

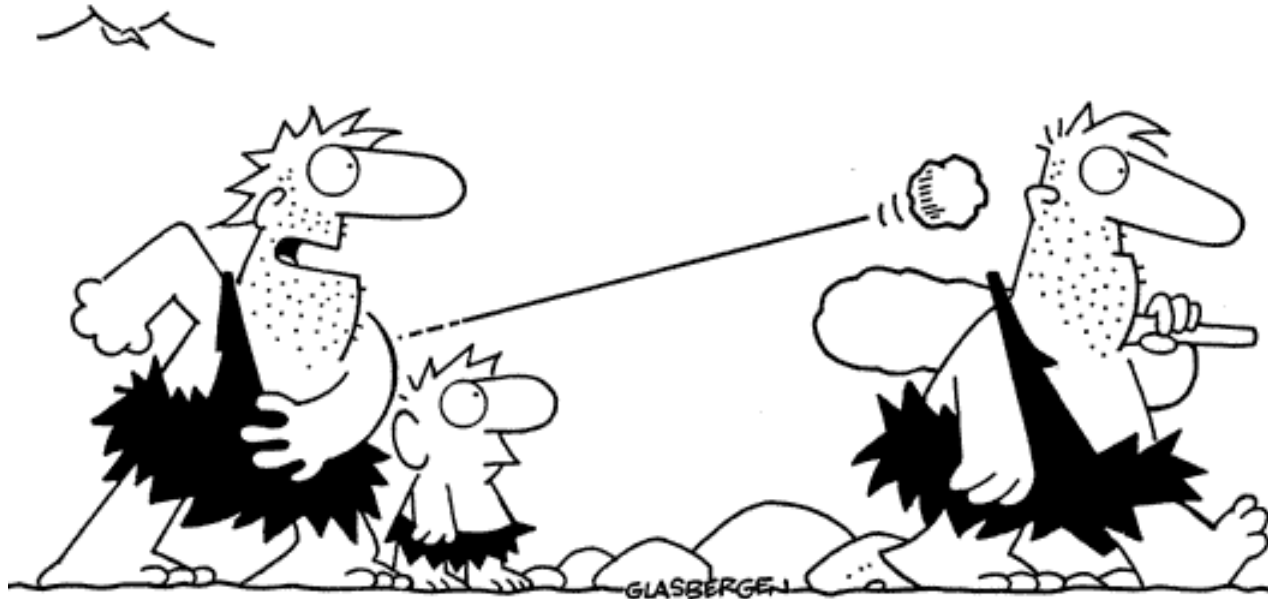
**FINPRO**

North American Wireless Personal Location  
Services

Gary Cranmer-Smith

## The Latest in Wireless Communication

© 2000 Randy Glasbergen. [www.glasbergen.com](http://www.glasbergen.com)



"WHEN YOU WANT TO GET SOMEBODY'S ATTENTION,  
THROW A ROCK AT HIS HEAD. IT'S THE LATEST  
THING IN WIRELESS COMMUNICATION!"

# Carriers

---



# Who Wants to be a Millionaire?

Put These US Wireless Carriers In  
Order from Largest to Smallest.



<b>Cingular</b>	• <b>Verizon</b>	<b>24.7%</b>
<b>AT&amp;T Wireless</b>	• <b>Cingular</b>	<b>18.3%</b>
<b>Sprint PCS</b>	• <b>AT&amp;T</b>	<b>14.1%</b>
<b>Verizon</b>	• <b>Sprint PCS</b>	<b>9.2%</b>
<b>Nextel</b>	• <b>Nextel</b>	<b><u>6.2%</u></b>
		<b>72.5%</b>

# Top Wireless Carriers

As of Jan. 2001

<u>Company</u>	<u>Technology</u>	<u>Subscribers</u>
1. Verizon Wireless	(CDMA, TDMA/GSM) 800MHz & 1.9GHz,	26.6 mil
2. Cingular	(TDMA/GSM) 800MHz & 1.9Ghz	19.7 mil
3. AT&T Wireless Services	(TDMA/GSM) 850MHz & 1.9Ghz	15.2 mil
4. Sprint PCS	(CDMA) 1.9GHz	9.85 mil
5. Nextel	(iDEN,SMR)	6.67 mil
6. Alltel	(CDMA) 800 MHz	6.24 mil
7. VoiceStream	(GSM) 1.9Ghz	3.9 mil
8. US Cellular	(CDMA, TDMA) 800MHz	3.06 mil
9. Western Wireless	(Analog, TDMA) 800MHz	1.05 mil
10. Powertel, Inc.	(GSM) 1.9Hz	906,000

# Consolidation Example US Cellular

Bangor Cellular Telephone, L.P.  
 California Rural Service Area 1, Inc.  
 Canton Cellular Telephone Company (IL)  
 Cedar Rapids Cellular Telephone, L.P.  
 Central Florida Cellular Telephone Company, Inc.  
 Charlottesville MSA Limited Partnership  
 Crook County RSA Limited Partnership  
 Davenport Cellular Telephone Company  
 Dubuque Cellular Telephone, L.P.  
 Evansville Cellular Telephone Company (for Appleton WI)  
 Farmers Cellular Telephone Company, Inc.  
 Florida RSA #8, Inc.  
 Georgia RSA #11, Inc.  
 Georgia RSA #13, Inc. (For WV7)  
 Green Bay Cell Telephone Co.  
 Hardy Cellular Telephone Company

Ohio State Cellular Phone Company (For Roanoke)  
 Oregon RSA No. 2 Limited Partnership  
 Oregon RSA No. 3 Limited Partnership  
 Peace Valley Cellular Telephone Company  
 Racine Cellular Telephone Company  
 Sheboygan Cellular Telephone Company, Inc.  
 Tennessee RSA No. 3 Limited Partnership  
 Tennessee RSA #4 Sub 2, Inc.  
 Texahoma Cellular L.P.  
 Texas #20 Rural Cellular, Inc.  
 United States Cellular Operating Company of Columbia  
 United States Cellular Operating Company of Des Moines  
 United States Cellular Operating Company of Medford  
 United States Cellular Operating Company of Richland  
 United States Cellular Operating Company (for IN-8)  
 United States Cellular Operating Company (for W1-10)  
 United States Cellular Operating Company (for W1-8)  
 United States Cellular Operating Company (for W1-9)

Illinois RSA #3, Inc.  
 Indiana RSA No. 4 Limited Partnership  
 Indiana RSA No. 5 Limited Partnership  
 Iowa 13, Inc.  
 Iowa RSA No. 12 Limited Partnership  
 Iowa RSA No. 9 Limited Partnership  
 Jacksonville Cellular Telephone Co.  
 Janesville Cellular Telephone Company  
 Joplin Cellular Telephone Company, L.P.  
 Kenosha Cellular Telephone L.P.  
 La Crosse Cellular Telephone Company, Inc.  
 Lar-Tex Cellular Telephone Company, Inc.  
 Lewiston Cell Tel Co. Partnership  
 Madison Cellular Telephone Company  
 Main RSA No. 4 Limited Partnership  
 Main RSA No. 1, Inc.  
 Manchester-Nashua Cellular Telephone, L.P.  
 McDaniel Cellular Telephone Company  
 Minford Cellular Telephone Company  
 Missouri #15 Rural Cellular, Inc.  
 NH #1 Rural Cellular, Inc.  
 North Carolina RSA No. 6, Inc.  
 North Carolina RSA #4, Inc.  
 North Carolina RSA #9, Inc.  
 Ohio RSA No. 1 Limited Partnership (For KS 15)  
 Ohio State Cellular Phone Company (For Iowa 5)  
 Ohio State Cellular Phone Company (For Lynchburg)  
 Ohio State Cellular Phone Company (For NC3)

United States Cellular Operating Company (Milwaukee)  
 United States Cellular Telephone Company  
 (Greater Knoxville L.P.)  
 United States Cellular Telephone Company  
 (Greater Tulsa L.L.C.)  
 USCOC of Corpus Christi, Inc.  
 USCOC of Cumberland, Inc.  
 USCOC of Hawaii 3, Inc.  
 USCOC of Idaho RSA #5, Inc.  
 USCOC of Illinois RSA #1, Inc.  
 USCOC of Illinois RSA #4, Inc.  
 USCOC of Iowa RSA #16, Inc.  
 USCOC of Iowa RSA #1, Inc.  
 USCOC of Missouri RSA #13, Inc.  
 USCOC of Missouri RSA #3, Inc.  
 USCOC of New Hampshire RSA #2, Inc.  
 USCOC of North Carolina RSA #7, Inc.  
 USCOC of Oklahoma RSA #10, Inc.  
 USCOC of Oregon RSA #5, Inc.  
 USCOC of Pennsylvania RSA #10-B2, Inc.  
 USCOC of South Carolina RSA #4, Inc.  
 USCOC of Tallahassee, Inc.  
 USCOC of Virginia RSA #2, Inc.  
 USCOC of Virginia RSA #3, Inc.  
 USCOC of Washington – 4, Inc.  
 USOC of Rockford, Inc.  
 Vermont RSA #2-B2, Inc.  
 Victoria Cellular Corporation  
 Virginia RSA #4, Inc.  
 Virginia RSA #7, Inc.  
 Waterloo Cedar Falls CellTelCo  
 Wausau Cellular Telephone Company L.P.  
 Western Sub – RSA Limited Partnership  
 Wilmington Cellular Telephone Co.  
 Wisconsin RSA #7, Inc.  
 Yakima MSA Limited Partnership

# Customer Revenues For Wireless Carriers

As of Jan. 2001

<u>Company</u>	<u>ARPU</u>
1. Verizon Wireless	\$52
2. Cingular	\$49.5
3. AT&T Wireless Services	\$63.8
4. Sprint PCS	\$61
5. Nextel	\$72
6. Alltel	\$49
7. VoiceStream	\$52
8. US Cellular	\$46.5
9. Western Wireless	\$65
10. Powertel, Inc.	\$53

# Networks

---

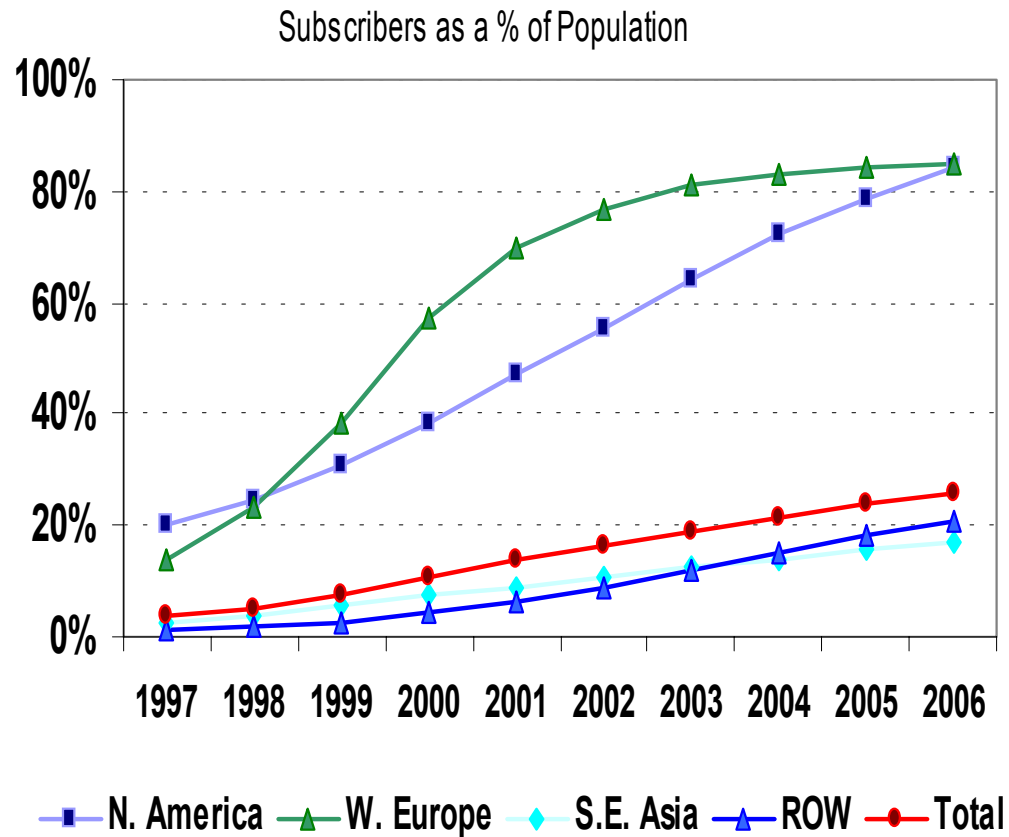


# U S Wireless Growth

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
<b>U.S. Population</b>	267.645	270.002	272.33	274.634	276.918	279.189	281.452	283.713	285.981
<b>% Penetration</b>	20.7%	25.6%	31.6%	36.1%	40.8%	45.4%	50.0%	54.5%	59.0%
<b>Additional Subscribers</b>	11.269	13.897	16.838	13.164	13.692	13.887	13.82	14.061	13.92
<b>Total Subscribers</b>	55.312	69.209	86.047	99.211	112.903	126.79	140.611	154.672	168.592
<b>% Growth</b>		25.1%	24.3%	15.3%	13.8%	12.3%	10.9%	10.0%	9.0%

