

## How to Compute in Persistent Memory Systems

### Motivation

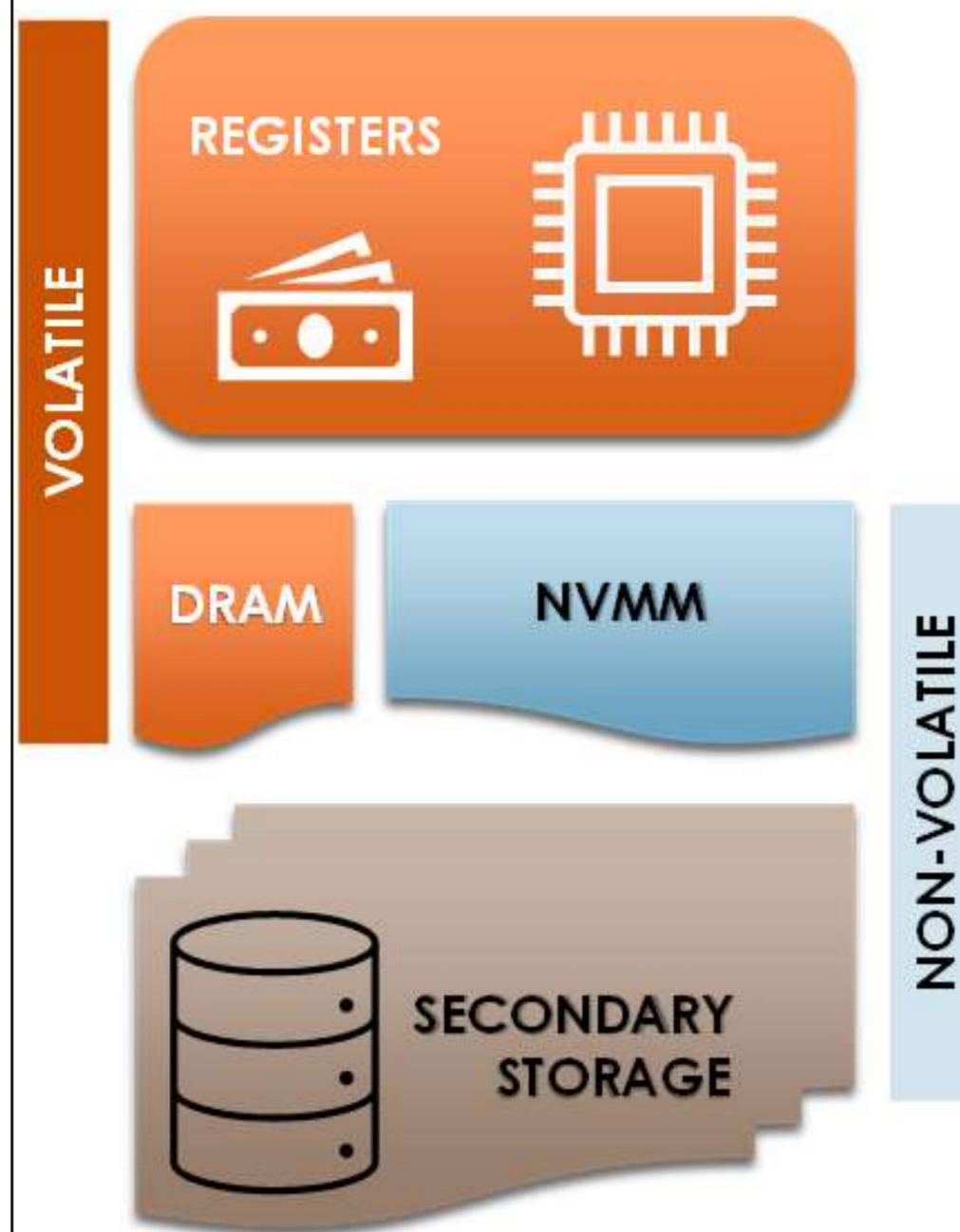
#### NON-VOLATILE MAIN MEMORY



Combines the benefits of secondary storage and DRAM:

- Large and inexpensive.
- Durable.
- Byte-addressable.

#### RECOVERABLE COMPUTING



**Durability**  
NVMM has the power to enable fast recovery.  
**Crash Recovery model**  
System may experience a crash failure.

