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Multimode/Wireless Terminals: The Role of Semiconductor Providers

*Author: Edgar Auslander,
European Business Development Manager
SC Wireless Communications Business Unit*

*Digital Signal Processing Solutions
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CONTACT INFORMATION

US TMS320 HOTLINE	(281) 274-2320
US TMS320 FAX	(281) 274-2324
US TMS320 BBS	(281) 274-2323
US TMS320 email	dsph@ti.com

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Multimode Wireless Terminals: the Role of Semiconductor Providers

Abstract

This document contains a presentation delivered by Edgar Auslander, European Business Development Manager of the SC Wireless Communications Business Unit at the First European DSP Education and Research Conference on September 25, 1996.



Product Support

World Wide Web

Our World Wide Web site at www.ti.com contains the most up to date product information, revisions, and additions. Users registering with TI&ME can build custom information pages and receive new product updates automatically via email.



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ESIEE

The First European DSP Education and Research Conference

September 25, 1996

Multimode Wireless Terminals: the Role of Semiconductor Providers

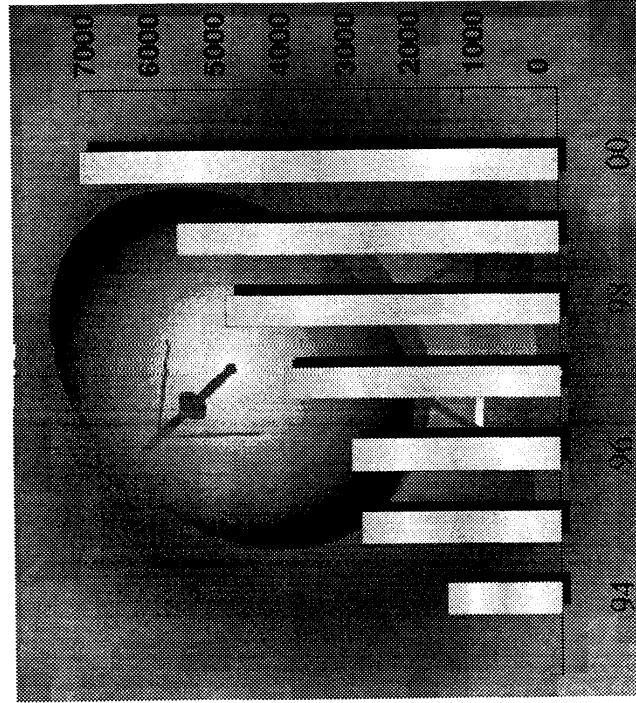
Edgar Auslander

***European Business Development Manager
SC Wireless Communications Business Unit
Texas Instruments Incorporated***



A Market Poised for Growth

- ❖ Tremendous growth potential: half the world has never placed a phone call
- ❖ Projections include analog & digital cellular, digital cordless phones & pagers
- ❖ IC TAM includes DSP solutions for Digital Base band, Analog Baseband and RF Products



Source: TI projections, \$ Millions





"In my business, minutes could cost millions. So, I need immediate and confidential communications."

Lynn A. Feltner
International Financial Consultant

"With wireless going digital, we needed a component supplier to take us from concept to volume quickly."

Bo Hedfors
President and CEO, Ericsson Inc.

A high-growth market, wireless communications, Texas Instruments is offering sound ideas in digital signal processing solutions. In fact, our DSP Solutions help enable breakthrough features that provide higher-level digital compression, better secure transmission, and ultralow power consumption for the ultimate portable communication.

To meet the never-ending quest for better performance, longer battery life and consistency, we've developed digital wireless standards like IS-54, GSM and GPRS, the world's leading manufacturers

continue to turn to TI to ensure our DSP Solutions road map will take them to the next generation products and beyond.

Through TI's system-level components and Texas Instruments' design expertise, the world's first handheld IS-54B digital cellular phone was created — two weeks ahead of schedule and 40 months ahead of industry expectations. Our technology, available in DSP Solutions allows our customers technology to deliver an integrated path that reduces their system to just a few chips, substantially lowering costs. Plus, our global

manufacturing capability serves consistently and a rapid ramp to volume in your product line.

From wireless communications to next computing, TI DSP Solutions are changing the live, learn, work and play. Sounds pretty good, doesn't it? Please see the Internet at www.ti.com

