THE WORLDWIDE MERCHANT EMBEDDED COMPUTING MARKET

2018 EDITION

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ABOUT THE AUTHOR

Randall Sherman is the president and principal analyst of New Venture Research Corp., a technology market research and business consulting firm focused on the EMS and OEM electronics manufacturing industries. Mr. Sherman has more than 25 years' experience in technology and business research. He began his career as a telecom network design engineer and holds an undergraduate degree in astrophysics. He has held senior positions at various market research firms, including Creative Strategies, Frost and Sullivan, BIS Strategic Decisions and Lucid Information Services. Mr. Sherman holds an MSEE from the University of Colorado and an MBA from the Edinburgh School of Business. His contribution to this report was to update the numbers and the product and technical announcements that have taken place since the last publishing of the report.

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New Venture Research (NVR) was formed in 1988 to assist industry executives in their decision making. We began as an independent consultancy and have recently evolved into a publisher of off-the-shelf market research reports in key areas of the electronics industry. The reports are written by a team of staff analysts and independent consultants. We also offer consulting services when our clients need information not found in our reports.

The backbone of each report is based upon primary market research information. Our market information originates from direct interviews with vendors, users, and other industry participants. We use secondary research to test for reasonableness, technical backgrounds, and, in some cases, for top-level forecasts. We distill the research into coherent forecasts and recommendations.

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Table of Contents

Buses: VME, PCI, PCIE, cPCI, PC/104, COM, SFF, ATCA, AMC, PMC

Chapter 1
INTRODUCTION

1.1 Objectives of the Report

This *Worldwide Merchant Embedded Computing Market Report, 2018 Edition* provides a macroeconomic analysis of the global marketplace for standards-based single-board computing systems and solutions. The report examines the total available market, its size, trends and technologies of the market, and the opportunities for companies that compete in this space. It provides an overview of technological advances and the development of various product specifications, and trends and issues of importance to the industry, as well as the market forces that are changing the nature of the business, including outsourcing trends and the impact of industry consolidation by mergers and acquisitions. The report analyzes various business issues and forecasts the market size and growth for the major segments and technologies. Data used for these forecasts is current as of March 2018. Finally, the report profiles selected vendors, and gives a summary of their business in terms of size and market segments.

The worldwide MEC report is designed to aid executives in senior management, sales, business development, and marketing among current and potential manufacturers, and users of embedded computing products, in making important strategic and product decisions.

1.2 Scope of the Report

1.2.1 Market Definitions

The MEC marketplace is extremely complex, encompassing a large array of technologies, standards, form factors, and products; therefore, defining the precise dimensions that comprise this report is difficult. There are many overlaps in products and markets. Attempting to put everything into neat categories does not always work to everyone's satisfaction, which makes markets hard to size and issues difficult to characterize.

The term “embedded computing” has become a favorite buzzword in high-tech circles. It is freely used throughout the industry to refer to anything that can be characterized as a computer in a box, whether it is to be used for industrial, military, or commercial purposes. If it consists of a printed circuit board with a microcontroller and other components (memory or I/O, for example) attached, and is assigned a specific performance task as part of a subsystem within a larger device, it can often qualify as an embedded system.

According to Jerry Gipper, Executive Director of the VITA trade association (i.e., the VMEbus International Trade Association), “The best way to look at embedded is really the end function of the computer. If it is truly embedded (inside something or tightly attached) and dedicated to a specific function, then these products represent the systems that must be “able” in many dimensions: dependable, supportable, configurable, reliable, serviceable—in another word, it relates to “mission-critical systems” [that] are intended to operate flawlessly to protect life, property, equipment, and the environment. Moreover, they rely on the durable products of today and tomorrow using VITA Technologies.”

In the following sections, we will try to specify exactly how the term is used within the context of this report.

1.2.1.1 What Is Merchant Embedded Computing?

Merchant embedded computing (or MEC) is defined as a standards-based computer system consisting of a single-board computer or a series of boards and a backplane. The key differentiator from a simple embedded computing device is the inclusion of the requirement that an MEC system supports an industry standard bus architecture for the signaling, bus, connectors, and physical form factors. It is usually in a pluggable format with multiple boards. MEC boards are designed for multiple applications and (usually) not a single, dedicated application. In addition:

- MEC systems are usually products available from multiple vendors, offering a variety of “off-the-shelf” boards available from merchant vendors within the open market.
- The system may run a proprietary operating system or a generic off-the-shelf operating system, with the application software usually product specific.
- The operating and application systems are not exposed to the end user, nor can the user change or run general-purpose applications software.

- Generally, the user does not see the actual function of the computer inside but may only access its operation with a button control panel, menu system, or screen with a dedicated application.

Typical MEC applications might include use in a medical scanner, industrial robot, manufacturing process control system, various communications equipment, complex military equipment, etc. Some embedded computing systems are operated in such a manner that the computer function is not apparent in the final application, while other embedded systems are clearly operated by computers that are integrated into a machine's functionality. An example of the former is the highly complex imaging system of a CAT, PET, or MRI diagnostic system or an industrial automation robot.

