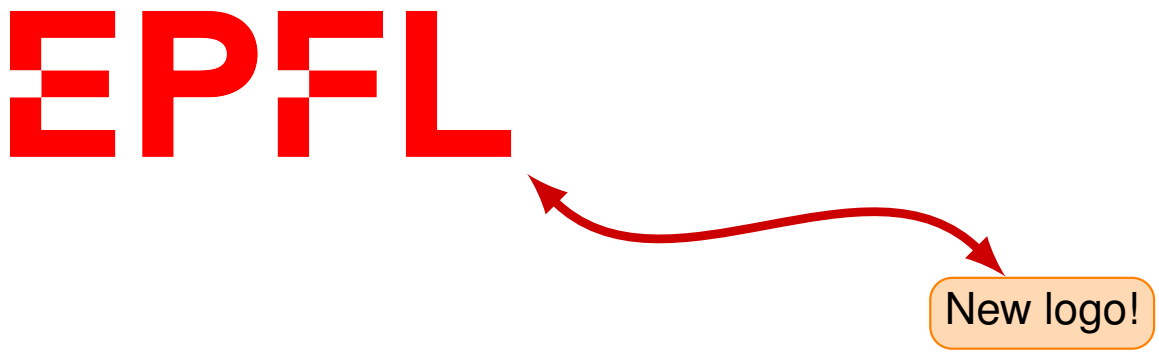
The Ratchet Race

Andrea Caforio, F Betül Durak, Serge Vaudenay



Several Competing Protocols

PR: **Poettering, Rösler**, CRYPTO 2018

JS: **Jaeger, Stepanovs**, CRYPTO 2018

BARK: our protocol, Eprint 2018/889

ACD: **Alwen, Coretti, Dodis**, this conference

JMM: **Jost, Maurer, Mularczyk**, this conference

new: our new protocol!

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Which Comparison Metrics?

- **security**
  - forward secrecy
  - postcompromise security
  - time to heal
  - bad randomness resilience
  - unforgeability
  - DoS resilience
- **efficiency**
  - runtime
  - message size
  - state size
- **incident awareness**
  - forgery detection
  - explicit ACK
- **functionality**
  - multi-device
  - immediate decryption?
  - on-demand ratchet?

