Grant agreement for: Collaborative project*

Annex I - "Description of Work"

Project acronym: LinkedTV

Project full title: " Television Linked To The Web "

Grant agreement no: 287911

Date of last change: 2011-06-01

Preparation of the DoW date: 2011-05-23

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Part A

Workplan Tables

A1:
Project summary

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per project

General information			
Project title [3]	Television Linked To The Web		
Starting date [4]			
Duration in months [5]	42		
Call (part) identifier [6]	FP7-ICT-2011-7		
Activity code(s) most relevant to your topic [7]	:		
Free keywords [8]	Television, networked media, hypervideo, interactive TV, iTV, IPTV, Linked Media		

Abstract [9]

There are still important gaps and breaks in the current “Networked Media Web”. TV-over-Web does not yet make full use of the interaction possibilities inherent in the Web model, and Web-over-TV is either about putting a Web browser onto the TV screen or overlaying parts of the Web over the TV signal; neither explore how one could browse between TV and Web content in a richer and more seamless manner. The vision of the realisation of a truly Networked Media Web is much more challenging: it means to provide audio-video information on the Web usable in a way similar as text based information is used today: interlinked with each other, with other kinds of information, searchable, and accessible everywhere and at every time.
Television Linked To The Web (LinkedTV) aims to provide a novel practical approach to Networked Media based on four phases: (1) annotation, (2) interlinking, (3) retrieval, and (4) presentation (including personalization, filtering, etc.). LinkedTV will allow us to seamlessly connect multimedia content on the Web by integrating networked media analysis, personalisation and presentation technologies within an integrated and coherent framework. LinkedTV will develop a comprehensive, coherent methodology for the end-to-end process, as the basis for the LinkedTV platform and tools. This platform will enable the information management and usage in the annotation, interlinking, and personalization process. It supports the media production process in a novel and integrated way, and provides support to users by providing linked information, filtering for personal preferences, search capabilities, etc.. This will be supported by building on the results of FP6 and FP7 projects on context analysis and representation, multimedia analysis, annotation, adaptation and delivery.
The result will make Networked Media more useful and valuable, and it will open completely new areas of application for Multimedia information on the Web.

A2:
List of Beneficiaries

Project Number [1]	287911	Project Acronym [2]	LinkedTV

List of Beneficiaries

No	Name	Short name	Country	Project entry month[10]	Project exit month
1	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	Fraunhofer	Germany	1	42
2	STI INTERNATIONAL CONSULTING UND RESEARCH GMBH	STI GMBH	Austria	1	42
3	CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS	CERTH	Greece	1	42
4	VYSOKA SKOLA EKONOMICKA V PRAZE	UEP	Czech Republic	1	42
5	UNIVERSITE DE MONS	UMONS	Belgium	1	42
6	STICHTING CENTRUM VOOR WISKUNDE EN INFORMATICA	CWI	Netherlands	1	42
7	EURECOM	EURECOM	France	1	42
8	Condat AG	CONDAT	Germany	1	42
9	STICHTING NEDERLANDS INSTITUUT VOOR BEELD EN GELUID	BEELD EN GELUID	Netherlands	1	42
10	Noterik BV	NOTERIK	Netherlands	1	42
11	UNIVERSITAT ST GALLEN	UNIVERSITAT ST GALLEN	Switzerland	1	42
12	RUNDFUNK BERLIN-BRANDENBURG	RBB	Germany	1	42

A3:
Budget Breakdown

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One Form per Project

Participant number in this project [11]	Participant short name	Fund. % [12]	Ind. costs [13]	Estimated eligible costs (whole duration of the project)					Requested EU contribution
				RTD / Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D	
1	Fraunhofer	75.0	A	961,699.00	0.00	216,500.00	63,000.00	1,241,199.00	1,000,774.00
2	STI GMBH	75.0	T	401,600.00	0.00	19,600.00	158,400.00	579,600.00	479,200.00
3	CERTH	75.0	A	1,161,600.00	0.00	18,200.00	30,600.00	1,210,400.00	920,000.00
4	UEP	75.0	T	455,360.00	0.00	3,840.00	11,520.00	470,720.00	356,880.00
5	UMONS	75.0	T	657,307.00	0.00	11,880.00	62,284.00	731,471.00	567,144.00
6	CWI	75.0	A	581,051.00	0.00	9,650.00	24,450.00	615,151.00	469,888.00
7	EURECOM	75.0	A	479,231.00	0.00	20,643.00	120,058.00	619,932.00	500,124.00
8	CONDAT	75.0	A	973,975.00	0.00	16,275.00	26,550.00	1,016,800.00	773,306.00
9	BEELD EN GELUID	50.0	F	402,960.00	0.00	8,496.00	14,592.00	426,048.00	325,308.00
10	NOTERIK	75.0	F	366,225.00	0.00	11,347.00	14,294.00	391,866.00	399,415.00
11	UNIVERSITAT ST GALLEN	75.0	T	502,400.00	0.00	11,900.00	31,200.00	545,500.00	419,900.00
12	RBB	75.0	A	409,156.00	0.00	15,333.00	82,831.00	507,320.00	405,031.00
Total				7,352,564.00	0.00	363,664.00	639,779.00	8,356,007.00	6,616,970.00

Note that the budget mentioned in this table is the total budget requested by the Beneficiary and associated Third Parties.

*** The following funding schemes are distinguished**

Collaborative Project (if a distinction is made in the call please state which type of Collaborative project is referred to: (i) Small of medium-scale focused research project, (ii) Large-scale integrating project, (iii) Project targeted to special groups such as SMEs and other smaller actors), Network of Excellence, Coordination Action, Support Action.

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project, and it cannot be changed. The project number **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

2. Project acronym

Use the project acronym as indicated in the submitted proposal. It cannot be changed, unless agreed during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry info force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a detailed justification on a separate note.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Activity code

Select the activity code from the drop-down menu.

8. Free keywords

Use the free keywords from your original proposal; changes and additions are possible.

9. Abstract

10. The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

11. The number allocated by the Consortium to the participant for this project.

12. Include the funding % for RTD/Innovation – either 50% or 75%

13. Indirect cost model

A: Actual Costs
S: Actual Costs Simplified Method
T: Transitional Flat rate
F :Flat Rate

Workplan Tables

Project number

287911

Project title

LinkedTV—Television Linked To The Web

Call (part) identifier

FP7-ICT-2011-7

Funding scheme

Collaborative project

WT1
List of work packages

Project Number [1]	287911	Project Acronym [2]	LinkedTV

LIST OF WORK PACKAGES (WP)

WP Number [53]	WP Title	Type of activity [54]	Lead beneficiary number [55]	Person-months [56]	Start month [57]	End month [58]
WP 1	Intelligent hypervideo analysis	RTD	3	141.00	1	42
WP 2	Linking hypervideo to web content	RTD	7	136.00	1	42
WP 3	LinkedTV interface and presentation engine	RTD	6	99.00	1	42
WP 4	Contextualisation and personalisation	RTD	1	128.00	1	42
WP 5	LinkedTV platform	RTD	8	84.00	1	42
WP 6	Scenarios	RTD	2	102.00	1	42
WP 7	Dissemination	OTHER	2	66.00	1	42
WP 8	Markets, Business Models and Exploitation Strategies	RTD	11	75.00	1	42
WP 9	Management	MGT	1	33.00	1	42
			Total	864.00		

WT2:
List of Deliverables

Project Number [1]	287911	Project Acronym [2]	LinkedTV

List of Deliverables - to be submitted for review to EC

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D1.1	State of the art and requirements analysis for hypervideo	1	3	12.00	R	PU	12
D1.2	Visual, text and audio information analysis for hypervideo, first release	1	9	27.00	R	PU	18
D1.3	LinkedTV annotation tool, first release	1	1	27.00	R	PU	24
D1.4	Visual, text and audio information analysis for hypervideo, final release	1	3	36.00	R	PU	36
D1.5	LinkedTV annotation tool, final release	1	1	18.00	R	PU	36
D1.6	Intelligent hypervideo analysis evaluation, final results	1	3	21.00	R	PU	42
D2.1	Specification of the Media Fragment URI scheme	2	7	6.00	R	PU	6
D2.2	Specification of lightweight metadata models for multimedia annotation	2	7	12.00	R	PU	9
D2.3	Specification of Web mining process for hypervideo concept identification	2	4	9.00	R	PU	12

WT2:
List of Deliverables

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D2.4	Annotation and retrieval module of media fragments	2	7	27.00	R	PU	24
D2.5	Specification of the Linked Media Layer	2	4	12.00	R	PU	24
D2.6	Advanced concept labelling by complementary Web mining	2	4	43.00	R	PU	36
D2.7	Final Linked Media Layer and evaluation	2	7	27.00	R	PU	42
D3.1	Specification of functionality requirements satisfying user information needs	3	11	12.00	R	PU	6
D3.2	Specification of presentation interfaces for the three scenarios	3	6	9.00	R	PU	6
D3.3	LinkedTV user interfaces sketch	3	6	9.00	R	PU	12
D3.4	LinkedTV interface and presentation engine version 1	3	10	18.00	R	PU	12
D3.5	Requirements document for LinkedTV user interfaces (version 2)	3	6	9.00	R	PU	24
D3.6	LinkedTV interface and presentation engine version 2	3	10	24.00	R	PU	24
D3.7	LinkedTV user interfaces selected and refined (version 2)	3	6	12.00	R	PU	36

WT2:
List of Deliverables

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D3.8	Design guideline document for concept-based presentations	3	6	6.00	R	PU	42
D4.1	Specification of user profiling and contextualisation	4	3	12.00	R	PU	6
D4.2	User profile schema and profile capturing	4	3	12.00	R	PU	12
D4.3	Content and concept filter v1	4	1	18.00	R	PU	12
D4.4	User profile and contextual adaptation	4	3	36.00	R	PU	24
D4.5	Content and concept filter v2	4	1	14.00	R	PU	24
D4.6	Contextualisation solution and implementation	4	5	24.00	R	PU	36
D4.7	Evaluation and final results	4	1	12.00	R	PU	42
D5.1	LinkedTV platform and architecture	5	8	6.00	R	PU	6
D5.2	LinkedTV front-end: video player and MediaCanvas API	5	10	18.00	P	PU	12
D5.3	First LinkedTV end-to-end platform	5	8	18.00	P	PU	18
D5.4	Final LinkedTV integrating platform	5	8	9.00	P	CO	24
D5.5	LinkedTV front-end: video player and MediaCanvas API v2	5	10	18.00	P	PU	30
D5.6	Final LinkedTV end-to-end platform	5	8	9.00	P	PU	36

WT2:
List of Deliverables

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D5.7	Validation of the LinkedTV architecture	5	1	6.00	R	PU	42
D6.1	Scenario descriptions	6	2	15.00	R	PU	12
D6.2	Scenario demonstrators	6	2	18.00	D	PP	24
D6.3	User trial results	6	11	24.00	R	PU	30
D6.4	Scenario demonstrators v2	6	2	24.00	D	PU	36
D6.5	Final evaluation	6	11	21.00	R	PU	42
D7.1	Project website	7	2	3.00	R	PU	2
D7.2	Dissemination and standardisation plan	7	2	9.00	R	PU	6
D7.3	Dissemination and standardisation report v1	7	2	9.00	R	PU	18
D7.4	Project demonstrator v1	7	2	12.00	D	PU	24
D7.5	Dissemination and standardisation report v2	7	2	9.00	R	PU	30
D7.6	Project demonstrator v2	7	2	12.00	D	PU	36
D7.7	Dissemination and standardisation report v3	7	2	12.00	R	PU	42
D8.1	Exploitation plan for the project	8	11	12.00	R	CO	6
D8.2	First market analysis	8	11	9.00	R	PU	12
D8.3	LinkedTV business models, v1	8	1	9.00	R	PP	18
D8.4	Evaluation of exploitation impact and recommendations	8	2	9.00	R	PU	24

WT2:
List of Deliverables

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D8.5	LinkedTV end-to-end platform value chain	8	11	12.00	R	PU	24
D8.6	Market and product survey for LinkedTV services and technology	8	11	9.00	R	PU	36
D8.7	LinkedTV business models, v2	8	1	9.00	R	PP	36
D8.8	Common and individual exploitation plans for after the project	8	11	6.00	R	PP	42
D9.1.1	Annual Project Scientific Report	9	1	3.00	R	PU	12
D9.1.2	Annual Project Scientific Report	9	1	4.00	R	PU	24
D9.1.3	Annual Project Scientific Report	9	1	4.00	R	PU	36
D9.2.1	Annual Project Financial Report	9	1	3.00	R	PU	12
D9.2.2	Annual Project Financial Report	9	1	4.00	R	PU	24
D9.2.3	Annual Project Financial Report	9	1	4.00	R	PU	36
D9.3.1	Self-Assessment of Work Performed and Recommendations for Workplan Revision	9	1	2.00	R	PU	12
D9.3.2	Self-Assessment of Work Performed and Recommendations for Workplan Revision	9	1	3.00	R	PU	24
D9.4	Final Project Report	9	1	6.00	R	PU	42
			Total	864.00			

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP1	Type of activity [54]	RTD
Work package title	Intelligent hypervideo analysis		
Start month	1		
End month	42		
Lead beneficiary number [55]	3		

Objectives

• Automatically and semi-automatically decompose the audiovisual material (using segmentation, tracking), and represent and evaluate the similarity of content segments, in order to support the annotation process.
• Associate content segments with a first form of semantic descriptions of it, i.e. with an appropriate multitude of object and/or scene labels.
• Analyse text and audio information that is complementary to the visual stream, and use input from other modalities to optimize the functionality of individual annotation processes.
• Enrich and extend the previous analysis results, by further labeling content segment with event labels and by identifying specific instances of objects and events.
• Integrate all developed analysis and labeling techniques in an annotation tool for hypervideo, which will support users in the semi-automatic linking of content with minimal effort.
• Thoroughly evaluate the developed techniques, both internally and by participation to international benchmarking activities.

Description of work and role of partners

T1.1 Visual information preprocessing and representation (CERTH-ITI, FRAUNHOFER, RBB) (M1-24)
T1.1.1: Requirements analysis and review of the state-of-the-art (M1-6)
T1.1.2: Content decomposition techniques for LinkedTV (M7-24)
T1.1.3: Content representation and similarity-based matching techniques for LinkedTV (M7-24)

T1.2 Visual object and scene labeling (CERTH-ITI, UEP) (M1-36)
T1.2.1: Requirements analysis and review of the state-of-the-art (M1-6)
T1.2.2: Learning and clustering techniques for LinkedTV (M7-36)
T1.2.3: Dimensionality reduction and GPU-based processing for computational efficiency (M7-36)

T1.3 Complementary text and audio analysis (S+V, CERTH-ITI, UEP, RBB) (M1-24)
T1.3.1: Requirements analysis and review of the state-of-the-art (M1-6)
T1.3.2: Components for state of the art audio and text analysis (M7-12)
T1.3.3: Extensions/improvements in audio/text analysis techniques for LinkedTV (M13-24)

T1.4 Event and instance-based labeling of visual information (CERTH-ITI, FRAUNHOFER) (M7-36)
T1.4.1: Requirements analysis and review of the state-of-the-art (M7-12)
T1.4.2: Event detection and event-based content labeling (M13-36)
T1.4.3: Instance-based content labeling using information from multiple modalities (M13-36)

T1.5 User assisted annotation tool (FRAUNHOFER, CERTH-ITI, RBB) (M7-36)
T1.5.1: Selection of baseline annotation tool and requirements analysis for its extension (M7-12)
T1.5.2: Intermediate version of the annotation tool (LinkedTV annotation tool, first release) (M13-24)
T1.5.3: Final version of the annotation tool (LinkedTV annotation tool, final release) (M25-36)

T1.6 Intelligent hypervideo analysis evaluation (CERTH-ITI, S+V, FRAUNHOFER) (M13-42)
T1.6.1: Internal evaluation of WP1 technologies (M13-42)
T1.6.2: Participation to international benchmarking activities with WP1 technologies (M13-42)

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	Fraunhofer	33.00
3	CERTH	59.00
4	UEP	21.00
9	BEELD EN GELUID	25.00
12	RBB	3.00
	Total	141.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D1.1	State of the art and requirements analysis for hypervideo	3	12.00	R	PU	12
D1.2	Visual, text and audio information analysis for hypervideo, first release	9	27.00	R	PU	18
D1.3	LinkedTV annotation tool, first release	1	27.00	R	PU	24
D1.4	Visual, text and audio information analysis for hypervideo, final release	3	36.00	R	PU	36
D1.5	LinkedTV annotation tool, final release	1	18.00	R	PU	36
D1.6	Intelligent hypervideo analysis evaluation, final results	3	21.00	R	PU	42
		Total	141.00			

Description of deliverables

D1.1) State of the art and requirements analysis for hypervideo: This deliverable will present a state of the art and requirements analysis for hypervideo. [month 12]

D1.2) Visual, text and audio information analysis for hypervideo, first release: The deliverable will describe the work done in visual, text and audio analysis for hypervideo. [month 18]

D1.3) LinkedTV annotation tool, first release: The deliverable describes the first release of the LinkedTV annotation tool. [month 24]

D1.4) Visual, text and audio information analysis for hypervideo, final release: The deliverable will describe the final release of tools for visual, text and audio analysis for hypervideo. [month 36]

D1.5) LinkedTV annotation tool, final release: The deliverable will describe the final release of the LinkedTV annotation tool. [month 36]

D1.6) Intelligent hypervideo analysis evaluation, final results: The deliverable presents the evaluation of intelligent hypervideo analysis. [month 42]

WT3:
Work package description

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	Requirements analysis and review of SoA for hypervideo, and selection of baseline annotation tool	3	12	
MS2	Implementation of LinkedTV analysis techniques and hypervideo annotation tool, first release	1	24	
MS3	Implementation of LinkedTV analysis techniques and hypervideo annotation tool, final release	1	36	
MS4	Final evaluation results	3	42	

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP2	Type of activity [54]	RTD
Work package title	Linking hypervideo to web content		
Start month	1		
End month	42		
Lead beneficiary number [55]	7		

Objectives

• Specify and implement a URI-based mechanism for addressing media fragments.
• Design lightweight annotation schemas for media objects, interoperable with existing multimedia standards.
• Research web mining techniques on semi-structured and unstructured data to annotate media objects with concepts and expand the Web-based metadata layer to become a Connected Media Layer.
• Develop the infrastructure to crawl relevant parts of the Web and mine concepts, creating and searching the Connected Media Layer.

Description of work and role of partners

T2.1 Media fragments addressing (EURECOM, CERTH-ITI)(M1-36)
T2.1.1 Specification for media fragment addressing (M1-24)
This sub-task will provide a URI-based mechanism for addressing fragments of multimedia content together with client-side and server-side implementations passing test-cases.
T2.1.2 Extension of Web search & retrieval to support media fragments (M13-36)
This sub-task will enhance the search and retrieval modules with the media fragments specification.
T2.2 Lightweight metadata models for hypervideo (EURECOM, UEP, CERTH-ITI)(M1-36)
T2.2.1 Design of a lightweight metadata model and alignment with other schemas (M1-18)
This sub-task will model a set of lightweight metadata ontologies for multimedia, compatible with existing standards.
T2.2.2 API implementation and refinements of the metadata models (M13-36)
This sub-task will implement, test and publicly release an API of the metadata models.
T2.3 Web mining for support of media annotation (UEP, EURECOM)(M1-42)
T2.3.1 Selection and evaluation of methods for Web mining (M1-6)
This sub-task will evaluate techniques and tools (e.g. OpenCalais, GATE, SPROUT) for extracting information from web resources in the context of media analysis.
T2.3.2 Specification of Web mining process for improved concept identification in hypervideo (M7-36)
This sub-task will research, develop and evaluate novel mining techniques for identifying and disambiguating concepts in hypervideo.
T2.3.3 Integration and refinement of concept labelling through Web content mining process (M13-42)
This sub-task will complement specifically the multimedia analysis performed in WP1 for labelling concepts in hypervideo.
T2.4 Retrieving additional content from the web (UEP, CONDAT, EURECOM)(M13-42)
T2.4.1 Specification of the Linked Media Layer (M13-24)
This sub-task will specify the Linked Media Layer composed of a fine-grained mechanism for addressing fragments of multimedia and annotations schemas.
T2.4.2 Search and Retrieval in the Linked Media Layer (M25-42)
This sub-task will iteratively integrate the media fragment specification and the metadata schemas together with the annotations gathered from web mining processes in order to provide a search and retrieval module in the Linked Media Layer.
T2.4.2 Web mining approaches to annotating Web-based content and gathering information around concepts (M13-42)

This sub-task will research and evaluate additional Web mining techniques on completely unstructured data to enrich the Linked Media Layer

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
3	CERTH	12.00
4	UEP	49.00
7	EURECOM	57.00
8	CONDAT	18.00
	Total	136.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D2.1	Specification of the Media Fragment URI scheme	7	6.00	R	PU	6
D2.2	Specification of lightweight metadata models for multimedia annotation	7	12.00	R	PU	9
D2.3	Specification of Web mining process for hypervideo concept identification	4	9.00	R	PU	12
D2.4	Annotation and retrieval module of media fragments	7	27.00	R	PU	24
D2.5	Specification of the Linked Media Layer	4	12.00	R	PU	24
D2.6	Advanced concept labelling by complementary Web mining	4	43.00	R	PU	36
D2.7	Final Linked Media Layer and evaluation	7	27.00	R	PU	42
		Total	136.00			

Description of deliverables

D2.1) Specification of the Media Fragment URI scheme: This deliverable specifies the Media Fragment URI scheme for LinkedTV [month 6]

D2.2) Specification of lightweight metadata models for multimedia annotation: This deliverable specifies the lightweight metadata models for multimedia annotation [month 9]

D2.3) Specification of Web mining process for hypervideo concept identification: This deliverable specifies the Web mining process for hypervideo concept identification [month 12]

D2.4) Annotation and retrieval module of media fragments: This deliverable describes the annotation and retrieval modules for media fragments [month 24]

D2.5) Specification of the Linked Media Layer: This deliverable specifies the Linked Media Layer. [month 24]

D2.6) Advanced concept labelling by complementary Web mining: This deliverable specifies the Web mining process extended to perform advanced concept labelling [month 36]

D2.7) Final Linked Media Layer and evaluation: This deliverable specifies the final Linked Media Layer and the results of its evaluation. [month 42]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS5	Media fragment addressing and multimedia metadata, Web mining for concept identification	7	12	
MS6	Media fragment implementation, Web mining for concept annotation and specification of Linked Media	7	24	
MS7	Multimedia metadata API, Web mining for concept identification and disambiguation	7	36	
MS8	Evaluation and final results	7	42	

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP3	Type of activity [54]	RTD
Work package title	LinkedTV interface and presentation engine		
Start month	1		
End month	42		
Lead beneficiary number [55]	6		

Objectives

- Collect user interface and system requirements for information interfaces
- Design a number of cross-scenario information interfaces
- Specify a flexible and adaptable description scheme for interfaces
- Implement information selection and browsing engine for concept-based presentations
- Compiling design guidelines for concept-based information interfaces

Description of work and role of partners

T3.1 User requirements analysis (USG, S+V, UMONS, RBB)(M1-6)
T3.1.1 Identify a number of cross-scenario information selection/browsing tasks (M1-3)
This sub-task will identify common user information needs based on the three scenarios envisaged in WP6.
T3.1.2 Establish user interface and system functionality requirements (M4-6)
This sub-task will specify the functionality requirements based on the previous analysis.

T3.2 User-centred design and specification of hypervideo information interfaces (CWI, UMONS, RBB)(M1-12, M25-36)
T3.2.1 Design of first user interfaces (M1-6)
This subtask will design two or three mockup interfaces per scenario based on the requirements previously defined.
T3.2.2 Development of first user interfaces (M7-12)
This sub-task will sketch the interfaces previously designed.
T3.2.3 Selection of final user interface design and specification (M25-36)
After an evaluation phase, the final interfaces for each scenario will be chosen among the various sketch and further specified and developed.

T3.3 Develop the interface and presentation engine (NOTERIK, CWI) (M7-36)
T3.3.1 Development of the interface and presentation engine (M7-12)
This sub-task will develop a first version of the presentation engine, part on the LinkedTV platform.
T3.3.2 Refinement of the interface and presentation engine (M13-36)
This sub-task will develop the final presentation engine, after an evaluation phase.

