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PROGRAMME DE R & D SUR LES TECHNOLOGIES DE POINTE DANS LE DOMAINE DES TELECOMMUNICATIONS EN EUROPE (RACE)

Rapport final concernant la Phase 1 (1988-1992) du programme décennal RACE

(présenté par la Commission
conformément à l'article 6 paragraphe 3
et à l'article 9 de la décision du Conseil 88/28/CEE
relative au programme RACE)

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Synthèse

Les télécommunications sous-tendent aujourd'hui la plupart des activités industrielles et sont essentielles au bon fonctionnement du secteur des services en Europe. La qualité des télécommunications s'avère donc déterminante pour la compétitivité des entreprises. La disparition des entraves aux échanges liée à l'achèvement de l'Espace économique européen ne manquera pas d'ouvrir de nouvelles perspectives et de créer de nouvelles pressions sur le plan de la concurrence, tandis que l'importance croissante des télécommunications au sein du commerce international modifie d'ores et déjà le mode de fonctionnement des entreprises. La prospérité de l'Europe au cours des années 1990 sera largement conditionnée par la qualité de ses communications.

Les secteurs des télécommunications, de l'informatique et de la radiodiffusion représentent aujourd'hui un chiffre d'affaires de plus de 500 millions d'écus dans le monde. En l'an 2000, le secteur des télécommunications sera le troisième d'Europe après celui de l'alimentation et des boissons, et celui des produits chimiques. Les infrastructures de télécommunications auront une importance économique plus grande que celle des transports physiques. La maîtrise des nouvelles technologies est donc devenue indispensable pour assurer la croissance et la création d'emplois. Plus de 50% des emplois sont aujourd'hui liés à l'utilisation de systèmes informatiques et télématiques, et c'est dans le secteur de l'information que la croissance de l'emploi est la plus forte.

La demande de services est en rapide évolution. Les entreprises réclament davantage de flexibilité, une capacité accrue de transmission rapide de données et d'images, et des tarifs plus concurrentiels. La progression des services à valeur ajoutée sur les réseaux numériques à grande vitesse est de l'ordre de 40% par an avec 40 millions de raccordements en 1987, 180 millions en 1989 et plus de 300 millions en 1991. Dès l'an 2000, près de 30% des recettes des prestataires de télécommunications pourraient être associés à ces services à valeur ajoutée. Au cours des quelques prochaines années, la plupart des grandes entreprises européennes voudront disposer de communications rapides de données entre leurs départements d'étude, de fabrication, de gestion et de vente au détail. Les Etats-Unis enregistrent déjà une très forte demande de ce type de service: la plupart des grands instituts de recherche de ce pays ont accès à des transmissions ultra-rapides de données tandis que 60% des 500 premières entreprises utilisent des liaisons numériques à haute vitesse.

C'est, compte tenu de ces tendances, que la "phase de définition" du programme RACE a été lancée en 1985, à l'initiative des ministres européens de l'Industrie. Cette phase a confirmé le bien-fondé et la nécessité d'un cadre européen de collaboration en matière de R&D. La première phase d'un programme RACE (programme de recherche et développement sur les technologies de pointe dans le domaine des télécommunications en Europe) de 10 ans a fait l'objet d'une Décision du Conseil des ministres en décembre 1987. Cette décision fixe l'orientation stratégique ainsi que le budget pour une période initiale de cinq ans, jusqu'en 1992, dans le cadre du deuxième programme-cadre communautaire pour la recherche et le développement technologique. Son objectif était de "promouvoir la compétitivité de l'industrie des télécommunications, des exploitants et des prestataires de services de la Communauté afin de fournir aux utilisateurs finals, au coût le plus bas possible et dans un délai minimal, les services qui soutiendront la compétitivité de l'économie européenne et contribueront au maintien et à la création d'emplois dans la Communauté".

L'Article 9 de la décision exige "*qu'à l'issue de la période initiale de cinq ans, la Commission, après consultation du comité de gestion du programme, transmette aux Etats membres et au Parlement européen un rapport sur l'exécution et les résultats du programme*". C'est ce rapport qui est présenté ici. Il met à jour le réexamen prévu après 30 mois et effectué en 1990.

Les principaux résultats

Grâce aux travaux effectués au cours des cinq premières années du programme RACE, l'Europe s'est placée en tête du développement conceptuel de réseaux et services de communications avancés. Pour la première fois, les exploitants des télécommunications, l'industrie de la télématique et les utilisateurs de pointe dans la plupart des grands secteurs d'application ont mis leur potentiel en commun en vue de développer les technologies de communications avancées requises pour la mise en place de services peu coûteux et innovateurs. Un environnement sans précédent a été créé dans le cadre du programme RACE pour concerter les efforts nécessaires à cette fin.

Le programme RACE a accéléré l'harmonisation de l'infrastructure européenne des télécommunications tandis que l'élaboration de spécifications fonctionnelles communes mettait en place le "schéma directeur" des communications intégrées à large bande (IBC). Le programme a favorisé une collaboration étroite entre les régions centrales et périphériques, contribuant ainsi à la cohésion économique et sociale de la Communauté. Sur le plan du développement technologique, la mise au point du mode de transfert asynchrone pour la commutation à grande vitesse des communications numériques place l'industrie européenne en tête de la concurrence internationale; les recherches en matière de gestion de réseaux ont conféré une notoriété internationale aux systèmes européens dans ce domaine; les travaux consacrés à la télévision et la vidéo numériques ont abouti à l'établissement de normes internationales de codage, à la mise au point de systèmes de distribution de signaux multigigabits ainsi que de spécifications pour l'enregistrement vidéo numérique. En ce qui concerne la normalisation, le programme a transmis 596 projets de spécifications aux organismes européens et internationaux de normalisation - ETSI, CCITT et CCIR (voir Annexe II). Une synergie très positive s'est développée avec les activités EUREKA, et plus de 1.700 documents scientifiques et techniques ont été largement diffusés (voir Annexe III).

Les résultats du programme RACE confèrent aux organisations européennes de télécommunications ainsi qu'aux exploitants européens de services un avantage compétitif stratégique. Ils ont permis de sensibiliser très largement l'industrie à l'égard des possibilités offertes par le marché qui accompagneront la mise en oeuvre de la prochaine génération des services de télécommunications en Europe. Ils ont démontré les avantages d'une collaboration à l'échelle européenne en matière de R&D préconcurrentielle, et ont fortement accéléré la normalisation européenne dans le secteur des télécommunications.

La gestion et l'évaluation du programme RACE

La spécificité de RACE réside dans le fait qu'il est le seul programme du deuxième programme-cadre de la Communauté à avoir été géré comme un ensemble de tâches totalement intégrées. Chacun des projets a, en effet, couvert une ou plusieurs séries de tâches de R&D contribuant toutes à un seul et même objectif:

"L'introduction de communications intégrées à large bande (IBC) compte tenu des réseaux numériques à intégration de services (RNIS) et des stratégies d'introduction nationales en vue de la mise en place de services à l'échelle communautaire d'ici à 1995".

Le programme de travail RACE, adopté en 1987, fixe le cadre de travail de chacun des projets ainsi que leur interaction, laquelle a été renforcée par une "concertation" régulière entre les projets (discussions techniques à un intervalle de 6 à 8 semaines auxquelles tous les

projets étaient tenus de participer). Les résultats techniques des projets ont été consolidés par un projet central chargé de développer des stratégies de mise en oeuvre des IBC, des modèles de référence fonctionnels, des fonctions d'utilisation et des configurations de référence. Un second projet clé, chargé de veiller à la formation d'un consensus et à l'élaboration de spécifications fonctionnelles communes, a assuré une interaction importante et cohérente avec les organismes européens de normalisation.

L'évaluation des travaux couverts par le programme a confirmé le caractère particulièrement intégré de celui-ci.

Au niveau du programme, un examen critique stratégique a été effectué en 1989 en vue de mesurer les progrès accomplis dans la perspective des objectifs stratégiques et économiques de la Communauté. En 1990, "le réexamen après trente mois", prévu dans la Décision du Conseil, a informé le Conseil des ministres et le Parlement européen de l'avancement de travaux. Il a été suivi, en 1990, d'une réévaluation des nouvelles exigences en matière de R&D par un groupe indépendant réunissant des hauts responsables de l'industrie et des hauts fonctionnaires (Telecom 2000). En 1991 et au début de 1992, les travaux ont fait l'objet d'une évaluation effectuée par un groupe indépendant (1) dans le contexte d'autres grands programmes d'application des technologies de l'information et de la télématique s'inscrivant dans le deuxième programme-cadre (ESPRIT et DRIVE). Enfin, en 1992, la Commission a inclus le programme dans son rapport synthétique d'évaluation du deuxième programme-cadre (2) et le Comité de Gestion RACE a procédé à sa propre évaluation à la demande du CREST (3).

L'évolution de la recherche et du développement technologique au sein du programme s'est accompagnée d'une évaluation régulière des répercussions économiques et sociales des percées dans le domaine des communications avancées (4). La plus récente de ces évaluations a été effectuée en 1991 et publiée en 1992. L'essentiel de cette activité est aujourd'hui intégré dans la deuxième phase de RACE conformément aux dispositions de la Décision du Conseil sur le Programme spécifique "Technologies des Communications".

Les procédures de gestion adoptées par les services de la Commission dans le cadre du programme RACE ont été soumises en 1989 à une "évaluation de gestion de programme" indépendante, laquelle a largement confirmé le bien-fondé de l'approche suivie par la Commission.

Au niveau des projets, chacun a fait l'objet d'un "examen technique" effectué chaque année par des experts indépendants et spécialisés dans le domaine concerné. Le premier de ces examens techniques a eu lieu en octobre 1988, et le dernier en octobre 1992. Les conclusions de ces examens critiques annuels ont servi à la réorientation ou la cessation éventuelle des projets en question.

Les résultats de ces examens critiques montrent tous que le programme RACE a atteint ses objectifs premiers.

Les travaux entamés au titre de la première phase de RACE ont été poursuivis et élargis par des projets de R&D relevant du nouveau programme spécifique RDT consacré aux technologies des communications; cette deuxième phase de RACE s'inscrit dans le troisième programme-cadre de la Communauté et prévoit un financement communautaire partiel de la

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(1) "The report of the information and communications technologies review Board", placé sous la présidence de Mr W. Dekker, juin 1992.

(2) Communication de la Commission - Evaluation du deuxième programme-cadre de recherche et de développement technologique (SEC(92) 675 final), juin 1992.

(3) Repris à la Section 3.2.1 du présent rapport.

(4) Les rapports relatifs à ces évaluations ont été publiés et largement diffusés dans la série de rapports sur "Les Perspectives pour les Communications avancées en Europe : PACE".

R&D jusqu'en décembre 1994. Ces projets ont démarré en janvier 1992 tandis que la poursuite de certains projets de la phase 1 en 1992 assurait la continuité des travaux. Le programme continuera de contribuer de manière significative au développement économique de l'Europe et à son intégration socio-économique. Il s'accompagne d'activités nationales (5) et d'actions internationales, telles que celles de l'EURESCOM (6), qui viennent étayer l'activité communautaire tout en étant renforcées par elle. Le programme RACE offre un cadre unique de collaboration entre les exploitants de réseaux, l'industrie et les utilisateurs dans le domaine des télécommunications.

(5) Des essais de communications à large bande ont lieu en Belgique, en Allemagne, au Danemark, en France, en Irlande, au Portugal et au Royaume-Uni.

(6) Eurescom : European Institute for research and strategic studies in telecommunications GmbH.

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1. Introduction

Les télécommunications constituent le secteur le plus dynamique de l'ensemble de l'industrie européenne - et celui dont l'évolution est la plus rapide. Les services de télécommunications engendrent un chiffre d'affaires annuel supérieur à 300 milliards d'écus en Europe, tandis que les investissements en réseaux et services de télécommunications approchent les 30 milliards d'écus par an. Si les revenus restent largement liés à la téléphonie vocale, l'essentiel des investissements actuels en capitaux est orienté vers les nouvelles générations de matériel numérique capable de soutenir l'intégration des transmissions vocales, de données et d'images. En l'an 2000, 30% des revenus pourraient provenir de services à valeur ajoutée utilisant des communications avancées de données.

A l'échelle mondiale, tous les secteurs sont touchés par la convergence des technologies de l'information, de la radiodiffusion et des télécommunications. L'association entre les techniques de traitement des données et les idées novatrices en matière de télécommunications a débouché sur la mise en oeuvre des réseaux numériques à intégration de services (RNIS), lesquels ne sont toutefois que la première étape d'une rapide évolution vers une large gamme de services multimédias exigeant de nouvelles technologies, de nouveaux systèmes de gestion des réseaux et des services, et de nouveaux systèmes réglementaires. L'intégration des services, associée à la technique des fibres optiques offrant un support peu coûteux pour la transmission à grande vitesse (un million de fois plus rapide que par câbles en cuivre), constitue la base technico-économique d'une restructuration fondamentale de l'ensemble des secteurs par le truchement du concept des communications intégrées à large bande (IBC). Le développement de ce concept est l'objectif même du programme RACE.

Le présent rapport résume et illustre les résultats de la première phase du Programme RACE, prévu sur dix ans, et couvre donc la période 1988-1992.

La section 2 du rapport aborde le contexte, l'organisation et les résultats du programme. La section 3 décrit le contexte, l'organisation et les résultats des évaluations et examens critiques du programme. La section 4 est consacrée aux relations avec d'autres actions communautaires et européennes. Les résultats de la R&D effectuée lors de la première phase de RACE ont déjà été largement exploités, tant pour l'élaboration de normes, de nouveaux réseaux et de nouveaux services que comme fondement des travaux ultérieurs prévus à la phase II du programme. L'exploitation des résultats de la phase I de RACE est décrite à la section 5, et la transition vers la phase II à la section 6. Les besoins et options futurs pour les travaux au niveau européen sont décrits à la section 7.

L'Annexe I reprend les informations détaillées concernant les résultats obtenus dans le cadre des projets de R&D. Les contributions aux travaux de normalisation figurent à l'Annexe II, tandis que l'Annexe III donne la liste de toutes les publications scientifiques et techniques issues des travaux. L'Annexe IV reprend les demandes de dépôts de brevets; l'Annexe V est un glossaire des termes techniques; l'Annexe VI donne les références des décisions officielles du Conseil des ministres ainsi que des communications de la Commission. La liste des projets de R&D financés au titre de la phase I du programme RACE figure à l'Annexe VII, celle des organisations participantes à l'Annexe VIII. L'Annexe IX donne la synthèse d'une série de statistiques financières et de participation.

2. Le contexte et l'organisation du programme RACE

2.1 La R&D dans le cadre de la politique des télécommunications dans la Communauté

Le programme RACE fait partie intégrante de la politique des télécommunications de la CE. Lié à la politique de normalisation et à la politique du marché de l'information, il appuie ses travaux sur les développements en matière de TI dans le cadre d'ESPRIT, et associe pour la première fois des exploitants de réseaux de télécommunications européens, en qualité d'acteurs principaux, à une étude conjointe des technologies et des services. Abordant la question du rapport coût-performance de l'infrastructure des communications en Europe, le programme RACE a contribué au développement du marché intérieur, à la compétitivité internationale de l'industrie européenne et à la cohésion socio-économique de la Communauté.

Les principaux objectifs de la politique des télécommunications dans la Communauté sont définis dans la Résolution du Conseil de juin 1988 (1) et peuvent être résumés de la façon suivante:

- créer ou assurer l'intégration d'un réseau de dimension communautaire en se fondant sur le principe d'une totale interconnectabilité de tous les réseaux publics concernés,

- créer progressivement un marché commun ouvert des services de télécommunications,

- encourager la création de services à l'échelle européenne conformément aux exigences du marché et aux nécessités sociales,

- poursuivre le développement au niveau communautaire d'un marché ouvert pour les équipements terminaux,

- développer un marché commun permettant aux administrations des télécommunications et à d'autres prestataires de services de faire face à la concurrence dans l'égalité des chances,

- poursuivre la mise en oeuvre des mesures prises par la Communauté dans le domaine des normes communes,

- renforcer la coopération européenne à tous les niveaux, notamment dans le domaine de la recherche et du développement en matière de télécommunications,

- créer un environnement social pour le développement futur des télécommunications, et

- intégrer complètement les régions moins favorisées de la Communauté dans le marché communautaire en voie de création.

Ces objectifs constituent un cadre précis pour la définition des futures orientation des technologies, des services et des applications.

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(1) **Résolution du Conseil du 30 juin 1988 concernant le développement du marché commun des services et équipements des télécommunications d'ici à 1992; 88/C 257/1 du 1/4/88.**

2.2 Les objectifs du programme RACE

L'objectif majeur du programme RACE est de contribuer à:

"L'introduction de communications intégrées à large bande (IBC) [2] compte tenu de l'évolution des réseaux numériques à intégration de services (RNIS) et des stratégies d'introduction nationales en vue de la mise en place de services à l'échelle communautaire d'ici à 1995[3]".

Les objectifs spécifiques de la phase 1 ont été les suivants:

- promouvoir l'industrie communautaire des télécommunications;
- permettre aux exploitants de réseaux européens de rester compétitifs dans les meilleures conditions possibles;
- permettre à un nombre critique d'Etats membres de la Communauté d'introduire des services IBC commercialement viables d'ici 1995;
- offrir aux fournisseurs de services la possibilité d'améliorer le rapport coût-performance et d'introduire des services nouveaux; mettre à disposition des services nouveaux à un coût et dans un délai au moins aussi favorables que dans d'autres pays;
- aider à la création d'un marché européen unique pour tous les équipements et services de télécommunications, et
- contribuer au développement régional en permettant aux régions défavorisées de tirer pleinement profit des progrès réalisés dans le domaine des télécommunications.

Une série d'objectifs techniques sont, en outre, définis à l'Annexe I de la Décision. La contribution des projets de R&D, menés dans le cadre de RACE, à la réalisation de ces objectifs est décrite au Tableau I.

L'interprétation du concept de communications intégrées à large bande (IBC) a évolué au fur et à mesure du déroulement du programme pour répondre à l'évolution du marché et des conditions réglementaires. La définition des IBC donnée ci-après reflète le consensus établi en 1990 au sein du Comité de Gestion RACE.

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(2) "I" "Integrées" signifie non seulement "services intégrés" (au niveau de l'utilisateur et aux niveaux appropriés du réseau), mais met également l'accent sur "l'intégrité" de l'ensemble du réseau et, par conséquent, sur l'interfonctionnement adéquat de tous ses constituants essentiels, tant actuels qu'en voie de création : Téléphonie (services téléphoniques classiques), commutation par paquets, RNIS, satellites, communications mobiles, etc.

"B" "Large bande" ("Broadband") signifie non seulement la partie "haut de gamme" des services (en termes de débits binaires) mais l'ensemble des services à considérer, depuis le "haut de gamme" du RNIS (y compris sans nul doute les accès 2 Mbit/sec. et éventuellement 64 Kbit/sec. dans des domaines d'application particuliers) jusqu'aux débits requis pour l'introduction réaliste de services vidéo (interactifs et distributifs) (140 Mbit/sec., par exemple).

"C" "Communications" signifie non seulement les fonctions "classiques" de commutation/transmission/CPN (réseaux personnels de communication) mais concerne également les caractéristiques les plus avancées permettant de rendre la fourniture de services conviviale, performante et rentable.

(3) Décision du Conseil du 14 décembre 1987 concernant un programme communautaire dans le domaine des technologies des télécommunications (recherche et développement) sur les technologies de pointe dans le domaine des télécommunications en Europe (Programme RACE); 88/28/CEE, J.O. No. L 16/35 du 21/01/88.

TABLEAU 1

Objectifs techniques	Façon dont RACE aborde ces objectifs	Incidence des travaux du programme RACE
Objectifs de la Partie I: Stratégies de développement et de mise en oeuvre des IBC		
Vision commune de l'évolution des IBC et de ses implications	Etablissement d'un cadre de collaboration entre les exploitants, industriels et utilisateurs.	Approche commune de la planification des réseaux par "l'ingénierie des systèmes"
	Etudes techno- économiques stratégiques communes, tenant compte de la demande et des options technologiques.	Etudes des conditions optimales pour l'introduction des IBC.
		Identification en commun des questions techniques essentielles.
		Position cohérente de la CE dans le cadre des activités internationales externes à RACE.
Définition commune des systèmes et sous-systèmes IBC.	Mise au point d'une configuration de référence afin de définir les systèmes et sous-systèmes des réseaux de communications intégrées à large bande(IBC)	Un renforcement de la normalisation européenne.
		Accord sur une stratégie européenne commune dans le domaine des spécifications ATM.
	Adéquation des options de mise en oeuvre et des technologies.	
Principe directeur pour la spécification fonctionnelle des systèmes IBC et services intégrés.	Mise au point d'un modèle de référence fonctionnel avec une structure logique des fonctions et interfaces.	Accord sur des spécifications fonctionnelles communes.
		Accords sur les concepts et protocoles de "l'intégration du réseau".
		Accords sur les options à moyen et long terme pour l'accès client en large bande.
Identification des besoins technologiques et de R&D.	Développement en coopération d'un modèle de référence d'utilisation destiné à établir un lien entre les besoins des utilisateurs et les options techniques.	Accent et concentration de la R&D européenne sur les technologies-clés et sur les nouveaux besoins des utilisateurs.
	Evaluations communes des évolutions des technologies.	

TABLEAU 1

Objectifs techniques	Façon dont RACE aborde ces objectifs	Incidence des travaux du programme RACE
Une vision cohérente de la rentabilité des autres options possibles de mise en oeuvre.	Mise au point d'outils communs pour les évaluations technico-économiques et opérationnelles.	Des outils communs ont été mis au point pour l'analyse technico-économique, ainsi que pour la planification et la gestion de réseaux avancés.
Analyse des besoins de normalisation.	Réunions régulières avec les organismes de normalisation; coordination entre le Projet de gestion du consensus et l'Institut européen de normalisation des télécommunications (ETSI), et études en commun des besoins de normalisation résultant de l'évolution des exigences des utilisateurs à l'échelle mondiale.	596 contributions à des organismes de normalisation (Annexe II)

TABLEAU 1

Objectifs techniques	Façon dont RACE aborde ces objectifs	Incidence des travaux du programme RACE
Objectifs de la Partie II: Les technologies des IBC		
Utilisation des technologies de pointe pour une mise en oeuvre rentable des IBC.	R&D en matière de composants optiques où l'élément coût est critique, de sous-sytèmes et systèmes tant pour la transmission à large bande vers les locaux des clients que pour la commutation.	Spécification et mise au point de prototypes de connecteurs, lasers et éléments de commutation pour réseaux locaux, CPN,etc. Démonstration de prototypes et procédures de production peu coûteuse.
	Etudes des possibilités à court terme de réduction immédiate des coûts.	Mise au point de technologies de détection "directe" et "cohérenteé.
	Etudes de possibilités à moyen/long terme d'importantes économies et d'amélioration du service.	Mise au point de technologies ATM pour l'usage rentable des bandes de fréquence.
		Mise au point d'algorithmes compatibles pour la compression des débits binaires pour la TV numérique à haute définition et les services vidéo de haute qualité, ainsi que pour le développement d'un nouveau CODEC à faible coût.
Logiciel de télé-communications pour les systèmes intégrés complexes.	Mise au point d'une nouvelle architecture pour l'offre de services: une architecture service ouvert.	Mise au point d'une programmation "orientée objet" des réseaux de télé-communications. Validation de prototypes d'outils d'ingénierie intégrée du logiciel.
	Etude des techniques avancées de traitement de l'information pour les fonctions IBC.	Développement d'architectures de type TMN (Telecommunication Management Network) et de prototypes pour la gestion du trafic, la maintenance, le contrôle de qualité du service, l'administration de la clientèle et du réseau, et la sécurité des communications.

TABLEAU 1

Objectifs techniques	Façon dont RACE aborde ces objectifs	Incidence des travaux du programme RACE
	Etudes de nouvelles technologies du logiciel afin de spécifier, de concevoir, de mettre en oeuvre, de vérifier et d'assurer la maintenance des réseaux de télé-communications.	Méthodes de spécification, environnement de développement et soutien en ligne pour les réseaux de télécommunications. Instauration de concepts d'intégration pour les services IBC, et gamme de sous-ensembles, de base orientés vers l'intégration.
Progression des fonctions ergonomiques et cognitives des équipements IBC.	Etudes des questions d'utilisation du dialogue, de la répartition, de la récupération et des services intégrés, ainsi que des CPN privés.	Taxonomie pour l'ingénierie d'utilisation. Mise en oeuvre des facilités d'utilisation dans les expériences de communications avancées, et notamment pour les personnes ayant des besoins particuliers.
	Etude des questions d'utilisation pour les personnes ayant des besoins particuliers (personnes âgées et handicapés).	Amélioration de l'interaction entre les chercheurs dans le domaine de l'utilisation, les utilisateurs et des concepteurs d'équipement.
	Mise au point de cibles de conception pour l'utilisation. Intégration et évaluation des questions d'utilisation dans les applications pilotes.	Prise en charge systématique et analyse des questions communes d'utilisation dans des projets pilotes d'application.

TABLEAU 1

Objectifs techniques	Façon dont RACE aborde ces objectifs	Incidence des travaux du programme RACE
Réalisation de sous-systèmes et réseaux évolutifs	Définition et démonstration d'architectures génériques pour systèmes et sous-sytèmes IBC, y compris la réduction du débit binaire pour la vidéo.	Définition des spécifications fonctionnelles et conceptuelles pour les réseaux locaux, CPN et terminaux (multi-services, multi-médias, intégrant l'enregistrement vidéo numérique et l'affichage sur écran plat.
	Développement de concepts et de cadres pour réseaux privés d'usagers visant à répondre à des exigences domestiques et commerciales.	Démonstration d'un écran plat EL couleurs et de son programme pilote.
	Mise au point de prototypes de terminaux.	Conception de composants et sous-systèmes pour CPN domestiques et commerciaux dans un environnement ATM.
	Adaptation des systèmes permetttant une transition souple vers les IBC.	Spécifications pour systèmes intégrés, et leur validation par démonstrateurs.
	Mise au point de prototypes de systèmes intégrés comprenant les réseaux locaux, les réseaux privés d'usagers et les terminaux, inter-connectés via les interfaces homologuées.	
Objectifs de la Partie III : Développement de programmes d'application des IBC		
Développement des outils de vérification, vérification des concepts de conception, groupes fonctionnels ou protocoles.	Mise au point en commun d'outils et de procédures pour tester les éléments et sous-systèmes du réseau IBC.	Vérification des outils et des fonctions IBC aux terminaux, dans les réseaux privés d'usagers et à la commutation sur les centraux locaux et inter-urbains.
	Vérification des protocoles aux points critiques de référence IBC.	Identification des points d'accès et des protocoles pour les essais. Recommandations pour les essais de conformité des protocoles.

TABLEAU 1

Objectifs techniques	Façon dont RACE aborde ces objectifs	Incidence des travaux du programme RACE
Affinage des spécifications fonctionnelles et/ou vérification des propositions de normalisation.	Intégration des systèmes pilotes pour tester les protocoles d'inter-fonctionnement.	Spécifications des systèmes et sous-systèmes dans un environnement multi-services.
	Vérification prénormative des éléments critiques de normalisation et de spécification.	Validation des mécanismes de démonstration de l'inter-opérabilité et de la conformité aux normes.
Développement de situations expérimentales dans lesquelles les prestataires de services, les exploitants de réseau et les utilisateurs peuvent tester les produits expérimentaux IBC afin de mieux saisir le potentiel d'exploitation commerciale des IBC.	Définition des exigences pour les services futurs, en collaboration avec les utilisateurs de pointe de l'ensemble des principaux secteurs commerciaux.	Réalisation d'applications pilotes dans tous les grands secteurs : banques, assurances, médias et éditions, fabrication, soins de santé, personnes ayant des besoins particuliers, transport et distribution, utilisation expérimentale de la TVHD.
	Mise en oeuvre d'une infrastructure de tests IBC dans différents pays d'Europe Exploration des questions d'inter-connexion et d'inter-fonctionnement.	Définition des exigences et accord sur les expérimentations d'interconnexion sur banc d'essai.

2.3 La mise en oeuvre du programme

Etant donné l'évolution rapide du secteur des télécommunications en Europe, une approche en plusieurs phases a été adoptée pour la mise en oeuvre du programme RACE. Le programme a débuté en 1986 par une phase de définition [4], suivie de la phase I, objet du présent rapport et officiellement entamée en juin 1987 pour s'achever en décembre 1992.

Les travaux de la phase I ont été divisés en trois parties:

Partie I - Stratégies de mise au point et de mise en oeuvre des IBC

Les projets de la partie I ont porté sur la mise au point des spécifications fonctionnelles ainsi que sur une recherche en matière de systèmes et d'exploitation orientée vers l'élaboration de propositions de normes, de concepts et de conventions IBC conformes aux systèmes ouverts, de même que sur des travaux d'analyse destinés à assurer l'interfonctionnement des équipements et services IBC. Les résultats des projets de la partie I sont aujourd'hui dans le domaine public et constituent un apport essentiel aux travaux des organismes internationaux de normalisation.

Partie II - Technologies des IBC

Les projets de la partie II ont été axés sur le défi technique que constitue la mise en oeuvre des IBC. Ils ont largement contribué au développement des nouvelles technologies requises pour la réalisation à faible coût des équipements et services IBC.

Partie III - Intégration fonctionnelle de prénormalisation

Les projets de la partie III ont couvert les objectifs de prénormalisation liés à la réalisation d'un "environnement ouvert de vérification" permettant l'évaluation des fonctions et des concepts opérationnels. Vingt projets relevant de cette partie du programme ont porté sur des applications pilotes de communications avancées dans divers environnements commerciaux et de services. Ces projets ont testé des équipements et applications expérimentaux par rapport aux spécifications fonctionnelles du monde réel et aux propositions de normalisation issues des travaux des projets de la partie I.

La mise en oeuvre du programme RACE s'est effectuée en deux étapes. Une première série de projets a démarré en janvier 1988 et couvrait l'ingénierie des systèmes (Partie I) et les travaux technologiques (Partie II) [5]. Une deuxième série de projets, couvrant l'étude de futurs services, de l'intégration des systèmes et de la vérification (Partie III) a fait l'objet d'un appel à propositions en juillet 1988. Ces projets ont commencé leurs travaux en janvier 1989.

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(4) **Décision du Conseil du 25 juillet 1985 concernant une phase de définition d'une action communautaire dans le domaine des technologies des télécommunications - Programme de la recherche et du développement sur les technologies de pointe dans le domaine des télécommunications en Europe (RACE); 85/372/CEE; J.O. No. L210/24 du 7/8/1985.**

(5) **Communication de la Commission au Conseil et au Parlement "Vers les Télécoms de l'an 2000 - Lancement du Programme RACE" - COM(88)240 final II du 31.5.88**

Les priorités accordées à chacune des parties susmentionnées ont évolué au fur et à mesure de la sélection des projets et de la mise en oeuvre du programme. Les ressources consacrées à la partie I ont été augmentées des 11,9% prévus au départ à 18%; la Partie II est passée de 66 à 55% tandis que la part de la Partie III augmentait de 22,4 à 27% des ressources. Cette évolution témoigne d'un déplacement des priorités du développement des technologies vers celui des services et vers l'étude de la demande, ainsi que d'un l'afflux majeur de propositions portant sur des travaux inclus dans les Parties I et III du programme.

La répartition des ressources financières du programme est résumée au Tableau 2.

TABLEAU 2

RESUME DE L'UTILISATION DES RESSOURCES FINANCIERES DANS LE CADRE DE LA PHASE I DU PROGRAMME RACE

PROGRAMME	DECISION (MECU)	(%)	EFFECTIF (%)
Partie I	60	11,9	18,0
I.1 Stratégies des IBC	14	2,8	
I.2 Réalisation des IBC	28	5,5	
I.3 Utilisation des IBC	10	2,0	
I.4 Environnement opérationnel commun	8	1,6	
Partie II	332	65,7	55,0
II.1 Fonction des systèmes IBC	94	18,6	9,0
Infrastructure de programmation des IBC	49	9,7	25,0
Ingénierie pour l'utilisation	12	2,4	11,0
Evolution du réseau	177	35,0	10,0
Partie III	113	22,4	27,0
III.1 Outils de vérification	63	12,5	6,0
III.2 Applications pilotes	50	9,9	

306 sociétés, parmi lesquelles les principaux acteurs européens des télécommunications, ont participé aux 92 projets de R&D. Vingt-sept organisations de pays de l'AELE (Autriche, Finlande, Norvège, Suède et Suisse) ont également participé aux travaux.

2.4 Les principaux résultats

Le programme RACE a renforcé l'harmonisation de l'infrastructure européenne des télécommunications, processus indispensable à l'achèvement du marché unique. Les spécifications fonctionnelles communes forment le "schéma directeur" des communications intégrées à large bande en Europe. Ce résultat n'a pu être atteint que par la collaboration de l'ensemble des exploitants de réseaux, de l'industrie des télécommunications, des organismes de radiodiffusion et des grands utilisateurs de pointe: cette coopération a été la force vive du programme RACE.

En assurant une sensibilisation précoce et une capacité rapide de réaction au changement, le programme RACE a également conféré aux acteurs européens du secteur des télécommunications et des services un avantage compétitif stratégique sur un marché toujours plus international.

