

Telecom Hotel and Data Storage Real Estate Opportunities in Chile and Argentina

By

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Submitted to the Department of Architecture in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Real Estate Development

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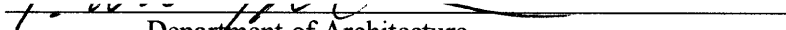
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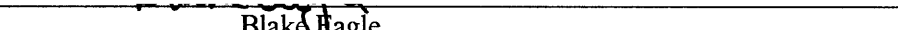
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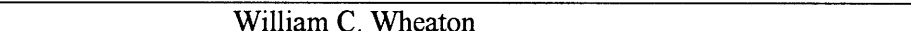
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ABSTRACT

Telecommunication deregulation and the Internet revolution have created the need for two new types of real estate, the telecom hotel and the data storage center. Similar forces are at work in much of Latin America. This thesis explains how the changing telecommunication industry and Internet have created demand for new real estate types and explores to what extent similar developments will create opportunities for telecom hotel and data storage facility development in Chile and Argentina.

Deregulation of the telecommunications industry is a reality to varying degrees in both Chile and Argentina, although in both countries the local telecom incumbents have greater market control than their U.S. counterparts. This will limit telecom hotel development opportunities in those countries. Data storage center development depends primarily on levels of Internet activity and in both countries such activity is growing rapidly, necessitating data storage center development.

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INTRODUCTION

This thesis was originally going to address investing in Chilean and Argentinean real estate. I believe that foreign investors over-estimate the risk associated with investing in those markets and consequently apply an unnecessarily high discount rate, which stems from perceived risks based on Latin America's economic and political history. Although such risks persist, they do so to a lesser extent and the degree to which changing circumstances have been incorporated, or not, into investment analysis was to be explored. Research began with a trip to Santiago to investigate the real estate markets and to better understand local attitudes and methods of investment analysis. While in Chile, a more specific Latin American real estate opportunity became apparent, that of technology oriented real estate development. The potential of this market niche is consuming and instigated a change of thesis topic. Investment considerations remain a critical factor in determining telecom hotel and data center real estate opportunities in Chile and Argentina, however, that component is now considered to much lesser degree in light of emphasizing the real estate development opportunity.

Within the U.S.A., deregulation of the telecommunications industry and the Internet revolution have created a demand for new building types. It is important to distinguish between new building types and changing demand for traditional real estate. E-commerce has made many retail property owners consider the potential changing demand for traditional retail space. The often-cited Amazon.com has created an awareness that demand for bricks and mortar retail space may be reduced, on the other hand, that same company has contributed to an increase in demand for distribution space. However, these changing demands have not necessitated the creation of any new property types. Likewise, almost all companies are requesting enhanced specifications in their work environments. At a minimum, the Internet and the common application of local area networks (LAN's) have created the need for a superior communication infrastructure than has traditionally been provided in buildings. At a less familiar level, internet start up companies have increased awareness of new work atmospheres where synergy and collaboration are

considered important, thus necessitating more flexible and presumably creative work environments. Once again these new space demands signify a modification to traditional workspace but by no means a radical departure from traditional real estate.

There is however demand for new property types which are required to house the increasing equipment needs for companies whose core business is the transmission of voice and data and the digital storage of data. The development and installation of global communication networks is increasing at a fast rate in response to companies around the world demanding connectivity. The most advanced fiber network only becomes useful when it can be efficiently tied in to end user facilities. The brains of these networks, located at their end and origination points, are switches and routers, which are sensitive equipment and consequently need to be housed not only next to the network backbones for connectivity but also in facilities that protect the equipment. Much of this equipment is not new and has often been housed in the communications providers' central offices. Deregulation in the U.S.A., combined with increased demand for connectivity, has made this traditional equipment storage solution inadequate and unfeasible.

Developers have responded by building telecom hotels, which are buildings designed or redesigned specifically to house telecommunication equipment and in many cases where competitor equipment is co-located.

A second and similar new building type is the data storage center. Telecommunication networks transmit data; however, this data is not always in transmission and must reside somewhere. Unlike data stored on paper, electronic data is more sensitive and must be stored on special equipment, which in turn, like switches and routers, requires special housing. Traditional companies such as banks and new economy companies such as Internet service providers (ISPs) require data storage and owing to the specialized and costly nature of electronic data storage it often makes sense for these companies to outsource this function. This new demand has spawned the development of data storage companies, which, like the

telecommunication companies, have particular real estate requirements that have not existed until recently.

In conjunction with the Internet and telecommunications revolution, the no longer new reality of the global economy has been maturing, and advanced communications are facilitating this phenomenon. Emerging markets such as Asia, Eastern Europe and Latin America stand to benefit immensely from the proliferation of communication technology, safely assuming of course that information is critical to economic advancement. The industrial revolution, which began in Europe and migrated to North America, was for a long period of time contained in those economies. A slow dissemination of information and knowledge eventually allowed for Asia, and to a lesser extent Latin America, to become industrialized. Nevertheless, Western Europe and North America's head start advantage created an international economic hierarchy, which has largely persisted to this day. It is possible that if the means of communication that exist today, existed 100 years ago, the international hierarchy may be different or not even exist. As with corporations, by not embracing these new information technologies, developing regions run the risk of being left behind. However, by embracing new technology these regions can possibly fast track their status in the global arena and begin to level the playing field. There are obviously many other factors that contribute to economic development but information is undoubtedly one of the most important. This paper looks at Latin America, where the realization of the importance of the information age and the consequent demand for such information is growing. This is evidenced by telecommunication deregulation in varying degrees in many Latin American countries and high growth rates of Internet access.

The current and potential Latin American demand for telecommunication and information technology will likely result in regional real estate requirements similar to those in the U.S.. Here an attempt is made to understand the similarities and differences of new economy real estate demand in Latin America and the U.S. and also to understand the new economy companies' approach to the associated real estate

requirements in the region. The thesis is more exploratory than conclusive as the topic ties in many areas, all of which could be studied in much greater detail. Two areas of particular importance are the communication infrastructure that is tying in Latin America and the nature and size of telecommunication and Internet demand in the region.

A study of Latin America as a whole goes well beyond the scope of this paper and therefore the focus is on two countries, Chile and Argentina. These two countries were chosen because they are both deregulating their telecommunications industry, are two of the wealthier Latin American countries and are therefore in relatively good positions to take advantage of the information age, and finally, because in both countries access to information was possible.

This thesis will first explain why the U.S. telecom de-regulation created a need for new building types and describe the characteristics of those buildings. The Internet and data storage demand for building space will also be described. Interviews were conducted with telecom companies and data storage providers to more precisely appreciate what their real estate requirements are. To address the supply side, telecom hotel developments and data storage facilities are reviewed. An attempt is also made to gain insight into the interviewed companies' approach to Latin America. The telecom and Internet industries in Chile and Argentina are described and comparisons are made with the U.S. experience to gauge the consequent demand for telecom hotels and data storage facilities in those countries.

Finally, methods of analyzing real estate investment in Chile and Argentina are looked at, specifically, how to account for country risk. It is understood that real estate investment risk in Latin America is a far-reaching topic. It is not the intent of this paper to provide new methodology of investment analysis but rather to highlight the main components of country risk and how they impact investment analysis.

Before delving into the main bodies of this topic it may be helpful to the reader to have a basic explanation of telecommunication and Internet terminology. What immediately follows is an overview of the technology vocabulary used throughout this paper.

Technology Overview

Analog versus Digital

Spoken words are transmitted as analog sound waves but much of the public telephone network is now digital. With people using computers to communicate and increasing calling volume, the analog format has become inadequate. Digital signals are faster, have more capacity and contain fewer errors than analog waves. Digital signals are transmitted in the form of bits, which are either a one or a zero.

Computers create digital signals and therefore when connecting to analog phone lines, a modem is needed which sits between the computer and phone line and converts the computer's digital signals to analog so they are compatible with analog phone lines. For example a 56,000 bit per second (bps) modem, enables the analog waves in a regular phone line to carry 56,000 bps. A one page 250 word document consists of roughly 9,000 bits.

Each character of a computer-generated code is called a byte and bytes usually contain seven or eight bits. In telecommunications and Internet terminology, document sizes and computer storage capacity are measured in bytes and transmission speeds in bits per second (bps). This thesis is roughly 1.5 megabytes (1,500,000 bytes).

Most Personal Computers come equipped with modems, which enable the computer to connect to the phone line, and ultimately to the Internet. These modems transfer information at a speed of 56,600 bps (56.6 Kbps). A 10-megabyte file would take 24 minutes to transfer at a speed of 56.6 Kbps. A 10 megabyte file (7 of these thesis) may seem like a lot, however, this thesis is mostly text whereas images and video are much weightier forms of information and when dealing with images, 10 megabytes is not very much. One photo or map could consist of 5 megabytes. It becomes clear that to be able to transfer

images and power point presentation, for example, transmission speed are very important, and a 56.6 Kbps dial-up modem becomes inadequate for many applications beyond e-mail and browsing the Internet. With a 1.54 Mbps T-1 connection the same 10-megabyte file would take only 52 seconds to transfer.

Bandwidth

Bandwidth is a measure of the capacity of a communication channel, a wideband carries more information faster than a narrowband. Bandwidth applies to both analog and digital transmissions.

Traditional analog telephone lines have a narrow bandwidth of 3000 Hz which means that they transmit 3000 analog waves per second. Cable TV, which is still analog transmission, has a wide bandwidth of 700,000,000 Hz (700 MHz) which is needed to transfer images in addition to sound. Digital transmissions are measured in bps and an example of a narrowband line is a T-1 that carries 1,540,000 bps (1.54 Mbps), in practical terms a T-1 line can carry 24 voice or data conversations at a speed of 64 Kbps each. Narrowband applications include electronic mail and residential Internet access.

A T-3 line is wideband and has a capacity of 44,700,000 bps (44.7 Mbps) or can carry 672 conversations at 64 Kbps each. Wideband applications include image transfer, video conferencing and LAN interconnection. Broadband provides 45 Mbps or better and is used for ultra-high-speed computer networking, video on demand and video file downloading.

Media: Fiber and Copper

Voice and data transmissions are carried over media, the choice of which directly impacts the speed, accuracy and distance of transmissions. Media and bandwidth are therefore correlated. The two most prevalent media are fiber optic cabling and copper. Fiber is a non-electric medium made of ultra-pure strands of glass and therefore, unlike copper, which transmits electrical signals, does not act like an antenna to pick up noise and interference. With fiber, signals are transmitted in the form of off and on light signals. In the absence of electricity, strands of fiber do not interfere with each other and are also immune from nearby electrical equipment such as manufacturing devices and radio stations, which can introduce interference into copper wires. Fiber is suitable for high-speed transmissions and when

enhanced by multiplexing technology (see below), it could possible to simultaneously carry over three million phone calls on a single fiber pair. That is enough capacity to have carried the voice traffic of all the major long distance carriers combined in 1998.¹

Other main advantages of fiber are: security, it is resistant to taps, its small and light and there is less fading and weakening of signals over distance. For the same capacity, much fewer lighter strands of fiber are required than copper. One important disadvantage to fiber is that termination component and connector costs are higher than for copper wiring. Specialized equipment is needed to terminate fiber cables within buildings, to test and splice fiber and to convert electrical signals to light pulses and visa versa. One can begin to appreciate where specialized real estate would be needed to house this equipment and how owing to the costs and maintenance of the equipment it can make sense to share it between multiple users needing connection to a main fiber backbone. When fiber is brought into buildings from telephone companies electrical power is needed and this is one of the reasons a key characteristic of telecom hotels and data storage facilities is an abundant constant power supply.