T3.4 Evaluate functionalities and interfaces of the connected media and background information (CWI, S+V, RBB, UMONS)(M19-24, M37-42)
T3.4.1 First evaluation (M19-24)
This sub-task will conduct the first user evaluation of the various interfaces developed
T3.4.2 Final evaluation (M37-42)
This sub-task will conduct the second user evaluation of the final interfaces chosen and the overall presentation engine.

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
5	UMONS	9.00
6	CWI	55.00
9	BEELD EN GELUID	5.00
10	NOTERIK	19.00
11	UNIVERSITAT ST GALLEN	5.00
12	RBB	6.00
	Total	99.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D3.1	Specification of functionality requirements satisfying user information needs	11	12.00	R	PU	6
D3.2	Specification of presentation interfaces for the three scenarios	6	9.00	R	PU	6
D3.3	LinkedTV user interfaces sketch	6	9.00	R	PU	12
D3.4	LinkedTV interface and presentation engine version 1	10	18.00	R	PU	12
D3.5	Requirements document for LinkedTV user interfaces (version 2)	6	9.00	R	PU	24
D3.6	LinkedTV interface and presentation engine version 2	10	24.00	R	PU	24
D3.7	LinkedTV user interfaces selected and refined (version 2)	6	12.00	R	PU	36
D3.8	Design guideline document for concept-based presentations	6	6.00	R	PU	42
		Total	99.00			

Description of deliverables

D3.1) Specification of functionality requirements satisfying user information needs: This deliverable specifies the functionality requirements of the user's information needs. [month 6]

D3.2) Specification of presentation interfaces for the three scenarios: The deliverable specifies the presentation interfaces for the three scenarios. [month 6]

D3.3) LinkedTV user interfaces sketch: The deliverable sketches the LinkedTV user interfaces. [month 12]

D3.4) LinkedTV interface and presentation engine version 1: The deliverable presents the first version of the LinkedTV interface and presentation engine. [month 12]

D3.5) Requirements document for LinkedTV user interfaces (version 2): The deliverable updates D3.2 on the LinkedTV user interface requirements. [month 24]

D3.6) LinkedTV interface and presentation engine version 2: The deliverable presents the second version of the LinkedTV interface and presentation engine. [month 24]

D3.7) LinkedTV user interfaces selected and refined (version 2): The deliverables updates D3.5 selecting and refining the final LinkedTV interfaces. [month 36]

D3.8) Design guideline document for concept-based presentations: This deliverable summarizes what we have learnt about LinkedTV interfaces into a design guideline document [month 42]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS9	Initial descriptions of scenario tasks as input for discussions with scenario partners	11	3	
MS10	User groups identified with which to try out sketch and prototype interfaces	11	6	
MS11	Initial sketches and mockups of interfaces available for discussions with scenario partners	6	9	
MS12	First interfaces created, first presentation engine ready for LinkedTV	10	12	
MS13	Refined presentation engine	10	24	
MS14	Final interfaces decided and implemented	6	36	
MS15	Final evaluation of interfaces in the user trials	6	42	

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP4	Type of activity [54]	RTD
Work package title	Contextualisation and personalisation		
Start month	1		
End month	42		
Lead beneficiary number [55]	1		

Objectives

- Specify a schema for user profiles
- Specify a schema for contextualised profile and knowledge pull
- Specify a means to filter and select concepts and content on the basis of user profiles
- Extend and refine user profile on the basis of user activity and social profiles

Description of work and role of partners

T4.1 User profiling (CERTH-ITI, FRAUNHOFER, UEP, CWI, STI) (M1-M24)
T4.1.1 State of the art and requirements analysis for user profiling (M1-6)
This subtask will provide a study of the user requirements and a comprehensive research and evaluation of the state-of-the-art approaches on user profiling for multimedia content.
T4.1.2 First specification of user profile schema and processes for profile capturing (M7-12)
Specification of the schema for semantic representation of the user profile and mechanism for unobtrusive capturing and updating of user preferences through his/her transactions.
T4.1.3 Extensions/refinements to the user profile schema and processes for profile capturing (M13-18)
Refined implementation for semantically representing of the user profile and advanced mechanism for profile learning and understanding.
T4.1.4 Final specification of user profile schema and processes for profile capturing (M19-24)
Final implementation and testing of the user profile representation and learning mechanisms.

T4.2 User Behaviour and Contextualisation (UMONS, FRAUNHOFER, CERTH-ITI) (M1-M36)

T4.2.1 State of the art and requirements analysis for contextualisation (M1-6)
This subtask will provide a study of the current research and evaluation of the state-of-the-art approaches on user behaviour tracking

T4.2.2 First specification for personalisation based on user behaviour (M7-12)
Mechanism for identifying user interests based on their physical behaviour, e.g. eye tracking allows to identify which concepts in video catch and hold user attention.

T4.2.3 Extensions/refinements for personalisation based on user behaviour (M13-24)
Mechanism for identifying and extracting the semantic knowledge in user behavioural tracking.

T4.2.4 Advanced concept-based analysis for personalisation based on user behaviour (M25-36)
This subtask will provide the mechanism to expand the personalisation of the LinkedTV services with the aid of external web resources based on available high-level multimedia concepts for filtering and contextualising the identified concepts and content of interest to the user.

T4.3 Personalized content filter (FRAUNHOFER, CERTH-ITI, UEP, STI) (M7-M36)
T4.3.1 Development of first profile matcher and content filter (M7-12)
First implementation of the profile-content semantic matcher, where provided concepts and content will be filtered based on the user profile.

T4.3.2 Refined profile matcher and content filter (M19-24)
Refined implementation of the profile-content semantic matcher, integrating advanced knowledge pulling.

T4.3.3 Final profile matcher and content filter (M31-36)
Final implementation of the profile-content semantic matcher, incorporating advanced concept and content filtering.

T4.4 Evaluation of personalization technologies (FRAUNHOFER, UMONS, CERTH-ITI) (M37-M42)
This task will define the user studies, test beds and evaluation metrics for testing the personalization module and provide an experimental evaluation of the module

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	Fraunhofer	36.00
2	STI GMBH	12.00
3	CERTH	31.00
4	UEP	20.00
5	UMONS	21.00
6	CWI	8.00
	Total	128.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D4.1	Specification of user profiling and contextualisation	3	12.00	R	PU	6
D4.2	User profile schema and profile capturing	3	12.00	R	PU	12
D4.3	Content and concept filter v1	1	18.00	R	PU	12
D4.4	User profile and contextual adaptation	3	36.00	R	PU	24
D4.5	Content and concept filter v2	1	14.00	R	PU	24
D4.6	Contextualisation solution and implementation	5	24.00	R	PU	36
D4.7	Evaluation and final results	1	12.00	R	PU	42
		Total	128.00			

Description of deliverables

D4.1) Specification of user profiling and contextualisation: This deliverable provides a first specification of the user profile and context model [month 6]

D4.2) User profile schema and profile capturing: This deliverable describes the processes for user profile capturing and content filtering/adaptation [month 12]

D4.3) Content and concept filter v1: This deliverable specifies the first version of the personalisation filtering component [month 12]

D4.4) User profile and contextual adaptation: This deliverable specifies the final user profile specification, as well as processes for user profile capture and refined/extended content filtering/adaptation [month 24]

D4.5) Content and concept filter v2: This deliverable describes the revised personalization filter component [month 24]

D4.6) Contextualisation solution and implementation: This deliverables provides a contextualisation solution and implementation based on user behavioural tracking [month 36]

D4.7) Evaluation and final results: This deliverable reports on an evaluation of the LinkedTV personalisation and contextualisation solutions and the final results [month 42]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS16	User profile specification	3	12	
MS17	User profile capture and refined/extended content filtering/adaptation, personalization filter	1	24	
MS18	Final specifications for content filtering/adaptation, final personalization filter	1	36	
MS19	Final results and evaluation	1	42	

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP5	Type of activity [54]	RTD
Work package title	LinkedTV platform		
Start month	1		
End month	42		
Lead beneficiary number [55]	8		

Objectives

This WP realises the integration of components of LinkedTV into an end-to-end platform. It will integrate or provide the following components on the back-end:
• audio / video and Web resource analysis and annotation
• local (meta)data repository and query functionality
• search and retrieval of media from the Web (Connected Media Layer)
• linking of all networked multimedia materials
• web crawler for periodic link update
• caching for efficient user quality of experience
• platform management (e.g. component monitoring)
• output of video, associated content and metadata to network delivery servers such as Web or IPTV
It will integrate or provide the following components on the front-end:
• clickable video playback
• interactive content layer for the LinkedTV user interfaces (the MediaCanvas API)
• user profile capture and personalization filter
• front-end cache for related content

Description of work and role of partners

T5.1 Integrating platform (CONDAT, NOTERIK)(M1-24)
T5.1.1 Specification and set-up of the integrating platform (M1-6)
T5.1.2 Development of delivery modules for Web TV and IPTV (M7-12)
T5.1.3 Testing of delivery over Web TV and IPTV (M13-18)
T5.1.4 Integration platform testing and reconfiguration (M19-24)

T5.2 Back-end architecture specification (CONDAT, NOTERIK)(M1-6, 19-24)
T5.2.1 First LinkedTV architecture specification (M1-6)
T5.2.2 Architectural validation and refinement (M19-24)

T5.3 Back-end development and component integration (CONDAT, NOTERIK)(M7-36)
T5.3.1 Initial set-up of the back-end system and specification of component integration (M7-12)
T5.3.2 Integration of components onto the back-end system (M13-18)
T5.3.3 Refinement of back-end system (M19-24)
T5.3.4 Integration of new components onto the back-end system (M25-30)
T5.3.5 Final refinement of back-end system (M31-36)

T5.4 MediaCanvas API (NOTERIK, CWI)(M7-12, 25-30)
T5.4.1 First MediaCanvas API and display tool (M7-12)
T5.4.2 Second MediaCanvas API and display tool (M25-30)

T5.5 Clickable Video Playback (NOTERIK, EURECOM)(M7-12, 25-30)
T5.5.1 First Clickable Video player (M7-12)
T5.5.2 Second Clickable Video player (M25-30)

T5.6 Front-end development and component integration (NOTERIK, CERTH-ITI)(M7-36)

T5.6.1 Initial set-up of the front-end system and specification of component integration (M7-12)
T5.6.2 Integration of components onto the front-end system (M13-18)
T5.6.3 Refinement of front-end system (M19-30)
T5.6.4 Final refinement of back-end system (M31-36)

T5.7 Validation (FRAUNHOFER, CONDAT, NOTERIK)(M37-42)
T5.7.1 Validation of the front-end (M37-42)
T5.7.2 Validation of the back-end (M37-42)
T5.7.3 Validation of the end-to-end platform (M37-42)

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	Fraunhofer	6.00
3	CERTH	4.00
6	CWI	4.00
7	EURECOM	4.00
8	CONDAT	45.00
10	NOTERIK	21.00
	Total	84.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D5.1	LinkedTV platform and architecture	8	6.00	R	PU	6
D5.2	LinkedTV front-end: video player and MediaCanvas API	10	18.00	P	PU	12
D5.3	First LinkedTV end-to-end platform	8	18.00	P	PU	18
D5.4	Final LinkedTV integrating platform	8	9.00	P	CO	24
D5.5	LinkedTV front-end: video player and MediaCanvas API v2	10	18.00	P	PU	30
D5.6	Final LinkedTV end-to-end platform	8	9.00	P	PU	36
D5.7	Validation of the LinkedTV architecture	1	6.00	R	PU	42
		Total	84.00			

Description of deliverables

D5.1) LinkedTV platform and architecture: This deliverable presents the outline of the planned LinkedTV platform and architecture [month 6]

D5.2) LinkedTV front-end: video player and MediaCanvas API: This deliverable presents the first version of the LinkedTV video player and MediaCanvas API [month 12]

D5.3) First LinkedTV end-to-end platform: This deliverable presents the first end-to-end platform with integrated back-end and front-end systems and functioning delivery modules for Web TV and IPTV [month 18]

D5.4) Final LinkedTV integrating platform: This deliverables provides the final specification of the integrating platform [month 24]

D5.5) LinkedTV front-end: video player and MediaCanvas API v2: This deliverable presents the second version of the LinkedTV video player and MediaCanvas API [month 30]

D5.6) Final LinkedTV end-to-end platform: This deliverable provides the final implementation of the end-to-end platform [month 36]

D5.7) Validation of the LinkedTV architecture: This deliverable contains the results of the validation of the LinkedTV architecture [month 42]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS20	First specifications of the LinkedTV architecture and integrating platform	8	6	
MS21	Development/deployment and integration of different components	10	12	
MS22	First end-to-end platform ready	8	18	
MS23	Final specification of the integrating platform	8	24	
MS24	Final development/deployment of components in the back-end and front-end	10	30	
MS25	Final implementation of the end-to-end platform	8	36	
MS26	Validation of the end-to-end platform	1	42	

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP6	Type of activity [54]	RTD
Work package title	Scenarios		
Start month	1		
End month	42		
Lead beneficiary number [55]	2		

Objectives

- Define the content and concepts relevant for each scenario
- Storyboarding, feasibility study and realizing the scenarios on the LinkedTV platform
- User trials and evaluation

Description of work and role of partners

T6.1 Media and content preparation (STI, RBB, UMONS, S+V, CERTH-ITI, UEP, EURECOM)
T6.1.1 Initial media and content preparation (M1-6)
T6.1.2 Revised media and content preparation (M25-30)

T6.2 Scenario realization on LinkedTV platform (STI, RBB, UMONS, S+V, FRAUNHOFER)
T6.2.1 Storyboarding of the scenarios (M7-12)
T6.2.2 Scenario realization on the LinkedTV platform (M19-24)
T6.2.3 Revised scenario realization on the LinkedTV platform (M31-36)

T6.3 User trials and evaluation (UNISG, EURECOM, RBB, UMONS, S+V, STI)
T6.3.1 Internal trials with the partners (M13-18)
T6.3.2 User trials held by the partners (M25-30)
T6.3.3 Final user trials held by the partners (M37-42)

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	Fraunhofer	2.00
2	STI GMBH	16.00
3	CERTH	2.00
4	UEP	4.00
5	UMONS	21.00
7	EURECOM	8.00
9	BEELD EN GELUID	21.00
11	UNIVERSITAT ST GALLEN	8.00
12	RBB	20.00
	Total	102.00

WT3:
Work package description

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D6.1	Scenario descriptions	2	15.00	R	PU	12
D6.2	Scenario demonstrators	2	18.00	D	PP	24
D6.3	User trial results	11	24.00	R	PU	30
D6.4	Scenario demonstrators v2	2	24.00	D	PU	36
D6.5	Final evaluation	11	21.00	R	PU	42
		Total	102.00			

Description of deliverables

D6.1) Scenario descriptions: This deliverable gives the technical and content-focused descriptions of the LinkedTV scenarios [month 12]

D6.2) Scenario demonstrators: This deliverable describes the demonstrators of the scenarios running on the LinkedTV platform [month 24]

D6.3) User trial results: This deliverables provides the results of the user trials of the scenarios [month 30]

D6.4) Scenario demonstrators v2: This deliverable describes the second versions of the demonstrators of the scenarios running on the (now finalised) LinkedTV platform [month 36]

D6.5) Final evaluation: This deliverables provides the results of the final evaluations of the scenarios [month 42]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments
MS27	The media and content required has been selected	2	6	
MS28	Scenarios have been described	2	12	
MS29	Scenario preparation is complete and has been trialed internally	11	18	
MS30	Scenarios have been realized on LinkedTV platform	2	24	
MS31	User trials have taken place	11	30	
MS32	Scenarios have been refined and realized anew on the LinkedTV platform	2	36	
MS33	Final user trials have taken place	11	42	

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP7	Type of activity [54]	OTHER
Work package title	Dissemination		
Start month	1		
End month	42		
Lead beneficiary number [55]	2		

Objectives

The aim of this workpackage is to ensure the dissemination of information about the project, its objectives, approaches and results. This will be achieved through a public website, dissemination materials, web based dissemination, participation and publication at academic and industry events as well as in scientific and trade journals, and the preparation of demonstrators which will showcase LinkedTV services, both at events and remotely (over Web channels). We will also push for standardisation of project results, particularly with respect to a URI-based mechanism for addressing spatio-temporal multimedia fragment within the W3C and an ontology and its API for representing multimedia metadata within W3C, EBU and IPTC.

In line with its obligations regarding dissemination of results and achievements, the Co-ordinator insures that all public documents (including, but not restricted to, the following material: video material covering experiments, trials; animations of "real-time" simulation results; presentations, animated/voice-over or not; promotional material (leaflets, posters, etc.); press releases etc.) generated by the project are available for download during until all the final administrative procedures are completed and the project is closed. In addition, all project related dissemination activities undertaken by the participants, individually or jointly, must explicitly acknowledge the project and the European Commission's FP7.

Description of work and role of partners

T7.1 Dissemination and standardisation planning (STI)(M1-6)

T7.2 Project website (STI)(M1-2)

T7.3 Production of dissemination materials and publications (STI)(M7-42)

T7.4 Project presentations at events (STI)(M7-42)

T7.5 Project demonstrator (STI)(M19-42)
T7.5.1 First project demonstrator (M19-24)
T7.5.2 Dissemination of the demonstrator online and at events (M25-30)
T7.5.3 Second project demonstrator (M31-36)
T7.5.4 Dissemination of the demonstrator online and at events (M37-42)

T7.6 Standardisation activities (STI)(M7-42)
T7.6.1 First standardisation push (M7-18)
T7.6.2 Evaluation of standardisation efforts (M19-24)
T7.6.3 Second standardisation push (M25-36)
T7.6.4 Sustainability actions for standardisation activities after the project (M37-42)

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	Fraunhofer	6.00

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	STI GMBH	18.00
3	CERTH	3.00
4	UEP	3.00
5	UMONS	6.00
6	CWI	3.00
7	EURECOM	11.00
8	CONDAT	2.00
9	BEELD EN GELUID	2.00
10	NOTERIK	2.00
11	UNIVERSITAT ST GALLEN	3.00
12	RBB	7.00
	Total	66.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D7.1	Project website	2	3.00	R	PU	2
D7.2	Dissemination and standardisation plan	2	9.00	R	PU	6
D7.3	Dissemination and standardisation report v1	2	9.00	R	PU	18
D7.4	Project demonstrator v1	2	12.00	D	PU	24
D7.5	Dissemination and standardisation report v2	2	9.00	R	PU	30
D7.6	Project demonstrator v2	2	12.00	D	PU	36
D7.7	Dissemination and standardisation report v3	2	12.00	R	PU	42
		Total	66.00			

Description of deliverables

D7.1) Project website: This deliverable describes the project website [month 2]

D7.2) Dissemination and standardisation plan: This deliverable describes the LinkedTV dissemination and standardisation plan [month 6]

D7.3) Dissemination and standardisation report v1: This deliverable reports on the intermediate dissemination and standardisation activities [month 18]

D7.4) Project demonstrator v1: The deliverable describes the first project demonstrator [month 24]

D7.5) Dissemination and standardisation report v2: This deliverable reports on the dissemination and standardisation activities since month 18 (D7.3) [month 30]

D7.6) Project demonstrator v2: The deliverable describes the second project demonstrator [month 36]

D7.7) Dissemination and standardisation report v3: This deliverable reports on the final dissemination and standardisation activities [month 42]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS34	Plan for dissemination and standardisation, project website	2	6	
MS35	dissemination activities have taken place, first push for standardisation	2	18	
MS36	First demonstrators for the project	2	24	
MS37	First use of the demonstrators at academic, industrial or public events	2	30	
MS38	Final demonstrator is ready	2	36	
MS39	Final actions disseminating and demonstrating the project results have taken place	2	42	

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP8	Type of activity [54]	RTD
Work package title	Markets, Business Models and Exploitation Strategies		
Start month	1		
End month	42		
Lead beneficiary number [55]	11		

Objectives

• To provide a detailed market overview of the current state-of-the art market developments and future trends based on a broad market analysis
• Development of innovative business models for different players involved in the LinkedTV value chain
• To develop an exploitation plan as a guideline for exploitation activities during the project as well as individual and common exploitation strategies that will assure that LinkedTV results can be turned in commercial success

Description of work and role of partners

T8.1 Product & Market Surveys (UNISG, S+V, UMONS, RBB, CONDAT, NOTERIK, STI)
T8.1.1 First market survey of user needs (M1-6)
The goal of this first market analysis is to explore how IPTV is used by users today and what their preferences for interactive IPTV would be. The focus of the analysis will be on preferences of users for different innovative interactive content formats. The analysis will be based on the one hand on secondary information sources, and on the other hand on primary quantitative and qualitative market research.
T8.1.2 First market survey of content and provider needs (M7-12)
The aim of the market analysis of content providers and providers is to analyse their requirements. Important questions that will be considered are preferences for content that needs to be connected, potential interaction content format, existing experiences and in particular how new interactive content formats may fit into existing routines. The analysis will be based on secondary analysis and comparison with similar formats in online media. In addition, the content providers of the project will be consulted together with external providers and content providers.
T8.1.3 Second market survey of user needs (M19-24)
The second market analysis will take place when the first version of the LinkedTV technology is designed. The concrete concepts will be evaluated by the user. The goaö will be to evaluate the potential adoption of LinkedTV services. At the same time the data resulting from quantitative and qualitative market research will be compared with the data from the first market analysis. In addition to that the findings based on secondary data will be updated.
T8.1.4 Second market survey of content and provider needs (M25-30)
The second market analysis will evaluate the acceptance of the proposed LinkedTV solution by content providers. In addition the findings from the secondary sources and the primary market research will be compared. The emphasize will furthermore be on potential new advertising models and their acceptance by content providers.
T8.1.5 Overall market analysis for exploitation of LinkedTV results (M31-36)
The final market analysis will be an update on the findings from secondary and primary market research. It will be input for the final version of the exploitation plans.

T8.2 Business Models (UNISG, FRAUNHOFER, STI)
T8.2.1 Business model development (M7-18, 25-36)
Business model development will be based on the results of the first market analysis, The main components of business models will be conceptualized. This are potential customers, participants in the value chain, product design in terms of content formats and user interaction, The main emphasize will be furthermore on payment models and financial flows. The business models will be developed for all players in the value chain and from perspective of advertisers. The analysis will also evaluate relevant legal aspects.

T8.2.2 Analysis of the LinkedTV end-to-end platform value chain (M19-24)
The second part of the business model analysis will concentrate on the analysis of the end-to-end value chain of the LinkedTV platform and the relationships among involved players.

