

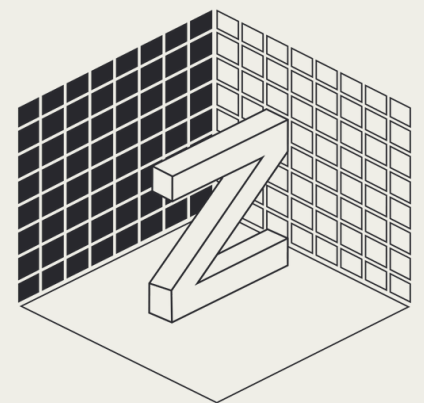
Zarr—Chunked, Compressed

CLOUD OPTIMISED, N- DIMENSIONAL ARRAYS

IndiaFOSS 2025

21st September, 2025

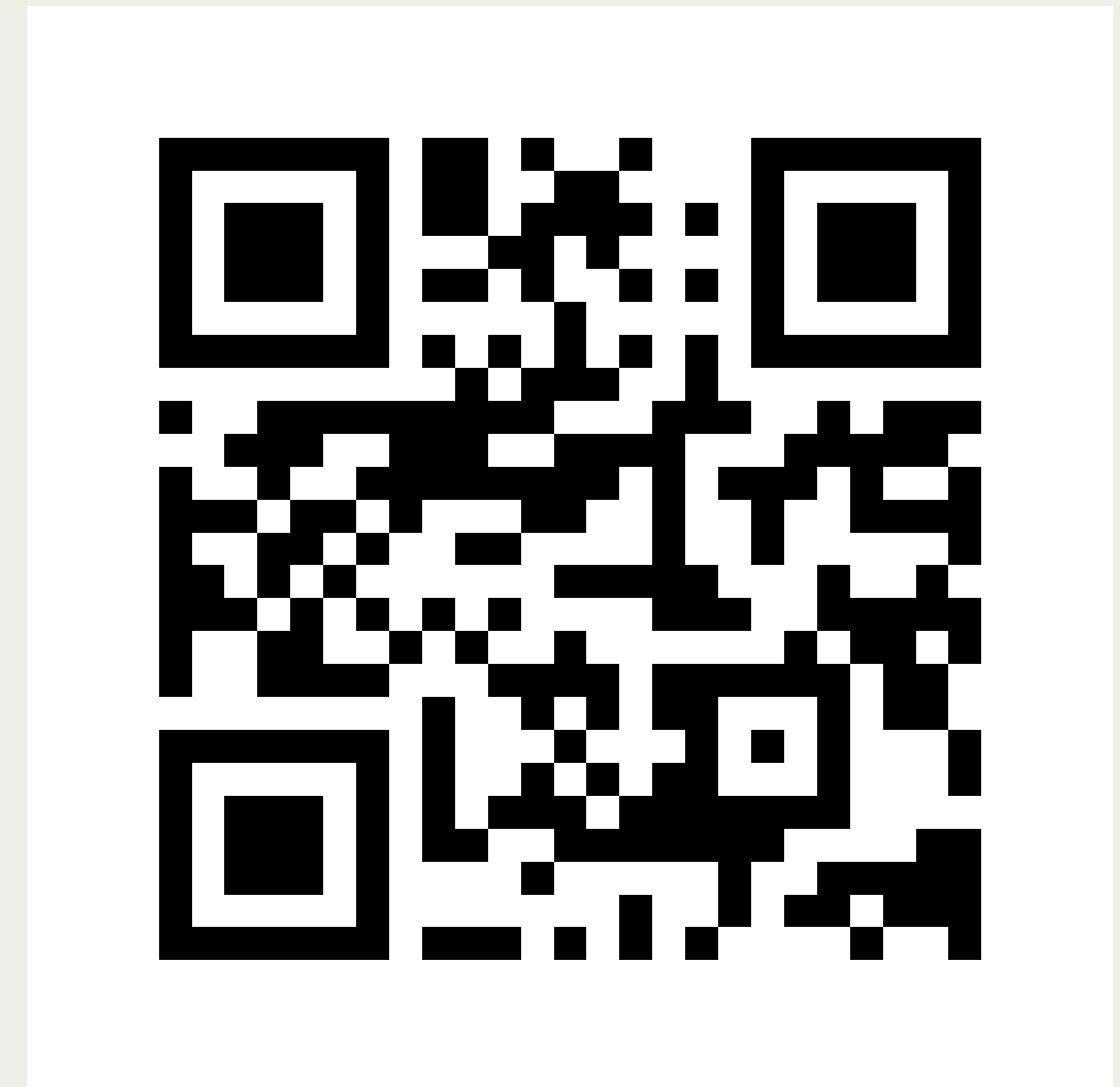
Bengaluru, KA



Zarr

Sanket Verma

Software Engineer



<https://sanketverma.com/>

Slides



https://bit.ly/zarr_indiafoss/

WHAT I'LL BE TALKING ABOUT?

- What is Zarr?
- What's new in Zarr-Python 3?
- How to get involved?
- QnA

WHAT IS ZARR?

Zarr is a community project that develops specifications and software for storing large, N-dimensional, typed arrays.

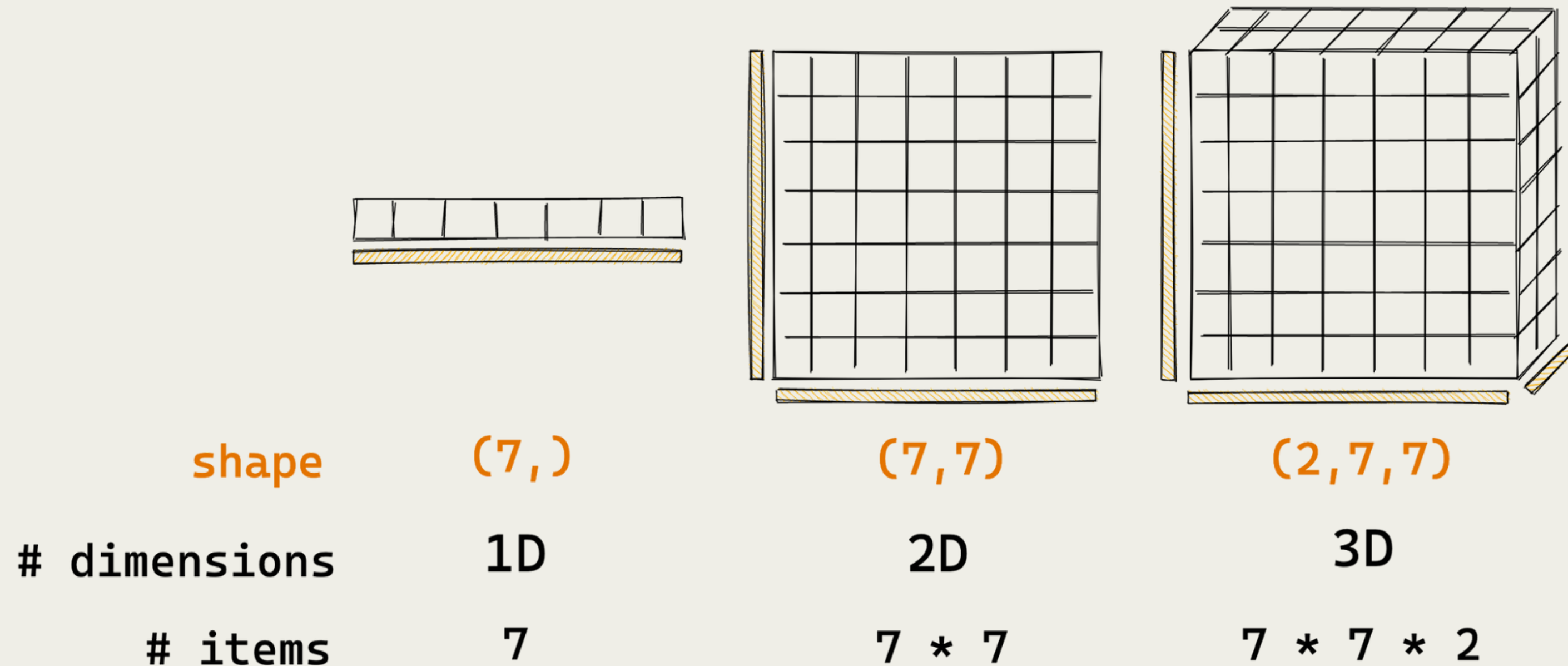
Zarr was created by Alistair Miles, a genome scientist who is studying Malaria mosquitoes. It started as a project to handle the massive genome datasets of mosquitoes, and has evolved since then!

