



Broadband in Asia

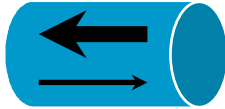




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Lee Daniels

AT&T Experience in USA

- **Project Angel in Chicago Area**
- **Resale RBOC Facilities**
- **Duplicate Telecom Infrastructure**
- **DirecTV Investment**
- **TCI Acquisition @\$44 Billion**
- **Time Warner Telecom Deal**

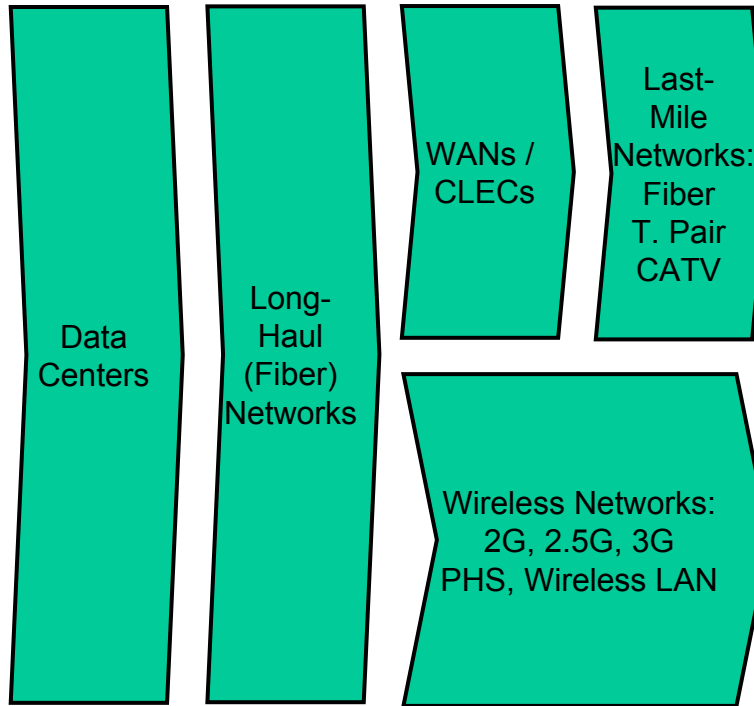
Residential BB Access Technology Comparison

<i>Medium</i>		<i>Characteristics & Functions</i>
<i>HFC Cable Modem</i>		Up to 27 Mbps down, 0.5 to 2 Mbps up (both shared) Cable plant needs fiber build-out, digitization and 2-way upgrade
<i>ADSL</i>		1.5 to 9 Mbps down, 16 Kbps to 640 Kbps up DSL capable copper loops up to 18,000 ft.
<i>uADSL ("DSL Lite")</i>		1.5 Mbps down, 384 Kbps up DSL capable copper loops up to 18,000 ft.
<i>Fixed Wireless MMDS</i>		Same up/down rates as HFC cable modem 30 Miles radius downlink only to be upgraded to 2-5 miles radius 2-way cellular-like infrastructure
<i>Satellite</i>		400 Kbps down, Telco POTS return path

