# Health Level Seven (HL7) Components

The **Health Level Seven** standards body was setup to define messaging standards in the Healthcare domain to ensure that diverse vendor solutions in this domain will have a consistent means of communication. The **Level Seven** refers to the highest level of the International Standards Organization's communications model for **Open Systems Interconnection (OSI)**. In other words this level defines the communications protocol that the applications layer will follow. This level supports security checks, identification, definition of data, data exchange structure, exchange mechanism, timing of the interchange and error handling. The HL7 protocol provides guidelines to define all of this.

HL7 is a standard means of exchanging data between any diverse healthcare applications or devices used in the medical space. In an organization, it is also common to have all applications send up the HL7 messages to a central router, which then determines how or to which application to notify these messages to. HL7 is a messaging syntax that has standardized the events and their corresponding message format that would enable different systems to communicate with each other. The standard specifies types of message formats that correlate to various functions found in a clinical and administrative setting. For example, the message type **ADT (Admit/Discharge/Transfer)** is used to communicate information about the patient's movement. All HL7 messages need to conform to these standards.
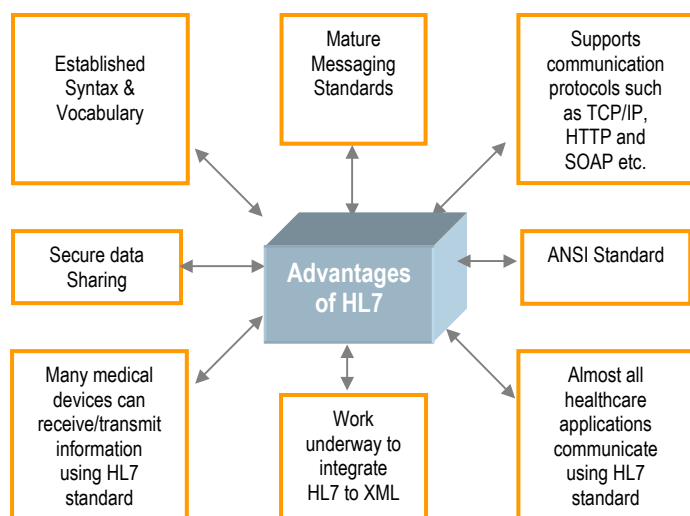
HL 7 Solution

Eutech being a Healthcare Solution provider has had extensive HL7 implementation experience. All products of the Copernicus Suite are interfaced to other applications via HL7. Some of the interfaces that currently have been implemented are as follows:

- Patient Details from SAP to SOCIS (Outpatient System) in Changi General Hospital, Singapore.
- SOCIS (Outpatient System) to the hospital's EMR system for Registration and Patient information in Changi General Hospital, Singapore.
- Inpatient Prescriptions and billing information from PHIS (Pharmacy System) To SAP in Changi General Hospital, Singapore.
- Case information from AEISS (A&E system) to SAP in KK Women's and Children's Hospital, Singapore.

- Patient Registration information from SAP to the AEISS (A&E System) in Changi General Hospital and in KK Women's and Children's Hospital, Singapore.
- Complete consultation and case information from AEISS (A&E System) to the hospital EMR system in KK Women's and Children's Hospital, Singapore.

Each implementation involves the following:

1. For **Sending HL7** Information
   - Collect the required information from the application database
   - Format it in the required HL7 format
   - Send the message to the receiving application
   - Handle data errors, transmission errors, communications medium errors and Receiving application errors.

2. For **Receiving HL7** Information
   - Receive messages from the sending application
   - Process the message and update the associated database tables
   - Handle data errors, transmission errors, communications medium errors and Sending application errors.

With the need to carry out this task repetitively as well as the constant need to support changes in requirements, Eutech has designed a HL7 engine to ease this entire process.

HL 7 Engine

The need for developing this product was born out of multiple implementations of HL7 Interfaces that Eutech has carried out. The information gathered during repeated testing such as errors that were generated and the users concerns in handling HL7 interfaces, prompted us to develop this tool.

