An international forum for the expression of ideas and opinions pertaining to the submarine telecoms industry
Welcome to the 19th edition of Submarine Telecoms Forum, our Legal and Finance issue. The long awaited thaw has yet to come to Virginia. What we thought was the beginning of another long spring was stymied by not one, but two major snowstorms that blanketed the American northeast in the past few weeks. Our crocuses and daffodils have seemingly stopped their annual ascent in mid stride as if reconsidering a longer winter slumber.

Yet there is green, too. If I look closely those same flora are growing day by day, albeit in spite of the frost, not in a single spurt, but in a slower, pedantic less noticeable pace - like much of our industry’s new business of late.

This issue, like spring, brings together a variety of interesting vantages. Larry Schwartz’s vision of the industry is revealed, while Andy Lipman discusses the future of IRUs. Doug Burnett describes some new developments on out-of-service cables, while Steve Wells, Basil Demeroutis and Ian Fletcher outline the project financing process. We continue the multi-part serialization of From Elektron to ‘E’ Commerce. Jean Devos returns with his ever-insightful observations, and of course, our ever popular “where in the world are all those pesky cableships” is included as well.

Good reading.
Alcatel Signs Contract with Nigeria’s Globacom
Alcatel has announced that it has signed a contract with
Globacom, Nigeria’s second national operator, to deploy the latest
mobile and fixed multimedia services.

Asia Netcom to Add US PoPs
Asia Netcom plans to install PoPs in New Jersey and London,
locations.

Batelco and Telecom Italia Sign Agreement
Batelco also announced that it has signed a BD9 million
agreement with Telecom Italia to provide high-speed leased
circuits between Bahrain and Italy for the next three years.

BT Completes Acquisition of Infonet
BT has announced the completion of the acquisition of Infonet,
one of the world’s leading providers of global managed voice and
data network services for corporate customers.

BT Opens Global Network Control Center in
Amsterdam
BT has announced the opening of a new Network Control Center
(NCC) in Amsterdam, responsible for monitoring BT’s global data
network.

Citigroup Reaches Settlement on Global Crossing
Class Action Litigation
Citigroup has announced that it has settled class action litigation
brought on behalf of purchasers of Global Crossing securities
which was pending in the United States District Court for the
Southern District of New York as In re Global Crossing Ltd.
Securities Litigation, No. 02 Civ. 910 (GEL).

Equant, FT Sign Definitive Agreement on Purchase
Equant has announced that it has signed a definitive agreement
with France Telecom providing for the purchase by France
Telecom, and the sale by Equant, of substantially all of its assets
in exchange for the assumption of all of its liabilities (other than
certain retained liabilities relating to the Agreement) and a cash
payment equal to approximately €1.26 billion.

FibraLink Jamaica Awarded Cable License
Cable Bahamas Ltd. has announced that FibraLink Jamaica Ltd.,
a controlled subsidiary of its wholly owned subsidiary, Caribbean
Crossings Ltd., has been issued a license by the Jamaican Office
of Utilities Regulation (OUR) to build and operate a submarine
fiber optic cable to Jamaica.

Fujitsu Wins Contract to Upgrade World’s Longest
Intercontinental Submarine Cable System with
Next Generation FLASHWAVE Solution
Fujitsu Limited (TSE: today announced that it has been awarded
a multi-million dollar contract by the “Sea-Me-We 3(“) consortium
to deploy Fujitsu’s next-generation FLASHWAVE S650 submarine
transmission equipment.

Citigroup has announced that it has settled class action litigation
brought on behalf of purchasers of Global Crossing securities
which was pending in the United States District Court for the
Southern District of New York as In re Global Crossing Ltd.
Securities Litigation, No. 02 Civ. 910 (GEL).
Global Crossing Names New Financial Leadership Team

Global Crossing has announced the appointment of a new financial leadership team with backgrounds in finance and telecommunications, as the company enters a new phase in 2005.

www.subtelforum.com/NewsNow/27_february_2005

Global Crossing Wins Contract to Connect Telmex Operations

Global Crossing has announced an agreement with the Telmex Group of companies, which includes Teléfonos de México, Mexico’s largest telecommunications company.

www.subtelforum.com/NewsNow/27_february_2005

Global Crossing, NWT Form IP-VPN, IPLC Alliance

New World Telecommunications Ltd. (NWT) has announced that it has forged a strategic alliance with Global Crossing that will deliver to multinational enterprises seamless, secure, reliable multi-protocol label switching (MPLS) IP VPN and international private leased circuit (IPLC) services spanning more than 500 cities in 50 countries. By interconnecting their state-of-the-art networks, the two companies will deliver a unified, superior experience to their multinational customers worldwide, NWT said in a statement.

www.subtelforum.com/NewsNow/30_january_2005

HDTV Trial in Japan

Asia Netcom, a wholly-owned subsidiary of China Netcom, has announced that its Japan operation, Asia Netcom Japan, together with partners, Miyagi Networks and Frontiers, have successfully completed one of the world’s first large scale trials of transmitting high-definition television (HDTV) over a shared Internet backbone.

www.subtelforum.com/NewsNow/27_february_2005

HGC and TTC of Russia Seal Agreement on Trans-Europe-Asia Data Services

Hutchison Global Communications Limited (HGC) and TransTeleCom Ltd. (TTC) of Russia have reached a partnership agreement to jointly roll out international data services. The services will be provided via a reliable trans-Europe-Asia land cable platform.

www.subtelforum.com/NewsNow/6_february_2005

Jamaica License Awarded to TCCN Consortium

Trans-Caribbean Cable Company (TCCC) has confirmed that its license proposal submitted on November 1, 2004, resulted in the issuance of a license by the Jamaican government on December 20, 2004.

www.subtelforum.com/NewsNow/9_january_2005

Nexans to Supply System for African Oil Field

Nexans has been awarded a contract worth approximately 9 million Euros by Perenco, an independent European oil company, to deliver power and control cables for the development of its oil fields, located 40 kilometers off the coast of Gabon, West Africa.

www.subtelforum.com/NewsNow/30_january_2005

Nexans Wins Windfarm Contract

Nexans has signed a deal worth more than 8 million Euros, with the consortium of Vestas Celtic Wind Technology Ltd and Kellogg Brown and Root Ltd (VKBR), to supply the Barrow Offshore Windfarm (BOW).

www.subtelforum.com/NewsNow/14_march_2005

PTCL Lowers Prices for SEA-ME-WE-3 Capacity from Pakistan

Pakistan Telecommunications Company Ltd. (PTCL) has lowered its pricing for full circuit IP backbone connectivity from Pakistan via SEA-ME-WE-3.

www.subtelforum.com/NewsNow/30_january_2005

Qtel Teams With AT&T and NavLink

Qatar Telecom (Qtel), AT&T and NavLink has announced that they have signed an agreement to extend the AT&T Global Network (AGN) in the Middle East region through the deployment of a state-of-the-art AGN node in Doha, the Qatari capital.

www.subtelforum.com/NewsNow/27_february_2005

REACH Says Owners Taking Up All Its Data Inventory

REACH, the Asian-focused international wholesale carrier, has announced that its entire data inventory will be consumed by its shareholders’ needs.

www.subtelforum.com/NewsNow/9_january_2005
SBC to Acquire AT&T
SBC Communications Inc. and AT&T have announced an agreement for SBC to acquire AT&T, a combination that creates the nation’s premier communications company with unmatched global reach, the companies announced in a joint statement.

www.subtelforum.com/NewsNow/6_february_2005

ingTel Connects Tokyo and Melbourne for Australian Open
Singapore Telecommunications Limited (SingTel) has announced that NEXION Corporation Limited (NEXION) has chosen SingTel to connect Tokyo and Melbourne. The term contract will allow satellite TV viewers in Japan to watch the Australian Open, Australia’s biggest tennis event, ‘live’.

www.subtelforum.com/NewsNow/9_january_2005

SMITCOMS, New World Announce Deal
New World Network, Ltd., the principal owner of the Americas Region Caribbean Optical-ring System (ARCOS), has announced that a major contract was signed to provide SMITCOMS Inc., a major international telecommunications service provider in St. Maarten, Netherlands Antilles, with international connectivity to the new SMPR-1 undersea fiber optic system.

www.subtelforum.com/NewsNow/14_march_2005

Sprint Teams with Reliance Infocomm to Expand IP Network to India
Sprint has announces the expansion of its global SprintLink(SM) internet protocol (IP) network to India as a part of continuing efforts to serve the global communications needs of U.S.-based and global multinational corporations.

