

# Winding Up the UNIX Clock

## SUMMARY

Due to computer word length incompatibility the UNIX clock subroutine can give incorrect times for computations exceeding 2147 secs.

In this short note a reliable UNIX clock subroutine is proposed that will return the correct time for longer running processes.

KEY WORDS : C function clock, UNIX, wrap around.

## INTRODUCTION

The C function clock (see man clock, appendix 1) in the UNIX operating system usually returns the execution time of a process since its last call. However the value returned by clock() is defined in microseconds for compatibility with systems that have CPU clocks with much higher resolution. Because of this, the value returned will wrap around after accumulating only 2147 seconds of CPU time. Thus the clock() is only reliable up to approximately 36 minutes. To rectify this situation, an optimised subroutine is proposed in this note for an efficient reliable clock to read the CPU time used. The reliability of this new clock subroutine is also observed by comparison with the usual clock() subroutine.

## DESCRIPTION OF THE NEW MODIFIED CLOCK SUBROUTINE

The new modified clock subroutine is used to read the computer's clock to provide the amount of processor time in seconds used by a program or algorithm when it is being executed. In fact, it returns a single precision float number representing the number of seconds that process takes. Notice that the time reported is the sum of the total user times and the total system times of the calling process. Child process times are not considered as most of the users do not spawn any child process / es. When called from PASCAL or FORTRAN language, float is equivalent to data type 'real'. An error is indicated when -1 is returned.

The structure of the subroutine depends totally on times (see man times) and is developed in the C language under the UNIX environment. Its resolution varies depending on the hardware and on the software configuration.

## USER INTERFACE

To measure the execution time of a full or portion of a program, call the modified clock subroutine at the beginning of the program segment and then call it once again at the end of the segment, and then subtract the two values. The standard calling statement is defined by,

```
X ← mod_clock()
```

Where ← denotes the usual assignment statement depending on the programming language being considered. The subroutine mod\_clock() must be declared as an external subroutine at the beginning of the program which calls it.

The corresponding function declaration

```
extern float mod_clock();
function mod_clock: real; external C;
External mod_clock
```

need to be used when the calling program is written

using the C, PASCAL and FORTRAN language respectively.

## PROGRAM LISTING

```
# include <sys/types.h>
# include <sys/times.h>
# define HP_HZ 100 /*For AT & T HP UNIX*/
# define SUN_HZ 60 /*FOR MOST OTHER UNIX*/
float mod_clock()

struct tms z1;
long l_error_signal;
float d,x;

error_signal = times (&z1);
if [error_signal != -1]
    l = z1.tms_utim + z1.tms_stime;
    x = HP_HZ (or SUN_HZ)
    d = (float)l/x

else
    d = -1.0;

return(d);
```

## CONCLUSIONS

We have used a 32-bit arithmetic, floating point, HP 9000/870 computer system at Loughborough University of Technology to compare the efficiency and reliability of the proposed new modified clock with those of the original clock(). (see Appendix 2).

The new modified clock subroutine is found to be considerably more reliable than the original clock subroutine when the execution time exceeds 2147 seconds (approx. 36 minutes). In fact both clock subroutines performed equivalently up to 2147 seconds.

## APPENDIX 1

```
Clock(3C)
NAME
clock-report CPU time used
SYNOPSIS
# include <time.h>
clock_t clock(void);
```

## DESCRIPTION

clock returns the amount of CPU time (in microseconds) used since the first call to clock. The time reported is the sum of the user and system times of the calling process and its terminated child processes for which it has executed wait(2) or system(3S). To determine the time in seconds, the value returned by the clock function should be divided by the value of the macro CLOCKS\_PER\_SEC.

The resolution of the clock varies, depending on the hardware and on the software configuration.

If the processor time used is not available or its value cannot be represented, the function returns the value (clock\_t)-1.

