UMP SUBJECT REGISTRATION SYSTEM IN MAINFRAME ENVIRONMENT

(zSRS)

SARVESWARY A/P ILAN SOLLAN

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ABSTRACT

UMP Subject Registration System in Mainframe Environment (zSRS) is a subject registration system done in the mainframe environment for the system operators to create a batch type input and output system. The system is designed using System-Z as the operating system, to ease the tasks of the system operator to browse for records and view it in a formatted file. It will make use of the logical partition of a mainframe, to run the managerial operations. This report will discuss on the preparation, analysis, development and discussion based on the development cycle of this system. A complete reference and research details have been furnished in this document. This document will be a quick reference to refer on the specification and requirements of the system.

ABSTRAK

UMP Sistem Pendaftaran Subjek dalam platform ‘Mainframe’ (zSRS) adalah sistem pendaftaran subjek yang dilakukan dalam platform ‘mainframe’ untuk para operator menghasilkan input dan output berjenis ‘batch’. Sistem ini direka menggunakan Sistem-z sebagai sistem operasi untuk memudahkan urusan carian maklumat, dan memaparkan dalam bentuk yang telah diformatkan. Ia akan menggunakan konsep ‘logical partition’ dalam ‘mainframe’, untuk menjalankan operasi pengurusan. Para pengguna akan mengakses sistem melalui pelayar web yang diingini, dengan sambungan internet yang stabil dan memanfaatkan perkhidmatan yang disediakan. Laporan ini akan membincangkan mengenai penyediaan, analisis, pembangunan dan perbincangan berdasarkan kitaran pembangunan sistem ini. Rujukan yang lengkap dan butir-butir penyelidikan telah disertakan dalam dokumen ini. Dokumen ini boleh digunakan sebagai rujukan spesifikasi dan keperluan sistem.

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CHAPTER 1

INTRODUCTION

This chapter briefly discuss on the overview of this research. It contains five sections. The first section is background; follow by the problem statement. Next are the objectives where the project's goal is determined. After that are the scopes of the system and lastly is the thesis organization which briefly describes the structure of this thesis.

1.1 Background

UMP Subject Registration System in Mainframe Environment (zSRS) is an administration system with combinations of 2 applications, namely **Student Details** and **Subject Registration**. University should make use the service of the mainframe, for uninterrupted access of students, lecturers and administration personnel. The term reliability, availability and serviceability (RAS) is a defining characteristic of mainframe computers [4].

Currently, registration system in university is done using servers. This zSRS is a concept of making use of a Logical Partition of a Mainframe, for University Management. Since mainframes generally functions in an environment which requires thousands of users to access the system simultaneously, it should be able to balance the workload for a system, and make it always available for any number of users [19]. The mainframe can support many users because the security of mainframe prevents users from accessing or changing any objects on the system, including user data, except through system-provided interfaces that enforce authority rules. Mainframe computers can provide a very secure system for processing large numbers of heterogeneous applications that access critical data [28].

Basically, a mainframe is a computing system that a management use to host the databases, servers, and applications that require a greater degree of security and availability than is commonly found on smaller-scale machines [4]. The power of a mainframe provides computing speed and capacity, enabling it to perform high volumes of processing. The mainframe can process a mixed workload of jobs from different time zones and of different types. Mainframe also has characteristics such as reliability, availability and serviceability to run the hardware or software components smoothly.

Since this is the first university management system developed in a mainframe environment, only few applications which needs high attention is included.

Student Details module is initially created by the system operators as a batch job, when a student enrols into the university. It contains particulars such as Student ID, Name, Password, IC Number, Address, Contact Number and Email ID. System admin will update their particulars, if there are any changes.

For **Subject Registration** module, students' details that are needed are Course Code, Course name, Section, Time, Location of class, Lecture's name and Student ID. The report will show what the courses are taken by the students, in that semester. Unreliable internet connection causes delayed write in updating the subject registration info. Mainframe users will not face such problems, as the course selection system allows a large number of students to select course online at the same time [6].

