

Internet and Internet Exchange in Taiwan

- Slowly growing but still a long way to go!

By Chief Telecom

Who is Chief Telecom?

CHIEF | 是方電訊

Chief Telecom- founded in January 1991.

- Biggest carrier neutral IDC in Taiwan with over 360,000 sqft floor space and 30MW capacity in 3 IDC buildings.
- The 1st and #1 IDC to customize-build and lease IDC to Global Carriers, ICPs, CDNs, ECs and Enterprises.
- Services: IDC/ Telehouse, VoIP E.164, Global MPLS, IPLC, Taiwan domestic LLC, VPN, Internet, Cloud, Company License and Telecom License Application.
- Operate the Biggest Internet Exchange in Taiwan- TPIX.
- Acquired by Chunghwa Telecom (CHT) in 2006.
- Certified ISO 27001 and ISO 27011 since 2011.



Agenda

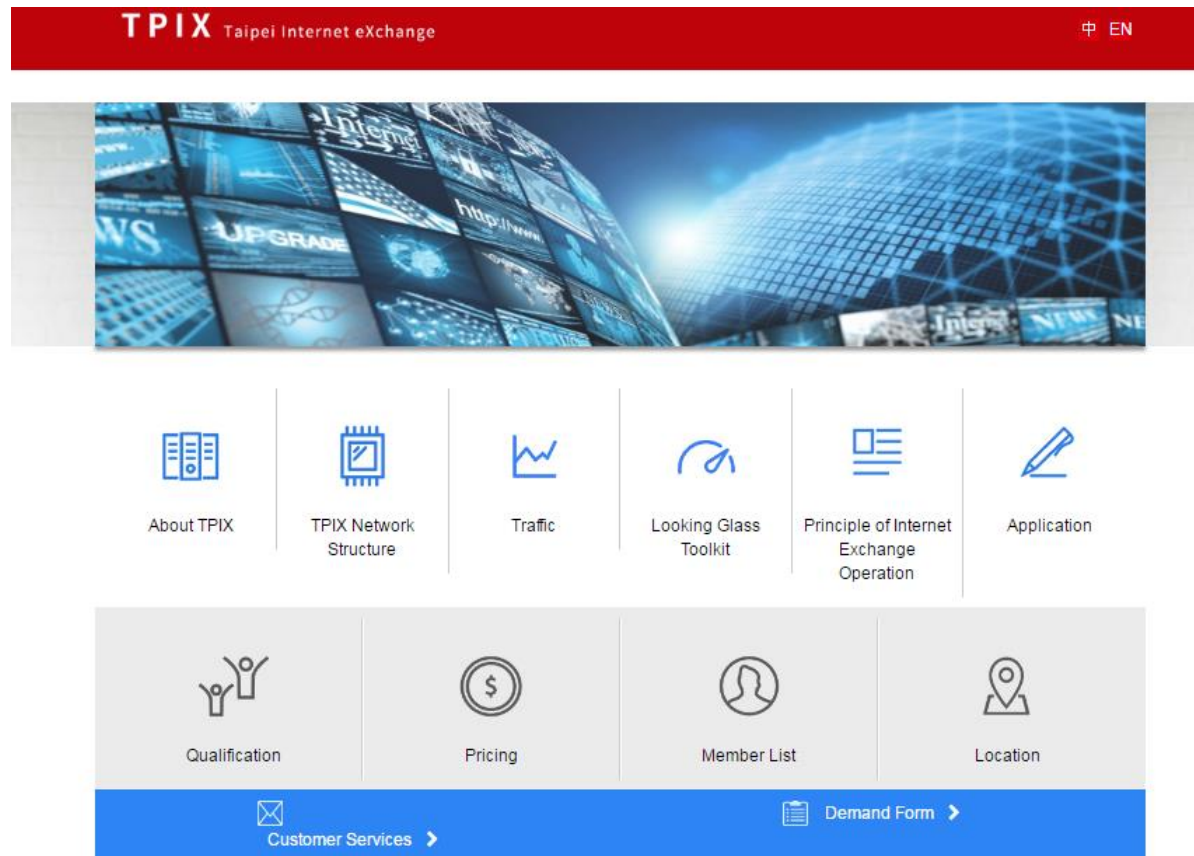
- **TPIX Introduction**
- **Taiwan Telecom/ ISP Development Mile Stones**
- **Taiwan IXP Status**
- **Taiwan Internet Market**
- **Where do Taiwan IXs Stand**

Connect with Taiwan ISPs at ***TPIX***

IXs in Taiwan- TPIX (by Chief)

Taipei Internet eXchange

<http://www.tpix.net.tw/index.html>



IXs in Taiwan- TPIX (by Chief) Member

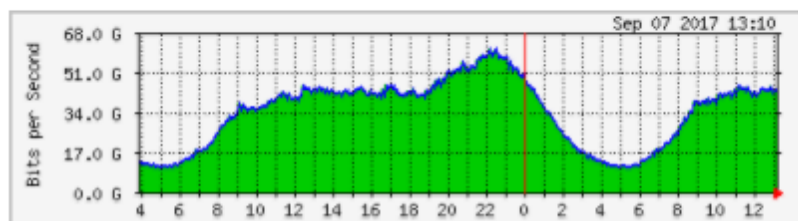
Member	AS Number	Links to TPIX
AboveNet	17408	10GE*2
Academia Sinica Network(ASNet)	9264	10GE
Akamai	20940	10GE
Amazon	16509	10GE*2
APT	17709	10GE
CHT-TWGate	9505	10GE
ChuanChan	18046	GE
CloudFlare	13335	10GE
DCTV	131607	GE*5
DMG	18419	10GE*2
Dwins	17416	GE
eASPnet	10135	GE
Facebook	32934	10GE*4
Google	15169	10GE*4
Hurricane Electric	6939	10GE
HYA Cable TV	131602	GE

Member	AS Number	Links to TPIX
i-Service	45816 55480	GE
Microsoft	8075	10GE
NCTU	9916	GE
ONNET Global	131303	GE
Sky Digital	134823	GE
So-net	18182	10GE
Taifo	131584	GE
TANet	1659	10GE*3
Telekomunikasi Indonesia Int (TELIN)	7713	GE
Telstra	4637	10GE
TINP	18049	GE*4
T-Star	24157	10GE
TWT	38851	GE
U-Home	131606	GE
Unigate	9831	GE
Veetime	17809	10GE
Worldstar	131603	GE
Yahoo!	10310	10GE*4
Zenlayer	21859	10GE

IXs in Taiwan- TPIX (by Chief) Traffic

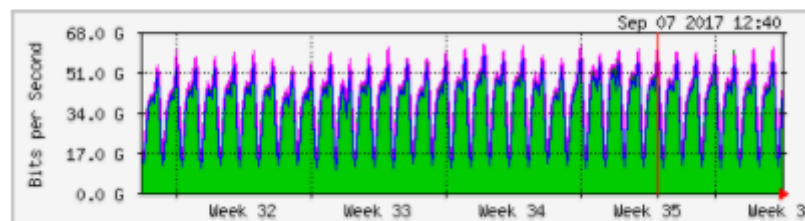
The statistics were last updated **Thursday, 7 September 2017 at 13:10**

`Daily' Graph (5 Minute Average)



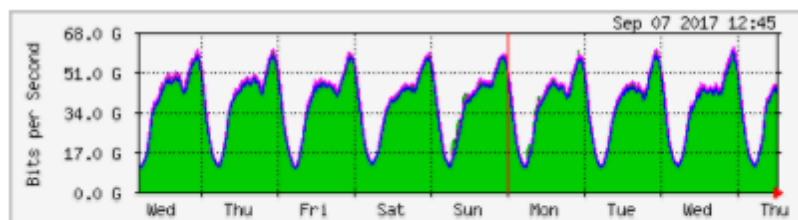
	Max	Average	Current
In	60.8 Gb/s (65.3%)	34.0 Gb/s (36.6%)	43.2 Gb/s (46.3%)
Out	61.0 Gb/s (65.5%)	34.0 Gb/s (36.6%)	43.2 Gb/s (46.4%)

`Monthly' Graph (2 Hour Average)



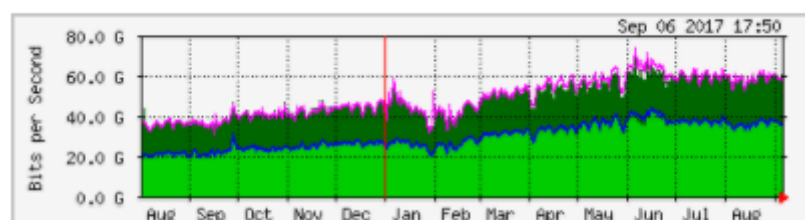
	Max	Average	Current
In	62.4 Gb/s (67.0%)	35.7 Gb/s (38.4%)	42.3 Gb/s (45.5%)
Out	62.4 Gb/s (67.0%)	35.7 Gb/s (38.3%)	42.3 Gb/s (45.5%)

`Weekly' Graph (30 Minute Average)



	Max	Average	Current
In	61.0 Gb/s (65.5%)	36.3 Gb/s (39.0%)	42.6 Gb/s (45.8%)
Out	61.0 Gb/s (65.5%)	36.2 Gb/s (38.8%)	42.6 Gb/s (45.8%)

`Yearly' Graph (1 Day Average)



	Max	Average	Current
In	71.7 Gb/s (76.9%)	29.2 Gb/s (31.4%)	35.8 Gb/s (38.4%)
Out	73.5 Gb/s (78.9%)	29.4 Gb/s (31.6%)	35.8 Gb/s (38.4%)

IXs in Taiwan- TPIX (by Chief)

- 19 members are using multiple 10G ports
- 16 members are using multiple 1G port
- 13 ICP- Content members including Akamai, AWS, CloudFlare, FB, Google, Microsoft, Oath: (Yahoo) etc.
- 22 ISP/ Carrier members
- 100G customers are on-the-way

39

35

members

73G

Peak Traffic

IPv4/v6

Supported

100G

Connection
available

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- Taiwan IXP Status
- Taiwan Internet Market

