

When is deletion, deletion?

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About Me

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Research Areas

Usable Security
Security and Privacy
Cloud Computing
Trust



"Before I write my name on the board, I'll need to know how you're planning to use that data."

*4.Are you under the age of 18?

Yes



If under the age of 18, please state why. (



Overview

Layout

- ➡ The importance of deletion
- ➡ Cloud Computing
- ➡ Assured deletion
- ➡ Cloud deletion requirements
- ➡ Cloud storage infrastructure
- ➡ Challenges
- ➡ Conceptual model

Why deletion?

- Regulations, GDPR (e.g., The right to be forgotten)
- Some business rely on deletion
- Privacy reasons
- To get more space
- To forget things
- Deal with regrets

Why deletion?



March 2018

Twitter: Trending...

2. ...
3. #DeleteFacebook
4. ...

Solved: Deleted folders keep reappearing - Dropbox Community - 20277

<https://www.dropboxforum.com/t5/...and.../Deleted-folders-keep-reappearing/.../2027...> ▼

13 Jun 2018 - I have been using **Dropbox** for a few years across a number of devices (2 desktop Macs, - 20277. ... Deleted folders keep reappearing. I'm hoping someone can ...

Deleted files keep reappearing - Dropbox Community - 259067	5 Jan 2018
Deleted folders keep reappearing - Dropbox Community - 228434	22 Jun 2017
Deleted folders keep reappearing - Dropbox Community - 226255	18 Jun 2017
Deleted folders keep reappearing - Dropbox Community - 220629	11 May 2017

More results from www.dropboxforum.com



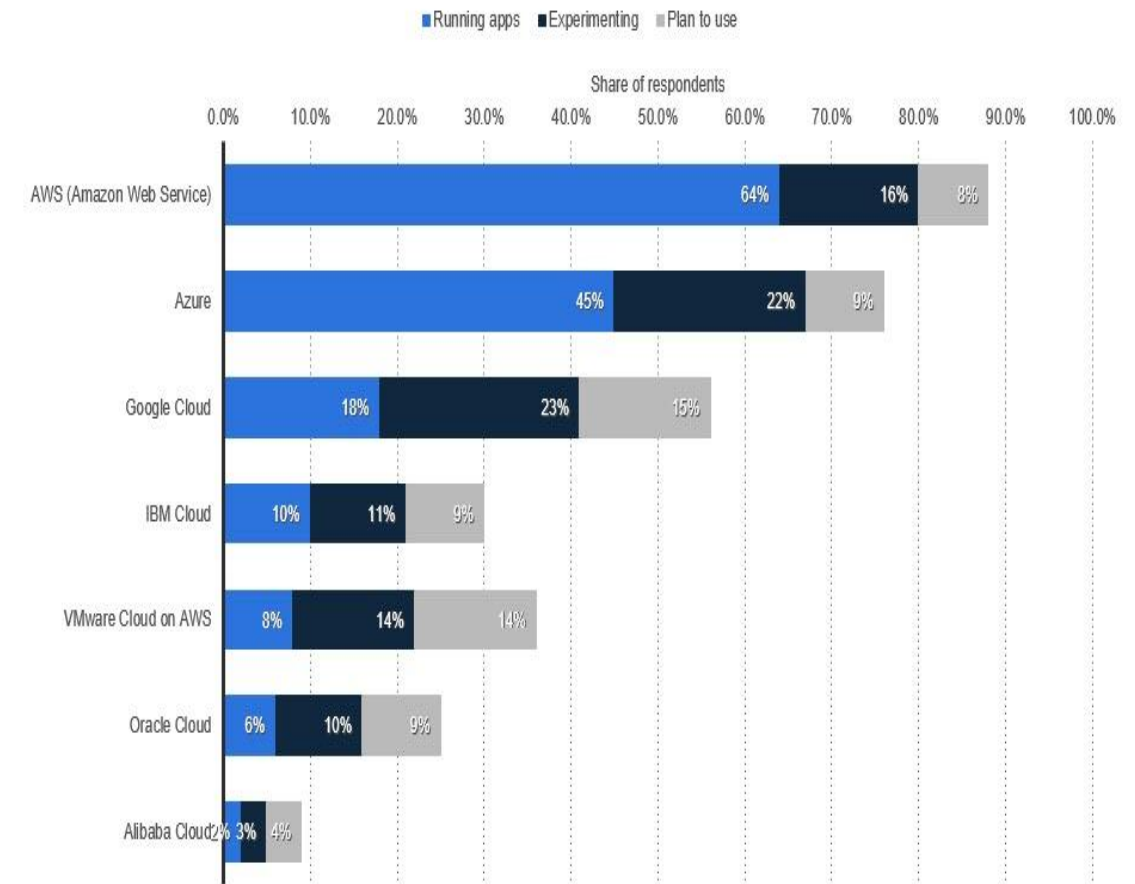
Cloud computing

- Infinite storage
- Rapid resource provisioning
- Multi-tenancy
- Real time collaborations



Public cloud platform usage worldwide 2018

Current and planned usage of public cloud platform services running applications worldwide in 2018



Note: Worldwide; January 2018; 997 Respondents; Technical executives, managers, and practitioners of cloud technologies

Further information regarding this statistic can be found on .

Source: RightScale;

Cloud deletion

Providing assured deletion should

- Not disrupt service availability
- Make data either inaccessible or completely remove it
- Affect all copies
- Be fine-grained
- Take place immediately and without errors
- Provable to users
- Computation friendly

Assured deletion properties

- Inaccessibility
- Timeliness
- adequate feedback
- Complete
- Granularity
- Anonymisation
- Provable
-

