Verificação Automática de Protocolos de Segurança com a ferramenta Scyther

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4o. Workshop Regional de Segurança da Informação (2019)

Motivação

Key **R**einstallation **Atta**c**k**s

Breaking WPA2 by forcing nonce reuse

Discovered by Mathy Vanhoef of imec-DistriNet, KU Leuven, 2017

Dragonblood: Data-leaking flaw in WPA3 Wi-Fi authentication

15 APR 2019 2

Data loss, Security threats, Vulnerability

Motivação

TLS Security 6: Examples of TLS Vulnerabilities and Attacks

POSTED ON MARCH 31, 2019 BY AGATHOKLIS PRODROMOU

Alert (TA14-290A)

More Alerts

SSL 3.0 Protocol Vulnerability and POODLE Attack

Original release date: October 17, 2014 | Last revised: September 30, 2016

Verificação Formal

Ferramenta de Verificação

Ferramenta Scyther

Considerações Finais

O Que é Verificação Formal?

O que é Verificação Formal?

- Verificar um protocolo é demonstrar sua corretude.

- Por que utilizar a Verificação Formal?
  - Garantir que o protocolo atinja o objetivo
  - Descobrir vulnerabilidades
  - Incitar interesse comercial
  - Precipitar movimentos de invasores

- Existem vários modos de se fazer a verificação formal

Verificação Formal

Ferramentas de Verificação

Ferramenta Scyther

Considerações Finais

Ferramentas de Verificação

- Avispa
- ProVerif
- Tamarim
- Scyther

Verificação Formal

Ferramentas de Verificação

Ferramenta Scyther

Considerações Finais

Ferramenta Scyther

Semânticas Operacionais

Verificação Formal de Protocolos

Semânticas Operacionais

- Termos atômicos:
  - fresh
  - var
  - const

- Chaves assimétricas:
  - sk(X)
  - pk(X)

Semânticas Operacionais

- Tipos predefinidos:
  - Agent
  - Function
  - Nonce
- Tipos básicos de eventos:
  - send
  - recv
- Eventos de afirmação:
  - secret
  - Nisynch

