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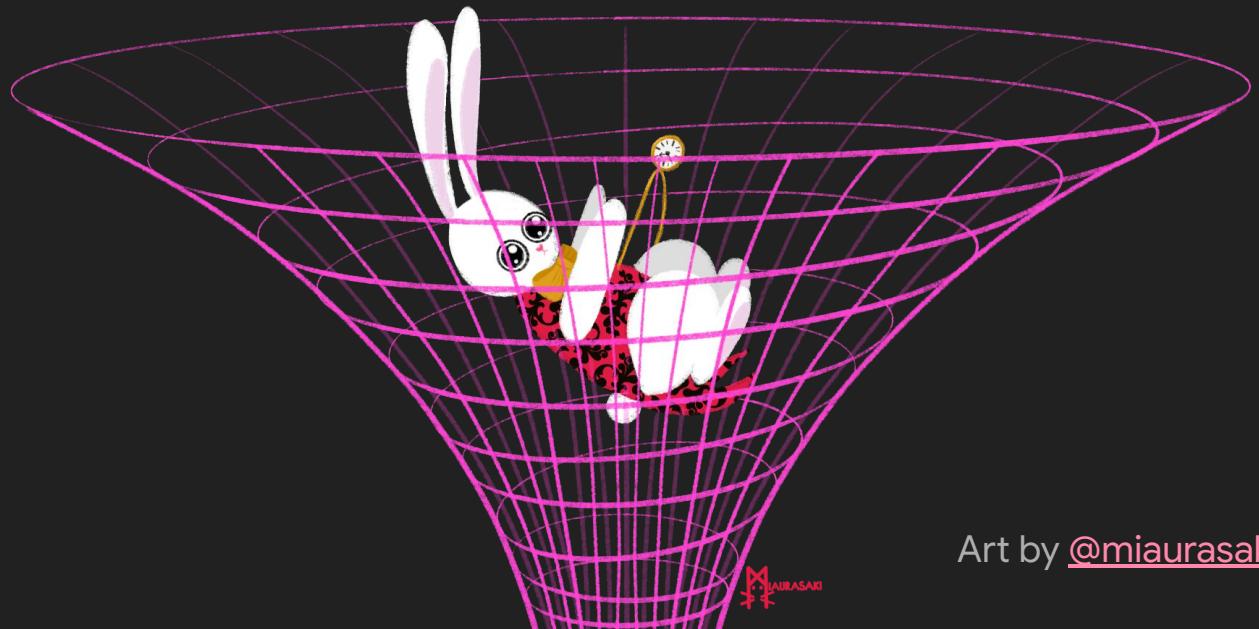
Down the rabbit hole of GridNG

Ethan Jimenez (he/him)

