

NORTH AMERICAN SUBMARINE CABLE ASSOCIATION
Summary of and Commentary on
the Report by Terabit Consulting, Inc.,
“A Forecast of Submarine Cable Deployment
in the State Of Florida”

This paper summarizes and comments on the attached report, “A Forecast of Submarine Cable Deployment in the State of Florida”, prepared by Terabit Consulting, Inc. at the request of the North American Submarine Cable Association (“NASCA”).

Introduction

Our goal was to answer a question put to NASCA members by staff of the Florida Department of Environmental Protection (“DEP”): How many submarine cables are expected to be landed on Florida’s shores in the foreseeable future? DEP staff had indicated that the answer was relevant to whether Florida needed to establish a new policy of requiring that future cables somehow be clustered into government-designated corridors.

To answer the question, NASCA retained a qualified independent expert, Michael Ruddy of Terabit Consulting, Inc. A summary of Mr. Ruddy’s relevant experience and credentials is attached. Much of his professional practice has involved looking critically at the economic feasibility of proposed projects, on behalf of potential lenders to or investors in such projects, rather than representing project proponents such as members of NASCA. He is not a “captive” of NASCA or its members, but rather has used truly independent expert judgment to produce the attached report (“the Report”).

Conclusions

The Report states its conclusions in terms of a lower-bound scenario and an upper-bound scenario for the number of additional individual cable landings through the year 2009. Under the lower-bound scenario, a total of 2 new ring systems, or 4 additional cables, would be landed through 2009, beyond those already under construction. The upper-bound scenario predicts 24 new cables in 12 new ring systems. Under either scenario, new construction comes in fits and starts: after each round of construction (such as the busy period of 2000-2001, when the industry responded to a surge in demand driven by the Internet’s new popularity and by phone deregulation and lower prices in other countries), there is a lull, until increasing demand calls for additional construction.

NASCA has built on the Report’s lower- and upper-bound scenarios by developing a “most likely” scenario somewhere in-between. As described below, NASCA used two different methods to develop the “most likely” estimate, which ended up in close agreement. These approaches suggest that the most likely number of additional cable systems landing in Florida through 2009 is approximately 4 (each with 2 landings in Florida, for a total of approximately 8 landings).

I. Summary of Terabit Consulting Report and Views

The following explanation is designed to help the non-specialist reader follow and appreciate the logic of Report.

A. Estimates of capacity demand

The first step in the Terabit analysis is to forecast changing total demand for capacity over the relevant time period. Demand is the bedrock for the analysis; it is assumed that additional capacity will be supplied (i.e., cables landed) by the existing competitive market to meet that demand. This demand-based approach is more objective and reliable than adding up the announced plans of individual cable-installing companies, and is probably the only approach that can support a long-range forecast.

Terabit's ten-year forecasts of demand are detailed in the Appendix to the Report. Although three other key assumptions in the analysis were varied in order to develop the alternative lower-bound and upper-bound scenarios, the same demand estimates were used for both the lower-bound and upper-bound scenarios. The demand estimates can be described as conservative, in the sense of trying to avoid underestimating the rate of cable deployment. (In other words, even for the lower-bound scenario, the report assumes a relatively large increase in demand over the time period studied.) For example, the Report assumes that in South America by 2009, the percentage of the population with phones will have continued to rise; two-thirds of all telephone subscribers will have Internet access; those Internet users will be using bandwidth (2000 kbps) equivalent to continuous streaming high-quality video; and two-thirds of that demand for Internet capacity will be routed through Florida.

B. Three geographic areas predicted to drive future Florida landings

Terabit's analysis was broken down into five geographic areas, representing the five possible types of cables that would land in Florida:

- 1) domestic cables, which would provide capacity solely to destinations within the continental United States;
- 2) cables that would connect North America to the South American continent;
- 3) cables connecting North America to Central America;
- 4) cables that would connect North America with Caribbean countries; and
- 5) any other destinations that would be served by undersea cables landing in Florida (therefore these five categories cover all of the possible undersea telecommunications cables that could land in the state of Florida).

The Report concludes that for two of these five possible types of routes, no cable systems are expected to be built. Specifically, the first area was eliminated because Terabit determined that the North American domestic undersea route faces significant cost disadvantages relative to its terrestrial competition, and therefore no such cables are

expected to be built. This conclusion by Terabit seems corroborated by the fact that the “Global Link” coastal festoon system proposed by Asset Channels, Inc. appears to be dead due to lack of financing.

Similarly, the fifth area was eliminated because Terabit found that the only other prospective route along which submarine cable developers might deploy cable was the Florida-Europe route (either as a direct route or as a segment in Europe-South America deployment). The Report concludes that no such systems are expected to be built because this route is longer and therefore subject to higher costs than North Atlantic routes. The Report notes that the price of capacity along the alternative routes to Europe (North American terrestrial and northern transatlantic) are among the lowest in the world, which would make it difficult for any Europe-Florida cables to compete.

