HYBRID SERVER WITH ZIGBEE TECHNOLOGY USING JOB SCHEDULING AND QUEUING PETRINET

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Abstract : A network which shares the data among computer systems contains a mix of both wired and wireless interface devices. These devices play a major role in routing and switching the data packets in the network. We used ZIGBEE Wireless device technology. This device possess the properties of sharing the behavior of computer systems. Such shared data storage mechanism was later enhanced with a method of centralized database storage called a server system. Thus all the client requests are properly responded from the server.

This standard client server architecture has been analyzed with various network devices. This part of the research work is an implementation of a multi mechanism hybrid model for effective and secured data transmission.

Keywords: *Client Server,Zigbee wireless device, Queuing petri net, job scheduling, Markov model..*

I INTRODUCTION

Hybrid Server

A hybrid server is one which accesses multiple servers with many different features to serve different applications. Figure 1 shows a typical hybrid model which already exists, where all the applications depend on sub servers which are targeted to a main server with bulk data storage. In this existing mechanism traffic congestion slows down the process and reduces the efficiency. A strong security mechanism is also needed to ensure the data transfer efficiently.

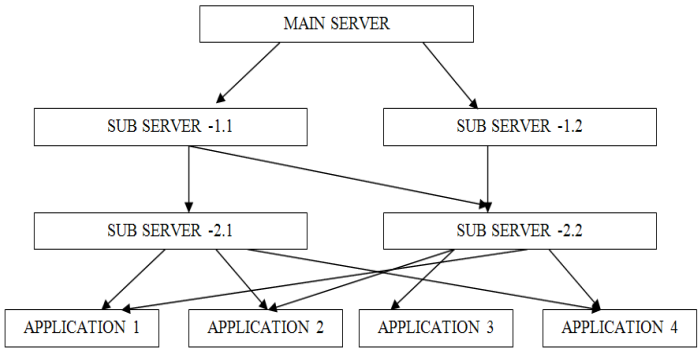


Fig. 1 A typical hybrid – client / server model

Hybrid Mechanism using Inheritance

Inheritance is a way to reuse the characteristics of existing server, to establish a sub server (Virtual or Proxy), based on the network support. In inheritance method the sub servers inherit attributes and behavior from pre-existing server called dedicated main server or parent. The new servers are known as derived servers or sub server or child.

DIFFERENT KINDS OF SERVERS SUPPORTING CLIENT SERVER MODEL

Proxy Server

In computer networks, a proxy server (a computer system or an application) that acts as an intermediary for requests from clients seeking resources from other servers. A client connects to the proxy server, requesting some service, such as a file, connection, web page, or other resource available from a different server. The proxy server evaluates the request according to its filtering rules. For example, it may filter traffic by IP address or protocol. If the request is validated by the filter, the proxy provides the resource by connecting to the relevant server and requesting the service on behalf of the client. A proxy server may optionally alter the client's request or the server's response, and sometimes it may serve the request without contacting the specified server. In this case, it 'caches' responses from the remote server, and returns subsequent requests for the same content directly.

The proxy concept was invented in the early days of distributed systems as a way to simplify and control their complexity. Today, more proxies are web proxies, facilitating access to content on the World Wide Web.

Virtual Private Server

VPS shares computer resources with other sub servers and main server. It simply means that it is not a dedicated server. Virtual server provides low-cost data sharing services. Instead of requiring a separate computer for each server, more virtual servers can co-reside on the same network. [11] In most cases, performance is not affected and each node behaves as if it is being served by a dedicated server. However, if too many virtual servers reside on the same network, or if one virtual server starts hogging resources, network data will be delivered more slowly.

In addition to reducing hardware and power expenses, virtualization allows businesses to run their legacy applications on older versions of an operating system on the same server as newer applications. Each virtual server can run its own full-fledged operating system and can be independently rebooted.

Web Server

Web server can refer to either the hardware (the computer) or the software (the computer application) that helps to deliver content that can be accessed through the Internet.

The most common use of web server is to host websites, but there are other uses such as gaming, data storage or running enterprise applications.

TECHNICAL DEVICE

A. INTEROPERABILITY

ZigBee has a wide range of applications; therefore, several manufacturers provide ZigBee -enabled solutions. It is important for these ZigBee based devices to be able to interact with each other regardless of the manufacturing origin. In other words, the devices should be interoperable, which is one of the key advantages of the ZigBee protocol stack. ZigBee-based devices are interoperable even when the messages are encrypted for security reasons.

