RUHR-UNIVERSITÄT BOCHUM

RUB

Datenschutz und Sicherheit von Instant-Messaging-Protokollen

a-i3/BSI-Symposium 2017

21.04.17

Faculty of Electrical Engineering and Information Technology
Chair for Network and Data Security
Paul Rösler

Agenda

- Motivation
- Introduction to Technical Concepts
- Protocol Weaknesses
- Conclusion

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Prof. Dr. Jörg Schwenk

Instant Messaging

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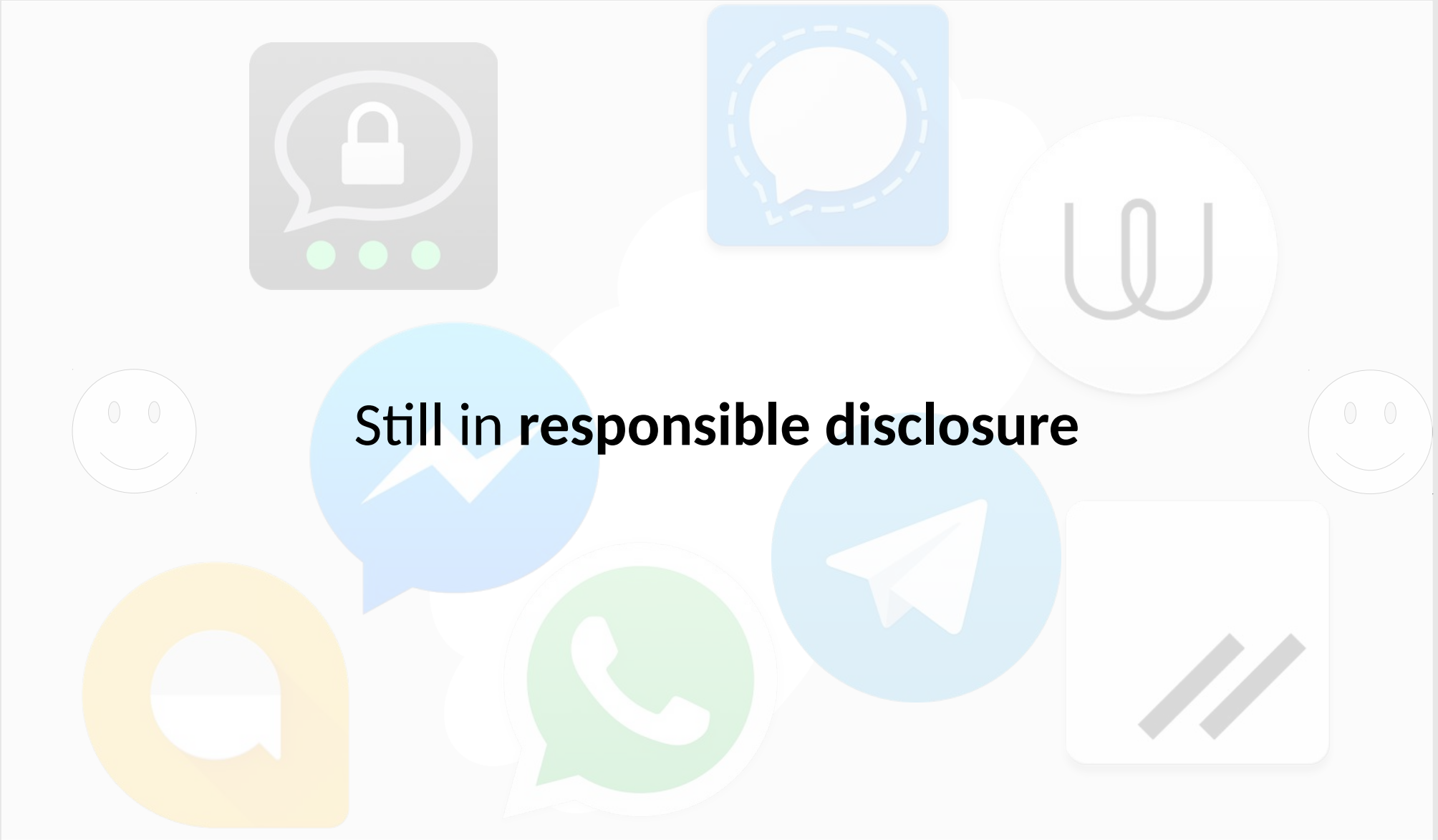
Instant Messaging

Instant Messaging



Still in **responsible disclosure**

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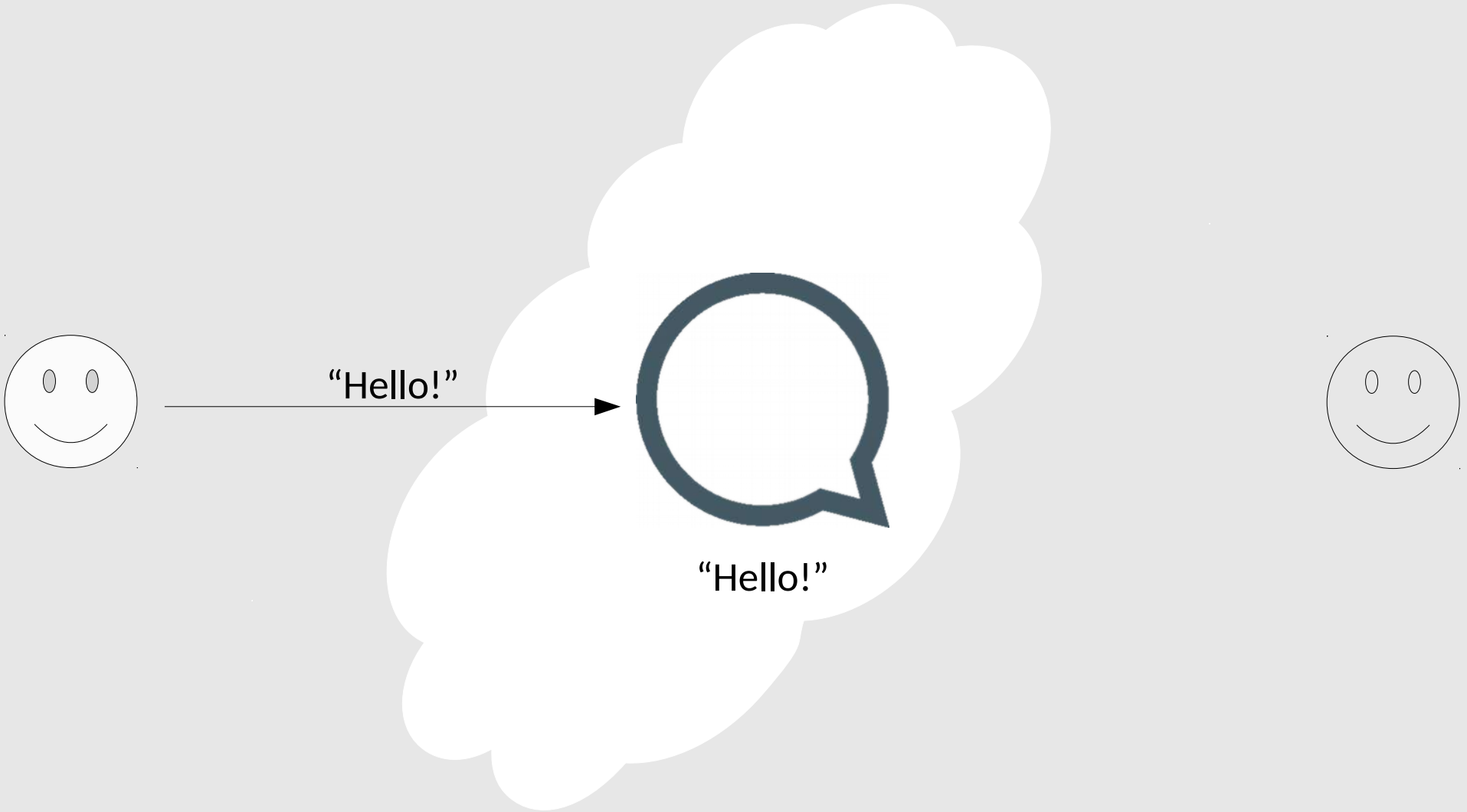
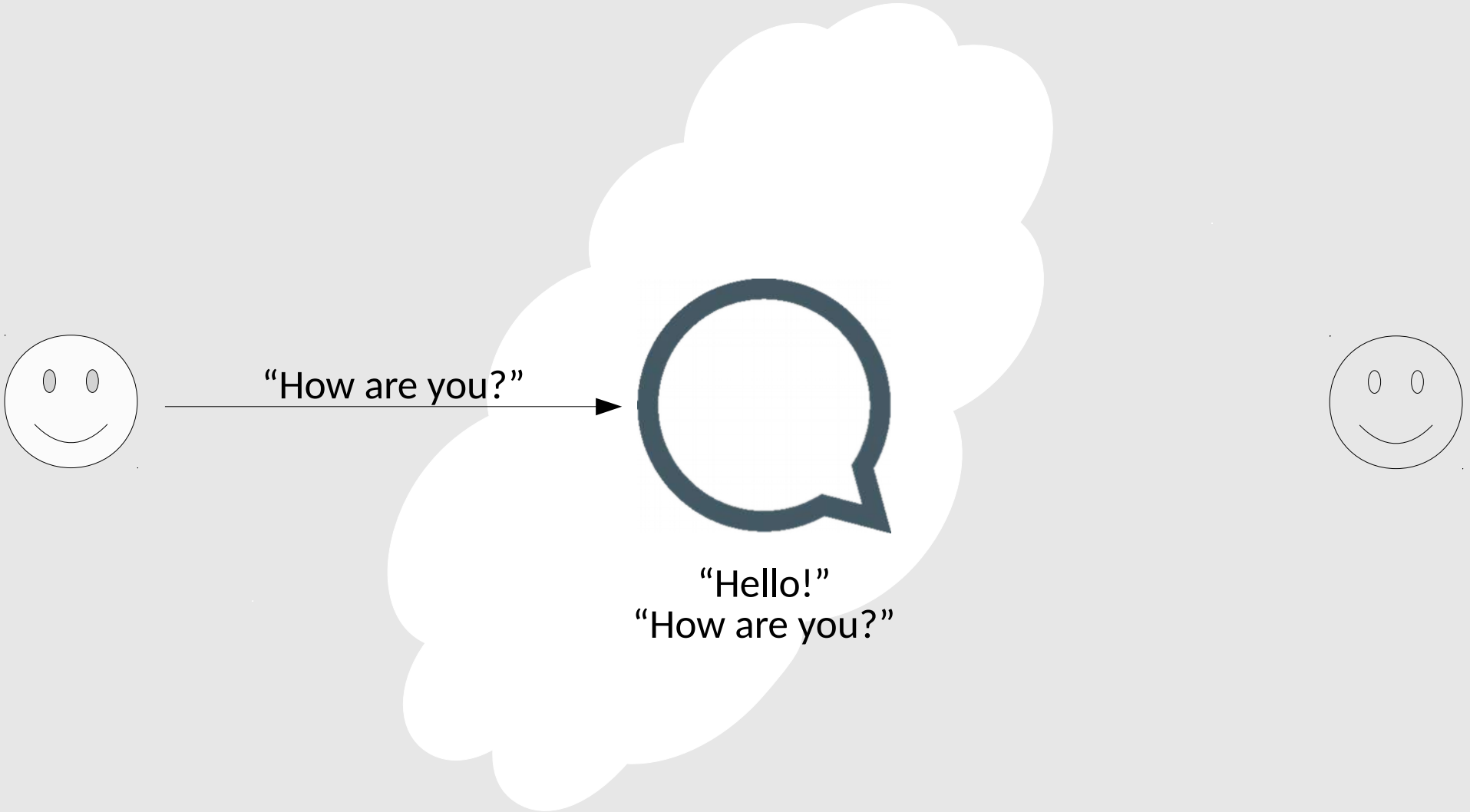
Instant Messaging

