Computer Networking in Ukraine with respect to the Ukraine's Universities and Research Institutions

Report by Dr. Mikhail Leshchenko

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1. General information about Ukraine.

Ukraine - basic facts

Ukraine is a state in Eastern Europe, bounded on the north by Belarus, on the north and east by the Russian Federation, on the west by Poland, Slovakia, on the southwest by Hungary, Rumania, and Moldova, and on the south by the Black Sea and the Sea of Azov.

Ukraine includes the Crimean Autonomous Republic, which was elevated from an oblast to a constituent republic in 1991.

Kyiv is the capital and largest city.

Ukraine is the second largest country in Europe after Russia. The total area of Ukraine is 603,700 sq. km (compare the area of France - 551,000 sq. km; Germany - 356,000; Great Britain - 244,000; Italy - 301,000; Spain -505,000). The area spanned in a west-east direction is 1300 km; from north to south - 900 km.

The population of Ukraine is 52 million (Germany - 78 million; France - 56 million; Great Britain - 58 million; Italy - 59 million; Spain - 40 million).

Ukraine's state border extends for a total of 7698 km: with Russia - 2484 km; Belarus - 952 km; Rumania - 608 km; Poland - 542 km; Slovakia - 98 km; Hungary - 135 km; Moldova - 1194 km. The total length of Ukraine's sea coast is 1758 km (Black Sea - 1533 km; Sea of Azov - 225 km).

The climate of Ukraine is moderate-continental; in the southernmost region of the Crimea the climate is sub-tropical. The largest river of Ukraine is the Dnipro, which is 2201 km in length, of which 981 km flow through Ukraine. The largest mountain system in Ukraine is

the Carpathian Mountains that extend for more than 270 km and are 100-110 km wide. The highest peak is the Hoverla (2061 m).

2.Information about higher Education in Ukraine.

The higher education system comprises 911 higher education establishments distributed among four accreditation grades. The training of junior specialists takes place in educational establishments of two accreditation grades. Bachelor's degree holders, specialists (engineers, teachers, specialists, etc.) and Master's degree holders are trained in four-year higher education establishments on the basis of the completion of secondary education.

3. General information about telecommunication infrastructure in Ukraine.

From CIA Report 1995:

Communications

Telephone system: 7,886,000 telephone circuits; about 151.4 telephone circuits/1,000 persons (1991); the telephone system is inadequate both for business and for personal use; 3.56 million applications for telephones had not been satisfied as of January 1991; electronic mail services have been established in Kiev, Odessa, and Luhans'k by Sprint local: an NMT-450 analog cellular telephone network operates in Kiev (Kyyiv) and allows direct dialing of international calls through Kiev's EWSD digital exchange intercity: NA international: calls to other CIS countries are carried by land line or microwave; other international calls to 167 countries are carried by satellite or by the 150 leased lines through the Moscow gateway switch; INTELSAT, INMARSAT, and Intersputnik earth stations

Radio:
broadcast stations: AM NA, FM NA, shortwave NA
radios: 15 million

Television:
broadcast stations: NA
televisions: 20 million

From report "Ukraine's Cable Network Characteristics and Problems of Development". By Prof. Victor B. Katok, PTT Ministry of Ukraine, Director of Cable Lines Centre. Prepared to the International Workshop "Computer Networking and Services of Distributed Systems" 23.-27.02.1997 Mengerskirchen-Probbach. Deutschland

Presently there are 44 Automatic trunk telephone Exchanges, - 22 analogue, 22 digital,- in operation in Ukraine. At the end of 1995, 8.8 million lines were available to Ukraine's city subscribers and 1.2 million lines were available in the country districts. The average ratio of telephones to population was approx. 18%. On intercity cable lines 74% of all length communication cables was copper pair cable, 25% coaxial cables and 1% optical fibre cables.

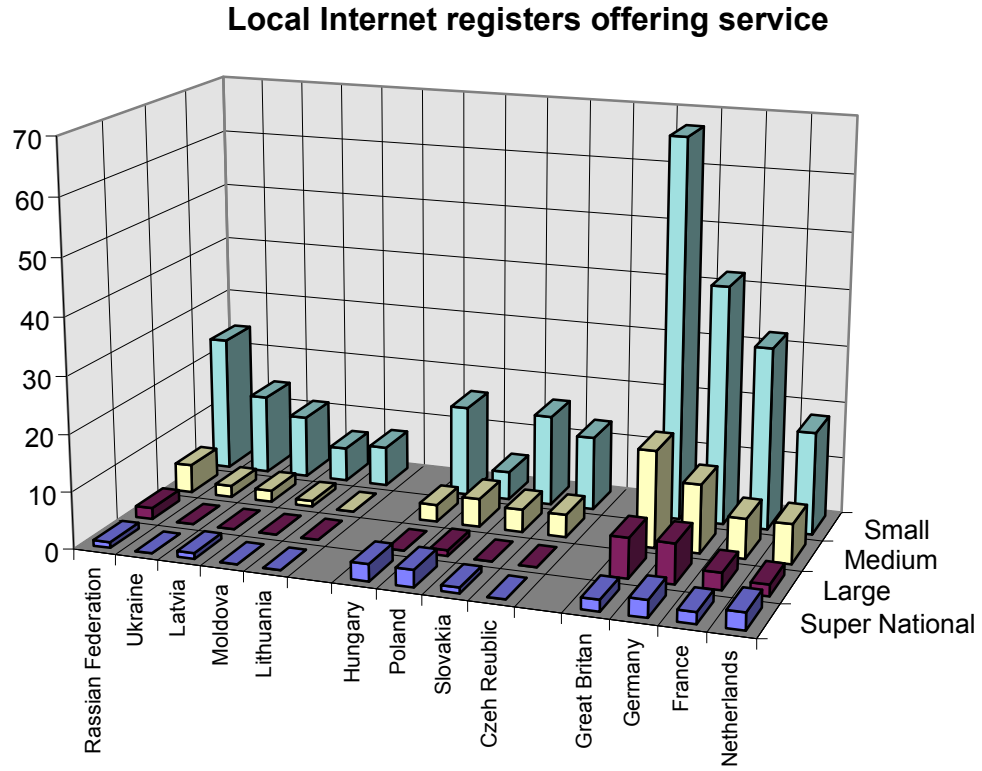
The optical fibre cable network is currently being expanded. More then 2'500 route kilometers of fibre cables are to be installed in 1996 and a further 7'000 route kilometers are planned by United National Communicational Network of Ukraine before 2000 year.