Microsoft

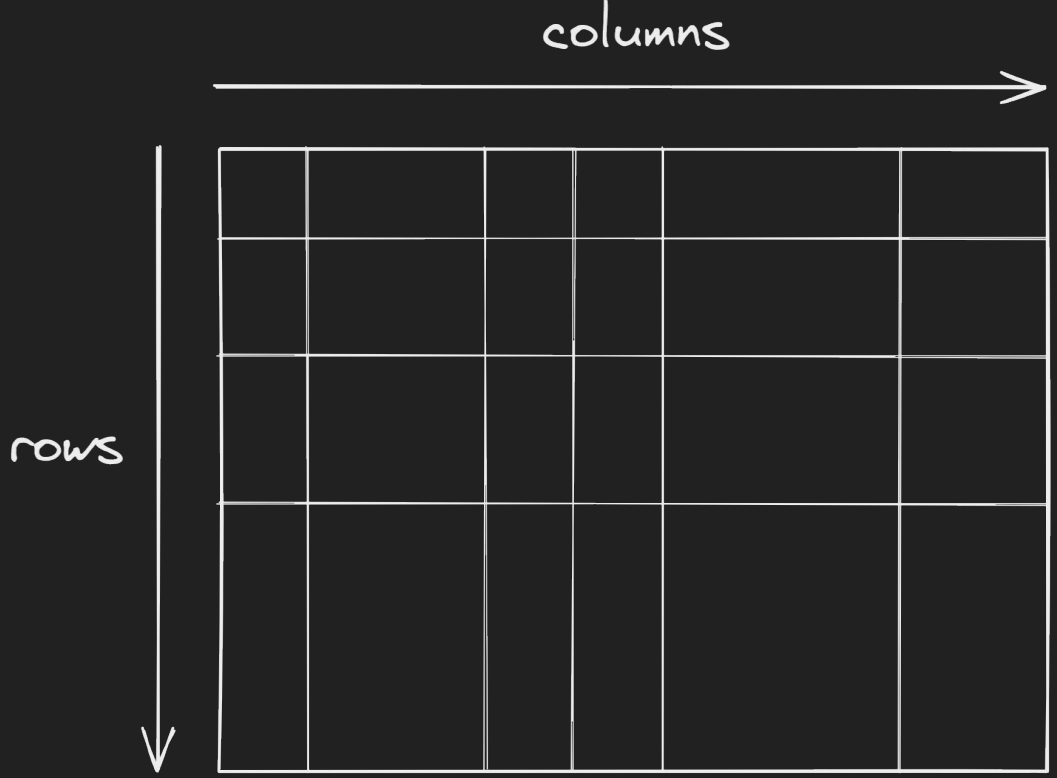
2022.05.18



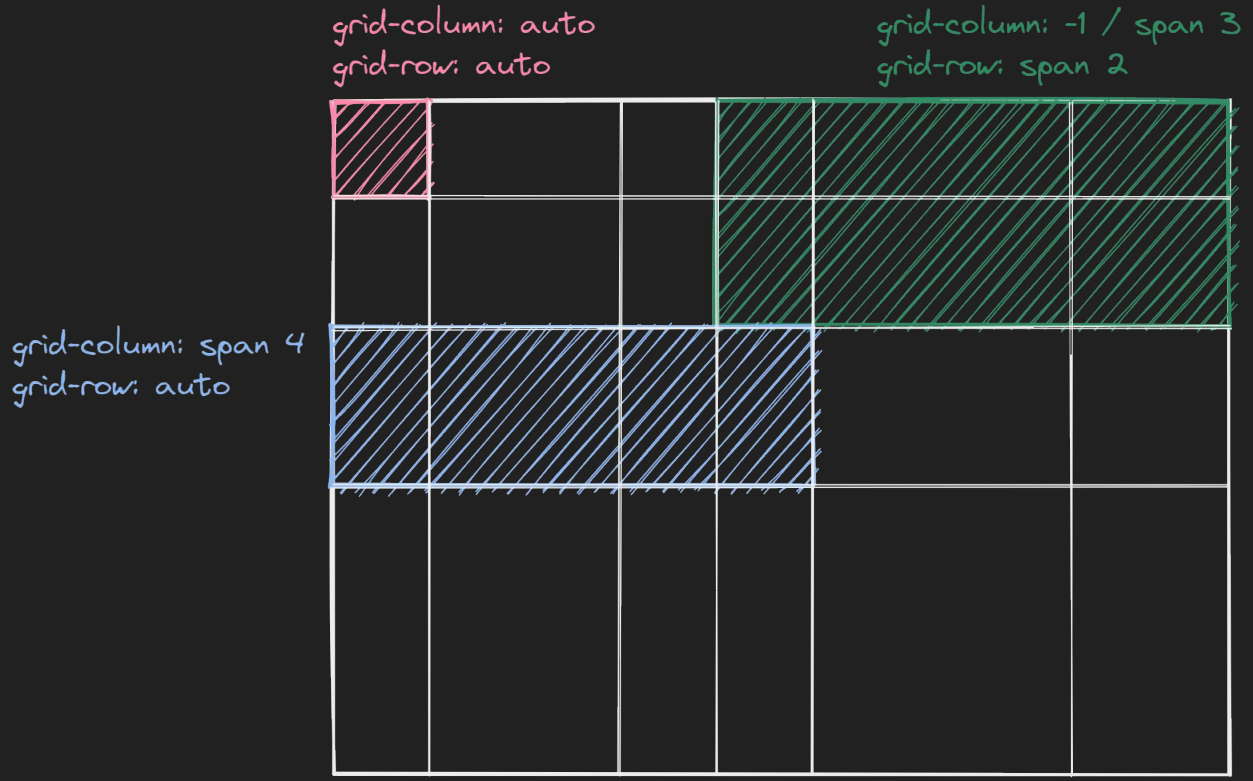
Art by @miaurasaki

Quick recap of grid concepts

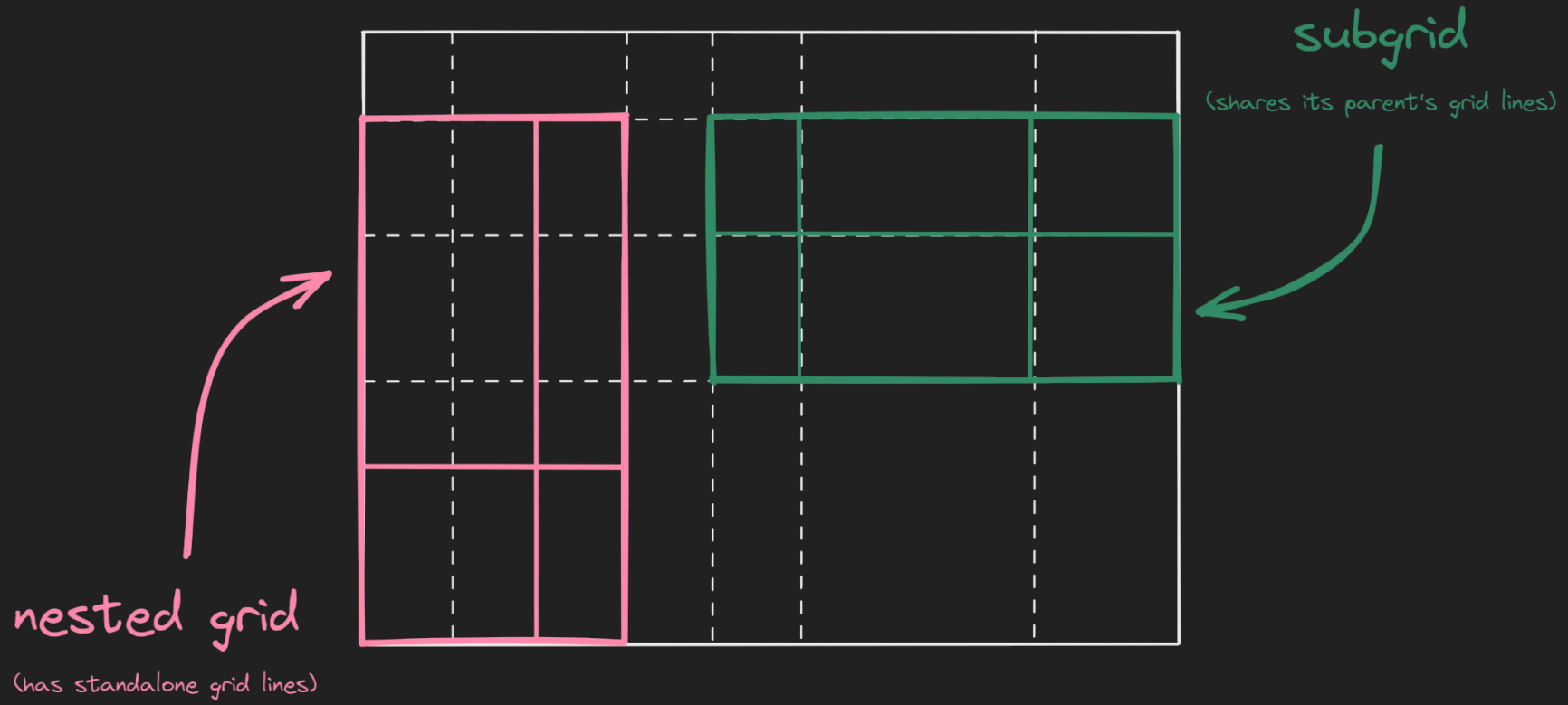
It all starts with...



