High Definition Video-over-IP in Japan

Talking Points

Talking Points Overview

- What is High Definition Video Streaming?
  - High Definition digital video titles transmitted *on-demand* over *unicast* IP networks
- High Definition Video Content
  - 1000s of HD titles now available
  - If you've got a big screen you need HD
- *Big Broadband* Networks required
  - Fibre-to-The-Home technology
    - Japan leads the world
  - ADSL inadequate
- Next-Generation Streaming Technology
  - Streamonix and partners have it

High Definition Video

- High Definition Video
  - 5+ times higher quality than regular (NTSC) TV
  - Resolution up to 1920 x 1080 pixels
  - Wide screen format (16x9 aspect ratio)
- Most video production now done in High Definition
- Large Flat Panel Displays driving HD demand
  - Have you ever tried watching regular TV on a large, high resolution display?
    - Ugly. Very ugly.
- Consumer electronics companies responding with BluRay and HD-DVD players

What is Video Streaming?

- Definition of "Streaming"
  - Transmitting digital video packets just-in-time over IP networks to video decode/display systems
  - Video packets arrive at the same rate that they are consumed by the video decoding/display hardware
  - Not file transferring, not file downloading
- The *5 Ds* of Video Streaming:
  - Demand
  - Deliver
  - Decode
  - Display
  - Discard
- "Use it and lose it"

Elements of Video Streaming

- On-Demand Program Delivery
  - Each user requests and receives own video program at own time
- Unicast IP packet transmission
  - Delivering unique programs to unique users requires unique packet streams
  - Not multicasting, not broadcasting
- Encryption
  - All video packets are encrypted on-the-fly by video transmission systems
  - Video packets decoded on-the-fly by users' video decode/display equipment

Why not Video Downloading?

- Content Owners hate it
  - Inherently insecure
    - Users download digital copy of intellectual property
  - Pirates always win
    - Copy protection always defeated by determined hackers
- Users tolerate it for now
  - Video files must be downloaded prior to viewing
    - Even partial downloads take time
  - Channel surfing possible but painfully slow
  - Digital Rights Management (DRM) systems complex, unfriendly, unreliable
- Only Hard Disk makers love it
  - Increases demand for hard disks in PCs, Set-Top-Boxes

Why HD Video Streaming?

- Inherently secure
  - File is never downloaded
    - Users never possess copies of the content
  - On-the-fly unique encryption of each stream makes piracy very difficult
    - Decryption done by video decoding hardware (Set Top Box or embedded decoder in video display)
- Greater choice and convenience for users
  - Centralized digital video library
  - What you want, when you want it
    - Immediate viewing, no waiting for download to finish
- Simplified billing and DRM systems
  - Analogous to Cell Phone billing and security systems

Enabling HD Video Streaming

- H.264 Video Compression Technology
  - Emerging as de facto video compression standard
    - Gradually replacing MPEG-2
  - H.264 is 21st century equivalent of NTSC and PAL
  - H.264 video bit rates
    - Standard Definition: 1.5 to 3.5 Mbps
    - High Definition: 8 to 12 Mbps
- HD H.264 Video Encoding & Decoding Chips
  - Highly integrated System-on-Chip solutions
- *Big Broadband* Networks
  - Fibre Optic (Fibre To The Home)
  - IP, Unicast,
  - Must provide 8+ Mbps sustained bandwidth per user

Enabling HD Video Streaming (continued)

- HD Consumer Electronics
  - High Definition Flat Panel Displays
    - LCD and Plasma technologies
      - Increasing in size, decreasing in price
    - *FullHD* - 1920 x 1080 pixels
  - High Definition Set Top Boxes
    - IP STBs receive and decode HD video streams
  - BluRay and HD-DVD players indirectly boosting HD video streaming market
    - Both use “Streaming-Friendly” compression schemes, including H.264
    - All the content prepared for BluRay and HD DVDs can be easily formatted for streaming

