Advanced cryptography for privacy protection

Cases from the government field

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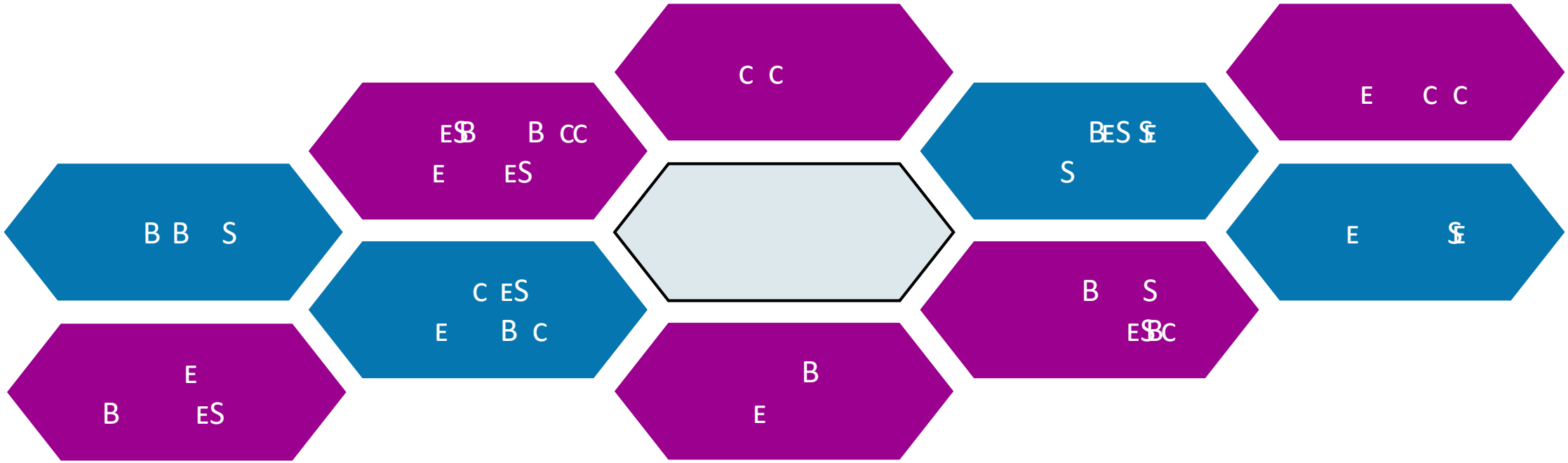
SUPPORT FOR E-GOVERNMENT

g-cloud

top EMPLOYER BELGIË BELGIQUE
CERTIFIED EXCELLENCE IN EMPLOYEE CONDITIONS

Smals Research



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Modern cryptography

Much more is possible with cryptography

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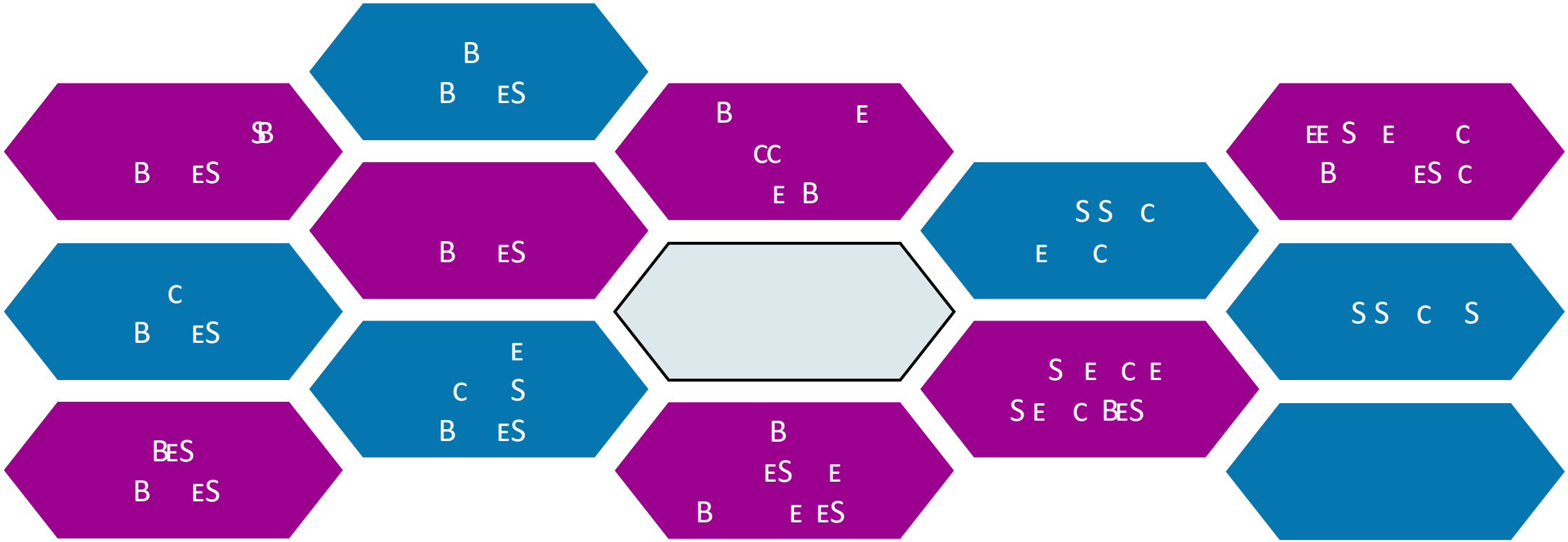
Advanced cryptography



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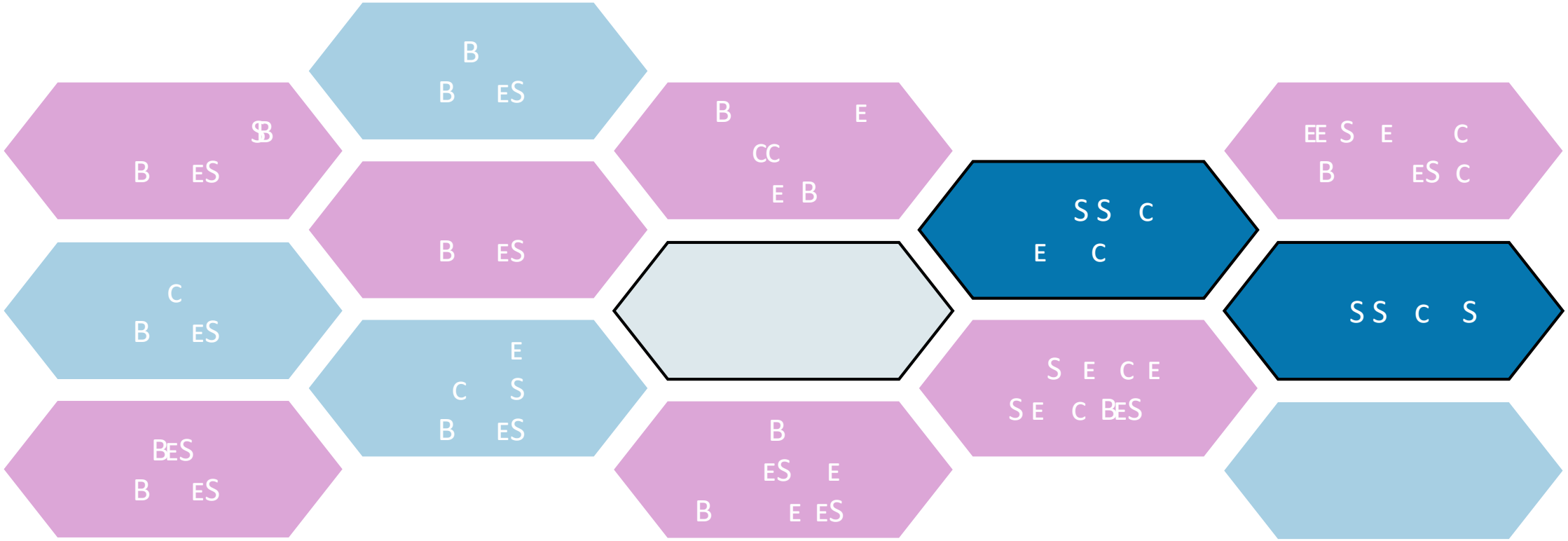
Advanced cryptography