Source: Yankee Group 2000

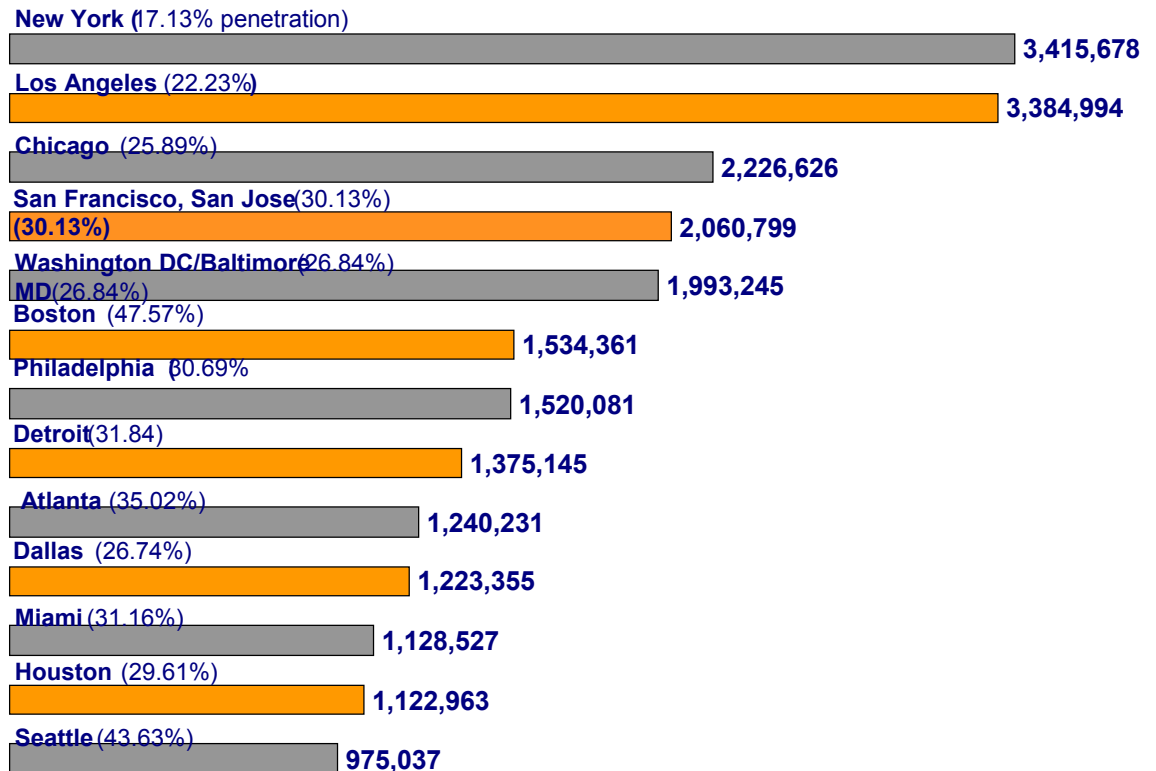
# Global Cellular Penetration



# Fragmented Markets

## Top Cellular Markets by Subscribers:

April 2000



U.S. is divided into  
734 cellular markets

## U.S. Internet Access Via Cell Phones

	1999	2000	2001	2002	2003	2004	2005
<b>Own a wireless phone</b>	32%	38%	44%	50%	54%	59%	62%
<b>Own a browser-enabled wireless phone</b>	1%	6%	12%	25%	39%	51%	60%
<b>Browse the Net on a wireless phone</b>	0.1%	0.3%	1%	3%	7%	13%	20%

# Future for CDMA and TDMA/GSM

## Next Generation Standards

Standard Name	Other Names	Upgrade path for	Expected
<b>CDMA</b>	IS-95, IS-95A cdmaOne	N/A	Current
<b>GSM</b>	N/A	N/A	Current
<b>1XRTT</b>	G3G-MC-CDMA-1X; 2.5G for CDMA	CDMA	2002
<b>GPRS</b>	2.5G for GSM	GSM and potentially CDMA	2001-2002
<b>EDGE</b>	2.5G for GSM and TDMA	GSM or TDMA	2002
<b>Wideband CDMA (W-CDMA)</b>	W-CDMA; FDD-1; G3G-DS-CDMA	GSM or TDMA	2003-2004
<b>cdma2000</b>	3XRTT, FDD Mode 2; G3G-MC-CDMA-3X	CDMA	2003-2004
<b>High Rate Data (HDR)</b>	HDR	Not true 3G upgrade	2002

# Network Migration

---

**U.S. –based telcos are investing in infrastructure but betting on different technologies to get there**

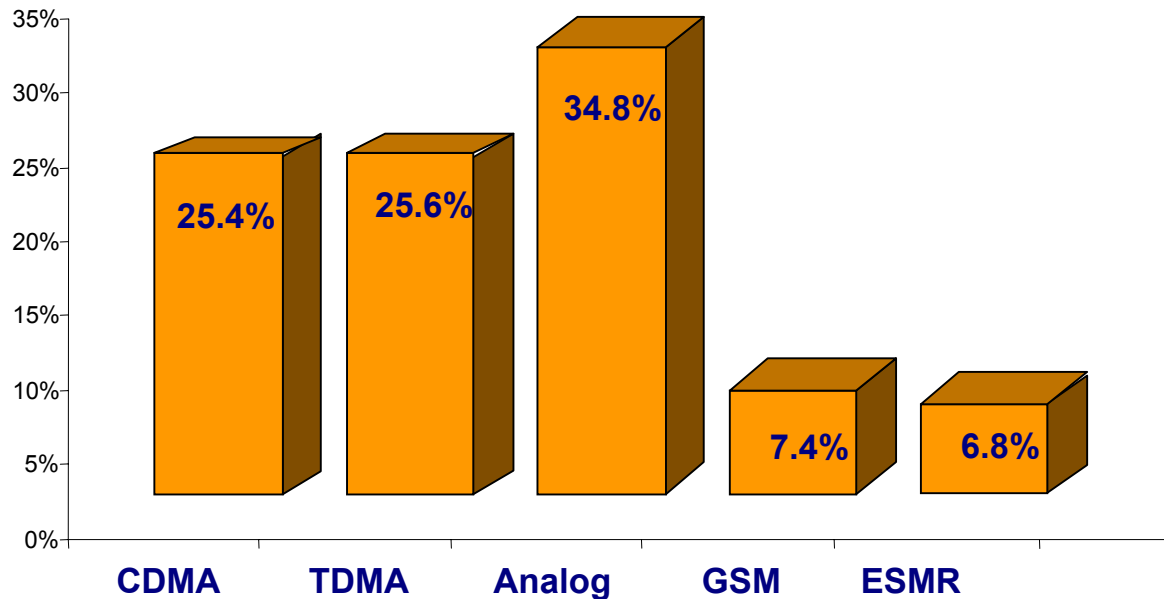
- Sprint:** CDMA/1XRR/HDD/CDMA2000
- Verizon:** CDMA/1XRR/HDD/CDMA2000
- Cingular:** TDMA/GSM/GPRS/EDGE/UMTS
- AT&T:** TDMA/GSM/GPRS/EDGE/UMTS
- Nextel:** ESMR/CDMA2000

## US Subscribers by Technology Standards

Technology	Subscribers	Market Share (%)	Digital Market Share (%)
<b>Total GSM Subscribers *</b>	<b>7,999</b>	<b>7.4</b>	<b>12.7</b>
<b>Total CDMA Subscribers</b>	<b>27,357</b>	<b>25.4</b>	<b>43.5</b>
CDMA Subscribers, 800 MHz	13,857	12.9	22.0
CDMA Subscribers, 1900 MHz	13,500	12.6	21.5
<b>Total TDMA Subscribers</b>	<b>27,573</b>	<b>25.6</b>	<b>43.8</b>
TDMA Subscribers, 800 MHz	24,401	22.7	38.8
TDMA Subscribers, 1900 MHz	3,172	3.0	5.0
<b>Total Digital Subscribers</b>	<b>62,928</b>	<b>58.5</b>	<b>100.0</b>
<b>Total AMPS Subscribers</b>	<b>37,398</b>	<b>34.8</b>	<b>NA</b>
<b>Total ESMR Subscribers</b>	<b>7,176</b>	<b>6.7</b>	<b>NA</b>
<b>Total Cellular Subscribers, 800 MHz</b>	<b>75,655</b>	<b>70.4</b>	<b>NA</b>
<b>Total PCS Subscribers, 1900 MHz</b>	<b>24,671</b>	<b>22.9</b>	<b>NA</b>
<b>Total Cellular / PCS / ESMR Subscribers</b>	<b>107,502</b>	<b>100.0</b>	<b>NA</b>

# U.S. Market Shares for Wireless Standards

Overall, 10-15 incompatible standards for cellular, PCS, paging, satellite and other networks that support mobile data.



