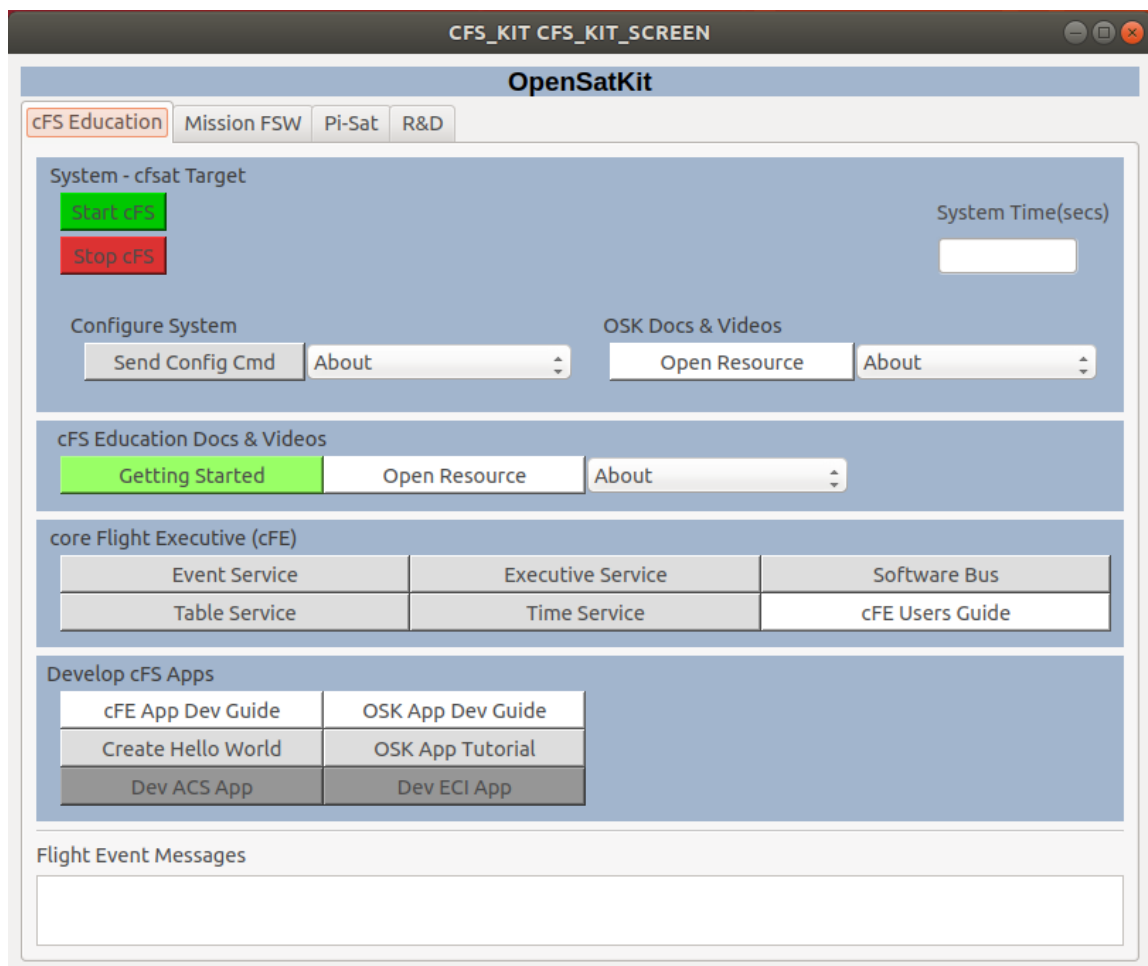




Getting Started with OSK's cFS Education Target

OSK v3.1

- The OSK cFS Education target provides a platform for learning NASA's core Flight System (cFS) features and how to develop cFS applications
- The main screen has 4 sections that will be describe in the following slides



System

- Start and stop the “cfsat” target
- Configure System provides easy access to common commands
- Access to OSK documents and videos

cFS Education

- Access to cFS documents and videos

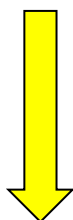
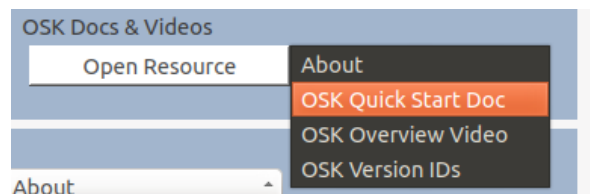
cFE Resources

