

**Hong Kong coming back from Telecommunication Stone Age
Taiwan Earthquake on December 26, 2006.**



(January 31, 2007)
(revised on February 14n)

General Information

Hong Kong is a regional hub for intra-Asia submarine cables and one of the gateways for submarine cables to China. Partial cable maps showing the major submarine cables connecting Hong Kong to the international gateways in USA are attached for reference (Attachment 1a to 1g).

The Earthquake

December 26, 2006, 20:26hr HKT (12:26hr GMT), earthquake measured 7.1 magnitude by US Geological Survey and 6.7 magnitude measured by Taiwan's Central Weather Bureau struck Taiwan's southern coast just outside Ping Tung County. The tolls were 2 casualties, 42 injuries and various degrees of damage to land and properties. These impacts were immediately apparent and widely reported over the news media. The full impact, however, was not immediately known. It was only until the next day, the first business day after the Christmas holiday, when people started to load their network did they notice a big problem. Still little was known about the severity of the damage to the submarine cables running across the fault line outside Ping Tung County in Taiwan. The full impact was gradually revealed a few days later. The initial assessment of a full restoration was first by end of January 2007 and subsequent assessments pushed it as far back as to end of February. Eventually, full restoration was more or less achieved within January.

Colocation Centre immediately witnessed actions

In HKCOLO, things were quite different. The "Managed IP Platform" operated by HKCOLO was already sounding warning alarms. Latencies on several ip transit providers were suddenly stretched. Among the top suppliers, suppliers 'F' and 'R' had average latency readings shot up from the normal 100-200ms to 300-500ms while 'V' still remained normal.

On the second day of the earthquake, when the demand on ip transit bandwidth increased at the opening of the day, average latency readings on suppliers 'F' and 'R' jumped to beyond 1,000ms. These networks became

immediately unusable. That morning, those carrier customers in HKCOLO had contracts for ip transit redundancy service were automatically routed to supplier 'V', about the only supplier providing a usable service. The carrier customers who did not have a contract for redundancy service were then routed to the remaining ip bandwidth supply for whatever in 'V' that had not been consumed. Other remaining carrier customers badly affected had no immediate escape route. This then filtered down to the general population and IDD phone calls became inaccessible and network seriously congested. There was then a frenzy of activities and these remaining carrier customers were eventually able to connect to the remaining supplier after much delay. Later on in that same week, supplier 'V' no longer accepted new orders as their network became completely filled.

On the transport side, the impact was clear immediately after the earthquake. Submarine cable companies and cable users immediately realized that they had severely damaged cables or completely severed cables to carry out any meaningful transport service. Cable users in HKCOLO also felt the impact and immediately tried to react to it. Predominant carrier customers in Hong Kong, China and Taiwan like 'P', 'C1' and 'C2' had shown up at their pops in HKCOLO within minutes after the earthquake. They were there to check for equipment failure. All were initially relieved when no fault was found on the equipment, but of course shocked when the severity of the problem was eventually revealed.

From the bigger map where the fault line is visible (Attachment 2 – Destruction Location), we can see where eight of the regional cable systems (APCN2, C2C, EAC, FNAL/RNAL, FEA, APCN, SMW3 and China-US) coming out of Hong Kong sustained serious damage. Of these cable systems, five (C2C, RNAL/RNAL, FEA, APCN and SMW3) were completely severed and rendered useless. Two (APCN2, EAC) were lucky to have at least one of their redundancies intact. One (China-US) was much reduced in connecting the Asia and North America continents. As a result, there were just limited capacities through the APCN2 and EAC for Hong Kong to access the outside world. But not every carrier was connected to these two systems.

For the few days after the earthquake but before New Year, carriers affected were busy in switching from the severed cables to the functioning two.