1.2 Problem Statement

Currently, Subject Registration System implemented in University Malaysia Pahang is being automated. However, there are a few problems in the current system.

i) The details required in the Subject Registration System, such as students and course details are being entered manually into the database.

ii) For the operator, they are only allowed to make single entry at a time, which is time consuming.

iii) The details which are inserted into the database are in the form of unformatted data, which makes the operators have difficulties in reading the information

1.3 Objectives

This system is developed with several objectives, which are;

i) To create automated data entry into the database via COBOL.

ii) To create a batch type input and output system.

iii) To generate a formatted report stored in an independent flat file as output.

1.4 Scopes

a) The scopes of this system are :-

i. The zSRS is developed is related to FSKKP courses only.

ii. The access for the operator will be using their Prometric ID (Marist) which has given authority for each ID by the IBM.

b) This System is intended for one type of users only, which is the

i) System Operator

The system operator monitors and controls the operation of the mainframe hardware and software. This group of user will access the system to insert data to students' profile, subjects' information and check the report based on register subjects. As it is designed for the system operator, they would not need GUI, to save the bandwidth.

ii) System Administrator

System administrators perform more of the day-to-day tasks related to maintaining the critical business data that resides on the mainframe. Admins will have the full rights on the system. They can insert, update and delete record as well as browse for data. This group of user will access the system to do modification on student profile and subject registration. Admins and operators will share the same UserID and password. Their access privileges are restricted by their knowledge on the system.

1.5 Thesis Organization

This thesis contains six chapters. **Chapter 1** gives an overview of the research conducted. **Chapter 2** explains about research that is done regarding to this project. This chapter divided into two major parts namely, research on the existing system and about techniques and technologies that is related to this project. In **Chapter 3**, the approach or overall framework about the development of project are discussed. This includes techniques, methods, or approaches that is used to develop and implemented throughout the project development. **Chapter 4** will document all the process that is involved in the development of the projects. It includes all the implementation and testing done for the project. **Chapter 5** will discuss about the findings or result that is obtained and analysis of the data, constraint and suggestion for improvement. Finally, **Chapter 6** will conclude overall project that was developed. This includes the project summary, the summary of the data that is obtained and the effectiveness of data obtained with the objectives and problem statement.

CHAPTER 2

LITERATURE REVIEW

This chapter briefly describes the review on existing techniques related with “University Subject registration System in Mainframe Environment (zSRS)” that will be developed later. This chapter comprises two sections: The first section describes the comprehensive review on existing related system. The second section describes the review on techniques and system requirement attributes previously used in the same domain.

2.1 Subject Registration System

The application is an integrated university course selection and registration system for each students' reviewing all the information needed to determine courses to be taken and at the same time for completing their registration of required and elective courses for each semester [21,31]. Computer-mediated communication have been started to use by several institutions as an aid in the delivery of distance of distance-education courses since 1988. Besides, since 1988 a university started to use mainframe computer as the host for computer-mediated communications. The academic e-learning practice has to deal with various participation patterns and types of online learners with different support needs. Therefore course registration system in mainframe environment will be more efficient. This is because a mainframe is a computing system that a management use to host the databases, servers, and applications that require a greater degree of security and availability than is commonly found on smaller-scale machines [4].

The power of a mainframe provides computing speed and capacity, enabling it to perform high volumes of processing. The mainframe can process a mixed workload of jobs from different time zones and of different types. Mainframe also has characteristics such as reliability, availability and serviceability to run the hardware or software components smoothly. The significance of information security to availability of information and information processing resources, and provide means to establish and retain the integrity and confidentiality of information within the system [28].

2.2 Existing System Review

This section is to review the current system and the existing system that related to subject registration system in mainframe environment.

2.2.1 Mobile Agent Registration System (MARS)

Subject registration by students is a typical methodical process that could be automated through the use of software agents that. A system, known as the Mobile Agent Registration System (MARS), has been designed and developed to explore the advantages of mobile agents [20]. A mobile agent is a software agent that has the ability to transfer its program code, data and execution state across the network to a remote computer for execution.

The system architecture of MARS is depicted in Figure 1. It is divided into two sub-systems according to the two phases described in section 2; Setup sub-system and Registration sub-system. The Setup subsystem is made up of student agents, login agents, database agents and registration agents. The Registration sub-system is made up of bid agents and subject agents [5]. These agents are implemented by extending Aglets class. The MARS system architecture is shown in Figure 2.1.

