HANDOFF PRESENTATION

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OUTLINE

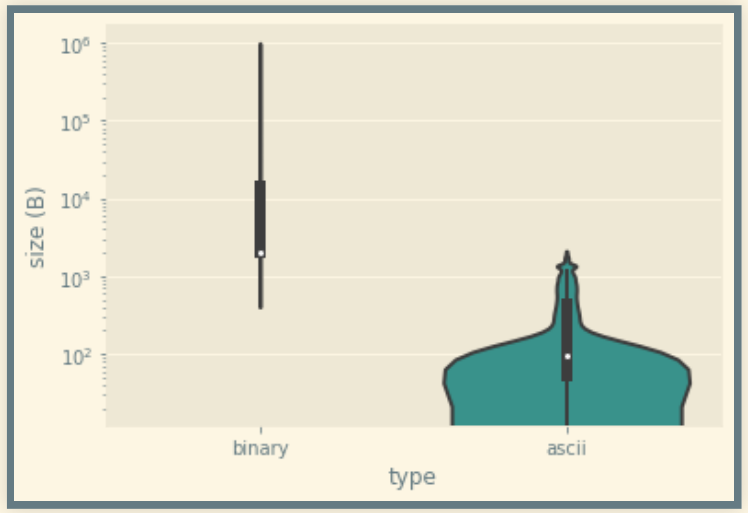
1. Small object data compression
2. Memcached benchmarking
3. OracleDB benchmarking
4. Steam data compression

SMALL OBJECT DATA COMPRESSION

OBJECTIVE

1. Understand the poten al benefit of a proprietary small object data compression technique
2. Iden fy some open-source alterna ves that could be used instead
3. Use case Memcached user running FORSA can realize further amplifica on benefits
    - Dataset Audioeye Memcached data dump

RESULTS



- Large amount of text-based data stored in cache
- Op mal compression algorithm depends on object type
  - Small, text objects compress best under LZW encoding
  - Large binary files do better with zstd level 19

MEMCACHED BENCHMARKING

OBJECTIVE

- Extstore allows Memcached to use disk space as a store for colder items
- Understand the performance benefit of FORSA + Memcached for various applica ons
    1. Batched workload
    2. Paced workload

PROCEDURE

- Memcached compiled from source with Extstore
- `mc-crusher` used to generate heavy Memcached workloads.
    - Batched workload 20 gets / request
    - Paced workload sleep 50ms between requests

MEMCACHED CONFIG

VM CONFIG

RESULTS

- FORSA allows for a lower end system to conform to strict latency requirements

	FORSA LEM	**SSD**
# keys	32,000,000	100,000,000
RAM	8GB	85GB
Treads	8	32
VM	yes	no
adj. keys / sec[1]	**200K**	**200K**

[1] $\max\{kps : P(latency(kps) > 1ms) < 0.01\}$

RESULTS

- Scaling down tes ng, FORSA provides much better throughput for a propor onally iden cal workload

	FORSA LEM	**SSD**
# keys	32,000,000	100,000,000
RAM	8GB	60GB
Treads	8	32
VM	yes	no
Clients	19	19
keys / sec[1]	**503K**	**94K**

ORACLEDB BENCHMARKING

OBJECTIVE

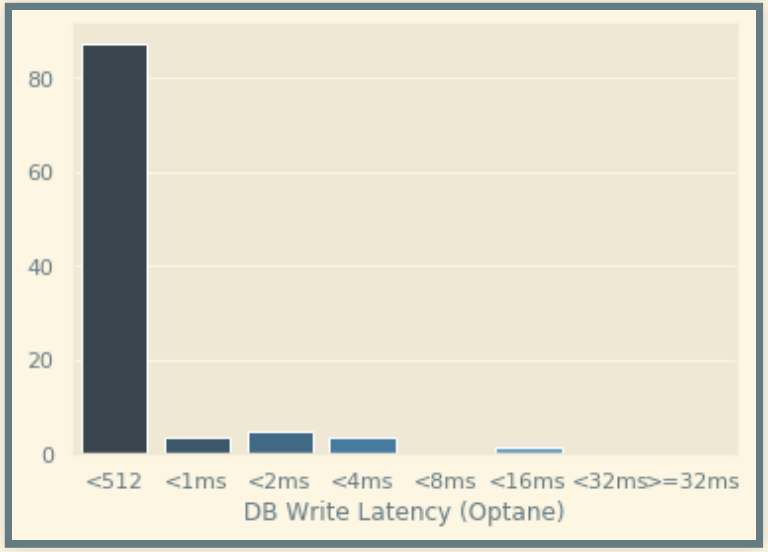
1. Discover the performance benefit FORSA can offer OracleDB
2. Compare against tradi onal storage media

