MARKET REPORT

RUSSIA ILD / DLD SEGMENT OVERVIEW

Prepared by J'son & Partners

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INTRODUCTION

The purpose of this research was to develop projections for Russian ILD and DLD segment in terms of physical traffic, service revenues and expected capital expenditures.

This research has been carried out to develop a comprehensive picture of the Russian DLD and ILD segment with a special focus on ECR main customer operators such as Rostelecom, Electrosvyazes and alternative DLD carriers. More specifically, J'son & Partners were asked to look into the following issues:

- Traffic, tariffs and revenues of the Russian LD operators
- Current and future demand for transit switching and backbone transmission
- Capital expenditures by the main Russian operators
- Market structure and product life cycles

This report is based on the extensive market research carried out by J'son & Partners in April and May 1999. It incorporates confidential data on 89 PSTN operators consolidated and reconciled by J'son & Partners, key traffic and revenue data and projections by Rostelecom, most recent figures on ILD traffic volumes and breakdown.

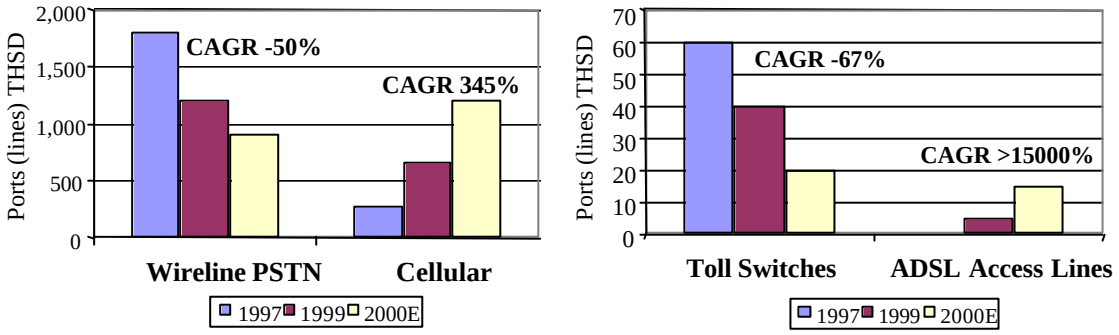
The projections and estimates in the report are based on the J'son & Partners' proprietary models and techniques that proved to deliver very accurate evaluations in Russia and other geographical markets internationally. On top of that the report features the results of the express **survey on the emerging alternative operators in the voice over IP segment**. The appendix to the report provides essential network statistics, tariffs and rates as well as the industry indicators.

EXECUTIVE SUMMARY

Historically the toll switching and backbone transmission has been one of the most important market segments. Switching platforms for ILD and DLD services accounted for 30-35% of the total equipment market in Russia between 1994 and 1996. The pick of transit switching equipment sales in Russia apparently took place in 1997 when Rostelecom expanded their fleet of international gateways and Svyazinvest embarked on an ambitious program to replace obsolescent analogue exchanges with the modern digital switching nodes. The process has been to a large extent financed from external sources, including vendors' finance happily extended by the leading manufacturers. Indeed at that time ILD and DLD segment was one of the few sectors where the borrowing operators could come up with a robust business case for outside investors. Total outstanding debt to vendors and other external investors by Rostelecom alone totalled about $500 mln by December 1999.

Following the completion of the initial modernisation program in 1998, main Russian customer operators are likely to cut their equipment purchase budgets earmarked for toll switching and backbone transmission. Instead they are projected to refocus on other segments such as wireless, access networks and IP technologies.

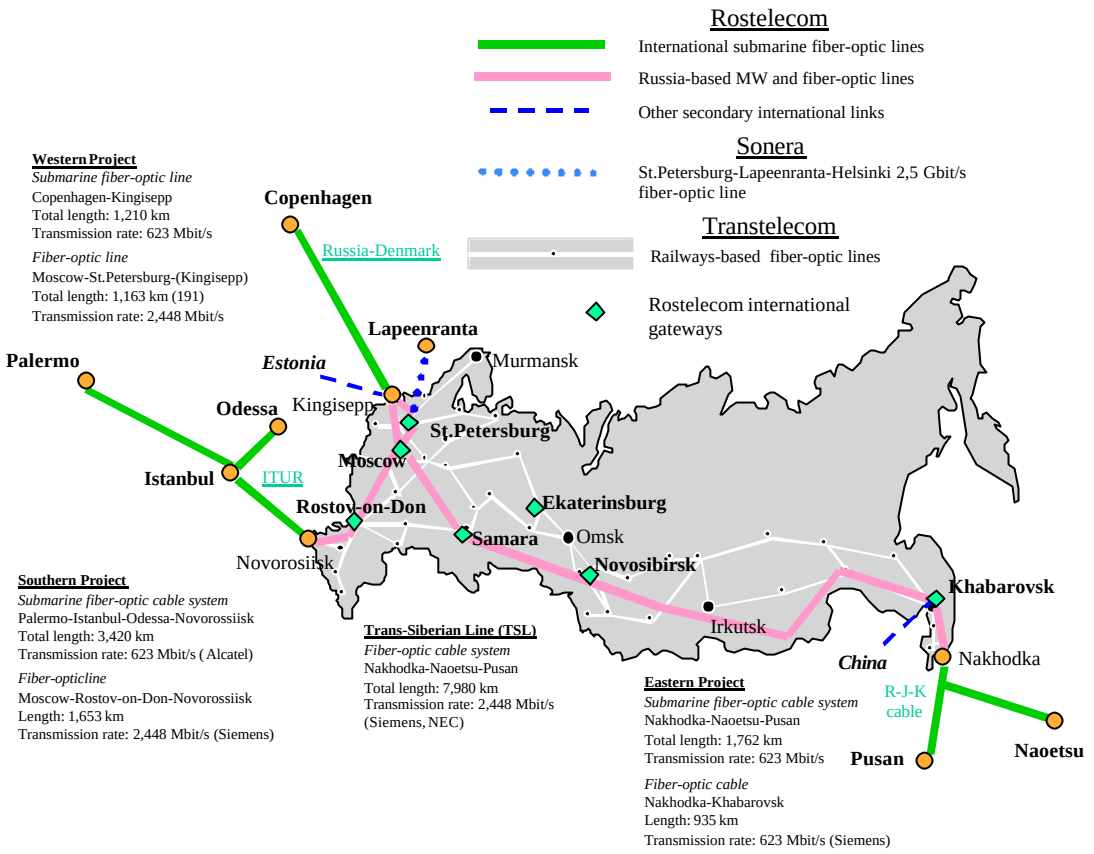
Growth and Saturation in Different Equipment Segments



The first indication of the market saturation could be seen already in 1998, when Rostelecom and regional operators replaced 85% of their total transit switching capacity and limited their purchase to 50,000 ports. The financial crisis in mid 1998 further contributed to the trend. **Limited internal finance sources and scares external credits made Russian operators severe their capital expenditures.**

In year 2000 the total long distance switching equipment sales in Russia is estimated to reach merely USD 6 mln. Based on the internal plans by Svyazinvest and Rostelecom the total equipment purchases will hardly exceed USD 20-25 mln in the following 5 years.

Overview of the Russian DLD and ILD Infrastructure



The addressable market for traditional switching and transmission started to shrink rapidly as a result of the following main developments:

- Out of 89 main toll switches on the Russian PSTN network 80% have been successfully replaced by AXE-10s, EWSDs and S-12s by the end of 1999. Russian roaming network for NMT and GSM operators might be said to have been also completed with 6 transit nodes installed by Interregional Transit Telecom. There are hardly any regional toll switches left for replacement. It is estimated that the maximum physical volume of switching equipment to be supplied annually should be 8,000 – 12,000 ports.
- By 1998 Rostelecom completed three principal international links to integrate Russia into the global telecommunications community. The aggregate ILD capacity available to Rostelecom has been increased to over 45,000 voice circuits (64K equivalents). Furthermore Rostelecom expanded its international switching base to approximately 50,000 ports (more than sufficient to carry an average of 400-450 mln minutes of proper ILD traffic typically generated by the Russian PSTN and CLECs). Rostelecom is unlikely to invest heavily into further modernisation of ILD networks.
- Although domestic backbone remains severely underdeveloped compared to other countries it has been substantially upgraded. The completion of the Trans Siberian Line with outspurs to all major industrial centres on the way from Moscow to Khabarovsk increased Rostelecom capacity by 150-200%. The new fibre-optic line commissioned in December 1999 along side the digital microwave helped Rostelecom to satisfy immediate demand for DLD connectivity in over 20 administrative units of the Federation with 45% of the Russian population.

Migration to new technologies could have maintained the overall volume of sales in the segment were it not for negative ramifications of the 1998 crisis. The devaluation and the following tariff decrease (in real terms) disrupted the capex programs by the leading operators.

The network development in Russian PSTN domestic and international long distance segment has been further slowed down because of the external factors:

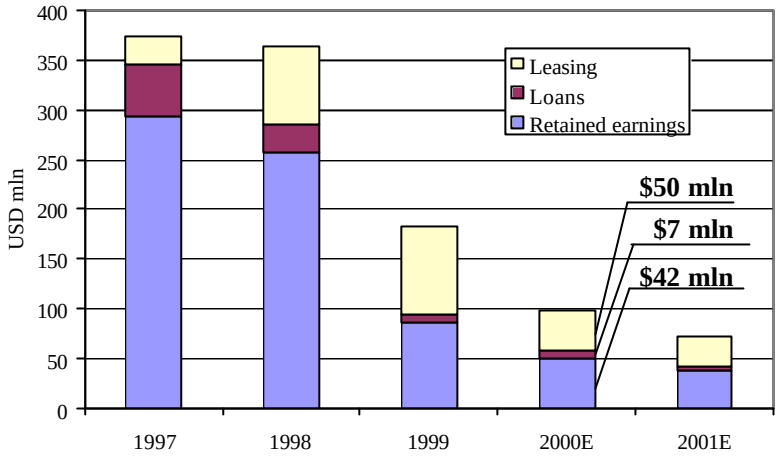
- **Very low socially subsidised tariffs** leave virtually no margin to be reinvested into network development. Unless the tariff structure is changed to reflect the depreciation and capital investment required to maintain and develop network, the Russian operators will be doomed to rely on external credits. Assuming that the total outside investment could potentially be between 150 mln and 200 mln in 2000, one can hardly expect that the investment into backbone infrastructure can be over USD 20 mln.

- **Slower than expected proliferation of broadband services** (ISDN, leased circuits and VPN solutions, FR, IP) undermines the demand for carrier's carrier services in Russia. Russian traffic is still predominantly (94%) voice. Data services failed to reach penetration similar to what one can see in the more developed economies. Currently the spending on IT is merely 0.5-0.6% of GDP compared to average 2.5-3.0% in Europe. In fact the GDP growth over the last 12 months driven primarily by energy and oil industries is unlikely to change the negative trend. Over 45% of Russians are still unaware of Internet, less than 20% Russian corporations have LANs and only a handful of largest corporations run their own WAN corporate networks.

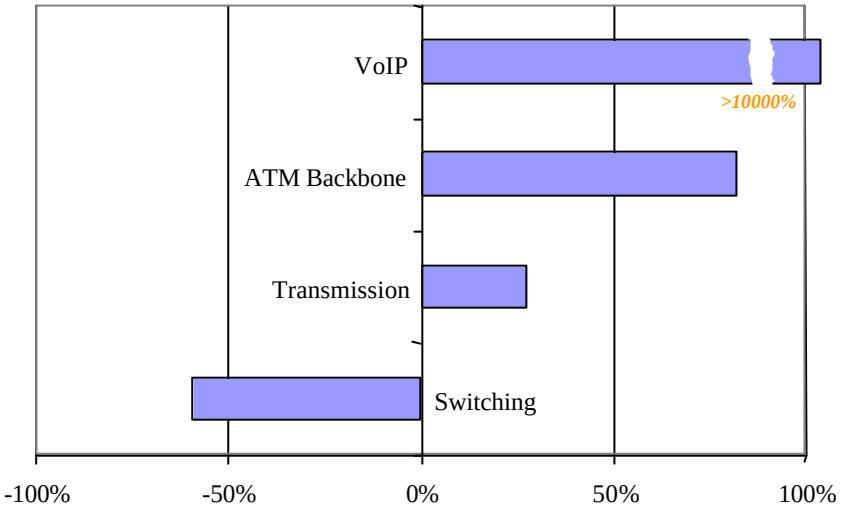
- **Severely underdeveloped local infrastructure** does not allow to fully capitalise on the investment into DLD segment. The newly commissioned backbone capacity does not generate enough incremental traffic revenue to justify the investment and thus does not make much economic sense. The majority of regional toll switches have call completion rates of better than 95%, while the major bottlenecks literally block traffic behind the switch deep in the dilapidated local infrastructure.

Overall the capital investment into DLD and ILD switching equipment and transmission on the Russian public switched telephone network is projected to decrease by 46% in 2000. It is expected to further decrease in 2001, the rate of decrease pending on regulatory decisions concerning tariff re-balancing.

Rostelecom Capex (1997-2001)



Market Momentum: Change in Sales Volumes (1997-2001)



Main opportunities lie in the area of new technologies that will gradually replace circuit switching as a primary technology for mass telephony services:

⇒ **IN platforms**. Although until very recently there has been a limited demand for IN platforms the introduction of sophisticated numbering plans in Moscow and other major cities might facilitate the increasing use of intellectual network services on the long distance level. Some of the services have been already pioneered by commercial overlays (Logic line by MTU-Inform) and the most advanced PTTs (IN services offered by Uralsvyazinform based on S-12 platform). "Eight hundred" numbers, call transfer to long distance destinations, remote operator assistance and other popular services are projected to generate between 3% and 5% of the total voice revenues in 2002-2003.

⇒ **Internet backbone**. Both incumbent DLD and ILD operators, such as Rostelecom, and emerging alternative providers (from CLECs and large enterprise networks to medium and small size start-ups) will try to establish presence in IP market. Rostelecom alone was originally to buy up to USD 100 mln worth of backbone ATM equipment to more efficiently route IP traffic. Although the

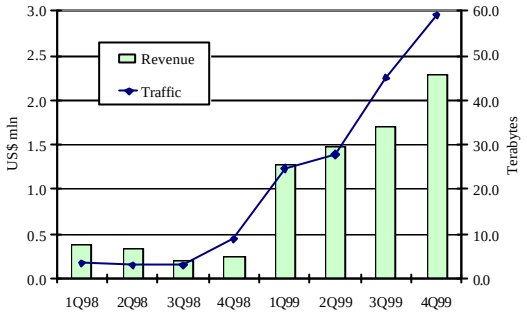
original plan has never been implemented in full, Rostelecom expect that their investment in IP could reach 15-20 mln. IP traffic on their network could reach 4,000 Tbytes per annum by 2003.

⇒ **VoIP segment**. IP telephony which is oftentimes treated as an insignificant segment (with a limited market for suppliers chasing a closed group of the most advanced customer operators) promises to quickly evolve into the dominant technology for DLD and ILD connectivity. Ironically in Russia, which represents a relatively underdeveloped telecom environment VoIP can develop faster that on the liberalised markets simply because Russian alternative operators could use IP telephony as a legitimate by-pass to break Rostelecom monopoly on ILD and DLD traffic.

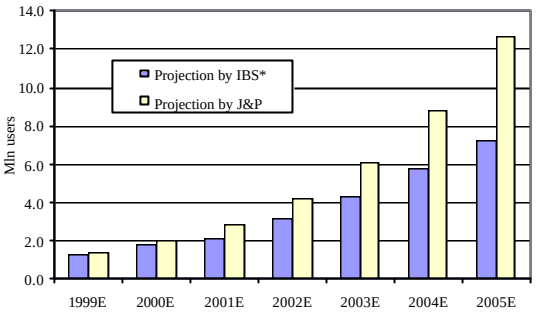
IP BACKBONE AND ACCESS EQUIPMENT

Although Russia has a fairly large IP population the IP penetration is so low that the data traffic accounts for merely 6% of the total traffic volume[1] and incumbent operators do not yet feel an imperative to migrate on the packet switched technologies.

IP Traffic on the Rostelecom



IP Growth Projections



** IBS is one of the leading IT vendors with an aggregate revenue of $173 mln.*

Internet growth in Russia is unlikely to match the proliferation of IP technologies in Europe and US. Potential IP audience is still projected to reach between 8 mln and 12 mln people by 2005. Shortly after that the growth might be arrested altogether, unless the PC penetration can increase dramatically. The following main factors that slow down the IP growth in Russia have been identified:

⇒ **Very low penetration of PCs**. Currently there are about 6.5 mln PCs in Russia. If the current trend is any reference (and the shipments of new PCs have been quite stable except for 1998), the Russian fleet of PCs should reach 9.4 mln by 2005. Almost 30% of the existing computers are obsolescent Intel 286/386 based PCs and compatibles.

⇒ **Comparatively high cost of access**. The average rate of Russian ISPs is USD 1.5 per hour (including VAT). Assuming an average user spends 5-7 hours on the Web, the total monthly bill hardly exceeds USD 10 for the dial up customers. If PSTN operators introduce by-the minute charge the cost of the dial-up access will increase almost 100% for the end-user. Although small in absolute figures, this cost would be very high compared to GDP per capita in Russia - 0.1% vs. 0.005% in Western Europe.

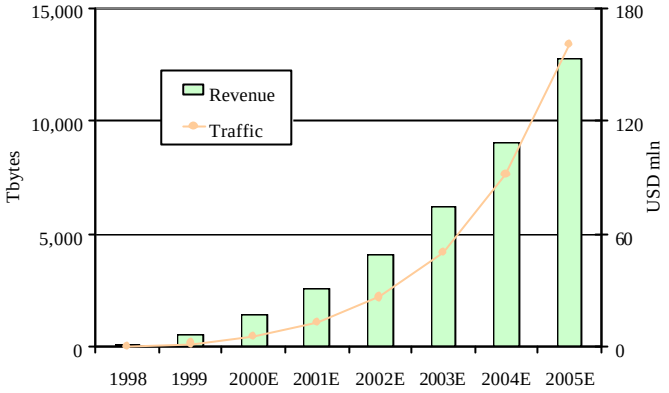
⇒ **Content deficit and lack of incentive to use IP**. The obvious language barrier and the gap in disposable income between Russia and the developed countries does not allow Russian audience to fully appreciate the consumer advantages offered by the Web internationally. At the same time domestic content is limited to about 6,000 sites more or less frequently visited by the Russian IP users. There are only 2 hosts per 1,000 population in the Russian Internet compared to 36 in Western Europe.

IP subscriber population, which is currently evaluated at 1.6 mln is expected to grow at a rate of 40-45% annually to reach 12.6 mln by year 2005. That would translate into 8.7% penetration (expected scenario), still lower compared to the average penetration of 9.5% in Western Europe in 1998.

[1] Including local and long-distance traffic

At the moment IP access service accounts for a fraction of Rostelecom revenue. In 1999 Rostelecom's IP driven revenue totalled 6.8 mln USD which is almost 6 times more than in 1998, when Rostelecom started to provide IP connectivity. It is expected that traffic will double annually during the nearest 2-3 years with increase of Internet audience and availability of enhanced Internet technologies, such as IP telephony, e-commerce, etc. And though prices are expected to drop 2.5-3 times within the next four years, increase in volumes will well offset such a drop.

IP Traffic: Rostelecom Own Projections



The increasing number of users and, which is even more important, the growing demand for broader band applications will definitely drive the demand for high capacity long-distance transport such as ATM backbone.

However, if Rostelecom requires about 1,200 2 Mbps bearers (E1 equivalents) to carry its current voice and data traffic, the IP (even assuming it keeps growing at the present rate) will hardly require more that 150-200 E1 equivalents by year 2003. This is partially explained by the peculiarities of the IP traffic pattern and partially by the fact that IP requires ostensibly lower capacity due to the very efficient bandwidth use in packet switched networks.

Overall it is fair to assume that DLD and ILD operators should account for 30-40% of the total sales of IP related equipment (including ATM backbone switches, routers, and access nodes). Furthermore in monetary terms the volume of sales is expected to grow 45-50% annually through to year 2002. In absolute figures that will translate into USD 40 and 80 mln for 2000 and 2002 respectively.

Currently this market niche is dominated by Cisco, Nortel, Lucent, Alcatel (following the alliance with Newbridge) and aggressively invaded by smaller manufacturers such as ECI Telecom.

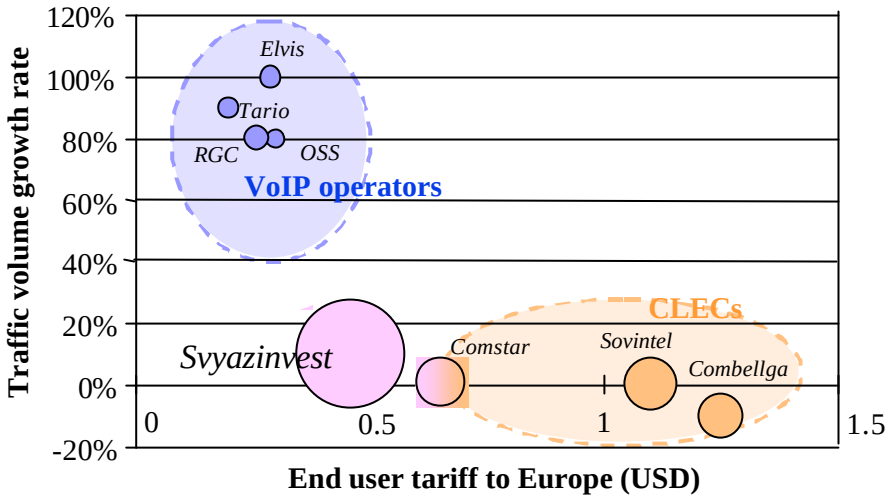
PACKET SWITCHED VOICE

Regardless of whether the higher penetration of IP services could generate more traffic for Russian carrier's carriers there is one transformation that IP will inevitably bring to the industry.

Both incumbent and alternative telephony operators will gradually migrate on the principally new technological platform – Voice over IP. The overwhelming majority of voice traffic will ultimately travel on the packet switched transport network which is by definition is more efficient and flexible than any circuit switched platform.

It is beyond the scope of the executive summary to discuss pros and cons of VoIP solutions vis-à-vis conventional telephony. There is an in-depth analysis of the IP telephony business models in a separate section of this report. However, it is important to mention here, that leaving to a side economic aspects and technical feasibility, the single most important advantage of VoIP is that it enables alternative operators to legitimately invade Rostelecom's home turf – premium ILD and DLD segment.

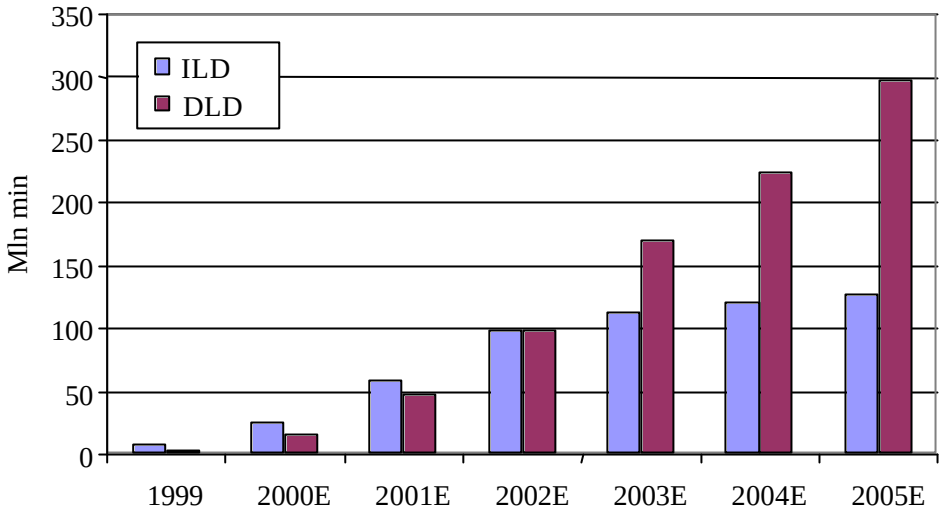
Revolution in ILD market



Bubble size stands for current ILD and DLD revenue in hard currency equivalent

Based on the most recent trend on the Russian market VoIP operators are currently the fastest growing carriers (in terms of traffic volumes). They offer much more attractive tariffs than traditional CLECs and even heavily subsidized PSTN. That is why, VoIP will most certainly take a far larger market share than currently projected by most of the analysts from outside the Russian telecom industry. In fact, Russia might very well catch up with the most advanced markets by 2005 in respect with the share of the ILD traffic carried over IP transport.