As a country's main communications operator, Ukrtelecom is the official representative of Ukraine in the design and construction of international optical fibre links such as TransEurope Lines (TEL), Trans-Asia-Europe (TAE), Italy-Turkey-Ukraine-Russia (ITUR) and Black Sea Fibre Optic Cable System (BSFOCS).

By 1995, Ukrtelecom had spent $84.6 million on capital construction projects including $27.3 million of foreign credit used in the building of optical fibre cable lines and Radio relay Systems.

Present stage of computer networking in Ukraine

Local Internet Registries offering service in
UKRAINE



Medium -2

Telecom Italia Spa Servizio Video On Line <Registry Based in IT>
Sovam Teleport <Registry Based in RU>

Small - 14

AT&T Internet Services <Registry Based in EU>
BankNet Kft. <Registry Based in HU>
BankNet Kft. <Registry Based in HU>
Upnet-Baltic Taide Network UAB <Registry Based in LT>
Teleport-TP <Registry Based in RU>
Apex NCC Net
STC FTICOM
JV Global-Ukraine.
INFOCOM JV
IAC "911"
International Telecommunications Center KS-NET
Lucky Net Ltd.
venture "Monolit Internet"
PACO Links Int.
TeNeT Networking Centre
S&PE Telematika
Relcom-Ukraine Ltd.
UKRTELECOM,UKRAINIAN STATE TELECOMMUNICATION CORPORATION

Review of the communication market in Kiev and Ukraine.

Present communication market in Ukraine is the market of retail sales and small-wholesales.

Now at Ukrainian communication market act the following companies - producers of communication equipment and software: IBM, DEC, 3Com, Cisco, Intel, Allied Telesys, Sequent, Cray Communication, Novell, Microsoft, SCO, Lotus.

These companies distribute their production in Ukraine through the Ukrainian distributors. The biggest of them are: Kvazar-Micro, ULYS Systems, Infocom, Soft-tronik, Inec, Global Ukraine, Iv Communications, ChernomorSoft, BMS-Trading, RGdata-Ukraine, Bankomsvjaz.

Each of these Ukrainian firms has its own specialization in the big communication area. Some of them specializes in LAN hardware and software, some - in the Internet area. Several firms have their own educational centers (for example - Kvazar-Micro). Most of them are not only distributors, but also the system integrators and some of them in addition are software developers.

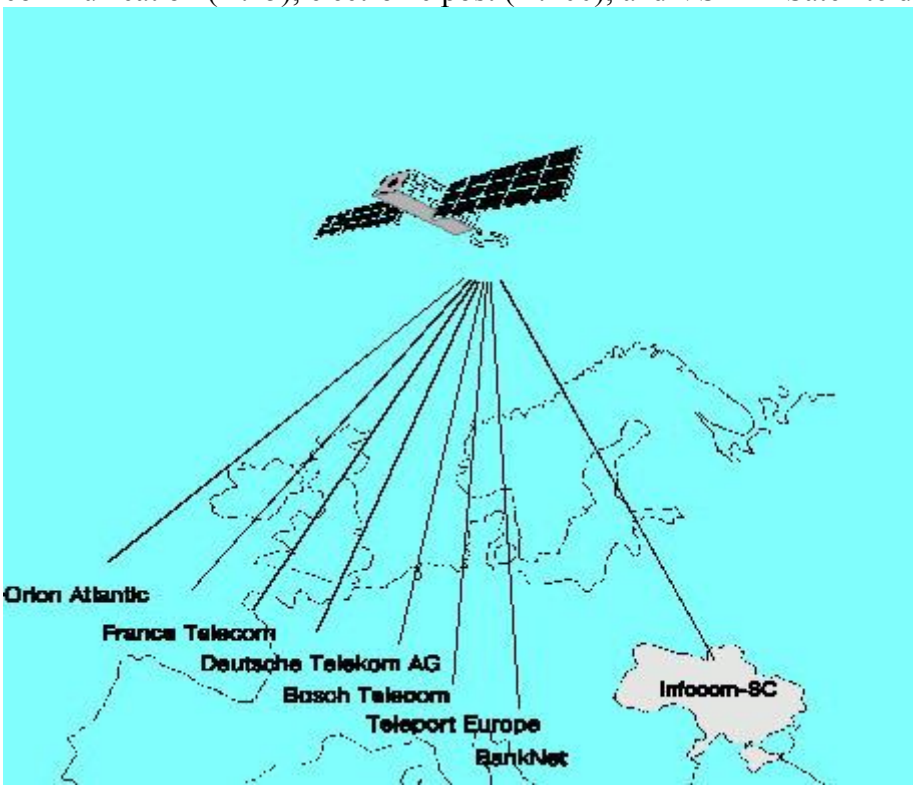
In Ukraine there are four main **commercial** Internet-providers:

- INFOCOM < infocom.com, infocom.kiev.ua>
- GLOBAL UKRAINE < gu.net, gu.kiev.ua>
- RELCOM-UKRAINE (also known as «Technosoft») <ts.kiev.ua>
- LUCKY NET <lucky.net, carrier.kiev.ua>

INFOCOM.