Les résultats obtenus par chacun des projets sont donnés à l'Annexe I du présent rapport ainsi que dans les rapports annuels de 1988, 1989, 1990, 1991 et 1992. Seuls les principaux résultats acquis dans chaque domaine sont repris ci-après.

Principaux résultats obtenus dans le cadre de la Partie I: stratégies de mise au point et de mise en oeuvre des IBC

Les travaux ont débouché sur une vision commune de l'évolution des IBC et de ses implications, sur une collaboration efficace entre les exploitants, les industriels et les utilisateurs en vue de l'établissement de spécifications fonctionnelles communes pour les IBC, et sur des études technico-économiques stratégiques communes.

D'étroites relations de travail ont été établies avec les organismes européens et internationaux de normalisation. Un groupe de coordination entre le Projet de gestion du consensus et l'ETSI (Institut européen de normalisation des télécommunications) a été créé en 1989. Les travaux consacrés au mode de transfert asynchrone (ATM) ont été une contribution directe à l'accord sur une stratégie européenne commune en la matière, ainsi qu'à l'émergence de normes internationales.

Des définitions communes ont été trouvées en ce qui concerne les systèmes et sous-systèmes IBC, tandis que des configurations de référence définissant la structure du système du réseau de communications intégrées à large bande (IBCN) étaient mises au point. Des spécifications fonctionnelles ont été adoptées pour les systèmes IBC et les services intégrés, et il existe aujourd'hui un modèle de référence fonctionnel. Celui-ci définit la structure logique des fonctions et interfaces IBC, agissant en tant qu'agence centrale pour toutes les exigences fonctionnelles concernant la mise en oeuvre. Les spécifications fonctionnelles communes ont été largement diffusées en 1990.

La définition des interfaces aux principaux points de référence a été établie pour les réseaux à large bande, de même que les exigences relatives aux composants et aux systèmes.

Un "modèle de référence d'utilisation" a été mis au point pour fournir un cadre conceptuel destiné à établir un lien entre les besoins des utilisateurs et les exigences fonctionnelles.

Des évaluations systématiques portant sur les options technologiques et économiques, y compris les communications optiques, les communications mobiles, les satellites, les CPN (réseaux privés d'usagers), les nouvelles techniques de commutations et la TVHD, ont été effectuées.

Des outils d'évaluation de la rentabilité des options alternatives de mise en oeuvre ont été mis au point: une première classe de ces outils concerne l'analyse économique et une seconde, la planification du réseau et les normes. Ces outils fournissent la base des comparaisons transnationales des options et stratégies, en fonction des caractéristiques techniques et économiques ainsi que des besoins de normalisation.

Principaux résultats obtenus dans le cadre de la Partie II: technologies des IBC

La R&D a été axée sur les composants optiques où l'élément coût est critique, sur les sous-systèmes et les systèmes pour les transmissions à large bande vers les locaux de l'abonné et la commutation afin de parvenir à des solutions rentables pour les applications dans tous les domaines importants.

Les technologies ATM ont été définies et développées en tant que moyen d'assurer une mise en oeuvre des communications à large bande qui soit à la fois souple et sans problèmes pour l'avenir. Il a été procédé à la réalisation et la comparaison des différentes options en matière d'ATM, et les spécifications des exigences pour les systèmes de commutation ATM ont été précisées.

Des techniques de codage vidéo compatibles pour la TVHD et la visiotéléphonie ont été développées, assurant une utilisation rentable des ressources en bandes de fréquence. Une simulation de l'utilisation des algorithmes pour les techniques de compression des débits binaires a été effectuée pour les services vidéo de haute qualité (TV et visio-téléphone). D'autre part, le développement d'un nouveau CODEC a d'ores et déjà eu une incidence majeure sur la normalisation et la commercialisation d'un système moins coûteux de vidéo-conférence.

Des progrès décisifs ont été accomplis en matière de systèmes de communications optiques multigigabits et de commutation photonique. Des spécifications ont été élaborées pour des systèmes, sous-systèmes et composants (connecteurs, lasers, éléments de commutation, etc), compte tenu en particulier des aspects de coût des différents domaines d'application (réseau local, CPN, etc). Des prototypes de ces composants et sous-systèmes ont été produits et ont fait l'objet de démonstrations.

En ce qui concerne les logiciels de télécommunication pour les systèmes intégrés complexes, les résultats suivants ont été acquis: mise au point de modèles orientés objet; élaboration d'architectures et de prototypes pour la gestion du trafic, la maintenance, l'administration de la clientèle et du réseau; définition de méthodes de spécification et d'un "environnement de développement" pour le soutien en ligne des systèmes de télécommunication. Une architecture pour la sécurité des communications a également été définie.

Dans le domaine de la recherche ergonomique et cognitive, une taxonomie pour l'ingénierie d'utilisation a été établie tandis qu'étaient définies les exigences en matière d'ingénierie d'utilisation dans les communications avancées, y compris en ce qui concerne les personnes ayant des besoins particuliers.

Des architectures génériques ainsi que des techniques et technologies appropriées pour les systèmes et sous-systèmes IBC, y compris la réduction du débit binaire pour la vidéo, ont été développées. Elles servent de cadre pour répondre aux exigences domestiques, commerciales et autres dans toute une série d'applications.

Divers types de terminaux intégrant les écrans plats ont fait l'objet d'essais et d'une adaptation aux services IBC. Des services intégrés (comprenant les réseaux locaux, les réseaux privés d'usagers et les terminaux, interconnectés via les interfaces homologuées aux points de référence S et T) ont été utilisés pour la validation des spécifications fonctionnelles et des technologies.

La recherche sur les "communications mobiles" a permis de mettre en place un cadre conceptuel pour la troisième génération de communications radio-cellulaires. Elle a abouti à la définition d'un UMTS (Système de télécommunications mobiles universelles) qui pourront répondre dès le milieu des années 90 à la forte demande du marché européen.
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Principaux résultats obtenus dans le cadre de la Partie III: développement de programmes d'application des IBC

Ces travaux ont essentiellement porté sur la mise au point d'outils de vérification, ainsi que sur la vérification des concepts de conception, groupes fonctionnels ou protocoles. Des terminaux, des réseaux privés d'usagers, des systèmes d'accès clientèle, la commutation (sur les centraux locaux et inter-urbains) et des systèmes de transmission ont été soumis à des procédures d'essai, mises au point en collaboration par des ingénieurs systèmes et des concepteurs d'outils d'essai.

Les applications pilotes des IBC ont impliqué les prestataires de services, les exploitants de réseau et les utilisateurs de pointe afin d'accélérer la compréhension des caractéristiques de l'exploitation commerciale des IBC. Des applications pilotes ont été réalisées dans tous les grands secteurs: la banque et la finance, les assurances, les médias et les éditions, la fabrication, les soins de santé, les personnes ayant des besoins particuliers, les transports et la distribution, et l'utilisation expérimentale de la TVHD. Plus de 100 utilisateuurs de pointe y ont participé.

La mise en oeuvre de la partie III ainsi que certains travaux relevant des parties I et II ont fait apparaître la nécessité d'une infrastructure banc d'essai à l'échelon européen. Les principales administrations européennes des PTT ont présenté en 1989 une proposition de réseau préliminaire et expérimental à large bande. Cette proposition s'appuyait sur un accord pour la mise en oeuvre d'EBIT (essai européen d'interconnexion à large bande) - commutation à 2 Mb/s progressant vers des connexions transnationales à 140 Mb/s. Les principaux exploitants de réseau concernés ont signé un mémorandum d'accord, tandis qu'une équipe multinationale a été créée pour soutenir et conseiller les applications pilotes en matière d'exigences au niveau du réseau et du logiciel afin d'assurer l'interfonctionnement des systèmes des utilisateurs finaux. Ce projet d'exploitation et de soutien a permis d'orienter, au sein de RACE, les diverses "applications pilotes". Toutefois, étant donné la difficulté d'établir des liaisons transnationales rentables à des fins de recherche, la plupart de ces applications se sont limitées jusqu'ici à des expérimentations sur bancs d'essai nationaux. Ce n'est qu'aujourd'hui, en 1993 et 1994, que - grâce à la possibilité d'une utilisation expérimentale des systèmes ATM - un essai transeuropéen à large bande, avec largeur de bande variable, devient une option rentable.

Il n'en reste pas moins que les applications pilotes ont rempli leur mission, à savoir l'intégration d'informations provenant d'une utilisation en environnement réel dans le développement de la technologie et l'élaboration des spécifications.

2.5 La participation des PME

En dépit du coût élevé de la R&D dans le domaine des télécommunications avancées, la première phase de RACE a donné lieu à une forte participation de petites et moyennes entreprises (PME). Elles ont, en effet, représenté 28% des participations aux projets RACE, soit un niveau nettement supérieur aux 16,5% enregistrés pour l'ensemble du deuxième programme-cadre [6]. De petites organisations, qu'il s'agisse d'entreprises ou d'organismes de recherche, ont pris part à plus de 60% des projets.

2.6 La contribution à la cohésion économique et sociale

En étudiant et en élaborant des stratégies pour l'introduction des IBC dans toutes les régions de la CE, y compris les régions moins favorisées, le programme a ouvert la voie vers la mise en place des réseaux transeuropéens de communications à large bande prévus au Chapitre XII du Traité sur l'Union européenne. Une attention particulière a été accordée à la nécessité de relier les régions insulaires, enclavées et périphériques aux régions centrales de la Communauté.

Un nombre important de mesures d'accompagnement, d'ateliers, de séminaires, et de cours d'été ont permis de veiller à ce que les résultats de la R&D soient accessibles aux chercheurs et ingénieurs de toutes les régions de la Communauté européenne, et un effort particulier a été consenti en vue de l'organisation d'ateliers et de séminaires dans les régions moins favorisées. La liste complète de ces activités est reprise à l'Annexe I.

53 projets (60%) ont impliqué des organisations appartenant à des régions moins favorisées de la Communauté et ont contribué, par cette participation même, au transfert de certaines technologies et compétences vers ces régions.

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(6) **Evaluation du deuxième programme-cadre de recherche et de développement technique : Rapport du CREST au Conseil, septembre 1992 - CREST, 1212/1/92.**

3. Les évaluations et examens critiques du programme RACE

3.1 L'évaluation: un processus permanent

Vu l'évolution rapide des technologies et services de télécommunications, l'évaluation a été envisagée comme un processus permanent tout au long de la préparation, de la mise en oeuvre et de l'exécution du programme. Il s'agit également d'un processus touchant tous les niveaux, à savoir l'orientation stratégique du programme et sa gestion opérationnelle, ainsi que la direction technique de chacun des projets.

L'évaluation a débuté avec l'étroite collaboration des acteurs des télécommunications lors de la planification du programme et de la mise au point du programme de travail. La poursuite de cette collaboration avec l'industrie et les exploitants des télécommunications a permis la mise à jour annuelle du programme de travail global comme de celui de chacun des projets. Les réunions régulières ("réunions de concertation") entre les consortia constituant le programme assurent, en outre, un processus permanent et informel de suivi des progrès et de réorientation éventuelle des projets. La cohérence des résultats est assurée par le "Projet de gestion du consensus", lequel a établi d'étroites relations avec les organismes européens de normalisation.

En 1990, le Conseil des ministres et le Parlement européen ont été informés de l'avancement des travaux par le "réexamen après 30 mois" prévu dans la Décision du Conseil (7).

Le présent rapport final a été rédigé conformément à l'article 9 de la décision qui stipule qu'à l'issue de la période initiale de cinq ans du programme, *"la Commission, après consultation du comité de gestion du programme, transmettra aux Etats membres et au Parlement européen un rapport sur l'exécution et les résultats du programme"*. Il met à jour et remplace le réexamen après trente mois présenté en 1990.

En vertu de l'article 6 paragraphe 4 troisième tiret, la Commission a transmis ce rapport au comité de gestion pour avis favorable.

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(7) Le rapport fait suite à l'article 9 de la Décision du Conseil qui précise que le programme est réexaminé après 30 mois, sur la base d'une évaluation des résultats obtenus, en fonction des objectifs précis énoncés à l'annexe II de la décision. La Commission informe le Conseil et le Parlement européen des résultats de ce réexamen.

3.2 Les examens critiques et les évaluations du programme

Les travaux sur les communications intégrées à large bande (IBC) dans le cadre de RACE ont été périodiquement ajustés pour répondre à l'évolution rapide des conditions technico-économiques et des possibilités offertes par les services. Un examen critique à deux volets a donc été effectué chaque année au sein du programme:

- **Les aspects stratégiques** : évaluation des performances de RACE dans son ensemble, eu égard aux objectifs stratégiques et politiques de la Communauté dans un contexte international.

- **Les aspects techniques** : évaluation des performances des projets RACE, eu égard aux objectifs de RACE.

Il a été procédé, en outre, à un examen critique de la **gestion du programme** fournissant une évaluation indépendante de la performance des services de la Commission dans l'exercice de leur responsabilité de gestion du programme.

3.2.1 Evaluations stratégiques et évaluations du programme

Un examen critique stratégique indépendant a été effectué en 1989 afin d'évaluer les travaux par rapport aux objectifs stratégiques et politiques de la Communauté dans une perspective internationale. Les principales conclusions ont été les suivantes:

- L'objectif fondamental de RACE est resté valable: le développement des IBC est approprié et nécessaire pour l'Europe, et la cible 1995 correspond aux besoins et à l'évolution à l'échelle mondiale.

- La pondération des efforts de RACE dans les différents domaines couverts est adéquate.

Le Groupe d'examen critique a également recommandé qu'au cours de la phase suivante, un effort accru soit fait pour les installations des abonnés, les applications mobiles, la TVHD numérique ainsi que la vérification et les essais, l'ATM (mode de transfert asynchrone) devant être considéré comme une technologie clé pour le réseau.

En vertu du principe de la subsidiarité, le Groupe d'examen critique a également insisté sur la nécessité pour les administrations nationales et les acteurs des télécommunications d'agir en dehors du programme RACE afin de veiller à ce que les résultats obtenus en R&D débouchent effectivement sur une mise en oeuvre des IBC. Ces recommandations sont reprises au Tableau 4.

Certaines de ces recommandations ont eu une suite concrète: la recommandation demandant que les administrations des télécommunications élaborent un mémorandum d'accord en vue d'une collaboration étroite au niveau de leurs liaisons et opérations intra-européennes à longue distance a été intégrée dans le mémorandum d'accord METRAN ainsi que dans l'instauration des accords GEN et la création d'EURESCOM (Institut européen de recherche et d'études statistiques en télécommunications); le champ d'activité couvert par la R&D a été étendu, les efforts de normalisation dans le domaine de l'ATM ont été multipliés, et une mise en oeuvre expérimentale de l'ATM est en cours. D'autres recommandations n'ont toutefois pas été suivies dans les délais proposés: l'environnement réglementaire européen n'a pas permis la convergence d'intérêt des administrations des télécommunications, de la radiodiffusion et de la télédistribution telle qu'elle avait été envisagée, et le développement de la TVHD a été plus lent que prévu.

L'évaluation stratégique de 1990 a été suivie d'une enquête sur les besoins et options futurs à laquelle ont collaboré des experts stratégiques et techniques de haut niveau. Les recommandations du Requirements Board (Comité chargé d'étudier les besoins) ont été formulées dans le rapport "Vers les Télécoms de l'an 2000" qui constitue la base de l'élaboration du programme de travail pour la deuxième phase de RACE.

En 1991 et au début de 1992, le programme RACE a fait l'objet d'une nouvelle évaluation dans le contexte d'autres grands programmes d'application des TI et de la télématique relevant du deuxième programme-cadre (ESPRIT et DRIVE), par un groupe indépendant placé sous la présidence de Mr Dekker [8]. La Commission a répondu séparément aux recommandations de ce groupe [9].

Recommandations du Groupe d'examen critique stratégique de 1989

A) Les gouvernements nationaux devraient définir ensemble d'ici à 1992 les conditions et dispositions réglementaires applicables à l'introduction de services paneuropéens de communications avancées;

B) Les administrations des télécommunications, de radiodiffusion et de télédistribution devraient proposer d'ici à mi-1989, une approche concertée ainsi qu'un calendrier pour la mise au point et l'utilisation d'infrastructures IBC destinées à la fois aux services de télécommunications et aux services de loisirs, y compris la TVHD, en tirant pleinement parti, le cas échéant, des initiatives d'investissement du secteur privé;

C) Les administrations des télécommunications devraient rédiger d'ici à 1990 un premier mémorandum d'accord visant au renforcement de leur collaboration en matière de liaisons et opérations intra-européennes à longue distance;

D) Les prestataires de service devraient préciser, d'ici à la fin de 1990, une première série d'exigences de services, de conditions commerciales et de dispositions réglementaires visant à promouvoir une utilisation précoce et étendue des services IBC;

E) Les administrations de télécommunications, de radiodiffusion et de télédistribution, les prestataires de services et l'industrie de la télématique devraient conclure, d'ici à mi-1989, un mémorandum d'accord destiné à compléter la R&D menée en collaboration dans le cadre de RACE par la mise en oeuvre pilote de certains services IBC à l'échelle européenne en vue d'introduire les IBC sur une base commerciale d'ici à 1992;

F) La collaboration en R&D devrait être étendue à l'ingénierie des services intégrés, aux applications fixes et mobiles, ainsi qu'aux techniques de vérification et d'essai des équipements de communications et des fonctions de services avant la fin de l'année 1989;

G) Les organismes européens de normalisation devraient intensifier et coordonner leurs efforts en vue de la normalisation internationale des IBC et des services avancés. Un calendrier devrait être établi à cette fin d'ici à mi-1989, en particulier pour ce qui concerne l'ATM;

H) Les Etats membres devraient aborder le problème de l'attribution des fréquences en Europe pour toute la gamme des fréquences et des applications. Ils devraient autoriser, d'ici à 1992, une rationalisation des attributions de fréquences répondant à l'évolution des besoins et des priorités.

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(8) "The Report of the information and communication technologies review Board", sous la présidence de Mr W. Dekker, juin 1992.

(9) Réponse de la Commission au rapport Dekker, janvier 1993.

Enfin, en 1992, la Commission a fait le point du programme dans le contexte de son Evaluation du deuxième programme-cadre [10]. Le Conseil a invité le Comité de la recherche scientifique et technique (CREST) à commenter ce rapport. Le CREST a transmis l'invitation au Comité de gestion RACE (RMC), lequel a présenté le rapport suivant en juillet 1992:

Qualité des résultats et incidences sur la compétitivité

De manière générale, les résultats obtenus dans le cadre de RACE ont pour le moins été excellents et des percées technologiques ont été réalisées dans de nombreux domaines; c'est le cas, par exemple, de l'ATM (mode de transfert asynchrone), des communications mobiles avec l'UMTS (système universel de télécommunications mobiles), et des technologies et appareils optiques.

RACE a permis une amélioration considérable de la position de l'Europe dans le domaine des télécommunications. Si d'autres pays la devancent encore, l'écart technologique entre l'Europe et les Etats-Unis ou le Japon dans ce secteur n'en a pas moins été fortement réduit.

Au cours des cinq années du deuxième programme-cadre, RACE a largement atteint les objectifs techniques fixés par la décision du Conseil. Le rythme de l'évolution dans le secteur des télécommunications (nouvelles exigences de services, nouvelles technologies, concurrence accrue entre les exploitants) a toutefois exigé une réajustement des objectifs et des priorités du programme lui-même au cours de ses cinq années d'existence. Des objectifs supplémentaires, assortis de nouvelles priorités, sont apparus (expériences de communications et infrastructures destinées à des essais et vérifications, par exemple); ils ont été intégrés à des programmes ultérieurs tels que RACE II (seconde phase du programme RACE prévu sur 10 ans).

Le programme RACE a stimulé la coopération entre les exploitants publics (dans le cadre d'une planification stratégique telle qu'EURESCOM), entre les industries (dans le cadre de la formation d'un consortium industriel - RIC), ainsi qu'entre les exploitants publics et les industries (notamment au sein d'organismes de normalisation tels que l'ETSI). Il convient toutefois de renforcer ce type de coopération tant en termes d'échelle que de champ d'activité couvert.

Parallèlement à ses nombreux acquis scientifiques et techniques, RACE I a fourni aux organismes de normalisation (principalement l'ETSI) 470 contributions basées sur le développement de ses spécifications fonctionnelles communes (à fin juin 1992).

La collaboration au sein de RACE a renforcé la compétitivité de l'industrie des télécommunications sur les marchés mondiaux. En ce qui concerne l'ensemble de l'industrie européenne, l'influence positive de RACE sera plus apparente à long terme avec l'adoption généralisée des communications avancées. Une R&D plus poussée en matière d'applications peut démontrer aux utilisateurs potentiels l'avantage compétitif qu'ils peuvent tirer des communications de pointe.

(10) **Communication de la Commission - Evaluation du deuxième programme-cadre de recherche et de développement technologique (SEC(92)675 final), juillet 1992.**

Gestion et rentabilité

RACE constitue, au sein du programme-cadre, un programme cohérent dont les objectifs spécifiques se retrouvent dans tous les projets avec un horizon temporel global de dix ans. Au cours de la phase RACE I, les progrès les plus notoires ont été accomplis dans le domaine de l'ATM, des composants et technologies optiques, des communications mobiles (UMTS) et des expériences en large bande. Ces deux derniers domaines ont d'ailleurs bénéficié d'une attention accrue au cours de la phase RACE II. Les domaines qui ont enregistré les progrès les plus faibles sont la sécurité et la facilité d'utilisation dont les objectifs initiaux ont dû être limités.

Le mécanisme de concertation a été déterminant dans la réussite du processus de collaboration au sein de RACE. Ce type de collaboration à l'échelle européenne est généralement rentable dans la mesure où il permet d'obtenir un facteur multiplicateur des résultats acquis par les partenaires par rapport à l'investissement consenti par chacun d'eux.

Les procédures de soumission et d'évaluation technique ont bien fonctionné: ainsi, par exemple, la procédure dite du "drapeau rouge" a permis de réorienter et de redynamiser des projets qui, sinon, n'auraient pas atteint leurs objectifs - ou d'arrêter très tôt des projets afin d'éviter un gaspillage de ressources.

Le programme a été globalement bien structuré et bien géré, mais des progrès restent possibles dans un certain nombre de domaines:

o La coopération/collaboration avec d'autres programmes multinationaux européens de recherche n'a pas été suffisamment efficace.

o La Commission, les Administrations publiques des télécommunications et l'industrie devraient prendre un engagement réciproque à l'égard du soutien du programme et de ses objectifs avant l'adoption du programme de travail.

o Un effort accru devrait être orienté vers le maintien de la qualité de l'ensemble du programme en dehors de celle des projets individuels qui le composent. Ainsi, par exemple, trop de participants-clés ne restent pas engagés pendant toute la durée du programme.

o Les réunions de concertation doivent être mieux rentabilisées.

o Le projet de gestion du consensus devrait, idéalement, être le premier projet adopté afin de garantir l'efficacité des relations avec les autres projets.

o Des mesures devraient être prises pour renforcer le rôle et la participation active des PME dans les futurs programmes.

o Un usage plus intensif devrait être fait des actions concertées et des mesures d'accompagnement.

Cohérence avec les politiques et principes communautaires

Les critères techniques de sélection utilisés pour l'évaluation des soumissions comme pour celle des projets se sont avérés satisfaisants.

Aucun critère social ou économique n'a été explicitement pris en considération dans la sélection des projets RACE I. De manière générale, toutefois, un programme de télécommunications tels que RACE se conforme aux politiques prévalant en matière d'environnement et de conservation de l'énergie.

Dans une perspective de subsidiarité, s'il est évident qu'une collaboration à l'échelle européenne en matière de recherche prénormative en télécommunications présente certains avantages, il n'en conviendrait pas moins d'encourager certaines interactions avec les programmes et expériences au plan national.

Conclusions

1995 ne peut marquer la fin des programmes de recherche dans le domaine des télécommunications en Europe: une autre action doit prendre le relais de RACE.

La recherche et le développement sont des éléments nécessaires mais non suffisants en vue d'une bonne implantation sur les marchés des télécommunications de demain. Le comité de gestion de RACE ne précise pas ici les mesures ultérieures requises pour atteindre cet objectif. La réorientation des priorités de la R&D en télécommunications vers les services et les applications devrait influencer la structure et l'organisation des futurs programmes.

Les résultats obtenus dans le cadre de RACE devraient être plus largement adoptés et appliqués en Europe. Les initiatives nécessaires à cette fin devront peut-être émaner des acteurs du secteur.

Ce rapport figurait parmi les documents sur lesquels le CREST a appuyé son rapport au Conseil concernant le deuxième programme-cadre (octobre 1992).

3.2.2 Evaluation de l'incidence et perspectives

La recherche et le développement technologique se sont accompagnés, tout au long des cinq années du déroulement du programme, d'évaluations régulières de l'impact socio-économique des évolutions en matière de communications avancées. Les compte-rendus de ces évaluations ont été publiés et largement diffusés sous la forme d'une série de rapports sur les "Perspectives pour les Communications Avancées en Europe: PACE". La plus récente de ces évaluations a été effectuée en 1991 et diffusée en 1992. Ces études fournissent les données factuelles qui sous-tendent la mise à jour annuelle des travaux menés dans le cadre du programme, ainsi que certains ajustements mineurs en cours d'année. L'essentiel de cette activité est aujourd'hui intégrée à la deuxième phase de RACE conformément aux dispositions de la décision du Conseil sur le Programme spécifique "Technologies des communications".

3.2.3 L'examen critique de la gestion du programme

Les procédures de gestion de programme adoptées par les services de la Commission dans le cadre de RACE ont été soumises, en 1989, à un examen critique effectué par des experts indépendants en la matière.

Selon les principales conclusions, la gestion de type industriel adoptée par les services de la Commission convient globalement aux objectifs et aux partenaires participant au programme; les examens critiques techniques annuels et les réunions régulières de concertation ont été confirmés en tant qu'approche efficace de la gestion du programme.

3.2.4 Les Examens critiques techniques des projets RACE

La Décision instaurant RACE a prévu une révision annuelle du programme de travail afin de permettre son adaptation à l'évolution de la technologie et de la demande.

Cette procédure implique l'examen annuel de l'état d'avancement de tous les projets en cours par rapport aux objectifs et par référence à des besoins nouveaux. C'est pourquoi chaque projet a fait l'objet, chaque année, d'un "Examen critique technique" effectué par des experts indépendants dans le domaine de recherche concerné. Le premier de ces examens critiques techniques a eu lieu en octobre 1988 et le plus récent en octobre 1992. Les résultats de ces examens critiques annuels ont servi à réorienter les travaux ou à mettre fin à certains projets, le cas échéant.

L'examen critique technique a comporté les principales étapes suivantes:

(a) Chaque année, les partenaires de chacun des projets ont procédé à une "auto-évaluation" en examinant tous les aspects importants du projet - les conclusions étant consignées dans un "Rapport annuel d'évaluation" (Annual Review Report).

(b) Ces rapports ont été analysés par des experts indépendants externes ("Examinateurs") sélectionnés avec l'aide du Comité de gestion de RACE (RMC). L'évaluation de ces rapports a été suivie d'une présentation des projets lors d'une "audition" présidée par la Commission. Ce fut l'occasion de mettre en évidence les progrès accomplis et de décrire les futurs travaux. Les "Examinateurs", répartis en Groupes selon leurs compétences respectives, ont eu la possibilité de poser des questions à propos des projets afin de compléter l'information fournie par le rapport annuel et la présentation.

(c) Les différents Groupes d'experts ont consolidé leurs conclusions et recommandations, et les ont consignées dans les "Rapports des Groupes d'Examen critique" adressés au Comité de gestion de RACE et à la Commission.

(d) Les rapports d'examen critique ont été complétés par une évaluation des rapports contractuels, effectuée par les responsables du projet au sein de la Commission (les rapports sont généralement considérés comme confidentiels et ne sont dès lors pas communiqués aux "Examinateurs").

Cette procédure s'est avérée équitable et efficace. Les rapports d'examen critique ont constitué, chaque année, une excellente base pour la négociation de contrats dans le cadre du programme de travail détaillé de chacun des projets.

4. Les relations avec d'autres actions communautaires et européennes

4.1 Les relations avec la CEPT

Les relations avec la CEPT et ses organisations filiales ont sensiblement évolué au fur et à mesure de l'élaboration et de la mise en oeuvre du programme RACE.

Au cours de la phase de définition, un groupe spécial pour les communications à large bande (GSLB), créé par la CEPT, a apporté une contribution majeure au programme de travail de la phase I de RACE. En 1987 et 1988, la coordination avec les travaux de la CEPT a été assurée par le GMR (Groupe mixte RACE) institué à cette fin en septembre 1987.

En 1988, la collaboration avec la CEPT a également débouché sur la signature par 13 administrations européennes des télécommunications d'un mémorandum d'accord en vue de l'introduction d'un banc d'essai généralisé pour les travaux IBC (EBIT).

La déréglementation des télécommunications, conforme à la nouvelle politique européenne en la matière, a conduit la CEPT à la création de plusieurs organismes distincts; deux d'entre eux ont noué d'étroites relations avec les activités RACE: le groupe ETNO (European Telecommunications Network Operators) offre aujourd'hui un forum où les exploitants de réseaux peuvent débattre des questions d'interexploitation, tandis que l'EURESCOM constitue une plate-forme de recherche stratégique en commun. Bien que les grands exploitants publics n'y soient pas tous présents, l'EURESCOM constitue une interface précieuse entre la Commission, les projets RACE et la plupart des exploitants de réseaux.

4.2 Les relations avec les organismes européens et internationaux de normalisation

L'ETSI (Institut européen de normalisation des télécommunications) a été créé en 1988 dans le cadre de la mise en oeuvre de la politique européenne des télécommunications. Il offre aujourd'hui un forum privilégié pour l'élaboration des spécifications techniques. Les travaux de prénormalisation effectués par RACE ont donné lieu à 576 contributions distinctes au travail de normalisation de l'ETSI, du CCITT et du CCIR.

Des réunions régulières ont, en outre, été organisées avec des représentants du CEN/CENELEC, de l'EBU et du SPAG.

4.3 Les relations avec d'autres programmes communautaires et activités européennes

Les projets RACE s'appuient sur les résultats de projets développant des technologies génériques, comme ESPRIT (composants microélectroniques, outils logiciels, traitement avancé de l'information pour la gestion du réseau, etc); de même, les besoins en matière de télécommunication des programmes d'application télématique (DRIVE, DELTA et AIM) tirent très largement parti des techniques abordées actuellement par les projets RACE.

La collaboration avec COST a été mise en place grâce à des liens étroits entre des travaux connexes et des réunions périodiques tenues au niveau de la gestion du programme.

La principale interaction avec l'initiative EUREKA se situe dans le domaine des technologies audiovisuelles. Une partie des travaux liés à la promotion de la TVHD (projet EUREKA 95) a été complétée de travaux effectués sous contrat RACE; et le projet EUREKA 256 consacré au codage vidéo est associé aux activités d'intégration de RACE.

4.4 Les relations avec l'AELE

Des organismes d'Autriche, de Finlande, de Norvège, de Suède et de Suisse participent à RACE. Vingt-sept d'entre eux ont pris part à 72 projets (soit à plus de 80% des travaux).

5. L'exploitation des résultats de RACE

Les possibilités offertes par les nouvelles technologies des communications auront à l'avenir une incidence considérable sur la croissance économique de la Communauté ainsi que sur la division du travail à l'échelon international et mondial. Trois processus de croissance, distincts mais interdépendants, sont en action:

- l'amélioration de l'accès à des informations de meilleure qualité augmente la productivité dans l'ensemble des secteurs économiques,

- les améliorations au niveau des communications accroissent l'utilité et, par conséquent, le potentiel de commercialisation des services tant anciens que nouveaux, ce qui entraîne leur expansion,

- la transition vers la nouvelle économie de services basée sur l'information exige des investissements publics et privés considérables dans de nouvelles infrastructures, tant physiques - câbles, commutateurs, terminaux - qu'humaines pour le développement de services de télécommunications à valeur ajoutée.

Aussi, la qualité - technique et organisationnelle - des communications constituera-t-elle un élément fondamental de la future croissance économique puisqu'elle détermine la capacité de l'économie de produire et d'utiliser efficacement le facteur le plus important de la "production" moderne: la connaissance. L'organisation géographique des infrastructures influencera de manière non négligeable l'espace social, économique et culturel de demain, comme l'ont fait les chemins de fer au XIXe siècle.

Toutes ces raisons militent en faveur d'une exploitation rapide et efficace des résultats de la R&D dans le domaine des communications. Une attention particulière doit donc être accordée à la valorisation des résultats obtenus par RACE tout au long du déroulement du programme.

5.1 Le plan d'exploitation RACE

Un "Plan d'exploitation RACE" a été régulièrement mis à jour de 1988 à 1992 en vue de stimuler et d'évaluer la valorisation des résultats de RACE par les participants. Il donne un aperçu complet de cette exploitation des acquis.

La liste des contributions aux travaux de normalisation figure à l'Annexe II, tandis que les titres des publications scientifiques et techniques sont repris à l'Annexe III. Avec plus de 1.655 de ces publications, le programme RACE a apporté une contribution majeure à la littérature scientifique à large diffusion.