Zarr is currently adopted by scientific domains, including but not limited to geospatial, bioimaging, data science, physics, etc.

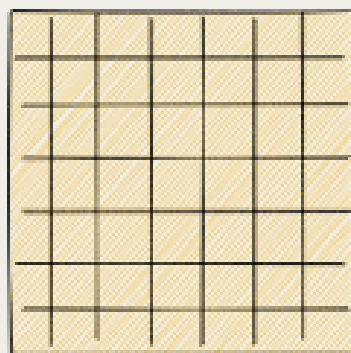
How does Zarr work?

HOW DOES ZARR WORK?

Arrays are container of items of the same data-type & size (in bits).

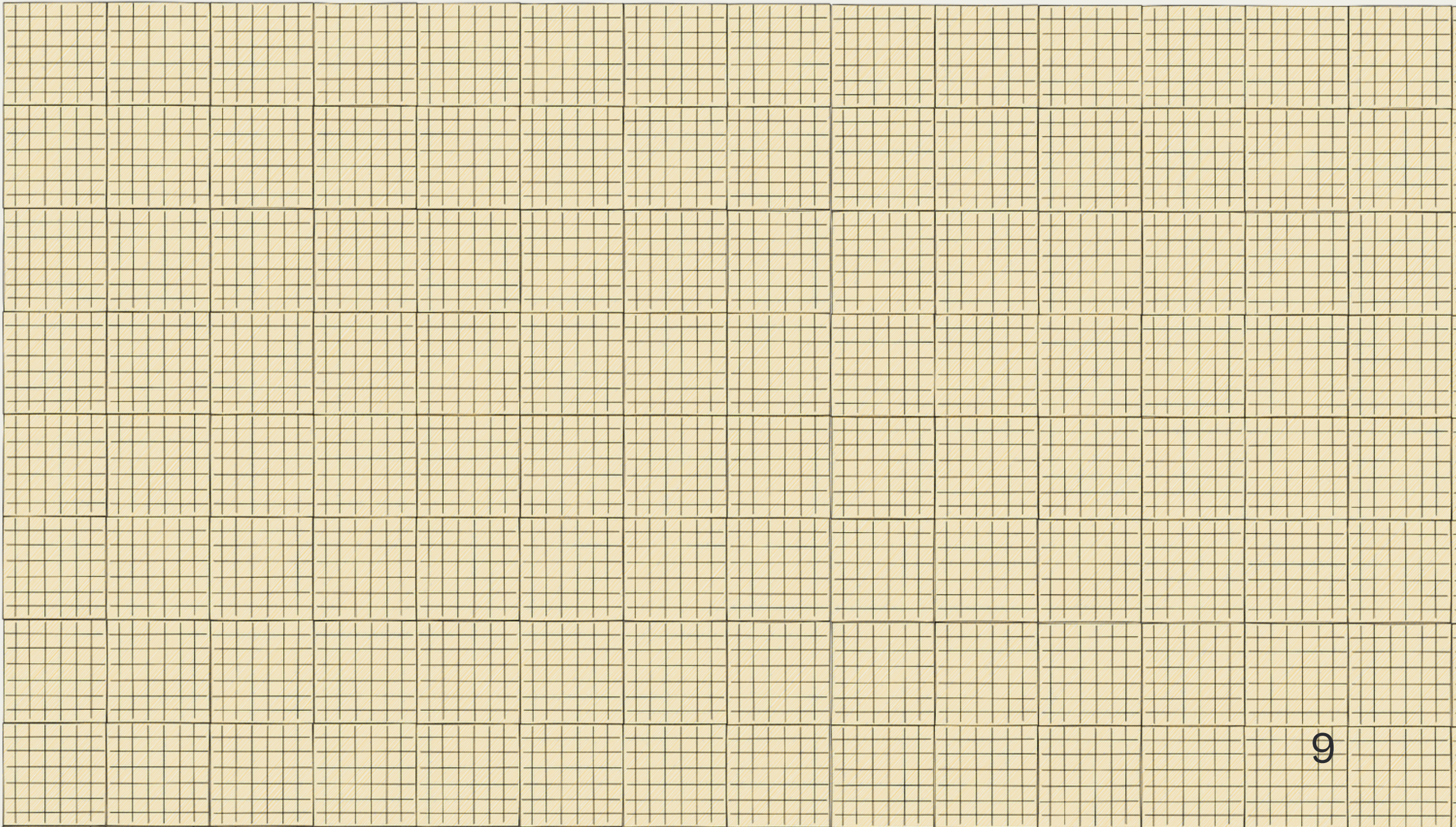


HOW DOES ZARR WORK?



