

Innovative Development of a Cross-Center Timeline Planning Tool

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PAYLOAD OPERATIONS INTEGRATION CENTER (POIC)

Introduction

- The Payload Operations Integration Center (POIC) at Marshall Space Flight Center (MSFC) is the United States focal point to support operations controllers and payload developers conducting payload science operations for the National Aeronautics and Space Administration (NASA) aboard the International Space Station (ISS).
- Some of its key functions:
 - Planning, coordination and scheduling of science activities with other NASA centers, international partners and payload developers.
 - Flight Control Team (FCT) to support real-time execution, and monitoring, of the science activities.

Problem

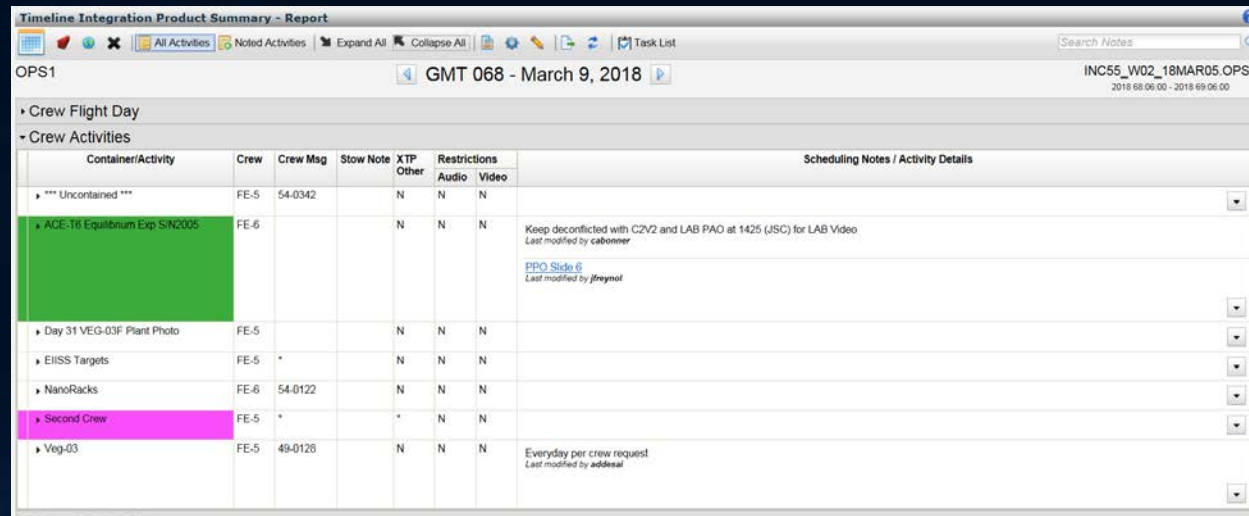
- FCT needs to understand why activities are planned in a specific order and the detailed constraints between activities, during real-time execution.
- Planners were manually creating a summary daily report consisting of planning and scheduling information, mixed in with discipline-specific notes.
 - Can be time consuming to gather this data and revise it when plans change.
 - Payload science operations, aboard the ISS, has recently increased with the addition of a fourth crew member.

Solution

- Enter the need for the Timeline Information Planning Summary (TIPS) application.
- Automatically generates summary reports with the most up-to-date data from various sources.

Features

- Calendar view for easy navigation.
- Daily report view shows information about planning activities and any associated notes.
- Planning activities are colored based on their current execution status.



Timeline Integration Product Summary - Report

OPS1 GMT 068 - March 9, 2018 INC55_W02_18MAR05.OPS1

2018 06 06 00 - 2018 09 06 00

► Crew Flight Day

▼ Crew Activities

Container/Activity	Crew	Crew Msg	Stow Note	XTP Other	Restrictions Audio Video	Scheduling Notes / Activity Details
► *** Uncontained ***	FE-5	54-0342		N	N N	
► ACE-16 Equilibrium Exp S/N2005	FE-6			N	N N	Keep deconflicted with C2V2 and LAB PAO at 1425 (JSC) for LAB Video Last modified by <i>cabonner</i> PPO Slide 6 Last modified by <i>jfreymat</i>
► Day 31 VEG-03F Plant Photo	FE-5			N	N N	
► EISS Targets	FE-5	*		N	N N	
► NanoRacks	FE-6	54-0122		N	N N	
► Second Crew	FE-5	*		*	N N	
► Veg-03	FE-5	49-0126		N	N N	Everyday per crew request Last modified by <i>addesal</i>

Features (cont.)

