

Lesson 2

Objectives

- Introduce the payload manage app, payload simulator app, and payload simulator library.
- Use the lib/app as examples for using the cFS App Exchange

Library and Application Summary

PL_SIM_LIB

- Simulate payload power states, detector states, and detector science data
- Provides an interface to set and clear a detector fault. Science data is corrupted when the fault is present
- JSON initialization table defines number of 1Hz cycles for power initialization and detector reset

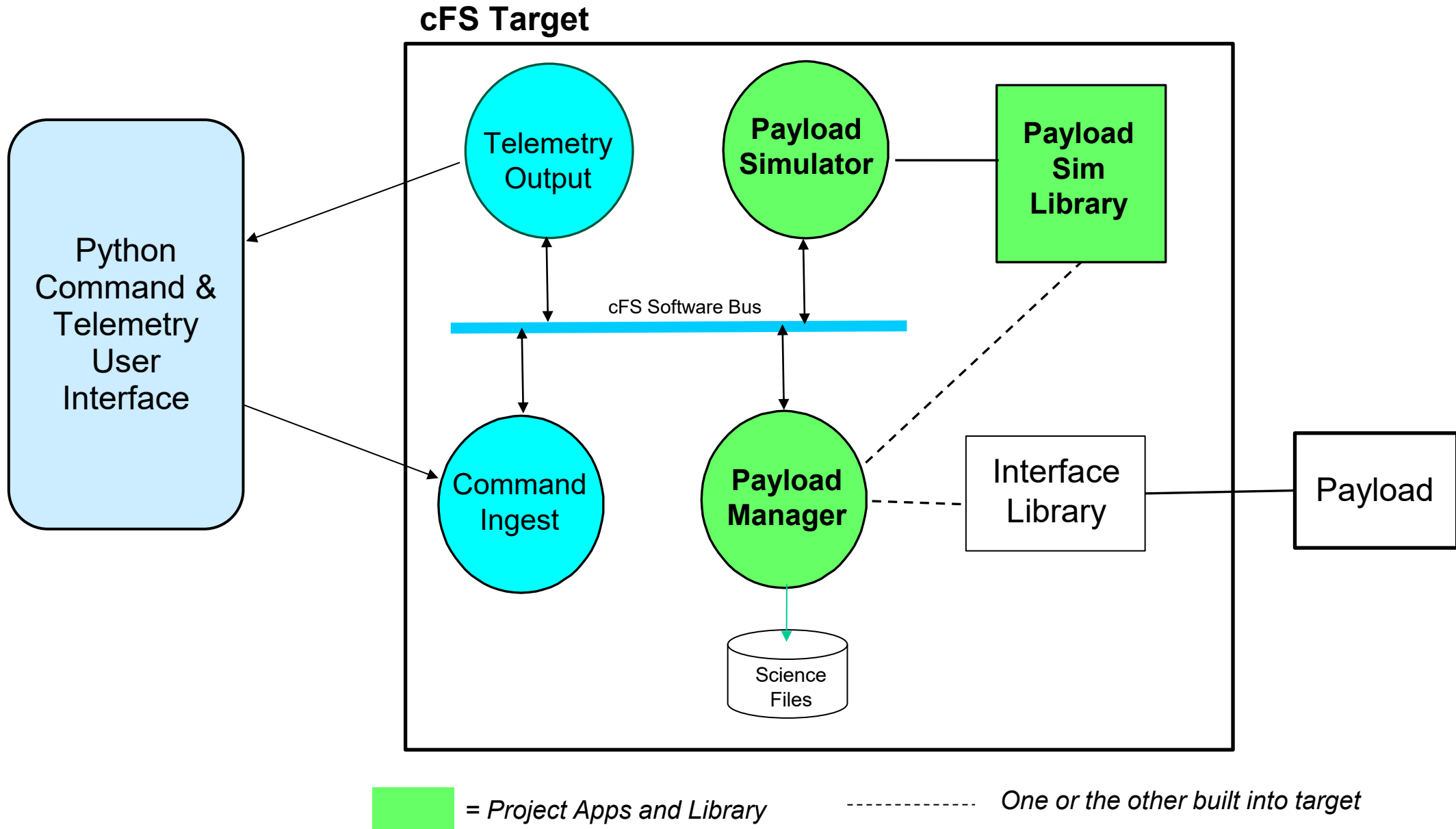
PL_SIM App

- Provides a ground command and telemetry interface to PL_SIM_LIB
- Command include: power on, power off, set fault, and clear fault

PL_MGR

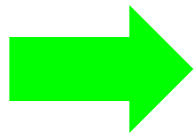
- Manage the data interface to the payload and the creation of science data files
 - Reads detector data and writes images to files
- Commands to start and stop science data that turn on and off the detector, respectively
- JSON initialization table defines the science file path, base science filename and number of images per file

Library and Application Architecture



Install Payload Manager

- Use the steps described in lesson one to download, install and build PL_MGR, PL_SIM and PL_SIM_LIB
 - PL_SIM_LIB must be added to the cFS target first which causes it to be loaded before the apps when the cFS initializes
 - The PL_MGR and PL_SIM apps require PL_SIM_LIB global symbols to be defined when they are loaded