T8.3 Exploitation Planning & Exploitation Activities (UNISG, CONDAT, NOTERIK, STI)
T8.3.1 Exploitation plan for during the project (M1-6)
From the very beginning of the project exploitation activities will be considered and scheduled. The first exploitation plan will collect and summarize exploitation activities during the project. The exploitation plan will summarize all planned exploitation activities.
T8.3.2 Exploitation activities (M7-18, 25-36)
During the project the agreed upon exploitation activities will be carried out. This in particular includes also the development of concepts for and negotiation of joined exploitation and
T8.3.3 Evaluation of exploitation impact (M19-24)
After first exploitation activities are carried out, their impact will be evaluated and corrective measures will be proposed in case necessary.
T8.3.4 Exploitation plan for after the project (M37-42)
The ideas for common and individual exploitation plans will be collected and summarized. The experiences of exploitation activities during the project will be the used as input.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	Fraunhofer	10.00
2	STI GMBH	10.00
5	UMONS	6.00
8	CONDAT	6.00
9	BEELD EN GELUID	6.00
10	NOTERIK	6.00
11	UNIVERSITAT ST GALLEN	28.00
12	RBB	3.00
	Total	75.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D8.1	Exploitation plan for the project	11	12.00	R	CO	6
D8.2	First market analysis	11	9.00	R	PU	12
D8.3	LinkedTV business models, v1	1	9.00	R	PP	18
D8.4	Evaluation of exploitation impact and recommendations	2	9.00	R	PU	24
D8.5	LinkedTV end-to-end platform value chain	11	12.00	R	PU	24
D8.6	Market and product survey for LinkedTV services and technology	11	9.00	R	PU	36

WT3:
Work package description

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D8.7	LinkedTV business models, v2	1	9.00	R	PP	36
D8.8	Common and individual exploitation plans for after the project	11	6.00	R	PP	42
		Total	75.00			

Description of deliverables

D8.1) Exploitation plan for the project: This deliverable provides the initial individual and common exploitation plan for LinkedTV [month 6]

D8.2) First market analysis: This deliverable reports on an initial market analysis for LinkedTV exploitation [month 12]

D8.3) LinkedTV business models, v1: This deliverable provides an initial list of business models around LinkedTV technology [month 18]

D8.4) Evaluation of exploitation impact and recommendations: This deliverable refers to early exploitation actions in LinkedTV analysing their impact and drawing recommendations for the future [month 24]

D8.5) LinkedTV end-to-end platform value chain: This deliverable will concentrate on the analysis of the end-to-end value chain of the platform and the relationships among involved players [month 24]

D8.6) Market and product survey for LinkedTV services and technology: This deliverable reports on a market and product survey for LinkedTV services and technology [month 36]

D8.7) LinkedTV business models, v2: This deliverable provides an updated list of business models around LinkedTV technology [month 36]

D8.8) Common and individual exploitation plans for after the project: This deliverable outlines the common and individual exploitation plans for after the project [month 42]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments
MS40	The exploitation plan for the project is ready	11	6	
MS41	The initial market analysis has been completed	11	12	
MS42	The first business plans are prepared, first exploitation activities have taken place	1	18	
MS43	The analysis of the LinkedTV value chain has been completed	11	24	
MS44	The final market analysis, final business plans and final exploitation activities are complete	11	36	

WT3:
Work package description

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS45	The common and individual exploitation plans for LinkedTV results have been produced	11	42	

WT3:
Work package description

Project Number [1]	287911	Project Acronym [2]	LinkedTV

One form per Work Package

Work package number [53]	WP9	Type of activity [54]	MGT
Work package title	Management		
Start month	1		
End month	42		
Lead beneficiary number [55]	1		

Objectives

The management workpackage covers all the activities of the management structure of the project, which have the goal of ensuring a correct and successful running of the workplan. Individual tasks and reports are intended to ensure regular reporting which can aid the co-ordinators in identifying potential risks or problems, as well as ensuring that the project is operating correctly and on track in its scientific and technological goals.

The project will actively participate in the activities organised at programme level relating to the Networked Media and Search Systems area with the objective of providing input towards common activities and receiving feedback (e.g. from clusters and coordination groups), offering advice and guidance and receiving information relating to ICT programme implementation, standards, policy and regulatory activities, national or international initiatives, etc. The project participants will also commit themselves to support the organisation of an annual conference of the Networked and Electronic Media constituency if requested by the EC, by providing papers, participating in technical programme committee, chairing sessions, etc.

Description of work and role of partners

T9.1 Project Management (M1-42) (FRAUNHOFER)
T9.2 Periodic Scientific Reports (M1-42) (FRAUNHOFER)
T9.3 Periodic Financial Reports (M1-42) (FRAUNHOFER)
T9.4 Work Self-assessment and Workplan Revision (M7-12, 19-24, 37-42) (FRAUNHOFER)
T9.5 Internal Communication Structures: mailing lists, wiki etc. (M1-42) (STI)

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	Fraunhofer	21.00
2	STI GMBH	2.00
3	CERTH	1.00
4	UEP	1.00
5	UMONS	1.00
6	CWI	1.00
7	EURECOM	1.00
8	CONDAT	1.00
9	BEELD EN GELUID	1.00
10	NOTERIK	1.00
11	UNIVERSITAT ST GALLEN	1.00

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
12	RBB	1.00
	Total	33.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D9.1.1	Annual Project Scientific Report	1	3.00	R	PU	12
D9.1.2	Annual Project Scientific Report	1	4.00	R	PU	24
D9.1.3	Annual Project Scientific Report	1	4.00	R	PU	36
D9.2.1	Annual Project Financial Report	1	3.00	R	PU	12
D9.2.2	Annual Project Financial Report	1	4.00	R	PU	24
D9.2.3	Annual Project Financial Report	1	4.00	R	PU	36
D9.3.1	Self-Assessment of Work Performed and Recommendations for Workplan Revision	1	2.00	R	PU	12
D9.3.2	Self-Assessment of Work Performed and Recommendations for Workplan Revision	1	3.00	R	PU	24
D9.4	Final Project Report	1	6.00	R	PU	42
		Total	33.00			

Description of deliverables

D9.1.1) Annual Project Scientific Report: The Annual Project Scientific Report [month 12]

D9.1.2) Annual Project Scientific Report: The Annual Project Scientific Report [month 24]

D9.1.3) Annual Project Scientific Report: The Annual Project Scientific Report [month 36]

D9.2.1) Annual Project Financial Report: The Annual Project Financial Report [month 12]

D9.2.2) Annual Project Financial Report: The Annual Project Financial Report [month 24]

D9.2.3) Annual Project Financial Report: The Annual Project Financial Report [month 36]

D9.3.1) Self-Assessment of Work Performed and Recommendations for Workplan Revision: A Self-Assessment of Work Performed and Recommendations for Workplan Revision [month 12]

D9.3.2) Self-Assessment of Work Performed and Recommendations for Workplan Revision: A Self-Assessment of Work Performed and Recommendations for Workplan Revision [month 24]

D9.4) Final Project Report: The final project report [month 42]

WT3:
Work package description

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments
MS46	Annual reporting and self-assessment, year 1	1	12	
MS47	Annual reporting and self-assessment, year 2	1	24	
MS48	Annual reporting, year 3	1	36	
MS49	Final report	1	42	

WT4:
List of Milestones

Project Number [1]	287911	Project Acronym [2]	LinkedTV

List and Schedule of Milestones

Milestone number [59]	Milestone name	WP number [53]	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	Requirements analysis and review of SoA for hypervideo, and selection of baseline annotation tool	WP1	3	12	
MS2	Implementation of LinkedTV analysis techniques and hypervideo annotation tool, first release	WP1	1	24	
MS3	Implementation of LinkedTV analysis techniques and hypervideo annotation tool, final release	WP1	1	36	
MS4	Final evaluation results	WP1	3	42	
MS5	Media fragment addressing and multimedia metadata, Web mining for concept identification	WP2	7	12	
MS6	Media fragment implementation, Web mining for concept annotation and specification of Linked Media	WP2	7	24	
MS7	Multimedia metadata API, Web mining for concept identification and disambiguation	WP2	7	36	
MS8	Evaluation and final results	WP2	7	42	
MS9	Initial descriptions of scenario tasks as input for discussions with scenario partners	WP3	11	3	
MS10	User groups identified with which	WP3	11	6	

WT4:
List of Milestones

Milestone number [59]	Milestone name	WP number [53]	Lead beneficiary number	Delivery date from Annex I [60]	Comments
	to try out sketch and prototype interfaces				
MS11	Initial sketches and mockups of interfaces available for discussions with scenario partners	WP3	6	9	
MS12	First interfaces created, first presentation engine ready for LinkedTV	WP3	10	12	
MS13	Refined presentation engine	WP3	10	24	
MS14	Final interfaces decided and implemented	WP3	6	36	
MS15	Final evaluation of interfaces in the user trials	WP3	6	42	
MS16	User profile specification	WP4	3	12	
MS17	User profile capture and refined/extended content filtering/adaptation, personalization filter	WP4	1	24	
MS18	Final specifications for content filtering/adaptation, final personalization filter	WP4	1	36	
MS19	Final results and evaluation	WP4	1	42	
MS20	First specifications of the LinkedTV architecture and integrating platform	WP5	8	6	
MS21	Development/ deployment and integration of different components	WP5	10	12	
MS22	First end-to-end platform ready	WP5	8	18	
MS23	Final specification of the integrating platform	WP5	8	24	

WT4:
List of Milestones

Milestone number [59]	Milestone name	WP number [53]	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS24	Final development/ deployment of components in the back-end and front-end	WP5	10	30	
MS25	Final implementation of the end-to-end platform	WP5	8	36	
MS26	Validation of the end-to-end platform	WP5	1	42	
MS27	The media and content required has been selected	WP6	2	6	
MS28	Scenarios have been described	WP6	2	12	
MS29	Scenario preparation is complete and has been trialed internally	WP6	11	18	
MS30	Scenarios have been realized on LinkedTV platform	WP6	2	24	
MS31	User trials have taken place	WP6	11	30	
MS32	Scenarios have been refined and realized anew on the LinkedTV platform	WP6	2	36	
MS33	Final user trials have taken place	WP6	11	42	
MS34	Plan for dissemination and standardisation, project website	WP7	2	6	
MS35	dissemination activities have taken place, first push for standardisation	WP7	2	18	
MS36	First demonstrators for the project	WP7	2	24	
MS37	First use of the demonstrators at academic, industrial or public events	WP7	2	30	
MS38	Final demonstrator is ready	WP7	2	36	

WT4:
List of Milestones

Milestone number [59]	Milestone name	WP number [53]	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS39	Final actions disseminating and demonstrating the project results have taken place	WP7	2	42	
MS40	The exploitation plan for the project is ready	WP8	11	6	
MS41	The initial market analysis has been completed	WP8	11	12	
MS42	The first business plans are prepared, first exploitation activities have taken place	WP8	1	18	
MS43	The analysis of the LinkedTV value chain has been completed	WP8	11	24	
MS44	The final market analysis, final business plans and final exploitation activities are complete	WP8	11	36	
MS45	The common and individual exploitation plans for LinkedTV results have been produced	WP8	11	42	
MS46	Annual reporting and self-assessment, year 1	WP9	1	12	
MS47	Annual reporting and self-assessment, year 2	WP9	1	24	
MS48	Annual reporting, year 3	WP9	1	36	
MS49	Final report	WP9	1	42	

WT5:
Tentative schedule of Project Reviews

Project Number [1]	287911	Project Acronym [2]	LinkedTV

Tentative schedule of Project Reviews

Review number [65]	Tentative timing	Planned venue of review	Comments, if any
RV 1	13	TBC	
RV 2	25	TBC	
RV 3	37	TBC	
RV 4	43	TBC	

WT6:
Project Effort by Beneficiary and Work Package

Project Number [1]	287911	Project Acronym [2]	LinkedTV

Indicative efforts (man-months) per Beneficiary per Work Package

Beneficiary number and short-name	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	WP 8	WP 9	Total per Beneficiary
1 - Fraunhofer	33.00	0.00	0.00	36.00	6.00	2.00	6.00	10.00	21.00	114.00
2 - STI GMBH	0.00	0.00	0.00	12.00	0.00	16.00	18.00	10.00	2.00	58.00
3 - CERTH	59.00	12.00	0.00	31.00	4.00	2.00	3.00	0.00	1.00	112.00
4 - UEP	21.00	49.00	0.00	20.00	0.00	4.00	3.00	0.00	1.00	98.00
5 - UMONS	0.00	0.00	9.00	21.00	0.00	21.00	6.00	6.00	1.00	64.00
6 - CWI	0.00	0.00	55.00	8.00	4.00	0.00	3.00	0.00	1.00	71.00
7 - EURECOM	0.00	57.00	0.00	0.00	4.00	8.00	11.00	0.00	1.00	81.00
8 - CONDAT	0.00	18.00	0.00	0.00	45.00	0.00	2.00	6.00	1.00	72.00
9 - BEELD EN GELUID	25.00	0.00	5.00	0.00	0.00	21.00	2.00	6.00	1.00	60.00
10 - NOTERIK	0.00	0.00	19.00	0.00	21.00	0.00	2.00	6.00	1.00	49.00
11 - UNIVERSITAT ST GALLEN	0.00	0.00	5.00	0.00	0.00	8.00	3.00	28.00	1.00	45.00
12 - RBB	3.00	0.00	6.00	0.00	0.00	20.00	7.00	3.00	1.00	40.00
Total	141.00	136.00	99.00	128.00	84.00	102.00	66.00	75.00	33.00	864.00

WT7:
Project Effort by Activity type per Beneficiary

Project Number [1]	287911	Project Acronym [2]	LinkedTV

Indicative efforts per Activity Type per Beneficiary

Activity type	Part. 1 Fraunho	Part. 2 STI GMB	Part. 3 CERTH	Part. 4 UEP	Part. 5 UMONS	Part. 6 CWI	Part. 7 EURECOM	Part. 8 CONDAT	Part. 9 BEELDE	Part. 10 NOTERIK	Part. 11 UNIVERS	Part. 12 RBB	Total
1. RTD/Innovation activities													
WP 1	33.00	0.00	59.00	21.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	3.00	141.00
WP 2	0.00	0.00	12.00	49.00	0.00	0.00	57.00	18.00	0.00	0.00	0.00	0.00	136.00
WP 3	0.00	0.00	0.00	0.00	9.00	55.00	0.00	0.00	5.00	19.00	5.00	6.00	99.00
WP 4	36.00	12.00	31.00	20.00	21.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	128.00
WP 5	6.00	0.00	4.00	0.00	0.00	4.00	4.00	45.00	0.00	21.00	0.00	0.00	84.00
WP 6	2.00	16.00	2.00	4.00	21.00	0.00	8.00	0.00	21.00	0.00	8.00	20.00	102.00
WP 8	10.00	10.00	0.00	0.00	6.00	0.00	0.00	6.00	6.00	6.00	28.00	3.00	75.00
Total Research	87.00	38.00	108.00	94.00	57.00	67.00	69.00	69.00	57.00	46.00	41.00	32.00	765.00
2. Demonstration activities													
Total Demo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Consortium Management activities													
WP 9	21.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	33.00
Total Management	21.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	33.00
4. Other activities													
WP 7	6.00	18.00	3.00	3.00	6.00	3.00	11.00	2.00	2.00	2.00	3.00	7.00	66.00
Total other	6.00	18.00	3.00	3.00	6.00	3.00	11.00	2.00	2.00	2.00	3.00	7.00	66.00
Total	114.00	58.00	112.00	98.00	64.00	71.00	81.00	72.00	60.00	49.00	45.00	40.00	864.00

WT8:
Project Effort and costs

Project Number [1]	287911	Project Acronym [2]	LinkedTV

Project efforts and costs

Benefi-ciary number	Beneficiary short name	Estimated eligible costs (whole duration of the project)						Requested EU contribution (€)
		Effort (PM)	Personnel costs (€)	Subcontracting (€)	Other Direct costs (€)	Indirect costs OR lump sum, flat-rate or scale-of-unit (€)	Total costs	
1	Fraunhofer	114.00	673,416.00	10,000.00	61,199.00	496,584.00	1,241,199.00	1,000,774.00
2	STI GMBH	58.00	319,000.00	2,000.00	42,000.00	216,600.00	579,600.00	479,200.00
3	CERTH	112.00	571,200.00	8,000.00	60,000.00	571,200.00	1,210,400.00	920,000.00
4	UEP	98.00	235,200.00	0.00	59,000.00	176,520.00	470,720.00	356,880.00
5	UMONS	64.00	415,233.00	1,500.00	41,000.00	273,738.00	731,471.00	567,144.00
6	CWI	71.00	298,911.00	1,500.00	35,000.00	279,740.00	615,151.00	469,888.00
7	EURECOM	81.00	356,821.00	2,450.00	43,000.00	217,661.00	619,932.00	500,124.00
8	CONDAT	72.00	424,800.00	3,000.00	58,000.00	531,000.00	1,016,800.00	773,306.00
9	BEELD EN G	60.00	320,040.00	0.00	35,000.00	71,008.00	426,048.00	325,308.00
10	NOTERIK	49.00	252,756.00	3,000.00	71,300.00	64,810.00	391,866.00	399,415.00
11	UNIVERSITA	45.00	292,500.00	1,500.00	47,500.00	204,000.00	545,500.00	419,900.00
12	RBB	40.00	235,200.00	3,500.00	30,500.00	238,120.00	507,320.00	405,031.00
	Total	864.00	4,395,077.00	36,450.00	583,499.00	3,340,981.00	8,356,007.00	6,616,970.00

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It cannot be changed unless agreed so during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

53. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

54. Type of activity

For all FP7 projects each work package must relate to one (and only one) of the following possible types of activity (only if applicable for the chosen funding scheme – must correspond to the GPF Form Ax.v):

• **RTD/INNO =** Research and technological development including scientific coordination - applicable for Collaborative Projects and Networks of Excellence

• **DEM =** Demonstration - applicable for collaborative projects and Research for the Benefit of Specific Groups

• **MGT =** Management of the consortium - applicable for all funding schemes

• **OTHER =** Other specific activities, applicable for all funding schemes

• **COORD =** Coordination activities – applicable only for CAs

• **SUPP =** Support activities – applicable only for SAs

55. Lead beneficiary number

Number of the beneficiary leading the work in this work package.

56. Person-months per work package

The total number of person-months allocated to each work package.

57. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

58. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

59. Milestone number

Milestone number:MS1, MS2, …, MSn

60. Delivery date for Milestone

Month in which the milestone will be achieved. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

61. Deliverable number

Deliverable numbers in order of delivery dates: D1 – Dn

62. Nature

Please indicate the nature of the deliverable using one of the following codes

R = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

63. Dissemination level

Please indicate the dissemination level using one of the following codes:

• **PU =** Public

• **PP =** Restricted to other programme participants (including the Commission Services)

• **RE =** Restricted to a group specified by the consortium (including the Commission Services)

• **CO =** Confidential, only for members of the consortium (including the Commission Services)

• **Restreint UE =** Classified with the classification level "Restreint UE" according to Commission Decision 2001/844 and amendments

• **Confidentiel UE =** Classified with the mention of the classification level "Confidentiel UE" according to Commission Decision 2001/844 and amendments

• **Secret UE =** Classified with the mention of the classification level "Secret UE" according to Commission Decision 2001/844 and amendments

64. Delivery date for Deliverable

Month in which the deliverables will be available. Month 1 marking the start date of the project, and all delivery dates being relative to this start date

65. Review number

Review number: RV1, RV2, ..., RVn

66. Tentative timing of reviews

Month after which the review will take place. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

67. Person-months per Deliverable

The total number of person-month allocated to each deliverable.

1. Table of contents

B1. Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan

B 1.1 Concept and project objective(s)

The World Wide Web already today has completely changed the way we are providing and using information. It has grown from a static, text and image based information medium to a much more dynamic, interactive, multimedia, and fixed-and-mobile network. Video content on portals like YouTube is growing in amount and consumption at an incredibly fast rate, spreading out from the PC onto the television set and mobile devices. It is clear that the future Internet will carry much higher amounts of video material than even today, and will become the dominant source of audiovisual information. Also classical television is being absorbed into IP networks as both live streams and catch-up, alongside other providers of video, and the content is mixed at the end device blurring the line between "Web" and "TV" content. However rich interlinking between this content is lacking, making TV-Web convergence offers today still very limited compared to the richness of browsing the World Wide Web.

This vision of the Networked Media Web is challenging: it means to provide audio-video information on the Web usable in a way similar as text based information is provided today in the Web browser: interlinked with each other, with other kinds of information, searchable, and accessible everywhere and every time. Just as hypertext fulfilled its potential in the Web through a set of related standards (HTTP, HTML, URLs), hypervideo – Television linked to the Web – can not fulfil its potential without standards and technologies. Many of the building blocks exist or are being formed today (HTML5, Linked Data, a common Media Ontology, Media Fragment identification) while some aspects are missing or incomplete (shareable user profiles, concept-level video analysis, dynamically linking media segments to related content, abstract presentation templating). LinkedTV will provide a tool chain seamlessly connecting these standards and technologies into an end-to-end platform for interlinking TV and Web content and enabling a new experience of Networked Media. Three pilots will be built to validate, elaborate and push current standards and technologies, forming the basis for the industry maturity and uptake of LinkedTV.

From the Web and hypertext to LinkedTV and hypervideo

Two features of the mainly text-based Web made it as accessible and usable as it is today: hypertext and search engines. Hypertext allows content creators to interlink related pieces of information. Search engines allow people to search what they need in the huge amount of information available on the Web. Both features are not available today in the same sense for rich media content such as video. The content of video is not transparent to search engines, and interlinking has to be done manually for complete videos. In order to be interlinked with their content and to be searchable they need annotations. Today, videos can be annotated by their creators or in social networks - but as a whole and on a keyword and simple metadata level. These annotations can be used by classical text-based search and for interlinking.

Television Linked To The Web is a central element of the vision for the future Networked Media Web. It will bring the last remaining established paradigm for consumption of video outside of the Internet fully within the rich interlinked model of Web content. This will in turn change the way we use audio-visual information in much the same way as the Web has changed the way we use textual information. The human visual sense is our most powerful "information channel" to our outside world. Video information will be used in much more cases than today if it can be accessed in the same way as text on the Web: ubiquitously available, easy to find, and dedicated to the special purpose at hand. Why read boring manuals if a short video sequence allows people to find out what they need? Why read long articles

about something if it can be explained in a video? Or if video information can augment and illustrate text based information? Furthermore, content can be interlinked to another video going more into the details, explaining a related issue, etc. complemented by links to other media such as texts, graphics, and audio presented where relevant in an appropriate and informative way (e.g. pictures of an event arranged chronologically).

Hypervideo is a research topic which aims at an extension of the hypertext approach towards video information. But it needs complex video analysis algorithms and is still an issue of research. LinkedTV will pursue a *practical* approach towards linking television into the Web which is now manageable. It will aim at a fine-grained annotation of video content using a broad spectrum of methods and information. Not just the whole video will be annotated but each relevant piece of its content on a level of detail allowing people and systems to use it in a dedicated way and to search for it. This fine grained annotation enables the rich interlinking of video content with all kinds of Web based information - including all the other videos. Full video annotation including automatic picture and video sequence analysis will continue to be a research issue for quite a while. LinkedTV will use as much of automatic and semi-automatic picture and video analysis and annotation as feasible (including results from other European research projects). *Additionally*, all other kinds of information available in the process of content creation and from other sources will be used for annotation in a systematic and integrated manner: production scripts, subtitles, audio information, Web based information like Wikipedia, geo-information, etc. This integrated approach needs an elaborated methodology how to treat the many different kinds of information in a systematic way.

Goal and vision of LinkedTV

Consequently, LinkedTV will concentrate on three tightly interconnected main goals towards a practical approach to a Networked Media Web:

- LinkedTV will develop a comprehensive methodology for information management to be used in the course of fine grained video annotation. This provides the basis for interlinking, search, personalization, and contextualization.
- We will create the LinkedTV platform in order to demonstrate the feasibility of our approach including all necessary components from annotation, interlinking, and search to personalization and effective, efficient and intuitive usage by users.
- Three representative usage scenarios of quite different types spanning a broad range of potential use cases of our approach will be developed as proof of concept.

We expect that LinkedTV will become the basis for a wide range of advanced hypervideo applications for different contexts beyond those which we will prototypically consider (PC and TV-based access), including mobile, 3D Internet and virtual worlds. The hypertext-centered Web will be extended by a hypervideo-centered Television Linked To The Web, where the access paradigm is not the HTML-based browser but an audio-visual channel from which the viewer can access concepts and browse content.

The objectives of LinkedTV

The Television Linked To The Web (LinkedTV) IP proposal aims at an innovative, integrative, and practical approach towards Networked Media which will be tackled via a set of tightly interrelated key scientific and technological research goals and measurable project objectives:

- The LinkedTV methodology aims at a comprehensive, integrative, and practical approach for annotation in audio-visual material. We will exploit and integrate state-of-the-art methods and tools (including those from other EU projects) and extend

them in order to provide a fine-grained annotation not just of the whole video but also of its content on a finer basis.

