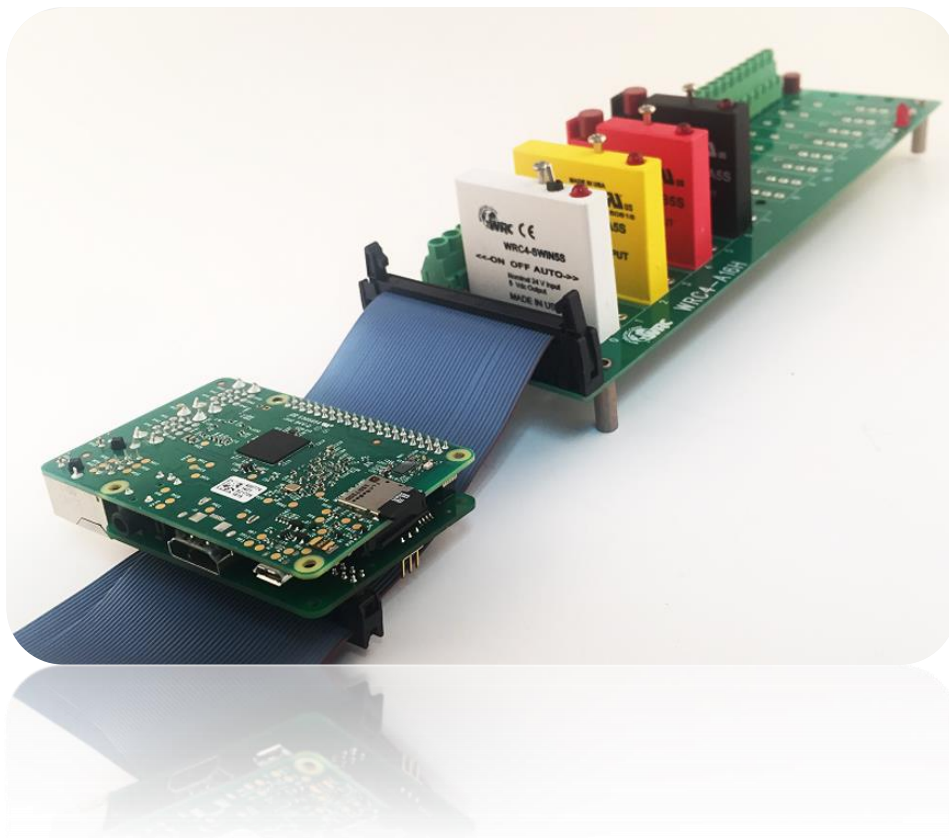


The Next Big Thing in Open Automation Is Here. Are You Ready?



THE NEW AUTOMATION INDUSTRY DISRUPTOR

Open Controllers... Open Networks... Open I/O devices... the world of Open Architecture automation is here with the Raspberry Pi and other Single Board Computers (SBC) becoming the IBM PCs of our time.

From educational projects to industry disrupting Industrial Automation applications, Open Architecture Control & I/O Systems are changing the way many OEMs and Systems Integrators are thinking when it comes to implementing their next automation project.

At WRC we believe the next 3-5 years will tell if this new generation of low cost SBCs and connected I/O will change the Automation Industry competitive landscape or fade away like so many other over-hyped automation technologies that have come and gone before.

When you hear people call SBCs like the Raspberry Pi a “prototyping platform”, a “hobbyist toy” or an “educational tool,” just remember what they said about the IBM PC.

No matter what happens, when you hear people call SBCs like the Raspberry Pi a “prototyping platform”, a “hobbyist toy” or an “educational tool,” just remember what they said about the IBM PC. We’re going to start seeing these low-cost SBCs everywhere and there’s no turning back!

So the question is: Will your automation business be ready to take advantage of this new technology or become a victim of it like the once large corporations that fell to the lowly IBM PC?

For example, if you’re a controls supplier, machine builder, Systems Integrator or End User there’s no doubt small, low-cost, SBCs like the Raspberry Pi will have an impact on your business in the next 3-5 years.