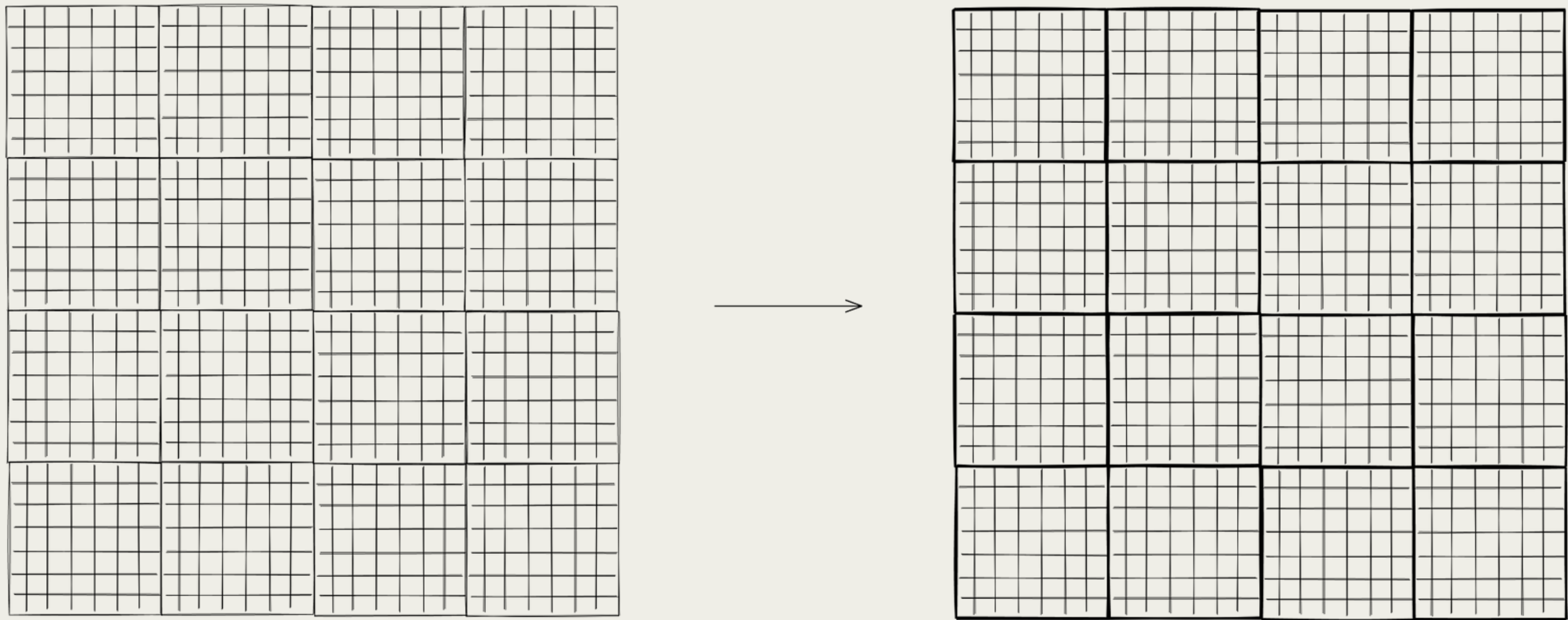
HOW DOES ZARR WORK?

What if data is too big to fit in memory?



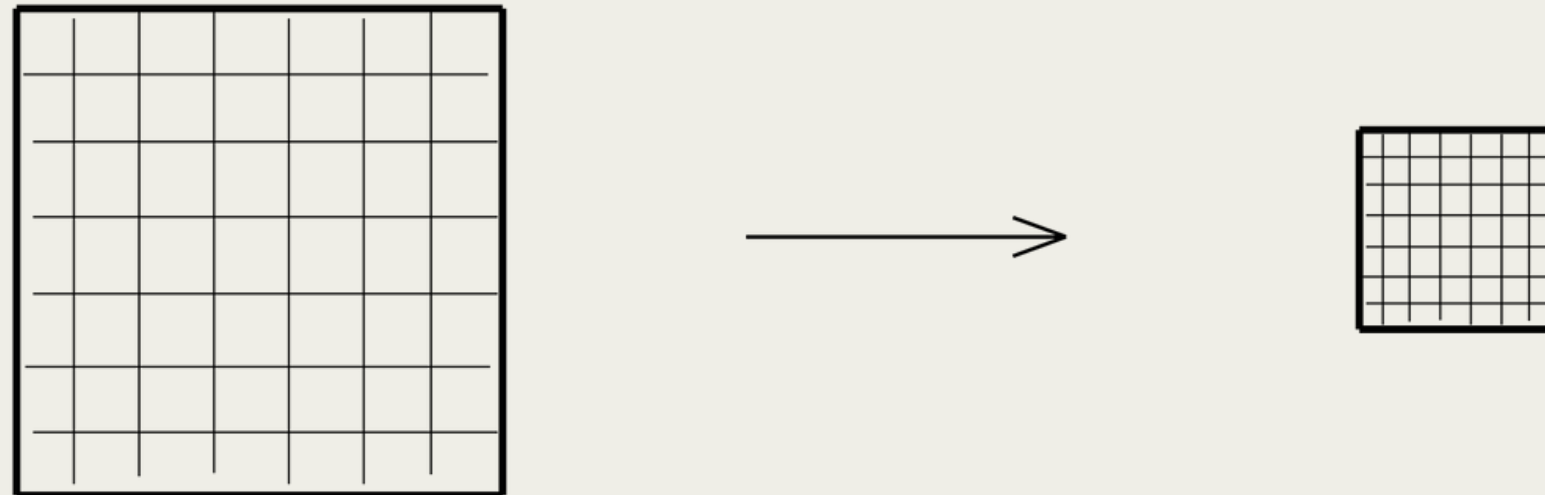
HOW DOES ZARR WORK?

Divide the array into chunks (Chunking)



