Freight Terminals and the Need for a Common Communications Code

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The rapid growth of the container transportation industry to date has revolutionized the movement of goods throughout the world. However, the great volume of these movements has brought attendant problems not the least of which is the handling, processing, and exchange of data that efficient control requires. The first logical step of automation has been taken but, in general, on a localized scale within a particular firm or carrier's organization. When these automated systems need to fit together as shipping lines, intermodal railroads, truckers, freight terminals, and other transportation providers get together, the individual systems are found not to be compatible. This results in an immediate bar to cooperation in the information data exchange field. The principal problem lies with the multiplicity of codes or languages used or being developed to communicate the required data elements within a given automated sytem. The author has been witness to the difficulty of trying to obtain agreement between two parties, each of whom has his own individual communication code. Even when a compromise between two codes results, a third code is added to the proliferation. The proposal outlined in this paper attempts to solve this problem by providing a standard communications code for use between operators, leaving each individual operator free to use the internal operating code of its choice. This proposed communications code is already being considered within the Technical Committee on Freight Containers (TC104) of the International Standards Organization (ISO). Development of this code, along with two other related items, should greatly facilitate the automatic transmission and processing of data between operators in the execution of container control and movement.

AUTOMATION AND THE NEED TO COMMUNICATE

During the 20-year history of the freight container, methods of controlling and recording movement have progressed from the original box of cards via wallboards to computers. In the past 7 years, since the rapid expansion of container fleets in the late 1970s, computers have played an increasing role in container control, originally in a main frame, centralized mode, and increasingly down to the operating level, in the ship, on the railroad, in the truck fleet, at the terminal, at the container leasing company local office, and in the repair yard. The trend to the interaction of computers linked to a company's main-frame systems, or with computers of another company, is growing in importance.

This is certainly the experience at Transamerica ICS, Inc., which is beginning to grapple with the problems of linking its computers to those of its suppliers; the repair depots; and its customers, the shipping lines. This is a challenge of huge proportions, given that, as a major lessor of freight containers, Transamerica ICS owns 27,000 20-ft equivalent units (TEU) in dry freight containers, chassis, and special containers. This equipment is leased worldwide through 16 offices and 250 depots, which further enlarges the challenge. There is an average of 40,000 on-hire and off-hire transactions each month worldwide. In addition, 12,000 to 14,000 repairs are made each month. It is believed that a plan to link Transamerica ISC computers with those of its suppliers and customers is the only way to solve this control problem satisfactorily.

Intermodal freight terminals and carriers that handle containers also have high levels of monthly transactions. These movement transactions can be typified as ship to gantry crane, gantry crane to straddle carrier, to stock, stock to straddle carrier, to chassis and trucker, and in- and out-gate control. In addition, consider associated inventory control, ship and train loading control, inbound and outbound shipment control, and, in most cases, repair control and notification. Most of these terminal activities take place without external contact; that is to say, the freight terminal can maintain internal control of equipment without reporting such moves to the shipping line, railroad, trucker, forwarder, or others. However, the in-moves and the out-moves often must be reported to third parties, and instructions must be received from the third parties for controlling container moves. Expeditiously controlling these moves and instructions relates to timely receipt and delivery of equipment and inventory control. This high level of activity and the need to efficiently and effectively communicate rapidly with third parties at high volumes are the subject of this paper.

THE BAR TO ON-LINE COMMUNICATIONS

The obvious solution to a high volume of routine, recurring transactions is to automate. Most businesses, including freight terminals, have gone a long way toward doing this. Like most businesses, transportation and freight terminal operators have started with their internal operation first and automated the control and movement of equipment. In almost all cases, these systems require some manual input; that is, keying in of data received from a number of manual means. The outputs from these systems tend to be manually employed as well. Outputs that are intended for external reporting to third parties, for example, in- and out-moves, are provided either in plain text or in some form of mutually agreed on code that may or may not be received on-line and then automatically processed. Ultimately, all information users will require such data on-line for real-time tracking purposes; therefore, freight terminal and transport operators will need to transmit data in a processable form among themselves and to all their clients.