Les résultats de certains développements technologiques ont également été protégés par des demandes de brevets, le cas échéant. 73 demandes de ce type, liées à des travaux RACE, ont été déposées; elles sont reprises à l'Annexe IV.

5.2 La planification de la mise en oeuvre des IBC

L'exploitation efficace de la R&D n'est possible que si tous les acteurs ont une vue cohérente de l'orientation et du rythme des développements commerciaux. C'est la raison pour laquelle la R&D dans le cadre du programme RACE a toujours été planifiée et définie parallèlement à un plan indicatif de mise en oeuvre des communications à large bande, lequel a été régulièrement mis à jour. Il prévoit l'introduction par étapes des services avancés, en commençant par ceux pour lesquels une demande commerciale et professionnelle existe dès 1992/1993. Le calendrier indicatif actuel de mise en oeuvre, tel qu'il est décrit dans le rapport annuel RACE '92, comportait les jalons suivants:

1992/1993:

- Introduction des premières applications commerciales et professionnelles;
- Expérimentation de communications avancées pour tester les nouveaux services et systèmes de gestion de réseau: ATM, MAN et IBC dans les réseaux privés d'usagers;
- Décisions en matière d'achats et d'investissements pour les futurs services IBCN paneuropéens et les services IBC complets;
- Mise au point définitive des normes principales.

1994:

- Achèvement de l'interconnexion entre toutes les capitales de la Communauté ainsi qu'avec les pays voisins, basée sur l'extension des réseaux optiques inter-urbains existants mais assurant la transmission de la voix, des données et des images, séparément ou en services intégrés.

1995:

- Mise en oeuvre initiale du réseau IBC et parachèvement de l'accès client à des fins commerciales dans les centres d'activité économique et de fabrication: un minimum de 50.000 entreprises clientes pour les services de pointe.
- Essais d'applications sur le terrain afin de tester une gamme complète de services IBC (y compris chez les clients privés avec la vidéo bidirectionnelle et la TVHD numérique) grâce à des équipements commerciaux IBC.

1996:

- Offre de services commerciaux de base à large bande s'appuyant sur des liaisons à 2, 34 et 155 MBit/s, y compris la transmission rapide de données entre réseaux locaux, la vidéoconférence individuelle, le traitement des images, la CAO/PAO et les applications au télé-travail.
- Interexploitation de réseaux fixes à large bande avec des réseaux mobiles, satellites et autres.

1997:

- Services IBC mis à la disposition des utilisateurs professionnels dans les villes de plus de 500.000 habitants, et début de la mise en oeuvre à grande échelle des connexions de fibres optiques chez les particuliers.

2005-2010:

- 50% de pénétration des services IBC.

Ce calendrier indicatif fera l'objet d'une nouvelle révision en 1993 dans le contexte de la préparation des orientations à donner au développement de réseaux transeuropéens à large bande, selon les dispositions du Titre XII, Article 129b et c, du Traité sur l'Union européenne.

6. La réalisation de la Phase II de RACE

Le programme RACE a toujours été conçu comme un programme de travail se déroulant sur dix ans et en deux phases. Dans un souci de continuité, la seconde phase a été adoptée en juin 1991 en tant que programme spécifique au titre du troisième Programme-cadre des actions communautaires de recherche et développement technologique.

Une évolution majeure se manifestait toutefois dès 1991 quant à la manière dont le programme était perçu. Ce qui était apparu au départ comme une vision ambitieuse, voire futuriste, devenait une possibilité réaliste. L'introduction commerciale des communications intégrées à large bande était résolument attendue dans un délai de quatre ans. Il devenait, en outre, de plus en plus évident que les télécommunications et les services avancés d'information auraient un rôle déterminant à jouer dans le développement socio-économique mondial à l'aube du 21e siècle.

Ces évolutions ont incité le Parlement européen et le Conseil des ministres à donner la priorité au nouveau programme spécifique. Ce fut, en effet, le premier programme adopté (II) parmi ceux du troisième Programme-cadre, et son programme de travail fit immédiatement l'objet d'un avis favorable de la part du comité de gestion. Un appel de propositions fut publié en juin 1991 et les réponses furent examinées en septembre et octobre de la même année. Plus de 200 propositions ont été analysées et 95 projets ont entamé leurs travaux au début de l'année 1992. L'achèvement de ces travaux est prévu, selon les dispositions budgétaires actuelles, pour la fin de 1994.

Si les projets de la phase I de RACE ont été axés sur l'évaluation des options, ceux de la phase II visent à préparer l'introduction des IBC. Les projets de RACE II vont renforcer la collaboration et les engagements déjà pris par les utilisateurs industriels, le secteur télématique et les exploitants de télécommunications dans le cadre de RACE I. La nouvelle R&D se concentre sur les applications, les services, l'exploitation et la gestion tout en continuant d'assurer un niveau élevé de développement technologique afin de consolider et étendre les domaines clés indispensables à la fourniture rentable de services IBC.

Les travaux couvrent les huit domaines prioritaires définis à l'Annexe de la Décision du Conseil:

DOMAINE 1 Recherche et développement sur les IBC (communications intégrées à large bande)
DOMAINE 2 Intelligence dans les réseaux/gestion souple des moyens de communications
DOMAINE 3 Communications avec les mobiles et avec les personnes
DOMAINE 4 Communications des images et des données
DOMAINE 5 Technologies des services intégrés
DOMAINE 6 Technologies pour la sécurité de l'information
DOMAINE 7 Expériences de communications avancées
DOMAINE 8 Infrastructure d'essai et interfonctionnement (domaine de recherche et développement en commun à tous les autres domaines prioritaires).

Les nouveaux projets de R&D de la phase II sont décrits en détail, ainsi que leur relation réciproque avec les projets de la phase I, dans les rapports annuels pour 1992 (RACE'92) et 1993 (RACE'93).

(II) Décision du Conseil 91/352/CEE du 7 juin 1991 : J.O. No 192/8, 16.7.91

7. Les besoins et options futurs pour la R&D au niveau européen en matière de technologies des télécommunications

Le comité de gestion RACE a créé en juin 1992 un groupe ad hoc chargé de définir les priorités de la future R&D européenne dans le domaine des télécommunications. Le rapport de ce groupe est repris ci-après.

Bon nombre de ces idées et thèmes pour la future R&D communautaire figurent déjà dans le Document de travail de la Commission relatif au quatrième Programme-cadre, en particulier les "technologies de l'image", "les ordinateurs et réseaux à haute performance", "l'intégration fonctionnelle en fabrication" et "les communications avancées". La Commission présentera ses propositions de programmes spécifiques au titre du quatrième Programme-cadre, après examen de toutes les contributions, en 1993.

Raisons d'être d'une R&D au niveau communautaire

Le Comité de gestion RACE reste convaincu des avantages incontestables que peut apporter une R&D à l'échelon de la Communauté dans le domaine des télécommunications. La recherche en général - et la recherche en télécommunications en particulier - est un processus permanent. Une poursuite des efforts de recherche en commun, s'appuyant sur les résultats déjà acquis, est indispensable au maintien de la position renforcée que les acteurs du secteur occupent grâce à leur participation à des actions communautaires telles que RACE.

Une consolidation plus poussée des réseaux fragmentés de télécommunications dans la Communauté s'impose pour assurer le bon fonctionnement du marché unique et accroître la compétitivité des organisations européennes sur les marchés mondiaux. Des organismes de normalisation tels que l'ETSI ont pu apprécier les contributions techniques provenant directement des travaux de RACE. Le processus de "gestion du flux" de résultats entre la R&D communautaire et les organismes de normalisation doit être poursuivi, voire renforcé dans le cadre des programmes ultérieurs.

Le rôle des télécommunications avancées devient à ce point déterminant pour la prospérité des économies nationales que leurs éléments constitutifs (à savoir "l'information" et la capacité de "communiquer" cette information) sont aujourd'hui considérés comme des ressources stratégiques. Cette approche se manifeste notamment au travers de

- *la part croissante des économies nationales consacrée aux investissements dans les télécommunications, et*

- *l'impact croissant des services avancés de télécommunications sur d'autres secteurs de l'activité économique.*

Ces orientations ont été reconnues par l'Acte unique et transparaissent dans les efforts actuellement déployés en vue de l'achèvement du marché unique. Le Traité de Maastricht prévoit la création de réseaux transeuropéens (couvrant notamment les réseaux de télécommunications). La mise en place à l'échelon européen d'infrastructures et de services de télécommunications demandera un engagement à long terme de la part de tous les acteurs du secteur concernés.

Une évolution parallèle, à l'échellon européen également, vers l'établissement d'une infrastructure de communications à large bande offre d'incontestables avantages économiques sur le plan du rendement des investissements. Cette synchronisation faciliterait, en effet, l'adoption de nouvelles applications dans toutes les régions d'Europe, et permettrait d'atteindre rapidement la masse critique nécessaire à une croissance autonome de l'utilisation des services avancés. Il ne fait aucun doute que les réseaux de télécommunications ainsi qu'un nombre croissant de services communautaires ont des perspectives internationales de plus en plus larges. Aussi une coopération étendue à des régions situées en dehors de la Communauté devrait-elle également être encouragée.

Toutes ces raisons font penser au comité de gestion RACE qu'une action de R&D communautaire spécifique en matière de télécommunications devrait être intégrée à tout programme-cadre futur, s'appuyant sur les acquis majeurs des programmes précédents. La nature de la R&D requise en matière de télécommunications au-delà de l'horizon temporel de 1995 diffère toutefois sensiblement, en termes de priorités, de celle qui a été entreprise par RACE jusqu'ici.

Objectifs de la future R&D en matière de télécommunications

La concrétisation d'une vision des télécommunications avancées selon laquelle "tout le monde peut communiquer avec tout le monde en tout lieu et à tout moment, en utilisant le texte, le son et les images" exige de l'Europe qu'elle prenne de nouvelles initiatives en matière de R&D.

Les programmes existants tels que RACE et ESPRIT ont déjà largement contribué à la faisabilité technique fondamentale d'une telle vision. La force motrice de tout nouveau programme de R&D communautaire en télécommunications doit désormais provenir des besoins au niveau des applications. Ce sont également ceux-ci qui devraient, en principe, définir les actions et priorités indispensables à la poursuite des recherches dans le domaine des principales technologies de soutien.

Tout nouveau programme devrait, par conséquent, être axé sur le double objectif suivant:

- *Promouvoir les "essais opérationnels" des services avancés, améliorer leur exploitabilité et veiller à ce que le résultat final soit suffisamment attrayant pour un usage généralisé dans la vie quotidienne des Européens.*

- *Poursuivre l'étude des "futures technologies" indispensables au soutien des communications avancées, parvenir à une diminution de coût des principaux composants et permettre ainsi d'offrir des services avancés plus praticables sur le plan économique.*

Ces deux aspects revêtent une importance particulière pour assurer concrètement la réalisation paneuropéenne et commerciale de réseaux et services de communications avancés - bien que cette réalisation concrète soit également fonction de toute une série d'autres facteurs. Pour que cette vision des communications avancées devienne réalité, il convient de s'appuyer sur la consultation réciproque de plus en plus poussée entre les acteurs du secteur pour arriver à un consensus sur :

- *le meilleur moyen d'apporter les améliorations nécessaires à la performance des services et des technologies de soutien qui leur sont associées*

- *les potentialités-cibles nées de la convergence des télécommunications, de la radiodiffusion et des technologies de l'information, et pouvant servir de base à une évolution rapide vers des communications avancées.*

En résumé, la poursuite de la R&D communautaire en matière de communications avancées assurera par elle-même la coopération et l'harmonisation au niveau européen; elle conduira ainsi à une compétitivité accrue de l'Europe sur les marchés internationaux et, par conséquent, au renforcement de l'ensemble de l'économie européenne.

Fondement et pratique de la collaboration

Il serait impossible de généraliser l'attrait des communications avancées et de rendre les technologies plus "praticables sur le plan économique" sans la participation de tous les acteurs concernés: utilisateurs, exploitants de réseaux, prestataires de services, industrie, centres de recherche et universités. Cette participation doit être acquise dès le départ en impliquant tous les intéressés à l'élaboration en commun du programme de travail. La collaboration active des exploitants de réseaux publics doit être plus particulièrement recherchée afin de pouvoir appuyer les expériences de communication sur les infrastructures actuelles ou prévues pour l'avenir.

Le prochain programme de R&D devrait réserver un rôle accru aux PME car bon nombre d'entre elles ont une expérience précieuse du développement d'applications et de services. Leur compétence en la matière est indispensable pour que la Communauté puisse valablement aborder ce nouveau domaine de recherche. La nécessité d'accroître le rôle des PME dans les futurs travaux de R&D en communication conduit à penser que des mesures spécifiques s'imposent pour stimuler une participation active de ces entreprises. Ainsi, par exemple, la Commission devrait-elle peut-être recourir davantage aux procédures contractuelles d'appui (le mécanisme CRAFT utilisé dans le cadre de BRITE/EURAM, par exemple, ou d'autres approches novatrices).

Bien que RACE puisse être globalement considéré comme un succès, certaines procédures nouvelles, ou améliorations des procédures actuelles, devraient être envisagées pour la gestion du prochain programme de R&D dans le domaine des communications. Chacun des projets devrait s'inscrire dans un cadre bien structuré, défini dans le programme de travail et spécifiquement orienté vers la réalisation des objectifs fixés pour l'ensemble du programme. Le mécanisme de concertation appliqué avec succès par RACE devrait, lui aussi, être renforcé.

Il convient d'encourager, dans toute la mesure du possible, une coordination renforcée entre les programmes communautaires, une meilleure collaboration avec d'autres programmes de recherche européens ou multinationaux, et une interaction plus grande avec les programmes et expériences au plan national. Des actions concertées avec EUREKA, COST et certains projets au niveau national peuvent également être envisagées.

Les mesures d'accompagnement du programme devraient prévoir une diffusion suffisante d'informations relatives aux projets pendant leur exécution ainsi qu'une promotion de leurs résultats (et des avantages/applications possibles de ces acquis) auprès de tous les acteurs du secteur, et des utilisateurs potentiels de communications avancées en particulier.

Essais opérationnels et développement de services

L'expérience acquise en matière d'introduction de nouveaux services et de nouvelles technologies de réseaux montre que le développement et la mise en oeuvre d'applications novatrices exigent une validation bien organisée, pré-opérationnelle et pratique (essais opérationnels) à laquelle participent tous les acteurs du secteur. Le véritable défi pour les prochaines générations d'essais de ce type au plan européen est de trouver les modalités d'offre (dans un contexte de libre marché) d'un faisceau de services potentiels pour répondre aux besoins des grands secteurs.

La R&D dans le domaine des essais opérationnels et du développement de services devrait être axée sur des aspects génériques qui feront évoluer les services avancés. Tout en s'appuyant sur les technologies existantes, les essais devraient mettre en évidence les applications rendues possibles au fur et à mesure que les réseaux deviennent plus intelligents et les services plus flexibles. Les essais opérationnels devraient notamment avoir pour objectifs l'élaboration et l'apport de propositions à des fins de normalisation, ainsi que des propositions de plates-formes intégrant tous les points de vue du secteur:

- *l'entreprise (y compris l'organisation, l'interaction, l'information de l'utilisateur, les politiques de gestion et de sécurité, l'analyse coût-profit, l'approche éthique et sociale),*
- *l'information en tant que telle (y compris la définition des éléments de l'information, sa qualité, sa circulation et sa présentation aux utilisateurs),*
- *les fonctions télématiques (y compris les fonctions de communication et de traitement, les types de représentation des données),*
- *les technologies (y compris le matériel et logiciel).*

Les essais opérationnels devraient ainsi tenir compte des modifications apportées à la législation, aux politiques de gestion et de sécurité, à l'accès utilisateur et aux interfaces hommes-machines, ainsi qu'aux calculs de rentabilité et aux définitions de qualité de l'information.

La mise au point de services génériques exige la création d'outils, l'intégration de téléservices et de terminaux multimédias ainsi qu'une offre de capacités avancées en ce qui concerne les services, leur gestion et leur ingénierie. Les futures applications doivent donc remplir les conditions préalables suivantes:

- *présenter des définitions propres au secteur, déterminées par les prestataires et les utilisateurs;*
- *s'appuyer sur des services génériques et être compatible avec la fourniture de réseau ouvert;*
- *se définir en termes d'objectifs précis de rentabilité;*
- *offrir un potentiel sur le marché international;*
- *être capables d'intégrer à courte échéance de nouvelles exigences telles que la mobilité et l'ubiquité des personnes, les services multimédias à large bande, les réseaux de coopération ou les réseaux intelligents.*

Les programmes nationaux et communautaires en cours (RACE, Telematic Systems ou ESPRIT, par exemple) constituent une base empirique particulièrement utile pour la définition de ces applications. Les futurs programmes de R&D doivent être essentiellement axés sur la réalisation d'essais pré-opérationnels ainsi que sur la démonstration de la validité des applications au plan européen. Le comité de gestion RACE estime qu'un futur programme de R&D devrait inclure les "Développements de services" spécifiques suivants afin de mieux répondre aux besoins des utilisateurs:

- *services multimédias interactifs et de vidéoconférence améliorés;*
- *télétravail et présence virtuelle;*
- *mobilité, ubiquité et sécurité de l'information;*
- *services de diffusion en bande étroite ou en large bande;*
- *gestion des services et services pour réseaux intelligents*

Recherche consacrée aux technologies d'appui

Tout nouveau programme de recherche en télécommunications devrait développer l'importante base technologique mise en place par les programmes précédents. La recherche stratégique actuelle doit faire en sorte que la prochaine génération de technologies engendre des avantages sur le plan des coûts. Les principaux objectifs dans ce sens peuvent être décrits comme suit:

- *Mise à disposition des technologies requises pour que l'évolution de réseaux et services compétitifs sur le plan des coûts en Europe devance celle des blocs économiques concurrents, et contribue ainsi de manière déterminante au renforcement de l'économie européenne.*

- *Etablissement des bases nécessaires à l'évolution techniquement réaliste et économiquement raisonnable du réseau de télécommunications, en vue également - dans une perspective de normalisation - de renforcer l'économie européenne.*

Les connaissances acquises dans ces domaines généraux de recherche pourraient conduire à une réorientation des objectifs et des priorités dans d'autres secteurs du programme. Ainsi, par exemple, l'évolution des technologies des services pourrait contribuer à faire progresser la recherche dans le domaine des technologies des composants et des réseaux. La préoccupation dominante doit toutefois rester la fourniture de nouveaux services aux utilisateurs via le réseau de télécommunications. Etant donné la forte personnalisation appelée à caractériser ce type de services, une interaction en boucle fermée s'impose entre l'évolution du réseau et le développement des services. Le comité de gestion RACE estime que les domaines spécifiques de recherche suivants devraient être intégrés dans un futur programme:

Evolution du réseau visant à offrir aux communications avancées une base réaliste sur le plan technique et raisonnable sur le plan économique

- *Intégration des médias et systèmes de transmission actuels et nouveaux (câbles en cuivre, fibres optiques, radiocommunication terrestre, satellites), notamment dans les réseaux de distribution et d'accès (fibres dans les boucles locales, etc.); intégration des réseaux mobiles et fixes;*
- *Evolution de la gestion des hiérarchies de transmission et amélioration des systèmes de gestion des réseaux;*
- *Systèmes de transmission optique à ultra-haute capacité, et architectures de réseaux opto-électroniques;*
- *Noeuds (réseaux) sommets administrés pour RNIS à large bande (ATM) et signalisation améliorée;*
- *Réseaux intelligents avancés, architectures de réseaux d'information (combinant les architectures de type IN (réseau d'information) et de type TMN (réseau de gestion des télécommunications)), et architectures logicielles de pointe.*

Evolution de technologies s'appuyant sur les résultats de RACE et d'autres programmes communautaires, et évolution plus particulière des terminaux vers un meilleur rapport coût/résultat et une convivialité accrue

- *Postes de travail multimédias, et visiophonie;*
- *traitement avancé image et audio;*
- *TV numérique (TVDS, TVDE, TVHD)*
- *contrôle vocal en langage naturel;*
- *dispositifs ultra-LSI (intégration à grande échelle) pour circuits de commutation et de transmission;*
- *circuits intégrés à micro-ondes, basés sur silicium et sur matériaux III-V; et*
- *matériaux et dispositifs opto-électroniques pour applications en télécommunications.*

Annex I

Project contributions to the RACE objectives

Annex 1

PROJECT CONTRIBUTIONS TO RACE OBJECTIVES

1. PART I : IBC Development and Implementation Strategies

1.1 Consensus Management and Synthesis

Project	Main Deliverable(s)	Impact
R1045 Consensus Management	Consensus management across all RACE projects, leading to the publication of Common Functional Specifications (CFS) for IBC. Workplan for, and organisation of the Technical Groups which undertook the drafting of the CFSs (staffed by other projects' participants).	Secured the "overall" results of the RACE programme, through co-operation between Industry and Operators within the project. Formal conduit for coherent transfer of RACE results to ETSI. Exploitation of results through standardisation, and by widespread distribution of CFS to organisations participating in RACE.
R1044 IBC Development & Implementation Strategies	Provided a consistent view of IBC systems options, based on own work and that of all other RACE projects. Functionally separated service definitions into service components and service control elements. Developed reference configurations for specific network implementations, and used these to identify and evaluate evolution steps towards IBC. Developed a series of detailed specifications defining the UNI at the "T" reference point (the termination interface for public networks).	Core project to the systems study of RACE. The largest source of RACE contributions to standardisation bodies. Many publications. Active in the detailed transfer of results to and from RACE usage projects, (via R1077) and all other systems projects. Provided the backbone of support offered to R1045 for development of the CFS.
R1077 URM	Compilation of operational requirements based on results of usage projects. Results captured in a usage database. Methodology for, and examples of the derivation of generic service definitions from usage requirements. Wide ranging contributions to CFSs and consensus formation.	Concepts relevant to service designers working in a market driven environment. Core project of the usage area of RACE. Impact mainly felt within the programme, transferring results to and from the systems projects.

1.2 Functional Specification

Project	Main Deliverable(s)	Impact
R1023 BEST	Functional Specification Methodology. Handbook and consultation support given to other RACE Projects.	Harmonised approach to functional specification work.
R1024 NETMAN	Models and Methods for TMN functional specifications (eg. Cube Model, QoS Methodology). The actual specification of TMN Functions. Animated Simulation (Hypermedia tool) of the behavioural aspects of TM Functions.	Significant impact on Standards (CCITT SG IV and ETSI NA4). Results exploited by EURESCOM and RACE II Projects.
R1025 SECURITY	Definition of basic security services (authentication, integrity, confidentiality, non repudiation and denial of service detection). Concepts for a functional architecture for IBC security and security policy guidelines.	Integration of security aspects within IBC specifications.
R1040 RIPE	Recommended Portfolio of Integrity Primitives. Specified modes of use for these.	Implementation of secured network systems. Improved understanding of integrity primitives (statistical tests and simulation tools).
R1047 TIMI	Development of integrity concepts within IBC services, to support legally binding procedures for data exchange.	Introduction of low cost, reliable and easy to operate security measures in IBC.

1.3 Reference Configurations

Project	Main Deliverable(s)	Impact
R1002 Satellite communication for IBC	Specification of satellite system capabilities with respect to their utilisation in evolutionary scenarios towards IBC	Identification of the role of satellite communications in IBC. Contribution to elaboration of IBC standards, identification of role of satellite technology within IBC
R1026 International Radio and TV	Identification of requirements and scenarios for the integration of the Eurovision network into IBC.	Eurovision and Euroradio network digitalisation, ensuring Europe remains in the forefront of technical excellence and programme quality. Essential step towards full digitalisation of TV media.
R1028 REVOLVE	Evolution Scenarios most likely to be implemented within Less Favoured Regions (LFRs) were identified and assessed. Platforms for co-operation of Sector Actors established in Portugal and Greece	Tools for strategic planners responsible for LFRs, in their preparation of business plans and justification for further investment in infrastructure
R1041 FUNCODE	Techno-economic studies to determine optimal locations for video codecs. Contributions to image and voice coding standards.	Standardisation and strategic network planning of audio-visual services.
R1049 ATM Concept	Contributions to the specification of the ATM layer, ATM signalling protocol and Connectionless Services in B-ISDN.	Contributions to ETSI NA5 and CCITT SG I, XI, XIII, XVIII Recommendations on B-ISDN.
R1052 SPOT	Simulation and optimisation of sub-carrier multiplexing systems for the CAC network	Exploitation, development and assessment of signal processing techniques in a CAC environment
R1053 TERRACE	TMN Reference Configurations at three levels of detail. Methods and criteria to design, describe and evaluate Reference Configurations. Concept of GAMS - Gradual Automation of Management Systems, used internally by the project to define the evolution of the TMN. Surveys and case studies (SDH, MAN and ATM)	Means of implementing TMN now understood in detail. Results exploited by EURESCOM, and are influencing ONP studies. Also exploited by RACE II projects addressing Reference Configurations for IBC Services. Significant contributions to Standards (CCITT & ETSI).
R1085 TET Adapt	Provision of tools for techno-economic analysis	Tools widely used for evaluation of IBC scenarios by RACE systems projects

1.4 Usage Reference Model

Project	Main Deliverable(s)	Impact
R1037 User criteria for the realisation of opportunities afforded by IBC	Development of a methodology to identify and quantify user requirements	Contribution to further work under R1071 (IBC Applications Analysis)
R1071 (1050) IBC Applications Analysis	Based on 126 case-studies in 102 organisations, the project has identified eleven generic IBC services and implemented a formalised methodology for description of IBC market developments	Market entry strategies for IBC. Improved understanding of factors affecting service take-up and delivered substantive usage data for the definition of IBC services.
R1076 REMUS	Requirements for Usability Design Targets Database	Method for making end-user requirements available to designers

PART II : IBC Technologies

2.1 Networks and Switching

Project	Main Deliverable(s)	Impact
R1012 BLNT	2 major demonstrators: an ATM switch model and a Customer Access Connection (CAC), based on SDH and an optical link, using OEICs. Definition of performance parameters for the ATM switch, based on traffic studies. VLSI produced to implement the switch. 4 patents filed relating to CAC and ATM.	Low cost local loop and ATM switch , able to support a wide range of broadband services in a flexible and cost effective manner. Demonstrated incorporation of new OEIC techniques and technologies. Contributions to standardisation of ATM/SDH mapping and broadband interfaces for the access network.
R1013 HDTV switching	Switch matrix chip operating in synchronous time division multiplex mode at speeds up to 1.25 Gbit/s.	Key technology for support of digital (HD)TV services using ATM switching networks.
R1014 Atmospheric	Network configurations and solutions to accommodate uncertainties in the growth and mix of services during network transitions towards a full ATM-based IBC. Flexible and economic network & system architectures to maintain compatibility with existing public / private networks and terminals, as advanced networks evolve. Solutions evaluated in a demonstrator.	Evolutionary network architectures and contributions to the standardisation of new transmission and switching techniques, and of interworking. Extended Stratified Reference Model (ERM) now adopted by ETSI allowing a more flexible use of the lower three layers of the OSI model.
R1022 ATD	Defined generic ATM components. Implemented RATT (R1022 ATD Technology Testbed), a laboratory network integrating several models of ATM subsystems. Introduction scenarios and techno-economic evaluation for ATM - consolidated in a Network Planning Guide. Other results include architectures and interfaces, ATM traffic engineering methods, performance evaluation of ATM traffic control, traffic source models, and signalling.	Major impact on the development of ATM Standards by ETSI & CCITT. Results further by exploited consortium members in RACE II (the laboratory testbed), and in national field trials. Commercially available products based on project prototypes (components and subsystems).
R1043 Mobile Telecommunications Project	Provided the foundation for the work now undertaken by RACE II projects in UMTS and MBS. Preparation of CFSs for UMTS	Definition of the spectrum requirements for UMTS. Prime-mover for the establishment of ETSI SMG5.

2.2 Optical Communications

Project	Main Deliverable(s)	Impact
R1008 Silicon-based Low-cost Passive Optical Components	Low cost passive optical components including very low loss waveguides, 3dB directional coupler, fibre pigtailed power splitter, 1:4 WMUX/DMUX devices	Components for the realisation of an economic and & flexible architecture of the Customer Access
R1010 Subscriber Coherent Multi-channel System	Demonstrator of a CMC network with a transmission rate of 140 Mbit/s on each of ten channels. Coherent optical devices evaluated on 3 testbeds: 622 Mbit/s CPFSK, 565Mbit/s DPSK, and 565 Mbit/s FSK	"Path-finder" technology, having strong economic potential to meet requirements of domestic customers for non-switched services in the longer term .
R1019 Polymeric Optical Switch	Optically non-linear polymers and devices, such as electro-optical modulators and 2x2 electro-optical switches	Progress towards low cost optical switching matrices
R1020 HYBRID	Integrated ultra-fast all-optical switching devices; technologies for low cost polymers	Low cost devices for all optical communication systems
R1027 Integrated Opto-electronics towards the Coherent Multi-Channel IBCN	Components for HDWDM: 3-channel DM-DPSK heterodyne transmission experiment using DFB lasers, state-of-the-art receiver preamplifier, InP integrated polarisation modulator, uniform grating DFB lasers with narrow spectral line width, multi-electrode DFB laser as FSK transmitter, continuous tuneable narrow line width DBR lasers, GSMBE amplifiers for coherent multi-channel systems, OEIC receivers (4 and 8 channels)	High bandwidth services through HDWDM using optical frequency multiplexing with coherent detection. Project results exploited commercially include : a grating, coherent transmitters and receivers and state-of-the-art fabrication techniques.
R1029 Improved InP Substrate Material for Opto-electronic Device Production	Semi-conducting Sn-doped and semi-insulating Fe-doped InP-substrates fabrication; method of routinely testing Fe-doped "Epi-ready" substrates	European InP- substrates, Sn- and Fe- doped, commercially available and competitive in world markets.

Project	Main Deliverable(s)	Impact
R1030 ACCESS	Flexible Customer Access Connection (CAC) for 622 MBit/s services in the future IBC (interactive services, plus analogue CaTV). CAC systems and architectures using TDMA/SCM 2 Mbit/s. Design and evaluation of key components and modules (Flexible multiplexers, broadband switches, EDFA-modules optimised for AM-TV distribution). Cost analysis has shown that fibre solutions are often cheaper than copper.	Cost optimisation of the Customer Access. Inherent flexibility in service provision to residential and small business users through use of optical network topologies. Realisation of corresponding Opto-electronic components.
R1031 Low Cost Opto-electronic Components	Integrated transceiver modules, high speed detector. Coaxial packages of lasers, micro-optics and detectors. 1.5 μm all MOVPE grown SIPBH lasers. Wafer testable 1.5 μm DFB-lasers Alignment and fixing of fibre and lenses, package material costs, hybrid integration of the opto-electronic and electronic functions.	Low cost active opto-electronic devices made commercially available for early implementation of IBC:
R1032 Optical Components for Subscribers Networks	Key components, technologies and test equipment required for introduction of optical fibres in customer premises	Low cost, rugged devices for use in Customers Premises. Complementary perspective to related projects addressing public networks
R1051 Multi-Gigabit Transmission in the IBC Subscriber Loop	10 Gbit/s optical transmission system distributing 64 TV-channels (each at 155 Mbit/s) to over 8 million different terminals	Technology for distributing digital (HD)TV now capable of supporting more subscribers than are likely to be connected to a single network node under any network architectures currently envisaged.
R1057 AQUA	High speed (up to 10 Gbit/s) and high power Quantum Well lasers	Europe now manufacturing high speed components for direct detection multi-gigabit transmission systems
R1064 MIOCA	Monolithically integrated, laser diode-monitor chip, and optical switch & amplifier chip with ridge waveguide structures.	Monolithic optical integration on InP substrates is a key technology for cost effective manufacturing of essential IBC components
R1069 EPLOT	Optical lasers for coherent systems, high speed devices for multi-gigabit systems, integration of amplifiers with DFB lasers	High density coherent systems and very high speed components made feasible, as a result of narrower spectral line-width and better control of wavelength.
R1089 LOOP	Realisation of superior quality passive optical components-better than any other commercially available devices. A low cost optical connector, de-mountable, achieving reflection-free 30% coupling to DFB lasers. A prototype connector-mounting machine for factory use. A fan-out connector (multi-way to single-way) equipped with optional monitoring functions.	The "Euro-Connector" now launched commercially, and adopted by most manufacturers and operators in Europe. Vigorous standardisation efforts ongoing, within international IEC and European CEN / CENELEC. Such components facilitate the earliest implementation of optical communications throughout Europe. Being truly transparent devices, evolution from multimode, to single mode and in future, to coherent transmission can be supported.