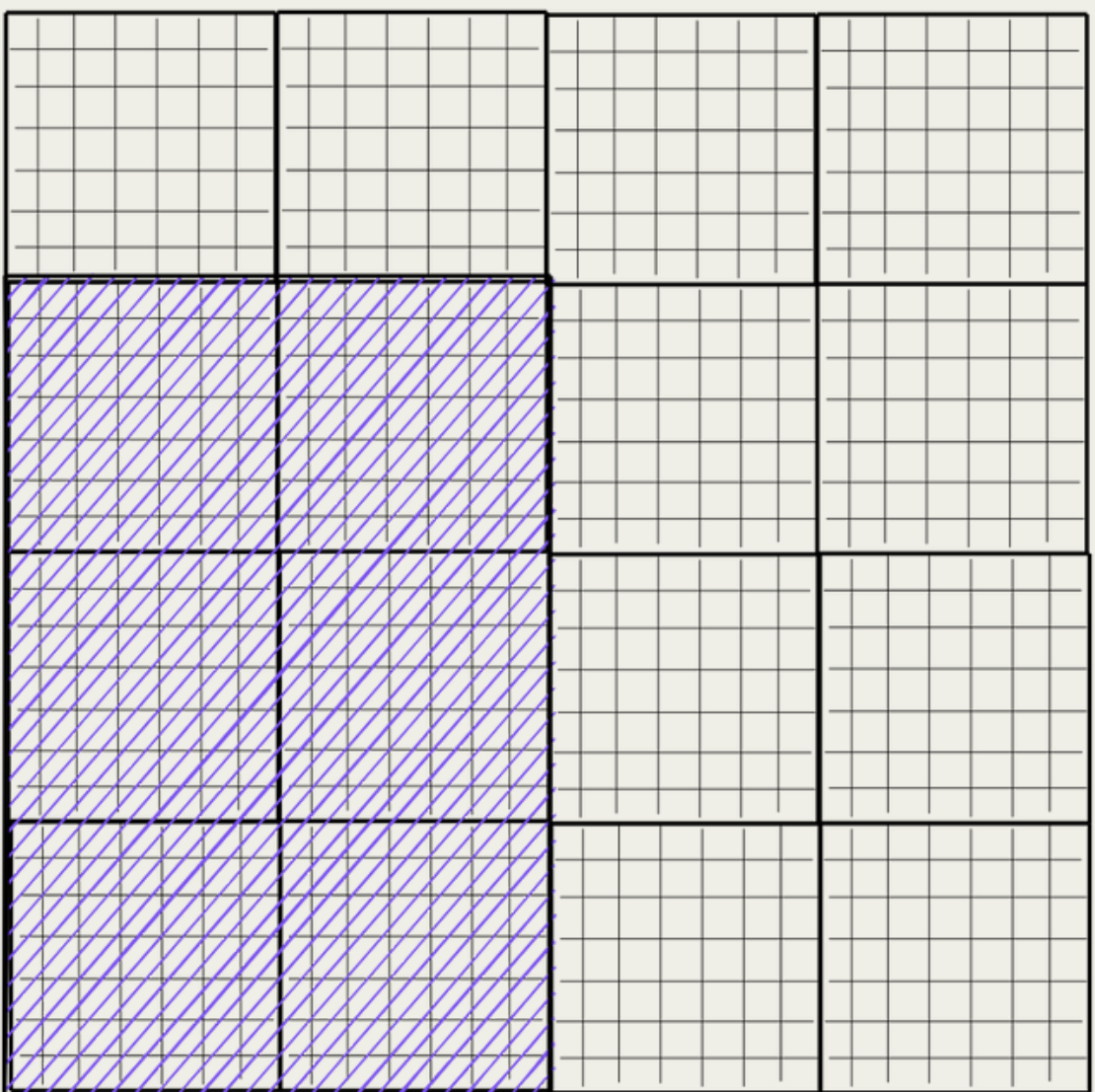
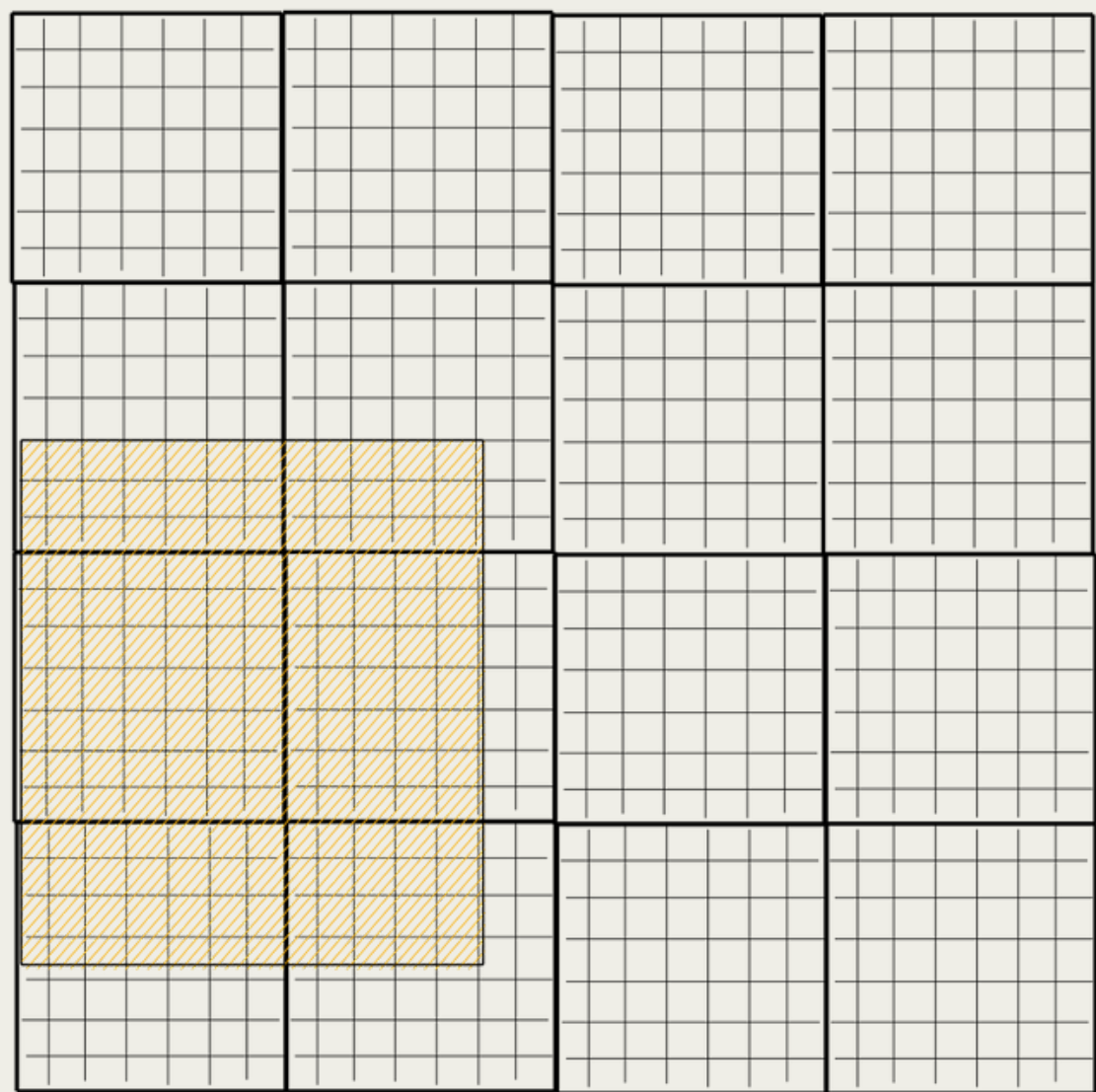
HOW DOES ZARR WORK?

