Boldly Going Where No SRA Has Gone Before: Automating and Assimilating Schedule Risk Analysis

April 23, 2024

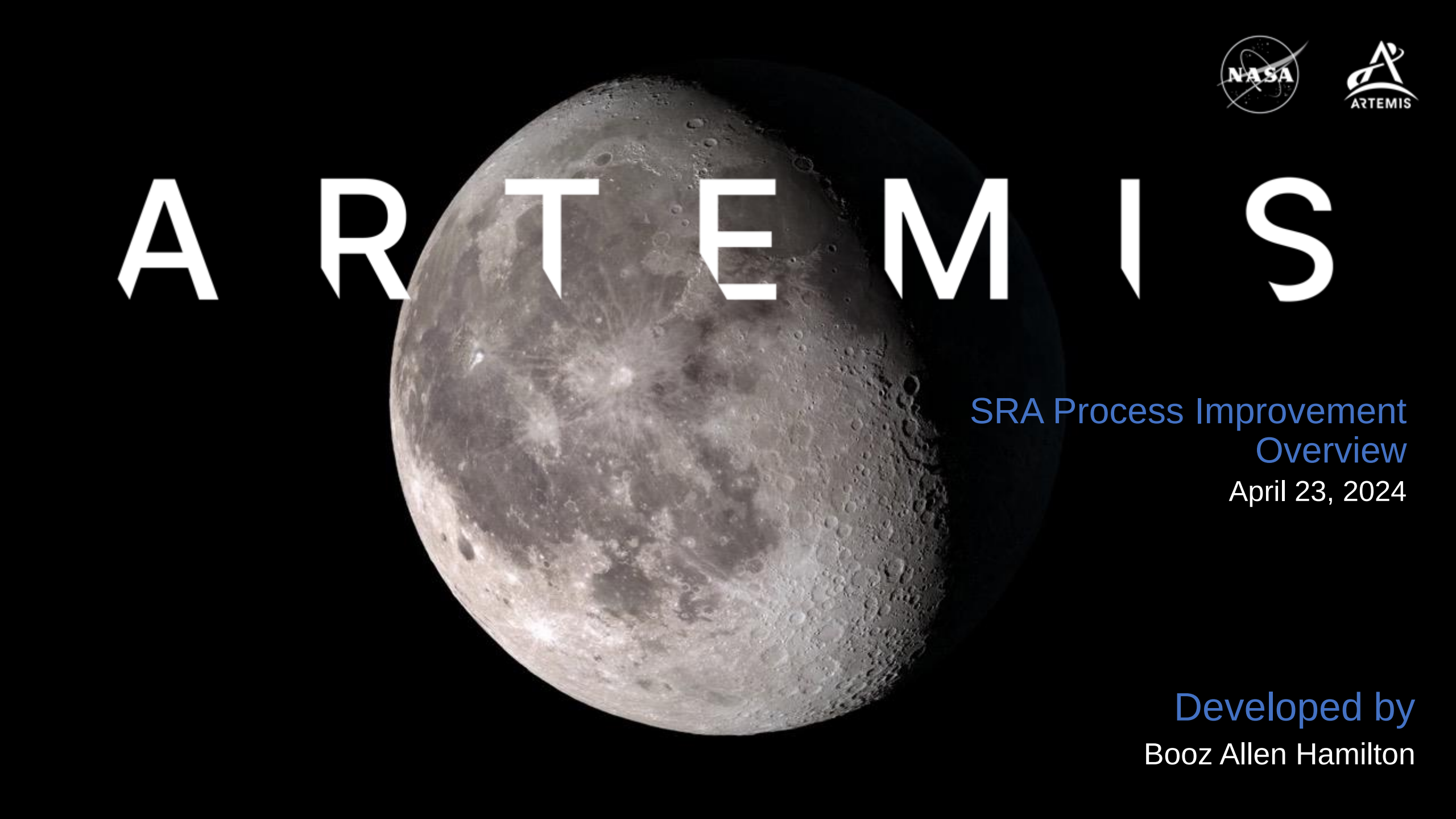
Developed by
Booz Allen Hamilton

Agenda

- Introduction
- SRA (Schedule Risk Assessment) Process Improvement Overview
- DISHC (Data Integrator for Schedule Health Checks)
- Splicer
- Credits

SRA

DISHC



SRA Process Improvement Overview

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Agenda

- The Challenge & Our Goal
- Areas Of Focus
  - Tools
  - Processes
  - Communications
- Tools
  - Tool Progress
  - SRA Process Assimilation Progress
- Future Efforts
- Questions / Comments

The Challenge & Our Goal

The Challenge:

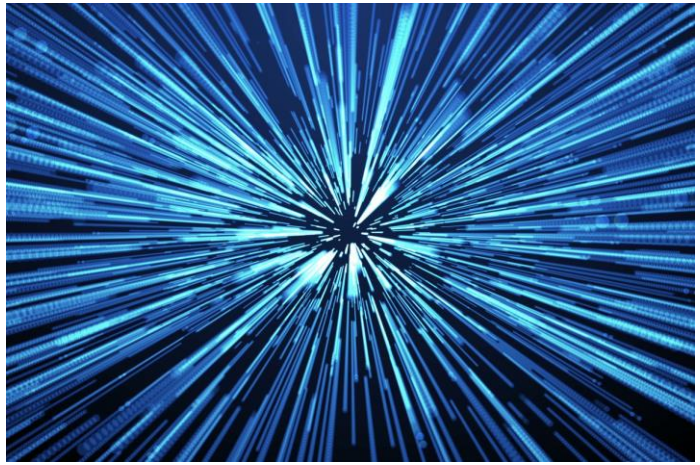
An SRA is a resource and time intensive effort.

- SRAs can be very time and manpower intensive efforts spanning multiple months to refine the model and work through stakeholder reviews.
- This often results in a lag between data collection and actionable results reducing the relevance of the SRA output.

Our Goal:

A real-time SRA with no lag between data collection and actionable results.

- We want our SRA process to move at the speed of the problem.



Areas Of Focus

Our efforts to speed up and reduce the resources & costs of an SRA fall into three areas:

Area:	Tools	Processes	Communications
Examples:	DISHC, Splicer, TIDBIT, Thresher, JCL Toolbox, ASIT, PowerBI, etc.	Data Collection, Data Processing, Report Development, etc.	Results and Product Reviews and Approvals, etc.

- **Tools** are today's focus and the "low hanging fruit" as automation often realizes massive time savings by reducing task time from hours or days down to minutes.
- **Processes** are how we do things; how data is collected, how reviews and approvals are performed, etc. Standardization, repeatability and predictability are our goals.
- **Communications** are important to get and keep all stakeholders on the same page. We are working on reducing the time required for data collection, reviews and approvals through standardization and ideas such as pre-approvals and automation.

Tools

Tools for data collection and processing are critical to an SRA; the better the toolset, the faster, more efficient and more accurate our results.

- Wherever possible, we leverage tools which have already been developed such as the NASA ASIT tool, JCL Toolbox, PowerBI, MS Excel, etc.
- Gaps remain and stitching tools together can be time consuming but an investment which pays large dividends.
- DISHC, Splicer, Thresher and TIDBIT are examples of tools we have developed to close these gaps.
- Today we'll introduce DISHC and Splicer[1].

