

From GIBN to GLIF

Early 21st Century subsea bandwidth glut?

APAN 21

Tokyo, January 22-26th 2006

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Dir. Bus. Dev.

IP services and

R&E sector


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In October 1994 Teleglobe and its partners inaugurated Cantat-3 with two fiber pairs, capacity of 5 gigabit (2x2.5Gb) linking Canada to the UK, Germany, Denmark, Iceland and the Faroe Islands.

***Doubled the capacity under the Atlantic
155mb was earmarked for data
Engineering estimated 17 years to fill the cable***

Toward GIBN

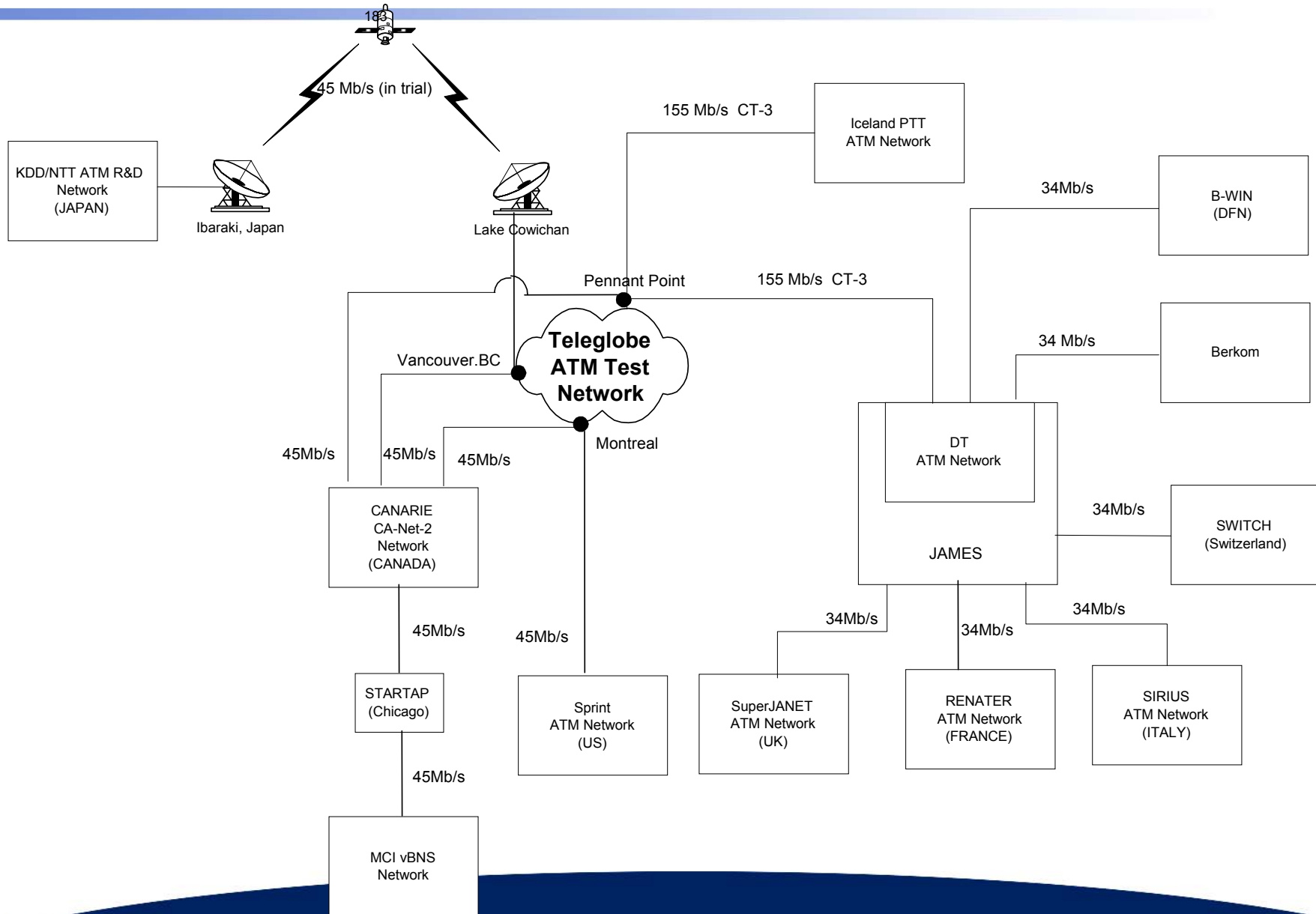
- July 1994: G7 meeting in Naples
 - President Clinton urges the G7 nations to develop an international information infrastructure
 - Decide on ministerial conference on Information Society in Brussels Feb 2005 meeting hosted by the European Union combined with a major industry leaders meeting and technology showcase
 - Feb 1995 Brussels meeting
 - Teleglobe provides a transatlantic STM-1 (155mb) on the new Cantat-3 cable for the showcase; Deutsche Telekom connects the European continental part through James.
 - 11 pilot projects identified including the Global Interoperability of Broadband Networks (GIBN)
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- GIBN meeting January 1996 in Paris

