



The State of Mobile Linux

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SDFForum

Mobile
IP SIG

Agenda

- Linux Progress in Mobile/Wireless
- Drivers for Linux Adoption in Mobile
- Paths to Deployment
- OSDL Mobile Linux Initiative
- Conclusion



Mobile Handset Market – Tremendous Growth

- 2.6 billion phones expected to be in use worldwide by 2009 (Gartner)
- SmartPhone market growing at a rate of 85 percent annually (IDC)
- Linux gaining ground in SmartPhones - growing 400% year over year



Three Dozen Linux Phone Models Shipping in 2004-2005 – More to Come in 2006-2007



Datang



e28



e28



Haier



NEC



Panasonic



Motorola



Motorola



Motorola



Motorola



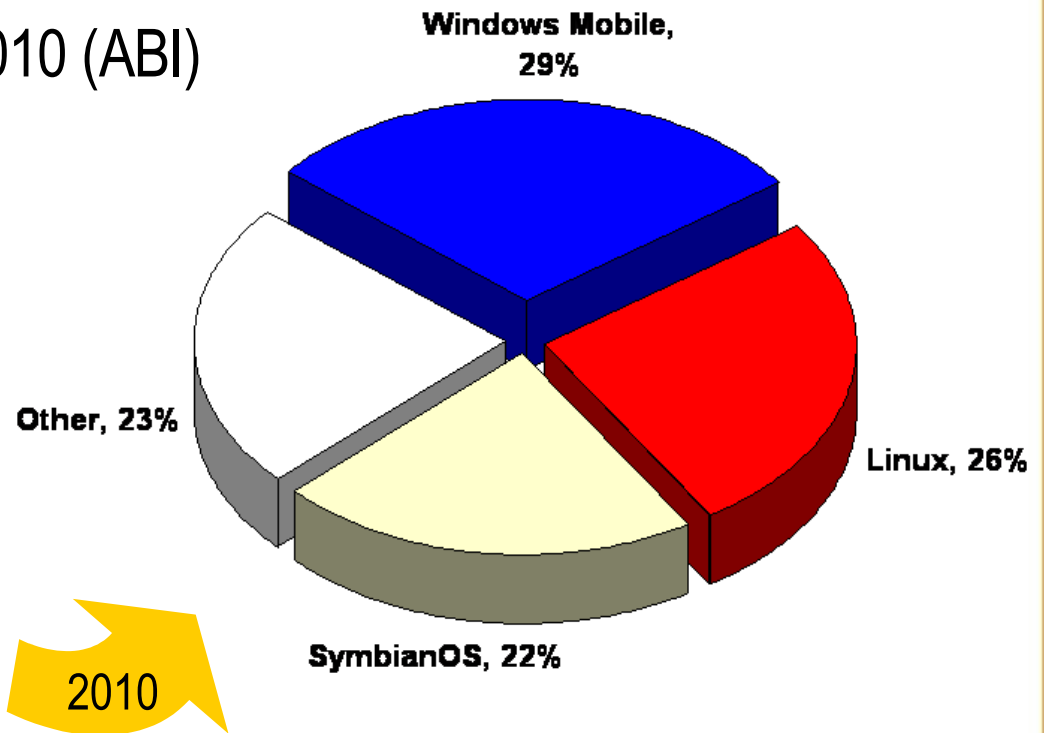
Samsung



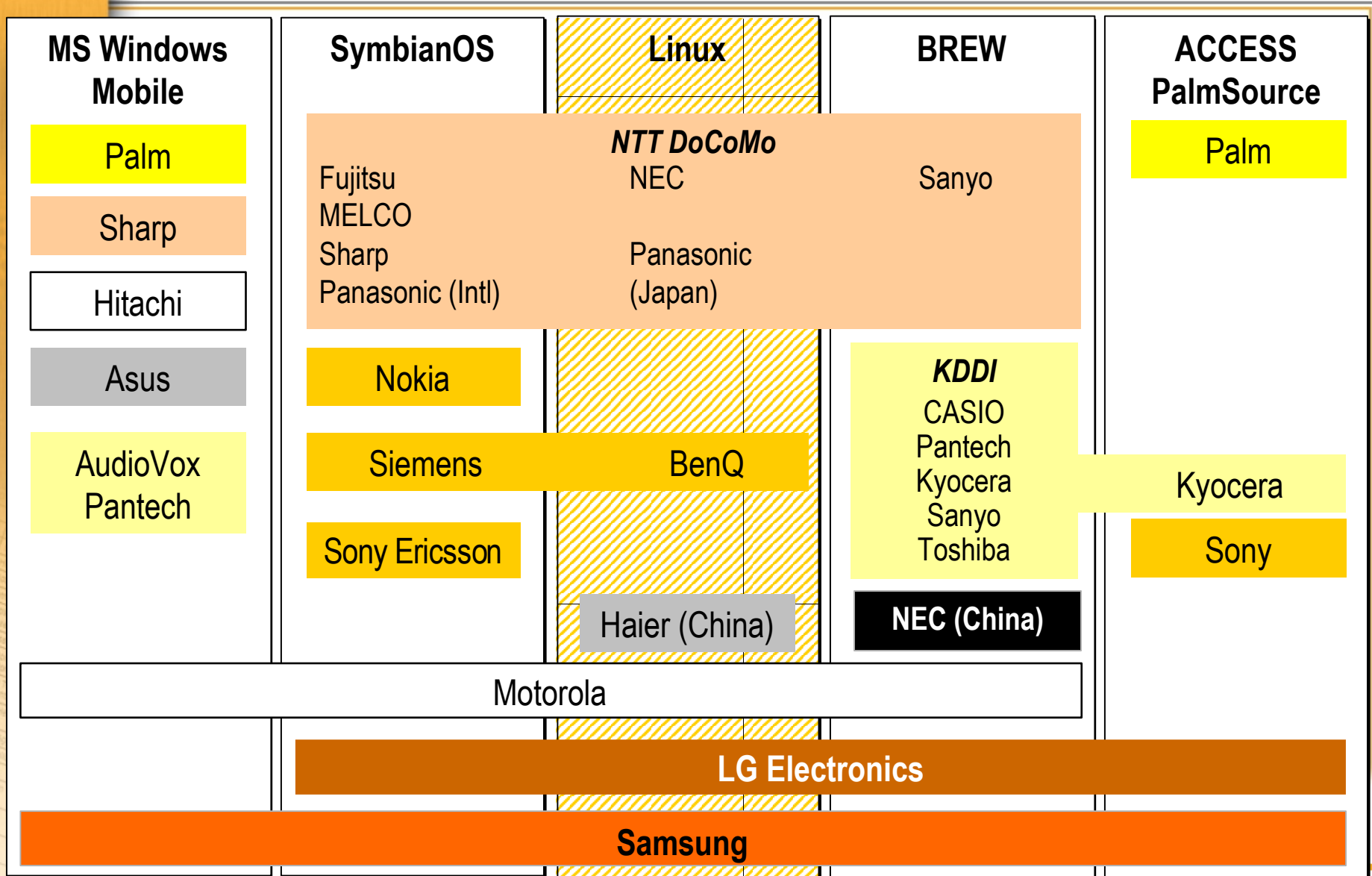
Samsung

Trends

- Smart Phone segment grew 70% in 2005 (InStat)
- 25% WiFi-enabled by 2010 (ABI)
- WindowsMobile to lead all segments by 2010 (Strategy Analytics)

