

Wireless 3G Applications - Primordial Chaos

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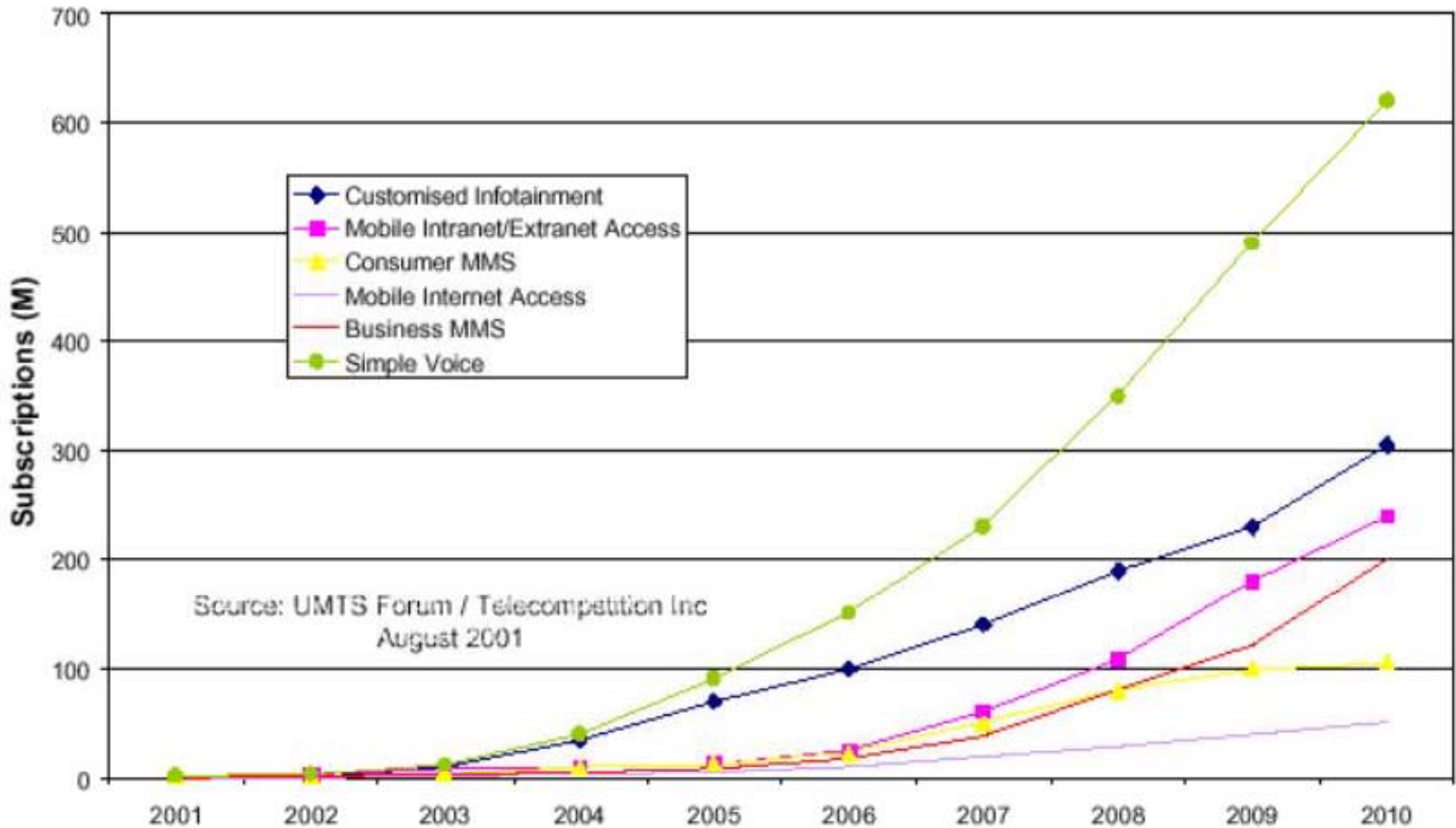
Outline