Dense Wavelength Division Multiplexing (DWDM)

DWDM expands the bandwidth of fiber. A multiplexer divides the light stream into multiple frequencies called colors. It works like a prism separating out colors into different frequencies that are carried on the fiber. This enables single strands of fiber to carry multiple channels of voice and data. Originally 8 channels could be carried but as the technology has improved, up to 96 channels can now be carried over a single fiber strand. The great value of this technology lies in the fact that fiber capacity can be increased without having to lay new fiber.

Digital Subscriber Lines (DSL)

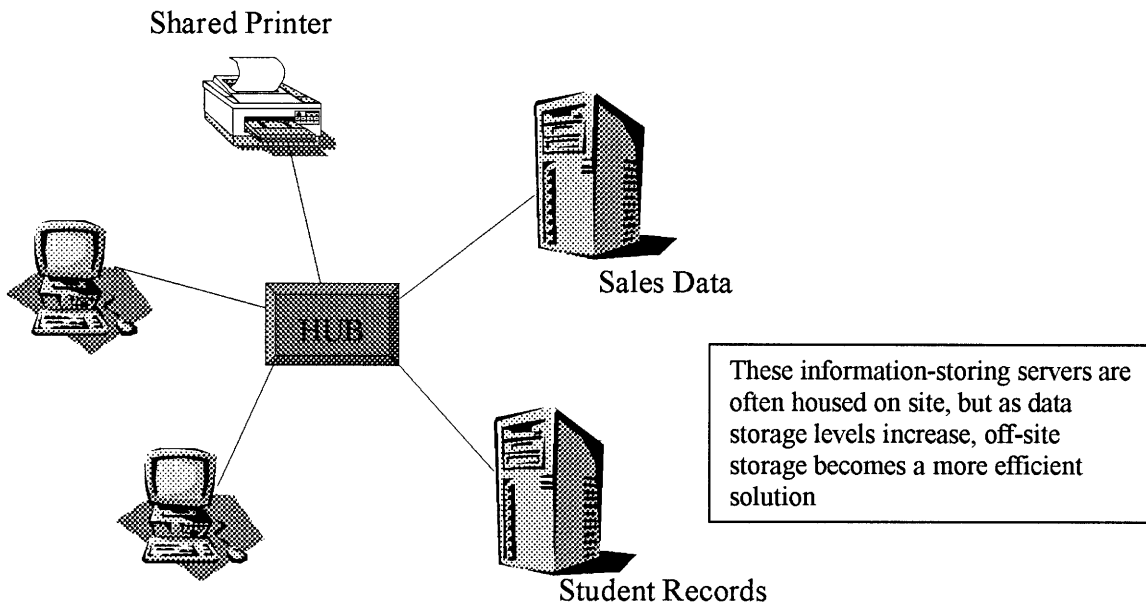
A technology introduced by Bellcore in 1989, as a way to send video and television signals from the telephone company's central office to end-users over standard copper cable used for voice service. It offers always on transmission speeds of up to 1.54 Mbps versus a maximum of 56.6 Kbps with standard

¹ Dodd, Annabel Z The Essential Guide to Telecommunications Prentice Hall Upper Saddle River, NJ 2000, pg. 65

dial-up service. DSL requires the installation of a special modem at the customer end and electronic equipment at the local telephone company's central office.

LAN (Local Area Network)

A local network, usually within a building or between close buildings, connects data devices such as computers and printers. In this way one printer, for example, can be shared by many personal computers (PCs). Servers are centrally located computers with common departmental or organizational files such as sales data, price lists and medical records. A server connects to a hub, which is the wiring center to which all devices in the LAN are connected. This arrangement has direct impact on real estate where servers that store large amounts of data are connected to but removed from the LAN in data storage facilities. As data storage requirements continue to increase, so does the demand for outsourced data storage facilities and the specific real estate needed to house these facilities. Someone working in a university could access student records stored on a server in a remote facility, via the LAN hub.



A local area network

A MAN (Metropolitan Area Network) is a group of data devices such as LANs that can communicate with each other within a city or a large campus area covering many city blocks. In a WAN (Wide Area Network) the data devices can communicate with each other from multiple cities.

Gateway

An entrance and exit into a communications network. They can be large, linking expansive overseas networks or small, linking LAN's for example.

Switch

A device, which opens or closes circuits, or selects paths or circuits. A switch looks at incoming data to determine the destination address. Based on that a transmission path is set up through the switching matrix between the incoming and outgoing physical communications ports and links. In a LAN, for example, a switch located in the hub will direct a command from a PC to the shared printer. Switches will also direct traffic between networks and that is why they are such an important feature in telecom hotels, which is where many incoming data and voice transmissions arrive and are switched onto long distance networks or the internet for example.

Routers

Intelligent data switches that are capable of setting up paths from end to end. Their intelligence allows them to consider the network as a whole and route based on: destination address, packet priority level, least-cost route, minimum route delay, minimum route distance, route congestion level and community of interest. Without routers, switches transfer data or voice link by link, so when sending an e-mail that has to cross many networks a switch is used at each network connection whereas a router can by-pass the intermediate switching by intelligently guiding the e-mail through the networks at the outset. Routers are also used in telecom hotels.

Interexchange Carriers (IEXs)

Prior to the Telecommunications Act of 1996, IEXs sold long distance services primarily between states and to international locations. How their range of services changed after the Telecommunications Act is discussed later. IEXs own most of the switching and transmission equipment over which the traffic they bill for is routed. IEXs carry calls between local access and transport areas (LATAs), whose boundaries usually fall within states. Local phone companies carried all calls within LATAs. An IEX would hand off an incoming long distance call to the local phone company and pick-up an outgoing long distance call at a “point of presence” or POP, which is where the IEX company’s switch connects to the local telephone company network. Examples of IEXs are AT&T, MCI WorldCom and Sprint.

Internet

The Internet is a collection of multiple networks that communicate with each other via a standardized protocol, TCP/IP, which allows computers and networks, with different architectures, to interact. TCP/IP sends data over the Internet broken up into packets. This is important because without this protocol when one computer connected to another their communication path would occupy a circuit exclusively. By breaking the communication into packets, gaps in the communication can be filled with data from other users. As a result, the packaging of transmissions makes for a much fuller utilization of communication lines. Another important benefit of the TCP/IP protocol is that any computer or network of computers equipped with TCP/IP protocol can link to the Internet and in doing so expand its coverage. The World Wide Web is a way to navigate from resource to resource on the Internet. Browsers such as Netscape, which is software, allows users to navigate the web by clicking from site to site, therefore making the Internet easy to use.

IP-based networks

Traditional public networks used to carry voice traffic are circuit-switched which means that networks save a path in the network for the entire duration of a call. During pauses in a conversation, for example, network capacity is used up but idle. IP networks break-up traffic into packages, which can fill these gaps and also be sent over different routes to the same destination depending on network traffic. The packets

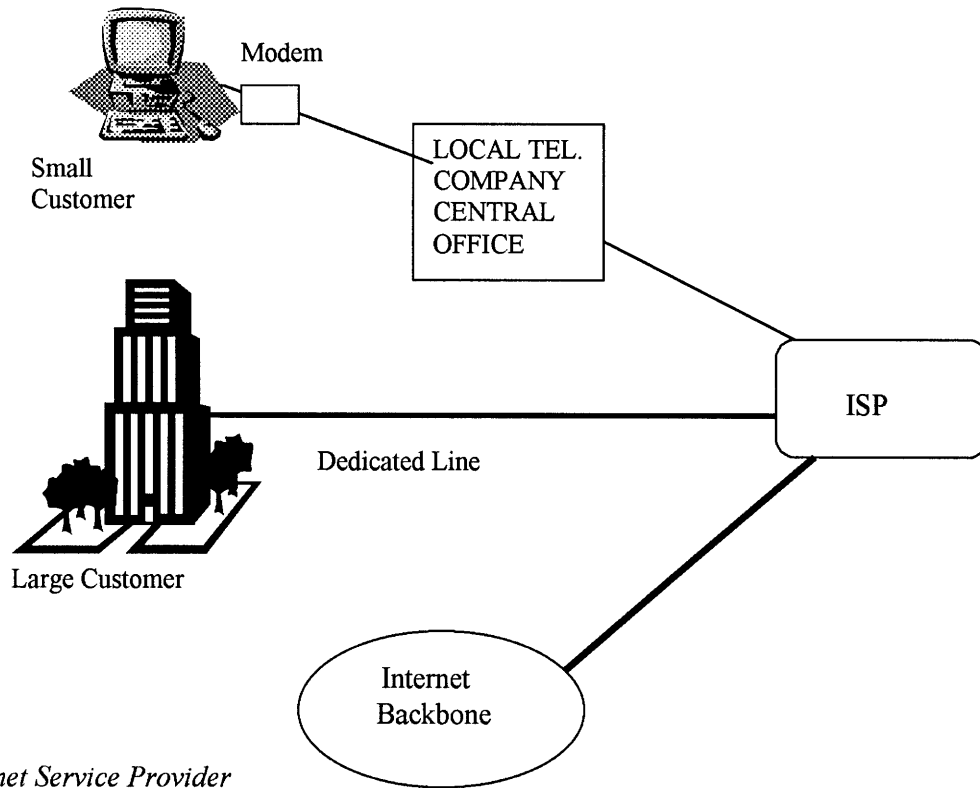
are reassembled at their destination. IP networks are smart, in their utilization of existing networks. The main draw back to IP networks is that during periods of high congestion packets can be dropped or delayed which in turn causes unacceptable gaps in real time voice communications. As technology improves, IP-based networks will likely become adequate for voice transmission.

Internet Backbone

The super fast network spanning the world from one major metropolitan area to another. Internet Service Providers connect to this backbone through routers so that data can be carried through the backbone to its final destination.

