

EARN EXECUTIVE

EARN OSI development plan - Draft Version 0.1

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1 Introduction & Executive Summary (to be completed)

2 OSI Transition Strategy

The EARN Board of Directors formally adopted ISO/OSI as the technical goal for EARN in 1987 and agreed the EARN OSI Strategy.

The overall OSI Transition Strategy has a number of elements:

2.1 To provide continuity of service to existing EARN users and ensure no disruption of service as the new OSI protocols are introduced.

2.2 To implement a better sub-network to carry the EARN traffic

using X.25 protocols.

2.3 To introduce ISO/OSI applications and the necessary application gateways to provide continuity of service between the existing EARN applications which are based on the network job entry protocols and the OSI applications.

2.4 Eventually to phase out the EARN applications when the ISO/OSI applications provide the services needed. This will take place progressively as EARN sites implement, at their own pace, the introduction of ISO/OSI applications.

3 Current OSI Transition Activities (to be completed)

4 CURRENT ENVIRONMENT, ASSUMPTIONS AND CONSTRAINTS

4.1 Current Environment

The current research networking environment in Europe is complex with many parallel and perhaps competing activities. Many of these activities have a bearing on EARN's plans for the introduction of ISO/OSI protocols and applications. The key activities are:

- . COSINE
- . IXI
- . RARE
- . EASINET
- . EUNET
- . HEPNET
- . National Networks

The funding of the EARN network and the EARN OSI transition is also complex, and the source of funds will be affected by some of the activities described above.

4.2 Assumptions

A number of general assumptions have been made in drawing up this development plan:

* EARN's goal is to serve the broadest possible academic research community and the associated industrial research community in Europe, the Middle East and Africa. Thus, EARN is a non-discipline oriented and non-supplier oriented network with the goal to provide computer

networking services to all scholars, whether in the sciences, engineering, the arts or humanities.

* EARN currently uses the network job entry (NJE) protocols and applications, with electronic mail gateways connecting EARN to all the other research networks in the world. It is a basic assumption that the introduction of ISO/OSI protocols and applications will improve the quality of the services available to EARN users, extend the range of services, and broaden the community with which the EARN users can communicate.

* EARN services are primarily electronic mail and file transfer and it is a basic assumption in this development plan that these store and forward services, and associated electronic mail and file servers, will remain the priority services for EARN. Introduction of additional services, including interactive services, have a lower priority until the bandwidth requirements are more clearly understood.

* It is important to note that EARN is an application network, not a communications carrier, and that EARN's focus is the introduction and development of applications of benefit to EARN users.

4.2.1 Assumptions: Continuity of Service

* The assumption in this development plan is that continuity of service to the EARN users has the highest priority and that the introduction of OSI protocols and OSI applications will take place in an evolutionary manner, and that no discontinuity of service is introduced between existing EARN users and EARN users who have access to the new ISO/OSI protocols and applications. This, EARN believes, is the correct approach and it is encouraging that continuity of service for existing network service providers like EARN has been endorsed as part of the COSINE Implementation Phase.

* In addition, it is assumed that the NJE/OSI technical approach to ensuring continuity of service is the appropriate approach for EARN. It is worth noting that this approach is similar to the approach adopted in 1985 by BITNET in the United States for the introduction of TCP/IP services. An obvious corollary is that the various implementations of NJE/OSI on the difference types of EARN computers must interoperate successfully.

4.2.2 Assumptions: X.25 Sub-Networks

* Since EARN is basically an applications network, it is an assumption in this development plan that EARN does not need to manage

and operate an X.25 sub-network, provided that an appropriate X.25 sub-networking infrastructure is available in Europe, the Middle East and Africa which is reliable, cost effective and well-managed, and that EARN has the appropriate input to the management and control of the sub-network.

* It is further presumed that the COSINE IXI Network is, at this time, a pilot network and not a service network. However, the potential importance of IXI to the european research community means that networks such as EARN must participate in the pilot and in the evaluation of the network.

* It is further presumed that the success of the COSINE IXI Network is not assured at this time. While it is clear that the pilot will take place, it is not clear that the single PTT supplier can successfully manage and operate an international X.25 network. Further, it is clear that the projected costs of the pilot phase are excessive. That the future of IXI is not assured is confirmed by the COSINE discussions on the possibility of seeking tenders for the provision of a replacement for the IXI network after the 16 month pilot phase. As a consequence, it is too early for EARN to decide on and to commit to the use of the IXI Network to provide the basic network for transport for EARN traffic, and therefore EARN must continue with the current EARN X.25 backbone plans.

* It is assumed, and this has been the EARN Board's stated policy, that EARN will participate in the IXI pilot network and in the evaluation of this network. It is presumed that the IXI project will proceed on schedule, so that EARN can participate, and so that EARN can gain sufficient experience to fully evaluate the IXI Network by June 1990.