## WARNINGS

The value returned by clock is defined in microseconds for compatibility with systems that have CPU clocks with much

\* Present address: Analyst, Management Information System, The Hospitality Group Ltd., 980 Young Street, Suite 200, Ontario, L6A 1H4, Canada [E-mail:kh.khoda@canrem.com].

\*\* Present address: Director, Parallel Algorithms Research Centre, Dept. of Computer Studies, University of Technology, Loughborough, Leicestershire, LE11 3TU, U.K.

higher resolution. Because of this, the value returned will wrap around after accumulating only 2147 seconds of CPU time (about 36 minutes).

#### DEPENDENCIES

series 300 / 400  
the clock resolution is 20 milliseconds.  
Series 700 / 800  
the default clock resolution is 10 milliseconds.

#### SEE ALSO

times(2), wait(2), system(3S).

#### STANDARDS CONFORMANCE

clock: SVID2, XPG2, XPG3, ANSIC.

#### APPENDIX 2

Table 1: Comparison of original clock and modified clock

Clock( )	mod_clock( )
0.000	0.050
0.450	0.500
0.900	0.950
1.450	1.500
2.000	2.050
2.500	2.550
2.900	2.950
4.000	4.050
9.000	0.050
...	...
127.000	127.500
...	...
1937.00	1937.550
1951.00	1951.050
2062.000	2062.050
...	...
2147.010	2147.060
2147.400	2147.450
2147.460	2147.510
2147.480	2147.530
-2147.467	2147.550
-2147.007	2148.010
-2144.967	2150.050
-2109.867	2185.150

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# Compaq Singapore Plant's Unmatched Achievement

Compaq Computer's Singapore Factory has shipped more than one million PCs in 1994, a remarkable achievement considering that the group as a whole shipped less than this two years ago—said Compaq Asia Vice-President and Managing Director Kiri Moul.

On the eve of first evening ministerial factory visit by Singapore's Trade & Industry Minister Yeo Chew Tong on 15th December, 1994 Mr. Moul said this to the accompanying reporters.

Mr. Moul said, "The Singapore Plant is a major contributor to our

"More than two-thirds of what we purchase for our production operations are from the Asia-Pacific region of which about 9% is from Singapore," said Mr. Moul.

Mr. Yeo said, "We must maintain our competitive edge. We have to encourage more local companies to improve their process technology, and to work more closely with the multinational corporations (MNCs) like Compaq for technology transfers." He cited Compaq as an MNC that has succeeded in tapping Singapore's skilled manpower and competitive advantage to compete effectively in



Singapore's Trade & Industry Minister Yeo Chew Tong, accompanied by Compaq Asia Vice-President and Managing Director Kiri Moul visiting Compaq's Singapore plant.

worldwide operations, and we expect to do even better when our new plant is ready in 1996."

He disclosed that raw material and component sourcing by Singapore-based Compaq Asia surpassed the US\$ 1 billion mark annually.

Compaq, the world number one PC seller has five production facilities worldwide, the most recent additions being one in Mexico and another in Shenzhen (China).

the fast changing PC industry.

Mr. Moul said, "Time-to-market is crucial in this industry, and Singapore's excellent infrastructure ensures that this is possible."

Asked if Singapore would lose out to neighboring low-cost countries, Mr. Yeo said, "We must concentrate on improving on high-tech capabilities. Ultimately, we just can't afford to keep the low-tech, labour intensive operations here anyway."

[ Compiled by—Azam Mahmud.]

# AIUB to Revolutionize Country's IT Scenario

AMA Computer College (AMACC) of Philip-pines, a pioneer in computer technology education in Asia, in its continuous effort to provide quality computer based education in other Asian countries, shall establish AMA International University- Bangladesh (AIUB)

Recently, AMA Computer College and local sponsors Dr. Anwarul Abedin and Mrs. Rabeya Chowdhury have signed an agreement to establish country's first full fledged Information Technology University of International repute.