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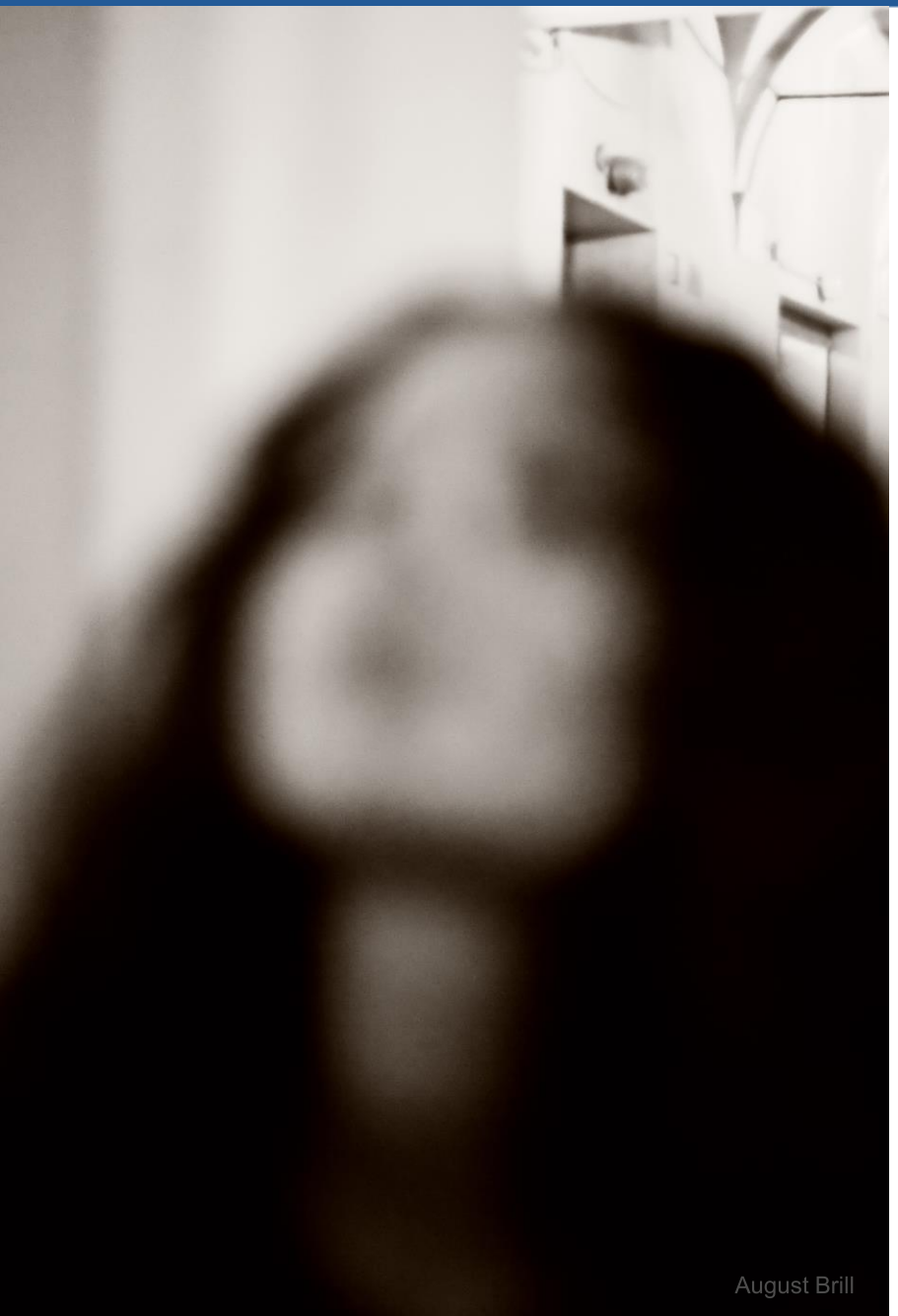
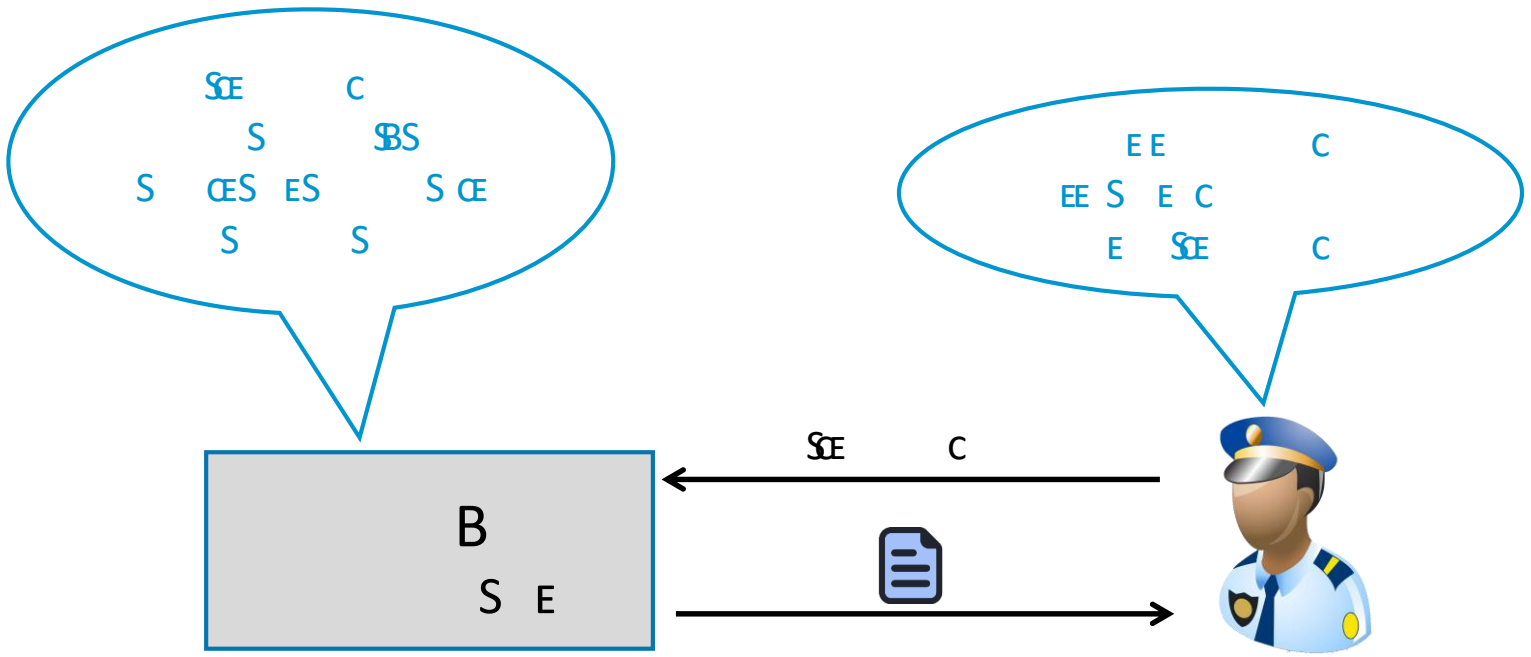
Oblivious transfer

Oblivious transfer – Problem statement





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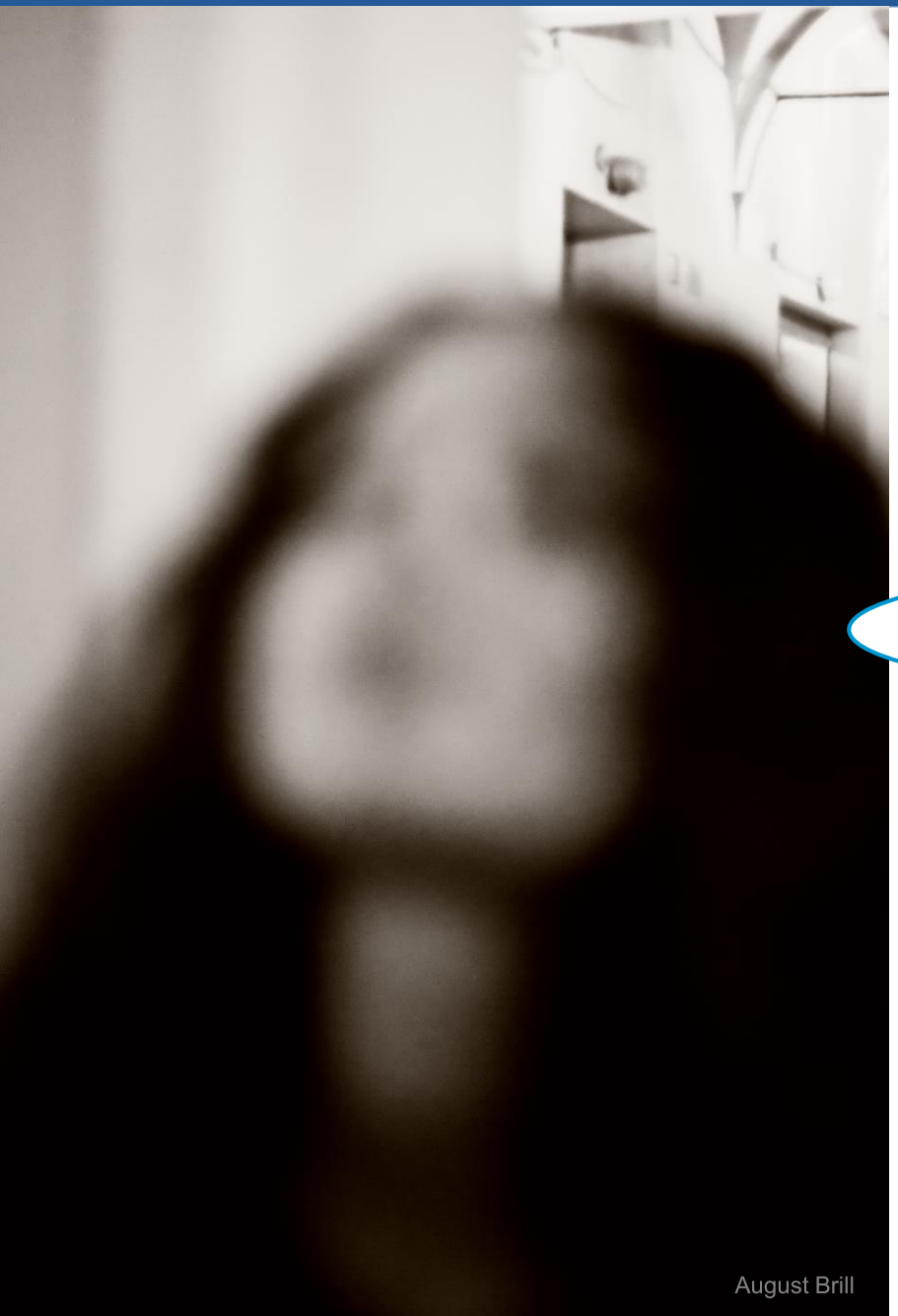
Oblivious transfer – Problem statement



