

D6.7: Recommender System Second Prototype: Software documentation

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Live Staging of Media Events – LIVE

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History

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V0.1	Janez Zaletelj	2008-04-12	Draft structure of the deliverable, first tasks
V0.2	JZ, TP, TM	2008-05-06	Inputs integrated.
V0.3	Marko Meža, Mladen Savić	2008-06-14	Feedback App. description
V0.4	Marko Meža	2008-08-28	Description of recommender services
V0.5	Mladen Savić	2008-09-08	Final user guide for the Feedback app.
V0.6	Marko Tkalčič	2008-09-18	Description recommender app.
V0.7	Janez Zaletelj	2008-09-22	Introduction, Summary, editing
V0.8	Janez Zaletelj	2008-09-30	Draft final version for QA
V0.9	Marko Meza	2008-10-10	Final version after QA

1 Executive Summary

This document serves as an introduction and the user manual of the Recommender System Second Prototype, which is a software component developed within the WP6. The goal of this document is to give an introduction to the second prototype of the Recommender System including its requirements and history, and to give an interested reader an explanation on how to set up and use software components of the Recommender System Second Prototype.

The Second Prototype of the Recommender System is the result of the work carried out within the WP6, Personalization and Feedback. This prototype represents an evolution of the Recommender system developed within the Period 1 of the project, which was delivered as a demonstrator in D6.2 “First prototype of the Recommender System”. The results of user evaluations of the First Prototype and new requirements for the further development were presented in D9.4 “Revised Requirements Analysis”, which served as an input for development of the specification of the Second Prototype. The final specification of the Second Prototype which includes functionalities and system architecture was delivered as D6.4 “Specification of LIVE Recommender system”. This deliverable was serving as a specification for the implementation of the Second prototype software components.

This document includes the following content:

- Section 2 gives an overview of the contents and scope of this deliverable, and relation to other deliverables of the LIVE project.
- Section 3 presents an introduction to the Recommender System, its role within the staging process, and its deployment within overall LIVE Staging system.
- Section 4 gives an overview of the setup of the Recommender system and the prerequisites to use it.
- Section 5 gives an overview of the services which are provided by the Recommender system, and gives instructions on how to start and use them.
- Section 6 presents an introduction to the Feedback Application, which is one of the software components of the Recommender system Second Prototype. It serves as a user manual and it explains the user interface and gives examples on how to efficiently use the Feedback Application in the live production environment.
- Section 7 presents an introduction and user manual of the Recommender Application, which is the second user application of the Recommender system.

2 Introduction

The integrated project “LIVE Staging of Media Events” (LIVE; FP6-27312) aims to create novel content production methods and tools for interactive digital broadcasters to help them to stage live media events such as the 2008 Olympic Games.

To enable staging of live media events, appropriate tools have been developed within the project. The tools developed within the LIVE project (LIVE Production Support System) will support production of novel interactive and personalised digital TV content. In order to achieve this goal, personalised content selection methods and tools need to be developed for the production and users of the system need to be appropriately modelled. The Recommender System is one of the LIVE subsystems which enables personalised content selection, user modelling and consumer feedback observation.

During the Phase 1 (M1-M18) of the project, First prototype of the Recommender system was developed and delivered as a demonstrator within deliverable D6.2. A new cycle of development started with user evaluations of the First prototype, which are described in D9.4 “Revised Requirements Analysis”. This document was a basis for the development of the specification of the second version of the Recommender system, which is described within deliverable D6.4 “Specification of LIVE Recommender system”. The D6.4 served as a specification for the implementation of the Recommender System Second Prototype software components.

In the remainder of this document, the software documentation of the Recommender System Second Prototype is given. The goal of this document is also to serve as an user manual for the applications which are part of the Recommender System Second Prototype.

Scope of the document

In the remainder of this document, the software documentation of the Recommender System Second Prototype is given. The goal of this document is also to serve as an user manual for the applications which are part of the Recommender System Second Prototype.

- Section 3 presents an introduction to the Recommender System, its role within the staging process, and its deployment within overall LIVE Staging system.
- Section 4 gives an overview of the installation and setup of the Recommender system and the prerequisites to use it.
- Section 5 gives an overview of the services which are provided by the Recommender system, and gives instructions on how to start and use them.
- Section 6 presents an introduction to the Feedback Application, which is one of the software components of the Recommender system Second Prototype. It serves as an user manual, it explains the user interface and gives examples on how to efficiently use Feedback Application in the live production environment.
- Section 7 presents an user manual of the Recommender Application, which is second user application of the Recommender system.

Relation to other deliverables

This document is based on the developments which were presented in the following reports:

- D6.2 “First prototype of the Recommender System” is a demonstrator of the first prototype of Recommender System and its GUIs.
- D6.3 “Report on Content Selection Methods” describes the content selection and personalization methods. These methods are partly implemented within the Second Prototype.
- D9.4 “Revised Requirements Analysis” presents results of user evaluations of the First Prototype and new requirements for the further development of the recommender system.
- D7.5 “Extended Specification of the Intelligent Media Framework” provides the description of middleware services provided by the Intelligent Media Framework. These services and data models are used by the Recommender System Second Prototype.
- D9.5 “Revised system architecture” provides overall specification of the system architecture, workflows and functionalities of the LIVE Staging support system. A part of these functions and workflows are implemented within Recommender system Second Prototype.
- D6.4 “Specification of LIVE Recommender system” was serving as a specification of the system architecture, services and applications for the implementation of the Second Prototype software components.

This document is also related to the following deliverables, which will provide further details on the topics presented in this document:

- D6.7 “Archive content recommendations for personalised TV production” will describe in detail the content search, contextualisation and personalisation algorithms implemented and tested within the Second Prototype.
- D6.8 “Feedback collection, analysis and interpretation” will describe algorithms for analysing consumer feedback, presentation of analysis results, and interpretation of these results within live TV production.

3 Recommender System Second Prototype Overview

This chapter gives a high level overview on the roles of the Recommender System within the LIVE system. This view should help to better understand the context of the following chapters giving more specific information about system functionalities, system architecture, services and their interfaces.

3.1.1 Roles of Recommender System within LIVE staging process

Main roles of the Recommender System within LIVE system are the following:

Support of the LIVE production by providing content recommendations to the Video conductor

The main role of the Recommender System is to support new conducting workflows of the LIVE Video conducting system by providing automatic recommendations of content suitable to be included in the program. The Recommender System implements automatic methods to find and recommend archive content, which will be used to help the Video Conductor in finding the related audio-visual content from the archives, and will enable him to react to live events. Because of the huge amounts of AV material available in the TV archives, the content selection and finding functionalities of the Recommender System can be also successfully employed during the program preparation phase, where the editor would get automatic recommendations of archive content for the given subject.

The Recommender Application software component is providing the fore-mentioned functionalities to the editor and his team. The Recommender Application is described in details within Section 7 of this document.

Collection, analysis and presentation of the Consumer feedback

The Recommender System is the system component through which information links to the Consumer systems are established. The Consumer System is represented by the application running on the consumer's set-top box or other end device, which is connected to Recommender system through suitable communication channel (also called the Feedback Channel).

The availability of consumer feedback information is one of the central requirements to the LIVE system. The collection of consumer feedback is one of the roles of the Recommender System. The feedback from each Consumer will be collected, stored and analysed by the Recommender System services.

Analysis of the feedback will provide two kinds of information. First, the analysis of the feedback from the single consumer will be performed, which will result in a detailed user model of the Consumer. This information will enable personalized services for the consumer.

The second goal of the analysis is to calculate statistical information on the whole TV audience, which will be available to the Video conductor. Feedback from many (or all) of the TV consumers will be taken into account to derive statistical information on the audience. The

software components which provide storage and analysis of consumer feedback are described within chapter 5.

A Feedback Application was developed, so that the Video conductor is able to setup feedback analysis parameters and to review the aggregated statistical information on his audience. Different feedback modalities such as voting results and rating results are shown. The Feedback Application is presented in more details in chapter 6.

3.1.2 Deployment of Recommender System within LIVE Staging Support System

The Recommender System requires supporting services and data models to perform its functions. It is implemented as a set of components within LIVE production support system. The components use other components and services of the LIVE production support system.

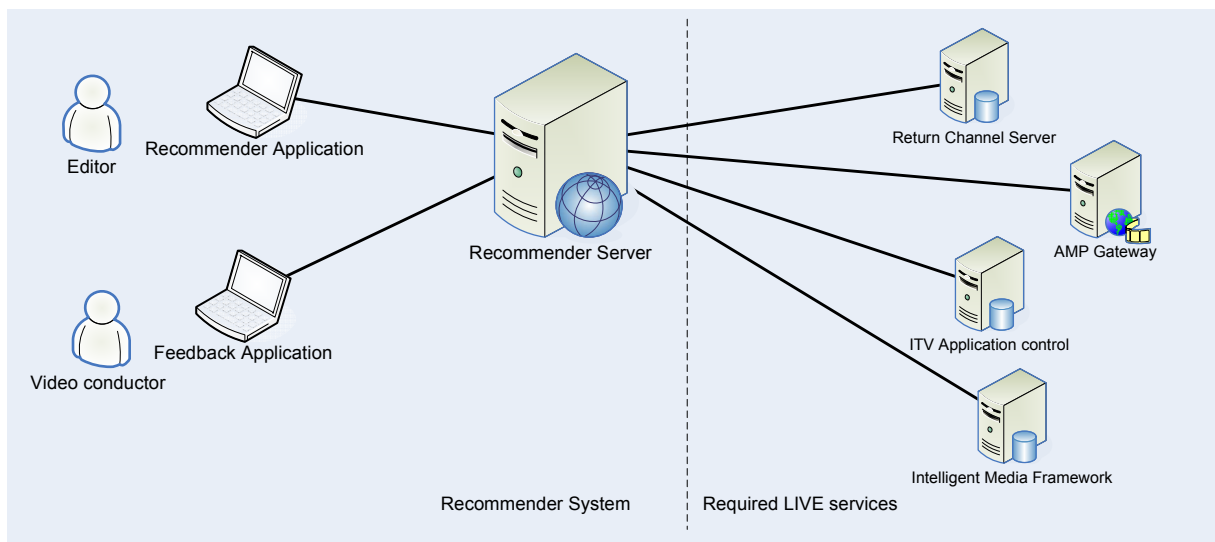


Figure 1: Recommender system components and interactions between them. Only components which are related to the Recommender system are shown here.

Figure 1 represents the Second Prototype implementation of the Recommender System as a client-server platform, whose components are:

- Recommender Applications, a client applications written in Java which use services of the Recommender Server,
- and the Recommender Server, which hosts the services and databases of the Recommender System. It must be stressed out, that Recommender services and database can be installed on one physical server. If increased performance is required, it can also be distributed over more physical servers.

To perform those two basic functionalities, Recommender System has to interact with other LIVE subsystems. These are:

- Intelligent Media Framework (IMF),

- Return Channel Server,
- ITV Application Control,
- AMP Gateway.

The IMF (described in D7.5) is responsible for the combination of content based knowledge with social based consumer knowledge and acts as a central storage of Intelligent Media Objects, which are video objects, enriched with extracted metadata. The IMF provides a functionality of searching for these media objects, which are then rated and sorted by the Recommender System according to the selected VC and audience profiles. The Recommender System sends a search query, composed out of programme related keywords, to the IMF, which in return sends a list of video clips.

The Return Channel Server (described in D8.2) provides consumer feedback collection. A consumer, who sits in front of TV and a set top box, has an option to rate show or content, or to vote on an explicitly defined poll. When the user creates feedback, it is collected by the Return Channel Server and sent to the Recommender System to be stored, further analysed and presented to the Video Conductor.

The AMP Gateway (described in D8.2) serves in the LIVE system as a remote control to the Grass Valley K2 A/V server, storing archive clips in broadcast quality. These clips are provided to the video conducting team for usage during the staging of the live event through the Recommender System, recommending the stored clips based on profiling and filtering algorithms. When the Recommender System recommends a video clip, it can also trigger a playback of that clip on a K2 Server through VDCP Proxy.

The ITV Application Control server (described in D9.5) provides the Feedback Application with information regarding the ITV Application messages. This includes description of all messages initiated by the Video conductor and directed to his viewers, for example text of voting question, and possible answers. By using this information, the Feedback Application is able to show resulting feedback of the audience to the given message (voting, rating, question) of the Video conductor (see Section 6).

4 Requirements and Setup of RS

This chapter describes installation and setup of the Recommender System components, the service applications and the user applications (user interfaces). It includes the software requirements for the Recommender System and describes the contents of the Second Prototype Package on the CD.

4.1 Recommender system installation

The application installation process is written for Windows XP SP2 and should also work on XP SP3. When performing installation and running the demo, the user should have administrator privileges on the machine being used. Firewall software on the computer should be disabled or configured prior to running and installing the demo (The application accesses the locally installed database which is running on port 3306).

To install and run the demo 3 components are required.

1. Working Java run time environment (JRE),
2. Database containing the data (MySQL server),
3. Recommender system applications with appropriate configuration and data files.

Files needed for installing and running are contained in the folder *LiveRecommenderSystemSP*. This **entire folder** should be **copied to the target PC**, for example in the C: root folder.

