- GENERIC REPORT -

DATA COMMUNICATIONS
MARKET UPDATE

Prepared by J'son & Partners

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1 Introduction

Devaluation of the local currency in Russia and the following deep economic and financial depression severely affected local telecom market. Contrary to what had been expected in early 1998, the overall telecom equipment market shrank to US$840 mln dollars (compared to US$1,140 mln in 1997). The most significant negative affect was on the PSTN switching equipment segment, which reduced from US$280 mln per annum to a mere US$140 mln in 1998. In 1999 this segment is likely to further shrink due to a decrease in capital expenditures by the majority of regional PSTN operators.

Supplier, who were historically very strong in wire-line segment, have been recently exploring opportunities outside the traditional PSTN switching market. The new target segments for Supplier include data communications, which elsewhere in the World appears to be the fastest growing sector. Supplier have asked J'son & Partners to carry out a market research and to evaluate Russian market for data communications equipment.

The purpose of the research was to evaluate the current market for datacom equipment, project future growth in data communications services and equipment sales as well as to identify main country specific trends in the development of datacom environment in Russia.

Apart from evaluating the overall potential J'son & Partners outlined opportunities available for Supplier on the market and provided the profiles of the main datacom operators.
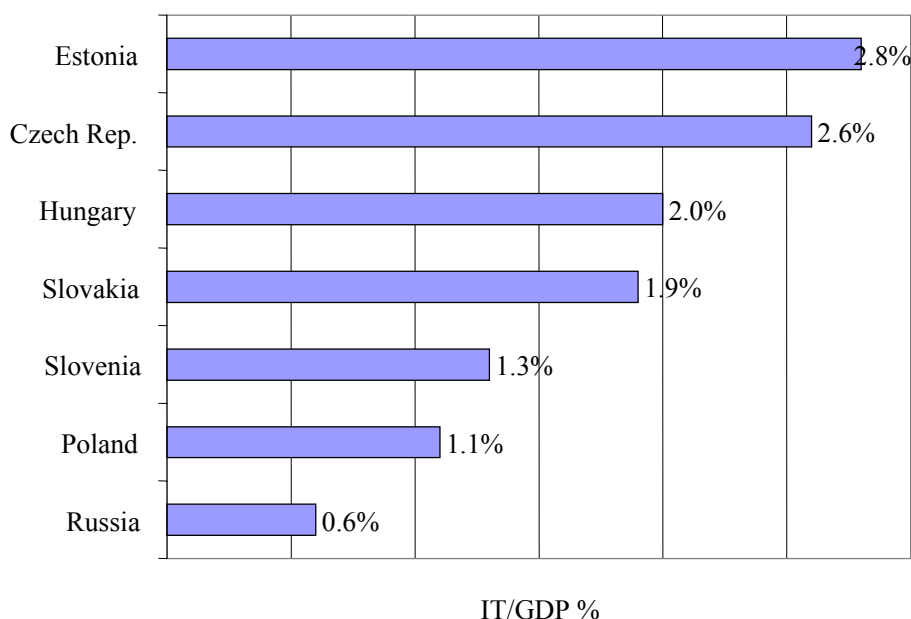
This report summarizes the extensive market survey carried out by J'son & Partners directly and through subcontractors. It includes the most recent actual data and sales records by the main vendors and distributors of data communications equipment, insider information from the major data service providers in Moscow, St.Petersburg and beyond. In addition to that the report features J'son & Partners' proprietary models and forecast.

Finally the appendix to the report includes the field research information on the distribution chains of the major Western datacom manufacturers and the most recent type approval certificates obtained by the leading suppliers on the Russian market.

1.1   Summary

Russian data communications market which has for a long time been fairly small and insignificant compared to other developed economies, promises to be one of the fastest growing customer segments for Western telecom vendors within the next 2-3 years. In absolute figures Russian datacom market is far more important than all Eastern European countries put together. Given that Russia is still lagging behind its fellow Europeans in terms of IT penetration, one could expect a very high growth in the foreseeable future driven by the huge unsatisfied demand.

IT / GDP Ratio

Country	IT/GDP %
Estonia	2.8%
Czech Rep.	2.6%
Hungary	2.0%
Slovakia	1.9%
Slovenia	1.3%
Poland	1.1%
Russia	0.6%

IT/GDP %

Since datacom is fully liberalized and self-regulated segment in Russia it has been only marginally affected by the ruble devaluation. Most of the datacom operators has already adjusted their tariffs according to US$/Rbl exchange rate increase and are likely to maintain a fairly high operational margin (compared to PSTN operators). Most of the major providers managed to retain their corporate clientele, simply because data communications is a mission critical element of contemporary business operation in practically all industries. Although the growth in individual user segment slowed down with higher churn rates and contract cancellations, the overall trend is still positive (in terms of net incremental subscribers) awing to proliferation of IP technology in Russia.

> **Russian data communications equipment market is evaluated at US$160-170 mln in 1999. In absolute figures it may become comparable to the formerly largest segment of Russian telecom market – PSTN switching equipment. Datacom segment is projected to grow within the next 2-3 years at least at 10% per annum to reach US$240 mln towards 2005.**

Equipment Sales Revenues
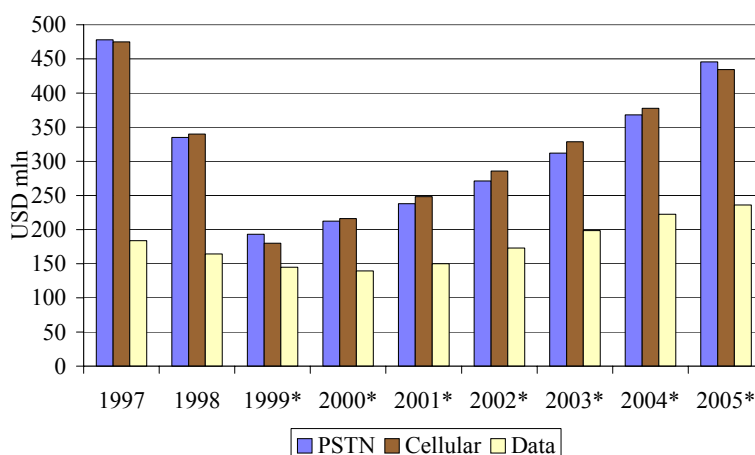
The following main trends on the Russian data communications market have been identified in the course of this research:

- **The share of telecom operators in equipment sales has been constantly growing over the last 12-18 months**. Correspondingly the share of the corporate customers and enterprise networks is likely to decrease. Data communications in Russia is gradually evolving from internal corporate solutions into a major service segment with more and more enterprise networks outsourcing datacom services to specialized telecom operators. The emerging residential datacom sector will further strengthen the potential customer base for specialized datacom operators.

- **IP will be the fastest growing segment of the market (30-45% per annum).** The increasing demand for IP connectivity generated by residential users and small corporate customers, who opt for intranet solutions, will be the main driver behind equipment sales in the longer perspective. It is expected that some of the conventional telephony providers (MGTS, PTS, Uralsvyazinform) may decide to build their own IP platforms to cover their respective markets and address the growing demand for residential data services.

- **Most of the alternative service providers tend to develop integrated service portfolio and diversify into data and broadband segment.** This is particularly the case with commercial overlays, who can no longer compete with PSTN on price and have to offer advanced integrated solutions to their potential customers in order to distinguish themselves from regional PSTN monopolies.

- **Cost effective and high capacity access will be the best selling product in Russia** where the implementation of the new datacom applications has been limited by the underdeveloped primary infrastructure. Frame Relay and ADSL equipment sales will increase at 60% per annum, driven primarily by the demand for IP connectivity. In the longer term, wireless broadband technologies (including W-CDMA, MVDS and LMDS) would probably take a fair share of this market.

LAN equipment market will change significantly with hubs phasing away and clearing the room for more advanced and sophisticated data switch solutions. Data switches will be the bestseller, accounting for 52% of the overall datacom market in 2005.

Market Projections for LAN/WAN Equipment
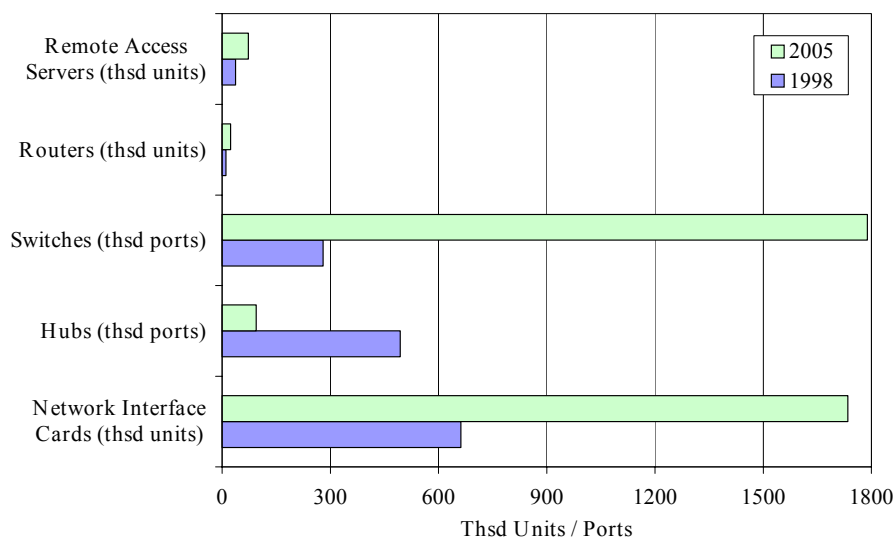
Overall, very much like in the rest of the World, datacom service in Russia will evolve from an exclusively corporate feature to a commodity service available and affordable for millions of individual subscribers.

Notwithstanding the achievements of the commercial overlays, the regional PSTN monopolies are very well positioned to address this new emerging market for they control the backbone and local access networks. With lower revenues from core business local telephony operators will certainly attempt to diversify into much more profitable datacom business.

This process has already started. The most advanced PSTN providers (such as MGTS, PTS, Uralsvyazinform, Kubanelectrosvyaz) are developing their own IP transport platforms to compete with commercial providers on price and coverage.

> **One could expect a major reshuffle on the market as a result of diversification of PSTN providers into IP and probably migration onto ATM transport platform. There is a major risk for traditional PSTN suppliers such as Ericsson, Alcatel, Siemens and Lucent to lose their market share in the regions as datacom manufacturers: Cisco and Nortel try to aggressively address the emerging customer segment.**

2   Market size

Russian market is still very small in terms of absolute figures compared to other European countries. Moreover the growth in penetration of IT and data services slowed down in 1998 as a result of economic uncertainty and financial crisis.

Data Communications Services
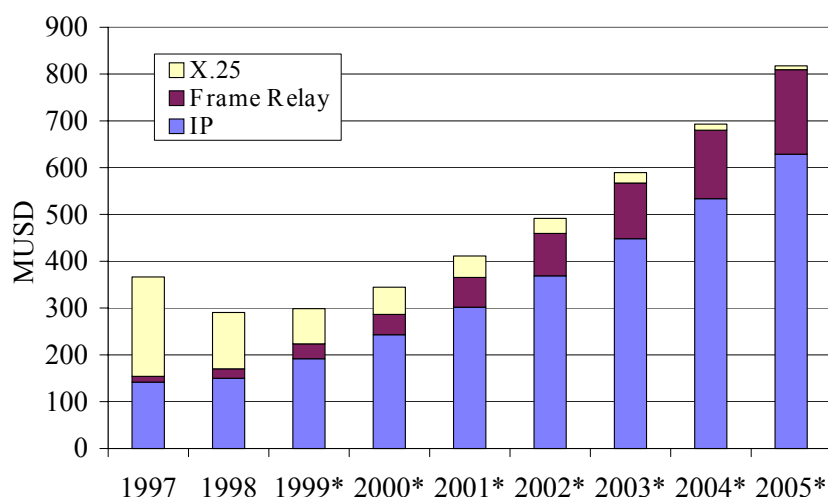
* estimated

Based on the Q1 1999 indicators, however, the growth in this particular segment of the market is likely to recover towards the end of the year ahead of the overall economic recovery. The two most important contributors to the growth would be individual IP users and small businesses upgrading their telecommunications capabilities to include at least E-mail and low speed IP connectivity. Apart from the increasing subscription base the growth in services volumes could be explained by the increasing traffic and higher penetration of broad-band services.