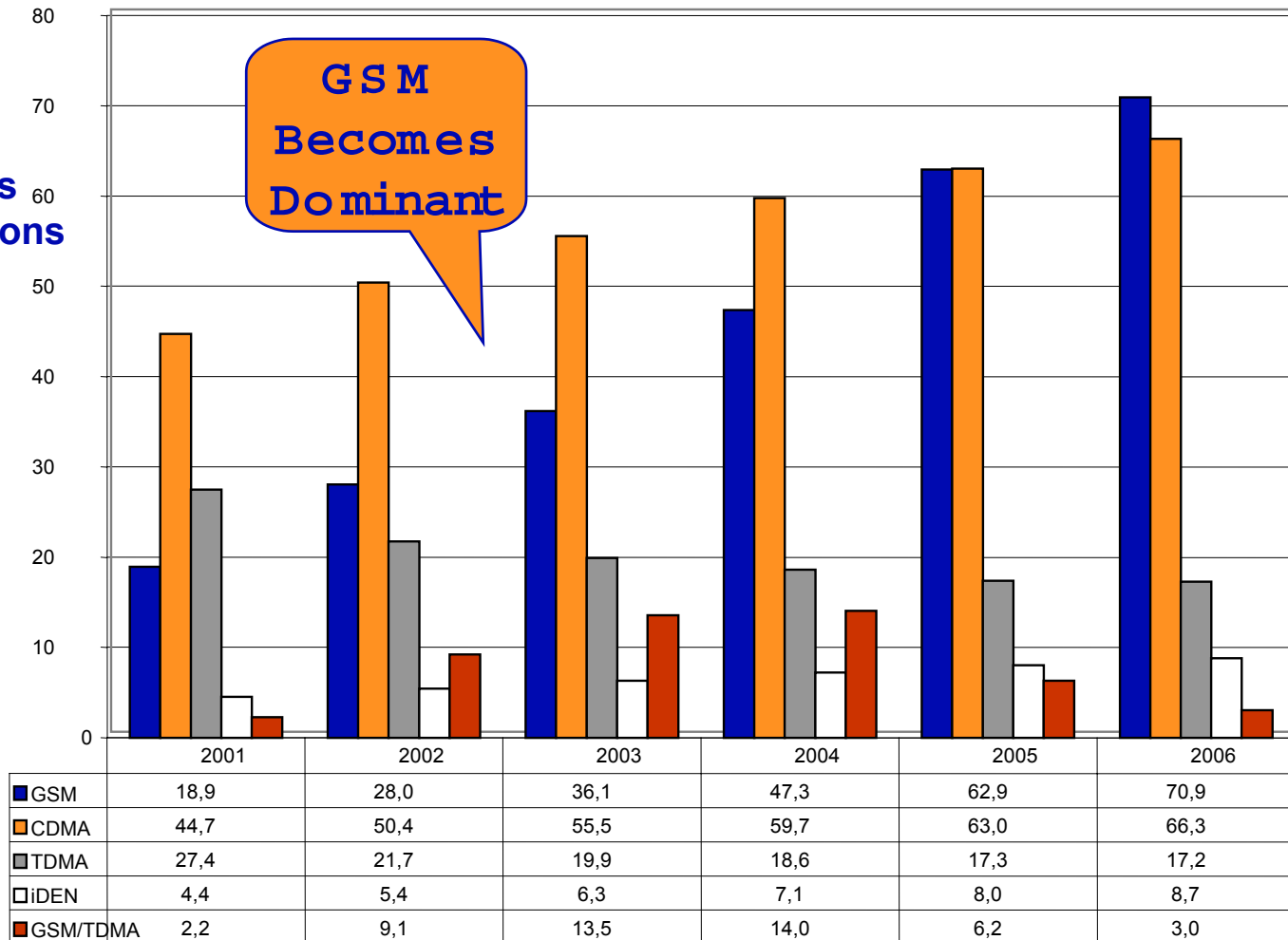
## 2001 - The Year of GSM

---

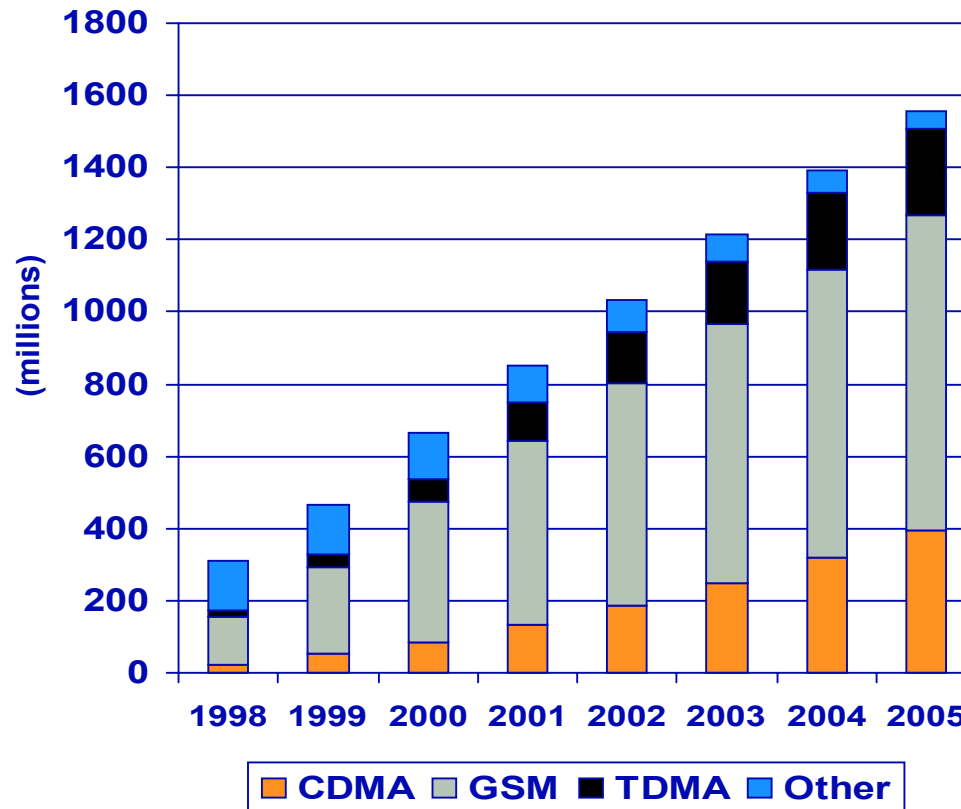
- **Docomo equity stake in AT&T - they decide to overlay GSM/GPRS over existing network**
- **Voicestream expansion of GSM Properties**
- **Cingular expansion of GSM properties**
- **Rogers Cantel of Canada will overlay GSM/GPRS over existing network**
- **Telcel of Mexico has decided to overlay GSM/GPRS over existing network**
- **3-4 Years to upgrade completely to GSM**
- **GSM/TDMA phones necessary for transition period**

# In What Year Does GSM Dominate NA?

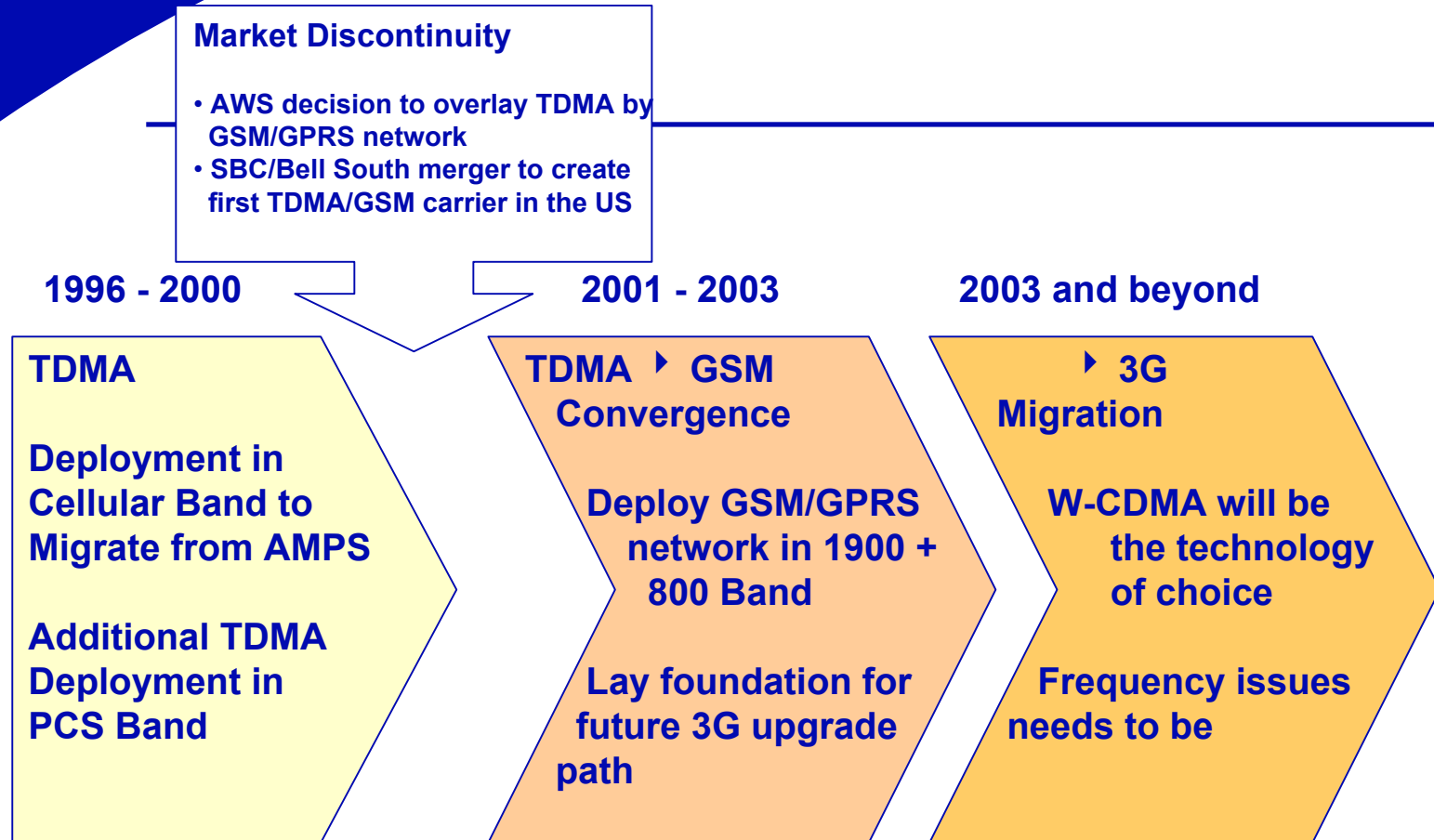
Mobile  
Phones  
in Millions



# Worldwide Installed Technology Standards



## GSM - integral in evolution to 3G



# Carrier Data Services

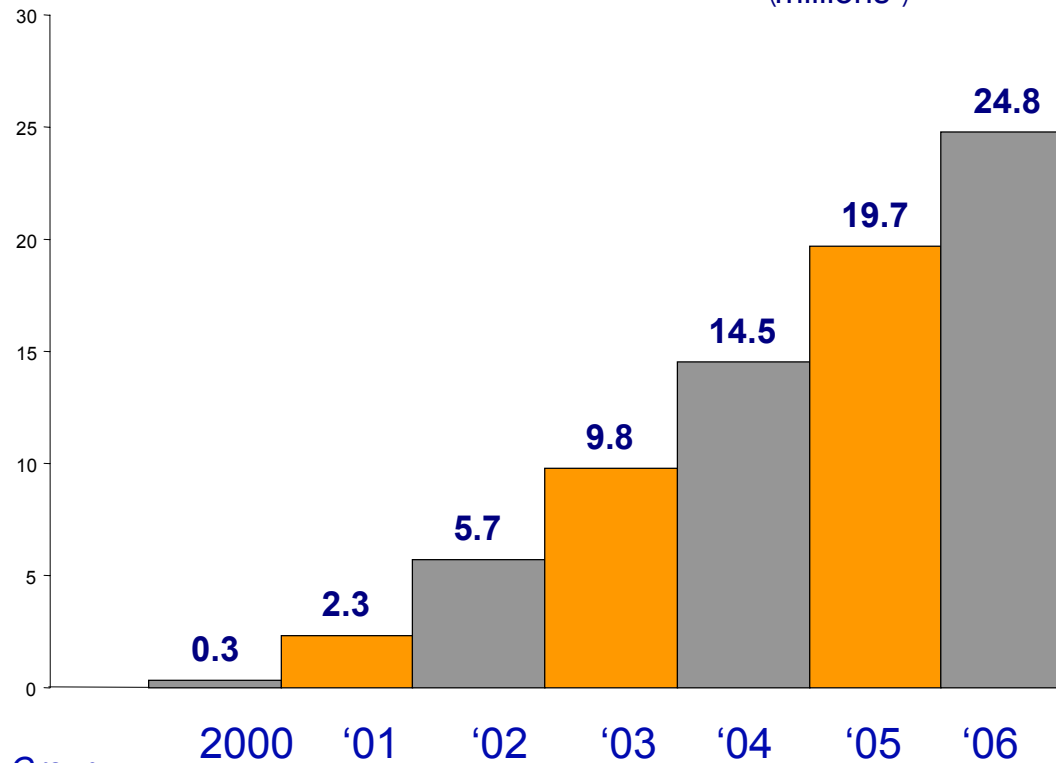
---



# Wireless Portals

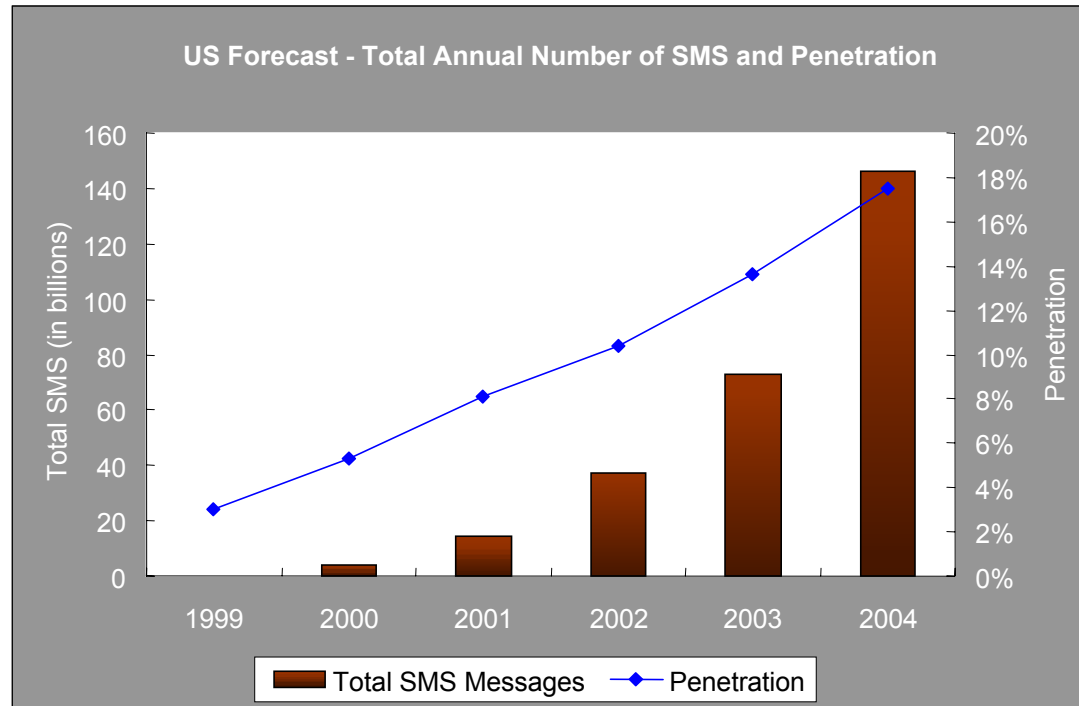
## US Wireless Portal Subscribers

(millions )



