Operating System Abstraction Layer (OSAL)

Flight Software Workshop

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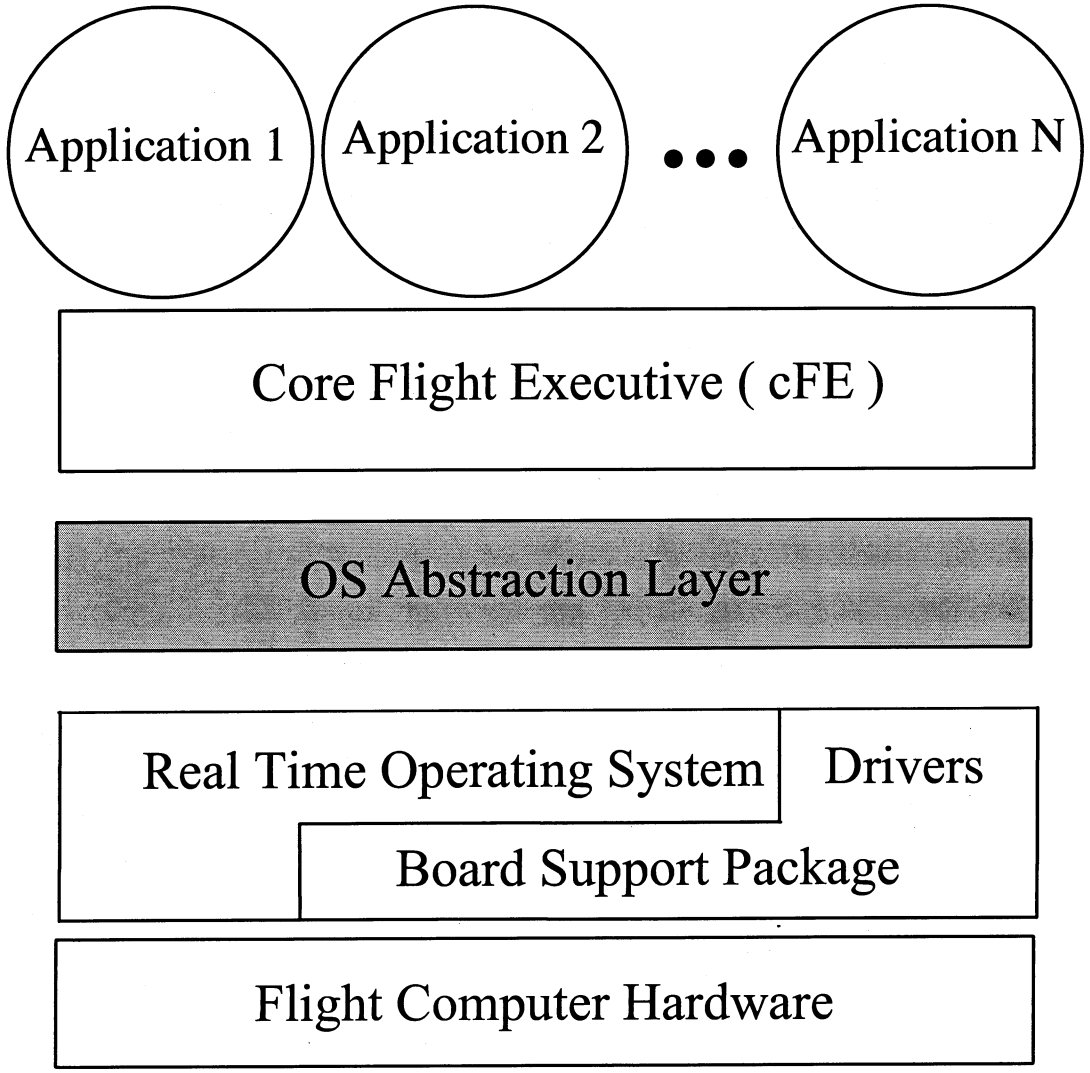
Agenda

- What is the OSAL?
- Where does it fit in our current FSW architecture?
- How does it work?
- Directory structure
- What functionality does the OSAL provide?
- OSAL releases
- Metrics
- Open Source Software
- Future Plans

