

DIGITALE LEUTE SUMMIT / 16.11.2021

# Hilfe, wir syncen!



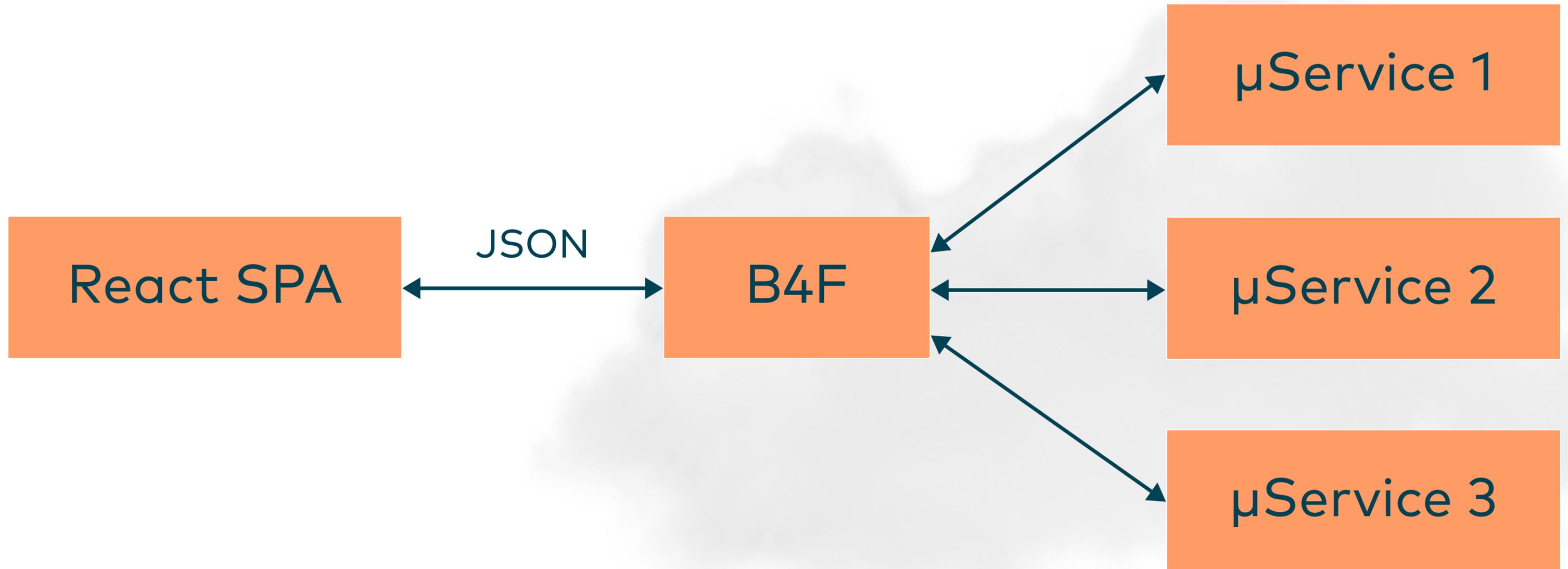
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**LARS HUPEL**  
@LARSR\_H