- Weekly view shows a summary of the daily reports for an entire week.
- Search for previous activities and notes.
- Summary of crew times and crew utilization.

Timeline Integration Product Summary - Weekly

Week of March 12, 2018

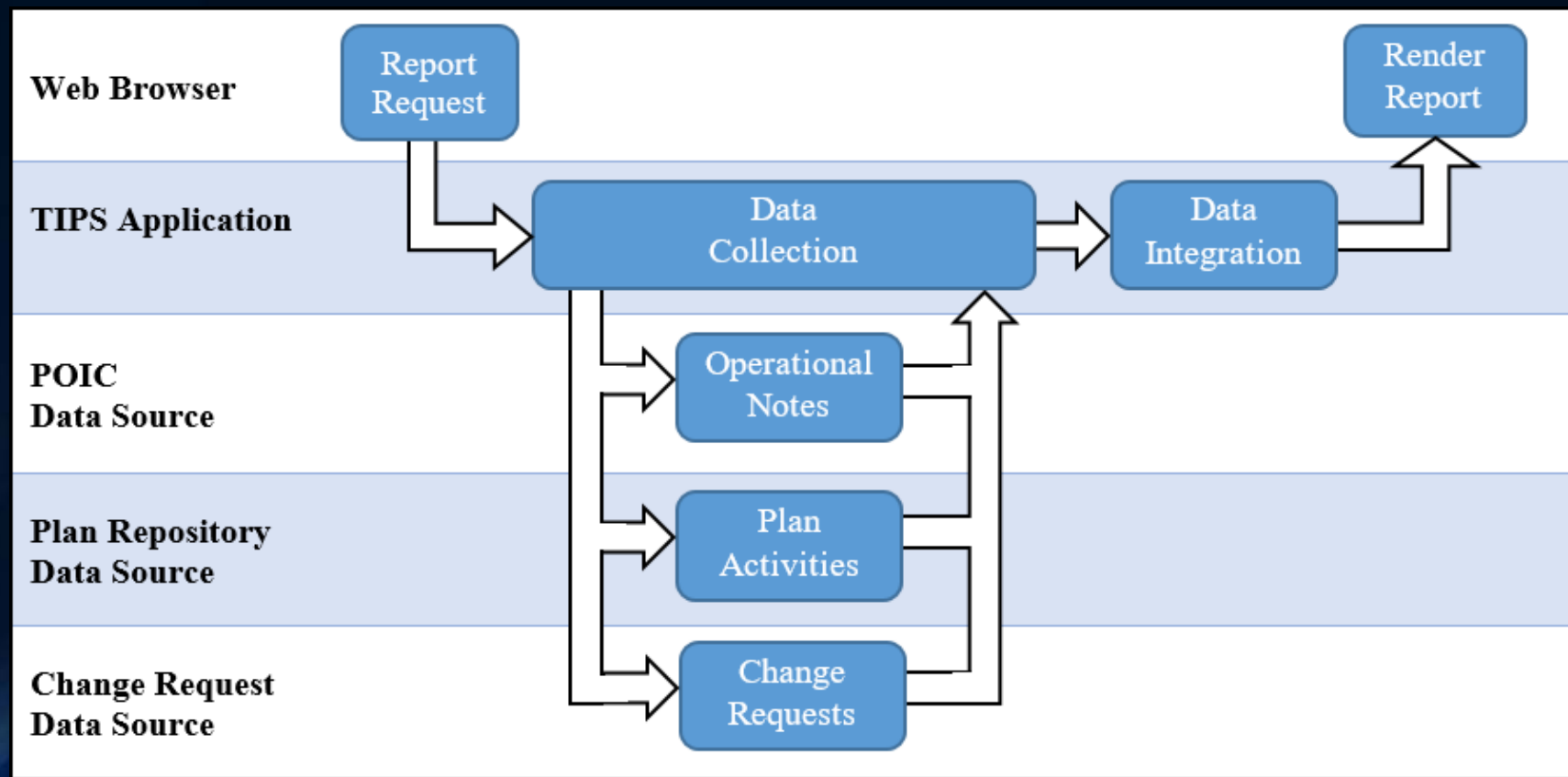
Task List Search Notes

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
12 71 ops1	13 72 ops1	14 73 ops1	15 74 malt	16 75 malt	17 76 malt	18 77 malt
Flight Container/Activity Crew NanoRacks PF2 - OCR FE-5 OpLead-0154 NMAP-TST-D1 FE-5 Plant Habitat FE-6 RADI-N FE-6 RSS Inventory Audit FE-6 Veg-03 FE-5	Flight Container/Activity Crew Post SPX 13 Cold Stowage Ops cldstow_0003 FE-5 Veg-03 FE-5 Untended Container/Activity ACE-T6 Equilibrium Exp S/N2005 CREAM DECLIC-ALI SC18-MF PGP Run5 Sample Proc PLC Plant Habitat SAS Shutter Ops Transparent Alloys Cart2 Testing USPL Unattends 55/56 Crew Time FE-5: 03:45:00 FE-6: 06:35:00 ISS CDR: 05:20:00	Flight Container/Activity Crew Day 36 VEG-03F Plant Photo FE-5 Earth Imagery From ISS (EISS) FE-5 HMS-ULTRASOUND * METECR FE-6 NMAP-TST-D0 FE-6 Veg-03 FE-5 Untended Container/Activity ACE-T6 Equilibrium Exp S/N2005 ACME TEST POINT DAY CREAM DECLIC-ALI SC18-MF HMS Ultrasound Ground Support HMS-ULTRASOUND Plant Habitat SAGE Transparent Alloys Cart2	Flight Container/Activity Crew RUSPAYLOADS FE-5 Ham