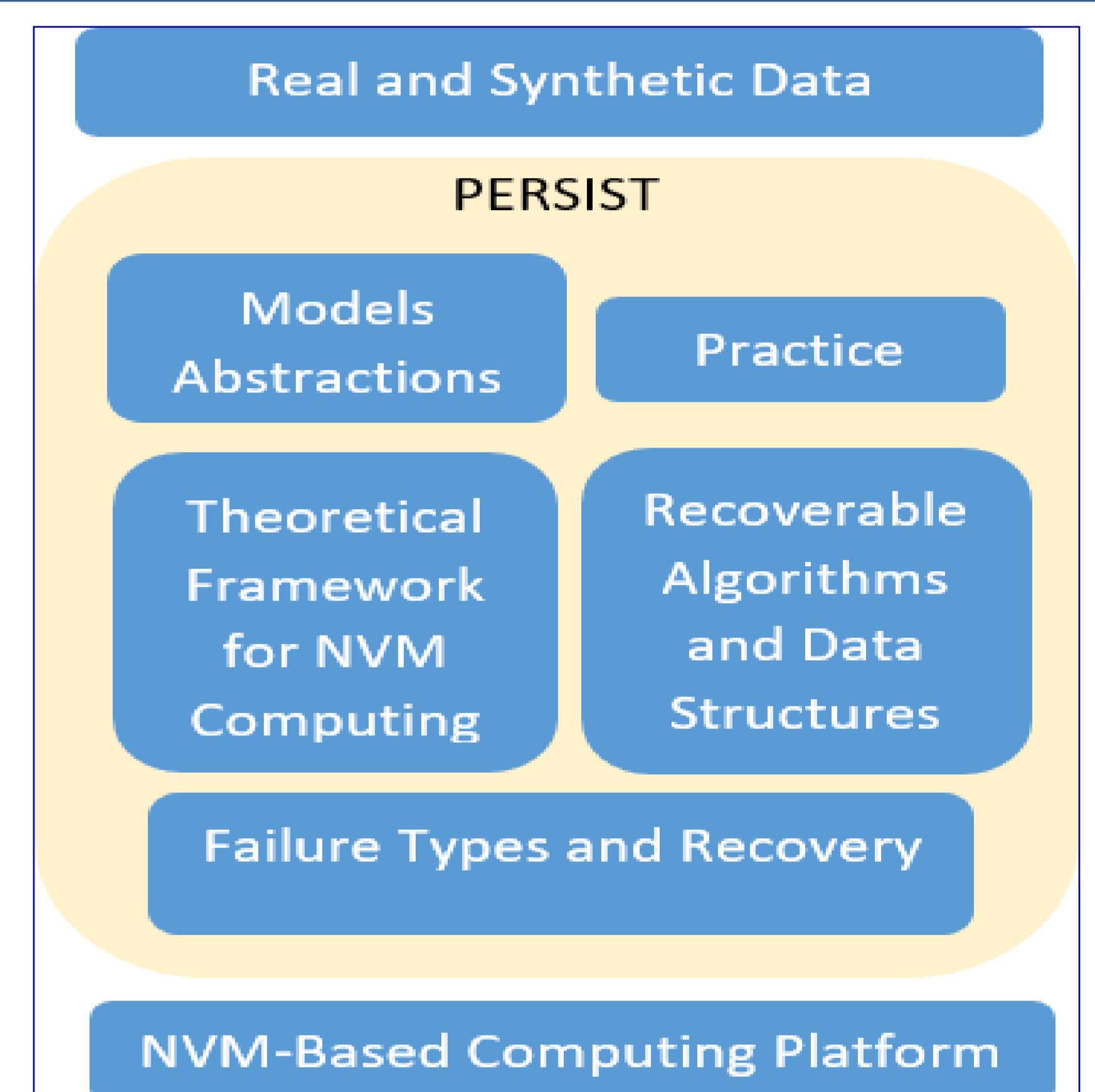
#### MAIN CHALLENGE

- Data stored in **CPU-registers, caches and DRAM** are volatile.
- Persistence instructions are used to ensure durability, but they are **asynchronous (e.g. pwb)**.
- Persistence instructions are **expensive** in terms of performance.