- Each screen provides in-depth material for each cFE service including hands-on demos and scripts

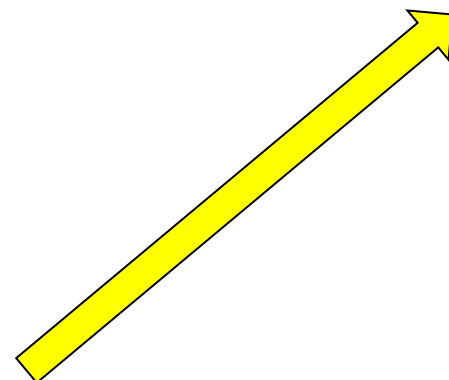
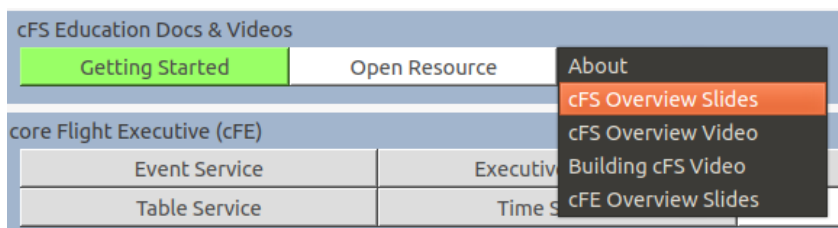
App Development Resources

- Hands on exercises to create a Hello World app and to develop a more sophisticated app using the OSK app framework

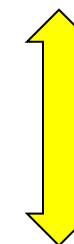
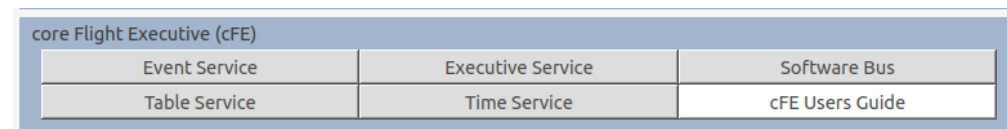
1. Learn OSK basics



2. Learn cFS and cFE basics

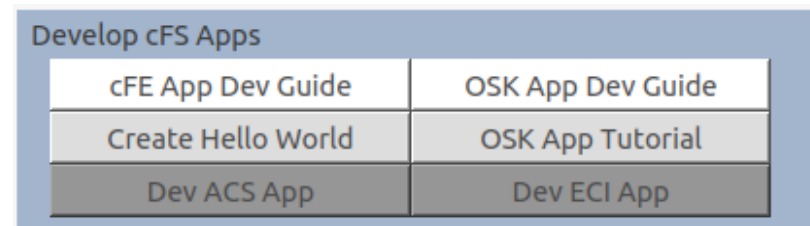


3. Learn cFE services



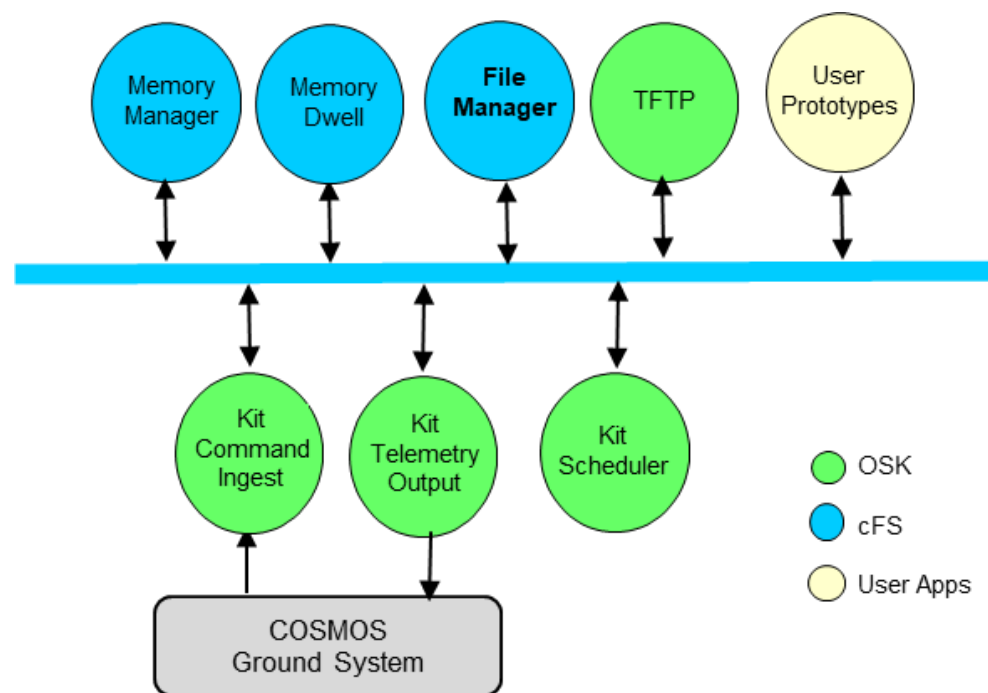
In practice, it's an iterate process of developing apps and learning service details as you need them