Instant Messaging

Instant Messaging



Instant Messaging



Instant Messaging

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Instant Messaging

Instant Messaging

“Hello!”

“How are you?”

Motivation

Target:
- Security
- Privacy

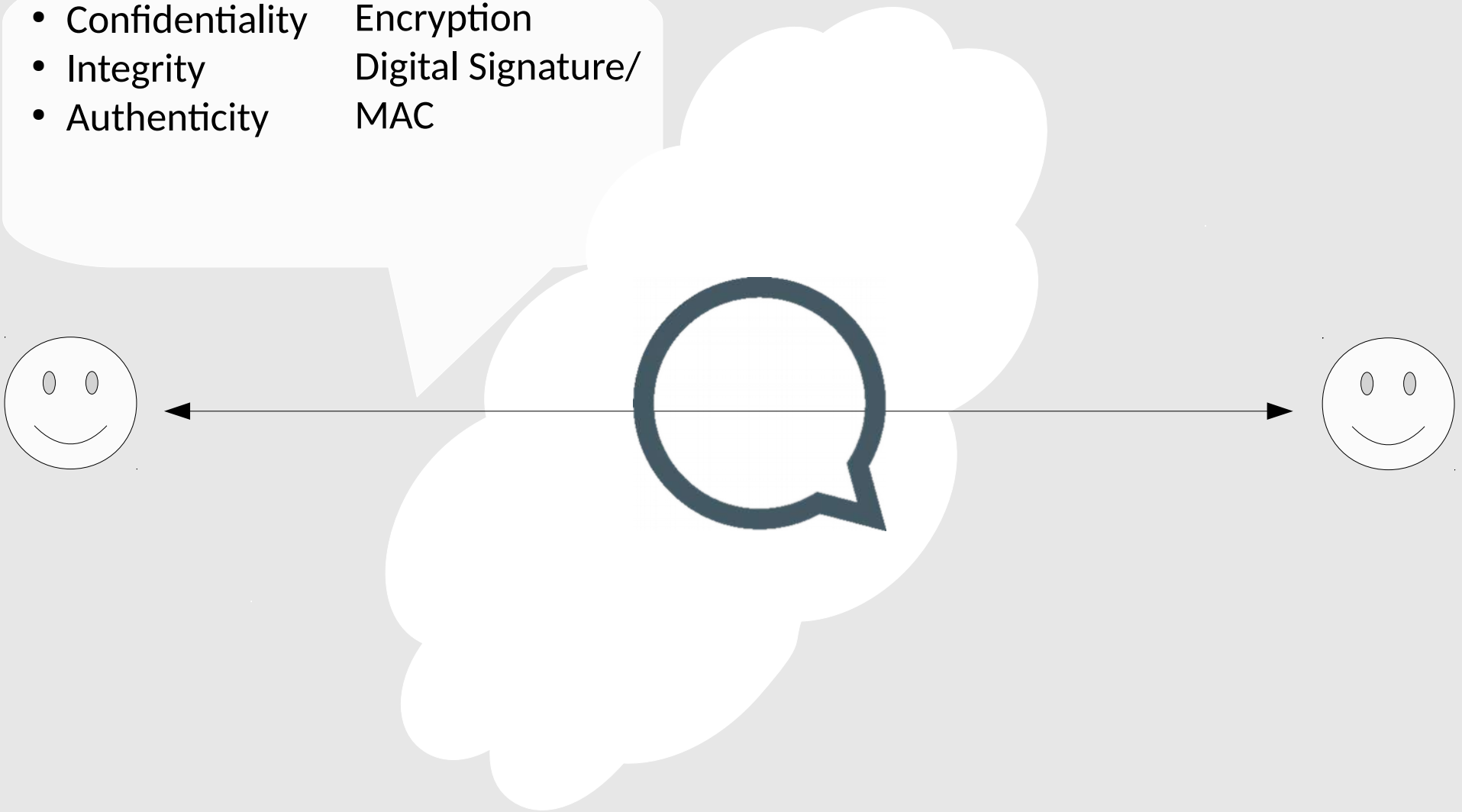
Not target:
- Safety

Motivation

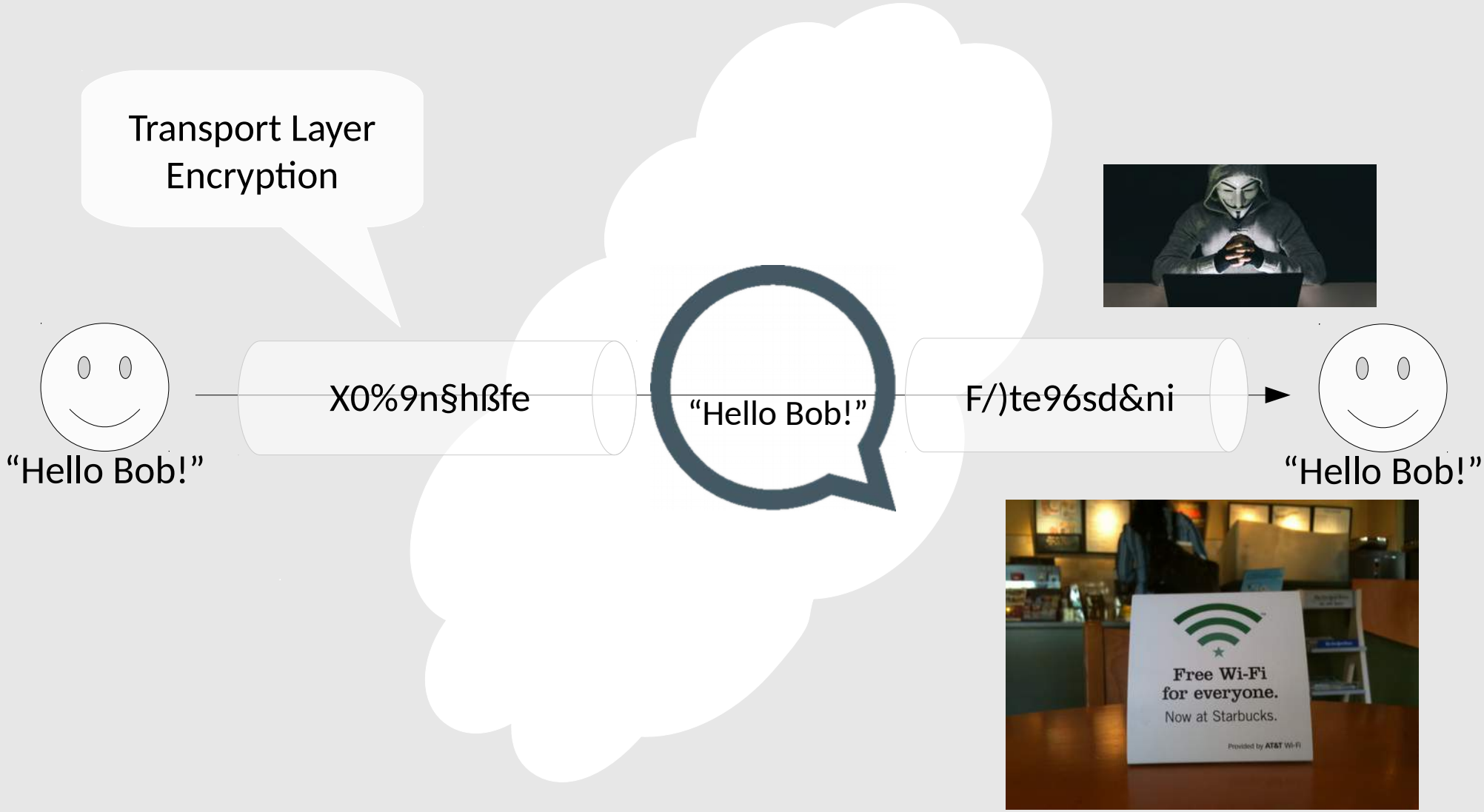
- Confidentiality
- Integrity
- Authenticity
  + Availability

Motivation

- Confidentiality — Encryption
- Integrity — Digital Signature/
- Authenticity — MAC



Motivation


Transport Layer Encryption
X0%9n§hßfe
“Hello Bob!”
“Hello Bob!”
F/)te96sd&ni
“Hello Bob!”
Free Wi-Fi
for everyone.
Now at Starbucks.