- At the initiative of the NSF and spearheaded by Steve Goldstein, the United States proposes a number of high-performance computing and communications candidate applications that would utilize intercontinental high-performance communications links.
- As part of the Canadian contribution Teleglobe donates the Cantat-3 STM-1 to Canarie for a two year period.
- Japan gets connected with a 45mb satellite link.

Nextgen R&E 1995-1998



Toward build-out madness



- The internet tsunami takes everybody by surprise.
 - Cantat-3 was full in less than 3 years.
 - The magic potion of DWDM : five years later, by the year 2000, cables of 1000 times the capacity of Cantat-3 were being installed.
 - Deregulation, easy access to capital, advances in laser and fiber technology and spectacular internet growth creates a new generation of global cable builders: Global Crossing, Level3, FLAG , 360networks and results in a cornucopia of transmission capacity.
 - Internet folly: myth that traffic will double every 90 days forever.
 - Capacity prices plummet: Trepidation in the R&E community
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The big build out of the early 2000's



- Starting shot was given by Atlantic Crossing (AC1) which came on-line in May 1998 and TPC-5 on the Pacific side in december 98.
 - Level3, Global Crossing, FLAG, 360 networks emerged as the major new generation cable builders.
 - The crowning achievements are the terabit level C&W transatlantic cable and the Tyco transpacific cable; both came on line early 2003.
 - The Atlantic has 4 terabit level cables, the Pacific one
 - A trinity of East-Asia terabit level cables : EAC, C2C and APCN2 and a North Asia terabit loop: FNAL/RNAL
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The Battle of the Atlantic

■ Design capacity and RFS	Gbps	RFS
➤ Level 3/GC (Project Yellow)	1,280	Sep00
➤ TAT-14 (Club)	640	Apr01
➤ Hibernia (360networks, Inc.)	1,920	Jun01
➤ FLAG Atlantic-1 (FLAG/GTS)	2,400	Sep01
➤ Atlantic Crossing -2 (Global Crossing)	2,560**	1Q01
➤ TyCo Global Network***	2,560	Jun02
➤ Apollo (C&W)	3,200	Feb03
➤	Total	12,000Gbps!

Lit capacity early 2005: 2,636Gb down from 2,696 early 2004 with the decommissioning of Gemini in dec 2004 (source: Telegeography 2005)

** Cancelled, AC-2 joining Level 3
 *** sold to VSNL nov 2004

The Battle of the Pacific



■ Design capacity and RFS	Gbps	RFS
➤ TPC-5 (club)	20	Dec98
➤ Southern Cross	480	Nov00
➤ China-US (club)	80	Jan 01
➤ PC-1 (Global Crossing & Marubeni)	640	Apr01
➤ Japan-US (club)	640	Oct01
➤ Tyco Pacific	5,120**	Jan03
➤ FP-1 FLAG Pacific	5,120***	2Q02
➤ 360 Pacific	4,800***	3Q02
➤	Total 6,980Gbps	

** = april 01: Tycom joins FLAG
aug 01: FLAG withdraws, Tycom continues alone
nov 03 : up for sale; nov 04: bought by VSNL

Lit capacity early 2005: 1,140 Gb
(Telegeography 2005)

***= project dropped

East Asia and North East Asia



■ Design capacity and RFS	Gbps	RFS
➤ EAC *	2,560	Jan01
➤ APCN-2	2,560	Dec01
➤ C2C	7,680	Dec01
➤ FNAL/RNAL	2,880	Jun01
➤	Total 15,640 Gbps	

* Asia Netcom takes over EAC in jan 2003

Lit capacity early 2005: 560 Gb
(Telegeography 2005)

The three East Asian telecommunication aortas

APCN2




C2C



EAC



Remarkable Central Asian build-out

- i2i: RFS april 2002; 8.12Tb capacity; 160Gb lit
50% Bharti 50% Singtel owned
 - Feb 2004: VSNL and Asia Netcom announce their Tata Indicom Chennai-Singapore cable ; RFS was nov 2004 with an initial lit capacity of 320gbps and a design capacity of 5.12Tbps; will connect into EAC and on to North America.
 - Together with i2i and the upcoming Seamewe-4 these 3 cables will greatly contribute to ensure India's continuing growth in the Global Economy.
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The South-American Gold Rush



■ Design capacity and RFS	Gbps	RFS
➤ Americas II	80	aug00
➤ Mid Atlantic Crossing (MAC) *	320	jun00
➤ Pan American Crossing (PAC)*	240	mar00
➤ Globenet **	1,360	jun00
➤ Emergia ***	1,920	mar01
➤ BICS	240	jul01
➤ ARCOS	960	dec01
➤ Other	46	
➤	Total	5,166Gbps!