DISHC

Thresher

TIDBIT

[1] Thresher and TIBIT were presented at the 2023 NASA Cost and Schedule Symposium:
Thresher and TIDBIT: Tools on Automating Schedule Risk Assessments

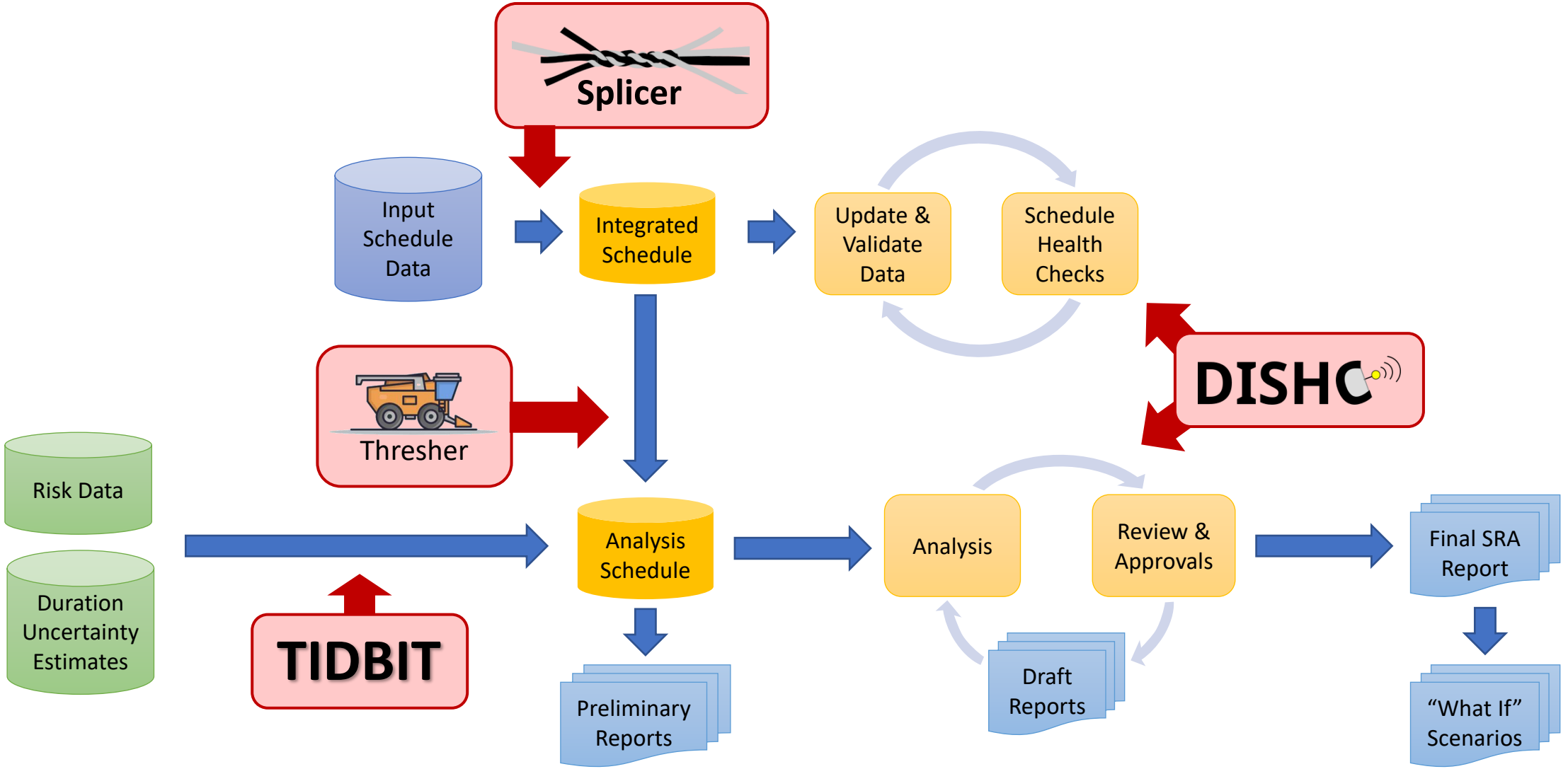
Tool Progress

These tools[1] collectively save approximately one labor-month per SRA

Tool	Use	Benefit Realized
DISHC	Combine and summarize schedule health check reports from the Joint Analysis Cost and Schedule tool (JACS) and Deltek Acumen Fuse.	Manual Process: 2-3 hours DISHC: ~5 minutes **Time Reduction: 95 – 98%**
 Splicer	Semi-automate integration and summary schedule updates from individual or multiple source schedules.	Manual Process: 3-4 hours Splicer: ~5 minutes **Time Reduction: ~98%**
 Thresher	Create small analysis schedule files from large project schedules.	Manual Process: ~2 hours Thresher: ~5 minutes **Time Reduction: ~95%**
TIDBIT	Calculate task duration uncertainty from an array of best case, most likely, and worst-case dates.	Manual Process: 5 days TIDBIT: 2 days **Time Reduction: ~40%**

[1] Thresher and TIBIT were presented at the 2023 NASA Cost and Schedule Symposium:
Thresher and TIDBIT: Tools on Automating Schedule Risk Assessments

SRA Process Assimilation Progress



Future Efforts

- **Tools** – The tools we have created have delivered great results – saving approximately one-labor month per SRA. We plan to holistically assess the SRA process to determine where to direct our efforts for the biggest gains. Some ideas we have include:
  - Further automation of as many parts/steps of the SRA as possible.
  - Develop standardized interfaces to make the automation process easier and faster.
  - Generalization of the tools to be useful in other scheduling and reporting processes.
  - Widening the use of existing analysis tools (i.e. JCL Toolbox, PowerBI).
- **Processes** – We are currently analyzing the SRA process (and reporting in general) to identify areas ripe for process improvement. We are also looking to, as much as possible, implement standardization (standardized forms and APIs) so people and tools can easily/efficiently "talk."
- **Communications** – There will always be a human component to SRAs and reporting in general. Along with this is the need for good communications and to build trust with data providers/owners. One idea we have is to develop a communications playbook to document and standardize these processes.

Questions / Comments

Questions on SRA Automation

Up Next:

DISHC

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ARTEMIS

DISHC Introduction

April 23, 2024

Developed by

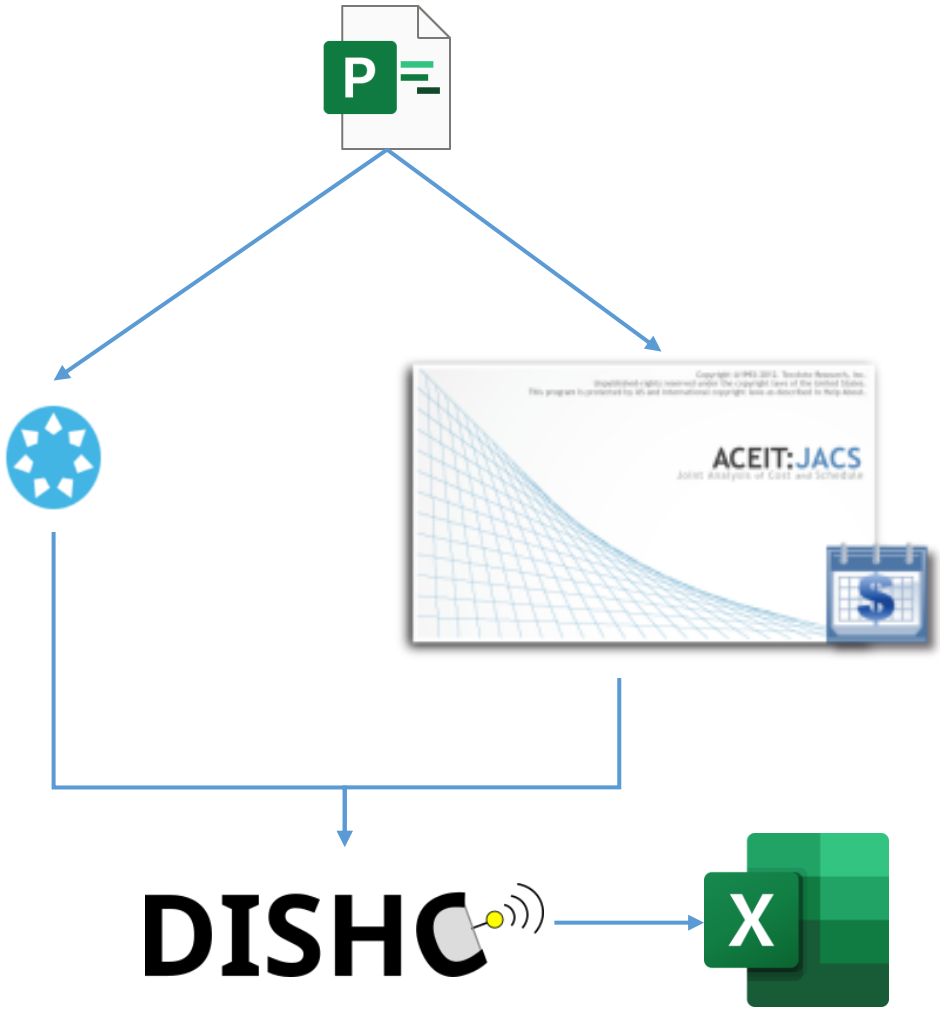
Booz Allen Hamilton

Agenda

- What is DISHC?
- How Does DISHC Help?
- JACS v Fuse
- How Do You Use DISHC?
- How Does DISHC Work?
- DISHC User Interface
- DISHC Demo
- Future of DISHC
- Questions / Comments

What is DISHC?

