

# Mobile and Embedded Linux

How Linux and Open Source Disrupt  
the Mobile and Embedded Industries

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# About Trolltech

**Founded in Oslo, Norway in 1994**

**Open source and Linux pioneer**

**Completed an IPO, July 2006**

**170 employees worldwide:**

Oslo, Norway (HQ); Redwood City (CA); Brisbane (Australia); Beijing (China); Berlin, Munich (Germany)

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# Trolltech's Products

## **Qt sets the standard for high-performance, cross-platform software development**

Windows, Mac OS X, Linux/Unix

Hundreds of thousands of open source developers

4,500 commercial customers

Dual Licensing Business Model

Customers: Google, Adobe, Skype,



## **Qtopia is unrivaled as the application platform for efficient, flexible embedded Linux development**

Mobile phones, PDAs, STB, media players, and more

>100 manufacturers building Linux devices

40 building mobile phones

Based on Qt



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# Trolltech – Dual Licensing and Open Source Pioneer

- **Dual licensing since 1995**
  - Free for development of Free and Open Source Software
    - QPL and GPL
  - Commercial license
- **Full product available for Open Source developers**
- **Snapshot versions**
- **Great help in our QA efforts from the community**
- **KDE Free Qt Foundation guarantees the freedom of Qt/X11**

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## Why Put Linux on Smartphones?

- Linux is a great operating system running some of the biggest servers on the Internet serving millions of users (Google, Amazon, Skype, etc.)
- Now – why on earth would you put Linux on millions of mobile handsets with limited memory and hardware?
- The hacker answer: because it can be done... 😊
- The real answer: **there are undeniable business advantages of moving to Linux and open source**

A typical handset 25 years ago...



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# Moore's Law made the hardware . . .

**Cheaper  
Smaller  
Faster**



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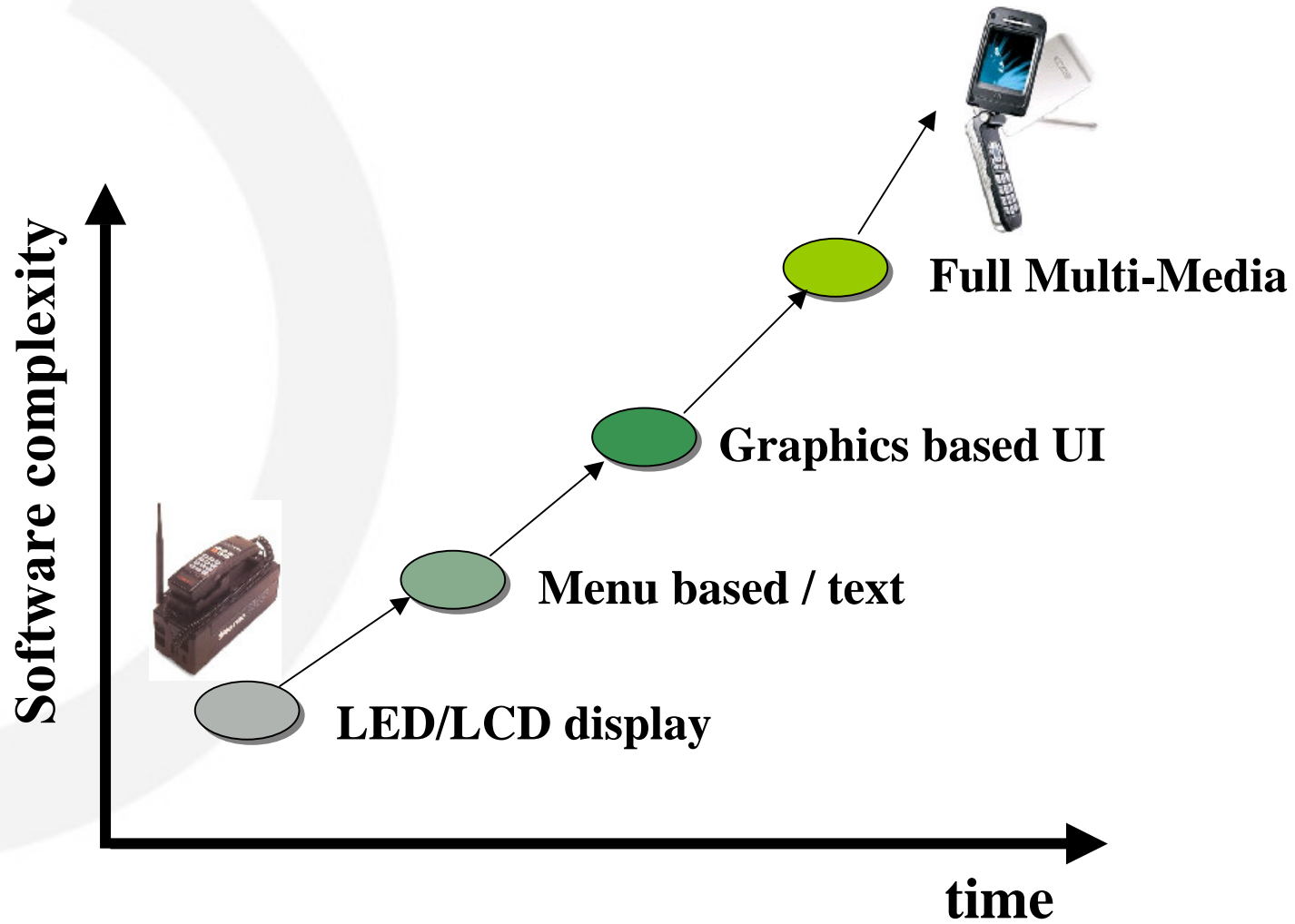
**But what about the software?**

