



ADC²⁴ *Bristol*

SYNCHRONISED DATA FOR AUDIO PLUGINS

ADAM WILSON

Background

Adam Wilson

Founder of Node Audio

10 years as an audio developer

Background in server-side web development

What is “Synchronised Data”?

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Data:

- Documents
- Songs
- Presets
- Settings
- ...

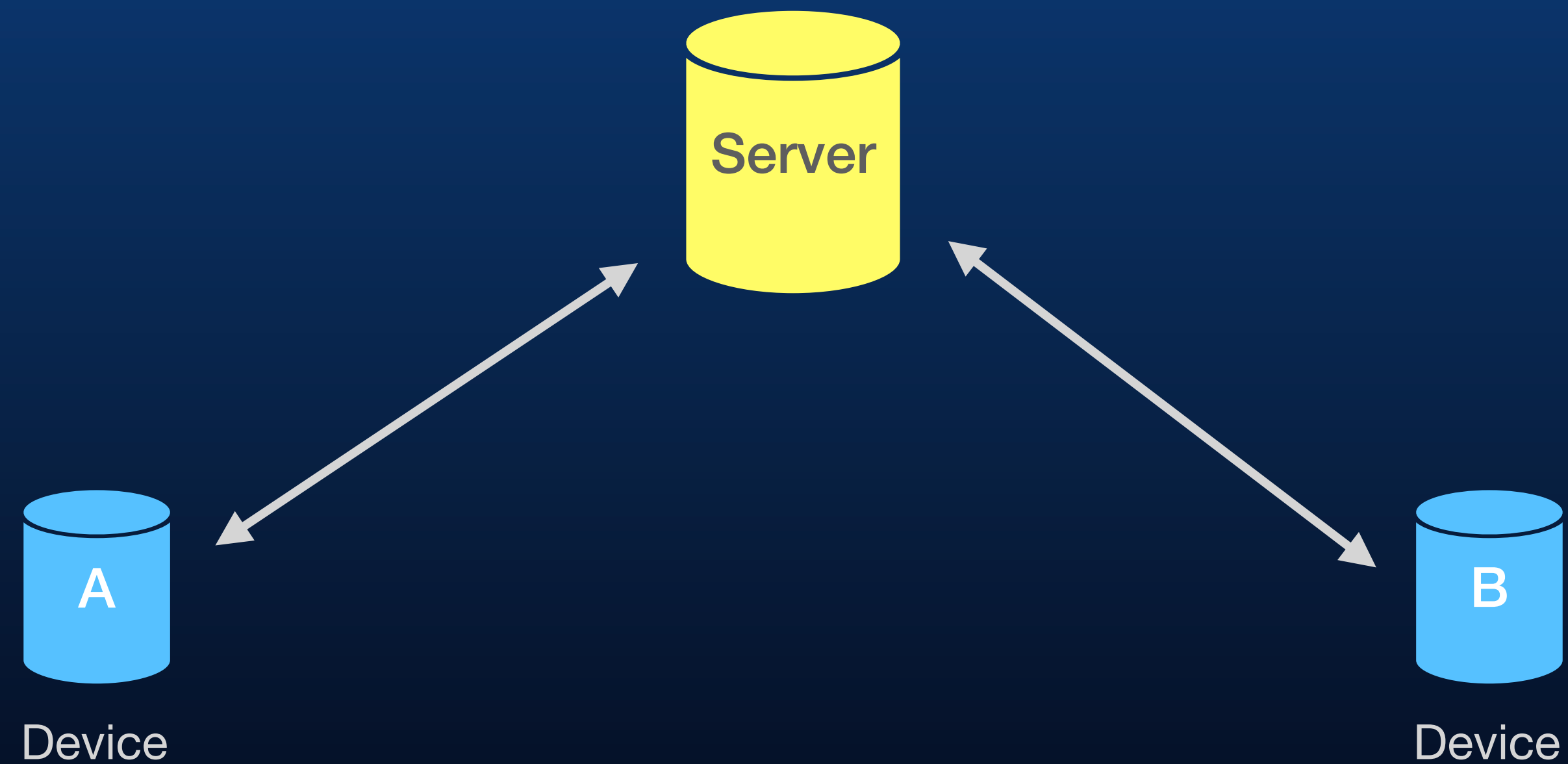
What is “Synchronised Data”?