Lit capacity early 2005: 507 Gb
(source: Telegeography 2005)

* Global Crossing

** Formerly 360americas, now Brazil Telecom owned

*** Telefonica Spain

Circling the African continent



■ Design capacity and RFS	Gbps	RFS
➤ SAT3/WASC/SAFE	120	apr02
➤ Africa One		cancelled
➤ Other	1	
➤	Total	121Gbps

Lit capacity early 2005: 61Gb
(source: Telegeography 2005)

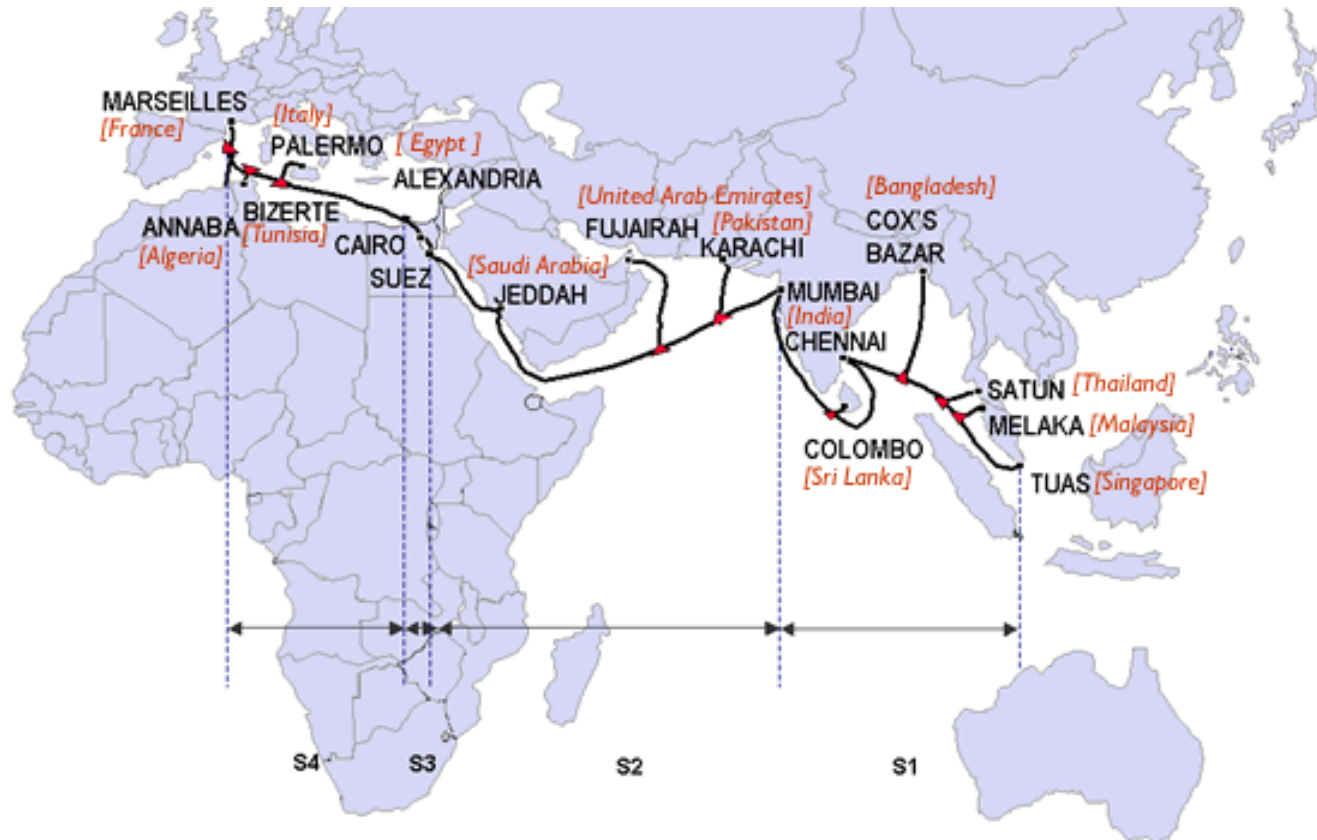
**Real Need for cable along African
East-Coast: EASSY project**

