Malaria

*Abstract*—Oblivious RAM is a cryptographic protocol for hiding memory access patterns in un-trusted external storage environment. However, adopting ORAM will also bring significantly overhead in memory accesses. Recently, Path ORAM has received wide attentions due to its simplicity and efficiency in secure processor design. Unfortunately, the memory bandwidth demand of Path ORAM is still too high, which restrict Path ORAM from further development. Through our observation, overlapping paths can be cached to reduce memory bandwidth without the loss of security.

In this paper, we propose SCPORAM (Self Clustering Path ORAM), an unsupervised learning method for path clustering, which transform memory requests into different categories. For each set, the intersection can be cached for every member sharing. Therefore, SCPORAM has the ability to effectively reduce memory access bandwidth. Based on this algorithm, a new ORAM controller is proposed. Compared to baseline Path ORAM, SCPORAM can reduce system overhead by 55%.

Keywords—Path ORAM, clustering, hardware assistant, secure processor, data protection (key words)

# Introduction

Malaria is one of the oldest and deadliest infectious diseases in human.(Depinay et al., 2004)，Since Laveran find the plasmodium, medicine research developed rapidly. However after using different medicines contain Chinese traditional medicine like Artemisinin and modern medicine like Quinine . Malaria remains uncontrolled and is increasing in many areas. Artemisinin used to consists effective drug for malaria, but Long-term use of the same kind of drugs contributes to the drug resistance. To solve the problem , scientists in the world keep finding the new drug.

Malaria infection includes 2 steps, one that plasmodium grows in the liver (exoerythrocytic phase), and one that plasmodium grows in the red blood cells(erythrocytic phase). When an infected mosquito took the blood from one person to another person, the plasmodiums would also transfer to another person with mosquito’s saliva. The plasmodiums accumulated and then cause the red blood cells broken.

The signs and symptoms of malaria typically begin 8–25 days following infection; however, symptoms may occur later in those who have taken antimalarial medications as prevention.

Malaria had been threating the world for 50,000–100,000 years，In 1880, Laveran firstly observed parasites inside the red blood, and proposed that malaria is caused by this organism, it was the first time a protist was identified as causing disease. Then a Cuban doctor treating people with yellow fever in Havana, provided strong evidence that mosquitoes were transmitting disease from human to human. Since April 1894, a Scottish physician Sir Ronald Ross and Sir Patrick Manson devoted to the research about malaria for 4 years, and finally they proved the complete life-cycle of the malaria parasite in mosquitoes by dissecting the mosquitos. Nowadays, malaria still do harm to many places in the world.

Africa represents the worst areas for malaria, it has 364.98 millions patients which suffered P. falciparum, and Southeast Asia is the next, which has 118.94 patients. According to the WHO and UNICEF, deaths attributable to malaria in 2015 were reduced by 60% from a 2000 estimate of 985,000, largely due to the widespread use of insecticide-treated nets and artemisinin-based combination.

In China, Hainan, Yunnan are the main infected areas.(Gething et al., 2011)

In ancient China, the doctors mainly used  Yingzhaosu A, zincpolyanemine, and artemisinin to cure the malaria. Artemisinin used to be very efficient on malaria treatment. The World Health Organization (WHO) currently recommends artemisinin-based combination therapies (ACTs) for malaria control.(Bhattarai et al., 2007)

Recently, the drug resistance became a big problem. And more compound artemisinin based medicines were produced to cure the malaria.

Artemether is one of the medicine that China produced, According to (郭宗儒, 2016), its anti-malarial activities is about 2 times higher than artemisinin, but it needs a long course of treatment (5 days). There is another defect that it only lasts a short period in blood so that plasmodium is easy to survive and recrudesce. The compound artemisinin which combines long-acting and short-acting composition would increase effective time, but more medicine compositions are possible to cause more side effects .

To investigate the high-efficiency which has shorter treatment time , lower toxic and side effects., we developed a new medicine . It needs a 2 days’ treatment , and there are no side effects performed locally or generally in most of patients we observed. To evaluate the toxic and side effects, we record the blood and fever condition of the patients. In the first week, the patients lived in the hospital and then they go home, we recorded the condition before and after they take the medicine for the whole 3 weeks. That includes headache, deaf, fever and other side conditions. Within 3 weeks , we continue to track and record all the information such as protozoology examination , hematology and blood biochemical examination about the patients.