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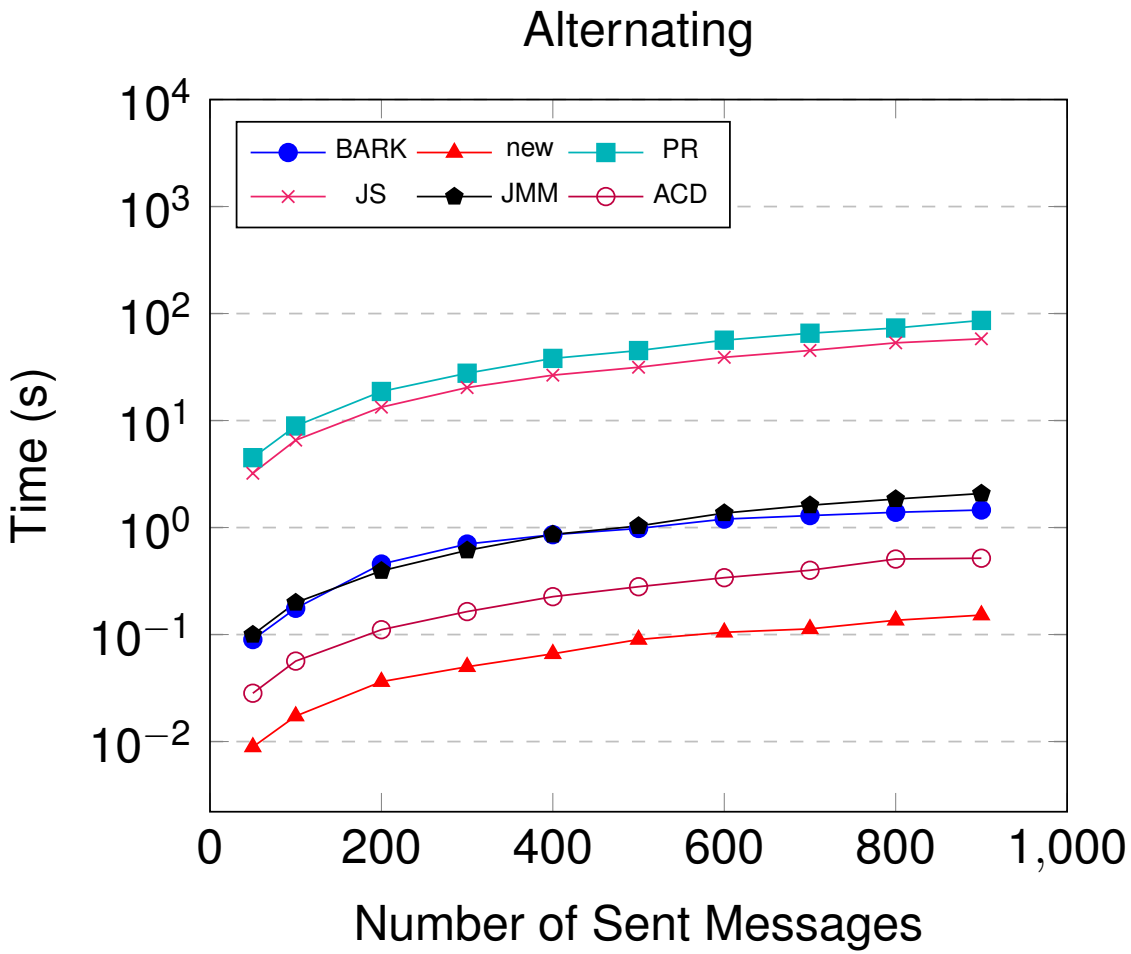
Our New Protocol

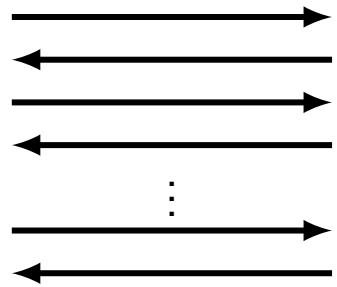
- generic composition of two protocols
- typically:

  ratchet protocol + symmetric-crypto protocol

  (we don't want to ratchet too often)
- $\approx$ "double ratchet" (ACD/Signal)
  - ACD ratchets when the direction of communication changes
  - our protocol ratchets at any message **"on demand"**

Performance (Runtime)





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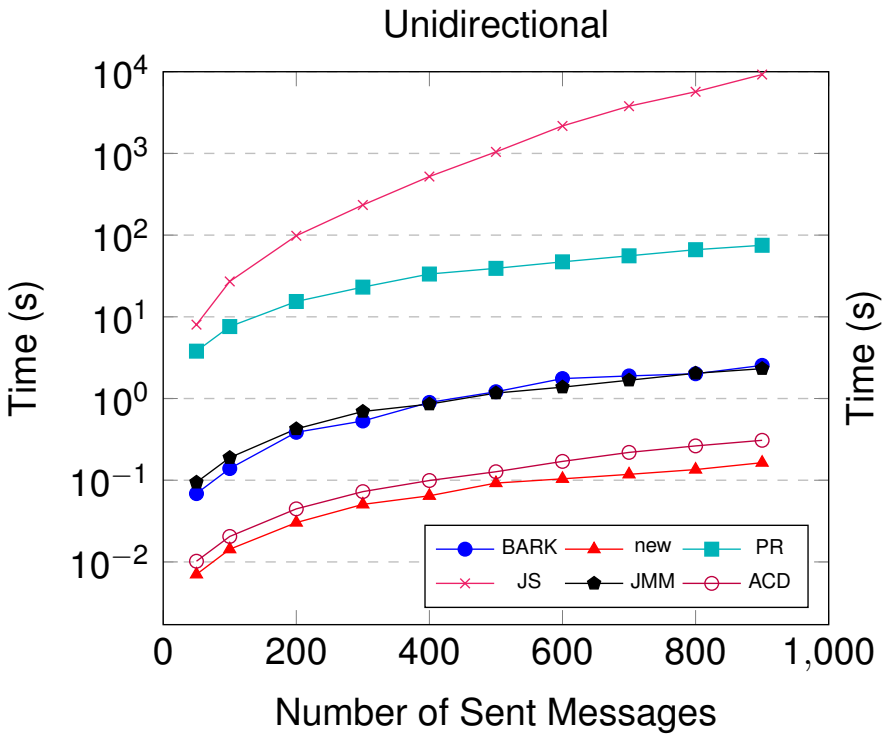