B. ZIGBEE TRANSMITTER

The ZigBee transmitter does major functions like, bit to symbol mapping, symbol to chip mapping, serial to parallel conversion, performing half sine pulse shaping and performing modulation. The receiver performs RF to baseband conversion, sampling and threshold, parallel to serial conversion and dispreading.

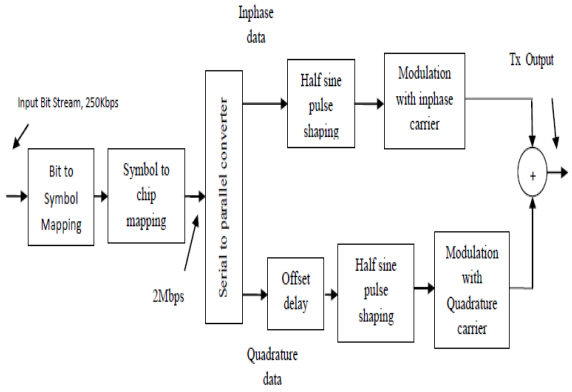


Fig 1.1 Block Diagram of ZigBee

PROPOSED METHODOLOGY

In the proposed model a multi mechanism hybrid client server model with a novel security mechanism is developed. This model has been suggested to save the client waiting time in the queue in both wired and wireless technology. This hybrid model has four levels of processes between a client and server which provides the best performance when compared to existing topology. This model can be used for building distributed computing system in any corporate network where tasks such as sending packets through the devices can be done in efficient manner.

The levels of proposed hybrid model

The proposed hybrid model possesses four levels of independent components in each level, [6] the data is passed and an efficient communication is established.

Data and Device Analysis with Markovian Model

- ***Various data and network devices are organized on the basis of their performance***

MARKOV ALGORITHM

A Markov algorithm is a string rewriting system that uses grammar-like rules to operate on strings of symbols. [2] Markov algorithms have been shown to be Turing-complete, which means that they are suitable as a general model of computation and can represent any mathematical expression from its simple notation.

- ***To avoid the network congestion and data wait time.***

Effective Queuing Petri net with Job Scheduling Schemes

- ***To enable the client request to completely process without any pending***

Petri Net

A Petri net consists of Places (P), Transitions (T), and arcs. Arcs run from a place to a transition or vice versa, never between places or between transitions. The places from which an arc runs to a transition are called the input places of the

transition; the places to which arcs run from a transition are called the output places of the transition.

Network Devices Organization using Markovian model

In the first level, the Inter-Arrival time and Service Time of the data transaction between client-server in hybrid model is made very efficient with the implementation of Markovian model using M/M(a,b)/1 bulk service.[7]

The data transfer between the server and client with the help of various network devices are analyzed. These devices are categorized based on wired and wireless technique and the performance measures are calculated.

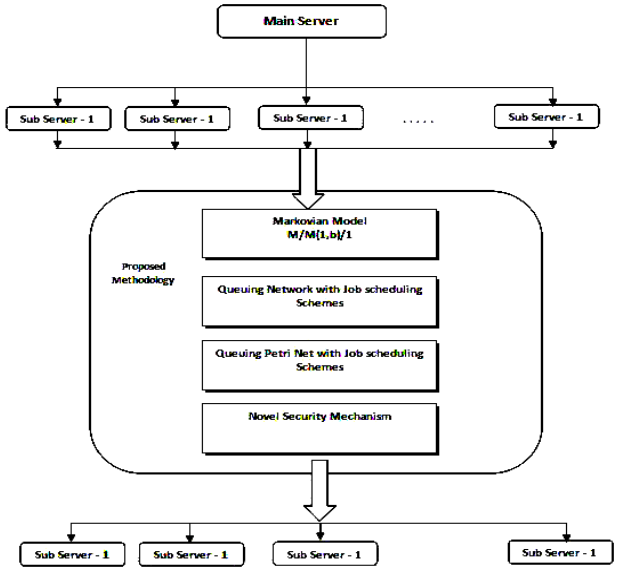
Reducing network congestion in Queuing Network using Job Scheduling Schemes

The bulk data transfer is organized using a novel mechanism using queuing network. The CPU Job scheduling schemes like FCFS, SJF Round Robin and Priority scheduling are implemented in this queuing model, [4] to organize the data transfer in more efficient manner without network congestion. As a part of the research work, the scheduling schemes are additionally added with the existing network program [13] which is the key tool to establish the connection between client and server. This proposed mechanism will organize the network devices by choosing appropriate interface devices based on various application.