Cloud Infrastructure

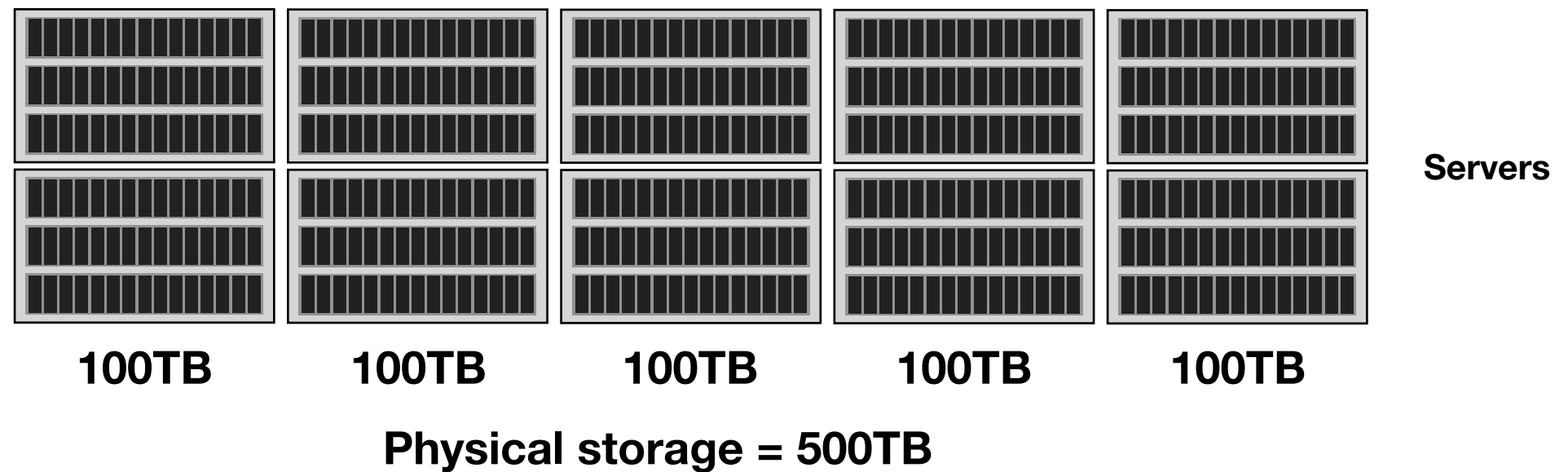


100TB

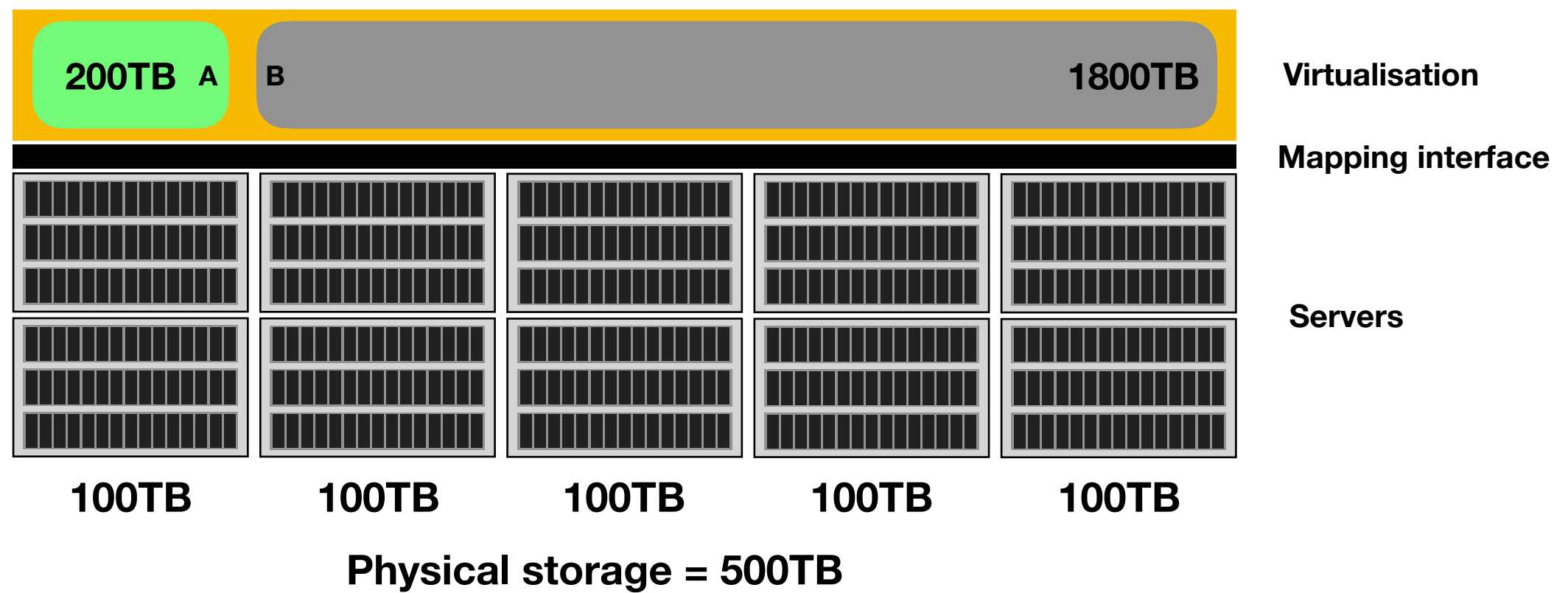


Cloud Infrastructure

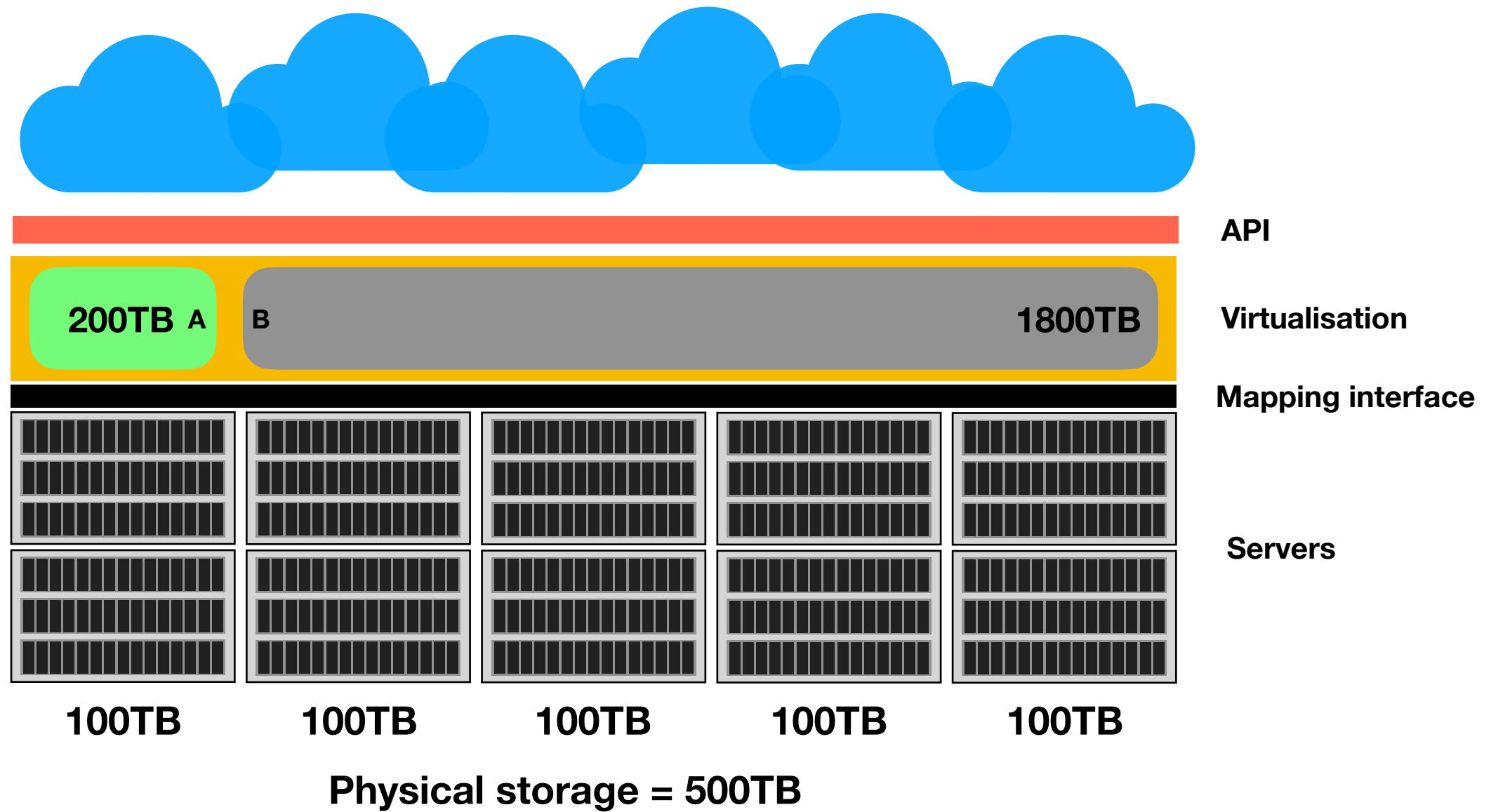
Hot Data = SSD
Cold Data = HDD
Archived = Tapes



Cloud Infrastructure

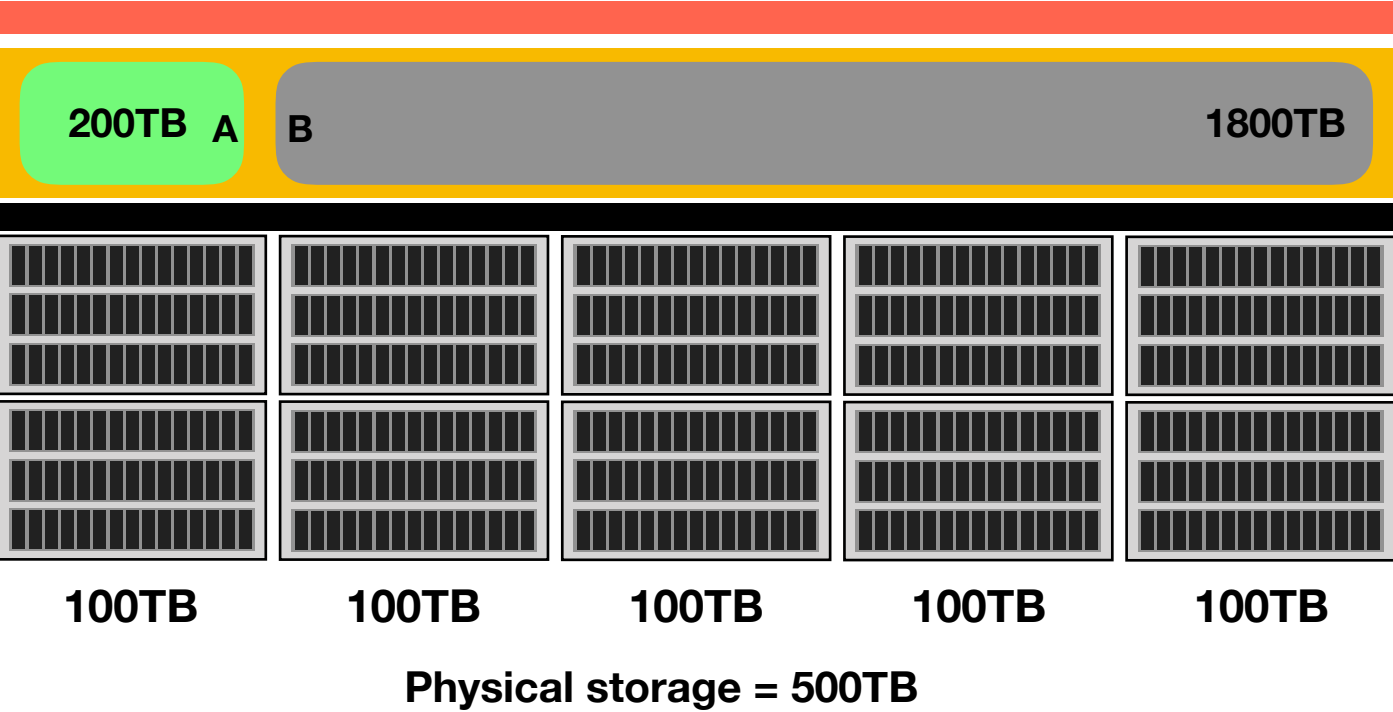
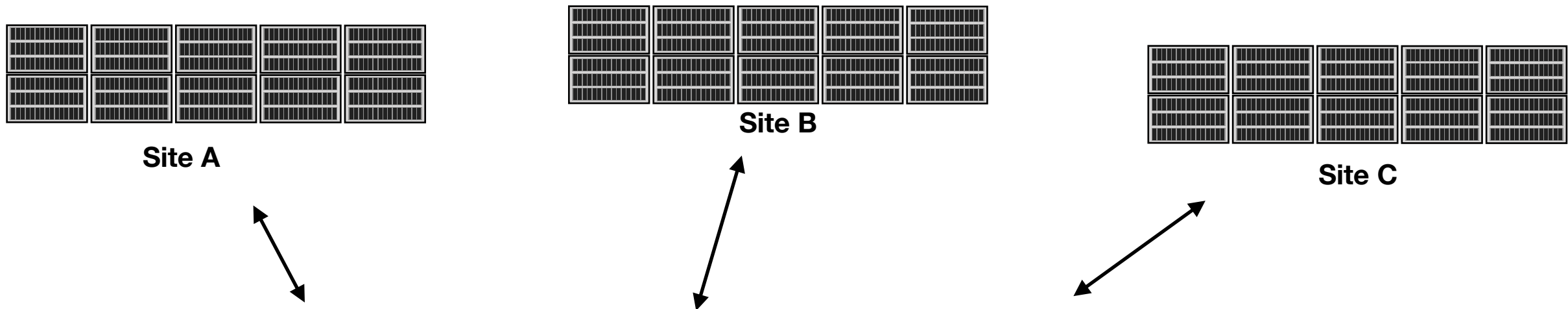