Ferramenta Scyther

Semânticas Operacionais

Verificação Formal de Protocolos

Verificação Formal do Protocolo

Protocolo de Needham-Schroeder

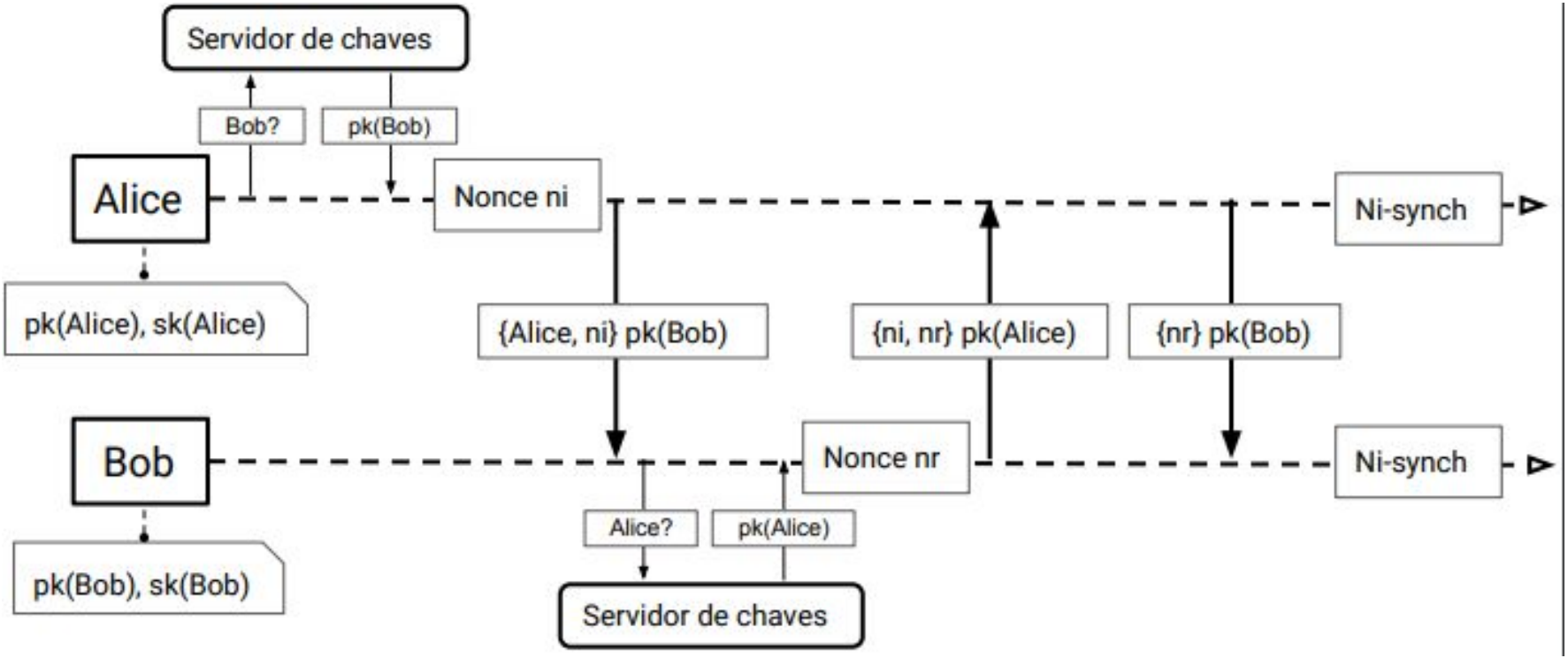
Algoritmo na Semântica da Scyther

Análise do Protocolo com a Ferramenta Scyther

Protocolo de Needham-Schroeder

- Características:
  - Método de autenticação entre dois participantes
  - Rede insegura
  - Apresenta falhas
  - Utiliza criptografia assimétrica