www.subtelforum.com/NewsNow/9_january_2005

Suggestions for Implementation of PTCL Broadband Policy
Pakistan Telecommunications Company Ltd. (PTCL) is in the process of formalizing local content hosting facilitation mechanism based on the new broadband policy guidelines given by the Government of Pakistan.

www.subtelforum.com/NewsNow/27_february_2005

Sweden-Latvia Link to Enter Service
Baltcom Fiber, a division of Baltcom telecommunications, has selected Lumentis to provide a 2.5 Gbps submarine data transmission link on a cable between Sweden and Latvia to support commercial Internet and voice traffic, as well as to secure future expansion in the region.

www.subtelforum.com/NewsNow/27_february_2005

TYCO Telecommunications And XchangePoint To Deliver Ethernet & Internet Peering Services
Tyco Telecommunications, a leading provider of international wholesale capacity, colocation and managed services, and XchangePoint, Europe’s first multi-country neutral peering point, announced today they have formed a strategic business relationship to deliver a fully-integrated multi-venue Ethernet/Peering solution for European customers.

www.subtelforum.com/NewsNow/30_january_2005

Tyco Telecommunications Opens Industry’s First Fully Integrated Submerged Equipment Manufacturing Facility
Tyco Telecommunications, a leading supplier of undersea fiber optic networks and marine services, announced today the strengthening of its Newington, NH manufacturing operations with the integration of its undersea repeater production capabilities into the existing Tyco Integrated Cable Systems (TICS) manufacturing facility.

www.subtelforum.com/NewsNow/9_january_2005

Tyco Telecommunications Providing Colocation Services To Portugal’s NFSI
Tyco Telecommunications, a leading provider of international wholesale capacity and colocation services on the Tyco Global Network (TGN), announced today that it has signed a multi-year contract for premium colocation services at the TGN Lisbon TelExchange Center (TEC) with Portugal-based NFSI, a rapidly growing Internet service provider and value-added service host.

www.subtelforum.com/NewsNow/7_march_2005

WFN Strategies Receives US Government Contractor Certification
WFN Strategies recently announced that it has received US Government Contractor Certification from the National Association of Government Contractors.

www.subtelforum.com/NewsNow/7_march_2005
Hi, Wayne,
Happy New Year!
I have received your Issue 18 of STF, for which thanks and, as usual, it is very interesting. However, I am very saddened to read of the passing of Ted Breeze. I remember him very well and liked him a lot, and also have some happy recollections of meeting him from time to time, in various places. Please convey my condolences to his family, if you will.
Ian Bell, Esq.

Wayne:
I noted your personal letter in the forum this month. I appreciate your loss and perspective.
Neil Rondorf, SAIC

Wayne,
Just received your SubTel Forum, and read your letter. I heard the news via Graham Marle, and it really hit me. A sad loss to us who knew him personally and I thought of you and others when I heard. I suppose I felt a little pang of guilt as well as grief, - we lived in the same town but never saw each other apart from in the work environment. That said he always had that cheerful greeting, and seeing him at SubOptic where I spent time talking to him was a real pleasure.
We are all the poorer for it and I suppose he also leaves us with a warning. Life is for living, as its duration is unknown.
Dick Borwick, Global Marine

Dear friends,
I received your 2005 Calendar. Thank you very much.
Fabian R. Vergara del Valle, Colombia Telecomunicaciones S.A. E.S.P.

Wayne,
This is a great issue, very informative. One of the best!!
Jean Devos, Submarcom consulting
Are business conditions improving or getting worse, and are you optimistic or pessimistic about the future?

With subsea capacity pricing having plummeted in the last few years and significant amounts of excess capacity still existing in many regions, we’re very realistic about the challenges our telecoms customers continue to face but we’re optimistic about our ability to succeed in this environment.

Perhaps not surprisingly, as cable system operators’ margins have dropped, operators have focused on their primary O&M cost, that of marine maintenance, to reduce their operating costs. Global Marine has reacted favorably to customers’ demands for lower maintenance costs and Global Marine has itself also modified the way in which it operates to ensure that we can reduce costs and, at the same time, increase quality.

In the last two years, Global Marine has invested more than 10,000 man-hours into research and development, primarily to find innovative ways to improve our overall costs, which translate into reduced maintenance costs for our customers. For example, we’ve found a way to grapnel more efficiently for a cable to be repaired. In addition, we’ve radically improved the processes involved in constructing a universal joint including the way in which our teams work, with the result that we’re much quicker at constructing joints and we’re also having fewer failures. We have received very positive customer feedback for these improvements and consequently we now see Global Marine as industry leading in this area. These innovations have meant that overall time to repair a subsea fault has been reduced significantly, translating into lower costs for our customers.

We’ve also been able to dramatically restructure our own costs over the past few years so we can deliver the same high quality service at improved price points.

What do you see as the short-term and long-term health of the international telecoms industry?

We certainly expect to see some additional consolidation in the international telecoms market, as evidenced by the recent announcements concerning AT&T and MCI, but we’re also mindful of the fact that consolidation of operators is easier said than done. It is always a challenge for an acquiring operator to find the cost synergies necessary to justify an acquisition since those synergies usually come primarily in the form of network consolidation, and network consolidation is typically an expensive proposition given the contractual commitments that relate to the network infrastructure itself.

In the short-term most large operators will continue to seek to run their networks in the most
efficient manner possible and continue to wait out the storm. Long-term we expect that, through a combination of select consolidations, operational efficiencies and increased traffic, the international telecoms industry will once again begin to make plans for future new-build transoceanic projects. Reasonable people can differ on when that may happen, but for Global Marine our viability as a healthy, independent leader of installation and maintenance isn’t dependent on these projects coming back within a particular time-frame.

Who do you see as your customers, and how do their past requirements compare to those in the future?

Our customers fall into three general categories: international telecoms operators; regional operators; and others. Whereas historically international operators tended to look to us for installation services associated with transoceanic new-build projects, for the foreseeable future they primarily look to us to deliver maintenance services in the most efficient manner possible. For the reasons I previously mentioned, Global Marine is well-equipped to meet these new priorities.

For regional operators, they continue to look to Global Marine for both installation and maintenance services. In addition, unlike large international operators, the regional carriers often are smaller and more entrepreneurial organizations. This often means they look to Global Marine to provide additional value-added services based on the breadth and depth of our experience on these projects. Indeed, we can often provide assistance at a very early stage as the business plan for the project itself is still being developed.

Our other customers include a wide-range of players, such as energy and environmental companies. We don’t see their requirements changing too much but we do see an uptick for Global Marine in these types of opportunities.

From your perspective, what is the state of the market, and how will your company cope with the change?

The state of the market is probably best described as challenging. Due to greater focus on costs and some consolidation, it is semi-stable at extremely low margins. For operators, equipment vendors and marine companies like Global Marine, it’ll continue to be a challenging environment for the foreseeable future. Having said that, we’re confident of Global Marine’s ability to excel, and not just cope, in this environment.

Our confidence comes from three fundamental factors: first, we’ll continue to offer industry-leading services at competitive prices; second, we’ll maintain our dynamic, entrepreneurial focus as a leading independent company; and third (and most importantly), we’ll continue to leverage the tremendous expertise, work ethic and pride of the Global Marine management and employees. Our work force has fought extremely hard over the past few years through a very difficult environment, and they bring a skill-set and determination to every project that is truly impressive.

In your opinion, what does the industry most need?

Well, with respect to marine companies, we think there are still too many cable ships. As a result, we expect to see some more consolidation in the marine market among installation and maintenance providers. While our primary focus is on our own organic growth, we continue to evaluate opportunities to acquire other marine businesses.

At the level of regional operators, we think they have at times been unfairly penalized by a perception that their projects aren’t fundable simply because of the general market view that there’s too much capacity available generally. While it is certainly true that over-capacity exists, there remain pockets of regional opportunities that should be finance-able.

At the level of international operators, we think they’re generally on the right path of being cost-focused to address their own margin challenges. Lastly, at the level of equipment companies, it wouldn’t be too surprising to see some consolidation there as well.

What are your views of the future of the market?

I suppose that one of the most significant views about the future we have relates to the dynamic between traditional zone agreements and those of private maintenance in the Atlantic. The traditional zone model works well when you have new cable systems being built and entering the zone at a rate faster than the rate of old cables being retired out of the zone. As we all know, that isn’t the case in the Atlantic.

This dynamic of fewer cables in the Atlantic means that each remaining member of the zone bears an ever-increasing percentage of maintenance costs. In other words, the cable owners take the risk on
the "cooperative" costs in the zone. And since no cable operator can predict what will happen to other operators in a zone, there's no ability for operators in a zone to predict with certainty what their O&M costs will be for the term of the agreement.