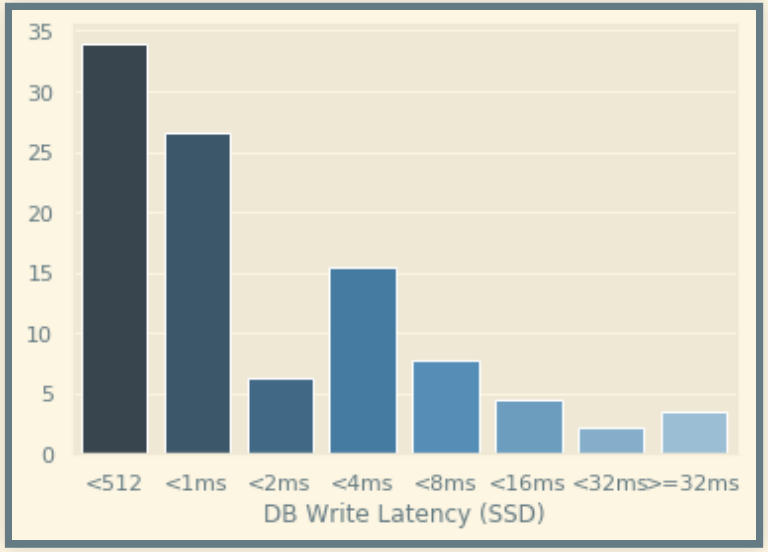
PROCEDURE

1. Use **SLOB** (Silly Little Oracle Benchmark) to drive as much I/O through to the underlying media (LEM, SSD) as possible
2. Compare results between SSD and Optane

