WLAN Video Phone
Overview

- The EECS488 Video Phone is targeted to compete with the new Video Mobile Phones available from wireless service provider phones and traditional conference calling equipment.

- Small handheld device similar to a Palm Pilot or wireless phone.
Features & Benefits

- Highly Portable
- Integrates with existing wireless LAN technology
- Cross platform compatible
  - Developed off Microsoft Netmeeting SDK
- Superior Performance at a competitive price.
Applications

- Video Conferencing
- Security/ Surveillance Systems
- Home
- Leisure
Market Analysis

- Competing Products
  - Price Analysis
  - Functional Analysis
  - Technical Analysis
- Market Research
  - Market Projection
  - Forecast
Competing Products

- Apitek 200t
- Tele-Eye LCD
- Vialta BM80
- Texas Instruments IP Phone
- Panasonic Victpro
- Prosperity VP-41
Price Analysis

- Average price of surveyed competing products $577
- Prices ranged from $400 to almost $900 for similar functionality
# Products Surveyed

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Manufacturer</th>
<th>Price</th>
<th>Description</th>
<th>Features</th>
<th>Missing Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - BM80</td>
<td>Vialta</td>
<td>450</td>
<td>Personal Video Phone Station</td>
<td>Works with a standard POTS phone line and an existing phone, Color motion video</td>
<td>No message recording features</td>
</tr>
<tr>
<td>2 - 2000T</td>
<td>Aiptek</td>
<td>470</td>
<td>Video Phone</td>
<td>POTS, .2 inch 250,000 pixel CCD, includes phone and camera, 7 to 8 fps</td>
<td>No message recording features</td>
</tr>
<tr>
<td>3 - DV324</td>
<td>8x8</td>
<td>489</td>
<td>Desktop Video Phone</td>
<td>H.324 video standard. POTS, Full Duplex</td>
<td>No message recording features</td>
</tr>
<tr>
<td>4 - 2000S</td>
<td>Hyperphone</td>
<td>879</td>
<td>Television Video Phone</td>
<td>H.324 compliant, POTS, 7-8fps, max 15fps, 33.6kbps</td>
<td>No message recording features</td>
</tr>
<tr>
<td>5 - Victpro KXC-AP150</td>
<td>Panasonic</td>
<td>429</td>
<td>Video Communication Terminal</td>
<td>POTS, Remote viewing/monitoring</td>
<td>No message recording features</td>
</tr>
<tr>
<td>6 - VP-41</td>
<td>Polycom</td>
<td>723</td>
<td>Video Phone</td>
<td>POTS, H.263, G.723.1, H.245, H.233, PIP, Camera, Mic, Speaker</td>
<td>Audio message recording only, no video</td>
</tr>
<tr>
<td>7 - Via Video</td>
<td>Polycom</td>
<td>600</td>
<td>Standalone Video Phone</td>
<td>POTS, H.324</td>
<td></td>
</tr>
</tbody>
</table>
Functional Analysis

- POTS - Plain Old Telephone System
- Integrated Modems 33.6 - 56K
- Performance: 7 - 8 fps (average), 15 fps (max), 30 fps (local)
- Video Size: 352 x 288, 176 x 144, 128 x 96
- Standard Display: 4 inch LCD
- Typical Camera: 0.2 inch CCD (250,000 pixels)
- Standard Protocol: H.324 - addresses video and audio communications over low bitrate connections such as POTS modem connections
Disadvantages of Competition

- Non-Portable
- Poor performance
- Some require identical models for best results
- Very few definitive standards for functionality and interoperability
- Price is relatively high for the average consumer, especially since two devices are required.
- Performance is low, considering the cost
Advantages of Competition

- Makes use of existing technology that is widely available and understood by the average consumer.
- Easy setup
- Use is similar to a standard telephone
- No hidden charges for other connection services or monthly fees

Comment: With all these standard technologies in use, why the high prices? No wonder this has not caught on in the market!
Market Forecast

International Data Corporation predicts the total shipments of screen phones to exceed 3 million units and the total revenues from these shipments to exceed $550 million.

- The above analysis translates into approximately $183 in revenue per unit
Market Forecast

- Shipments are expected to exceed approx 3 million units:
  - 5% of the market = 150,000 units
- Required capital:
  - \(( \text{Unit Cost} ) \times ( \text{# of Units} ) = ( \text{Production Capital} )\)
  - \(( 166.28 \times 150,000 ) = 24,942,000\)
- Spread production capital expense over 5 years
  - 10% = $2,494,000
  - 20% = $4,988,400
  - 30% = $7,482,600
  - 40% = $9,976,800
Market Forecast

Units: Profit:

Year 1: 15,000 units $900,000
Year 2: 30,000 units $1.8 million
Year 3: 45,000 units $2.7 million
Year 4: 60,000 units $3.6 million

Profit after 4 years: $9 million USD

At this time initial investors can begin to receive dividends
Product Concept

Duplex Communication Via:
- Ad-Hoc
- WLAN
- Internet

Message storage via remote/local server
Design Focus

- **Speed to Market**
  - Utilize off the shelf components.
  - Minimize component count.
  - Use provided software libraries to reduce design time.

- **Low Power Consumption**
  - More hours between charging
  - Less expensive Battery
Specification - Processor

Texas Instruments OMAP
- Targeted for Mobile Multimedia
- Includes all necessary peripheral ports to reduce hardware development and overall cost.