2.3 Advanced Information Processing

Project	Main Deliverable(s)	Impact
R1003 GUIDELINE	Synthesis of TMN Architecture based on experimental results and prototypes of other RACE I projects. Guidelines on the Application of AIP techniques to network management	Results exploited by RACE II and EURESCOM Projects. Potential harmonisation and reduction of risks in the commercial development of TMN systems. Significant contribution to Standards (CCITT and ETSI).
R1005 NEMESYS	3 major testbeds for the evaluation of AIP techniques for Traffic and QoS Management. Corresponding simulators for Network, ATM traffic, Services & Users. Practical verification using case studies on Call acceptance & Virtual path.	Reduction of risks in the commercial development of Traffic Management and QoS related TMN systems. Specific results (Simulators, Platform, testbeds) used by RACE II and ESPRIT Projects.
R1006 AIM	Prototypes of maintenance applications for BERKOM, System X and Interconnected MANs. Specification of corresponding IBC maintenance functions. Development of AIP based Generic Maintenance System (GMS) in 11 modules Evaluation of applicability.	Significant increase in the reuse of system components when developing new applications. Larger scale prototype GMS applied to real networks in RACE II (R2002 GEMA) and ESPRIT projects. Development of commercial products based on GMS.
R1009 ADVANCE	Prototypes for Network and Customer Administration Systems (NCAS). Evaluation of the applicability of AIP techniques .	Reduction of risks in the commercial development of NCAS. Results used by RACE II and ESPRIT Projects.
R1017 IOLE	On-line environment (operating system) to support the execution of applications within IBC. Prototype tools for on line software extension, fault tolerance, testing, monitoring and HMI.	An Open Services Architecture for IBC Applications. Exploited by project consortium (embedded in products) and RACE II projects.
R1021 ARISE	Prototype integrated software engineering environment, specifically tailored for Telecommunications. Methods for software reuse. More than 20 tools for use within the environment. Applied to ISDN and IN software development.	Improvements in the cost and time required to develop software. Results exploited by RACE II and ESPRIT Projects and consortium members. Products now being based on tools produced by the project.
R1046 SPECS	Method providing maximum automation in the production, execution and maintenance of telecommunications software, based on the use of FDTs - Formal Description Techniques. Ability to handle and incorporate less formal specifications. Open tool architecture to support the method. Prototype tool set used in pilot case studies.	Facilitated the application of Formal Description Techniques in industrial environments. Significant contribution to Standards (CCITT SG X and ISO). Results exploited by RACE II and ESPRIT Projects and consortium members.
R1068 ROSA I (see also R1093)	Feasibility study for an Open Services Architecture. Identification of requirements and development of the essential concepts to be incorporated.	Leading-edge technology and concepts for service provision. Justified increased RTD in this field.

Project	Main Deliverable(s)	Impact
R1093 ROSA II (See also R1068)	Architectural framework for the provision of IBC services - this a fundamental step towards the definition of an Open Services Architecture. Developed an object model (ROOM), compatible with the ODP standard, and incorporating the characteristics required in a Telecommunications Open Architecture and for IBC service specifications. Methodology for Service analysis, specification and implementation..	Major benefits in terms of cost and time for the development of advanced IBC services. Significant contribution to world-wide research initiatives (TINA-C). Results are exploited by EURESCOM and various RACE Projects.

2.4 IBC Customer Systems

Project	Main Deliverable(s)	Impact
R1001 DVT	Video codec and scanner assembly for 100 Mbit/s HDTV digital recorder on very high density ME tapes.	High density digital video recorder for the consumer electronics market.
R1004 Electro-luminescent Flat panel Display	1st European electro-luminescent (EL) flat panel display and corresponding driver developed and launched commercially.	World leadership in multicolour EL displays. Technology essential for multi-service terminal and high quality displays.
R1011 B-CPN	B-CPN demonstrator, validating a framework architecture covering business requirements across many applications and network sizes.	Economically viable evolution steps from current installations in customer premises, towards the future IBC.
R1015 D-CPN	D-CPN demonstrator, validating a concept which supports services and applications offered by pre-existing systems (e.g. EUREKA IHS) as well as new advanced services like switched high quality sound and video, using low cost technology.	Definition of services and technical/technological developments to facilitate the introduction of IBC in the domestic environment.
R1018 HIVITS	HDTV codec for use by the EBU during WARC 92 for HDTV broadcasting around 20GHz. (Digital video codecs for video telephony, TV and HDTV.) Successful demonstration that current low-bitrate coding standards can be significantly improved by means of advanced image analysis techniques. Significant advances in VLSI technology for video encoding.. Complete study of video transportation over ATM networks. Adaptation of current coding schemes for ATM.	World leadership in devising hierarchical multi-resolution coding techniques which will play a key role in the ongoing definition of digital TV standards. Central contribution to the development by ETSI of the 34Mbit/s standard for contribution codecs. Hierarchical coding is an essential element for the compatibility of different terminal types where video interworking will be required under future MPEG (& multimedia) standards. Products based on HIVITS technology are already being marketed. Basis for further analysis/coding projects in Race II.
R1035 CPN Part I	Specification of the terminal-CPN interface (at the S reference point), including medium adapters. Definition of CPN architectures suitable for business and domestic environments. Evaluation of options these provide, for evolution from present diverse implementations towards IBC.	Provided customers perspective on public-network termination requirements. Strong contributions to standards bodies (ETSI and CCITT). Results exploited within RACE Part II Projects.
R1036 WTDM Broadband Customer Premises Network	Broadband Customer Premises Network suitable for digital (HD)TV contribution services and for a wide range of applications up to 40 Gbit/s. Uses 16 WDM channels (at 2.5 Gbit/s each). Mux/Demux: 16 STM-1 to STM-16 and vice-versa. All-fibre 16x16 star coupler. Node controller for internal CPN routing. Wavelength demultiplexer with wavelength tracking. 2.5 Gbit/s silicon ASICs (interleaver/disinterleaver, 12x12 expandable cross-point switch matrix). Project has proven interworking of a WTDM CPN and a public B-ISDN through a protocol converter.	A practical solution for routing of studio quality digital video and HDTV signals within private domains. Can also support interworking across public networks : The viability of early IBC implementations depend on an ability to support a rapidly expanding demand for video services. Expectation that this technology will be increasingly exploited as HDTV is introduced. Contributions to ETSI TM3 on the use of SDH for studio quality video and audio services.

2.5 Usability Engineering

Project	Main Deliverable(s)	Impact
R1034 Usability Engineering Requirements for IBC	An overview of usability issues for IBC.	Contribution to IBC requirements in the area of Usability Engineering.
R1065 ISSUE	Usability requirements and design recommendations for videophone and multi-media retrieval services	Guidelines for embedding user requirements in the design process for IBC equipment and services
R1066 IPSNI	Functional specification of requirements for input/output media at the man-machine interface of a generic IBC terminal	Full incorporation of people with special needs within the population using IBC services and equipment
R1067 GUIDANCE	Design method and recommendations for distributed multi-author multi-media co-operative system	Guidelines for embedding user requirements in the design process for IBC equipment and services
R1088 TUDOR	Usability requirements, market data and design recommendations regarding elderly and/or handicapped people	Full incorporation of people with special needs within the population using IBC services and equipment

3.1 Demonstrators and Verification

Project	Main Deliverable(s)	Impact
R1007 ITIS	Multi-service, multi-media IBC terminal demonstrator on a PC platform with ISDN and TV interfaces	Initial implementation of functional design, modular architecture and user interface for multi-service terminals.
R1016 Test Tools and Equipment	Specific hardware, software and ancillary requirements for an IBC testbed.	Availability of tools for verification of Subscriber Network functionality
R1033 OSCAR	3 photonic switching demonstrators: Access Cross-Connect for fully transparent optical switching, space packet-switching at 622 Mbit/s and VHSOL with a ring structure New packaging techniques for low cost mass-manufacture of OEICs	Photonic switching components (optical switches, optical amplifiers, detectors and electronics) complete the realisation of systems employing all-optical transmission / switching .
R1038 MCPR	IBC terminal demonstrator on workstation platform, having multimedia, hypermedia, and ATM handling functions	Architecture for multi-media information access on IBC facilities
R1048 RSVP	Initial studies towards a common methodology for Verification	Identification of an approach for the development of common verification techniques
R1056 BIPED	A business IBC demonstrator integrating multi-service-terminals, CPN, customer access network and ATM switch with a gateway to ISDN	Assessment of the relationship between QoS and Network Performance within selected network configurations
R1072 ITACA	Protocol Conformance test specification and automation	Protocol specification and testing methodologies.
R1080 HDTV Experimental Usage	Complete chain of HDTV production, transmission, and consumer equipment according to HD-MAC.	Operational experience in HDTV production and distribution. Raised public awareness of HDTV, within Europe.
R1081 BUNI	IBC Demonstrator constructed as two separate sub-systems, each comprising multi-service terminals, customer premises network, customer access and broadband switch. One demonstrator addresses the broadcasters studio environment, the other, domestic needs. These were later integrated together as a final, 3rd demonstrator.	Major contribution to the agreed T-interface specification in Europe. Verification of IBC system design concepts. Feedback on the application of test tools to the demonstrator, to improve both future network performance and the tools themselves.
R1082 QOSMIC	Methods and Models for the verification of Quality of Service (QoS). 2 prototype tools for verification of QoS. Physically connected to the hardware test environment via the UNI. 4 Case studies evaluated. Animated presentation of project results.	Prototypes of future commercial test equipment. Significant contributions to standards formation in ETSI.
R1083 PARASOL	ATM traffic generator and analyser tools for network verification	Support of network integration projects with tools for testing and verification
R1084 MIME	Emulator/Simulator hybrid systems for ATM networks	Provision of tools to support design, verification and testing of methods, protocols and functions of IBC (including TMN prototypes)
R1087 PROVE	Development of a series of verification and testing modules as an integrated tool set : cell generator/analyser, testing of signalling protocols using test scripts, analysis of signalling and call handling	Verification, test and maintenance strategies for IBC. Contributions to ETSI (e.g. Computer Aided Test Generation). User interface design for test tools. Assessment of ATM signalling.
R1092 DIRAC	Definition of a structured data collection procedure targeted on an innovative analysis method for reliability data. Calculation of reliability of telecommunication systems.	Production of a specification on reliability prediction and measurement. Potentially a European standard.

3.2 Applications Pilots

Project	Main Deliverable(s)	Impact
R1039 DIMUN	Development and testing of new 'intelligent' applications & services to support distributed design and manufacture	A multimedia communications facility proven in an international manufacturing environment. Yielded increased efficiency, reduced costs and reduced time for the order-design-manufacture cycle
R1042 MULTIMED	Definition and development of a prototype multimedia environment for the health-care sector	Improvement in the accessibility and usability of multimedia health-care information.
R1054 APPSN	Six videophone service trials for (social care of) elderly and/or handicapped people	Service models for applications of videophone in social care; user requirements for elderly and handicapped people
R1055 MERCHANT	Definition of a general architecture for a pan-European ERP (Electronic Retail Payment) system. Implementation of a laboratory demonstrator. Validation of technical options for wider-scale implementation.	A new generation of ERP systems that respects the role, independence and responsibility of each existing ERP actor.
R1058 RESAM	Field trials have shown that real demand exists for broadband applications in the airline industry, supporting unscheduled aircraft maintenance. These applications involve video, still picture and broadband data transmissions, supporting aircraft maintenance . Users, their needs and business functions, application domains and system requirements were each identified or defined.	Meets the need for multimedia, distributed problem-solving applications within airlines, aircraft manufacturers and shipping companies. Potential applications in many other sectors identified, e.g. design, health care, crisis management, marketing and sales.
R1059 DIVIDEND	Production of functional requirement specifications for the use of advanced communications within the banking sector, and a multimedia terminal based on these.	Raised awareness of users re the potential offered by advanced services in banking sector. User interest triggered.
R1060 DIDAMES	Demonstration of collaborative work in manufacturing, using local and wide area broadband communications, supporting PC-integrated video conferencing.	Resulted in commercial tools, applications and telecommunications products. with emphasis on standards, (eg. for workstation interface cards and video codecs).

Project	Main Deliverable(s)	Impact
R1061 DIMPE	Pilot of Distributed Multimedia Publishing Environment between major publishing sites.	An understanding of publishers requirements, to realise commercial viability of the application. Development of an open, flexible application architecture and agreement on standards.
R1062 MARIN ABC	Demonstration of IBC application in the maritime industry: non-routine maintenance and repair of a ship at sea, with assistance of shore-based expertise.	Demonstrated feasibility and cost effectiveness of ship-to-shore video communications via satellite, to prevent/solve maintenance problems as they arise.
R1063 MAPS	Specification of four application pilot schemes for mobile communications	Focus and approach better defined for subsequent projects in RACE II
R1070 Testing pay-per view	Pilots for pay-per view television in three separate, existing CaTV networks. Specialised software for traffic modelling and evaluation tools.	Requirements for the man-machine interface. Strategy for the transition to IBC.
R1073 GEOTEL	Multinational pilot implementation of a library service for petrochemical and related industries	An effective commercial image library accessible from all over Europe (initially by ISDN)
R1074 ECHO	Installation of an IBC-based, electronic case handling system within insurance companies.	Increase in effectiveness and productivity of clerical and professional personnel in the insurance sector by the use of a distributed system of workstations and servers.
R1075 Telepublishing	2 Application Pilots : An individualised electronic newspaper The designing, printing and publishing of catalogues.	Scenario of a broadband working environment, providing easy, time shared interaction between separate locations in the printing and publishing industry.
R1078 European Museums Network	A full digital multimedia system with as applications, an authoring tool for museum staff and a "discovery machine" for navigation of the museum by visitors	Identification of requirements for workstations and man-machine interface.
R1079 CAR	A conference demonstrator to support design engineers at different sites in their decision-making. A remote surveillance system relevant to the manufacturing sector. A multimedia messaging system between the various actors in manufacturing design. New methodologies for requirements capture and evaluation	Provided an understanding of the implications of introducing IBC services in the automotive industry. Established knowledge base for future service design.
R1086 TELEMED	Demonstration of the potential for medical image and data transmission in an IBC environment	Stimulation of the development of medical applications such as remote expert consultation and diagnosis, co-operative research and teaching
R1091 ESP	Assessment of a common strategy for implementation of the communication links required to support RACE Application Pilots. Assisted in the Pilots' own assessment of requirements for end-systems, software protocols and network provision.	Focused the on-going discussions amongst Sector Actors, and acted as a catalyst for further network provision initiatives. Results & synergies achieved now exploited in RACE II.

Concerted Actions and Accompanying Measures

Date	Event / Workshop	Impact
1988 (7 Dates)	**RACE Concertation Meetings**	Established working relationships amongst RACE projects, with appropriate links to other CEC programmes (Esprit, COST and Eureka). Technical approaches and systems concepts pooled, to mutual advantage.
1989 (7 Dates)	**RACE Concertation Meetings**	Integration of application pilots, usage and verification projects within the on-going programme. Extensive work supporting the development of Common Functional Specifications (CFS)
6 & 14 June 1990	**User Meeting on Advanced Communications in Europe**	Raised awareness of the potential for application of advanced communications in different business sectors. Generated the interest of user organisations to respond to possible future call for application pilots.
20 June 1990 (in Dublin)	**IBC Islands Workshop**	Highlighted the extent to which broadband communications already existed, and showed how interconnection of such "islands" could feasibly be achieved in the shorter term
26 June 1990	**Fibre to the Home**	Examined the economics of deploying optical fibre in the Customer Access network, and highlighted the most promising technical approaches, for further development.
2 July 1990	**Mobile Communications in IBC**	Determined the relationship between systems supporting broadband and mobile communications. Intelligence in Networks and "Mobility in the fixed network" amongst the common factors.
10-12 July 1990 (in Aveiro)	**Optical Communications Summer School**	Strengthening of links with peripheral countries. Dissemination of optical RACE results to engineers expecting to begin research in this field.
15 October 1990 (in London)	**International IBC Conference**	Single conference giving the broadest coverage of RACE I results, and progress made in the functional specifications of IBC. Wide dissemination achieved.
23 October 1990	**Impact Assessment and Forecasting**	A review of socio/political issues pertinent to the development of IBC. An indication of the priorities for future RTD in the area.
24 October 1990	**Intelligent Network, Service Engineering and Usability**	Raised awareness of the potential for separation of service provision from network operation. Technological basis for a faster, more effective approach to service design, based on combinations of discrete service components.
26 October 1990	**IBC Implementation Framework**	Communication with the sector actors concerned. Examined the feasibility of implementing evolutionary scenarios developed within RACE.
30 October 1990	**Image Communications**	Identification of priority areas for RTD to meet emerging IBC requirements, based on a review of the state-of-the-art in image communications.
13 December 1990	**Intelligent Cities**	Development of co-operation between City authorities , in applying informational resources and communications links to find solutions to urban problems. Identified requirements for RTD, which led to the establishment of the ENS Action.
1990 (6 Dates)	**RACE Concertation Meetings**	Mid-Term results collated and fed into planning process for RACE II. First draft of CFSs fed back to projects.
10 September 1991	**Fibre to the User (International Audit)**	Comparison of roll-out strategies in Japan, USA, Canada and Europe, for introduction of optical fibre in the customer access. Factors determining the technical and economic suitability of the different approaches examined in detail
1991 (6 Dates)	**RACE Concertation Meetings**	Highlighted issues of common interest, for further examination. Second consolidation of CFS.
1992 (6 Dates)	**RACE Concertation Meetings**	Transfer of RACE I results to newly launched RACE II projects. Assured continuity of momentum and links between RACE Projects & other Programmes.

Annex II

Contributions to Standards

RACE
CONTRIBUTIONS TO STANDARDS

R1003 AIP and Standards for TMN

Taxonomy of Reference Points (Re view of M.30)	CCITT		1991/03	UK
Mediation function definition	ETSI	NA 4	1990/03	UK
Taxonomy of Reference Points (Review of M.30)	ETSI	NA 4	1991/03	UK
The workstation function	ETSI	NA 4	1990/03	UK
TMN reference point definition	ETSI	NA 4	1990/09	UK
Taxonomy of Reference Points (Re view of M.30)	ETSI	NA4	1991/03	UK

R1014 Atmospheric

Distributed Bit Scrambling Method for ATM Cells	ANSI	T1S1.1.	1989/09	Canada
The Distributed Bit Scrambling Method for ATM Cells	ANSI	T1S1.5	1990/02	USA
New questions on string mode for the next CCITT period	CCITT		1992/06	
Distributed Sample Scrambler : State Transition Machine	CCITT	SG	1991/06	Switzerland
Mapping of ATM cells into lower-order VCs	CCITT	SG	1992/03	
On the Equivalence Between two Proposed Network Architectures	CCITT	SG	1991/06	Switzerland
On the harmonisation of two proposed network architectures	CCITT	SG	1991/12	Australia
The Distributed Bit Scrambling Method for ATM Cells	CCITT	SG	1990/01	Switzerland
The Stratified Concept - an extension to ISDN PRM I.320	CCITT	SG	1990/01	Italy
Distributed Sampler Scrambler : Technical Description	CCITT	SG	1990/12	Japan
Cell Delineation with the Distributed Sample Scrambler	CCITT	SG	1990/10	Japan
Distributed Sample Scrambler : Synchronisation Confidence Limits	CCITT	SG	1990/12	Japan
Introduction of the Stratified Reference Model	ETSI	NA4	1989/11	
Signalling and Management in the SRM	ETSI	NA4	1992/09	
Stratified Reference Model	ETSI	NA4	1992/03	
31st Order Distributed Sample Scrambler	ETSI	NA5	1990/10	France
600 Mbit/s structure at T	ETSI	NA5	1989/03	Germany
Allocation of PTI Values	ETSI	NA5	1991/04	Netherlands
ATM Cell Format	ETSI	NA5	1989/03	Germany
ATM header error control cell delineation combined with scrambling	ETSI	NA5	1989/05	France
ATM Information Field Size	ETSI	NA5	1989/03	Germany
ATM Routing Field	ETSI	NA5	1989/03	Germany
ATM Routing Field	ETSI	NA5	1989/05	France
Distributed Bit Scrambler with 8-bit HEC	ETSI	NA5	1990/03	Italy
Distributed Bit Scrambling Method for ATM Cells	ETSI	NA5	1989/09	France
Distributed Scrambler with 31st order Polynomial	ETSI	NA5	1990/09	Spain
Frame Synchronisation	ETSI	NA5	1989/04	Netherlands
Layer Stamping	ETSI	NA5	1990/10	France
Mapping the ATM UNI into the SDH UNI	ETSI	NA5	1989/03	Germany
Media Adaptors at T	ETSI	NA5	1989/03	Germany
Multi-link protocols for ATM	ETSI	NA5	1991/09	Turkey
NT1 Functionality	ETSI	NA5	1989/04	Netherlands
Proposed Structure of CCITT B-ISDN Rec.	ETSI	NA5	1989/05	France
Service Requirements for ATM Priority and Layering	ETSI	NA5	1989/03	Germany
Service Requirements for ATM Priority and Layering	ETSI	NA5	1989/03	Germany
String Mode	ETSI	NA5	1991/09	Turkey
String Mode Protocol for ATM Network	ETSI	NA5	1991/04	Netherlands
Synchronisation	ETSI	NA5	1988/10	Netherlands
The Distributed Bit Scrambling Method for ATM Cells	ETSI	NA5	1989/10	Sweden
The Distributed Bit Scrambling Method for ATM Cells	ETSI	NA5	1989/11	UK
The Distributed Byte Scrambling Method for ATM Cells	ETSI	NA5	1990/04	Portugal
The resilience of the distributed bit scrambling method to Random or Malicious Interference	ETSI	NA5		
Transmission aspects - Virtual Bandwidth	ETSI	NA5	1992/09	
Transmission Format	ETSI	NA5	1988/10	Netherlands
Transmission Format for ATM	ETSI	NA5	1988/10	Netherlands
Transmission System on the Line Side of NT1	ETSI	NA5	1989/03	Germany
Virtual Network Concept	ETSI	NA5	1988/10	Netherlands
Virtual Path Identifier	ETSI	NA5	1988/10	Ireland

VPI Field Size at the UNI	ETSI	NA5	1989/11	UK
Proposal for definition of the Service Profile Concept for B-ISDN and its use for customer/access/terminal	ETSI	SPS3	1991/05	Germany
Mapping ATM into lower order VCs	ETSI	TM1	1990/10	Germany
The Distributed Bit Scrambling Method for ATM Cells	ETSI	TM3	1989/10	Portugal
Signalling at the UNI and NNI. Introductory Remarks	RACE	ARG	1990/06	Norway
Naming and Addressing within the Stratified Reference Model	RACE	STG 1.1	1992/05	
The Extended Stratified Reference Model	RACE	STG 1.1	1991/09	
Contribution to D410 CFS : Signalling Protocols	RACE	STG 3.1	1990/05	Belgium
Contribution to the Functional Model for IBC Basic Service	RACE	STG 3.1.	1991/02	Belgium

R1015 Domestic Customer Premises Network

Comments on Draft Recommendation I.363	ETSI	NA 5	1990/04	Portugal

R1018 High Quality Videotelephone and (High Definition) Television

Impact of digital transmission on HDTV sampling parameters	CCIR	IWP-11/	1990	
Hardware realisation of a 140/155 Mbit/s HDTV-codec progress report	CCIR	TG11-2	1991/02	France
ATM cell loss experiments with TM1	CCITT	IEC	1992/07	Netherlands
ATM cell loss experiments with TM1	CCITT	ISO	1992/07	Netherlands
H 261 compatible 2-layer video codec with high cell loss resiliance.	CCITT	SG XV	1991/05	France
Simulation of random cell loss	CCITT	SG XV	1992/01	UK
Two Remarks to the text of the Flexible Hardware specification	CCITT	SG XV	1989/11	Germany
Two Remarks to the text of the Flexible Hardware specification	CCITT	SG XV	1989/11	France
Two Remarks to the text of the Flexible Hardware specification	CCITT	SG XV	1989/11	Italy
Two Remarks to the text of the Flexible Hardware specification	CCITT	SG XV	1989/11	Netherlands
Two Remarks to the text of the Flexible Hardware specification	CCITT	SG XV	1989/11	Sweden
Two Remarks to the text of the Flexible Hardware specification	CCITT	SG XV	1989/11	UK
ATM cell loss experiments with TM1	CCITT	SG XV/1	1992/07	Netherlands
Error sensivity of the TM1 syntax	CCITT	SG	1992/07	Netherlands
Normes pour les systèmes de distribution secondaire	CMTT		1989	France
Rewording of annex A of report AD/CMTT	CMTT		1990/03	
Comparison of the two VLC and videomultiplier proposals according to report AD/CMTT	CMTT/2		1989/12	
Contribution codec VLC parameters	CMTT/2		1989/10	
Contribution to the adhoc group on 34 Mbit/s DCT coding	CMTT/2		1988/03	
Contribution to the specification writing	CMTT/2		1988/08	
Corrections and rewording to the draft recommendation AT/CMTT	CMTT/2		1990/03	
Criticality and Quantisation	CMTT/2		1989/09	
Hardware realisation of the 34/45 Mbit/s 4:2:2 codec and of the 140 Mbit/s HDTV codec	CMTT/2		1990/03	
Performances of the VLC based on ACVLC	CMTT/2		1989/10	
Proposal for an amendment to CMTT DCT ad hoc group document No 1	CMTT/2		1988/04	
Scanning standard to be used on the secondary distribution channels	CMTT/2		1990/02	
Specification of a variable length coding	CMTT/2		1989/09	
The issue of VLC and videoframing	CMTT/2		1989/10	
Variable length coding	CMTT/2		1989/08	
Videoframing	CMTT/2		1989/09	
VLC and videomultiplex proposal	CMTT/2		1988/06	
Hardware realisation of a 140/155 Mbit/s HDTV-codec Progress Report	CMTT/2	WB11	1991/02	France
34/45 Mbit/s videocodec - The issue of VLC and videoframing	ETSI	NA	1990	
Introduction to the project HIVITS	ETSI	NA	1990	
Status of the 34/45 Mbit/s contribution codec standard	ETSI	NA	1990	
H 261 compatible 2-layer video codec with high cell loss resiliance.	ETSI	NA 5	1991/04	Netherlands
Specification for CCITT H.261 comatible video coding for ATM networks	ETSI	NA 5	1992/02	UK
A draft proposal for ALL Type 2	ETSI	NA5	1992/05	UK

R1022 Technology for ATD

AAL-PDU Structure for CBR audio and video services	CCITT	SG	1990/01	Portugal
Sequence number protection for AALL Class 1 services	CCITT	SG	1990/05	Portugal
VCI Management For A Signalling Link	CCITT	SG		USA
"VPI/VCI pastition at UNI and ""active bits"" restriction"	CCITT	SG	1990/01	Germany
Compatibility Between S and T Interfaces In The Subscriber Premises Network	CEPT	NA5	1988/10	Portugal
Echo in the Finnish PSTN	CEPT	NA5	1988/10	Portugal
Bit Error Bursts At 139 264 kbit/s	CMTT	IWP		
Monitoring Of The Quality Of Digital Circuits Using ATM	CMTT	IWP		
On The Necessity Of Protection Against Cell Losses For High-Quality Audio And Video Services	CMTT	IWP		

Synchronization Aspects In A Pure ATM-Based Broadband Network	CMTT	IWP		
Treatment Of Cell Losses In An ATM-Based Broadband Network	CMTT	IWP		
AAL Sequence number synchronization algorithm	ETSI	NA 5	1990/09	Portugal
Application Of Maintenance Principles To B-ISDN Basic Customer Access	ETSI	NA 5	1989/03	
Impact of ATM Cell Size on Mobile Communications	ETSI	NA 5	1989/05	
Priorities In An ATM Network	ETSI	NA 5		Germany
ROS subattributes in I. 2XX	ETSI	NA 5	1989/11	
Sequence number protection for AAL Class 1 Services	ETSI	NA 5	1990/04	Portugal
Sequence number protection for AAL type 1	ETSI	NA 5	1990/10	Portugal
Service Bit Rates Amendments to Draft Rec. I. 2XX	ETSI	NA 5	1989/11	
Considerations on the ATM Layer Functions	ETSI	SPS 3	1990/04	
Considerations on the Cell Header Translation Function	ETSI	SPS 3	1990/04	
Considerations on the Physical Layer Functions	ETSI	SPS 3	1990/04	
Considerations on Virtual Channel	ETSI	SPS 3	1990/04	
Functions of ATM Network Nodes	ETSI	SPS 3	1990/04	
General Characteristics of ATM Network Nodes	ETSI	SPS 3	1990/04	
INTERFACES	ETSI	SPS 3	1989/10	
"Introduction, Scope and Field of Application (for Rec. on Broad-Bandswitching)"	ETSI	SPS 3	1990/04	
New Structure for Recommendation on Broadband Switching	ETSI	SPS 3	1990/04	
Some Considerations on Overload Handling	ETSI	SPS 3	1989/10	
ATM-Related Functions	ETSI	STG 3.2	1990/06	Netherlands
Connection Acceptance Control	ETSI	STG 3.2	1990/08	Netherlands
Connections through an Exchange	ETSI	STG 3.2	1990/06	Netherlands
Maintenance aspects of an ATM Exchange	ETSI	STG 3.2	1990/06	Netherlands
Performance of established connections	ETSI	STG 3.2	1990/07	Netherlands
Service specific functions in an ATM Exchange	ETSI	STG 3.2	1990/06	Netherlands
Traffic Characterization	ETSI	STG 3.2	1990/08	Netherlands

R1024 Functional Specifications for IBC System Requirements

QOS Methodology	ETSI	NA	1990/03	UK
Analysis of Network Management Requirements	ETSI	NA 4	1990/09	

R1030 Advanced Customer Connections, an Evolutionary System

Consideration concerning loopback in CAC	ETSI	NA 5	1991/06	Sweden

R1031 Low Cost Optoelectronic Components

Measurement Techniques for Essential Ratings and Characteristics of Components	CCITT	IEC		
"Blank detail specification: ""Coaxial laser"""	CENELEC	CECC	1989/04	Germany

R1035 Customer Premises Network

Physical Layer OAM for cell based option.	ETSI	NA 5	1991/09	
Cost and performance of different coaxial cable and receiver types.	ETSI	TM 3	1991/04	
Definition of terminal failure voltage for the coaxial interface at 155.52 Mbps.	ETSI	TM 3	1991/04	
"Input to the ""Living List"" for Rec. I.432."	ETSI	TM 3	1991/04	
Line code for Interfaces at TB- and SB reference points.	ETSI	TM 3	1991/04	

R1041 Functional Specifications of Codes

Principle of Functional Modelling	ETSI	NA 4	1990/09	France

R1044 IBCN Development of the Functional Reference Model

UK Contribution on Protocol Reference Models	CCITT	SG	1988	
UK contribution on Signalling Channel Structures	CCITT	SG	1988	
Optical CATV User-Network-Interface Based on a High-speed WDM	ETSI	NA 3	1990/02	Germany
Optical CATV-User-Network-Interface b.opt.	ETSI	NA 3	1990/02	Germany
Impact of intelligent Networks on TMN	ETSI	NA 4	1989/10	Denmark
A formal stage I description of Multi-Media services	ETSI	NA 5	1989/10	Denmark
AAL messages	ETSI	NA 5	1990/09	Belgium
AAL primitives for non-assured operation without flow control	ETSI	NA 5	1990/09	Belgium
AAL primitives for operation with flow control	ETSI	NA 5	1990/09	Belgium
AAL protocol model and peer-to-peer procedures	ETSI	NA 5	1990/09	Belgium
AAL type 3 functional model (allocation AAL)	ETSI	NA 5	1991/09	Belgium
An adaptation convergence sub-layer (CS) and protocol for connectionless services	ETSI	NA 5	1990/03	