In our Atlantic “Guardian” private maintenance contract, there's no "cost sharing" model. As a result, the cable operator knows exactly what his costs will be for the term of the agreement. This ability to predict costs with greater certainty enables the Atlantic cable operator to budget better and operate more effectively in today's competitive marketplace.

Since 2001, Submarine Telecoms Forum has been the platform for discourse on submarine telecom cable and network operations. Industry professionals provide editorial content from their own niche and focus.

Each bi-monthly edition includes commentary and information on system and service provision, and issues critical to the industry.

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Global Marine Systems
Is an IRU a Safe Bet for Submarine Capacity

by Andrew Lipman

During the late nineties, a number of companies ventured into connecting the world through numerous privately owned submarine cables and “sold” significant amounts of telecommunications capacity in the form of Indefeasible Right of Use (“IRUs”). Subsequently, in the past few years, several of these submarine network providers, including Global Crossing and FLAG, went bankrupt. Although the worst years for the telecommunications industry appear to be over, it is important for future telecommunications capacity purchasers to ascertain what risks, if any, they may be assuming if they “purchase” some amount of submarine capacity in the form of an IRU.

IRUs were originally developed in the context of submarine fiber optic networks, where they continue to be the usual means how capacity is conveyed. Nowadays, IRUs are prevalent throughout the telecommunications industry as a means to transfer rights to network capacity for long periods of time. However, what is an IRU? What type of rights are associated with it? What would happen to these agreements in the event of bankruptcy of the grantor? These are some of the questions that to date have not been squarely addressed by any court in the United States. Of particular concern to purchasers of submarine capacity, is whether these types of arrangements can be considered “executory contracts” in the context a potential bankruptcy of the network owner, and can be “rejected” under Section 365 of the Bankruptcy Code (11 U.S.C. § 365(a)) to the detriment of the IRU holders. Providing answers to these questions is particularly important to potential acquirers of telecommunications capacity in submarine systems around the globe.

If in the context of a future bankruptcy of a network owner, a bankruptcy court were to determine that these types of arrangements are executory contracts under Section 365, the grantor (debtor-in-possession or trustee) may be able to reject the agreement(s) and would be excused from future performance thereunder. The IRU holder may still assert a claim for damages (as an unsecured creditor), but would undoubtedly suffer significant losses, as the IRU holder may be unable to service its own customers until it finds a suitable alternative to the facilities (which may or may not be available) or may be forced to seek bankruptcy protection itself due to its inability to continue implementing its business plan. If such a determination were to be made in the context of a large bankruptcy, it could have crippling effects to the telecommunications industry at large, as many small players could...
be forced out of business because of a judicial ruling.

To try to assess how future acquirers of IRUs can try to protect themselves in the absence of well-defined rules of the road, we turn first to the question of what is an IRU. Not all IRUs are the same and there is no standard definition of what an IRU is. An IRU can be defined as an agreement whereby the owner of the network (i.e., grantor) grants certain rights to a third party (i.e., grantee or IRU holder) over certain telecommunications capacity for a considerable amount of time (generally the expected useful life of the facility). In consideration of these rights, the IRU holder makes a payment to the grantor (usually the total consideration is delivered prior to conveyance of the capacity) and also may make periodic payments for operation and maintenance (“O&M”) of the network. As a general rule, there are three types of IRU arrangements: (i) dark fiber IRUs where the grantor transmits to the holder a right to use unlit fiber strands that have not been outfitted with “electronic” equipment to transmit telecommunications signals; (ii) lit fiber IRUs which convey the right to use fibers that have been equipped with electronic equipment; and (iii) wave IRUs which convey the right to use an absolute amount of bandwidth between two geographic points.

Next we turn to the question of what rights are associated with IRUs. Determining whether an IRU is an agreement that transfers a property right, leases the right of use certain assets, or is merely a service contract, is at the heart if the discussion and the courts answer to this question can have enormous consequences for the telecommunications industry. Several legal commentators have written scholarly articles on the subject and although there is no bright line to answer the question, it is evident that the terms of the particular agreements will determine whether courts will decide the matter one way or another.

Although the most common type of IRU used in the submarine cable context is the lit fiber IRU, it is worthwhile to explore the elements of each of these agreements so we can provide guidance to potential IRU holders. In general, dark fiber IRUs resemble more a sale of property than a lease as: (i) the grantor usually does not have a continuing obligation to operate the conduit or fiber (although in certain cases they also receive O&M fees); (ii) these agreements usually have a term that approximates the useful life of the facility; and (iii) the grantee has either paid in advance or is under an enforceable obligation to pay the consideration to the grantor. Thus, dark fiber IRUs generally should not be considered by a bankruptcy court as an agreement where the debtor still has significant ongoing obligations, and a bankrupt grantor should not be allowed to reject these agreements under Section 365.

Conversely, lit fiber or wave IRUs resemble more a true lease or a service agreement than a transfer of property rights, because the grantor is more involved in the day-to-day operation of the network and therefore has ongoing performance obligations, that if not performed, could render the IRU useless. As such, a bankruptcy court may find these arrangements to be executory and could be rejected by a bankrupt grantor.

However, lit fiber IRU holders may argue that these arrangements are capitalized leases, and may not be rejected by the debtor as the grantee has “economic possession” of the assets underlying the IRU (as IRU holders typically suffer the risk of loss of the facilities and usually also are responsible for taxes and other fees assessed on the underlying assets). Moreover, in many instances the majority of the consideration payable by the grantee is paid prior to the delivery of the capacity and the grantees usually have an option of purchasing the underlying assets (for nominal consideration) at the end of the IRU term. Finally, IRU holders can argue that the FCC has over the years referred to IRUs as conveying many of the “indicia” of network ownership.

Determining what was the intention of the parties in entering into these agreements, would be key for any decision maker. In many instances, it is apparent that both parties intended that the agreement would convey an interest in the networks themselves in addition to an interest in the bandwidth transmitted over such networks. However, in some other cases there are provisions that expressly state that the agreement does not transfer any own-
ership rights to the underlying assets, and that ownership and control of such assets remains with the grantor.

Therefore, what can potential IRU holders try to do? The first thing is to recognize the potential risks associated with IRUs and to be aware that the law is not clear as to what would be the rights of an IRU holder in the context of a bankruptcy proceeding. Second, IRU holders are strongly encouraged to draft IRU agreements in a way that most closely resemble sales or capitalized leases, rather than as service agreements. In addition, the contract drafters must minimize the ongoing obligations of the network owner and try to reduce them to separate documents. Finally, it is important to ensure that O&Ms can be provided by a third party (other than the grantor) so that in the event of bankruptcy a third party can “step into the shoes” of the grantor and provide such maintenance services going forward.

1 Vice Chairman and head of the Telecommunications Media and Technology practice group at Swidler Berlin LLP in Washington, D.C.
2 There is no statutory definition of what is an executory contract. However, under bankruptcy law a contract is deemed executory if the debtor’s performance has not been completed, whereas an executed contract is one in which the object of the agreement is already performed by the debtor.
3 In the bankruptcy context, a bankruptcy court cannot order specific performance of a contract by the trustee or a debtor after it emerges from bankruptcy.
5 See Subramanian supra note 3, at 2111.
One measurable effect of the bursting of the “telecom bubble” is the tremendous number of submarine cable systems that have been recently retired and taken out-of-service. In the 2003-2005 period, at least 22 cable systems were retired or were announced by their owners to be in the process of being taken out-of-service. These systems include Brunei-Singapore, China-Korea, Cuba 7, Gemini, GPT, HAW4, HAW5, HJK, HONTAI II, NPC, PTAT, TAT8, TAT9, TAT10, TAT11, TCS1, TPC3, TPC4, UK-Denmark 4, and UK-Spain 4, UK-Netherlands 12, and UK-Belgium 5.

The retirement life spans of these cables are in almost every case significantly less than the planned commercial life of the systems that characteristically were expected to match the service life of the repeaters in the system of between 20 and 25 years. In one case the cable had only about 7 years of service. The premature retirements of so many modern systems is a direct reflection of the market-shaping forces at work in international telecommunications. These forces include the oversupply of capacity that peaked in 1999-2002, especially in the transpacific and transatlantic routes, and the continued exponential technology evolution that dramatically increased the capacity available in the newest ring fiber optic sub sea systems. One of these new systems has the capacity of several systems which a few years before were then considered to have revolutionary capacity increases. Faced with stiff global competition and declining revenues, cable owners have applied intense scrutiny to the operations and maintenance (“O&M”) costs of their cable systems. Those systems that provide largely redundant capacity have or are in the process of being taken out of service.

