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Simple Network Management Protocol

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Declaration

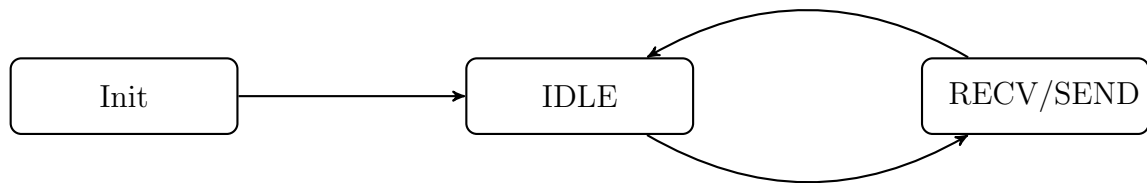
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1 Introduction

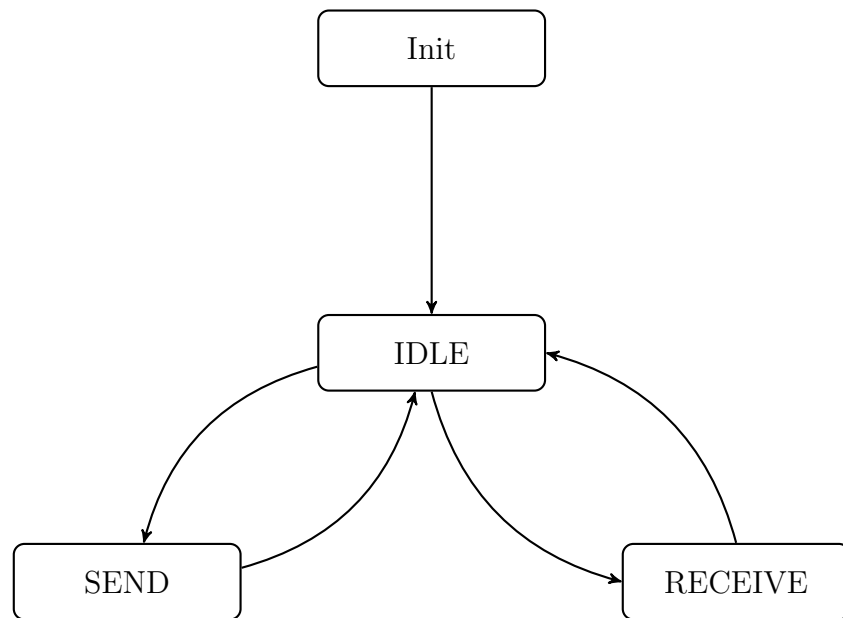
Simple Network Maanagement Protocol (SNMP) is used for collecting and organising information about managed devices on IP networks and for modifying that information to change device behavior. It allows an SNMP manager (the controller) to control an SNMP agent (the controlee) by exchanging SNMP messages. The main purpose of an SNMP message is to control (set) or monitor (get) parameters on an SNMP agent.

An SNMP manager can set or get the value for each instance (each parameter). In an SNMP agent, parameters are arranged in a tree. SNMP uses an Object Identifier (OID) to specify the exact parameter to set or get in the tree. An OID is a list of numbers separated by periods. Every SNMP agent has an address book of all its objects, called the MIB or Management Information Base. The MIB provides the name, OID, data type, read/write permissions, and a brief description for each object in an SNMP agent.

All SNMP devices must understand an SNMP message, which presents a couple problems. The first problem exists because different software languages have slightly different sets of data types (integers, strings, bytes, characters, etc). This is provided by Abstract Syntax Notation One (ASN.1).



FSM for SNMP Agent



FSM for SNMP Manager

2 ASN.1

ASN.1 data types falls into two categories: primitive and complex.

2.1 Primitive data types

ASN.1 primitive data types include Integer, Octet (byte, character) String, Null, Boolean and Object Identifier. The Object Identifier type is central to the SNMP message, because a field of the Object Identifier type holds the OID used to address a parameter in the SNMP agent.

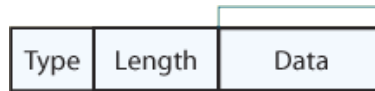
2.2 Complex data types

Sequence and PDU (Protocol data unit) are complex data types. A Sequence is simply a list of data fields. Each field in a Sequence can have a different data type. The PDU field contains the body of an SNMP message. Two PDU data types available are GetRequest and SetRequest, which hold all the necessary data to get and set parameters, respectively. Ultimately the SNMP message is a structure built entirely from fields of ASN.1 data types.

3 Basic Encoding Rules

The SNMP message is a Sequence of fields with varying data types, so to let the recipient the starting and ending of a field. This is where basic encoding rules are used.

The most fundamental rule states that each field is encoded in three parts: Type, Length, and Data. Type specifies the data type of the field using a single byte identifier. Length specifies the length in bytes of the following Data section, and Data is the actual value communicated (the number, string, OID, etc).



