PEACESAT Celebrates 30 Years in the Pacific Islands:
A Program Update and Look at Public Service Telecommunications in the Region

Christina Higa
Director, Pan-Pacific Education and Communication Experiments by Satellite
Social Science Research Institute, University of Hawaii
U.S.A

Abstract

The Pan Pacific Education and Communication Experiments by Satellite (PEACESAT) Program celebrates 30 years in the Pacific Islands. This paper provides an overview of the PEACESAT program development, current update and also covers prevailing issues regarding telecommunications in the Pacific Islands in particular the growing digital divide happening even within the region.

1. Background

The year 2001 marks the 30th anniversary of the Pan Pacific Education and Communication Experiments by Satellite (PEACESAT) Program. The initial founding concepts of the program are the same today with a primary objective of providing public service satellite telecommunications to the Pacific Islands Region. Even with the advancement of technology and applications, the program is just as vital today as it was 30 years ago.

PEACESAT is currently using the National Oceanic and Atmospheric Administration (NOAA) GOES-7 satellite. From a single simplex circuit for voice teleconferencing and experimental packet data applications, current services include interactive video and voice teleconferencing and access to the Internet.

The technical solutions were available several years ago, however the forging partnerships among agencies contributed to the recent digital roll-out and enhanced programming. Cooperation and collaboration are key program elements that have been sustained for 30-years.

PEACESAT is committed to assisting in lessening the digital divide in the Pacific Islands. The PEACESAT network provides limited bandwidth capacity, however as other opportunities arise and Pacific Island entities migrate to commercial networks, the limited PEACESAT satellite capacity will be made available to the underserved and the very remote areas where telephone capacity may be limited or not currently available.

This paper provides an overview of the PEACESAT program development, current update and also covers prevailing issues regarding telecommunications in the Pacific Islands in particular the growing digital divide happening even within the region.

2. Looking Back by Decades

2.1 Birth: The 1960/70s

To set the stage we need to reflect back to what was happening in the world of communications in the mid-60's. In 1963, the first geosynchronous communication satellite was launched. In 1966, NASA's Application Technology Satellite (ATS-1) was launched to conduct weather information experiments that were completed in two years. The historians of Boeing Satellite Systems Inc. (formerly Hughes Space and Communications Company) note that ATS-1 although primarily a test satellite was used for communication "during the recovery operations for the flight of Apollo 11 in 1969, the spacecraft served as the primary communications link between the White House and President Nixon in the Pacific as the President witnessed the return of the moon-landing astronauts from the deck of the U.S. Navy carrier USS Hornet."[1]

Also in 1969, Dr. John Bystrom of the University of Hawaii responded to NASA's call for proposals for further innovative uses of ATS-1. In 1971 NASA approved Dr. Bystrom's proposal to initiate the PEACESAT Project "…to demonstrate the benefits of currently available telecommunication technology when applied specifically to the needs of sparsely populated, less industrialized areas."[2]

The early PEACESAT pioneers to join Dr. Bystrom included Dr. Paul Yuen of the University of Hawaii (UH) Engineering and Dr. Katashi Nose of UH Physics. Yuen and Nose designed and built the first PEACESAT earth stations that were approximately $3000 U.S. These systems used Yagi antennas, supported push-to-talk audio teleconferencing on a simplex circuit. By 1972 PEACESAT was the first educational satellite network in the world linking the University of Hawaii at Manoa, the University of Hawaii at Hilo, Maui Community College, Wellington Polytechnic and the University of the South Pacific. The PEACESAT network eventually grew to support more than 100 earth stations and incorporated sub-networks including the University of the South Pacific, Kangaroonet, Micronet and Ocean networks.

2.2 Reestablishment: The 1980-90s

In 1985 ATS-1's station keeping fuel was depleted. The PEACESAT program under the leadership of Dr. Donald M. Topping, Principal Investigator and Ms. Lori Mukaida, Director realized the importance of the services to the Pacific Island communities and worked tirelessly on a solution. In 1987, the U.S. Congress authorized $3.4 million U.S. to re-establish the PEACESAT program and stewardship assigned to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce[3.]

A replacement satellite was a major concern. Ms. Mukaida, along with NTIA, led the PEACESAT User Groups and Technical Option Panels to determine user requirements, functional and technical specifications. NOAA's GOES-3 satellite met the requirements and in 1989 established an agreement with NTIA to approve PEACESAT's use of GOES-3.

Marine-Air Systems Ltd (MAS), a New Zealand company, developed analog based earth stations. These systems were capable of providing 9.6 Kbps data and audio teleconferencing.