Pans FE-5 LTE-AWS-D1 FE-6 MD Print Removal/Slow FE-5 NMAP-TST-D1 FE-6 Post SPX 13 Cold Stowage Ops cldstow_0003 FE-6 Veg-03 FE-5 Untended Container/Activity RUSPAYLOADS ACE-T6 Equilibrium Exp S/N2005 CREAM DECLIC-ALI SC18-MF LTE-AWS-D1 MD Print Removal/Slow NMAP-TST-D1 Transparent Alloys Cart2 Testing USPL Unattends 55/56	Flight Container/Activity Crew Day 39 VEG-03EF Plant Photo FE-5 LTE-SLEEP-OPS SHFT FE-6 Veg-03 FE-5 Untended Container/Activity RUSPAYLOADS CREAM Transparent Alloys Cart2 Testing USPL Unattends 55/56 Crew Time FE-5: 00:15:00 FE-6: 00:05:00 ISS CDR: 00:35:00	Flight Container/Activity Crew LTE-SLEEP-OPS SHFT FE-6 Veg-03 FE-5 Untended Container/Activity RUSPAYLOADS CREAM Transparent Alloys Cart2 Testing USPL Unattends 55/56 Crew Time FE-5: 00:15:00 FE-6: 00:05:00 ISS CDR: 01:35:00	Flight Container/Activity Crew LTE-SLEEP-OPS SHFT FE-6 Veg-03 FE-5 Untended Container/Activity RUSPAYLOADS CREAM Transparent Alloys Cart2 Testing USPL Unattends 55/56 Crew Time FE-5: 00:15:00 FE-6: 00:05:00 ISS CDR: 01:35:00

Architecture

- TIPS is a rich web application that runs on most of today's modern browsers.
- Follows a three-tiered architecture model:
 - Data layer
 - Business Logic
 - Presentation
- Web services written in .NET C#.
- User Interface written in JavaScript, using the Dojo Framework.