* It is assumed that a decision on the IXI project will be taken before September 1989, that a contract for the network will be signed at that time, and that the duration of the pilot project will be 16 months as currently planned.

* In considering connections between the EARN X.2 backbone network and other international and national networks, it is assumed that X.75 will not be available and that it will be necessary to use gateway X.25. It is further assumed that all networks involved will adopt the X.25 1984 version during 1989/90.

4.2.3 Assumptions: ISO/OSI Applications

In developing this EARN OSI Transition Plan, it has been assumed that the priority for the introduction of ISO/OSI applications is as

follows:

First, the introduction of X.400 electronic mail and the associated RFC987 electronic mail gateways between X.400 and existing mail services.

Second, the introduction of directory services based on the X.500 standards.

Third, the introduction of the FTAM applications and appropriate gateways to ensure that existing EARN file transfer mechanisms can interwork with the FTAM applications.

In all of the above, it is assumed that EARN will participate with RARE in the determination and adoption of practical functional standards for the transition of EARN to ISO/OSI.

A major and basic assumption in the plan is that the COSINE Implementation Phase will include support for the transition of existing operational service networks towards the use of ISO/OSI protocols, and therefore that funding will be available to provide the manpower and facilities to ensure that EARN's OSI Transition Programme proceeds rapidly and is successful.

4.2 Constraints

These development plans for the transition to the use of ISO/OSI protocols and applications is constrained by a variety of considerations.

* First, and most importantly, the major constraint is that of continuity of service. This means that all sites who continue to run the NJE protocols and applications during the transition phase (and this phase may take several years), must be able to communicate with all EARN nodes without diminution of the quality of service provided.

* Second, all countries in EARN, whether in Europe, the Middle East or Africa, must be assured that this development plan protects the interests of their users. This is particularly important for countries which are members of EARN but are not participants in the COSINE Programme.

* A major constraint, as always in these matters, is the limits on the amounts of funding available to EARN from the member countries. Additional funding and sponsorship will be required to ensure that the development plan described here can be implemented. It is anticipated that these funds will be provided as part of the COSINE implementation

phase.

* The EARN OSI Transition Programme is substantially sponsored by a number of international computer and communications suppliers - namely, IBM Europe (IBM), Digital Equipment International Europe (DEC) and Northern Telecom Europe (NT) - and this support puts a number of constraints on the activities in the plan.

- First, at the X.25 level, the funding available for the line upgrades involved in the current EARN X.25 backbone activities, has been provided by DEC. Since the agreement between DEC and EARN is for DEC to support a large-scale OSI pilot project, the agreed constraint on the use of the funding for the X.25 leased lines is that the protocols used on this EARN backbone will be limited to ISO/OSI protocols or the NJE/OSI protocols.

- In addition, the Northern Telecom X.25 switches, which have been accepted by EARN for use on the X.25 backbone, provide X.75 functions and will provide gateway X.25 prototype implementations by 1 September, 1989. Thus testing of the connections between the EARN X.25 backbone and other X.25 networks to provide inter-operability at the X.25 level can only start in September 1989.

- A major opportunity for EARN at the X.25 level, although possibly one which will give rise to additional constraints, is IBM's offer of bandwidth sharing with the IBM EASINET Project. This offer has been welcomed by the EARN Board and detailed planning activities have been incorporated in this Plan.

- A major constraint on the success of the continuity of service is that the NJE/OSI implementations on at least IBM and DEC systems interoperate successfully.

- To take advantage of the DEC offer of MicroVAXs to act as OSI application gateways in each country - the so-called G-Boxes - VAX/VMS based solutions for each of the application gateways between the existing NJE protocols and the ISO/OSI protocols are required.

- More generally, all the ISO/OSI protocols applications and gateways to be implemented in the EARN OSI Transition must conform to agreed COSINE/RARE/EARN functional standards, and

- Possibly most importantly, there are funding and staffing constraints. The existing staff levels and fundings levels budgetted by the EARN Board will not be sufficient to ensure that the development programme described here proceeds as rapidly as planned. Additional COSINE funding will be required.

5) PROPOSED OSI TRANSITION ACTIVITIES (JULY 89 - JUNE 90)

5.1 X.25

- * Continue Northern Telecom X.25 backbone.
- * Participate in IXI Project.
- * Evaluate IXI Service.
- * Prepare report for EARN Board for IXI.
- * Investigate line sharing possibilities with EASINET, EUNET, HEPNET and prepare report for EARN Board Meeting in October 1989.
- * Consolidate the EARN OSI Operations Centre (EOC) with DEC support.
- * Operate and manage the Northern Telecom X.25 backbone from the EOC.
- * Test Northern Telecom Gateway X.25 software with international and national networks, and with the IXI X.25 network. It is assumed that all networks will make the transition to X.25 (1984).
- * Establish criteria for interconnection between the EARN backbone network and national and international networks which will protect the EARN bandwidth for EARN services.
- * Evaluate bandwidth requirements for EARN in the shared X.25 environment provided by the IXI sub-network.

