The Roman Crowded Field Photometry Pipeline

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Roman Science Team Community Briefing 2021

Motivation & purpose

- Roman capability to push source separation in nearby galaxies at an unprecedented level and beyond ground observation capability

- Production and analysis of synthetic Roman crowded field images using photometry routines

- Verification of suitability between both observatory design specifications and team science program objectives

Building blocks

- Space Telescope Image Product Simulator (STIPS) for Roman
  - Simulate single detector WFI image from catalogue
  - Catalogue contains both stars & background galaxies
  - Calculates PSF from WebbPSF-WFIRST
  - Includes noise and residual errors

- DOLPHOT
  - Stellar photometry PSF-fitting package
  - Roman module currently in development

Workflow diagram

Workflow diagram

- First tests of STIPS used simple grid of identical stars
  ⇒ catalogue size α 10,000

- Render of M31 press release image with PHAT photometry
  ⇒ catalogue size α 100 million

- Currently aiming at a render of an M81 analogue from the suite of simulations FIRE
  ⇒ catalogue size α 200 million (+CANDELS background)

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or &

Run STIPS on splits

Prepare images and DOLPHOT parameters

HOT

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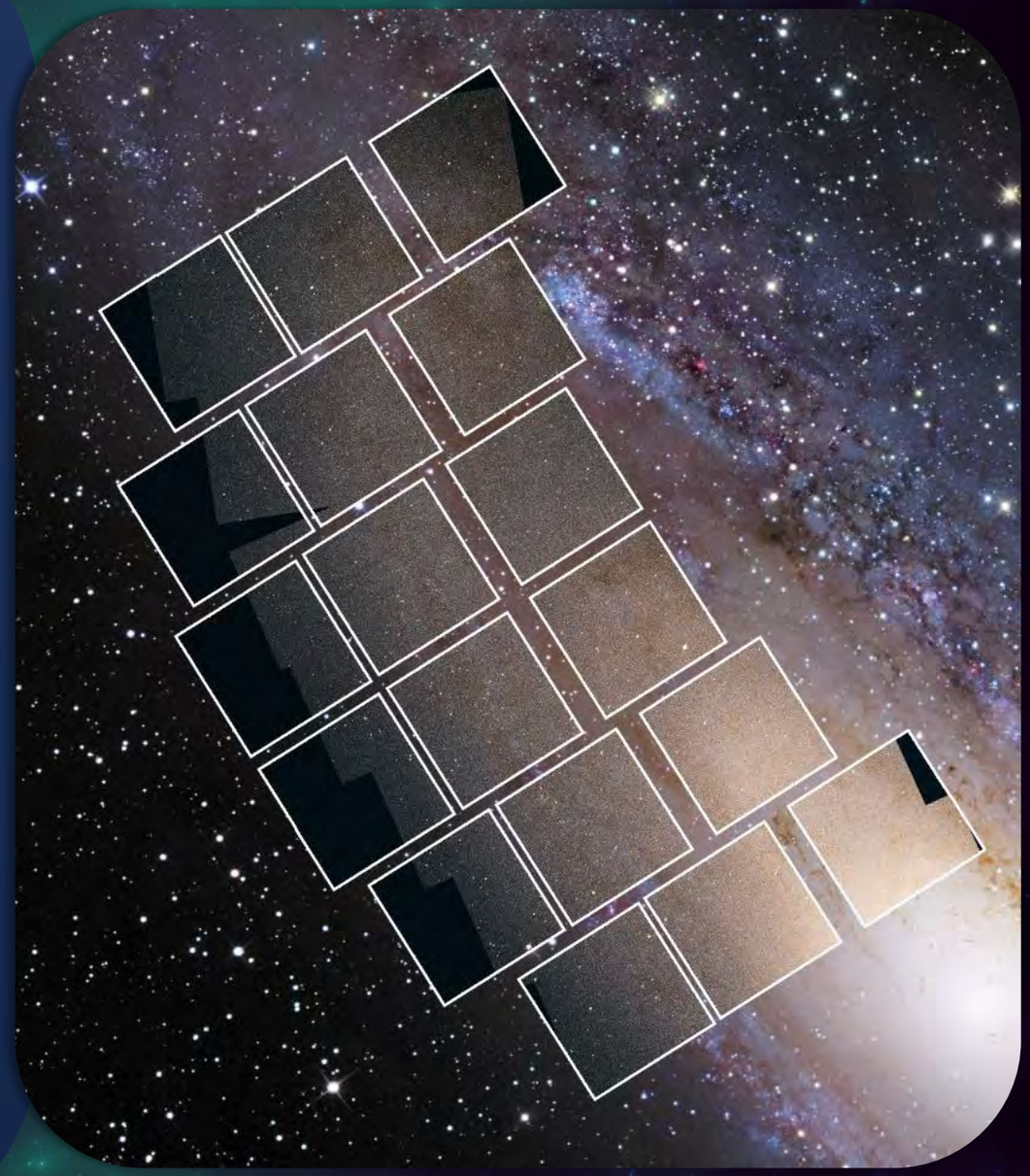

