CLELL HARRAL INTERNATIONAL
CHAMBERS, CONLON & HARTWELL

UKRAINE RAILWAYS

DEVELOPMENT OF STRATEGIES
FOR
COMMERCIAL TELECOMMUNICATIONS
AND
MANAGEMENT INFORMATION SYSTEMS

AND

IDENTIFICATION OF POTENTIAL PRIVATE INVESTORS
IN A
RAILWAYS TELECOMMUNICATIONS PROJECT

FINAL REPORT

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DEVELOPMENT OF STRATEGIES FOR COMMERCIAL TELECOMMUNICATIONS AND MANAGEMENT INFORMATION SYSTEMS AND IDENTIFICATION OF POTENTIAL INVESTORS IN A RAILWAYS TELECOMMUNICATIONS PROJECT

I. Introduction

Like other railways of the Former Soviet Union, the Ukraine National Railways (Ukrzaliznytsia or 'UZ') suffered a dramatic loss of traffic after 1989, due primarily to macro-economic upheaval in Ukraine and neighboring states rather than inter-modal competition, which is only just emerging. UZ—still the largest railway system in Europe after Russia—is now planning the measures required to adapt the scale and structure of its plant and establishment to its new role. The European Bank for Reconstruction and Development (EBRD) is providing technical assistance to develop a restructuring program, and is expected to finance the associated capital expenditures program commencing in 1998.

As Ukraine moves increasingly to a market economy, and closer linkages to Western Europe, UZ faces growing pressure to modernize its communications and management information systems to better serve its clients and enhance its operating efficiency. Provided it can bring service quality in line with international standards, while also lowering costs, UZ is in an excellent position to compete, not only for purely domestic traffic and Ukraine trade with Europe, but also for the growing transit traffic between the Russian Federation and Europe. To capture the potential, however, UZ must have access to modern information systems and the communications networks to offer its clients unbroken linkage with each shipment, including electronic data interchange (EDI) from initiation of the order for shipment to the final delivery and revenue collection.

At the same time, the Ukraine public switched telecommunications network (PSTN) faces a similar large gap between rising market expectations and what existing systems can deliver. As yet there is no optical fiber backbone network, and only 7.65 million analogue lines to serve a nation of 51 million inhabitants. The average telephone penetration level of 15 lines per hundred population is far below the OECD average of 43. More than 3.8 million applicants were awaiting phones at last count, and investment in modernization of the fixed public networks is proceeding only slowly. Mobile communications are now developing, but penetration levels are still minimal. Data transmission and other value added services are still in their infancy. Unlike most countries, there is no established dominant telecommunications provider, as organization of the sector has been fragmented.

As the entire transmission needs of the railway can be met with only a fraction of the capacity of an optical fiber network, UZ perceives an opportunity to employ the spare capacity to serve other, unsatisfied market demands for telecommunications—voice, data, and video—and thereby

to generate revenues sufficient to repay the entire investment plus profits. The investment requirements for development of the optical fiber backbone would thus be met by private investors (with potential finance from EBRD). To achieve this, UZ management is considering establishing, or contracting with, a separate communications entity, including a partner well proven as a telecommunications services provider, either a Public Telecommunications Operator (PTO) or Private Network Services Provider (PNSP).

In this context it was recognized that the UZ management officials in charge of communications and information systems development could benefit from the experience of the United States. US railways, under private ownership, were early pioneers in the commercial exploitation of railway rights-of-way for communication networks. They have also been world leaders in the development of MIS systems to support operating efficiency and meet client demands in extremely competitive markets. These service segments have been very dynamic elements of the US industry, continuously evolving over the years from their origins within the railways company to entirely separate corporate structures today.

At the same time, it was deemed desirable to test the interest of potential international investors in a Ukraine Railway based telecommunications venture at as early a stage as possible. Given the difficult circumstances of Ukraine—juxtaposed against attractive telecoms investment opportunities in other, rapidly growing economies—it is not clear that private investors would have appetite for Ukrainian market risks. Before investing substantial resources into preparation of company structures and detailed business plans, it was desired to identify potential investors through a well planned sounding of the markets, drawing on brief background documentation.

Consequently, the EBRD arranged a grant from the US Trade and Development Agency for a Technical Assistance Project to aid the UZ management in gaining a more detailed understanding of the American experience, drawing the applicable lessons, and building thereon. There were three specific objectives:

- To assist UZ in development of a commercial strategy to exploit the telecommunications potential of its rights of way and infrastructure

- To assist UZ to define the business opportunity and to identify and test interest of potential private investors within the telecommunications and railways communities

- To assist UZ in identifying and reviewing state-of-the-art US railway management information systems (MIS) and exploring ways of adapting those systems to meet UZ requirements.

To assist in achieving these objectives UZ selected a project team headed by Clell Harral of Clell Harral International and Ray Chambers and Jerome Conlon of Chambers, Conlon, and Hartwell. The scope of work comprised four main elements:

- preparation for UZ management of a briefing paper reviewing American experience on the commercial exploitation of railway rights-of-way for telecommunications purposes and on railway management information systems (MIS) development

- organization of a series of roundtable discussions in the United States with leaders of the relevant segments of the American industry for UZ officials to gain a deeper understanding and probe areas of deepest interest for Ukraine Railways—this took place during October 12-24, 1997

- preparation and circulation to potential investors of a brief *Information Memorandum* summarizing the Ukrainian telecommunications investment opportunity and addressing the basic questions which prospective investors would use for first screening

- organization of meetings with prospective investors on an individual, confidential basis.

The entire project was accomplished over a seven-month period, from May-December, 1997. This Final Report marks the conclusion of the technical assistance project funded by the Trade and Development Agency, but follow up discussions are continuing.

II. American Railways' Experience with Development and Commercialization of Telecommunications

Samuel F. B. Morse initiated modern communication with the practical demonstration of the telegraph in 1844. Railroads were among the first and most intense users of the telegraph, while telegraph lines (including those owned by the dominant public operator, Western Union) were strung for the most part along railroad rights of way. Early in the 20th Century, when telephony, led by American Telephone and Telegraph (AT&T), began to supplant telegraphy, railroads again provided rights of way for long distance transmission lines—at that time, copper wire. With the advent of microwave technologies in the 1950s, American railroads were again at the forefront. By the 1960s the Southern Railway boasted the largest privately owned microwave system in the world. It was just a few steps behind AT&T, which completed the nation's first microwave relay—between New York and Chicago—in 1950. The Southern used the microwave system for extensive internal communications within the railroad and, in addition, leased a modest amount of excess capacity to telecommunications companies.

Then, from the mid 1970s to mid 1980s, two key developments changed the very nature of the telecommunications industry. One was the break-up of AT&T, which permitted new competition in the marketplace. Pursuant to an anti-trust suit initiated in 1974, the 1982 Modification of Final Judgment (MFJ) between AT&T and the US Justice Department insured there would be competition for long distance telephone service. Today, almost 500 privately owned firms compete to offer long distance service in the U.S. As a result, since 1984 long distance telephone rates have declined by as much as 60% and calling volume has exploded from 40 billion switched access minutes to 111 billion. In 1996 the Congress further broadened telecommunications competition by opening local telephone markets to contest and authorizing the auctioning of radio frequency spectrum for digital service.

The other was the revolution in telecommunications technology, based on dramatic advances in computers, digital switching, and fiber optics transmission. In 1978, United Telecom laid seven miles of experimental fiber optic cable in Pennsylvania. In 1979, the company installed the first digital switch that opened to way for telephone users to take advantage of computer driven services such as call forwarding, call waiting, and conference calling.

Southern Pacific Railroad, in anticipation of the AT&T divestiture, had already decided to exploit its rights of way and microwave investments in the 1970s, when it created a long distance telephone company called Sprint to compete for long distance communications. With the advent of the new technology, Sprint was quick to begin laying fiber optics cable down the Southern Pacific rights of way. Shortly thereafter, virtually all American railroads were putting together fiber optics deals with telecommunications companies.

Today, the U.S. has more than 15 million optical fiber kilometers, carrying more than 90 percent or all long-distance telephone calls. A striking feature is that 60% of that fiber cable is laid along the rights of way of America's railroads. The railroads have, thereby, exploited the value in their rights of way and been major partners in the telecommunications revolution.

What part of this experience is relevant for the Ukraine Railways? In the remainder of this section we briefly highlight key points of the interface between American railroads and the telecommunications industry which appear to hold transferable lessons, both positive and negative. A more detailed discussion is provided in the *Briefing Paper on U.S. Railways' Experience with Development and Commercialization of Telecommunications and Management Information Systems* (Appendix A).

- Access to large blocs of contiguous rights of way which are under the control of a single entity, such as a railway, constitutes a valuable property right, because the number (and associated costs) of transactions needed by a telecommunications company to gain coverage of a given geographic area can be minimized. Railroad rights of way, moreover, pose fewer safety hazards or other risks of interference than do other types of right of way, e.g. highways.

- The value of access to the right of way will be higher the higher is the communications revenue generation potential of the region served (which can be related to factors such as income levels, density of population, the density of industry with heavy usage of telecommunications, e.g. banking and other service industries, etc)

- The value of access will be lower the greater the availability of alternative rights of way. Pipelines, highways, water and electricity distribution networks often compete with railways in providing access for communication lines.

- The American railroad industry sought to capture the value of communications access through two different approaches. The first approach—direct investment in telecommunications—was attempted by three US railroad companies. Two, the Southern Pacific Railroad and the Kansas City Southern + Williams Pipeline, developed successful telecommunications businesses. The third, Norfolk Southern, failed to implement its plan.

- Southern Pacific and Kansas City Southern did not retain their direct telecommunications investments over the long term. However, each railroad secured a handsome profit on its investment on exercising its exit from the telecommunications business. The Southern Pacific subsequently developed a new telecommunications system which was retained by the railroad's owner when the railroad was sold. The value of the telecommunications business has far exceeded the value of the railroad business, which was subsequently merged into another company, Union Pacific.

- The second approach, followed by most American railroads, has been to negotiate leases with a variety of telecommunications firms for the use of rights of way for fiber optics and other communications technologies. These railroads have taken no direct ownership in the telecommunications business, although they may draw rents and some may even share profits. These "arms length" transactions take the form of commercially confidential contracts which cannot be divulged by any party, so the precise terms are known only by the parties thereto.

- There have been conflicts in some cases between the railroads and the telecommunications companies over maintenance of the shared rights of way. This is thought to have arisen partly from the failure to properly define contractual rights and obligations, including inadequate technical specifications for construction of the optical fiber lines, and partly from failure to adhere to contractual specifications in actual construction. One result is a movement by some telecommunications companies to have Congress pass a law giving telecom companies more control over railroad maintenance.

- Some telecommunications companies are also asking state governments to give them the right of eminent domain so they can force themselves on railroad rights of way at low cost. In recent years there has been some tendency in American jurisprudence to expand the concept and/or applicability of the power of eminent domain in general, but it is not yet clear whether this would be extended to the issue of access rights in favor of telecommunications companies, all of which are privately owned.

- Additionally, there are some cases where US railroads are experiencing legal challenges to their ability to use rights of way for multiple purposes, by owners of underlying residual property rights. Clarification of the precise legal ownership of land access rights for the purpose of constructing communication lines is a critical issue.

- While some difficulties and conflicts have arisen, the overall results, nonetheless, have been quite positive. Railroads have provided rights of way for over 9 million fiber kilometers, or more than 60 percent, of the American optical fiber network, and they appear to have won, at minimum, the provision of most of their own long distance communication needs in remuneration.

- Part of the relative success of the railroads, however, may be attributable to regulatory blockages which restricted access by telecommunications to the US system of interstate highways; such artificial impediments are likely to be reduced in future, as a matter of sound public policy.

- American railroads are presently undertaking extensive negotiations with communications firms on additional rights of way access for new technologies, such as digital personal communications systems which require "line of sight" antennas. These negotiations are expected to lead to large new sources of revenue and profit for the railroads, perhaps as much as $100,000 per line mile (~$62,000 per kilometer).

III. Development of a Commercial Telecommunications Strategy for Ukraine Railways and Identification of Potential Investors

Drawing on the experience of the United States and other countries, with particular attention to present Ukrainian circumstances, consideration was given to a wide range of alternative strategies to attract private investment in a commercial development of telecommunications in conjunction with Ukraine Railways. Both the market focus and the form of the business structure were viewed as variable, while associated risks to the different parties were identified and assessed.

The essence of the investment opportunity can be summarized as the juxtaposition of three basic elements:

- a market of 51 million inhabitants, with excellent economic prospects for the long term, so far served by very limited telecommunications and no dominant services provider yet in place

- a contiguous right-of-way of 14,000 miles under a single administration, providing an unmatched platform for construction of the nation's first optical fiber backbone network

- an investment partner, Ukrzaliznytsia, of high professional competence and political gravitas, with proven effectiveness under the most difficult of circumstances.

This investment opportunity (hereinafter 'Ukraine Transport Communications', or UTC) has not yet been forged into a specific company structure, and could be exploited in any of several alternative ways, depending on the particular interests and capabilities of the investment partners ultimately involved.

To delineate the options for UZ management and to assist in the identification of prospective investors, an *Information Memorandum* was prepared and circulated to potential investors in September, 1997. A revised version of this document (reflecting developments through December 1, 1997) is given at Appendix B.

A preliminary project plan for the initial stages of development of the digital backbone network is presented there. However, alternative plans may be presented by potential investors for consideration by Ukrzaliznytsia. The *Information Memorandum* also provides basic information on such issues as:

- the present Ukraine telecommunications market, principal participants, and Government policies re ownership and regulation

- the proposed scope, technical structure, and estimated costs of the project

- the financial potential through commercial operation, lease, or sale of cable capacity in excess of the Railway's own communications needs

- the principal risks in terms of market, engineering, project implementation and other factors

- specific next steps to be taken by interested parties.

Key aspects are summarized below.

Identifying Alternative Strategies

Market focus: From virtually a continuous spectrum of options corresponding to a narrower or wider group of services to be offered at earlier or later stages of the production chain, three prototypical strategies— each depicting a particular market focus for UTC—were identified for consideration:

> Strategy 1: 'railway own-account services provider + wholesale provider of infrastructure capacity': the communications undertaking would provide for the railways' internal communications (say, transmission from trunk through local switches), plus the existing UZ paying subscribers, and in addition serve as a wholesale provider of digital network transmission capacity (probably without switching services) to other service providers for resale;
>
> Strategy 2: 'mixed wholesaler cum selective retailer': the same strategy as own-account + wholesaler defined above, plus provision of switching services and customer premises connections for selected private networks (e.g. banks for ATM networks, large enterprises with multiple locations), possibly also retail paging services; and
>
> Strategy 3: 'full retailer': provision of the railway's own-account services plus entry into the market as a public telecommunications operator, providing a range of telephony, data transmission, and paging services to any who wish to subscribe.

Form of the undertaking: Any market strategy could be implemented through a variety of corporate and/or contractual structures. Among the most obvious choices are: (i) an arms length lease contract with an entirely separate telecoms company simply leasing right of way from the railway (as most commonly done in the United States)—in this case, if the lessee is already an established company entitled to do business in Ukraine, no new entity (or 'legal person') need be created, as a contract drawn between two existing entities could suffice; (ii) a new joint venture between UZ and a partner, presumably a proven telecoms services provider, could be established to pursue the business; or (iii) a long-term Build-Operate-Transfer (BOT) concession could be awarded to either a separate company or joint venture with UZ.

Assessing the Options

Market Strategies: Strategy 1 suffers from the risk that UZ could find itself in a poor bargaining position to obtain remunerative contracts for wholesale leasing, given the limited number of potential buyers (i.e. communications retailers)-- although the advent of KievStar as a potentially serious competitor to Ukrtelecom/Utel should improve prospects. Such a strategy also provokes questioning as to whether the most profitable segments of the business would be passed on to the retail vendors.

At the opposite, and most ambitious, end of the spectrum is Strategy 3, i.e. establishment of a full retail services provider. There are important precedents, e.g. Sprint and Qwest, which each happened to originate as a department of the Southern Pacific railway (although under different owners, more than a decade apart). Each subsequently became a subsidiary company, and ultimately emerged an entirely separate communications company, far larger than the railway which gave it birth.

Pursuing such a strategy in Ukraine would require a large and sustained commitment of financial resources, far beyond the $46.3 million identified for the first stages of the optical fiber digital backbone. It would also require initially a heavy injection of managers well proven in communications services in emerging markets, as current UZ telecoms staff have no experience in operating a profit-maximizing communications service company in a competitive market context. It is a strategy which would likely appeal only to an international service provider with a long-term corporate strategy to build global networks encompassing Eastern Europe—and it is a strategy which would be unachievable in the short run in the absence of such a strategic investor partner.

Strategy 2 represents the middle ground, and, as it appears at this stage, the most plausible of the alternatives identified. By assuming a limited retail function focused on the most profitable segments of the market and requiring relatively limited marginal investments, profits could be maximized and commercial and financial risks also minimized. Given the nature of the clientele—mainly well established large companies (banks and multinationals)—and their potential heavy usage of the proposed services, significant upfront commitments, perhaps even firm offtake contracts, might be achievable, provided UTC offered sufficient credibility as a reliable supplier.

In this respect it must be noted that UZ expects UTC to command the traffic of all the state transport enterprises, including air, water, and road, as well as rail. This will ensure a heavy base traffic load, but care must be taken to ensure payment discipline of state enterprises, which has been deficient in the past.