5.2 Continuity of Service

- * Introduce NJE/OSI on G-Boxes.
- * Test interoperability of NJE/OSI implementations on DEC VAX/VMS and IBM VM and MVS systems.
- * Test NJE/OSI under load conditions.
- * Evaluate the reliability, availability and serviceability of the NJE/OSI approach.

* Establish a fall-back approach to the provision of continuity of NJE services in an OSI environment should the NJE/OSI approach fail to provide satisfactory results.

* If the NJE/OSI approach is successful, reliable, available, etc. then proceed with the implementation of NJE/OSI.

* If the NJE/OSI approach is not successful, either due to unreliability, performance constraints, or lack of interoperability between systems, then test and implement the fall-back approach for supporting NJE in an OSI environment.

* Establish the basis on which suppliers will provide continuing development and support for the NJE/OSI software implementations.

5.3 OSI Applications and Gateways

5.3.1 X.400

* Evaluate X.400 and RFC987 gateway implementations available for the EARN G-Boxes. Install and implement the selected solution. (An interim solution may be required.)

* Test interoperability of the various EARN X.400 implementations and the G-Box X.400 implementation.

* Test interoperability of the EARN X.400 implementations and the national network implementations of X.400.

* Participate in the RARE X.400 pilot projects and coordinate with RARE X.400 and RFC987 gateway plans.

* Ensure the X.400 and RFC987 gateways chosen can be managed by the EOC.

* Establish accounting and charging model for the transfer of EARN traffic to and from national and other networks using X.400 (this may be necessary since some networks may be using public X.25 networks and will have to bear the transmission costs).

* Coordinate the EARN RFC987 gateway tables with other implementations in international, and national networks, and with the multiplicity of institutional RFC987 gateways which will be implemented.

* Evaluate X.400 as a support mechanism for LISTSERV and NETSERV and other EARN E-Mail applications.

* Evaluate X.400 as a support mechanism for the EARN unsolicited file transfer service.

5.3.2 X.500

* Evaluate X.500 implementations available for the EARN G-Boxes. Install and implement an appropriate solution. (Interim solutions may be required.)

* Test interoperability with other EARN X.500 implementations and with X.500 implementations on other international and national networks.

* Participate in the RARE pilot X.500 directory projects, and coordinate with RARE.

* Ensure solution chosen can be implemented and managed by the EOC.

* Establish accounting and charging models for the support of X.500 traffic between the EARN network and national and other international networks. (Other networks may be using the public data network X.25 services and will have to pay these costs.)

* Coordinate with other X.500 activities.

* Evaluate X.500 as a substitute for the NETSERV directory functions, and design and implement transition to X.500.

* Investigate approaches to the collection and maintenance of "white pages" directory entries. Implement selected solution for the EARN community of users.

5.4 Funding and Staff Resources

During the period of this development plan, EARN has budgeted for two groups of staff under an EARN Manager (to be appointed). The first group is comprised of two or three technical support staff, funded by EARN, plus one staff member funded by EARN France, located at Paris and at other EARN sites. These staff will be responsible for the existing operational EARN services. The second group consists of one EARN senior technical support staff member, funded by EARN, plus three staff members funded by Digital International Europe, located at the EOC in Amsterdam. This group of staff will be responsible for

the implementation of the EARN OSI Transition Programme.

The funding for this level of EARN staffing is included in the EARN 1989 and EARN 1990 budgets, and will (it is hoped) be provided by the EARN national contributions. However, it is clear that the aggressive programme of work outlined here cannot successfully be undertaken by the EARN staff budgeted, and additional EARN staff are required. It is our understanding that this need has been foreseen by the COSINE Implementation Phase Programme and that funding has been allocated to support EARN, and indeed other networks, in their OSI Transition Programme activities.

A high priority activity therefore is the preparation of a proposal to COSINE for funding and securing these funds required before 1 January, 1990. It is expected that the funding requested will cover an EARN OSI Transition Manager, four technical support staff to be located at the EOC, plus support for travel and meetings and support for the acquisition of additional OSI software and hardware if required. The timescale for this proposal depends on the COSINE Implementation Phase Programme but is planned for 1 October, 1989 with funding anticipated to be available before 1 January, 1990, so that the additional staff can be hired. It is expected that funding will be available from COSINE for the three years 1990 through to the end of 1992.

