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The concept of a distributed state synchronization system

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Examples of distributed applications that could be powered by DSSS

- backend of web applications, mobile applications, SaaS (Software as a service), and online services in general;
- the server side of online games;
- IoT and Edge Computing applications;
- HPC and HTC applications;
- and maybe others.

DSSS definition

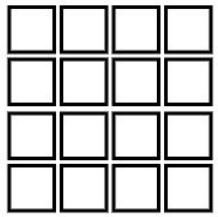
Distributed State Synchronization System (DSSS) is a system that implements the abstraction of shared memory for processes of distributed application, implements a mechanism for concurrent access to shared memory, and ensures its persistence.

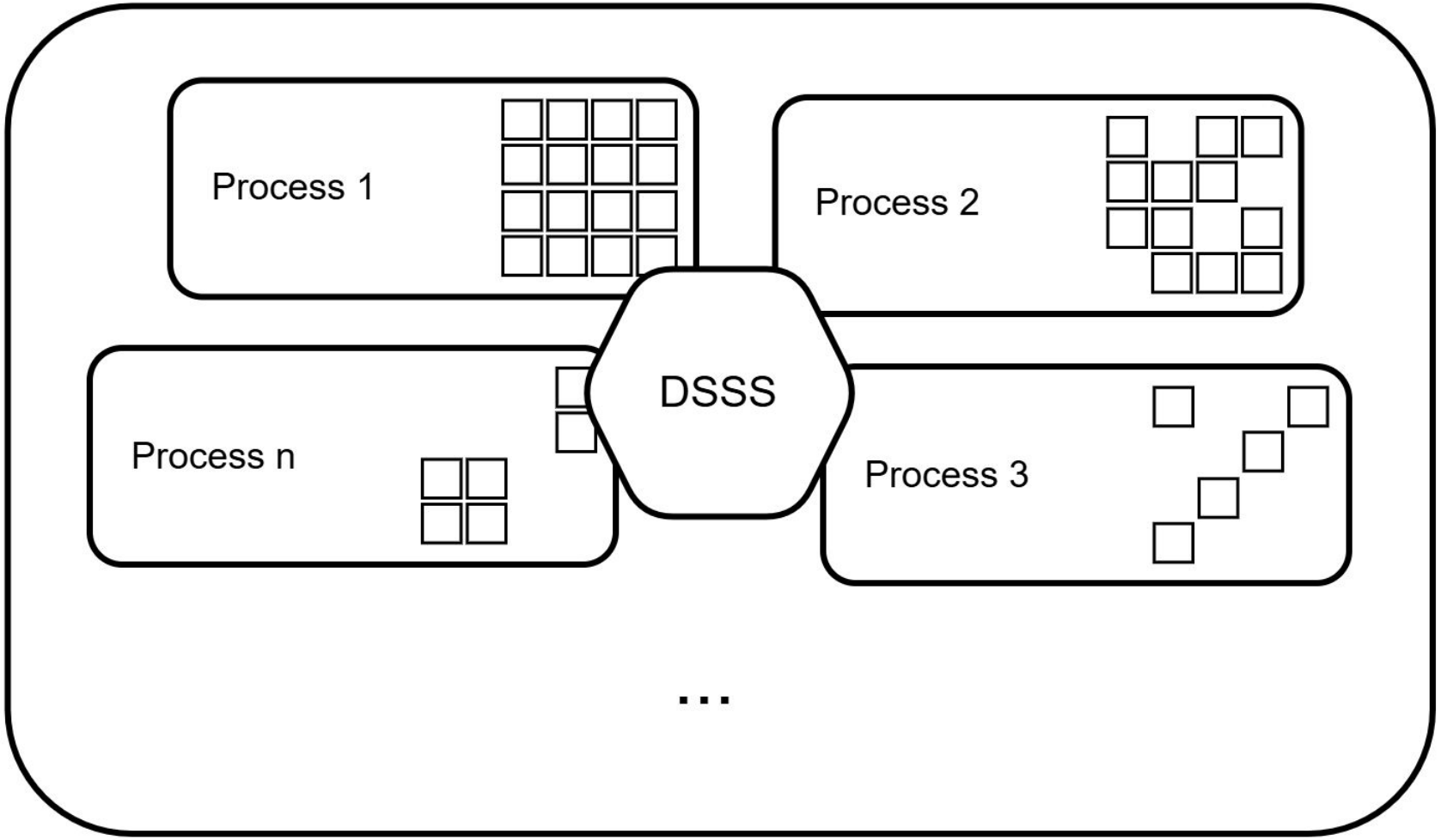
DSSS components

- cloud platform (PaaS);
- software development kit;
  - code libraries for different programming languages;
  - middleware.