- The wireless market
- Evolution of Wireless Data Infrastructure
- Basic Wireless challenges
- Wireless Application Chaos
- Evolution of Wireless Services
- Wireless Development Chaos
- Wireless Provisioning & Billing Chaos
- Next Generation System Requirements
- ActiveSky Solution
- Conclusions

The Wireless Data Market

- Verizon is averaging 2 Million BREW application downloads/month.
 - 30M handsets but only a small % BREW capable

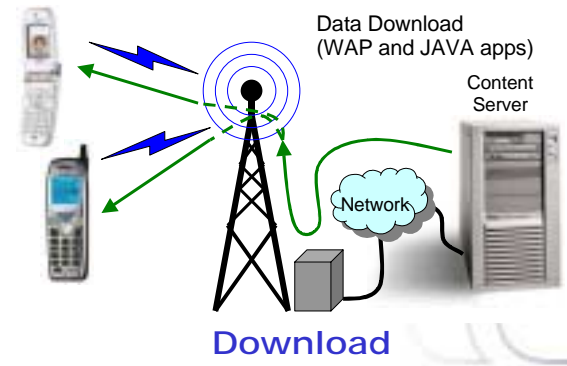
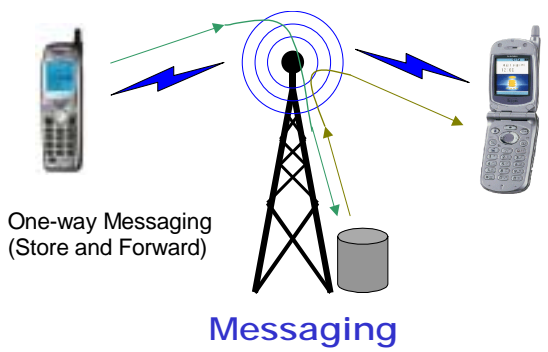
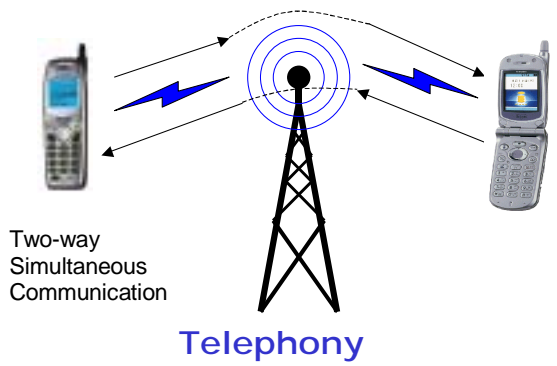
Worldwide Subscriptions - Selected Services



Evolution of Wireless Infrastructure



Service		Telephony	Messaging	Download	Online / Streaming
Mode	Year	2 Way	Push	Pull	Duplex
1G	1980s	Voice	-	-	
2G	1990s	Voice	SMS	WAP	Proprietary
2½ & 3G	2000s	Voice	SMS / MMS	xHTML / JAR	Proprietary
4G	2010s	Video??	MMS	Flash / Video	3GPP/4GPP



Wireless Handset Challenges

- Application and content download latency
 - Slow networks - data segmentation – not full page
 - 100kB @ 25kbps = 32 seconds
- Download memory limitations 30k or 60k
 - Distributed memory management
- Limited Device Capabilities
 - Automated media transcoding
- QoS Management and adaptation
 - Network bandwidth and adaptation
- Application / Content Portability
 - lightweight virtual machines
 - Standard formats – 3GPP
- Publishing / Distribution / Provisioning
 - WAP?