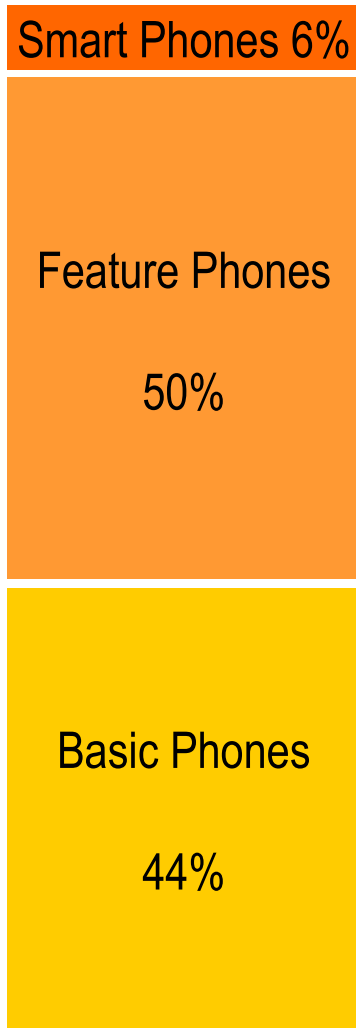


Mobile OS & Platform Map



Phone Market Tiers and Trends: 2005-2010

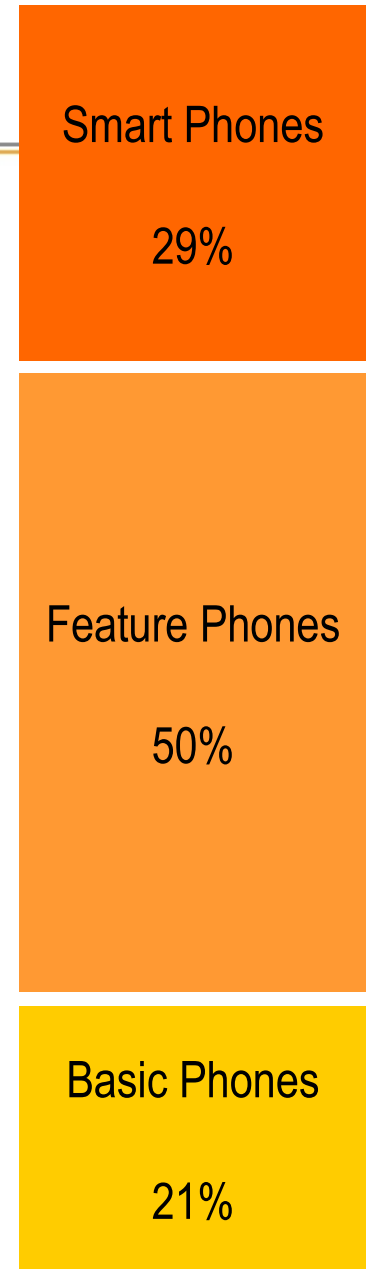
↑ million handsets 700 ↓



2005



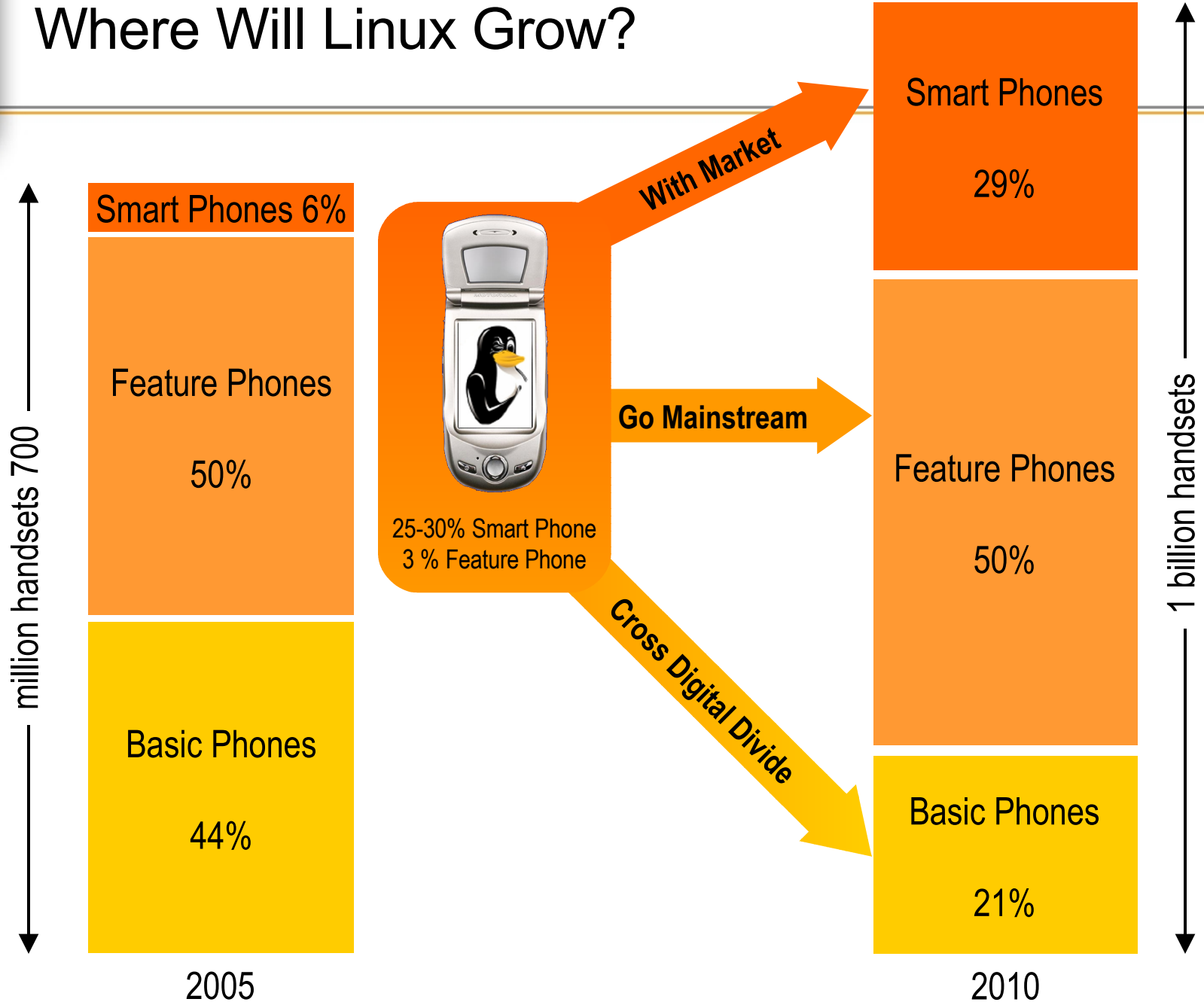
Source – Strategy Analytics



2010

↑ 1 billion handsets ↓

Where Will Linux Grow?



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Technical Drivers for Mobile Linux Adoption

- Unified “Strategic” Product Platform
 - OEMs can have 3-6 legacy OSes, stacks, tool sets
 - Platform diverges across products, networks, regions
 - Need to unify training, support, expertise/headcount
 - Base platform design developed by CTO office
- Surging Software Content
 - Handset LoC doubling every year
 - Need OS / platform capable of hosting large/complex loads
- Flexibility throughout the stack
 - Multiple options for Linux platform, CPU support
 - Choice in graphics, middleware
 - Freedom to mix legacy apps, commercial and free software



Non-technical Drivers for Mobile Linux Adoption

- Reduced deployment costs and vendor lock-in
 - Royalty-free base platform
 - Multiple sources for m/w and applications
 - Help improve margins / lower MSRP in non-subscription markets
- Room to differentiate
 - Linux brand equity is “friendlier” than Microsoft
 - Allows Tier I OEMs to brand, skin, “own” platform
- Lowers Barriers to Entry into Marketplace
 - Using SymbianOS incurs high design / licensing costs
- Ecosystem Development around Phone “Platforms”
