ANNEX I - PROJECT PROGRAMME

MECCANO

Multimedia Education & Conferencing Collaboration over ATM Networks & Others

RE

Commencement date ***1 December 1997***

Page Numbered 1 through 56

Content list

TELEMATICS APPLICATIONS Programme

Form A: OVERVIEW OF MECCANO PROJECT

A.1 - Summary Information on the Project

Project Number	Acronym - Title	
	MECCANO : Multimedia Education & Conferencing Collaboration over ATM Networks & Others	
Lead sector	**Other sectors (Initials)**	**Project Duration in Months**
3 RE		***24***

Project Objectives, Summary description and anticipated results (up to 20 lines):

The objective of the project is to provide all the technology components, other than the data network itself, to support collaborative RTD through the deployment of enhanced tools for multimedia collaboration in Europe. The project will improve and deploy the existing toolsets with a particular application aim of distance education and of conferencing. The improvements will occur in many important aspects:

- Better integration of the multimedia conferencing tools to make them easier to use by untrained users;
- Capability for optimum video, audio, shared workspace and applications sharing over heterogeneous bandwidths;
- Identify the additional support and management facilities required to meet and enhance the end-user applications;
- Inter-operable cross-platform support for many systems - UNIX workstations and PCs
- Better support for the introduction and recording of multimedia information in conferences;
- Support for network reservation and multicast deployment over concatenated networks technologies - mainly using IP - including packet-switched, ATM, SMDS, Direct Broadcast Satellite, mobile and ISDN;
- Improved inter-operation between workstations running the multicast Internet and normal ITU-T procedures;
- Integration of low-speed access facilities via intelligent packet filtering, multiplexing and transcoding gateways with distributed, secured, control;
- Capability of interworking between Internet MBONE and ITU-T styles of end-station.
- Facilities for secure conferencing - with the keys distribution compatible with a large-scale CA infrastructure;
- Distributed measurement, monitoring and management of Resource Reservation and Quality of Service:
- Conference announcement and invitation - including of private sessions - integrated with booking systems.

Verification activities will be pursued both inside the project and in other Telematics projects which stress each of the technical activities. They following test all the tools over various network technologies and geographic regions.

- Regular research seminars given from the sites of the partners - and from North America
- Use in the research community, including over the national research networks of UKERNA, DFN, UNINETT, and CA*Net II of seminars, lectures, research collaboration and home working.
- Use by at least 8 other Telematics, ESPRIT and ACTS projects and several national ones. Besides tools from MERCI and ICETEL projects, it will utilise results from ICE-CAR, current National, and EC projects.

Major Validation sites[1] :

Institution/ Organisations	City/Town + Postal Code	Region [2] ·	Country [3] ·
Academic Computer Centre CYFRONET	Krakow 30-950	N/a	PL
British Telecom Research	Martlesham	UK54	GB
Communications Research Centre	Ottawa K2H 8S2	n/a	CA
Hewlett Packard Limited	Bracknell RG12 1HN	UK52	GB
Institut National de Recherche en Informatique et Automatique	Sophia Antipolis 06902	FR82	FR
Universitetet i Oslo	Oslo 0378	n/a	NO
Universitaet Stuttgart	Stuttgart 70174	DE11	DE
Shell International Exploration & Production BV	Rijswijk		NL
School of Slavonic and East European Studies, UCL	London WC1E 6BT	UK55	GB
TELES GmbH	Berlin 10587	DE301	DE
Universitaet Erlangen-Nuernburg	Erlangen 19058	DE22	DE
Universitaet Freiburg	Freiburg i. Br.	DE13	DE
Universitaet Mannheim	Mannheim	DE126	DE
Universitaet Bremen	Bremen	DE5	DE

Other Characteristics of the Project:

- Users involved (up to 3 lines)

The user groups include: Field trials of distance education, for mathematics, medicine and languages in Canada, Germany, Norway, Poland and the UK; medical consultation in Germany; seminars, both inside the UK and across Europe and Canada; German commercial trials to residential users and for collaborative engineering.

- Technologies and/or approach used (up to 3 lines)

The **network technologies** include Multicast IP over ISDN, DBS, SMDS, ATM, cable TV and mobile radio - with reservation and priority in routers and gateways which support filtering and transcoding and ITU-Mbone. The tools have multi-bandwidth capability via hierarchical coding of audio, video and shared workspace. There is WWW in many areas of the control and the tools. Security support is provided for the streams, components and announcements.

- Expected benefits for the citizen (up to 3 lines)

The Benefits for Citizens include the ability to receive multimedia teaching, learning and events in home premises via ISDN or DBS; ability to reach isolated communities by DBS; medical access by cable TV, mobile and ISDN.

- Expected benefits for the users of the application (up to 3 lines)

The **benefits for Users** include the ability to collaborate in multimedia learning, teaching and seminars with locally available communications networks; remote access to multimedia learning material at speeds suitable to the access network; specific collaborations achievable without putting in special communications facilities. Good support.

- **Expected benefits for the European Industries (up to 3 lines)**

Expected Benefit to European Industry arise from the participating industrial concerns interested in developing and marketing the relevant components, service providers interested in trials of the systems on their networks, and user communities realising that the technology will improve internal productivity and will ease collaboration with others.

- Contribution to EU-policies (up to 3 lines)

The project **contributes to EU policies** in several ways: by establishing networked multimedia capability in European industry and user sites, by including East European partners in a genuine way, and by helping ensure that international standards in multimedia, network technology and security are promulgated with a European flavour.

1 A complete list of validation sites has to be provided in the Supplementary Informations - Form S.6

2 See annexed list of regions

3 Please use ISO country codes as described in annexed notes

Co-ordinator:

Name of Institution/Organisation	City + Postal Code	Region[1]	Country [2]
University College London	London, WC1E 6BT	UK55	GB

Contact person from the Co-ordinating Contractor:

Title, First Name, Name	Professor Peter Kirstein	***Address:***	University College London Gower Street London WC1E 6BT
Tel:	+44 (0)171 380 7286	**Fax:**	+44 (0)171 387 1397
E-mail 1:	Kirstein@cs.ucl.ac.uk	**E-mail 2:**	

Other Contractors:

Participants Code[3]	Name of Institution/Organisation	City + Postal Code	Region[1]	Country [2]
C2	Academic Computer Centre CYFRONET	Krakow 30-950	N/a	PL
C3	Communications Research Centre	Ottawa K2H 8S2	N/a	CA
C4	Hewlett Packard Limited	Bracknell	UK52	GB
C5	Institut National de Recherche en Informatique et Automatique	Sophia Antipolis 06902	FR82	FR
C6	Universitetet i Oslo	Oslo 0378	N/a	NO
C7	Universitaet Stuttgart	Stuttgart 70174	DE11	DE
C8	TELES GmbH	Berlin 10587	DE301	DE
A1.1	School of Slavonic and East European Studies, UCL	London WC1E 6BT	UK55	GB
A6.1	New Learning AS	Oslo 0371	N/a	NO
A7.1	Universitaet Erlangen-Nuernburg	Erlangen 19058	DE22	DE
A7.2	Universitaet Freiburg	Freiburg i. Br.	DE13	DE
A7.3	Universitaet Mannheim	Mannheim	DE126	DE
A8.1	Universitaet Bremen	Bremen	DE5	DE

1 See annexed list of regions

2 Please use ISO country codes as described in annexed notes

3 Codes for the participant roles are as follows:
C1 = Co-ordinator; C = Contractor; A = Associate contractor

A.2 - Budget Summary Information

Project Number	Acronym - Title
	MECCANO : Multimedia Education & Conferencing Collaboration over ATM Networks & Others

Human Resources Summary (Person-month)

Total Resources of funded[1] Contractors	214 ‡
Total Resources of funded Associated Contractors	44
Total Resources of funded Subcontractors	
Subtotal Resources of funded Participants	258
Total Resources of non-funded[2] Contractors	36
Total Resources of non-funded Associated Contractors	
Total Resources of non-funded Subcontractors	
Total Resources of Sponsoring Partners	3

Cost Summary in KECU

Participants Code[3]	Person-month[4]	1. Personnel	2. Equipment	3. Third Party Assistance (subcontractors)	4. Travel and Subsistence	5. Consumables and Computing	6. Other significant Specific Project Cost	7. Overheads	Total	% of EU[5] Contribution %	FC AC	EU Contribution
C 1	78	275			30	56		72	433	100	AC	433
A 1.1.	6	19	6		2	3		3	33	100	AC	33
Subtotal 1	84	294	6		32	59		75	466	100		466
C 2	60	42		9	20	15		15	86	100		86
C 3	36	345	36		15				396	0	FC	0
C 4	12	133							133	50	FC	67
C 5	24	250			17				267	50	FC	134
C 6	12	54			5	4		4	67	100	AC	67
A 6.1	12	124			10				134	50	FC	67
Subtotal 6	24	178			15	4		4	201	67		134
C 7	12	53			8			6	67	100	AC	67
A 7.1	6	27			3	3			33	100	AC	33
A 7.2	6	27			3	3			33	100	AC	33
A 7.3	6	25	3		2	1		2	33	100	AC	33
Subtotal 7	30	134	3		16	7		6	166	100		166
C 8	16	166	4		8				178	50	FC	89
A 8.1	8	36			8				44	100	AC	44
Subtotal 8	24	202	4		16				222	60		133
Total	294	1576	49	9	131	85		102	(a)			(b)

Total estimated allowable costs (KECU) (to art 3.1. in contract)	(a) 1952 ǂ
*EU contribution in % - (to art. 3.2. in contract) (EU Contribution excluding 100% additional cost * 100 / Total cost excluding 100 % additional cost)*	38%
EU Contribution (ECU) (to art. 3.2. in contract)	(b) 1186 ǂ

from Sponsoring Partners (ECU)	83

ǂ Includes 60 Person Months (86 KECU) from a different EU funding source for the Polish partner ACC (C2) shown greyed in the above table.

1 Within the funding arrangements of this *Estimated contribution* contract

2 Accepted participants, not qualified for EU/EEA funding agreements

3 Codes for the participant roles are as follows: C1 = Co-ordinator; C = Contractor; A = Associated contractor;

4 Including Subcontractors

5 See contract Art. 3.2 (FC = full cost; AC = additional cost). Indicate the appropriate cost model

A.3 - Participants List

Project Number	Acronym - Title
	MECCANO : Multimedia Education & Conferencing Collaboration over ATM Networks & Others

Participants Code[1]	Participant's Institution/Organisation (full legal name)	Participant's - Short Name	Country[2] + Postal Code.
C 1	University College London	UCL	GB, WC1E 6BT
A 1.1	School of Slavonic and East European Studies	SSEES	GB, WC1E 7HU
C 2	ACC CYFRONET	ACC	PL, 30-950
C 3	Communications Research Center	CRC	CA, K2H 8S2
C 4	Hewlett Packard Limited	HPLB	GB, RG12 1HN
C 5	Institut National de Récherche en Informatique et Automatique	INRIA	FR, 06902
C 6	Universitetet i Oslo	UiO	NO, 0316
A 6.1	New Learning	NL	NO, 0316
C 7	Universitaet Stuttgart	RUS	DE, 70174
A 7.1.	Universitaet Erlangen-Nuernburg	UEN	DE, 19058
A 7.2	Universitaet Freiburg	UF	DE, 79110
A 7.3	Universitaet Mannheim	UM	DE, 68131
C 8	TELES GmbH	TELES	DE, 10587
A 8.1	Universitaet Bremen	BU	DE, 28359
X 1	EUTELSAT	EUTELSAT	FR, 1
X 2	Shell International Exploration and Production BV	SIEP	NL, 2280AB

Number of Participants

Number of Contractors (including Co-ordinator)	8
Number of Associated Contractors	6
Number of Subcontractors	
Number of Sponsoring Partners	2
Total Number of Participants	16

1 Codes for the participant roles are as follows: C1 = Co-ordinator, C = Contractor; A = Associated Contractor; S = Subcontractor; X = Sponsoring Partner

2. Please use ISO Country codes as described in annexed notes

Part B - Project & Contractor Description

1. RATIONALE OF THE PROJECT

Why another Networked Multimedia Conferencing and Dissemination Project?

The interest in network multimedia does not need to be made in this proposal. It is evident from the numerous work items both in many national programmes, and in the three EC Programmes ESPRIT, Telematics and ACTS, that the need has been accepted. Nevertheless, there is a need to discuss why the sort of project proposed here under MECCANO is needed. In the ESPRIT Programme, the whole of Domain 3 addresses multimedia systems; however the main emphasis is on the provision of the systems, with appropriate standards and interfaces. Multimedia pilots in specific environments are envisaged - but mainly as proof that the systems are commercially viable. The services are a major aspect of Area 1 in the ACTS programme; here much very useful work will be done - particularly to develop the services in the context of the BISDN. The same technologies pervades the workplans of the Telematics Programme; most of the sectors have some aspect of multimedia services in them. In this project we will be addressing the user needs as they have already been recognised not only by different sets of users of the Telematics MERCI project, but also by potential groups in the Research and Education & Training areas. The technology has much wider ramifications, but it is only these that we have targeted in the Validation workpackages.

Because of the target user groups identified, this proposal addresses the open call for RE 2.1 *real-time interactive multimedia collaboration.* However wide deployment and good quality collaboration depends vitally on having advanced network access and proper management both of resource and quality of service; for this reason, the proposal addresses also RE 1.*2 validation of access methods to advanced communication services* and RE 1.3 *managing the network as a resource*. These items are not being addressed in an official Call at this time, nevertheless they are being addressed here of necessity; good performance multimedia conferencing cannot be addressed separately from the underlying network infrastructure, and the middle-ware between the network and the multimedia tools.

Several current projects e.g. MERCI and MATES address multimedia conferencing. However, in MATES the conferencing technology is secondary. MERCI has been addressing the technology, but many vital areas have not been resolved. Moreover, there have been important developments in standards, networks, applications funded from other bodies which should be incorporated into a full networked multimedia conferencing and seminar system. Other ACTS projects have tackled the same area; however in these the emphasis has been on high speed conferencing using the B-ISDN; they have not tackled the same heterogeneous network environments targeted first by MERCI and now by MECCANO.

The Market Situation and prospects

We indicate below why none of the increasing range of suitable products is a clear market winner.:

- The increasing speed of Workstations/PCs now allow coding and decoding without special purpose hardware - though low-cost hardware support is becoming widely available. Nevertheless performance bottlenecks must still be localised to ensure that suppliers can take corrective action;
- Media coding is being standardised - but different sectors of the IT industry are still pursuing their own directions. With the rapid increase of units in each camp, ability to interconnect is critical;
- None of the current commercial options allows adequate flexibility for general-purpose operation, flexible configuration for differing applications or reliable cost effective multipoint operation;
- There is an increasing move towards LAN/desktop systems. However, these do have to be reliable and multipurpose and capable of secure operation. Hence the need for the Mbone tools;
- Not all users want video at all times. Mbone tools provide the flexibility to use just audio and shared workspace;
- The network bandwidth available is becoming less constrained, but the variety is still increasing; ISDN, ATM, Cable TV, Broadcast Satellite, Digital Radio all have a place. Each provides optimal facilities within its limitations - but the market needs all to be interconnected economically;
- Packet working for multimedia workstations has become much more popular and economic; nevertheless user access and bearer technology may use a different one of the above technologies:
- Most commercial Video Servers, addressing the hoped for “video-on-demand” market, target the local environment; recent standards, both of transport and resource management in networks, make WAN deployment more feasible - but facilities are still rudimentary and deployment rare;
- Security facilities are becoming available, though regulatory constraints still impact deployment.

Product updating is a continuous process. Early product impact, during 1998, will derive partly from earlier initiatives like MERCI - but a further great advance is expected for four reasons:

- The importance of the Internet is now realised widely, even ITU-T standards take it into account;
- Access and distribution technologies are being redirected to work with backbone technologies;
- The leading edge chip suppliers are providing multimedia hardware components, processor chips, smart cards, and economic network interfaces to ensure that the services can be provided economically; the computer manufacturers are integrating them into their newer products;
- The move towards the facilities of ATM and of IPv6 (on standardisation, IP/ATM integration, PNNI interfaces), support for high speed routing, partial implementation in components, and pilot projects, are starting to make a reality of bandwidth reservation or routing based on service class - thus achieving a Quality of Service.