Internet Service Provider (ISP)

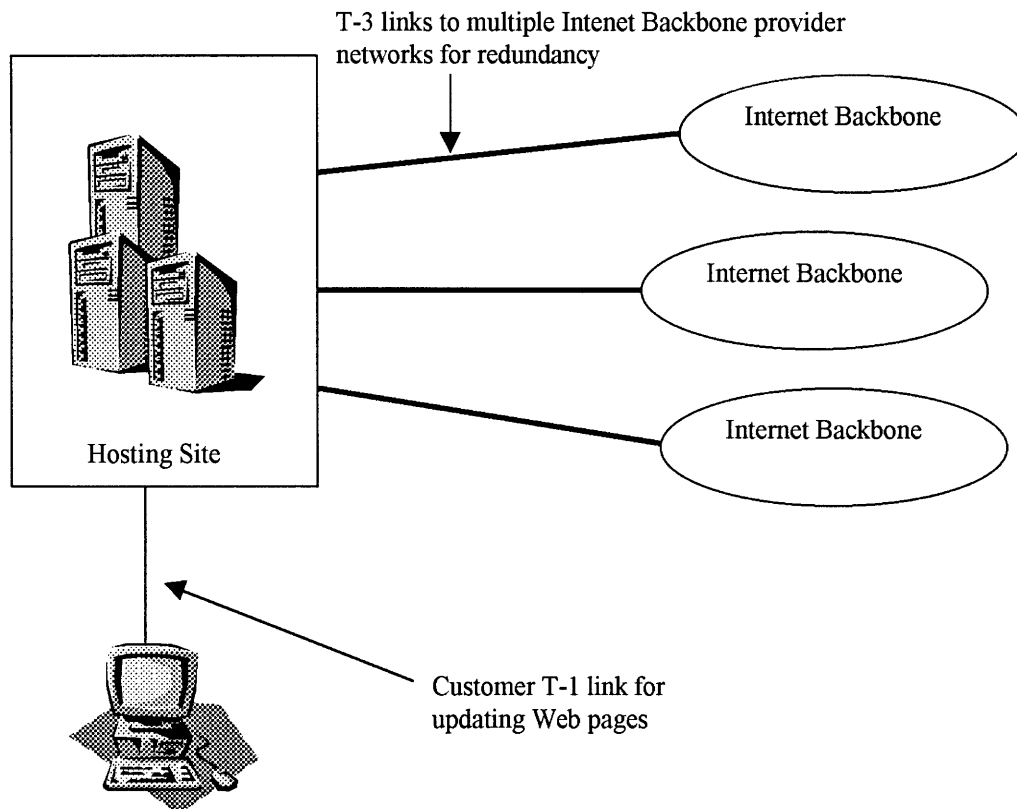
ISPs sell Internet access to residential and commercial users and usually provide e-mail services and content such as news and weather. Small ISP customers access the Internet by dialing up with their computer, modem and telephone line to an ISP which in turn connects them to the Internet backbone. Larger ISP customers will often have a direct line to the ISP, such as a T-1, that is always on and therefore requires no dial-up access. ISPs need routers that can receive transmissions from disparate users and channel it onto the Internet backbone, therefore real estate that is located near the Internet backbone and that can house the ISPs specialized equipment is necessary.



Internet Service Provider

Hosting

A World Wide Web host is the computer at which documents or databases for Web pages are located. Hosts are located at corporations, ISPs and hosting companies on servers connected to the Internet. Due to the cost of providing full time telephone connections to the Internet and of storing and maintaining servers, hosting is often outsourced to companies such as Globix and Exodus which have specific real estate requirements that are discussed later in this paper.



Web Hosting Configuration

Application Service Provider (ASP)

An ASP will offer software applications from a centralized server often housed in a data storage facility. In this way a software user does not have to incorporate the software onto their own systems but rather is able to connect to the ASP via the internet and access the software on a per need basis. Internet connectivity is obviously important for ASPs in order to distribute their software, as is server storage space on which the software is kept.

Server

A server is a shared computer that can be used as a repository and distributor or as a gatekeeper controlling access to e-mail for example. Data storage facilities house numerous servers on which their clients information, such as data bases, is stored, modified and retrieved. A web site is stored on a server which stores and keeps the site's content in tact while allowing computers to access the information.

Streaming

Streaming media is software used to speed up transmission of video and audio over the Internet. When graphics and text are sent to an Internet user's browser, the text can be viewed immediately and the slower to transmit graphics are filled in as they are received. Experts think that streaming will turn the Internet into another medium of communications. Applications include the dissemination of speeches, events, and education.²

The above described technologies are much more complicated than made out to be here, but the technology is not the focus of this paper. The new real estate types that are the focus of this paper incorporate and or are dependant on much of the above described technology and for that reason to understand the demand for and the real estate itself, a general appreciation of the technology is helpful. The telecommunications and Internet industries have evolved in a way that has created demand for new building types and therefore the changes and impacts of those industries on real estate is now discussed.

CHAPTER 1 – The nature and history of telecommunications and Internet building demand in the U.S. Telecommunication and Internet physical commercial space demand is hard to quantify as these demands are new and have been explosive. As a result the demand has yet to stabilize and much of the new development has yet to be synthesized and registered. Another reason for the lack of concrete numbers surrounding the supply and demand of telecom and Internet space is that such space is not classified as a category unto itself like industrial or office space. In many cases telecom hotels and data centers are conversions of office space and therefore may still be considered just that. Older obsolete office, warehouse and retail buildings in downtown locations have proven particularly suitable to telecom hotel and data storage facilities as they have the physical characteristics necessary to house the required equipment and are also close to main fiber and power lines. Chapter one focuses on verifying that there is in fact demand for new real estate types and clarifying how this demand evolved and why it is growing.

² Ibid., pg. 21

“A recent study by Cushman & Wakefield of California, Inc., identifies more than 340,000 square feet of telecommunications space leased in the (Los Angeles) downtown area in the past year, with 1 million more square feet square feet identified for telecom rehabilitation in mostly Class B and C buildings,”³.

The same company’s New York office said that almost 1 million square feet of space was leased to telephone and Internet firms,” in NYC, and “Industry analysts estimate that the demand for carrier hotel space at as much as 1.2 million square feet in second-tier cities.”⁴

The demand for telecom space will continue to grow as the telecommunications industry and Internet uses grow. “Today there are 150 million Internet users worldwide, and the number is expected to grow to 500 million by 2004”⁵ There is obviously no doubt that the related telecom and internet industries are having a real impact on North American real estate markets, and will continue to do so at least in the short term.

To understand the evolution of telecommunication real estate demand, it is necessary to understand the recent history of the telecommunications industry because it was the deregulation of that industry that gave rise to telecom hotels, which are the recent manifestation of telecommunication real estate demand.

1.1 – History of telecom deregulation

Prior to 1984 the Bell system consisted of 22 local Bell companies that were owned by AT&T which sold local and long distance services. Competing long distance providers were at a disadvantage because when they had to connect a long distance call to a metropolitan area they were forced to do so via an AT&T subsidiary. The long distance carriers often charged that AT&T was uncooperative in the provision of access to the local networks, after all, these long distance carriers were competing directly for AT&T’s long distance business. In 1974 the Justice Department filed an antitrust suit against AT&T. In 1984 the suit was resolved and AT&T was divested of the 22 local phone companies, ownership of which was transferred to seven Regional Bell Operating Companies. AT&T retained the right to sell interstate and international long distance.

³ Skelley, Jack “Telecom Skirmishes” Urban Land Volume 59, Number 3 March 2000 pg. 72

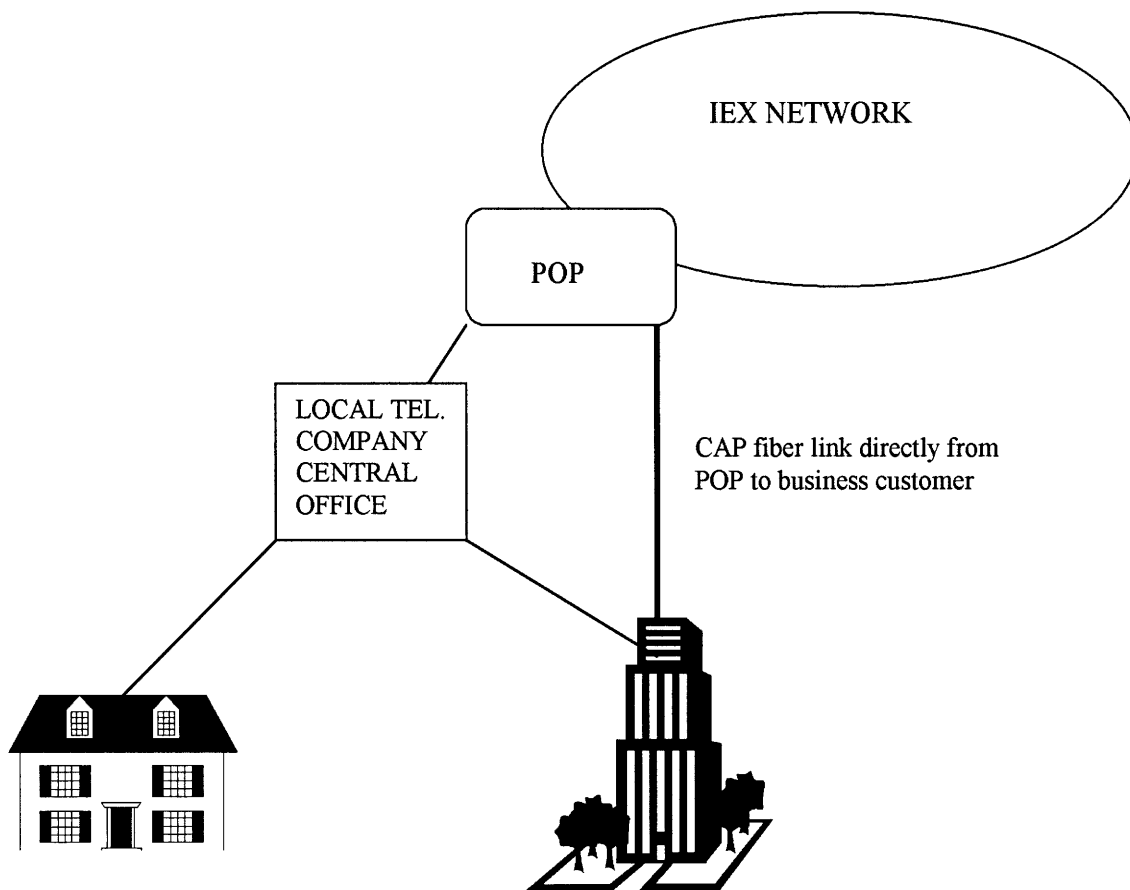
⁴ Reagor, Catherine “Telco Hotels” Urban Land Volume 59, Number 5 May 2000 pg. 40 Reagor, pgs. 40-41

⁵ Ibid., pgs. 40-41

The telecommunications Act of 1996 opened the Bell territories to competition from long distance vendors, cable companies, local access providers and utility companies. In return, the Bells were allowed to manufacture and sell telephone systems and provide interstate long distance service. However, the Bell companies' greatest revenue continued to come from selling in-state telephone service, interconnecting interexchange carriers (IEXs) to local service, cellular calling and publishing yellow page directories.

Before 1996, IEXs only carried calls between local networks. For final destination delivery within a local area, the interstate call was handed off to local phone companies. These drop-off and pick-up points have switches, which interconnect the two networks and are called POPs (Point of Presence). IEXs own most of the switching and transmission equipment over which the traffic they bill for is routed. The cost to carry the local access portion was paid for by the IEXs to the local telephone companies, but passed on to the IEX consumer. These local access fees made up a significant portion of the Bell companies' revenues.

In the early 1980's, long distance business customers realized that not only were these local access charges costing them a lot of money, the connections to the long distance network were taking a long time to be installed. In 1983 the New York City Merrill Lynch office formed a communications company to carry its calls from Merrill Lynch's city locations to its IEXs and in doing so bypassed the local New York company access fees. This began the competitive access provider (CAP) industry. CAPs used T-1 digital connections, which carried 24 channels of voice and or data, while the local telephone companies were using standard copper lines, which were less reliable, and had less capacity. Connecting large multi-tenanted office buildings directly to the IEX network was the only way that a CAP could justify the necessary capital expenditure associated with metropolitan wire line installation.