Objective

The key objectives for developing the tool are:
- For each new Interface, restrict new development to a small component that interacts with the database. In other words, segregate the application specific logic from the rest of the engine
- Generalize message parsing, communications and debugging
- Provide an Admin tool to setup and administer the interfaces
- Parameterize all application configuration data and read from this parameterized file
- Architecture should support future technologies without changing the interfaces between components of the engine.
- Eventually, template based customization. Thereby, customization to be carried out easily without much technical effort

Salient Features

All interface services require the customization of the following
- The Database Layer
- The Segment Builder (template provided)
- The Message Map
- Segment Definition files and message rules file

The Architecture

The Architecture has been built to support the currently common ASCII format and socket communication. It also caters for other forms of data manipulation like XML as well as other means of communication like queues. The entire messenger layer is common across all implementations. A Messenger Layer Interface API is provided with samples on how to use these API's. The Service Manager and Business Layer interface is also documented to ensure that the required interfaces are implemented by the business layer. This architecture ensures that any new implementation of the HL7 interface requires only the Business layer, which is application specific to be customized.
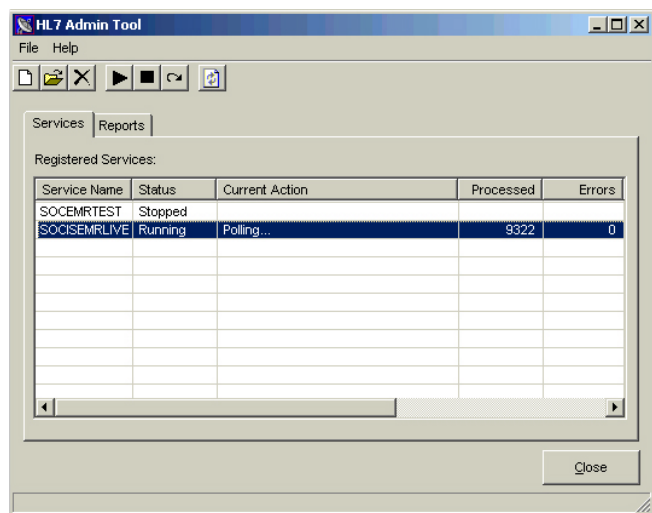

Acknowledgement and Error Handling

This handles sending of acknowledgements for successful messages received as well as handling acknowledgements from the receiving application. Error Handling is extensive along with error logging. All errors are classified into:

- Application errors
- Network errors
- Database errors
- Client/server errors
- Miscellaneous errors

When sending HL7 messages, an erroneous message will be retransmitted a predefined number of times before the service gives up. After a certain pre defined number of successive errors, the service will stop assuming that there is some major problem with the network or the other program might have rejected it.
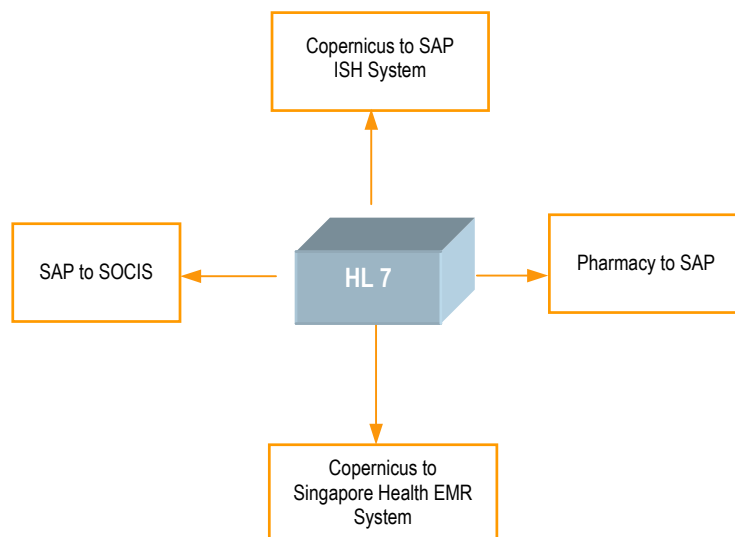
Admin Tool
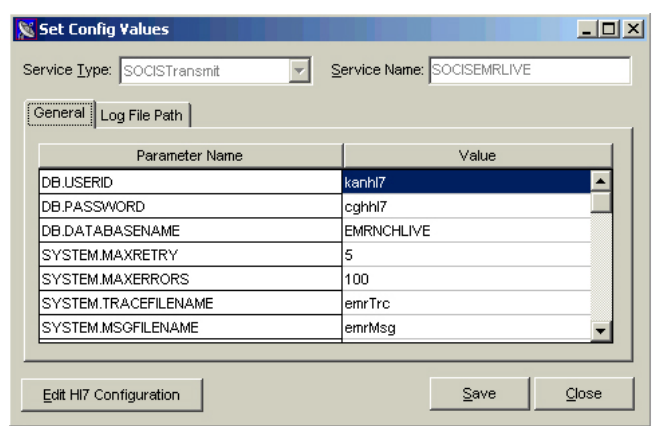
This product provides an Administrator tool that help configure, manage and view the status of different HL7 interfaces. This includes creating and updating the different files, configuring the location of different logs as well as detailing the IP address of the listener / sender application.

