IEEE P802.11
Wireless Access Method and Physical Layer

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TITLE: Wireless In-Building Network Market Considerations

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SUMMARY

In the past year, there have been a plethora of announcements regarding new wireless initiatives. To the casual observer, programs such as WIN (Wireless In-building Network), CT-2 (Cordless Telephone-2), DECT (Digital European Cordless Telephone), and PCN (Personal Communications Network) represent an "alphabet's soup" of technology acronyms. Because these programs are wireless, there is a tendency to view these programs as direct competitors. However, a deeper look at the applications would indicate that some of these systems may in fact be complementary solutions that offer targeted price/performance levels to different economic classes of customer.

The applications of wireless to in-building communications are many and varied. One single solution will not optimize all applications; in fact, such a proposed solution will penalize each attempted served application through lower performance and higher cost, and will fail against focused, function-specific product alternatives.

The wireless systems finding success will be those that most precisely meet the application requirements of a chosen customer segment. Each wireless application has trade-off considerations in performance, capacity, cost, supported equipment types, domain of coverage, protection from interference, and ease of implementation. In any standards effort, it is crucial to first properly define the served application so that the appropriate trade-offs can be assessed and agreed-upon. This contribution attempts to shed some light on the various market considerations relative to wireless in-building networks.

"USERS MAY NOT KNOW IT, BUT ONE OF THE SINGLE BIGGEST EXPENSES IN THEIR COMMUNICATIONS BUDGET IS WIRING--MOSTLY LABOR TO KEEP THINGS WORKING RIGHT"

Jerry McDowell
McDowell Romero & Assoc.
"Worth Noting" Column
Network World

IN-BUILDING COMMUNICATIONS PROBLEMS

- THE WIRING LINK BETWEEN THE DESK AND ASSOCIATED VOICE AND DATA NETWORKS ONE OF THE BIGGEST PROBLEMS FACED BY NETWORK MANAGERS
- SIGNIFICANT INHIBITOR TO MORE EFFECTIVE PERSONNEL DEPLOYMENT IN ORGANIZATIONS
- INSTALLATION AND CONTINUOUS RE-WIRING FOR MOVES/ADDS/CHANGES VERY COSTLY
- PRODUCTIVITY LOSSES DUE TO COMMUNICATIONS "DOWN-TIME"
- PROBLEMS BECOME EVEN MORE ACUTE WITH FURTHER PENETRATION OF PCs IN THE OFFICE
- BOTTOM LINE: GREATER DEGREE OF FLEXIBILITY AND EXPENSE REDUCTION IN THE USE AND MOVEMENT OF EQUIPMENT IN THE WORKPLACE IS CRUCIAL