Compress each chunk

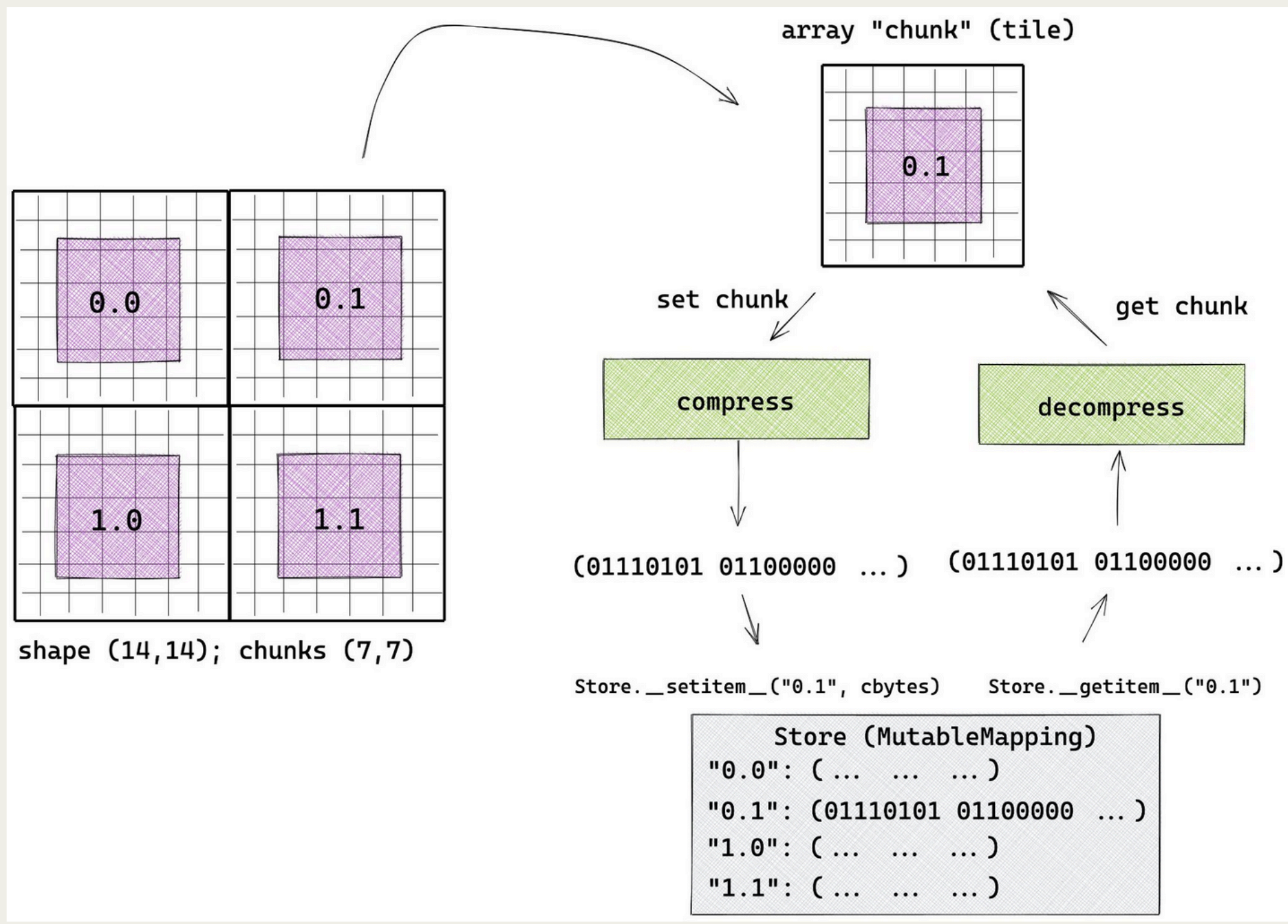


HOW DOES ZARR WORK?

Retrieve chunks only when needed



HOW DOES ZARR WORK?



