PCCW

PCCW Background

PCCW is Hong Kong's largest telecoms operator; with the most extensive fixed line coverage and over 2.6 million fixed line subscribers, PCCW controls a 68% market share – far outpacing its nearest competitor. In addition to standard home and business voice and broadband services, PCCW is also the only telecom provider in Hong Kong with mobile and television broadcasting rights and the only operator that can provide all four services in one. The following is a summary of PCCW's fixed line, broadband, mobile, and IPTV market share in Hong Kong, as of mid 2008:

- 2.6 million fixed line subscribers — 68% market share
- 1.275 million broadband subscribers (1.1 million home broadband subscribers) — 58% market share
- 923 thousand IPTV subscribers — 60% market share (compared to cable TV)
- 1.176 million mobile subscribers (288 thousand 3G subscribers) — 12% market share

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- **Fixed Line —** Stable customer base with firm ARPU
- **Broadband —** Leading market with high speed and mobility
- **Mobile —** Fastest growing 3G, positive EBITDA
- **now tv —** Largest local pay-tv operator and growing

PCCW's WiFi Strategy

In late 2006, PCCW began expanding its WiFi hotspot coverage from 300 hotspots to nearly 4,000 in mid 2008, and predicts it will reach 5,500 hotspots by the end of 2009. PCCW hotspots can be found in numerous locations throughout Hong Kong, including convenience stores, coffee shops, restaurants, shopping centers, large housing complexes, phone booths and subway stations. PCCW sees WiFi as an important component of its mobile data strategy. PCCW's WiFi development strategy is based on the following:

- Demand stems from growing consumer use of WiFi technology. In recent years, the proliferation of end user devices like the iPhone and other WiFi-enabled

handhelds, along with the explosive growth of netbooks has driven WiFi use at hotspots.

- The combination of WiFi and 3G + HSPA can provide users with city-wide wireless data access, reducing carriers' reliance on pure 3G networks to provide data service. This not only reduces the load on the existing 3G + HSPA networks, but also reduces the need for further investment in 3G equipment and provides users with faster and higher bandwidth wireless service.

- The increasing availability of WiFi-enabled mobile devices on the market will result in consumers growing more accustomed to using WiFi to connect to the Internet. This in turn will drive increasing use of WiFi hotspots and expanding coverage.

Why not use WiMax?

Network equipment suppliers and service providers are currently investigating the deployment of WiMax to provide mobile data service. The following factors play a major role in defining strategies for network development:

- Practical business opportunities, with respect to market popularity and tolerance.
- Network equipment investment costs, and return on that investment.

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W I R E L E S S

Because WiMax is not yet widely available on end user products, and the cost of deploying networks of WiFi hotspots is far less expensive than deploying WiMax, PCCW decided to provide mobile data service using a combination of 3G + HSPA and WiFi.

However, a network of WiFi hotspots is not completely without complications. The disadvantages of WiFi include:

- Limited coverage. Building an extensive WiFi network to cover a sizable metropolitan area requires large numbers of access points to provide adequate coverage.

- Stability. Especially when many users concurrently access value-added services like IPTV, network instability can lead to problems.

For service providers, mobile data service must have wide coverage. Providing a wide coverage area allows carriers to satisfy customer demand and increase the quantity and quality of mobile data use.

Quad-Play Services

From a business perspective, the greatest advantage of developing WiFi networks for PCCW lies in its ability to promote quad-play services: fixed line, broadband, IPTV, and mobile. By providing four services through a single customer account, PCCW can offer an attractive array of service packages, such as:

- Fixed line (voice) + broadband + IPTV (NOW TV)
- Mobile (voice + 3G + HSPA data)
- Home broadband + mobile (voice + 3G + HSPA data + WiFi)

For example, a customer who is already a PCCW home broadband customer subscribes to PCCW's mobile data service, and with it also gets WiFi access and WiFi NOW Sports. The customer can now watch English Premier League football, music videos and other programs on PCCW's IPTV service (NOW TV) both at home and at wireless hotspots like Starbuck's coffee shops anywhere in Hong Kong. The existing customer is no longer limited to watching IPTV programs at home.