Motivation

X0%9n§hßfe

5$c2mqa1r

F/)te96sd&ni

“Hello Bob!”

“Hello Bob!”

Transport Layer Encryption
+
End-to-End Encryption

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Introduction to Technical Concepts

- Confidentiality ✓
- Integrity ✓
- Authenticity ✓

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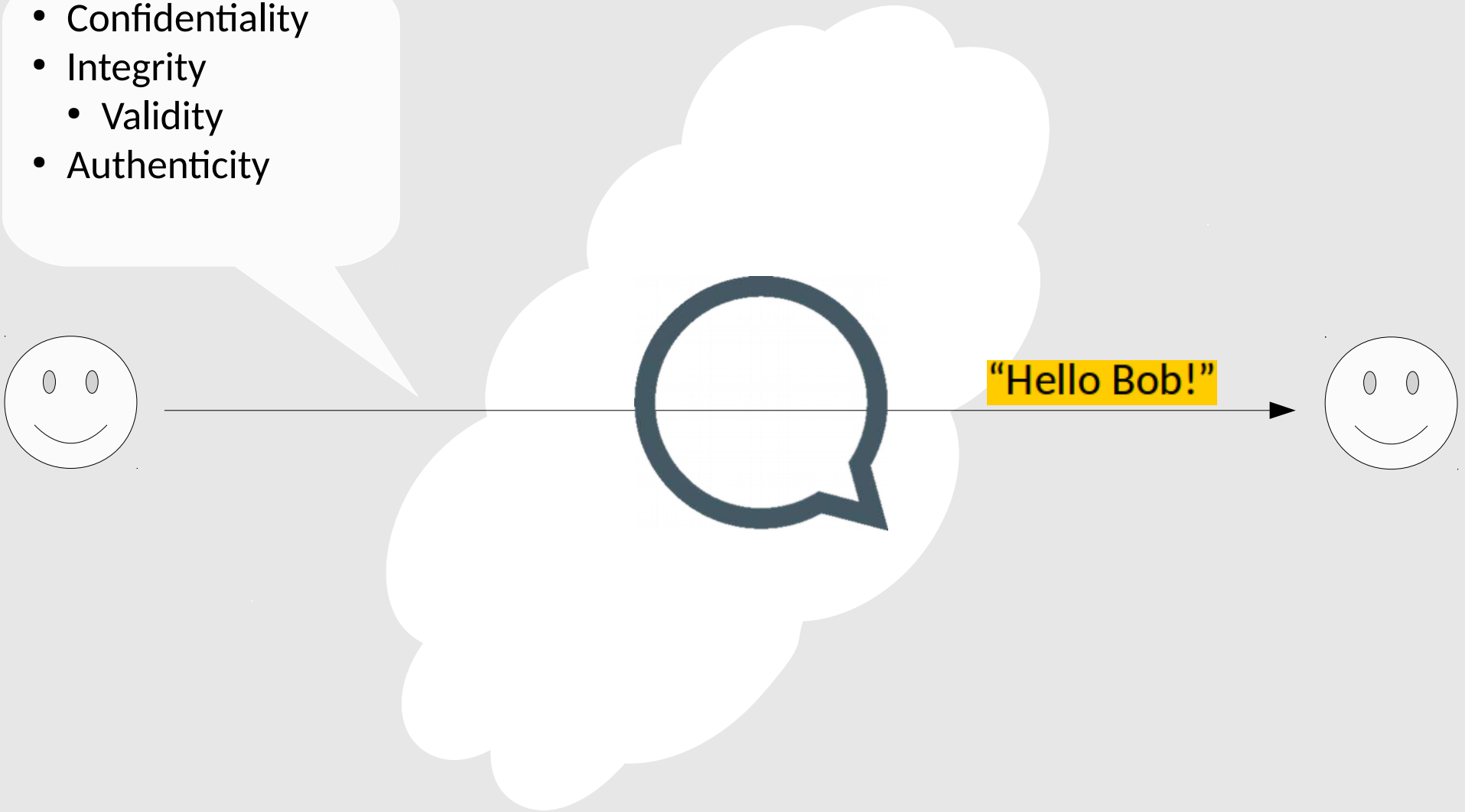
Introduction to Technical Concepts

- Confidentiality
- Integrity
  - Validity
- Authenticity



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Introduction to Technical Concepts