In the 1993, Ms. Mukaida approached Dr. Norman H. Okamura of the UH Social Science Research Institute for assistance in improving data services. The PEACESAT users outgrew the 9.6 Kbps and required increased data rates and access to applications such as the World Wide Web. Dr. Okamura proposed a PEACESAT digital upgrade, now referred to as "digital PEACESAT." Dr. Okamura worked with MAS on a design that enabled the digital upgrade of existing earth stations.

By 1996 the PEACESAT network grew to include 53 earth stations in 22 Pacific Island economies.

3. The New Millennium: 2000/Present

3.1 Partnerships

One of the fundamental philosophies of PEACESAT that survived thirty years is that the program is built on partnerships. The initial design of the network and extensions to a variety of educational institutions and regional organizations created and fostered collaboration.

There have been a variety of funding agencies, too many to name here, that supported PEACESAT over the years, with NTIA as a primary source of support of the overall network and operations of the PEACESAT Headquarters at the University of Hawaii. Other programs have provided resources to develop segments of the network. In more recent years PEACESAT entered into a Cooperative Agreement with the Pacific Resources for Education and Learning (PREL) and their PRELStar program.

The PRELStar, a U.S. Department of Education funded program provides direct services to students, teacher training and certification, adult and family learning, technical expertise, and technology infrastructure in the rural Pacific region.

PEACESAT and PREL share overlapping service areas in the Pacific Island jurisdictions and share objectives particularly in improving access to telecommunication and information services and applications. PRELStar funded the end-user equipment required for video teleconferencing at the nine jurisdictions served by PREL. As the

networks are developed locally, other public service organizations and health care facilities will also reap its benefits.

PEACESAT works directly with the Departments and Ministries of Health and Education in the Pacific Islands because telecommunications is a common need of these agencies and it is often a driving force for collaboration and cooperation.

3.2 Technology

3.2.1 Satellite

NOAA has provided PEACESAT with decommissioned satellites, PEACEAST's most important resource, at no cost. NOAA also provided for many years the navigational engineering support and services to keep the satellite in its correct orbit. PEACESAT contracts NASA for telemetry tracking and control.

GOES-2 was decommissioned in May 2001. GOES-7 was repositioned to 175 degrees West for optimal Pacific Island coverage and commissioned for PEACESAT's use on July 24, 2000. GOES-7 is a 12-year old environmental satellite that was used to collect environmental data sensed by river and rain gauges, seismometers, tide gauges, buoys, ships and weather stations and was used for international search and rescue missions. The GOES-7 satellite outperforms its predecessor, GOES-2, with more reliability and better power and will serve PEACESAT for approximately ten years.

3.3 Digital PEACESAT Services

The main attraction of the digital PEACESAT services is the video teleconferencing capabilities. The standard earth stations that are upgraded with digital modem interfaces, antenna autotrack controllers and digital modems are able to support digital carriers. The video codec and/or routers are connected to the digital modem using a V.35 interface. The data rates supported by these smaller antennas are up to 128Kpbs. Larger PEACESAT Hub earth stations ranging from 6m to 10m systems support data rates up to 384Kbps. The satellite has a hard limiting transponder and therefore due to the restricted satellite power budget, video teleconferencing sessions are generally supported at data rates of 128Kbps.

Digital PEACESAT also supports data services such as access to the Internet. At the UH, PEACESAT leases a T-1 and Internet service through a local telecommunication carrier to support non-UH agencies.

Currently there are a total of ten PEACESAT earth stations that have been upgraded for digital services. This was possible in part through the PRELStar agreement, the University of Guam's Rural Utilities Services Grant and local Ministries and

Departments of Education and Health. Following is a list of the digital upgraded earth stations:

<u>Sites equipped with video teleconferencing, voice and data services:</u>

1. Hawaii – University of Hawaii at Manoa

2. Guam – University of Guam

3. Pohnpei, Federated States of Micronesia (FSM) – College of Micronesia and National Hospital

4. Kosrae, Federated States of Micronesia (FSM) – Department of Education

5. Yap, Federated States of Micronesia (FSM) – Department of Education

6. Chuuk, Federated States of Micronesia (FSM) – Department of Education

7. Palau, Republic of Palau – Ministry of Education & Emergency Management Office

8. Majuro, Republic of the Marshall Islands – College of the Marshall Islands

9. American Samoa – DELTA Consortium, operated by American Samoa Power Authority

<u>Site equipped with digital data services:</u>

10. Fiji – Central Queensland University in Suva

The PEACESAT network today still supports analog services that are effective for the traditional mesh-type voice audio teleconferencing. The audio teleconferencing usage is important however video teleconferencing and email correspondence appears to have reduced the amount of audio teleconferencing traffic on the network.