Inside the *LiveRecommenderSystemSP* folder, there is a *FeedbackInstallation* subfolder. The folder contains third party software with included licence files.

It is required to obtain and setup working Java run time environment (JRE). It can be obtained from Sun Java homepage: <http://java.sun.com/> . Required JRE is contained in JDK 6 Update 6, available on given site, but this is a subject of change in the future: there will be newer versions available. JDK 6 Update 6 is bundled in one installation file `jdk-6u6-windows-i586-p.exe`. All further instructions will assume this file was obtained.

To install database it is required to have MySQL server installed and running. The easiest way to do so is to obtain XAMPP package, which contains database engine and database management tools. The XAMPP package is obtainable from XAMPP homepage: <http://www.apachefriends.org/en/xampp.html> .

Installation of the Java Runtime Environment

To install **JRE**, please run the

jdk-6u6-windows-i586-p.exe

This will install JRE 6 update 6 on the machine.

Installation of the database

To install the database, one should obtain database engine bundled in XAMPP package and follow the install instructions provided on the XAMPP homepage.

After the database is up and running one should import required database structures and data by importing the files */LIVERecommenderSystemSP/FeedbackInstallation/db_dump/live_offline.zip* and */LIVERecommenderSystemSP/FeedbackInstallation/db_dump/live_online.zip* using the database management tools provided with XAMPP distribution. An elegant way to do it is to point browser to <http://localhost/phpmyadmin> and use the provided import function.

Directory structure and content

The directory structure is shown in the following table:

Directory	Description
<i>LIVERecommenderSystemSP</i>	Main directory of the RS Second Prototype, containing all the files needed to install and run.
<i>LIVERecommenderSystemSP \ Feedback-OnlineApp</i>	Files needed to run the Feedback Application in online mode (working LIVE system required).
<i>LIVERecommenderSystemSP \ Recommender-Application</i>	Files needed to run the Recommender Application.
<i>LIVERecommenderSystemSP \ FeedbackInstallation</i>	System database structure and data for online and demo version.
<i>LIVERecommenderSystemSP \ FeedbackDemoApp</i>	Files needed to run the Feedback Application in demo mode (stand-alone mode).

There are two versions of the Feedback Application:

- ◆ **Feedback Application Demo.** This version is a stand-alone (demo) mode of the Feedback Application for the end user (video conductor), which only requires the locally installed database. This demo application allows the user to test all functionalities on the consumer data gathered during the Olympics Trial (number of consumers on channels, results of votings etc.).
- ◆ **Online feedback services and application.** *FeedbackOnlineApp* folder includes all Recommender system components regarding feedback analysis. These are actual components which need to be connected to other LIVE system components. They allow on-line collection of consumer feedback, on-line analysis and presentation of the feedback to the Video Conductor. In order to install and test online feedback, the whole LIVE system must be set up and properly configured. These components are part of the Second prototype which was used during the Field Trial.

4.2 Setting up Recommender system

Following are descriptions of flags in the `RecommenderApplication/ConfigRecommenderSystem.conf` which concerns different LIVE components. These settings should be edited on a target system according to actual URLs and settings of used servers. By adding a # symbol on the beginning of a line, the line is commented and effectively turned off. This is useful, because it can be used instead of deleting the whole line.

Database setup

<code>databaseName = uol_feedback_online</code>	Name of the database
<code>databaseServer = localhost</code>	Database server. Use localhost if using a database on the local computer, use another server if indicated.
<code>databaseUserName = root</code>	Database username
<code>databasePassword = live123</code>	Database password

Feedback collection service

<code>useFC = true</code>	Application should use the Feedback collection service
<code>fcLocal = true</code>	Feedback collection service is located on localhost, otherwise <code>fcURL</code> is used.
<code>fcURL = http://live.fe.uni-lj.si</code>	Name of the server where the Feedback collection service is located.
<code>fcPort = 9990</code>	Port on the server where the Feedback collection service is located.

IMF service

<code>useIMFservices = true</code>	IMF services should be used.
<code>imfServer = live.fe.uni-lj.si</code>	The URL of the IMF server.

AMP gateway

<code>useAMPG = true</code>	AMP gateway should be used.
<code>ampGatewayLocal = false</code>	true: ampGateway server is localhost; false: ampGatewayURL is used
<code>ampGatewayURL = http://live.fe.uni-lj.si:8080</code>	The URL of the AMP gateway.

ITV control service

<code>useITVControl = true</code>	ITV control should be used.
<code>itvControlLocal = false</code>	true: ITV control server is localhost; false: itvControlURL is used
<code>itvControlURL = http://live.fe.uni-lj.si:8080</code>	The URL of the ITV control.

4.3 Starting the Recommender system

To run the complete application, a series of batch files located inside the *LiveRecommender-SystemSP* folder need to be run in the sequence shown below:

Running the demo (stand-alone) Feedback Application

1. Please start the database first by running the file **runDB.bat**,. This will start the database engine.
2. Then please start the Feedback Application by running **runFDApp_Demo.bat**.

Running the online feedback services and Feedback Application

All batch files are located in the root folder *LIVERecommenderSystemSP*.

1. Please make sure, database is up and running.
2. Please start the feedback collection server by running **1-runRecServer_Online.bat**.
3. Please start the feedback analysis service by running **2-runFDAnalysis_Online.bat**.
4. Please start the voting analysis service by running **3-runFDAnalysisVot_Online.bat**.
 - when the window opens, if prompted, click "**Start service**"
5. Please start the Feedback Application by running **4-runFDApp_Online.bat**.

Running the Recommender Application

The Recommender Application is located inside the *RecommenderApplication* folder. It is started by running **Run_Recommender.bat** file.

5 Recommender System Services

This chapter provides an overview of the system architecture of the Recommender System for the Second Prototype. It outlines the system components that the Recommender System is composed of and defines the interfaces through which the Recommender System components communicate with each other and other components within the LIVE Production Support System. Databases that store Recommender System data are also described.

5.1 Feedback Collection service

Description

The Feedback Collection Service is responsible for collecting Consumer's feedback provided by the Consumer System through the feedback channel:

- Collects and stores explicit consumers' feedback (voting for one of the presented options or rating of the content),
- Collects and stores consumers' actions or implicit feedback (channel switching).
- Retrieves information of the messages which are presented to the Consumer (questions, answers for the voting)

This service maintains a database of consumer feedback. The Feedback Collection service is called by the Return Channel Server which aggregates feedback information from several consumers and sends it as an XML file to the Recommender System.

Usage

The Feedback Collection service is periodically called by the Return Channel Server when it receives new feedback from consumers. The Return Channel Server acts as a proxy between the Feedback Collection Service and the Consumer's set top boxes. This means that Feedback collection service is independent of the actual end user's device and connection, and several Return Channel servers can be deployed for different end user clients (such as MHP STB, ipTV STB, mobile TV etc).

The Feedback Collection service (Second Prototype) is delivered as a java program which listens on the specific port and connects to the Recommender system database. The JAR file is located in the *FeedbackOnlineApp* folder and is called *FeedbackCollectionServer.jar*. The service is started by the following command:

```
java -jar FeedbackCollectionServer.jar
```

When started, a log file *FeedbackCollectionRolling.log* is created and the level of the logging can be set up in the *config\ConfigLogging.xml* file.

5.2 Feedback Analysis service

Description

This service provides analysis of collected feedback and therefore provides aggregated data and statistics on the current audience which is watching the program. The professional user (Video Conductor, editor) is interested in real-time data about his viewers, which includes the preferences of the channel viewers, how they rate his show, the results of voting and channel statistics.

The service actually consists of two services. These are Feedback analysis, which analyzes channel observers through time, and Voting analysis, which analyzes the user voting events.

Feedback and Voting services are analysing the data, which is entered into feedback analysis database by the feedback collection service. For the Feedback service to work properly, it is crucial to have relations `userID - groupID` defined in the database. `UserID` and `groupID` are numerical integer values. For the Voting service it is crucial to have notification data (notification ID and answer ID, which are numerical) entered into the database. Notification data is entered into the database by the feedback collection service, which obtains the data from the `ITVControl`.

Both services periodically check the state of the database. If new events (channel switch, voting) since last check have emerged, the services analyse these records and records analysis digest. These digests are used by the Feedback GUI, which presents the data to the Professional user.

Installation of the service

To install the service the supplied jar files (*FDAnalysis.jar*, *FDAnalysisVotings.jar*) along with the configuration files (*ConfigRecommenderSystem.conf* and *ConfigLogging.xml*) can be used. The properties in the configuration file *ConfigRecommenderSystem.conf* must be set in a way that they comply with the system configuration. Special attention must be paid to the properties

- *databaseName*: Name of DB on database server
- *databaseServer*: URL to the DB server
- *databaseUserName*: user name for usage of the abovementioned DB
- *databasePassword*: password for usage of the abovementioned DB
- *feedbackAnalysisServerFullControl*: [true/false] True: user is given control over the feedback analysis service when feedback analysis server is started via feedback analysis server user interface; false: the service start automatically when feedbackAnalysis application is started, starting the analysis from the time of the run.
- *feedbackAnalysisServerServiceSleep*: delay in ms between two consecutive feedback analysis runs. Please don't set this value too low, because it will seriously hinder the performance of the machine, the service is running on.
- *feedbackAnalysisServerAnalysisGranularity*: Granularity of the computed channel switch analysis in ms. Please don't set this value too low, because low value will pro-

duce overwhelming amount of database records, seriously crippling the system performance.

Starting the Feedback analysis service

The Feedback analysis service can be started by issuing command from the command line:

```
java -jar FDAnalysis.jar
```

If started without parameters it will read data from configuration file and act according to the configuration parameters. It can also be run with command line parameters which override setting in configuration file. These parameters are

- *feedbackAnalysisServerFullControl*: [true/false] True: user is given control over the feedback analysis service when feedback analysis server is started via feedback analysis server user interface; false: the service start automatically when feedback analysis application is started, starting the analysis from the time of the run.
- *feedbackAnalysisServerServiceSleep*: delay in ms between two consecutive feedback analysis runs. Please don't set this value to low, because it will seriously hinder the performance of the machine, the service is running on.
- *feedbackAnalysisServerAnalysisGranularity*: Granularity of the computed channel switch analysis in ms. Please don't set this value to low, because low value will produce overwhelming amount of database records, seriously crippling the system performance.
- *log4jfile*: Defines which log4j configuration file should be used for configuration of the logging subsystem.

To start the server with parameters, add the required parameter at the end of the command line command and equip it with a value e.g.:

```
java -jar FDAnalysis.jar feedbackAnalysisServerFullControl=true.
```

When the Feedback analysis service is running, the console is shown and updated periodically with the information about analysed data. In the status line, one can observe the status of the service. Possible states of the status are Active, Running and Expired. If the status remains in Expired state for prolonged time (> 10 minutes), there was an error and the service should be restarted.

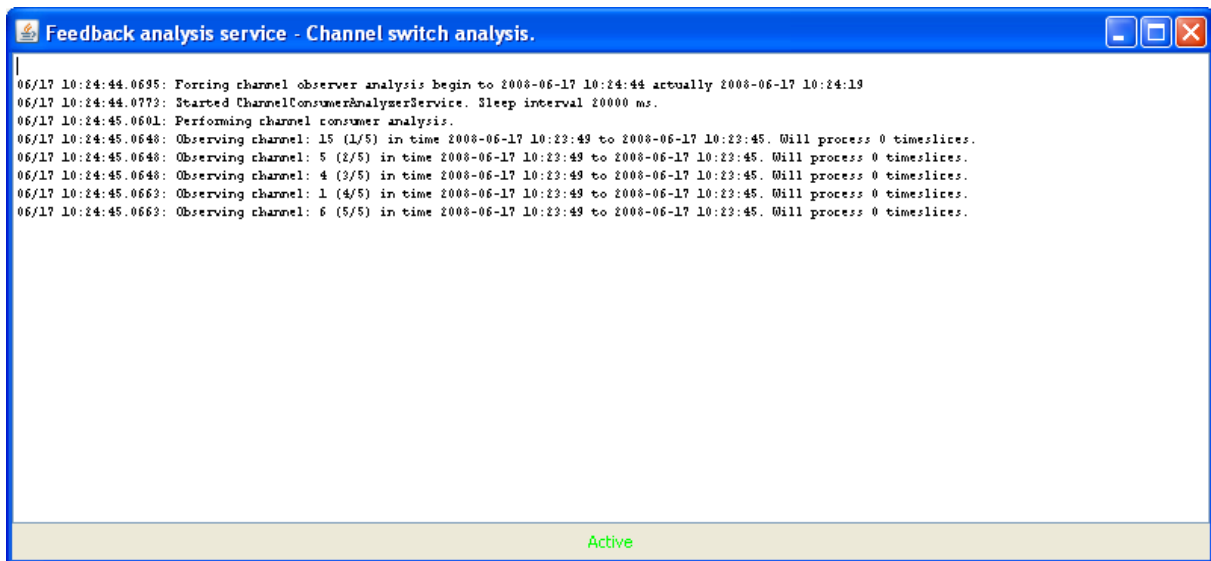


Figure 2: Live Feedback Application GUI window

Starting the Voting analysis service

The Voting analysis service can be started by issuing command from command line:

```
java -jar FDAnalysisVotins.jar
```

If started without parameters it will read data from the configuration file and act according to the configuration parameters. It can also be run with command line, which overrides setting in configuration file. This parameter is:

- *log4jfile*: Defines which log4j configuration file should be used for configuration of the logging subsystem.