Source: The Strategis Group

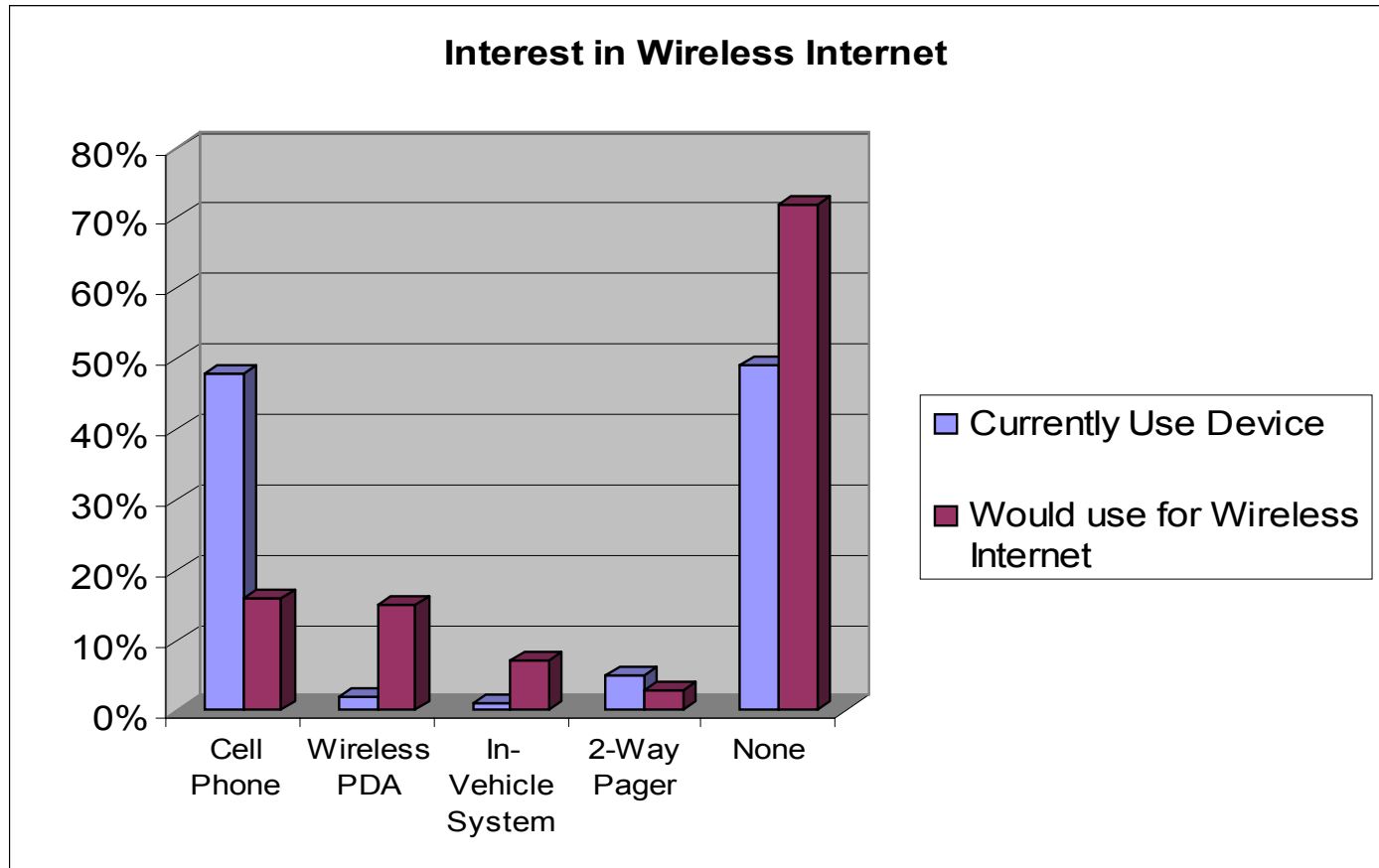
## US SMS Usage Projections



- Globally expected to reach over 200 billion this year

*\*Source: Cap Gemini Ernst & Young, 2001, GMS Association*

# US Survey of Wireless Internet Usage



## Data Services and Pricing

Carrier		Cost	Access
AT&T	PocketNet basic	Free with rate plan	Unlimited Access to featured sites
	PocketNet plus	6.99**	Unlimited access to expanded list of sites
	PocketNet Premium	14.99**	Unlimited access to all sites
Cingular	My Wireless Window/Wireless Internet	\$6.99- \$15.99**	Unlimited access to all sites
	MyBiz/Wireless Internet	\$6.99- \$15.99**	Unlimited access to all sites
	Wireless Internet Express	\$14.99 - \$21.99*	Unlimited access to all sites
	My Sprint PCS Wireless Web	\$5**	Unlimited Access to featured sites
Verizon	Mobile Web, MYVZW	\$7**	Unlimited Access to any sites
Nextel	Nextel Online	\$5**	Unlimited Access to featured sites
	Nextel Online Plus	\$10**	Unlimited Access to featured sites
Alltel	BrowseNow	\$15	Unlimited Access to Any site
VoiceStream	iStream	\$2.99-\$39.99*	Unlimited Access to Any site

\*GPRS per Kilobyte billing in Seattle

\*\* plus airtime

Source: Carriers

# Wireless Pricing Plans

Wireless Internet Express			
Package Price	\$14.99	\$17.99	\$21.99
Included Kilobytes	500	500	500
Price per Kilobyte	\$0.07	\$0.07	\$0.07
Included Messages	100	250	500
Price per Message	\$0.10	\$0.10	\$0.10
Internet Access	Yes	Yes	Yes
<i>Related to GPRS services where available</i>			

VoiceStream Get More!	Monthly Rate	Whenever Minutes	Weekend Minutes	VoiceStream Minutes	Ping Pong Messages	Overage
Basic	\$19.99	60	500	NA	50	40¢
Talk & Text	\$29.99	200	1000 or Unlimited*	NA	500 or 1 MB† iStream	35¢
Get More	\$39.99	500	2000 or Unlimited*	NA	50	35¢
Get More Plus	\$59.99	800	2000 or Unlimited*	NA	50	35¢
Get More Max	\$99.99	1400	2000 or Unlimited*	NA	50	30¢
Family Time	\$69.99	800	1000	1000	50	35¢

VoiceStream Smartphone	PDA (Windows-CE based Pocket PC)	Laptop	Any Device
\$2.99 per month	\$19.99 per month	\$39.99 per month	\$10.00 per MB
1 Megabyte† (MB) (about 500 phone screen pages)	5 Megabytes (MB) (about 90 web pages or 850 e-mails)	10 Megabytes (MB) (about 180 web pages or 1,700 e-mails)	Roaming outside of the iStream network.
300 Ping Pong™ text messages	300 Ping Pong™ text messages	300 Ping Pong™ text messages	
Get access to information on your phone.	Connect your phone to your Windows® CE-based PDA.	Connect your phone to your laptop or Windows® CE-based PDA.	
\$10.00 per additional MB	\$5.00 per additional MB	\$4.00 per additional MB	

Verizon Mobile Web				Interactive Messaging 10	Interactive Messaging 250	Interactive Messaging 500
Plan	Mobile Web 100	Mobile Web 200	Mobile Web 600			
Monthly Fee	\$6.95	\$8.95	\$12.95			
Included Alerts	100	200	600			
Included Messages	0	100	250	500		
Monthly Rate	\$0.00	\$6.99	\$9.99	\$13.99		
Add'l Messages	\$0.10	\$0.10	\$0.10	\$0.10		
Internet	No	Yes	Yes	Yes		

# Services & Technologies

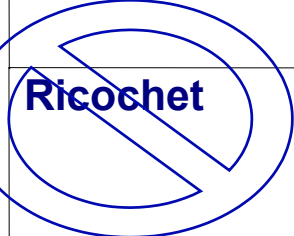
---



## Internet Access Provided by Mobile Operators

ISP	Cost per month	Notes
<b>AT&amp;T PocketNet</b>	Free -existing customers (access to 40 Web sites) \$6.99 to \$14.99 for additional seivces	Targeted for business & their mobile professionals
<b>Go America</b>	\$9.99 for 25K; \$59.99 unlimited	Available to RIM, Novatel Wireless Minstrel II, Sierra Aircard 300 and Handspring Visor
<b>MobileLogic Web</b>	\$70.00	Complete solution for wireless web access. Compresses and optimizes Web page to deliver faster transmission.
<b>Nextel Online</b>	From \$14.95	Partnered w/MSN Mobile. Allows Int. access via Nextel phone or utilize phone as modem for full Web access.

## Internet Access Provided by Mobile Operators (Con't)

<b>OmniSky</b>	\$39.95 unlimited	Only available for Palm V series, and for Windows CE/Pocket PC, pagers and WAP
<b>Palm.Net</b>	From \$9.99 limited vol. To \$44.99 unlimt.	Available only to Palm VII. Limited to e-mail & Web clipping
 <b>Ricochet</b>	\$29.00	Utilizes Microcell Radios and Wired Access points in coverage areas (SF, Seattle, Wash. DC, major airports. Requires use of Metricon Modem
<b>Sprint PCS Wireless Web</b>	From \$9.95 with Sprint PCS plan	Calling plan minutes can be used for either calls or Internet
<b>Verizon Wireless</b>	\$6.95	Allows users to customize handset or through MyVWZ.com, Verizon's portal.
<b>VoiceStream</b>	\$4.99 (Free 2 way messaging until recently)	Allows limited internet e-mail and basic Web info in form of text messages for stock quotes etc.

# LBS Service Accuracy Needs

• Location-independent	Stock prices, sports reports
• Regional (up to 200km)	Weather reports, localized weather warnings, traffic information (pre-trip)
• District (up to 20km)	Local news, traffic reports
• Up to 1 km	Vehicle asset management, targeted congestion avoidance advice
• 500m to 1km	Rural and suburban emergency services, manpower planning, information services (where are?)
• 100m (67%)	U.S. FCC mandate (99-245) for wireless emergency
• 300m (95%)	calls using network based positioning methods
• 75m-125m	Urban SOS, localized advertising, home zone pricing, network maintenance, network demand monitoring, asset tracking, information services (where is the nearest?)
• 50m (67%)	U.S. FCC mandate (99-245) for wireless emergency
• 150m (95%)	calls using handset based positioning methods
• 10m-50m	Asset Location, route guidance

# LBS Services

---

Commercial Services In-vehicle Services

Personal Services

Automated Tolling/Ticketing

Asset Tracking/Control

Delivery Tracking

Traffic Information

Fleet Management

Logistic Management

Emergency Call - In Vehicle

Breakdown Call

Floating Car Data

Lock/Unlock

Theft Alert

Car Finder

Off-Board Navigation

Vehicle Diagnostics - OEM

Driving Diagnostics

Smart Radio

Location Sensitive Billing

Location Sensitive Routing

Location Sensitive Quick-dials

Location Sensitive Call/Mobile Control

Emergency Call-Mobile

Assistance Call-Mobile

Where am I?

Pinpoint

Law-force Tracker

Where is?

Who's Nearest?

