Abstract
At present most of the organizational Information systems are formed using several heterogeneous distributed systems. Relevant information might be maintained in several distributed systems. “Openness” is the basic and the most important property of a distributed system for intercommunication. It describes how systems can be extended to be inter-operated with other systems. So many standards and protocols are developed for sharing data. Among several available standards and protocols, Simple Object Access Protocol (SOAP) web-service is becoming popular. However, these standards and protocols have limitations when it is necessary to transfer different formats of information between heterogeneous systems.

The new protocol that is introduced in this research is based on human communication and conversation techniques. Rather than in system communication, human communication gives the upper hand for the two parties by enabling a meaningful communication exchange. This new protocol is built upon the SOAP protocol for online communications. It is designed in such a way, that most of the drawbacks of existing protocols and standards are eliminated.

This new information transfer protocol is bundled with security features and better performance mechanism. It also can handle a communication process even when one party is rapidly changing, and hence it allows continuous system developments independent of the communication interface. Heterogeneous systems will be able to use this new protocol to exchange their information in a more effective and flexible manner.

Keywords
Information Communication Protocols, Web-services, Information Systems, Distributed Systems, Heterogeneous Information Systems

I. Introduction
Computer systems are one of the major revolutions of history. Until about 1980–1985, computers were large and expensive. As a result, most organizations had only a limited number of computers and there were very limited technologies to interconnect each computer, so they operated independently from one another [3].

Two technological breakthroughs pioneered the change of independent operation of computers in around 1985. One breakthrough was the invention of small, powerful and inexpensive microprocessor based computers. The second one was the development of high-speed networks for computer systems. The result of these technologies ended the computers being operated independently [3].

With the rising of network computer systems, people tried to make use of distributed computer systems, resulting in concepts such as “Data distribution”, “Distribution of Computations” and “Applications distribution”. To achieve these kinds of technological advances, some protocols such as Transmission Control Protocol/ Internet Protocol (TCP/IP), User Datagram Protocol (UDP), Hypertext Transfer Protocol (HTTP), Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP), etc., some middleware such as Socket Communication, Remote Procedure Call (RPC), Remote Method Invocation (RMI), etc., networking operating systems (OSs)such as Windows NT, Windows Servers, Novell NetWare, Router OS, etc. or totally distributed clustering OSs such as Linux Rock Cluster, Red Hat Cluster Suite, Solaris Cluster, Veritas Cluster Serve and many more technologies were developed [4-5].

Today, organizational IT environments are getting more and more user friendly. However, developing user-friendly applications to cater complex requirements through unified systems are not that feasible. In many business operations, IT systems are not a unique single entity. Rather it could be a combination of several distributed heterogeneous systems, irrespective of whether they are purchased systems, in house developed systems, or Open Source systems. As a single system, they may not be complex, but as a distributed system, they form a complex architecture. Even though it is easier to maintain as single systems, maintaining distributed systems is a complex task. Specially for real-time integration, the communication protocol should support ambiguous business operations. The outcome of this research enables new dimension for the real-time information communication for complex heterogeneous information systems in present business environment [6].

II. Problem
Usually organizational information systems do not behave as a single homogeneous unit. There are many issues related to information transfer mechanisms between heterogeneous systems. If one system requires the other system’s or systems’ information, owner of information must provide an application programming interface (API) to the requesting system to get the information. However, APIs are not provided for highly customized applications. Even if an API is provided, it may not guarantee the compatibility of two sets of systems for communication. In addition, other way of system communication is using a Middleware [7]. It is not easy to address most of the required properties such as language independence, OS independence, better performance, adequate level of security in a single Middleware. If any Middleware addresses the above properties at some level, most of the times there might be issues regarding tightly coupled interfaces, and the architecture.

