

# Figures

FIG. 1 - Camera Module Integration into TraceLoop Closed-Loop Control

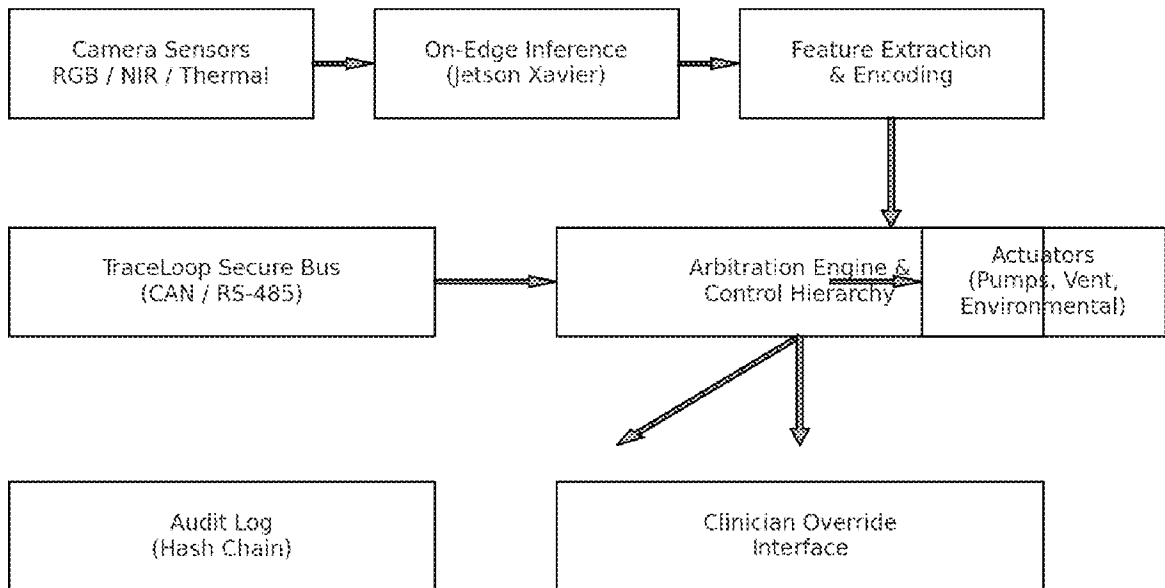


FIG. 2 – Mapping of Vision-Derived Inputs into TraceLoop Control Layers

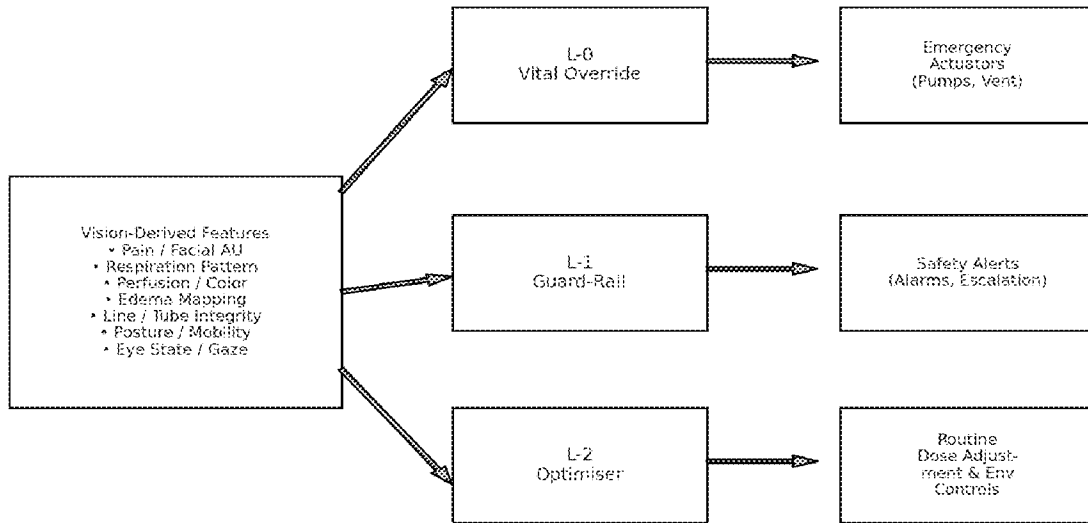