Queuing Petri Net with Job Scheduling Schemes

Usually the application users expect the **s**erver to respond all the requests to be processed without any drop-outs. Such process could be made efficient if proper queuing model is implemented based on the scheduling and organizing the tasks. Queuing Petri Net mechanism mainly deals with organizing the processes in a queue by distribution of token. The major limitation of this model is that if the tokens are insufficient in the last iteration, the process may be dropped. The implementation job schedules algorithms in petri net shows remarkable results, to overcome the drop outs.

The hybrid model with all the above said work can be implemented in any corporate network [5] where different applications and different clients communicate in bulk data network. The use of various wired and wireless devices is made more effective in the place of their appropriate use. Fig: 1.2



The multi mechanism hybrid model is shown in figure 1.2 . The high capacity main server serves the entire client's needs and requests. Different application uses

different kind of data access mechanism. This mechanism tends to appropriate interface devices. Each

time, when a client application requests the server for service, the entire server is scanned. The server response time reduces when number of client application requests increases.

Sub server is created to balance the load to response the requests from the client. These sub servers play the role of a proxy server or virtual server. The main aim of such hybrid mechanism is to inherit the data from the main server.

Application-1 can search subserver-1 alone and not any other servers. So, the subserver-1 will inherit the required data from the main server and reduces the load.

II Experimental Results

Three clients C1, C2, C3 are considered to request a task from the server. The arrival time is assumed as 1,2,3 and the service time for C1, C2, C3 are 24,3,6 respectively.

In FCFS - First Come First Scheduling, all the clients' requests are processed on the basis of first come first served. In SJFS (Shortest Job First Scheduling), all the clients' requests are processed on the basis of shortest job to schedule first. In Round Robin Method, all the clients' requests are processed based on time-sharing, giving each job a time slot or quantum and interrupting the job if it is not completed by then. In priority scheduling, all the clients' requests are processed on the basis of allocating the priority and process one by one and the results are tabulated in the table 2

Table 2. Scheduling Algorithm Comparisons

Algorithms	C	AT	ST	WT	TWT	AWT	TAT	E	ATAT	T
	C1	1	24	0			24	0.04		
	C2	2	3	22			25	0.04		
FCFS	C3	3	6	24	46	15.3	30	0.03	26.3	
	C2	2	3	0			3	0.33		
	C3	3	6	0			6	0.17		
SJF	C1	1	24	8	8	2.6	32	0.03	13.6	
RR Quantum : 2	C1	1	24,22, 20,18	32			31	0.03		
	C2	2	3, 1,0	10			9	0.11		
	C3	3	6, 4,2	26	68	22.6	11	0.09	17	
	C3	3	6	0			6	0.17		
	C2	2	3	4			7	0.14		
Priority	C1	1	24	8	12	4	32	0.03	15	11

AT : Arrival Time; ST: Service Time; WT: Waiting Time; TWT : Total Waiting Time; AWT: Average Waiting Time; TAT : Turn Around Time; E : Efficiency; ATAT : Average Turn Around Time; T : Throughput; C : Clients ;

III JOB SCHEDULING IN QUEUING NETWORK PETRI NET

All the Servers are expected to respond the entire Clients' request without any drop-outs. Such process could be made efficient if proper queuing model [8] is implemented based on the scheduling and organizing the tasks. [12] Graphically, places in a Petri net contain a discrete number of marks called tokens. Any distribution of tokens over the places will represent a configuration of the net called a marking.

3.1 Existing method

In an abstract sense relating to a Petri net diagram, a transition of a Petri net may fire whenever there are sufficient tokens at the start of all input arcs; when it fires, it consumes these tokens and places tokens at the end of all output arcs.

Illustration

Assume that three places p1, p2, p3 are connected through a transition T to Place p4. Initial token values for p1 = 5; p2= 10; p3=15;

T (minimum, maximum) = (0, 1)