EXTENDING YOUR RE



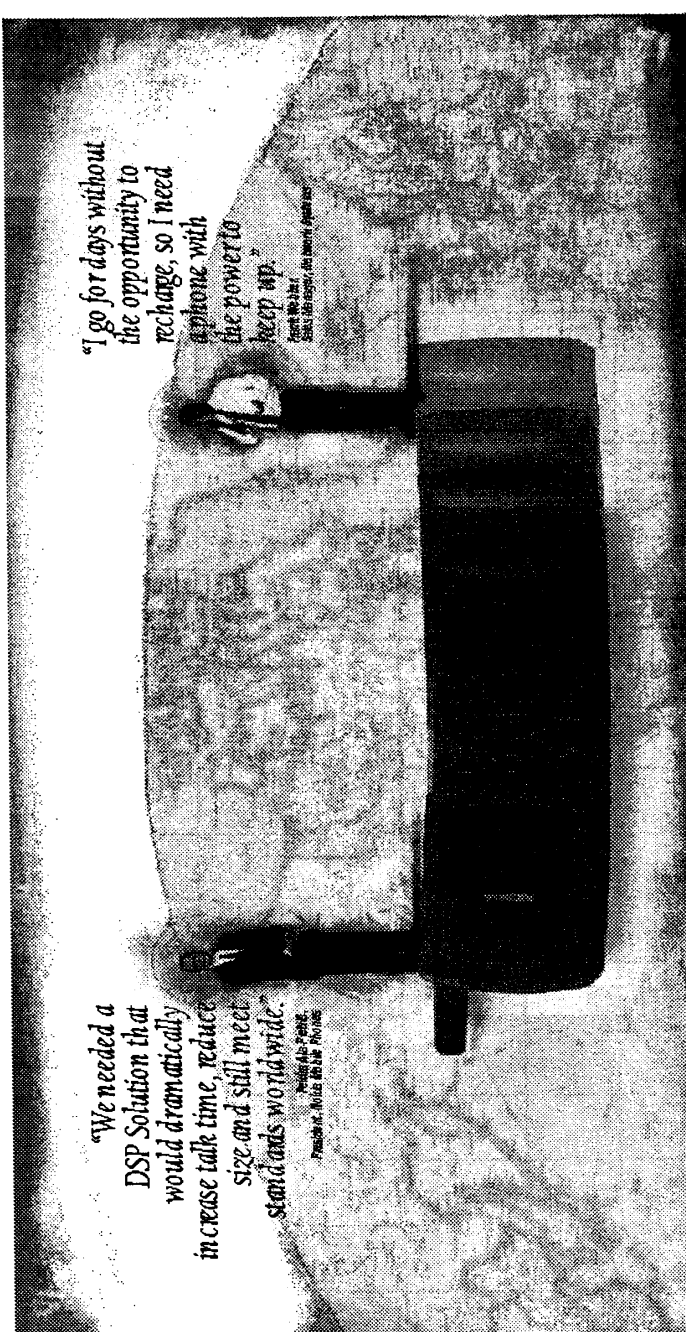
We're bringing together DSP Solutions that sound good to our customers. And theirs.

"We needed a DSP Solution that would dramatically increase talk time, reduce size and still meet standards world-wide."

TI's TMS320C54P
Procesor, 100MHz, 100Kb/s

"I go for days without the opportunity to recharge, so I need the power to keep up."

TI's TMS320C54P
Procesor, 100MHz, 100Kb/s



Maximize your power with DSP Solutions from TI.

Extend your reach.

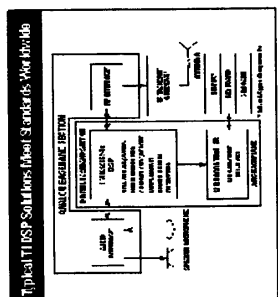
Longer talk and standby times, smaller hardware, global J4A terms. These breakthroughs are coming from leading wireless communications manufacturers like Motorola, and DSP Solutions from Texas Instruments are making them happen.

TI has the key technologies for tomorrow's wireless designs. High performance, low-power DSP and microcontroller cores on a high-density /ASD technology reduce chip count. On-chip memory, including flash, allows reprogrammable DSPs for evolving standards. Breakthrough capabilities with IP protection, global connections and sharing. And software modules which give system operators the power to pull it all together.

The global manufacturing and technical support capabilities of Texas Instruments and its global network of sales and technical support offices in key global markets. So maximize your market power with TI DSP Solutions.

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Typical TI DSP Solution Block Diagram



EXTENDING YOUR REACH

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www.ti.com



Do You Speak Esperanto ?

- | | |
|-----------------------------------|---|
| ■ Analog Cellular | ■ PCS |
| ▼ AMPS, TACS, NMT | ▼ PCS1900, PCS 136+,
PCS CDMA, DCS1800 |
| ■ Digital Cellular | ■ Satellite |
| ▼ GSM, IS54x, IS136,
IS95, PDC | ▼ Globalstar, Iridium, Leo,
Inmarsat ... |
| ■ Analog Cordless | ■ Wireless Data |
| ▼ CT0, JCT, CT1 | ▼ ERMES, CDPD, Mobitex,
Ardis, IEEE802.11,
Pocsag |
| ■ Digital Cordless | |
| ▼ DECT, PHS,
CT2/CT2+, PACS | |
| ■ PMR | |
| ▼ Tetra, Tetrapol, Rubis,
SMR | |

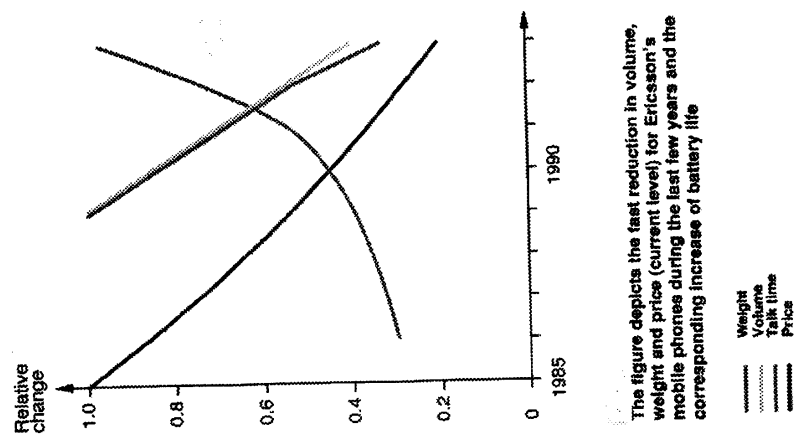


UMTS? FPLMTS?