Technologies such as web-services provide better solutions for the above issues. However, web service interfaces’ structure is highly dependent on the information. Parallel development of communicating systems’ interfaces can be a difficult task without considering the other end interface. However, web-services technologies are incapable to handle independent communication in parallel systems development and highly dynamically change the systems. So web-services may not be able to cope up with the highly dynamic nature of system life cycle.
III. Objective

The objective of this study is to develop a protocol to transfer information between heterogeneous systems in a secure and efficient manner for systems which has dynamic system life cycle. Primary objective of this research is to develop a protocol or a standard way to facilitate information transfer between heterogeneous systems in adequate system independency (platform independency, technology independency and interface independency). There are many more technologies available to communicate between distributed systems. If a distributed system is developed using existing technologies, most of the times there might be issues regarding tightly coupled interfaces and in the architecture. Therefore, the scope of this research is to identify the available technologies and to assess advantages and disadvantages of available technologies, and develop a new protocol that totally or partially uses some available protocols or may operate on top of the existing protocols.

Secondary objective of this research is to construct a protocol which is feasible in utilizing practically in real information system applications. This new protocol should facilitate performance, security and any other important parameters to achieve this object.

IV. Research Approach and Methodology

The research consists of four main steps in the methodology. First step is literature review and currently available technologies for information transfer, issues, quality aspects such as security and performance were analyzed based on the secondary data.

Second step is conceptually design a new protocol which can provide a solution for research problem. The new protocol was designed based on robust communication methods and their proven features. Human communication methods are the most effective and the most information oriented. Rather than in system communication, human communication gives the upper hand for the two parties by enabling a meaningful communication exchange. By using features of human communication methods, most of the information based error-areas in computer system communication can be eliminated.

Third step is case study selection and new protocol development. As it was discussed previously, this case study should be chosen in a way such that it represents common issues faced in the information transfer and sharing process. To apply the new protocol, the communicating systems should be heterogeneous and should be in a dynamic development life cycle. And there should be a secure and efficient communication requirement between those two systems. The development will be done using a suitable technical stack that will be compatible with the case study. Using the new protocol’s standards, the development will be done for the selected case problem.

Fourth step is case study analysis and consist two segments. First, analysed the new protocol is achieved primary objective is or not. That means new protocol or a standard facilitates information transfer between heterogeneous systems in adequate system independency. Second, analyse the collected data through case study development for perceive the state of performance, security and other crucial aspects in new protocol. The second object analysis also crucial, because it proves feasibility of the new protocol in practically usage in enterprise level information systems.

V. Distributed Applications

Presently large numbers of computer users are familiar with desktop computer applications; such as Office packages, Media players, Anti-Virus applications, Web browsers, Games, etc. Even though such kinds of applications give a look and feel of stand-alone applications, most of those applications are not pure stand-alone. The reason behind is that, most of the desktop applications run at least networking update functions. Since in the backend it communicates with service providing servers, these stand-alone applications actually perform as Distributed Systems (DS). Some applications are distributed by their nature and those applications run across multiple computers because of one or more of the following reasons [3][6];

- Distributed data
- Distributed computation
- Distributed users

An Application Programming Interface (API), Socket-based Communication, Transport Layer Interface(TLI), Remote Procedure Call (RPC), Remote Method Invocation (RMI), Dot Net Remoting, Distributed Component Object Model (DCOM), Common Object Request Broker Architecture (CORBA), Web-Services many more technologies available to manage distributed system communication. Each and every technology has its own strength and weaknesses. Initially technology just focused performance and some level of security requirement [6]. Now it was focused about loosely couple, low dependable and high secure mechanisms. Web-service is the leading technology aspect that achieved this and can operate and provide services in a heterogeneous environment such as a variety of software platforms and architectures, and allows them to be written in different programming languages. Simple Object Access Protocol (SOAP) and REpresentational State Transfer (REST) are web-service standard in present [2, 8].

