User Ratings of Protocol Conversion Systems

Protocol conversion, no longer the robust, hot market that it was in the 1970s, faces an uncertain future. With IBM's introduction of the 3174 cluster controller, which supports direct connection of ASCII terminals, other protocol conversion vendors began to lose market share. Responding to the 3174, protocol conversion vendors reduced the price of their products, sometimes by more than 25 percent. The market is also being dampened by the increasing use of microcomputers, which support internal conversion devices, lessening the need for standalone products.

Although the market is less active, it is not dying. To maintain the market, vendors are adapting their products for special applications or aligning themselves with vendors selling complete systems, in which the conversion unit is incorporated. Vendors are also supporting Unisys and Honeywell applications, moving away from the ASCII-to-IBM product line.

Incompatibility of devices remains an acute problem in all communications networks. Users stepping out of a one-vendor shop are forced to deal with a lack of industry-wide standards. In fact, until the data communication industry adapts worldwide protocol standards for linking equipment, protocol converters and emulators will continue to participate in the general market, and standards remain well in the future.

This year's User Ratings of Protocol Conversion Systems rates 26 vendors in five categories. Once again, IBM had the largest response share, receiving 105 responses out of a total of 350. Users seem to be generally satisfied with product performance but not entirely pleased with vendors' service and support. While the number of responses was larger than last year's survey, the market itself is shrinking, primarily a result of IBM's 3174 cluster controller and its capability of connecting directly to ASCII terminals.

Protocol conversion, therefore, is still alive and well—it is just changing its shapes and forms. Standalone black boxes, for instance, are no longer in demand as they once were. Users now can purchase multifunction boxes or systems, instead of a standalone box that takes up space and performs only one function. Integrated equipment embraces many functions such as protocol conversion, line concentration, and multiplexing. An example of such a device is Netlink's SNA Gate, which performs the functions of a cluster controller, a line concentrator, and a remote job entry station facility. The unit also provides multiple protocol conversions, including concurrent asynchronous and bisynchronous to IBM's Systems Network Architecture (SNA). It also emulates an IBM Physical Unit Type 2 cluster controller, providing a gateway to the IBM SNA/SDLC environment.

Despite these shifts in the conversion systems marketplace, the majority of protocol converters and terminal controllers on the market still handle conversions between ASCII devices and IBM units. Another large segment covers units that convert IBM's BSC to SDLC protocols—many users with older IBM BSC equipment want to migrate to an SNA/SDLC environment without having to discard existing equipment.

X.25-to-SNA conversion represents another growing market. Users of 3270 terminals save money by communicating with packet networks because they share bandwidths and gain public access to multiple resources. Nonetheless, X.25-to-SNA conversion is problematic in that it incurs long delays caused by synchronous and bisync 3270s transmitting data in blocks, not characters.

Top Vendors in Terms of Response to
Protocol Conversion Systems Survey

Codex 2%   Ark 2%
Datastream 2%
Digital Equipment 2%
Renex 3%
Micom 4%
Black Box 4%
Local Data 5%
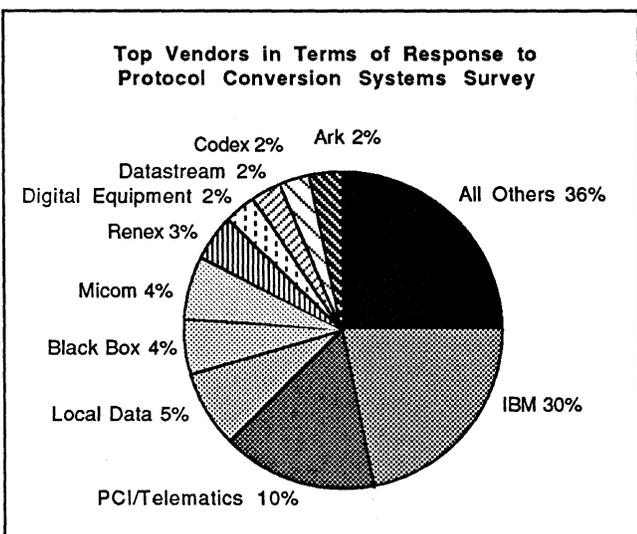PCI/Telematics 10%
All Others 36%
IBM 30%

Figure 1. This chart shows the top protocol conversion system vendors in the market, according to the percentage of responses received.

