

# The Design of Protocol Converter

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## ABSTRACT

The need for Internet Protocol based telecommunication system arises due to the fact that the traditional telecommunication systems are rarely in use. A combination of circuit switched and packet switched telecom network is currently used in India. Every device has its own communication protocol as pre-defined by its manufacturer. Hence, there is a need for the conversion of these protocols (working on different as specified by the manufacturer) so as to establish an INTERCONNECTION between the two devices, by the help of which a communication medium between the devices is established. This asks for a need for a Protocol Converter, which would enable the data to be accessed and sent through/by different protocols.

**IndexTerms:** Converter, Internet, Protocol, Packet Switched

## 1. INTRODUCTION

Convergence is the technique of merging different modern digital technology namely telecom, radio and television etc. Convergence plays a major role in changing the way in which both people and devices communicate. IP based networks form the backbone of such convergence as the opportunities presented by these networks are immense. This technique will provide huge bandwidth besides terminating traffic and reducing long distance charges. With IP based network, it is possible to integrate all telecommunications traffic of an operator into one network. These networks also provide the scope for modification as per the requirements and technological developments over time. The network efficiency can be increased by transporting telecommunications traffic as packets and not by reserving a complete channel for each voice call. The overall quality of these services are high for lesser tariff.

## 2. DESIGN STRATEGY/METHODOLOGY

After analyzing the current communication systems, it was seen that our communications system demands are the more efficient and reliable mechanisms to that the data (voice, information etc.) may be sent by a rather simple approach based on the conversion of protocol (As the device protocols are established by the manufacturers The complete block diagram of the process is described here –

### 2.1. PIC Microcontroller

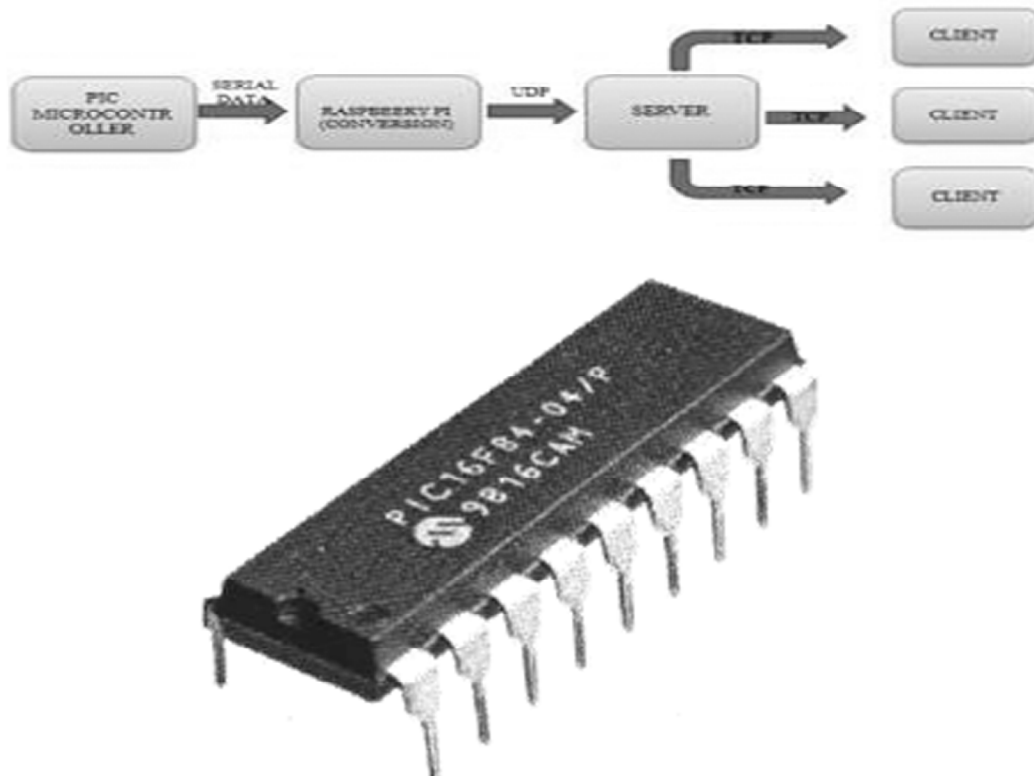
Peripheral Interface Controllers (PIC) is one of the advanced microcontrollers developed by microchip technologies. These microcontrollers are widely used in modern electronics applications. A PIC controller integrates all type of advanced interfacing ports and memory modules. These controllers are