Closing the loop : Europe-Asia



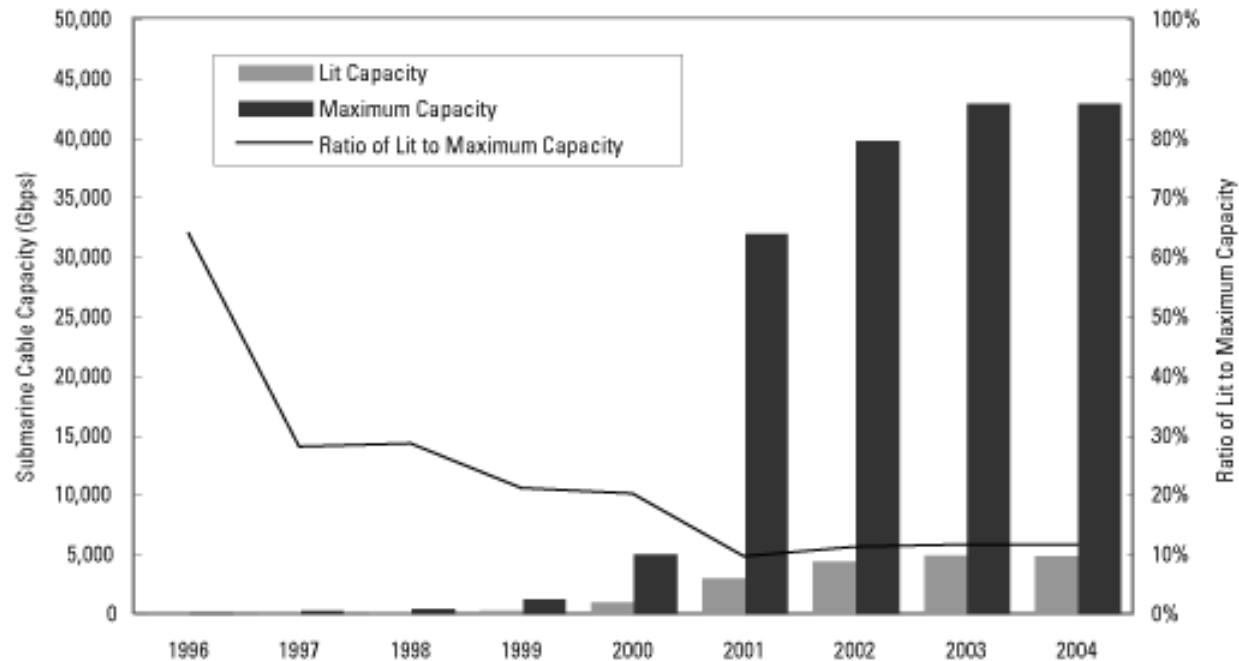
- **With the activation of the C&W Apollo the Tyco cables early 2003, the current phase of intense transatlantic and transpacific build-out has come to an end.**
- **The weak point was Europe-Asia : with a spectacular surge in activity the loop is closing as we speak:**
 - SEAMEWE-4 cable laying started in feb 05; scheduled RFS date Q4 2005 with 160Gb lit capacity ;1.28Tb/s design capacity. Final agreement had been signed March 28th 2004 in Dubai. Sixteen countries participate including Pakistan, India, Sri Lanka and Bangladesh; the UAE, Saudi, Egypt, Tunisia and Algeria. Inaugurated dec 13th 2005.
 - FLAG(now owned by Reliance of india) announced a similar project called Falcon in February 2004, including Oman, Kuwait, Qatar, Bahrein, Iran and Iraq, 1.28 Tbit design , chose Alcatel as supplier in feb 2005; RFS Q1 2006

Seamewe4



Could there be some oversupply?

The gap between lit and design capacity

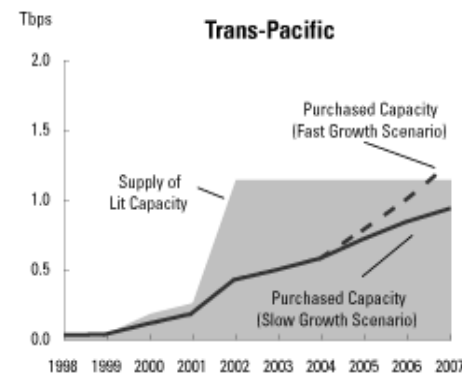
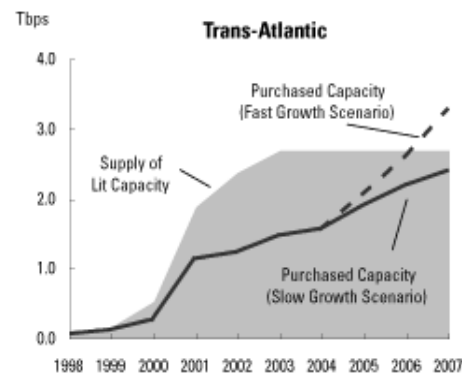