- We will use external information for these annotations from many different sources related to the audio-video material which
  - was generated during the content production process,
  - which comes from external sources like Wikipedia or Google Maps,
  - from the audio track,
  - user annotations in a social network, etc.
- We will develop appropriate multimedia description schemes for annotating audio-video material with the necessary precision and granularity for LinkedTV services.
- The LinkedTV methodology and platform support the Networked Media production process in a novel way. The many currently unrelated pieces of information will be brought together for annotation purposes. On the other way, the availability of annotated audio-video information will significantly support the production of new annotated audio-video content.
- The annotations provided to audio-video content will also allow us to interlink this content with other related information of any kind (audio-video, graphics, text, data) on the Networked Media Web. We refer to this new Web-based layer of interlinked media content as the *Linked Media Layer*.
- Search engines will be able to use this annotated information in a way much similar to the way they are used for text based information.
- We will support the end user using this novel approach of annotated audio-video content and all related features (interlinked, searchable). Appropriate browsing and information presentation concepts will be defined for Networked Media for the different kinds of users and scenarios. This will smoothly be integrated into current Web browser and TV environments.
- We will support users to manage the huge amount of interlinked multi-media information in a way tailored to their requirements and needs. User profiles, filters, and other user personalization techniques will be integrated. Context awareness will be integrated which can ensure the greatest relevance for the viewer with respect to the concepts which can be selected and the content which is presented
- The LinkedTV platform will allow us to demonstrate the feasibility of our approach. It integrates automatic and semi-automatic annotation techniques with manual techniques, with knowledge management techniques in order to use other related information for annotations, and with user interaction capabilities for user-driven annotations. It will be developed as an end-to-end platform to integrate all LinkedTV services into the existing content development chain - from content producer through broadcaster and delivery network to the user device.
- To achieve this, we will repurpose the components/standards/models developed by our partners and as part of previous research projects, extending and integrating these where needed.

Our LinkedTV methodology and our platform will be evaluated in our three representative use scenarios and in related user trials.

Commercialisation of results will be supported by business modelling:

- Analyzing market and user needs and requirements regarding connected media and to extract market and user-centered use cases
- Analyzing and developing potential business models for innovative connected media applications including in particular analysis of emerging players and value chains as well as potential for commercialization through innovative connected advertising concepts.

Through industry participation, LinkedTV will transfer its results to the Web, broadcast and telecommunication industries to enable new and innovative IP-based services which can

create new market opportunities for SMEs and protect and improve the competitiveness of large traditional market players in an increasingly fragmented future media landscape.

Hence, the LinkedTV project will enable a new approach for hypervideo with dynamic and personalized content enrichment on any online media device, hence making Television linked to the Web the ubiquitous and intuitive information delivery means of choice in the future digital society. We expect LinkedTV results to be re-applicable in future networked media contexts, such as mobile, 3D Internet or virtual worlds. The basic approach will have a lot in common with the needs in these media paradigms and the LinkedTV platform will be designed to be neutral to the chosen content delivery network as well as adaptable to the chosen end device (Web, TV, mobile etc.).

In the table below, we illustrate the place of each objective in our work plan, and the means for its concrete and measurable evaluation.

Table 1: Objectives by workpackage

Objective	WP	Achievement	Evaluation
Apply and improve media analysis approaches for the semantic analysis and linking of audiovisual information	1	(1) Automatic and semi-automatic decomposition, representation, similarity evaluation and semantic annotation of video (2) Analysis of complementary text / audio information, and use of results from different modalities for optimizing other annotation processes (3) Labeling of content segments with event labels, identification of specific instances of objects and events, and use of these results for the semi-automatic linking of content with minimal effort	Ground-truth data setup, manual or semi-automatic annotation of available content, design of evaluation metrics and methodologies, performance of experiments to measure the effectiveness of the developed technologies, participation to relevant international benchmarking activities
Enable Web-scale hypervideo through the conceptual annotation of media	2	(1) A URI-based mechanism for addressing fragments of media content (2) Lightweight annotation schemes interoperable with most of the multimedia metadata standards (3) Novel information extraction techniques and	1) Client-side and server-side implementation of media fragments that conform to the Test Cases developed in the W3C Media Fragments WG 2) Lightweight ontology model and API for reading and writing metadata, compatible with existing standards and conform to the Test Cases developed in the W3C Media Annotations WG

		disambiguation algorithms for web content	3) Ground-truth data setup, benchmark and evaluation campaign comparing existing information extraction tools and assessing the added value of novel disambiguation algorithms
Develop intuitive interfaces for Web and IPTV-based concept browsing and content presentation in video	3	(1) Understanding of user tasks for accessing linked information from networked, dynamic media. (2) Creation of interactive presentation engine for supporting tasks in a concept-based navigation environment. (3) Development of design guidelines for user interaction with linked information in a media network.	(1) Sufficient functional and user interface requirements to allow design of supporting software in the context of the project scenarios. (2) User environment satisfies identified requirements and can be incorporated into the overall LinkedTV environment using scenario data. 3) Confirmation that users' tasks are supported in the context of the scenarios through user evaluations.
Personalise selected concepts and content presentations to the user's profile and context	4	(1) Unobtrusive detection of user general interests and their semantic representation (2) User behaviour pattern recognition and knowledge pulling for contextual personalization (3) Enhanced state-of-the-art techniques on content-profile matching for personalized concept and content delivery	Manual or semi-automatic content and concept ratings, design of evaluation metrics and methodologies for detecting user interests and behaviour patterns, user study
Create an end-to-end platform for LinkedTV services	5	(1) Platform deployable in heterogeneous environments (2) Flexible integration of all components (3) Seamless cooperation of all components to generate annotated videos (4) Provide clickable video playout for Tele-vision linked to the Web	(1) Evaluation of each component in the corresponding WPs 1-4 (2) Systematic verification of all features from end- to–end in WP5 (3) Evaluation from the user perspective by the trials in WP 6

Realize the scenarios where LinkedTV services are used to enhance the TV/video experience	6	(1) An environmental / informational scenario (2) A cultural heritage scenario (3) A media arts scenario	1) Internal qualitative evaluation by the partners 2) User trials using members of the target community 3) Public feedback to scenario demonstrations
Disseminate project results in the community	7	(1) Conference papers (2) Journal articles (3) Workshops on LinkedTV topics (4) Standardisation actions at W3C etc.	1) Number of publications 2) Global standing of the conferences and journals where LinkedTV results are presented 3) Attendance at and results of LinkedTV workshops 4) Contribution to standards
Exploit project results commercially	8	(1) Market surveys (2) Business plans (3) Exploitation plans	1) Market reports on potential for LinkedTV services and technology 2) Business plans taken up in commercial ventures 3) Exploitation by LinkedTV partners and others

B 1.2 Progress beyond the state of the art

LinkedTV targets the state of the art in interactive media experiences, in which Web-based approaches for PC devices are currently the most advanced. In our application to IP-based TV and Web services, we propose a system that will provide dynamic and innovative content aggregation that goes beyond any offerings that are available at present. Quite like hypertext was the key in the boom of the WWW by its one-click link-following navigation paradigm, we argue, in the application of LinkedTV functionality across networks and devices, that hypervideo will be realised with the potential to become key to the boom in the networked media domain.

The below table addresses the different areas of technology where LinkedTV expects to produce a result beyond the state of the art. For each area, a baseline is defined: the current, most common approach within this area on which LinkedTV research expects to build. The expected state of the art in the next 4 years is also given, defining what LinkedTV partners expect will emerge in the given technology area in the period of the LinkedTV project outside of and separate from our R&D efforts (i.e. what is expected to develop in the area based on current trends and activities, if LinkedTV didn't exist anyway). Finally, we give for each area performance/research indicators based on what we expect LinkedTV to contribute beyond the state of the art to each area, i.e. our foreseen progress beyond the state of the art which we aim to achieve in and as a direct result of LinkedTV.

Table 2: Contribution of LinkedTV to relevant technology areas

Area of technology	Baseline	Expected state of the art in the next 4 years	Performance / research indicators
Web-based video	Embedded in pages without integration of internal content to the Web	Deeper annotation and better search, increased monetization	More formal, granular (semantic) annotation leading to object-level integration of video with related Web content
IPTV	Delivery of TV over IP with back channel, STB based applications independent of current broadcast	Growth of in-TV "widgets" offering Web content parallel to and separate from the broadcast	Enabling a fine grained selection of concepts WITHIN broadcasts and browsing of related Web content parallel to the broadcast
IP-based video streaming	TV content is often replicated for the web. Users distribute video material (often of low quality)	More sophisticated publishing tools; more skilful "ordinary" producers; growth in available material	Enabling a fine grained selection of concepts WITHIN video and browsing of related Web content parallel to the video stream
Video analysis and annotation	Analysis and classification in narrow domains, with high	Visual analysis and classification in progressively broader domains,	Computationally efficient analysis and classification, including instance-

	computational cost, simple-event detection	and more advanced event detection	level object annotation and dynamic event detection, in broad domains.
Integration with local data sources (home server, corporate Intranet)	No implicit integration, only menu-based access to local data separate from the TV broadcast	Partial integration with local data by linking metadata description of atomic media items to local media	Seamless integration by rich, granular media annotation of media fragments (e.g. objects in video frames) with other media
Links to external data sources	Only a limited, dumb integration (e.g. Blinkx) with little disambiguation	Improving integration by using linguistic analysis and concept clustering to improve disambiguation	Deep integration through formal (semantic) annotation of media and unambiguous linkage to a global network of concepts (the Semantic Web)
Connection to social networks (feedback, blogs)	Only weak linking between video as a whole embedded in Web pages and data from social networks	More Web based mash-up of video material with social network data, as well as more integration of social networks into the (IP)TV platforms	Finer, granular linking between social network data and individual objects in the video stream
Personalisation	Possible on a basic level such as video genres	More refined filtering based on analysis of available data (titles, descriptions...)	Concept-centred filtering based on the object-level annotation of TV content and inference of conceptual relevance through the use of formal semantics
User interfaces	Generally “outside” of the video itself, and offering controls related to the video as a whole (e.g. EPG based program descriptions)	More intuitive interfaces for IPTV, enabling more interaction possibilities (e.g. widget menus)	Interface for the intuitive selection of individual objects in the video stream as well as the non-disruptive browsing of related media on screen
Multimedia presentation	Limited ability to automatically generate multimedia presentations	Step-wise improvements in the presentation generation through	A Linked Media infrastructure in the Web providing global knowledge on

	without effortful manual preparation of input data	increased availability of metadata and better understanding of the rules to create presentations on that basis	concepts and related media, to enable Web-based automatic multimedia presentation generation
Networked Search and Retrieval	First attempts to connect web mining with multimedia to create annotations	Use of low level video analysis to create connections between video segments and web mining results	Advanced search and retrieval based on concepts in video streams, personalization taking the social network and external resources under consideration
Innovative Business Models	Mainly different technical approaches and no focus on advertising	Commercialization by way of connection to online shops	Commercialization by way of innovative advertising models that connect to advertising in the video content and online.

B 1.3 S/T Methodology and associated work plan

The result of the project will be a platform which comprises all steps for the generation of meaningful linked video presentations. This covers the selection of videos, automatic annotation with metadata based on video speech and graphical objects, linking to external web sources and other videos and generation of presentations on clients with Browser or STB (Set-top box).

The platform can be deployed for different soft- and hardware environments. The usage of standard interfaces and formats enables the connection of arbitrary Content Management or Media Asset Management Systems to receive video sources and to foster any other IPTV-distribution- and service platform for video transfer and user interaction management. The platform will be realized on the basis of an APS (Application Server), ESB (Enterprise Service Bus) and WebServices to connect all internal and external components, which allows to deploy flexibly other commercial or open APS for the later exploitation.

The LinkedTV platform is illustrated below:

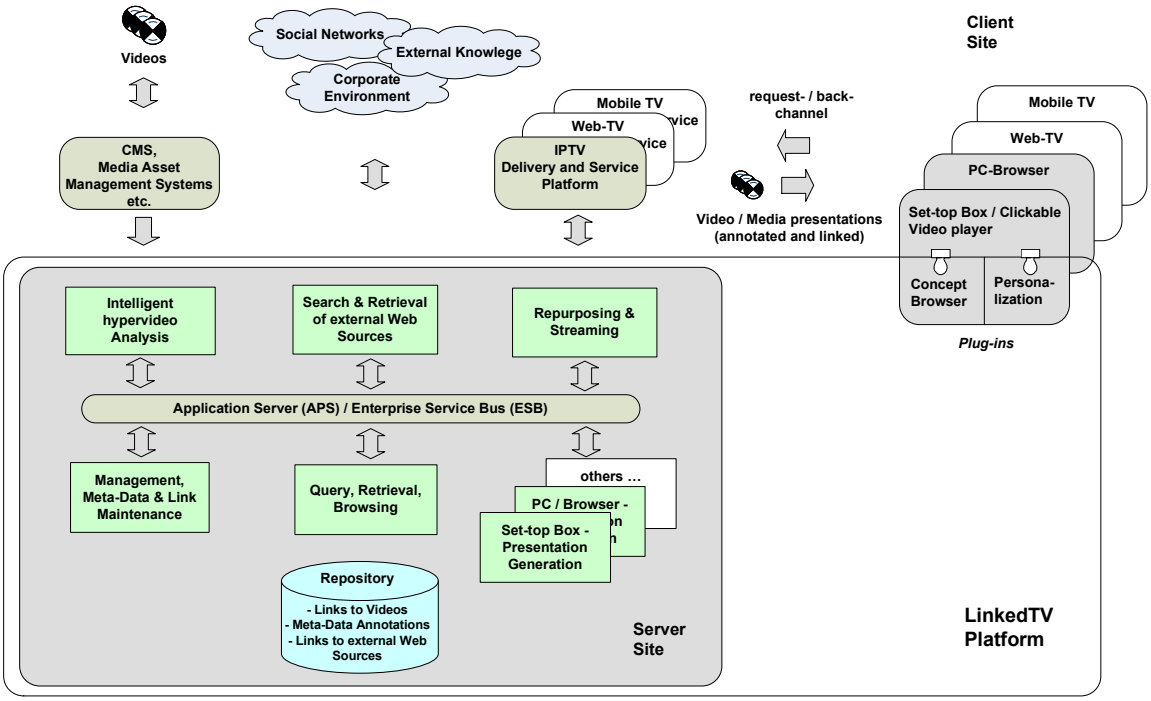

Figure 1: The LinkedTV Platform

Content side (broadcasters, archive holders, content owners)

At the broadcaster end, broadcasters can re-use their video production and preparation tools. The IT infrastructure will be extended by a means to provide rich annotation of the selected broadcasts, to store this annotation, to deliver (part of) the annotation to the end device, and to provide a query endpoint to acquire further information about broadcasts on the fly. For this, a semantic repository and tools will be developed:

- a tool for enabling content providers/owners to annotate content in a semi-automatic manner, aided by media analysis tools, data mining tools and integration with online knowledge sources (CERTH, UEP);
- a repository for storing created annotations, querying annotations and providing additional services, e.g. browsing annotations or expanding them with low level features or high level concept associations (CONDAT);
- a delivery framework that will support the broadcasting of AV material with their annotations, either interleaved in the broadcast stream or parallel by an IP channel with synchronization information (Noterik).

Linked media: a supporting Internet infrastructure

The Linked Media infrastructure is foreseen as a decentralised Web-based platform based on the distribution of Web media annotations and associated conceptual models over the Internet (based on the Linked Data model of Web-scale interlinking of concepts and metadata about concepts, extended with media annotations which tie online media with Linked Data concepts). For the project, sample metadata stores (media annotation with concepts) will be created and linked in the Web to existing Linked Data metadata stores (concept metadata and association). The creation of the Linked Media Layer will be a project-backed initiative led by WP2 and the partners EURECOM, STI and UEP.

Service side (telecommunications operators)

For efficiency and Quality of Service, we will most likely cache Linked Media and Linked Data locally for the concepts relevant to the TV programming. This will be hosted by the service provider which can be between the broadcaster and the delivery network (injecting the service added data, such as concept viewing and browsing interface, content presentation templates and pre-prepared media presentations and other associated services such as e-shops or Web 2.0 community widgets).

We will develop

- a tool for supporting Linked Media metadata creation by enabling the service provider to browse and select media found online for a given concept, to create annotations tying online media to concepts (supported by data mining and media analysis techniques), and to index and store Linked Media metadata for efficient retrieval (EURECOM, UEP)
- programs for filtering/selecting concepts and related media on the basis of an user profile or a context description, which may run either on the broadcaster side or on the user's end device (CERTH)
- a tool for enabling service providers to select and model presentation templates for different services, concept classes, contexts etc. defining how the end user may access LinkedTV services, browse active concepts, and view sets of media associated with a concept in an appropriate and meaningful way. (CWI)

IPTV network and platform

A LinkedTV delivery network and evaluation infrastructure (testbeds) will be provided by the partner Noterik, who develops IPTV delivery solutions for the industry. The IPTV Service Platform has the functionality to

- Organize TV channels,
- Manage services,
- Configure networks,
- Configure subscribers (incl. user profiles),
- Monitor services.

It contains asset management, channel management, profile management of groups and users, plus monitoring services in a statistics service.

The LinkedTV platform will be realized on the basis of an Open Source application server with an ESB. This platform will host the modules developed by the partners. It will offer an open framework to enable each partner to develop, integrate and validate its modules independently of other partners. This framework is based on a distributed network architecture providing high scalability, high robustness and high performance. The framework integrates the management of workflows, jobs, load balancing and failover. It also integrates the supervision and the configuration of the platform via Web services, JAVA Applet and SNMP.

End user devices

The core purpose of end device development will be to provide an open multi-layered, client and server customisable canvas front-end on which all LinkedTV media and content can be

projected onto, and which will be called upon using a REST API [1]. In order to play out all available media, it needs to interlink to a variety of metadata descriptors. It will be able to interface with the services in LinkedTV and will need to be able to interface to third party LinkedTV services to establish relevant mashups, and obtain high quality multimedia content from different sources such as Wikis, Maps, ASR and object tracking, for example. Research will be performed on creating an interoperable canvas, allowing smooth integration with third party XML-driven services.

The hypervideo player will connect a variety of services developed within the LinkedTV project and will power the hotspot click technology on the Flash player. It will introduce video hotspot technology which will give end-users and content creators the option to find on-screen objects using layered technology enabling an enriched user experience when viewing a TV program. This component will enable direct user interaction with available content. A dense web of interacted links will steer these hotspots on the canvas. The dynamic use of manually and automatically identifying objects will enable both end-users and content creators with a state-of-the-art service which extends the video player beyond play-out. A dynamic click will enable end-users to navigate to other related content in the video itself of other available media. An API will be made available which will interact with the LinkedTV platform and make possible implementations of LinkedTV hypervideo playout in Flash and HTML5.

Our primary end user device for the IPTV context will be a Set Top Box (STB). While the STB market has traditionally been supporting proprietary platforms, or used common platforms for development such as MHP or MHEG-5 which were complex and restricted in their functionality, we see an emerging trend towards use of open source (Linux based) OS which have existing developer communities and reuse of open (Web) standards, with the expected benefit of eased application development and lower costs, e.g. Android-based like GoogleTV. All new Internet-TV platforms provide for the provision of applications/widgets to the client, e.g. Yahoo! Connected TV has its own developer community, while Google TV is expected to reuse the Android Market. While many approaches are closed, so that broadcasters can have assurance about what content/functionality is provided in association with their programming (e.g. HbbTV), Google TV and others (Boxee, for example) seek to offer open application markets to enhance the TV experience. However, even HbbTV can be expected to move towards a (controlled, á la Apple) application store model. What is still missing today is common APIs to access TV and STB resources (e.g. to integrate content with the current broadcast) and while it is hoped open systems like GoogleTV will provide support for such in an Android SDK, the W3C has also started an initiative to define Web-compliant open APIs and models for (Web-converged) TV.

Hence LinkedTV expects to be able to move quickly to take up and support emerging platforms and APIs in the TV/STB domain which is increasingly becoming Web-convergent. We foresee to follow two parallel approaches in our STB development: partners like RBB and CONDAT ensure that we have the skills to develop applications for HbbTV and, using our connections with EBU, W3C and IRT, to contribute to further versions of HbbTV to reflect the insights and standardization requirements emerging in LinkedTV; through partners like STI and EURECOM we have the skills to develop apps on open platforms like Android and test them on Linux OS-based STBs. Until a GoogleTV or other STB is available it is possible to use an open source media center like MythTV.

The project will also support the use of Smartphones by providing a version of the hypervideo player for Android devices. This allows the use of links in TV or videos also on Smartphones with broadband connection to the internet. For porting the hypermedia player to the Android operating system, the functionality of the player will be reduced and adopted according to the

[1] REST (Representational State Transfer) is a software-architecture model for distributed hypermedia systems

constraints of the smaller display and input options. For the activation of links has to be considered, that on the mobile device no mouse is available and instead multi-touch is offered by an increasing number of manufacturers. With the release of Android 3.0, which will support the input and display for tablets, there will also be the option to furnish larger devices with the platform.

B 1.3.1 Overall strategy and general description

We organize the work in workpackages so that the research and development of the LinkedTV platform and its subsequent evaluation and dissemination are clearly represented in the ordering of the workpackages:

We start with workpackages that provide the **fundamental research in preparing Networked Media for interlinking across the Web**: WP1 will focus on challenges of concept-level analysis of audiovisual content, while WP2 will complement this with concept-based association to relevant Web content through data mining of Web resources. The data mining work done here will also be applied to improving the annotation from the media analysis of WP1. A suitable multimedia annotation scheme and fragment reference scheme will also be developed.

This is to be supported by workpackages designing the basis for **Television linked to the Web**: the interactive access to concepts and content through an intuitive user interface and the dynamic generation of multimedia presentations to present packages of content related to the selected concept will be tackled in WP3; while the adaptation of the concept browsing and content presentation to the user and context, whose preferences will be captured in a profile using a schema defined in the project, will be tackled in WP4.

Building on this, we have the workpackage focused on the **LinkedTV platform** (WP5): there, the integration work will take place, taking software developed from the results of the research WPs 1-4, integrating these into a backend platform with Internet search and data caching capabilities, providing network delivery capabilities (Web, IPTV) and developing the front end application for PC and STB, focused on a parallel targeting of the Web browser via HTML/Flash and IPTV via HbbTV, with clickable video playback and concept/content browsing capabilities. Applying this in use case **scenarios** (WP6) will be the means to validate the LinkedTV platform functionality and achieve its transfer – prototypically – into actual WebTV and IPTV services. The scenarios will involve a test environment to deliver LinkedTV services to a selected group of testers. Through both technological evaluation (e.g. robustness, scalability) in WP5 and user trials (for usability, response levels) in WP6 we will validate the work both scientifically and socio-economically, as well as in terms of ease-of-use and quality of experience.