Wireless Data Services

<p>Data Pull – WAP / xHTML</p> <ul style="list-style-type: none"> User downloads one page at a time Limited UI - Bland content Very Limited Functionality Slow and expensive for users Portable to most handsets 	<p>Download Games (C/C++/JAVA)</p> <ul style="list-style-type: none"> Limited memory - 64k RAM Slow display updates Mostly static - limited lifetime Costly development Redevelop for each handset
<p>Messaging (SMS, MMS)</p> <ul style="list-style-type: none"> Limited scope on its own Notification for other services 	<p>Streaming Media</p> <ul style="list-style-type: none"> Not generally feasible 1-2 max users per cell on 2 ½G Only on niche market devices V.High packet charges \$5-\$10 /min

	WAP	Games	Streaming	Messaging	Flash
Dynamic	Limited	x	x	✓	x
Interactive	✓	✓	x	Limited	✓
Media support	Text	Limited	Video	Limited	Limited
All Handsets	✓	x	None	✓	None

active sky Evolution of Online Wireless Services

Text Page Download



WAP 1.0

- Text Only
- Very Slow
- Poor Layout

“DOS”



xHTML

- Hyper-Linked Text
- Limited Formatting
- Limited UI Function

“DOT COM”



J2ME / BREW / ActiveSky

- Rich graphics, text, video, audio
- Animated / Interactive / Dynamic
- Download Games, streaming

“CABLE TELEVISION”

activesky Wireless Application Development Chaos

- **Divergent Mobile Operating Systems**
 - J2ME / BREW / SYMBIAN / WinCE / PalmOS?
 - Develop in Java / C / C++ ?
- **Divergent Wireless Networks**
 - GSM, GPRS, CDMAOne, 1xRTT, CDMA2000 ?
 - 2G (9.6kbps), 2½ G (25kbps), 3G (50kbps),
- **Divergent Handsets**
 - What Capabilities, form factors, APIs?
 - From 1 MIP to 400 MIP CPUs
 - Redevelop application for each handset.
- **Divergent Provisioning Systems**
 - What application management (download only, online, streaming)?
 - Billing support (pay per view, pay per download, subscription) ?