Protocolo de Needham-Schroeder



Verificação Formal do Protocolo

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Algoritmo na Semântica da Scyther

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Algoritmo na Semântica da Scyther

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Algoritmo na Semântica da Scyther

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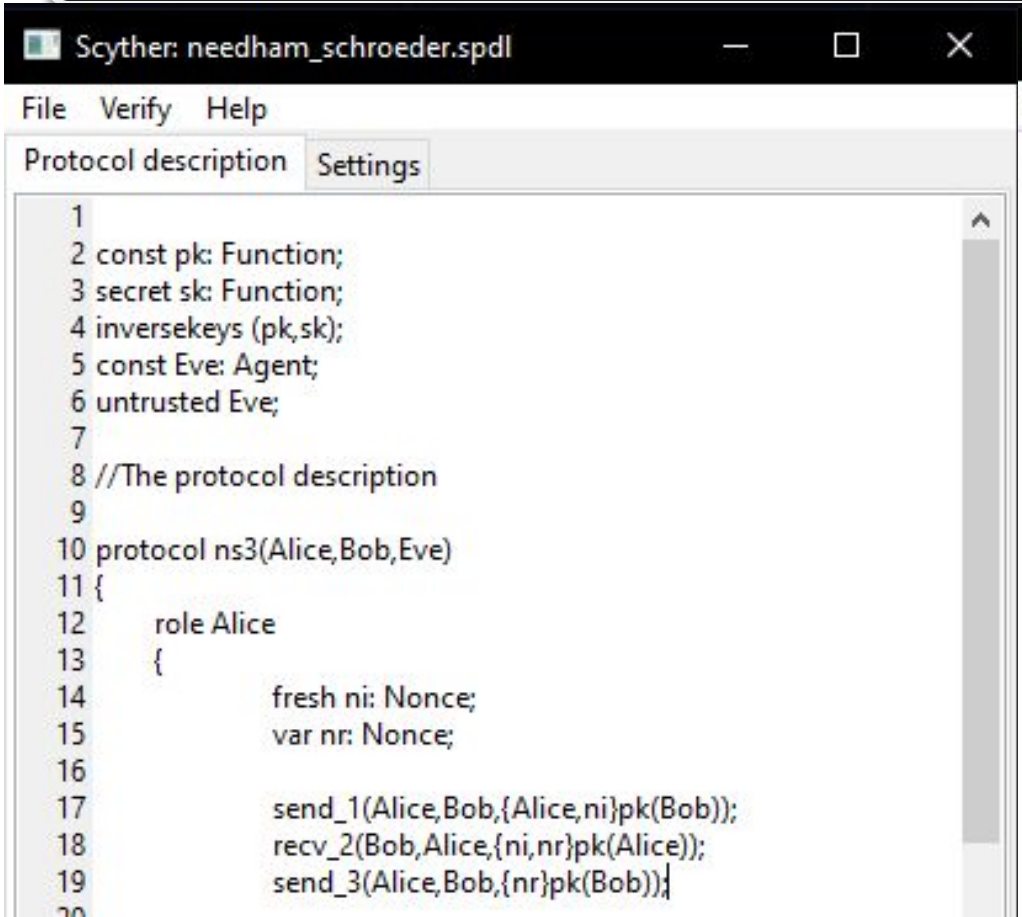