An adaptation layer protocol model for signalling packet-mode connection oriented service and	ETSI	NA 5	1989/10	
An ATM Adaption Layer Protocol Model for IEEE LAN Interconnects	ETSI	NA 5	1989/11	Belgium
An ATM Adaption Layer Protocol Model for packet mode services	ETSI	NA 5	1989/11	Belgium
Analysis of Multi Media Aspects of Broadband Services	ETSI	NA 5	1989/10	Denmark
Answer to CCITT XI/4 open questions on meta-signalling	ETSI	NA 5	1990/09	Belgium
ATM adaptation layer for VBR service	ETSI	NA 5	1989/10	
ATM adaptation model layer service classification for non-time-related services	ETSI	NA 5	1990/03	
ATM signalling channel allocation and meta-signaling issues	ETSI	NA 5	1989/10	
Attributes classification	ETSI	NA 5	1990/09	Belgium
B-ISDN Arch.Prin.for Interactive and Non-Switch.Distribn.Services	ETSI	NA 5	1990/07	UK
B-ISDN Arch.Prin.for Interactive and Non-Switch.Distribn.Services	ETSI	NA 5	1990/07	Germany
B-ISDN bearer service definition	ETSI	NA 5	1990/09	Belgium
B-ISDN Connection Types and their attributes	ETSI	NA 5	1992/01	Belgium
Basic Requirements and Principles for MANs	ETSI	NA 5	1990/01	Belgium
Benefits of activation/deactivation at the TB reference point	ETSI	NA 5	1990/09	Belgium
Categorization of B-ISDN Connection Types	ETSI	NA 5	1992/01	Belgium
Clarification of channel associated signalling (CAS) at the access	ETSI	NA 5	1991/01	Belgium
Clarification of the ATM adaptation service classification model	ETSI	NA 5	1990/03	
Comments on ATM header functions	ETSI	NA 5	1990/10	
Comments on NA5 Draft Rec.1413 (UNI)	ETSI	NA 5	1989/11	
Comments on SG XI meta-signalling document	ETSI	NA 5	1991/01	Belgium
Common channel signalling (CCS) for B-ISDN	ETSI	NA 5	1991/01	Belgium
Contribution on Short term IBCN	ETSI	NA 5	1989/03	
Cost comparison of the coaxial with the fibre optical interface at UNI	ETSI	NA 5	1989/11	
Cost figures of a coaxial interface at UNI	ETSI	NA 5	1989/11	
Cost figures of a fibre optical interface at UNI	ETSI	NA 5	1989/11	
Error detection for PO services	ETSI	NA 5	1989/11	
Estimate of activation times for an activation/deactivation procedure at the TB reference point	ETSI	NA 5	1990/09	Belgium
Evolution of Optical Multi-Customer Access Links in the IBCN	ETSI	NA 5	1990/03	Germany
Guidelines for dynamic description of Multi-Media services using SDL diagrams	ETSI	NA 5	1989/10	
Implications of the introduction of the P bit for AAL type 3 and 4 (allocation AAL)	ETSI	NA 5	1991/09	Belgium
Information type related attributes for service components	ETSI	NA 5	1989/03	Germany
Introduction IBCN Reference Configuration	ETSI	NA 5	1990/03	
Introduction of the BRAN and LIT functional groups into the functional architectural model (allocation	ETSI	NA 5	1991/09	Belgium
Introduction to the static description of multimedia services	ETSI	NA 5	1989/03	Germany
Introductory description of multimedia services	ETSI	NA 5	1989/03	
List of parameters for the physical medium dependent layer of an electrical interface at the Tb reference	ETSI	NA 5	1989/09	
Location of meta-signalling in the B-ISDN FRM	ETSI	NA 5	1991/01	Belgium
Meta-signalling	ETSI	NA 5	1990/03	Italy
Meta-signalling message transport	ETSI	NA 5	1989/11	
Meta-signalling states description	ETSI	NA 5	1989/11	
Multi-media structure	ETSI	NA 5	1990/09	Belgium
Notes on Access Network MAN Architecture 5	ETSI	NA 5	1990/03	Italy
Open questions on meta-signalling raised at Brussels meeting of CCITT SG XI/4	ETSI	NA 5	1991/01	Belgium
Optical CATV User-Network-Interface Based on a High-speed WDM	ETSI	NA 5	1990/02	Germany
Optical CATV-User-Network-Interface b.opt.	ETSI	NA 5	1990/02	Germany
Optical Multicustomer Access Networks and its Evolution	ETSI	NA 5	1990/03	Germany
Optical Multicustomer Access Networks and its Evolution	ETSI	NA 5	1990/03	Germany
Optical Network Architecture for a Combined B-ISDN & CATV Multicustomer Access Link in IBCN	ETSI	NA 5	1990/04	Switzerland
Optical Network Architecture for a Combined B-ISDN & CATV Multicustomer Access Link in IBCN	ETSI	NA 5	1990/04	Germany
Optical Reference Configuration of Multigigabit CATV Customer Access Network (R.1051)	ETSI	NA 5	1990/02	Germany
Physical layer of the cell-based UNI	ETSI	NA 5	1990/09	Belgium
Power feeding accross the interface at the Tb reference point	ETSI	NA 5	1989/09	
Preliminary Network Architecture for the IBCN	ETSI	NA 5	1989/10	
Principles on Interworking	ETSI	NA 5	1989/10	UK
Proposal for a cyclic counting in the AAL sequence number field	ETSI	NA 5	1990/03	
Proposal for a data-link protocol as part of AAL Convergence Sub-layer (CS) protocol for non-time-related	ETSI	NA 5	1990/03	Italy
Proposal for basic primitives between the ATM adaptation layer (AAL) and the ATM layer	ETSI	NA 5	1990/03	
Proposal for primitives between the ATM adaptation layer and the ATM layer	ETSI	NA 5	1990/03	
Proposal for single BASIC ATM Adaptation (SAR) sub-layer for all Packet Oriented (PO) services	ETSI	NA 5	1989/11	
Proposed Document Structure for MAN Standards	ETSI	NA 5	1990/01	Belgium
Proposed Structure for ETSI draft ETSI on MANs	ETSI	NA 5	1990/03	
Prose description and definition of multimedia services	ETSI	NA 5	1989/03	Germany
Protocol Architecture for AAL type 3 and type 4 (allocation AAL)	ETSI	NA 5	1991/09	Belgium
Reference Configuration for TMN	ETSI	NA 5	1989/03	

Reference Configurations Construction Rules	ETSI	NA 5	1990/09	Belgium
Service Component Concept	ETSI	NA 5	1988/03	Germany
Service primitives exchanged between the ATM Layer Entity and the AAL Layer Entity (allocation PRS)	ETSI	NA 5	1991/09	Belgium
Service Requirements for MANs	ETSI	NA 5	1990/01	Belgium
Signalling requirements for multiparty calls	ETSI	NA 5	1990/09	Belgium
Specification of the Physical Characteristics for an electrical interface of 155.52 MBit/s	ETSI	NA 5	1989/11	Belgium
Stage 2 studies on Multi-Media Services	ETSI	NA 5	1989/10	Denmark
Support of Broadband distributive services	ETSI	NA 5	1989/10	
SVCI management protocol SDL	ETSI	NA 5	1990/09	Belgium
Target IBCN Reference Configuration	ETSI	NA 5	1990/03	
Target IBCN Reference Configurations	ETSI	NA 5	1989/03	
The BRANching functional group in the CAN	ETSI	NA 5	1992/01	Belgium
The Optical Line Outlet concept	ETSI	NA 5	1989/10	
The use of selective broadcasting	ETSI	NA 5	1990/09	Belgium
Transmission range for coaxial interface	ETSI	NA 5	1989/09	
Transmission ranges for an optical fibre interface	ETSI	NA 5	1989/11	
Use of generic layering architecture to structure the broadband user-network signalling interface	ETSI	NA 5	1989/10	
Use of unused octets in meta-signalling messages and indication	ETSI	NA 5	1991/01	Belgium
User network interface based on SDH	ETSI	NA 5	1989/10	
Utilisation of the 780 nm optical window for transmission at the UNI	ETSI	NA 5	1990/09	Belgium
A framework for the TSI TC/TR on "Signalling protocol requirements for B-ISDN services"	ETSI	NA5	1991/11	Finland
A proposal for S-AAL protocol architecture	ETSI	NA5	1992/05	Sweden
AAL functional models for class D services	ETSI	NA5	1991/10	Greece
AAL SSCP protocol model for B-ISDN signalling and CO Data Service	ETSI	NA5	1992/05	Sweden
AAL SSCP protocol model for B-ISDN signalling & (high speed) conection oriented data services	ETSI	NA5	1992/01	France
AAL type 3 functional model	ETSI	NA5	1991/09	Turkey
AAL type 4 functional model	ETSI	NA5	1991/09	Turkey
Application of the Service Component - Concept to stage 2 and 3 of I.130	ETSI	NA5	1991/04	Turkey
B-ISDN Connection Types and their attributes	ETSI	NA5	1992/01	France
Categorization of B-ISDN Connection Types	ETSI	NA5	1992/01	France
Cell delineation for burst & continuous ATM, cell based option	ETSI	NA5	1991/09	Turkey
Clarification of the PRM information flows	ETSI	NA5	1992/01	France
Comments on pr ETS DE/NA-52511 par. 13 "Operational Functions"	ETSI	NA5	1992/09	Sweden
Comparison of the BRAN FG Concept for the Optical Access Network as an addition to the liaison statement	ETSI	NA5	1992/04	Italy
Editorial amendment for paragraph 4.4 in I.432	ETSI	NA5	1991/10	Greece
Functional ATM Layer Model for service primitives definitions	ETSI	NA5	1991/09	Turkey
General NNIs and Interworking	ETSI	NA5	1992/09	Sweden
Identifiers for B-ISDN signalling	ETSI	NA5	1991/11	Finland
Impact of service component concept on stage 2 & stage 3 of CCITT Rec. I.130	ETSI	NA5	1991/10	Greece
Implication of the introduction of the P bit for AAL type 3 & 4	ETSI	NA5	1991/09	Turkey
Improved wavelength allocation	ETSI	NA5	1991/10	Greece
Introduction of BRAN into the Generic RC of CE; Introduction of BRANs into the FAM of a PL	ETSI	NA5	1992/09	Sweden
Introduction of the BRAN and LIT functional groups into the functional architecture model	ETSI	NA5	1991/09	Turkey
Loss priority parameter in AAL Primitives	ETSI	NA5	1991/10	Greece
Maintenance for cell based UNI	ETSI	NA5	1991/09	Turkey
Mapping of service components into bearer components for multimedia services	ETSI	NA5	1991/10	Greece
Naming conventions for primitives related to the association between VCI/VPI & CEI	ETSI	NA5	1992/01	France
No need for a Fast Reservation Protocol	ETSI	NA5	1991/09	Turkey
Physical layer functional model for service primitives definition	ETSI	NA5	1991/10	Greece
Physical Layer OAM for cell based option	ETSI	NA5	1991/09	Turkey
Physical layer OAM for cell based option	ETSI	NA5	1991/10	Greece
Primitives definition related to local monitoring functions : M-ATM CONGESTION-INDICATION	ETSI	NA5	1992/09	Sweden
Primitives definition related to local monitoring functions : M-ATM MONITOR-INVOKE	ETSI	NA5	1992/09	Sweden
Primitives definition related to local monitoring functions : M-ATM MONITOR-REMOVE	ETSI	NA5	1992/09	Sweden
Primitives definition related to local monitoring functions : M-ATM MONITOR-INDICATION	ETSI	NA5	1992/09	Sweden
Primitives exchanged between the PMD sublayer entity & the TC sublayer entity	ETSI	NA5	1991/10	Greece
Proposal for a Concept of multiparty	ETSI	NA5	1991/09	Turkey
Proposal for burst ATM transmission	ETSI	NA5	1991/09	Turkey
Proposed Structure for MANs	ETSI	NA5	1990/03	Italy
Protocol architecture for AAL type 3 & type 4	ETSI	NA5	1991/09	Turkey
Revision of ATM layer functional model	ETSI	NA5	1992/01	France
Revision of service primitives exchanged between the ATM Layer Entity & the AAL Layer Entity	ETSI	NA5	1992/03	Portugal
Service primitives exchanged between the ATM Layer Entity and the ATM Layer Management Entity	ETSI	NA5	1991/09	Turkey
Service primitives exchanged between the ATM Layer Entity and the ATM Layer Management Entity	ETSI	NA5	1991/09	Turkey
Service primitives exchanged between the ATM Layer Entity and the AAL Layer Entity	ETSI	NA5	1991/09	Turkey

Service primitives exchanged between the ATM Layer Entity and the SAR Sublayer Entity	ETSI	NA5	1991/09	Turkey
Service primitives exchanged between the ATM layer Management Entity related to data transfer	ETSI	NA5	1991/09	Turkey
Service primitives exchanged between the PH layer entity & the ATM layer entitiy	ETSI	NA5	1991/10	Greece
State matrix at TB interface for cell based option	ETSI	NA5	1991/10	Greece
The BRANching functional group in the Customer Access Network	ETSI	NA5	1992/01	France
The way ahead on broadband numbering within NA2	ETSI	NA5	1991/09	Turkey
Use of the PRM for user plane and control plane connection establishments	ETSI	NA5	1991/09	Turkey
Comments on SG XI meta-signalling document	ETSI	SPS 3	1991/01	Belgium
Comments on the CCITT SG XI metasignalling protocol working document WD4-33	ETSI	SPS 3	1990/04	Belgium
Global messages for remove and check procedures	ETSI	SPS 3	1990/10	Belgium
Global primitives for remove and check procedures	ETSI	SPS 3	1990/10	Belgium
Initialisation of Meta-signalling and SVCI assignment procedure	ETSI	SPS 3	1990/10	Belgium
Location of meta-signalling in the B-ISDN FRM	ETSI	SPS 3	1991/01	Belgium
Metasignalling protocol functions and limitations	ETSI	SPS 3	1990/04	Belgium
Open questions on meta-signalling raised at Brussels meeting of CCITT SG XI/4	ETSI	SPS 3	1991/01	Belgium
Point-to-point signalling channel management procedures and SDLs	ETSI	SPS 3	1990/10	Belgium
Signalling Virtual Channel Bandwidth	ETSI	SPS 3	1990/10	Belgium
Use of unused octets in meta-signalling messages and indication	ETSI	SPS 3	1991/01	Belgium

R1045 Consensus Management

UK contribution on the Service Component Concept for the definition of Multi Media Services	CCITT		1988	UK
UK contribution to CCITT SG XVIII on Protocol Reference Models	CCITT		1988	UK
UK contribution to CCITT SG XVIII on Signalling Channel Structures	CCITT		1988	UK
Overview of the current status of the CM0 activities I	CEPT	GMR	1990/11	Portugal
Presentation of RACE projects to GMR	CEPT	GMR	1990/01	
R1022 Initial Network Planning Guideline	CEPT	GMR	1989/12	Portugal
RACE Application Analysis R1071	CEPT	GMR	1990/09	
RACE Atmospheric R1014	CEPT	GMR	1990/09	
RACE Concertation Meeting Technical Workshops	CEPT	GMR	1990/01	
RACE Mobile Project R1043	CEPT	GMR	1990/01	
RACE Satellite Communication for IBCN R1002	CEPT	GMR	1989/07	Portugal
RACE: Spectrum Requirements for the 1-3 GHz	CEPT	GMR	1989/10	Italy
Request for support the RACE Workpackage EPF	CEPT	GMR	1989/03	Germany
Testbed Infrastructure for RACE Operation 92	CEPT	GMR	1989/03	Germany
Long Distance Network : Preliminary Results	CEPT	PSR	1989/12	Germany
Optical Interfaces for the Customer Access Network	ETSI		1991/01	Denmark
"Optical Transmission in the OLN, Architecture and Evolution"	ETSI		1991/01	Denmark
The Optical Line Outlet concept	ETSI		1989/10	France
Acronyms and abbreviations related to specificaiton and testing of communication systems	ETSI	ATM	1990/09	Netherlands
Draft report: State of research and standardisation in the area of analytical/formal test specification methods	ETSI	ATM	1991/06	Belgium
Draft Specification RACE B410: Protocol Conformance Testing	ETSI	ATM	1990/09	Belgium
Proposal for a new work item : Study of the Scope for interoperability testing	ETSI	ATM	1990/04	France
Requirements on methodology for conformance testing of lower layers in advanced digital networks	ETSI	ATM	1991/06	Sweden
Standardisation opportunities in the area of formal test methods	ETSI	ATM	1991/06	Sweden
Technical Specifications of the IBC PCT Service	ETSI	ATM	1990/09	Netherlands
Vocabulary	ETSI	ATM	1990/04	France
Vocabulary of interims terms	ETSI	ATM	1990/09	Netherlands
Vocabulary of stable terms	ETSI	ATM	1990/09	Netherlands
Proposal for extending the terms of references of ETSI/TC-HF	ETSI	HF	1989/10	Germany
ISDN Videotelephony Requirements for the Deaf	ETSI	HF 3	1990/07	UK
A comparison of the Layered Network models used in draft CCITT Recs. M.gnm and Gsna.1	ETSI	NA 4	1991/03	Belgium
A Stratified Reference Model - an Extension to ISDN PRM	ETSI	NA 4	1989/11	France
Contribution to the Definition of Reference Configurations (RCs) for the Telecommunications Management	ETSI	NA 4	1990/03	UK
Definition of QoS and NP	ETSI	NA 4	1990/09	France
Deletion of F Reference Point	ETSI	NA 4	1990/03	UK
Draft text for ETR on TMN vocabulary	ETSI	NA 4	1991/03	Belgium
Functional Scope of TMN	ETSI	NA 4	1990/09	France
Impact of Intelligent Network on TMN	ETSI	NA 4	1989/10	Germany
Mediation Function Definition	ETSI	NA 4	1990/03	UK
"QoS and NP, relationships between related terms"	ETSI	NA 4	1991/07	Belgium
Quality of Service Methodology	ETSI	NA 4	1990/03	UK
Reference Configuration Construction Rules	ETSI	NA 4	1990/09	France
Requirements Capture Methodology	ETSI	NA 4	1990/09	France
Revised Vocabulary of Terms for TMN	ETSI	NA 4	1990/09	France

Some comments on draft CCITT Recommendation I.35B	ETSI	NA 4	1990/09	France
Taxonomy and Naming of Reference Points	ETSI	NA 4	1991/03	Belgium
Telecommunications Management Specification Method	ETSI	NA 4	1991/03	Belgium
The Layering of OSFs	ETSI	NA 4	1990/03	UK
The timeline model	ETSI	NA 4	1991/07	Belgium
TMN Reference Point Definition	ETSI	NA 4	1990/09	France
A Formal Stage 1 Description of Multimedia Services	ETSI	NA 5	1989/10	Denmark
AAL protocol model and high level description of the AAL peer-to-peer procedures for B-ISDN signalling	ETSI	NA 5	1990/09	Spain
Addressing Requirements in MAN	ETSI	NA 5	1990/04	France
All functional Models for Class O Services	ETSI	NA 5	1991/10	Belgium
An Adaptation Convergence Sublayer (CS) Protocol for Connectionless Services	ETSI	NA 5	1990/03	Italy
"An Adaption Layer Protocol Model for Signalling, Packet Mode-Connection oriented and Connectionless	ETSI	NA 5	1989/10	Belgium
An Application Layer Protocol Model for Signalling - Packet Mode-Connection oriented and	ETSI	NA 5	1989/10	Denmark
Analysis of Multimedia Aspects of Broadband Services	ETSI	NA 5	1989/10	Denmark
Answer to liaison statement from NA5 concerning Activation/Deactivation Procedures in B-ISDN	ETSI	NA 5	1990/03	Italy
Application of the Service Component concept to stage 2 and 3 of I.130	ETSI	NA 5	1991/09	Belgium
Assumptions on the Dynamic Behaviour of Multimedia Services	ETSI	NA 5	1990/03	Italy
ATM Adaptation Layer for VBR Services	ETSI	NA 5	1989/10	Denmark
ATM Adaptation Layer Service Classification for non-time related services	ETSI	NA 5	1990/03	Italy
ATM based Broadband ISDN	ETSI	NA 5	1989/03	Germany
ATM cell format	ETSI	NA 5	1988/12	Ireland
ATM Cell Header Error Protection	ETSI	NA 5	1989/04	Netherlands
ATM Header Functionalities and Size	ETSI	NA 5	1989/03	Germany
ATM Signalling Channel Allocation and Meta-signalling issues	ETSI	NA 5	1989/10	Denmark
ATM signalling channel structure and allocation	ETSI	NA 5	1989/04	Netherlands
Attributes and possible values for B-ISDN	ETSI	NA 5	1992/01	France
B-ISDN Architectural Principes for interactive and non-switched distribution services	ETSI	NA 5	1990/09	Spain
B-ISDN Connection Types and Attributes Values	ETSI	NA 5	1990/10	France
B-ISDN Reference Configuration with MAN and MSS	ETSI	NA 5	1990/04	France
Basic Concept of B-ISDN Connection Types	ETSI	NA 5	1990/10	France
Basic Requirements and Principles for MANs	ETSI	NA 5	1990/01	Germany
Benefits of activation/deactivation at the TB reference point	ETSI	NA 5	1990/09	Spain
Bit Timing for the Likely Solution	ETSI	NA 5	1989/04	Netherlands
Business customers where MAN facilities do not exist	ETSI	NA 5	1991/02	Belgium
Categories of B-ISDN Connection Types	ETSI	NA 5	1992/01	France
Clarification of Channel Associated Signalling (CAS) at the access	ETSI	NA 5	1991/01	France
Clarification of the ATM Adaptation Service Classification Model	ETSI	NA 5	1990/03	Italy
Comments on ATM Header Functions	ETSI	NA 5	1989/10	Denmark
"Comments on DETS ""Connectionless Broadband Data Service"""	ETSI	NA 5	1991/02	Belgium
Comments on NA5 Draft Rec. I413	ETSI	NA 5	1989/11	UK
Comments on SG XI metasignalling baseline document	ETSI	NA 5	1991/01	France
Comments on the NA4 liaison related to SAP location	ETSI	NA 5	1991/04	Belgium
Comments on the suitability of an activation/deactivation procedure of B-ISDN	ETSI	NA 5	1991/02	Belgium
Comments to draft Rec. L311	ETSI	NA 5	1990/04	Portugal
Comments to draft Rec. L363	ETSI	NA 5	1990/04	Portugal
Common Channel Signalling (CCS) for B-ISDN	ETSI	NA 5	1991/01	France
Commonality between SNI and T interfaces	ETSI	NA 5	1990/06	Finland
Congestion Control for CL Services	ETSI	NA 5	1990/04	France
Congestion control for MAN Networks	ETSI	NA 5	1990/09	Spain
Congestion Control of Connectionless Services	ETSI	NA 5	1990/06	Finland
Considerations on the use of physical layer maintenance signals for fault location indication	ETSI	NA 5	1990/09	Spain
Considerations on VPI/VCI Allocation for Physical Layer OAM Flows	ETSI	NA 5	1990/04	Portugal
Coordination of RACE Contributions	ETSI	NA 5	1990/04	France
Core network and interworking aspects	ETSI	NA 5	1991/02	Belgium
Cost comparison of the coaxial with the fibre optical interface at UNI	ETSI	NA 5	1989/11	UK
Cost figures of a coaxial interface at UNI	ETSI	NA 5	1989/11	UK
Cost Figures of a Fibre Optical Interface at UNI	ETSI	NA 5	1989/11	UK
Customer Network Evolutionary Aspects	ETSI	NA 5	1991/02	Belgium
"Description of the Convergence Sub-layer (CS) Protocol for UNI Access Signalling,Broadcast	ETSI	NA 5	1990/04	Portugal
DQDB Performance Enhancements	ETSI	NA 5	1990/04	France
Editorial amendment for par. 44 in I432	ETSI	NA 5	1991/10	Belgium
Error detection for PO services	ETSI	NA 5	1989/11	UK
Estimate of motivation time for activation/deactivation procedure for broadband ISDN	ETSI	NA 5	1990/09	Spain
Evolution of MANs	ETSI	NA 5	1991/02	Belgium
Evolution of mobile	ETSI	NA 5	1991/02	Belgium

Evolution of satellites	ETSI	NA 5	1991/02	Belgium
Evolution of the residential area	ETSI	NA 5	1991/02	Belgium
Evolutionary graph	ETSI	NA 5	1991/02	Belgium
First revision of I.140 attributes	ETSI	NA 5	1990/09	Spain
Functional ATM Layer Model for service primitive definitions	ETSI	NA 5	1991/09	Belgium
Handling of Distributed Databases	ETSI	NA 5	1991/09	Belgium
Impact of Deactivation on Metasignalling and Signalling	ETSI	NA 5	1991/03	Belgium
Impact of Service Components into Bearer Components for multi media services	ETSI	NA 5	1991/10	Belgium
Impact of the OLI/OLO concept on the evolution of services and of the optical access network	ETSI	NA 5	1991/02	Belgium
Inclusion of the OLI/OLO concept in CCITT Rec. I.327	ETSI	NA 5	1990/10	France
Indentifiers for B-ISDN Signalling	ETSI	NA 5	1991/10	Greece
Information Field Size	ETSI	NA 5	1989/03	Germany
Initialisation of metasignalling and SVCI assignment procedure	ETSI	NA 5	1990/09	Spain
Introduction of the BRAN and LIT functional groups into the functional architectural model	ETSI	NA 5	1991/09	Belgium
Introductory IBCN Reference Configurations	ETSI	NA 5	1990/03	Italy
List of Contributions	ETSI	NA 5	1990/09	Spain
List of contributions from RIC	ETSI	NA 5	1989/09	France
List of contributions from RIC	ETSI	NA 5	1989/10	Denmark
List of Contributions from RIC	ETSI	NA 5	1990/01	Germany
List of contributions from RIC	ETSI	NA 5	1990/03	Italy
List of contributions from RIC	ETSI	NA 5	1990/04	Portugal
List of parameters for the PMD layer of an electrical interface at the T-reference point	ETSI	NA 5	1989/11	France
Location of metasignalling in the B-ISDN PRM	ETSI	NA 5	1991/01	France
Loss Priority Parameters in AAL primitives	ETSI	NA 5	1991/10	Greece
MAN ACCESS Facility	ETSI	NA 5	1990/06	Finland
Management Issues related to MAN Architecture	ETSI	NA 5	1990/06	Finland
Mapping of Service Components into Bearer Components for multi-media Services	ETSI	NA 5	1991/10	Greece
Meta-signalling assignment procedure	ETSI	NA 5	1990/03	Italy
Meta-signalling message transport	ETSI	NA 5	1989/11	UK
Meta-signalling states description	ETSI	NA 5	1989/11	UK
Metasignalling Protocol Functions and Limitations	ETSI	NA 5	1990/04	Portugal
Metasignalling Protocol Issues	ETSI	NA 5	1990/04	Portugal
Model	ETSI	NA 5	1990/11	Germany
MSS Functional Model	ETSI	NA 5	1990/06	Finland
Multimedia service structure	ETSI	NA 5	1990/09	Spain
No need for a Fast Reservation Protocol	ETSI	NA 5	1991/09	Belgium
Notes on Access Network MAN Architectures	ETSI	NA 5	1990/04	France
On traffic and service evolution in TR in evolution onwards B-ISDN	ETSI	NA 5	1991/10	Belgium
Open questions on metasignalling raised at the Brussels meeting of CCITT SG XI/4	ETSI	NA 5	1990/09	Spain
Open questions on metasignalling raised at the Brussels meeting of CCITT XI/4	ETSI	NA 5	1991/01	France
Performance measurement aspects of the cell based interface	ETSI	NA 5	1991/02	Belgium
Physical Layer OAM for cell based option	ETSI	NA 5	1991/09	Belgium
Physical Medium Dependent Sublayer for the Broadband S Interface	ETSI	NA 5	1989/09	France
PL-OAM cells and rate-adaptation of the cell-based UNI	ETSI	NA 5	1990/09	Spain
Point-to-point signalling channel management procedures and SDLs	ETSI	NA 5	1990/09	Spain
Possible conflicts in CUG membership	ETSI	NA 5	1991/02	Belgium
Possible options for multiparty cells	ETSI	NA 5	1990/09	Spain
Power Feeding across the interface at the T-reference point	ETSI	NA 5	1989/09	France
Preliminary considerations of the early stages network evolution towards the B-ISDN	ETSI	NA 5	1990/09	Spain
Preliminary Network Architecture for the IBCN	ETSI	NA 5	1989/10	Denmark
Primitives between ATM and ATM LME for Meta-signalling	ETSI	NA 5	1991/03	Belgium
Primitives between ATM LE and ATM LME connection establishment/release	ETSI	NA 5	1991/09	Belgium
Principles of Interworking	ETSI	NA 5	1989/11	UK
Proposal for a cyclic counting in the Sequence number field	ETSI	NA 5	1990/03	Italy
Proposal for a new recommendation on Adaptation Protocol for Signalling	ETSI	NA 5	1990/04	Portugal
Proposal for a single BASIC ATM Adapt. (SAR) sublayer for all Packet Oriented (PO)Services	ETSI	NA 5	1989/11	UK
Proposal for Basic Primitives Between the ATM adaptation Layer and the ATM layer	ETSI	NA 5	1990/03	Italy
Proposal for cell delineation at S reference point	ETSI	NA 5	1989/10	Denmark
Proposal for Characterization of Broadband Traffic	ETSI	NA 5	1990/09	Spain
Proposal for data-link protocol as part of AAL Convergence Sublayer (CS) protocol for non-time related	ETSI	NA 5	1990/03	Italy
Proposal for Physical Layer Transmission Parameter	ETSI	NA 5	1990/04	Portugal
Proposal for Primitives Between the ATM adaptation Layer and the ATM layer	ETSI	NA 5	1990/03	Italy
Proposal for text on AAL Type 3 primitives for AAL operations to be inserted in I.363	ETSI	NA 5	1990/09	Spain
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Proposal for the use of Terms in I.311	ETSI	NA 5	1990/03	Italy
Proposal of a new recommendation on a Metasignalling Protocol	ETSI	NA 5	1990/04	Portugal
Proposed Document Structure for MAN Standards	ETSI	NA 5	1990/01	Germany
Proposed structure of draft ETSs for MANs	ETSI	NA 5	1990/03	Italy
Qos Principles for CL Services	ETSI	NA 5	1990/04	France
Reference Configuration Construction Rules	ETSI	NA 5		Spain
Reference Configurations for the SB interface	ETSI	NA 5	1989/09	France
Reference Configurations (RC) and their Implementation Options	ETSI	NA 5	1989/11	UK
Section and Path Overhead Functions Required for Performance Monitoring at the UNI	ETSI	NA 5	1989/09	France
Selective broadcastsignalling channel (SBSVC) management	ETSI	NA 5	1990/09	Spain
Service Component Concept	ETSI	NA 5	1989/03	Germany
Service primitives between the ATM LE and the ATM LME for error reporting	ETSI	NA 5	1991/09	Belgium
Service primitives between the ATM LE and the SAR SLE	ETSI	NA 5	1991/09	Belgium
Service primitives exchanged between the ATM LE and the ATM LME for data transfer	ETSI	NA 5	1991/09	Belgium
Service Primitives exchanged between the PM Layer Entity and the ATM Layer Entity	ETSI	NA 5	1991/10	Belgium
Service Primitives for the Connectionless Data Service	ETSI	NA 5	1991/04	Belgium
Service Requirements for MANs	ETSI	NA 5	1990/01	Germany
Signalling Virtual Channel bandwidth	ETSI	NA 5	1990/09	Spain
Specification of different functionality	ETSI	NA 5	1989/11	UK
Specification of the self-synchronizing scrambler in Recommendation I.432	ETSI	NA 5	1990/09	Spain
Specifications of B-ISDN addressing functions - first draft	ETSI	NA 5	1991/02	Belgium
Stage 1 Description of CL Service (1)	ETSI	NA 5	1990/06	Finland
Stage -1 Description of CL Service (2)	ETSI	NA 5	1990/06	Finland
Stage 2 studies on Multimedia Services	ETSI	NA 5	1989/10	Denmark
Support of Broadband Distributive Services	ETSI	NA 5	1989/11	UK
Surface Transfer Impedance in the specification of the TB interface	ETSI	NA 5	1990/09	Spain
Target IBCN Reference Configurations	ETSI	NA 5	1990/03	Italy
Termination of the section and path overhead (POH) at the UNI	ETSI	NA 5	1989/10	Denmark
Termination of the SOH and POH at the UNI	ETSI	NA 5	1989/09	France
Terminology Lifecycle	ETSI	NA 5	1990/09	Netherlands
Terminology (related to Connectionless Data Service)	ETSI	NA 5	1990/09	Spain
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Terminology Update	ETSI	NA 5	1990/10	Sweden
The Branching Functional Group with Functions and Reference Points in the Customer Access Network	ETSI	NA 5	1992/01	France
The Coding of the Sequence Number (SN) in SAR class 2	ETSI	NA 5	1990/04	Portugal
The messages used by the AAL protocol for B-ISDN signalling and connection oriented data services	ETSI	NA 5	1990/09	Spain
The OLI/OLO concept	ETSI	NA 5	1991/02	Belgium
The Optical Line Outlet Concept	ETSI	NA 5	1989/10	Denmark
The Optical Line Outlet Function	ETSI	NA 5	1990/10	France
The way ahead on Broadband numbering within NA2	ETSI	NA 5	1991/09	Belgium
Third-Party-Charging	ETSI	NA 5	1991/09	Belgium
Traffic aspects	ETSI	NA 5	1991/02	Belgium
Transmission aspects in the core network	ETSI	NA 5	1991/02	Belgium
Transmission Range for a Coaxial Interface	ETSI	NA 5	1989/08	France
Transmission ranges for an optical fibre interface	ETSI	NA 5	1989/11	UK
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Use of Generic Layering Architecture to structure the Broadband User - Network Signalling Interface	ETSI	NA 5	1989/10	Denmark
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Vocabulary - Abbreviations	ETSI	NA 5	1989/09	France
Working procedures for ETSI/NA5	ETSI	NA 5	1990/09	Spain
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Execution of Service on a Functional IN Model	ETSI	NA 6	1989/11	Germany
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Broadening of the User Concept in UPT	ETSI	NA 7	1990/09	Netherlands
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UPT Numbering Plan Requirements related to Location Information included in the Number	ETSI	NA 7	1990/09	Netherlands
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UPT User Requirements related to Charging	ETSI	NA 7	1990/09	Netherlands
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Numbering and Addressing Requirements Architectural Requirements	ETSI	NA2	1990/10	Denmark
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Medium Term Evaluation on Codec location in B-ISDN	ETSI	NA3	1989/10	UK
TV Picture frequencies used in picture coding for transmission	ETSI	NA3	1990/05	Sweden
Comments on SG XI metasignalling baseline document	ETSI	SPS	1991/01	France
Connection Acceptance Control	ETSI	SPS 3	1990/10	Italy
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Performance of Established Connections	ETSI	SPS 3	1990/10	Italy
Requirements for the separation of Call and Connection Control	ETSI	SPS 3	1990/10	Italy
Traffic Characterization	ETSI	SPS 3	1990/10	Italy
Spectrum Allocation in the Optical Local Network	ETSI	TM 1	1989/10	France
CMI coding on the 155.520 Mbit/s optical interface	ETSI	TM 3	1991/04	Belgium
Cost benefits of utilising the 800 nm optical window for transmission at the UNI	ETSI	TM 3	1991/04	Belgium
EMC aspects of CATV cable at the B-UNI: spectral considerations	ETSI	TM 3	1991/04	Belgium
Functional Architecture Model & Realisation of an Optical Access Network (OAN) with OLI/OLO	ETSI	TM 3	1991/04	Belgium
Improved Wavelength Allocation in OAN's	ETSI	TM 3	1991/10	Belgium
Optical Interfaces for the Customer ACCESS Network	ETSI	TM 3	1990/04	Germany
Optical Interfaces for the Customer Access Network	ETSI	TM 3	1991/03	Belgium
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Proposal for Physical Layer Transmission Parameters	ETSI	TM 3	1990/04	Austria
Quality of Services and Netw. Performance Requirements in ATM Networks	ETSI	TM 3	1989/10	Portugal
Specification of Surface Transfer Impedance to Tb interface cabling and connectors	ETSI	TM 3	1991/04	Belgium
Utilisation of the 800 nm optical window for transmission at the UNI	ETSI	TM 3	1990/10	
Evolution towards UMTS	ETSI	UMTS	1990/11	Belgium
Status of the RACE Mobile Project	ETSI	UMTS	1990/11	Belgium
Study items for the network aspects of UMTS	ETSI	UMTS	1991/03	Belgium
UMTS at the Turn of the Century	ETSI	UMTS	1990/08	Belgium
UMTS Requirements to B-ISDN	ETSI	UMTS	1990/11	Belgium
UMTS Services - Environmental Considerations/Potential Usage Characteristics	ETSI	UMTS	1990/11	Belgium

R1046 Specification and Programming Environment

"Extension of SDL to support Object-Orientation, Generic Parameter and Libraries"	CCITT	SG X	1990/06	Finland

R1053 TMN Evolution of Reference Configuration for RACE

A TMN Functional Hierarchy	ETSI	NA 4	1990/03	UK
Contribution to the Definition of Reference Configurations (RCs) for the Telecommunication Management	ETSI	NA 4	1990/03	UK

R1054 Application Pilot for People with Special Needs

Specifications of terminals for disabled users with respect to standards for user-system interface	ETSI	NA3.2	1991	

R1060 Distributed Industrial Design and Manufacturing

"Structural Walkthrough of the IPC Standard and Electrical Conceptual Model, STEP"	CCITT	ISO	1990/09	Germany

R1077 Usage Reference Model for IBC

Engineering IBC Services. Joint URM/CSF/RCD Position Paper	ETSI	HF-1008	1991	

R1079 CAR-CAR/CAM for Automotive Industry in RACE

Appraisal of M-IT-04	CEN	TG 11-2	1992/06	UK

R1080 HDTV Experimental Usage

Progress on development of studio equipment for progressively scanned HDTV	CCIR		1991/02	
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Progress report on the 1250/50/2 system	CCIR		1991/01	

R1082 Quality of Service (QoS) Verification Methodology and Tools

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"Sectional Specification, Connectors sets type CF08"	CCITT	IEC	1990/07	France
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Annex III

List of Publications

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R1001 Digital Video tape Recording Terminal for HDTV

A new single-table assignment technique for transform coded images
1990/04 Paper for 8th Conference on Video, Audio & Data Recording

A Simple Recursive Motion Estimation Technique for Compression of HDTV Signals
1992/04 IEEE proceedings 4th Int. Conf. Image Proc. & its Applications (IPA 92), Conf. Publ. No 354 -

Characterisation and measurements of non-linear bit shifts in digital magnetic tape recording
1990/04 8th conference on Video, Audio & Data Recording

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1988 Journal of Applied Physics, vol 63(8)

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IEEE Journ. Sel. Areas Commun, Spec. Issue on Digital Rec.