Personal Navigator

Vehicle Navigator

Local Information

Guardian

Critical Health Monitoring

Location Specific Advertising

Announcements

Multi-user Gaming

Synchronization

**How many real services are there?**

# Nokia's Hypermarket of Services

<b>INFORMATION</b>	<b>NEWS</b>	<b>BANKING &amp; FINANCIAL SERVICES</b>	<b>LOCAL SERVICES (CITY GUIDE)</b>	<b>BUY &amp; SELL</b>	<b>TRAVEL</b>	<b>Special Interest</b>			
	<ul style="list-style-type: none"> <li>General Headlines</li> <li>Financial &amp; Business</li> <li>Politics</li> <li>Tabloids</li> <li>Culture &amp; Entertainment</li> <li>Sports</li> <li>Lottery</li> </ul>	<ul style="list-style-type: none"> <li>Stock indexes</li> <li>Stock prices</li> <li>Metal prices</li> <li>Stock alert</li> <li>Currency rates</li> <li>Interest rates</li> <li>Account balance</li> <li>Credit/debit balance</li> <li>Cheque balance</li> <li>Money transfers</li> <li>Bill payments</li> <li>Automatic call</li> <li>Account status flash</li> <li>Stock purchase</li> <li>Financial products</li> </ul>	<ul style="list-style-type: none"> <li>Taxi</li> <li>Restaurants</li> <li>Cinema</li> <li>Theatres</li> <li>Concerts</li> <li>Exhibitions</li> <li>Night Clubs</li> <li>Emergency services</li> <li>Pharmacies</li> <li>Household assistance</li> <li>Weather</li> <li>Time</li> <li>Directory services</li> <li>ATM Locator</li> </ul>	<ul style="list-style-type: none"> <li>Classifieds               <ul style="list-style-type: none"> <li>Cars</li> <li>Properties</li> <li>Jobs</li> </ul> </li> <li>Auctions</li> <li>Shopping               <ul style="list-style-type: none"> <li>Small daily items</li> <li>Specific promotions</li> </ul> </li> <li>Tickets</li> </ul>	<ul style="list-style-type: none"> <li>Traffic (traffic jams, radar, control,...)</li> <li>Public transportation</li> <li>Navigation services</li> <li>Train schedules</li> <li>Flight schedules</li> <li>Hotels</li> <li>Holiday packages</li> </ul>	<ul style="list-style-type: none"> <li>Mobile telephones</li> <li>Internet sites and services</li> <li>Computers and hardware</li> <li>Automobile</li> </ul>			
<b>COMMUNICATION</b>	<b>Messaging</b>		<b>E-MAIL</b>		<b>FAX</b>	<b>BULLETIN BOARDS</b>			
	<ul style="list-style-type: none"> <li>Send/receive SMS messages</li> <li>SMS to postcard</li> <li>Multimedia Messages</li> </ul>		<ul style="list-style-type: none"> <li>Send/receive e-mails</li> <li>E-mail to voice (IVR)</li> </ul>		<ul style="list-style-type: none"> <li>Send/receive fax</li> <li>Special features (delivery and receipt storage for later delivery)</li> </ul>	<ul style="list-style-type: none"> <li>Groups with common interest</li> <li>Messages, News, etc</li> </ul>			
<b>PRODUCTIVITY</b>	<b>ORGANIZERS</b>		<b>PERSONAL ASSISTANT</b>		<b>TOOLS</b>	<b>MISCELLANEOUS</b>	<b>FAMILY</b>		
	<ul style="list-style-type: none"> <li>To do lists</li> <li>Calendar</li> <li>Address book</li> <li>Agenda</li> </ul>		<ul style="list-style-type: none"> <li>Reminder</li> <li>Call management</li> <li>Correspondence management</li> <li>Voice to SMS, E-mail and fax</li> <li>Translation services</li> </ul>		<ul style="list-style-type: none"> <li>Calculator</li> <li>Dictionary</li> <li>Translator</li> <li>Currency converter</li> </ul>	<ul style="list-style-type: none"> <li>Activating domestic appliances</li> <li>Paying at vending machines</li> <li>Identity verification</li> </ul>	<ul style="list-style-type: none"> <li>Family VPN</li> <li>Synchronised</li> </ul>		
<b>ENTERTAINMENT</b>	<b>MUSIC</b>	<b>TV</b>	<b>LIFESTYLE</b>	<b>FUN</b>	<b>CHATS</b>	<b>PICTURES</b>	<b>GAMES</b>	<b>ASTROLOGY</b>	<b>DATING</b>
	<ul style="list-style-type: none"> <li>Ringtones</li> <li>Short clips (e.g. MP3)</li> </ul>	<ul style="list-style-type: none"> <li>Programme schedules</li> <li>Highlights</li> </ul>	<ul style="list-style-type: none"> <li>Gastronomy</li> <li>Hobbies</li> <li>Fashion</li> <li>Parties</li> </ul>	<ul style="list-style-type: none"> <li>Jokes</li> <li>Sayings</li> <li>Dream analysis</li> </ul>	<ul style="list-style-type: none"> <li>Topic specific</li> <li>Private</li> </ul>	<ul style="list-style-type: none"> <li>Icons</li> <li>Logos</li> <li>Photos</li> <li>Postcards</li> </ul>	<ul style="list-style-type: none"> <li>Puzzles</li> <li>Quizzes</li> <li>"Tamagotchi"</li> <li>Games</li> <li>Gambling/Betting</li> </ul>	<ul style="list-style-type: none"> <li>Horoscopes</li> <li>Astrolove</li> <li>Biorhythm</li> <li>Specific Horoscopes</li> </ul>	<ul style="list-style-type: none"> <li>Chats</li> <li>Dating services</li> </ul>

## Reasons for wireless data links

Reason	Percentage
Send and receive email	62
Surf the internet	45
Play games online	23
Check and trade stocks	12
Plan their next vacation	9
Look for a new job	8

# Bell Mobility - GPS Location Service Trial



## Sample Location Platforms

---

- SignalSoft's Location Manager
- SCC Communications'
- TCS Xypoint Platform
- Mapinfo Location Management Platform
- Autodesk LocationLogic Solution
- Airflash Smartzone

# Sample WASP's

---

There are over 400 WASP's currently serving the US market. The following is a sample of the more than 100 members listed as ASP's in CTIA.

**@Road**

**Air2Web**

**Aether Systems**

**Bantu, Inc**

**BitFlash, Inc.**

**Everypath**

**GoAmerica  
Communications  
Corp**

**GiantBear**

**IBM**

**i3Mobile**

**iMedeon, Inc**

**Infinite Technologies**

**Lightbridge**

**OracleMobile**

**Phone Online**

**Strategy.com**

**TeleMessage**

**Televigation**

**Unimobile, Inc.**

**ViAir**

**Xpoint**

**Ztango**

Source:CTIA

# E911

---



# Original E911 Legislation

- All States have legislated E911 services
  - as outlined in the FCC 94-102 mandate.
- Phase I
  - 10-digit call-back number
  - specific originating cell site or cell sector location
  - by April 1, 1998.
- Phase II
  - radius of 50m in 67 percent of all cases
  - 150m in 95% of all cases
  - by October 1, 2001.



Not one carrier  
made this deadline

## LBS for E911 Solutions

<b>Carrier</b>	<b>Primary Network</b>	<b>Technology</b>
Alltel	CDMA	AGPS
AT&T	TDMA/GSM	MNLS/E-OTD
Cingular	TDMA/GSM	MNLS/E-OTD
Nextel	iDEN-ESMR	AGPS
Qwest	CDMA	AGPS
Sprint PCS	CDMA	AGPS
Verizon Wireless	CDMA	AGPS
VoiceStream	GSM	E-OTD

## 4 Days After October 1, 2001

---

- Many Carriers including Nextel, Verizon, and Sprint had submitted waivers for extensions
- FCC issues extensions
  - considers sanctions and fines for late waiver filers AT&T and Cingular
- New rules by Oct. 2003 AT&T and Cingular must have E-OTD phones
  - 50 m for 67%
  - 150 m for 95 %

## 21 Days After October 1, 2001



- The First E911 Phase II is implemented by Verizon in St Clair County Illinois
  - Using Grayson Wireless' (sub. Allen Telecom) Geometrix
  - Signalsoft's mobile positioning platform

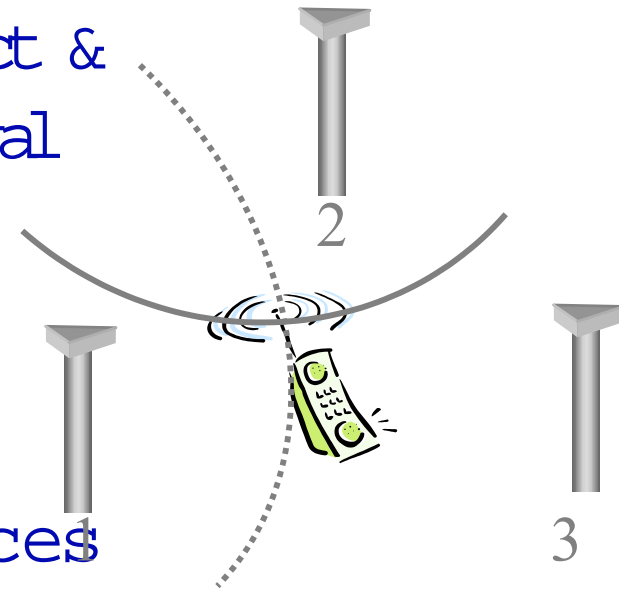
## Geometrix™ Approach

---

- Locates Existing Handsets
- Measures Voice Channel:  
Less Equipment & Supports Tracking
- Proven Technologies
  - Time Difference of Arrival (TDOA)
  - Angle of Arrival (AOA)
- Integrates with Handset Solutions

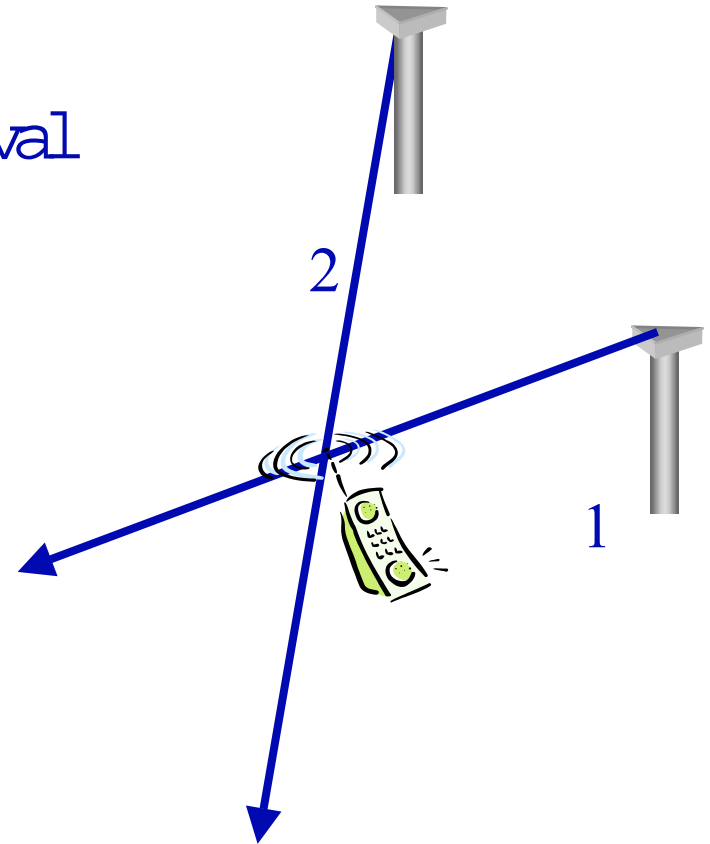
## Time Difference of Arrival

- Location Sensors Detect & Timestamp Signal Arrival
- Arrival Time Sent to Central Controller
- Controller Calculates Time of Arrival Differences
  - Pairs of sensors 1,2 & 2,3
  - Location at Time Difference Intersection
  - At least three sensors required