- Confidentiality
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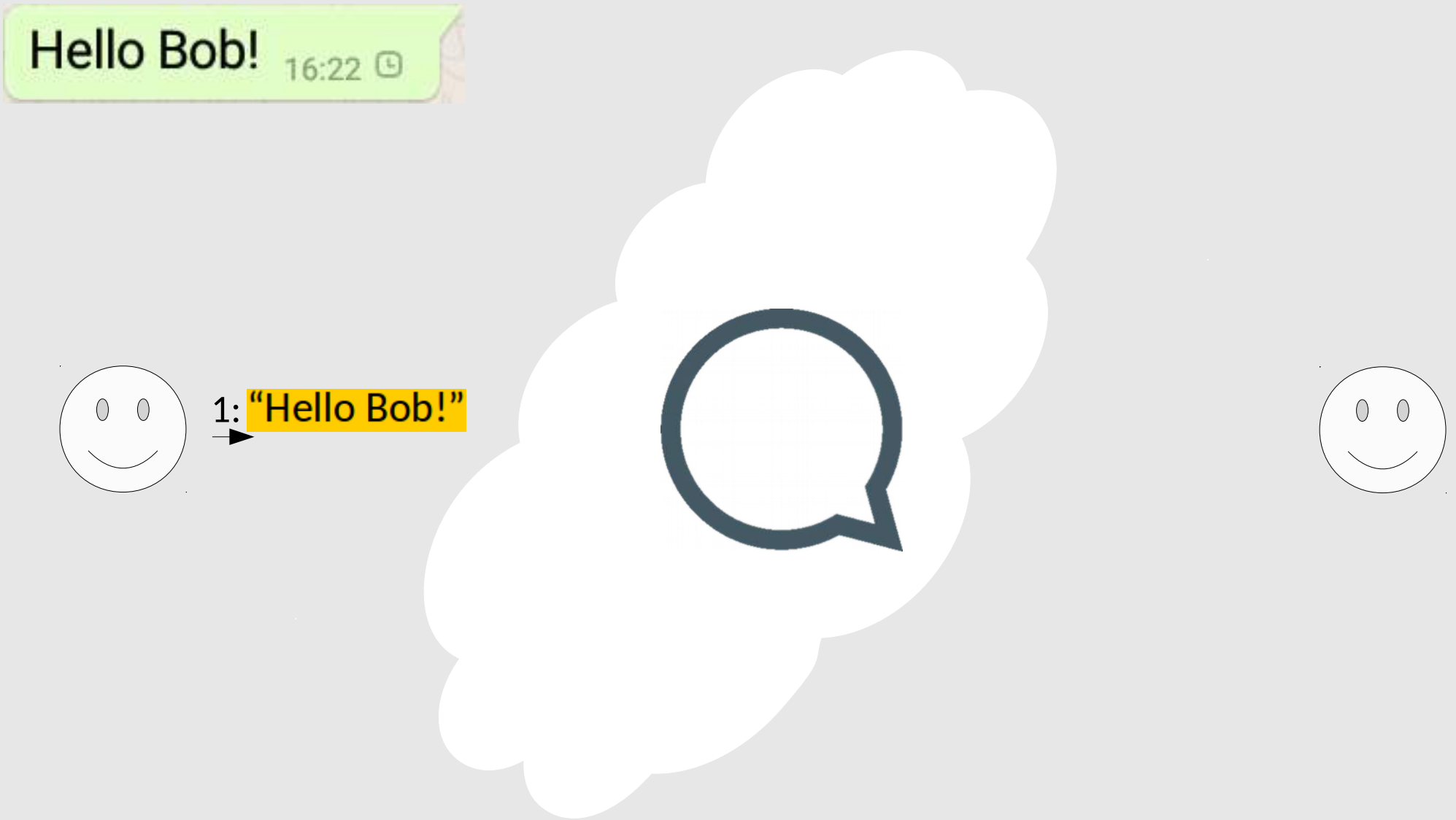
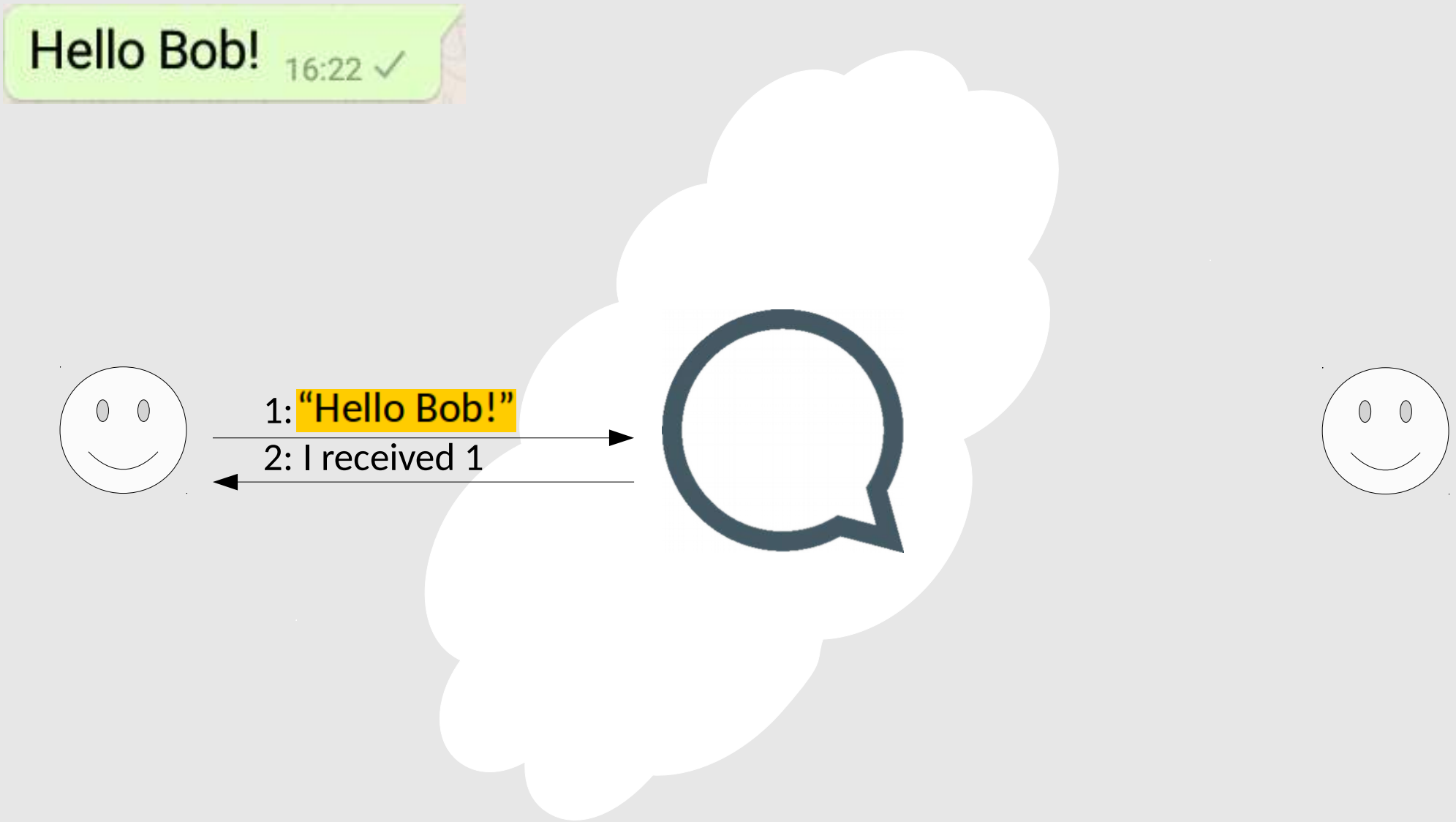
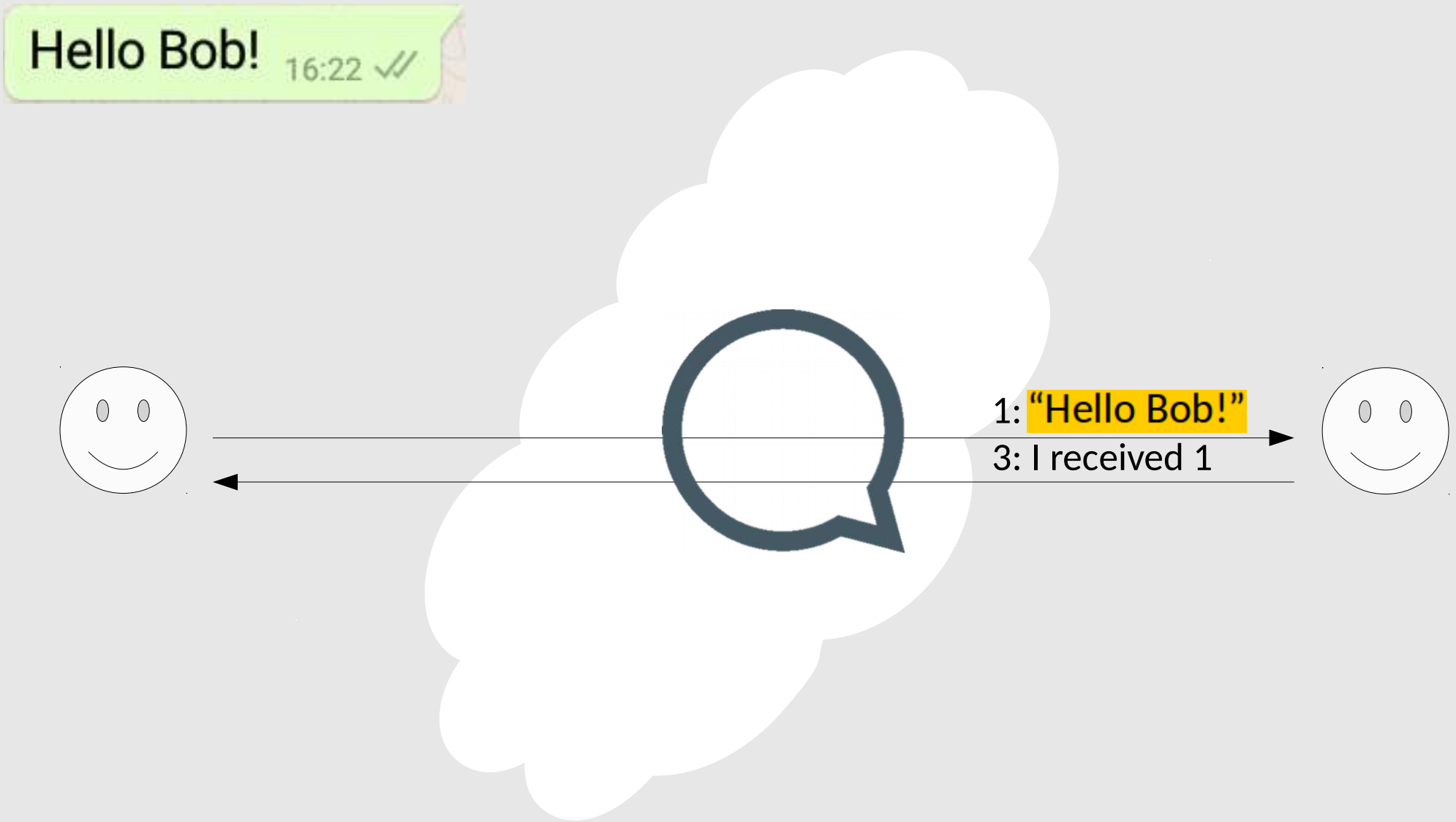
Protocol Weaknesses