 - Carriers, Operators, ISVs can add services/applications to standards-based handsets



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How Are Linux Phones Built Today?

OEM Apps Skins Operator Apps ISVware eCommerce Enterprise

Deployment Value-Added

Dialer PIM Media Player IM/SMS/MMS Games Utils Config

In-house Base Applications

Browsing Engine Desktop Mail Engine Messaging

DRM Database Sync Crypto PM Policy

Java Graphics Multimedia WiFi/Bluetooth Telephony

COTS and In-house Enabling Middleware

File Systems Libraries Kernel Networking Security Utilities

Mobile-optimized (Commercial) Embedded Linux

Device Drivers Device Drivers Device Drivers Board Support

DRAM Flash SD Baseband DSP ARM CPU

Mobile H/W Platform (MX, OMAP, XScale, etc)



How Are Linux Phones Built Today? (uncovered)

- OEM Apps
- Skins
- Operator Apps
- ISVware
- eCommerce
- Enterprise

Deployment Value-Added

- Dialer
- PIM
- Media Player
- IM/SMS/MMS
- Games
- Utils
- Config

In-house Base Applications

- Browsing Engine
- Desktop
- Mail Engine
- Messaging
- DRM
- Database
- Sync
- Crypto
- PM Policy
- Java
- Graphics
- Multimedia
- WiFi/Bluetooth
- Telephony

COTS and In-house Enabling Middleware

- File Systems
- Libraries
- Kernel
- Networking
- Security
- Utilities

Mobile-optimized (Commercial) Embedded Linux

- Device Drivers
- Device Drivers
- Device Drivers
- Board Support

- DRAM
- Flash
- SD
- Baseband
- DSP
- ARM CPU

Mobile H/W Platform (MX, OMAP, XScale, etc)



Getting the Stack “Just Right”

Which stack do you want?