Workflow diagram

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Input photometry catalogue

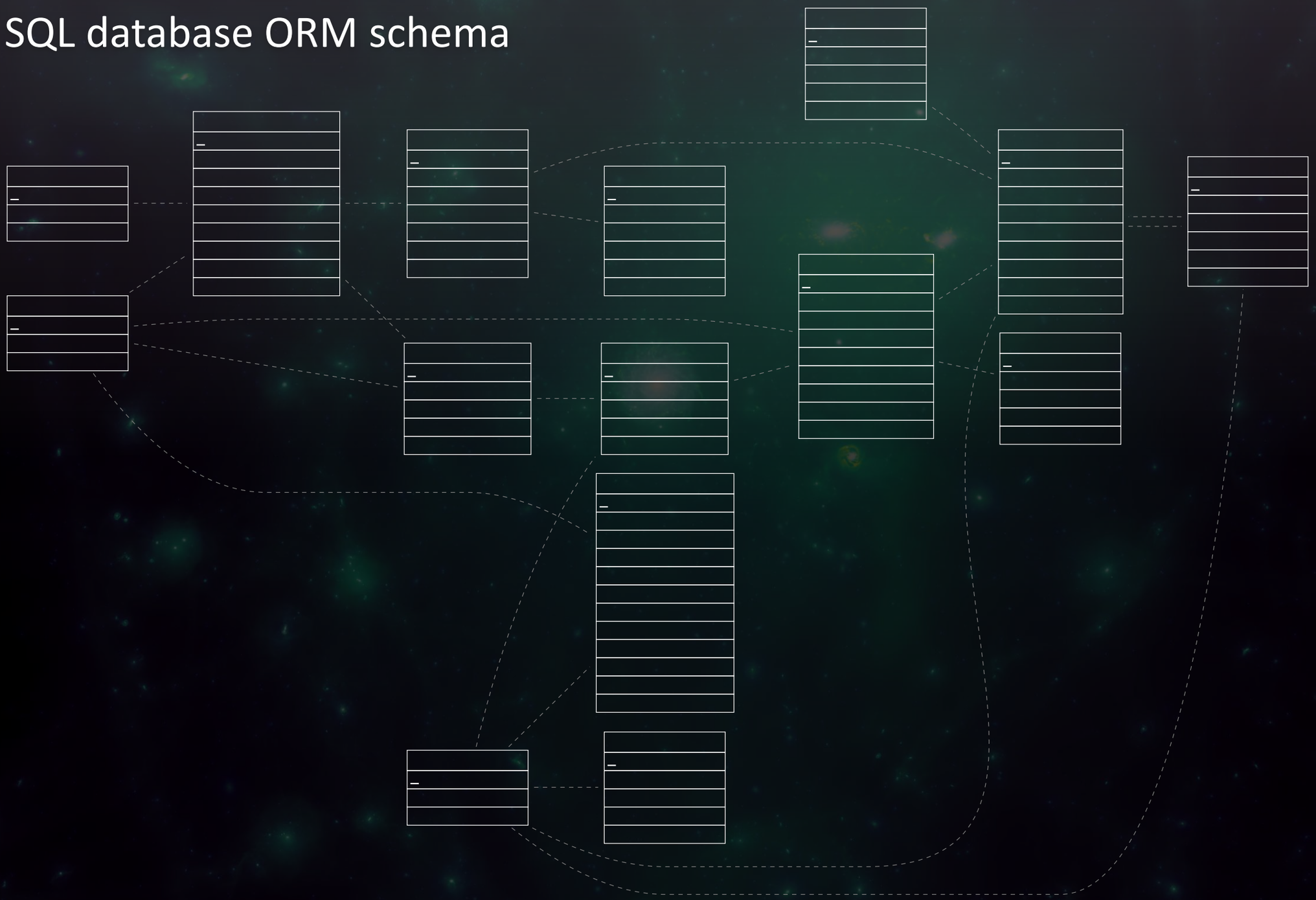
Split catalogue per detector & filter

Run STIPS on splits

- STIPS to simulate images per:
  - 18 detectors
  - 6 filter bands (R062, Z087, Y106, J129, H158, F184)