Openness is one of the main goals of developing a distributed application system. “The openness of a computer system is the characteristic that determines whether the system can be extended and re-implemented in various ways” [1]. An open distributed system is a system that can offer services to others, and developed according to standard rules. These standard rules describe the syntax and semantics of those services offered by the distributed application system. Opened system describes the format, contents, and meanings of messages sent and received. Such rules are formalized in the protocols. In opened distributed application system’s, services are generally specified through interfaces, which are generally described in an Interface Definition Language (IDL) [3].

Simple Object Access Protocol or SOAP was the first Web Services standard or protocol that was developed. SOAP is a simple and lightweight protocol, which runs in a distributed environment, and supports exchanging structured and typed information between decentralized peers. SOAP is XML based protocol that is passing information to unidirectional and messages can be combined to implement request / response processes, or other more sophisticated interactions [9]. “SOAP does not itself define any application semantics such as a programming model or implementation specific semantics; rather it defines a simple mechanism for expressing application semantics by providing a modular packaging model and encoding mechanisms for encoding data within modules” [10].

SOAP can operate between large varieties of systems ranging from messaging systems to RPC. SOAP based Web-Services also work with other specifications such as WS-Security, WS-Transaction,
etc. [11]. SOAP based Web-Services architecture describes in the Figure 1. SOAP has many more advantages such as platform independent, language independent, Running over the HTTP, there are less firewall policy and security issues, Works with the important viewpoints of remote object system, so it is simple, Neutral to any vendor applications, Can handle more connections, Can be used to extend existing systems or even to connect to new systems, many other specifications. One of the main weakness of web-service is interface dependability and this is common issue with all presently available other technologies too [12].

![Fig. 1: SOAP based Web Services Architecture](image)

**VI. New Protocol**

New protocol is based on currently available information communication technologies and it was choice SOAP Web-Services technology for the design and development. Fig. 2 shows the core segments of the new protocol.

![Fig. 2: Core Segments of the New Protocol](image)

**A. Issues in Names and Values**

Information is the core of any computer system, regardless of the nature of a system, information is the most vital element. Even a basic set of information has attributes such as description and its value. In an information transfer process, the key task is to manage and handle its description and value.

Consider the following case of naming conflict. Even when the information names are different; they give the same meaning. That means whatever the information label, the system must have some kind of a mechanism to recognize that naming convention.

- Subject
- Course
- CourseName
- Course_Name
- Course-Name

When considering the information values, typically there is no meaning other than in the relevant business domain. Even some data has no meaning within the business domain when it consider as a single segment. This is one of the issues in independent development of several systems that should operate together. That can happen due to the usage of some identity numbers (eg; primary or unique keys) and some values that are derived from other values. The other problem is, information values can have same meaning in business domain but they can be represented in several different ways. Consider the following examples to get an idea about the above discussed three issues.

- **AcademicYearID** = 3
  - (Not meaningful information in the business domain.)
- **OfferingID** = 124
  - (Not meaningful information in the business domain and this value is derived from others.)
- **AcademicYear** = 2013-2014
- **AcademicYear** = 2013:2014
- **AcademicYear** = 2013/2014
  - (All three academic years’ values are not equal. But they give the same meaning in the business domain.)

**B. Solution for Names and Values Issues**

1. **Static Mapper**

   In most cases, information variable names or descriptions differ in different systems. Most of the times, there is no identical pattern for comparisons across several systems. When considering a set of information names, most of the times it is static and does not grow as data and information name sets are not bulky. Usually information variable names are defined only in certain point and they do not change for a long time even when the business process goes on. A set of attribute names may change in case of an addition of a new module or any change in the business requirement of the system. The new protocol proposed solution is ‘Static Mapper’ for this issue.

   It is doubtful about which party (information sender and the receiver) is going to have this static information mapper and is going to manage the synchronization. However, when it is considered it can be seen that the information receiver is the one who should play the key role of this synchronization process. It is because the receiver specifically knows what kind of information it requires and to what content among the available all the services from information sender. The information provider has the total freedom to use any naming convention for information representation process in service providing interfaces.