Cloud Infrastructure



Cloud Infrastructure

Backup



API

Virtualisation

Mapping interface

Server Rack

Cloud Infrastructure

BOB

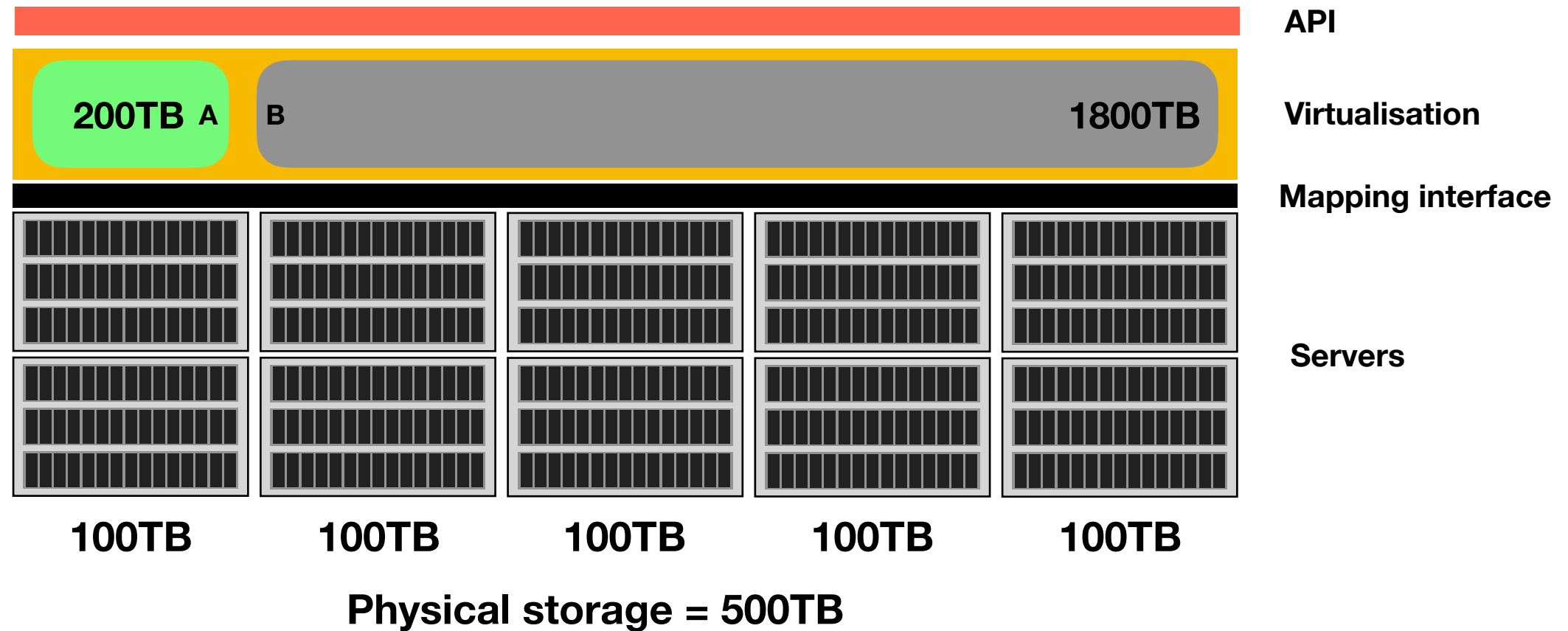
Requested = 200TB

Current data = 50TB

Alice

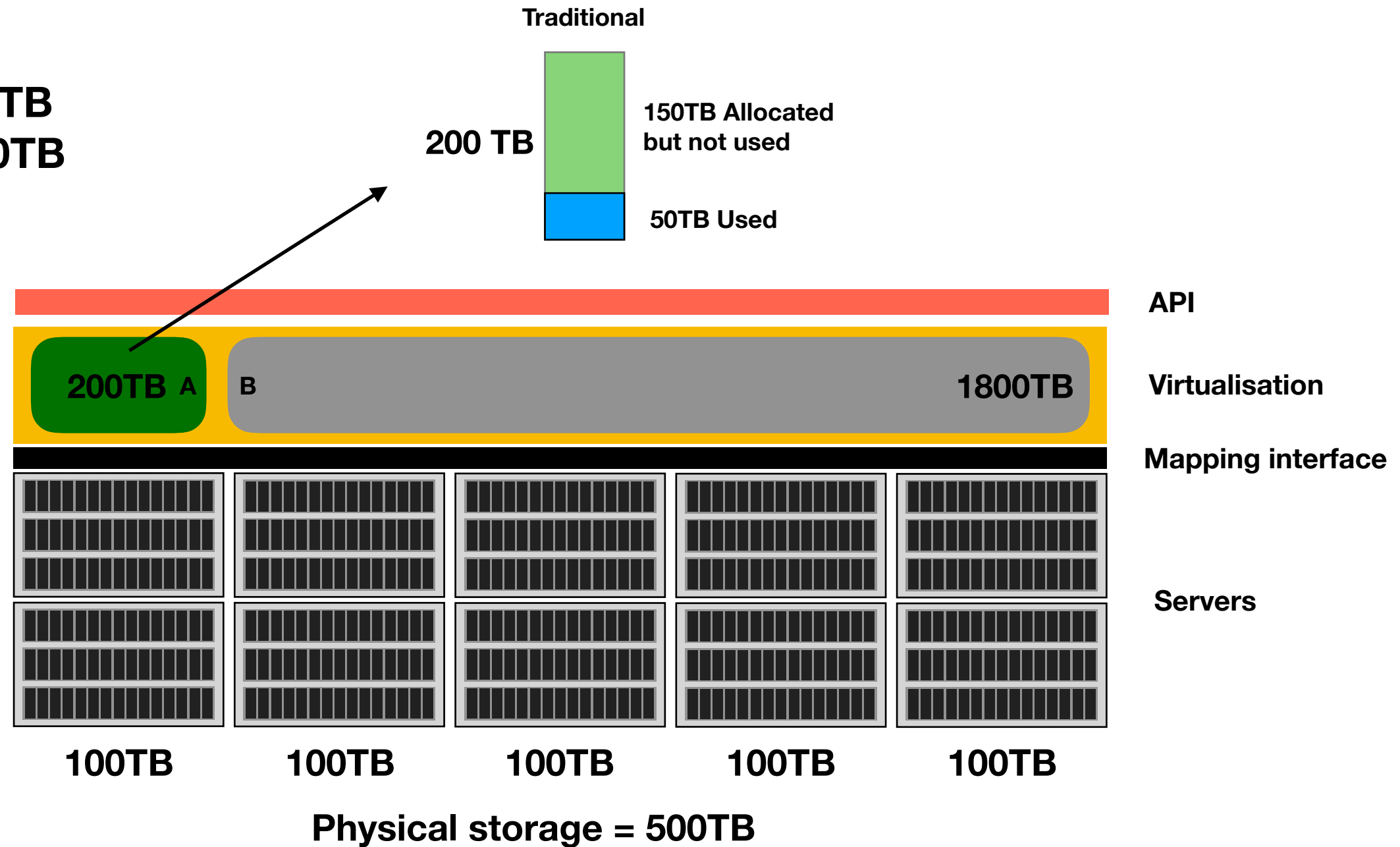
Requested = 400TB

Current data = 10TB



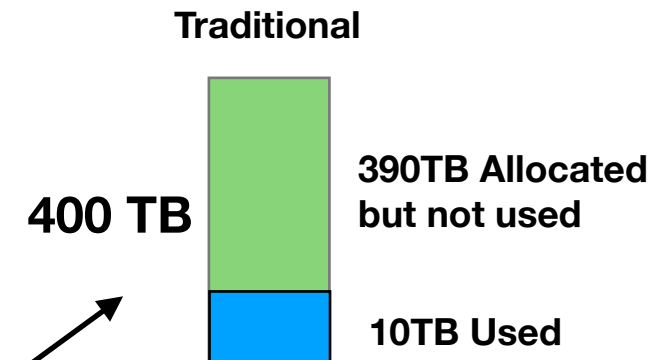
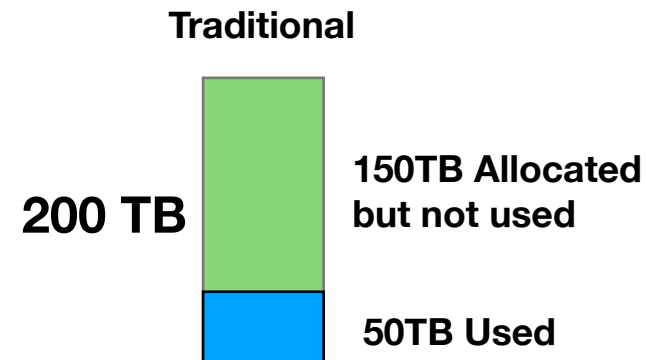
Cloud Infrastructure