- Workflow must operate each image in parallel
- Dedicated module to track and manage workflow
  - All workflow records kept in centralized SQL database

Workflow manager

SQL database ORM schema



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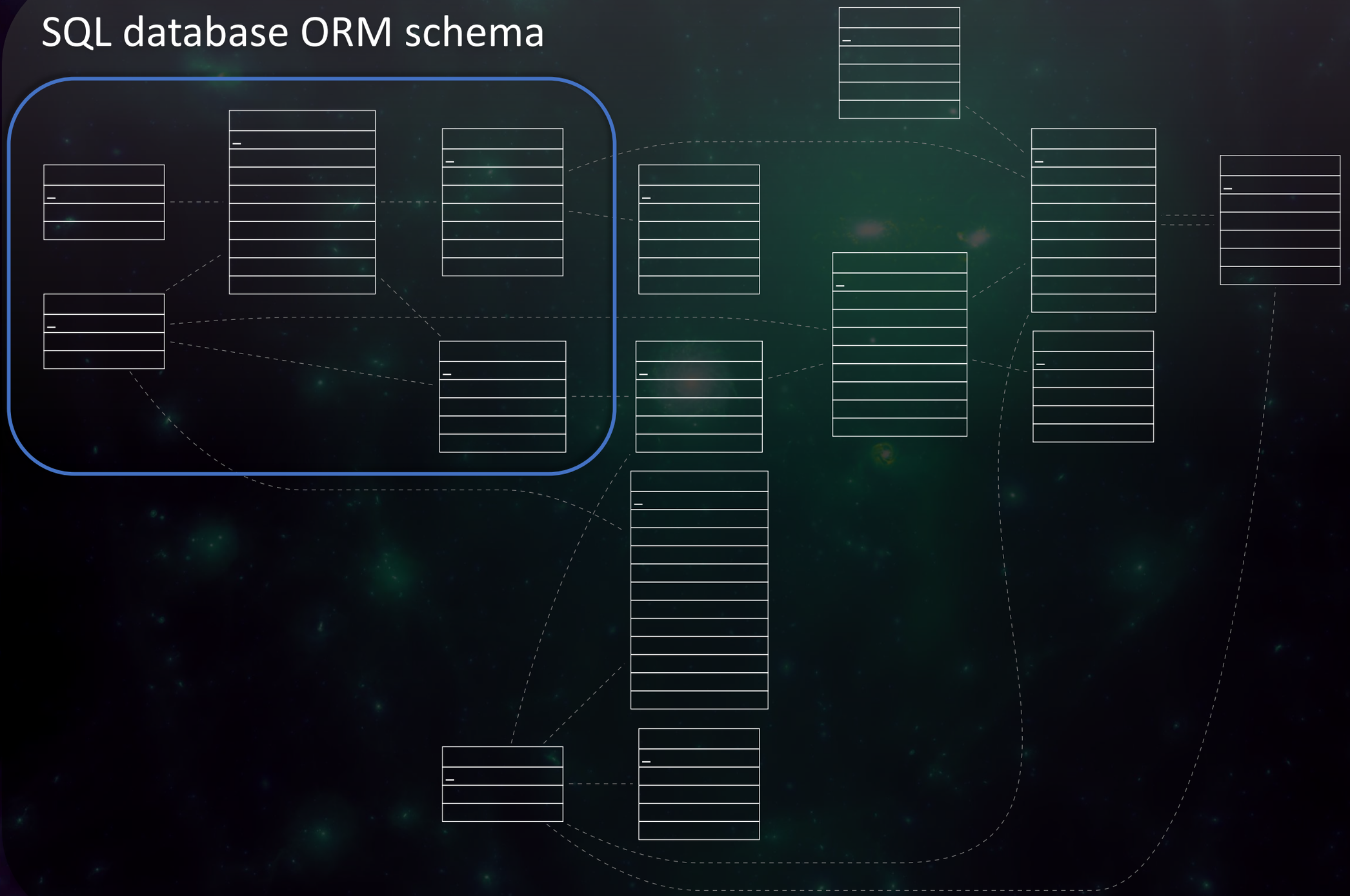