Data:

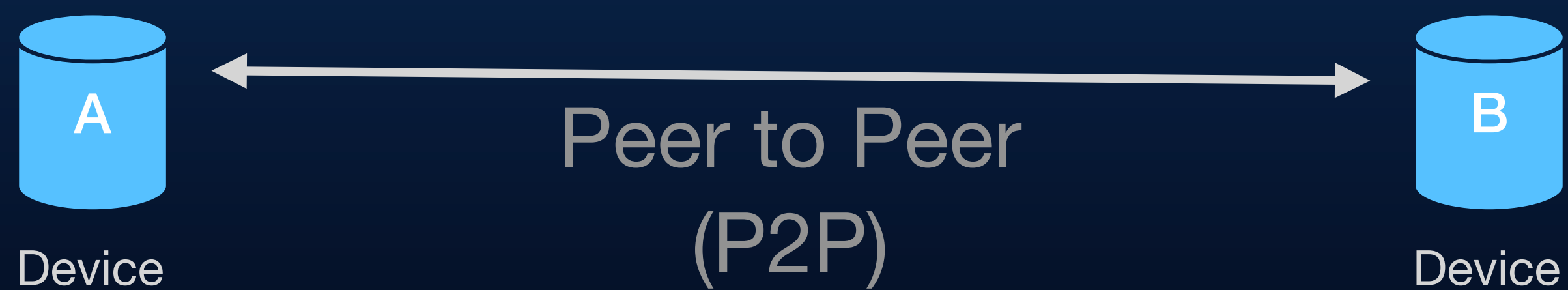
- Documents
- Songs
- Presets
- Settings
- ...

Synchronised across devices

What is “Synchronised Data”?



What is “Synchronised Data”?



Why synchronise?

Why synchronise?

Pain points:

- Copying presets or other data between machines

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- Sending presets/data to others

Why synchronise?

Pain points:

- Copying presets or other data between machines
- Sending presets/data to others
- Updating factory presets

Why synchronise?

Pain points:

- Copying presets or other data between machines
- Sending presets/data to others
- Updating factory presets
- Data backup

What would an ideal solution look like?

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User:

- See the same data on all connected machines and devices

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User:

- See the same data on all connected machines and devices
- Don't need to be online to use it
- Automatically update when online
- Conflicts are resolved automatically (or via user prompts)

Requirements for audio plugins

- Cross-platform

Requirements for audio plugins

- Cross-platform
- C++ API

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- Concurrent access

Requirements for audio plugins

- Cross-platform
- C++ API
- Concurrent access
- Thread safety

General Requirements

- User specific data (e.g. user presets)
- Public data (e.g. factory presets)

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- “Offline first”

Nice to have's

- Web access
- Mobile APIs (e.g. iOS / Android / Flutter)

What would an ideal solution look like?

Developer:

- Cross-platform
- C++ API
- Concurrent access
- User data
- Factory data

Potential Solutions

- Broadly split into:
- Custom solutions (roll your own)
 - Third party solutions

Roll Your Own

Requirements

- Conflict resolution?

Roll Your Own

Requirements

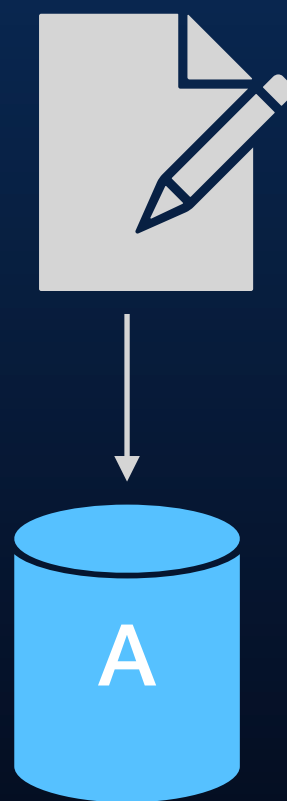
- Conflict resolution?