Market Size for Datacom Equipment
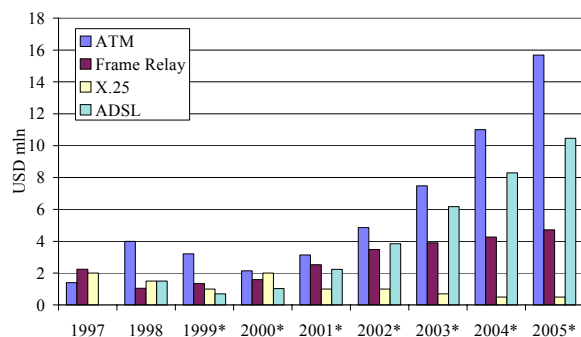
* estimated

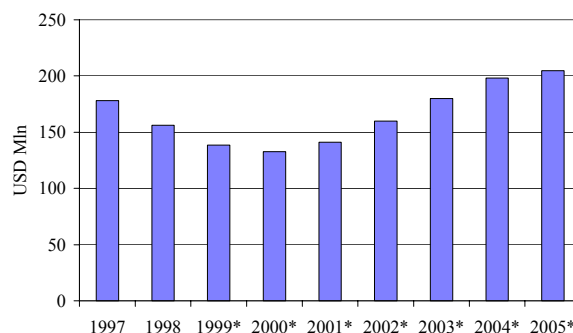Customer premises equipment and LAN solutions would account for over 86% of the total datacom equipment sales. It is expected that in absolute figures LAN would remain the most important segment of the market in the foreseeable future, although the share of WAN equipment and applications will grow rapidly as Russia enters the era of converging telecommunications.

Share of Capacity Used for Various Protocols
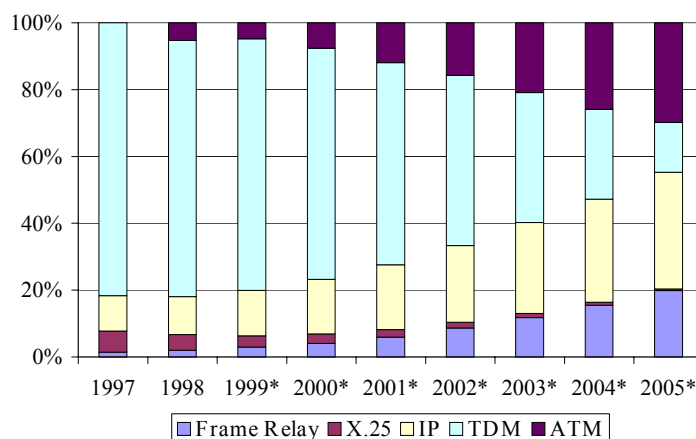
* estimated

Eventually, ATM may very well replace traditional TDM transmission on the primary PSTN network. That would be followed by a substantial increase in data traffic and penetration of IP services. Rostelecom and MGTS will most certainly become the pioneers in introducing ATM based backbone networks. However, given the current financial situation and the underdeveloped terrestrial infrastructure, this process is not likely to start until 2001. The growth in Frame Relay and ADSL/XDSL would be driven by the increasing demand for high capacity and cost-effective transport for IP connectivity.

2.1 Regional Overview

Historically Moscow has been far ahead the rest of the country in IT penetration. In absolute figure Moscow accounts for 58% of the datacom services and 72% of equipment sales.

Data Communications Services Top 10 Markets (1998)

| CITY	US$ mln
Moscow	121.4
St. Petersburg	31.1
Ekaterinburg	12.2
Samara	7.6
Krasnodar	7.4
Khabarovsk	7.1
Rostov-on-Don	6.6
Tomsk	6.5
Saratov	5.1
Perm	4.6
TOTAL	**209.5**

Not surprisingly, the major populated centers and capital cities occupy the top five positions in the table above. At the bottom of the top 10 list there are smaller regions, where datacom service market growth is driven primarily by IP users and relatively more advanced local digital infrastructure. It is particularly the case with Tomsk and Perm.

There are several factors that cause the concentration of data services and equipment sales in Moscow:

- Moscow was a starting point for the further proliferation of data services and IT technologies in Russia. The first users of data networks in Moscow were foreign representative offices and joint-venture companies. The data communications "culture" then spread all over the Russian business community. Moscow, however, still has the largest datacom user population (both corporate and individual).

- Unlike in conventional telephony, data services are usually managed and billed from a singe location (even if the customer has several connections all over the country). Most typically the HQs in Moscow order and settle for the services provided elsewhere in the regions. It is particularly the case with X.25 and Frame relay, but is also very relevant for corporate IP connections.

- The development of data communications in the regions has been hindered by the inadequate terrestrial infrastructure and very limited digital capacity on the domestic routes within Russia. Oftentimes, the cost of the transport is several times higher than of the services and applications provided to the customers.

This trend may change as datacom service becomes a commodity. The shift towards the regions has already started and in terms of IP subscription Moscow and St.Petersburg accounted for 46% of the total market in 1998.

Internet Subscribers Distribution by Region
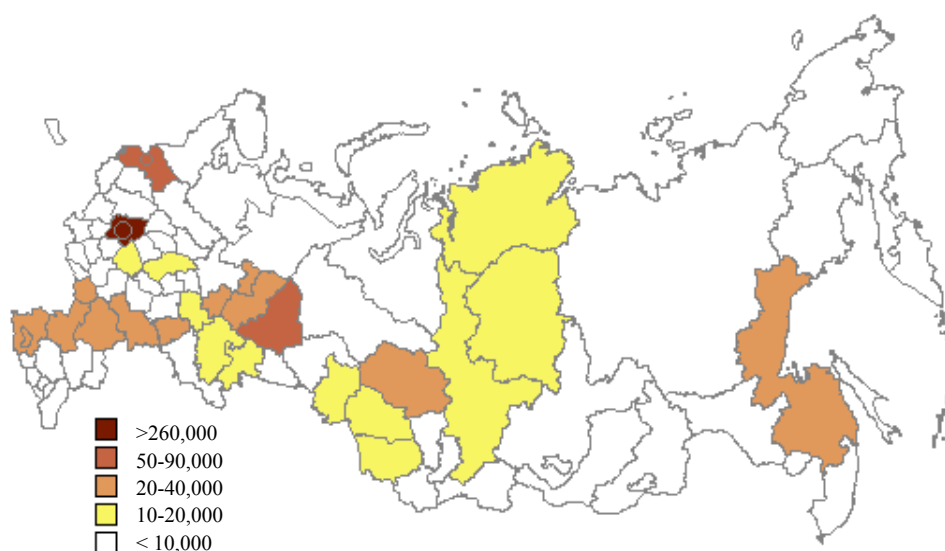
In the long term regional markets would generate substantial demand for data communications equipment (particularly broad-band transport and IP access devices). Driven by the growing demand in the regions Russian datacom service providers will inevitably have to upgrade their points of presence (POPs) in the regions.

2.2 Outlook

Although data service market is rather small in absolute figures at this stage it is bound to grow faster than any other segment in Russian telecoms. Increasing penetration of IT in corporate and residential segments would drive the evolution process. The diagram below illustrates the expected growth in PC installed based.

PC Installed Base and Penetration
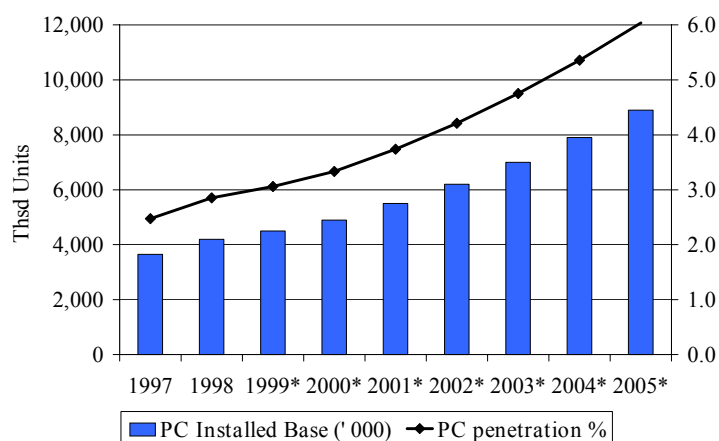
* estimated

The share of Internet service revenues in particular will substantially increase, compared to that of PSTN. Consequently the data communications equipment market will grow to satisfy the increasing demand for customer premises equipment and backbone upgrade. The local currency devaluation and following erosion of ruble-denominated PSTN tariffs translated in a sharp decrease in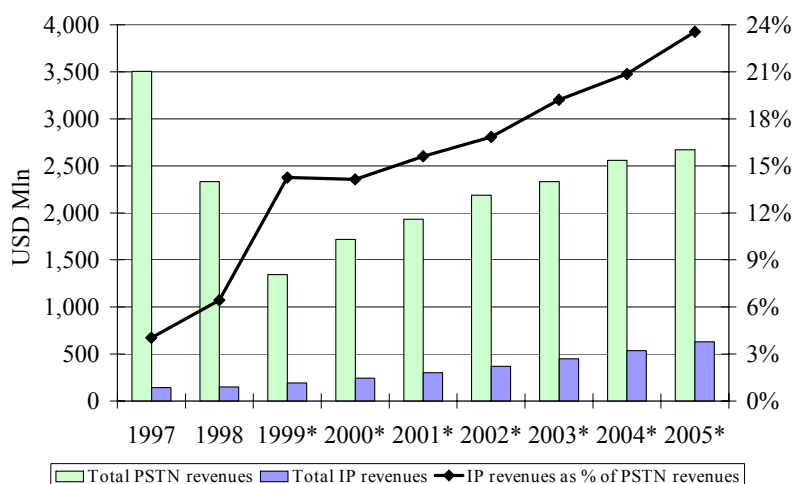 PSTN revenue compared to IP revenue in 1998-1999. This trend is likely to develop into the first decade of the next century, when IP revenues is projected to reach over 20% of the total telecom revenue.

Projection of PSTN and IP Revenues

* J&P estimates

	1997	1998	1999*	2000*	2001*	2002*	2003*	2004*	2005*
ASSUMPTIONS									
Traffic DLD, mln min	3,759	3,627	3,755	3,882	4,088	4,341	4,648	4,972	5,312
Average DLD tariff, US$	0.71	0.40	0.20	0.25	0.25	0.25	0.20	0.20	0.15
PSTN subscribers, mln	22.8	24.5	24.7	25.5	26.3	27.6	29.2	31.3	33.5
Average local tariff per subscriber, US$	36.0	36.0	24.0	29.3	34.7	40.0	48.0	50.0	56.0
Internet subscribers, mln	0.7	0.9	1.2	1.5	2.0	2.6	3.4	4.4	5.7
Average revenue per subscriber, US$	190	170	165	159	151	142	132	121	110
REVENUES, US$ MLN									
Total PSTN revenues	3,505	2,333	1,345	1,718	1,932	2,188	2,332	2,558	2,670
Total IP revenues	142	150	192	243	302	369	448	534	629
IP revenues as % of PSTN revenues	**4%**	**6%**	**14%**	**14%**	**16%**	**17%**	**19%**	**21%**	**24%**

* estimated

3   Market Segmentation

There will be three main customer segments on this emerging market that would determine the Russian telecommunications landscape in the next 5 to 10 years:

Commercial overlay operators, diversifying into data services

The vast group of Russian regional overlay operators, who have approximately 300 thousand main lines installed, have been put into a very tough situation where they can not compete with PSTN on price (because of very low ruble tariffs on the PSTN). They have to develop a new attractive offer to their clientele in order to retain their customer base and maintain premium tariffs. Naturally they are trying to diversify into IP and other data services, capitalizing on the advance digital infrastructure that they have already built.