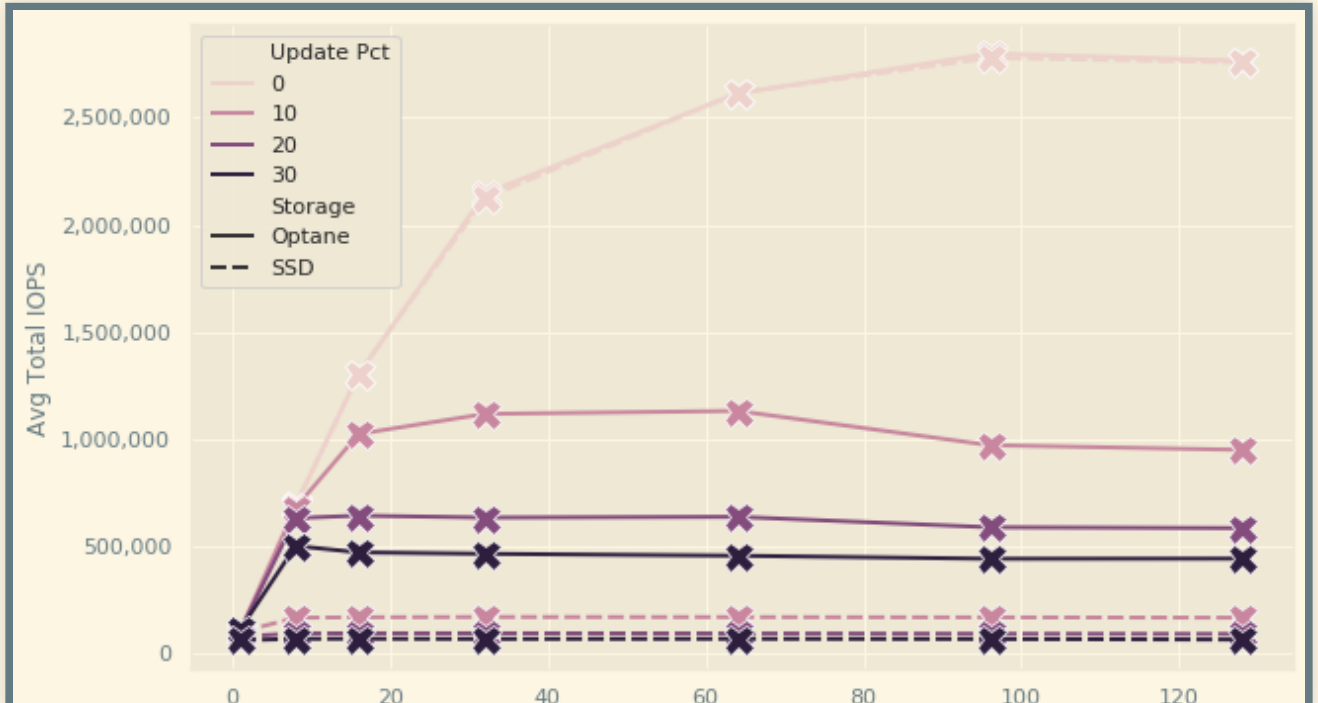
RESULTS

- Lower tail latencies when using FORSA compared to SSD





RESULTS


Update Pct
0
10
20
30
Storage
Optane
SSD
Avg Total IOPS
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
0
20
40
60
80
100
120

APPENDIX

ORACLEDB CONFIGURATION

```
   1   | _db_block_prefetch_limit=0
   2   | _db_block_prefetch_quota=0
   3   | _db_file_noncontig_mblock_read_count=0
   4   |
control_files='/u02/oradata/orcl/control01.ctl','/u02/oradata/orcl/control02.

   5   | db_block_size=8192

   6   | db_cache_size=128M
   7   | disk_asynch_io=FALSE
   8   | db_create_file_dest='/u02/oradata'
   9   | db_name='orcl'
  10   | db_files=200
  11   | compatible=19.0.0
  12   | log_buffer=32M
  13   | pga_aggregate_target=1G
  14   | processes=500
  15   | recyclebin=OFF
  16   | resource_manager_plan=''
```