A student agent, which is a stationary agent, provides a GUI for users to login and select their timetables. A timetable consists of at least one subject. A repeat or accelerated student may choose a timetable encompassing multiple classes. The login agent is a sub-agent of student agent [17, 21]. It uses the student's matriculation number as a login name accompanied by a password. The matriculation number serves as a key to extract other information from the database guarded by the database agent. The role of the database agent is to prevent direct database access by non-trusted agents. Bid agent will then be created with a copy of the timetable combinations and be dispatched to the virtual market place. The virtual market place provides a hosting environment for bid agents and subject agents to meet and interact [1].

The registration agent is a stationary agent that creates and controls all subject agents. A subject agent is a mobile agent that is passive in nature. After its deployment in the market place, a subject agent listens for messages from all the bid agents [17]. If it

receives a bid of value zero, the subject agent would treat it as a query for the minimum bid required and replies accordingly.

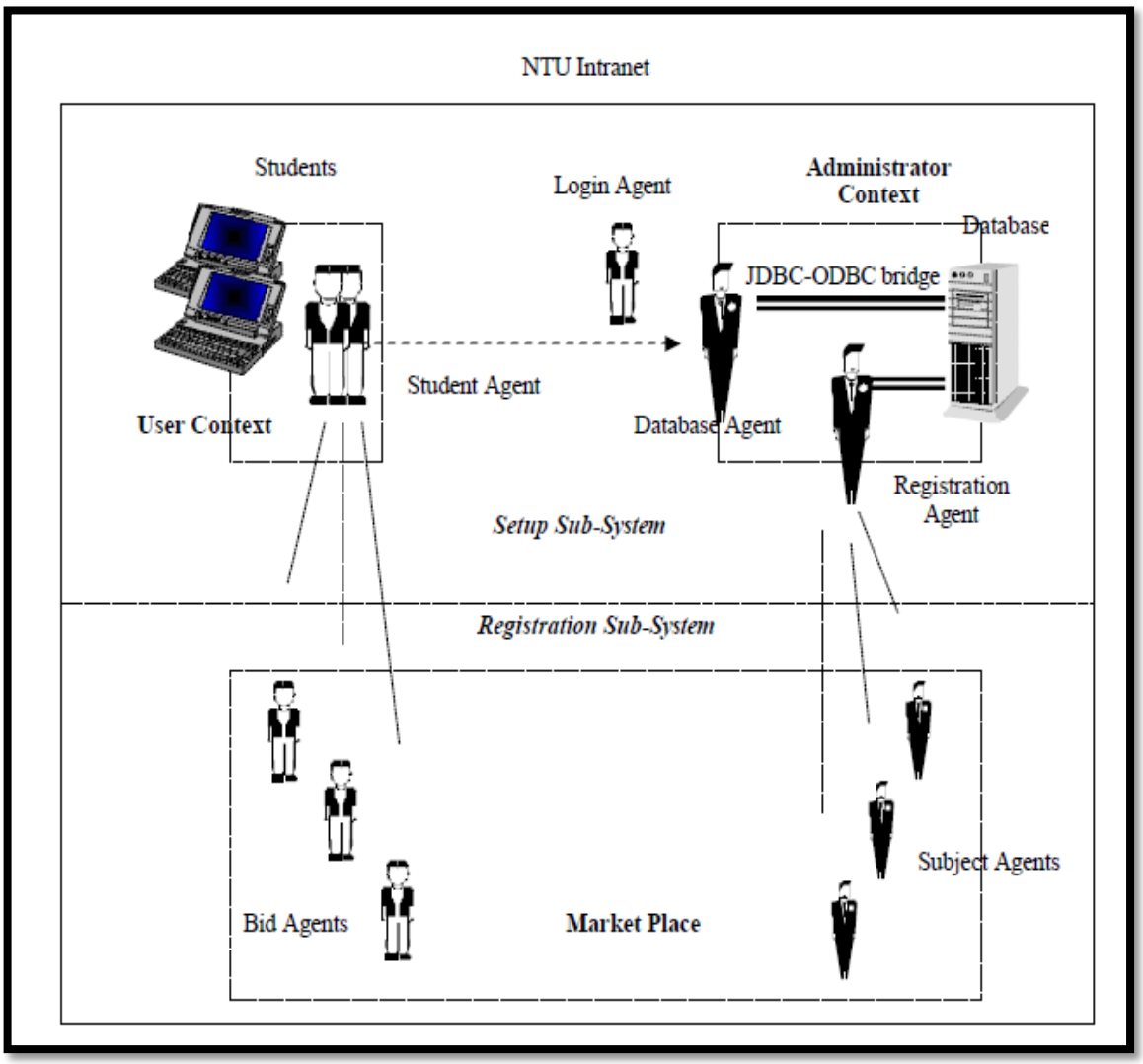

Figure 2.1: MARS system architecture

2.2.2 Design and Realization of High-reliability Courses Selection System Based on Mainframe (zBase)

Web technology are generally operating in PC servers, often peak in the selection phase, due to too many classes of students, parallel operation of too many servers vulnerable to congestion, or even collapse of the state. Elective System cannot be caused by normal use, students often can't get they want to select or classes election failed so that delay the selection time, but also allows schools in the organization of courses on a part of this to lag, to bring certain teaching management in a mess. So, course registration system based on mainframe is developed. The objectives of the system are the system provides access to data with a high concurrency, provide high stability and reliability of data access and improve the efficiency of courses selection system.

IBM mainframe with super security, availability, reliability [19], and have the prominent advantages: complete system connectivity, easy to manage, the lowest operating costs, the lowest total cost of computing. It is obviously to make a conclusion that mainframe is the very platform that are able to normally process tens of thousands data accesses request at the same time, which makes the process for client request and sever management highly efficient and convenient.

Through the careful investigation of the past users, this system is supposed to have the following functions. There are students access the system through the browser and are able to landing, students can visit the selected courses, and the details about courses by browse the course that has not been selected, students can visit the selected courses, and cancel the selected courses. The teachers can browse all courses that are in charge, and browse the details such as students who selected the course and can add, delete or change the details of course. The education administrator can log on the system by CICS map, can inquire the details about students, can add, delete or update the details about students, The education administrator can inquire the details about teachers, can add, delete or update the details about teachers, can inquire the details about courses and can add, delete or update the details about courses [22].

In the system, all the programs' structure and logic are defined and installed in the CICS region on the mainframe. The UI (User Interface) selects the WEB method which everybody is familiar with. Communication between the front-end Web and the back-end mainframe is a technical difficulty [15]. CICS Transaction Gateway is used to access mainframe resource by WEB [3]. Figure 2.2 gives the method that how the data communicate between WEB and back-end mainframe.

