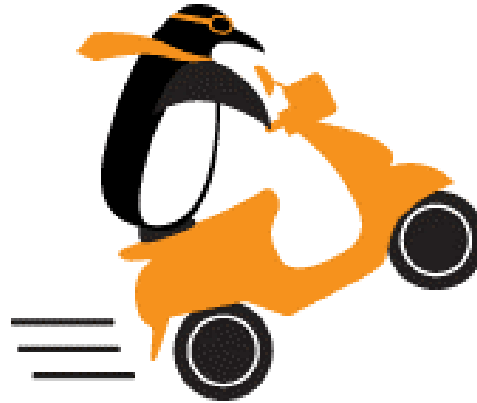


Beyond the PC: The Realization of Linux in the Mobile Device Market

Mike Kelley
SVP Engineering
PalmSource Inc., An ACCESS Company

- Why Mobile Linux is Exciting
- Advantages of Open Source for Mobile
- Challenges – Choice vs. Fragmentation
- Adapting Linux for Mobile Devices
- Ecosystem and Developer Opportunities
- What Next?

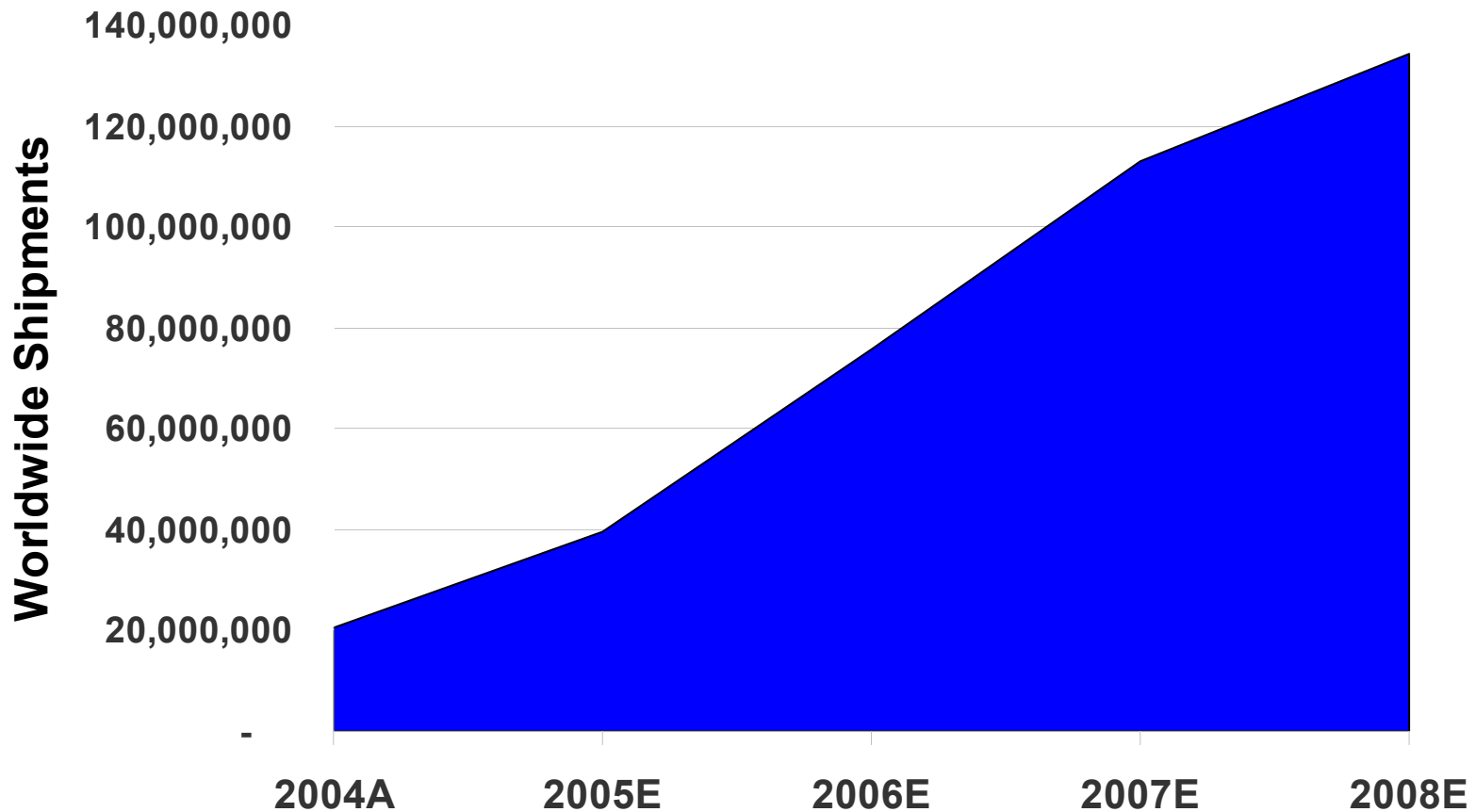


Why Mobile Linux is Exciting

- The phone market is HUGE! Approaching 1B units/year
- Smart mobile device category is growing fast. We expect 30% of phones sold in 2010 will be smart – more than 200M units/year



Strong growth projected for
smart mobile devices ...