© PriMetrics, Inc. 2005

Not many cable builds likely for the rest of the decade


Lit capacity versus demand

- **Cost to activate all major unlit capacity is high:**
 - transatlantic capacity (9.6Tb) is estimated at \$3.5 billion and \$3.9 billion transpacific (7.9Tb) and \$12 billion intra Asia (15.6Tb). (source: Telegeography 2005)
 - Some additional lit capacity likely needed in 2006-2007
 - better equilibrium between supply and demand



Could there be surprises?

■ What about following scenario? far fetched?

- Soliton technology, 160 waves at 40 gb, hollow core fibers multiplying capacity 100-fold etc.
 - 2008: Lucent, Alkali etc announce nextgen cables; prices of optical gear start to drop considerably.
 - 2010: first soliton based transoceanic cable installed
 - 2012: first of the present terabit cables retire with only a fraction of their capacity ever having seen light.
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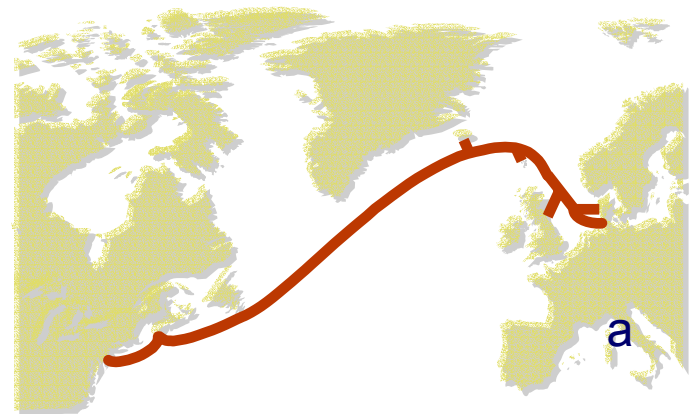
Predictions and forecasts revisited



- What will fill the capacity and how fast?

- Current (2005) transatlantic: voice: 13.3Gb
internet 773.2gig ; other (IPL etc): 62.5Gb

- TeleGeography predicts for end 2007:
a slow growth scenario of 1,570Gb
fast growth scenario of 1,955Gb



- This still leaves ample capacity but who would dare this time around to predict it will take 17 years to fill the capacity?

- Internet represents approx 85% of all transoceanic capacity use and has seen renewed growth (32% in 2004, 52% estimate for 2005).

- How fast will internet traffic soak-up excess? Any new international bandwidth hungry internet applications in sight? How much more capacity does the R&E community need in coming years?

- In the meantime bandwidth prices still keep dropping but at a slower rate.

Disruptive capacity growth?



It happened before

In the 1950s new technology put cables ahead of radio. Small vacuum tubes that could operate under water for 20 years or more meant that amplifiers could be buried at sea with the cable. This boosted the cable's information capacity to the point that it could even carry telephone signals.

Small vacuum tubes like this could be buried at sea with the cable for years. They helped to increase a cable's information-carrying capacity by more than a thousandfold.