Finally, the prototypical use of the LinkedTV services and results of its scientific and socio-economic evaluation will be widely disseminated to both the research and industrial community. Commercial exploitation will be assured and standardization of the underlying technologies pursued. Hence, we dedicate workpackages to **dissemination** (WP7) and **exploitation** (WP8). Parallel to all activities, one workpackage will handle all **management issues** (WP9) including the regular reporting of project activities, financial matters and the monitoring of the project's progress vis-à-vis its objectives. The figure below represents the structure of the LinkedTV workpackages:

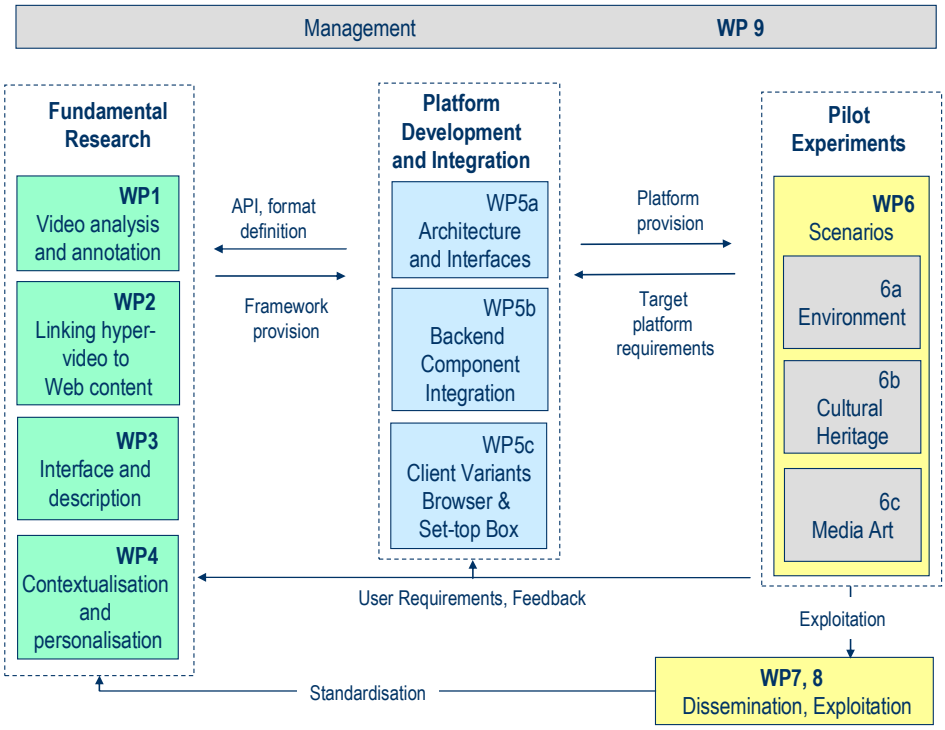

Figure 2: WP structure

All workpackages will also take care to identify risks early and implement contingency plans where necessary. We anticipate possible risks and plan in advance contingency plans in the table below:

Table 3: Risk management

Risk	Potential for risk	Impact on project	Contingency plan
Consortium – a partner can no longer provide the resources or skills foreseen in the workplan	Medium – personnel changes can not be avoided but all partners are very committed to the research themes of the project	High – work may no longer be done on time	The LinkedTV consortium is prepared and agreed to immediately react to this risk by shifting resources internally to partners who can replace the lost resources or skills. All main skill needed for the project are available at more then one partner.
Technology – new commercial results are made public which parallel	Low – while *similar* results may be launched, it is unlikely others will be able to replicate the expertise brought	High – work done may not be able to justify the originally foreseen added value	While we do not expect commercial organisations to be able to replicate LinkedTV work due to the specialised

LinkedTV work	together in LinkedTV to realise truly semantic "meaningful multimedia" services		expertise required, technology tracking will take care to pre-empt commercial releases and, if necessary, to re-focus goals of LinkedTV
Workplan – the estimated resources prove too little for a task or partner to fulfil the work foreseen	Medium – despite partner experience in these areas of research, it is unavoidable that some work may prove more resourceful than originally thought	High – the LinkedTV workplan is tightly related so the completion of individual tasks is part of the successful completion of the entire project	The project coordinator and management board are responsible to monitor this and some resources may be saved from other tasks where the allocated resources proved too high. Where additional resources are not available, some results may have to be produced outside of the project.
Scientific work – a certain task can not achieve its intended goal	Medium – partners have strong experience in the research area of their tasks and have taken care to set realistic goals, however LinkedTV does aim at being innovative and stretching research beyond the state of the art.	Medium – for some tasks, partial results may be able to act as sufficient input for ongoing work. In other tasks, LinkedTV may choose as an alternative to take other solutions which can provide at least part of the required results.	LinkedTV has a consortium of partners with significant research work in the relevant areas and, if necessary, parts of the LinkedTV work could be replaced by prior results (e.g. from previous projects) in order to ensure that the remaining work can continue and produce innovative results
Exploitation – LinkedTV results fail to be taken up in the market	Low – while an innovative result does not always guarantee commercial success, LinkedTV aims at achieving a multimedia delivery platform which is clearly a valuable goal for broadcasters and WebTV producers. The scenarios ensure that some public	Medium – while immediate exploitation of the results is the goal of LinkedTV, it may be that the technology is still too immature at the end of the project for commercial uptake, or that commercial broadcasters are still not ready to use such technology (depends	The exploitation task runs throughout the LinkedTV project and is in a strong position to measure interest in the broadcasting and WebTV communities through our industrial partners. It is also able to quickly respond to changes in market outlook, as well as work strongly to influence that market

	broadcasters in Europe will showcase the results.	heavily on the general uptake of semantic technology in the next 5 years)	itself with LinkedTV dissemination and standardisation activities.
Unable to demonstrate LinkedTV on client IPTV devices	Unlikely, since partners are able to source STBs and use open source OS and platforms (e.g. Linux and Android) for development. Commercial deployability will be shown via HbbTV application development	Medium – while Flash or HTML5 based LinkedTV demos can also be shown on fixed and mobile devices such as PCs and smartphones/tablets, LinkedTV's main focus is on future IPTV services running on STBs or Connected TVs.	If for unforeseen reasons STB/IPTV platforms become more closed in the future (against the trend, which is to more openness), LinkedTV can demo its (open) technology using PC-based media centers while also using its contacts to HbbTV and other IPTV platforms to gain access to means to produce IPTV demonstrators

An issue has also be raised regarding the legal aspect of Copyright and access rights to modify content presentation and linking it to other content without prior agreement of the content owner. We will initially operate with a small number of video sources and additional content sources and ensure there is agreement and control on all sides. One aspect which will be taken into account as part of the broadcaster-side components in the LinkedTV platform will be the means for broadcasters to predefine, control and check which content sources are used when associating auxiliary Web content with their TV-program.

The modification of a content presentation and linking it to other content without prior agreement of the owner is very similar to the dynamic linking from Web 2.0 sites to other materials. We intend to uptake and extend best practised means from the conventional Web for a legal and careful treatment of content from other owners. This includes functionality in the LinkedTV platform to process content metadata which identifies content rights, service-based negotiation for content usage, and the use of black and white lists (similar to spam filtering) to provide a control of permitted and forbidden external content.

LinkedTV has a broadcaster (RBB) in the consortium, which will ensure that the concerns of content suppliers are taken into account and the experience of CONDAT as lead developer for the platform on the broadcaster-side will ensure that these requirements are respected.

Meanwhile, the use case on media art provides us with an interesting opportunity to explore the alternative: when augmented video is just as open as the open Web in terms of associating different juxtapositions of Web content with video material (using video for which this is permitted, e.g. archive.org material). This scenario enables us to look at precisely the benefits and challenges which arise in an open hypervideo context, if video content is augmented with other content in a creative and artistic context.

B 1.3.2 Timing of work packages and their components

A Gantt chart illustrating the timing of each of the work packages and their components follows.

Table 4: Workplan as a Gantt chart

WP	WP and Task Descriptions	Start (Mo)	End (Mo)	Duration (Mo)	Year 1												Year 2												Year 3												Year 4					
					M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18	M 19	M 20	M 21	M 22	M 23	M 24	M 25	M 26	M 27	M 28	M 29	M 30	M 31	M 32	M 33	M 34	M 35	M 36	M 37	M 38	M 39	M 40	M 41	M 42
1	**Intelligent hypervideo analysis**	1	42	42																																										
T1.1	Visual information preprocessing and representation	1	24	24																																										
T1.2	Visual object and scene labeling	1	36	36																																										
T1.3	Complementary text and audio analysis	1	24	24																																										
T1.4	Event and instance-based labeling of visual information	7	36	30																																									
T1.5	User assisted annotation tool	7	36	30																																										
T1.6	Intelligent hypervideo analysis evaluation	13	42	30																																									

2	**Linking hypervideo to web content**	1	42	42																																									
T2.1	Media fragments addressing	1	36	36																																										
T2.2	Lightweight metadata models for hypervideo	1	36	36																																									
T2.3	Web mining for support of media annotation	1	42	42																																									
T2.4	Retrieving additional content from the web	13	42	30																																									

WP	WP and Task Descriptions	Start (Mo)	End (Mo)	Dura-tion (Mo)	Year 1												Year 2												Year 3												Year 4					
					M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18	M 19	M 20	M 21	M 22	M 23	M 24	M 25	M 26	M 27	M 28	M 29	M 30	M 31	M 32	M 33	M 34	M 35	M 36	M 37	M 38	M 39	M 40	M 41	M 42
3	**LinkedTV interface and presentation engine**	1	42	42																																										
T3.1	User requirement analysis	1	6	6																																										
T3.2	User-centered design and specification of hypervideo information interfaces	1	36	24																																									
T3.3	Develop the interface and presentation engine	7	24	18																																									
T3.4	Evaluate functionalities and interfaces of the connected media and background information	19	42	12																																									
4	**Contextualisation and Personalisation**	1	42	42																																									

T4.1	User profiling	1	24	24	
T4.2	Contextualisation	1	36	36	
T4.3	Personalized content filter	7	36	30	
T4.4	Evaluation of personalisation technologies	37	42	6	

WP	WP and Task Descriptions	Start (Mo)	End (Mo)	Dura-tion (Mo)	Year 1												Year 2												Year 3												Year 4					
					M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18	M 19	M 20	M 21	M 22	M 23	M 24	M 25	M 26	M 27	M 28	M 29	M 30	M 31	M 32	M 33	M 34	M 35	M 36	M 37	M 38	M 39	M 40	M 41	M 42
5	**LinkedTV platform**	1	42	42																																											
T5.1	Integrating platform	1	24	24																																											
T5.2	Back-end architecture specification	1	24	12																																										
T5.3	Back-end development and component integration	7	36	30																																										
T5.4	MediaCanvas API	7	30	12																																										
T5.5	Clickable Video	7	30	12																																										

	Playback																																													
T5.6	Front-end development and component integration	7	36	30																																										
T5.7	Validation	37	42	6																																										
6	**Scenarios**	1	42	42																																										
T6.1	Media and content preparation	1	30	12																																										
T6.2	Scenario realization on LinkedTV platform	7	36	18																																										
T6.3	User trials and evaluation	13	42	18																																										

WP	WP and Task Descriptions	Start (Mo)	End (Mo)	Dura-tion (Mo)	Year 1												Year 2												Year 3												Year 4					
					M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18	M 19	M 20	M 21	M 22	M 23	M 24	M 25	M 26	M 27	M 28	M 29	M 30	M 31	M 32	M 33	M 34	M 35	M 36	M 37	M 38	M 39	M 40	M 41	M 42
7	**Dissemination**	1	42	42																																										
T7.1	Dissemination and standardisation planning	1	6	6																																									
T7.2	Project website	1	2	2																																									
T7.3	Production of dissemination materials and publications	7	42	36																																									
T7.4	Project presentations at events	7	42	36																																									
T7.5	Project demonstrator	19	42	24																																									
T7.6	Standardisation activities	7	42	36																																									
8	**Markets, Businnes Models and Exploitation Strategies**	1	42	42																																									
T8.1	Product & market	1	36	30																																									

	surveys				
T8.2	Business models	7	36	30	
T8.3	Exploitation planning & Exploitation activities	1	42	42	

WP	WP and Task Descriptions	Start (Mo)	End (Mo)	Dura-tion (Mo)	Year 1												Year 2												Year 3												Year 4					
					M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18	M 19	M 20	M 21	M 22	M 23	M 24	M 25	M 26	M 27	M 28	M 29	M 30	M 31	M 32	M 33	M 34	M 35	M 36	M 37	M 38	M 39	M 40	M 41	M 42
9	**Management**	1	42	42																																											
T9.1	Project Management	1	42	42																																											
T9.2	Periodic Scientific Reports	1	42	42																																										
T9.3	Periodic Financial Reports	1	42	42																																										
T9.4	Work self-assessment and workplan revision	7	42	18																																										
T9.5	Internal communication structures	1	42	42																																										

B2. Implementation

B 2.1 Management structure and procedures

The management structure of LinkedTV is illustrated in Figure 10. The **project coordinator** will have overall responsibility for the project. **Dr. Joachim Kohler (Fraunhofer)** is an experienced researcher and project coordinator who provides all necessary capabilities for this role. He has been technical co-ordinator of the European IP-project LIVE as well as deeply active in the CHORUS coordination action on multimedia search. Together with the management board he will take all necessary decisions to lead the project. He will coordinate the work of the technical board with all work package leaders including the needed communication between them. The communication to the European Commission will be one of his main responsibilities – including annual review meetings, regular management reports, dissemination actions at European level, etc. The performance of partners will be checked at regular intervals by the project co-ordinator. He will organize full project meetings on a regular basis. He will supervise the management office which takes care of the budget, the quality management, risk management, and IPR management. The project coordinator will organize the activities of the advisory board and its communication with the project.

LinkedTV as an Integrated Project will be a complex endeavour with many related efforts. In order to manage this complex research the project coordinator will be supported by a **scientific director**. He takes charge of ensuring the scientific and technological contributions of the work and of the scientific coherence of all partners' contributions in the work packages and tasks. The project's scientific director will be **Dr. Lyndon Nixon (STI International)**. The scientific director will pay special attention to the activities in the technical board and together with the project coordinator guarantee the necessary coordination between them.

The **technical board** will be responsible for the coordination of all work packages and tasks. It is lead by the project coordinator who is supported by the scientific director. All work package leaders work together in this board. Decisions related to the scientific and technological work of the project will be made on a majority basis. An assessment of the project's performance will be made at regular intervals in meetings of the project's technical board.

The **project office** will be based at Fraunhofer. This guarantees the necessary tight collaboration of the project coordinator and those people supporting him with budget, risk, quality, and other related management issues of the project.

An advisory board will be established made up of external experts from industry, broad casting organizations, and research institutions with a scientific interest in the project and comprehensive experiences in the project's areas.

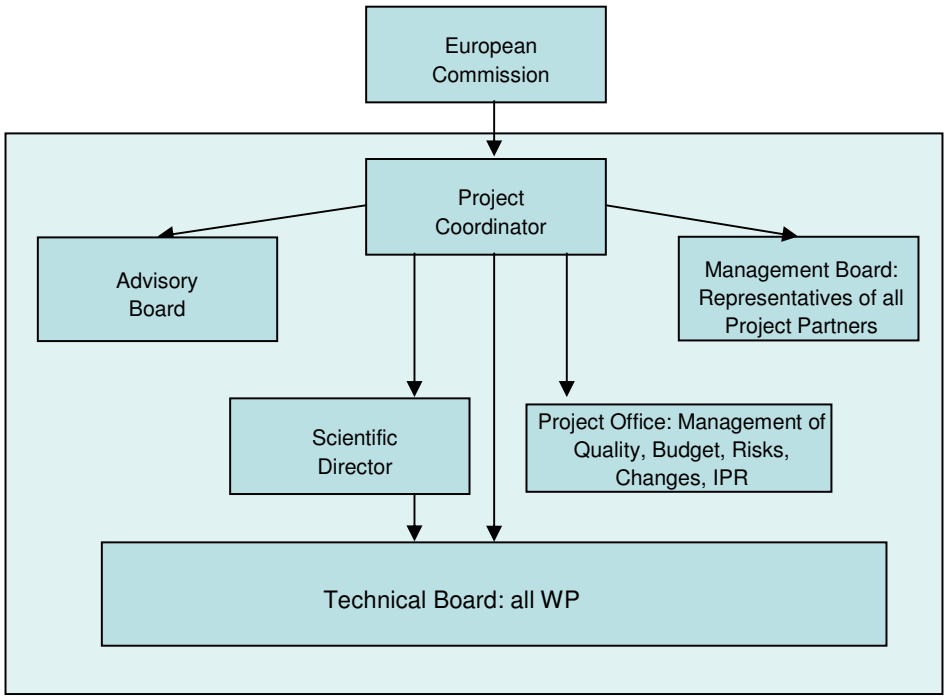

Figure 3: LinkedTV Management Structure

Meetings and communication

Partners in LinkedTV will meet face to face at least 4 times a year, excluding the annual review meeting. In-between, they will hold regular telephone conferences and bilateral meetings as required. Furthermore, daily activities in the project will be enabled by communication structures which also allow for monitoring and assessment.

LinkedTV will hold project meetings quarterly, in which all partners are expected to attend with adequate personnel who are capable of reporting about activities performed and future plans. These meetings are the primary gatherings of LinkedTV partners and will consist of:

1. meetings of all work packages
2. meetings of the technical and management boards
3. potentially, invitation to and participation of members of the advisory board
4. additionally, organised events as judged profitable to the project, e.g. invited speaker(s), involvement of industry observers etc.

Furthermore, each work package (except WP9 management) may organise additional face to face meetings which are to be attended as required and appropriate. The agenda of such meetings can be to address specific matters of relevance in individual work packages, co-operation between work packages etc. Such meetings are decided by the work package leader(s) according to necessity, e.g. at the point close to the completion of an important task/deliverable.

Apart from face to face meetings, there will be telephone conferences at regular intervals among members of each work package. While this can be left to the discretion of the work package leader, it is

advised to have a call at monthly intervals, and these calls shall have public minutes. There shall also be regular telephone conferences for the technical board in which the project co-ordinator and the scientific director receive updates on progress and activities from each work package leader. Technical board calls shall occur 4 times a year, between the quarterly face-to-face meetings. Finally, the management board shall have at least one telephone conference a year in addition to face-to-face meetings following the annual review report, plus additional calls as called for by the project co-ordinator.

The project's project coordinator has the powers to call an extraordinary meeting should he feel this is required for the successful continuation of the project or individual parts thereof by giving the partner(s) in question a minimum of 3 weeks notice before any such meeting. In an extreme situation, it may even be necessary for the project coordinator to call an extraordinary meeting of a work package or the entire project. Such meetings will generally be in the form of an extra telephone conference, though a face to face meeting may also be chosen if it is thought to be more effective.

Decision process

The decision making process in LinkedTV is organized hierarchically and has as its aim to ensure that issues are addressed at the appropriate level, generally with those "closest" to the issue being tasked with the decision at first, and only in the case of a lack of resolution, shifting the decision process to a higher level. Another aspect of the decision making process is the documentation of decisions which can be of great importance later in the project.

At the lowest point, issues may arise within tasks and should first be resolved between those partners participating in the task, with a final decision being made by the task leader. The issue and decision must be communicated to the work package leader for acceptance. If the work package leader rejects the decision then it must again be addressed by the task participants or may be addressed at the work package level (i.e. involving all work package participants).

At the next point, an issue may be raised at the work package level, e.g. dependencies between tasks, or issues which exist in relation to other work packages. Such issues should be discussed at a work package meeting and the work package leader makes a final decision. One possible decision is to address the matter to the technical board.

The technical board is the next level of decision-making and may have issues referred to it from individual work packages. It is also the right level for resolving issues between work packages. Decisions made at the work package level may be reported to this board, giving other work packages the chance to respond. The technical board can decide to call upon an external expert, e.g. a member of the advisory board, if necessary.

Finally, for issues which may have an impact on the overall project, the management board is the final point for raising and resolving any issue. If necessary, the project coordinator can choose to address an issue at the management level to the EU as final arbitrator.

For documentation of the decision process, technical and management boards will maintain protocols and minutes of meetings, where issues on the agenda will be listed and decisions referenced to the appropriate issue, which shall include the results of any vote as well as subsequent action items for persons with deadlines. Such protocols shall also be maintained by each work package for their records. Out-of-meeting decisions, e.g. at the task level, shall be formally reported by e-mail to the work package leader and added to the next meeting protocol.

Conflict and risk management

It is recognized that in the activities of the project, and particularly in the case of hindrances to completion of work, conflicts may arise and it is of great importance to identify, acknowledge and resolve such conflicts as soon as possible.

If a problem is reported by a partner, it is first addressed to the project coordinator. It is also the responsibility of those coordinators to recognize and respond to emerging problems within the project, in order to potentially resolve them before they become more critical. The project coordinator supported by the scientific director will be responsible for identifying issues which may have an impact on the scientific and technological results of the project and taking necessary measures to resolve them. The project coordinator will be responsible for identifying issues which may have an impact on the management of the project and taking necessary measures to resolve them.

When a problem has been identified, the first step is to raise this on the agenda of the next board meeting. If the next board meeting is scheduled to take place at a time which is judged by the coordinator to be too late to begin a successful resolution of the problem, the coordinator may call an extraordinary meeting which can be scheduled to take place with a minimum of three weeks notice. Solutions shall be decided at board meetings using the decision process described above.

B 2.2 Beneficiaries

1. **Fraunhofer IAIS**

Fraunhofer is the largest application oriented research and innovation organization in Europe. It comprises 14000 researchers and engineers in 57 institutes with an overall annual budget of 1.4 Bill €. The Fraunhofer Institute for Intelligent Analysis and Information Systems (IAIS) is the leading Fraunhofer institute in the area of intelligent information systems with special emphasis on business processes, web based multi-media applications, and knowledge mining.

IAIS possesses a broad spectrum of scientific skills and competences needed for the LinkedTV project like web-based multimedia search engines, automated analysis of sound and video recording, speech processing, document analysis and image/video analysis. These skills have been acquired in many years of research and industry activities including EU research projects under the 6th and 7th Framework. In the large scale German Theseus program Fraunhofer IAIS develops semantic search technology and applications in the Core Technology Cluster and for the use case CONTENTUS focusing on intelligent multi media technology applications.

In addition, IAIS is the coordinator of the LIVE EU project and of the FP6 Integrated Project IRRIIS. Furthermore, IAIS is partner in the EU FP6 and FP7 projects Boemie, Vitalas, CitizenMedia, MoveOn, DIESIS and CHORUS.

Dr. Rüdiger Klein has a long record of research in areas like intelligent systems and Semantic Web applications. After his Diploma and doctoral thesis at Humboldt University in Berlin he worked at the Academy of Sciences in Berlin in the Knowledge Based Systems Lab. Rüdiger Klein joined Daimler Research in Berlin 1991 as a senior researcher and project leader with a focus on intelligent system applications in industrial environments. He was responsible for knowledge management systems with Mercedes and Airbus. He was a member of the EU Project MOKA and of the industrial advisory boards of EU Projects IBROW and OntoWeb. Two years ago Rüdiger Klein left Daimler Research and joined Fraunhofer IAIS. He is the project coordinator of the EU Integrated Project IRRIIS.

Dr. Joachim Köhler received his diploma and Dr.-Ing. degree in Communication Engineering from the RWTH Aachen and Munich University of Technology in 1992 and 2000, respectively. In 1993 he joint the Realization Group of ICSI in Berkeley where he investigated robust speech processing algorithms. From 1994 until 1999 he worked in the speech group of the research and development centre of the SIEMENS AG in Munich. The topic of his PhD thesis is multilingual speech recognition and acoustic phone modelling. Since June 1999 he is with Fraunhofer IAIS in Sankt Augustin and head of the department NetMedia. The research focus of NetMedia lies in the area of multimedia indexing and search methods and applications. His current research interests include pattern recognition and speech recognition, spoken document and multimedia retrieval and multimedia information systems. He is currently involved in the European research CHORUS project which creates a roadmap for audio-visual search technologies and is technical co-ordinator of the European IP-project LIVE.

Dr. Jobst Löffler has been working as research scientist at the Fraunhofer IAIS since 1997 in the areas of distributed media information systems, automatic media analysis and software architectures for cooperative environments and digital libraries. He was responsible for the EU project SHARE as technical coordinator and project leader of the iFinder project which aims at developing a media analysis and retrieval system as a product for the media industry. In 2002 he received his PhD in computer science from the Technical University of Braunschweig, Germany with a dissertation about adaptive visualization of 3D documents for cooperation within open information spaces.

2. CERTH-ITI

Centre for Research and Technology Hellas – Informatics and Telematics Institute (CERTH-ITI)

The Informatics and Telematics Institute (http://www.iti.gr) of the Centre for Research and Technology Hellas (http://www.certh.gr) was founded in 1998 as a non-profit organisation under the auspices of the General Secretarial of Research and Technology of Greece (GSRT), with its head office located in Thessaloniki, Greece. Since 2000 it has been a founding member of the Centre of Research and Technology Hellas (CERTH) also supervised by the GSRT. CERTH-ITI's related areas of R&D activities include: semantic multimedia analysis, multimedia indexing and retrieval, large-scale and social media analysis, knowledge structures, languages and reasoning for content analysis, personalization and knowledge discovery for Semantic Web applications, intelligent human computer interaction. CERTH-ITI has participated in more than 50 EC IST and 85 National projects and subcontracts. Over the last eight years, the ITI research team has authored over 200 publications in scientific journals, 65 books and book chapters and over 500 presentations to international conferences.

CERTH-ITI currently coordinates the FP7 ICT IP WeKnowIt "Emerging, Collective Intelligence for personal, organisational and social use" and has leading roles in the FP7 ICT IP GLOCAL "Event-based Retrieval of Networked Media", FP7 ICT STREP JUMAS "Judicial Management by Digital Libraries Semantics", and FP7 ICT STREP PESCaDO "Personalized Environmental Service Configuration and Delivery Orchestration". It also participates in the European Defense Agency funded project MEDUSA "Multi Sensor Data Fusion Grid for Urban Situational Awareness", and in the audiovisual search engines Coordinated Actions "CHORUS" & "CHORUS+". In the past, CERTH-ITI participated and had leading roles in several IST-FP6 IPs (aceMedia, MESH, X-Media), IST-FP6 STREPs (BOEMIE, VIDI-Video) and NoEs (Knowledge Web, K-Space), and also lead the Greek national R&D Training Network MULTI-MINE. CERTH-ITI also participates in standardization activities, such as activities carried out within the MPEG, JPEG and W3C standards groups, and is very active in the organization of related scientific conferences, including the 2nd ACM Workshop on Events in Multimedia (EiMM 2010), the 2nd ACM Workshop on Social Media (WSM 2010), ACM CIVR 2009, and WIAMIS 2007.