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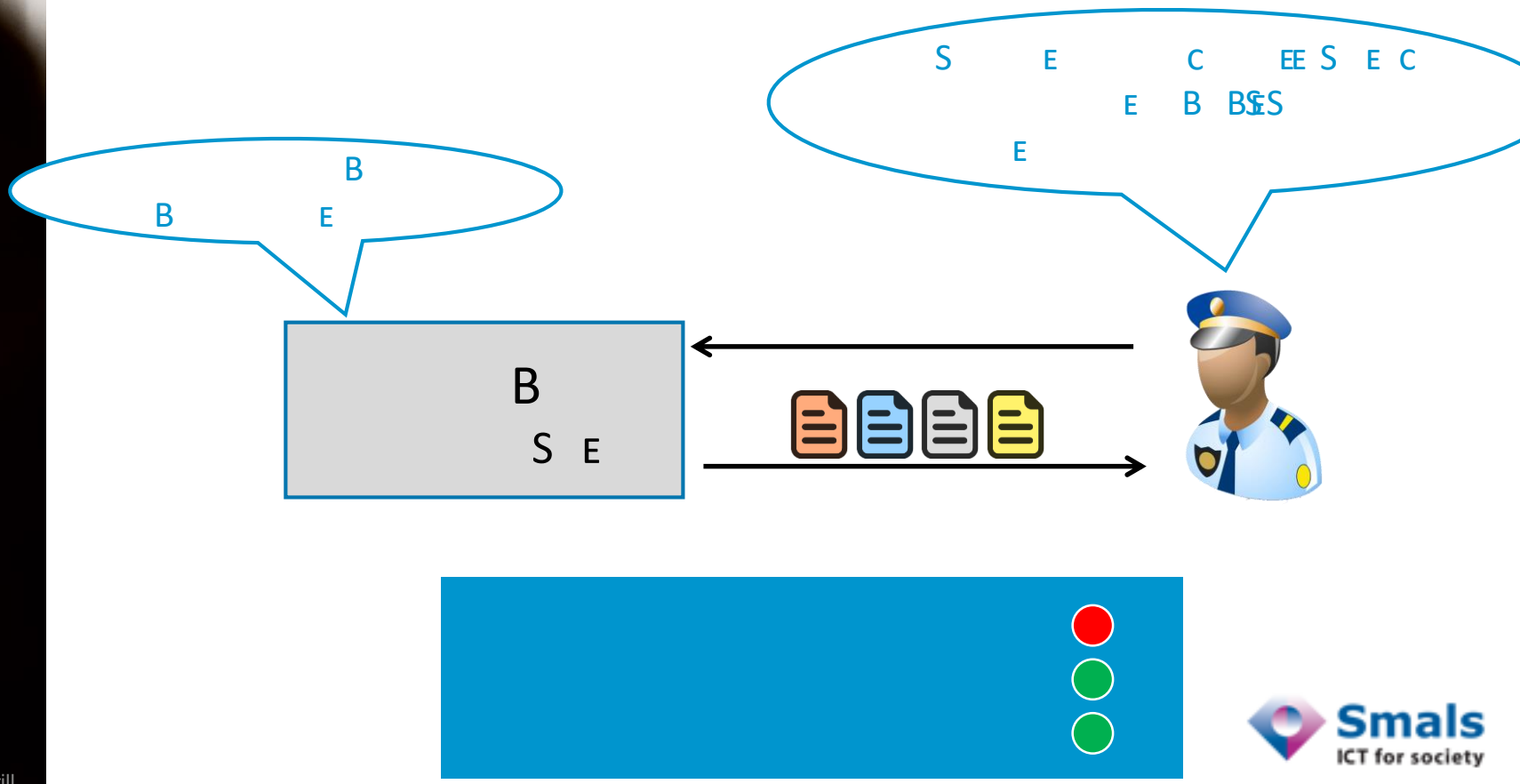
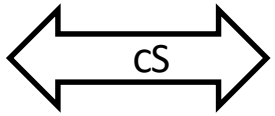
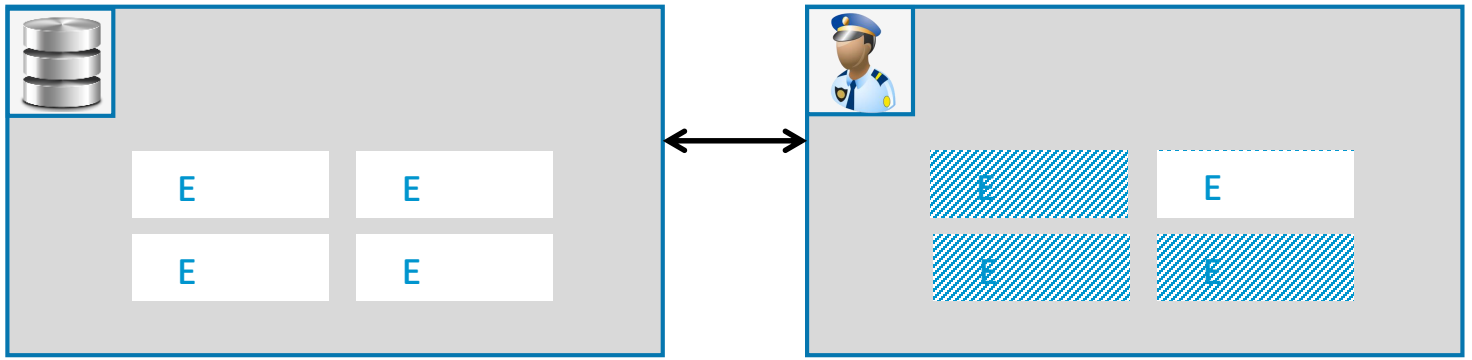


