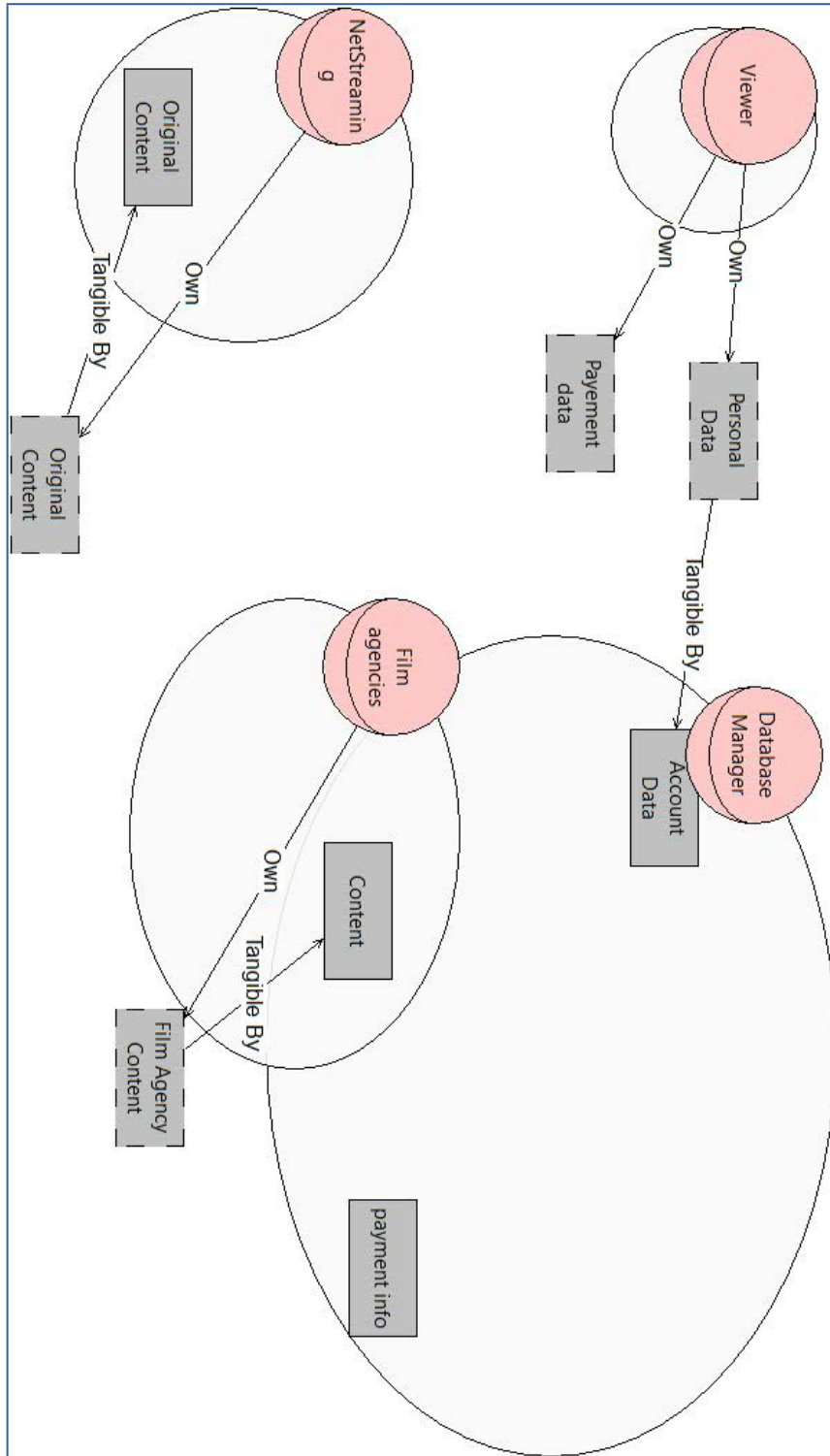


Figure 2 - Information View for the NetStreaming project

Appendix B

Details of Well-formedness analysis:

- **Empty Diagram**

This check verifies whether the given diagram is empty or not. If that is the case, then no other well-formedness checks are performed. If the diagram is not empty, the well-formedness analysis returns: "No errors found" and continues performing the rest of the well-formedness checks.