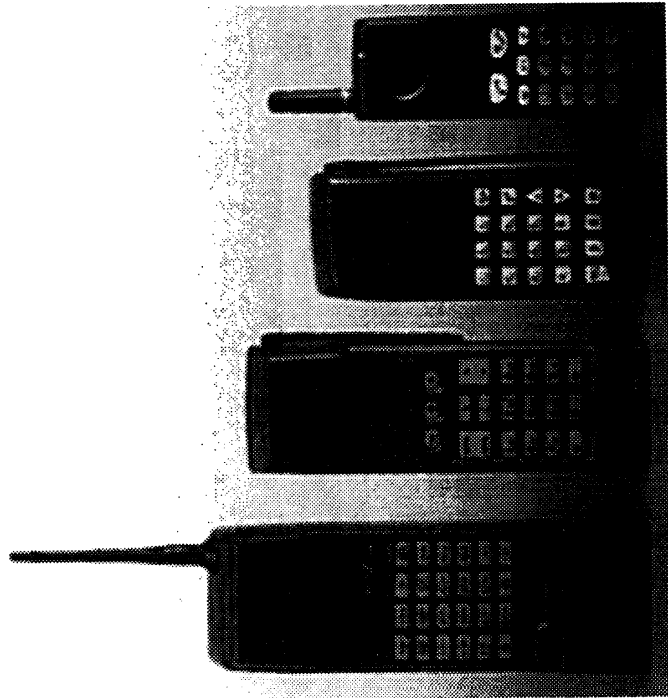
Churchill, with his cigar and his mobile phone

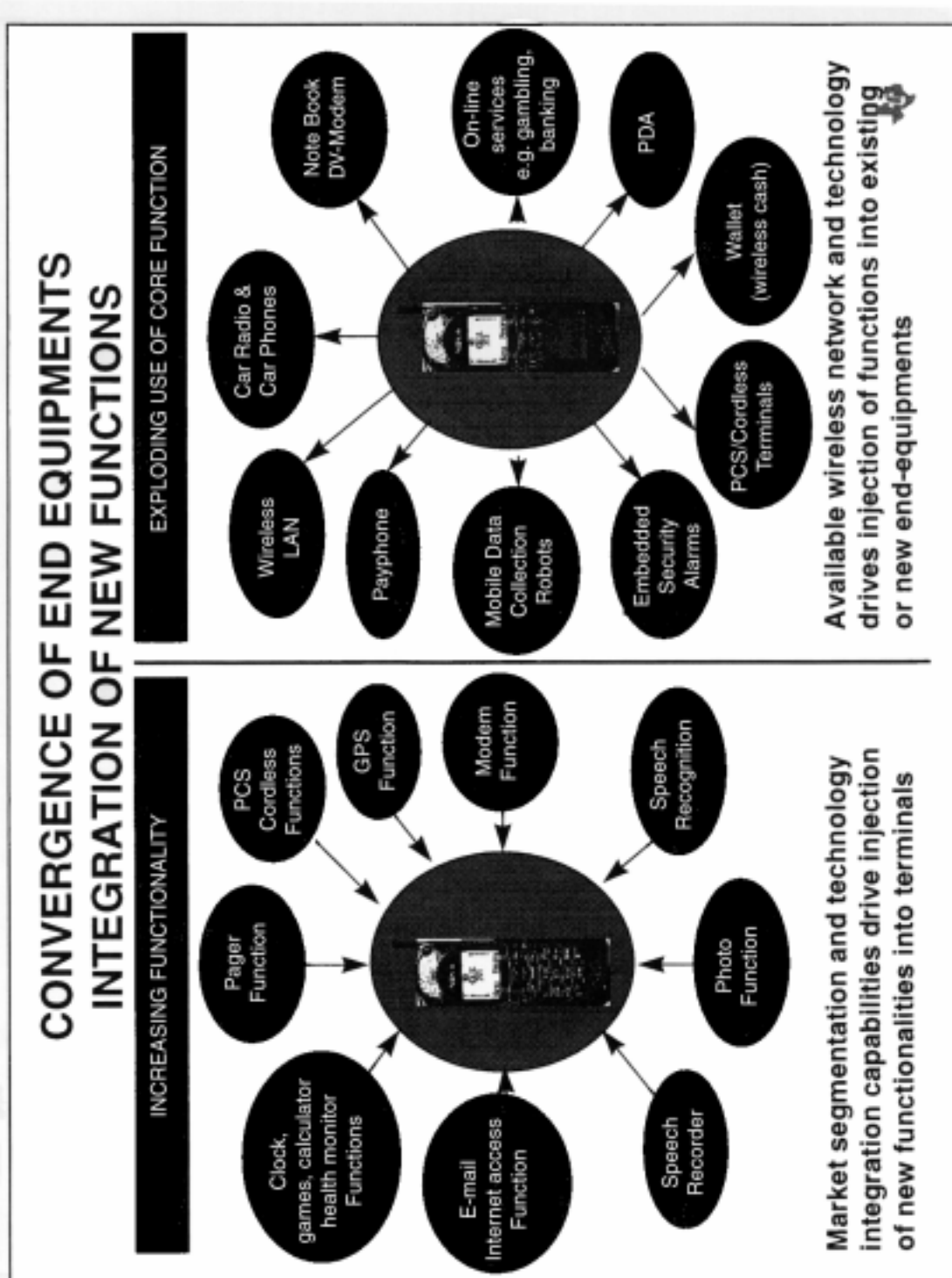


Size, Weight, and Price Decrease while Functionnalities, Talk and Standby times Increase