Source: Canalys, 2005.

Includes both voice centric smartphones and data centric devices wireless handhelds

○ Wireless Handhelds Defined*

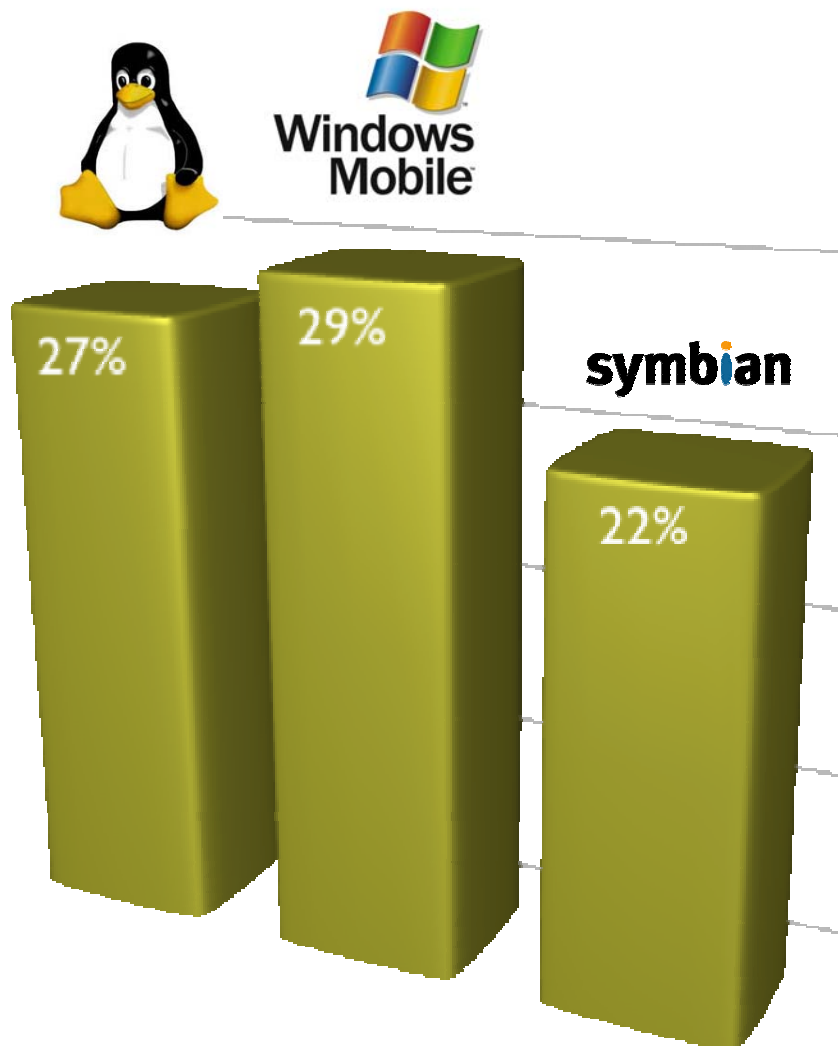
- Similar to handhelds (aka PDAs) but with cellular capabilities
- Positioned as data-centric devices
- Typically uses a stylus/touchscreen or keyboard as primary input mechanism



Smartphones Defined*

- Voice-centric devices with cellular capabilities
- Typically uses keypad as primary input mechanism
- Uses an advanced OS or runtime environment to allow application extensibility





"We look forward to making Linux a viable technology within the telephony market and accelerating a wide variety of data rich and innovative services."

- Roberto Vannini, EVP Business Innovation & Technical Solution, Telecom Italia

"Orange is committed to developing innovative and exciting mobile applications... working with ACCESS to develop and deliver the Orange Application Package for ALP, will enable us to foster the growth of the mobile Linux market."

- Yves Maitre, Vice President Devices, Orange

- Increasingly complex hardware and device requirements are raising the importance of open software platforms
- Existing proprietary mobile solutions have limitations
 - Customization is difficult
 - Pace of innovation is controlled
 - Complexities and support issues impede time to market
- Linux represents an attractive alternative
 - Secure, robust, efficient, flexible, open!

- It's a fair fight – Linux begins with strong market share
 - Mobile market has no defacto standard
- Mobile is a high growth, end-user market
 - Mobile devices are the desktop in many emerging markets
- Mobile devices enable and demand innovation
 - Always On and Always On-Line
 - Community, communication and media centric
 - Constant flow of disruptive new technologies



Advantages of Open Source for Mobile

1 Choice

Mix and Match Components

2 Control

Vendor Independence and Time to Market

3 Modern Operating System

Scalable, Advanced Processing Model

4 Community

Ground swell of innovation

Control and Choice: Linux vs. Proprietary OS

- Proprietary Operating System
 - Complex
 - Closed
 - Limited customization opportunities

- Linux
 - Open
 - Flexible
 - Customizable
 - Scalable



Challenges – Choice vs. Fragmentation

○ What's proven to work in Open Source

- Individual projects addressing specific operating system needs
- Gradual, meritocratic definition of the software stack
- Flexible components with short learning curves – titanium legos!