HKCOLO just happened to be in the best position in providing that switching in its MMR. Whoever had spare capacity in the two functioning cables will be there to help others. HKCOLO also had to work feverishly in laying out cables to those not in the MMR. To react to the situation and due to the severity of the problem, predominant carrier 'T' from Taiwan sent a technical team from Taipei to HKCOLO on standby to handle whatever necessary to recover their network by switching submarine cables. The HKCOLO technical team also went into high gear and completed cabling instructions within the shortest possible time. Our provision team worked days and nights in that week in helping carrier customers and only in late evening on 30/12/2006 that HKCOLO had completed the pile of instructions received up to the COB of the same day. HKCOLO had by then helped a large portion of its customers to get over an extreme predicament. From the cabling instructions received in HKCOLO, it was estimated that over 50% of carriers were affected or badly affected in the incident.

On the second week after the earthquake (first week in 2007), there were still intermittent cabling orders from various carriers coming in from outside HKCOLO. By then, the remaining capacities in the working cables were mostly exhausted and unfulfilled demands in the region were then forced to look for yet other ways to connect to the international gateways in the USA.

Market adjustment mechanism kicked into action

Since Hong Kong is the regional hub used by carriers from all countries in the region, the capacity in the two functioning cable systems (APCN2, EAC) could not possibly accommodate all the demand. Congestion and high latency continued to cause havoc. An alternative route to the international gateways in the USA via TEA cabling system through Europe was not yet fully commissioned and could not help much in mitigating the current situation. Users and providers in the market then adopted different adjustments within days of the outage.

Cable system APCN2 (cable leg Hong Kong/Shanghai severed) re-routed its capacity from Hong Kong -> Kuantan -> Singapore -> Shantou -> Shanghai -> Japan and use the Trans-Pacific cables to connect to the international gateways in the USA.

Cable system EAC (cable leg Hong Kong/Korea and cable leg Hong Kong/Japan severed) re-routed its capacity to the intact cable leg from Hong Kong -> Singapore -> Philippines -> Taiwan -> Japan and use the trans-Pacific cables to connect to the international gateways in the US.

Russian incumbent 'R', though only commissioned a small portion of the **TEA Cable system**, used its capacity to help out individual carriers in the region.

Chinese incumbent 'C', major user of the trans-Pacific capacities, did the most extra-ordinary. 'C' re-routed its traffic via APCN2, which it owns a small capacity, from Shanghai to Japan, then fully light up the intact part of the low capacity China-US cable system. Having done that, they were still faced with a very congested network due to the huge traffic they were carrying. Nevertheless, 'C' went further and did an unexpected act by sharing its network with its partners. At times up to 50% of the already congested network was carved out for the exclusive use by their partners 'P', 'H' and 'W' in the region. The general population as well as the carriers in the region were thus benefited from this extraordinary generosity. Needless to say, 'C' thus faced an even more congested network in their home market in mainland China.

Our observation and opinion

The submarine cable industry would undoubtedly go through an evaluation on how submarine cables in the region should be laid out in the future to provide greater resilience. One very obvious way is to build more cables and the future cables will have at least one redundancy cable leg going south bound to avoid the fault line between Taiwan and the Philippines. North bound route like using the Taiwan Strait would be another possibility although routing through this China/Taiwan tangle zone is both sensitive and prong to fishing activities.

Russian incumbent 'R' is now an important player in the region due to their ownership in the TEA cable system and their willingness in helping in the region. Other than that, the TEA system does provide a meaningful

alternative to the mainly US centric trans-Pacific cable systems in connecting Hong Kong to the outside world. We recommend that 'R' fully make use of this TEA cable system and put the capacity on the market to complement this US centric approach in long haul cables in the region. It would provide a much needed alternate route to regional players and good return to itself.

Chinese incumbent 'C' is poised to take on a more active role in the region. Its ability and willingness to sacrifice its own interest for the health of others will undoubtedly enhance its leadership role in the region. Currently, its silent treatment of its sacrifice did not bring out its regional role and kept the impression that it still operated under a veil of secrecy. It would be better that the detail of this assistance be revealed openly for recognition and reviewed for opinions. Carriers in the region would have appreciated the act and give opinion thereby cementing its image as a regional leader.