Big Broadband Networks

- Or, whatever happened to the "Information Super Highway"?
  - Where is the Fibre Optic infrastructure linking homes and businesses in a high-performance network?
- The US talked about it – and built parts of it
  - Fibre Optic trunk lines, not end-user access
- Japan didn't talk about it – but built the world's best and biggest Fibre Optic network
  - Highest performance
  - *Lowest cost!*
- Sweden, Korea and France are building nation-wide Fibre Optic networks

Big Broadband
Copper Wires vs Optical Fibres

- Broadband over Copper Wires
  - ADSL (Asymmetric Digital Subscriber Line)
- Does ADSL give you Big Broadband?
  - Sometimes yes, usually no
    - Depends on user's distance from network hub
  - *Actual* bandwidth several times lower than *advertised* bandwidth
- Broadband over Optical Fibres
  - FTTH (Fibre To The Home)
  - FTTB (Fibre To The Business)
- Does FTTH give you Big Broadband?
  - Yes: 10+ megabits/second

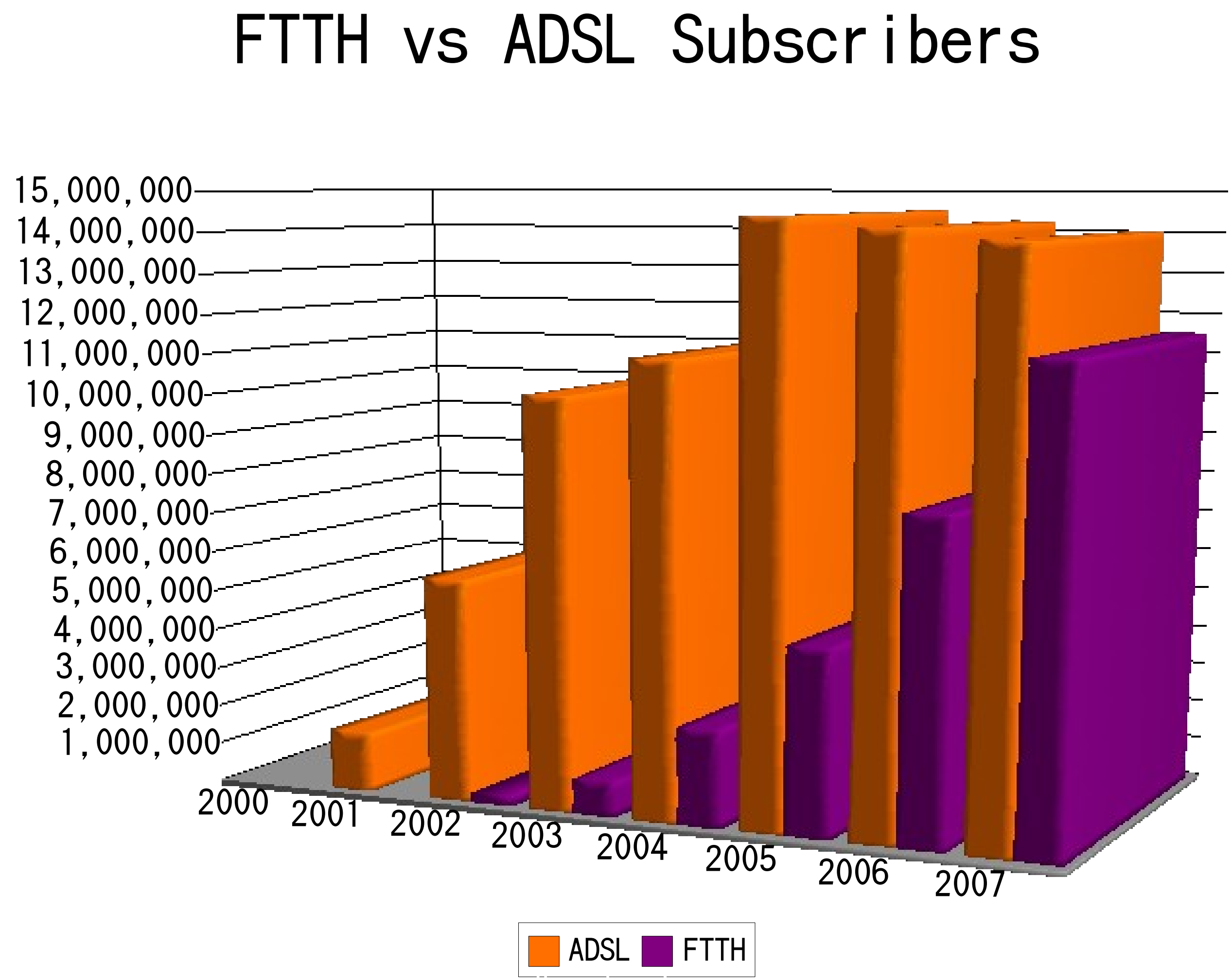
Japan's Broadband Market

- Japan is 1st in the world for FTTH users
  - 7.9 million FTTH users (OECD: 12/2006)
    - FTTH users alone in Japan outnumber *total* broadband users in 23 of the 30 OECD countries
- Japan ranks 3rd for total broadband users behind the US and China
  - 25.8 million FTTH, ADSL and CableTV users (OECD: 12/2006)
- Wireless Broadband Networks
  - 4th Generation (4G) wireless networks arrive in 2010 offering 100 Mbps per user
  - 4G is Dark Horse of Japan's broadband market

