

# The Vision of Computer Networking Communication and its Influence on East-West Relations and the GDR

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## 1 Introduction

At a conference in Berlin, Germany in October 2001 I was shown a map of computer networking between the East and West in the 1970s. (Figure 1) The map shows networking sites in Wroclaw (Poland), Kiev (Ukraine), Laxenburg (Austria) and Menlo Park (USA) connected by telephone lines. A satellite connection is used to connect the Austrian and US computers. This was a temporary computer networking connection established for a period of a few weeks in 1977. The colleague who showed me the map had been a professor at Humboldt University in the former East Berlin. While the map did not include the GDR, my colleague believed that there had been some computer networking connections between the GDR and other countries by the early 1980s.

There is little knowledge in the West about computer networking developments in Eastern Europe before the 1990s.<sup>1</sup> Thus the map (Figure 1) is an intriguing piece of evidence that there was interest in computer networking and actual efforts toward its development in Eastern Europe, and even more importantly, between Eastern Europe and the West, as early as the 1970s.

The colleague who showed me the map, Klaus Fuchs-Kittowski, had learned of my interest and research into the origins and development of the Internet. He recounted how he had been invited to attend a workshop at the International Institute for Applied Systems Analysis (IIASA) in 1975. This was a workshop on data communication held

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<sup>1</sup> "Innovations for an e-Society: Challenges for Technology Assessment". It was published in 1978 in *International Forum Inf Doc.*, 1978, vol 3. There is relatively little English-language scholarship on the development of computer networking in Russia and Eastern Europe during the 1970s and 1980s. See for example: *Computing in Russia: The History of Computer Devices and Information Technology Revealed*, edited by Georg Trogemann, Alexander Y. Nitusssov, and Wolfgang Erns, and translated by Alexander Y. Nitusssov, Germany, Vieweg, 2001. See also *Proceedings of INET'93*, edited by Barry Leiner, San Francisco, August 17-20, 1993. This *Proceedings* includes several talks by Eastern European networking researchers describing the networking research in the 1990s toward becoming part of the Internet.

September 15-19, 1975 at IIASA. At the workshop, Fuchs-Kittowski met researchers from a number of countries in both Eastern and Western Europe. One of the researchers that he met was Peter Kirstein, a computer networking researcher from the UK. Fuchs-Kittowski remembered a conversation with Kirstein at one of the evening gatherings in Laxenburg. They discussed whether there was some kind of data that the British government and the East German government would agree to allow to be exchanged as a pilot project.<sup>2</sup>

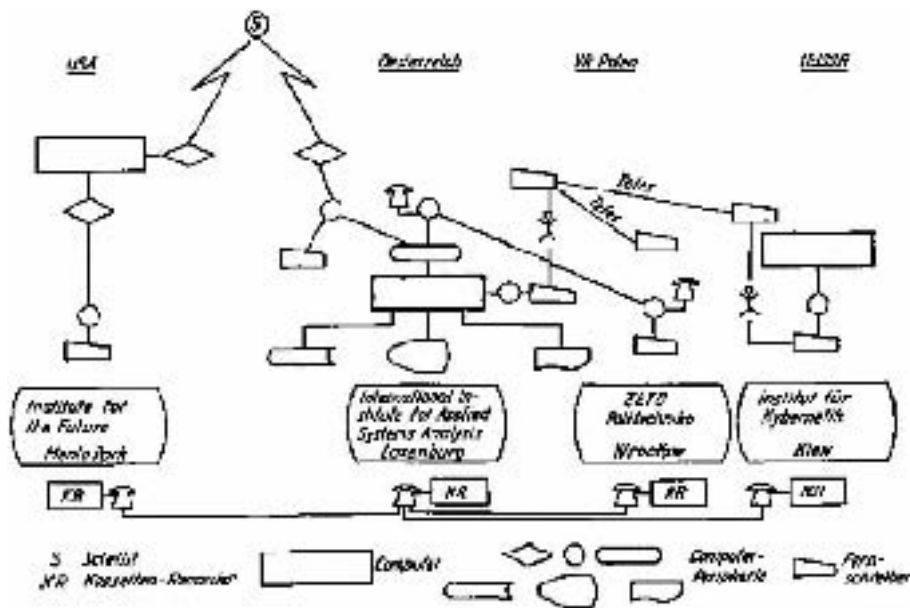


Figure 1: Computer networking between the East and West in the 1970s

Fuchs-Kittowski also showed me a copy of the proceedings of the workshop. It contained a number of articles by early computer networking pioneers, along with a description of the Norwegian, UK and US collaboration to create TCP/IP, the protocol that makes the Internet possible. When I returned to the US, I was able to get a copy of the proceedings of the “Workshop on Data Communications” (1975). The papers it contained demonstrated that networking developments were shared by researchers from Eastern and Western Europe as early as 1975. Before considering the nature and importance of such