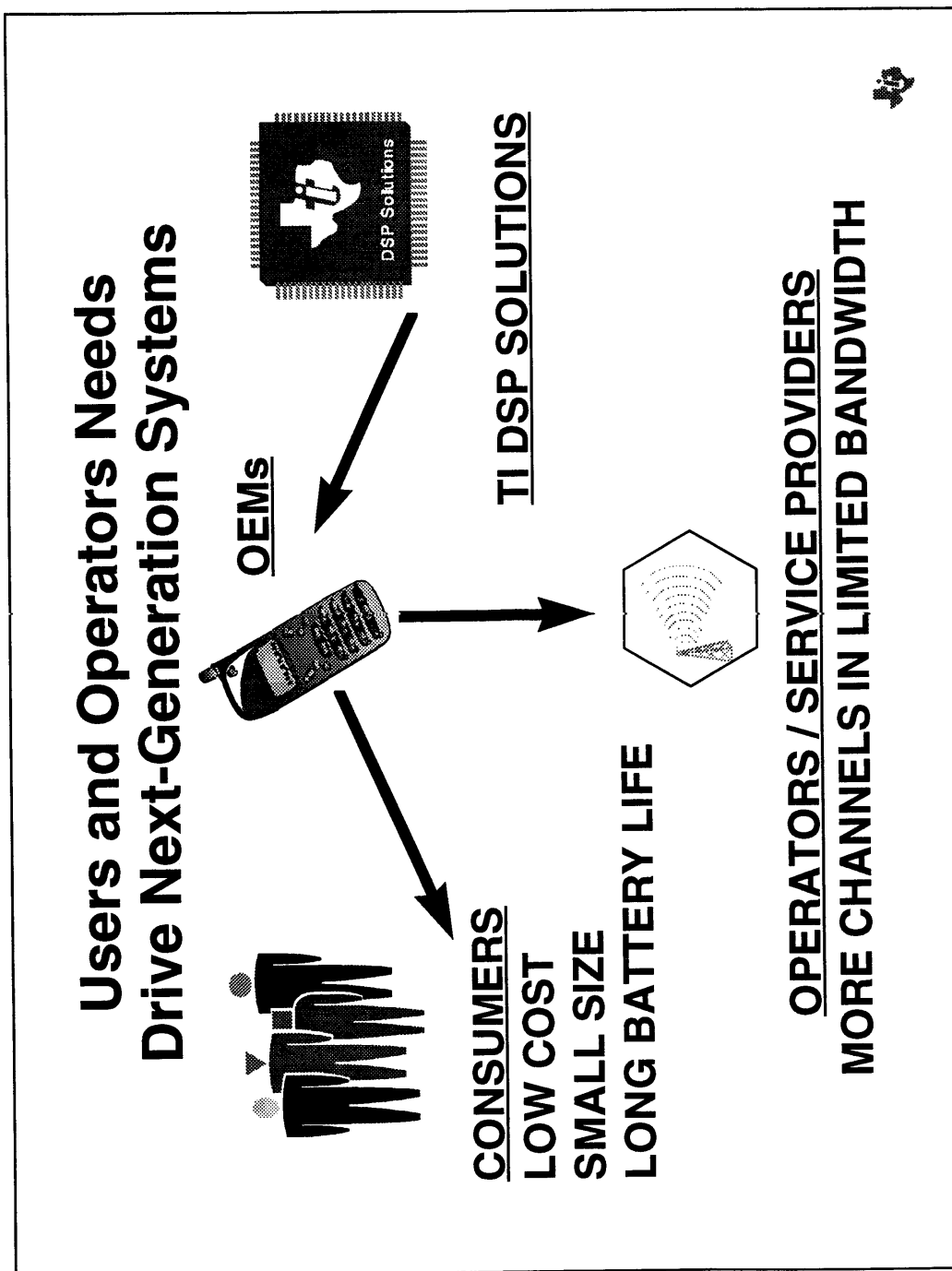
The figure depicts the fast reduction in volume, weight and price (current level) for Ericsson's mobile phones during the last few years and the corresponding increase of battery life

