

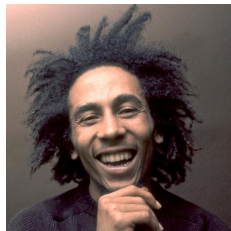
GEMS OF TCS

COMMUNICATION COMPLEXITY

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COMMUNICATION COMPLEXITY



EXAMPLES

EQUALITY

VLSI CIRCUITS

RANDOMIZED COMMUNICATION

CLOUD SYNC

- Synchronize local files to the cloud

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- Synchronize local files to the cloud
- Has file been changed? File length: n bits

RANDOMIZED PROTOCOL

local file

1	0	0	1	1	0	1	1	0	0
---	---	---	---	---	---	---	---	---	---

1	0	0	1	1	1	1	1	0	0
---	---	---	---	---	---	---	---	---	---

cloud file

RANDOMIZED PROTOCOL

local file

1	0	0	1	1	0	1	1	0	0
---	---	---	---	---	---	---	---	---	---

$$a \in \{0, \dots, 2^n - 1\}$$

1	0	0	1	1	1	1	1	0	0
---	---	---	---	---	---	---	---	---	---

cloud file

RANDOMIZED PROTOCOL

local file

1	0	0	1	1	0	1	1	0	0
---	---	---	---	---	---	---	---	---	---

$$a \in \{0, \dots, 2^n - 1\}$$

$$b \in \{0, \dots, 2^n - 1\}$$

1	0	0	1	1	1	1	1	0	0
---	---	---	---	---	---	---	---	---	---

cloud file

RANDOMIZED PROTOCOL

local file

1	0	0	1	1	0	1	1	0	0
---	---	---	---	---	---	---	---	---	---

$$a \in \{0, \dots, 2^n - 1\}$$

Pick random

prime $p \in$
 $\{2, 3, \dots, 100n^2 \log n\}$

$$b \in \{0, \dots, 2^n - 1\}$$

1	0	0	1	1	1	1	1	0	0
---	---	---	---	---	---	---	---	---	---

cloud file

RANDOMIZED PROTOCOL

local file

1	0	0	1	1	0	1	1	0	0
---	---	---	---	---	---	---	---	---	---

$$a \in \{0, \dots, 2^n - 1\}$$

$$a \bmod p$$



$$b \in \{0, \dots, 2^n - 1\}$$

Pick random

prime $p \in$

$\{2, 3, \dots, 100n^2 \log n\}$

1	0	0	1	1	1	1	1	0	0
---	---	---	---	---	---	---	---	---	---

cloud file

RANDOMIZED PROTOCOL

local file

1	0	0	1	1	0	1	1	0	0
---	---	---	---	---	---	---	---	---	---

$$a \in \{0, \dots, 2^n - 1\}$$

Pick random

prime $p \in$
 $\{2, 3, \dots, 100n^2 \log n\}$

EQ iff

$$a = b \pmod{p}$$

$$a \pmod{p}$$



$$b \in \{0, \dots, 2^n - 1\}$$

1	0	0	1	1	1	1	1	0	0
---	---	---	---	---	---	---	---	---	---

cloud file

DISJOINTNESS