6. PROPOSED OSI TRANSITION ACTIVITIES (JULY 90 - JUNE 91)

The activities for the second year of the development plan are somewhat more difficult to predict and plan for than the activities in the first year. Key assumptions are that the COSINE funding will be available to EARN and will continue during 1990 through to the end of 1992 so that continuing, rapid progress can be made. A second assumption is that the IXI pilot network situation will be stable and that an evaluation report will have been completed by EARN for a formal decision by the EARN Board of Directors at their November 1990 meeting.

6.1 X.25 Network

It is anticipated that, by July 1990, the COSINE/RARE/CEC evaluation of the IXI pilot project will have resulted in a decision by COSINE/RARE/CEC on whether or not to continue the IXI pilot beyond the initial 16 months, and the basis on which any such extension will be funded. Alternatively, a decision may have been taken by COSINE to solicit tenders for a replacement for the IXI pilot service, and decisions on the basis of funding of that replacement service will have been made.

A variety of scenarios may exist, for example:

IXI Network - Scenario A: A decision may have been taken by COSINE/RARE/CEC to extend the IXI pilot service for a further two years and the terms and funding of the extended IXI X.25 network service may be clear. In addition, the EARN evaluation of the IXI pilot project may have concluded that the IXI pilot network's reliability, availability, serviceability, etc. is sufficient to support EARN traffic and is acceptable, and that the IXI funding model is acceptable and appropriate for EARN.

In this case, it is anticipated that the EARN Board of Directors will decide to use the IXI network for all of EARN's traffic. A decision will then be taken to stop any further development of the EARN X.25 backbone, to transfer all traffic to the IXI X.25 network, and to discontinue the EARN backbone. If this decision is taken by the EARN Board, then it could be implemented by 1 January, 1991.

IXI Network - Scenario B: The decision on the future of the funding of the IXI network may be quite unclear by July 1990. In addition, the EARN evaluation may not have had time to come to a firm conclusion on the suitability of the IXI X.25 network for EARN's purposes.

In this case, it is anticipated that the dual approach proposed above for the first year of the EARN OSI Development Plan will be continued for a further six months until 1 January 1990. In that extended period, further evaluation work by COSINE/RARE/CEC will hopefully clarify the future and funding of the IXI network, and further evaluation of IXI by EARN will result in a clear statement on the use of the IXI network by EARN.

IXI Network - Scenario C: A further possibility is that a decision may have been taken by COSINE/RARE/CEC to discontinue the IXI network, and to replace the IXI X.25 network by a different network provided by a different supplier. The tendering process for this new network may be under way.

In this case, it is anticipated that EARN will discontinue use of the IXI network and concentrate on the development of the EARN backbone network until the new COSINE/RARE/CEC funded replacement X.25 network for IXI is available for evaluation and testing.

At this point in time, it is not clear which of the above scenarios will be correct. However, it is more probable that the first scenario, A above, will be the outcome, and that EARN will use the IXI X.25 network exclusively from 1 January 1991. It is expected

that the funding model for IXI beyond the initial 16 months pilot phase will be the key factor in determining this decision.

6.2 Additional OSI Applications

* FTAM

6.3 Funding and Staff Resources (to be completed)

7. ADDITIONAL DEVELOPMENTS

The EARN OSI Transition Programme described in this document does not take place in isolation but in parallel with several other EARN activities. In particular, EARN will be developing additional applications for users, similar to existing applications such as the Trickle Server, the ASTRA Service at CNUCE, or the MACSERV Server in Dublin. These new applications services will also need to be included in the OSI Transition Programme. A separate plan for these additional application developments will be drawn up at a later date.

In addition to the development of new EARN applications, it is anticipated that during the period covered by this Plan, there will be further development in the use of proprietary protocols in EARN. (e.g. SNA and DECNET. These protocols will not be carried on the EARN X.25 backbone). At the present time, it is planned that these proprietary protocols will be used simply to carry NJE applications. However, it is also expected that there will be increased demand for new services based on proprietary protocols and that pressure for these services will increase rapidly unless corresponding services can be introduced as part of the OSI Transition Plan.

It is also anticipated that there will be growing pressure to support the TCP/IP protocol suite in Europe in general, and on the EARN network in particular. This protocol suite has some advantages in that it can be extended to incorporate existing workstations on campuses in addition to the mainframe service machines. At this time, it is certainly not clear how such existing workstations can be incorporated using the ISO/OSI protocol and application suites. Thus it is anticipated that additional development work to support the TCP/IP suite on EARN will be required. As the requirement for such additional developments becomes clearer, appropriate development plans for EARN will be drawn up.

However, the EARN OSI Transition Programme should be unaffected by these additional developments, and this Plan assumes that they will

not detract from the EARN OSI Development Programme.