When only two parties are involved it is easy to agree on a means of communication. The parties need only to agree on a language or code to convey the data they wish to pass and to a format in which to pass the code. This is simple enough. Let us say the two parties in this example are an intermodal freight terminal and a shipping line. Should another party wish to communicate with the freight terminal, it has either to use the system established by the terminal and the shipping line or, more usually, the freight terminal must also adopt and support the system of the second party; and so on. When multi-user terminals have 20 to 30 users, this problem will grow as each terminal user begins to require on-line processing data. Maintenance of so many alternative codes and formats obviously becomes a major burden on the terminal operator. Most operators will agree that over the next 5 years or so, on-line communications will become routine. However, in the meantime, there is a problem in need of a solution. The problem is the need for a common communications code to be used as a bridge among various well-established system automations. Agreement on the code itself becomes difficult when there are already-established, but different, codes. This may appear unduly pessimistic to the reader. However, the pessimism is based on experience in trying to solve the problem working with the very parties that freight terminals deal with in controlling container movement.

MULTIPLICITY OF CODES

Like intermodal freight terminals, shipping lines, railroads, other common carriers, and container leasing companies and their repair depots have already installed automation or started automating. These organizations started with their internal operations first, and when that was done they began to look toward automating their external operations, some with limited success. The means of automating these internal operations--that is, the codes that were designed--actually made more difficult, if not impossible, automation linkage to organizationally external operations. Codes designed by different people are different.

In a survey of the industry in 1984, it was found that there were more than 50 different codes in existence. The codes were mainly for repair work, which is obviously not of primary interest to a terminal. It was noted that there was no consistency in coding, even with regard to header information and its layout--a most necessary part of basic computerized information interchange. Although shipping lines have realized the desirability of getting together and agreeing on a common code, no one has been ready to give up what it has designed in favor of another. Bringing that problem a little closer to home, would intermodal freight terminals get together and agree on a common communications code or on any other matter of potential common gain? Why should they, the reader may ask, because intermodal freight terminals rarely, if ever, have direct dealings or transactions with each other, especially those in different cities or even in different countries. It is the same for shipping lines, although, of course, consortia and joint ventures are common. As far as intermodal freight terminals are concerned, the answer should be that even if they do not deal directly with each other, they must deal with shipping lines, railroads, and other common carriers who do. Thus a common communications code for shipping lines should be a common code for intermodal freight terminals and other modal carriers as well.

NONACCEPTANCE OF A COMMON OPERATOR CODE

To illustrate why it is so difficult to agree on a common code, the following example is offered. The members of the International Institute of Container Lessors (IICL) own approximately 1.55 million TEU of containers or 30 percent of the world's container population. Approximately 70 percent of containers coming off-hire are damaged and must be repaired before they are ready for another lease. This means hundreds of thousands of transactions involving repairs every month. Each repair has to be estimated and the estimate must be approved by the lessor and then passed to the lessee for approval. These actions, or transactions, involve a great deal of routine paperwork that lends itself to automation, providing the problem of communications can be solved. The Technical Committee of the IICL began to consider automation of the administration of the repair process in 1981. The original concept, developed by the Code and Communications Sub-Committee, of which the author is chairman, was for a universal operator language or code. In 1982 the IICL published its Guide for Container Damage and Repair Coding. This was to be the basis of the leasing companies' automation efforts, and it was expected that each repair depot and leasing company would adopt it.

It soon became apparent that the IICL code was not received with universal approbation. Some depots already were using different codes; another major leasing company, not a member of the IICL, used another. Also, many shipping lines and customers had their individual codes. Thus, these various groups--ultimately more than 1,000 repair depots, 100 leasing companies, and 500 shipping lines--were all going to be going their own way and the prospect of a common language was already as remote as a solution to the Tower of Babel. The problem was and is that everyone thinks his code is best; because he is already using it, it would be costly to change.

SOLUTION

A year ago, the author came to the conclusion that operators should be free to use whatever code they wished--they would in any case--and that the only way for them to communicate on-line with other parties was to create and use a common communications code. In this case, an operator communicating on-line with another party would translate his code into the communication code, transmit it, and the receiving party would translate from the communication code received into his own operating code. It is a simple matter, in computer terms, to reference a file and translate from one code to another. That is, from an operator's own code into a communication code and from the communication code to the recipient's code. If this method were adopted, all parties would be free to use, internally, the code of their choice and would need to maintain only one translation file.

It should be noted that if such on-line communication could come about without a common communication code, each party would have to maintain multiple translation files, one for each party dealt with, and create a new one for each new party.