### PERSIST Objectives and Methodology

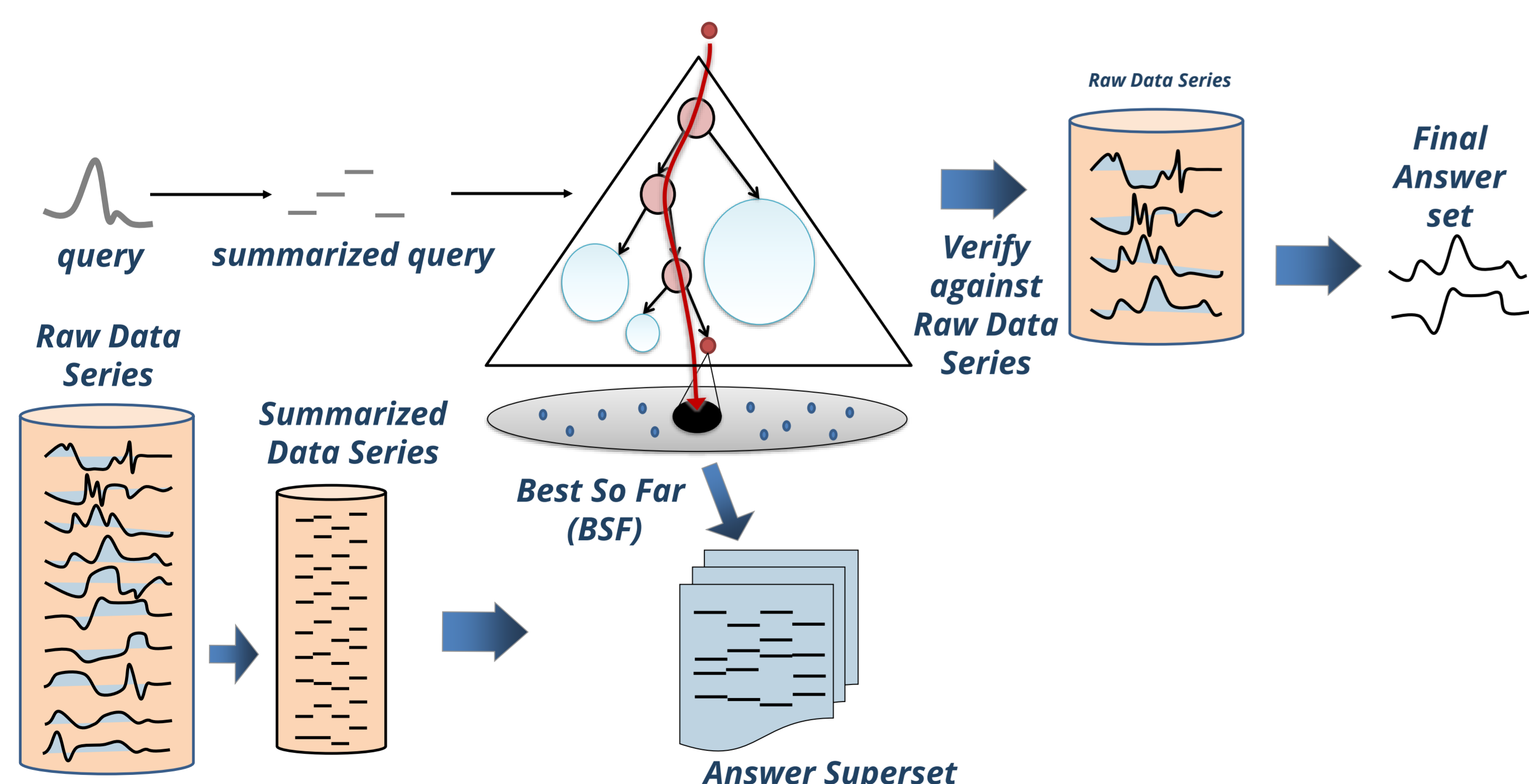
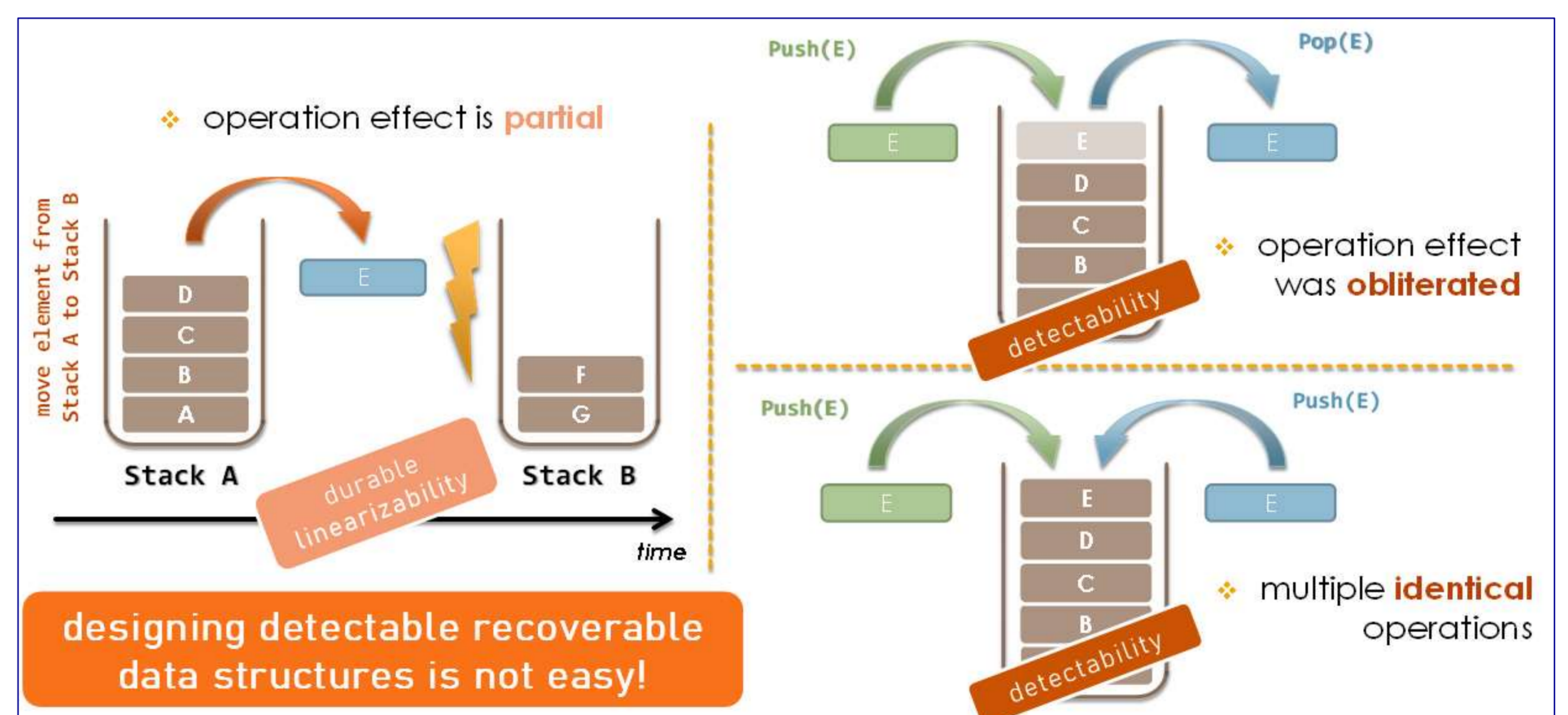
#### OBJECTIVES