<sup>2</sup> Fuchs-Kittowski remembers that during the 1975 conference at IIASA, Butrimenko asked him to participate in working on a paper about the transport of data flows across the boundaries of various countries. He also spoke with Dobrov on this topic and Dobrov encouraged him to encourage the Academy of Science of the GDR to support international networking and the use of modems. It was in this context that Fuchs-Kittowski remembers having the conversation with Kirstein to try to determine what kind of data might be acceptable to different countries to flow across borders. In 1975 it seemed to Fuchs-Kittowski that perhaps the transport of medical data would be possible. Fuchs-Kittowski remembers how later Butrimenko became frustrated because each country had its own telephone system and different pricing situations. The problem of crossing borders for data transport using telephone lines seemed insurmountable in the 1970s. “This,” Fuchs-Kittowski explains, “is why the Internet is such a success, those problems don’t exist anymore.” Conversation with Fuchs-Kittowski, December 31, 2004.

discussion and collaboration, it is appropriate to describe the institution where this activity took place, the IIASA. Then this article will explore the efforts at IIASA in the 1970s to create an East-West network called IIASANet, and the problems encountered. While these efforts established the goal of creating a computer network linking the East and West, it was not then possible to solve the technical and political problems to establish permanent networking links.

## 2 The Creation of IIASA in 1972 during the Cold War.

IIASA grew out of an understanding between the US President Johnson and the Soviet Premier Kosegin sometime around 1966. They agreed it would be desirable to have a research institute where scientists from the East and the West could collaborate on global problems, except those relating to military or space.<sup>3</sup> The charter for the Institute was signed six years later, in 1972. A goal of the research institute, described in the founding charter, was "...to initiate and support collaborative and individual research (and to – ed) devise means of enhancing appreciation of this type of research among scientists from all nations." (See Figure 2)



Figure 2: IIASA

IIASA was created by an agreement between the USSR and the US, Japan, Canada, and seven European countries: Poland, Czechoslovakia, Bulgaria, the German Democratic Republic, France, Italy, the UK and the Federal Republic of Germany. Established at a former castle in Laxenburg, Austria, the institute was to be a place where collaborative research could be carried out in the applied sciences, especially the study of large scale systems by modeling and systems analysis.

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<sup>3</sup> Alan McDonald, International Institute for Applied Systems Analysis (IIASA): "Systems Analysis as a Bridge Across the Cold Water Divide", Working Paper, New York Academy of Sciences.

### 3 IIASA Conferences Promote East-West Computer Network Collaboration

In September, 1973, there was a research planning conference on computer systems at IIASA.<sup>4</sup> This was one of a series of future planning conferences in the different research fields that were to be supported at IIASA. The computer systems planning conference gathered well-known computer scientists like John McCarthy from the US, N. J. Lehmann, from the GDR, and V.M. Glushkov from the USSR. Several areas of possible computer science research were explored during the meeting, including software development and artificial intelligence. Emerging from the conference, however, was the recognition of the need for computer networking among the researchers who would be collaborating as part of the different IIASA fields of interest. Thus the importance of research in computer networking to link the East and West was established at IIASA. The conference proceeding reports:

Final discussion recapitulated urgent interest in real problems connected with implementation of international computer networking. It was proposed that study of prospects of linking east-west lines across Europe should commence with IIASA perhaps attempting to coordinate present activities of the European Community and various postal-communication systems at work on the problem.<sup>5</sup>

The researcher who was to head the computer science research group was Alexander Butrimenko who had worked with Glushkov at the Institute for Cybernetics in Kiev. Butrimenko later wrote, referring to this 1973 meeting, that the conclusion of the conference recognized, “the urgent interest in real problems connected with implementation of international computer networking.”<sup>6</sup>

The following year, in October 21-25, 1974, there was another computer conference at IIASA. This conference was dedicated to computer networking. The “Proceedings of the IIASA Conference on Computer Communication Networks” documents the growing emphasis on computer networking at IIASA and the understanding of how essential this was for facilitating the Institute’s other goals. Butrimenko, in his introduction to the conference proceedings, writes, “We believe that connecting computers installed in various national institutions will contribute significantly to the achievements of the main goals, allowing for the exchange of data and programs, and in this way facilitating the understanding of problems, resulting in faster solutions.”<sup>7</sup> Other papers included one by

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<sup>4</sup> *Proceedings of IIASA Planning Conference on Computer Systems, September 24 – 27, 1973*, Laxenburg, Austria.