Fragmented Wireless Market

- Limited application portability
- Limited application distribution

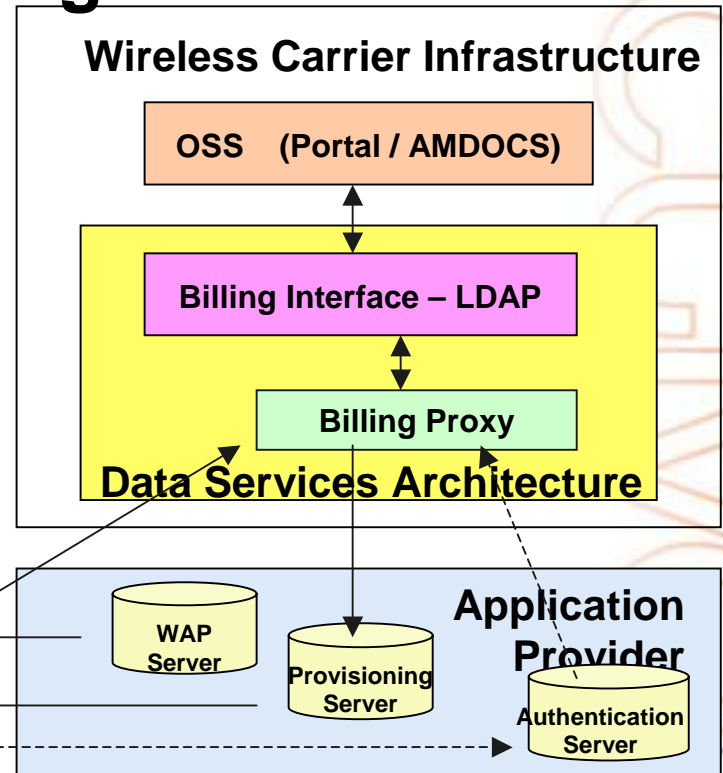
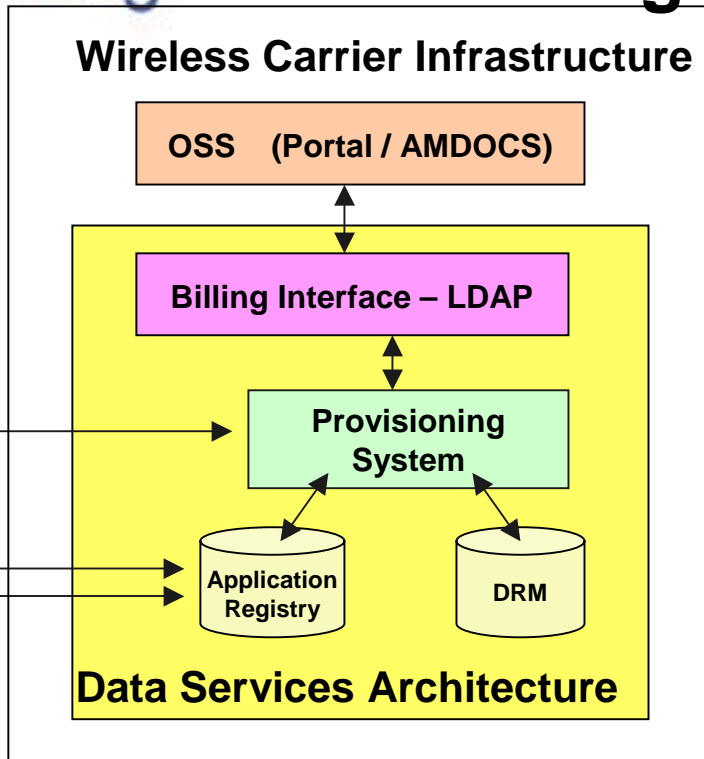
- Binary Runtime Environment for Wireless
- Only available to CDMA carriers
 - Americas and Asia
- C/C++ language based development
- Digitally signed applications
 - Secure and clear path to revenue
- Certification - true BREW testing
 - Expensive but ensures customer satisfaction
- End-to-end solution
 - BREW Shop (on handset)
 - ADS (application download system)
 - Provisioning system and rights management
 - BDS (BREW Distribution System)
 - Billing and payment, billing system integration service,

Mobile Java / J2ME

- Used mainly by GSM / GRPS carriers
- 30k or 64k application size limitation
- Many different versions exist
 - Standard J2ME / MIDP
 - J-PHONE JSCL
 - i-mode DoJa
 - Vodaphone VSCL
 - iAppli / kjava
 - KDDI ezplus
 - Sprint PCS extensions
- WRITE ONCE AND DEBUG EVERYWHERE
- No standard provisioning methods or billing infrastructure
 - Path to revenue patchy
- Immature standard - lots of non standard options
 - Waiting for JSR 185
 - No device integration in MIDP 1.0

- **Symbian**
 - C/C++ based development
 - Object oriented operating system
 - Mainly for niche market handsets
- **Microsoft**
 - PocketPC Phone Edition / Windows SmartPhone
 - C/C++ based development
 - PDAs or Niche Market Phones

Provisioning / Billing Chaos



Front End Authentication

Access control performed at handset
 Requires software on handset
 BREW ADS. SPRINT (WAM), 4th Pass

Back End Authentication

Access control performed at server
 Handset must provide SubID
 Server must validate ID to carrier