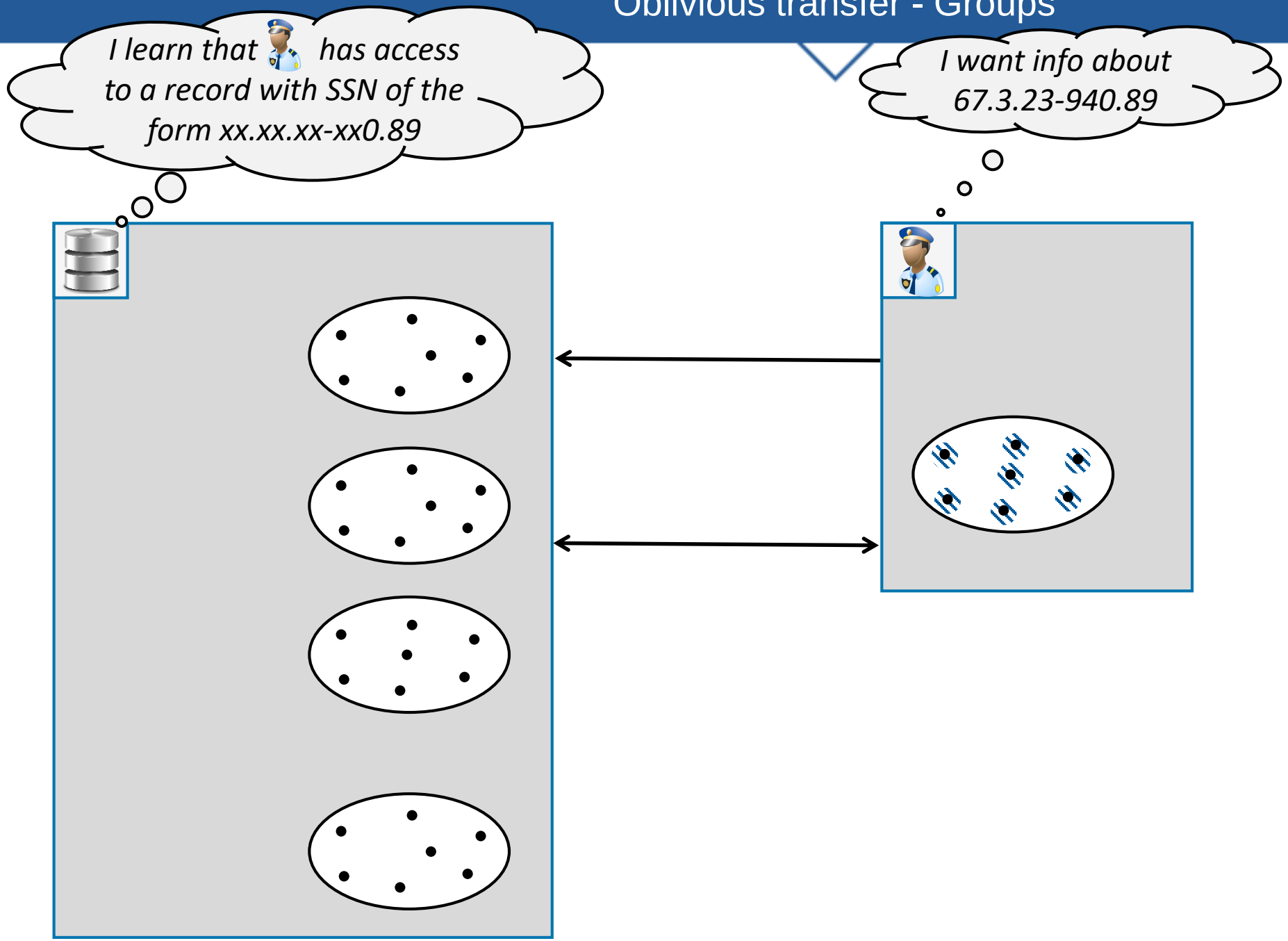
Oblivious transfer - Tension



Oblivious transfer - Concept

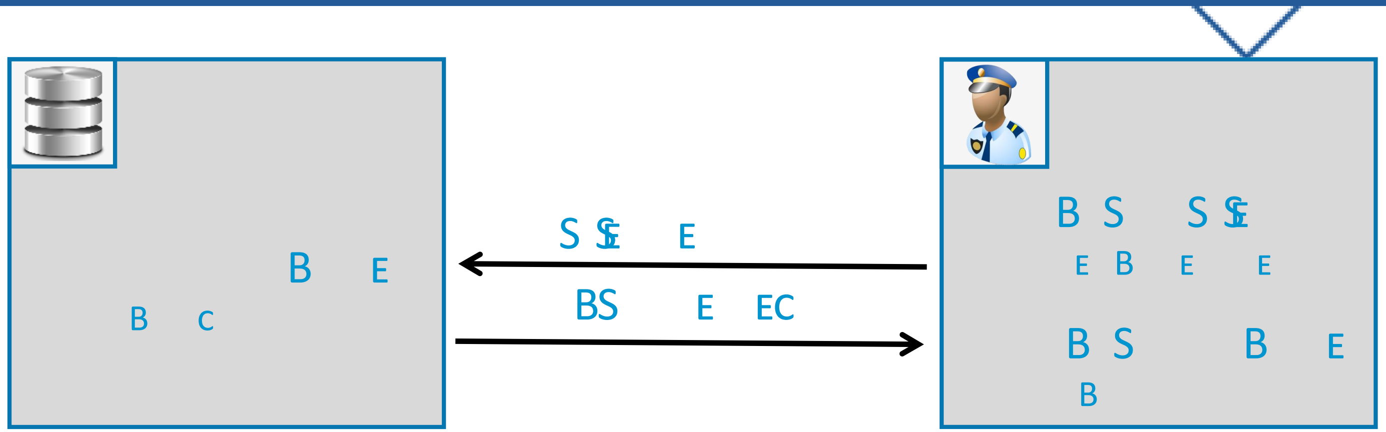


Oblivious transfer - Groups



- S S C B C E S
- S ES E S E BS E EC C

Oblivious transfer – Implementation & performance



E ES

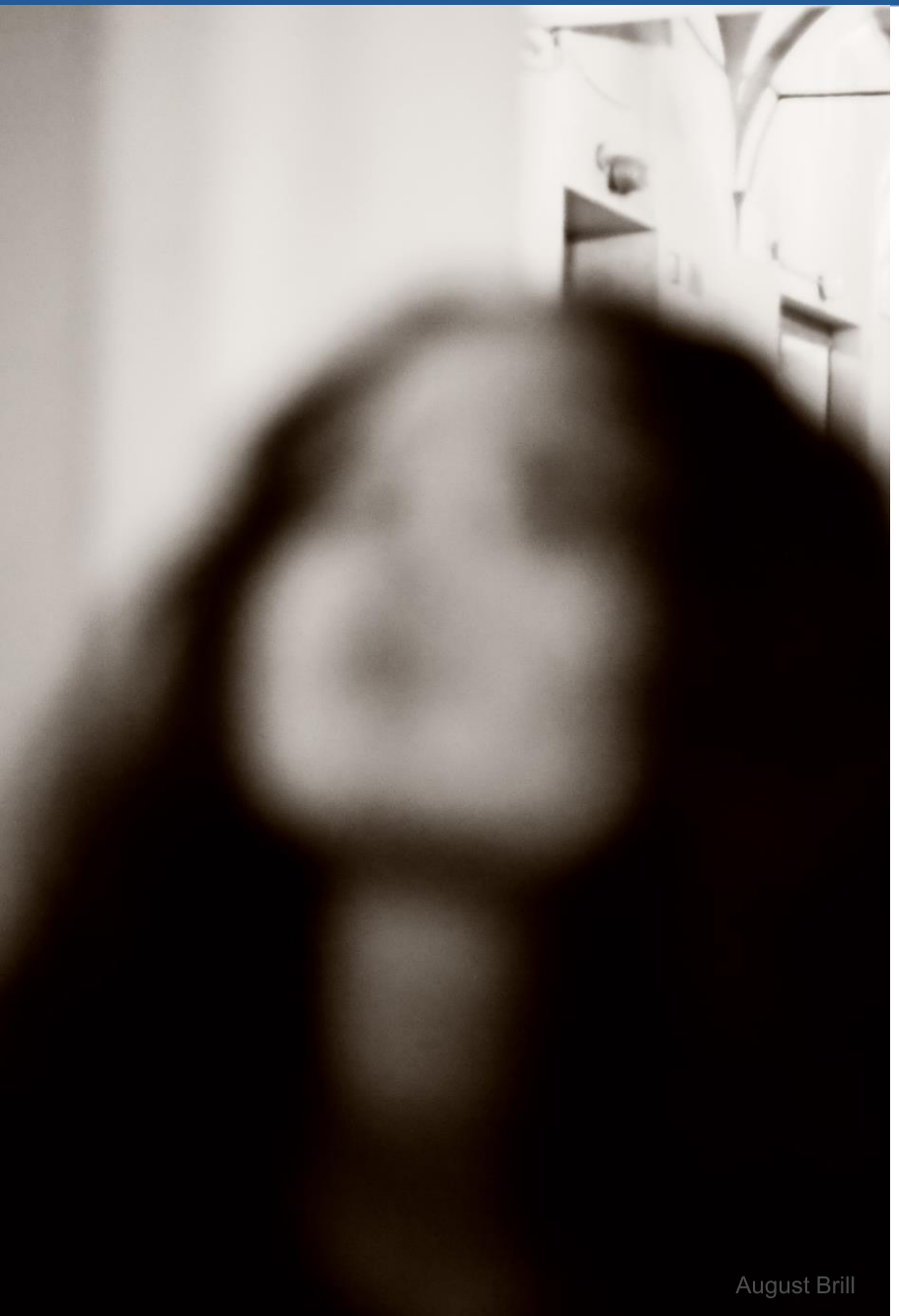
E C

	B S S S E O(log n)	B E O(log n*s)	B S B E O(s + log n)	B S S S E O(log n)	B E O(log n*s)	B S B E O(s + log n)	B S S S E O(log n)	B E O(log n*s)	B S B E O(s + log n)
B	C	C	C	C	C	C	C	C	C
B	C	C	C	C	C	C	C	C	C

E S S S C E S B ES S B E B B ES C E CE B SB ES C S C E

S E S *Fast and Universally-Composable Oblivious Transfer and Commitment Scheme with Adaptive Security* E S E B S S E S E E E C *A Framework for Efficient and Composable Oblivious Transfer.* B C S E

Oblivious transfer



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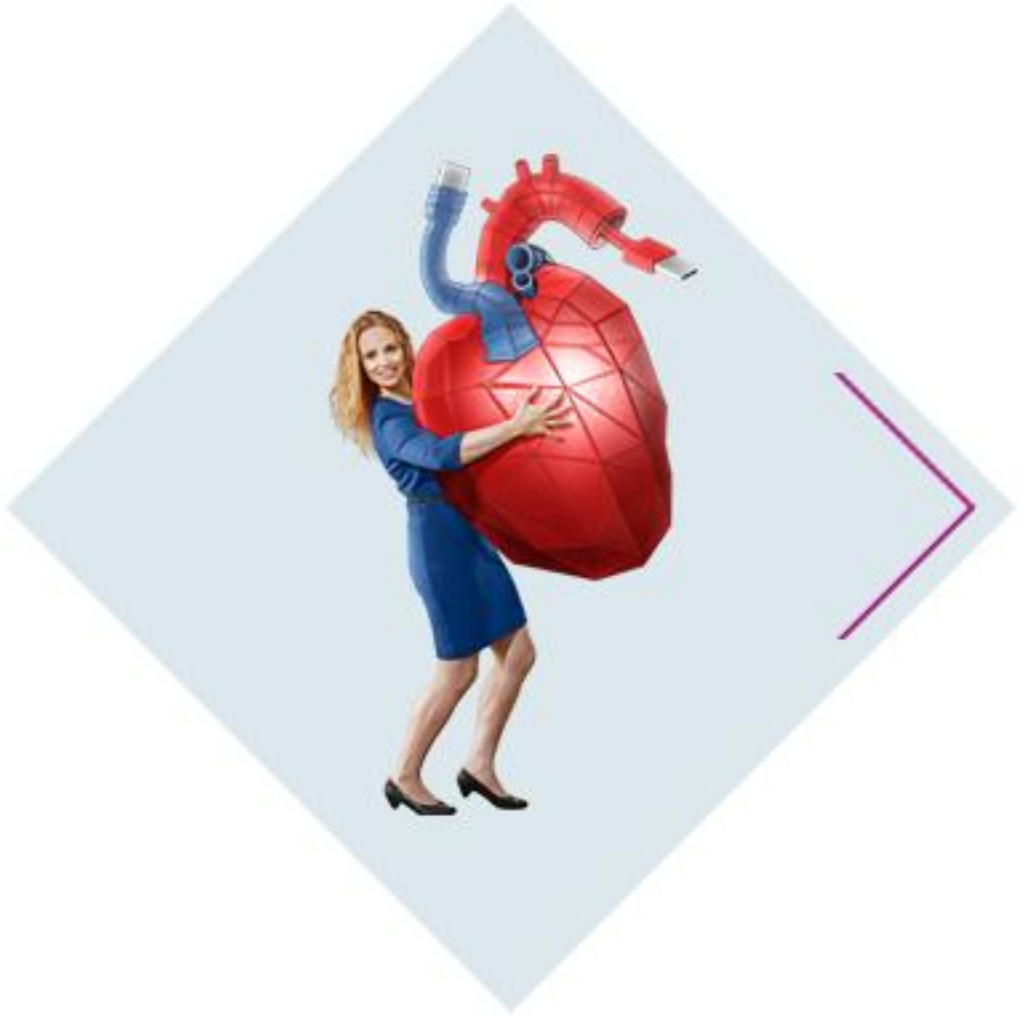