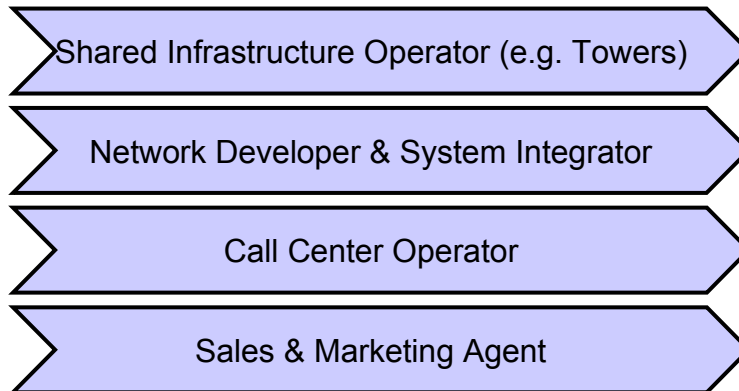
Telecoms Value Chain

Infrastructure
Services
Provider

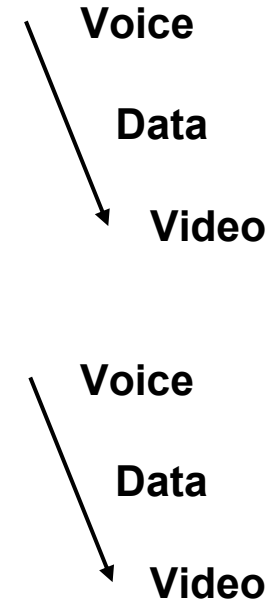
Centralized



Sub-Sector
Provider



Distributed



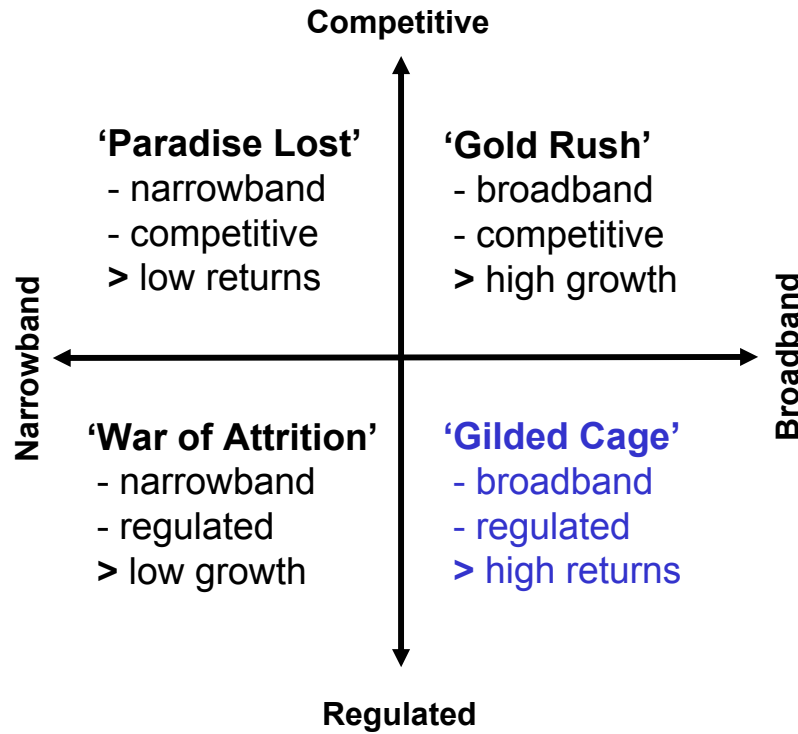
Mature markets are penetrated in all sectors, however, developing markets growing from:

- central to distributed
- voice to video
- core to sub-sector

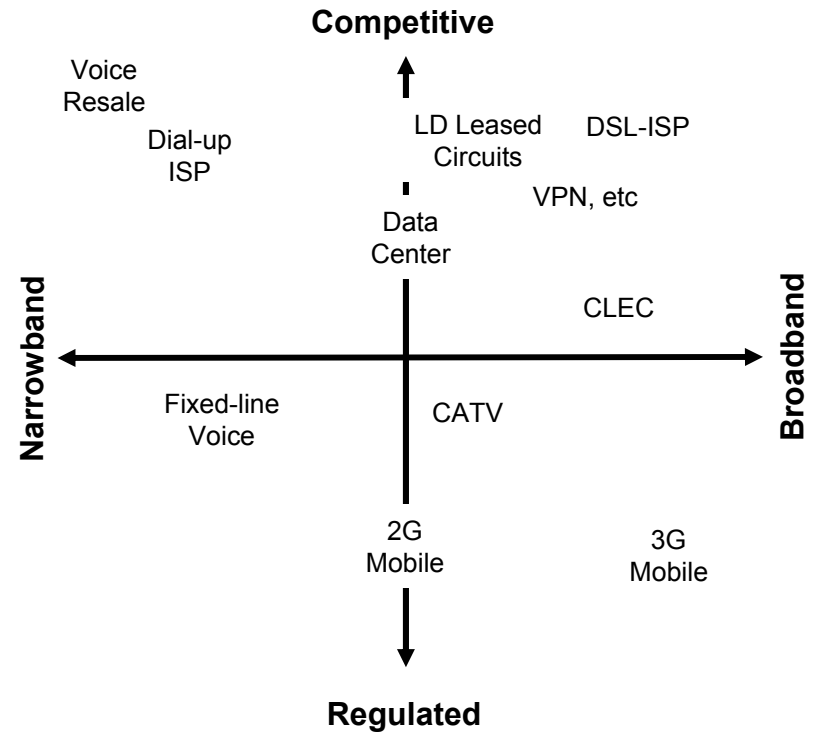
Telecom Industry Status

- Key activity in each sector
 - Voice (wireline)
 - ❖ Increasing wireless penetration is resulting in net line decrease in mature markets
 - ❖ VoIP is displacing circuit switched for both initial deployment in developing markets, e.g. China Netcom and new entrants in mature markets, e.g. Fusion (Japan)
 - BROADBAND**
 - Wireless
 - ❖ This is the high-growth area in most Asian markets, some to point of saturation
 - ❖ Capital intensive network upgrades to launch of 3G services is next wave
 - ❖ Application and content development becoming hot sectors, albeit venture
 - Data (wireline)
 - ❖ DSL has taken off in mature markets, e.g. penetration of >50% in Korea
 - ❖ Business (customer) services moving towards higher value-add services, e.g. VPN
 - ❖ Business bandwidth requirements have grown: Low-end 1.5M to High-end SANs
 - Cable TV
 - ❖ Incremental data business has made this more attractive in the specific metros with high TV penetration and consolidated operations, however, these markets are few
 - ❖ Convergence of Broadcast TV – Data – Voice
 - ❖ Digital broadcasting – the “3G” of Cable TV

Opportunity Assessment Framework



Source: Morgan Stanley Research

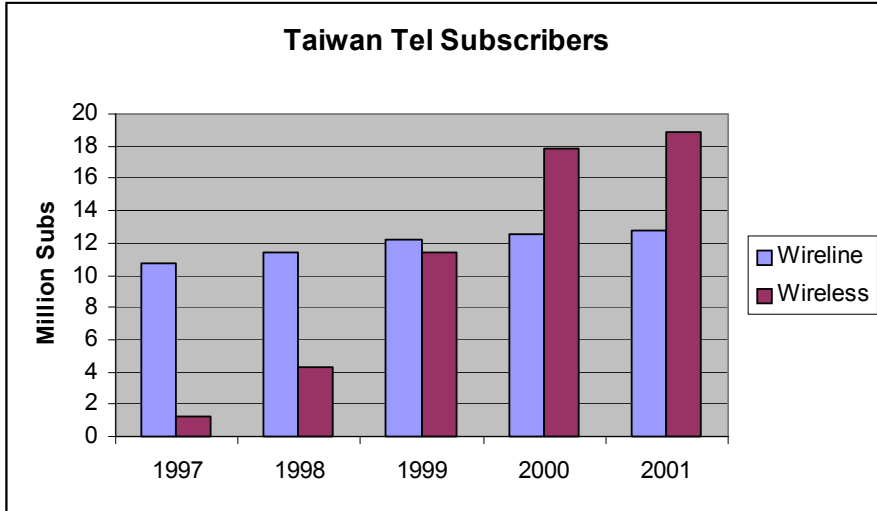


Note: Illustrative of Japan/Taiwan/Korea/HK/Singapore/Australia, may vary by country

Broadband businesses in regulated sectors will offer the most attractive opportunities – namely mobile and proprietary, last-mile infrastructure