CAP connection to interexchange carrier

As CAPs built out their networks, they began to offer local telephone service, Internet connections and data networks within metropolitan regions. By entering the local telephone market, CAPs became competitive local exchange carriers (CLEC'S) and they also entered the interexchange business by constructing fiber optic links between major metropolitan areas.⁶

Telecom carriers enter the market at varying degrees of service provision. Carriers such as Level 3, Qwest Communications and Global Crossing are focussing on the long distance market and building primarily high-speed fiber-optic-based networks which connect metropolitan area networks. These

⁶ Dodd, pgs 88-101

companies represent facilities-based carriers, which own the fiber optic cabling over which telecommunications services they sell are routed. Additional industry participants are resellers and agents who purchase bulk services from local telephone companies and long distance providers at discounts which are then partially transferred to their customers. Some carriers offer services that combine both their own fiber facilities and fiber they resell from larger companies. In high-volume calling areas, resellers will typically own switching equipment, the cost of which is spread out over numerous customers and allows the reseller to avoid paying the carrier for the switching portion of the call.

An important component of the telecommunications deregulation, and what allowed for multi-tenanted telecom hotels, was the Federal Communications Commission ruling in 1992 that permitted co-location. With co-location, local competitors can install their own central office switch in the same building as the local Bell company's switch. Without co-location rights, new local telephone service competitors would have to build their own switching facilities and also install lines connecting their facility to the Bell facility where they could then tie into the Bell network. The associated costs would have made entering the local Bell telephone market prohibitive. Co-location was intended to assist new entrants in the local telephone services market in the pursuit of creating a more competitive market place. The increased competition created by industry deregulation combined with increasing communication and internet demand, has greatly increased the supply and demand of telecommunication services and consequently the demand for real estate capable of housing the equipment used to route and interconnect the growing maze of communication lines.

1.2 Telecom Hotels

Large cities on the East and West Coasts were the first areas of telecom locating due to those being the points at which fiber-optic cables that cross the Atlantic and Pacific oceans connect the U.S. to the rest of the world. After the first telecom company set up its multimillion dollar equipment in a building, competing firms, permitted by the telecommunications deregulation, set up in the same location to tie into

the original tenant's costly networks and the carrier hotel was born.⁷ Although these firms compete for customers, by co-locating they save money and for that reason telecom hotels are successful. In terms of the real estate, companies offering long-distance service and internet connection look for specific characteristics that can accommodate computers, servers and wires. Transmission and routing equipment is heavy, expensive, heat generating and sensitive to the elements, therefore housing for the equipment must have the following specific characteristics:

- The building must be close to a main fiber optic loop so that the distance of the necessary connection between the building and main communications network is kept to a minimum. A telecom hotel feeds large communication capacity onto a main fiber optic loop or trunk line, therefore, the connection between the building and the main fiber has to have equally large capacity that requires the installation of expensive media. Most fiber loop connections are close to large city centers, which results in expensive underground installation. Finally, the greater the distance between the telecom hotel and the fiber loop means the greater the risk of damage to the connection line and consequently greater costs of monitoring and line maintenance.
- Floors must support between 125 and 250 lbs. per square foot; a typical new office development has a floor capacity of 60 lbs. per square foot.
- 12-foot high ceilings are necessary to accommodate stacked wires, racking, access flooring and HVAC ducts.
- The power supply must be 480 volt, 960 volt is better. Regular office use may use only 5 watts per square foot on a busy day whereas carrier hotels need as much as 50 watts per square foot. Access to multiple power grids is preferred.
- There must be space for fuel storage and backup generators. To ensure that they never lose power, telecom providers need backup generators and batteries to supply power while the generators are starting.
- Sealed ventilation and windows to guard against water leaks and break-ins.
- Security and dry fire safety systems to protect equipment.
- Enhanced HVAC to cool densely packed heat generating telecommunication equipment that runs 24 hours a day 7 days a week.
- Minimal window exposure which contributes to security and temperature control.
- A meeting room for tenants.
- Lines of sight for rooftop antennas.
- Large floor plates with wide column spacing.

⁷ Reagor, pg. 39

- High-capacity freight elevators with large dimensions
- Low parking ratios as the building's equipment to people ratio is high.⁸

What drives the demand for telecom hotels are the tenants. To understand the telecom hotel markets, one must understand the entities that occupy the space. A typical tenant for a telecom hotel would be Level 3, a global communications and information services company. Although Level 3 is not a real estate company, as a means to promote their bandwidth offerings they have assumed the role of telecom hotel developer in certain instances.

Level 3 offers a wide selection of IP-based services including broadband transport, co-location services, submarine transmission services (cross-oceanic), and the industry's first Softswitch based services, which are software based switching systems that allow Level 3 to combine internet features and traditional telecom network features. Level 3 offers services primarily to Internet companies that deliver their services over the Level 3 Network. The Network will include metropolitan networks in 56 U.S. markets and 21 international markets connected by an approximately 16,000 mile U.S. inter-city (long-distance) network, an approximately 4,750 mile European inter-city network, both transpacific and transatlantic undersea cables and 6.5 million square feet of gateway and technical space. Level 3 expects to substantially complete the U.S. and first two rings of the European inter-city network by the fourth quarter of 2000 and currently offers broadband infrastructure services in 38 U.S. markets and 5 European markets.⁹

Lou Walsh, a manager in Level 3's global real estate group, was interviewed to better understand the company's approach to real estate. He explained that Level 3 is first and foremost a bandwidth provider. He compares Level 3 to Qwest, differentiating both from AT&T, which is very vertically integrated and

⁸ *Ibid.*, pgs. 42-43

⁹ www.level3.com

which offers bandwidth provision as one of many services and products. Level 3 is horizontally integrated and aspires to do one thing well.

In terms of space specifications, Mr. Walsh said that power, connectivity (buildings located in close proximity to as many carriers' networks as possible), security, climatization and dry fire suppression systems are all critically important. Unless all are present, the equipment and operations are jeopardized which in turn would jeopardize Level 3's business, as much of what they sell is reliability. Level 3 has found that old distribution facilities, department stores and big box buildings are well suited to Level 3 facilities due to their high ceilings and open floor plates. Although Level 3 is not in the business of real estate they will accommodate co-location of customers' equipment as a means of selling their bandwidth. Offering space to an ISP, for example, facilitates that ISP's use of the Level 3 network that ties into their building. It is common for a Level 3 owned or master leased facility, which are usually between 50,000 and 100,000 square feet, to be half occupied by its customers. Level 3 will occupy excess capacity based on projected customer demand in that market. Mr. Walsh said that image was not a concern as their customers are concerned with how good the space is in terms of housing and connecting their equipment. Nor did employee amenities seem to be a concern, most likely due to the fact that very few people work out of these facilities, often around ten.

Internationally, Level 3 operates out of England, France, Belgium, Germany, Tokyo and Hong Kong, and in all markets Level 3 operates out of and develops similar buildings. Their preference for leasing or buying is confidential, however, the basic strategy when leasing is to sign long term master leases and sub-let built out space to their customers. Regarding Latin America, Mr. Walsh commented that when the aggregate demand is high enough, they will be there, but in the meantime it's not sufficient and as a company they are not speculative.

1.3 – Data Storage Facilities

Data storage facilities, like telecom hotels, primarily house equipment, although serving a different purpose than the telecom transmission equipment found in telecom hotels, requires similar storage treatment. The main difference between the two real estate types is that data storage facilities in addition to needing connectivity need data storage capacity that involves a higher level of service provision. In a telecom hotel, information is switched and routed but not stored.

Data generation and storage requirements are growing at astronomical rates.

“In just two years, search engine and Web portal company Excite.com’s data grew from nothing to 45 terabytes (a terabyte is 10^{12}). But even that is leisurely compared with e-mail service provider Mail.com, which took just 45 days to build up 27 terabytes of data – the equivalent of 7 billion e-mail messages. Meanwhile, some of the leading dot coms expect to break the petabyte barrier (a petabyte is 10^{15}) by the end of this year.”¹⁰ This growth is a result of the speed at which these customer-oriented companies are adding new customers. Examples of data storage facility users are Internet Service Providers (ISPs), web portals and banks.

Individuals and organizations access the Internet via an ISP, which therefore must be able to receive incoming communication from disparate customers and connect them to the Internet backbone, which requires high capacity transmission lines and constant connection. Some large ISPs, such as GTE Internetworking and Sprint, operate their own high-speed Internet networks. Many ISPs have broadened their services through mergers with Portal providers which enlarges the ISP’s presence on the web and attracts traffic. Two well known combined ISP / Portal providers are Yahoo and AOL. Portals are the doors to the Internet and offer information usually geared to particular communities of interest such as college students, women and sports enthusiasts. Portals contain digital information on servers. News and sports statistics, for example, are stored on servers and accessed by Internet users, the information is

obviously changing and updated but is constantly contained. As transmission capacity improves and network coverage increases, there will be more demand for remote location storage. University lectures, for example, could be stored on servers in data storage facilities and accessed by students at their convenience. More specially designed real estate will be required to house the increasing supply of servers.

Many traditional economy companies also have increasing digital storage requirements. Banks have large databases containing customer information and transaction histories, the storage of which requires significant digital storage capacity. Major banks often have several hundred servers, each with its own storage, which represents about 80% of the cost of the servers. Another traditional economy example comes from the pension fund industry. New York based MeasurRisk.com provides on-line risk analysis services for pension funds, hedge funds, insurance companies and others. A typical pension fund portfolio of 15,000 securities equates to roughly five megabytes of data, which MeasurRisk.com takes in at least once a month for analysis. The portfolio data is stored as is the analysis and all the intermediate analytical steps. Indicative of the growing demand for data storage is the fact that MeasurRisk.com's client list is not only growing rapidly, the amount of analytical data that it stores for each client is also increasing. Unlike data that can be stashed away on tapes, on-line data must continuously be accessible which also means that downtime has to be avoided. The Internet has made it very easy for customers to switch to a competitor site, all it takes is a click, and this reality has heightened the need for minimal downtime.¹¹

For large companies such as major banks and high-traffic Web Portals, it is feasible to own and house their own data storage facilities. However, for smaller firms and especially Internet start-ups, outsourced data storage facilities are a sensible, if not the only, alternative. The success of many new Internet related

¹⁰ Davidson, Clive "The data deluge" Risk March 2000 pg. 33

¹¹ Ibid., pg. 33

companies depends on efficient access to the Internet backbone and the latest computer technology. The problem for many young companies is that the needed technology is expensive, and can quickly become obsolete. As a result a start-up company's capacity requirements are very unpredictable. It has not been uncommon for start-up companies to suddenly need much more technology capacity all of a sudden or none at all as their business plan fails. Data storage facilities often have the most up to date computer technology for lease and the personnel needed to recommend information technology solutions and maintain the equipment. Finally, by outsourcing data storage and Internet connectivity, companies can achieve scalability, which means that the fluctuating equipment and network needs of a typical Internet start-up can continually be met. One can begin to appreciate that a data storage facility has two principal capacities, connectivity and data storage. Data storage equipment, like telecommunication switching equipment, is heavy, expensive, heat generating and sensitive to the elements and consequently necessitates provision of the earlier mentioned telecom hotel building characteristics.