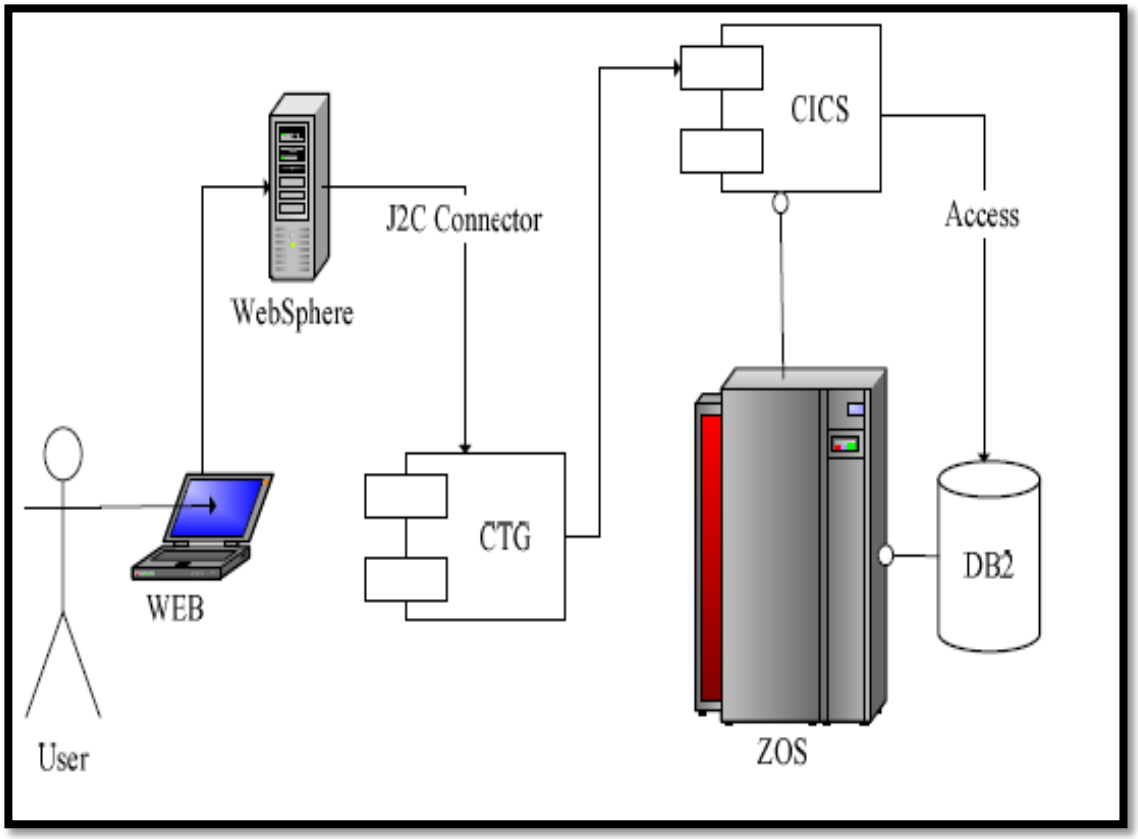

Figure 2.2: The link between web and mainframe

2.2.3 A framework for a WAP-based course registration system (WAP system)

WAP technology has emerged as one of the promising tools for facilitating opportunities for many and exciting services worldwide. WAP technology has promising prospect facilities for educational institutions in order to enhance the educational process. The demand for a WAP-based course registration system in a large number of universities worldwide, we feel, is growing necessity [18].

The application is an integrated WAP-based university course-registration system to enable students to review all the information needed for determining courses to be taken and, at the same time, to complete their registration of required and elective courses for each semester as showed in Figure 2.3. Students are allowed to select either English or Arabic language for the interface purposes. A unique user ID and password is assigned to every individual student. The registration courses are instantly verified, analyzed, classified, and their credits are summed up and added to the previously obtained credits [23].

The results are provided to the applicants with class enrolment confirmation along with common and individual guidance message. System developed a seasonal components model for providing the registration department with the rate of growth in the number of students expected to register in each semester around the year [8,23].

The WAP-based system allows students to register for courses using their mobile phones at any time, day or night. From the comfort of their own home they can complete the required forms at a time convenient to them, with all the relevant information at hand, and be able to view their transcripts dated as per their requirements.

