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Status Report on the EURATN Project

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SUMMARY

The EURATN Project is one of the activities underway in Europe to provide a platform for the validation of the draft ATN SARPs contained in the ATN Manual (Second Edition). This paper summarizes the project background, provides a status summary of the project at this date, and offers a forecast for project completion.

REVISION HISTORY

Section	Date	Issue	Reason for Change
	12 October 1994	Issue 1.0	Document Creation

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1. Introduction

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In its validation rôle, the EURATN Project will be used during early 1995 to support initial ATN trials activities. The first such use is expected for support of the planned Automatic Dependent Surveillance (ADS) trials in the North Atlantic.

The EURATN project is currently in the system integration and test phase, having completed the requirements definition and specification phases during October 1993, and having begun the development, integration and deployment phases at that time. Also, while the EURATN Project began under the sponsorship of the CEC with the EURATN Partners being funded on a 50% basis, the Project is now continuing with EUROCONTROL sponsorship and funding in addtion to that provided by the CEC. This paper provides an overview of the project in both contexts, in order that the current status may be better understood.

2. Background on the EURATN Project

2.1 The EURATN Project

In 1990, the PHARE partners began discussions regarding the development of an experimental ATN that would have the dual objectives of 1) providing PHARE partners with a realistic data communication environment for conduct of ATM experiments, and 2) providing a platform for the concept validation of the ICAO ATN SARPs. The result of these discussions was the project known as the PHARE ATN (P-ATN).

The main principle underlying the P-ATN project was the development of an experimental aeronautical network allowing interconnection of the PHARE partners experimental centers with PHARE test aircraft using ATN internetworking concepts. This experimental ATN was expected to be realized via the interconnection of available ground subnetworks (i.e. LANs at each center and national public packet switched data networks) and available air/ground subnetworks (i.e. the UK and French Mode-S/GDLP stations and early commercial satellite services).

In early 1991, the General Directorate for Transport (DG/VII) of the Commission of the European Communities (CEC) submitted a call for tender proposing a transport industry research program, called EURET, including tasks related to Air Traffic Management enhancements and, in particular, to air/ground data communications. As a reply, a European Consortium including certain PHARE partners, industrial entities and universities proposed the EURATN Project. This proposal was selected by the CEC DG/VII during 1991, along with two other proposals dealing respectively with air traffic control human factors research and with the definition of future ATM scenarios.

This proposal was accepted by the CEC, and the EURATN Project formally began during January 1992.

Note: Since several P-ATN partners are involved in EURATN, it was decided to temporarily suspend parallel work on the P-ATN Project until the software developed within the EURATN project is available. Then, the P-ATN Project is expected to resume, with PHARE research centers using experimental ATN software and hardware developed and integrated within the EURATN Project.

2.2 EURATN Project Objectives

The initial EURATN project objectives have been largely derived from P-ATN requirements. The primary objective is to provide a platform for early validation of ATN internetworking concepts, and to

provide ATN experimental equipment (i.e. ATN routers and host computers) for the construction of the PHARE ATN. As the Project has progressed, a secondary EURATN Project objective has been recognized by the Consortium to be important. This secondary objective is the provision of an early experimental platform to support general research and development in ATN communication-related areas (e.g. upper-layer protocols, applications, network performance, security management, and network management).

2.3 Initial Structure of the EURATN Consortium

In order to realize the objectives described in the previous section, the EURATN Consortium was organized for the CEC contract into a consortium consisting of eight Main Partners and five Associate Partners or Subcontractors.

The Main Partners are:

- Sofréavia/CENA,
- Cap Sesa Tertiaire[1] (CST)
- ESG (Elektronik System Gesellschaft),
- ISDEFE (Ingeneria de Systema para la Defensa de España),
- LIR (Logiciels pour l'Informatique Répartie),
- NLR (Nationaal Lucht en Ruimtevaartlaboratorium),
- SITA (Société Internationale de Télécommunications Aéronautiques),
- THOMSON CSF/SDC and THOMSON CSF/CNI (covering both the ATC and Avionics branches).

The Associated Partners or Subcontractors are:

- AEROSPATIALE,
- DLR (Deutsche Forschungs und Versuchtanstalt für Luft und Raumfahrt),
- NTUA (National Technical University of Athens),
- SEXTANT Avionique,
- TUB (Technical University of Braunschweig).

Sofréavia/CENA is the EURATN Project Coordinator, and as such, is responsible to the CEC for the overall management of the project.