> **This group is of particular interest for traditional equipment suppliers for oftentimes they can be easily migrated on advanced datacom platform through an upgrade of their existing switch and transmission. So, the sale of datacom equipment could be achieved on the back of switch or multiplexer already supplied to the account.**

Electrosvyazes

With the decrease in PSTN revenues, Electrosvyazes who have developed advanced technical platforms are determined to address other market segments. They have recently focused on the emerging IP market and other data services (credit card validation, Frame Relay access, etc.). Since the data communications tariffs and rates are not regulated by the State, Electrosvyazes can develop a business case for the IP operation and acquire vendor's finance for the new datacom equipment. Furthermore they tend to indirectly subsidize their affiliated IP operator through exclusive arrangements on leased circuits and last mile solutions, which makes the revenue side even more attractive for the prospective vendors.

> **Cisco and Nortel who have not inherited any scalable bad debts from the massive vendor's finance offerings to Electrosvyazes before August 1998 aggressively explore this new segment.**

Nation-wide datacom providers

At this stage there is no dominant datacom provider in Russia. Rostelecom, who own the primary digital infrastructure and apparently have competitive advantage vis-à-vis alternative operators have never put emphasis on the data communications business and are hardly equipped to build an effective sales organization and provide world-class customer support (including Service Level Agreements and customer credit system). Other contenders for the position of the nation-wide data service provider, such as Global One Russia, Rosnet, Rospack, etc., have serious capacity constraints (for they have to lease very expensive capacity from Rostelecom and Electrosvyazes).

Nevertheless, the datacom market evolution would inevitably produce a new leader on the market, a nation-wide datacom carrier's carrier who would provide connectivity to medium size and small operators. This new operator will be the single most important account for datacom vendors.

The emerging data communications market will be soon divided between a few leading suppliers. There are several manufacturers that have been actively marketing their solution for the next generation of Russian converging telecom operators.

Alongside with the traditional leaders on the Russian telecom market such as Siemens, Alcatel, Ericsson and Lucent, there are several new entries that would rapidly increase their market share as Russian telecom operators integrate IP and other data services into their service portfolio.

Market Share Breakdown by Vendors

1998   **2000**
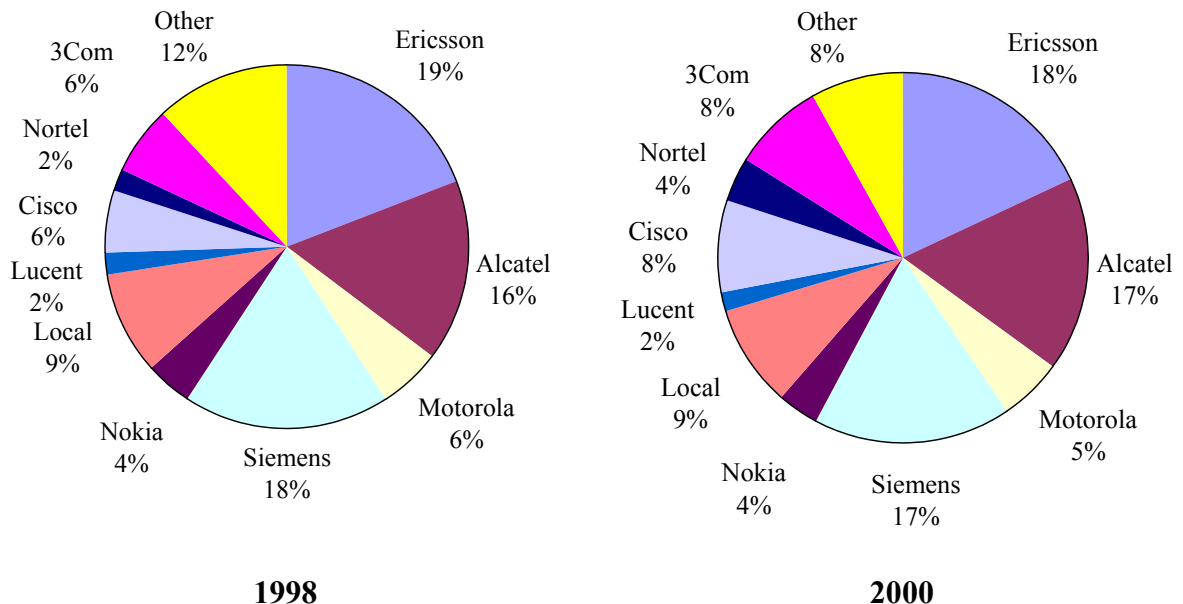
In order to secure a leading position on the Russian market, Supplier should actively explore new opportunities in data communications and develop a comprehensive solution for the new generation of Russian telecom operators, including IP, broad-band transport and customer premises equipment.

4   Customer Operators

There are over 500 licensed data communications providers in Russia, offering the whole spectrum of services from messaging and X.25 to Frame Relay, voice over IP and broad-band data. In addition to that there are over 10,000 private and enterprise networks of various caliber and coverage.

By 1999 Russia have developed a highly fragmented and extremely competitive data service market with very few regulatory restrictions.

4.1   Retrospective analysis

The first Russian data communications system for civil applications was launched in late 80s. Research Institute for Automated Systems commissioned the first X.25 network with affiliations in Moscow and St.Petersburg. The network quickly developed into a leading data service provider with over 250 points of presence across the Russian Federation and the former USSR. Almost simultaneously Russia entered IP market. Demos and Relcom created the prototype IP infrastructure based on the enterprise network at Kurchatov Institute for Nuclear Research. It was hardly feasible at that time to expand the networks beyond Moscow and St.Petersburg for the simple reason of hugely underdeveloped telecom infrastructure. On the other hand there was a very limited solvent demand for datacom services outside the two principal banking and industry centers - Moscow and St.Petersburg.

Situation changed dramatically with the liberalisation of the Russian economy and sharp increase in foreign investment. The unsatisfied demand for high quality international data connectivity stimulated the development of join-venture datacom operators. Several global telecom providers established their presence in Russia:

- Rossprint (with Sprint International) later restructured into Global One Russia
- Infonet (with Telecom Finland)
- Infotel (with DATAX-P)
- Rosnet (with AT&T)
- Sovam Teleport (with GTS)

Russian providers have also developed their service platforms and expanded into the regions. The increasing supply of the digital connectivity to the regions driven the proliferation of data services beyond the points of presence established by the main operators. New small local datacom service providers mushroomed all around Russia, with over 500 datacom licenses issued by the regulatory authorities.

The premium datacom market segments have been aggressively addressed by commercial overlay operators (such as Comstar, Comincom, Peterstar, etc.) who bundled their voice services with data applications. In addition to that the companies specialising initially in leased circuit and point-to-multipoint backbone transport platforms (such as Golden Line and Macomnet) have diversified into data services, offering IP and Frame Relay.

Top 10 Service Providers: 1998 Revenues
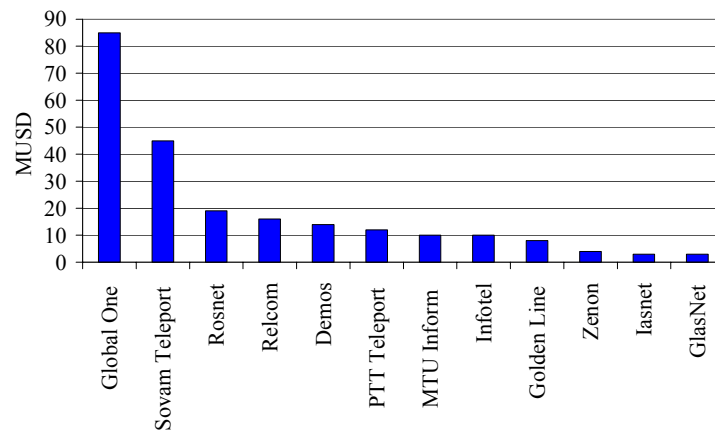
The following diagram illustrates the break-down of key service segments in data communications.

Datacom Services Market Breakdown 1997-1998
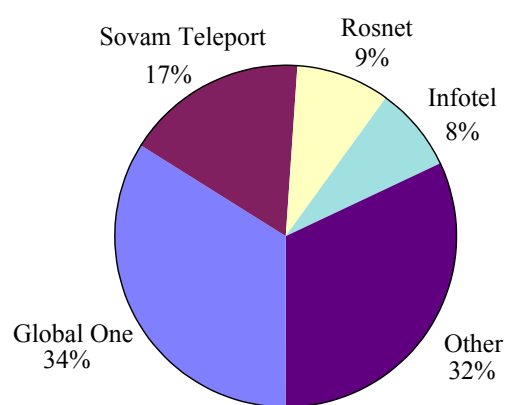
X.25

Frame Relay

TCP / IP

With the IP boom Russian Internet providers caught up with the traditional X.25 network operators and quickly won the dominant share of the overall data communications market in Russia.

4.2 Customer groups

The whole variety of datacom service providers could be divided into several groups based on the following main criteria:
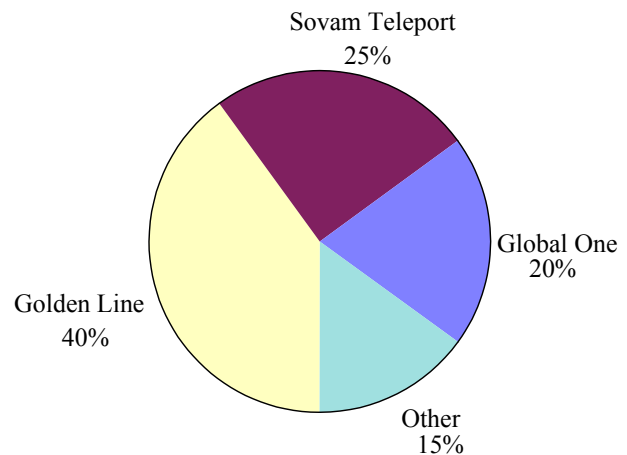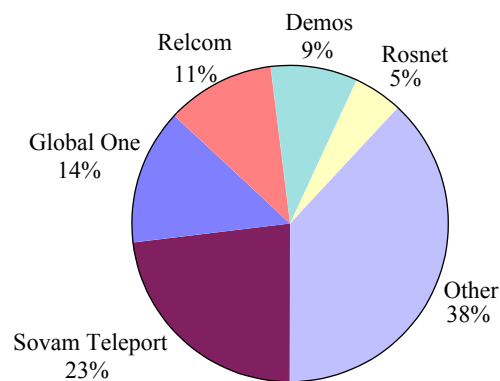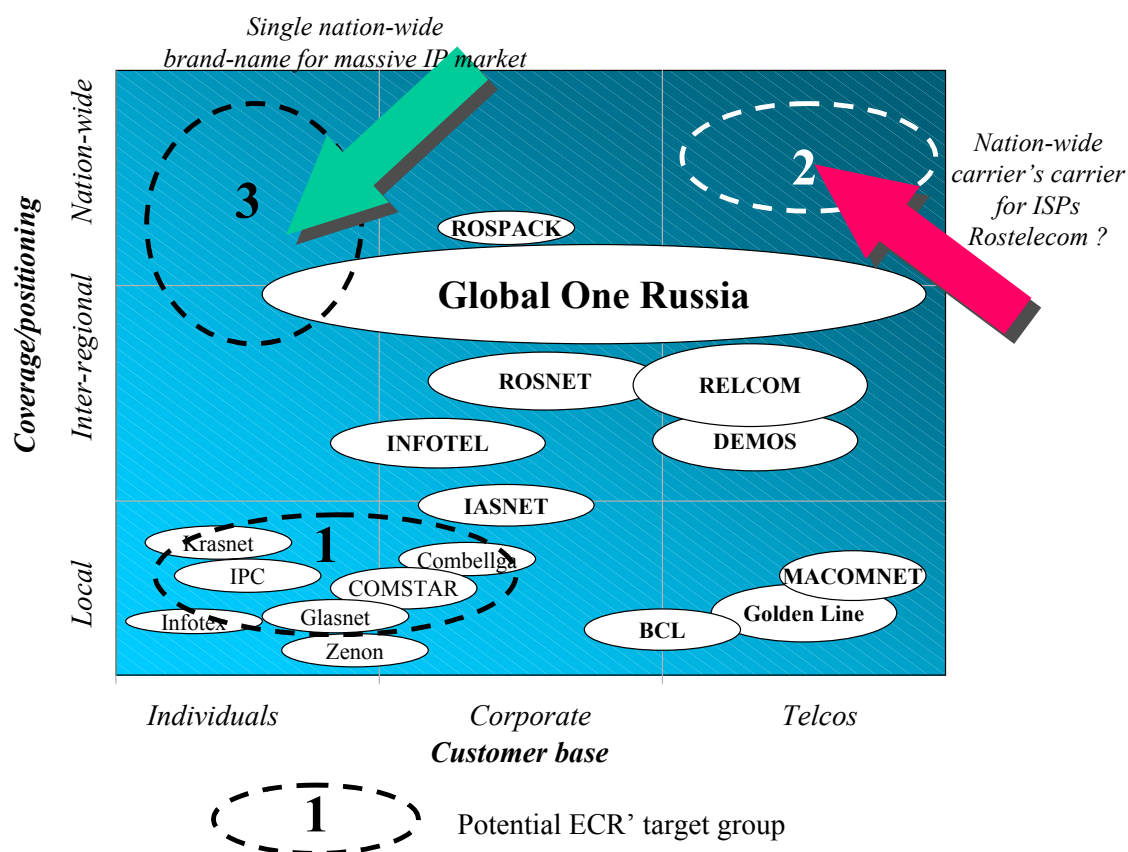
- Coverage (Local, Interregional, National)
- Customer Mix (Individual, Corporate, Telcos)
- Range of Services