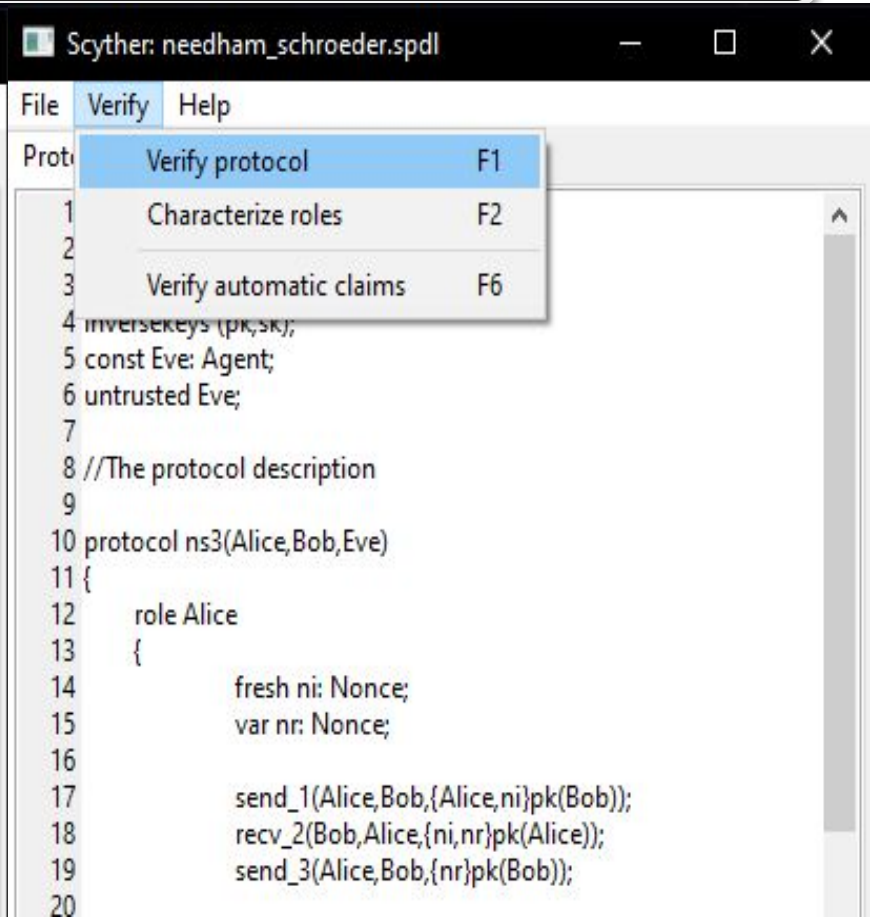

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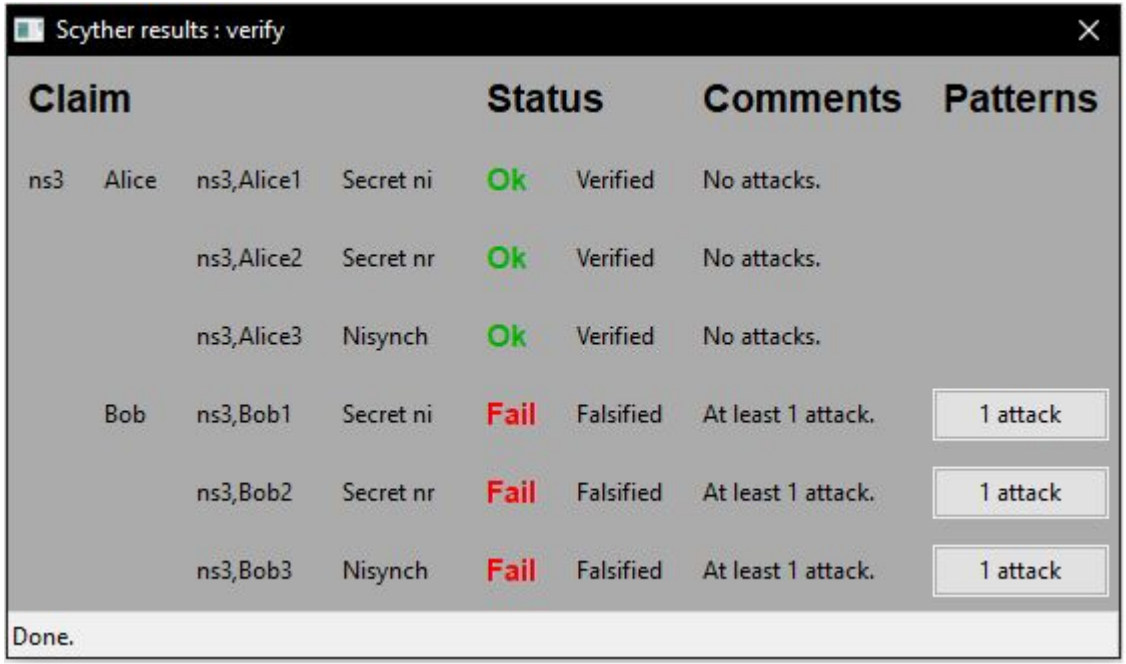

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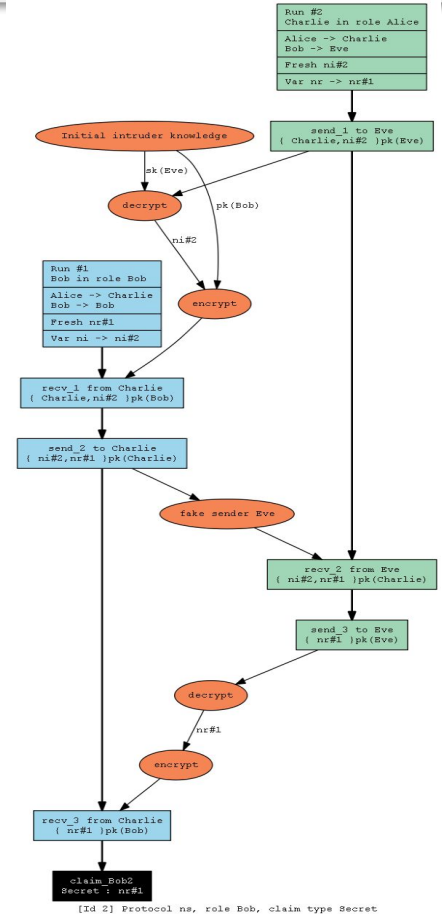