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more advanced than normal microcontroller like INTEL8051. The first PIC chip was announced in 1975 (PIC1650). As like normal microcontroller, the PIC chip also combines a microprocess or unit called CPU an disintegrated with various types of memory modules (RAM, ROM, EEPROM, etc), I/Oports, timers/counters, communication ports, etc.

Harvard Architecture is generally used in PIC microcontroller. Program and data are accessed from separate memories. Thus the bandwidth is improved and instructions are sized separately.

CPU does the same function as in normal microcontroller. The sub units of PIC CPU are instruction decoder, ALU, accumulator and RISC. Most of the instructions a computer decodes are simple. The number of instructions that are built into the microcontroller are limited so that it can be carried out rapidly.

The advantages of RISC structure are that only 35 instructions are needed and execution time is very less. Following advantages.

- The RISC structure only has 35 simple instructions as compared to others
- The execution time is same for most of the instructions (except very few numbers).

The execution time required is very less (5 million instructions/second (approximately)). The memory in a PIC chip used to store the data and programs temporary or permanently. As like normal microcontrollers, the PIC chip also has certain amount of RAM, ROM, EEPROM, other flash memory, etc.

EEPROM memory is also a type of ROM memory. The contents within the EEPROM is modified for the duration of run time (the contents within the EEPROM changes inside the course of run time and ) and at that time it acts like a RAM Random Access Memory (at that point it acts like a RAM memory). However the distinction is after the power goes off, the statistics remains in this ROM chip. That is one of the special advantages of EEPROM.

In the PIC chip the function of EPROM is to store the values created all through the run time (function of EPROM is to store the values created inside the runtime.)

RAM memory is the one of the complicated memory module in a PIC chip. As soon as the electricity is going off, the information within the RAM could be cleared. As like everyday microcontrollers, the RAM memory is used to keep transient information and provide immediately results.

Flash memory is a special kind of memory wherein READ, WRITE, and ERASE operations can be finished usually. This type of memory become invented by way of INTEL employer in 1980. A PIC chip commonly incorporates a certain amount of flash memory. The contents stored in a CPU memory location is called a register. Registers can be thought of as the CPU's tiny scratchpad, temporarily storing commands or information. Registers essentially labeled into the following.

- 1) General Purpose Register (GPR): A general purpose register is a small storage area available on a CPU whose contents may be accessed more quickly. Both data addresses can be stored simultaneously in a general purpose register.
- 2) Special Function Registers (SFR): SFR is the upper area of addressable memory. Comparing with GPR, purpose of SFR is predetermined at the time of manufacturing and cannot be modified by the user. It is only for special dedicated functions.

The temporary delay in a running program is an interrupt which stops the current execution for a certain interval. This interval/delay is generally known as interrupt. The interrupt stops the regular execution when an interrupt request arrives into a current execution program.ops its regular execution. Interrupt may be achieved via externally (hardware interrupt)or internally (through the use of software).

BUS is the verbal exchange or records transmission/reception route in a microcontroller unit.

Generally two types of buses are available in a microcontroller.

Data bus

Data bus is used to transfer addresses of memory. The feature of data bus is interfacing all of the circuitry components inside the PIC.

Address bus

Address bus carries the address of the memory or I/O device to be read from or written to. The address bus is used to transmit the address between CPU and memory locations. The transmission will be carried out with the help of various digital data transceiver moduls like RF, IR, Bluetooth , and so forth.

The function of address bus is to transmit the address from the CPU to memory locations those ports are used for the transmission (TX) and reception (RX) of data. These transmissions possible with help of diverse digital statistics transceiver modules like RF, IR, Bluetooth, and so forth. This is the one of the easiest way to communicate the PIC chip with other devices.