STEAM DATA COMPRESSION

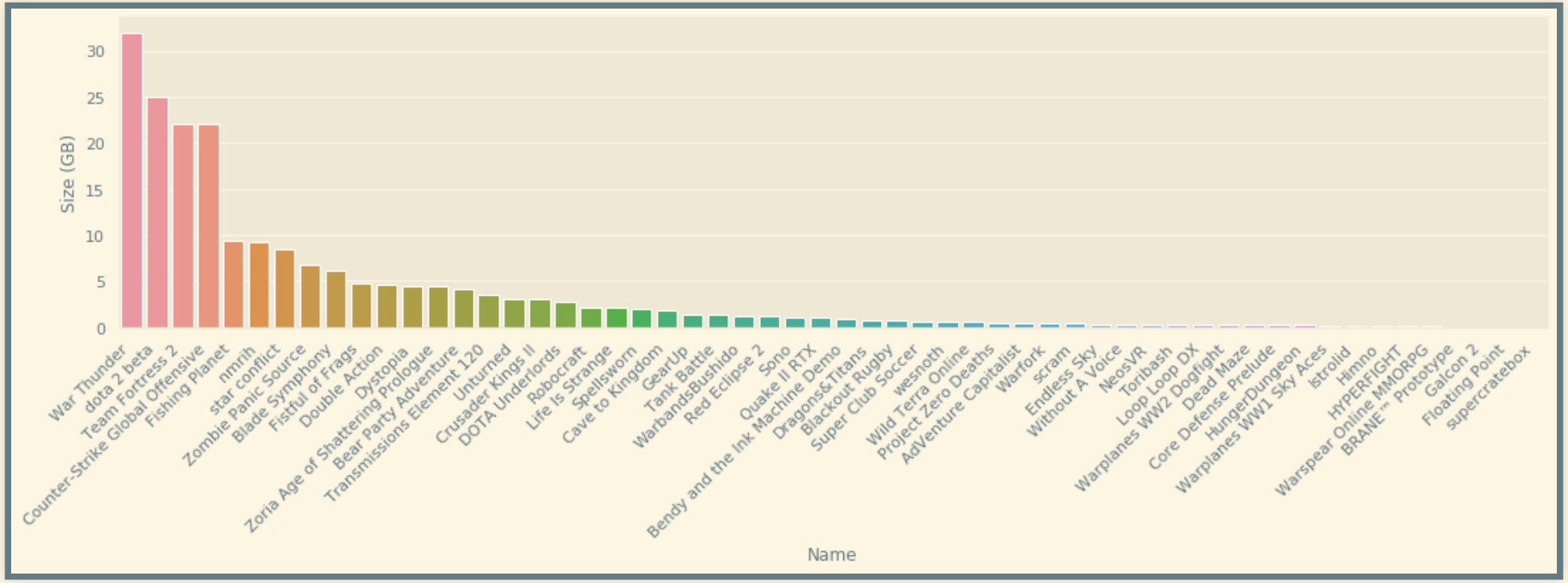
OBJECTIVE

1. Understand the value BitMarker deduplica on can bring to the gaming industry
2. Iden fy the compe ve advantage of FORSA over open-source alterna ves

