Basecamp Introduction Tutorial

Objectives

- Introduce Basecamp features so users can quickly be productive
- Provide guidance on what to do next based on your goals

Lesson 1 Objectives

Describe Basecamp's objectives, components, and terminology

Notes

 This tutorial describes what is available. Other tutorials and documents provide details on workflows and how to accomplish goals.

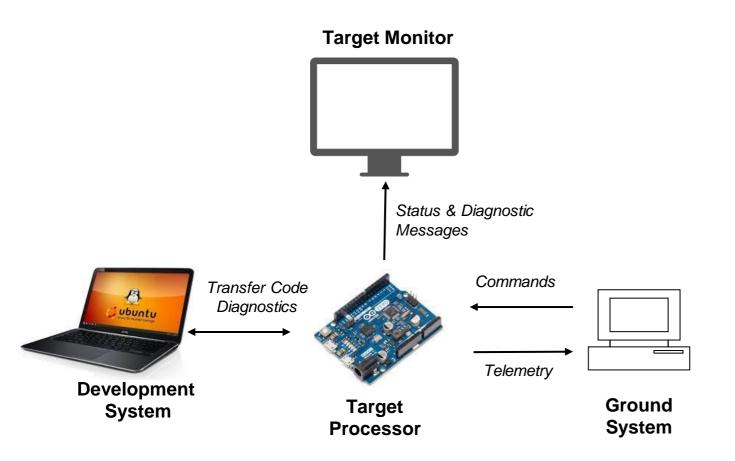
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Why Basecamp?

- Basecamp provides a cFS architectural framework, build/runtime tools, and a lightweight GUI that simplify creating, integrating, testing, and deploying cFS applications
- Provides a foundation for users and educators to create cFS-based projects
- Command and telemetry routing design supports interfacing to external systems
- Supports the following application activities
 - Learn the cFS application architectural model
 - Learn Basecamp's application framework (heritage from OpenSatKit)
 - Develop new applications
 - Download apps from the github cfs-apps repositories
 - Integrate apps into Basecamp's cFS target
 - [future] Learn Basecamp's application packaging specification
 - [future] Certify new apps comply with Basecamp's packaging specification
- Not intended to be a fully functional ground system
- Basic command and telemetry GUI/script interfaces provide app development and runtime support
- [future]cFS build tools can be customized to generate command and telemetry definitions for different ground systems

Slide 2

Embedded Flight Systems Context



Target Processor

A processor that runs the cFS target image

Development System

- Used to build and transfer the cFS target image to the target processor
- Requires a 'cross compiler' if the target process is different than the development system
- May include runtime diagnostic tools

Target Monitor

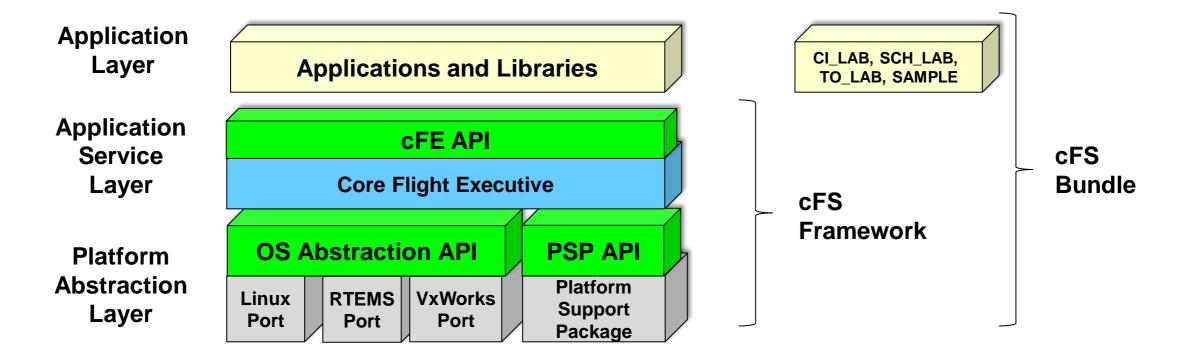
- A common diagnostic tool used to help verify the embedded system is operating correctly
- Often a monitor connected over a serial port

Ground System

- An application that sends command messages to the target and receives telemetry messages from the target
- The command & telemetry communications link may vary between test configurations and operations

Lesson 1

core Flight System Context

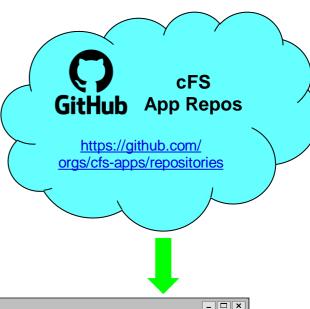


- Platform Abstraction Layer ports to different operating systems (OS) / processor combinations
 - Contains the Operating System Abstraction Layer (OSAL) and the Platform Support Package (PSP)
- Application and libraries that only use the cFS APIs are portable across platforms
- The cFS Framework managed by NASA at https://github.com/nasa/cFE/
- The cFS bundle provides a starter system with a minimal runtime app suite, https://github.com/nasa/cFS