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# Mobile Market Trend



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# SOFTWARE COMPLEXITY - THE ACHILLES HEEL OF THE MOBILE PHONE INDUSTRY

*Early days*

Communications  
Software

Hardware



*Today*

Applications

-----  
Application  
platform

-----  
Operating  
system

Hardware



- Only high-end, open OSs can keep up with today's data and multimedia requirements
- In-house solutions have proven too complex to maintain
  - Costly
  - Limited in capabilities
  - Few third party applications
  - Slow innovation and long time-to-market

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# The Six C's: Catalysts Driving Linux Adoption

**Complexity – Control**  
**Customization – Cost – Community**  
**China**

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## 1) Complexity in Software can be Managed

- Linux is a **modern operating system** suitable for running **complex**, mission-critical applications
- Linux features a **modular architecture** with installable device drivers and modules
- Linux lets manufacturers **create** handsets with **greater robustness** and more **predictable quality**

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## 2) Control and Freedom

- Manufacturers (OEMs and ODMs) want to **control their own business destiny**
- **Linux is open source** and gives manufacturers complete control of the software in the phone
- Manufacturers get **full freedom and independence** to create the phone the market wants
- Windows Mobile and Symbian make manufacturers **dependent** on Microsoft and Nokia business goals

### 3) Customization and Flexibility

- Linux allows **total customization** of the phone software and user interface
- **Unlimited freedom** to innovate
- Linux enables developers to **leverage a single code base** across smartphones and feature phones
- Linux is **extremely scalable and configurable**, can be used to build much more than phones

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## 4) Cost and Profitability

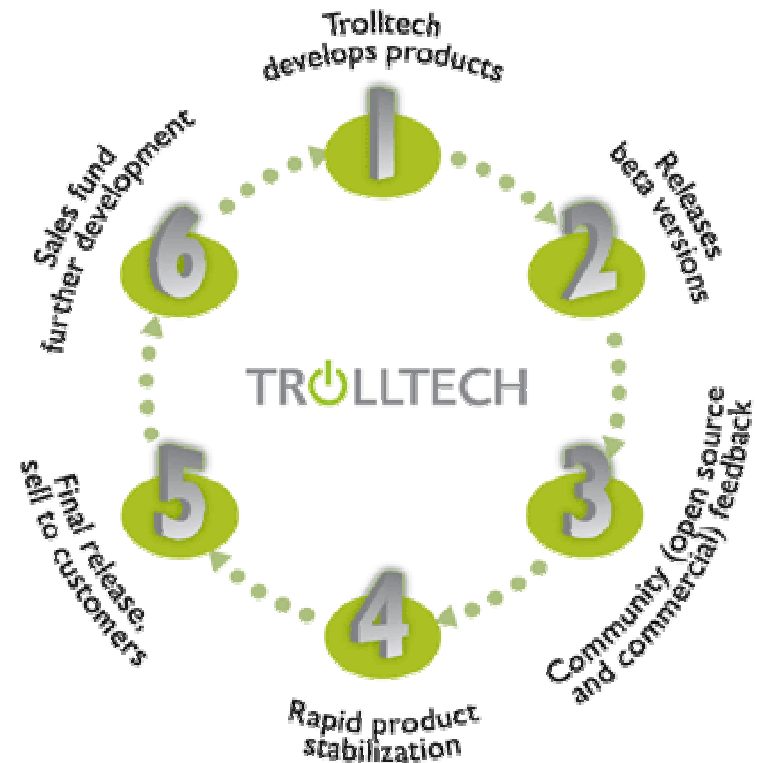
- Linux enables device manufacturers to control BOM costs through **better flexibility** of hardware and software
- Linux drives commoditization of the software stack
- Software quality is **more predictable** than proprietary systems → **shorter time-to-market**