User Ratings of Protocol Conversion Systems

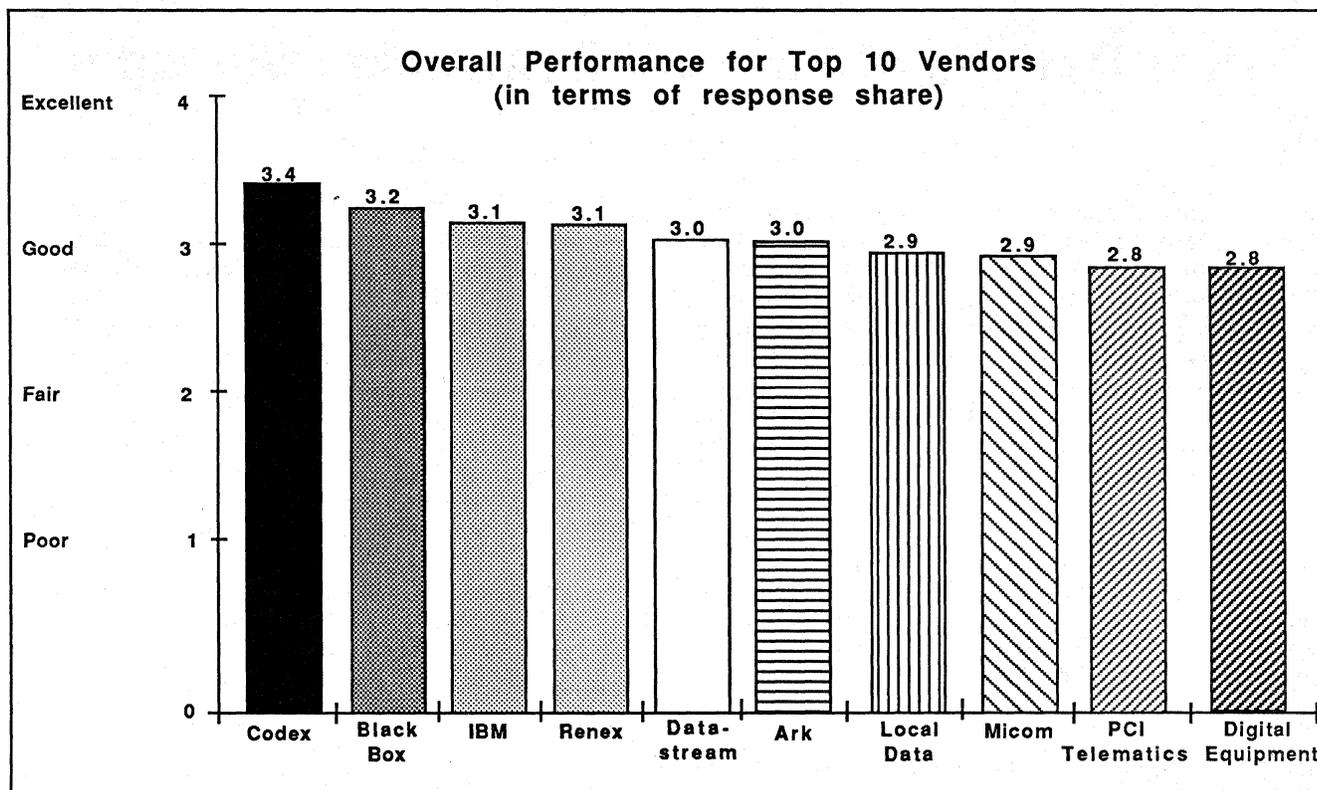## Overall Performance for Top 10 Vendors (in terms of response share)

Figure 2. Shown above are the ratings the top 10 vendors of our survey received in regard to the overall performance of their protocol conversion products.

A top vendor in the market, PCI, has changed its marketing approach, becoming more competitive and aggressive. Part of its new strategy is selling to other companies under a private label. The company has also revamped its products into a line of SmartNet units, which users can expand by simply replacing the older conversion device with a program pack that offers a different conversion. All the modular program packs fit into a single enclosure. Clearly, modularity and integration mark today's protocol conversion technology.

METHODOLOGY

Datapro's senior data communications editors designed a questionnaire that was mailed in April 1988 to a select group of *Data Communications* magazine subscribers identified as domestic end users of data communications equipment. The subscribers were asked to provide ratings and other information on various data communications topics, including transmission facilities, value-added networks, dial and leased line modems, and multiplexers. Datapro received approximately 800 completed forms by the cutoff date for returns, May 30.

When Datapro received the returns, senior-level editors edited the forms and examined them for validity before they were sent for tabulation. Subscriber names and ad-

dresses were initially validated and identified. In addition, the editors disqualified any survey in which a vendor/model identity was omitted, user ratings were not assigned, a vested interest was apparent, or incomprehensible or unreasonable answers were given.

A total of 674 valid forms were thus identified. These were shipped to DataVision Research, Inc. of Princeton, New Jersey for key entry and computer tabulation. Summary information was prepared in the form of totals, percentages, or weighted averages as appropriate for each question.

Weighted averages determine the final ratings. "Excellent" is weighted 4; "Good" is weighted 3; "Fair" is weighted 2; and "Poor" is weighted 1. The total number of ratings for each value are multiplied by the corresponding weight, and the average taken by dividing the sum of the products by the total number of responses for that category.

Datapro strongly suggests that the reader use the information presented with discretion. The individual equipment ratings are not presented to readers as the major consideration in selecting equipment. Rather, the ratings and other information should be used as guides to potential strengths and weaknesses that may call for further investigation before purchasing.

User Ratings of Protocol Conversion Systems

THE RESULTS

The survey results identify 26 conversion system and emulation device vendors that received enough responses to warrant separate tabulation. Predictably, IBM, with 105 responses, had the largest response share. Most IBM users referenced either the 3708 or 7171 protocol converter. PCI/Telematics followed with 34 user responses. Other notable vendors were Micom, Renex Corporation, Black Box, and Local Data. Figure 1 shows a breakdown of those companies in terms of percentage of total responses to the 1988 survey.

We asked the users to rate their products (which included protocol converters, interface converters, terminal emulators, terminal controllers, and X.25 PADs) in areas such as Ease of Installation, Ease of Operation, Device Reliability, Vendor's Maintenance Service and Technical Support, and Overall Performance. Of the 10 vendors shown in the response share pie chart (Figure 1), Codex Corporation received the highest score in Overall Performance, 3.4, with Black Box coming in second, 3.2. Among vendors with few respondents, users rated Datagram (4.0) and Avatar (3.5) highest in overall performance. The overall performance ratings of the top 10 vendors are shown in Figure 2. Of the vendors sited in the pie chart, Local Data and PCI/Telematics rated the lowest, each scoring 2.8.

Among the top vendors, Black Box scored highest (3.6) in ease of operation. Renex was second at 3.3. Codex, Datastream, and Digital Equipment rated under the "good" mark (3.0) in ease of operation with scores of 2.9, 2.8, and 2.7, respectively. Our users rated Black Box converters as having the highest device reliability among the top 10 vendors with a score of 3.6. Among other vendors, Datagram products rated excellent, with a weighted average of 4.0 across the board. The users ratings of vendors'

maintenance and technical support put Black Box at the top, with a score of 3.5. Outside of the top vendors, Datagram, Avatar, and DCA were the top scorers with ratings of 4.0, 3.5, and 3.5, respectively.

SUMMARY

The averaged, grand total scores summarizing overall vendor and product user ratings, show that reliability of product performance rates highest. Generally, users are satisfied with their protocol converters. The area receiving the lowest score, predictably, is manufacturer's maintenance and technical support. It rated just below "good," with a grand total average of 2.9. This supports findings in most of our user ratings; in maintenance and service, vendors need to do better.