Figure 1 shows the current structure of the EURATN Consortium, i.e. the structure that has been in place[2] during Phase 1, Phase 2 and Phase 3 (i.e. the requirement and specification phases) of the Project. In particular, this figure shows the relationship among the Main Partners, the Associated Partners and the Subcontractors during the execution of these initial project phases. This figure also indicates the EURATN organizations that are PHARE partners.

2.4 EURATN Project Strategy

The strategy of the EURATN Project is to deploy an early experimental ATN to support internetworking concept validation work and to support research in related areas of aeronautical communications standardization. It should also be noted that it is the intent of the EURATN Consortium to build this

[1]Known as Cap Gemini International Support in previous EURATN documentation.

[2]A different organizational structure will be employed during Phase 4 (Development) and Phase 5 (Integration and System/Network Integration). This structure is described in the EURATN IMP.

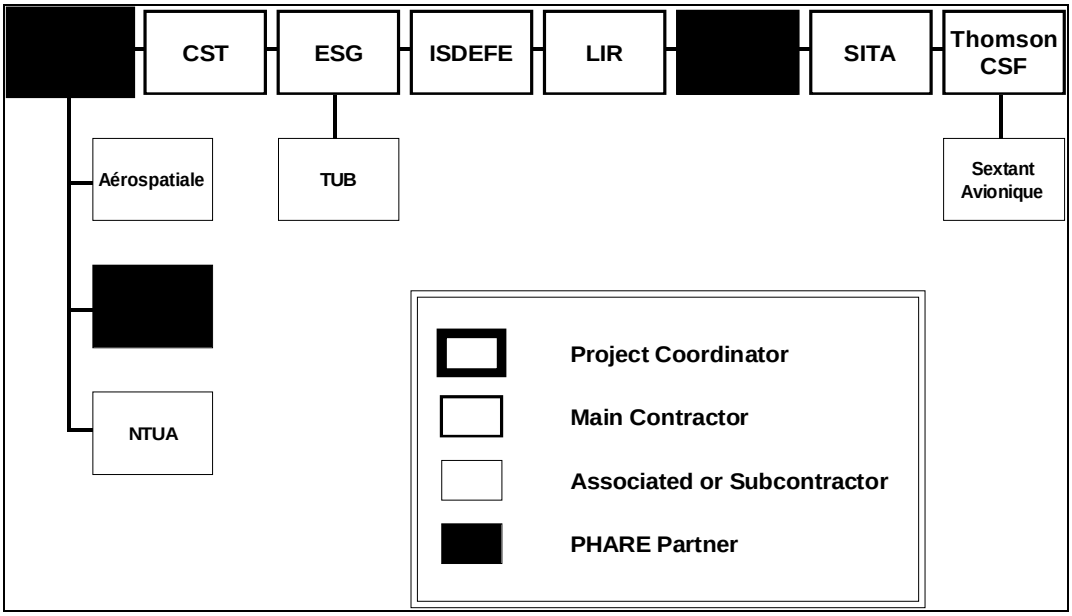

Figure 1: EURATN Consortium Structure

experimental ATN to conform as closely as possible to the provisions of the ATN Manual[3] (Second Edition). In support of this strategy, the Consortium intends to develop experimental ATN routers and end-systems, and will deploy these systems to form the EURATN Demonstrator from which validation work can begin. Using this demonstrator as a basis, the original P-ATN may then be deployed to interconnect the PHARE partner centers and to allow initial ATM experiments to be conducted in an ATN environment.

In order to support a wide variety of ATN research and validation activities, the development of the EURATN Demonstrator is focused at an experimental level. This experimental priority is evident in many of the technical design choices made within EURATN. For example, it is intended to develop ground (i.e. fixed) and airborne (i.e. mobile) routers and end-systems on conventional workstations (e.g. RISC workstations) without attempting to develop specific performance-oriented or operationally-certified hardware. The airborne systems will ultimately be flight-tested on experimental aircraft, and therefore no strong certification requirements are foreseen. Likewise, the dimensioning of the network will be defined based on the expected scale of experimental data traffic (i.e. with a limited number of aircraft), and not on the basis of operational traffic levels. This experimental approach is expressly designed to support validation of the ATN concept, deferring issues of operational certification until the concept itself has been validated. This approach is also considered essential to achieve an early deployment of an experimental ATN.

[3]This approach supports the validation of the ATN Manual for progression of that material into ICAO SARPs.