After the application has started, the actual analysis starts automatically. Analysis can be stopped by pressing “*Stop service*” button and wait until it stops. Then it can be restarted again by pressing the “*Start service*” button.

When the Feedback analysis service is running, the console is shown and updated periodically with the information about analysed data.

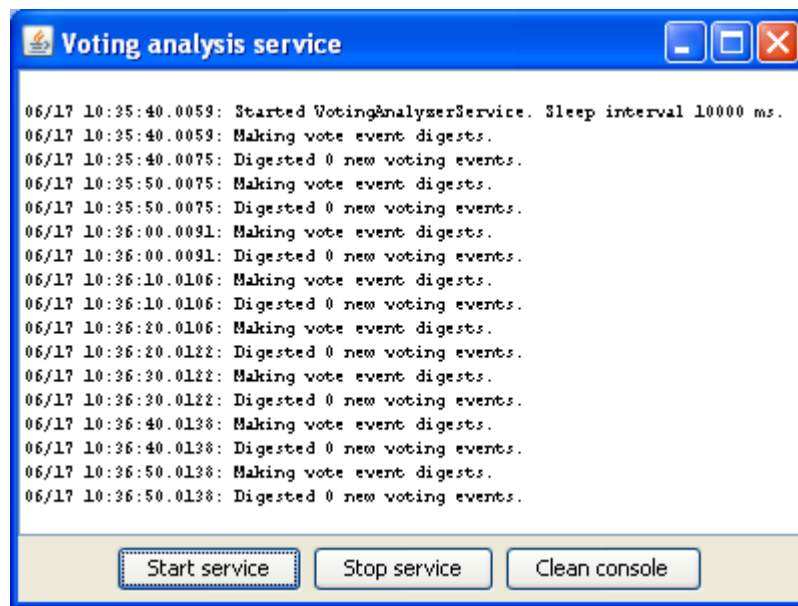


Figure 3: Voting Analysis service user interface.

5.3 Recommender System Database

Description and purpose

The main purpose of the Recommender System database is:

- Storage of the user profiles;
- Storage of user data;
- Storage of voting and channel switch events generated by users, obtained from the feedback collection server;
- Storage of computed statistical analyses of voting and channel switch events.

Usage

When the database is set up, users of the Recommender system should be unaware of it. It is used by the Recommender system services. Interaction of users is required only for backing it up, starting and stopping the database server.

Installation

Installation of the database is straight forward. The database is a MYSQL database. The database engine is part of the database and management bundle distribution XAMPP which can be obtained for free from <http://www.apachefriends.org/en/xampp.html>.

Data must be imported into properly installed database by importing */FeedbackInstallation/db_dump/live_offline.zip* and */FeedbackInstallation/db_dump/live_online.zip* files using the tools provided with XAMPP. An elegant way to do it is to point the browser to <http://localhost/phpmyadmin> on the machine with installed and running XAMPP package.

Running

To start the database engine, one must follow the instructions on running the MySQL server, which is part of XAMPP distribution.

6 Feedback Application User Guide

The Feedback Application is a user interface to the feedback analysis computed by the Recommender system. Feedback Application is a client application which connects to the Recommender system database to retrieve and display feedback analysis data as graphical charts.

6.1 Feedback Application setup

Following are descriptions of flags in the */FeedbackOnlineApp/ConfigRecommenderSystem.conf* and */FeedbackDemoApp/ConfigRecommenderSystem.conf* which concern different LIVE components servers. These settings should be edited on a target system according to actual URLs and settings of used servers. By adding a # symbol on the beginning of a line, the line is commented and effectively turned off. This is useful, because it can be used instead of deleting the whole line.

Database setup

<code>databaseName = uol_feedback_online</code>	Name of the database
<code>databaseServer = localhost</code>	Database server. Use localhost if using a database on the local computer, use another server if indicated.
<code>databaseUserName = root</code>	Database username
<code>databasePassword = live123</code>	Database password

Feedback collection service

<code>useFC = true</code>	Should use the Feedback collection service be used
<code>fcLocal = true</code>	Means that the Feedback collection service location is localhost, otherwise it uses fcURL.
<code>fcURL = http://live.fe.uni-lj.si</code>	Name of the server where the Feedback collection service is located.
<code>fcPort = 9990</code>	Port on the server where the Feedback collection service is located.

IMF service

<code>useIMFservices = true</code>	Should the IMF services be used.
<code>imfServer = live.fe.uni-lj.si</code>	The URL of the IMF server.

AMP gateway

<code>useAMPG = true</code>	If the AMP gateway should be used.
<code>ampGatewayLocal = false</code>	Value <code>true</code> means that <code>ampGateway</code> server is localhost, otherwise it uses <code>ampGateway-</code>

	URL.
ampGatewayURL = http://live.fe.uni-lj.si:8080	The URL of the AMP gateway.

ITV control service

useITVControl = true	Should the ITV control should be used.
iTVControlLocal = false	Value true means that ITV control server is localhost, otherwise it uses iTVControlURL.
iTVControlURL = http://live.fe.uni-lj.si:8080	The URL of the ITV control.

6.1.1 Running the application

To run the complete application, a series of batch files located inside the *LiveRecommender-SystemSP* folder need to be started in the sequence shown below:

Running the demo application

1. The database should be up and running.
2. The Feedback Application is started by running *Demo_runFDApp.bat*.

Running the online application

1. The database should be up and running.
2. The collection server is started by running *Online_1-RunRecServer.bat*.
3. The feedback analysis service is started by running *Online_2-runFDAnalysis.bat*.
4. The voting analysis service is started by running *Online_3-runFDAnalysisVot.bat*
 - when the window opens, if prompted, one should click "Start service"
5. The Feedback Application is started by running *Online_4-runFDApp.bat*.

6.2 Feedback Application Usage

6.2.1 Introduction

The Feedback Application is a client application, which analyses and displays various modalities of consumers' feedback. Feedback Application GUI with channel statistics histogram and channel statistics time-chart is shown in the Figure 4:

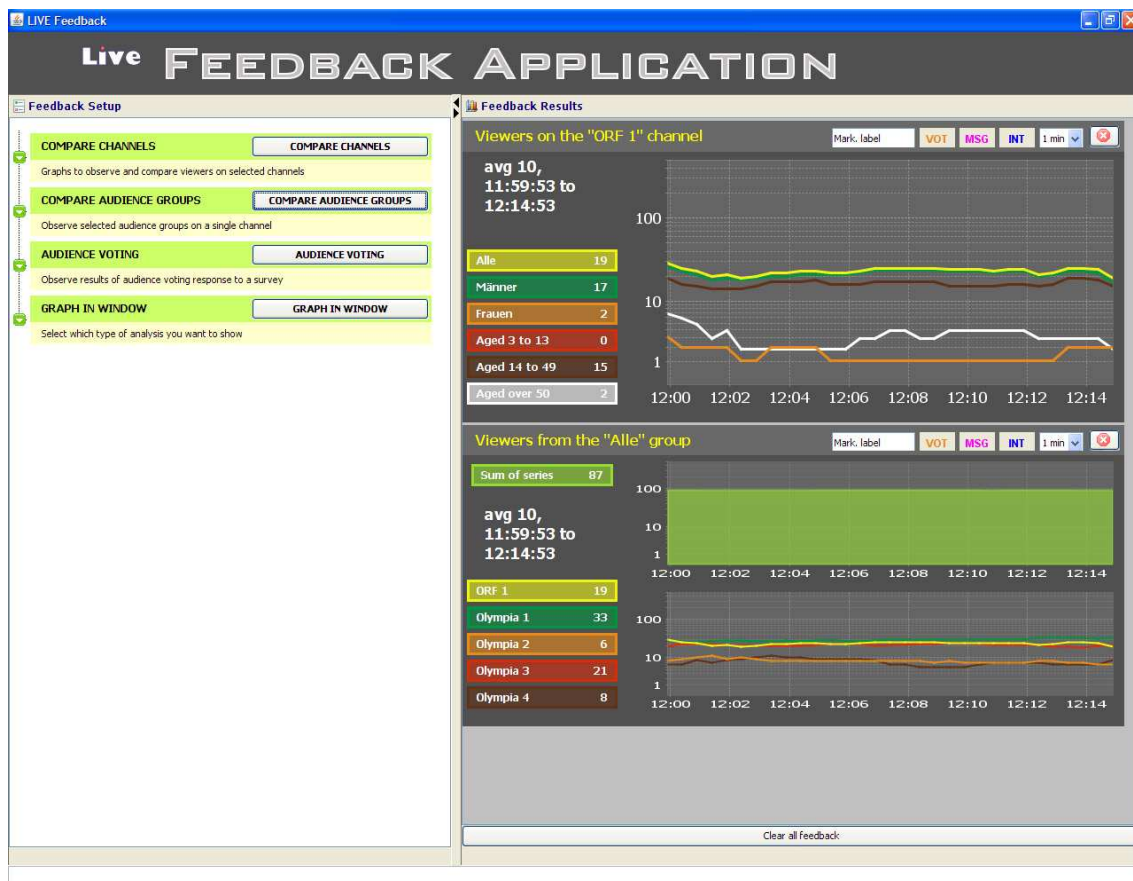


Figure 4: Live Feedback Application GUI window

Feedback can be shown in different modalities, as described below:

- Viewing statistics:** statistics show a number of viewers currently watching selected channels over a period of time. Viewing habits of viewers can be inferred and also some viewing trends can be concluded from this kind of feedback. A total number of viewers over time is also presented. As users stated in the (I10.2), they would like to see also which content was broadcasted on specific time. This could be also presented in a chart, but it has to be evaluated in terms of integrating different LIVE systems (K2 Server for example). There are two types of graphs available for displaying viewing statistics: **time graph** and **histogram**. Time graph shows the actual number of viewers on a channel and sum of all users on the observed channels. It can be used to compare different channels or different audience groups on a selected channel. Histogram shows average number of users over a period of time in percentages or in absolute values.

User scenario: The Video Conductor can assess the effect of his actions on his viewers. He can see viewing trends, which channels and contents are getting more attention.

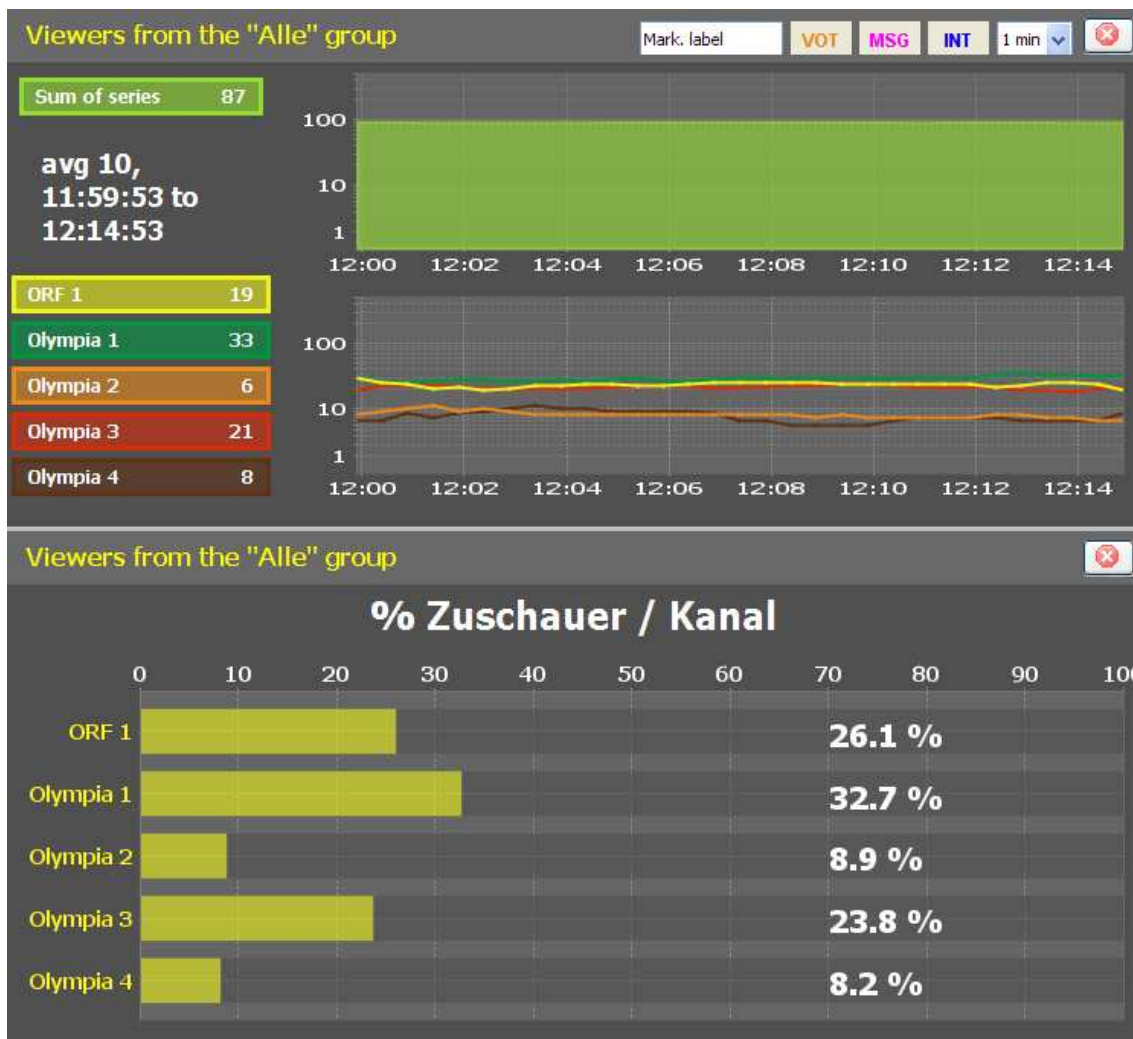


Figure 5: Viewing statistics graphs: time graph and histogram

- **Voting on demand:** this is an explicit feedback, which is triggered on demand by the director. This kind of feedback is for helping the director to choose between future content, which is going to be shown. There are two types of graphs available for displaying viewer votings: **time graph** and **pie chart**, as can be seen in Figure 6.