This is one of the biggest company in Ukraine among the connection-service providers.

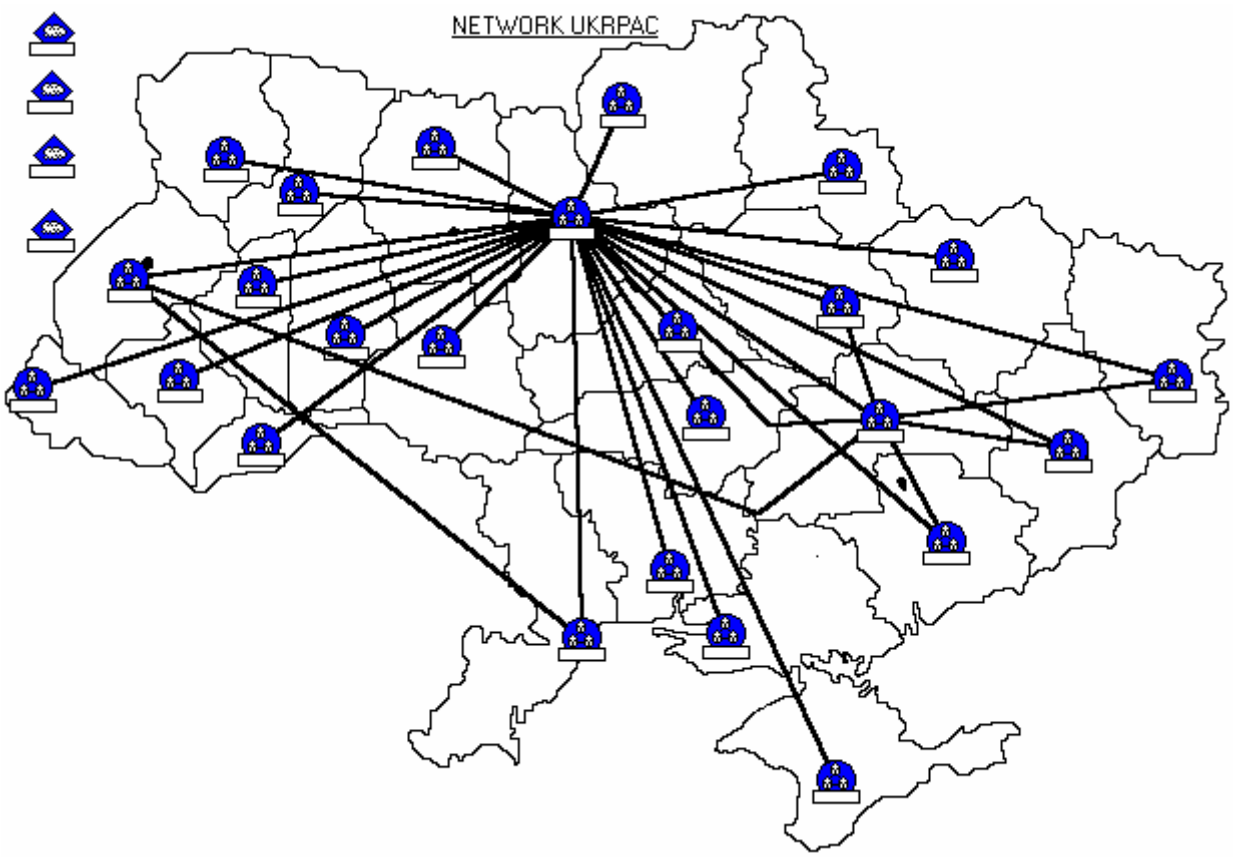
The Ukrainian-German joint venture, "INFOCOM", is the official X.25 operator in Ukraine which works in close cooperation with the Ministry of Communication regarding Data communication (X.25), electronic post (X.400), and VSAT - Satellite data communications.



In 1991, the well-established national enterprise, "UKRATELECOM", created "INFOCOM" in cooperation with the German company "Controlware". The primary services/operations offered by INFOCOM to its clients concerning Telecommunication Technology are:

- The operation of the National Data Network of Ukraine UKRPACK (X.25) (see brief description below);
- Connections to over 100 world wide X.25 networks;
- Electronic Post (X.400) including delivery via FAX and Telex;
- Connections and delivery to other international Electronic Post X.400 networks and the INTERNET;
- Direct connections to the Internet;
- The connection of local networks to global networks;
- The installation of the VSAT business satellite network;
- The construction of corporate networks(LAN), area wide networks, and regional networks;

UKRPACK is a modern transport mode of data transmission working according to protocol X.25. The network is constructed with complex communication equipment supplied by the Hughes Network Systems company and ensures interaction of subscribers of many analog networks all over the whole world. UKRPACK interacts directly with SprintNet /USA/, ROSPAK /Russia/ and DATEX-P /Germany/, through which it has the ability to transfer information to over 60 networks worldwide. There are divisions of UKRPACK Network in every region of Ukraine. They provide connection and technical service for subscribers throughout Ukraine, including all interaction between the Ministry of Communication departments.



