SENTINEL AUTHORITY

ODDC Scenarios

Cross-Industry Application of ODDC Certification

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Document Purpose

This document illustrates how ODDC certification applies across safety-critical domains. Each scenario describes the autonomous system, the operational boundaries that would be defined, the enforcement behavior, and the value to stakeholders.

1. Autonomous Vehicles

System: Level 4 autonomous driving system operating in defined geographic and environmental conditions.

Example Boundary Parameters:

- Geographic geofence (approved operational area)
- Speed limits per road classification and weather
- Minimum sensor visibility thresholds
- Weather condition limitations (rain intensity, snow coverage, fog density)
- Traffic density maximums

Enforcement Behavior: If the vehicle approaches the geofence boundary, self-correction adjusts routing. If a sensor drops below visibility threshold, MRC safely pulls over. If multiple boundaries fail simultaneously, hard halt brings the vehicle to a safe stop.

Stakeholder Value: Insurers get quantitative evidence for underwriting. Regulators get independent verification of ODD compliance. Operators get defensible proof that the system stayed within bounds when incidents are investigated.

2. Healthcare AI — Diagnostic Assistance

System: AI-assisted diagnostic system providing clinical decision support in a hospital environment.

Example Boundary Parameters:

- Approved diagnostic categories (cannot expand scope without re-certification)
- Confidence threshold minimums (must flag low-confidence results)
- Data input quality requirements (image resolution, completeness)
- Response latency maximums
- Patient population parameters (age ranges, conditions)

Enforcement Behavior: If the system receives input outside its trained population parameters, self-correction flags the case for human review. If confidence drops below threshold, MRC suppresses the AI recommendation and routes to a clinician. If the system attempts to operate outside approved diagnostic categories, hard halt disables the recommendation engine.

Stakeholder Value: Hospital systems get evidence of AI governance for accreditation. Malpractice insurers get conformance data for risk assessment. FDA has a reference framework for AI medical device oversight.

3. Industrial Robotics

System: Collaborative robot (cobot) operating in a mixed human-robot manufacturing environment.

Example Boundary Parameters:

- Force and torque limits for human-proximity zones
- Speed limits by zone classification
- Workspace geofence boundaries
- Payload limits per operation type
- Emergency stop response latency

Enforcement Behavior: If the cobot approaches force limits in a human-proximity zone, self-correction reduces speed and force. If force exceeds the limit, MRC retracts to safe position. If the cobot detects a human in the restricted zone and cannot safely reduce force, hard halt stops all motion.

Stakeholder Value: OSHA has quantitative enforcement evidence for workplace safety compliance. Manufacturers get defensible proof of safety system performance. Workers' compensation insurers get behavioral data for risk-differentiated premiums.

4. Data Center AI — Autonomous Cooling

System: AI-controlled cooling optimization system managing HVAC and liquid cooling in a hyperscale data center.

Example Boundary Parameters:

- Temperature range limits per server zone
- Humidity bounds (prevents condensation and electrostatic discharge)
- Power consumption ceilings
- Rate-of-change limits for temperature adjustments
- Minimum redundancy requirements for cooling circuits

Enforcement Behavior: If temperature approaches the upper limit in any zone, self-correction increases cooling to that zone. If the AI's adjustments push humidity outside bounds, MRC reverts to manual cooling profiles. If multiple zones exceed limits simultaneously, hard halt switches to emergency cooling.

Stakeholder Value: Data center operators get provable SLA compliance for temperature management. Equipment manufacturers get evidence for warranty coverage. Insurance providers get conformance data for business interruption risk models.

5. Energy Grid Management

System: AI-controlled grid balancing system managing distributed energy resources (solar, wind, battery storage).

Example Boundary Parameters:

- Frequency stability margins (grid frequency within defined Hz range)
- Voltage regulation limits per node
- Power flow limits per transmission line
- Ramp rate limits for renewable dispatch
- Reserve margin minimums

Enforcement Behavior: If grid frequency approaches the stability margin, self-correction adjusts dispatch priorities. If voltage exceeds limits at any node, MRC disconnects the affected distributed resource. If the grid approaches cascading failure conditions, hard halt isolates the AI-managed segment and transfers control to human operators.

Stakeholder Value: FERC and NERC have verifiable conformance evidence for AI grid management oversight. Utilities get defensible proof of AI system compliance. Ratepayers benefit from transparent oversight of AI systems managing critical infrastructure.

6. Construction Automation

System: Autonomous heavy equipment (excavator, crane, grader) operating on an active construction site.

Example Boundary Parameters:

- Geographic workzone geofence
- Proximity limits for personnel and other equipment
- Load limits per lift operation
- Ground stability parameters
- Operating speed limits by zone

Enforcement Behavior: If the equipment approaches the workzone geofence, self-correction adjusts path. If a person enters the proximity zone, MRC halts motion and sounds alert. If load exceeds structural limits, hard halt stops the operation and locks the equipment.

Stakeholder Value: OSHA has enforcement evidence for autonomous equipment oversight. General contractors get defensible proof of equipment safety compliance. Liability insurers get quantitative risk data for construction automation policies.