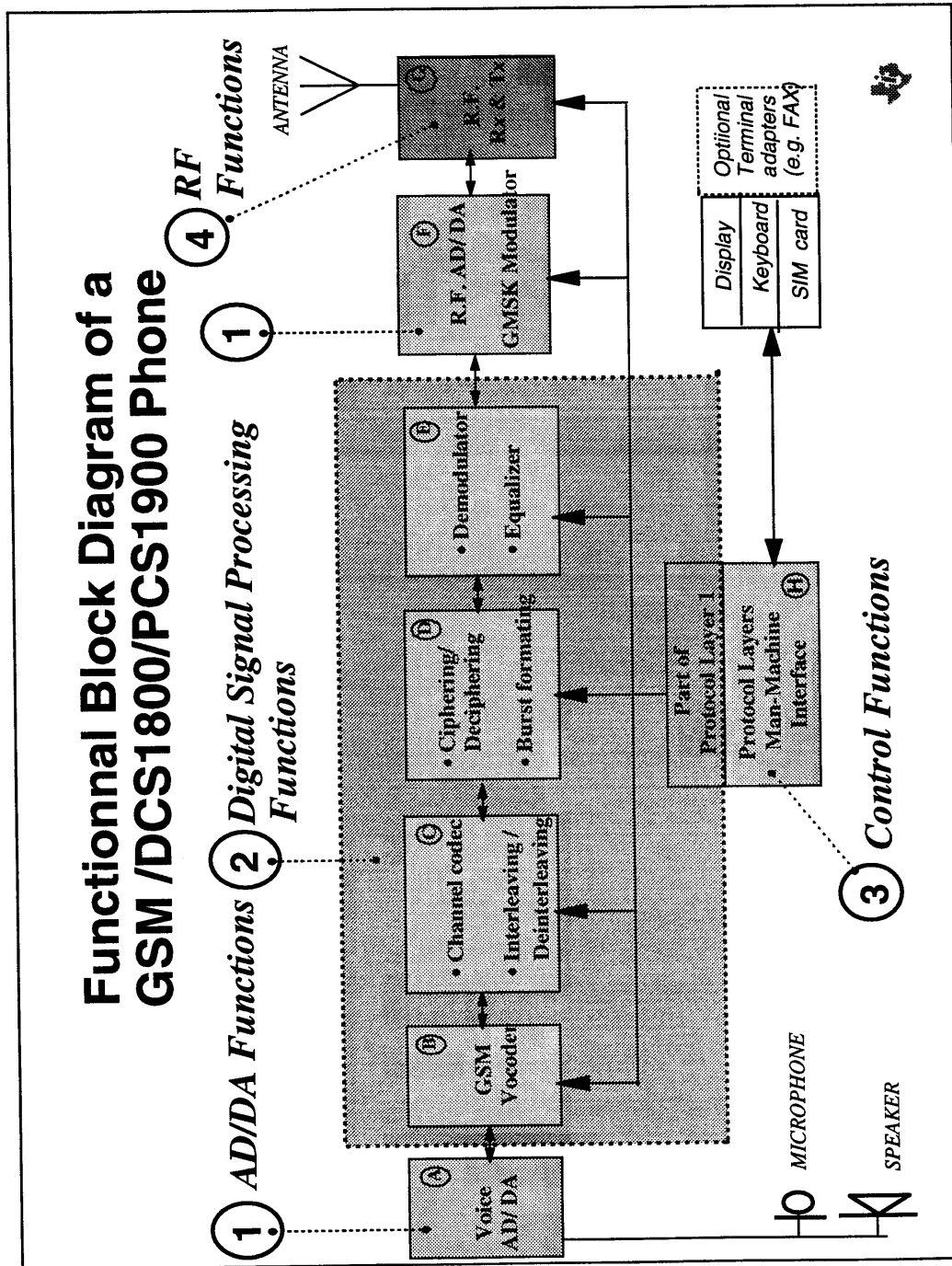




Wireless Coms: What's Next?







Discussion Topics

- ❖ Why are multimode terminals valuable in the wireless world?
- ❖ Which combinations make the most commercial sense?
- ❖ What are the impacts and efficiencies of combining multiple modes in a single handset?
- ❖ What options can semiconductor manufacturers offer to mitigate the multimode impact?





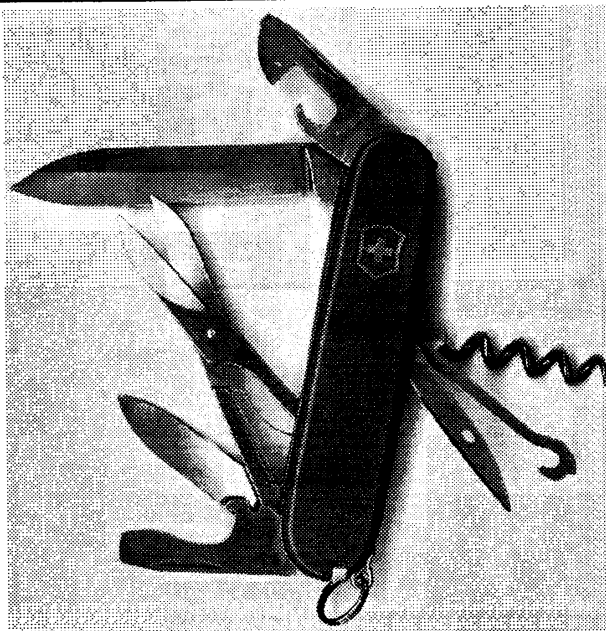
**During the day:
Different environments, different services needed**

- **At Home**
 - Private indoor access point
 - ▾ low-power transmitter and very good audio quality
- **On the way to the Office**
 - Public cellular system adapted to vehicle speed
 - ▾ Medium to high power transmitter, good audio quality is acceptable
- **At the Office**
 - Company facilities access to Wireless PBX
 - ▾ low-power transmitter, good to very good audio+data



Key Combinations

- ❖ **Public/Private Combinations**
 - ◆ **GSM Based Combinations**
 - ◆ GSM 900 plus DECT
 - ◆ DCS 1800 plus DECT
 - ◆ PCS 1900 plus DECT
 - ◆ PCS 1900 plus ISM cordless
 - ◆ PCS 1900 plus AMPS
 - ◆ **Other Technologies**
 - ◆ AMPS based “Telego” service
 - ◆ IS 136 Home Basestation
 - ◆ IS 95 Home Basestation





One Concept, Three Motivations

Small Cells and Large Cells: Why?

