Machfu Recognized for

2021

Enabling Technology Leadership

North American Industrial
Edge-to-Enterprise Automation Market
Excellence in Best Practices

FROST & SULLIVAN

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Background and Company Performance

Industry Challenges

The COVID-19 pandemic has revealed inherent operational challenges in the industrial sector. Mobility restrictions and physical distancing measures have altered staffing patterns and caused manpower constraints, leading to supply chain disruption and unplanned shutdowns. Even as companies prioritize business continuity and operational flexibility to future-proof business growth, Frost & Sullivan analysts monitor how the Industrial Internet of Things (IIoT) has taken center stage as a critical technology enabler.

The advent of information technology and operational technology (IT-OT) convergence at the edge and cloud connectivity has encouraged renewable energy producers, utility providers, and oil and gas (O&G) operators to implement agile decision-making methods to unlock business value from petabytes of data logged by field assets. With millions of industrial assets operating on legacy automation and control systems that cannot speak or understand the language of modern IT systems and web applications hosted by IIoT platforms, Frost & Sullivan notes that it is quite expensive for industrial customers to transition and create value from new ways of working.

Fragmentation at the edge is another major barrier to achieving edge-to-enterprise automation. Original equipment manufacturers (OEMs) spend heavily to develop proprietary edge applications that solve machine-specific problems and, in many cases, duplicate problem-solving efforts using different hardware and software. Moreover, devices and systems from various automation vendors follow different protocols and do not communicate securely through the Internet and the cloud. The strategy adopted by large OEMs to maintain a captive customer base by obstructing interoperability does not support digital transformation objectives.

With the exponential growth of stand-alone and resource-constrained connected devices, it is imperative for IIoT device suppliers to offer compatibility with high speed and low latency wide area network technologies (such as LTE-M). Such compatibility allows for bi-directional low power long-range communication, allowing battery-powered devices to operate for years without the need for replacement.

Due to these challenges, Frost & Sullivan points out that industrial asset owners have an urgent need for cost-effective and scalable IIoT solutions that democratize the edge, ensure ubiquitous connectivity, and can run modern cloud-based applications to improve business outcomes.

Technology Leverage and Customer Impact

Founded in 2015, Maryland-based Machfu is an IIoT solution provider with a mission to remove connectivity barriers in edge-to-enterprise automation and maximize the business value of IIoT deployments for industrial customers. Machfu's core team has worked together for the past two decades and is nicely dedicated to eliminating the repetitive and time-consuming steps involved in taking edge data to the cloud. With a portfolio of more than 35 patents over 20 years cutting across different domains, including IoT devices, protocol conversion methods, networking, and security, Frost & Sullivan analysts

recognize how Machfu offers a fully integrated IIoT service delivery package for edge-to-enterprise automation.

Commitment to Innovation and Creativity

Today's industrial world is analogous to the smartphone market of the early 1990s, when each manufacturer used a different operating system (OS) that made application compatibility OS-dependent. The resulting interoperability problems restricted the device's functionality within a confined application developer community until the launch of Android.

Frost & Sullivan notes that Machfu's innovation objectives are aligned with a vision to democratize the edge — essentially launching the Android of the industrial world. Machfu's holistic approach involves a creative low-power IIoT device concept embedded with unique protocol conversion capabilities, essentially unifying the edge. The company's MACHGateway® offering is a globally-certified edge computing device with a state-of-the-art software stack consisting of a Linux Kernel with Android User Space and LoWPAN wireless drivers. MACHGateway supports IIoT protocol libraries such as Modbus, DNP3, MQTT and COAP, making it compatible for deployment in a typically resource-constrained industrial market.

Frost & Sullivan's research reveals that MACHGateway®'s edge intelligence capabilities are highly differentiated. Three unique features unlock new capabilities and functions, namely:

- *Containerization at the edge.* Machfu has brought containerization technology from traditional enterprise IT to the IIoT edge. Such an approach allows for the isolation of edge functionalities into separate partitions (i.e., containers), which can subsequently be protected by a layered security approach. Each application container at the edge is assigned role-based security and is functionally isolated from other applications. The architecture allows for the easy addition of new applications at the edge without impacting or altering the intended functions of other existing applications. Moreover, the OS' modular nature enables the dynamic addition of new applications during run-time while introducing modern security-by-design.

- *Power efficiency for resource-constrained deployments.* Machfu saw a significant opportunity for low-power gateways at the edge for industrial applications where energy and processing power are limited. Leveraging its extensive software knowledge and expertise, Machfu embedded a smart power management strategy with granular resource control in its MACHGateway offering. As a result, power management is optimized across all software stack layers (i.e., from the kernel to the application layer). Like many battery-powered communication hardware that can be selectively put to sleep to save power, the MACHGateway can switch on and off pieces of the software stack while extracting machine intelligence. As a result, the MACHGateway is ten times more power-efficient than other competing products currently deployed for industrial sites.

- ***Protocol-agnostic translation engine:*** Machfu's protocol translation capabilities at the edge are unmatched in the industry. Its MACHREACTOR™ protocol translation engine is an integrated application that resides on the MACHGateway at the edge to integrate, collect, and aggregate data from legacy controllers and devices in the field.