The following table provides the overview description of the main operator groups identified in the course of this research.

	DESCRIPTION	**EXAMPLES**
Group 1	Nation-wide datacom providers with diversified service portfolios	Global One Russia
Group 2	Large ISPs and Internet access providers	Demos, Relcom, Sovam
Group 3	Traditional X.25 and Frame Relay providers with IP capabilities	IASNET, Infotel, Rosnet
Group 4	Medium size and small ISPs with predominantly local coverage	Glasnet, Centronet, PTT Teleport, Zenon
Group 5	Regional datacom networks with IP capabilities reselling services of nation-wide datacom providers	Krazinfo, Kubaninformsvyaz, Infotex
Group 6	Overlay operators with IP capabilities	Comstar, Combellga, PeterStar, BCL
Group 7	Carrier's carrier companies with their own primary digital networks that are diversifying into IP and broadband data	Rostelecom, Golden Line, Macomnet

The above groups of operators have very different strategies and positioning. In fact the operators in two different groups rarely compete with each other, even if they offer similar range of services. To the contrary datacom operators tend to develop vertical structures where smaller regional operators ally with big ones, forming multi-layer seamless networks with wide inter-regional coverage.

Datacom Service Market: Segmentation

Single nation-wide brand-name for massive IP market

Nation-wide carrier's carrier for ISPs Rostelecom ?

Coverage/positioning: Nation-wide, Inter-regional, Local
Customer base: Individuals, Corporate, Telcos

ROSPACK — **Global One Russia** — ROSNET — RELCOM — INFOTEL — DEMOS — IASNET — Krasnet — IPC — Combellga — COMSTAR — MACOMNET — Infotex — Glasnet — Zenon — BCL — Golden Line

1 — Potential ECR' target group

Evidently various groups of datacom operators have totally different requirements for equipment and network solutions. Based on the customer operator's requirements and existing Supplier datacom product line, the following key target areas could be identified for Supplier:

Immediate opportunities (Target area 1)

Regional ISPs and Frame relay networks affiliated with regional Electrosvyazes. Operators from this group are well positioned to develop into dominant datacom providers. They are supported by local PSTN monopolies and most typically have exclusive access to the primary networks and local access facilities. With the increasing demand for IP connections among residential users and small corporate customers they will quickly build clientele and expand. Since Supplier has already established accounts with Electrosvyazes and supplied switching and transmission equipment for the PSTN it would be easier to introduce its datacom equipment and position itself with the prospective customers.

This target area also covers overlay operators who have recently diversified into data communications (such as Comstar in Moscow or Corona in Nizhny Novgorod). Supplier may want to package its datacom products with other network solutions offered to this group of operators.

Longer Term opportunities (Target area 2)

The niche of the nation-wide carrier's carrier for datacom operators remains to be vacant in Russia. Rostelecom have not yet developed technical capabilities to occupy this market segment, although the company is very well positioned to become a leading IP transport provider in the future. There has been a fierce competition between Nortel, Cisco and Newbridge for the prospective datacom contracts from Rostelecom. The financial crisis in Russia and the sharp reduction in Rostelecom's capital expenditure seem to have delayed the development of Rostelecom backbone ATM network. However, in terms of equipment sales Rostelecom is likely to be the single most important customer for the datacom suppliers.

Prospective Market (Target area 3)

It is expected that with the increasing demand for IP connectivity among the individual residential users and small businesses a single national brand-name holder would emerge as a dominant service provider on this new mass market. This does not necessarily rule out the possibility for smaller regional companies to survive the consolidation of the market. They may keep providing the services in their respective license regions under franchise arrangements with a single or a few brand-name holders. The future IP holding(s) would most certainly develop a centralised technical strategy and ally with strategic equipment suppliers.

At this stage there is no clear leader on the market. However Global One Russia appears to be ahead of other contenders for a nation wide consumer brand-name for a retail IP service.

Various groups of customer operators have different requirements and specifications for potential vendors. The table below provides an overview structure of demand for datacom equipment, based on the interviews with senior technical specialists and executives of selected datacom companies.

Main Customer Groups (Telecom Operators)

	Service Revenues: 1998, US$ mln	Projected Investment into Equipment 1999-2003, US$ mln	ADSL	ATM	Frame Relay	TCP/IP	TDM	X.25
Group 1	85	100		√	√	√		√
Group 2	75	50	√		√	√		
Group 3	32	60			√	√		√
Group 4	19	100	√		√	√		√
Group 5	5	60				√		√
Group 6	8	30	√	√		√		
Group 7	10	100		√	√	√	√	
TOTAL	**290**	**500**						

In terms of total dollar amounts Frame relay and ADSL technologies are likely to be the best-sellers in data communications equipment for telecom operators, with ATM backbone switches coming as a second most important product line.

5   Internet

IP segment in Russia represents a huge potential for telecom vendors. The overall incremental IP subscription in Russia within the next 5 years is estimated at 3.4 mln, based on the most conservative assumption that Russia will increase IP penetration level to that of its Eastern European peers.

IP penetration in selected Eastern European Countries
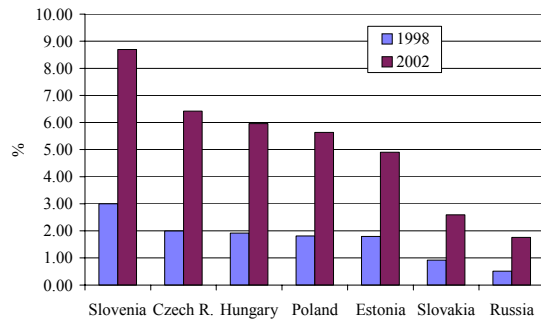
Internet Subscription base, 1998
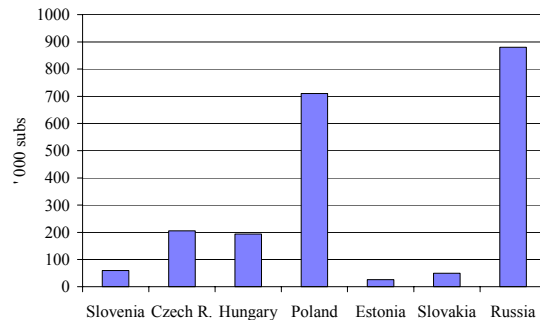
Based on the existing trends and actual sales records of Q1, 1999 a steady growth in Internet subscription base is expected through year 2003. Moreover, it is projected that the IP customer base in the regions will increase at approximately the same rate as in Moscow and St.Petersburg.

Internet Subscribers

The following main trends have been identified for the development of IP services in Russia:

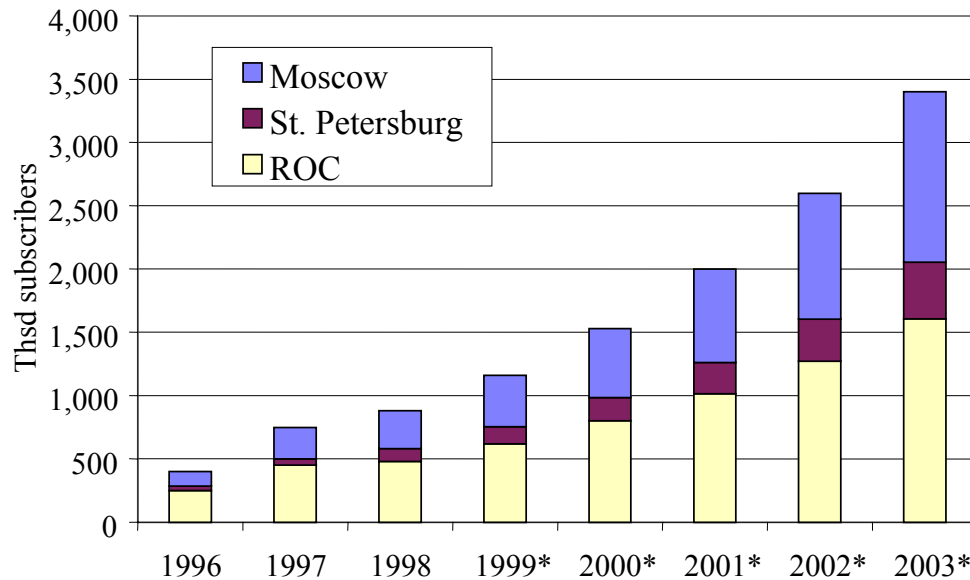- IP service will shortly become a mass market with tariffs and rates affordable for a wide range of prospective customers

- With the growing demand for high speed connectivity the dial-up solutions using existing PSTN local access infrastructure would no longer satisfy key customer groups. High speed access based on ADSL or wireless platforms would become a best selling product.

- Local PSTN operators would have to develop either a parallel infrastructure for IP or an upgrade solution for the existing voce-grade network

- New services such as voice over IP may reshape the traditional telephony market, driving down ILD and DLD tariffs.
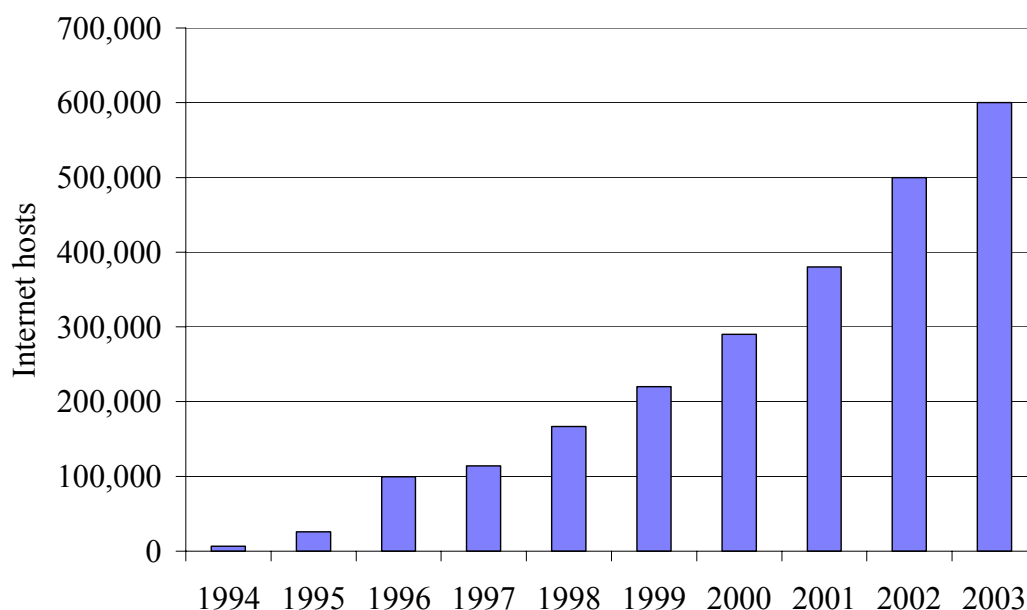
The growing demand for IP connectivity and evolution of Internet to a commodity service requires a new strategic approach from both operators and manufacturers. The main trend in the first decade of the next century in Russian telecoms would be the development of "Public Internet Protocol Network" comparable by the coverage, capacity, traffic and service revenues to the existing PSTN.

