GridGain

The Future Of In-Memory Computing

In A Rapidly Changing World

Nikita Ivanov
GridGain Systems
Founder & CTO

In-Memory Computing: **History**

- 1985-1995 – Local caching
  No distribution, KB to MB capacity, no TX

- 1995-2005 – Distributed caching
  LAN distribution, K/V access, MB++ capacity, no TX

- 2005-2015 – In-Memory Data Grids & Databases
  LAN/WAN distribution, SQL, K/V access, co-located processing, MB to GB capacity, distributed TX

- **2015+ - In-Memory Computing Platforms**
  LAN/WAN distribution, SQL, K/V access, co-located processing, GB to TB capacity, distributed TX, DC replication, persistence, streaming, ML/DL

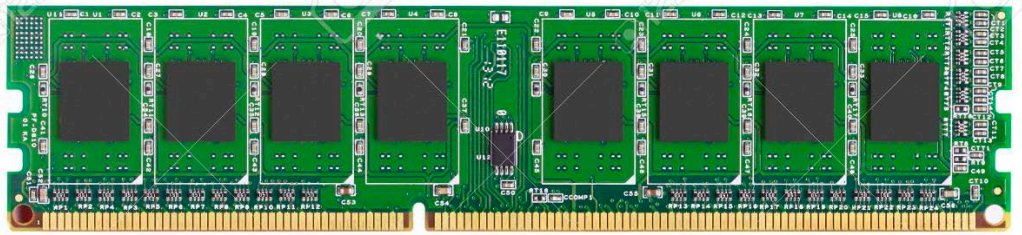
In-Memory Computing: **Future**

The **next decade** in In-Memory Computing will coalesce around:

1. New memory products
   Non-volatile RAM, cheaper RAM
2. HTAP adoption & Multimodel
   Analytics + Transactional processing (HTAP, HOAP, Translytical)
3. Cloud native architectures
   ~100% move to cloud-native architecture, SaaS and MSO models
4. More User Friendly
   Easier adoption, simpler entry point, out-of-the-box integrations

1. New Memory Products

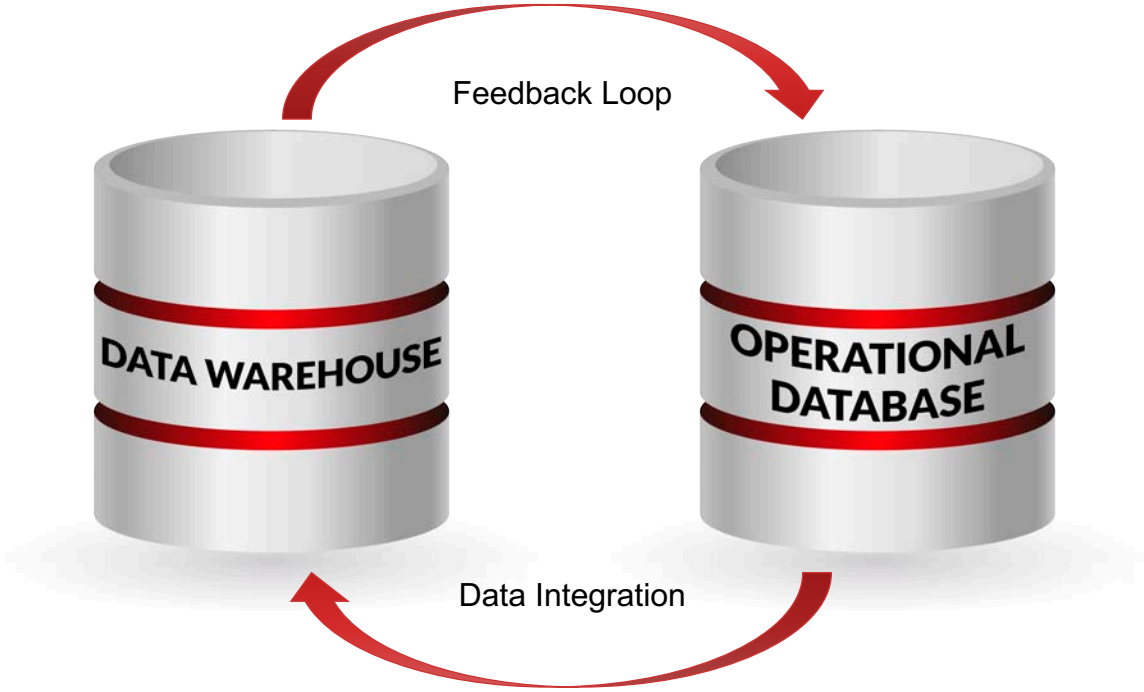
- **Volatile vs non-volatile RAM**
  - Intel Optane
  - Different types of integration
  - Broad OS/BIOS support



- **Different class of RAM**
  - Complex matrix of features vs. single DDR/2/3/4/5 product line:
    - Expensive, fast, low capacity (DDR5)
    - Cheap**er**, slow**er**, high**er** capacity (Intel Optane)
  - Ability to have >100TB of NVRAM in a single system
- **Different RAM systems**
  - Local RAM vs. cluster interconnect

1. HTAP Adoption & Multimodel

1970 – today:
Legacy Architecture



2020+
HTAP Architecture

IMC-enabled HTAP enables situation awareness on **live transaction data** as opposed to after-the-fact analysis on stale data

3. Cloud Native Architecture

CLOUD NATIVE COMPUTING FOUNDATION

- **Today IMC is almost not present on cloud providers**
  - Except for ElastiCache - nothing on AWS, Azure, Google, CNCF
- **Today IMC is at odds with many cloud technologies:**
  - Shared resources and containers degrade performance
  - Slow adoption of RAM-focused instances
  - IMC SaaS is inadequate or not present
- 2020+ IMC must become cloud native
  - AWS, Azure, Google must introduce IMC as-a-service
  - IMC vendors must adopt cloud first approach

4. User Friendly

- **IMC is one of the most complex software middleware**
  - Combines distributed programming & in-memory storage paradigm
- **Must simplify IMC usage and concepts**
  - Familiar query semantics, e.g. ANSI SQL vs. proprietary xQL
  - Familiar transaction semantics (MVCC, consensus, 2PC)
  - Native polyglot language support vs. predominately JVM eco-system
  - Focus on the cost of initial adoption
  - Out-of-the-box integrations
  - Standardization beyond failed JCache efforts
  - Maturity of devops and production support systems

In-Memory Computing: **2020 and Beyond**

1. Adopt new memory products and technologies
2. Support growing HTAP & multimodel use cases
3. Migrate to cloud-first architecture and SaaS models
4. Democratize and simplify

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Thank you!

@gridgain
nivanov@gridgain.com