

build_reports

User Manual

Flow Metrics for Agile Teams - Setup and Usage

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1 What is build_reports?

build_reports is a tool that automatically creates meaningful charts about the progress and efficiency of your agile team. As input it uses the data that the transform_data module has exported from your issue tracker (e.g. Jira). build_reports reads these files and calculates several flow metrics — graphical analyses showing how fast and how much your team delivers.

The program has a simple graphical user interface (GUI): no programming knowledge required. At the click of a button, charts are displayed in the browser or saved as a PDF file.

Metrics overview

- Flow Time / Cycle Time: How long does it take for an issue to be completed?
- Flow Velocity / Throughput: How many issues does the team close per week?
- Flow Load / WIP: How many issues are in progress simultaneously?
- Cumulative Flow Diagram: How does the inventory develop over time?
- Flow Distribution: How are issues distributed across types, stages and cycle times?
- Process Flow: Transitions: Which status paths do issues take? Where do rework and loops occur?
- Process Flow: Time: How long do issues dwell in each stage? Which transitions cost the most time?

2 Prerequisites and Installation

2.1 What needs to be installed?

build_reports is delivered as a portable package. No separate Python installation is required.

- Windows: Python 3.11 is already included in the package — just unzip and run.
- macOS / Linux: On the first launch, a Python environment is set up automatically (approx. 1 minute, internet required). After that the app runs offline.

2.2 Starting the program

Double-click the appropriate launcher in the extracted folder:

- Windows: Double-click BuildReports.bat — starts the GUI without a console window.
- macOS: Right-click BuildReports.command → Open (once, to bypass Gatekeeper).
- Linux: In a terminal: `./BuildReports.sh`

Tip (Windows): On the first launch, SmartScreen may show a warning. Click More info → Run anyway.

3 Input Files

build_reports requires one or two Excel files produced by the transform_data module. These files must not be edited manually — the structure must exactly match the expected format.

3.1 IssueTimes.xlsx (required)

This file contains all issues (tickets) with their time data and current processing status. It is required for all metrics except the Cumulative Flow Diagram.

Column	Meaning
Project	Project key (e.g. ARTA)
Key	Issue key (e.g. ARTA-123)
Issuetype	Type of issue (e.g. Feature, Bug, Story)
Status	Current status (e.g. In Progress, Done)
Created	Creation date of the issue
First Date	Date on which the issue was first actively worked on
Closed Date	Completion date (empty = still open)
Resolution	Resolution type (e.g. Fixed, Duplicate)
Stage columns	One column per workflow stage with minutes spent in that stage

3.2 CFD.xlsx (optional, for Cumulative Flow Diagram)

This file contains daily entry counts: how many issues entered a given stage on each day (not snapshots). build_reports accumulates these values into a running total. It is only needed if the Cumulative Flow Diagram is to be calculated.

Column	Meaning
Day	Date (YYYY-MM-DD)
Stage columns	One column per stage with the number of new entries on that day

3.3 PI configuration file (optional, for Flow Velocity)

With an optional JSON configuration file you can define your own PI intervals (Program Increments) for the Flow Velocity bar chart. Without this file, calendar quarters are used automatically.

Example (date mode):

```
{ "mode": "date",
  "intervals": [
    { "name": "PI 2025.1", "from": "2025-01-06", "to": "2025-04-04"},
    { "name": "PI 2025.2", "from": "2025-04-05", "to": "2025-07-04"},
    { "name": "PI 2025.3", "from": "2025-07-05", "to": "2025-10-03"},
  ]
}
```

```
{
  "name": "PI 2025.4", "from": "2025-10-04", "to": "2026-01-02"
}
```

The file must have a .json extension. Copy the provided example file `pi_config_example.json` and adjust the dates and names to match your PI schedule. The format must be preserved.

Note: Always use date format YYYY-MM-DD (year-month-day). Example: January 6, 2025 = 2025-01-06.

3.4 Transitions.xlsx (optional, for Process Flow)

This file contains all status transitions per issue in chronological order. It is produced by the `transform_data` module and is required exclusively for the Process Flow metric. All other metrics can be calculated without this file.

Column	Meaning
Key	Issue key (e.g. ARTA-123)
Transition	Target status after the transition (e.g. 'In Analysis')
Timestamp	Timestamp of the transition (DD.MM.YYYY HH:MM:SS)

Note: `Transitions.xlsx` and `IssueTimes.xlsx` must come from the same `transform_data` export run so that issue keys match.

4 The Graphical User Interface (GUI)

After starting, the main window opens. It consists of three areas: the file area (top), the filter area (middle) and the action area (bottom) with the log window.

