Pisces:
A Scalable and Efficient Persistent Transactional Memory

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Non-volatile memory (NVM) is revolutionizing memory and storage.

- Phase-change memory (PCM)
- Resistive Random-access Memory (ReRAM)
- Intel/Micron 3D-XPoint
Industrialization: Intel 3D-Xpoint

- Non-volatile memory (NVM) is revolutionizing memory and storage

Phase-change memory (PCM)  Resistive Random-access Memory (ReRAM)  Intel/Micron 3D-XPoint

- The recent release of Intel Optane DC Persistent Memory (3D-XPoint) marks the transition of NVM technology from research prototypes to mainstream products
NVM Features

- Byte-addressability
- Non-volatility (high speed)
- Low read latency and high persistency cost

Intel/Micron 3D-XPoint

10x write latency comparing with DRAM
Programming Abstraction for NVM

- Persistent Transactional Memory (PTM)
  - *transaction* is a widely-used abstraction
  - an efficient abstraction for programming on persistent memory:
    i.e., builds *transactional memory* abstraction over *NVM*
Existing PTM Issues

read-deficiency

Cause: **exposing** high NVM persistence overhead to readers
Existing PTM Issues

**read-deficiency**

- **w/o conflict**
- **w/ conflict**

**Cause:** exposing high NVM persistence overhead to readers

**low-scalability**

**Throughput**

- **w/o conflict**
- **w/ conflict**

**Cause:** over-constraining NVM persistence ordering
Can a PTM achieve both read-efficiency and high-scalability?

Cause: exposing high NVM persistence overhead to readers

Cause: over-constraining NVM persistence ordering
Reuse redo logs as new versions

Dual-version concurrency control

Three-stage commit

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read-efficiency

high-scalability

Read Latency

Throughput

Others

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# CPU cores
Thanks & Welcome

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