Additionally, by subscribing to PCCW's 3G + HSPA data + WiFi service, customers can access mobile IPTV on either a notebook or a 3G mobile phone, providing more value and freedom for the customer. For the service provider, the ability to offer quad-play services enables increased average revenue per user (ARPU) from existing single-service customers, and expanded revenue streams.

The following sample pricing for PCCW services gives a general idea of the offerings available for individual subscribers:

- Fixed line (home telephone): HK$95 per month (~US$13.90). Monthly rates can be lower (one or two year contract).

- Broadband: from HK$170 – 350 (~US$24.90 – US$51.24) per month and up (depending on speed).

- IPTV: from HK$4 – 400 (~US$58.60) per month (depending on channels purchased).

- Mobile: from HK$122 – 450 (~US$17.86 – $65.89) per month (depending on mobile use or package rate).

Mobile Data Network Strategy

PCCW employs a mixed network format to integrate 3G + HSPA + WiFi networks and provide mobile data service. This format is able to fully utilize existing network resources, and achieve the highest level of synergy between those resources. The advantages of a 3G + HSPA network are its extensive coverage and low data volume (primarily voice). The disadvantages are the comparatively low data bandwidth and the high cost of equipment investment. WiFi networks, on the other hand, provide the advantages of higher data bandwidth and speed along with lower equipment costs. Their disadvantages are lower coverage area and susceptibility to interference.

Because so many of today's mobile wireless devices support both 3G and WiFi, it is not overly difficult for operators to provide near universal coverage. However, they must consider the cost of investment for these different approaches to building out coverage and capacity when deciding on which to use in a given area. The high cost of increasing 3G + HSPA capacity (by expanding equipment) coupled with the fact that users typically consume significantly more bandwidth indoors than outdoors, leads to the conclusion that the most efficient way to increase capacity in may situations is by expanding WiFi hotspot coverage.
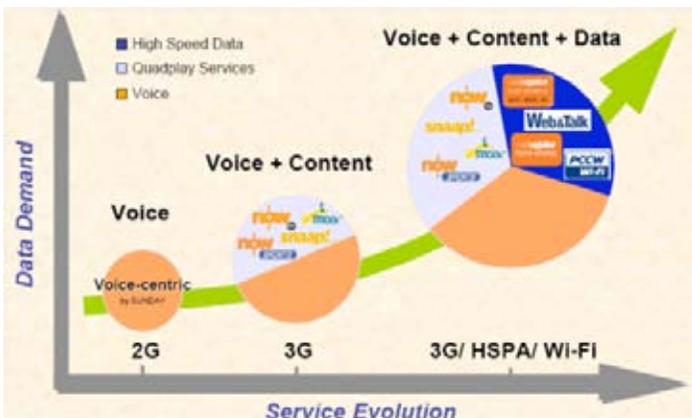
The following issues must be addressed in deploying a mixed 3G + HSPA + WiFi network model:

- Automatic switching between 3G + HSPA and WiFi IPTV applications
- Notebook 3G + HSPA connectivity
- Wireless authentication at WiFi hotspots

Automatic Switching between 3G and WiFi

PCCW addresses this issue by providing software that installs on mobile devices for IPTV applications. The software ensures that when a user switches from 3G to WiFi or from WiFi to 3G, their IPTV programming will not be interrupted.

Notebook 3G Internet Access

Notebooks generally do not generally include 3G connectivity. Therefore, they can only access the Internet at WiFi hotspots. To provide seamless coverage for users, PCCW provides a USB dongle to its customers to enable 3G access. When using the USB dongle, driver software is installed on the notebook that can automatically detect 3G and WiFi signals and prioritize WiFi connectivity over 3G. When no WiFi is available, the software allows Internet access using 3G + HSPA.