Russian VoIP Market Overview

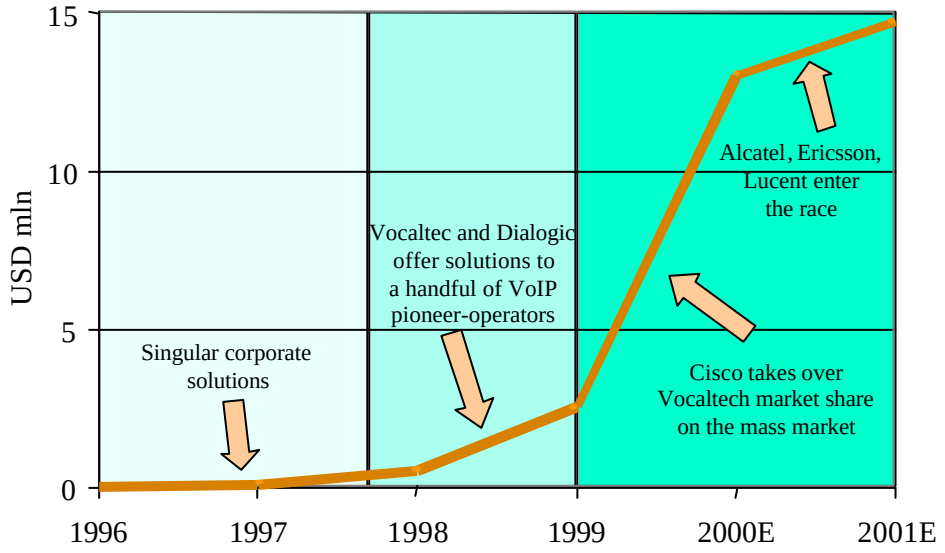


	1999	2000E	2001E	2002E	2003E	2004E	2005E
% of Rostelecom ILD	2.3	7.1	16.3	26.3	29.0	29.8	30.3
% of Rostelecom DLD	0.1	0.4	1.2	2.5	4.1	5.3	6.9

Much like in other markets, the growth in VoIP segment will be achieved to a large extent at the expense of the traditional voice revenues cannibalised by the VoIP operations. It is projected that world-wide up to 50% of long distance traffic should be carried via the packet switched transport.

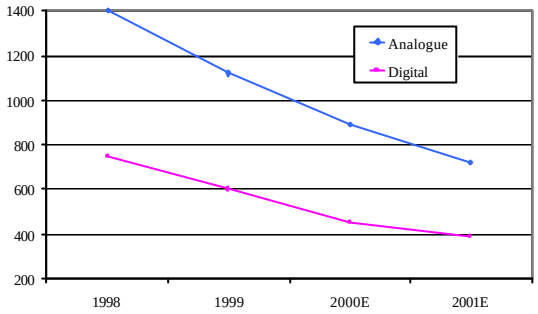
This trend will gradually start affecting equipment market too. Similar to the switched voice services, switched voice equipment sales will gradually phase away to give more room to VoIP equipment. A substantial share of the existing switching equipment sales will then be cannibalised by the VoIP equipment sales. Although it would have been preposterous to say that the growth in VoIP sales in 2000-2001 will be proportional to the decline in the conventional switching sales, but over the last 12 months VoIP equipment distributors (particularly Cisco and Vocaltec) registered increase in sales of 200-300% from quarter to quarter.

VoIP Equipment Sales

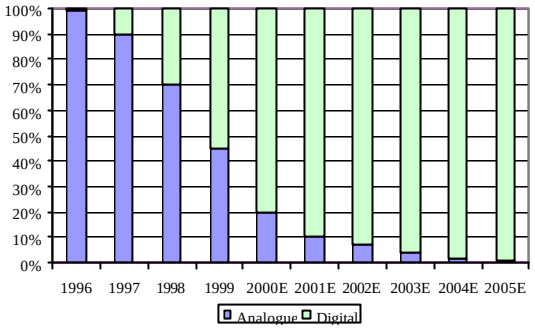


Increasing sales elsewhere in the world where operators migrate on the VoIP platform have been driving prices down. The price per port which is currently evaluated at USD 700 for analogue and USD 400 for digital interface is likely to further decrease towards USD 150-100 per port (much like with the conventional switching equipment). Simultaneously, the mix of digital and analogue ports will change on the Russian market in favour of digital ports (simply because analogue lines on the PSTN will gradually be replaced by the digital ones).

VoIP Price Per Port In Russia



The Mix Of Digital And Analogue VoIP Ports Supplied



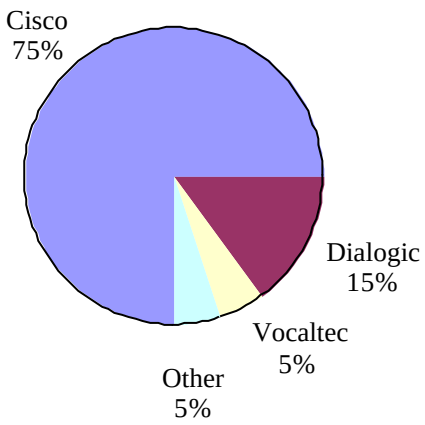
The market is likely to change dramatically as the largest multinational manufacturers enter the competition in VoIP segment. Until late 1999 the most popular hardware and software solution for VoIP was Vocaltec with Dialogic being the second largest supplier of VoIP ports. At the moment the market is unquestionable dominated by Cisco. There are several factors that determined their success:

⇒ Unlike Dialogic and Vocaltec, Cisco offer an easy-to-install almost "plug & play" solution which is particularly appealing to the traditional operators who are not very strong in VoIP environment

⇒ Cisco units are fully compatible with the access nodes of the leading global IP platforms (such as Delta Three and Carrier One) offering services to the emerging Russian operators

⇒ Cisco solution is very attractive to the small and medium size VoIP operators, such as ISP taking a fresh new start in VoIP with the minimum capital investment. Indeed the Cisco units already installed by most ISPs are quickly upgradable to accommodate VoIP traffic.

Market Breakdown (2000E)



Out of top 10 distributors of VoIP equipment, 80% offer Cisco equipment. The following table illustrates the loyalties of the largest Russian IT companies (systems integrators, wholesale suppliers, etc.).

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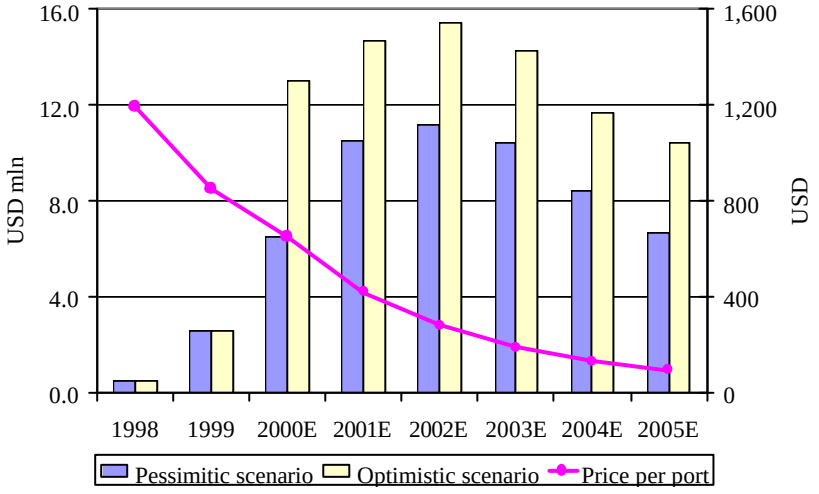
Main Distributors and Market Breakdown

Company	Vendor	Market Share
CompTek	Vocaltec, Dialogic, Cisco	25%
AMT Group	Cisco	15%
Croc	Cisco	15%
IBS	Cisco	15%
Microtest	Cisco	10%
Acantis	Telspec	Insignificant
Sitek	Ericsson	Insignificant
Classic	Lucent	Insignificant

Unless there is a massive migration of the regional PTTs on the VoIP platform, equipment sales may decrease slightly in 2003-2005 in monetary terms to reflect lower average price per port.

VoIP Market[2]



Overall the VoIP market is projected to grow at an annual rate of at least 30% through to year 2002. The total addressable market for VoIP equipment is evaluated at USD 6.5-13 mln in 2000[3]. By year 2003 the total VoIP sales are expected to reach USD 10.5-14.3 mln.

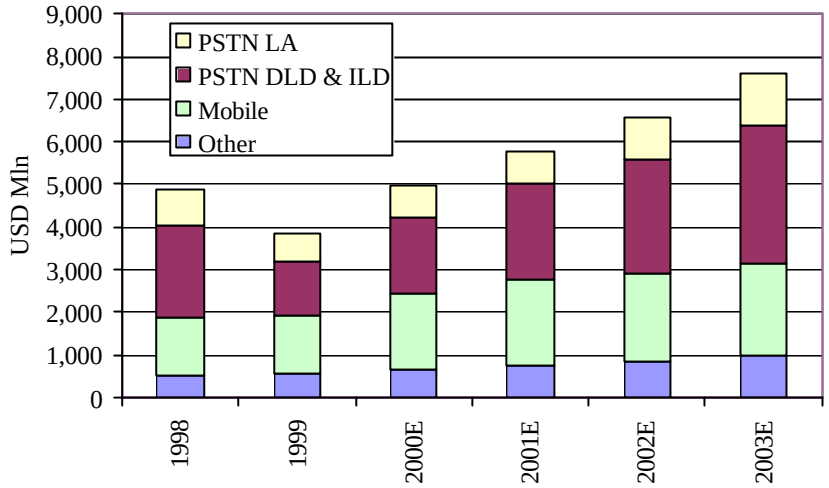
[2] ILD and DLD segment

[3] Under conservative and optimistic scenario respectively

DLD & ILD SERVICE SEGMENT

Russian ILD and DLD segment has been traditionally providing one of the most important contributions to the overall revenue of the telecom industry. Between 1994 and 1999 Rostelecom ILD proceeds accounted for over 50% of the total Russian telecom turnover.

Russian Telecom Services Revenues



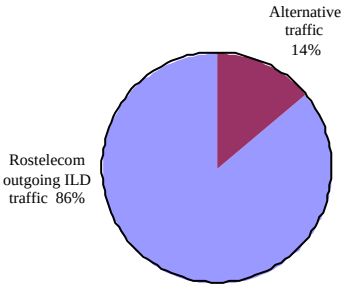
Very much like in the rest of the underdeveloped markets international long distance connectivity remains to be a matter of strict regulation. Rostelecom, the State controlled national ILD and DLD carrier, still enjoys the monopoly right on ILD within the PSTN environment. Since all regional PTTs are effectively controlled by the same holding company as Rostelecom the latter also has a de-facto DLD monopoly.

MAIN TRENDS

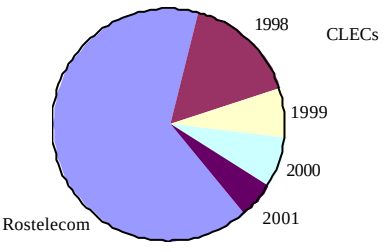
The current regulation on interconnect[4] unequivocally requires that all regional PSTN operators including the majority of CLECs should route their ILD and DLD traffic through Rostelecom facilities.

With the liberalisation of the DLD and ILD segment some time in 2003-2005, the share of commercial alternative operators is likely to increase dramatically both in terms of revenue generated and the physical volumes.

Originating Traffic Breakdown (Rostelecom & Alternative Operators)



ILD Revenue Breakdown (Rostelecom & Alternative Operators)



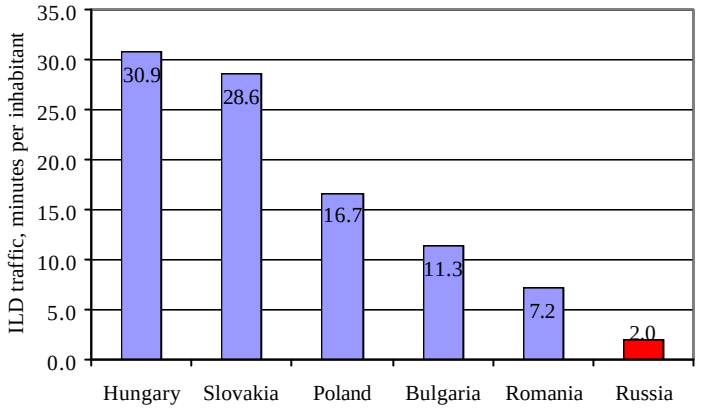
Toll traffic and long distance connectivity are bound to become an area of fierce competition among Russian operators in the next several years, as one can see from the diagrams above. It is expected that Russia will slowly but surely go through tariff re-balancing and introduce more alternative long distance licenses.

[4] The Resolution on the interconnect of PSTN operators

However, based on the in-depth analysis of the primary networks, current calling patterns by the corporate and residential users one can hardly anticipate any substantial increase in DLD or ILD traffic in the foreseeable future. The traffic per access line in service will only marginally increase through to year 2005 and could reach 12 min per annum.

The principal limitation for the traffic growth is the severely underdeveloped local access network and the dreadfully low penetration of IT technologies in Russia, compared even to its fellow Eastern Europeans.

ILD Traffic Per Main PSTN Line Per Annum



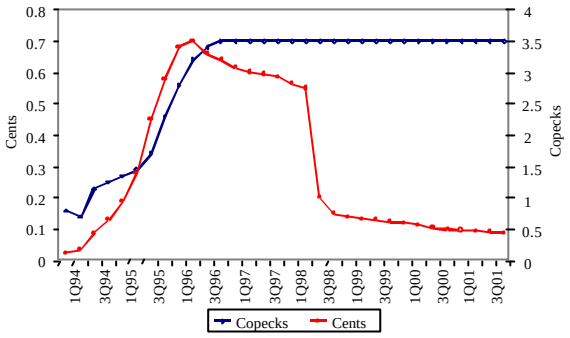
As far as the leased circuits, ISDN, IP and other broadband services are concerned, Russia is lagging even farther behind the rest of the world. Currently the total demand for international IPLC and IP connectivity is estimated at 40 Mbs and 100 Mbs respectively.

It could be said that the Russian telecom industry has been thrown back to 1992-1993, when very low disposable income and heavily subsidised PSTN tariffs would not justify capital-intensive network expansion programs.

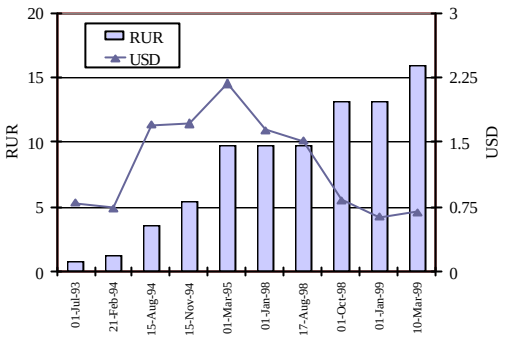
Very low tariffs are likely to remain the most important issue for the Russian telecom market, where the bulk of telecom services are provided either below cost or at a very narrow margin. Given the current projections of the exchange rate and inflation (consumer price index) the tariffs are unlikely to recover to the pre-crisis level in the foreseeable future.

For all PSTN tariffs and rates (except for international private leased circuits) are priced in roubles, the revenue has also been devaluated with the rouble crash. The crisis resulted in a 42% decrease of revenues for the total PSTN segment between August 1998 and August 1999, DLD & ILD revenues decreased by 40%. Russian telecom blue chips lost 50% of their value in terms of market capitalisation, which was also reflected in a significant reduction of their borrowing capacity.

Rostelecom Carrier's Rate, US Cents per 50 km per Minute



PSTN Tariff to USA



Evidently ILD monopoly is likely to be jealously protected by the regulatory authorities, if only to secure some hard currency cash flow to Rostelecom and regional PTTs from international settlements.

Apart from the PSTN, domain ILD traffic has been an important revenue item for the emerging CLEC operators. In fact, the majority of them have been established as alternative providers of enhanced international access in the early days of the market liberalisation in Russia. Currently alternative operators are estimated to account for over 35% of the total ILD traffic generated in Russia in terms of service revenues.

However in physical terms the traffic generated and routed by the alternative operators is still quite insignificant compared to that of PSTN. The truth also is that some CLECs, who are fully integrated into PSTN tend to transit their originating ILD traffic through Rostelecom rather then directly deal with counterparts internationally. They simply surcharge their clientele for enhanced access and pocket the margin between the end user tariff and discounted Rostelecom transit rate for overlay operators.

The following main trends have been identified in Russian ILD and DLD segment as a result of this research:

⇒ **Rostelecom might give-up the monopoly already in 2000-2001, as the government grants regulatory concessions to former enterprise networks** of Transtelecom and Gaztelecom. Both Transtelecom and Gaztelecom, who have been span-off MPS and Gazprom respectively, have ambitious plans to build alternative long-distance backbone networks and win a substantial share of ILD and DLD market from Rostelecom. It remains unclear whether Transtelecom project does much economic sense, taking into account the current domestic long-distance tariffs in Russia. Even if Transtelecom could win 10-15% of Rostelecom toll traffic within Russia (Rostelecom domestic long distance revenue is evaluated at USD 225 in 1999), Transtelecom could hardly justify several hundred million dollars invested into the new infrastructure.

⇒ **By-pass operators are aggressively taking over Rostelecom market share**, through illegitimate and other unorthodox solutions such as "leaking PABXs" and outright by-pass disguised under VoIP. Re-file through CIS countries in particular has been increasing, over the last 12 months with more operators trying to capitalise on the regulatory uncertainties and loosely defined interconnect rules. The growing by-pass is very much driven by ludicrously high Rostelecom termination rates (compared to what US and other international operators are prepared to pay for Russian traffic). Although it is impossible to scientifically measure by-pass through re-file it is currently estimated at least at 35 mln min per annum.

⇒ **Rostelecom failed to take advantage of whatever transit traffic they could secure** being effectively on a transit routes between Europe and Asia, former CIS countries and the principal telecom hubs internationally. Currently there is hardly any sizeable transit ILD traffic on the Russian long-distance backbone network. The Moscow-Khabarovsk microwave link could not possibly satisfy the availability and error bit rate requirements by the major international operators for international transit between Europe and Asia. Simultaneously the CIS countries opted for alternative transit routes such as regional fibre-optic systems (TAE and ITUR to name a few) as well as satellite communications solutions.

It is expected that the **bulk of the new ILD capacity** to be commissioned within the next 2-3 years will be used for IP traffic. If the current IP growth rate holds, Russia IP traffic can increase up to 100% every year.

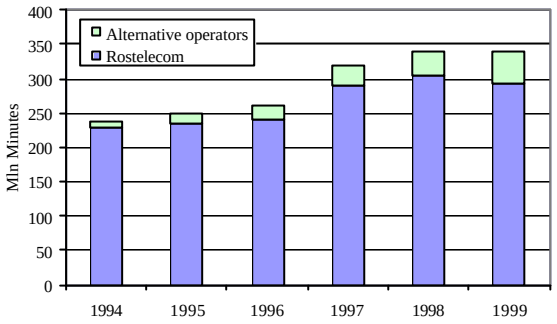
Overall Russian ILD and DLD market is quite underdeveloped and is not likely to increase dramatically within the next 2-3 years. It is expected that Russia will have to increase its international backbone capacity by 3-5% annually to accommodate existing traffic. The demand may increase sharply, should Russian local access operators significantly expand their networks and improve access to the backbone nodes (for both voice and data). However, that would require enormous investment into local loop, which presently would have been a money loosing undertaking.

ILD TRAFFIC

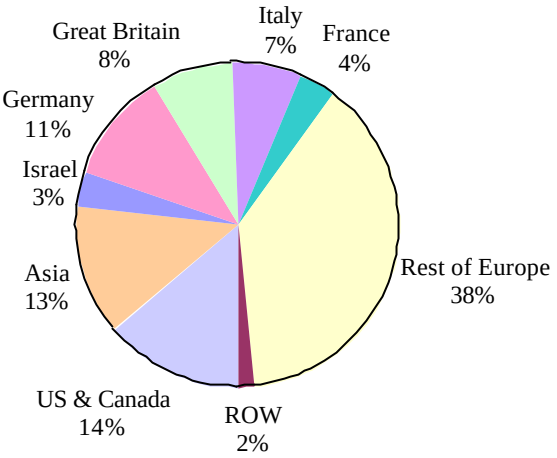
International Outgoing Traffic

International traffic has been increasing steadily through 1992-1998. In many respects the volume of the international traffic is an indicator of liberalisation in the Russian economy and integration of Russia into international business community following the collapse of the former Soviet Union.

Russian Outgoing ILD Traffic

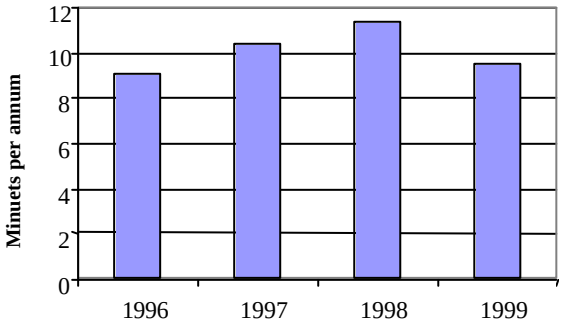


Traffic Breakdown

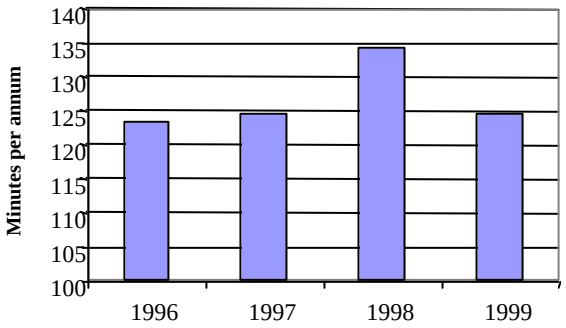


Unlike in the DLD segment, where the growth in traffic volumes has been driven primarily by the increasing number of access lines on the PSTN and to a smaller extent by the increasing availability of toll, ILD traffic increase does reflect fundamental changes in the Russian economy. ILD traffic per access line in service (ALIS) has been gradually increasing until 1998, while DLD traffic per ALIS has been approximately on the same level since 1995 (except for 1998, when the DLD service became suddenly several times cheaper for the population in dollar terms, as the PSTN operators failed to adjust their tariffs to the devaluation of local currency).

ILD Traffic per ALIS

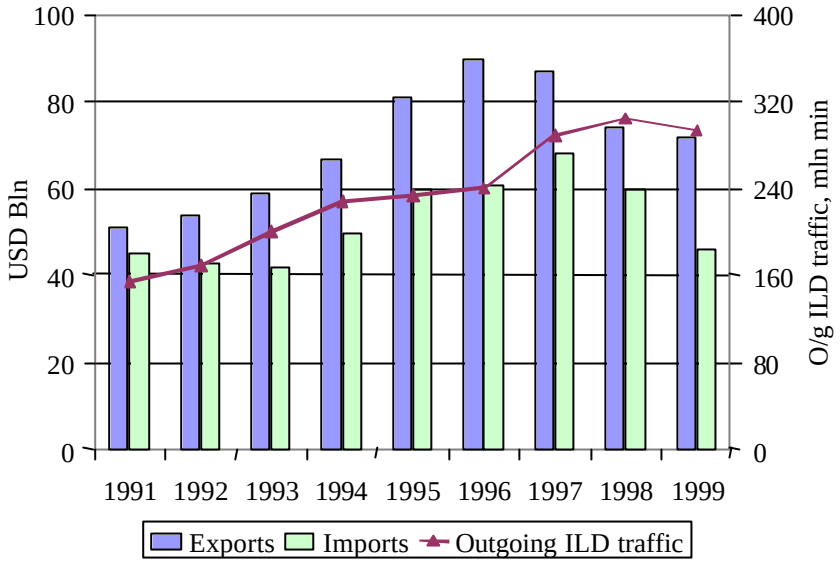


DLD Traffic per ALIS



Indeed there is a strong correlation between the ILD traffic and the volume of Russian imports and exports (see diagram below). Ironically enough, the substantial increase of the outgoing international traffic took place regardless of the severe depression in Russian economy with GDP shrinking by 9% between 1994 and 1999, industrial input decreasing by 60% and local currency devaluating by factor of 4.

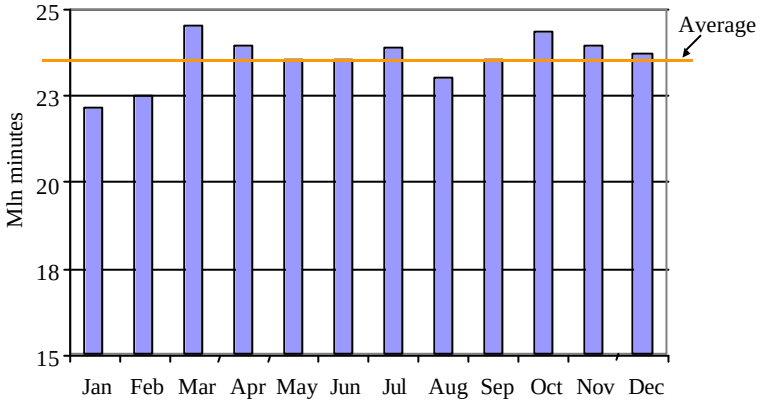
Russian Trade Balance and Outgoing ILD Traffic



Source: Rostelecom, Goskomstat, Institute of Economic Analysis, GfK MR, Rostelecom

There is some, although, limited seasonal fluctuation of ILD traffic. January and February appear to be the worst months (which is clearly due to the slow-down of business activities in January, Russian Orthodox Christmas season). August, another traditional vacations period, has the third lowest traffic.