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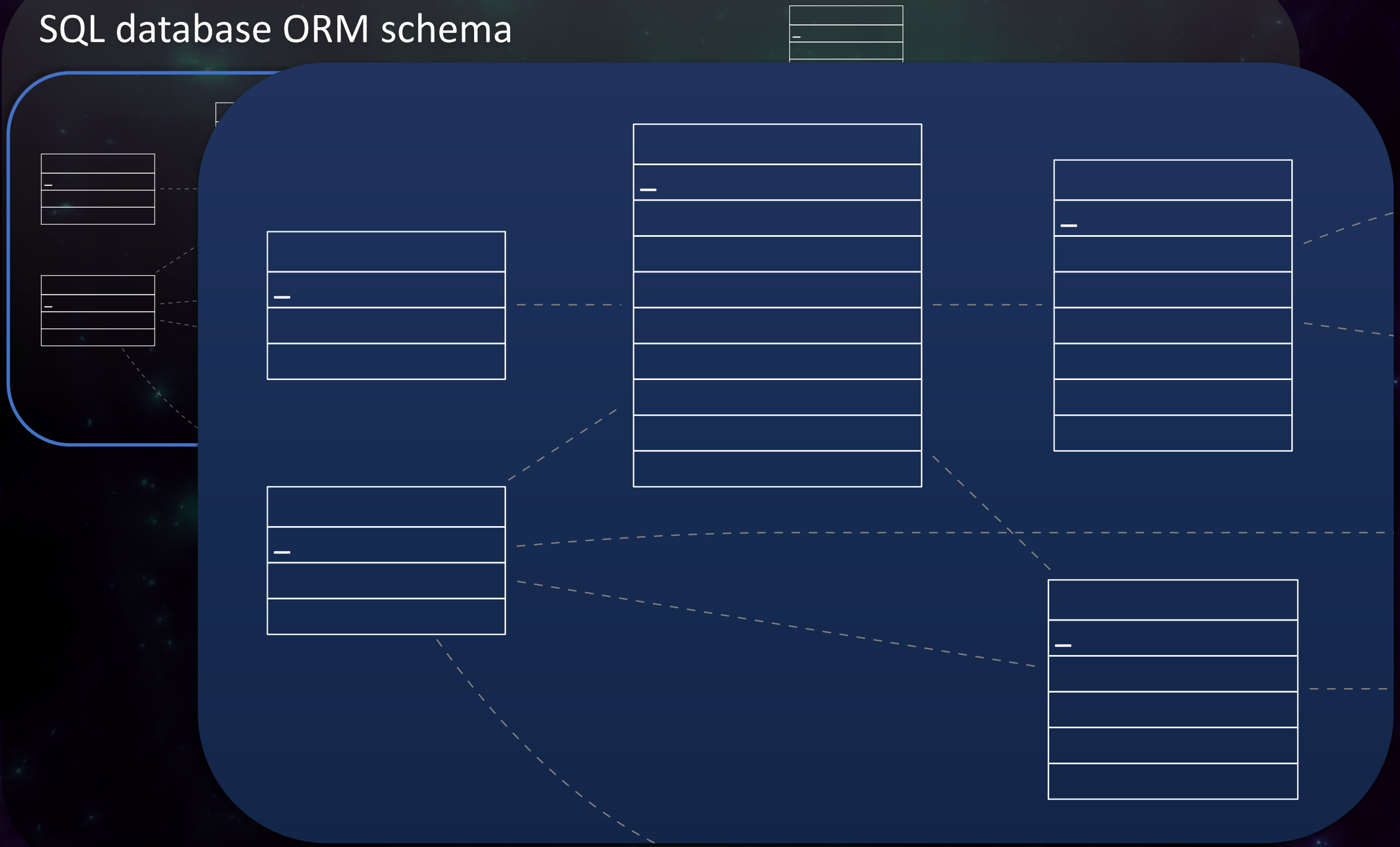