**INNOQ**

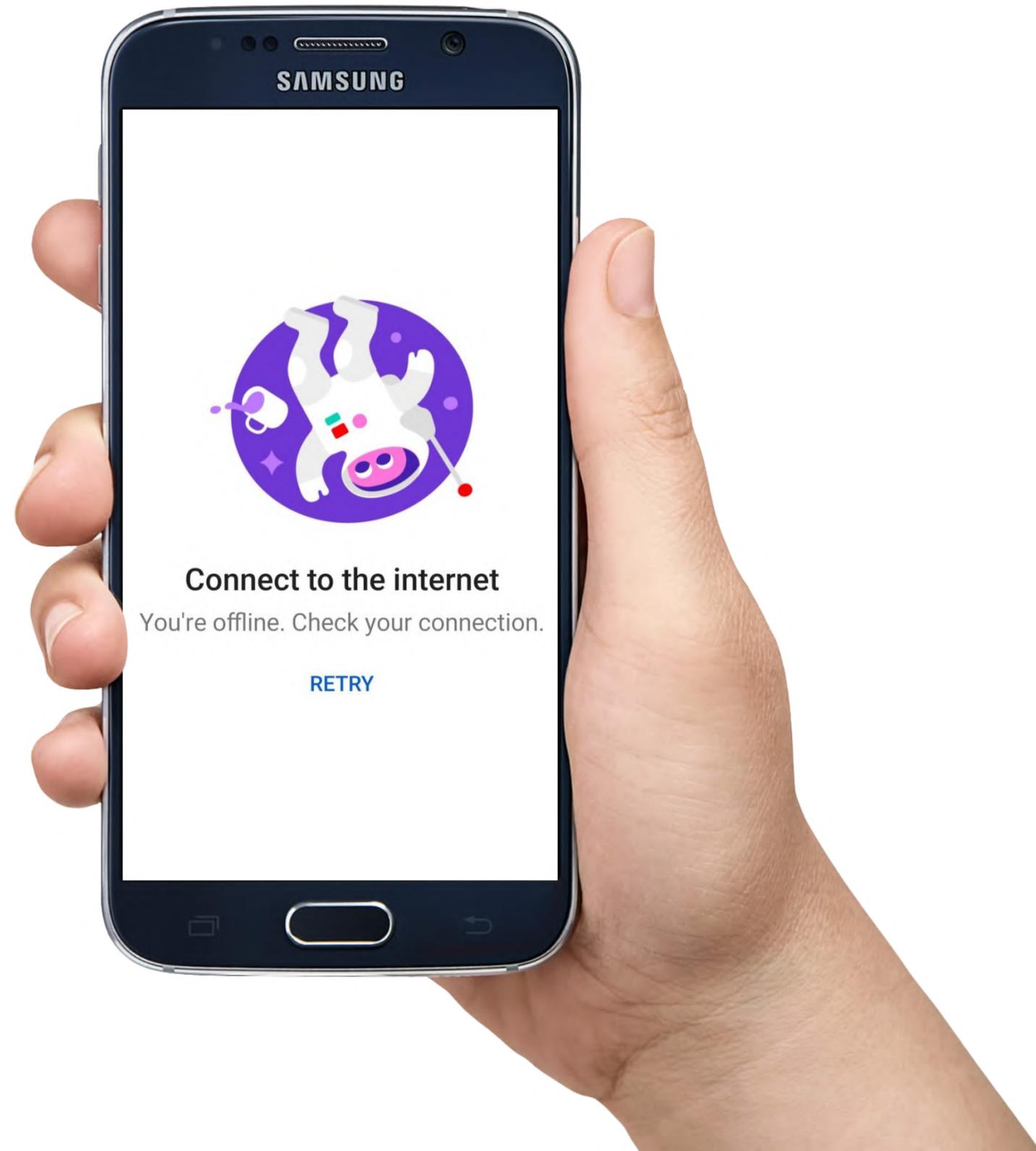
# Moderne Frontend-Architektur





# Wenn alles in der Cloud ist ...

- ... sind wir abhängig vom Internet
- ... können wir nur eingeschränkt arbeiten
- ... schließen wir Menschen aus



# Offline arbeiten?

- früher™ hat man auch nicht ständig Internet gehabt
- lokale Datenspeicherung, manuelle Synchronisierung



# Offline-first ist Standard in der Entwicklung

- wir arbeiten gerne offline
- niemand möchte mehr Subversion benutzen
- Warum verlangen wir Konnektivität von unseren User:innen?





```
graph TD; A[Hello world!] --> B[Hello world]; A --> C[Hello, world!];
```

Hello  
world!

Hello  
world

Hello,  
world!

RD Merge Revisions for D:\Projects\Git\Demo\Nancy\src\Nancy\DependencyContextAssemblyCatalog.cs