Business forms: In considering the form of the business, the nature and current position of Ukraine Railways itself must be taken into account. While UZ is already an established operator of a major nationwide telecommunications system (encompassing some 168,000 lines, including 70,000 paying subscribers not otherwise served by public networks), it is not a commercial telecoms operator— nor would UZ management wish to divert attention or resources

from its primary task of operating one of the world's largest railways. Thus, whatever the business form selected, it should provide for an enterprise other than UZ to accept the obligation to design, finance, construct, market, and operate the new communication networks (with remuneration to UZ including, but not limited to, in kind communication services).

Any of the different business forms identified above could be workable for Strategies 1 and 2, but for Strategy 3 (full retailer or public telecoms operator), at the present time a BOT concession may constitute the only feasible solution, given restrictions in current Ukraine law against private or foreign ownership of communications infrastructure in public use (as distinct from private networks serving closed user groups, e.g. Strategies 1 and 2, which may be owned by private investors, including foreign parties). Such a BOT structure might or might not include UZ ownership participation, depending on the bargain ultimately struck with private investors.

Note, however, that new legislative developments are afoot, as summarized in the following section, which may greatly expand the potential role for foreign private investment in the Ukraine telecoms sector.

Proposed New Legislation and Prospects for Privatization of Ukrtelecom

On October 24, 1997, the Cabinet of Ministers instructed the State Communications Committee (successor to the former Ministry of Communications) to draft a new law on 'Particulars of Privatization in the Communications Sector', with reference particularly to Ukrtelecom. The State Committee is also reportedly drafting another law to replace the current Law on Communications (No.161/95, of 16 May, 1995, as amended by Law No. 626/96 of 20 December, 1996). The new Prime Minister, Valeriy Pustovoitenko, appears to be pushing the initiative and has publicly stated that privatization of Ukraine's telecommunications enterprises will commence from January, 1998.

Press releases indicate that a two-stage program is planned. The first stage, to be accomplished by the end of 1998, envisages restructuring Ukrtelecom as one large Joint Stock Company (JSC) somehow incorporating all 35 state owned enterprises (mostly local telecom network operators, but also including Ukrtec, the long distance infrastructure provider) presently comprising the Ukrtelecom 'association'. The exact nature of the relationship of the 35 entities to the new Ukrtelecom JSC, if it has been determined, is not yet public—various press releases suggest that Ukrtelecom itself may take the form of a holding company, or something akin thereto, with 35 'affiliates', while other reports envisage a highly centralized, vertically integrated structure.

In the second stage, Ukrtelecom would be privatized by the end of 1999, through an as yet undefined process. Further details of the plan have not yet been released, and it is too early to judge whether this major new initiative will succeed in privatizing the sector.

Foreign investors may view these developments as the latest twist of many in the continuing turmoil which has afflicted the Ukraine telecommunications sector, and the associated body of law, since independence was regained in 1991. The probable short-term effect will be to encourage delay of the final decision on any major investment in the sector until after

clarification of Ukrtelecom's future—although it could have the opposite effect, as investors may be stimulated to act before all is finalized.

Risks Assessment

It must be recognized that the proposed UTC undertaking is inherently risky, requiring substantial commitment of resources over a long period in a highly uncertain environment. The full gamut of risks customary in emerging markets are present. Political risks include regulatory risks (license rights, obligations, and fees; competition policy; tariff controls), taxation, repatriation of profits and capital, expropriation, legal environment (clarity, stability, and enforceability of laws re companies, contracts, foreign investments, and concessions), and political instability. Macro-economic instability, price inflation, and foreign exchange risks, although well under control during the past year, cannot be ruled out for the future. Commercial risks include weak subscriber purchasing power, market share, tariffs competition, project completion (time and costs), and company management.

Standard mitigation measures are available to cover some of these risks, e.g. political risk insurance against expropriation and joint finance with an IFI sharing guarantees of exchange convertibility. Commercial risks such as market share and tariffs competition could possibly be mitigated through long term contracts with potential major users of the OFN.

Close observers of the Ukraine scene during the post-Soviet period attach particular significance to the regulatory and taxation risks identified above. In a public utility industry such as telecommunications, the issues of first concern are normally the transparency, stability, predictability, and evenhandedness of regulatory policies. Unfortunately, in the Ukraine, constantly shifting government policies in these areas have undermined confidence of private investors that they can depend on the terms struck in their original agreements, and this perception constitutes a major hurdle restraining private investment in telecommunications.

On this issue, the 10-year grandfathering provisions of the 1996 Foreign Investment Law do provide some comfort. In the case of the particular investment opportunity presented herein, investors can take additional comfort from the professional quality and political weight of the main partner, Ukrzaliznytsia. UZ, one of Ukraine's largest employers, is widely respected as one of the most effective organizations in the country. If its vital interests, including any communications venture, were threatened, it could be expected to make its voice heard at the highest political levels.

Identification of Potential Investors

The objective of the *Information Memorandum* (Appendix B) is to open a dialogue with international investors and assist in determining whether there is interest in becoming a business partner/investor with Ukraine Railways in a project for the construction and commercial exploitation of a digital communications network connecting the major cities of Ukraine, including an optical fiber backbone along the railway right of way. In addition, UZ would value input from sophisticated telecommunications investors to further assess the opportunities and

risks of the UTC concept. UZ seeks a practical discussion on alternative corporate structures, potential products, and partnership arrangements.

The *Information Memorandum* has been circulated to a group of multinational companies known to have requisite qualifications and potential interest to invest in East European communications. The document is available for broader circulation, and meetings between prospective investors and UZ management are being arranged on an individual, confidential basis. Interested parties should contact:

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IV. Strategy for Modernization of Management Information Systems

Over the past two decades, the rapid technological advance of computers and informatics has been a powerful driving force in the development of management information systems (MIS)[1]. In the case of the American railroads, institutional factors of virtually equal force were also present: the restructuring movement unleashed by the Staggers Act of 1980, which effectively freed railways from crippling governmental regulatory controls. Where there were 20 major rail companies in the US two decades ago, there will soon be only four giant rail corporations, and some 300 new short line railways which have spawned from the debris of the restructuring movement. Nonetheless, most freight traffic in North America is still interchanged between two or more carriers before it reaches its destination, while shippers in extremely competitive markets demand "seamless" rail service. There are growing international complexities as well: Canadian railroads are aggressive players in the United States rail market, and US carriers are acquiring rail lines from the Mexican government.

There are thus many parallels between the information system requirements of the American railroads and UZ, as it faces restructuring and commercial interaction with its neighboring European states. As UZ considers the requirements to modify and modernize its own management information systems, it can profit from a close look at the American experience. At minimum, UZ should be able to avoid some of the costly, evolutionary steps, and missteps, of the American railroad industry. More positively, it will hopefully be able to leapfrog over intermediate generations of technology to directly obtain the best which has been distilled from three generations of computer systems and MIS technology.

In the following section highlights from the US experience are briefly summarized. Further detail is given in the final section of the *Briefing Paper* at Appendix A. The report then concludes by defining Terms of Reference for an MIS Needs Assessment Study (Appendix C), which is recommended to assist UZ in determining how to proceed.

Evolution of Management Information Systems among US Railroads

Railroads—geographically dispersed and data intensive—were the first large industry in America, and management information systems have necessarily been with the railroad industry from the beginning. It is thus not surprising that railroads, from the early dawn of the computer era, sought to harness computers to their massive data processing needs. Given this fact, it should also not be surprising that railway MIS development has closely shadowed the evolution of computer technologies.

When computers first came into use, mainframes, centralized processing, and a company called IBM dominated the industry. When the desktop personal computer revolutionized the industry, decentralization took root on a large scale as small subgroups and individuals suddenly found themselves capable of directly meeting their own processing needs—and IBM's fortunes sank as Apple's grew. Now in the latest twist of the screw, the radically enhanced computational power

[1] The term 'management information systems', or MIS, is used here in a broad sense to encompass all information systems, including operations, marketing, finance and administration, as well as executive information.

of mainframes, and even more radical reductions in their cost, coupled with similar advances in telecommunications (which allows the seamless interweaving of computers near and far), has brought a resurgence in the use of mainframes—only this time, at least for the time being, in a symbiotic harmony with desktop client servers. At the same time, the growing power of artificial intelligence promises further flux in the continuing advance of railway MIS software.

The parallel evolution of railway MIS systems can similarly be categorized in three corresponding generations:

- early mainframe centralized processing and control—from which emerged large-scale systems, some of which have survived and are still in operation today

- independent processing—characterized by independent development of individual client server programs, with little or no standardization or integration of data bases—in its ultimate form perhaps more aptly termed "decentralized, disintegrated" processing

- integrated hierarchies—integrating both central and distributed processing on client server platforms linked through local area networks (LANs) and wide area networks (WANs) to common database servers (typically, but not always, mainframes).

In the early mainframe era, access to information was typically controlled by a central Information Department, which managed the computer, determined priorities, and assumed the role of "final judge" as to the information needs of each of the using departments. This control, often firmly exercised, by the Information Department frequently led to great frustration and unhappiness within every other department of the organization. Many staff often felt they could not get information they needed when they needed it. Within the railroad only the Chief Executive, if he were lucky, had more information than the head of the computer or Information Department!

Then in the 1980s and early 1990s the widespread availability, low cost and easy access of personal computers entirely altered railroad information management. With the personal computer revolution the power of the Information Department was broken. Users within individual departments throughout the work place became aware that, at a low price, they could simply set up individual systems to satisfy their own needs. At first department users brought in their own personal computers and designed software to meet their individual needs. Then individuals began to network computers and linked mini or even major LAN or WAN systems within a department. The result was a new team cooperation within the functional areas of each department. Productivity rose and satisfaction grew within the individual units.

But, however satisfactory for the individual user groups, the result also raised the specter of long term information chaos for the railroad as a whole. The lack of any central and long term planning caused duplicate investment, and software was used that was not up to the next step. Often the programs were at cross purposes and identical data were sometimes entered in incompatible forms. For example, on many railroads the billing department and operating

departments would use different physical station designations for billing systems and operating systems. Data security fell by the wayside, and in some cases the integrity of the data bases deteriorated.

It is only over the last five years that the major US railroads have addressed the management challenge brought about by the somewhat chaotic evolution described above, which was exacerbated by the powerful forces of the restructuring. The effort to rectify the situation has been enormous and costly. Legacy systems which have been produced at great expense in earlier generations cannot simply be discarded. For each a choice has to be made between modernizing and harmonizing, or simply supplanting by a new system.

By now, those railroads which have made the investment are increasingly convinced that they have found a workable solution in the form of integrated hierarchies, which provide the convenience of client server platforms and the cross-functionality of standardized systems. Common overall system standards have been (and are still being) reintroduced, and new generation mainframe computers are being extensively employed once again, both as data base servers and computational centers.

Defining the MIS Needs of Ukrzaliznytsia

Terms of Reference are given at Appendix C for a brief study by a senior specialist in management information systems to assess the information delivery capabilities of UZ's existing MIS (software and hardware) against the capabilities of current state of the art systems in leading American and European railways. Taking into account the particular circumstances of Ukraine Railways, the study would identify system enhancements or additional features which would be desirable, and then assess the practical alternatives for procuring these enhancements— ranging from a turnkey delivery of a comprehensive new system from an external source, at one extreme, to purely internal development, at the opposite, or some combination of external procurement and internal systems development.

APPENDIX A
FINAL REPORT TO UKRAINE RAILWAYS

BRIEFING PAPER

ON

THE AMERICAN RAILWAYS' EXPERIENCE

WITH THE

DEVELOPMENT AND COMMERCIALIZATION OF

TELECOMMUNICATIONS

AND

MANAGEMENT INFORMATION SYSTEMS

DECEMBER 1997

CHAMBERS, CONLON & HARTWELL
CLELL HARRAL INTERNATIONAL

The American Railways Experience
with
Development and Commercialization of Telecommunications
and
Management Information Systems

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BRIEFING PAPER ON U.S. RAILWAYS' EXPERIENCE WITH DEVELOPMENT AND COMMERCIALIZATION OF TELECOMMUNICATIONS AND MANAGEMENT INFORMATION SYSTEMS

On July 4, 1827, fifty-one years to the day after he signed the American Declaration of Independence, Charles Carroll of Maryland turned the first spade full of earth to begin the construction of the Baltimore and Ohio--America's first railroad. Soon railroads became the first "national industry" in the United States. With far flung commercial operations came a critical need for communication and information transfer across the system. Modern communications and information systems grew up with the railroad industry. Samuel F. B. Morse initiated modern communication with the practical demonstration of the telegraph in 1844. The railroads were among the first and most intense users of the telegraph; telegraph lines were, for the most part, strung along railroad rights to way. This technology dominated railroad communications for 100 years. Western Union, which once monopolized commercial communication in America, began to lose ground to AT&T early in the 20th Century.

Railroads led the way, as well, into the world of microwave telecommunications in the late 1950s--largely for internal railroad use. There was a modest commercial sale by the Southern Railroad of excess microwave capacity. AT&T also invested heavily in microwave in the same period for long distance telephone service. Then in the 1970's Southern Pacific Railroad decided to exploit its microwave investment and its rights of way and created a long distance telephone company called Sprint for the specific purpose of bringing some competition to AT&T.

From the mid 1970s to mid 1980s two key events changed the very nature of telecommunications in America. One was the break-up of AT&T, which permitted new competition in the marketplace. The 1982 Modification of Final Judgment (MFJ) between AT&T and the US Justice Department insured there would be competition for long distance telephone service. Today, almost 500 privately owned firms compete to offer long distance service in the U.S. As a result, since 1984 long distance telephone rates have declined by as much as 60%, and calling volume has exploded from 40 billion switched access minutes to 111 billion. In 1996 the Congress further broadened telecommunications competition by opening local telephone markets to competition and authorizing the auctioning of the spectrum for digital service.

The other significant event was the dramatic revolution in computer technology together with the development of fiber optics cable. In 1978, United Telecom laid seven miles of experimental fiber optic cable in Pennsylvania. In 1979, the company installed the first digital switch that opened the way for communications users to take advantage of computer driven services such as massive data transfer and remote processing, electronic mail, call forwarding, , and conference calling. Sprint soon began laying fiber optics

cable down the Southern Pacific rights of way. Shortly thereafter, all railroads were putting together fiber optics deals with telecommunications companies.

This paper consists of two parts. The first deals with the experience of American railroads in partnering with telecommunications firms. It describes the experience of US railways in providing rights of way for direct investment and investment by telecommunications companies in fiber optics technology as a basis for commercially successful ventures.

The second part covers the concomitant development of information systems, which has been driven to a remarkable degree by the same technological forces, but subject also to strong additional forces originating from the dynamic competition in America's transportation markets and the associated restructuring of its railways industry.

It is intended that the paper, together with roundtable discussions with managers of leading US railway telecommunication and management information systems, will assist in determining the most beneficial role strategic partners may play in the Ukraine Railways.

I. American Railroads Exploiting the Telecommunications Marketplace

The Fundamentals

More than 15 million fiber kilometers have been deployed in the US and now carry more than 90 percent of all long distance telephone calls. 60% of that fiber cable is laid along the rights of way of America's railroads. The railroads have been major partners in the telecommunications revolution and have, thereby, exploited the value of their rights of way.

Why does the right of way have value? In a free market economy, the price of any product or service is determined by its quality, availability and demand. When there is demand for anything with commercial value, unless regulated, scarcity will drive up its price. Unbroken longitudinal rights of way are quite scarce. When they are treated in a private market environment they have stand-alone value. In the US, there is particular value in and near large population clusters in the East, the upper Midwest, the South, and along the West Coast. Even where population densities are low, access to unbroken longitudinal rights of way that are controlled by a single private entity are scarce. Together, the American railroad companies control over 153,000 miles of this rights of way.

These rights-of-way can be publicly or privately owned. Although most US rail rights of way are under private ownership, a few are publicly owned, the most notable being the 456-mile Northeast Rail Corridor between Washington, DC and Boston, Massachusetts, which is owned by the federal government and operated by the federally owned National Railroad Passenger Corporation (Amtrak).

Certainly, limited availability and access increase the value of these unbroken rights-of-way. Value is added by single-firm ownership. The alternative to dealing with a single entity that owns, controls and/or manages the right of way is a multiplicity of more costly transactions involving a multitude of individual property owners or bureaucracies.

Are railroads the only rights of way alternative for fiber optics cable? No! Pipeline operators remain competitors to railroads as do electric utilities. Fiber optics cable can be carried within the steel ground wire atop high-voltage power lines along an electric utility's right of way, within a decommissioned oil or natural gas pipeline, or down the median of an Interstate Highway.

Oil and natural gas pipelines in the US generally are privately owned. One such, Williams Pipeline, was an early entrant into the fiber optics marketplace. Electric utilities have been less aggressive. This is due, in part, to the relatively short longitudinal rights-of-way of electric utilities as compared with railroads so that the transaction costs of dealing with dozens of electric utilities (in order to gain the desired geographic coverage) are considerably greater than the costs dealing with just one railroad. Long-distance telephone companies now have rights of way agreements with the federally owned Tennessee Valley Authority as well as investor-owned electric utilities such as Indiana Power & Light and Louisville Gas & Electric.

Until recently, the Federal Highway Administration (FHWA), which exerts considerable control over state-owned roadways, discouraged longitudinal access along Interstate Highways. For example, for three years beginning in 1983 -- when every railroad was negotiating with fiber optics firms for buried cable -- the Federal Highway Administration issued only 53 permits for longitudinal access, and none for more than five miles. FHWA subsequently relaxed its tight restrictions, however, and in 1991, for example, MCI gained longitudinal access for fiber optics cable along Interstate Highway 81 between Harrisburg, Pennsylvania, and Baltimore, Maryland.

Within cities and towns, where long-distance fiber optics systems connect with regional telephone companies, the municipally owned rights of way carrying sewer and water lines generally offer a good environment for the laying of fiber optics cable.

