



Characterizing ReRAM for NVM cache applicaiton

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ReRAM (Resistivity RAM)

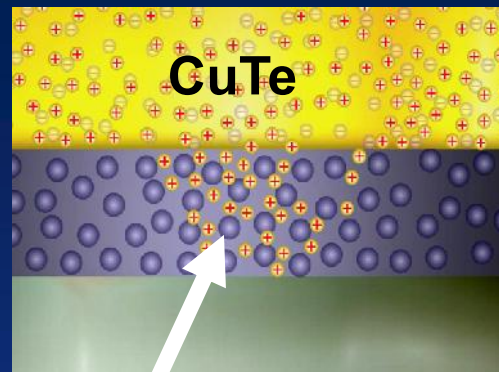
- Why is ReRAM?
 - Scalable for cost
 - NVM and RAM (not DRAM and not Flash)
- Many types of materials
 - Polymer, Electrolyte
 - Ta_2O_5 , SiO_2 , WO_3 , TiO_2 , ZrO_2 ,,,
 - Ge, Te, S, GST, Cu, Ag, Gd,,,
- Switching element
 - Diode (Cross Point) for capacity
 - Transistor for performance

Adaptive ReRAM Technology by Sony

Cu⁺ source layer

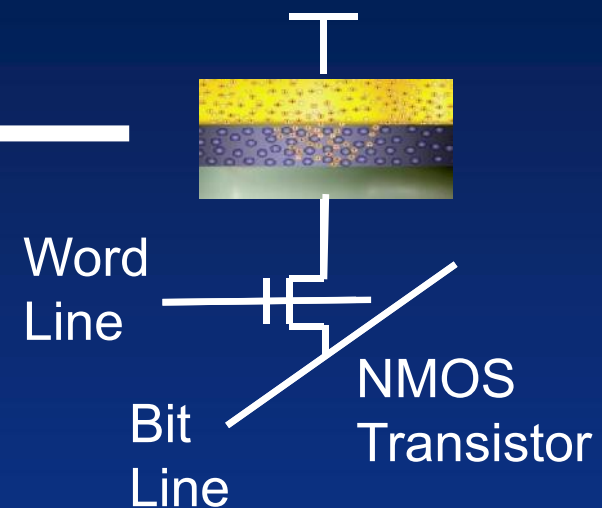
Thin insulator

Lower Electrode



Copper filament
($\Phi < 10\text{nm}$)