○ What the mobile industry is used to

- 100% specified and controlled development
- Closed software platforms – no 3rd party native apps
- Commercial software with warranties, indemnity, SLA
- Top-down driven innovation

Can Mobile tap into Open Source Momentum?

○ Will not work

- Open phones
- Desktop software “just fits” in mobile
- Top-down managed, fully specified “open source” platforms

○ Will work

- Adoption of selected open source suitable for mobile devices. Examples: GTK+, SQLite, GStreamer
- Collaboration to improve Linux for mobile. Example: OSDL Mobile Linux Initiative
- New open source projects for mobile features – more legos!
- Commercial investment to tune open source and fill gaps for mobile
- Innovative applications (commercial and open source)

○ Practical

- Kernel and drivers for a wide range of hardware
- Large, world-wide developer community
- Easy to develop applications
- Flexible middleware components
- High quality, modern OS foundation

○ Strategic

- Not locked into proprietary vendor's IP
- More freedom to differentiate



Adapting Linux for Mobile Devices

- **Users** expect high functionality and ease of use
- **Third party developers** need tools to develop, install and manage applications
- **Device vendors** need commercial quality software including required mobile features
- **Operators** need to customize and extend the platform, and ensure devices are secure

***“[One phone manufacturer]
has spent something in the
order of \$200M on its Java-
Linux-based smart OS ...

... very difficult to make
Linux [sic] into a platform.”***

Richard Windsor, Nomura Equity Research Analyst

***“Linux won't save
handset manufacturers
the effort of building
application functionality
or the user interface”***

Michael Gartenberg, Jupiter Research

Desktop



GHz

Gigabyte

AC

Large Screen

Keyboard & Mouse

Mobile Phone



MHz

Megabyte

Lithium-Ion

Small Screen

5 Way & Touch

1

Commercializing Open Source

selection, optimization, and distribution of open source

2

Enhancing Open Source for the Phone

improving widget set, theming, and drawing for mobile devices

3

Creating New Proprietary Components

telephony, messaging, mobile application framework

4

Integrating & Distributing a Mobile Platform

commercial grade, open source and proprietary co-existence

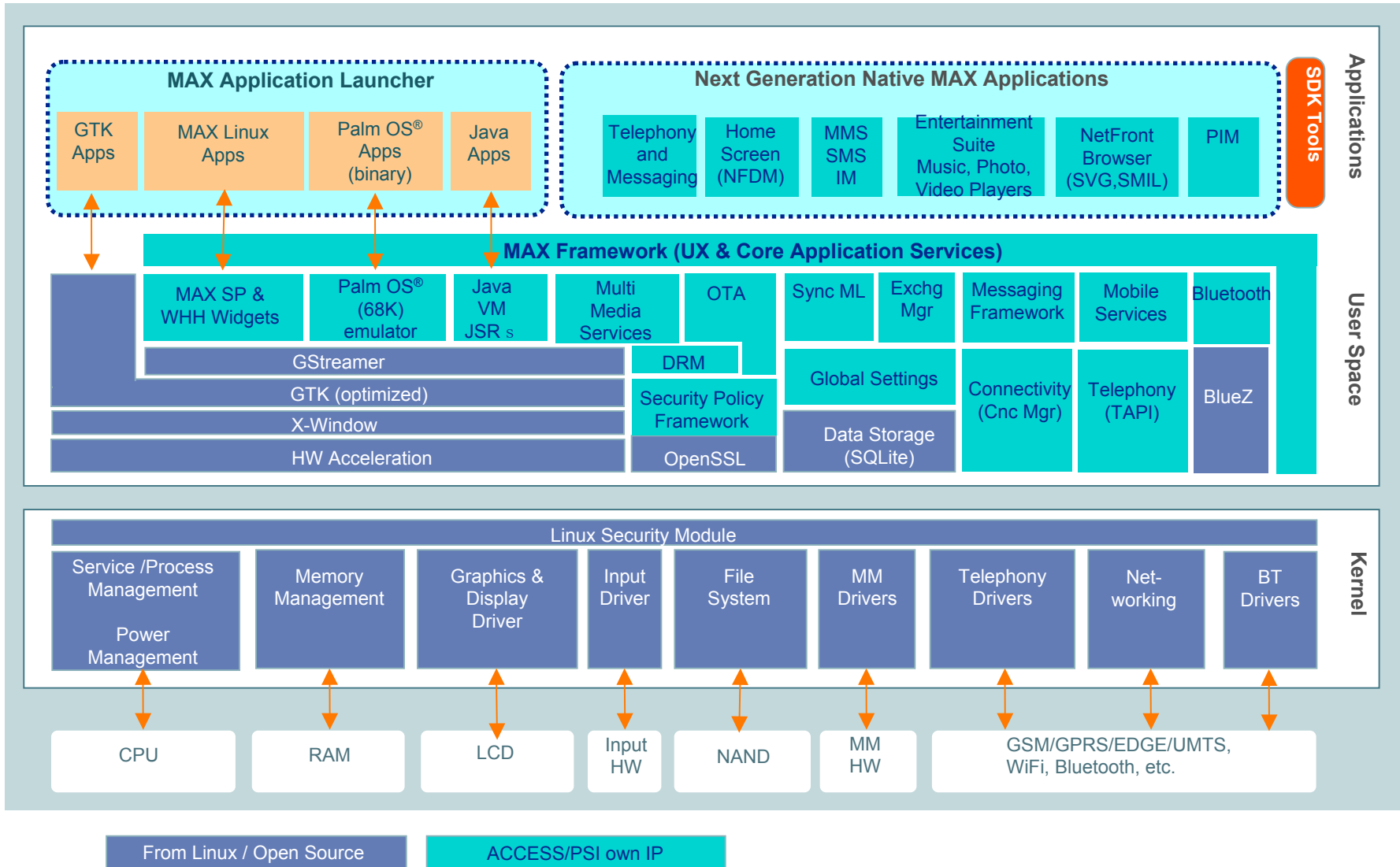


ACCESS Linux Platform = Mobile Linux

ACCESS Linux Platform (ALP)