1.2.1.2 What Is NOT Included in the MEC Definition?

Logically, we consider "a microprocessor on a board of electronics" as including a much broader market than is covered in this report, especially if the item in question does not conform to an industry bus standard. Such a product could encompass virtually everything with a microprocessor. Other factors that exclude particular products or devices from consideration include:

- Single application-specific microcontroller-operated products—"single" applications such as a musical greeting card, appliance, toy, stereo system, thermostat, etc., or any device that embeds a microprocessor of some kind
- Complex, single-chip embedded solutions and systems on chip (SoCs)
- Consumer PC motherboards and add-in boards, as well as data center server boards

To be sure, PC motherboards are bus-based and popular in many industrial applications. However, most such products are designed primarily for general desktop applications, not for dedicated applications. Capturing data on PC-grade motherboards that are used in the embedded market is quite difficult, especially because a large percentage of such boards are sold through commercial channels. In the context of this report, motherboards sold by merchant vendors are included in our "PC/104, EPIC, EBX, ATX, and ITX" architecture category, as they typically have been

enhanced beyond the normal PC-grade quality used to run Windows and other general-purpose computer operating systems.

1.2.1.3 Who Are the "Merchants" of Embedded Computing?

The MEC business consists of several dozen large companies with diversified product portfolios and well over a hundred or more small companies targeting product niches, often with special, long-established relationships with buyers. Many, if not most, of the competitors have been in existence for 15 to 20 years or more. Not surprisingly, with so many competitors the vendor landscape is in continuous flux. Several of the companies profiled in NVR's last MEC report are gone, either having been acquired by larger competitors or having simply closed their doors.

Given the number of vendors in the market, operating from countries across the globe, detailed data is often not available in all cases. MEC products number in the thousands and unit shipments in the hundreds of thousands. Therefore, much of the data provided about the market and about the marketers must be estimated based on the information and data that is available.

1.2.2 Market Segmentation

This report sizes the major applications and segments by revenue as well as analyzes both market and technology trends and key issues facing MEC executives. Analyses are provided for both standards-based assemblies and non-standards-based MEC assemblies.

1.2.2.1 Five Application Areas

While there are hundreds of subapplications, MEC vendors generally compete in five broad vertical market application categories:

1. Communications (cellular infrastructure, CPE, etc.)
2. Industrial (process control, test and measurement, and other)
3. Medical (diagnostics/imaging, therapeutic, and surgical/monitoring)
4. Military/Aerospace (flight navigation, weapons, C3, and other)
5. Other (automotive, off-road, ships, trains, kiosks, etc.)

Each of these application areas typically has unique product characteristics and operating environments. Military/aerospace applications, for example, require battlefield-rugged architecture, whereas medical equipment typically operates in the “72 degrees and fluorescent lighting” environment of a hospital. Industrial automation boards may be used in process control, mining, chemical, or agricultural equipment, or in a production line robot. Communication boards might be focused on high-speed, optical transfer data rates. Outside plant equipment often operates in harsh environments and requires the ability to withstand –40°C to +80°C temperatures and greater levels of shock, vibration, humidity, and electrostatic discharge.

1.2.2.2 MEC Suppliers and EMS Contract Manufacturers

For the first time, we have focused on tracking the ecosystem of MEC suppliers and their sales by market application. This focus was chosen in place of tracking product sales by industry standard or form function, as this was reported to be more relevant. In addition, our customers wanted more information on the total available market, which included non-standards-based MEC assemblies. For this reason, we have added a new chapter that reports on the top 89 MEC standards-based suppliers with the leading 81 EMS contract manufacturing companies across their main application industries.

1.3 Report Organization

1.3.1 Methodology

The information presented in this report was gathered from a variety of sources. The primary sources were engineering, marketing, business development, and communications managers in merchant embedded computing companies who were contacted directly. These individuals were asked to respond to a survey. In some cases, the answers to the survey were delivered as written responses. In other cases, the information was conveyed via telephone interviews.

The secondary sources were company literature, such as websites, investment reports (e.g., annual reports and SEC filings), white papers, and press releases; investor analyses; and trade publications.

1.3.2 Chapter Structure

This report is organized into seven chapters plus an appendix:

- Chapter 1, Introduction: this chapter outlines the scope and organization of the report.
- Chapter 2, Executive Summary: provides an overview of the market and highlights of the top-level market segments.
- Chapter 3, Technical Trends: presents key technology issues that are affecting the embedded computing market today and that will impact the future market environment. This chapter also provides a quantitative analysis of the market over the past decade.
- Chapter 4, Economic Outlook and Worldwide Electronics Industry Forecast: provides recent historical data and trends as well as analysis and forecasts for the marketplace.
- Chapter 5, MEC Market Forecasts, 2015–2022: analyzes the key issues and trends by the five application areas defined in the report.
- Chapter 6, MEC Competitive Ranking: lists leading suppliers for both the standards-based and non-standards-based product assemblies and shows their leading market segments.
- Chapter 7, Company Profiles: provides profiles of the key vendors competing in the MEC marketplace.
- Glossary of Terms: short descriptions of many of the technical and trade terms used in the report.