C. Consideration of capacity already available or under construction

To convert total future demand into number of future cables, Terabit next had to consider the capacity available from relevant systems¹ already existing or under construction, listed in Table 1 below:

Table 1: Relevant Systems Existing or Under Construction

Region Connected To	Existing Systems	Under Construction
South America	Americas-1 Americas-2	360Americas Emergia Mid-Atlantic Crossing, or “MAC” (by connecting to South America Crossing, or “SAC”)
Caribbean	TCS-1, Bahamas II, and other systems ²	Arcos-1 Bahamas Internet Cable System (“BICS”)
Central America	Mid-Atlantic Crossing (by connecting to Pan-American Crossing, or “PAC”)	Maya-1 Arcos-1

¹ Existing or under-construction capacity cables are deemed relevant by the Report if and to the extent that they serve the three areas that the Report expects to drive future Florida landings. Therefore PAC is listed even though it connects the three areas to California rather than to Florida. Similarly, some existing cables with Florida landings are not included (e.g., Columbus II and III from Florida to Europe), because Terabit believes that the areas they serve will not drive future Florida landings.

² The Caribbean is currently linked to Florida through a combination of existing cable systems, including TCS-1 and Bahamas II (both landing in Florida) and Antillas I, CJFS, ECFS, and Taino-Carib.

Terabit assumed that all of the capacity in such cables would eventually be consumed, including the designed-in potential upgrades of those systems, and therefore counted that capacity against the estimated demand over time.

D. Configuration of future systems

For both the lower-bound and upper-bound scenarios, Terabit assumed that all future systems connecting North America with these three regions would be ring systems, each with two landings in Florida. This assumption is conservative because recent history shows that the inter-continental demand on which the Report is based can be partially satisfied by landing at U.S. locations other than Florida (the PAC system connects Central America, South America and the Caribbean to California).

E. Rate of technological change (capacity of future systems)

Terabit estimated the capacity of systems that would be deployed in the future. This is the first of three steps in the analysis where Terabit used a low-end estimate and a high-end estimate, in order to differentiate the upper-bound and lower-bound scenarios. On average, the capacity of the most technologically-advanced cable systems has doubled every year; for the lower-bound scenario, Terabit forecast that this historical doubling of capacity would continue until 2007, when the capacity per cable would hit a technological “cap” of 96 terabits per second (“Tbps”). For the upper-bound scenario, in order to depict a scenario in which systems would fill as quickly as possible and prompt more cables sooner, Terabit assumed that the capacity of the most technologically-advanced cable systems would double only once every two years (*i.e.*, at half the historical average).

F. Timing of future systems relative to filling of available systems

To estimate when additional cables will be deployed, Terabit had to consider some factors in addition to those already discussed above. One such factor is the number of years in advance of the saturation point that additional deployment would take place. For the lower-bound scenario, the Report assumes that additional cables would enter service one year before the expected date when existing capacity would be fully absorbed, such as occurred in the year 2000 for the Florida-South America route. For the upper-bound scenario, Terabit instead assumed that additional cables would come on-line two years before existing capacity was filled.

G. Estimated number of simultaneous new cables per market

Historically, when existing capacity in the markets considered here has approached exhaustion, generally a single new cable system has been brought into service. Therefore, for the lower-bound forecast, Terabit assumed that only one system would be deployed each time that demand in each market exceeded supply, until the next round of construction was triggered by continued growth in demand. However, three new cable systems linking Florida to South America have are currently being deployed in

response to anticipated capacity saturation. Therefore, for its upper-bound deployment forecast, Terabit relied on this precedent and assumed that in each of the three markets, three new cable systems would be deployed in response to each anticipated excess of demand.

H. Lower-bound and upper-bound scenarios

Based on these assumptions, Terabit developed the lower-bound and upper-bound forecast of deployment of undersea telecommunications cables in the state of Florida shown in Figures 1.1 and 1.2 in the Report. Table 2 below combines the information from those two figures. This ten-year view includes those systems that already entered service in 2000 or are presently under construction: 360Americas, Emergia (SAM-1), Mid-Atlantic Crossing, Arcos-1, and Maya-1. (Physical deployment of all other existing cables in the state of Florida, including Americas-2, was determined to have occurred prior to 2000.) Focusing on cables not yet under construction (i.e., eliminating the above cables) results in a total of 2 additional systems (4 cables) through 2009 in the lower-bound scenario, and 12 additional systems (24 cables) in the upper-bound scenario.

Table 2: Terabit’s Forecasted Range of Deployment of Undersea Cables in Florida, 2000-2009³

Key: SA = North America-South America cable system
 Car = North America-Caribbean cable system
 CA = North America-Central America cable system

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Lower-Bound Systems Forecast	4*	2**	0	0	1 -SA	1-Car	0	0	0	0	8
Lower-Bound Cable Forecast	7	3	0	0	2	2	0	0	0	0	14
Upper-Bound Systems Forecast	4	1	0	3-SA	3-Car	0	0	0	3-CA 3-SA	0	17
Upper-Bound Cables Forecast	7	2	0	6	6	0	0	0	12	0	33

* 2000 systems = Atlantica-1; Maya-1; Mid-Atlantic Crossing; SAM-1

** 2001 systems = Arcos-1; BICS⁴

³ The Report notes that it does not claim to predict precisely in what years additional systems will be built, so a cable system could well be built sooner or later than depicted in Table 2. Rather, Terabit states that the Report is most reliable for predicting the total number of cables over the time period considered.