BOB
Requested = 200TB
Current data = 50TB

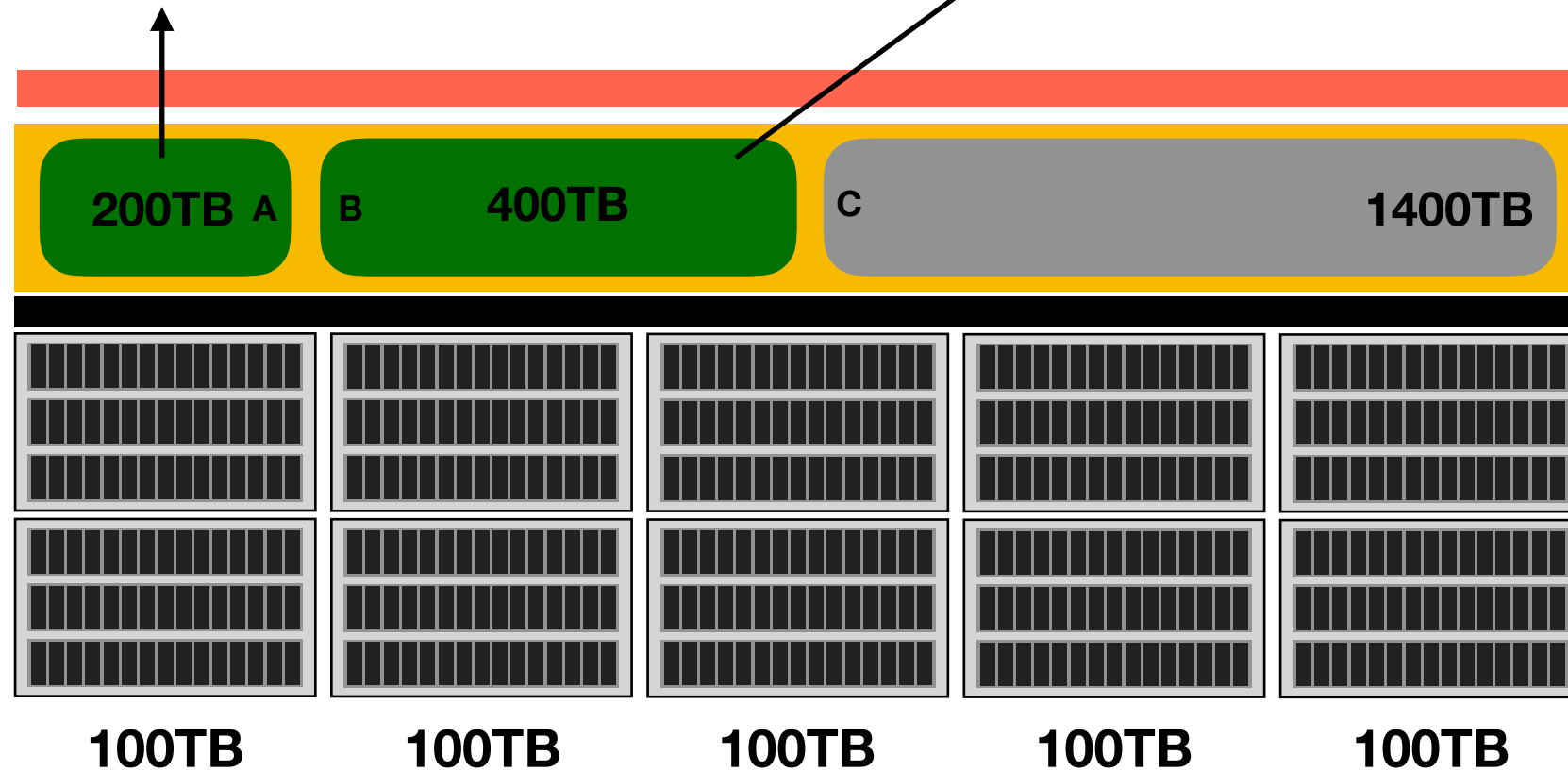


Cloud Infrastructure

BOB
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Current data = 50TB



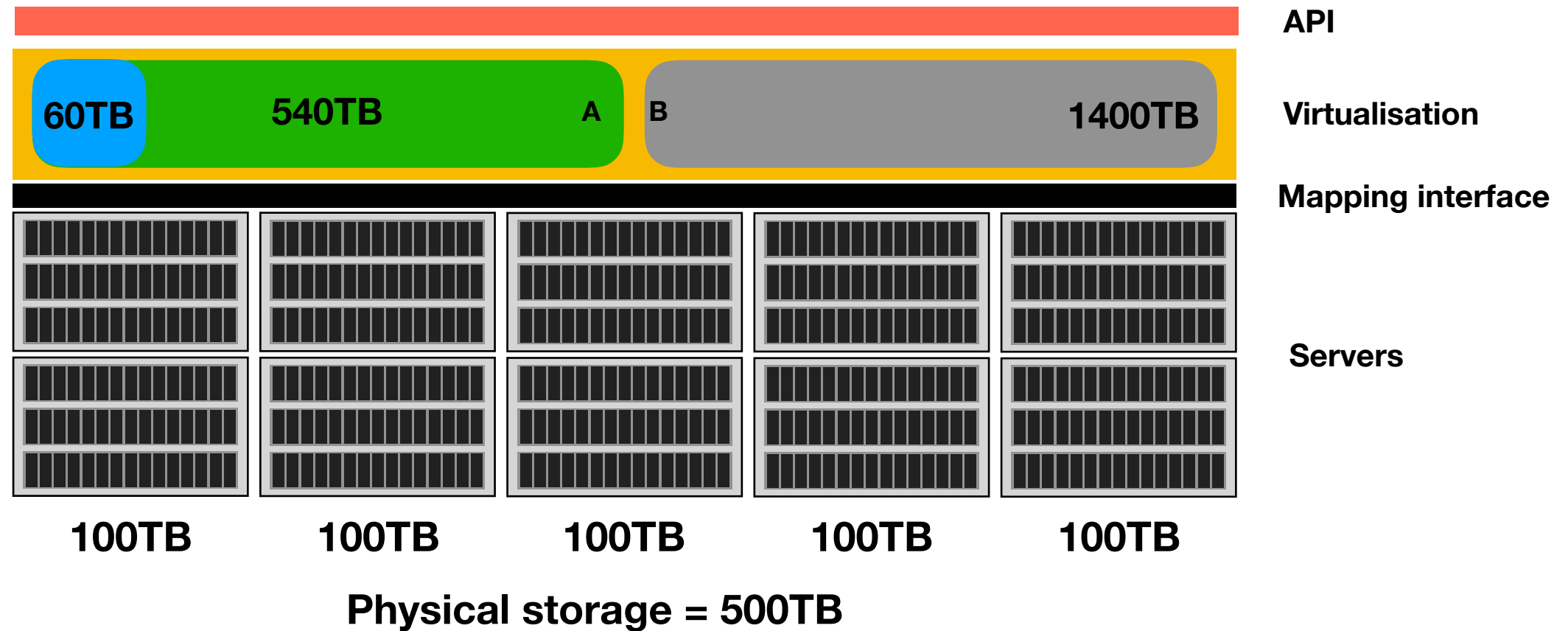
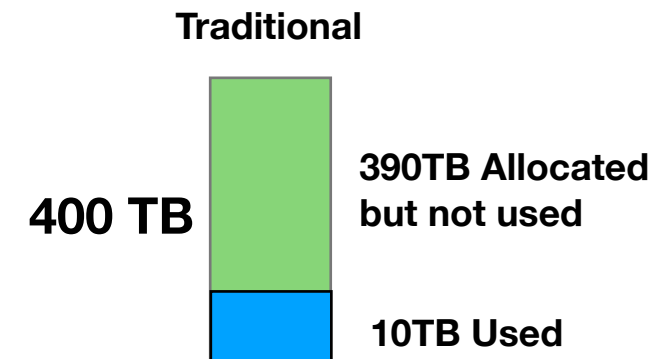
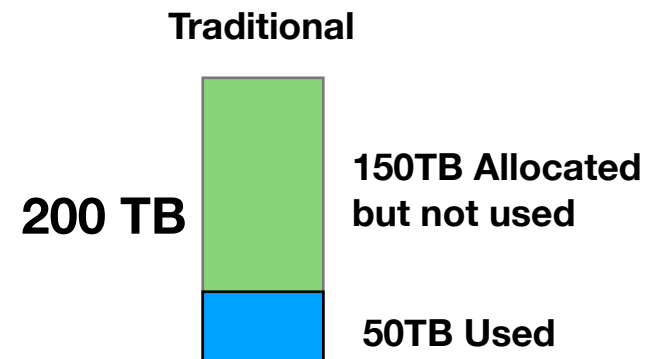
Alice
Requested = 400TB
Current data = 10TB



Physical storage = 500TB

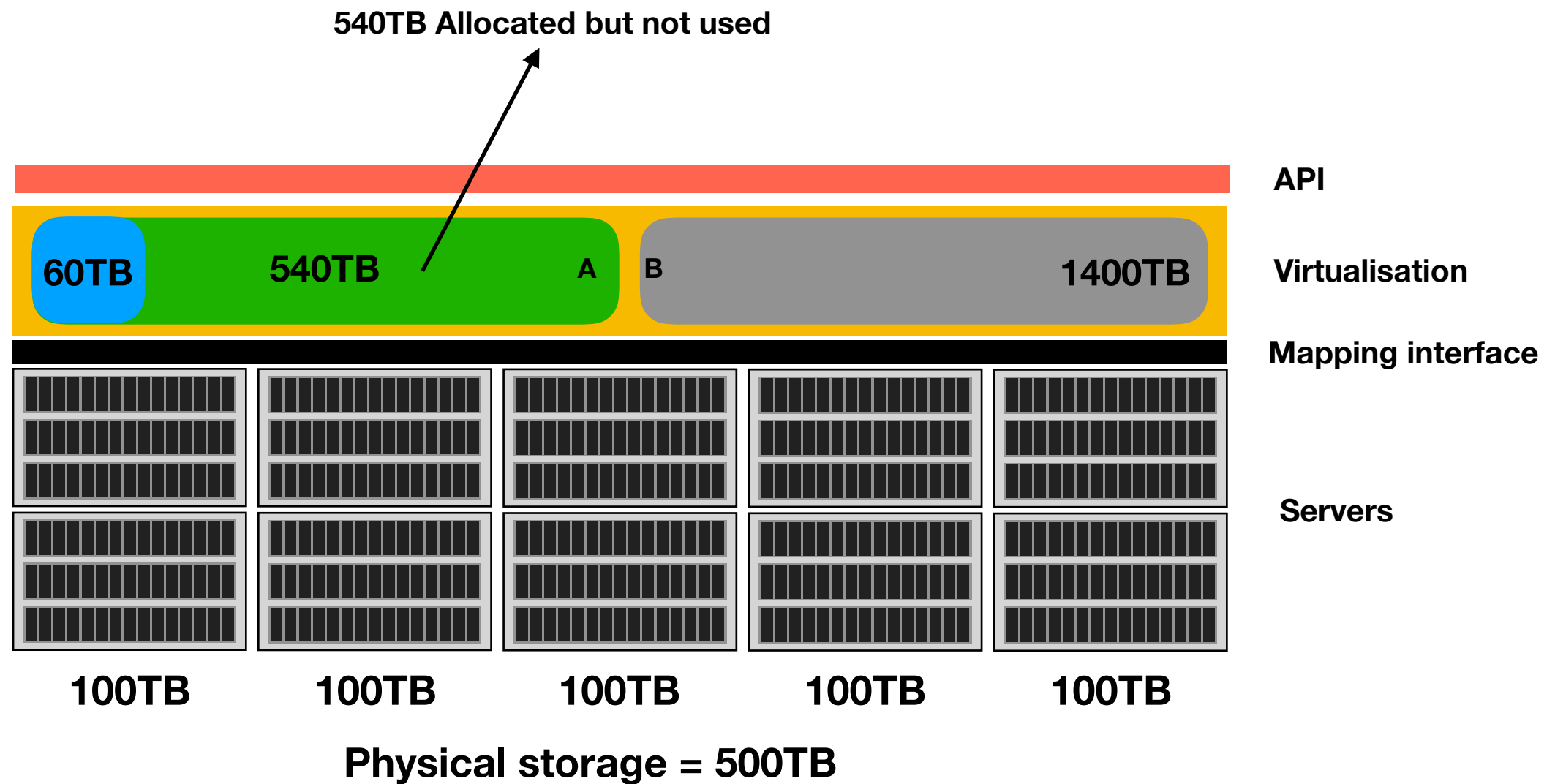
Cloud Infrastructure

BOB
Request = 200TB
Current data = 50TB



Cloud Infrastructure

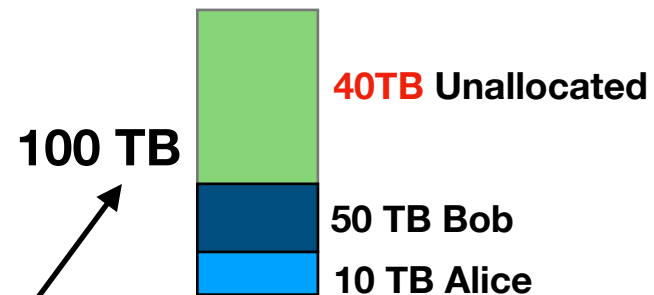
BOB
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Current data = 50TB



