

behavior of the application program may include sending ASN.1 messages which are not in a human readable form. It should, of course, be understood that manually translating information into an ASN.1 message as well as deciphering ASN.1 messages into a human readable form is complicated and extremely error-prone. Errors occurring during the testing process often originate from improperly translated test data or improperly translated ASN.1 messages as opposed to errors in the application program.

**[0007]** Accordingly, it is an object of the present invention to provide a tool which can take an instance of a data type in a human readable format, as well as pursuant to an ASN.1 specification, and output an ASN.1 message.

**[0008]** It is also an object of the present invention to provide a tool which can take an ASN.1 message, also pursuant to the corresponding ASN.1 specification, and translate the ASN.1 message into a human-readable data structure.

## SUMMARY OF THE INVENTION

**[0009]** The present invention is directed to a system, method, and apparatus for testing an application stack in a software system by taking an Abstract Syntax Notation One (ASN.1) specification and test data, translating the test data into an ASN.1 message, and inputting the ASN.1 message into the application stack. The present invention is also directed to a system, method, and apparatus for testing an application stack in a software system by taking an ASN.1 specification and an ASN.1 message generated by the application stack, and translating the ASN.1 message into a human readable format.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** A more complete understanding of the system, method, and apparatus of the present invention may be obtained by reference to the detailed description of the preferred embodiment(s) that follows, taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a block diagram of a traditional telecommunications network;  
 FIGURE 2 is a block diagram illustrating an ISDN telecommunications network including an ISDN node that provides enhanced services over public and private lines;  
 FIGURE 3 is a block diagram of a software system using Abstract Syntax Notation One;  
 FIGURE 4 is a block diagram of an exemplary testing tool in accordance with the present invention;  
 FIGURE 5 is an information flow diagram of a testing method in accordance with the present invention; and  
 FIGURE 6 is a diagram illustrating a platform configurable for embodying the principles of the present invention.

## DESCRIPTION OF PREFERRED EMBODIMENTS

**[0011]** The present invention is particularly directed to the communication signaling message standards promulgated by the CCITT in Abstract Syntax Notation One (ASN.1) for the implementation of ISDN features and services. It should be understood, however, that the present invention is not limited to the standards set by CCITT for the interchange of data between telecommunications computing systems. Moreover, it is generally applicable to telecommunications computing environments which use deviations, modifications and extensions of the CCITT standards for the ASN.1 notation. The scope of the present invention with respect to the CCITT standards is more fully described in the following text.

**[0012]** The growth in information and communications technologies in recent years has created a wealth of economic opportunities. Vendors providing telecommunications services to the public are continually faced with new customer demands. Providing traditional telephone services is no longer enough. Today's users want the ability to transmit not only voice signals but also data, audio, video and multimedia signals in both real time as well as through asynchronous channels. To facilitate and to standardize the provision of enhanced telecommunications services, standard setting organizations such as the CCITT continue to publish a number of standards.

**[0013]** A traditional telecommunications network providing several types of conventional services, including that which is known as the Plain Old Telephone Service (POTS), is shown in FIGURE 1. In FIGURE 1, there is shown an illustrative schematic diagram of a telecommunications network including a plurality of local exchanges 21 to 26, each of which have a plurality of local subscribers connected thereto and represented by telephones 27. Two of the local exchanges 21 and 24 are represented as having remote subscriber multiplex stages 28 and 29 associated therewith which, in turn, have local customers 27 connected thereto. The network of FIGURE 1 also includes a plurality of trunk exchanges 31 to 34 which serve primarily to interconnect various local exchanges with one another and to provide routes between various parts of the network. Trunk exchange 31 is shown connected to a mobile exchange 35 which includes a pair of illustrative base stations 36 and 37 serving a plurality of mobile radio telephone subscribers represented at 38. In addition, other telecommunications services such as data bases, intelligent network Integrated Service Digital Network (ISDN) nodes, and private nodes such as PBXs may also be connected to various ones of the exchanges shown. Between