Initial State

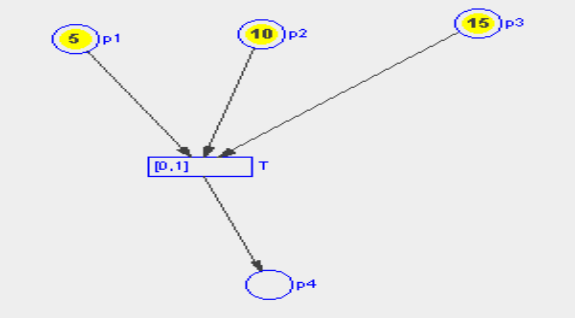


Fig:1. 1st Iteration

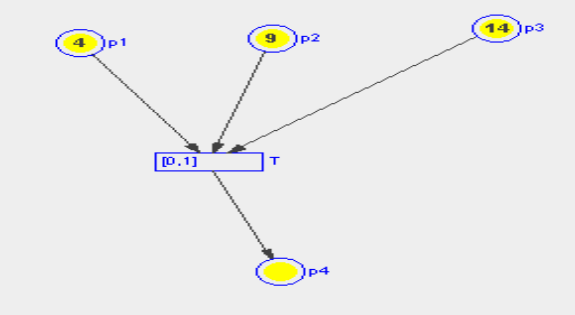


Fig:2. 2nd Iteration

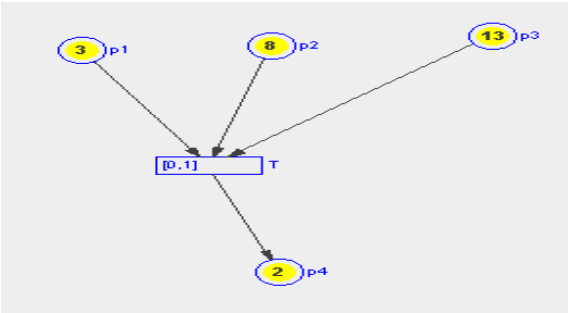


Fig:3. 3rd Iteration

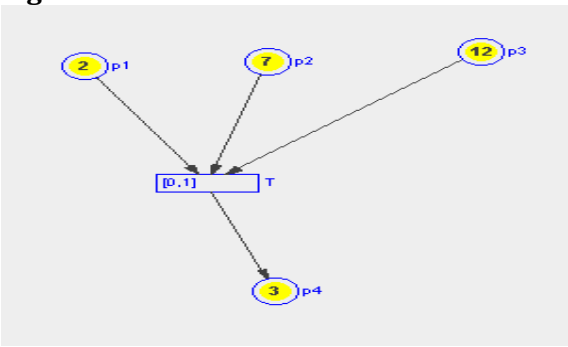


Fig:4 4th Iteration

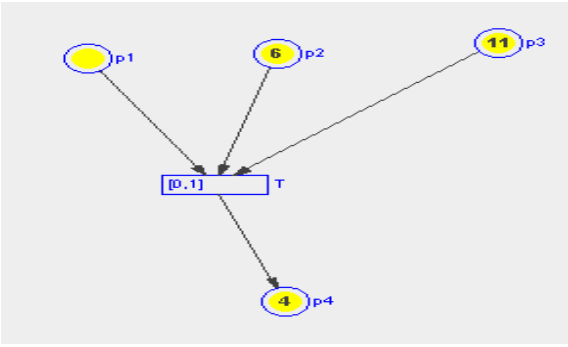
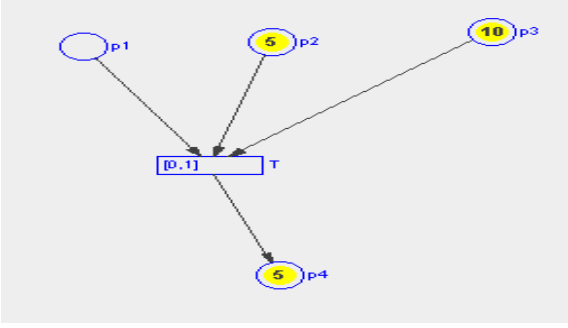


Fig:5. 5th Iteration



At the 5th iteration the process is stopped, since there are no enough tokens available in p1 to process and so the expected result was not derived. This is one of the limitations in Queuing Petri net.

3.2 PROPOSED METHOD

To overcome this limitation, a novel mechanism is proposed where the insufficient place p1 is disabled and again the process is made to continue with the remaining places p2 and p3. In addition to this, the following job scheduling algorithms are also suggested which may be included in the transition devices to process the jobs in efficient manner.

IV. CONCLUSION AND FUTURE WORK

In this research work, the performance of the network devices in both wired and wireless network with various technologies in terms of various parameters were estimated . In Zigbee device, data transfer and the client/server communications gets affected due to large volume of data processing. Hence, a graphical arc mathematical model called Queuing Petri Net is taken as a part of the research work to analyze various job scheduling algorithms, and with security for data transmission which is developed to overcome the exiting limitations. In this research work, more care has been taken for data transfer between these sub servers and various applications.

The main objective of this paper is to find the following parameters with the usage of Queuing network with job scheduling and petri nets in a high secure manner using Zigbee device.

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