<sup>5</sup> *Ibid.*, p. 51-52.

<sup>6</sup> A. Butrimenko, “Computer Networking for Scientific Collaboration: The IIASA Case”, *Euro IFIP 1979*, p. 383.

<sup>7</sup> *Proceedings of A IIASA Conference on Computer Communication Networks, October 21-25, 1974*, Laxenburg, Austria, p. xiii.

Louis Pouzin, who was creating the CYCLADES network in France; a paper by Leonard Kleinrock (along with W.E. Naylor and H. Opderbeck) about the development of the ARPANET in the US; and a paper by Donald Davies from the UK describing a number of different initiatives in packet switching network development.

The "Workshop on Data Communications" held the following year, in September of 1975, is the conference that Fuchs-Kittowski attended. The papers at this workshop were focused on the theme of the "Interconnection of Computer Networks." Fuchs-Kittowski presented a paper, "Man/Computer Communication: A Problem of Linking Semantic and Syntactic Information Processing".<sup>8</sup> The paper explores the gateway between the human information processing capability and the computer information processing capability. The authors are interested in identifying and investigating the general principles for the design of information systems. Their paper puts the technical research at the workshop into a broader conceptual framework. While the promise of computers relates to the machine part of the human-computer relationship, how the user will be treated in the relationship is also a significant factor.

A paper by Professor Andre A.S. Danthine of the University of Liege in Belgium, titled "Host-Host Protocols and Hierarchy" describes his investigation into what characteristics would be needed to create a protocol for international computer networking.<sup>9</sup> Referring to research to develop the French Cyclades network, and the Norwegian, UK and US efforts to develop the Cerf-Kahn protocol, Danthine considers these different designs for a Host-Host protocol. He examines the advantages and drawbacks of the protocols, but explains that there were not yet adequate performance studies to support a determination of which is the best protocol.

Another paper given at the workshop was by Peter Kirstein (with Sylvia Kinney) entitled, "The Uses of the ARPA Network via the University College London Node." They explore the human computer relationship that Fuchs-Kittowski described as so important. Their paper proposes that the crucial research for the development of computer networks is to investigate "the nature of how they would be used, by whom, and for what purpose." The authors present a diagram of current research efforts to create an internet-work protocol. Figure 3 shows the actual connections that had been set up between the Norwegian research site NORSAR, the US research network ARPANET and the UK network at UCL. This early research was a collaborative project involving three different countries to create the TCP/IP protocol.

Their paper describes research to determine what forms of collaboration computer networking would make possible. They write:

A significant body of cooperative work has been possible in the first eighteen months of operation of the UCL node of the ARPANET. This usage has been in widely different

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<sup>8</sup> Klaus Fuchs-Kittowski, K. Lemgo, U. Schuster and B. Wenzlaff, *Workshop on Data Communication, September 15-19, 1975*, Laxenburg, Austria, p. 169-188.

<sup>9</sup> Andre A. S. Danthine, *Workshop on Data Communication, September 15-19, 1975*, Laxenburg, Austria, p. 9-15.

fields, most of which was not foreseen at the start of the project. The principle uses have been for information retrieval, communication between research groups, and shared development and use of common programming packages.<sup>10</sup>