The scale of the retirements of so many relative “young” cable systems during the past two-to-three years appears to be without precedent in the 149-year history of transoceanic submarine cable communications. Parallel to these changes is a new interest by coastal state regulators in requiring that out-of-service cables be removed from the seabed. Liabilities for out-of-service cables is also a concern. These changes raise important questions about the legal status of out-of-service cables and the management of out-of-service systems.

The International Cable Protection Committee (“ICPC”) recently responded to these dynamics by issuing its updated “ICPC Recommendation No. 1 Management of Redundant and Out-Of-Service Cables.” The Recommendation, like other ICPC recommendations, generally represents a consensus view of international owners and operators of submarine cable systems. It provides timely guidance for the owners of these recently or soon to be retired cable systems. The Recommendation takes into full account the

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By Douglas R. Burnett

...there are no legal requirements for removal of an out-of-service cable does not mean that the cable owners do not continue to have other legal responsibilities.”
legal status of out-of-service cables. While a full examination of the legal status of these systems is beyond the scope of this article, salient points can be summarized.\(^3\) 

International telecommunication cables enjoy unique status under international law and treaties. The freedom to lay, maintain, and repair international cables is well established in the International Convention for the Protection of Submarine Cables (14 Mar 1884), 24 Stat 989 (1 Dec 1886), 25 Stat 1424, 25 Stat 1425 (7 Jul 1887) TS 380 (“Cable Convention”); The Geneva Convention on the High Seas, April 29, 1958, 13 U.S.T. 2312, T.I.A.S. S200, 450 U.N.T.S. 82 (“Geneva Convention”); and the United Nations Law of the Sea Convention (1982) (“UNCLOS”). As of February 1, 2005, 157 nations are signatories to UNCLOS and 148 nations have ratified the Convention. These treaties do not address removal of out-of-service cables. In fact, only UNCLOS addresses the decommissioning of structures and installations, but essentially those related to natural resources on the seabed. Even these provisions do not include pipelines, let alone cables.\(^4\) The treaties do, however, establish that a coastal nation may not unilaterally impede the universal freedom to lay and maintain cables, especially outside of its 12-mile territorial sea.\(^5\) If any nation were to unilaterally require the removal of cables outside of its jurisdiction, it would be a violation of these treaties. Accordingly, under international law, there is no requirement to remove out-of-service cables. A coastal nation can require removal of an out-of-service cable within its territorial waters. This has been done in the United Kingdom.\(^6\) The issue is whether international cable removal can be required outside of a nation’s territorial seas. In Canada, the province of Nova Scotia,\(^7\) and the United States, New Jersey\(^8\) and California are attempting to implement cable removal regulations or requirements through permitting despite an obvious lack of jurisdiction over international cables outside of territorial seas. As the above legal discussion shows, removal of out-of-service cables outside of national territorial seas is primarily a decision made by the cable owners. The fact that there are no legal requirements for removal of an out-of-service cable does not mean that the cable owners do not continue to have other legal responsibilities. Under international law, cable owners continue to have liability for third party claims for indemnification of sacrificed fishing gear or anchors.\(^9\) Indemnification only validly arises when the owner of the lost anchor or fishing gear makes a sacrifice to avoid injuring a submarine cable and after having taken all reasonable precautionary measure beforehand to avoid the cable.\(^10\) Thus, for example, a fishing vessel which trawls over a charted cable with culpable negligence cannot validly claim for sacrificed gear. Even though the likelihood of successful sacrifice claims are low, the risk is further reduced by the fact that a telecommunications company’s general and excess liability policies on its property already cover this risk. The ICPC Recommendation takes international law into account in providing cable owners and operators with guidelines which can be considered in determining whether a cable which has been taken out-of-service should be removed from the seabed. The Recommendation factors that may be considered in deciding whether to remove a cable include the following:

### Pre-Decision Factors\(^12\)

Factors which cable owners should consider in deciding whether to remove an OOS Cable including the following:

3.1.1 Any potential effect on the safety of surface navigation or other uses of the sea including a comparison of whether removal is reasonable or realistic given the presence of other manmade objects on the seabed such as shipwrecks, debris, and oil and gas structures and installations.

3.1.2 Present and possible future effects on the marine environment. If the cable is composed of material that is inert or environmentally benign, consideration should be given to leaving the cable in place.

3.1.3 The risk that the cable will significantly shift position at some future time.

3.1.4 The costs and technical feasibility associated with removal of cables.

3.1.5 The determination of a new use or other reasonable justification for allowing the cable or parts thereof to remain on the sea-bed.

3.1.6 The comparative environmental impact of leaving the cable in place compared to the disruption caused by attempting to remove the cable.

3.1.7 The management of out-of-service cables as part of the cable protection program.

3.1.8 The potential socio-economic & economic benefits of recovering the cable.

### Post-Decision Factors

If the decision is to retain a redundant cable for future use or to leave an out-of-service cable in place, cable owners should consider implementation of the following:

3.2.1 Notification to International & Natural charting authorities that the cable is no longer in service.

3.2.2 Notification to local fishermen and other seabed users of the change in status, and confirmation that any future claims for sacrificed gear will be considered on their merits.
3.2.3 Confirmation that the cable owner remains responsible to any party by insurance cover or otherwise for the OOS Cable.

3.2.4 Consideration of alternative uses for the cable such as donation to a scientific research today.

With these basic steps, the management of out-of-service cables can be responsibly handled by cable owners and operators as a routine business task. While the recent level of activity in placing cables in an out of-service status may be unprecedented, the applicable international legal norms in UNCLOS govern all international cables, including those which are out-of-service. These norms do not allow coastal nations to require removal of cables beyond territorial seas. Cable owners should evaluate each cable system and make the appropriate voluntary choice by responsibly considering the various factors involved.

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(Footnotes)
1 International Cable Law Advisor (ICLA) for the International Cable Protection Committee (“ICPC”), Partner, Holland & Knight LLP; B.S. U.S. Naval Academy (1972); J.D. University of Denver (1980); Captain, USNR (ret.). The opinions expressed by the author are his own and do not represent the position of the ICPC.
2 Copies of this ICPC Recommendation and other ICPC recommendations can be obtained at no charge by contacting the Secretary, ICPC at www.iscpc.org.
3 For a more detailed legal analysis, see Burnett, “The Legal Status of Out-of-Service Submarine Cables,” J. of Maritime Studies 22 (July-August 2004).
4 Article 6 (3) of UNCLOS does provide for decommissioning of installations or structures on the seabed:
   a) Article 21.3 refers to “facilities or installations” under (b) and separately to “cables and pipelines” under (c).
   b) In Part V of the EEZ a distinction is made between “artificial islands, installations and structures” (cf., Articles 56.1(b) and Article 60 throughout) in respect of which the coastal nation has exclusive rights (Article 60.1-2); and cables and pipelines (cf., Article 58.1), in respect of which all states have rights, so that the rights of the coastal nation cannot be expropriated. Additionally, the wording in Article 60.4-5 regarding a 500m safety zone around installations could not practically be applied to pipelines (or cables).
   c) The same split can be found in Part VI on the Continental Shelf where separate provisions are given in respect of artificial islands, installations, and structures (Articles 79.4 and 80) and in respect of cables and pipelines. (Articles 79.1, 2, and 4) (or Article 79.3 - pipelines only)
   d) The distinction is repeated in Part VII on the High Seas refers Articles 87.1(a) and 112-115 deal with cables and pipelines, while Article 87.1(d) deals with artificial islands and other installations in a context that excludes pipelines. Note that the special regime for cables and pipelines in Article 112-115 also applies to cables and pipelines in the EEZ (cf., Article 58.2) and on the continental Shelf (cf., Article 78.2); which supports the conclusion that cables and pipelines are not covered under Article 60 (and Article 80).
   e) In Part IX on the Area, Article 145(a) refers to “installations, pipelines and other devices” from which it follows that a pipeline is not an installation. Article 147.2 refers to other installations which, from the context, do not include pipelines (cf., another provision of safety zones around the installations). Article 147.3(a) contains a specific provision on the removal of the installations, which is to be solely in accordance with the Provisions of Part XI and therefore not subject to the mandatory rule of Article 60.3; Peters, Soons, Zima, “Removal of installations in the Exclusive Economic Zone”, 15 Netherlands Yearbook of Int’l Law 167,189-190 (1984)
5 See Cable Convention, Art. 1, Geneva Convention, Art. 26, and UNCLOS, Articles 98, 79, 87 and 112.
6 Outside of territorial waters, the Petroleum Act of 1998 in the United Kingdom does address decommissioning of offshore installations and pipelines on the United Kingdom’s continental shelf and requires a comparative assessment to determine whether removal will be required. Submarine telecommunications not involved with the exploitation of petroleum are not covered under this law. The assessment balances the complexity and associated technical risk, risk to personnel, risk to navigation and other users of the sea, environmental impact and cost.
8 The ICPC Comments on Coastal Zone Management; Coastal permit Program; Proposed Sediment Amendments N.J.A.C. 7:74 (submerged cables) January 7, 2002, DEP Docket Number 34-01-12/71 were submitted by the ICPC Secretary on March 7, 2002.
9 See the Cable Convention, Article 7, the Geneva Convention, Article 29, and UNCLOS, Article 115. Legally sacrificed anchor or fishing gear claims are limited to the actual item sacrificed and do not under any circumstances include lost profits.
10 See the Cable Convention, Article 2, the Geneva Convention, Article 27 and UNCLOS, Article 113. The Submarine Cables Act, 47. U.S.C. §§21-23 is an example of national law implementing these obligations.
11 Culpable negligence is conduct which falls short of prudent seamanship.
12 The reader is urged to review the complete ICPC Recommendation, No. 1, only of portion of which is quoted in this article.
The collapse of capacity prices and the scarcity of investment capital have together led to unprecedented pressure on the cost optimisation and robustness of business plans for new networks. This article will approach the problem from both sides - how to minimise the cost of a new network, and how to raise the funds to build it. We first review the key cost elements and their minimisation in the light of clearly defined availability and performance objectives. Then we address the process of raising capital, how investors analyse proposals, the key elements of a good business plan and some examples of what is currently going on in the market.