Products will continue to emerge throughout the next few years. We will use, and extend, products both from inside the project and from other industrial and research sources. Such prototypes will be superior to most commercial products.

User Needs in applying Networked Multimedia to Conferencing and Dissemination

Many users would like access to network multimedia facilities for consultation, conferencing and database access. They want a number of specific services - all of which we address in this project:

- **Light Weight Conferencing:** Simpler digital systems - with workstations by themselves or in co-ordination with a video projector - using the available network technology.
- **Commercial users** want multimedia conferencing for general purpose communications in business affairs, but would accept somewhat lesser quality - if they gain in reachability, speed (of reaction and configuration) and economy. Other applications, e.g. sales presentations in commerce, have more quality demanding requirements. Ease of use, user configurability and interoperability are vital. Mobile access is also often very important.
- **Video/audio**: Different qualities of service (QoS) are required, depending on the nature of the application, the availability and cost of bandwidth; the audio is the more critical for User acceptance.
- **Shared Workspace**: The requirements depend on the applications area - but it is often a vital feature;
- **Introduction of Multimedia Servers:** Some users must record conferences; other users would like to introduce multimedia information, or may be concerned mainly in interacting with the server.
- **Range of Network Support**: Users often employ the same equipment for local or wide area applications - requiring its de-coupling from particular applications or attached network.
- **Range of Workstation Support**: Both PCs and UNIX workstations are required in different environments. It is important that there be a range of equipment allowing users to opt for using the same workstation for a longer time.
- **Conference Room Support**: Users may accept a quality of multimedia in workstations lower than for lecture room or conference room presentations; for the latter some practitioners would also like electronic whiteboards..
- **Security**: In many applications, confidentiality and authentication are indispensable. One needs to protect against unauthorised intrusion, permit transfer of confidential information, allow for verification and non-repudiation of participants; the system must allow only authorised setting of components or provision of session information.
- **Multiple Locations**: It is often important to have the sessions be multi-way. Sometimes a few locations could participate closely in the same sessions; at others many users would like rather weaker interaction. The use may even be mainly one-way, e.g. for providing information or server access, with minimal reverse communication.
- **Management and Trouble Shooting**: Users would like to run their conferences and seminars with minimum need to interact with other sites to find out and resolve transmission problems. The set-up and conduct of the sessions should be straightforward and simple. Technical support in one sites, this should be able to support multiple sites.

All these aspects are being addressed in the present project.

The Impact on the Users

There are many applications where the facilities outlined in Section 1.3 would be of considerable value to the User Community. Many research users, which are the first group addressed in this project, already have powerful workstations, and access to good network facilities. With only small upgrade of their existing workstations, such users would be able to collaborate fully with researchers at other locations. The first place we are introducing the facilities is to aid collaboration with our partners in EU projects; here we are

sometimes hampered by the lack of uniform network access by our collaborators. Network access is becoming less of an issue for European Framework projects - cost considerations may still impede wider commercial deployment. We are applying the technology also in education and in training. The technology allows a lecture or a training session to be provided at a number of locations simultaneously - with full interaction. With reduced quality, the sessions may be available in the home over the ISDN or on the move with mobile radio; with reduced interactive capability, they may be delivered by direct broadcast satellites (DBS) or cable TV.

The technologies already exist; they need improving in the light of the users' application-specific needs. It is in this light that the present project is particularly important; we intend to make the facilities developed in this project openly available at the very least to the users of other EC Telematics and national initiatives. Several sets of such users have already indicated that their use of the MERCI/MECCANO technology will allow them to concentrate on the application areas themselves - without requiring also tool development.

The Application and its Validation Sites

The work proposed here has very general applicability. Nevertheless, it is a tenet of the Telematics Programme that each project have specific sets of users to validate the work. In this project there are many suppliers of technology; we start from the tenet that each supplier should also assist in some validation, to ensure that the product is usable and works well. At the same time, this project is only part of the portfolio of each partner, and real validation is expensive. Initially we had proposed the following main areas of application: Collaborative automotive engineering, Customer support in a particular industry, medical collaboration between doctor and hospital, and lectures and seminars in various disciplines. The comments from the reviewers, and financial stringency, led to the Commission proposing that we restrict the validation to different types of seminar, using a variety of modes of communication including DBS satellites, high speed terrestrial and ISDN. These will involve both conference rooms and workstations.

2. OVERALL DESCRIPTION OF THE PROJECT

2.1 Objectives of the Project

The objective of the project is to provide all the technology components, other than the data network itself, to support collaborative RTD through the deployment of enhanced tools for multimedia collaboration in Europe. The project will improve and deploy the existing toolsets with a particular application aim of distance education and of conferencing. The improvements will occur in many important aspects:

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- Conference announcement and invitation - including of private sessions - integrated with booking systems.

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- Regular research seminars given from the sites of the partners - and from North America
- Use in the research community, including over the national research networks of UKERNA, DFN, UNINETT, and CA*Net II of seminars, lectures, research collaboration and home working.
- Use by at least 8 other Telematics, ESPRIT and ACTS projects and several national ones. Besides tools from MERCI and ICETEL projects, it will utilise results from ICE-CAR, current National, and EC projects.

2.2 Knowledge of sector and technologies to be used

2.2.1 The International State-of-the-art on Networked Multimedia Conferencing.

Packet networks are becoming more suitable for network multimedia. The emerging generation of Internet facilities, in which the backbone services have a lower limit of 34 Mbps, and a higher end limit soon pushing the Gbps range, is fully suitable for wide-area distribution. In the MERCI project we have shown the feasibility of connecting in limited facilities over narrow-band ISDN, supporting good quality facilities at 1.5 Mbps speeds, and distributing the multimedia cheaply over DBS satellites. In ACTS projects like ATHOC, and in commercial services like AT HOME, the potential of two-way multimedia using cable TV plant is being demonstrated. Pilot networks like TEN-34, JAMES, SuperJANET and CAIRN are starting to demonstrate that multicast is a viable technology - as evidenced by the increasing availability of resource reservation in commercial routers. These developments are still in the *proofs of concept* state; it is only from projects like this one that deployable systems will emerge.

Chips for workstations are becoming faster at affordable cost. Recent Codec chipsets and multimedia instruction extensions will ensure very economic multimedia facilities - even current generation PCs and workstations operating in the range of 200 MHz can decode all the algorithms, and encode many, at full motion quality and in real-time. New developments in IR and in smart cards ensure that these two functions will become standard on the PCs deployed later in 1998. In North America, 1-1.5 Mbps transmission speeds are already affordable over the local and wide-area - with higher speed aggregation becoming very attractive into and out of larger sites. Of course, there will continue to be pressure to reduce all costs. For this reason, we expect that many organisations will continue to want to reduce the bandwidth used for videoconferences to less than 300 Kbps for larger meetings and to less than 100 Kbps for desktops in the wide area - even at the cost of video quality. Growth in switched Ethernet hubs, UTP-5 wiring, low cost, higher speed 100baseT and cable TV technologies have made local distribution of multimedia relatively straightforward. Improvement of video projectors, working directly from workstations, has reduced greatly the cost of conference rooms. Even audio problems are being resolved by good quality headsets for workstation operation and affordable echo cancellation in conference rooms.

Single channel Basic Rate ISDN for circuit-switched networks has been available for some years; only now are workstations and PCs able to support both channels; reasonable cost equipment for 6 and 30 channel ISDN is available, but the cost of operating many channels is high. With improved codecs, less demanding applications can now be satisfied with two-channel ISDN. The protocols supported on most ISDN boards available (PCs) have not been compatible with those on the packet networks, but this is changing: more PC software now supports IP, and ISDN gateways are becoming available which support the common ISDN protocol structures. The workstation and communications suppliers realise that the H.320 protocols, adopted earlier by the carriers for multimedia working on the ISDN, are incompatible with both the Internet and with Local Area Network distribution; their recent H.323 family is much more appropriate and is well adapted to MBONE packet working. It is no coincidence that Intel and Microsoft are very active in both the IETF and ITU-T committees. There are still significant differences between the MBONE and the ITU-T protocol structures. Early gateways between the two are available from the MERCI project; further development of these gateway facilities is still required - partly because the two communities are still evolving their standards.

Video Servers are being developed frantically to meet an expected *video-on-demand* market. The WGs developing standards for video-conferencing are also addressing the video server standards - enabling the use some of video servers in broader environments. Many such servers have the requisite hardware base needed for this project - but the software facilities are less flexible than we require. We will collaborate in this project with several manufacturers wishing to enter also this market.

Many providers of workstations and network components understand the need to incorporate security features. Providing a light level of security is easy, but this may not meet serious demand. Stronger security, using Public Keys and DES, is wanted - but regulatory considerations still impede the introduction of secure products on a world scale - thus constraining the growth of such products. Nevertheless, smart cards will become standard features in some PCs next year; both organisations like Verisign and Nortel in North America, and projects like ICETEL in Europe, are showing that a full security infrastructure could be

deployed. Relevant standards are being developed in both the ITU-T and the IETF; the MERCI project has pioneered these facilities for the end-user, using the ICE-TEL infrastructure. Proof of concept is needed to establish viability on a significant scale, and to incorporate mechanisms for the protection of network components like gateways and multimedia servers.

The research community, particularly in the IETF, must standardise packet-switched environments with the multicast capability that is so much more powerful, economic and flexible than the circuit-switched approach using Multiplexed Control Units (MCUs); nevertheless, further developments in network and router technology are required to allow easy deployment of such facilities. This technology and the requisite network speeds are nearly there to allow widespread deployment; even without this project people will deploy such functionality widely over the next few years. This project will accelerate its deployment in the Telematics Sectors and will improve the features provided.

2.2.2 The Current Standards Relevant to Multimedia Conferencing

Many groups of organisations are producing standards relevant to multimedia conferencing; amongst them are the following: The International Telecommunications Union (ITU), the Internet Engineering Task Force (IETF), the PC Industry Working Group (PCWG), the International Multimedia Teleconferencing Consortium (IMTC), the Packet Video Forum (PVP), and the DAVIC consortium. The technology also uses the results of many other groups like those on security, media coding, system management, ISDN and ATM. We do not have space here for a diatribe on these standards; several of the partners are deeply involved particularly in the ITU-T and IETF standards - partly under commercial, partly SCIMTAR and partly MERCI auspices. We have been particularly active in the *Audio/Video Transport (AVTWG), Resource Reservation Set-up (RSVPWG), Integrated Services (IntSVWG), Multimedia control (MMUSICWG), Common Authentication Technology (CATWG) and the Public Key Infrastructure Exchange (PKIXWG) working groups* of the IETF, and their equivalent in the ITU-T. Indeed, MECCANO partners have chaired several of the activities and brought through many of the standards e.g. those on audio/visual transport, session announcement, audio coding with redundancy, asymmetric routing, and security. We are encouraged that there is convergence between many of the standards - so much so that a MERCI gateway between the ITU-T and Mbone world could be realised. Nevertheless, the standards are still developing in all the above fora and some still do not realise the need for compatibility. Here we refer particularly to the DAVIC consortium in interactive TV standards, whose dialogue with the other groups is only just starting. Nevertheless, progress in standardisation is being made. For example, ITU-T has just adopted (in H323) the transport level protocols of the IETF (RTP-2), and the real time streaming protocol (RTSP) is being pursued by the same people in several fora.

2.2.3 Likely Developments of Networked Multi-media Products and Services

In the ongoing struggle between suppliers, trying to constrain users to be locked into to their proprietary offering, and the more open environment envisaged in this project, the latter are clearly winning. Increasingly workstations and PCs provide the functionality needed for the current services. Moreover, the need for interworking between the cultures is growing - both because of the wide deployment of the relevant network functionality and because of users' increasing annoyance at not being able to use their favourite workstations for these conferences. This in turn will make it essential that we understand well the nature of the communications loads these applications will provide and ensure that there is adequate gateway performance (both at the interfaces between packet and circuit systems, and at the end-points of the networks). Our initial experiences, both with ISDN and ATM gateways, suggest that the measurement functionality does not yet exist; we believe that it will be deployed over the next couple of years very widely. The technology development is addressed fully in Section 3 - where the technical work-packages are described. This project will be near the leading edge of the technology; it will be linked to other activities further advance the technology - funded both under National and EC auspices.

2.3 Methodology of the Project

The components will be largely derived from the results of the previous Telematics MERCI project, though there will also be input from the Telematics ICE-TEL project and from activities financed by DFN in National projects.

The main improvements being made over the MERCI tools are the following:

- Better integration making the tools more easily used by untrained users;
- Better capability for both high and variable quality video, high quality audio, and a variety of shared workspace facilities;
- Most of the facilities will operate cross-platform on both UNIX workstations and PCs running Microsoft operating facilities;

- Better support for recording of multimedia information, off-air or from conferences, and for the introduction of media clips - including recorded conferences - into such conferences;
- Support for Internet Quality of Service and DBS network facilities;
- Fuller Inter-operation between workstations running Internet and the normal ITU-T procedures;
- Better facilities for secure conferencing - with easy distribution of keys and information;
- Better Distributed measurement, monitoring and control;
- There will be verification activities pursued inside the project, but the majority will be in other Telematics projects. There will be regular MECCANO seminars given from the sites of the partners, including from North America
- Besides tools from earlier EU projects, it will utilise results from concurrent Telematics projects: - in particular security tools from the ICE-CAR project.
- The tools and MECCANO software will be provided to other projects and there is a specific work-package to support outside users.

2.3.1 Technical development and integration work required.

Here we refer to Section 3 where this subject is treated in great depth. We need to improve the media tools and the servers, provide support for the different network technologies, develop further the different network types, update the conference announcement systems, and improve the user interfaces. In MECCANO, unlike in the MERCI project, we will be incorporating tools and technologies from many new suppliers; there will be substantial integration. Finally the specific demands of the validation exercises, both inside the project and from external users, will incur effort.

2.3.2 The operation, performance and test criteria for the demonstrator

The pilot testing will be a regular bi-weekly project meeting where the current status of the technology will be exercised. This is the procedure we have been adopting during the MERCI project and it serves as an excellent and continuous test for our accomplishments. Subsequently the technology will be introduced into both specific MECCANO application workpackages and by other projects as outlined in Section 3. The acceptability and test criteria can only be determined by the different user communities; we will endeavour to meet the needs and performance criteria they express.

2.3.3 Geographic Coverage

The MERCI technology has been demonstrated widely over the whole Internet - wherever the bandwidth is adequate; it is used both by MERCI and by various ACTS projects over the JAMES network. The MERCI bi-weekly project meetings include six countries - and typically involve a dozen different people. The quality is variable if the normal Internet is used - network overload can lead to 40% packet loss at modest international traffic levels of 70-80 Kbps; when the JAMES ATM pilots is used there can be packet loss in intermediate routers, but we obtain excellent QoS with seven country working simultaneously and have done wide-area demonstrations in eight countries. Truly pan-European coverage will depend on the progress in Task RE1 of the Telematics programme. We will not be constrained by the availability of the JAMES pilot; it is an essential part of this proposal that our technology scales down to 128 Kbps ISDN - and even provides interfacing between such facilities and the more powerful ones usual in the research community. Because of the incorporation of DBS and ISDN techniques, geographic limitations are largely removed; we will demonstrate application in at least Poland, in addition to the EU and Canada, and will incorporate mobile users by radio.

2.4 The Phases of the Project

2.4.1 The Relationship to the Different Phases

The work previous to this project spans already all phases: Analysis of user requirements (Phase 1), Definition of functional phases (Phase 2), Building of a demonstrator (Phase 3), Validation - including some verification - Phase 4a, but not really demonstration in the way used by the EU (Phase 4b). From our contacts with workstation suppliers, there is already some movement even under Phase 5. Under MECCANO we will do some work again in phases 2-4. The purpose of the project is to help development of the tools so that they are available to other applications. A major activity, after the present proposals have been awarded, will be to assess the real needs of the projects which have stated that they want to use MERCI/MECCANO tools to see what they really need. Inside this project, we will only move to Phase 4a over the two years proposed - though both the National Research Networks and some other projects will do Phase 4b, and we expect also to go to Phase 5 of exploitation! Our main Demonstrators will be other projects which capitalise on the facilities being developed in MECCANO. However, to retain a clear

assessment of the success of the technology, we have put in a number of application consolidation activities which are discussed in WP8 and activities to support the outside activities, discussed in WP9.