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## 5) Community and Ecosystem

- Open source dual licensing
- Combines the benefits of open source licensing and distribution with the reliability and support of commercial players



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## 6) China

Chinese handset manufacturers are *Linux pioneers*

Chinese manufacturers are extremely competitive on quality and price

Linux will be a *catalyst* for Chinese companies to grow and become the next giants in the mobile phone industry



- Strong Government Support:  
[www.cww.net.cn/tzwb/Linux2005](http://www.cww.net.cn/tzwb/Linux2005)
- Zhang Xinsheng, Vice DG, Science & Technology Dept of MII said:  
“We hope China’s enterprises can leverage Linux to build their leadership in the coming years”

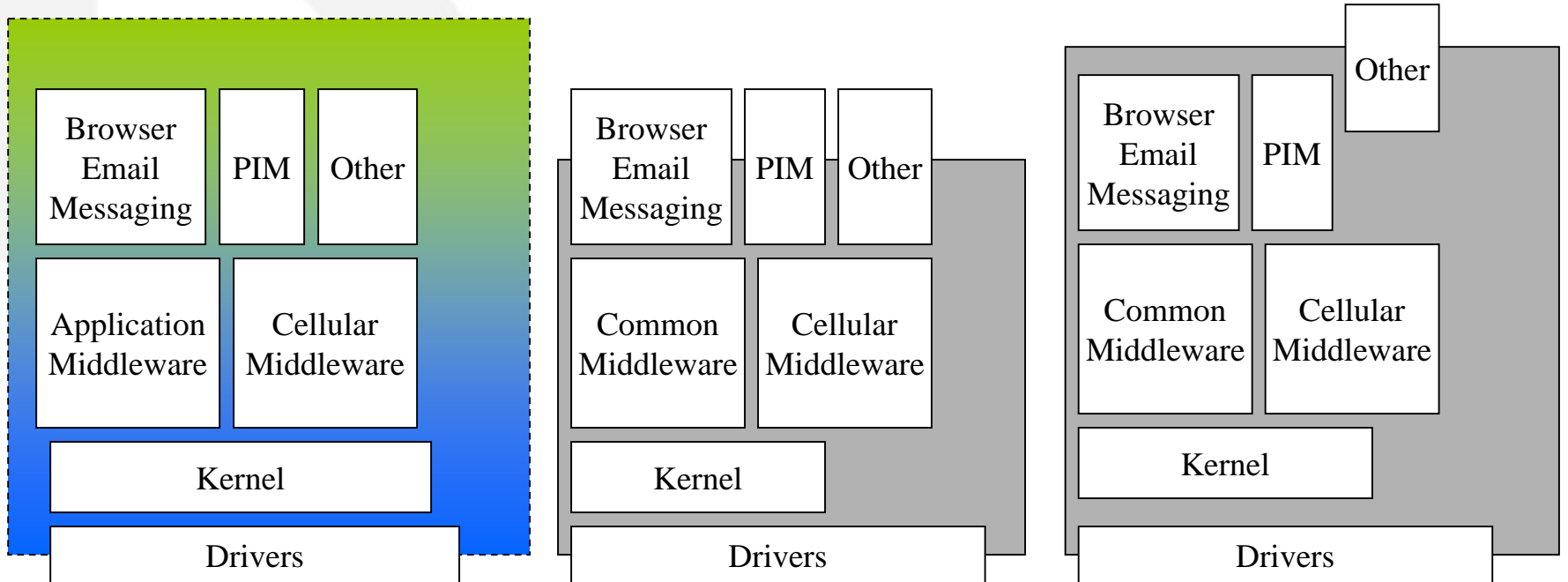
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## Who Are the Linux Players?