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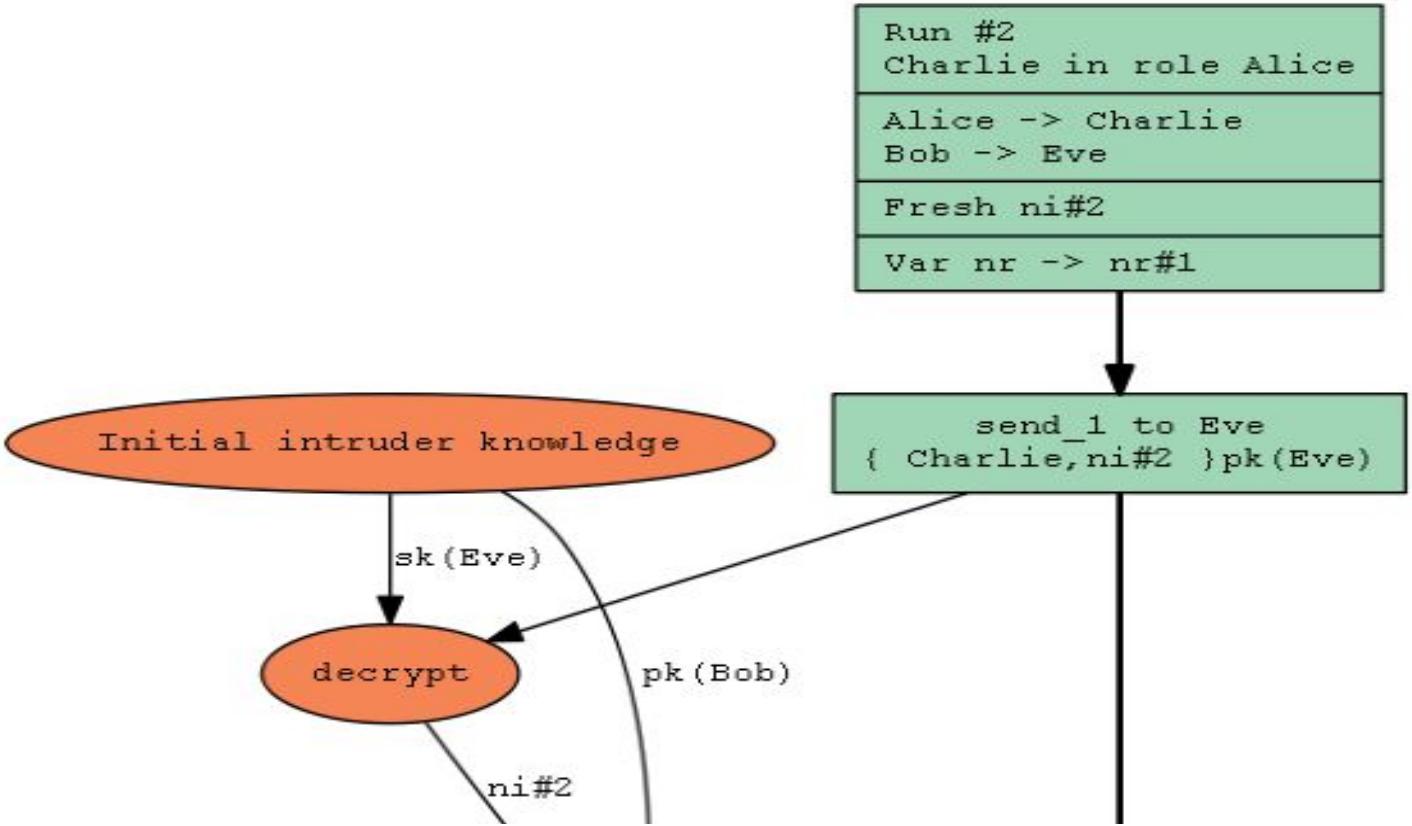