Roll Your Own

Requirements

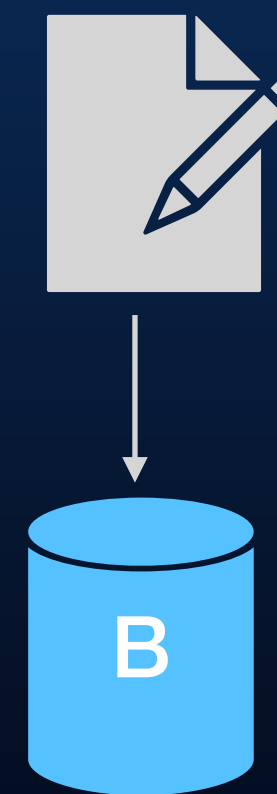
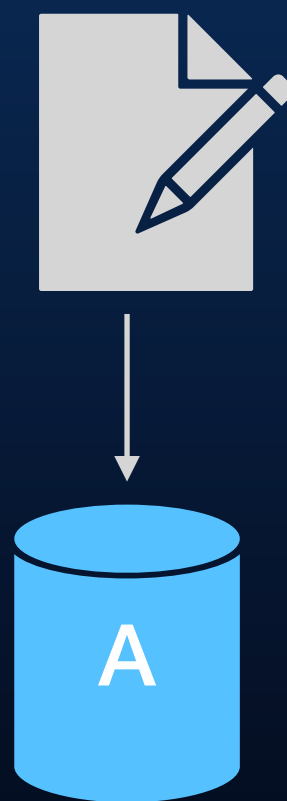
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Roll Your Own

Requirements

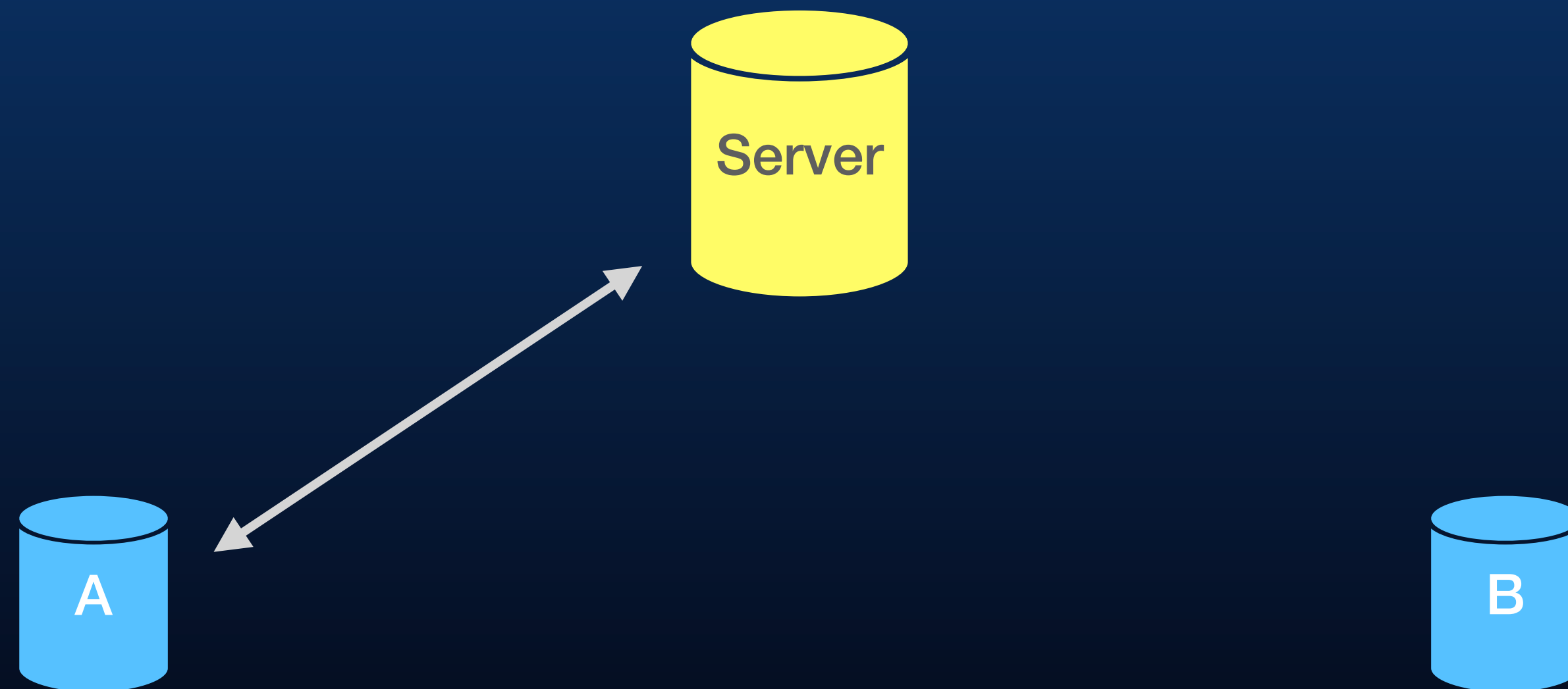
- Conflict resolution?