- DISHC – Short for Data Integrator for Schedule Health Checks, takes in two schedule health check reports from the Joint Analysis Cost and Schedule tool (JACS) and Deltek Acumen Fuse.
- SRA analysis starts with the DCMA 14-point health check. During our studies of health checks, we noticed discrepancies between the two reports.
- DISHC then imports desired information into a combined MS Excel workbook that is used to analyze schedule integrity.
- The outputted workbook provides a clean look using the combined data for ease of analysis and reporting.



JACS v Fuse

- Leverage multiple existing tools.
- When a schedule is run through one of the two tools for a DCMA 14-point health check, the results are not the same.
- Both reports have sections that are not used in our current analysis and so are (purposefully) ignored by DISHC.

Contains all possible issues across the 14-point assessment

- **Metric #1: Logic**
- **Metric #2: Leads**
- **Metric #3: Lags**
- **Metric #4: Relationship Types**
- Metric #5: Hard Constraints
- Metric #6: High Float
- Metric #7: Negative Float
- Metric #8: High Duration
- **Metric #9: Invalid Dates**
- Metric #10: Resources
- Metric #11: Missed Tasks
- Metric #12: Critical Path Test
- Metric #13: Critical Path Length Index (CPLI)
- Metric #14: Baseline Execution Index (BEI)

- **Bolded metrics <u>are used</u> in our SRA Health check analysis.**
- Other metrics are *not* used in our analysis due to the high level of our summary schedule. Some of these tasks may be justified and appear in the report due to increased duration levels of summary tasks.

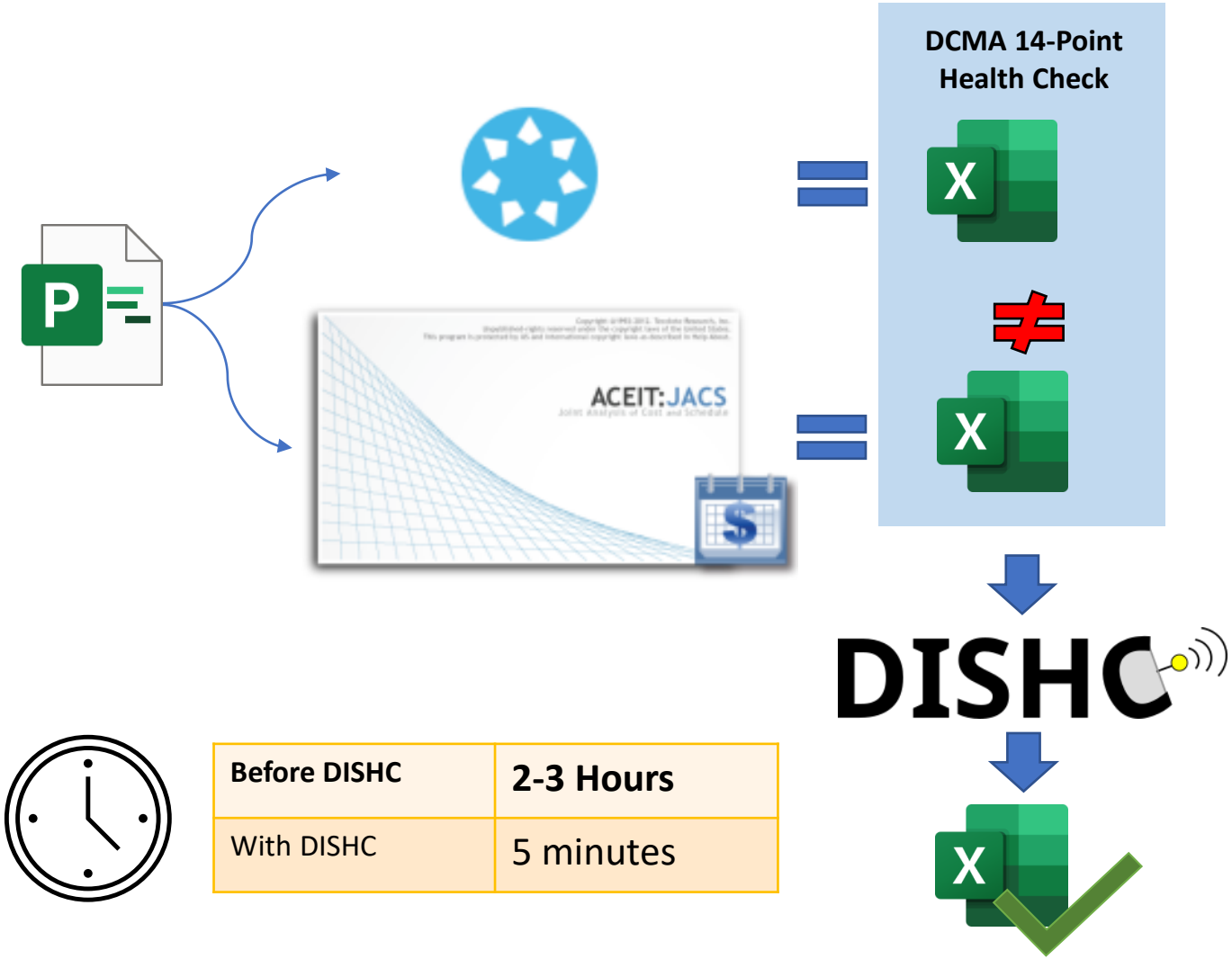
Differences*	JACS	Fuse
Reports 0 day durations/ Milestones	✗	✓
Reads float between tasks, not just hard coded lag/lead	✗	✓
Includes inactive tasks	✓	✗
Non- FS relationship links captured	✓	✗
Captures all lags and leads	✗	✓
Flags tasks with actual start/finish dates	✓	✗

* In the current versions of JACS and Deltek Acumen Fuse 8.6

How Does DISHC Help?

- **Saves time!**
  Processing these workbooks together manually takes up to an **hour**. Running DISHC cuts that time down to a few **seconds**. This allows more time for the analyst to work through schedule integrity analysis and other tasks.

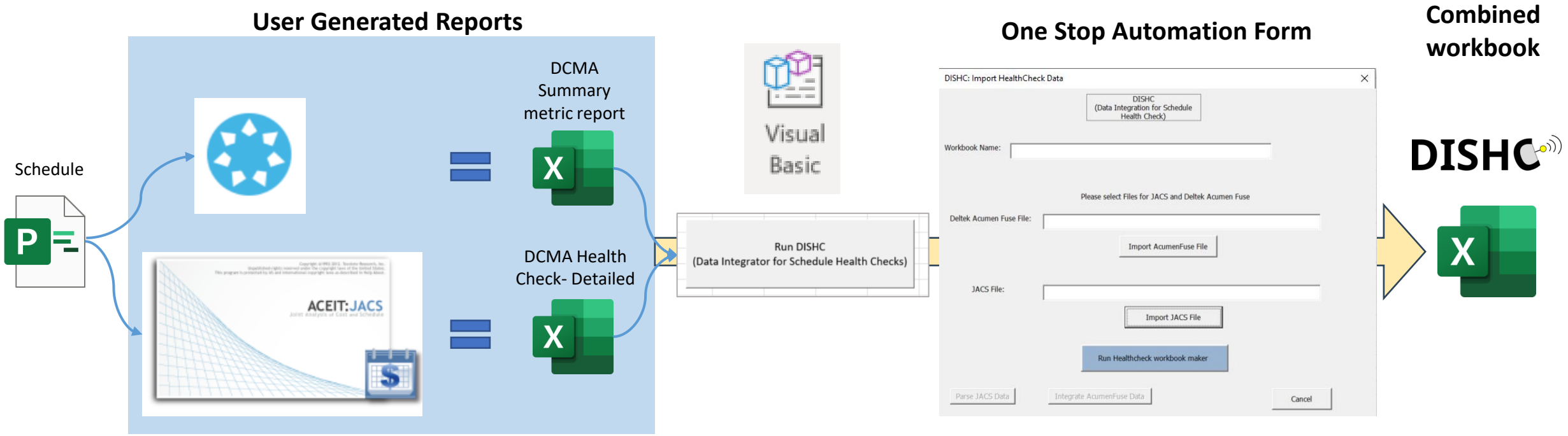
- DISHC combines and filters the two reports into one cohesive workbook that identifies schedule checks from both reports making it easy to identify similar problem tasks.