MARKET NEEDS OVERVIEW

- **HARD WIRED IN-BUILDING COMMUNICATION NETWORKS ARE EXPENSIVE, TIME-CONSUMING, AND FRUSTRATING TO:**

  --INSTALL

  --MAINTAIN

  --MOVE AND CHANGE

MARKET NEEDS OVERVIEW

- **INSTALLATION**

  --COST CRISIS

  --NO DOCUMENTATION, WIRE RE-USABILITY UNCERTAIN

  --WIRE OFTEN HAS TO BE RERUN

  --FACILITIES DELAYS PROCESS

  --OLDER BUILDINGS NOT DUCTED

  --OVERFLOWING WIRE TROUGHS

MARKET NEEDS OVERVIEW

- **MAINTENANCE**

  --NO DOCUMENTATION

  --SYSTEMS BROUGHT DOWN BY WIRING FAULTS

  --FAULTS CAUSE MORE THAN 50-% OF SYSTEM FAILURES

MARKET NEEDS OVERVIEW

- MOVES AND CHANGES

  --WIRE OFTEN HAS TO BE RE-RUN

  --CHANGE ORDERS TAKE UP TO 8 WEEKS

  --DOWNTIME FOR CHANGES = PRODUCTIVITY LOSSES

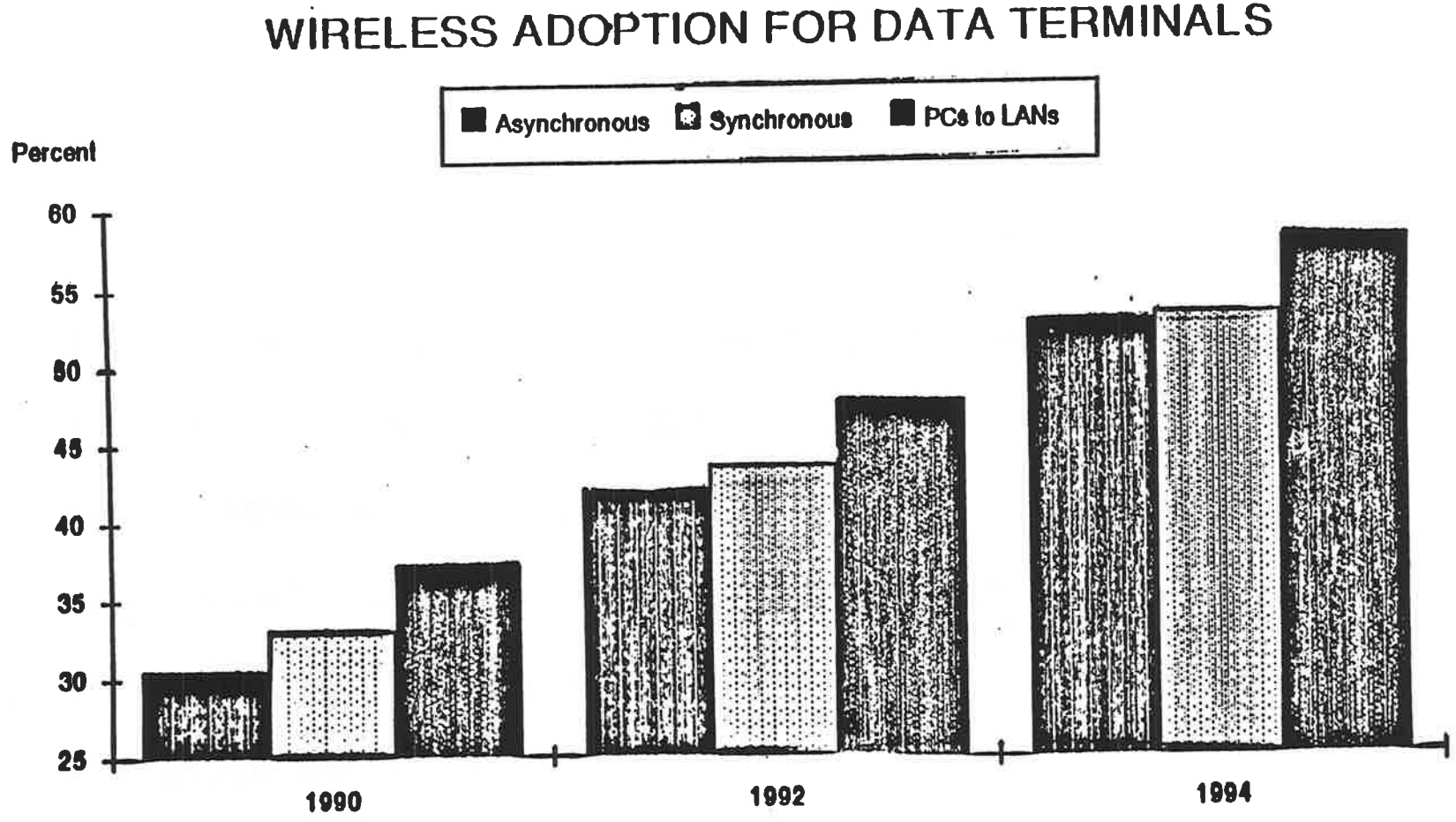
  --DATA TERMINALS MOVED FREQUENTLY

  --COST PER CHANGE = $200 TO $3000

  --WIRING INVESTMENT LEFT BEHIND--MUST SPEND AGAIN

MARKET NEEDS OVERVIEW

- **CUSTOMERS EXPRESS HIGH DEMAND FOR WIRELESS CONNECTIVITY...**



SOURCE: Motorola Market Study

MARKET NEEDS OVERVIEW

- ...BUT WILL NOT SACRIFICE TO ENJOY WIRELESS FLEXIBILITY BENEFITS

  --SPEED PERFORMANCE EQUAL TO/BETTER THAN WIRE

  --NO LOG-ON REQUIREMENTS, CHANGES TO HARDWARE/SOFTWARE

  --COMPATIBILITY WITH EXISTING WIRED NETWORKS AND COMPUTER/COMMUNICATIONS DEVICES

  --RELIABLE, SECURE, COST EFFECTIVE

IN-BUILDING BUSINESS REQUIREMENTS

- **WIDE RANGE OF NEED**

  --INCREASING DEPARTMENTAL RECONFIGURATIONS

  --DRAMATIC GROWTH IN PCs/HIGH SPEED LANs

  --LITTLE INTEREST IN ON-PREMISE PORTABILITY

  --LITTLE INTEREST IN ALLOWING OFF-PREMISE USE

WIRELESS CONNECTIVITY ISSUES

- THERE IS A TENDENCY TO LOOK AT VOICE COMMUNICATIONS AS UNIFORM, AS WELL AS DATA COMMUNICATIONS

  --"THEY ARE BOTH DIGITIZED DATA SO THERE'S NO PROBLEM SUPPORTING THEM"