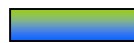

- Hardware: Freescale, Intel, TI, ...
- Linux OS: MontaVista, Wind River, ...
- Platform/SDK: Trolltech Qtopia, Access ALP =
- Java: Esmertec, IBM, Sun, Aplx, ...
- Browser: Opera, Access Netfront , ...
- Multimedia: Real (Helix), PacketVideo, ...
- And many more...

# Linux vs. Symbian vs. Microsoft



symbian



 Open, modular  
 Closed, fixed environment

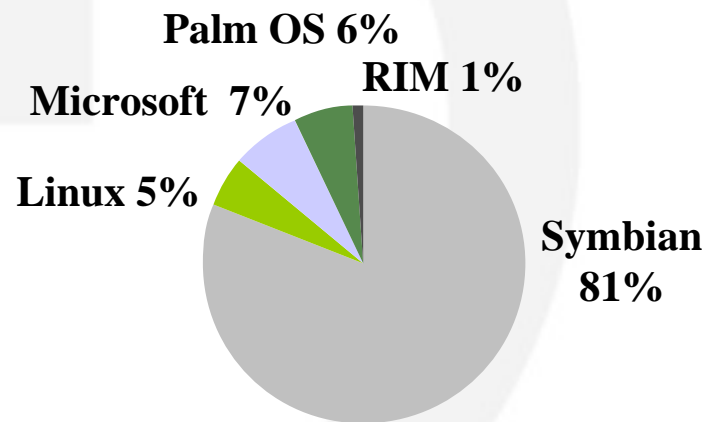
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# LINUX IS THE ANSWER FOR SMARTPHONES...