4. Develop applications



If you can't wait to code, reading the *cFE App Developer's Guide* and creating a Hello World app is good third step

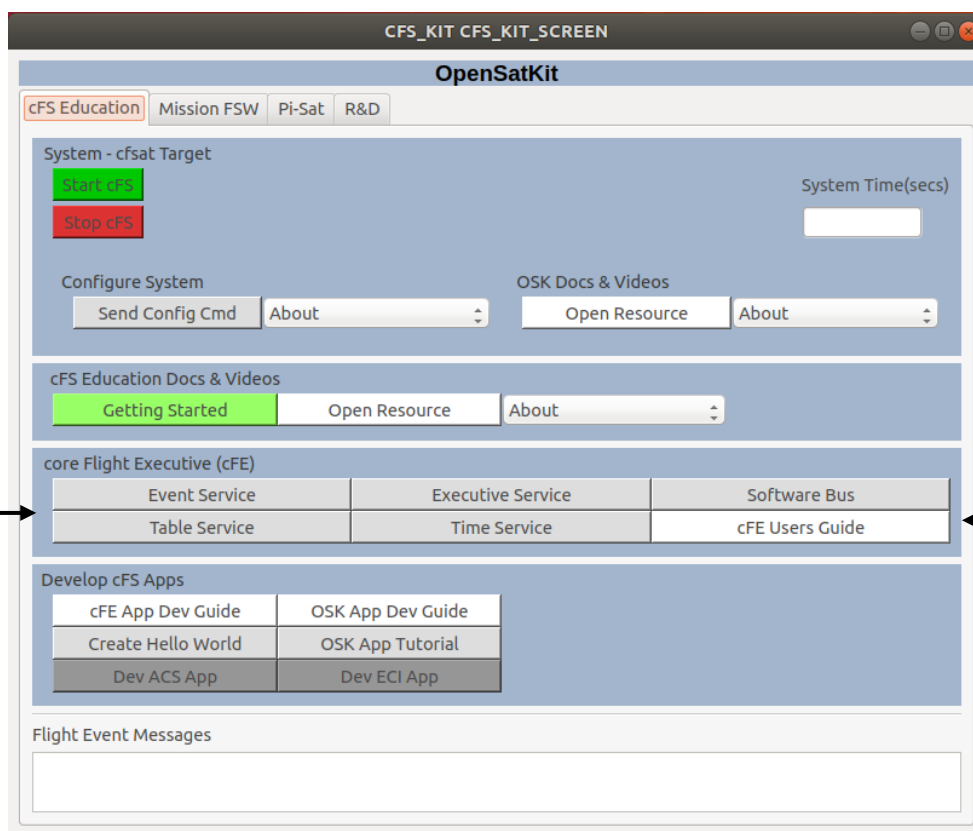
A cFS target is a collection of apps that runs as a complete system



CFSAT

- Contains a reduced number of apps to minimize complexity so users can focus on the material being taught.
- Included apps provide a runtime environment and participate in demos