- DIVERSITY OF CONNECTION TYPES, TRAFFIC REQUIREMENTS FOR VOICE, DATA, AND VOICE/DATA

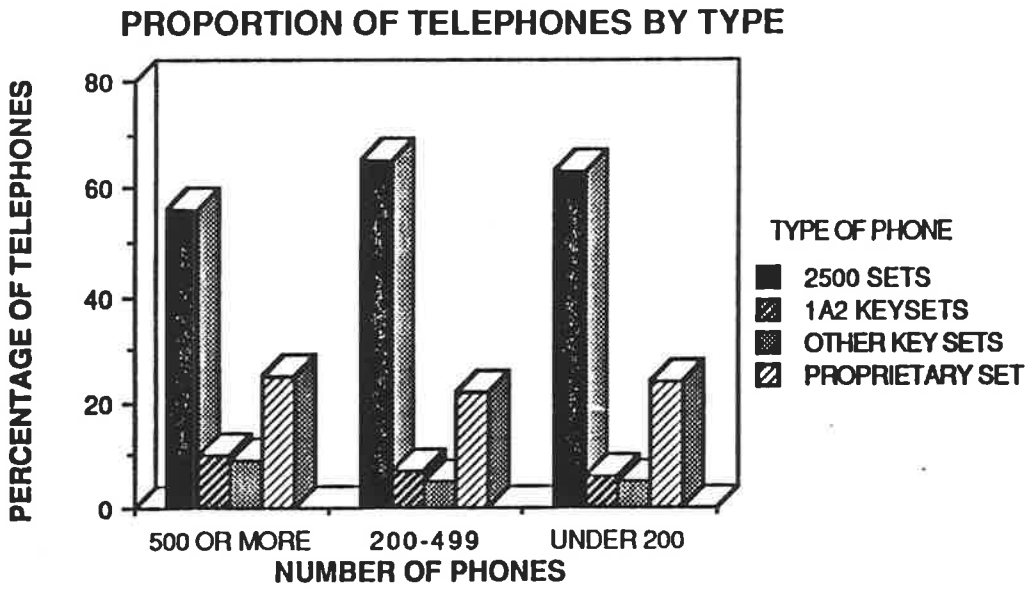
DATA SUPPORT ISSUES

- PC TYPES
  - - IBM PC AND COMPATIBLES
  - - PS/2
  - - MACINTOSH
- TERMINAL TYPES
  - - ASYNCHRONOUS "DUMB" TERMINALS
  - - IBM "3270" TERMINALS
- HOST COMPUTERS
  - - IBM
  - - DEC
  - - OTHERS
- LOCAL AREA NETWORKS
  - - ETHERNET
  - - TOKEN RING
  - - APPLE TALK
  - - OTHER PROPRIETARY LANS

VOICE SUPPORT ISSUES

- PHONES
  - -- SINGLE LINE PHONES
  - - - 1A2 KEYSETS
  - -- ELECTRONIC KEYSETS ON ELECTRONIC KEY SYSTEMS
  - -- FEATURE PHONES ON PBXS
  - - - ISDN SETS
- VOICE SYSTEMS
  - - - KEY SYSTEMS
  - - - HYBRIDS
  - - - PBXS
  - - - CENTREX

TELEPHONE DEVICE DEMOGRAPHICS/IMPLICATIONS



SOURCE: Motorola Market Study

IMPLICATION:

ALTHOUGH A CUSTOMER MAY HAVE 60% SINGLE LINE PHONES AT HIS SITE, THESE PHONES ARE OFTEN MIXED-IN WITH MULTI-LINE AND PROPRIETARY PHONES.

DESKTOP EQUIPMENT U.S.-1990

- IBM SYNCHRONOUS TERMINALS
  OVER 10 MILLION INSTALLED

- ASYNCHRONOUS TERMINALS
  OVER 7 MILLION INSTALLED

- PERSONAL COMPUTERS AND LOCAL AREA NETWORKS
  OVER 30 MILLION INSTALLED

- TELEPHONE SETS
  OVER 38 MILLION INSTALLED

MICROCELL ARCHITECTURES

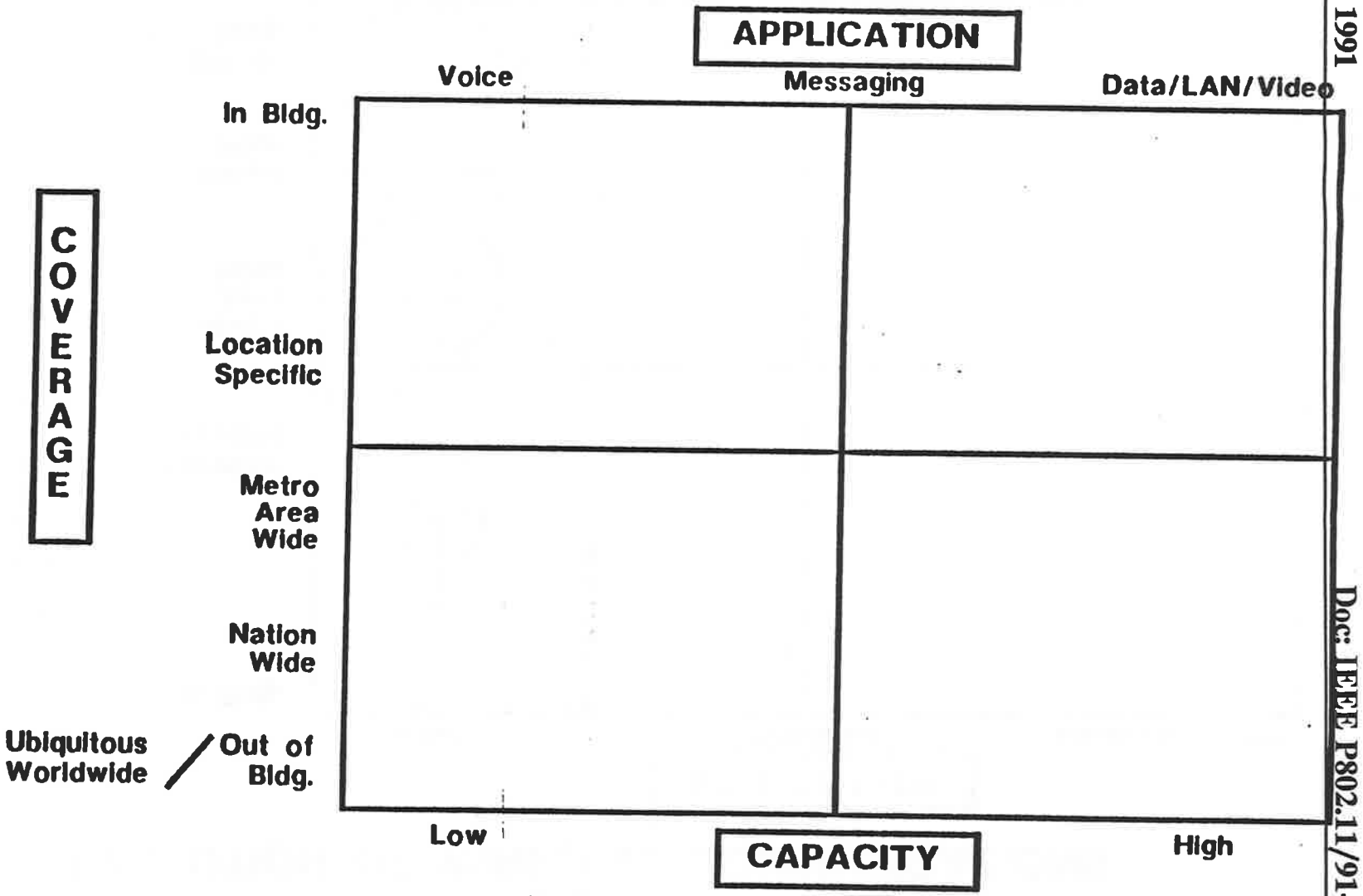
Optimized For More Defined and Focused Coverage Areas