IBM, clearly, is the top protocol conversion systems contender in the market. PCI maintains its hold on second place and can be expected to gain ground if the company continues to pursue its target groups aggressively. PCI is also taking off in the area of wide area networking and packet switching, so growth in those areas may stabilize customer security and add to sales in other areas. Other contenders for a piece of the market include Local Data, Black Box, Renex, and Micom.

Protocol conversion offers users an alternative to replacing older terminal equipment when making the move towards newer network architectures. From the results of our survey, we see that protocol conversion remains a strong and viable alternative, despite the decline in the protocol converter market as a whole. As long as incompatible equipment resides in communications networks, protocol conversion devices will remain an important element in the general market.

TABLE 1. USER RATINGS OF PROTOCOL CONVERSION SYSTEMS

MANUFACTURER/ MODEL	No. of User Responses	Ease of Installation					Ease of Operation					Device Reliability					Manufacturer's Maintenance Service/ Technical Support					Overall Performance				
		WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Alcatel— All Models	5	2.8	0	4	1	0	3.0	0	5	0	0	2.4	1	0	4	0	2.2	0	1	4	0	2.2	0	1	4	0
Amnet— All Models	3	3.3	1	2	0	0	3.3	1	2	0	0	3.0	1	1	1	0	3.3	1	2	0	0	3.3	1	2	0	0
Ark Electronics— All Models	6	3.2	2	3	1	0	3.2	2	3	1	0	2.8	1	3	2	0	2.4	0	2	3	0	3.0	1	4	1	0
AST Research— All Models	3	3.7	2	1	0	0	3.7	2	1	0	0	3.7	2	1	0	0	2.7	1	1	0	1	3.3	1	2	0	0
AT&T— All Models	5	3.2	1	4	0	0	3.4	2	3	0	0	3.2	2	2	1	0	3.0	0	4	0	0	3.0	0	5	0	0
Avatar— All Models	4	3.5	2	2	0	0	3.5	2	2	0	0	3.8	3	1	0	0	3.5	2	2	0	0	3.5	2	2	0	0

User Ratings of Protocol Conversion Systems

TABLE 1. USER RATINGS OF PROTOCOL CONVERSION SYSTEMS (Continued)

MANUFACTURER/ MODEL	No. of User Responses	Ease of Installation					Ease of Operation					Device Reliability					Manufacturer's Maintenance Service/ Technical Support					Overall Performance				
		WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
BBN— All Models	4	2.5	0	2	2	0	2.5	1	0	3	0	2.8	1	1	2	0	2.3	1	1	0	2	2.8	1	1	2	0
Black Box— All Models	13	3.3	6	6	0	1	3.6	8	5	0	0	3.5	8	3	2	0	3.5	7	5	1	0	3.2	5	6	2	0
Codex— 4255 Gateway	3	2.3	0	1	2	0	3.0	1	1	1	0	3.7	2	1	0	0	3.3	2	0	1	0	3.7	2	1	0	0
Others	4	3.0	1	2	1	0	2.8	1	1	2	0	3.3	1	3	0	0	2.8	1	1	2	0	3.3	1	3	0	0
Subtotal	7	2.7	1	3	3	0	2.9	2	2	3	0	3.4	3	4	0	0	3.0	3	1	3	0	3.4	3	4	0	0
Datagram— All Models	3	4.0	3	0	0	0	4.0	3	0	0	0	4.0	3	0	0	0	4.0	3	0	0	0	4.0	3	0	0	0
Datastream— All Models	8	2.5	1	2	5	0	2.8	3	1	3	1	3.0	3	3	1	1	2.4	2	1	3	2	3.0	2	4	2	0
DCA— All Models	4	3.0	0	4	0	0	3.3	1	3	0	0	3.3	1	3	0	0	3.5	2	2	0	0	3.3	1	3	0	0
Digital Equipment— All Models	6	2.8	0	5	1	0	2.7	0	4	2	0	3.0	1	4	1	0	3.0	1	4	1	0	2.8	0	5	1	0
Dynapac— Multipad	5	2.8	1	2	2	0	3.2	1	4	0	0	2.8	1	2	2	0	2.8	0	4	1	0	3.0	1	3	1	0
Hewlett Packard— 2334A	5	2.8	1	3	0	1	2.8	1	3	0	1	3.0	2	2	0	1	2.8	2	1	1	1	2.6	0	4	0	1
IBM— 3174	11	3.0	4	3	2	1	3.2	4	5	2	0	3.5	6	4	1	0	3.4	5	5	1	0	3.3	4	6	1	0
3274	12	2.8	2	7	2	1	3.1	3	7	2	0	3.4	6	5	1	0	3.6	7	5	0	0	3.3	4	8	0	0
3708	38	2.8	7	19	11	1	3.0	9	23	4	2	3.2	12	22	3	0	3.0	10	19	5	3	3.0	7	23	7	0
3710	3	2.3	0	2	0	1	2.7	1	0	2	0	3.0	2	0	0	1	1.7	0	0	2	1	2.3	0	1	2	0
7171	23	3.1	8	10	4	1	3.0	8	9	4	2	3.4	12	9	2	0	2.9	6	9	7	1	3.2	7	13	3	0
Other	18	2.8	4	7	6	1	2.9	4	8	2	2	3.2	6	7	3	0	2.8	5	4	5	2	2.9	4	7	4	1
Subtotal	105	2.9	25	48	25	6	3.0	29	52	16	6	3.3	44	47	10	1	3.0	33	42	20	7	3.1	26	58	17	1
JDS Microprocessing— Hydra II	4	3.5	2	2	0	0	3.0	0	4	0	0	3.5	3	0	1	0	2.8	0	3	1	0	3.0	0	4	0	0
KMW Systems— Series II	4	3.5	2	2	0	0	3.5	2	2	0	0	3.5	2	2	0	0	3.3	1	3	0	0	3.3	1	3	0	0
Local Data— Datalynx	9	2.9	2	4	3	0	3.0	1	7	1	0	3.0	3	4	1	1	2.3	0	5	2	2	2.9	1	6	2	0
Interlynx	4	2.8	0	3	1	0	3.3	2	1	1	0	2.5	1	1	1	1	3.3	1	3	0	0	3.0	2	0	2	0
Other	3	3.3	1	2	0	0	3.3	1	2	0	0	3.0	1	1	1	0	2.7	0	2	1	0	3.0	1	1	1	0
Subtotal	16	2.9	3	9	4	0	3.1	4	10	2	0	2.9	5	6	3	2	2.6	1	10	3	2	2.9	4	7	5	0
Memotec— All Models	3	2.7	0	2	1	0	2.3	0	1	2	0	3.0	1	1	1	0	2.0	0	0	3	0	2.7	0	2	1	0
Micom— 7400	5	3.0	0	5	0	0	2.8	0	4	1	0	2.6	0	3	2	0	2.2	0	2	2	1	2.6	0	3	2	0
Other	8	2.8	1	4	3	0	3.1	2	5	1	0	3.3	2	6	0	0	2.8	1	4	3	0	3.0	1	6	1	0
Subtotal	13	2.9	1	9	3	0	3.0	2	9	2	0	3.0	2	9	2	0	2.5	1	6	5	1	2.9	1	9	3	0
PCI/Telematics 276	9	3.0	1	7	1	0	2.9	0	8	1	0	2.9	2	4	3	0	2.6	1	4	3	1	2.8	0	7	2	0
1076	7	2.6	0	4	3	0	2.7	0	5	2	0	2.4	0	4	2	1	1.7	0	2	1	4	2.3	0	3	3	1
Other	18	3.1	6	8	4	0	3.1	7	6	5	0	3.0	6	5	6	0	2.6	4	4	7	2	2.9	5	6	6	0
Subtotal	34	3.0	7	19	8	0	3.0	7	19	8	0	2.9	8	13	11	1	2.4	5	10	11	7	2.8	5	16	11	1
Perle— All Models	3	3.0	0	3	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.3	1	2	0	0
Renex— All Models	12	3.1	2	8	1	0	3.3	4	8	0	0	3.2	4	6	2	0	2.9	3	7	0	2	3.1	4	5	3	0
Telenet— All Models	8	2.9	1	4	2	0	2.9	1	4	2	0	3.3	3	3	1	0	2.9	1	4	2	0	3.1	2	4	1	0
Timeplex— All Models	4	3.0	1	2	1	0	3.3	1	3	0	0	3.5	2	2	0	0	3.0	1	2	1	0	3.3	1	3	0	0
All Others	63	3.1	18	31	13	1	3.1	20	31	11	1	3.1	21	29	12	1	2.9	16	29	10	7	3.1	16	36	10	1
GRAND TOTAL	350	3.0	83	182	73	9	3.1	100	183	55	9	3.2	129	150	59	7	2.9	88	149	73	32	3.0	82	195	64	4