Roll Your Own

Requirements

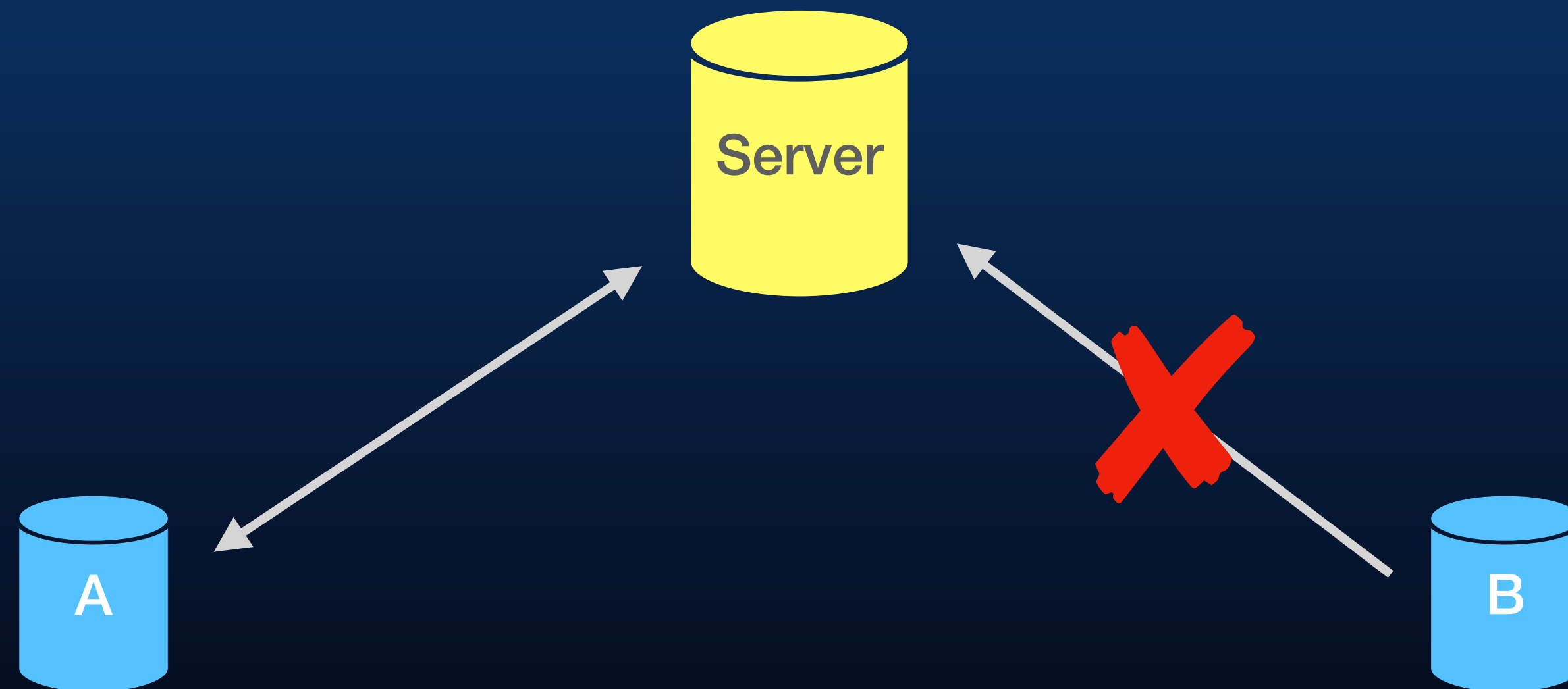
- Conflict resolution?