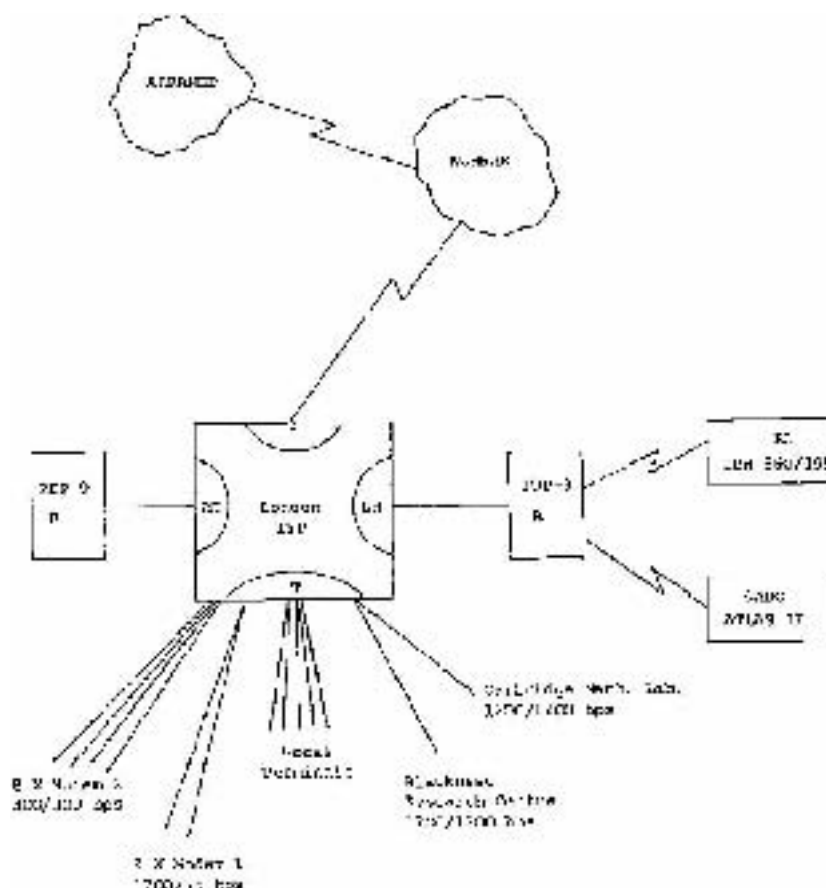


Figure 3: Schematic of UCL configuration, July 1975

They observe that experimental research leads to unforeseen new developments. The research they present in Figure 3, research to interconnect the ARPANET in the US with NORSAR in Norway and UCL in the UK, was early research to create the Internet. It is impressive to learn that this research was presented at a workshop in Laxenburg, Austria as early as 1975, to participants from Eastern and Western Europe. At the workshop, there were researchers representing 13 countries. These countries were Austria, Belgium, France, the Federal Republic of Germany, the German Democratic Republic, Hungary, Italy, Netherlands, Poland, Switzerland, the Soviet Union, the UK, and the US.

<sup>10</sup> Peter Kirstein and Sylvia Kenney, *Workshop on Data Communication, September 15-19, 1975, Laxenburg, Austria*, p. 53-62.

Another paper presented at this 1975 workshop was equally surprising. The paper was entitled, "IIASA Data Communication Network" by A. Butrimenko, J.H. Sexton and V. Dashko. Butrimenko and Dashko were from the Soviet Union, and Sexton, the UK. The three researchers were part of the IIASA Computer Science Project. Their paper describes the effort to create an international computer network linking researchers and their research institutions from both Eastern and Western Europe. They call this network IIASANet. They offer several possible configurations.

Figure 4 shows one possible configuration to link several research centers with the Digital Equipment Computer PDP 11/20 at IIASA. The plan was then to link this network with a computer network designed for the Austrian Universities and to the European Informatics Network (EIN) being developed at the time to connect computer centers in West European countries.

Describing the progress made by 1975, the authors write:

IIASA began a practical networking activity in 1974 by initiating a series of experimental connections. Since then, connections have been made from IIASA to Moscow, Bratislava, Pisa, Edinburgh and Budapest; from Bratislava to Moscow; and from Budapest to Paris. We recognize the ever increasing importance of this activity for IIASA, and for international cooperation in various fields.<sup>11</sup>

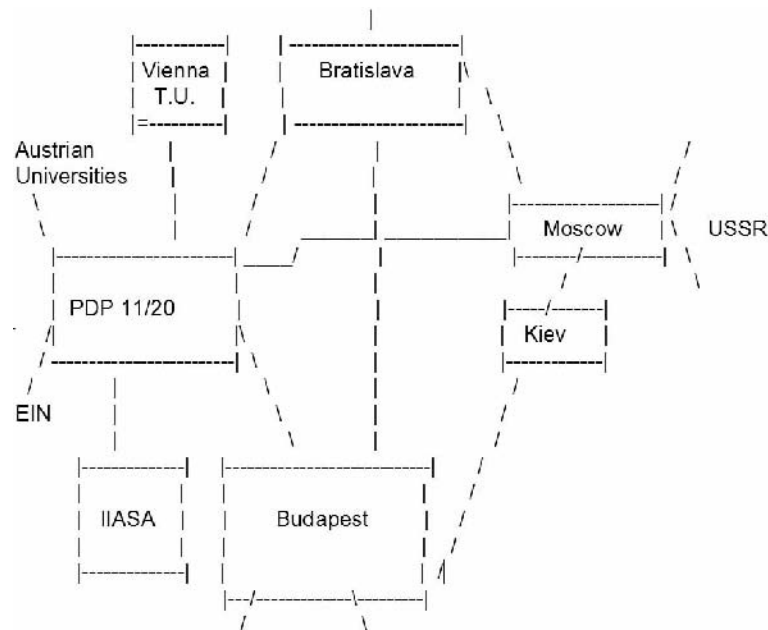


Figure 4: A Proposed IIASANet Configuration, September 1975

<sup>11</sup> A. Butrimenko, J. H. Sexton and V. Dasko, *Workshop on Data Communication, September 15-19, 1975, Laxenburg, Austria*, p. 141-152.