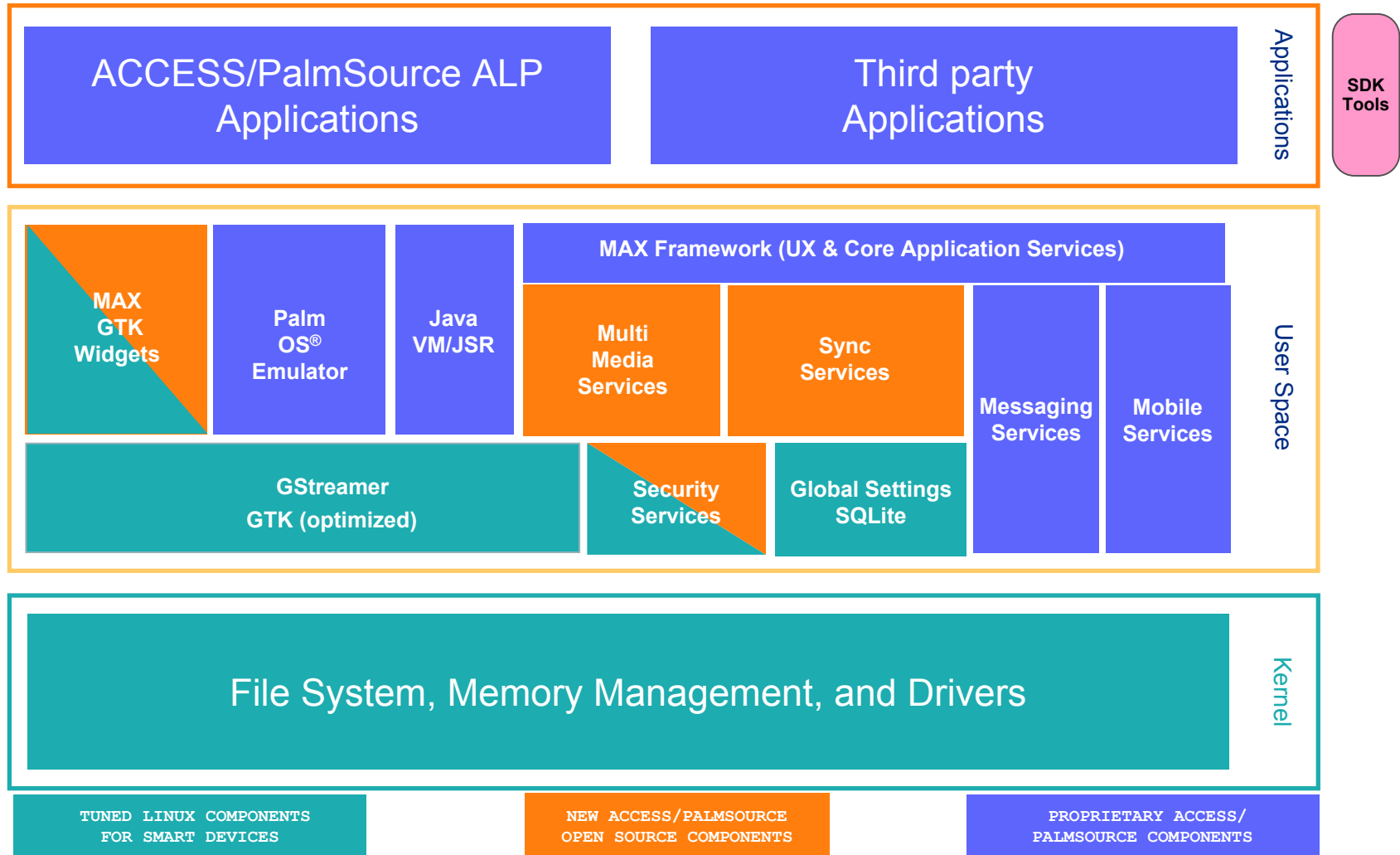
ACCESS

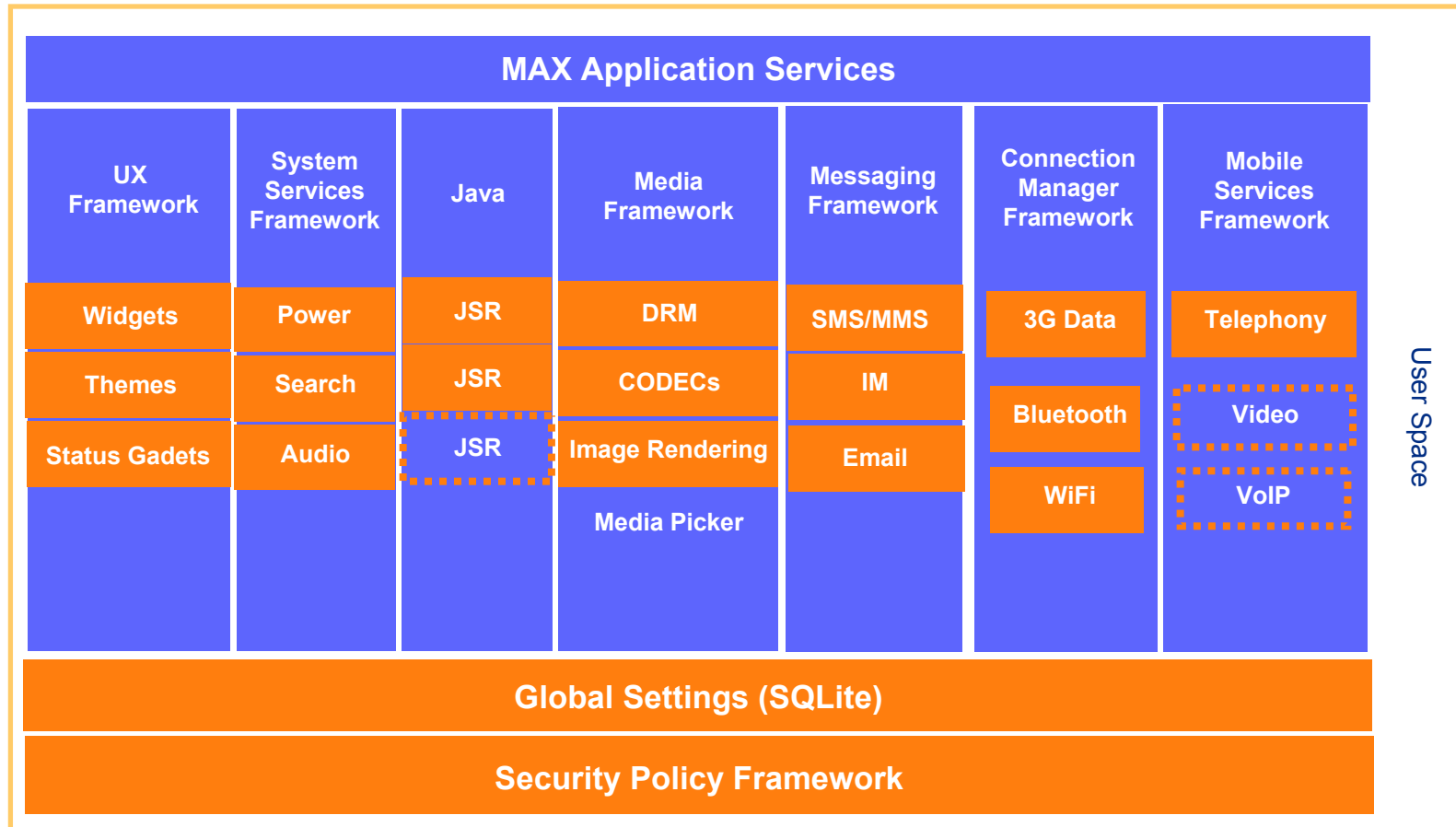
palmsource[™]
An ACCESS Company



ACCESS Linux Platform (ALP)