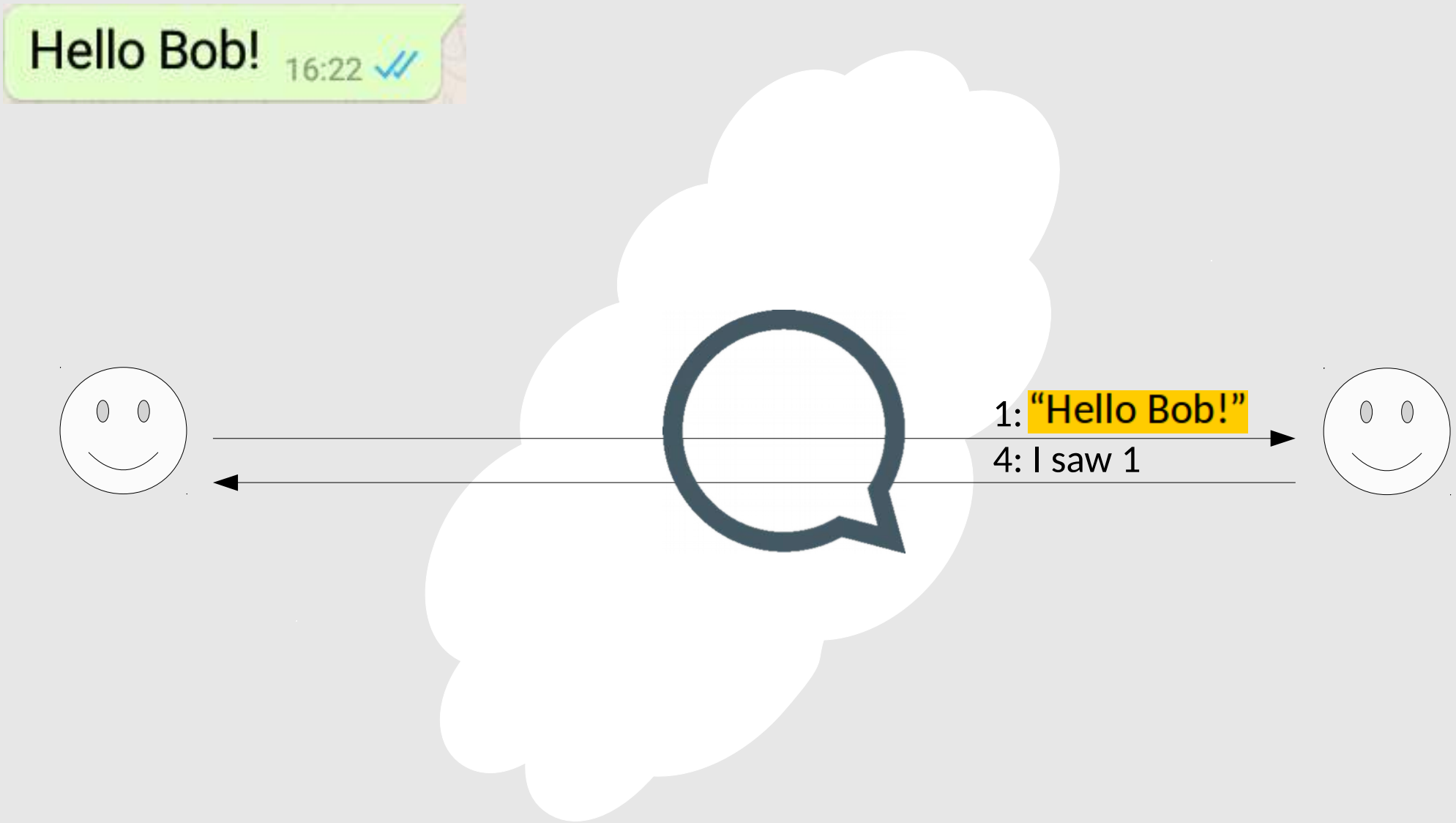
Protocol Weaknesses



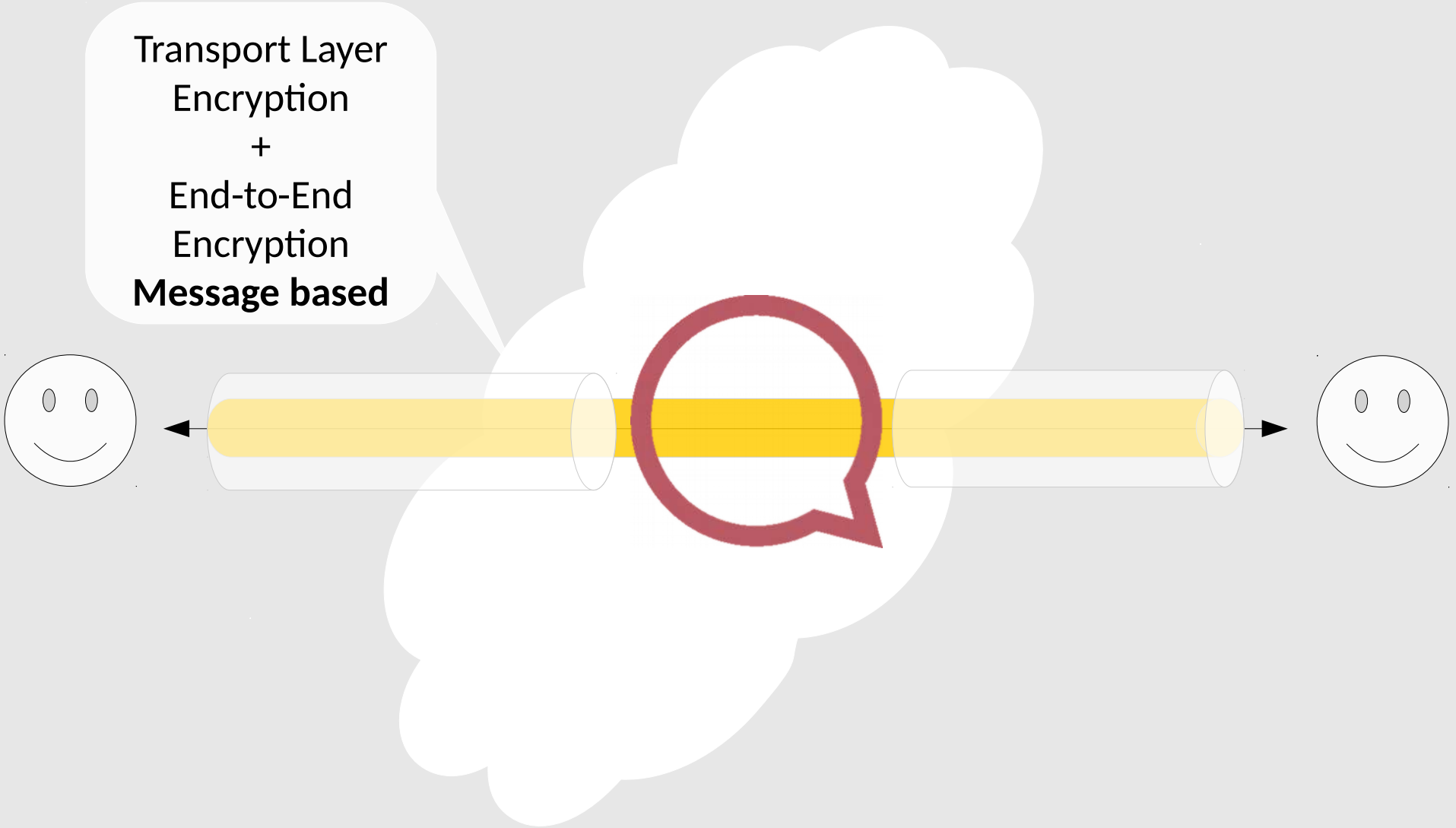
Protocol Weaknesses



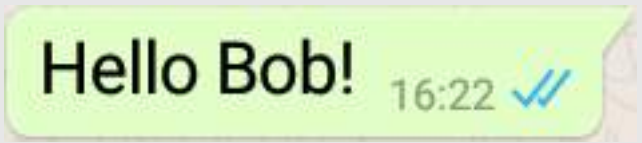
Protocol Weaknesses



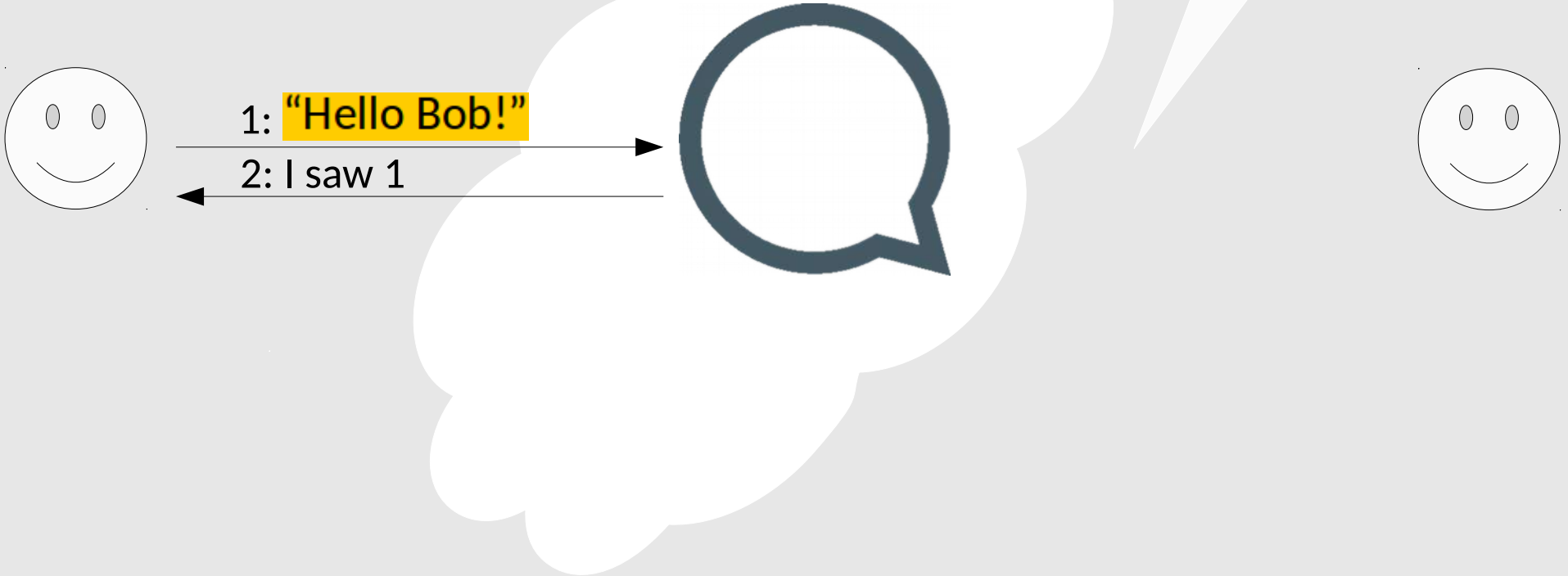
Motivation


Transport Layer
Encryption
+
End-to-End
Encryption
Message based

Protocol Weaknesses



All analyzed protocols vulnerable



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Introduction to Technical Concepts

- Confidentiality
- Integrity
  - Validity
- Authenticity

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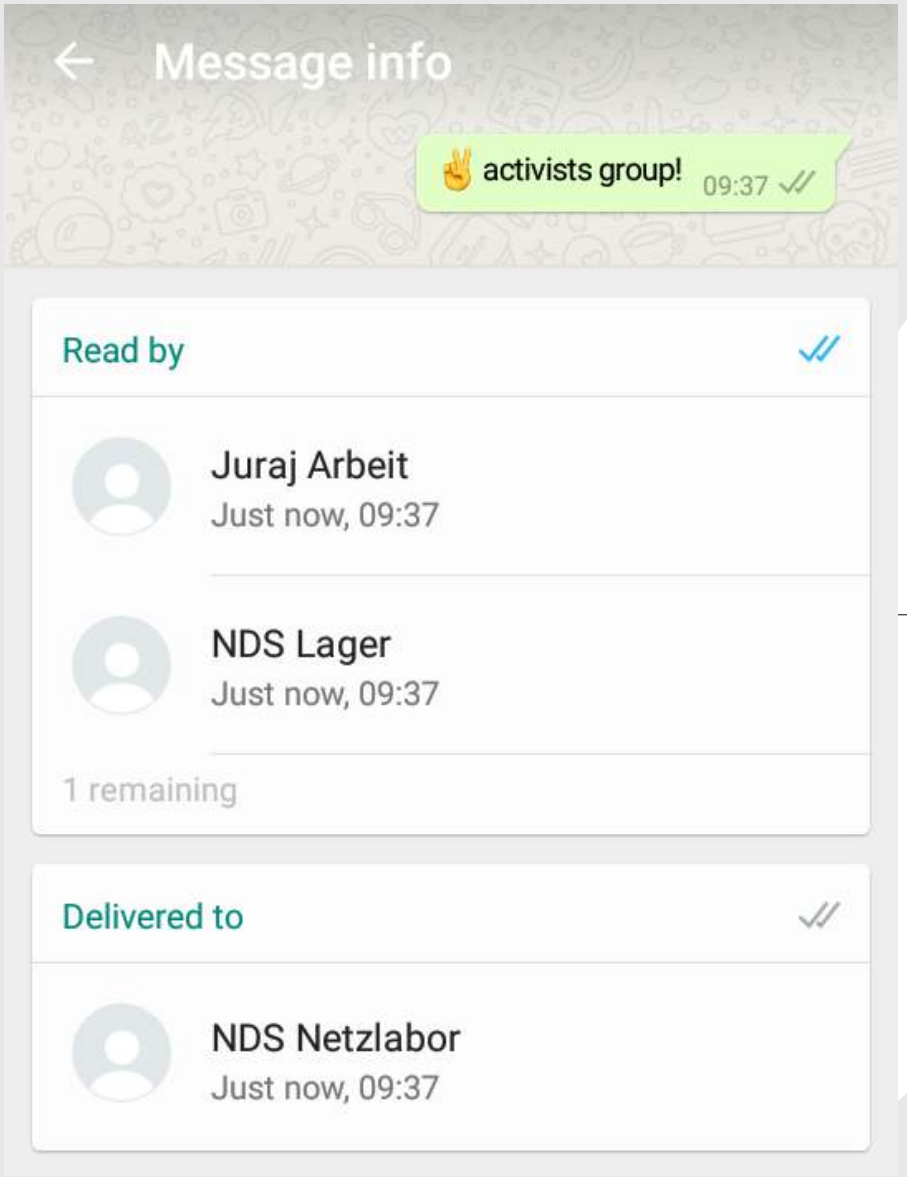
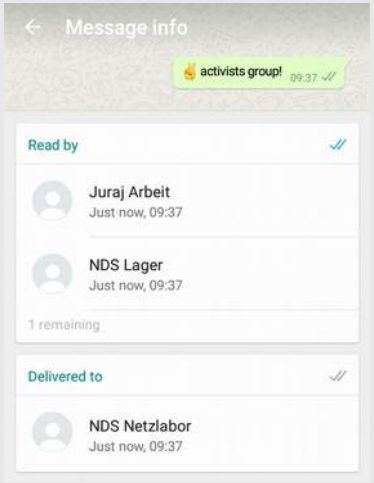
Introduction to Technical Concepts