Oscillator unit provides proper clock pulses to the PIC chip. This clock pulses also helps the timing and counting programs. A PIC chip generally uses various frms of clock generators. Depending upon the application and the type of PIC used, the oscillators and its frequencies may be changed. RC (Resistor-Capacitor), LC (Inductor-Capacitor), RLC (Resistor-Inductor-capacitor), crystal oscillators, et are the various oscillators used with PIC chip. The complete PIC chip has an region for storing the go back addresses. This place or unit is called Stack is used in some Peripheral interface controllers. The software stack can not access the hardware. However for maximum of the controllers, it is able to be easily handy.

Limitations of PIC Architecture

- Peripheral Interface Controller has most effective one accumulator.
- Small instruction set.

- Register banking switch required to get right of entry to RAM of other devices.
- Operations and registers are not orthogonal.
- Program memory is not accessible.

#### Advantages of PIC Controlled System

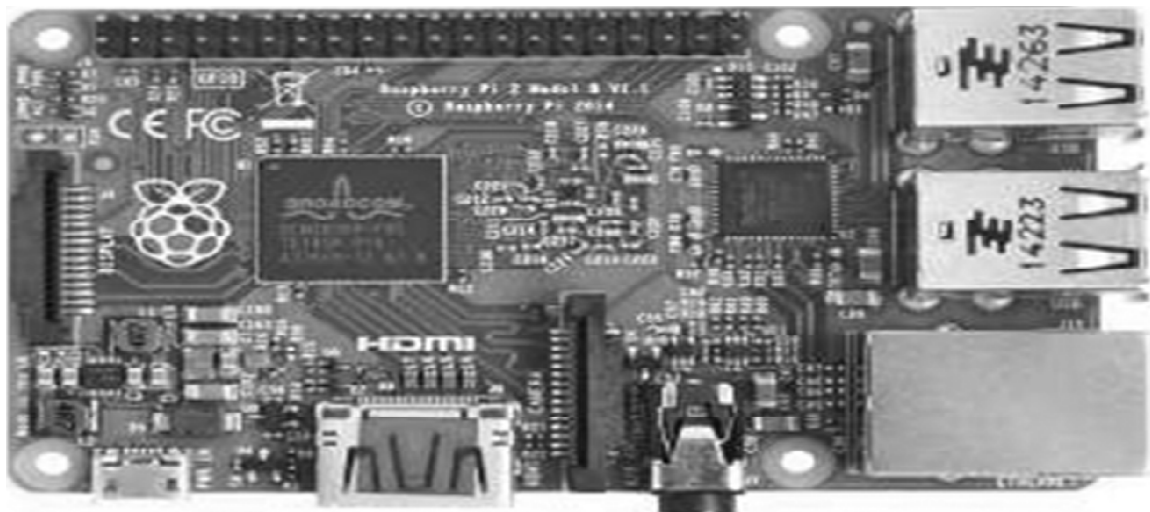
- **Reliability:** The PIC managed system regularly resides machines which can be predicted to run continuously for decades without any blunders and in some instances recover via using themselves if an mistakes takes place (with help of assisting firmware).
- **Performance:** A number of the PIC based totally embedded gadget use a simple pipelined RISC processor for computation and maximum of them offer on-chip SRAM for records storage to beautify the overall performance.
- **Power consumption:** A PIC controlled system operates with minimal electricity intake without sacrificing performance. power consumption can be reduced through independently and dynamically controlling a couple of electricity platforms.
- **Memory:** Most of the PIC based systems are memory expandable and will assist in easily adding an increasing number of memory in line with the usage and sort of application are memory expandable and will help in easily adding more and more memory according to the usage and type of application. The in-built memory is used in some small applications