Rostelecom Average Monthly ILD Outgoing Traffic (Seasonal Fluctuation)



Recently, when the number of Russian well-to-do tourist leaving country for Christmas season to European destinations increased to over 3 mln people, there is a more pronounced growth traffic peak in December. Otherwise, Russian calling pattern is similar to what one may see elsewhere in the world.

There are several factors that determine the growth and fluctuations of the outgoing international traffic. The following main influences has been identified as a result of this research:

- **The fundamental economic and demographic trends**. Apart from international trade and financial transactions on the stock market that drive the demand for international connectivity the ILD traffic appears to have been increasing with the growing migration of Russian population to the adjacent Poland, Czech Republic, Turkey and Israel.

- **Enhanced ILD connectivity**. The easier it becomes to place an international call (in terms of call completion rate and availability of the service) the higher is the traffic per ALIS indicator. The fastest growth of ILD traffic was achieved between 1994 and 1996 when the number of international voice grade circuit equivalents in Russia increased from 1,100 to over 15,000 and the traffic volume jumped from 140 mln minutes to over 250 mln minutes. The more international circuits are being commissioned in the regions with the introduction of new domestic backbone trunks beyond Moscow and St.Petersburg, the more international traffic would reach the principal international gateways.
- **Expanded coverage and lower tariffs**. Rostelecom have substantially increased the number of direct international routes. The direct connectivity has been established to US and the principal European countries, traditional Russian trade counterparts such as China and Vietnam, popular destinations for Russian tourists such as Spain, Greece, Turkey, Cyprus, Israel. Until 1995-1996 the majority of those destinations could only be served through transit deals with the major international carriers (BT, C&W and Sprint). The introduction of direct routes and new fibre-optic submarine cables enabled Russian operators to offer more affordable international tariffs, which also stimulated traffic growth.

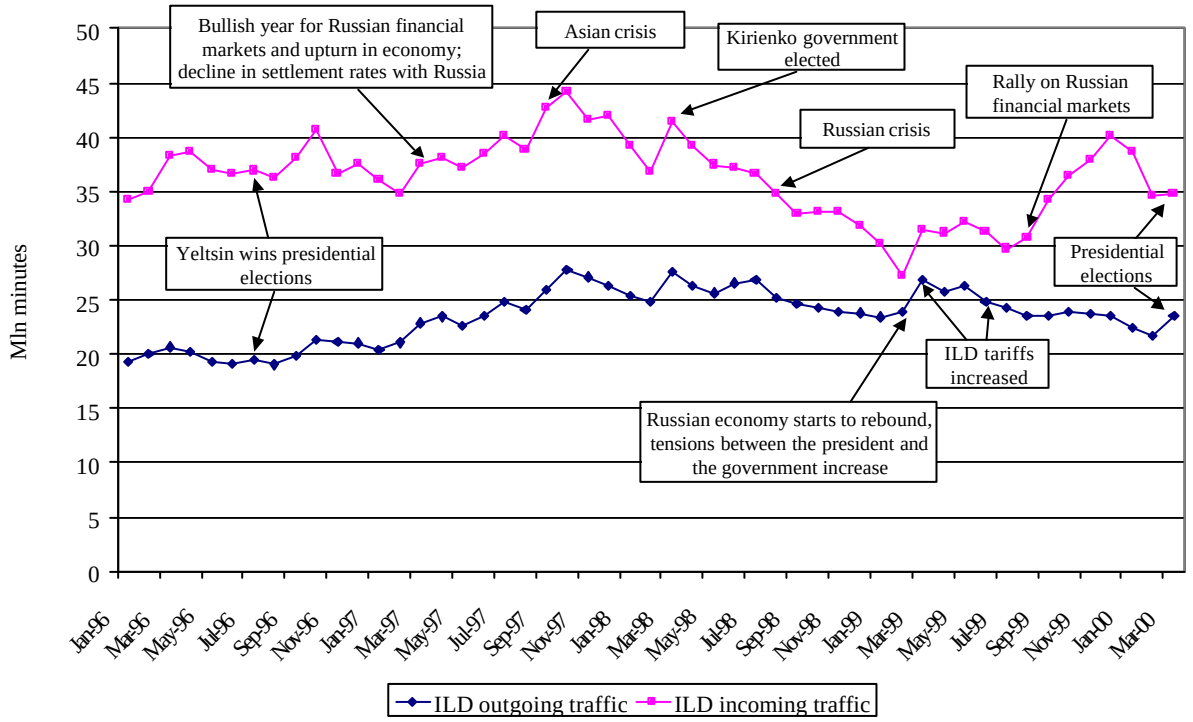
Overall one should not expect any substantial growth in outbound ILD traffic. It is projected to grow at the annual rate of 5-7% and reach 420 mln minutes towards year 2005.

International Incoming Traffic

Incoming ILD traffic has been growing almost at the same rate as outgoing traffic between 1992 and 1996. However, it traditionally exceeded outbound traffic, very much like on other underdeveloped markets. Starting from 1996 inbound ILD traffic growth slowed down. In fact it has been slowly decreasing starting from fall 1997 through 1998, which reflects the reduction in foreign investment activities on the eve of the Russian financial crisis and following the collapse of the local currency.

Inbound ILD traffic is probably one of the best indicators of Russian economic health and the volume of the traffic reacts quickly to the subtle changes on the Russian financial market and political arena.

Russian ILD Traffic

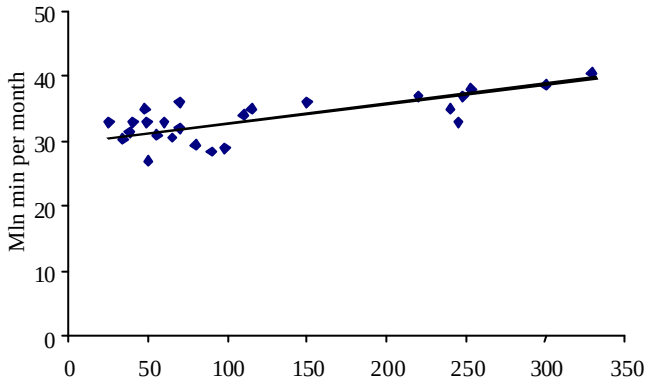


- The worst month for Rostelecom (as far as the ILD traffic is concerned) was evidently January 1999, when the seasonal decrease was further deteriorated by the fact that most of expatriates and foreign companies, who decided to scale down their activities following the crisis, left the country.
- One of the highest picks in ILD traffic coincides with the period, when Russian stocks reached their highest level prior to the severe crisis and correction on the stock market in 1997. In fact, ILD traffic failed to recover since the maximum just before the Asian crisis.
- Indicative enough traffic increase took place at the end of 1999, when another rally started on the Russian stock market in anticipation of the parliamentary elections.

Based on the above, one can conclude that the incoming ILD traffic is generated to a large extent by corporate users and specifically foreign investment agencies seeking to capitalise on the Russian opportunities, when the market is bullish on Russia.

There is a theory that Russian incoming ILD traffic could even be accurately projected based on the popular stock index, namely MT index. There is a strong correlation between ILD traffic and MT index at least, based on 1997-1999 data.

Regression of Russian Incoming ILD Traffic on $ MT Equities Index, 10/97-10/99

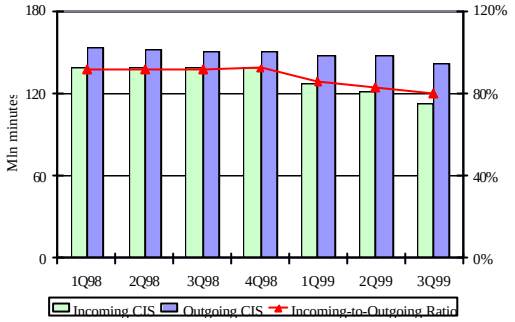


The volume of inbound traffic is also affected by other factors. The following three trends had the strongest influence on the incoming ILD traffic apart from the overall economic trends:

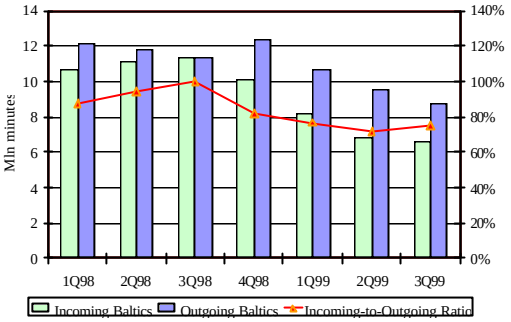
- **By-pass** eats away a substantial part of the incoming ILD traffic that would have been destined to Rostelecom network otherwise. Since Rostelecom sticks to a relatively high termination rate commercial operators are trying to establish by-pass (using either leaky PABXs on the corporate and other private networks) or simply terminate traffic through alternative operators such as Comstar (+7 503 index) or Sovintel (+7 501) who in their turn transit it to the PSTN by-passing Rostelecom. This traffic is rarely accounted for in official reports.
- **Call-back** changes the balance between the incoming and outgoing traffic in favour of incoming. Call-back was a rather widespread practice in Russia (particularly in 1996-1997). It has never been a fully legitimate business and thus failed to evolve into a large-scale commercial operation. In 1998, following devaluation of the local currency the ILD tariffs effectively decreased four times (in hard currency terms) and call-back did not make much sense.
- **Re-file** has ambivalent effect on incoming traffic. On one hand re-file through Russia (to CIS countries and certain international destinations where it is difficult to achieve reasonable termination rates such as Cuba and Iran) adds incoming traffic. On the other hand re-file through CIS countries (particularly Ukraine) and Baltic States takes away a significant traffic volume that could have been terminated on Russian PSTN as proper inbound ILD traffic.

Although it is difficult to accurately evaluate quantitative effect of the above factors on the traffic flow, certain conclusions could be made based on the comparative analysis of traffic figures for CIS and Baltic States.

CIS Traffic: Incoming Declines More Than Outgoing, (1998-99)



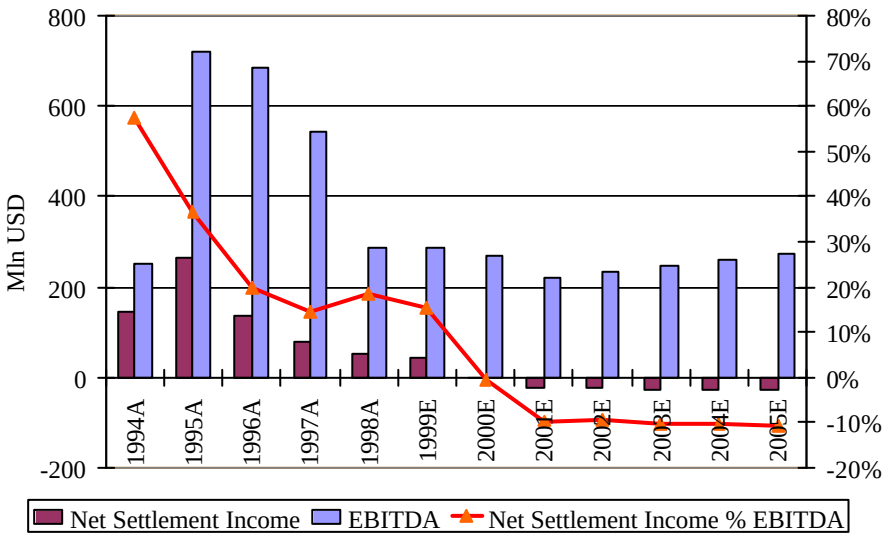
Baltics Traffic: Incoming Declines More Than Outgoing, (1998-99)



The fact that incoming traffic with the above destinations declines faster than outgoing (following the introduction of the proper international interconnect practices on the intra-CIS networks) indicates that a substantial share of the traffic is actually re-file that is no longer economically feasible.

Rostelecom and Russian regulatory authorities are very particular about the incoming traffic and net balance. Historically the net settlements in hard currency were one of the important items on Rostelecom revenue sheet. Since Rostelecom has been settling with its international counterparts through offshore accounts, the revenue accumulated there was immune to foreign exchange loss.

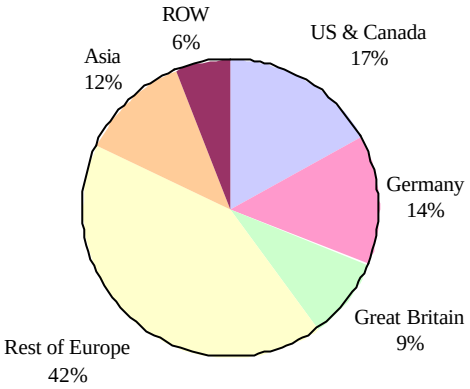
Net Settlement Income Continues to Decline, 1994-2005E



More recently the gap between the inbound and outbound traffic has been narrowing leaving less room for Rostelecom to capitalise on the net settlement. Evidently Rostelecom will try to jealously protect its market share of incoming ILD traffic to minimise its exposure to the net settlements.

The breakdown of the incoming traffic is almost identical to that of outgoing and reflects the relative gravity of Russian economy towards different trade counterparts.

Breakdown of the Russian Inbound ILD Traffic

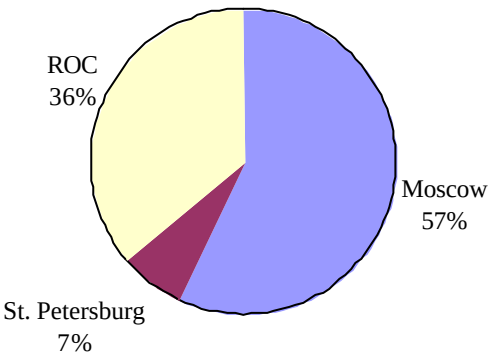


The following main trends have been identified with respect to the incoming ILD traffic.

- **North America** developed into one of the most important counterparts for Russia. Very much like with other countries there is a positive net settlement for Russia, since there is more incoming traffic from US than reciprocal traffic from Russia[5].
- **Germany, UK and Italy** tend to be the three largest counterparts in Europe. The incoming traffic from both Germany and Italy tend to exceed the reciprocal traffic from Russia. It was also the case with UK until late 1997 and early 1998, when Russian net settlement with UK (including re-file to third destinations) became negative.
- **Eastern European countries** such as Poland and more recently Czech Republic account for visible 2-4% of the incoming traffic (since they are among the principal Russian trade partners and supply a fair share of food and consumer goods to Russia). Other important routes are to Israel, Turkey, Greece, Cyprus (countries frequented by Russians lately and having large Russian communities).

Moscow and St.Petersburg account for overwhelming majority of international traffic terminating in Russia.

Incoming ILD Traffic (Destinations in Russia)



[5] Situation promised to change slightly when Russian outgoing traffic to US started to pick up following the devaluation of the ILD tariffs in August-October 1998. However as soon as Rostelecom adjusted ILD tariffs, in late 1998 and early 1999, the growth of Russian originating traffic slowed down.

There are several reasons why Moscow remains to be the largest destination for the proper ILD traffic:

- In the first place Moscow has the largest installed PSTN base, which accounts for 15-17% of the total Russian PSTN access lines in service. There are over 4 mln main wire-lines installed on MGTS, complemented by over 600,000 wireless connections and over 200,000 lines installed on private and overlay networks.

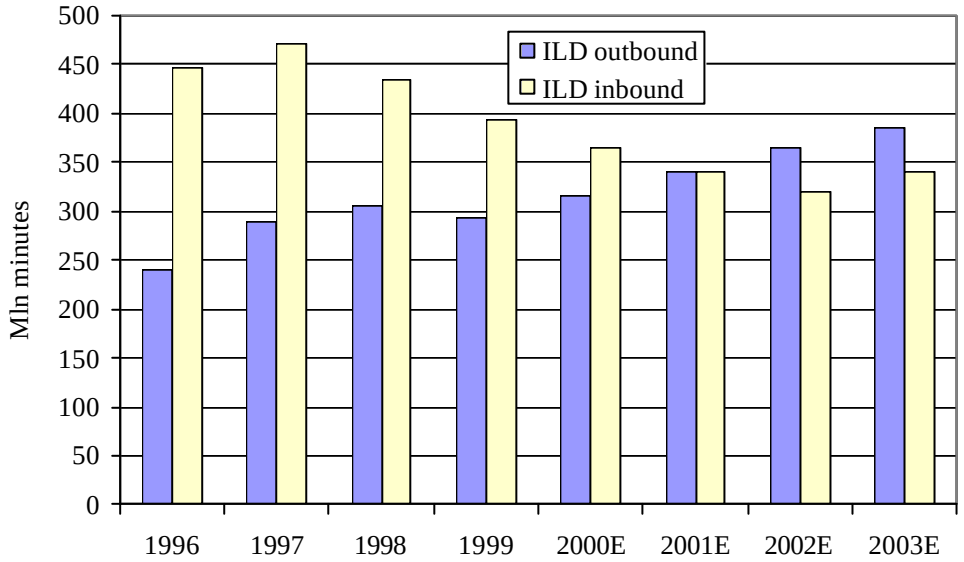
- Moscow and St.Petersburg are evidently the two most important centres of international trade and financial operations. Over 90% of the foreign community (including diplomatic missions, foreign rep offices and joint ventures) are located in Moscow and St.Petersburg.

- Moscow has the highest call completion rate for the international traffic. Compared to Moscow the rest of country (apart from a few destinations with their own international gateways) have a very poor call completion rate due to underdeveloped switching facilities and the lack of digital transport networks.

It is fair to assume that the above trend will hold through 2000-2005 and the thin route traffic to the regions is unlikely to develop into something more substantial.

The following diagram outlines the J'son & Partners forecast for the Russian ILD traffic. Overall the originating traffic should exceed the inbound traffic by 2001.

Russian ILD Traffic Projections

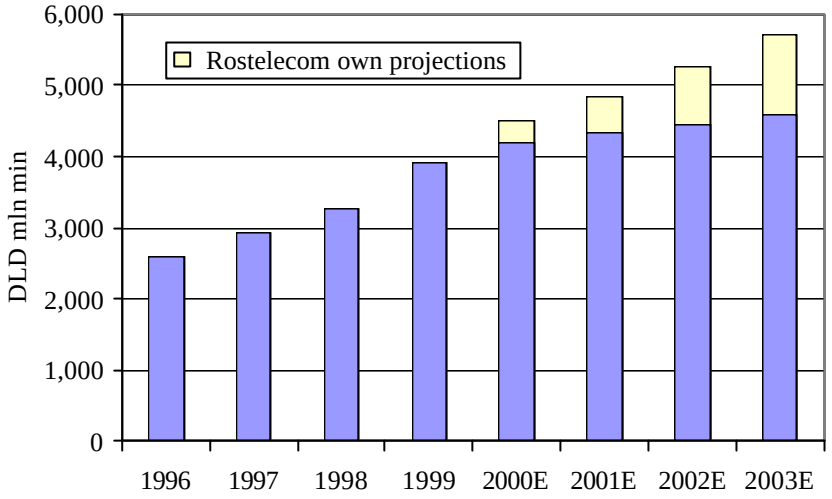


The total volume of ILD traffic is projected to be growing towards 800 mln minutes in 2005. Part of the potential growth is expected to be cannibalised by the data traffic, particularly messaging (both E-mail and SMS-like services).

DLD TRAFFIC

Russian domestic long distance segment is even less dynamic than ILD. The growth in this segment that took place in 1995-2000 resulted from the increase in PSTN lines in service rather than anything else. It is very unlikely that the traffic could increase substantially unless the PSTN operators could significantly improve connectivity on the local level. Access to the toll switch appears to be at the moment the main bottleneck for DLD traffic.

Russian DLD Traffic

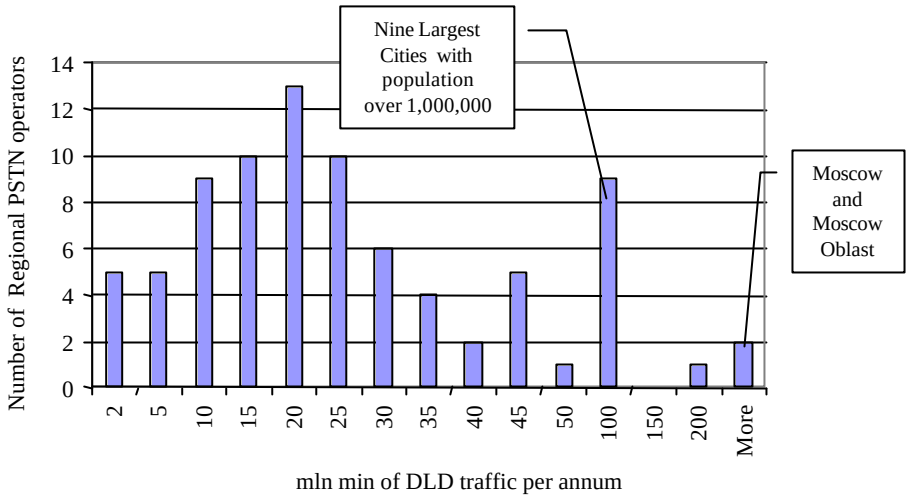


Rostelecom is a dominant carrier's carrier in the Russian DLD segment. Even with the liberalisation of the market and the launch of alternative DLD networks Rostelecom is likely to play the main role in the Russian long-distance communications. There are several peculiarities of the Russian switched voice network than make most analysts believe that Rostelecom will be able to retain de-facto monopoly even after its exclusivity on DLD and ILD is abolished by the regulatory authorities.

- The new operator will have to absorb a huge cost associated with the provision carrier's carrier services to the regions where traffic revenues can not possibly justify the investment into alternative infrastructure. For the overwhelming majority of the regions the only route that could return some revenue on investment is to Moscow.
- Russian network is designed in such a way that apart from the sufficient backbone capacity the DLD operator should be able to terminate traffic to over 89 regions. At the moment it is hardly feasible to duplicate the network owned by Rostelecom. In order to implement this alternative network the new operator would have to re-route traffic at 89 regional toll switches some of which are still analogue and thus difficult to reconfigure.
- Whoever decides to compete with Rostelecom will have to match Rostelecom's carrier's carrier tariffs and rates which are currently almost on the cost level (or even below cost for long-haul circuits such as Moscow to Far East).

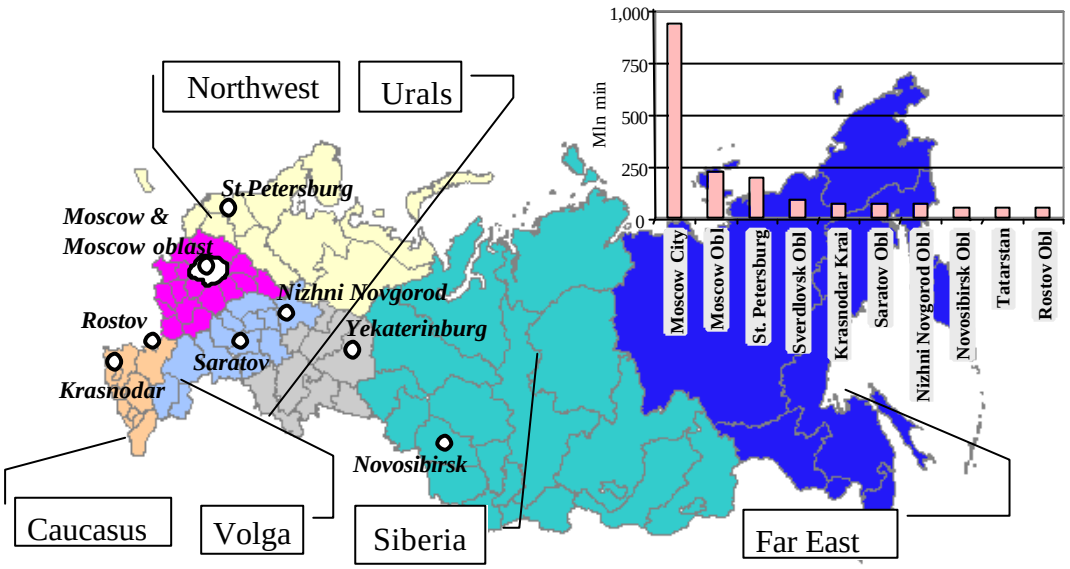
The majority of regional PSTN providers generate less than 20 mln minutes of proper DLD traffic per annum. Between 50% and 70% of this traffic (based on the region specific conditions) is destined to the closest population centres (100-200 km distance) and thus generate limited revenue for the carrier's carrier.

Distribution of DLD traffic in Russia



The bulk of the traffic is being generated by the ten largest cities. They are also the main destinations for the DLD traffic generated by the rest of the regions and cities.