In fact, if you’re an automation supplier who has been using embedded SBCs to implement a custom machine control solution or some other type of industrial automation project, the introduction of the Raspberry Pi 3 Compute Module costing about \$31 has put the whole embedded world on notice.^[1]

For example, with a Commercial-Off-The-Shelf (COTS) processor core of the Raspberry Pi 3 now being available with industrial temperature ratings, a variety of specialized “base boards” will soon appear fitting

Raspberry Pi Compute Modules and industrial rated I/O into every nook and cranny of automation equipment.

And it has already started.

In September 2015, Raspberry Pi Foundation CEO Eben Upton revealed that a third of their sales are for industrial uses, including digital signage, industrial automation, and even telecom base stations.^[2] At 33% of sales, this would put Raspberry Pi modules used for industrial application at over 1 million units per year in 2016 and growing.

So what can automation component or system suppliers do to be ready for this potential automation industry disruption?

At WRC our philosophy is “being forewarned is being forearmed.”

This whitepaper will review both the opportunities and the threats these new open architecture SBC platforms present traditional automation providers and offers suggestions on how to respond to the growing influence these new competitors will have on the automation industry in the future.

WHEN “GOOD ENOUGH” WINS

As mentioned earlier, single-board computers are often looked at as “prototyping platforms”, “hobbyist toys” or “educational tools.” That’s because when first launched these new technologies typically don’t have enough “horsepower” or perceived reliability to attempt the applications currently being performed by proprietary systems being delivered by the major automation controls suppliers. (see Figure 1.)

Proprietary automation architectures like those produced by the major controls suppliers are typically optimized for performance in terms of functionality and reliability. These architectures are usually proprietary in nature because each controls supplier typically attempts to optimize performance in their own differentiated way.

Furthermore, even if a major controls supplier claims to have an open architecture it is typically built upon a communications network and/or data model that has been developed internally to give the controls supplier

a first mover advantage when bringing new products and services to market.

This competitive strategy can best be illustrated by the competing open network communications protocols and alliance ecosystems developed by Siemens and Rockwell Automation.

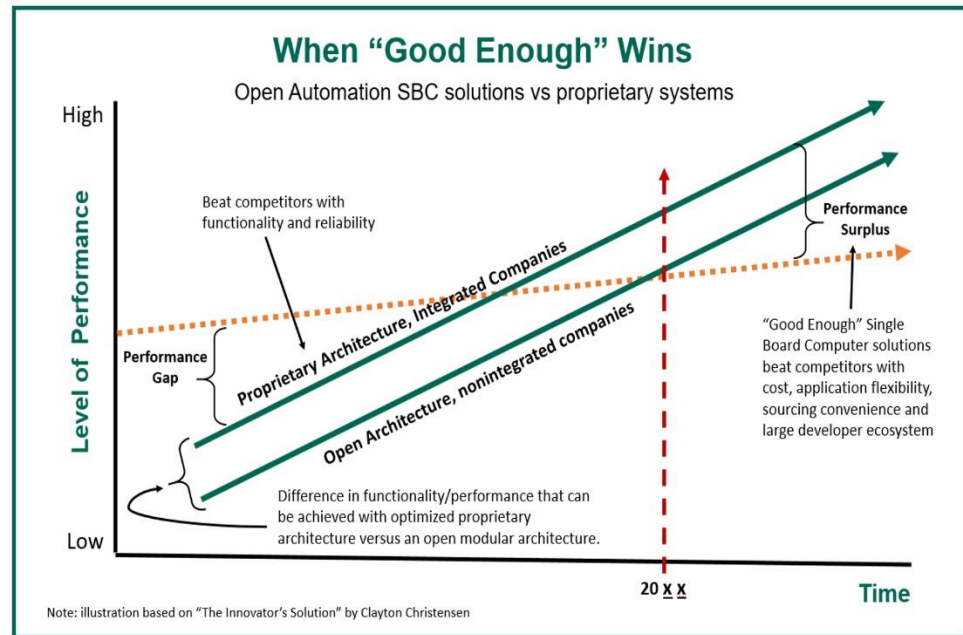


Figure #1.