The competitive deregulated telecommunication industry has increased the demand for specialized real estate located near telecommunication networks and with specific characteristics that are necessary to house the expensive network switching equipment. At the same time, the growth of the Internet is fueling demand for increased network capacity and as Internet applications are continually uncovered the demand for server storage space is also growing. Like switching equipment, servers require specialized real estate. However, unlike pure telecom hotels, data storage facilities are often combined with a higher level of service, which necessitates greater emphasis on human amenities.

CHAPTER 2 – What has been supplied to satisfy the demand.

It is difficult to know how much telecom space, data storage space and high-tech people oriented space exists. In many cases those three uses are combined into one structure making measurement of space occupied by each category difficult. As an aside, it's worth mentioning that mixed technology use buildings may become more common. It seems that one of the main reasons for this is that concern is

being expressed about the negative impact telecom hotels and data centers have on neighborhoods. Such facilities have few people working in them and for connectivity reasons are usually located in city centers, many of which are already struggling to recuperate lost activity. Evidence of these concerns and the significance of them was demonstrated recently in Los Angeles. Level 3's proposal for a telecom hotel in Los Angeles was denied by the city in favor of a proposal from Infomart, a Dallas based technology hub developer, who will build a facility to house equipment and users. The plan is for half the building to be a telecom hotel and the other half to be used by tenants that will employ up to 1,000 people.¹² Another reason for not knowing the supply of this new economy driven space is that due to the newness and explosive creation of the market, not all the stock has necessarily been considered.

When looking at the supply of data centers and telecom hotels, it becomes apparent that for data centers there is greater developer consolidation than for what are often known as "one-off" telecom hotel developments. The main reason for this has to do with different levels of service provision. The more vertically integrated data center services necessitate a more intimate and complex relationship with the tenant. Due to this complexity, once a landlord-tenant relationship is established and working it is in both parties best interest to duplicate that working platform across markets. This in turn means that a development company wanting to capture these tenants must have a multi-market development strategy to satisfy their demands. In some cases it is more than a matter of convenience. The Globix Corporation, for example, can offer clients server redundancy across multiple locations, whereby if a client's server in the London Globix Data Center fails, a back-up server in another location will be activated and utilized thereby further reducing the chance of downtime for the client. The telecom hotel product is simpler, often just a shell, in which telecommunication companies install their own equipment, and is usually without the information technology consulting services. As a result, there is less need for a consolidated multi-market service oriented development strategy. Some network providers have become de facto

¹² Gose, Joseph "When Data Checks In" The Industry Standard July 24, 2000 pg.127

telecom hotel developers as is the case with Level 3, but more often it seems as though telecom hotels are built by independent developers on a one-off basis.

An exception to this is Trizec Hahn's joint venture with Global Switch and their strategic approach to building a worldwide chain of telecom hotels. Trizec Hahn partnered with Chelsfield of London, each investing \$160 million in Global Switch International to allow Global Switch to develop telecom hotels and services worldwide. Global Switch is a provider of digital fiber-optic cable systems and they now hope to create a one stop shop option for telecom companies, international fiber carriers, ISP's and application service providers (ASPs), who require large amounts of telecommunications and network equipment in multiple cities worldwide. Trizec Hahn contributes core real estate and facilities management expertise.

In many cases telecom hotels are the creation of a landlord becoming aware of new value in his property generated by telecom company demand. Often such developers will merely gut an old low-rise office building, department store or warehouse, and provide the telecom companies a shell that complies with their basic physical requirements. The telecom tenants in turn build out the interior to accommodate their particular equipment needs, and install their own equipment. Leases for telecommunications companies are long term, usually 20 years, which makes sense given the capital intensity of their build-outs and equipment installations. According to Jim Walsh, from Level 3, tenant improvements can cost between \$500 and \$1,000 per square foot. Even the most basic telecom hotel fit-outs, consisting of not much more than bolting racks to concrete, can cost \$200 per square foot. In most U.S. cities it costs \$140,000 or more to lay each mile of fiber optic cable.¹³ Chicago based Sterling Capital recently gutted an old newspaper building in downtown Phoenix for one of the city's first telecom hotels. The firm paid less than \$5 million for the 180,000 square foot building and will put another \$20 million into getting it ready for tenants which will then install their own expensive equipment. These deals are great for the

landlords who in many cases have been able to lease their class B or C properties for Class A office rates to well capitalized companies such as Sprint and MCI on a long term basis.

Some noteworthy telecom hotel projects are:

- The Carlyle Group is converting a 1.2 million square foot press plant in Chicago into a telecommunications hub called the Lakeside Technology Center. Companies such as GlobalCenter, Level 3 and Qwest are outfitting the building with tons of equipment to process and direct Internet traffic.
- Taconic Investment partners have transformed the New York and New Jersey Port Authority headquarters.
- Rudin Management has purchased one of the AT&T buildings in New York for conversion.
- Argent Ventures is converting the 1931 May Department Store in Cleveland.
- Industry City Associates is converting a 5.5 million square foot, 12 building manufacturing and distribution center, which was built in 1890, to create The Bush Terminal Technology Campus in Brooklyn N.Y..

When looking at data storage development companies it becomes clear that the development approach is more involved as the degree of value added services is higher than that found in telecom hotel developments. The REIT, SL Green Realty Corp., has set up eEmerge, a temporary office space provider, for start-ups. Eureka Broadband Corp., is one of the three partners in eEmerge and provides high-speed Internet access, a data center where tenants can store their servers or buy space on Eureka's servers, a staffed help desk and Compaq desktop computers linked to its network. Tenants pay between \$2,000 and \$40,000 a month depending on how many people will be working out of the space. Rents can cover conference room use, secretarial and reception staff, copy machines and office furniture. Companies are expecting ready to occupy space and space that doesn't require a huge lease commitment. These expectations are obviously very different from those of the telecom hotel tenants. Another provider is Tech Space LLC which has been supplying start-up tech companies with short-term real estate in NYC since 1998 and is opening new space in Boston, Toronto and San Francisco.

¹³ Reagor, pg. 41

The lines that define new economy real estate can begin to blur. Emerge and Tech Space are not primarily data storage companies, although data storage is an important component of their offerings. It is important to understand the additional concerns that go into technology space when the person-to-equipment ratio is higher than that of pure data center facilities. Even the most equipment intensive data centers require qualified personnel to work out of the facilities on a daily basis. Building products that cater to people space must combine the strict physical and technologic infrastructures with a work environment that appeals to the educated work force that is needed to operate these high-tech companies. In the U.S. where current unemployment is very low, additional amenities will be more of a consideration than for buildings in markets where there is high unemployment. Although overall unemployment in Chile and Argentina is lower than that in the U.S. it is likely that the availability of the necessary skilled labor is scarce which could necessitate amenity provision at least similar to that provided in U.S. developments. In Seattle, Martin Smith Inc., has spent the last five years developing and implementing new standards to attract and satisfy new economy tenants. In 1999 the company completed a \$40 million 331,000 square foot renovation of the Seattle Trade and Technology Center, which was one of the first major transformations of an office building in the area, specifically designed for the high-tech tenant base. In addition to, redundant fiber optic systems, heavy floor loads, abundant parking, flexible mechanical systems, minimum 12 foot ceilings, Martin Smith found that, “Depending on the site, amenities such as public art, destination retail, a central concierge service, day care facilities visible to office workers, bicycle lockers, spiritual assembly rooms and dog walking services were considered.”¹⁴

Here we concentrate on data storage real estate companies whose priority is data storage equipment and connectivity. As has been alluded to, such companies are providers of both real estate and information technology products and services. Telecom hotel companies can be considered providers of strictly real estate. Data storage companies provide equipped real estate but do not manufacture the equipment.

¹⁴ Briscoe Robert, Smith Greg “When Technology Come to Town: A Case Study in Seattle” Development, Summer 2000 volume 31 no. 2

EMC, on the other hand, is a provider of strictly information technology and in fact prides itself on being the caretaker of the world's information but does not provide housing for their storage systems. A data storage company may equip their facility with EMC equipment. Cisco is another well-known provider of information technology equipment.

I have looked in detail at two data storage companies to better understand how and what they supply and for whom. Exodus Communications, which was founded in 1994 and according to their web site, pioneered the Internet Data Center market. In 1999, Exodus climbed from a rank of 76 to number 11 in Business Week's "Info Tech 100" profiling the "Hottest of the Hot" businesses of the information technology industry for the year. Exodus is a leading provider of complex Internet hosting for enterprises with mission-critical Internet operations. The Company offers sophisticated system and network management solutions, along with technology professional services to provide optimal performance for customers' web sites. Through its subsidiary, Service Metrics, Exodus is a source of web site performance monitoring and measurement services. Exodus manages its network infrastructure via a worldwide network of Internet Data Centers (IDCs) located in North America, Europe and Asia Pacific.

Exodus's IDCs provide the physical environment necessary to keep servers up and running 24 hours a day, 7 days a week. These facilities are custom designed with raised floors, HVAC temperature control systems with separate cooling zones, and seismically braced racks. They offer physical security features, including state-of-the-art smoke detection and fire suppression systems, motion sensors, and 24x7 secured access, as well as video camera surveillance and security breach alarms. Within these facilities, Exodus claims to deliver the highest levels of reliability through a number of redundant subsystems, such as multiple fiber trunks coming into each IDC from multiple sources, fully redundant power on the premises, and multiple backup generators. Exodus currently operates a global network of Internet Data Centers in major metropolitan areas, with close proximity to major public and private interconnects to maximize connectivity rate and overall site performance. Finally, all Exodus IDCs combine around-the-clock

systems management with onsite personnel trained in the areas of networking, Internet, and systems management. The result is a physical and technical environment affording customers the reliability and flexibility necessary to outsource their mission-critical Internet operations.¹⁵

One of Exodus's more well known customers is Yahoo Inc., which uses Exodus IDCs and recently established a mirror site at the Exodus facility on the East Coast. The director of operations at Yahoo said that Exodus provides the infrastructure and level of service needed to maintain the reliability of Yahoo's worldly popular Internet domain. A more recent client of Exodus is the Republican Party's election 2000 web site. www.georgebush.com contains campaign information essential to constituents, and the site deploys streaming media technology that allows it to cover the Republican National Convention. With 84% of states now offering online registration election web sites have become important and reflect the breadth of demand for outsourced data storage and web hosting.¹⁶

Janet LaPerle of Exodus's real estate department said that access to fiber and power were the two most critical factors in their real estate decisions, although, life safety, climatization, and security were also ranked very important. Physical dimensions were considered slightly less important. In terms of office amenities, the only ones that were considered moderately important were: restaurant / cafeteria, meeting rooms and conference rooms. Price was more important to determining location than proximity to clients and labor force or image. Proximity to suppliers and competitors was not considered at all important. From a developments point of view, Exodus would be an attractive tenant, one of the main reasons being that Exodus prefers longer lease terms in order to depreciate their costly equipment infrastructure over longer periods. Exodus prefers to lease their buildings to avoid having real estate on their books. In terms of what markets to enter, the decision comes from predicted sales demand for website hosting which in turn depends on where the internet companies are located and according to Janet that depends on

¹⁵ www.exodus.com

where there is access to the internet backbone. Access to main trunk lines is found in New Jersey, New York, Boston and Silicon Valley and consequently that is also where there is demand for Exodus facilities. A total square footage number was not available but Exodus has 27 data centers worldwide, 19 in North America, 4 in Europe and 4 in Asia.