Main Russian Traffic Concentration Points

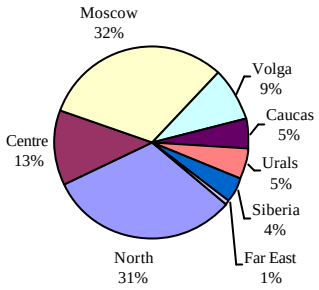
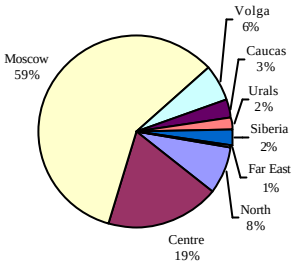
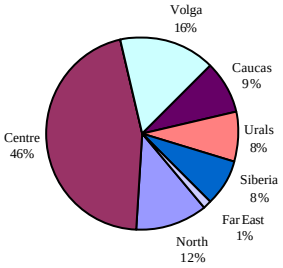
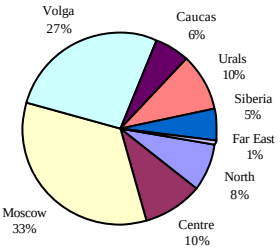
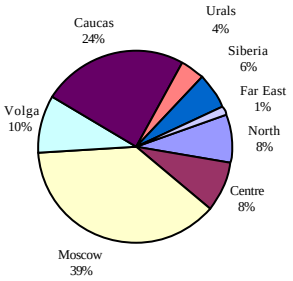
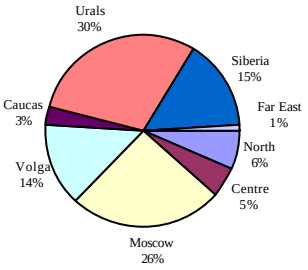
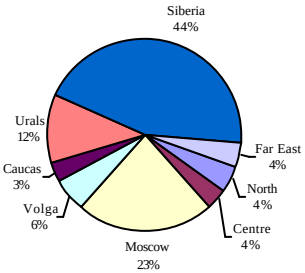
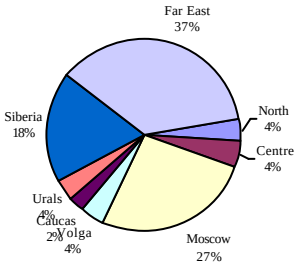


Evidently, each of the regions above has its unique traffic pattern. There are several generic trends in the calling patterns that could be traced throughout the country. The following main tendencies could be identified:

- The bulk of traffic within each macro-region is destined into other administrative units within this macro-region.
- Moscow is typically the most important DLD destination for all regional PSTN operators after the largest adjacent population centres (macro-regional capitals)
- For the non-Moscow traffic, generally the traffic gravitation decreases with the distance. The closer the regions are, the more there is interregional communication.

The table on the following page illustrates the calling patterns for various regions.

Outgoing DLD Traffic Breakdown by Region

North: 346 mln min	Central: 601 mln min
	
Moscow City: 941 mln min	**Volga: 398 mln min**
	
Caucasus: 209 mln min	**Urals: 285 mln min**
	
Siberia: 362 mln min	**Far East: 80 mln min**
	

Source: Rostelecom, J'son & Partners

DLD Tariffs and Transit Rates

Currently Rostelecom, a national carrier's carrier monopoly, provides the transit service for a fraction of the total DLD tariff charged by the regional PSTN operators to the end user.

Historically the transit rate or "Integral Settlement Rate" (ISR) used by Rostelecom has been tied to the state regulated tariff for the entities financed from the State budget (Federal agencies and regional governments, including police and military). The existing ISR does not reflect the surcharge paid by the residential users and business customers for the same DLD service. This surcharge on top of the State regulated tariff is retained by regional Electrosvyazes.

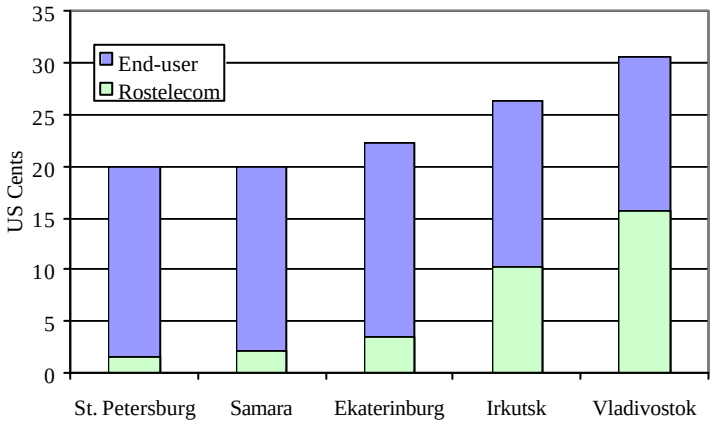
The Ministry of Communications and Svyazinvest are unlikely to change the existing settlement procedures with Electrosvyazes where Russian carrier's carrier retains only a fraction of DLD revenues and cross subsidises- regional networks.

There are several factors influencing regulatory decision on tariffs and IST:

- DLD and ILD proceeds account for 48% of the total revenues collected by Electrosvyazes and are critical for keeping them afloat.
- ISR review may only lead to the increasing debt to Rostelecom from Electrosvyazes who can not collect payment from government agencies, Military and Militia and thus accumulate substantial debentures.
- Review of ISRs will automatically translate in higher cost for Government agencies, Military, defence industries and State enterprises, which is not politically acceptable under present circumstances.
- ISR is lagging behind DLD tariff by virtue of being a synthetic settlement rate calculated based on the previous 12 months tariff and traffic.

Furthermore, if Russian regulatory authorities decide against ISR review in 2000 as they did in 1999, potential NSA should decrease as a result of inflation and ISR devaluation.

Selected End User DLD Tariff and Rostelecom Rate (NSA Benchmark)



It is highly unlikely that NSA (net settlement amount) to Rostelecom and other carrier's carriers will increase significantly in 2000.

DLD & ILD NETWORKS

INTERNATIONAL CONNECTIVITY

Russia has substantially improved its international connectivity over the last 7 years. Three fibre-optic submarine cables have been commissioned since 1993. Rostelecom installed several new international gateways and upgraded the international switches in Moscow and St.Petersburg. The total international capacity increased from 1100 voice grade circuits in 1992 to over 2 Gb worth of digital capacity. By the time Sonera completes its terrestrial fibre-optic link to connect Helsinki with St.Petersburg and Moscow, total international capacity will increase towards 5Gb.

The following principal terrestrial and submarine routes are available to the Russian ILD operators, ISPs and corporate users.

- **Moscow to Copenhagen** submarine cable (Russia-Denmark One). It starts in Copenhagen and goes through the Baltics to land on the Russian coast close to the town of Kingisepp. It takes from there towards St.Petersburg (terrestrially by cable and microwave) and Moscow.
- **Moscow to Palermo** (ITUR) submarine cable. It is an international cable system, linking Italy to Turkey, Ukraine and eventually Russia (that is why the system was called ITUR). The cable starts in Palermo and goes through the straight of Bosporus to the Black sea. It terminates on the Russian coast near the town of Novorossiisk (more precise a village of Djugba). It takes from there toward s Rostov-on-Don and further northwards all the way up to Moscow.
- **Nakhodka to Pussan** submarine systems, known also as R-J-K. It starts in Pussan (Korea) and terminates in the port of Nakhodka (close to Vladivostok). It goes from there to Khabarovsk to meet with Trans Siberian Moscow to Khabarovsk link. The total capacity of the link is 632 Mbps.
- **Rascom** (a JV carrier's carrier owned by Andrew Corporation and Russian Railway Operator) built a fibre-optic link along the railway between Moscow and St.Petersburg. The link goes all the way to the border with Finland where it interconnects with Telia.
- **Sonera** are to commission shortly a brand-new fibre optic cable to link Helsinki and Moscow (FROG). The service via this new 2.5Gbt/s cable was commissioned on March 23, 2000. The new system will become the single longest fibre-optic cable in Europe and should double Russian international capacity.

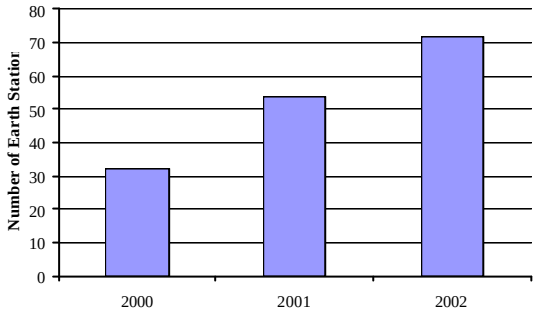
Until recently Rostelecom did not have many direct routes to the counterparts overseas. Instead it used to hub the switched voice traffic through BT, Cable & Wireless and other global networks. In fact some of the overlays that operate under unique internationally recognised prefixes are still using the same interconnect scheme. Comstar for example route their traffic trough BT, while Sovintel use both BT and Global One. Telmos have exclusive deal with AT&T and Combellga use Cable & Wireless transit services.

Rostelecom has been gradually reducing the volume of international transit through the third operators as they introduced new direct routes. The following table provides the most comprehensive overview of Russian international connectivity

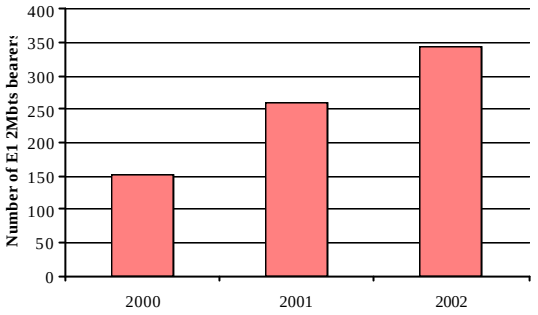
In addition to the terrestrial capacity, Rostelecom and other ILD operators in Russia are actively using satellite communications facilities. There are several powerful

teleports in Moscow and St.Petersburg. In addition to the existing facilities under Russian Space Communications Corporation Rostelecom plan to phase-in another 72 teleports in the regions to provide digital connectivity to the key regional centres off the principal backbone routes from Moscow to Khabarovsk (in the Far East) and Moscow to Novorossiisk (in the South). Lockheed Martin Intersputnik – a JV satellite operator who have recently launched LMI-1 satellite with multiple C-band and Ku-band transponders specifically designed to cover Russian territory with high EIRP (up to 39 DbW). The following diagrams illustrate how Rostelecom intends to rollout the network. The planned teleports are shown on the Rostelecom map (page 32).

Number of planned Earth Stations



Number of Incremental 2Mbps ILD and DLD bearers



Overall Rostelecom and other Russian operators have sufficient international connectivity, taking into consideration the current level of Russian originating voice and IP traffic. It is not expected that Rostelecom will increase its ILD capacity in the medium term.

DOMESTIC CONNECTIVITY

Rostelecom has a powerful domestic transport telecommunication network based on digital and analogue cable, microwave and satellite communication facilities, which carry the major share of the long-distance and international telephone traffic of Russia. In addition Rostelecom owns a diverse terrestrial network of TV and radio broadcasting facilities.

Since 1991 the company has been expanding the telecommunication network utilising the most advanced digital equipment, with the key goal of bringing the level of telecommunications in Russia to that in the most advanced countries in the world.

The following table sets forth certain details regarding the principal lines which constitute Rostelecom's transport network as of December 1999.

Backbone Link	Line Type	Length (km)	Transmission (Mbit/sec)	Number of Channels
Moscow-Khabarovsk	Digital Microwave	7,977	6 x 155	11,340
Moscow-Ekaterinburg	Fibre Optic Cable	4,164	2,448	11,520
Moscow-St. Petersburg	Underground Fibre Optic	1,163	2,448	30,240
Nakhodka-Naoetsu-Pusan	Submarine Fibre Optic	1,762	560	15,360
Nakhodka-Khabarovsk	Fibre Optic Cable	897	622	15,120
Kingisepp-Copenhagen	Submarine Fibre Optic	1,210	565	15,360
Kingisepp-St. Petersburg	Overhead Fibre Optic	191	622	15,120
St. Petersburg-Kingisepp-Moscow	Digital Microwave	949	3 x 140	5,760
Novorossiisk-Istanbul-Palermo	Submarine Fibre Optic	3,420	565	15,360
St. Petersburg-Finland	Fibre Optic Cable	197*	622	7,560
Kingisepp-Tallinn	Fibre Optic Cable	26*	2,448	30,240
Moscow-Novorossiisk	Fibre Optic Cable	1,653	2,448	30,240
Khabarovsk-Harbin (China)	Fibre Optic Cable	150*	622	7,560
Perm-Ekaterinburg	Digital Microwave	565	2 x 155	3,780
Apastovo-Shigony	Fibre Optic Cable	220	622	7,560

**Length of link owned by Rostelecom.*

The Trans-Siberian link, connecting Moscow and Khabarovsk is the most significant of all the projects implemented by Rostelecom recently. At a length of approximately

8,000 kilometres, the Moscow-Khabarovsk digital-microwave segment of the Trans-Siberian link is also presently the world's longest microwave line of a synchronised digital hierarchy. Rostelecom has completed the installation of a fibre-optic cable line running parallel to the Trans-Siberian microwave link which will, when cut over, have a capacity of 16 x 155 Mbit per second. These and the other major lines in Rostelecom's transport network are the foundation for the program of ongoing expansion of the entire domestic transport network.

Rostelecom is still very much "analogue" in terms of architecture. In order to route traffic Rostelecom uses several primary switching nodes (each serving roughly one eight of Russian territory). All toll switches across the country are interconnected to Rostelecom backbone through these primary nodes, unless there is enough traffic between a pair of toll switches to justify a direct route. Rostelecom as a rule does not own toll switches they belong to the regional PSTN operators.

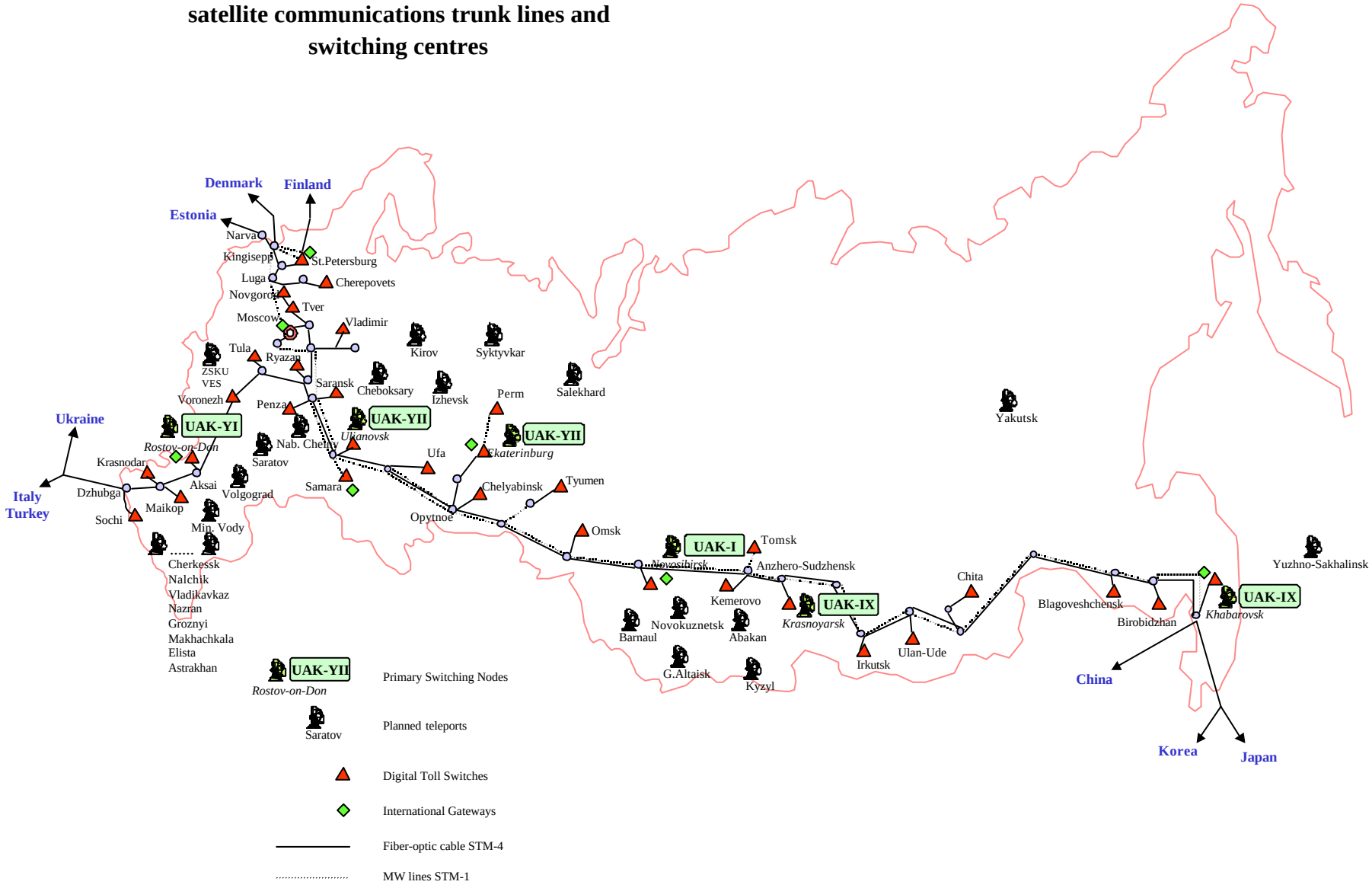
Rostelecom currently owns seven international digital switches, two in Moscow and one in each of the following cities: St. Petersburg, Rostov-on-Don, Samara, Ekaterinburg and Khabarovsk. The combined capacity of these switches is approximately 75,000 ports. Rostelecom also has eight international transit switches and four ordinary inter-city switches, including three in Moscow and one in Pavlov-Possad, which can route domestic inter-city traffic between switching centres as well as directly to and from end-users.

ROSTELECOM MAIN SWITCHING CENTRES (MAXIMUM CAPACITY BY 2005)

	LOCATION	SWITCH MODEL	SUPPLIER	CAPACITY
INTERNATIONAL GATEWAYS	Moscow	AXE-10, EWSD	Ericsson Siemens	19,678
	St. Petersburg	AXE-10	Ericsson	10,000
	Rostov-on-Don	EWSD	Siemens	9,800
	Samara	EWSD	Siemens	9,420
	Khabarovsk	EWSD	Siemens	8,910
	Novosibirsk	EWSD	Siemens	6,330
	Ekaterinburg	EWSD	Siemens	2,680
DIGITAL TOLL EXCHANGES	Gatchina (St.Petersburg)	S-12	Alcatel	26,640
	Krasnodar	AXE-10	Ericsson	20,000
	Ufa	AXE-10	Ericsson	18,280
	Perm	S-12	Alcatel	12,000
	Tyumen	EWSD	Siemens	12,000
	Krasnoyarsk	AXE-10	Ericsson	12,000
	Tula	S-12	Alcatel	11,100
	Voronezh	AXE-10	Ericsson	11,096
	Ekaterinburg	AXE-10	Ericsson	10,200
	Novosibirsk	EWSD	Siemens	10,000
	Samara	EWSD	Siemens	9,600

The map on the following page provides an outline of Rostelecom network.

Rostelecom Primary Network of terrestrial and satellite communications trunk lines and switching centres

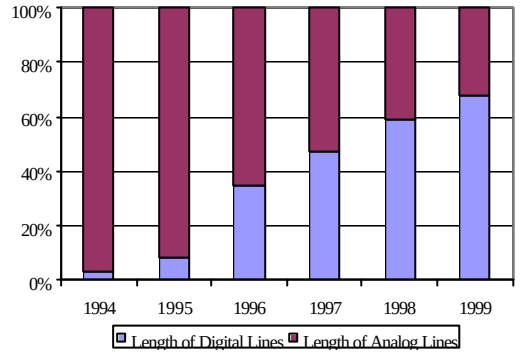


NETWORK DEVELOPMENT PROSPECTIVE

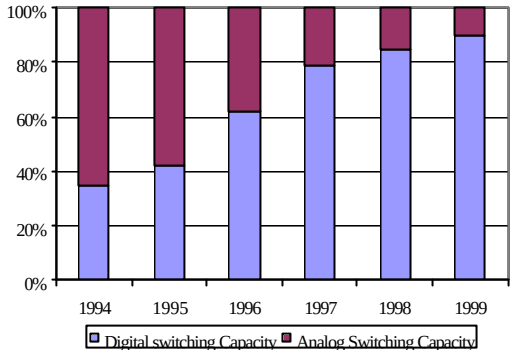
Rostelecom effectively built a brand-new digital transport network in Russia from scratch. While back in 1992 digital circuits accounted for merely 2% of the total backbone capacity, in 1999 Rostelecom's network became predominantly digital with STM-1 and STM-4 transport linking Moscow to the principal regional centres via terrestrial fibre-optic cable or digital microwaves.

The Quality of Rostelecom Network

The share of Digital Circuits in the Total Rostelecom Backbone Capacity



The share of Digital Lines in the Total Rostelecom's Switching Fleet

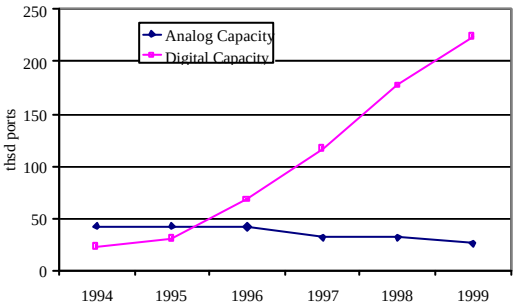


Notwithstanding the financial crisis and decreasing revenue, Rostelecom is determined to proceed with its ambitious capital expenditure program. Following the sharp decrease of capital expenditure in 1999, Rostelecom is expected to resume network expansion in 2001-2002.

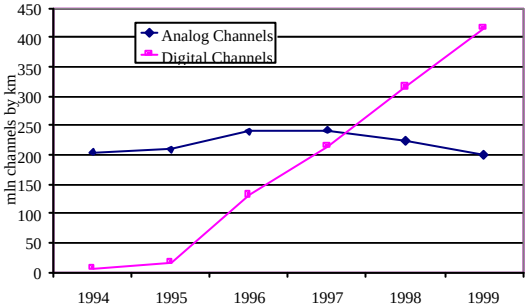
Rostelecom's network development program has already resulted in a significant improvement of ILD and DLD connectivity. The average growth rate achieved by Rostelecom in terms of incremental backbone lines (measured in km multiplied by number of voice grade circuits[6]) and new digital transit switching capacity has been 70% in 1996-1999.

Rostelecom Network Capacity

Switching Equipment



Backbone Lines



Since its formation, Rostelecom has been engaged in a significant capital investment program to modernise its entire international and domestic long distance network. The initial phase of this program entailed the modernisation and expansion of Rostelecom's transport network international facilities. The second phase involves expanding the capacity and updating the technology of the trunk lines and switches in the domestic long distance network. Rostelecom expects the entire network digitalisation program to be completed prior to the year 2010.

[6] Rostelecom uses 64K equivalents to evaluate the capacity of each individual line.

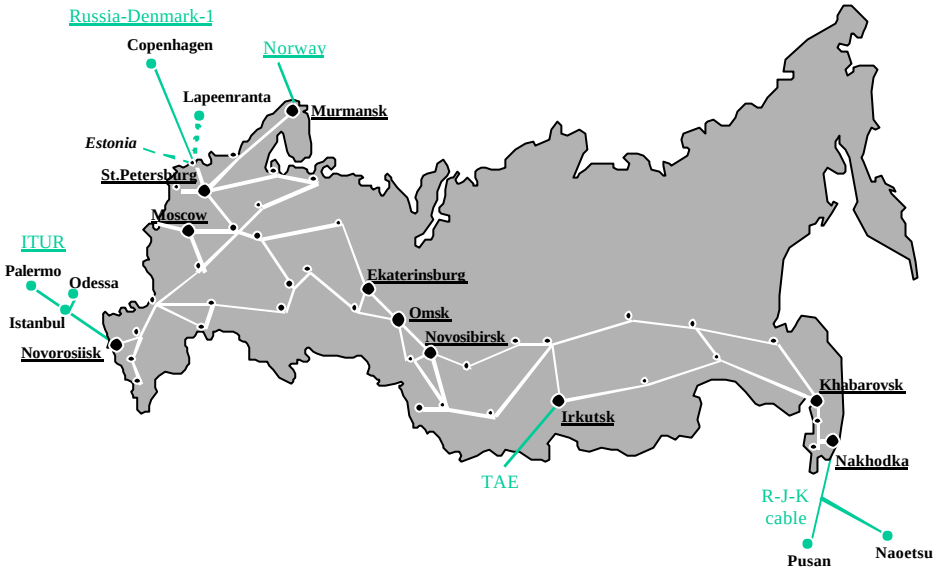
EMERGING ALTERNATIVE CARRIERS

Transtelecom

Transtelecom, initially a corporate network for the Ministry of Railways was established as a separate commercial entity in February 1997. Since then the company has been actively marketing its network platform and service portfolio. It recently announced that it was going to receive important regulatory concessions in ILD and DLD sector and obtain the status similar to Rostelecom. That would effectively break Rostelecom monopoly on ILD and DLD traffic generated on PSTN and promote Transtelecom into a second national carrier's carrier.

Technically, Transtelecom is already capable of carrying large volumes of traffic and has developed unparalleled terrestrial backbone network. It expands from Moscow to Murmansk in the North and Novorossiisk in the South. A few fibre-optic spurs are completed on the way from Moscow eastwards. Once completed the network will provide connectivity to over 50 regions and have access to all principal international routes from Russia.

Transtelecom Network



Transtelecom has licenses for voice, data and broadband services in 56 out of 88 Russian regions, complimented by licenses to provide Internet and VoIP services.