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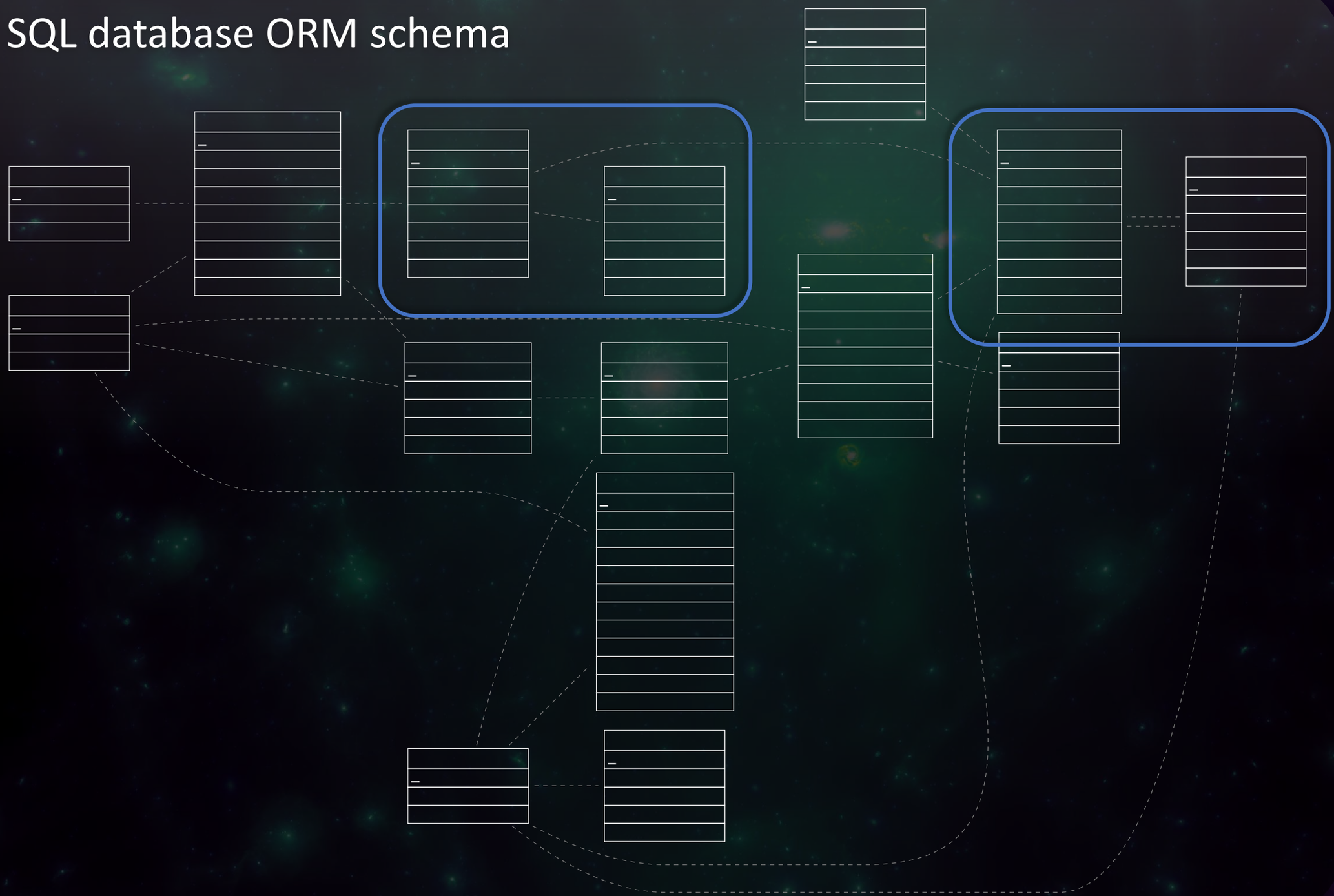

