



Submarine Cable Protection - Experience of Hong Kong, China

Mr. Lawrence S M Kwan
Chief Telecommunications Engineer

OFTA

**Workshop and Information Sharing on Submarine Cable Protection,
Security and Prosperity Steering Group, APEC TEL39,
Singapore, 13 April 2009**



What happened to Hong Kong during the Taiwan earthquake in 2006

- Earthquakes struck at 2026H (magnitude 7.2) and 2034H (magnitude 6.7) on 26 Dec 2006 (HKG time)
- Almost all submarine cables (connecting Hong Kong to Taiwan, Korea, Japan and the United States) passing through the earthquake region (Luzon Strait) were damaged,
 - ▶ resulting in serious disruptions of the external telecommunications services including IDD, roaming services, Internet services and IPLC etc.



What happened to Hong Kong during the Taiwan earthquake in 2006 (cont.)

- All IDD services resumed within a few days
- Internet services were gradually restored
- Alternative overland routes were activated

How we recover






Restoration paths

Eastern :
Very limited capacity

South-East Asia :
Hong Kong => SEA => Australia
=> USA

Northern :
Hong Kong => China => Russia
=> Europe => USA
Hong Kong => China => Japan
=> USA

Western :
Hong Kong => India => Middle
East => Europe => USA

	Broken Submarine Cable
	Emergency Backup Cable
	Unaffected Cable



Improvement after the incident

- **Government**

- ▶ improved emergency response system
- ▶ enhanced reporting mechanism
 - Operator to OFTA
 - OFTA to Public
 - Operator to Public
- ▶ offered advices
 - Issued guidelines to SMEs on how to deal with similar situations in future
 - advise the submarine cable operators to avoid laying cables in the earthquake regions



Improvement after the incident

- **Government (cont.)**

- ▶ drawn up guidelines on contingency plans
 - Guidelines for Submarine Cable-based operators for Reporting Outage
- ▶ requested ISPs to provide SMEs with backup and diversity services
- ▶ cooperated with other Administrations
- ▶ to formulate long term measures
 - Explore measures to improve the reliability and resilience of the network infrastructure of Hong Kong



Improvement after the incident

- **Industry**

- ▶ set up contingency plan for backup and diversity
 - OFTA will assess the plans of operator and where necessary give guidance
- ▶ improved external cable capacities and routings
- ▶ made use of land cable
- ▶ provided level of network services
- ▶ participated in regional cooperation




Emergency Response System (ERS)

