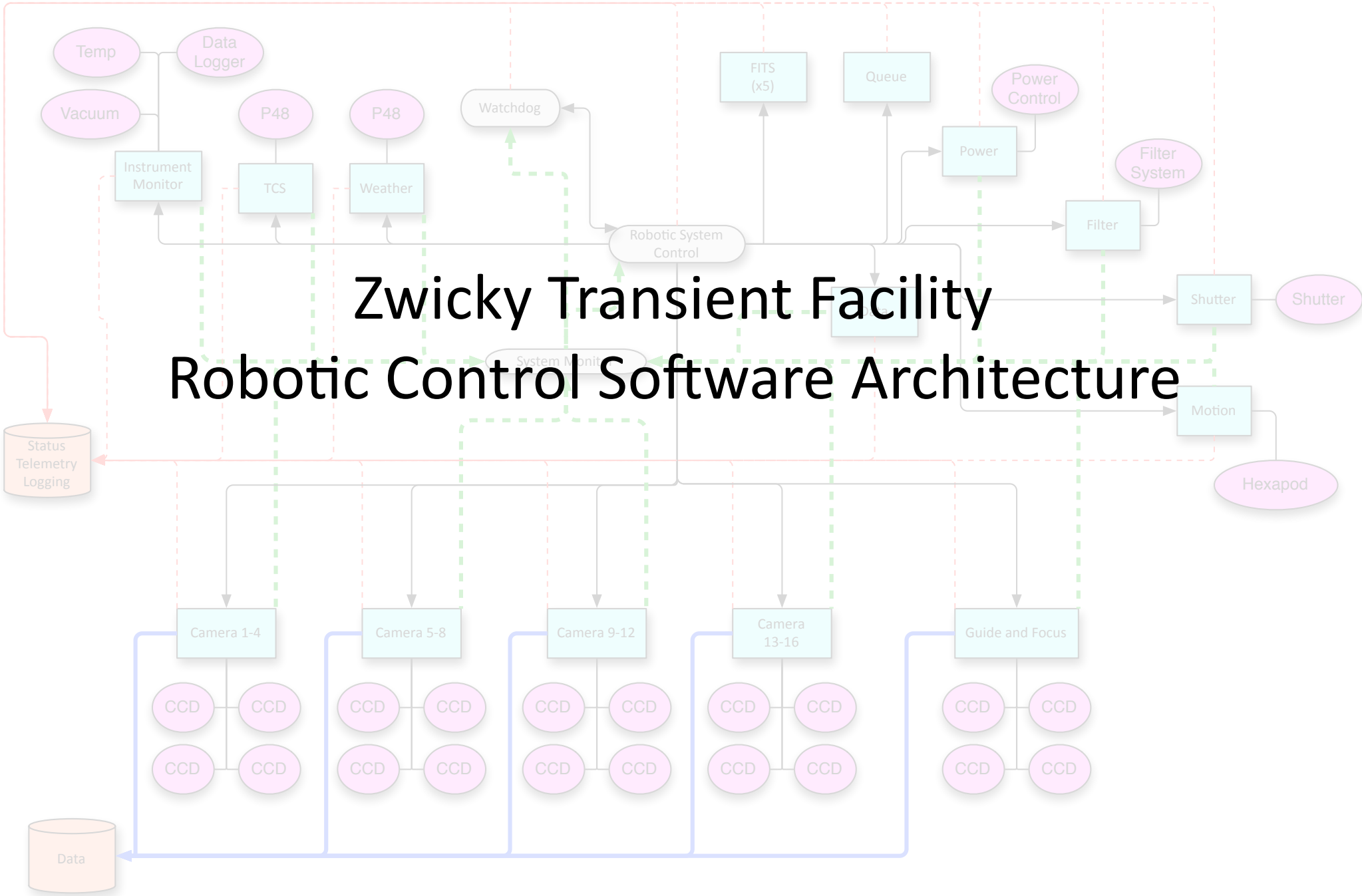
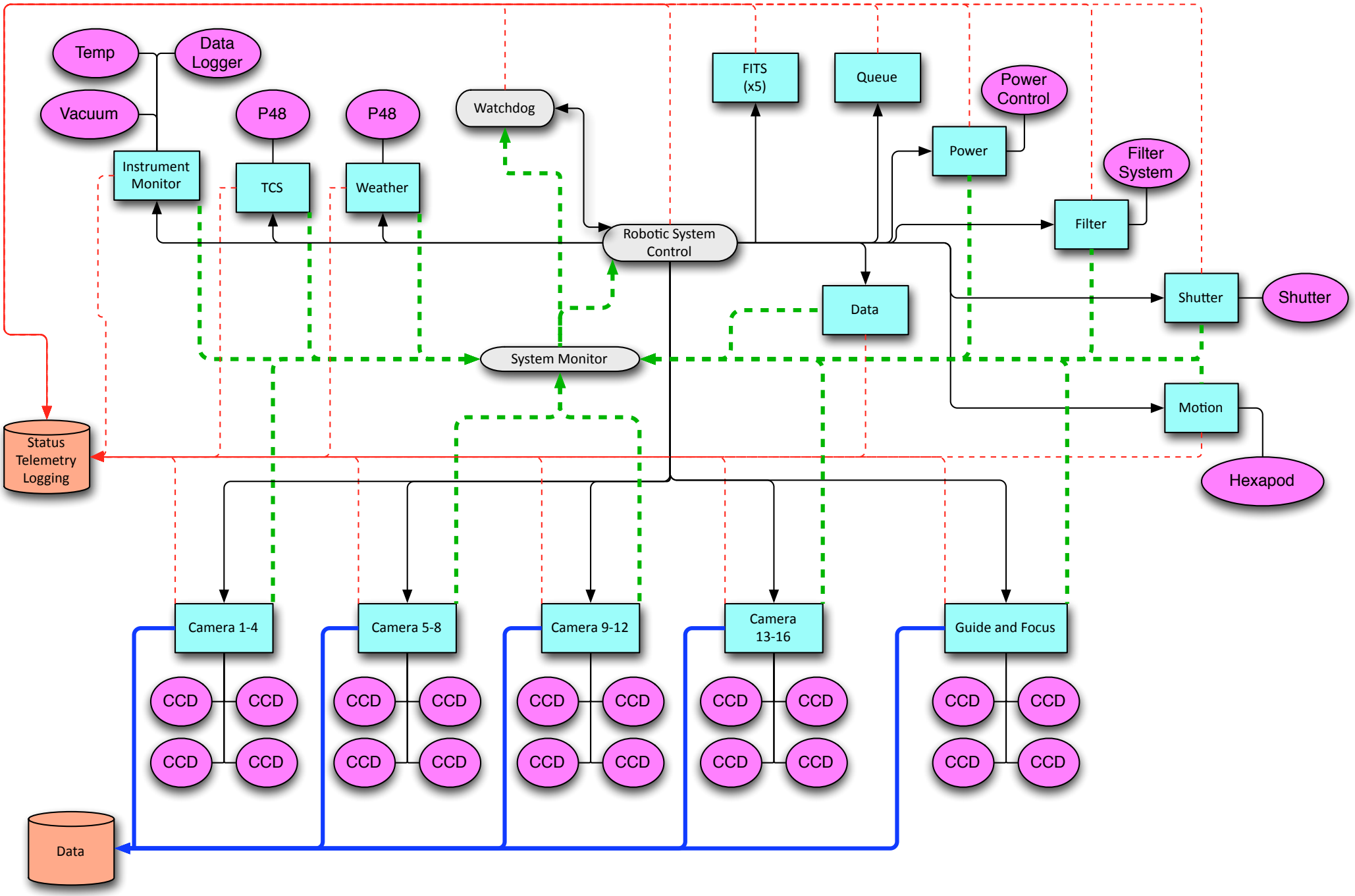