Pre-Paid

Authenticated before access granted
 Access to billing data Required

Post-Paid

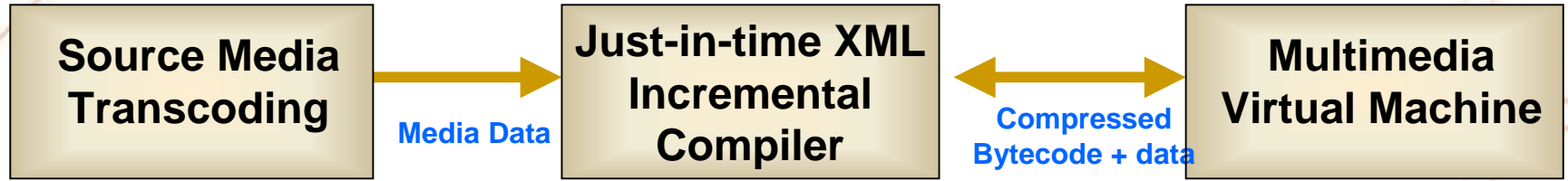
Authenticated after access granted
 Bad debt problem exists
 Users must be registered

activesky Next Generation System Requirements

1. Device Abstraction – Write once run anywhere
 - True application portability across all handsets.
2. Media Object based, not Page based
 - Only update individual screen objects as needed – cheaper/faster
 - Create/remove new display objects during run-time
3. Unconstrained User Interfaces
 - Multimedia “Brand True” applications
4. Capability based Adaptation
 - Network and Device adaptation
5. XML based Development
 - Compatible with standards
6. Real-Time Personalization
 - Eg Location based applications.
7. Distributed Resource Management
 - Overcome handset limitations
8. Event based push, pull or time based delivery
 - Avoid costly polling
9. Uniform billing/authentication/provisioning Infrastructure
 - .



ActiveSky Solution



Text & Forms
(Forms, WAP, xHTML)

Images
(JPEG, PNG, GIF)

Video
(MPEG4, H263, etc)

Animation
(AVI, Flash)

Graphics
(SVG)

Audio / MIDI
(MIDI, WAV, ADPCM)

