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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
CUSTOMERS EXPRESS HIGH DEMAND FOR WIRELESS CONNECTIVITY...

WIRELESS ADOPTION FOR DATA TERMINALS

MOTOROLA MARKET STUDY

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
TELEPHONE DEVICE DEMOGRAPHICS/IMPLICATIONS

PROPORTION OF TELEPHONES BY TYPE

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.

SOURCE: Motorola Market Study
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.
E G A R E V O C

EVOLUTION OF WIRELESS COMMUNICATIONS

APPLICATION

Voice

Data/LAN/Video

NOTE: Coverage is defined as Network Access Location

Ubiquitous/Out of Bldg.

Nation Wide

Metro Area Wide

Location Specific

In Bldg.

CAPACITY

Low

High

APPLICATION

Iridium

Mobile/Portable

Satellite Comm.

Analog Cellular

CT2

Ubiquitous/Out of Bldg.

Nation Wide

Metro Area Wide

Location Specific

In Bldg.

Ubiquitous/Out of Bldg.

Nation Wide

Metro Area Wide

Location Specific

In Bldg.

Ubiquitous/Out of Bldg.

Nation Wide

Metro Area Wide

Location Specific

In Bldg.
EVOLUTION OF WIRELESS COMMUNICATIONS

APPLICATION

High Speed
Low Speed

Low

High

Ubiquitous /Out of Bldg.
Nation Wide
Metro Area Wide
Location Specific
In Bldg.

Voice
Messaging

Data/LAN/Video

Low

High

Krilum
Mobile/Portable
Satellite Comm.
Analog Cellular
CT2

NOTE: Coverage is defined as Network Access Location...
EVOLUTION OF WIRELESS COMMUNICATIONS

APPLICATION

Voice
Messaging
Data/LAN/Video

In Bldg.
Location Specific
Low Speed
High Speed

Metro Area Wide
CT2
PCN
Advanced Digital Cellular

Nation Wide
Analog Cellular
Mobile/Portable Satellite Comm.

Ubiquitous Worldwide
Out of Bldg.
Iridium
PCN II
PCN III

NOTE: Coverage is defined as Network Access Location
## CHALLENGE OF COMBINED CAPABILITIES

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<th>CHARACTERISTIC</th>
<th>WIDE AREA</th>
<th>IN-BUILDING</th>
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<tr>
<td>CONTROL OF RF</td>
<td>NONE</td>
<td>SOME (&gt; w/ hi freq.)</td>
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<tr>
<td>POWER</td>
<td>HIGH</td>
<td>LOW</td>
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<tr>
<td>&quot;TALK&quot; TIME</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>LOCATING USER</td>
<td>MORE DIFFICULT</td>
<td>LESS DIFFICULT</td>
</tr>
<tr>
<td>USER DENSITY/CAPACITY</td>
<td>LOW</td>
<td>HIGH (&gt; w/ hi freq. &amp; coord.)</td>
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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

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<tr>
<th>ANALOG CT</th>
<th>DIGITAL CT</th>
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<td>CONVERSE</td>
<td>DISPATCH</td>
<td>CONVERSE</td>
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<td>SINGLE ENV.</td>
<td>MULTI-ENVIRONMENT</td>
<td>HIGHEST DENSITY</td>
<td>VEH/PORT H.O.</td>
<td>TELINTERC./LIM DATA</td>
<td>LOW DENSITY</td>
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## BASIC MARKETS

<table>
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<tr>
<th>BASIC</th>
<th>ENHANCED</th>
<th>LINKED</th>
<th>ISLANDS</th>
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<td>CORDLESS</td>
<td>TERM/HOST</td>
<td>WIRELESS</td>
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<td>SMALL/KEY</td>
<td>PBX/CENTRX</td>
<td>R-LANS DATA</td>
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<td>BUSINESS/OFFICE*</td>
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*SEGMENT OF COMMERCIAL/INDUSTRIAL*