Roll Your Own

Requirements

- Conflict resolution?



Roll Your Own

Requirements

- Conflict resolution?
- User-specific data?
- Authentication?
- Changelog?

Roll Your Own

Simple

- Store XML/JSON files on a server

Roll Your Own

Simple



Complex

- Store XML/JSON files on a server
- JSON synchronisation (JSON-Patch)

Roll Your Own

Simple



Complex

- Store XML/JSON files on a server
- JSON synchronisation (JSON-Patch)
- SQLite Session Extension

Roll Your Own

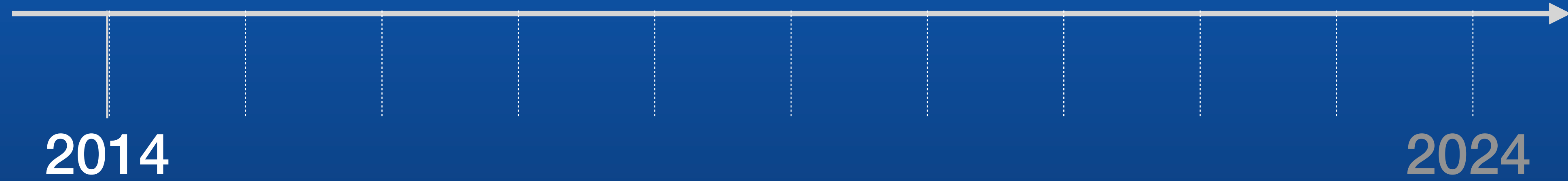
Simple



Complex

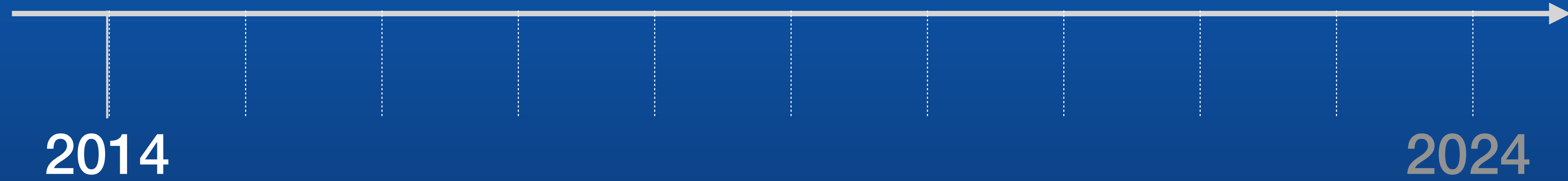
- Store XML/JSON files on a server
- JSON synchronisation (JSON-Patch)
- SQLite Session Extension
- CRDT log
(Conflict-free Replicated Data Type)

A Brief History...