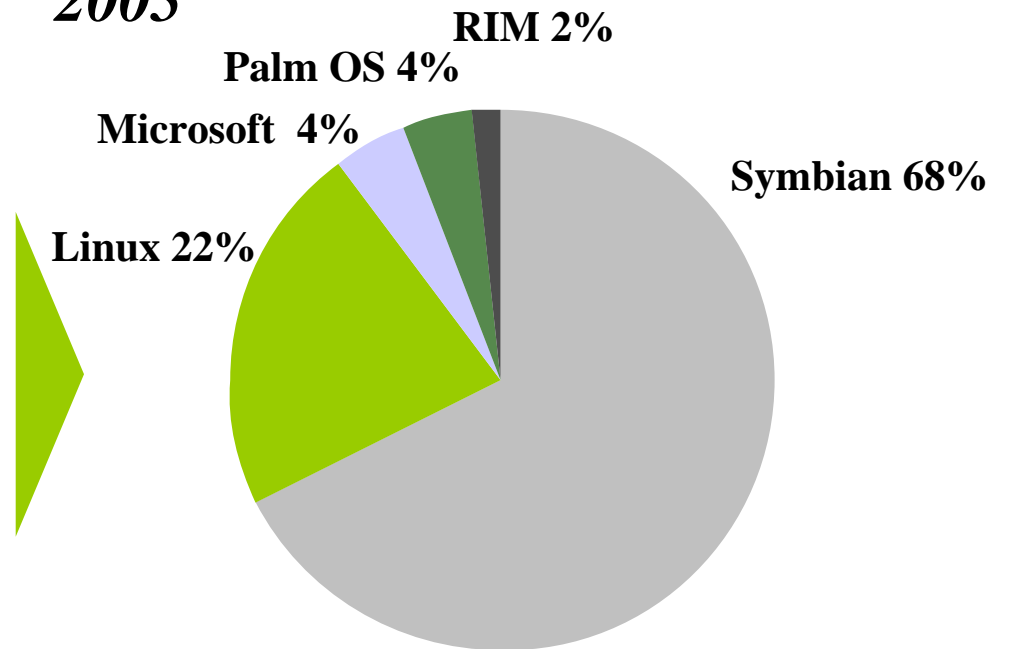
## Smartphone Unit Shipments

**2004**



16.7 million shipments

**2005**



49.0 million shipments

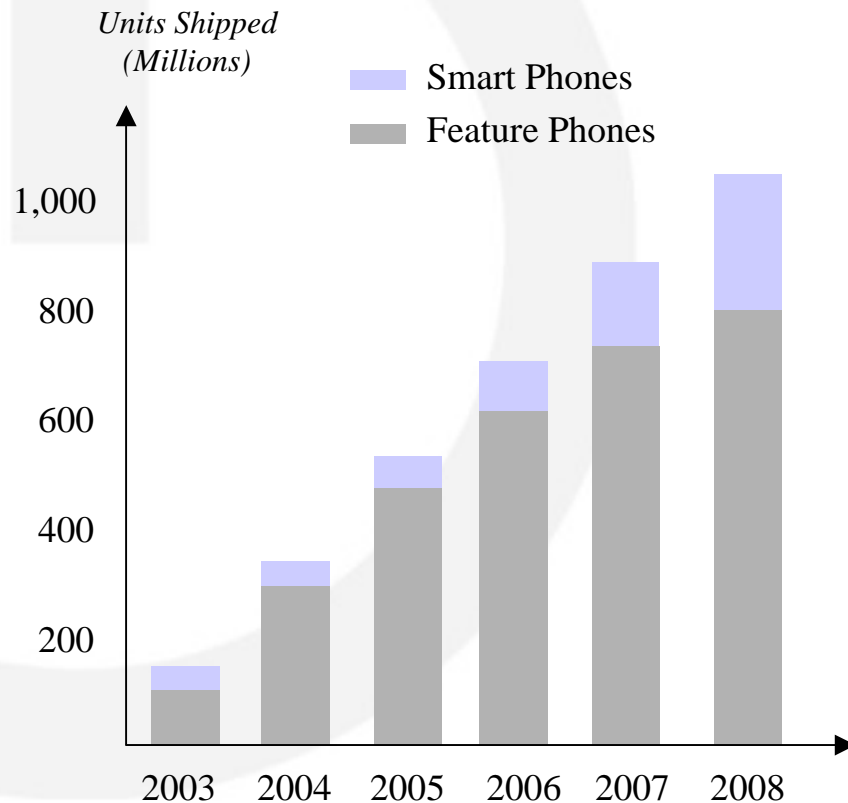
Source: Gartner 2006

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# ...WITH HUGE POTENTIAL IN LESS ADVANCED PHONES...

## Phone Market Opportunity



Source: Ovum

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## Why Linux?

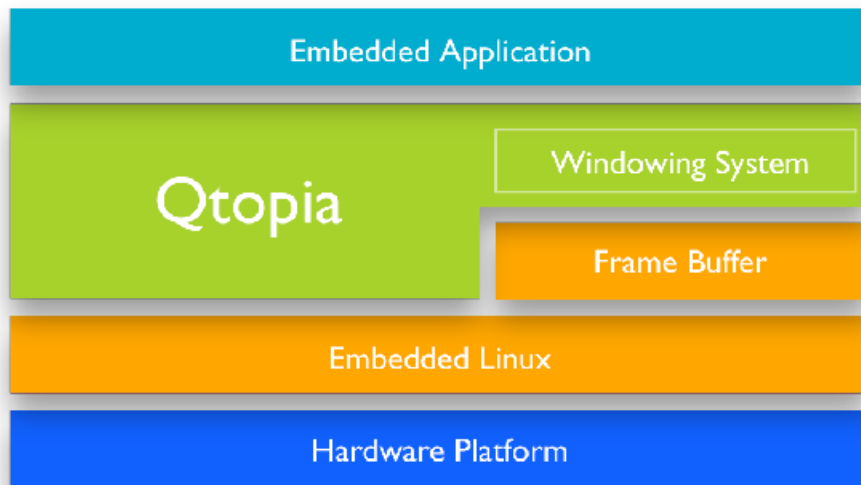
- Robust and flexible
- Open source
  - low cost
  - large community
- Independence
  - leaves manufacturers with a choice

**"Linux is open and it's free. In the end it's the only answer. For the mass, high volume market, I can't see another software platform."**

*Mr. Ron Garriques, President of Mobile Devices, Motorola, Inc.*

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# QTOPIA CORE INTRODUCING QTOPIA 4 FAMILIES



Qtopia Core brings the benefits of Trolltech's proven software for embedded Linux to developers of a broad range of equipment:

- Medical instruments
- Embedded appliances
- Image processing machines.