**ActiveSky
Presentation
Server**

- GSM
- CDMA
- HSCSD
- GPRS
- EDGE
- UMTS
- CDMA 1X
- W-CDMA

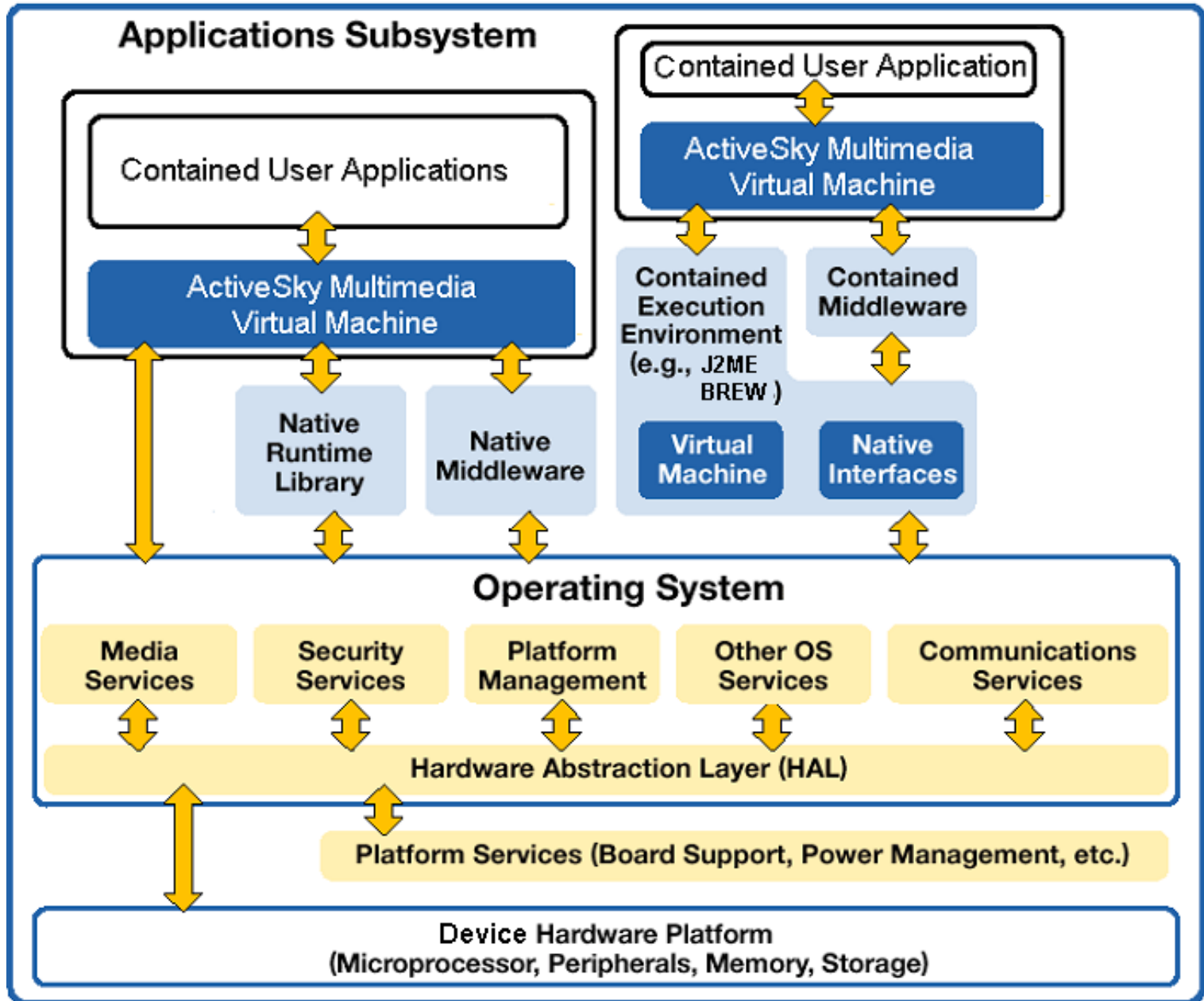


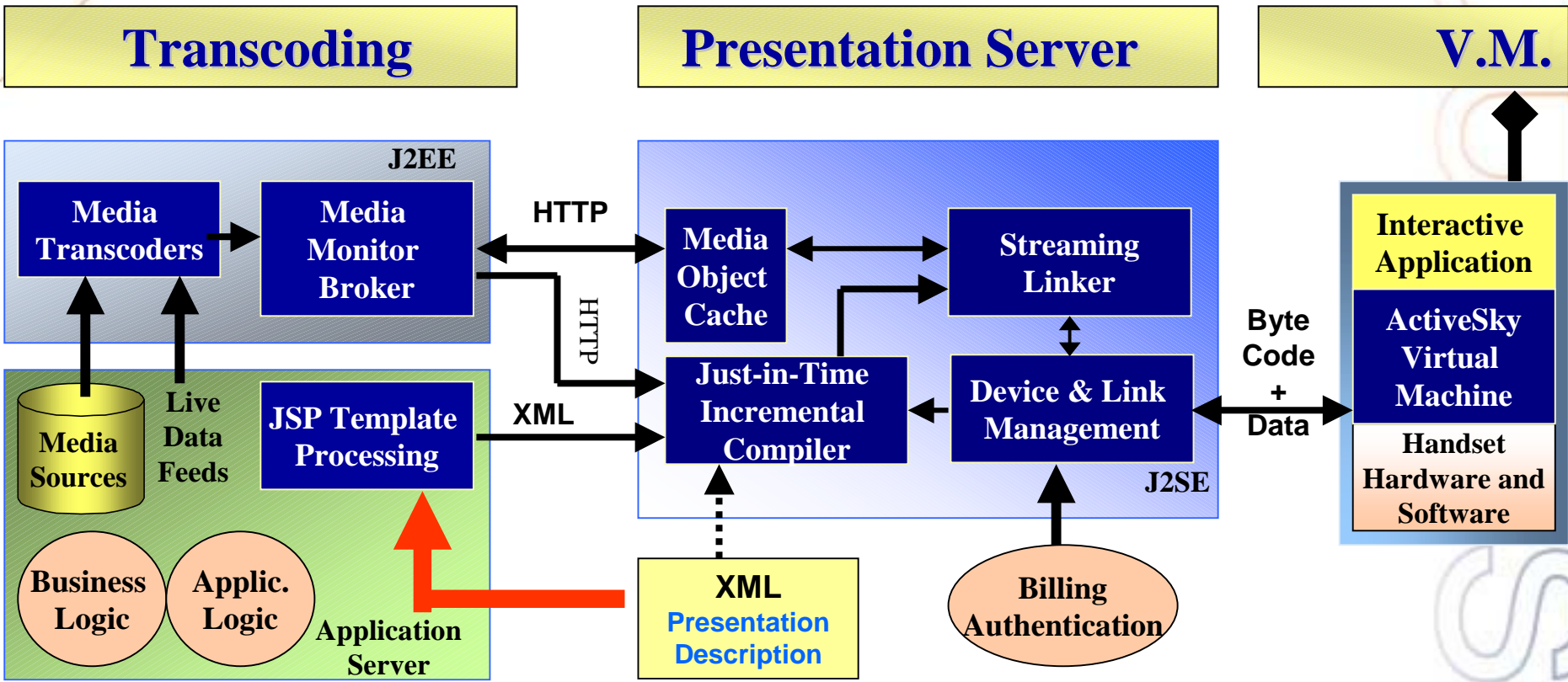
SMIL 2.X
(Scene Description)