3. Project Organization during the Requirements Definition and Specification Phases

3.1 Initial Project Task Structure

The EURATN project was organized initially into six phases which were intended to correspond to the complete life cycle of such a project:

Phase 1: **EURATN Requirements Specifications**

Phase 2: **EURATN Functional Specifications**

Phase 3: **EURATN System Specifications**

Phase 4: **EURATN System Development**

Phase 5: **EURATN System/Network Integration**

Phase 6: **EURATN Experiments**

These phases were designed to be conducted sequentially, i.e., a particular phase was to be completed prior to commencing work on the next phase.

In order to complete the work required for the first three phases (i.e. for the design phases), the Project was organized into eight functionally-oriented task groups (i.e. sub-projects), with particular Consortium partners identified as ‘‘Task Responsible’’ partners (i.e. as task group leaders). These tasks are summarized as follows, with the task-responsible partners noted in parentheses after the task name:

Task 1: EURATN Internetworking (CST)

This task defined the internetworking aspects within EURATN up to and including OSI layer 4, including network topology, routing organization, SNICP (Sub-Network Independent Convergence Protocol), SNDCP (Sub-Network Dependent Protocol), SNAcP (Sub-Network Access Protocol), and systems management support.

Task 2: EURATN Applications and Upper Layers (NLR)

This task defined the applications that will communicate through EURATN, and the OSI upper layer services and protocols they require.

Task 3: EURATN Network Management (SITA, ESG)

This task defined the overall management of the EURATN, in terms of objects and events to be collected and monitored among the elements of the network, and in terms of the central management application station.

Task 4: EURATN Specific Studies (ISDEFE)

This task defined studies required for evaluation of the EURATN demonstrator: dimensioning (e.g. in terms of computer performances requirement), performance analysis (to determine the influence of different choices on the performance level), and performance measurement (to validate the analysis).

Task 5: EURATN Demonstrator Definition, Integration and Tests (Sofréavia/CENA)

This task defined the EURATN demonstrator topology and configuration, and the integration of the elements developed in the three first tasks into the ”EURATN demonstrator”. This

integration will require some specific tests, in addition to those conducted to validate the demonstrator elements separately

Task 6: EURATN Experiments (Thomson/CSF)

This task defined the experiments to be conducted during any follow-up phases to the EURATN project: objectives, required environment, etc. Demonstration experiments were also defined to be performed under this task at the end of the project (i.e. a limited demonstration in flight was initially foreseen).

Task 7: EURATN Operation (SITA)

This task defined the EURATN demonstrator operational environment, in particular, focusing on the EURATN User Manual.

Task 8: Management and Coordination (Sofréavia)

This task comprised the project-wide effort required to manage the work progress of Task 1 through Task 7.

These task groups have been active during the three initial phases[4] of the project. They are further divided in sub-tasks corresponding to the activities within the task group.

3.2 Initial Project Management Structure

Project decision-making during the first three phases has been carried out by the EURATN Project Management Group (PMG). This group is composed of a representative of each of the eight main Contractors[5] and of representatives of the CEC and EUROCONTROL. The PMG meets regularly, under the chairmanship of the Project Coordinator, to review the progress of the work and to decide on any appropriate actions to be taken. PMG meetings have been held approximately every three months.

At the end of each of the first three project phases, a PMG meeting has been convened to conduct a formal review of the work performed during the phase, and to endorse of the work. Each phase has then resulted in the delivery of a Project Phase Report, consolidating the work achieved within the phase in the various tasks.

3.3 Resource and Funding Approach under the Initial Phases

With respect to human resources applied during the first three phases of the project, each commercial/research partner has funded 50% of its effort within the project and the CEC has funded the remaining 50%. In the case of the university partners, the CEC provides 100% funding.

The commercial off-the-shelf OSI software and commercial hardware (e.g. workstations, satellite equipment, etc.), that are necessary to support the project have been made available by EUROCONTROL via the PHARE Programme for the duration of the project. The ATN routers and end-systems developed within the EURATN Project will then serve as the components of the PHARE experimental network (i.e. the P-ATN).

[4]The initial task structure will be replaced with a work-package structure for the development and integration of the EURATN Project (i.e. for completion of Phases 4 and 5). This approach is described later in this document, and in the supporting material.

[5]The PMG structure will continue to be used as a decision-making body for the Consortium during Phase 4 and Phase 5 of the EURATN Project; however, the membership is proposed to include all active partners.

3.4 Completion of the Design Phases

The EURATN project began the **System Development** phase (i.e. Phase 4) during October 1993. This means that the software architecture of all the EURATN system types is fully defined and that the detailed specifications of all software components (software modules, UNIX software processes) have been completed.