- Department
- Floor
- Entire Building
- City Block

A Number of Micro-Cell Alternatives Will Be Available, Based On:

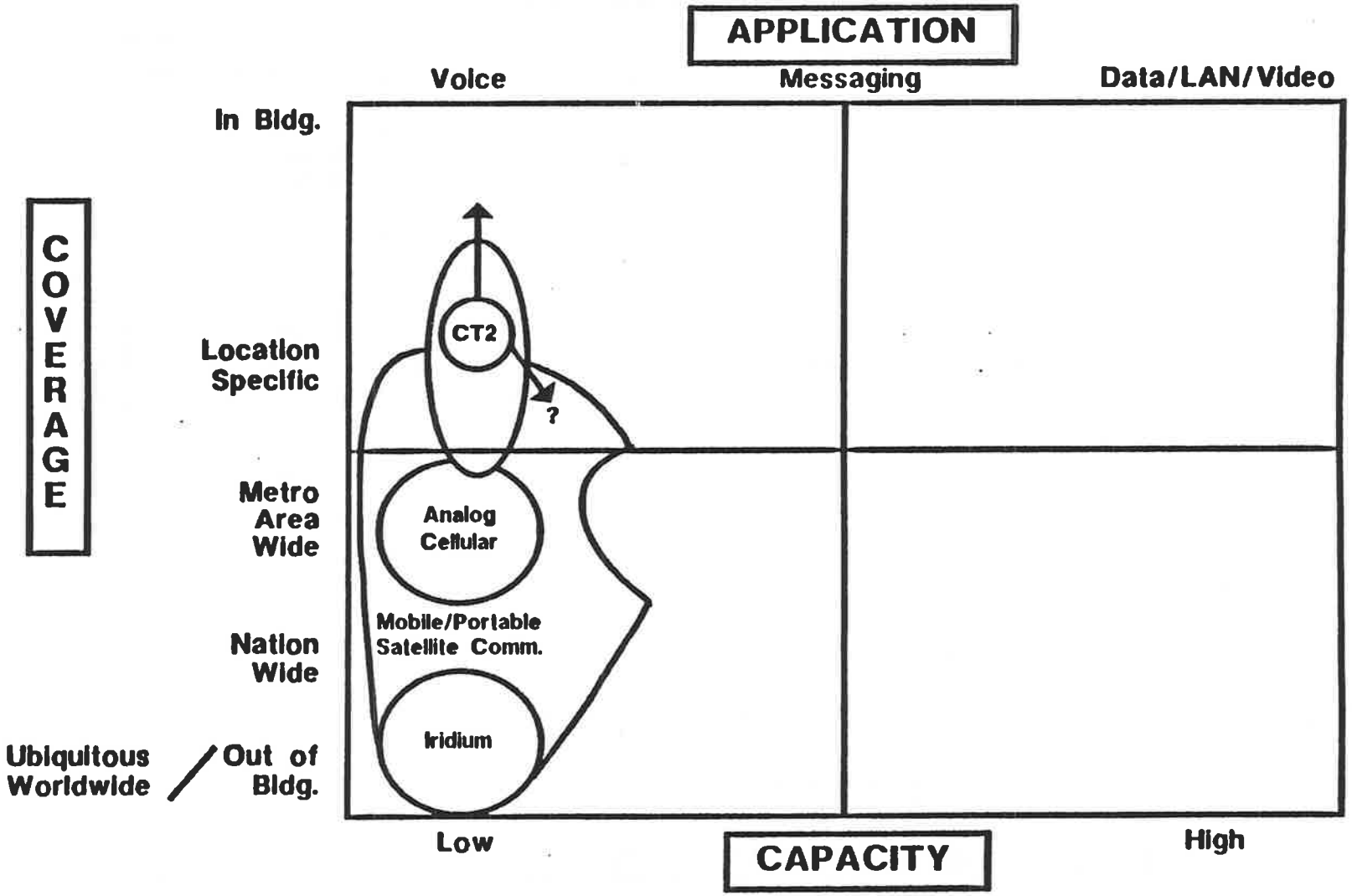
- Coverage Area Requirement
- Voice/Data Densities and Usage
- Frequency Availability