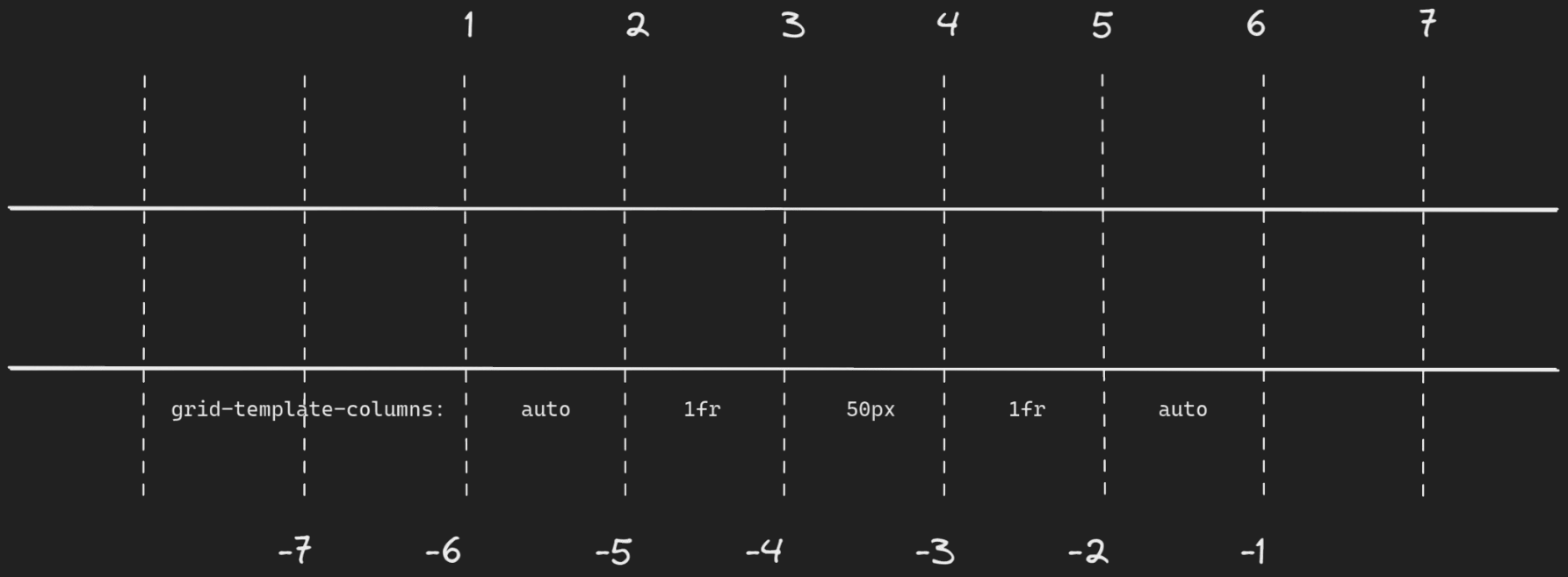
Grid items and placement



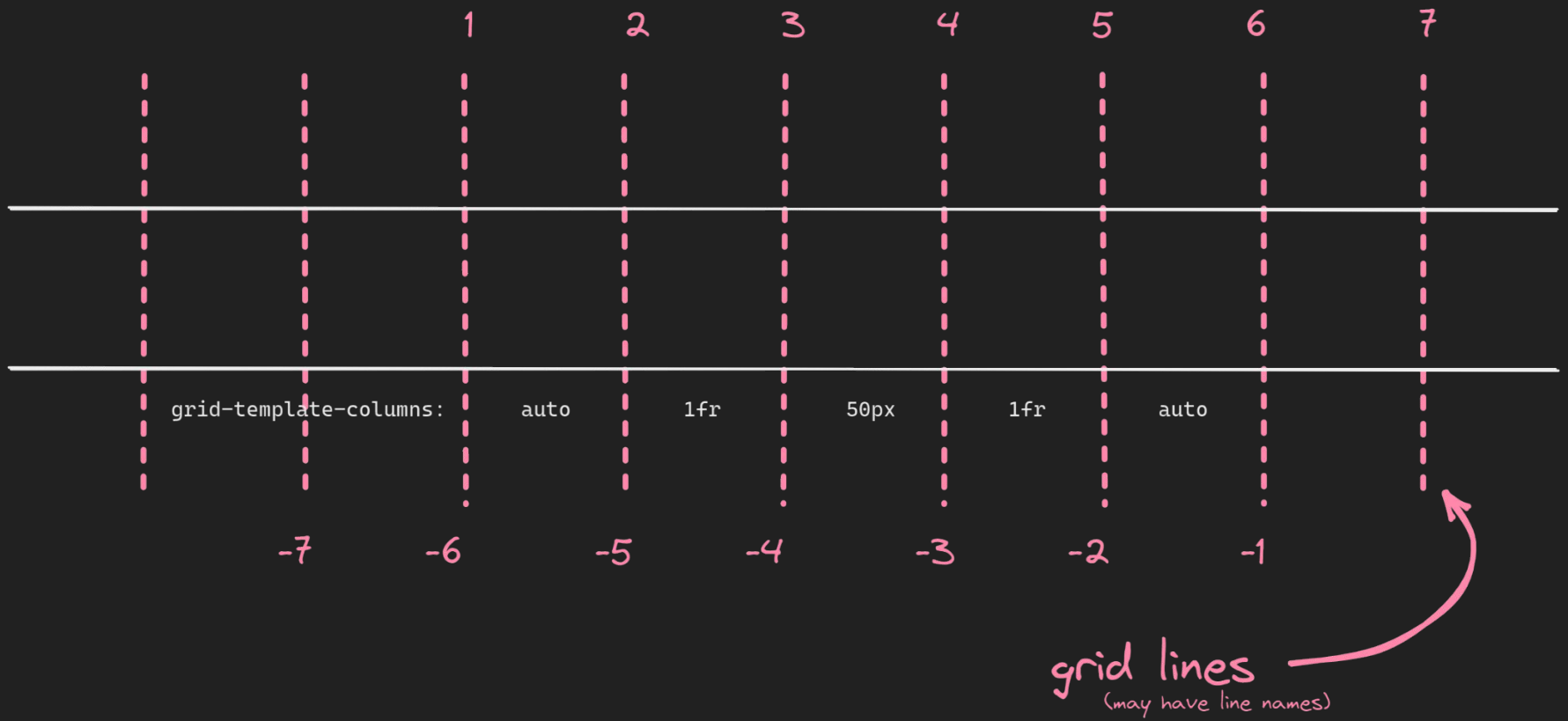
Grids within a grid



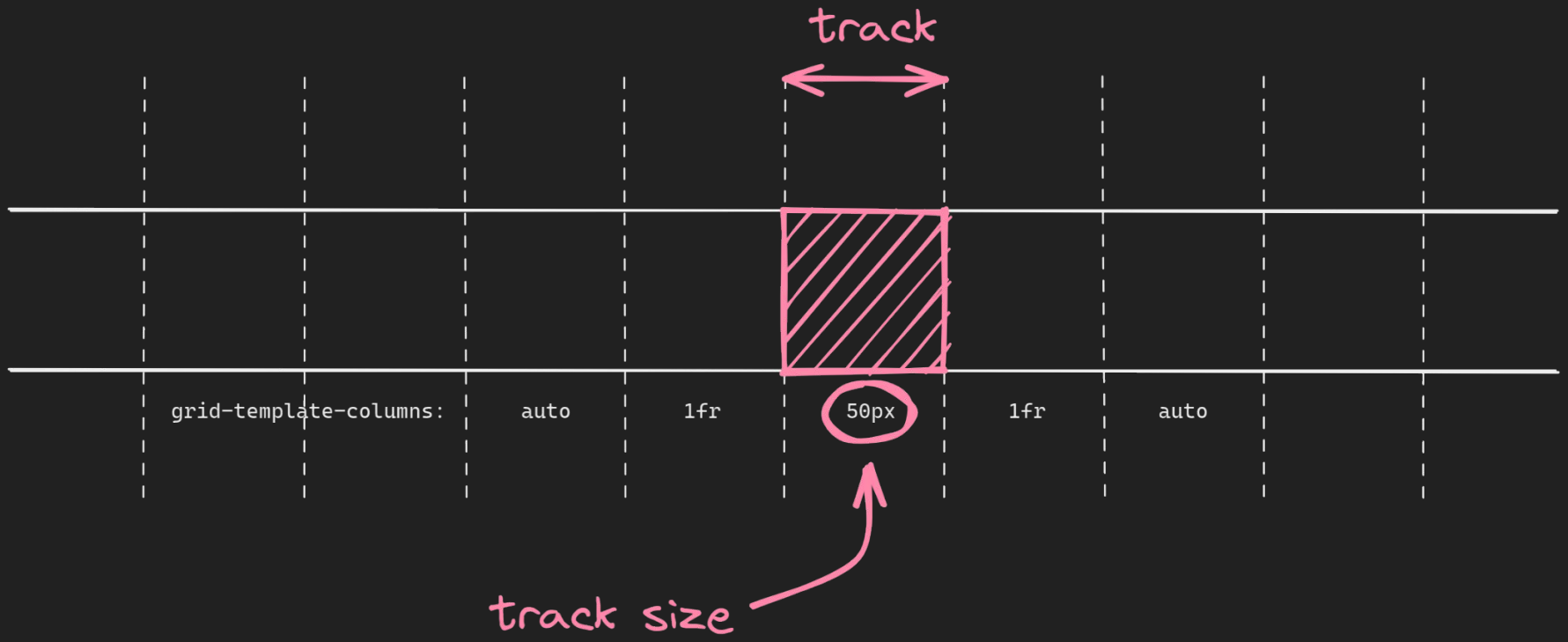
Track collection



Grid lines

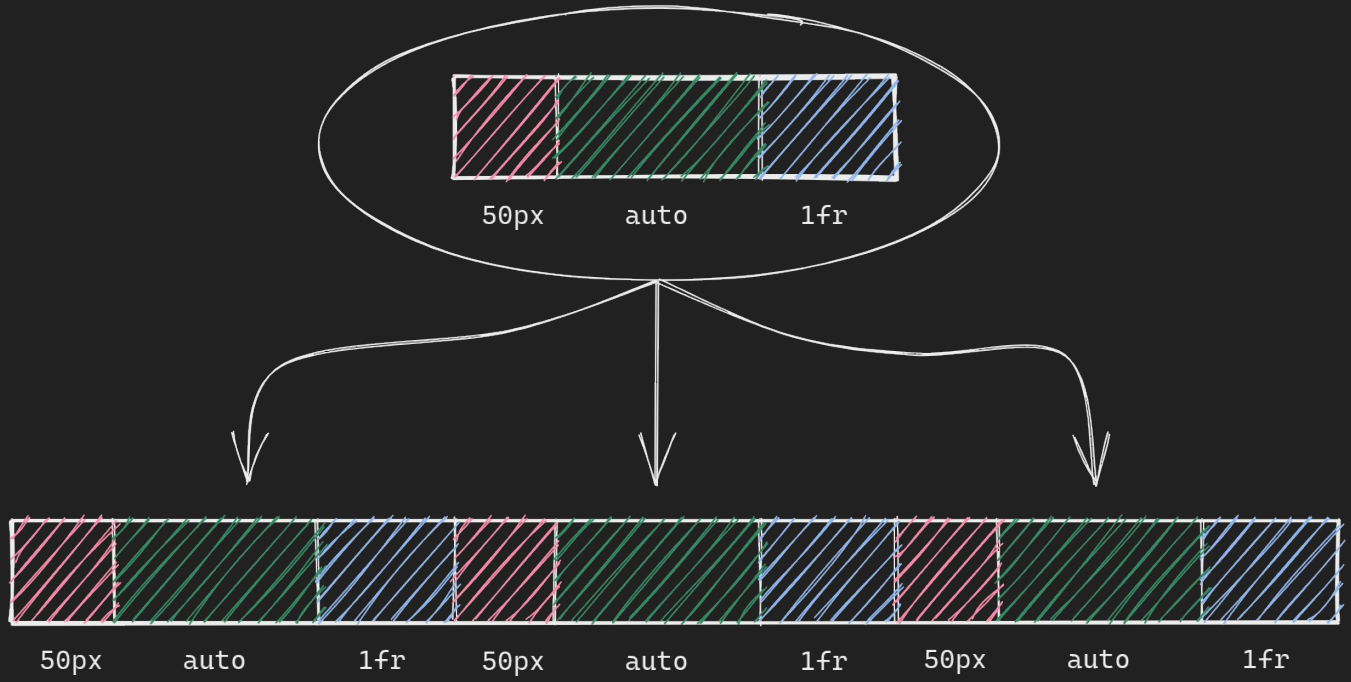

1
2
3
4
5
6
7
grid-template-columns:
auto
1fr
50px
1fr
auto
-7
-6
-5
-4
-3
-2
-1
grid lines
(may have line names)