Dr. Vasileios Mezaris is a Senior Researcher (Researcher C') with the Informatics and Telematics Institute of CERTH. He received the Diploma and the Ph.D. degree in Electrical and Computer Engineering from the Aristotle University of Thessaloniki, Thessaloniki, Greece, in 2001 and 2005, respectively. His current research interests include image and video analysis, content-based and semantic image and video retrieval, event detection in multimedia, medical image analysis. He is the co-author of 20 papers in refereed international journals, 6 book chapters and 70 papers in international conferences, and he has filed two patent applications.

Dorothea Tsatsou received the Diploma degree in Applied Informatics from the University of Macedonia (UOM), Greece in 2003. She received the Master of Science (M.Sc.) degree in Multimedia Applications and Virtual Environments from the Universityof Sussex, UK in 2004. Since July 2007 she has been working as a research associate in the Informatics and Telematics Institute of CERTH, where she is involved in domestic and international projects. Her research interests include extraction and analysis of semantic knowledge for the development of personalization strategies for the Semantic Web and Web 2.0, primarily involving semantic user profiling and contextualization for semantic recommendation services, as well as integration of such services in resource-constrained devices.

3. University of Economics Prague

The group at UEP is recognised for its research and educational activities in knowledge discovery from databases, web/text/multimedia mining, web engineering and knowledge-based systems. It recently participated as funded partner in seven EU projects: in the multimedia area (6FP NoE K-Space), in the knowledge discovery from databases area (5FP projects Sol-Eu-Net and MiningMart), in the medical informatics area (4FP project MGT and DG SANCO project MedIEQ), in the e-learning area (6FP IP KP-Lab), and in the digital libraries area (eContent M-CAST). The group was involved in multiple EU network projects such as KDnet, Knowledge Web, Ontoweb or EUNITE, and its members participate in several W3C working groups. The group also host/ed top-class international conferences such as ECML (1997), PKDD (1999), EKAW (2006) and ISMIS (2009). The key expertise wrt. LinkedTV is related to *web mining and information extraction*, as well as to the issues of *multimedia-text analysis complementarity* and *multimedia metadata systems*, which will be exploited in WP1 and WP2 of LinkedTV. Web mining and information extraction was thoroughly studied in the EU MedIEQ project and in the national (CSF-funded) project Rainbow. In the EU K-Space project, in turn, UEP has been the leader of the task devoted to mining complementary resources to multimedia, and contributed to the development of the COMM – core ontology for multimedia. From KP-Lab UEP will bring the experience with text-based construction of shared domain models, and from M-CAST that with online question answering.

Dr. Vojtěch Svátek obtained the PhD in Informatics from the UEP in 1998 and became Associate Professor in 2007. His main research domains are data/text/web/multimedia mining and ontological engineering. Local contact person in EU-funded projects K-Space and MedIEQ, co-ordinator of two grants of the Czech Science Foundation. Program Co-Chair of EKAW 2006 conference, PC member of about ten other relevant conferences (ECML/PKDD, ESWC, ASWC, SAMT, BIS, CBMI etc.). Member of the W3C OWL working group.

Prof. Petr Berka obtained the PhD in Bionics from the Czech Technical University in 1991, became Associate Professor in 1995 and Full Professor in 2005. His research and educational activities concentrate on machine learning, data mining and rule-based systems, with applications in medicine, finance and information retrieval. Local contact person in the EU-funded project MiningMart. Program (Co-)Chair of the ISMIS 2009 conference. Member of ECCAI and SIGKDD. Most recently he led

experiments on applications of fuzzy rule reasoning for semantic region merging in multimedia analysis (within the K-Space project).

Tomáš Kliegr is a Researcher, part-time Lecturer, and PhD student (to complete the PhD study in September 2011) at UEP. He has practical experience with numerous methods of data/text/web mining. In the last four years he has been coordinating three research projects of UEP's Internal grant agency involving more than 15 junior researchers and students. Author of 25 refereed papers. Holder of the national Hlávka award for talented students. In 2008 he undertook a 5–month PhD internship at Queen Mary, University of London, focused on image query disambiguation.

4. Centrum Wiskunde & Informatica (CWI)

The Interactive Information Access group at the Centre for Mathematics and Computer science (CWI) carries out research on improving models and tools for presenting multimedia information to end-users on a variety of platforms. CWI is the research institute for mathematics and computer science research in the Netherlands. CWI's mission is twofold: to perform frontier research in mathematics and computer science, and to transfer new knowledge in these fields to society in general and trade and industry in particular. CWI has always been very successful in securing considerable participation in European research programs and has extensive experience in managing these international collaborative research efforts. CWI is also strongly embedded in Dutch university research: about twenty of its senior researchers hold part-time positions as university professors and several projects are carried out in cooperation with university research groups. In addition, CWI has strong links to the World Wide Web consortium, and houses the Benelux office. CWI has a staff of 210 fte (full time equivalent), 160 of whom are scientific staff. CWI operates on an annual budget of EURO 13M.

Prof. dr. Lynda Hardman is the head of the Interactive Information Access group and part-time professor at the University of Amsterdam. She obtained her PhD from the University of Amsterdam in 1998, having graduated in Mathematics and Physics from Glasgow University in 1982. During her time in the software industry she was the development manager for Guide, the first hypertext authoring system for personal computers (1986). She participated in the EU FP6 K-Space Network of Excellence and several other EU research projects in the past. She co-edited a special issue of the Multimedia Systems Journal on the canonical processes of media production and a special issue for IEEE Intelligent Systems on AI and Cultural Heritage. She was co-programme chair for the international conference on semantic and digital media technologies (SAMT) in 2008. She is a member of the editorial board for the Journal of Web Semantics and the New Review of Hypermedia and Multimedia. Her favourite chocolates are from Puccini, Amsterdam.

Dr. Jacco van Ossenbruggen is a senior researcher at CWI and a part time assistant professor at the Vrije Universiteit of Amsterdam. He obtained his PhD from the Vrije Universiteit Amsterdam in 2001. He was a member of the W3C working group that developed the SMIL recommendation. He was deputy project manager of the Dutch MultimediaN E-culture Project, which won the first prize at the Semantic Web Challenge at ISWC'06. He participated in the EU FP6 K-Space Network of Excellence and several other EU research projects in the past. He is currently working on the EU FP7 PrestoPrime and EuropeanaConnect projects and on the Europeana Thoughtlab demo. His current research interests include multimedia on the Semantic Web and the exploration of heterogeneous media repositories.

Prof. dr. ir. Arjen P. de Vries is a senior researcher at CWI and a part-time full professor in the area of multimedia data spaces at the Technical University of Delft. He received his PhD in Computer Science from the University of Twente in 1999, on the integration of content management in database systems. He is especially interested in the design of database systems that support search in multimedia digital libraries. He has worked on a variety of research topics, including (multimedia) information retrieval,

database architecture, query processing, retrieval system evaluation, and ambient intelligence. He coordinates the TREC and INEX Entity Ranking tracks, which is of particular relevance to the search activities in this project. In 2004, De Vries and his then PhD student Westerveld received the best paper award in the international conference on image and video retrieval (CIVR), and in 2007, De Vries and his PhD student Cornacchia received the best student paper award in the European conference on Information Retrieval (ECIR). He is currently participating in the EU projects Vitalas (FP6) and PuppyIR (FP7).

5. Eurecom

Eurecom, Sophia Antipolis, France, is a graduate education and research center, funded by two schools: Telecom ParisTech (France) and EPFL (Lausanne, Switzerland), with several academic and industrial members. Our research activity is organized in three themes: mobile, corporate and multimedia communications. We have a very active collaboration program, and participate in many projects at the national (Argos, RPM2) and European (STATION, GM4iTV, PorTiVity) level. Research at Eurecom includes in particular topics such as signal processing, information theory, speech processing, watermarking, biometry, multimedia analysis, information filtering. Our group is a regular participant in the TRECVID evaluation campaigns. We have participated in several European projects, including the K-Space Network of Excellence. We recently organized the 15th Multimedia Modeling international conference (MMM 2009) in January 2009.

Dr. Raphaël Troncy is currently Assistant Professor in the multimedia information processing group of Eurecom (France). He obtained with honors his Master's thesis in Computer Science at the University Joseph Fourier of Grenoble (France), after one year spent in the University of Montreal (Canada). He benefited from a PhD fellowship at the National Audio-Visual Institute (INA) of Paris where he received with honors his PhD from the University of Grenoble (INRIA/INA) in 2004. He selected as an ERCIM Post-Doctorate Research Associate 2004-2006 where he visited the National Research Council (CNR) in Pisa (Italy) and the National Research Institute for Mathematics and Computer Science (CWI) in Amsterdam (The Netherlands). He was a senior researcher for CWI from 2006 till 2009. Raphaël Troncy is co-chair of the W3C Incubator Group on Multimedia Semantics and the W3C Media Fragments Working Group, contributes to the W3C Media Annotations Working Group and actively participates in the EU K-Space Network of Excellence. He is an expert in audio-visual metadata and in combining existing metadata standards (such as MPEG-7) with current Semantic Web technologies. He works closely with the IPTC standardisation body on the relationship between the NewsML language family and Semantic Web technologies.

Dr. Benoit Huet received his BSc degree in computer science and engineering from the Ecole Superieure de Technologie Electrique (Groupe ESIEE, France) in 1992. In 1993, he was awarded the MSc degree in Artificial Intelligence from the University of Westminster (UK) with distinction, where he then spent two years working as a research and teaching assistant. He received his DPhil degree in Computer Science from the University of York (UK) for his research on the topic of object recognition from large databases. He is currently Assistant Professor in the multimedia information processing group of Eurecom (France). His research interests include computer vision, content-based retrieval, multimedia data mining and indexing (still and/or moving images) and pattern recognition. He has published over 80 papers in journals, edited books and refereed conferences. He is a member of IEEE, ACM and ISIF. He has served in many international conference organization and technical program committee. He is regularly invited to serves as reviewer for prestigious scientific journals as well as expert for project proposal at national, European and International level. He is the conference chair of the International Conference on Multimedia Modeling (MMM'2009) which took place in Sophia-Antipolis (France) in January 2009.

Prof. Bernard Merialdo was admitted in the Ecole Normale Supérieure (Maths section) in 1975. He received a Ph.D. in Computer Science from Paris 6 University in 1979 and an "Habilitation à Diriger des

Recherches" from Paris 7 University in 1992. He first taught at the Faculty of Sciences in Rabat (Morocco). In 1981, he joined the IBM France Scientific Center in Paris, where he led several research projects on natural language processing and speech recognition using probabilistic models. From 1988 to 1990, he was a visiting scientist in the IBM T.J Watson Research Center in Yorktown Heights, N.Y. (USA). In 1992, he became a professor in the Multimedia Communications Department of Eurecom. His current research topics are multimedia indexing and information filtering applications. He is a member of IEEE, ACM, he was associate editor for the IEEE Transaction on Multimedia, and general chair for the ACM Multimedia 2002 conference. He participates in several conference program committees and expert boards. He is currently Head of the Multimedia Communications Department at Eurecom.

6. University of St Gallen

University of St. Gallen is the university for Business Administration, Economics, Law and Social Sciences, founded in 1898 as a "business academy", is one of the oldest universities of its kind in the world. The University of St. Gallen today is one of Europe's leading business schools and was among the first to be accredited by international EQUIS and AACSB standards. In this setting the mcm institute – founded in 1998 with support of the Bertelsmann Foundation and the Heinz-Nixdorf Foundation – has established itself as a leading international centre in the field of media and communication for research and consulting. The institute is exploring business models, acceptance and the management of new media as well as the application of digital media in corporate communication. With its engagement in leading cooperative research projects, the University of St. Gallen has broad access to experts and knowledge in the field of mobile service creation. Furthermore, the mcm institute-Forschungsbeirat (Advisory Board) equipped with C-level business- and thought-leaders from leading ICT and media companies (e.g. Swisscom, SAP AG), guarantees vital exchange of ideas for applied research. In addition, collaborations with worldwide leading business schools (e.g. MIT, Columbia University of St. Gallen) fertilise the research on the forefront of management science.

Prof. Dr. Katarina Stanoevska is vice-director of the =mcminstitute and associated professor at the University of St. Gallen. Her research work is focused on business models and strategies in telecommunication and media industries. She is in particular interested in topics related to market trends, innovative advertising and communication models based on connected media as well as development and evaluation of business models. She has published numerous papers in these areas and has participated as work package leader for business aspects and user requirements and as exploitation manager in four European projects related to mobile services. From 1992 till 1997 she worked as a Research Assistant and Doctoral Student at the Institute for Information Management, University of St. Gallen, where she also got her Ph.D.. In1997 she was a Project Manager at the Institute for media and communication management. Since September 2004 she becomes a member of the executive board of the mcm institute and since the beginning of 2005 assistant professor and vice-director of the Institute for Media and Communications Management. Since January 2009 she is elected associate professor at the University of St. Gallen.

Thomas Wozniak works as Research Assistant and is doctoral candidate at the Institute for Media and Communications Management of University of St. Gallen (Switzerland). He has been involved in EU research projects in the fields context-aware mobile services, thereby focusing on business aspects. He works on market analyses, business models, and provides business consultancy to project partners. Thomas Wozniak studied at University of Leipzig (Germany), Berlin University of the Arts (Germany), and Edith Cowan University Perth (Australia). He holds a diploma degree in Business Administration of the University of Leipzig and a diploma degree in Electronic Business of the Berlin University of the Arts.

7. Semantic Technologies Institute International

STI International was founded in April 2007 and is established as a research association within Austria. As a natural outcome of the European Semantic Systems Initiative ESSI, the EU FP6 Network of Excellence Knowledge Web, and DERI International, STI International is a mature association of interested scientific, industrial and governmental parties sharing common R&D objectives: to establish semantics and semantic technologies as an integral part of modern computer engineering. Currently we can count 25 public and corporate members, whilst several further member applications are being processed. To support its members and promote semantics, STI International coordinates and actively contributes to major research and education activities in Europe and promotes greater awareness and faster take-up of semantic technology in full synergy with these activities. The association is structured accordingly in three areas (*research*, *technology*, *realization*) which further comprise a series of services to the members as well as to other external parties (*education*, *road maps*, *commercialization*, *standardization and reference architectures*, *test beds and challenges*). Designated area leaders and service managers are responsible for the successful operation of STI and its services.

Alexander Wahler is CEO of STI International. He is also co-founder of Hanival Internet Services GmbH and has a degree in electrical engineering from the Vienna University of Technology. He has many years of experience in the management of European research projects and is currently leading the work of Hanival in the IST-FP6 project SUPER. He was an advisor to the Austrian Chamber of Commerce on the FP7 Framework programme.

Dr. Lyndon J B Nixon has joined STI International as senior postdoctoral researcher in November 2008. Previously he was a researcher at the FU Berlin, where he acted as Industry Area Co-Manager of the EU NoE KnowledgeWeb and double Workpackage Leader in the EU STREP TripCom. In KnowledgeWeb, Dr. Nixon organized and led activities promoting the transfer of semantic technology to industry. He received his PhD in January 2007 with the topic 'Semantic Web enabled Multimedia Presentation system'. His research focus is Web-based TV/video and the semantically guided integration of Web-based content, and he has organized a number of workshops around related themes.

8. Condat AG

The Condat AG is a medium sized company located in the centre of Berlin developing and integrating innovative solutions for leading European companies. Condat is one of the main German providers for planning, distribution and media asset management including EPG for the major public and private TV-broadcasters (e.g. RBB, ARD, MDR, WDR, NDR3, n-tv, arte, Deutsche Welle). Condat has actively participated (co-ordinating or member of consortiums) in 7 EU-Projects from the 3rd to the 7th Framework Programme.

Condat provides Web-TV solutions introduced by television broadcasters to offer their video materials on-demand via the internet. The attractive presentation of videos requires to include a comfortable navigation, advanced search, meta data and user profile evaluation. We apply semantic search engines to retrieve and analyse large, heterogeneous data sources distributed throughout the network for the semantic connection of objects and to ensure the integrity and actuality of links. Our business unit mobile applications develops personalised user interfaces for different mobile devices using descriptions concerning screen format, in-/output facilities and operational system. Several mobile TV solutions have been developed, which show video transmitted via WLAN, DVB-H or DVB on mobile devices.

Condat covers the entire Plan – Build – Run cycle applying modern methods such as V-Model or OOP. The development of server and client side applications uses J2EE, Java, Web- and Open Source – technology. Project and quality management is certified according to DIN EN ISO 9001:2000. In the

LinkedTV project Condat contributes in the areas architecture specification and implementation, network search, semantic classification of static and dynamic content, profiling of programs for different user profiles. Due to our close relation to customers in the TV sector, we participate in the field trials to validate the project approach and pilot system.

Rolf Fricke graduated in Diplom-Informatik (computer science) in 1985 at the Technical University of Berlin. He has actively participated in 7 EU-Projects from the 3rd to the 7th Framework Programme and 8 national funded research projects (BMBF/BMWI) in different domains concerning TV, New Media, Semantic Web and Mobile Applications. He was involved in various industry projects for TV-Broadcasters, Telcos and Car Industry concerning video asset management and transmission, electronic program guides, distributed mobile applications, web mining and avatar based solutions. His focus is the design and development of Internet- and mobile applications on the basis of APS, ESB, relational databases, search engines, web content management, IPTV, Web-TV, DVB-H and HbbTV.

Jan Thomsen graduated in Diplom-Informatik (computer science) at the Technical University of Berlin. He is a system architect with a strong background in Semantic Web Applications, Search Engines, Open Linked Data, Metadata and Enterprise Integration Architectures. One main focus is on the design of advanced Web-TV and non-linear Multimedia solutions with Metadata annotations using emerging standards and technologies. He has participated in 3 EU-Projects from the 4th to the 6th Framework Programme and 5 national funded research projects (BMBF/DFG).

Kerstin Mathaj graduated in Diplom-Informatik (computer science) at the Technical University of Berlin in 2004. Her focus is the design and development of model-driven Video-, TV- and mobile applications on the basis of APS, ESB, web content management (CMS), Electronic Program Guides (EPG) and Semantic Web technology. She is familiar with Object-oriented methods for analysis and design (OMT, UML), SOA (Service Oriented Architectures), database design (Oracle, MySQL) and network search (Lucine). She participated in 2 EU-Projects and 3 national funded research projects.

9. Noterik

Noterik, established in 1996 in Amsterdam, the Netherlands, is a privately held company (SME). The founders, (MSc) mr. J. Gural and mr. N. Hershler, started the company as Noterik & Doonder V.O.F. The legal identity of the company was changed into B.V. (corresponding to Ltd) in 2001. Noterik is an R&D driven full service multimedia company providing efficient solutions in the field of digital media, employing highly skilled software engineers and (interaction) designers which develop media applications based on open standards. Noterik operates with a multilingual staff of approximately 12 people.

The solutions Noterik develops in the field of indexing, management, retrieval and delivery of digital media are related to the StreamEdit framework, a Media Content Management application (MAM), also known as a Digital Asset Management system (DAM) developed by Noterik. Clients and partners include European broadcasters, the European Commission, National Research and Educational Networks (NERN's), large public service organisations and well known national and international research organisations. Noterik has received a number of awards including the Dutch Telework (2002) and the Dutch Europrix (2004) award.

Rutger Rozendal is the Chief Operatinal Officer of Noterik. He started working at Noterik in 2003. During the first years he was responsible for the coordination and implementation of webcasting services to different customers. In 2006 the service expanded to include educational webcast functionality so that the technique could be used by learning institutions to provide online interactive lessons. Rutger oversaw implementation of this technology in both the medical and financial sectors. Since 2009 Rutger is

responsible for the overall marketing and sales strategy of Noterik. In close collaboration with Daniel Ockeloen, Head of the Technical Development, he provides the roadmap for the WebTV development for the coming years.

Daniel Ockeloen started as software designer. In 1993 he was involved in writing software for the first ISP in the Netherlands, During this time he was asked by one of the Dutch National Broadcasters (VPRO) to setup their digital department, From 1994 to 2000 he was responsible for over 30 projects ranging from live media events to designing applications. One of the products was MMBase a CMS designed for national broadcasters, he prepared MMBase for open-source release in 2000, he left VPRO to co-found the multi-media company Submarine, which produces cross-media products where he took the role of CTO. Mr. Ockeloen was part of the MMBase Management Committee for the first few years of the open-source phase. In 2004 he left Submarine to work on MMBase fulltime mostly hired by Dutch broadcasters and education related companies. In 2006 he was asked to join Noterik as Head of the Technical Development.

Jechiam Gural is co-founder of Noterik BV and member of the board of directors. He had a number of management functions within Noterik and provided consultancy to many of its clients. He is an expert in the field of online video, streaming media and e-learning. He graduated from the University of Amsterdam in 1996 in the field of Biology (Msc). After his graduation he managed a variety of media and web related projects and has spent much of his time on R & D activities. He envisioned the StreamEdit on-line video editing software around 1999, at that time one of the first internet based demonstrators of webbased video editing based on the SMIL XML standard. Mr Gural has initiated many of Noterik international contacts and has participated in a number of European R & D programmes, included FP6 IST MESH, Birth of TV and Video Active.

10. The Netherlands Institute for Sound and Vision (NISV)

The Netherlands Institute for Sound and Vision (NISV) maintains and provides access to 70 per cent of the Dutch audio-visual heritage, comprising approximately 700,000 hours of television, radio, music and film, making NISV one of the largest audiovisual archives in Europe. NISV combines the highest professional standards concerning the release and storage of material, with easy access for its users, by using state of the art systems for asset management and storage.

NISV is the business archive of the national broadcasting corporations as well as a cultural heritage institute. NISV has brought thousands of hours of archive footage on-line for educational use and also operates a facility for the general public, the Media Experience, which is visited by 200,000 people annually. In 2007, the seven-year Images for the Future programme was launched. The project, funded with a budget of €154 million from the FES Fund, will realise the digitisation of the Netherlands' audiovisual memory in a process whereby NISV will conserve and digitise 17,500 hours of film, 124,000 hours of audio, 137.000 hours of video and 1.2 million photos. This material will be made available for (broadcast) professionals, education and the general public. In the scope of this prioject, Sound and Vision is experimenting with crowdsourcing.

NISV is an experienced partner in National and European research projects and active in the following international organisations FIAT/IFTA, EBU and UNESCO. Current research projects include LiWA, PrestoSpace,MultiMatch, VidiVIDEO, P2PFUSION, Video Active, COMMUNIA, CATCH programme, and MultiMediaN.

Johan Oomen is head of the NISV He is mainly working on externally funded research projects. Since June 2007, he joined the Images for the Future project team. He is part of the research groups of national and international research projects. He holds a BA in Information Science and an MA in Media Studies.

He is member of the Webstroom expert group funded by the SURF Foundation, on the use of streaming media in higher education and general secretary of the DIVERSE network. Johan Oomen has also worked for the British Universities Film and Video Council and the Holland Media Group. He has given papers at leading conferences and published several articles in journals, including Ariadne, Innovate and Informatie Professional. His book Internet en het Nieuwe Leren: de toepassing van streaming media was published recently.

Roeland Ordelman is project manager R&D at the Netherlands Institute for Sound and Vision and researcher Speech & Language Technology and Multimedia Retrieval at the University of Twente. He is co-founder of XMI (Cross Media Interaction), a company that provides services for automatic, speech-based annotation of audio data. He received his PhD on "Dutch Speech Recognition in Multimedia Information Retrieval" at the University of Twente in 2004. He has been working on a number of national and international projects in the area of multimedia retrieval and speech and language technology, such as more recently LiWA, MESH, MediaCampaign, MultimediaN and the CATCH project CHoral. His work focuses on deploying multimedia retrieval technology for accessing information in audiovisual data and enhancing the exploitability of the information that is available within and along with audiovisual data collections. He is specifically interested in robust speech recognition, time-synchronization of collateral textual data such as minutes, subtitles and transcripts with audio and the representation of information that is extracted from the audio stream. The latter also includes exploiting user communities for correction/enhancement of automatically generated audio labels.