Couchbase Lite

(TouchDB)

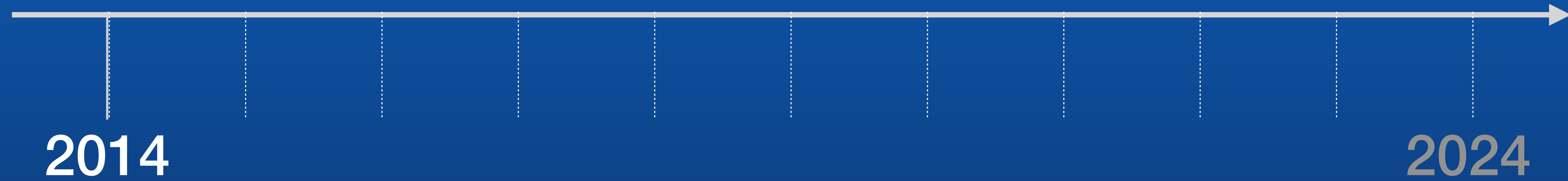


Couchbase Lite

(TouchDB)

Synchronises with:

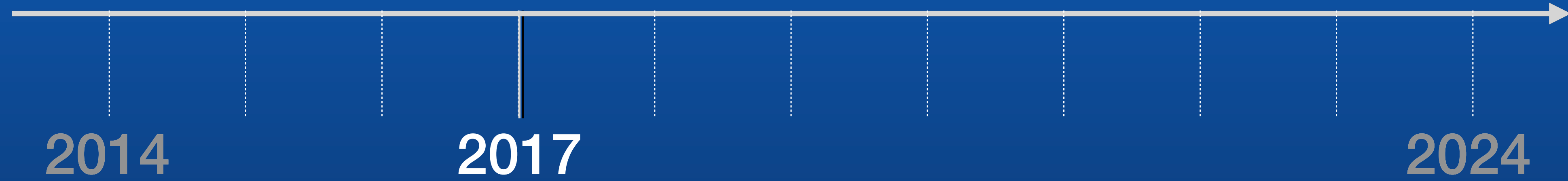
- CouchDB
- Couchbase Server + Sync Gateway



Couchbase Lite

Synchronises with:

- CouchDB - Cheap to run
- Couchbase Server - Expensive!



Couchbase Lite 2.0 announcement

LiteCore C++ library





Couchbase Lite 2.0

LiteCore C++ library



Unstable

Synchronises with:

- ~~CouchDB~~
- Couchbase Server - Expensive!





Flip

Flip is a data model library designed as a framework.

- Real-time
- Collaboration-oriented
- Transactional
- Portable
- Compact
- Handles complex data structures



2014

2017

2019

2024

Flip

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- Transactional
- Portable
- Compact
- Handles complex data structures



LiteSync

- Replication between remote SQLite databases



2014

2017

2019

2024

LiteSync

"Only a single application can access the database at the same time. Each instance must use its own database, and then they will be replicated and synchronized using LiteSync"



SQLite
+
Session Extension

A log of all operations from a given point in time





SQLite
+
Session Extension

How to synchronise with a server?



2014

2017

2019

2024

Abandoned

SQLite
+
Session Extension

How to synchronise with a server?





Ampli-Sync
(SQLite-Sync)

Syncs SQLite with PostgreSQL
Required a C++ client...



2014

2017

2019

2022

2024

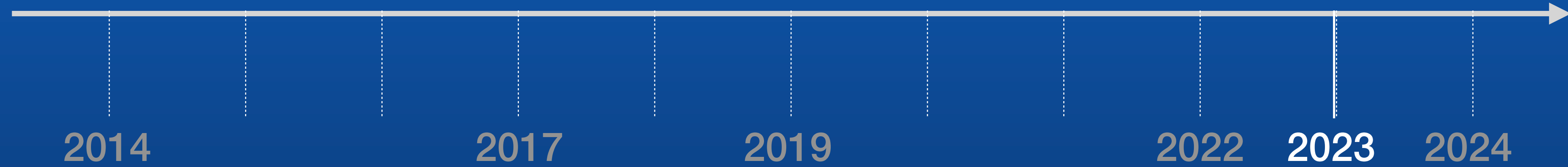
Abandoned

Ampli-Sync

Syncs SQLite with PostgreSQL

(SQLite-Sync)

Required a C++ client...