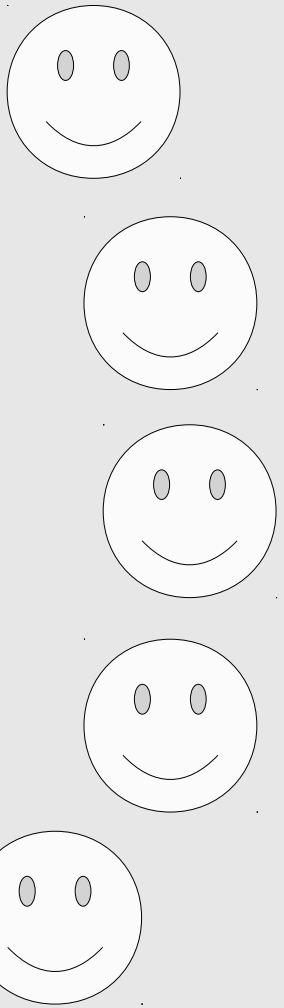


Protocol Weaknesses



1: "✌ activists group!"

2..n: Alice, Bob, ... saw 1



All analyzed protocols vulnerable

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Introduction to Technical Concepts

- Confidentiality
  - Closeness
- Integrity
  - Validity
- Authenticity

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Introduction to Technical Concepts

- Confidentiality
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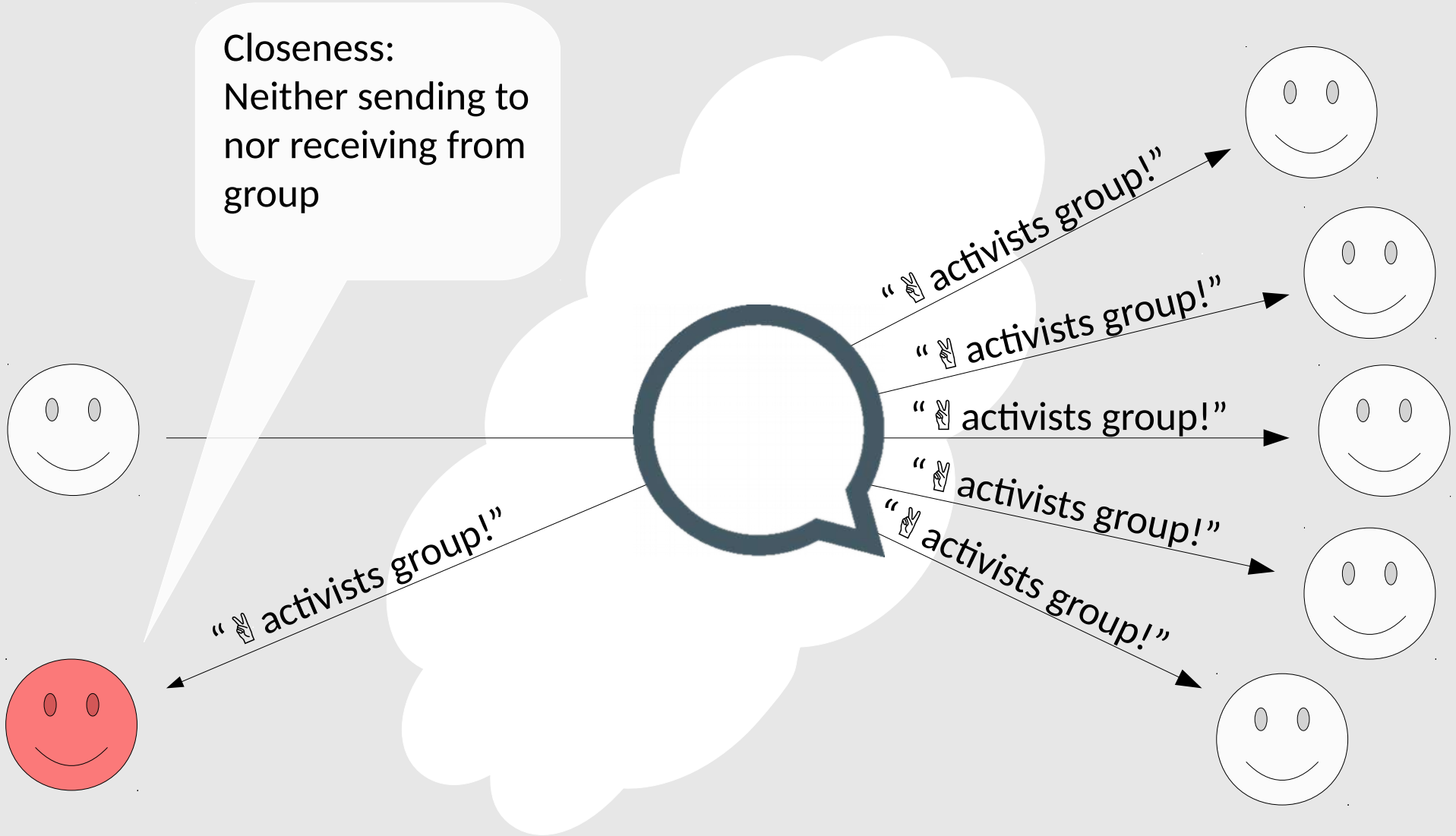
Introduction to Technical Concepts