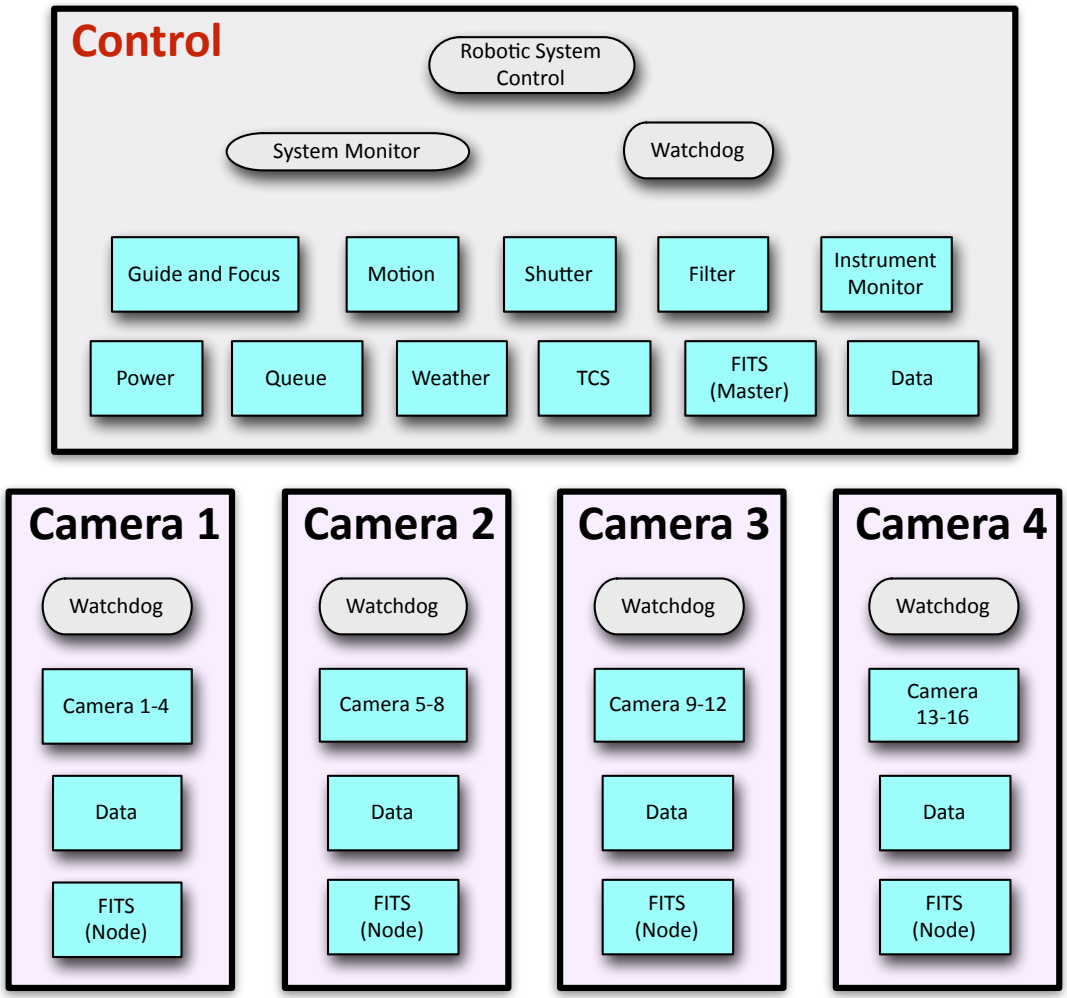
Zwicky Transient Facility
Robotic Control Software Architecture