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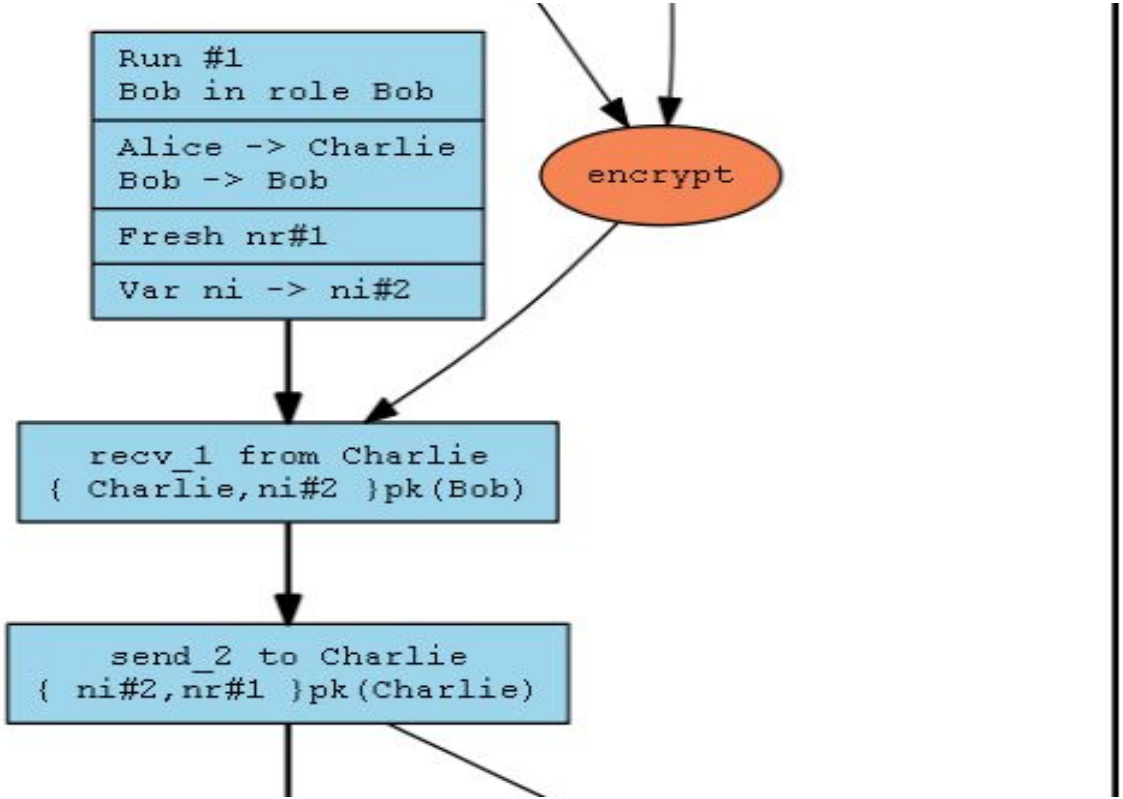

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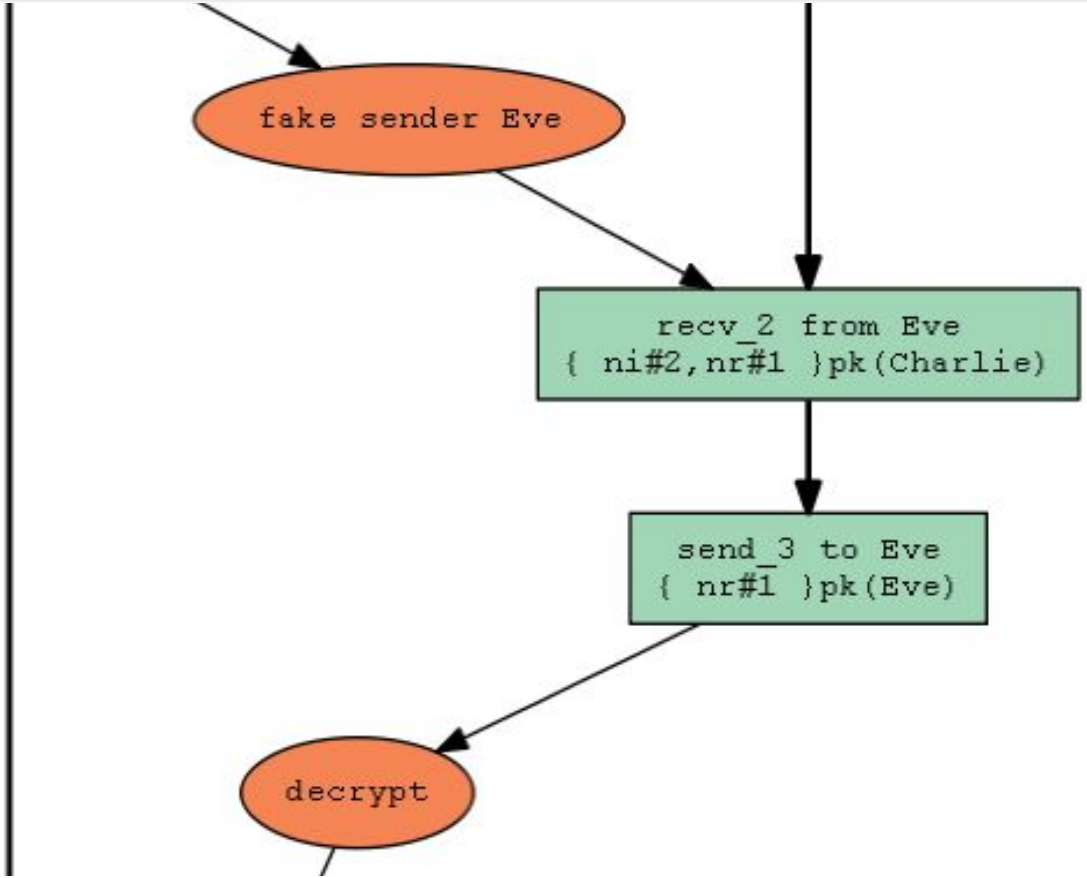