5.1 Main trends

IP connectivity is becoming a commodity service in Russia. With the growing number of IP applications and increasing volume of Russian language IP content resources it becomes an inherent part of the overall mass media environment. That stimulates a fast growth in residential IP services, which is bound to eventually become the largest data communications segment. It is expected that the pre-paid systems to be introduced by a number of ISPs and subsidies from portal operators dwelling on advertisement revenues would further stimulate growth in IP services. Currently this segment grows at 30% per annum and is evaluated at total US$450 mln in 2003.

In addition to the rapid growth in IP services to individual subscribers, there will be an IP boom among small corporate customers. Inexpensive IP connectivity would provide unparalleled communications and marketing capabilities for this group of customers. IP address for E-mail communications and web page have already became inherent parts of business. The market research among 152 corporate customers in 16 regions of Russia, carried by J'son & Partners in October 1998 indicates that 85% of them consider IP connectivity as a mission critical element of their business. Only 7% of companies polled said they would not subscribe to Internet service or upgrade their IP connectivity in 12 months.

The number of new Internet hosts has been increasing rapidly, regardless of the economic decline and financial instability.

Internet Hosts in Russia

The existing PSTN infrastructure could no longer satisfy the demand for high speed connections. PSTN operators will have to come up with a strategic solution for IP connectivity and either create a by-pass for data traffic or build a brand-new network for IP. On one hand, customers require a higher dial-up connections for the advanced IP applications while PSTN terrestrial infrastructure can hardly support 20Kbit/sec on the most advanced networks such as MGTS and PTS. On the other hand, PSTN operators themselves want to avoid traffic overload in the downtown areas where IP dial-up traffic can cause network congestion in peak hours.

Based on the average traffic of 0.01 Er per main PSTN line in service, the dial-up IP traffic on the PSTN already accounts for 6% of the total local traffic. It is expected to increase dramatically with the reduction in dial-up tariffs. The table on the following page provides the estimates of the dial-up traffic for the top 20 Moscow ISPs based on the measurements of the modem pool load.

Dial-up Traffic of Top 20 ISPs in Moscow

Provider	Average number of simultaneous connections (Er)	Provider	Average number of simultaneous connections (Er)
PTT Teleport	480	ORC	50
Zenon ISP	275	PlugCom	44
MTU Inform	400	Portal	41
GlasNet	207	Relcom	40
Demos	200	Centronet	26
Corbina	124	RedLine	19
2com	97	IPC	16
Sovam Teleport	93	Deol	10
Elvis-Telecom	108	Sitek	6
Central Telegraph	87	ARSTEL	2

TOTAL TRAFFIC   2,325 Er

There are several solutions for alternative datacom transport on the local level, which have been actively explored by the prospective service providers and PSTN monopoly operators:

- **ATM transport networks with data gateways at every PSTN network node to route data and broad-band traffic by passing PSTN altogether**. This solution may not be applicable in the small geographical markets with the low user density. However it appears to be the best future proof solution for large PSTN networks (in Moscow, St.Petersburg, Yekaterinburg, Samara, Novosibirsk, Nizhny Novgorod).

- **ADSL link to the customer premises**. Low cost and quick implementation makes ADSL the most efficient immediate solution for IP transport. However, ADSL is a specific "last-mile" transport that still requires an advance backbone network for data.

- **Wireless solutions including W-CDMA, MVDS and LMDS**. Spectrum availability in 2.2GHz, 24 GHz and 41GHz makes the above systems very attractive for alternative IP providers and incumbent PSTN operators.

The existing service market will change significantly because of the new applications available to the IP subscribers. Voice over IP may win up to 5% of the ILD and DLD market share from telephony carriers. Voice over IP makes perfect economic sense for the corporate users in a situation where Rostelecom and Electrosvyazes keep raising their ILD and DLD tariffs to cross-subsidise money losing local loop. However it is unlikely that voice over IP will become a mass product before the community of IP users could reach a critical mass of 10-12 users per 100 population.

IP applications Used by Russian Corporate Customers

IP APPLICATION	% OF CORPORATE IP CUSTOMERS
E-mail	95%
Internet Resources	45%
Intranet solutions	12%
Corporate Web page	7%
Voice over IP	4%
Broad-band services over IP (Video, Hi-Fi audio, remote control over technological process, conferencing)	1%

5.2 Market break-down

Internet service segment in Russia is highly fragmented. There are over 300 companies licenses specifically for IP services (oftentimes referred to as "telematics" in the official regulatory documents). Most recent polls carried out J'son & Partners indicates that only about 50% of licensees have actually implemented IP platforms in one way or the other and started providing services.

The following map illustrates the distribution of IP license holders among the regions of Russian Federation.

Number of Licensed ISPs as of January 1999

>90
20-40
10-20
<10
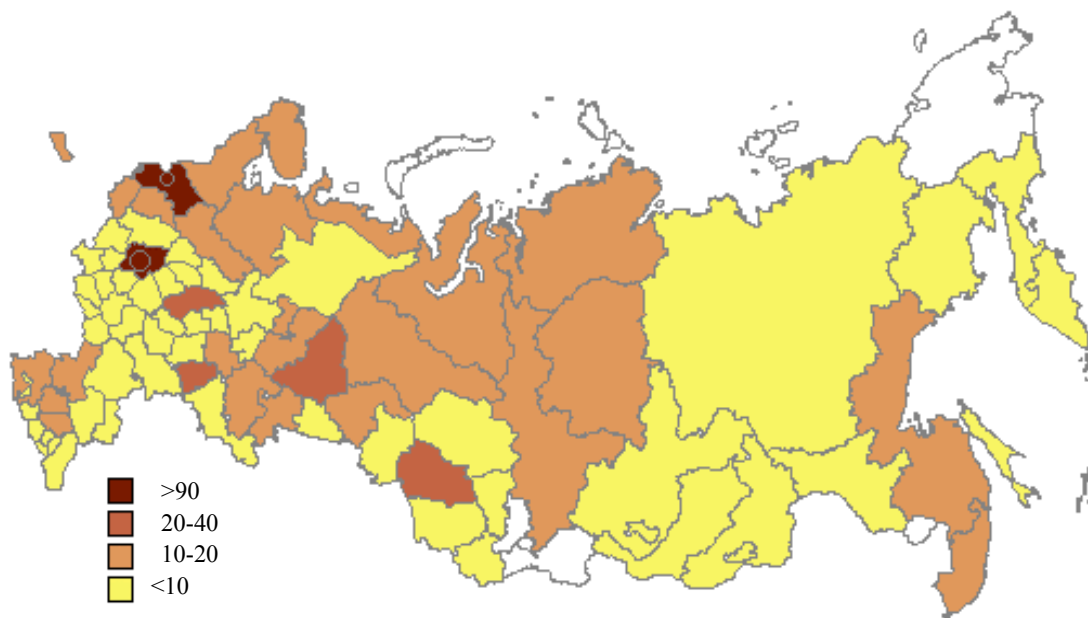
The distribution of ISPs by size and revenue is summarised in the table below, which incorporates the results of the survey among 152 ISPs.

Distribution of ISPs

Internet Service Provider	Number of Subscribers	Total ISPs, %	Revenues of One ISP, US$ mln p.a.	Sum of Revenues US$ mln p.a.	Share of total revenues,%
Large (regional) ISPs	More than 10,000	6%	6.0	60	34%
Medium size (local) ISPs	5,000 - 10,000	24%	2.0	70	46%
Other ISPs	Less than 1,000	70%	0.2	20	20%
Total active ISPs		100%		150	100%

5.3 LAN equipment market

Very much like in the rest of the World LAN equipment accounts for an majority of datacom equipment sales. In Russia this market is dominated by the four leading datacom suppliers: 3Com, Cisco, Nortel, Cabletron

The trends on the Russian TCP/IP market reflect the global changes and evolution of LAN/WAN technologies. The following main developments would determine the situation on the Russian equipment market:

With the development of datacom technologies would result in the shift from traditional architecture built on network interface cards, hubs, routers and switches to a more advanced environment with highly intellectual switches integrating functionalities of other datacom units and replacing hubs.

Hubs Market Size with Technology Breakdown (Thsd Ports)
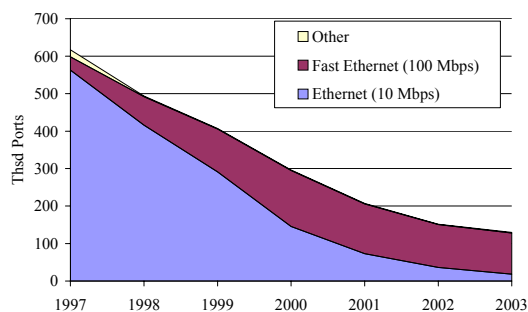
Hubs Market Size with Technology Breakdown (Thsd US$)
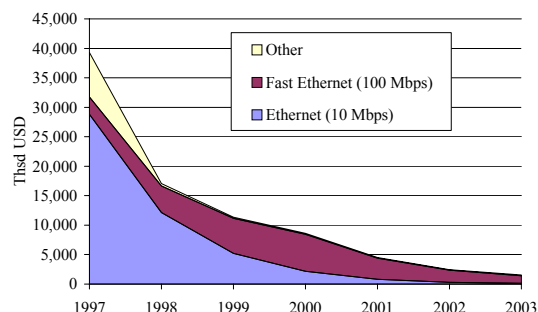
Switches Market Size with Technology Breakdown (Thsd Ports)
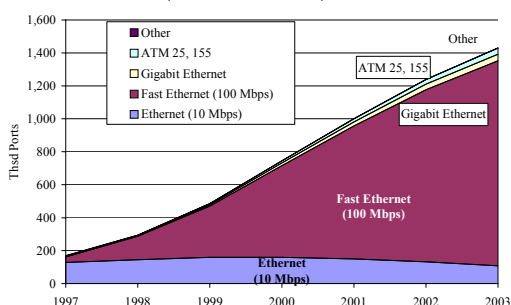
Switches Market Size with Technology Breakdown (Thsd US$)
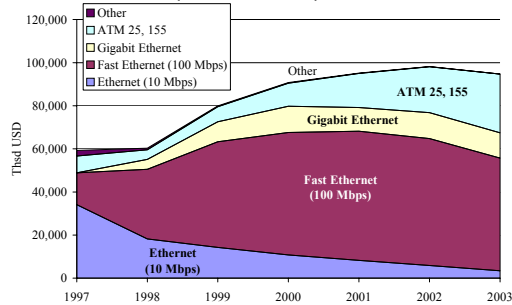
The proliferation of IP services will result in a substantial increase in routers sales. The demand for high capacity routers from ISPs will significantly change the product line mix towards the high capacity units.