Wireless Authentication at WiFi Hotspots

3G and WiFi user authentication must be resolved in any practical application. 3G authentication generally takes the form of SIM card approval, but at the time PCCW began expanding its hotspot network, the industry's support for SIM-based authentication over WiFi was not mature enough to make that approach practical, or more important, adequately seamless for subscribers. As an alternative, PCCW used a combination of MAC authentication and SMS-based validation for security — the net result of which is a single sign-on for subscribers when they first register their devices on the WiFi network, and then at most one-click agreement to re-connect when subscribers come into a Wi-Fi coverage area again.

PCCW offers the following mobile data (3G + HSPA + WiFi) service plans:

WiFi

• HK$ 2.6 per 10 minutes (PCCW customers)

• HK$ 5.2 per 10 minutes (non-PCCW home broadband users)

• HK$ 42 per month (200 minutes); afterwards, HK$ 2.6 per 10 minutes

• HK$ 86 per month (unlimited – PCCW customers) or HK$ 13.8 per month (unlimited – non-PCCW customers)

3G + HSPA + WiFi

• RMB 285 per month (2 year contract)

• RMB 285 per month (18 month contract) + RMB 1,460 (USB Dongle)

PCCW Hotspot Network Topology

PCCW's network design emphasizes leveraging existing network resources. The majority of hotspots use DSL to access the Internet, and at each hotspot, the access point is connected to a DSL modem. Wireless data travels through the DSL modem to the DSLAM at the data center, then to the user management gateway, then to the Internet.
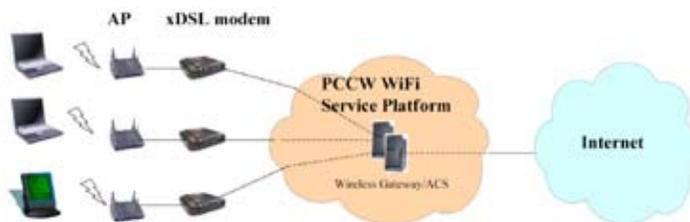
Because WiFi hotspots need to provide different types of service, access points must include the following features:

• Support for multiple SSIDs
• Multiple types of authentication and encryption protocols, including EAP-SIM
• High density online user connectivity
• User bandwidth limits and QoS prioritization for different applications
• IPTV transmission stability

For example, for user authentication, the most basic requirement is that the device supports Captive Portal and EAP-SIM authorization, and provides at least two SSIDs: one open (for portal use) and one 802.1x (for EAP-SIM use).

For the general public (non-PCCW customers), Internet access is provided by a Captive Portal Web page when a user connects to a hotspot. The user then chooses a service type such as hourly or daily rate access. If the user is a PCCW customer, she can enter her username, password and mobile phone number for more secure authentication.

Moving Forward

PCCW's hotspot network was initially expanded primarily to extend the operator's existing service value proposition to subscribers — giving them a superior broadband experience in the Hong Kong market regardless of their location or device. As the network has moved into full use and subscriber habits have become formed to take full advantage of the network, PCCW is reaping significant rewards on the cost side of the equation as well. As of mid 2009, their WiFi network was handling as much as 5% of the traffic that would have otherwise been consuming precious capacity on their 3G network, and the proportion was rising quickly. In addition, the PCCW team was beginning to notice patterns in subscriber behaviors around specific locations and times of day — with resolution that would not have been possible with their 3G network alone.

PCCW is currently expanding their WiFi network more slowly, focusing more closely now on upgrading older access points to 802.11n, to take advantage of the sustantial improvements in capacity and coverage offered by the latest BeamFlex-enabled access points from Ruckus*. Their sights are also set on mining the information their network provides them about subscriber location and behavior patterns, to create personalized brand and service experiences — leading the next wave of wireless innovation.

* Ruckus APs power nearly 50% of the PCCW WiFi hotspot network, a proportion that is rising over time with replacement of legacy 802.11g equipment with Ruckus 11n solutions.

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