While occasional experimental connections were established, these connections were not maintained on a permanent basis. Butrimenko presents the details of further meetings documenting the efforts to develop IIASANet. Describing one such meeting in Budapest in April 1976, he writes:

At the last meeting of the committees, held in Budapest in April 1976, 19 national institutions were represented, 12 of whom committed themselves to active participation in the IIASA Computer Network. Discussion centered on establishing a communication subnetwork.<sup>12</sup>

He provides a diagram (Figure 5) showing the hardware planned for each of the computer centers which were to be part of the network. Butrimenko provides this diagram to represent the plan developed at the April 1976 meeting. A site on this plan is Berlin.

Fuchs-Kittowski remembers a IIASA meeting he attended in Budapest, probably the April 1976 meeting, where there was a computer network demonstration using modems to link a computer in Budapest, Hungary with a computer in Grenoble, France. Fuchs-Kittowski recalls that at dinner one night during this conference, Dashko asked him to urge the Academy of Science in the GDR to actively support the use of modems and networking among its researchers.

When Fuchs-Kittowski returned to the GDR from the IIASA meeting in Budapest, he included a recommendation that the Academy of Science encourage the use of modems and computer networking in his report. He remembers that an official reading the report expressed concern that using modems could jeopardize the security of GDR computer systems. Encountering such resistance among officials at their home institutions was a common experience for researchers from both the East and the West, who were trying to encourage the use of new technology in their scientific institutions. Fuchs-Kittowski reports that the official later apologized and the use of modems began to be encouraged by the Academy of Science in the GDR.

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<sup>12</sup> A. Butrimenko, "Computer Networking", *IIASA Conference '76 10-13 May 1976* Vol. 2, p. 210.

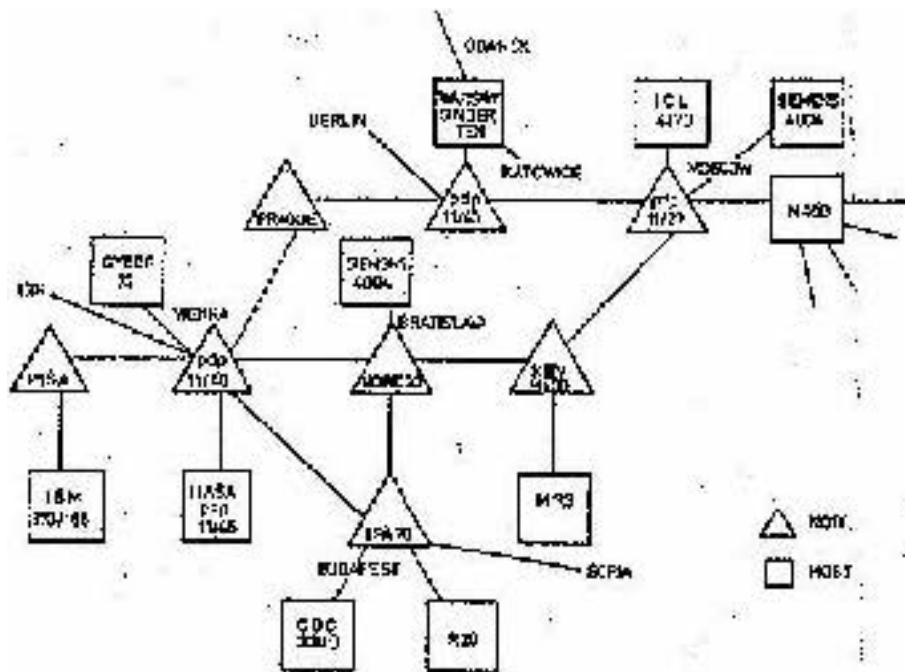


Figure 5: IIASA Computer Network

#### 4 Early Computer Networking Research in the GDR

International computer conference proceedings from this period in the late 1970s and early 1980s include papers describing networking research in the GDR and other Eastern European countries. While modem use was not widespread in the GDR before Fuchs-Kittowski's report, there is evidence that there was some use. For example, Franz Stuchlik, manager of information systems at the Otto von Guericke University in Magdeburg, GDR, describes how he did cooperative research with colleagues at the Technical University in Wroclaw in Poland, using modems in the 1970s.<sup>13</sup>