User scenario: The Director initiates a voting on two or three options. He gives the viewers a possibility to influence the future program, to vote on several options what they would like to see next (for example, Player1 interview or Studio comments).

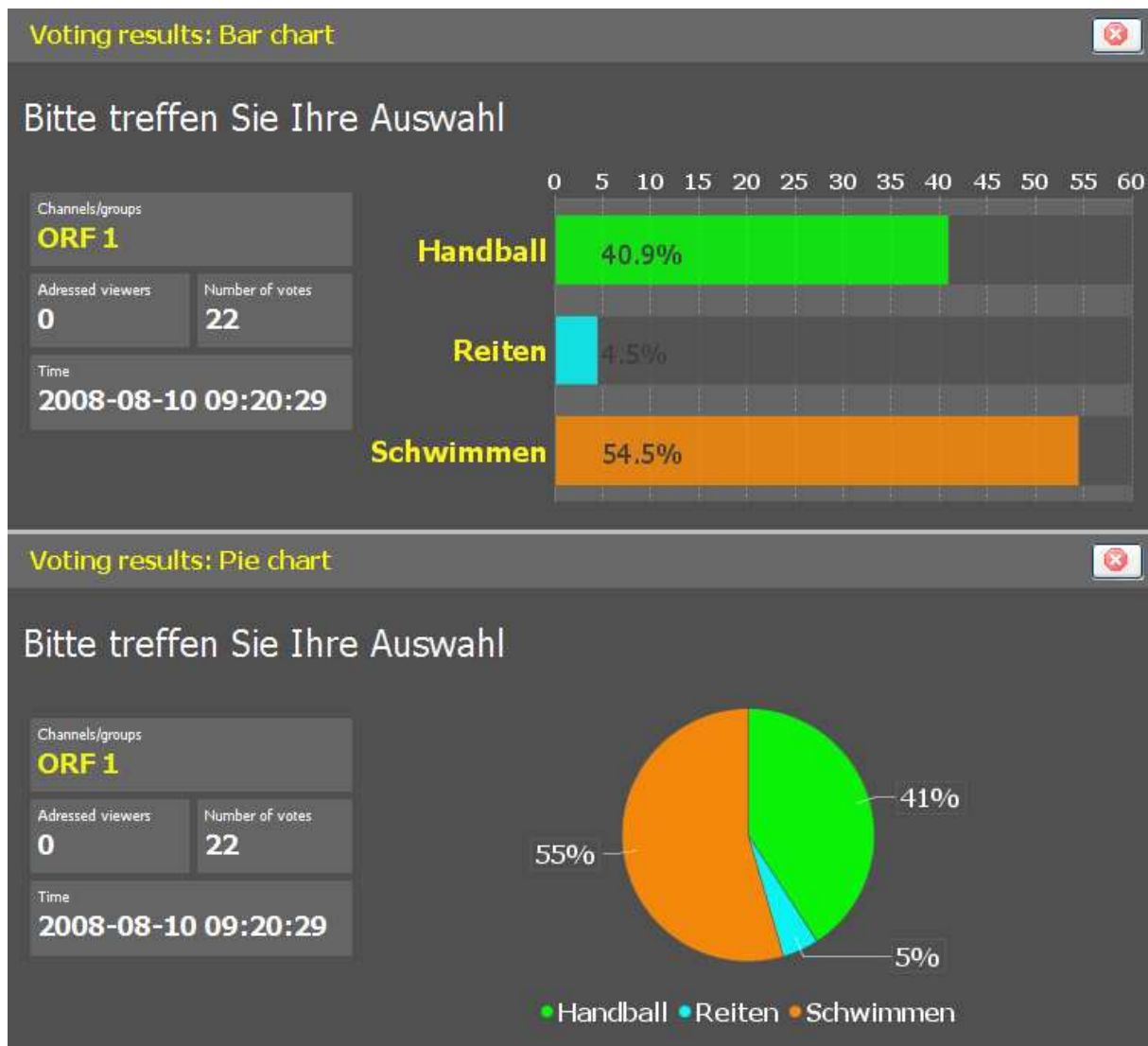


Figure 6: Voting statistics graphs: histogram and pie chart

6.2.2 Description of the Live Feedback Application options

The following section describes Live Feedback Application options. When the application is started, a window opens, like the one on the Figure 7. The left pane of the window (Feedback Setup) contains a tree-like structure which enables user to select the type of the chart to display and set its parameters. Having set all the parameters, the chart is displayed by clicking the “Get feedback” button in the lower-left corner of the window. The chart then appears in the right pane of the window (Feedback Results).

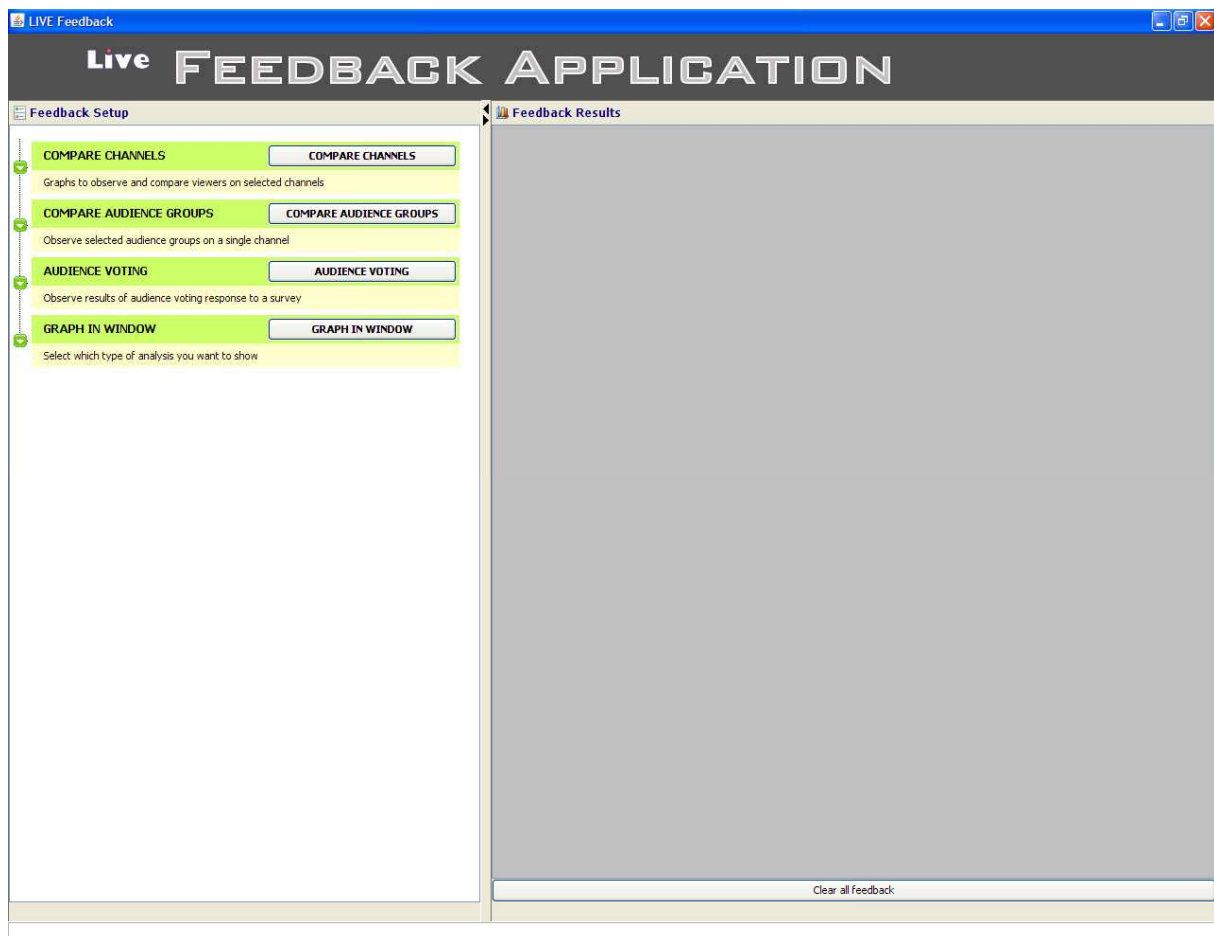


Figure 7: Live Feedback Application GUI upon opening

The tree structure on the left side of the window comprises four different sections: Compare channels, Compare audience groups, Audience voting and Graph in window. Each section is expandable via green arrow located left to the section. Expanded view of a section offers options for setting graph parameters. Each section also contains a button which creates a corresponding graph with set up options. If the options were not set up, a graph is created using default options and values. The default values are the values for on-line (real-time) analysis with the most common options pre-selected. In the next section, the available options for setting up the graphs are described.

6.2.3 Graph options

In the following sections, additional options for setting up graphs are presented in detail for each analysis type (comparing channels, comparing audience groups and viewing audience votings).

Channels viewing statistics options:

COMPARE CHANNELS COMPARE CHANNELS

Graphs to observe and compare viewers on selected channels:

Analysis Interval 5 minutes ▼
Select time span of the analysis.

Graph Type Time graph ▼
Select graph type: time-based (num. of viewers per channel) or histogram (relative ...)

Observed Channels ----- ▼ Add
Specify channels
ORF 1 ▲ Rem
Olympia 1 ▲
Olympia 2 ▼

Group selector Alle ▼
Select audience group

Other time settings
Set the time parameters for offline analysis of past results

Figure 8: Channels viewing statistics section options

- Analysis interval: time-span of the analysis is selected. Default selection is »5 minutes«, options range from 30 seconds up to one day.

Analysis Interval 5 minutes ▼
Select time span of the analysis.

Graph Type ▼
Select graph type: time-based (num. of viewers per channel) or histogram (relative ...)

Observed Channels ----- ▼ Add
Specify channels
ORF 1 ▲ Rem
Olympia 1 ▲
Olympia 2 ▼

5 minutes
5 minutes
30 seconds
1 minute
15 minutes
30 minutes
1 hour
2 hours
6 hours

Figure 9: Selecting the analysis interval duration

- Graph type: time graph or histogram: time graph shows number of viewers per channel and histogram shows percentage of users per channels for a time period. Time graph is the default selection.

Graph Type Time graph ▼
Select graph type: time-based (num. of viewers per channel) or histogram (relative ...)

Time graph
Histogram

Figure 10: Selecting the graph type – time graph or histogram

- Observed channels: channels to be included in the analysis and displayed on the charts. It is possible to select multiple channels to be displayed. All the available channels are added to graph by default.

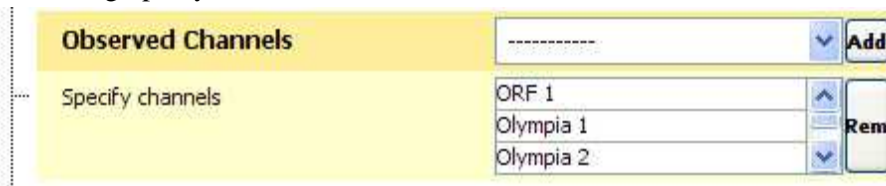


Figure 11: Selection of channels to be observed in graph

- Group selector: groups to be included in the analysis and displayed on the charts. It is possible to select only one group at a time. There are over 30 available groups to choose from. The groups are based on demographical and sport interest data about users.

