



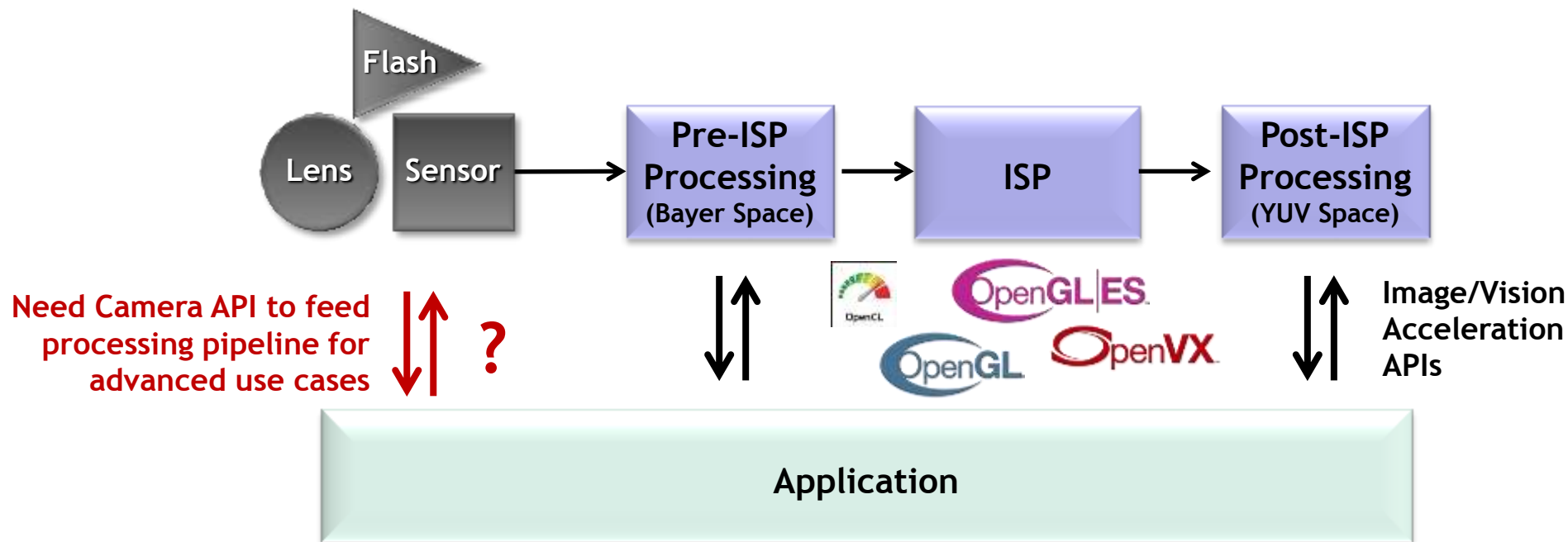
# Camera Control API Provisional Working Group

May 2013

# Advanced Camera Control Use Cases

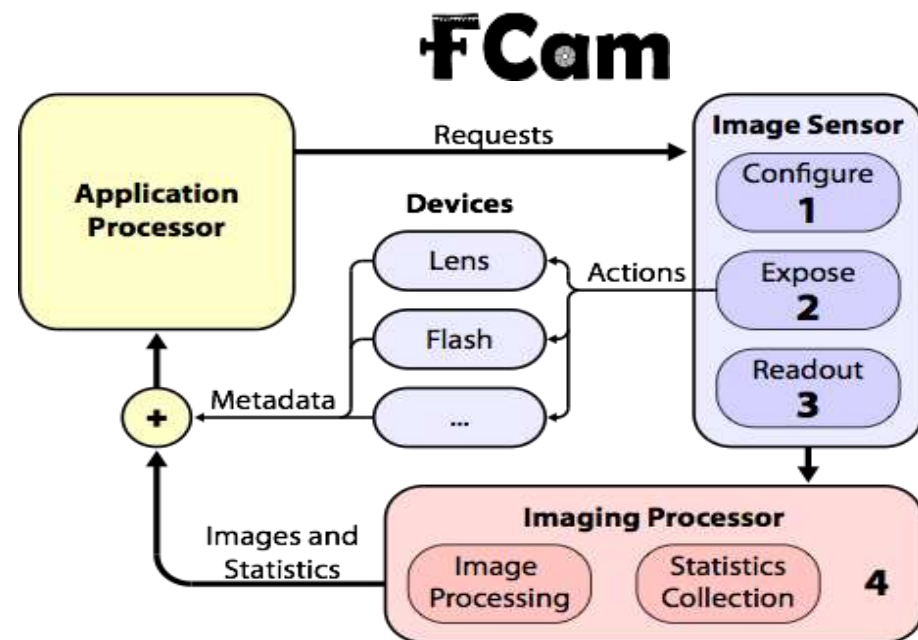
- **High-dynamic range (HDR) and computational flash photography**
  - High-speed burst with individual frame control over exposure and flash
- **Rolling shutter elimination**
  - High-precision intra-frame synchronization between camera and motion sensor
- **HDR Panorama, photo-spheres**
  - Continuous frame capture with constant exposure and white balance
- **Subject isolation and depth detection**
  - High-speed burst with individual frame control over focus
- **Time-of-flight or structured light depth camera processing**
  - Aligned stacking of data from multiple sensors
- **Augmented Reality**
  - 60Hz, low-latency capture with motion sensor synchronization
  - Multiple Region of Interest (ROI) capture
  - Multiple sensors for scene scaling
  - Detailed feedback on camera operation per frame

# Camera Control API Complements Acceleration



# Precursor APIs for Camera Control Initiative

- FCAM - Open source project
  - Capture of stream of camera images with precision control
    - A pipeline that converts requests into image stream
    - All parameters packed into the requests - no global state
    - Programmer has full control over sensor settings for each frame in stream
  - Control over focus and flash
    - No hidden daemon running
  - Control ISP
    - Can access supplemental statistics from ISP if available
- Android New Camera HAL (2013)
  - Uses some of these concepts



# Potential Camera Control API Functionality

- **Burst Sensor Control**
  - Exposure, time, gain, CFA pattern ...
- **Burst Lens control**
  - Target focus distance, aperture, focal length, position state ...
- **Burst Flash Control**
  - Brightness, duration, burst, activity state ...
- **ISP Control**
  - Demosaic-ing quality, denoising quality, 3A, CCM, Gamma, color space ...
- **Output(s) Control**
  - Resolution, ROI extraction, quality, format (including Bayer, YUV) ...
- **Frame timestamp**
  - To be used to synch with motion sensors
- **Parameter access**
  - Standard-defined parameters **AND** Vendor-specific extensions registry
- **Feedback Statistics**
  - Histogram, sharpness map ...
- **Multi-sensor control**
  - Synchronization, master sensor controlling other sensors, image stacking
- **Metadata**
  - Per frame: Focal length (fx, fy), principal point (cx, cy), skew (s), image resolution (h, w), exposure
  - Per device: Cameras and sensors physical layout, calibration and lens distortion

# Camera Control API Usage

