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
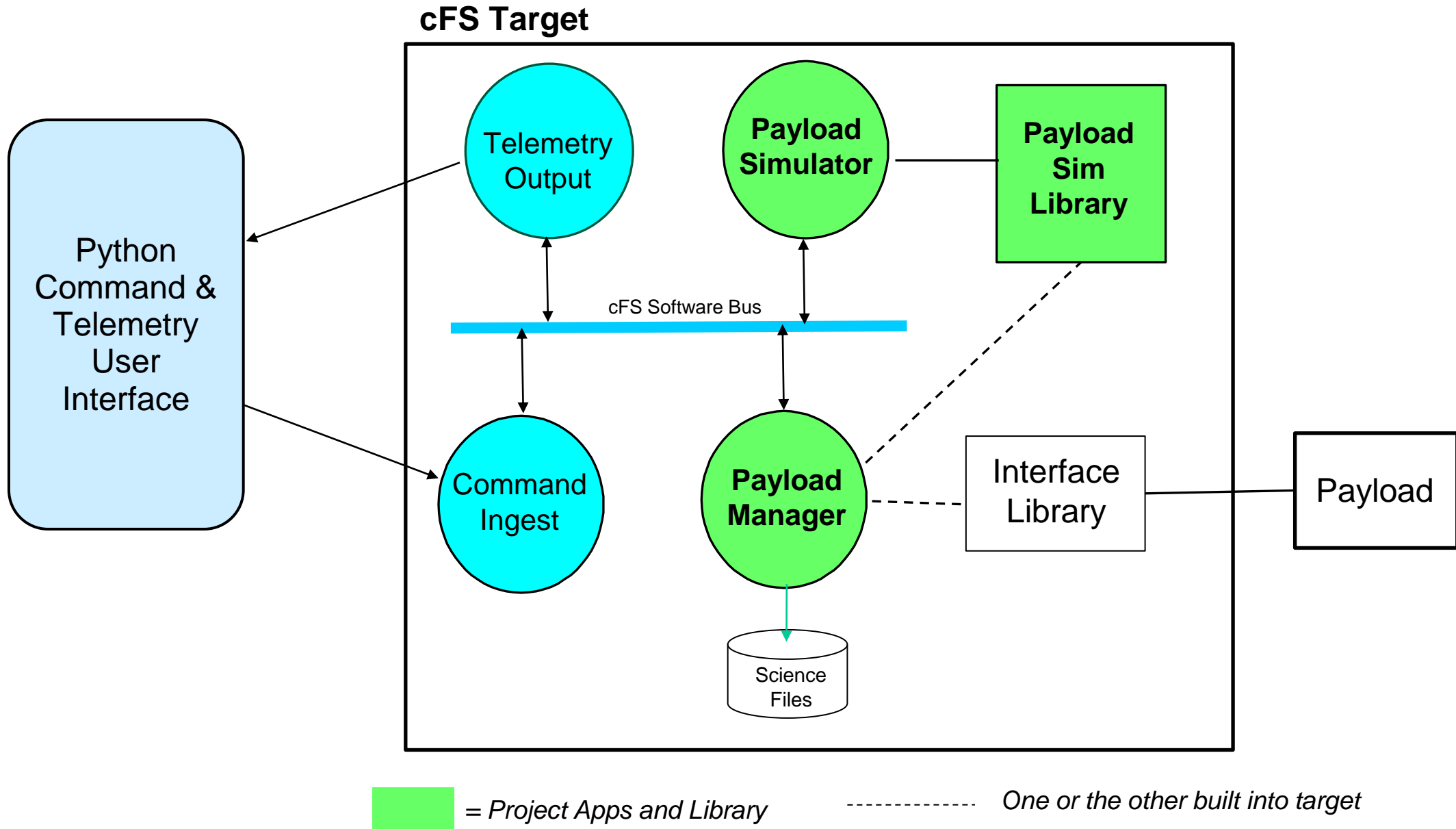
PL_SIM App

- 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

cFS Target

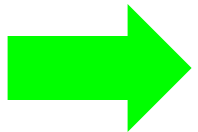- Python Command & Telemetry User Interface
- Telemetry Output
- Payload Simulator
- Payload Sim Library
- cFS Software Bus
- Command Ingest
- Payload Manager
- Interface Library
- Payload
- Science Files

= *Project Apps and Library*

------------- *One or the other built into target*

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

Select one or more apps to download then follow the steps in 'Add App'. See 'Add App' tutorial if you are unfamiliar with the steps.

☐ BC42_CTRL   Executes a 42 Simulator spacecraft control algorithm that has been ported from 42. This app requires the BC42_LIB library, the E

☐ BC42_INTF   Provide an interface between a 42 Simulator socket and the cFS Software Bus.

☐ BC42_LIB   Encapsulates 42 simulator data types and functions as a single cFS library. It contains a minimal set of utilities that are required t

☐ BERRY_IMU   Core Flight System app that interfaces to the Ozzmaker Berry IMU over a Raspberry Pi I2C interface, https://ozzmaker.com/berryi

☐ GPIO_DEMO   Example app controlling a GPIO pin that can be used as a starting point for more sophisticated apps.

☐ MQTT_GW   Provide a gateway between the core Flight System (cFS) Software Bus messages and MQTT messages. The initial version supp

☐ MQTT_LIB   The Eclipse Paho Embedded C MQTT Library ported to the core Flight System. The Eclipse Paho software and the accompany

☐ PI_IOLIB   cFS library providing an interface to Raspberry Pi peripherals

☐ PL_MGR   Example payload management app.

☐ PL_SIM   Payload simulator app that provides a ground interface to the payload simulator library (PL_SIM).

☐ PL_SIM_LIB   Payload simulator library that simulates a fictitious detector that provides text data. PL_SIM_LIB relies on the payload simulator a

☐ SC_SIM   Simulate a simple spacecraft operational interface that exposes users to a remote operational interface. This is not a dynamic sir

☐ TBL_SAT   Raspberry Pi app used in the Table Sat kit.

Download   Cancel

- **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**

Running Payload Manager

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 following Basecamp project:
https://openmissionstack.com/projects_read/payload_manager