Oblivious join

B E C C B

Joining personal data

- C CC CC B BES S
- S C

- BSSB SB E
- E ESC B CS E

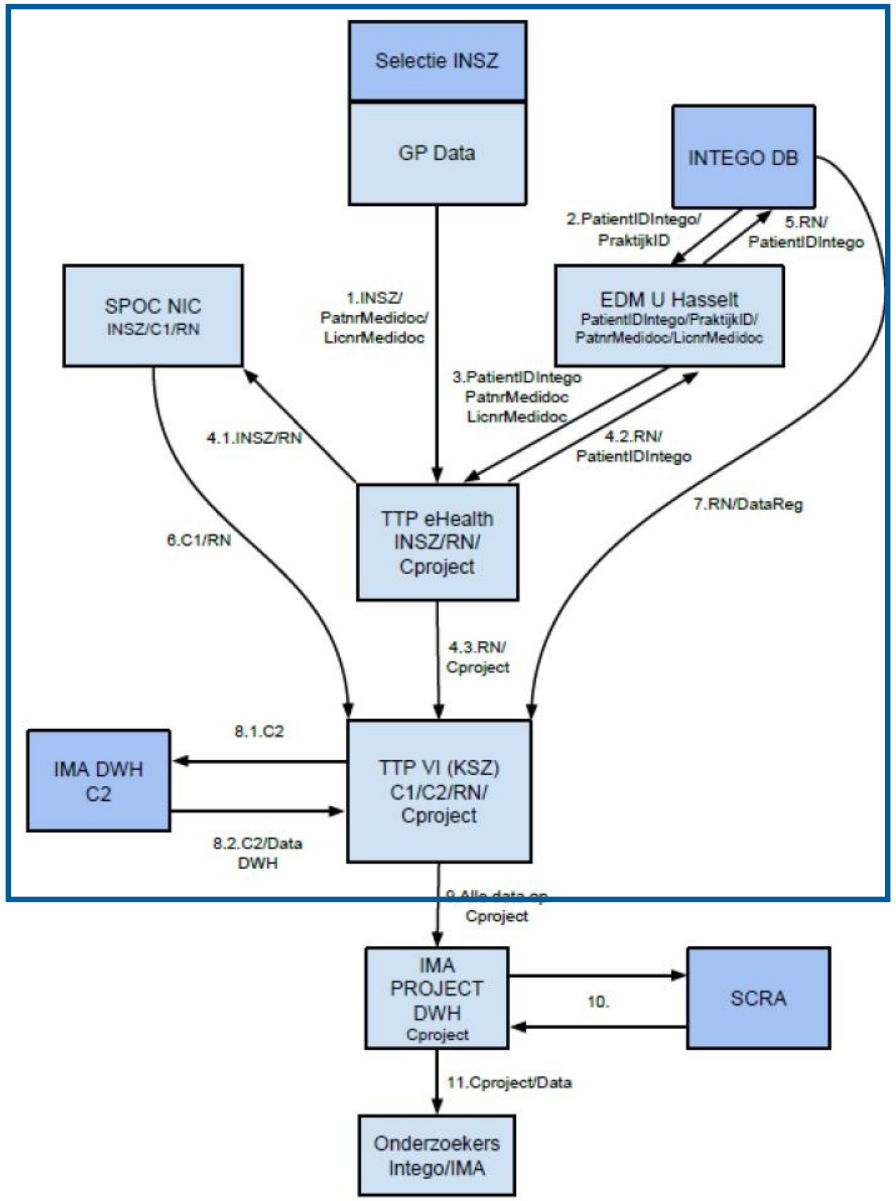
S S C S S
C E ES C B C
C B C C

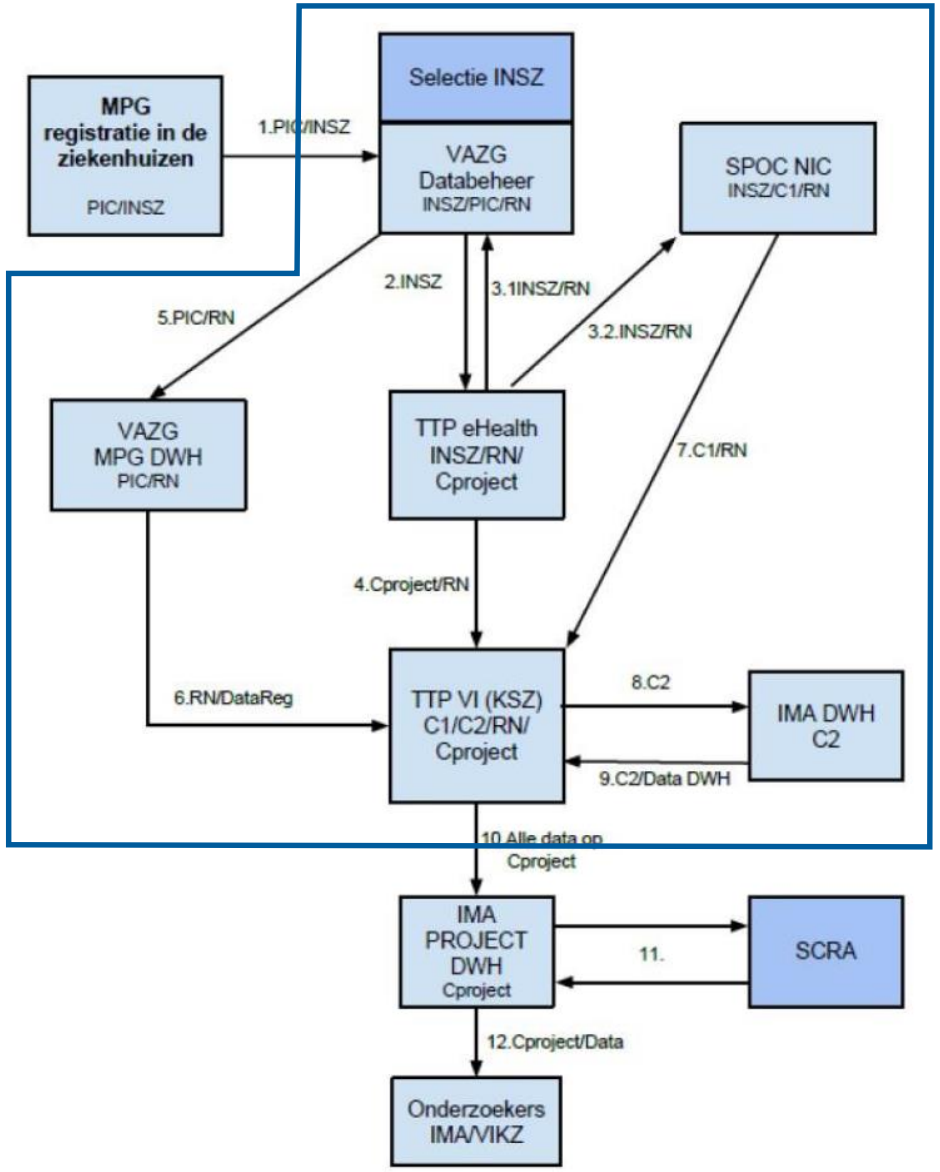
RSZ - ONSS - LSS

RSVZ

Belgian Cancer Registry

Joining personal data – Current practice





KSZ BCSS

S ES

E

S ES

S E

- Complex flow
- Bespoke
- Slow
- Security risks
- Data leakage

Oblivious join – Data leakage

Context

Joining and pseudonymizing personal data from multiple sources for research purposes

Scenario

Citizen selection

- All persons self-employed as secondary activity
- With a wage above € 50 000 / year as employee

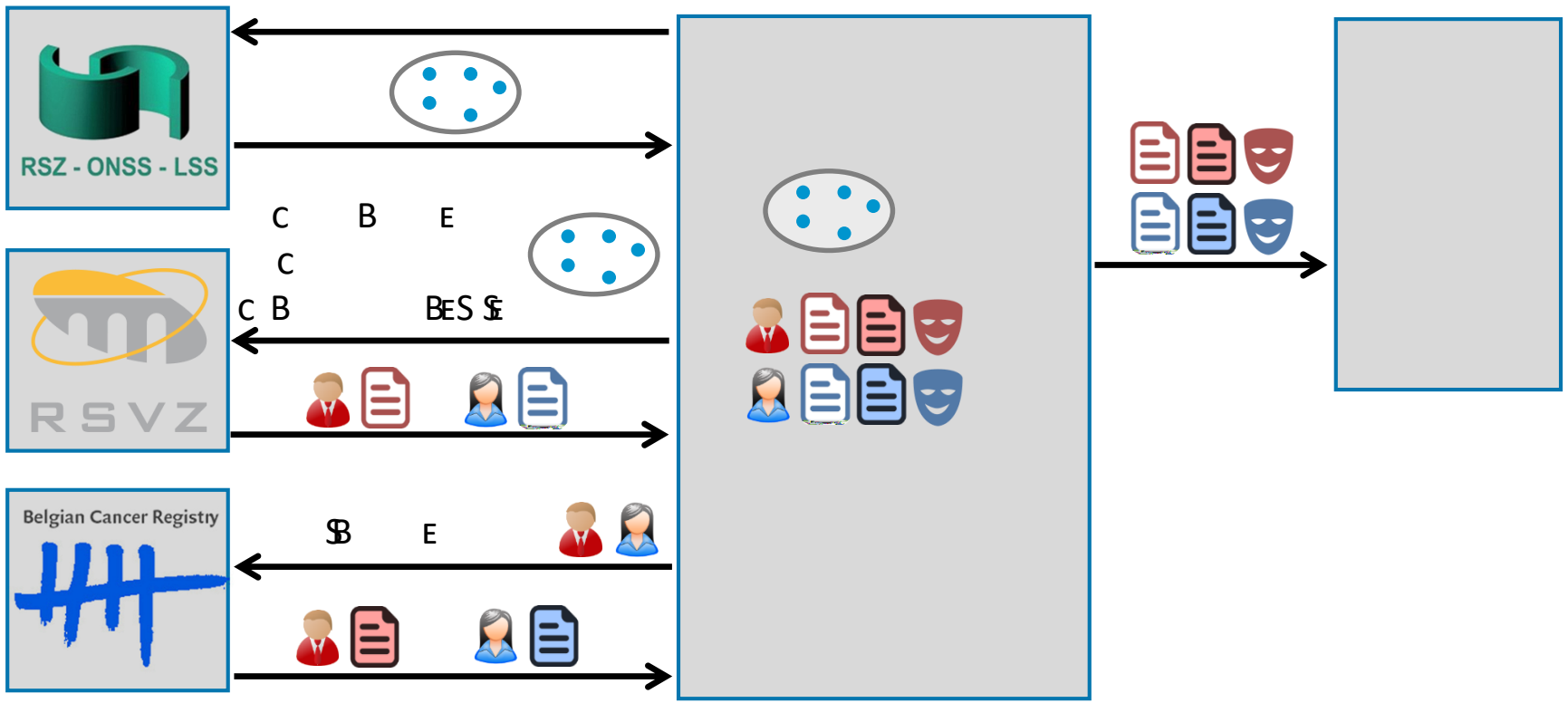
Required data

- Specific medical data
- Data about insurance as independent

Issues

- Data leakage towards senders and/or TTP
- Extra intermediaries increase complexity