Taiwan Telecom Development Mile Stones

- 1912-1932 Ministry on Communication Telecom Policy Division
- 1932-2006 DGT (Directorate General of Telecommunications)
- **2006-now NCC (National Communications Commission)**
- **1996 3 Laws of Telecom- DGT/ CHT/ Telecom Laws, Type I and Type II License Opened**
- 1998 TWM (GSM), FET(GSM)
- 1999 TWNIC, TWIA founded
- 2000 Submarine License Opened (Special Type I)
TFN (Type I), EBT (Type I),
- 2001 NCIC (Type I), EBT founded APBW (3G)
ISR, VoIP License Opened
- 2002 3G License Opened
- 2003 MVNO License
- 2004 EBT changes name to APBT(APTG)
- **2006 CHT invested in Chief Telecom**
- 2007 TWM merge TFN
APT merge APBW
- 2008 TWM merge TTN
- 2009 NCIC merge SeedNet (Digital united)
- 2010 TWM merge Kbro (#2 MSO)
FET merge NCIC
- 2011 APT merge APOL
- 2014 Foxconn merge APT
- 2016 APT merge TBC (#3 MSO)
- 2016 FET merge KBT(#1 MSO) **(2017- Feb., Failed)**

Major Telecom ISP AS# Groups

- **CHT Group-**
 - HiNet 3462, TWGate 9505, emome(CHT mobile) 17421, HINETUSA 9680, HINET-IPV6-TW 17419
- **TWM Group-**
 - TFN 9924, TWM 24158, Kbro 38841, TTN 4747
- **FET Group-**
 - NCIC 9919, FET 9674, SeedNet 4780, KGEx 9918
- **KBT 9416**
- **APT Group-** APOL 7842, EBT 17709,
- **Government-**
 - TANet 1659+ ASNet 9264+TWAREN 4782+ TANET2-TW/7539
 - NTU 17716, NTHU 18047, NCTU 9916, NCKU 18177, NSYSU 17713, NCU 1659, NCHU 38847, CCU 17712
 - GSN 4782
- **CHIEF-**
 - Chief 10133, Abovenet TW 17408, Unigate 9831

Government Role- NCC

- Type I: Total 82 operators
 - 4 General Type I- CHT, TWM, NCIC(FET), APT
 - 66 local cable Providers (Multiple-System Operator MSO)
 - 5 3G/ 4G operators- CHT, TWM, FET, APT, T-star
 - 4 Submarines- GCX (FNAL), TIGC (TSE1), Telstra(EAC, C2C), PCCW (RNAL)
 - 4 satellite providers
- Type II: Total 412 operators
 - 228 Internet Access Licenses
 - 4- E.164 VoIP Licenses

http://www.ncc.gov.tw/chinese/news_detail.aspx?site_content_sn=2013&is_history=0&pages=0&sn_f=36949

<http://www.ncc.gov.tw/chinese/files/17062/2tel.pdf>

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Where do Taiwan IXs Stand – by NCC Q1

http://www.ncc.gov.tw/chinese/news.aspx?site_content_sn=3898&is_history=0

網際網路交換中心(Internet Exchange IX) 客戶數及訊務量

日 期		106 年 第 1 季				
項 目 交換中心		客戶數	訊務量 (Mbps)			
			來(Inbound)		去(Outbound)	
			平均(Average)	最大(Maximum)	平均(Average)	最大(Maximum)
台灣網際網路交換中心 TWIX	1月	26	36,090	61,060	38,250	60,570
	2月	26	38,340	61,650	39,520	61,310
	3月	26	36,840	62,680	37,420	62,210
台北網際網路交換中心 TPIX	1月	29	44,203	53,429	44,164	54,149
	2月	29	43,690	51,219	43,041	51,275
	3月	29	51,467	57,456	51,146	58,086
亞太網際網路交換中心 EBIX	1月	19	27,300	54,400	28,400	53,200
	2月	19	29,700	61,600	30,800	59,700
	3月	19	29,000	61,800	30,200	62,900
中華民國網際網路交換中心 TWNAP	1月	1	0	0	0	0
	2月	1	0	0	0	0
	3月	1	0	0	0	0

Where do Taiwan IXs Stand – by NCC Q2

https://www.ncc.gov.tw/chinese/news.aspx?site_content_sn=3898

網際網路交換中心(Internet Exchange IX) 客戶數及訊務量						
日 期		106 年 第 2 季				
項 目 交換中心		客戶數	訊務量 (Mbps)			
			來(Inbound)		去(Outbound)	
			平均(Average)	最大(Maximum)	平均(Average)	最大(Maximum)
台灣網際網路交換中心 TWIX	4月	26	47,540	61,010	45,960	57,570
	5月	26	12,020	24,620	12,160	24,560
	6月	26	10,200	21,520	10,240	21,840
台北網際網路交換中心 TPIX	4月	30	53,748	61,629	55,755	63,188
	5月	32	56,736	65,442	58,698	67,710
	6月	33	62,045	76,202	64,660	78,208
亞太網際網路交換中心 EBIX	4月	19	46,300	79,100	47,800	79,200
	5月	19	40,500	78,300	46,900	77,400
	6月	19	39,000	79,300	47,100	79,500
中華民國網際網路交換中心 TWNAP	4月	1	0	0	0	0
	5月	1	0	0	0	0
	6月	1	0	0	0	0

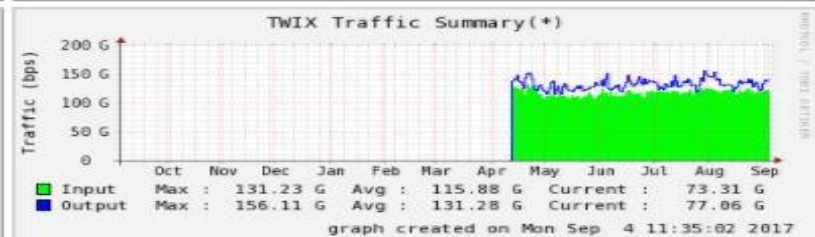
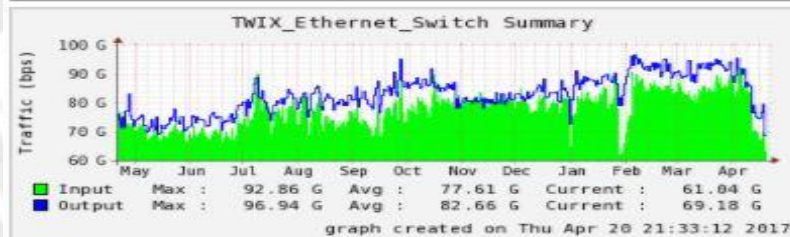
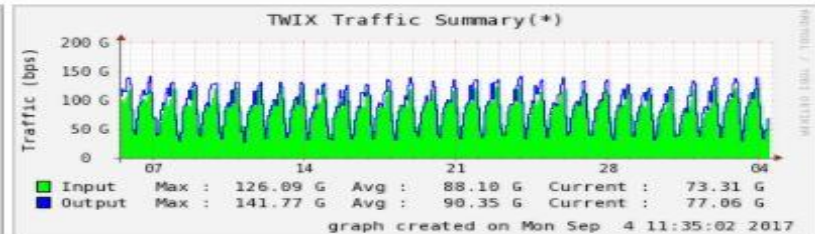
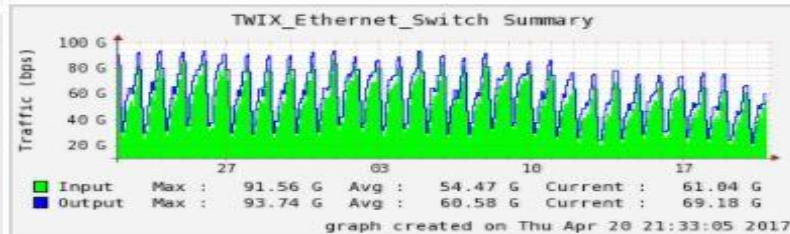
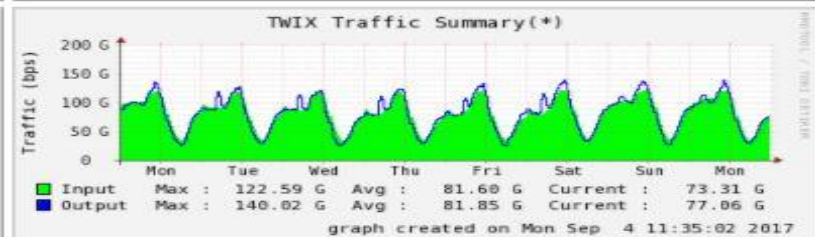
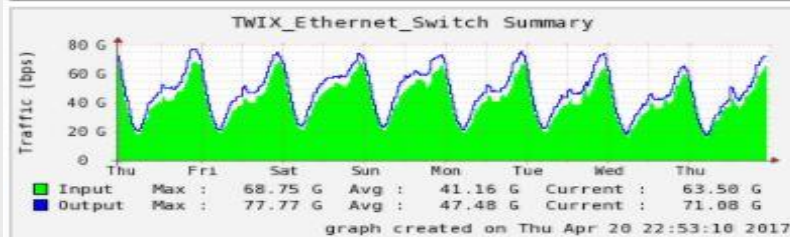
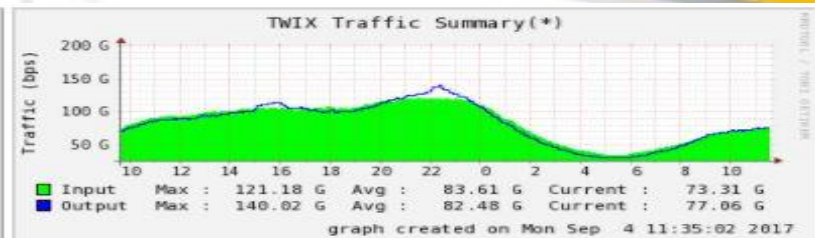
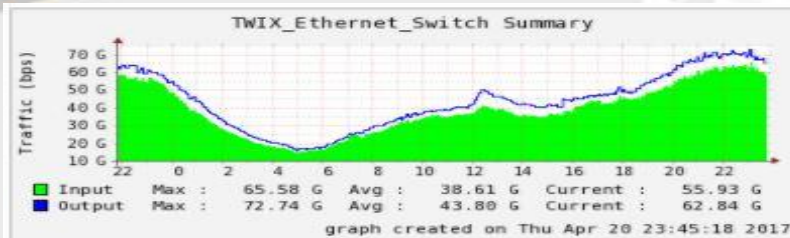
IXs in Taiwan- TWIX (HiNet)