4.1 Loading files

First load the required files:

- IssueTimes — Click the folder button to the right of the field and select the IssueTimes.xlsx file. After loading, available projects and issue types appear automatically in the log.
- CFD (optional) — Select the CFD.xlsx file if you need the Cumulative Flow Diagram.
- Workflow (optional) — Select the workflow text file from transform_data. It contains <First> and <Closed> markers that determine which stage boundaries the CFD trend lines mark.
- PI config (optional) — Select your JSON configuration file for custom PI intervals. Leave the field empty to use calendar quarters.
- Transitions (optional) — Select the Transitions.xlsx file from transform_data. Only required if the Process Flow metric is to be calculated.

Tip: Hovering over an input field shows a tooltip explaining what the field is used for.

4.2 Setting filters

Filters restrict which issues are included in the analysis:

Filter / Exclusion	Description
From / To	Only consider issues closed within this date range. Format: YYYY-MM-DD. The calendar button opens a date picker.
Last 365 days	Automatically sets From and To to the last 365 days up to today.
Projects	Only analyse specific projects. Separate multiple projects with a comma, e.g. ARTA, ARTB. The selection button shows all available projects.
Issue types	Only analyse specific issue types, e.g. Feature, Bug. Leave empty = all types. The selection button shows a pick list.
Exclude: Status	Completely remove issues with certain Jira statuses from all metrics, e.g. 'Canceled'. The selection button shows all existing statuses.
Exclude: Resolution	Exclude issues with certain resolution types, e.g. 'Won't Do' or 'Duplicate'. The selection button shows all existing resolutions.
Exclude zero-day issues	Checkbox: issues whose cycle time (First to Closed Date) is shorter than the configured threshold are removed completely. Default: 5 minutes. Typical for issues that were manually clicked through the workflow without any real development work.

4.3 Selecting metrics and CT method

Use the checkboxes to select which metrics should be calculated. The All and None buttons set or clear all checkboxes at once.

The CT method determines how cycle time is calculated — relevant only for the Flow Time metric:

Method	Calculation
Method A (default)	Difference in calendar days between First Date and Closed Date. Simple and straightforward.
Method B	Sum of minutes in the individual workflow stages (last stage excluded), divided by 1440. Measures only active processing time.

4.4 Creating a report

You have two options:

- Show in browser — All charts are opened in your default browser. The charts are fully interactive there: zoom in, inspect data points via hover tooltip, and toggle individual categories in the legend.
- Export reports — All charts are exported to a multi-page PDF file. A save dialog asks for file name and location. In addition to the PDF, two Excel files are automatically created: a report Excel with all issues, status groups and cycle times, and — if zero-day issues exist — a separate file for those issues.

Note: While calculations are running, the interface is briefly locked. Progress is shown in the log window. Please do not close or click until the log shows the completion message.

4.5 Templates — saving and loading configuration

In the Templates menu you can save all current settings (file paths, filters, metric selection, CT method, terminology) as a JSON file and reload them later — no need to fill in all fields every time.

- Save... — Choose a location and a name for the configuration file (e.g. myTeam_QuarterlyReport.json).
- Load... — Open a saved configuration file. All fields are filled in automatically. If a saved file can no longer be found, a note appears in the log.

4.6 Language and terminology

The language can be switched in two ways:

- Flag button in the top-right corner of the window — shows the current language as a national flag. One click advances to the next of the five languages (German, English, Romanian, Portuguese, French).
- Options → Language menu — alternatively via the menu.

Via Options → Terminology you can also switch between SAFe and Global. In SAFe mode the metrics are called e.g. 'Flow Time', in Global mode 'Cycle Time'. This switch affects only the labels, not the calculations.

4.7 Opened from transform_data

build_reports can be launched directly from transform_data: after a transformation, its 'Open in build_reports' button pre-fills the file fields (IssueTimes, CFD, Transitions, Workflow) here automatically. If a project template was loaded in transform_data, its build_reports settings (PI config, filters, metric selection) are carried over too.

5 Metrics Overview

This section explains each metric in plain language: what it measures, what the charts show and how to interpret the results. The example charts are based on a sample dataset.

5.1 Flow Time / Cycle Time

What is measured? The cycle time — i.e. the number of days an issue takes from first work to completion. Shorter is better.

Chart 1: Box plot (distribution)

The box plot shows at a glance how cycle times are distributed. The chart header contains the key statistics:

Statistic	Meaning
Min / Max	Shortest and longest measured cycle time
Q1 / Q3	25% / 75% of issues fall below this value
Median	The middle cycle time — 50% of issues fall below it
Mean	Average cycle time (can be skewed by outliers)
90d CT%	Share of issues with cycle time <= 90 days (Service Level Expectation)
P85 / P95	85% / 95% of issues were completed within this time
Std dev	Standard deviation — how much do the values vary?
CV	Coefficient of variation — relative spread (smaller = more stable process)
Zero-Day	Number of issues with cycle time 0 (excluded from the analysis)

Red dot in the box plot = statistical outlier. In the browser you can read the issue key via hover tooltip.