   Considering Table 1, it contains a simple database table with only three columns. The first column contains information name as they exist in the own system (information seeker). The second and third columns contain values of the responder’s identification number (ResponderID) and the responding attribute name (RespondingName) of that particular responder.

<table>
<thead>
<tr>
<th>Information Name</th>
<th>ResponderID</th>
<th>RespondingName</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td>1</td>
<td>Course</td>
</tr>
<tr>
<td>AcademicYear</td>
<td>1</td>
<td>AccYear</td>
</tr>
<tr>
<td>Marks</td>
<td>1</td>
<td>ExamMarks</td>
</tr>
<tr>
<td>Subject</td>
<td>2</td>
<td>SubjectName</td>
</tr>
<tr>
<td>Marks</td>
<td>2</td>
<td>ExamMark</td>
</tr>
<tr>
<td>SemesterName</td>
<td>3</td>
<td>SemesterDescription</td>
</tr>
</tbody>
</table>
First of all, requesting system must maintain a static information name mapping table for non equal names as above (there is no issue in equal names available or not). When process of requesting information, requesting system has to replace the attribute names using this table for related responding system. If there is no entity available, that means there is no difference between requester and responder attribute names. Both request and respond contain responder keywords. So respond keywords or attribute name are mapped by using static mapping table and can process further. Figure 1 shows the operational location of “Static Mapper” in the new protocol architecture.

2. Dynamic Mapper
In a business domain, representation of information values can be different among several systems or in several organizations that share the same information sets. Even though the representations of information values are different, the final meanings of those are the same. Usually information value sets are dynamic and have a tendency of rapid growth. When we take a particular information set in an information system with the daily operations going on, its size grows. Hence it is nearly impossible to use a ‘Static Mapper’ for information values. However, there is a common pattern of representation information values for particular system. So the best way to solve this kind of issue regarding information values is to use a dynamic mapper, which uses a mechanism such as string matching can be easily used to identify the information value. As an example for more clarification, if a particular system has the academic year as “2013/2014” and the other system which communicates with previous system has the academic year as “2013-2014”, a string matching mechanism can be defined to match these two values as having the same meaning. This defined string matching mechanism can understand any growth in academic year entities of both systems. Figure 1 shows the operational location of ‘Dynamic Mapper’ in the new protocol architecture.

C. Meaningful Information
When considering information transfer mechanisms, there are four issues in independent development of several systems that should operate together. ‘Static Mapper’ and ‘Dynamic Mapper’ solve two issues and rest of two issues are:
- Some information values have no meaning for others.
- In some information values, there is no meaning in a single value.

When considering the information values, all values must follow a rule to solve those remaining two issues listed above. That rule is simple but it helps to develop systems independently. The rule is “All information must be in a meaningful manner inside the business domain”. Two examples stated below show how to follow that simple rule and solve the issue.

- AcademicYearID = 3
  (Not meaningful information in the business domain.)
- AcademicYear = 2013/2014
  (This is meaningful in the business domain.)
- OfferingID = 124
  (Not meaningful information in the business domain and this value is derived from others.)
- Subject = CS1010
  Semester = Semester-01
  AcademicYear = 2013/2014
  (“CS1010” subject is offered in “Semester-01” semester in “2013/2014” academic year is meaningful in the business domain.)

3. Information Transfer Mechanisms
Considering modern information systems, they are based on different kind of infrastructure, platforms and software such programming languages, databases, application servers, etc.. Because of that, the new protocol should be independent from all above. So, to achieve this, independence SOAP based Web-service is the ideal solution. For the online information transfer, “Information Provider” and “Information Recipient” must have web-service server and web-service client interfaces. Figure 3 shows high level architecture for new protocol and how the different layers interact and how the standard interfaces are used for communication. In that figure, “X” stands for all additional requirements that are necessary for the on-line information transfer through the new protocol.