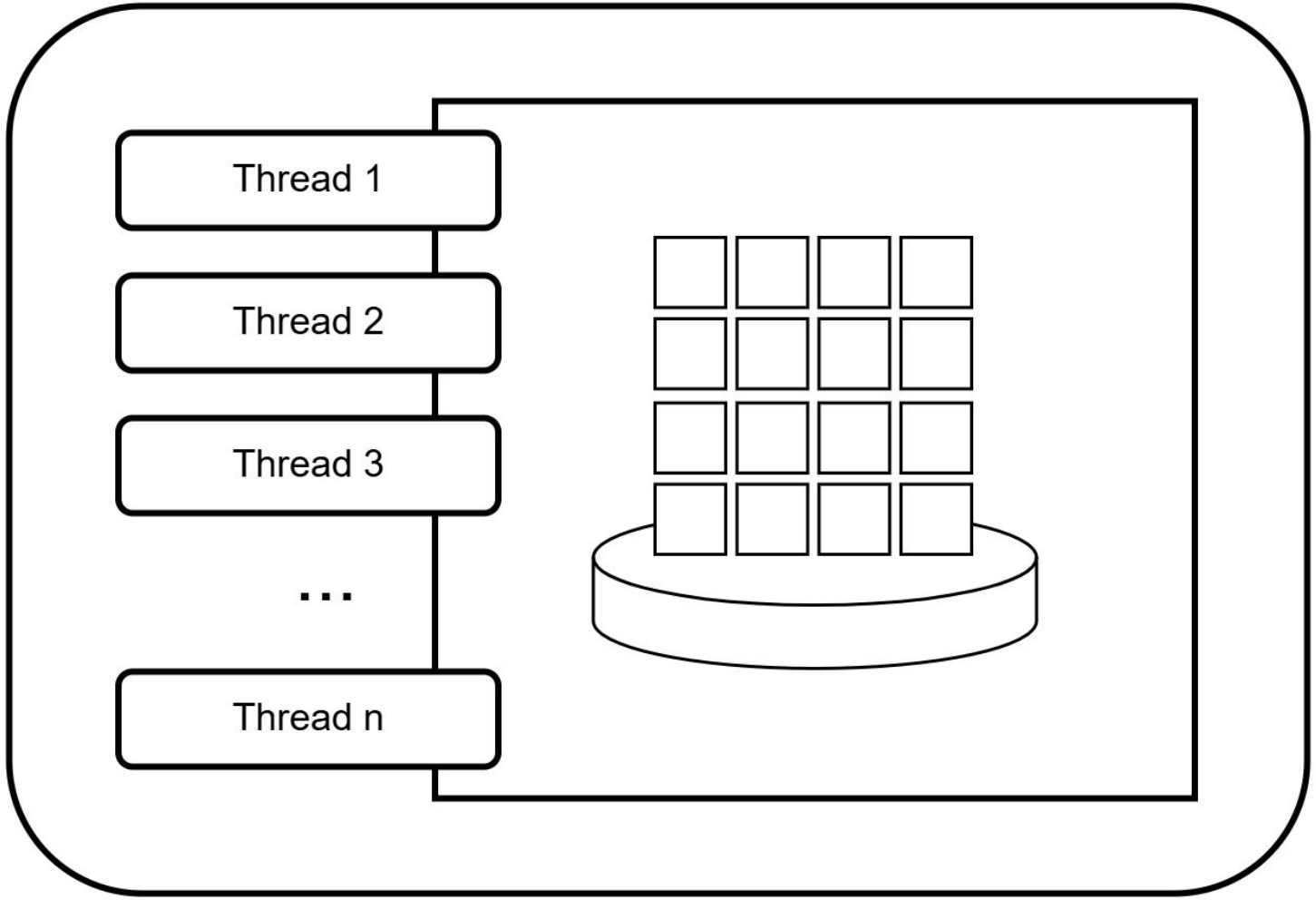
Distributed (multi-process) application based on DSSS