DECEMBER 1988

User Ratings of Protocol Conversion Systems

The protocol conversion market is no longer the robust, hot market that it used to be in the 1970s. With the entrance of large-scale integration and personal computers to the communications marketplace, the demand for boxes with the sole function of providing protocol conversion declined. The 1986 release of IBM's multifunction 3710 controller, the 3708 network processor, and the 3174 cluster controller also contributed to the decline of the black box market. Before 1983, in fact, IBM did not produce a "black-box" protocol converter of it's own. Thus, the protocol conversion market was left open to several smaller companies. The introduction of a "Big Blue" conversion system, however, gave IBM a large chunk of the protocol conversion industry, leaving other companies to scramble for a piece of the market-share pie. Today, IBM is still at the forefront of the market.

But stating that the market has experienced a decline in growth is not synonymous with saying the market is dying. Incompatibility of devices remains an acute problem in all communications networks. Once a user steps out of a one-vendor shop, he/she is forced to deal with a lack of industry-wide standards. In fact, until the data communication industry adapts worldwide protocol standards to link equipment, protocol converters and emulators will continue to be significant members of the general market. At this time, however, such a day can only be seen in the *far* horizons.

Protocol conversion, therefore, is still alive and well—it is just changing its shapes and forms. Standalone black boxes, for instance, are no longer in demand as they used to be. Users now can purchase multifunction boxes or systems, instead of a standalone box that takes up real estate and performs only one function. Integration has enabled the new protocol conversion units to embrace functions such as protocol conversion, line concentration, and multiplexing. An example of such a device is Netlink's SNA_Gate, which can function as a cluster controller, a line concentrator, and a remote job entry station facility. The unit also provides multiple protocol conversions, including concurrent asynchronous and bisynchronous to IBM's Systems Network Architecture (SNA). It also emulates an IBM Physical Unit Type 2 cluster controller, providing a gateway to the IBM SNA/SDLC environment.