EVOLUTION OF WIRELESS COMMUNICATIONS



NOTE: Coverage is defined as Network Access Location

EVOLUTION OF WIRELESS COMMUNICATIONS



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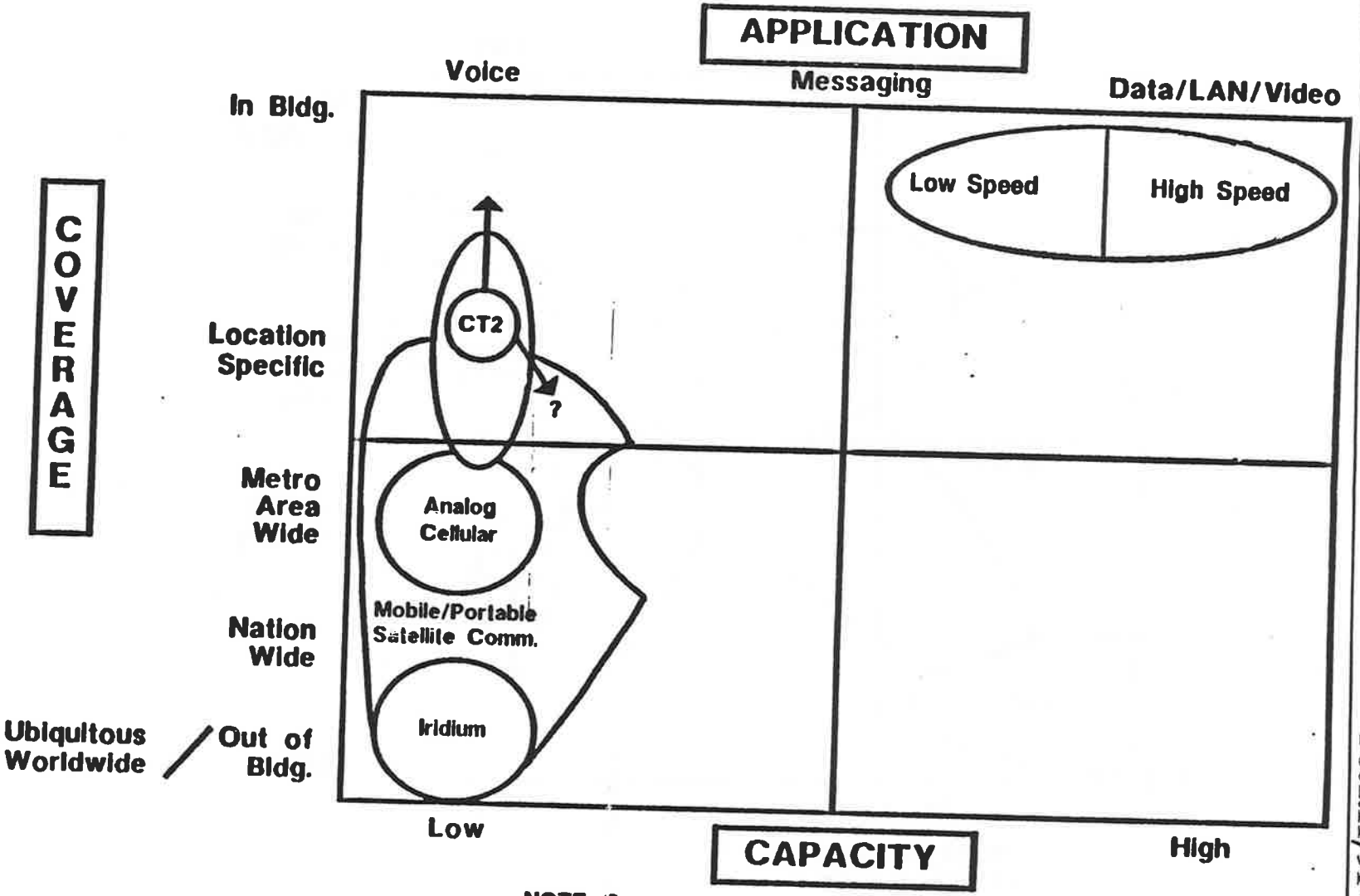