**Any Media /
Data Format**

Run on any Handset

Client Virtual Machine Architecture





- Intelligent Media Transcoding
- Pushes “live” data to running applications
- Plugs into web Infrastructure
- Supports: Images, xHTML, SVG, MIDI, WAV, video

- JIT Incremental XML Compiler
- Synchronisation & Serialisation
- Push, Pull & Streaming Transport
- QoS & resource management
- Capability based adaptation
- User authentication

- <100 Kb RAM
- 1+ MIPS
- Handset Abstraction
- Lightweight real-time Virtual Machine
- Powerful Multimedia Extension Capabilities

FoxSports Mobile

BEST SPORTS PERIOD
FOX SPORTS
FoxSports Mobile
 NEWS
 SCORES
 SCHEDULES
 TV SCHED.
AUTO **NFL**

FOX SPORTS **GAMETRAX**
 HOME STARS RECAP
 MATTHEWS
 3RD INNING
 STRIKES
 BALLS
 OUTS
 SCORES
 FIELDERS
 P: G ROBERTS B: R MACHADO

1	2	3	4	5	6	7	8	9	R	H	E
NY	1	0	0						1	1	0
BOS	3	0	1						4	5	0

 CHC: G. ROBERTS PITCHING
 CHC: MATTHEWS JR. WAS INTENTIONALLY WALKED

FOX SPORTS **FOX** **SPORTS WORLD**
 BACK TO BASEBALL
 NEWS BROADCAST CHOS CHOICE
 BACK TO DAYTONA SLEEP STAKES
 DOWNLOAD RACING
 STANDINGS
 CAROL PROFILE
 1. D. CARRHARDT JR.
 2. J. GORDON
 3. T. STEWART
 1. J. GARDNER
 2. D. MARTIN
 3. D. JARRET

FOX SPORTS **FOX SPORTS WORLD**
 CPL FANTASY CHALLENGE
 2002 WORLD SERIES
 1. FRANCE
 2. ARGENTINA
 3. BRAZIL
 4. ITALY
 5. JAPAN
 Follow All Of Our Live Action Game Casts

