

The Title of Your Paper

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Abstract

Anonymous broadcast functionality \mathcal{F}_R^K

Initialise:

- (1) a list of pending messages $L_{pend} \leftarrow []$
- (2) $status_P \in \{0, 1\} \leftarrow 0$ for party P indicating whether P has sent a message in the current round

■ Upon receiving **(sid, WRITE, M)** from honest party P or **(sid, WRITE, M, P)** from S on behalf of corrupted party P :

If $status_P = 0$, then

- (1) set $status_P \leftarrow 1$
- (2) append M to L_{pend}
- (3) if $|L_{pend}| = K$, then
 - (a) order the messages lexicographically as $< M_1, \dots, M_K >$
 - (b) set $L_{pend} \leftarrow []$
 - (c) set $status_P \leftarrow 0$ for every P
 - (d) send **(sid, BROADCAST, $< M_1, \dots, M_K >$)** to all parties and **(sid, BROADCAST, $< M_1, \dots, M_K >, P$)** to S
- (4) else, send **(sid, WRITE, $|M|, P$)** to S

Riposte UC Protocol

Variables:

- R - number of rows in each database table
- C - length of messages
- e_l - $R \times C \times 2$ bitstring containing 0 everywhere except in row l which contains $(M, M^2) \in \mathbb{F}^k$, where M is the message to be sent
- K - message limit in a round

Initialise:

- (1) $status_P \in \{0, 1\} \leftarrow 0$ for party P indicating whether P has sent a message in the current round
- (2) $count \in \mathbb{N} \leftarrow 0$ indicating the number of valid write requests received this round

■ Upon receiving **(sid, WRITE, M)** from P

If $status_P = 0$, then

- (1) set $status_P \leftarrow 1$
- (2) P chooses index $l \xleftarrow{\$} \{x | x \in \mathbb{N}, 0 \leq x < R\}$ and generates bitstring e_l
- (3) generate random $R \times C \times 2$ bitstring r
- (4) send **(prove, P, e_l)** to $\mathcal{F}_{ZK}^{R, R'}$
- (5)
- (6) send $r \oplus e_l$ to Server B using $\mathcal{F}_{\mathcal{AEC}}(\{A, B\})$
- (7) send r to Server A using $\mathcal{F}_{\mathcal{AEC}}(\{A, B\})$
- (8) $count \leftarrow count + 1$
- (9) if $count = K$, then
 - (a) set $status_P \leftarrow 0$
 - (b) set $count \leftarrow 0$

■ Upon receiving **(sid, BROADCAST, M_A)** from Server A and **(sid, BROADCAST, M_B)** from Server B

- (1) Verify that $M_A = M_B$
- (2) If $M_A = M_B$, forward to \mathcal{Z}

■ Upon receiving **(sid, SEND, $r \oplus e_l$)** from P , if P has not executed a write request in this phase, then

Server B executes the following:

- (1) XOR $r \oplus e_l$ into its database
- (2) if $count = K$, then
 - (a) combine database with Server A's database
 - (b) check for collisions
 - (c) resolve collisions
 - (d) order messages lexicographically as $M_B = < M_1, \dots, M_K >$
 - (e) broadcast messages to all parties

■ Upon receiving **(sid, SEND, e_l)** from P , if P has not executed a write request in this phase, then

Server A executes the following:

- (1) XOR r into its database
- (2) if $count = K$, then
 - (a) combine database with Server B's database
 - (b) check for collisions
 - (c) resolve collisions
 - (d) order messages lexicographically as $M_A = < M_1, \dots, M_K >$
 - (e) broadcast messages to all parties

Figure 1: Anonymous broadcast ideal functionality.

Figure 2: Anonymous broadcast protocol.

AE channel functionality $\mathcal{F}_{AEC}(\{A, B\})$

Initialise a list $PendingMsg \leftarrow \emptyset$.