While other rights of way were available, the railroads industry won the vast majority of contracts. In the United States today, about 60 percent of the fiber optics cable is buried beneath railroad rights-of-way, some 25 percent is carried along steel ground wires of electric utility transmission lines, and the remainder follows other rights of way.

MCI was an early starter in the race to provide AT&T with competition. It was the first company to aggressively contact railroads and enter contracts to use rights-of-way to lay fiber optics cable. MCI subsequently purchased rights of way of the former Western Union Telegraph Company for the sole purpose of using those rights of way to bury fiber

optics cable. AT&T also began laying fiber optics cable -- often using railroad rights of way for its long distance service.

Due to its advanced features, economy, speed, and quality, fiber optics technology quickly dominated long distance transmission, largely supplanting microwave technology and redefining the communications role of satellites. There was a virtual explosion of fiber construction.

Structuring the Telecommunications Business—Two Approaches

Because of their long rights of way and their need for internal communications over long distances, the railroads were logical companies to enter the telecommunications business and, as noted, they have done so. Two different approaches were taken.

The first, proactive approach was for railroads to directly enter into the communications business through companies they controlled. Three railroads, one in a joint venture with a pipeline operator, attempted this approach. The railroads were: the Southern Pacific, the Norfolk Southern, and the Kansas City Southern in a joint venture with the Williams Pipeline Company.

The second, basically passive, model was a landlord-tenant structure, which is here termed the "Arm's Length Transaction". In this model telecommunications companies were the initiators in approaching the railroad to buy or lease access to rights of way through an "arm's length" contract. In the context of very strong, competing demands for rights of way access ("sellers' markets" from the railways' perspective), all other railroads have selected this option.

Approach l: The Railroad Controlled Telecommunications Company

The Southern Pacific Railroad (SP) was perhaps the most far sighted railroad when it came to entering into the telecommunications business. The Southern Pacific (SP) was an early user of microwave for its internal communications, and it began its telecommunications venture from its microwave system. Interestingly, the SP began its telecommunications efforts as an outgrowth of its decision to create a totally integrated operational information system. The SP had created a wholly owned subsidiary called Sprint Communications (which was named after a premier freight service between Dallas and Houston and was later designated to mean Switched, Private Network Telecommunications) Though it was justified primarily as an internal communication system, far sighted managers had one eye on the opportunities that might come with a break up of the AT&T monopoly, and the investment was made by the railroad holding company.

Southern Pacific was the first carrier to envision telecommunications as a separate revenue and profit stream. Obviously it was a distinct advantage to its operating railroad subsidiary to be able to use the microwave capacity at a portion of the full "stand alone"

cost of providing it. After fiber optics was shown to have commercial value, SP began laying fiber optics cable alongside its right of way and became an early entrant into the long distance telephone market.

In the long term, Southern Pacific did not retain control of Sprint. The communications business was growing rapidly and required enormous capital investment. In 1983, Southern Pacific Railroad Corporation sold Sprint to GTE. In 1986, GTE/Sprint formed a 50%-50% joint venture with US Telecom, which they named US Sprint. That year 15% of US Sprint's calls were carried over the fiber optics network. By 1988, 100% of the company's traffic was traveling through the world's most advanced fiber optics network. Today, following AT&T and MCI, Sprint is the third largest long distance company in North America.

Why did Southern Pacific sell Sprint? Certainly the telecommunications company was profitable from the beginning. The company was a success (and later became even more successful under GTE and subsequently in combination with US Telecom.) The real reason for the sale had more to do with the fact that the Southern Pacific Railroad itself was in financial difficulty. Throughout the 1970s the railroad teetered on the brink of bankruptcy. Starved for cash, and with deep debt, the holding company, attempted a rail merger with the Santa Fe which was rejected by government regulators as anti-competitive. Since it was unable to merge itself into profitability, the holding company decided to sell Sprint in order to raise enough cash to stabilize the core business--which was the railroad. Simply put, the Board of Directors ultimately determined that SP needed the cash. Further the SP Holding Company's top management were railroad people. There is a question, in practice, whether the top managers had the depth to manage both the railroad and the telecommunications company. There was a great deal of deferred maintenance on the railroad, and some concern that bankruptcy was possible. Certainly there was competition between the two subsidiaries for the capital to meet the extensive infrastructure demands of both a telephone company and railroad.

There was, in fact, an internal debate at the time of the sale as to whether the holding company should retain Sprint, or perhaps even retain Sprint and sell off the railroad. This would not have been an entirely unreasonable position for the holding company. A few years later, the venerable Illinois Central Corporation did sell off its historic railroad and keep its subsidiary corporations (not including a telecommunications company). This is indeed what subsequently happened with the second Southern Pacific telecommunications venture, Qwest.

A few years after the sale of Sprint in 1983, the majority of the stock in Southern Pacific was acquired by the Anschutz Corporation which is wholly owned by one individual, Phillip J. Anschutz. A subsidiary of Southern Pacific was formed in 1988 to lay fiber optics in exchange for cash and capacity rights. Thereafter, it expanded its construction operations as a platform to expand into the business of providing telecommunication services. In 1995, it acquired Qwest Transmission Inc. This entire Southern Pacific telecommunications business is now known as Qwest Communications International, Inc.

Qwest was retained entirely by Anchutz when the Southern Pacific railroad was sold to and merged with the Union Pacific in 1996. Qwest has become a major "carriers' carrier"— thus, for a second time, the Southern Pacific railroad became the ancestor to a major communications firm, but in neither case did that firm remain a part of the railroad. Because Qwest is similar in concept to a proposal by the Norfolk Southern railroad, a more complete discussion follows the description of the Norfolk Southern initiative below.

The Kansas City Southern (KCS), is a smaller independent railroad that runs a North-South route from Kansas City to the Gulf of Mexico. It is the only other American railroad to set up its own telecommunications company. In the early 1980s, KCS formed a joint venture with Williams Pipeline and then acquired a small telecommunications engineering firm. Their goal was similar to the SP's— to use their microwave system to enter into the newly emerging long distance market. The goal of KCS was to work with a number of other companies to create a new national telephone system. They would own a piece of that system. There was some thought that eventually the participating companies might merge into a new giant telecommunications company.

Working together, KCS, Williams Pipeline, and their allies not only laid fiber optics down railroad and pipeline rights of way but also leased as much capacity as possible from AT&T. The core business of KCS is running a railroad. The core business of Williams is owning and operating oil and gas pipelines throughout the United States. This is a particularly interesting case in the American experience, because neither company had been in the telecommunications business previously. Both sensed, at about the same time, an opportunity to capitalize on AT&T's divestiture and enter the long distance market.

A major KCS goal, beginning with the utilization of its microwave capacity, was to cut the expense of its internal railroad communications and at the same time make some money in a new line of business. Like KCS, Williams was eager to grasp a new opportunity to use its right of way for a new purpose. Reportedly, its primary goal was to gain more than scrap value for its decommissioned pipelines. Housing fiber optics cable in those defunct pipelines certainly created new value. The KCS/Williams joint venture was a new subsidiary long distance communications firm called WilTel. While railroads and pipelines are competitors for transportation of liquids such as oil, KCS and Williams worked closely together to become a competitor to AT&T and aggressively sought to forge links with other regional telecommunications systems.

KCS lost interest first. Like SP, its management was struggling with the railroad, which was in marginal financial condition. The fiber optics effort required a huge capital investment, and managers from the railroad subsidiary and the telecommunications subsidiary found themselves fighting at the Board of Directors level for capital budget. When it realized that it no longer wanted to stay directly in the communications marketplace, KCS simply sold its subsidiary outright to the Williams subsidiary WilTel , around 1990. Then, in 1994, Williams sold WilTel to LDDS, which in turn sold the long

distance telephone operation to WorldCom. Ironically, the early dream of KCS was to create a great national company, and the KCS telecommunications asset is now a part of WorldCom, which, with completion of its acquisition of MCI, will become the second largest telecommunications company in the nation.

KCS sold its interest in WilTel and its fiber optics for a one time fee; but, as a part of the deal, the railroad retained the right to use two dedicated paired T-cables for its internal use. Although it made a clear profit, the KCS today recognizes that it was not sufficiently optimistic about the future. They now realize that they need far more communications capacity for internal use and are unable to get it -- except at full market price.

Norfolk Southern (NS) is an aggressive and profitable major railroad that operates in the Southeastern United States. A little history on the NS entry into telecommunications is instructive. A predecessor railroad of Norfolk Southern, the Southern Railway, long had been on the leading edge of modern communications. During the 1960s, the Southern Railway boasted the largest privately owned microwave system in the world. It was just a few steps behind AT&T, which completed the nation's first microwave relay -- between New York and Chicago -- in 1950. It used the microwave system for extensive internal communications within the railroad and, in addition, leased modest amounts of excess capacity to telecommunications companies.

In the early 1980s, the Southern was merged into the Norfolk Southern System. NS sought to enter into a joint fiber optics company with two other railroads, the Southern Pacific and Santa Fe, to create a system that would blanket the West and the Southeast. NS was in the communications business in a limited fashion, while the SP was already in the business with Sprint and had expertise. The Southern's proposal was to pre-sell space on a joint fiber optic network to telecommunications companies and (with those commitments in hand), to build and own the fiber optics cable itself. It did not immediately find telecommunications buyers for this concept. At the same time, the negotiations amongst the three railroads fell apart. Thus, its effort to create a new joint venture which built and owned the fiber optics but rented out capacity failed. This probably had more to do with corporate relations between the railroads than with the merit of the idea to establish a joint fiber optics owning company. At about the same time, a giant rail merger between the SP and the Santa Fe was blocked by Federal regulators creating a financial strain on both companies, and SP sold Sprint. It was simply not a good time for those particular companies to go into a capital intensive joint venture. Unable to construct a viable joint venture, the Norfolk Southern than began entering into more traditional contracts with the existing telecommunications companies to lease space to lay fiber optics cable like most other railroads. Those traditional concepts are described under the heading "Arms Length Transactions" which begins on page

Qwest. The Qwest concept originating from the Southern Pacific- appears to be closely akin to that which was proposed by the Norfolk Southern. From its beginnings in 1988, Qwest telecommunications has expanded rapidly and has become a major player in

the construction, ownership, and lease of fiber optic cable. As it explained its mission in an 1997 public offering of stock, "...the company entered the carrier services market in 1988 by marketing and providing dedicated line services to other carriers using the long distance capacity that it had received under construction contracts to build conduit systems, principally for MCI. Through the acquisition of a carrier's carrier in 1990, the company increased its presence in the carriers services market and expanded its geographic coverage of digital dedicated line services to other long distance companies."

Construction of the Qwest network is scheduled to be completed by late 1998. Its network will extend approximately 13,000 route miles, 70-80% of which is over railroad rights of way which it has leased. Growing out of its extensive railroad experience, Qwest maintains its own construction capacity, employing 530 persons and a rail plow train which consists of locomotives, plow cars, and several supply cars. A plow car travels along the railroad track and simultaneously plows a trench approximately 42-56 inches deep, approximately eight feet from the nearest rail into which conduit and fiber cable is laid. A plow train can cover up to four miles a day.

The Qwest cable contains 96 fibers, of which between 48 (and in some cases 60) have been pre-sold to other communications carriers. The sale of this capacity has provided a major part of the capital needed to construct the lines. Qwest intends to retain 48 lines throughout its network and will increase the number of lines where necessary to meet that goal. It is laying two conduits along virtually all of its route with the second conduit available for additional fiber optic cables as technology and demand change.

It should be noted, in all fairness, that although the long term prospects for Qwest appear to be very bright, the company has actually lost money in 5 of the last 6 years, and this year was forced to sell stock to the public in order to raise sufficient capital to complete its system ($1 billion of financing by sale of line to MCI). The stock has proved to be popular on wall street, but the final word is not yet in as to whether the firm will fulfill its promise over the long run.

Exit scenario: the lesson from Southern Pacific and Kansas City Southern ventures. The Southern Pacific and Kansas City Southern are the only two American railroads to have established their own telecommunications companies. Williams, also a rights of way owner, did the same thing. Norfolk Southern tried with its 3-railroad joint venture proposal and did not succeed . Thus the American experience could lead to the conclusion that an effort by a railroad to establish a telecommunications company subsidiary is doomed to failure. That would be the wrong conclusion.

It is true that those companies that did establish telecommunications subsidiaries and got them into operation are out of the commercial telecommunications business today. These examples from the American experience should not, however, discourage the UZ from establishing Ukraine Transport Communications and seeking a strategic investor and entering into a venture primarily owned by the railroad. The experiences of these rights of way owners venturing into telecom were not failures. They were successes.

Both SP and KCS (like Williams) deployed a successful "exit scenario". They sold their telecommunications subsidiaries, reportedly at large profits which provided long term benefits to the railroads involved. One subsidiary ended up with GTE and the other two with WorldCom. Both of the resulting companies are in the core business of telecommunications. In the case of the SP, its second venture into telecommunications resulted in a sizable and expanding telecommunications company still under the ownership of the individual who was the majority rail shareholder prior to the sale of the railroad.

In private enterprise, investors are motivated by a desire to make money on their investment. This can happen in two ways. The first way is through a regular stream of profit from the operation of the company. In one way or another, the investor is returned a part of that operating profit to pay back his investment and then to make additional money for himself. A profitable company that pays dividends will give him a favorable financial return on the original investment.

The second way is through an exit scenario. This simply means the investor has a plan to sell the enterprise. If he sells the enterprise for substantially more than he paid for it in the first place, he can make a great deal of money. In many cases, especially in the short term, much more money can be made from an exit scenario than from an operating profit.

"Profit" and "Exit Scenario" are twin pillars for free market investment. Most large corporations, including all major railroads, look for opportunities to purchase other companies. Many times those companies are related to the transportation business; sometimes they are not. In these cases the investment is made simply to make money for the railroad corporate shareholder.

A quick example involving the Chicago & North Western Railroad (CNW)provides clear example of a non-transportation investment made with a clear exit scenario in mind. Jerome Conlon, then a senior vice president of CNW, (now a partner at Chambers, Conlon and Hartwell), arranged for CNW to purchase Douglas Dynamics, a small company that manufactures snow plows in the states of Wisconsin and Maine. The plows fit on the front of four-wheel drive vehicles. The purchase price was for $53 million. The purchase had nothing to do with CNW's core railroad business. Douglas was a profitable operation that brought tax benefits to the CNW consolidated tax return. Further, based on market research, Conlon speculated that the increasing popularity of 4-wheel drive utility cars and trucks across America would continue. In turn, in the cold sections of the country, sales of more 4-wheel drive vehicles should mean greater snow plow sales. If this proved true, the increased profits would mean enhanced earnings for the shareholders of the CNW. CNW allowed Douglas to operate independently; they did not try to influence management in any way. During the next year and a half , the sales of 4-wheel drive vehicles, and snow plows, increased dramatically across America. The market value of the Douglas also went up. Less than 18 months after purchase, Conlon

sold Douglas Dynamics for $100 million. From the beginning, the investment strategy included an exit scenario.

Approach 2. The "Arm's Length Transaction"

Under this option, which might also be called the "mere landlord structure", the railroads do not establish a subsidiary or a joint venture to operate commercial communications. The railroad companies simply sell rights of way access to telecom companies, which then string wire, lay fiber optics, or erect antennas. This has become the standard procedure in the railroad industry.

Commercial agreements between parties are limited only by the creativity of those at the negotiating table. It is not uncommon today for multiple fiber optics communications firms to be utilizing a single railroad right of way. In some cases, railroads already have gained access to sufficient fiber optics capacity to meet their own voice and data transmission needs. Similarly, some long distance telephone companies have determined that the value of granting railroads zero-price access to fiber optics exceeds the value of the rights of way access. Most recent agreements involve simply a fee for access to the right of way.

How arm's length agreements work. Existing contracts between railroads and fiber optics communications firms are, of course, proprietary as to compensation and length of the agreement. Both the railroads and the communications companies involved absolutely refuse to make public the details of their agreements. It is therefore impossible for anyone to compare the specifics of actual agreements or to give actual cost and length of such agreements. However, these agreements generally take one of several forms:

1) A joint investment into which both the railroad and the telecommunications firm put capital, but the railroad is a passive investor only and does not generally interfere in the telecommunications activity;

2) An exchange or barter-- in exchange for permission to bury fiber optics cable beneath the railroad right of way, the fiber optics communications firm makes available to the railroad a portion of the transmission capacity (perhaps a "dark line" in each direction or a preferential price for utilizing fiber optics capacity), and/or even helps to install certain train control hardware and software;

3) Straight payment-- The fiber optics communications firm pays the railroad for access on a linear foot or other basis; or,

4) Some combination of 1), 2) and/or 3).

In a free market, owners of a scarce right of way will auction access to the highest bidders, with those rights-of-way serving the highest density population centers being the most valuable. It is not uncommon for the owner of the right of way to believe that

access to that right of way is worth more than the long distance telephone company believes it is worth. The existence of alternative rights of way can have a significant impact on the perceived and actual value of the railroad right of way.

In an "arm's length transaction" companies like MCI or AT&T approach the railroads and negotiate access for a price. Since railroads and long distance telephone companies keep their internal costs secret from each other, establishing the price can be difficult. Generally, the railroads will hold an auction with the rights of way going to the highest bidder. In some cases, the access to the rights of way is exclusive to one communications company, but in most cases, the right to lay fiber optics cable is not exclusive, and the railroad can (and does) deal with more than one company. This, of course, affects the price.

The arm's length transaction was the path taken by companies such as the Chicago North Western, Union Pacific, Burlington Northern, Illinois Central, and Amtrak from the beginning. When the joint venture attempted by Norfolk Southern failed, it also began to make agreements with long distance telephone companies for the laying of fiber optics cable. These arrangements have largely been successful, although there is some feeling in the railroad community that they did not get enough money for their asset. However, there have been real problems between the telecommunications companies and the railroads over maintenance issues on the shared rights of way.