- TWIX: <http://www.twix.net/>
- Members: 26
- Traffic :
 - 21G (Free Peering)
 - 156G (Peering + including Private Interconnection for paid peering with HiNet)
- During the initial stage of setting an exchange center in TWIX, an ISP with the following qualifications can apply for interconnection:
 1. with Type II telecommunications license issued by NCC (National Communications Commission), **Internet Content Provider** , or special permission license issued by Ministry of Transportation and Communications.
 2. with legal IP addresses assigned directly by NIC or an ISP with NIC delegation.
 3. with a legal AS number assigned directly by NIC.
- If TWIX establishes multiple Internet exchange POPs in the future, to apply for interconnection with more than one IXP, **the ISP should build their own backbone network** between Internet exchange POP

IXs in Taiwan- TWIX (by HiNet) Member

Client Name	Website	ASNumber	Client Name	Website	ASNumber
 HiNet	HiNet	3462	 新世紀資訊股份有限公司	NCIC	4780
 GSN政府網際服務網	GSN	4782	 中嘉寬頻股份有限公司	Gigamedia	9416
 APOL 亞太線上	APOL	17709 9415	 台灣大 電訊	TFN	9924
 SYSNET	SYSNET	4783	 So-net	So-net	18182
 TWNAP	TWNAP	7655	 CHIEF 是方電訊 CHIEF TELECOM	Chief	17408
 TISNet	TISNet	7535	 神坊資訊 Symphox Information	Symphox	9216
 gamania Taiwan	Gamania	7532	 PACNET	AGC	10026
 DYnet 第一線	Diyixian	9244	 中華電信 TAIWAN CKT-International	TWGate	9505
 eASPN 數位通國際	eASPN	10135	 KBT 中嘉和網	KBT	18042
 PIC 統一資訊 President Information CORP.	PIINet	17710	 verizon	Verizon_TW	703
 Sprint	Sprint_TW	1239	 T STAR 台灣之星	TST	24157
 Yuan-Jhen Info. Co. Ltd. 遠振資訊	YuanJhen	131149	 Taifo 台灣智慧光網	Taifo	131149
 Pumo	Pumo	38843	 台灣基礎開發科技	TINP	18049

IXs in Taiwan- TWIX (by HiNet) Traffic



(*)106年4月12日起，TWIX將Public Peering與Private Peering訊務併計為IX訊務總量

IXs in Taiwan- TWIX (by HiNet) Price

Item			Rate
			Price (NTD/USD)
TWIX	Monthly rent fee for racks (Remark 1)		11,000/ 333
	Monthly rent fee for ports	FE/GE	20,000/ 606
		10GE	120,000/ 3,636
	Monthly Maintenance fee for ISP circuits XC	T1	3,000/ 100
		T3 or above	10,000/ 303
	Monthly Maintenance Fee for ISP Interconnections	T3/ FE	5,000/ 151
		STM-1 or above	10,000/ 303

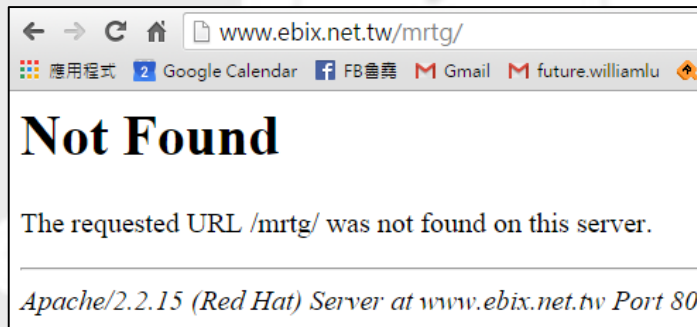
Remark 1. The specification of one rack is 19 inches in width, 7U (about 30 cm.) in height, 85 cm in depth, and with 6A/110V power supply.

http://www.twix.net/fee_e.html

IXs in Taiwan- EBIX (by APT)

- EBIX- <http://www.ebix.net.tw/index.html>

- Operated by APT
- Member- 19 (According to NCC)
- Traffic:



APTG /24154
APTG /131142
APTG /131591
NCIC /4780
TFN /9924
KBT /9416
FaceBook/32934
Google/15169
ASNet/9264
TANET2-TW/7539
TANET/1659
NTU /17716
NTHU/18047
NCTU/9916
CCU /17712
NCKU /18177
NSYSU/17713
NCU/1659
NCHU/1659 (38847)

http://www.ebix.net.tw/application_2.html#3

IXs in Taiwan- EBIX (by APT)

- EBIX- http://www.ebix.net.tw/application_2.html#3
 - Charge:

Item	Service	Unit	Charge(NTD/USD)
8	Cache & Casting Domestic	Mb/Month	Case by case
9	Cache & Casting International	Mb/Month	Case by case
10	OTC	set	1,500/45
11	1/4Rack	unit/Month	6,000/181
12.1	Transit T3/ FE	port/Month	3,000/90
12.2	Transit STM-1/ GE	port/Month	5,000/151
13.1	Peering FE	port/Month	60,000/1,818
13.2	Peering 1/3 GE	port/Month	168,000/5,090
13.3	Peering GE	port/Month	424,000/12,848
14.1	ISP Circuit XC	T1/Month	2,400/72
14.2		T3/Month	8,000/242
14.3		STM-1/Month	8,000/242
14.4		STM-4/Month	Case by case
15.1	ISP interconnection	FE /Month	4,000/121
15.2		GE /Month	8,000/242

IXs in Taiwan- TWNAP (by Savecom)

- TWNAP- <http://www.savecom.net.tw/>
- <http://www.savecom.net.tw/Nap.htm>
 - Can not find webpage anymore.

找不到這個頁面

您所要找的頁面可能已經被移除了，可能是它的名稱已經變更，或暫時無法使用。

請嘗試執行下列動作：

- 請確定在瀏覽器的網址列中顯示的網站位址的拼字及格式正確。
- 如果您是按了連結而到達這個頁面，請連絡系統管理員以通知他們這個連結的格式錯誤。
- 按一下 [[上一頁](#)] 按鈕，試試其他的連結。

HTTP 錯誤 404 - 找不到檔案或目錄。

網際網路資訊服務 (IIS)

技術資訊 (供技術支援人員使用)

- 移至 [Microsoft 產品支援服務](#)，並進行 **HTTP** 及 **404** 等字的主題搜尋。
- 開啟 [IIS 說明] (您可以從「IIS 管理員 (inetmgr)」存取)，並搜尋名為「站台設定」、「一般系統管理工作」及「關於自訂錯誤訊息」的主題。

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Government Role- NCC

Tariff Control

- According to Type I Tariff Regulation, Service Charge adjustment shall follow the following formula:
- $[(Pt - Pt-1) \div Pt-1] \times 100\% \leq (\Delta CPI - X)$
- Each **X** is valid for 3years
- Since 2000, X=CPI
- 2007 ADSL X=5.35%, Voice X=4.88%, Peering X= 0
- 2010 ADSL, Peering X=4.816%; Voice X=5%
- 2013 X=5.1749%
- 2017/03/08 Fixed X 3.19%, Voice X= 5.1749%

Paid Peering Price

- Before 1995 not sure...
- **1995 NTD7,500(\$250)/Mbps**
- 2009 NTD1,500(\$50)(<500M); 3000(\$100>(>500M)
- 2009 April TWM refuse to pay CHT peering, CHT limit TWM peering to 2G, 5M users impacted
- **2009 Aug. NTD1,480**
- 2012 NCC tried to intervene Peering Price and push for CHT/ TWM/ FET free peering
- 2012 NTD1,480->NTD900->NTD600
- 2013 NTD600->NTD540
- 2014 NTD540-> NTD430->NTD411
- 2015 NTD411->NTD394
- 2016 NTD394->**NTD349**
- **2017 NTD 349-> NTD170 (NOW)**