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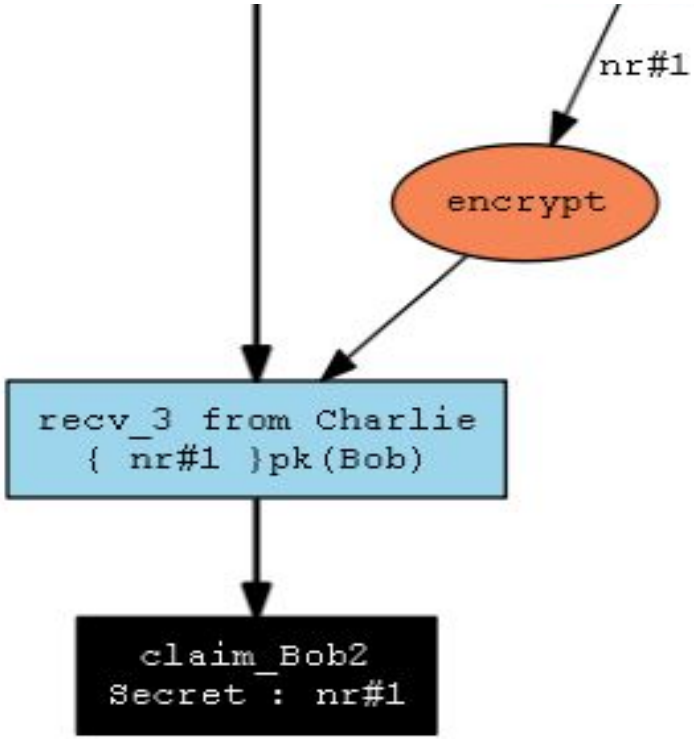