Definition of Contracts and Avoidance of Disputes

Operational impediments to sharing rights of way. the importance of detailed contractual agreements. As in any arm's length deal, it is important that all the details of the relationship be committed to a contract, and that the details be well thought out in advance. Reportedly, both Kansas City Southern and Amtrak are disappointed that they do not have greater use of the fiber optics capacity on their rights of way. However, that was not negotiated in the original deal, and the telecommunications firm is not about to make it available now--except at a regular market price.

As a major part of its "price" to MCI for the right to lay fiber optics cable in the Northeast Corridor between Washington, DC, New York City, and Boston, a new step was taken between the railroad and the telecommunications company. MCI not only gave Amtrak access to fiber optics cable for internal use, but also provided a computerized train-control system. However, as will be seen, these transactions have become a point of dispute between the two companies.

There are many specific problems that can arise from two very different operations under different corporate ownership sharing the same rights of way. There are sensitive issues of control over the rights of way. Railroad operations are active, since trains pass over the track on a regular basis, and the track must be kept in good repair.

Telecommunications are passive, since the signal travels under the rights of way and has no impact on train operations. The relationships between the two must be defined in the contractual agreements on which the arm's length relationship is based. When the original deals were signed, neither party believed the relationship would be particularly complicated. Some US railroads and telecommunications companies, in fact, failed to establish a workable relationship through contractual agreements. Unfortunately, the failure in this area in certain cases has generated such acute problems that the United States Congress has been requested to intervene on behalf of the telecommunications companies.

The principal difficulty centers on the issue of who controls activities on the right of way. Because of a failure to arrive at strict contract terms, there is an almost hostile relationship growing between the rail carriers who own the rights of way and the telecommunications companies who have laid cable under them. Each side feels the other is neglecting its responsibilities, and tempers have become heated. The telecom companies charge that the railroads are careless in the maintenance of their shared rights of way. The railroads charge the telecom companies were careless in laying the cable. Although contracts often called for the fiber optics cables to be buried to a depth of at least three to ten feet, it now appears that there was uneven supervision of this requirement and many cables are much closer to the surface. Since railroads require heavy and constant maintenance to make sure trains can operate safely over the track at high speeds, there is an increasing conflict. With heavy equipment constantly grading and regrading ditches and ballast, the depth will change over time. If the fiber cables have not been buried deeply enough the potential for a problem becomes greater. There have been a number of examples where railroad equipment operated by railroad crews have accidentally cut the fiber optics cable, and tens of thousands of people have been left without telephone service.

The telecom companies want the railroads to seek clearance from the telecom companies before performing any maintenance. The telecom companies would then locate and mark all cable prior to any maintenance activity. The railroads claim this would be a burdensome chore. They charge it would lead to operational difficulties that would add to railroad costs by limiting the use of mechanized equipment and forcing employees to dig by hand in the proximity of underground facilities (regardless of the depth at which it is located). Further, the railroads feel the utility workers who mark the location of such facilities would be exposed to danger from passing trains. All of this, the railroads claim, will unnecessarily interfere with their maintenance schedules and practices. The utilities simply claim it is intolerable to expose telephone and data customers to interruptions resulting from railroad maintenance practices.

This conflict has become so strident that a number of telecommunications companies have requested the federal government to require railroads to give the communications companies 48 hour advance notice of every maintenance activity which might potentially involve a fiber optics cable. A new law would override existing contracts. In response to this perceived administrative nightmare, the railroads accuse the telecommunications

companies of bad faith and failure to meet contract specifications on cable depth. A quiet, but intense, legislative struggle between telecommunications lobbyists and railroad lobbyists is now occurring in the offices of Congressional Committees.

There have been problems also in cases in which the railroads have contracted to receive communications services for their internal use as a part of the deal. Engineering consultants indicate there is often a conflict between the desire of communications companies for as few as possible maintenance points on their systems and the more complex requirements of the railroads. Railroads, for example, have a greater need for frequent signals junctions along the fiber optics cable than do long distance telephone users. This is at the heart of disagreements between Amtrak and MCI on the Northeast Corridor. MCI feels they laid a fiber optics cable system that is satisfactory to their commercial requirement and provided Amtrak with the computerized train control system for which the contract called. Amtrak feels the communications company did not do enough to meet the special requirements of the dense railroad corridor. Obviously, there was insufficient understanding between the parties on the need of the railroad for signaling locations.

For railroads; which have for a century and a half had absolute control over all aspects of their rights of way, the shared responsibilities have become a major irritant—though not enough to discourage their continuing desire to lease their land. The solution is to identify as many of these problems as possible in advance and then avoid future misunderstandings through detailed and strict contractual terms.

Legal impediments to sharing rights of way. An investor always seeks to minimize his risk. The greater the risk, the less likely he will make the investment. An investor always wants to be certain that he has a clear legal right to engage in the operation that is the subject of an investment. American railroads assembled their rights of way in various ways. Companies like the Union Pacific and Illinois Central received land grants from the Federal government. In most cases the government used the right of "eminent domain" that forced land owners to sell rights of way to railroads. These arrangements were often complex and many are over 100 years old. Under the laws of many states, regardless of how the railroad obtained its rights of way the railroad's easement is abolished when the railroad ceases to continue operations on a railway. The rights of way then revert to the land owners. There are, of course, many variations on this theme enshrined in thousands of contracts.

Since, in many instances, the railroad right to the way ceases when railroad operations cease, there is a legal line of argument that the railroads may not use their rights of way for any purpose other than providing railroad transportation. One class action law suit, in New Orleans, has been filed by land owners adjoining the Kansas City Southern route. They claim that Kansas City Southern only has a right to use its rights of way easement for "railroad purposes". Therefore, plaintiffs claim, LDDS (now WorldCom) did not have a right to lay fiber optics cable without the permission of each of the previous land owners. In its defense, LDDS said KCS does have the legal right to permit fiber optics

cable on the rights of way so long as they are operating a railroad. They cite the fact that early in the railroad history, Western Union planted telegraph polls along the same right of way. Western Union then sold its services to commercial users. This case has not yet been resolved and is being watched closely by railroad and telecommunications lawyers.

Note should also be made of the growing extension of the legal power of eminent domain—the right to take property rights for 'public' use without permission of the owner—in various spheres of American business in recent years. Many public utilities have been granted the power of eminent domain, and where their facilities are placed along railroad rights of way, the result can be that there is little or no compensation paid to the affected railroad for land corridors to string wire, install underground facilities or lay natural gas pipelines. Fiber optics corridors have so far been an exception where "arm's length" negotiations have generally resulted in a negotiated market price. The power to grant eminent domain belongs to the individual states. In Wisconsin, companies hoping to lay fiber optics communications cable are lobbying for legislation that will give them the power of eminent domain over railroad property. If Wisconsin passes a law, there will soon be bills in every legislature in the United States. This would be a blow to American railroad efforts to use its rights of way for diverse commercial enterprises.

In the Ukraine, where private property rights are just now being developed, the legal right to non-rail uses of the property will need to be clear. Partly because of the unclear situation in America, investors may insist the rights of the railroad to the use of its rights of way be clearly settled by the government.

Barter--achieving the benefits of fiber optics in kind. Obviously direct ownership of a telecommunications company by a railroad , such as the original Sprint, insures that the railroad will get the full benefit of the system for its internal use. In fact, one reason Sprint was established in the first place was because the railroad did not want to give up control over any aspect of the telecommunications system it would be relying on for its operations.

However, direct control through a wholly owned subsidiary is not the only way to gain the benefits of fiber optics communications for railroad use. As a common practice, the railroads selling access to their rights of way for fiber optics also enter into a variety of agreements with long distance telephone companies. As a part of the price, the railroad trading access to its right of way gains access to fiber optics capacity as well as money. Generally, these agreements involve direct payments from the communications companies to the railroad plus a variety of arrangements to cede to the railroad either below cost use of fiber optics cable or exclusive use of a number of the fibers within the cables. For example, the Burlington Northern has leased rights of way to all the major communications carriers and has received not only cash but sufficient communications capacity to accommodate nearly all of its management information system. In almost every instance its use of the communications system is without additional cash transfer -- a successful application of the barter principle. It uses the fiber optic system for, among

other things, its state of the art telemetry system of train control, whereby every train on the system is tracked and can be centrally stopped.

In another example, the federally owned Amtrak structured an agreement during the mid-1980s with MCI. MCI obtained access to the densely populated Northeast Corridor between Washington and New York, while Amtrak obtained fiber optics cable capacity, plus installation by MCI of a computerized train control system. However, as already stated, this has resulted in a disagreement between Amtrak and MCI on the extent of the obligation.

Learning from the Past and Looking for Future Telecom Opportunities

Telecommunications and the success in attracting fiber optics cable is only a part of the story of the railroad effort to extract additional value out of their rights of way. In addition to telecommunications, rights of way have also been leased and sold for advertising, pipeline rights of way, and real estate development. In some cases, the financial return to the railroads has been significant. In other cases, the railroads have received little for use of their property. Some American railroads are even considering such ideas as combining rights of way of several companies to exploit non-transportation potential and to protect their interests in Congress and the state legislatures—although caution must be exercised to avoid legal entanglements concerned with claimants to residual property rights and the exercise of the powers of eminent domain, as noted above.

However, it is a fact that telecommunications constitutes the overwhelming opportunity for American railroads to increase the value of their rights of way. Fueling the demand for fiber optics communications are the colossal data needs of US and multi-national corporations and the phenomenal growth of the Internet. Newly authorized open entry into the US local telephone market is expected to result in the seven regional Bell telephone monopolies entering the long distance field, while several of the long-distance providers will undoubtedly challenge the local markets of the regional Bells. Long distance telephone companies also are looking to expand their proprietary reach and create a grid including alternate routes, so as to permit rapid restoration of their network when line failures occur. The increase in commercial data transmission, Internet usage and full-motion video demand should result in the laying of still more fiber optics cable locally, regionally, and nationally.

The American railroads are also looking to the prospect of other technologies that may work along side fiber optics for specialized communications or compete with fiber optics. One of the most promising of these for the use of railroad rights of way is Personal Communications Service (PCS) technology. The technology requires "line of sight" antennas for which railroad rights of way are ideal. Most major railroads have recently been contacted by service providers, and negotiations are underway across the country. Allan E. Kaulbach, a Vice President of Mercer Management, estimated that in the US,

antenna along railroad rights of way has the potential to generate from $25,000 to $100,000 per line mile.

As in the early days of fiber optics, it is hard to know what the future holds for PCS. Certainly, the market looks very good. Today, in America, one in seven people use a cell phone. By the year 2005, it is predicted that one in two people will use a cell phone with PCS digital technology. The United States Government, through the Federal Communications Commission (FCC), has auctioned off vast blocks of wireless frequency over the last two years to PCS companies. Over 2000 licenses have been granted. Sprint, for example, participated aggressively in the FCC PCS auction and was awarded wireless licenses in 29 markets. Together with their venture affiliates, Sprint is now licensed for a nationwide footprint reaching 180 million Americans.

Every major railroad in America has aggressively entered into the new communications marketplace. Certainly, there is a long term threat that satellite based technology could become more practical for mass long distance telephone use. However, there is little possibility in the near term that fiber optics will be displaced. This is especially true in America where major capital investments have been made in fiber optics. However, American railroads are now looking to the next market. Some railroad executives are giving some thought to using rights of way to site dishes for the next generation of satellite telephone communications.

Comparisons of US and Ukraine Railways and Their Contexts

The Railways

For more than one hundred years America has gone through a debate over whether private railroads are more of a "public utility" to be regulated by government or a truly private enterprise to be left to free market forces. For nearly 80 years, from the turn of the Century until 1980, American railroads were treated more as a "utility" and were strictly regulated by the Interstate Commerce Commission. The result was a failing industry -- with most railroads in the East and many in the Midwest in bankruptcy and reorganization. This regulatory atmosphere changed with the passage of the Staggers Act of 1980, which largely deregulated the American railroad industry and left it to the forces of the free market for such purposes as setting prices, making contracts, abandoning service, or entering new lines of business. Today, American freight railroads lead all American industry in productivity gains. Profits have risen, and the infrastructure is well maintained. Freight railroads are adding business, taking back market share from the highways, and have become increasingly profitable.

This is an important point for the UZ, because the government and the railroad are going through a similar debate. If decisions are made which favor free market approaches, as has happened throughout North America, then it will be easier to attract outside investors

to enterprises such as the telecommunications opportunity that is the subject of this project.

When comparing US railroads and the UZ, one must be very careful that the distinctions between the systems are fully comprehended. For example, all US railroads face substantial competition from other railroads, as well as barge operators on extensive internal waterways and, especially, interstate trucks operating over a comprehensive interstate highway system. Ukraine Railways are less burdened with competition. Thus, the freight information needs of US railroads are enormous as they try to compete in a highly charged market where "just in time" delivery of raw products and manufactured goods is increasingly critical. The internal railroad demand for fiber optics cable access is likely to be considerably greater in the US than the UZ demand at any time in the near future.

On the other hand, American freight railroads do not move passengers. Commuter trains and a very limited number of intercity Amtrak passenger trains pass over their tracks under contract. The needs of the UZ for an MIS and communications system that must integrate extensive freight operations with the movement of what approaches a billion passengers a year far eclipses similar requirements in America.

The Telecommunications Context

Commercial telecommunications requirements are also quite different in the US and Ukraine. The telephone is ubiquitous in the US, and personal computers with access to the Internet almost so. Indeed, since 1984 the number of switched access telephone minutes in the US has exploded from 40 billion to almost 111 billion.

By contrast, newly free Ukraine is suffering from years of unsatisfactory attention to telephone service by the old regime. There is a huge opportunity, if a coherent plan can be put together to accelerate access to personal and business telephone service. At last count there were more than 3.8 million requests for telephone service that had not been satisfied. The number may be much greater, since many citizens undoubtedly simply don't bother to apply. The demand is bound to grow. Ukraine in most other respects is an advanced economy with much high-tech industry, including manufacturing of satellites and other aerospace related products, and one of the world's highest literacy rates (98%). Currently, industry and services contribute almost 70% to GDP . Strong demand for a reliable means of transmitting business related data already exists. Once the capacity is provided to meet this demand, there will be an explosive growth in the communications sector. Indeed, Sprint already is providing electronic mail services in Kiev and Odessa. The American railroads are satisfying an existing need for telecommunications service in their marketplace, and the UZ may be in a position to fill a similar need as the Ukraine economy grows.

Until recently, Ukraine has had a de facto state monopoly in telecommunications. The issuance of the first mobile license introduced the potential for competition between

mobile and fixed services, and now a large number of mobile operators are rushing in to fill the gaps between the perceived market demand and the supply of voice telephony. Although the technological capabilities of mobile telecommunications have advanced, mobile technologies cannot, however, compete across the full spectrum of modern telecommunications possible via optical fiber transmission.

There are two developments that will ultimately bring a further strong dose of competition into the Ukrainian communications market. The first is global--a dramatic world wide agreement to bring maximum competition into the telecommunications marketplace. The second is local--the decision by TeleNor to invest in the KievStar license.

In 1996, the US Congress passed a new law to essentially bring total competition into the American communications market. On February 15, 1997, seventy countries which cover more than 95% of the world telecom revenue concluded an agreement to completely open market access and permit foreign ownership or control of telecommunications services and facilities. Each major American communications firms is now attempting to position itself to become the premier global telecom services provider. Sprint, for example, is developing a global partnership with two major telecommunications companies: Deutsche Telekom and France Telecom with the goal of "seamless" communications around the globe. No nation, including the Ukraine, will be able to resist the new international competitive drive.

The second important development is the recent TeleNor (Norwegian) decision to acquire the KievStar license. This creates the potential for a universal telephone system that will be in direct competition with the UTEL service. . Not only is this a challenge and opportunity for the railroad, but it is also a challenge and opportunity for every major telecommunications player in the world, if it wants to be in the Ukraine market.

As indicated, private property rights in the US are well defined and are applied to railroad rights of way for purposes commercial development. Following an era of communist and Russian domination, private property rights in the Ukraine are only now being defined. Much land remains in public ownership, and while change is rapid, private land does not have a high value when compared to the US. Thus, there is less scarcity attached to Ukraine Railways' right of way than to rail rights of way in the United States. Nonetheless, the basic comparison remains. Ukraine Railways possesses an unbroken right of way that can be exploited for telecommunications or other purposes.

The European Context

Finally, a major contrast in railroad organization may result if Ukraine decides that it will attempt to conform to the economic structure of the European Union. EU Directive 140 requires Member states to provide rail operators with access to track in order to encourage competition. Priority "corridors" or "freeways" are under design. This will entail significant separation between rights of way ownership and rail operations. It will

also entail an operating atmosphere significantly more complicated than that in the United States where shared rights of way occur only under limited circumstances and under very strict contractual conditions. If, in fact, this EU program is implemented, and if Ukraine determines to adopt it, there will be an expanded need for common MIS/rail communications systems among all the variety of rail carriers which might conceivably use the common track. These EU requirements should be factored into UZ thinking as new MIS and telecommunications systems are designed.

How Is the American Model Relevant to Ukraine?

The question must be asked: Is the American experience relevant to Ukraine, and, if so, how? Is there an opportunity to attract investment partners and create a new stream of revenue by selling communications off the rights of way as has been accomplished in the United States? As the Transmark and other studies have indicated, UZ faces growing railroad communications and information needs. As pointed out earlier in this paper, there is an enormous pent-up demand for telephones and telecommunications services outside the railway system. Whether these two needs can be brought together through private fiber optics investment in the UZ rights of way is the issue. This may be central to whether an investor can be attracted.