<input type="checkbox"/> MQTT_LIB	The Eclipse Paho Embedded C MQTT Library ported to the core Flight System. The Eclipse Paho s
<input type="checkbox"/> PL_MGR	Example payload management app.
<input type="checkbox"/> PL_SIM	Payload simulator app that provides a ground interface to the payload simulator library (PL_SIM).
<input type="checkbox"/> PL_SIM_LIB	Payload simulator library that simulates a fictitious detector that provides text data. PL_SIM_LIB r
<input type="checkbox"/> PROXY_DS	Basecamp proxy for NASA's Data Storage (DS) App. This proxy allows DS https://github.com/nasa/
<input type="checkbox"/> PROXY_SAMPLE_APP	Basecamp proxy for NASA's Sample App. This proxy allows sample_app https://github.com/nasa/s
<input type="checkbox"/> PROXY_SAMPLE_LIB	Basecamp proxy for NASA's Sample Lib. This proxy allows (sample_lib)[https://github.com/nasa/sa
<input type="checkbox"/> RPI_BTN	Raspberry Pi app demonstrating how to interface with a button. This app can be used as a starting
<input type="checkbox"/> RPI_IOLIB	cFS library providing an interface to Raspberry Pi peripherals
<input type="checkbox"/> RPI_LED	Raspberry Pi app demonstrating how to control an LED using General Purpose I/O (GPIO) pins. This
<input type="checkbox"/> SC_SIM	Simulate a simple spacecraft operational interface that exposes users to a remote operational int

Download

Cancel

Running Payload Manager (1 of 2)

- After you start the new cFS target scroll through the start messages and verify that PL_SIM_LIB, PL_SIM and PL_MGR were loaded and initialized without any errors

cFS Target Process Window

Telecommand: 127.0.0.1:1234

Telemetry: Local

Time: 1001051

```
1980-012-14:03:20.37583 CFE_ES_ParseFileEntry: Loading file: /cf/pl_sim.so, APP: PL_SIM
1980-012-14:03:20.37597 CFE_ES_ParseFileEntry: Loading file: /cf/pl_mgr.so, APP: PL_MGR
1980-012-14:03:20.42601 CFE_EVS_Register: Filter limit truncated to 8
EVS Port1 66/1/KIT_SCH 4: JSON initialization file successfully processed with 14 parameters
1980-012-14:03:20.42620 CI_LAB listening on UDP port: 1234
EVS Port1 66/1/CI_LAB_APP 3: CI Lab Initialized. CI Lab App DEVELOPMENT BUILD v2.4.0-rc1+dev46,
EVS Port1 66/1/FILE_XFER 4: JSON initialization file successfully processed with 11 parameters
EVS Port1 66/1/FILE_XFER 100: FILE_XFER App Initialized. Version 1.0.0
EVS Port1 66/1/KIT_TO 4: JSON initialization file successfully processed with 25 parameters
EVS Port1 66/1/PL_MGR 4: JSON initialization file successfully processed with 11 parameters
EVS Port1 66/1/PL_MGR 100: PL_MGR App Initialized. Version 1.0.0
EVS Port1 66/1/PL_SIM 4: JSON initialization file successfully processed with 7 parameters
EVS Port1 66/1/PL_SIM 100: PL_SIM App Initialized. Version 1.0.0
EVS Port1 66/1/APP_C_DEMO 4: JSON initialization file successfully processed with 17 parameters
```

Running Payload Manager (2 of 2)

These telemetry screens represent the default states

PL_MGR App Status Telemetry

PL_SIM/Application/STATUS_TLM - Port 9003		
App ID: 110	Length: 18	Seq Cnt: 63
Payload		
StatusTlm.Payload.ValidCmdCnt	:	0
StatusTlm.Payload.InvalidCmdCnt	:	0
StatusTlm.Payload.LibPowerState	:	OFF
StatusTlm.Payload.LibPowerInitCycleCnt	:	0
StatusTlm.Payload.LibDetectorResetCycleCnt	:	0
StatusTlm.Payload.LibDetectorState	:	OFF
StatusTlm.Payload.LibDetectorFault	:	FALSE
StatusTlm.Payload.LibDetectorReadoutRow	:	0
StatusTlm.Payload.LibDetectorImageCnt	:	0

PL_MGR App Status Telemetry

PL_MGR/Application/STATUS_TLM - Port 9004		
App ID: 109	Length: 81	Seq Cnt: 59
Payload		
StatusTlm.Payload.ValidCmdCnt	:	0
StatusTlm.Payload.InvalidCmdCnt	:	0
StatusTlm.Payload.PayloadPowerState	:	OFF
StatusTlm.Payload.PayloadDetectorFault	:	FALSE
StatusTlm.Payload.PayloadDetectorReadoutRow	:	0
StatusTlm.Payload.PayloadDetectorImageCnt	:	0
StatusTlm.Payload.SciFileOpen	:	FALSE
StatusTlm.Payload.SciFileImageCnt	:	0
StatusTlm.Payload.SciFilename	:	Undefined

For more information on payload manager refer to the Basecamp Payload Manager project:

<https://spacesteps.com/2024/10/12/cfs-payload-manager-app/>