Some data stored in a shared memory





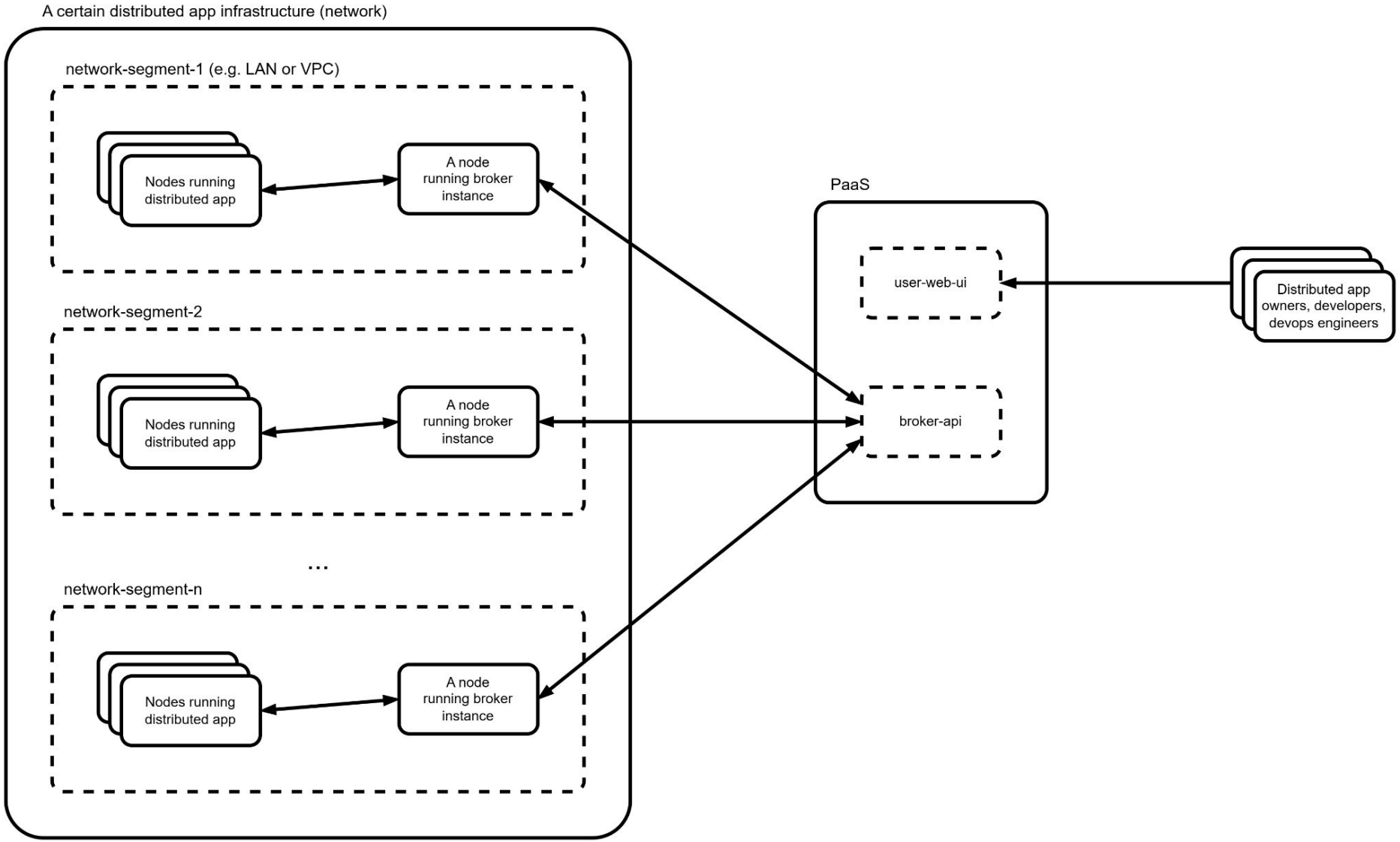
Abstraction of a single-process application with persistent memory