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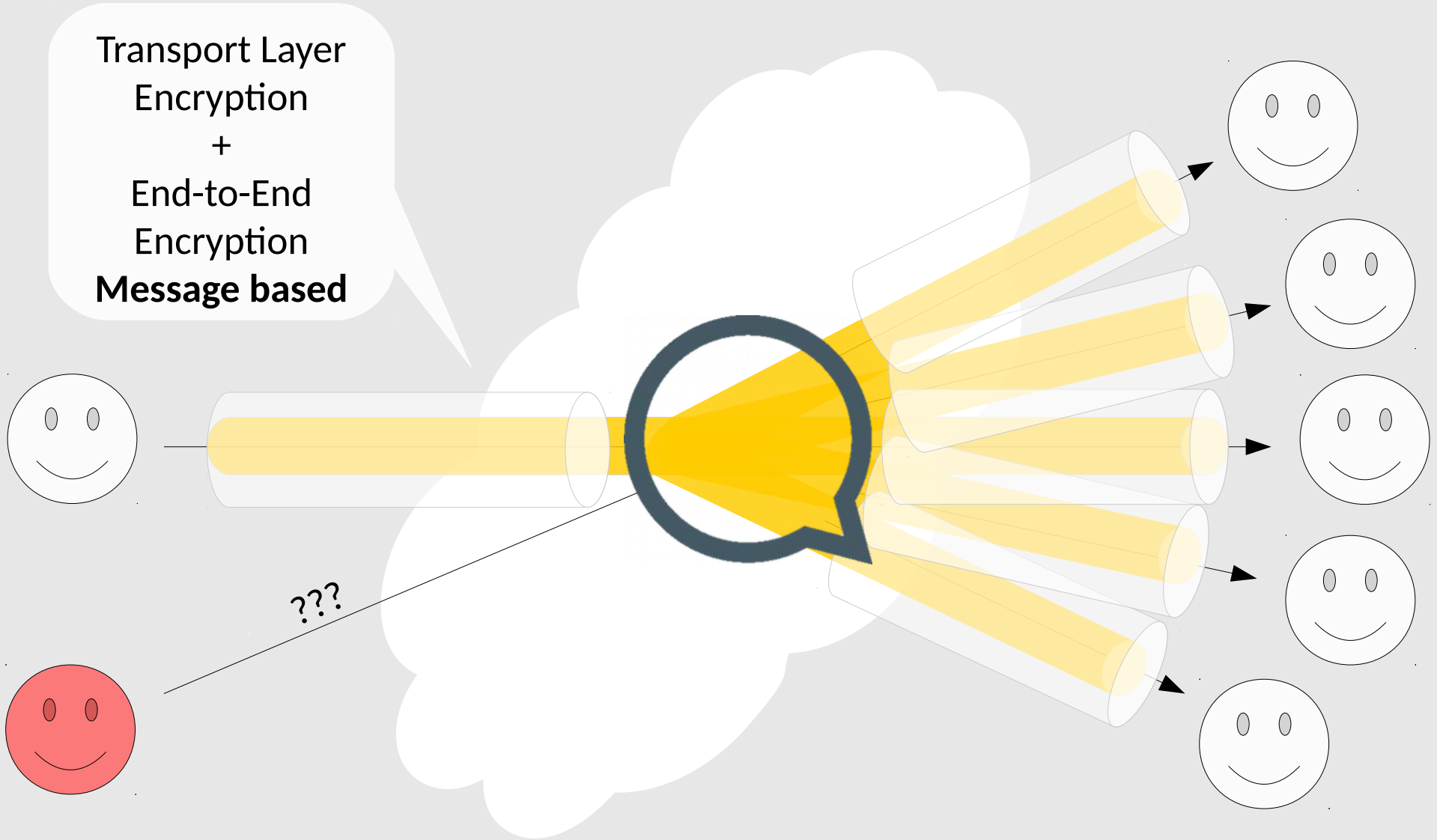
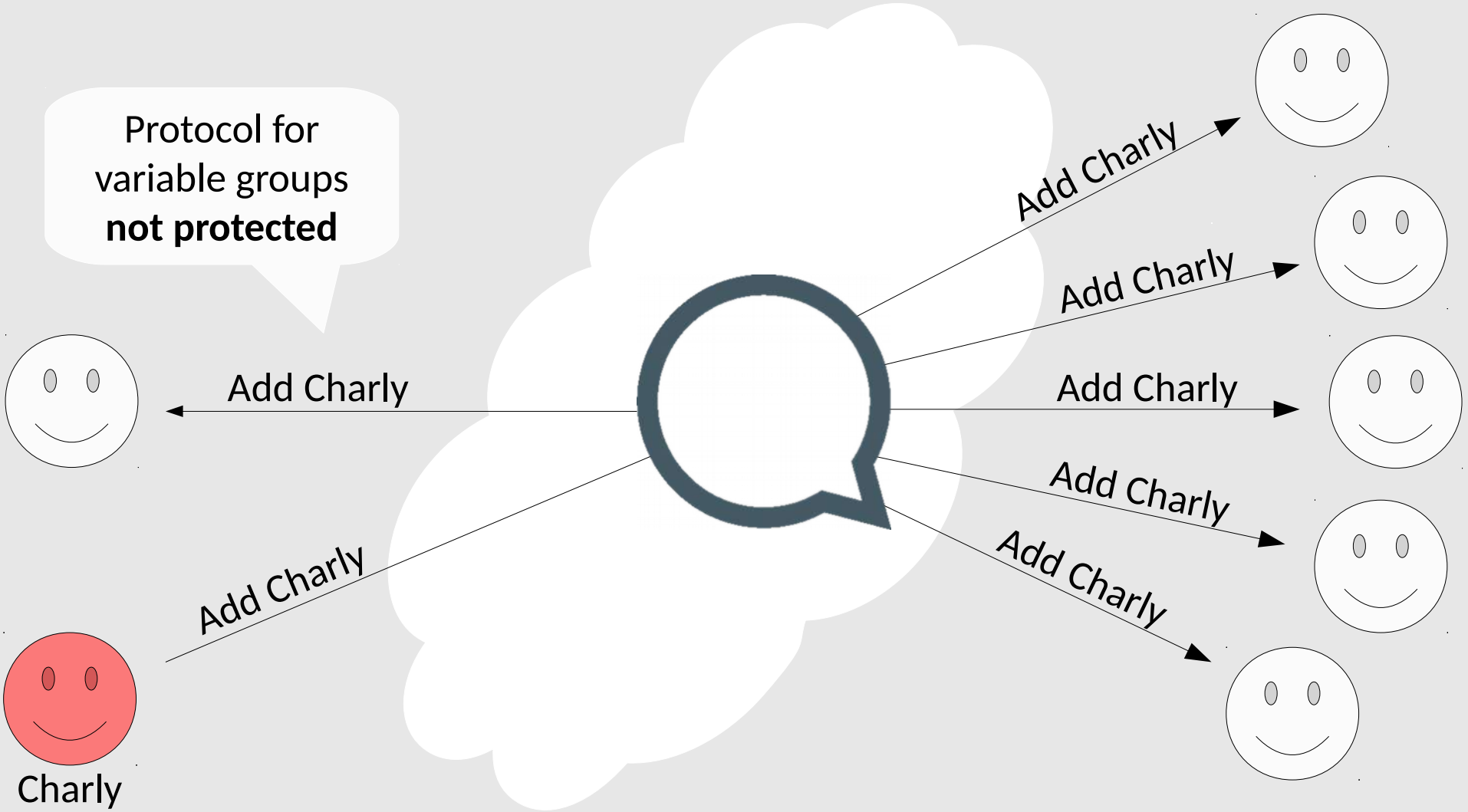
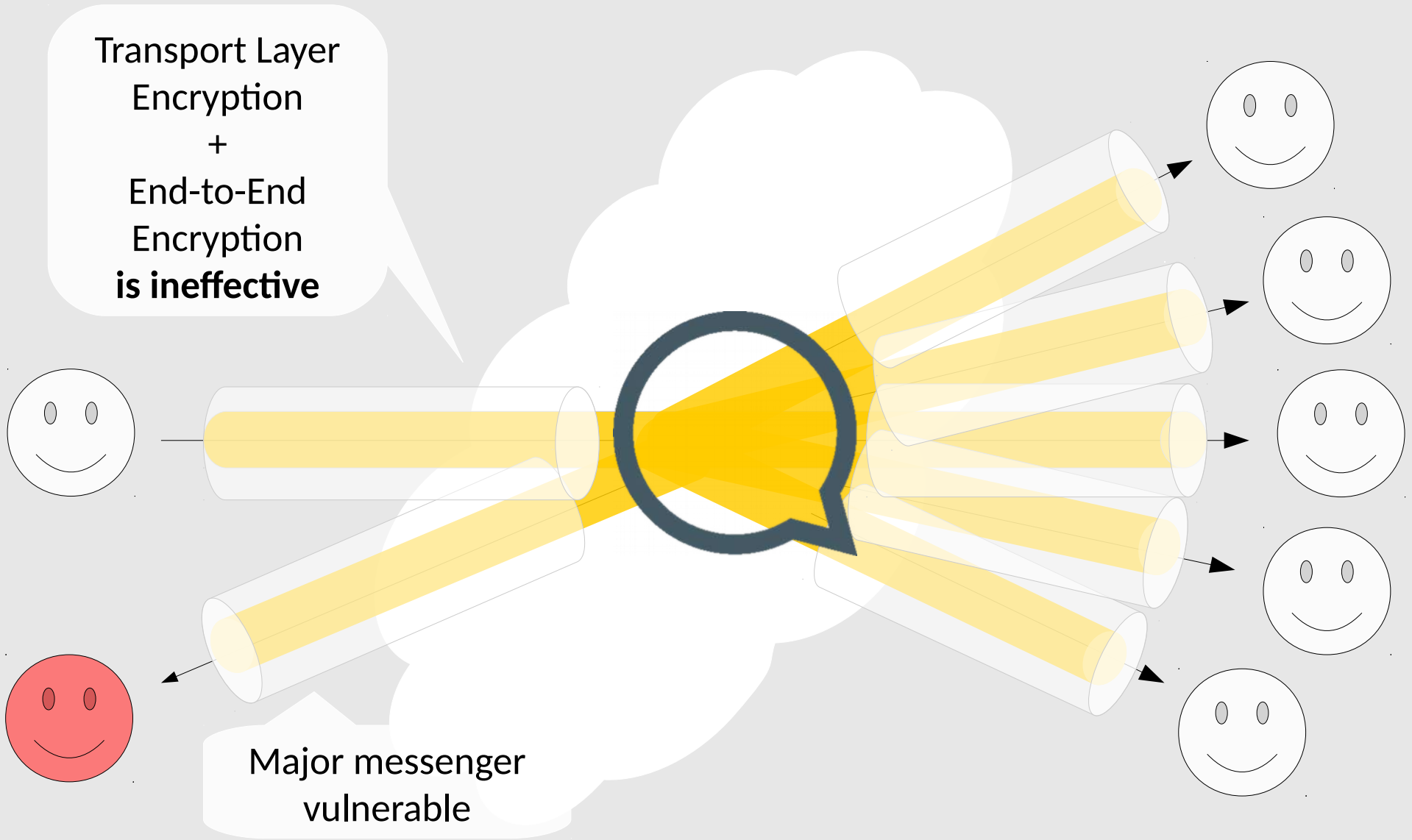
Introduction to Technical Concepts