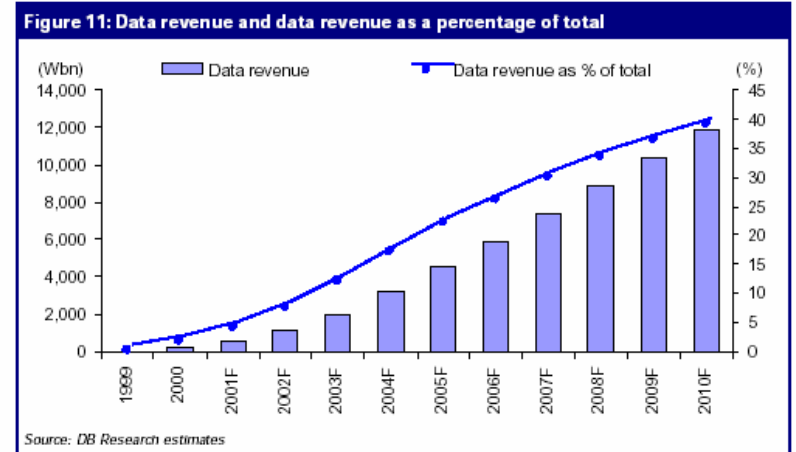
Trends: Mobile + Data = 3G?

- Mobile subs set to exceed wireline voice – Taiwan already has



- This may be especially interesting in countries without existing wireline network
- Frequency allocation / licensing provides a natural barrier to entry for competition

- Mobile data revenues set to grow, as is projected in Korea



- PC penetration in many Asian countries is low relative to the west – suggesting handset is key terminal
- But, 3G applications not yet proven
 - ‘Jury still out’ on Japan launch
 - Question of technical scalability

Mobile is proven, but 3G take-up is unclear due to costs and adoption of the new applications

Trends: Industry Restructuring

Dis-aggregation – competitive pressures forcing split between network specialists and marketing specialists

- Network (wholesale) specialists
 - ❖ Key is scale and lowest unit price
 - ❖ E.g. eAccess, Acca, Thrunet, Heisei Denden
- Marketing (& Content) specialists
 - ❖ Keys are brand recognition and scale
 - ❖ E.g. AOL, MSN, voice resellers
 - ❖ No clear winners in Asia yet
- Parallels seen in other regions
 - ❖ Wireless Towers business
 - ❖ MVNO business

Consolidation – “up or out” phenomenon as mid-sized players can not keep up with business requirements

- Especially in un-regulated areas where over-competition has driven down margins
- E.g. ISPs, data centers, Sub sea cable, fragmented mobile markets (India, Malaysia, etc)
- Potentially very interesting if economies of scale can be leveraged into scope
 - ❖ E.g. CATV incremental service model of adding data and digital services

Industry restructuring to specialize or to gain economies of scale will afford significant opportunity for investment – albeit risky

Trends: Bottleneck shifted to “Last Mile”

- Broadband is a key driver of IP traffic growth - particularly DSL in mature markets
 - Korea: 11mn DSL/Cable subs
 - Japan: 3mn, adding 300k/month
- Bandwidth utilization still growing rapidly, but not fast enough to fill capacity in LD networks or Data Centers (i.e. central infrastructure)
 - Asia Content
- Resulting in rapid price erosion, business failure and consolidation
 - L3 sold to Reach
 - 360networks, AGC, Tycom, PCL, Exodus entered Ch11



- Local Access still generally under-serviced in most markets
 - Consumer Market
 - ❖ Telephone is the default monopoly except for CATV in key metropolitan markets