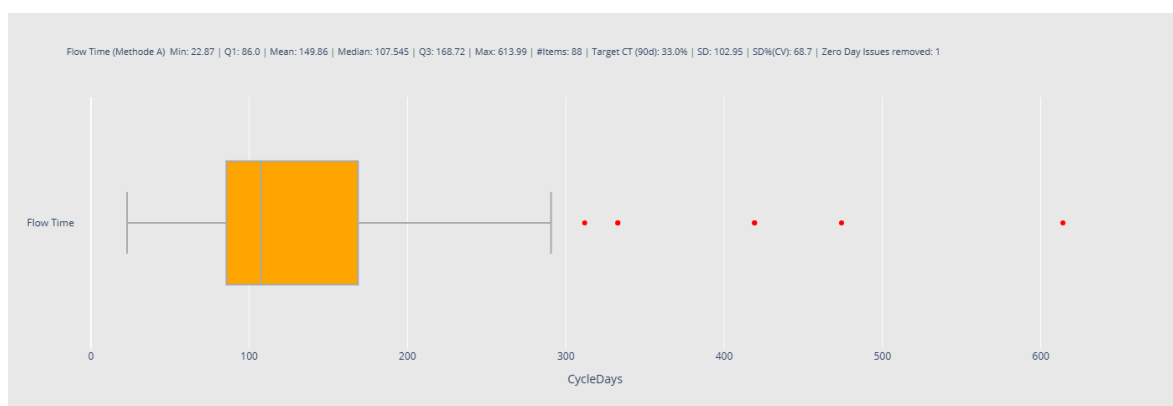


Fig. 1: Box plot of cycle times — distribution, quartiles and statistics header.

Chart 2: Scatter plot (trend over time)

Each dot is a completed issue. The x-axis shows the completion date, the y-axis the cycle time in days. Colours and reference lines aid interpretation:

Element	Meaning
Blue dot	Normal issues (below the 85th percentile)
Orange dot	Slow issues (between 85th and 95th percentile)
Red dot	Very slow issues (above the 95th percentile)
Blue curve	LOESS trend line — shows the cycle time trend over time
Red line	Median reference line
Green line	85th percentile reference line
Cyan line	95th percentile reference line

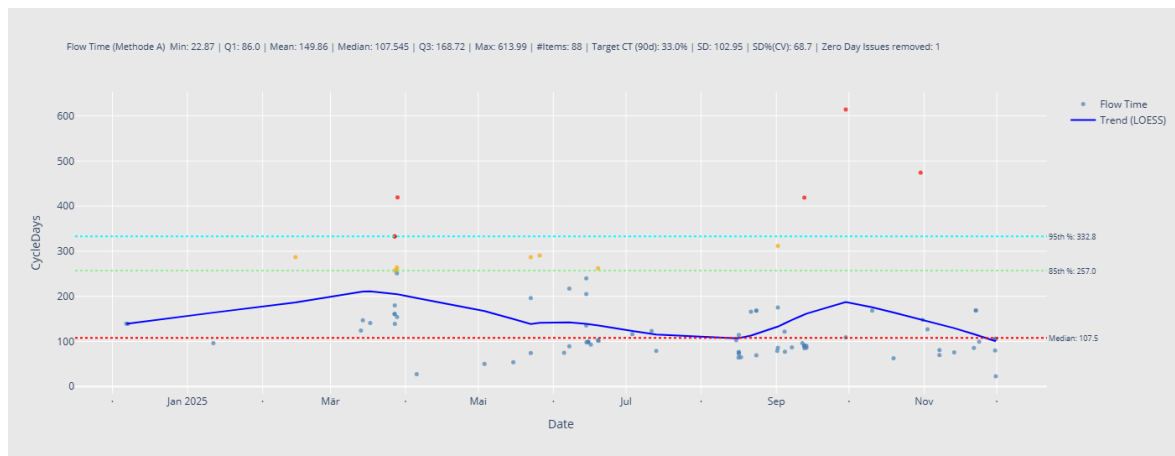


Fig. 2: Scatter plot — cycle time per completion date with LOESS trend line and reference lines.

Interpretation: If the LOESS trend line rises to the right, issues are getting slower over time. A flat line signals a stable process. Many red and orange dots indicate frequent bottlenecks.

5.2 Flow Velocity / Throughput

What is measured? Throughput — i.e. how many issues the team closes per week or per PI. Consistently high velocity indicates a delivery-capable team.

Chart	Shows
Daily frequency (histogram)	How often exactly 1, 2, 3 ... issues are closed on a single day. Shows typical daily output.
Weekly trend (line chart)	Number of issues closed per week over the entire period. Fluctuations and trends become immediately visible.
PI trend (bar chart)	Number of issues closed per PI (Program Increment) or quarter. The red line shows the average. Bar colours: Grey = first bar; Orange = current PI; Blue = completed PIs; Light grey = future PIs.