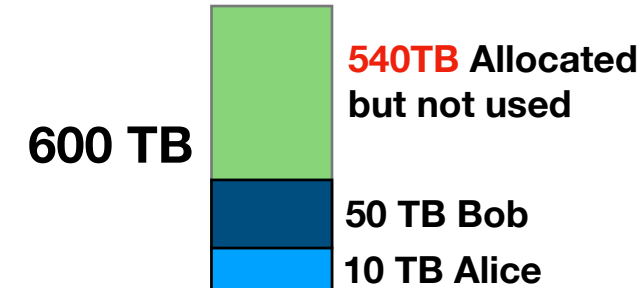
Cloud Infrastructure

BOB
Request = 200TB
Current data = 50TB

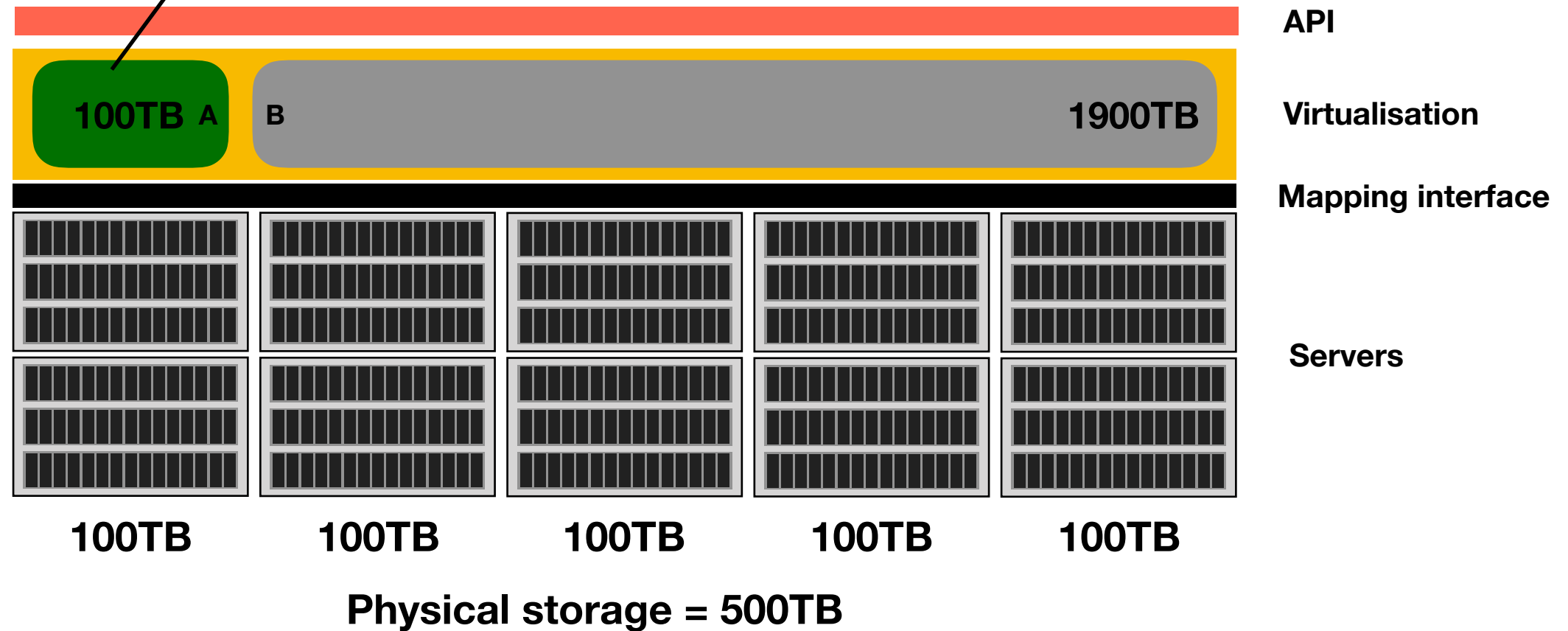
Thin Provisioning



Traditional Provisioning



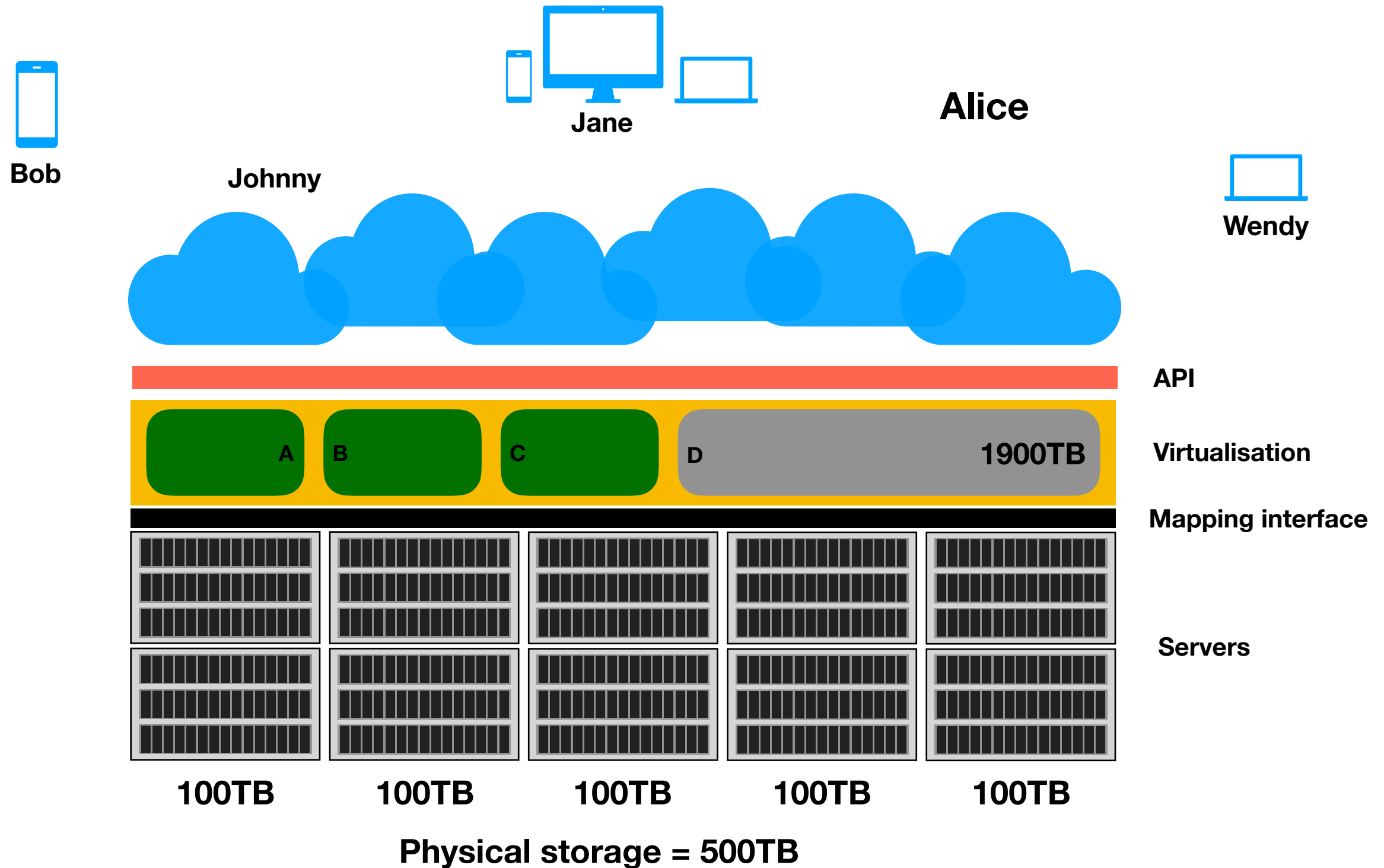
Alice
Requested = 400TB
Current data = 10TB



Existing assured deletion solutions

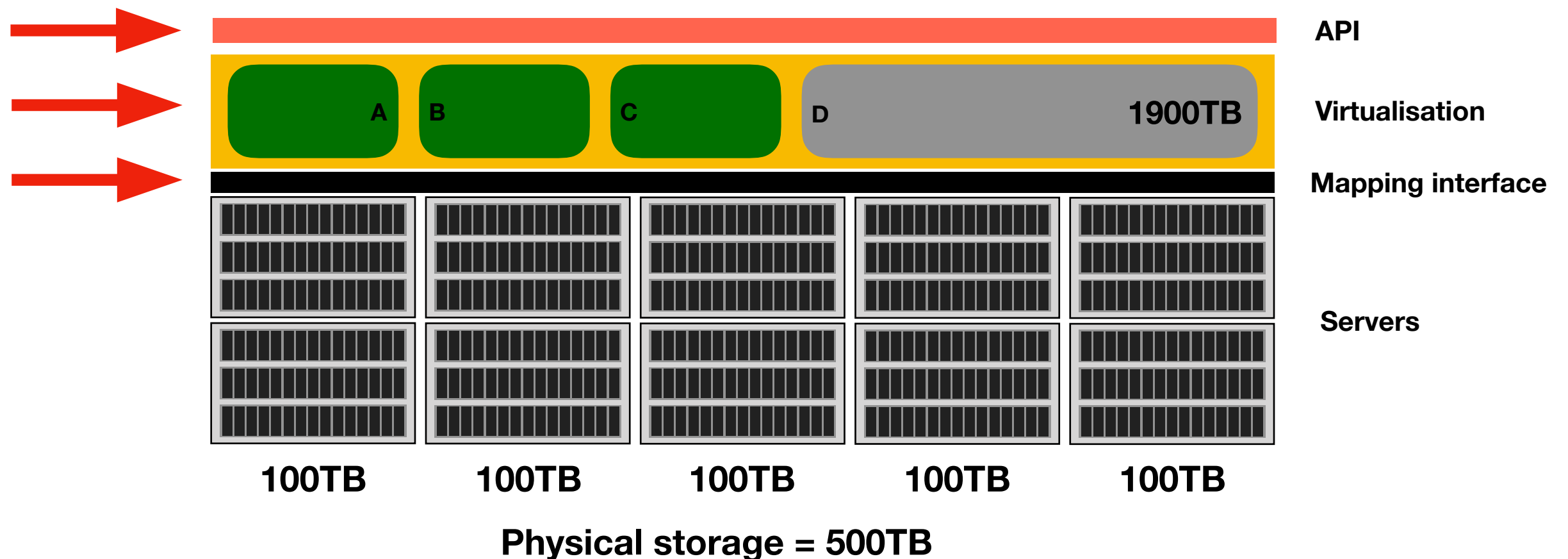
- **Overwriting**
- **Encryption**
- **Media destruction**
- **Scrubbing**
- **...**

Challenges



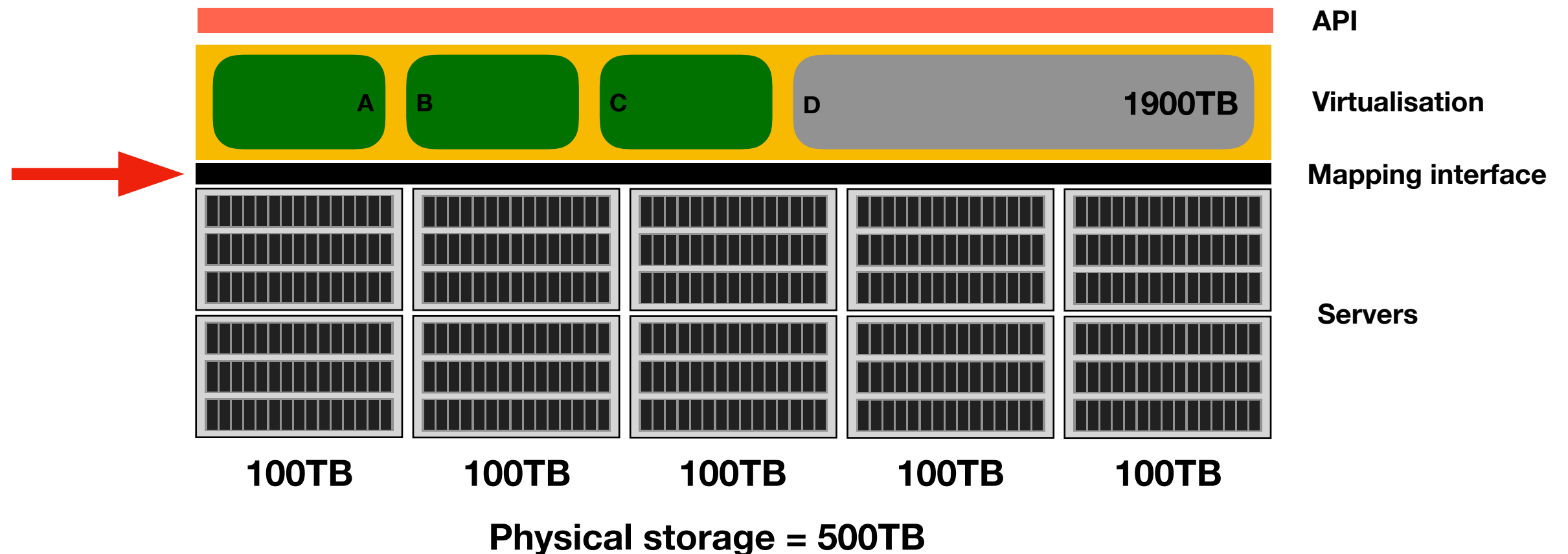
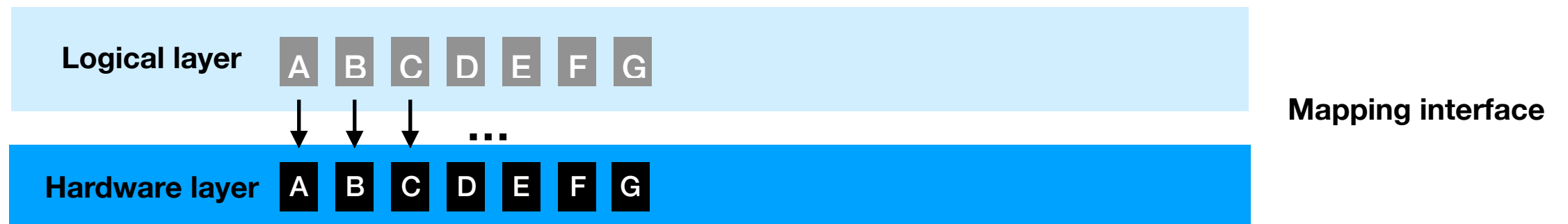
Challenges