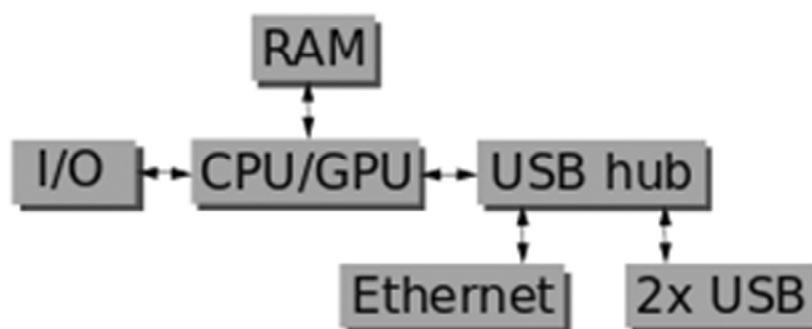
## 2.2. RaspberryPi

The Rasp berry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard key board and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to programin languages like cratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spread sheets, word-processing, and playing games. The Raspberry Pihastheability to interact with the outside world, and has be enused in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting bird houses with infra-red cameras.

The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-devicesupport.

This block diagram depicts models A, B, A+, and B +. Model A and A + and Zero lack the Ethernet and USB hub components. For our project we are going to use Raspberry Pi 2 model B.





### Raspberry Pi 2 model B contains following specifications–

Specifications	Raspberry Pi 2 Model B
System on a chip (SoC)	Broadcom BCM 2835
CPU	900 MHz quad-core ARM Cortex-A7
Graphics processing unit (GPU)	Broadcom Video Core IV @ 250 MHz (BCM2837: 3D part of GPU @ 300 MHz, video part of GPU @ 400 MHz) Open GLES 2.0 (BCM2835, BCM2836: 2.4 GFLOPS / BCM2837: 28.8 GFLOPS) MPEG-2 and VC-1 (with license), 1080p30 H.264/MPEG-4 AVC high-profile decoder and encoder (BCM2837: 1080p60)
Memory (SDRAM)	1 GB (shared with GPU)
USB 2.0 Ports	4 (via the on-board 5-port USB hub)
Video Input	15-pin MIPI camera interface (CSI) connector, used with the Raspberry Pi camera
Video Output	HDMI composite video (3.5 mm TRRS jack)
Audio Output	Analog via 3.5 mm phone jack; digital via HDMI
On Board Storage	MicroSDHC slot
On Board Network	10/100 Mbit/s Ethernet 802.11n wireless Bluetooth 4.1
Low-level Peripherals	17 × GPIO plus the same specific functions, and I2C and SPI bus
Power Rating	800 mA (4.0 W)
Power Source	5 V via MicroUSB or GPIO header
Size	85.60 mm × 56.5 mm (3.370 in × 2.224 in)
Weight	45 g

## 2.3. Software Integration

### 2.3.1. Python Language

Python is an extensively used, high-level, preferred-purpose, interpreted, dynamic programming language. Its design philosophy emphasizes code readability, and its syntax permits programmers to express concepts in fewer lines of code than could be viable in languages along with C++ or Java. The language affords constructs meant to permit clean applications on both a small and huge scale.

Python supports multiple programming paradigms, inclusive of object-oriented, imperative and useful programming or procedural styles. It functions as a dynamic type gadget and automatic memory control and has a large and comprehensive standard library. Python offers two levels of access to network services. At a low degree, you may get right of entry to the fundamental socket support in the underlying operating system, which allows you to put in force clients and servers for each connection-oriented and connectionless protocols.

Python additionally has libraries that offer higher-stage access to specific software program-level network protocols, inclusive of FTP, HTTP, and so on.

### 2.3.2. Sockets

A socket is one endpoint of a two-way communication link between two programs running on the network. Sockets may additionally communicate inside a process, between processes on the same system, or among procedures on different continents. Sockets can be implemented over a number of special channel types: Unix domain sockets, TCP, UDP, and so on. The socket library presents precise classes for dealing with the not unusual transports as well as a regular interface for dealing with the rest. Sockets have their own vocabulary:

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Domain	The family of protocols that is used as the transport
Type	The type of communications between the two end points, typically SOCK_STREAM for connection-oriented protocols and SOCK_DGRAM for connection less protocols.
protocol	Typically zero, this may be used to identify a variant of a protocol with in a domain and type.
hostname	The identifier of a network interface: A string, which can be a hostname, a dotted-quad address, or an IPV 6 address in colon (and possibly dot) notation. A string "<broadcast>", which specifies an INADDR_BROADCAST address. A zero-length string, which specifies INADDR_ANY, or An Integer, interpreted as a binary address in host byte order.
port	Each server listens for clients calling on one or more ports. A port may be a Fixnum port number, a string containing a port number, or the name of a service.

