

The ALMA Observation Support Tool (OST)

Helping us to see what ALMA sees

Dan Walker

What is the OST?

- An online ALMA simulator to create a synthetic observation of a given source image
- Set up an observation by defining some basic parameters (e.g. frequency, resolution, time-on-source)
- Provide your own FITS image to 'observe', or choose from one of the examples

ALMA Observation Support Tool

Version 9.0

OST NEWS HELP QUEUE LIBRARY ACKNOWLEDGE ALMA HELPDESK

WARNING: Issues with Gmail accounts. (more info). OST Team

Array Setup:

Instrument: ALMA

Select the desired ALMA antenna configuration. Full ALMA means the simulations will be done with the full capabilities ALMA will achieve in the future (e.g. observing with 50 antennas, or Band 10 Configuration 10 observations); some of these may not yet be offered in the current cycle. Selecting cycle-specific configurations will simulate the capabilities of ALMA in that cycle, and therefore some observations might be restricted (you will be notified if this is the case). Please, refer to the ALMA documentation for each cycle capabilities.

Sky Setup:

Source model: OST Library: Watchmen logo

Upload: Choose file No file chosen

Declination: -35d00m00.0s

Image peak / point flux in mJy 0.0

Choose a library source model or supply your own. You may upload your own model here (max 10MB). This must be a FITS file with the extension .fits included in the name of the file, e.g. model.fits. Ensure correct formatting of this string (+/-00d00m00.0s). Rescale the image data with respect to new peak value. Set to 0.0 for no rescaling of source model.

Observation Setup:

Observing mode: Spectral Continuum

Central frequency in GHz: 93.7

Bandwidth in MHz: 32

Use full Stokes parameters: Yes No

Number of polarizations: 2

Spectral or continuum observations? The value entered must be within an ALMA band. Select the total bandwidth for continuum observations. Enter 7.5 GHz to select ALMA recommend full continuum setup. If your input image contains more than one Stokes plane use them all (Yes), or just Stokes I (no/default). This affects the noise in the final map. Ignored in continuum mode if "Use full Stokes parameters" is set to yes.

Required resolution in arcseconds: 1.0

OST will choose array config based on this value if instrument is set to ALMA.

Why use the OST?

Proposal preparation

- Test your technical case — i.e. can you detect your source / resolve the relevant structure with a realistic ALMA setup?
- Strengthen your science case — showcase what ALMA will be able to detect with your proposed setup, and how this links to your science objectives.

Comparing numerical simulation with real data

- Comparison between idealised (model) data and real (observed) data is a fundamental part of astronomy. Using the OST, simulated data can be ‘corrupted’ with observational noise and artefacts in order to make a fairer comparison, and ultimately strengthen such models.

How does it compare to a real observation?

The OST is itself an idealised version of a real observation, and there are some differences, such as:

- Only atmospheric water vapour is considered, and it is a static value. In reality, this will change during a real observation, along with other weather effects that are not considered (e.g wind speed).
- Scan spacings may differ in real observations (i.e. the cycling between observing the science target, phase calibrator, amplitude calibrator)

Overall, the OST gives an accurate* approximation of what ALMA will see, but it is important to keep caveats in mind — real data will not be identical!

(Note: if you want further control, you can run simulated ALMA observations in CASA using the tasks `simobserve` or `simalma`)