■ Upon receiving $(sid, SEND, M)$ from P , if P is honest, then:

- (1) If $\{A, B\} \setminus \{P\}$ is corrupted, then send $(sid, SEND, M, P)$ to S .
- (2) If $\{A, B\} \setminus \{P\}$ is honest, then
 - Choose a random tag $\stackrel{\$}{\leftarrow} \{0, 1\}^\lambda$.
 - Add (tag, M, P) to $PendingMsg$
 - Send $(sid, SEND, tag, |M|, P, \{A, B\} \setminus \{P\})$ to S .
- (3) Upon receiving $(sid, ALLOW, tag)$ from S , if there is a (tag, M, P) in $PendingMsg$, then remove (tag, M, P) from $PendingMsg$ and send $(sid, SEND, M)$ to $\{A, B\} \setminus \{P\}$

Figure 3: Anonymous broadcast ideal functionality.

Zero-knowledge functionality $\mathcal{F}_{ZK}^{R, R'}$

- (1) Wait for an input (prove, y, w) from P such that $(y, w) \in R$ if P is honest, or $y, w \in R'$ if P is corrupt. Send $(\text{prove}, l(y))$ to \mathcal{A} . Further, wait for a message **ready** from V , and send **ready** to \mathcal{A} .
- (2) Wait for message **lock** from \mathcal{A} .
- (3) Upon receiving a message **done** from \mathcal{A} , send **done** to P . Further, wait for an input **proof** from \mathcal{A} and send (proof, y) to V .

Corruption rules:

- If P gets corrupted after sending (prove, y, w) and before Step 2, \mathcal{A} is given (y, w) and is allowed to change this value to any value $(y', w') \in R'$ at any time before Step 2.

Figure 4: Zero-knowledge functionality $\mathcal{F}_{ZK}^{R, R'}$

Broadcast functionality \mathcal{F}_{BC}

- (1) Wait for an input (prove, y, w) from P such that $(y, w) \in R$ if P is honest, or $y, w \in R'$ if P is corrupt. Send $(\text{prove}, l(y))$ to \mathcal{A} . Further, wait for a message **ready** from V , and send **ready** to \mathcal{A} .
- (2) Wait for message **lock** from \mathcal{A} .
- (3) Upon receiving a message **done** from \mathcal{A} , send **done** to P . Further, wait for an input **proof** from \mathcal{A} and send (proof, y) to V .

Corruption rules:

- If P gets corrupted after sending (prove, y, w) and before Step 2, \mathcal{A} is given (y, w) and is allowed to change this value to any value $(y', w') \in R'$ at any time before Step 2.

Figure 5: Zero-knowledge functionality $\mathcal{F}_{ZK}^{R, R'}$

1 Introduction

2 Proof

Cases:

- (1) U.r. $(sid, WRITE, |M|, P)$ from functionality:
 - Simulate a WRITE request on behalf of P where M is all-zeroes
 - Generate $e_{\ell, M}$
 - \mathcal{F}_{ZK} leaks nothing. \mathcal{F}_{AEC} leaks the length of the message $|M|$, so the simulator sends $|M|$ to the adversary
- (2) U.r. $\langle M_1, \dots, M_k \rangle$ from the functionality: If Server A is corrupted, then
 - Simulator sends a dummy message containing all zeroes over \mathcal{F}_{AEC}
 - Randomly assign honest messages to honest parties
 - Generate $e_{\ell, M}$ of the corresponding party and send r to Server A, then $e_{\ell, M} \oplus r$ is the share of party P for Server B

If Server B is corrupted, then

 - Simulator equivocates by sending any r to Server A
 - Randomly assign honest messages to honest parties
 - Construct a consistent $e_{\ell, M}$
 - Send $e_{\ell, M} \oplus r$ of the corresponding party to Server B

3 Background

Perhaps you want to cite the seminal paper of Turing [3], or prior [2] and concurrent [1] work.

4 My Amazing System

5 Evaluation

5.1 Experimental Setup

5.2 Experimental Analysis

Our results are summarized in Table 1, and a visual representation of our analysis can be seen in ??.

	machine A	machine B
CPU	Intel Core i7-9700 CPU	2x Intel Xeon E5-2630 v3
CPU Frequency	3.00GHz	2.40GHz
RAM	16GB DDR4	128GB
OS	Ubuntu 20.04 LTS	Ubuntu 16.04 LTS
Compiler	GCC 9.3	GCC 7.3
libm	v2.31	v2.23
libomp	v4.5	v4.5

Table 1: This is the table caption.

6 Conclusions

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Acknowledgments

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References

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