Hans Westerhof is programme director at NISV. He is responsible for Images for the Future, a large digitisation project. Hans Westerhof is also manager of the department of collections, which looks after the total of 700.000 hours of analog and digital collections of the archive. Before his work at the archive he worked at Knowledgeland, an Amsterdam-based think tank, at Andersson Elffers Felix, a management consultancy firm and for the Amsterdam Municipality, as political advisor to the alderman of urban planning and housing.

11. University of Mons

The POLETI (Research Center in Information Technologies) group of the Faculty of Engineering at the University of Mons (UMONS), Mons, Belgium, is active in the following areas and their applications: voice quality processing and voice modeling, text-to-speech systems, statistical pattern classification, noise robust speech recognition algorithms, audio processing, automatic character recognition, biomedical data processing, sensor an data fusion, image processing, DSP implementation and software optimization. Activities in the area of multimedia content analysis and human behaviour analysis are in particular pursued within the NUMEDIART (http://www.numediart.org) research project, a long term national research program centered in Digital Media Arts. In this project, the POLETI group collaborates with other Belgian partners with developments related to hypermedia navigation in the context of artistic installations or performances, as well as media production needs. Our group also benefits from international collaborations with first class institutions and involvement in several European projects (e.g., HIMARNNET, SPRACH, RESPITE, THISL, SIMILAR Noe, CALLAS IP, COST 232, 249, 250, 278, 2102 and 2103) and national projects. The POLETI group also has R&D contracts with the industry (e.g., ACEC, PHILIPS, SAIT), owns several international patents, and has created ACAPELA S.A, a spin-off company licensing speech technologies (30 employees). The POLETI has also co-created a spin-off R&D Lab, Multitel ASBL, which now has 60 people on its payroll.

The numediart Institute for New Media Art Technology was founded in 2010 by the University of Mons. Building upon MONS 2015 (Mons will be the EU Capital of Culture in 2015), the Institute organizes internationally-renowned scientific training and research activities in the area of new media art tech-

nology. The topics covered by the Institute are: audio, image, video, gesture, and bio-signal processing, for applications in which man-machine interaction aims at creating emotions. Through UMONS, the media arts scenario (WP7c) will be executed in collaboration with the numediart Institute.

Prof. Bernard Gosselin is professor of Image and Information Processing at the Faculty of Engineering of the University of Mons. He is also a Research Consultant at Multitel Research Center, where his responsibilities cover image processing and video activities. Since 2001, he has been heading the Image Processing Research Group at the Faculty of Engineering, Mons. He is a member of program committees of several international journals and conferences on image processing, artificial intelligence, and pattern recognition. He is author or co-author of more than 50 international publications in journals and conference proceedings. He has been an invited speaker in several conferences, and visiting professor at the University of Orléans, France. His expertise in image analysis and information processing covers, through several past or ongoing research projects, the fields of pattern recognition, defect detection and classification, traffic analysis and video surveillance, and video or secure signal processing. He has supervised several PhD theses in these fields.

Dr. Matei Mancas holds a PhD in applied sciences from the FPMs (now Faculty of Engineering of the University of Mons, Belgium) since 2007. His research deals with signal understanding and computational attention. This mechanism is used by humans in order to select "important" features in an image or a sound and it is the beginning of a higher level signal understanding. He is currently working on the use of computational attention for expressive gestures and emotion description and in social interaction analysis. Dr. Mancas wrote several national and European projects for several years and he has been a member of the SIMILAR network of excellence. He is also a member of Eucognition network and a Belgian expert in a COST action dealing with real-life complex video analysis.

Dr. Stéphane Dupont received the PhD degree in Electrical Engineering at FPMs (now Faculty of Engineering of the University of Mons, Belgium) in 2000. He has been post-doctoral associate at the ICSI (California) in 2001-2002. There, he participated to the ETSI standardization activity on robust distributed speech recognition over wireless networks (Aurora). In 2002, he joined Multitel (Belgium), a research and innovation center, to be in charge of speech recognition research. There, he organized the writing and coordinated several projects, including the EU FP6 DIVINES project (multimodal interfaces challenge). He joined UMONS in 2008. Dr. Dupont interests are in multimodal and speech interaction technologies, multimedia content management, computer music, pattern recognition, artificial neural networks and signal processing. He has authored/co-authored over 40 papers on these topics and holds 3 international patents.

12. RBB

RBB is the regional public broadcaster for the federal states of Berlin and Brandenburg. It produces and broadcasts one television channel and six radio stations in addition to providing a range of interactive multimedia services including websites, community video platforms, mobile and teletext services. As part of the ARD (Association of Public Service Broadcasting Corporations in Germany), it contributes to several nationwide TV and radio channels and multimedia services. RBB hosts and manages the ARD Play-Out-Center which is responsible for the playout of the ARD Digital programme bouquet via DVB-S/T and the production and editing of SI data for all ARD TV and radio programmes. RBB employs approx. 1,500 staff in addition to a large pool of free-lancers.

RBB has longstanding experience in EU co-funded research projects, gaining extensive knowledge in the creation of innovative formats and services, in content production and distribution and also in usability testing of services. Recent activities concentrated on collaborative content production, personalized media and accessibility services. RBB follows the most recent developments in interactive content authoring

technologies, such as Adobe Air, JavaFX, MPEG-LASeR, and BD-Java (BluRay) and is capable of prototyping applications and content based on these technologies for different end devices. Annotation metadata formats such as TV-Anytime, MPEG-21 or APML are also within its research focus.

Bettina Heidkamp was awarded her master's degree in Media Studies, English and Modern History from Freie Universität Berlin in 1995. On completion of her professional journalistic training, she worked in journalism/PR and project management for a number of broadcast related EC co-funded projects. Since January 2002 Bettina Heidkamp has been employed by RBB's Department of Production & Operation to coordinate multimedia research and development in EC projects. To date she has led eight EU projects and is currently coordinating RBB's activities in the EC co-funded projects DTV4ALL and Vital++ and the European Space Agency co-funded project COTV.

Nicolas de Abreu Pereira studied English and History of Art at Freie Universität Berlin. He has worked on several EC projects with a focus on user interactivity, including MHP-KDB – The MHP Knowledge Base, ENTHRONE 2, OnRadio and Audiotain (as project coordinator) for RBB and its predecessor. While working at Berlin's Technical University he concentrated on user requirement analysis in the fields of eGovernment and eParticipation, technologies for the Ageing Society, technology-enhanced and innovative learning concepts. He is currently RBB's project manager in the FP7 project VITAL++, focusing on IPTV over IMS-based P2P networks.

Sven Glaser was awarded his diploma in International Media and Computing from University of Applied Sciences in Berlin (FHTW) in 2005. Since 2006 Sven Glaser has been employed by RBB as project engineer for its Innovation Projects. His special focus is on the DVB framework and its combination with network technologies as well as user-centred interaction paradigms and barrier-free access technologies. He was RBB's technical manager in the FP6 project PORTIVITY and is now working on the PSP project DTV4All and FP7 project VITAL++.

B 2.3 Consortium as a whole

The success of LinkedTV will be guaranteed through the combined expertise and knowledge of its consortium members. As an Integrated Project, we focus on a consortium made up of a significant number of academic research partners, including one economic unit, a couple of SMEs which stand to benefit from LinkedTV market opportunities and several large traditional media players who will benefit from the innovation of LinkedTV technology to strengthen their respective market position (broadcasters, IPTV system provider, telecommunications).

Firstly, as project co-ordinator, a partner is needed who can provide proven project administration skills and experience, so that day-to-day project operation runs smoothly, as well as a clear vision for the aims and outcomes of LinkedTV, so that the research and innovation proceeds according to a clear, directed path to a common, well defined goals. Only under these conditions it is possible to trust in the successful running and completion of LinkedTV. Here, **Fraunhofer IAIS (DE)** demonstrates the required project administration skills and experience, being project coordinator in several past and present EU projects.

To provide the research expertise in content analysis for relations extraction, annotation and adaptation, we have two partners who have clear leadership in this area, including the successful work in these areas in past EU projects. Results from these projects will be acquired and extended for LinkedTV. **CERTH (GR)** is a leading research institute in the area of semantic multimedia, using hybrid low level and high level content analysis approaches to bridge the so-called „semantic gap" and enable conceptual annotation of media streams. The **University of Economics, Prague (CZ)** is a pioneer in the use of data mining to improve media annotation processes, enabling the association of related media through shared concept

identification in accompanying data sources (e.g. subtitles on a TV program, surrounding text on a Web page). **Eurecom (FR)** will complement both partner's activities with their multimedia research unit, and particularly expertise in appropriate multimedia description schemes for referencing media fragments and tying fragments to concepts. Through their combined research expertise, these partners will also create an infrastructure for the „Connected Media“ services on the Internet.

This expertise is complemented by a leading institute in multimedia retrieval and presentation research **CWI (NL)**. CWI is a leader in multimedia metadata research, and will support LinkedTV in the use of appropriate, simple metadata schemes for annotating and linking media content. As the developer of the automated presentation system Cuypers and e-culture search portal MultimediaN, its experience in multimedia presentation and interaction will be used in designing the LinkedTV user interface. Research work on multimedia annotation and presentation generation will be complemented by **STI International (AT)** through the senior researcher Dr Lyndon Nixon, whose PhD focused on this topic. Furthermore, as he has instigated the proposal and given the vision for LinkedTV, he has the clear vision and goal for the project which is necessary in a scientific coordinator. Further research support will be provided through the startup Playence as a third party, whose activities focus on user interfaces and capturing user feedback. STI also brings its experience as organizer of leading events in the academic and industrial communities and its worldwide network of experts in semantic technologies, to make it the ideal partner for dissemination activities.

Given the potential of LinkedTV to generate new business models for traditional media companies as well as the need during the project to keep up to date with the rapidly moving IPTV market so that LinkedTV can be best positioned to innovate in this market and introduce a powerful paradigm shift with the potential to disrupt, we draw on the expertise of **University of St Gallen (CH)** to carry out market surveys, develop business models and support our industry partners in the project in best profiting from LinkedTV.

For development of the back-end infrastructure, including metadata repositories and service endpoints, and to support the broadcasters in integrating LinkedTV technologies into their content processes, the SME **CONDAT (DE)** Condat has been chosen as they bring the required expertise and skills to the consortium. Condat has longterm experience regarding the development and customizing of search engines to retrieve and analyse large, heterogeneous data sources. This knowledge will be used in the project to weave video annotations with other media and configure crawlers to maintain the integrity and actuality of all links.

For development of the LinkedTV player, as well as support for video preparation and delivery at the broadcaster side, the SME **Noterik (NL)** is "on board". Noterik bring their ClickVideo technology to the project. Furthermore, they will provide the IPTV client development skills including realisation of interactive services through widgets.

It is of vital importance in LinkedTV to have a tight co-operation with major players in the areas of broadcasting and telecommunication. The results of the project have the potential to provide new services and business models for broadcasters (offering their content in a enhanced fashion) and broadcast providers (increasingly telcos in „triple or quadruple play“ offers). Through industry participation in the consortium, we have first adopters of the technology, a clear target for exploitation and a means for user trials and business model proofing.

In LinkedTV, the public broadcaster **RBB (DE)** will provide broadcast and additional content, tailored to implementing one or more usage scenarios. It will plan and perform user trials and explore the potential for technology- and service-related exploitation for the project. The research experience of RBB includes developing future usage patterns and scenarios, content metadata extraction and personalization, content management and publication, dynamic user services creation and user testing and evaluation

Complementing this with their extensive media archive, **Sound and Vision (NL)** will enrich the LinkedTV scenarios with a rich source of cultural heritage and news media content.

Finally, the POLETI department of the University of Mons (BE) has acquired an expertise in natural interaction approaches, which provides non-intrusive ways of analyzing behavior. This expertise is needed for workpackage 4 and more precisely for task T4.2. Computational models of human attention are also part of the equation, with models focusing on efficiency and real-time processing in ecological situations, with both bottom-up and top-down models implemented on still images, audio and video signals. The variability of the signals which can be processed and the efficiency and robustness of the models on real-life data are two key points needed by the LindedTV project. Moreover, machine learning algorithms and interactive visualization/search have been applied in the framework of multimedia data including music, images, videos or laughter signal. Finally, POLETI/UMONS recently founded, and hosts, the NUMEDIART Institute for New Media Art Technology, providing a connection with the creative arts, and means for creating appealing showcases**.**

B 2.4 Resources to be committed

LinkedTV work will be done with a total of 864 person months over 42 months, representing 20.57 persons' effort per month with 12 partners asking for funding. The total funding requested is ca. 6.586 Mill. €.

LinkedTV is an Integrated Project. It is directed towards innovations in one of the central fields of Networked Media where expertise from different domains has to be integrated. We have partners from industry including SME, from public broadcasting organizations, and from research institutions and universities. They all have to provide their own dedicated contributions, and they have tightly to cooperate in order to achieve our goals.

The four WPs 1-4 are directed towards methodological research. They integrate efforts from different domains related to our methodological research. Mainly Fraunhofer, CERTH, UEP, CWI, and EURO contribute their methodological research and experiences here in joint efforts. All four WPs have a comparable workload (with some more emphasis on the annotation and production support side). Especially in WP3 (LinkedTV interface and presentation engine) the three use case providers and public broadcasters will take an active part in order to make sure that their requirements to these issues are fulfilled.

WP5 is dedicated to the creation of the LinkedTV platform. This is typically a bigger effort including large amounts of software engineering and integration. Our partners Condat and Noterik will take most of the efforts here. These resources will be needed in order to build the integration platform including those efforts to integrate the software modules from WPs 1-4.

WP6 is dedicated to the creation and evaluation of our three use cases. Each of our use case partners RBB, UMONS, and S+V will use their 20/21 PM to prepare the use cases raw material, to define the requirements, specify the scenarios, contribute to their implementation on the LinkedTV platform, and evaluate the fulfilment of their initial requirements. They will be supported by STI which will take the lead for this WP6. This guarantees that all three broadcasters can contribute to the overall approach of LinkedTV in a coordinated way, and that the bridge between use cases, methodological research, and platform creation and integration is strong and active.

WP7 collects our dissemination activities. The amount of dissemination activities corresponds with 66 PM to the needs of this Integrated Project. Especially the standardization activities which form a central

part of the whole project are contained in this WP. Our partner STI is leader of this WP, and together with EURO which will lead the standardization efforts they will get the largest portion of the work load in the WP.

WP8 contains the exploitation efforts of all in all 75 PM. USG leads this WP with the greatest amount of work load. This is especially dedicated to market analyses and the development of business models and exploitation strategies. Our industrial partners and the broadcasters support these activities with sufficient allocated effort for a meaningful contribution. Additionally, the Fraunhofer IAIS and STI International both contribute to exploitation as organisations specialised in transferring research into commercialization opportunities and industry uptake.

The management WP9 is deliberately lean. The main effort in this area will be provided by Fraunhofer as IP coordinator. All other partners will get a small amount of work load for their management activities. They will be tightly integrated with all other activities in the IP.

With respect to the necessary software and hardware, LinkedTV plans to base its platform development on primarily open source and free software and available hardware, since the results of the project should also be available as open source and free (in a non-commercial context). The LinkedTV service bus and application server runs on available Linux servers and many partners can make their servers available to the project for hosting LinkedTV platform components. Client hardware can be sourced from CONDAT, Noterik and other partners. The below table identifies each partner's contribution:

Partner	HW/SW to be contributed	HW/SW to be purchased
CONDAT	Via HbbTV trials with partners DiscVision and KabelDeutschland, CONDAT has access to Linux based STBs	€18 000 budgeted for equipment to be identified in the system design phase; cost for advanced STBs: 300-1000 €
STI International	Can provide server space during LinkedTV to host the platform, also to sustain LinkedTV after the project as part of an exploitation plan.	
CERTH	Existing computing infrastructure and related software for developing and testing Video Analysis techniques	€20 000 budgeted for purchasing additional dedicated video analysis development hardware (e.g. GPUs) and related software; also, server for hosting selected Video Analysis tools
RBB	Provision of facilites for a test playout of a LinkedTV service. Existing computing and infrastructure and related software for the development of tv-centric hybrid UIs and services.	Equipment for development and user tests: €4000 = Tablets + TV set, €2500 = Smartphones + STBs
NOTERIK	Existing SOA based Media Asset	€35 000 budgeted support:

	Management system (SPRINGFIELD) and broadband WEBTV service (including server hardware and colocation services) supporting MPEG-4 video streaming and enriched media playback.	BACKEND: new servers and colocation costs required for LinkedTV services, FRONTEND, STB devices and other CLIENT hardware to test playout and playback, DEVELOPMENT: staging development servers and software and development computers.

B3. Impact

B 3.1 Strategic impact

One central result of LinkedTV will be a framework that will enable rich annotation of audiovisual material with associations to concepts, and on the basis of these annotations related Web content can be associated dynamically with objects in the video stream. An end user receives a video in which objects can be accessed and multimedia presentations received to communicate information about those objects. This framework can form the basis for added value services to users, which generate new value in video content by making it interactive and informative. Here we focus on two aspects of the expected impact of LinkedTV: in society, and in business.

Social impact: strengthening digital society

The Lisbon declaration stated that the EU should become "the most competitive and dynamic knowledge based economy in the world" (2000). Competitiveness and dynamism is based on access to information which is available at our fingertips, and which is intuitive and relevant. This is also the central research goal of LinkedTV. Our focus on industrial and social uptake aims to ensure that we not only achieve our research aims but that this result has a real and viable impact in both industry (strengthening European competitiveness) and society (advancing the information society).

The impact of this is to change our understanding of IP-based audiovisual content and particularly IP-based Television. Television has already established itself as a passive medium, and efforts to promote Interactive Television must fight against this ingrained expectation. The Web, on the other hand, has always been interactive and the convergence of the Web with TV must not turn the Web experience into a passive experience like television viewing.

A new paradigm of IPTV merges the popularity of television as a means of communication with the benefits of the Web as an immense content source. We expect this can impact in different ways: (1) in society, European citizens as part of the information society have eased access to relevant information about objects addressed in video, independent of language or national barriers; (2) in business, professionals can use video more effectively as an information source (the various business and financial TV channels and programmes show already how video is used) because the access to related information about a topic in the program can be more readily available for perusal, being presented in an intuitive and meaningful way; (3) in industry, the growing sectors of TV & video production, TV broadcasting and software firms supporting the development and consumption of broadcast media, challenged by the growth in Web video which is already clearly seen as a competitor of traditional broadcasters, need new services to gain a competitive edge and increase market share. The LinkedTV framework can offer this new added value to bring European industry ahead competitively in the increasingly global market.

To achieve this impact, the relevant communities must be prepared, standards sought to ensure industry uptake and early adopters found to demonstrate the value of LinkedTV services. The consortium has prepared itself well for all these challenges, as outlined beforehand and described in detail in this document.

Education and access to information are two important pillars of the European digital society of the future. Here, Web based audiovisual material and TV broadcaster archives represent a definitive and significant source for both education and information.

Digitization of analogue audiovisual material will ensure future access. Over the past years, technologies for large-scale migration have matured. The same is also true for thinking about migration projects in

terms of their efficiency and the workflow models they could follow. Although the process is far from complete, approximately ten million hours of European audiovisual material has already been digitized [7]. Recently, the audiovisual production process shifted from analogue to digital. This so-called 'born digital' content is directly ingested in asset management systems and will also be kept for posterity as electronic files. Due to digitization and digital production, audiovisual content collections are transforming from archives of analogue material into very large stores of digital data.

For the humanities, digital cultural heritage sources are a fundamental dataset. In the Netherlands, Academia (www.academia.nl), developed by Sound and Vision, offers online access to thousands of hours of streaming video for higher education purposes. Similar services are being created across Europe. As television studies have grown and the study of television history in particular, so has the need for original sources. While historians have long been reluctant to use media for research of the 20th century past, they increasingly use audiovisual sources to fill in gaps, to shed new light on where traditional sources only reveal part of the story [6]. The need for digitized sources along with expertise, standards, tools and services to support use and reuse of content has been acknowledged, but this need is still far from being fully met.

Digitization is also a driver to establish new services. Distribution over networks, interoperability with other collections and flexible integration in other environments are just a few of many properties in this new era of enormous potential for audiovisual archives. Therefore, large-scale digitization efforts do not only ensure long-term access, but also have the potential to reveal the social and economic value of the collections. LinkedTV will allow this material to be exploited in a new way, namely by

1. adding a more fine-grained, concept specific, level to access the collections and
2. combining materials of different types, sources and origins to discover and demonstrate new knowledge about the artifacts.

Business impact: strengthening IPTV in Europe

IP-based video (including IPTV) is a growth market globally. The global IPTV subscriber base is expected to grow from 20 million in 2008 to almost 90 million in 2012. LinkedTV can provide the technologies to place Europe at the innovative forefront of IPTV service creation and provision. Already, Europe is being heralded as the potential market leader in IPTV[2] with 42% of the world's IPTV subscribers and nearly half of the sector's revenues by 2010. In actual numbers, this translates to 21.3 million IPTV users generating $5.1 billion of IPTV service revenues in Western Europe by 2010. We expect additionally through HbbTV that we will see in the next years a Europe-wide convergence on IPTV standards and technologies which will further drive the European IPTV market.

Yet television, while playing a significant role in the everyday life of citizens globally, remains a largely passive experience with limited interaction possibilities. The much heralded convergence of television and the Web still tends to mean only that content from both sources share the same cable, and that the content may be switched between or viewed in parallel on the same device. For true interaction with digital content, citizens still need to switch to their computer or other Web-enabled device, relying on a browser or associated plug-ins.

Faced with the explosion of digital audio-visual content on the Web, much of it user-generated or independently produced, the traditional media creators and deliverers – including television companies

[2] Europe to dominate IPTV growth, Light Reading, 5.3.2007
http://www.lightreading.com/document.asp?doc_id=118668

and telecommunication operators - face a challenge to their business models as users face broader choice and greater flexibility in their viewing activity. Despite traditional media players tending to have higher quality, more professional, and branded material , the digital citizen is drawn to innovative new ways to access and interact with digital content, where the traditional marketplace is in danger of finding itself playing catch-up. Established "old" players risk losing touch with the younger generation (especially the under 20s) who have grown up with the Internet and for whom the idea of a shared television viewing experience or the need to watch a particular program at a particular time is something hard to imagine[3].

The investment in IPTV (estimated at a total $21 billion[4]) needs to be complemented with new innovation which can use the convergence of TV and Web content to provide new types of interactive service to the digital citizen. This can help produce new market opportunities, particularly for SMEs, protect the business models of the traditional media companies, give European IPTV technology a competitive advantage in a growth market and support the digital society by enabling new forms of information access to citizens.

If this succeeds, IPTV can become a "potential goldmine" for the key business players in the IPTV market[5]. Service providers, it is found, "to make any headway at all, ... they will need to develop unique and compelling applications". We believe that the converged services that can be made possible over the LinkedTV framework can hold the key to establishing European leadership in IPTV technology and to unlocking the "goldmine" of new compelling IPTV applications.

Why Europe? And why us?

The work of LinkedTV is necessarily European because (a) it is within Europe where much of the leading research in the relevant fields (video analysis, Web data mining, multimedia annotation, Linked Data, user interfaces, multimedia presentation) is taking place (b) it is within Europe where emerging players in sectors of TV & video production, TV broadcasting and software for the development and consumption of online media are encountering huge opportunities for growth and yet strong global competition, and it is the unique innovation and research skills of European multimedia researchers who can provide new solutions to give them the competitive edge.