5 changes. 1 conflict

| Local Changes (Read-only)  | Result | Changes from Server (revision 9d4b6795...)                                     |
|--|--------|--|
| using System.Reflection;   | 7      | using System.Reflection;   |
| using Microsoft.Extensions.DependencyInjection;                                | 8      | using Microsoft.Extensions.DependencyInjection;                                |
| <del>using Microsoft.Extensions.DependencyInjection;</del>                     | 9      | <del>using Microsoft.Extensions.DependencyInjection;</del>                     |
| /// <summary>  | 10     | /// <summary>  |
| /// Default implementation of the <code>IDependencyContext</code> interface.   | 11     | /// Default implementation of the <code>IDependencyContext</code> interface.   |
| /// retrieving <see cref="IDependencyContext">                                 | 12     | /// retrieving <see cref="IDependencyContext">                                 |
| /// </summary>   | 13     | /// </summary>   |
| public class DependencyContext   | 14     | public class DependencyContext   |
| {  | 15     | {  |
| private static readonly IDependencyContext _default = new DependencyContext(); | 16     | private static readonly IDependencyContext _default = new DependencyContext(); |
| private readonly IDependencyContext _context;                                  | 17     | private readonly IDependencyContext _context;                                  |
|  | 18     |  |
| /// <summary>  | 19     | /// <summary>  |
| /// Initializes a new instance of the <code>DependencyContext</code> class.    | 20     | /// Initializes a new instance of the <code>DependencyContext</code> class.    |
| /// using <paramref="context">   | 21     | /// </summary>   |
| /// </summary>   | 22     | public DependencyContext(IDependencyContext context)                           |
| public DependencyContext(IDependencyContext context)                           | 23     | {  |
| : this(AssemblyContext.Default, context)                                       | 24     | var entryAssembly = context.EntryAssembly;                                     |
| {  | 25     | this.dependencyContext = context;  |
| }  | 26     | }  |
|  | 27     |  |
| /// <summary>  | 28     | /// <summary>  |
| /// Initializes a new instance of the <code>DependencyContext</code> class.    | 29     | /// Gets all <see cref="IDependencyContext">                                   |
| /// using <paramref="context">   | 30     | /// </summary>   |
| /// </summary>   | 31     | /// <returns>An <see cref="IDependencyContext">                                |
| public DependencyContext(IDependencyContext context)                           | 32     | public IReadOnlyCollection<IDependencyContext> GetAll()                        |
| {  | 33     | {  |
| dependencyContext = context;   | 34     | var results = new List<IDependencyContext>();                                  |
| }  | 35     | }  |
|  | 36     |  |

Accept Left    Accept Right    Apply    Abort

Document1 - Microsoft Word

File Home Insert Page Layout References Mailings Review View

Spelling & Grammar Research Thesaurus Word Count Proofing

Translate Language Language

New Comment Delete Previous Next Comments

Track Changes Tracking

Final: Show Markup Show Markup Reviewing Pane

Accept Reject Previous Next Changes

Compare Compare Block Authors Restrict Editing Protect

**TITLE**

8 Support for Track Changes in the OpenDocument (ODF) format

Visualization and printing of comments:

Improvements to printing of comments inside the margin: Bug 36815. Please also see the OpenOffice.org bugs: i#94514, i#767, i#61644.

Ability to apply comments to text selections: Bug 38244 (This is partly done and will be integrated in LibreOffice 3.7. Limitation: Text ranges cannot span over more than one paragraph)

User interface for comments: Bug 36896, Bug 38247, Bug 38246. Further design ideas of the Comments Ruler Control are collected

- 1 Introduction
- 2 Related issues and requirements
- 3 Solution Proposals
- 4 Further ideas for improvements
- 5 Google Summer of Code 2009: Improve Writer's compare function, 7 Related OpenOffice/LibreOffice extensions
- 9 Manuals on using Writer's existing track changes features
- 10 Press Coverage and blogs on track changes
- 11 Please also see

Track changes is a possibility for Writer users to keep track of the changes a user makes or other users have made to a document. All changes are recorded and are visualized in order to ease the

This. It also aims to collect some ideas on potential improvements in this area in Writer.

The standard view always displays the most recent version and changes are not marked. However, it is possible to access the So-called "History" which makes it possible to easily navigate on a time scale through all changes made by all authors. Insertions are underlined in the colour of the respective co-author. Deletions are displayed as "Interactive markers" that display the deleted text if the mouse

Deleted: Track changes¶ Contents¶ [hide]

Formatted: Font: 18 pt, Bold

Moved (insertion) [1] Go

Moved (insertion) [2] Go

Markup Area

Comment [g1]: This is a comment, but there is nothing to say

Deleted: ¶ 6 Competitive Analysis¶

Moved up [1]: 8 Support for Track Changes in the OpenDocument (ODF) format¶ Go

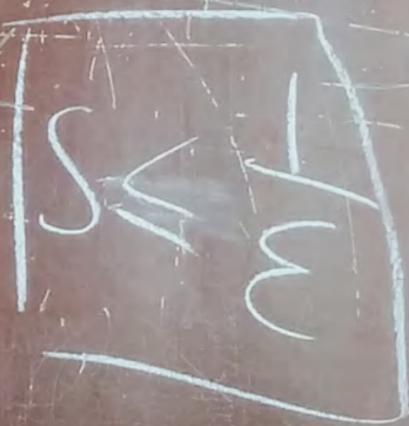
Deleted: ¶ page aims to collect some information on the track changes feature of Writer.