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1992/06 Signal Processing and Image Communications, Vol 4, No 3

Electronics for reading and writing
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Error detecting run-length limited sequences
1990/04 8th Conference on Video, Audio & Data Recording

Full-Search versus Tree-Search Vector Quantization of Discrete Cosine Transform Coefficients
1990/09 Proceedings of the European Signal Processing Conference

Head-to-tape spacing and recording process evaluated from modulation noise spectra
1988/11 Intermag 88, IEEE Trans. Magn.

High-performance metal-in-gap heads with very small track widths
1990 J. Magnetism and Magnetic Material (jmmm) 83

High-performance small-track-width metal-in-gap heads made by reactive-ion etching
1990 J. Magnetism & Magnetic Materials (JMMM)

Implementation of TV and HDTV in B-ISDN
1990/09 Invited paper for 16th ECOC conference

Magnetic recording trends: media developments and future (video) recording systems
1990/01 MRM'89, published in IEEE Trans Magn, vol 26

Modelling of electromagnetic systems
1991/11 IEEE Transaction on Magnetics, Vol. Mag-27, No. 6

Motion adaptive intraframe transform coding of video signals
1989 Philips Journal of Research, vol 44 Nos 2/3

On the Construction of High-Performance Self-Synchronizing Codes
1990/10 Proceedings 11th Benelux Symposium Information Theory, Noordwijkerhout 1990

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1990 IEEE Trans Magn., vol 26

Perpendicular recording with a one-sided MIG-head on SL Co-Cr
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Source Coding of HDTV with Compatibility to TV
1990/10 SPIE Vol. 1360, Proc. 5th Visual Communications & Image Processing '90

Sputtered sandwich heads for high-density digital video recording
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1989 PMRC'89, Journal Magn. Soc

Transform Coding of Digital TV Signals using Vector Quantization
1990 Image Communication

Transform Coding of Images using Adaptive Tree-Searched Vector Quantization
1988/09 Abstract in Proceedings Picture Coding Symposium

Transform Coding of Images using Directionally Adaptive Vector Quantization
1988/04 Proceedings International Conference on Accoustics, Speech and Signal Processing

R1002 Satellite Communication for IBC

Satellite links and integrated broadband communication networks
1990/10 Int. Conf. on Integrated Broadband Services & Networks

R1003 AIP and Standards for TMN

A Model of the TMN Workstation Function
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A Proposal for an Integration Methodology for a TMN
1991/11 Proceedings of the Fifth RACE TMN Conference

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1990/05 XIII International Switching Symposium Proceedings

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1990/10 IEEE Broadband Conference on Broadband TELECOM

Network Management for RACE
1991/11 British Telecommunications Engineering Journal, to be pub. later this year.

Synergies Between ESPRIT and RACE
1990/08 European conference on Artificial Intelligence (ECAI - 90)

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1990/01 IEE Electronics division colloquium organised by professional group E7 (Telecom Networks &

The application of information modelling in the telecommunication management network (TMN)
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R1004 Electro-Luminescent Flat Panel Display for Terminal Applications

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1991 SID 1991

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1990/11

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A Framework for Computing Platforms to support TMN systems
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1991/10 International Conference Prepress '91

Probieren geht ueber Studieren
1992/01 PC Woche, Special Desktop Publishing, IDG VErlag, Munich, Germany

Publishing as a broadband application
1990/10 IEE Conference Integrated Broadband Services & Networks

Publishing Tools Need Both: State-Oriented Version Support
1991/09 Proceedings 15th Annual International Computer Software & Applications Conference COMP-SAC

RACE Telepublishing
1990/11 Workshop Bundesverband Druck, Working Group Reproduction Techniques

RACE - Telepublishing
1991/10 BERKOM - Breitbandkommunikation im Glasfasernetz

Telepublishing
1990/01 Forschungsfuehrer, Technische Universitat Berlin

Telepublishing
1989/11 Telematikbrief Nr 3, FhG/ISI

Telepublishing, an application oriented broadband project
1990 IDATE conference 1990 - Proceedings

Telepublishing - an application oriented IBC project
1991/06 OII-Workshop CEC/DG XIII B

Telepublishing as a Broadband Application
1990/11 Proceedings 12th International Conference Key Technologies, Experiments, New Concepts

Telepublishing- ein Anwendungsprojekt im Breitbandumfeld
1991/10 GI '91 Annual Conference Telekommunikation und Multimediale Anwendungen der Informatik

The BERKOM Project
1991/03 IEEE Review

The Individualized Electronic Newspaper : An Application Challenging Hypertext Technology
1992/09 Conference "Hypertext und Hypermedia 1992 : Konzepte und Anwendungen auf dem Weg in die

The RACE Telepublishing Project
1989/10 Proceedings of International Press Telecommunication Council (IPTC), Working Party

The use of co-operation models for specification and design of user interface
1991/09 Proceedings of the Fourth International Conference on Human-Computer Interaction Human

Uebersicht Pilotprojekte : Einordnung, Technik und Bedeutung
1991/11 4th DPT Congress - Berlin, Germany

Verteilte Produktion und Seitengestaltung von individualisierten Publikationen
1990/11 GI-Workshop Multimediale elektronische Dokumente

R1076 REMUS - Reference Models for Usability Specifications

Designing for Usability - The development of the REMUS Database
1990/09 Human Factors in Telecommunications, 13th International Symposium

Usability Issues and Solutions in IBC
1991/10 TELECOM 91

R1077 Usage Reference Model for IBC

A Unified Method for the Design of Telecommunication Services
1992/08 Ergonomics Special Issue, Telecommunication Industry

Applications Analysis : Case-Study Results for European Organisations
1992/03 Elsevier - North Holland

Applications Analysis : The RACE Application Pilots
1992/03 Elsevier - North Holland

Commercial Issues in the Definition and Marketing of Broandband Services
1992/03 Elsevier - North Holland

Conceptual Framework for Usage of Telecommunication Services
1992/03 Elsevier - North Holland

Designers Requirements for Usage information in the development of a Usage Reference Model for IBC
1990/10 Proceedings of the IEE conference on Integrated Broadband Service and Networks

Designers Requirements in the development of a usage reference model for IBC
1990 Proceedings of Human Factors in Telecoms Conference

From ISDN to Broadband Services: First experiences from the RACE programme
1991/05 Proceedings of the Teleconference Europe '91

Generic User Services Defined
1992/03 Elsevier - North Holland

Glossary : A Guide to IBC Terminology from a Usage Perspective
1992/03 Elsevier - North Holland

IBC - Views from Usage
1991 Integrated Broadband Communications: Views from RACE Network and Engineering Aspects

Integrated Broadband Communications : Views from RACE : Usage Aspects
1992/03 Elsevier - North Holland

Integration of Services for Applications
1992/03 Elsevier - North Holland

Integration of Services for Human End-Users : Design Principles, Enabling States Analysis, and a Design
1992/03 Elsevier - North Holland

Modelling Advanced Communication Services
1991/04 The International Symposium on Subscriber Loops and Services

Modelling Broadband Services from a Usage Perspective
1990 Proceedings of Human Factors in Telecoms Conference

Multimedia Communications in CSCW
1991/07 Proceedings of Seminar:Computer Supported Cooperative Work

Piloting New Services
1992/03 Elsevier - North Holland

Public Infrastructure Design from a Usage Viewpoint
1992/03 Elsevier - North Holland

Stored programme controlled telecommunication services
1990 International Conference on Communications

Telecommunications from the usage point of view
1991 Integrated Broadband Communications: Views from RACE. Network and Engineering Aspects

The Implications of Human Factors Recommendations for Network Infrastructure Design
1992/08 HFT, Darmstadt, 1993

The Usage Reference Model
1991 The Enabling States Approach : designing usable telecommunications services.

Usage oriented service design
1992/06 HFT, Darmstadt, 1993

Usage oriented service engineering
1992/08 International Symposium on subscriber loops and services, Vancouver, 1993

Usage Reference Model for Integrated Broadband Communications
1990/10 Proceedings of the IEE conference

R1079 CAR - CAR/CAM for Automotive Industry in RACE

A generic model for the use of high speed communications and CAD/CAM for design and manufacturability
1991/07 International Ergonomics Association, 11th Congress

A user-centred approach to define high-level requirements for next generation CAD systems for mechanical
1989/12 IEEE Transactions and Engineering Management Special Issue

An investigation into control protocols and use of video in a MULTIMEDIA task environment
1991/04 Ergonomics Society Annual Conference

An investigation into control protocols and use of video in a MULTIMEDIA task environment
1991/07 International Ergonomics Association, 11th Congress

An Investigation of User Requirements for Broadband Communications in the Automotive Industry
1990 Human Computer Interaction, Interact '90, Elsevier

An investigation of user requirements for broadband communications in the automotive industry
1990/08 Interact '90

Assimilating IBCN into CIM - some Human Factors aspects
1990/08 Human Factors in Design for Manufacturability in Process Planning (Hellander conference)

Communication and Interaction Issues in a Multi-Media Customer Facing System
1991/03 British Telecom FCTS Technical Workshop

Communications in the concurrent engineering paradigm - a European perspective invited paper in session,
1991/12 ASME 1991 Winter Meeting

Cooperative graphical applications in high speed networks
1991/10 Proceedings of the GI Conference - Darmstadt, Germany

Cooperative Sketching in a Network Environment for the Automotive Industry in Europe
1992 Eurographics '92 - Vienna, Austria

Design by Optimisation : Addressing Usability Problems in Multimedia Conferencing Systems
1993/04 Inter CHI 93, Amsterdam

Design to Product. A prototype of a system to enable Design for Manufacturability
1992/05 Chapter in "Human Factors in Design for Manufacturability", ed M. Helander and Mitsuo

Evaluating complex systems: the application of Heisenberg's uncertainty principle
1991/07 International Ergonomics Association, 11th Congress

First computer vision symposium
1991/06 ESA

Formal Specification and Design of an On-line Product Catalogue
1991/09 Journal of Computer and Software Engineering

Formal Specification and Design of an Online Product Catalogue
1992/04 Journal of Computer and Software Engineering

Future Communications Services in the Automotive Industry
1993 BT Technology Journal

Human Factors Implications of the 'Distributed Enterprise'
1992/05 Journal of Engineering Computers

Human factors in concurrent engineering
1991/07 International Ergonomics Association, 11th congress

IBC and Co-operative Working in the Automotive Industry
1990/09 Computer Supported Co-operative Work, Multi-User Interfaces and Applications

IBC Networks: Security from the users view
1990/10 International Conference on Integrated Broadband Services and Networks

Kooperative graphische Anwendungen in Hochgeschwindigkeitsnetzwerken
1991 Proceeding GI '91 - Darmstadt

Management of Technical and Organisational Change in large scale CIM systems
1990/08 Human Factors Aspects of Advanced Manufacturing & Hybrid Automation

Managing Screens and Interactions : Observations on the use of Multimedia Conferencing
1992/11 ACM Conference on CSCW - Toronto

Managing the organisations knowledge resources
1989/09 Proceedings of 3rd International Conference on Human-Computer Interaction

Module for the DTI Awareness Programme for Strategic Manufacturing - Man Machine Interfacing
1992/03 HCI and User Interface Design - Institute for Electrical Engineers

Multi media interactive working in design to manufacture
1990/05 Proceedings of 22nd International Symposium on Automotive Technology and Automation

Multi-Media Collaborative Working in the Automotive Industry - The role for Broadband Communications
1992/04 Ergonomics and Design Colloquium - East Midlands Ergonomics Group of the Ergonomics Society

Multimedia Collaborative Working in the Automotive Industry - The Role for Broadband Communication
1990/05 Proceedings of the CIM Europe Conference

Multimedia Conferencing as a Tool for Collaborative Writing : A case study
1991/11 Proceedings of the CSCW SIG Seminar on Collaborative Writing

Multimedia Conferencing : From Prototype to National Pilot
1992/06 Proceedings of INET '92 Conference - Kobe

Multimedia interactive working in design to manufacture
1991/09 4th IFIP Conference on computer applications in production and engineering

New Applications in High Speed Networks for the European Automotive Industry (in German)
1991/10 Annual GI Conference 91 - Darmstadt, Germany

Problems of Designing Task-Based User Interfaces for large-scale CIM systems
1992/05 Computer-Integrated Manufacturing Systems, Butterworth-Heinemann Ltd, Vol 5 No 2, 91-96

RACE CAR - New applications in High Speed Networks for the European Automotive Industry
1991/10 Proceedings of the GI Conference 91 - Darmstadt, Germany

Some Multimedia Traffic Characterisation and Measurement Results
1992/04 Networks '92 - Trvandrum, India

The Open Multimedia System Architecture : An overview
1992/05 The Computer Journal

User requirements specifications for workstations incorporating high speed broadband communications links
1990/08 Human Factors Aspects of Advanced Manufacturing & Hybrid Automation

R1080 HDTV Experimental Usage

HD tape to film transfer
1992/02 SPIE/IS & T - San Jose, US

HDP/HDQ processing in an Experimental Digital HDTV studio
1992/06 Les assises des jeunes chercheurs - Tokyo

HDTV production and postproduction : an original compatible digital approach
1992/06 FKTG Berlin

Progress on development of studio equipment for progressively scanned 1250/50 HDTV
1991/02 Document TG 11/1, Document TG 11/2

Progress on HDTV standard conversion
1991/02 Document TG11/1. Document WP11/A

Progress report on the 1250/50/2 system
1991/01 Document : TG 11/1

Transferring to film
1991/09 HDTV Dublin

Vision 1250, A European economic interest grouping
1991/02 Document TG 11/1

R1081 BUNI - Broadband User/Network Interface Demonstrator

An European Demonstrator and Test-bed for the Broadband User/network Interface
1993/01 BT Technical Journal

Broadband User-Network Interface Projects in RACE
1990/10 International Conference on Integrated Broadband Services and Networks, IEE

R1082 Qual. of Serv. Verif. Method. & Tools for Integr. Broadband

ATM technology
1990/10 7th Congress de Nouvelles Architectures pour les Communications

QoS in Broadband Networks
1990/06 NETWORKS '90 conference

Some aspects of quality of service
1991 13th ITC Conference

R1083 PARASOL - ATM Specific Measurement Equipment

A Model for Real-Time Generation of ATM Traffic from a Large Number of Sources
1990/08 9th Nordic Teletraffic Seminar

ATM Measurement Tool
1990/08 9th Nordic Teletraffic Seminar

ATM Traffic Processes: A Model for Real-Time Generation
1990/09 Technical Seminar on B-ISDN

Bitfehlerstrukturanalyse in der Breitband-ISDN-Me-technik
1991 Nachrichtentechnische Zeitschrift 44

Correlation in ATM traffic streams
1991/06 Queuing Performance & Control in ATM

Guaranteeing B-ISDN transmission quality internationally
1991 Telcom Report International 14, No 2

Me-prezision auf breitem Band
1991 Telcom Report 14, Heft 2

Measurement precision over broadband
1991 Telcom Report 14, No 3

Messtechnik fÄr zukÄnftige Breitbandsysteme
1990/12 Nachrichtentechnische Zeitschrift ntz.

Network performance measurements in ATM systems
1991/08 Telecommunications

Testing in the ATM environment
1991/10 Communications International

Traffic generation for ATM systems testing environment modelling and feasibility studies
1991 ITC-13

Uebertragungsqualitaet im B-ISDN international sicherstellen
1991 Telcom report 14

R1084 MIME - Development of Emulators and Simulators

A high speed parallel simulator for ATM networks
1990/11 Proceedings of 4th RACE TMN conference

A high speed simulation engine for B-ISDN
1991/05 3rd Bangor Communications Symposium

A modular simulator for ATM based B-ISDN communication
1991/04 IEE conference

An ATM parallel simulator
1991/06 4th Greek National Confeence of Informatics

ATM Network Simulation Emulation Hybrid Systems
1990/11 2nd TMN Implementors Workshop

Broadband Network Simulation Using Parallel Transputer Technology
1990/10 RACE/IEE Conference - Publication No 329

Conservative parallel simulation of ATM networks
1991/11 5th TMN Conference

Contribution à la realisation d'un simulateur de reseaux ATM
1992/09 Thèse de Doctorat Un. de NICE-SOPHIA ANT

MEM for arbitrary exponential open network with blocking and multiple job classes
1991 Performance Engineering Workshop '91

Modelling of ATM networks
1991/11 5th TMN conference

Queueing Models of Packet-Sqitched Networks with Locally Adaptive Routing
1991 Performance Engin. Workshop '91

Simulation support for the Management Network
1992/09 6th TMN Conference

Switch Models for TMN applications
1992/09 6th TMN Conference

Unified representation of different Flow Control Methods
1991/11 5th TMN conference

R1086 TELEMED

Anwendung neuer Kommunikationskonzepte zur kooperativen Bearbeitung unterschiedlich strukturierter
1990/06 Berliner Herzkonferenz

Bridging the Gap: Using a Summary Primary Health Care Patient Record in Secondary Health Care
1990/12 Second European Conference on Health Services Research & Primary Health Care

Communication aspects in the RACE TELEMED Project
1990/11 12th International Conference

Communications between Hospitals and Remote Users
1990/04 IMIA working conference

Creation d'une banque de donnees europeenne inter-universitaire d'Imagerie Medicale

Design of a Cost-Effectivesness Analysis Study in Teleradiology
1991/07 CAR '91, 5th International Symposium & Exhibition

Design of a Portable software on X-Window for Interactive Image Analysis PACS Workstations
1990/06 EuroPACS 90

Experiences in picture communications in the medical field
1990/11 IDATE 12th International Conference: Key Technologies, Experiments, New Concepts

High Speed Medical Applications
1989/05 Proceedings of EARN 89. An International Conference of Technical Aspects of networking and

Integration und Kommunikation von Patientenbefunddaten am Deutschen Herzzentrum Berlin
Einsatz der EDV im Gesundheitswesen S.164

Laboratory results - Reporting to General Practitioners
1990 Current Perspectives in Health Computing

Perspectives in Teleradiology
1991/06 IV Congr. Naz. Ass. Ital. Fisica Biomedica

Presentation of the TELEMED project
1990/10 RACE seminar (organised by Swedish Telecom)

Proposal of a Relational Model for a Radiological Scientific Data Base
1990/05 EuroPACS 90

Proyecto de una PACS en un Hospital pedi†trico con integraci†n en el proyecto TELEMED
1990/11 XX Congresso Nacional de Radiologia

RECPHONE: A new environment for medical remote expert consultation
1991/07 EuroPACS '91, 9th International Meeting

Scientific and Technological Experiences and Tendency of Medicine in Italy
1991/02 Teleradiology

Specifications for the Development of a Programming Environment for Remote Expert Consultation in Medicine
1991/05 3rd Panhellenic Conference on Computer Technology

TELEMED: First results from Europe's largest Broadband Communications Project in Telemedicine
1990/05 EuroPACS 90

Telemed: il ruolo della tecnologia fiorentina in un programma europeo di ricerca applicata
1991/03 Rotary Club Firenze Sud

Telemed: project within telemedicine
1990/02 2nd Information Technology Conference

Telemed: un progretto Applicativo
1991/01 Assolombarda

Teleradiology in Europe, EEC project TELEMED
1991/05 PACS and Teleradiology Conference

The RACE TELEMED Project R1086
1989/10 AIM Concertation Meeting

The robusness of communication of emotion via facial expression
1991 European Journal of Social Psychology

The TELEMED approach to terminology standardisation
1991/03 Workshop ECR-SCDI

The TELEMED project
1990/12 AIM Euroforum

The Teleradiology in Europe
1991/03 Milano Europa

Value Added and Data Services in Health
1990 Medical Informatics in Europe

Videoconference
1991/06 Informatica in Radiologia

R1087 PROVE - Provision of Verification

Architecture Modulaire de Test pour Reseaux ATM Large-Bande
1991/09 L'Onde Electrique - Vol 71 No 5 pp 34-39

Assynchroner Transfer-Modus : Grundbaustein fuer das Breitband-ISDN
1992 Nachrichtentechnik, Elektronik - Berlin - Vol 2-3-4

Modulare Testarchitektur fuer Breitbandige ATM-Netze
1992/02 NTZ : Nachrichtentechnische Zeitschrift - Helft 2, 45 Jahrgang, pp 88-97

Provision of Verification in RACE
1993/01 BT Technology Journal, Vol 11, No 1

RACE Partners all over Europe
1992/09 Clemessy "News Magazine" - No 2

Test architecture for Broadband Network
TE&M magazine (Geneva exhibition issue)

Test derivation for SDL based on ACTs
1992 FORTE 92 - 5th International Conference on Formal Description Techniques

The RACE to Test Broadband Nets
1991/09 TE&M : Telephone Engineer & Management - Vol 95 No 17 pp 68-72

R1088 TUDOR - Usability Issues for People with Special Needs

Attitudes and acceptance
1991 Chapter in Issues in Telecommunications for People with Disabilities, COST 219

Concerns of elderly consumers and their attitudes towards new technologies
1990/09 13th HFT Conference

Domestic Terminals
1991 Future Telecommunications and Teleinformatics for Disabled People. Final report of COST 219

Elderly people in a new world: Attitudes to advanced communications
1991/08 Gerontechnology: First International Conference on Technology and Ageing

Picture Communication
1991/10 6th World Telecommunications Exhibition and Forum

Pilot Applications for Advanced Communication Technology in Care for the Elderly in Europe
1991/08 1st Internationa Conference on Technology and Ageing

RACE projects: APPSN and TUDOR
1990/06 Telematics '90 - Proceedings of the Conference held at Bremen

Remote Working in the United Kingdom
1991 Future Telecommunications and Teleinfomatics fo. Disabled People. Final report of COST 219

Telecommunications needs as expressed by elderly people and people with disabilities
1991 Chapter in Issues in Telecommunications for People with Disabilities, COST 219

The interface between the elderly and new technology
1990/04 BPS Annual Conference

The Role of Human Factors in Designing for Special Needs
1990/05 Belgium Ergonomics Society Journal

Uability Issues for People with Special Needs with Regards to IBC
1990/04 Institute of Electrical Engineers

R1089 LOOP - Low-cost Optimised Optical Passive Components

Achievements of Both Low Cost, Low Loss and Very Low Reflection for a New European Connector
1991/03 French-German Workshop on Optical Measurements Techniques and Fibre Optics Conference

Connecteur monomode à hautes performances et à faible cout = Application au Reseau Large Bande
1991/03 OPTO '91

High performance and low cost passive optical components for the subscriber loop
1991 IWCS 1991

Low cost wavelength independent 1 x N and N x N Branching Components
1991 ECOC 91 Proceedings

Low Reflection Receptacles for Active Devices
1992/05 42nd Electronic Components and Technology Conference - San Diego, CA - USA

Passive components for multichannel networks
1991/02 Technical Digest of OFC 91

Silicon-based fibre-pigtailed 1x16 and 2x16 power splitters
1992/09 ECOC 92 - Berlin

R1091 ESP - Exploitation and Service Project

Contributions to the integration of advanced applications with high-speed protocols - RACE 1091 ESP
1991/05 RARE 2nd European Networking Conference

ESP - Exploitation of RACE I Application Pilots
1991/06 Networks 91

Perspektiven zu einem europNischen IBC
1990 TUBKOM-Kolloquium Breitbandtechnik

Prototyping Multimedia Tele-Services
1991/06 R1022 Technical Committee Workshop

Transportprotokoll Profile und erweiterte Transport Service fÁr integrierte Breitbandnetze
1990 Vorschlag des RACE Projectes 1091 ESP, TUBKOM-Kolloquium Breitbandtechnik

What Infrastructure do the RACE Advanced Communication Experiments Need
1990/06 RACE Broadband Islands Workshop

R1092 DIRAC - Database for Reliability Calculations

DIRAC - A Component Reliability Database
1991 Proceedings of ESREF 91

European Database for Component Reliability in Telecommunications
1990/06 Proceedings of 7th International Conference on reliability and maintainability

R1093 ROSA - RACE Open Services Architecture

Introduction to Algebraic Specifications based on ACT ONE
1989/12 GMD Technical report

Object-Oriented Service Descriptions in ROSA
1991/04 Proceedings of the TINA Workshop

Platform Modelling Requirements from the ROSA Project
1992/01 Proceedings of the TINA Workshop

ROSA: An Object Oriented Architecture for Open Services
1990/10 British Telecom Technology Journal

ROSA: An Object-Oriented Architecture for Integrated Broadband Communication Services
1990/06 Proceedings of the TINA workshop

ROSA: From the service to the Architecture
1991/06 Proceedings of the TINA Workshop

ROSA - RACE Open Services Architecture
1989/07 Proceedings of SETSS '89

Suggestions for Object Oriented Modelling form ROSA
1992/01 Proceedings of the TINA Workshop

The ROSA Object Model
1991/10 Proceedings International Workshop on Open Distributed Processing

Towards a Convergence between Telecommunication Services Architectures and ODP
1991/10 Proceedings International Workshop on Open Distributed Processing

Annex IV

RACE Patents Registered

RACE PATENTS REGISTERED

PROJECT :	R1010
PAT-TITLE :	Modulierbare Laserdiode für hohe Frequenzen
PAT-AUTHOR :	Siemens
DATE :	1992/07/08
COUNTRY :	Germany
OBSERVATIONS :	German Patent Application P 42 22 466.7 - GR 92 P 1393 DE

PROJECT :	R1010
PAT-TITLE :	Abstimmbarer Halbleiterlaser
PAT-AUTHOR :	Siemens
DATE :	1989/02/15
OBSERVATIONS :	European Patent Application 89 10 25 96.7 - GR 89 P 1075.E. Corresponding applications in Japan and USA.

PROJECT :	R1010
PAT-TITLE :	Doppel-PIN-Photodiode mit sperrendem p-n-Übergang zwischen Substrat und Absorptionsschicht
PAT-AUTHOR :	Siemens
DATE :	1989/03/17
COUNTRY :	Germany
OBSERVATIONS :	German Patent Application P 39 08 886.3 - GR 89 9 1181 DE

PROJECT :	R1010
PAT-TITLE :	Monolitisch integrierte Photodiode-FET-Kombination
PAT-AUTHOR :	Siemens
DATE :	1990/15/16
COUNTRY :	Germany
OBSERVATIONS :	European Patent Application 0 400 399 - GR 89 P 1457 E. Corresponding applications in Japan and USA.

PROJECT :	R1010
PAT-TITLE :	pin-FET-Kombination mit vergrabener p-Schicht
PAT-AUTHOR :	Siemens
DATE :	1990/06/11
COUNTRY :	Germany
OBSERVATIONS :	European Patent Application 0 405 214 - GR 89 P 1525 E. Corresponding applications in Japan and USA.

PROJECT :	R1010
PAT-TITLE :	Verfahren zur Herstellung eines dotierten Bereiches in einer Halbleiterschicht
PAT-AUTHOR :	Siemens
DATE :	1989/09/15
COUNTRY :	Germany
OBSERVATIONS :	European Patent Application 0 417 348 - GR 89 P 1770 E. Corresponding applications in Japan and USA.

PROJECT :	R1010
PAT-TITLE :	Verfahren zur Herstellung von FETs
PAT-AUTHOR :	Siemens
DATE :	1989/10/19
COUNTRY :	Germany
OBSERVATIONS :	German Patent Application P 39 864.4 - GR 89 P 1918 DE

PROJECT : R1011
PAT-TITLE : Verfahren zur Übertragungstechnischen Integration von ISDN-Kanälen mit einem breitbandigen asynchronen Zeitmultiplex-Kanal für digital betriebene Kommunikations-Vermittlungsanlagen

PROJECT : R1012
PAT-TITLE : Koppelnetz, bei dem Kurzwege schaltbar sind
PAT-AUTHOR : Siemens
DATE : 1992/08/06
COUNTRY : Germany
OBSERVATIONS : Patent No 92 11 34 50.8 - GR 92 P 1477 E

PROJECT : R1012
PAT-TITLE : Monolithisch integrierte Laserdiode-Wellenleiter-Kombination
PAT-AUTHOR : Siemens
DATE : 1989/05/24
COUNTRY : Germany
OBSERVATIONS : German Patent Application P 39 16 962.6 - GR 89 P 1404 DE

PROJECT : R1012
PAT-TITLE : Verfahren und Schaltungsanordnung für die Aufnahme und Weiterleitung nach einem asynchronen Transfermodus übertragen
PAT-AUTHOR : Siemens
DATE : 1990/08/10
OBSERVATIONS : Corresponding applications in Canada, Japan and USA. European Patent Application 90 11 54 17.9 - GR 90 P 1488 E.