Before DISHC	**2-3 Hours**
With DISHC	5 minutes

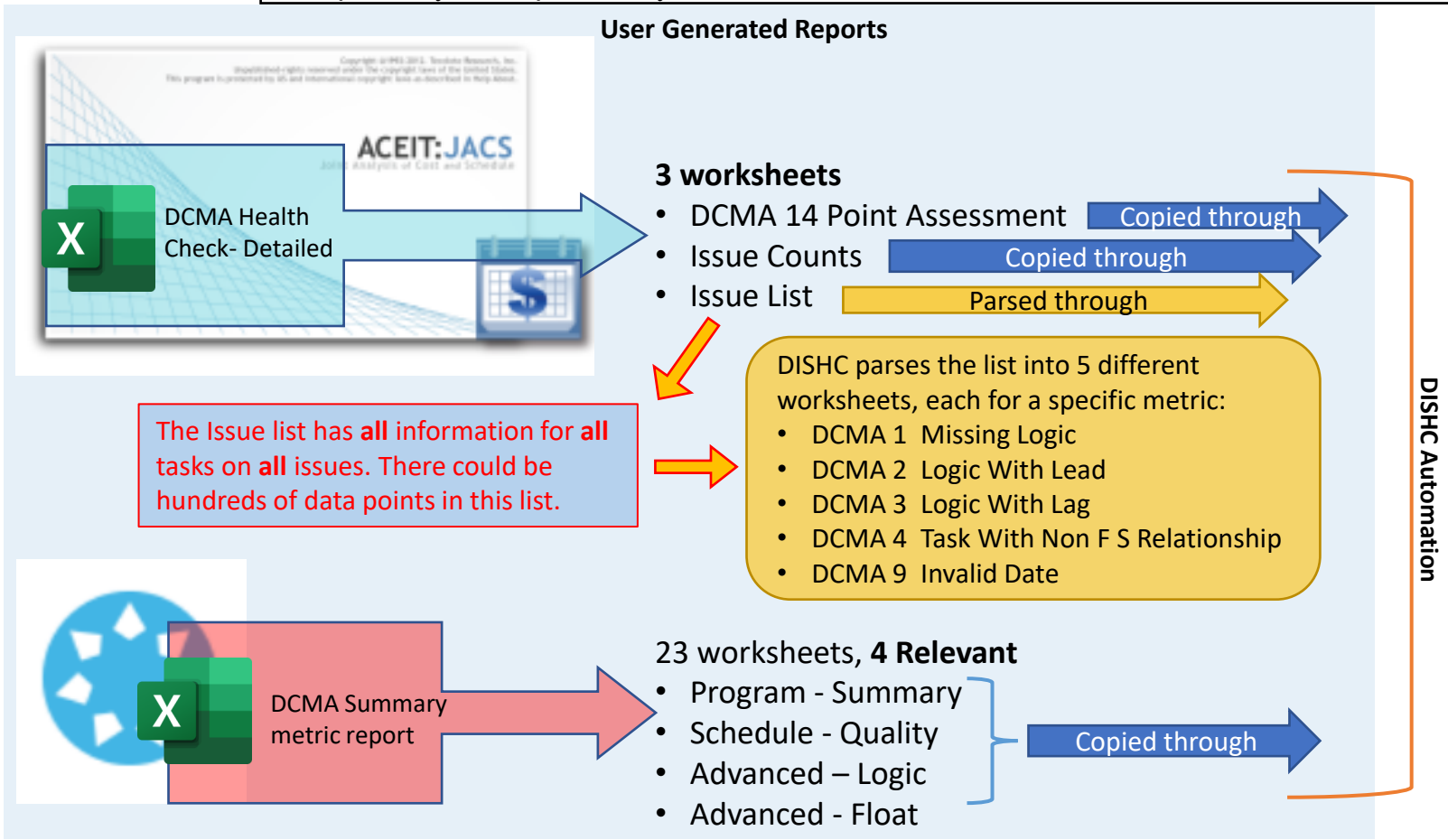
How Do You Use DISHC?

- DISHC Requires *some* initial user report configuration.
  - **Generate User Reports,** For the inputs to be valid in the automation procedure, two reports need to be generated; one from Fuse and one from JACS.
- When the DISHC Form is activated, the user can then select the Fuse and JACS reports file locations.
- DISHC is built in Microsoft Excel VBA software. Using Excel functions and properties, DISHC copies worksheets of required data to the new workbook from both JACS and Fuse schedule health check reports.



How Does DISHC Work?

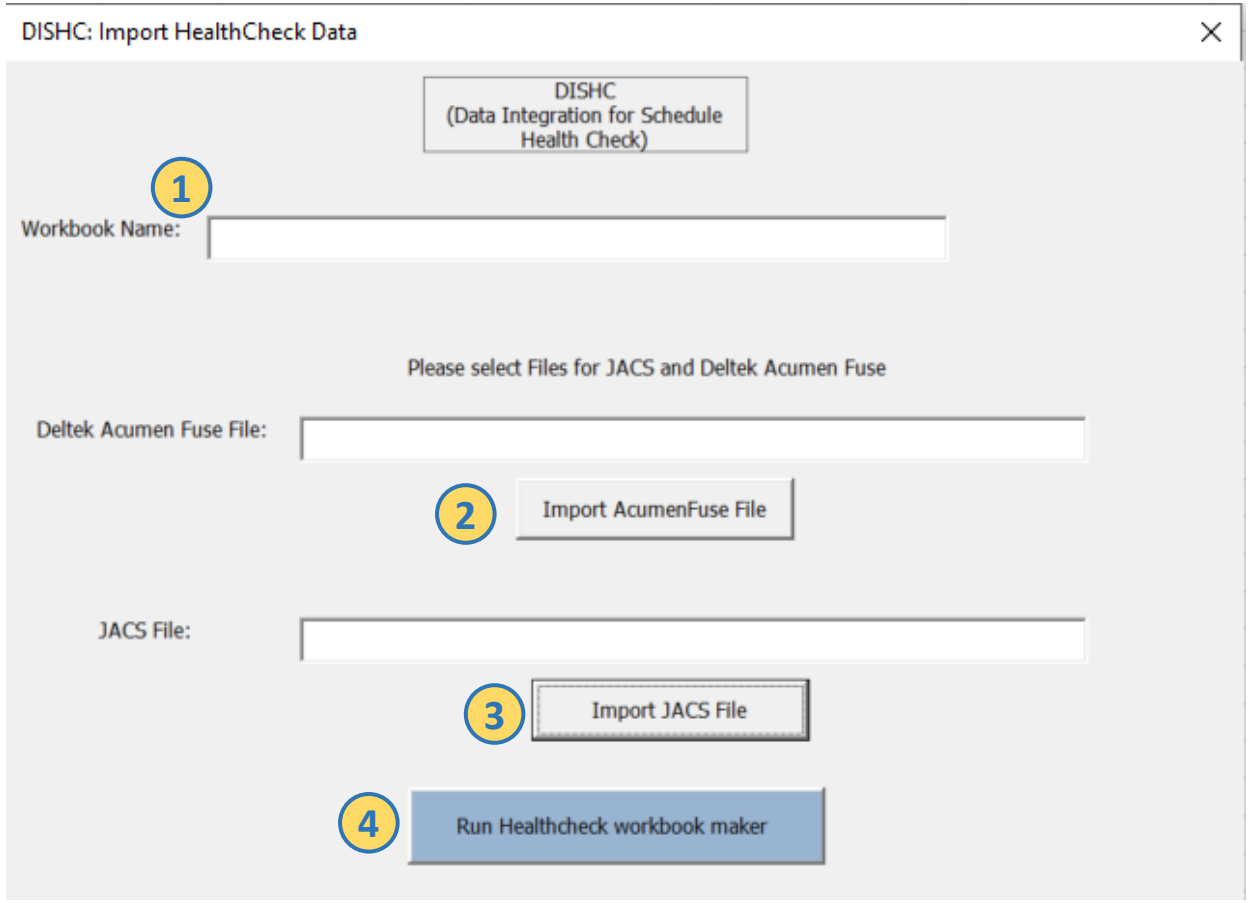
- DISHC **imports** data from JACS and Fuse files into a new workbook.
- The user must run the schedule through JACS and Fuse to grab their respective schedule health checks.
- Each workbook has a different configuration need in DISHC, so they need to be inserted into the form separately and specifically.