<http://www.cht.com.tw/enterprise/iib-rate.html>

http://www.ncc.gov.tw/chinese/news_detail.aspx?site_content_sn=8&sn_f=37243

Taiwan Telecom Market Status

- Fixed/ Wireless Broadband Market Users in Taiwan

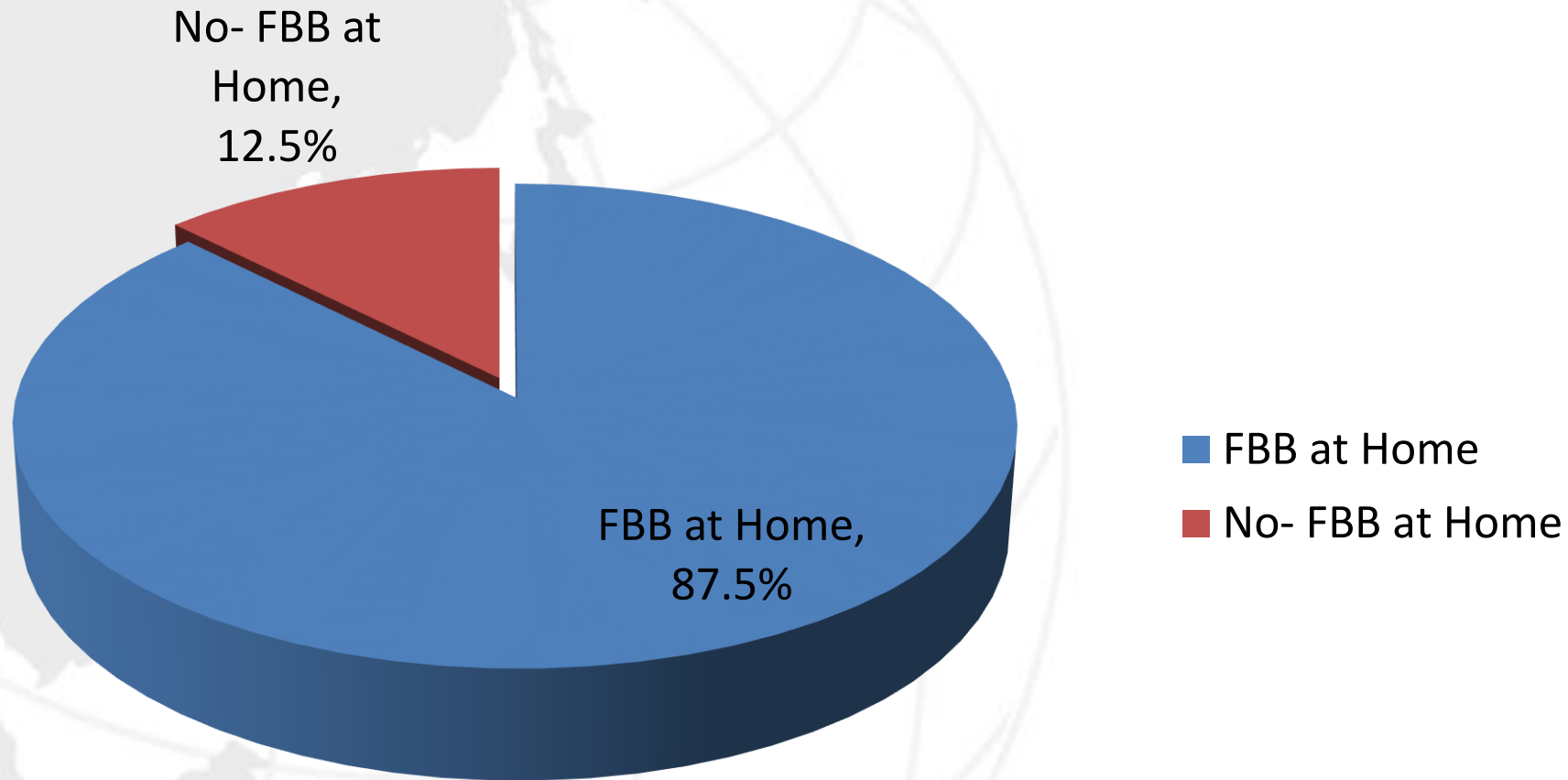
Year	Month	Fixed Broadband				
		ADSL	FTTX	Cable Modem	Leased Line	Total
2017	Jan	854,729	3,538,652	1,293,953	2,739	5,690,073
2017	Feb	844,087	3,547,462	1,298,389	2,735	5,692,673
2017	March	828,119	3,557,824	1,305,239	2,721	5,693,903
2017	April	816,945	3,566,027	1,312,397	2,710	5,698,079
2017	May	807,555	3,572,313	1,317,798	2,702	5,700,368

Year	Month	Wireless Broadband			
		Mobile		PWLAN	Total
		3G Data	4G Data		
2017	Jan	3,490,041	18,464,879	106,486	22,061,406
2017	Feb	3,302,138	18,816,704	106,839	22,225,681
2017	March	3,112,346	19,186,433	107,177	22,405,956
2017	April	2,946,832	19,516,488	107,532	22,570,852
2017	May	2,829,209	19,926,955	107,829	22,863,993

http://www.ncc.gov.tw/chinese/news.aspx?site_content_sn=2035&is_history=0

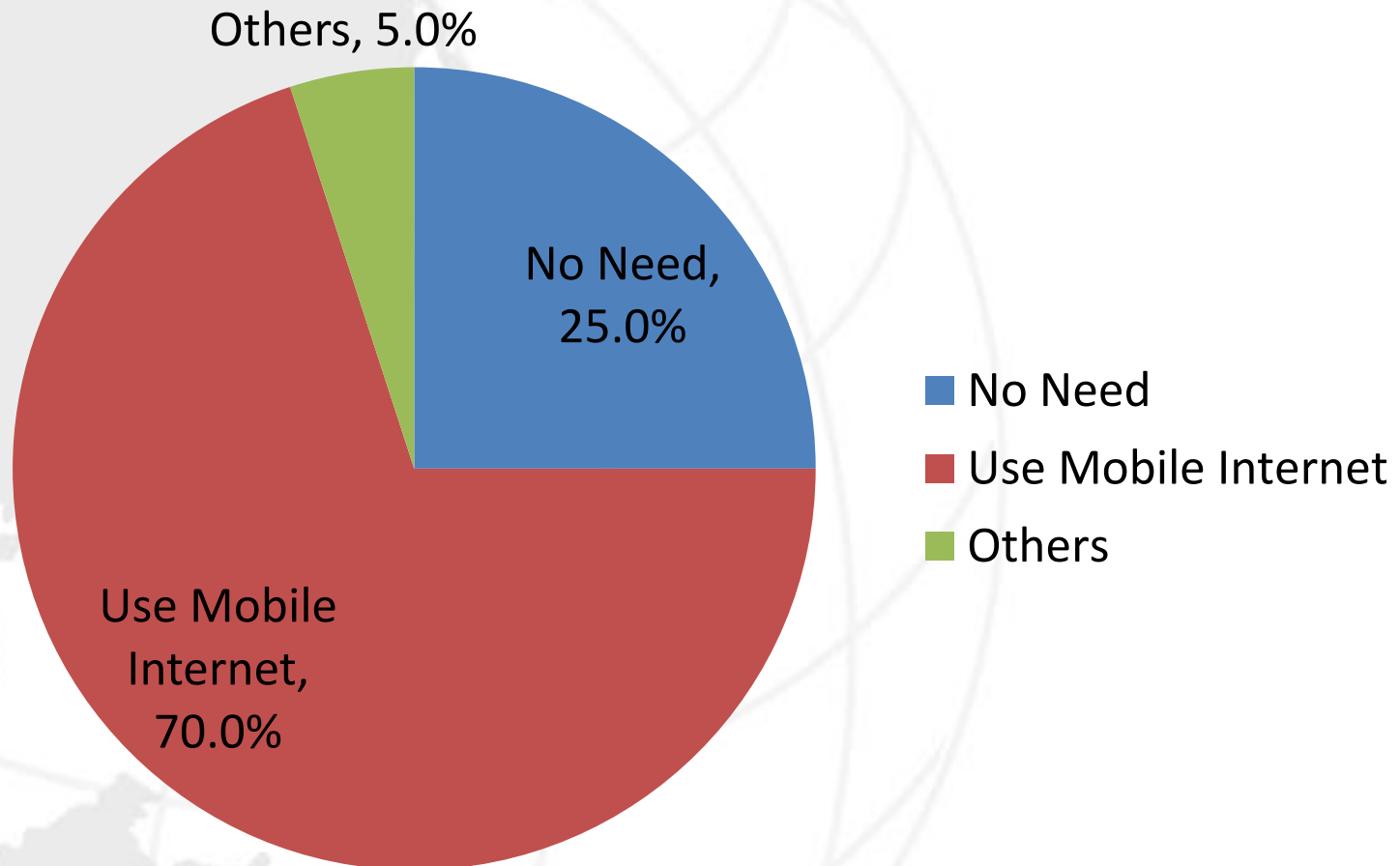
Taiwan Telecom Market Status

Do you have Fixed Broadband at Home?



Taiwan Telecom Market Status

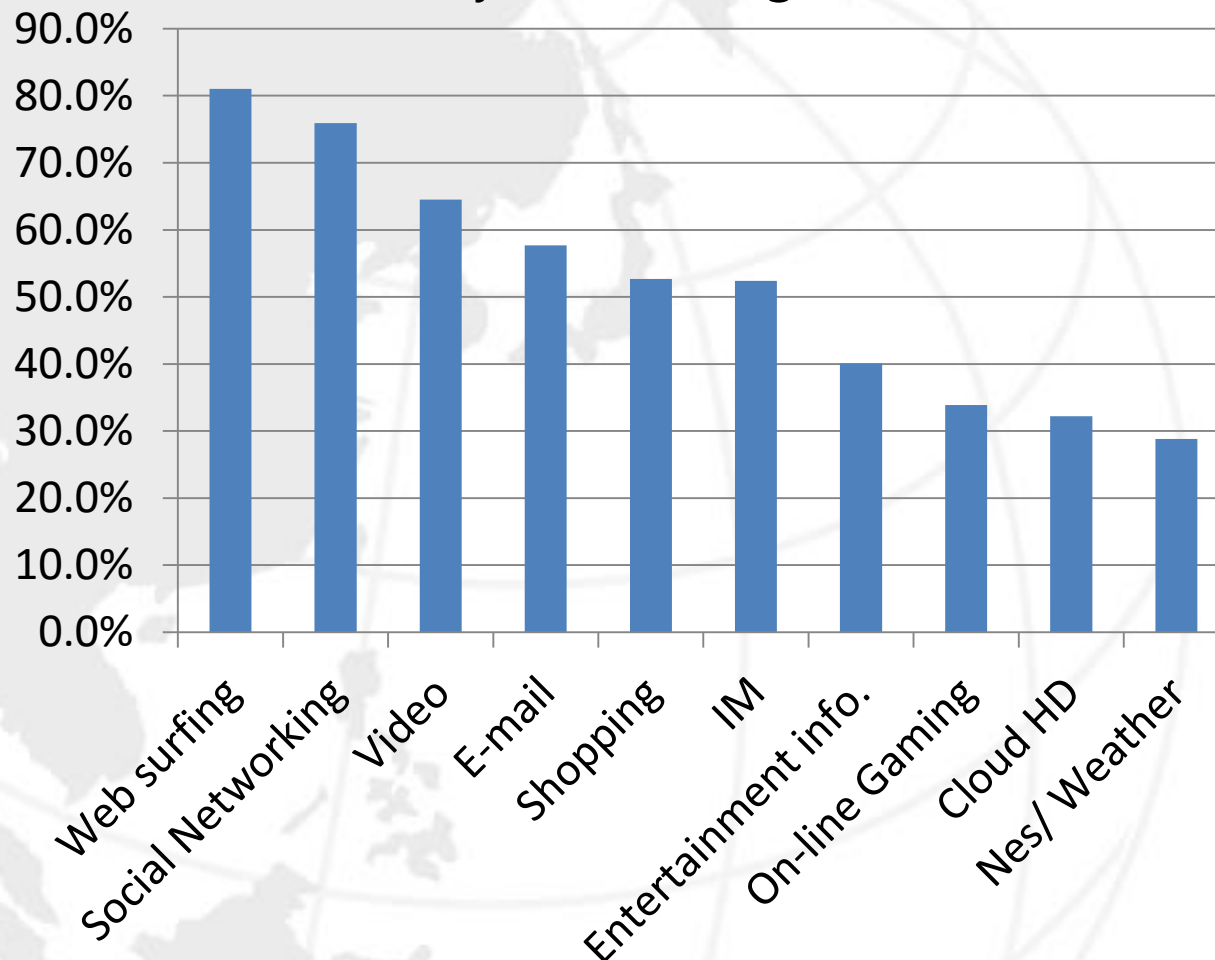
Why don't you have Fixed Broadband at Home?