AMACC founded by Dr. Amable M. Aguiluz V. in 1981 started out as a clear strategy to educate the market. The campus of AIUB will be located in first and second floor of Hosaf Tower, 9, Mohakhali, Dhaka. In an exclusive interview with Computer Jagat AIUB's Project Director Ms. Carmen Zita Lamagna said, "The main objective of AIUB will be to produce graduates who will contribute further to the growth and development in Bangladesh."

She said that in line with AMA's world wide reputation, AIUB will continue to maintain its leadership in computer, engineering and business education. She asserted that the curriculum of AIUB will be better than India's IIT and for that reason alone AIUB shall save considerable amount of foreign exchange by stopping the local students going abroad for higher studies.

Ms. Lamagna, a career educational administrator and teacher in Computer Science education said that AMCC is also pioneer in Electronics, Business Administration and Communication Engineering. She informed that at AMACC four Philippine Campuses in Makati, Cauzon, Cebu and Devao a total 11,000 students are enrolled at present. "AMACC's growth as a first rate educational institution has been phenomenal and to maintain its quality driven lead, AMACC have a full-time Research and Development group that

continuously working" commented Ms. Lamagna.

On composition of teaching staff of AIUB she said that 80% of the teachers, mostly of Computer Science and Engineering subjects will be from Philippines and rest 20% will be recruited locally to teach Mathematics, Science and Humanities. Under a rigid screening process the competent, responsible and top caliber experts will be selected as the teaching staff.

AIUB will be a non-sectarian, non-profit, private educational institution whose students and personnel shall remain committed to bring the benefits of IT to the reach of masses. It shall be involved in the advancement of new knowledge, in undertaking research and in extending relevant community service that creatively improve the quality of human life and living, using as tool the fast changing field of Computer and Engineering technology and also in the business world, said Ms. Lamagna.

The local sponsor Dr. Anwarul Abedin pointed out during the interview that AIUB will be the first private university in Bangladesh to have an IBM mainframe 4331, RISC 6000 and latest model of AS/400 Mid Range computers to be used for higher studies. He said that since these computers will be used purely for service to the Bangladeshi students, an appeal has been filed with NBR to exempt them from duty.

AIUB will also have extensive hardware and software libraries, digital laboratories, drafting with AUTOCAD and Local Area Network (LAN) laboratories. All university systems will be computerized.

AIUB curriculum will help Bangladesh in its effort of producing manpower at pace with the fast changing world of IT. The University shall offer a 4-years course in the following field of specialization :

- I. Faculty of Computer Science
  1. B. Sc. Computer Science
- II. Faculty of Engineering :



Carmen Zita Lamagna

1. B. Sc. Computer Engineering
  2. B. Sc. Electronics and Communication Engineering
- III. Faculty of Business Administration:
1. BBA Business Administration major in Management Information Science (MIS)
  2. B. S. Economics.
- "AIUB shall enjoy international recognition upon its admission as an accredited member of the American league of Colleges and Universities (ALOCU) with more than 50 members from Australia, Canada, Japan and USA. With these rated honor, AIUB students can pursue higher learning in affiliated universities all over the world. It has also academic collaborative arrangements via sister-school relations with Australia, Canada, China and Malaysia" informed a very dedicated IT educationist Ms. Lamagna.

She continued, "The opening of overseas branches pave the way for academic exchange of methods and materials as well as students with unlimited educational opportunities. AIUB is also a member of the John F. Kennedy Educational Institute, Tokyo, Japan and American Chamber of Commerce. Another outstanding achievement is its admission into International Athletic League (IAL), an inter-collegiate meet in basketball, volleyball, soccer and other sports among school from Asian countries."

Ms. Lamagna expressed her sincere thanks for effective cooperation of Bangladesh University Grant Commission, Education Ministry and Philippines Embassy in Dhaka in establishing AIUB.