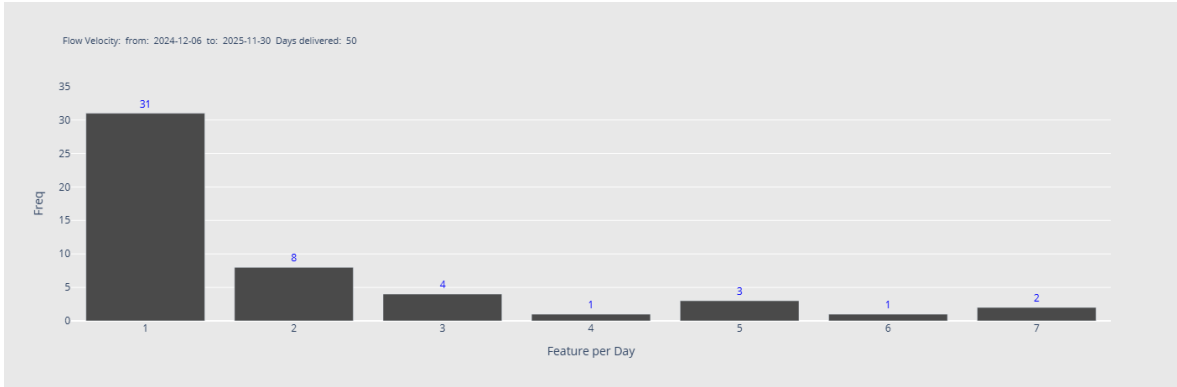


Fig. 3: Daily frequency — frequency of daily closure counts.

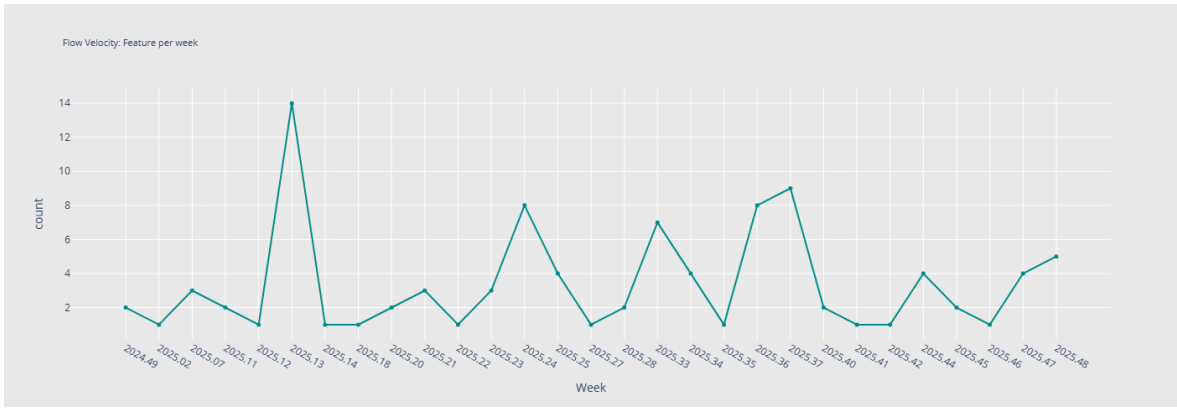


Fig. 4: Weekly trend — issues closed per calendar week.

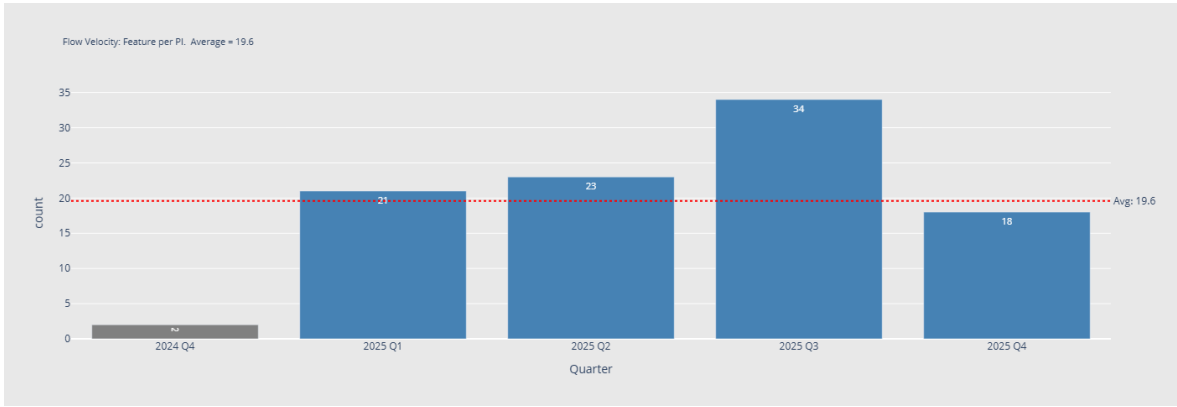


Fig. 5: PI trend — issues closed per PI or quarter with average line.