Platform

This tool currently runs as a service on a Windows® NT or Windows® 2000. The Admin tool has to run on the same machine on which the HL7 service is running. The Tool has been currently been developed in Delphi 6.0.
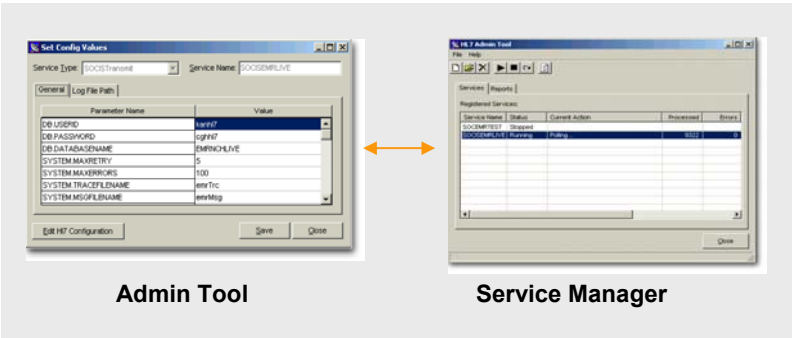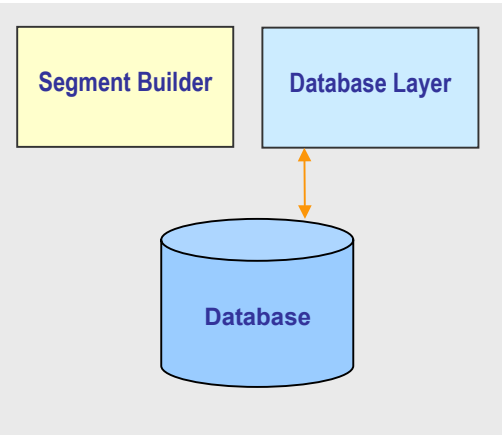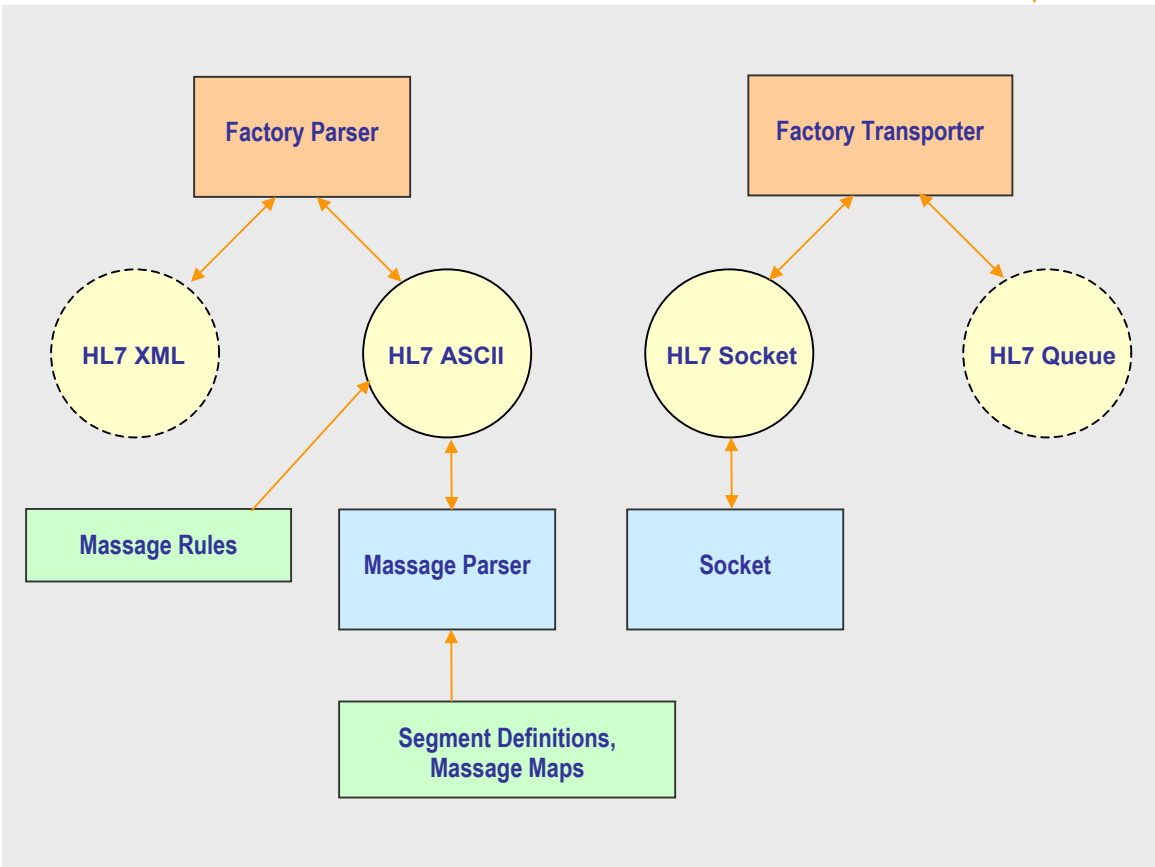
Interface Implemented