In the last five years, we have witnessed the biggest change in our industry since long-haul voice cables were first conceived around 50 years ago. It may seem strange to make that claim, in the light of recent technological developments, however we hope to provide some insights by illustrating the symptoms and the underlying financial causes that lead inevitably to our current market conditions. It is really the story of the sudden transformation of international capacity, from a specialised premium product to a cheap open-market commodity, and the reactions of the market to that change.

Many outside observers have remarked that the bursting of the dot-com bubble caused a sudden re-adjustment of demand forecasts. It is of course tempting simply to lay the blame on the dot-com collapse – existing installed cables could meet new, dramatically lower demand for many years to come, particularly with ever-improving DWDM technology. At a superficial level, this analysis has its merits. However, to fully understand the cause of this market change and the impact it has had on our industry, we must first briefly characterise the market that existed prior to the change.

In the early 20th century, trans-oceanic voice communication was achieved mainly by HF radio at huge cost per channel. The subsequent installation of early cables enabled operators to begin developing an international business; however, use by the public at large was still restricted by high pricing. A key feature of this phase was that even allowing for technology development - for example, a shift from co-axial cables to optical fibres - demand exceeded supply. For each major route, a consortium of top-tier telecom operators would jointly fund and project manage the next cable on a superfluous technology. At this point, it was becoming a natural succession from a previous series of cables – or mysterious mutterings in dark smoke-filled rooms.

The complex interplay of elasticity between pricing, supply and demand has thus far led to price declines of the order of 50% per year on many routes. But the turning point has now occurred. For the near future, new capacity will continue to be obtained largely through the upgrade of existing cables at upgrade prices, and not through installation of new cables. Even for new cables, there is no longer any reason to assume that capacity pricing will be that much cheaper, due to the specific mix of fixed and capacity-dependent cost elements in new cables. Technology has become just one of the necessary factors enabling price

The theme that we develop here is that the major market change has been caused by the interruption of the 'virtuous circle', where transport is now such a small part of the total price paid by the end user that demand can no longer be stimulated by international transport price cuts alone – that is, elasticity has effectively gone and further price cuts lead simply to proportionately reduced revenues. This point was bound to arrive sooner or later due to the success of the installed global networks in shifting the capacity pricing bottlenecks back towards the regional and last-mile areas of the national feeder networks.

The process by which systems are initially conceived is largely a mystery to those of us who have not done it. It may be a single brilliant flash of inspiration or a natural succession from a previous series of cables – or mysterious mutterings in dark smoke-filled rooms.
decline, some of the others being fill rate, market elasticity and the rate of cash return (revenues servicing debt capital) to the system owner. The final upgraded capacity is, in a sense, irrelevant - the crucial factors now are the upgrade capacity. This argument, if correct, implies that prices will stabilise at current levels unless cross-subsidy is deployed.

It is worth while pointing out that behind this phenomenon was an influx of 'me-too' investors, anxious to not miss the boat. The collapse of the market was exacerbated by a serious slip in the objective investment standards. It is important to lay out some of the changes of investment behaviour that led to the market as we see it now, with very limited telecom operator investments and the banks all but closed to new telecom build projects.

Until the start of the 1990s tech boom, network construction and in particular expensive international capacity projects had been undertaken primarily by the large carriers who raised capital based on the strength of existing cash flow generated by their decades-old business. As a result of a confluence of factors – the perceived market opportunity but equally as important near-simultaneous deregulation of global telecoms markets, growth in the pool of global capital seeking higher returns – this changed dramatically. Network construction became funded on a “project finance” basis, where the project itself formed the basis for an investment decision. Significantly, the implication is that the future, not the historic, cash flows were used to secure the financing. This project-specific funding relies heavily on the structure and timing of the supply contracts, and the planned revenue profile. The need for proven revenues as a key criterion to obtain finance, shifted to signed contracts, to probable contracts, contracts in the “pipeline” and ultimately what was little more than blind faith in the ability to achieve a target market share. Pre-sales were used almost as equity to increase the ability of the company to raise debt or equity finance.

Thus, the early-stage successes of companies such as Global Crossing were instrumental in attracting less experienced players into the arena, and the market became flooded with competition. This, in turn, emphasized speed to market and cost as the decisive competitive factors. Hence, a new, less virtuous ‘virtuous circle’ emerged – build faster, achieve first to market advantage, grab vendor finance, raise as much external capital as possible, enter a new market and build faster. . . . With few exceptions (e.g., Colt in Europe), operators pursued a land-grab strategy of trying to capture market share, because this was the metric on which their backers had invested.

Further fuelling the fire of unsustainable network expansion, of course, were the vendors. Looking initially to achieve their own top-line growth targets and meet investment market expectations, and later on as a survival issue, they eagerly lent money to their customers on highly attractive terms. At first, 50% to 60% loan to purchase price deals were made available, and later, leverage of up to 80% was possible.

Almost simultaneously, all of these sources of finance – equity, debt and vendor – dried up, leaving the whole industry in the cold. Why this happened is a complex discussion, it could be described as ‘waking up from mass-hypnosis’ or perhaps in more favourable rational terms.

However, it is important to say that without doubt, the current dearth of financing for network projects will end. When, is difficult question to answer. How it will end, is a topic perhaps a bit easier to address.

Much of the following content on cost minimisation will be familiar to those who have been in the industry for a while, but the evidence is mixed on whether more recent market entrants have all adhered to the principles described. We suggest that it would do no harm to review these ideas which seem obvious when written down, but which also seem to be at the root of some of the recent difficulties affecting our industry.

The process by which systems are initially conceived is largely a mystery to those of us who have not done it. It may be a single brilliant flash of inspiration or a natural succession from a previous series of cables – or mysterious mutterings in dark smoke-filled rooms. Whatever the method, the outcome is a rough idea of landings, routes and the identity of parties requiring capacity.

This initial vision will need to be filled out with details. The order in which the details are tied down will vary from case to case; however there will need to be recent, well founded and specific demand studies which will generate a matrix of traffic between the connected nodes as a function of time. Taking the geographical locations of the traffic origins and destinations into account will allow the generation of a first cut at the physical routes. Seabed specialists will give good general advice on areas to avoid due to factors such as anchorages, hydrocarbon activity or geological instability.

The predicted growth of traffic will allow a forecast of the required upgrade potential, and for many cases this will be substantially below the maximum offered by the industry. Although 10G per wavelength is currently the standard, reduced fibre count will reduce the unit cost of cable and repeaters, and reduced wavelength upgrade count will allow repeater spans to increase for further cost savings. New build is not the only option – careful investigation may uncover supplier inventory stock that is heavily discounted, and there may even be entire systems that can be recovered, re-configured and re-laid in a new location at even heavier discounts. The relatively slow movement of transmission technology in increasing cable capacities means that such options can now be realistically considered for stock or segments up to five years old. In addition to the wet plant, the terminal equipment initial and upgrade capacity pricing has improved in recent years as competition and equipment integration have developed.