The majority of protocol converters and terminal controllers on the market today are handling conversions between ASCII devices and IBM units. Another large segment covers units that handle conversions between IBM's BSC and SDLC protocols. This conversion is quite popular because there is a large base of users with older IBM BSC equipment who want to migrate to an SNA/SDLC environment without having to discard all their old equipment. An area that is currently growing is the market for X.25-to-SNA conversion. It is beneficial for users of 3270 terminals to communicate with packet networks because they save money by sharing bandwidth and by gaining public access to multiple resources. A problem in this type of conversion is long delays caused by the fact that synchronous and bisync 3270s transmit data in blocks, not characters.
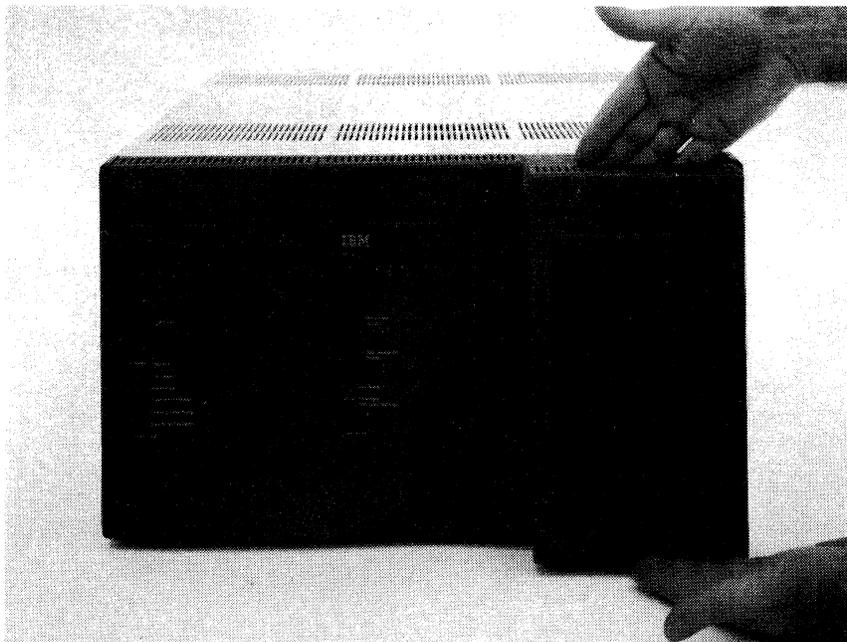
According to the Datapro 1987 User Ratings Survey, IBM was the leading vendor in percentage of response share. Shown at left is the company's 3710 Network Controller, which features simultaneous line concentration, protocol conversion, protocol enveloping, and ASCII passthrough.

User Ratings of Protocol Conversion Systems
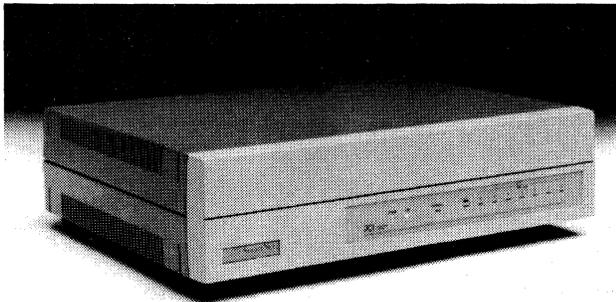
PCI rated the Number 2 vendor in our conversion systems and emulation device survey, according to response share. Above is the SmartNet 5250/T Plus protocol converter, which connects up to seven asynchronous terminals, PCs, printers and graphic devices to the twinax port of IBM Systems 34/36/38 minicomputers, enabling virtual disk and PC file transfer.

A top vendor in the market, PCI, has changed its marketing attitude recently, becoming fiercely competitive and more aggressive with its offerings. Part of this strength has come from selling its products to other companies under a private label. The company has also revamped its products into a line of SmartNet units, which can grow with the user by simply replacing the older conversion device with a program pack that offers a different conversion. All the modular program packs fit into a single enclosure. Clearly, modularity and integration have become the names of the protocol conversion game.

To further show you the placement of other companies in the market and our subscribers' feelings about the products, we present the 1987 Data Communications Survey, which was compiled by Datapro in conjunction with *Data Communications* magazine.

METHODOLOGY

A questionnaire was designed and produced by Datapro's senior data communications editors and mailed in January 1987 to a selected group of subscribers to *Data Communications* magazine. These subscribers were identified as domestic end users of data communications equipment. The subscribers were asked to fill out the forms, providing ratings and other information on transmission facilities, value added networks, dial and leased line modems, fiber optic and limited distance modems, multiplexers, network management systems, and test equipment. They were then asked to return the completed form, in a postage-paid envelope, to Datapro. By the cutoff date for returns, February 28, approximately 700 completed forms had been received by Datapro.

When Datapro received the returns, they were edited by senior-level editors. All forms were examined for validity before being sent for tabulation. Subscriber names and addresses were used for initial validation and identification. In addition, responses to the survey were disqualified whenever a vendor/model identity was omitted, user ratings were not assigned, an obvious vested interest on the part of the respondent was judged to exist, or incomprehensible or unreasonable answers were given.

When the invalid forms had been eliminated, a total of 687 valid forms were identified. After these forms were processed by Datapro personnel, they were shipped to *Mathematica Policy Research, Inc. (MPR)*, of Plainsboro, NJ for key entry and computer tabulation. Summary information was prepared in the form of totals, percentages, or weighted averages as appropriate for each question.

Weighted averages were used to determine the ratings given by the users of the equipment. These were computed in the following manner: "Excellent" was weighted as 4; "Good" was weighted as 3; "Fair" was weighted as 2; and "Poor" was weighted as 1. The tallied numbers for each value were then multiplied by the corresponding weight, and the average taken by dividing the sum of the products by the total number of responses for that category.

Datapro strongly suggests that the reader use the information presented with discretion. The individual equipment ratings are not presented to readers as the major consideration in making an acquisition decision. Rather, the ratings and other information should be used as guides to potential strengths and weaknesses that may call for further investigation in selecting the most suitable equipment for your needs.

THE RESULTS

Using the formula mentioned above, we isolated 23 conversion system and emulation device vendors who hold enough of the response share to warrant being individually identified. The vendor with the largest response share was predictably IBM, with 45 responses. Most of those responses were in reference to the 7171 protocol converter. PCI followed with 40 responses, distributed among the
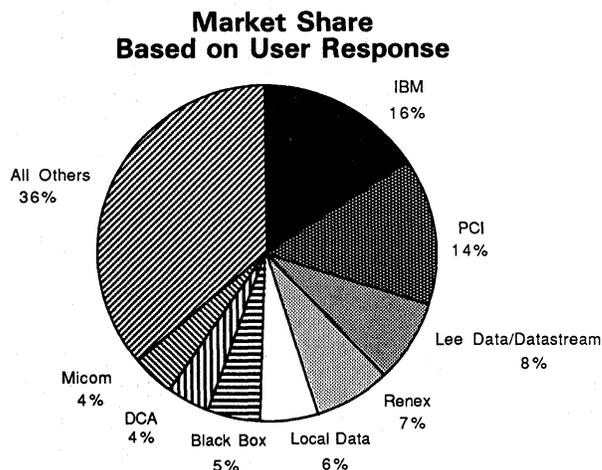
Market Share Based on User Response

Pie chart segments:
- IBM 16%
- PCI 14%
- Lee Data/Datastream 8%
- Renex 7%
- Local Data 6%
- Black Box 5%
- DCA 4%
- Micom 4%
- All Others 36%

Figure 1. This chart shows the top protocol conversion system vendors in the market, according to the percentage of responses received.