Page: 1 of 6 Words: 1,390 English (U.S.) 116%

$$\frac{dN}{dt} = \frac{1}{q_{\text{fact}}} - q_0(N - N_0)(1 - \epsilon S)S + \frac{N_e}{T_n} - \frac{N}{T_p}$$

$$\frac{dS}{dt} = T_0 q_0(N - N_0)(1 - \epsilon S)S + \frac{f_0 N}{T_n} - \frac{S}{T_p}$$

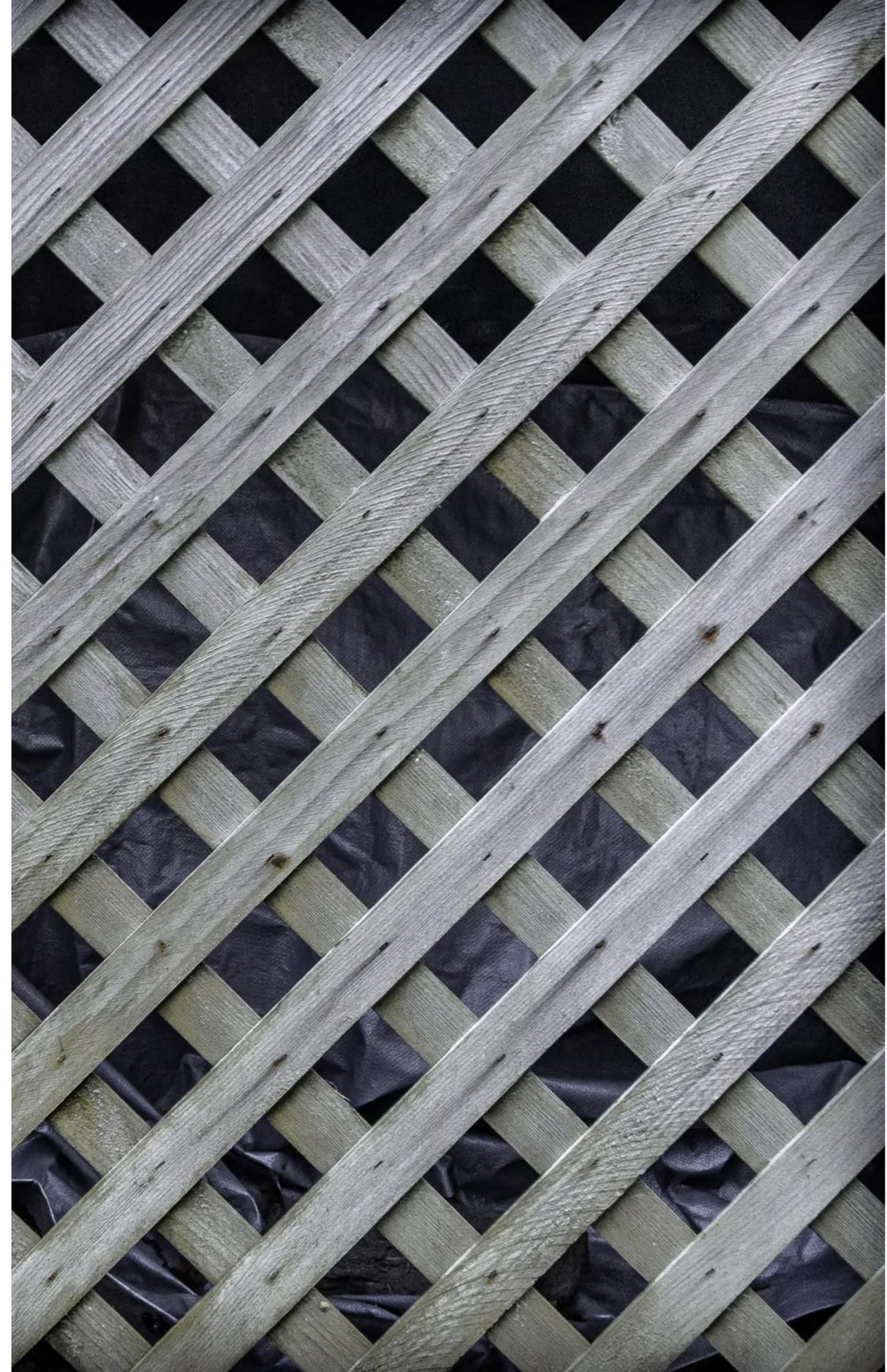
$$\frac{S}{P_k} = \frac{T_p \lambda_0}{T_{\text{act}} \eta_{\text{nc}}} \quad \text{--- } \textcircled{a}$$