ACCESS



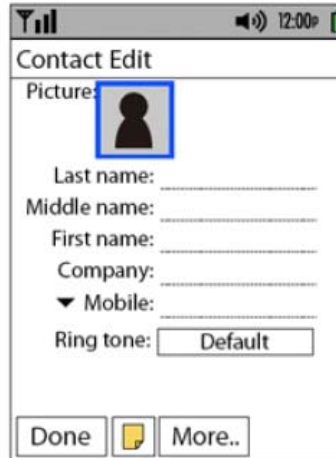


Example: Solving Theming

Mobile market has strong requirements for UI theming

- Carrier customization
- User personalization
- Handset vendor customization

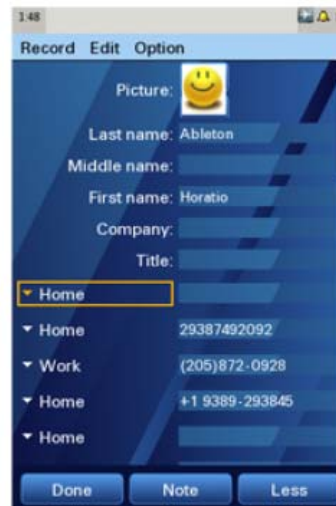
GTK+ theming provides basis for ALP solution, then PalmSource is doing extensions and providing toolchain (e.g. Glade)



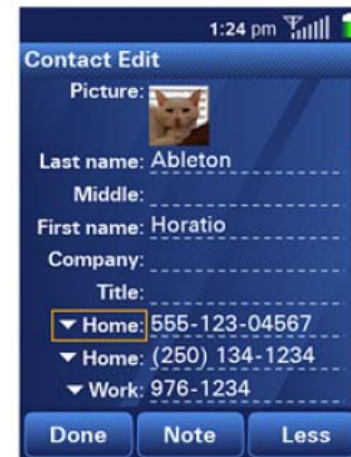
1) Wireframe



2) GTK Un-themed



3) GTK Themed

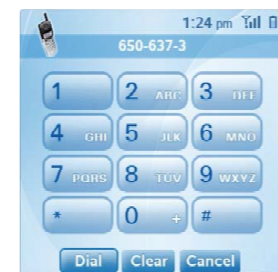
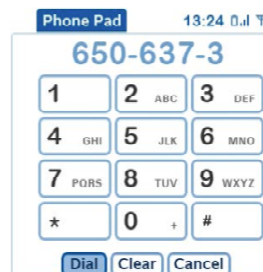
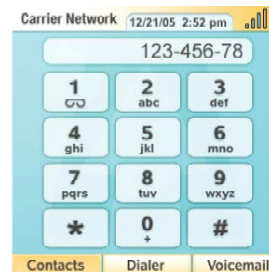
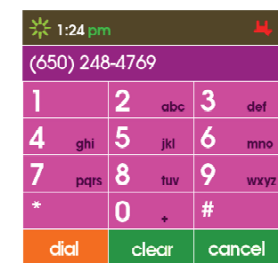
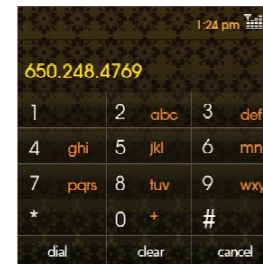
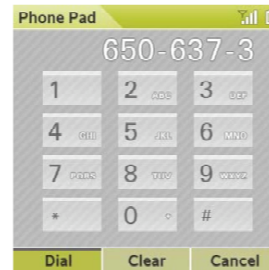
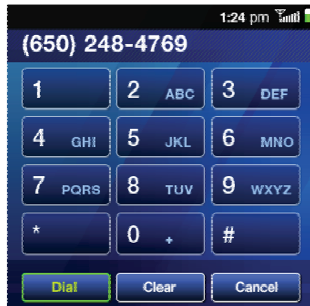
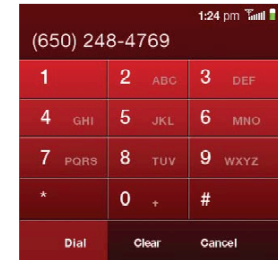
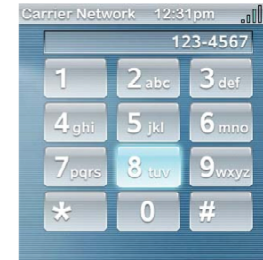
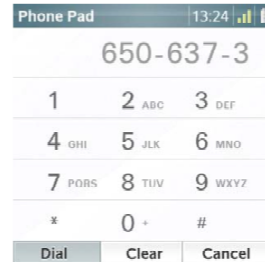


4) ALP Themed

Themes

ACCESS

palmsource
An ACCESS Company



Example: Solving Device Configuration and Management

- Mobile industry has specifications for device configuration and management
 - Open Mobile Alliance-Device Management (OMA-DM)
- Need a secure, compliant registry to store and manage settings
- Solution: libsqlfs, an LGPL library on top of SQLite
 - Implements POSIX file system semantics on an SQL database
 - Fast, flexible solution. Solves mobile market security requirements but probably will have other uses as well