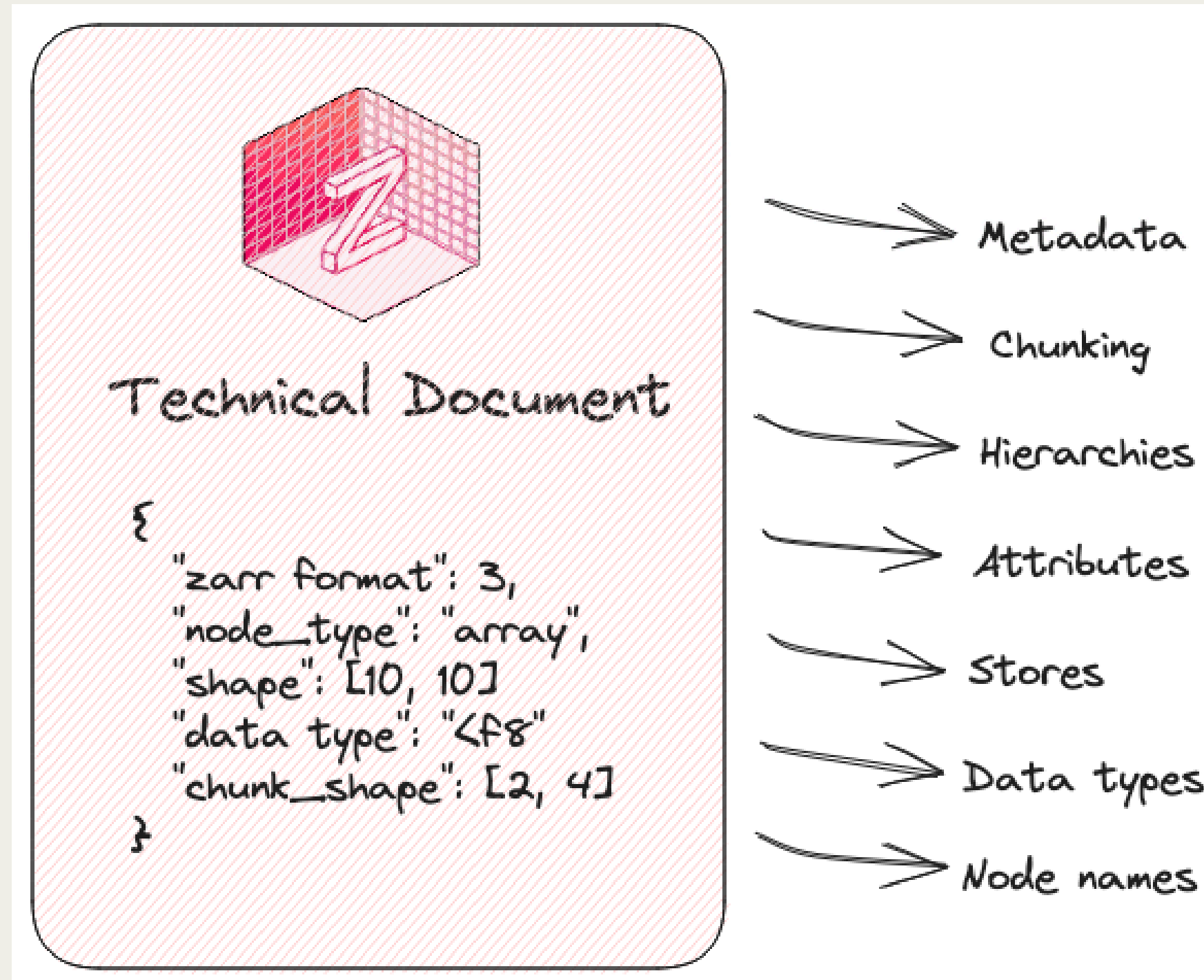
Zarr Specification

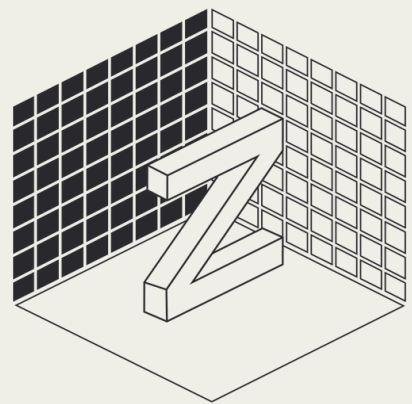
V1 → V2 → V3



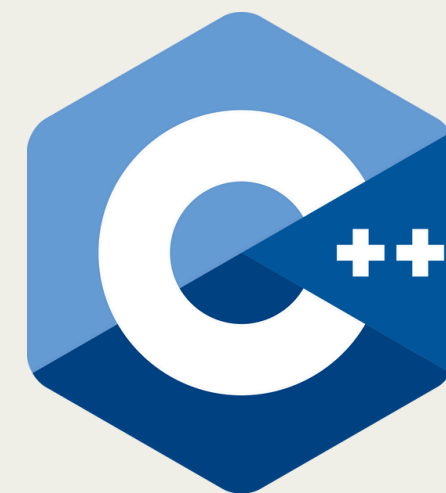
<https://zarr-specs.readthedocs.io/>

ZARR SPECIFICATION





Zarr



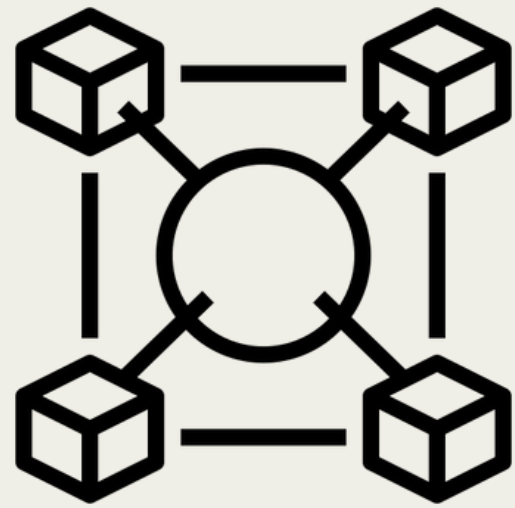
Zarr-Python 3

\$ pip install --upgrade zarr

\$ conda install --channel conda-forge zarr

What's new in Zarr-Python 3 &
Zarr-Spec 3?

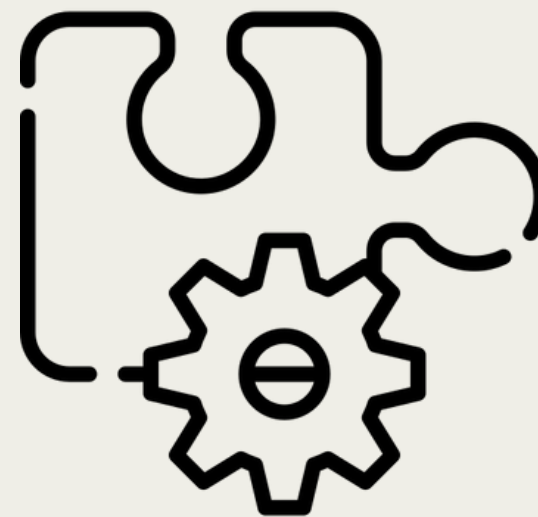
WHAT'S NEW?