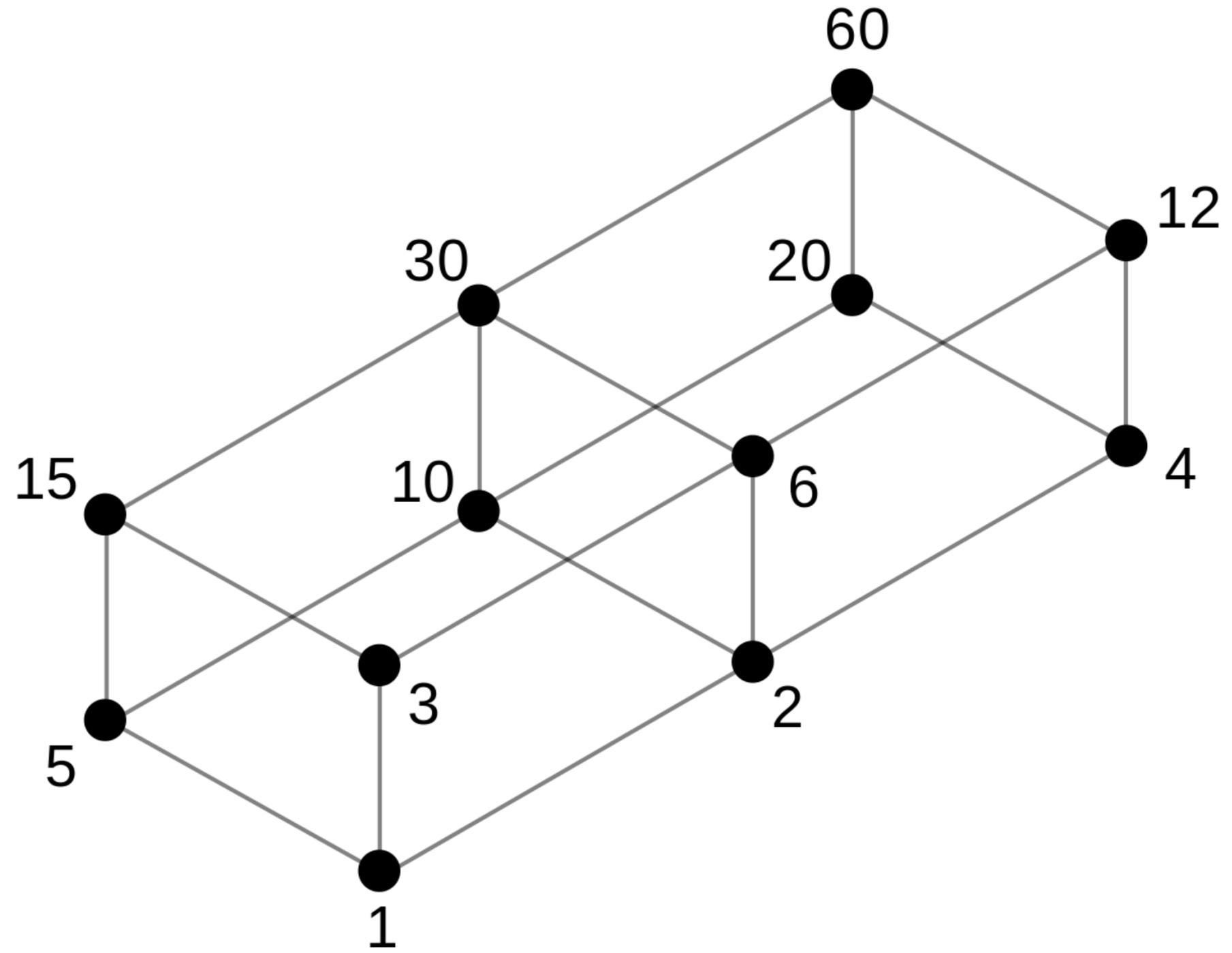


$$\left. \begin{aligned} N &= N_0 \\ P_f &= (m \end{aligned} \right\}$$

# Lattices

- mathematische Struktur
- abstrakte Definition einer Ordnungsrelation



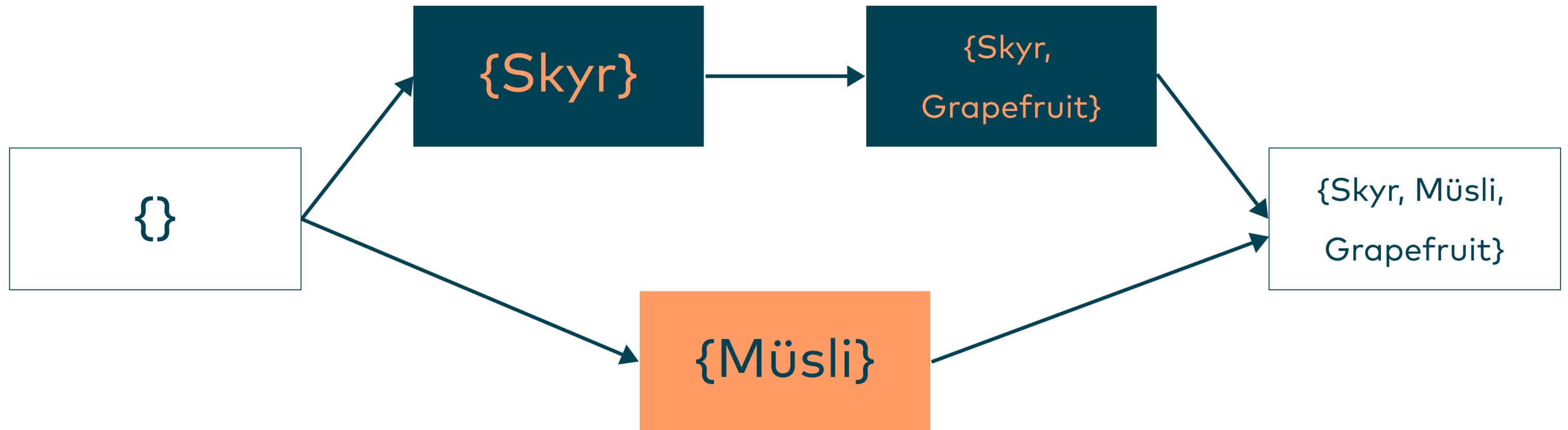




**CRDTs**

**Conflict-Free Replicated Datatypes**

# Beispiel: G-Sets

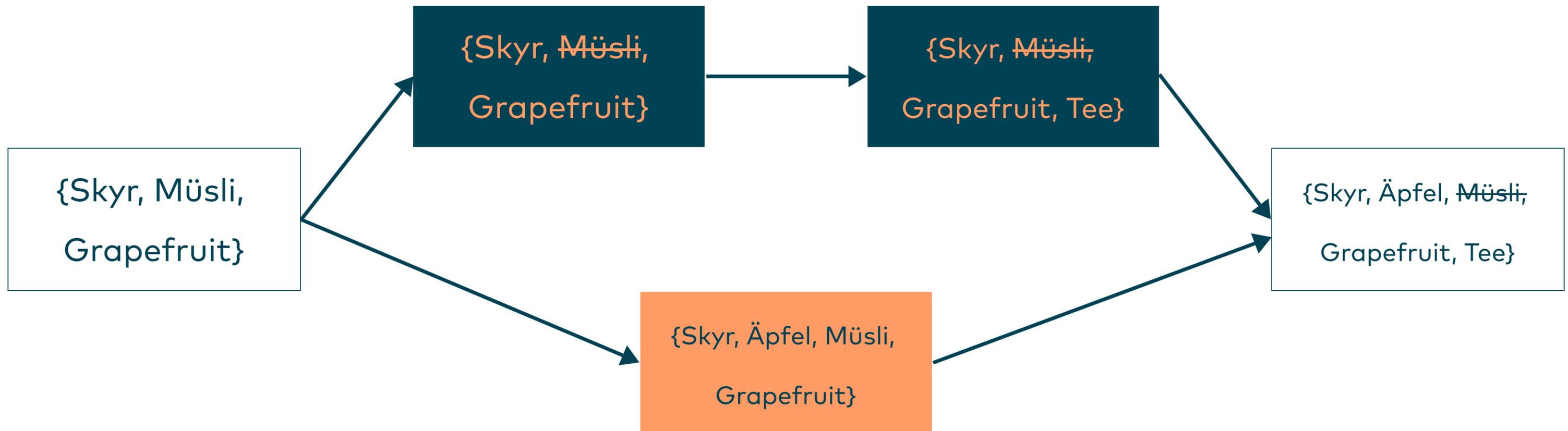


# Tombstones

- Löschen ist nicht monoton 😞
- Lösung: als „gelöscht“ markieren