Joint Venture "INFOCOM" is extensively represented throughout Ukraine. In addition to the headquarters in Kiev, there are regional offices in Odessa, Kharkhiv, Dniperpertrovsk, L'viv, and in many other cities as well.

GLOBAL UKRAINE.

This company is not only a service provider but also a system integrator. It offers many types of connections to the Internet.

RELCOM-UKRAINE (TECHNOSOFT).

Relcom-Ukraine is the first official Internet provider in Ukraine. AS number - AS3252. This company offers full service of global computer networks Relcom and Internet.

They have the following external connection to Internet:

Kyiv - (64 Kbit/s) - Ebone (Vienna)
Kyiv - (64 Kbit/s) - Sprintlink (Washington)
Kyiv - (28.8Kbit/s) - Moscow - (512 Kbit/s) - Helsinki

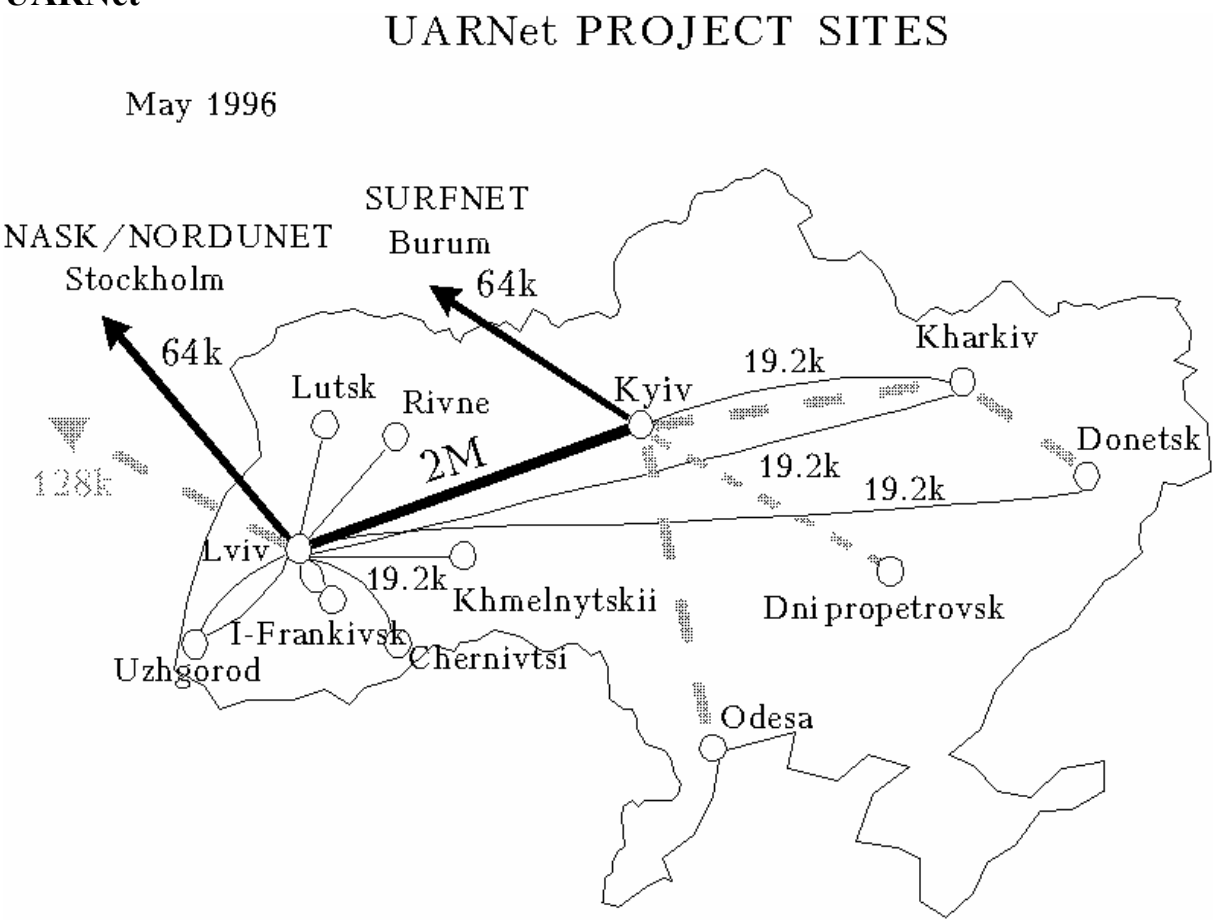
LUCKY NET.