Interoperability



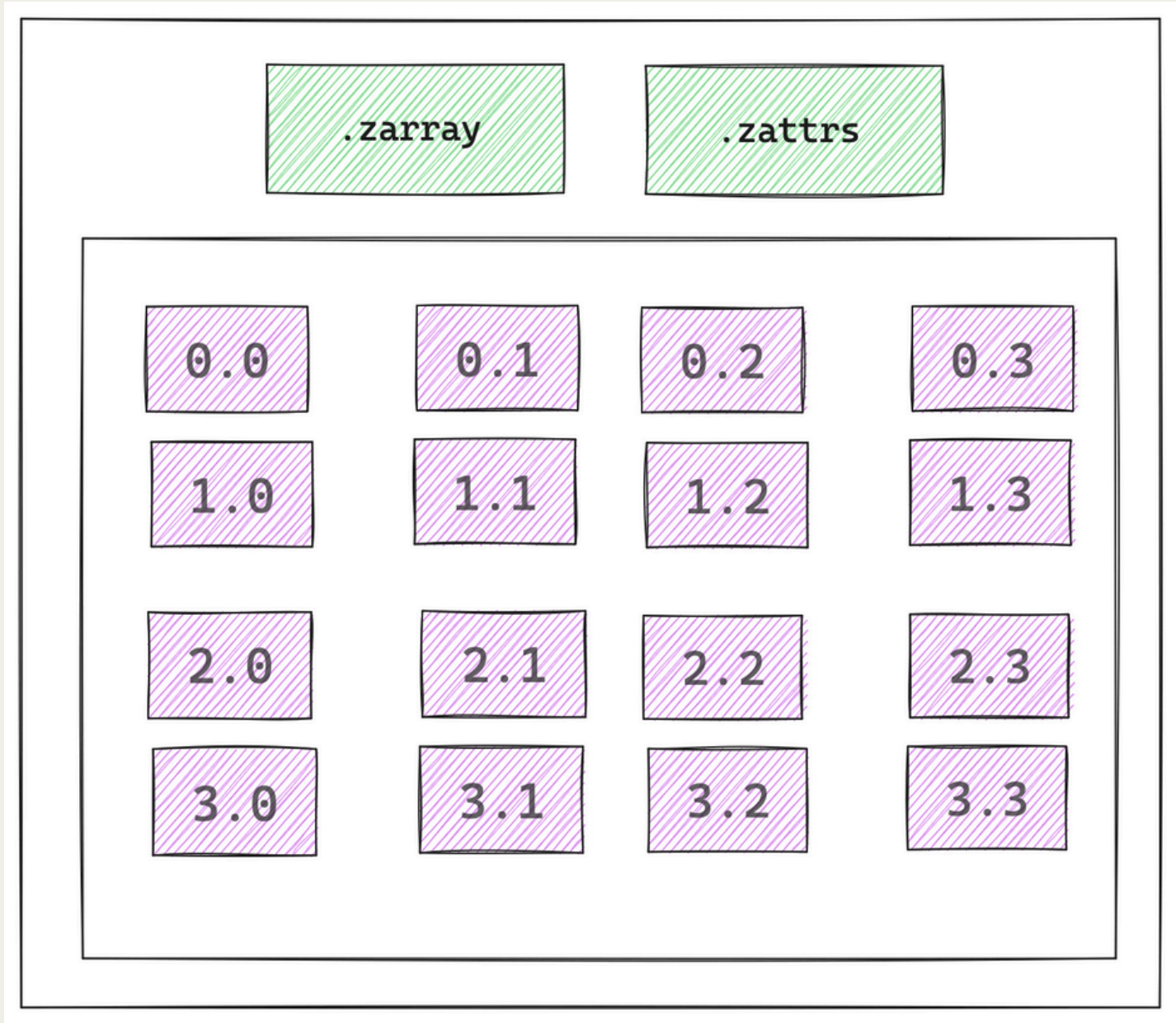
High-latency storage



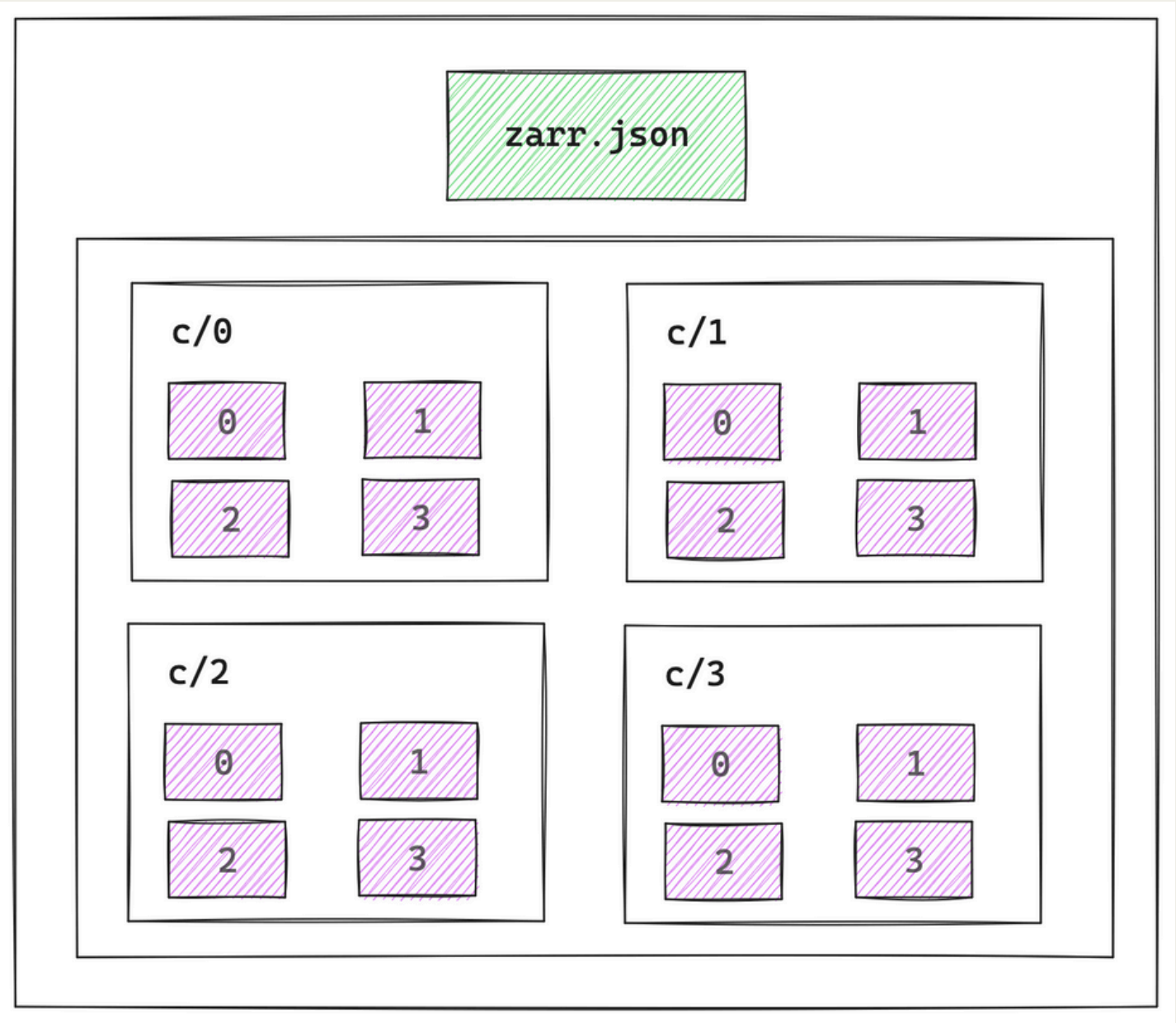
Extensibility

WHAT'S NEW?

