TinyPC: Enabling Low-Cost Internet Access in Developing Regions\textsuperscript{1}

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Introduction

Technology can impact everyone
- Health, education, government, commerce

“First World” technology is a bad fit
  – New research agenda

Our focus
  - Not targeting literacy problems
    - “Wiring” the “Jungle” OR
    - Internet for the “other” billion
Introduction

$100 Laptop, Simputer …

TinyPC

Embedded World

Motivation

David Culler, ArchRock’s Primer Pack/IP, IPSN’07

LoWPAN
IPv6-based Low-power Wireless Personal Area Networks

Adam Dunkels, 8-bit TCP/IP Stack, MobiSys’03

Image Courtesy: Moteiv
Motivation

- **Limited access** to information (libraries, books)
- **High demand** (billions of potential users)
- Extremely low **Internet penetration**
**Motivation**

- **Limited access** to information (libraries, books)
- **High demand** (billions of potential users)
- Extremely low **Internet penetration**
- Previous attempts were **commercial failures**
  (Computador Popular, Simputer)

$200 + is NOT low cost!!

**Design Goals**

- Leverage Local Resources
- **Low Cost**
- Simplicity
- Internet Access
- Wireless Connectivity
Mobile Phones

Fundamental (human) limits:
- size of screen (output)
- size of keyboard (input)

(TVs + cell-phones) vs PCs

Big Picture
TinyPC Hardware

Computing
- Intel Xscale 312-520 MHz

Memory & Storage
- 16 MB DRAM,
- 2 MB FLASH,
- 1 GB USB (integrated)

Display
- TV or External Display

Networking
- 802.11 b/g (integrated)

Target Price
- $50 or less

Networking

Delay Tolerant Networking
- intermittent connectivity

802.11 Long-Distance
- rural access

MIT RoofNet
- last mile
Networking

- Meraki Mini $49
- Meraki Outdoor $99

Images Courtesy: Meraki

Comparison – MIT $100 Laptop

- $100
- Aimed at children & education
- New display technologies
- Power supply

Image Courtesy: OLPC
### Comparison – Simputer

- $240 - $440
- PDA-like display
- Touch-screen

![Image Courtesy: Amida Simputer](image)

### Comparison – Rural Kiosks

- Personal or family use vs. Shared computing
- Complimentary concepts

![Image Courtesy: Comat](image)
Comparison – Computador

- $300
- Never came to market
- No hard drive

Open Questions

Social issues
Sustainable development
TV as display
Other open research problems
Conclusions

Help bridge the digital divide
Low-cost, practical
Not a short-term solution
“Fancy cell-phones” vs. TinyPC

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If you think I am crazy …

Further Information

Muneeb Ali

http://muneeb.org

Thank You!
## Comparison Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Year</th>
<th>Memory</th>
<th>Processor</th>
<th>Storage</th>
<th>Network</th>
<th>Display</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer 1</td>
<td>2021</td>
<td>64 GB RAM</td>
<td>Intel i5</td>
<td>1 TB SSD</td>
<td>Ethernet</td>
<td>Monitor</td>
<td>$500</td>
</tr>
<tr>
<td>Laptop 1</td>
<td>2022</td>
<td>16 GB RAM</td>
<td>AMD Ryzen</td>
<td>256 GB SSD</td>
<td>Wi-Fi</td>
<td>Built-in</td>
<td>$1200</td>
</tr>
<tr>
<td>Tablet 1</td>
<td>2023</td>
<td>4 GB RAM</td>
<td>Qualcomm</td>
<td>64 GB eMMC</td>
<td>USB</td>
<td>External</td>
<td>$400</td>
</tr>
</tbody>
</table>

- **Memory**
- **Processor**
- **Storage**
- **Network**
- **Display**
- **Price**