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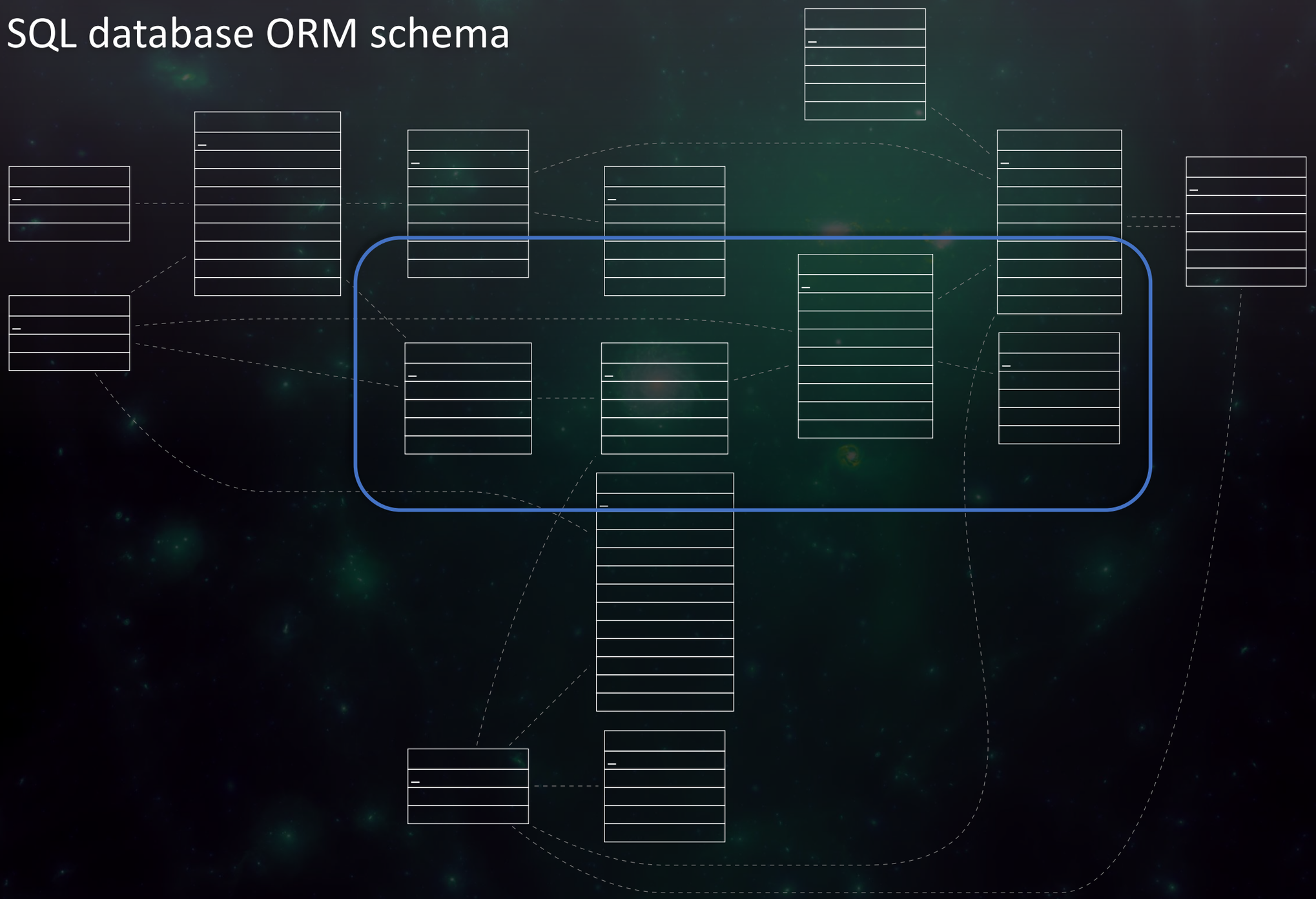