The MACHREACTOR interfaces with programmable logic controllers and meters, integrating them with the back end and the cloud to allow users to easily map their nodes remotely through a cloud management system. As a result, asset owners can monitor and control vital field parameters at the enterprise level. The engine also eliminates the need for additional code for translation, thus enabling the remote monitoring of legacy assets and reducing IIoT deployment costs for many industrial sectors.

Commercialization Success and Application Diversity

In the O&G sector, Machfu works with upstream and midstream operators to automate artificial lift systems, allowing operators to improve production rates, reduce downtime, and optimize the operating expenditure of aging infrastructure through the use of remote monitoring and web services. With most assets adopting OPC UA and MQTT protocols in the oilfield, MACHGateway removes the limitations of traditional SCADA systems with a centralized back office. By enabling the local polling of devices in the field while maintaining device connectivity with the existing SCADA system, the MACHGateway can continually poll at high frequency to assess system state, translate into other protocols, and easily communicate with other IIoT applications in real time. Such a capability is superior to existing SCADA system architectures that can typically poll at 15 minute (or longer) intervals.

Machfu's commercialization strategy is built on strategic partnerships within an ecosystem of leading industrial communication network service providers, IIoT device suppliers, and IIoT platform management solution providers. For O&G, Machfu has partnered with many leading digital oilfield solution providers to employ its MACHGateway capabilities at the edge and enable real-time access to field data. In 2019, Machfu entered into a strategic partnership with Infrastructure Networks Inc. (iNet), a broadband wireless connectivity provider with more than 130,000 miles of network coverage across US shale basins. iNet distributed and serviced Machfu's MACHGateway and Mach-IO devices to its O&G customers, enabling the gathering and transmission of real-time data from IoT sensors in the field over iNet's network. As a result, it is possible to monitor, control, and automate equipment in the oilfield. In partnership with SignalFire, Machfu's MACHGateway offers the in-built capability to integrate with SignalFire's 900 megahertz wireless telemetry network products, allowing for easy set-up, single touch auto-discovery of nodes, and the automated transfer of sensor data to SCADA system dashboards.

Machfu's IIoT solution capabilities enable electric utility customers to maximize returns on equipment upgrades and improve grid performance. Smart sensors with a built-in Bluetooth link are now able to connect with MACHGateway, allowing for the transmission of data over LTE network - and thus supporting analytics and visualizations at the enterprise level. As a result, utility companies can push data in real time, manage

complex grids with multiple devices through cloud-based infrastructure, and improve cybersecurity compared to legacy grid monitoring systems. Access to fault detection data also allows grid operators to predict, prevent, and fix outages, improve grid reliability, and reduce downtime.

In 2020, Machfu reinforced its protocol translation capabilities in-line with the needs of its North American utility customers. Funded by a $2 million Small Business Innovation Research grant, Machfu introduced a new add-on global connectivity module that allows utility customers to create custom applications using Machfu's software development kit. The applications can be installed on the MACHGateway to communicate with existing and new components of the distribution network, including sub-station devices. MACHGateway's protocol-agnostic architecture covers DNP3, Modbus, and IEC 60870 protocols, making it a low power and cost-effective solution that can be deployed globally to control and automate electric power transmission grids.

Machfu continues to expand its horizon of applications in the industrial space, where prognostic health monitoring and condition-based maintenance can prevent failures and unlock business value. In the smart water market, Machfu, in partnership with REDtrac, a farm equipment manufacturer and water monitoring solutions provider, has launched WATERtrac® to monitor agricultural well sites. WATERtrac® is a cloud-based solution that unifies sensors and controllers from different well sites, enabling REDtrac's customers to monitor electrical usage, manage utility costs based on analytics of peak-hour usage, and reduce water consumption through remote monitoring and control.

Customer Purchase and Ownership Experience

Machfu's customers are proud to own the company's products and have a positive experience throughout the product's life due to its unique IIoT services. The company works in close contact with its customers to understand requirements and offer consultative solutions that solve both well- and ill-defined problems with a clear understanding of the differentiation delivered by Machfu.

By supporting the complete integration of Machfu IIoT service products with legacy infrastructure, Machfu eliminates the need for re-engineering typically required by competing products. Machfu's approach (i.e., embedding a hardware-independent Android/Linux-based software platform in MACHGateway) has unlocked new growth potential for IIoT application developers seeking to create innovative edge applications that can be rapidly deployed in existing industrial infrastructure. The simplification of the workflow (i.e., from app development to deployment) accelerates solution development from years to days, delivering quick returns on IIoT investments. Frost & Sullivan analysts conclude that the proper combination of unique features makes Machfu IIoT service an optimal solution for industrial customers.

Conclusion

Machfu's Industrial Internet of Things service product portfolio addresses industrial customers' need to operate expensive assets in resource-constrained environments. Machfu's innovative MachIO and MACHGateway® products leverage a hardware-independent Android/Linux-based software platform to unify legacy and modern end-point devices, ensuring real-time edge-to-enterprise connectivity.