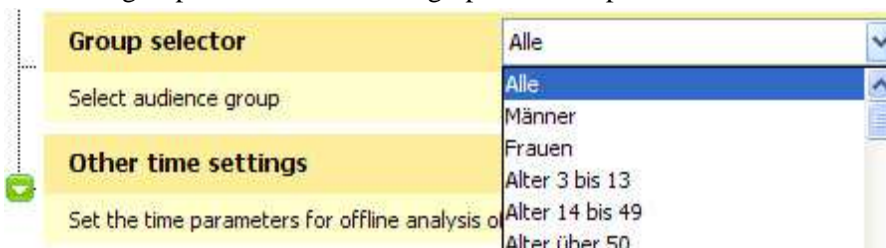


Figure 12: Selection of user group to be observed in graph

- Other time settings: Upon expanding this node, additional time settings such as Refresh interval and Interval start time/date are shown. These settings are available only in online mode (explained in detail in section 6.2.4 Usage scenarios)

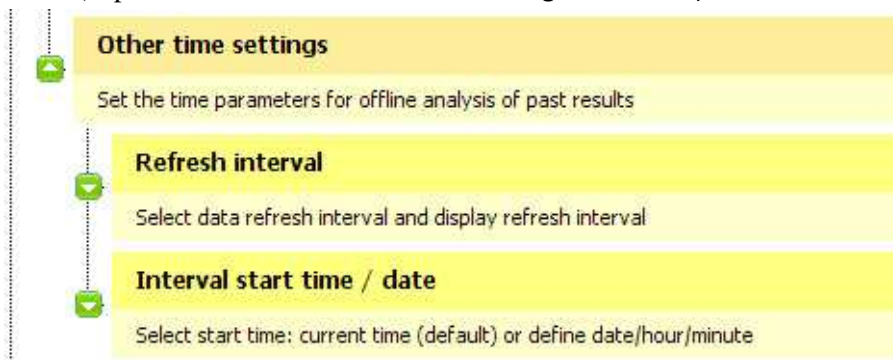


Figure 13: Other time settings section

- Refresh interval: user can decide whether the chosen graph should refresh, and if so, how long the refresh interval should be. **Refresh data interval** denotes the time interval between the old and the new data. **Refresh display interval** denotes how often should the data be refreshed using the refresh data interval. Default values are 20 seconds for both refresh intervals. Using different refresh intervals is not recommended for most situations and should be used only for quick review of the past data already saved in database.

Refresh interval

Select data refresh interval and display refresh interval

Refresh data interval 20 seconds default

Select data refresh interval

Refresh display interval 20 seconds default

Select display refresh interval

Figure 14: Refresh interval section options

- Interval start time / date: We can optionally define start date and time of the analysis. Default selection is »current date and time«, which means that the analysis takes place in present time.

Interval start time / date

Select start time: current time (default) or define date/hour/minute

Day Today

Select interval start date: day

Month This month

Select interval start date: month

Year This year

Select interval start date: year

Interval Start: Hours Current time

Select interval start time: hour

Interval Start: Minutes Current time

Select interval start time: minute

Figure 15: Interval start time / date section options

Audience groups viewing statistics options:

COMPARE AUDIENCE GROUPS COMPARE AUDIENCE GROUPS

Observe selected audience groups on a single channel

Analysis Interval 15 minutes ▼
 Select time span of the analysis.

Graph Type Time graph ▼
 Select graph type: time-based (num. of viewers per channel) or histogram (relative ...)

Observed Channels ORF 1 ▼
 Specify channels

Group selector Alle ▼ **Add**
 Select audience group

Männer	▲	Rem
Frauen	▬	
Alter 3 bis 13	▼	

Other time settings
 Set the time parameters for offline analysis of past results

Figure 16: Audience groups viewing statistics section options

Most of the options for audience groups viewing statistics are the same as the options for channels viewing statistics. The difference is in the observed channel and group selector options. When comparing channels, it is possible to select multiple channels and only one audience group at a time, and vice-versa, when comparing audience groups, it is possible to select multiple audience groups and only one channel.

Audience voting statistics options:

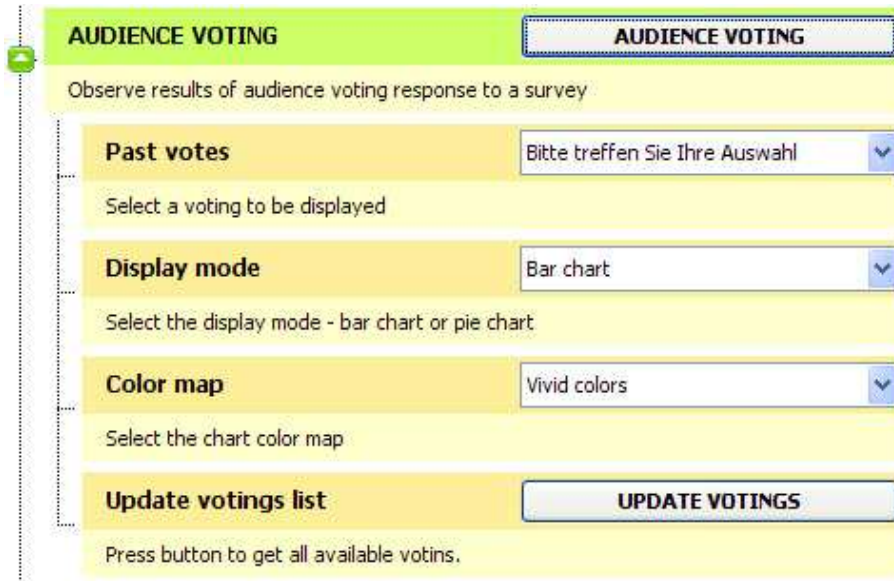


Figure 17: Audience voting statistics section options

- Past votes: contains a list of all available votings. The default selection is the first voting in the list.

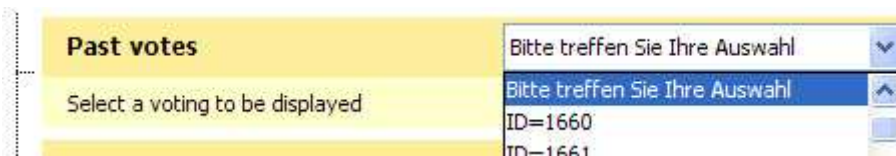


Figure 18: List of past votings

- Display mode: available options are bar chart (histogram) and pie chart.



Figure 19: Display mode selection for audience voting graph

- Color map: available options are “vivid colors”, “normal colors” and “from green to red”. This option influences the way colors are displayed in audience voting graph.

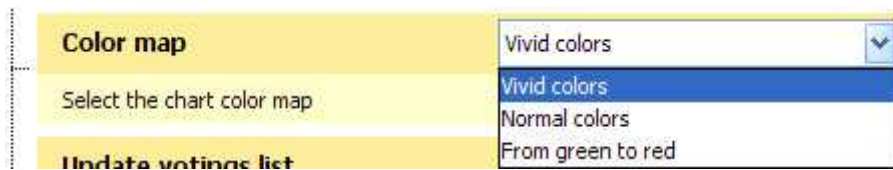


Figure 20: Color map options

- Update votings list: when the Feedback Analysis Application starts, it loads a list of past votings from a database. However, during the application operation new votings are initiated, but are not automatically added to the “Past votes” list. User has to click on the Update votings button for this to happen.



Figure 21: Update voting list button

Graph in window

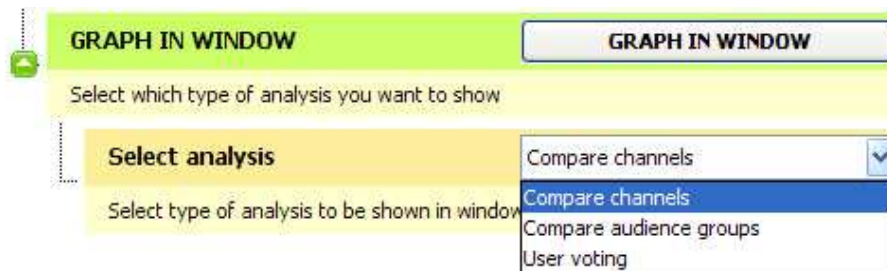


Figure 22: Graph in window section options

This is a special section, which enables the user to create a graph in separate window, instead in the right hand side of the Feedback Application. The User simply selects the desired analysis type and clicks the button. The corresponding graph is then displayed with options set within the graph’s options section.

Time-graph options and functionalities:

Time-graph has some additional options and functionalities. When we create a time-graph using Compare channels or Compare audience groups button, it will be displayed in the right-hand side of the Feedback Application. The example of the time-graph is presentend on Figure 23.

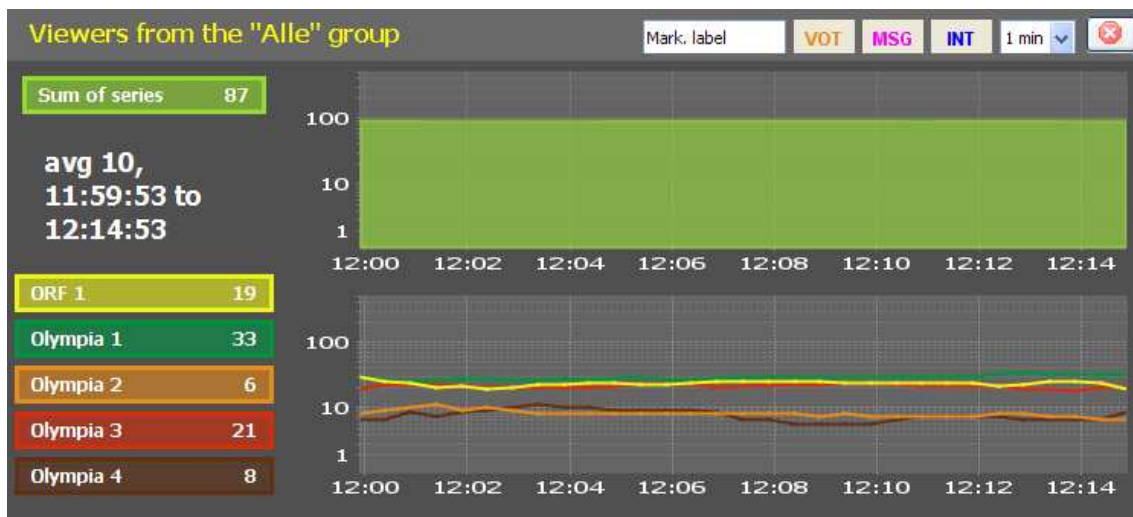


Figure 23: Typical look of time graph

The legend on the left shows the current (leftmost on the graph) values for each series and for the sum of all series. Time of the analysis is also displayed on the left. A short description of the current analysis is displayed in yellow text as the title of the graph. Right to the title there is a set of buttons. These buttons are used for displaying graph markers. These markers denote a moment in time when something significant happened (the director initiated a voting, sent a message etc.). There are three types of markers: for votings, for messages and for time-intervals.

Voting markers and message markers (orange and violet respectively) are the same except for their color. In the graph they are shown as vertical coloured lines with some optional text. The text is entered in the text field left to the buttons. Only the first 10 characters of text that the user enters will be displayed in the graph. The markers are set the moment the user clicks on the appropriate button. If there is a delay between the current time and the time of the analysis, the markers will appear after that delay has passed.



Figure 24: Voting and message markers

Interval markers are represented as an area of different color with an optional text displayed in the center. The duration of the interval to be displayed can be set with the drop-down menu right to the INT button.

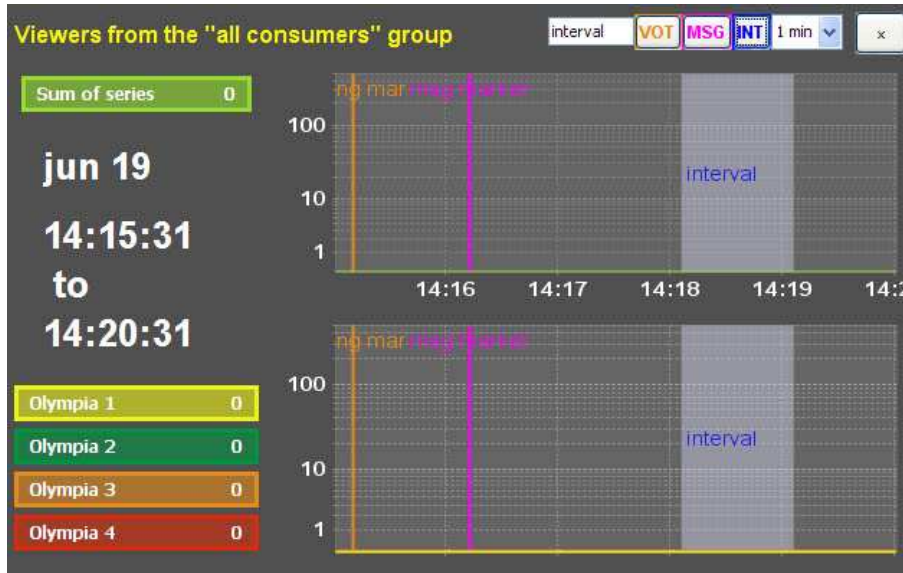


Figure 25: Interval marker

Each time a marker is added to the graph, that event is logged into a log file “laterAnalysis.log”. This is useful when the user wants to perform an analysis for a past time period.

Besides the markers, the time-graph also has an option of **alarming the user** about some important trends (positive or negative) in user statistics. The two events for which alarms are raised are:

- a) Number of users on a channel (or from one group) falls below a pre-defined value.
- b) Number of users on a channel (or from one group) falls or rises by a pre-defined percentage.

Each time the graph is refreshed, the application checks to see if there were any significant events for the new data. When an event occurs, the system alarms the user by painting a coloured frame around the chart on which the event occurred. The frame is coloured red for negative events and green for positive. Degree of event seriousness is also marked with colour saturation. More important events are marked with more vivid colours. If several events, negative and positive, occur on the same time, the system calculates overall sum of events and raises the alarm accordingly. For example, if one negative and two positive events happen, the frame will be coloured in low-saturated green colour.