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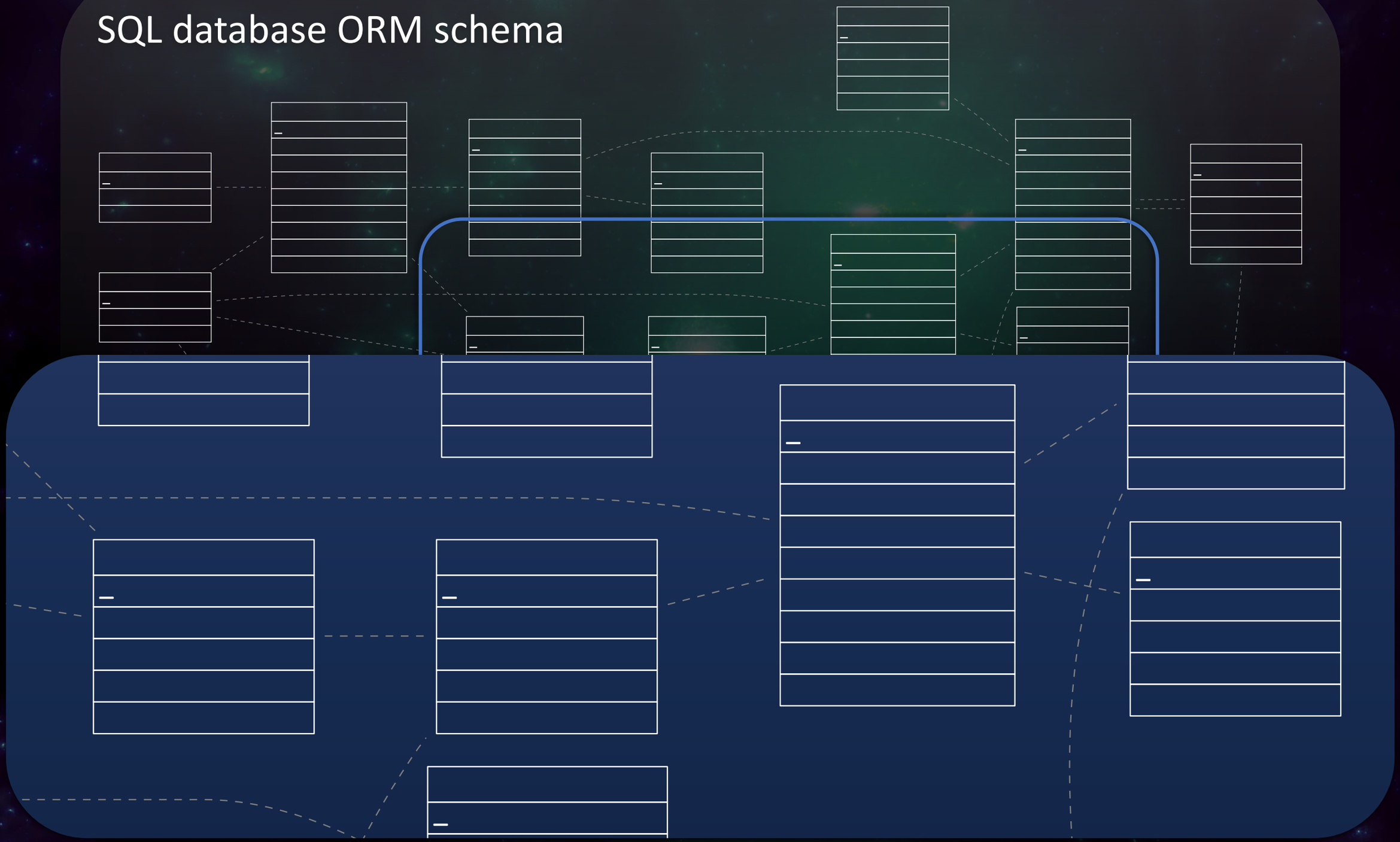

Scheduling automation

- Workflow ORM manager `wingspipe` automates scheduling
  - ⇒ Automates parallelized scheduling across nodes with commonly used jobs schedulers (PBS, Slurm)

- Tracking allows resuming of pipeline without loss of progress
  - ⇒ Useful if the pipeline breaks for unforeseen reason

- Currently developing a web interface to view pipeline status

Take-home points

- Roman Crowded-Field Photometry pipeline's infrastructure is ready & available on GitHub (https://github.com/benw1/WINGS)

- Infrastructure relies on `wingspipe`, a new dedicated workflow management ORM software tracking & automating pipeline scheduling

- Now optimizing STIPS and DOLPHOT to efficiently run a full 18 detector simulated observation