[Id 2] Protocol ns, role Bob, claim type Secret

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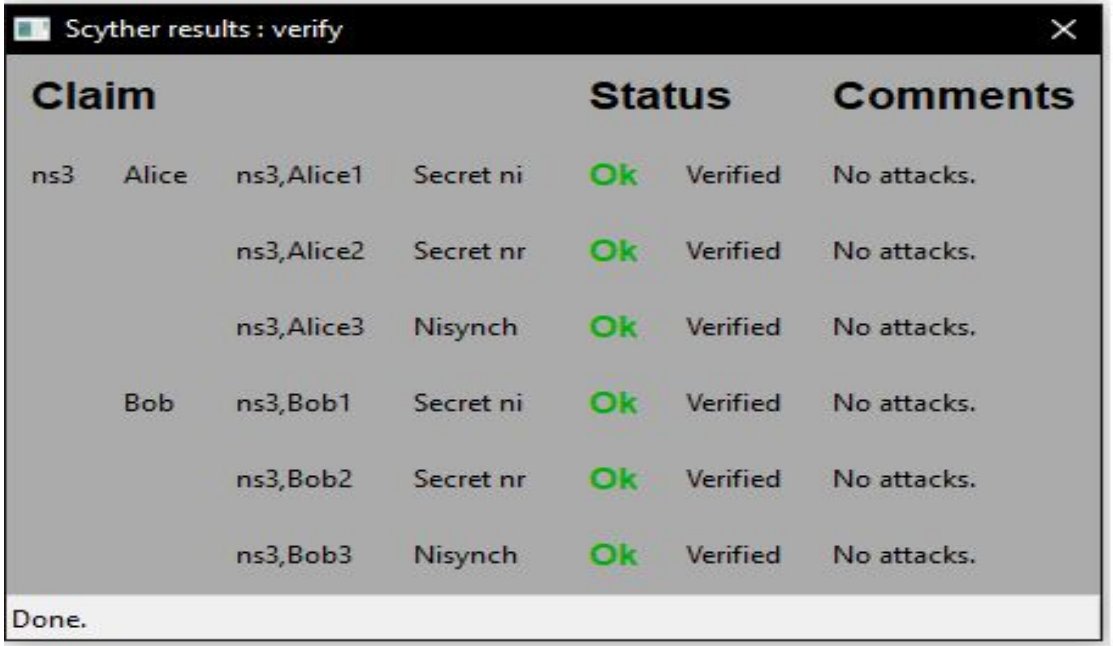

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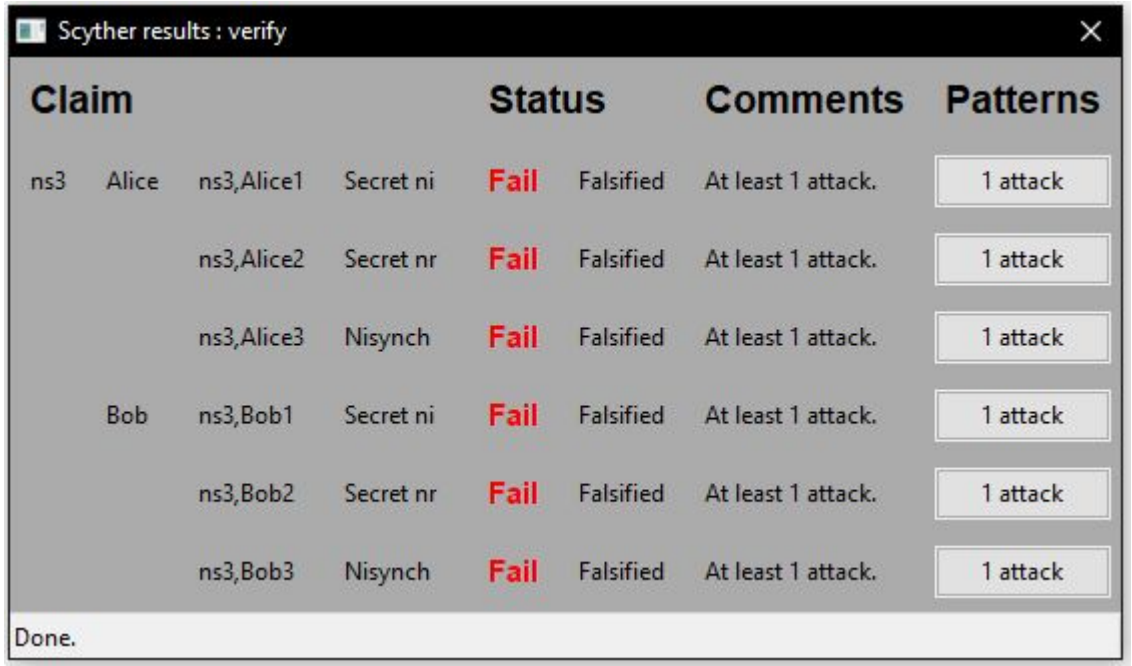

Verificação Formal

Ferramentas de Verificação

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Considerações Finais

Considerações finais

Detectação de Falhas

Corretude do Protocolo

Aplicação Prática

Automatização

Obrigado!

tadeujenuario@hotmail.com
joaootaviors@gmail.com
giulliano94@gmail.com
kreutz@acm.org