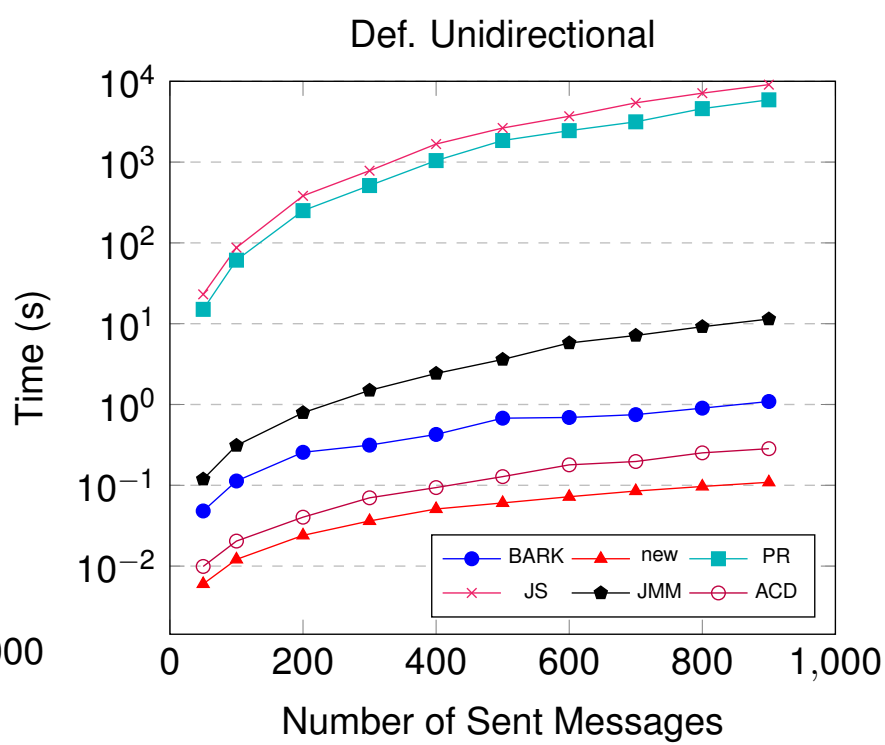

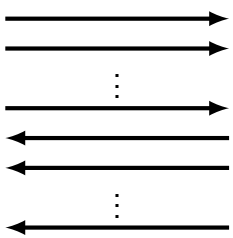

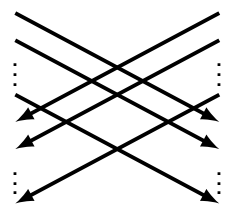

Comparison

* adapted to the functionality offered by the protocol

	PR	JS	BARK	JMM	ACD	new
Security	optimal	optimal	near-optimal	near-optimal	adapted*	adapted*

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Bad \$ resilience	$-$	$+$	$-$	$+$	$+$	$-$

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Forgery detection	$-$	$+$	$+/-$	$-$	$-$	$+$

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Forgery detection	$-$	$+$	$+/-$	$-$	$-$	$+$
Explicit ACK	$+$	$+$	$+$	$+$	$-$	$+$

to be continued...

References

- BARK: Eprint 2018/889
- new protocol: on eprint soon
- implementations:

  `https://github.com/qantik/ratcheted`