The new protocol designed to achieve interface independent development process for the information providing system and for the information requiring system. Mainly if it is an independent development, both systems should be able to carry out their own development process regardless of the other end. Traditional service oriented architecture does not provide independent development of this kind due to some reasons. Mainly attributes such as function names, number of functions, number of input and output, input and output names, etc. should be known to the other system in order to carry out the development process.

New information transfer protocol design has a simple interface. This simple interface concept is helpful to develop a universal independent interface. This new interface that is based on the new protocol, enabled for one standard function with only one input and only one output. However, all the services are provided using this single interface. These two input and output formats are strings. Information provider interface and information recipient interface can be developed independently because of the new proposed interface.

Interface Format
- Function Name -
  GlobalServiceFunction (Just a name for standard)
- Request Data -
  String (That string contains XML file structure)
- Response Data -
  String (That string contains XML file structure)
4. Request Data
Request string only contains XML file structure inside. Figure 4 shows sample of the requesting data structure. “username” and “password” attributes contain requesting system (information recipient) authentication data required for the responding system (information provider). Information provider can have several business functions to provide information. The “businessFunction” attribute contains relevant business function name that assists to discover the required information sets. The “known” attribute contains information that the requesting system already knows. Since this structure contains only the critical set of information, it is very efficient when requesting information.

```xml
<request>
  <username>RequestServerUserName</username>
  <password>RequestServerPassword</password>
  <businessFunction>Function-1</businessFunction>
  <known>
    <attribute_1>Value-01</attribute_1>
    <attribute_2>Value-02</attribute_2>
    <attribute_3>Value-03</attribute_3>
  </known>
</request>
```
Fig. 4: Sample Request XML String with Efficient in Request

```xml
<request>
  <username>RequestServerUserName</username>
  <password>RequestServerPassword</password>
  <businessFunction>Function-1</businessFunction>
  <known>
    <attribute_1>Value-01</attribute_1>
    <attribute_2>Value-02</attribute_2>
    <attribute_3>Value-03</attribute_3>
  </known>
  <unknown>
    <name>Unknown-attribute-01</name>
    <name>Unknown-attribute-02</name>
  </unknown>
</request>
```
Fig. 5: Sample Request XML String with Efficient in Response

Fig. 5 shows another way of a requesting data structure. Other than the previous structure’s attributes, this contains an attribute called “unknown”, which contains all the required sets of information attributes for the requesting system.

5. Response Data
Response string only contains XML file structure inside. Fig. 6 demonstrates the sample responding data structure. The “data” attribute contains information sets, which are responding to requesting system (information recipient).

```xml
<respond>
  <data>
    <Unknown-attribute-01>Value-1.1</Unknown-attribute-01>
    <Unknown-attribute-02>Value-1.2</Unknown-attribute-02>
    <Unknown-attribute-03>Value-1.3</Unknown-attribute-03>
    <Unknown-attribute-04>Value-1.4</Unknown-attribute-04>
  </data>
  <data>
    <Unknown-attribute-01>Value-2.1</Unknown-attribute-01>
    <Unknown-attribute-02>Value-2.2</Unknown-attribute-02>
    <Unknown-attribute-03>Value-2.3</Unknown-attribute-03>
    <Unknown-attribute-04>Value-2.4</Unknown-attribute-04>
  </data>
  <data>
    <Unknown-attribute-01>Value-3.1</Unknown-attribute-01>
    <Unknown-attribute-02>Value-3.2</Unknown-attribute-02>
    <Unknown-attribute-03>Value-3.3</Unknown-attribute-03>
    <Unknown-attribute-04>Value-3.4</Unknown-attribute-04>
  </data>
</respond>
```
Fig. 6: Sample Response XML String

Information recipient’s requesting XML data structure and information provider’s responding XML data structure must follow the above defined message structure. However, the attribute order is not compulsory; both information recipient and information provider can maintain their own sequence.