Developing DSSS based application

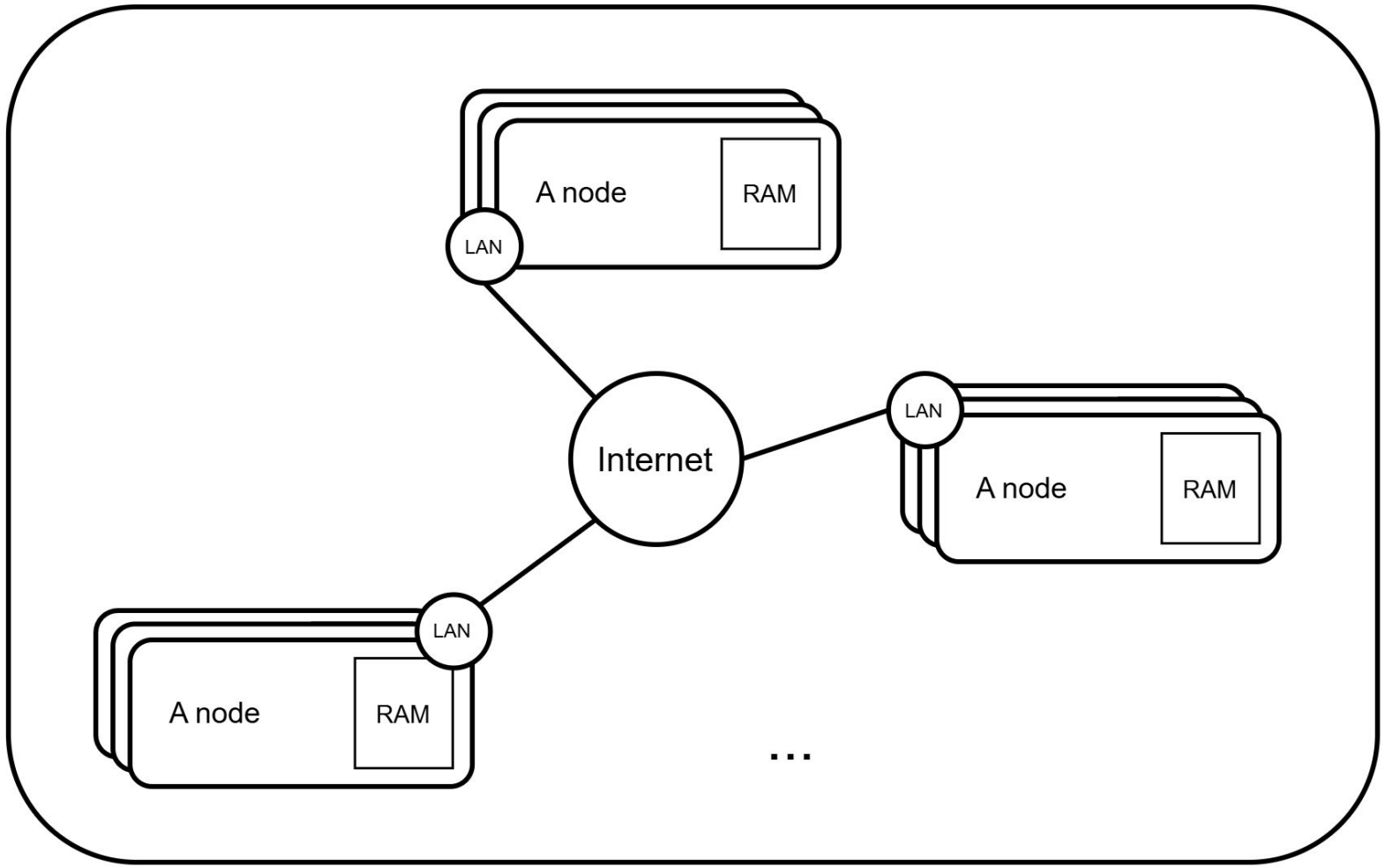
- the developer defines a class whose object will encapsulate shared data;
- the developer defines methods for reading the object's contents (getters) and methods that modify the object;
- for each method that can modify an object, the configuration class specifies:
  - a function that serializes method arguments into a sequence of bytes and back;
  - the unique identifier of the method, for example, the sequence number.
- using code generation, the functionality necessary for the operation of DSSS is created.;
- a single data class object is created in the business logic of the application;
- DSSS guarantees the data object:
  - atomicity of data modification methods;
  - consistency of copies of the data object between all instances of the application;
  - the visibility that any operations on the data object (both reading and modifying) are performed sequentially;
  - the persistence of the data object.
- the business logic of the application interacts with the data object by calling its methods.

