

**For Information
on 17 April 2007**

**Legislative Council Panel
on Information Technology and Broadcasting**

**Report on the Disruptions of Internet Services
due to Earthquakes near Taiwan on 26 and 27 December 2006**

Background

At the Panel meeting on 15 January 2007, the Office of the Telecommunications Authority (OFTA) briefed Members on the impact of the Taiwan earthquake on 26 and 27 December 2006 (the Incident) on the external telecommunications services of Hong Kong and the restoration status of the affected services. Taking into account the comments of the Members and the suggestions of the deputations of the industry representatives and individuals at the above Panel meeting, OFTA has conducted a review on the Incident in relation to the Internet services with a view to identifying possible areas for further improvement. This paper briefs Members on:

- (a) the summary of incident reports submitted by the ISPs¹;
- (b) OFTA's detailed responses to the deputations' suggestions; and
- (c) measures that have been drawn up and actions taken to improve Hong Kong's preparedness to cope with similar incidents in future.

¹ Parties that have participated in OFTA's review include Hong Kong Broadband Network Limited, Hutchison MultiMedia Services Limited, i-Cable WebServe Limited, PCCW IMS Limited, New World Telecommunications Limited, Hong Kong Internet Exchange and Hong Kong Internet Service Providers Association.

The Incident

2. A chronology of the work of OFTA during the initial hours between the earthquake that happened at around 8:26 pm Hong Kong time on 26 December 2006 and the morning of 27 December 2006 is given in the LC Paper no. CB(1)697/06-07(01) issued on 9 January 2007 and presented to the Members on 15 January 2007. We wish to highlight the fact that submarine cable damages occurred at different times after the initial earthquake on 26 December 2006 and that significant impact on external telecommunications services of Hong Kong did not occur until the early hours of 27 December 2006 when a substantial proportion of the diverted routes was also disrupted.

Actions Taken by the ISPs for Service Restoration

3. According to the incident reports submitted by the respective ISPs, prior to the Incident, there were already contingency plans in force to cope with severe network outage or congestion caused by natural and/or man-made disasters. When the Internet traffic was affected due to the damages to submarine cables caused by the earthquake on 26 December 2006 evening and the afterquakes in the early hours of 27 December 2006, the ISPs had promptly activated their respective contingency plans and established crisis management teams in an attempt to restore their services. To cope with the serious submarine cable outage, operators have used different means to acquire external network bandwidth to alleviate the problem of capacity loss, including:

- (a) acquiring bandwidth from other cable-based External Fixed Telecommunications Network Services (EFTNS) operators who had spare capacity;
- (b) acquiring bandwidth of the overland cables (via the Mainland);
- (c) prioritizing the access of bandwidth for different services and limiting the access of high bandwidth applications;
- (d) re-dimensioning the network configuration and bypassing faulty

external networks and the affected submarine cable systems with a view to re-arranging traffic flow to achieve maximum performance; and

- (e) provisioning with foreign operators at the overseas point of presence in order to get the additional bandwidth.

4. The extent of the damages to the submarine cable systems was on a scale which has never happened before. Although there were a few cable links in Luzon Strait that survived the Incident, the cable operators needed time to acquire and set up additional equipment for the cable systems so as to increase the capacity provisioning before they could serve the others. In addition, the remaining capacity of the surviving cables was not sufficient to meet the need of all the operators. Overseas ISPs in the affected region were also competing for the external network capacity at the same time in the international market in order to restore services as much as possible. Such huge demand for bandwidth during the crisis cannot be foreseen. The responses and contingency actions of the respective ISPs were therefore different. On the whole, the Hong Kong ISPs managed to increase the bandwidth progressively since 28 December 2006 and had recovered about 80% of their international bandwidth on 3 January 2007. It was not possible to recover 100% as there was no more spare capacity available in the market. As the damaged submarine cable systems were repaired and resumed normal operation progressively by 29 January 2007, the Internet services in Hong Kong resumed normal soon afterwards.

Measures Drawn Up and Actions Taken by OFTA

5. In order to improve the preparedness of Hong Kong to cope with similar incidents in Internet service interruption in future, OFTA has undertaken a multi-pronged approach including facilitation to the Internet industry for the on-going development of the Hong Kong telecommunications infrastructure; promoting business continuity for Small and Medium Enterprises (SMEs) and exploring inter-government cooperation for precautionary mechanism.