Of course there will be many options for interconnecting the required landings, and this is the first point where the options of point-to-point, ring or mesh architectures will arise. Choices made here will have first-order impact on the capital outlay and O&M recurring charges, as well as whether the system will meet its availability targets.
Although laser failures and other intrinsic failures should be considered, the dominant failure mode will likely be external aggression resulting in loss of all fibres in the affected cable, so backbone systems or collapsed rings will suffer loss of service unless an instant grade of off-network service restoration has been arranged. Such topologies will require a high grade of cable engineering (e.g. cable armouring and burial) and even then would struggle to achieve the contractual QoS level for voice usage. Capacity in a backbone or collapsed ring cable could be sold cheaply at low QoS as part of a larger meshed all-IP network; however the revenues would be correspondingly lower.

Turning to protected ring topologies, these need not be as costly as might be expected. Indeed, considerable cost savings can be made by designing ring systems that will actually use the ring protection, saving on armour, burial and off-network restoration facilities. Further savings could be made by specifying a slower grade of repair service in the C&MA. There are several examples around the world of ring systems that have had frequent faults without affecting customers although they were not deliberately cost-optimised to that end.

For both the topologies discussed above, the key point is to design the robustness of the system to meet the contractual QoS demands – including external aggression. The repair strategy should also take into account the relative urgency of the repair operations in each case.

Having done the outline design this way, and having found a hungry supplier with an irresistible price, it is time to be seriously building a business plan and presenting it to potential investors.

There are numerous avenues that can be pursued to secure financing for telecoms infrastructure projects such as undersea cable systems. From bank loans to government subsidies, equity to subordinated debt, each of these types of capital come with their own individual merits and of course costs. For the prospective operator, the financial aspect of a project can be as vexing as “repeater spans” or “mesh architecture” are to the financiers. How do we navigate through this and get a project financed?

Essentially, each type of funding source can be defined by the willingness on the part of the financier to trade off risk for return. The bank market, for example, has a very low tolerance for risk but will charge a correspondingly low cost to the operator for the use of its capital. This can be as low as 6% to 7% in some cases. In return, however, a bank may only be willing to advance a small percentage of the total cost of the project, and in most cases will want to take a first lien on the assets of the company. An equity provider, on the other hand, will be willing to take significantly more risk but will expect a commensurately higher return on its capital, say 35% to 40%. In between, there are sources of capital that look more like equity and others that look more like debt.

It can be difficult to know which of these markets to approach for a given project. There is a theoretical optimal capital structure for any project, a mix of equity and debt that generates the highest return for the shareholders. This will depend on the exact nature of the project and the financial forecasts, but we can generally say that ideally you should have a solid foundation of funded equity with a mixture of several types of capital. Of course, to make matters more complicated, the nature of the company’s capital structure must change over the life of the project. For example, equity is generally the first capital in, with banks following later after the future of the project is more secure. Additionally, whether to approach banks or equity investors will depend on the resources of the project sponsors – an undersea project developed by a large multinational firm can be financed much differently than that developed by a new start-up venture.

What are financial institutions looking for when evaluating a project? Generally this can be broken down into several major topics. Firstly, there are the technical aspects – is the project technically feasible. The specific steps to develop a technically sound business plan have largely been covered above. Notably, for financiers, this is only a very small part of their evaluation. It is also, unfortunately, the area that too often gets the most attention from the prospective operator. This is to the detriment of the other critical components of a sound business plan.

Before even looking at the technical feasibility, any financier will first ask the question, does this fit our strategy, and does this make sense as a general business proposition. Each banker, lender, equity investor or strategic partner will have its own opinion as to countries they will invest in, where they want to be in the value chain, whether they want to be asset rich or asset poor, plus a litany of other strategic criteria. The first barrier any project looking for financing must cross is this question of fit. Often it can take dozens of calls before a match is found.

Once through this barrier, typically high on the list of investor concerns is the question of market. The investor will want a detailed market analysis to determine if the demand / supply characteristics are currently attractive and whether they are likely to continue to be attractive in the future. Costs are also a critical component of the business plan and will be subject to intense scrutiny, not only initial capital costs but ongoing operating expenses. The sales and marketing plan will be evaluated carefully. Who are the target customers? How much will be charged for each service? How will these services be sold? And lastly, quality of management is of paramount concern. Investors need to be confident that the management team can execute the business plan and meet or exceed expectations. Throughout the due diligence process, the way questions are answered can be as important as the answers themselves – a well-prepared management team inspires confidence. Investors also look for management with a track record of success.

All these elements – market analysis, costs, sales and marketing, management strength, and yes, the technical plan – are then distilled down to create a detailed financial model. This model is usually built from the bottom up, that is, by taking each type of product and forecasting volumes and pricing to get revenues, by taking each cost line item and breaking it down into its component parts. This can be a time consuming and incredibly complex process, but in completing it both the financier and the company will...
Steve Wells has been involved in submarine systems for 35 years and has studied mechanical engineering, as well as possessing a postgraduate degree Masters in Business. He has worked in research and development for submarine systems for over 30 years, and was a key engineer in burial technology, optical repeater terminations, optical jointing and optical fiber packaging. He was Head of Operations for marine engineering and maintenance at BT with the responsibility of European and Far Eastern permits. He was also Director of Global Fiber Networks at PricewaterhouseCoopers and instrumental in many successful projects over this period. He is Managing Director of WFN Strategies (Europe), located in the UK since 2003.

Ian Fletcher has worked on submarine cable technology for almost 20 years at the BT Research Laboratories at Martlesham Heath, and spent the second half of that time as BT’s head of submarine cables R&D when he worked on the technology of most of the cables landing in the UK. He then joined PricewaterhouseCoopers, in their London-based Submarine Cable Networks unit, where he accomplished investment appraisal, due diligence, dispute arbitration, technical troubleshooting and network valuations. He is a Chartered Engineer (C.Eng) and a European Engineer (Eur-Ing, FEAED) as well as a Member of the Institution of Electrical Engineers (MIEE) and a Member of the Chartered Management Institute (MCM). He joined WFN Strategies in 2003 as Director of Technology.

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Just a few years ago a phone call from Europe to New York or Tokyo was an expensive proposition, even for companies. Now you hardly have to think twice about it. Today, the cost of a transatlantic call is a matter of pennies rather than pounds, thanks to two closely linked phenomena: the deregulation of telecommunications which has unleashed fierce competition between the major players in Japan, France, the USA and the UK and the deployment of intercontinental submarine fibre optic cables. These two events have revolutionised the industry and, just like the laying of the first submarine cable in 1850, are changing the world - at warp speed.

Revolutions, of course, don’t just happen. Twenty years before the first commercial submarine fibre optic cable was laid in 1986, two British scientists working at Standard Telecommunications Laboratories (STL), the research division of STC/ITT in Harlow in the UK, Dr Charles Kao and Dr George Hockham, reported a major discovery:

“A fibre of glassy material constructed in a cladded structure with a core diameter of about 1” and an overall diameter of about 100” represents a practical optical waveguide with important potential as a new form of communication medium...compared with existing co-axial cable and radio systems, this form of waveguide has a larger information capacity and possible advantages in basic material cost.”

PROC. IEE, Vol. 113, No. 7, July 1966

“Larger information capacity” proved to be something of an understatement. When finally glass fibres replaced traditional copper cables the amount of traffic that could be squeezed into a single strand of cable leapt from 5,500 to 12,000 channels but this was only a foretaste of what was to happen in the following years. What nobody realised in the late 1980s was that the ribbons of light beginning to gird the globe wouldn’t just revolutionise conventional telecommunications. Optical cables were also wiring the planet for the Internet. The first submarine cable back in 1850 carried a single channel: today each fibre has a capacity of a mind-boggling 15 million channels. Without them the Internet would soon hit gridlock.

Pure Genius

In 1966, Kao and Hockham had pointed out that the attenuation of glass fibres was not a fundamental property of the fibre itself but was caused by impurities. Reduce the impurities sufficiently and an attenuation of only a few decibels per kilometre, or even less should be achievable. The significance of their proposal was widely realised and led to considerable research effort in the UK and also in the USA, France, Japan and Germany.
purity levels higher than 99.9999%. In 1977, over a 4km stretch between Hitchin and Stevenage, north of London, STL installed the first experimental high-capacity optical system in the UK. The system operated at 140Mbit/s and at a wavelength of 850nm transmitted over graded-index multi-mode fibre and, significantly, proved itself competitive with co-axial systems. But we were still on dry land: it was high time fibre optics got its feet wet.

Cables and Kippers

In 1980 STC, working with British Telecom, installed a short experimental submarine system in Loch Fyne, a seawater loch located to the north-west of Glasgow hitherto renowned for its herring and the beauty of its scenery. The cable for the Loch Fyne project, the world’s first tri-plex CS Iris (III) (a good name for an optical cableship) the following February. Six fibres, four of which were multi-mode for operation at 850nm, and two single-mode test fibres were packaged into the 10km cable which was laid in a loop at an average depth of 100 metres with both ends installed into the nearby Inveraray repeater station. The cable was subsequently recovered and a submerged repeater spliced into the system before being re-laid.

