Ascent Systems Technologies

THE TRUE AUTONOMY MANIFESTO

A First-Principles Framework for Autonomous Infrastructure

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1. Purpose

Every engineered system exists to fulfill an intended purpose.

The purpose may be to observe, communicate, transport, manufacture, monitor, protect, explore, or perform countless other functions. Regardless of its application, the value of a system is ultimately determined by its ability to continue fulfilling that purpose.

Purpose precedes architecture.

Architecture precedes implementation.

Every engineering decision should therefore contribute to fulfilling the intended purpose.

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2. Capability

A system fulfills its purpose through one or more capabilities.

Capabilities represent what the system provides, not how it is implemented. They are independent of technology and remain valid even as individual components evolve.

Users do not require batteries, processors, sensors, radios, or artificial intelligence. They require the capabilities these technologies enable.

Engineering should therefore focus first on defining and preserving capabilities rather than selecting technologies.

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3. Persistence

Capabilities have value only while they remain available.

A capability that exists for minutes may be appropriate for one application, while another may require days, months, or years of uninterrupted operation. The required duration depends on the intended purpose, but persistence itself is never optional.

A system that cannot sustain its capabilities cannot continue fulfilling its purpose.

Persistence is therefore a fundamental characteristic of autonomy.

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4. Dependence

No system exists in isolation. Every system operates as an element of a larger system and is itself composed of smaller systems. Its behaviour, capabilities, and long-term viability depend on interactions within this hierarchy.

Every capability depends on resources such as energy, communications, information, computation, environmental protection, maintenance, and logistics.

The frequency with which these resources must be supplied externally determines the degree to which a system depends on its environment.

Reducing these dependencies increases operational independence.

Eliminating unnecessary dependencies is therefore a fundamental objective of engineering for autonomy.

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5. True Autonomy

Autonomy has traditionally been associated with “independent” behaviour. Navigation, perception, planning, decision-making, and task execution without direct human control have become defining characteristics of modern autonomous systems.

These capabilities are essential. They are not sufficient.

A truly autonomous system is able to sustain the capabilities required to fulfill its intended purpose over extended periods without continuous external support.

True autonomy therefore extends beyond behaviour. It requires the ability to sustain operation, adapt to changing conditions, survive disruptions, manage essential resources, and preserve the capabilities upon which the system's purpose depends.

Behavioural autonomy enables independent action. Operational independence enables sustained purpose.

Together, they define **True Autonomy**.

6. Autonomous Infrastructure

Every autonomous system depends on capabilities that enable its operation.

Traditionally, these capabilities are provided by external infrastructure. Energy, communications, computation, protection, logistics, and maintenance are assumed to exist independently of the autonomous system itself.

This assumption has shaped autonomous systems for decades.

As intelligent systems move into remote, austere, hazardous, and contested environments, it becomes increasingly unrealistic.

Infrastructure must therefore evolve from passive support into an active participant in autonomous operation.

We call this **Autonomous Infrastructure**.

Autonomous Infrastructure provides the persistent capabilities upon which intelligent systems depend while sustaining its own operation independently over extended periods. It enables autonomous systems to continue fulfilling their intended purpose where conventional infrastructure is unavailable, impractical, or compromised.

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7. A New System Architecture Paradigm

True Autonomy represents a shift in system architecture perspective.

Instead of asking: *"How can a system perform tasks autonomously?"* we should ask: *"How can a system continue fulfilling its intended purpose independently?"*

This change transforms the architectural problem.

The objective is no longer simply to automate behaviour.

The objective is to eliminate external dependencies while preserving capability.

Autonomous Infrastructure is the architectural consequence of this way of thinking.

8. From Principles to Practice

These principles have guided the development of a new class of autonomous systems.

Rather than treating energy, communications, sensing, computation, resilience, and mission support as separate subsystems dependent on external infrastructure, they are integrated into a single self-sustaining autonomous platform.

This philosophy underpins the Autonomous Expeditionary Mission System (AEMS), which embodies the principles of Autonomous Infrastructure. Designed for operation in remote, austere, and contested environments, AEMS provides persistent situational awareness, resilient communications, autonomous energy management, on-site intelligence, and mission-specific capabilities while operating with minimal external support.

AEMS is not the only implementation of Autonomous Infrastructure.

It is the first realization of a broader architectural vision.