Ecosystem and Developer Opportunities

Three Application Environments

ALP



Solid environment for new
application investment

Palm OS[®]



25K+ Palm OS applications

Java

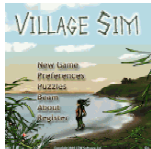
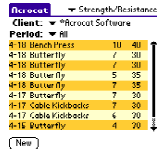
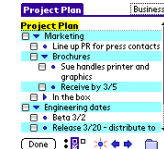
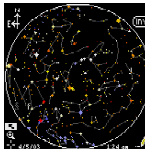
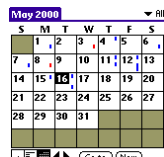
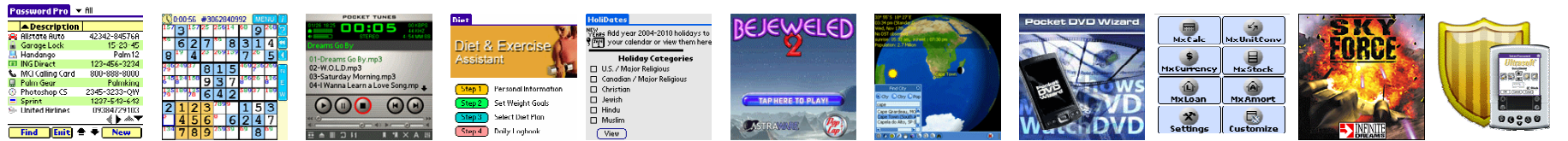


Hundreds of mobile phone
Java applications

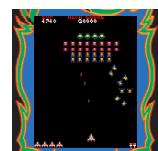
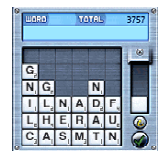
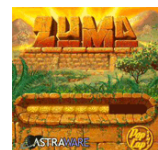
Palm OS Compatible Development

