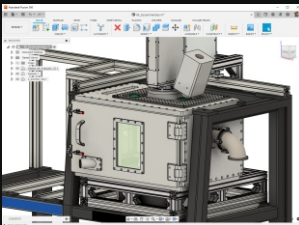**AUTODESK**
Machine Control Framework

Save millions of development budget
# with the **Autodesk Machine Control Framework**

The software toolkit for Additive Machine Tool Development
Beyond state of the industry. Open Source. Zero cost.
Ready for Fusion 360.

Focus your Resources on Process IP and Hardware Differentiation

▶ Similar to how Android supercharged the mobile phone industry, the framework transforms the machine development process from a huge software development exercise into a focused effort about core capabilities.

▶ A modern plugin architecture separates generic functionality (like data management, user authentication, hardware communication) from the machine specific details.

▶ Many technologies like LPBF, DLP or Filament Extrusion are supported out of the box.
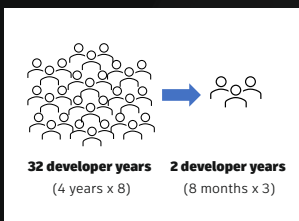
Incredible Boost in Developer Productivity

▶ An extensive software codebase provides commodity functionality for implementing the control software for 3D Printers in an unprecedented pace.

▶ It demonstrably reduces the development effort by 95% and time to market by 75%.

▶ It allows to rapidly adapt and to manage multiple product variants and use cases without the exponentially growing development overhead.

32 developer years
(4 years x 8)

2 developer years
(8 months x 3)

Pervasive Open Source Strategy

▶ As the machine control software is one of the crown jewels of any machine tool maker, retaining the source code is essential for long term business success.

▶ Autodesk is in a unique position in the industry to deliver a comprehensive open source toolkit under a BSD license, allowing full ownership at zero cost.

▶ The open development model on GitHub is based on Autodesk's extensive contributions to the 3MF Consortium, which is hosted by the Linux Foundation.

Open Driver Architecture and Transactional Journaling

▶ Comes with a multitude of drivers for off the-shelf-laser scanners, PLC systems, cameras, thermo-cameras and and other auxiliary equipment.

▶ Being primarily developed on B&R PLC systems, it comes with an initial open source LPBF implementation project as starting point for custom modifications.

▶ Data capture of external devices and sensors is stored in a central time stream journal.

▶ Together with all machine state changes, this gives an unprecedented insight on what happened during the printing process at what time and why - with millisecond accuracy.

Made under Guidance from the Laser Experts

▶ Thanks to the generous support of SCANLAB, the framework allows to integrate their market leading Scan Solutions within a few developer hours.

▶ This includes Laser Scanning and Multilaser Synchronisation for building parts with LPBF and SLA, and process monitoring with SCANLAB's Open Interface Extension for pyrometers and similar coaxial measurement devices.

▶ The clear separation of framework and implementation code makes it easy to upgrade to leading edge SCANLAB functionality that far exceeds the state of the industry. From Microvectoring to Power Modulation, from Beam Wobbling to Closed Loop Control.

▶ Autodesk strives to provide an open source reference implementation to anybody who wants to use SCANLAB's leading technology.
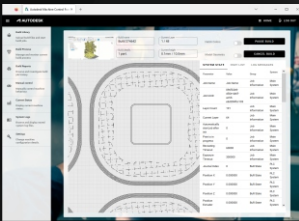

Rich Feature Set and Beautiful User Experience

▶ A rich API makes it easy to configure the full process flow with only a few lines of code.

▶ The feature set includes data management, secure authentication, laser control and synchronization, closed loop control, connectivity to PLC systems and much more.

▶ The human machine interface uses the most modern design patterns and is configurable out of a large number of powerful widgets to efficiently support any corporate identity.

▶ From 3D model viewer to toolpath inspection and sensor value visualization.
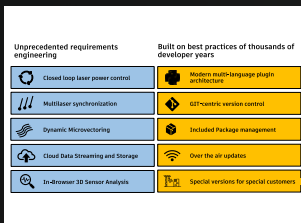
Best Practices of a Thousand Developer Years

▶ Creating a quality software stack that can successfully evolve over many years is very hard, and often not the core expertise of a machine tool maker.

▶ The Framework is built with the professional development DNA that is very unique to only the world's largest software companies.

▶ From over the air updates, CI/CD systems with hourly builds that include all of the PLC software, to stable binary interfaces and modern client-server architecture.
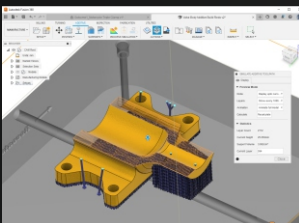
Natural Companion to Fusion 360

▶ Autodesk Fusion 360 is easy to use and accessibly priced, offering everything from CAD, CAE and CAM in a single environment and to everyone.

▶ Its powerful additive workspace combines DfM functionality with data preparation and process simulation in an integrated way.

▶ The Machine Control Framework is open and not vendor-locked, but its natural integration in Fusion 360 offers any machine tool maker an incredible proposition at an unbeatable value.

"We are using the Machine Control Framework in several research projects and it is amazing how quickly we can build up completely new machine concepts."
David Wenzler, Institut für Werkzeugmaschinen und Betriebswissenschaften, Technical University of Munich

"This will be key in redefining how we think and adapt industrial AM and it perfectly aligns with the open source approach of our Open Additive Manufacturing Initiative."
Sebastian Aagaard Andersen, DTU Construct, Technical University of Denmark

"It took us two weeks to build our first parts…"
Sven Müller, BIAS - Bremer Institut für angewandte Strahltechnik GmbH

"We especially like the open source approach. By embedding the software in Fusion 360, we can offer our customers a complete solution, from product idea to finished product. "
Johannes Weiser, Head of Additive Manufacturing, Evobeam GmbH

Download the source code from **github.com/autodesk.**

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