On the following screenshot there are no users, so this event is marked with a vivid red frame.

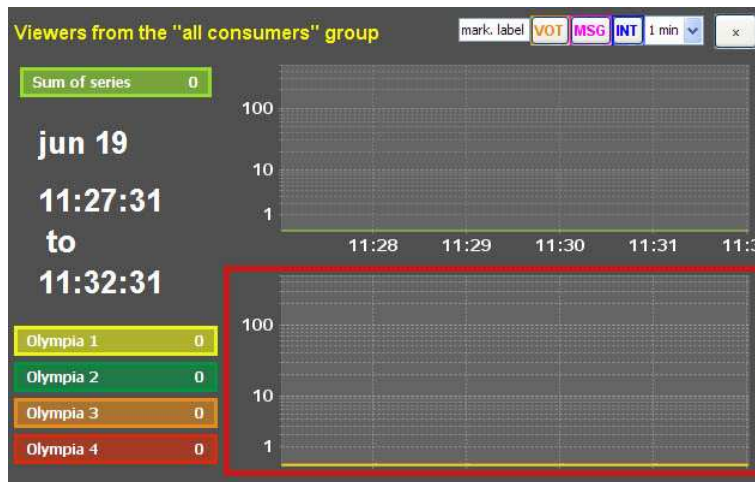


Figure 26: Vivid red warning frame around plot

The next time the graph was refreshed, some users started to appear on every channel. The event is marked with a vivid green frame.

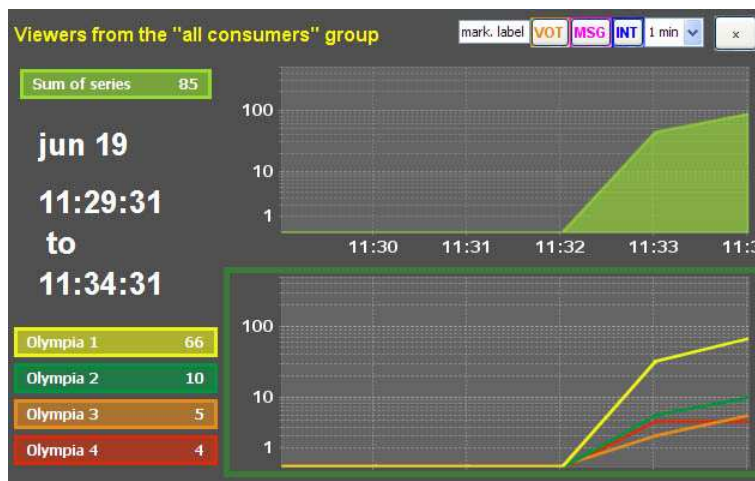


Figure 27: Vivid green warning frame around plot

After a while, the number of users is still increasing, but not as dramatically as in the beginning and not on all channels. The event is marked with a paler green frame. The alarms are also logged in the log file "laterAnalysis.log".

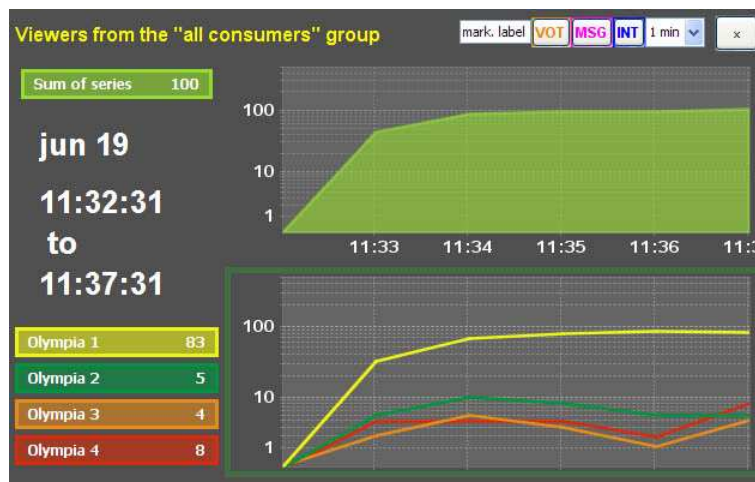


Figure 28: Pale green warning frame around plot

Histogram functionalities:

Histogram graphs also have an additional functionality, namely a trend indicator. Upon refreshing the data, the Feedback application remembers the past values of users on different channels and compares them to the present values. It then draws line indicators where previous values used to be. The lines are coloured red and green, depending whether the number of users decreased or increased. If the number of users remained unchanged, no lines are drawn.

The first screenshot shows the state of histogram upon opening. There are no previous values, so no lines are drawn.

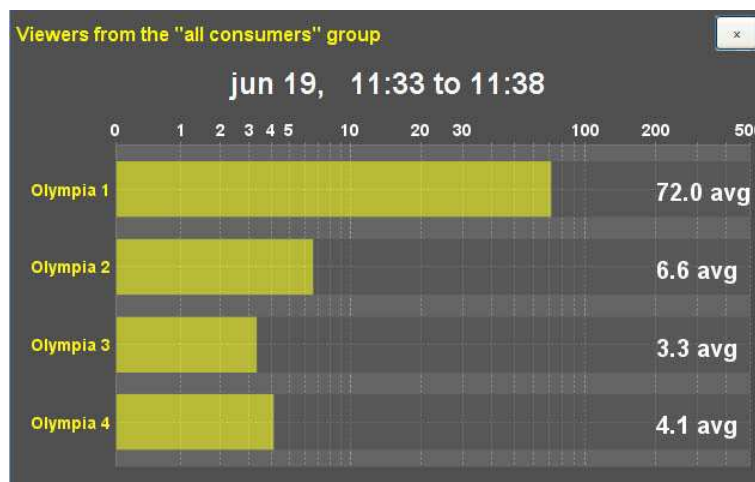


Figure 29: Histogram chart for the number of viewers per channel.

After data was refreshed, number of users increased on all channels. This is indicated with green lines.

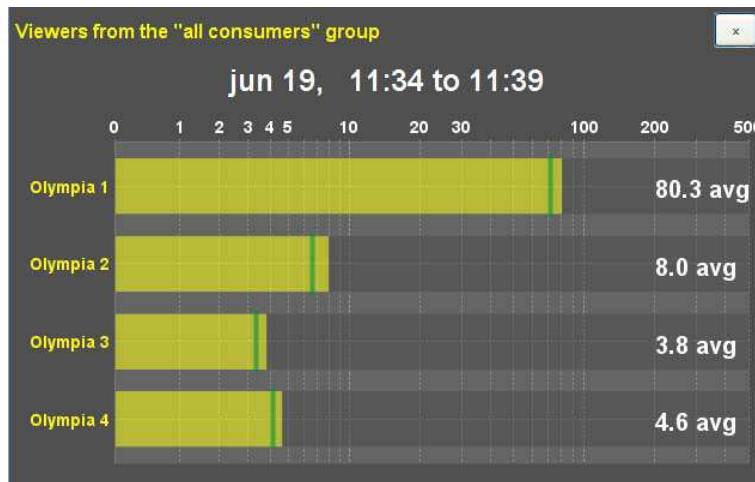


Figure 30: Histogram chart, the red lines show previous values.

After data was refreshed the next time, there were some new changes in user numbers. The number of user on channel Olympia 1 increased slightly and this is indicated with a green line. Number of users on channels Olympia 2 and Olympia 4 decreased and this is indicated with red lines. Number of users on channel Olympia 3 remained the same.

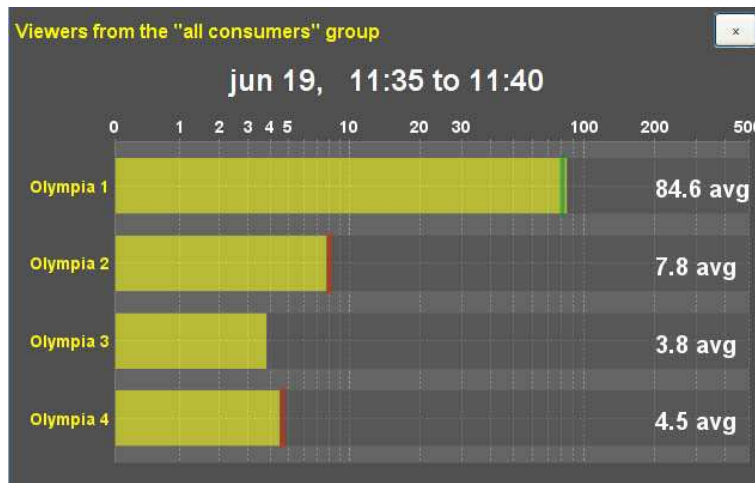


Figure 31: Histogram chart, the green and red lines show changes.

6.2.4 Usage scenarios

The Live Feedback application can work in two different modes: demo mode and online mode. Demo mode means that all the application time settings have been preset and cannot be changed by the user in the “Other time settings” section. Online mode has no such restrictions and the user can change all settings available in the application. Default time values are the preset values in demo mode, and current time values in online mode. Demo mode is turned on/off in config file *ConfigFeedbackApp.conf*, located in the *Config* folder. Flag for changing application mode is `useDemo = false/true`. When set to `true`, application will work in demo mode, and when set to `false`, application will work in online mode. When the `useDemo` flag is set to `true`, additional time parameters can be set:

- `interval_duration = 5` - duration of analysis interval in minutes
- `startDate = 2008-06-19 11:33:31` - start date and time of the analysis
- `realTime = true` - should the graphs refresh
- `refreshDataMinutes = 1` - time interval between the old and the new data
- `refreshDisplaySeconds = 60` - how often should the data be refreshed using the refresh data interval

The parameters which are not set, or the ones commented with a “#” are ignored, and application defaults are used instead.

In the following sections, some of the possible usage scenarios will be presented. Time settings of these graphs will be set according to the description above.

Scenario 1: Compare number of viewers per channel in time

Option 1: Current viewers in a Time graph view

1. In section “COMPARE CHANNELS”, one should click the “COMPARE CHANNELS” button.

A time-based graph is created which shows number of viewers per channel during time period of 5 min. Start time of the analysis is the current time (online mode) or the time set with the `startDate` time flag (demo mode).

Option 2: Current viewers in a Histogram view

1. Expand the section “COMPARE CHANNELS”.
2. “Graph Type” option : select “Histogram”.
3. Click the “COMPARE CHANNELS” button.

A histogram is created which shows average number of viewers per channel during time period of 5 min. Start time of the analysis is the current time (online mode) or the time set with the `startDate` time flag (demo mode).

Scenario 2: Compare number of viewers per audience group in time

Option 1: Current viewers in a Time graph view

1. In section “COMPARE AUDIENCE GROUPS”, click the “COMPARE AUDIENCE GROUPS” button.

A time-based graph is created which shows number of viewers per audience group during time period of 5 min. Start time of the analysis is the current time (online mode) or the time set with the `startDate` time flag (demo mode).

Option 2: Current viewers in a Histogram view

1. Expand the section “COMPARE AUDIENCE GROUPS”.
2. “Graph Type” option : select “Histogram”.
3. Click the “COMPARE AUDIENCE GROUPS” button.

A histogram is created which shows average number of viewers per audience group during time period of 5 min. Start time of the analysis is the current time (online mode) or the time set with the `startDate` time flag (demo mode).

Scenario 3: Compare user votings

Option 1: User votings in a histogram view

1. In section “AUDIENCE VOTING”, click the “AUDIENCE VOTING” button.

A histogram is created which shows results of a past user voting.

Option 2: User votings in a pie chart view

1. Expand the section “AUDIENCE VOTING”.
2. “Display mode” option : select “Pie chart”.
3. Click the “AUDIENCE VOTING” button.

A pie chart is created which shows results of a past user voting.

Scenario 4: Displaying a graph in a separate window

Option 1: Compare number of viewers per channel in time

1. In section “COMPARE CHANNELS” optionally change desired settings.
2. Expand section “GRAPH IN WINDOW”
3. From the drop-down menu select “Compare channels”

4. Click the “GRAPH IN WINDOW” button

A graph with set-up or default values is created in a separate window.

Option 2: Compare number of viewers per audience group in time

1. In section “COMPARE AUDIENCE GROUPS” optionally change desired settings.
2. Expand section “GRAPH IN WINDOW”
3. From the drop-down menu select “Compare audience groups”
4. Click the “GRAPH IN WINDOW” button

A graph with set-up or default values is created in a separate window.

Option 3: Compare user votings

1. In section “AUDIENCE VOTING” optionally change desired settings.
2. Expand section “GRAPH IN WINDOW”
3. From the drop-down menu select “User voting”
4. Click the “GRAPH IN WINDOW” button

A graph with set-up or default values is created in a separate window.

This is the fastest and simplest way of creating graphs.

If the analysis interval is set to a past time, clicking the marker buttons in the time graphs makes no sense, since the markers are set in current time. This means the markers would appear in the graph after a time period from the set time to now has passed.

7 Recommender Application User Guide

Recommender Application is a client (user) application, which uses the Recommender System services and Intelligent Media Framework services to search for and display video content recommendations to the professional user.

7.1 Requirements and setup

Requirements

The Recommender Application for its full operation requires several system services to be present and running.