Worksheets that are imported/ created through DISHC:

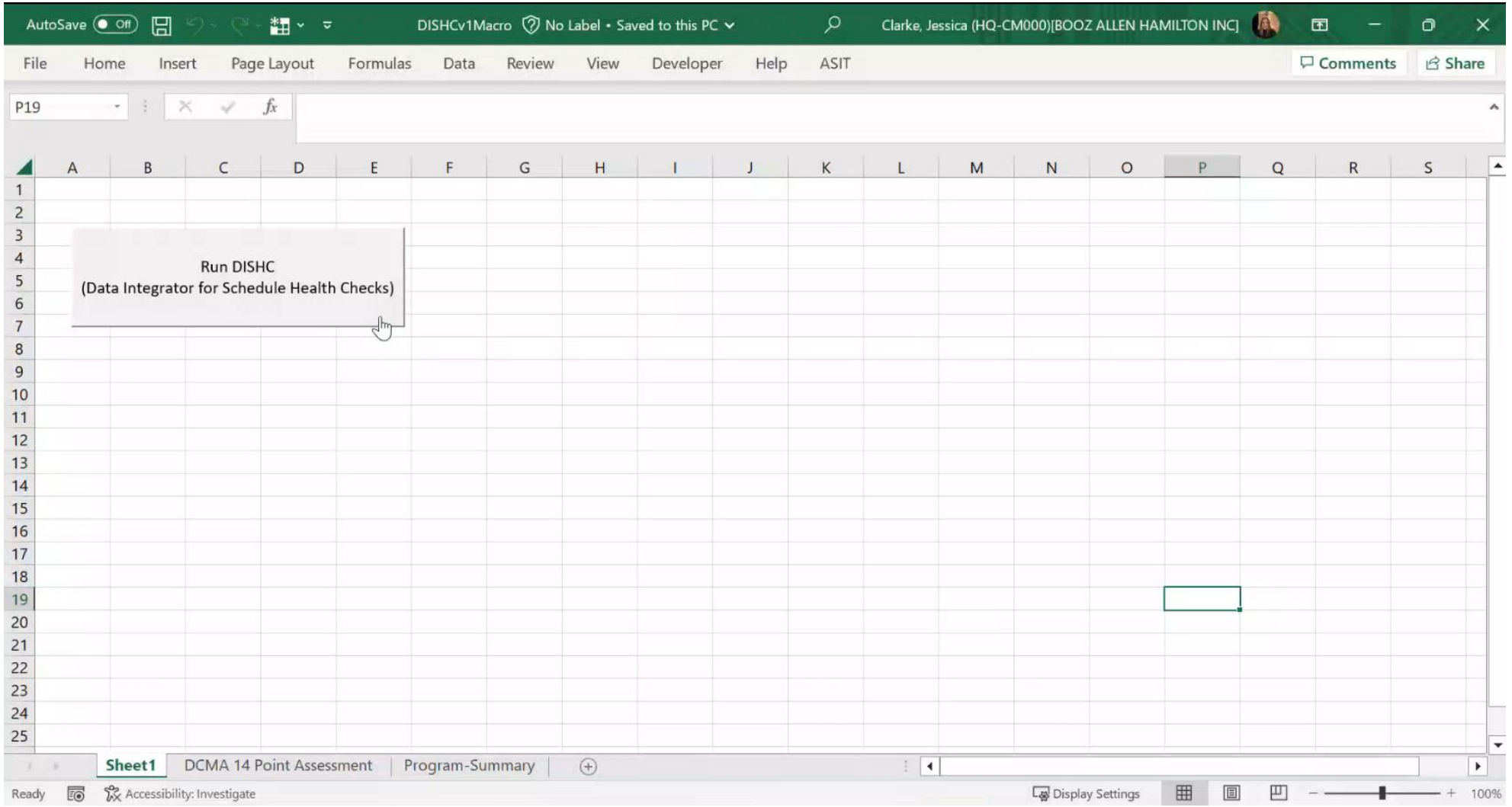
- DCMA 14 Point Assessment
- Issue Counts
- Issue List
- DCMA 1 Missing Logic
- DCMA 2 Logic With Lead
- DCMA 3 Logic With Lag
- DCMA 4 Task With Non F S Relationship
- DCMA 9 Invalid Date
- Program - Summary
- Schedule - Quality
- Advanced – Logic
- Advanced – Float

DISHC User Interface



1. Workbook Name: Input a name for the schedule health check data workbook.
2. Select the workbook that contains the Deltek Acumen Fuse Health Check Report.
3. Select the workbook that contains the JACS Health Check Report.
4. Click Run.

DISHC Demo


AutoSave Off
DISHCv1Macro
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Clarke, Jessica (HQ-CM000)[BOOZ ALLEN HAMILTON INC]
File Home Insert Page Layout Formulas Data Review View Developer Help ASIT
Comments
Share
P19
Run DISHC
(Data Integrator for Schedule Health Checks)
Sheet1
DCMA 14 Point Assessment
Program-Summary
Ready
Accessibility: Investigate
Display Settings
100%

Future of DISHC

- Planned updates to DISHC:
  - Comparison on DCMA 14-point metric data
    - Dashboard focused on issue metrics and discrepancies.
    - Highlighting which tasks are misaligned between the two data sources.

What if JACS or Fuse Changes?

- Generalizing intake forms on the VBA end to encompass various SRA Health Check reports across other software.
  - Looking for specific key words and metrics in reports, such as “Lag” or “Missing Logic.”

Questions / Comments

Questions on DISHC

Up Next:

Developed by Eric Zander

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Splicer Introduction

April 23, 2024

Developed by

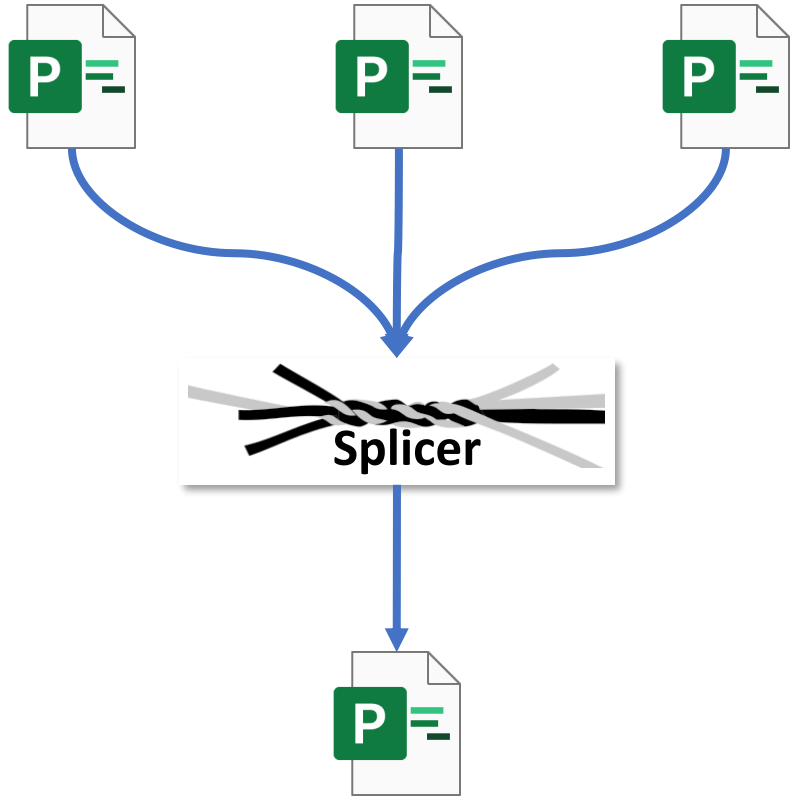
Booz Allen Hamilton

Agenda

- What is Splicer?
- How Does Splicer Help?
- Where Can Splicer Be Used?
- Use Cases
- User Interface
- Process Overview
- Questions / Comments