Routers market size (Thsd Units)
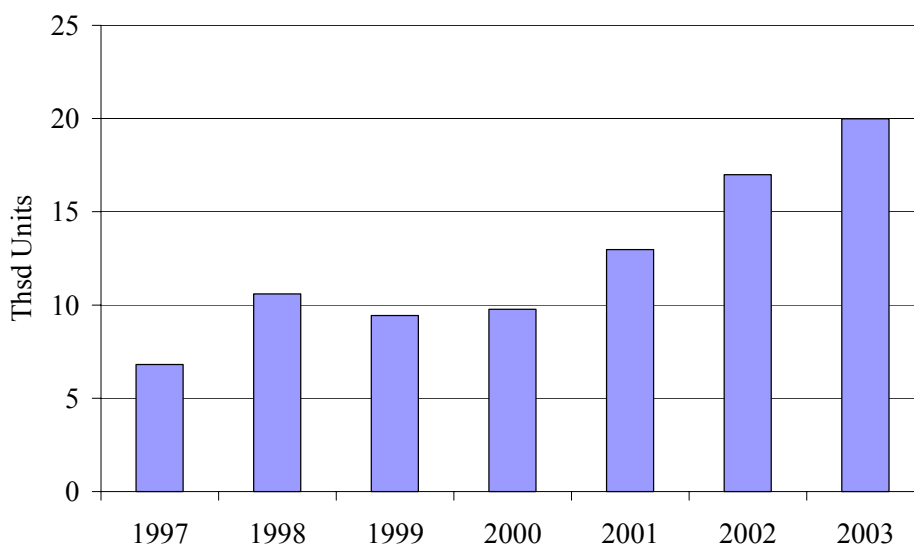
The data communications boom will considerably increase the demand for network interface cards (NICs) to be supplied with new PCs. The ratio between installed PCs and installed NICs will increase to over 70% towards 2003.

	1997	**1998**	**1999***	**2000***	**2001***	**2002***	**2003***
PC Shipments (' 000)	1,400	950	840	965	1,150	1,400	1,500
NIC to PC (Shipment) Ratio	46%	70%	72%	72%	77%	73%	75%
NIC Installed Base (' 000)	1,330	1,880	2,340	2,850	3,500	4,250	5,000
PC Installed Base (' 000)	3,650	4,200	4,500	4,900	5,500	6,200	7,000
NIC to PC (Installed) Ratio	36%	45%	52%	58%	64%	69%	71%

* estimated

NIC Market Size with Technology Breakdown (Thsd Units)
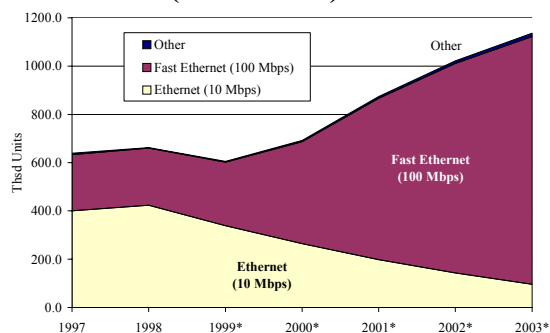
NIC Market Size with Technology Breakdown (Thsd US$)
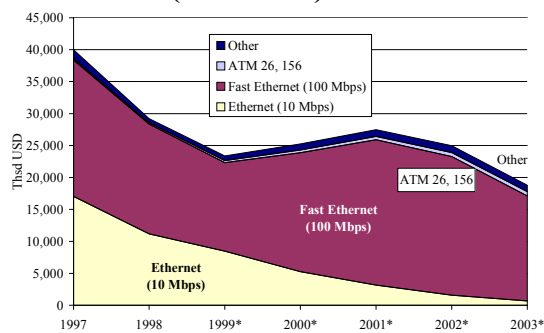
6   Regulatory Developments

Data communications has always been one of the most liberalised market segments in Russia. There is no limitation whatsoever as to the number of datacom providers on the national or regional level. For a long time Russian regulatory authorities refused to distinguish between various datacom protocols and applications. Until very recently it was sufficient to have a general data communications license to provide the whole range of services from lightest massaging applications to broad-band data services and IP connectivity.

The State Committee for Telecommunications has recently introduced a number of important changes to improve regulatory environment in data communications:

- IP service was finally defined as a separate telecom business to be licensed by Goscomsvyazi[1]

- Regulatory authorities called off a number of previously issued datacom licenses on the ground that licensees had never commenced the service. Tougher regulatory control was imposed on license applicants. Fewer licenses were issued in 1998.

- The concept for the development of data communications is to be drafted by the Regulatory Authorities to accommodate new technologies on the converging telecom market

However, Russian regulatory authorities are lagging far behind their counterpart in the developed countries and seem to be unprepared for the advance of the new datacom technologies and convergence of the telecom market. The regulatory uncertainty remains to be one of the most serious risk factors that defers Western and Russian investors from committing substantial financial resources to the development of the Russian data communications infrastructure.

There are several outstanding regulatory issues to do with data communications that should be resolved in 1999-2000 .The following regulatory developments would determine the face of datacom market in Russia:

⇒ Licensing for broadband data services (ATM and other)
⇒ Regulatory status of IP Telephony
⇒ Implementation of SORM[2] on datacom networks

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[1] Goscomsvyazi has been recently renamed into The State Committee on Telecommunications
[2] Functionality that enables low enforcement agencies to remotely monitor voice and data traffic on public networks

While the resolution on the first two issues could have an ambivalent effect on Supplier business, SORM would clearly represent a major threat to both Supplier and Supplier target customer operators.

6.1   IP-Telephony

There has been a fair amount of uncertainty over the status of IP telephony. It has never been included in the list of the services that are supposed to be licensed by Goscomsvyazi. Thus, strictly speaking, IP telephony should have been considered as an application within the whole range of IP services loosely defined in Russian regulation as "telematics services". However, the lack of transparency in the regulatory status of IP telephony was one of the major obstacles for the development of this service in Russia.

At the end of May this year, the State Committee on Telecommunications announced that IP-telephony in Russia had been finally given legalised. (No written official documents, however, has been published so far). The Committee simply stated that IP-telephony is a telematics service and shall be licensed accordingly.

Voice over IP has been recognised as an application rather than a separate service to be licensed.

The State Committee's announcement put an end to a long discussion over whether IP-telephony should be licensed as a telephony or data communication service. There were two power camps involved in this regulatory dispute:

⇒ Association for Data Transmission (and its working group on IP-telephony in particular). The Association, representing over 150 datacom providers and manufacturers insisted that IP-telephony should be considered as a telematics service, which would open the way for using voice over IP as an alternative to conventional telephony and compete for ILD and DLD with PSTN operators.

⇒ Svyazinvest and Rostelecom claimed that IP-telephony should be given a status of telephone service. In that cases IP-telephony would have been regulated by the same principals as wireline services. IP-telephony could have been subject of tariffs regulation. In addition to that IP-telephony operators could have been forced to route their international traffic via Rostelecom.

To-date, seven companies applied for an IP-telephony license with Goscomsvyazi. Currently there are around twenty-five operators which are offering IP-telephony services with other 40-50 exploring opportunities in this segment.

Rostelecom which is planing to receive #1 license to provide IP-telephony intends to become the dominant provider of the service in Russia. Regional operators, however, see IP-telephony as a possibility to by-pass Rostelecom.

Despite of a continuing devaluation of the rouble, Rostelecom's international long-distance tariffs remain very high. IP-telephony providers can offer much lower rates than Rostelecom and still return fairly high margins. Initially the incremental revenue will be reinvested into IP infrastructure. Even though voice over IP is not likely to

become a significant market segment before IP penetration in Russia reached 10-12%
IP-telephony is becoming a lucrative segment for equipment vendors in 1999-2000.

6.2   Licensing of broadband services

Asynchronous Transfer Mode (ATM) platform provides a unique capability for datacom operators to integrate voice, data, video and other broadband traffic within a single transport environment. Currently, ATM is licensed as a usual data transmission service.

Datacom operators, however, may use ATM platform to transfer telephone long-distance traffic. This is a direct threat to Rostelecom as a monopoly provider of long-distance services in the country. Rostelecom may try to lobby for limitations on datacom licensees in order to restrict ATM operators from diversification into Rostelecom traditional market segment.

The State Committee on Telecommunications has failed so far to clarify the regulatory status of broadband data services. However, based on the previous experience The Committee is certainly more concerned about protecting nation-wide natural monopolies (Rostelecom in this case) rather than developing environment for the potential competition on the converging telecom market.

Regulatory uncertainty over the broadband technologies and applications would be a major irritant for potential investors and suppliers, exploring opportunities with alternative Russian operators.

6.3   Sorm-2

SORM is the Russian acronym for "Sistema Operativno-Rozysknykh Meropriayatyi" (System for Operational-Investigative Activities). The regulation adopted in 1995 oftentimes referred to as SORM gave the Russian law enforcement agencies the power to monitor all telecommunications transmissions in the country. Under the terms of SORM, all telecommunications equipment installed in Russia has to be compatible with the hardware and software solutions used by the Russian security services to remotely control traffic to and from individual subscribers and to record individual conversations and/or data messages.

Currently, The State Committee on Telecommunications, The Federal Security Service (FSS), the Federal Agency of Governmental Communications and Information under the President of Russia (FAPSI) are working on a amending the existing SORM regulation to include IP and other data services. This amended regulation for datacoms is also known as SORM-2. If adopted the new regulation would translate into substantial incremental expenditure for IP operators and manufacturers.

The way the draft SORM-2[3] regulation reads today, every datacom operator would have to provide a communication channel between SORM equipment and/or

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[3] Detailed information on SORM-2 is available upon request

functionality on its network and a remote control center of the law enforcing agencies. It is particularly threatening for broadband service providers that under the SORM-2 regulation "the circuit to the remote control center should guarantee the transmission at the maximum speed available to the individual users and corporate customers".

SORM-2 is the single most important threat to the datacom industry as it would require significant extra investment and may ruin the business case for smaller regional operators. It will also require extra effort form manufacturers, who want to supply datacom equipment for the public network operators.

Because SORM-2 is essentially an industry standard rather than a Federal legislative act, it will not require approval by the State Duma or any other representative bodies. In order to be introduced it would require an approval by the Ministry of Justice and therefore is very likely to be adopted in its present version.

7   Operator Profiles

This section of the report provides brief profiles on the main data communications operators in Russia. They were chosen as a result of the expert poll conducted by J'son & Partners among 28 industry experts and IT managers based on the following criteria:

- Brand-name recognition
- Coverage
- Customer base
- Revenue

It is understood that the selected operators will to a large extent determine the trends on the Russian datacom market in the short term. In the longer term they would probably become the nuclei for consolidation of Russian datacom networks into a few major national operators.

7.1 *Global One Russia*

Profile	Started as data service provider for the global customers, based in Russia the company evolved into a carrier's carrier for over 100 regional X.25 and Frame Relay networks and built a single X.25 environment for domestic and international network connectivity
Range of services	Data communications (LAN-to-LAN, VPN, X.25, Frame Relay, IP), Intranet solutions, Telephony, ISDN services, leased lines
Number of subscribers	Provides services to the total number of over 110,000 individual and corporate customers across Russia
Subscription base	93 regional networks, over 1000 corporate customers
1998 revenues	US$85 mln
Geographical presence	Russia and CIS
Vendors	Cisco, Nortel, NET, Newbridge
International partners	Global One
Datacom licenses	#11088 data communication, #11089 telematic services
Operation started	1990 (as ROSSPRINT)

Global One group of companies in Russia, comprising of Global One Network and Global One Russia command the largest nation-wide data network with nodes in almost every major city, as well as an impressive in-country digital high bandwidth back-bone. Global One Russia is capable today of providing almost the whole range of Global One services available elsewhere in the World. A number of solutions that Global One provides in Russia on an exclusive or semi-exclusive basis such as Reuters 2000 dealing and particularly MICEX dealing make Global One a must for numerous Russian banks and trading houses. Global One has managed to consolidate the strongest customer base on the Russian market, covering a number of market segments from individual users and small businesses to major Russian banks and multinational accounts.

