



## OPEN SYSTEMS' SYMPOSIUM" '94

**Mr. Anwar M. Motan**

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**Re: "Health Level 7 (HL7), an emerging solution for exchange of data in health industry"**

Dear Mr. Anwar M. Motan:

On behalf of the Technical Committee of the Open Systems Symposium '94 to be held during November 8-9, 1994, I have the great pleasure of informing you that your paper has been accepted for presentation at the symposium.

May I congratulate you on the acceptance of your paper! The response to the Call for Papers has been overwhelming. The program committee received a very large number of high quality submissions; and, therefore, had to be extremely selective in determining which papers would be presented. To be accepted for a presentation in the symposium under these circumstances is definitely a sign of the exceptional quality of your paper.

During the early part of October 1994 you will receive complete details of the conference, including the formats of the presentation, registration information, accommodation options, etc. To complete necessary arrangements, we need you to send us three passport size photographs. All presenters requiring an Entry Visa to Saudi Arabia are also required to send us a copy of their passport.

Thank you very much for your interest in Open Systems Symposium '94. We are looking forward to seeing you during its session. If you need any additional information or assistance in the meantime, please feel free to contact us.

Sincerely,

*F.A. Bubshar*

*Dr. M. A. Al-Tayyeb,*  
Chairman, Technical Committee

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## Health Level 7 (HL7), an emerging solution for exchange of data in health industry

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### ABSTRACT

*Health Level 7 (HL7) is a conceptual definition of an application-to-application interface placed in the seventh layer of the OSI model. It is designed to support central patient care systems as well as distributed environments where data resides in departmental systems. Today, users are not given target dates for their application development instead most institutions prefer to purchase off-the-shelf applications that meet their functional requirements. HL7, a data exchange standard, allows users to follow standard definition of the data to be exchanged, the timing of the exchanges, and communication of certain application specific errors between the applications. The standard currently addresses the interfaces among various systems that send and receive patient admission or registration, discharge or transfer (ADT) data, queries, orders, results, clinical observations, billing and master file update information. At King Faisal Specialist Hospital and Research Center, we have started following this standard for exchanging data information between our mainframe, where we have our central hospital information systems (HIS), laboratory information system (LIS), pharmacy systems and several other departmental systems. We are hoping that this exercise for standardizing data exchange will allow us in the future to build our clinical data repository as part of the Clinical Information Systems.*

### INTRODUCTION

The term "Level 7" refers to the highest level of Open System Interconnection (OSI) model of the International Standards organization (ISO). As it is known that the OSI model describes all seven layers

of conceptual model, HL7 describes the seventh layer, the application. HL7 is the definition of the data to be exchanged, the timing of this exchange and the communication of the error messages of the applications during this exchange. HL7 is basically the work of healthcare providers, vendors and consultants over the years since its inception in 1987. The release 2.1 was published in 1990 and now the draft copy of release 2.2 is out with adoption date of August 1994. ANSI's Health Information Standards Planning Panel (HISPP) is currently evaluating to make HL7 an Accredited Standards Committee (ASC) and so is ASTM, another computer messaging standard organization.

### Setting

At KFSH we are in a process of standardizing all our communications on the network at the application level using HL7 message format. It was developed internally over the last six months as part of an effort to establish clinical computing and to support our users on departmental applications. In addition to this automated process we are making use of HCI Link which will help us to broadcast these messages automatically to different hosts and it will also be responsible for proper error handling.

In this paper we present our progress in using the HL7 standards as a starting point for developing the clinical computing system prototype and transparent integration of different systems. We review what we have learned about the usefulness and limitations of the HL7 for this purpose.

### Identify applications and event codes for integration

The first step was to identify all the applications we will require for integration. This list included HIS on mainframe, LIS and RIS on a minicomputer, Pharmacy, Blood Bank and Operating Room scheduling systems on Novel network. These were the initial systems for integration and data collection for clinical computing. Next, the job was to identify the event codes for these applications and/or



systems. Following event codes were selected for exchange of information :

- A01 Admit a patient
- A02 Transfer a patient
- A03 Discharge a patient
- A04 Register a patient
  
- A08 Update patient information
- A11 Cancel admit
- A12 Cancel transfer
- A13 Cancel discharge
- A17 Swap patients
- A34 Merge patient inf.- patient ID only

#### What is HL7 message :

A message is a unit of data transfer between systems. Each message contains group of segments in a single string which has been preselected by the user for the purpose. Each message is triggered by the event that takes place i.e. Admit function may trigger an event A01 which needs to be broadcasted to several different hosts on the same network. A trigger event code beginning with Z can be defined for local use.