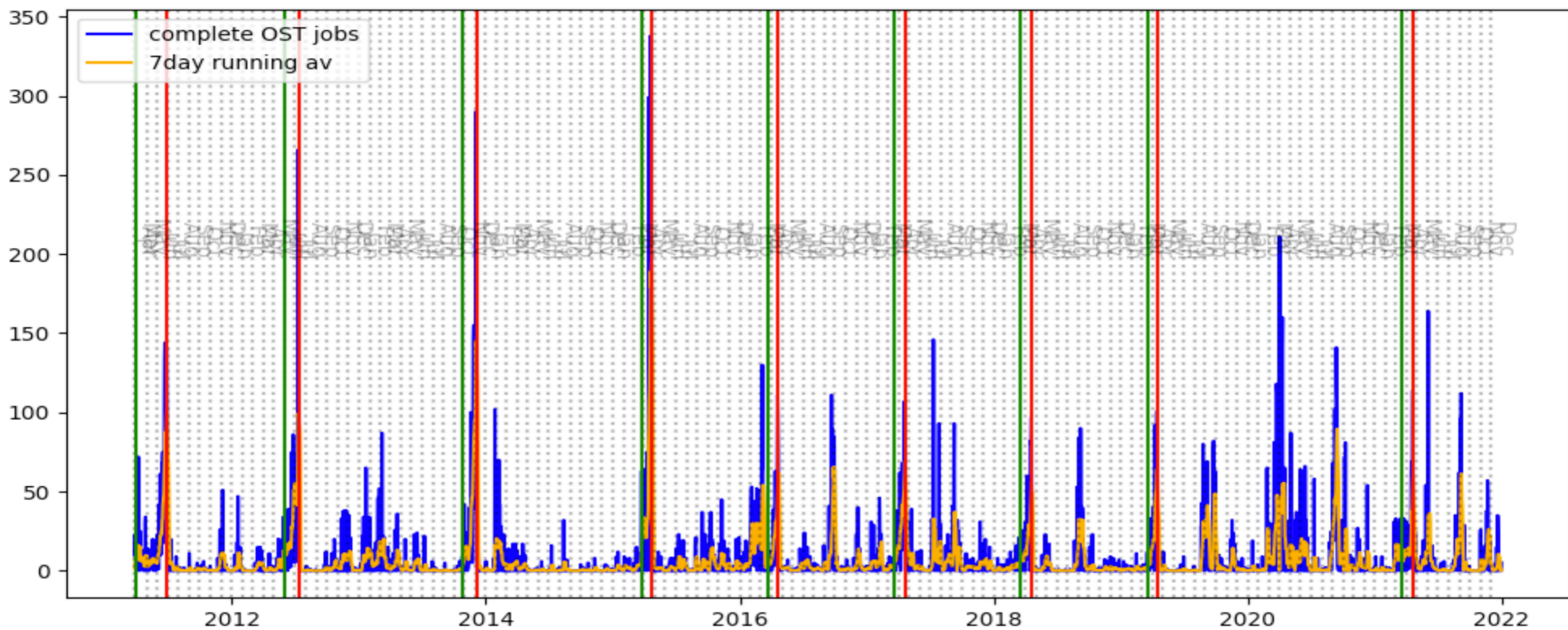
* provided user inputs are sensible! :)

A brief history of the OST

- Became available to the public on 28-Mar-2011 (Cycle 0)
- Original version by Ian Heywood (2010), upgraded and maintained by Adam Avison* (2011-2021), Ana Karla Díaz-Rodríguez (2021-now), and me (2022-now)
- It has processed ~ 29,000 simulations for users in at least 42 different countries to date
- A new version is released each year, increasing the OST capabilities, as well as accounting for new ALMA capabilities and antenna configurations.

* watch Adam's [I-TRAIN video](#)