COMMON COMMUNICATIONS CODE

The characteristics of a common communication code are

- It must be capable of carrying sufficient data components to satisfy the most discriminating user.
- It must be capable of being segregated so that less discriminating users can eliminate, or not use, some data components. (For example, in repair work, some users would not want location coding and could program their computers not to use this data component.)
- It must have agreed-on data components so that the communication code is the standard on which all other codes are developed. Thus all codes would be comparable and translatable to it.

These characteristics form the basis for agreement on a common code. The communication code itself can and should be devised and assigned by one central agency in order to avoid or minimize the subjectivity problems likely to arise in agreeing on a common code.

To arrive at an appropriate communication code, the involved parties will have to agree on the data components that any operator will require and the purposes for which the transactions are used. There could be potentially many different uses. They can be characterized into three levels:

Level	Type of Content	Contains Information on
1	Interchange information	Level 1 only
2	Condition information	Levels 1 and 2 only
3	Repair estimate information	Levels 1, 2, and 3

The minimum data components at each level must fulfill the needs of the most demanding or discriminating user. Other users may, at their option, make use of fewer data components.

The minimum data components in each higher level make use of identical data components of each lower level; thus each level is a building block for each higher level.

By way of illustration, the following are examples of the three levels involved:

- Level 1--Interchange information data components: owner's prefix, serial no./check digit, size and type codes, year of manufacture, user code, location code, CIR date, and so forth.
- Level 2--Condition information data components: Level-1 data components plus location coding component code, damaged code, and so forth.
- Level 3--Repair estimate information data components: Level-1 and Level-2 data components plus type/method of repair code, size, quantity, scale, manhours, and so forth.

It can be seen that the majority of interchanges that only record changes of possession would use Level 1. Intermodal freight terminals issuing or receiving containers at the gate would normally need or provide this data only. Level-2 information is used when condition information is required. Repair estimating, work orders, and invoicing will require Level-3 data.

It is envisioned that a central agency would control authorized additions or changes to these data elements and be responsible for publishing and distributing the code data. For example, data components could be listed as follows:

Component	Communications Code	Operator Code
Top rail	"? (or whatever symbol is decided)	Operator enters his own operating code equivalent here
Bottom rail	/,	
Side panel	#¢	
Door panel	&*	
Locking bar	%	
Other		

A clerk or computer operator would never have to see or understand the communication code. He or she would enter or read information only in his or her own operating code. Only the computer programmer specialist need ever see the communication code itself as he or she up-dates the translation file periodically.

This concept was originated by the author about 12 months ago. It is the opposite to the solution of using the bottom-up approach. Users, in this case, would not have to get together to create a means of communicating. What is proposed is the top-down approach. If a common communications code is created, all operators can use it when they wish to solve their external communication problem. At the same time, the individual operator can continue to use its own code internally.

It is fortunate that the IICL Technical Committee and the United States Technical Advisory Group (USTAG 104) to International Standards Organization Technical Committee 104 (ISO/TC 104) on Containers see the potential of this proposal. It is also fortunate that after some work in subcommittee, this proposal, having become the U.S. proposal, has been adopted as an item of work of ISO TC 104 Working Group 3, Coding and Marking (WG3).

SUMMARY

Many readers will be familiar with the work of ISO, particularly in regard to containers. Containers are the shining example of the ISO at work. The standards committees of the world were able to agree on the physical characteristics of containers, which was a major achievement. A greater achievement was that the container concept worked, and today containers move freely and efficiently throughout the world. The volume of such moves is now so great that the next advance must be in the automation of control and handling of data. An intermodal container infrastructure had to be created in the first place, in a common form to handle the common item, the container. Automation of control and handling data will, itself, require that systems, if not made common, be made compatible. A communications code will make uncommon operating codes compatible.

It will take some time to complete the work on the code. The code has first to be created. This is being done by a small multinational and cross-industry group consisting of representatives of a shipping line, a depot, and a leasing company. The group has no representative from an intermodal freight terminal. After having first created the code and obtained agreement from the various standards groups, the draft standard will be circulated for comment. Final agreement on the standard will thus take 2 to 3 years. This may sound like a long time and it is, but it offers plenty of time to obtain ideas and input from all interested parties including intermodal freight terminal operators.

It will take that time, or longer, for the significant increase in automation on the part of all potential users before the need for the code becomes critical. It will also take some time for the on-line data requirement to grow significantly. It is hoped, therefore, that by the time there is a real need, the solution will be available.