The Telecom Authority (OFTA) of Hong Kong also has a very special role in the submarine cable industry in the region. Immediately after the earthquake, the local media was quick to blame the government in their allegedly late response and announcement of the service outage. They also demanded that the government take lead or intervene in announcing the outage for the cable operators. However, we hold a different opinion. We found the government had reacted in an amicable way. Hong Kong never needed a strong government or wanted the government to be in the lead position or to provide first hand information. This is not desirable because the government would be intervening in cable operators' business thereby creating unwanted burden and delay. This 'Big Brother' approach would make the business environment less favorable.

The cable operators would obviously take initiatives to deal with the situation. They will focus on righting and fixing their operation when things go wrong. The currently self adjustment mechanism observed in this report indicated that the cable operators and the carriers have done well and the telecom industry as a whole is healthy and recovering in the most effective and efficient way. We should let the same adjustment mechanism work itself when similar situation occurs again. The submarine cable companies and the carriers value their corporate images and would do the necessary for their users. This is by far a more desirable system than having all of them hide behind the government or guarded by the government. The government is

then faced with a huge task of intervening pro-actively and answering for private companies.

What OFTA would need to do though is to acknowledge that more cables will be built as a consequence. Landing stations will likely be in short supply. Its job would be to review the number of landing stations, Hong Kong's attractiveness to submarine cable operators and Hong Kong's competitiveness in the industry. To ensure or to create a supportive business environment is one of the most important roles of the government. This is a far more important job while close monitoring and intervention to deal with any unanticipated situation is not.

HKCOLO has demonstrated its leading role as an enabler. Its data center enabled submarine cable companies and various carriers to deal with the situation and find solutions quickly in one place. Bypassing cut cables and re-routing of traffic can be done within the confinement of a room or under the same roof. It is obvious from our observation that cable operators and large capacity users colocated in our premises recovered swiftly. Users of HKCOLO services were able to recover within minutes of outage when their traffic were re-routed before a problem was registered by their customers. HKCOLO went through checking of all available networks within its premises to find out which network was working and which was not. Its 24 hours network monitoring service worked well for its customers. Our carrier customers were thus blessed for this quick action because after they were re-routed to the only available network in Hong Kong, as mentioned in the early part of our report, the network became so full that the not-so-lucky late carriers were no longer entertained.

From the cable laying works that HKCOLO carried out during the two weeks immediately after the earthquake, it indicated that cable operators have a scurry of activities to perform to fix the problem or to do a bypass in specific. And since there were only 3 working days before the on-set of another long holiday after the earthquake, the enabling function of ours became so much more valuable and meaningful. Quick and prompt actions in completing job requirements for our customers shortened their outages. They were quickly put back on their footings to minimize disruption. And in this situation, when end users are gauging how quickly their providers can recover from a natural disaster, the faster to recover almost always represents a gain in

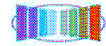
business while the slower represents just the opposite. To find a way to respond fast, not-so-lucky carriers must now seriously consider whether their colocation providers are enablers or just someone merely selling space and power.

Remarks

Earthquake is an act of Nature. It is unavoidable and unpredictable and the industry will react by a modified design of network and reorganize itself for resilience and redundancy. With all the redundancies already built to any of those cables mentioned (see anyone of Attachment 1a-1g), no one would have thought that a complete cut was possible. Yet it happened and it happened to such a large scale. This earthquake in Taiwan will have a lasting effect in how submarine cables are to be laid out and how companies will re-align themselves and their networks to cater to another occurrence. HKCOLO is blessed to be in a position to provide part of the recovery service, observe the event and to express our view.

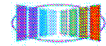
Major economic disruption and international trade outages were averted due to the quick actions of all the parties mentioned in this report and those not mentioned but did a good job in the background. These parties had not allowed a major disruption to have a prolonged interference in our way of life and they deserved our recognition in their roles and efforts in the restoration.