2.4.2 Previous work

The project has several aspects: the facilities required by the user, the technical development of the different aspects of the multimedia technology for this type of application, and the requirements of the applications themselves. The user requirements have been developed from experience in running a series of MERCI applications including a successful seminar series, trials in industry and a medical workshop. This has identified a number of new user requirements, reflected in the material included in the Work-Packages of Section 3. Examples are: the need for better user interfaces, some form of resource management, better audio and video, security, multimedia server facilities, better Quality of Service (QoS) at different levels, interconnection of ITU workstations into MBONE conferences (and vice versa), and the availability of support for more kinds of network. All of these needs have been addressed at some level in the MERCI project; nevertheless this proposal is for a very significant improvement in all of these areas. The needs for the provision of scaleable coding techniques, with a consequent ability to provide intelligent gateways and relays, more sophisticated ways of dealing with private sessions, better user interfaces, and readier access to resource reservation in key components all arise from previous work on the MERCI project. Nevertheless they will result in very significant improvements in the facilities available.

From our current regular bi-weekly meetings, seminars, and pilot use in industry; we know only too well what aspects need further improvement.

2.4.3 Conclusions from past work

The main conclusions, all of which will be addressed here, are:

- The MERCI technology is adequate for applications over the current packet networks - provided adequate bandwidth, resource reservation or at least traffic priorities, are available;
- Redundant audio, as in RAT and FreePhone, greatly improves performance in lossy networks;
- Hierarchic coding is becoming available for both audio and video. Implementations still need some development to reach the maturity of the current VIC and RAT products. Particularly when combined with intelligent filtering in gateways, they provide an excellent mechanism for heterogeneous communications - e.g. for linking in workstations via DBRI ISDN or mobile radio; significant piloting is needed both for the hierarchical coding and for the filtering gateways;
- Current shared workspace facilities are invaluable - but require a reliable multicast infrastructure. Shared workspace tools with different facilities are still needed in specific applications. Several candidates for further development are available from MERCI, DFN and commercial products.
- The current MERCI products are usable by trained people - but much needs to be done to improve their user interfaces and their usability;
- The Conference Announcement and Invitation tools have made possible the widespread take-up of the technology. Private announcements and relayed personal invitations require further development - partly because the relevant IETF standards are still being refined. It is essential that this series of procedures, and their implementations, become integrated with conference booking systems;
- The international component of current European research networks often have marginal quality for this application; their replacement by clean Internet Channels (as in the UCL CAIRN link to the US), or ATM facilities (as in our use of SuperJANET and JAMES) give excellent results;
- Some implementations of resource management are now available as RSVP or traffic priority; others are coming in under IPv6; large scale piloting is required to ensure that they can be deployed ruggedly, and can take proper advantage of emerging, high speed research networks in their ATM or other forms;
- Direct Broadcasting Satellites provide an important adjunct to terrestrial mechanisms for large-scale educational delivery. The MBONE protocols can be extended to integrate this technology - still allowing interactive feedback. Further piloting is needed to validate manageability and deployability.
- Considerable management and monitoring work is needed - particularly under difficult conditions on Internet Routers and current ATM switches; this will provide an understanding of performance limitations, improve conferencing and help optimise the resource reservation;
- Confidentiality and authentication are required; ongoing activity under MERCI will provide a good basis for securing the conferencing application, but more work is required with deployable public key infrastructures and smart cards and with securing network components like gateways;

- Multimedia servers require further development. Some products now provide adequate video-on-demand even compatible with current MBONE standards. The major WWW suppliers and Software companies are collaborating in the IETF MMUSIC Working Group in advancing RTSP; this still needs to be related to the DAVIC initiative. Much work is still needed in the browsing and indexing of the server data. Many products are being integrated with WWW facilities.
- MBONE multicast facilities are much more flexible that the ITU-T H.320 MCU ones; the newer activities with H323 look very hopeful, and the early interworking gateways have demonstrated proof of concept. Much more work on gatewaying between the two worlds is essential;
- Many new products are emerging based on the H.323 recommendations; this is further strengthening the need for interworking with the Internet family;
- Compatibility with the equipment manufacturer Standards is vital. Nevertheless validation for these standards is needed from projects like MERCI and MECCANO - particularly in real demonstrators over the research networks.
- Problems remain with conference room technology; multiway transmissions and variable delays of the media streams present particular problems. Standards in wide-area conference room control facilities will impact standards for the whole of the conference room equipment.

2.4.4 Relevant References

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2.5 Dependencies

2.5.1 Links and complementarity to other relevant European or National activities

This project is linked closely with a number of European and national activities. The following is a partial list of the projects closely related to the MECCANO project: (here a*as* denotes “and any successor”, since many of these projects are putting in extension proposals to this Call)

Collaborating EU Telematics Projects:
CoopWWW, MANICORAL, TEN-34, JAMES - all as

Participating Projects:

EU
Telematics Projects : MERCI, CoopWWW (aas), ICE-CAR,

ACTS Projects: VITAL, PROSPECT, ATHOC,

ESPRIT Project: HPCN ATV-DSD, MATES

National
UK: At UCL sponsored by: British Telecom, DTI, EPSRC, Hewlett Packard, JISC, SUN, UKERNA,
France: At INRIA sponsored by Dassault, EUTELSAT, NEC
Germany: Several sponsored by DFN at Us of Dresden, Erlangen-Nuernburg, Freiburg, Mannheim, RUS
Several others at RUS sponsored by: State of Bavaria,

Norway: LAVA, UNINETT
Poland: At ACC: Polish Research Council

Most partners are funded to provide national support for the technologies already developed under the MERCI programme and to extend particular areas of the technology. There are close links with the national Research Network provider; CA*Net II (Canada), DFN (Germany), UNINETT (Norway) and UKERNA (UK) have committed to large scale demonstrator trials based on the MERCI/MECCANO technology, and the project will be closely linked to the national activities over high-speed national networks. EUTELSAT's interest is evidenced by their sponsoring of the MECCANO project and the material assistance they are providing. However this project is essential if such a technology is to be applied in these domains, because the MERCI tools still have clear defects and need extensions. Users on many more national networks have been using the MERCI technology over the last year, even if their formal sponsorship has not been requested for MECCANO. At least ten project applications for funding propose to use the MERCI technology, or preferably that produced under this project.

A good international data infrastructure is essential for high quality conferencing. For this reason, we rely on being able to get good distribution of IP through National research networks, with good international connectivity through TEN34 and preferably JAMES. For the DBS access we rely on our sponsoring partner EUTELSAT, but they have guaranteed the access to their satellites during the period of the project.

2.5.2 Scope for Collaboration.

With ICE-CAR, we expect particularly close collaboration. The media tools, announcements and gateways developed in MECCANO, will be provided in a secured mode. However, the key exchange system, and the Public Key infrastructure, deployed in ICE-CAR will be used for MECCANO. In addition, we expect to benefit from the ICE-CAR studies on working with and through firewalls, to impact the sort of security architecture we provide in MECCANO; in practice the security work in WP3 will probably be in collaboration with the ICE-CAR project.

The ESPRIT MATES project has some relevant Server tools; we expect to have a mutual exchange with them. The ACTS PROSPECT project is using the MERCI tools; we expect to update them with the MECCANO tools, and to benefit from their network management and ATM activities. Finally, we expect to collaborate closely with the ACTS NICE, ACTS JAMES and Telematics TEN34 project on network measurements, We do not yet know what Telematics projects will be funded for 1998/99; we expect to provide them with the MECCANO tools, but to adopt any relevant tools from such projects.

2.5.3 Dissemination of Results

We have a proven track record of broad dissemination in this area. We are deliberately making the software widely available - and this is very popular with the suppliers. Clearly the commercial partners have a considerable advantage; they will get the software at a much earlier stage, and will have more influence on what is produced. It is not expected that all the software from the commercial suppliers will be disseminated as freely as from the research ones - hence the advantage also of having so many research partners in this activity.

A primary means of dissemination will be via the MECCANO web sites. The main project web site will link to those of the partners to provide a distributed source of project and product information across Europe, both in English and the languages of the partners.

We disseminate information widely at conferences and exhibitions. During the MERCI projects we have shown our capabilities at dozens of such events - creating a huge current of interest and awareness in broad segments of the communities. Moreover, more than a dozen high quality publications, and several theses, have come from the MERCI activities. We have established some half dozen MERCI National Support Centres to disseminate and support the information in different countries. We have some national funding already for this area for this dissemination - but the national bodies hope that the technology will be developed further.

2.6 Exploitation Plan

2.6.1 The Partners

Exploitation by the partners will vary, of course, depending on the nature of the partner..

As a very new SME, **New Learning AS** is already using results from the MERCI project in current products, and expects to learn from many parts of the MECCANO project in a way which will enable them to produce better and more appropriate products. The uniqueness of this multimedia conferencing over wide area European networks will provide valuable experience, and should develop software which will be a

basis for products; we expect to be able to test internally developed software with software developed by other partners of the project, and derive real products.

TELES has a straightforward path to commercial application of MECCANO technology into its prudcuts. It is interested in products using conventional PSTN/ISDN equipment (e.g. H.3xx PCs and videophones) to access Mbone/Internet-based services - bypassing ISP bottlenecks. The results of MECCANO (gateways, tools, and operational experience) are going to provide an important part of the foundations for products in the above area - in terms of services as well as equipment.

HP is interested in the use of the tools and the associated project outputs across its own enterprise network for personnel support facilities. It is also a major contributor via its philanthropy programme to promote educational facilities at all levels of education; it anticipates that initial exploitation will be most effective in that area. The current project is based on the use of an open environment to achieve wide-scale interoperability. Such a programme is based on the use of tools, many of which have been made available in the public domain. Full commercial exploitation of the outputs from this project will involve the need to resolve the IPR issues arising from this aspect.

INRIA derives an appreciable proportion of its income from industrial contracts and from license fees. It will support Dassault Electronique in using the MECCANO tools as a basis for building other training and collaboration tools, and SGS-Thomson in their use of MECCANO shared postscript/pdf viewer as a remote collaboration tool between sites in Crolles (near Grenoble), Italy, and India. That viewer will include reliable multicast transmission, with specific functions like rotate and zoom, etc. - coupled with the MERCI audio tool (FreePhone) and text tool (NTE). INRIA will work closely with the **EUTELSAT** partner on the DBS activity, who clearly intend to use the MECCANO scenarios in service offerings. We expect that other MECCANO tools will lead to direct commercial licences.

CRC's role is slightly different. Its exploitation role is more to promulgate the use of the underlying communications technologies, and encourage wide dissemination to any Canadian industrial partners desiring to provide products; it has no immediate plans to pursue products from MECCANO - merely to encourage the widespread take-up of this important technology in the government and industry.

ACC's primary role is to provide advice and services to academia and industry in the Krakow area. Thus its main exploitation route will be to introduce the MECCANO technology into the area, and to encourage its wider take-up both inside Poland and between Poles and other countries. It may decide to commercialise specific tools in conjunction with local industry, but this has not been decided.

All the research partners plan to exploit the MECCANO technology for distance learning, seminars and personal collaboration. An important exploitation route for all of them is the direct production of research papers, and the basis the results give for future projects. In this case, the close involvement in MECCANO of the national research networks in Germany, Norway and the UK will ensure that the output is immediately exploited throughout the national academic and research communities; in view of the close European ties of these countries, this means also throughout European academia.

Each of the partners have additional routes to exploit the results into products. **BU** is working directly with TELES, who would provide the exploitation route. **RUS** is introducing the technology in industrial ACTS and ESPRIT projects, and is working closely with companies such as Aerospatiale, Le and Mureaux to introduce the technology into their sectors. **Oslo U** started NL as a spin-off; that will provide its product exploitation route. **UCL** works closely with many companies, including HP. It has started spin-offs in the past, and has also licensed its technology to many companies. It expects its primary exploitation path will be via consulting; some may also be by direct licensing.

2.6.2 The Users

This project will have strong impact on the users. First, many users have access to different networks as part of their research or commercial activity; they will be able to use their normal networks for these advanced services. Their organisations normally have a specific procurement policy - be it PCs or UNIX workstations; that the same platform can be used for multimedia conferencing has strong impact on the support requirements and investment decisions needed inside the organisation - and hence on the ease with which the technology can be introduced. At present the ITU-T and Mbone users who do conferencing cannot interwork; the advanced facilities, multi-platform and multi-network environment proposed here will improve the Mbone environment, and remove much of the interworking barrier.

There are already many specific conferencing products; most are much more limited in their approach to security, incorporation of servers and control functionality. Without the security aspect, there are many application areas which cannot be addressed. The present approach, which is compatible with that in the Internet research community, supports much more flexible and comprehensive services; moreover the secured products could not be imported into Europe under the present US export laws.

2.6.3 The Suppliers

Suppliers are interested in this activity because of its potential impact in many of their products. From workstation manufacturers, we have had considerable support - because of their interest in seeing the technology developed further. The commercial MECCANO partners have made their interest clear above. Many more commercial companies have expressed their interest by working with one of the research or university MECCANO partners. During the MERCI period, this interest has led to contracts, consultancies, donations, sponsoring partnerships in MERCI and licensing. For example HP has moved from a sponsoring partner (with substantial donations to the MECI partners) to full partner in MECCANO, EUTELSAT has moved from interested outsider to sponsoring partner, GPT proposed a full ESPRIT project to develop the MERCI technology further.

There is no doubt that the technology is fast moving from prototype to product. MECCANO will not only embrace one product; several projects are proposing to take pieces of the technology developed here and emphasise specific areas. One plans to develop the mobile access, several to exploit the teaching/training environment, yet others specific workstation products. Several are eyeing our network experience closely; intending to incorporate our control strategies into their products.

2.6.4 Business Plan

In view of the basic nature of the many technologies incorporated in this project, and the variety of partners, it is inappropriate to formulate a central business plan. This will be pursued by the partners in accordance with their natural commercial alliances. We will not form a single MECCANO company as a result of this work; but do expect to spawn a number of products in associated companies.

2.7 European Added Value

The value of doing the Project on a European Basis Some aspects of the MECCANO work are easier to achieve nationally; e.g. during the MERCI project, we have had significantly better national network connectivity than international. Both technical and political considerations have made connectivity to some countries difficult in the past - but MECCANO is addressing this problem. Moreover, it is very clear from the other European projects in which the partners are involved, that the international benefits are huge:

- Many applications are pan-European; the benefits are related to the numbers and dispersal of users;
- The availability of the requisite skills are not found easily in one country;
- The multinational nature ensures that national constraints do not limit the technological development;
- The project brings in tools which have been developed under different national and EC initiatives.

The Potential Impact on European Economic and Social Policies The availability, and wide deployment, of this technology will have an integrating effect that cannot yet be fully appreciated. This will be in full support of the information society in Europe and of the European Union policies. Moreover, the way that the multimedia technology plans to embrace most of the underlying network technologies will have several important consequences:

- It is applicable to application sites without the latest, most expensive, communications infrastructures;
- it will, however, be able to utilities the latest infrastructure as it becomes available (cf. MERCI);
- It will act as a searching probe to discover weaknesses in the European communications infrastructure - even though it will continue to be able to operate at reduced performance.

The Contribution to the European Information Society It is difficult to envisage a project which has a greater impact on the Information society, than one which aims to provide:

- Audio, visual and shared application collaboration with users irrespective of location or application;
- Capability of working with most current communications technologies and end-user platforms;
- Addresses applications areas which are well-nigh universal in their impact.

2.8 Economic and Social Impact

To the extent that the project is generic, we can discuss only the impact on telematic applications in general. Here we can talk only in generalities - as have been addressed already in the call for proposal. In the particular education, training and health-care areas, the impact can be immense. In tertiary education, Oslo U, KTH and UCL are already discussing putting on full joint courses - something which we are considering applying much more widely. Hewlett Packard and other similar organisations already have a European wide training mission; they are looking to this project to help provide an insight on whether it is now possible to organise the training on a genuinely pan-European basis.

In the medical education field, University College London already has integrated course across the three medical sites that have been part of their catchment area - hence the ease with which they have entered a

larger British project, funded nationally, to provide surgical education embracing 6 universities and using SuperJANET. This in turn has meant that the infrastructure was in place to introduce operations from Sweden and the US into a workshop at short notice. These operations were watched in their turn (and questions were asked) by doctors at that workshop, at other hospitals seminar rooms, and on individual workstations. The impact this will have for medical consultation will be immense, when the technology is developed to incorporate higher quality video and audio, and to introduce the better instrument data used by the medical practitioners. Because we are also embracing lower levels of technology, namely ISDN, we will be able also to influence also secondary health care - allowing medical consultation between the doctor's office and the hospital.