The ISO Technical Committee 104 has other work items under way that will further facilitate control and movement of containers and that are of interest to intermodal freight terminal operators. They are as follows:

Uniform Stowage Plan

A uniform stowage plan system and data information system for transmitting on-line loading plans to the next port. Data to be included in the system are

- Ship information for each container;
- Port of discharge;
- Port of loading;
- Weight;
- Owner, operator;
- Serial number;
- Cargo information relating to dangerous goods, temperature control, overheight or width, delivery method; and
- Size and type code.

Adoption of such a uniform method would benefit the users of such information, who include, of course, intermodal freight terminals, especially multiuser terminals. Multiuser freight terminals would receive from their current lines unloading and loading instructions in a common format and code--again permitting automatic processing of the data. This item of work, originating with the major German terminals, is already in the final stages of receiving comments before being circulated as a draft standard.

U.S. shipping lines know about this development and recognize its value in the future. The plan is different from the systems currently being used by them. To get any value from the uniform stowage plan, the U.S. lines will have to give serious consideration to adopting it. Unlike the Interchange and Repair Code, no transaction or communication code is thought practical; therefore, operators will have to make changes to benefit from the uniform stowage plan concept.

Automatic Identification of Containers

The other item of work currently undertaken by ISO in the facilitation area is one that is the most difficult but yet is potentially the greatest advance in efficiency. This item is the automatic identification of containers. If such a system were in operation, it would enable containers to be identified automatically at set points. For example, at a terminal gate, movement of containers could be reported automatically. Clearly intermodal freight terminals would benefit from such a system. To get such a system into operation is not easy because it will require proven technology at economical cost.

The Dutch terminal companies originated this idea in ISO. Currently, they are considering a bar code with an improved light reader, or, alternatively, a transponder system. The transponder is possibly the better system, but the cost of transponders has to be reduced dramatically for it to be economically feasible because retrofitting anything to a fleet of containers is an expensive and time-consuming task.

The ISO TC104, WG3 is studying the features that a system of automatic identification of container and chassis has to meet. In addition, WG3 will survey existing systems to see if they meet those features and then prepare the necessary standardization work. This is the most difficult because, for such a system to work, there has to be only one compatible system. Two or more automatic identification technologies at work at the same time are unacceptable in the worldwide trade situation that containers are exposed to. Except in initial tests to verify compatibility, performance, reliability, and endurance, more than one system defined by a performance specification will not be accepted by potential investors in the system. The potential investors are the potential beneficiaries, all intermodal operators.

Adoption of one technology over another calls for a great deal of presumption and is not the course that ISO takes. You will recall the early efforts of both the railroads and Sea-Land with an optical label-reader system. These systems did not live up to expectations because of limitations of the hardware and software in real operating conditions. Now it is thought that recent improvements in hardware and software make workable systems possible. It is hoped that commercial pressure will bring forward one usable system and that an ISO standard can make it universally acceptable. The benefits of such a system, providing it is reliable and accurate, are clear, and it is a logical step in the automation process of handling and controlling container operations.

In freight terminals, data automatically generated at checkpoints and gates would provide on-line and real-time internal control and external reporting. It is understood from one freight terminal operator that present manual systems allow for keying updated data into their computer once every 4 hr. Control, therefore, must, at present, always play catch-up. An automatic system in operation would save lost time in marshalling containers for loading, provide for accurate inventory, and reduce the manhours needed to check and recheck the present manual effort.

CONCLUSION

Three areas under study by ISO in which intermodal freight terminals can potentially benefit in the future through standardization have been outlined. The degree of such benefit to intermodal freight terminals depends on total transportation industry involvement in the development of the standards. When a standard is finalized, it becomes too late to say it does not provide for industry needs. Willingness to get involved in the work of the ISO committees will make knowledgeable transportation officials aware of what is developing and enable them to have an influence on the results.

This is not a commercial. ISO committees, like the Transportation Research Board, are not in the business of extolling commercial activities. ISO is more like public television. It needs support. The pledges are for personal participation and interest. Individuals can participate directly or through trade groups and associations in the work of USTAG 104. Participation will help keep you and your organization informed of what international progress is being made in your area or areas of interest.

Even if work on the items discussed in this paper is incomplete, awareness of their existence will allow the reader to take them into account when he or she engages in planning and design work. These potential standards will be nothing more than bits of paper unless operators see the benefit of using them and work toward that goal.

Automation is here, and in the next decade more things will be automated than anyone has dreamed of. In the three areas reported, ISO is working to provide standards before they are needed, but the time they will be needed is soon, if not now.