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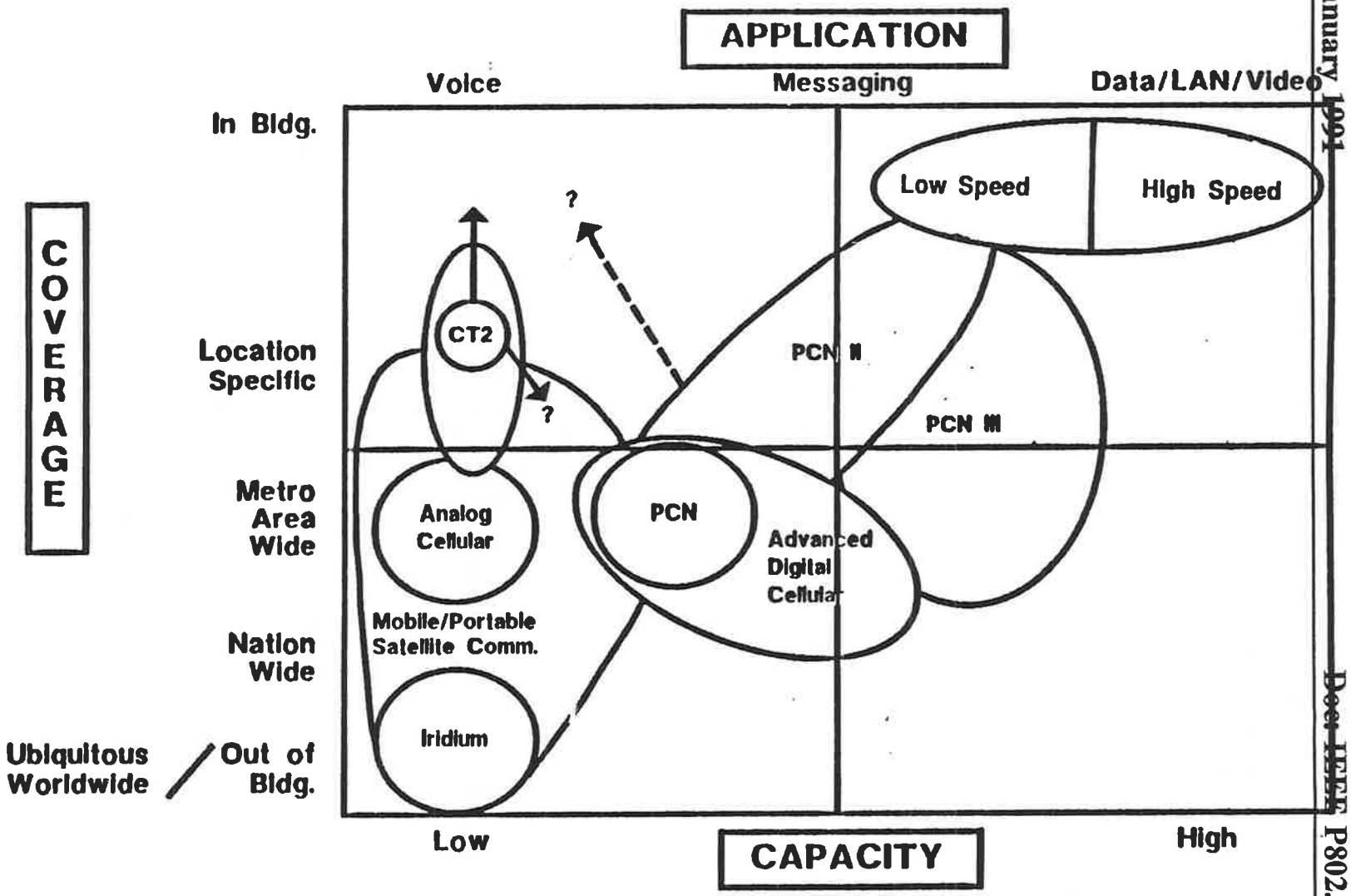

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CHALLENGE OF COMBINED CAPABILITIES

CHARACTERISTIC	WIDE AREA	IN-BUILDING
CONTROL OF RF	NONE	SOME (> w/ hi freq.)
POWER	HIGH	LOW
"TALK" TIME	LOW	HIGH
LOCATING USER	MORE DIFFICULT	LESS DIFFICULT
USER DENSITY/CAPACITY	LOW	HIGH (> w/ hi freq. & coord.)

LICENSED VS UNLICENSED ISSUES

- SEVERAL "MISCONCEPTIONS" ABOUT LICENSED SERVICE

  MISCONCEPTION 1: "There will be a fee to the 'Private Carrier'".

  --PART 94 OF FCC RULES SPECIFICALLY CREATED SO SYSTEMS COULD BE OPERATED PRIVATELY.
  --PART 94 RULES DO NOT PERMIT CHARGING FOR AIRTIME

  MISCONCEPTION 2: "Licensing is a burden to the customer."

  --LICENSING IS A BURDEN FOR THE CUSTOMER ONLY IF THE MANUFACTURER DOES NOT MAKE THE INVESTMENT NOR COMMITMENT TO MAKING IT PAINLESS FOR THE CUSTOMER.