We will contact the various parties who played a role in the restoration of service and seek their permission to reveal their names to give due recognition. Once permission is obtained, we will be replacing the names which are now just alphabets. We also recognize that the content of this report may not have brought out a full picture because a lot of things happened in the background but all attention has been given to bring out a true picture. If there are areas readers have more information or opinion that we can use to make this report more complete, we welcome them. We may not be able to amend all the issued reports but information and opinion passed to us will be used to amend our online report and considered carefully for our future publications.



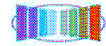
Attachment 1a - EAC



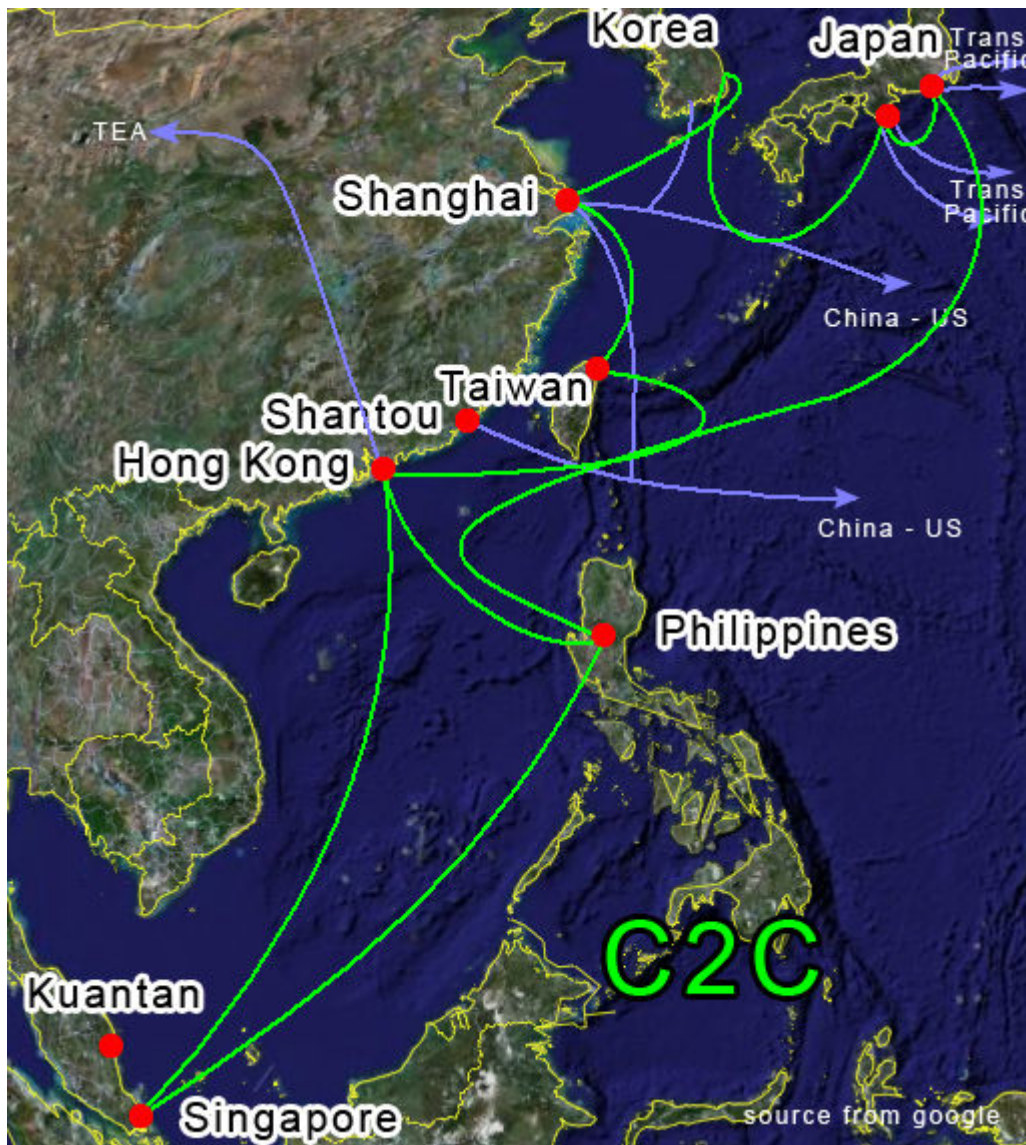


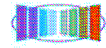
Attachment 1b – APCN2



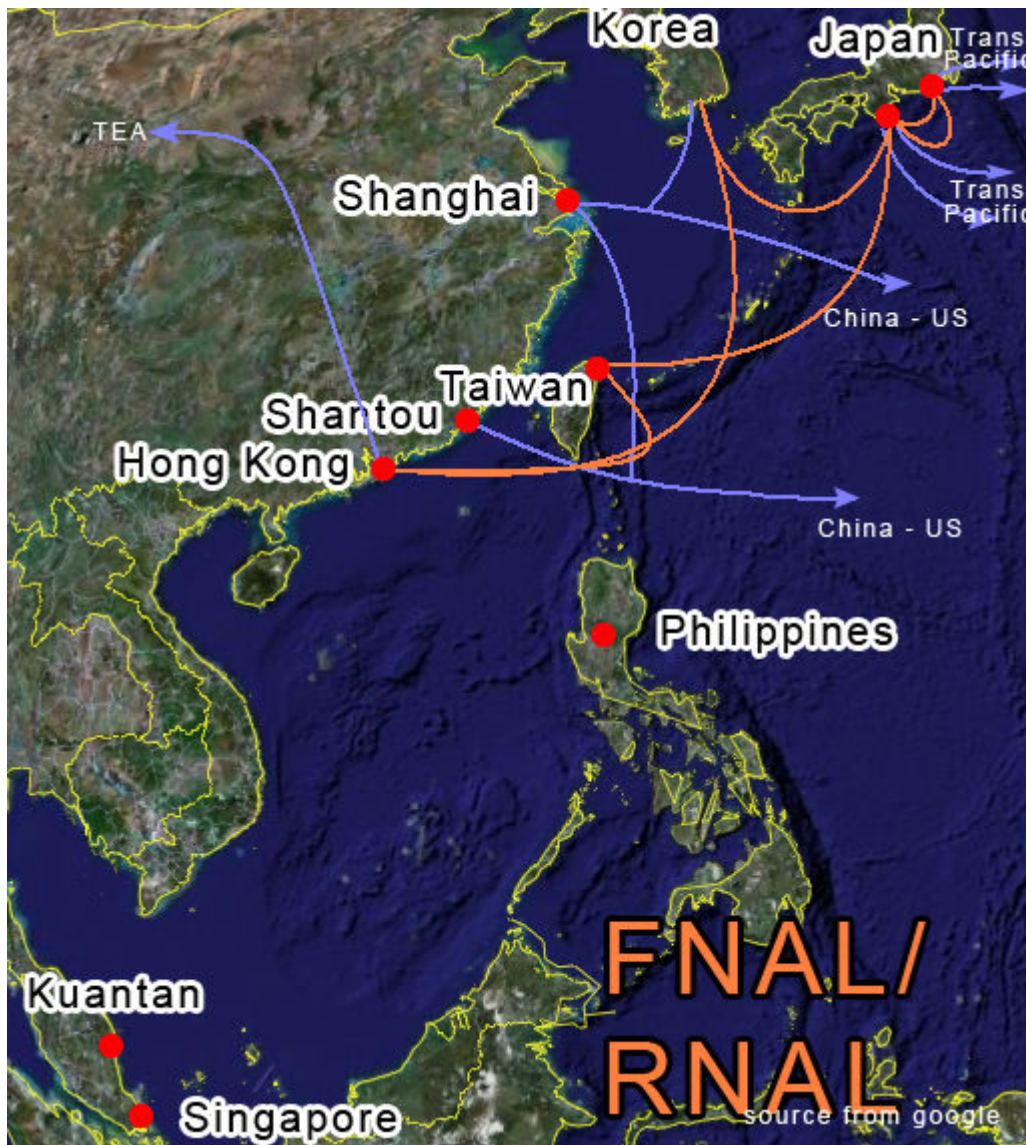


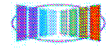
Attachment 1c – C2C