6. A number of suggestions had been made by the deputations of the industry representatives and individuals at the Panel meeting on 15 January 2007. OFTA's detailed responses to these suggestions are given in the Annex. Being a regulator, OFTA should avoid unnecessary interventions that may distort market mechanisms. Nonetheless, OFTA has undertaken the following actions/measures to improve the preparedness of Hong Kong in the event of similar incidents in future:

(a) Critical Review on ISP's Contingency Planning

7. The Incident revealed the importance of contingency planning by the ISPs. With the cooperation of the ISPs, OFTA has reviewed their contingency plans and offered comments for further improvement as well as suggestions for better preparedness for similar incidents in future. Such improvements on the technical measures could be collectively summarised as follows:

- To adopt more diversity routes for the four geographical regions of Asia, Mainland China, Europe and North America for backup purpose. Each region will have designated primary and contingency routes as well as possible additional contingency routes. More capacity in addition to the normal demand should be made available via the primary and the contingency routes;
- To make pre-arrangements with international partners to cater for temporary increase of bandwidth demand during unforeseen circumstances; and
- To build more resilience in network topology to avoid adverse impact on services due to single failure of the major network component.

(b) Review the Mechanism on Information Dissemination by ISPs

8. Effective internal working procedures and timely information dissemination to the public by the ISPs are also important as they may

help the ISPs to activate their contingency plans in the earliest possible instance and may also help ease the anxiety of the public. Besides the contingency plans which are already in force, the ISPs have also reviewed their internal procedures for monitoring the real-time network performance and service outages and communicating with their customers, including:

- escalation procedures to keep the management informed of the latest status and impacts on the networks;
- strict compliance with the OFTA's guidelines on reporting of network and service outages (please see also (c) below); and
- prompt update on service impacts and restoration progress to customers via hotlines and customer services. Incident reports and proactive alerts will be provided based on the service level agreements for the major customers and business sectors.

9. OFTA will monitor the situation from time to time and ensure that the relevant ISPs have mapped out their improvement plans on the contingency measures for (a) and (b) in reasonable time.

(c) New Reporting Mechanism for Internet Service Outage

10. In the light of the Incident, OFTA also considered that there was an urgent need to review the outage reporting mechanisms. In addition to the existing guidelines², OFTA had worked with the cable-based EFTNS operators and ISPs and formulated new guidelines for reporting submarine cable system outages, external telecommunications services outages and Internet service outages with a view to strengthening the communications and coordination among different parties. The new guidelines have been effective since 28 February 2007. In general, in the event of major submarine cable system outage or disruption in external telecommunications or Internet services, the operators concerned are required to report to OFTA within 2 hours from the confirmation of the incident or within 4 hours from the

² OFTA has issued two sets of guidelines for handling public telephone network outage and congestion, namely "Guidelines for Fixed and Mobile Network Operators for Reporting Network Outage" and "Guidelines for Handling Network Congestion".

happening of the incident. OFTA will assess the significance of impact on the territory and determine whether public alert to be issued by OFTA is warranted.

(d) Promoting Awareness for Business Continuity

11. OFTA is mindful about the adverse impacts on the industry and, in particular, SMEs caused by the disruption of the Internet service. After the Panel meeting on 15 January 2007, OFTA attended the meeting of the SME Committee (SMEC)³ of the Trade and Industry Department in February 2007. OFTA discussed with SME representatives and shared their concerns about the difficulties experienced by SMEs during the Incident as well as their required assistance to cope with similar circumstances in future. OFTA took the chance to offer suggestions to the SMEs on improving the communications links with their business partners and on service agreement terms to be entered with ISPs so as to manage business continuity during disaster situations in future. Meanwhile, the Office of the Government Chief Information Officer (OGCIO) is also working to provide information to help the SMEs in relation to business continuity planning and incident response to cater for adverse events, such as service disruption of the Internet, and plans to publish a booklet on the issue within months. OFTA will provide the necessary assistance to OGCIO for preparing the information.

(e) Further Strengthening the Telecommunications Infrastructure of Hong Kong

12. In order to avoid heavy reliance on the submarine cable systems passing through the earthquake region in Luzon Strait, it is advisable that Hong Kong be served by different cable systems with large geographical separations. OFTA notes that there are industry proposals to install new submarine cable systems landing at Hong Kong. OFTA will offer possible assistance to the submarine cable industry, including facilitation of the operator in the development of cable landing stations. Hong Kong currently already has six cable landing stations. OFTA has also initiated discussions with the Ministry of Information Industry (MII)

³ The terms of reference of SMEC is to advise the Chief Executive on issues affecting the development of SMEs in Hong Kong and to suggest measures to support and facilitate their development and growth.

of the Mainland to explore the possibility of additional arrangements, on top of what have already been put in place by existing commercial agreement, for backup capacity by using overland cables to connect Hong Kong to other countries via the Mainland's cable systems. The feasibility of such "transit" arrangements impinges upon regulatory policies of the Mainland and other considerations of the relevant carriers. OFTA will continue exploring possible solutions with the relevant parties.