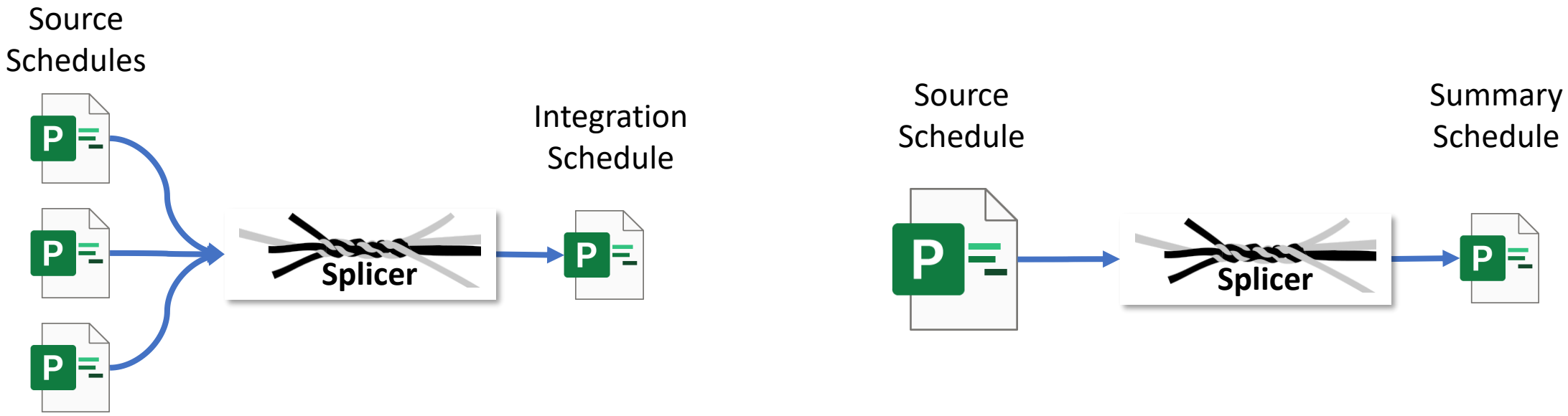
What is Splicer?

- Splicer is a new tool to semi-automate integration and summary schedule updates from individual or multiple source schedules.
- Splicer saves time and effort, increases accuracy and eases traceability of schedule data.
- Prior to the development of Splicer these updates were, in most cases, performed manually.

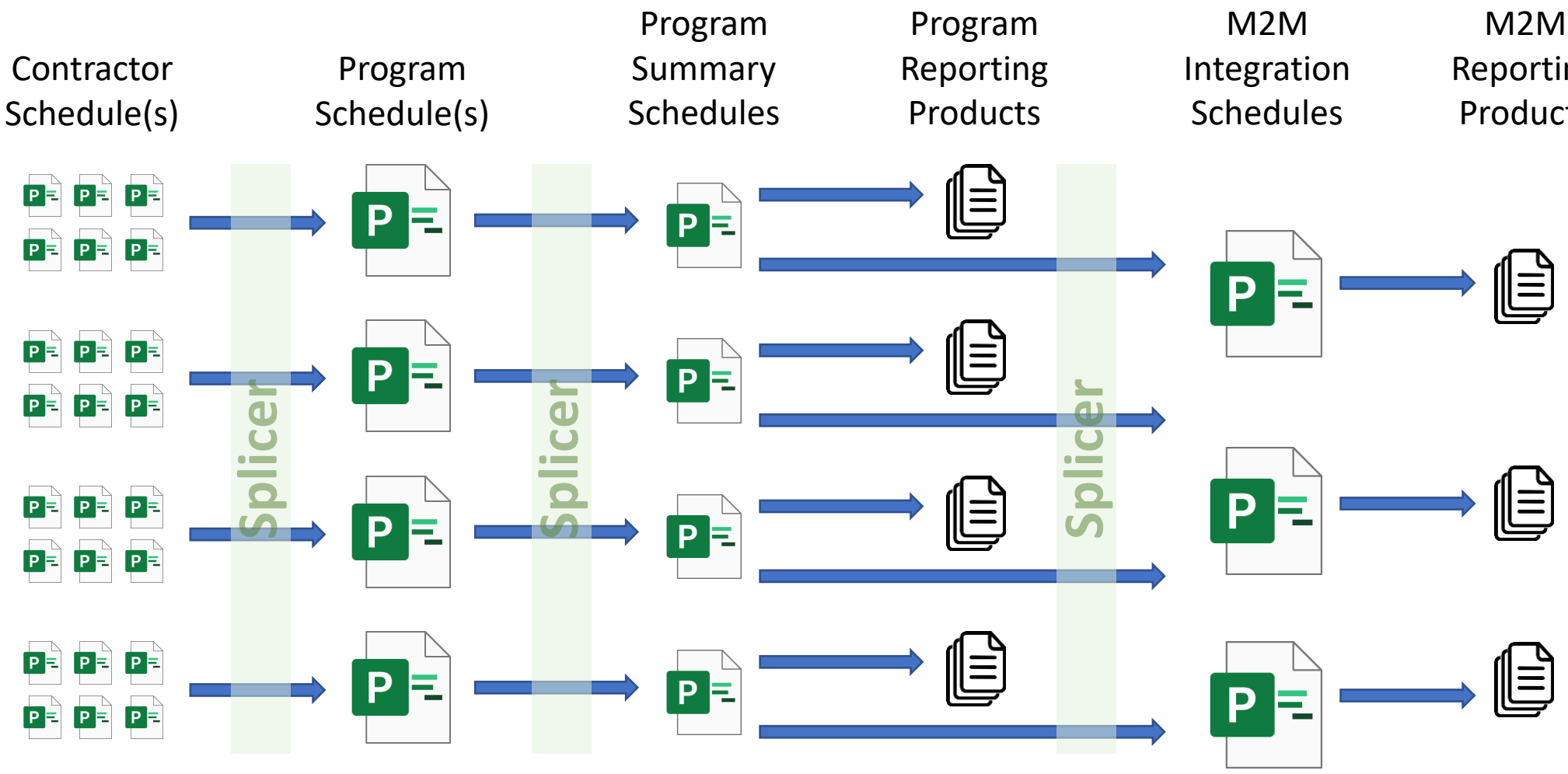


How Does Splicer Help?

- Splicer simplifies and automates the update process for summary or integration schedules.
- All mappings, fields and configurations are contained in the Integration or Summary file.
- Mappings and configurations provide traceability from source to integration/summary schedules.
- Source schedule(s) remain unaltered through the process (i.e. read only).
- Source schedule(s) are read and processed one at a time with built-in opportunities to review and edit the data.



Where Can Splicer Be Used?