Direct development by a railroad of a telecommunications company. The US example would seem to indicate that the common ownership, management and development of a railroad and a telecommunications company are incompatible, or, at the least, very difficult, given the intense demand for capital and management skills by both enterprises. This may not be true in Ukraine, however, as the UZ appears to have one of the most comprehensive and competent nation-wide management systems of any sector of the economy. As such, its penetration of all geographical portions of the nation may make it a natural entity for a truly nation-wide telecommunications system. Although new management would clearly need to be attracted with the requisite telecommunications background, the UZ nation-wide management framework may be expandable.

The significant availability of market share in Ukraine may also provide the UZ with a readily available market for communications on an immediate basis, in contrast to the Southern Pacific's entry into the telecommunications market during the turbulent years in the US when the AT&T monopoly had barely begun to crack. Because there is a great pent-up demand for telephone service, there may be an instantaneous market which would result in early cash flow to meet financing costs. However, there is significant doubt that loan financing would be easily available to the UZ to undertake such an ambitious investment in its own right.

The Southern Pacific/Sprint example should inspire UZ managers to analyze their internal management and transportation needs with caution. Although there is no clear cause and effect relationship, it is true that the concentration on Sprint may have motivated top Southern Pacific management to relax their diligence in meeting the needs of the railroad

itself and may have been a significant factor in its failure to survive as a separate transportation company.

The American experience may teach that those who have spent a career as railroad executives should concentrate on railroading. Without exception, in the final analysis the corporate managers of Southern Pacific, Kansas City Southern and Norfolk Southern were railroad men. Ultimately, they opted to concentrate on the core business-- railroads. When the second Southern Pacific telecom venture, Qwest, succeeded, it is important to point out that it brought on board highly successful executives with long experience in telecommunications. Railroad management was largely separate from the telecommunications venture.

Joint venture structures. Although the US experience did not result in the establishment of joint venture companies between railroad and telecommunications, this does not invalidate the concept. In Ukraine, where government ownership of all infrastructure has been the rule for most of this century, there may be a reluctance on the part of the government entirely to abandon ownership of as important a part of the national infrastructure as telecommunications. However, it may well be that an interested investor would feel more comfortable in a partnership with a national railroad rather than directly with the government. Only direct discussions with possible investors which determine whether this possibility exists.

It is possible for a railroad company or a pipeline to create viable commercial communication companies that utilize their rights of way. However, the companies should be operated independently of the railroad.

Exit strategies. There is nothing wrong with an exit scenario. In fact, if UZ establishes Ukraine Transport Communications and finds a strategic investor, an exit scenario should be a part of the planning process from the beginning. This will give comfort to the investor that the railroad has an agenda to make money rather than to control the telecommunications operation. It could also prove a wonderful way for the UZ managers to make a transition into a private enterprise that could prove central to the economic and social restructuring of the Ukraine.

Determining the price of the right of way. American rail companies have set the price for their leases almost entirely through a private auction process; contrasting the offers of various telecommunications firms. Although US railroads have often found it advantageous to accommodate more than one telecommunications carrier on their rights of way, it is possible that the UZ would find that its value is enhanced if it can offer some degree of exclusivity. This can only be accomplished in close coordination with the State Committee on Communications.

Maintenance conflicts. It is important for the UZ pay close attention the failures of the US railroads and telecommunications companies to have good mutual understandings of maintenance problems at the outset of their contracts. The disputes

have occurred despite the fact that in the US the contract negotiations were conducted between equally sophisticated teams of lawyers, working within long understood contractual and legal guidelines. Given the fact that any negotiations between the UZ and any western telecommunications company will be conducted with a background of highly different cultural and legal understandings, special care must be taken to spell out at the outset all maintenance and repair responsibilities and procedures.

II. Railroads, Computers, and Management Information Systems

This section addresses the railroad experience in using computer technology and developing modern management information systems (MIS).

The UZ can take comfort from the American example that it is not essential that MIS and telecommunications decisions be reached simultaneously. It is important, however, that UZ consider the issue as it seeks a telecommunications partner. The consultants understand that UZ would like to upgrade and enlarge its internal telecommunications network. If that is the decision, then UZ should seek some joint arrangement with a strategic investor that will permit use of the fiber optics network partly for internal railway communications and partly to sell commercial capacity. An ultramodern telecommunications and MIS system is always attractive. It is a separate issue as to whether it is cost effective given other investment priorities by the railroad.

Legacy Systems and the Mainframe Computer

Railroads were the first large industry in America. Management information systems have necessarily been with the railroad industry from the beginning. The early systems, in the 1800s were patterned on the army, because that was the only large organization in the Nation. From the 1850's forward, telegraph wires provided the means of communication In recent years, however, the computer technology revolution has led to an MIS revolution--not always with happy results.

From the dawn of the computer era, railroads attempted to harness computers to process massive amounts of information. The early structure involved reliance on mainframe units, mostly IBM, which railroad employees used to provide "in house" information and support. As Merill Bryan, CEO of Union Pacific Technologies said: "a few years ago, data processing used to be fairly simple. You went and listened to IBM about what was coming out next, there were a few vendors that were cloning or copying, and if you needed to do more, it might be what size mainframe you would buy next. But now, the mainframe is just a node on a vast network, with all kinds of computing capabilities." Parenthetically, the whole Sprint system grew out of the SP's desire to construct a modern MIS and its decision to use an IBM mainframe to structure this system.

Unfortunately, in the early days, individual computer applications were generally designed to do only one specific job. A payroll application would be developed.

Separately, an application for keeping track of interline payments between railroads would emerge. Billing customers was often an additional system. Each application was independent of the other; nor were they designed to work with one another. In fact, the root data used as input into the separate application programs was often from different and, not compatible, sources.

The systems composed of these separate and incompatible applications were costly, each required investment in expensive equipment, and a separate workforce bureaucracy was hired to operate it. As new, less high-priced and more efficient computer technology came onto the market, it was not always economical to completely scrap the mainframe systems into which great capital had already been poured. Nor was it always possible to displace employees who had become highly skilled in early computer applications. Therefore, for various economic and employee relations reasons, these older systems were not be terminated. In many cases these older systems have survived and are in use today. These are called "legacy systems". This denotes that they are the legacy from a prior era in a railroad's computer development.

They represent a very large challenge for the railroads because they use an aging technology that is manpower intensive. In addition, most of these systems were developed from now archaic language such as Basic - Accumulator - Language (BAL) and COBAL. The "older generation" railroad personnel familiar with these unique languages, including coding, are aging, and many are dropping from the work force. Many who remain are resistant to retraining and are unable to operate the newer, more efficient systems. Thus, many American railroads have experienced information departments that are bifurcated between old and new systems, and old and new employees.

The elaborate bureaucracies required to support a mainframe computer led to the creation of large **Computer or Information Departments** which were charged with the management of information needs across the railroad organization. These departments placed into priority order all of the requests of the many operating, personnel, accounting, engineering, and marketing departments across the entire railroad using the system.

There has always been a need for great security in such areas as transportation pricing at a time when trucks and other railroads are happy to undercut a price in order to take business away. Thus, the computer managers were required to safe guard the source and integrity of data and provide security for confidential information. This resulted in the creation by computer managers of a "Chinese Wall" which separated which information goes to which other departments within the railroad. Thus, the Information Department assumed the role of "final judge" as to the needs of each of the other using departments. In large organizations, information is power. This control, often firmly exercised, by the Information Department frequently led to great frustration and unhappiness within every other department within the organization. Often staff in other departments felt they could not get the information they needed when they needed it. Further, the Information Department established a "pecking order" as to which department had the most important

needs. Within the railroad only the President, if he were lucky, had more information than the head of the Computer or Information Department.

Independent Processing Era

In the 1980s and early 1990s, the widespread availability, low cost, and easy access of personal computers entirely altered railroad information management. With the personal computer revolution the "Chinese Walls" and the absolute power of the Information Department crashed. Users within individual departments throughout the work place became aware that, at a low price, they could simply set up individual systems to satisfy their own needs. That is exactly what began to happen. At first, department users brought in their own personal computers (PC's) and designed software to meet their individual needs. Then, individuals began to network computers and linked mini, or even major, LAN or WAN systems within a department. The result was a new team cooperation within the functional areas of each department. Unit by unit, productivity rose and satisfaction grew.

However satisfactory for the many user groups, the result also raised the specter of long term information chaos for the railroad as a whole. The lack of any central and long term planning caused duplicate investment, and software was used that was not up to the next stage. Security fell by the wayside, and, in some cases, this was accompanied by a further deterioration of data integrity; often the programs were at cross purposes. For example, on many railroads the billing department and operating departments would use different physical station designations for billing systems and operating systems.

Thus, the early adaptation of computers in US railroads was a success in handling mass transactions, but, problems set in early. As a result of central mainframe systems yielding, but often operating on parallel courses with PC systems, the rail industry was presented with a real need for information consolidation and reform. The railroad industry had to move quickly to use information technology in more specific and mutually reinforcing ways.

Current Reintegration

It is only over the last five years that the major US railroads have addressed the management challenge brought about by the somewhat chaotic evolution described above. The effort has been enormous, and the "jury is still out" on the final result. The MIS undertaking has been made more complicated by corporate restructuring underway within the industry. Where there were twenty major rail companies in the US two decades ago, there will soon be only four giant rail corporations. In the same time period, nearly 300 new small "short line" railroads have been created from lines that have been abandoned or sold by the large companies. Most freight traffic is still interchanged between two or more carriers before it reaches its destination, but shippers expect to receive "seamless" rail service. There are international complexities as well; Canadian railroads are aggressive players in the United States rail market, and US carriers are

acquiring rail lines from the Mexican government. A true North American network is rapidly developing. MIS is a growing requirement.

As previously noted, the recent US effort has been especially hard because so much of the early mainframe investment cannot simply be scrapped. Companies have invested thousands of man-years in applications residing on these legacy systems. The investment required to reprogram these systems has little return in the near term. The legacy systems must serve as a foundation with their information integrated to prepare a new platform for the company to maximize future technological developments. As such, the large investment in integrating this information does not have sufficient short term returns on investment to protect it from being reduced though short term budget cutting.

However, when the integration phase is finally over, the product of mutual support, good source material, and user satisfaction well supports the investment. The most recent efforts have involved heavy reliance on mainframes with large campaigns to recode the old "legacy systems". Most of the recoding involves the modular coding techniques using C++ language or high level languages such as Visual Basic. This results in the ability to reprogram tasks without disturbing the major program and makes the information so generated usable in a Graphical User Interface (GUI) environment. The goal is to take advantage of a Graphical User Interface, making the application easier for the user without incurring the expense of rewriting the entire application. This provides the user with flexibility to meet his requirements while preserving the integrity of the information as well as the control of the Information Department through the continuing reliance of mainframe processing.

The experience of the US railroads has been that there needs to be a controlled centralized computer center to safe guard the integrity and security of the information sources. However, at the same time, there must be, as much as possible, an ability for the user in every department to manipulate data and use it for his or her specific needs. This computer department must also be entrusted with the responsibility for setting technological standards within which all other departments in the railroad must operate.

The current state of affairs for US railroads is that they have a very advanced computer environment that allows maximum asset management at the lowest cost. The most pressing challenge remains in managing freight car equipment that is owned by one railroad and is being used by another, "off line". Since this involves cooperative efforts with other carriers, it will take some time to resolve.

RESOURCES UTILIZED TO PRODUCE THIS PAPER

Interviews: John Casper, Director Routes and Contracts, MCI, Dallas; James Farrell, Director of Fiber Optics and Asset Utilization, Union Pacific, Omaha; Kathleen Franklin, U.S. Telephone Association; Dan Flanagan Jr., former Chief Washington Representative, Southern Pacific; Steve Ingish, Public Affairs Department, WorldCom, Omaha; Linda Loflin, Public Affairs Department, WorldCom, Tulsa; Louis S. Thompson, Railway Adviser, The World Bank; Joseph Walton, retired Chief Communications Officer, Norfolk Southern, Covington, Georgia; Henry Watts, retired Vice President, Marketing, Norfolk Southern; Richard Weyand, Weyand & Associates Telecommunications Consultant, Naperville, Illinois; Jules Eberhart, former Vice President, Chicago & North Western Railroad; Phil Brown, Vice President and General Counsel, Kansas City Southern Railroad; Bruce Flohr, President & CEO of RailTex, a corporation comprising more than 30 shortline railroads and a former Deputy Administrator of the Federal Railroad Administration

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APPENDIX B
FINAL REPORT TO UKRAINE RAILWAYS

UTC

UKRAINE TRANSPORT COMMUNICATIONS

Information Memorandum for Prospective Investors

DECEMBER, 1997

CLELL HARRAL INTERNATIONAL
CHAMBERS, CONLON & HARTWELL

IMPORTANT INFORMATION

This document is not a solicitation to purchase or an offer to sell securities. This document has been prepared solely for the purpose of giving an introduction to the fiber optic telecommunications options along the Ukrainian National Railways and assisting possibly interested persons in evaluating the Opportunity in connection with a potential investment in the Opportunity. The information contained in this Document is not to be used for any other purpose.

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EXECUTIVE SUMMARY: UKRAINE TRANSPORT COMMUNICATIONS (UTC)

The Ukrainian National Railways (Ukrzaliznytsia, or 'UZ') is considering establishment of a separate company, Ukraine Transport Communications (UTC), to fund and implement communications developments. It is UZ's current intent to seek a foreign strategic investor who is well experienced as an operator of commercial networks, either a public telecommunications operator (PTO) or a substantial private network services provider, possibly in conjunction with passive investor partners.

This document is intended to open a dialogue with international investors and assist in determining whether there is interest in becoming a business partner/investor with Ukrzaliznytsia in a project for the construction and commercial exploitation of a digital communications network connecting the major cities of Ukraine, including an optical fiber backbone along the railway right of way ('the Project'). In addition, UZ would value input from sophisticated telecommunications investors to further assess the opportunities and risks of the UTC concept. UZ seeks a practical discussion on alternative corporate structures, potential products, and partnership arrangements.

The essence of the investment opportunity presented herein can be summarized as the juxtaposition of three basic elements:

- a market of 51 million inhabitants, with excellent economic prospects for the long term, so far served by very limited telecommunications and no dominant services provider yet in place
- a contiguous right-of-way of 14,000 miles under a single administration, providing an unmatched platform for construction of the nation's first optical fiber backbone network
- an investment partner, Ukrzaliznytsia, of high professional competence and political gravitas, with proven effectiveness under the most difficult of circumstances.

This investment opportunity has not yet been forged into a specific company structure, and could be exploited in any of several alternative ways, depending on the particular interests and capabilities of the investment partners ultimately involved.

UZ has developed preliminary plans for the initial stages of development of the network. Total investments in this first phase, including a single-mode, 20-fiber (10-pair) optical fiber bone of 2135 miles, to operate initially at STM-4 standards, are estimated at US$ 43.9 million. An additional investment of $ 6.4 million is proposed for a paging system, bringing total investments proposed at this time to $ 50.3 million.

This document provides basic information on such issues as:

- the present Ukraine telecommunications market, principal participants, and Government policies re ownership and regulation
- the proposed scope, technical structure, and estimated costs of the Project
- the financial potential through commercial operation, lease, or sale of cable capacity in excess of the Railway's own communications needs
- the principal risks in terms of market, engineering, project implementation and other factors
- specific next steps to be taken by interested parties.

Prospective investors should note that, while developments in the Ukraine communications sector, like the economy more generally, have heretofore been stagnant, and political risks remain a major concern, recently the market dynamics appear to have shifted. The economy appears to have bottomed out and growth has resumed, even in the formal economy. Several recent events have signaled fundamental change for the communications sector: the abolition of the Ministry of Communications in favor of a new State Committee on Communications in July, the recent uptake by TeleNor(way) of the long-dormant KievStar license, and the decision of the Cabinet of Ministers on October 24 to commence the corporatization of Ukrtelecom in January, 1998, in preparation for its privatization before the turn of the century. These events will soon dictate an entirely different market situation. Any company interested to obtain a prime position in development of the Ukraine communications market for the 21st Century must consider action now, or risk being preempted. An alliance with Ukrzaliznytsia, and access to its unequaled right-of-way, could well prove the determining factor in the outcome of the competition for the primary market position.

UTC

UKRAINE TRANSPORT COMMUNICATIONS COMPANY

Information Memorandum for Prospective Investors

UTC

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1. Introduction

The objective of this document is to open a dialogue with international investors and assist in determining whether there is interest in becoming a business partner/investor with Ukrainian National Railways (Ukrzaliznytsia, or 'UZ') in a project for the construction and commercial exploitation of a digital communications network connecting the major cities of Ukraine, including an optical fiber backbone along the railway right of way ('the Project'). In addition, UZ would value input from sophisticated telecommunications investors to further assess the opportunities and risks of the UTC concept. UZ seeks a practical discussion on alternative corporate structures, potential products, and partnership arrangements.

The document provides basic information on such issues as:

- the present Ukraine telecommunications market, principal participants, and Government policies re ownership and regulation
- the proposed scope, technical structure, and estimated costs of the Project
- the financial potential through commercial operation, lease, or sale of cable capacity in excess of the Railway's own communications needs
- the principal risks in terms of market, engineering, project implementation and other factors which may impact the Project
- specific next steps to be taken by interested parties.