A competitor of Exodus is Globix Corporation, which describes itself as a leading provider of Internet connectivity and sophisticated Internet solutions for businesses in the United States and abroad. They claim to offer customers fast, reliable Internet connections via fault-tolerant, fiber-optic backbone as well as high-performance hosting services and other advanced technology applications from state-of-the-art, SuperPOP Internet Data Centers. Globix offers: co-location, web hosting, dedicated access, streaming media, E-Commerce, Internet security, corporate training, and workstation/server sales.

To meet the increasing demand for high-quality Internet solutions and accommodate the company's phenomenal growth, Globix has opened a new 160,000 sq. ft. facility in New York. The new, New York SuperPOP includes an expanded Internet Data Center and can house over 300 employees.

The new Globix facility offers:

- 24,000 square feet of space designed specifically for co-location and web hosting
- Climate controlled data center and FM200 dry fire-suppression system to protect your equipment
- Fully redundant power supply to keep your service up and running
- Designated floor for classroom training and seminar space
- Round-the-clock security staff

In keeping with plans to provide customers with service throughout the United States, Globix has constructed a specially designed building in Santa Clara, CA, the center of Silicon Valley.

¹⁶ Ibid.

A good understanding of Globix's business can be gained from a look at the types of clients they attract. One such client is iWon.com which is a high-traffic web site and destination portal. iWon is co-locating its Internet servers and applications in the Globix Internet Data Center facilities in New York. The Globix solution includes providing iWon with systems architecture and integration, customized power configurations, streaming media applications and multiple T-1 and T-3 circuits connected to the newly enhanced 32 Gbps capacity Globix tier-1 international backbone network. iWon has become a top-rated portal, ranking No. 1 in visits per person and No. 2 in time spent at the site per person at work for the top 50 Web sites (Nielsen//Net Ratings, week ending July 2, 2000) by combining premier e-commerce, content and search partners with the largest guaranteed cash giveaway on the Internet.

"It is critical that iWon.com be available to provide round-the-clock services to our users. With the tremendous growth we have experienced over the past nine months, it was of the utmost importance to have a rigorous and reliable back-end Internet solution," said Jonas Steinman, iWon founder and co-CEO. "Globix has a top-of-the-line network, superior facilities, expertise in streaming media, and the bandwidth capacity we need to support our current and future demand."¹⁷

Internationally, the company has a new location in London, which according to Globix signals the company's success in becoming a world-class provider of superior Internet solutions and services. The building is situated in the heart of London's West End, the commercial centre of the city, and benefits from exceptional access to London's major rail lines.

Globix has an agreement with Guardian Newspapers Ltd. to support Learn.co.uk, the newest addition to the Guardian's network of news and educational Web sites. Globix is co-locating the Guardian's servers in its London IDC, providing a firewall solution, backup software and, beginning in September, will also provide a Streaming Media solution to webcast interactive and pre-recorded educational videos over the

¹⁷ www.globix.com

Internet. "The main factors that influenced our choice were the Globix data centre's convenient New Oxford Street location, the resiliency of the Globix network, experienced staff and, most importantly, the ability to respond to a fast installation requirement," said Colin Hughes, publisher of Learn.co.uk. "We had a shortlist of three Internet companies — out of these Globix came up with a package that best met our needs." The site is connected to the Globix global backbone, a network with a total capacity of 32 Gbps linking data centres and peering points throughout Europe and the United States. Hughes added, "Since our launch the site has been getting about 12,000 page impressions per day. We expect this to remain stable until the new school year in September. As the scope of the site grows, we expect our bandwidth requirements to increase correspondingly. With the scaleable solution Globix provides, we will have the flexibility to increase our bandwidth in line with our site traffic."

"Learn.co.uk is an exciting project that will supplement the national curriculum," said John Moore, general manager at Globix. "Video streaming will be a particularly useful feature of the site, enabling users to participate in live tutorials and classes. Globix can deliver an end-to-end Streaming Media solution, from live production to encoding and through hosting the content, thereby assuring a consistent high level of quality throughout the process."¹⁸

In determining where to locate, Vijay Raina, the Director of Globix real estate, said that they go to where the customers are, and in response to asking who their customers are he said anybody. In terms of infrastructure characteristics Vijay emphasized redundant power (100 watts per square foot), HVAC, and fiber connectivity, and physical characteristics: 125-150 pound per square foot floor capacity, 12 foot high ceilings, a solid roof for roof top equipment installation and large floor plates, ideally 50,000 square feet. In keeping with redundancy, Globix also offers parallel server provision so that if a client's server in one location fails, another server at another location will be activated. Their fiber loop is also protected from failure resulting for example from breakage. Other important attributes are meeting rooms and image, Mr. Raina suggested that these important amenities are what distinguish Globix from its

competitors. Globix will buy or lease depending on building availability and the real estate market itself, if they decide to lease, their preferred terms are for 20 years with two five year renewal options. Mr. Raina said that a typical data center is operated by about 50 people, who for the most part are highly skilled and for that reason proximity to that labor pool is a consideration when selecting a site.

Globix is considering Latin America, specifically Brazil and Mexico, although Vijay expressed concerns that Mexico does not have enough fiber. If the company determines that a region does not have enough customers to support a data center, what demand does exist will be served via a Point of Presence (POP). For example, a customer in Hungary may be given access to the London Data Center via a Globix POP in Austria, which serves Eastern Europe. Globix does not have specific benchmarks in terms of leasing commitments or customer demand and do speculate when it comes to data center development.

Yahoo Inc, iWon, and Guardian Newspapers Ltd. are very different companies but are all users of data storage facilities. The demand for data storage space will continue to come from a wide range of industries and grow as new uses for data storage are uncovered. It is difficult to estimate the real estate demand to house data storage equipment as the outsourcing of that service is only recently beginning to grow at fast rates and to date many companies with data storage requirements house the necessary servers on their own premises. It would be the topic of another thesis to quantify that demand and the corresponding pure data storage facility supply. In the meantime it is important to appreciate that the demand is broad based and growing, and that specialized data storage companies are developing real estate and services to meet the demand. This demand for connected information combined with increasing telecommunication provider competition is fueling the demand for another, but similar, real estate type, the telecom hotel. Telecom hotels are network interconnection points and do not offer the higher level of service provision associated with data storage facilities.

¹⁸ www.globix.com

CHAPTER 3 – Telecom and Internet Industries in Latin America compared with the U.S.

3.1 Telecommunications Industry

Latin America has by no means been immune to the telecommunication and Internet revolution. “The total volume of communications traffic carried by the Latin American telecom companies is increasing at an unprecedented pace. This volume expansion is being driven not only by the growing number of phone users in the region, but also by the explosive growth of new types of applications such as Internet and data services.”¹⁹ As with in the U.S., regional deregulation is helping to accommodate the growth. In the last ten years, most of Latin America has been undergoing privatization of state run companies, with the telephone monopolies being some of the most important. However, as in most markets in the world, competing with the local incumbents for local communication service is difficult due to the necessary well-capitalized nature of the incumbents and capital intensity of investing in heavy infrastructure. What alleviated this barrier to entry into the local services market in the U.S. was the required unbundling of the local network elements mandated by the 1996 Telco Act. Unbundling meant that a new carrier could rent or lease the elements of the incumbent’s network that it desired while supplying its own equipment for the remaining components. This greatly reduced network build-out costs for the new carriers and contributed to the highly competitive CLEC market.

CAPs have emerged in Latin America and, like in the U.S., offer alternative routes to interconnect high-volume users to the long distance operators, routes that bypass the local loop and avoid paying the corresponding access charges. These CAPS build high capacity intra-city networks that link high-volume customers directly to the long distance company’s switch. As CAPs build out their networks they will probably become CLECs, also offering local telephone services. To do so CAPs need to install switches that link their network to the local loop, but the main barrier is regulatory, as a license must be obtained to operate local services. There are other factors that will slow the evolution of CLECs. In the U.S.,

¹⁹ Amaro Steve, Carvalho Luiz, Rossi Vera “Latin America Telecommunications, The Connection,– Special Edition” Latin America Investmet Research Morgan Stanley Dean Witter December 30, 1999 pg. 9

regulations favored new entrants, whereas in Latin America such favorable treatment was not made and consequently it was easier for the incumbents to maintain market dominance. Residential local service is capital-intensive, and the region's high cost of capital makes investments even more expensive. Local tariffs in Latin America are low by world standards whereas prices for other business segments such as long distance and data are above competitive levels, making the local services market less appealing to new competitors.

Incumbents in L.A. are vertically integrated providers of a complete range of telecommunications services, whereas in the U.S. more aggressive deregulation resulted in a more open and competitive playing field that reduced the spectrum of services offered by telecommunication service providers. As discussed, U.S. deregulation broke up AT&T into different market segments, but in most of Latin America, the telecom companies were state owned and the privatizations were accompanied by limited periods of exclusivity which allowed the companies to solidify their presence in the various market segments. Another important difference is that in Latin America local calls are metered which means that the incumbents had much more to gain by offering internet access than their U.S. counterparts for whom local calls are not metered and therefore the typical local calling area internet access does not translate into significant additional revenue. This explains why the Latin American incumbents have integrated into the Internet access market more aggressively than the Baby Bells. Competition in Latin America will come mostly from CAPs concentrating on high volume clients, leaving the small business and residential service in the incumbent's domain, at least for the short term.²⁰

Chile's regulatory environment is most like that of the U.S. in that it has mandated network unbundling and pure reseller operations. The local incumbent, CTC, is required to offer competitors unbundled last-mile transmission lines, as well as switching and billing systems. Complete resale of the local network is

²⁰ Amaro Steve, Carvalho Luiz, Rossi Vera "Latin America Telecommunications, The Connection,- Special Edition" Latin America Investmet Research Morgan Stanley Dean Witter December 30, 1999 pgs. 41-43

required and the incumbent must offer the reseller a 9% discount. Line sharing is permitted for DSL service but the DSL provider must pay for the installation costs of equipment in CTC's central office. To date no company had requested line sharing for DSL service. Competitors can co-locate equipment such as switches and billing equipment in CTC's central office but there are charges related to floor space, separate power source and temperature control. Building owners are prohibited from refusing access to telephone providers, and therefore there is open access to the customer base. Despite such aggressive deregulation, there have been few new entrants looking to take advantage of the opportunities created by the unbundling. This may be due to: the relatively high existing line penetration rate, low local telephone tariffs, CTC's efficient service and aggressive stance in deploying new technologies.²¹

“Argentina has one of the highest GDP per capita and teledensity profiles in Latin America, as well as the highest cable and PC penetration rate. Argentina should thus be one of the best-positioned markets in Latin America to benefit from the Internet revolution.”²² In the considerably larger Argentine market, network unbundling is not required, and there is no good reason why the incumbents would voluntarily provide access to their networks. Companies are not required to provide resale of local or long distance services to competitors but the incumbents must offer long distance transport to long distance carriers who have a POP in either the originating or terminating destination. Incumbents have the obligation to provide equipment co-location for the purposes of network interconnection, for both local or long distance services. Despite no unbundling regulation, healthy competition should emerge due to the recent issuance of local and long distance licenses. Argentina Communications Secretary Henoah Aguilar, who regulates telecom companies, predicts that prices for local calls will drop 80%, just as they did for international calls when competition was introduced last year.²³ Building owners in Argentina are