- Recommender System database, which stores the audience and consumer profiles.
- Intelligent Media Framework, which provides event data, content metadata and content search capabilities.
- AMPGateway service, which provides content keyframes and control of the K2 media server.

Setup of LIVE system services

Following are descriptions of flags in the *ConfigRecommenderSystem.conf* which concern different LIVE components servers. These settings should be edited on a target system according to actual URLs and settings of used servers. By adding a # symbol on the beginning of a line, the line is commented and effectively turned off. This is useful, because it can be used instead of deleting the whole line.

Database setup

<code>databaseName = uol_feedback_online</code>	Name of the database
<code>databaseServer = localhost</code>	Database server. Use localhost if using a database on the local computer, use another server if indicated.
<code>databaseUserName = root</code>	Database username
<code>databasePassword = live123</code>	Database password

IMF service

<code>useIMFservices = true</code>	Should the IMF services be used.
<code>imfServer = live.fe.uni-lj.si</code>	The URL of the IMF server.

AMP gateway

<code>useAMPG = true</code>	Should the AMP gateway be used.
<code>ampGatewayLocal = false</code>	Value <code>true</code> means that <code>ampGateway</code> server is localhost, otherwise it uses <code>ampGateway-</code>

	URL.
<code>ampGatewayURL = http://live.fe.uni-lj.si:8080</code>	The URL of the AMP gateway.

Setup of Recommender Application

Several options for the Recommender Application can be selected within the configuration file *ConfigRecommenderApp.conf*, which is located in *RecommenderApplication\config* folder.

<code>workspacePanelWidth = 400</code>	View options for Workspace component.
<code>searchPanelWidth = 400</code>	View options for Search component.
<code>borderWidth = 3 frameGap = 2 horizontalScrollBarHeight = 25 descriptionPanelHeight = 30 descriptionPanelWidth = 80 timeCodeHeight = 20 westPanelWidth = 80 panelRankWidth = 30 imageWidth = 120 imageHeight = 90</code>	View options for the Recommendation Results component. For example, key-frame image size can be set up.
<code>keyFrameDirectory = videos\\</code>	Directory for caching key-frames.
<code>workspaceDirectory = Workspace</code>	Workspace directory
<code>contextSpecXML = templates\\Context_Template_01.xml</code>	XML file which defines the options available in the Context Specification component.
<code>searchSpecXML = Workspace\\SEARCH_TEMPLATES\\ Search_Default_Template.xml</code>	Default search template XML file.
<code>workspacePath = Workspace</code>	Workspace directory
<code>maxNumOfKeyframes = 100 maxNumOfVisibleKeyframes = 10 defaultTimeGap = 10 displayKeyframeTimecodes = true</code>	Visualisation of the key-frames
<code>channelToLoad = 3</code>	Default channel of the K2 server, where clips are uploaded and controlled via Rec. Application.
<code>demoMode = false demoModeSearchResults = templates\\Search_Sport_results.res</code>	Demo mode setup. Allows for uploading of pre-existing clips list without performing actual search in the IMF.
<code>updateTermsFromIMF = true</code>	Defines if terms are loaded automatically from IMF vocabularies for the search fields
<code>loadEventList = false</code>	Defines if the event list is loaded at startup.
<code>preferredLanguage = de</code>	Language selection (de, en,..) for the meta-

	data of the clips.
<code>thumbnailMode = mode2</code>	Key-frame retrieval mode for the AMPGateway. mode2 is default for Second Prototype, mode1 is needed for old versions of AMPGateway.
<code>retrieveTermLabels = true</code>	Defines if term labels are retrieved from IMF.
<code>useProfileClipRanking = true</code>	Defines if clip list personalisation is used (ranking according to the selected audience profile).

7.2 Recommender Application User interface

The Recommender system UI is a standalone application, which allows searching for clips in an archive, managing resulting clip lists, and organising selected content. It consists of four main components: search management, context specification, search specification, and recommendation results component.

7.2.1 Login Screen

When the user starts the application, he is prompted to enter username and password to authenticate. The user is also prompted to select the workspace folder. Workspace folder contains all user's content and search results. The default workspace folder is configured in *ConfigRecommenderApp.conf* file.

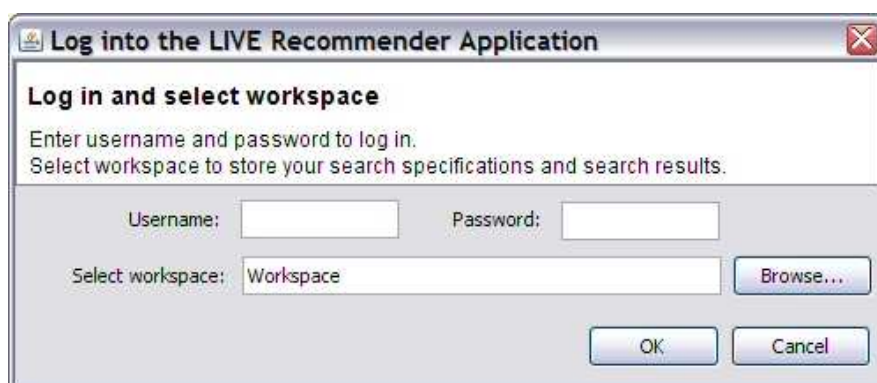


Figure 32: Recommender Application log-in screen.

7.2.2 Recommender Application Main window

Figure 33 shows the Recommender System second prototype user interface and the layout of interface components. The five main interface components are outlined with red rectangles.

The main GUI components are the following:

1. Title panel (top rectangle)
2. Search Management component (top left area)
3. Context Specification component (bottom left area)
4. Search Specification component (middle area)
5. Recommendation Results component (right).

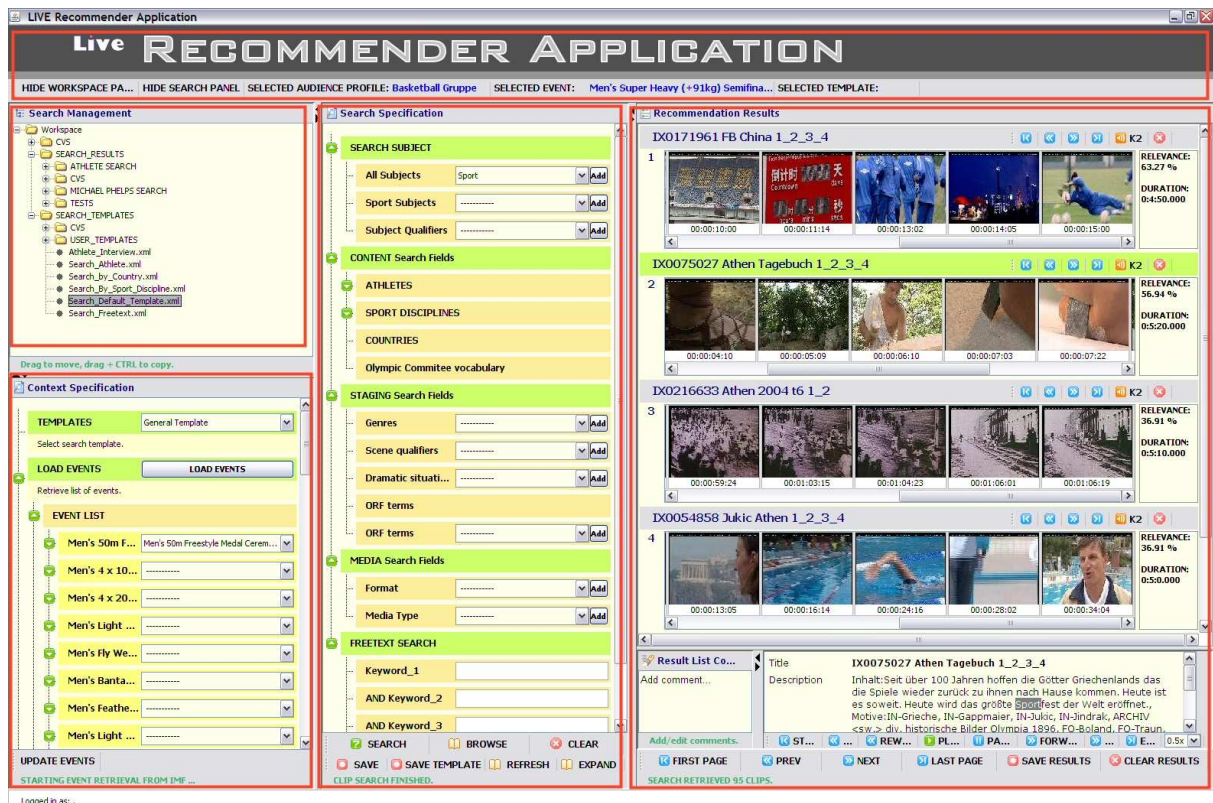


Figure 33: Recommender Application user interface: layout of GUI components.

Title Panel

Title Panel shows general information about currently selected settings, and allows adjustments of the appearance of the User interface.



Components of the Title Panel are the following:

- Show/Hide Workspace Panel Button. This button closes or opens left-side GUI components: Search Management and Context Specification component. If the two compo-

nents are closed (hidden), then the Recommendation Results component resizes and takes larger portion of the screen, so that the manipulation of clips and preview of key-frames is easier.

- **Show/Hide Search Panel Button.** This button minimizes or maximizes the middle (Search) component. Other components are resized.
- **Selected Audience Profile display.** The currently selected group name is displayed. The selected audience profile is used for personalisation of the results.
- **Selected Event display.** Event name is shown.

Search management

A search management component is intended to organize and save all searches, alerts and results. It is organized as a tree of folders. Each folder in the tree is actually a folder on a hard disk which can have its subfolders or items. Results, searches and alerts are saved on a hard disk as an XML file and displayed in the tree as items. Folders and their content are opened when the application starts up. A root folder is hard coded into the user interface. Functionalities, which are well known from the file browsers are available in that component and are described later on.

Actions that can be performed in search management component are described bellow:

- **Select a folder or file.** Subsequent save operations create files in this folder.
- **Create new folder.**
- **Delete selected folder.**
- **Delete** selected saved **item** in a folder.
- **Load selected item.** The selected item is an xml file representing either search specification or clip list. Search specification component gets populated from saved data and results show in a results window, if any. Selected item is loaded and displayed by double-clicking on it.
- **Select folder** to add new item. A new item is added to the selected folder automatically when a new search is performed.
- **Rename** selected folder.

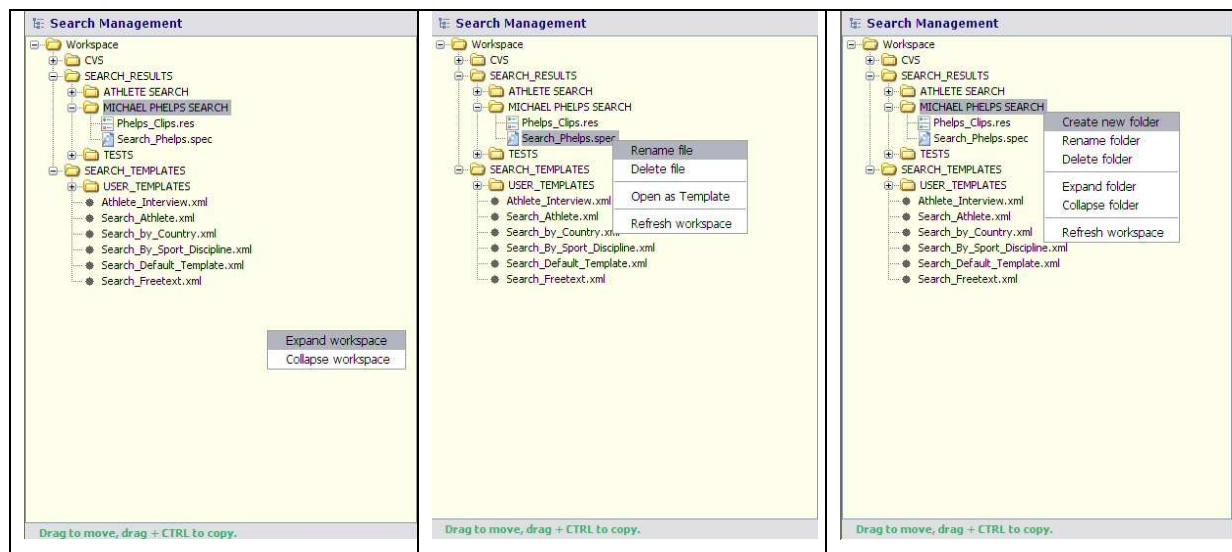


Figure 34: Search management component.

Context specification

A context specification component is used to specify the context of a search. This context is defined as an information which was not explicitly given as a search topic specification (query specification), but is available in the system and influences the result of the content selection process. A part of context can be global, which means that it does not change through the show. It is defined by the directed event and program specification. A part of the context can also change during the show according to the current topic or to the selected event action message, which is received from IMF system. Selected context can already define search terms in subject domain category. If “Olympics 2008” were selected as a global context, sport is automatically defined as a subject. The current topic can further define subject matter and detail. For example, the topic “Swimming 100m” would define “swimming” as a subject matter and “100m” as a subject detail.