UZ—the world's fifth largest railway system in terms of traffic, with a network length of some 22,500 kilometers (14,000 miles) serving a nation of 51 million inhabitants—is increasingly burdened by an obsolete telecommunications system inherited from the past command and control economy. UZ currently employs some 9,400 staff to maintain and operate a nationwide analogue private network encompassing 168,000 user lines and some 4 million primary and secondary channel kilometers, primarily for internal railway communications purposes, but also including some 70,000 paying subscribers who could not otherwise be served by existing public networks. UZ is not, however, a commercial telecommunications operator, nor has its network until now been shaped by profit considerations.

The investment opportunity presented herein has not yet been forged into a specific company structure, and could be exploited in any of several alternative ways, depending on the particular interests and capabilities of the investment partners ultimately involved. UZ proposes to establish a separate company, Ukraine Transport Communications (UTC), to implement the Project, and is seeking a foreign strategic investor who is well experienced as an operator of commercial networks, either a public telecommunications operator (PTO) or a substantial private network services provider, possibly in conjunction with passive investor partners.

2. The Ukraine Telecommunications Market

The Ukraine Economy

Until recently the macro-economic picture has been grim. Ukraine, with 50.8 million population, is the second most populous state of the CIS. In the face of the general economic dislocations following dissolution of the USSR, and with strong parliamentary forces opposed to reform, Ukraine was slow to adapt. Its economy—skewed toward heavy industry and export to the former COMECON trading bloc—was particularly hard hit. Formally-reported GDP plummeted between 1989-1996 to hardly more than 40% of its previous level. In 1993 real GNP per capita, as measured in Purchasing Power Parity (PPP) terms, was approximately US$4,450, but subsequent declines took it by 1995 to levels ranging (according to various estimates) from $2900 to as low as 2400, putting it behind Russia (4480), Belarus (4220), and Kazakstan (3010). GNP continued to fall in 1996 and the first months of 1997, but at a slowing pace, with the majority of forecasts for 1997 in the range of only minus 2 to minus 3 percent for the year (as compared with estimated declines of 11.8% in 1995 and 10% in 1996). In interpreting these data it is important to bear in mind that, for the Ukraine as for the other CIS economies, the 'informal' (i.e. unreported) segment of the economy is thought to have buffered the fall in real incomes to a substantial degree. The informal economy is today variously estimated to amount to 50 to 100% of the formal economy, i.e. between a third and a half of the total Ukraine economy.

Most forecasters foresee the economy bottoming out by the end of 1997, resuming growth of +2 to 3 percent in 1998, and then accelerating to the range of 4 to 6 percent per annum in subsequent years. Indeed, while industrial production through July 1997 was down by 3.8 percent over the comparable 1996 period, the decline appears already to have been reversed, with positive growth recorded for the months of June and July. Price inflation, earlier a major problem, appears also to have been brought under control—falling from 376 percent in 1995, to 80 percent in 1996, and 17.8 percent per annum for the first half of 1997; future projections by various forecasters are in line with the most recent trends, with continuing improvement anticipated over the years ahead. Significantly, a new currency unit, the hryvna, was introduced in September 1996 and has since roughly held its value, trading in the range of 1.76-1.84 to the US dollar. Exports grew by 17.6% in 1996, and the portion paid in barter dropped from 31 to 20%; these favorable trends continued in the 1stQtr 97. The pace of reform also accelerated with the privatization of over 16,000 small-scale enterprises and more than 3,000 medium and large enterprises in 1996, bringing the total since 1992 to more than 48,000 privatizations.

Direct foreign investment rose sharply in the first 6 months of 1997 to $335.5 million, an increase of almost 75 percent over the same period of 1996 ($192.2 million).

While the worst of the macro-economic adjustments may now be behind it, the future course of the Ukraine economy depends greatly, in the short run, on continued prudence in fiscal and monetary management, and, over the longer term, on greater aggressiveness in tackling the reform of large state enterprises and generally continuing improvement of the business environment for the private sector, including simplification, clarification, and even-handed enforcement of licensing and taxation policies.

Status of the Telecommunications Sector

The public switched telecommunications network (PSTN) in Ukraine is not well developed. With 7.89 million telephone lines, the average penetration level is 15.5%. This is some 800,000 lines below the norm of 16.7% estimated by the European Bank for Reconstruction and Development (EBRD) from cross-country regressions based on 1993 PPP per capita incomes of $4450, and hardly more than one-third of the OECD average of 43%-- but far above the 9.7% estimated from the same relationship and the most recent formally-reported 1995 PPP income of $2400. The official number of applicants awaiting phones stood at 3.8 million in 1994, and is estimated to have changed little since. Interpretation of these data requires careful weighing of various factors which have countervailing effects. While the number on the waiting list would be inflated by the very low prevailing tariffs (see below), the number must be depressed, on the other hand, by the lengthy waiting period of several years, which discourages many potential applicants. While incomes have unquestionably dropped severely, underreporting of incomes nonetheless substantially overstates the magnitude of the fall in real incomes. None of these various effects is quantified, leaving a major element of uncertainty as to the exact magnitude of unsatisfied market demands at this time. Over the longer run, however, as the economy grows again, there can be little doubt that the demand for telephones will quickly outstrip the current limited and outmoded fixed systems.

Mobile telephony, still in its infancy, so far serves only some 35,000 analogue subscribers, and disputes over the terms of three recently granted GSM licenses briefly retarded development of digital mobile communications. A DCS1800 system, currently limited to the city of Kyiv and the corridor to its Borispol Airport, became operational in December 1996. Ukrainian Mobile Communications (UMC) announced on 20 August, 1997, that its GSM 900 system had become operational.

Data transmission and enhanced services have also recently become available. Public data transmission is now available via nationwide X.25 packet switched networks. Several banks in Ukraine are now connected through the SWIFT system for international inter-bank transfers. Access to e-mail and Internet services is today available from a number of competing firms, but problems with service quality have been reported in some cases. Paging services are also now available.

Networks inherited from the Soviet period were almost exclusively analogue technology, and switching was largely obsolete crossbar and step-by-step (Strowger) types. 150 international channels remain leased through the Moscow gateway switch. Subsequent network development has focused on modern digital international gateways, trunk exchanges, and long distance transmission, initially by micro-wave relay, increasingly by satellites for international telephony, and now also by optical fiber networks. At the local level, networks remain primarily analogue with the exception of private networks.

Intelsat satellites carry some 500 channels to Asia and the USA through an earth station in Zologchiv near Lviv. 120 channels link Ukraine though an international gateway in Kyiv and

Eutelsat satellites to Western Europe. Plans exist to expand transmission capacity for both these satellite corridors. Satellite based data communications networks involve VSAT stations and provide service mainly to government organizations, commercial entities, and banks. Currently, capacity on Russian telecommunications satellites is being leased for traffic within Ukraine, and Eutelsat satellites carry data traffic to other parts of the world. Ukraine has developed its own VSAT terminal manufacturing industry.

Recent completions, and planned extensions, of optical fiber cable links in the public network will increasingly compete with satellite up-take for international services and microwave for domestic backbone transmissions. A westward link via Kyiv-Lviv-Chop to Poland and Germany is now in place, though not yet in operation, as is a link to Southern Europe from Kyiv via Odessa and the Italy-Turkey-Ukraine-Russia (ITUR) international submarine cable under the Black Sea. An OF cable to the north from Kyiv to Gomel linking Belarus is also now in place.

Industry Structure, Regulatory Policy, and Competition

In contrast to the monolithic railways sector, where UZ is the only public services provider, telecommunications has several participants and a complex industry structure in continuing flux. This is not the result of a systematic policy design, but rather the consequence of modifying the structure inherited from the Soviet Union by a series of ad hoc moves, apparently intended initially to bring in foreign expertise and investment as quickly as possible—a strategy which met, at best, mixed success. In addition to the public switched networks, there is a multiplicity of private (i.e. own-account or departmental) networks, serving single entities (such as Government ministries or large state owned enterprises, including Ukrzaliznytsia itself in a prominent position), either with interconnection to the PSTN or for closed user groups without interconnection. The extent of such 'own-account' provision of telecommunications may be viewed in some respects as a barometer of the inadequacy of the public switched networks.

Since 1994, when Parliament determined that telecommunications licenses could not be exclusive, Government has ostensibly supported a pro-competition policy. Over 150 operating licenses were granted, but many of these have not gotten beyond the licensing stage, and others are for private networks or closed user groups. Today, the principal operators for public switched networks remain few and competition so far virtually non-existent. In reality, it would appear that the Government until now has been comfortable with a policy of limited competition for fixed networks. However, in a move toward the opposite extreme, for mobile telephony no fewer than 6 licensees will soon be competing with 4 different technologies, as discussed below. This can be expected to create severe competition within the mobile sector—with prices undoubtedly falling sharply until some companies are squeezed out—and coincidentally introduce significant competition between fixed services and mobile services.

Thus, it can be observed that no coherent, transparent, and stable licensing policy has yet been established, and uncertainty over licensing rights and obligations remains one of the two major regulatory impediments to investment in the sector. The other regulatory barrier is tariff controls, which are discussed subsequently.

The state regulatory authority was until recently exercised by the Ministry of Communications (MOC). On 25 July, 1997, MOC was abolished by Presidential Decree No.708/97, and superseded by a new State Committee of Ukraine for Communication (SCC). The most recent Minster of Communications, Mr D A Khudoliy, was retained as SCC Chairman. The precise structure, functions, and scope of SCC are not entirely clear and are to be further defined by the Cabinet of Ministers.

Restructuring Plans Announced October 24, 1997— Proposed New Legislation and Prospects for Privatization of Ukrtelecom

On October 24, 1997, the Cabinet of Ministers instructed the State Communications Committee to draft a new law on 'Particulars of Privatization in the Communications Sector', with reference particularly to Ukrtelecom, currently an 'association' of local and regional Public Telecoms Operators (described in more detail below). The State Committee is also reportedly drafting another law to replace the current Law on Communications. The new Prime Minister, Valeriy Pustovoitenko, appears to be pushing the initiative and has publicly stated that privatization of Ukraine's telecommunications enterprises will commence from January, 1998.

Press releases indicate that a two-stage program is planned. The first stage, to be accomplished by the end of 1998, envisages restructuring Ukrtelecom as one large Joint Stock Company (JSC) somehow incorporating all 35 state owned enterprises (mostly local telecom network operators, but also including Ukrtec, the long distance infrastructure provider) presently comprising the Ukrtelecom 'association'. The exact nature of the relationship of the 35 entities to the new Ukrtelecom JSC, if it has been determined, is not yet public—various press releases suggest that Ukrtelecom itself may take the form of a holding company, or something akin thereto, with 35 'affiliates', while other reports envisage a highly centralized, vertically integrated structure.

In the second stage, Ukrtelecom would be privatized by the end of 1999, through an as yet undefined process. Further details of the plan have not yet been released, and it is too early to judge whether this major new initiative will succeed in privatizing the sector.

Foreign investors may view these developments as the latest twist of many in the continuing evolution of the Ukraine telecommunications sector, and associated body of law, since independence was regained in 1991.

The Existing Infrastructure and Service Providers— Status prior to October 24, 1997 Cabinet Decision

Table 1 provides a summary overview of the various companies involved in the different segments of the public telecommunications market at the present time, prior to implementation of the industry restructuring plans announced by the Cabinet of Ministers on October 24, 1997 .

Local access: basic telephony (i.e., fixed public switched voice services) is provided by the 26 *Regional Enterprises for Communications* (*RECs*), which operate the local network in

Table 1. Ukraine Telecommunications Enterprises by Function

Infrastructure Providers

Local	National	International	Mobile	Paging	Data
		EXISTING			
Oblast REC	Ukrtec (long dist lines)	Ukrtec (long dist lines)	UMC (NMT-450)	Link (paging)	Infocom (PKSN)
UZ (limitd 3rd party net)	CBRT (micro-wave & satellite)	CBRT (micro-wave & satellite)			Ukrtelecom (telex)
	UTEL (trunk exchanges)	UTEL (gateway switch)			
UZ (own acct)	**UZ (own acct)**		**UZ (own acct)**		**UZ (own acct)**
		PROPOSED			
	KievStar	KievStar	UMC (GSM)	**UZ JV? (paging)**	
	UZ JV (OFN)		URS (GSM)		
			KievStar (GSM)		

Service Providers

Local	National	International	Mobile	Paging	Data
		EXISTING			
Oblast REC	UTEL	UTEL	UMC (NMT-450)	Link (paging)	Infocom
UZ (limitd 3rd party net)	Oblast REC	CBRT (broadcasting)			Ukrtelecom (telex)
					Ukrpak
UZ (own acct)	**UZ (own acct)**		**UZ (own acct)**		**UZ (own acct)**
		PROPOSED			
Ukrtelecom?	KievStar	KievStar	UMC (GSM)	**UZ JV? (paging)**	**UZ JV? (X.25)**
UZ JV? (expand 3rd party)	Ukrtelecom?	Ukrtelecom?	URS (GSM)		
	UZ JV? (OFN)		KievStar (GSM)		

NOTES
UZ (own acct): facilities and services for railway's own use
UZ JV? : facilities or services which may be incorporated in Joint Venture for resale to 3rd parties

each of the 26 oblasts (counties). Licenses are apparently freely available for local networks, and a number of new licenses for local networks has been issued to private parties. Many of these enterprises were established with the support of the local REC and intended primarily as a vehicle to circumvent regulatory restraints on tariffs, which have depressed the revenues of RECs below market returns and hence prevented generation of funds to support local network development. In concept, the new companies are permitted to charge fees for connection and enhanced services beyond basic telephony sufficient to fund network development. But the basic picture is so far largely unchanged: local fixed public access services remain a de facto monopoly of the local REC, regulatory controls hold tariffs at artificially low levels, and long queues of applicants continue to await service.

In addition, Ukrzaliznytsia itself provides local services to nearly 70,000 paying subscribers (55,400 individuals and 14,200 businesses) , i.e. 3rd parties in areas where public telephone services are not otherwise available, in addition to some 98,000 non-paying lines (73,000 for UZ internal operating and management needs and 25,000 for railway employee housing). In January 1995 UZ estimated the demand for additional paying connections to its network at some 143,650 lines, plus an additional 145,500 lines for internal UZ use.

Long distance and international services: At the national level, public infrastructure has partly been debundled from services. Since 1992 the main international operator has been *Utel* (a joint venture of 13 of the RECs (51%), AT&T and DeutscheTelekom (each with 19.5%) and KPN Netherlands (10%)), which in August 1997 was reported to be handling 100% of international services and 39% of domestic long distance. The remainder of services are provided by the RECs/Ukrtelecom. Utel provides the international gateway switch and trunk exchanges, but is not permitted to own transmission lines, which must be leased from the two state-owned long distance public infrastructure providers: Ukrtec (which was originally established to provide long distance cable networks, but has recently been extending also to microwave systems) and CBRT (originally established to provide microwave systems, now increasingly reoriented to focus on the broadcasting industry, including satellite access). Originally, Utel was granted an exclusive license for international switched services and domestic long distance not otherwise provided by the RECs, but the exclusivity was nullified by the Verkhovna Rada (parliament) in 1994. In addition to these public networks, Ukrzaliznytsia and other major state enterprises and ministries possess private long distance networks for their own account, mostly based on earlier analogue technologies. So far these have not been made available for 3rd party usage.

Ukrtelecom: In 1993 the Government established Ukrtelecom as a national coordinating and supervising association for Public Telecoms Operators (PTOs), partly in an effort to divest MOC's operational duties from its regulatory duties. It was apparently the Government's intention at that time, and may still be, that Ukrtelecom in the future become rather like a national PTO, re-bundling Ukrtec and the RECs, perhaps in the structure of a holding company. Originally a rather loose association, the relationships have become increasingly formalized over time, embracing all 26 RECs. It has since absorbed the Kyiv city network and trunk exchange, the planning institute Gyprosviaz, and, significantly, Ukrtec (with the exception that Ukrtec

retains certain financial autonomies, primarily related to servicing of its international debt obligations). However, by August, 1997, as indicated above, the Government was considering other possibilities, including re-separation of Ukrtec from Ukrtelecom, and merger of the former with CBRT, potentially as preparation for privatization of long-distance infrastructure.

KievStar: In 1995 a new license for national long distance and international services was awarded to KievStar, a nascent joint venture originally owned by various Ukrainian parties, including the parent group of a Kyiv newspaper, the Ministries of Railways, Electricity, Petroleum, Gas, and Oil Refining, and by Tiller International (reportedly an agent for British Telecoms) and Impex Group (a Luxembourg registered company, apparently the arrangers of the license). As with other joint venture licenses, the KievStar license was awarded without public consultation, and the details of the license are regarded as commercially confidential, although they are reputed to be comparable to those of Utel. It appears originally to have been partly an attempt to bring into public use existing private communications infrastructure and those assets of public utilities which are suitable for telecommunications applications. In light of its failure to attract a strategic investor partner after two years, KievStar appeared until recently to be stillborn.

In March 1997, in a move which surprised a market anticipating only two GSM 900 licenses, KievStar was awarded a third GSM license. Moreover, the Government announced that it would not allocate any radio frequencies for another five months in order to give KievStar an opportunity to catch up with the other two licensees, who had received licenses in 1992 and 1993, respectively. Award of the third GSM license and delay to the other licensees' network development constitute a strong (and costly) commitment to resuscitate KievStar, but it now appears as if the tactics will succeed. TeleNor, the Norwegian PTO, has reportedly taken up the KievStar license, for fixed networks as well as mobile, and is expected as strategic investor to breathe new life into the company. If this is realized, as now seems likely, a strong new element of competition could be introduced into the market for fixed communications.

Mobile telephony: The main existing mobile network, with an established client base of 35,000 subscribers, is an analogue NMT-450 system owned and operated by *Ukrainian Mobile Communications (UMC)*, a joint venture held 51% by Ukrtelecom, with the remainder divided equally between KPN (Netherlands PTT), TeleDanmark, and DBP Telekom (Germany). UMC also holds one of the three GSM 900 licenses, and as noted above, has just put its network into operation, the first of the three licensees to do so.