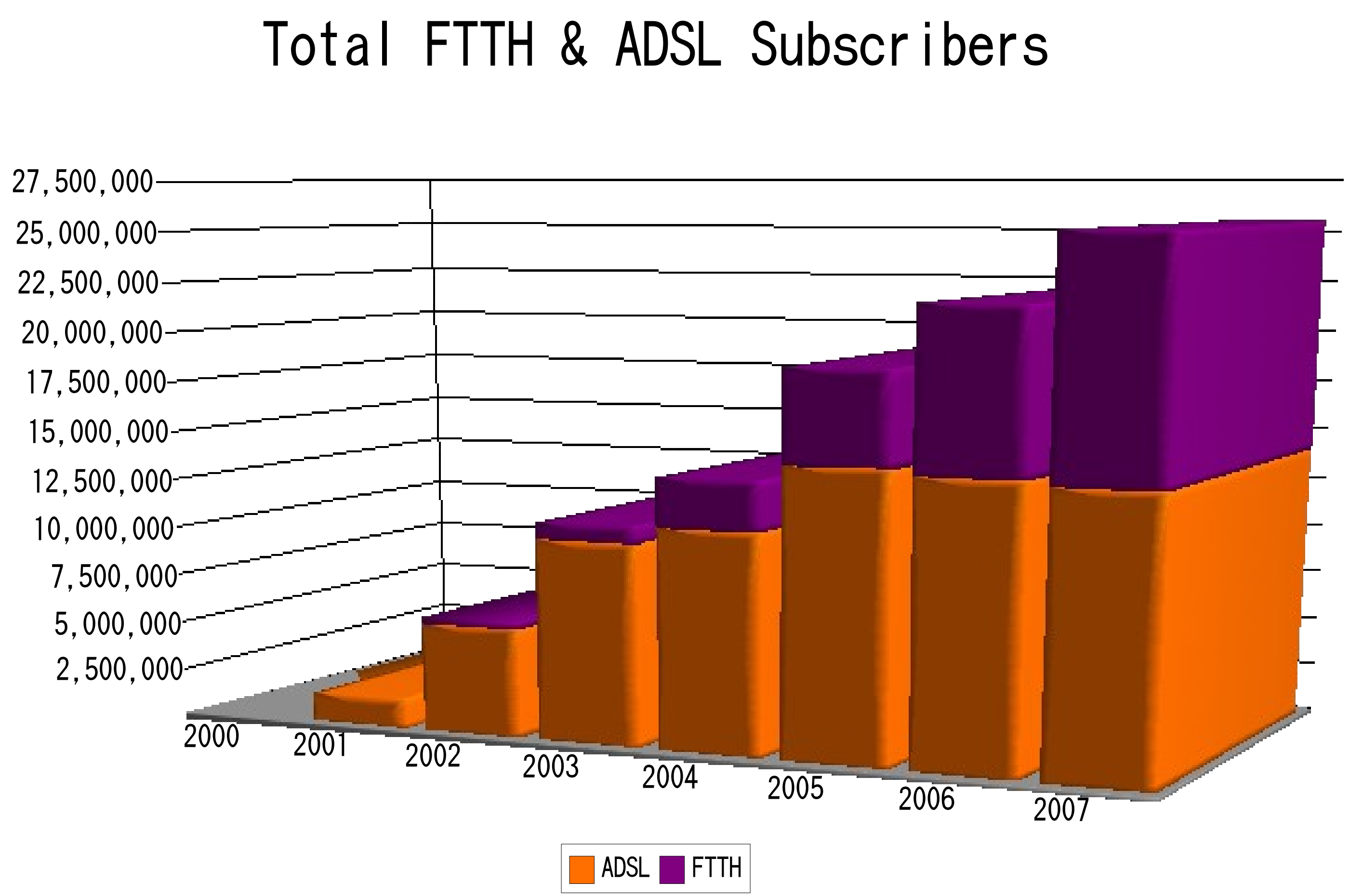
Japan's FTTH Market

- Japan’s FTTH users growing 45% annually
- Currently: more ADSL than FTTH users. But:
  - Existing ADSL users are switching to FTTH
  - New broadband users choose FTTH over ADSL
- NTT now has more FTTH than ADSL users
  - In fiscal 2006, 6.08 million FTTH customers, compared to 5.32 million for ADSL
    - 360,000 fewer ADSL customers than in 2005
- NTT forecasts continued rapid FTTH growth
  - 3.4 million new FTTH users in 2007
- **NTT says 30 million FTTH customers by 2010**

Growth of FTTH in Japan



Japanese FTTH & ADSL Market



Japan's Network Infrastructure
Leading the World

- NTT and other major FTTH providers boosting network capacity
  - Increasing bandwidth per user
  - Adoption of GE-PON (Gigabit Ethernet Passive Optical Network)
    - Moving to 10GE-PON (10 Gigabit Ethernet-PON)
- Adoption of IPv6
  - Billions of wired/wireless network devices
- 4G Wireless Networks will increase broadband competition
  - 4G receivers/video decoders embedded directly in large Flat Panel Displays

Japanese Streaming Equipment
Where is it?

- Japan leads in Flat Panel Displays, but lags in all other “streaming” equipment areas
- Where are Japan's Set Top Box makers?
  - Korea has over 100 STB makers
  - Japan has less than 10
- Where are Japan's video decoder chip manufacturers?
  - Matsushita and others only make chips for themselves
- NTT DoCoMo's “HD-over-4G” wireless demo
  - Canadian and German, not Japanese, video streaming/decoding technology

