Privacy Preserving User Authentication Scheme based on Password and Smart Card for Multi-Server Environment

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Research

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Abstract

Advancement in information and communication technology provides a scalable platform for various communication services, where a remote user can access the server from anywhere and anytime. The multi-server environment introduces a scalable platform such that a user can interact with any server using single registration. These services adopt authentication schemes in order to ensure secure and privacy preserving access to the resources. Recently Zhao et al. proposed a user authentication scheme based on password and smart card for the multi-server environment. They argued that their scheme is secure from well-known attacks. In this paper, we first identify that Zhao et al.'s scheme suffers from the denial of service attack and the privacy attack and does not provide user friendliness. After that, we propose a new privacy preserving user authentication scheme as a remedy scheme of Zhao et al.'s scheme. Through the rigorous formal and informal security analysis, we show that our scheme is secure against various known attacks including attacks founded in Zhao et al.'s scheme. Furthermore, we simulate our scheme for the formal security verification using ProVerif tool.

Full Text

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Figures

Figure 1

System environment.

Figure 2

Proposed privacy preserving user authentication scheme.

ProVerif text output:

```
Starting query ini-event(SUend(t)) ==> ini-event(SUbegin(t))
RESULT ini-event(SUend(t)) ==> ini-event(SUbegin(t)) is true.
-- Query not attacker(svalueA[]); not attacker(svalueB[]) in process 0
Completing...
200 rules inserted. The rule base contains 191 rules. 17 rules in the queue.
Starting query not attacker(svalueA[])
RESULT not attacker(svalueA[]) is true.
Starting query not attacker(svalueB[])
RESULT not attacker(svalueB[]) is true.

-----
Verification summary:

Query ini-event(USend(t)) ==> ini-event(USbegin(t)) is true.
Query ini-event(SUend(t)) ==> ini-event(SUbegin(t)) is true.
Query not attacker(svalueA[]) is true.
Query not attacker(svalueB[]) is true.
```

Figure 3

The results of ProVerif validation.

Supplementary Files

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- [authorbiography.doc](#)
- [proverif.pv](#)