Track definition



Repeater

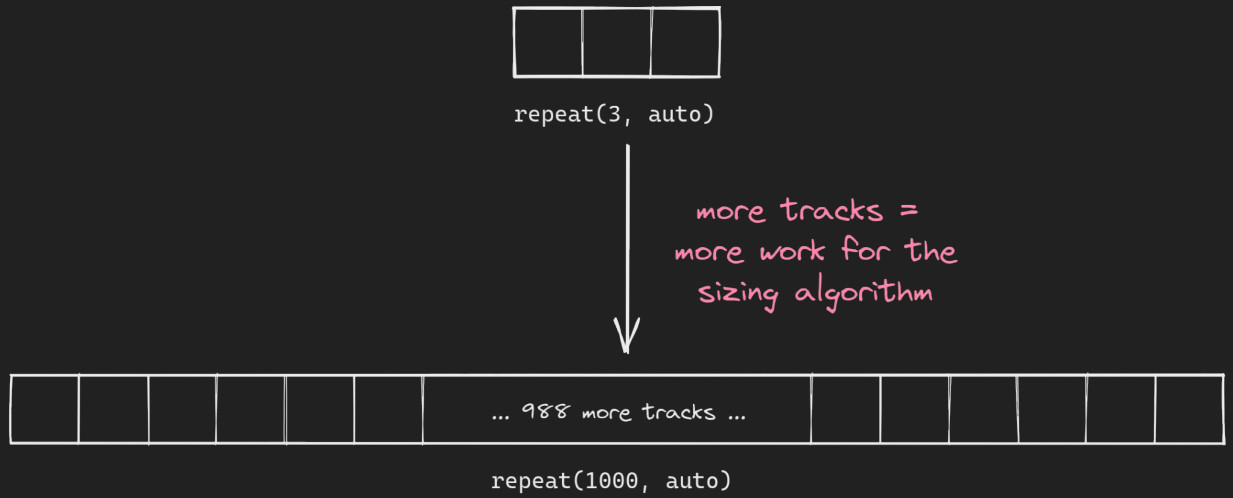
```
repeat(3, 50px auto 1fr)
```



What GridNG does differently

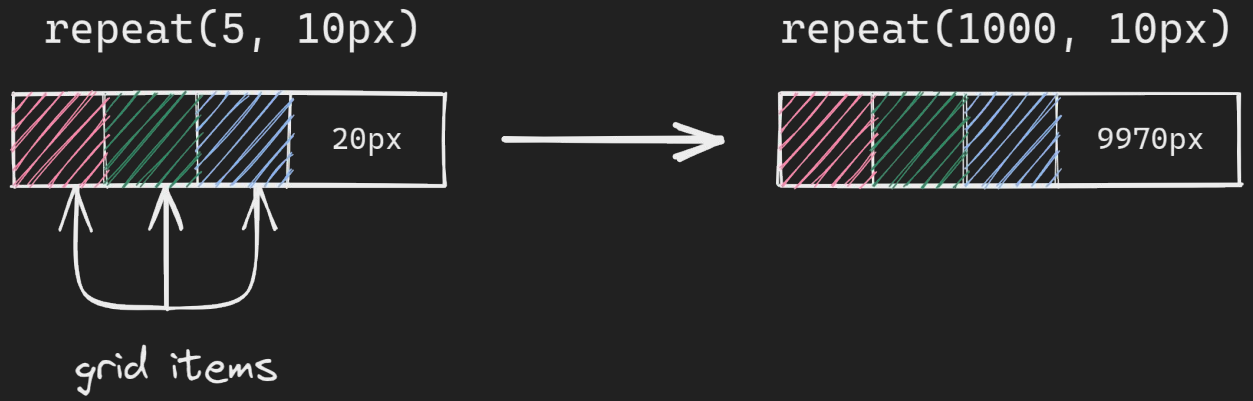
Deliberate features

- Avoid expanding repeaters as much as possible
  - How to deal with `grid-template-columns: repeat(1000, auto)`?



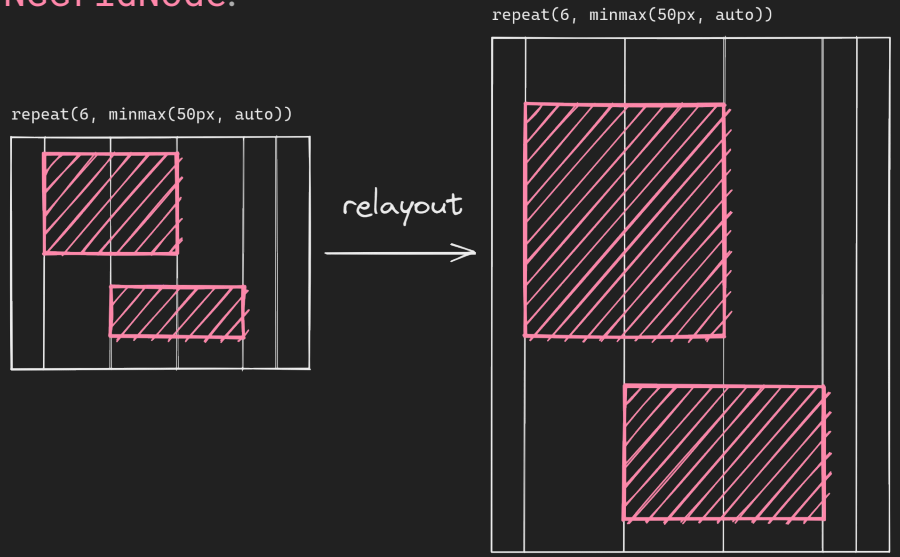
Deliberate features

- Avoid expanding repeaters as much as possible
  - Complexity is tied to the number of tracks and grid items that the author defines.
  - Changing the hard-coded max number of tracks that a grid can have does not affect performance or memory usage of our implementation.



Deliberate features

- Keep the state of grid algorithms in stack
  - In other words... pass all context for grid methods via parameters.
  - Couple of methods rely on this to invalidate cached results.
    - E.g., resolved grid item positions in `NGGridNode`.



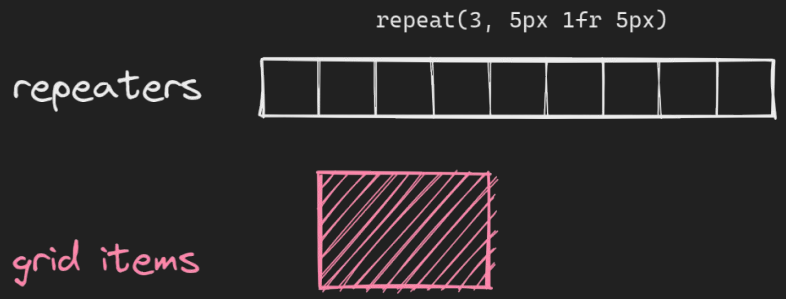
Don’t expand repeaters!

repeat(3, 5px 1fr 5px)

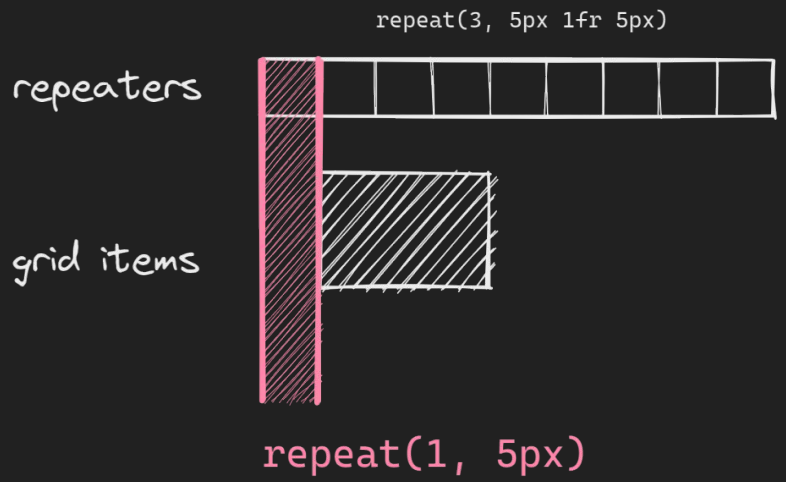
repeaters

= 15px 3fr 15px

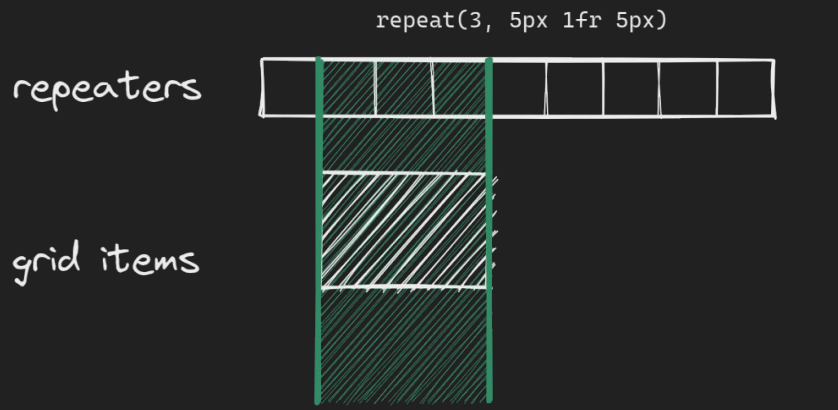
Don’t expand repeaters!