Transtelecom Licenses

#	Description
11347	Leased Circuits (56 regions)
11756	Data transmission services (ATM, Frame Relay, IP, X.25)
11757	Telematic services including Internet

Transtelecom is considered to be a strong opponent to challenge Rostelecom's long distance monopoly. The company is reputed to have influential lobby with the Government. Although Minister of Railways, Mr. Aksenenko has been recently losing political influence, Transtelecom is well positioned to get additional concessions.

Network Description

Transtelecom is constructing a 35,505 km fibre-optic backbone network, which runs alongside Russia's major railways from Nakhodka in the Far East to St.Petersburg in the West, and from Murmansk in the North to Novorossiisk in the South of Russia. The network consists of over 700 nodes, located at the buildings and facilities that belong to the Ministry of Railways. The following table provides an outline network implementation schedule and the description of the major backbone routes on Transtelecom network.

Transtelecom Network Segments

	Route	Distance (km)	Status
Segment 1	Moscow-Adler	2,500	Completed
Segment 2	Moscow-Tver-St.Petersburg	900	Completed
Segment 3	Moscow-Smolensk-Belorus (Berlin)	550	1Q 2000
Segment 4	Moscow-Vladivostok	6,665	1Q 2001
Segment 5	Moscow circular road and railroad	1,100	2Q 2000
Segment 6	Moscow-Ekaterinburg-Samara-Moscow	2,407	4Q 2000
Segment 7	Moscow-Yaroslavl	178	4Q 2000

The planned network should cover the area with over 85% of the total Russian population. It will provide seamless carrier's carrier service to over 700 locations (landing points) in 9 time-zones.

The use of existing infrastructure and, more importantly, the right of way across the country allow Transtelecom to construct up to 2,600 km of fibre per month at the cost of only $18,000 per km, while Russian national long-distance operator, Rostelecom should spend $20,000-25,000 per km (based on the most recent cost records on Trans-Siberian line). Transtelecom has reportedly built around 37% (13,000 km) of the planned fibre-optic infrastructure. It completed the routes from Moscow to Novorossiisk and Nizhny Novgorod. In addition to the domestic routes, Transtelecom plans to introduce modern interconnect and transit facilities for ILD traffic. It specifically plans to access Moscow–Copenhagen submarine cable, ITUR (Moscow to Palermo) and R-J-K (Russia Japan Korea). It also breaks out into the networks of Central Asian countries through TAE cable system.

It is quite conceivable that Transtelecom network will be completed by the end of 2001, regardless of the ramifications of the financial crisis and other negative trends in the contemporary Russian business environment. However, Transtelecom's business plan is overoptimistic and it is not clear whether the company can establish sufficient revenue flow.

Technical Platform

The network is based on SDH transmission at the transport layer and ATM technology at the protocol layer, with SS7 signalling. Powerful SDH network is built on the basis of STM-1, STM-4 and STM-16 equipment from the leading suppliers: Lucent Technologies, Alcatel, NEC, Marconi, Siemens.

Transtelecom's network is upgradable to around 100 Gbps, the overall network development plan calls for four DWDM-upgradable fibres with the capacity of 20 Gbps each plus 12 standard single-mode fibres.

Apart from backbone links between the major regional capitals, Transtelecom will provide connectivity to small and medium size locations. While on the highest level the network has STM-16 transport (bypassing small landing points), secondary locations are connected by STM-1 transport, which goes parallel to STM-16. Intermediate nodes are used to provide mission critical communications services to the facilities along the railroads. The higher level transport has enough spare capacity for commercial voice and data traffic as well as broadband applications (including PSTN traffic).

On the multi-protocol level the network will be a based on ATM equipment and shall provide ATM interface to the wide range of customers at ATM network access nodes.

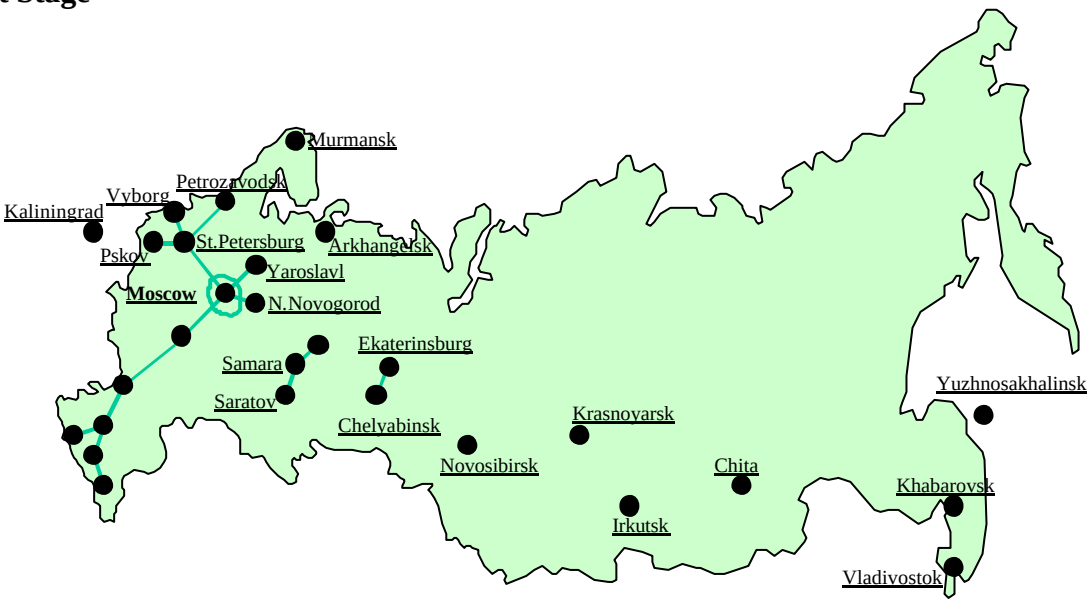
Transtelecom also plans to lease two Ku-band transponders from LMI-1 satellite for backup and connections with Russia's remote regions (VSAT network). The overall network topology is based on several SDH loops, enabling automatic re-routing if the quality of transmission is deteriorating for any reason. Availability of service is likely be in the range of 99.25% to 99.99% over 12 months, which is close to or above 99.5% quality benchmark used by Russian and international carriers.

Construction Stages

Transtelecom network is to be rolled out in three principal stages. Initially the company shall cover the service area between St.Petersburg and Novorossiisk (the busiest railroad routes in Russian Federation).

In addition to the North-South backbone line, Transtelecom shall install nodes in the principal cities to the east of the Urals (Novosibirsk, Krasnoyarsk, Chita, Vladivostok, etc.)

First Stage



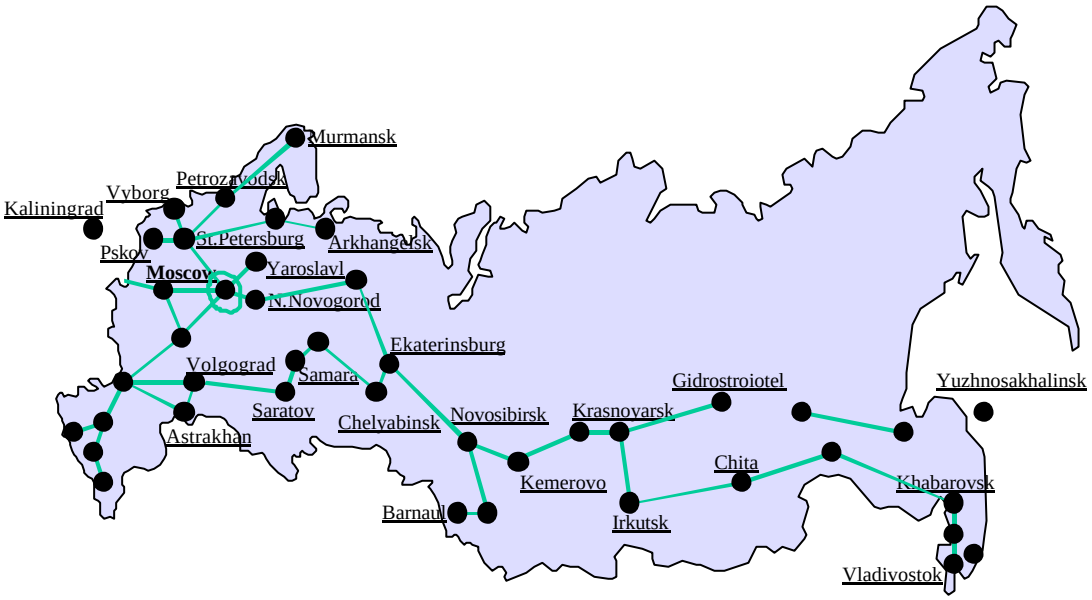
First stage (end-1999 – 1-2Q 2000) envisages:

⇒ Completion of Moscow-Voronezh-Rostov-Novorossiisk-Adler fibre-optic line
⇒ Completion of backbone lines in the following directions:
- Moscow – N.Novgorod
- Moscow – Yaroslavl
- St.Petersburg – Volkhovstroy – Petrozavodsk
- Ring around Moscow
- St.Petersburg – Pskov

⇒ Total length of fibre-optic cable should reach 17,000 km
⇒ Installation of inter-city and local gateways in the regional centres
⇒ Commissioning of VSAT terminals (2,040 Kpbs capacity) at key railway facilities, major regional centres and sea ports.

Towards the end of year 2000 Transtelecom is to complete the primary transport network between Moscow and Khabarovsk. Fully resilient STM-16 network will link Ekaterinburg, Chelyabinsk and other key locations in the Urals with the Central Russia (something that Rostelecom will not be able to do for another 12-18 months).

Second Stage



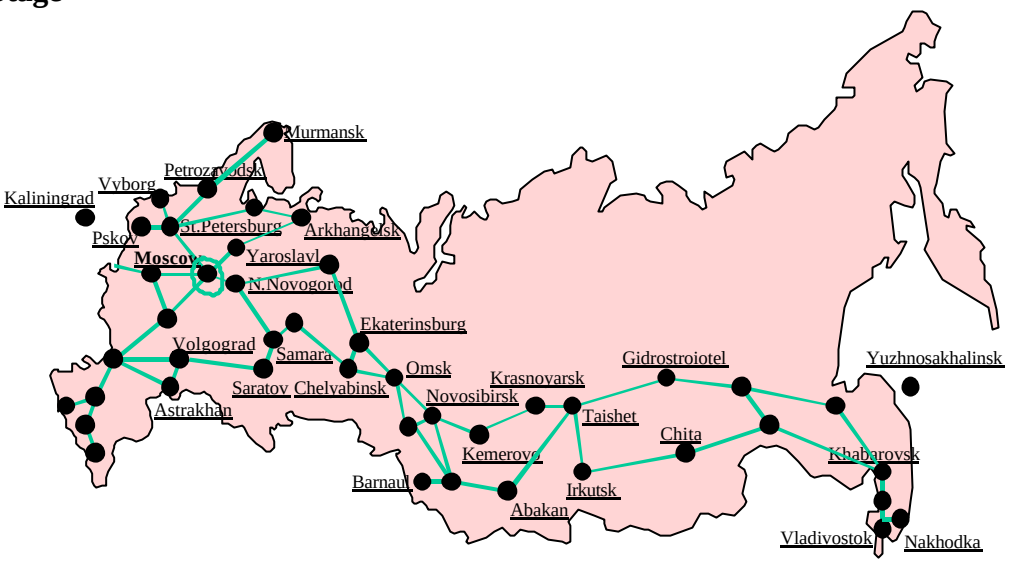
Second stage (3-4Q2000) envisages:

⇒ Completion of the f/o lines in the following directions:
- Moscow-N.Novgorod-Kotelnich-Cheptsa-Ekaterinburg-Omsk-Novosibirsk-Krasnoyarsk-Taishet-Irkutsk-Chita-Khabarovsk-Vladivostok-Nakhodka;
- Bogdanovich-Chelyabinsk-Ufa-Samara-Syzran-Saratov-Rtischevo-Liski;
- Saratov-Volgograd-Astrakhan;
- Moscow-Yaroslavl-Vologda;
- Moscow-Smolensk-Krasnoye-Brest
- Novosibirsk-Barnaul

⇒ Total length of fibre-optic cable should reach 30,000 km

Parallel to the implementation of the backbone network Transtelecom intend to develop service layer and install several dozens of access nodes as well as other data and voice interface devices. Transtelecom will also start rolling-out VSAT network (each of the teleports connected to the hub stations in St.Petersburg, Rostov-on-Don, Saratov, Ekaterinburg, Novosibirsk, Irkutsk and Khabarovsk). Two transponders on board LMI-1 satellite (total capacity 54 MHz) will connect 117 VSAT terminals by the end of year 2000.

Third Stage



Network should be completed and ready for commercial use by the end of 2001. In terms of capacity, flexibility and applications available it will be compatible to the Rostelecom backbone. In terms of cost (and which is even more important) maintenance expenditures it promises to be much more efficient.

As far as the SLA (Service Level Agreements) are concerned Transtelecom network could be the most advanced operator in Russia for the simple reason that the network will be maintained by the local railroad teams. The table below outlines key reliability parameters for Transtelecom network.

Service Level Commitment by Transtelecom

SERVICE LEVEL ASPECT	TRANSTELECOM CONTRACTUAL COMMITMENT
Response time (maintenance crew on site)	20 min (working day) 40 min (weekends)
Restoration time (physical disruption)	4 hours including: 1.5 hours – cable dismantling 2 hours replacement of the faulty segment
Overall availability	99.99% over 12 months on the backbone better than 99.2% on the customer links

Gazcom and Gaztelecom

Both enterprises are 'daughter' companies of Russian natural monopolist Gazprom. Gazcom was established in 1992 by Gazprom, RSC Energia named after S.P.Korolyov, and Gazprombank.

Main activities of Gazcom stated in its Charter are:

- Telecommunication services within Yamal system
- Deployment of corporate networks of different types
- Design and implementation satellites based on Yamal bus

Gaztelecom was founded by Gazprom and StroyTransGaz. In Russia Gaztelecom is going to combine several enterprise networks in order to become a fully-fledged long distance operator. There are three main strategic directions for Gazcom and Gaztelecom:

- Gazprom is going to capitalise on big ABC code 477 issued to Gazprom in 1997. Numbering capacity of this code is 8 mln, which is far beyond the Gazprom own requirements. Given that Russian gas monopolist possess DLD and LA licences in 77 out of 88 regions of Russia, it is only logical that Gazprom is diversifying its business into commercial telecom services. At the moment the 477 code is working only for outgoing communications, but by the middle of 2000 it will be recognised by the majority of toll and transit switches on the Russian PSTN.
- Giprosvyaz developed a report on combining the Gazprom network with other large enterprise networks. It is expected that first of all, RAO UES and Transneft could merge with Gazprom network, though technology of such a merger is still unclear.
- Gaztelecom also has an ambitious project to build Moscow-Brussels international fibre-optic link in order to provide connectivity for PSTN, overlay and datacom operators. The strategic partner for this project is not found yet, though its first phase completion is scheduled to the end of the year 2000.

License Properties

The telecom affiliations of Gazprom have a few very attractive licenses.

Gazcom Telecom Licenses

#	DESCRIPTION	REGIONS
5172	Local and DLD	77 out of 88 regions of the Russian Federation
5359	Data Transmission	RF territory

It should be noted that above listed licenses, Gazcom is perfectly licensed to design and build communications facilities. It also has in-house licenses by the Russian Space Agency to design, build and launch communications satellites.

Gaztelecom Telecom Licenses

#	DESCRIPTION	REGIONS
5626	Local, DLD and Intrazonal comms	46 regions of Russia
	Telematic services	Moscow City, Moscow Oblast, Kaliningradskaya Oblast
4917	Data Transmission	21 regions of Russia

Network and Services

Gazcom network consists of more that 50 Earth Stations and two Yamal-100 satellites. Yamal-100 and 100M satellites were designed and built by JSC Gazcom and RSC Energia. They were launched on September 6, 1999, to 90 E slot. One of them has been reportedly decommissioned for an unspecified failure. The other satellite covers practically the whole territory of Russia and some neighbouring countries.

In addition to the satellite communications platform Gaztelecom plan to build a fibre-optic backbone line alongside the pipeline from Moscow to Western Europe. It is currently planned to implement a DWDM-upgradable fibre-optic system with initial capacity of 2.4Gbps. First STM-16 routes have been reportedly started in Western Europe and Poland. The Russian segment of the line from Moscow to Minsk and Warsaw is scheduled to be completed in 2002. It is planning to build another line - 'Blue Stream' fibre under the Black Sea to Turkey.

Gaztelecom Yamal – Europe Fibre-Optic Line

Internet Activities

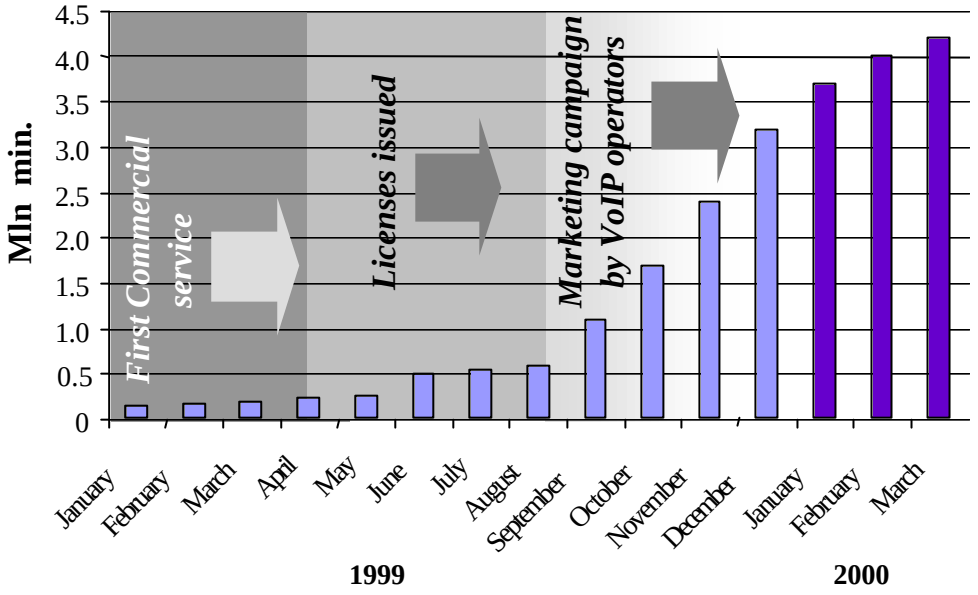
Gaztelecom intend to aggressively address the IP market. The company plans to build its primary IP backbone to provide connectivity to its regional affiliations. Gaztelecom has reached an agreement with Alcatel and Siemens whereby the latter should supply a range of high capacity network access nodes for Gaztelecom IP network. Once deployed in Central Russia, the IP solution is likely to be duplicated elsewhere on Gaztelecom network. The three main hubs for IP traffic on Gaztelecom network are chosen to be Maloyaroslavets (Kaluga region) and Ukhta (Komi).

IP TELEPHONY

The Russian IP-telephony market is far from maturity. Currently the total monthly traffic of all VoIP operators in Russia is evaluated at approximately 4 mln billable minutes of international and domestic long distance traffic.

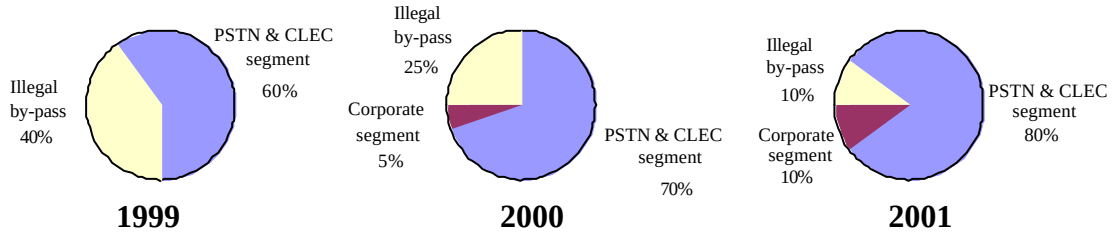
The IP-telephony market in Russia might be said to have started in 1999, when the Ministry of Communications finally clarified the regulatory status of VoIP service and issued the first few licenses. Unlike in other developed economies, the proliferation of IP-telephony in Russia has been to a large extent driven by the alternative ILD operators, who used VoIP set-up as a loop hole to by-pass national ILD and DLD monopoly carrier Rostelecom. The VoIP operators thus take over the market share from conventional carriers, rather than generate incremental traffic.

Russian VoIP Market (Billable Minutes)



Following the commencement of a fully legitimate VoIP service and the diversification of several CLECs into IP-telephony business, the market has been growing at a rate of 20-30% per month. Furthermore the share of pirate and semi-legitimate operators is shrinking rapidly. It is expected that the number of licensed VoIP operators will grow to over 120 towards the end of the year, while the share of "shadow" service providers will decrease to less than 25%.

VoIP Market Breakdown



The Russian VoIP market in 2000 is expected to grow by 180% and reach USD 12.4 mln in terms of the total turnover. IP-telephony operators are projected to carry 41.5 mln of billable minutes or 1% of the total ILD and DLD traffic on the Russian PSTN network.

MAIN TRENDS

The following main trends in the IP-telephony sector have been identified as a result of the operators survey in Moscow and the regions.

⇒ **IP-telephony tariffs have been decreasing steadily (in dollar terms) over the last 18 months. It is expected that the VoIP offering[7] will become increasingly competitive compared to the conventional PSTN service notwithstanding rouble devaluation.** As Rostelecom and regional PTTs adjust their ILD and DLD tariffs to the consumer price index, more and more corporate and individual users are likely to opt for VoIP solution. The IP-telephony had in a sense a false start in Russia in the second half of 1998. By that time several alternative operators had managed to develop sufficient technical platforms to carry voice over IP transport. However the sharp devaluation of the local currency and PSTN tariffs made IP-telephony only marginally competitive with a cheap PSTN service. Situation started to turn around in mid 1999, when Rostelecom reviewed their ILD tariffs and brought them almost to the pre-crisis level. Currently the average PSTN end user ILD tariff is estimated at USD 0.75 per minute while VoIP average charge is only USD 0.35 per minute[8].

⇒ **Quality of service is currently the main obstacle for the further growth of the VoIP segment**. Since digital infrastructure on the main ILD routes and particularly within the country remains to be fairly expensive, the overwhelming majority of IP-telephony operators still use an open Internet environment for VoIP connectivity. That inevitably drives the quality of voice service down and has a very negative effect on reliability. Only 25% of the total IP-telephony traffic is being carried via dedicated IP backbone bearers at the moment. As Rostelecom and other carrier's carriers offer more affordable transport to international destinations and main cities inside of Russia, VoIP will clearly take over conventional switched voice service. In fact, some CLECs are already using IP platform to deliver their voice traffic to the major hubs, where they can break-out into international networks. Sovintel, for example reportedly use VoIP on three European routes.

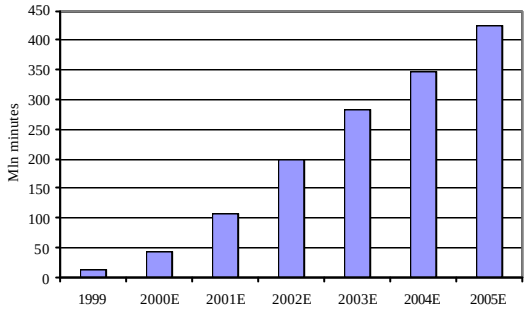
⇒ **Russian VoIP segment remains to be highly fragmented with over 70 license holders and about 40 fully operational VoIP platforms in Moscow and the regions. However, there is no clear leader on the market** who can potentially consolidate VoIP traffic within a single transport network and offer to the regional operators an affordable transit solution. Rostelecom is well positioned to take this niche. It has been offering VoIP services through its regional outfits and is determined to further diversify into IP-telephony. There are a few alternative providers keen to compete for the market share with Rostelecom including Global One and Concert as well as Golden Telecom and Direct Net.

⇒ **IP-telephony remains to be a segment with a relatively high regulatory uncertainty.** The key regulatory act – "The Ruling Document on IP services", which covers VoIP has yet to be officially adopted. In addition to that a new concept for development of IP-telephony services is expected to be developed by Q3 2000 in a concerted effort of MoC, Rostelecom and principal Russian telecom operators

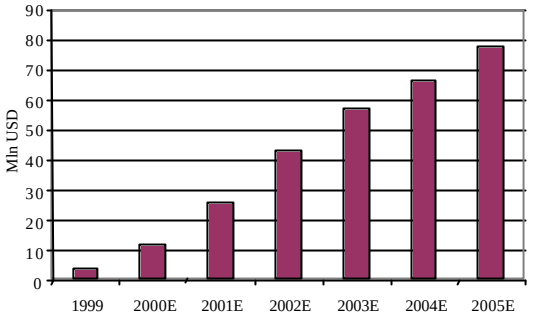
[7] Denominated as a rule in hard currency
[8] Based on the limited data collected through the survey of 15 VoIP operators.

It is expected that in the long term Russian VoIP operators will take over a substantial market share in the ILD and DLD segments, much like in the rest of the world where packet switched voice may very well become a dominant protocol towards the end of the decade.