User Ratings of Protocol Conversion Systems

Overall Performance for Top 8 Vendors
(in terms of response share)
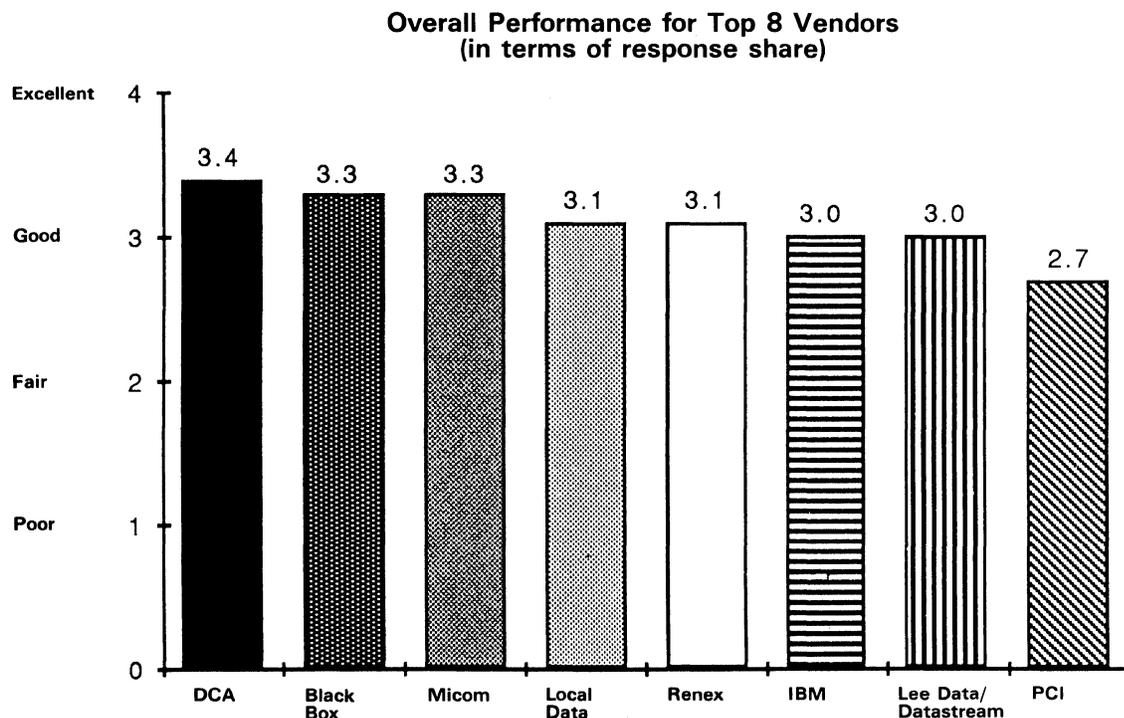
Figure 2. Shown above are the ratings the top eight vendors of our survey received in regard to the overall performance of their protocol conversion products.

1067, 1076, 176, and 276 protocol converters. Other players who held a large share of responses were Lee Data's Datastream Networking Division, Renex Corporation, Black Box, and Local Data. Figure 1 shows a breakdown of those companies' market shares.

We asked the users to rate their products (which included protocol converters; interface converters; terminal emulators; terminal controllers; async/sync converters; code, speed, and interface converters; and X.25 PADs) in areas such as ease of installation, ease of operation, device reliability, vendor's maintenance service and technical support, and overall performance. Of the eight companies shown in the market-share pie chart, Renex Corporation, a veteran in the industry, rated the highest score, 3.4. Outside of the top eight contenders, our users told us that GTE and Tri-Data products were comparatively easy to install, each rating 3.7.

Among the top vendors, Renex again scored the highest in ease of operation, with a score of 3.5. Black Box trailed closely behind with a score of 3.4. Only PCI rated under the good mark, with 2.8. Our users rated Black Box converters as having the highest device reliability out of the top eight vendors. Outside of those vendors, Wall Data products were rated almost excellent, with a weighted average of 3.8.

The users rated the vendors' maintenance and technical support, putting Wall Data and DCA at the top with scores of 3.8 and 3.5, respectively. The overall performance ratings can be seen in Figure 2. Of the eight vendors sited in

the pie chart, DCA rated the best, with a 3.4 rating. PCI, the company with the second largest response share, rated the lowest of the eight in this category, with a score of 2.7.

SUMMARY

When looking at averaged, grand total scores that summarize how the users rated all the players in the market in general, the averages show that the reliability of the units is what users rate highest. Generally, users seem satisfied with the protocol converters that they own. Of 288 responses, 219 said they would recommend the devices they use again. The area that received the lowest score was predictably the manufacturer's maintenance and technical support. It rated just below good, with a grand total average of 2.8.

From examining the users' ratings of protocol conversion systems, we see that IBM clearly is the top contender in the market. PCI is strengthening its hold and can be expected to gain footage if the company continues to aggressively market and pursue its target groups. PCI is also taking off in the area of wide-area networking and packet switching, so growth in those areas may stabilize customer security and add to sales in other areas. Lee Data/Datastream and Renex are also keeping a stronghold in the market. Local Data, Black Box, DCA, and Micom are left to contend for the rest of the market.