FIG. 3 - Representative Camera-Triggered Actuation Pathways

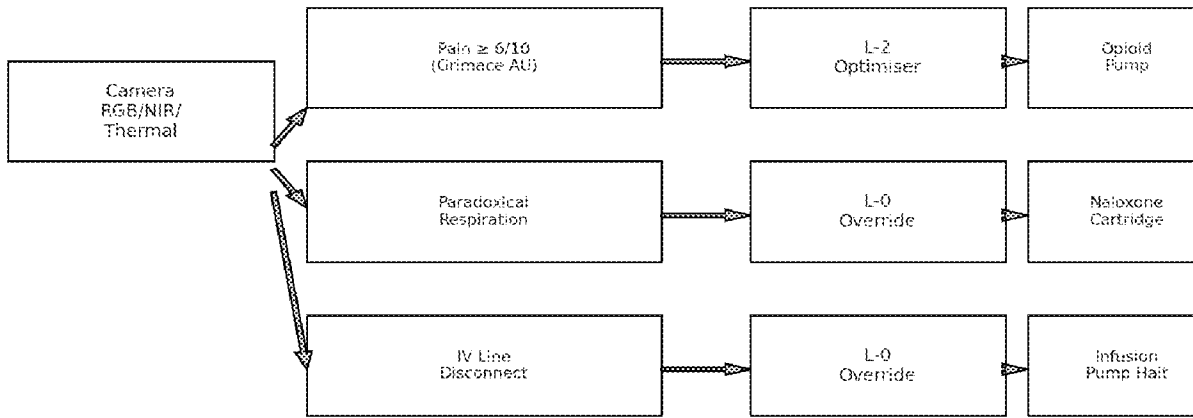


FIG. 4 - Minimal Viable vs Future Optimized Camera Configurations

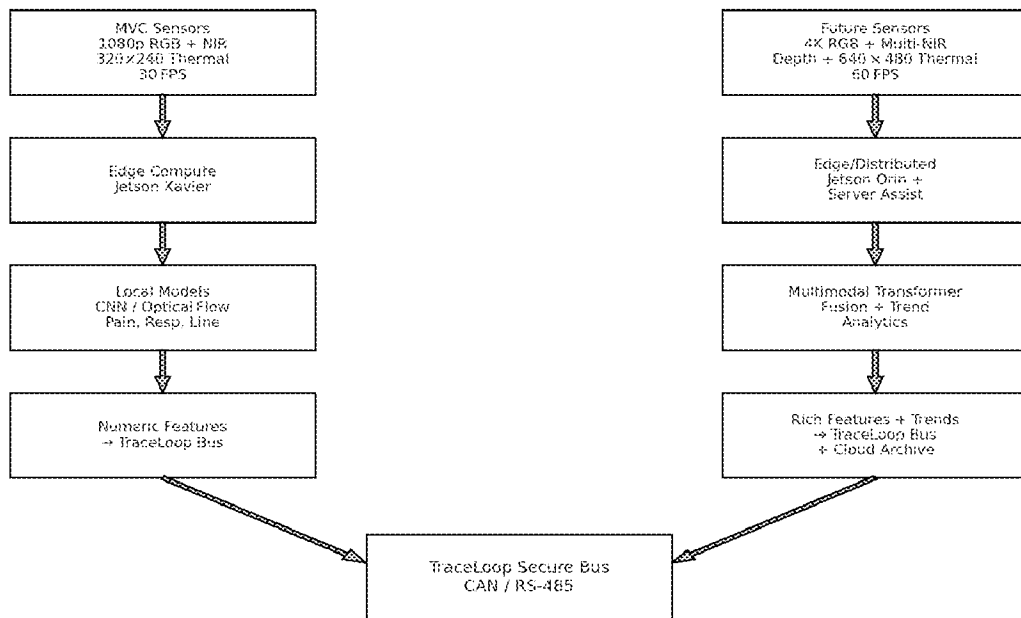
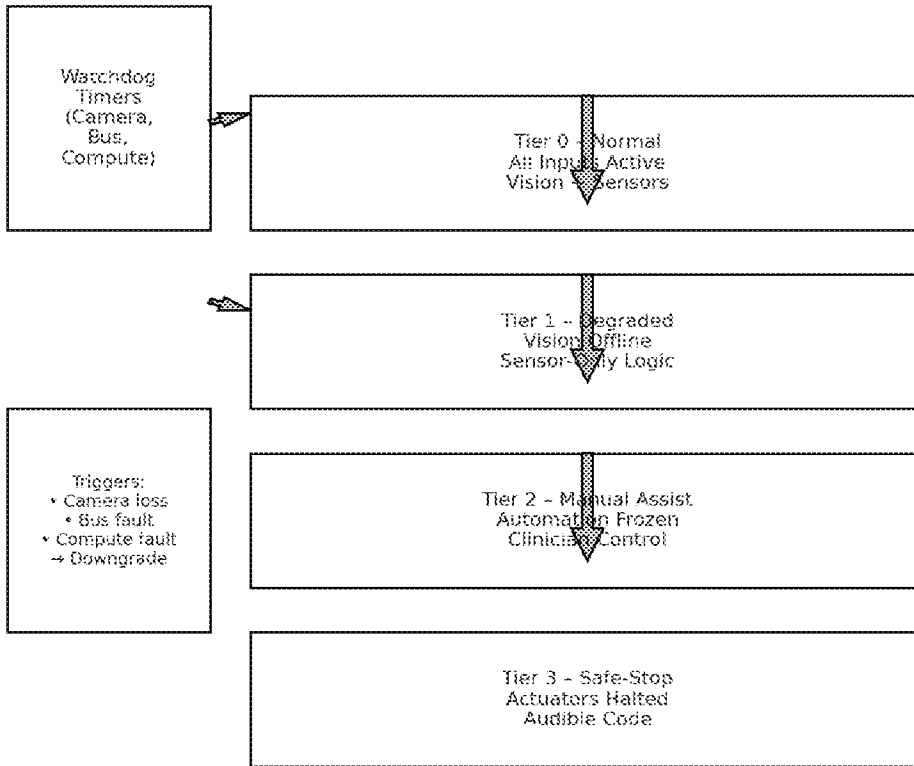