Also there are papers in various conference proceedings describing the effort in the GDR to create the computer network called DELTA and the packet switching subnetwork called KOMET.<sup>14</sup> DELTA was planned as "the project of the national computer network

<sup>13</sup> Email from Franz Stuchlik, December 12, 2004. See also, F. Stuchlik, "The Strategy of Preparing the Applications of the Computer Network DELTA by the Management Information System of Higher Education in the GDR", in "Networks from the User's Point of View, Proceedings of the IFIP TC-6 Working Conference COMNET'81", Budapest, Hungary, 11-15 May, 1981, p. 183-195.

<sup>14</sup> See for example, D. Carl, W. Dames, D. Hammer, V. Heymer, G. Hofmann, H.W. Meier, C. Sattler, and I. Wende "The System Concept of the Computer Network DELTA", in *Evolution Computer Communications Proceedings of the 4th International Conference on Computer Communication*, North-Holland, 1978, Amsterdam, (Ed. by N. Inose), p. 703-708.

for the Academy of Sciences, the Academy of Agricultural Sciences, and the University System in the DDR." In Figure 6, KOMET is listed in the upper left hand corner. KOMET was the networking connection. Figure 6 also shows that by 1978, modems were included in the plans for an academic network in the GDR.<sup>15</sup>

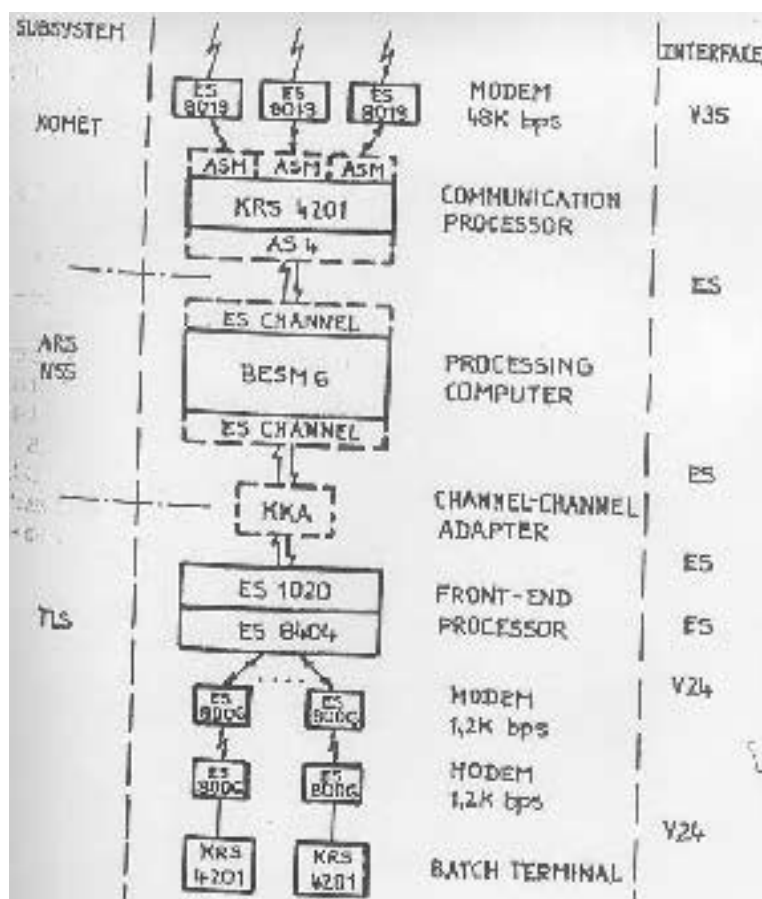


Figure 6: Typical configuration of a network node

The plan for DELTA included a provision for it to be part of a broader network, part of an internetwork. The authors of the paper write, "In implementation, the interface of the datagram service is designed so that it may be used not only by the levels of the computer network DELTA located over it but also by other computer systems, particularly by computer communication networks."<sup>16</sup> A report on the early implementation of the plan to create DELTA was presented at the 1981 KOMNET conference held in Buda-

<sup>15</sup> Ibid, p. 707.