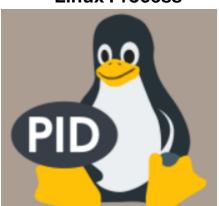
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Basecamp Ecosystem



cFS target runs as a **Linux Process**



Apps

Commands

Telemetry

Status & Diagnostic Messages

cFS Basecamp - v1.8 System Developer Operator Documents Tutorials Mission: basecamp Target: cpu1 Image /home/osk/cfs-basecamp/cfe-eds-framework/build/exe/cpu1/core-cr iles... Quick Cmd: -- Common Commands--Send Cmd: -- Command Topic --View Tlm: -- Telemetry Topic cFS Target Process Window Telecommand: 127.0.0.1:1234 Telemetry: Local Time: 1001033 EVS Port1 66/1/KIT TO 306: Removed 0 table packet entries EVS Port1 66/1/KIT_TO 310: Skip subscribing to tunnel message 0x0862(2146)

1980-012-14:03:20.71667 CFE_ES_Main: CFE_ES_Main entering APPS_INIT state 1980-012-14:03:20.71671 CFE ES Main: CFE ES Main entering OPERATIONAL state EVS Port1 66/1/CFE_TIME 21: Stop FLYWHEEL EVS Port1 66/1/KIT TO 303: Telemetry output enabled for IP 127.0.0.1 EVS Port1 66/1/KIT_SCH 407: Slots skipped: slot = 2, count = 2 EVS Port1 66/1/KIT SCH 406: Multiple slots processed: slot = 1, count = 2

EVS Port1 66/1/KIT TO 301: Successfully loaded new table with 46 packets EVS Port1 66/1/KIT_TO 201: Packet Table load updated 74 entries

EVS Port1 66/1/KIT TO 100: KIT TO Initialized. Version 3.2.0

EVS Port1 66/1/KIT SCH 407: Slots skipped: slot = 2, count = 2 EVS Port1 66/1/KIT SCH 404: Major Frame Sync too noisy (Slot 1). Disabling synchronization.

EVS Port1 66/1/KIT TO 25: Successfully replaced table 0 using file /cf/kit to pkt tbl.json

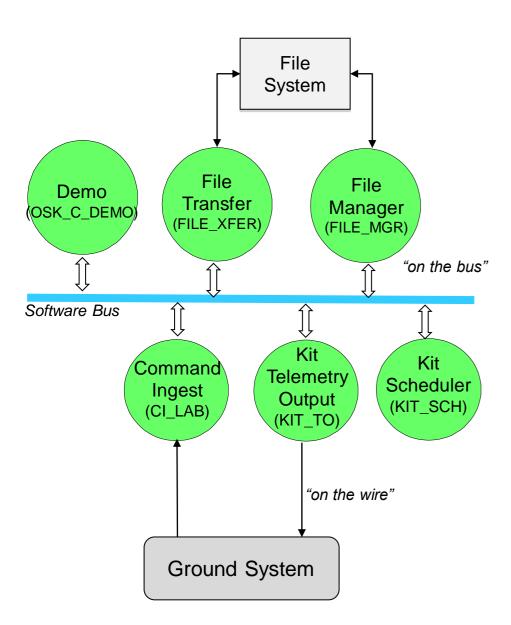
Ground Events Clear

Ground System

16:34:52 - Basecamp version 1.8 initialized with mission 'basecamp', target 'cpu1' on 07/02/2023 at 16:34:52 16:34:52 - Basecamp target host 127.0.0.1, command port 1234, telemetry port 1235 16:35:02 - Sent KIT TO/EnableOutput command 16:35:02 - Sent CFE EVS/AddEventFilterCmd command 16:35:03 - Sent CFE EVS/AddEventFilterCmd command 16:35:03 - FSW Event at 1001001: KIT_TO, 2 - Telemetry output enabled for IP 127.0.0.1 16:35:05 - FSW Event at 1001004: KIT SCH, 3 - Slots skipped: slot = 2, count = 2 16:35:13 - FSW Event at 1001012: KIT_SCH, 2 - Multiple slots processed: slot = 1, count = 2 16:35:14 - FSW Event at 1001013: KIT_SCH 3 - Slots skinned: slot = 2 count = 2

Target Monitor Display

Basecamp cFS Target Apps



Electronic Data Sheets (EDS) specs define command and telemetry messages

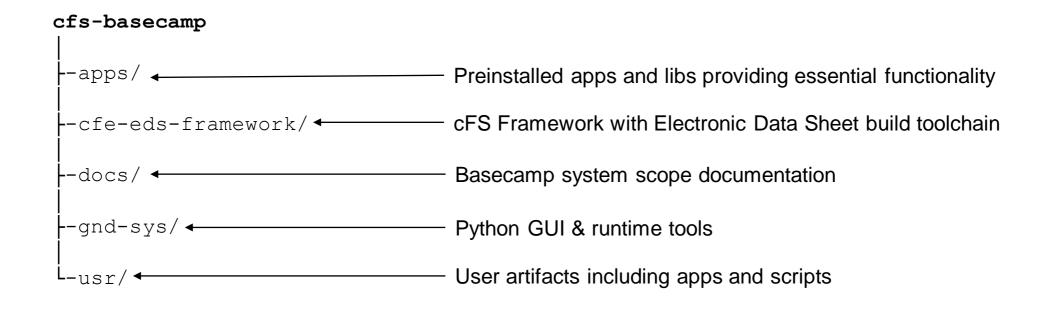
- "on the wire" → are off card interfaces
- "on the bus" ⇒ are native host definitions

Basecamp comes preconfigured with 6 apps

- CI_LAB and KIT_TO manage external-to-internal message bus translations
- KIT_SCH coordinates synchronous application functionality
- FILE_MGR provides onboard directory and file management services
- FILE_XFER manage file transfers between flight and ground
- APP_C_DEMO is used for educational purposes

Lesson 1 Slide 6

Basecamp Directory Structure



Lesson 1