Within the Second Prototype, three context types were available in the Recommender Application:

- **Search template.** Different templates can be selected to define a search query. Each template predefines some information, and leaves some search categories open. For example, an Interview template would define content type as interview, and leave open the field for the athlete name.

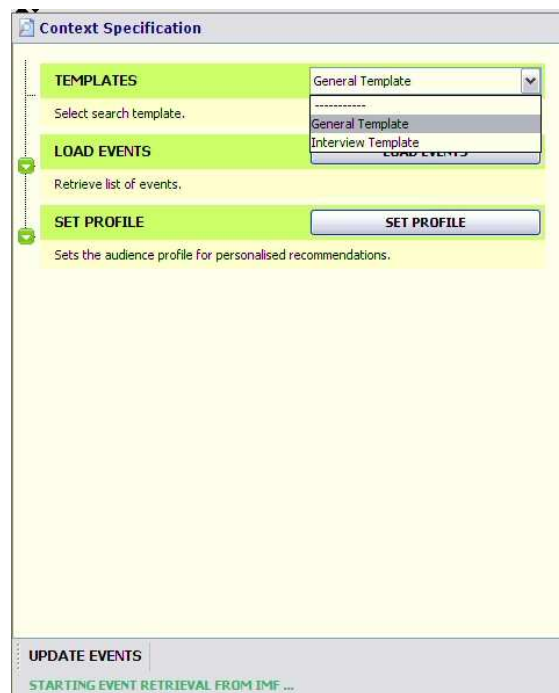


Figure 35: Selection of a search template.

- **Event selection.** A list of available events is loaded from the Intelligent Media Framework, and the user can select a single event to work with. This enables the Recommender Application to show only information relevant to this event (race, sport discipline), for example, in the athlete search field, only athletes competing with the event are shown. Selecting the event context thus limits the scope of the search. The first step is to press Load Events button, after which a tree of available events is shown. Then, a single event can be selected from drop down menus, and finally the Select Event button should be pressed.

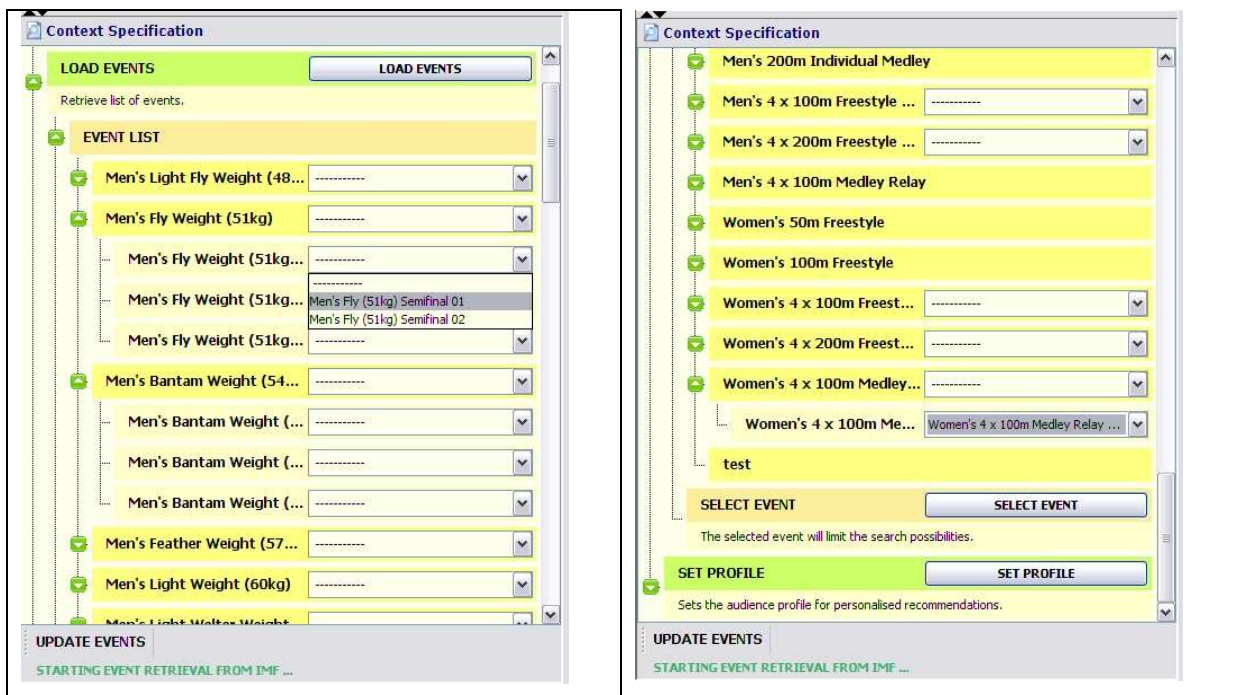


Figure 36: Selection of an event.

- Audience profile selection.** Audience profile influences the ranking (personalisation) of search results. The context specification panel allows selecting one from the available profiles, depending on the target audience of the show (the group of viewers, such as male, female, kids, football fans, etc.).

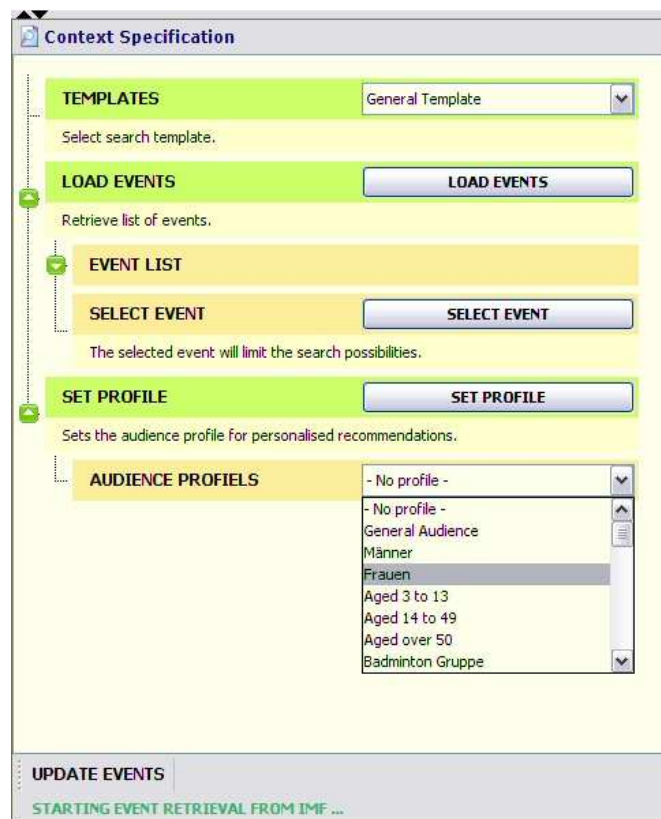


Figure 37: Selection of a target audience profile.

Search specification

A search specification component is used to specify a content search query. Search keywords can be selected from drop down menus and added to the search query.

The number and content of the search fields is defined within a search template, which is an XML file defining for example search field names and descriptions. Different search templates will have different number and names of the fields. The available values of the search fields are not defined in a template, they are retrieved from the Intelligent Media Framework in real time.

Search specification component shows the search fields which are organised hierarchically. Search fields can be grouped into groups.

Each search field specifies a field name (example: "Athletes") and possible values, which can be selected from a drop-down list. Optionally, field name can be accompanied by field description. Each field supports selection of a single value (by selecting an item in a drop down list), or selection of multiple values (by pressing Add button new items can be added to the selected list table). Multiple values for a search field result in a query where these values are connected by OR (search will result an item which has at least one of the selected items).

The final search query is composed from the values selected in the search fields. Values from different search fields are combined by AND. The example below results in a query: Favorite AND (Andorra OR Bulgaria OR Sweden) AND History. In this way, by combining multiple selections within a field, it is possible to specify complex queries.

Figure 38: Example of a search component. The selected query is: Favorite AND (Andorra OR Bulgaria OR Sweden) AND History.

A Search specification (template) can be composed of search fields from different categories or domains:

- **Subject (content) domain:** this category defines the subject that a user is interested in. Subject domain is divided into two parts. The first one provides detailed description about the content subject. This could be for example, sport, swimming, 100 m, men. The second part allows a search in a selected subject domain for individual sportsman, teams, actions, etc. This second part is defined by the selected subject, be-

cause each subject (sport, tourism ...) can have its own search fields. A person, a role that a person can have, and an action are examples of search fields that could be defined for swimming 100m men. Terms, that are available from these search fields are also dependent on selected sport and selected context (list of persons can be extracted from event start list). An important part of this category is also a free text field search, which allows searching for clips with unstructured search.

- **Staging domain:** this category defines staging features of clips. A genre, scene, emotional tags, dramatic situation can be selected here. These search categories are independent of selected context and subject and do not change.
- **Media domain:** this category defines different metadata about clips from a technical point of view. A clip duration, production date, rights, etc, can be selected here. These search categories are also independent of selected context and subject and do not change.

Actions that can be performed within the Search specification component are described below. They are named by the appropriate buttons:

- **Search.** Starts a process of searching clips in an archive. The search query is composed from the values selected in different search fields.
- **Browse.** All video clips available in an archive are retrieved, with no specific query. The intention of this functionality is to give the user an ability to browse through all available content.
- **Clear.** Clears all search fields, as a preparation of a new search.
- **Save.** Saves current search specification as an XML file into a currently selected directory within a workspace.
- **Save Template.** Saves current search specification as a template XML file (.templ) into a currently selected directory within a workspace.
- **Refresh.** This button reloads the possible search values into all drop-down lists. This is done automatically on each reselecting of a search template, or can be triggered through Refresh button.
- **Expand.** This button expands or collapses the search fields in a search template.

Recommendation Results component

The Recommendation Results component displays a result of a content search, which is a list of video clips. Each video clip is represented by a sequence of key frames, which are displayed in a row. Subsequent video clips are displayed in one column which contains up to 4 clips. Next 4 clips are displayed on a next page.

For each video clip an overall ranking is displayed first. Video clips are ordered by their relevance to the search query and to the selected audience profile. Relevance (in percents) and duration of the clip is displayed on the right, after the key-frames.

The screenshot displays the 'Recommendation Results' window, which lists four video clips. Each clip entry includes a row of five thumbnails with their respective start times, a title, a relevance percentage, and a duration. The selected clip, 'IX0075027 Athen Tagebuch 1_2_3_4', is highlighted in green. Below the list, a detailed view of the selected clip is shown, including its title, description, and a set of navigation buttons. At the bottom, there are buttons for 'FIRST PAGE', 'PREV', 'NEXT', 'LAST PAGE', 'SAVE RESULTS', and 'CLEAR RESULTS', along with a search status indicator.

Clip ID	Title	Relevance	Duration
IX0171961	FB China 1_2_3_4	63.27 %	0:4:50.000
IX0075027	Athen Tagebuch 1_2_3_4	56.94 %	0:5:20.000
IX0216633	Athen 2004 t6 1_2	36.91 %	0:5:10.000
IX0054858	Jukic Athen 1_2_3_4	36.91 %	0:5:0.000

Selected Clip Details:

- Title:** IX0075027 Athen Tagebuch 1_2_3_4
- Description:** Inhalt: Seit über 100 Jahren hoffen die Götter Griechenlands das die Spiele wieder zurück zu ihnen nach Hause kommen. Heute ist es soweit. Heute wird das größte Sportfest der Welt eröffnet., Motive: IN-Grieche, IN-Gappmaier, IN-Jukic, IN-Jindrak, ARCHIV <sw.> div. historische Bilder Olympia 1896, FO-Boland, FO-Traun.

Navigation and Controls:

- Buttons: FIRST PAGE, PREV, NEXT, LAST PAGE, SAVE RESULTS, CLEAR RESULTS
- Search Status: SEARCH RETRIEVED 95 CLIPS.

Figure 39: Recommendation Results component.

Management of the clip list

The Recommendation Result component allows the user to manage list of clips, review them, select and delete them, and save the final selection as an XML file.

The bottom row of buttons allows for navigation between pages. The page navigation buttons are:

- **First Page** displays first page of clips (top ranked clips).
- **Prev** (Previous Page) displays previous page of clips.
- **Next** (Next Page) displays next 4 clips.
- **Last Page** displays least relevant video clips.
- **Clear Results** button deletes all the clips in the list.

An additional button is displayed on the clip component. **X** button deletes the clip from the clip list.

The current clip list can be stored as a file in a workspace. **Save Results** button creates the XML file (.clips) within the currently selected folder. Comments are stored into the same XML file.

Adding comments to the clip list

The comments component allows the user to add textual comments to the created content list and store these comments for later use.

Clip metadata component

The clip metadata component displays the associated metadata of the currently selected clip. This includes title, description, and keywords of the clip. The words of the description which match with the query keywords are highlighted.

Clip review component

This component displays the title of the clip, its key-frames, and some additional data (relevance, duration). The key-frames are displayed in a row, and buttons allow for navigating between subsequent pages of key-frames.

Clip preview controls

The clip preview buttons control the preview of the selected clip on a professional video playout server (K2). A common set of play controls is available (Start, Fast Rewind, Rewind, Play, Pause, Stop, Forward, Fast Forward, End).

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1. LIVE Deliverable D6.2, “First prototype of the Recommender System: Software Documentation” (2007).
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