This company is small and its personnel is young. It gives access to the Internet recourses to end-users as well as to service providers. This company does not have a price list for leased

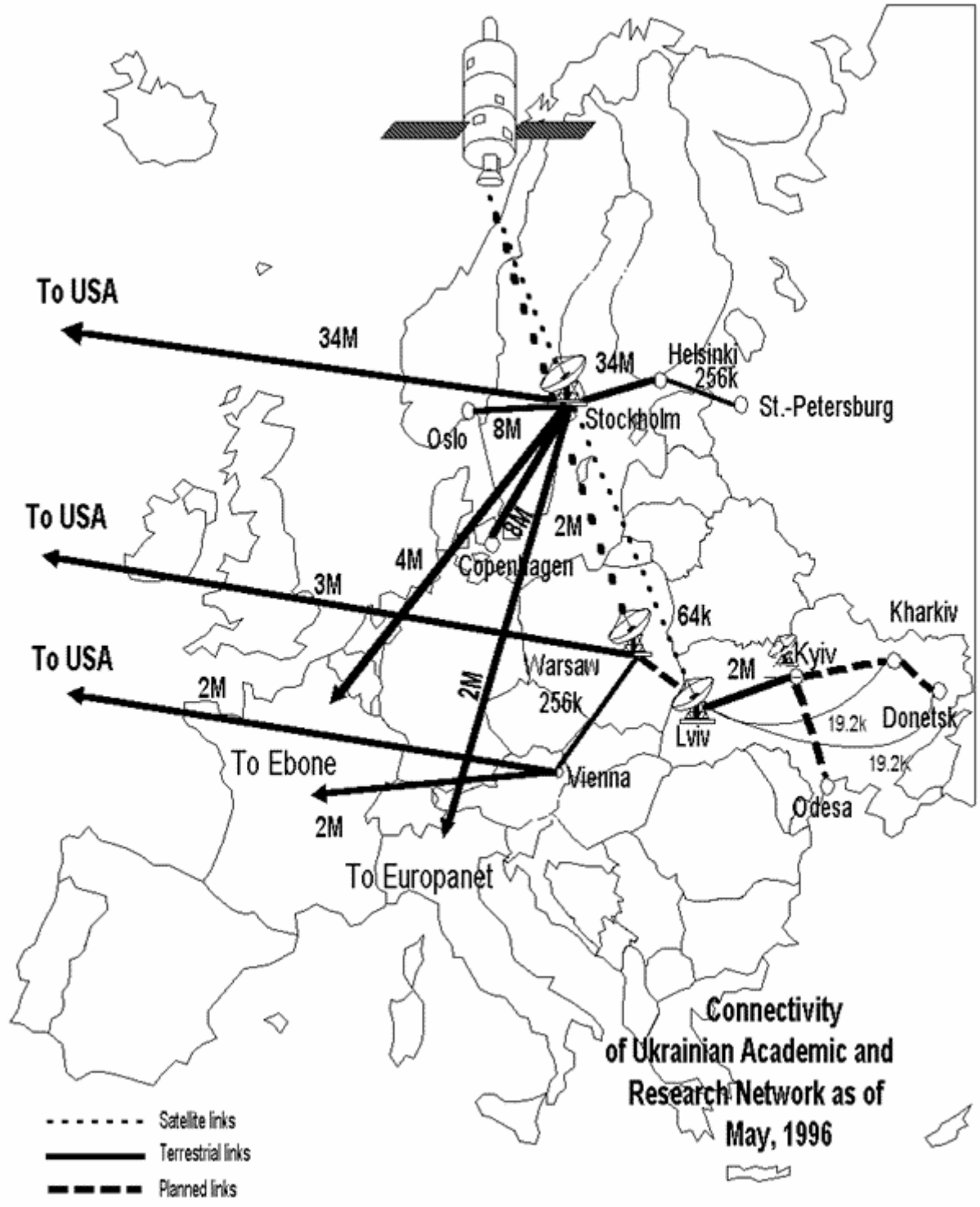
line connections and prices are determined by a particular agreement between LuckyNet Ltd and a customer.

Most of all these services almost always use dialup connections. Most telephone lines and an equipment served them are very old and hardly can permit connect speed more than 2400 bps.

UARNet



UARNet Project was started in 1993 at the Institute for Condensed Matter Physics to initiate the development of computer networking in Ukrainian academic and research community. From that time, the project has grown up to national scale providing the connectivity to global Internet and full Internet services for more than 30 universities, research centers and other institutions from public sector all over the country. Many hundred of users use dial-up services like electronic mail. UARNet follows the dynamic development of communication facilities in the country and tries to use modern digital data transmission once it becomes available, thus forming a national academic backbone infrastructure. UARNet Project owes its success to international cooperation with Central and Eastern European networking organizations, particularly, CEENet, NASK (Poland), ACONet (Austria), NORDUNET which help to expand the European networks eastwards. Also the assistance of national and international institutions, funds, programmes and companies like Parliament of Ukraine, US Congressional Research Service, UNDP/UN office in Ukraine, George Soros Foundation, EURASIA Foundation, Digital Equipment Corporation is greatly acknowledged. Currently, UARNet approaches national Parliament and government agencies for recognition and support of the modern networking and information technologies.

