Service 1: Image Capture (Frame Capture)

- **Function:** Captures images from the camera at a specified frame rate.
- **Data Flow:** Captured frames are stored in a circular buffer.
- **Buffering:** Uses a circular buffer to store captured frames temporarily before processing.
- **WCET:** 1ms
- **T (Period):** 5ms
- **D (Deadline):** 5ms
- **Core Assignment:** Core 0 (dedicated core to ensure real-time performance)
- **Priority:** 1 (highest priority in RMA)
- **Implementation:** The process_image function handles image processing and saving frames, while the mainloop function captures frames at the defined period.

Service 2: Image Processing (YUV to RGB Conversion)

- **Function:** Converts the YUV formatted image to RGB format for further processing.
- **Data Flow:** Processes the YUV data from the circular buffer and outputs RGB data.
- **Buffering:** Utilizes an intermediate buffer bigbuffer for storing converted RGB frames.
- **WCET:** 2ms
- **T (Period):** 10ms
- **D (Deadline):** 10ms
- **Core Assignment:** Core 0 (shared with Image Capture to optimize processing)
- **Priority:** 1 (high priority in RMA)
- **Implementation:** The yuv2rgb function is used within process_image to handle the conversion and storage of frames.

Service 3: Data Transmission (Frame Dump to File)

- **Function:** Saves the processed frames to the filesystem as either PPM or PGM files.
- **Data Flow:** Writes processed data from bigbuffer to the storage medium.
- **WCET:** 7ms
- **T (Period):** 29ms

- **D (Deadline):** 29ms
- **Core Assignment:** Core 0 (shared with Image Capture and Image Processing)
- **Priority:** 1 (high priority in RMA)
- **Implementation:** The dump_ppm and dump_pgm functions handle the storage of frames, which are invoked by process_image.

Service 4: Log and System Monitoring (Syslog Handling)

- **Function:** Logs system events, including frame capture and processing times, to the syslog for debugging and monitoring purposes.
- **Data Flow:** Logs are sent to syslog and optionally saved in a file for post-run analysis.
- **Buffering:** No specific buffering; logs are sent immediately.
- **WCET:** 2ms
- **T (Period):** 10ms
- **D (Deadline):** 10ms
- **Core Assignment:** Core 1 (dedicated core for logging, ensuring it doesn't interfere with critical tasks)
- **Priority:** 1 (shared priority in RMA with other tasks on Core 1)
- **Implementation:** The syslog function is called throughout the code to log events. Log output redirection to a file is managed in the main function.