Improving Mobile Security

Braden Luthi

Division of Science and Mathematics
University of Minnesota, Morris
Morris, Minnesota, USA

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Outline

1. Background
2. GSM Weakness in UMTS
3. Application Security Threat
4. EM Leaking Key Information
5. conclusion

Outline

1. Background
   - Cryptography
   - GSM and UMTS
     - GSM
     - UMTS
2. GSM Weakness in UMTS
3. Application Security Threat
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Cryptography

Cryptography or ’secret writing’ is the study and practice of techniques for securing communications between two parties.

- **plain-text** Readable message to be sent during communications.
- **cipher** method for transforming plain-text
- **key** parameter for cryptographic algorithm
- **cipher-text** Unreadable form of the message

Cryptography

- **Symmetric cryptography** Both parties share a secret key for encryption and decryption
- **Asymmetric cryptography** Each individual has a public and a private key. Parties use the public keys for encryption and the private keys for decryption

GSM

Global System for Mobile Communications (GSM) is a 2G telecommunication standard developed in the early 90's by the European Telecommunications Institute. Has become one of the most widely used standards, reaching an 80% market share at its height.

UMTS

Universal Telecommunications Standard (UMTS) is 3G telecommunication standard based on GSM by the Third Generation Partnership Project.

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2 GSM Weakness in UMTS
- Authentication
- GSM and UMTS Inter-working Networks
- Man-in-the-middle Attack
- Solution

3 Application Security Threat

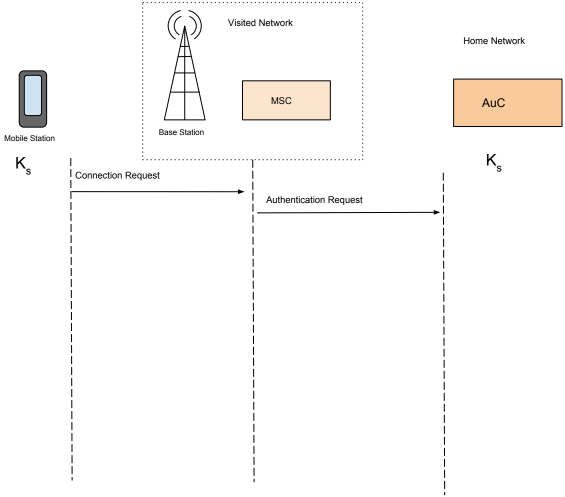
4 EM Leaking Key Information

5 conclusion

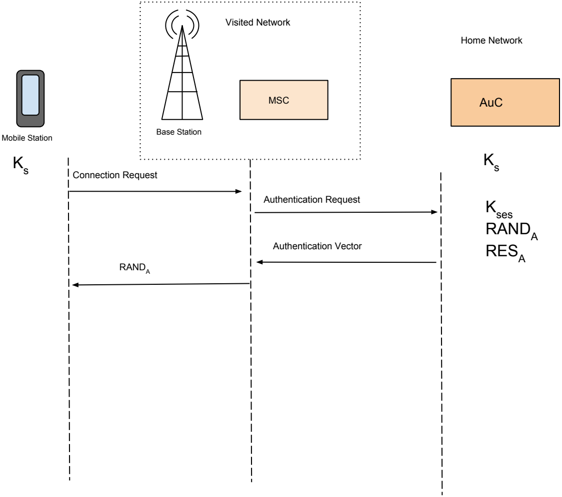
Encryption in GSM and UTMS

- GSM and UMTS both have secret keys that are shared between the mobile and the mobile's home network authentication center.
- GSM and UMTS both utilize the A5 family of encryption algorithms.
    - A5/0
    - A5/1
    - A5/2
    - A5/3

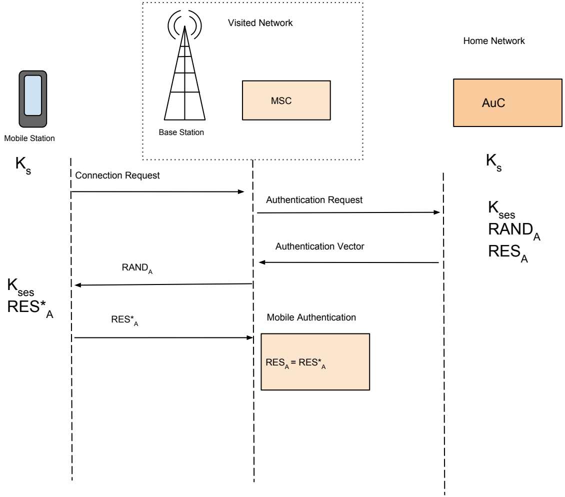
GSM Authentication



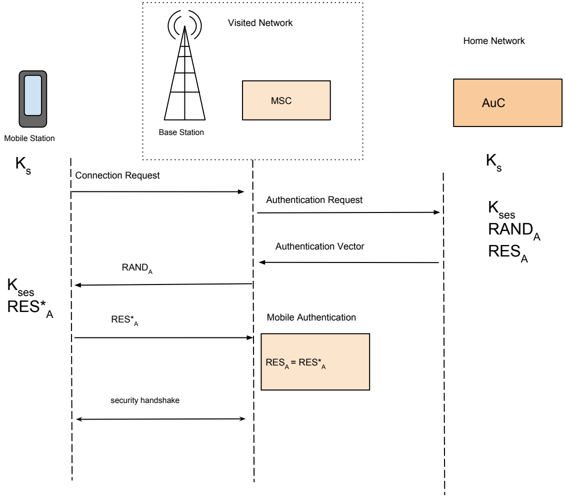
GSM Authentication



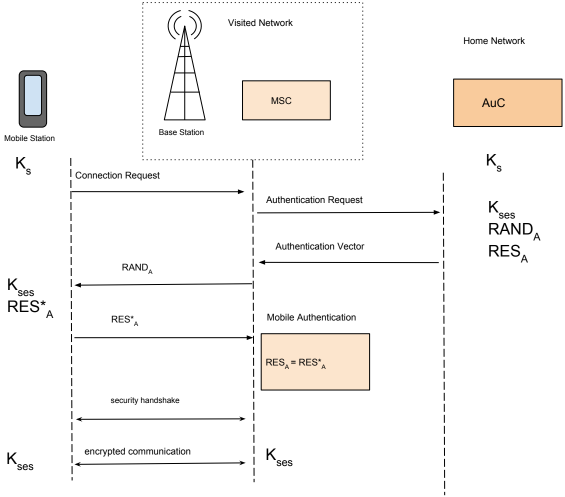
GSM Authentication



GSM Authentication



GSM Authentication



Inter-working Networks

Man-in-the-middle Attack

Man-in-the-middle weakness in GSM

Protecting UMTS from GSM Man-in-the-middle attack

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Applications (Apps)

Application Permissions in Android

Application Threat keyboard Key-logger

KBS Checker

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4 EM Leaking Key Information
- Side channel attack
- Side channel through EM

5 conclusion

What is a Side channel attack?

RSA Example

Ranged Side channel

Findings

Solution

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Conclusion

Questions

Questions?