Who am I?



Linux Platform / Stack Continuum

Stack Description	How Complete	OEM/ODM Value-Add	Challenges
Finished product, off-the-shelf	90-100%	Brand, Manufacturing	Minimal differentiation
Shrink-wrapped "solution" stack	80%	Look & Feel, Management Interface	Branding offset by identical functionality; components commoditized
OS platform, development tools and middleware	60%	Application Stack, Management I/F	Device OEM invests to add value / differentiate
Hardware and OS platform support	40%	Application Stack, Management I/F, M/W and Drivers	Maximum opportunity to add value – significant engineering required
Bare hardware and ROM monitor only	10%	Whole stack, including OS, M/W and Applications	Large development and code management



Getting the Stack “Just Right”

OEM Apps

Skins

Operator Apps

ISVware

eCommerce

Enterprise

Deployment Value-Added

Dialer

PIM

Media Player

IM/SMS/MMS

Games

Utils

Config

Base Applications

Browsing Engine

Desktop

Mail Engine

Messaging

DRM

Database

Sync

Crypto

PM Policy

Java

Graphics

Multimedia

WiFi/Bluetooth

Telephony

Enabling Middleware

File Systems

Libraries

Kernel

Networking

Security

Utilities

Mobile-optimized Embedded Linux

Device Drivers

Device Drivers

Device Drivers

Board Support

DRAM

Flash

SD

Baseband

DSP

ARM CPU

Mobile H/W Platform (e.g., OMAP)