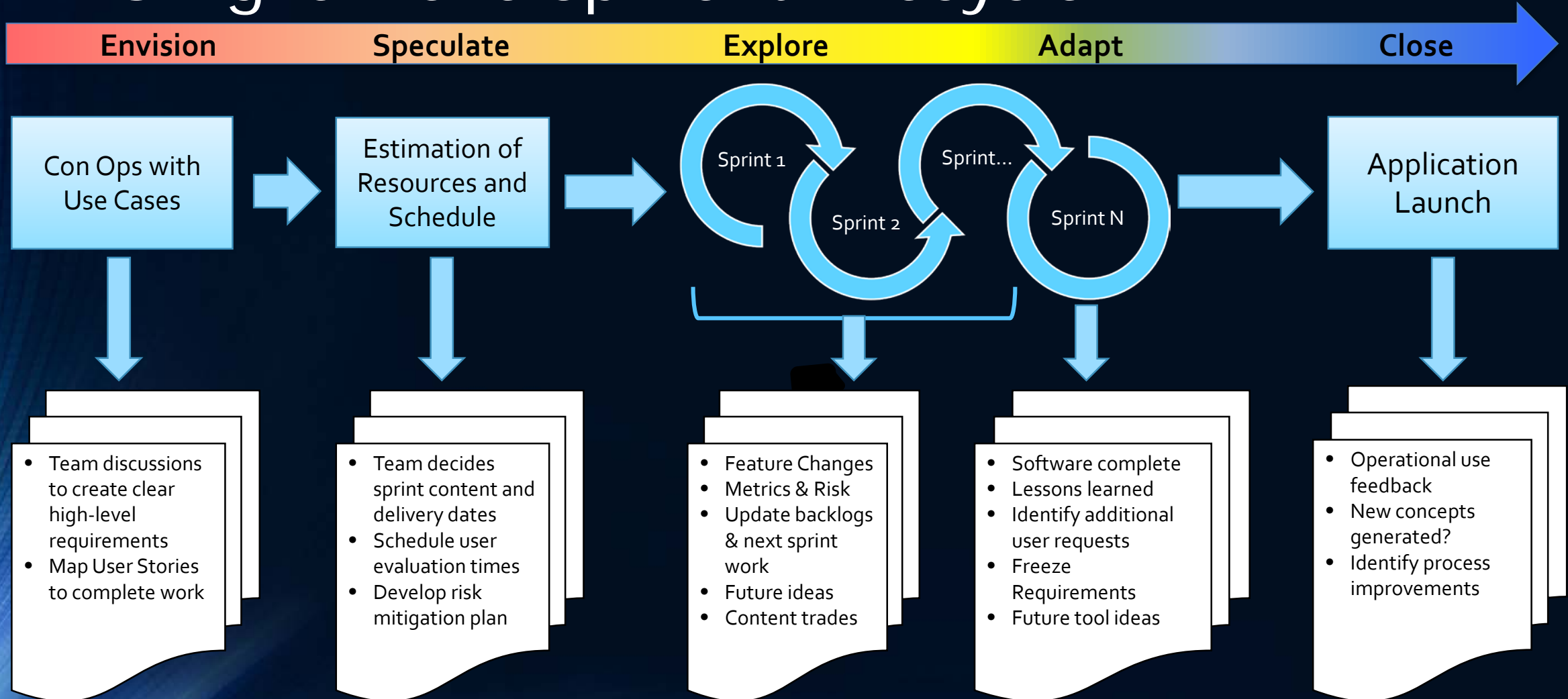
Architecture (cont.)



Development Strategy

- Introduced the Agile Software Development paradigm to the POIC development environment.
- Created a derivative of the Scrum process to address several constraints unique to Space Ops at the POIC:
 - Development team has multiple project priorities.
 - Users/Evaluators have rotating shift schedules.
 - Deadlines inherent to any operational environment.
- Iterative development with periodic user evaluations which permitted software changes during development cycle.

TIPS Agile Development Lifecycle



Conclusion

- TIPS was the first Agile effort at the POIC, bringing together operations planners and software developers to quickly complete a valuable automated tool for ground support of space operations.
- It has been successfully embraced by all positions at the POIC.
- TIPS has reduced the time it takes to prepare a daily summary report by an entire order of magnitude.
 - 40 hours to 40 minutes.
- Currently being extended for use at the Johnson Space Center (JSC).