By breaking communication barriers between sensors, devices, and SCADA systems for multiple industry applications, Machfu allows operators to gather, access, transmit, and process real-time data to derive mission-critical insights and unlock business value. Moreover, Frost & Sullivan appreciates how Machfu's unique and unparalleled ability to enable complete transformation at the edge is democratizing the industrial world.

With its strong overall performance, Machfu earns the 2021 Frost & Sullivan Enabling Technology Leadership Award.

Significance of Enabling Technology Leadership

Ultimately, growth in any organization depends on customers purchasing from a company and then making the decision to return time and again. In a sense, then, everything is truly about the customer. Making customers happy is the cornerstone of any successful, long-term growth strategy. To achieve these goals through enabling technology leadership, an organization must be best in class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.

- Acquire competitors' customers
- Increase renewal rates
- Increase upsell rates
- Build a reputation for value
- Increase market penetration

- Earn customer loyalty
- Foster strong corporate identity
- Improve brand recall
- Inspire customers
- Build a reputation for creativity

DEMAND

BRAND

Enabling Technology Leadership

COMPETITIVE POSITIONING

- Stake out a unique market position
- Promise superior value to customers
- Implement strategy successfully
- Deliver on the promised value proposition
- Balance price and value

Understanding Enabling Technology Leadership

Product quality (driven by innovative technology) is the foundation of delivering customer value. When complemented by an equally rigorous focus on the customer, companies can begin to differentiate themselves from the competition. From awareness, to consideration, to purchase, to follow-up support, organizations that demonstrate best practices deliver a unique and enjoyable experience that gives customers confidence in the company, its products, and its integrity.

Key Benchmarking Criteria

For the Enabling Technology Leadership Award, Frost & Sullivan analysts independently evaluated Technology Leverage and Customer Impact according to the criteria identified below.

Technology Leverage

Criterion 1: Commitment to Innovation

Requirement: Conscious, ongoing adoption of emerging technologies that enable new product development and enhance product performance.

Criterion 2: Commitment to Creativity

Requirement: Technology leveraged to push the limits of form and function in the pursuit of white space innovation.

Criterion 3: Stage Gate Efficiency

Requirement: Adoption of technology to enhance the stage gate process for launching new products and solutions.

Criterion 4: Commercialization Success

Requirement: A proven track record of taking new technologies to market with a high rate of success.

Criterion 5: Application Diversity

Requirement: The development and/or integration of technologies that serve multiple applications and can be embraced in multiple environments.

Customer Impact

Criterion 1: Price/Performance Value

Requirement: Products or services offer the best value for the price, compared to similar offerings in the market.

Criterion 2: Customer Purchase Experience

Requirement: Customers feel they are buying the optimal solution that addresses both their unique needs and their unique constraints.

Criterion 3: Customer Ownership Experience

Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

Criterion 4: Customer Service Experience

Requirement: Customer service is accessible, fast, stress-free, and of high quality.

Criterion 5: Brand Equity

Requirement: Customers have a positive view of the brand and exhibit high brand loyalty.

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan analysts follow a 10-step process to evaluate Award candidates and assess their fit with select best practices criteria. The reputation and integrity of the Awards are based on close adherence to this process.

STEP		OBJECTIVE	KEY ACTIVITIES	OUTPUT
1	**Monitor, target, and screen**	Identify Award recipient candidates from around the world	• Conduct in-depth industry research • Identify emerging industries • Scan multiple regions	Pipeline of candidates that potentially meet all best practices criteria
2	**Perform 360-degree research**	Perform comprehensive, 360-degree research on all candidates in the pipeline	• Interview thought leaders and industry practitioners • Assess candidates' fit with best practices criteria • Rank all candidates	Matrix positioning of all candidates' performance relative to one another
3	**Invite thought leadership in best practices**	Perform in-depth examination of all candidates	• Confirm best practices criteria • Examine eligibility of all candidates • Identify any information gaps	Detailed profiles of all ranked candidates
4	**Initiate research director review**	Conduct an unbiased evaluation of all candidate profiles	• Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles	Final prioritization of all eligible candidates and companion best practices positioning paper
5	**Assemble panel of industry experts**	Present findings to an expert panel of industry thought leaders	• Share findings • Strengthen cases for candidate eligibility • Prioritize candidates	Refined list of prioritized Award candidates
6	**Conduct global industry review**	Build consensus on Award candidates' eligibility	• Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates	Final list of eligible Award candidates, representing success stories worldwide
7	**Perform quality check**	Develop official Award consideration materials	• Perform final performance benchmarking activities • Write nominations • Perform quality review	High-quality, accurate, and creative presentation of nominees' successes
8	**Reconnect with panel of industry experts**	Finalize the selection of the best practices Award recipient	• Review analysis with panel • Build consensus • Select recipient	Decision on which company performs best against all best practices criteria
9	**Communicate recognition**	Inform Award recipient of recognition	• Announce Award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10	**Take strategic action**	Upon licensing, company is able to share Award news with stakeholders and customers	• Coordinate media outreach • Design a marketing plan • Assess Award's role in strategic planning	Widespread awareness of recipient's Award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of the research process. It offers a 360-degree view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, resulting in errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry participants and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS

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