Potential traditional approach



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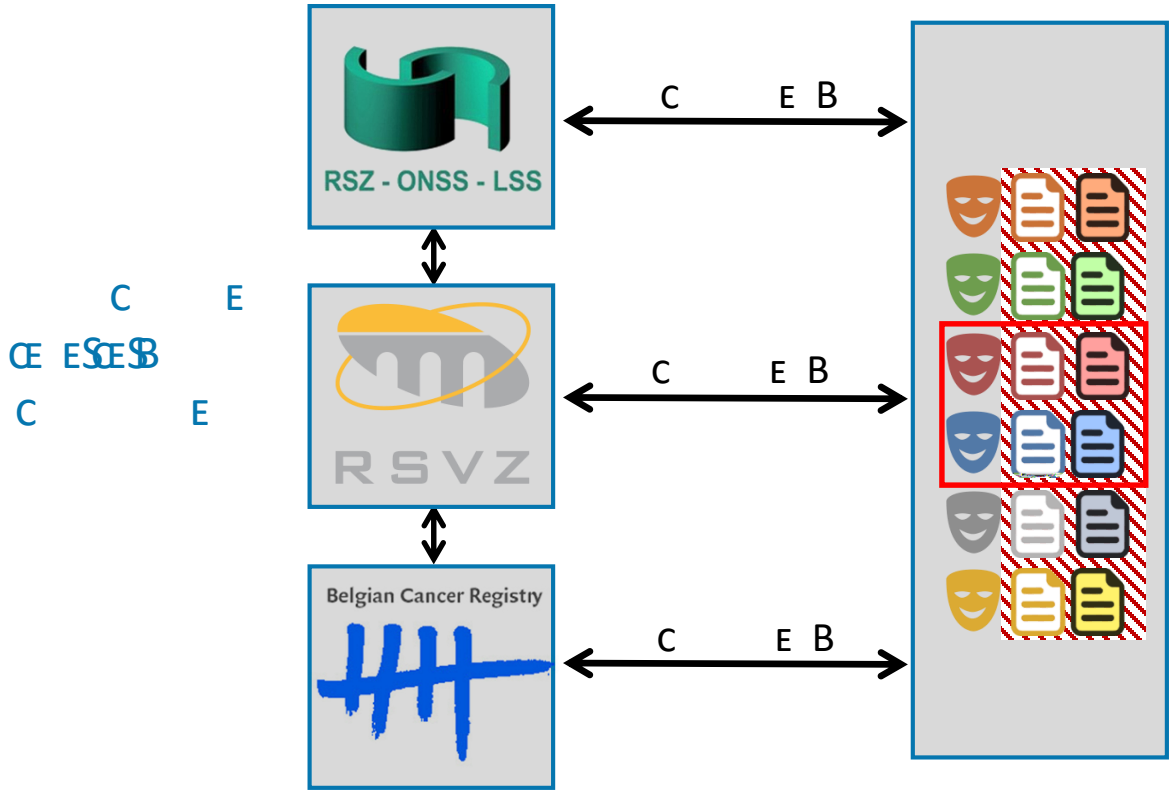

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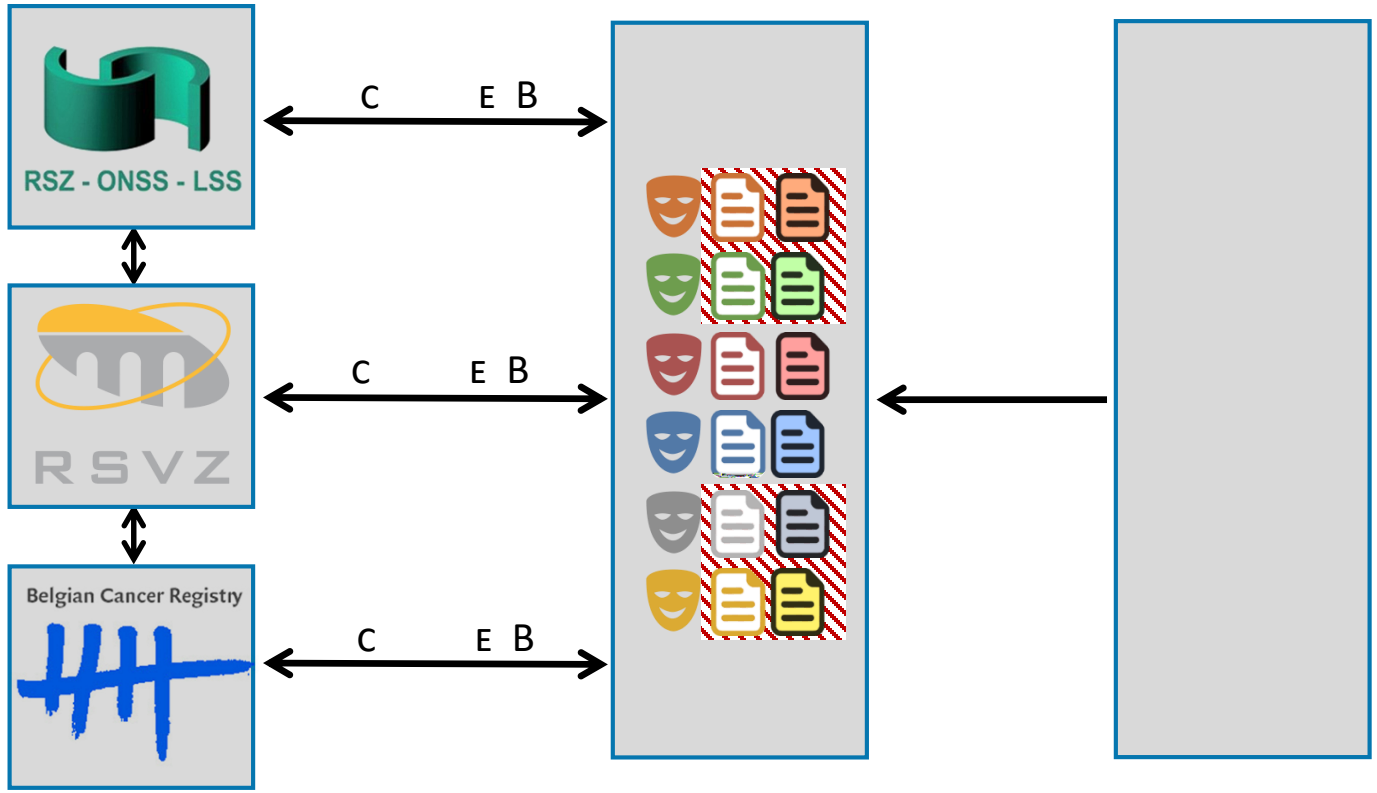

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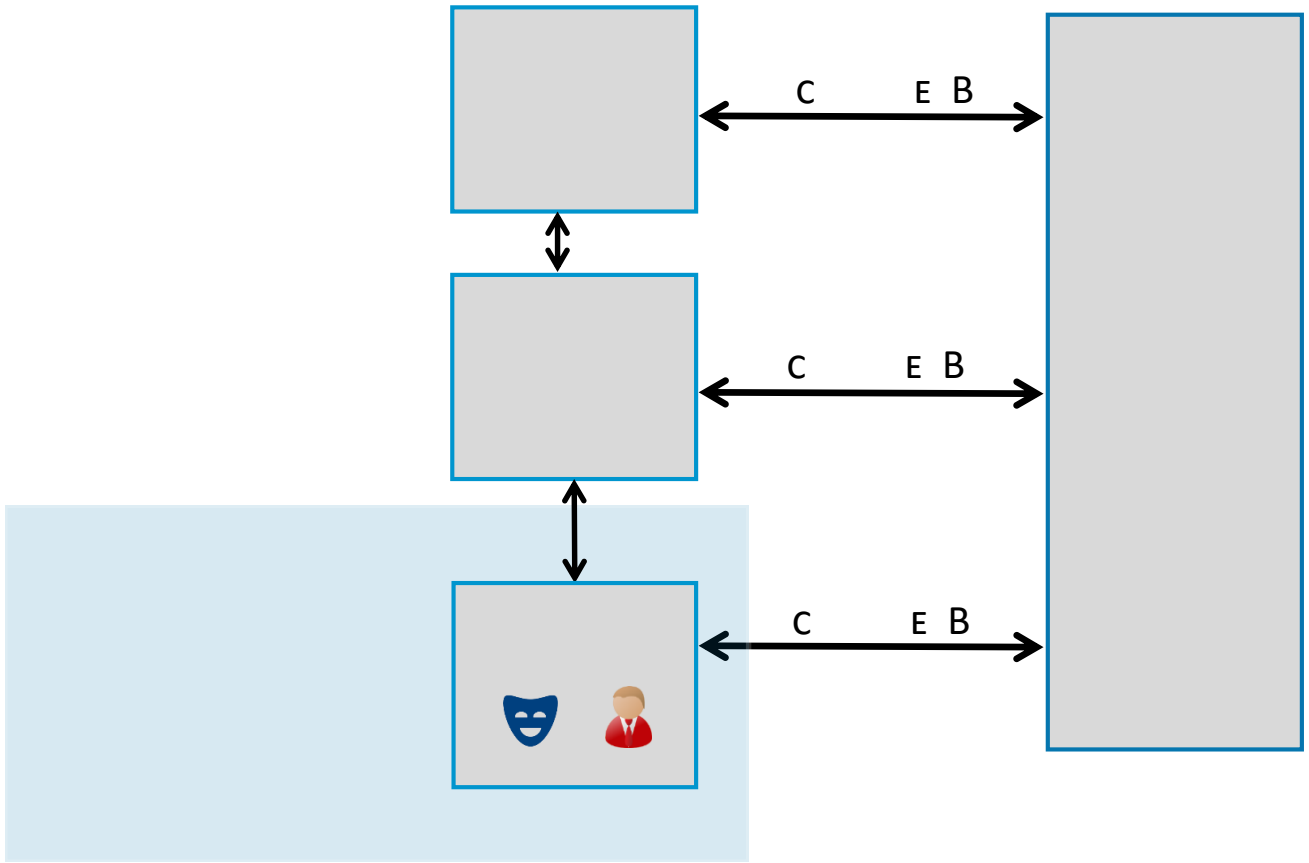