3.4. Institutional and Human Resource Development

3.4.1 Technical Training

The focus on institutional and human resource development is emphasized. The technology deployed is increasingly complex and requires increased technical skills and support. PEACESAT and its parent umbrella organization, the University of Hawaii Telecommunications and Information Policy Group (UH TIPG) recognize the need for technical training on many levels including base support of PEACESAT earth stations to configuration of routers, servers and networks. There is a need throughout the region for information technology and telecommunication training. In the short-term PEACESAT provides technical training sessions via video teleconferencing and is working with many agencies in the region on a more comprehensive long-term program.

3.4.2 Technical Consultation and Design

In the recent years, other program areas that have significantly developed primarily with the leadership and technical assistance of Dr. Norman H. Okamura, current PEACESAT Principal Investigator, are technical consultation and strategic and cost-effective network design. Dr. Okamura is also responsible for many public service telecommunication network designs and implementation plans in the Pacific Islands. In the grand opening of the Commonwealth of the Northern Marianas Islands (CNMI) Partners in Distance Learning Network, the Special Assistant to the CNMI Governor described Dr. Okamura as the "Babe Ruth of telecommunications." Dr. Okamura has many years of experience in developing such networks. During his tenure as the State of Hawaii Director of the Information and Communication Services Division he built most of the major telecommunication networks in Hawaii that support government and education. Dr. Okamura is also the chief architect of the Hawaii State Telehealth Access Network (STAN) that is operated and managed by the UH TIPG.

3.5 Network Cross Connectivity

The UH TIPG network operations center (NOC) and the PEACESAT headquarters NOC are integrated. TIPG is equipped with two multipoint video teleconferencing bridges and several ISDN lines. It serves as a bridge for interconnecting many networks including STAN, UH Hawaii Interactive Television System (HITS), State HAWAIIAN network, Departments of Education (Hawaii, Guam, American Samoa, CNMI) to the PEACESAT network. It is important to underscore the capability of connecting the PEACESAT sites to another location via ISDN for video teleconferencing because in many of the PEACESAT locations (excluding Hawaii, Guam and Fiji) there are no ISDN services off-island. In the Republic of Palau there are on-island ISDN services and in Guam the off-island rates are extremely pricey ($234 per hour for a 384Kbps connection to U.S. Mainland. This is a reduction from $900 per hour)[4].

The UH TIPG and PEACESAT have a very strong policy of open networks verses closed networks meaning it will enable the cross connection between any organization that meets the program objectives and mandates. The value of the network is increased if the opportunities for interconnection are kept open instead of restricted.

3.6 Program Areas

Program areas supported are: distance learning and training, telehealth/telemedicine, emergency management, research and economic development. The video teleconferencing services and the improved performance of GOES-7 enables improved program delivery using PEACESAT. The infrastructure for cross connecting numerous networks has also significantly increased the amount of available resources for program development and regional cooperation.

There are numerous programs and applications; these are a selected few:

- The UH Telemedicine Program, weekly grand rounds session. Participants include physicians in Hawaii, Guam and other Pacific Islands. The University of Hawaii is seeking authorization to provide continuing medical education credit outside of Hawaii.

- Institute for Telemedicine and Telehealth provides organizational updates, educational programs and workshops. For the first time ever health professionals in the Islands are able to participate in these sessions through video teleconferencing.

- In 2000, the Shriners Hospital for Children conducted 1,248 out of state outreach clinics in the Pacific Islands. In total the hospital treated 19,568 children where 743 were referred from Guam, 403 from the Federated States of Micronesia, 412 from American Samoa and 273 from Saipan. Telehealth outreach clinics where the doctors can provide consultation and follow-up meetings with patients in their respective islands are conducted by video teleconference. These services are in great demand in the Pacific Islands particularly because they are offered at no cost to the patient. In addition to clinical evaluations and continuing medical education, Shriners have used PEACESAT for conducting administrative meetings and coordinating region wide telehealth associations (i.e., Nurse Practitioners, Physicians Assistants, Pacific Telemedicine Association, Pacific Telehealth Consortium, etc.)

- The National Weather Service Pacific Region Headquarters -Emergency Management Weather Information Network (EMWIN): The EMWIN system uses GOES-9 to broadcast weather information such as warnings reports, weather graphics and satellite images, PEACESAT rebroadcasts this signal from GOES-7 to locations not currently covered by GOES-9.

- PREL Teacher Training Sessions: Adult Education, Distance Learning Techniques and Applications, etc.