The Economic Justification The actual cost of the project to EU Telematics Programme would be 1.1 MECU. The direct contribution by national and industrial organisations to just the technological portions is probably an order of magnitude greater. For example, DFN alone has invested 520 KECU in the current projects of EU, FU and MU; on marginal costing; these universities are receiving only 99 KECU from the EU, and are supplying the total infrastructure and teaching effort required to do Distance Learning. EUTELSAT and the national sponsors of INRIA have invested at least 1 MECU in the INRIA developments of their tools and satellite facilities; the EU contribution requested by INRIA is only 200 KECU (at 50% funding), and this does not include the investment made by the various industrial companies in putting in facilities and running validation activities inside their own facilities. Finally the economic value of a successful outcome of the MECCANO project would be immense. It would provide the basis of many software products and communications services, and have demonstrated their viability in many environments. Moreover, the entry costs for the users are not high. A normal high-performance workstation costing between 3 KECU and 10 KECU will give access facilities - without the need for expensive networks though higher performance workstations, servers and networks will improve the facilities that can be offered. The economic justification seems over-powering.

3. DETAILED DESCRIPTION OF THE PROJECT

3.1 List of Work-Packages

WP1 Management (C1)

This work-package deals with all aspects of the management of the project. It is entirely the responsibility of the Co-ordinating Partner. Both the Project Director and the Project Manager will be heavily involved.

WP2 Activity with External Groups (C1)

This work-package is concerned with all aspects of relationships with other groups. This includes concertation activities like the SCIMITAR project and anything else set up by the Commission. It also includes the other group with whom we expect to have a particularly close relationship: ICE-CAR (Telematics) and PROSPECT (ACRS); we expect to add other groups to this list after the next set of Telematics projects have started. It will be necessary to ensure common interface specifications between the projects, co-ordinate deliveries of software between the projects, feed back one assessment of the quality of the deliverables, and ensure that the feedback is properly progressed inside the projects. Other activities will be the interface between the project and other communities such as the relevant Standardisation bodies like the Internet Engineering Task Force (IETF), the ITU standardisation bodies etc. Yet a third sector will be the various user groups in other programmes with similar needs.

WP3 Systems Architecture and Demonstrators (C4)

The objective in this workpackage is to review the total structure of the protocol systems in the light both of the networked multimedia field and the applications. The total systems architecture being used for the multimedia applications will be reviewed and compared to the Standards being developed by the bodies mentioned in Section 1.3 and those being mooted by other relevant activities, such as the DARPA CAIRN project, and other European Community projects. If any gaps are identified, attempts will be made to have the gaps addressed in the relevant IETF Working Groups and by this project. The following topics will be addressed in this activity: security architecture; priority scheduling, resource reservation, high quality Mbones; role of the World Wide Web; role and location of gateways, transcoders and relays; requirements of the Demonstrator, and their impact on developments.

WP 4 MM Conference Components (C5)

This work-package is concerned with the development of the fundamental multimedia components: video, audio and shared workspace. Most developments will be improvements from the MERCI components, but some will come from new partners who were not in that project. The work-package will ensure that the tools work on different hardware and software platforms, and are applicable both to workstations and conference rooms. The requirements of usability, security and performance will all be addressed in this WP.

WP5 Network Support (C7)

Only too often the tools are integrated, unnecessarily, into the network support envisaged by the supplier. In the MECCANO project we support a variety of interconnected networks: LANs, Packet-Switched Networks, SMDS, ISDN, DBS, ATM and possibly even mobile. This work-package is concerned with ensuring that the tools work over the different networks; it also provides performance monitoring to aid configuration management and control.

WP6 Gateways (C8)

This work-package will consist of three activities: gateways between the ITU-T and MBONE worlds, transcoding relays, intelligent multiplexing and filtering relays. It also includes management tools to aid gateway configuration, control and security.

WP7 Conference Announcement, Management and Control (C1)

The set-up, management and control of conferences is essential to allow widespread usage. This work-package is concerned with providing the components to allow distributed control: integration of booking systems, the set-up of the conference and of intermediate relays, the control of active conferences and fault diagnosis.

WP8 Consolidation of Applications (C6)

Multimedia conferences, distance education and seminars are excellent consumers of the MECCANO technology - and cover a wide range of fields. For this reason, we have organised this consolidation work-package to apply the tools in several sets of distributed seminars. Other existing applications will be examined also as potential consumers of the tools. The components developed in the technology work-packages (WP3 - WP7), will be tried out in this work-package, and the feedback will be used to improve the tools further.

WP9 Support for Validation Sites (C1)

We expect to provide our tools to a number of validation activities both in WP8 and in outside projects. Such provision provides excellent feedback, which is invaluable for improving the tools in WP3 - WP7. However to encourage the use of the tools always requires significant effort from inside the project; this effort is provided under WP9.

3.2 Timing of the Work

The logic of this timing is to allow the release of software tools at intervals related to the cycle of the project review process - in time for the Annual reviews in each of the two years. We will release an initial software package at the end of month 3 and subsequent packages at the end of months 10 and 22. Workpackages involved in the production of the software releases are all timed to complete at month 24; the two months after the second release at month 22 will be used for final modifications and bug-fixes which arise after the release.

3.3 Structure of the work

The following table illustrates the dependencies of the work defined in the Workpackages and relates this to the timing of the deliverables. Workpackages in the project generate few interdependencies, since they are largely self-contained. The main exception to this is the incorporation of the results of Workpackage 3 into the ongoing work of WP 4 and WP6, WP7 and WP8. To formalise this process, we have defined an internal deliverable R3.2. The work of WP5 and WP8 will proceed with the latest versions of the software, even though these may still be under development. In WP9 we will provide support for the latest software release available, D4.1, D4.2 or D4.3. For brevity we have combined R3.1 and R3.2 as R3.1/2 on the table.

Interdependency of Tasks and timing of Deliverables

WP	ACT	Task	Initial Release M3	Major Release I M10	M12	Major Release II M22	M24
3	3.1	Security Architecture	----------	----------	------>**R3.1**	----------	------>**R3.3**
	3.2	Priority Scheduling requirements	----------	----------	------>**R3.1**	----------	------>**R3.3**
	3.3	Role of the World Wide Web	----------	----------	------>**R3.1**	----------	------>**R3.3**
	3.4	Role and location of Gateways, transcoders and relays	----------	----------	------>**R3.1**	----------	------>**R3.3**
	3.5	Requirements for Interworking	----------	----------	------>**R3.1**	----------	------>**R3.3**
	3.6	Requirements of Demonstrators	----------	----------	----->**R3.1/2**	----------	------>**R3.3**
	3.7	Tool Acceptability	----------	----------	----->**R3.1/2**	----------	------>**R3.3**
4	4.1	High quality audio delivery	-------->**D4.1**	-------->**D4.2**	----------	R3.1/.2-->**D4.3**	----------
	4.2	Optimal quality video coding	-------->**D4.1**	-------->**D4.2**	----------	R3.1/.2-->**D4.3**	----------
	4.3	Generic shared workspace support	-------->**D4.1**	-------->**D4.2**	----------	R3.1/.2-->**D4.3**	----------
	4.4	Media servers	----------	-------->**D4.2**	----------	R3.1/.2-->**D4.3**	----------
	4.5	Usability	----------	-------->**D4.2**	----------	R3.1/.2-->**D4.3**	----------
	4.6	Confidentiality	-------->**D4.1**	-------->**D4.2**	----------	R3.1----->**D4.3**	----------
	4.7	Platform & Conference Room Support	-------->**D4.1**	-------->**D4.2**	----------	R3.1/.2-->**D4.3**	----------
5	5.1	Support for network technologies	----------	D4.1---------	D4.2---------	---------->**R5.1**	----------
	5.2	Network & Applications monitoring	----------	D4.1---------	D4.2---------	---------->**R5.2**	----------
6	6.1	ITU-T to Mbone gateways	-------->**D6.1**	-------->**D6.2**	----------	R3.1/2--->**D6.3**	----------
	6.2	Transcoding relays	-------->**D6.1**	-------->**D6.2**	----------	R3.1/2--->**D6.3**	----------
	6.3	Intelligent filtering & multiplexing	----------	-------->**D6.2**	----------	R3.1/2--->**D6.3**	----------
7	7.1	Conference set-up	----------	-------->**D7.1**	----------	R3.1/2--->**D7.2**	----------
	7.2	Control of active conferences	----------	-------->**D7.1**	----------	R3.1/2--->**D7.2**	----------
	7.3	Conference relay set-up & control	----------	-------->**D7.1**	----------	R3.1/2--->**D7.2**	----------
8		Consolidation of Applications	----------	----------	------>**R8.1**	----------	------>**R8.2**
9		Support for Validation sites	----------	----------	------>**R9.1**	----------	------>**R9.2**

D deliverable demonstration, R deliverable report, I internal deliverable
Those deliverables to which the Work Package is a contributor are show in **bold** type.

3.4 Description of Work-Packages

The work packages are described briefly on the forms on the following pages. A fuller account, giving the rationale for each Activity, was given in the original proposal. It is impossible to provide the same level of detail in the Programme Plan within the constraints of one page per Work-package.

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	1 of 9

WP ID **1**	Work Package TITLE: **Management**						
WP LEAD	C1	START	1	END	24	DUR	24
TOTAL Person/Month	30			TOTAL KECU		164	

Objectives: This work-package will provide an appropriate management structure and activity to ensure that the Consortium members, the Project Management, the Commission, and External Bodies interacting with the project have the relevant information on the financial and technical progress to plan and develop their relations with the project.

Work Description: The detailed management structure and way of working are discussed in Section 4. The activity under this workpackage is principally to ensure that each party is aware of those aspects of the technical and financial progress of the project so that they can take the actions needed for their part of the interaction. The parties who must be considered are the following: the Partners of the Consortium, the Project Management, the Commission, User Groups inside the project and any external parties relying on the results of the project for their work. In order for this to be accomplished, all the parties concerned must communicate adequately with each other, and take action if there are slippage or defects by themselves or another party.

To achieve this, the following must be done:

- The Project Management and Technical Committees must clearly state what each member is supposed to be accomplishing - and must be informed on how the work is progressing; in sufficient detail that remedial action can be organised.
- The Project Members must inform the Project Management and each other of their technical progress, the financial consumption of resource in a timely manner - with due regard to the needs for internal control and external reporting.
- If progress shortcomings are identified, Project Partners must be prepared to take action to remedy them.
- The Project Manager must arrange for IPR and Collaboration agreements between the partners and appropriate attendance at Concertation Meetings. He must arrange for the timely provision of progress reports, Deliverables and financial claims to the Commission and the timely distribution of funds received from the Commission to the partners.
- The Project Manager must organise regular Project Management meetings with agendas and minutes. These will be both bi-weekly by videoconference, and quarterly in person.
- The Project Manager must be aware of who is responsible for Deliverables, and how they are progressing. If there are problems in their preparation, he must first inform the Project Management and Technical Committees; if problems are likely to persist, then they must be reported in the Progress Reports to the Commission.
- The Project Manager must liaise with external groups on the products being provided to, or being received from, other projects. This will involve organising Collaboration Agreements, and informing projects which depend on results of the MERCI project of the progress, and any shortfalls in functionality or delivery;

The Project Manager must ensure that there is an adequate external awareness of the project by distributing information on meetings and relevant calls in journals, organising presentations at conferences, keeping collections of publicity material and project publications, and organising the material on the project WWW site.

Deliverables:

R1 Progress management reports, financial management reports, Annual Review Reports (ARR), Final Report, IPR agreements, collaboration agreements, deliverables, payments to partners as per the contract

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	2 of 9

WP ID **2**	Work Package TITLE: **Activity with External Groups**						
WP LEAD	C1	START	1	END	24	DUR	24
TOTAL Person/Month	15			TOTAL KECU		115	

Objectives: The Objective of this work-package is to ensure that all activities concerned with external groups are adequately staffed, carried out and funded.

Work Description: There are a number of separate external interactions of the Project with the outside world. Under this work-package we include the following: *concertation activities, interaction with user groups, annual reviews, dissemination activities, production of information activities, and collaboration with other projects*; each will be considered below.

We will participate in *concertation meetings*, at which the project partners will be represented. We will have very strong ties with the ICE-CAR and PROSPECT project, and will extend these to others when the next batch of Telematics projects start. These will include joint meetings with these projects - probably organised around the concertation meetings. The Project Manager of SCIMITAR will be invited also to attend these joint project meetings. We will have a joint in-depth study of what each project has to offer to the others, and will provide documents detailing what products each expects to provide to the others. In the joint meetings we will review progress in these promised products - flagging potential delay or shortfall in specifications. After delivery of the products to other projects, we will expect feedback from them and we will provide feedback to other projects. Of course we will provide the relevant material, and participate in, the annual reviews - whether they are organised directly by the Commission or via the SCIMITAR project.

The support by the project partners of the User Groups will be an integral part of WP9. We expect considerable interaction with both our Sponsoring Partners and other User Groups who also will wish access to the MECCANO products. We will organise publicity material, documentation, and limited information and training meetings with such groups. While the initial responsibility for documentation is with the component provider, the production of appropriate external technical documentation will be carried out under this work-package.

The MERCI project was particularly strong in presenting its activities at public demonstrations, conferences and in journal articles. We expect to carry on this tradition into the MECCANO project; of course we will strive to present our results at the relevant meetings organised by the Telematics Programme or the SCIMITAR project; we expect also to participate in important other events such as the Joint European Network Conferences, the Internet Society Conferences, and the Telematics Application Conferences and Exhibitions. Finally, while presentations at conferences provide substantial short-term exposure, it does not replace publication in the learned journals; we expect to provide material for conferences to such a standard that the organisers will wish it to be reproduced in the journals which often publish the best conference papers, and will also submit papers independently to the relevant journal editors.

It is relatively straightforward to develop products and services to meet specific narrow needs; it is much more complex to develop them in a way that inter-operates with products developed in other projects or by other vendors. We will ensure that our activities align with ITU-T and IETF Standards where feasible. We expect, through this work-package, to retain our participation with the relevant co-ordination and standardisation groups.

Deliverables:

R2 Publications, publicity material as requested by the Commission or required for conferences, annual reviews, documentation for user groups, IETF and ITU-T submissions, and for other projects.

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	3 of 9

WP ID **3**	Work Package TITLE: **Systems Architecture and Demonstrators**						
WP LEAD	C4	START	1	END	24	DUR	24
TOTAL Person/Month	16			TOTAL KECU		131	

Objectives: The objective in this workpackage is to review the total structure of the protocol systems and tools implemented in the light both of the networked multimedia field and the applications. It should ensure that all the necessary protocol components and implementations needed by the Validation sites or Demonstrators are either in place, or are being advanced.

Work Description: At the beginning of the project, and periodically, the total systems architecture being used for the multimedia applications will be reviewed - in relation to the Standards being developed by the different bodies, and those being mooted by other relevant activities such as the DARPA CAIRN and other European Community projects. If any gaps are identified, attempts will be made to have the gaps addressed in the relevant IETF Working Groups and in this project. The areas below require such an architectural treatment.

A3.1 The security architecture: Here we define where security facilities may be required, and what features are needed. Besides the actual tools, this includes gateways and routers, multimedia servers, session announcements and invitation, session participation, and firewall proxies and working through firewalls. This study will be co-ordinated with the relevant IETF conferencing WGs and security experts - both in the IETF and other EC projects like ICE-CAR.

A3.2 Priority scheduling, resource reservation, high quality Mbones. This activity is fundamental to attempts at high QoS. We must investigate what is required from the end-user perspective, how it should be provided, and how it interacts with a wider Mbone without such mechanisms. In general this is concerned with configuration of "time to live", administrative scope and input packet filtering at routers; however the thinking will involve theoretical and practical collaboration with the US CAIRN project.

A3.3 The role of the World Wide Web The WWW and JAVA are starting to be used in the MERCI programme, providing a uniform form of User Interface - with platform portability. We expect that their use should expand in the MECCANO activities - and that their integrating role should be explored. Examples are the following: the WWW for announcement caching, interactive WWW as the basis for some of the shared whiteboard tools, WWW for distributing encryption keys, WWW interfaces to multimedia servers.