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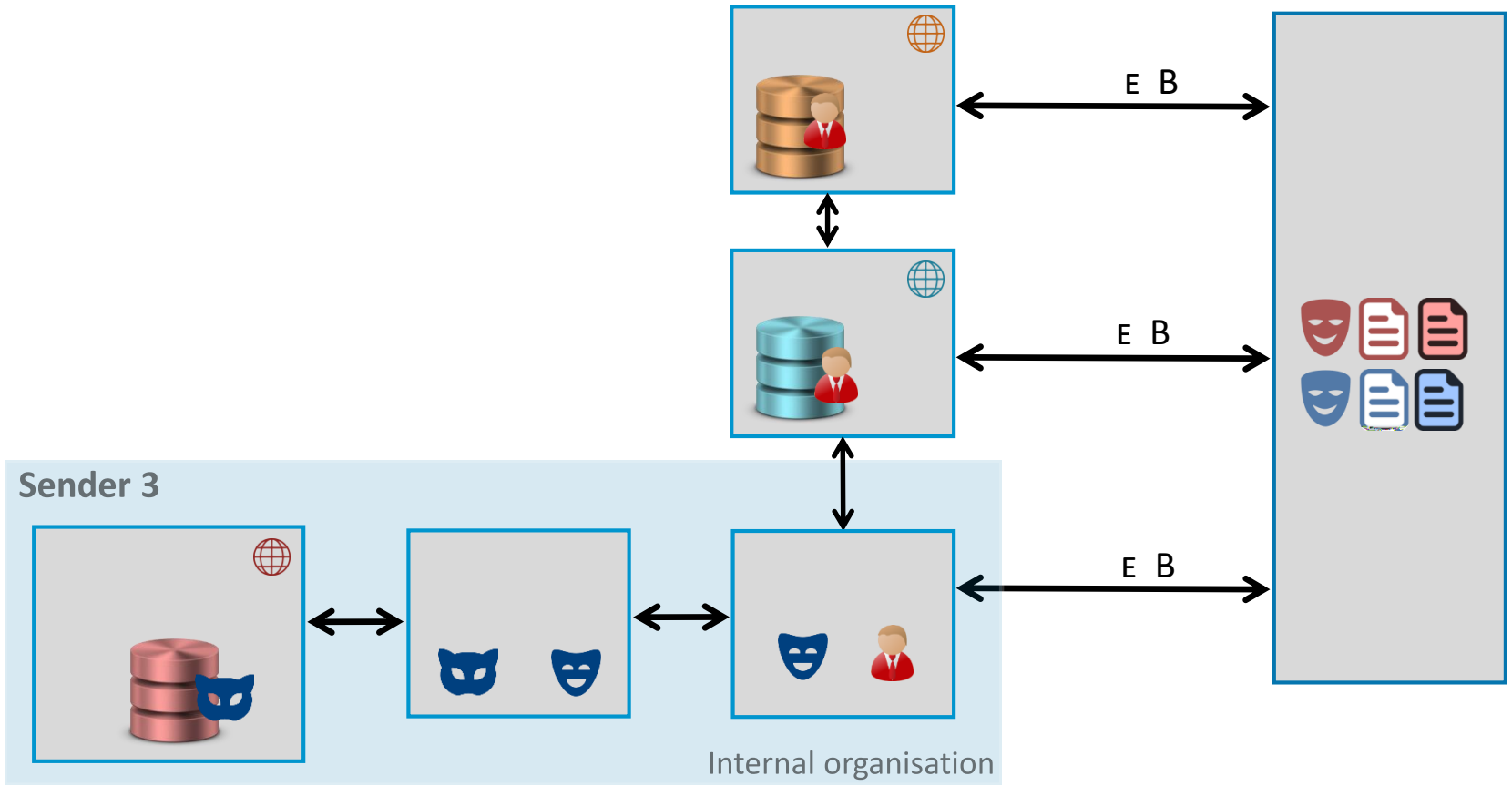

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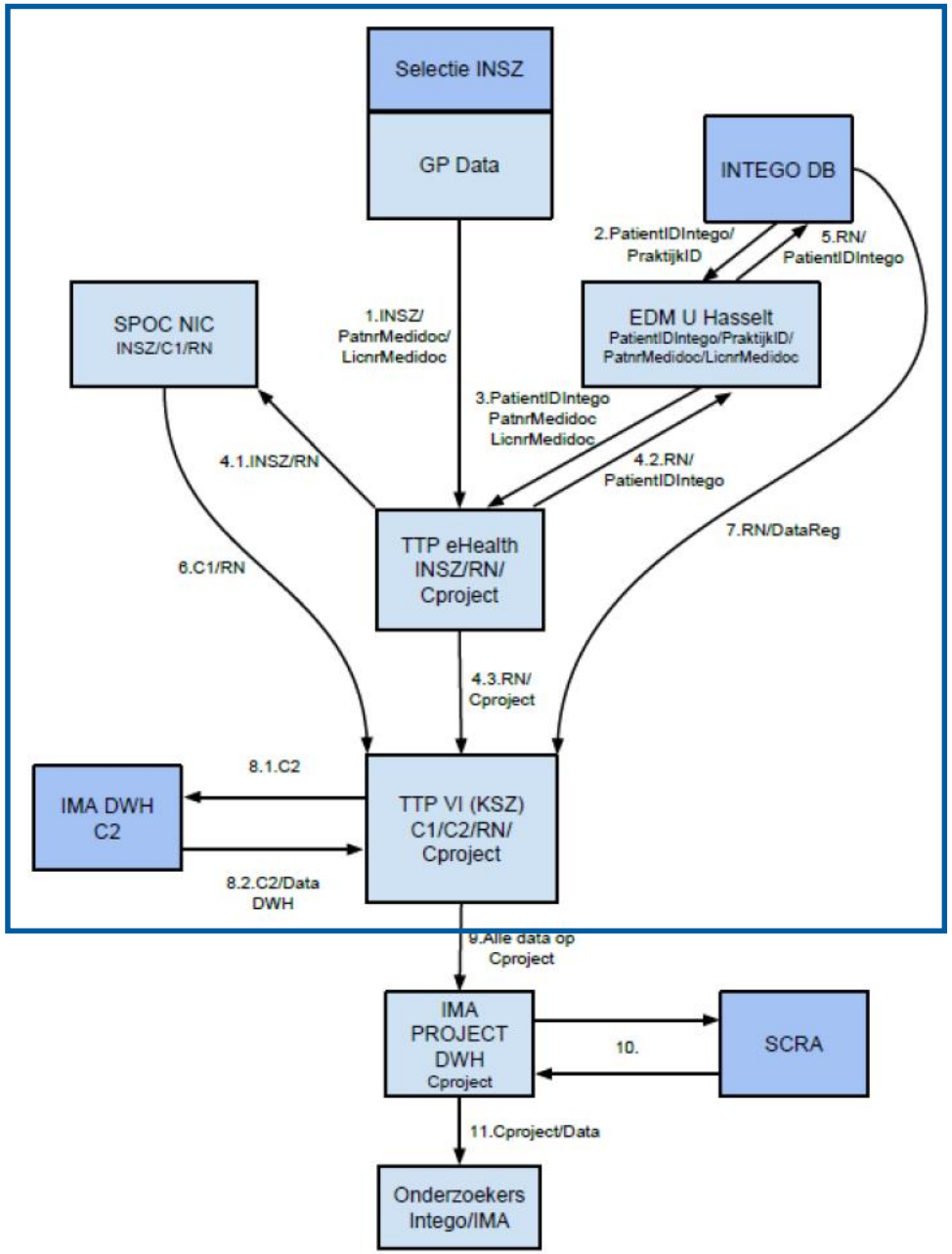
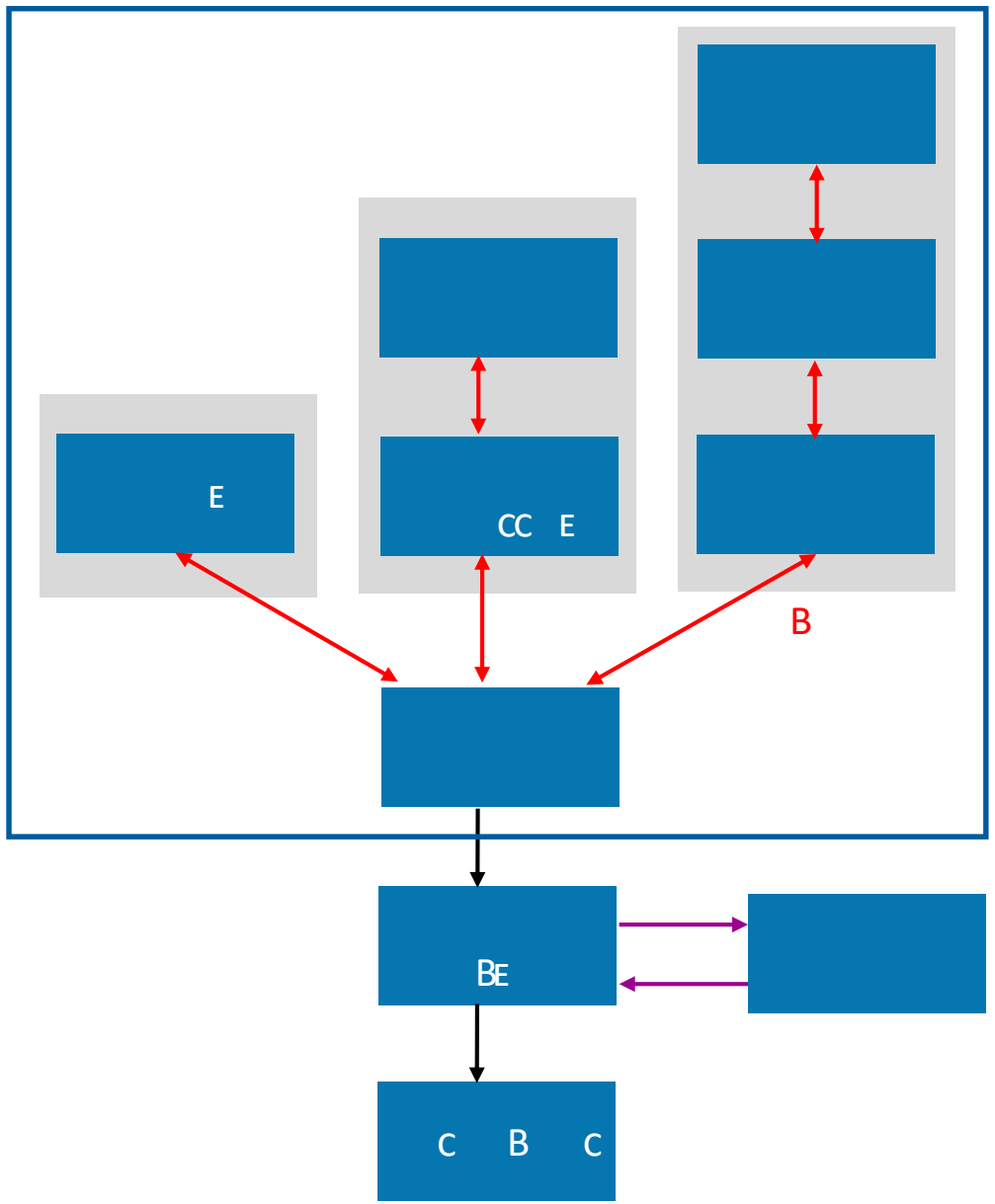
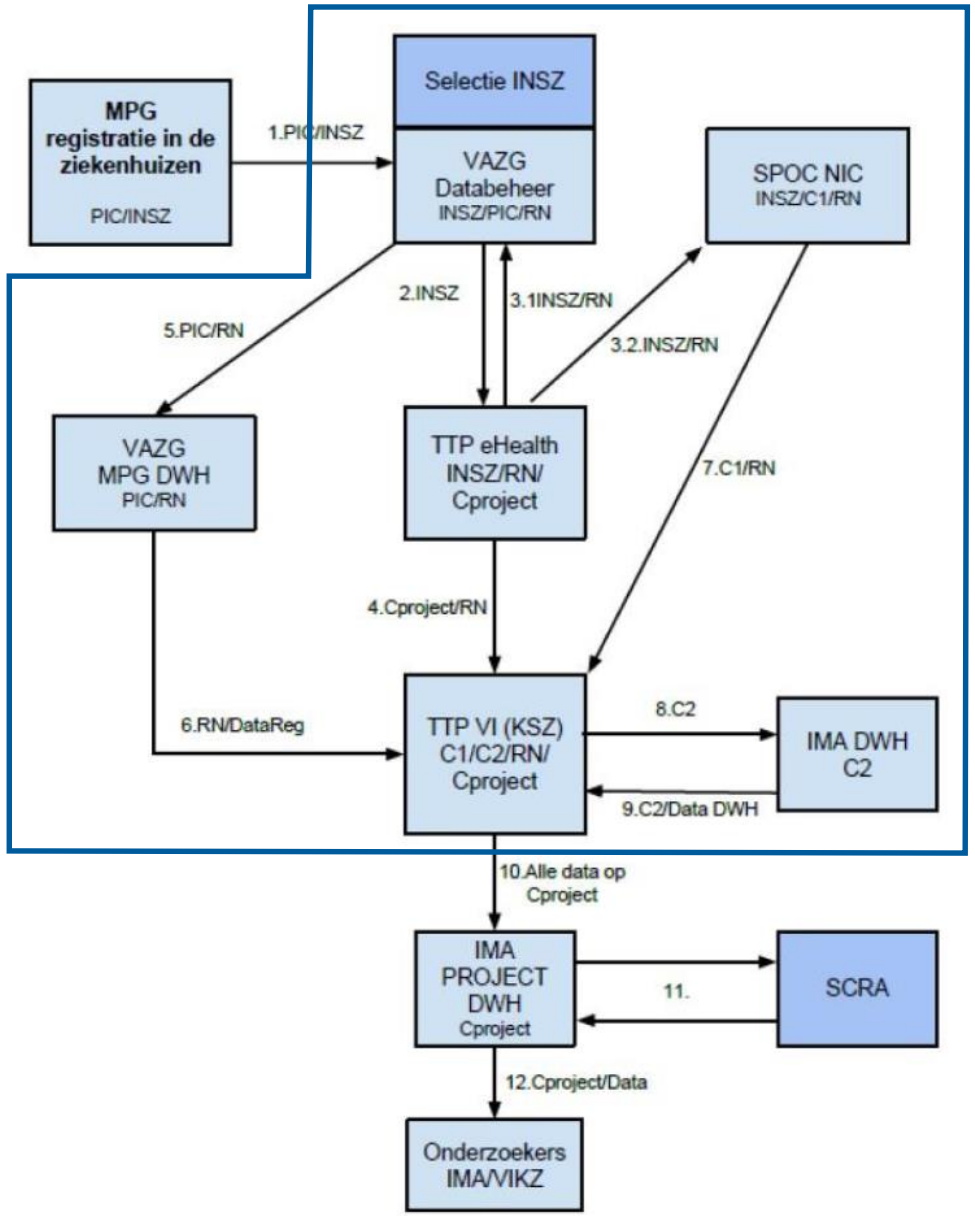
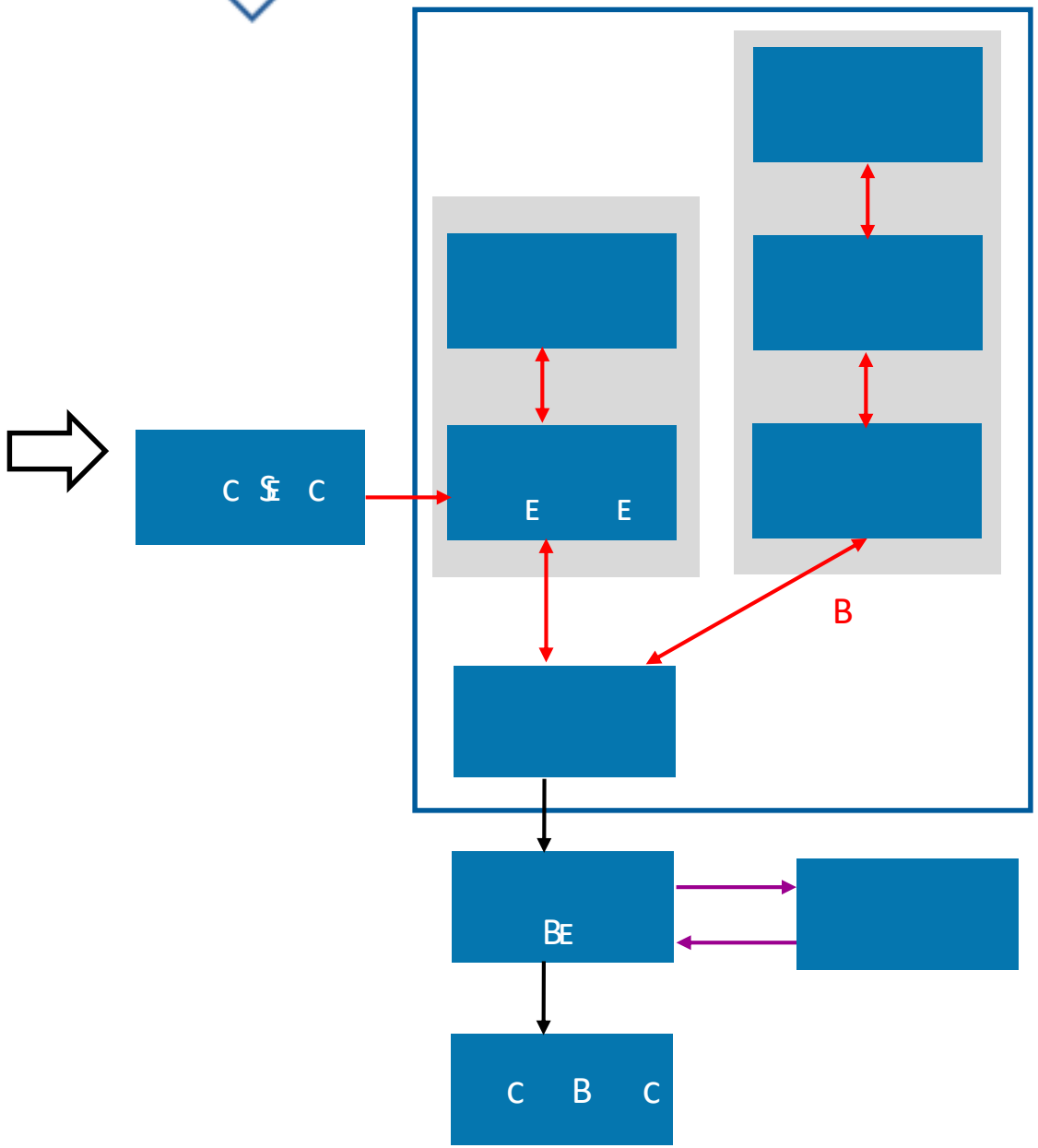
Current practice Vs. Oblivious join