<https://events.techbang.com/2016internet-trends/>

Taiwan Telecom Market Status

What do you do using Fixed Internet?

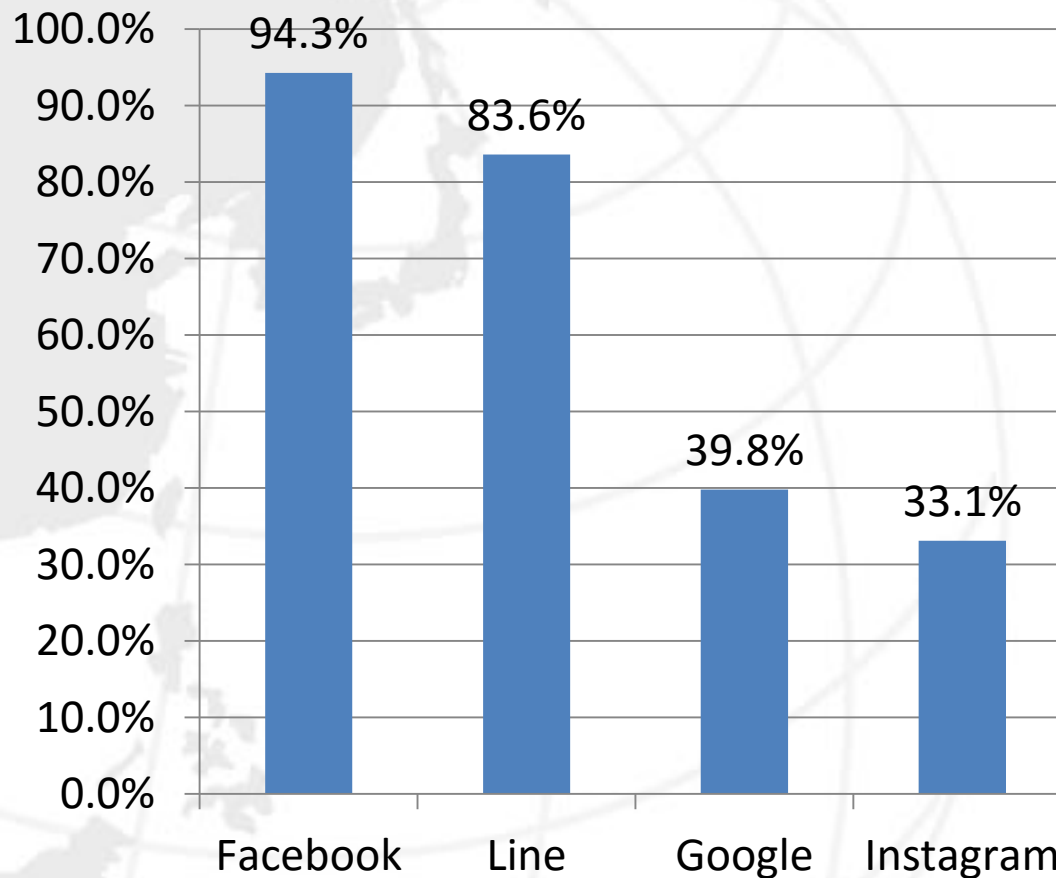


Web surfing	81.0%
Social Networking	75.9%
Video	64.50%
E-mail	57.7%
Shopping	52.7%
IM	52.4%
Entertainment info.	40.1%
On-line Gaming	33.9%
Cloud HD	32.2%
Nes/ Weather	28.8%

<https://events.techbang.com/2016internet-trends/>

Taiwan Telecom Market Status

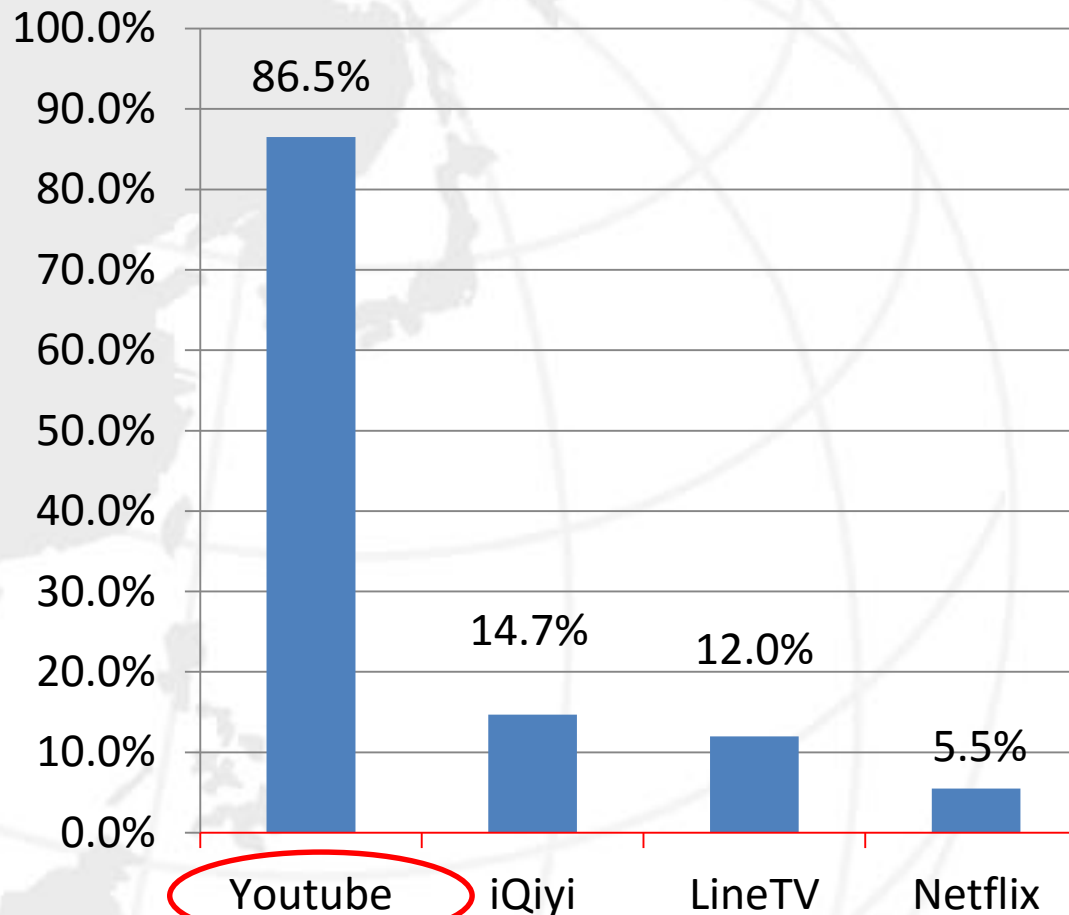
Choice of Social Network when using Fixed Broadband



<https://events.techbang.com/2016internet-trends/>

Taiwan Telecom Market Status

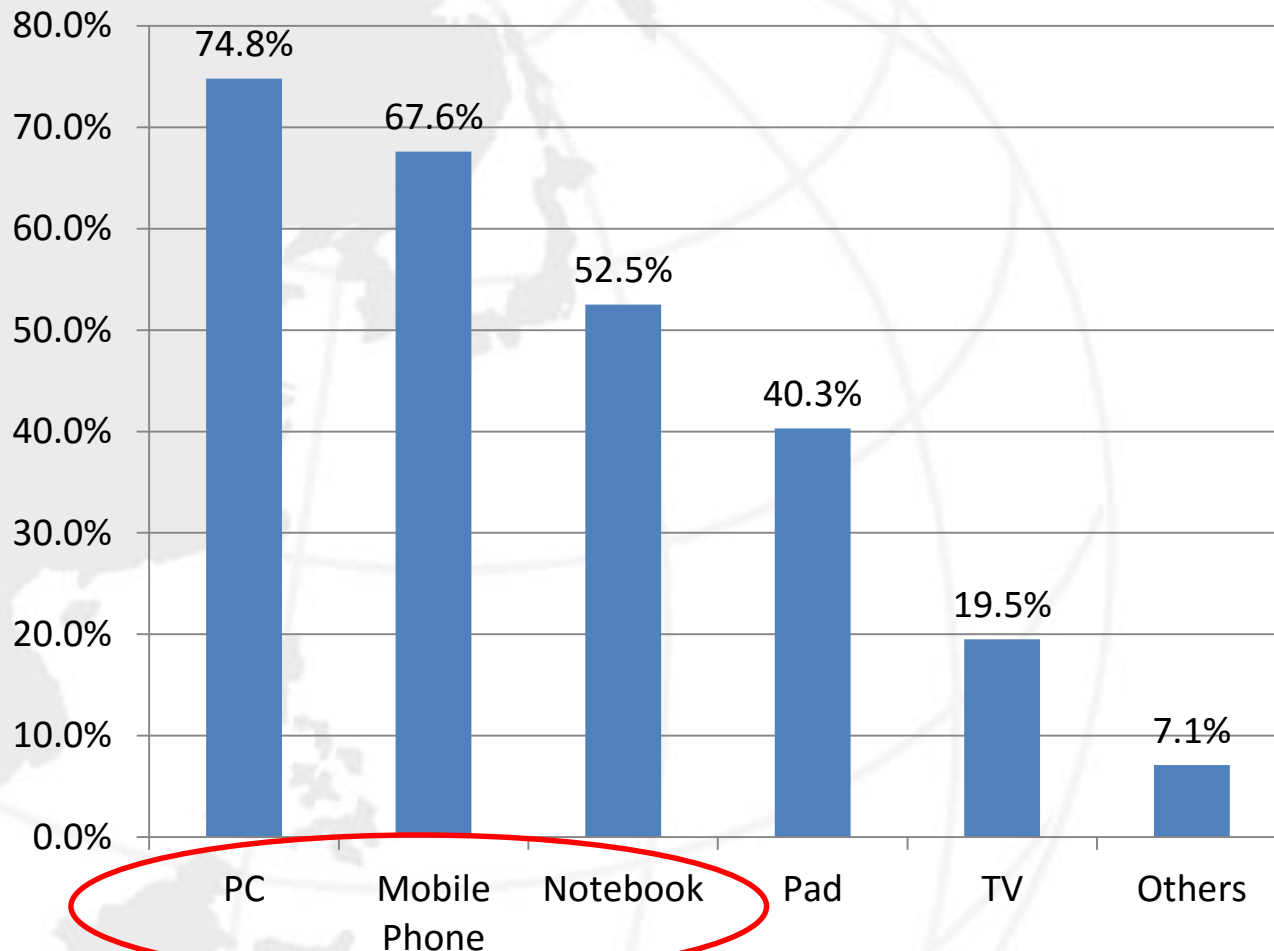
Choice of On-line Video when using Fixed Broadband