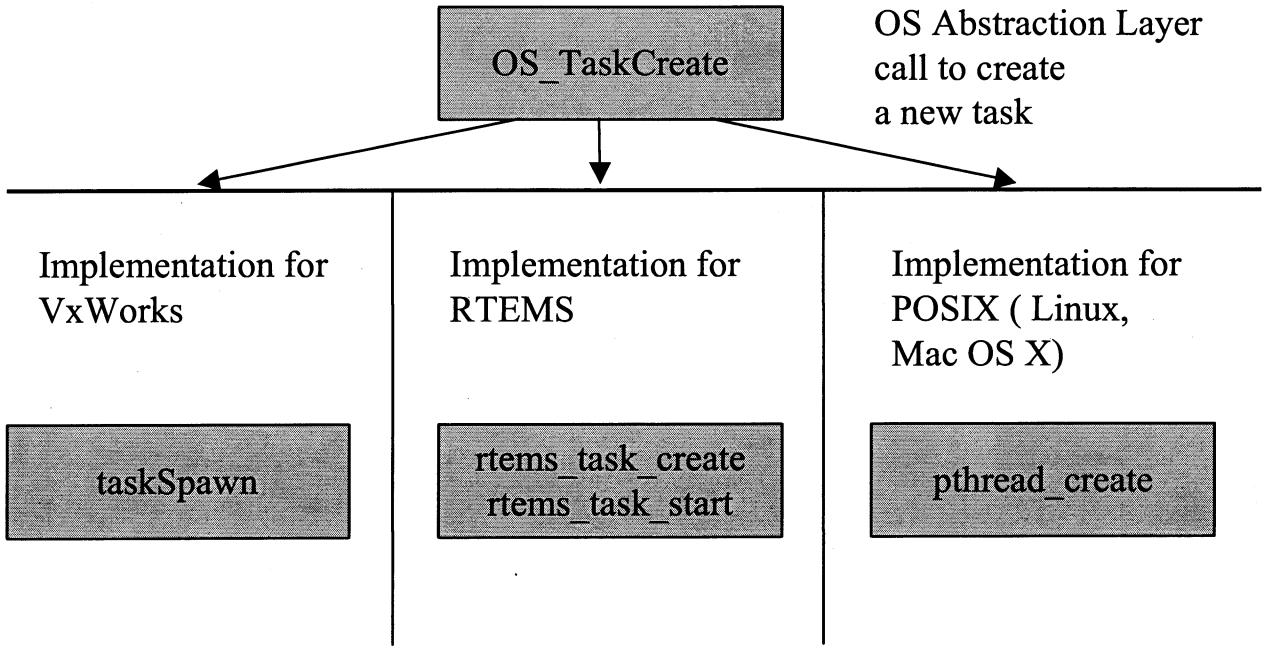
What Is The OSAL And What Are Its Benefits?

- **What is the Operating System Abstraction Layer?**
  - A small layer of software that allows programs to run on many different operating systems and hardware platforms
  - Independent of the underlying OS & hardware
  - Self-contained
- **Why do we want it?**
  - Removes dependencies from any one operating system
  - Promotes portable, reusable flight software
  - Core FSW can be built for multiple processors and operating systems
  - Example: different missions require different hardware & operating system
- **What does it do?**
  - Allows developers to write and maintain one version of code
  - Allows for easy reuse across different missions with different hardware
  - Bonus: Allows for desktop development of flight software; reduces impact of potential hardware delays

Where Does It Fit in Our Current Flight Software Architecture?