At the commencement of the production phases of the project, a more optimal organization was adopted. This structure is described fully in the EURATN Implementation Management Plan, and the EURATN Production Management Plan. The remainder of this report focuses on the latter phases (i.e. the production phases) of the EURATN project, operating in the context of these two documents.

4. Principles for Development, Integration and System/Network Deployment

4.1 Reference Documents

The following table lists the key documents comprising the detailed specifications and management plans supporting the production phases of the EURATN Project:

Reference	Document Title	Document Number
[REF1]	EURATN Implementation Management Plan (IMP)	SOF_0.0_IMP_04/V3.0
[REF2]	EURATN Production Management Plan (PMP)	SOF_0.0_PMP_05/V4.0
[REF3]	EURATN Development Environment Document (DED)	SOF_0.0_DED_07/V3.0
[REF4]	EURATN Configuration Management Document (CMD)	SOF_0.0_CMD_08/V3.0
[REF5]	EURATN System Implementation Specification (SIS)	SOF_0.0_SIS_06/V2.0
[REF6]	EURATN Subtask 1.3 Synthesis Report (SSR 1.3)	CGS_1.3_SSR_20/V2.0
[REF7]	EURATN Subtask 2.3 Synthesis Report (SSR 2.3)	NLR_2.3_SSR_15/V2.0
[REF8]	EURATN Subtask 3.3 Synthesis Report (SSR 3.3)	SIT_3.3_SSR_14/V2.0
[REF9]	EURATN Subtask 5.3 Synthesis Report (SSR 5.3)	SOF_5.3_SSR_21/V2.0
[REF10]	EURATN ES-IS Routing Information Exchange Protocol PICS	Sofréavia Document SOF/FWC/339/D0023/94
[REF11]	EURATN Internetworking PICS	Sofréavia Document SOF/FWC/339/D0024/94
[REF12]	EURATN Transport Protocol PICS	Sofréavia Document SOF/FWC/339/D0025/94

Document [REF1] provides an overview of the new project plan for support of the development, integration and deployment phases of the EURATN Project, and Document [REF2] provides the detailed work breakdown structure required to implement the plan in [REF1]. Documents [REF3] and [REF4] detail the quality assurance measures to be taken during these three phases of the EURATN Project, with respect to configuration management standards and standards for software development.

Document [REF5] contains the technical specifications for all project global interfaces and services, while Documents [REF6], [REF7], [REF8] and [REF9] provide the detailed technical specifications for the software to be developed within the EURATN Project.

Documents [REF10], [REF11] and [REF12] present a summary of the EURATN compliance with the APRLs of the ATN Manual (Second Edition, 19 November 1993), where the current compliance differs from that noted in the system functional specifications (i.e. the SSRs from Phase 2), or from that noted in the system technical specifications (i.e., [REF6], [REF7], [REF8], and [REF9]).

Except where noted, these documents are EURATN Project documents. Note also that certain of these documents are considered to be confidential within the EURATN Consortium, and may not be circulated outside the Consortium without the partners approval.

4.2 Management Plan

The EURATN work plan is based on the material in the Production Management Plan (PMP) [REF2]. This work plan (or project plan), is structured in four parts: the Main Build, Option 1 (Network Management), Option 2 (Integration of Eurocontrol ISO 10747), Option 3 (Experimental Mode S).

Each of the four parts of the EURATN work plan comprise a set of work packages (WPs) forming the EURATN work breakdown structure (WBS). Each WP has allocated to it a level of required productive effort (in man-days) and one or more responsible Consortium members to which that effort has been assigned. Additionally, these WPs are related by dependencies, which have been created for either technical or scheduling purposes. In general, the WP schedules are the result of fixing the project start dates, the WP task duration/effort levels, and the inter-task dependencies. The result of this process is documented in detail in Annex A of [REF2], with WP descriptions provided in the main body of that document

This work plan is used by Sofréavia/CENA, as the Project Coordinator, to manage the project, to anticipate problems in meeting projected milestones, and to gauge the overall level of conformance to predicted results.

4.3 Quality Assurance

This section defines the principles of Quality Assurance that are used within the Development and Integration phases of the EURATN Project. This section also identifies the EURATN Documentation that will support these principles.