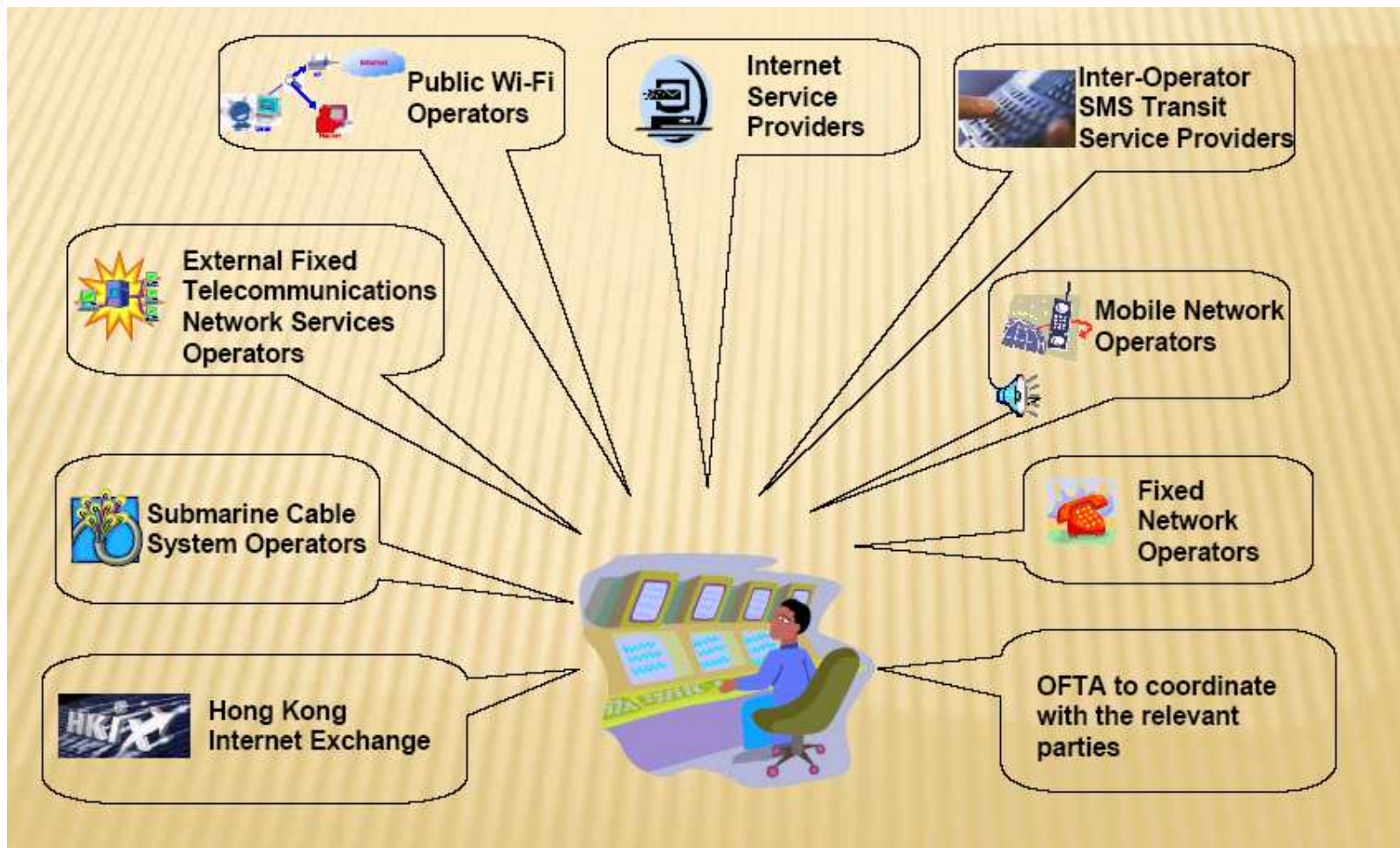
- **OFTA has established an ERS under which an emergency response team will stand by round the clock and 365 days a year**
 - ▶ The team is to keep in close contact with its counterparts (including all types of operators, relevant Government agencies and overseas administrations) to obtain first hand information about emergency incidents.
- **Purposes of ERS**
 - ▶ To prevent, prepare for and respond to network/service congestion and outages.
 - ▶ To minimize the impact and restore the affected services, if any, as soon as possible



Emergency Response System (ERS) (Cont.)

- 
- **ERS will be activated once network congestion, outage or poor weather happens or anticipated**
 - **Will ensure that prompt and coordinated response will be taken by the relevant operators to restore the affected services, if any, as soon as possible**

Emergency Response System (ERS) managed by OFTA





Enhanced Reporting Mechanisms

- **Dissemination of Information to Public**
 - ▶ Operators and OFTA have their respective roles
 - ▶ Operators have first-hand information on operational status of their systems and services and should be responsible to provide prompt information and advice to their customers about outages
 - ▶ For critical/major outages, operators should also report to OFTA under reporting mechanisms. If outage has significant and territory-wide implications, OFTA should alert the public through making warning messages on TV and radio



Enhanced Reporting Mechanism (Cont.)