5.3 Flow Load / WIP (Work in Progress)

What is measured? How many issues are simultaneously in progress and how old they already are. Too many parallel issues slow down delivery (the more WIP, the longer the cycle time).

The chart shows a grouped box plot: each stage gets a box showing the age (in days) of the issues currently there. Individual dots represent individual issues — in the browser you see the issue key on hover.

Dashed reference lines from closed issues (median, 85th percentile, 95th percentile) provide orientation: issues already above the 95th percentile of closed issues are significantly delayed.

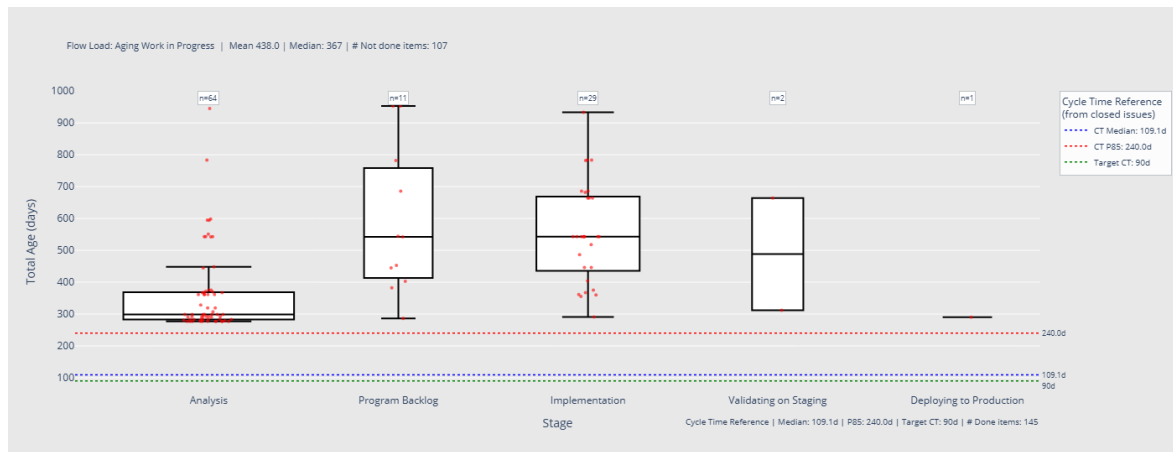


Fig. 6: Flow Load — age of open issues per stage with reference lines from closed issues.

Note: each box's width is proportional to the number of issues it contains, so the mass of open work is visible at a glance (on by default, can be turned off).

5.4 Cumulative Flow Diagram (CFD)

What is measured? How many issues in total have entered each stage — cumulated over time, broken down by workflow stage. A well-functioning system shows parallel, evenly rising bands without swelling in individual stages.

The chart is a stacked area diagram: each coloured layer corresponds to a stage. The first stage is at the top, the last (Done/Closed) at the bottom. The chart always starts at 0 — regardless of the selected start date. Two black trend lines show:

- Upper line (inflow): Runs along the visual top edge of the <First> stage (system entry). Without a workflow file: first stage.
- Lower line (outflow): Runs along the visual top edge of the <Closed> stage (system completion). Without a workflow file: last stage.

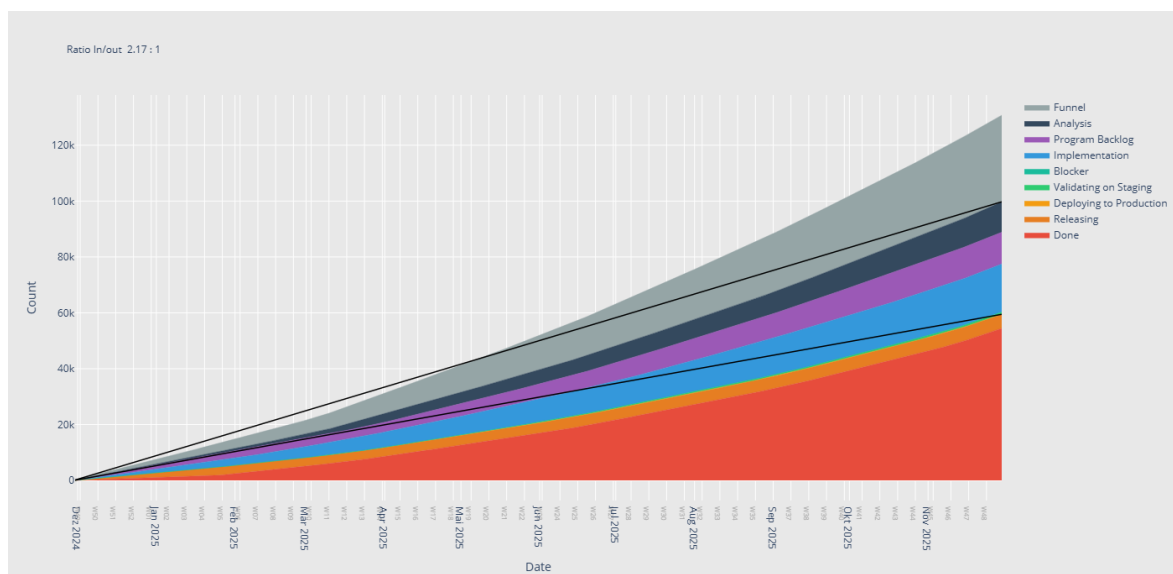


Fig. 7: Cumulative Flow Diagram — cumulative entries per stage with inflow and outflow trend lines.