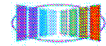
Attachment 1d – FNAL/RNAL



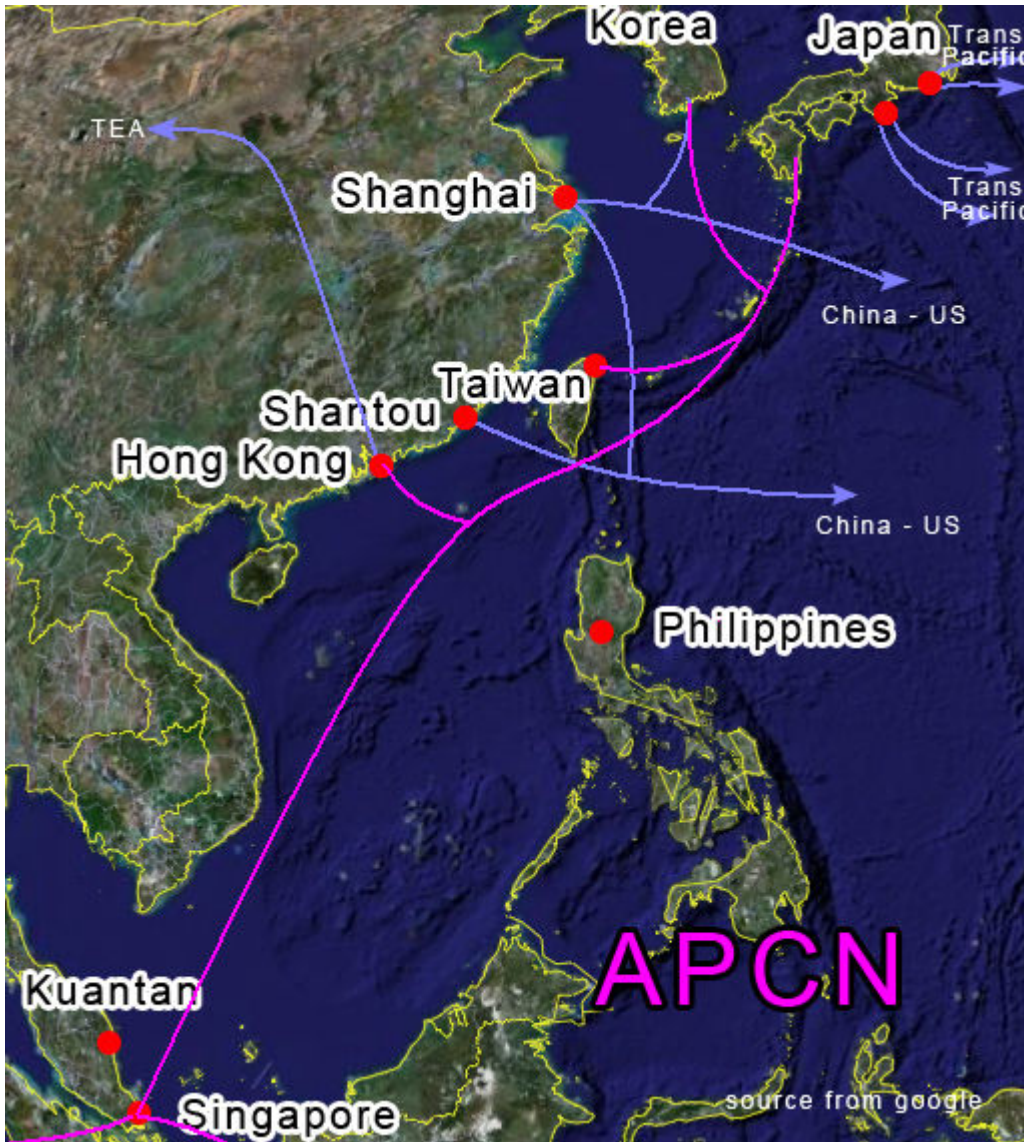


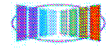
Attachment 1e – FEA



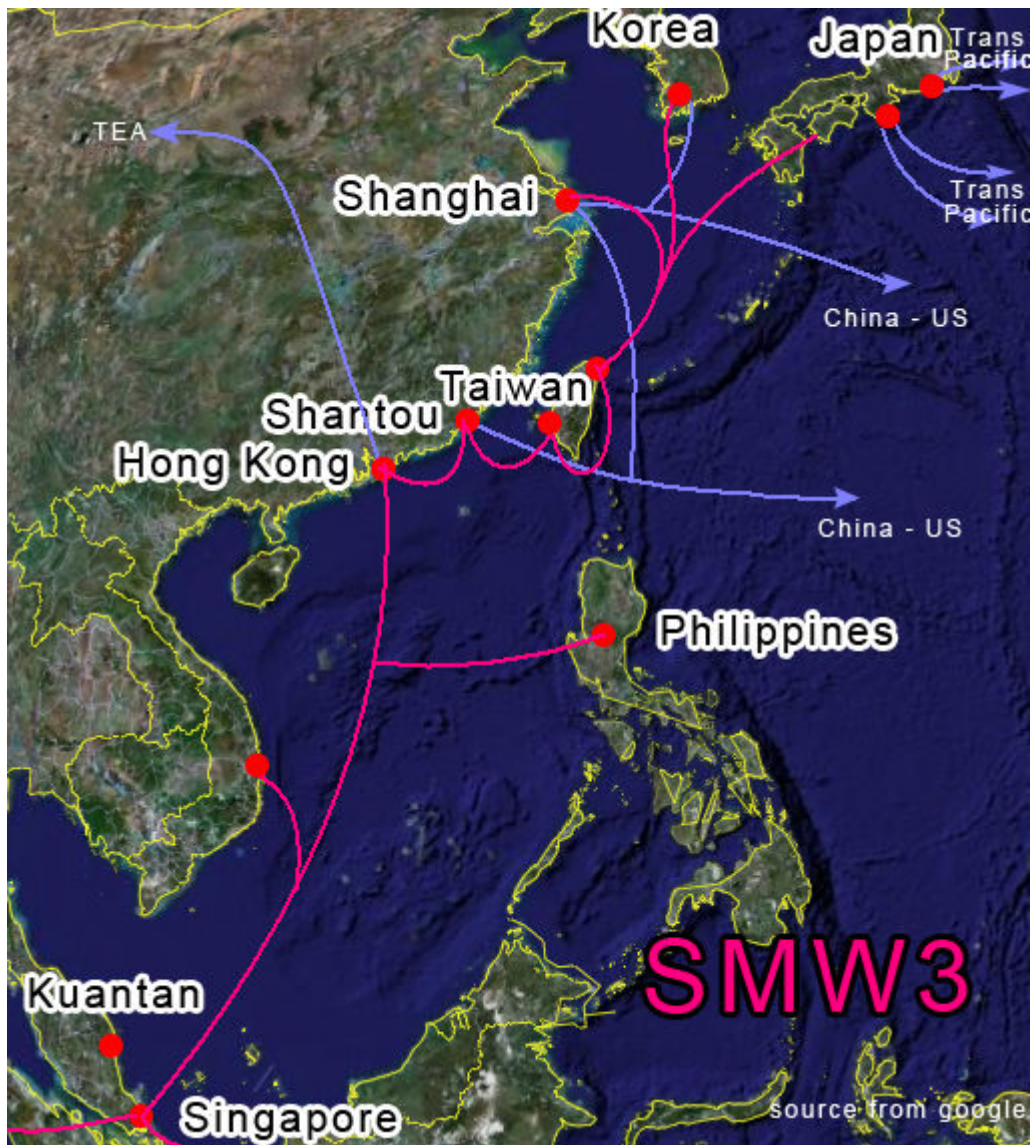


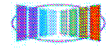
Attachment 1f – APCN





Attachment 1g – SMW3





Attachment 2 – Destruction Location