Figure 18: Broadband statistics for Asia

	Cable ARPU (US\$/month)	ADSL ARPU (US\$/month)	Per capita GDP (US\$)	Cable subs ('000)	ADSL subs ('000)	Total subs ('000)	Total households ('000)	Penetration rates (%)	Cable ARPU as % of Income
Australia	31.3	38.0	20,800	100	200	300	7,127	4.2%	2%
Hong Kong	29.5	33.3	23,200	150	350	530	2,070	25.6%	2%
Korea	24.0	29.6	9,600	1,300	4,000	5,300	13,091	40.5%	3%
Singapore	40.6	48.6	23,100	40	48	88	974	9.0%	2%
Taiwan	21.7	44.1	12,664	200	400	600	7,228	8.3%	2%

Source: Zenith Media, IDC, DB Research estimates

- Business Market
 - ❖ Building access networks are slowly being served by CLECs



Proprietary last-mile access continues to be attractive

Investment Thesis and Risks

Investment Thesis

- Regulated broadband sectors offer most potential – namely, (3G) mobile
- Centralized infrastructure a commodity, but last-mile a bottleneck
- Asset sharing likely to become a new business opportunity
 - Towers, MVNO, wholesale
- Scope for consolidation of fragmented sectors
 - ISPs, CATV, 2/2.5G Mobile
- Bankruptcies and exit of some global players creating opportunities
- High capital & license entry barriers

Risks & Concerns

- Foreign ownership and telecom regulations require significant lobbying to circumvent
- Cannibalization of existing markets
- Significant overcapacity in (commodity) markets
 - Unlikely that margins will return
- Incumbents often block competitors' asset sharing / new entry
- Opportunities often too big or too small/new
 - Incumbent players are very large
 - New entrants require <\$25m
- Exit options may be decreasing
 - Fewer strategic buyers around

Good time to buy, but high (competitive) risk in unregulated sectors

Optical Communications and Broadband Trends in Asia-Pacific

* Summary of New Submarine Systems in Asia-Pacific

Ready for service	System	Peak Capacity (Gbls)	Transpacific	Pan-Asian	Global/Other
1999	SEA-ME-WE 3	160			✗
1999	China-US	640	✗		
1999	FLAG Euro-Asia	640			✗
2000	PC-1	640	✗		
2000	Japan-US	640	✗		
2000	Southern Cross	160		✗	
2001	EAC	2,560		✗	
2001	APCN-2	2,560		✗	
2001	C2C	7,680		✗	
2001	Tiger	640		✗	
2001	Aus-Japan	640		✗	

Source: RHK, Inc.

Optical Communications and Broadband Trends in Asia-Pacific

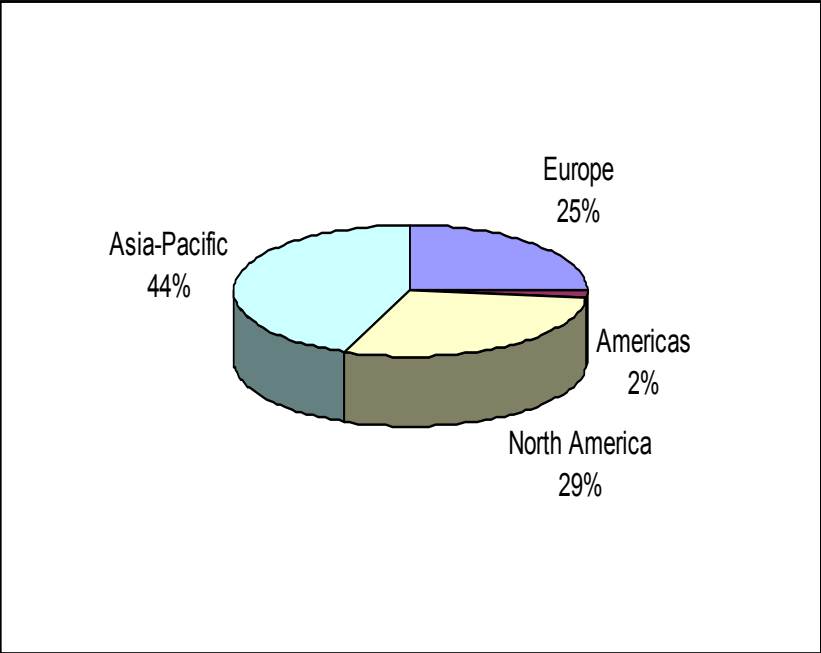
* Snapshot of Network Construction in Asia-Pacific

