



Predator DNC™ – White Paper

Technical White Paper

A Blueprint for the Digital Shop Floor: Unleashing Productivity with Predator DNC Software

Executive Summary

In today's competitive manufacturing landscape, the path to improved productivity, quality, and compliance is paved with intelligent automation. Predator DNC (Distributed Numerical Control) software serves as the central nervous system of a modern shop floor, providing a secure, reliable, and scalable communication platform for all manufacturing equipment. By seamlessly connecting CNC machines, robots, CMMs, PLCs, and other devices, Predator DNC eliminates the inefficiencies of manual data transfer and forms the foundation for a truly integrated, data-driven factory. This white paper details how Predator DNC, in conjunction with other Predator applications, addresses critical business needs from the machine level up to the enterprise level, ensuring readiness for Industry 4.0, cybersecurity mandates like CMMC and ITAR, and quality regulations like CFR 21 Part 11.

The Communication Hub: Connecting 50+ Industrial Protocols

Predator DNC is a universal communication solution designed to network a diverse range of manufacturing equipment. It goes beyond simple file transfer by supporting over 50 unique industrial communication protocols, including:

CNC Machines:

Robust support for a wide array of legacy and modern CNC controllers from leading manufacturers like Fanuc, Haas, Mazak, Okuma, and Fagor, enabling drip-feeding of large programs, uploading, downloading and in-process probing.

Robots & Automation:

Integrate robotic cells to send and receive programs and data, streamlining the automation of robot program transfer, backup and data.

CMMs & Quality Equipment:

Facilitate the transfer of inspection programs to Coordinate Measuring Machines (CMMs) and retrieve quality data and inspection results.

PLCs & Control Systems:

Communicate with Programmable Logic Controllers (PLCs) to transfer recipes and machine settings, ensuring consistent and repeatable processes.

Auxiliary Devices:

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The system also connects to a variety of other equipment, including part markers (laser, dot peen), tool presetters, and test stands, unifying a disparate ecosystem under a single network.

This extensive protocol support ensures that manufacturers can integrate new and legacy equipment seamlessly, protecting their existing investments while expanding their capabilities. The system can network up to 4,096 machines per PC, with the ability to scale to an unlimited number of devices by networking multiple PCs.

Automating the Shop Floor: Bar Code, QR Code, and RFID

Predator DNC's Remote Request™ functionality automates program retrieval, making the process faster and error-free. This capability is enabled through seamless integration with common identification technologies.

How It Works:

An operator uses a handheld scanner to read a bar code, QR code, or an RFID tag on a job traveler, part, or fixture. Predator DNC automatically identifies the corresponding CNC program and sends the correct revision to the machine.

Benefits:

For CNC Programmers: Ensures that the latest, approved program is always used on the shop floor, preventing the use of outdated files.

For Operators: Eliminates the need to manually search for files at the machine control, saving time and reducing the risk of human error.

For Manufacturing Engineers: Creates a traceable, auditable record of which program was run on which machine, at what time, which is critical for quality control.

Enterprise Integration: MES and ERP

The value of Predator DNC is amplified when it's integrated with existing enterprise systems. By leveraging open API and database architecture, the software becomes a vital link between the shop floor and the front office.

MES (Manufacturing Execution System) Integration:

This integration provides a real-time, holistic view of the manufacturing process. When a job is started in the MES, Predator DNC can automatically download the required program to the correct machine, eliminating manual steps. As the job progresses, it can send real-time status updates back to the MES, providing accurate data on job progress, part counts, and cycle times.

ERP (Enterprise Resource Planning) Integration:

Connecting Predator DNC to an ERP system automates job scheduling and resource management. The ERP can trigger a Predator DNC download based on a work order, ensuring that machines are always running the correct jobs.

This streamlines production workflows and improves overall resource utilization.

The Digital Factory: A Path to Industry 4.0

Predator DNC is a foundational technology for achieving Industry 4.0 objectives. By providing a networked, data-rich environment, it enables the core tenets of the digital

factory:

Real-Time Data & Visibility:

The system captures and delivers real-time information about what programs are being run, when, and on which machines.

Automation & Autonomy:

It automates the program transfer process, paving the way for lights-out manufacturing and flexible manufacturing systems.

Interconnectivity:

It provides the critical communication infrastructure that allows machines and systems to talk to each other, a prerequisite for advanced concepts like data collection, machine learning and predictive maintenance.

Regulatory Compliance & Data Integrity: CMMC, ITAR, and CFR 21 Part 11

In highly regulated industries like aerospace, defense, and medical devices, compliance is non-negotiable. While no single software product can make an organization compliant, Predator's suite of applications is designed to provide the necessary controls and documentation.

CMMC & ITAR:

These regulations require stringent control over sensitive technical data and unclassified information. Predator PDM (Production Data Management) works hand-in-hand with Predator DNC to create a secure, centralized vault for all manufacturing documents, including CNC programs.

NOTE: CMMC stands for Cybersecurity Maturity Model Certification and ITAR stands for International Traffic in Arms Regulations.

Secure Revision Control:

PDM ensures that only the latest, approved version of a program can be transferred by DNC, preventing the use of unapproved or outdated files.

Access Control:

It enforces granular user permissions, limiting access to sensitive data to only authorized personnel.

Audit Trails: Predator PDM and Predator DNC work together to provide a complete, time-stamped audit trail of every file transfer, modification, and access event, which is vital for a CMMC or ITAR audit.

21 CFR Part 11 (Electronic Records and Electronic Signatures):

This regulation, set by the FDA, ensures that electronic records and signatures are as trustworthy and reliable as paper-based ones. Predator's integrated solutions provide the technical controls necessary to help manufacturers meet these requirements.

Secure Login:

Unique user IDs and passwords ensure accountability.

Change Control:

The system tracks and logs every change to a program, and the audit trail

cannot be altered.

Electronic Signatures:

For critical program approvals and changes, the system can require an electronic signature with a time-stamp and purpose.

Predator's software provides the tools to demonstrate documented change control, robust traceability, and secure data handling, all of which are essential for satisfying the rigorous requirements of these regulatory bodies.

Holistic Shop Floor Management: Predator PDM and Predator MDC

The true power of Predator DNC is realized when it is deployed as part of the integrated Predator suite.

Predator PDM (Production Data Management):

This is the ultimate source of truth for all manufacturing data. When integrated with Predator DNC, it provides the secure vault for programs, automatically serving the correct, approved version to the machine, and preventing the use of unauthorized files.

Predator MDC (Manufacturing Data Collection):

This software provides real-time machine monitoring. The Predator DNC system's program transfer action can automatically trigger data collection in Predator MDC, allowing the system to track machine status, cycle times, and part counts in real-time. This integration provides a comprehensive view of shop floor activity, transforming raw data into actionable insights for OEE (Overall Equipment Effectiveness) calculation and productivity improvements.

Ready to transform your manufacturing operations?

Predator DNC is the critical first step toward a more productive, secure, and compliant shop floor. By eliminating manual processes and connecting your entire equipment ecosystem, you can lay the groundwork for true digital transformation.

To learn more about how Predator DNC and its integrated solutions can maximize your ROI, improve data security, and prepare your business for the future, contact us at info@predator-software.com or visit our website at www.predator-software.com