Don’t expand repeaters!

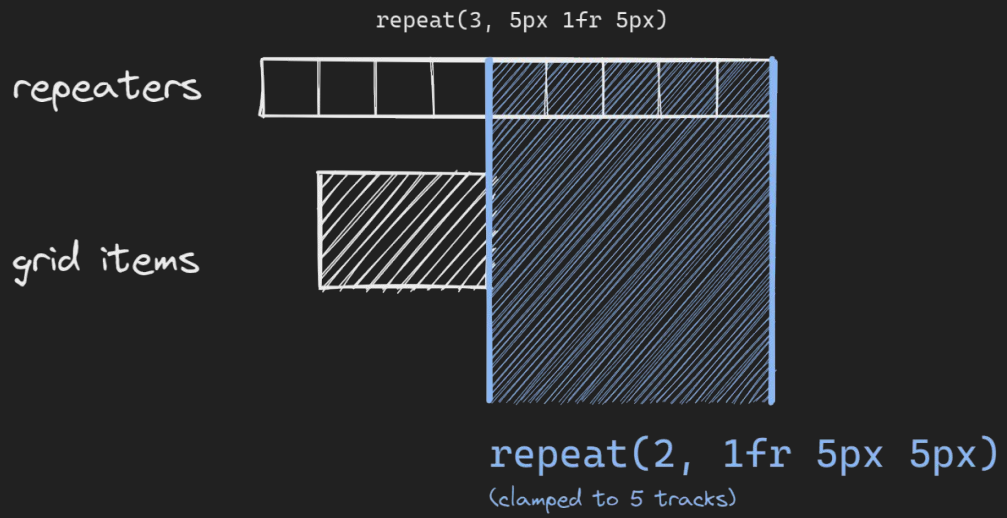


Don’t expand repeaters!

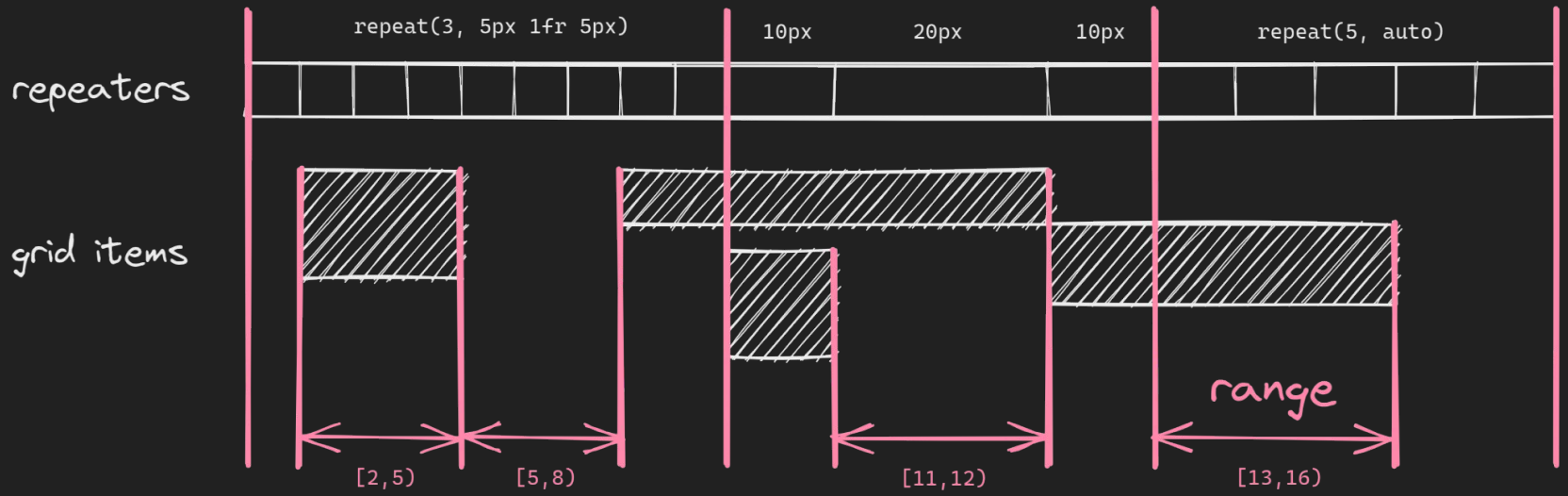


`repeat(1, 1fr 5px 5px)`

Don’t expand repeaters!

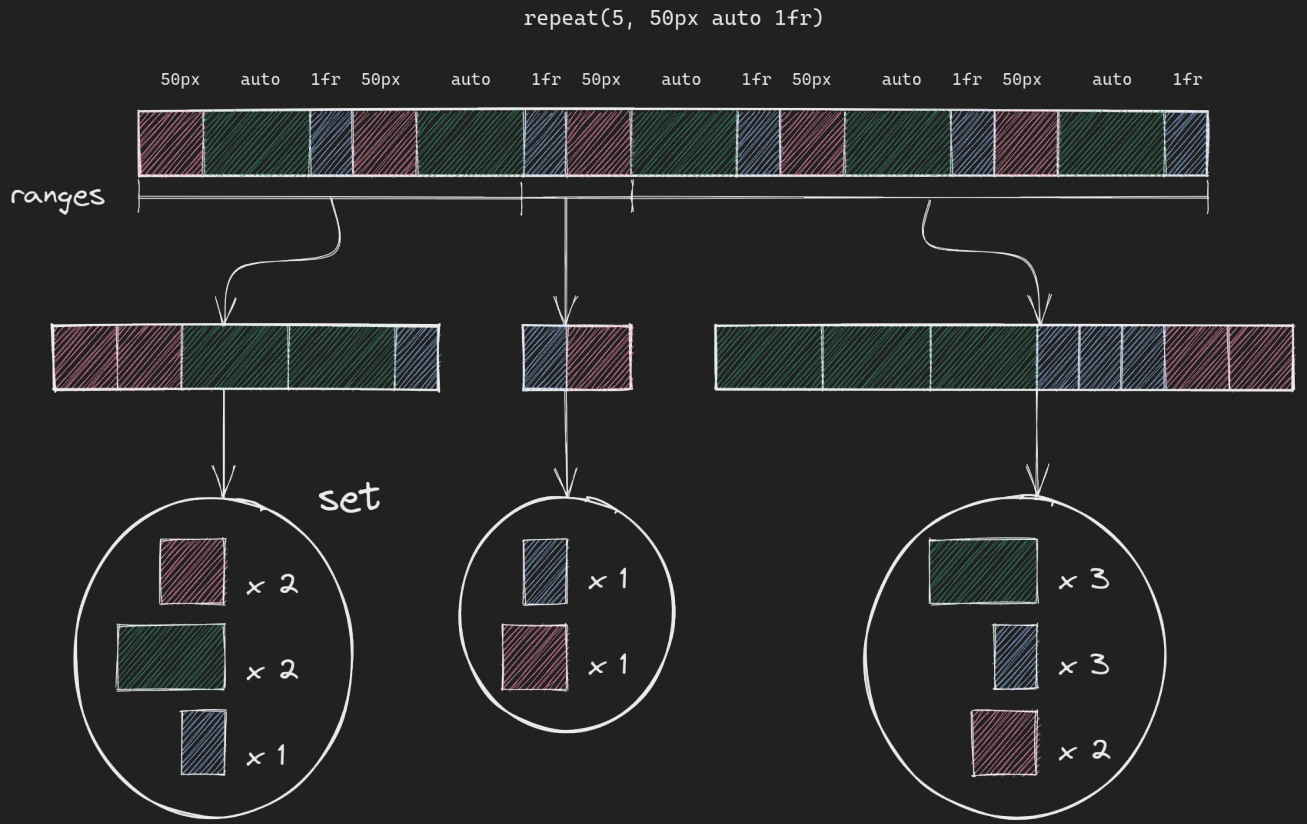


Track ranges




```
ranges = [[ 1,  2), [ 2,  5), [ 5,  8),
          [ 8, 10), [10, 11), [11, 12),
          [12, 13), [13, 16), [16, 18)]
```