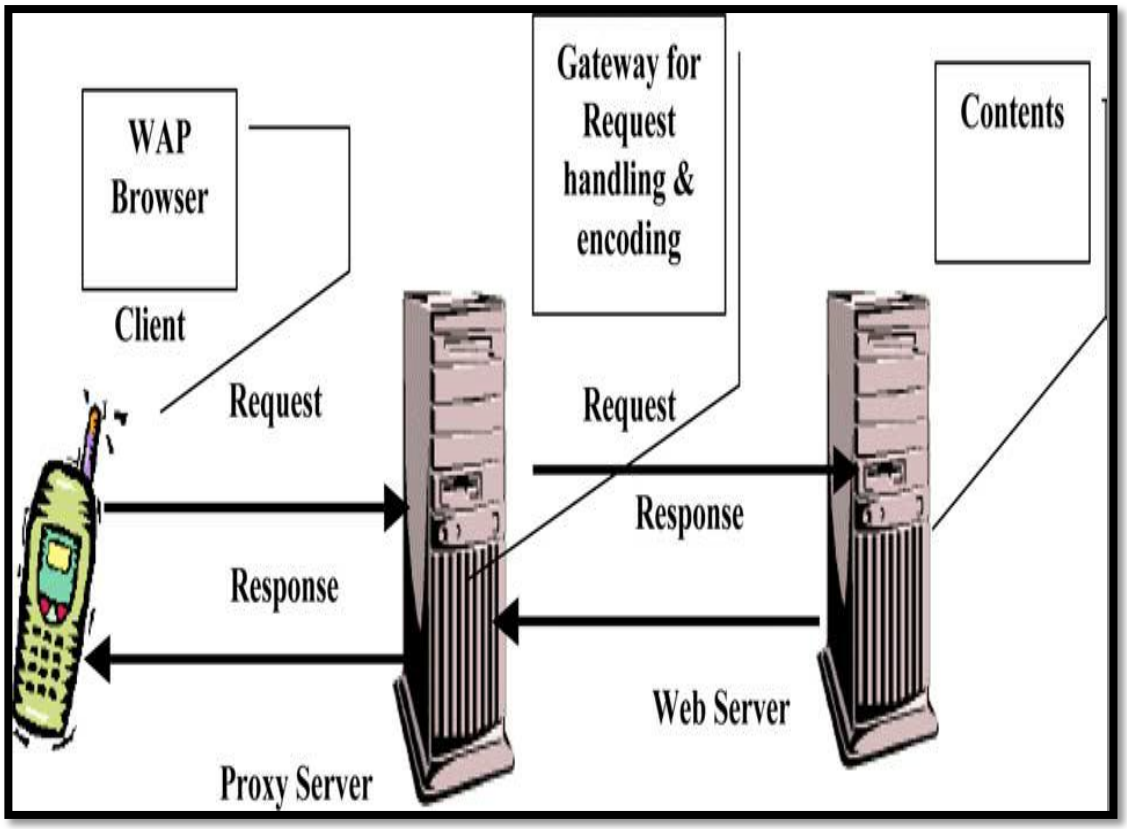

Figure 2.3: A WAP programming model

2.3 Technique / Technology

There are different techniques and technology used to develop the systems. The technique / technology used based on the features.

2.3.1 Java Development Toolkit (JDK) with IBM's Aglets

Java Development Toolkit (JDK), as a base for mobile agent software development, IBM's Aglets. IBM's Aglets is a lightweight mobile agent development toolkit that is freely available on the Internet. It supports the creation, cloning, dispatching, retracting and activation/de-activation of agents, and facilitates the creation of dynamic itineraries. The Aglets development tool kit [16], written in Java, is deployed in the implementation of MARS. Aglets are agents that are modelled after the applets, using an event-driven programming model. The Aglets platform provides a customizable agent server, known as Tahiti. Aglets communicate with each other through messaging. A mobile agent platform provides the execution environment (aka a context or server), state preservation, agent migration mechanisms and methods for agent communications.

This is implemented as a SQL query through the JDBC-ODBC Bridge to a Microsoft Access database. The list of eligible subjects is presented in a dynamically configured GUI. The student can choose the subjects and classes to register [21]. Students are also required to allocate the maximum amount of points to be used during the bidding of each subject. A student can create up to three different combinations of timetable, which will be updated in the database. Only in the event that an agent fails to bid for any timetable combinations will the users be required to intervene. The deployment of mobile agents [10], working in close proximity, also ensures that users are not disadvantaged by slow network connections.

2.3.2 Customer Information Control System (CICS)

Customer Information Control System (CICS) is a transaction server that runs primarily on IBM mainframe systems under z/OS and z/VSE. CICS applications comprise transactions, which can be written in numerous programming languages, including COBOL, PL/I, C, C++, IBM Basic assembly language, REXX, and Java [15].

CICS is a transaction manager designed for rapid, high-volume online processing. This processing is mostly interactive (screen-oriented), but background transactions are possible. Applications are written in a variety of languages and use CICS-supplied language extensions to interact with CICS resources such as files, database connections or to invoke functions such as web services. CICS manages the entire transaction such that if for any reason a part of the transaction fails all recoverable changes can be backed out. CICS application is acting as a web services client or server, the mapping of data to and from XML is governed by the generated WSBIND file. The message body is wrapped in and unwrapped from, a SOAP envelope by CICS Web Services "plumbing" code external to the application program [3].

2.3.3 CICS Transaction Gateway (CTG)

CICS Transaction Gateway provides secure access to CICS from Java applications, using Internet protocols (for example TCP/IP). CICS TG has an API to allow programmers to use the features of a J2EE-compliant runtime environment. The CICS Universal Client is a part of the CICS Transaction Gateway, sometimes sold separately, which allows similar connections from C, C++ and COBOL to CICS.

CTG's scalability and availability provides secure, scalable and highly available connectivity between distributed applications and CICS servers, while maintaining end-