A segment is a group of data fields. Each segment can be repeated for several different observations. However, it is also possible that a segment may or may not appear in a message. Each segment is terminated by hex 0D. Each field is separated by | and each component of data field is separated by ^. Types of data are referenced by ST (string data), TX (text data), FT (formatted text data), NM (numeric), DT (date), TM(time), TS (time stamp), PN (person name), TN (telephone number), AD(address), ID, SI (sequence ID), CM (composite), CK (composite ID with check digit and so on. A typical message for vital signs observation will look like this :

```
MSH...
EVN...
***-Vital signs-***
OBR|4|P8756^OE|N2345^NR|3000.02^VITAL
SIGNS|R|198703281530|198703290800|||401
-0^INTERN^JOE^^^MD^L|N<CR>

OBX|1|ST|1002.3^BP DIAS||90|mm(hg)|60-
90|<CR>
OBX|2|ST|1002.2^BP SYS||120|mm(hg)|100-
160|<CR>
OBX|3|ST|1002.4^BP MEAN||100|mm(hg)|80-
120|N<CR>
OBX|4|ST|1006.2^HEART RATE||74|/min|60-
100|N<CR>
```

```
OBX|5|ST|1002.1^BP METHOD||MANUAL BY
CUFF|<CR>
OBX|6|ST|1006.1^PULSE METHOD||MANUAL BY
PALP|<CR>
OBX|1|ST|1010.1^WEIGHT||72|kg||<CR>
OBX|1|ST|1010.3^HEIGHT||160|cm||<CR>
```

#### METHODS

In order to accomplish appropriate integration we identified the data elements that were required for each application and then we compared against the HIS data elements on mainframe. To our surprise most of the data elements were available in one form or the other. However certain application like ATWORK Corporation's ORSOS application did not follow HL7 standard and we had to create special transmission of identified data elements to this application. Based on these identified data elements the transactions were identified on HIS. These transactions were linked to single program which transmitted our final data string to HCI Link. HCI Link was programmed by professional staff to receive these data strings and depending on the transaction type records were transmitted to different computers. For example HCI Link was told to broadcast an A01 record to Laboratory and Pharmacy. A query from ORSOS triggered a non HL7 transmission of biographic data. A query from outpatient pharmacy triggers our institution specified segment ZAR (Arabic bio data of patient) to be transmitted from HIS to outpatient pharmacy. Error handling process was left to HCI Link to handle.

#### RESULTS

Although a true integration has not been accomplished and data redundancy is still there leaving several copies of same data on different machines. Studies and statistical analysis does not require to go to the actual source of data because a copy of that data is already there on their machine. We are in a process of synchronizing all data bases on different platforms and we are hoping HCI Link will allow us to identify any data discrepancies and non transmission of these data because of non availability of certain application on the network. We are hoping that we will be able maintain the level of security and data integrity using this HCI Link.

## **DISCUSSION**

The purpose of the HL7 message swapping was to eliminate the total dependency on one single system. It has always been a severe deficiency in meeting the users requirements. One single application for all users is impossible on one system. A distributed approach that we have taken satisfies our users in general. They depend on their particular system for better and accurate responses from their applications. They are at leisure to schedule their down time, their backups etc. Most of all they have security and data integrity of their application data in their hands. This does not mean that traditional MIS staff has lost their control over the users. Their energy is now very well utilized in dealing with training and educating the institution staff in better utilization of resources. Their expertise becomes more enlightened in the global MIS utilization of an institution.

## **REFERENCES**

1. Al-Daig Hamad, Motan Anwar M. Integration of Hospital Information system Applications and Single workstation strategy. The 8th International Computer, Information technology & business systems exhibition & Conference for the middle east. Manama Bahrain.
2. Health Level Seven, Version 2.2 1994. Working group ballot 1.