<sup>16</sup> Ibid, p. 706.

pest. This conference also included a paper about the research to create a gateway for IIASANet in Budapest.<sup>17</sup>

In an article Butrimenko presented in 1979, he includes a diagram of the remote connections available through dial-up lines. (See Figure 7) Also Butrimenko reports on the difficulty of getting support for IIASANet from IIASA member research institutions. The need to have agreements between IIASA and government officials in the countries of the researchers to allow for networking access was becoming too burdensome. Describing the problem, Butrimenko writes:

This loosely organized coordination worked reasonably well during the development phase, but started to show some stagnation when implementation began. Attempts to create two additional committees or groups of interest - user groups responsible for advertising and checking on available applied facilities, and communication groups involving PTT people and those who are especially interested in communication problem - have not been successful.<sup>18</sup>

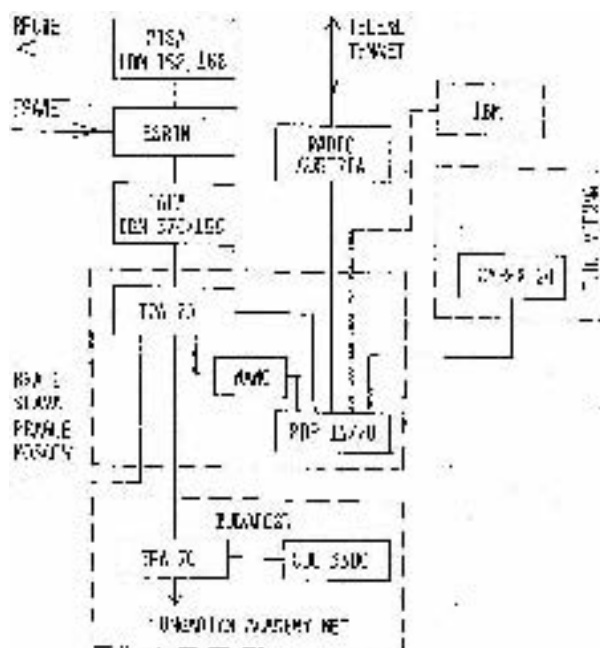


Figure 7: Configuration June, 1979

<sup>17</sup> Peter Bakonyi, Istvan Kiss, Alexander Petrenko, and Istvan Sebestyen, "Promotion of East-West Computer Communication in IIASA's International Environment and the Hungarian Case Study", in Networks from the User's Point of View, Proceedings of the IFIP TC-6 Working Conference COMNET'81, Budapest, Hungary, 11-15 May, 1981, p. 119-125. See also in same conference proceedings, Albert Labadi, "IIASA Gateway System and Experiments in Daily Operation," p. 127-131.

<sup>18</sup> A. Butrimenko, "Computer Communication for Scientific Cooperation," in The IIASA Case, Euro IFIP '79, 1979, p. 387.

The technical networking links that could be made are reported to have been functional only for short periods of time, rather than on a regular basis. Networking access on a regular basis was needed to be able to create a functioning network linking the computer centers of research institutions in different member countries participating in IIASA.

Note also that in Figure 7, there is a connection to TELENET/TYMNET which then makes it possible to connect to networks in the U.S. For several years RADIO Austria was the data link between East and West.

## **5 Vision of Interdisciplinary Collaborative Research Using Computer Networks**

Along with the difficulties of creating the actual network, was the growing recognition of the desirability of collaboration via computer networks. An article written by the Russian scientist, Gennadij M. Dobrov, the American scientist, Robert N. Randolph, and the Austrian scientist, W. D. Rauch was published in 1978. It explores the importance for science of international collaborative research, which the authors referred to as International Team Research (ITR). The article emphasizes that computer networking is needed to achieve this goal.

The authors utilize a collaborative process to write the article. They describe a 3-week experiment using computer networking for researchers from different countries to participate online in a conference on a common research problem.<sup>19</sup> They report that technical difficulties made the experience frustrating for the researchers. Nevertheless, the experiment verified that computer networking would play an important role in realizing the potential of ITR in the future. The map Fuchs-Kittowski showed me in October 2001 was from this experiment in ITR. (See Figure 1)

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<sup>19</sup> The title of the article is "International Networks for International Team Research". It was published in 1978 in *International Forum Inf Doc.*, 1978, vol 3, No. 3, p. 3-13. The article was also published in Russian.

## 6 Difficulties Recognized but Desirability of InterNetworking Established

My research is a preliminary investigation into the role of IIASA in helping to promote interest and experience in computer networking among researchers in several countries in Eastern Europe. Not only did IIASA encourage the development of computer networks within a number of countries, but also the importance was established of providing for the possibility of linking up with the networks of other countries. Reports from some members on the technical staff of IIASA during this period corroborate Butrimenko's account of the difficulties encountered.