The In/Out ratio in the chart title (e.g. 'Ratio In/out 1.80 : 1') shows whether more is coming in than being completed. A value of 1.0 means a balanced system; values significantly above 1.0 indicate a growing backlog.

The x-axis shows month boundaries with large labels (e.g. 'Jan 2025') and ISO calendar weeks with small grey labels (e.g. 'W03'), so that labels do not overlap.

Note: The CFD requires the optional CFD.xlsx file. Without this file the CFD metric cannot be calculated.

5.5 Flow Distribution

What is measured? The composition of all issues by type, dominant stage and average cycle time. Shows at a glance which issue types dominate, where issues spend most time, and which types are processed fastest or slowest.

The chart consists of three sub-charts side by side:

Chart	What is shown?
By Issue Type (donut)	Count and percentage share of issues per issue type. All issues are included.
Stage Prominence (donut)	For each issue the stage in which it spent the longest time is identified. The chart counts how often each stage was dominant across all issues. For closed issues the terminal Done stage (current status) is excluded, so that waiting time after closure does not distort the result. The subtitle shows the number of contributing issues (n=...). Issues without stage data are not counted.
Avg Cycle Time by Type (bar)	Average cycle time in days per issue type (Method A: Closed Date - First Date). Only issues with both date fields and CT > 0 are included. Bar labels in format '15.0d'.



Fig. 8: Flow Distribution — issue type distribution, Stage Prominence and avg cycle time per type.

Interpretation Stage Prominence: If a stage dominates particularly often, issues linger there disproportionately long — a potential bottleneck in the workflow. Closed issues are included, but their terminal Done stage is hidden, so actual processing bottlenecks remain visible.

5.6 Process Flow: Transitions

What is measured? All status transitions of issues are visualised as a directed graph: nodes = statuses, arrows = transitions. Arrow thickness is proportional to the frequency of the transition. This makes it immediately clear which paths issues take through the workflow, how often rework occurs, and where issues get stuck in loops.

This metric requires the optional Transitions.xlsx file (from transform_data). Without this file a warning appears in the log.

Element	Meaning
Blue arrow	Forward transition — issue moves forward in the workflow.
Red arrow	Backward transition (rework) — issue returns to an earlier stage.
Orange arc	Self-loop — issue stays in the same status (e.g. stage traversed again).
Arrow width	The thicker the arrow, the more frequent this transition.
Number on arrow	Absolute count of this transition across all issues.
Node	Dark blue circle with status name. Order: workflow stages first (clockwise), then additional statuses alphabetically.

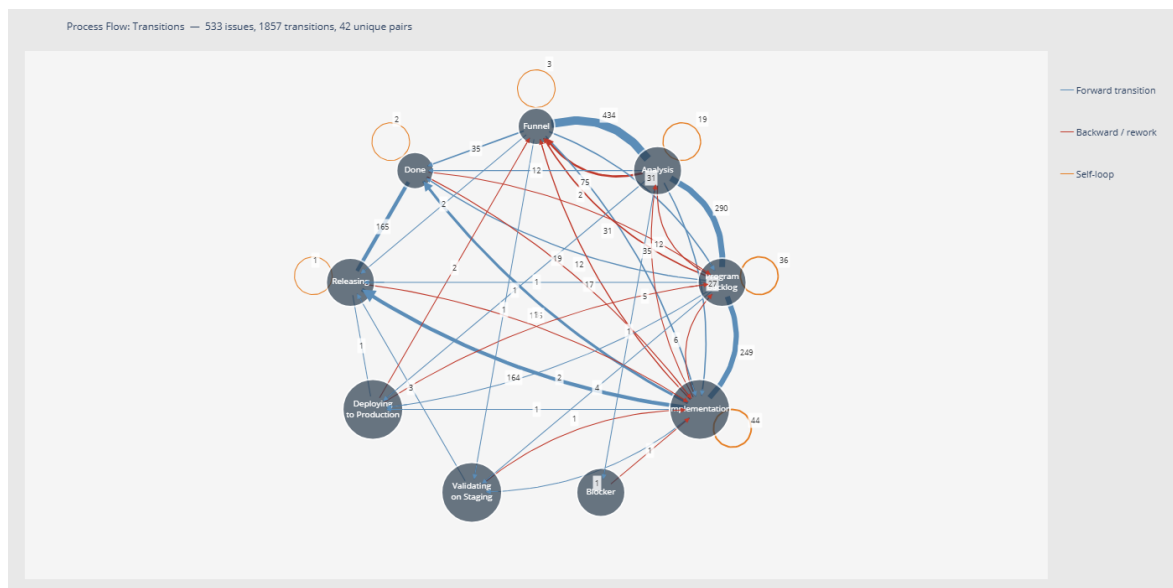


Fig. 9: Process Flow: Transitions — directed graph of all status transitions with edge width and colour coding.