1. Theoretical Underpinning of NVM computing:
  - a. Develop a **robust theoretical framework** for NVM computing
  - b. Formulate **NVM consistency theory** and define efficient assumptions
  - c. Explore **complexity measures** and propose appropriate models for NVM computing.
2. Recoverable computing at low cost
  - a. Design **efficient recoverable algorithms, data structures, and synchronization methods**
  - b. Enable **rapid execution recovery after failures**
  - c. Come up with **recoverable versions of complex indexing structures** for processing big data-series collections



### PERSIST Innovation & Impact

1. The proper understanding of the functioning of current and future NVM approaches and the capability to formally assess them.
2. The harnessing of the performance challenges of NVM-based **recoverable computing** (i.e., computing whose state can be restored after recovery from a failure or a reset), and the better conceptualization of its **performance characteristics and boundaries**.



#### ECONOMIC IMPACT

1. **NVM** is expected to bring significant improvements on a wide spectrum of systems and applications e.g. data centers, cloud computing Future Internet, big-data etc.
2. Exa-scale computing and the future of high-performance computing (HPC).
3. Storage systems and architectures.
4. Transaction-oriented systems.

#### Contact

Prof. Panagiota Fatourou  
University of Crete, Dept. of Computer Science & Foundation for Research and Technology- Hellas, Institute of Computer Science (ICS)  
Tel.: +30 6973 99127, Email: faturu@csd.uoc.gr

#### More Information

[persist-project.gr](http://persist-project.gr)  
[linkedin.com/groups/9235182](https://www.linkedin.com/groups/9235182)  
[facebook.com/profile.php?id=61552692594031](https://www.facebook.com/profile.php?id=61552692594031)