The problem with proprietary architectures and products produced by integrated companies like Siemens and Rockwell (even if declared open) is that over time a performance surplus is created as more and more capabilities are added to their products in order to satisfy the needs of ever more demanding automation applications.

This performance surplus adds unneeded cost to their solutions and puts their high-performance, high price, solutions at a competitive disadvantage as OEMs, Systems Integrators and End Users begin looking for lower-cost ways of implementing their simpler automation projects.

Examples of these "good enough" industrial applications can be seen in the use of the Raspberry Pi in manufacturing quality control applications and simple SCADA systems as demonstrated by the two Youtube videos available at the URL links below:

- <https://youtu.be/PRAbPSmCPD4>

- <https://youtu.be/oyP7-yxc9Mk>

Simple applications like those often found in Building Automation and Home Automation projects will be the first to employ these next-generation SBCs but there's no doubt Industrial Automation projects will soon become users of widely available, low-cost, SBCs like the Raspberry Pi as the Industrial Internet of Things (IIoT) drives the need for lower-cost connectivity and data processing deeper and deeper into control systems architectures.

“Raspberry Pi modules offer flexible programming, customizable signal types and easy adaptation to existing installations — real benefits to the industrial world.” – ARC Advisory Group

Examples of Industry 4.0 IIoT applications are beginning to appear on the fringes of larger automation projects often fulfilling application spaces where traditional PLCs don't have the wide degree of functionality required to implement applications such as embedded vision systems or video processing for HDMI kiosk displays.

So the question isn't if, but when will “good enough” SBCs win in the industrial automation marketplace?

At WRC we're convinced that the Raspberry Pi and its SBC “cousins” can be valuable and reliable alternatives to well-established industrial controllers so we've equipped many of our I/O products with interfaces to these next generation open architecture SBCs to be ready for that eventuality.

In fact, dozens of control Systems Integrators and component suppliers are already using the embedded wireless capabilities of these low-cost SBCs to connect legacy industrial systems to the IIoT cloud and we expect to see these types of gateway IIoT applications continue to accelerate over the next few years.

As further evidence of this growing trend, as of March 2017, more than eight million IT experts and hobbyists around the world are known to be developing and modifying applications, devices, software and accessories for the Raspberry Pi family^[3] and there's no end in sight for the amount of growth this market leading hardware platform can experience.

So the question now becomes: how will this rapid growth in SBC applications impact your automation business and how can you best prepare to defend against or take advantage of this growth?

The following are WRC's observations and recommended best practices for leveraging open architecture SBCs and how your business can best prepare and prosper from the next big thing in Open Automation.

BEST PRACTICES FOR LEVERAGING OPEN ARCHETECTURE SBCs

For automation industry participants looking for ways to leverage (or compete against) these new SBC hardware platforms and the legions of global software developers adopting them as their small "engines of creation", WRC offers the following three tips to keep your business ahead of the pack.

TIP #1) RAMP UP SOFTWARE KNOWLEDGE

If you're not familiar with programming in Python or [Node Red](#) flows, now's the time to ramp up learning about all things software as well as everything related to [cloud computing](#) and the [Industrial Internet of Things](#).

Open architecture SBC platforms like the Raspberry Pi are creating a whole new generation of software developers using new software tools and development methods your automation business must understand in order to engage them.

Today's automation software developers aren't programming in ladder logic or function blocks. They're generating their control sequences and analytics algorithms in new programming languages and sharing their work with a global open source community of developers through open source repositories like [GitHub](#).

Future customers for your automation controllers, I/O and peripheral devices, will be talking about concepts such as "cloud connectors," "data lakes" and a [Hadoop](#) distributed file systems rather than PLC scan times and message rungs.

Identifying and understanding the software development tools and environments needed to support these new SBC platforms, and being

ready to talk about them with the next generation of engineers and customers who will be using them, will help prepare your business for the day when the market for your current product shifts to these new open automation hardware and software systems.

TIP #2) PACKAGE THE VALUE

Do you want fries with that? Do you want a protective case and car charger with your new iPhone? How about some I/O to go with that PLC?