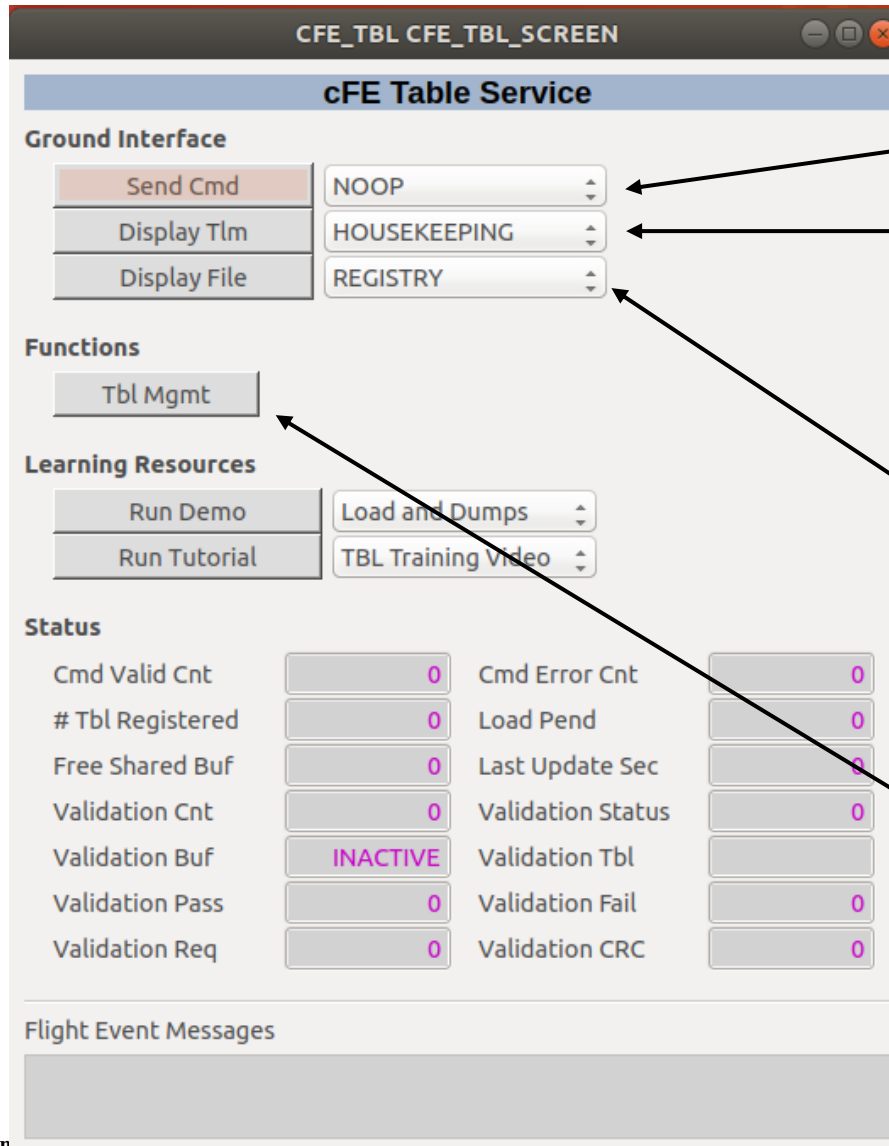
- The cFE has 5 services
 - **Executive Services (ES):** Manage the embedded software system and create an application runtime environment
 - **Time Services (TIME):** Manage spacecraft time
 - **Event Services (EVS):** Provide a service for sending, filtering, and logging event messages (time stamped text messages).
 - **Software Bus (SB) Services:** Provide an application publish/subscribe messaging service
 - **Table Services (TBL):** Manage application binary file table images



One button/screen
for each service

cFE HTML
User's Guide

Table Service screen shown. All cFE screens have the same layout but may not have every component/button



The screenshot shows the 'cFE Table Service' window. It has a title bar 'CFE_TBL CFE_TBL_SCREEN'. The main content is divided into several sections:

- Ground Interface:** Contains three buttons: 'Send Cmd', 'Display Tlm', and 'Display File'. To the right of these buttons are three dropdown menus with values 'NOOP', 'HOUSEKEEPING', and 'REGISTRY' respectively.
- Functions:** Contains a button labeled 'Tbl Mgmt'.
- Learning Resources:** Contains two buttons: 'Run Demo' and 'Run Tutorial'. To the right are two dropdown menus with values 'Load and Dumps' and 'TBL Training Video' respectively.
- Status:** A table of status indicators.

Cmd Valid Cnt	0	Cmd Error Cnt	0
# Tbl Registered	0	Load Pend	0
Free Shared Buf	0	Last Update Sec	0
Validation Cnt	0	Validation Status	0
Validation Buf	INACTIVE	Validation Tbl	
Validation Pass	0	Validation Fail	0
Validation Req	0	Validation CRC	0
- Flight Event Messages:** A large empty box at the bottom.

Select and send commands

Display a telemetry packet using COSMOS's Packet Viewer.