4.3.1 Principles

The principles of Quality Assurance that are applied within the EURATN project have been defined under the hypothesis that the EURATN project is a rapid-prototyping approach to the problem of ATN Standards validation. One of the consequences of this hypothesis is that it is more important to develop quickly a proper experimental network than to delay developments by burdening them with very stringent Quality requirements. On the other hand, the Consortium recognizes that it is likely that the EURATN produced systems may be upgraded at some point to incorporate new functionalities required for ATN SARPs validation, and therefore, these products can not be seen as black boxes only, within which no one can ever understand the internal mechanisms. It is also understood that an essential quality requirement is the need to qualify the delivered experimental network, in order to show the extent to which it is an implementation of ATN functions. Therefore, the Consortium feels that the following high level Quality Assurance Requirements (QAR) are relevant for EURATN:

- QAR1: Ensure timely and proper implementation of the experimental network as specified in [REF1] and [REF2];
- QAR2: Ensure a good level of readability and maintainability for the produced documentation and software;
- QAR3: Provide a consistent level of quality throughout all documentation and software produced for EURATN within the Consortium;
- QAR4: Provide a good level of confidence that the delivered systems and network are conformant to specifications.

To meet these objectives, the following Quality Assurance mechanisms are applied by the Consortium:

QAR1:

- Involve all partners in the quality procedures instead of centralizing these procedures on the Quality Manager;

- Define internal communication rules and procedures to ensure prompt discovery and resolution of potential problems.

QAR2 and QAR3:

- Define a project-wide set of common rules for development of documentation and software (i.e. development and configuration management rules);
- Perform some level of formal quality verification on developed products.

QAR4:

- Define and execute a set of project-wide qualification and acceptance activities on the developed systems and network.

4.3.1.1 Distributed Quality Assurance

Because of the distributed nature of the project (i.e. many partners, various development sites, etc.), the Consortium feels that the best chance of success for overall quality in the project is to distribute the application of commonly defined quality principles throughout the partners during the software development phase, to organize only a minimum set of quality control activities during and at the end of this phase (see Formal Quality Verification) and finally verify that the delivered products meet their functional requirements by conducting a formal project-wide qualification and acceptance procedure.

4.3.1.2 Problem Discovery and Resolution

In order to achieve good internal communication within the Consortium as far as problems are encountered during products development, it is proposed to apply a common procedure to allow quick discovery and resolution of problems. This procedure is based on the following principles:

- reporting of any problem encountered to the Configuration Manager;
- elaboration of solution with appropriate parties;
- communication of problem/solution to appropriate parties;
- storage of problem/solution on EURATN electronic archive.

4.3.1.3 Project-Wide Development Rules

In order to ensure readability and maintainability of EURATN products, it is essential to define a set of project-wide common rules, to be applied by all partners during development and integration of the products. It is proposed to define such common rules for:

1. the definition of the UNIX environment underlying the software development and execution
2. the definition of the hardware and software configuration of the EURATN target machines for which software is being developed,
3. the standards, rules and conventions to be applied for:
   (a) documentation;
   (b) software building procedures;
   (c) use of compiler options;
   (d) use of programming language (including commentaries);
   (e) use of file extensions.
4. the procurement of a project-wide configuration management procedure allowing:

(a) centralized project items identification and configuration;

(b) centralized EURATN electronic archiving ;

(c) centralized change control procedures;

(d) centralized delivery procedures.

4.3.1.4 Formal Quality Verification

Although the basic principle of quality assurance in EURATN is to rely on quality provided by each partner individually, the Consortium will perform a minimum level of verification on individual conformance to quality rules. This will be done with two objectives:

1. ensure that common development rules are applied, in a consistent manner, among all partners
2. ensure that unit testing rules (i.e. at the module or process level) are applied, in a consistent manner, on the critical components of the EURATN systems and network.

The first objective is proposed to be met by organizing code reviews on all partners, on randomly selected pieces of code produced by the partner. This activity of the Quality Manager will take place at the beginning of the software development activities, in order to detect, as soon as possible, misinterpretations or misunderstandings in applying common development rules.

The second objective is proposed to be met by organizing code and tests reviews on a set of modules or processes that are considered as critical elements for the EURATN systems and network. This review will be organized at the unit testing time. This effort will focus on ensuring that for critical software elements, the testing rules (e.g. level of testing coverage) have been achieved.

4.3.1.5 Qualification and Acceptance Principles:

The acceptance of a product within the EURATN Project is measured in two steps:

- the qualification of the product;
- the acceptance of the product by EUROCONTROL and the CEC.

The qualification of the products allows verification within a chosen confidence level that the product satisfies its functional requirements. It is the last development activity for a given product. The acceptance test is a subset of the qualification procedure that is performed for demonstration of provided functionalities at the time of system or network delivery.