X.25 Network (2Q 1999)
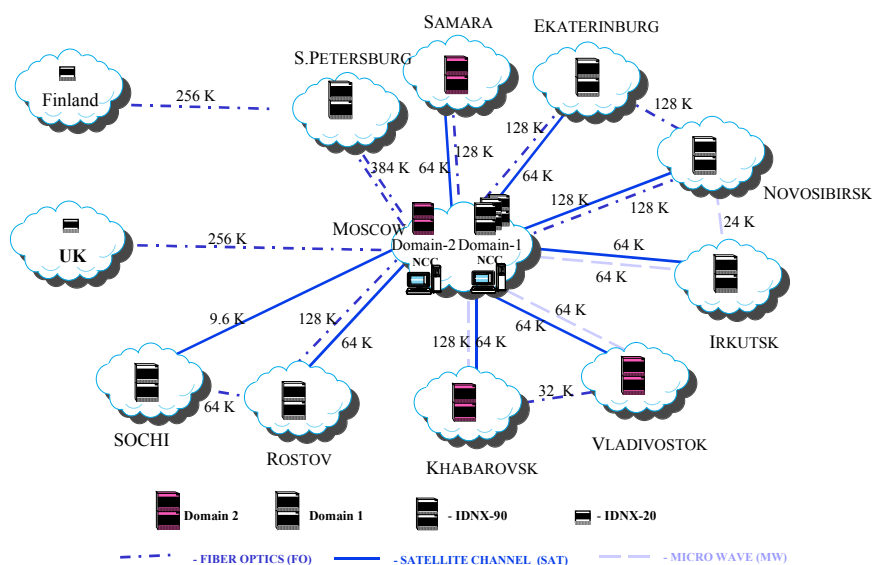
Global One has about 300 X.25 nodes with 8-16 ports per each node. Global One has about 12 acting Frame Relay nodes.

Backbone IP Network (2Q 1999)
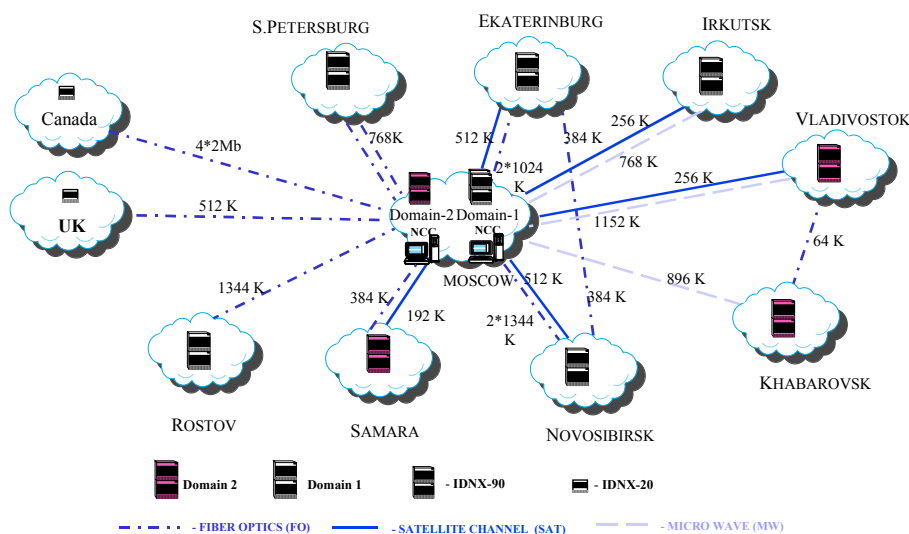
In addition to 10 regional centers, Global One has secured 93 contractual relationships with local data providers reselling Global One brand-name services, 28 distributors and 4 voice agents. There are over 250 locations in Russia covered by Global One X.25 services directly or through partners and resellers.

Global One Coverage
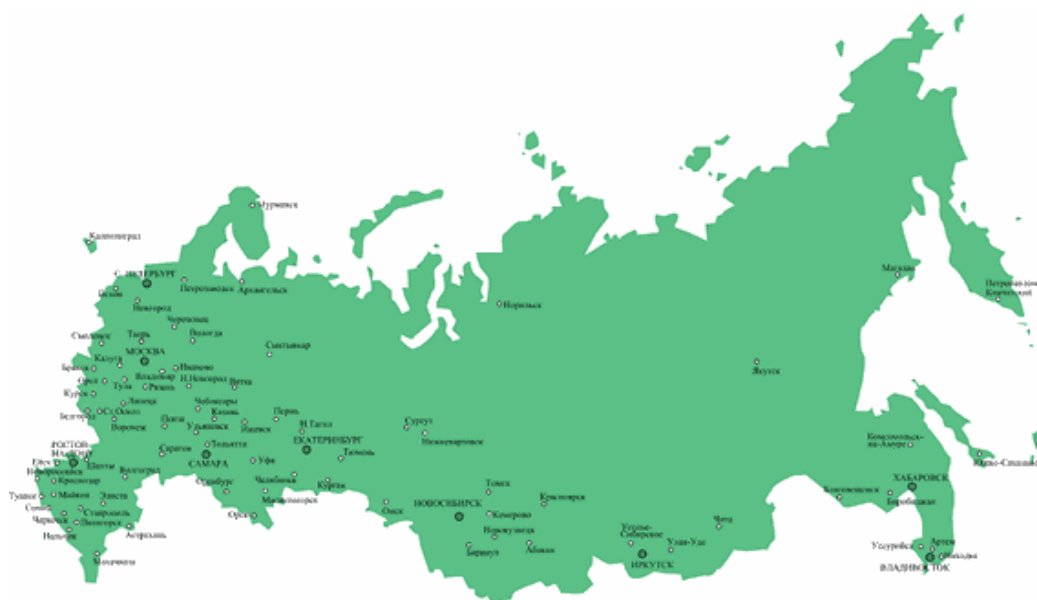
7.2 Sovam Teleport

Profile	The largest wide area Frame Relay network in Russia, the holder of "Russia-on-Line" brand name
Range of services	Data communications (LAN-to-LAN, X.25, Frame Relay, IP), Internet services, SovamBankNet (secure LAN for interbank communications, access to S.W.I.F.T., Moscow Interbank Currency Exchange (MICEX), international financial services, Credit card validation and Automatic Teller Machine networking
Number of subscribers	16,000
Subscription base	Over 500 large corporate customers who access Sovam service directly or through a satellite base TeleRoss network, over 15,000 individual and small corporate users of Sovam's Internet platform
1998 revenues	US$45 mln
Geographical presence	Russia and CIS
Vendors	Nortel
International partners	GTS
Datacom licenses	#9899, #10991 data communications, #10992 telematic services
Operations start	1990

Sovam Teleport is a Russian-American joint venture, which is a part of GTS group of companies. This operator has started its activities in 1990 serving several clients in Moscow.

SovamNet is build on high-speed digital channels and switching equipment of Nortel Passport/DPN Magellan series. Network has a flexible configuration. Every large node has a spare capacity and 2 alternative routes for data communication. In summer 1998 a new 8 Mbps channel was installed. Now Sovam Teleport has a 13 Mbps international link capacity. It is connected to backbone channels to USA through Finland, Sweden and Denmark, and then through CANTAT-3 transatlantic cable network.

Network management and control centres are located in Moscow and St. Petersburg. They are equipped with Sun Microsystems computer systems. Data communications protocols in use are ATM, Frame Relay, TCP/IP, X.25, HDLC, SDLC and SNA, what gives a possibility for communication and connectivity with other networks. Sovam Teleport has the largest Frame Relay nation-wide network with more than 60 nodes.

Sovam Teleport Network (SovamNet)
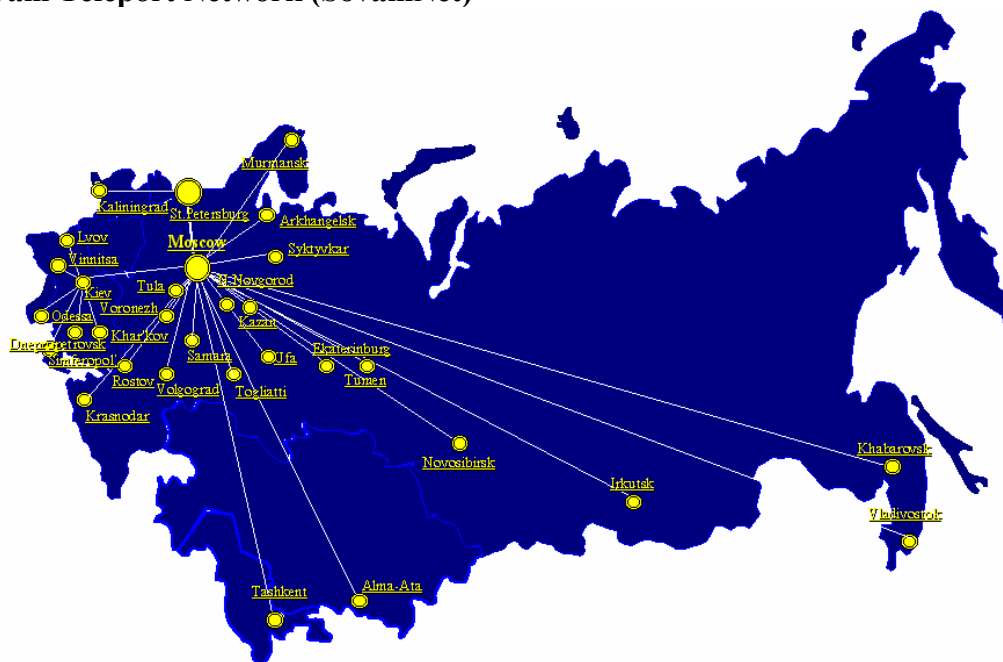
In September 1995 Sovam Teleport has started "Russia-On-Line" (ROL) service for Internet access both for individuals and businesses. It was the first service with free of charge Internet roaming in Russia and CIS and also with credit card payments possibility. ROL and Sovam Teleport provide dial up and dedicated channels Internet services, including multi-protocol data communication.

In 1998 about 80% Sovam Teleport traffic was IP protocol and about 10% of it was voice over IP and broadband applications. About 40% of Sovam customers are Internet users. There are about 14,000 customers, including about 500 corporate (with number of users from five to two hundred).

Amongst large customers are banks, investment companies and other financial institutes. Sovam provides interconnection between local networks for inter-bank communications, access to S.W.I.F.T., Moscow Interbank Currency Exchange (MICEX), international financial services, Automatic Teller Machines (ATM) and credit card processing networks.

7.3 *Iasnet*

Profile	The oldest X.25 network in Russia, a partner in Rospac (the Federal Data Communications Network), Has been reselling BT and Concert services in Moscow and beyond
Range of services	Data communications (X.25, Frame Relay and IP) messaging (X.400), local, intercity and international telephony on the private network, Concert global network services (CPS, CFRS and CRAS)
Number of subscribers	1,200
Subscription base	The core of the customer base is 150 large Russian corporate customers. There are also 120 Concert customers on IASNET Frame Relay network.
1998 revenues	US$3 mln
Geographical presence	Russia
Vendors	Alcatel, Cisco, NET
International partners	British Telecom
Datacom licenses	#2245, #5733 data communications and telematic services
Operations start	1989

IASNET is the holder of the first Russian X.25 DNIC - 2502. It currently provides international and domestic connectivity to more than 80 cities in Russia and CIS. Although IASNET remains to be one of the few independent operators (without Western strategic investors) it developed a number of international gateways with global providers and its counterparts in CIS. IASNET provides interconnection to 120 international data communication networks via X.75.

IASNET's core business remains low speed dial up and dedicated X.25 access (from 9.6K to 64K). The operator has recently introduced Frame relay services and is capable of providing integrated voice and data services over Frame Relay.

IASNET/IP network (Internet access) has both dial up and dedicated users. Direct connection can be provided in Moscow, Surgut and Cheboksary. Users from other regions have to access IP platform via X.25/Internet gateway. IASNET X.25/Internet gateway gives inexpensive online access to Internet for X.25 users and locations where only X.25 services are currently available. The gateway supports SLIP, CSLIP, PPP protocols.