Developing DSSS based application

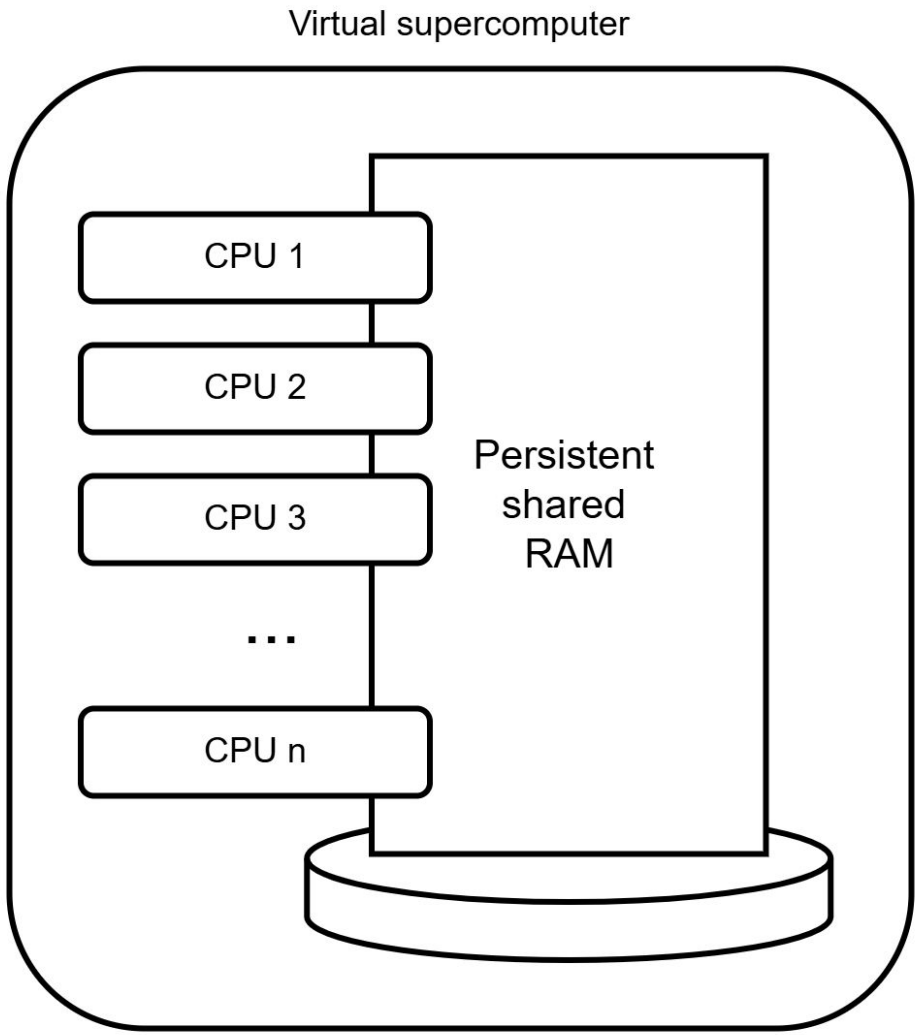


Distributed infrastructure

Geo-distributed computing infrastructure



Abstraction of virtual supercomputer



Done:

- system architecture designed;
- system proof-of-concept implemented;
- the system concept has been presented to multiple organizations developing distributed applications;
- positive feedback received, demonstrating organizations' interest in adoption.

In progress: prototype implementation and testing on a sample application.

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Thank you for your attention