Qualification/acceptance procedures will be performed only on the final products to be delivered, i.e.:

- on the EURATN Systems;
- on the EURATN Demonstrator.

Qualification/acceptance will be performed as a set of tests to be conducted on the delivered products. These tests will be documented in Functional Test Procedures and the results of the tests will be recorded. Selection of the tests to be performed will be done at the beginning of the development activities according to the following strategy:

- performance of a complete analysis of the systems functionalities;
- definition of areas of interest for qualification;
- definition of test objectives and functionalities to be qualified for each qualification area, based on available Project resources;
- precise specification of the Functional Tests Procedures (including tests objectives, test configuration, input/output data, expected results, etc.).

Performance of these tests will then be performed under the control of the Quality Manager with the technical support of the relevant EURATN partners.

4.3.2 Quality Assurance Documentation

The following documents support the EURATN Project quality assurance planning and execution:

- The EURATN project-wide common rules for development are defined in detail in the EURATN Development Environment Document [REF3].
- The EURATN project-wide problem reporting/fixing and centralized configuration management procedures and means are defined in detail in the EURATN Configuration Management Document [REF4].
- The EURATN Quality Assurance principles will be defined in the EURATN Quality Assurance Plan (QAP) that will be completed as defined in [REF2].
- The EURATN Qualification and Acceptance principles will be defined respectively in the EURATN Qualification Management Plan (QMP) and the EURATN Acceptance Management Plan (AMP) that will be completed as defined in [REF2].
- Finally, the EURATN functional tests, to be performed during systems and network qualification, will be detailed in the EURATN Functional Tests Procedures and completed as defined in [REF2].

5. Key Deliverables

5.1 EURATN Integrated Systems

The EURATN Project comprises the development of a number of system types, as illustrated in Figure 2, and as specified in the supporting documentation. These systems will be configured in the topology shown in Figure 3.

As a part of the plan detailed in the PMP, it is proposed to produce the types and numbers of systems detailed in Table 1. The notation ‘‘N/A’’ is used in Table 1 to indicate that no systems of a particular type are proposed to be delivered as a part of the referenced Main Build or Option.

A detailed description of the EURATN Integrated Systems technical aspects may be found in Section 5.4.1 (Deliverables) of [REF1], with proposed dates of completion of the various aspects of the Main Build and the three Options given in Annex A of [REF2].

5.2 EURATN Demonstrator Network

The systems proposed in the previous section will be configured to form the EURATN Demonstrator at the three PHARE partner sites, as illustrated in Figure 3. The illustrated site topology will be used for the qualification and demonstration of the delivered systems under the Main Build, as well as for any of the three options completed during follow-on phases to the current EURATN plan.