- Telemetry packets can be generated in response to a command
- E.g., Telemeter the registration information for a single table

Display a binary file using COSMOS's Table Manager

- Binary files can be generated in response to a command.
- E.g. Dump the entire table registry to a file

Display a screen that simplifies user interaction with a service

CFE_TBL CFE_TBL_SCREEN

cFE Table Service

Ground Interface

Send Cmd

Display Tlm

Display File

NOOP

HOUSEKEEPING

REGISTRY

Functions

Tbl Mgmt

Learning Resources

Run Demo

Run Tutorial

Load and Dumps

TBL Training Video

Status

Cmd Valid Cnt	0	Cmd Error Cnt	0
# Tbl Registered	0	Load Pend	0
Free Shared Buf	0	Last Update Sec	0
Validation Cnt	0	Validation Status	0
Validation Buf	INACTIVE	Validation Tbl	
Validation Pass	0	Validation Fail	0
Validation Req	0	Validation CRC	0

Flight Event Messages

Select and run a demo

- Demos are a sequence of interactive screens that step the user through a task

Select and run a tutorial

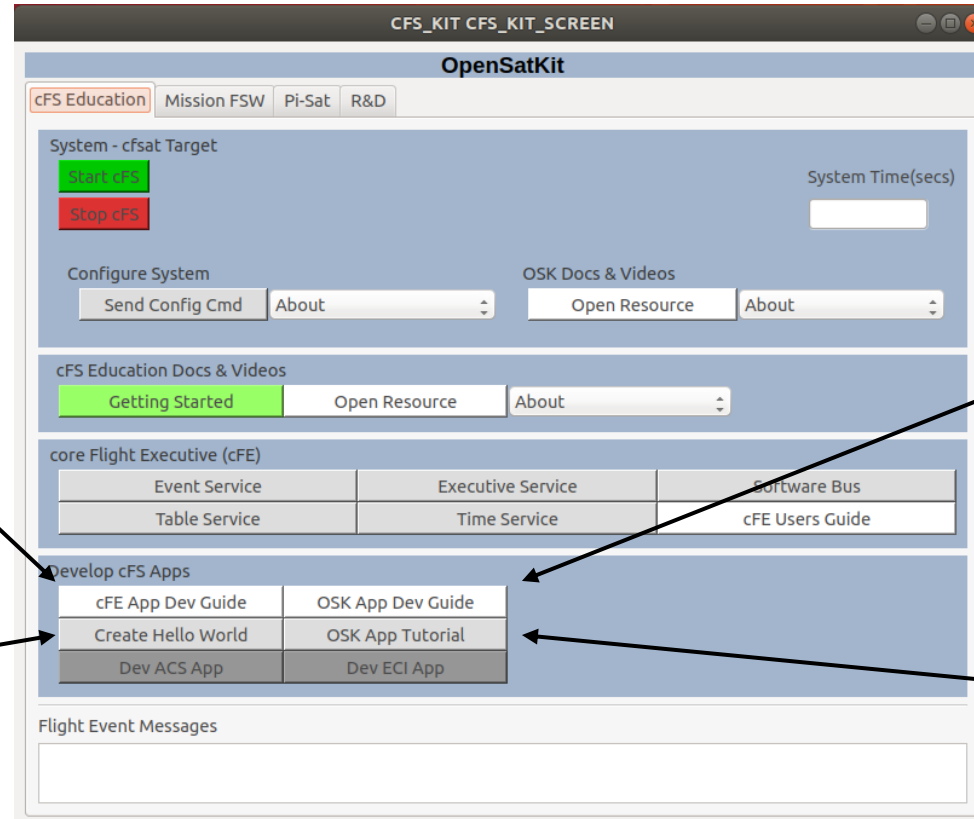
- Tutorial are typically, but not limited to a set of slides coupled with a ruby script for exercises

Each service generates a periodic “housekeeping” telemetry packet every few seconds

- The ‘Status’ section displays a portion of the housekeeping packet
- The entire packet can be displayed using the <Display Tlm> button in the Ground Interface section

Describes key cFE APIs when developing apps and uses the 'cFE' app design conventions

Create, build, and run a Hello World application. Supports multiple app style templates



Describes how to develop app using the OSK Object-based App Framework

Hand-on tutorial the steps the user through the creation of the `osk_c_demo` app that is included in the R&D target