Temp
Data Logger
Vacuum
Instrument Monitor
P48
TCS
P48
Weather
Watchdog
FITS (x5)
Queue
Power Control
Power
Filter System
Filter
Robotic System Control
Data
Shutter
Shutter
System Monitor
Motion
Hexapod
Status Telemetry Logging
Camera 1-4
Camera 5-8
Camera 9-12
Camera 13-16
Guide and Focus
CCD
Data

Computer System Architecture

- Control computer contains most functions
  - Interfaces to hardware
  - Robotic control system
- Camera computers have one Archon controller each
- New data manager
  - All systems
  - Controls upload of IPAC data



Observing Loop Functions

- Prepare observation
  - Get queue target information — 100ms
  - Filter exchange — 60-90s
  - Point telescope — ?
  - Setup mosaic for image — 1.9s
- Take a science image
  - Arm Archon controllers — 30ms
  - Take science image — Exposure time + 50ms
- Write FITS data
  - Synchronize FITS headers — 300ms
  - Arm Archons to readout — 55ms
  - Readout image data — 11-21s
  - Write FITS files — 9.5s

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Total Overhead: ~35s

Requirement: 15s

Observing Loop Operation

- Basics working, still have some things to sort out
  - Simulated telescope, CCD readout, FITS writing
  - Lots of details to check through
- Current observing loop overhead time: **~13s**
- Overlapping camera operations required, tricky
  - Archon can only take one command at a time
    - Should be able to handle parallel commands
    - Memory transfer while taking a new image
    - Observation preparation, CCD readout overlap
  - Camera software requires modification to support overlapping data readout & FITS writing
- FITS synchronization has to capture the right data
- Detect shutter closure, wait before readout?

Data Synchronization

- Data synchronization daemon
  - Manages transfer of data to external site
  - Robotic system only transfers relevant data to IPAC
    - Guide/focus data transferred in the morning
- Once image files are created:
  - Robotic system tells data system what files to look for
  - Data system adds new files to **synchronize** list
  - Attempts to transfer 3 times
    - If successful, add to **completed** list
    - If transfer fails, add to **failed** list
  - When synchronize list is empty, retry failed list images
- Works in parallel to observing system
- Software almost ready for testing