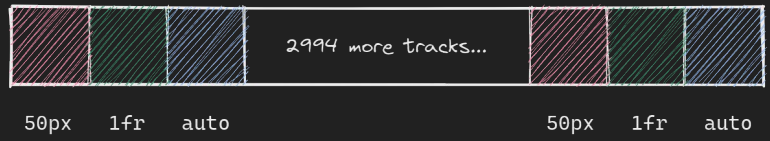
Sets of track definitions



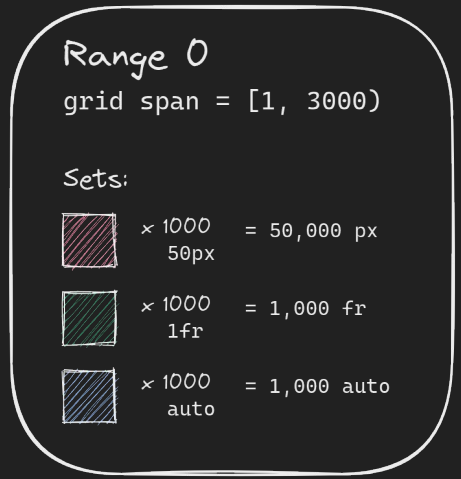
Not expanding repeaters = lower complexity

`repeat(1000, 50px 1fr auto)`

Legacy track collection

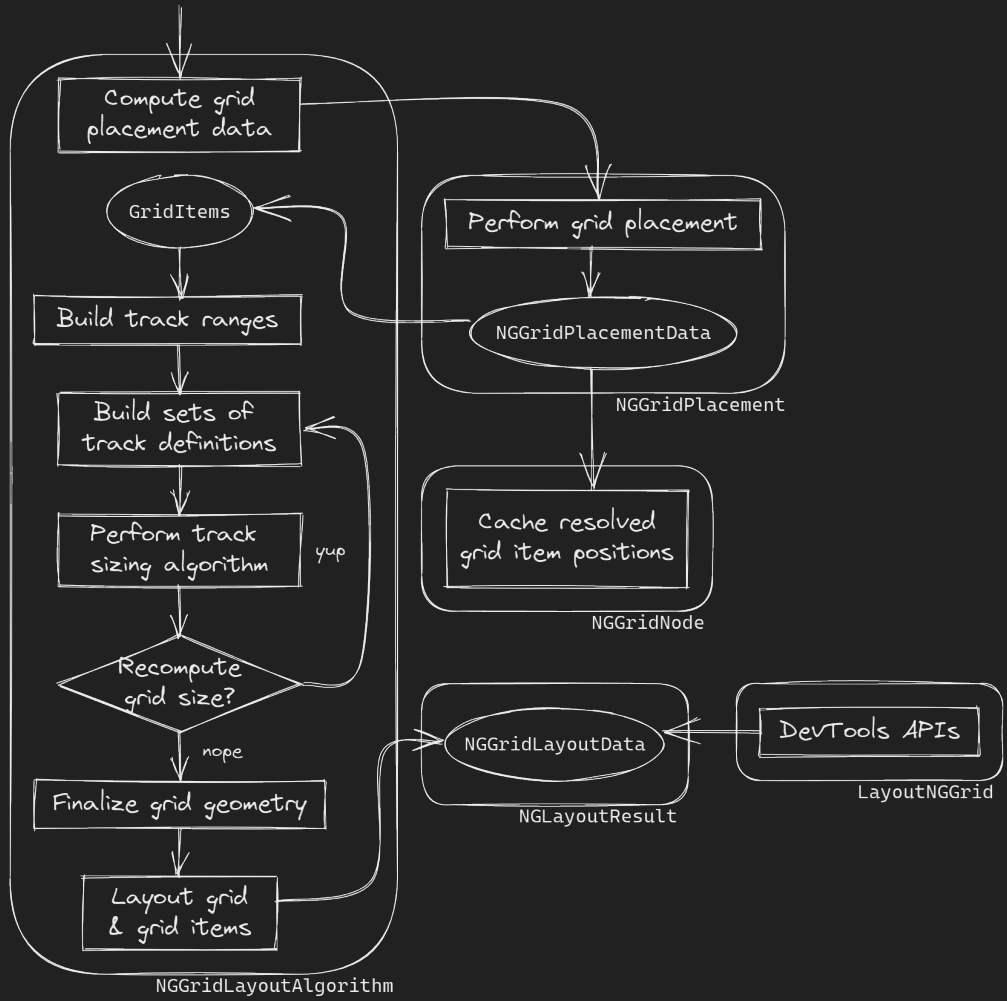


GridNG track collection



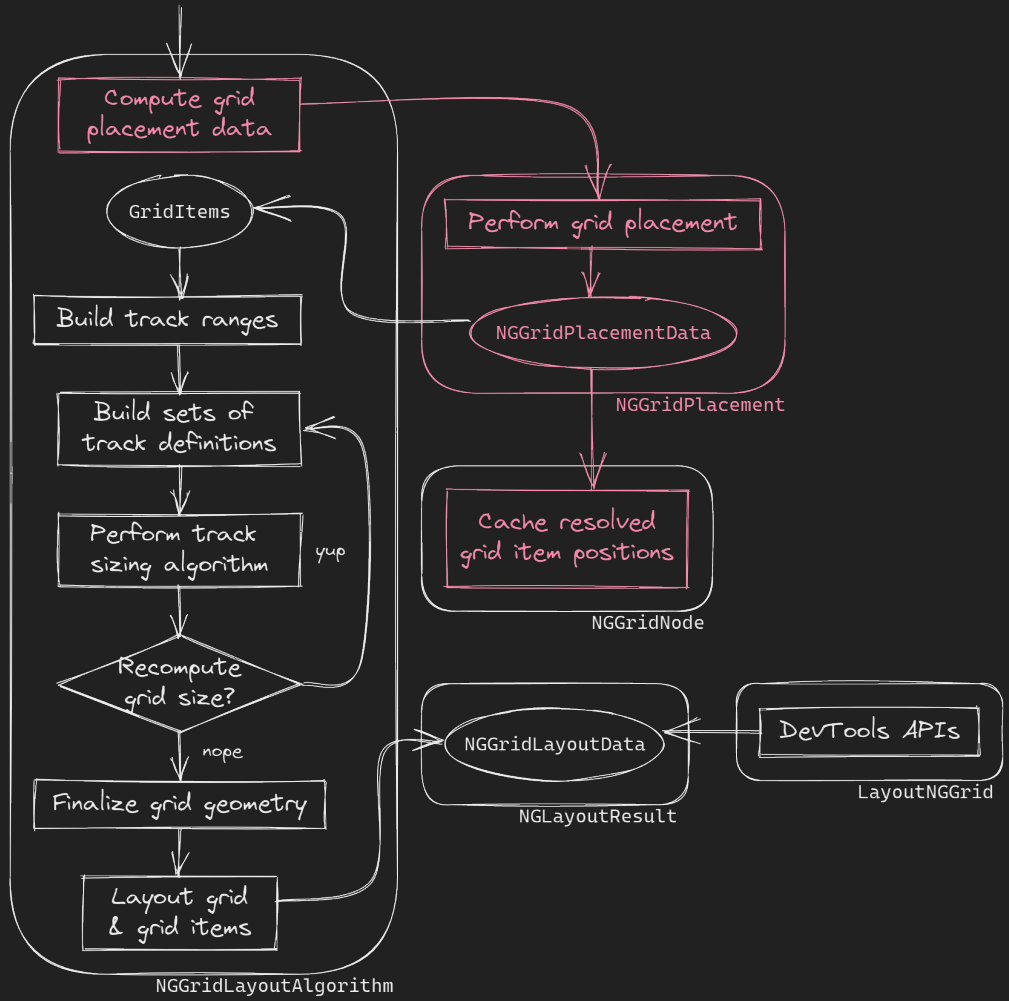
GridNG pipeline

... before subgrid



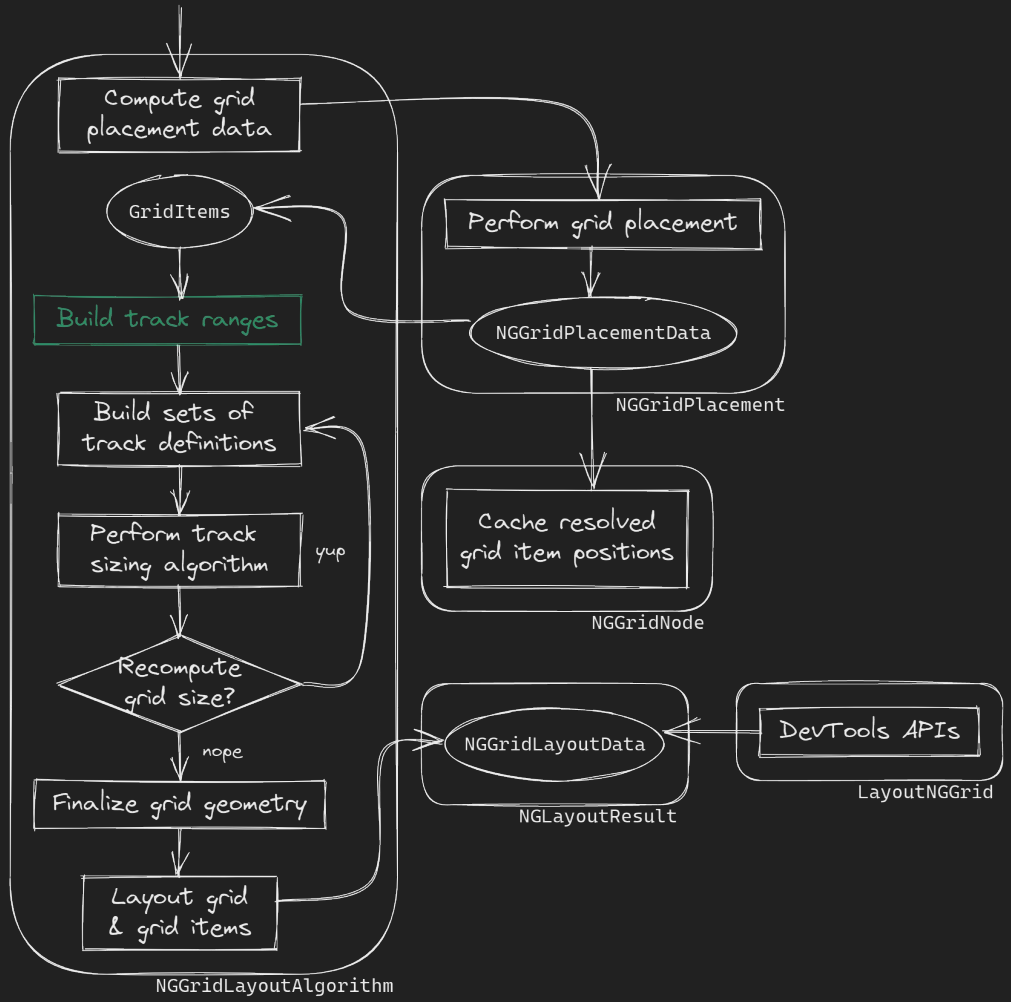