Multiple logical layers



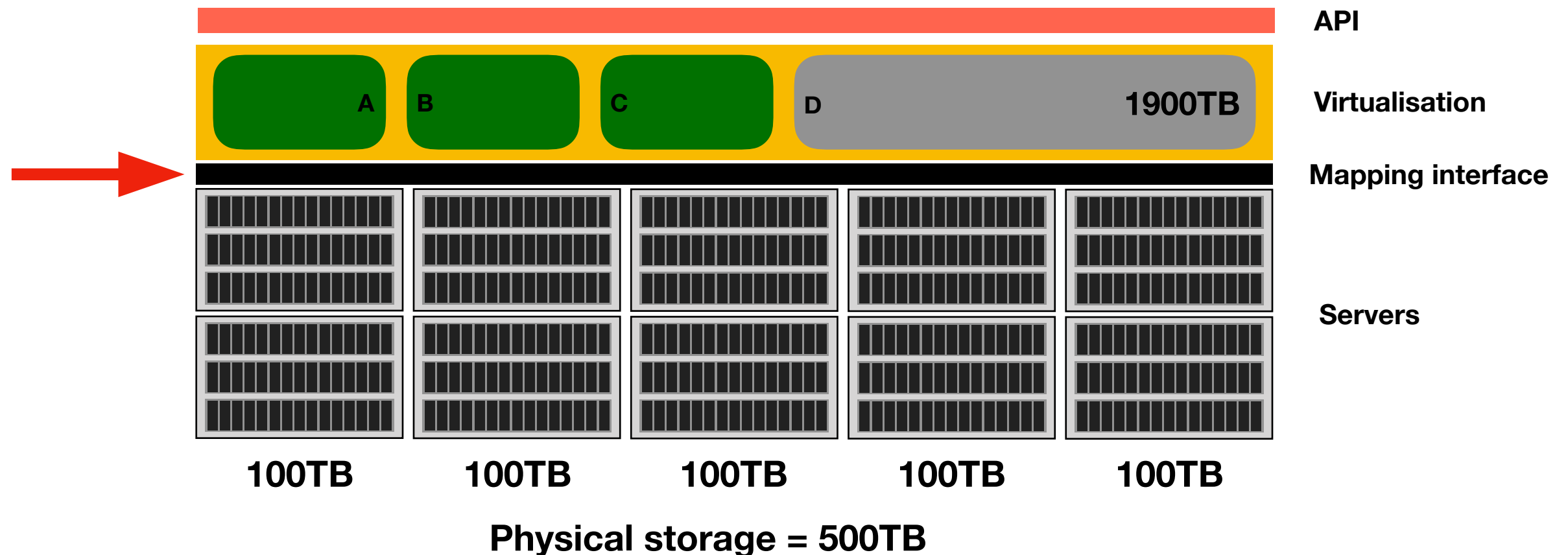
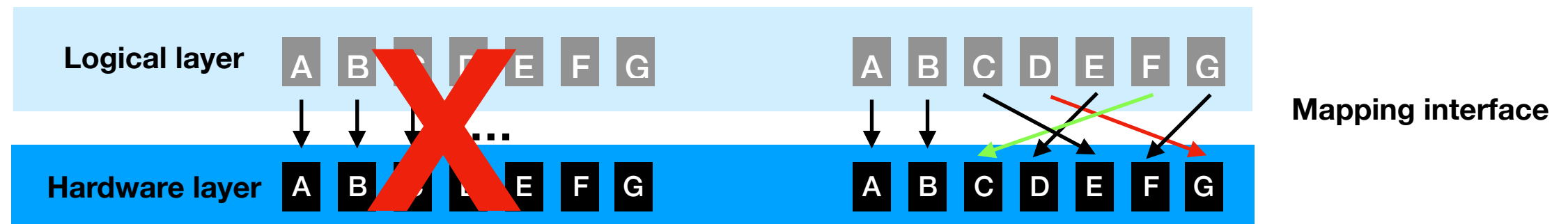
Challenges