Note: the edge labels can be shown or hidden (shown by default) -- this applies to Process Flow: Time as well.

Interpretation: Many red arrows mean frequent rework — a sign of quality issues or unclear requirements. Thick blue arrows show the main workflow path. Self-loops (orange) occur when an issue is set to the same status multiple times.

5.7 Process Flow: Time

What is measured? The same directed graph as Process Flow: Transitions, but with a focus on time: node width and edge labels are based on the median dwell time of the source stage. This makes it immediately visible in which stages issues wait the longest and which transitions cost the most time.

This metric also requires the optional Transitions.xlsx file (from transform_data).

Element	Meaning
Node width	Proportional to the median dwell time in this stage.
Edge width	Proportional to the median dwell time of the source stage.
Number on arrow	Median dwell time of the source stage in days (d) for issues that took exactly this transition.
Blue arrow	Forward transition.
Red arrow	Backward transition (rework).
Orange arc	Self-loop.

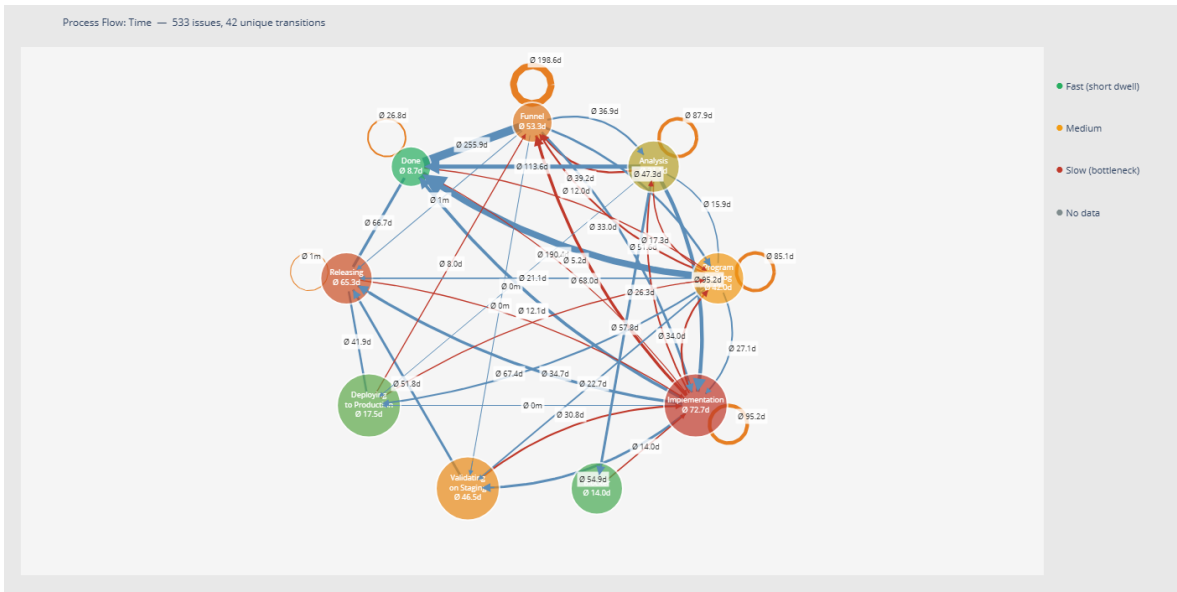


Fig. 10: Process Flow: Time — node width and edge labels based on the median dwell time per stage.

Interpretation: Wide nodes and thick edges indicate stages where issues linger particularly long — potential bottlenecks. Compared with Process Flow: Transitions, you can see whether frequent transitions also carry significant time weight or are just brief status changes.

6 PDF Export

The PDF export creates a multi-page PDF file with all selected charts. Each chart appears on its own page.

Step	Action
1	Load files and set filters (as described in Chapter 4).
2	Select desired metrics via checkboxes.
3	Click 'Export reports'.
4	In the save dialog, choose a file name and location and confirm.
5	The program calculates and exports; progress appears in the log.
6	After completion, the PDF and report Excel are available at the chosen location.