²¹ Ali Rizwan, Parker Daniel “Latin American Telecommunications, New Technologies and Unbundling of the Local Loop” Emerging Markets Equity Research Bear, Sterns & Co. Inc. February 2000 pg 32

²² Hickman Matthew, Rappaport Mirela, Saez Baruc, Rossoni Caio “Impact of the Internet on the Latin telcos” Telecoms Internet ABN AMRO, March 24, 2000 pg. 13

²³ Helft, Daniel “Wake-Up Call” The Industry Standard July 24, 2000 pg. 156

required to allow competitive access but telephone and electrical companies are not required to offer competitors access to their proprietary “rights of way” such as transmission poles or underground ducts.²⁴

3.2 Internet Industry

David Schwartz, a senior analyst for Dataquest said “We expect Internet growth in Latin America to be the highest in the world”²⁵. In Latin America internet hosts grew faster than in any other region in the world, internet users increased an estimated 14-fold from 1995 to 1999 and according to Nortel, internet accounts grew from 300,000 in 1998 to over 2 million in 2000.²⁶

“On the corporate side, the increase in demand is being driven mostly by data communication services. The development of Internet-based applications and the need for high-speed and real-time data communications is driving the demand for bandwidth to record levels.”²⁷

Such steep projections can be partially explained by the low base at which the region is starting. GDP per capita in the region is low and consequently so are penetration rates for elements of the technology boom such as, computers and Internet access. The number of Internet users in the region translated into a household penetration rate of around 4% in 1999, this ratio is expected to leap to 26% by 2004 and to 31% by 2009; for comparison sake, the U.S. ratio in 1999 was estimated at 37%. In the U.S. Internet penetration growth rates are slowing and at the same time, barring economic crises, they are about to take off in Latin America. The Latin American online community is expected to triple to more than 35 million in four years, about twice the U.S. growth rate.²⁸ This reality is reflected in the strategies that some major Internet companies are adopting towards entering Latin America. AOL has aggressively been forging its way into Brazil, apparently understanding that “Foreign markets are critical to AOL’s growth. ... many

²⁴ Bear Sterns pg. 21

²⁵ Tassin Kimberly “Latin America eyes up wireless broadband access” Telecommunications Volume 34 Issue 5 Dedham, May 2000

²⁶ Shetty, Vineeta “Latin Lessons” Communications International, Volume 27 Issue 5 London, May 2000 pages 42-45

²⁷ Ibid., page 9

²⁸ Druckerman, Pamela Wingfield, Nick “Lost in Translation AOL’s Big Assault on L.A. Hits Snaggs in Brazil” The Wall Street Journal July 11, 2000 pg. A-1 column 1

observers doubt the company can maintain its torrid subscriber growth unless it wins contracts abroad.”²⁹

AOL predicts that non-U.S. subscribers could amount to half of their total in ten years. Several regional forces should fuel the internet revolution: education levels are rising commensurate with rising economic development, the younger average population is likely to be particularly receptive to the evolution of technology and the region has excellent cultural, linguistic and time zone synergies with the U.S., where the penetration of technology activities is generally the highest in the world, and where the cutting-edge of technology development is at its sharpest.³⁰

One of the determinants for continued Internet growth is relatively cheap circuit connection to North America, where Internet traffic is concentrated, but these costs remain high. Telecom Argentina charges \$71,351 per month to lease a 2Mbps line and in Chile, Entel charges \$26,600 per month for a similar line. In the U.S., AT&T offers a T-3 (45 mbps) Internet connection for \$26,000 per month and a T-1 (1.54 mbps) connection for \$1,850 per month.³¹ The higher costs in Latin America are largely due to the local incumbents’ having foreseen the Internet revolution and having captured large shares of the ISP market. In Chile the incumbents, CTC and Entel have captured 95% of the ISP market. As a result, the incumbents have obstructively priced interconnection to their networks. A further hindrance is the fact that Latin American ISP’s have to pay for a complete loop connection when connecting to the U.S. Internet backbone, which means that U.S. based ISP’s can send information down to Latin America on circuit connections paid for by Latin American ISP’s. What will alleviate this hindrance to Internet growth in the region are the many fiber projects scheduled over the next few years.³² The following table describes the fiber projects that are being developed and that will ultimately efficiently connect Latin America to the critical North American Internet connections. Connection to these lines will be important for telecommunication and Internet companies that depend on fast and reliable connectivity. From a real

²⁹ Ibid., pg. A-16 col.4

³⁰ Dennis, Geoffrey “Sector Focus: The Internet Revolution in Latin America” Salomon Smith Barney pg. 1

³¹ Pappalardo, Denise “Dedicated T-3 prices drop dramatically” Network World Framingham July 26, 2000 vol. 17, Issue 26 Pg. 41

estate point of view, buildings located near the origination and termination points of these networks should be valued by telecom and data storage companies.

PENDING BACKBONE PROJECTS

Project	Capacity	Route	Developers	Completion date	Comments
Americas 2	80 Gbps	Brazil to North America and Argentina	Consortium led by Embratel	May 2000	Single-span rather than ring system
Atlantica 1	1.28 Tbps	Ring linking New York to the Bermudas, Brazil, Venezuela and Florida	GlobeNet, owned by 360 networks	September 2000	Valued at \$1 bn. Second phase will connect to southern Europe
Americas 3	1.5 Tbps – 2.5 Tbps	Circles the Americas from the US to Argentina	Embratel, Sprint, C&W and Teleglobe	2002	Not formally announced
Emergia	1.92 Tbps	Links North, Central and South America	Telefonica International, Tyco and IDT	2001	Further Telefonica’s effort to consolidate its global assets
Oxygen	2.56 Tbps ATM & SDH	Brazil, Surinam and Cabo Verde will be connected by two cables	Project Oxygen	2003	Connects to Oxygen’s proposed network of 97 landing points in 76 countries
South America Crossing (SAC)	40 Gbps WDM	Backbone for the Americas	Global Crossing	Early 2001	Connects Global Crossing’s proposed network of 100 largest cities
Mercus 1	80 Gbps – 1.5 Tbps	US, Brazil, Argentina and Uruguay	Bias	End 2001 to early 2003	Also serves domestic long-distance market
Arcos 1 / Americas 8	15 Gbps – 720 Gbps	Figure 8 network connecting US and 14 Latin American countries	New World Network	2001-2002	Originally proposed as a 50:50 consortium, now private deal.
New Millenium	N/A	Links several countries in the Americas via the Atlantic and Pacific coasts	New Millenium Development Group (NMDG), West Palm Beach	N/A	Proposed as a series of three regional networks in Europe Asia and South America providing end-to-end global solutions

Source: Kessler Marketing Intelligence, Newport, RI and Pioneer Consulting, Cambridge, MA., USA

Not all projects will materialize, although it appears that Brazil and Argentina will not miss out on connectivity, and given a high likelihood of a Santiago / Buenos Aires connection, Chile should also

³² Vinceta, pg. 43

benefit. It would also make sense that Valparaiso or Vina del Mar, the two Chilean coastal towns to the west of Santiago will be the landing points for the transamericas submarine cables. Chile's relative country stability and telecom industry competitiveness combined with Santiago's proximity to Buenos Aires and southern Brazil make it a more likely landing point than any of the ports of Peru, Ecuador or Columbia to the north.

Domestic connectivity is also proving to be a bottleneck in the proliferation of the Internet. Satellite is currently the dominant means of local Internet distribution, or backhaul as it is referred to, but is slowly being replaced by fiber as costs come down. As part of a \$220m investment, a Canadian operator, Teleglobe, will activate broadband metropolitan access nodes in 35 locations over the next four years to target in-country ISP's, businesses and content providers. Impsat is preparing deployment of a pan-regional broadband network comprising IP/ATM/, DWDM and fiber to provide terrestrial backhaul for Global Crossing's submarine landing points. Global Crossing's network will locate its points of presence in telehouses constructed by Impsat. However, Global Crossing's SAC is seen as a low capacity system in comparison to other terabit networks in South America.³³

The costs of DSL make residential use unlikely but the technology will appeal to commercial users as a middle of the road alternative between analog dial-up modem access at the low end and dedicated T1 lines at the high end. It is estimated that as much as 75% of commercial Internet users access through dial-up services.³⁴ According to Morgan Stanley Dean Witter, data communications is by far the fastest growing sector of the telecom services business, driven by: increasing number of internet users, increasing corporate demand for data communications and finally, growing demands for high bandwidth applications such as voice, image and video.

³³ *Ibid.*, pg 44

³⁴ Bear Sterns pg. 14

Internet access fees are still high and that is hindering general Internet growth. In Argentina high local telephone rates were inhibiting high internet usage but the recently elected De la Rúa Government has convinced the two incumbents, Telefonica de Argentina (TAR) and Telecom Argentina (TEO), to lower internet usage rates to 60 cents per hour.

The business to consumer (B2C) e-commerce area, which has contributed to the Internet revolution in North America, will probably not have as big an impact in Latin America in the short to medium term for socio-economic reasons. To avoid confusion it should be mentioned that Amazon.com which was cited in the introduction would be considered a B2C company and yes companies like it do have an impact on the new real estate types discussed here. However, this impact stems from their server requirements and not their impact on retail and distribution space.

In Latin America, credit card penetration, an obvious catalyst for the B2C e-commerce industry, is low compared to North America. Secondly, disposable income levels are considerably lower in the region than in North America. Thirdly, there are few sites that effectively cater to the local markets, and finally, in most countries the postal system and delivery service industry is less developed and what exists is less reliable. Potential advertising and e-commerce revenues are higher in Chile compared to other Latin American countries due to: higher levels of disposable income, better income distribution, high penetration of telephone service, high quality local network service and higher credit card penetration. It is obviously important to know to what extent B2C has fueled Internet demand in North America and to what extent the above mentioned hindrances to its development in Latin America can be overcome. Although answers are not provided here, despite slower B2C growth in the region, there is rapidly increasing telecommunications demand, which is the necessary catalyst for telecom hotel development. In terms of data storage demand, it does not appear that those facilities are reliant on B2C clients and therefore the lesser B2C market in Latin America should not significantly impact the overall demand for data storage facilities in the region.

Owing to telecommunication deregulation and growing Internet activity in Latin America, there is a demand for telecom hotel and data storage facilities. The demand for telecom hotels will probably be comparatively less than in the U.S. due to the local incumbents market dominance, especially in the case of Chile, and in Argentina due to a less competitive playing field.

CHAPTER 4 – Investment considerations in Chile and Argentina.

This thesis deals with telecom hotel and data center real estate opportunities in Chile and Argentina, both are relatively new real estate types, the demand for which depends largely on telecommunications deregulation and internet activity. Despite the necessary emphasis on understanding both the telecommunications and Internet industries in Latin America, this thesis addresses the opportunities caused by those industries for real estate. Investing in foreign real estate is complicated and involves analysis that encompasses criteria not applied when investing in domestic markets. Real estate investment criteria for Chile and Argentina warrants the exclusive attention of at least an entire thesis and complete coverage of the subject goes beyond the scope of this paper. As with most commercial real estate investments, the value of telecom hotel and data center developments lies in the cash flows, making determination of the discount rate the logical focus of the investment analysis.