- **Goal Single Decomposition**

This check verifies the consistency of goal decompositions. Following the semantics of STS-ml a given goal is decomposed in two or more subgoals. As a result, the decomposition should specify at least two subgoals. Therefore, goal single decomposition verifies whether there are cases of decompositions to a single subgoal.

- **Delegation Child Cycle**

This check verifies the consistency of goal delegations, so that no cycles or loops are identified as a result of the delegatee decomposing the delegatum (delegated goal) and re-delegating back one of the subgoals. Delegation child cycle verifies exactly this and gives a warning in case of inconsistency.

- **Delegated Goal Part Of a Decomposition**

This check verifies that all goals (in the delegatee's scope) that have been delegated are not child (subgoals) in the decomposition.

- **Inconsistent Contribution Cycle**

This check verifies whether there are loops of positive or negative contribution relationships, and whether this loop contains contradictory relationships. If such a loop is identified, the well-formedness analysis returns a warning.

- **Negative Contributions Between AND Subgoals**

This check verifies that there are no negative contribution relationships between and-subgoals of a given goal (within an actor's scope). It returns a warning if such a case is identified.

- **Documents PartOf Cycle**

This check verifies whether there is a loop or cycle of Part Of relationships starting from and ending to a given document. If a case like this is verified, a warning is returned enumerating the documents that form the cycle.

- **Informations PartOf Cycle**

This check verifies whether there is a loop or cycle of Part Of relationships starting from and ending to a given document. If a case like this is verified, a warning is returned enumerating the documents that form the cycle.

- **Information No Ownership**

This check verifies that all information have an owner. If there are cases of information without any ownership relationships from any actor in the diagram, the well-formedness analysis returns a warning.

- **Authorizations Validity**

This check verifies that all authorization relationship between two given actors are valid. An authorization relationship specifies authorizations or permissions an actor grants to another on some information, to perform some allowed operations. The authorizations could be limited to a goal scope and they can be re-delegated or not. However, the first two attributes should be specified for an authorization relationship to be valid. If there are no information specified, the well-formedness analysis returns an error. The same applies to the cases, in which no allowed operations are specified.

- **Duplicate Authorizations**

This check verifies that there are no duplicate authorization relationships, that could be merged. There are several cases that are addressed by this check: (i) we encounter two identical authorization, i.e., between the same roles, in the same direction, for the same set of information, allowed operations and goals, and having the same value of transferability; (ii) identify authorization relationships between the same roles, in the same direction, in which one grants permissions that are subset of the other authorization's relationship.

Appendix C

Details of security analysis:

- **No_Delegation Violation check**

This violation is verified whenever a delegatee actor further delegates a goal, over the delegation of which a no-delegation security need is specified from the delegator actor. No-delegation is specified over a goal delegation by the delegator, who requires the delegatee not to further delegate the delegated goal. Therefore, to check for any violations of no-delegation, the analysis searches for redelegations of the delegatum (delegated goal) or any of its subgoals.

- **Redundancy Violation check**

This check verifies if redundancy is satisfied by controlling that single actor redundancy or multi actor redundancy are not violated. At design time we cannot make the distinction between fallback and true redundancy, so they cannot be verified at this stage. Therefore, both fallback redundancy single and true redundancy single are mapped to single actor redundancy. Similarly for multi actor redundancy. The analysis verifies a redundancy violation if one of the following occurs: (1) actor does not decompose the delegated goal in any or-subgoals, for which both types of redundancy are violated (2) actor decomposes the goal into or-subgoals and delegates one to another actor when single actor redundancy has been specified, for which this type of redundancy is violated (3) actor decomposes the goal into or-subgoals, but does not delegate any of the subgoals to another actor when multi actor redundancy has been specified, for which this type of redundancy is violated.

- **Authorization Conflict check**

This task identifies a conflict of authorization whenever at least two authorization relationships for the same information are drawn towards the same actor from two illegible actors (being the owner of information or another authorised actor) such that: (1) one limits the authorization to a goal scope (requiring a need-to-know security need) and the other does not (authorising the actor without any limitations) (2) for the same goals or intersecting goal scopes, different permissions are granted in terms of operations or authority to transfer authorisation. That is, one passes the actor the authority to perform operations (use, modify, produce, distribute) on a given information, and the other does not (requiring non-usage, non-modification, non-production, non-disclosure); one passes the actor the authority to further transfer authorizations and the other requires no further authorizations take place.