<https://events.techbang.com/2016internet-trends/>

Taiwan Telecom Market Status

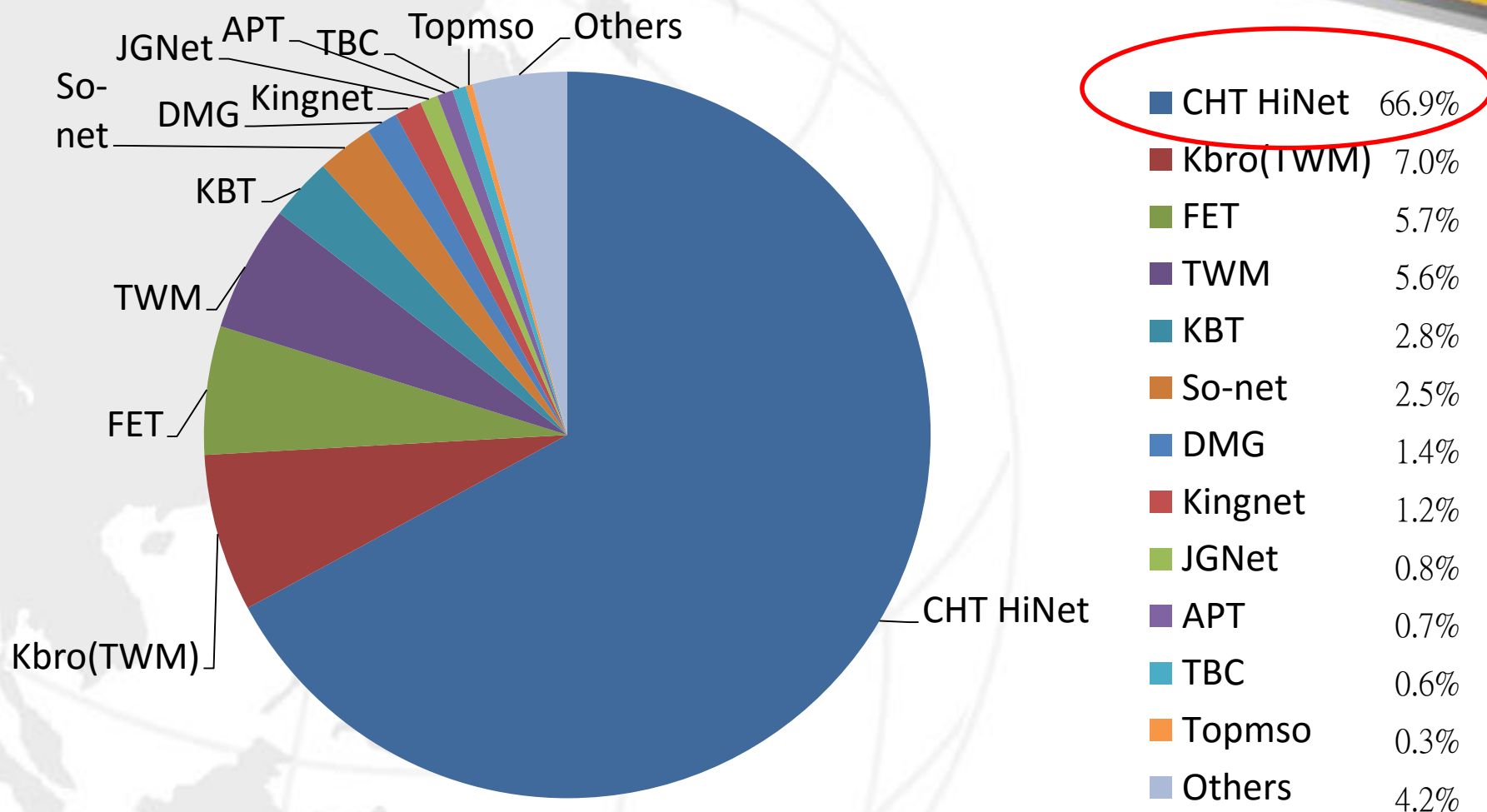
Choice of Device when using Fixed Broadband