- **More operators are required to report outage**
 - ▶ Operators concerned are required to report outages of submarine cable systems, external telecommunications services and Internet services within a timeframe as prescribed in the relevant Guidelines
- **Reportable submarine cable system outage**
 - ▶ Submarine cables being damaged by anchors dropped from ships, dredging fishing nets, earthquakes or other unknown reasons.
 - ▶ Multiple failures in the backhaul links leading to a loss of more than 50 % of the backhaul capacity of a submarine cable system within Hong Kong



Law on protection of submarine cables

- **Convention for the Protection of Submarine Cables**
 - ▶ Made at Paris on 14 March 1884
 - ▶ Has become part of the Submarine Telegraph Ordinance (Chapter 497 of Hong Kong Law) under which
 - A person who unlawfully and wilfully breaks or damages any submarine cable to which the Convention applies, in such manner as might interrupt or obstruct in whole or in part telegraphic communication, commits an offence and is liable on conviction on indictment to a fine of \$500000 and to imprisonment for 5 years.
 - A person who by culpable negligence breaks or damages any submarine cable to which the Convention applies commits an offence and is liable on summary conviction to a fine and to imprisonment for 1 year.



Protective measures of operators

- **Selection of suitable submarine cable routes**
 - ▶ cable route survey
 - ▶ bypass the cliffs and mountains under the sea;
 - ▶ new cables not to pass through the Luzon Strait, thus removing one potential single-point failure
- **Selection of suitable cable landing stations**
 - ▶ have little marine traffic to minimise the risk of cable being damaged by anchors and trawlers
 - ▶ with gently sloping, sandy or silty sea-floors to minimise cable damage
 - ▶ without strong currents that would uncover buried cables and potentially move cables
 - ▶ fewer crossings with other cable/facilities



Protective measures of operators (Cont.)

- **Protect the cables from shipping, fishing and other activities**
 - ▶ Burial of submarine cables at 3 - 5 meters deep into the seabed
 - ▶ Protect the cables with armouring
 - ▶ Using metallic pipes to protect the cables that are lying along the beaches;
- **Educate the fishermen**
 - ▶ Liaise with fishermen organizations and provide them with maps and information about the cable routes
 - ▶ Advise fishermen not to anchor or fish within the cable route areas





Contingency plans of operators

- **Improved capacities**
 - ▶ Operators concerned have taken various initiatives to enhance their capacity
 - ▶ Activated capacity of external facilities has increased from 698 Gbps in December 2006 to 1,838 Gbps in December 2008, an increase of almost 163%
- **Enhanced Route diversity**
 - ▶ Multi-ring, diversified network architecture
 - ▶ Traffic to be rerouted to alternative segments of the network
 - ▶ Interconnection links between different submarine cables have been added
 - ▶ Capacity of submarine cable over the Mainland of China has increased significantly as a backup route



Contingency plans of operators (Cont.)

- **Use of land cable**

- ▶ Land cables via China
- ▶ Land cables via China for connecting
 - Vietnam, Mongolia, Central Asia and Russia
 - submarine cable landing stations in Shanghai and Qingdao with on-ward connection to international submarine cable systems, giving access to South Korea, Japan and North America
- ▶ The land cables via China provide unique capability and resilience for Hong Kong to connect with the outside world
- ▶ There are duplicated routings between HK and China, which improve our resilience further




Contingency plans of operators (Cont.)

- **Contingency Procedures**

- ▶ Operators have tightened up their operational procedure for speedy response in the event of network outage / service disruption
- ▶ OFTA has vetted the contingency plans and given advice to some operators




Level of network services

- 
- Operators provide different levels of services to meet the business needs of users
 - Companies should choose the appropriate level of service that meet their business needs
 - ▶ Route diversity
 - ▶ Service provider diversity
 - ▶ Site diversity
 - ▶ Enhanced service level agreement



Regional cooperation

- 
- **Regional cooperation of operators in the region is encouraged**
 - ▶ to improve the reliability of the regional submarine cable infrastructure
 - ▶ to pursue cooperation initiative that will pool all available resources at their disposal to deal with major cable failures that may occur in future



Cooperation with other Administrations

- **Administrations would enter into arrangements on information exchange relating to failure of major submarine cable systems**
 - ▶ Notification mechanism of such a nature will help secure early warning and first hand information about incidents that may adversely affect our telecommunications services
 - ▶ identify what is appropriate at Government level to facilitate the acquisition of adequate backup capacity and route diversity



Thank You