A3.4 The role and location of gateways, transcoders and relays. While relay and gateway technology has been developed well; the rationale of how they should be configured, controlled and located, and how they interact with scaleable media tools has not yet been thought through.

A3.5 Interworking. For some environments, the MECCANO capability is needed for a range of user applications, user tools and platforms. The impact of this requirement when it includes both UNIX and Microsoft options will be explored.

A3.6 The requirements of the Demonstrators, and their impact on developments It has been found in the MERCI project that it is necessary to understand the overall needs of the User applications and the demonstrators. This can be used to establish what particular applications need from the multimedia services and infrastructure support. This, in turn, defines the multi-media requirements for different user applications, and will both steer the work in the development activities, and help plan the infrastructure to be provided.

A3.7 Tool Acceptability The adequacy of User Interfaces of the different tools and components, and their integration

Deliverables:

R3.1 The Architecture of the MECCANO tools and other components

R3.2 Preliminary report on the usability of the MECCANO tools and other components

R3.3 Final report on the usability of the MECCANO tools and other components

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	4 of 9

WP ID **4**	Work Package TITLE: **MM Conference Components**						
WP LEAD	C5	START	1	END	24	DUR	24
TOTAL Person/Month	74			TOTAL KECU		421	

Objectives: This workpackage will advance existing multimedia components to meet the conferencing and educational delivery needs expressed by the users. We see these needs as principally the ability to provide optimal video, optimal audio, stream synchronisation, a good shared workspace environment, multimedia servers and an integrated user interface. It is the objective of this workpackage to provide these components.

Work Description: Here we will not passively follow the published standards, but will actively influence the standards to be compatible with the MECCANO directions. We will provide diagnostic, configuration and performance feedback to allow set-up and control of each tool. Most tools will be made available over PCs under Microsoft operating systems and workstations under UNIX.

A4.1 High quality audio delivery We will add echo cancellation (required for a true "hands free" utilisation of the tools), layered coding, and examine the error and congestion control mechanisms suitable for heterogeneous networks. Some work in layered codecs from other projects will be incorporated able to accommodate FEC-based error control

A4.2 Optimal quality video coding We add redundancy to the conventional coding algorithms, in an analogous way to the improvements we have already made in audio distribution, improve the hierarchical coding variants in the light of experience, and add some of the newer conventional coding algorithms like H.263. Here we will incorporate work from outside MECCANO by different partners. The mechanisms provided here will interact with the gateway control of WP6 to provide high quality video

A4.3 Generic shared workspace support environment We will assess not only the shared whiteboards used in MERCI (e.g. UCB's WB, TeleDraw and UCL's NTE), but also Microsoft NetMeeting, AOF-wb tools from Freiburg U, the WET suite from CRC, and mDesk from Lulea U. We aim not to develop new systems, but to integrate existing systems into a common user framework - preferably allowing customisation of the tools as in the Validation exercises. Some of the tools will be WWW-based, often written in JAVA for portability.

A4.4 Media Servers We will incorporate existing media servers from MERCI and from other MECCANO partners and evaluate others from both commercial sources (like PRECEPT) and research ones (like Lulea U). We will respond to the rapid changes in standards both at the IETF and WWW Consortium, including the Real Time Stream Protocol (RTSP) being standardised in the IETF with strong industrial backing.

A4.5 Usability We note the needs expressed by the MERCI User Groups for making the tools more user-friendly, with User Interfaces integrated for non-specialist users - presenting a uniform view onto the tools.

A4.6 Confidentiality We will develop further the ability, already attained in MERCI, to announce and hold private conferences, with reasonable confidence that only authorised participants can obtain or introduce the media streams. Key distribution must continue to follow the emerging standards of the ITU and IETF.

A4.7 Platform and Conference Room Support We will ensure that the tools operate on a variety of platforms - including both variants of UNIX workstations and Windows PCs. We envisage supporting at least Sun Solaris, HP-UX, Windows'95 and Windows NT. We will also test relevant cards like frame grabbers, smart cards and network cards.

Deliverables:

D4.1 Initial Release of tools to be used in MECCANO

D4.2 First major release of MECCANO tools

D4.3 Second major release of MECCANO tools

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	5 of 9

WP ID **5**	Work Package TITLE: **Network Support**						
WP LEAD	C7	START	1	END	24	DUR	24
TOTAL Person/Month	50			TOTAL KECU		396	

Objectives: To ensure that the tools operate over a wide range of interconnected, heterogeneous technologies: LAN, B-ISDN, SMDS, packet-switched medium speed networks, ATM (including the JAMES pilot), Direct Broadcast Satellite (DBS), ISDN and mobile - with adequate QoS. In this context, it will also provide tools to measure the QoS, and to manage interconnection resources to achieve adequate performance.

Work Description: It is important that the different components work over a variety of network technologies and that QoS can be monitored and maintained over concatenated networks. In MECCANO, IP will be used as an intermediate layer; many of the technologies provide specific considerations. A key problem with multimedia applications is their dependence on the QoS, provided by the underlying infrastructure. We may need to pilot the protocols that ensure that the relevant resource management and routing can be achieved.

A5.1 Support for Network Technologies For this we must acquire Drivers for different network technologies, including: packet-switched IP, ISDN, DBS and mobile - both in PCs and workstations under UNIX and with Microsoft Windows/NT support. For each combination of network technology we see a need to: pilot and verify the topology, set up the technology infrastructure, understand how to provide multicast and adequate QoS support.

During the lifetime of MECCANO, the new IPv6 will allow new Internet services (provided by QoS allocation schemes in routers). Since this subject was removed from the next Telematics Call, we must provide a "reasonable" QoS; we will investigate providing this with IPv6, RSVP and CBQ protocols which promise a large payback in the dynamic reservation of network resources. A number of advances are needed to construct managed, high-performance, virtual Mbones able to communicate with average performance public Mbones. We will continue the current RSVP MERCI pilots on a much larger scale than hitherto with the assurance of the active collaboration of the JAMES consortium, the TEN-34 project and of a number of national research networks - several of whom are specifically supporting MECCANO. Here our JAMES link to Canada and the UCL CAIRN link to the US ensure that the scope is truly international. Provision of mobile network support is part of several National projects; the technology from these projects will be introduced to MECCANO. The DBS activity requires both active collaboration with EUTELSAT, a sponsoring partner, and work on the relevant protocols.

A5.2 Network and Applications Monitoring To achieve high quality multimedia performance, in multicast environments, we will make detailed measurements within applications, gateways, routers, and network switches. Correlation between network behaviour and user acceptance will help achieve required QoS.

A detailed measurement and monitoring programme, begun in the MERCI project, in collaboration with both the TEN-34 and JAMES projects, will be continued over the heterogeneous MECCANO systems. We will integrate this activity both with work by the national networks, and with the international activity under the CCIRN working groups. The importance of this work has been recognised by the establishment of relevant IETF working groups, in which we will participate under MECCANO. This work will be co-ordinated also with the work in NICE-Global, GIBN, MAY and CA*Net II - in each of which at least one MECCANO partner participates. Via WP4 and W6, we will incorporate measurement and monitoring facilities into the components, gateways and relays.

The insights gained with the measurements will help determine the correct parameters needed for the design of the following: efficient hierarchical audio and video coding schemes, gateways and relays, the impact of wireless links compared to wireline ones (quite different loss characteristics), the parameters in traffic shaping, in the requests for bandwidths in VPs, and in the way that RSVP reservations are required.

Deliverables:

R5.1 Support for network technologies in the MECCANO Tools.

R5.2 Performance Characteristics of the MECCANO system and their effect on system parameters.

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	6 of 9

WP ID **6**	Work Package TITLE: **Gateways and Relays**						
WP LEAD	C8	START	1	END	24	DUR	24
TOTAL Person/Month	19			TOTAL KECU		164	

Objectives This workpackage will realise several of the forms of gateways and relays that are required: between the ITU-T mechanisms and those of the MBONE, that can filter and multiplex streams and that transcode intelligently at network boundaries. The realisation should allow both for resource management and confidentiality requirements.

Work Description: This work-package will consist of three activities: gateways between the ITU-T and MBONE worlds, intelligent multiplexing and filtering relays, and transcoding relays. Since each of these may be between different network technologies, there will be several variants. Each gateway must be well instrumented, at different levels, for providing good measurement data on packets arriving, transferred and dropped Though the three activities are described as separate tasks; practical gateways will be a composite, and their control will be linked closely with resource reservation. This in turn will be impacted by feedback on bandwidth available and QoS achieved. In each activity, both configurability and the needs of security will be considered. The Standards are still advancing; we will participate in the advancement both in the ITU-T and the IETF. The multicast session announcements of WP7 will be impacted by such relays; since relays will participate in the announcements.

A6.1 ITU-T - MBONE gateways In this activity, the final configuration should allow endstations running the ITU-T multi-way conference tools to join Mbone conference, endstations running Mbone conference tools to join conferences run under ITU-T auspices, and a maximum use of the facilities provided in the separate sets of conferences. Simple gateways with such functionality have been provided already under the MERCI project; much more functionality is needed, and will be provided, than will be achieved in the MERCI gateway releases.

A6.2 Transcoding Relays There are many forms of coding used both for audio and video; the choice depends on the characteristics of the channels, the amount of compression desired, the utility of hierarchical coding, the provision of forward error correction, etc. The media tools of WP4 support a variety of codings - but not every tool supports each coding. In a heterogeneous network environment, different codings will be more appropriate for particular network parameters. One could use only a minimal common subset in a linked network conference; this is inflexible, and penalises users on the more performant networks. An alternate approach is to put in transcoders, receiving media streams in one coding format and transmitting them in another. We will develop transcoding relays, concatenating several media coding filters. We will provide mechanisms for locating relays and handling announcements. Often relay locations will be pre-identified, or by default (e.g. at boundaries between the ITU-T and Mbone domains). Sometimes they will be under the control of the receivers, at others they will be based on measurement and monitoring feedback.

A6.3 Intelligent Filtering and Multiplexing The high quality media streams of WP4, together with the heterogeneous networks of WP5, supporting both high and low bandwidth, could cause operational problems. A low speed network like a two channel ISDN just cannot support the data traffic of a high quality MPEG conference. With the emergence of the hierarchical coding of WP2, and the introduction of resource reservation, much more intelligent functionality is both required and achievable. We will transport the media streams of WP4 over a number of multicast streams; for high quality we transfer several such streams. The functionality of these gateways is to multiplex and filter the streams from the high speed to the low speed side of the gateway in the light of the resources available at the low end. In some variants, these gateways will be between networks - for example, when going from a high-speed ATM network into a medium speed packet-switched one. In others it will be on a per-recipient basis - as when workstations use different numbers of ISDN B-channels. These gateways may support multicast on one side but unicast streams on the other.

Deliverables

D6.1 The gateways and relays in MECCANO Release 1

D6.2 The gateways and relays in MECCANO Release 2

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	7 of 9

WP ID **7**	Work Package TITLE: **Announcement, Management and Control**							
WP LEAD	C1	START	1	END	24	DUR	24
TOTAL Person/Month	19	TOTAL KECU	77				

Objectives: This workpackage will develop tools for announcing sessions, inviting participants, booking conferences, starting sessions, and controlling sessions. The initial simple ideas have led to more complex facilities with a variety of tools - but with standard formats reprocessed by different session control tools. We will continue to participate in the Standards making process; we will also implement tools to announce, manage and control the sessions, and to invite participants.

Work Description: The activity is divided into four activities: ***Set-up of Conferences, Control of Active Conferences*** and ***Conference Relay Set-up.***

A7.1 Set-up of Conferences This includes the description and announcement of conferences and invitation to them. A *"session directory"* format for the description of conference tool parameters (SDP) has been developed under the auspices of the IETF MMUSIC Working Group, with major input from the MERCI project. These formats have provision for private announcements. SDP is moving to draft standard, but further changes will be required in the light of deployment with both security and resource reservation Session Announcement (SAP) and Session Invitation (SIP) protocols. The early versions of these, completed under MERCI, will be upgraded in the light of the on-going standardisation activity.; the impact of mobile networks will cause further modification. The relevant SDR package implementation facilitating conference set-up, was developed jointly at UCL and in the US, and is widely accepted. The security aspects will be co-ordinated with other Public Key security infrastructures partly under the auspices of the ICE-CAR project using the packages produced under MERCI in collaboration with ICE-TEL. Here again, considerable change can be expected during the period proposed for the MECCANO project. The activities of WP4, WP5 and WP6 imply significant modification in the SDR package - requiring MECCANO participation. It is also necessary to integrate the Session Announcements into local "programming" and "booking" systems - particular for Server-based sessions. It is probably that we will collaborate in modifying the facilities being provided by CoopWWW in this area.

A7.2 Control of Active Conferences Three activities are implied. The ITU-T style of conference has mechanisms for conference control, which must be re-interpreted in the IETF world. There is also a need to provide mechanisms to invite media servers, or individuals, to join a conference. Finally, there may be need for some floor control

A7.3 Conference Relay Set-up and control. The "*session directory*" protocol allowing the set-up, advertisement and start-up of multicast conferences, needs a number of enhancements to allow flexible and reliable start-up of the various relays and gateways of WP6. There will be a subtle interaction between the changes of parameter in the media tools, the requirements voiced by participants joining Mbone conferences, the control capabilities in the relays and gateways and operation of the resource reservation implementations. We shall participate within the IETF in devising standards for these capabilities. Here security and integrity provisions will have to be taken into account.

Deliverables

D7.1 The Session Announcement and Management Facilities in MECCANO Release 1

D7.2 The Session Announcement and Management Facilities in MECCANO Release 2.

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	8 of 9

WP ID **8**	Work Package TITLE: **Consolidation of Applications**						
WP LEAD	C6	START	4	END	24	DUR	21
TOTAL Person/Month	48			TOTAL KECU		267	

Objectives: While the majority of the validation and demonstration of our techniques is accomplished in other projects, some must be carried out inside the project. The objective in this workpackage is to consolidate and run a number of validation activities from inside the project. These will be used to validate the quality and acceptability of the technology for different applications and user communities, to assess the relative value of the different tools and to propose changes for subsequent work inside and outside the project.

Work Description: A number of specific validation activities will be carried out inside the project; at the suggestion of the Reviewers, these will mainly concern seminars, and will consolidate existing applications. Most of the costs will be met from National or Institutional funding, but some MECCANO funding will be made available by the partner most associated with the pilot groups. The choice of pilots is not arbitrary; it is based on activities with which the participating parties are already associated and which will validate specific aspects of the total MECCANO system. One aim is to validate a component, a second is to validate its applicability in an application area and a third is its dissemination to a user community. The participating national research networks operators, CA*Net II, DFN, SuperJANET and UNINETT want to assess the value of the technology, and its impact on operations. Clearly EUTELSAT has a similar interest on the use of Direct Broadcast Satellite networks in this mode.

The different validation activities will adopt different assessment criteria. Some will be subjective, merely that the audience are satisfied, or that the participants have the necessary facilities over the relevant networks; others will be objective, e.g. that the sponsors will proceed to larger scale trials - indicating both .the user acceptance and the cost effectiveness in that application.

The applications sites will be mainly in universities, hence the financial commitment to the infrastructure is hard to quantify. Often it is part of the whole research infrastructure, or even, in the DBS case, includes the underwriting of a whole satellite-based system. All MECCANO partners will participate in a regular series of seminars. These will be demonstrating high performance multimedia, by setting up a higher quality Mbone than would be possible over the normal service network using the successor to the JAMES network. This seminar series will include Computer Science, Experimental Cardiology, Health Care, Surgery, Telecommunications and various technological subjects.

The common seminar series activity will be supplemented by more specific ones which exercise particular tools and network technologies - which may not have been accepted by all - or even be available at all the sites. Thus some of the partners will be carrying out trials on the ISDN with more than two channels, some will use high speed ATM, or DBS satellites. Some of the seminars will deliberately use secured sessions, which have been announced securely. Some of the partners have conference rooms equipped with specific digital whiteboards. Several of the environments will be heterogeneous, making substantial use of all the types of gateway considered in WP6. At least three versions of media servers will be in routine use by different partners. There are at least four shared workspace tools. All the components will be exercised in these seminars - but not necessarily by each partner. All six countries will be represented in the seminars - but not necessarily all together at any one time; we also expect to include other countries in the seminars including the US (via CAIRN) and the EuroDemo centre in Brussels.

During many of the seminars, we expect to make substantial measurements, and record the sessions in a distributed way. Hence we should be able to determine the characteristics required for high performance seminars.