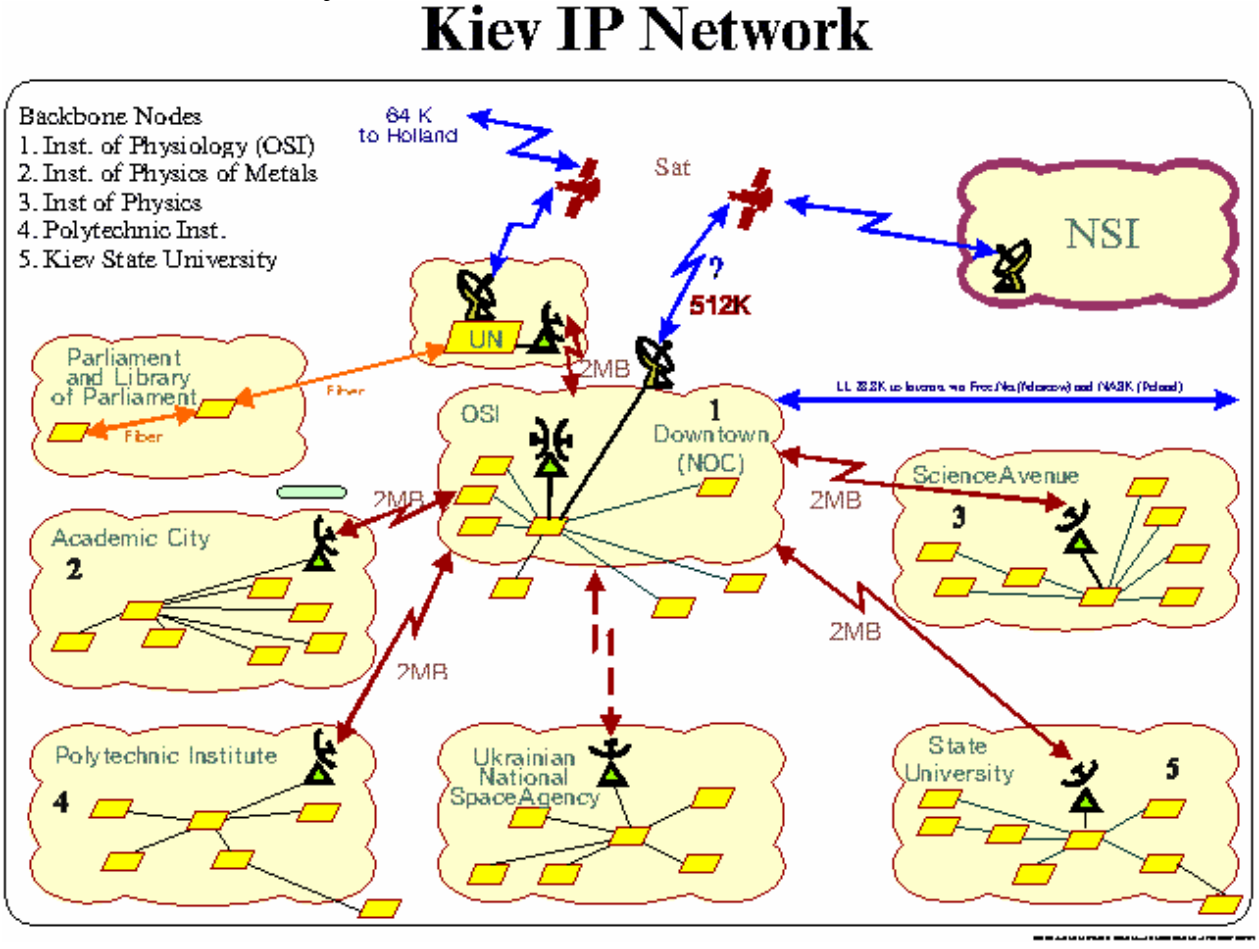

To USA
34M
34M
Helsinki
256k
St.-Petersburg
Stockholm
Oslo
8M
To USA
8M
2M
4M
Copenhagen
3M
64k
Kharkiv
To USA
Warsaw
256k
2M
Kyiv
2M
2M
Lviv
19.2k
Donetsk
To Ebone
Vienna
19.2k
Odesa
2M
To Europanet
Connectivity
of Ukrainian Academic and
Research Network as of
May, 1996
Satellite links
Terrestrial links
Planned links

Kiev-region

ISF (International Science Foundation) OSI (Open Society Institute) - J. Soros Foundation "IP Network in Kiev"