ACCESS

palmsource
An ACCESS Company

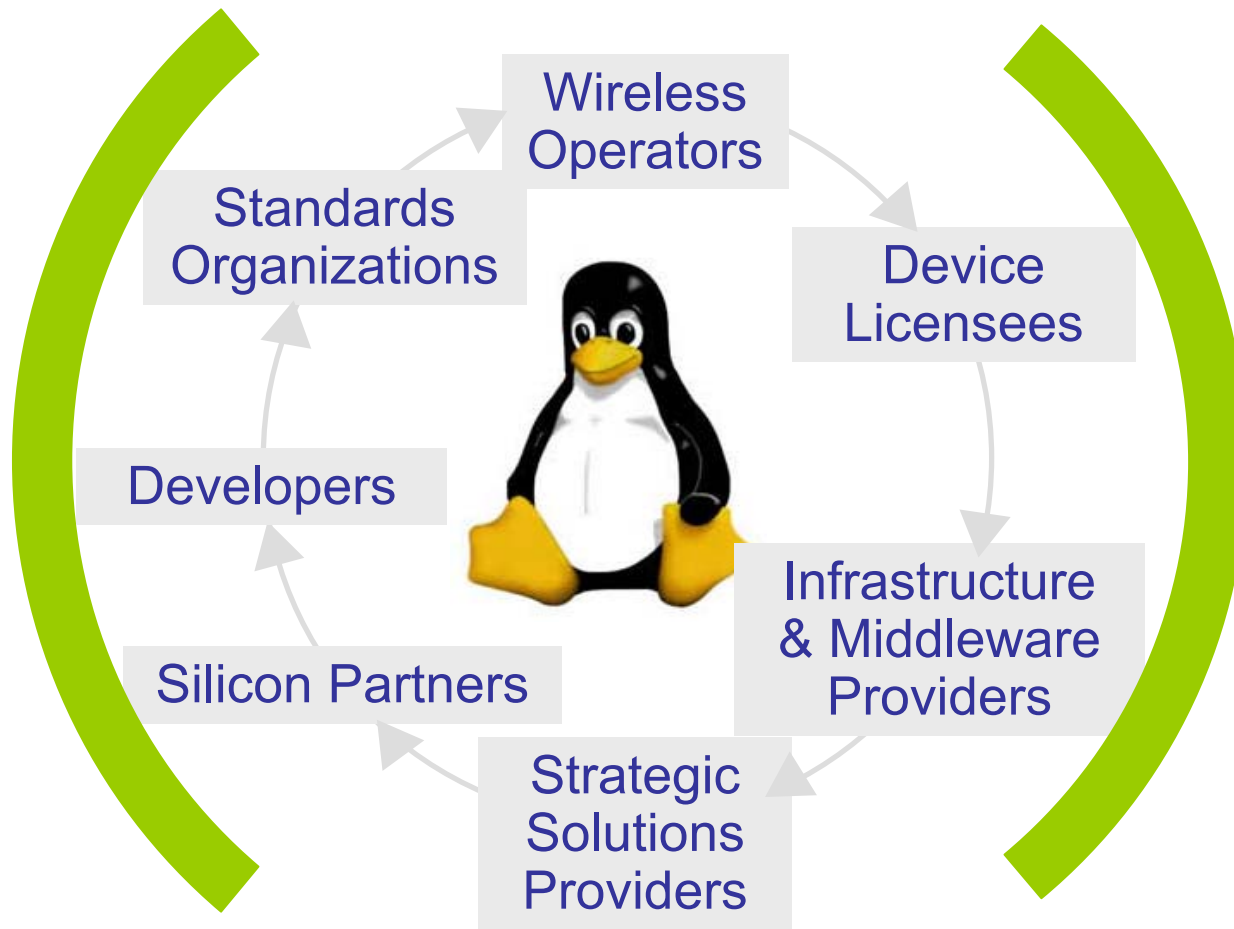


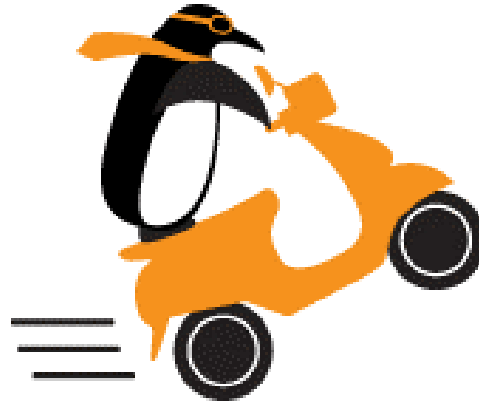
- Palm OS® Garnet module extends ALP application compatibility to existing Palm OS applications.
 - Provides compatibility to thousands of existing Palm OS applications including popular business efficiency tools, games, travel guides, references, and utilities.
- Integrated into ALP device and desktop technology
 - Consistent application install experience
 - Integrated Launcher for application selection and execution
 - Leverages ALP system functions for consistent user experience within Palm OS and native ALP applications.



ALP Linux	Ubuntu 5.10 Eclipse with gcc, gdb Glade UI Builder EABI-compliant tool chain Scratchbox Pre-Linker Valgrind memory debugger, profiler
Palm OS	Metroworks CodeWarrior Palm OS Developer Suite
Java	Eclipse NetBeans

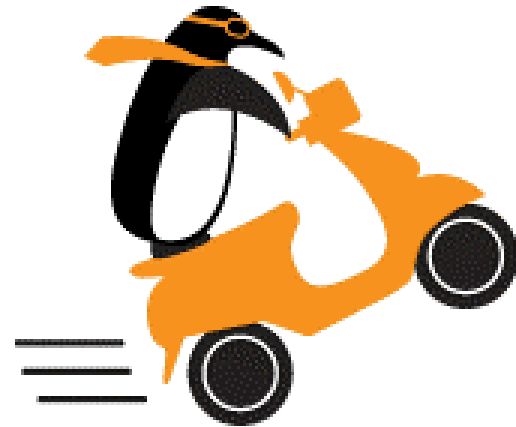
A Mobile Linux Ecosystem





What Next?

- Mobile Linux will be very big
- Linux has a unique opportunity to become the leading, end-user visible solution for smart mobile devices
- Titanium Legos are cool
- You can help:
 - Collaborate with open source projects for mobile
 - Develop mobile Linux applications of your own



○ PalmSource/ACCESS:

- Join the ACCESS developer network: www.palmsource.com/developers
- Visit our website(www.palmsource.com) to stay updated on what is happening with ALP
- Also, we're hiring!

○ Check out OSDL Mobile Linux Initiative

- www.osdl.org/lab_activities/mobile_linux