Deliverables

R8.1 Description of, and conclusions from, the seminars carried out in the first year.

R8.2 Description of, and conclusions from, the seminars carried out in the second year.

B1 - Work package Description

Project ref.	Acronym	Date	Sheet
	MECCANO	September 1,1997	9 of 9

WP ID **9**	Work Package TITLE: **Support for Validation Sites**						
WP LEAD	C1	START	7	END	24	DUR	18
TOTAL Person/Month	23			TOTAL KECU		158	

Objectives:. This work-package will ensure that the MECCANO software releases meet the needs of the different validation activities using the packages. This includes both fixing problems in the Releases, and ensuring that the contents of the Releases meet the needs of the validation projects...

Work Description:

Already in the MERCI project, a number of projects have come to rely on the existence of the MERCI tools. Specific projects, like MANICORAL, PROSPECT and national projects in Germany, Norway, Sweden and the UK continually take the latest releases, and provide strong feedback on their impressions and needs. The project has done its best to respond. By this time, at the start of MECCANO, the situation has changed dramatically. Now the MERCI tools are considered vital to proposals like PROSPECT (ACTS), ICE-CAR (Telematics), NICE (Telematics) and various successors of WWW for groups, MANICORAL and similar national projects.

However, some of these projects are now starting to provide tools themselves, which they would like to see integrated into the MECCANO toolset. Thus the support for other validation projects comes in three forms: we must ensure that direct deficiencies in our tools are remedied; we must ensure that the tools meet the needs of these validation and demonstration projects; we must ensure that their tools can be integrated with the tools used by MECCANO.

The work implied comes under this workpackage. We cannot provide great detail on the activities - because they are driven by the needs, activities and desires of the other projects. We do allocate specific effort to the liaison and tailoring tasks - but much more effort will be done in the technical workpackages to support these projects. We expect also to set up a User group, which will meet regularly either in person or through the use of MECCANO technology; this will cement the relations between the other projects and the technical groups in MECCANO. This has been discussed already under the auspices of WP2, which is responsible for such external liaison.

We will also provide a limited *Help Desk* facility to provide users of the MECCANO tools with direct help in their use on the various platforms we support and the network environments in which we operate.

Deliverables:

R9.1 The support provided to validation projects during Year 1 of MECCANO.

R9.2 The support provided to validation projects during Year 2 of MECCANO.

4. PROJECT MANAGEMENT

4.1 The Management Plan

Most of the MECCANO partners have worked together before, and realise that this type of project is complex and needs careful management. The management will be through a combination of central management, from the Co-ordinating Partner, and local management from each partner; the details are described in Section 4.2. With tight deadlines for demonstrations and delivery schedules to be met, partners need to be in regular contact. A set of infrequent but regular Project Management Meetings (PMMs) will be supplemented by bi-weekly project meetings held over the Internet using video conferencing; details are given in Section 4.3. The combination of frequent on-line progress meetings, regular face-to-face meetings and monthly progress reports give both the PM and the partners a clear view of the current progress. The bi-weekly on-line meetings keep both the PM and partners fully aware of the success of the tools currently deployed. Quality Assurance is of major importance in a project of this kind, which is producing software for others to use. The mechanisms to be used are discussed in Section 4.4. A Project Server has been set up; this will be the key to good dissemination of information both inside and outside the project.

4.2 The Project Management Structure

4.2.1 Project Management

The Co-ordinating Partner will appoint both a Project Director (PD) and a Project Manager (PM) - who will be members of that Partner's staff. The Project Director and the Project Manager work as a team; the former is responsible for many of the Executive management decisions; the second for the administrative ones. Both posts are part-time. Each partner will appoint a Technical Manager, who will act as the focus of interactions with the other partners in the project

The role of the PD is to represent the project from a policy perspective in the following respects:

- Represent the Project to the CEC
- Lead major policy discussions between partners
- Lead negotiations for changes in contractual, technical or financial matters with the CEC.

The Project Director will be Professor Kirstein, initially.

The Role of the Project Manager is to lead the project from an administrative viewpoint in the following respects:

- Represent the project to the CEC and the outside world;
- Liaise with TMs at partner sites;
- Ensure that schedules and deliverables are met;
- Handle the overall financial aspects of the projects;
- Manage the MECCANO project archive;
- Disseminate information about MECCANO to the research community and the outside world;
- Take executive decisions between GMs (subject to discussion at the bi-weekly meetings);
- Chair PMMs;
- Prepare Periodic Management Reports (PMRs).

The Project Manager will be Mr. R. Bennett, initially.

4.2.2 Work Package Management

For each Work Package (WP), there will be a work-package leader, responsible for planning and over-seeing the progress of the WP. It is the leader's responsibility to report on progress at the PMMs, and PTMs (See Section 4.3) for the WP. He/she is also responsible for progressing Deliverables for the WP. Normally the WP leader will be chosen from the organisation having the largest effort in the WP

4.3 The Organisation of Meetings and the Management Structure

4.3.1 General Management Meetings

The general meetings will normally comprise a one-day management meeting (PMM) and two-day technical meetings (PTM). The purposes of the PMM are the following:

- Review progress of the project;
- Identify changes required in strategy or schedules;
- Take decisions on changes needed in management, goals or effort devoted to work packages

Each partner will appoint a Technical Manager (TM) as representative and main contact point. TMs are expected to follow the bi-weekly meetings and attend PMMs. The Sponsoring Partners will have the same rights as a partner to attend any project meetings and receive project documents.

We have not found it necessary, in the past, to set up a mechanism for reaching consensus; this has normally followed naturally from the meetings held.

4.3.2 Project Technical Meetings (PTMs)

In addition to the PMM, one or two day Project Technical Meetings (PTMs) will take place as required - though often around the PMM. One form discusses the technical progress in each Work Package, and reports any problems to the PMM; a second is of a "workshop" character - focused on dealing with specific points, such as interworking between two pieces of software, preparing a piece of software for release, or specifying a new protocol. The minutes of the PTMs are put onto the document store.

4.3.3 Bi-weekly multimedia conferences

We will continue the successful bi-weekly multimedia conferencing meetings started in the MERCI project, putting the project technology to good use. The conferences have the additional advantage that they make it clear to all partners the current status of the different tools. The main topics in these meetings are current progress, preparations of demonstrations and deliverables, results from remote testing of software, discussion of draft versions of specifications, reports and deliverables, etc. Over the MERCI project, a procedure has evolved for preparing, conducting and documenting those meetings:

- An agenda is compiled and circulated before each meeting;
- Documents relevant to agenda points are available from the MERCI document server;
- The agenda is displayed on a shared whiteboard and "worked through" in the course of a meeting;
- Minutes of the meeting are circulated to all partners and kept in the MERCI document server.

The same procedure will be followed in the MECCANO project.

4.3.4 User Meetings

We expect to hold periodic meetings of the users of the MECCANO tools to ensure that we have a realistic view of their requirements. In the MERCI; two such meetings per year seemed appropriate; we expect to have a similar frequency in MECCANO. These meetings will be open to any organisations that are using, or plan to use, the MECCANO tools. The format, duration and agenda for these meetings will be agreed with the interested organisations after the start of the project.

4.4 Quality Assurance

Each major software module produced by a partner will be tested for quality by another partner. When we are satisfied internally that the functionality is adequate, it will be passed to one of the collaborating user organisations for further testing. This second stage will normally serve also for the Peer Review. When the module is considered satisfactory, it will be put on the Multimedia Server (cf. Section 5.3).

Two other aids to quality assurance will be employed. We have as Validation Tasks regular sets of MECCANO Seminars; these will show only too graphically if there are problems either in the tools deployed or in the networks. We will introduce various tools regularly into the weekly meetings and seminars, to provide realistic tests of our progress.

A second important tool is the Multimedia Server, which will hold all Project documentation.. This server is described in greater detail in Section 4.5. In addition to all project documentation (held for internal project purposes), it also will hold publicly available information. This helps greatly to ease the burden of technology dissemination - which is so vital to this project.

4.5 Project servers

MECCANO will produce substantial amounts of documents and software, which have to be distributed to partners, individual users, user groups, and other interested parties. The Co-ordinating Partner will maintain a document and ftp server containing general project documents such as minutes, management reports, technical reports and publications, and a directory of national support centres (NSCs), their contact points, and MECCANO software. Partners releasing software are responsible for making this available to NSCs in an agreed fashion, and updating entries in the general project server. The project server is held as a World Wide Web (WWW) server. In view of potential information sensitivity, some of the WWW pages will not be available to outsiders, but will be held in a private area restricted to the partners.

The WWW server will be run on a large Server supplied by the co-ordinating partner as the main document store, though there will be many links to other stores. As in the MERCI project, the existence of shared editing tools will ease the shared preparation of documents. The Project Server will also be the first level into the project for links from Servers operated for the Commission or for TERENA.

4.6 Handling of Deliverables and IPR

4.6.1 Document Dissemination

In general documents will be passed between the partners either by electronic mail or via the Project Server. It is recognised that the Private Area of the Project Server may not be considered very secure. We will discuss in an early PMM whether we need to secure documents in an encrypted form for any purpose.

All working documents will be held in the Private Area, but we will strive to make these widely available, through the Public Area, as soon as possible. All publications and most presentations will be held in the Public Area.

All partners are expected to be able to process and transmit formatted documents using the Microsoft Office Suite.

4.6.2 Deliverables

While under preparation, the Deliverables will be held in the Private Area of the Project Server, or in the store of the editor of that Deliverable; if the latter is done, the document will be circulated between the partners by e-mail. Deliverables must be approved by organisation participating in the Work-package, and by the Project Manger. The official delivery of Deliverables to the Commission will be by the Project Manager.

4.6.3 IPR and Consortium Collaboration

A Consortium Collaboration Agreement (CCA) will be prepared; unless another partner so volunteers, this will be the responsibility of the Co-ordinating Partner. This will be circulated for agreement to the other partners. Eventual agreement of the CCA must be unanimous. The CCA will consider questions of confidentiality, conditions for exploitation of Project results, and any other matters considered relevant.

5 THE PARTNERSHIP (CONSORTIUM)

5.1 The Roles and Responsibilities of the Participants

University College London is the Co-ordinating Partner. While it is unusual for a University to act in this role, but UCL is an exception for several reasons:

- It has acted in this role for three series of previous pilot projects (PARADISE, PASSWORD, MICE and MERCI);
- It has the best connectivity of the partners to the outside world;
- It has excellent links to many related technologies and partners through its other projects
- It has particular links with BT, suppliers (e.g. Hewlett Packard and Sun Microsystems) and UKERNA - the British Research Network organisation.

UCL has a role not only in co-ordinating the project, but in ensuring its links with other such activities in European, North American and National activities. It is active in every work-package and will form a link with other Telematics and ACTS programmes. It leads the management (WP1), many of the bridge functions between projects (WP2), the networks (WP5), Announcement (WP7) and Validation Support (WP9) activities. We have a number of partners who were not in the previous MERCI project; when the relative strengths of some of these partners becomes clearer, it is probable that they will lead one or other of the WPs now assigned to UCL. HPLB, as the leading workstation supplier, is keen on assuring that the overall systems balance is complete; hence their leading of the architecture (WP3) activity. INRIA's specialities are video coding and communication satellites; their Rendez-Vous system is recognised as being in advance of other relevant activities in Europe; hence they have taken the leadership of the components (WP4) activity. TELES' main contribution is in the area of ITU-T to Mbone gateways; hence they have taken the lead on the Gateways (WP6) activity. Finally Oslo U has many applications projects in distance learning, hence their lead of the Application Consolidation (WP8) activity.

CRC and ACC have large participation, CRC has only not been asked to lead a WP so far, partly because their contract is being negotiated independently, and partly because they have never participated in EC projects before. They are very strong in some components activity, and we hope that they will lead one WP later. CRC was slated to lead the User Interface package, but this was removed after comments from the Reviewers. They will probably take the leadership of one of the other Work-packages later, but this has not yet been decided. NL has specific strengths in Conference Rooms; thus they bring in a much-needed skill. All the partners have strong validation activities, but often would be helped by user groups; this, and availability of specific tools is the reason for the inclusion of the Associated Partners.

5.2 The Profile of the Consortium

With three partners each from industry (two SMEs), research institutes, and universities, the organisational balance is ideal. Most partners are strong in some complementary technology; all the partners are either strong in a relevant technology, or have access to important validation sites. The three university partners have a particularly strong commitment to distance learning, and close links with their research networks and communications carriers; thus the MECCANO partners bring in also the strong desire of their national research networks to provide extensive user trials. This is also one of the reasons for the Associated Partners, who were often put forward by the national research networks. Clearly EUTELSAT as a communication provider, and Shell as a User organisation, complete the profile of a well-rounded consortium.

5.3 The Balance of the Consortium

All the partners except ACC have had several years of collaboration on the MERCI project, and represent complete knowledge of all the relevant technology. There is an excellent geographic balance; Canada. France, Germany, Norway, Poland and the UK are all involved. Each will have high quality access to their research networks, their National pilots, and their ISDN networks.

From industry, HP brings in their unrivalled experience in workstations and industrial needs. TELES brings in their familiarity with the ITU equivalent approach, and their extensive experience of ISDN products and services. NL, though a new SME, is actually a spin-off resulting from its founder's activity in the MICE/MERCI projects. From the universities, RUS brings in directly its supercomputer centre and contacts with large ACTS trials; these make unique demands on the MECCANO technology. Moreover, its relationship with DFN will bring in many tools from their development activities under DFN sponsorship. The University of Oslo projects with distributed classrooms will provide a unique feedback on the project's needs in this area; UNINETT is probably the leading European exponent of distributed teaching. The UCL broad network and multimedia activities provide the latest technology in audio, security, gateways, server and resource reservation techniques; they are also responsible for national support centres and several validation activities. From the research institutes, ACC has a strong activity in multimedia servers, and a set of equipment, facilities and staff rare in Eastern Europe. CRC has a unique place on the Canadian communications scene; its wide range of skills and its excellent relationships with both CA*Net, provide both much needed adjuncts to the European partners, and a North American partner with the highest leverage. The INRIA skills in video and audio coding are a vital part of the project; they have led to their involvement with DBS technology - and hence also the sponsorship of EUTELSAT.

HPLB, INRIA, TELES and UCL all have very strong links with the US - an important ingredient for ensuring international interoperability. All are very active in the IETF - particularly in the relevant working groups. UCL's membership of the DARPA CAIRN project gives it direct, high quality access to the latest resource reservation technology. Also both UCL (to the US) and CRC (from Canada) have direct control of high quality transatlantic links; this ensures firm North American - European validation of the MECCANO technology, and full transatlantic compatibility of procedures.

All the partners (with the exception of ACC) have had successful partnerships over many years in other areas - directories (PARADISE), security (PASSWORD and ICETEL) and high speed networks (HIPPARCH, PREPARE). UCL has acted some years ago as a test site for the TELES EUROBRIDGE technology. Thus it is clear that the partnership has been chosen because we all know we work well together, and do not expect the problems endemic in many European projects. It is significant that there were 11 partners in the original MICE project; while all contributed well in the MICE context, and several remain our partners in other activities, only six remained in the original MERCI consortium, and four in MECCANO. Three partners brought into MERCI remain in MECCANO; we are striving to ensure the optimum technical and collaborative balance.

5.4 The Mechanisms for involving the Users

The users will be involved both directly in the internal project demonstrators and indirectly via the other projects which will be using the MERCI and MECCANO technology. We are now introducing the use of the MECCANO tools into many of our research programmes as a working practice; this brings a broad range of users into direct contact with the technology. Our first WP1 Deliverable will be an analysis of the user requirements - derived principally from the users' comments and the validation plans. We expect to hold our first User Workshop within a month of its publication; thus users will be directly involved from the beginning. In many other projects the Validation Projects are well down stream; we will continue the seminars, started in MERCI, at the beginning of the project. We will take stock at the beginning of the project of what tools we wish to continue to support, but will provide a complete release to users both inside MECCANO and in associated projects within four months. While the multimedia national support centres

are not being funded on a European basis, the three universities are receiving national support, and will involve a wide range of users via these national centres. We will hold user meetings from early in their project; moreover we expect to maintain the flow of information to our users through the Project Servers of Section 4.1.2. We expect to set up a User Committee to advise us of user needs. This committee will include expected participants in validation work-packages (WP7 and WP8), and the related projects MANICORAL, CoopWWW, PROSPECT, VITAL and any of the new projects which have declared their intention to use the MERCI/MECCANO tools.