Protocol conversion offers users an alternative to replacing older terminal equipment when making the move towards newer network architectures. From the results of our sur-

User Ratings of Protocol Conversion Systems

vey, we see that protocol conversion remains a strong and viable alternative, despite the decline in the protocol converter market as a whole. As long as there is incompatible equipment in communications networks, protocol conversions will remain an important element in the general market.

User Ratings of Protocol Conversion Systems

TABLE 1. USER RATINGS FOR CONVERSION SYSTEMS AND EMULATION DEVICES

MANUFACTURER/ MODEL	No.of User Responses	No of Devices installed	Ease of Installation					Ease of Operation					Device Reliability					Manufacturer's Maintenance Service/Technical Support					Overall Performance					Would you Recommend This device?		
			WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	Yes	No	Unde-cided
Avatar—																														
All models	4	13	3.3	1	3	0	0	3.0	1	2	1	0	3.5	2	2	0	0	3.3	1	3	0	0	3.5	2	2	0	0	3	1	0
Black Box—																														
A/S-2	5	7	3.0	2	1	2	0	3.2	2	2	1	0	3.8	4	1	0	0	3.4	3	1	1	0	3.4	2	3	0	0	5	0	0
Others & unspecified	11	32	2.9	2	7	1	1	3.5	6	5	0	0	3.5	6	5	0	0	3.0	2	7	2	0	3.3	4	6	1	0	9	0	1
Subtotal	16	39	2.9	4	8	3	1	3.4	8	7	1	0	3.6	10	6	0	0	3.1	5	8	3	0	3.3	6	9	1	0	14	0	1
Bridge—																														
All models	4	7	3.3	1	3	0	0	3.3	2	1	1	0	3.0	1	2	1	0	2.5	0	2	2	0	3.3	1	3	0	0	2	0	2
Codex—																														
4250/4255	3	7	3.0	0	3	0	0	3.0	0	3	0	0	3.3	1	2	0	0	2.3	0	1	2	0	3.0	0	3	0	0	3	0	0
Datagram—																														
All models	6	74	2.7	0	4	2	0	2.8	0	5	1	0	2.8	0	5	1	0	2.8	0	5	1	0	2.8	0	5	1	0	5	0	1
Lee Data, Datastream Networking Div.—																														
774	3	3	3.3	1	2	0	0	3.0	1	1	1	0	3.3	1	2	0	0	3.0	1	1	1	0	3.3	1	2	0	0	3	0	0
Series 8000	2	3	3.5	1	1	0	0	3.0	0	2	0	0	3.5	1	1	0	0	3.0	0	2	0	0	3.0	0	2	0	0	1	0	1
8010	4	4	3.5	2	2	0	0	3.5	2	2	0	0	3.5	2	2	0	0	2.8	1	1	2	0	3.5	2	2	0	0	4	0	0
874	6	10	2.8	0	5	1	0	2.7	0	4	2	0	3.2	1	5	0	0	2.3	0	2	4	0	3.0	0	6	0	0	4	1	1
Others & unspecified	8	12	3.1	1	7	0	0	3.1	2	5	1	0	2.9	2	3	3	0	2.9	1	5	2	0	2.8	1	4	3	0	5	3	0
Subtotal	23	32	3.2	5	17	1	0	3.0	5	14	4	0	3.2	7	13	3	0	2.7	3	11	9	0	3.0	4	16	3	0	17	4	2
DCA—																														
Irma	3	20	3.3	1	2	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.3	2	0	1	0	3.3	1	2	0	0	3	0	0
Irmaline	2	24	3.5	1	1	0	0	3.0	0	2	0	0	3.0	1	0	1	0	3.5	1	1	0	0	3.5	1	1	0	0	2	0	0
Irmaprin	4	55	2.5	1	1	1	1	3.5	2	2	0	0	3.8	3	1	0	0	4.0	4	0	0	0	3.5	2	2	0	0	4	0	0
Others & unspecified	8	0	3.5	1	1	0	0	3.0	0	2	0	0	3.0	0	2	0	0	3.0	0	2	0	0	3.0	0	2	0	0	2	0	0
Subtotal	11	99	3.1	4	5	1	1	3.3	3	8	0	0	3.4	5	5	1	0	3.5	7	3	1	0	3.4	4	7	0	0	11	0	0
DDR—																														
Hydra 2	4	7	2.8	0	3	1	0	3.3	1	3	0	0	3.0	1	2	1	0	2.8	1	1	2	0	3.3	1	3	0	0	2	0	2
Digital Equipment Corporation—																														
All models	3	10	2.5	0	1	1	0	2.7	0	2	1	0	2.7	0	2	1	0	2.0	0	0	3	0	2.5	0	1	1	0	2	1	0
Dynapac—																														
All models	5	10	3.0	1	3	1	0	3.0	2	1	2	0	2.8	2	0	3	0	2.8	1	2	2	0	3.0	1	3	1	0	4	1	0
GTE—																														
All models	3	390	3.7	2	1	0	0	3.3	2	0	1	0	3.7	2	1	0	0	2.3	0	2	0	1	3.7	2	1	0	0	2	0	1
IBM—																														
Series 1	4	4	2.0	0	0	4	0	2.8	1	1	2	0	2.5	0	2	2	0	2.3	0	1	3	0	2.3	0	1	3	0	1	3	0
3708	15	22	2.5	0	9	5	1	3.1	3	11	1	0	2.8	2	10	1	2	2.7	2	8	4	1	2.9	1	12	2	0	10	2	3
7171	24	41	3.1	8	11	5	0	3.1	7	12	3	1	3.3	11	9	1	2	3.0	7	10	4	2	3.1	9	9	4	1	18	3	3
Others & unspecified	2	2	3.5	1	1	0	0	3.5	1	1	0	0	3.5	1	1	0	0	2.8	0	2	0	0	3.5	1	1	0	0	2	0	0
Subtotal	45	69	2.8	9	21	14	1	3.1	12	25	6	1	3.0	14	22	4	4	3.0	9	21	11	3	3.0	11	23	9	1	31	8	6
Local Data—																														
DataLynx Series	5	9	3.2	2	2	1	0	3.4	2	3	0	0	3.2	3	1	0	1	2.8	1	2	0	1	3.0	2	2	0	1	4	1	0
DataLynx/3274	5	11	3.0	1	3	1	0	3.2	1	4	0	0	3.2	2	2	1	0	3.0	1	3	1	0	3.2	1	4	0	0	4	0	1
Datalynx/3780	2	1	3.0	0	2	0	0	3.0	1	0	1	0	3.5	1	1	0	0	3.0	0	2	0	0	2.5	0	1	1	0	2	0	0
Datalynx/3287	3	8	3.3	1	2	0	0	3.7	2	1	0	0	3.0	1	1	1	0	3.0	1	1	1	0	3.0	1	1	1	0	2	1	0
Interlynx Series	3	3	3.3	2	0	1	0	3.0	1	1	1	0	3.0	1	1	1	0	3.3	2	0	1	0	3.3	2	0	1	0	3	0	0
Subtotal	18	32	3.2	6	9	3	0	3.3	7	9	2	0	3.2	8	6	3	1	3.0	5	8	3	1	3.1	6	8	3	1	15	2	1
Memotec—																														
All models	4	250	3.3	1	3	0	0	3.3	1	3	0	0	3.3	1	3	0	0	3.3	1	3	0	0	3.3	1	3	0	0	3	0	0