Protocol Weaknesses

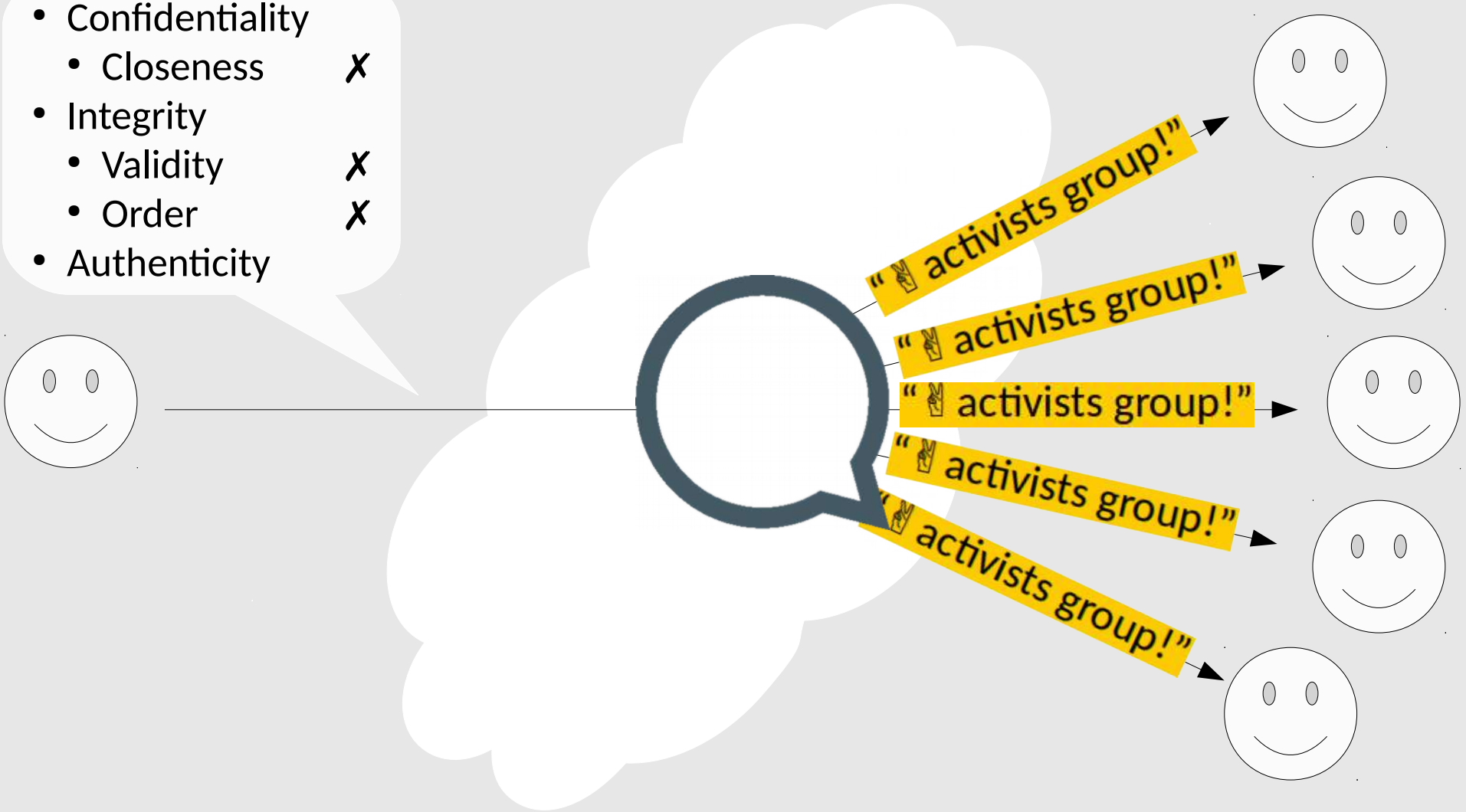


Protocol Weaknesses

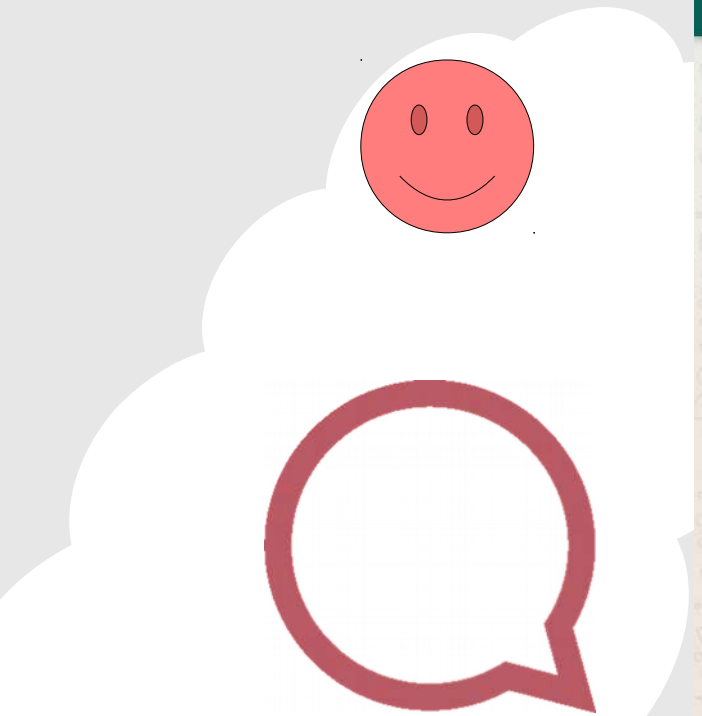


Protocol Weaknesses

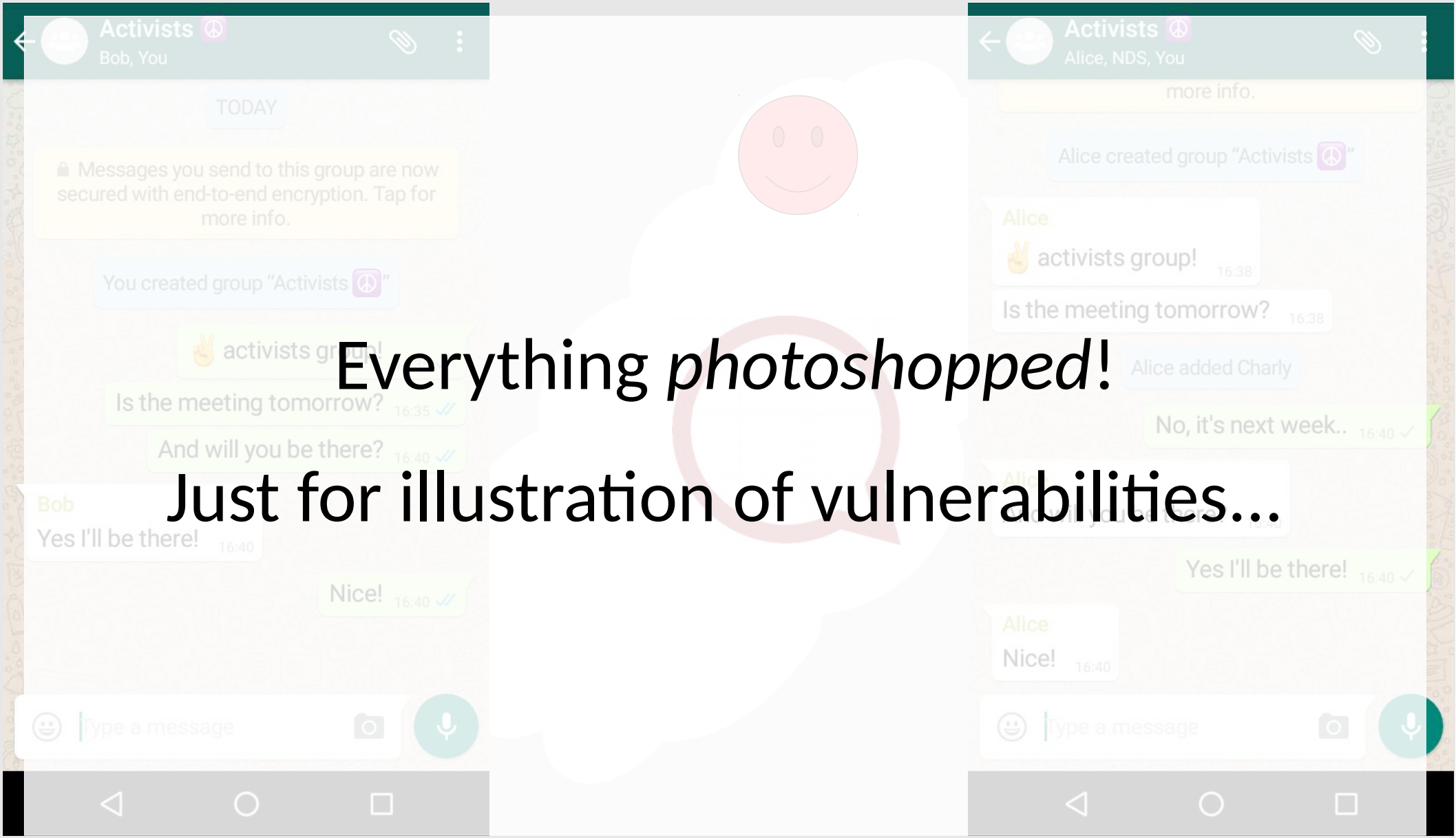
- Confidentiality
  - Closeness ✗
- Integrity
  - Validity ✗
  - Order ✗
- Authenticity



Protocol Weaknesses



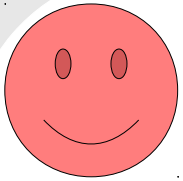
Protocol Weaknesses



Everything *photoshopped*!

Just for illustration of vulnerabilities…

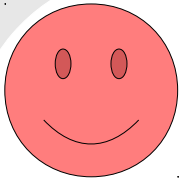
Protocol Weaknesses



Alice thinks:

- Meeting is tomorrow
- Bob will be there

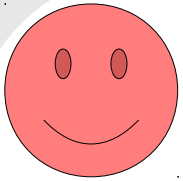
Protocol Weaknesses



Bob thinks:

- Meeting is next week
- Alice knows that meeting is next week
- Alice will be there
- Some Charly was added

Protocol Weaknesses



Attacker knows:

- Bob's meeting is next week
- Alice' meeting is not next week

Conclusion

- Confidentiality
  - Closeness ✗
- Integrity
  - Validity ✗
  - Order ✗
- Authenticity

We cannot trust
- The transcript
- That all members trustworthy

Provider can
- Intercept and eavesdrop
- Drop messages
- Reorder messages
- Send to groups

Conclusion

- Confidentiality
  - Closeness ✗
- Integrity
  - Validity ✗
  - Order ✗
- Authenticity

We cannot trust
- The transcript
- That all members trustworthy

End-to-end Encryption

≠

Security

Provider can
- Intercept and eavesdrop
- Drop messages
- Reorder messages
- Send to groups

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Thank you for your attention!

Any questions?