Almost every market, from fast food restaurants to airlines, bundles products into packaged deals. Companies bundle because it's a cost-less form of R&D where new offerings can be added to their existing product portfolio with little effort, and consumers buy them because of the perceived value they believe they're getting when they purchase multiple items together.

Do you want fries with that? How about some I/O to go with that PLC? This same bundling strategy can work for automation suppliers

This same bundled "package of value" strategy can work for automation industry component suppliers when disruptive technologies like the Raspberry Pi are introduced into the marketplace.

For example, a sensor manufacture could bundle an I/O module, a Raspberry Pi module and LabVIEW software from National Instruments into a data acquisition package that allows them to sell more of their sensors.

In a similar fashion, an I/O manufacturer could bundle one of their I/O products with a Raspberry Pi module and sensors from a third-party partner to provide an easy to order kit that automation application developers could use to deliver completed solutions.

The key to using bundling as an effective marketing strategy is to develop what are called *mixed bundles* in which the items in the bundle can also be purchased individually. Market research has shown *pure bundles* in which the items can only be purchased together are less effective in generating long-term sales. [4]

TIP #3) LOOK FOR DISRUPTIVE CHANNELS

For existing automation industry suppliers looking to reach new customers with new disruptive products, the development and/or use of non-traditional, disruptive, channels is often required.

The term channel, as it's commonly used in business, typically refers to the wholesale and retail businesses that distribute and sell products. However, when launching and marketing new disruptive products, businesses need to think more broadly about what defines a channel.

A channel can be any entity that adds value or creates value around a disruptive product as it moves towards the hands of the end user.

When launching and marketing new disruptive products, businesses need to think more broadly about what defines a channel.

For example, an Architectural Engineering firm may be an indirect channel that causes a disruptive building automation product to come to the attention of commercial real estate developers; or a home audio system supplier may be the disruptive channel that introduces a new home security device into the home automation marketplace.^[5]

For automation industry participants looking for ways to “get into the game” with an Open Architecture SBC-based offering, exploring alternative, disruptive, channels (where the channel partner can move up-market into a higher margin product space) is the key to market disruption success.

If your disruptive product provides the fuel that partners in the disruptive channel need to move towards improved margins, then the energy of the disruptive channel will help your new product succeed.^[6]

And lastly, from a defensive perspective, when we talk about how automation industry disruptors like the Raspberry Pi will find their way into the hands of industrial equipment OEMs, Systems Integrators and End Users, existing automation industry suppliers must “keep an eye out” for these alternative channels as they already may be talking to your existing customers without your knowledge!

SUMMARY AND CONCLUSIONS

So is your business ready for the next big thing in Open Automation?

Automation industry suppliers and professionals must take the long-term view and begin educating themselves about these new SBC hardware platforms and their associated programming software now; even if it

appears that these “prototyping” and “hobbyist toy” platforms are not ready for commercial applications today.

Remember, “being forewarned is being forearmed.” A new control paradigm and ecosystem like the one built around the IBM PC during the 80s and 90s isn’t built in a quarter. The Raspberry Pi and its SBC cousins may not seem like a real threat today but they are gaining power and application adoption rapidly to the point where they day “good enough wins” may come sooner than you think.

ABOUT WRC

For over 25 years WRC has provided automation OEMs, Systems Integrators and End Users advanced Open Architecture Control & I/O technologies ranging from IEC 61499 Distributed Controllers to Communications Gateways and Industrial I/O on CAN Bus, DeviceNet™, EtherNet/IP™ and other open protocol networks. Whether you need a custom OEM design or a commercial-off-the-shelf (COTS) solution, WRC has the Open Control & I/O technologies you need. To find out more about what WRC can do for you, please visit WRCAkron.com

[1], [2] *The Raspberry Pi and other SBCs are the IBM PCs of our time. From educational project to industry disruptor.* By Alexandros Marinos, resin.io

[3] *Raspberry Pi meets Industrial Automation.* By Fabian Wanke, ARC Advisory Group

[4] *The Benefits of Bundling,* Yale School of Management

[5] *John Weisenberger,* ChainReactionsMarketing.com

[6] *The Innovator’s Solution.* By Clayton M. Christensen, Harvard Business School Press

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