Applied Cryptosystems:

Techniques & Architectures

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Catalogue Description

- Introduction to encryption and information hiding.
- Mathematical Foundation of Cryptography.
- Private and Public key Cryptosystems.
- Key Protocol and Management.
- Ciphers.
- Advanced Encryption Standard.
- Digital Signatures.
- Elliptic Curve Cryptosystems.
- Architectures of Cryptosystems and Processors.

Grading Policy:

- Attendance 5%
- Assignments & Quizzes 20%
- Project 50%
  - Paper Summary & Discussion 10%
  - Testing & Verification 10%
  - Modification & Comparison 10%
  - Report & Presentation 20%
- Exam 25%

Paper Summary & Discussion 10%

- Each student needs to give the instructor three (3) papers to choose from for their focus study. These three papers should be submitted by end of ***Week 5***
- The instructor will assign a paper for the student to work on by ***Week 6.***
- The chosen paper should be understood in depth and a one page summary report is to be submitted. The report should be in the students *own words and not copied from the resources*. This summary report should be submitted by the end of ***Week 7***
- Note that the papers should be on related topic to the course, from reputable journals or conferences, and ***should not be more than three years old.***

Testing & Verification 10%

- To proof understanding the chosen paper, it should be tested & verified by the student.
- These testing & verification are to be completed by ***week 8***

Modification & Comparison 10%

- A modification to the idea is to be agreed upon.
- This modification is to be tested and verified.
- The modification needs to be compared to the original idea tested results.
- This should be ready by ***week 10.***

Report & Presentation 20%

- ¨ Title:
- ¨ Your Name
- ¨ Abstract: (to briefly describe your work and improvement)
- ¨ Keywords:
- ¨ Introduction: (importance and possible applications, previous work, your exact achievements, and briefing of the sections flow within the document)
- ¨ Brief Theoretical Background and/or Available Methods: (presented different techniques as examples)
- ¨ Detailed description of the studied work: (describe the idea, procedure, algorithm and your implementation tests)
- ¨ Your improvement: (describe all updates and implementation of your improvement)
- ¨ Detailed comparisons:
- ¨ Conclusion
- ¨ Acknowledgment: Thank UQU; Example: “Thanks to Umm Al-Qura University for supporting this work.”
- ¨ References

Considerations:
What do we want?

- Privacy of our data
- Integrity of our data
- Usability of our system/data

Concepts

- Confidentiality of data
- Integrity of data
- Authentication of users

What Functionality Is Needed?

- Authentication -- who user is
- Authorization -- who is allowed to do what
- Enforcement -- make sure people do what they are supposed to do

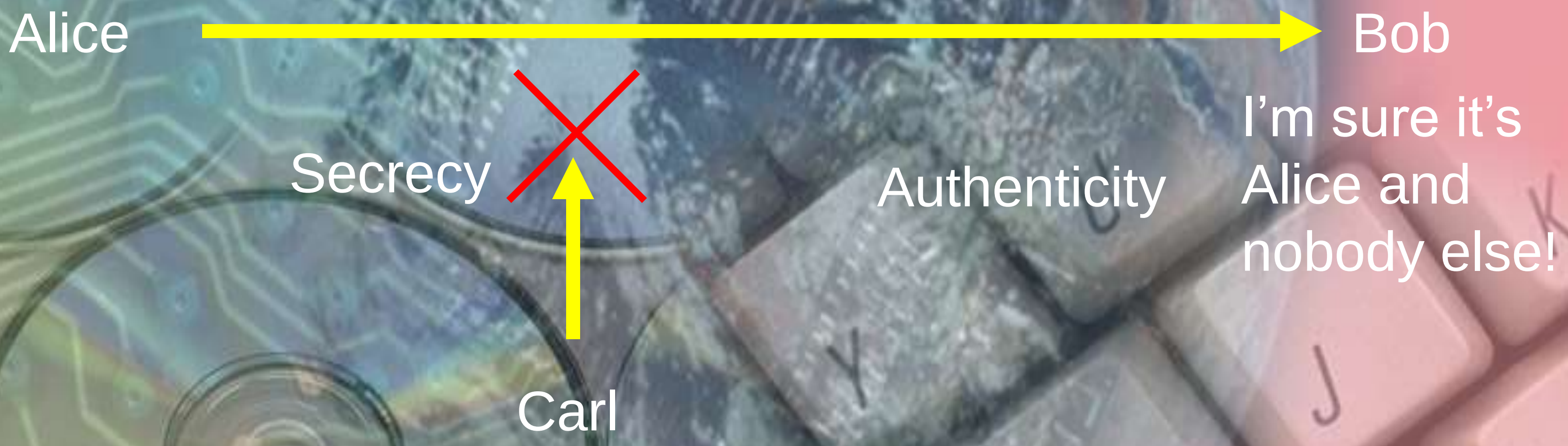
Definitions

- Secrecy (Confidentiality)
  - Diary Lock
- Authenticity
  - Hi it's Bob.
  - Prove it Dude...

Definition Examples

- Secrecy
  - – Alice sends message to Bob. Carl intercepts the message... but can't read
- Authenticity
  - – Alice sends message to Bob. Bob can verify that Alice is the sender.

The Big Picture



Alice

Bob

Secrecy

Authenticity

I’m sure it’s Alice and nobody else!

Carl

Methods

- Cryptography
  - Converting messages to unreadable forms... Unconverting it back to the readable form
- Steganography
  - Hiding the existence of a message

Steganography

Null Cipher

Fi**s**hing fr**e**shwater be**n**ds an**d** sa**l**twater co**a**sts re**w**ards an**y**one fe**e**ling st**r**essed. Re**s**ourceful an**g**lers us**u**ally fi**n**d ma**s**terful le**a**pers fu**n** an**d** ad**m**it sw**o**rdfish ra**n**k ov**e**rwhelming an**y**day.

Send lawyers, guns, and money.

Invisible Ink

- Write with lemon juice and a toothpick/ cotton swab. Let the paper dry.
- Heat the paper with an iron to reveal the hidden message.

Cryptography

Greek: kryptos + graphein → hidden writing