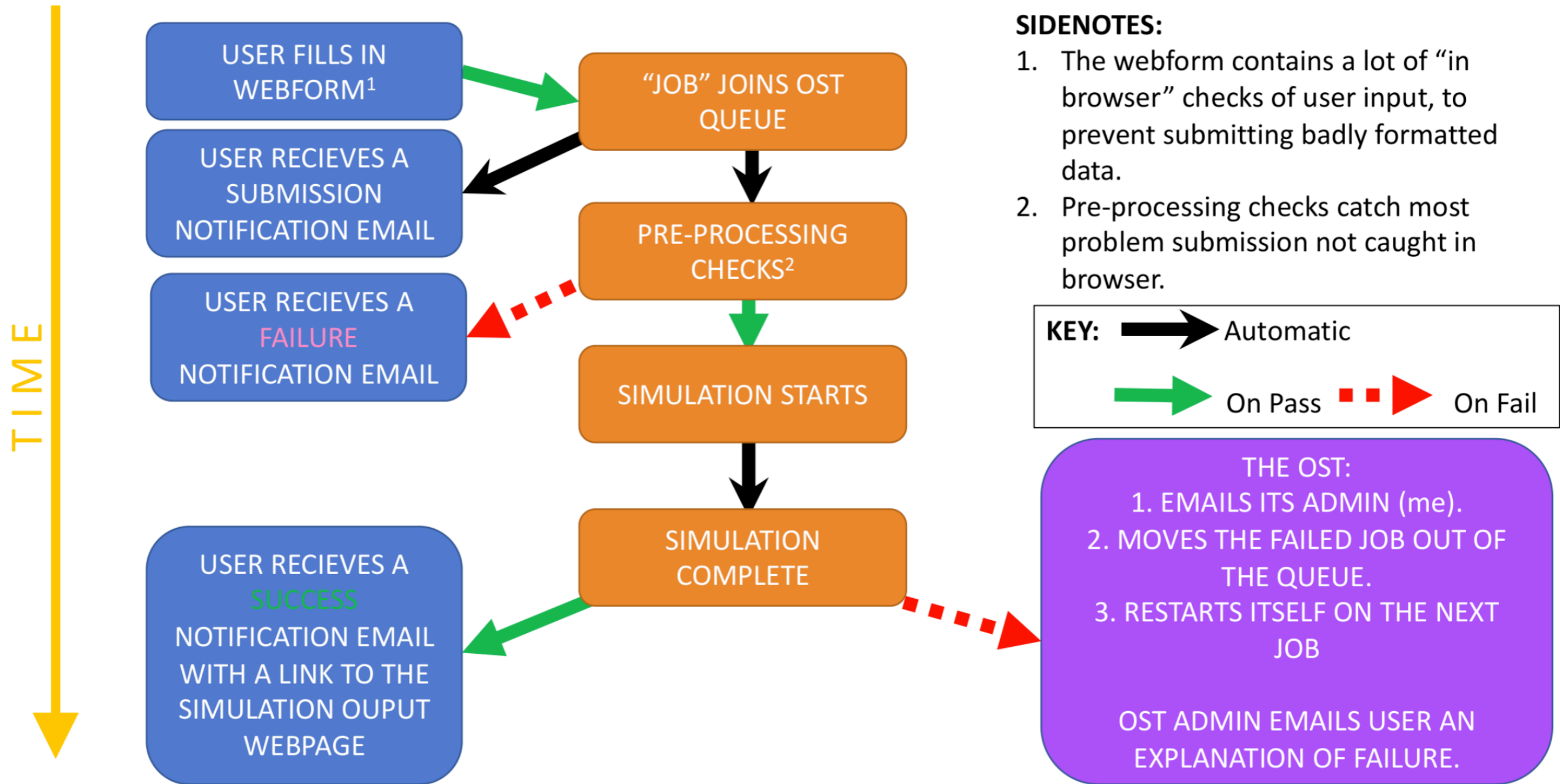
OST usage vs. time



— Proposal submission opened
— Proposal submission closed

* until Dec 31st, 2021

OST workflow



SIDENOTES:

1. The webform contains a lot of "in browser" checks of user input, to prevent submitting badly formatted data.
2. Pre-processing checks catch most problem submission not caught in browser.

Let's use the OST!

<https://almaost.jb.man.ac.uk>

OST demo overview

1. A simple continuum observation of a point source
2. A slightly more complex continuum
3. A spectral line/cube demonstration

OST PARAMETER	DEMO 1: Point Source Continuum	DEMO 2: Full BW Model Image Continuum	DEMO 3: Spectral Cube
INSTRUMENT	ALMA	ALMA Cycle 9 C-2 & C-6	ALMA Cycle 9 C-6
SOURCE MODEL	OST Library: Central Point Source	OST Library: Protostellar Cluster	OST Library: Test Cube 64x64x16
DECLINATION	-40d00m00.0s	-25d30m00.0s	-35d00m00.0s
IMAGE PEAK/POINT FLUX	0.5mJy	0.0mJy	0.0mJy
OBSERVING MODE	Continuum	Continuum	Spectral
CENTRAL FREQ. IN GHZ	230	333.0	90
BANDWIDTH	0.5GHz	2.2GHz [SPW 0: 328.0 / BW 0: 1.1] [SPW 1: 338.0 / BW 1: 1.1]	144.8kHz
USE FULL STOKES PARAMETER?	No	No	No
NUMBER OF POLS.	2	2	2
REQUIRED RES. IN ARCSEC	0.2	1.0*	1.0*
POINTING STRATEGY	Single	Mosaic	Mosaic
ON-SOURCE TIME	2hours	4hours	2hours
START HOUR ANGLE	-1.0	+1.0	0.0
NUMBER OF VISITS	1	2	1
CYCLE TO PHASE CALIBRATOR?	No	Yes [Phase Cycle: 300s / On Phase: 30]	No
ATMOSPHERIC CONDITIONS	0.913mm (3 rd Octile)	0.472mm (1 st Octile)	5.186mm (7 th Octile)
IMAGING WEIGHTS	NATURAL	BRIGGS	UNIFORM
PERFORM DECONVOLUTION	YES	YES	YES
OUTPUT IMG FORMAT	FITS	FITS	FITS
EMAIL	<YOUR EMAIL>	<YOUR EMAIL>	<YOUR EMAIL>

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