Grid placement

- Auto-placement algorithm is very expensive, we cache its resolved grid item positions.



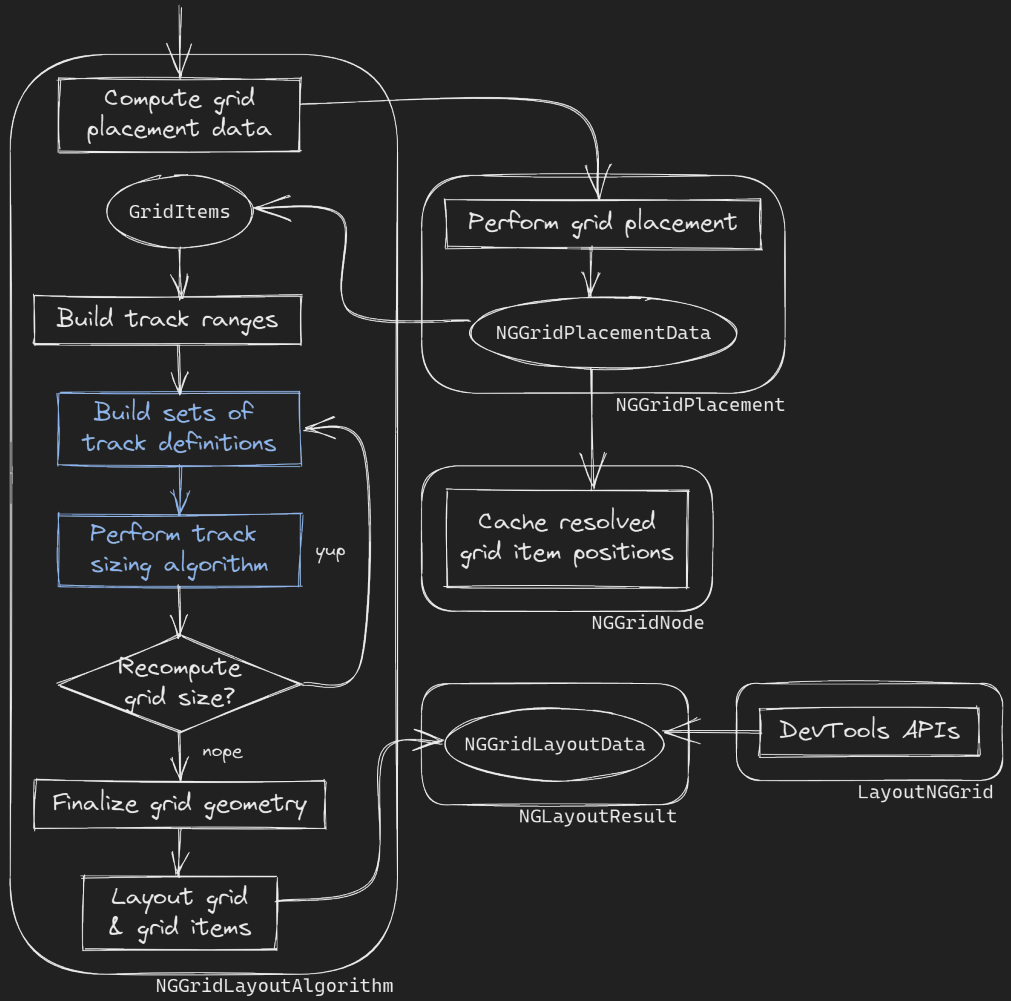
Build track ranges

- NGGridBlockTrackCollection
- Cache properties of each track range, we need to know if they contain intrinsic or flexible tracks, rely on block size, etc.
- Cache the subset of ranges spanned by each grid item.