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### 2.3.3. The socket Module

To create a socket, you must use the `socket.socket()` function available in socket module, which has the general syntax

```
s = socket.socket (socket_family, socket_type, protocol = 0)
```

Here is the description of the parameters

`socket_family`: This is either `AF_UNIX` or `AF_INET`, as explained earlier.

`socket_type`: This is either `SOCK_STREAM` or `SOCK_DGRAM`.

`protocol`: This is usually left out, defaulting to 0.

Once you have socket object, then you can use required functions to create your client or server program.

### A Simple Server

To write Internet servers, we use the `socket` function available in `socket` module to create a socket object. A socket object is then used to call other functions to set up a socket server.

Now call `bind (hostname, port)` function to specify a port for your service on the given host. Next, call the `accept` method of the returned object. This method waits until a client connects to the port you specified, and then returns a connection object that represents the connection to that client.

The following code is used to create a server-

```
import socket
import sys
import sys as copg 2
HOST = ''
PORT = 5005
s = socket.socket (socket.AF_INET, socket.SOCK_DGRAM)
print 'Socket created'
s.bind((HOST, PORT))
print 'Socket bind complete'
```

```

conn=psycopg2.connect(database="l",user="postgres",
password="postgres",host="127.0.0.1",port="5432")
print"Openeddatabasesuccessfully"
cur=conn.cursor()
cur.execute(\'''CREATETABLEloyola
(IDSERIALPRIMARYKEY,
TIME INT NOTNULL,
Direction INT NOTNULL,
Distance INT NOTNULL);\''')
#print"Tablecreatedsuccessfully"
conn.commit()
conn.close()''
    #id=0
    while 1:
d=s.recvfrom(1024)
data=d[0]
addr=d[1]
    #id+=1
ifnotdata:
break
    reply='OK...' +data
s.sendto(reply,addr)
print'Data[' +addr[0]+' ':' +str(addr[1])+']-' +data.strip()
values=data.split(".")
time=values[0]
Direction=values[1]
Distance=values[2]
conn=psycopg2.connect(database="l",user="postgres",
password="postgres",host="127.0.0.1",port="5432")
#print"Openeddatabasesuccessfully"
cur=conn.cursor()
    cur.execute("INSERTINTOloyola(TIME,Direction,Distance)\
VALUES(%s,%s,%s)",(time,Direction,Distance));
conn.commit()
#print"Recordscreatedsuccessfully";conn.close()
s.close()

```

### A Simple Client

Let us write a very simple client program which opens a connection to a given port 12345 and given host. This is very simple to create a socket client using Python's socket module function. The socket.connec

t(hostname,port) opens a TCP connection to host name on the port. Once you have a socket open, you can read from it like any IO object. When done,remembertocloseit,asyouwouldcloseafile.