(f) Inter-Governmental Precautionary Mechanism

13. OFTA had met with MII and the Infocomm Development Authority (IDA) of Singapore in March 2007 and discussed the feasibility of exchanging information with them when similar problems arise in future. OFTA will continue to explore possible cooperation in this regard.

Office of the Telecommunications Authority

17 April 2007

OFTA's Responses to Deputations' Suggestions in Relation to the Incident

	Deputations' Suggestions	OFTA's Responses
1.	<p><u>Reporting Mechanism</u> OFTA should review the reporting mechanisms among OFTA and the operators.</p>	<p>Immediately after the Incident, OFTA had convened a meeting on 3 January 2007 to review the outage reporting mechanisms with the local and EFTNS operators as well as the ISPs. After the meeting, OFTA established two working groups to review the outage reporting mechanisms for cable-based EFTNS operators and ISPs respectively. In consultation with the two working groups, OFTA had formulated new guidelines for reporting submarine cable system outages, external telecommunications services outages and Internet service outages with a view to strengthening communications and coordination between the operators and OFTA. The guidelines have been effective since 28 February 2007.</p>

	Deputations' Suggestions	OFTA's Responses
2.	<p><u>Centralised Bandwidth Backup Pool</u> OFTA should consider purchasing backup bandwidth capacity from international carriers in order to provide a Centralized Bandwidth Backup pool.</p> <p>Instead of purchasing bandwidth capacity for consumption by citizens, the Government should consider providing financial incentives to promote route diversity.</p>	<p>The Incident has confirmed that market mechanisms are working effectively. Though the recovery rates might be different, the operators managed to restore the affected services promptly in response to the market demand. The proposal on centralised bandwidth arrangement is not appropriate. This is because such proposal will not only affect market operation, but also impair operators' incentive for investment in backup capacity. Nonetheless, OFTA is liaising with the Mainland authorities on the feasibility of additional arrangements, on top of what have already been achieved under commercial agreements, for overland cable capacity for backup use of the Hong Kong ISPs. There are also announced plans of the industry about installation of more submarine cable systems in the Asian region. Please see item (3) below.</p>

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3.	<p><u>Additional Submarine Cable</u></p> <p>The Government should take the lead in installing an additional submarine cable with funding subsidised by other governments joining the venture or by increasing the Universal Service Contributions.</p>	<p>OFTA notes that a number of companies and consortiums in the private sector have announced plans to install new submarine cable systems to connect Asia and the US including (i) the Asia American Gateway (AAG), (ii) EAC Pacific and (iii) the Trans-Pacific Express (TPE).</p> <p>The AAG will link South East Asia with the US. It is currently planned to be routed via, among others, Hong Kong. Hong Kong can also be connected to the planned EAC Pacific through the existing submarine cables. As the TPE will have landing points in the Mainland at Qingdao and Shanghai, Hong Kong can be connected to the TPE through the Mainland's overland cables. According to the announced plans, the AAG, EAC Pacific and the TPE are scheduled to be completed by 2008.</p> <p>Noting that the companies and consortiums in the private sector already have active plans to build new cable systems to increase the route diversity in the region that bypass the Luzon Strait, OFTA considers that the current market-led approach should be maintained and that</p>

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		unnecessary market intervention should be avoided. OFTA will offer possible assistance to the interested operators, including facilitation in the development of suitable cable landing stations.
4.	<p><u>Compulsory Interconnection and Promoting Sharing of Resources among ISPs</u></p> <p>During contingency, interconnection among networks of ISPs should be made compulsory.</p>	<p>Under the Telecommunications Ordinance, the Telecommunications Authority may direct a licensee to coordinate and cooperate with another licensee to share the use of the bandwidth facility only when the facility is a "bottleneck". However, the outages in question did not give rise to bottleneck situations as there were a number of alternative routings such as overland cables to the Mainland in the north and submarine cables to the westerly and southerly directions for traffic diversity. Operators could enhance mutual cooperation to further strengthen their contingency measures. The Government should avoid interfering with the operators' commercial negotiation processes.</p>