Two ways of arriving at the discount rate for foreign market investments are a categorization-based model and a market approach. In the categorization model, the risk premium for investing abroad is a measurement and compilation of the various risk categories such as political, legal, economic and currency. In the market approach risk premiums are estimated through publicly traded securities, and it is assumed that such markets can correctly price risk. In the categorization model, risk must first be broken down into all the relevant components and then, each measured. Both tasks are complex and owing to a dearth of empirical evidence relating country characteristics to market volatility, measuring risk components quickly becomes subjective. To further complicate the categorization approach it appears that many of a country's risk components are interrelated which creates yet another challenge of by how

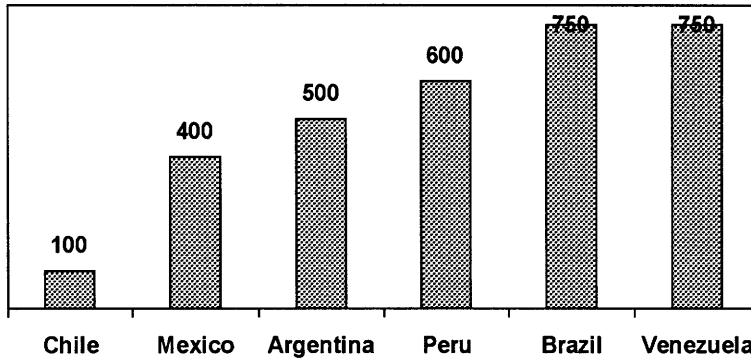
much or how little the risk premium should be adjusted depending on the mix of risk components. The market approach overcomes many of these problems by using statistical evidence from publicly traded securities and country credit ratings to calculate the overall premium.³⁵ Prudential Insurance Company, one of the largest financial services institutions in the world, came up with the following results for country risk premium, Chile 4.7% and Argentina 9%, in other words, assuming an expected rate of return in the U.S. of 12%, the expected returns for Chile and Argentina would be 16.7% and 21% respectively.

Country risk alone is not enough for one to analyze a real estate investment, other critical considerations are the particular real estate market risks and the deal risk. Country risk should partially account for some of their influences but not entirely. Market size and liquidity may not be reflected in country risk. For example, although Chile as a country may have a lower expected rate of return, due to its small size relative to Argentina, real estate investments may be much riskier on account of lower real estate market liquidity.

GSIC Realty Corporation, who advises the Singapore Government on Latin American real estate investing, has come up with the following risk measurement. First, a correlation is made with the real estate, for example a class A office investment in Buenos Aires will be discounted by what GSIC would discount a Class A office investment in a principal U.S. city. The spread between U.S. treasuries and Argentina's sovereign debt is then added to the discount rate. In the case of Argentina recently, this spread was 600 basis points.³⁶ By comparing like investments one can account for the deal risk component, although the local real estate market risk is left unaccounted for. The inherent characteristics of real estate markets such as political impacts and the proprietary nature of much of the information make comparing international real estate markets even more problematic.

³⁵ Liang, Youguo McIntosh, Willard "Country Risk Premiums for International Investing" Prudential Real Estate Investors January 2000 pgs. 1-14

Country Risk Factors Used for Latin America



Assumptions for spreads of sovereign bonds over similar US Treasuries

Source: Morgan Stanley Dean Witter Research

It is one thing to look at current spreads determined by the public markets, but that is only a snap shot and an investor should be aware of the degree to which those spreads can change and what makes some countries more volatile than others. The Argentine sovereign debt spread over U.S. treasuries increased by more than 200 bps, from 468 in early March 2000 to 672 in the week ending June 2. This was in response to the increase in U.S. interest rates, which have made the considerable Argentine foreign debt more expensive. Debt instruments in other Latin countries, Brazil, Peru, Chile and Venezuela saw increases of between 100 and 150 bps (100 in the case of Chile).³⁷ The countries with less foreign debt exposure are obviously less vulnerable to changing U.S. interest rates. The above suggests that exposure to foreign debt plays an important role in country risk, a sentiment that was echoed by a notorious Chilean economist who commented that, “the Latin countries that depend most on foreign financing will be most complicated by rising rates and less international liquidity. Fiscal problems and social conflict are demonstrating Argentina’s vulnerability”.³⁸

³⁶ Interview with Scott Peterson, Senior Investment Manager

³⁷ From the Santiago daily El Mercurio “Se Profundiza la Crises Economica Argentina” June 3, 2000.

³⁸ Hernan Buchi, From the Santiago daily El Mercurio “Periodo de Siembra” May 29, 2000.

Using the spread on sovereign bonds may be slightly inaccurate, due to the fact that investing in a foreign country and holding a foreign bond are not identical. A bondholder can at best get his principal and interest back and at worst lose his principal. A foreign investor in real estate may have significant upside potential and an ability to manage downside outcomes. The probability of expropriation of a local project typically is lower than the default risk of a developing country's Government bond. The spread on sovereign debt theoretically prices the risk that a country will default on a loan, however, a country could default on loans without risking a foreign investor's real estate investment. Beyond the deal and market risk, which includes currency risk, country risk should not necessarily amount to much because it is extremely unlikely that political events will jeopardize a foreign investors real estate ownership. It may be more appropriate to use the spreads on U.S. dollar denominated local corporate bonds versus U.S. Treasuries.³⁹ The point is that a public securities approach to risk evaluation may be convenient and largely an accurate measure of the impact of country risk on a particular securities class, but may not be an entirely apples to apples comparison.

One of the biggest investment considerations when investing in South America is currency devaluation and although it is a component of country risk, recent crises made it especially topical. Foreign investors have become particularly sensitive to this risk in lieu of the Mexican crises in 1994 and more recently, the Russian crises that had a direct impact on Brazil and the neighboring countries. The driver behind such devaluations seems to be the withdrawal of capital from these economies. "More than any other factor, it was the reversal of bank loans which was responsible for the intense crisis of the emerging markets in 1997-99. "As soon as the banks started to withdraw their loans en masse, the emerging market economies faced a crisis of illiquidity (no short-term capital available), collapsing exchange rates, failing banks

³⁹ Abuaf, Niso Chu, Quyen "The Executive's Guide to International Capital Budgeting: 1994 Update" Salomon Brothers August 1994 pg. 11

(because the emerging markets' own banks could not survive when the foreign banks pulled the plug on bank lending) and sky-rocketing interest rates.”⁴⁰

Many of the international bank loans are short term and the borrowers often make long term investments, so that when the short-term capital is pulled, borrowers typically do not have sufficient liquid assets to cover the withdrawals. A measure of vulnerability to capital flight is the ratio of short-term international bank loans to the recipient country's liquid foreign exchange reserves. If it is greater than one, the country is vulnerable. In Argentina, the ratio is just under 1.5 and in Chile, just over 0.5.⁴¹ When the debt to reserve ratio is high, capital becomes flighty because as soon as devaluation appears possible, foreign investors panic and withdrawal their capital so as not to get caught short.

One way of effectively dealing with currency risk in foreign real estate investments is to charge rents in U.S. dollars. This is a strategy deployed by Hines, an international real estate development company based out of Texas, and is made possible by the fact that they build products for multi national corporations for whom dollar denominated rents are not a problem. Telecom hotels that are rented to large multi national telecom companies should likewise be able to benefit from dollar denominated rents and therefore the discount rate should be largely a reflection of deal and market risk. Data storage centers will be more problematic because the end user, in many cases local internet companies, will not likely be able to pay in dollars. Therefore, the master tenant such as a Globix or Exodus will not be willing to commit to dollar denominated payments on the master lease. In these cases a currency risk premium will have to be built into the discount rate. The spreads on sovereign bonds are a good starting point for arriving at this premium, but because those spreads account for default and currency risk they may exaggerate the risk premium that should be applied to a real estate investment.

⁴⁰ Global Competitiveness Report 1999 pg. 18

⁴¹ Ibid, pg. 18-19

CONCLUSIONS

Deregulation of the telecommunications industry and the internet revolution have spawned the development of two similar new building types, the telecom hotel and the data storage facility. Both are equipment intensive buildings that require most of all, abundant and redundant power and connectivity. It appears to be more common for the vertically integrated service oriented data centers to be owner-occupiers and for the telecom hotels to be leased. In either case when the buildings are leased the terms are necessarily long due to the very high capital costs of equipment installations and tenant improvements.

Demand for both building types is on the rise, although, it would seem that demand for data storage facilities will be greater and last longer. This speculation is based on the notion that global telecommunication capacity has been expanding at astronomical rates as numerous providers of fiber networks are aggressively laying cable. Telecom hotels will continue to be built at the end and origination points of these networks, but once the infrastructure and connecting equipment is in place, demands for increased capacity will probably be met by existing line capacity and or line enhancing technology. Additionally, as switching equipment becomes more sophisticated, the real estate requirements could probably be met with small increments to existing facilities.

The demand for data storage facilities, on the other hand, will likely be greater because now that the internet infrastructure capacity has been enhanced, users are understanding its potential which is generating internet demand from new and old economy companies alike. New ways of becoming more efficient and utilizing the internet are continually uncovered and it appears that new uses and applications of the Internet will continue to be uncovered for a long time as all industries strive to embrace the benefits that the internet can offer. Data storage facilities will be one of the many beneficiaries of the newfound uses for and applications of the Internet. Imagine a high volume clean water connection that runs to a town. Where the main line ends there will have to be a water utility substation where access to the water

is controlled, this is analogous to a telecom hotel. Homes and businesses will require varying water volumes and quality. The facilities that contain and distribute the water to different users could be analogous to data storage centers. As the town grows, demand for water will increase and so will the demand for water containment and distribution facilities. The Internet community is like a boom town and although the capacity rich main ducts are, or will soon be, in place, the resource storage and distribution facilities will be forced to continue to grow with the demand.

To create a market for telecom hotels, a deregulated telecommunications industry is critical, and the most important component of such deregulation is that which allows for co-location of equipment. In this sense, Chile is more attractive from a telecom hotel development standpoint than Argentina. Although the regulatory environment is in place in Chile, the local incumbents control of the various market segments have limited competitor interest and therefore it is questionable if there is or will be sufficient demand for telecom hotel development in that country. In Argentina, co-location is not required but competition is being promoted through the issuance of long distance and local licenses. It is not unlikely that owing to the size of the Argentine market and the advent of telecommunication competition, there will be considerable demand for telecom hotel development. For data center companies to become interested in a market there must be significant demonstrable demand for their space and services. This demand comes from Internet activity, which is a product of computers, working telecommunications, and telecom hardware that can support high bandwidth. In both Chile and Argentina, Internet growth is on the rise, and there is and will be opportunities for the development of data storage centers.

Appendix – Country Specifications

	Argentina	Chile
Population (m)	36.5	15.0
GDP per capita (US\$)	\$8,594	\$4,547
Wireline Penetration	22.0%	18.5%
Wireless Penetration	14.0%	14.3%
PC Penetration	6.5%	5.2%
I-accounts ('000)	450	210

Source: ABN AMRO estimates

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