The following code is used to create client–import socket

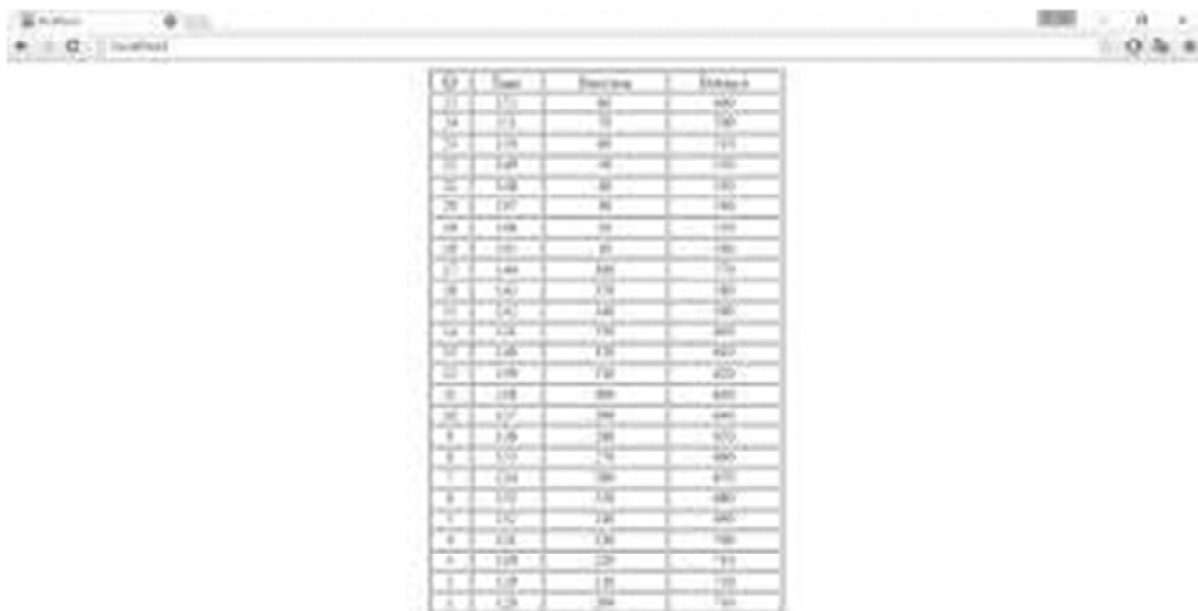
```
import serialser=serial.Serial('/dev/ttyAMA0',9600)UDP_IP="192.168.0.17"
UDP_PORT=5005
s=socket.socket(socket.AF_INET,socket.SOCK_DGRAM)while(1):
msg=ser.readline().strip()
s.sendto(msg,(UDP_IP,UDP_PORT))d=s.recvfrom(1024)
reply=d[0]addr=d[1]
print'Serverreply:'+reply
```

### 3. MYSQLANDWAMP SERVER

MySQL is the very best Open Source Relational database management system. MySQL is the popular RDBMS, mostly used for developing web related software applications.

#### 3.1. MySQL Database

MySQL is a quick, easy to use RDBMS getting used for many small and huge businesses,MySQL is developed, advertised and supported by MySQL AB, which is Swedish business enterprise.MySQL is prominent because of many reasons.MySQL is launched underneath an open-source license. So it is free to use. It manages a large subset of features of the most expensive and powerful database packages. MySQL is a standard form of the well known SQL data language.MySql works on various operating systems like PHP, PERL, C,C++, JAVA, etc.MySQL works efficiently with large data sets. MySQL is friendly to PHP, the most preferable language for web development. MySQL supports databases for 50 million rows or more in a table. The ideal file size limit of a table is 4GB, but can be extended depending on the operating system to a theoretical limit of 8 million terabytes. MySQL is customizable . The open-source GPL license permits programmers to change MySQL software depending on their environments. The final outcome of the experiment is the message received by the local client, which looks like -



ID	Name	Address	Salary
11	111	11	111
12	112	12	112
13	113	13	113
14	114	14	114
15	115	15	115
16	116	16	116
17	117	17	117
18	118	18	118
19	119	19	119
20	120	20	120
21	121	21	121
22	122	22	122
23	123	23	123
24	124	24	124
25	125	25	125
26	126	26	126
27	127	27	127
28	128	28	128
29	129	29	129
30	130	30	130
31	131	31	131
32	132	32	132
33	133	33	133
34	134	34	134
35	135	35	135
36	136	36	136
37	137	37	137
38	138	38	138
39	139	39	139
40	140	40	140
41	141	41	141
42	142	42	142
43	143	43	143
44	144	44	144
45	145	45	145
46	146	46	146
47	147	47	147
48	148	48	148
49	149	49	149
50	150	50	150



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- [2] Consultation Paper on Migration to IP based Networks by Telecom Regulatory Authority of India (TRAI) Consultation Paper No:8/2014 Publication Date:30<sup>th</sup> June 2014 Publication Place: Mahanagar Doorsanchar Bhawan, Jawahar Lal Nehru Marg, New Delhi – 110002