Zarr Arrays V2 → V3



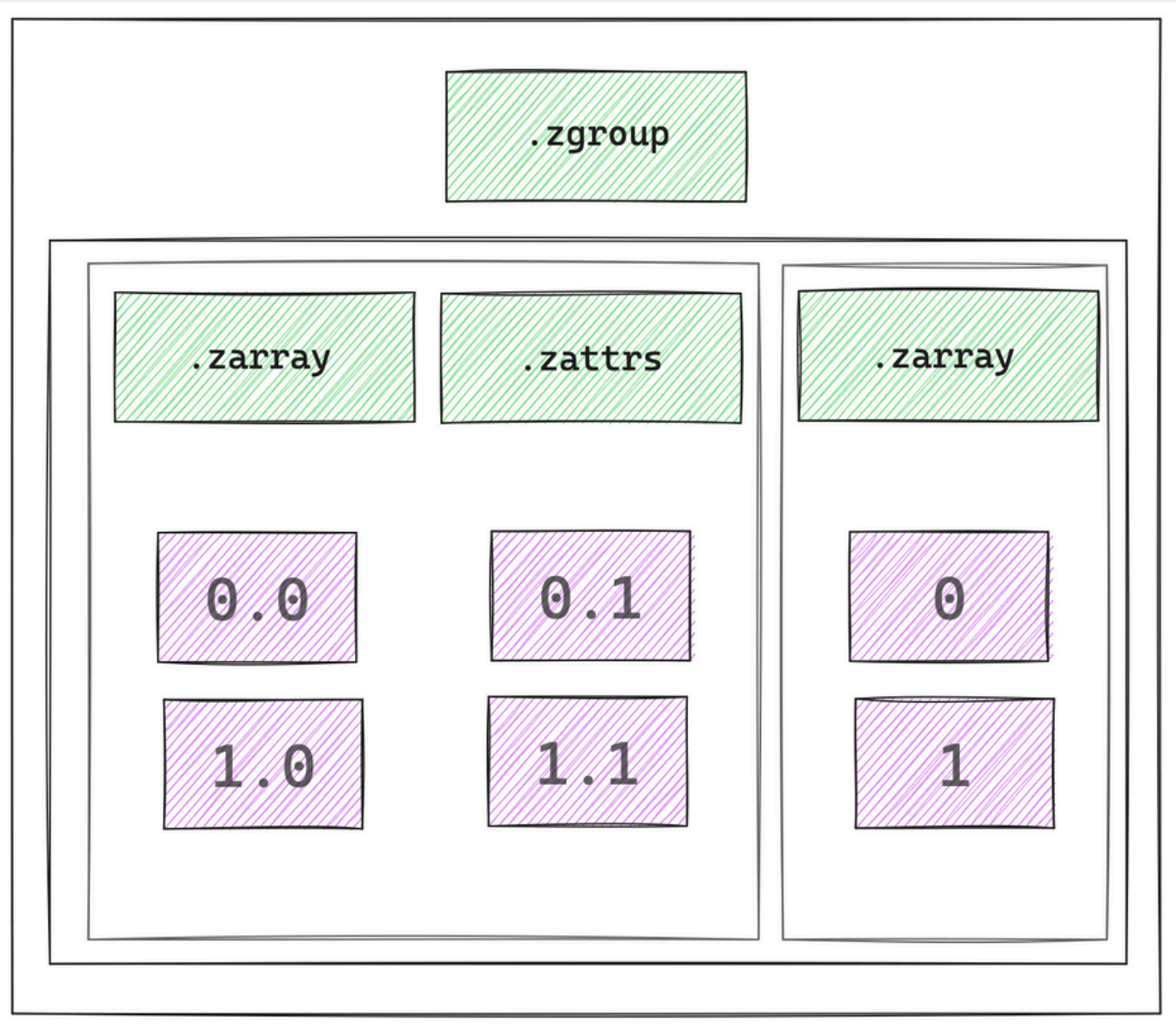
V2



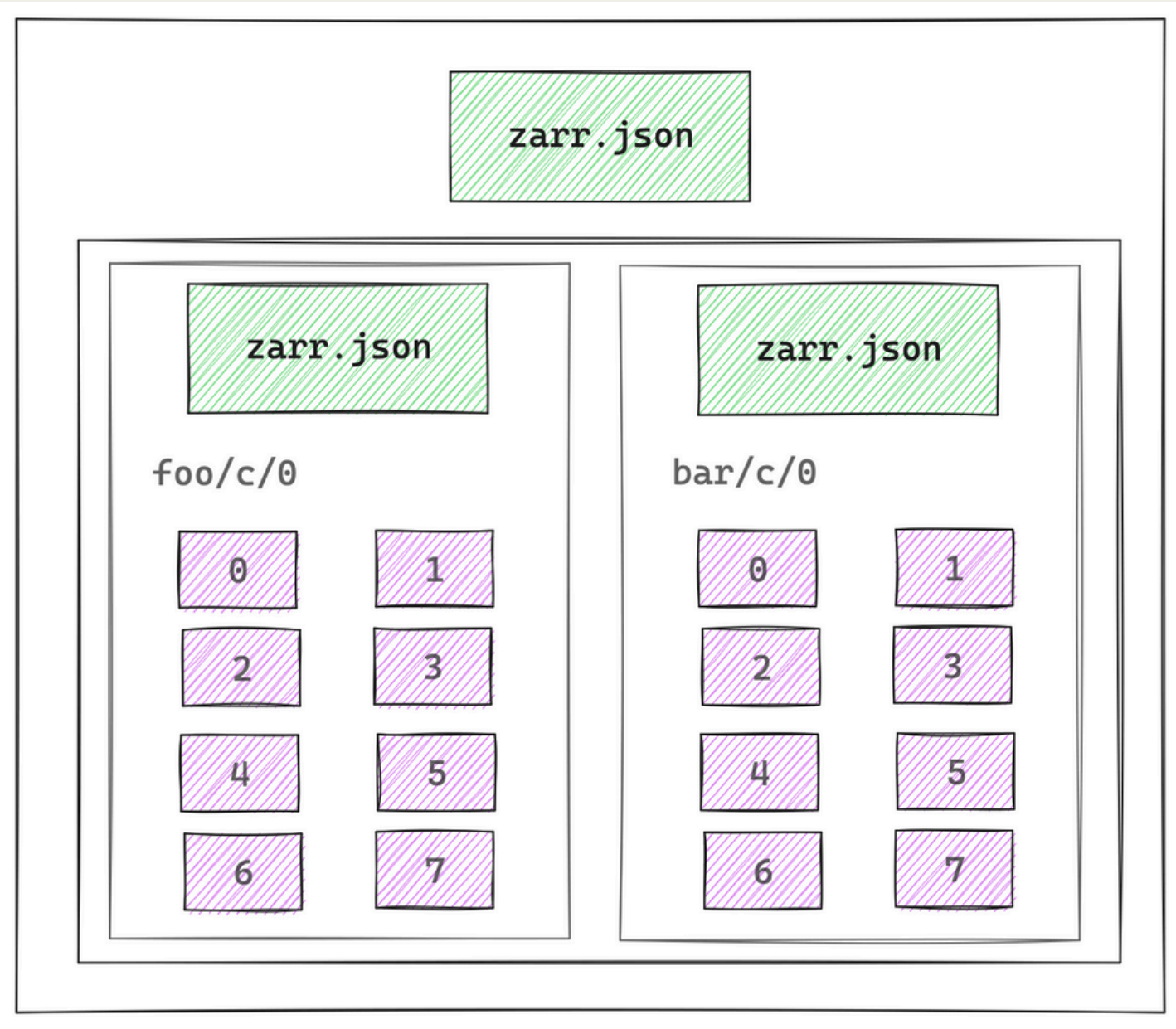
V3

WHAT'S?

Zarr Groups V2 → V3



V2



V3

New **ABC** Store (Abstract Base Class)

A B C S T O R E

- Replaces MutableMapping base class
- Allows extensibility to add new custom stores
- Implements LocalStore, ZipStore and FSStore
- Removed various exotic stores like SQLite, MongoDB, Redis, DBMS, LMDBS Stores

Custom **Codecs** via Entrypoint Mechanism

CUSTOM CODECS

- Enable flexible data compression and encoding strategies
- ZP3 includes Blosc, Zstandard and Gzip compressors only
- Numcodecs has been adapted to use Zarr's Codec entriypoint system

Zarr Adopters!

<https://zarr.dev/adopters/>



DANDI

→ Zarr is currently used by DANDI for lightsheet microscopy and some ex vivo MRI datasets, and is being considered as a backend for Neurodata Without Borders (NWB) neurophysiology datasets.

ZARR ADOP

hhmi

janelia
Research Campus

→ Zarr is used extensively within Janelia Research Campus for efficiently storing and accessing large imaging datasets



LEAP

JOIN US!

Today

< >

September 2025

Month

MON 1 Sept	TUE 2	WED 3	THU 4	FRI 5	SAT 6	SUN 7
		20:30 GeoZarr 23:30 Zarr Com		19:30 Zarr-Pyth 23:30 VirtualiZa		
8	9	23:30 Zarr Offic	11	19:30 Zarr-Pyth	13	14
15	16	23:30 Zarr Com	18	19:30 Zarr-Pyth 23:30 VirtualiZa	20	21
22	23	23:30 Zarr Offic	25	19:30 Zarr-Pyth	27	28
29	30	20:30 GeoZarr 23:30 Zarr Com	2	19:30 Zarr-Pyth 23:30 VirtualiZa	4	5

Zarr Public Calendar

Events shown in time zone: (GMT+05:30) India Standard Time - Kolkata

[Add to Google Calendar](#)

Google

Calendar

<https://zarr.dev/community-calls/>

Thank you!

ANY QUESTIONS?

Sanket Verma

21st September, 2025