Upper Electrode

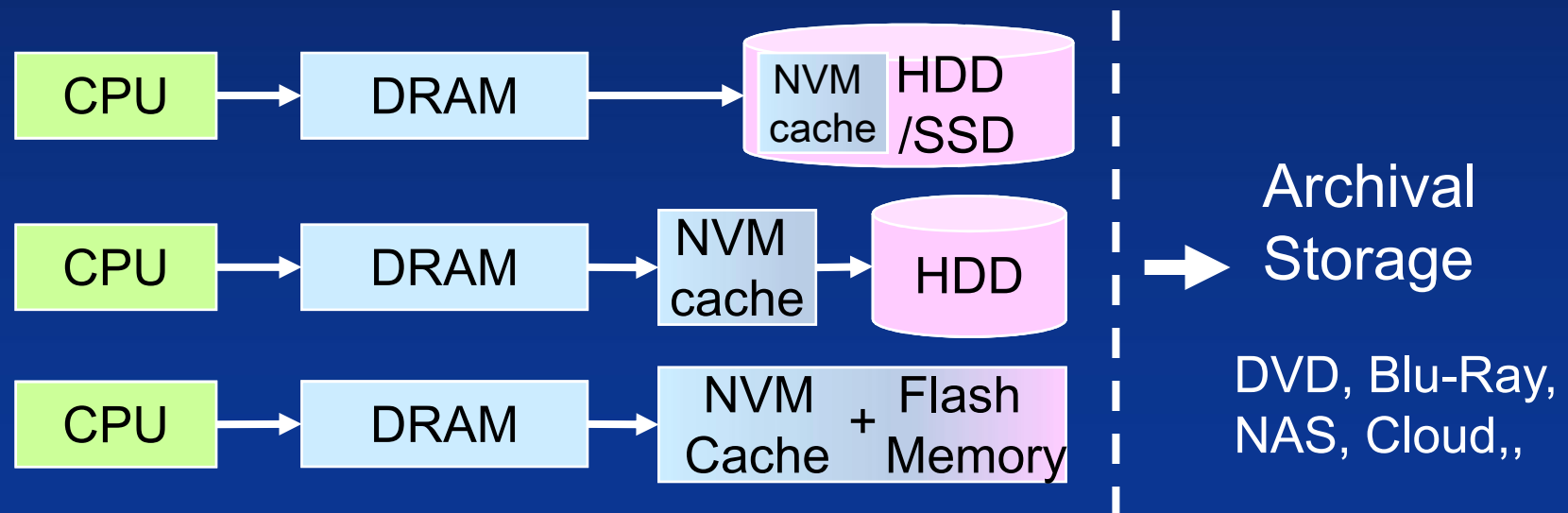


■ 4Mbit Test Macro Testing @ ISSCC 2011

- Read: 2.3GB/s, Program: 216MB/s, Latency: ~ 100ns
- Read endurance: 10^{11} cycles
- Program endurance: 10^6 cycles
- Data retention: 10 years

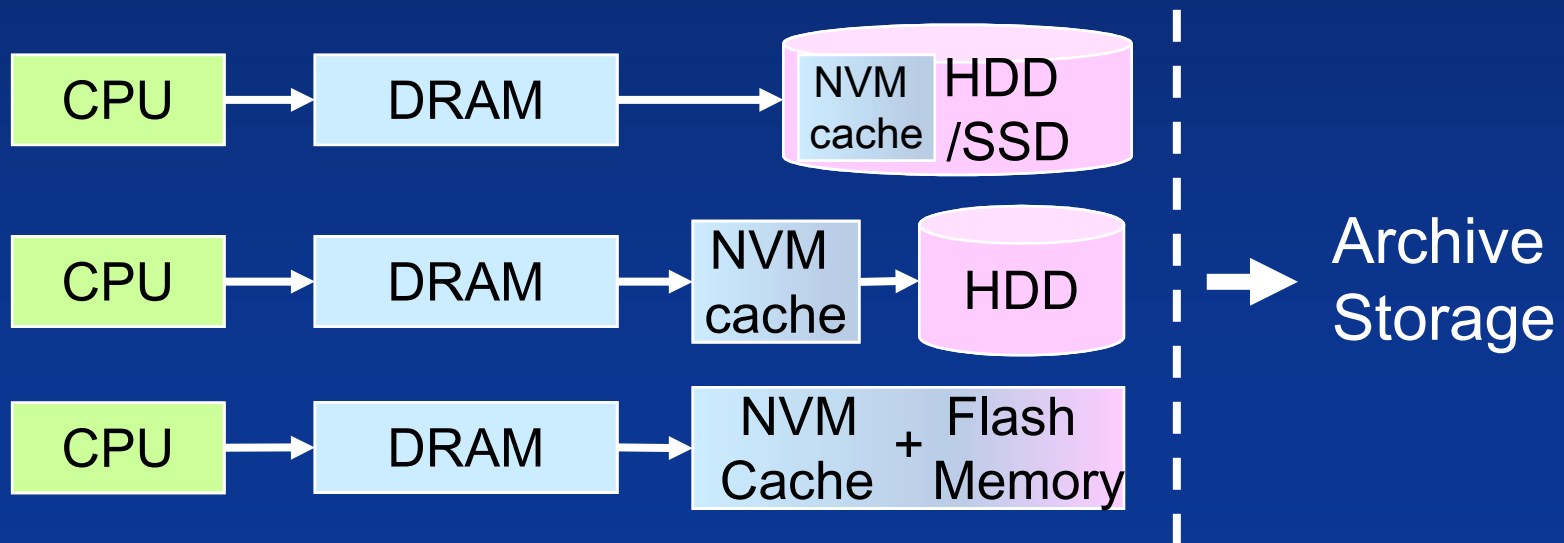
Application: NVM cache

- Improve system-level performance
 - High speed, low latency and Non-volatile
- Complement existing DRAM
 - Low power in stand-by for mobile device



Target: NVM Cache Module

- Cost: ~ DRAM
- Capacity: ~ DRAM
- Throughput: Read > 5GB/s, Write > 500MB/s
- Reliability: >> Enterprise SLC NAND
- Schedule: ?





Thank you!

For questions, please contact

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