In light of the KievStar license award, and also in the face of disputes over license fees, Motorola chose to pull out of the third GSM joint venture *Ukrainian Radio System (URS)*, which actually had been the first established (in 1992). Subsequently, Daewoo has replaced Motorola in URS.

Another licensee for mobile telephony is *Golden Telecom*, a joint venture of Global TeleSystems of the USA and Bankomsvyaz of Ukraine, which began operation of a DCS 1800 network for Kyiv city and its airport in December 1996. (DCS 1800 is a GSM derivative, operating at the 1800 MHz frequency.)

The latest American technology, Qualcom's CDMA, is to be introduced in Kyiv in October 1997 by *TeleSystems of Ukraine*, a joint venture of Qualcom and Rhutaform. Originally envisaged as a fixed wireless system, a mobile network is now being implemented under a nationwide license.

Data services: Nationwide packet switched network data transmission is provided by *Infocom*, which retails an X.25 packet switched data service over its Ukrpack network using a line leased from Ukrtec. Infocom is a joint venture involving a local equipment manufacturer, Kievelectrosyvaz, and a German-owned company, Controlwave. Ukrzaliznytsia has not yet obtained a license to offer third party subscriber services based on the railway's own newly acquired X.25 capabilities.

Other players in the Ukraine telecommunications markets include:

- *Kancom*: a joint venture between Kyiv Metropolitan and Andrew Corporation which acquired the rights to lay optical fiber cable in the metro systems of Kyiv and Kharkov to offer digital leased lines and packet switched data services to commercial users in Kyiv. The venture actually constructed an SDH ring around Kyiv, but regulatory disputes caused it to lose its interconnection with the local PSTN, and the network is not currently in use.

- *RadioCom*: a privately owned company, the largest operator of radio paging services, with a subscriber base of some 14,000 in Kyiv, Donetsk, and Lugansk. (Several other, much smaller paging operators exist in various cities across Ukraine.)

- *Electronic mail*: In addition to *Infocom*, which offers e-mail over Ukrpack, Sprint has established e-mail access in Kyiv, Odessa, and Lugansk, and at least five other retail vendors of Internet access are now operating.

Tariffs and Revenues

Telecommunication tariffs and revenues present a very mixed picture in Ukraine, depending on which segment of the market is being considered. Current tariffs are depicted for mobile services in Table 2a, and for fixed public switched basic telephony in Table 2b, while revenues are shown in Table 3. Latest available data (1994) on call volumes (minutes usage) for basic telephony are given in Table 4. Corresponding usage and revenue data are not available for mobile telephony or other services.

On the positive side, international and domestic long distance tariffs have been set by agreement with Utel at world levels, while rates for interconnection to the local networks have been negotiated on terms also favorable to Utel. These two factors contribute greatly to making Utel a profitable undertaking, which generates the revenue streams necessary to sustain further investment.

Of similar positive note, tariffs for enhanced services (mobile telecommunications, paging, data transmission, Internet, email, and other value added services) are subject to a regulatory regime which seeks to encourage investment, while private telephone networks and closed user groups without interconnection to the public switched networks are unregulated, free to market determination.

Table 2a. Tariffs for Mobile Telephony (June 1997) (US Dollars)

	Golden Telecom DCS1800			UMC NMT-450			
	City Line	Silver Line	Gold Line	Economy	Standard	Business	WLL
Connection Fee	300	580	880	200	200	200	200
Advance Payment	200	250	250	250	250	250	250
Monthly Rental	30	50	200	20-30	25-35	80	15-25
Per Call Minute (peak)	0.55	0.50	0.40	0.50	0.40	0.30	0.40
(off-peak)	0.30	0.35	0.30	0.25	0.21	0.17	0.11

Table 2b. Tariffs for Basic Telephony (21 July 1997)

(US Dollars)

Call Tariffs (per minute)	
International long distance (non-CIS)	$1.90 - 3.80
Inter-regional	$0.08
Intra-regional	$0.04
Street phones (local)	$0.03
Monthly Rental	$1.32-1.89/residential - $9.19/business
Connection Charges	$135-162/residential line - $703-843/business line

Table 3. Revenues

	1995 (actual)	1996 (est 1)	1996 (est 2)
Customer Type	(US $ million)		
Business	104.97	118.13	
Residential	90.66	102.81	
State Business Organization	30.21	33.99	
Total	225.84	254.93	708.40
Ave. revenue per line	$28.59	30.71	85.34

UTEL	1995 (actual)	1996 (actual)	1st 7 mos 97
Revenues	72.10	262.6	
Net Profits	15.05	27.4	24.7
(FX rate:Hryvna / US$)	1.76	1.82	

Table 4. Call Volume (1994)

Call type	Minutes (million)	percent
Local	11,576.40	79.6
Intra-oblast	1,106.40	7.6
Inter-oblast	1,293.60	8.9
CIS	498.00	3.4
International	68.40	0.5
Total	14,542.80	100.0

At the opposite extreme is access to basic fixed public switched telephony ('plain old telephone services', or POTS), for which severe regulatory restraints are in force. In 1995, average annual domestic revenues were only US$ 29 per line overall, with residential lines yielding merely $ 17, while business lines yielded $ 77. There is a wide range of reported earnings for 1996 from various sources, ranging between $ 30.71 and $ 85.33 per line, or a factor of 2.7, which may be attributable partly to exchange conversion difficulties in a period of hyperinflation. Recent (21 July, 1997) tariff increases can be expected to boost revenues from monthly rentals by 15 % and from usage charges by 17 %, while lowering international rates for various regions of the world from 7% to 30% for existing subscribers.

It is evident that tariffs for line access—even if one accepts the higher estimate of $85 per line—have been suppressed far below world levels, or the levels needed to remunerate investment in extension of the networks or even modernization of existing systems. One-time connection fees—in the range of $ 135-162 for residential lines and $ 703-843 for business lines—only partially close the gap.

In the past, regulation of telephone tariffs was exercised at the first level by MOC, and, in the case of installation charges for connection to the local networks, by the oblasts, but the ultimate control was and still is the Cabinet of Ministers. It is not yet clear what tariff powers will be vested in the new SCC. MOC, whose stated priority was to stimulate investment to develop the national network, recognized the necessity to raise tariffs for local access (installation, rental, and usage), but its freedom of action was greatly constrained, as was also that of the local RECs, which have borne the main burden of tariff restrictions. Basic telephone tariffs have typically been raised along with other utility prices as part of a general government policy on public services, which is coordinated by the Ministry of Economy and approved by the Cabinet of Ministers. As a consequence, monthly access charges are extremely low, and local networks can attract no investment. The International Monetary Fund (IMF) is reportedly pressing the issue of inadequate utility prices and the necessity to raise them to full cost levels, and significant progress has already been made in other sectors, e.g. energy and housing.

3. UTC: Potential Market Role and Strategy

The investment opportunity presented herein has not yet been shaped into a specific company formation, and could be exploited in any of several alternative ways, depending on the particular interests and strategy of the investment partners ultimately involved.

The essence of the investment opportunity consists of the juxtaposition of three basic elements:

- a market of 51 million, with accelerating foreign investment and excellent long-term economic prospects, so far served by very limited telecommunications services and no dominant services provider yet in place
- a contiguous right-of-way of 14,000 miles under a single administration, providing an unmatched platform for the construction of the country's first digital backbone network
- in Ukrzaliznytsia an investment partner of high professional competence, proven effectiveness in the most difficult of circumstances, and the political weight to make its voice heard at the highest levels

As noted above, Ukrzaliznytsia is already an established operator of a major nationwide telecommunications system encompassing some 168,000 lines, including 70,000 paying subscribers not otherwise served by public networks. It is not, however, a commercial telecoms operator, nor would UZ management wish to divert attention from its primary task of operating one of the world's largest railways.

UZ seeks instead to establish a separate company, Ukraine Transport Communications (UTC), involving a foreign strategic investor partner which is well proven as an operator of commercial networks, either a public telecommunications operator (PTO) or a substantial private network services provider, possibly in conjunction with passive investor partners.

Identification of Alternative Strategies

Market focus: From virtually a continuous spectrum of options corresponding to a narrower or wider group of services to be offered at earlier or later stages of the production chain, three prototypical strategies—each depicting a particular market focus for UTC—were identified for consideration:

> Strategy 1: 'railway own-account services provider + wholesale provider of infrastructure capacity': the communications undertaking would provide for the railways' internal communications (say, transmission from trunk through local switches), plus the existing UZ paying subscribers, and in addition serve as a wholesale provider of digital network transmission capacity (probably without switching services) to other service providers for resale;
>
> Strategy 2: 'mixed wholesaler cum selective retailer': the same strategy as own-account + wholesaler defined above, plus provision of switching services and customer premises

connections for selected private networks (e.g. banks for ATM networks, large enterprises with multiple locations), possibly also retail paging services; and

Strategy 3: 'full retailer': provision of the railway's own-account services plus entry into the market as a public telecommunications operator, providing a range of telephony, data transmission, and paging services to any who wish to subscribe.

Structure of the business: Any market strategy could be implemented through a variety of corporate and/or contractual structures. Among the most obvious choices are: (i) an arms length lease contract with an entirely separate telecoms company simply leasing right of way from the railway (as most commonly done in the United States)—in this case, if the lessee is already an established company entitled to do business in Ukraine, no new entity (or 'legal person') need be created, as a contract drawn between two existing entities could suffice; (ii) a new joint venture between UZ and a partner, presumably a proven telecoms services provider, could be established to pursue the business; or (iii) a long-term Build-Operate-Transfer (BOT) concession could be awarded to either a separate company or joint venture with UZ.

Assessing the Options

Market Strategies: Strategy 1 suffers from the risk that UZ could find itself in a poor bargaining position to obtain remunerative contracts for wholesale leasing, given the limited number of potential buyers (i.e. communications retailers)-- although the advent of KievStar as a potentially serious competitor to Ukrtelecom/Utel should improve prospects. Such a strategy also provokes questioning as to whether the most profitable segments of the business would be passed on to the retail vendors.

At the opposite, and most ambitious, end of the spectrum is Strategy 3, i.e. establishment of a full retail services provider. There are important precedents, e.g. Sprint and Qwest, which each happened to originate as a department of the Southern Pacific railway (although under different owners, more than a decade apart). Each subsequently became a subsidiary company, and ultimately emerged an entirely separate communications company, far larger than the railway which gave it birth.

Pursuing such a strategy in Ukraine would require a large and sustained commitment of financial resources, far beyond the $46.3 million identified for the first stages of the optical fiber digital backbone. It would also require initially a heavy injection of managers well proven in communications services in emerging markets, as current UZ telecoms staff have no experience in operating a profit-maximizing communications service company in a competitive market context. It is a strategy which would likely appeal only to an international service provider with a long-term corporate strategy to build global networks encompassing Eastern Europe—and it is a strategy which would be unachievable in the short run in the absence of such a strategic investor partner.

Strategy 2 represents the middle ground, and, as it appears at this stage, the most plausible of the alternatives identified. By assuming a limited retail function focused on the most profitable

segments of the market and requiring relatively limited marginal investments, profits could be maximized and commercial and financial risks also minimized. Given the nature of the clientele—mainly well established large companies (banks and multinationals)—and their potential heavy usage of the proposed services, significant upfront commitments, perhaps even firm offtake contracts, might be achievable, provided UTC offered sufficient credibility as a reliable supplier.

In this respect it must be noted that UZ expects UTC to command the traffic of all the state transport enterprises, including air, water, and road, as well as rail. This will ensure a heavy base traffic load, but care must be taken to ensure payment discipline of state enterprises, which has been deficient in the past.

Business structures: In considering the form of the business, the nature and current position of Ukraine Railways itself must be taken into account. While UZ is already an established operator of a major nationwide telecommunications system (encompassing some 168,000 lines, including 70,000 paying subscribers not otherwise served by public networks), it is not a commercial telecoms operator— nor would UZ management wish to divert attention or resources from its primary task of operating one of the world's largest railways. Thus, whatever the business form selected, it should provide for an enterprise other than UZ to accept the obligation to design, finance, construct, market, and operate the new communication networks (with remuneration to UZ including, but not limited to, in kind communication services).

Any of the different business forms identified above could be workable for Strategies 1 and 2, but for Strategy 3 (full retailer or public telecoms operator), at the present time a BOT concession may constitute the only feasible solution, given restrictions in current Ukraine law against private or foreign ownership of communications infrastructure in public use (as distinct from private networks serving closed user groups, e.g. Strategies 1 and 2, which may be owned by private investors, including foreign parties). Such a BOT structure might or might not include UZ ownership participation, depending on the bargain ultimately struck with private investors.

A preliminary project plan for the initial stages of development of the digital backbone network is presented in the following chapter. However, alternative plans may be presented by potential investors for consideration by Ukrzaliznytsia.

4. The Project

Proposed Scope, Structure, and Costs

In 1994-96 UZ invested some US$21 million to modernize its communications system, including an X.25 packet switched network (PKSN) now operating nationwide over pre-existing lines.

UZ currently envisages new investments of $43.9 million to construct a 3436-km (2135-mile) optical fiber network (OFN) connecting major cities with Synchronous Digital Hierarchy (SDH) transmission technology; $ 6.4 million for a paging system; and large further investments to replace existing open air lines along rail segments being electrified. Ultimately, investments in a

comprehensive modernization of its telecommunications system—including a 6400-km, ring-topology OFN and renewal of 41 trunk exchanges with 102,700 ports—are estimated to total $149.9 million, including the presently proposed investments of $43.9 million.

Given the strong economies of scale in optical fiber networks, relatively minor extra investments in the proposed OFN will furnish several times the capacity needed to serve UZ's own needs. The proposed design would provide total UZ communication needs (including capacity requirements for new MIS systems) with only 20-40% of total system capacities, while providing 60-80% of system capacity for other users. A single mode, 20-fiber (10-pair) optical fiber cable is planned for the transmission network, operating initially with 622 Mbps (STM-4) for the main optical links and 155 Mbps (STM-1) for the spur routes. Analogue-digital conversion costs are to be minimized by concentrating interworking at the transit exchanges in the trunk network. If demands subsequently warrant, capacity could be upgraded within the selected SDH framework to 2.48 Gbps (STM-16).

The proposed first stage of development of the OFN incorporates two components, intended to maximize revenues from the earliest stage: (i) a major east-west corridor of some 933 kms, with one segment linking Lviv with west European networks at Chop on the Polish border, and another linking Kyiv to Russia via Dnipropetrovsk, Donetsk, and Lugansk; and (ii) a major north-south spine of 660 kms linking Kharkiv via Zaporizhya to Simferopol in the Crimea. The subsequent stage would extend the network 1493 kms: (i) from Kyiv via Poltava to Kharkiv in the northeast; (ii) from Kharkiv southeast to Donetsk; and (iii) provide a duplicate linkage between Lviv and Kyiv. Subsequent stages, not considered in the present investment proposal, would involve additional linkages to form a comprehensive ring network topology. A network map is given at the end of the report, and the estimated costs of the respective elements of stages 1 and 2, including switching and transmission equipment, are given in Table 5.

Financial Potentials & Taxation

Revenues, debt service, and return on equity. Current revenues for the major players in Ukraine's telecommunications markets today are given above in Table 4. Obviously, profitable investment cannot be made in local public fixed networks under the present regulated tariff ceilings (Table 2); the present opportunity for profitable investment lies elsewhere in the sector, in keeping with Strategies 1), 2), or 3). Any investment play in local public networks will be entirely dependent on either major tariff reform or a bypass to exempt new entrants from the present tariff ceilings, e.g. by permitting market-based installation fees.

Various financial scenarios can be hypothesized, depending, inter alia, on macro-economic developments, the strategy pursued, the share of the market captured, etc. For example, consider total capital expenditures of $50 million, a 50/50 equity/debt structure, with debt priced at 14 % per annum (~LIBOR + 7OO BP) with 7 year term, 2 years grace on principal. Under this scenario, in order to pay back the investment and debt over 7 years, while earning 30 % p.a. average return on equity, annual operating profits (after taxes, before debt service, in constant prices) of some $20 million will be required over years 3 through 7. Such an amount would represent just under 20% of the 1996 profits of Utel alone, or less than 8% of the total revenues

Table 5. Project Costs: Stages 1 and 2		
I. Optical Fiber Network (OFN)		
Segment	Length (kilometers)	Cost US$ (million)
Stage 1		
Chop-Lviv	273	4.0
Kiev-Dnipropetrovsk-Donetsk-Lugansk	1,010	11.4
Kharkiv-Zaporizhya-Simferopol	660	8.7
Sub-total	1,943	24.1
Stage 2		
Kiev-Poltava-Kharkiv	520	6.9
Kharkiv-Donetsk	345	4.6
Kiev-Lviv	628	8.3
Sub-total	1,493	19.8
TOTAL OFN Stages 1 & 2	**3,436**	**43.9**
II. Paging system	-	**6.4**
GRAND TOTAL		**50.3**

for Ukraine fixed public switched basic telephony, excluding mobile, paging, data transmission, and other enhanced services.

The nature of the investments involved—primarily optical fiber networks—can be expected to have a far longer economic life, and average return on equity over the actual market life of the investment would be expected to be far in excess of 30% per annum.

Company Formation

UZ proposes to establish a separate company, UTC, to implement the Project and is seeking a foreign strategic investor who is well experienced as an operator of commercial communications networks. Given restrictions on foreign ownership in the sector, the likely structure will be a Joint Venture with no more than 49% shareholdings by foreign parties. Within those parameters, prospective investor partners are invited to offer suggestions on company structure.