FOX SPORTS **GAMETRAX**
 HOME **LIVE ON FOX**

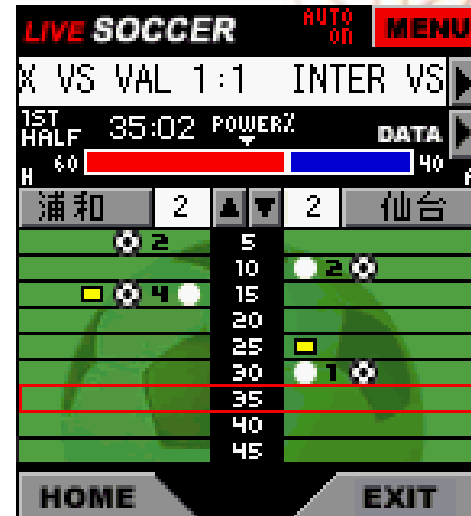
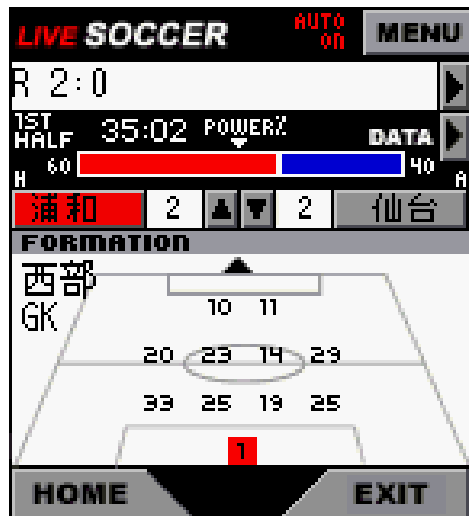
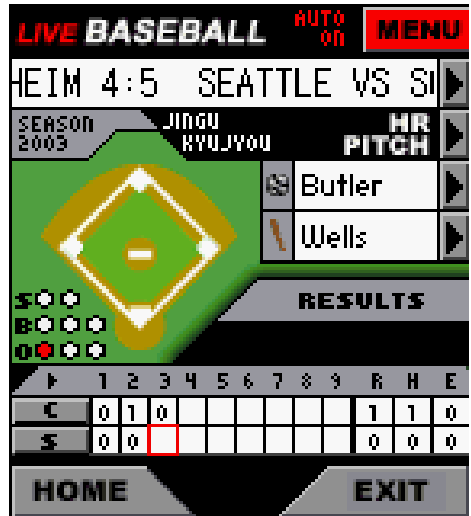
OAK	TIME	DEN	STATS	ZONE
00	10:35	07	MATCH	UPS
DOWN TO GO	BALL	QTR	GAME	
01	10	45	2	TEAM
				PLAYER

 SCOREBOARD 01 02 03 04
 OAKLAND OAK DENVER

FOX **NBA Gamecast**
 LAL @ PHO PHI
 LYC 76
 130 10005 125
 TIMOUTS
 10 FG 10
 12 RFD
 1 FST
 2 STL
 2 FLS
 10:05 LAL Harry with defence rebound

FOX **FOX NFL**
 QUARTERS
 100 10000
 DOWN TO GO BALL QTR
 1 10 45 2
 SUBWAY STATSBURE
 OAKLAND
 100000000
 100000000
 CHC: E. LARBER PASS COMPLETE TO T. BROWN - 5 YARDS

Excite! Sports



Wireless Challenges Resolved

- **Application and Content download latency**
 - Only update individual display objects as needed – not full screen
 - Automatic push of data / content updates – avoid polling
- **Overcome device resource limitations**
 - Distributed memory management and data processing
 - Streaming of application code in chunks to handset as needed
- **Incompatible Device Capabilities and Application / Content Portability**
 - Capability negotiation and Just-In-Time compilation
 - Capability based media/data transcoding and adaptation
 - Lightweight virtual machine
- **QoS Management and adaptation**
 - Scalable media formats & selective transmission
 - Real-time transcoding
- **Publishing / Distribution / Provisioning**
 - XML based development
 - Authentication

Conclusions

- Wireless market presents big opportunities
- There are still big challenges
- Wireless infrastructure is still immature
- Competing and incompatible standards
- Path to revenue is still patchy

- Distributed Application Execution model is a potential solution to many problems.