“Complete” Stack

“Solution” Stack

Short Stack

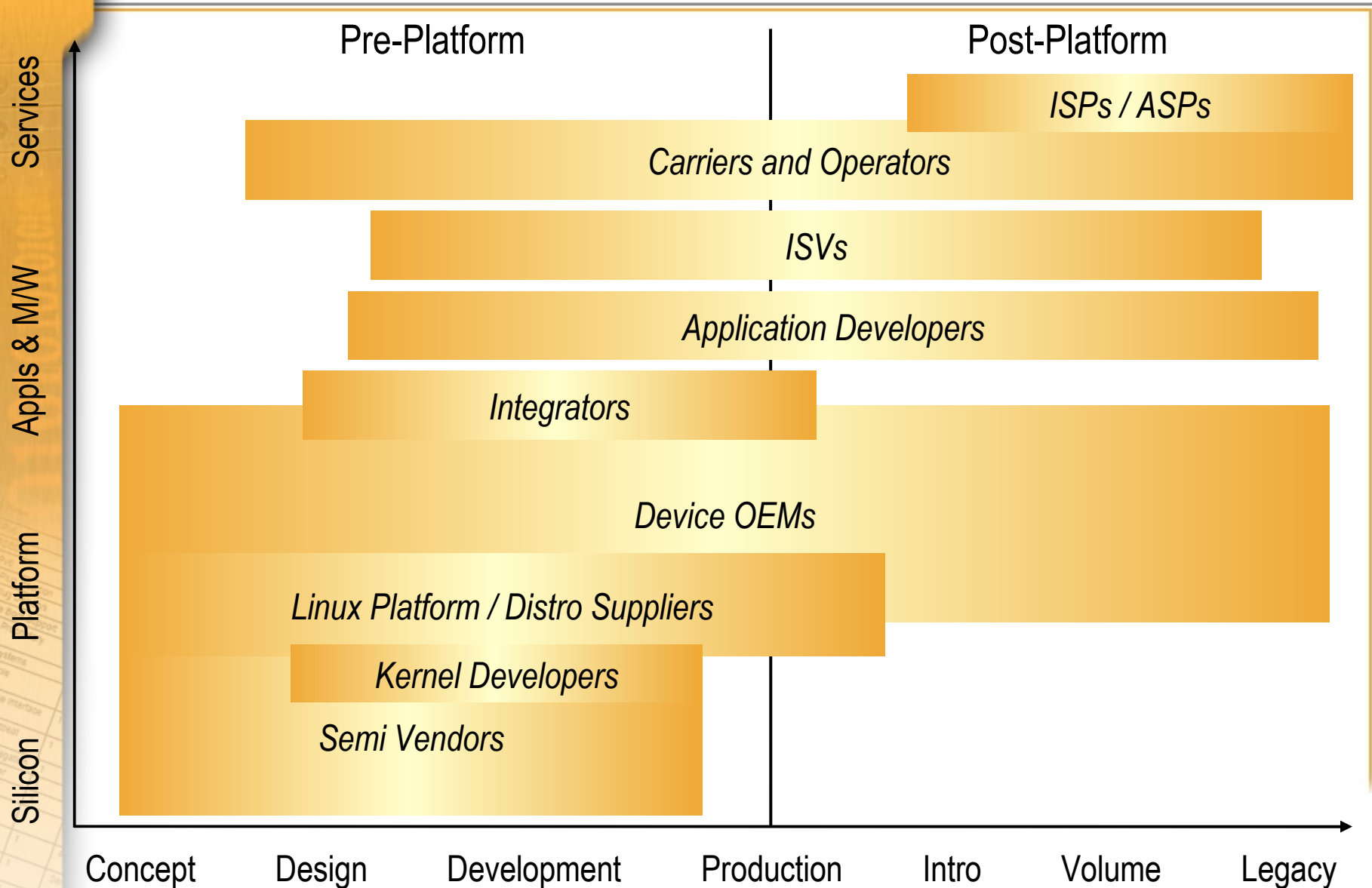


Who Delivers Which Stacks Today/Soon?

Stack Description	Category	Suppliers
Finished product, off-the-shelf	Complete	Motorola, NEC, Panasonic, Samsung Bird, Haier, e28
Shrink-wrapped "solution" stack	Solution	PalmSource, Mizi, a la Mobile
OS platform, development tools and middleware	Short	MontaVista, Wind River, FSMLabs Mizi, Trolltech
Hardware and OS platform support	Shorter	FreeScale, Intel/Marvell, TI, et al.
Bare hardware and ROM monitor only	Shortest	Other semiconductor vendors



Pre- and Post-Platform Ecosystems



Many Approaches, Same Goal?

COTS Base + Proprietary Value-add	Handset Manufacturers	Motorola, NEC, Panasonic, Samsung
Commercial Base + Ecosystem Offering	OSVs	MontaVista <i>Mobilinux</i> , Wind River
COTS Stack	OSVs/ISVs	PalmSource, a la Mobile
Top-down Reference Implementation	X Foundation	Motorola, NEC, NTT, Panasonic, Samsung, TI, Vodaphone
Specifying Standard Platform(s)	Consortia	OSDL, LiPS, CELF
Open Source Projects	Phone stack components	Gnome Mobile, (GTK+, gstreamer), YAFFS, OpenEZX, others



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OSDL Mobile Linux Initiative - Mission

Accelerate Linux adoption in the mobile space:

- Identify and address technical and non-technical industry requirements
- Create and foster implementations in open source
- Advocate/explain industry needs to the kernel/open source community
- Promote mobile Linux (including education of Carriers about benefits of open source)
- Clarify legal and regulatory issues surrounding mobile phones as they relates to Linux and open source
- Enable and foster pre-platform developer ecosystem*