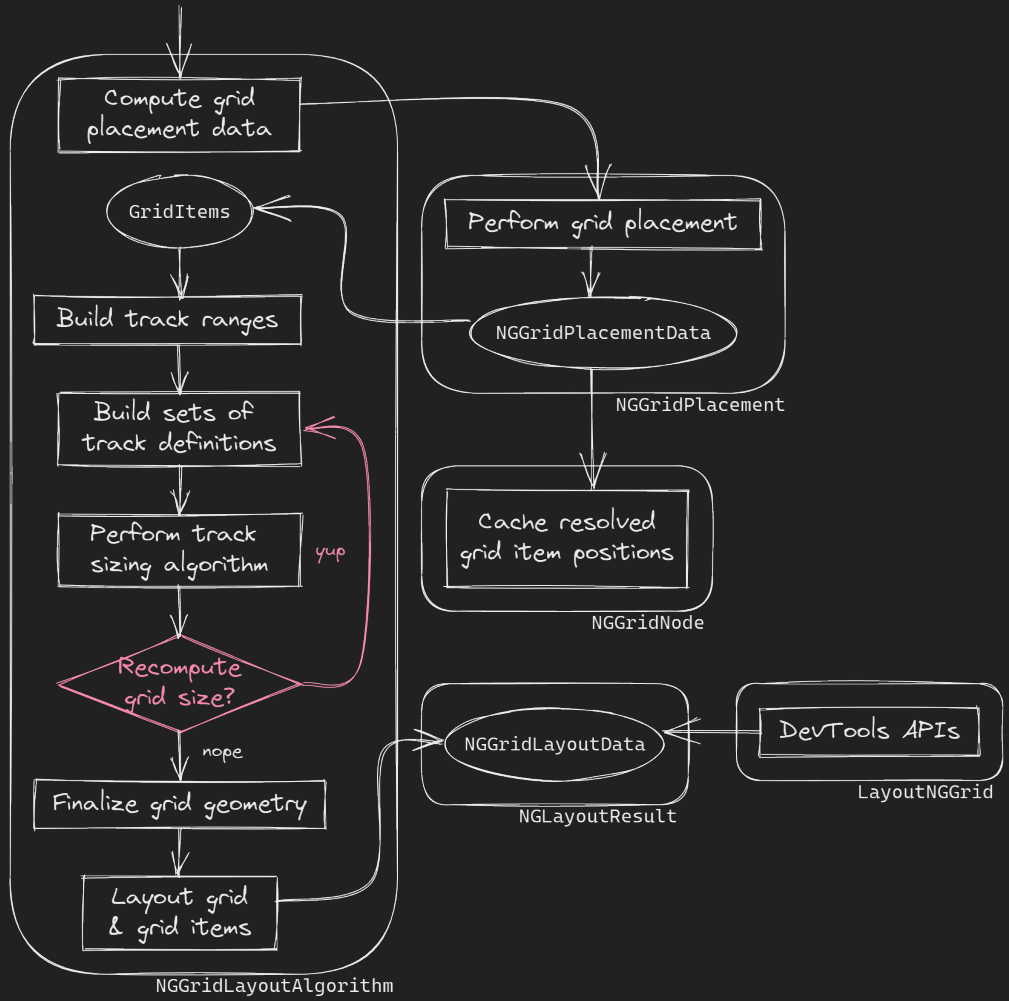
Grid sizing

- Track sizing algorithm works mostly the same, but our implementation sizes sets of tracks instead of single tracks.
- Between passes of the track sizing algorithm, we make use of `NGGridLayoutData` to compute the available space for measuring grid items.



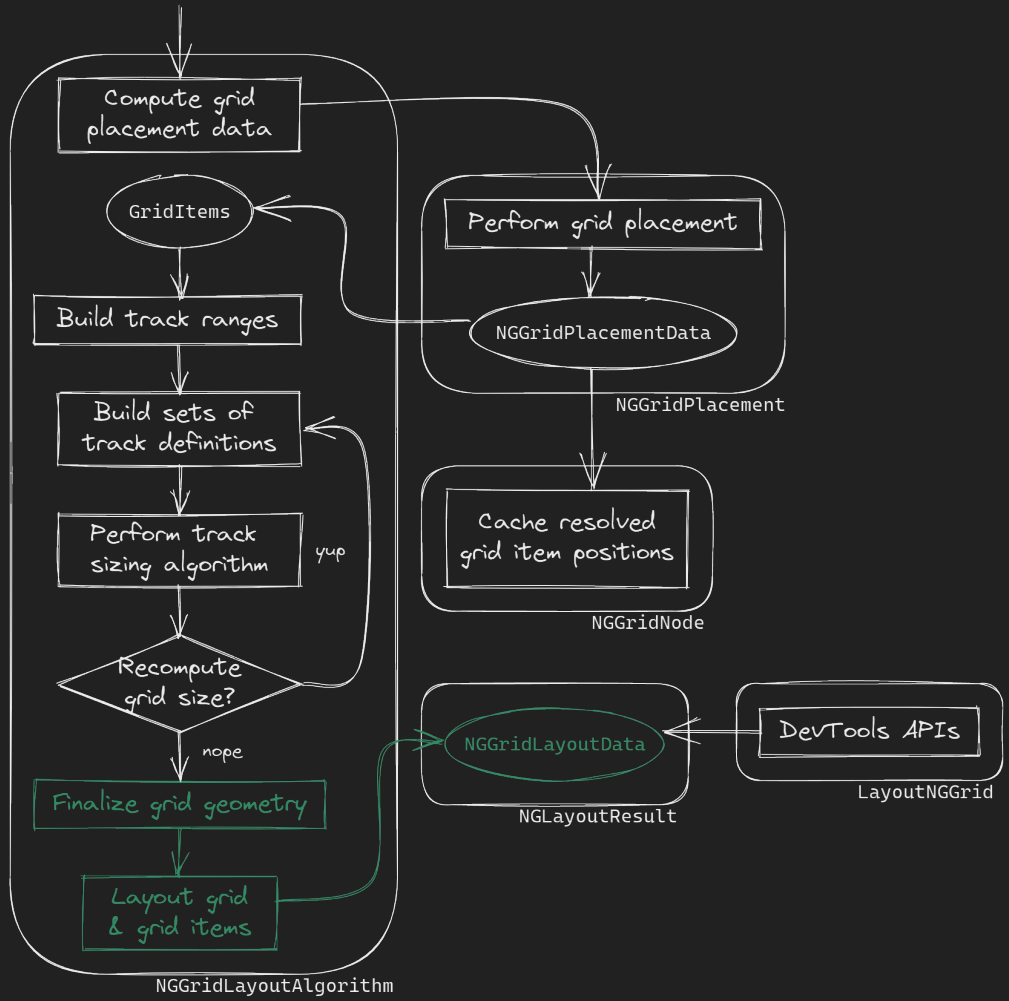
Recompute grid size

- We need to recompute the grid size whenever the available block size was indefinite and we have a dependency on it, e.g., a row has percentage size.



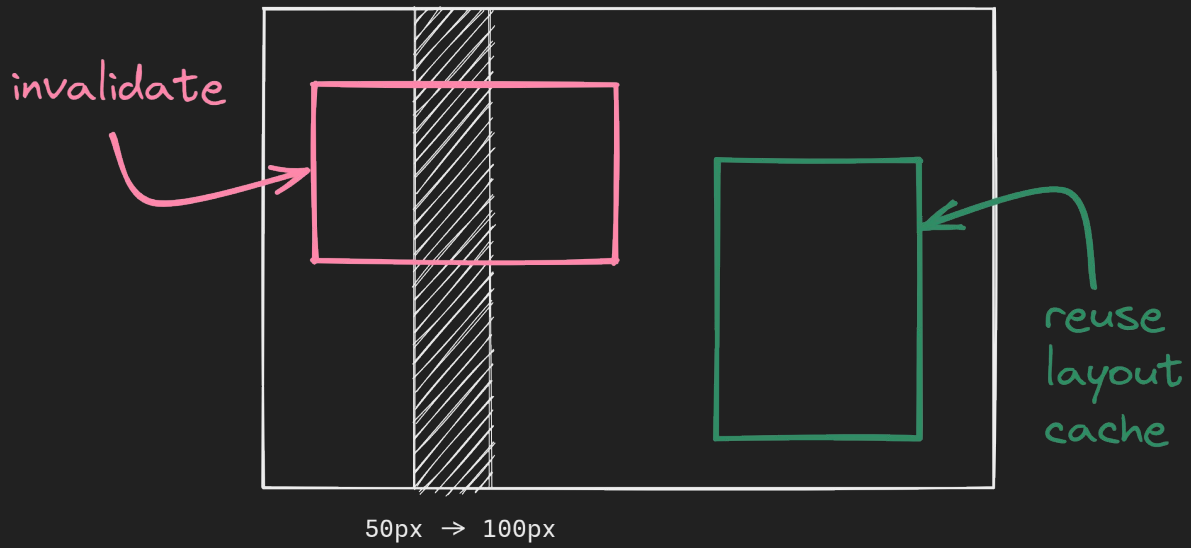
Layout

- After sizing, we cache the start offset of every set in both track collections. These offsets are known as the “grid geometry”.
- At this point, we adjust the grid geometry for fragmentation.



Taking advantage of LayoutNG

- Free caching of `NGLayoutResult`!
  - `NGConstraintSpace` is built from `NGGridLayoutData`.
  - Changes to a track range only invalidate the cache of relevant grid items.



What’s next?

Subgrid will challenge our implementation

- Subgridded items need to be placed before we size the grid.
  - We need to entirely isolate grid placement from `NGGridLayoutAlgorithm`.

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  - A full revamp of `GridPositionsResolver` is necessary to inherit grid line names.
- Subgridded items account for a subgrid's margin, border, padding.
  - Rework of track sizing algorithm to accommodate hypothetical items.
  - Introduce accumulated "extra" margin to subgridded items.

Special thanks to the GridNG task force

- Ana Sollano Kim <ana.sollano@microsoft.com>
- Christian Biesinger <cbiesinger@chromium.org>
- Daniel Libby <dlibby@microsoft.com>
- Ian Kilpatrick <ikilpatrick@chromium.com>
- Jacques Newman <jacques.newman@microsoft.com>
- Kurt Catti-Schmidt <kschmi@microsoft.com>

Thank you!

Questions?