Qtopia Core has an API and a windowing system for GUI application development

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# QTOPIA PHONE EDITION THE ONLY OPEN PHONE APPLICATION PLATFORM

## Features:

- Full Support for button-based and/or touch-screen

- Support as low as 8 MB flash configuration (but 16 or 32 widely used)

- Configurable User Interface

- Complete Source Code

- No Branding Requirements

## Targets multimedia phones

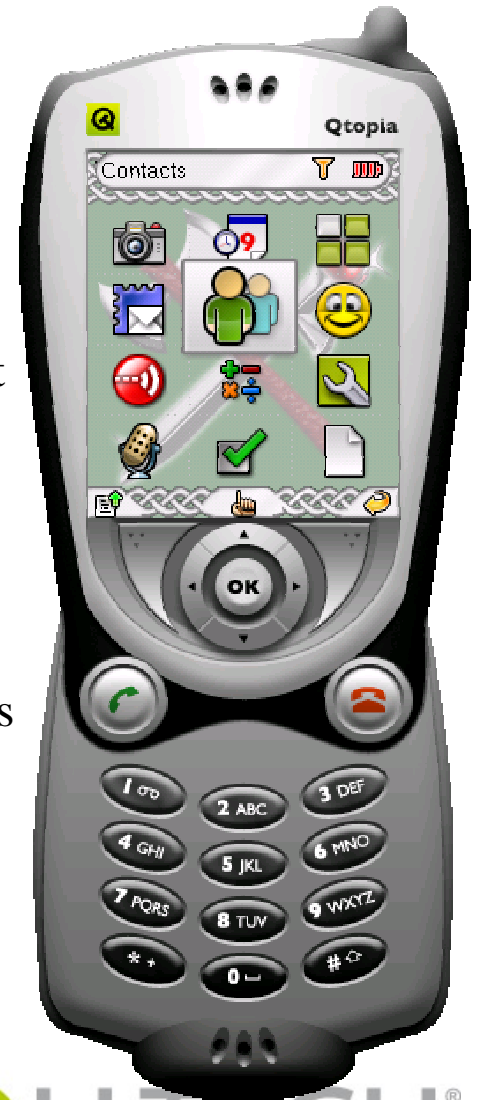
- (and smartphones, feature phones, media players and CarPC s)

## The Leading Linux Mobile Phone Platform

### Released April 15, 2004

- Available for evaluation

- 2.2 released Nov 29, 2005



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# What about Applications? Introducing Greenphone



- Open mobile phone for development of 3<sup>rd</sup> party Linux applications
- Enables the creating, modifying, extending or testing of applications on a working GSM/GPRS mobile phone
- Fully open and customizable
- Enables faster development and quicker time to market

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# Greenphone: Open and Proven Development Platform



- Includes Qtopia Phone Edition
  - Fully customizable UIs and extending capabilities
  - Documentation
  - The platform used by mobile phone manufacturers today: Motorola, Cellon, ZTE and many more
- Based on Qt – Trolltech’s cross-platform application framework.

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## Greenphone: Community of Developers



- Backed by Large OS & Commercial Community of Developers
  - Fully customizable UIs and extending capabilities
  - Documentation
  - The platform used by mobile phone manufacturers today: Motorola, Cellon, ZTE and many more

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**Devices, devices, devices...**

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## ... AND BEYOND

**Linux opportunities from phones to embedded devices**

Linux enables software standardization across devices

Linux has a strong convergence story and enables innovation

The Qtopia platform is very similar across phones and consumer electronics

Of Trolltech's >100 Qtopia customers 40 are on phones, the rest on other embedded devices



**Wireless TV/handheld**



**Personal Video Recorder (PVR)**



**Home Automation**



**Industrial apps**



**VOIP Phones**



**Automotive/transportation**



**Medical devices**



**Video Phone**



**Set-top box**

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