RealmDB

realm-cpp

(Atlas Device Sync)

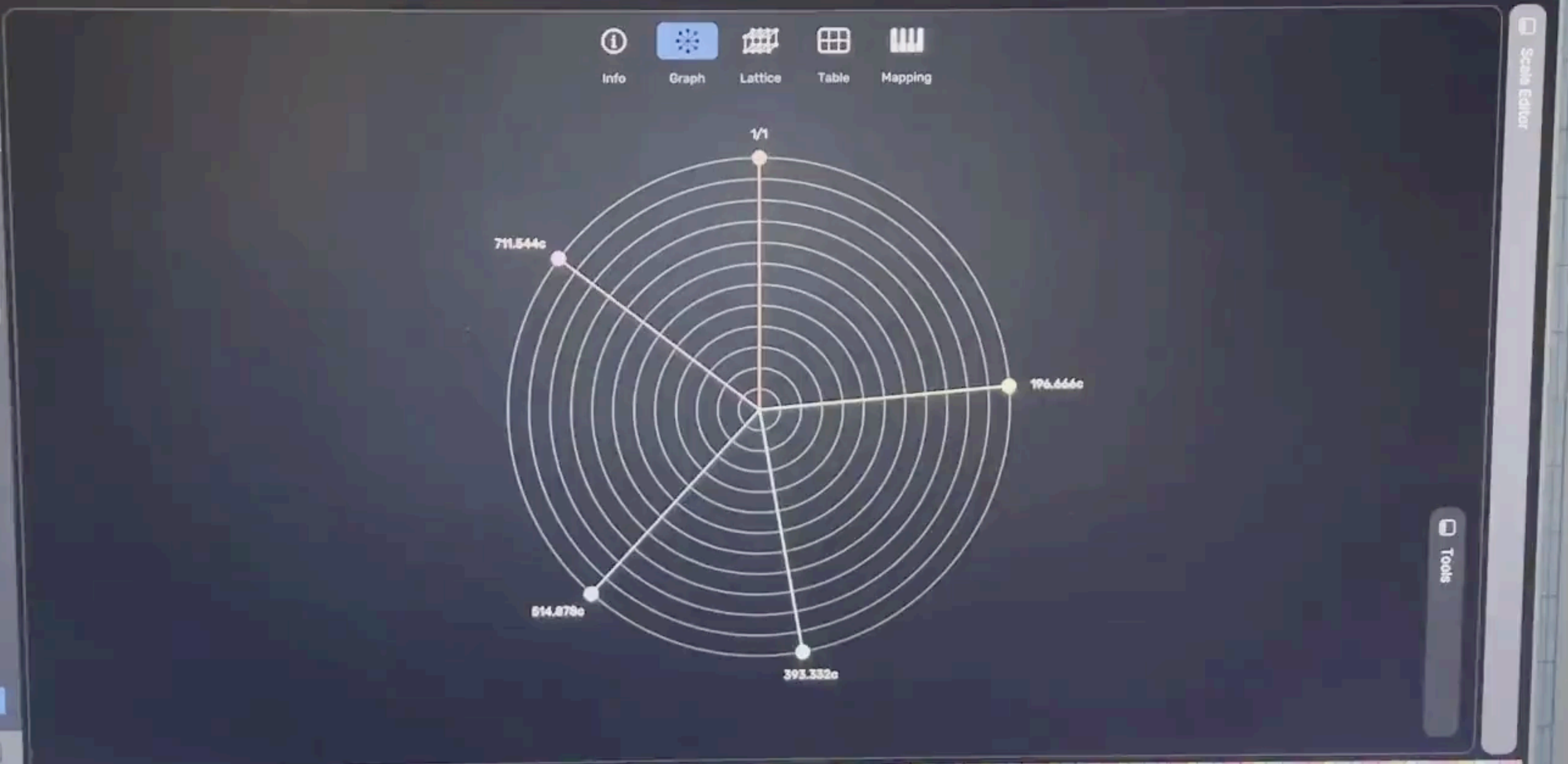
C++ client library

Syncs with MongoDB Atlas



entonal studio INPUT TUNING RETUNER PLUGIN GROUP
MIDI Golden None Simple Synth

- Browser
- Search
- Single
 - 12-tone Equal Temperament
 - Carlos Super Just
 - Wendy Carlos Alpha
 - Camatic 12
 - Triadic 26:30:39
 - Other Music 7-limit
 - Euler Monochord
 - 7-limit 12
 - Gamelan Udan
 - 3-7 Lattice in A
 - 7-limit Tritone
 - Orwell[9] 53ed2
 - 7-limit Hexany
 - Harmonics 1-12 sub
 - Bali-Java Slendro
 - 88 cent scale
 - Machine[6] 11ed2
 - Alternate 7-limit 12 tone
 - Colonna 1
 - Erlangen Revised
 - Golden
 - Harrison Bevelation
- New Save As Save