Since 1995 IASNET have been reselling British Telecom services and providing access to Concert global network. Since then BT telehoused with IASNET a powerful IDNX network node and started providing broad-band services (including Frame Relay, closed user group voice and video). Over 100 Concert customers based in Moscow are generating 50% of IASNET revenues.

7.4 *Infotel*

Profile	
Range of services	Frame Relay, IP, PPP; X.25 ; X.400; fax store-and-forward system; telex
Number of subscribers	3,500 businesses, plus over 5,500 individuals
Subscription base	300 German multinationals and Russian government agencies
1998 revenues	US$10 mln
Geographical presence	Russia
Vendors	Siemens, Cisco, Motorola
International partners	Deutsche Telekom
Datacom licenses	#5719, #11659 data communication, #11660 telematic services
Operations start	1992

INFOTEL network was created in 1992 to service foreign community and joint ventures seeking reliable data communications to European destinations. Infotel since then diversified into domestic data market and obtained one of the first DNICs - 2504. Infotel does not have very strong presence in the regions and initially it capitalised on the cheap "last mile" solutions available to Infotel through one of its shareholders – MGTS. Very much like other traditional X.25 providers Infotel gradually developed IP capabilities and is currently operating as an ISP with points of presence in 45 cities in Russia and Middle Asian republics of CIS. There are 6 main regional nodes on Infotel network:

- Rostov-on-Don
- St.-Petersburg
- Samara
- Ekaterinburg
- Novosibirsk
- Khabarovsk

In the above locations Infotel offer high-speed data and broad-band services. Other customers on Infotel network long-line to the regional nodes and most typically support X.25 and IP applications.

Infotel Presence in Russia and CIS

Infotel is one of the few Russian datacom providers who managed to establish a strong presence in Kazakhstan, Kyrgyzstan and Uzbekistan with a network center in Bishkek.

The majority of Infotel customers are government agencies and large Russian banks, who have been severely affected by the crisis (State Parliament, Foreign Ministry, FAPSI, Moscow Administration, Central Bank of Russia). It is expected however, that Infotel will be able to retain its premium customers – German multinational corporations (BASF, Siemens, etc.).

7.5   ROSNET

Profile	One of the largest X.25 networks in Russia
Range of services	Data communications (X.25, X.28, Frame Relay, TCP/IP, SNA/SDLC, DSP), X.400/X.500, telephony, IP
Number of subscribers	More than 50,000
Subscription base	Large Government agencies with multiple points of presence, Major banks
1998 revenues	US$19 mln
Geographical presence	Russia
Vendors	Cisco, Motorola, Telematics, Newbridge, Alcatel, ECI Telecom
International partners	AT&T
Datacom licenses	#5835 data communication and telematic services
Operations start	1993

Presently Rosnet has about 400 nodes in about 45 regions of Russia. It is one of the largest data communication networks in Russia. Network Management Center is located in Moscow, major support nodes are in St. Petersburg, Ekaterinburg, Barnaul and Rostov-on-Don.

Rosnet Network Structure
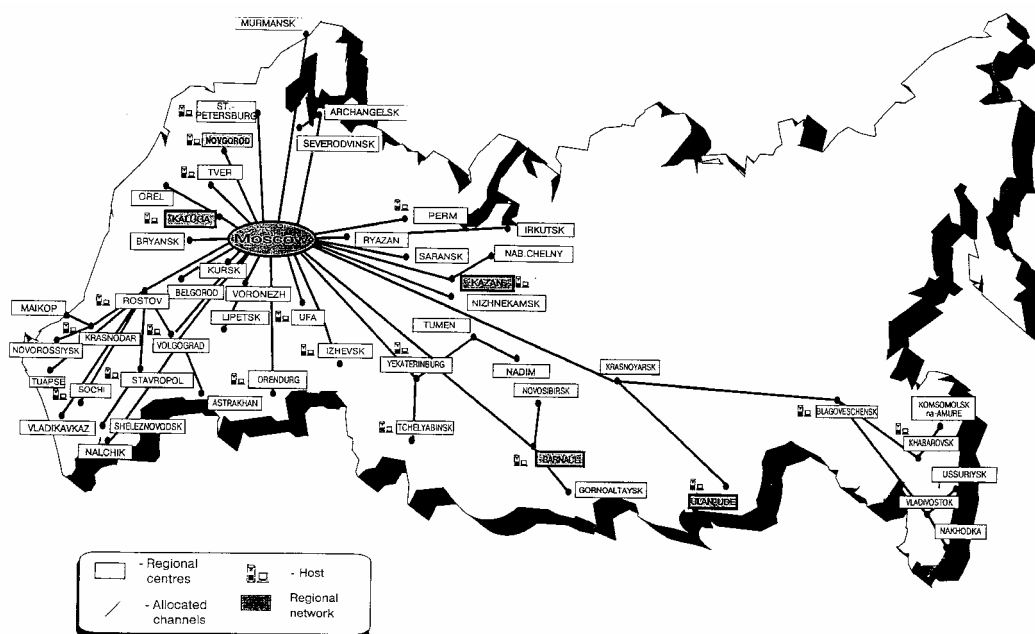
Rosnet network has a gateway that provides Internet access via X.25 and Frame Relay protocols. Operator also provides wireless Internet access over point-to-multipoint 2.4 MHz microwave. Major clients of Rosnet are Central Bank and Pension Fund, which both have very sophisticated virtual private networks on Rosnet platform. Rosnet has been chosen as a preferred service provider for State Customs Committee and is now implementing a nation-wide network to link regional Customs offices to the Central Processing Node in Moscow.

Rosnet in cooperation with Alter-Vest has started a new electronic commerce project.

7.6   Golden Line

Profile	The largest local Frame Relay network, The dominant Frame Relay and TDM service supplier in Moscow
Range of services	Multi-protocol data communication services, Internet services, leased circuits
Number of subscribers	4,000
Subscription base	Large corporate customers, Overlay operators in Moscow, MGTS and affiliated service providers
1998 revenues	US$8 mln
Geographical presence	Moscow and Moscow region
Vendors	Newbridge, RAD, Telematics
International partners	BT, Teleglobe, Sonera
Datacom licenses	Data communication and telematic services
Operations start	1993

Golden Line built a full fledge digital backbone network Moscow with about 500 km of fiber optic cables, 200 TDM multiplexers and 50 ATM switches.

Out of 4,000 customers about 800 use virtual private circuits for LAN-to-LAN connections. Approximately 500 users lease capacity to remotely access financial services and other information resources. More than 1000 customers use Golden Line Frame Relay service to connect to ISPs and other data communication networks. Golden Line's share on Moscow leased channels and Frame Relay market is estimated at 50-60%.

In addition to the commercial service providers, Golden Line has a major account with MGTS. Golden Line network is oftentimes used as a back-up for MGTS own backbone.

7.7 MTU-Inform

Profile	One of the largest local ISP and data communication operators with its own backbone network and wireless local loop capability. MTU-Inform is a flagship datacom operator in "Sistema Telecom" family of companies
Range of services	Multi-protocol data communication, Internet, telephony, cable TV, cellular TV and broad-band services, leased circuits
Number of subscribers	30,000
Subscription base	Predominantly individual subscribers and small businesses
1998 revenues	$10 mln
Geographical presence	Data communication and telematic services in Moscow and Moscow region; telematic services in Vladimir, Kaluga, N. Novgorod, Ryazan, Smolensk, Tver, Tula and Yaroslavl oblast
Vendors	Newbridge, Cisco
International partners	Teleglobe
Datacom licenses	#8483 data communication, #8462, 10550 telematic services
Operations start	1995

MTU-Inform, which has been originally set up as an overlay network for conventional telephony, developed an unparalleled digital network in Moscow metropolitan area. In addition to the enhanced local access it introduced data communications and leased circuit services. MTU-Inform quickly built a strong customer base for datacom and broadband services and pioneered in wireless local loop access for voice and data. It accounts for over 15% of the Moscow IP market.

MTU Inform Network Topology

MTU-Inform is currently exploring opportunities in cellular TV (MVDS, LMDS) and will launch a high capacity wireless IP network for corporate and individual customers in downtown Moscow.

Apart from access services MTU intends to enter contend market and diversify into electronic commerce business.

7.8   Demos

Profile	The company was the pioneer on the Russian IP market and still controls a major share of the IP access market
Range of services	Data communication services, Internet services, system integration and local area network installation
Number of subscribers	12,000
Subscription base	Apart from individual customers Demos provides connectivity to over 40 smaller ISPs
1998 revenues	US$14 mln
Geographical presence	Moscow, several remote nodes in the regions
Vendors	Digital Equipment Corp., Cisco, Hewlett Packard, Sun Microsystems
International partners	MCI
Datacom licenses	#771, #5715, #10068, #11245 data communications, #11246 telematic services
Operations start	1990

Demos, who created the first IP network in Russia (datacom platform, linking a few enterprise networks and R&D centers in Moscow) launched a commercial service in 1992 and quickly evolved into a leading provider of IP connectivity in Russia. It is now operating a high capacity gateway to MCI and long lining to the regional providers who offer Demos services under franchise arrangement. There are over 50 regional nodes connected to Demos IP resources through terrestrial and satellite circuits (from 64K to 2M).

In addition to the regional telcos Demos has a strong individual customer base in Moscow. However, the core business for Demos remains high capacity IP access for secondary providers. Demos have recently launched "Internet Russia" initiative, which envisages a single IP environment and seamless service under Demos brand name in 80 regions. Currently there are 11 regional nodes and three customer service centers promoting the services of Demos and allied IP operators.

Traffic Break-Down For "Internet Russia"

	External link	Russian networks	Dedicated channels (clients)	DialUP	Collocation	Demos	Total
Total ports' capacity, Mbps	10	100	24	10	40	100	284
Average incoming traffic, Mbps	8.6	11.1	5.1	0.3	4.8	13.3	43.2
Average outgoing traffic, Mbps	6.5	19.6	7.7	1.0	0.8	7.6	43.2

7.9   Relcom

Profile	One of the first IP providers in Russia and a preferred supplier of government agencies
Range of services	IP, Data communications
Number of subscribers	15,000
Subscription base	Government and non-commercial organisations, banks and other financial institutes, commercial companies, scientific organisations, computer and telecom companies, information agencies and mass media, individuals.
1998 revenues	US$16 mln
Geographical presence	Russia and CIS
Vendors	Cisco
International partners	EUnet
Datacom licenses	#8523 data communications, #8188 telematic services
Operations start	1990

Relcom split from Demos in 1992 and launched an independent service in partnership with EUnet. Since then Relcom developed a well recognised brand name and won a dominant share of light IP applications such as E-mail and dial-up access. The company expanded beyond Moscow and established presence in over 50 locations in Russia and CIS.

Relcom Presence In Russia And CIS

In 1996 Relcom introduced an ambitious project to consolidate Relcom, Rospac and Rostelecom platforms in order to build "Business Network of Russia". The project was supported by a few overlay operators in Moscow (Comstar, Belcom) and Government agencies (FAPSI). However it has never been realised due to the lack of finance.

Nevertheless, Relcom have substantially improved their coverage and even launched a satellite based Relsat service for remote correspondent networks and major corporate customers.

Relcom Moscow node traffic

Year	UUCP, Gb	IP, Gb	International e-mail, Gb	Domestic e-mail, Gb
1993	143.9	19.6	11.1	84.4
1994	155.4	189.8	12.4	88.4
1995	217.6	1,089.1	17.0	147.9
1996	365.3	5,452.9	23.2	180.3
1997	248.2	16,088.9	20.9	160.9
1998	171.2	38,218.0	17.24	278.6

Relcom have recently refocused their activity on large corporate customers and scaled down its retail sales for dial-up users. It is expected that Relcom would be a strategic partner for Rostelecom, should Rostelecom decide to diversify into IP carrier's carrier service and compete for the end users with Global One and Demos.

8   APPENDIX

Equipment certificates

List of suppliers' distributors