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5.	<p><u>Telecommunications Infrastructure</u> The Government and OFTA should provide proactive assistance to local operators on their access to the Mainland telecommunications market and facilitate the development of the telecommunications infrastructure.</p>	<p>According to some operators, during the Incident, they had made temporary arrangements to use the Mainland's overland cables for re-routing the Hong Kong traffic to the cable landing stations at Shanghai, Shantou and Qingdao and then delivering it to the submarine cable systems. OFTA has initiated discussions with the Mainland authorities about "transiting" arrangements, on top of what have already been achieved on a commercial basis, via Mainland's over-land cable to the Mainland's cable landing points for connection to the submarine cable systems so as to provide more effective route diversity.</p>
6.	<p><u>Inter-Governmental Precautionary Mechanism and Contingency Plan</u> OFTA should liaise with the telecommunications services regulators of those countries affected by the Incident for establishing an effective precautionary mechanism as well as putting in place contingency plans.</p>	<p>OFTA had met with the Ministry of Information Industry (MII) of the Mainland China and the IDA of Singapore. Among other things, OFTA discussed the feasibility of exchanging information with them when similar problems arise in future. OFTA will continue to explore possible</p>

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		cooperation in this regard.
7.	<p data-bbox="259 397 1133 480"><u>Community Awareness and Education in Business Continuity</u></p> <p data-bbox="259 493 1133 624">The Administration should join hands with the IT industry to step up education for SMEs and general domestic users.</p>	<p data-bbox="1155 493 2029 1011">OFTA attended the meeting of the Small and Medium Enterprises (SMEs) Committee of the Trade and Industry Department in February 2007 and discussed with the SME representatives about the impacts to SMEs caused by the Incident as well as the assistance that they needed to cope with similar circumstances. OFTA took the opportunity to offer advice to the SMEs on how to improve their communications links with their business partners and on service agreement terms to be entered with ISPs to ensure adequate access to the Internet during critical network outages.</p> <p data-bbox="1155 1070 2029 1294">Meanwhile OGCIO is coordinating with the relevant parties in enhancing the SME Information Security Guidelines with content including business continuity planning, management and incident response for catering for adverse events such as service disruption of the</p>

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		<p>Internet. A booklet on the issue will be published within months. In addition, OGCIIO is also collaborating with the Hong Kong Computer Emergency Response Team to conduct an Information Security Survey on SMEs by May 2007 that will also cover aspects of business continuity planning. OFTA will provide assistance to OGCIIO on the telecommunications issues as necessary.</p>
8.	<p><u>Information on Outages, Undersea Cables and International Bandwidth</u> The public should be notified of any network incidents 180 minutes after the occurrence and ISPs should publicise business information on the undersea cables and international bandwidth suppliers they use, so that consumers can make informed choices.</p>	<p>OFTA shares the views that early notification and timely dissemination of information to the public will be an effective tool to help alleviate public anxiety and misunderstanding. The operators, having the first-hand information on the operational status of their networks and services, should take a more proactive role in disseminating prompt information and advice to their customers through hotlines or websites as appropriate. Where the outages fall within the reporting criteria, the operators concerned should, in addition to providing information and advice to their customers, report to OFTA</p>

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		<p>within the specified timeframe. Upon receiving such information, OFTA will promptly inform the public and provide guidance where necessary, if the outages have significant and territory-wide implications. OFTA also welcome Hong Kong Internet Service Provider Association's suggestion to offer more service packages to consumers.</p>
9.	<p><u>PCCW's Contingency Measures</u> Whether PCCW had implemented any contingency measures during the recent network outage, and whether it had any difficulties in acquiring bandwidth from other ISPs during this incident, etc</p>	<p>The Internet market is very competitive in Hong Kong and PCCW is only one of the ISPs. According to the submitted incident reports, prior to the incident, all the ISPs have already had contingency plans in force, including backup facilities and traffic diversity measures to deal with cable outages, network congestion and etc. However, the scale of cable outage on 26 December 2006 was unprecedented. The seven cable systems passing through the Luzon Strait failed to perform mutual backup as they were all damaged with only one cable link surviving from the incident. Nonetheless, the ISPs managed to restore service connection after a few days</p>

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		<p>from the Incident and their restoration capability was on par with their peers in other places in the Asian region. The Internet services in Hong Kong and other Asian countries fully recovered when the damaged submarine cable systems were progressively restored by 29 January 2007.</p>