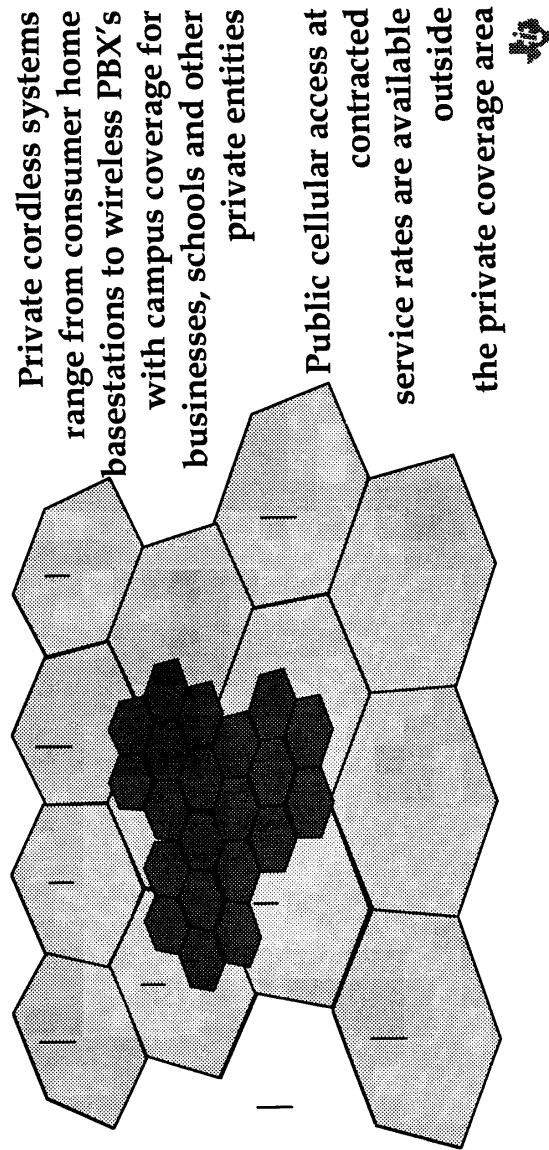
❖ (User)

1. Air time free (private) or not (public)



Public /Private Systems Allow Users to Manage Airtime Costs

- ❖ Multimode terminals allow users to use cordless service without airtime charge and public cellular when out of cordless coverage





One Concept, Three Motivations

Small Cells and Large Cells: Why?

❖ (User)

1. Air time free (private) or not (public)

❖ (Service Provider)

2. Extend service area

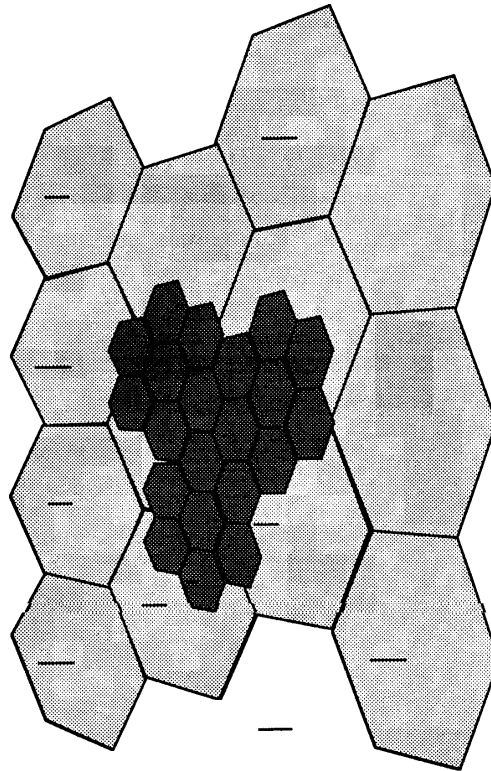
❖ (Both)

3. Ultimate (global) coverage



Small Coverage/Large Coverage Combinations

New services based on high capacity, small cell technology can offer expanded coverage via multimode phones that “roam” to the established large cell service once the user has crossed out of the home system.





One Concept, Three Motivations

Small Cells and Large Cells: Why?

❖ (User)