CFS_KIT MNG_APP_DEV_SCREEN

Manage App Development

```

cfs
|- apps
|  |- example
|- osk_def
|  |- cpul_cfe_es_startup.scr
|  |- targets.cmake
cosmos
|- config
|  |- targets
|     |- EXAMPLE
|     |- cmd_tlm
|- tools
|  |- cmd_tlm_server.txt
|- lib
|  |- message_ids.rb

```

Generated by APPGen

Manually edited by user

Definitions assumed by AppGen

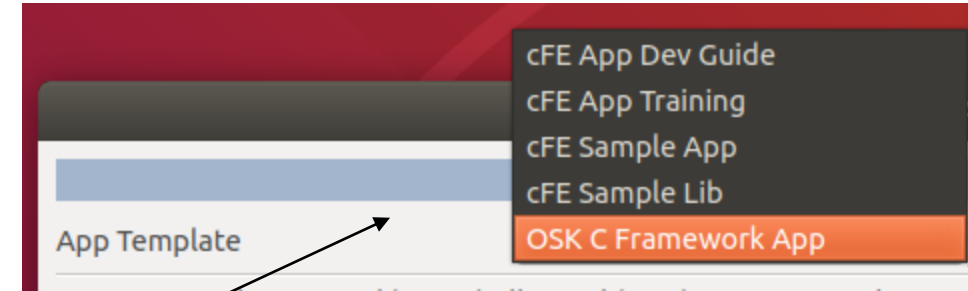
- 1 Create App Launch tool to create new app/lib from a template
- 2 Edit cmake Add app file to cmake target list TGT1_APPLIST
- 3 Edit ES Startup Add app to cFE Executive Service startup script
- 4 Stop cFS/Server Stop cFS and COSMOS cmd-tlm server
- 5 Build cFS Run cmake to build new app
- 6 Start Server/cFS Start cFS and COSMOS cmd-tlm server

Run Training Videos

Create 'Hello World' App
⌵

Six quick steps to create a “Hello World” created and integrate it into the kit

- Select from different app and library templates
- Select a template and then select <Template Info> to get information about a particular template
- Select create app when your ready to generate code



CFS_KIT CREATE_APP_SCR

Create App Version 1.0

App Template

cFE App Dev Guide

Template Info

Create App

Generate application or library 'hello world' code from a template. Additional artifacts may be generated. See <template info> for details. Using template directory /mnt/hgfs/OpenSatKit/cosmos/cfs_kit/tools/create-app/templates.

1. Select a template from the drop down menu. Click <Template Info> to get a description of the template.
2. Modify the cFS and COSMOS target directories below. Not necessary with default OSK configuration.
3. Click <Create App> to generate the code.