Company License

Obtaining a license as a public communications operator has proved a problematic and costly issue for other entrants into the sector. GSM licensees are reportedly expected to pay US $34 million for each license.

UZ is already an established operator of a dual-purpose communications network, and the prominent and respected position of Ukrzaliznytsia in the Ukraine economy can be expected to facilitate the licensing process. Additional license authorities are expected to be required, and substantial license fees may be required, depending on the strategic focus chosen by the company.

5. The Legal and Tax Environment

Communications Law

Reform of the legal system in the transition from a socialist to a market economy is a massive undertaking, and it should not be surprising that the Ukraine legal system continues in a state of flux. The decision of the Cabinet of Ministers of 24 October, 1997, foreshadows further important legal developments which, if ratified by the Verkhovna Rada and pursued by future governments, could fundamentally alter the structure of the telecommunications sector in favor of private ownership. The presumable impact on the UTC proposal would be to expand the scope for private ownership and widen the array of available business forms. As even draft legislation has not yet been tabled, little more can be said at this point. The following discussion focuses on the legal context as it prevails today (December 1997).

The current legal foundation for organization, development, and regulation of the sector is provided by the Communications Law, No. 161/95, adopted May 16, 1995, as amended by Law No. 626/96 of 20 December, 1996 ("the Law").[1] It should be noted that the Law does not cover 'administrative [or departmental] communications networks', i.e. private or own-account networks, except for matters relating to their interaction with public networks (Article 4).

The Law entrusted the regulatory functions of the state (except radio frequency matters) to "The Administration of Communication of Ukraine...a central state administration body... subordinate to the Cabinet of Ministers..." and then delegated those regulatory functions to the Ministry of Communications (MOC)—a delegation since revoked by Presidential Decree No. 708/97. The Administration of Communication is empowered as the Regulator of the sector, but restrained from interfering in the 'economic activity' of the communications operators, which are to be 'managed by the owners thereof' (Article 5). The Regulator has the responsibility and powers to establish the rights and obligations of license holders—including developmental obligations, terms and conditions for interconnection among public networks, and quality of service standards—and to issue licenses pursuant thereto (Articles 24, 21). It is also empowered to limit the number of licenses available, but not thereby to create a monopoly (Articles 24, 15).

Ultimate authority for the procedure to establish tariff ceilings is explicitly reserved to the Cabinet of Ministers (Article 21), and the tariff ceilings thereby established are obligatory for all communications carriers covered by the law, which includes any carrier engaged in public service, but not 'administrative' (i.e. own-account or private) networks.

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[1] A copy of the law as amended (uncertified English translation) is available on request.

The Law requires that primary communications networks for public use, apart from local networks, be owned by the state, and further prohibits ownership of communications enterprises with more than 49 percent foreign ownership (Articles 11, 19). It also provides for 'dual purpose' networks, i.e. networks operated both for own-account and to provide services under license to all users of communications (Article 14). Communications enterprises have the right to issue and sell securities for the development of communications networks (Article 7).

A very long-term concession arrangement for UTC has been suggested by Ukrzaliznytsia as the likely solution to the prohibition of private ownership for primary networks.

Taxation Law

A new law amending business profit tax law, No. 283/97, came into effect 1 August, 1997. Currently, imported capital goods are taxed at a constant 20% Value Added Tax (sic) plus Import Duties averaging 16%. Output of goods and services are also subject to the 20% Value Added Tax. Salaries are taxed at 52% for various social contributions. Corporate income taxes are 30% of net profits after costs of production, depreciation, and interest. An earlier provision for a 5-year tax holiday for qualified foreign investments was rescinded in 1995. Recently, the profits repatriation tax of 15% for overseas investors has [reportedly] been rescinded. A Bilateral Tax Treaty convention for the avoidance of double taxation and the prevention of fiscal evasion was signed between Ukraine and the United States on 4 March 1994, but has not yet entered into force.

Law on Foreign Investments

A new 'Law on Foreign Investments' took effect on 23 April 1996. This law[2] replaces the law of 1993 and creates a more stable, legislated environment for the foreign investor. Some of the highlights of the new law include:

- More liberal definition of what constitutes a foreign investor
- Ten year "grandfather" clause against any subsequent changes in legislation.
- Protection from expropriation

The International Commercial Arbitration Law was enacted by Ukraine in February 1994. This Law parallels commercial arbitration laws set forth by the United Nations Commission on international trade law and is in accordance with international standards. Several recent cases have shown that receiving fair arbitration is not difficult. Enforcement of those decisions is difficult to obtain. There is no clear precedent and many courts are unsure of how to proceed in commercial cases.

A Bilateral Investment Treaty Concerning the Reciprocal Encouragement and Protection of Investment between Ukraine and the United States was signed in March 1994. Commonly referred to as 'the BIT', it guarantees non-discriminatory treatment for US investments and operation in

[2] A copy of the law as amended (uncertified English translation) is available on request.

Ukraine, free transfers of capital and returns on investments, expropriation compensation, the right of third party international arbitration in the event of a dispute between a US firm and Ukrainian government, and protection against performance requirements.

6. Project Risks

It must be recognized that the Project is an inherently risky undertaking, requiring substantial commitment of resources over a long period in a highly uncertain environment. The full gamut of risks customary in emerging markets are present:

Political Risks

- regulatory risks
  - license rights, obligations, and fees
  - competition policy (number of entrants, level playing field)
  - tariff controls
- taxation
- repatriation of investment and profits
- expropriation
- legal environment (clarity, stability, and enforceability of laws on companies, contracts, foreign investments, concessions)
- political instability

Political cum Commercial Risks

- macro-economic instability
- foreign exchange (convertibility, exchange rate)

Commercial Risks

- subscriber purchasing power
- market share
- tariffs competition
- project completion (on time, within budget)
- company management

Mitigation measures are available to cover some of these risks, e.g. political risk insurance against expropriation and joint finance with an IFI sharing guarantees of exchange convertibility. Commercial risks such as market share and tariffs competition could possibly be mitigated through long term contracts with potential major users of the OFN.

Close observers of the Ukraine scene during the post-Soviet period are likely to attach particular significance to the regulatory and taxation risks identified above. Constantly shifting government policies in these areas have undermined confidence of private investors that they can depend on the terms struck in their original agreements. On this issue, the 10-year grandfathering provisions of the 1996 Foreign Investment Law will provide some comfort. In the case of the particular investment opportunity presented herein, investors can take additional comfort from the professional quality and political weight of the main partner, Ukrzaliznytsia. UZ, one of Ukraine's largest employers (800,000 including support staff involved in housing, health, and

education services), is widely respected as one of the most effective organizations in the country. If its vital interests were threatened, it could be expected to make its voice heard at the highest political levels.

7. Steps to Be Taken by Potential Investor Partners

UZ is seeking a foreign strategic investor who is well experienced as an operator of commercial networks, either a public telecommunications operator (PTO) or a substantial private network services provider, possibly in conjunction with passive investor partners. To assist in the search for a suitable partner, the services of the firm of Clell Harral International have been retained under a grant from the U.S. Trade and Development Agency. Pursuant thereto this *Information Memorandum* has been prepared.

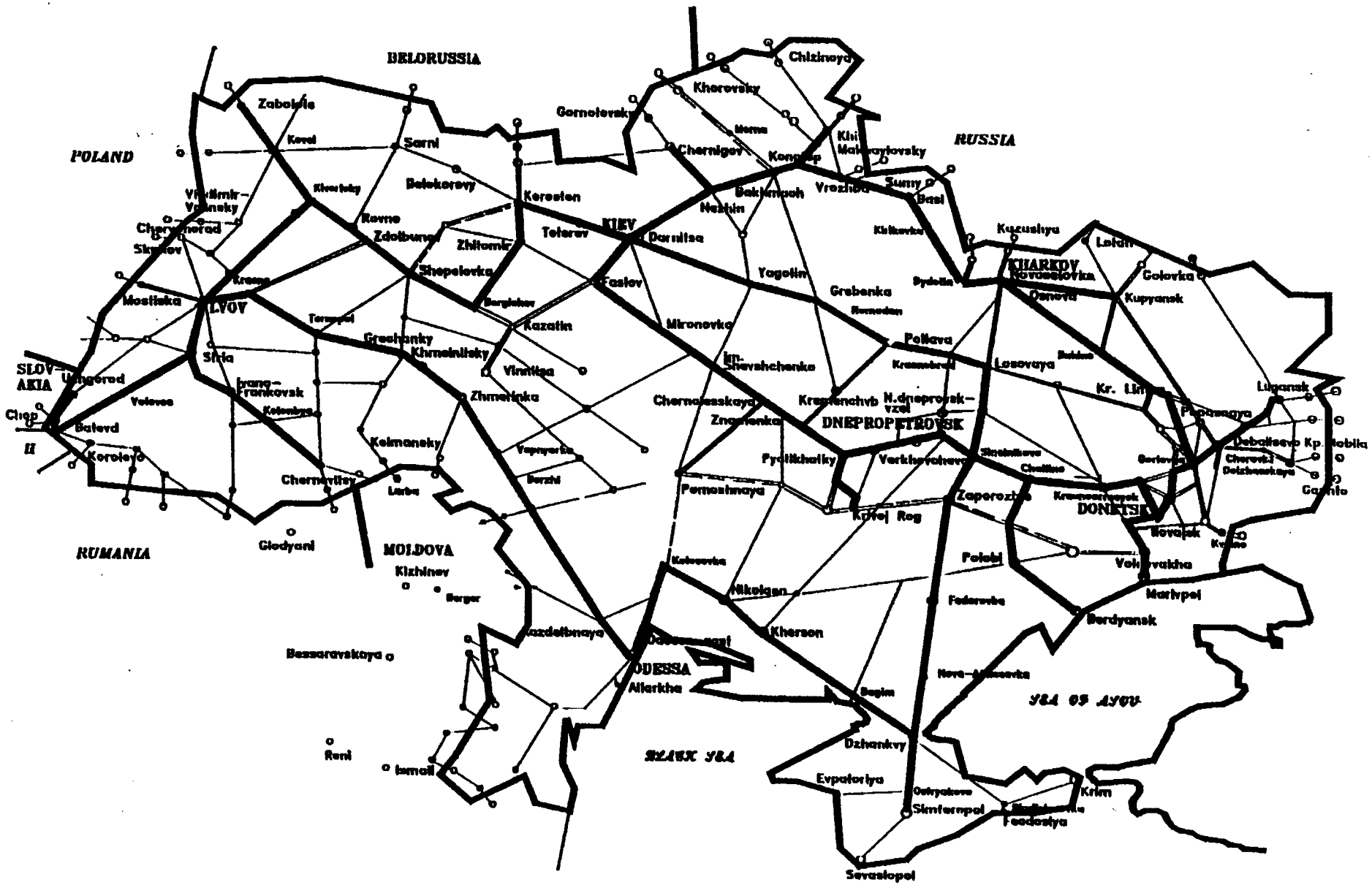
The document is being circulated to a limited, select group of multinational companies known to have requisite qualifications and potential interest to invest in East European communications. The document is available for broader circulation, and meetings between prospective investors and UZ management are being arranged on an individual, confidential basis. Interested parties should contact:

Clell G. Harral, President
Clell Harral International
1102 Canvasback Drive
Granbury, Texas 76048-2613
Tel: 1-817-579-9939
Fax: 1-817-579-1644

and/or

Thomas Till, Principal Banker
Transport Team
European Bank (EBRD)
One Exchange Square
London EC2A 2EH
Tel: 44-171-338-6036
Fax: 44-171-338-7301

FIBRE OPTIC/SDH TRANSMISSION NETWORK



UKRAINE RAILWAYS
MANAGEMENT INFORMATION SYSTEMS NEEDS ASSESSMENT

TERMS OF REFERENCE

Introduction

1. Like other railways of the Former Soviet Union, the Ukraine National Railways (Ukrzaliznytsia or 'UZ') suffered a dramatic loss of freight traffic after 1989, due primarily to macro-economic upheaval in Ukraine and neighboring states rather than inter-modal competition, which is only just emerging. UZ—still the largest railway system in Europe after Russia, and a major passenger as well as freight carrier—is now planning the measures required to adapt the scale and structure of its plant and establishment to its new role. The European Bank for Reconstruction and Development (EBRD) is providing technical assistance to develop a restructuring program, and is expected to finance the associated capital expenditures program commencing in 1998.

2. As Ukraine moves increasingly to a market economy, and closer linkages to Western Europe, UZ faces growing pressure to modernize its communications and management information systems to better serve its clients and enhance its operating efficiency. Provided it can bring service quality in line with international standards, while also lowering costs, UZ is in an excellent position to compete, not only for purely domestic traffic and Ukraine trade with Europe, but also for the growing transit traffic between the Russian Federation and Europe. To capture the potential, however, UZ must have access to modern information systems and communications networks. Its present information systems are a legacy from the Soviet era.

3. As UZ moves forward with restructuring, it has requested assistance to assess its present management information systems[1], identify improvements needed to better meet its new market conditions, and assess alternative avenues for obtaining the requisite improvements. These Terms of Reference define the objectives and scope of the proposed study.

Objectives

4. The objectives of the study are to:

a) survey major component systems of the existing MIS to gain an understanding of:

i) the main information flows (what information is flowing to which parties from which points for which purpose);

ii) the locus of principal computational processes;

iii) the key characteristics of software and hardware components; and

[1] In this context the term 'management information systems' has a broad definition, including executive information; marketing management; costing, tariffing, and revenue management; as well as the basic operating information system.

iv) the information delivery capabilities of the existing MIS.

b) identify the principal management information requirements to support the restructuring of UZ, improve efficiency, and better meet client expectations in increasingly competitive markets, both domestic and international;

c) compare identified MIS requirements against existing MIS capabilities, identify system enhancements or additional features which would be desirable, and assess priorities; and

d) identify and assess practical alternatives for procuring the recommended system enhancements.

Scope of Work

5. The Consultant shall:

a) review available previous studies which are relevant to the objectives of this study, including but not limited to, the *Ukrainian Railways Telecommunications Development Study Final Report* (c August 1995);

b) visit Ukraine Railways headquarters in Kyiv to inspect the main computer center, and conduct interviews with officials who are responsible for MIS functions, principal user groups, and higher level management;

c) work with UZ officials and the consultants who are assisting in the Development of a Five-Year Commercialisation Plan for Ukraine Railways to ascertain key information requirements, compare current and anticipated requirements against current MIS delivery capabilities, and assess priorities of system improvements with respect to:
   i) financial management (planning, budgeting, accounting, costing, profitability);
   ii) basic operating systems (yards, trains, waybills, revenue collection, purchasing and material supply, payroll, infrastructure maintenance, rolling stock repair);
   iii) productivity measurement (staff levels per unit output, car and motive power utilization, traffic and revenue density per route);
   iv) marketing and customer service delivery, both domestic and international (customer profiles and volumes, car and intermodal fleet management, shipment transit reliability, customer interface capability including electronic data interchange (EDI), customer satisfaction surveys)
   v) interfaces with other railways (revenue settlements, car hire settlements, shipment tracking and transit time reliability, advance train information, customs clearance and other border crossing formalities, including European Union requirements)

d) taking into account the particular circumstances of UZ and considering also capabilities of current state of the art systems in leading American and European

railways, identify and assess practical alternatives for procuring the recommended system enhancements— ranging from a turnkey delivery of a comprehensive new system from an external source, at one extreme, to purely internal development, at the opposite, or some combination of external procurement and internal systems development.

e) prepare and submit a Draft Report to Ukraine Railways and the EBRD for review and comment;

f) prepare and submit a Final Report, taking into account the comments received from Ukraine Railways and the EBRD.

Time Schedule and Reporting

6. The Consultant shall commence work within 21 days from signature of contract.

7. The Draft Report shall be submitted within 60 days from signature of contract (10 copies in Russian language and 2 copies in English to Ukraine Railways and 5 copies in English and 2 copies in Russian to the EBRD).

8. The Ukraine Railways and European Bank for Reconstruction and Development shall submit joint comments to the Consultant within 30 days from receipt of the Draft Report.

9. The Final Report shall be submitted by the Consultant within 30 days of receipt of comments (in the same languages and number of copies as indicated above).

Staffing

10. The Consultant must have recent and substantial experience in the railway sector, in particular in design and management of information systems, including both software and hardware dimensions. Experience of both North American and European railway information systems is desirable.

U.S. Sources

Potential Suppliers of Equipment and Services to Ukraine Transport Communications / Ukraine National Railways

A. Fiber Optic Cable and Equipment Manufacturers

- AMP, Inc.
- 3M Fiber Optics Products
- Nortel
- Rockwell International
- Stromberg Carlson
- LDC Inc. Fiber Optics Communications
- Lucent Technologies
- Corning Class Works
- Siecor Corporation
- US Fiber Optics
- Harris Corporation

B. Data Communications Equipment Manufacturers

Modems

- Anderson-Jacobson
- Codex Corporation
- Digital Equipment Corporation
- Hayes Microcomputer
- Mkom
- Lucent
- Concord Data Systems
- General Datacom
- Mitel Datacom
- Microcom

Packet Switching Equipment

- Dynatech Communications
- Hewlett Packard
- Infotron
- Micom Communications Corp.
- Timeplex
- Hughes Network Systems
- Sprint Telenet

Communications Processors

- Lucent Technologies
- Control Data Corp. Communications
- Harris Corporation
- Unisys
- Computer Communications
- Digital Equipment Corp.
- Micom Communications

Protocol Converters

- Codex Corporation
- Datapoint Corporation
- Micom Communications
- Data General Corporation
- Digital Communications
- Timeplex

C. Railway Management Information Systems

- EDS
- Burlington Northern/Santa Fe
- IBM
- Union Pacific Technologies