[Azam Mahmood]

# POWER PROTECTION FOR BANGLADESH!

## UPS/STABILISERS-WHY YOU NEED IT, HOW DO THEY WORK AND TYPES AVAILABLE!

Abdul Kader (Babor)

The use of computers both in private and government sectors are spreading in Bangladesh. In the same time the use of high tech consumer electronic products such as TVs, Freezes, microwaves, AC coolers and other related products are even growing faster. There is a need for an extra power to meet such rapid growth.

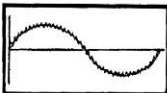
All developing countries like Bangladesh, the power supply authorities are finding it difficult to meet such rapid growth. Due to this high growth the electricity supply gets difficult to manage and creates various problems, like under voltage, over voltage, sudden spikes or even Power cut. An electronics device such as Computer requires a steady supply voltage all the time. In Bangladesh steady supply voltage varies on area to area. In some area supply voltage becomes as low as 140V or as high as 390V.

This type of power fluctuation is very common in almost all the third world countries. In Kenya, for instance, the legally allowed voltage fluctuation either side of the standard 240V is 5%. In reality 15% to 20% fluctuation is common. It is reportedly much the same in Zimbabwe and in Tanzania the situation is apparently even worse with fluctuation in the order of 30%.

Fluctuation in computer power supply can mean data corruption as well as blown power supplies if a spike comes down the line. These sudden high voltage surges of 300-400V generally caused by switching ON and OFF of heavy electronic product such as photo copier, last only a split second, but can cause everlasting damage to a computer.

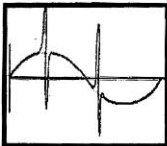
Another problem in Bangladesh is that most, if not all, power lines are overhead, which can easily be damaged and affected by accidents, violent weather and the like. Lack of maintenance has also resulted in lines not doing tightend properly in many places. Following shows the common power disturbances:

### NOISE



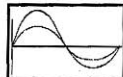
This is like the interference you get on a radio set often caused by a 'buzzing' fluorescent light. Unless filtered out, it can cause screen interference, corrupt data or cause read write errors.

### SPIKES



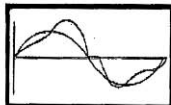
These are dramatic unpredictable 'jumps' in power (such as a strike by lightning). As many as 6000 volts can 'zap' through your system enough to permanently damage your computer hardware.

### SURGES (and SAGS)



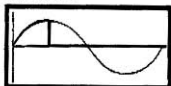
These are slower and less powerful than spikes. They can be caused by switching on a nearby electrical appliance which creates an overvoltage (or under voltage) that can scramble data and distort programmes.

### FLUCTUATIONS



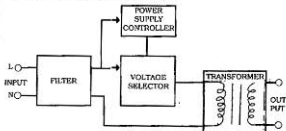
Circuit switching at your local powerstation can create surges and brief interruptions that can fool your PC into thinking that it is experiencing a power failure. The result? Lost data any time!

### BLACKOUTS



A complete loss of mains power (no matter how brief) can completely wipe out your data.

These fluctuations and disturbances can be overcome by using a device called voltage stabiliser. Its function is to supply a steady voltage, no matter what input condition is. Ofcourse there are so many makes and models in market and not all provide the protection and function that it is supposed to do. It is advisable to shop around. A simple block diagram of a modern voltage stabiliser is shown below.



The filter is used to clean out spikes and noises which are very common in the mains supply. The power supply controller, controls the overall function of the stabiliser, i.e. it is an electronic intelligent circuit which decides how much voltage selection are required and



ABDUL KADER (BATOR)

then voltage selector selects the correct amount in order to give a constant supply voltage at the output.

There are two major factors in choosing stabiliser namely (a) input voltage fluctuation range. (b) output power capacity.

**(a) Input Voltage Fluctuation Range:** This depends on the area you live in. But for Bangladesh, anything from 130V to 400V fluctuation range would be an ideal option.