- LICENSED SERVICE BENEFITS

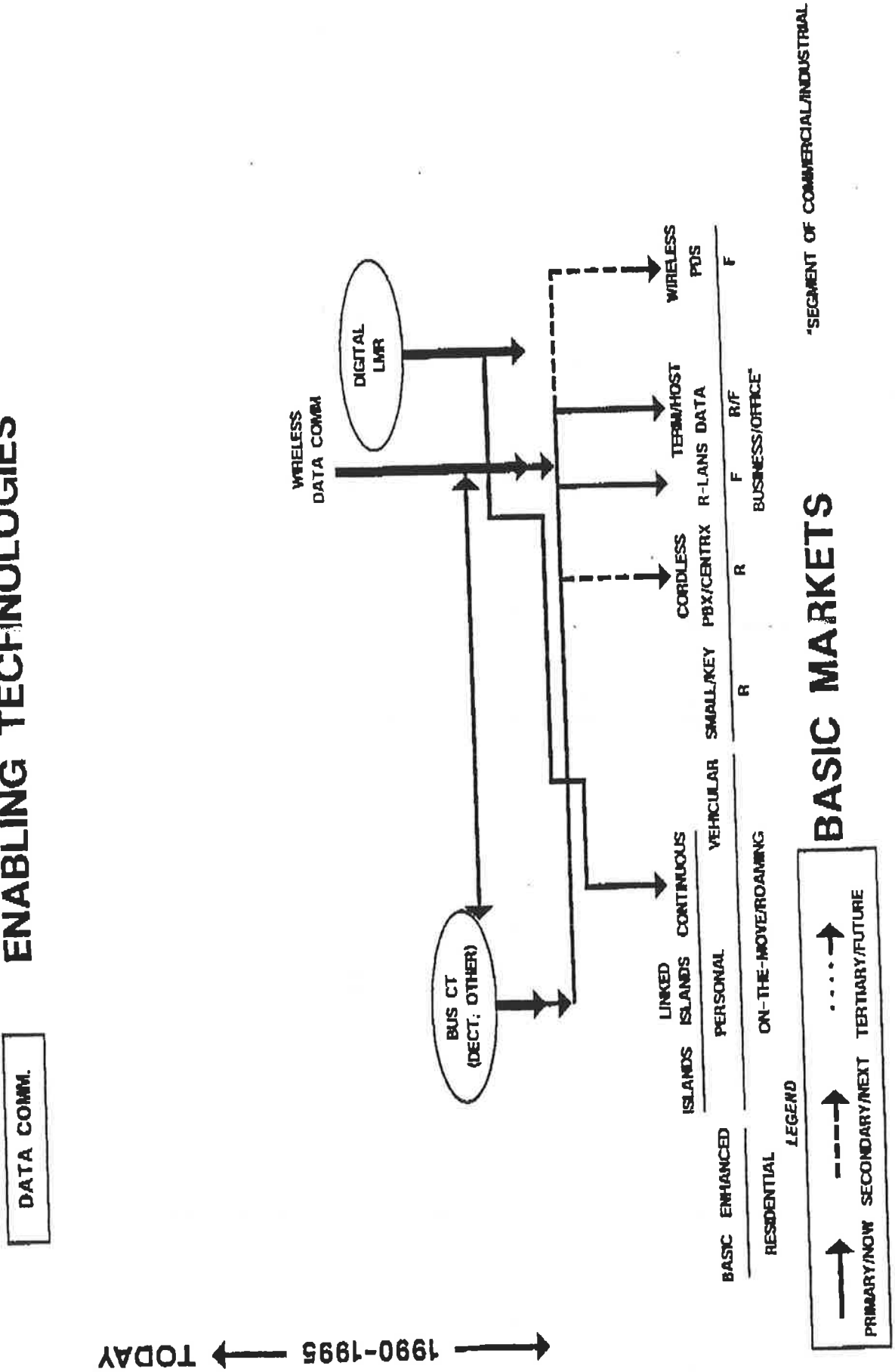
  --FREQUENCIES ARE MANAGED SUCH THAT FREQUENCIES CAN BE RE-USED OVER AND OVER, ENABLING VERY HIGH CAPACITY