- **Non_Reading Violation**

This violation is detected whenever an actor discloses information without having the right to distribute it. Non-disclosure expresses the need of not disclosing or further distributing the given information to other actors, apart from the authoriser. Thus, authority to distribute the information is not passed. The way actors exchange information is through document provision. In order to disclose some information, an actor would have to provide to others the document(s) containing that information. Hence, to verify if there are any unauthorized disclosures of information, the analysis checks for provisions of documents representing the given information from any unauthorized actors towards other actors.

- **Non_Modification Violation**

This violation is detected whenever an actor modifies information without having the right to modify it. Non-modification expresses the need that information should not be changed (modified), i.e. authority to modify the information is not granted. To verify if there could be any violations of non-modification, the analysis looks if the authorisee (or an actor that is not authorised by authorised party) modifies the given information. For this, it searches for modify relationships from any goal of this actor to any document representing the given information.

- **Non_Production Violation**

This violation is detected whenever an actor produces information without having the right to produce it. Non-production expresses the need that information should not be produced in any form, i.e. authority to produce the information is not granted. To verify if there could be any violations of non-production, the analysis checks whether if the authorisee (or an actor that is not authorised by authorised party) produces the given information. For this, it searches for produce relationships from any goal of this actor to any document representing the given information.

- **Non_Disclosure Violation**

This violation is detected whenever an actor discloses information without having the right to distribute it. Non-disclosure expresses the need of not disclosing or further distributing the given information to other actors, apart from the authoriser. Thus, authority to distribute the information is not passed. The way actors exchange information is through document provision. In order to disclose some information, an actor would have to provide to others the document(s) containing that information. Hence, to verify if there are any unauthorized disclosures of information, the analysis checks for provisions of documents representing the given information from any unauthorized actors towards other actors.

- **NTK Violation**

This violation is detected whenever an actor uses, modifies or produces information for other purposes (goal achievement) than the ones for which it is authorized. Need-to-know requires that the information is used, modified, or produced in the scope of the goals specified in the authorization. This security need concerns confidential information, which should not be utilised for any other purposes other than the intended ones. To verify if there could be any violations of need-to-know, security analysis checks if the authorisee (or an actor that is not authorised by any authorised party) uses, modifies or produces the given information while achieving some goal different from the one it is authorised for. In a nutshell, it searches for need, modify, or produce relationships starting from goals different from the specified ones towards documents representing the given information.

- **Explicit non-reauthorization**

Verifies whether a given actor transfer rights to others even when it does not have the authority to further delegate rights.

- **Non-reauthorization Violation: read**

Verifies whether a given actors transfer to other actors the right to use a given information, without having itself the right to do so.

- **Non-reauthorization Violation: modify**

Verifies whether a given actors transfer to other actors the right to modify a given information, without having itself the right to do so.

- **Non-reauthorization Violation: produce**

Verifies whether a given actors transfer to other actors the right to modify a given information, without having itself the right to do so.

- **Non-reauthorization Violation: transmit**

Verifies whether a given actors transfer to other actors the right to distribute a given information, without having itself the right to do so.

- **Sod Goal Violation**

This violation is detected whenever a single actor may perform both goals, between which an SoD constraint is expressed. Goal-based SoD requires that there is no actor performing both goals among which SoD is specified. To perform this verification, the analysis checks that the final performer of the given goals is not the same actor.

- **Bod Goal Violation**

This violation is detected whenever a single actor may perform both goals, between which an SoD constraint is expressed. Goal-based SoD requires that there is no actor performing both goals among which SoD is specified. To perform this verification, the analysis checks that the final performer of the given goals is not the same actor.

- **Agent Play Sod**

This check verifies the consistency of the Separation of Duty (SoD) constraint between roles. This constraint requires that two roles are not played by the same agent, therefore the check verifies whether there is one agent playing both roles. If that is the case an error is identified, otherwise the check finds no errors.

- **Agent Not Play Bod**

This check verifies the consistency of the Binding of Duty (BoD) constraint between roles. This constraint requires that two roles are played by the same agent, therefore the check verifies whether there is one agent playing both roles. If that is the case the check finds no errors, otherwise an error is identified.

- **Organizational Constraint Consistency**

This check verifies that no conflicting organisational constraints (SoD or BoD) between goals are specified.