Country	Company	Details
Japan	Crosswave Communications	Leasing 6,000km of dark fibre from KDDI as it builds its own backbone, which will be 12,000 route km by 2005.
China	China Unicom	As of 2000, its national network includes nearly 30,000 route km of fibre (mostly in the backbone).
China	China Netcom	Its phase I, complete at year-end 2000, will give it 23,000 route km of fibre (including four city loops).
Taiwan	NCIC TFN EBT	Each new licensee is building a national fibre backbone and metro access networks. By 2006, each network must have capacity to serve at least one million lines (Taiwan currently has ~12 million lines).
India	Powergrid	Had 3,000 route km of fibre in March 2000, will add 15,000 over the next three years. Wants to be long-distance player post-deregulation.
Australia	Powertel	Is building a Brisbane-Sydney-Canberra-Melbourne-Adelaide intercity network and metro access networks in most markets. Affiliate of Williams Communications.
Korea	Hanaro	Already built national backbone using 2.5Gb/s-based WDM. In target cities, it builds STM-16 rings, with subtending STM-1 rings to serve buildings.

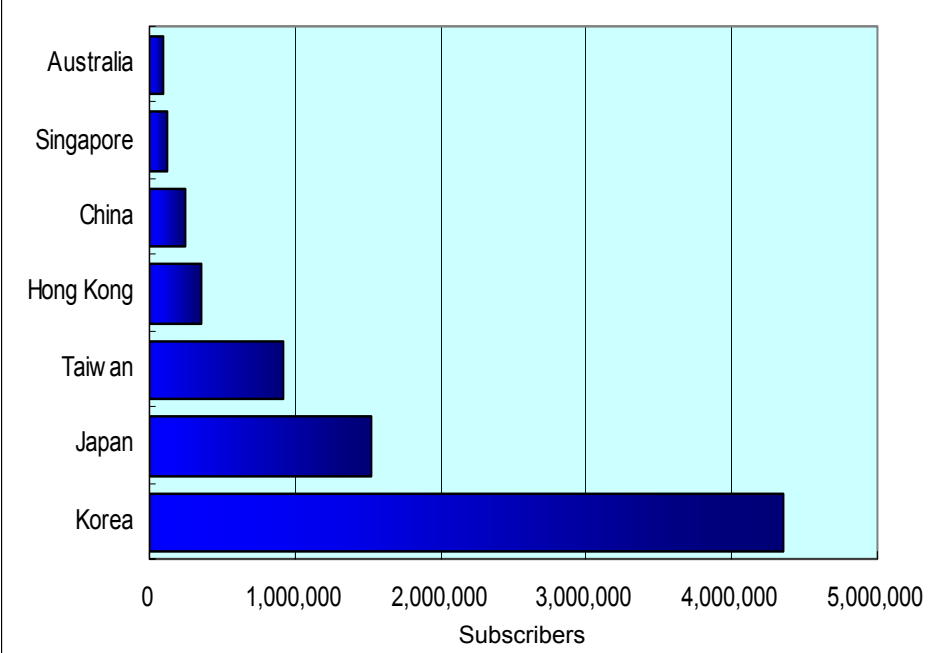
Source: RHK, Inc.

Optical communications and Broadband Trends in Asia-Pacific

** 2001 DSL subscriber Distribution by Region*



** 2001 Asia-Pacific DSL Subscribers by Country*



Source: RHK, Inc.

Japan Broadband Market

Casualties

KDDI Winstar
New Century Global Net
Tokyo Metallica

?

Yahoo Broadband
EAccess (Wholesale to JT for ODN)
CATV
Freebit

Winner

NTT (Cost Allocation)