The cable contained six single-mode fibres and could carry a total of 12,000 simultaneous two-way telephone conversations. In a fibre optic system, there are three windows for transmission, 820, 1,310 and 1,550nm. At the longer wavelengths the loss in the fibre is less, this allows greater distances between repeaters and, fewer repeaters means lower costs. The first system crossed the English Channel over a distance of 112km and contained three repeaters.

The experience in Loch Fyne led to the design of the cable that was used in UK-Belgium No. 5, which was the big commercial breakthrough. The UK-Belgium project was the world’s first international underwater optical fibre telecommunications system and operated at the longer wavelength of 1,310nm with single-mode fibres. The work was completed on 4th May 1986 and the link was opened for commercial traffic shortly afterwards. Fibre optics was finally beginning to deliver its promises.

The world’s first optical system being laid in Loch

At the same time, AT&T and Alcatel, working with France Telecom developed their first commercial systems, Optican and Mainland - Corsica respectively. Both were deployed in deep water in order to experiment with new lightweight cables.

It soon became clear that fibre-optic technology offered the prospect of some even more radical technical and commercial solutions. The 133km UK-Channel Islands No. 7 link, operating at the 1,550nm wavelength and completed in 1988, was the longest commercial “repeat- less” system in the world at the time. The system used single-mode technology, high-performance lasers and a new Avalanche Photo Diode or APD receiver, that enable the light signals to travel much further before they need to be regenerated, thus requiring fewer repeaters or, in this case, none at all. The six-fibre pair system had the same capacity as the UK-Belgium No. 5 link with the added advantage that the terminal equipment could be upgraded to operate at 2.5Gbit/s at a later date. The only downside with repeaterless submarine optical cable systems is that you are limited, even today, to a maximum length of 300-400km. So you can’t, with current technology, span intercontinental distances without using repeaters.

Crossing the Pond

Up until the 1960s, the North Atlantic was the most prestigious route for luxury ocean liners and has always been the Blue Ribbon challenge for transoceanic submarine cable technology. Once the new optical technology had been put through its paces over relatively short distances, planning got underway on this Atlantic challenge. AT&T was the lead contractor for the TAT-8 system. The first intercontinental system anywhere to employ optical fibre digital technology. TAT-8 comprised two pairs of fibres. One pair between the USA and the UK, the other between the USA and France, the two pairs separating at a branching unit (located off the European Continental Shelf). A separate pair of fibres connected France and the UK, giving four fibres in each leg of the system.
The advent of branching units brought a new system component, which allowed countries, often smaller nations, along the way to take advantage of the network being laid by dropping a spur cable rather than installing a point-to-point link. The first system of this type was TAT-8, using technology developed by AT&T.

Fittingly, the whole pioneering venture optically linking Europe and North America was an international collaborative effort involving three leading suppliers: AT&T of the USA, STC of the UK and Alcatel Submarcom of France. Their three different designs presented the greatest wet integration challenge the industry had attempted. Naturally, these three manufacturers had different philosophies in their approach to achieving the specified system reliability. The TAT-8 contract required a design life of 25 years and only three ship repairs due to equipment failure: ship repairs take a lot of time and cost a lot of money. Each of the suppliers set up a comprehensive life-testing programme. They also used redundancy arrangements to a greater or lesser extent. Finally, test programmes were initiated to demonstrate that the three designs, along with the three different prototype repeaters, were compatible and worked together successfully. They did and TAT-8 was commissioned on schedule in October 1988. It operated at a relatively modest 280Mbit/s and with a capacity of just under 8,000 x 64 Kbit/s channels (64 Kbit/s digital channel is equivalent to a 4kHz voice channel).

Private Investment Returns

By the early 1980s, AT&T began to assume a monopolistic position in the market and America’s Federal Communications Commission pounced. On 1st January 1984 the FCC broke up AT&T, giving birth to half a dozen operating companies called “Baby Bells” in the process. The UK followed shortly after when the Conservative Government, under Margaret Thatcher, returned Cable & Wireless to private investors. This kick-started the world-wide deregulation of the telecommunications industry. Next came the privatisation of BT in UK followed in due course by the gradual and often less than enthusiastic liberalisation of many other state telecom monopolies across mainland Europe. Due largely to this deregulation within the telecoms industry, the optical era for submarine cables got underway with a vengeance, with tenders issued for projects like PTAT-1 and TPC-3 required in 1989, EMOS in 1990, and TAT-9 and NPC in 1991.

Now the competition was between companies rather than between countries and it was hotting up. EMOS, linking Italy, Greece, Turkey and Israel, marked the beginning of the era of “gloves-off” competition between the leading suppliers. Every system was a little different, influenced by the different technological approaches of the now fiercely competing manufacturers of the four main producer countries, France, Japan, the UK and the USA. With the unfettered interplay of market forces now operating, new suppliers, often from other countries, were able to enter the market. Siemens of Germany developed an innovative cable design for repeaterless systems using a miniature basic cable dubbed “Minisub”; the Italian company Pirelli laid a festoon around Italy; STK of Norway, Ericsson of Sweden and NKT of Denmark all developed their own repeaterless technologies.

A freed-up market also meant survival of the fittest. On the EMOS project, Alcatel with their fibres cocooned inside a steel protective core were able to demonstrate a key advantage over STC to secure the contract. Following its success on EMOS, in 1992 Alcatel was awarded another major project, TASMAN-2, linking Australia and New Zealand and set up a cable manufacturing plant near Botany Bay. In late 1988, STC and NEC working in consortium were awarded the NPC (North Pacific Cable) contract and the following year STC set up a new cable factory in Portland, Oregon. Both Alcatel and STC were going global while thinking local, and the upshot was that by March 1994 Alcatel had purchased STC from its owners, Northern Telecom to form Alcatel Submarine Networks. The unification of Alcatel and STC’s research and development activities, together with the integration of their manufacturing capabilities and resources, was a key milestone in the development of the industry.

Advancing further around the Globe

In mid-1988, a link delivering similar capacity to TAT-8, around 8,000 channels, was installed between the UK and Denmark. The difference was that for the first time
the repeaters were spliced into the cable in the factory, rather than on the ship during loading. This had the double advantage that the system could be tested for overall integrity in comfort on dry land and then be loaded onboard the ship in a much shorter time. The cable industry was hacking its way up a steep learning curve but it was getting there.

In 1989, STC increased cable capacity by the introduction of 420Mbit/s technology and this was employed, that same year, in the first privately sponsored transatlantic cable, PTAT-1. This was the first complete transatlantic fibre optic cable to be supplied by a single contractor, with a capacity of 18,000 channels. The cable was notable because it had more service channels (channels used by the system for housekeeping) than the total capacity of the original TAT-1 system.

Two years later TAT-9, the first repeatered long wavelength (1,550nm) system, and the first to operate at 560Mbit/s, was installed. An underwater branching multiplexer was used at both ends. The European end was divided into spurs to France, Spain and the UK with the multiplexer splitting the traffic. The USA end was split between America and Canada. This system, along with TPC-4 (Trans Pacific Cable 4) in 1992, heralded the beginning of a new generation of 1,550nm regenerative optical systems with significantly greater repeater spacing.

By now fibre optic cables were beginning to snake out from land mass to land mass across the planet. These included Denmark-Russia in February 1992, Russia-Japan-Korea in November 1994 and SEA-ME-WE-2 in mid-1994, which connects Europe to the Far East with a complex multi-landing network. In August of the same year, the pace-setting CELTIC (UK-Ireland) system, was commissioned. It was an impressive 270 kilometres of unrepeatered cable, operating at 2.5Gbit/s.

In the early 1990s, based on the 1985 work of Drs D Payne and S B Poole at Southampton University, the industry began to develop optically amplified systems to achieve longer repeater spacing for a specific bit rate. They were used initially for land cables, and then in repeaters for submarine cable, compensating for the fibre loss without the need for any optical/electrical conversion of the signal. The first fully optical systems, which were laid in 1995 and 1996, were TAT-12/13; both systems operating at 5Gbit/s. Two cables rather than one were deployed across the Atlantic in a ring configuration with one cable protecting the other. Because of the very high capacity of each cable, it was seen that if a single cable was damaged it would be a disaster for the overall transatlantic telephone business. The other early, amplified system was the 2.5Gbit/s Rioja system linking Spain-UK-Belgium-The Netherlands. This was the first system to deploy a ROFA or Remote Optically Pumped Amplifier.