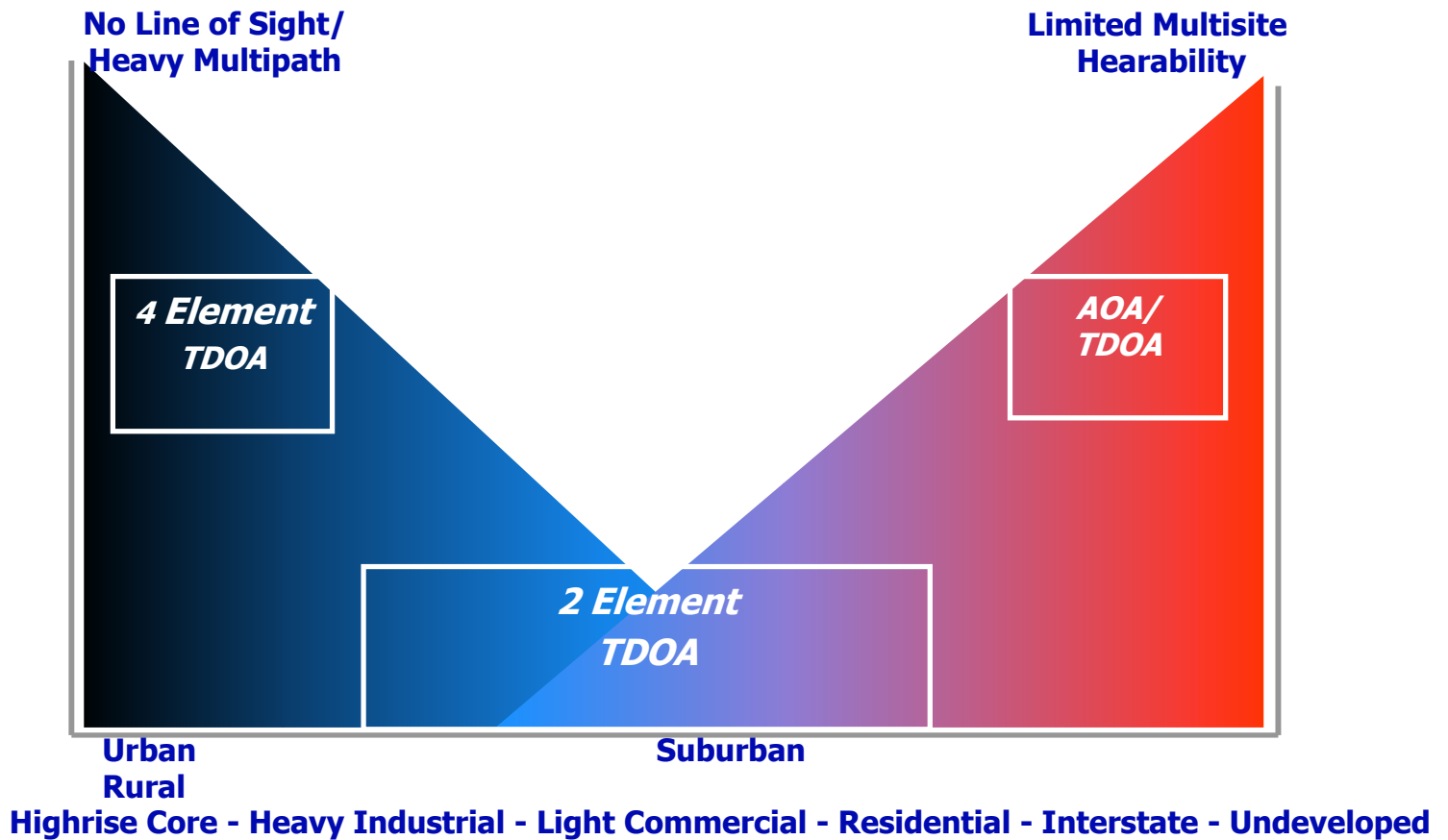


## Angle of Arrival

- Sensors Calculate Signal's Angle of Arrival
- Arrival Angle Sent to Central Controller
- Controller Calculates Position from Angle Intersection
- Minimum of two sites required



# Environment Challenges



# Privacy

---



## Privacy Quiz

---



Once gathered, carriers own location information.

- False (an easy one)



Carriers may not legally disclose location information without the customers consent.

- False



User consent will eliminate privacy problems.

- False False False!!!!

## Customer Trust

---

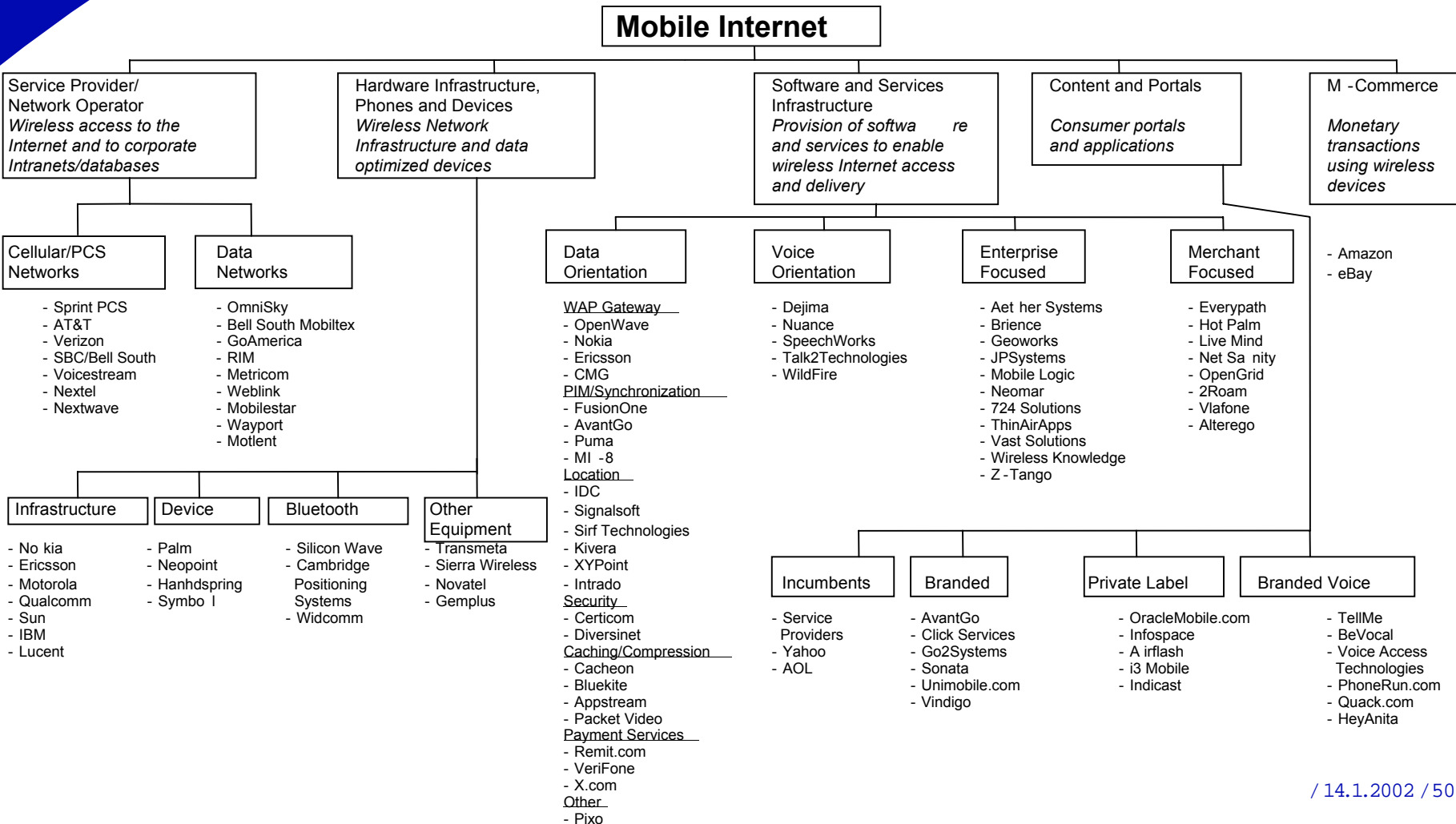
- Carriers need to maintain trust to succeed
- Avoid deceptive practice lawsuits
- Avoid media “big brother” mentality