- Camera Interface
- Digital I/O (Keys, Buttons)
- LCD Display Driver (8-bit RGB)
- Serial Peripheral Interface for WLAN and Audio Codec Chips
- FLASH Controller (if needed)
- UART/USB for Software Download/Updates
Texas Instruments OMAP
- Excellent Design Resources
- Standard TI DSP Libraries
- Provided compression/decompression algorithms for MPEG, MP3, ATC, etc.
- Code Composer Studio IDE
  - ANSI C
  - Real Time Debugging/ Breakpoints
Texas Instruments OMAP
- Dual Core RISC/DSP
- Public Peripherals are accessed in either the DSP or RISC GPP.
- DSP will handle compression/decompression in real time
- RISC GPP can be used for Interface and Network Communications.
Specification - Display

NEC Color TFT LCD
- Much Larger than 3.5 inch displays common in competition.
- Excellent Viewing Angle
- Low Power Sleep Mode conserves energy when not in use.
- Touch Screen Capable

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Model number</td>
<td>NL3224BC35-20</td>
</tr>
<tr>
<td>Drive method</td>
<td>a-Si TFT active matrix</td>
</tr>
<tr>
<td>Number of pixels</td>
<td>320 x 240</td>
</tr>
<tr>
<td>Pixel pitch</td>
<td>0.348 (H) x 0.348 (V) mm</td>
</tr>
<tr>
<td>Luminance</td>
<td>400 cd/m²</td>
</tr>
<tr>
<td>Screen size</td>
<td>5.5 inches (14 cm diagonal)</td>
</tr>
<tr>
<td>Effective display area</td>
<td>111.36 (H) x 83.52 (V) mm</td>
</tr>
<tr>
<td>Display colors</td>
<td>262,144 colors</td>
</tr>
<tr>
<td>Pixel arrangement</td>
<td>RGB stripe</td>
</tr>
<tr>
<td>Backlight</td>
<td>2 cold cathode fluorescent lamps</td>
</tr>
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</table>
Specification - WLAN SoC

- **TI TNETW1100B**
- Complete System on Chip WLAN Solution.
- IEEE 802.11b 11 Mbps
- IEEE 802.11g 54 Mbps available in same package (Late 2003)
- Support of WLAN Identification features similar to WLAN PCMCIA used in laptop computers.
- Ad-hoc and Infrastructure Modes.
- Support for WLAN Security
## Pricing

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>Part Number</th>
<th>Cost per Unit</th>
<th>Required Volume</th>
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<tbody>
<tr>
<td>LCD TFT Display</td>
<td>NEC</td>
<td>NL332</td>
<td>$59.00</td>
<td>500+</td>
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<tr>
<td>Microphone</td>
<td>Panasonic</td>
<td>WM-62HNT</td>
<td>$2.04</td>
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<tr>
<td>Speaker</td>
<td>Panasonic</td>
<td>EAS-2P113D</td>
<td>$4.29</td>
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<tr>
<td>DSP</td>
<td>TI</td>
<td>OMAP</td>
<td>$36.95</td>
<td>1000+</td>
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<tr>
<td>FLASH</td>
<td>Not Needed</td>
<td>Not Needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera</td>
<td>Panasonic</td>
<td>GP-CX151/45P</td>
<td>$35.00</td>
<td></td>
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<tr>
<td>WLAN SOC</td>
<td>TI</td>
<td>TNETW1100B</td>
<td>$19.00</td>
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<tr>
<td>Packaging</td>
<td>Custom</td>
<td>?</td>
<td>$15.00</td>
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<tr>
<td>PCB</td>
<td>Custom</td>
<td>?</td>
<td>$10.00</td>
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<tr>
<td>Development Cost</td>
<td>Engineering</td>
<td>Manhours</td>
<td>$40.00</td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>Supply</td>
<td>Warehouse, shipping etc</td>
<td>$15.00</td>
<td></td>
</tr>
<tr>
<td>Profit</td>
<td></td>
<td>20% otherwise buy tech stocks</td>
<td>$60.00</td>
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<tr>
<td></td>
<td></td>
<td>Total</td>
<td>$296.28</td>
<td>$300.00</td>
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<td></td>
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<td>Target Price</td>
<td></td>
<td></td>
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<td></td>
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<td>Available Capital</td>
<td>$3.72</td>
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<table>
<thead>
<tr>
<th>Engineering</th>
<th>ManHours</th>
<th>Salary</th>
<th>Total Development</th>
<th>Per 50,000</th>
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<tbody>
<tr>
<td>2 X 2000</td>
<td>$100,000 per 2000 hours</td>
<td>$200,000.00</td>
<td>$40.00 per unit</td>
<td></td>
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Availability

Verification of Performance

Theory:
- Microsoft Netmeeting provides similar audio and video capabilities.
- Typically Netmeeting is used on 10/100 Ethernet based LAN or Internet.
- Test capability of Netmeeting over Wireless LAN 802.11b to evaluate potential quality of video and audio.
Verification

- Using Netmeeting SDK provided by Microsoft, we developed a simple application that embeds Netmeeting Objects and Controls into a Windows Application.
- Netmeeting Objects will automatically adjust frame rate and compression depending on transmission rate.
Verification

- Setup
- Two Laptops with WLAN 802.11b PCMCIA cards.
- Netmeeting DLL must be available.
- Network is Ad-Hoc.
- Microphone and Internal Speakers
Verification

- Results
- Video and Audio was impressive, better than anticipated.
- Video Frame Rate was adequate for motion perception.
- DEMO!!!!