Jim Kulp joined the staff at IIASA in 1978. He was hired to do technical work and to help Butrimenko's group. Kulp writes:

Alexandr (Sasha) Butrimenko and Valeri Dashko were still there when I arrived in 1978. I was the head of "computer services" from 1978 to 1981, which involved everything from terminals, to servers, to some data links. The Institute did a variety of non-controversial (in cold-war terms) research projects. The job of my department was to supply and support the computer facilities for the researchers.

However, there was a separate group, under Butrimenko, that did some communication oriented research projects. So, some of the data links were created and managed by that group, and some others were created and managed by the (my) services group. This was the era of terminals and timesharing computers, and most data links were either used for terminal access or for "remote job entry" to submit batch jobs (and retrieve results) from mainframes. Some links were really just a "terminal concentrator" from one site to a mainframe/time sharing server machine at another site. Others were for terminals at IIASA to access commercial networks like Tymnet and Telenet.

I don't think the network ever got to the state as described in....[Figure 4 –ed], but a number of those individual links did exist, at one time or another, usually working differently. There was no real "network" in the sense that any connected computer could easily access any other connected computer. But when the links were in service, it did allow access from IIASA to other institutions, and occasionally terminal access from those locations to Vax and PDP11/70 timesharing computers at IIASA.<sup>20</sup>

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<sup>20</sup> Email, James Kulp, February 23, 2004. Kulp wrote: "I worked with UNIX from Bell Labs in a small software firm in New York from 74-78 and built and delivered continuously operating commercial systems using somewhat customized version of UNIX (V6, and V7), and IIASA was already playing with UNIX on a pdp 11/45 when I arrived in 1978. My familiarity with UNIX was one of the main reasons why I got the job. Kulp also emphasized the basic bureaucratic problem with respect to the challenges of obtaining data links (circuits) across national boundaries. Most facilities (east and west) were controlled by government entities (PTTs), and

During this same period, Michael J. Ferguson worked at IIASA to try to make the networking goals a reality. Ferguson has this summary of what happened:

Butrimenko headed the Computer Science group, Dashko was the other Russian in the group, and Sexton was a systems programmer. There was, indeed, a desire for a network before I arrived in November 1976, and there had been many point to point modem experiments to see if data could be transmitted across the existing telephone lines. My job was to get the various national groups to agree on committing resources for such a network, and to agree to work together to create it. The problems to do this were both political and technical. An example of a political problem was that the commitment to use a telephone line in Eastern Europe, was usually made by the Minister of Communications, while in Western Europe, it was made by the head of Computer Center. There was also a need to create documents to spell out the details of the cooperation and structure of the network. The cultural differences for what kind of detail was needed was immense. Finally, there was a need to convince the parties involved that they would benefit from being a part of the network. This was especially difficult because, unlike the rest of my colleagues at IIASA, it was clear to me that the current level of the technology was not compelling. It was not to become compelling for another 25 years, and required a huge political enabling event, the fall of the Berlin Wall.<sup>21</sup>

These former IIASA staffers document that there was neither the ability to overcome the political obstacles nor the level of technology adequate to make it possible to realize the goal of creating IIASANet.

## 7 Conclusion

By the end of the 1970s, the desirability of having access to an international computer network was well established in Europe. The 1970s was still an early period in terms of the development of the Internet. It would take another ten years, however, for the technical research to develop adequately to make an Internet possible. Also the political upheavals in the late 1980s and early 1990's helped to weaken the obstacles to interconnecting the networks of different countries. That the Internet spread around Europe and the world is in no small measure the result of efforts over a long period of time to establish international computer networking, like the efforts at IIASA.

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they were more oriented toward voice than data. Getting circuits installed was always a bureaucratic challenge with these organizations since flexible use of such circuits would bypass those organizations in how the circuits were used." Email, James Kulp, December 28, 2004.

<sup>21</sup> Email, Michael Ferguson, March 5, 2004. Ferguson added: "The infrastructure for networking was too weak. An example is that the Soviet Union was connected to the west, namely Vienna, by only two telephone lines. It was obvious, at least to me, that to commandeer one of these lines for a computer network was rather presumptuous." Also he noted that "as far as I know, there were physically only two lines to Vienna. Since those lines went through several countries, any concept 'leasing' would probably have required an international conference." Email, Michael Ferguson, December 28, 2004.

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