# Value Chain

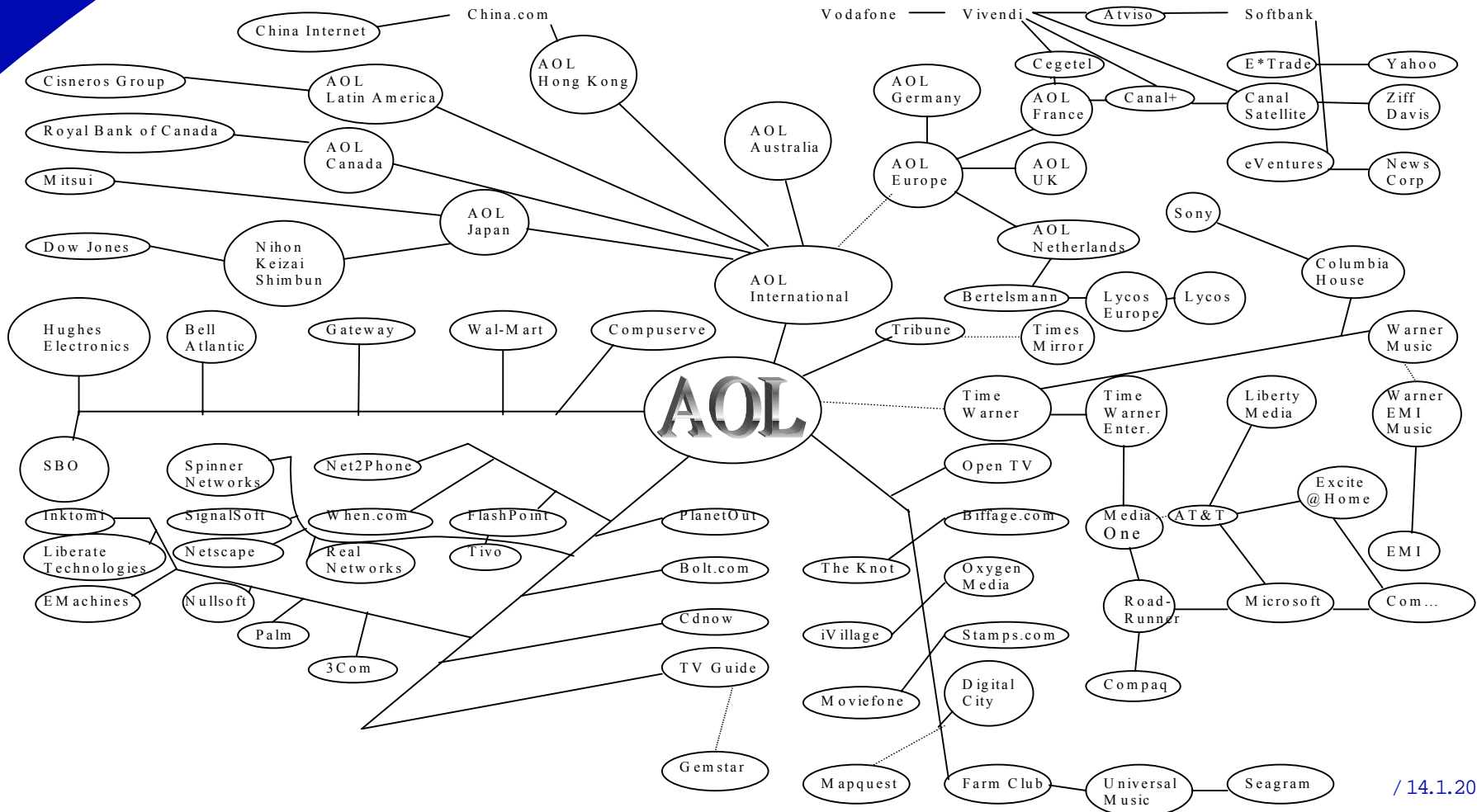
---



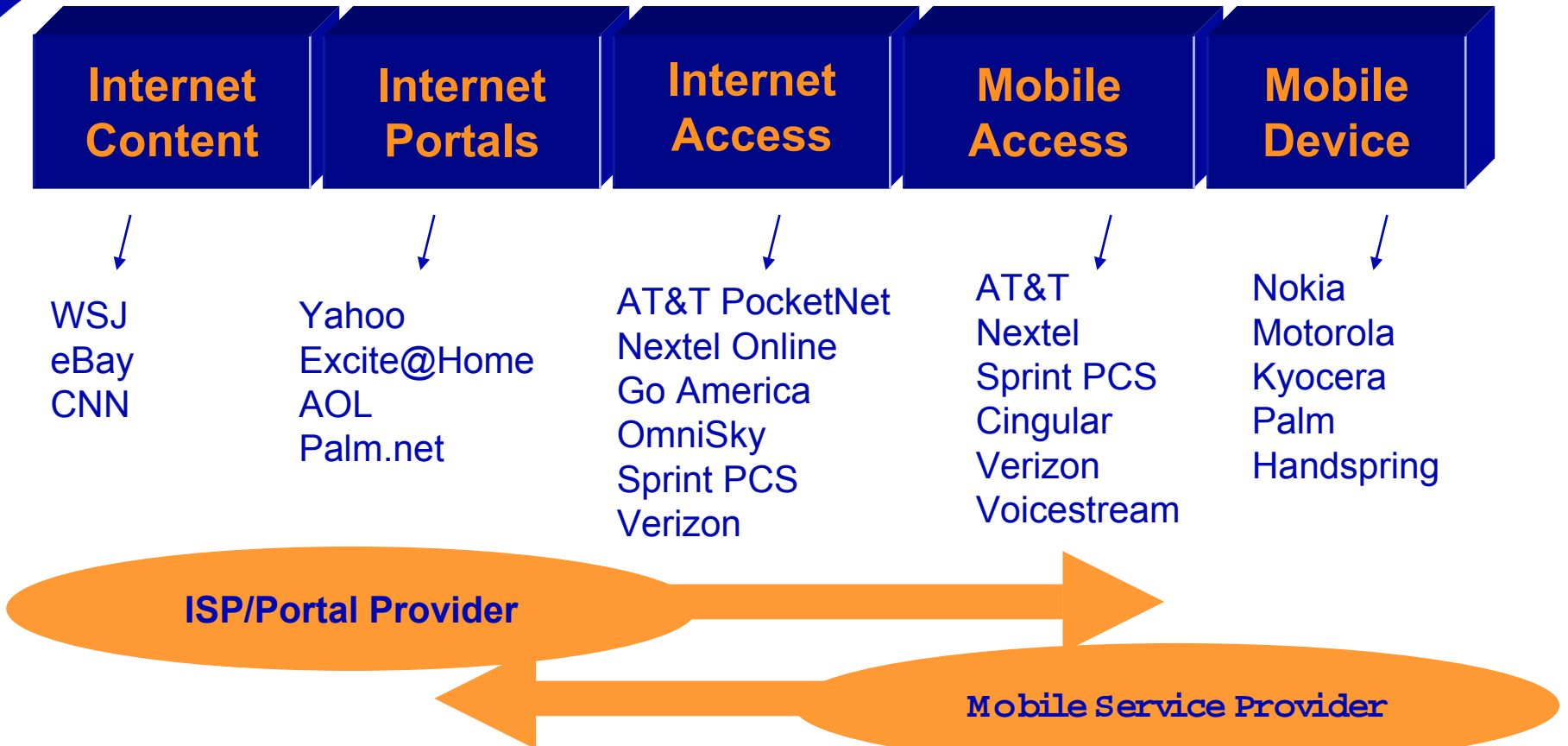
# Mobile Internet in USA



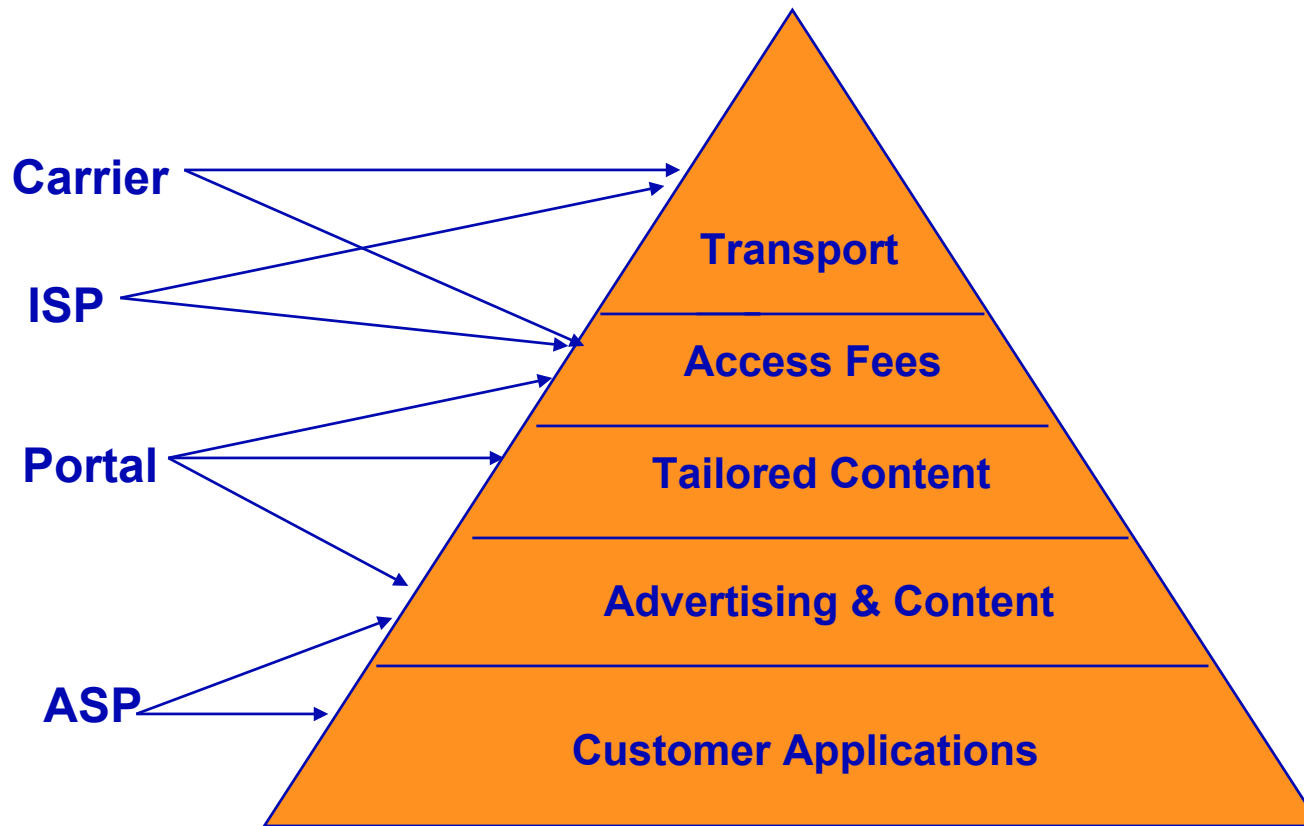
# AOL - Partnering



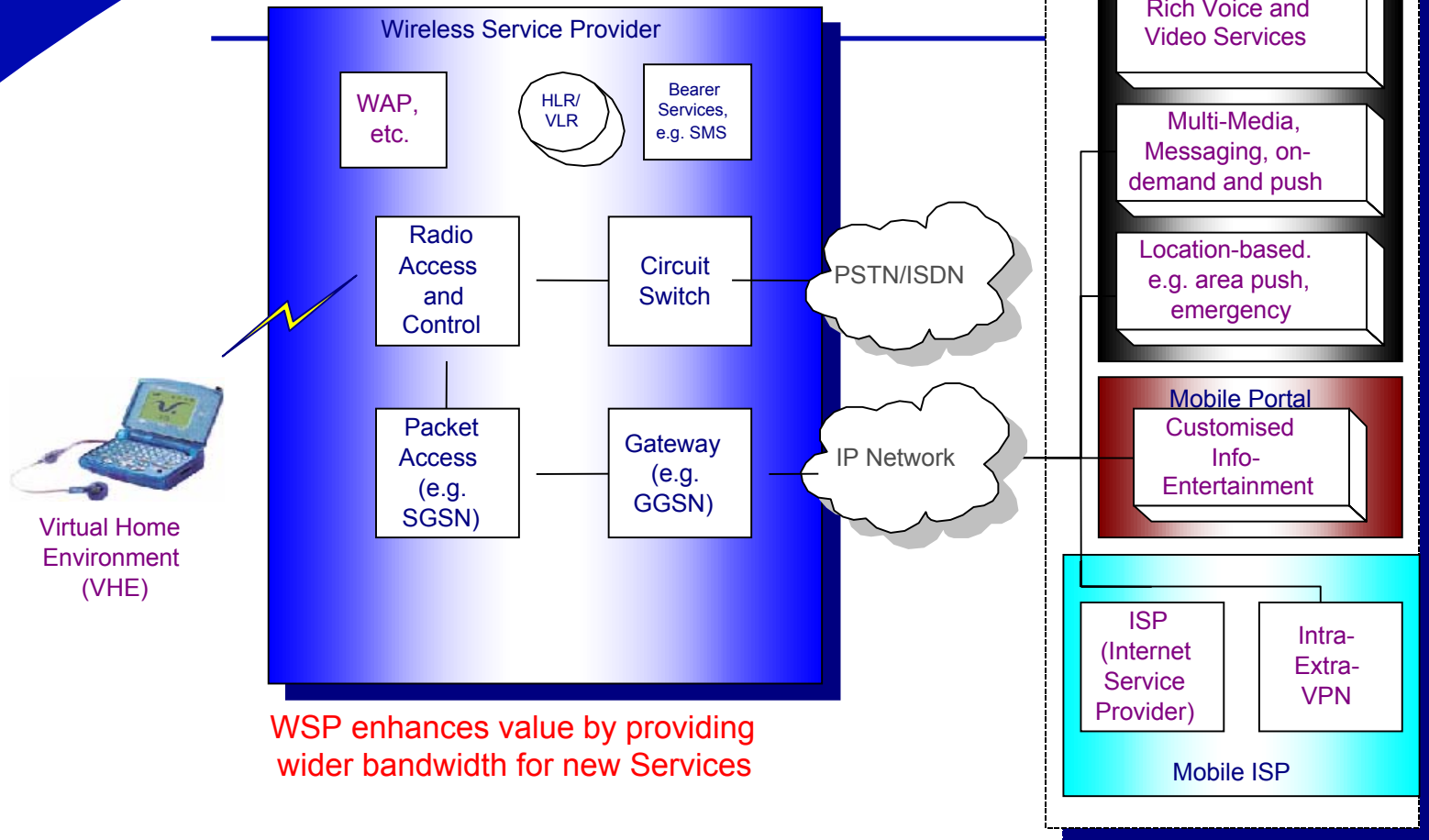
# Mobile Internet value chain



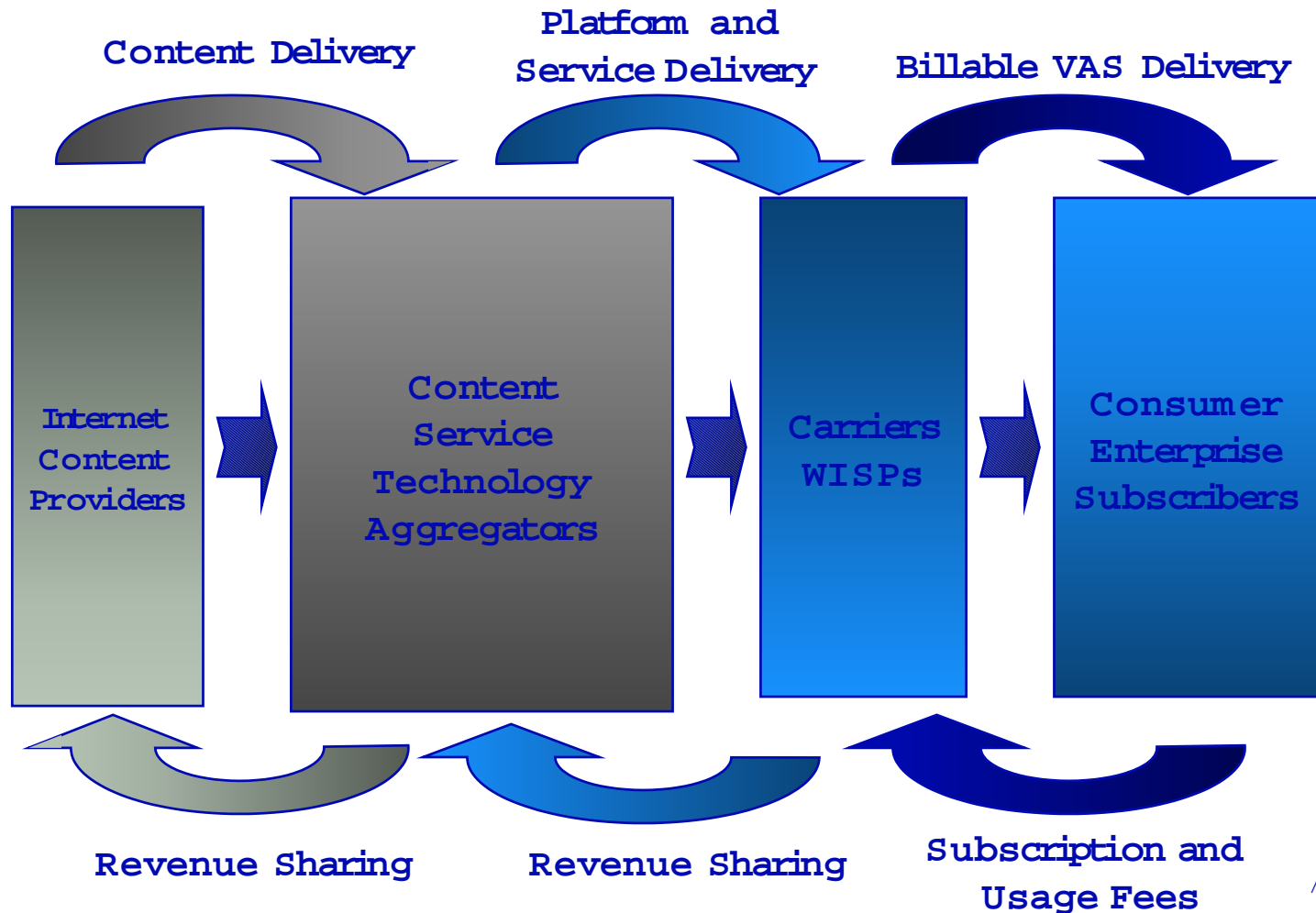
# Who Controls the Value?