FIG. 5 - Hierarchical Failsafe / Watchdog Escalation for Vision Module



Control Pump

Winch Pump

Clutch

Winch Pump

Control Valve

Winch

FIG. 6 - Sensor-Actuator Command Matrix (Vision Row Added)

Vision (Camera)	X	X	X	X	X	X	
Winch Slides	X	X	X				
Carriage Sensors	X	X	X	X			
Lab Values			X	X			
Operator Input						X	

FIG. 7 – Conflict-Group Priority Ladder Integrating Vision Inputs

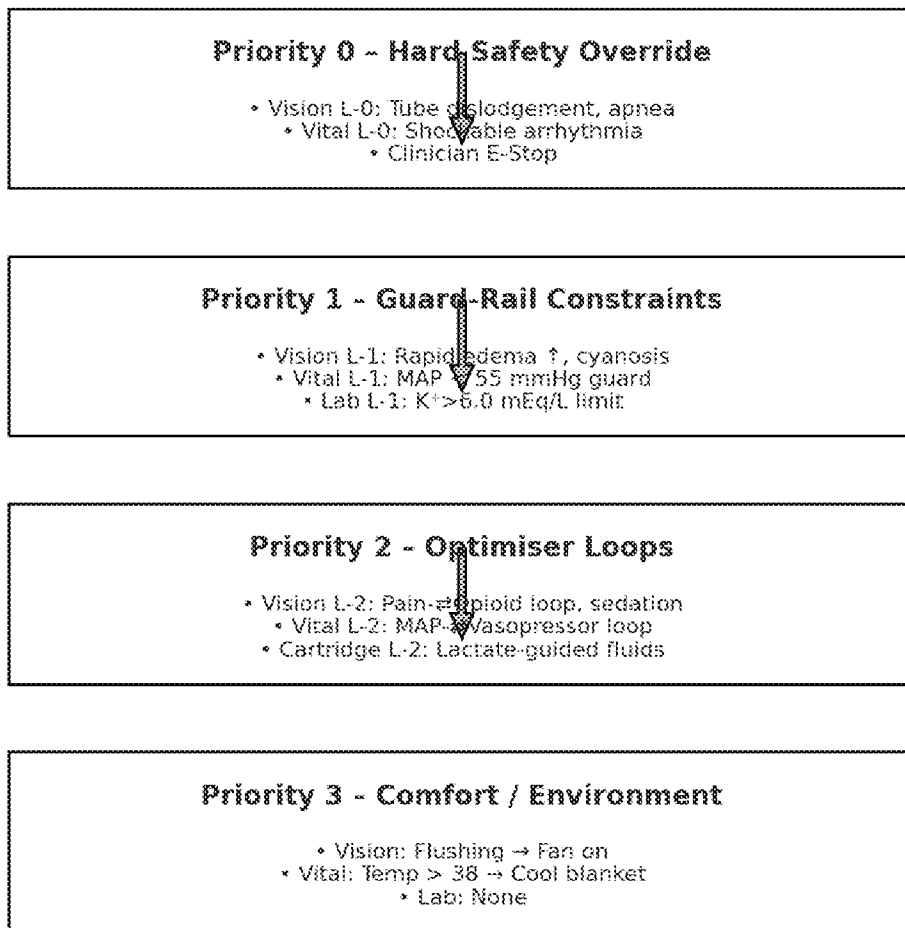


FIG. 8 - Watchdog Architecture Linking Vision Subsystem to Failsafe States

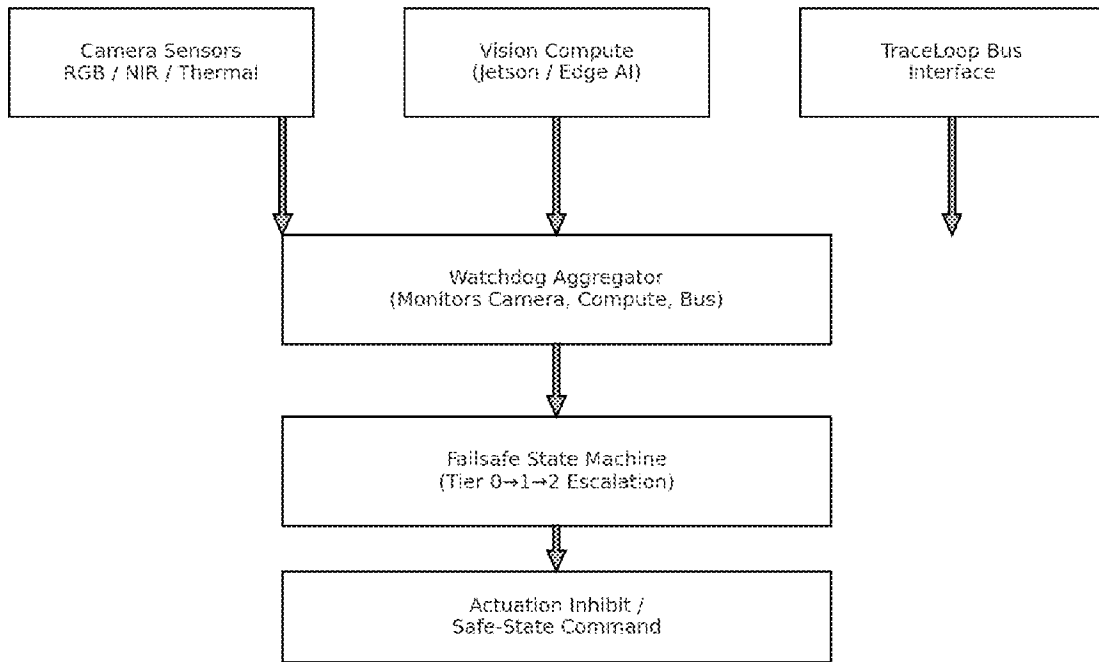


FIG. 9 - Data Provenance & Audit Chain Integrating Vision Events

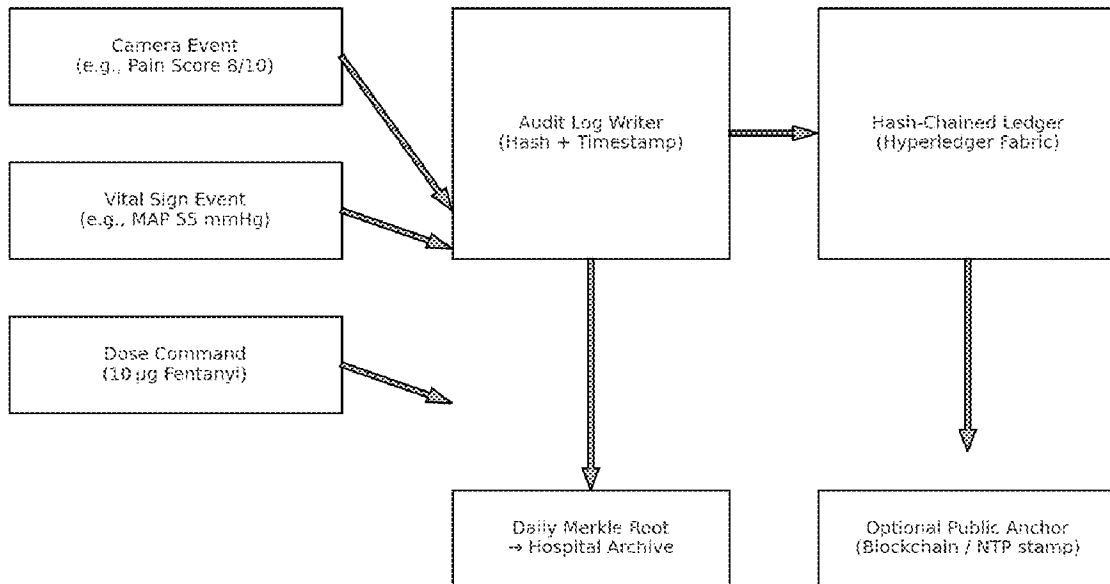


FIG. 10 - Clinician Override & ML Release Gate with Alert Escalation