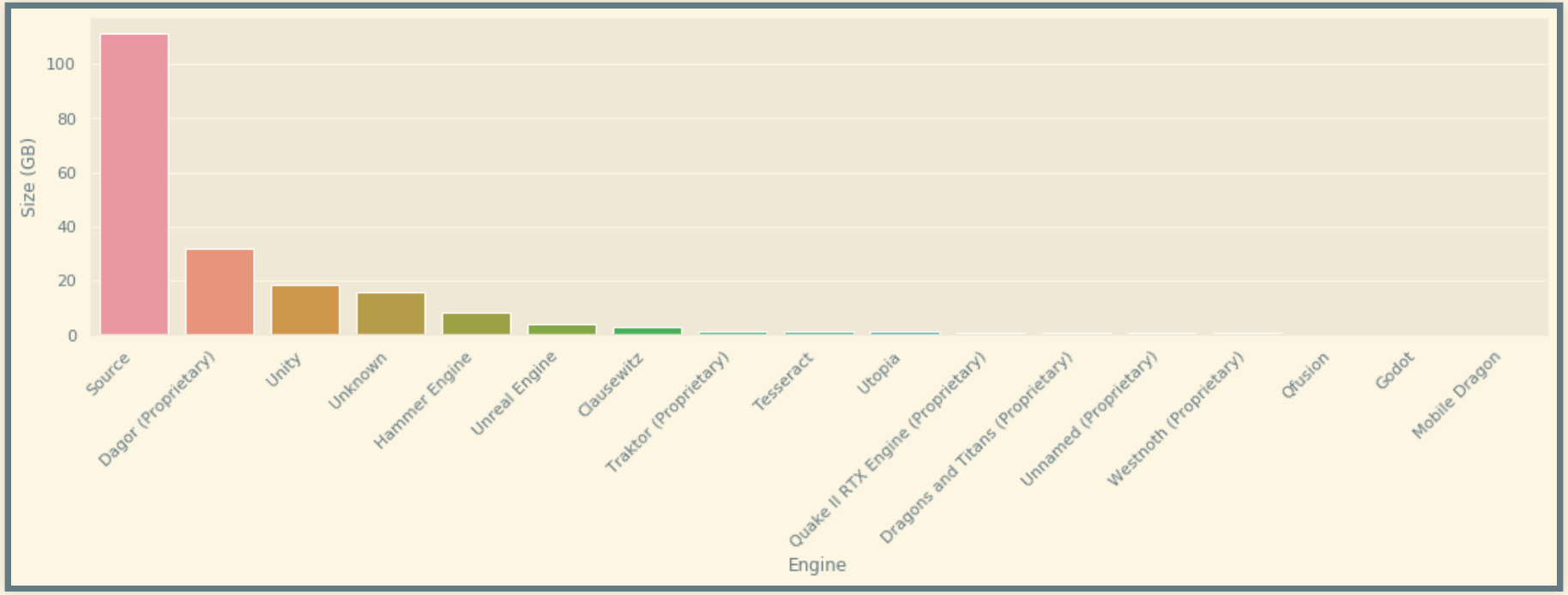
PROCEDURE

1. Download ~200GB worth of games from Steam
2. Iden fy benefits from BitMarker methodology, `lessfs`, `zfs`, and file deduplica on
3. Clone game data mul ple mes, to simulate a host server streaming mul ple copies of games from its library to subscrip on users

THE GAMES

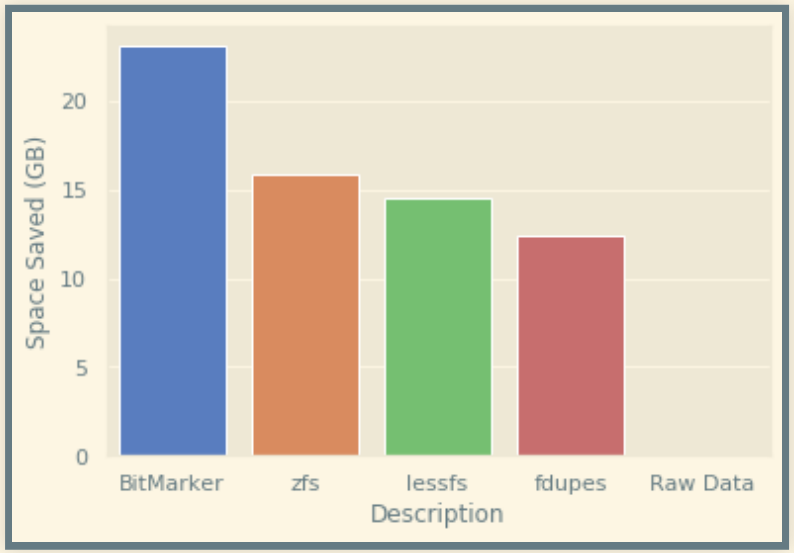

Size (GB)
30
25
20
15
10
5
0
War Thunder
dota 2 beta
Team Fortress 2
Counter-Strike Global Offensive
Fishing Planet
nmrih
star conflict
Zombie Panic Source
Blade Symphony
Fistful of Frags
Double Action
Dystopia
Prologue
Zoria Age of Shattering
Bear Party Adventure
Transmissions Element 120
Unturned
Crusader Kings II
DOTA Underlords
Robocraft
Life Is Strange
Spellsworn
Cave to Kingdom
GearUp
Tank Battle
WarbandsBushido
Red Eclipse 2
Sono
Quake II RTX
Bendy and the Ink Machine Demo
Dragons&Titans
Blackout Rugby
Super Club Soccer
wesnoth
Wild Terra Online
Project Zero Deaths
AdVenture Capitalist
Warfork
scram
Endless Sky
Without A Voice
NeosVR
Toribash
Loop Loop DX
Warplanes WW2 Dogfight
Dead Maze
Core Defense Prelude
HungerDungeon
Warplanes WW1 Sky Aces
Istrolid
Himno
HYPERFIGHT
Warspear Online MMORPG
BRANE™ Prototype
Galcon 2
Floating Point
supercratebox
Name