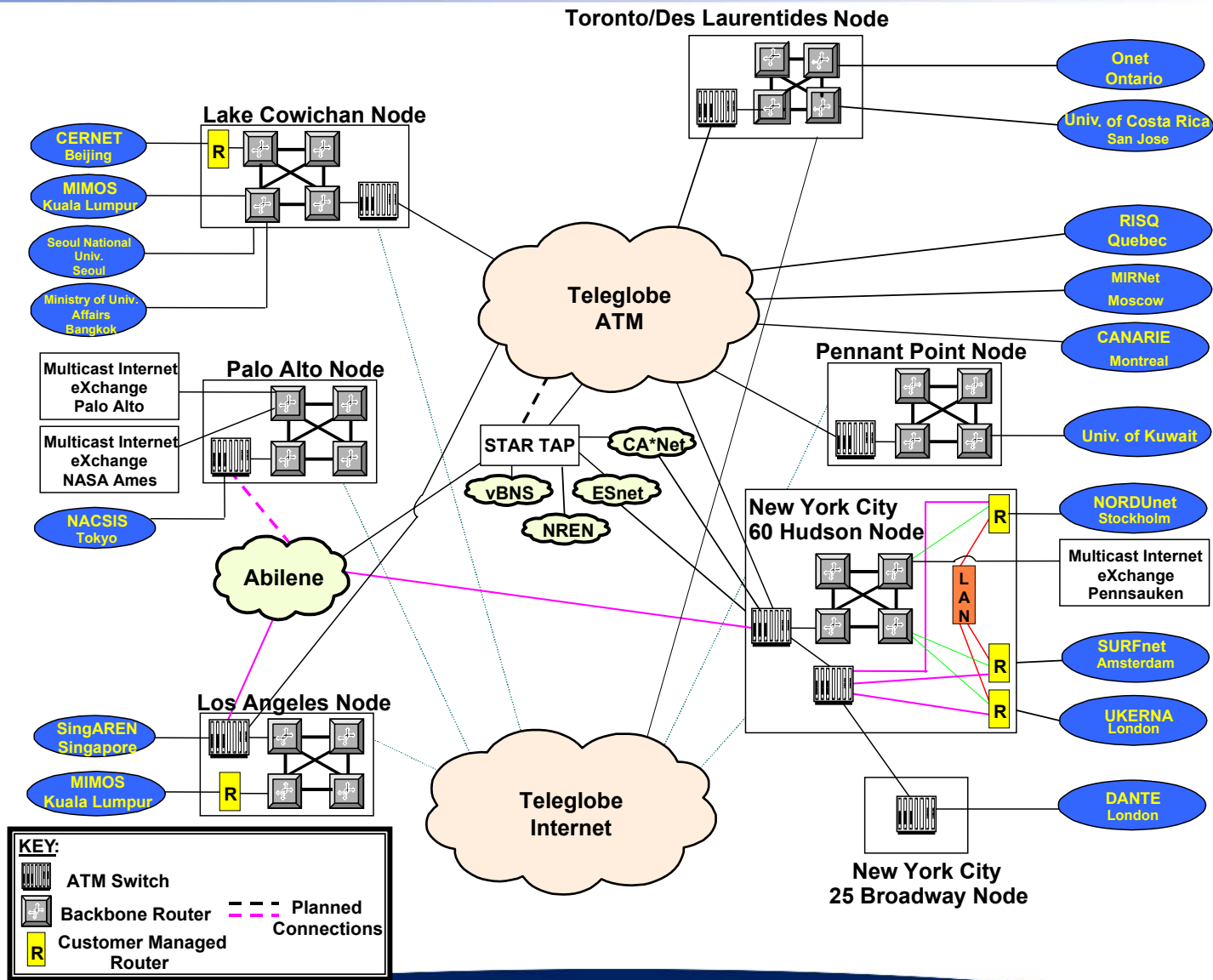
Borrowed from : The Underwater web, Smithsonian Institute

<http://www.sil.si.edu/Exhibitions/Underwater-Web/uw-credits.htm>


R&E and commodity internet traffic

- **Strict AUP segregates R&E and commodity internet traffic in North-America**
 - **Pre 2000: internet content is US centric**
 - Major overseas R&E networks operate managed routers in North-America with international circuits carrying segregated R&E and commodity internet
 - R&E sector becomes Teleglobe Center of Excellence
 - **Post 2000 : internet goes global**
 - Internet becomes multipolar; R&E networks increasingly connect locally to the public internet.
 - Widespread aggregation of transatlantic R&E capacity under Dante's Géant
 - The R&E network attention shifts to very high speed
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Teleglobe R&E Connections ca 2000