There will be a careful monitoring of the success of the validation activities, and the users' comments from the early exercises will be fully taken into account in further developments. Here we should emphasise that this is not just talk, the collaboration with MANICORAL and ICETEL has been shown to work well in the MERCI project.

5.5 The Experience of the Project Director

Professor Kirstein will act as Project Director. Professor Kirstein has had extensive experience of managing successful CEC and other collaborative projects. These include the following: PARADISE (COSINE) 91/94, PASSWORD (Telematics) 92/94, MICE (ESPRIT) 92/95, MERCI 95/97.

As in these previous projects, Professor Kirstein will appointed also a Project Manager.

5.6 The Contractors

5.6.1 University College London

The Organisation University College London (UCL) is one of the premier universities in the United Kingdom, with a strong emphasis on research, 1996 income of £240M, some 5000 staff, and 1400 students. Its strong audio-video department is sited in one of the associated hospitals, and is linked particularly to medical teaching. It has recently a Language teaching centre a distant learning centre. UCL has been running a video teaching network between a number of sites for some years; it is also one of the first sites on both the British SuperJANET SMDS and ATM networks.

The Department of Computer Science (UCL-CS) has been in the forefront of computer network technology development and applications deployment for many years. It operated the first international link to ARPANET (and later the Internet) from 1973, providing a gateway between the US and British networks, for some 15 years, and still supports the international connectivity; it is the only foreign DARPA contractor in network activities. It operates a high speed internal LAN and ATM infrastructure, with direct ATM and SMDS links to SuperJANET (and hence to the JAMES network) and to the US CAIRN network. UCL-CS has been involved with European Telematic projects since 1985 in many relevant areas - most recently co-ordinating the MICE and MERCI multimedia pilots, and participating in the ICETEL security pilot and many national and European communications projects.

Contribution to the Project UCL-CS will contribute to many of the technical aspects of the project - particularly audio coding, multimedia servers and shared workspaces (WP4), resource reservation and ISDN (WP5), filtering and transcoding gateways (WP6), conference announcement (WP7) and validation support (WP8). It will act as the Co-ordinating partner, provide the Project Manager and the Director, and lead WPs 1, 2, 5, 7 and 9. It will be the main source of security technology to all the work-packages. It will make available its two conference rooms, an extensive set of servers, workstations and network facilities including ATM, SMDS, Primary Rate ISDN, mobile radio and a direct ATM link from the department to the US CAIRN Internet nodes (with a 1-2 Mbps channel dedicated to resource management-CS research activities, particularly multimedia).

Team Leader Professor Peter T. Kirstein, who will also be Director of the whole project. Professor Kirstein has led many projects in data communications, document systems, multimedia and security. For 15 years he was Head of Department of the Department of Computer Science, where he is currently Professor and Director of Research. Professor Kirstein has been both Technical and Administrative Director of many European and National projects - including INCA, PARADISE, PASSWORD, MICE and MERCI.

Role and services of Associated Partners Most of the UCL activities will be carried out directly by UCL-CS. However, the School of Slavonic and East European Studies (SSEES) will be an Associated Partner. SEES specialises in the study of Eastern, Central and south-eastern Europe and Russia through the disciplines of language, history, literature, culture, economics, political science, geography, anthropology and sociology. It will participate in WP7 via two demonstrators described.

5.6.2 Academic Computer Centre Cyfronet

The Organisation The Academic Computer Centre *CYFRONET* (ACC) in Krakow, Poland is an independent non-profit organisation under the Ministry of National Education, to provide the heterogeneous universities of Krakow and research institutes with powerful facilities for tasks which were beyond the

scope of their own computer installations. CYFRONET delivers computing, advisory and network services to staff and students, runs courses, conferences and seminars. It is financed by the Ministry of National Education and the State Committee of Scientific Research. ACC is well equipped with several high-performance CONVEX supercomputers, and a variety of high performance workstations. All computers and workstations, as well as the Automated Tape Libraries systems (capacity 2.64 TB and 520 GB) are integrated in the Local Area Network based on the Ethernet, FDDI, ATM and HIPPI. It is one of the main Internet providers in Krakow. Besides a local community, many users throughout South Poland access us via the Krakow MAN - which is based on ATM technology, with HIPPI and FDDI nodes also. Its current 155 Mbps backbone will be migrated to 622 Mbps. Transmission between Krakow and the international nodes in Warsaw are at 2 Mbps.

Contribution to the Project The main focus of ACC's activity is on the media server (SDVA) in WP4 - providing flexible hierarchical storage mechanisms for organisation, indexing and retrieval of multimedia document collections with a "video-on-demand" interface based on WWW. In WP5, we will install the MECCANO tools on their ATM MAN, and do careful performance evaluations. SVDA, the booking function, will be integrated in WP5 to support for SAP and SAP MBONE operation - enabling interworking with other MECCANO/MERCI applications over the MBONE. Interfaces based on JAVA will be provided under WP6. Under WP8 they will provide a group of health care researchers (mainly oncologists and cardiovascular specialists) to exchange sequences of tomographic images. Finally, to ensure that our server is usable for other projects, and to assist other Polish groups requiring pan-European collaboration with the MERCI/MECCANO tools, they will have a substantial involvement in the user support of WP9.

Team Leader Krzysztof Zielinski is Professor and Head of the Distributed Systems Research Group at its Institute of Computer Science, where he is. He is also Senior Computer Networking Advisor at the Academic Computer Centre CYFRONET in Krakow. His research interests focus on high-performance distributed computing and networking. He has spent two years at the Olivetti Research Lab. in Cambridge U.K, where he contributed to the communication software for the Cambridge Backbone Network. Besides leading national projects, he was also Technical Manager of the EC R&D COPERNICUS Project TOCOOS (CP94247).

5.6.3 Communications Research Centre

The Organisation CRC, in Ottawa, Canada's primary federal government laboratory for research in advanced telecommunications and information technologies; its research contributes to the orderly evolution of the Canadian communications infrastructure, to the development of new communication services and to support industry through the transfer of knowledge and technology. The core research areas at CRC include radio science, satellite communications, broadcast technology and communications networks. CRC houses a number of special facilities including the Broadband Applications (BADLab) and the Advanced Television Evaluation Laboratories.

Contributions to the Project Under WP5, CRC will manage and expand the trans-Atlantic infrastructure, will participate in the multicast activities in the Canadian National Test Network, and will continue development of the MERCINARI monitoring. Under WP4, it will provide an integrated interface its WET training suite. Under WP8, the integrated WET/MECCANO tools will be tested in a program of field trials; in addition, other transatlantic validation exercises are planned. Finally, under WP9, they will look for, and support national partners beyond CRC and Teleglobe (especially CANARIE Inc. and the new CA*Net II) to work with MECCANO.

Team Leader John Robinson is a Research Scientist in the CRC Network Technologies Research Directorate, involved in research projects in communications protocols, network design and management and distributed computing. John has been active in research on computer networks since 1980, first at CRC and then at the ST Centre in the Hague.

5.6.4 Hewlett Packard Laboratories Bristol

The Organisation Hewlett-Packard Company is a leading global manufacturer of computing, communications and measurement products and services recognised for excellence in quality and support. Hewlett-Packard Laboratories are the company's longer-range research laboratories with three bases in the US, Europe and Japan. The European Laboratories based in Bristol, UK (HP European Laboratories Bristol, HPLB) employ around 300 researchers - one third of HPL's total world-wide. HPLB's charter is to engage in world-class research in the inter-related technologies that will enable people to create, manipulate and share electronic information with others wherever they happen to be, for professional and social purposes. HPLB also invest in an extensive network of relationships with selected departments in academic institutions throughout Europe and the rest of the world, which help to keep HPLB at the forefront of fundamental research efforts in areas of relevance to HP. Technical leadership for this project will be

provided by CNS department within HPLB, with a total responsibility for the IT infrastructure within HPLB, and working closely with the CNS teams on HP's other major sites across Europe.

Contributions to the Project HPLB's concern that there be a clear and agreed architecture across the project, for use in the development and exploration of real time multi-media applications, persuaded it to lead WP3. It is particular concerned to define the applications with their related performance and the supporting infrastructure, identifying components and interfaces, against current standards and thus identifying potential problem areas and shortfalls in the current tools. The development of new applications, or the use of existing ones, will be part of the proposals which will include coverage of Web-mounted and alternative solutions, including the evaluation of the new operating system options, as they become available. Under WP8, HPLB will implement proposals for use in the Bristol site for collaborative purposes. It will give support to other HP divisions in using the tools, and will set up broadcast and collaborative events with partners and outside organisations - assessing differing contexts and recommending changes

Team Leader Sandy Johnstone works for Hewlett-Packard Corporate Development in Europe, with responsibility for leading and co-ordinating all of HP's technical activities within European Collaborative Research. He has worked as Computer Consultant, Service Manager and MIS Manager, firstly in Eastern Europe and the USSR, then in Benelux and Scandinavia. Between 1986 and 1996 he was Training and Development Manager for HP's European Computer Consultancy operation, with special interests in collaborative trans-national co-operation.

5.6.5 INRIA

The Organisation INRIA (National Institute for Research in Computer Science and Control) is a French public-sector scientific and technological institute under the responsibility of the Ministry for Research and the Ministry of Industry with over 1 000 scientists, and a budget of 70 MECUs, 20% of which comes from contracts, royalties and sales. Industrial relations are strategic for INRIA including tenure positions, scholars and trainees, researchers from public laboratories, engineers from industry, and visiting researchers from abroad. The research carried out at INRIA is mainly concerned with software and control engineering, bringing together experts from the fields of applied mathematics, control, signal processing and computer science within the framework of 6 research programs. It has joint contracts, and interchanges staff with, industry; it stimulating the creation of spin-off companies and subsidiaries by former INRIA researchers and engineers..

The Contribution to the Project The INRIA team will focus on delivery of higher quality multimedia data over heterogeneous networks - improving performance by combining layered coding schemes, audio and video, with a layered transmission schemes. While this idea is attractive specifying how/when receivers are to join and quit layers has only recently been described and simulated; furthermore, it has not yet been deployed over the Internet. Most of this activity is in WP4, but in WP5, they will consider also the impact of transmission over local wireless and DBS, unidirectional, satellite links - using also IPv6 and resource management services.

The Team leader Jean-Crysostome Bolot's recent work has focused on designing and evaluating congestion and error control mechanisms for the multicast distribution of audio and video over the Internet. These mechanisms have been included in FreePhone and in the INRIA Videoconference System IVS. In parallel with the work on control mechanisms, he has also been investigating performance characteristics of the Internet.

5.6.6 University of Oslo

The Organisation UiO is Norway's largest university with 39 000 students and a staff of over 4 500. The centre for Information Technology Services (USIT) provides computer network, computer resources and computer services for all parts of the university and has more than 100 full time employees. USIT has played a key role in establishing the national and Nordic academic networks, now organised in UNINETT. The university has Supernet (a national high-speed network for experimental services) ATM with 34 Mbps connection, with plans for upgrading to 155 Mbps.

USIT has built an advanced Electronic classroom, which has been used for regular distance learning over the last 6 years, being continually enhanced. There are currently 5 operating classrooms in Norway, and several more being built. The classroom concept is now commercialised, and handled by a USIT spin-off, "New Learning". USIT is responsible for the real time Multimedia National Support Centre funded by UNINETT A/S and participates in a collaborative project nationally funded by the Research Council of Norway (LAVA), introducing advanced broadband video services in application areas as teaching, research, mediation, security and television.

The Contribution to the project UiO will bring into the project an existing and fully operating high-end Electronic Classroom, a multimedia server (optical jukebox) and several Multimedia workstations. It will

contribute users from its own University, and the UNINETT connection will bring in user from the other three Norwegian Universities as well as numerous Colleges. will utilise fully the existing infrastructure in teaching with these kind of services. There will also be extensive collaboration with the Department for Informatics (UiO), who have active groups on long distance educational questions and on network activity.

UiO will participate in the WWW aspects of WP3, and in the media server and video coding aspects of WP4, particularly from the viewpoint of WWW-based real-time browsers with media stream synchronisation. We will participate in the resource management activities of WP5. Our classrooms are heavily utilised, so that integration of mail-based session invitation and session booking will be one of our activities in WP7. In the context of WP8, we will set up the mechanisms for regular international Mbone events in the Oslo environment - in the context of MECCANO but also LAVA. These will be organised around our regular teaching, and also one-off special events. We intend to introduce the MECCANO technology not only into the classroom, but also into the tutorial environment - capitalising on the distributed organisation of Norwegian Colleges.

The Team Leader Ingvil Hovig is both a UiO researcher and a part-time associate professor at the Department for Informatics. She is currently the USIT project leader for LAVA, the UNINETT support Centre, the MERCI project and a collaborative project funded by the Research Council of Norway on "Maintaining information quality on the WWW".

Role and services of Associated Partners. New Learning AS was established in 1996 and is located at the Research Park at the University of Oslo. The company has sprung out from the university exploiting results from European and nationally funded research projects including the Telematics for Research MERCI-project. The products of New Learning AS include distance education tools based on real time multimedia communication over the Internet and ISDN as well as knowledge support to organisations who want to employ information technology tools to support learning processes. Current customers include Norwegian universities, colleges of higher education, and commercial organisations

Its main contributions will be around an integrated electronic classroom system which will remain compatible with the other MECCANO components. We will contribute to the Audio, video and shared workspace activity of WP4, being concerned also with the ITU-T H.323 and T.120 developments. We will concentrate on providing an integrated user interface to the electronic classroom system presenting itself through a touch-screen and will ensure encryption compatibility with other MECCANO tools. Our work with IP/ATM, IP/ISDN resource management and conference scheduling will contribute to WP5 and WP7. We have, of course, particularly close relationship with UiO; while they will conduct the main validation and demonstration exercises, our support of both of their and of other projects' use of our electronic classroom will come under WP8.

The team leader at New Learning, Geir Pedersen, is the Technical Director and has been responsible for a number of technical development projects at USIT over the last few years. He was project leader for the MUNIN and KOMPAKT projects and the USIT's participation in the MERCI project. Other activities include the deployment of X.500 within the academic community in Norway, piloting the usage of smart-card technology as a campus multi service card, and participating in the core technical reference group UNINETT..

5.6.7 The Rechenzentrum Universitat Stuttgart

The Organisation The Stuttgart University Supercomputing Centre (RUS) is the first German national supercomputing centre. In addition to serving users from Academia, RUS also maintains close co-operation with industry. The RUS director is also head of the Institute for Computer Applications. The total staff of RUS is about 100. RUS has a record in supercomputing, visualisation, networking and information services. RUS has initiated and manages the State science network 'BelWue', the German science Internet and its international connections; it leads the upgrade of BelWue into a 155 Mbps ATM network, closely integrated in the forthcoming national and international ATM and other high-speed infrastructures; it is actively participating (ESPRIT and RACE) in Framework Programme - acting as a multimedia national support centre for Germany. As a supercomputing centre, an industry partner and a member of Stuttgart University, RUS develops and applies multimedia techniques for collaboration, teaching and support at large scale. It is central to many national European and transatlantic links.

Contribution to the Project Under WP 4, RUS will continue its work on shared Workspace TeleDraw (TD) with special emphasis on generic multicast and application specific scaleable reliability support. Under WP 5, it will contribute to the deployment of a 'QoS infrastructures`, participating (in co-operation with DFN) in setting up and running of related trials. In the same context, it will extend our NeTraMet monitoring activity to the study of flows and possibly RSVP bringing in consider both WWW-based interfaces, and the use of the HP OpenView tools. In the context of WP7, RUS will bring into MECCANO a number of user communities outline in Section 3. Since many of these activities have additional funding

from the DFN; it is under their funding that we will support other projects in WP9, collaborating with the DFN Multimedia Support Zentrum at Dresden U to support DFN-provided user communities.

Team Leader Paul Christ is head of the department 'Communications Systems and BelWue-Development' of RUS, which has pioneered high-speed networking locally, nationally and internationally. He is responsible for BelWue's upgrade to 622 Mbps ATM - including the corresponding transitions into the national and international ATM projects. Under the ATHOC project, he participates in a major cable trial - which has MECCANO implications.