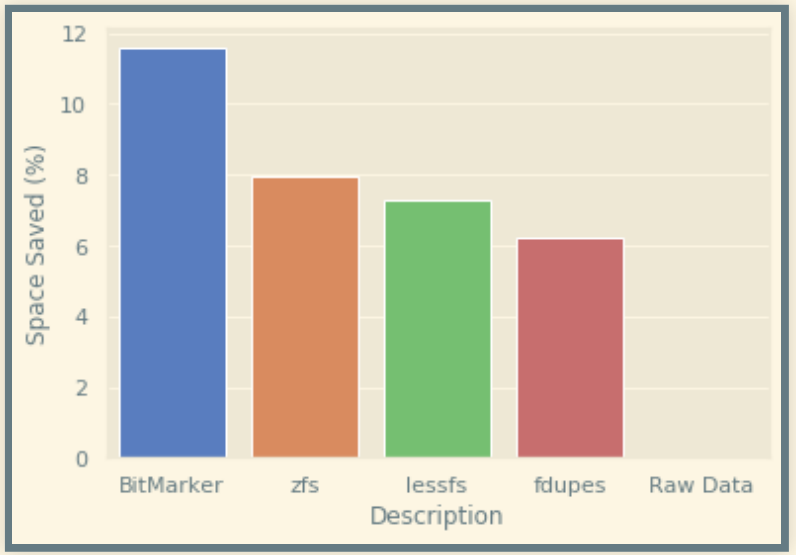
GAME ENGINES



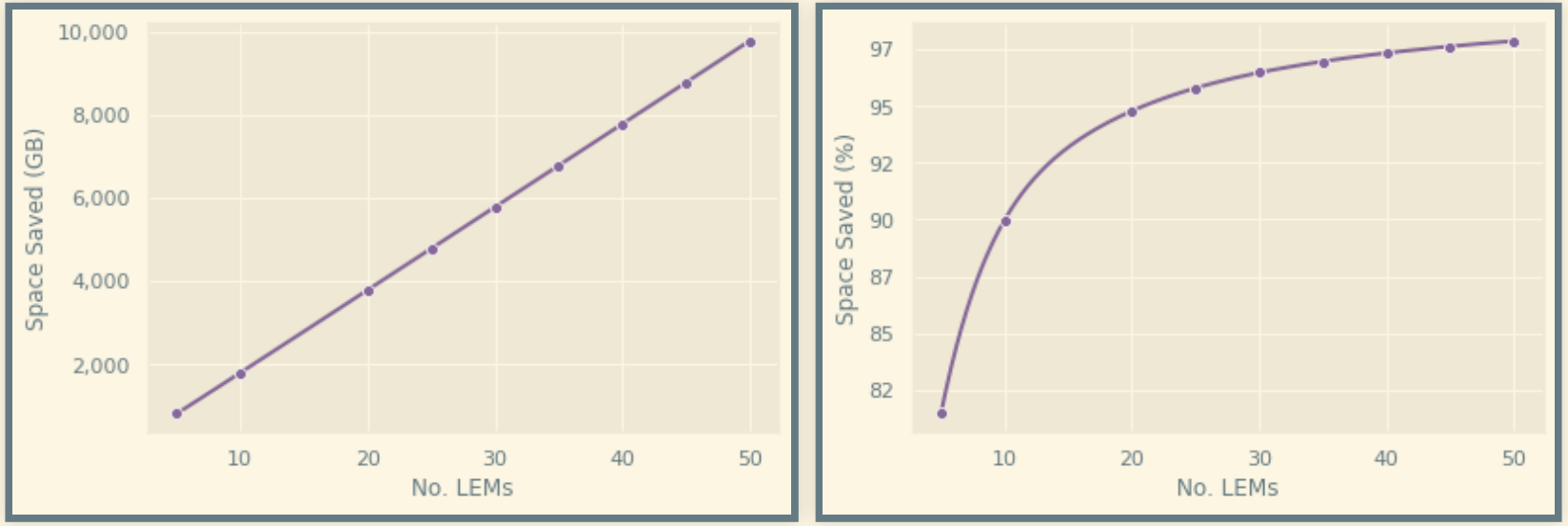
RESULTS

- BitMarker outperforms other deduplica on approaches when applied to game data.





RESULTS



- As expected, cloned game data incurs no appreciable

THANK YOU!

- Stay in touch!
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