# Methods

# 3. Results

### *3.1 Curative Effects*

Before the treatment, 3 cases are in abating fever period, and other 47 cases is in fever period. As Figure 2.1 show, there are the patients’ temperature before the treatment.

Table 2.1 The condition of patients

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| total | cases | Tf(h) | Tp(h) | d7 | d14 | d21 | d28 |
| 50 | 46 | 17.2±9.9 | 52±20.2 | no recrudescence. | | | |
|
| 3 | no recrudescence | | | missing |
| 1 | unknow | | | |

Table 2.1 shows the condition from d7 to d28, 46 cases can be recorded from start to end, 3 cases are missing since d21, and the last case is unknow. Tf stands for Average fever clearance time, and Tp stands for Average parasite clearance time.

There are 7 cases with gametophyte before curation, and after curation, there is only one case with gametophyte at d3. The gametophyte of 5 cases gradually disappeared within d3~d6 after curation, and the remaining 2 disappeared after d21. The details is in Table 2.2 and Table 2.3.

Table2.2 The situation of hematology

|  |  |  |  |
| --- | --- | --- | --- |
|  | N/case | Nwbc/(X 10^9·L-¹) | Nrbc/（x 10^12·L-¹） |
| before treatment | 46 | 6.3±2.5 | 4.6±0.6 |
| after treatment | 46 | 6.1±2.0 | 4.6±0.5 |

Table2.3 The situation of blood biochemical

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | N/case | Jalt/(U·L-¹) | Jast/(U·L-¹) | Ctb/(μmol·L-¹) | Cdb/(μmol·L-¹) | Ccr/(μmol·L-¹) |
| before treatment | 34 | 15.4±8.8 | 24.2±3.2 | 10.9±5.0 | 3.2±2.3 | 115.9±29.8 |
| after  treatment | 34 | 13.7±8.3 | 18.9±7.7 | 5.8±1.7 | 1.9±1.0 | 106.6±29.9 |

### *3.2 Side Effects*

Figure 2.2 The side effects of the patients

As the Figure 2.2 shows, there are no side effects performed locally or generally in most of patients, 3 cases have headache, 1 has anorexia, and another one has pruritus. It only lasts 1~2day, and we can not eliminate condition that they are caused by malaria.

Table 2.4 The condition about abnormality of ALT,AST and total bilirubin

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | N/case | Nalt/case | Nast/case | Ntb/case |
| Before the treatment | 34 | 1(42 U/L) | 1(48 U/L) | 4 |
| After the treatment | 34 | 0(27 U/L) | 0(20 U/L) | 0 |

It is known that the normal value about ALT is 8 ~ 40 U·L-¹,about AST is 8~40U·L-¹ and about the total bilirubin is 1.7~17.1μmol·L-¹

# Discussion

By comparing the average fever clearance time and average parasite clearance time of 50 cases. After tracing and recording 46 cases of them within 28 days, no one from the 46 cases recrudesce. Our therapy shortens the course of the treatment from 3 days to 2 days. Most of these 50 patients have no side effects which performed locally or generally on their bodies, 3 cases have headache, 1 has anorexia, and another one has pruritus, and it only lasts 1~2day. Therefore, it is reasonable to consider that our therapy targeting to shorten the course to 2 days is better then before which needs 3 days.

We can know from[1] that in three-day therapy, the patients’ average fever clearance time and average parasite clearance time are respectively 23.9 and 71.9 hour. Compare with this earlier study, here we show that in our two-day therapy, the average fever clearance time and average parasite clearance time are respectively (17.2±9.9)h and（52.0±20.2）h. And the cure rate is also 100%, That means our two-day therapy is efficiency even though it shorten the cure time.

The experiment has some limitations, the lack of the control group make our experiment could not eliminate the effect of other irrelevant factors such as gender , age, the severity of disease mentioned in the[2]. In their research, in order to support that efficacy of dihydroartemisinin-piperaquine tablets are more good than before, they divided the cases randomly into 2 groups . Then treated them under the same conditions except the types of medicine, record and analyze the data with math model. And the experiment did not consider complication, people with complication are not suitable for Artecom.

The results of experiment show that the 2-day course of Compound Dihydroartemisinin for Falciparum Malaria has high effects when treat the non-complication falciparum malaria , most of patients have no significant side effects and toxic reactions. So it can be recommended as clinical usage.

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