System Architecture

User Interface

Admin Tool

Service Manager

Business Layer

Segment Builder

Database Layer

Database

Business Layer

Factory Parser

Factory Transporter

HL7 XML

HL7 ASCII

HL7 Socket

HL7 Queue

Massage Rules

Massage Parser

Socket

Segment Definitions,
Massage Maps

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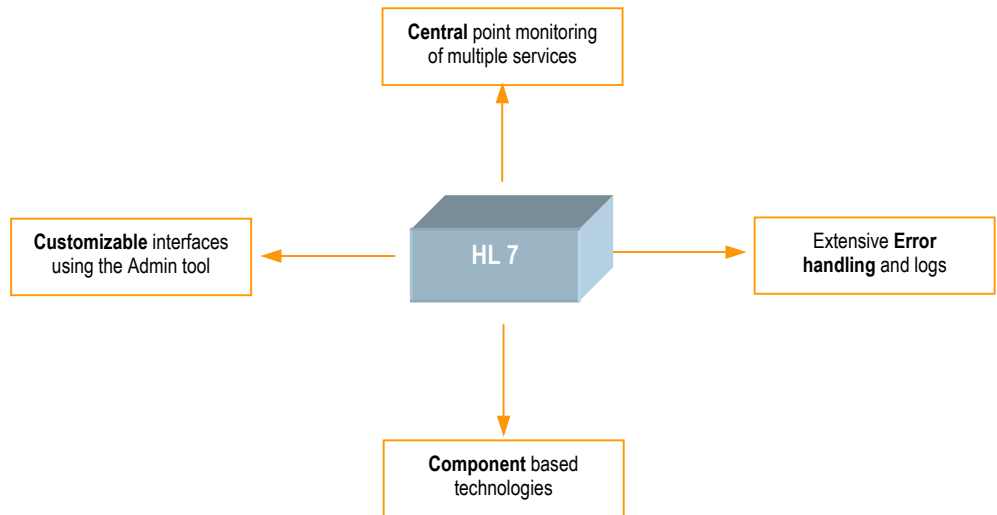Fax: (1) 650 654 8928

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Key Features

Central point monitoring of multiple services

Customizable interfaces using the Admin tool

HL 7

Extensive **Error handling** and logs

Component based technologies

Benefits

Benefits of the HL7 include:

- Reduces testing cycles
- Reuse of pre-tested components
- Highly configurable module
- Efficient and robust transportation module
- Process status available at the click of a button
- Reduces development cycle
- Errors can be easily traced

Other modules in Copernicus™ Suite

- Hospital Information System
- Specialist Outpatient Clinic Information System
- Pharmacy Management System
- Purchase Order & Inventory System
- Accident & Emergency System
- Mammography System
- Operating Room Scheduling System
- Clinical Workstation System
- Electronic Medical Records

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