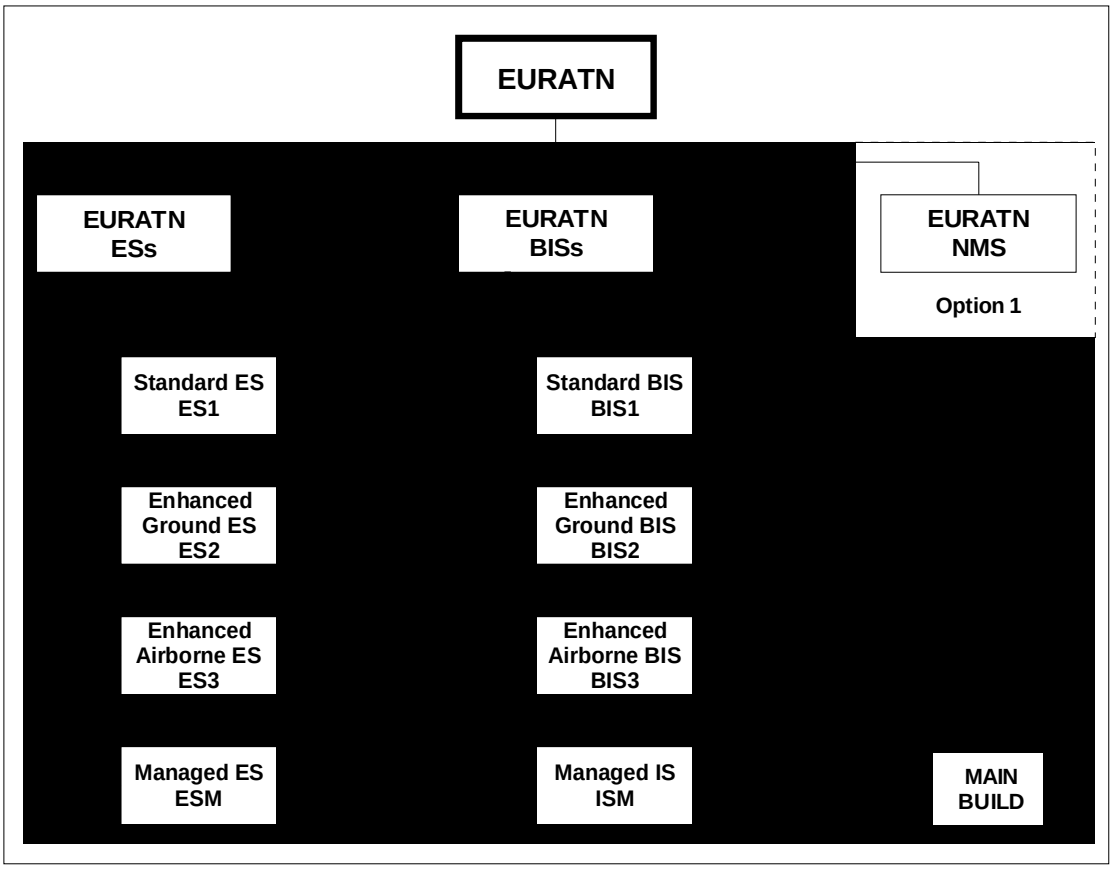

Figure 2: EURATN System Deliverables

Based on the fixed number of available workstations, and based on the fixed number of software licenses for the commercial off-the-shelf software, the EURATN Demonstrator Network will operate with a maximum of eleven workstations which will be physically located at the three PHARE sites (i.e., CENA/Toulouse, CENA/Athis-Mons and NLR/Amsterdam).

A detailed description of the EURATN Demonstrator Network technical aspects may be found in Section 5.4.1 (Deliverables) of [REF1], with proposed dates of completion of the various aspects of the Main Build and the three Options given in Annex A of [REF2].

Table 1: Summary of Systems to be Produced for the EURATN Demonstrator

System Type	Main Build	Option 1: OSI Systems Management	Option 2: Eurocontrol ISO 10747	Option 3: Experimental Mode S
Standard BIS	2	2	2	N/A
Enhanced Ground BIS	2	2	2	1
Enhanced Airborne BIS	1	1	1	1
Enhanced Ground ES	4	4	N/A	N/A
Enhanced Airborne ES	1	1	N/A	N/A
Network Management Station	N/A	1	N/A	N/A

Notes to Table:

1. The systems noted in the Main Build column will be produced and qualified according to the plans detailed in the supporting documentation.
2. The systems noted in the shaded portion of the Option 1 (Systems Management) column will comprise new versions of the same system types produced for the Main Build, with the new versions including the integration and qualification of systems management agent software developed as a part of the Main Build. These systems will comprise the same hardware components as used in the Main Build, but will perform as ''managed systems'' based on the newly-integrated software. The Network Management Station will comprise a newly produced system, and will be qualified in operation with the managed versions of the ESs and BISs (i.e. with the versions now including the newly integrated management agent software).
3. The systems noted in the shaded portion of the Option 2 (Eurocontrol ISO 10747) column will comprise re-qualified versions of the systems produced for the Main Build, after the integration of the EUROCONTROL-provided ISO 10747 software into these systems has been completed. These systems will comprise the same hardware components as used in the Main Build.
4. The systems noted in the shaded portion of the Option 3 (Experimental Mode S) column will comprise re-qualified versions of the systems produced for the Main Build, after the integration of new experimental Mode S subnetwork software has been completed. These systems will comprise the same hardware components as used in the Main Build.

5.3 Production Documentation

The documentation products to be produced as a part of the EURATN production phases are described in detail in Section 5.4.2 of [REF1], with the proposed dates of completion given in Annex A of [REF2].

In particular, it should be noted that the documents associated with ATN concept validation planning and with the integration of the EUROCONTROL ISO 10747 are produced under Work Package 2 (Harmonization Studies) of the Main Build, and that the user documentation (i.e. the operations manuals) are produced under Work Packages 18, 6, 6 and 9 (Deployment and Qualification), respectively, of the Main Build and the three Options.