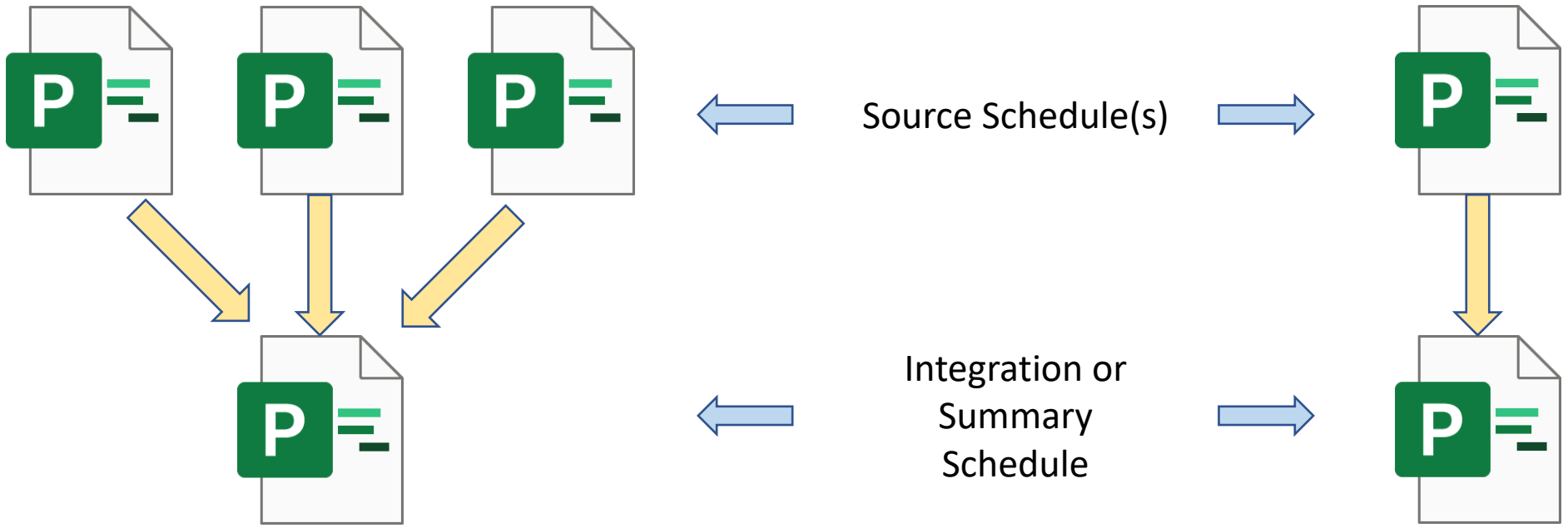


Splicer Use Cases

Splicer has two main use cases:

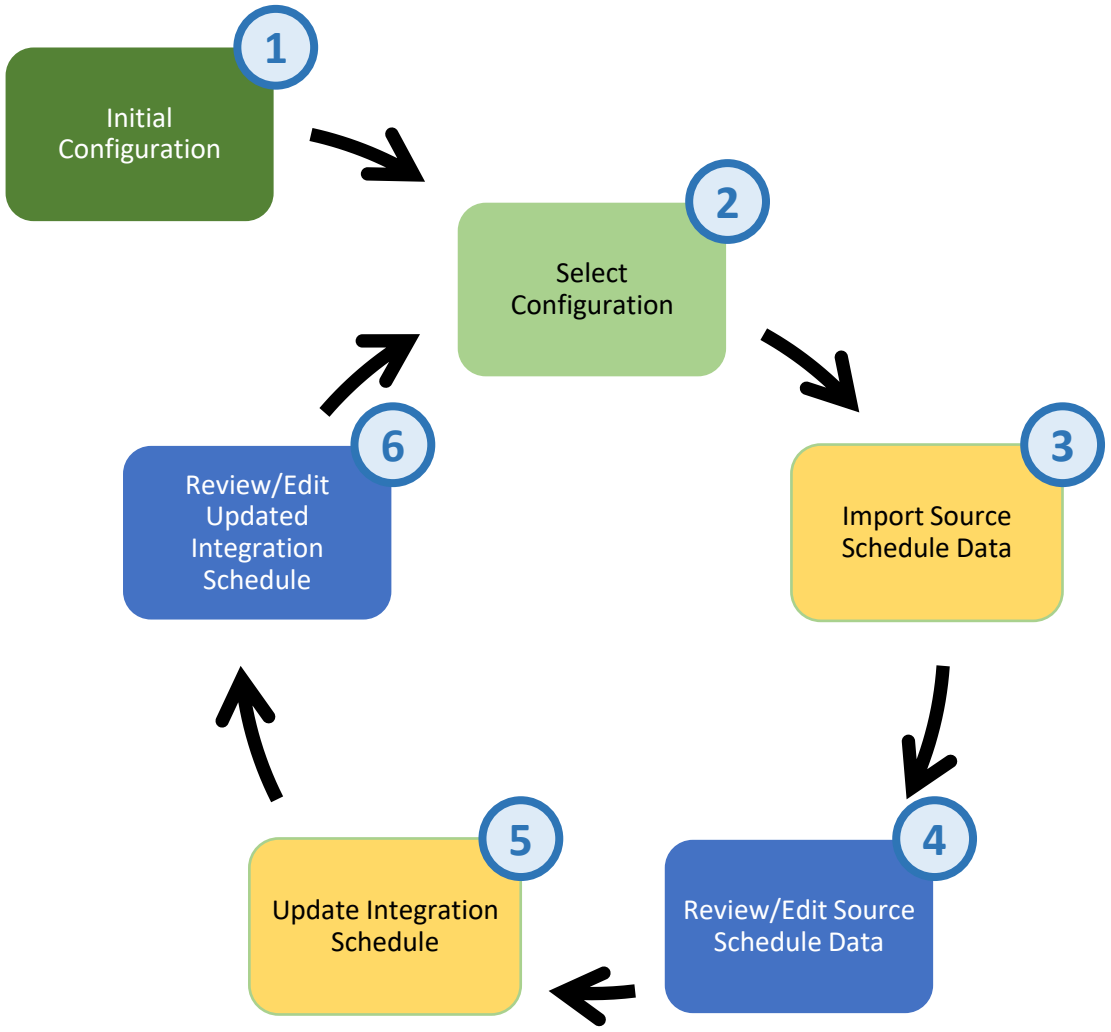
Integration of multiple schedules

Summary schedule from a single schedule



Splicer Process Overview

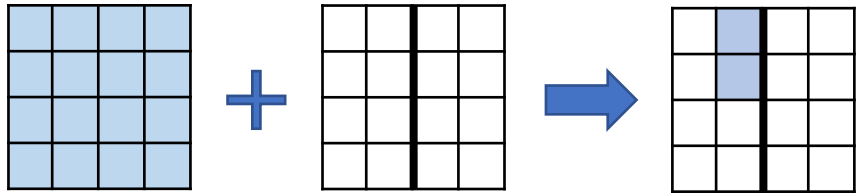
- There are two stages to running Splicer: Initial Configuration and the Schedule Update Process.
- **Initial Configuration** (step 1) involves adding and populating fields in the Integration Schedule and creating Splicer configuration(s).
- The **Schedule Update Process** has two built-in "break points" (steps 4 & 6) after importing and after updating data to the Integration Schedule (steps 3 & 5).
  - Built in highlighting assists data validation.
  - "Break points" allow for data validation & verification and manual editing (if needed).
- Update process (steps 2-6) repeats for each source schedule.



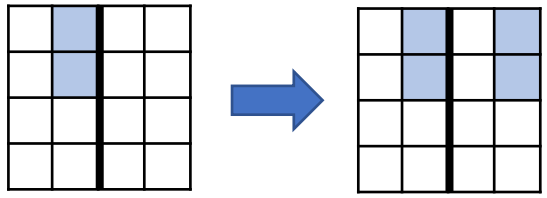
How Does Splicer Work?

Splicer **Imports** data from one or more source files to a target file then **Updates** the target file with this data:

Importing copies data from one or more source files to “temp” fields in the target file.



Updating copies data from the “temp” fields to the “real” fields using logic for sequencing.



Other features include:

- Highlighting / de-highlighting differences in data between “temp” and “real” fields.
- Ability to preserve original (pre-update) data.
- Ability to track update date.