6.1 Automatic report Excel

With every PDF export an Excel file with the same name is automatically created (e.g. report.xlsx next to report.pdf). This file contains all filtered issues in IssueTimes format, supplemented by three columns:

Column	Content
Status Group	Status group of the issue: 'To Do' (not yet started), 'In Progress' (being worked on) or 'Done' (completed). Derived from First Date and Closed Date.
Cycle Time (First->Closed)	Cycle time in calendar days from First Date to Closed Date (Method A). Empty if either date is missing.
Cycle Time B (days in Status)	Sum of minutes in all workflow stages except the last, divided by 1440 (Method B). Empty if either date is missing.

Zero-day issues: Two mechanisms operate independently:

1. Exclusion filter (before calculation): If the checkbox 'Exclude zero-day issues' is active, issues with a cycle time below the configured threshold (default: 5 minutes) are completely removed from all metrics.
2. Within the Flow Time metric: Issues with a cycle time of 0 days (same calendar day) are reported separately and not included in the statistics.

In both cases a separate Excel file is created (e.g. report_zero_day_issues.xlsx in the same folder).

7 Frequently Asked Questions

Q: The charts do not appear in the browser.

A: Check whether a default browser is configured. Alternatively try the PDF export. Make sure the IssueTimes file was loaded correctly (check the log).

Q: The PDF export takes very long or fails.

A: Rendering charts as PDF requires the Kaleido package. If this has not yet been set up, contact your technical contact.

Q: The log shows 'Stage only in IssueTimes' or 'Stage only in CFD'.

A: The stage columns in IssueTimes.xlsx and CFD.xlsx do not match. This is a warning that does not stop the analysis, but indicates that the files come from different workflow versions.

Q: How can I analyse only a specific project?

A: Enter the desired project key in the 'Projects' field (e.g. ARTA). Separate multiple projects with a comma. Alternatively: use the selection button for a list of all available projects.

Q: The Cumulative Flow Diagram does not appear.

A: The CFD metric requires a CFD.xlsx file. Load it in the 'CFD (optional)' field.

Q: Process Flow shows 'No transition data available'.

A: The Process Flow metric requires a Transitions.xlsx file from transform_data. Load it in the 'Transitions (optional)' field. Make sure the file comes from the same export run as the IssueTimes.xlsx.

Q: What is the difference between PI intervals and quarters?

A: By default, calendar quarters (Q1-Q4) are used as time intervals. With a PI configuration file you can define your own intervals that match your actual PIs — for example if your PI starts on January 6 instead of January 1.

Q: How do I save my settings?

A: Use the menu 'Templates' -> 'Save...' to save all current settings in a JSON file. Next time: 'Templates' -> 'Load...'. Exclusion settings can additionally be stored permanently under 'Templates' -> 'Save exclusions as default'.

Q: An issue appears in the metrics even though it was never really worked on.

A: This happens when an issue was manually clicked through all workflow stages within seconds — without any real development work. Enable the checkbox 'Exclude zero-day issues' under 'Exclusions' in the GUI (threshold e.g. 5 minutes). The issue is then completely removed from all metrics and documented in a separate Excel file.

Q: Can I present the results without a computer?

A: Yes: first export a PDF report. The PDF file contains all charts and can be opened on any device. For interactive presentations, the browser view is recommended.

8 Glossary

Term	Explanation
Closed Date	The date on which an issue was completed.
Cycle Time	Alternative term for Flow Time (Global terminology).
First Date	Date of the first active work on an issue.
Flow Load	Number of issues currently in progress (SAFe term).
Flow Time	Cycle time from first work to completion.
Flow Velocity	Number of issues completed per time period (SAFe term).
Issue	A ticket in the issue tracker (e.g. a Jira card).
Issue type	Category of an issue, e.g. Feature, Bug, Story, Task.
IssueTimes	The Excel file with all issues produced by transform_data.
JSON	Simple text format for configuration files.
LOESS	Statistical smoothing method for trend lines.
P85 / P95	85th / 95th percentile of cycle times.
PI	Program Increment — a fixed planning and delivery period.
Process Flow: Transitions	Directed graph of all status transitions (frequency-based). Shows main paths, rework, and loops in the workflow.
Process Flow: Time	Directed graph of all status transitions (time-based). Node width and edge labels show the median dwell time per stage.
Resolution	Resolution type of an issue, e.g. 'Done', 'Won't Do', 'Duplicate'.
SAFe	Scaled Agile Framework — a framework for agile scaling.
Stage	A step in the workflow, e.g. Analysis, Implementation, Done.
Template	Saved configuration file with all settings.
Throughput	Alternative term for Flow Velocity (Global terminology).
Transitions	Record of every status change per issue. Exported by transform_data as Transitions.xlsx.
WIP	Work in Progress — issues that are currently being worked on.
Zero-day issue	An issue whose cycle time (First to Closed Date) is so short that it does not represent real processing time. Usually caused by manually clicking through the workflow. Can be removed from all metrics via a threshold filter.