Current practice Vs. Oblivious join





Oblivious join

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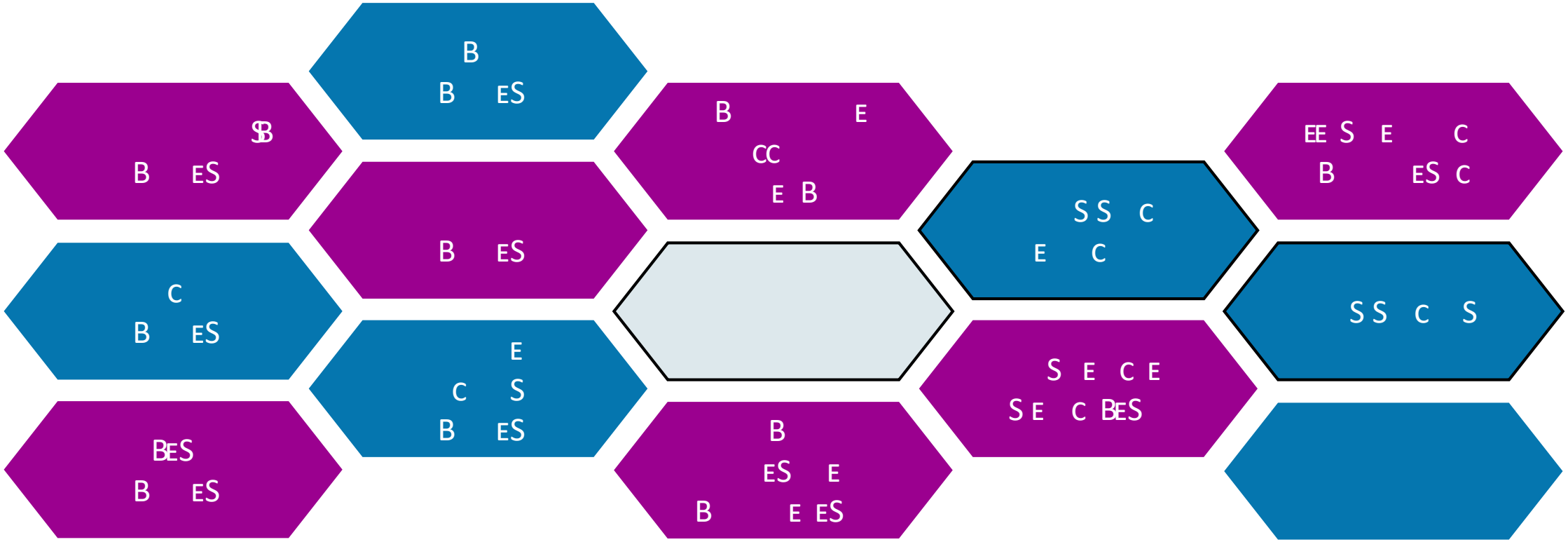
Advanced cryptography



Advanced cryptography - Conclusions

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