# Beispiel: 2P-Sets

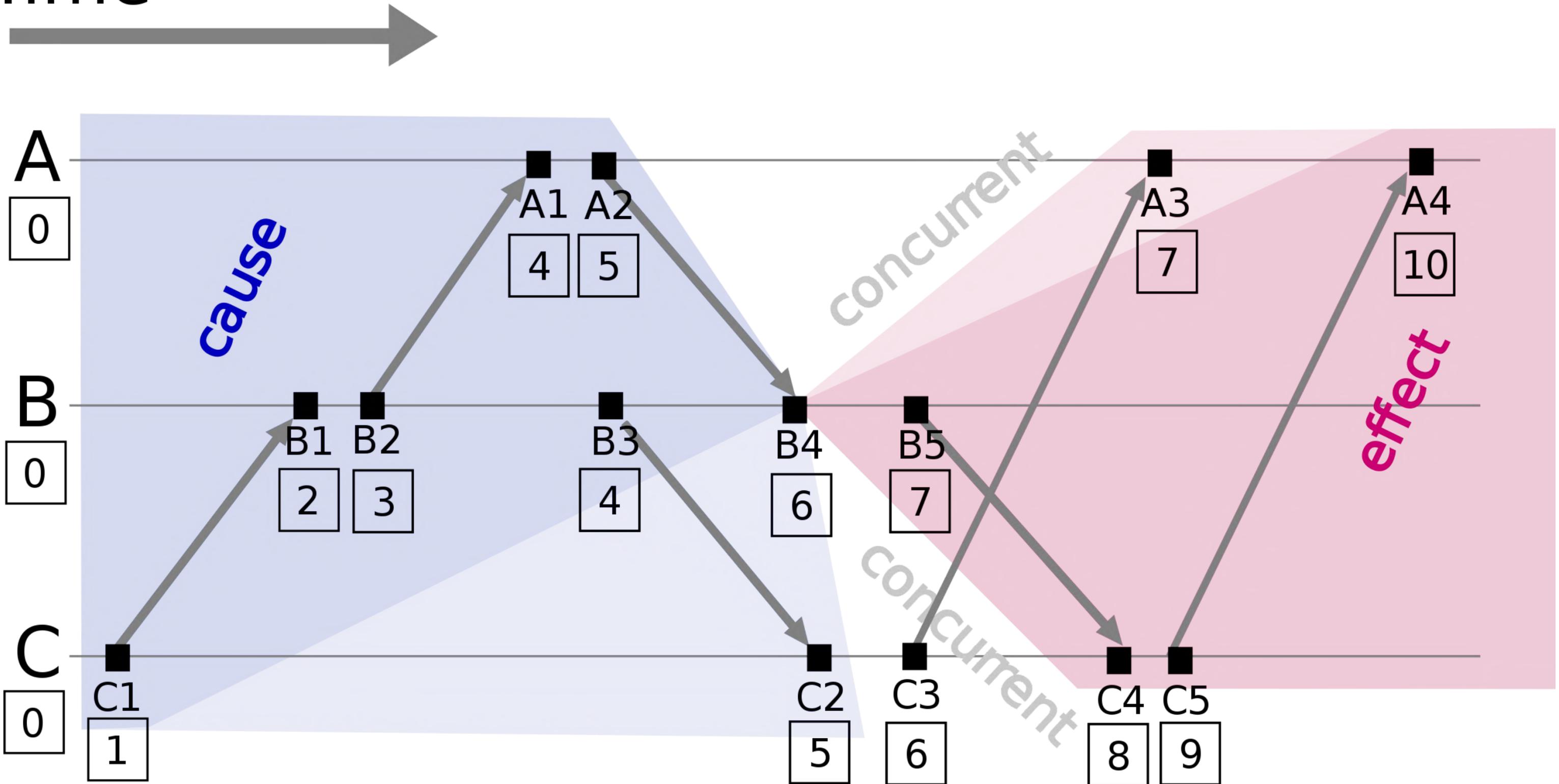


# Vector Clocks

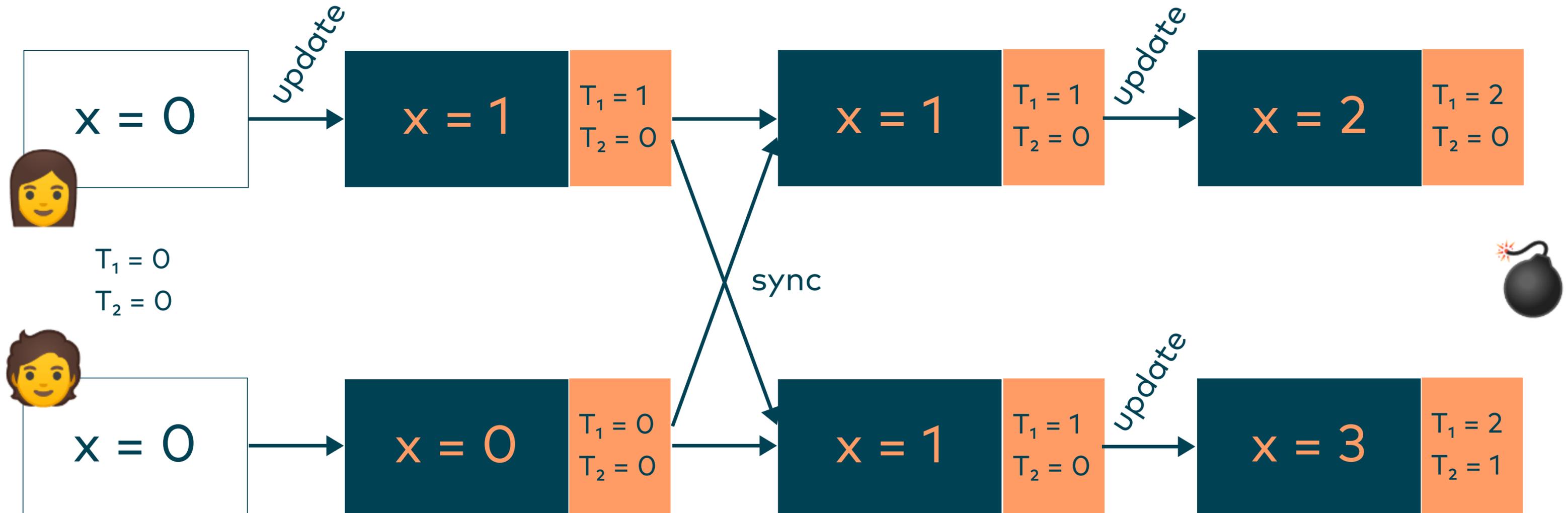
- jedes der  $n$  Geräte bekommt einen eigenen Zeitstempel
- ein Gesamt-Zeitstempel setzt sich aus  $n$  Geräte-Zeitstempeln zusammen



# Time



# Beispiel: MV-Register



**"Any two object replicas of a CvRDT eventually converge, assuming the system transmits payload infinitely often between pairs of replicas over eventually-reliable point-to-point channels."**





**Automerge**

# Automerge

- JavaScript-Bibliothek für Browser & Node.js
- bietet als Datentyp JSON-Dokumente
- 💡 JSON-Dokumente sind CRDTs



# Verwendung

```
doc1 = Automerge.from({ todos: [] })
```

```
doc2 = Automerge.change(doc1, 'Add muesli', doc => {  
  doc.cards.push({ text: 'Müsli', done: false })  
})
```

```
doc3 = Automerge.change(doc1, 'Add skyr', doc => {  
  doc.cards.push({ text: 'Skyr', done: false })  
})
```

```
Automerge.merge(doc2, doc3)
```

```
// enthält Spuren von Müsli & Skyr
```



**Demo**

**Eine Einkaufsliste**

# Groceries

- a
- b
- c
- left 1
- left 2
- left 3

Text:

Add

Go online

# Groceries

- a
- b
- c

Text:

Add

Go online

# Weitere Features

- mehr Datentypen:
  - Counter
  - Text (kollaboratives Editing)
  - Table
- P2P-Anwendungen mit Hypermerge



# Q&A



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