Virtualisation



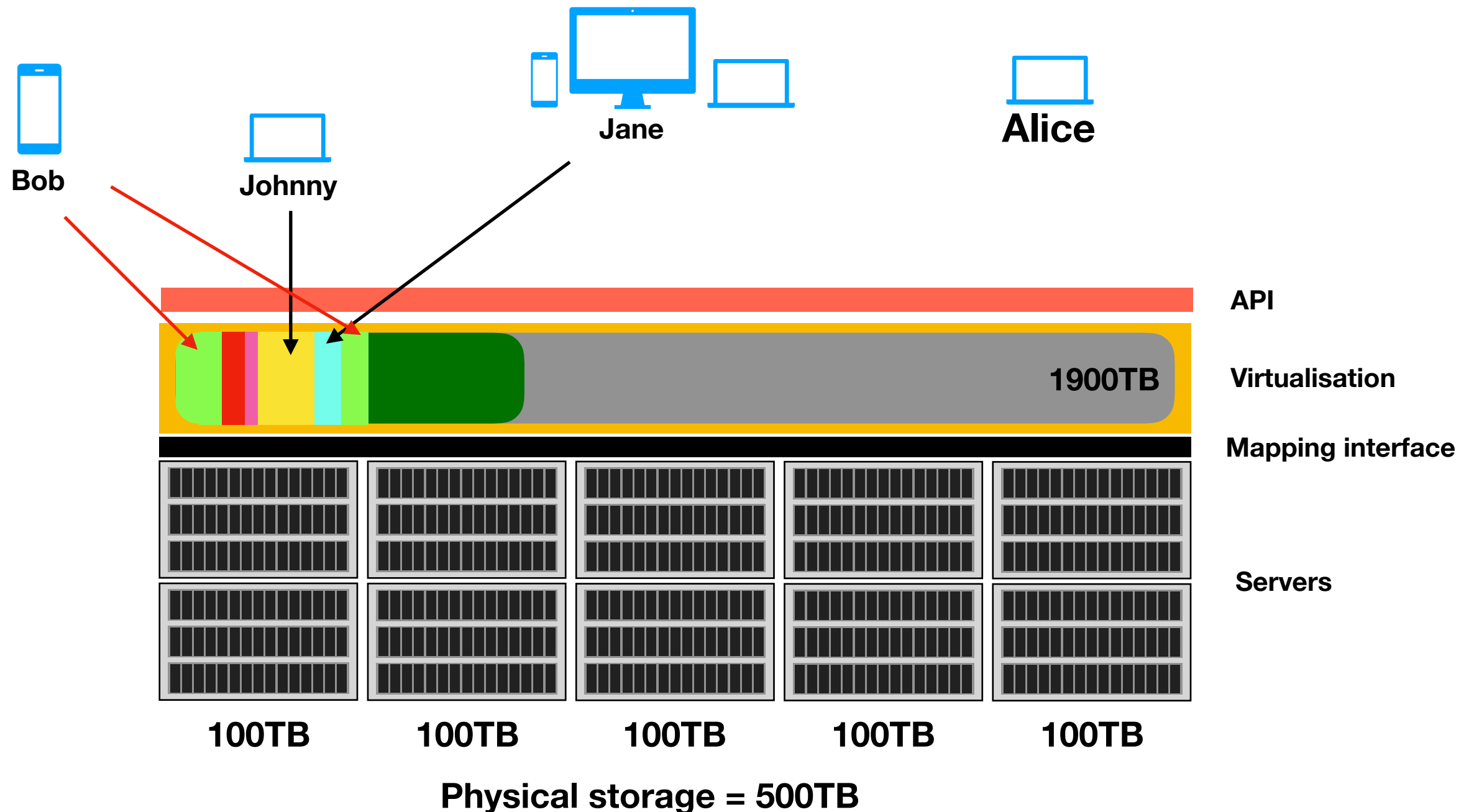
Challenges

Virtualisation



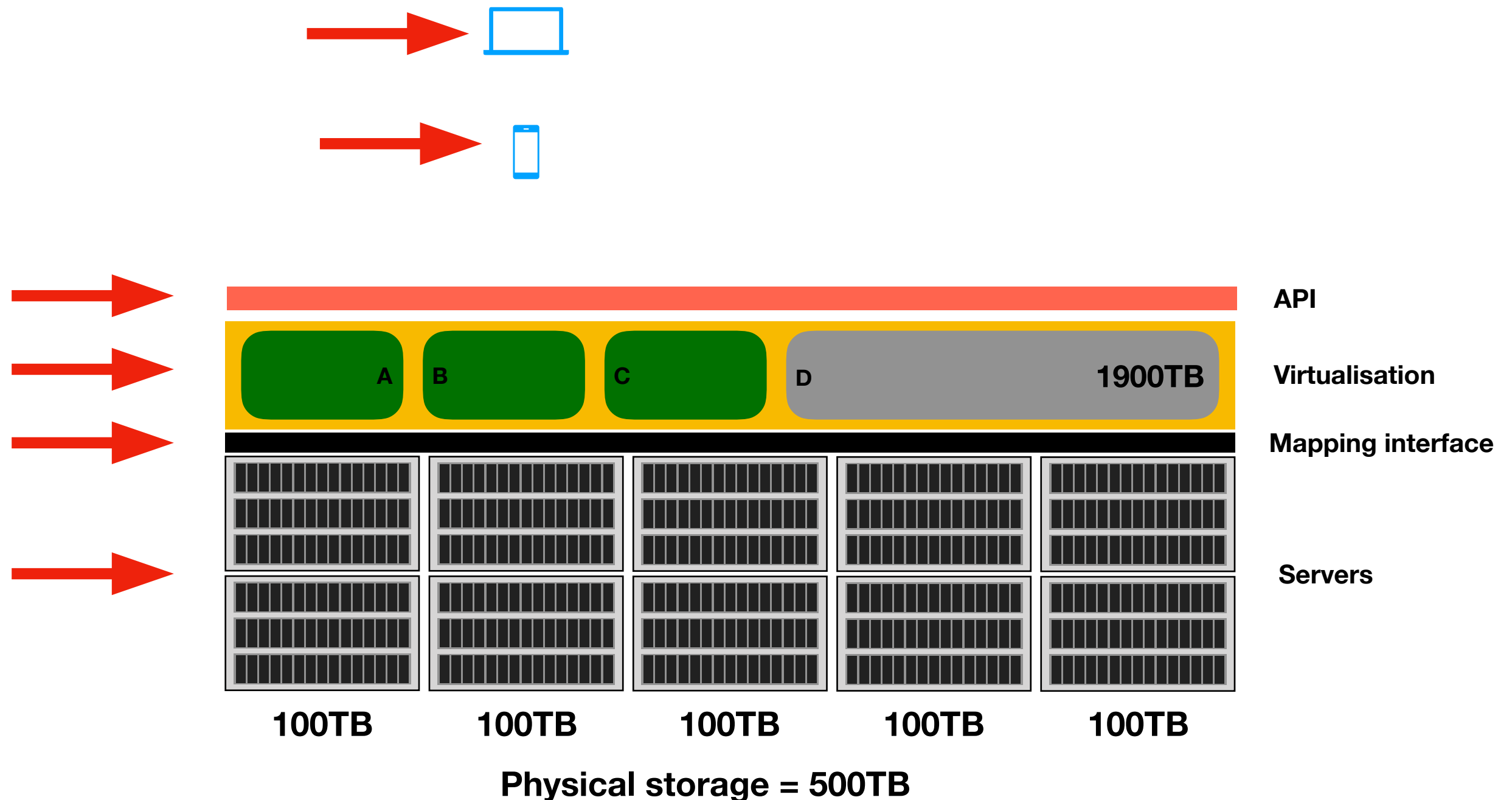
Challenges

Data Entangled Together



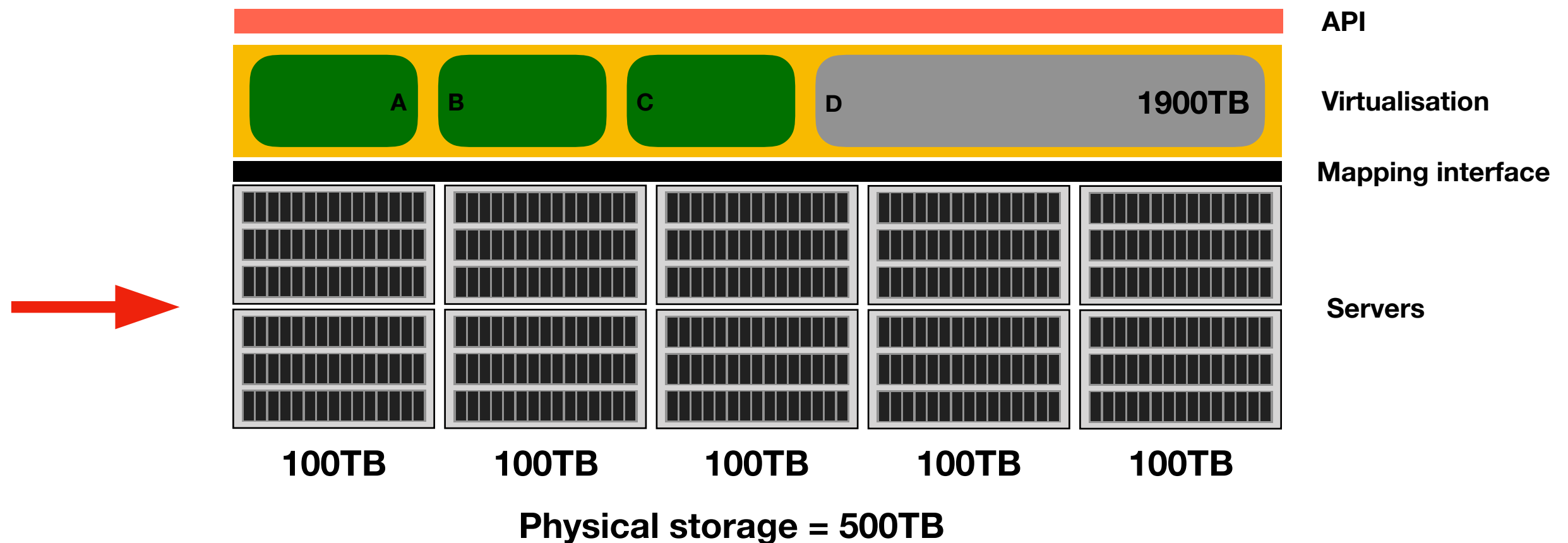
Challenges

Multiple components



Challenges

Hardware



Magnetic tape



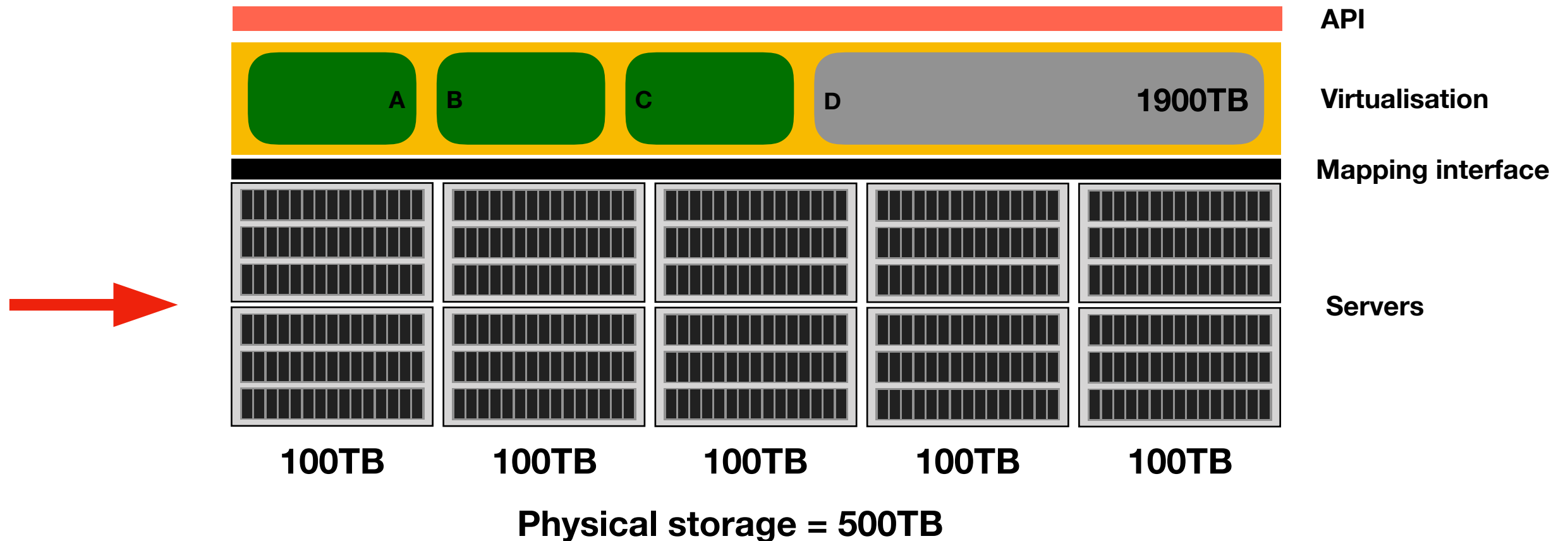
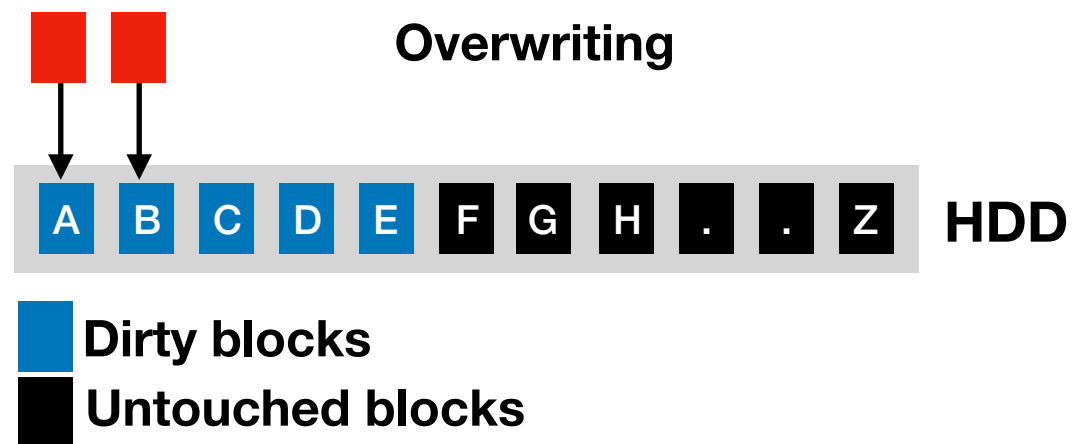
SSD