⁴ The Report does not include BICS in its Figures 1.1 and 1.2 that focus on drivers of future demand, but does in its main text; NASCA however includes BICS in this Table 2, because from DEP’s impact-assessment point of view it was a recent landing in Florida.

II. “Most likely” Scenario

As noted in the Report, Terabit is very confident in saying that its lower-bound and upper-bound estimates bracket the number of cable systems and individual cables that will be deployed in the state of Florida between 2000 and 2009. NASCA does not disagree. However, to further respond to DEP’s request and to support its policy deliberations, NASCA wanted to also develop a “most likely” scenario. NASCA did so using two different approaches, described below.

A. “Most likely” estimate derived from the Report

For this estimating approach, NASCA generally accepted all of the “fixed” assumptions and estimates in the Report. NASCA then evaluated each of the three alternative assumptions that Terabit varied in order to differentiate the lower-bound and upper-bound scenarios, and made the judgments described below.

First, it seems more likely that cable capacity technology will continue to grow at its recent historical rate at least until hitting 96 Tbps per cable, as assumed for the lower-bound scenario, rather than at half that historical rate, as assumed for the higher-bound estimate. NASCA understands that Terabit agrees with that judgment.

Second, it seems more likely that new cables will be brought into service approximately one year rather than two years prior to relevant capacity becoming fully absorbed. NASCA understands that Terabit agrees with that judgment. Accepting these two judgment calls and the other report assumptions described above predicts that, through 2009, there will be one more round of construction to serve South America and one more round to serve the Caribbean (estimated to occur in 2004 and 2005, respectively; see Table 2, above).

The third assumption that the Report varied in order to differentiate the lower-bound and upper-bound scenarios was the number of new cables to be deployed in each round of construction on each of the areas considered. The Report’s lower-bound scenario assumed that one new system would be deployed in each additional round of construction serving each area; the upper-bound scenario assumed three. If one accepts the first two “most likely” judgment calls described above, that implies a range of between 2 and 6 additional systems through 2009.

Selecting what is most likely for this third variable is inherently different and more difficult than selecting what is most likely for the other two variables described above. That is because the number of entrants per “round” is driven not by demands for capacity, but rather by the less-predictable individual choices of independent providers of cable systems in a competitive market. For this reason, neither Terabit Consulting nor NASCA believes it has a sound basis for saying whether one, two or three entrants per round is demonstrably more likely. One could therefore say that, for purposes of

completing the “most likely” scenario, one could simply select the midpoint between 2 and 6 additional cable systems, i.e., 4 additional cable systems through 2009.

B. “Most likely” estimate based on member survey

NASCA made one other attempt to answer the question of most likely number of additional cable systems, using a polling approach. To conduct the survey, a NASCA officer interviewed privately by telephone an appropriate representative of each of NASCA’s ten current members, and asked each for his or her best guess as to how many additional ring systems landing in Florida would be constructed through 2009.⁵ Each provided an estimate without first being told what the others had estimated, so as to maximize the independence of each estimate. As might be expected in a diverse competitive industry, the answers were not uniform, and not all members were sufficiently engaged in the region to want to offer a view. However, the individual estimates generally formed a fairly tight cluster close to 4 additional cable systems.⁶

The fact that these two very different estimating approaches described above ultimately produced a similar estimate lends further credibility to that estimate. Further support can be found in the following comment made by several member representatives. Although it made sense for the Report to analyze demand as coming from three geographically discrete areas (i.e., South America, the Caribbean, and Central America), actions on the supply side do not always neatly fit those categories. In other words, individual systems have recently been built and probably will be built that link not just one but two or three of those areas to a pair of landings in Florida. Recent examples include the Mid-Atlantic Crossing system and the Arcos-1 system, each of which links to the Caribbean, Central America, and South America. This helps explain why, even if another round of construction to serve South America and the Caribbean should be assumed as “most likely”, there may well not be three separate systems built for each of the two areas. This insight also helps explain why the two different approaches described above converge on a similar “most likely” scenario of about 4 additional ring systems through 2009.

⁵ Each member representative was asked to predict how the market would behave as a whole. Such predictions were based on professional judgment rather than quantitative analysis – what might be called an informed gut reaction. No member representative was asked for information about its or any other participant’s competitive plans, and no participant volunteered such information.

⁶ The ten responses were: “3”; “3”; “up to 4”; “3 or 4”; “4”; “3 to 5”; “4 or 5”; “6”; and “closer to 9 than 3”; and no opinion. The median response is 4; the mode (loosely interpreted) is 4; and the average (arithmetic mean) of these responses is under 4 1/2.