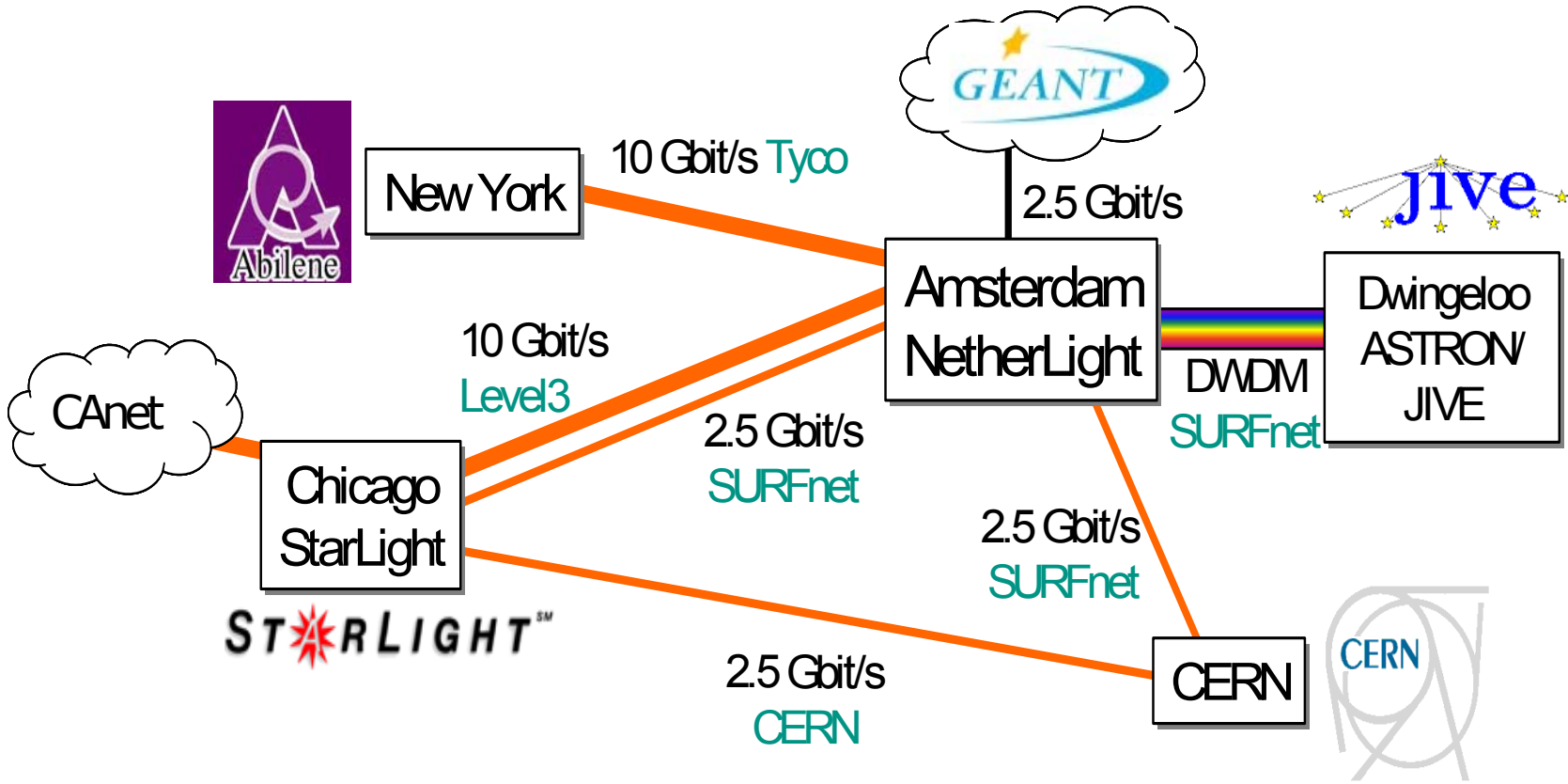


Toward gigabit connectivity

- **First transatlantic gigabit level circuit :**
 - 2001: 2.5 gig Surfnet to Chicago Starlight
 - **First transpacific STM-4's**
 - 2001: two Transpac STM-4's
 - **2002: first transatlantic 10gb**
 - Surfnet leads again
 - **The big R&E scare of 2002:**
 - KPNQwest disappears, Teleglobe reorganizes
 - **Global Crossing, L3 and Tyco become major transcontinental lambda providers**
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Amsterdam, early lambda capital

- First lambda workshop, Amsterdam sept 2001
- iGrid2002 focuses lambdas on Amsterdam