With regard to other research activities, the research community relevant to LinkedTV is sufficiently small to be aware of other work, and big enough to carry out the proposed work. The consortium is European in nature, with many of the consortium members being key players in their respective research area, equipped with excellent contacts to other actors in the community. Hence, through conferences and other research events, the consortium is able to keep abreast of developments outside of LinkedTV. To formalize this, a specific task has been created to monitor ongoing activities to identify potential developments which may impact the workplan. Through early recognition of such developments, the LinkedTV management structure is in a position and has been assigned the powers to consider and execute workplan changes, e.g. take advantage of external results or refocus areas in the workplan. As part of the dissemination activities, partners have the opportunity to identify potentially related activities

[3] Klingler Walter: "Jugendliche und ihre Mediennutzung 1998 bis 2008" (Media usage of young people 1998 to 2008). In: Media Perspektiven 12/2008, pp. 625-634

[4] IPTV'S Economic Realities, Light Reading, 21.11.2005 http://www.lightreading.com/document.asp?doc_id=84604&WT.svl=deptop_1

[5] IPTV a potential goldmine, Light Reading, 28.11.2005 http://www.lightreading.com/document.asp?doc_id=84783

at national and international events and reach out to external partners to determine potential complementary activities, or discuss overlaps. However, it can also be clearly stated that, to the best of the knowledge of the consortium, no existing project or other research activity focuses on the central goal of LinkedTV: intuitive access to objects in video to provide dynamically generated multimedia presentations about concepts using media extracted semantically from the Web. Many other activities in the multimedia research community are complementary to tasks or sub-tasks of LinkedTV, and the partners of the consortium are already involved in or aware of such activities (and will continue to do so in the duration of the project) and hence are well suited to guide their workpackages to successful, innovative and new research results. In fact, partners are often themselves involved in other activities, giving LinkedTV strong co-operation opportunities. In particular, standardisation activities will be carefully monitored and to the best of the partner's abilities influenced by our work, so that standards in this area are complementary to our results.

The achievement of this impact is most heavily predicated on the non-emergence of a similar solution in the project duration. This may occur if there is work taking place in the field which is not public, e.g. within a commercial organization. Market and product reports will attempt to anticipate new developments in the area of IP-based video provision and related sectors of relevance to the LinkedTV work, and ensure LinkedTV's uniqueness in what will be a rapidly growing market. As partners come from the broadcasting, content provision, network operation, server side software and client side software sectors, we are in a good position to keep in touch with developments in each of these areas. Also, each of the partners has a strategic interest in knowing the state_of-the-art in their respective business area. Given the preconditions for the LinkedTV framework, including the multimedia semantic modeling and meeting research challenges such as concept extraction at instance level or generating dynamically multimedia presentations, it is unlikely that a commercial solution will emerge in the short term sufficiently close to the LinkedTV objective.

B 3.2 Plan for the use and dissemination of foreground

Dissemination

Dissemination is regarded as a two-way dynamic and interactive process, which will be continuous and progressive. Dissemination will be effected at both the consortium level and at partners' level and will be effected through the following channels:

- Setting up of the project web site with clearly visible and regularly updated project information. The site will be set-up by STI International and present the LinkedTV vision as a 'story' grounded in non-expert, real world, meaningful language. It will keep interested parties informed about project developments and project news. Furthermore, the project website will be the main point of call for external inquiries and serve as the project's "business card".
- Presentation of the project and its results as they become available at related thematic national and international events, workshops and conferences. This activity will be led by STI International, and all partners will actively participate in it.
- Participation in related events organised by the EC, including the IST programme's annual events and relevant concertation meetings. All partners will play an active role here. It will be co-ordinated by STI International.
- Participation in pre-standardization and standardization activities. STI International provides a pre-standardization service.

- Establishment of close links with other FP7 projects active in the same areas as LinkedTV as well as related areas (all partners involved)
- Publications in scientific and industrial journals.
- Production of promotional material (posters, brochures, videos, etc.). The purpose of this activity is to "spread the word" about our aims and activities, and do so in an understandable, easy-to-understand way. It will be led by STI International and supported by all project partners.
- Establishing a page in Wikipedia about LinkedTV and its related technologies
- Establishing a presence in the Social Web to raise public awareness (Facebook, blogs, bookmarking sites etc.)

The target audiences for the foreseen dissemination activities are the following:

- The EC – ICT community: to raise awareness for our objectives and trigger collaborations with projects, initiatives and undertakings sharing similar or complementary goals.
- The scientific community: to spread the scientific results and help trigger their use in other areas as well.
- The broadcasting and telecommunications industry: to promote LinkedTV results in relevant industrial sectors through information days, and promotion at industry events. Also, wider uptake of the technologies by tutorials and workshops for professionals will be supported.
- The general public: Targeted, initially at project launch, to inform peers and actors close to the individual partners from all sort of areas in order to interest them in the project as such and raise awareness in order to gain support. As the project matures, the prime dissemination target will move more to parties active in related sectors (details above). However, it is a goal of the consortium to continue involving the so-called "general public" as much as possible and deemed suitable. After all, it is taxpayers' money that funds activities such as LinkedTV. Consequently, the consortium sees it as its responsibility to also inform the public who makes such undertakings and activities possible.

A number of deliverables, milestones and events have been planned to assure the effectiveness of the general dissemination activities. Details can be found in the project workplan. Deliverables will be, where appropriate and possible (such as for the research tasks), research publications whose value will be demonstrated by successful peer review (e.g. submissions to conferences or journals).

The main tool for organising and steering dissemination activities will be laid out in the "Plan for the dissemination and use of knowledge".) The LinkedTV partners are well positioned in the academic community to undertake effective scientific dissemination of results, given both their leading roles in the publication of work and the organisation of events in the relevant fields. Some of the top conferences in which partners publish or (co-)organize, and where LinkedTV work will be disseminated, include:

Standardization

Standardization efforts will be pushed through active involvement in the W3C standardisation activities, such as the W3C Multimedia Semantics Incubator Group and the W3C Multimedia Annotation on the Semantic Web Task Force, and related initiatives for Web and TV convergence within the broadcasting community (EBU, HbbTV). LinkedTV's advancement is expected to foster ongoing efforts by consortium members of applying Semantic Web technologies in Multimedia Semantics within the above

standardisation activities. Hence we expect LinkedTV will have substantial impact on further standardization efforts.

LinkedTV partners are uniquely positioned to contribute due to their past and existing activities and contributions in the area:

CERTH-ITI actively participates in standardisation activities. In the near past it participated in activities such as the W3C Multimedia Semantics Incubator Group, http://www.w3.org/2005/Incubator/mmsem/, which among others has published the "Image annotation on the Semantic Web Incubator Group Report" and the "Multimedia Vocabularies on the Semantic Web Incubator Group Report". CERTH-ITI also participated and continues to participate in ISO/IEC JTC1/SC29/WG1 (JPEG) and ISO/IEC JTC1/SC29/WG11 (MPEG) standards working groups, and as part of its work it has authored and submitted several input documents to these working groups' meetings.

The W3C has recently stated its strategy to make video a first class citizen on the web. A new Video Activity, following the Multimedia Semantics Incubator Group co-chaired by Raphaël Troncy of EURECOM, has been launched encompassing several working groups. Among others, the W3C Media Fragments Working Group will address temporal and spatial media fragments on the web using Uniform Resource Identifiers (URI). URI-based addressing of spatio-temporal fragments of audiovisual news content on the web will be a key issue for LinkedTV. Having global identifiers for clips and media objects would allow substantial benefits, including linking, bookmarking, caching and indexing the content. Furthermore, the W3C Media Annotations Working Group will develop an ontology designed to facilitate cross-community data integration of information related to media objects on the Web. This ontology will be compatible with the knowledge infrastructure put in place in LinkedTV. Consortium member EURECOM will actively participate and co-chair these working groups.

Also, project results will be fed into the activities of the European Broadcasting Union (EBU), especially with regards to interactive services and metadata provision. We will also outreach to The Open Video Alliance which is an ad-hoc group of organizations dedicated to fostering the growth of open video.

Naturally, and in addition to what has already been outlined above, dissemination activities will also be undertaken with the clear goal to address the markets targeted for potential exploitation: broadcasters, content owners, telcos, IPTV network operators and platform providers, as well as equipment manufacturers (STBs).

In particular through consortium contacts to members of the HbbTV consortium, we will feed necessary adaptations or extensions to the HbbTV specification for enabling LinkedTV back into the HbbTV standardization process, for example we expect to contribute to recommendations on use of DVB and OIPF in transmitting hyperlinks in video via broadcast, and extensions to APIs to trigger both broadcast and broadband content in order to support LinkedTV requirements such as time code access to streams.

Exploitation by partners

It is planned to pursue a two-way exploitation strategy in LinkedTV:

- On a joint level (the consortium as a whole or a combination of consortium partners)
- On an individual partner level.

Joined exploitation strategies will be developed for LinkedTV results that are being developed collaboratively. Details of joined exploitation strategies will be agreed in the Consortium Agreement and in the Exploitation Plans and Agreements to be developed. This will be done as project results are becoming available and will be updated regularly. In addition to exploitation being carried out jointly on a

collaboratively level (e.g. of), individual partners will also pursue exploitation activities individually. Besides possible new products and services, this includes, for example, things such as changed business practices, improved workflows, partnerships established with the help of LinkedTV work and activities, and the like.

Regarding commercialisation of the LinkedTV framework, it is foreseen that users subscribe to particular services which – potentially independent of the AV content or its annotation – provide particular types of data aggregated to the AV content. Besides entertainment and monetisation opportunities (e.g. companies provide sponsored services which promote their products), other use cases are

- education
- academic or commercial research
- public information dissemination

Exploitation will be led by the industry members of the LinkedTV consortium. Following this, aided by the early adopter effect, we expect exploitation of results to be able to be spread to external companies. We look at the way it is expected that the consortium plans to address exploitation issues both on an overall project level, as well as on an individual partner level.

Exploitation Strategies of individual LinkedTV Partners

LinkedTV will develop cutting-edge technology that enables interactive connection of AV and Web content. The LinkedTV technology will provide the potential of first mover advantage of the companies involved in the project and other European companies in the industry.

At present, telecommunications companies base new business models around delivery of TV over IP (IPTV) bundled with other services made possible by the integration of the Internet/Web in the broadcast network. IPTV broadcasts are generally no different from TV broadcasts over other channels, the „IP“ only introduces a means to offer television, telephony and Internet access in one line („Triple Play“) and deliver other applications to the television (via the Set Top Box) which exist alongside the normal TV broadcast option.

LinkedTV, on the other hand, will deliver new technology which will allow IPTV broadcasts to be radically different from traditional TV broadcast through the integration of Web technology. Telcos offering services based around LinkedTV can expect to profit from the added value of such services over their competitors. For such services to exist, the media providers will be enabled by LinkedTV to enhance their broadcasts in dynamic, intelligent and customizable fashion. Through the LinkedTV-enabled analysis and annotation of broadcast material, the set of LinkedTV technologies can be used to create added value services without prohibitive manual preparation. Media providers can increase market share by offering their content over LinkedTV services, winning viewers through the new possibilities enabled to interact with the content. The different players in the market – media owner, producer, broadcaster, distributer – may each have specific types of service developed which reflect their intended aims with the content, whether it be education, gaining feedback, building communities, advertising or winning market share.

Through LinkedTV, interaction with television will reach maturity as usage will be based on the content of broadcasts – hence tightly integrated with the viewing context. New and innovative opportunities will arise for stakeholders of different types to reach viewers – and achieve different aims, from education and social cohesiveness to marketing and higher profits.

Against the background of the overall market trends and the specific opportunities created by LinkedTV technology, the following section highlights exploitation plans on a project partner level.

CERTH-ITI is already participating in the VR-Sense spin-off company with the aim to produce and distribute innovative high technology products based on research results and results from R&D projects. Furthermore, part of the CERTH-ITI business plan is to participate in a number of new spin-off commercial companies capable of exploiting its research when new market needs and solutions are identified. The Centre for Research and Technology Hellas (CERTH), where ITI belongs, was in fact founded so as to accomplish Technology Transfer, encouragement of entrepreneurship and innovation. The Informatics and Telematics Institute as a member of CERTH has all the necessary support including legal support, business management, marketing, distribution sales channels and accounting in order to create innovative enterprises. CERTH-ITI is active in providing research services and results to the local and European industry through direct research contracts and licensing agreements.

Furthermore, depending on the progress of the industrial exploitation efforts, a suitable subset of the techniques implemented by CERTH will be made available in the form of open source software, under an appropriate open-source license and according to the exploitation plan decided during the project. This will enable its use outside the consortium. As part of its commitment to open source software, CERTH has made available in the near past the source code of tools developed by it, such as the VIA: Video and Image Annotation Authoring tool (*http://mklab.iti.gr/via/*) and the GPU-accelerated implementation of LIBSVM (*http://mklab.iti.gr/content/gpu-accelerated-libsvm*). The foreseen open-source distribution will facilitate the further exploitation of the project's results and allow CERTH's technology to be integrated with other third party tools.

CONDAT expects to exploit the project results by reusing methodology and software components developed within the project to enhance their existing TV- and media solutions by the advanced annotations to browse and retrieve videos. Condat´s customers in the broadcasting and Web-TV sector have expressed growing interest for such features. The main strategic impact on Condat's business is to lay foundations for a competitive advantage for their Condat® Media Suite. This solution comprises modules for planning, media asset management and editing for different distribution channels such as DVB-T, DVB-H, Web-TV or videotext. The functional modules of the Media Suite range from 30.000 up to 250.000 €. Condat's market focus is medium to large enterprises, especially in the TV, media and telecommunications sector.

The new features of LinkedTV will allow the customer to offer interweaved content, better search possibilities and browsing which makes the whole presentation more attractive and optimises working time for the end users. This allows Condat to raise the prices for product and support, especially because of the advantage related to other products in this market segment. The additional revenues planned will reach the ROI in a few years related to the investment in the project. The consortium agreements concerning IPR and exploitation will allow Condat to enhance their existing solutions with the main features developed in the project.

Sound and Vision intents to implement the technology provided by LinkedTV to its current online portal. Sound and Vision aim to introduce hyperlinked video as an integral part of its online services Additional resources will be invested to implement this knowledge in the current catalogues as ORPHEUS releases the technology.

Furthermore, Sound and Vision positions itself as one of the key players in the development of Europeana (part of EDLnet), through its involvement in the Video Active project, and as a research organization highly active in the areas preservation and digital durability (undertaken for example in the PrestoPRIME project). It is also expected that LinkedTV technology will be used to enhance access to material on Europeana. Finally, Sound and Vision is also an active participant in the evolving landscape of European media production, working closely with the EBU and the CHORUS Coordinated Action on

standardization issues. Fruitful co-operations and exchanges for mutual benefit are expected on these levels, too.

Noterik will implement LinkedTV technology on its video platform. All partners and relations will be notified if new technology comes available to them and so will LinkedTV technology be offered to a wide range of Dutch institutes and companies.

Noterik will also provide LinkedTV technology to possible new clients and will venture into possibilities of exploiting specific LinkedTV technology to a wider range of suitable clients and prospects in the Netherlands. It will also try to exploit this technology within the realms of the EUScreen project.

Primarily, **RBB** will exploit the LinkedTV technology and services internally by integrating the developed environment to enrich its content offerings. Initially, it is foreseen that the online offer will be the prime beneficiary. Later, and once the service operates robustly, it is expected to become more TV-centric. By integrating the LinkedTV technology in its workflow, and by offering it to the content production staff, RBB will be enabled to create enhanced and improved services with no significantly increased production time. This equals either cost savings or being in a position to produce more / better services with the same resources. If successful, both the system as well as experiences gained can be transferred to other companies / organizations with similar aims and ambitions.

Clearly, on the production side, RBB will benefit from the open architecture allowing easy, seamless integration of content from any source into these new user-oriented meta-services and corresponding new workflows. RBB intends to apply the LinkedTV project results to its production and provisioning of services, programmes and content in order to offer its existing and new audiences the type of services and content they want in a manner that is fair and acceptable to all parties. As a member of the ARD – the Association of Public Service Broadcasting Corporations in Germany, RBB will use its contacts with other broadcasters within the ARD and beyond to promote LinkedTV results and developments using internal events, meetings and workshops. RBB will present the project developments at international exhibitions such as the IFA and IBC, also within the ARD group and the European Broadcasting Union, e.g. the annual Eurovison TV Summit. RBB will also support publications in journals like the EBU Technical “tech-i” and provide input for promotional flyers, brochures etc.

In addition to the exploitation plans outlined above, RBB intends to participate in collaborative exploitation activities with other project partners. Being a co-developer of the technology (especially contributing evaluations, tests and trials) detailed agreements are to be entered into once tangible results materialize.

LinkedTV offers new exploitation opportunities for universities and research institutions as well. First of all new, exclusive knowledge related to new technologies, interactive content formats and innovative business models will be developed. Technical universities will explore the opportunities to leverage developed technological components and knowledge through spin-offs or by offering consulting services on how to integrate and develop interactive IPTV and Web content services. The business administration University of St. Gallen will leverage the new knowledge regarding interactive content formats, advertising models and business models to offer dedicated services to the media and telecommunication industry in Europe. The University of St. Gallen will furthermore develop specific executive education courses for the media and telecommunication industry.

Joint exploitation strategy

The development of a common exploitation strategy will be an important goal of the LinkedTV project consortium. The main project result will be an Open Source (OS) platform supporting the end-to-end process for linking TV to the Web. However, also specific components of the LinkedTV platform as well

as complementary offers as for example consultancy or training related to the main LinkedTV platform have commercialization potential which should be realized through good preparation in the project period.

In order to develop visions for common exploitation either among all partners or certain groups of partners, and also to optimize the dissemination activities towards supporting potential market entry strategies, the question of a common exploitation strategy will be considered from the very beginning of the project. At the beginning of the project through intensive brainstorming and consensus-building sessions attended by all partners first potential results suitable for commercialization will be identified.

The identified common and individual exploitation strategies will be summarized in an early exploitation plan and further developed and detailed during the course of the project. Potential common exploitation measures are identified in the table below in consortium discussions:

Table 5: Common exploitation measures

Potential Exploitation Partner	LinkedTV Result for Exploitation	Measures to Ensure Exploitation
TV/Video Production	Tools for annotation	Open source tools, further commercial development, standardisation of annotation schemes, demonstration events
TV/Video Broadcasting	Tools for delivery of content-aggregated video streams	Open source tools, further commercial development, standardization of delivery format, demonstration events
Software/Services for TV/Video creation & management	LinkedTV platform for annotation & content aggregation	Further development, documentation, licensing, monetarization opportunities (server-side advertising)
Software/Services for TV/Video playback	LinkedTV hypervideo player	Further development, documentation, licensing, monetarization opportunities (client-side advertising)
The European citizen	LinkedTV services	Public promotion (e.g. online showcases), user trials, private service offers

In a second step, based on the early common and individual exploitation plans, the interest of consortium partners with respect to the identified commonly exploitable results will be assessed and clustered. It is expected that for example universities would rather cluster around a potential common product related to

consultancy and training in new technologies, while industry might develop a shared commercialization vision around the LinkedTV platform.

In a next step, potential common commercialization strategies will be prioritized and evaluated in more depth. For example: the product and market surveys as well as business model and business plan development planned in WP8 will consider and focus on the identified common exploitation strategies.

In particular, various potential business models will be considered:

- Business models typical for open source products[6]: selling of support, accessorizing, service enabling, widget frosting, brand licensing, customization or software franchising.
- Alternative business models would be providing LinkedTV functionality in a Software-as-a-Service manner or according to the Platform-as-a-Service business model paradigm.
- Business models for complementary value adding services such as consultancy and training for the LinkedTV platform.

An important part of the business model consideration will be the analysis of the emerging value chain in a linked Web and TV solution and the positioning of different players and partners of the project within it. Another important focus will be the evaluation and assessment of different organizational forms suitable to enable common exploitation strategies, such as joint ventures among partners or spin-offs.

Knowledge Management

Knowledge management is very important in an innovative project such as LinkedTV. Both the *background knowledge* brought to the project by the partners to do the work and the *foreground knowledge* being generated by the work done in the project must and will be clearly identified and appropriately protected. All consortium members agree:

- to bring all necessary knowledge for the performing of their work as foreseen in the workplan to the project without restriction or charge;
- to make knowledge available to other partners where that is necessary for the correct understanding of work done or the successful alignment or integration of separate activities without restriction or charge, other than that the partner may request that said knowledge may not be shared outside of the project;
- where knowledge brought to the project is already (prior to the project) restricted in some way, the partner responsible for providing that knowledge commits to making that knowledge available within the project to the necessary partners in a fair and free manner, possibly associated to restrictions in use;
- commercial partners with IPR may retain those rights, while making available knowledge in the project as is necessary for fulfilling the workplan, or may choose to grant rights to the research partners so that they may carry out the work;
- to make available all knowledge generated as a result of the work done in the project to the project without restriction or charge, other than that the partner may request that said knowledge may not be made public outside of the project;
- where knowledge generated within the project applies to work which already is restricted in some prior and agreed way, that new knowledge will be made available within the project in a manner no more restrictive than the prior work.

[6] Open Source Initiative, "Open Source Case for Business" http://www.opensource.org/advocacy/case_for_business.php

In short, while the consortium members agree to a fair and free access to knowledge within the project (this will ensure that no difficulties in carrying out the workplan occur), we wish to ensure that both academic and commercial partners who will have the opportunity in LinkedTV to advance their own research and development, have a basis for protecting the knowledge gained for both future dissemination and exploitation.

While LinkedTV will carry out public dissemination and exploitation activities, some of the knowledge may be protected in a fair manner agreed by the consortium. For example, research advances may be licensed to individual partners, while generally we expect the use of open source and free of charge licenses. This ensures that intellectual property remains the property of the originator but that other research may be able to make use of results to achieve further advances.

Commercial advances should not be restricted by the consortium, especially as this is a major goal of the project. The LinkedTV platform will carry an open source license, so that further development by commercial organisations is supported. We will allow the software partners Condat and Noterik to enhance their existing solutions with the main features developed in the project. The exploitation partners RBB and Sound & Vision will also continue to have access to the platforms for LinkedTV services developed in the project.

The consortium agreement will be the basis in LinkedTV for the clarification of IPR brought to the project or created in the project, and the rights to access for the other project partners and for external organisations, both during and after the project duration.

B4. Ethics issues (if applicable)

As LinkedTV plans to deploy innovative technology for user behaviour measurements, we have to follow up-to-date guidelines and constraints defined by international standardization organisations such as ISO/IEC 15408 as well as respect European regulations and laws about the privacy of data about the citizen such as *Directive 95/46/EC*.

We will also contact other FP7 projects active in security research concerned with related scenarios in order to derive appropriate measures for the specific conditions of LinkedTV[7]. At present we plan at least the following bundle of measures to perform our exploration of user preferences and behavioural capturing while respecting user privacy:

1. Personal multi-media data streams (video, audio) are never sent to servers and they are recorded on the client disk only during their processing. They are used to extract behavioral data (emotions for given frames, eye gaze maximum at given locations in the frames, etc…) which are turned into text annotations. Those text annotations only are recorded in the client disk or sent to the server (if necessary). The multi-media data used to generate the text annotations is not needed anymore once the processing achieved and it is never sent to the server and even erased from the client disk. So multi-media data (videos, audio track, etc…) are never recorded or sent to any server.
2. If possible, private data (text annotations) is available only on the client side while statistical data (anonymized from the name and profile point of view but also from a localization point of view: no client ID but client neighborhood ID) should be sent (in a secured way: https, etc.) to the

[7] ftp://ftp.cordis.europa.eu/pub/fp7/security/docs/securityresearch_catalogue2010_2_en.pdf

servers. The size of the neighborhood is to be set during the research step. Each step of the project will be designed to minimize the volume of anonymized text annotations sent to the servers.

3. When installing the system the users should be made aware (explicitly informed) that part of their behavior will be analyzed and resulting annotations will be recorded locally, and they must also clearly agree to the behavioral analysis through a confirmation action in the system (explicit user consent). They may also freely choose to use LinkedTV technology with the behavioural tracking aspect of the personalization service disabled.
4. A hardware guarantee should be provided on the time limit of behavioral recordings. Old data is anonymized and sent for aggregation to servers, than erased from the client by new data. Also multi-media streams are erased as soon as analyzed. This could be guaranteed by **limited hardware storage** capacities: the client hard-disk should have a maximum size to avoid keeping in memory private data for a too long time. Concerning the data sent to servers, in order to avoid sending multi-media data (videos from the user, audio from the user, eye path of the user…) the **upload bandwidth should be limited** to be able to send only text annotations to servers.
5. The user should also have the possibility at any time to fully erase the behavioural data, stored on any client device they have used.
6. Even if all measurement data are anonymized, they are naturally associated with the device owner, and could potentially be read through unauthorized remote access. This will be prevented by always storing profile and measurement data in an encrypted form and transfer them by secure protocols.