1. Air time free (private) or not (public)

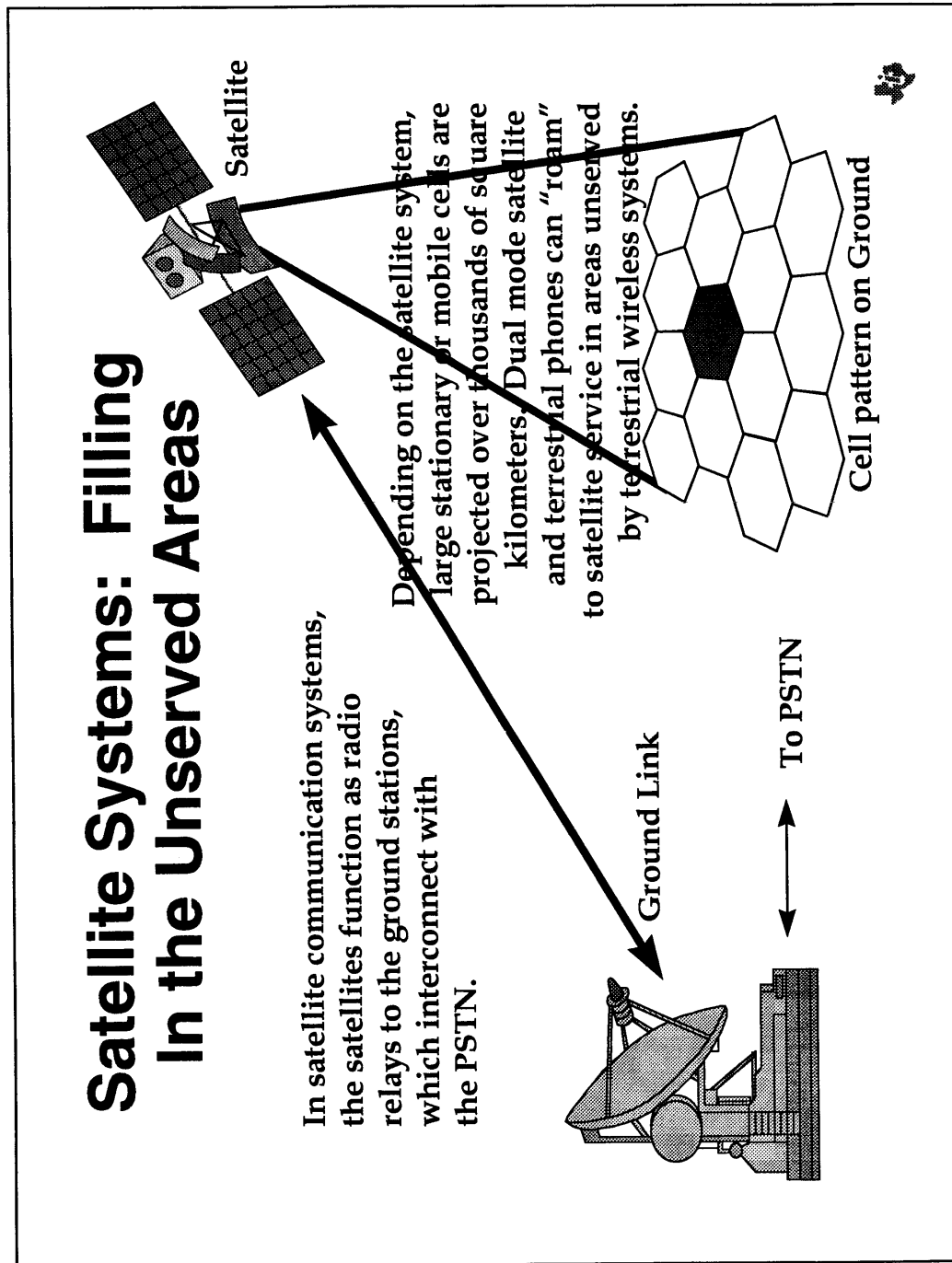
❖ (Service Provider)

2. Extend service area

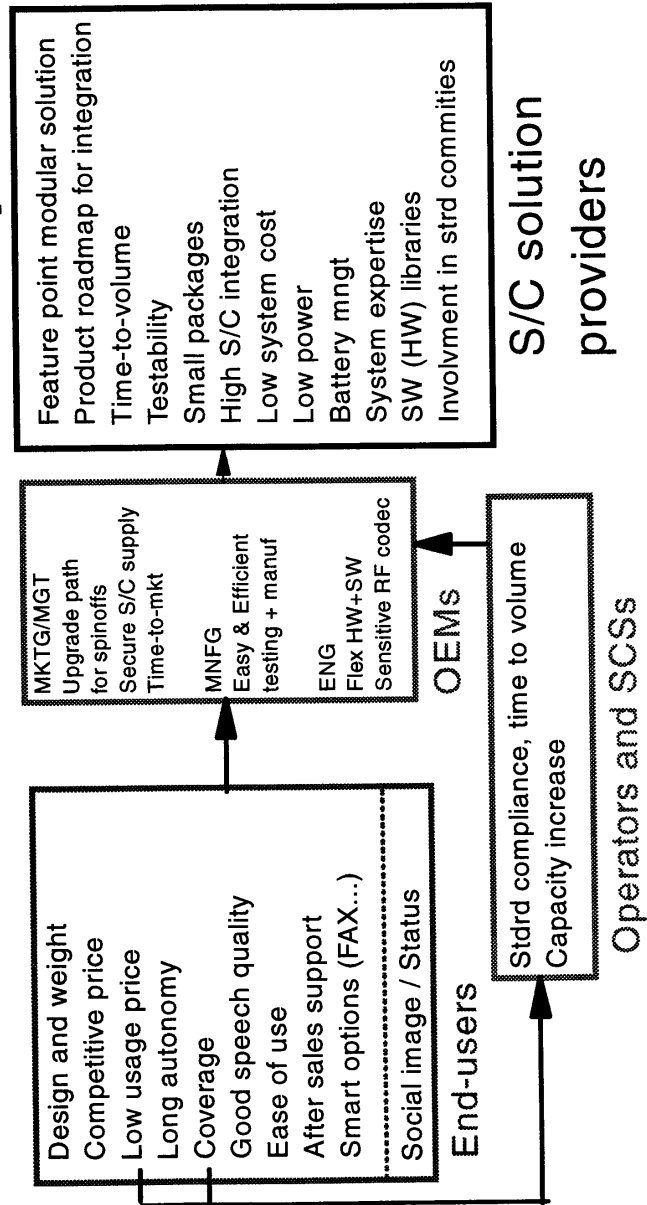
❖ (Both)

