The Connected Home

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Outline

- Overall Trends
- Home Networking Technologies
- Digital Home Platforms
- End-to-End Technology
- Singapore Landscape
- Conclusion
Overall Trends

- Broadband sharing is the key driver for home networking
- Rise of household with multiple PCs and the desire to share peripherals (data centric, files sharing)
- Emergence of smart devices & home platforms with standard networking capabilities for ease of sharing digitised information within the home
Overall Trends

- Bandwidth will not be an issue for in-home network
- Wireless connectivity will be the key networking technology providing mobility to user
- Data networking was the first wave. Home entertainment as the catalyst for the next wave of home network applications
- Digital media will be transported over common IP-based protocols to support convergence of data networking devices and home entertainment systems
Bundled end-to-end services will become increasingly strategic for service providers. The completion of OSGI spec. is expected to enhance platforms like Residential Gateway for end-to-end applications.

Smart home applications will evolve from home automation and control, to home security, surveillance and healthcare; Smart kitchen appliances will not see demand before 2007.
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Home Networking Choices

- Phoneline Networking
  - HomePNA (Home Phoneline Networking Alliance)

- Powerline Communication
  - HomePlug, CEA R7.3 (Consumer Electronics Assoc.)

- Wireless Networking
  - IEEE 802.11a/b/g, HomeRF, Bluetooth, ZigBee, UWB

- Structured Wiring
  - CAT-5, Coax, Fibre, ...

Most moving towards higher data rate with better features!
“No New Wire” Approach

Phone wiring has the bandwidth, is low cost, is user installable but has failed to capture the market

HomePNA version 1.0 (1Mbps) and 2.0 (10Mbps) products are available

Specification for version 3.0 (>100Mbps) is expected to be ready by 2003
Earliest home networking technology for simple home control & automation

PLC has evolved to support high-speed data communication

Key programs such as EchoNet & Konnex provide more impetus for the usage of PLC for home automation

Key programs
- EchoNet
- Konnex

CEA R7.3
- 20+ Mbps (future)

HomePlug
- 2007: 100 Mbps?

Mainly home automation
- X10, LonTalk, CEBus, BatiBus, EIB, etc (few bps to kbps)
- Many different PLC standards and proprietary technologies - Interoperability is thus an issue
- Overlap of spectrum with PLC last mile access - Interference will remain a challenge
- Increasing market size

Source: In-Stat/MDR Jan 2002

Forecast for Overall Powerline Home Networking Equipment Market

US$706m
US$190m

Source: In-Stat/MDR Jan 2002
A key home networking technology for 2002 and beyond -- users want mobility

WLAN technologies include IEEE 802.11 family, HiperLAN/2 & HomeRF

Importance of Wi-Fi certification. 802.11 continues to dominate the wireless home networking space, driven by the demand for wireless connectivity

Growth of WLAN in home/SOHO is projected to surpass the enterprise market by many folds
IEEE 802.11a/e/g/h/i ongoing standard development

- **2002**
  - Task Group ‘a’
  - ETSI HiperLan/2

- **2003**
  - Task Group ‘e’ - QoS
  - Task Group ‘g’ - 2.4GHz High Rate

- **2004**
  - Task Group ‘h’ - Dynamic Frequency Selection / Transmit Power Control

- **2005**
  - Task Group ‘i’ - Security

Legend:
- ★ Product availability
- ○ Expected standard ratification
Wireless PAN (WPAN)

A complementary class of wireless technologies for short range communication. Includes Bluetooth, ZigBee & Ultra-Wideband

Bluetooth a short range wireless technology for cable replacement operating in the ISM band

ZigBee a low cost, low power, low data rate WPAN for simple home automation devices, PC peripherals & toys

UWB holds promise as a high speed technology for consumer electronics multimedia applications
Home Networking Market Breakdown

PC Home Networking Market Breakdown
[Percentage of Total Unit Shipments]

Wireless LAN 38%
Ethernet 60%
HomePNA
HomePLUG

1st Half, 2002

[Source: In-Stat/MDR, 09/02]
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Traditional CE products are standalone

Emergence of CE products with networking capability, e.g. Hi-fi MP3 systems, network-ready Personal Video Recorder (PVR), game console with Internet connection

Everything in the media world is going digital and can be shared over IP-based protocols

Emergence of home centre to play the role of media storage, management and distribution

Home centres can be any digital platform with embedded computing power and middleware/APIs e.g. Game console, PVR, DTV/ITV, Media Server, etc.
**Consumer Benefits:**

- Products individually do more and work together
- Improved convenience
- Greater functionality

**Industry Opportunities:**

- Deliver higher value, interoperable network products
- Deliver services to broadband and broadcast devices
Standards and Guidelines Provide Interoperability

Example of an Industry Initiative -- Digital Home Interoperability Stack from Intel
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Need a service platform to bridge the in-home network with external service providers

Access technologies:
- Cable, DSL
- Mobile wireless network
- Public WLAN (Hot-spots)
- PON
- Fixed wireless
- Terrestrial
- Satellite

In-Home Network
- New wiring
  - Ethernet
  - Firewire
- Wireless
  - Bluetooth
  - WLAN
  - Mobile Network
  - Irda
- Existing wires
  - powerline
  - phoneline

Smart Home Platforms
- DTV, PVR, A/V, HMS
- PC, printer
- Mobile devices
- Home appliances
- HVAC, security, etc.

 RG supports:
- OSGI
- UPnP
- Jini
- HAVI, etc.

Managed Services or Network Provider

Home Service Providers
- Healthcare service
- Home security service
- Other value added services
- Entertainment service
- Information services

Internet

End-to-End Technology
The Connected Home
Service platforms available today:

- OSGI (Open Service Gateway Initiative)
- HomeGate by JTC 1 / SC 25 Working Group 1
- CableHome by CableLabs

OSGI is a Java-based application layer framework that provides vendor-neutral application and device layer APIs to deploy a variety of services.

OSGI Service Platform Release 2 has simplified the delivery of bundled services. Development is underway to support telematics applications.
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More than 56.8% household with Internet access

Broadband as of 2001 has reached 17.7% of household

Home PC ownership (end 2001) = 63.9%

Base: Total Households as at Oct 2001 is 1,049,600
### Multiple PCs ownership (end 2001) = 26.7%

<table>
<thead>
<tr>
<th>Year</th>
<th>Ownership Percentage</th>
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<tbody>
<tr>
<td>2000</td>
<td>23.4%</td>
</tr>
<tr>
<td>1999</td>
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<td>1996</td>
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<tr>
<td>1993</td>
<td>5.3%</td>
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<tr>
<td>1990</td>
<td>4.7%</td>
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</tbody>
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Base: Number of Households with Home Computers = 672,000

23% of these household have some form of home networking technologies
HDB proactive in developing network-ready flats, wired with structured cabling

IDA initiated a Connected Home Programme that aims to provide a test bed for industry to develop end-to-end solution for the homes

IDA initiated an OSGI-compliant Residential Gateway (RG) reference design project to serve as a blueprint for industry to shorten time-to-market for manufacturing of next generation RGs

SBA is also supporting the development of original, innovative and high quality content and services for digital radio and digital television
Bandwidth will not be an issue for in-home network

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