<https://events.techbang.com/2016internet-trends/>

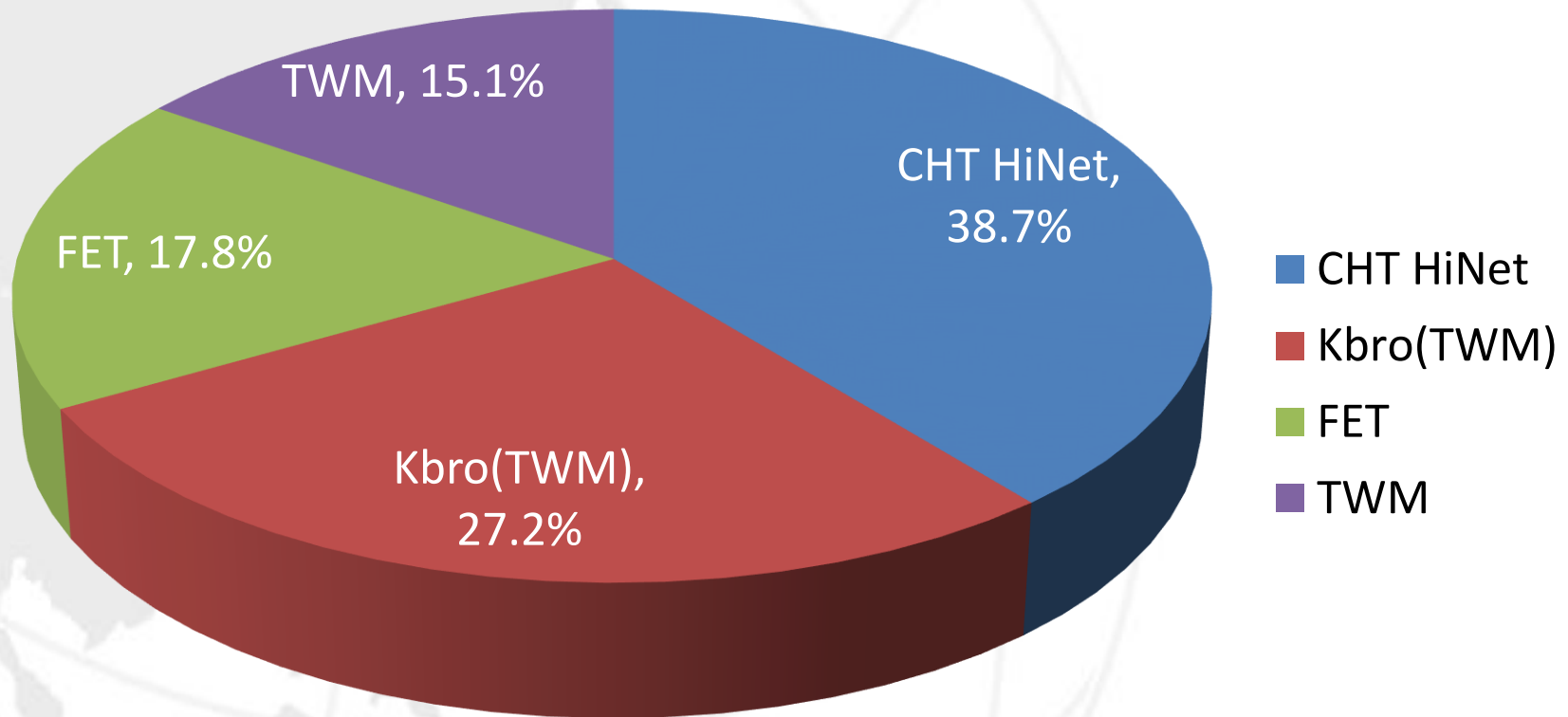
Taiwan Telecom Market Status

Fixed Broadband Market Share

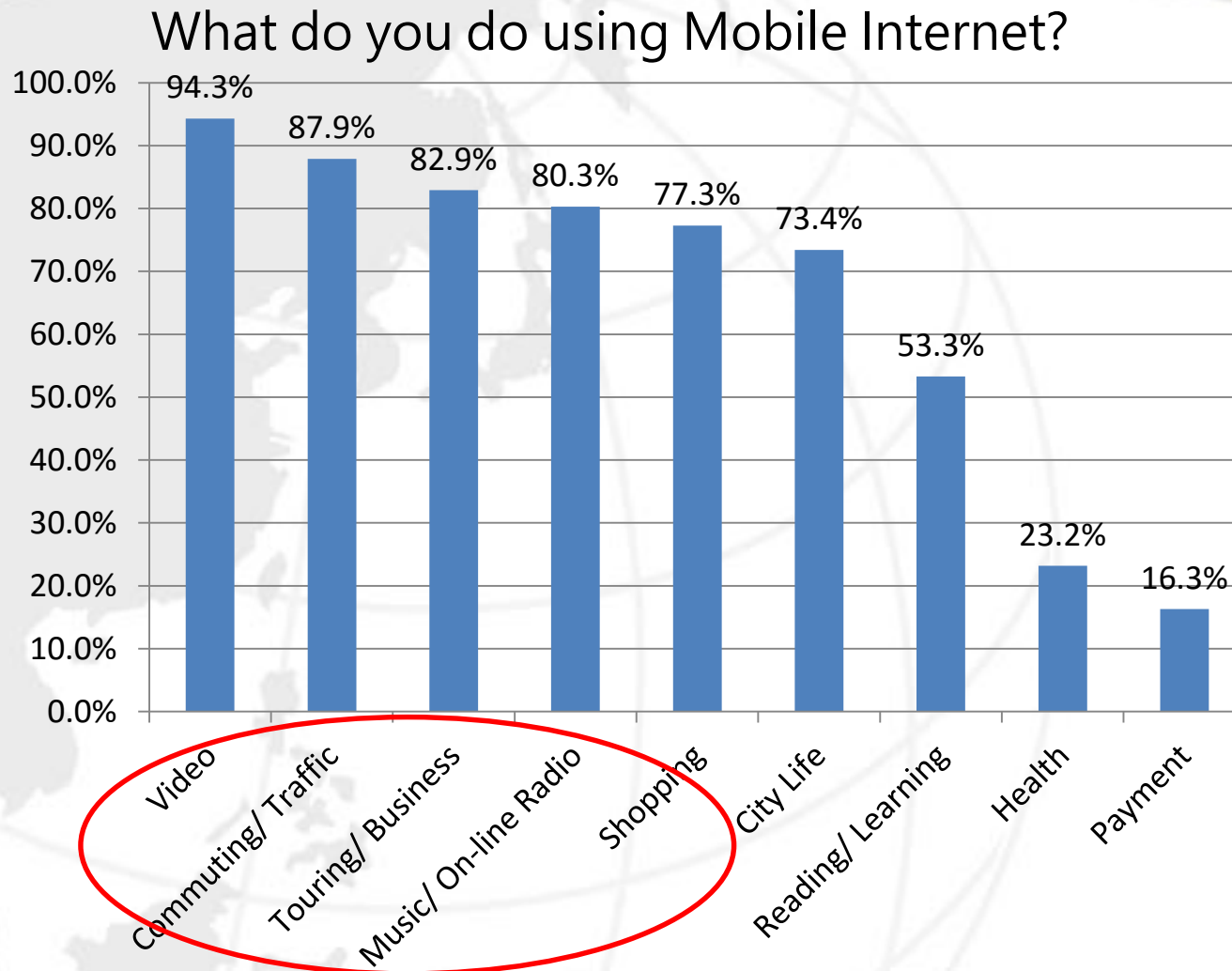


Taiwan Telecom Market Status

Fixed Broadband Market Share >100M

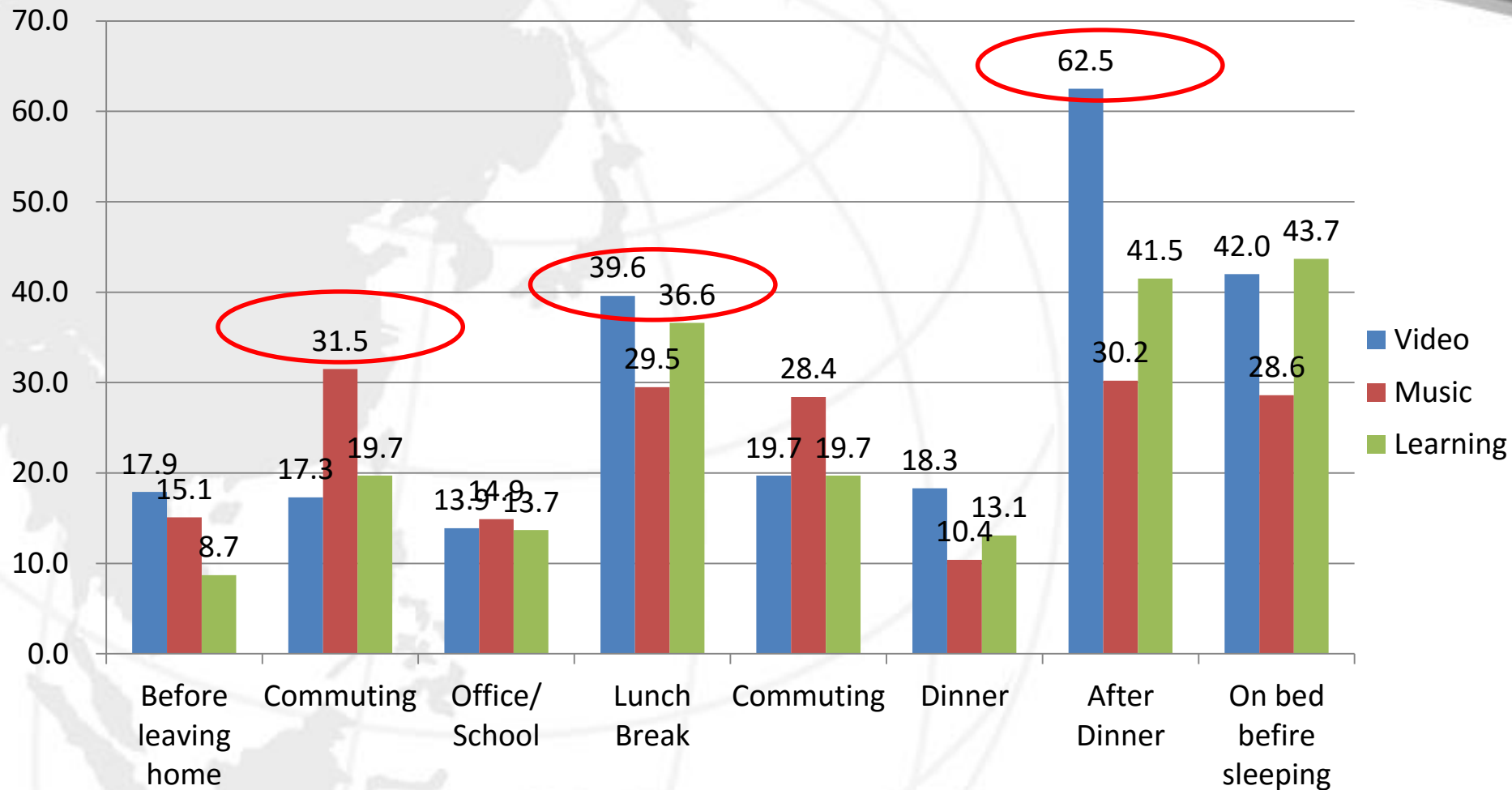


Taiwan Telecom Market Status



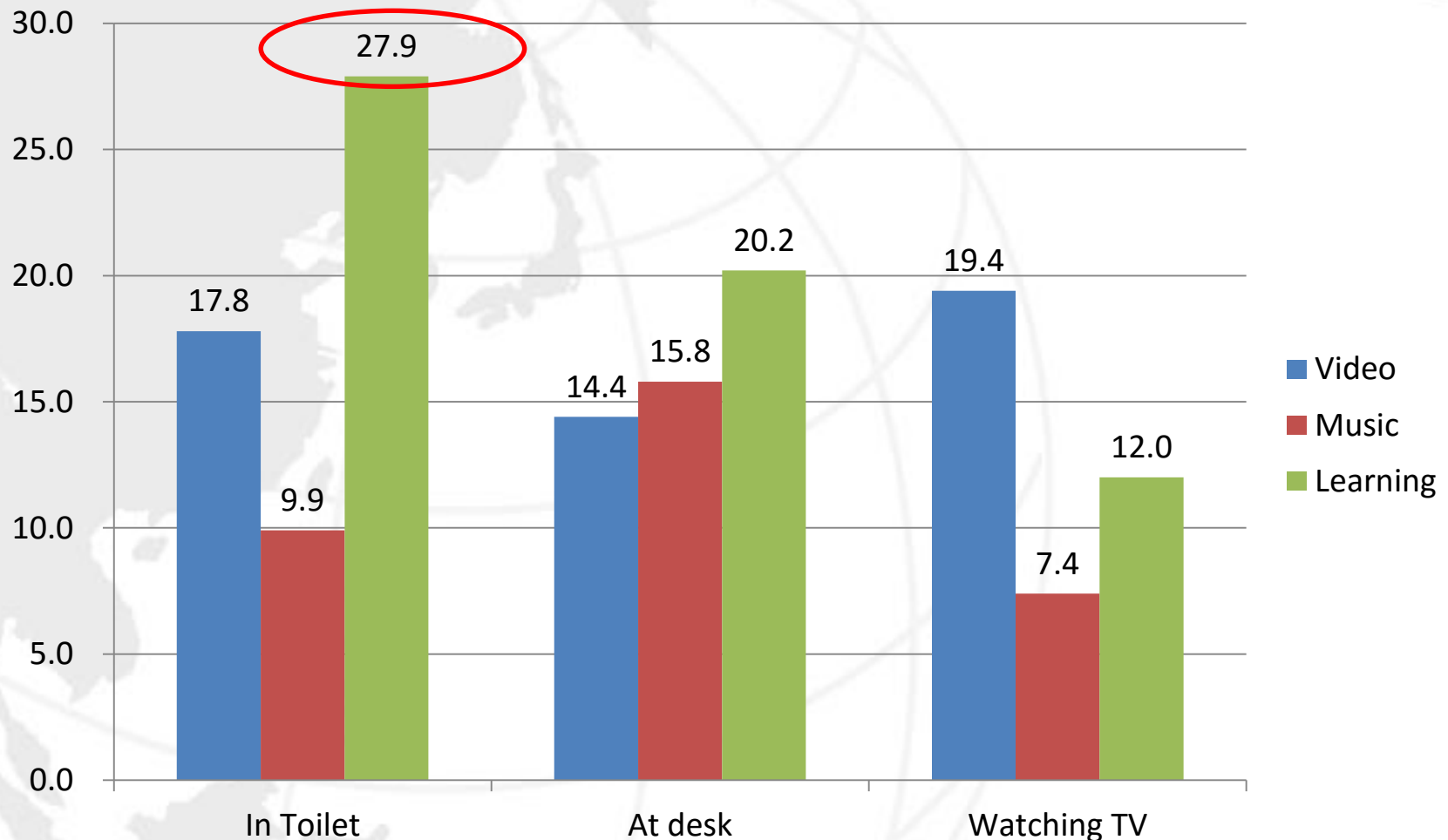
Taiwan Telecom Market Status

What do you do using Mobile Internet at different time? (/100 person)