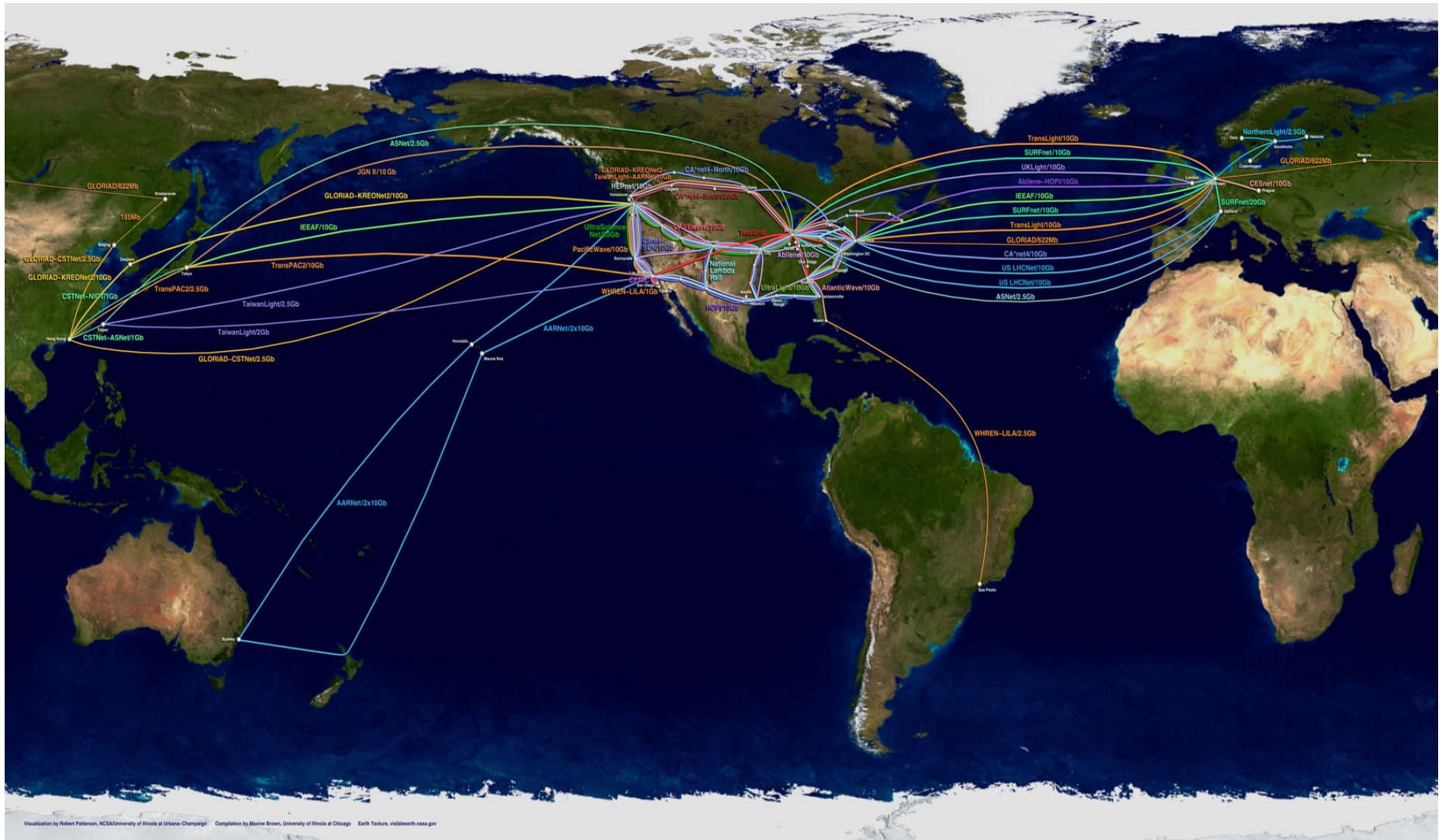


toward dark fiber and




- **Third lambda workshop : Reykjavik aug 2003:
GLIF is born (Global Lambda Integrated facility)**
- **National R&E networks start to go dark fiber**
 - Canarie's Bill St.Arnaud and Surfnet's Kees Neggers amongst trailblazers.
 - Lambda switching and speed records
- **High Energy Physics and Astronomy provide
much of the intercontinental impetus.**

The early 2006 look of R&E networking



Supply side consolidation

■ Consequences of the fiber glut:

- Europe: major shake-out amongst cable builders.
 - USA and Canada: players such as Velocita and 360networks disappear. Consolidation into more traditional telecom providers.
 - Transcontinental: difficult times for capacity wholesalers and pure cable providers. Massive changes in cable and cable-capacity ownership.
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VSNL buys Tyco, then Teleglobe




■ In its August 2nd 2004 issue, Business Week reported:

- A number of potential buyers emerged led by the Tata Group (India)
- Other interested parties included Pivotal Private Equity (owner of Network Solutions), Reliance (now owner of Flag), Singapore Technologies (has stake in Global Crossing) and Trinity Ventures (US private security firm)

■ Amazing finale:

- Today Tyco Pacific represents about 36% of lit transpacific capacity (73% of design capacity) and 20% of both lit and design capacity under the Atlantic; was at its peak valued at approx US\$3.5 billion
- November 1st 2004: VSNL India announces purchase of Tyco Communication assets for US\$130 million; July 1st 2005: deal completed
- July 25th 2005 : VSNL announces purchase of Teleglobe

VSNL international and R&E

- A long and rich tradition of cooperation between Teleglobe, Tyco and the R&E community.
 - The new integrated company is a major supplier of IP transit, IPL's and lambda capacity to R&E.
 - The Global R&E sector will receive renewed focus and attention as Centre of Excellence.
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Some final thoughts



- The laws of gravity still apply, even in the New Economy. Progress alternates between bursts of exponential growth and plateaus where the progress is absorbed
- Fundamental shift in cable ownership: Asia owns the Pacific
- A phenomenal amount of unlit capacity left but cost of lighting exceeds revenue potential on certain streams.
- Always be on the look-out for disruptive technologies

- What an amazing decade it has been
- Never easy to make predictions, especially about the future

Thank you for your attention

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Discussion