cFS Target Directory

Show Default

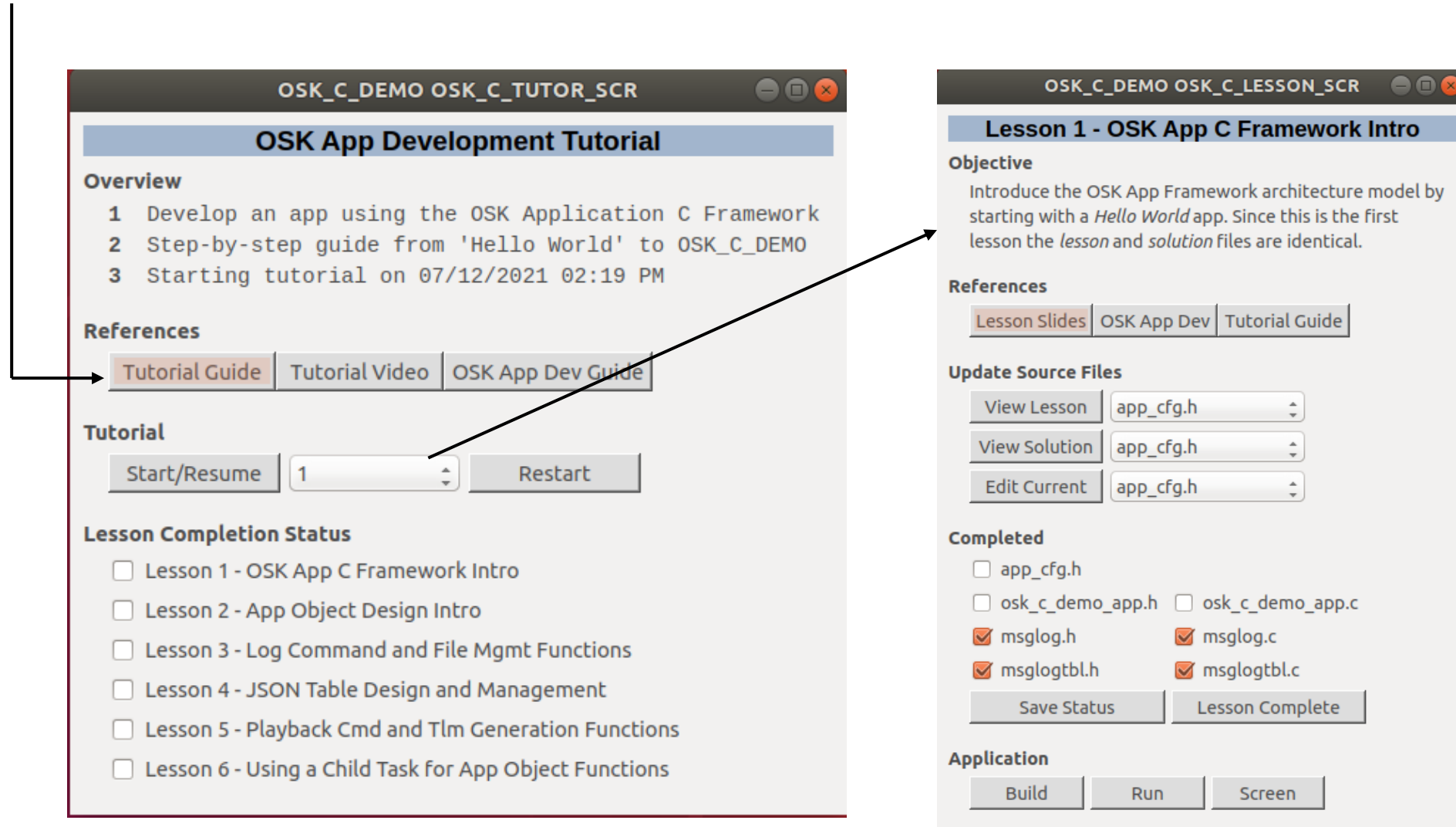
Browse

COSMOS Target Directory

Show Default

Browse

- Uses a series a lesion to incrementally transform a Hello World app into the osk_c_demo app
- The Tutorial Guide describes how to use the tutorial



The screenshot displays the OSK App Development Tutorial interface, which is divided into two main panels: the left panel for the tutorial overview and the right panel for the current lesson details.

Left Panel: OSK_C_DEMO OSK_C_TUTOR_SCR

- OSK App Development Tutorial**
- Overview**
 - 1 Develop an app using the OSK Application C Framework
 - 2 Step-by-step guide from 'Hello World' to OSK_C_DEMO
 - 3 Starting tutorial on 07/12/2021 02:19 PM
- References**
 - Tutorial Guide (highlighted)
 - Tutorial Video
 - OSK App Dev Guide
- Tutorial**
 - Start/Resume
 - 1 (dropdown menu)
 - Restart
- Lesson Completion Status**
 - ☐ Lesson 1 - OSK App C Framework Intro
 - ☐ Lesson 2 - App Object Design Intro
 - ☐ Lesson 3 - Log Command and File Mgmt Functions
 - ☐ Lesson 4 - JSON Table Design and Management
 - ☐ Lesson 5 - Playback Cmd and Tlm Generation Functions
 - ☐ Lesson 6 - Using a Child Task for App Object Functions

Right Panel: OSK_C_DEMO OSK_C_LESSON_SCR

- Lesson 1 - OSK App C Framework Intro**
- Objective**

Introduce the OSK App Framework architecture model by starting with a *Hello World* app. Since this is the first lesson the *lesson* and *solution* files are identical.
- References**
 - Lesson Slides
 - OSK App Dev
 - Tutorial Guide
- Update Source Files**
 - View Lesson: app_cfg.h
 - View Solution: app_cfg.h
 - Edit Current: app_cfg.h
- Completed**
 - ☐ app_cfg.h
 - ☐ osk_c_demo_app.h
 - ☒ msglog.h
 - ☒ msglogtbl.h
 - ☐ osk_c_demo_app.c
 - ☒ msglog.c
 - ☒ msglogtbl.c
- Buttons**
 - Save Status
 - Lesson Complete
- Application**
 - Build
 - Run
 - Screen