Russian VoIP Market. Total Billable Minutes of ILD and DLD Traffic



Revenues of IP-telephony Operators in Russia



There are three main drivers behind the VoIP growth in Russia:

- **Pricing:** Since VoIP can more efficiently use backbone capacity on the majority of the existing PSTN routes and particularly within corporate networks, IP is going to be price competitive compared to switched voice solutions. As VoIP reaches the critical mass and the rest of the world migrates on the packet switching (30-50% of the long distance traffic world-wide is likely to go via IP transport 2005-2007), IP-telephony solution will become cheaper than conventional switching platforms.

- **Liberal regulation:** In the shorter term VoIP will be a facility for the Russian operators to break the Rostelecom monopoly and play into the premium market segments such as ILD. Indeed VoIP offers a legitimate solution for Rostelecom by-pass. Currently the by-pass traffic is evaluated at 35-40 mln. Assuming that 50% of this traffic could migrate on the VoIP platform, the IP-telephony volume will grow to almost 110 mln min in 2001.

- **Growing IP population:** The proliferation of IP technologies will facilitate the growth of IP-telephony traffic volumes. With the expansion of ISPs and the growing Internet audience the VoIP operators will get easier access to a wider customer spectrum. In practical terms VoIP providers have many synergies with ISPs and can sell their service on the back of Internet access. The pre-paid IP access cards in particular can be sold along with VoIP calling cards[9]. Based on world-wide trends 50-60% of the IP subscribers tend to use corporate and residential VoIP applications. Assuming there are 4 mln dial-up customers in Russia in 2005 (and each of the IP users generate on the average at least 2 min of proper international traffic and 100 min of DLD traffic) the IP-telephony volume could potentially reach 425 mln min per annum in 2005.

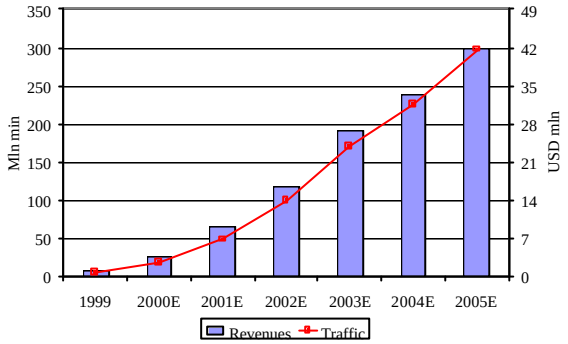
If the current trend holds and the IP-telephony tariffs decrease slightly, while the PSTN charges grow marginally in dollar terms, VoIP market share is likely to further grow through to the year 2005 and reach up to 9-10% of the total Russian ILD and DLD market.

[9] One of the leading VoIP providers in Russia – OSS have already started marketing their calling cards in a package with their pre-paid IP dial-up access services. They also promote the service through other ISPs.

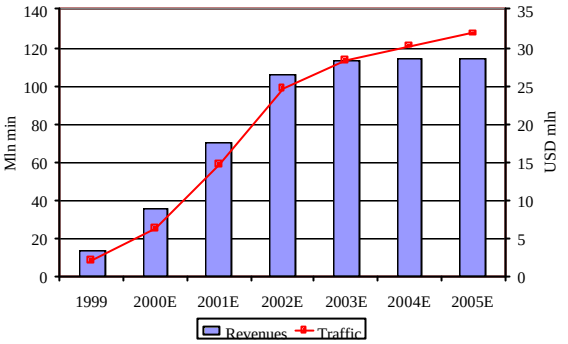
MARKET SIZE AND PROJECTIONS

Russia is likely to lag behind most of the developed economies in terms of IP-telephony traffic volumes. Given the present situation and world-wide trends, Russia is unlikely to catch up with other European countries until 2010 as far as the penetration of IP-telephony service is concerned. While VoIP is projected to get 40% of the world ILD and DLD market share by 2007, in Russia it will most likely account for only 20% of the toll traffic.

DLD IP-telephony in Russia. Expected Scenario



ILD IP-telephony in Russia. Expected Scenario



Summary Projections

ILD IPT traffic, mln min

	1999	2000E	2001E	2002E	2003E	2004E	2005E
Pessimistic scenario	**7.9**	**12.5**	**23.4**	**39.4**	**50.3**	**53.2**	**56.6**
% of Rostelecom ILD	2.3	3.6	6.5	10.5	12.9	13.1	13.5
Expected Scenario	**7.9**	**24.9**	**58.6**	**98.4**	**113.1**	**120.9**	**127.4**
% of Rostelecom ILD	2.3	7.1	16.3	26.3	29.0	29.8	30.3
Optimistic Scenario	**7.9**	**49.8**	**93.7**	**142.2**	**165.2**	**175.7**	**186.9**
% of Rostelecom ILD	2.3	14.2	26.0	37.9	42.4	43.4	44.5
Average ILD IPT tariff, USD	0.42	0.35	0.30	0.27	0.25	0.24	0.22

DLD IPT traffic, mln min

	1999	2000E	2001E	2002E	2003E	2004E	2005E
Pessimistic scenario	**4.2**	**8.3**	**19.2**	**39.4**	**75.4**	**98.8**	**132.2**
% of Rostelecom DLD	0.1	0.2	0.5	1.0	1.8	2.4	3.1
Expected Scenario	**4.2**	**16.6**	**47.9**	**98.4**	**169.7**	**224.5**	**297.4**
% of Rostelecom DLD	0.1	0.4	1.2	2.5	4.1	5.3	6.9
Optimistic Scenario	**4.2**	**33.2**	**76.7**	**142.2**	**247.8**	**326.3**	**436.1**
% of Rostelecom DLD	0.1	0.9	2.0	3.6	6.0	7.8	10.1
Average DLD IPT tariff, USD	0.26	0.22	0.19	0.17	0.16	0.15	0.14

Even within the most pessimistic scenario, IP-telephony operators are projected to earn over USD 12 mln by 2003 on ILD traffic. In a more likely scenario the IPT turnover is projected to exceed USD 28 mln in 2003, the average ILD tariff offered by IP-telephony operators decreasing from roughly 40 cents in 1999 to about 25 cents in 2003.

Projection Techniques

J'son & Partners used two approaches to independently project market growth in the IP-telephony segment:

- **Bottom-up approach** is based on the detailed market survey among the existing VoIP operators. Using insider intelligence, on plans and projections, as well as actual traffic growth figures collected from the VoIP operators, J'son & Partners build extrapolations to forecast VoIP volumes and tariffs for the next 3-5 years. It was assumed that VoIP is unlikely to get more than 45% of the current ILD market segment and 10% of the DLD traffic (taking into consideration the regulatory and general market limitations described above).

- **Top-to-bottom approach** is based on extrapolating European trends. It was assumed that Russia is lagging 2.5-3 years behind other developed economies in terms of VoIP penetration. Thus the target penetration (as percentage of VoIP traffic in the total originating DLD and ILD traffic) was set at 5-6% for 2003 and 9-10% for 2005. Most recent world-wide projections[10] indicate that IP-telephony can take as much as 5.6% of the total toll traffic in 2000 and further grow to 20% in 2005.

The following table outlines the key performance indicators and projections by selected VoIP operators in Russia:

Survey Results

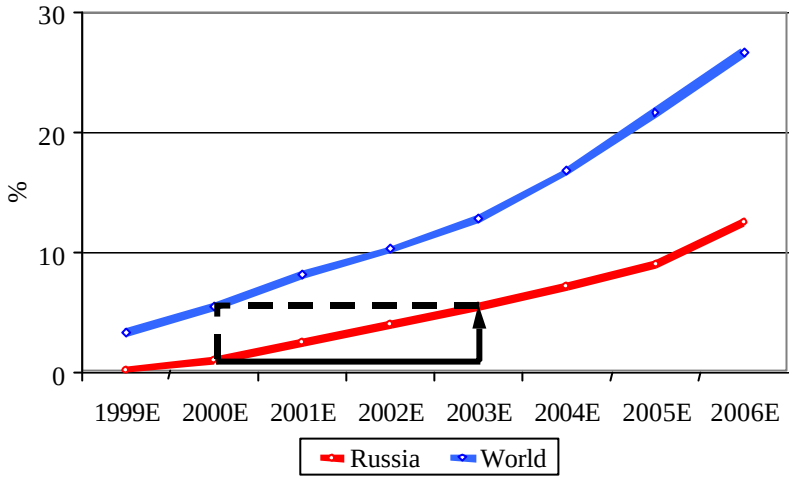
Operator	Region	Average Monthly Traffic, Thsd min	Current Market Share	Projected 2000 Traffic
RGC	Moscow, St.Petersburg, Yuzhno-Sakhalinsk and other 9 regions	1,000*	N/A	28,800*
OSS	Moscow, St. Petersburg, Ulan-Ude, Samara and CIS	500	13%	6,000
Sitek	Moscow, St.Petersburg, Nizhny Novgorod, Samara, Kiev and CIS	400	10%	4,800
Tario	Moscow and 65 sites of presence	300	8%	3,600
Elvis-Telekom	Moscow	300	8%	3,600
Incomtel TG	Moscow	250	6%	3,000
Zond Holding	Moscow	150	4%	1,800
Trans TS	Moscow	100	3%	1,800
Rinet	Novosibirsk	50	1%	600
Telecom Systems	Orenburg	20	1%	240
Dion	Chelyabinsk	20	1%	240
NP Maginfocenter	Magnitogorsk	5	-	60
Other	Regions	300	8%	3,600

** transit traffic*

[10] Based on IDC, MCI, Forrester Research

Assuming that the operators polled account for 70% of the total legitimate VoIP segment[11] and the "shadow" traffic is currently about one third of the total IP-telephony traffic, the overall DLD and ILD traffic could be evaluated at 42 mln minutes in the year 2000. Furthermore, based on the sales record to date and present growth rates one may expect that the VoIP traffic should increase by factor of 7 annually and exceed 280 mln min by year 2003. This projection agrees with the "helicopter view" picture from the global markets.

Share of VoIP in the Total ILD and DLD Traffic



Assuming Russia is lagging 2.5-3 years behind the rest of the world (which is definitely the case in IP growth), it is perfectly conceivable that 9-10% of the total Russian long distance traffic will migrate onto IP platform by 2005.

In addition to this general projection several variations have been explored to the base line scenario. Under the most pessimistic assumptions the VoIP volume will grow in 2000 by less than 50% and the share of VoIP in 2005 will reach only 4% of the total long-distance traffic. That may very well happen if the first wave of VoIP users will be scared off by a terrible quality of service. Indeed the sale of VoIP pre-paid cards seem to have stabilised in the first quarter of 2000. The existing customers can theoretically desert their VoIP providers as soon as their cards expire.

Under the opposite scenario the existing VoIP operators will be joined by Rostelecom who are likely to enter the market in co-operation with Central Telegraph and cannibalise a good deal of its own ILD and DLD revenues to stay on top of the market and retain the overall market share. In that case Russia is projected to quickly catch up with the world-wide trend and VoIP can take up to 9-10% of the total toll traffic.

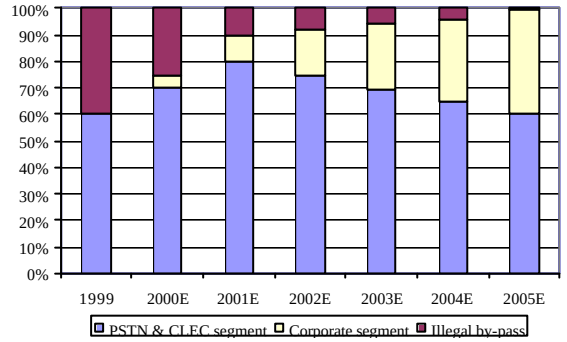
Overall IP-telephony is projected to account for at least 13.5% of the total Russian ILD traffic and 4% of the DLD traffic. The share of IP-telephony in total proceeds from long distance telephony are likely to reach about USD 60 mln in 2003 with further growth towards 2005 at a rate of 15-20%.

[11] J'son & Partners interviewed 15 out of about 35-40 existing operators (total number of license holders is about 55 as of December 1999).

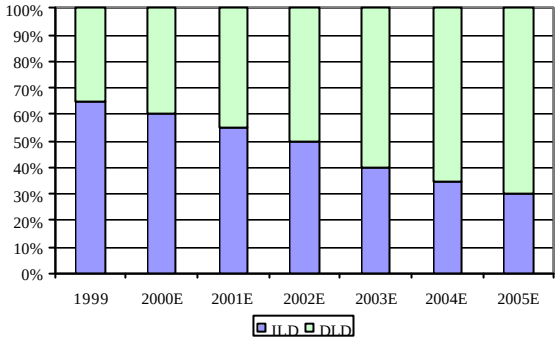
The breakdown of the VoIP market is also likely to change substantially over the next 3-5 years. Very much like in the rest of the developed economies the share of the corporate users will grow faster than PSTN segment.

It will take Russian regional PSTN operators some time before they can get rid of the obsolescent switched voice technologies and implement fully fledged VoIP network nodes in their respective regions. In the meantime corporate clients will happily use IP as a cheaper alternative to corporate voice solutions. Eventually the PSTN will be the dominant user of VoIP platform, as the majority of traditional carriers opt for packet switched environment. However this is more applicable to the US and the most advanced European markets (such as the UK). The Russian market is unlikely to see the implications of this global long-term trend within the next few years.

IP-telephony applications. Traffic breakdown (PSTN, corporate, shadow)



DLD vs. ILD traffic in IP network environment



One of the key developments on the domestic market will be the growth in DLD volumes carried via IP transport network. There is a truly unlimited room for growth, compared to what is currently being addressed by the VoIP operators.

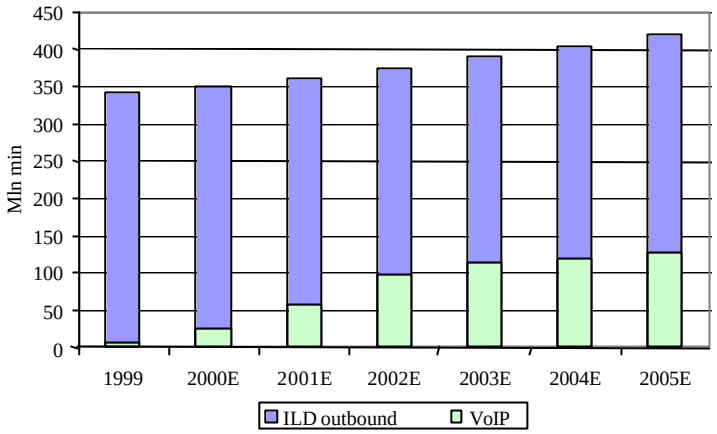
Eventually domestic long-distance IP-telephony will grow faster than ILD, long-haul routes to Siberian and Far-East destinations are expected to be the first PSTN infrastructure elements migrating on IP platform.

IMPACT ON ROSTELECOM

The growing VoIP business should theoretically represent a major threat to the traditional operators and Rostelecom in particular. Since Rostelecom has been retaining a de-jure monopoly on ILD and DLD traffic (generated on the public switched telephone network of Russian Federation) the very fact of legitimate VoIP operation breaks Rostelecom monopoly and creates a fertile bed for competition. In addition to that price-wise VoIP operators by definition are more competitive and can quickly win a major market share from the incumbent carrier's carrier.

The following chart illustrates the impact that VoIP is likely to have on ILD segment, where until very recently Rostelecom has been an unquestionable leader.

Reshuffle in Russian ILD Segment



Contrary to what one might expect, Rostelecom decided against a segregationist approach towards VoIP. So far Rostelecom has refrained from using its influence with the regulatory authorities to review the regulation and squeeze VoIP operators from the lucrative ILD market. Instead Rostelecom has moved aggressively into the VoIP segment themselves with a view to become one of the dominant carrier's carriers.

Over the last 6-9 months Rostelecom have undertaken the following main measures to get a share in IP-telephony segment.

- Rostelecom have decided to partner Central Telegraph in order to build domestic VoIP transport network, based on Rostelecom ATM platform and Central Telegraph nodes in 12 key regions of the Russian Federation. The pilot operation is to commence this year in Moscow, St.Petersburg and a few other cities (most likely Samara and Ekaterinburg).
- Rostelecom affiliations in the regions such as Rinet and Dion (reselling IP access services in the Urals and Siberia) started to actively diversify into VoIP segment and offer IP-telephony services on top of the general IP access.
- Rostelecom's regional branches have also entered the IP-telephony market. At least two out of 12 regional branches within Rostelecom family offer VoIP access to Moscow and St.Petersburg.

Taking into consideration what Rostelecom has been doing so far in VoIP market segment, it is expected that the Russian national carrier's carrier will compete with the emerging rival operators on tariffs and quality rather than leverage its political relationships to strangle the new business initiatives.

However, there is some tension between incumbent operators and alternative providers using VoIP platform. Strangely enough, the main opposition for IP-telephony operators comes from the Russian CLECs and commercial overlay networks. They consider VoIP as a major threat, since the new IP-telephony operators are very well positioned to successfully compete for the premium corporate customers and offer ILD access at the rates lower than PSTN, let alone premium tariffs charged by Comstar, Sovintel, Combellga and the likes. There are two main areas, where VoIP operators are quite vulnerable and may give in under pressure from the incumbent service providers.

Some VoIP operators (particularly those who carry substantial volumes of international inbound traffic) **are likely to face certain difficulties with terminating calls in Russia**. Indeed they can not (strictly speaking) breakout into PSTN through the local providers and shall instead seek an interconnect deal with Rostelecom. Rostelecom then will be in a position to influence VoIP termination charges to international originating operators. It is also the case with regional PTTs – VoIP service becomes less competitive if the termination charge is too high.

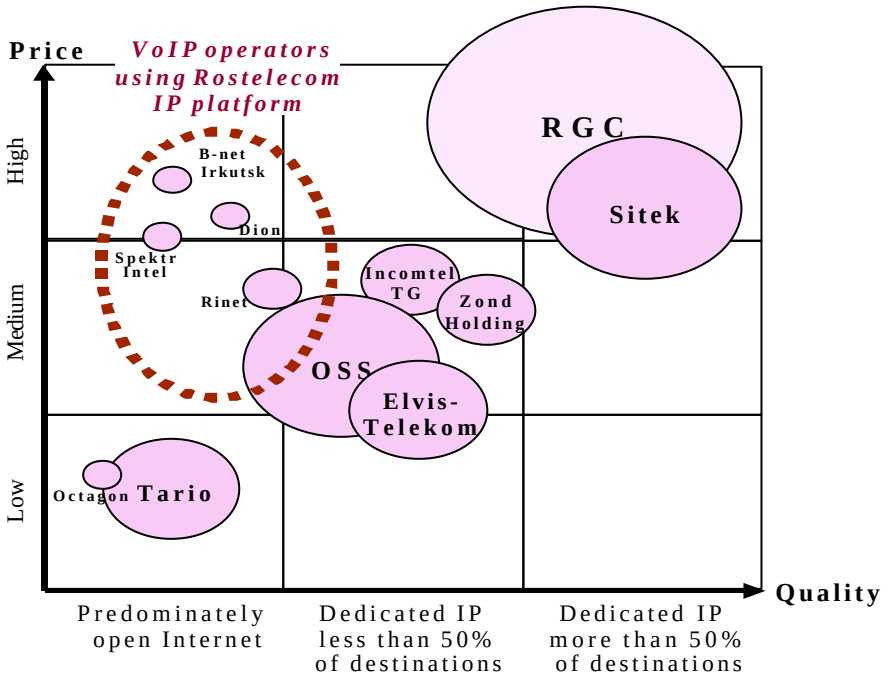
Dial-up access to VoIP nodes remains to be the weakest point for the overwhelming majority of VoIP operators. Since the incumbent PSTN providers own the numbering capacity, they can effectively limit the capacity of the VoIP nodes and stop IP-telephony providers from taking "too much originating traffic". There were a number of instances when Comstar (using sophisticated number identification software) blocked the numbers that had been identified as VoIP modem pool. Hostile measures have been reportedly taken against VoIP operators by Combellga. **Although there have been no cases reported by the regional VoIP providers, one can not rule out the possibility for regional Electrosvyaz to "crack down" on by-pass telco, should the opportunity come**.

PRICE TO QUALITY SEGMENTATION AND MARKET REQUIREMENTS

It may be somewhat early to discuss price-to-quality segmentation, since the market itself is far from maturity and has been changing rapidly over the last 12 months. Furthermore, quality in the VoIP environment has been traditionally evaluated based on the subjective adjudication. However, there are some trends that could be quantified.

Generally there is an obvious relationship between price and quality – the cheaper the service the worse the quality and reliability. It is fair to say that on the Russian market both the price and the quality depend on the ratio between open Internet and dedicated IP transport used by each individual operator. The more traffic is carried via dedicated IP transport, the higher the tariff and quality and vice versa. The following chart illustrates current market segmentation, based on the data on several selected operators.

Price-to-Quality Segmentation of VoIP Market



It must be stressed here that the division into low, medium and high tariff groups is very tentative. There are operators who focus on international traffic and offer affordable tariffs on

international routes (such as Elvis). Others have been capitalising on their unparalleled domestic VoIP infrastructure (OSS).

The tariffs generally reflect the cost of retaining dedicated infrastructure to certain destinations. Not surprisingly the tariffs to CIS countries are several times higher than rates to US and Europe. Indeed, lack of reliable terrestrial digital transport to CIS capitals makes dedicated IP circuit a very costly item, even compared to international circuits. On the other hand, the cost of VPC to main international hubs could be spread over tens if not hundreds of thousands of minutes per month, while most of domestic and CIS circuits are classified as thin route traffic.

Market Segmentation: Tariffs

MEDIAN TARIFFS	LOW TARIFF TIER	MEDIUM TARIFF TIER	HIGH TARIFF TIER
USA	0.20	0.26	0.32
Russia DLD (Novosibirsk-Moscow)	0.16	0.20	0.28
CIS	0.40	0.55	0.70

It is quite indicative that IP-telephony operators transiting their traffic through Rostelecom network have a slightly higher tariff with a mediocre quality. Rostelecom is not quite prepared to offer very low carrier rate to the regional VoIP operators.

The boundaries between various quality tiers are even less conspicuous. The quality of the IP-telephony connectivity has been traditionally measured on a five-point scale, each operator being assigned a score based on subjective perception. There is a convention that 2-3 score should be assigned to what users oftentimes refer to as "synthesised voice", while PSTN quality should be rated at 3-4 points.

Extensive studies on this matter prove that the quality of service depends largely on the vocoder (codec) technology employed by various operators. RT29HQ encoding rarely gets more than 3 points, while G.723 and G.729 get "three plus" and "four plus" scores, G.711 rated as high as "five minus". The difference between the technologies boils down to the bit rate used for encoding voice (4 Kbps technology - RT29HQ can hardly match 32 Kbps encoding – G.711). Thus the quality of speech might be said to be a measure of bandwidth that could be cost efficiently allocated by each VoIP operator for individual "conversation".

Since Russian VoIP providers use similar vocoder techniques, the difference in quality is essentially determined by the IP bandwidth available to the operator in question (on each particular route). Based on the survey of about 10 operators, the more traffic goes over dedicated IP transport, the higher is the quality (see the chart on the previous page).

There are no clearly defined quality requirements in the Russian VoIP segment. Nevertheless based on the operator survey J'son & Partners developed a list of empirical quality requirements:

- Delay should be better than 200 ms. The worst possible delay that could still be acceptable for the low paying user is widely believed to be 500 ms.
- Voice distortions should not be excessive and the voice of the counterpart at the distant end should be recognisable as opposed to totally synthesised voice. The acceptability threshold is typically tied up with the recognition of male and female voice patterns.
- Availability of service and call completion rate should be on the level with the PSTN.
- The customers should have reliable and accurate billing with fully itemised call logger reports.

Further down the road the list is likely to be expanded to include certain functionalities that are considered to be a part of a standard PSTN service portfolio but have never been available to VoIP customers. The list will include, but clearly will not be limited to, the following main features[12]:

- Tone dial and DTMF transmission capability
- Compatibility with the most popular telephony interfaces and signalling systems
- Echo cancellation, particularly on the long haul routes
- Full duplex connectivity
- Valued added services such as call transfer, call wait, etc.

Ironically the VoIP operators express their concern over the lack of standards and quality requirements. Unlike in other segments of the Russian telecommunications industry where standards and quality requirements are over-regulated and oftentimes are ridiculously detailed, VoIP sector is so liberalised that open Internet arrangements can live together with highly sophisticated IP solutions.

The recognised VoIP operators who have already invested heavily into IP platform are likely to become catalysts for the new self-regulation that could define quality standards and stop the "traffic flight" from large VoIP operators to the cheap providers of IP-telephony.