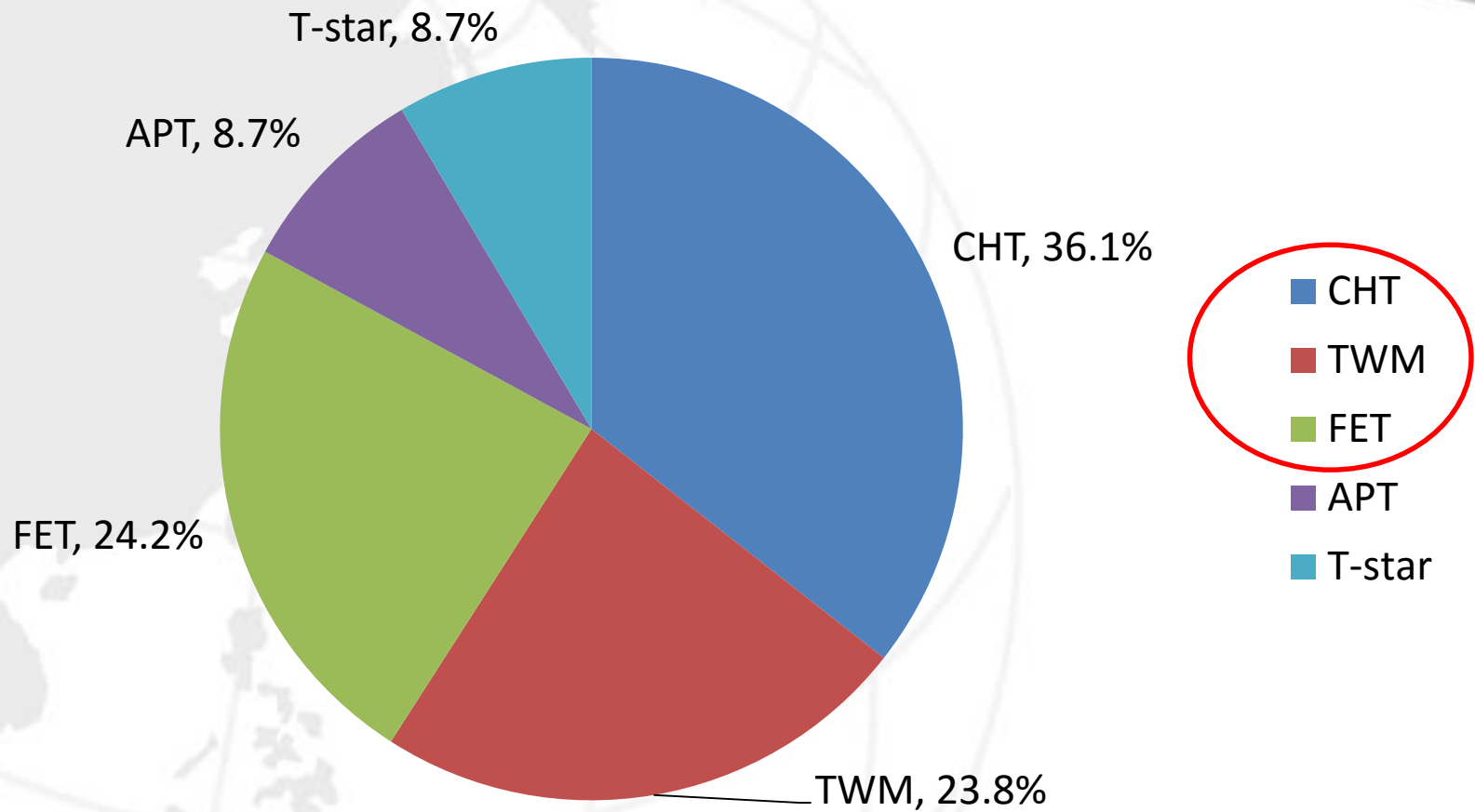
Taiwan Telecom Market Status

What do you do using Mobile Internet at different Venue? (/100 person)



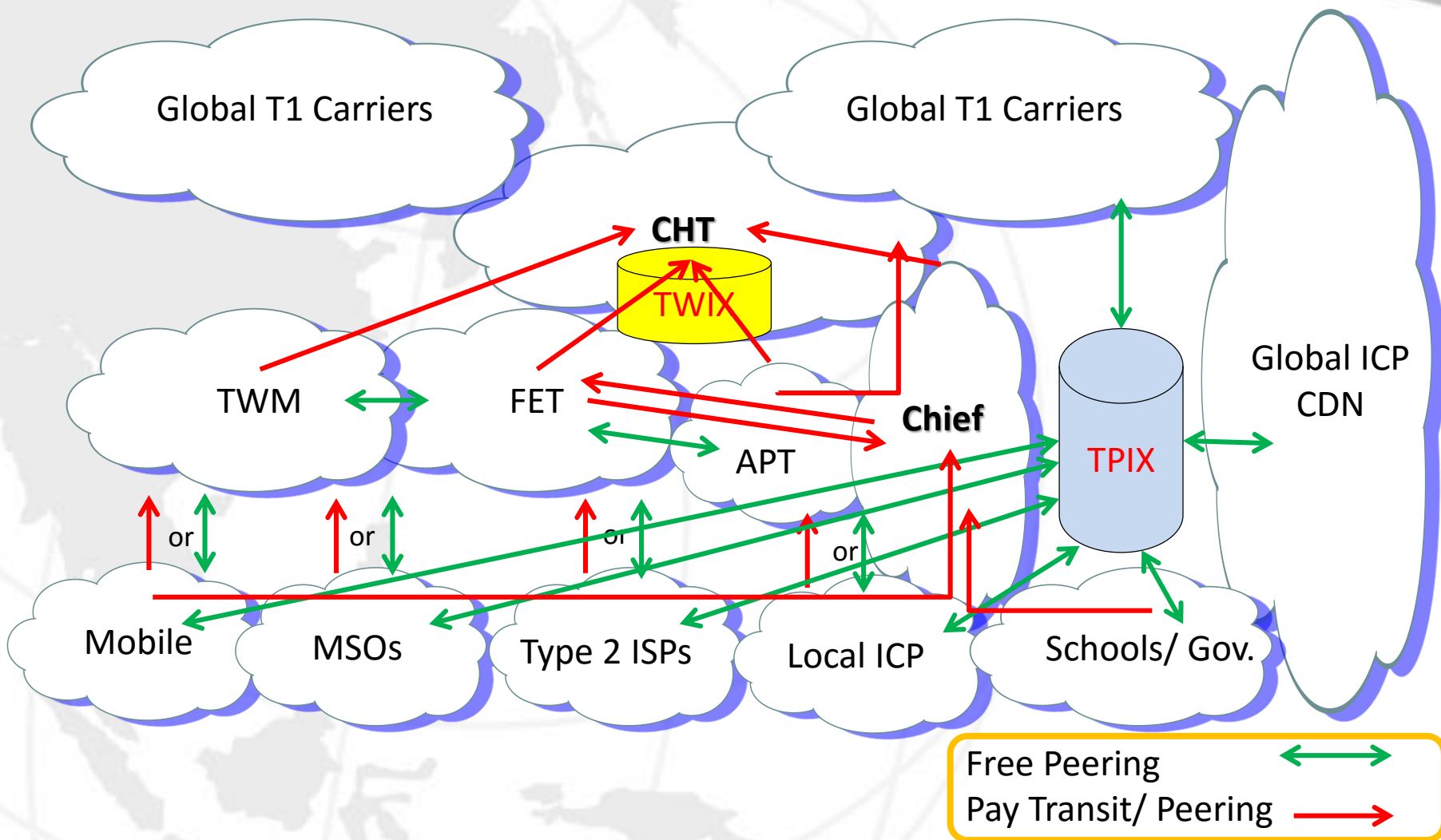
Taiwan Telecom Market Status

4G Mobile Internet Market Share



Taiwan ISP Interconnection, Peering Status

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Where do Taiwan IXs Stand- Challenges

- Big ISPs don't offer enough bandwidth because they all want to sell “Paid Peering” to smaller ISPs
- Big ISPs not willing to join IX because of positioning concern
- Not enough ISP customers (merged by Telecom Groups)
- Big ISPs can also use Direct Interconnection (private peering) to connect to Major ICPs
- High Domestic LLC cost for smaller ISPs to connect to IX
- Some ISP want to operate it's IX, or, don't really want to operate but reluctant to let go
- User experience is not ISPs priority concern
- No Act like “FCC Open Internet Order “

Where do Taiwan IXs Stand- Conclusions

1. NO Peering, NO Internet!
2. IX is Home to **Public Peering**
3. **Peering** is typically **Free**
4. Private Peering is not IX's business
5. In IX, there is only "Open" or "Selective" peering policy.
6. A Strong and Prosperous IX in Taiwan can lead to:
 - Easier and More Peering (free)
 - Lower latency and Better Network Management
 - Lower Transit Price
 - No-more Paid Peering
 - Much better user experience
 - Much lower cost to Internet Business Startups
 - Much lower cost to social activity using Internet

Questions and Suggestions to Taiwan?

Q: How can we make Taiwan as globalize and as energetic in Telecom/ ISP/ ICP/ CDN industry as HK?

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Welcome to Taiwan!!!

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