- Various distance learning programs such as: "Building Relationships with secondary and post secondary schools in the Marshall Islands and Federated States of Micronesia" and "Viability of VTC for Distance Learning Opportunities in the Pacific, scheduled for San Diego State University."

- Programs on collaboration in grants and funding opportunities, i.e., "Minority Serving Institution Grant - status, plans, for implementation, and upcoming workshops and sessions."

4. Changing Environment

PEACESAT is a program that is based on providing non-profit telecommunications

for public service applications because telecommunication services are cost prohibitive for the public sector in the Pacific Islands. There are many reasons for the high cost of telecommunications in the region including the large geographic areas, small populations, developing economies and monopolies. If the PEACESAT objectives were attained with complete success, there would no longer be a need for the program. PEACESAT's 30-year history is an indication that the need and environment remains the same.

Yet, there have been many considerable changes in public service telecommunications in various areas in the region. In U.S. Territories of American Samoa, Guam and the Commonwealth of the Northern Marianas Islands the E-Rate program of the Universal Services Fund has significantly improved telecommunication infrastructure. Each of these jurisdictions has at least a T-1 network link to Honolulu, terminating at the UH TIPG and PEACESAT network operations center. There is also very high-speed fiber connectivity on-island. For the PEACESAT network, the development of larger bandwidth connections supported by E-Rate means more capacity available on PEACESAT for even more rural and remote areas in the Islands. There are issues with the Rural Health Care Program rules. As written they currently do not benefit to the islands. This issue is under review by the Federal Communications Commission. Another major concern is the disproportionate amount of funding and development of public service telecommunications in the Region. The Freely Associated States (Federated States of Micronesia, Republic of the Marshall Islands and the Republic of Palau) are not eligible for U.S. Federal Universal Services Funds. The digital divide in these areas of the region along with the non-US affiliated locations are increasing rapidly.

The Freely Associated States developed a "Micronet Proposal" that would establish a robust public service network using satellite communications. This proposal is a regional effort and has been endorsed by the president of each respective country and submitted to the Government of Japan. The proposal development started long before the Japanese Government announcement of a $15 Billion U.S. fund to assist in closing the digital divide, however time was such that it is now being considered as one of these projects and potentially a US-Japan Common Agenda item.

5. Strategic Partnerships

Following is a brief summary of new domestic consortia for public service telecommunication networks. Each Pacific Island jurisdiction worked to seek expertise, combine resources and plan strategic partnerships.

5.1 ASG DELTA Consortium

The American Samoa Distance Education Learning and Telehealth Applications (ASG DELTA) consortium is made up of the all the major government agencies and educational institutions [5]. The American Samoa Telecommunication Authority donated for public service telecommunications a 384Kbps circuit from LBJ Tropical Medical

Center to UH TIPG/PEACESAT NOC. The other consortia members contributed funds in developing on-island connections. On-island there are 21 video teleconferencing locations.

5.2 Samoa-American Samoa Link (SAS)

The Samoa-American Samoa Link (SAS) is a public service telecommunication connection, 960 Kbps, between Samoa (formerly Western Samoa) and American Samoa. The National University in Samoa and the National Hospital of Samoa is also connected to the connection for video teleconferencing and Internet.

5.3 Partner's in Distance Learning Network

The Commonwealth of the Northern Marianas Islands implemented a network that includes the Public School System, Office of the Governor, Electronic Data Processing Center and the Commonwealth Health Center. There is a T-1 connection from Tinian and Rota to Saipan. There are 18 video teleconference locations in CNMI.

5.4 Guam Education Network

The Guam Education Network will be implemented in early 2002 and will include the University of Guam and Department of Education. There will be high-speed on-island fiber connectivity. In Guam there is a potential collaboration with the National Guard and the Guam Memorial Hospital.

Notes

1. Boeing Satellite Systems. " Satellite Firsts." (September 2001).

    http://www.hsc.com/about/hughes1st.html

2. The PEACESAT Project: Brief History. Circa 1980.

3.   Cooperman, W., Mukaida, L., Topping, D. 1991, "The Return of PEACESAT."

     Proceeding: Pacific Telecommunications Conference, Honolulu, Hawaii.

4.   Pallison, Max. < maxp@mail.gov.gu> "New ISDN Long Distance Rates from

     Guam." Personal e-mail. (May 2001).

5.   The American Samoa Distance Education Learning and Telehealth consortium
     members include: Office of the Governor, American Samoa Telecommunication

Authority, Power Authority, Community College, Department of Education, Department of Public Works, Department of Commerce, LBJ Tropical Medical Center, Department of Health, PEACESAT Headquarter/ UH TIPG