Security
Today most of the information systems contain a lot of data and most of the times this data can be highly sensitive and this is the biggest asset the organisation some time. Since this new protocol is going to be used in information systems, the security aspect should be closely considered. Therefore, this new protocol is equipped with well-functioning security measures.

An on-line information transfer mechanism always has two information systems that carry out the sending and receiving through some kind of information channel. Therefore, as a security measure, a secure channel can be used. It is not compulsory to have a secure channel for communications but it is essential for secured information transfer. In a practical scenario, usually HTTP is used for SOAP based Web-Services communications, but HTTPS (Hypertext Transfer Protocol Secure) can be used for secured communications.

When considering a single isolated information system, different information sets are owned by different end-users based on system policies. However, the ownership of information sets become complex, when information transfer process occurs between two information systems. In a scenario where one information system transfers a set of information to a seeking information system,
after transfer the information to the receiving system, it must take over the full responsibility of handling received information ownership according to its system policies. Information ownership can have several levels. Some information sets can be publicly available and some information sets can be highly confidential. Therefore, according to the sensitivity of information in an online information transfer process, the security level of the information offering should be provided.

The new protocol has provided three main services controlling security levels. Such as “Open services”, “Close services” and “Location close services”.

In “Open services”, the information providing system allows any other information seeking systems to access its corresponding information services without any control for information. In “Close services”, the information providing system allows only authorized information seeking systems to access its corresponding information service. Information seeking system can authenticate itself using “ServerName” (same as a username) and “Password”.

In “Location close services”, the information providing system allows only the authorized information seeking systems with an authenticated location to access its corresponding information service. Authorization process is the same as in “Close services”, but the information providing system considers the location (identified using the IP address) of the information seeking system for authentication. In practice, one information seeking system may require several server addresses to access the information providing system. Therefore, to facilitate this, several information seeker addresses can be registered in the information providing system.

VII. Development

Globally most of the leading organizations have understood the need of information systems (ISs) to compete with the growing rivalry. Most of the ISs make the organizational operation more effective, efficient and accurate. University of Moratuwa is most noble technological university in Sri Lanka, which uses ISs in the full potential. Several ISs covering various operational needs operate in the university. These ISs cover areas such as human resource management, e-learning, time tabling, examinations, finance, procurements, welfare and many other administrative tasks. When considering the examination operations, the university is using two IT systems namely ‘Moodle’ (university e-learning system) and ‘LearnOrg’ (university core management information system). The Moodle is mainly used for the purpose of learning management, in other words to manage learning objects or contents and all the learning operations. The LearnOrg has a separate examination module to manage all the administrative operations related to the examination process. Case study development was the examination marks related information transfer between Moodle and LearnOrg.

There were three main areas to develop, namely information provider, information seeker and information mapper. Both information provider and information seeker are developed by using the SOAP Web-Services technology. Information provider is developed as a web service and Information seeker is developed as a web service client. To develop the solution to cater to the case study, “NuSOAP” Web-Services library was used for more convenient development.

Information mapper was developed by using existing technologies used in programming language and used some extend to the database. Static mapper mainly uses available information in database and dynamic mapper mainly uses string matching technologies, which is enabled in the programming language.

VIII. Analysis and Results

There are two phases in analysis of results to address the achievement of objects.

A. Analysis and Result - 1

The first analysis is focused on testing the compatibility of the new protocol for information transfer between heterogeneous systems in adequate system independency. After application level development and deployment of new protocol on actual information systems analysis was done through some test cases for end-user operations. The testing process was carried out throughout a whole academic semester with live information. Around 750 students’ information were transferred between two systems and ten lecturers used the system to perform various system’s operations to test the new protocol.

This new protocol successfully application level development and implementation emphasize primary object of this research achieved and the new protocol facilitates information transfer between heterogeneous systems in sufficient system level independency. The new protocol was developed top of the available web-service SOAP protocol and it inherits all the advantage of the parent protocol and mitigate interface level dependency drawback though the new design of the protocol architecture.