REGULATION

It was unequivocally accepted by the regulatory authorities that neither PSTN regulation on interconnect and traffic routing (Order by the Ministry of Communications # 54 dated from March 28, 1995) nor PSTN standards (should apply for VoIP operators. Among other things that gives VoIP operators the following main advantages:

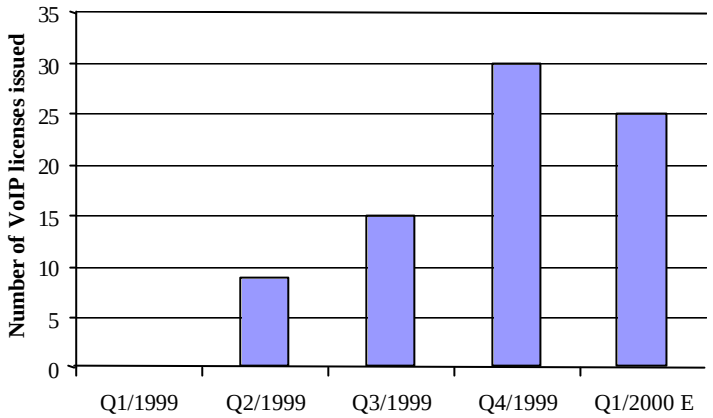
- Alternative VoIP operators have no restrictions as to where they collect the originating voice traffic. Indeed, since VoIP interconnect with PSTN is not restricted, IP-telephony companies can use dial-up rotaries to channel toll traffic from PSTN and by-pass Rostelecom.
- VoIP can be used as a legitimate facility to terminate traffic on the Russian PSTN without paying ludicrously high settlement rate to Russian ILD monopoly operator – Rostelecom. VoIP will help a whole range of alternative operators to legalise their existing by-pass and re-file operations.
- Theoretically VoIP operators can introduce their own numbering (address) plans in parallel to PSTN numbering and use IP address as a network identification. In that case VoIP operators will be totally independent from whatever regulatory limitation could be imposed on telephony service provider.

[12] The features herein are not listed in the order of priority

- The emerging IP-telephony operators have a lot of flexibility when it comes to tariffs. They do not necessarily have to observe tariff schemes imposed by the Ministry of Communications on regional PTTs and Rostelecom. Theoretically the billable unit for VoIP could be kilo-segment of data transferred or an individual packet, rather than a minute of conversation. This is particularly attractive option for corporate applications – the pauses in conversation do not count and are not being charged for.
- IP-telephony service may or may not meet the quality requirements set for the conventional PSTN service.

Not surprisingly the new segment instantly became very attractive for small and medium size alternative operators, who would like to expand their operations, but were reluctant to challenge Rostelecom monopoly in ILD and DLD. The explosion of interest to VoIP translated into an unparalleled growth in the number of applicants and new license holders.

New VoIP Licenses Issued by Ministry of Communications



It is expected that the new regulation will be adopted to effectively canonise the internetworking principals that have been developing over the last 12-18 months in VoIP environment.

The three most powerful and influential supporters of the new regulation are Rostelecom and Central Telegraph (apparently not without blessing from their strategic partners – Global One). The above companies convinced regulatory authorities that a new VoIP concept should be developed and adopted in the Russian telecommunications industry. The new concept is being drafted by Giprosvyaz to be submitted to the Ministry of Communications this summer (at least until September 1, 2000).

Based on the first draft the new concept promises to be a truly revolutionary regulatory act that could pave the way for the further VoIP expansion. The concept will effectively abolish State control over the industry and Rostelecom monopoly on ILD and DLD voice services. It, for example, contains the following fundamental clauses:

- VoIP shall be supported as a facility to lower ILD and DLD tariffs
- The Ministry of Communications shall gradually give up on the strict tariff control and introduce free competition in ILD and DLD communications
- Packet switched voice service shall be introduced on the PSTN and a new integrated network shall be developed in Russia to support a variety of voice and data applications. Conventional PSTN network shall finally merge with the new service platform.
- Common technical specification, standards and quality requirements shall be worked out for the national VoIP network in Russia.

If the new concept is adopted by the Ministry of Communications, that could give a new momentum for the development of IP-telephony and open new unparalleled opportunities for international operators.

APPENDIX I: ROSTELECOM TRAFFIC AND TARIFFS

ROSTELECOM INTERNATIONAL TRAFFIC

min

	OUTGOING				INCOMING			
	1996	**1997**	**1998**	**1999**	**1996**	**1997**	**1998**	**1999**
Jan	19,295,000	20,445,330	25,397,291	23,462,514	34,270,750	36,115,696	39,177,023	30,263,763
Feb	19,995,000	21,077,560	24,837,843	23,945,419	35,058,260	34,738,521	36,811,764	27,170,327
Mar	20,697,181	22,901,854	27,678,362	26,862,714	38,256,106	37,620,063	41,365,216	31,448,027
Q1	**59,987,181**	**64,424,744**	**77,913,496**	**74,270,647**	**107,585,116**	**108,474,280**	**117,354,003**	**88,882,117**
Apr	20,198,977	23,479,560	26,260,828	25,703,411	38,665,358	38,052,700	39,250,044	31,187,370
May	19,377,503	22,643,612	25,672,813	26,335,262	36,948,507	37,253,046	37,451,371	32,218,222
Jun	19,082,710	23,581,681	26,576,857	24,879,668	36,680,594	38,520,960	37,179,290	31,346,768
Q2	**58,659,190**	**69,704,853**	**78,510,498**	**76,918,341**	**112,294,459**	**113,826,706**	**113,880,705**	**94,752,360**
Jul	19,443,735	24,826,286	26,841,622	24,307,060	36,921,658	40,207,538	36,638,734	29,719,040
Aug	19,051,226	24,108,567	25,180,812	23,611,834	36,244,630	38,840,541	34,833,397	30,767,844
Sep	19,913,389	25,911,767	24,681,441	23,531,761	38,062,047	42,743,239	32,924,242	34,310,646
Q3	**58,408,350**	**74,846,620**	**76,703,875**	**71,450,655**	**111,228,335**	**121,791,318**	**104,396,373**	**94,797,530**
Oct	21,334,294	27,821,779	24,253,357	23,901,996	40,705,361	44,213,377	33,171,518	36,499,784
Nov	21,145,726	27,139,002	23,872,951	23,669,678	36,699,694	41,551,578	33,210,862	37,979,754
Dec	21,060,531	26,303,992	23,817,385	23,564,054	37,485,389	42,033,075	31,895,530	40,160,999
Q4	**63,540,551**	**81,264,773**	**71,943,693**	**71,135,728**	**114,890,444**	**127,798,030**	**98,277,910**	**114,640,537**

APPENDIX II: DIRECT ILD ROUTES ON ROSTELECOM NETWORK

Direction	Zone	Connection via Cable / Satellite		Channels Quantity	Signalling System	Response %	Peak Hours
Argentina	N. America		x	30	N5	66	19-20
Australia	Australia		x	30	N5	40	15-16
Austria	Europe	x		180	R2D	68	11-12, 16
Belarus	Europe	x		29	N7	47	22
Belgium	Europe	x		90	N7	63	11-12
Brazil	America	x		30	N5	41	17
Bulgaria	Europe	x	x	180	R20, N5	44	9-10, 21-22
Canada	N. America	x		105	N5	58	17-18, 20
China	Asia		x	210	N5	55	17-18, 20
Croatia	Europe	x		90	R2D	65	10
Cuba	America		x	7	N5	62	16
Cyprus	Europe		x	106	R2D, N5	62	11-12,21-22
Czech Republic	Europe	x		90	R2D, R2?	53	11-12, 21
Denmark	Europe	x		119	N7	69	12-13, 16
Egypt	N.-E.Africa	x		7	N5	35	9
Estonia	Europe	x		120	N7, 1vF	59	15, 19
Finland (Finnet)	Europe	x		30	N7	60	14, 16
Finland (Telecom)	Europe	x		270	N7	67	11, 14
Finland (Telivo)	Europe	x		30	N5	60	14
France	Europe	x		298	R2D, N7E	61	10-11,15-16
Germany	Europe	x		885	R2A, R2D	63	11-12, 20
Great Britain (GB)	Europe	x	x	448	N7, N7?	58	12-13,14-15, 22
Great Britain (RTN)	Europe	x		90	N5	64	16
Great Britain (? ercury)	Europe	x		119	N5	74	22-23
Greece	Europe		x	60	N5	55	15-16,22-23
Hong-Kong	Asia		x	24	N5	58	11, 16
Hungary	Europe	x		115	R2D	58	11-12, 20
India	Asia		x	58	N5	45	21
Ireland	Europe	x		30	R2D	72	14, 20
Israel	M. East	x	x	270	N5	52	22
Italy	Europe	x		558	R2D	61	11-12, 16
Japan (IDC)	Asia		x	30	N5	79	10-11, 13
Japan (ITJ)	Asia	x	x	60	N5	61	10, 14
Japan (KDD)	Asia	x	x	150	N5	58	9-10,13
Kirgizstan	Asia	x		27	1vF	46	18-19, 20
Korea (Dacom)	Asia	x	x	50	N5	82	10, 19
Korea (Pyongyang)	Asia		x	11	N5	36	5
Korea (Telecom)	Asia	x	x	110	N5	62	9-10, 11
Latvia	Europe	x		14	1vF	42	12-13, 19
Lithuania	Europe	x		17	1vF	61	23
Luxembourg	Europe	x		30	R2D	62	11, 16-17
Macedonia (Skopie)	Europe	x		30	N5	55	14-15, 19

Direction	Zone	Connection via Cable / Satellite		Channels Quantity	Signalling System	Response %	Peak Hours
Moldavia	Europe	x		7	1vF	59	
Monaco (Transit)	Europe	x		59	N7	55	13, 17-18
Mongolia	Asia	x		11	N5	47	9-10
Netherlands	Europe	x		149	N7	65	12
Norway	Europe	x		90	N7	53	12, 15
Philippines	Asia	x		30	N5	40	10
Poland	Europe	x		210	R2D	44	11-12, 23
Portugal	Europe	x		30	R2	63	13-14
Romania	Europe	x		36	R2A	38	12, 22
RSA	Africa		x	30	N5	59	10-11, 14
Singapore	Asia	x	x	90	N5	64	10-11
Slovakia	Europe	x		85	R2D	48	11-12, 13
Slovenia	Europe	x		29	R2	61	10-11, 12
Spain	Europe	x		90	R2D	61	12, 15
Sweden (Tele2)	Europe	x		59	N7	64	12, 16
Sweden (Telia)	Europe	x		60	N7, N7?	66	11-12,17-18
Switzerland	Europe	x		208	N7, N7?	66	11-12, 16
Syria	M. East	x		30	N5	45	22
Taiwan	Asia		x	46	N5	75	10
Thailand	Asia	x		30	N5	47	10
Turkey	Europe	x	x	240	N5, R2A	54	11-12,15-16
Turkmenistan	Asia	x		38	1vF	32	12-13, 17
USA (AT&T)	N. America	x	x	496	N7	56	17-18, 20
USA (IDB)	N. America	x		30	N5	67	17, 22
USA (MCI)	N. America	x		297	N7E	57	18-19,20-21
USA (Sprint)	N. America	x		188	N7, N7E	66	17, 19
U? ?	M. East		x	30	N5	58	10, 12
Vietnam	Asia	x		7	N5	64	20
Yugoslavia	Europe	x		87	R2	25	22

OUTGOING INTERNATIONAL TRAFFIC TO CIS IN 1998

THSD MIN

TELECOM ADMINISTRATIONS AND OPERATORS	TOTAL	including												
		Azerbaidjan	Armenia	Belarus	Georgia	Kazakhstan	Kyrgyzstan	Moldova	Russia	Tajikistan	Turkmenistan	Uzbekistan	Ukraine	Baltic countries and the rest of the world
Azerbaidjan	42,878.8		-	563.4	1,322.2	841.4	87.2	91.8	21,861.7	17.0	341.7	465.9	2,293.0	14,993.5
Armenia	56,641.0	9.7		698.0	2,294.1	477.8	36.2	158.2	43,807.4	26.6	257.4	388.4	3,919.0	4,568.2
Belarus	176,148.7	1,171.7	1,244.8		773.3	2,233.8	267.3	2,205.8	104,684.8	184.4	255.1	961.7	25,052.8	37,113.2
Georgia	45,619.5	1,802.7	2,042.2	519.5		438.6	56.1	96.3	30,276.7	31.3	105.4	286.2	3,353.7	6,610.8
Kazakhstan	200,999.7	1,653.1	978.4	1,946.4	598.0		6,256.2	333.8	71,333.9	1,373.4	1,165.1	9,083.5	5,360.6	100,917.3
Kyrgyzstan	30,421.7	164.6	30.9	274.4	34.7	7,401.5		44.5	14,659.4	572.8	220.4	3,456.3	658.9	2,903.3
Moldova	53,349.9	100.5	125.1	1,832.3	69.5	190.7	26.4		22,473.1	16.3	63.9	70.9	15,763.9	12,617.3
Russia	1,038,238.0	37,789.5	52,338.4	105,258.1	40,846.4	68,598.6	10,960.9	33,596.2		9,890.4	5,547.8	32,787.7	290,824.0	349,800.0
Tajikistan	9,935.7	15.8	18.7	100.3	27.0	673.2	368.8	20.7	6,427.5		39.4	1,579.1	283.6	381.6
Turkmenistan	15,279.4	731.5	397.5	261.4	106.9	696.0	171.8	159.7	5,746.4	214.5		1,165.5	963.9	4,664.3
Uzbekistan	133,818.4	707.4	733.2	1,785.2	430.5	18484.3	6,741.8	241.6	62,338.8	4,765.8	2,971.9		6,910.9	27,706.9
Ukraine	465,941.0	4,364.2	6,384.2	24,100.2	4,007.9	4,964.6	598.1	18,590.9	278,852.1	435.4	910.8	3,873.6		118,859.0
Turkey	644,084.4	10,071.3	21.1	669.1	4,767.6	2,342.4	1,362.3	4,368.0	21,874.1	218.5	2,215.9	2,882.5	10,116.0	583,175.6
Latvia	55,370.0	73.1	121.6	2,652.9	91.9	352.7	33.1	243.5	15,357.1	12.9	26.5	199.3	4,120.0	32,085.4

ROSTELECOM SERVICES & PRICING

Switched voice and data

Services to Russian Customers include**:**

- **Direct Dial to any other country**
- **International Telecommunications Services provided with an operator's assistance**
- **International Calling Cards**
- **International Freephone Service (IFS)**
- **ISDN Services**

The table below outlines basic tariffs offered to customers.

Tariffs For International Telephone Calls

	Time	Tariff per minute, week-days (RUR)	Tariff per minute week-ends and holidays (RUR)
EUROPE, BALTIC COUNTRIES, TURKEY I ZONE	08.00-20.00 20.00-08.00	19,50 13,00	9,75 9,75
EUROPE II ZONE	08.00-20.00 20.00-08.00	21,90 14,60	10,95 10,95
ASIA III ZONE	08.00-20.00 20.00-08.00	29,40 19,60	14,70 14,70
ASIA IV ZONE	08.00-20.00 20.00-08.00	44,85 29,90	22,43 22,43
AMERICA (USA, Canada, Alaska) V ZONE	08.00-20.00 20.00-08.00	24,00 16,00	12,00 12,00
AMERICA VI ZONE	08.00-20.00 20.00-08.00	38,85 25,90	19,43 19,43
AUSTRALIA, PACIFIC REGION VII ZONE	08.00-20.00 20.00-08.00	35,40 23,60	17,70 17,70
AFRICA VIII ZONE	08.00-20.00 20.00-08.00	42,30 28,20	21,15 21,15
COUNTRIES OF THE CIS (Belarus, Moldova, Ukraine) IX ZONE *	08.00-20.00 20.00-08.00	7,50 5,00	3,75 3,75
COUNTRIES OF THE CIS (Belarus, Moldova, Ukraine) IX ZONE **	08.00-20.00 20.00-08.00	13,20 8,80	6,60 6,60

	Time	Tariff per minute, week-days (RUR)	Tariff per minute week-ends and holidays (RUR)
COUNTRIES OF THE CIS (Azerbaidjan, Armenia, Georgia) X ZONE	08.00-20.00 20.00-08.00	15,00 10,00	7,50 7,50
COUNTRIES OF THE CIS (Kazakhstan, Kirgizstan, Tajikistan, Turkmenistan, Uzbekistan) XII ZONE	08.00-20.00 20.00-08.00	12,00 8,00	6,00 6,00

All tariffs are defined in roubles. Enterprises are additionally charged 20% VAT. To order a call through an operator: 8-(beep)-191; 8-(beep)-192; 8-(beep)-193; 8-(beep)-194. Urgent calls are charged twice the rate efficient at the respective time. Calls of duration less than 3 minutes are charged as 3-minute calls.

In addition to that Rostelecom offers services to Russian operators:

- **International Traffic Routing via Rostelecom's facilities**
- **ISDN Services**
- **International Digital Streams (Circuit) Leasing**
- **International Roaming for mobile networks**
- **Access to Internet Networks**
- **Data Transmission at any bit rate**

There are no publicly quoted tariffs and rate s for that. Instead Rostelecom negotiates the rates on a case by case basis.

IPLCs, PLCs and VPCs

Rostelecom offers international private leased circuits (digital dedicated circuits) with the capacity of N x 64 Kbps, and the digital streams 2 Mbps, and above.

The dedicated international telecom circuits/streams are provided on conditions specified in a Leased Agreement between a Customer and a Telecom Operator. The customer should be a legal entity, which leases an international circuit from an Operator for its private use and pays all the costs and rental charges according to the rates established by this Operator.

OUTGOING AND INCOMING DLD TRAFFIC IN 1999

Company	DLD Outgoing Traffic 1999, Thsd Min				DLD Incoming Traffic 1999, Thsd Min				Disbalance in/out '99, %
	Total	To Moscow	To CIS countries	To Baltic countries	Total	From Moscow	From CIS countries	From Baltic countries	
Electrosvyaz, Khakassia Republic	13,997	1,784	617	20	12,890	1,617	608	20	-8
GPSI, Chuchotka Autonomic District	1,865	481	323	5	1,627	488	320	5	-13
Artelekom, Arkhangelsk Oblast	23,206	6,188	2,263	144	26,648	7,385	2,309	144	15
Svyazinform, Astrakhan Oblast	11,607	452	2,650	111	18,823	6,167	2,557	111	62
AltayTelekom, Altay Krai	27,666	2,807	3,231	28	37,430	5,781	3,259	28	35
Belgorod Electrosvyaz, Belgorod Oblast	32,904	11,169	8,345	122	32,534	12,236	8,314	122	-1
TTK, Evrei Autonomic Oblast	2,992	322	143	1	2,666	280	138	1	-11
AmurSvyaz, Amur Oblast	8,744	1,585	729	5	9,698	1,792	726	5	11
BryanskSvyazinform, Bryansk Oblast	20,664	8,953	3,338	249	26,081	11,308	3,669	249	26
Svyazinform, Chuvashia Republic	20,531	5,684	922	41	25,402	7,450	973	41	24
Svyazinform, Chelyabinsk Oblast	61,725	12,205	6,114	182	73,339	15,435	6,196	182	19
Karachaevo-CherkesskElectroSvyaz	4,834	1,435	448	9	5,967	2,154	477	9	23
Electrosvyaz, Chita Oblast	9,948	1,884	918	3	11,385	2,242	988	3	14
Uraltelekom, Sverdlovsk Oblast	117,138	22,326	12,698	350	96,957	20,187	12,367	350	-17
Electrosvyaz, Kalmykia Republic	3,533	831	145	2	5,144	1,552	141	2	46
Electrosvyaz, Altay Republic	3,653	400	160	1	3,846	330	172	1	5
Electrosvyaz, Chechen Republic	247	51	38	0	152	93	39	0	-38
Martelekorn, Mary-El Republic	12,070	2,703	517	20	14,774	3,328	524	20	22
Electrosvyaz, Irkutsk Oblast	35,108	6,284	4,080	87	37,435	8,532	4,115	87	7
Ivtelekom, Ivanovo Oblast	22,127	7,249	1,605	47	28,014	9,810	1,567	47	27
Electrosvyaz, Kaliningrad Oblast	17,319	6,364	5,234	882	20,020	7,848	4,911	882	16
Electrosvyaz, Kaluga Oblast	28,363	12,468	3,953	145	43,106	24,723	3,951	145	52
Electrosvyaz, Kemerovo Oblast	39,387	7,471	3,298	29	44,929	9,461	3,354	29	14
Ministry of Telecom, Tatarstan Republic	70,448	19,448	5,007	98	64,863	18,656	5,382	98	-8
Electrosvyaz, Khabarovsk Krai	17,783	2,925	1,298	18	25,825	4,824	1,309	18	45
KirovElectrosvyaz, Kirov Oblast	28,040	6,492	1,285	116	27,268	7,118	1,619	116	-3

Company	DLD Outgoing Traffic 1999, Thsd Min				DLD Incoming Traffic 1999, Thsd Min				Disbalance in/out '99, %
	Total	To Moscow	To CIS countries	To Baltic countries	Total	From Moscow	From CIS countries	From Baltic countries	
Electrosvyaz, Kostroma Oblast	15,547	5,167	1,079	40	18,051	6,028	1,008	40	16
KubanElektrosvyaz, Krasnodarsky Krai	81,569	25,525	13,441	250	117,379	39,068	13,825	250	44
Electrosvyaz, Krasnoyarsk Krai	56,661	11,966	7,807	103	50,824	11,579	7,718	103	-10
Electrosvyaz, Kurgan Oblast	17,769	2,226	1,457	32	17,264	2,285	1,478	32	-3
Electrosvyaz, Kursk Oblast	24,826	9,609	3,575	125	26,247	10,332	3,267	125	6
GPSI, Tuva Republic	1,819	320	34	0	2,457	445	36	0	35
LipetskElectrosvyaz, Lipetsk Oblast	24,440	9,752	1,929	86	34,120	15,732	2,106	86	40
Udmurtlelekom, Urdmurt Republic	24,975	5,767	1,728	83	27,281	6,607	1,731	83	9
DagSvyazinform, Dagestan Republic	5,413	207	1,115	12	16,221	7,244	1,260	12	200
MagadanSvyazinform, Magadan Oblast	6,775	1,618	932	7	6,176	1,749	922	7	-9
Electrosvyaz, Adygeya Republic	6,272	1,233	455	13	6,307	1,878	474	13	1
Electrosvyaz, Moscow Oblast	303,455	216,404	21,035	340	263,573	216,029	21,121	341	-13
MGTS, Moscow	1,079,545	0	266,187	5,343	895,719	0	253,243	5,343	-17
Electrosvyaz, Murmansk Oblast	40,263	6,934	6,778	124	31,202	6,203	6,636	124	-23
KabBalkTelekorn, Kabardino-Balk. Rep.	11,477	3,421	795	0	14,836	5,265	819	0	29
GPSI, Ingushetia Republic	662	203	0	0	2,680	1,616	7	0	305
Svyazinform, Nizhny Novgorod Oblast	82,810	29,441	7,594	452	83,722	31,187	7,747	452	1
Novgorodtelekom, Novgorod Oblast	19,844	3,806	1,529	271	21,081	4,737	1,570	271	6
Electrosvyaz, Novosibirsk Oblast	73,440	12,153	7,853	121	67,913	12,063	7,791	121	-8
Electrosvyaz, Omsk Oblast	31,267	6,482	5,126	86	33,592	7,099	5,120	86	7
Electrosvyaz, Orel Oblast	18,432	8,143	1,947	82	21,297	9,215	1,998	82	16
Electrosvyaz, Orenburg Oblast	28,974	5,437	4,688	169	32,702	8,233	4,656	169	13
Svyazinform, Penza Oblast	23,301	7,658	1,665	96	28,368	9,941	1,718	96	22
Uralsvyazinform, Perm Oblast	34,885	8,355	3,122	203	51,906	12,572	3,132	203	49
KamchatSvyazinform, Kamchatka Oblast	8,559	2,394	1,673	10	7,979	2,716	1,701	10	-7
Electrosvyaz, Karelia Republic	16,444	2,890	1,925	118	18,337	3,541	2,265	118	12
Electrosvyaz, Pskov Oblast	19,716	3,768	2,332	1,297	22,116	4,652	2,579	1,297	12