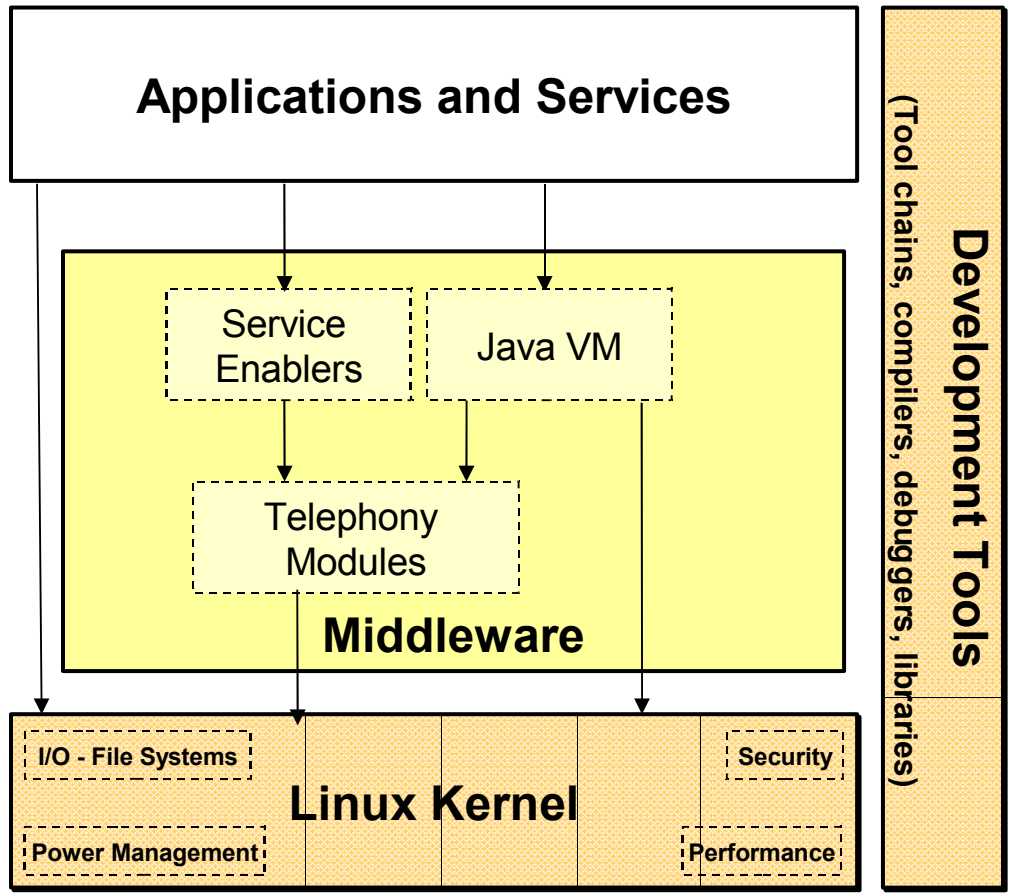


*Creating/enhancing Linux; enabling aftermarket development & ISVs deferred for 2006

MLI Workgroup Membership – October 2006



Architecture and MLI Focus for 2006



MLI 2006 Technical Priorities:

- Power Management
- File Systems
- Performance
- Security
- Development Tools

 **MLI Focus area for 2006**



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Linux for Mobile – A SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none">▪ Flexible, technically robust phone platform<ul style="list-style-type: none">– Security, networking, performance▪ Open Source, lower BOM impact▪ Multi-vendor, multi-source▪ Leverages large ecosystem of embedded, enterprise and vertical apps and m/w▪ End-to-end OS<ul style="list-style-type: none">– Synergy with carrier infrastructure	<ul style="list-style-type: none">▪ No standard platform for ISVs, Carriers<ul style="list-style-type: none">– Bottom-up piecemeal approach▪ Only viable for smart phones & top feature phones (needs robust BOM)▪ Time-to-market<ul style="list-style-type: none">– Perceived difficulties in development, integration– Required technical expertise leaves out Tier II and ODMs
Opportunities	Threats
<ul style="list-style-type: none">▪ Strong option for OEM value-added▪ Partnership between community, industry▪ Low financial barriers to entry▪ Compete with Java with native run-time▪ Key platform for 4G rollout▪ Platform for new VoIP/WiFi telephony	<ul style="list-style-type: none">▪ Current organic growth may stall▪ Short-term competition from Symbian, legacy RTOS▪ Short- and long-term competition from MS▪ Perceived “fragmentation” limits ecosystem



Conclusion - Open (Ended) Questions

- How open should phones become?
 - Support (commercial) applications and services
 - Allow in-channel customization?
 - Permit end-user modification?
- Does the industry care about “single core” phones?
- How will ubiquitous WiFi and VoIP change the mobile marketplace?
 - Impact on carriers and operators
 - De-regulation of existing markets