About the time TAT-12/13 was installed, the scientists suddenly produced another couple of tricks from up their sleeves. Firstly, they showed that it was possible to double capacity by adding a second wavelength and that this principle could be extended by up to as many as 16 wavelengths. This technology was branded Wavelength Division Multiplexing or WDM. Secondly, a technique that Alcatel had been working on for some years, Forward Error Correction became commercially viable. This allows the spacing between repeaters to be increased further and has become an essential element of all modern submarine systems. FEC combined with WDM allowed a three-fold increase in the traffic carrying capability of TAT-12/13. This was over-capacity with a vengeance and a shock for both suppliers and operators who thought they suddenly had too much capacity on their hands, and not enough traffic. But this was back in 1995 when the full impact of the Internet had yet to sink in. The relentless explosive acceleration in capacity continued further with the development of DWDM technology, Dense Wavelength Division Multiplexing, which was soon capable of delivering up to 640Gbit/s per fibre pair (64 wavelengths at 10Gbit/s). DWDM takes advantage of the wide bandwidth of line fibre and optical amplifiers by combining multiple traffic streams into a single fibre. Each traffic stream has a different wavelength (colour) and can be combined and separated using optical components. The technique is analogous to splitting white light into the colours of the rainbow using a prism.

Large Sharks, Subatomic Sparks and Burial at Sea

You might think fibre-optic cable laid underwater is relatively safe from damage but in fact the hazards are legion. Sharks, for example, have big jaws, sharp teeth and sometimes peculiar feeding habits.

AT&T was the only supplier to report shark damage, which happened on their early experimental Optic system in the Canary Islands. The cable appears to have been suspended above the seabed, it was therefore moving in the currents and at the same time creating an electrical field. A shark was attracted and took something of a mega bite. The fish lost a tooth, which became imbedded in the cable, so it's unlikely it would repeat the experience. Unfortunately it also caused a fault to the cable. The industry's answer was to develop and use lightweight screened cable, which has an outer metallic screen and has been successfully deployed
around the world in areas of perceived high shark-bite risk. The screening makes the cable more like the co-axial lightweight of the telephone era and eliminates the minute electromagnetic effects that sharks appear able to detect and which apparently make the fish think they’ve found a tasty meal. Beyond 2,000 metres water depth this screen is not required because no sharks are found at these greater depths.

Over its projected lifetime of 25 years, a submarine cable has a lot to put up with. It has to withstand storage, laying, plough burial in water depths of up to 1,500 metres, potential de-trenching and then hauling up to a ship for repair as well as being jointed in a simple and speedy manner. It also has to withstand the perils of the sea. Not just mean fish but also deep-sea pressure in the ocean depths, abrasion in shallower water, mile-wide trawler nets and ships’ anchors.

In the early 1980s, with trawlers increasing in size and with optical cable on the horizon, British Telecom International, after initially opting for bigger and better armour, decided that burial provided greater and less expensive protection. This meant a reappraisal of cable designs and a commitment to developing new cable-laying and recovery techniques.

The first question was how deep should the cable be buried, to best protect it from anchor or trawl damage? After studying the literature and analysing fault reports, a good compromise was struck between security and economics by specifying a burial depth of 600 mm, safe from conventional fishing techniques in most soils but limited protection against anchors.

The next big issue was the methodology. British Telecom International, in collaboration with Soil Machine Dynamics, developed a unique design for a ship-towed plough which underwent a successful sea trial in early summer 1986 and was immediately put to work burying an 88km stretch on the ground-breaking UK-Belgium No. 5 system. This new plough could plough deeper, left lower residual tension in the cable and back filled the trench after minimal disturbance of the seabed. Two years later the same plough was used to bury the UK section of TAT-8 and the UK-Denmark No. 4 cable systems. This plough was a major step forward from the “sea plow” developed by AT&T to bury co-axial cables and has become the de-facto industry standard.

The new plough’s performance was exemplary but it wasn’t really suitable for burying the final splice of a submarine system nor was it economical for reburying short lengths of cable after repair. In the 1970s, France Telecom in collaboration with the French firm SIMEC, successfully developed a tracked trencher called Castor (French for beaver), which was used to bury cable on France-UK No. 4 and UK-Belgium No. 6. It was a bottom crawling remotely controlled tractor, ideally suited to the strong tides and currents found in the North Sea and English Channel. British Telecom designed a similar unmanned submersible known as the BTI Trencher. The Trencher was designed not only to uncover buried cable for fault location and recovery but also to jet a trench alongside surface-laid cable into which the cable could then be lowered. All by remote control from the cableship. This vehicle still operates in the North Sea as a maintenance tool for remedial burial. A third type of burial tool is the free swimming ROV (remotely operated vehicle). This is attached to a mother ship by an umbilical and can carry out fault location, burial, de-burial, and recovery. In response to the increasing depth of commercial fishing these vehicles can operate down to 2,500 metres water depth, well beyond the range of ploughs or tractors.

This improved burial technology achieves three highly desirable goals: it reduces armouring costs substantially; it greatly enhances the reputation of submarine cable for reliability; and it means that trawlemen have one less headache to contend with.

Continued in the next issue....
At submarine depths, goes deeper

Nexans was the first to manufacture and install 384 fiber submarine cable. Nexans has qualified and installed their URC-1 cable family for fiber counts up to 384 fibers.

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Nexans
Global expert in cables and cabling systems
My Dear Friend

My dear friend,

“The Hour of Truth”

The submarine cable supplier industry is approaching the hour of truth, and the cable’s owner needs to recognise it. The market price for a submarine system is not only going down and down at each project, but this price is now at the cost level. The $1B contracts, once natural, are now gone forever!

Some construction costs have actually decreased especially in the electronics and components sectors, but the hyper-pressure on prices by the buyers, together with the hyper-competition between the suppliers have created a dangerous situation from which our industry may never recover.

At today’s market size – a few hundred millions dollars per year in the coming 5 years – and today’s market prices, the present industry structure is not viable.

In front of such an obvious situation it seems to me, my friend, that the supplier industry is heading in the wrong reaction, hiding their head in the sand! Everyone retrenches behind the thick walls of their fortress, waiting for better times, better prices, better conditions! They accept some orders at cost, so as to keep their capability alive!

But it is clear that the market prices will not recover and that there is an absolute need to restructure the global industry.

Two specific areas require immediate attention: The cable manufacture and the marine works. Let’s be simple and clear; the cable needs to be part of the cable industry and the marine needs to be controlled by the cable owners.

In the years to come the market will require no more than 30-50,000 Km of cable per year. Today we have at least four factories, each of them equipped for more than the global need.

And only one is owned by a cable maker who is in the best position to properly buy the raw materials, manage the personnel on a bumpy road, and then optimise the costs. Two factories would be the right structure.

On the ship side, the cable owner needs to get their maintenance at cost and at a cheap cost. The maintenance is the real driver; laying is a side business. No room there for extra margin. The cable owners are presently in a contradic-

tion: They prefer to outsource such service but they need it at cost. So the solution is that in each “Maintenance Zone”, a couple of their members own and operate ships for the benefit of the group. Making one or more of their ships available for laying operations would further decrease their maintenance costs.

My friend, in my last letter to you I was stressing the necessity to structure the Japanese industry. Here is yet another example to highlight what I try to say: In France, Alcatel divested itself from the cable business. The ex Alcatel cable capability is now with Nexans and Draka. The Calais Submarine telecom cable factory is now the only Alcatel cable plant, when Alcatel keeps moving up the value chain.

On the ships side we have FT(M) and ASN(M), two units offering similar services and competing against each other. This does not make sense in the present circumstances.

A handful of reasonable people, with the help of an external consultant, should sit around a table, forget the history, keep down their emotions and come up with a solution which would better serve the future needs.

My dear friend , most of the “buyers” just think that they will always find a supplier ready to sell and that they can just squeeze and squeeze in a sado-maso way.

But these “buyers” should remember that the supplier’s corporate management acts in the best interest of their own company, which is normal. They cannot stand forever behind a non profitable activity!

Who is taking care of the long term interest of our industry?

Jean Devos

Jean Devos
Submarcom consulting
Member of Don Quixote
Director Axiom
## THE CABLESHIPS

A global guide to the latest known locations of the world’s cableships*, as at January 2005

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* Over 1000 tons
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## UPCOMING CONFERENCES AND EXHIBITIONS

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<td>Submarine Communications World Asia Summit 2005</td>
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<td>Oceans 2005 Europe</td>
<td>20-23 June 2005</td>
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<td>Offshore Communications 2005</td>
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