Company	DLD Outgoing Traffic 1999, Thsd Min				DLD Incoming Traffic 1999, Thsd Min				Disbalance in/out '99, %
	Total	To Moscow	To CIS countries	To Baltic countries	Total	From Moscow	From CIS countries	From Baltic countries	
Electrosvyaz, Rostov Oblast	69,694	20,966	12,033	114	77,979	25,335	12,000	114	12
Electrosvyaz, Ryazan Oblast	30,600	15,925	1,319	65	36,330	19,652	1,678	65	19
Svyazinform, Samara Oblast	65,708	15,945	10,924	163	62,721	16,023	10,654	163	-5
Svyazinform, Mordovia Republic	17,728	6,442	643	23	23,457	10,209	778	23	32
SaratovElectrosvyaz, Saratov Oblast	45,305	14,120	5,079	69	47,965	15,520	5,636	69	6
SmolenskSvyazinform, Sm. Oblast	25,576	12,761	4,512	367	29,721	15,080	4,098	367	16
PTS, St. Petersburg	235,316	57,872	49,234	5,724	235,668	74,313	46,172	5,724	0
Electrosvyaz, Stavropol Krai	46,774	13,112	6,794	122	56,163	17,741	6,696	122	20
Svyaz, Komi Republic	17,776	3,453	2,531	70	26,616	7,876	2,692	70	50
Tambov Electrosvyaz, Tambov Oblast	23,740	10,050	1,497	65	31,404	15,191	1,397	65	32
TomskTelekom, Tomsk Oblast	27,736	4,165	3,181	51	24,618	4,218	3,165	51	-11
Electrosvyaz, Tula Oblast	40,246	21,161	2,785	7	47,807	25,205	2,779	7	19
TumenTelecom, Tyumen Oblast	52,325	6,847	7,493	19	63,631	11,947	7,178	19	22
Electrosvyaz, Tver Oblast	47,417	17,460	3,424	349	44,399	21,547	3,606	349	-6
Bashinformsvyaz, Bashkir Republic	53,501	9,262	4,811	163	64,843	14,291	4,810	163	21
Electrosvyaz, Buryat Republic	12,910	2,352	825	12	13,189	2,437	887	12	2
Electrosvyaz, Ulianovsk Oblast	31,404	6,433	2,239	80	33,199	7,988	2,336	80	6
Sevosetinelectrosvyaz, South Osetia Rep.	19,511	6,447	3,213	72	18,918	7,950	2,450	72	-3
Electrosvyaz, Vladimir Oblast	36,305	17,322	2,532	148	44,277	21,877	2,781	148	22
Electrosvyaz, Primorsky Krai	26,602	4,494	3,412	31	28,875	6,506	3,362	31	9
Electrosvyaz, Volgograd Oblast	58,024	16,321	7,514	182	54,344	17,731	7,416	182	-6
Electrosvyaz, Vologda Oblast	16,160	4,401	954	117	19,086	4,882	1,072	117	18
VoronezhSvyazinfonn, Voronezh Oblast	57,092	19,586	5,794	208	61,267	21,331	5,989	208	7
Sahatelecom, Saha (Yakutia) Republic	17,587	4,369	3,074	38	18,319	5,456	3,089	38	4
Yartelecom, Yaroslavl Oblast	43,664	17,220	3,494	224	41,583	16,724	3,481	224	-5
Electrosvyaz, Sakhalin Oblast	12,246	2,610	1,001	17	11,180	2,981	993	17	-9

APPENDIX III: INTEGRAL SETTLEMENT RATE

Company	Integral Settlement Rate		
	1999	1998	Change %
Electrosvyaz, Khakassia Republic	3.18	3.52	-10
GPSI, Chuchotka Autonomic District	2.68	2.97	-10
Artelekom, Arkhangelsk Oblast	1.76	2.07	-15
Svyazinform, Astrakhan Oblast	2.60	3.05	-15
AltayTelekom, Altay Krai	2.57	3.30	-22
BelgorodElectrosvyaz, Belgorod Oblast	3.44	3.98	-14
TTK, Evrei Autonomic Oblast	2.85	3.33	-14
AmurSvyaz, Amur Oblast	2.32	2.60	-11
BryanskSvyazinform, Bryansk Oblast	2.21	2.25	-2
Svyazinform, Chuvashia Republic	2.69	2.75	-2
Svyazinform, Chelyabinsk Oblast	2.60	3.22	-19
Karachaevo-CherkesskElectroSvyaz	2.41	3.21	-25
Electrosvyaz, Chita Oblast	2.65	2.94	-10
Uraltelekom, Sverdlovsk Oblast	3.76	3.96	-5
Electrosvyaz, Kalmykia Republic	2.51	2.67	-6
Electrosvyaz, Altay Republic	2.58	3.15	-18
Electrosvyaz, Chechen Republic	2.80	3.49	-20
MarTelekom, Mary-El Republic	3.20	4.09	-22
Electrosvyaz, Irkutsk Oblast	2.73	3.15	-13
Ivtelekom, Ivanovo Oblast	2.48	3.08	-19
Electrosvyaz, Kaliningrad Oblast	3.13	3.88	-19
Electrosvyaz, Kaluga Oblast	0.93	2.54	-63
Electrosvyaz, Kemerovo Oblast	2.80	3.18	-12
Ministry of Telecom, Tatarstan Republic	3.58	3.78	-5
Electrosvyaz, Khabarovsk Krai	1.54	2.38	-35
KirovElectrosvyaz, Kirov Oblast	2.95	3.16	-7
Electrosvyaz, Kostroma Oblast	2.36	2.42	-2
KubanElektrosvyaz, Krasnodarsky Krai	2.95	3.00	-2
Electrosvyaz, Krasnoyarsk Krai	2.88	3.26	-12
Electrosvyaz, Kurgan Oblast	2.96	3.56	-17
Electrosvyaz, Kursk Oblast	3.08	3.72	-17
GPSI, Tuva Republic	1.73	1.92	-10
LipetskElectrosvyaz, Lipetsk Oblast	2.18	2.64	-17
Udmurtlelekom, Urdmurt Republic	2.72	2.89	-6
DagSvyazinform, Dagestan Republic	1.44	1.90	-24
MagadanSvyazinform, Magadan Oblast	2.55	2.59	-2
Electrosvyaz, Adygeya Republic	1.95	2.86	-32
Electrosvyaz, Moscow Oblast	1.65	2.32	-29
Electrosvyaz, Murmansk Oblast	2.85	3.19	-11
KabBalkTelekorn, Kabardino-Balk. Rep.	2.55	3.00	-15
GPSI, Ingushetia Republic	2.80	3.49	-20
Svyazinform, Nizhny Novgorod Oblast	3.35	3.63	-8

Company	Integral Settlement Rate		
	1999	1998	Change %
Novgorodtelekom, Novgorod Oblast	2.92	3.29	-11
Electrosvyaz, Novosibirsk Oblast	3.31	3.58	-8
Electrosvyaz, Omsk Oblast	3.05	3.31	-8
Electrosvyaz, Orel Oblast	2.85	3.44	-17
Electrosvyaz, Orenburg Oblast	2.77	3.29	-16
Svyazinform, Penza Oblast	2.90	3.28	-12
Uralsvyazinform, Perm Oblast	1.78	2.42	-26
KamchatSvyazinform, Kamchatka Oblast	2.28	2.30	-1
Electrosvyaz, Karelia Republic	1.44	1.98	-27
Electrosvyaz, Pskov Oblast	2.90	3.25	-11
Electrosvyaz, Rostov Oblast	3.10	3.70	-16
Electrosvyaz, Ryazan Oblast	1.70	2.41	-29
Svyazinform, Samara Oblast	3.20	3.21	0
Svyazinform, Mordovia Republic	2.72	3.17	-14
SaratovElectrosvyaz, Saratov Oblast	2.98	3.51	-15
SmolenskSvyazinform, Sm. Oblast	2.22	3.15	-30
PTS, St. Petersburg	4.22	4.46	-5
Electrosvyaz, Stavropol Krai	3.08	3.29	-6
Khanty-MansiyskOkrTelekom, K-M AD	3.18	3.63	-12
Svyaz, Komi Republic	1.35	2.00	-33
Tambov Electrosvyaz, Tambov Oblast	1.75	2.30	-24
TomskTelekom, Tomsk Oblast	2.91	3.31	-12
Electrosvyaz, Tula Oblast	1.52	2.56	-41
TumenTelecom, Tyumen Oblast	2.25	2.41	-7
Electrosvyaz, Tver Oblast	2.64	2.98	-11
Bashinformsvyaz, Bashkir Republic	2.77	2.92	-5
Electrosvyaz, Buryat Republic	2.90	2.93	-1
Electrosvyaz, Ulianovsk Oblast	3.24	3.57	-9
Sevosetinelectrosvyaz, South Osetia Rep.	2.47	2.47	0
Electrosvyaz, Vladimir Oblast	1.51	2.74	-45
Electrosvyaz, Primorsky Krai	2.36	2.85	-17
Electrosvyaz, Volgograd Oblast	3.14	3.54	-11
Electrosvyaz, Vologda Oblast	2.23	2.30	-3
VoronezhSvyazinfonn, Voronezh Oblast	2.94	3.14	-6
Sahatelecom, Saha (Yakutia) Republic	2.24	3.05	-27
Yartelekom, Yaroslavl Oblast	2.86	3.80	-25
Electrosvyaz, Sakhalin Oblast	2.53	2.87	-12

Annual Traffic – Selected Destinations, Mln min

	Big ABC	TOTAL O/g Traffic	Total Within Selected Destinations	St. Petersburg	Moscow City	Samara	Saratov	Bashkir Rep.	Perm	Ekaterinburg	Chelyabinsk	Kemerovo	Novosibirsk	Tyumen	Krasnoyarsk	Irkutsk	Vladivostok
St. Petersburg	812	199	76.63		51.87	1.95	2.91	2.33	2.23	3.74	2.67	1.20	1.78	1.70	2.32	1.27	0.66
Moscow	095	945	224.0	67.16		14.14	19.42	13.82	12.10	21.26	15.33	9.74	12.27	12.34	11.7	8.74	6.02
Saratov	845	35	18.43	1.59	11.77		2.57	0.49	0.35	0.53	0.43	0.10	0.16	0.14	0.15	0.10	0.07
Samara	846	72	34.88	3.28	19.13	2.95		2.37	0.85	1.53	1.56	0.29	0.49	1.53	0.50	0.25	0.16
Bashkir Rep.	347	44	24.68	1.94	7.63	0.48	2.32		1.37	3.07	4.65	0.20	0.34	2.05	0.32	0.16	0.16
Perm	342	43	18.31	1.57	7.63	0.25	0.59	0.98		4.45	1.23	0.18	0.28	0.64	0.22	0.16	0.11
Ekaterinburg	343	97	60.68	4.41	20.40	0.68	1.77	3.87	7.32		11.55	0.84	1.32	6.40	0.94	0.63	0.55
Chelyabinsk	351	52	34.56	2.21	10.98	0.40	1.27	4.52	1.40	9.76		0.44	0.71	1.68	0.54	0.40	0.25
Kemerovo	384	32	20.11	0.96	6.80	0.09	0.20	0.21	0.21	0.62	0.43		7.70	0.25	1.64	0.57	0.41
Novosibirsk	383	59	29.07	1.50	8.70	0.21	0.47	0.37	0.41	1.17	0.81	8.00		1.14	3.22	2.05	1.01
Tyumen	345	43	20.53	1.84	5.69	0.15	0.99	1.86	0.87	5.55	1.64	0.30	1.11		0.28	0.15	0.11
Krasnoyarsk	391	47	26.84	2.24	11.19	0.19	0.48	0.45	0.36	0.94	0.64	2.37	3.80	0.30		2.95	0.93
Irkutsk	395	28	14.82	1.17	5.47	0.10	0.23	0.19	0.21	0.57	0.43	0.62	1.79	0.18	2.67		1.20
Vladivostok	423	23	6.24	0.44	1.54	0.07	0.14	0.14	0.14	0.36	0.26	0.40	0.85	0.11	0.71	1.07	

Rostelecom IST Rate – Selected Destinations, US Cents

	Big ABC	IST, Kopecks	IST, US Cents	St. Petersburg	Moscow City	Saratov	Samara	Bashkir Rep.	Perm	Ekaterinburg	Chelyabinsk	Kemerovo	Novosibirsk	Tyumen	Krasnoyarsk	Irkutsk	Vladivostok
St. Petersburg	812	4.22	0.1487		1.78	4.16	3.87	4.76	4.46	5.20	5.50	9.51	9.22	5.95	10.56	13.08	19.33
Moscow	095	3.49	0.1229	1.47		2.21	1.72	2.95	2.83	3.44	3.69	7.37	6.88	4.18	8.11	10.32	15.73
Saratov	845	2.98	0.1050	2.94	1.89		0.74	0.84	1.37	1.58	1.58	4.83	4.41	2.21	5.67	7.46	12.29
Samara	846	3.19	0.1125	2.93	1.58	0.79		1.80	2.25	2.59	2.48	5.85	5.51	3.15	6.86	8.66	13.95
Bashkir Rep.	347	2.77	0.0974	3.12	2.34	0.78	1.56		0.68	0.68	0.68	3.60	3.31	1.27	4.48	6.04	10.61
Perm	342	1.78	0.0626	1.88	1.44	0.81	1.25	0.44		0.31	0.50	2.25	2.06	0.69	2.69	3.75	6.63
Ekaterinburg	343	3.76	0.1325	4.64	3.71	1.99	3.05	0.93	0.66		0.53	4.11	3.71	0.80	5.17	7.42	13.38
Chelyabinsk	351	2.59	0.0915	3.38	2.74	1.37	2.01	0.64	0.73	0.37		2.84	2.47	0.64	3.57	5.03	9.33
Kemerovo	384	2.80	0.0986	6.31	5.92	4.54	5.13	3.65	3.55	3.06	3.06		0.39	2.46	0.79	2.46	6.90
Novosibirsk	383	3.31	0.1165	7.22	6.52	4.89	5.71	3.96	3.84	3.26	3.15	0.47		2.56	1.40	3.38	8.62
Tyumen	345	2.25	0.0791	3.16	2.69	1.66	2.21	1.03	0.87	0.47	0.55	1.98	1.74		2.61	3.95	7.59
Krasnoyarsk	391	2.88	0.1016	7.21	6.70	5.48	6.19	4.67	4.37	3.96	3.96	0.81	1.22	3.35		1.73	6.30
Irkutsk	395	2.73	0.0960	8.45	8.06	6.82	7.39	5.95	5.76	5.38	5.28	2.40	2.78	4.80	1.63		4.42
Vladivostok	423	2.36	0.0008	10.80	10.64	9.72	10.30	9.06	8.81	8.39	8.48	5.82	6.15	7.98	5.15	3.82	

Rostelecom Revenues – Selected Destinations, THSD USD

	Big ABC	St. Petersburg	Moscow City	Saratov	Samara	Bashkir Rep.	Perm	Ekaterinburg	Chelyabinsk	Kemerovo	Novosibirsk	Tyumen	Krasnoyarsk	Irkutsk	Vladivostok
St. Petersburg	812		925	81	113	111	100	195	147	114	164	101	245	166	127
Moscow	095	990		313	334	407	342	732	565	718	844	515	947	902	947
Saratov	845	47	222		19	4	5	8	7	5	7	3	9	8	8
Samara	846	96	301	23		43	19	39	39	17	27	48	34	22	23
Bashkir Rep.	347	61	178	4	36		9	21	32	7	11	26	14	10	17
Perm	342	29	110	2	7	4		14	6	4	6	4	6	6	7
Ekaterinburg	343	205	757	14	54	36	49		61	35	49	51	49	47	73
Chelyabinsk	351	75	301	5	26	29	10	36		12	18	11	19	20	24
Kemerovo	384	61	402	4	10	8	7	19	13		30	6	13	14	29
Novosibirsk	383	109	568	10	27	15	16	38	26	37		29	45	69	87
Tyumen	345	58	153	2	22	19	8	26	9	6	19		7	6	8
Krasnoyarsk	391	162	750	11	29	21	16	37	25	19	46	10		51	59
Irkutsk	395	99	441	7	17	11	12	31	23	15	50	9	44		53
Vladivostok	423	48	164	7	15	13	12	30	22	23	52	9	36	41	

APPENDIX IV: IP-TELEPHONY TARIFFS

Per Minute Tariffs of Selected IP-Telephony Providers, USD

	Incomtel TG	OSS*	RGC*	Elvis	Sitek	Tario*	Business Net-Irkutsk*	Dion*
Location	Moscow	Moscow	Moscow	Moscow	Moscow	Moscow	Irkutsk	Chelyabinsk
International								
USA	0.30	0.24	0.29	0.20	0.24	0.32	0.42	0.29
Europe (UK)	0.30	0.29	0.29	0.20	0.24	0.30	0.27	0.29
Asia								
China	0.58	0.45	0.60	0.50	0.49	0.42	0.67	0.59
Japan	0.34	0.27	0.39	0.20	0.24	0.51	0.38	0.29
Israel	0.35	0.25	0.39	0.40	0.29	0.47	0.42	0.29
Baltic (Latvia)	0.56	0.32	0.33-0.64	0.45	0.34	0.30	0.06	0.44
CIS								
Ukraine	0.48	0.29	0.33-0.64	0.52	0.36	0.12	0.06	0.50
Kazakhstan	0.71	0.35	0.33-0.64	0.75	0.49	0.50		0.79
Intercity								
Moscow		0.07	0.15	n/a		0.04	0.06	0.15
Ekaterinburg	0.27	0.18	0.28	n/a	0.24	0.07	0.06	0.10
Novosibirsk	0.27	0.18	0.28	n/a	0.24	0.16	0.06	0.20
Vladivostok	0.27	0.25	0.37	n/a	0.29	0.27	0.06	0.24

**VAT-excluding*

APPENDIX V: LICENSES FOR IP-TELEPHONY SERVICES

IPT Licenses as of Q4 1999

License #	Valid from	Valid through	Company	Licensed area	Location
12092	21.05.2000	21.05.2004	Global One	Russian Federation	Moscow
12093	21.05.2000	21.05.2004	Tario Communications	Russia	Moscow
12094	29.04.2000	29.04.2004	ASVT	Moscow; Moscow obl.	Moscow
12095	21.05.2000	21.05.2004	MTU-Inform	Moscow; St.Petersburg; Vladimir obl.; Leningrad obl.; Moscow obl.; Novosibirsk obl.; Ryazan obl.; Tver obl.	Moscow
12096	29.04.2000	29.04.2004	Orensot	Orenburg obl.	Orenburg
12145	11.06.2000	11.06.2004	Financial Engineering	Moscow; St.Petersburg; Moscow obl.; Nizhny Novgorod obl.: Nizhny Novgorod; Primorsky krai: Vladivostok	Moscow
12146	11.06.2000	11.06.2004	Rustel-Macrocom	Moscow obl.; Stavropolsky krai; Moscow	Moscow
12147	11.06.2000	11.06.2004	Redkom Company Limited	Khabarovsky krai	Khabarovsk
12235	11.06.2000	11.06.2004	MTU-Intel	Moscow; St.Petersburg; Leningrad obl.; Moscow obl.; Novosibirsk obl.; Ryazan obl.; Tver obl.	Moscow
12506	25.08.2000	25.08.2004	Komet	Moscow; Moscow obl.	Moscow
12569	25.08.2000	25.08.2004	Company Etype	Moscow; St.Petersburg	Kaliningrad
12607	25.08.2000	25.08.2004	Alfa-Telecom	Moscow; Moscow obl.	Moscow
12608	25.08.2000	25.08.2004	Niavek	Moscow	Nazran
12609	25.08.2000	25.08.2004	Telros Service	St.Petersburg	St.Petersburg
12610	25.08.2000	25.08.2004	Rinfotels	Ryazan obl.	Ryazan
12611	25.08.2000	25.08.2004	Svyaz-Stroi-Service	Moscow obl.	Tomilino, Moscow obl.
12612	25.08.2000	25.08.2004	MKS (Mezhdunarodnaya Companiya Svyazi)	Vladimir obl.; Volgograd obl.; Voronezh obl.; Moscow; St.Petersburg; Kaliningrad obl.; Kaluga obl.; Krasnodarsky krai; Moscow obl.; Novosibirsk obl.; Omsk obl.; Perm obl.; Tatarstan; Rostov obl.; Samara obl.; Saratov obl.; Sverdlovsk obl.; Stavropolsky krai; Tomsk obl.; Tula obl.; Tyumen obl.; Khabarovsk krai; Yaroslavl obl.	Moscow
12613	25.08.2000	25.08.2004	SaNi-S	Voronezh obl.	Voronezh

License #	Valid from	Valid through	Company	Licensed area	Location
12614	25.08.99	25.08.2004	R.L.KOM	Moscow; Moscow obl.	Moscow
12671	25.08.2000	25.08.2004	OSS Corporation	Moscow; Moscow obl.	Moscow
12672	25.08.2000	25.08.2004	Maginfocenter	Chelyabinsk obl.; Orenburg obl.; Bashkortostan	Magnitogorsk
12690	25.08.2000	25.08.2004	NPO Crosna	Arkhangelsk obl.; Astrakhan obl.; Belgorod obl.; Bryansk obl.; Vladimir obl.; Volgograd obl.; Vologda obl.; Voronezh obl.; Ivanovo obl.; Irkutsk obl.; Kaliningrad obl.; Krasnodarsky krai; Krasnoyarsky krai; Primorsky krai; Mordovia; Tatarstan; Stavropolsky krai; Khabarovsky krai	Moscow
12799	21.09.99	11.06.2004	Izhkom	Udmurtia	Izhevsk
12805	25.08.2000	25.08.2004	Zond-Holding	Saha (Yakutia); Primorsky krai; Khabarovsky krai; Arkhangelsk obl.; Kaliningrad obl.; N.Novgorod obl.; Novosibirsk obl.; Sakhalin obl.; Khanti-Mansiysk ?.?.; St.Petersburg	Moscow
13204	11.11.2000	11.11.2004	Edinstvo-Telecom	Irkutsk obl.	Irkutsk
13205	11.11.2000	11.11.2004	Mezhregionalny Transit Telecom	Russian Federation	Moscow
13206	11.11.2000	11.11.2004	Polarkom	Murmansk obl.	Murmansk
13207	11.11.2000	11.11.2004	Norlink IKS	Karelia	Petrozavodsk
13210	11.11.2000	11.11.2004	Inter-NET	Ivanovo obl.; Ivanovo	Ivanovo
13211	11.11.2000	11.11.2004	Garant-Park-Telecom	Moscow	Moscow
13212	11.11.2000	11.11.2004	NPP Interantenna	Moscow; Moscow obl.	Moscow
13213	11.11.2000	11.11.2004	Private proprietorship by V.Kukulitis	St.Petersburg	St.Petersburg
13214	11.11.2000	11.11.2004	North-West GSM	Arkhangelsk obl.; Vologda obl.; St.Petersburg; Kaliningrad obl.; Leningrad obl.; Murmansk obl.; Novgorod obl.; Pskov obl.; Karelia	St.Petersburg
13215	11.11.2000	11.11.2004	Grazhdan-Service	Udmurtia	Izhevsk
13216	11.11.2000	11.11.2004	Rustelnet	Moscow; St.Petersburg; Moscow obl.; Leningrad obl.	Moscow
13217	11.11.2000	11.11.2004	Satcom-Tel	Altaiski krai; Belgorod obl.; Vladimir obl.; Volgograd obl.; Voronezh obl.; Moscow; St.Petersburg; Irkutsk obl.; Kabardino-Balkaria; ?emerovo obl.; Leningrad obl.; Moscow obl.; Murmansk obl.; N.Novgorod obl.; Novgorod obl.; Novosibirsk obl.; ? msk obl.; Orenburg obl.; Perm obl.; Bashkortostan; Karelia; Komi; Tatarstan; Rostov obl.; Samara obl.; Saratov obl.; Sverdlovsk obl.; Smolensk obl.; Tomsk obl..; Tyumen obl.; Udmurtia; Khanty-Mansiysk ?.?.; Chelyabinsk obl.; Chuvashia; Evenkiyski ?.?.; Yamalo-Nenetski ?.?.	Moscow
13218	11.11.2000	11.11.2004	TVB Communication	Moscow	Moscow

License #	Valid from	Valid through	Company	Licensed area	Location
13219	11.11.2000	11.11.2004	Comcor VIP	Moscow; Moscow obl.;	Moscow
13220	11.11.2000	11.11.2004	Private proprietorship by O.Banshchikova	Bratsk, Irkutsk obl.	Bratsk, Irkutsk obl.
13221	11.11.2000	11.11.2004	Kareltelecom	Karelia	Petrozavodsk
13222	11.11.2000	11.11.2004	Amro-Telecom	Moscow; Moscow obl.	Moscow
13223	11.11.2000	11.11.2004	Spectr-Intel	Chelyabinsk obl.	Chelyabinsk
13224	11.11.2000	11.11.2004	Sabas	Moscow	Moscow
13225	11.11.2000	11.11.2004	RISS-Telecom	Moscow	Novosibirsk
13228	11.11.2000	11.11.2004	Kommunikatsii-Eks-Net	Voronezh obl.; Lipetsk obl.; Tula obl.	Lipetsk
13229	11.11.2000	11.11.2004	Ratecom	Moscow obl.	Chernogolovka, Moscow obl.
13230	11.11.2000	11.11.2004	Reis Telecom – Urals Branch	Bashkortostan	Ufa
13231	11.11.2000	11.11.2004	Lanit	Moscow; Moscow obl.; St.Petersburg	Moscow
13232	11.11.2000	11.11.2004	Kursktelecom	Kursk obl.	Kursk
13234	11.11.2000	11.11.2004	NPF Li	Balakovo, Saratov obl.	Balakovo, Saratov obl.
13236	11.11.2000	11.11.2004	Prima-Telephone	Moscow; St.Petersburg; Krasnodarsky krai; Moscow obl.	Moscow
13237	11.11.2000	11.11.2004	Kominkom	Voronezh obl.; St.Petersburg	Moscow
13239	11.11.2000	11.11.2004	Rustel	Altaiski krai; Astrakhan obl.; Belgorod obl.; Moscow; Krasnoyarsky krai; Magadan obl.; Moscow obl.; Perm obl.; Komi; Sverdlovsk obl.; Tyumen obl.	Moscow

**obl. = oblast (administrative unit of Russian Federation)*