Role and Services of Associated Partners Most of the RUS activities will be carried out directly by RUS. However, three activities will be carried out by partners associated with RUS, whose work has been mainly supported under the DFN initiatives. As part of WP2, Freiburg U. will integrate in and develop further the whiteboard started under the DFN project "Whiteboard for Tele-teaching and Authoring on the fly". In addition, U of Erlangen-Nurenberg will provide a technique to integrate real-time scaleable video services into existing WWW Browsers and Mbone tools. As a validation exercise in WP7, Univ. Mannheim will send real lectures from the University to students' homes via ISDN using scaleable video technology - in a manner compatible with the MERCI/MECCANO Tools.

5.6.8 TELES

The Organisation TELES with a 1996 turnover of 32 MECU and 275 employees is a leading-edge supplier of information technology, with a "centre of excellence" in the ISDN/PC area, especially in multimedia technology. TELES is the current ISDN/PC-market leader, shipping up to 50K.month with about 25% for exports, and 50% of its sales in R&D for the PC mass market. It has the broadest and the most innovative range of ISDN products world-wide - PC boards and boxes, highly sophisticated and scaleable PBXs, videoconferencing systems and media servers. In addition to R&D for its own products, TELES also performs contract R&D for major international companies. TELES has had long in working on CEC pan-European projects and is also active in international industry consortia and in standards bodies such as IMTC, DAVIC, ITU, IETF, EIUF, NIUF.

Contribution to the Project In WP4, TELES will support the PCs under Microsoft OSs to support multimedia streams efficiently, and will integrate in Microsoft application developments like Net Meeting. They will put considerable effort in platform management and monitoring - partly in the context of network components of WP5 and partly in the gateways of WP6. They will continue current H323-Mbone gateway activity, including transcoding, announcement and security. Since their components are an integral part of WP8 and outside projects, they will expect to devote a considerable effort on the user support in WP9.

Team Leader Hans-Peter Scharf is a manager of Research and Development projects at TELES - both EC and National. He has been responsible for the management of TELES' involvement in MERCI and of several other projects.

Role and Services of Associated Partners A significant part of the gateway development activity, and some of the validation, will be carried out at the University of Bremen.

5.7 The Contributions of the Sponsoring Partners

5.7.1 EUTELSAT

The Organisation EUTELSAT was created in 1977 and formally established in 1985 as an inter-governmental organisation with the mission of operating satellites for fixed and mobile communications in Europe. Eutelsat member states now stands at 45.

Eutelsat shareholders (the Signatories) are public and private telecommunication operators or other bodies designated by their governments.

Eutelsat operates under an inter-governmental treaty, the Convention, which was amended in 1996 by Eutelsat's Assembly of Parties (i.e. the government of each member country) to permit the designation of more than one Signatory per member country, which means that new entities such as broadcasters and private telecom operators may invest in Eutelsat's satellite system.

There are currently eight Eutelsat satellites in orbit carrying telephony, business communications (VSAT) and, most importantly, analogue and digital TV programmes for DTH and CATV with a penetration of over 60 million homes. Seven additional Eutelsat satellites are going to be launched before the end of the millenium.

Contribution to the Project Eutelsat will provide 200 hours of equivalent 2 Mbit/s unidirectional capacity (receivable by dishes smaller than 1.2m over a large number of European and Mediterranean countries) at an estimated equivalent cost of 40 KECU. It will also loan *receive DVB PC-cards*, valued at 10 KECU, for 20 receiving sites and provide satellite transmission engineering support of1 man-month.

Team Leader Huu Nghia PHAM was born in Vietnam, Saigon and graduated in 1981, from Ecole Nationale Supérieure des Télécommunications (Sup'Telecom) de Bretagne (or ENSTBr), Brest, France.

After two years with Thomson-CSF, he joined EUTELSAT in 1983 where he has been involved in all their advanced digital technology projects Since 1996, he has lead the EUTELSAT-INRIA initiative for harmoniously integrating Satellite into the Internet. This work has led to the creation of the UDLR WG in the IETF. Since 1993, he has represented EUTELSAT in the Technical Working Groups of the DVB (Digital Video Broadcasting), in particular its standard-making Technical Module (TM). From 1992 to 1994, he coordinated the RACE-II FLASH-TV (Flexible and Advanced Satellite system for HDTV) project which was selected by the Commission as part of the showcase during the G-7 Ministers meeting on the Global Information Infrastructure, Brussels, February 1995. Previous assignments include: Low-rate speech encoding for DCME (Digital Circuit Multiplication Equipment), Transmission aspects for EMS payload (digital mobile telephony), EUREKA 95/PG10 (bit rate compression for HDMAC contribution links) and Participation in ISO/MPEG2 work.

5.7.2 SHELL RESEARCH

The Organisation Shell undertakes research and development at fifteen research centres world-wide. Two of the main centres are Thornton near Chester, UK, which is the main Oil Products laboratory and is primarily focused on research into fuels and lubricants, and Amsterdam in The Netherlands, which supports the Chemicals business and focuses on process R&D. Both laboratories employ staff from many disciplines, including Chemists, Physicists, Engineers, Mathematicians and Materials Scientists. Substantial research effort is also carried out for Shell by Extra-Mural Research (EMR) partners at UK and European Universities.

Shell's objectives in the development and use of MERCI technology are to investigate the feasibility of improving the effectiveness of such EMR arrangements in support of Shell's business, with a view to enabling greater use of EMR. Secondary objectives address the desire to exploit such technology within the Company to improve communication and access to scarce skills across the globe. We plan to introduce MERCI technology to staff working on EMR projects, and to evaluate the results.

Contribution to the Project Shell's contribution to MERCI is intended to offer access to specific business-oriented research team activities where the teams are distributed between two Shell laboratories (Thornton and Amsterdam) and specific EMR partners. By these means it is anticipated that Shell will assist the project to expand the effective application of the technology to the business world. Specifically, it is hoped that Shell will be able to assist the MECCANO project in developing tools that are of direct value to research scientists working in a business environment. User aspects, such as usability, training, and effectiveness of specific software tools, and technical issues, such as effect of degradation of communications, security, logging, and the storing and retrieval of information, etc. will be able to be evaluated. In addition, the actions necessary to brief senior management about the availability of such tools and their effective use will be tested.

Team Leader The Shell team leader will be Eur. Ing. Stuart Gillies who is located at the Amsterdam laboratory.

Part C - Project Resources and Deliverables

C.1 Work-Package List

Project N°	Acronym	Sheet
	MECCANO	1 of 1

Work-Package ID (1)	Title	Lead Contractor ID (2)	pms (3)	Start Month (4)	End Month (5)	Phase (6)	Deliv-erable IDs (7)
WP1	Management	C1	30	1	24		R1
WP2	Activity with External Groups	C1	15	1	24		R2
WP3	Systems Architecture and Demonstrators	C4	16	1	24		D3.1 D3.2 D3.3
WP4	MM Conference Components	C5	74	1	24		D4.1 D4.2 D4.3
WP5	Network Support	C7	50	1	24		R5.1 R5.2
WP6	Gateways and Relay	C8	19	1	24		D6.1 D6.2
WP7	Announcement, Management and Control	C1	19	1	24		D7.1 D7.2
WP8	Consolidation of Applications	C6	48	4	24		D8.1 D8.2
WP9	Support for Validation Sites	C1	23	7	24		R9.1 R9.2
	TOTAL		294				

Notes
(1) ID of the form: 'WP*n*' where *n* = 01- ~10
(2) Responsible contractor for the work (see form A.2)
(3) pms = Total direct labour in person months (for AC partners both additional labour and self financed full time staff)
(4) Of the form: *'n'* where *n* = 01 - ~ 36 i.e. project month **not** calendar months
(5) Ref. Work Programme Project Life-Cycle: 1 = 'Identify User needs' : 2 = 'Functional Specification' : 3 = 'Demonstrator build' : 4a = 'Validation - *verification'* : 4b = 'Validation - *demonstration' :* 5 = Exploitation Plan
(6) ID of the form 'D*n*.m' where *n* = *n* in 'WP*n*' : m = deliverable number for that work package i.e. m = 1 - <total number of deliverables in WP*n*>

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	1 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP1	Management	Commencement date

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
C1	Professor	1	2	2				4
C1	Project Manager	2	11	11				22
C1	Staff Member	3	2	2				4
	TOTAL[5]		15	15				30
	TOTAL to A2, S1[6]		15	15				30
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

7 The efforts put into the work package by permanent staff for contrcators using the additional cost model and for sponsoring partners

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	2 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP2	Activity with External Groups	Commencement date

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
C1	Project Manager	2	1	1				2
C1	Staff member	3	2	2				4
C5								3
C8								3
A8.1								3
	TOTAL[5]							15
	TOTAL to A2, S1[6]							15
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

7 The efforts put into the work package by permanent staff for contrcators using the additional cost model and for sponsoring partners

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	3 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP3	Systems Architecture and Demonstrators	Commencement date

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
C1	Staff member	3	6					6
C4			8					8
C6			2					2
	TOTAL[5]		16					16
	TOTAL to A2, S1[6]		16					16
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

7 The efforts put into the work package by permanent staff for contrcators using the additional cost model and for sponsoring partners

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	4 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP4	MM Conference components	Commencement date

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
C1	Staff member	3	5	3				8
C2	SC	A	17	7				24
C5								12
C6								2
A6.1								6
C7								6
A7.1								6
A7.2								6
C8								4
	TOTAL[5]							74
	TOTAL to A2, S1[6]							74
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

7 The efforts put into the work package by permanent staff for contractors using the additional cost model and for sponsoring partners

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	5 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP5	Network Support	Commencement date

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
C1	Staff member	3	4	4				8
C2	SC	A	3	6				9
C3								18
C5								9
C6								2
A6.1								2
C7								2
	TOTAL[5]							50
	TOTAL to A2, S1[6]							50
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

7 The efforts put into the work package by permanent staff for contrcators using the additional cost model and for sponsoring partners

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	6 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP6	Gateways and Relays	Commencement date

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
C1	Staff member	3	4.5	3.5				8
C8								6
A8.1								5
	TOTAL[5]							19
	TOTAL to A2, S1[6]							19
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

7 The efforts put into the work package by permanent staff for contractors using the additional cost model and for sponsoring partners

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	7 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP7	Announcement, Management and Control	Commencement date

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
C1	Staff member	3	3.5	2.5				6
C2	SC	A	4	5				9
C6								2
A6.1								2
	TOTAL[5]							19
	TOTAL to A2, S1[6]							19
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

7 The efforts put into the work package by permanent staff for contractors using the additional cost model and for sponsoring partners

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	8 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP8	Consolidation of Applications	Month 4

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
A1.1								6
C2	SC	A	5	7				12
C3								12
C4								4
C6								4
C7								4
A7.3								6
	TOTAL[5]							48
	TOTAL to A2, S1[6]							48
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

7 The efforts put into the work package by permanent staff for contractors using the additional cost model and for sponsoring partners

C.2 Work-Package Resources

Project N°	Acronym	Sheet
	MECCANO	9 of 9

Work-Package ID[1]	Title	Starting Event[2]
WP9	Support for Validation Sites	Month 7

Participants Code	Labour category[3]	Rate Code	Yr 1 pms[4]	Yr 2 pms	Yr 3 pms	Yr 4 pms	Yr 5 pms	Total pms
C1	Staff member	3	2.5	3.5				6
C2								6
C3								6
A6.1								2
C8								3
	TOTAL[5]							23
	TOTAL to A2, S1[6]							23
	TOTAL to S9[7]							

1 ID of the form: 'WP*n*' where *n* = 01- ~10

2 Either a project date, e.g. Commencement Date + 3 months - or Deliverable 01.1

3 As in form reference S 2

4 pms = direct labour in person months (for contractors using Additional Cost Model, both additional and self financed labour).

5 Total direct labour both self-financed and additional for contractors using the additional cost model

6 Total of direct labour for contractors using the full cost model and the additional direct labour for contractors using the additional cost model. Total to be transferred to forms A2 and S1s.

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C.3 Deliverables List

Project N°	Acronym	Sheet
	MECCANO	1 of 2

Deliverable ID (1)	Title	Delivery date (2)	Nature (3)	Dis-semination Level (4)	Type PD or X (5)
R1	All required Management Reports		RE	RP	PD
R2	Publications and publicity		RE	PU	X
R3.1	Architecture of the MECCANO tools and other components	12	RE	PU	PD
R3.2	Preliminary report on the usability of the MECCANO tools and other components	12	RE	RP	X
R3.3	Usability of the MECCANO tools and other components	24	RE	PU	PD
D4.1	Initial release of tools to be used in MECCANO	3	TO	PU	PD
D4.2	1st major release of MECCANO tools	10	TO	PU	PD
D4.3	2nd major release of MECCANO tools	22	TO	PU	PD
R5.1	Support for network technologies in the MECCANO tools	22	RE	PU	PD
R5.2	Performance characteristics of the MECCANO system and their effect on system parameters.	22	RE	PU	PD

Notes
(1) ID of the form 'D*n*.m' where *n* = *n* in 'WP*n*' : n = number of the work package and m = deliverable number for that work package i.e. m = 1 - <total number of deliverables in WP*n*> - in chronological order down the page
(2) of the form: '*n*' where *n* = 01 - ~ 36 i.e. project **not** calendar months
(3) PR = Prototype (Demonstrator) : RE = Report : SP = Specification : TO = Tool : OT = Other.
PR, TO & OT will have an associated document for contractual purposes. All deliverables will be accompanied by a 'peer' review report
(4) PU = Public Usage of the result : LI = limited to programme participants : RP = restricted to project participants (Public documents shall be of a professional standard in a form suitable for publication)
(5) PD = A 'Project deliverable' as defined in Article 4 of the contract : X = Submitted on request deliverables where appropriate available for review or dissemination purposes limited to participants of the TELEMATICS APPLICATIONS Programme

3 Deliverables List

Project N°	Acronym	Sheet
	MECCANO	2 of 2

Deliverable ID (1)	Title	Delivery date (2)	Nature (3)	Dis-semination Level (4)	Type PD or X (5)
D6.1	The gateways and relays in MECCANO Release 1.	10	TO	PU	PD
D6.2	The gateways and relays in MECCANO Release 2.	22	TO	PU	PD
D7.1	The Session Announcement and Management Facilities in MECCANO Release 1.	10	TO	PU	PD
D7.2	The Session Announcement and Management Facilities in MECCANO Release 2.	22	TO	PU	PD
R8.1	Description of, and conclusions from, the seminars in Year 1.	10	RE	PU	PD
R8.2	Description of, and conclusions from, the seminars in Year 2.	22	RE	PU	PD
R9.1	The support provided to validation projects during Year 1.	12	RE	PU	PD
R9.2	The support provided to validation projects during Year 2.	24	RE	PU	PD

Notes
(1) ID of the form 'D*n*.m' where *n* = *n* in 'WP*n*' : n = number of the work package and m = deliverable number for that work package i.e. m = 1 - <total number of deliverables in WP*n*> - in chronological order down the page
(2) of the form: '*n*' where *n* = 01 - ~ 36 i.e. project **not** calendar months
(3) PR = Prototype (Demonstrator) : RE = Report : SP = Specification : TO = Tool : OT = Other.
PR, TO & OT will have an associated document for contractual purposes. All deliverables will be accompanied by a 'peer' review report
(4) PU = Public Usage of the result: LI = limited to programme participants: RP = restricted to project participants (Public documents shall be of a professional standard in a form suitable for publication)
(5) PD = A 'Project deliverable' as defined in Article 4 of the contract: X = Submitted on request deliverables where appropriate available for review or dissemination purposes limited to participants of the TELEMATICS APPLICATIONS Programme

C.4 Equipment List

Project N°	Acronym	Sheet
	MECCANO	1 of 1

Description	Month of purchase (1)	Cost ECU	Depre-ciation period (2)	% alloc. to project (2)	Resp. contractor ID (3)	Amount to be allowed ECU (2)
					Total	

Notes
(1) of the form: '*n*' where *n* = 01 - ~ 36 i.e. project month **not** calendar months
(2) For allowable costs calculation see Article 19.2 of Annex II
(3) Responsible contractor for purchasing the equipment

C.5 Other Significant Specific Project Costs

Project N°	Acronym	Sheet
	MECCANO	1 of 1

Description	Resp. contractor ID (1)	Amount to be allowed ECU (2)
TOTAL:		

Notes
(1) Responsible contractor for purchasing the specific items
(2) For allowable costs see Article 19.6 of Annex II