User Ratings of Protocol Conversion Systems

TABLE 1. USER RATINGS FOR CONVERSION SYSTEMS AND EMULATION DEVICES (Continued)

MANUFACTURER/ MODEL	No.of User Re- sponses	No of De- vices in- stalled	Ease of Installation					Ease of Operation					Device Reliability					Manufacturer's Maintenance Service/Technical Support					Overall Performance					Would you Recommend This device?		
			WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	Yes	No	Unde- cided
Micom—																														
Micro 7400	2	7	2.5	0	1	1	0	3.0	0	2	0	0	4.0	2	0	0	0	3.0	0	2	0	0	3.0	0	2	0	0	2	0	0
Micro 800	3	6	3.0	1	1	1	0	3.0	1	1	1	0	3.0	0	3	0	0	3.3	1	2	0	0	3.0	0	3	0	0	3	0	0
Micro 800I	2	2	3.5	1	1	0	0	3.0	0	2	0	0	4.0	2	0	0	0	3.0	0	1	0	0	4.0	2	0	0	0	2	0	0
Others & unspecified	4	13	3.0	2	0	2	0	3.0	2	0	2	0	3.5	2	2	0	0	2.5	0	2	2	0	3.3	2	1	1	0	3	0	1
Subtotal	11	28	3.0	4	3	4	0	3.0	3	5	3	0	3.5	6	5	0	0	2.9	1	7	2	0	3.3	4	6	1	0	10	0	1
NCR Comten—																														
All models	5	29	2.8	1	3	0	1	2.6	1	2	1	1	2.8	1	2	1	1	3.0	2	1	0	1	2.8	1	3	0	1	3	2	0
Netlink—																														
All models	4	35	3.0	1	2	1	0	2.8	0	3	1	0	3.0	0	4	0	0	2.8	0	3	1	0	3.0	0	4	0	0	4	0	0
PCI—																														
1067	3	17	2.7	0	2	1	0	3.0	0	3	0	0	3.0	1	1	1	0	2.0	0	0	3	0	2.3	0	1	2	0	1	1	1
1076	12	28	2.9	2	7	3	0	3.0	3	6	3	0	3.0	3	6	3	0	2.4	1	3	6	1	2.9	2	7	3	0	9	1	2
176	5	13	3.4	2	3	0	0	3.2	3	0	2	0	3.2	2	2	1	0	2.8	1	2	0	1	3.2	2	2	1	0	4	0	1
276	4	6	2.8	1	1	2	0	2.5	0	2	2	0	3.0	0	4	0	0	2.0	0	1	2	1	2.5	0	2	2	0	2	1	1
Others & unspecified	16	25	2.6	2	6	8	0	2.6	0	10	5	1	2.5	3	4	7	2	2.3	1	4	8	2	2.6	1	7	8	0	7	6	3
Subtotal	40	89	2.8	7	19	14	0	2.8	6	21	12	1	2.8	9	17	12	2	2.3	3	10	19	5	2.7	5	19	16	0	23	9	8
Renex—																														
TMS1	4	5	3.3	2	1	1	0	3.3	1	3	0	0	3.5	2	2	0	0	3.0	1	2	1	0	3.3	1	3	0	0	2	0	1
Others & unspecified	16	27	3.4	7	9	0	0	3.6	9	7	0	0	3.3	7	7	2	0	2.9	4	8	2	2	3.1	3	12	1	0	15	1	0
Subtotal	20	32	3.4	9	10	1	0	3.5	10	10	0	0	3.3	9	9	2	0	2.9	5	10	3	2	3.1	4	15	1	0	17	1	1
Tri-Data—																														
Netway 1000	3	99	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.3	2	1	0	0	3.3	1	2	0	0	3	0	0
Unisys—																														
All models	3	6	2.3	0	1	2	0	3.0	1	1	1	0	3.3	1	2	0	0	2.3	0	1	2	0	3.3	1	2	0	0	3	0	0
Wall Data—																														
All models	5	62	3.4	2	3	0	0	3.6	3	2	0	0	3.8	4	1	0	0	3.8	4	1	0	0	3.8	4	1	0	0	4	0	1
Wang—																														
All models	4	19	3.5	3	0	1	0	3.5	3	0	1	0	3.5	3	0	1	0	2.3	0	1	3	0	3.5	3	0	1	0	3	1	0
All others—	44	91	3.0	17	22	3	1	2.8	15	22	5	2	3.0	16	22	3	2	2.8	12	16	11	3	3.0	15	24	3	1	35	8	1
GRAND TOTAL—	288	1,529	3.1	80	148	53	5	3.1	87	151	44	5	3.2	104	135	36	10	2.8	62	120	81	16	3.1	77	163	41	4	219	38	28