  --FREQUENCIES ARE MANAGED SUCH THAT INTERFERENCE IS MINIMIZED--UNLICENSED AFFORDS NO SUCH PROTECTION TO THE CUSTOMER

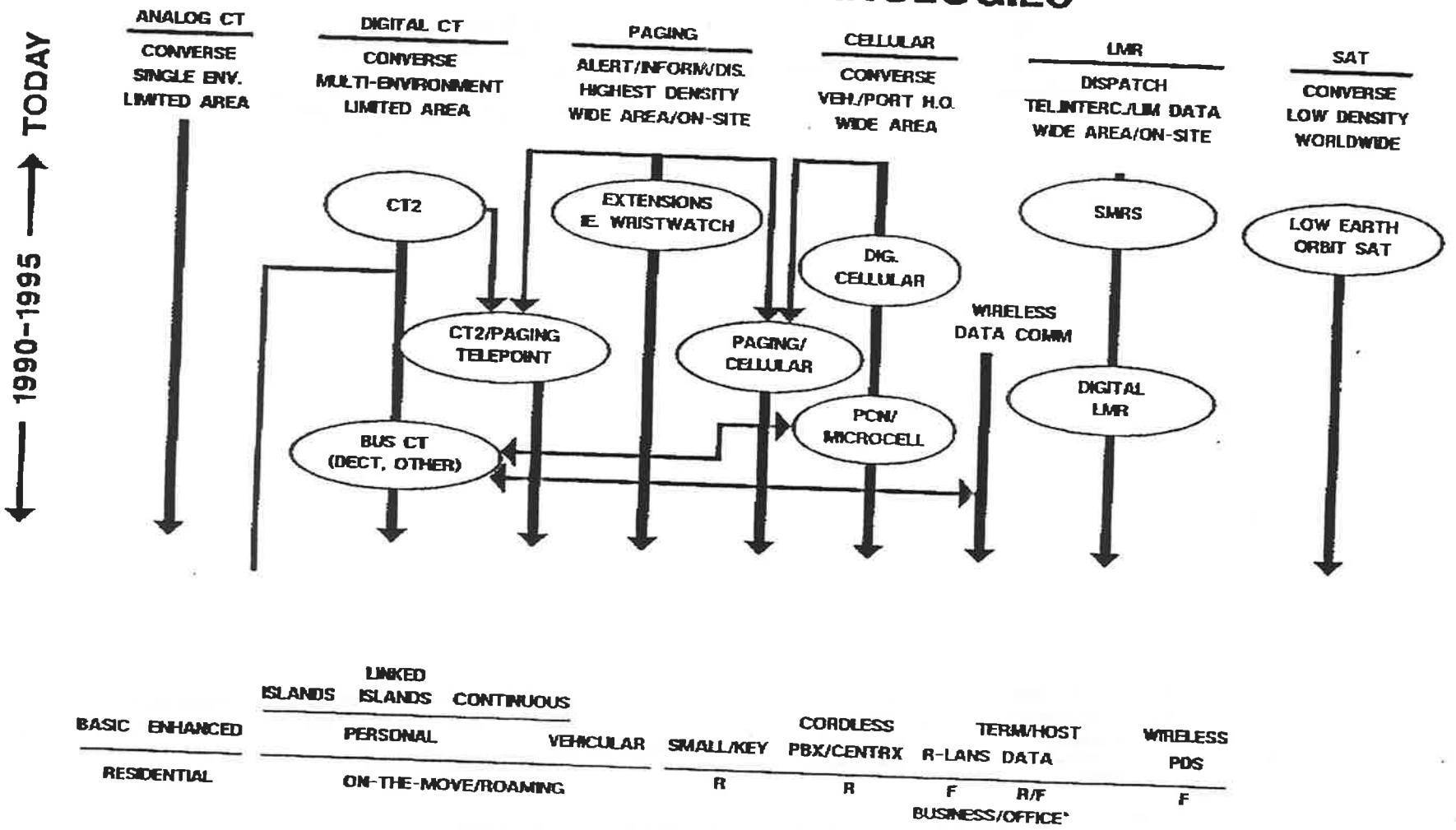
CONCLUSIONS FOR STANDARDS EFFORTS

- NO "SINGLE" DATA SOLUTION
- DIFFERENCES IN APPLICATIONS IMPACT WIRELESS TECHNOLOGY AND PRODUCT CHARACTERISTICS
- SPECIFIC DEFINITION OF SERVED APPLICATION FOR STANDARD IS KEY
- TRADE-OFF CONSIDERATIONS OF CHOSEN APPLICATION MUST BE ASSESSED

  --LOW SPEED VS HIGH SPEED DATA
  --CAPACITY/DENSITY OF SUBSCRIBERS
  --DOMAIN OF COVERAGE: WORK GROUP/FLOOR/BUILDING/METRO AREA, ETC.
  --COMPATIBILITY WITH EXISTING WIRED NETWORKS
  --EASE OF IMPLEMENTATION
  --PROTECTION FROM INTERFERENCE
  --SECURITY
  --LICENSING BENEFITS
  --COST


ENABLING TECHNOLOGIES
DATA COMM.
1990-1995
TODAY
WIRELESS DATA COMM
DIGITAL LMR
BUS CT (DECT; OTHER)
WIRELESS PDS
TERM/HOST
R-LANS DATA
CORDLESS PBX/CENTRX
R/F BUSINESS/OFFICE
"SEGMENT OF COMMERCIAL/INDUSTRIAL
BASIC MARKETS
LINKED ISLANDS
CONTINUOUS
VEHICULAR
SMALL/KEY
R
F
R
F
ISLANDS
PERSONAL
ON-THE-MOVE/ROAMING
BASIC ENHANCED
RESIDENTIAL
LEGEND
PRIMARY/NOW SECONDARY/NEXT TERTIARY/FUTURE

ENABLING TECHNOLOGIES



BASIC MARKETS

*SEGMENT OF COMMERCIAL/INDUSTRIAL

ENABLING TECHNOLOGIES

TODAY

ANALOG CT	DIGITAL CT	PAGING	CELLULAR	LMR	SAT
CONVERSE SINGLE ENV. LIMITED AREA	CONVERSE MULTI-ENVIRONMENT LIMITED AREA	ALERT/INFORM/DIS. HIGHEST DENSITY WIDE AREA/ON-SITE	CONVERSE VEH/PORT H.O. WIDE AREA	DISPATCH TELINTERC./LIM DATA WIDE AREA/ON-SITE	CONVERSE LOW DENSITY WORLDWIDE

		LINKED							
	ISLANDS	ISLANDS	CONTINUOUS			CORDLESS		TERM/HOST	WIRELESS
BASIC ENHANCED	PERSONAL			VEHICULAR	SMALL/KEY	PBX/CENTRX	R-LANS	DATA	PDS
RESIDENTIAL	ON-THE-MOVE/ROAMING				R	R	F	R/F	F
							BUSINESS/OFFICE*		

BASIC MARKETS

*SEGMENT OF COMMERCIAL/INDUSTRIAL