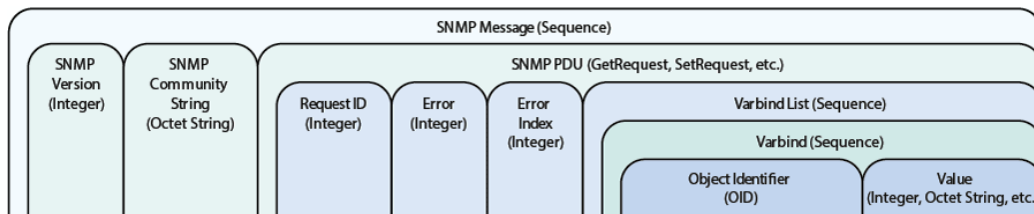
BER Encoded Field (Primitive Data Type)



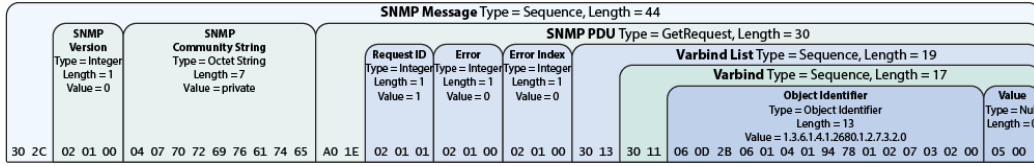
BER Encoded Field (Complex Data Type)

4 The SNMP Message Format

The SNMPv3 message format specifies which fields to include in the message and in what order. Ultimately, the message is made of several layers of nested fields. At the outer-most layer, the SNMP message is a single field, of the Sequence type. The entire message is a Sequence of three smaller fields: the SNMP Version (Integer), the SNMP Community String (Octet String), and the SNMP PDU (GetRequest, or SetRequest).



Packet Format

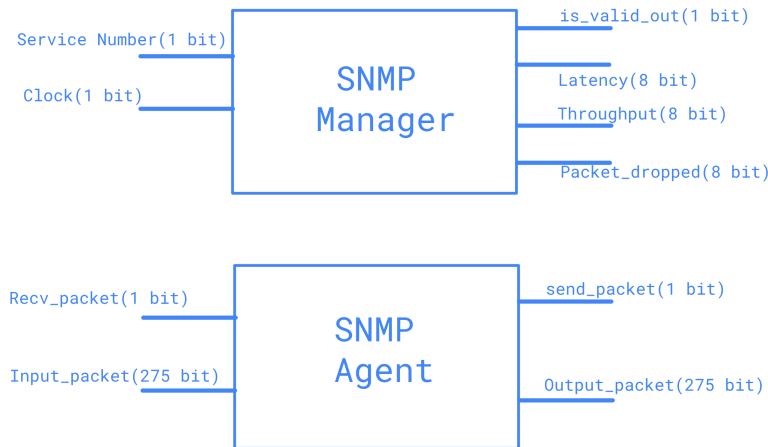


SNMP GetRequest Message Datagram

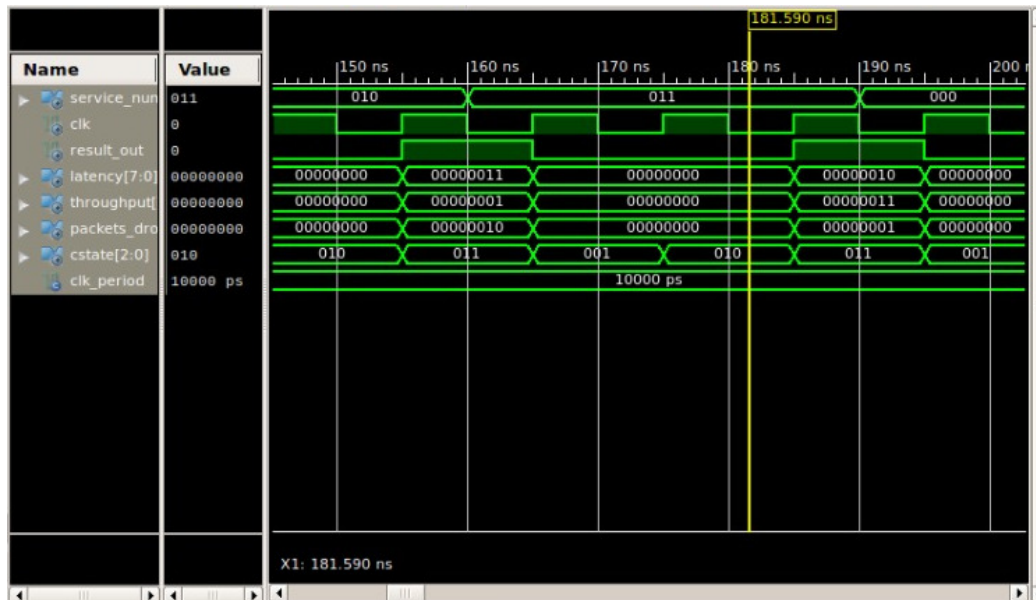
5 Implementation

5.1 Work Flow

A service number is provided as an input to the SNMP Manager. The service number denotes the agent number from which the information is requested. The SNMP manager then prepares a packet to be sent to the Agent. The packet contains respective SNMP application layer header with OID of throughput, latency and packet dropped mentioned. The SNMP manager sends a GET Request to the corresponding SNMP agent. The SNMP packet from manager is received by the SNMP agent. The agent responds to this packet by inserting the requested information i.e, latency, throughput and packet dropped in the corresponding positions. The SNMP agent then sends the Response packet to the SNMP manager. ‘



Block Diagram



Timing Diagram of SNMP manager with three agents

References

- [1] SNMP overview: [Click Here](#)
- [2] SNMP white paper : [Click Here](#)
- [3] SNMP RFC 1157 for implementation : [Click Here](#)
- [4] Huge Thanks to people at [Stack OverFlow](#)
- [5] Our Reliable Search Engine [Google](#)