## Division of Ownership



# The "Happy" Simple Value Chain

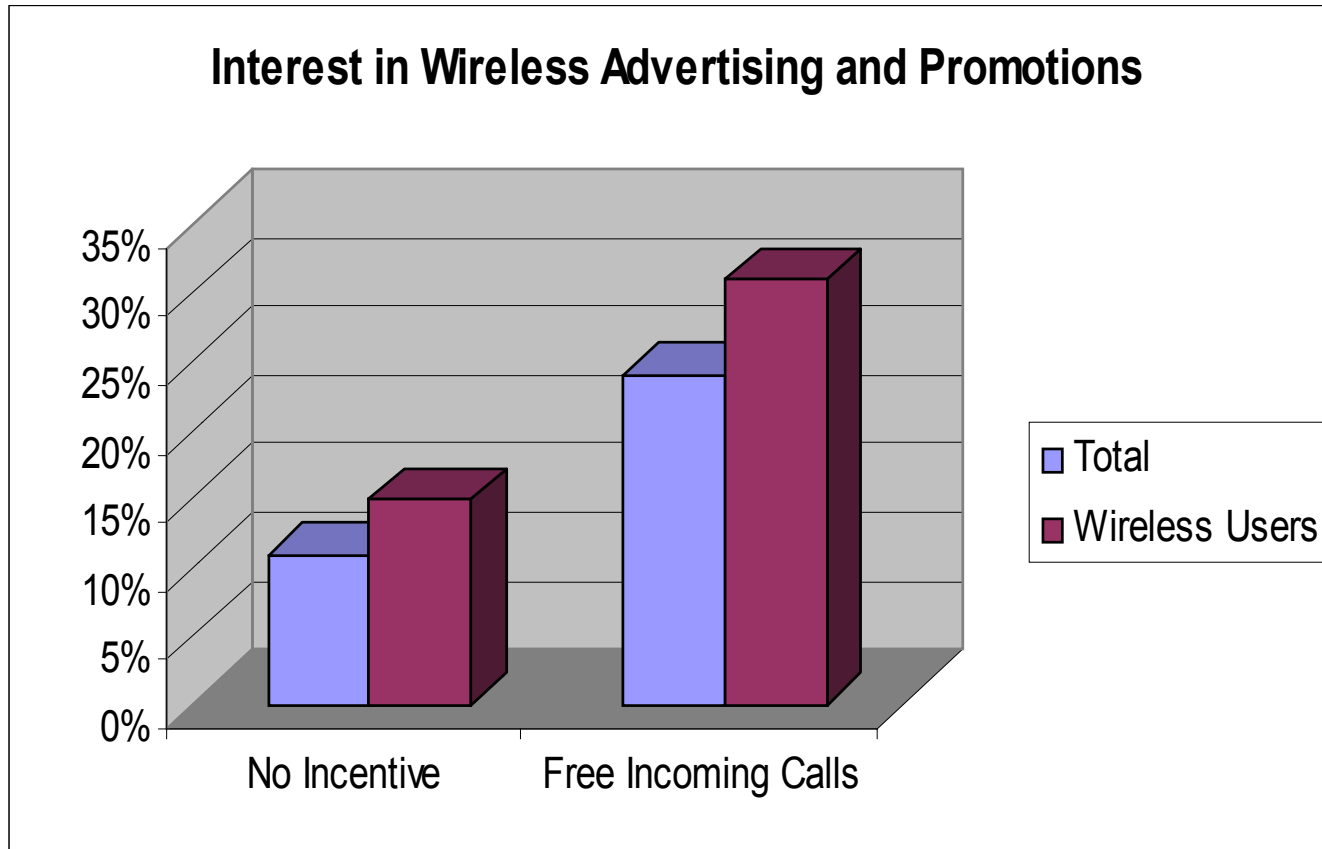


## Revenue Generation

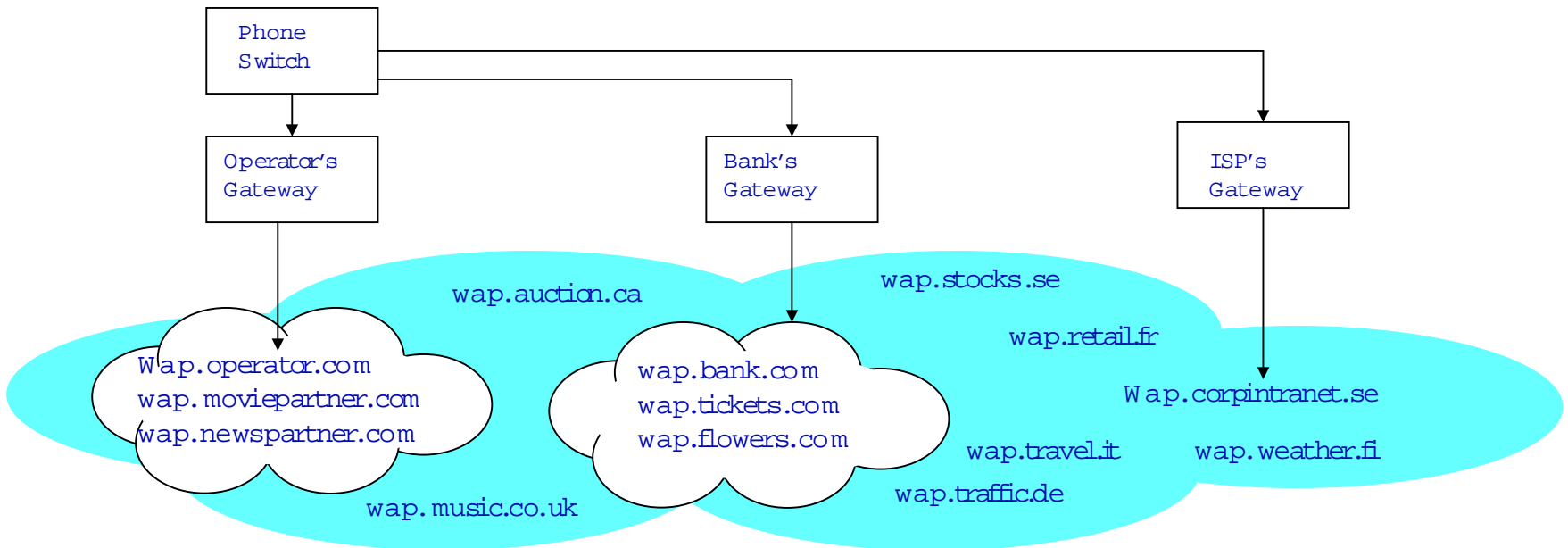
---

- Minutes
- Bytes
- Subscription
- Advertising
- Premium Placement
- Per Service Usage
  - per transaction
  - per message
  - per activity

## Non - Subscriber Revenue



# Value Chain Changes



## Power of portal players

Wireless Portal Player	Strengths	Weaknesses
<b>Mobile Operator</b>	Billing relationship Location information Strong National Brand	Little content expertise Little partnering experience
<b>Equipment Vendor</b>	Technology understanding Developers contact	Not core business Not core expertise
<b>Traditional Portal</b>	Strong portal expertise Leading content/apps. Strong partnering experience	No mobile experience No location information No billing usually
<b>New Player</b>	Flexible Niche focus	Technology focused No content expertise

# Handsets

---



# Wireless Connectivity



## **GPS enabled handsets**

---

**Can you guess whose it is?**

**It allowed Sprint to meet the FCC deadline of selling a GPS-enabled phone by October 1st, 2001**

**Samsung**

**It's called the SPH-N300**

**Motorola and Nokia say they will ship in early 2002**

# US Mobile Handset Shipments

In thousands of units

	<b>Shipments 2000</b>
Nokia	28,651.7
Motorola	10,162.1
Ericsson	7,949.6
Audiovox	7,327.2
Kyocera	6,080.9
Samsung	5,745.3
LGIC	2,487.6
Mitsubishi	2,053.2
Others	2,898.7
<b>Total</b>	<b>73,356.4</b>

## US Digital Mobile Handset Shipments

In thousands of units

	<b>Shipments 2000</b>
Nokia	24,883.8
Ericsson	7,923.8
Motorola	7,846.3
Audiovox	6,116.2
Kyocera	6,080.9
Samsung	5,745.3
LGIC	2,487.6
Mitsubishi	2,040.3
Others	2,598.9
<b>Total</b>	<b>65,723.1</b>

# Operating Systems for Wireless Devices

Company/ JV	Operating System	Key Features	SDK	Registered Developers	Microbrowser/Java	Protocol	Hardware Platforms
<b>Microsoft</b>	Windows CE	Windows GUI, integrated MS Office, Instant-On, pen-based	Yes	2.3 million	Mobile explorer and pocket Internet explorer, Java	XML and HTML, Bluetooth and 802.11	Compaq, Hewlett-Packard, Casio, Siemens, Samsung, SAGEM
<b>Palm Computing, Inc.</b>	Palm OS	Pen-based GUI, Integrated PIM	Yes	130,000 50,000	Palm.net Palm OS	Proprietary	Palm, Handspring, Nokia, Kyocera, Samsung,
<b>Symbian (JV)</b>	EPOC	Multi-form factor OS, embedded PIM, pen-based	Yes	34,000	HTML, WML, Java	HTML, WML, Bluetooth	Symbol, IBM Motorola, Psion, Matsushita, Panasonic, Philips Nokia, Ericsson
<b>Research in Motion Ltd.</b>	BlackBerry	Integrated PIM, Java-based SDK	Yes	15,000	Java, third-party WML	Proprietary	RIM, Compaq

Source: The Strategis Group, company reports, and J.P. Morgan.

## GPS PDA add ons



- Magellan's GPS Companion
  - Includes Megeellan's Magellan's Map Companion and Nav Companion
- GeoDiscovery's Geode
  - Includes GeoDiscovery's GeoView Mobile
- HandyGPS Pro
  - includes Rand McNally's StreetFinder

# Applications For Wireless PDAs

---

- Palm lists 10000+ titles
- 400+ for Mobile Apps for Locations Services
- Location Web Services
  - 10Best.com
  - Shopping.com
  - BarPoint.com
  - Citysearch
  - Conferenza
  - Digital City
  - Traffic Touch
  - Fodors.com's
  - Frommer's City To Go™
  - Go2online
  - LocalFrontPage.com
  - MapQuest

# Java Handsets

---



- Nextel is the first to offer Java Handsets with air upload capability
- Motorola use MapInfo's mi Guide application for handset location applications

# Unlicensed Services

---

- Public spaces
- Bluetooth and 802.11 applications
- Emerging unlic. spectrum technologies