HDD

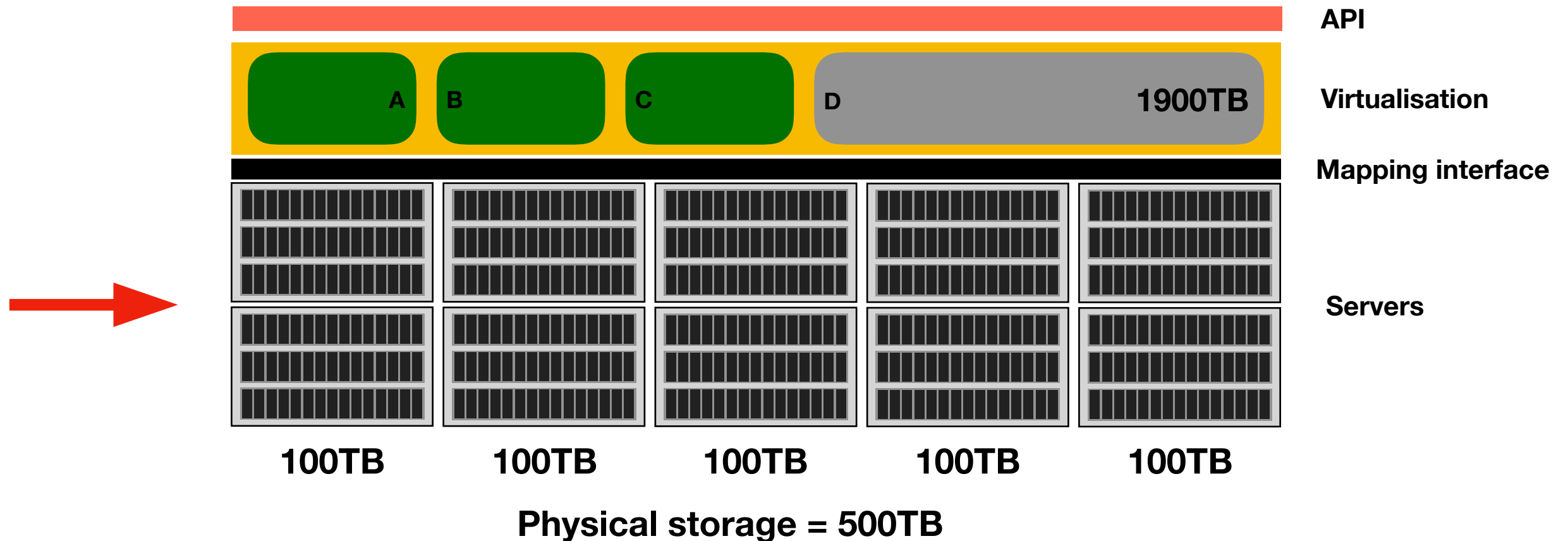
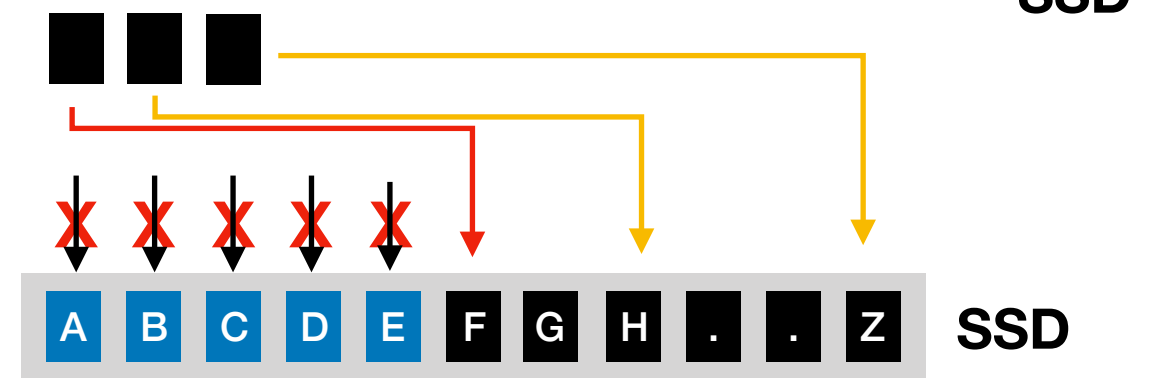
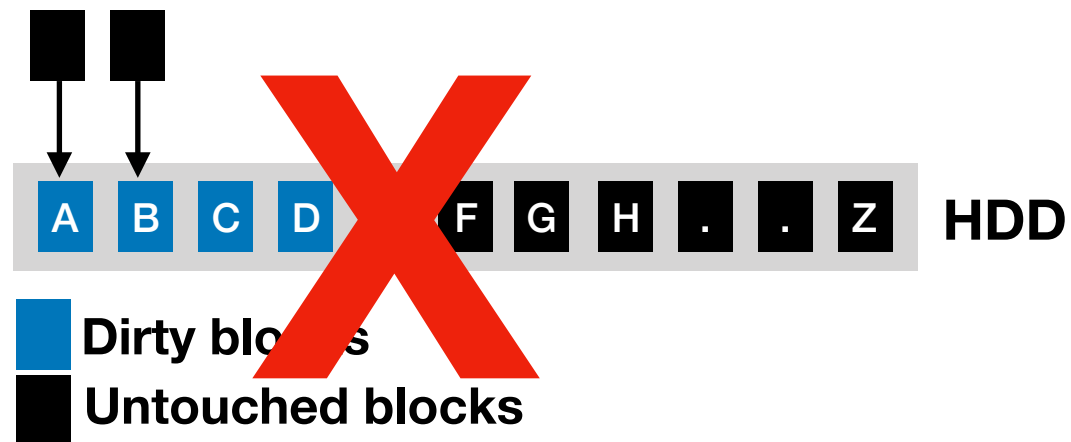
Challenges

SSD - Challenges



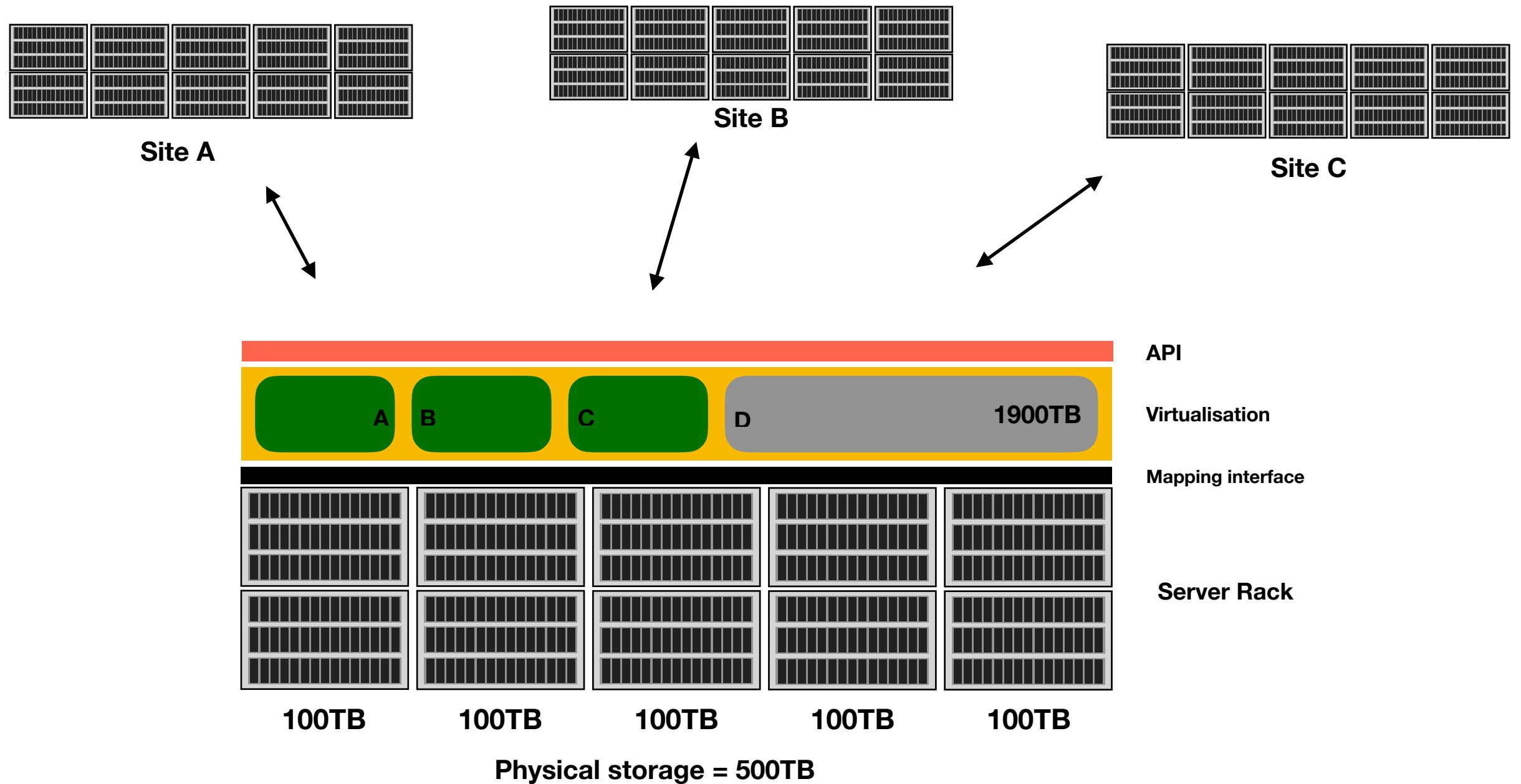
Challenges

SSD - Wear leveling

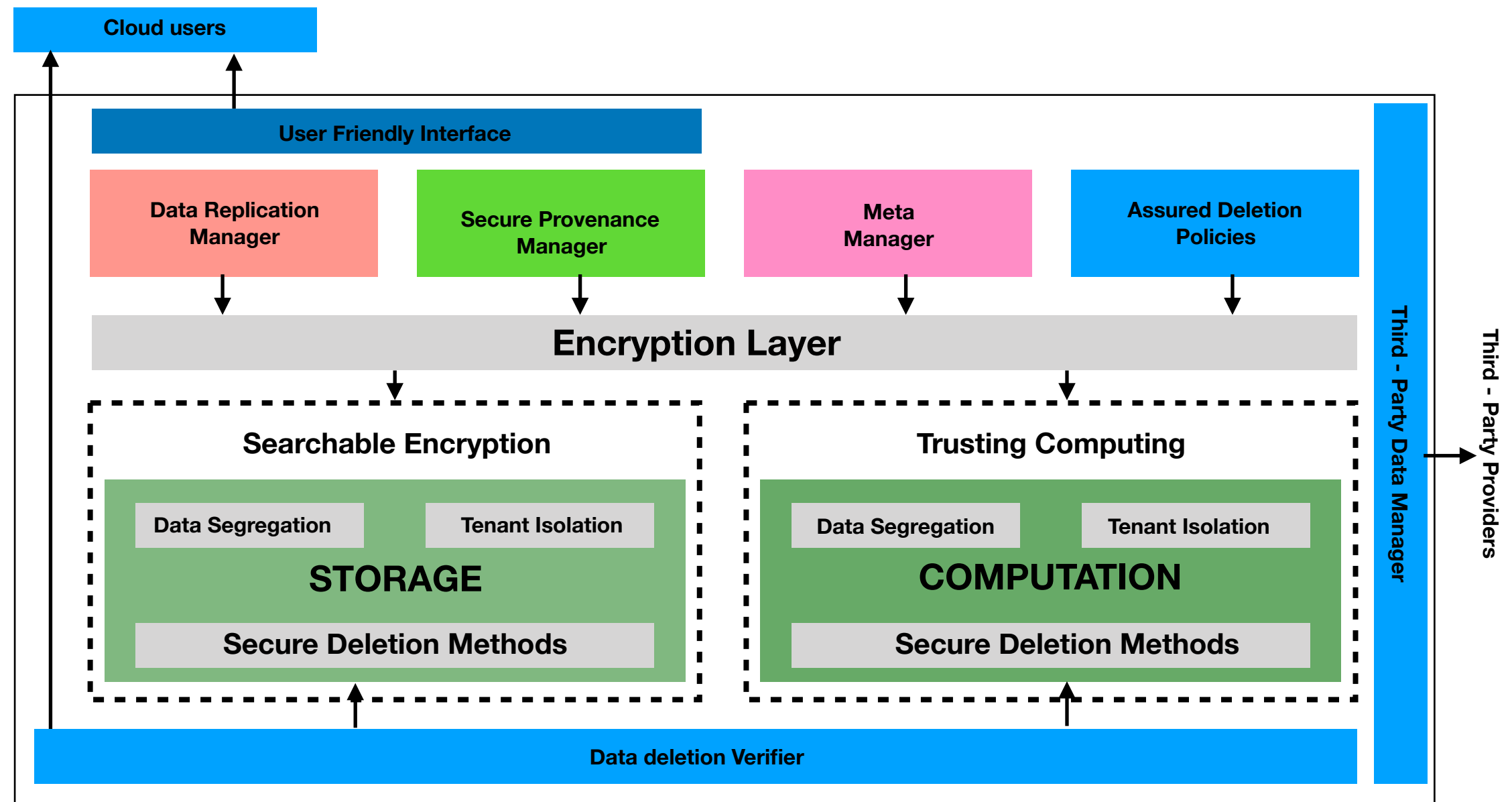


Challenges

Multiple copies



Conceptual Model



Thank you

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