6. Status

6.1 Key Milestones

The following list summarizes key milestones achieved:

January 1992	Start of Functional Requirements Development
September 1992	Start of Functional Specification Development
February 1993	Start of Technical Specification Development
October 1993	Start of Software Development

March 1994	Start of integration of router and end-system core processes, allowing test of static routing capabilities, and basic Transport protocol operation among end systems
July 1994	Start of formal system integration
August 1994	**First operation of EURATN routers with Merit IDRP**
August 1994	**First operation of EURATN Routers (with mobile SNDCF) and ESs over Satellite Subnetwork**

6.2 Forecast

A detailed description of the projected project phases and their dates for completion is given in [REF2]. A brief summary is as follows:

Spring 1995	Initial trials for support of network and demonstrator deployment, including proposed use in the North Atlantic Unified ADS Trials
Summer 1995	Start of acceptance test period for EURATN Demonstrator
Autumn 1995	EURATN Demonstrator qualified for validation support

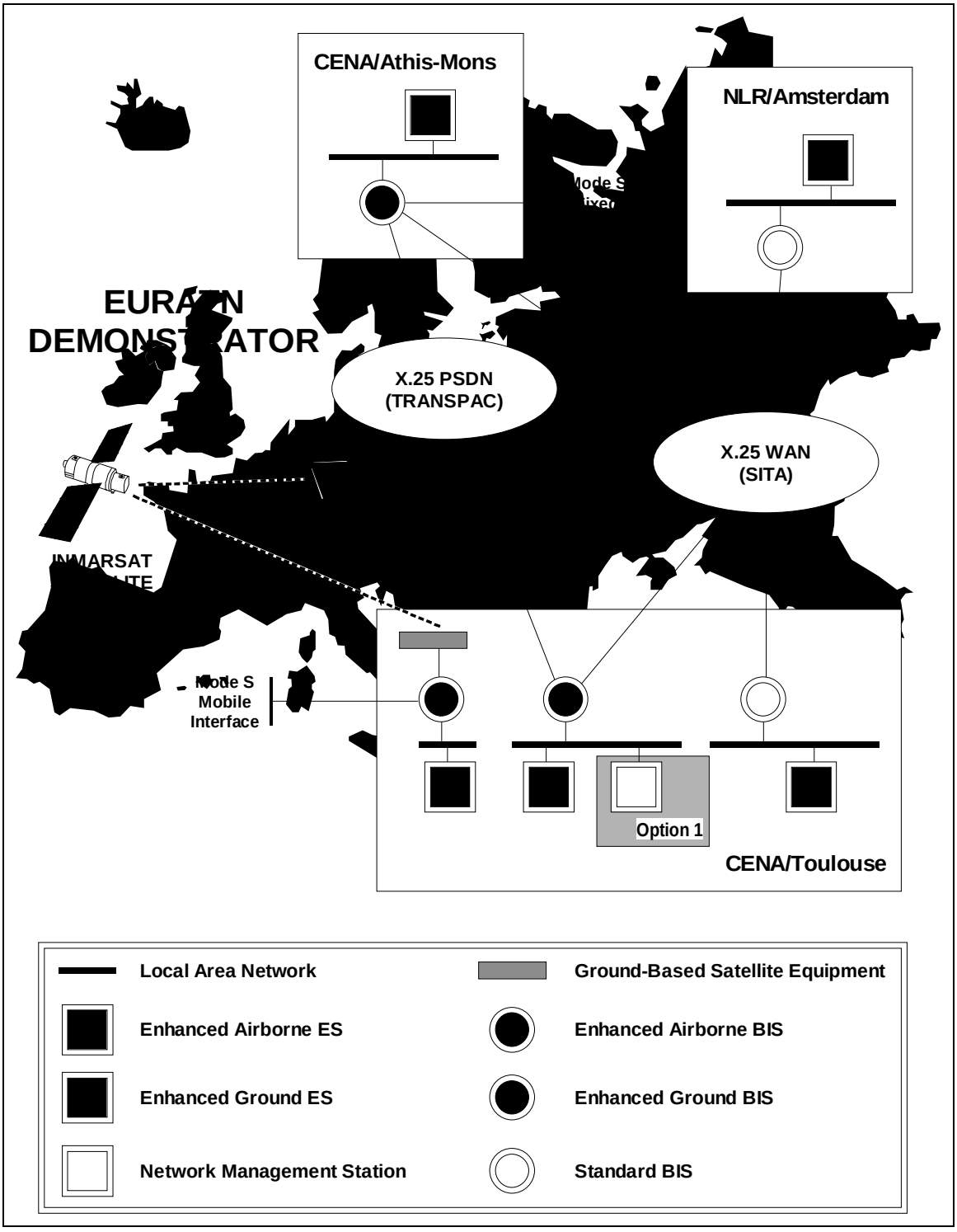

Figure 3: EURATN Demonstrator Topology