3. Ultimate (global) coverage





The Careabouts and their Impact



The needs for multimode terminals and their impacts

- **THE NEEDS:**
 - Diversity of standards
 - Indoor, Outdoor, Private, Business
 - Different environments, different services, Different access technologies
- **THE IMPACTS:**
 - Soft Terminals
 - Soft Bases stations
 - Integration of interoperability
 - Roaming,
 - Handover at different speeds
 - Billing
 - Authentication
 - Type approval issues
 - Frequency licensing issues
 - Economics





Preserving competitive price, form-factor and...

Technological area	Issues for multimode
Antenna	multi-band integration
Radio	Multi-band Multi-bandwidth
Baseband	Soft platform, DSP+MCU+ASIC integration, Support of multiple vocoders, modulation schemes, etc.
MMI	Ease of use of multimode Transparency to user
Algorithms	Power savings and ctrl Best access technology selection and download
Software	Multi-standard management

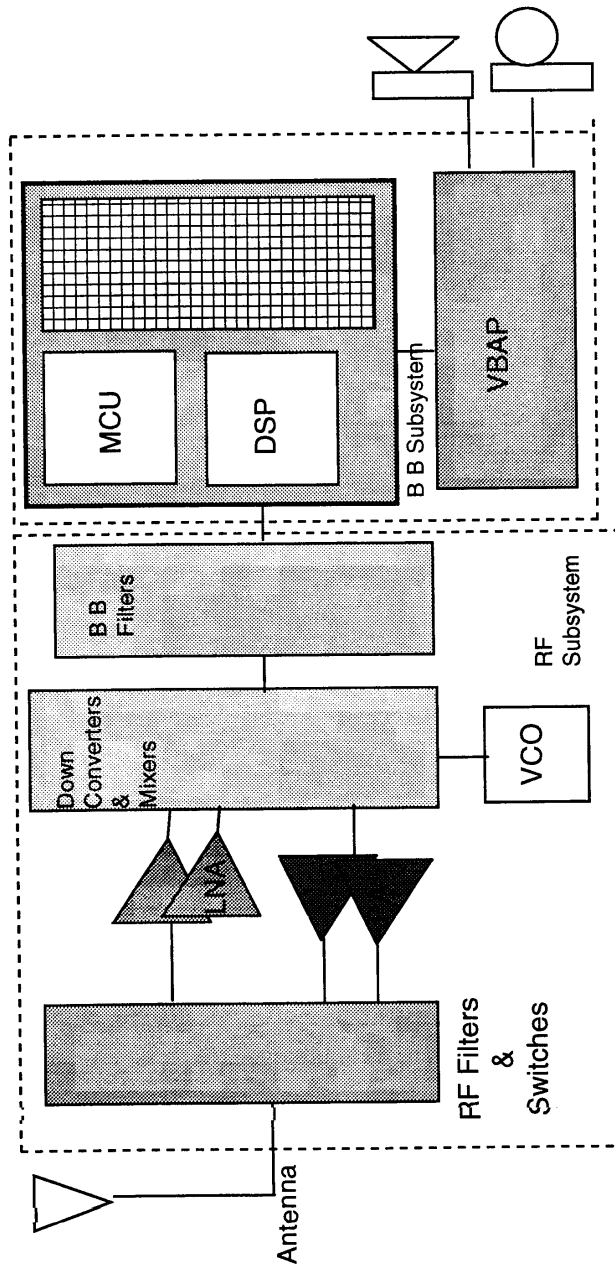


Flexible Handset Architecture Approaches

- ❖ Multimode design strategy requires *hardware reuse* where possible
 - ◆ RF subsystems need to accommodate broad ranges or dual band operation
 - ◆ RF and Voice Band Codecs can be unaffected with proper system design
 - ◆ Digital Baseband must accommodate software for each mode (more memory)
 - ◆ Microcontroller must process a superset of system commands and must be capable of “preferring” one service over the other



Multimode Terminal: Architecture Proposal



Example Implementation - GSM plus DECT

- ❖ Typical DECT is simple with a few integrated components
- ❖ GSM utilizes DSP and Microprocessor
- ❖ Multimode terminal uses GSM processors to implement DECT functions
- ❖ While some integration is possible, it is mainly a dual radio with a single baseband
- ❖ Microcontroller must automate the preference for DECT when it is available
- ❖ Final result is slightly more complex and more costly than GSM alone





Summary and Conclusions

- ❖ **Multimode terminals do have a place in the current wireless communications marketplace which will grow in the next few years**
- ❖ **The combinations that make sense will be ones where the economic value to end customers overcomes the increased cost introduced by multimode operation**
- ❖ **Product planning that takes advantage of DSP and advanced microprocessor abilities to support multimode operation in software will mitigate the impact of multimode terminal inefficiency and reduce the barrier to successful product introduction**