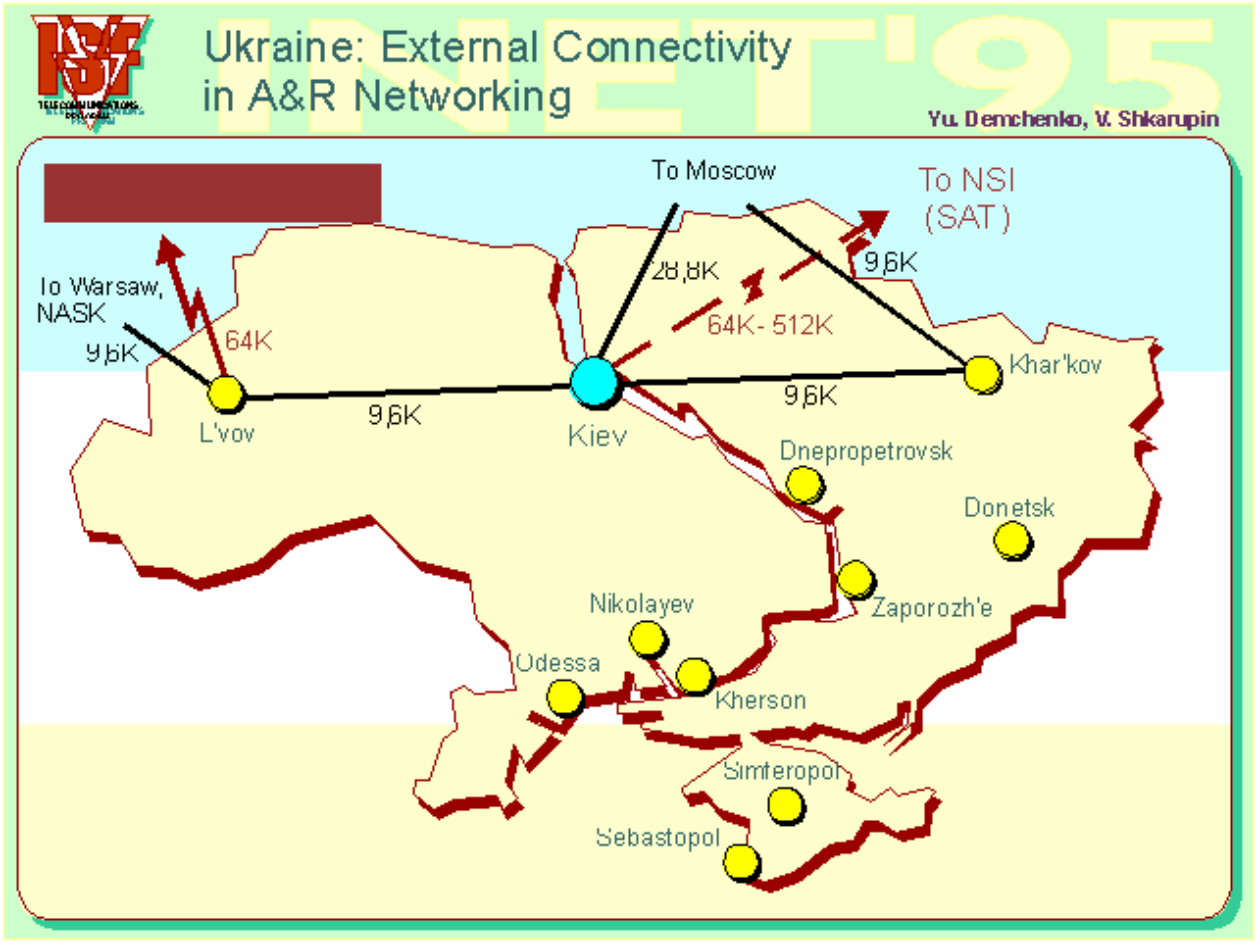
- Funding J.Soros International Sciense Foundation (ISF), Open Society Institute(OSI USA) $500'000 in 1994-1997.
- 2Mbps Radio relay Backbone, 7 nodes.
- NTUU-KPI is the main node with the biggest number of potential (outside KPI) users.
- Radio relay Backbone has no license (up to now)
- No more than 100 regular users
- Outside connection 28'800bps to Moskow FreeNet
- Free of charge to the end of 1996.

IP Network in Kiev as a joint effort of ISF and UN office in Ukraine



Three networking projects are being realized now in Kiev in close cooperation. The Kiev Pilot Network project of ISF, the project of the UNDP, called " Strengthening of Information and Communications" Infrastructure for Democratic Reform ", and a project conducted on the basis of an agreement of the National Space Agency of Ukraine with NASA . It should be noted that all these initiatives are mostly being funded by international agencies, the State participation being limited to the role of a passive observer. These three projects are closely coordinated with each other and compliment one another. The UNDP project has set up an Internet node at the location of the UN office in Kiev, currently uses a 9.6 Kbps leased line to Lviv- Warsaw for external connectivity and mainly provides non-commercial users in Kiev

with dial-up UUCP services. The number of users has been constantly growing. The project of the National Space Agency includes the installation of a satellite link to NSI, which will be used by all non-commercial networks in the country. The kernel of the network - the backbone is being built by the International Science Foundation Telecommunications Program.



Kiev Pilot IP Network

The objective of the Kiev Pilot IP Network project is to set up a star-structured backbone in Kiev (the Capital of Ukraine) connecting nodes in four major clusters of scientific institutions in the city at a speed up to 2 Mbps and to link the above backbone to the Global Internet.

The completion of the backbone is due in the end of 1995 beginning of 1996. But up to now this network is not completed.

7 commercial INTERNET providers (Autonomous Systems). Price for leased line connection to them is approx. $400 per month

Single mode optical fiber (up to 655Mbps) bone by KANCOM (ANDREWS - USA) private system in MetroChannels (see map). Not connected to the INTERNET nodes, Not connected to PTT City Telephone system. No Clients.

Universities in Kiev has no common computer network and are not connected all together.

Present stage of networking and communication facilities in NTUU-KPI (December 1996)

National Technical University of Ukraine -"Kiev Polytechnical Institute"

General information :

Students

25139 - students
334 -postgraduates
30 - getting a doctor of science degree
689 - foreign students

Academic staff:

33 Academicians
215 Professors
706 Teachers (PhD)

2509 Research staff
4288 Service staff

21 Faculties
15 Scientific and Research Institutes

In the campus of NTUU - KPI plased:
41 buildings, 23 dormitroy buildings (hostels), 12 Apartment houses, 2 clinics, etc.