PROJECT : R1012
PAT-TITLE : Verfahren zur Überwachung und Glättung von Datenströmen, die nach einem asynchronen Übertragungsverfahren übertragen worden
PAT-AUTHOR : Siemens
DATE : 1991/02/01
OBSERVATIONS : European Patent Application 91 30 08 07.4 - GR 91 P 8002 E (Coapplicant Plessey Research Roke Manor Ltd. Corresponding)

PROJECT : R1013
PAT-TITLE : Circuitry for regeneration and synchronization of a digital signal (P4025 004)
ABSTRACT : The invention describes a way to perform bitsynchronization of a data stream with respect to a local or masterlock in a mesochronous or plesiochronous environment (jitter, wander, static phase arbitrary).
The principle can be used from DC up to slightly above 1 Gbit/s, using available semiconductor technologies. It can be monolictically integrated, no chip-external components are needed.
This is done by oversampling (for medium frequencies) or tapped delay lines (for 1/TB>300 Mbits).
The correlation of subsequent samples (spaced < = TB/4) of the input signal used to evaluate the eye opening.
The eye opening is catched and tracked in a way that data are sampled in its middle.
In a first stage jitter and wander are overcome up to 1.5 bitlenghts; a second stage, working with bit clock, overcomes bigger jitter and wander, only limited by chip size, not by principle. The second stage is realized with FIFO, RAM or shift register structures.
A control clock, which processes the algorithm for catching and tracking, organizes a coordinated step of the two stages, if the first stage is going to reach its range limits. This is done without slips or biterrors --> Bit slip compensation.
PAT-AUTHOR : K.-D. Menk and H. Preisach - SEL ALCATEL ZFZ/NV
DATE : 14990/08/dd
COUNTRY : Germany

PROJECT : R1015
PAT-TITLE : Procédé et dispositif pour contrôler le débit de données d'un terminal couplé à un réseau de transmission de l'information
DATE : 1990/12/27
OBSERVATIONS : Registration No (France) : 90 16330

PROJECT : R1015
PAT-TITLE : Procédé et dispositif de protection contre les erreurs bits et les pertes de cellules dans un reseau temporel asynchrone
ABSTRACT : The ATM Adaption Layer of the Protocol Reference Model of the B-ISDN aims at ensuring the Time Transparency and the Information Transparency for the services,
This patent describes a mechanism which deals with the Information Transparency. Based on an interleaving mechanism gathered with a Reed-Solomon error correcting code this patent provides a Convergence Sublayer format, the originality of zhich is the splitting of one cell payload on two rows of the interleaving array used together with the capacity of correcting errors and erasures.
PAT-CATEGORY : IBC Customer Systems
PAT-AUTHOR : Mr B. Guilbaud
DATE : 1991/06/25
COUNTRY : France
OBSERVATIONS : Registration No 91 07 797

PROJECT : R1015
PAT-TITLE : Procédé et dispositif pour le multiplexage asynchrone de donnéées sur des réseaux à support partagé
ABSTRACT : Thanks to a flow control mechanism installed inside data sources connected on a small multiplexer, a file dimensioning is possible for both data source and multiplexer without assumptions on the other party, This mechanism is based on a counter inside the sourcem increased when data are sentm decreased at a regular rate. Further data can be sent only if the counter value is below a given threshold. This is an original application of the "leaky bucket" mechanism.
PAT-CATEGORY : IBC Customer Systems
PAT-AUTHOR : F. Adam
DATE : 1991/02/01
COUNTRY : France
OBSERVATIONS : Registration No (France) : 91 01171

PROJECT : R1020
PAT-TITLE : Bistable optic device utilising the thermo-optic effect in a polymer
PAT-AUTHOR : D.J. Westland, V. Skarda, W. Blau, L. Costa

PROJECT : R1020
PAT-TITLE : Non-linear optical switch utilising organic conjugated materials and four wave mixing techniques
PAT-AUTHOR : D.J. Westland, V. Skarda, W. Blau, L. Costa
OBSERVATIONS : Ultra-fast all-optical switch

PROJECT : R1027
PAT-TITLE : A method for adjusting the operation on integrated optic devices
ABSTRACT : A method for the adjustment of operation characteristics of integrated optical devices, which allows the recovery of a considerable fraction of devices, being initially out of tolerance, by depositing on the surface of the waveguide material, after the final processing step of the device, a suitable layer of transparent material.
PAT-CATEGORY : Optical Communiation
PAT-AUTHOR : C. Caldera, S. Morasca, C. de Bernardi
DATE : 1991/03/07
COUNTRY : Italy, USA, Canada, Japan, GB, F, D, NL and Sweden
OBSERVATIONS : Applicant : CSELA - It will be extended by March 1991 to USA, Canada, Japan, GB, F, D, NL and Sweden.

PROJECT :	R1027
PAT-TITLE :	Fabrication procedure for an integrated semiconductor structure
ABSTRACT :	The fabrication of a butt-coupled integrated photodectector-waveguide with high efficiency of the detector, is usually prevented by the poor quality of the regrown interface. To overcome this limitation, a special structure is proposed, with the photosensitive material grown on a double stepped waveguide/substrate surface; this structure is also made suitable the high optical power thanks to the insertion of a beam spreading region between the waveguide and the detector.
PAT-CATEGORY :	Optical Communication
PAT-AUTHOR :	L. Menigaux, A. Carenco, A. Scavennec
DATE :	1990/05/21
COUNTRY :	France
OBSERVATIONS :	Applicant : CNET

PROJECT :	R1031
PAT-TITLE :	High Speed Submount
PAT-AUTHOR :	H.P. Mayer, G. Luz
OBSERVATIONS :	German Patent No P4110378

PROJECT :	R1031
PAT-TITLE :	Laserwafer und Verfahren zu seiner Herstellung (Laser wafer and method for fabrication)
PAT-AUTHOR :	K. Dutting, K. Wünstel
COUNTRY :	Germany
OBSERVATIONS :	German Patent OE 3934748 and European Patent EP 423513

PROJECT :	R1031
PAT-TITLE	Dispositif semiconducteur intégré incluant un élément optoélectronique de commutation en forme de Y
PAT-AUTHOR :	Ph. Authier, M. Erman. LEP
DATE :	1988/06/27
COUNTRY :	UK, F, D, I, SW, NL
OBSERVATIONS :	Filed with the US, Japan and South Korea Patent Office and under the European Patent Convention

PROJECT :	R1031
PAT-TITLE :	Method for testing edge emitting semiconductor devices
PAT-AUTHOR :	K.H. Bihler, H. Hauer, B. Schwaderer
COUNTRY :	Germany
OBSERVATIONS :	Applied for German Patent under No P3916924

PROJECT :	R1033
PAT-TITLE :	Dispositif semiconducteur intégré incluant un commutateur optoélectronique
PAT-AUTHOR :	J.A. Cavailles, LEP
DATE :	1989/06/09
COUNTRY :	UK, F, D, I, NL, SW
OBSERVATIONS :	Filed with the US, Japan and South Korea Patent Office and under the European Patent Convention

PROJECT :	R1033
PAT-TITLE :	Dispositif semiconducteur intégré incluant un élément optoélectronique de commutation
PAT-AUTHOR :	M. Erman, LEP
DATE :	1988/11/28
COUNTRY :	UK, F, D, I, SW, NL
OBSERVATIONS :	Filed with the US, Japan and South Korea Patent Office and under the European Patent Convention

PROJECT : R1033
PAT-TITLE : Optical Devices (HBT Waveguides)
PAT-AUTHOR : GEC
DATE : 1988/06/16
COUNTRY : F, D, I, NL, SW
OBSERVATIONS : Filed with the US Patent Office and under the European Patent Convention

PROJECT : R1033
PAT-TITLE : Verfahren und Vorrichtung zum dezentralen Aussenden von Information auf eine Uebertragungsstrecke
PAT-AUTHOR : S. Rao, M. Potts, R. Beeler, ASCOM TECH AG
OBSERVATIONS : Filed with the Swiss Patent Office (No 04 093/88-4)

PROJECT : R1033
PAT-TITLE : Dispositif semiconducteur comprenant un guide de lumière intégré qui présente au moins une partie rectiligne
PAT-AUTHOR : Ph. Autier, M. Erman, J.M. Auger, LEP
DATE : 1988/06/27
COUNTRY : UK, F, D, NL
OBSERVATIONS : Filed with the US, Japan and South Corea Patent Office and under the European Patent Convention

PROJECT : R1033
PAT-TITLE : Dispositif semiconducteur incluant un coupleur directionnel pour les composantes TE, TM
PAT-AUTHOR : J. Angenent, J.A. Cavailles, LEP
DATE : 1989/07/28
COUNTRY : UK, F, D, I, SW, NL

PROJECT : R1033
PAT-TITLE : Uebertragungseinrichtung mit einer optischen Uebertragungsstrecke
PAT-AUTHOR : P. Vogel, Th. Martinson, Ascom Tech AG
DATE : 1989/12/12
OBSERVATIONS : Filed with the Swiss Patent Office

PROJECT : R1033
PAT-TITLE : Bit- und Rahmensynchronisiereinheit für einen Zugriffseinheit einer optischen Uebertragungseinrichtung
PAT-AUTHOR : P. Vogel, Th. Martinson, ASCOM TECH AG
DATE : 1990/04/09
OBSERVATIONS : Filed with the Swiss Patent Office (No 01 192/90-3)

PROJECT : R1033
PAT-TITLE : Code-Erkennungseinheit und Verwendung derselben
PAT-AUTHOR : P. Vogel, Th. Martinson, ASCOM TECH AG
DATE : 1990/05/23
OBSERVATIONS : Filed with the Swiss Patent Office (No 01 769/90-0)

PROJECT : R1033
PAT-TITLE : Optoelectronic assemblies (SiTHRU packaging)
PAT-AUTHOR : I.R. Crostonm S.G. Tyler, GEC-Marconi
DATE : 1991/06/26
OBSERVATIONS : Filed with the UK Patent Office

PROJECT : R1035
PAT-TITLE : Connectionless ATM Data Services
OBSERVATIONS : Official publication of the application did not occur yet

PROJECT : R1038
PAT-TITLE : Vermittlungsunabhängiges Konferenzsystem (Audio/Video)
OBSERVATIONS : Application submitted by Alcatel SEL

PROJECT : R1038
PAT-TITLE : Videophone bei Multimedia mittels Umlenkspiegelanordnung
OBSERVATIONS : Application submitted by Alcatel SEL

PROJECT : R1038
PAT-TITLE : Videophone bei Multimedia - "Periskoplösung"
OBSERVATIONS : Application submitted by Alcatel SEL

PROJECT : R1041
PAT-TITLE : Hybrid-Codierer für Videosignale
PAT-AUTHOR : J. Speidel, P. Vogel
OBSERVATIONS : Patent No EP 0 244 01

PROJECT : R1041
PAT-TITLE : Verfahren u. Schaltungsanordnung zur Bitratenreduktion
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3631252 - EP 0 260 748

PROJECT : R1041
PAT-TITLE : Quellcodierer für Videobilder
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3710119 - EP 0 284 161

PROJECT : R1041
PAT-TITLE : System zur Übertragung von Videobildern
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3726520 - EP 0 290 085

PROJECT : R1041
PAT-TITLE : Verfahren zur Bestimmung von Bewegungsvektoren
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3727530

PROJECT : R1041
PAT-TITLE : System zur Übertragung von Videobildern
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3744280

PROJECT : R1041
PAT-TITLE : Schaltungsanordnung zur Auswertung eines Videosignals
PAT-AUTHOR : M. Riegel
OBSERVATIONS : Patent No DE 3809076 - EP 0 333 274

PROJECT : R1041
PAT-TITLE : Steuersignalgenerator für die Verarbeitung eines Videosignals
PAT-AUTHOR : M. Riegel
OBSERVATIONS : Patent No DE 3809075 - EP 0 333 275

PROJECT : R1041
PAT-TITLE : Prädiktiver Standbildcodierer
PAT-AUTHOR : K. Hienerwadel & G. Weth
OBSERVATIONS : Patent No DE 3811536 - EP 0 336 510

PROJECT : R1041
PAT-TITLE : Hybrid-Codierer für Videosignale
PAT-AUTHOR : K. Hienerwadel & G. Weth
OBSERVATIONS : Patent No DE 3811535 - EP 0 336 535

PROJECT : R1041
PAT-TITLE : Verfahren zur Speicherung und Wiedergabe von Videosignalen
PAT-AUTHOR : G. Weth
OBSERVATIONS : Patent No DE 38731277

PROJECT : R1041
PAT-TITLE : Speicher für Videosignale
PAT-AUTHOR : M. Riegel
OBSERVATIONS : Patent No DE 3838171 - EP 0 365 069

PROJECT : R1041
PAT-TITLE : Verfahren zur Bestimmung der Bewegungsvektoren einer Sequenz von Videobildern
PAT-AUTHOR : K. Hinerwadel
OBSERVATIONS : Patent No DE 3839502

PROJECT : R1041
PAT-TITLE : Schaltungsanordnung zur Filterung eines Videosignals
PAT-AUTHOR : K. Hinerwadel
OBSERVATIONS : Patent No DE 3917085

PROJECT : R1041
PAT-TITLE : Codierer für blocksweise Codierung von Videobildern
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3929280

PROJECT : R1041
PAT-TITLE : Schaltungsanordnung zur Bestimmung der Lage von extremalen Werten einer Ähnlichkesf
PAT-AUTHOR : K. Hinerwadel
OBSERVATIONS : Patent No DE 4009610 - EP 0 449 363

PROJECT : R1041
PAT-TITLE : Vorrichtung zur Steuerung einer Videokamera
PAT-AUTHOR : W. Demmer & G. Weth
OBSERVATIONS : Patent No DE 4012846

PROJECT : R1041
PAT-TITLE : Adaptives Filter zur Reduktion von Codierartefakten
PAT-AUTHOR : W. Demmer
OBSERVATIONS : Patent No 4017375

PROJECT : R1041
PAT-TITLE : Schaltungsanordnung zum Erkennen eines menschlichen Gesichts
PAT-AUTHOR : E. Badiqué
OBSERVATIONS : Patent No DE 4028191 - EP 0 474 304

PROJECT : R1041
PAT-TITLE : Anordnung zur Speicherung digitaler Farbbildsignale
PAT-AUTHOR : B. Friedrich
OBSERVATIONS : Patent No DE 4041821

PROJECT : R1044
PAT-TITLE : Multi-user Optical line Outlet
PAT-AUTHOR : Fussgänger (SEL)
DATE : 1990
COUNTRY : Germany
OBSERVATIONS : Exploitation of this patent will be "free of charge" to all participants in RACE Programme

PROJECT : R1044
PAT-TITLE : Optical Communication System for the Multi-Customer Access Area
ABSTRACT : Multi-Customer Optical Line Inlet/Multi-Customer Optical Line Outlet (MC-OLI/MC-OLO); Threefold WDM :
- High Density WDM (eg. 2-5 nm) for multi-customer signal transmissions
- Medium-Density WDM (eg. 65-85 nm) for bidirectional signal transmissions, and
- Low-Density WDM (eg. 185-235 nm) for optical integration of interactive (B)ISDN and distributive CATV service signals

PAT-CATEGORY : IBC Customer Systems
PAT-AUTHOR : Dr. Kurt Fussgaenger, SEL
DATE : 1989/90
COUNTRY : Germany, EC

PROJECT : R1064
PAT-TITLE : Integrierte optische Anordnung mit wenigstens einem auf einem Substrat aus Halbleitermaterial integriertem optischem Wellenleiter
DATE : 1989/09/01
COUNTRY : Germany
OBSERVATIONS : German Application P 39 29 131.6 - GR 89 P 1730 DE

PROJECT : R1064
PAT-TITLE : Monolithisch integrierter Schaltkreis mit einer DDB-Laserdiode, optischem Schalter und Wellenleiterverbindungen
DATE : 1990/05/03
COUNTRY : Germany
OBSERVATIONS : German Application P 40 14 234.5 - GR 90 P 1231 DE

PROJECT : R1064
PAT-TITLE : Steuerbarer integrierter optischer Richtkoppler
DATE : 1990/09/28
COUNTRY : Germany
OBSERVATIONS : German Application P 40 30 754.9 - GR 90 P 1725 DE

PROJECT : R1064
PAT-TITLE : Steuerbarer integrierter optischer Mach-Zehnder-Interferometer
DATE : 1990/09/28
COUNTRY : Germany
OBSERVATIONS : German Application P 40 30 755.7 - GR 90 P 1726 DE

PROJECT : R1064
PAT-TITLE : Passiver integrierter optischer Richtkoppler
DATE : 1990/09/28
COUNTRY : Germany
OBSERVATIONS : German Application P 40 30 756.5 - GR 90 P 1727 DE

PROJECT : R1083
PAT-TITLE : Method and Circuit Arrangement for Data Block Synchronisation in TDM Communiation System, particularly in an ATM
PAT-AUTHOR : S. Wahl, B. Cesar
DATE : 1991/07/12
OBSERVATIONS : (EP 91 111 615.0 12.07.91)

PROJECT : R1089
PAT-TITLE : Verfahren zum Absetzen von Kabeln, insbesondere Lichtwellenleiterkabeln
ABSTRACT : Cutting of aramid yarns for cable end preparation
PAT-AUTHOR : H. Deharde, J. Rogalla, J. Schulte
DATE : 1989/0
COUNTRY : Germany
OBSERVATIONS : Application Submitted

PROJECT : R1089
PAT-TITLE : Verfahren zum zugfesten Verbinden eines Steckers mit einem Lichtwellenleiterkabel
ABSTRACT : Procedure for the mounting of the crimp sleeve of an optical connector
PAT-AUTHOR: H. Deharde
DATE : 1990/01
COUNTRY : Germany
OBSERVATIONS : Application submitted

PROJECT : R1089
PAT-TITLE : Connecteurs pour fibres optiques à verrouillage et déverrouillage rapide
ABSTRACT : Design of the housing for a push-pull operating fibre optic connector
PAT-AUTHOR : E. Grassin d'Alphonse, S. Dubois, N. Valade
DATE : 1990/06/21
COUNTRY : France
OBSERVATIONS : Application submitted, extension to foreign countries planned

PROJECT : R1089
PAT-TITLE : Connecteur pour fibres optiques
ABSTRACT : Silicone-based membrane fixed inside the adaptor connecting 2 optical fibres
PAT-AUTHOR : L. Boillot, S. Boudard
DATE : 1990/01/29
COUNTRY : France
OBSERVATIONS : Application submitted, extension planned for European cointries and the US

PROJECT : R1089
PAT-TITLE : Oblique Fibre Cleaving
OBSERVATIONS : Application submitted

PROJECT : R1089
PAT-TITLE : Singleway re-enterable splice
OBSERVATIONS : Application submitted

PROJECT : R1089
PAT-TITLE : Design of compact fan-out with splitters
OBSERVATIONS : Application submitted in April 1992

Annex V

Glossary of technical terms

ATM - Asynchronous Transfer Mode.
CEPT - Conference of European Post and Telecommunications Organisations
CCIR - Comite Consultatif International des Radiocommunications of ITU
CCITT - Comite Consultatif International des Telegraphique et Telephonique - International Telephone and Tele
CFS - Common Functional Specifications
CODEC - Coder/Decoder
COST _ Co-operation in Science and Technology: A European multi-national framework for R&D co-operation.
CPN - Customer Premises Network
CREST - EC Committee on Research, Science and Technology.
DRIVE - EC R&D on Telematic systems in the area of Transport
EBIT - European Broadband Interconnection Trial
ECU - European Currency Unit
EDTV - Enhanced Definition Television
EFTA - European Free Trade Association
EL - Electro-luminescent
ESPRIT - European Strategic Programme of Research in Information Technologies
ETSI - European Telecommunications Standards Institute
EURESCOM - European Institute for Research and Strategic Studies in Telecommunications GmbH
GEN - General European Network: A 34 MBit/s fibre transmission Backbone
IBC - Integrated Broadband Communicatons
IC - Integrated Circuit
IN - Intelligent Networking
ISDN - Integrated Services Digital Network
ITU - International Telecommunications Union
HDTV - High Definition Television
LSI devices - Large-Scale Integrated devices
METRAN - Managed European Transport Network
MOU - Memorandum of Understanding
PNO - Public Network Operator
RACE - Research on Advanced Communications technologies for Europe
RMC - RACE Management Committee
SME - Small and medium-sized Enterprise
TMN - Telecommunications Management Network
UMTS - Universal Mobile Telecommunications System

Annex VI

Key references

Council Decision of 25th July 1985 on a definition phase for a Community action in the field of telecommunications technologies - R&D programme in advanced communications technologies for Europe (RACE): 85/372/EEC; O.J. No L 210/24; 7.8.1985

Council Decision of 14 December 1987 on a Community programme in the field of telecommunications technologies - R&D in advanced Communications technologies in Europe (RACE programme); 88/28/EEC: O.J. No L 16/35, 21.1.88.

Council resolution of 30th June 1988 on the development of the common market for telecommunications services and equipment up to 1992; 88/C 257/01: O.J. No C 257/1, 4.10.88.

Communication from the Commission to the Council and Parliament "Working towards Telecom 2000 - Launching the Programme RACE - COM(88) 240 final II of 31.5.88

Report of the IBC strategic Audit: "Establishing advanced communications in Europe". February 1989.

Communication of the Commission to the Council concerning R&D in Advanced Communications technologies for Europe (RACE) - Progress report '89 and 30-month review, SEC(89) Final, July 1989.

Annual technical reports on the RACE programme - RACE '88; RACE '89; RACE '90; RACE '91, and RACE '92 - Available on request from the RACE central office, DG XIII, Direction B.

Perspectives for Advanced Communications in Europe: PACE '89; PACE '90; and PACE '92, January 1992 - Available on request from the RACE central office, DG XIII, Direction B.

Council Decision 91/352/CEE of 7th June 1991 adopting a Specific Programme of research and technology development in the field of Communications technologies: O.J. No L 192/8, 16.7.91

The report of the information and communications technologies review Board, Chaired by Mr. W. Dekker, June 1992.

Communication from the Commission on "Evaluation of the second Framework Programme for research and technological development (SEC(92)675 Final), July 1992.

Evaluation of the second Framework Programme of RTD: **Report from CREST to the Council**, September 1992. CREST/1212/1/92.

Annex VII

Listing of Projects

1001 DVT:Digital video-tape recording terminal for HDTV
1002 Satellite communications for IBCN
1003 GUIDELINE:AIP and standards for TMN
1004 Electro-luminescent flat-panel display for terminal applications
1005 NEMESYS:Traffic and QOS management for IBCN
1006 AIM: AIP application to IBCN maintenance
1007 ITIS: IBC terminal for interactive services
1008 Silicon-based low-cost passive optical components
1009 ADVANCE: Network and customer administration systems for IBCN
1010 Subscriber coherent Multi-channel system
1011 Business CPN
1012 BLNT: Braodband local network technology
1013 HDTV-Switching
1014 ATMOSPHERIC
1015 Domestic CPN
1016 Test tools and equipment
1017 IOLE: IBC on-line environment
1018 HIVITS: High-quality video-telephone and hihg-definition television system
1019 Polymeric optical switching
1020 All-optical switching and bi-stable devices based on semi-conducting polymers
1021 ARISE: A resuable infrastructure for software engineering
1022 Technology for ATD
1023 BEST: A methodological approach to IBC system requirements specifications
1024 NETMAN: Functional specifications for IBC TNM
1025 Functional specification of security and privacy in IBC
1026 International transmission of digital radio and television
1027 Integrated opto-electronics towards coherent multi-channel IBCN
1028 REVOLVE: Regional evolution planning for IBC
1029 Development of improved InP substrate material for opto-electronic devices
1030 ACCESS: Advanced customer connections, an evolutionary systems strategy
1031 Low-cost opto-electronic components
1032 Development and testing of optical components for subscriber networks
1033 OSCAR: Optical switching systems, components and architecture research
1034 Usability engineering requirement for IBC
1035 Customer premises network (CPN)
1036 WDTM broadband customer premises network
1037 User criteria for the realisation of opportunities afforded by IBC
1038 MCPR: Multi-media communication, processing and representation
1039 DIMUN: Distributed international manufacturing
1040 RIPE: RACE integrity primitives evaluation
1041 FUNCODE: Functional specification of codes
1042 MULTI-MED: Functional service integration in support of professional users
1043 Mobile telecommunications project
1044 IBCN development and implementation strategies

1045 Consensus management project
1046 SPECS: Specification and programming environment for comms software
1047 Techniques and integrity mechanisms in IBCN
1048 RSVP: RACE strategy for verification
1049 ATM concept
1050 IBC applications analysis
1051 Multi-gigabit transmission in IBCN subscriber loops
1052 SPOT: Signal processing for optical and cordless transmission
1053 TERRACE: TMN evolution of reference configurations for RACE
1054 APPSN: Application pilot for people with special needs
1055 MERCHANT: Methods in electronic retail cash handling
1056 BIPED: Basic business IBC demonstrator
1057 AQUA: Advanced quantum-well lasers for multi-gigabit transmission
1058 RESAM: Remote expert support for aircraft maintenance
1059 DIVIDEND: Dealer interactive video
1060 DIDAMES: Distributed industrial design and manufacturing of electronic subassemblies
1061 DIMPE: Distributed integrated multi-media publishing environment
1062 MARIN: Marine industry applications of broadband communications
1063 MAPS: RACE mobile applications pilot scheme
1064 MIOCA: Monolithic integrated optics for customer access applications
1065 ISSUE: IBCN systems and services useability engineering
1066 IPSNI: Integration of people with special needs by IBC
1067 Usability design information support
1068 ROSA: RACE open services architecture
1069 EPLOT: Enhanced performance lasers for optical transmission
1070 Testing Pay-per-view in Europe
1071 Applications analysis
1072 ITACA: IBCN testing architecture for conformance assessment
1073 GEOTEL: Application pilot in the petroleum and chemicals industry
1074 ECHO: Electronic case-handling in offices
1075 Telepublishing
1076 REMUS: Reference models for useability specifications
1077 Usage reference model for IBC
1078 European museums network
1079 CAR: CAD/CAM for the automotive industry in Europe
1080 HDTV experimental usage
1081 BUNI demonstrator
1082 QOSMIC: QOS verification methodology and tools for integrated communications
1083 PARASOL: ATM specific measurement equipment
1084 MIME: Development of emulators and simulators
1085 TET-ADAPT: Adaptation of techno-economic evaluation tools for RACE
1086 TELEMED
1087 PROVE: Provision of verification
1088 TUDOR: Usability issue for people with special needs
1089 LOOP: Low-cost optical components
1091 ESP: EBIT service project
1092 DIRAC: Database for reliability calculations

Annex VIII

Organisations involved in RACE Projects

ANNEX B - Alphabetical List of Participating Organisations

	Organisation	Country	Project(s)
01-PLIRO	01-PLIROFORIKI	GR	R1075
AAS/TAU	Austrian Academy of Sciences Technology Assessment Unit	A	R1037
ACEC	ACEC SA	B	R1018, 22, 41
AEG	AEG Aktiengesellschaft	D	R1018, 39
AEG	AEG Forschungsinstitut	D	R1041
AEG	AEG Kabel AG	D	R1030, 44, 56
AEG	AEG Olympia AG	D	R1063
AET	Applicazioni Elettrotelefoniche A.E.T. Spa	I	R1044
AIB	Allied Irish Bank Plc	IRL	R1059
AKZO	AKZO International Research BV	NL	R1019*
ALCASP	Alcatel Espace SA	F	R1002*, 86
ALGO	Algotech Sistemi	I	R1076*
ALPHA	ALPHA SAI	GR	R1016, 84
AMPER	Amper SA	E	R1044, 45, 81
ANALYSIS	Analysis Ltd	UK	R1028
ANDUS	ANDUS GmbH	D	R1060
ANITRA	Anitra Medienprojekte	D	R1070*
ANT	ANT Nachrichtentechnik GmbH	D	R1002, 30, 31, 44, 47*, 51
APD	Grupo de Empresas A.P.D.	E	R1042
APM	Architecture Projects Management	UK	R1068
APSIS	APSIS	F	R1042
APT	AT&T en Philips Telecommunicatie Bedrijven BV	NL	R1022, 31, 33, 44, 51, 81, 83
ASCOM	Ascom Tech AG	CH	R1053, 83, 87
AT&T NSI	AT&T Network Systems International BV	NL	R1045, 77
ATEA	ATEA	B	R1044
ATR	ALCATEL Radiotelephone	F	R1043
AXI	AXION A/S	DK	R1009
B&S	Barr & Stroud Ltd (Pilkington)	UK	R1019
B3i	Bureau International d'Ingénierie Informatique	F	R1083
BALT	Baltimore Technologies (Subcontractor)	IRL	R1021
BARCO	Barco Industries N.V.	B	R1044
BED	BED	D	R1015
BBC	British Broadcasting Corporation	UK	R1018, 36*,43, 63, 77, 81
BC	Bertin & Cie.	F	R1092
BCOM	Broadcom Eireann Research Ltd	IRL	R1003, 09*, 21*, 23, 24*, 28, 53, 91
BELSER	Belser Verlag	D	R1078
BIBA	Bremer Institut für Betriebstechnik und angewandte Arbeitswissenschaft an der Universität Bremen	D	R1039*, 62, 85
BICC	BICC Cables Plc	UK	R1032*, 39, 60
BNP	Banque Nationale de Paris	F	R1059
BOSCH	Robert Bosch GmbH	D	R1043, 44, 54

BT	British Telecommunications Plc	UK	R1003*, 06, 09, 18, 22, 23, 24, 25, 28, 30, 32, 33, 34, 37*, 41, 43, 44, 45, 48, 55, 59, 67, 68*, 77, 79, 81*, 87, 91, 92*
BT/NoI	British Telecommunications Plc (Northern Ireland)	UK	R1028
BT/NoS	British Telecommunications Plc (North of Scotland District)	UK	R1028
BTM	Alcatel/BTM	B	R1002, 22*, 44, 45, 46, 83
BTS	Broadcast Television Systems GmbH	D	R1080
BURDA	Burda GmbH	D	R1061
CAP	CAP SESA Régions	F	R1087
CAP	CAP Sesa Telecom	F	R1021
CAP	CAP SOGETI Innovation	F	R1016, 17
CASE	Case Communications Ltd	UK	R1003, 05*, 53, 79, 82
CCETT	Centre Commun d'Etudes de Télédiffusion et Télécommunications	F	R1018
CEA	Commissariat à l'Energie Atomique	F	R1008
CEL	Crosfield Electronics	UK	R1061
CERDA	Institut Cerda	E	R1037, 71
CET	(Centro de Estudos de Telecommunicações) Correios & Telecomunicações de Portugal	P	R1009, 21, 23, 24, 28*, 54,
CIRU	Computer Industry Research Unit	UK	R1055, 59
CIT	Alcatel CIT SA	F	R1022, 44, 45
CLEM	Clemessy SA	F	R1016, 82, 87
CNET	Etat Français - Ministère des PTT Centre National d'Etudes des Télécommunications	F	R1015, 18, 22, 27, 30, 32, 5, 41, 44, 46, 48, 57, 68, 3, 87, 92
CNR	Consiglio Nazionale Delle Ricerche	I	R1066*
CNRG	Communication Networks Research Group	GR	R1083
CNUSC	C.N.U.S.C.	F	R1086
CONTEL	Contel IPC (UK) Ltd	UK	R1059
CORNEL	Cornelsen Verlag	D	R1075
COSI	Consorzio per l'OSI in Italia	I	R1044, 72*
CPR	Consorzio Pisa Ricerche	I	R1091
CPS	Condatec Projekt Software GmbH	D	R1075
CSATA	CSATA - Tecnopolis (Centro Studi e Applicazioni in Tecnologie Avanzate)	I	R1028, 38, 92
CSELT	C.S.E.L.T. - Centro Studi e Laboratori Telecomunicazioni Spa	I	R1018, 27, 44, 46, 48, 53*, 54, 57, 68
CT	Compagnie Technicon	F	R1042
CTE	Centro de Textos Electronico SA	E	R1061
CTT	Correios e Telecomunicações de Portugal	P	R1022, 91
CU	Commercial Union Assurance Company	UK	R1074
CWI	Stichting Mathematisch Centrum - CWI	NL	R1040*
DANAOS	Danaos Shipping Co.	GR	R1062

DANET	DANET GmbH	D	R1006
DBP	Bundesministerium für das Post und Fermeldewesen	D	R1045
DBP	Deutsche Bundespost	D	R1051, 92
DEA	Danish Engineering Academy	DK	R1092
DETECON	DETECON GmbH	D	R1075*, 86*, 91*
DEUTSCH	Compagnie Deutsch	F	R1031
DHL	DHL Worldwide Express	B	R1063*
DHZ	Deutches Herzentrum	D	R1086
DIT/UPM	Departamento de Ingenieria Telemática Universidad Politecnica de Madrid	E	R1072
DLV	Delta Lloyd Verz.	NL	R1074
DORNIER	Dornier System GmbH	D	R1002
DTB	Deutsche Thomson-Brandt GmbH	D	R1001, 18
EBT	EB Teknologi Ltd	N	R1039, 43, 46
EBU	Technical Centre of the EBU	B	R1026*
ELBASA	ELBASA	E	R1060
ELCENT	ElektronikCentralen	DK	R1016, 84, 87
ELCOMA	Philips International BV. Elcoma Division	NL	R1022
ELEC	Electricity Council	UK	R1063
ELIN	Alcatel Austria Elin Forschungcentrum GmbH	A	R1046
ELSYP	ELSYP	GR	R1075
EMI	EMI Electromagnetics Institute	DK	R1014
EMP	Empirica GmbH	D	R1054
ENI	Enichem Synthesis Spa	I	R1020
EOLAS	The Irish Science and Technology Agency	IRL	R1087
EPFL	EFPL	CH	R1057
ERA	ERA Technology Ltd	UK	R1020
ERC	Alcatel Austria - ELIN Research Center	A	R1017
ERICSSON	Ericsson Radio Systems AB	S	R1043
ERICSSON	Ericsson Telecom	S	R1056*, 68, 81
ESTTO	ESTTO SA	GR	R1061
FACE	Industrie FACE Standard Spa	I	R1002, 06, 08, 13, 17, 22, 38, 44, 45, 66
FATME	Fabbrica Apparecchiature Telefoniche e Materiale Elettrico - Brevetti Ericsson	I	R1011*, 15, 35*, 44, 45, 56, 72, 81
FCR	France Cable & Radio	F	R1059, 87
FCRE	F.C.R. Entreprises	F	R1091
FI/DBP	Forschungsinstitut der DBP TELEKOM beim Fernmeldetechnischen Zentralamt	D	R1018, 22, 25*, 32, 41
FIAR	Fabricca Italiana Apparecchiature, Radioelettriche SpA	I	R1009
FINTEL	Post and Telecommunications of Finland	SF	R1039, 44
FIT	Swiss Federal Institute of Technology, Zurich	CH	R1033