Japan's Streaming Companies
Where are they?

- Where are the companies offering new video streaming services for FTTH users?
  - Japan's FTTH investment is being wasted
  - Most service providers are not developing FTTH-based streaming video business models
    - 4^{th} Media is only company providing serious video-over-IP
      - but requires private multicast network
    - YahooBB, USEN and others offer US-style video download services
    - Missed opportunity for Japanese companies to define next-generation video services?
- Japan's Public Sector
  - NHK and Government displaying more innovation and leadership than Private Sector

Next-Generation Streaming Technology

- Big Broadband networks demand Big Broadband streaming equipment
  - Conventional video servers cannot handle the huge demand for popular titles
    - Cannot deliver 1000s of independent HD video streams simultaneously to thousands of users
- Streamonix has developed next-generation video server technology targeting Japan’s FTTH market
  - Purpose-built video streaming systems
  - Scales up to support *millions* of HD Video Streaming users

HD Streaming Enabling Factors
Japan's Strengths & Weaknesses

	Japan	Korea	Other Countries
Big Broadband (FTTH) Infrastructure	●	●	Sweden (now) France (2009)
Millions of Big Broadband users	●	●	
Innovative Set Top Box manufacturers		●	●
Aggressive Broadband Application Providers		●	USA
Thousands of digital video titles	●	●	●
Next-Generation Streaming Technology			Canada USA Sweden