INTRANET of the NTUU -KPI

- Ethernet-based backbone .
  - ⇒ 10Mbps. Thin coax cable 75Om(long, up to 1'200m lines).
  - ⇒ 10 of 29 main buildings connected.
  - ⇒ 15 UNIX-based routers. (486 and Pentium based)
  - ⇒ 200 PC connected (out of 3'000 available).
  - ⇒ 500 registerd users .
- Main computer and information resourses concentrated in
  - ⇒ CIM Centre (ES-9000, AS-400, RISC-6000, SUN, SG)
  - ⇒ CAD Department (VAX claster)
  - ⇒ Multimedia Centre
  - ⇒ Library (VAX, Alef-software- not connected yet!)
  - ⇒ Telecommunication Centre
- Potential number of users in 2005: 10'000-15'000

Outside connections:

- 4.800 bps - leased line to "TechnoSoft" commercial INTERNET provider. price $200 per Month. Quality - bad(!)
- 9'600 bps - GeoSAT satelite node - Phone and FAX facilities only(!). Out of operation since 01.1996.
- 2Mbps - Radio relay to the "Kiev Bone Network"(Open Society Institute funded). **Testing stage**. NTUU-KPI is most important node of "Kiev Bone Network". We install two Cisco 2511 routers with 16 serial ports. 20 serial "dial-up" incoming lines. 5 leased lines to the other Universities of Kiev, Institutions of Academy of Science of Ukraine, Leased line to Sevastopol (Krimia region) with the connection to 12 organisations.
- 3 City Telephone stations are plased in KPI. The modern ERICSON station (4000 numbers) is under constructing. 350 numbers are available now. Close connection to the International PTT Telephone station.

http://liner.polytech.kiev.ua/ - WWW-server was created first in the beginning of1996. It contains general Information about NTUU-KPI.

Ongoing projects and expecting results for NTUU-KPI

National Technical University of Ukraine -"Kiev polytechnical Institute"

EU TEMPUS-TACIS Project ("University Management")
Funding 100kECU(instullation expected to the end 1996):

- Optical Fiber Backbone (see figures)
- CISCO Routers and WorkGroup Switches based Campus Network (ATM based)
- IPP procedure to create University Management IS. Staff training in TU Delft and RWTH Aachen is finished now.

EU TACIS Project N EUK 9406 ("Energy conservation training and information center")1996-1997

- Training Center of "EnergyManagers" for all-Ukrainian purposes
- All Ukrainian DataBase on Energy Conservation and Energy Control

Application of Pre_JEP in EU TEMPUS-TACIS on "Distance Study"

Outside links:

- 14'400bps leased line to UARNET (via RADA node - Supreme Council of Ukraine - Parliament)
- leased lines to a number of other Universities of Kiev

Registration procedure to receive B-Class of IP addresses and AS for NTUU-KPI in INTERNET

Here are main strategic tasks for KPI communication activity:
1. To develop INTRANET of NTUU-KPI
2. To build fast connection to the INTERNET
3. To achieve good connections to other Universities of Ukraine

Activity of the Ministry for Education of Ukraine to achieve "National Data Network for the Academic and Research institutions in Ukraine (UARDN)"

In May 1996 Minister of Education of Ukraine Prof. Mikhail Zgurovskij set up an initiative group oriented on creation of National Data network for the Academic and Research institutions in Ukraine (UARDN). Representatives from leading Ukrainian Ukiversities , Ministry of education and Academy of Sciences of Ukraine participate in its work. Preparatory phase of this work was resulted in the document :"Programme of creation of national Data network for the academic and research institutions in Ukraine (UARDN) and connection to the INTERNET", signed on 24.06.1996 by Minister of Education Prof. Zgurovskij, President of Academy of Sciences of Ukraine Prof. Paton and Head of the committee for Science , technology and industrial policy Prof. Storigko. More detailed information on this document would be presented at this workshop by Dr. Vladimir Timofeev. Here are only some fact s from this document.

- There is no non-commercial telecommunication network for Academic and research activity in Ukraine
- Coordination of such an activity on the national scale is low
- Campus networks of a few Universities are already connected to the commercial providers and have INTERNET access
- existing programs in the field of telecommunication are oriented on the local tasks and due to lack of national financial resources have no progress
- Universities and research institutions in spite of financial difficulties are still most active actors in creation of national-wide Data network.

According to this Programme it is suggested at the first stage of such a national-wide project to create data network that should cover 29 universities in 8 regions of Ukraine (see map). Estimated value of financial resources for such a project is approx. $7'000'000 for the first year. It should be mentioned that this project was oriented at the support of Ukrainians Government an a available low financial resources. That is why this project was oriented at low cost technical solutions with low speed transfer rates (up to 512kBps). But such a decision can not satisfy rapidly growing demands of Ukraine's academic and research community.

Present problems of development

- All existing computer WANs, INTERNET providers are strongly oriented on the users from market (private companies, joint ventures) NOT at the Universities and research institutions. That is why only a few Universities are able to pay comparably high prices for comparably low quality services provided by such a commercial companies
- Existing data transferee links are of bad quality and not satisfy to the demands of modern networking technologies.
- No national Back Bone
- In spite of such a distributed and wide spread co-ordination structure (see Table 1) there was no really effective co-ordination in the field of Telecommunication at the all national level in Ukraine.
- Lack of national financial resources for the aims of creation of UARDN
- Lack of specialists in the field of strategic planning of large WANs, information Policy Planning, Management , Control and Maintenance of complex data Networks and Information systems
- 90% of software used in Ukraine is out of license.

Perspectives

Lack of Money and equipment is not our main problem!
We need a consolidation of all forces in Ukraine to achieve a real and effective co-ordination of Computer networking activities at the all levels - from all-Ukrainian to the small local networks at the faculties or laboratories!
Good will of all participants and strong force have to be combined in this Co-ordination!
Such a consolidation should give us an opportunity to create national, long term, strategic Development Programme for information, telecommunication and computer infrastructure in the higher education and research system of Ukraine.
Such a program brings Ukraine a step forward to the modern INFORMATIONAL SOSCIETY without a respect to the politic and near past history.