FHG	Fraunhofer Abbeitsgruppe für Graphische Datenverarbeitung	D	R1079
FLZ	Fischer-Madsen & Lorenz Petersen Data Communications Consultants A/S (Fischer and Lorenz)	DK	R1005
FMH	Universidade Tecnica de Lisboa, Faculdade de Motricidade Humana, Departamento de Educaçao Especial e Reabilitaçao, (FMH-DEER)	P	R1054, 88
FOKKER	Fokker Aircraft BV	NL	R1058
FORD	User 2 - Ford (Europe)		R1079
FORTH	Foundation for Research and Technology - Hellas	GR	R1005, 66
FTZ	Deutsche Bundespost TELEKOM - Fernmeldetechnisches Zentralamt	D	R1044, 48, 53, 87
FUB	Fondazione Ugo Bordoni	I	R1043, 65, 68, 72
GEC	GEC-Marconi Research Ltd.	UK	R1043, 92
GEC	GEC Research Ltd (Subcontractor)	UK	R1011
GEC	The General Electric Company Plc (GEC Research Ltd, Marconi Research Centre)	UK	R1002
GEC	The General Electric Company Plc	UK	R1014, 18, 24, 30, 33, 35, 36
GEOSTOCK	Société Francaise de Stockage Géologique	F	R1073*
GMD	Gesellschaft für Mathematik & Datenv.	D	R1068, 72, 75
GPT	GEC-Plessey Telecommunications Ltd.	UK	R1005, 44, 45, 46, 51 56, 81
GRUNDIG	Grundig AG	D	R1001
HAI	Hellenic Aerospace Industry	GR	R1044
HAMBURG	Museum Hamburg	D	R1078
HASLER	Research & New Technologies Division of Ascom Holding Ltd (Hasler AG)	CH	R1016, 33
HELL	Dr. Ing. Rudolf Hell GmbH	D	R1061
HHI	Heinrich Hertz Institut	D	R1010
HIDB	Highlands & Islands Development Board	UK	R1028
HP	Hewlett-Packard Ltd	UK	R1016, 83
HUSAT	Husat	UK	R1063, 65*, 76, 79
HUT	Helsinki University of Technology	SF	R1039, 62
IAD	International Automotive Design	UK	R1079*
IBM	IBM France SA	F	R1005, 46, 53, 68, 79, 82*, 84
ICOM	International Council of Museums	F	R1078
ICOM	Intracom SA	GR	R1009, 21, 24
IDATE	IDATE	F	R1050, 71, 77, 86
IFC	IFC Research Ltd	UK	R1050*, 71*, 77
IMEC	Inter-universitair Mikro-electronika Centrum vzw	B	R1010, 19, 22, 33, 69
IMS	Irish Medical Systems	IRL	R1086
INESC	Instituto de Engenharia de Sistemas e Computadores	P	R1011, 22, 46
INET	I-NET Limited	UK	R1053

INMARSAT	Inmarsat	UK	R1062
INST	Instruments SA	F	R1032, 36
INSTM	Institut Montpellier	F	R1086
INTECS	INTECS Sistemi Spa	I	R1017, 21
INTELSA	Industrias de Telecomunicacion SA	E	R1023, 44, 48
INTERCAI	INTERCAI	NL	R1070
INTRACOM	Intracom SA	GR	R1053, 60, 61
IPSYS	IPSYS Plc	UK	R1021
IROE	Instituto di Recerca sulle Onde - Electromagnetiche del Consiglio Nazionale dell Recerche	I	R1020
IRR	Institute for Rehabilitation Research	NL	R1066
ISI	ISI-Fraunhofer GmbH	D	R1050, 71, 75, 78*
ISL	Institut für Seeverkehrswirtschaft und Logistik	D	R1062
ISOFT	Intrasoft (Subcontractor)	GR	R1009, 21
ISR	Alcatel/ISR	F	R1053, 55, 60, 63
IST	Instituto Superior Tecnico	P	R1051
ITALTEL	Societa Italiana di Telecomunicazioni SpA	I	R1012, 44, 45, 49, 81
ITEC	Reading ITEC (Information Technology Centre)	UK	R1066
JTAS	Jutland Telephone Aktieselskab	DK	R1022, 44, 72, 81
KME	Kabelmetal Electro GmbH	D	R1032, 44, 89
KONE	Kone Belgium SA	B	R1039
KTAS	Kjobenhavns Telefon Aktieselskab	DK	R1005, 09, 22, 44, 53, 58, 82, 83, 84, 91
KUL	Katholieke Universiteit Leuven	B	R1066
L-CUBE	L-CUBE Information Systems SA	GR	R1061
LABEIN	Labein	E	R1072
LC	Lohja Corporation Electronic Industries	SF	R1004*
LDM	Laboratoires de Marcoussis	F	R1006, 19, 27, 46, 57
LEP	Philips - LEP (Laboratoires d'Electronique Philips)	F	R1010, 18, 33*
LER	Thomson-CSF	F	R1080*
LME	L.M.Ericsson Ireland	IRL	R1009
LME	Telefonaktiebolaget L M Ericsson	S	R1014, 21, 30, 33
LOEWE	Loewe Opta GmbH	D	R1007*
LOHJA	Lohja Corporation	SF	R1081
LUT	Loughborough University of Technology Dept of Electronic & Electrical Engineering	UK	R1042
LWB	Lloyd Werft Bremerhaven GmbH	D	R1062*
MARCONI	Marconi Italiana Spa	I	R1044
MARI	MARI Advanced Microelectronics Ltd	UK	R1007, 09, 21, 23*, 81
MATRA	MATRA Communication	F	R1004, 07, 18, 41, 81
MATRA	SA Matra-Space	F	R1014
MBLE	MBLE N.V./ S.A.	B	R1022
MCC	Maxwell Communication Corporation Plc	UK	R1061*

MCS	(Marconi Communication Systems) The Marconi Company Limited	UK	R1002
MCP	MCP Wafer technology	UK	R1029*
MECF	Medical Computers France	F	R1042
MET	Matra-Ericsson Télécommunications	F	R1014*, 44, 56, 83
METATYPE	Metatype SA	GR	R1061
MM	Midland Montagu	UK	R1059
MONOTYPE	Monotype Corporation Plc	UK	R1061
MSS	Marconi Space Systems The Marconi Company Limited	UK	R1002
NAH	Nassauisches Heim	D	R1054
NAVICON	Navicon SA	E	R1062
NCC	National Computing Centre Ltd.	UK	R1048
NCI	Norcontel (Ireland) Ltd	IRL	R1059
NEDPTT	Centraaldirectie Nederlandse PTT	NL	R1088
NEWPOL	Newcastle Polytechnic	UK	R1088
NIHE	The National Institute for Higher Education	IRL	R1046
NKT	Aktieselskabet Nordiske Kabel & Traadfabriker Denmark	DK	R1014, 30*, 45, 51, 56
NMRC	National Microelectronics Research Centre	IRL	R1020, 43
NOKIA	NOKIA Corporation	SF	R1011, 22, 35, 43, 44
NSDD	Telecom Eireann NSDD	IRL	R1059
NTA	Norwegian Telecommunications Administration	N	R1022, 44, 53, 68, 83, 86, 91
NTA	Research Department (Teledirektorat) of Norwegian Telecommunications Administration	N	R1023
NTE	NTE GmbH	D	R1075
NTUA	National Technical University of Athens	GR	R1014, 22, 24, 62
NTUA	National Technical University of Athens (Subcontractor)	GR	R1009
ORT	Offset Repro Technik	D	R1075
OTE	Hellenic Telecommunications	GR	R1028, 43
OTTO	Otto Versand	D	R1075
OXC	Oxford Consultants (Europe)	UK	R1042
OXP	Oxford Polytechnic Dept of Computing And Mathematical Science	UK	R1042
PEUSA	Peugeot SA	F	R1079
PHILIPS	Nederlandse Philips Bedrijven BV	NL	R1001, 10*, 31, 64, 69, 80
PHILIPS	Philips SA	B	R1022
PHILIPS	Philips Telecommunicatie en Data Systemen, Nederland BV	NL	R1022, 45
PHILIPS	Philips USFA	NL	R1040, 47
PHILIPS	Philips International BV	NL	R1074*
PKB	PK Berlin	D	R1078
PKI	Philips Kommunikations Industrie AG	D	R1015, 18, 22, 35, 41, 43, 44, 58, 74, 78, 83
PLANET	Planet SA	GR	R1061, 73
PLES	Plessey Research, Roke Manor Ltd	UK	R1009, 11, 12*, 15, 35, 49*

PLES	Plessey Research (Caswell) Ltd	UK	R1010, 18, 64, 69*
PLESSEY	Plessey UK Ltd	UK	R1043, 67, 68
PRC	Philips Radio Communication Systems Ltd	UK	R1043*, 63
PRENSA	PRENSA	E	R1075
PROMAR	Proyectos Marinos	E	R1062
PRL	Philips Research Labs	UK	R1043
PTT	Swiss PTT	CH	R1045, 86
PUM	Philips Universitaet Marburg	D	R1057
QMC	QMC Instruments Ltd	UK	R106
QMC	Queen Mary College, London	UK	R1022
QMW	Queen Mary & Westfield College (University of London)	UK	R1083
RADI	Radiall SA	F	R1032, 89*
RAL	Rutherford Appleton Laboratory of the Science and Engineering Research Council	UK	R1042
REFER	Refer BVBA	B	R1076, 87
RIC	RIC Association Internationale	B	R1044*, 45*
RKL	Regio Kabel Limbourg	NL	R1070
RNL	Research Neher Laboratories of the Netherlands PTT	NL	R1015, 18, 19, 22, 25, 33 35, 36, 40, 41, 43, 44, 46, 48, 54, 65, 68, 81, 91
RTC	RTC-Compelec	F	R1031
RTT	Régie T.T.	B	R1022, 44, 45
SACM	SACM	F	R1062
SAGEM	Sagem Sa	F	R1047
SAIT	SAIT S.A. (Subcontractor)	B	R1041
SARDE	Sarde S.A.	F	R1073
SARIN	Sarin	I	R1065
SAS	SAS Denmark	DK	R1058*
SAT	Société Anonyme de Télécommunications	F	R1030, 44, 45, 56
SEB	S-E-Banken, SEB Data	S	R1059
SEC	SOURIAU & Cie.	F	R1089
SEL	Alcatel/SEL AG	D	R1003, 06*, 13*, 15, 16*, 17*, 22, 31*, 32, 33, 34*, 35, 38*, 44, 45, 51*, 53, 54*, 57*, 60, 67*, 77*, 81, 83, 86, 87, 88*
SEPT	Service d'Etudes communes des Postes et Télécommunications	F	R1025
SES	Scitex Europe Sa	B	R1061
SESA	Alcatel/SESA	E	R1002, 06, 11, 17, 18, 22, 35, 36, 38, 43, 44, 46, 48, 56
SFI	Senter for Industrieforskning	N	R1039
SGS	SGS Microelletronica SpA	I	R1004, 14, 44
SGS	SGS-Thomson Microelectronics SA	F	R1030, 36
SIBS	Sociedade Interbancaria de Servicos	P	R1055
SID	Synergie Informatique et Developpement	F	R1068
SIE	Sistemas Expertos	E	R1042,

SIEMENS	Siemens AG	D	R1010, 12, 31, 40, 44, 45, 47, 49, 53, 64*, 69, 81, 83, 92
SIETEC	SIETEC	D	R1075
SIETTE	SIETTE	I	R1086
SIGOS	SIGOS	D	R1074
SINTRA	Thomson - SINTRA	F	R1033
SIP	Società Italiana per le Telecomunicazioni	I	R1053
SIRTI	SIRTI SpA	I	R1032, 89
SIXCOM	Sixcom (Olivetti Group)	I	R1055
SLIGOS	Sligos	F	R1055*
SNS	Sloman Neptun Schiffahrts AG	D	R1062
SOFREC	SOFRECOM	F	R1070
SOGITEC	SOGITEC	F	R1075
SOPHA	Sopha Medical	F	R1042
SOURIAU	Souriau et Cie.	F	R1030
SPAG	SPAG Services S.A.	B	R1048*, 87*
SPECTRUM	Spectrum Energy & Information Technology Ltd	UK	R1073
STAL	Televerket (Swedish Telecommunications Administration)	S	R1009, 11, 14, 18, 21, 23, 24, 25, 30, 33, 35, 41*, 43, 44, 45, 53, 56, 59, 67, 83, 86, 87
STAT	STAT SA	GR	R1075
STC	Alcatel STC Plc	UK	R1014, 22, 24, 27*, 31, 36, 44, 45, 53, 56, 57, 59*, 68, 83, 86, 89
STK	Alcatel/STK	N	R1022, 38, 86
STL	STC Technology Ltd	UK	R1036
STL	STC Plc, STC Technology Ltd	UK	R1008*
STOLL	Stollmann GmbH	D	R1060
SUS	SUS Research Ltd	IRL	R1028
SWIFT	S.W.I.F.T.	B	R1055
SWIN	(Swedish Institute for the Handicapped	S	R1088
SYD	Synergie Informatique et Developpement	F	R1009
T&T	Thrane & Thrane	DK	R1062
TCD	University of Dublin, Trinity College	IRL	R1009, 20*
TCE	Thomson Consumer Electronics	F	R1080
TCSF	Thomson-CSF	F	R1015*, 18*, 29, 33, 35, 36, 47, 57, 81
TECHNI	Technisystems	GR	R1062
TECHNO	TechnoPlan	D	R1060
TECSI	GSI-Tecsi SA	F	R1005, 46*, 59, 82, 84
TEE	Telecom Eireann (Subcontractor)	IRL	R1020
TEKNON	Teknon Gesellschaft für Wissenbasierte Systeme GmbH	D	R1017
TELE-S	Telematic Services GmbH	D	R1060*

TELEFON	Telefónica de España SA	E	R1014, 18, 22, 24, 27, 28, 30, 41, 44, 48, 51, 53, 55, 72,
TELENORMA	Telefonbau & Normalzeit GmbH	D	R1011, 35, 38, 44, 45, 56
TELES	Télésystèmes SA	F	R1061, 65, 73, 74, 77, 86
TELETTRA	Telefónica Elettronica e Radio Spa	I	R1027, 44
TELINDUS	Telindus N.V.	B	R1044
TELSI	Telefónica Sistemas	E	R1009, 42*, 78, 86, 91
TELSPACE	Telspace S.A.	F	R1002
TESA	Telettra Espanola S.A.	E	R1043, 44, 45, 81
TFL	Teleteknisk Forskningslaboratorium	DK	R1046, 68
THEM	Thomson Hybrides et Microondes SA	F	R1029, 30, 43
THOMSON	Thomson SA	F	R1044, 45
THORN	Thorn EMI Central Research Labs	UK	R1015, 43
TITN	T.I.T.N.	F	R1044, 61
TL	TeleLOGIC AB	S	R1021, 24
TLP	Telefones de Lisboa e Porto	P	R1053, 78
TNC	The Networking Centre Ltd	UK	R1083
TRCF	Technical Research Centre of Finland	SF	R1008, ,42, 54, 65, 66
TRICOM	Konsortium TRICOM	CH	R1022, 44
TRT	Telecommunications Radioélectriques et Téléphoniques	F	R1018, 22, 43, 63
TST	Telefunken System Technik and Logistics	D	R1062
TUB	Technische Universität Berlin	D	R1075
TUD	Technical University of Denmark	DK	R1013, 27
TVE	Thomson Video Equipment	F	R1080
UCL	University College London	UK	R1005, 54, 67, 79
UCW	University College of Wales (Subcontractor)	UK	R1021
UDOR	Universitat Dortmund	D	R1033
UNIBIT	UNIBIT (Holdings)	UK	R1006
UOA	University of Athens	GR	R1027, 51
UOA	University of Aveiro	P	R1052*
UOB	University of Bremen	D	R1062
UOC	University of Cambridge	UK	R1042
UOD	University of Dundee	UK	R1066
UOF	University of Florence	I	R1086
UOG	University of Ghent	B	R1004
UOH	University of Heidelberg	D	R1086
UOL	University of London	UK	R1086
UOM	University of Manchester	UK	R1088
UOMU	University of Mulhouse	F	R1087
UOS	University of Strathclyde	UK	R1043
UOS	University of Stuttgart	D	R1022, 57
UPM	Fundaciòn General de la Universidad Politècnica de Madrid	E	R1023
UPMC	DNAC - Université Pierre et Marie Curie	F	R1009
UST	Stirling University	UK	R106[illegible]

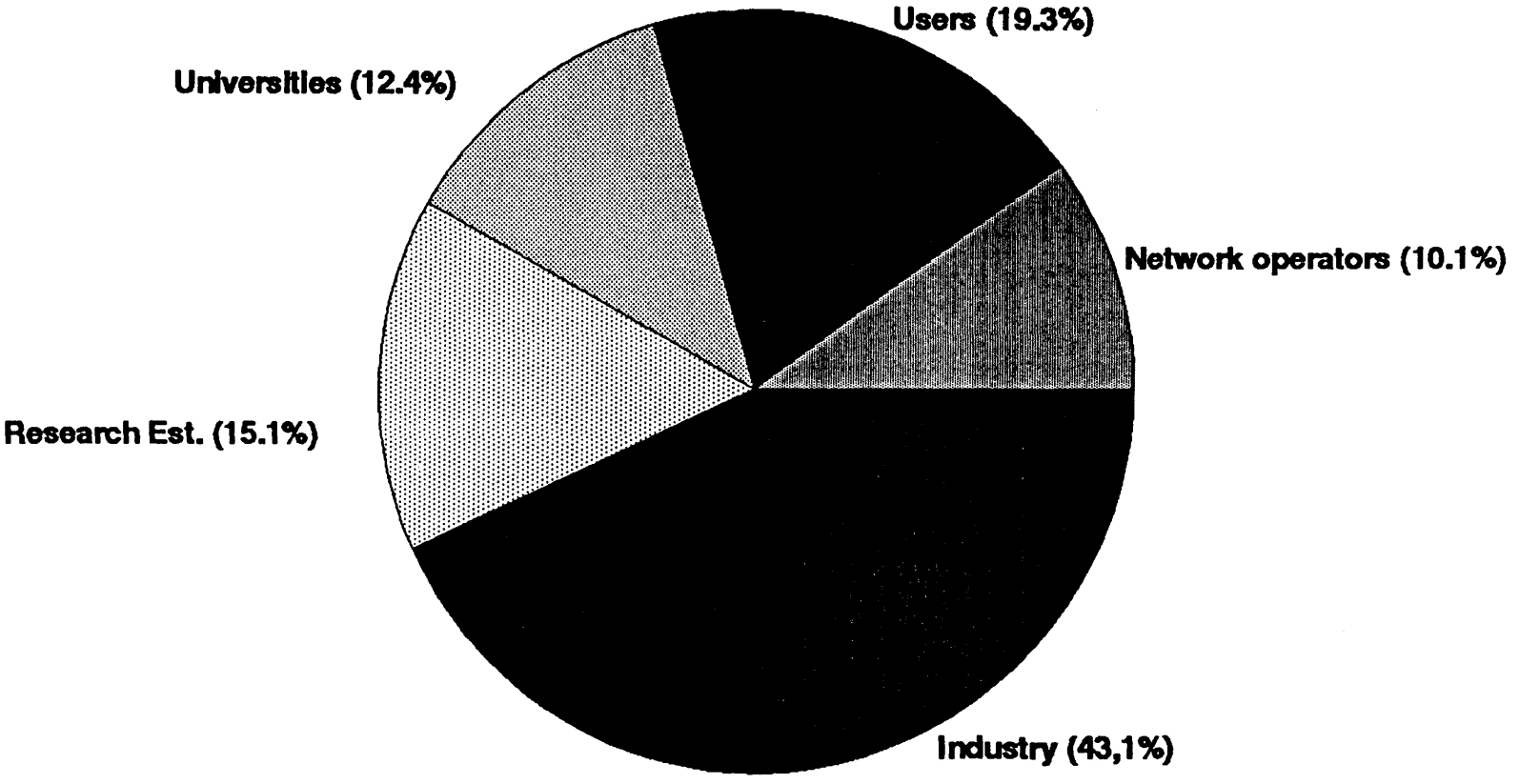
USTL	Université de Sciences et Techniques du Languedoc	F	R1029
UVA	University of Aarhus	DK	R1040
UVD	University of Durham	UK	R1084
UVL	University of Leuven	B	R1040
UVS	University of Surrey	UK	R1023
VERITAS	Det Norske Veritas	N	R1062
VITEC	VITEC	F	R1079
W&G	Wandel & Goltermann GmbH & Co	D	R1083*
WRC	Work Research Center Ltd	IRL	R1034, 77
WSD	Wärtsilä Diesel	SF	R1062
ZMF	ZMF	D	R1078

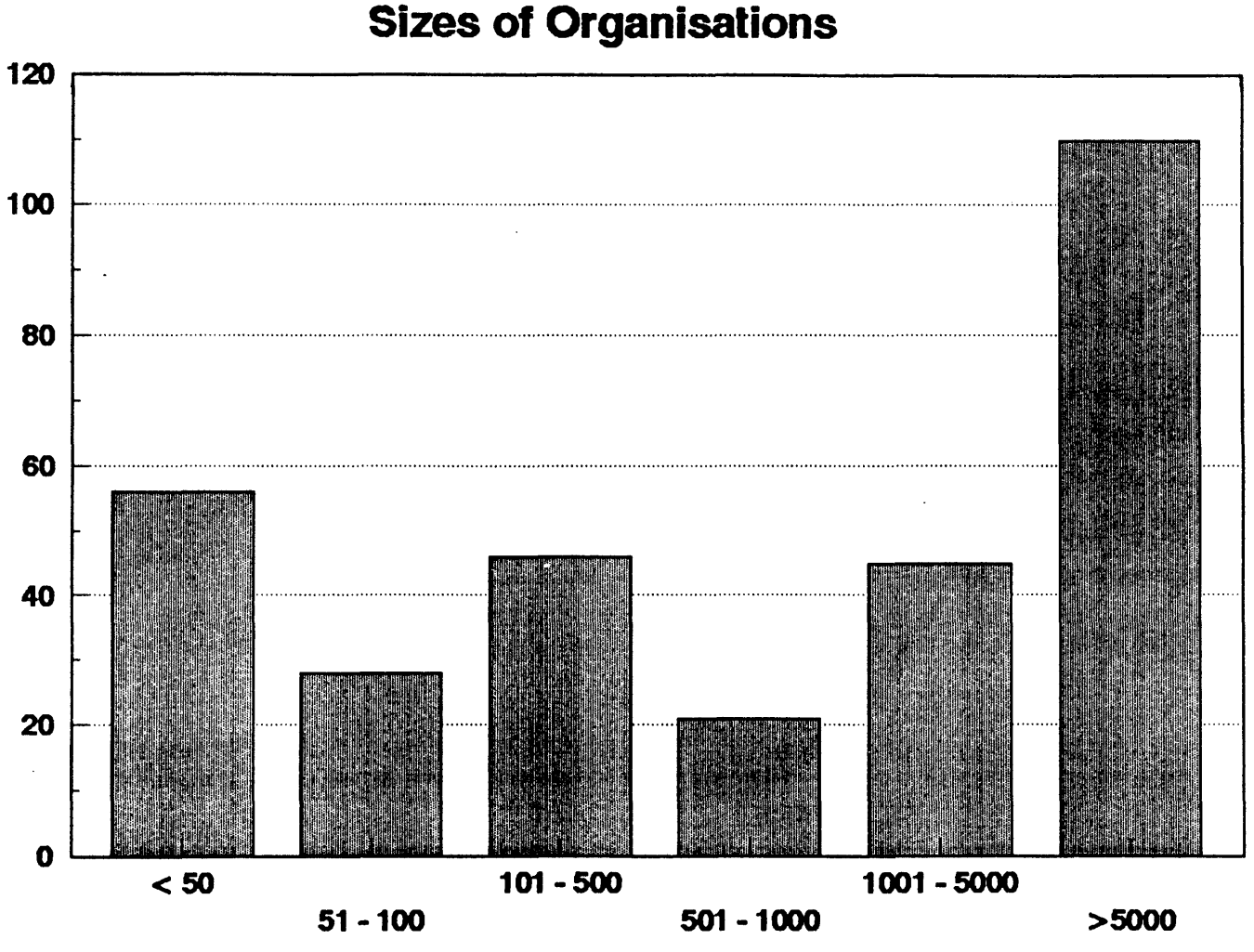
*** Prime Contractor for Project**

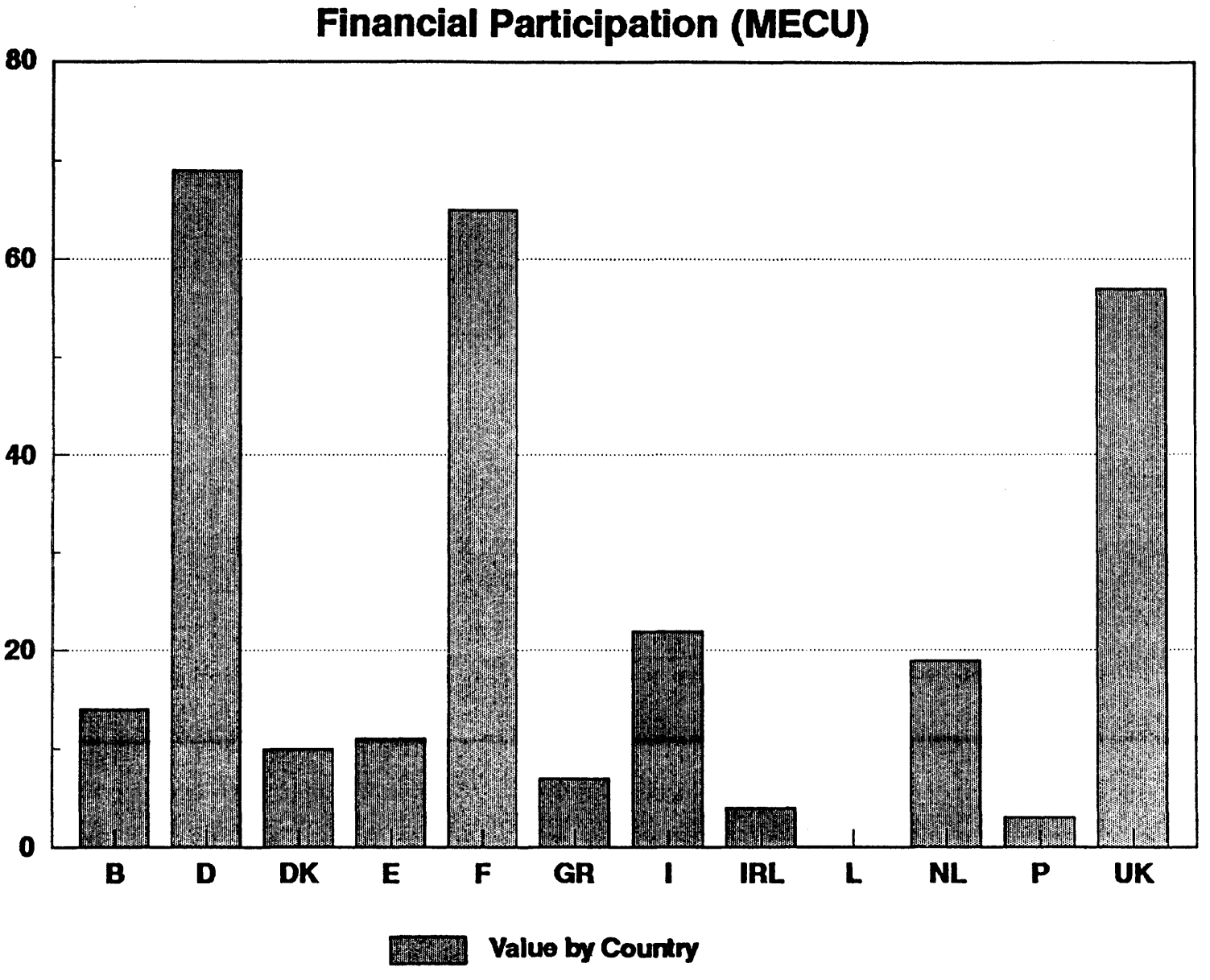
Annex IX

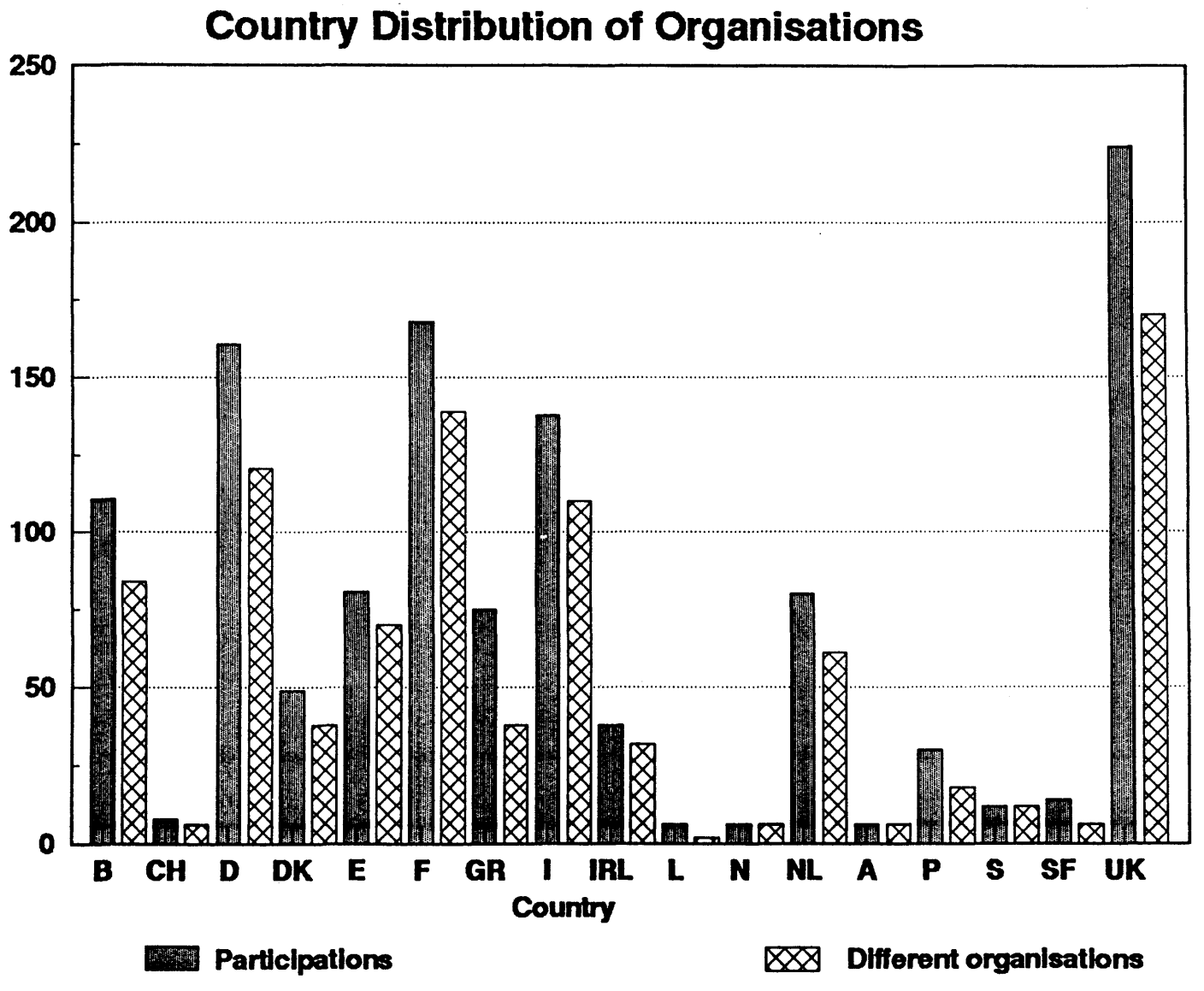
Financial and participation statistics

Types of Organisations




Sizes of Organisations
120
100
80
60
40
20
0
< 50
51 - 100
101 - 500
501 - 1000
1001 - 5000
>5000


Financial Participation (MECU)
80
60
40
20
0
B
D
DK
E
F
GR
I
IRL
L
NL
P
UK
Value by Country


Country Distribution of Organisations
250
200
150
100
50
0
B
CH
D
DK
E
F
GR
I
IRL
L
N
NL
A
P
S
SF
UK
Country
Participations
Different organisations

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