nKV in Action
Accelerating KV-Stores on Native Computational Storage with Near-Data Processing

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Demo Setup

COSMOS+

Flash (SLC)
Zynq 7045
ARM FPGA

Host

Demo GUI

PCIe

nKV
Demo BC

Switch to nKV VLDB Demo GUI

1. Execute BC (Duration 2-4 min): Best Paper Award Check

Switch to presentation during execution to explain the issues we solve with nKV
Read Amplification of LSM-Trees

One request might end up in reading the entire data, but is that all?
Drawbacks of Traditional Stacks

- **System Paradigm:** only "Data-to-Code"

- **Intermediate Layers:** introduce levels of indirection

- **Resources:** used for compatibility

- **Bandwidth:** Device ↔ Host ≪ On-Device

Several elements impair performance – let’s do it differently!
Native Computational Stack

- **System Paradigm:** only “data-to-code”
- **Compatibility Layers:** introduce levels of indirection
- **Resources:** used for compatibility

**Traditional Stack**
- DBMS
  - Execute
  - Storage

**Native Computational Stack**
- nKV
  - Native Storage Manager

**File System**

**Block Device**

**Processing**

**Storage**

**Bandwidth:** Device <-> Host <-> On-Device

**nKV uses NDP to utilise on-device resources and to reduce data transfers**
Demo BC

Switch to nKV VLDB Demo GUI

1. Discuss Runtimes BC

2. Execute Get on best BC Result (Duration 1-2 second)
   - Discuss Runtimes Get
   - Discuss Best Paper Award Check?

3. Execute Scan on Paper same year (Duration few seconds)
   - Discuss Runtimes Scan
nKV in Action

native Computational Storage
- Elimination of intermediary layers
- Physical data placement
- Embedded NVMe interface

near-Data Processing
- NDP interface extension
- Data format parsers and accessors
- Flexible scheduling

Demo Showcases:
- Paper detail retrieval: **1.4x**
- Scan for papers: **>2x**
- BC calculation: ~**2.7x**

More Details:
**nKV: Near-Data Processing with KV-Stores on Native Computational Storage**
In Proc. [DAMON 2020](#).