**(b) Output Power Capacity :** This depends on number of devices to be connected to it and also on the power consumption of each device. Freeze, for instance, may require anything from 300W to 600W whereas an average computer requires 200-250W. The simplest way to calculate is to add power consumption of each device to obtain the total power consumption then by a stabiliser which will take the total consumption. It is strongly recommended not to overload the stabiliser. However some good stabilisers have a overload protection which will either blow a fuse or trip out the circuit breaker.

In general this device can be used with any piece of electrical equipments such as TVs, Freezes, Video recorders, or other electrical equipments where the equipment is not so critical when there is a sudden power cut. A device like a computer not only requires steady voltage all the time, it needs to be told before shutting it off so that it takes necessary action prior to switch off. Primarily because it has a device inside the computer called "Hard disk" on which the information or data is stored and it takes certain time to process such information or data. Therefore a sudden power cut could be catastrophic.

Secondly when the computer is in use the information or data is processed from one section of the computer to another at the very high speed. Which means when there is a sudden power cut the data in processed can be lost or damaged, that is why computers require a protection from this type of power cut. One way of protecting would be to have a back-up battery connected to the computer so that when there is a sudden power cut, the battery will take over to provide power until the computer finishes its tasks. Life would be very simple, if we could just use the battery to solve the problem. In a real world a device has been developed called UNINTERRUPTIBLE POWER SYSTEM (UPS). As the name suggests it does not interrupt the operation of the computer or any other device connected, i.e. it



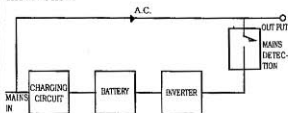
continues to provide power in the event of power cut. Here is a simple diagram of how UPS is used.

A properly designed UPS can protect you against random noise on the power lines high voltage, spikes and peaks of too high or too low voltage (surge and brown out). A computer and the data on it represent a big investment, so it is worth protecting.

#### HOW UPS WORKS!

A UPS consists of a battery, battery charging circuit, mains power detector and an inverter. The mains

detector, detects when there is a power cut occurs and as soon as power cut is detected it starts giving power from the battery. The inverter convert output of the battery DC (direct current) into mains 240V AC (alternating current)-50 Hz. The block diagram of a UPS shown below:



Mains power has what's technically known as a sinusoidal waveforms. This means that it is just 50Hz, no nasty high frequency bits hidden away. The output of most UPS has near square wave, the computer power supply can cope with this for very short time but it is undesirable for long term use. However some UPS manufacturer offer UPS with pure sine wave output, it is always advisable to go for such option.

When a power failure is detected, it takes certain time to switch over to battery power this is known as transfer time, lower the transfer time the better the UPS and it is measured in milliseconds. Typical UPS has a transfer time from 3ms to 5ms. The problem is that you won't know if it is fast enough, sensitive enough or even still working (in some cases) until the power fails.

Generally UPS must run the computer for at least 6 minutes to give it enough time for an orderly unpanicked shut down. Unfortunately, you can not just buy a 6 minute UPS, it is little more complicated than that. The amount of power stored in a UPS battery is actually measured in Ampere/hours, a figure thats rarely quoted. Instead UPS power supply ratings are given in Volt/amps (VA).

First you need to determine the ampere hours required in order to supply that level of power for the time you need to shut down the system. Most UPS are about 70 percent efficient so you first have to divide the computer power requirements by 0.70. The computer power requirements are usually quoted in Watts, but one Watt is just 1VA. So 200W computer power supply will need a UPS rated 285VA. The majority of UPS manufacturers state the back up time in minutes, therefore if 285VA last for 5 minutes then 1140VA UPS with 200W computer will last 20 minutes.

**There are three types of UPS's namely:**

- (a) OFF LINE SYSTEM
- (b) LINE INTERACTIVE SYSTEM
- (c) ON LINE SYSTEM

For in depth details UPS specifications and different types available please read **Part II** in the next issue of **Computer Jagat**.

**\*Abdul Kader (Babor)**  
49 Collindon Street  
Luton, Beds,  
England, (UK)  
TEL : +44-582-487878