B. Analysis and Result - 2

The second analysis is focused on testing the feasibility analysis of new protocol to utilize in enterprise level information systems in practical manner specially considering performance and security features.

1. Performance

Performance of the new protocol analysed by using the random system generated information sets up to the 2000 sets of information, which included “Assignment Marks” of a sample of students and results gathering process was done over and over while increasing the number of information sets and test results available in Table 2.

<table>
<thead>
<tr>
<th>Number of Results</th>
<th>Request Message Size (KB)</th>
<th>Performance Enabled Request Message Size (KB)</th>
<th>Response Message Size (KB)</th>
<th>Performance Enabled Response Message Size (KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.34</td>
<td>0.42</td>
<td>0.24</td>
<td>0.15</td>
</tr>
<tr>
<td>10</td>
<td>0.34</td>
<td>0.42</td>
<td>1.72</td>
<td>0.92</td>
</tr>
<tr>
<td>25</td>
<td>0.34</td>
<td>0.42</td>
<td>4.47</td>
<td>2.27</td>
</tr>
<tr>
<td>50</td>
<td>0.34</td>
<td>0.42</td>
<td>8.87</td>
<td>4.47</td>
</tr>
<tr>
<td>100</td>
<td>0.34</td>
<td>0.42</td>
<td>17.67</td>
<td>8.87</td>
</tr>
<tr>
<td>200</td>
<td>0.34</td>
<td>0.42</td>
<td>35.27</td>
<td>17.67</td>
</tr>
<tr>
<td>500</td>
<td>0.34</td>
<td>0.42</td>
<td>88.07</td>
<td>44.07</td>
</tr>
<tr>
<td>1000</td>
<td>0.34</td>
<td>0.42</td>
<td>176.07</td>
<td>88.07</td>
</tr>
<tr>
<td>2000</td>
<td>0.34</td>
<td>0.42</td>
<td>352.07</td>
<td>176.06</td>
</tr>
</tbody>
</table>
Fig. 7 demonstrates the test performance for the online information transfer and it is plotted in a log scale line graph. This graph clearly shows that, when the number of information sets goes up, the performance factor (Number of information sets/file size) is also going up and that means better performance. When enabling the performance feature requesting message, that results in a small performance lag. However, this embedded performance feature gives a greater overall performance in total communication process.

Fig. 7: New Protocol Test Performance

### 2. Security

The new protocol’s security aspect was tested in two ways by new protocol based using developed ISs. First, it was tested for secure communications and second, it was tested for compatibility of security policies. Figure 8 shows a set of information flowing through a secure channel. Because the information set is encrypted from one end to another, by capturing the information in the middle will not affect to the information security.

Fig. 8: Information Communication Through a Secure Channel

IX. Conclusion

Two or more heterogeneous systems can communicate in a very effective and efficient manner by using this new protocol. The special feature of this new protocol is that it can be used for systems even which have highly dynamic life cycle. Generally in other standards and protocols it is not required such a process, because they consider the transfer process of relevant information as data with only a slight meaning to the business process. However, by doing the above process, it solved information meaning, naming convention and value representation issues.

The new information transfer protocol achieves better efficiency level by enabling the performance enhancement request and respond messaging structure. When enabling the performance feature requesting message, it results in a small performance lag. However, this embedded performance feature gives a better overall performance. When considering the larger information sets, the performance factor (Number of information sets / Message size) is very high.

During the information transfer process, there is no intermediate information processing operation taking place in between two communicating parties’ interfaces. Therefore, the performance can be drastically improved if it is developed an end-to-end information compression mechanism.

Information seeking systems may be repeatedly requesting the same information, previous respond can be same or can be different. However, if there is no difference or slightly difference, repeating the same set of information is a big overhead to the communication process. A Versioning technique can be used on information set(s) to reduce such an overhead and improve the performance.

### References