Splicer User Interface

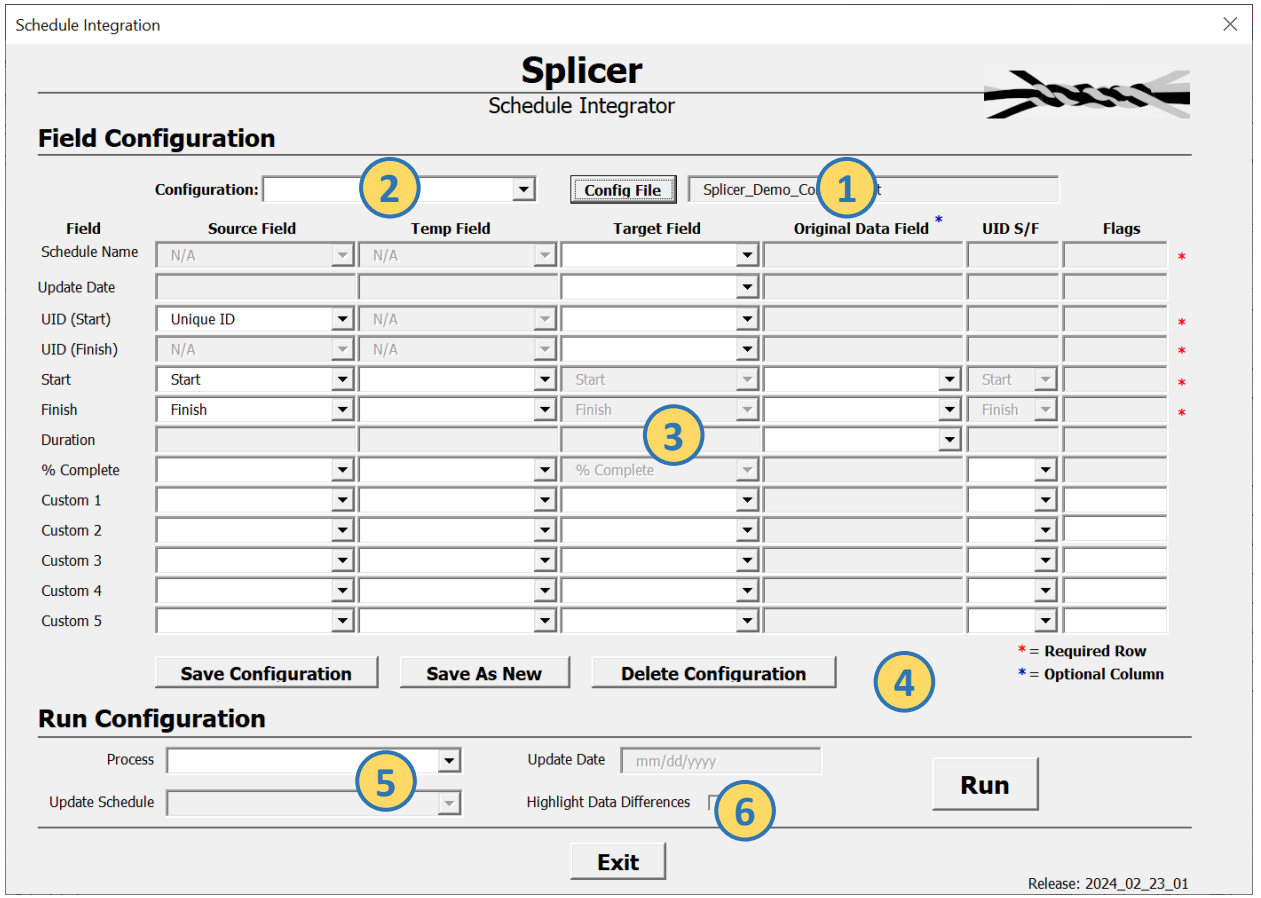
Two Main Sections

Field Configuration

The mappings of fields between source files and integration or summary files. Mappings can be saved and are portable.

Run Configuration

Using a configuration mapping, select and either import or update a source schedule to the integration or summary file.



Feature Highlights

1. Multiple configurations in external files
2. Multiple source schedules can have multiple mappings
3. No field mapping restrictions
4. Easy and intuitive configuration management
5. Fast and simple data import and schedule updates
6. Automated highlighting to ease data validation and updates

Questions / Comments

Questions on Splicer

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Author Biographies

Jessica Clarke (Jessica.Clarke@nasa.gov; Clarke_Jessica@bah.com) has been working as an Artemis schedule analyst for the past two years. Ms. Clarke began at Booz Allen after graduating with two semesters as a NASA Intern, working with the Disasters Program, automating satellite imagery for format and upload to the public NASA Disaster website. Through her time at CU Boulder where she majored in Information Science and minored in Space, she was also part of the executive board as president of the Woman of Aeronautics and Astronautics (WoAA) chapter at CU, empowering and cultivating a community of women and gender minorities with a common interest in aerospace.

Mike Hemrich (Michael.J.Hemrich@nasa.gov; Hemrich_Michael@bah.com) earned his bachelor's degree from Penn State in Security and Risk Analysis and, after graduating, spent a year working as a supply chain optimization analyst supporting a variety of NAVAIR programs. In January 2022, Mike started working at Booz Allen and began working as an Artemis mission schedule analyst. He spent his first year mainly focused on the Artemis V mission schedule while providing support on the Artemis IV mission schedule. Over the last year, Mike has taken on the role of the Artemis IV mission schedule lead where he maintains and updates the mission schedule, as well as heading up all of the Artemis IV mission schedule analysis.

Eric Zander (Eric.S.Zander@nasa.gov; zander_eric@bah.com) has, much like the critical path of a large and complex project, followed an unexpected career path. He started with a Bachelor of Science in biochemistry followed by several years in the Peace Corps (Thailand). After returning to the US, he earned an MBA with a focus on technology management and half a master’s degree in urban planning. He has spent 20 years in the consulting field in numerous areas and roles of portfolio/program/ project management and controls. He has a particular interest in solving challenges and developing tools to make (work) life simpler and easier.

Footnotes

1. *Thresher and TIDBIT: Tools on Automating the Schedule Risk Assessment*, May 2023 NASA Cost and Schedule Symposium. Jessica Clarke, Kim Smith, Et. All 36-thresher-and-tidbit-tools-on-automating-scheulde-risk-assessments-2023.pdf (nasa.gov)

Credits

Special Thanks For All Their Help:

Maritza Alexander
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Splicer:	Zander_Eric@bah.com, Eric.S.Zander@nasa.gov

Backup Slides

Splicer Import Process

- Splicer uses the user-defined configuration to map tasks and fields between the source file(s) and the target file.
- Source data file is read-only.
- Tasks are mapped using a unique ID (doesn't have to be "the" Unique ID).
- Splicer copies data from source to mapped "temp" fields in target file.
- Target tasks are not altered during import; data is copied from source fields to target fields only.
- Flexible task mapping:
  - Target file tasks can have separate source tasks for Start and Finish or,
  - They can be mapped to just a Start or Finish task with the other value (Start or Finish) determined by Duration.

Splicer Update Process

- Similar to the Import process, the configuration maps and Splicer copies “temp” fields to “target” fields.
- Current algorithm processes tasks by order of task Start date (earlier Start dates processed first). This reduces task constraint changes resulting from task updates.
- If the “Original Data Fields” for Start, Finish and/or Duration are mapped in the configuration, Splicer copies the data to those fields prior to other field updates. This facilitates post-run analysis and validation.
- Data from the imported Start/Finish “temp” fields is compared to “target” fields (Duration is calculated) and one of five possible scenarios is implemented (See “Task Change Scenarios” slide).
- Other fields are simply copied from the “temp” to “target” fields.
  - Some fields require processing such as % Complete and Notes (text) fields.
  - Flags in the configuration add flexibility to prepend, append or, replace text field data.

Task Change Scenarios

- Five possible change scenarios

1) **Slide**
   - Start Change
   - Finish Change
   - Duration **NO** change
2) **Shrink or Expand – 1**
   - Start **NO** Change
   - Finish Change
   - Duration Change
3) **Shrink or Expand – 2**
   - Start Change
   - Finish **NO** Change
   - Duration Change
4) **Slide & Shrink or Expand**
   - Start Change
   - Finish Change
   - Duration Change
5) **No Changes**
   - Start **NO** Change
   - Finish **NO** Change
   - Duration **NO** Change