Track 16

8°C Mostly cloudy 07:11

2014

2017

2019

2022

2023

2024

Deprecated

RealmDB

C++ client library

realm-cpp

Syncs with MongoDB Atlas

(Atlas Device Sync)





r/mongodb • 1 day ago
keule_3000



18 NSFW

F**** you MongoDB

We have spent the past two years developing an enormous app to get a deprecation notice shortly before release. Get f****ed MongoDB, we already are.

↑ 129 ↓

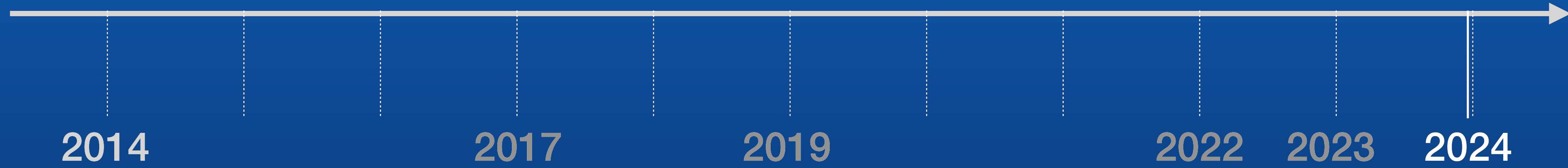
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What now?

Ditto			
C++ library: Linux or Android only Rust library: macOS or Linux only			
Proprietary database			
MongoDB / P2P			

Ditto	PowerSync		
C++ library: Linux or Android only Rust library: macOS or Linux only	No C/C++ library (yet)		
Proprietary database	Based on SQLite		
MongoDB / P2P	PostgreSQL		

Ditto	PowerSync	Couchbase Lite	
C++ library: Linux or Android only Rust library: macOS or Linux only	No C/C++ library (yet)	C/C++ Library	
Proprietary database	Based on SQLite	Proprietary database built on SQLite	
MongoDB / P2P	PostgreSQL	Couchbase Server	

Ditto	PowerSync	Couchbase Lite	ObjectBox
C++ library: Linux or Android only Rust library: macOS or Linux only	No C/C++ library (yet)	C/C++ Library	C++ Library
Proprietary database	Based on SQLite	Proprietary database built on SQLite	Proprietary database
MongoDB / P2P	PostgreSQL	Couchbase Server	Other ObjectBox instances MongoDB (alpha)

Couchbase Lite	ObjectBox
C/C++ Library	C++ Library
Proprietary database (Based on SQLite)	Proprietary database
Couchbase Server Capella - Free Tier	Other ObjectBox instances MongoDB (alpha)
User-specific data via Collections and Scopes	No support for user-specific data (Coming Q1 2025)
Schema-less	Requires a schema definition (FlatBuffers) (Also has a "Flex" type)
P2P	P2P

Vector Search

- A technique to retrieve semantically similar items based on “vector” representations of the items in a multi-dimensional space
- An essential component of Generative AI and Predictive AI applications

Couchbase Lite

Via a Vector Extension to Couchbase Lite SDK

Only available to “Enterprise” customers

ObjectBox

Built into ObjectBox

Available to all customers



2014

2017

2019

2022

2023

2024

Addendum

Turso / libSQL

The day after giving this talk, I discovered a project called Turso. They have forked and extended SQLite, naming it libSQL. They have added replication capabilities, and they currently have a two-way data synchronisation feature in beta.

The libSQL project is fully open source, and written in Rust!