○ Check out LiPS Linux Phone Standards Forum

- www.lipsforum.org

ACCESS



Thank You

Sign-up for the ACCESS Developer Network
www.palmsource.com/developers

The content, including without limitation, descriptions of third party products, features, functions, specifications, release dates and programs and feature products is supplied "AS-IS" AND WITH NO EXPRESS OR IMPLIED WARRANTIES whatsoever made by ACCESS Co., Ltd. PalmSource, Inc. or its third party suppliers or licensees. Product features, functions, specifications, programs and the development thereof may be modified, deleted or discontinued and any release date may be modified or cancelled, at any time and without prior notice, in ACCESS Co., Ltd's, PalmSource, Inc.'s or the applicable third party's sole discretion.

ACCESS Linux Platform, ALP, GHost and MAX are all codenames subject to change upon release of the final product without prior notice, in the sole discretion of ACCESS CO., LTD., PalmSource, Inc., or the applicable third party.

ACCESS is a trademark or registered trademark of ACCESS Co., Ltd., in Japan and other countries. Palm OS, PalmSource and its related logo are trademarks or registered trademarks of Palm Trademark Holding Company and are licensed exclusively to PalmSource, Inc.

Linux is a registered trademark of Linus Torvalds

All other brands and trademarks used in this document are or may be trademarks of, and are used to identify other products or services of, their respective owners.