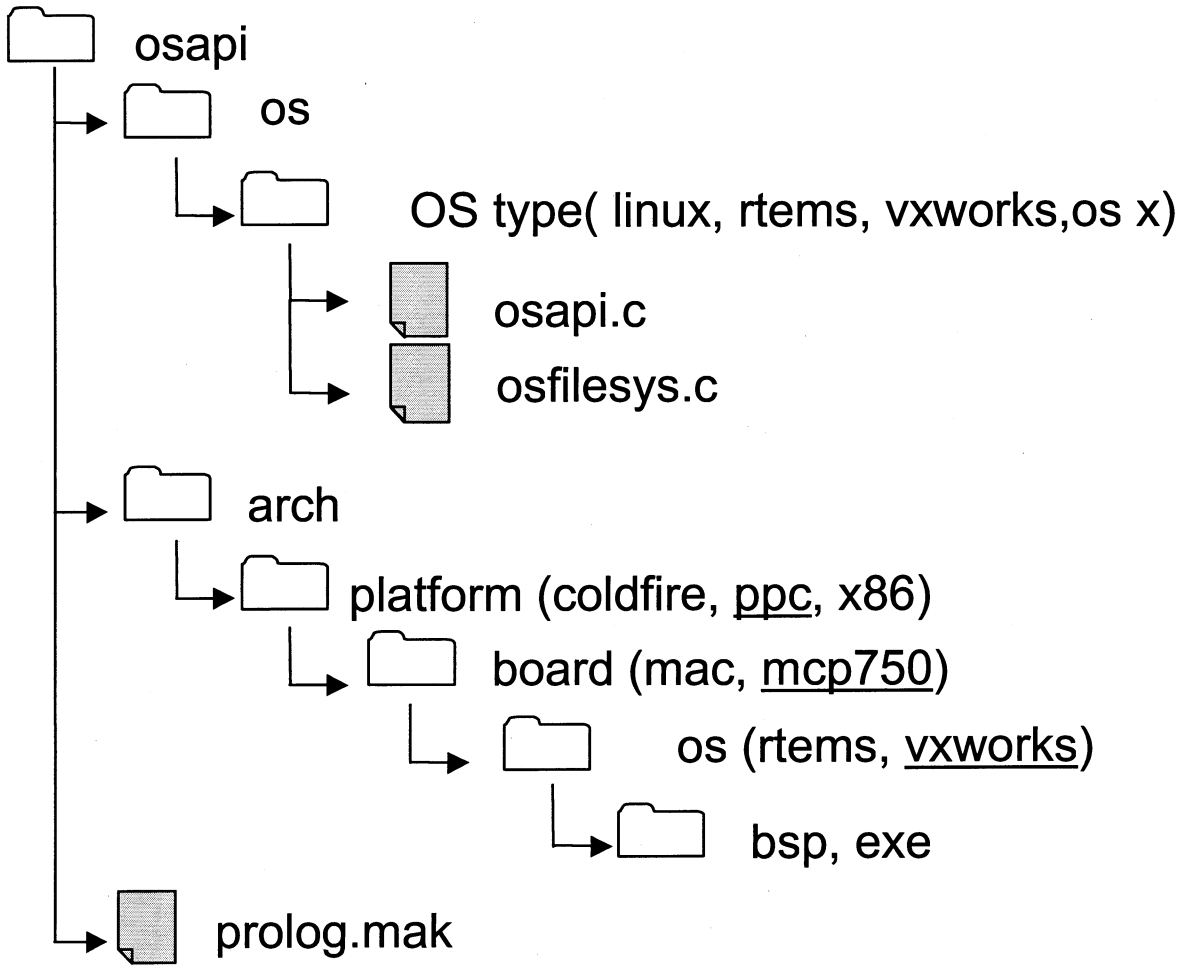


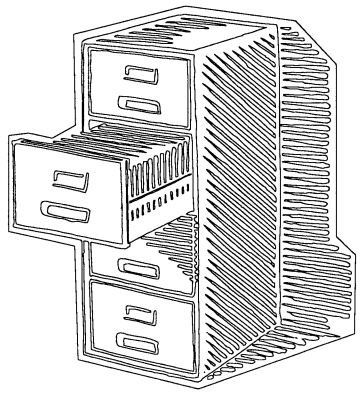
How Does It Work?



- **Implemented by make files**
- **Compiles in only the files needed for a specific OS/architecture**

Directory Structure





Functionality - Standard API's

- **Abstracted ID's and information**
  - **All entities named**
- **Task API**
  - **Create, Delete, Exit, Delay, Set Priority, Get Info, Register, Get ID, Get ID by Name**
- **Queue API**
  - **Create, Delete, Get (w/ timeout), Put, Get ID, Get ID by Name, Get Info,**
- **Semaphore API**
  - **Binary Semaphores**
  - **Counting Semaphores**
  - **Mutexes**
  - **Create, Delete, Take, Give, Get Info, Timed Wait, Get ID by Name**
- **Misc API**
  - **Millisecs to System Ticks, Ticks to MicroSecs, Get Time, Interrupt Disable/Enable and Lock/Unlock, Printing utility**

Functionality (2) - File System API's

- **Abstracted FS**
  - **The file system has the same interface to the user no matter the underlying OS**
- **File System API**
  - **Make FS, Remove FS, Init FS, Mount, Unmount, Get Physical Device Name**
- **File API**
  - **Create, Remove, Open, Close , Read, Write, Lseek, Rename, Copy, Move Files**
  - **Make, Remove, Open, Close, Read Files**
  - **Get Info on File Descriptors**
  - **Send Shell Command to a file**

OSAL Releases

- **Version 1.0 (Released August 2004)**
  - Developed by Alan Cudmore / code 582
  - Currently being used on SDO
  - Open source via a Flight Software Branch Technology Initiative
  - Capabilities: Creation of OS resources, Interrupt and Exception API, Hardware and memory API
- **Version 2.0 (Released July 2005)**
  - Used with the cFE for LRO (and previously HRV)
  - Additional Capabilities: dynamic object creation, deletion of resources, file system layer, networking functions, general API improvements with parameters and error codes
- **Version 2.10 (Release Before 2008)**
  - Currently being used by the cFE, LRO mission, SDO mission, ESA EDROOM, DISILCAS.
  - Additional Capabilities: Counting semaphores
  - Enhancements made to almost all aspects of the OSAL, including file system, task, queue, and semaphore code

Metrics

- **Executable Lines of code: 8168**
- **Average Lines per BSP: 1500**
  - **Number of distinct BSP's: 7**
  - **VxWorks on MCP750 skews results**
- **Number of OS's supported: 4**
  - **VxWorks**
  - **RTEMS**
  - **Linux**
  - **OS X**
- **Number of boards supported: 6**
  - **M5282lite**
  - **m5235bcc**
  - **Mcp750**
  - **Intel Mac**
  - **PPC Mac**
  - **x86 Desktops**

Open Source Software

- **Version 2.0**
  - **Available at http://opensource.gsfc.nasa.gov/projects.php**
- **NASA Open Source License (2004)**
  - **Allows users to redistribute code, but must include source code**
  - **Allows additions to software, but additions must be the work of the author**
  - **Requests users to register software**
  - **Requests users to inform us of modifications**

Future Plans

- **Continue development of threaded model**
- **Support Current Customers**
- **Develop Version 3.0**
  - **Conversion from Thread Model to Process Model**
  - **Shared Memory API**