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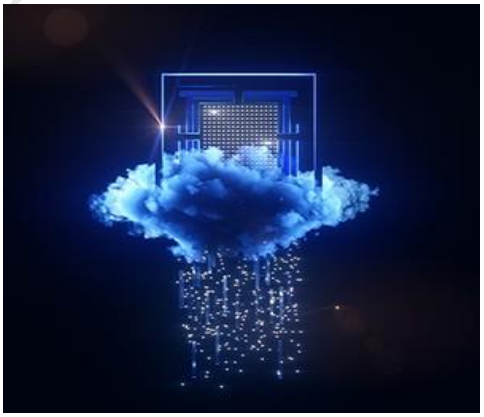
5 Top Technology Trends Reshaping the Digital Landscape

By: James Harmison



Technology has changed the world. This is not a controversial statement. From the plow to the printing press to the personal computer, advancing technology has the power to radically reshape the world and the ways we live. The many changes in the past decades have driven us to the point that some of the most transformative changes in our society are enabled by software. Digital transformation is not just a buzzword, it's a reality. 2023 has been a year of rapid change, with many dramatic new software-defined technologies making their way into businesses. In this article, we consider five particularly impactful developments and offer some predictions for 2024.

IT/OT convergence

The modernization of Operational Technology (OT) networks using principles from Information Technology (IT) has been on a dramatic rise. "Industry 4.0" is a term that has floated around for over a decade. Commonly used as a buzzword, it is an umbrella term for the use of automation and digital systems to manage physical processes in manufacturing and process control systems. By breaking down the barriers between IT and OT, manufacturers can embrace collaboration with new functionality and proactively strengthen and speed up operations, with the flexibility and intelligence to scale based on demand. This concept also includes things like Internet of Things (IoT) and computer vision.

Startups have been sprouting up using advanced manufacturing techniques with software-defined control systems that blend the physical and digital worlds (Think, e.g. collaborative robotics.) where humans and industrial robots can work side by side with computer vision and other sensor data driving its motion. Something new that we're seeing this year is many major industrial players rolling

out big changes to their processes rather than simple experiments. Some quick examples include Ford, Nestle, and ExxonMobil. In 2024, this will become the de facto norm as industrial organizations retool their manufacturing or process lines to enable software-defined control systems.

Generative AI

Obviously, artificial intelligence has to make the list. Generative AI, in particular, has become a catalyst empowering businesses to create, iterate, and optimize solutions to complex problems. With generative AI applications and the correct data, companies can explore more possibilities, minimize risk, optimize production, and automate tasks, leading to breakthrough solutions and cost savings. Large Language Models (LLMs) like OpenAI's ChatGPT and Google's Bard are already changing the world. Image generation models like Stable Diffusion are now inspiring new generations of creatives.

Many organizations are driving ahead to make it easy for you to build your own generative AI models, and some are working on tuning the open-source foundations of models like Llama2 to fit them to specific use cases. New use cases are still evolving, but early use cases include things like virtual assistants and support chat bots, tools for being more productive in doing things like writing business emails or sometimes even code, and better engagement in normal customer service interactions in e-commerce. Expect lots of exciting new use cases for generative AI beyond LLMs and cool pictures in 2024 as the field continues to mature and garners increasing commercial interest after a breakout year in 2023. Indeed, it has become difficult to imagine anything in the spectrum of human endeavor to which AI is not now or may not one day be applicable, and we are only at the beginning of the journey.

Multi/hybrid cloud complexity

As applications have grown to planet scale, the diversity of the infrastructures supporting them has exploded. This has prompted many teams to launch projects in the ecosystem to help manage the resulting complexities. Hashicorp's Terraform, and CNCF's Crossplane and Open Cluster Management projects have exploded in utilization and experimentation. None of the tools to help teams wrangle infrastructure, data, pipelines, and other complex abstractions from the cloud have been able to completely corral that complexity; however, they have all, in some ways, added their own flavor. Now that teams are dealing with these complex new abstractions hidden in the cloud, they are required to understand everything about how these tools work. In an ideal world, some of their pain and toil will force something to mature well enough to become very valuable. We don't know if one multi-cloud complexity wrangling tool will win in 2024, but we know that they'll all keep getting better and enable more cool use cases.

Edge computing security

Data gravity, the principle that as data gains volume, it also gains "mass" and draws elements of the overall software architecture closer to the site where data is generated or processed, has continued to drive modern architecture. This trend has forced applications to become more modular, enabling components of applications requiring low-latency or high-bandwidth access to data to be pushed to the network "edge." In 2023, the various trends mentioned above played into this bigger trend, requiring hybrid cloud architectures to respond to the data needs of applications, like AI needing direct access to data at the edge, which often means on the manufacturing or process floor. As an example, the U.S. Army has been doing "edge computing" for years, calling it the "Tactical Network,"

which allows for the rapid and reliable exchange of data at the point of need in contested environments. In edge computing, an increase in data and processing outside the traditional data center creates potential risk to organizations, as reduced physical security, a limited compute footprint, lower cost expectations, and remote management are often compounded by a lack of IT personnel. Security concerns are on the rise in this environment, as centralized control and distributed execution is the name of the game. Modern advances in theory around Zero Trust Networking are making it harder to understand the security impact, but standards such as FIDO Device Onboard (FDO) are helping to ensure a secure future for edge computing. Implementations have matured a lot in 2023 and we expect the market to mature much more in 2024.

Return from the cloud

Cloud computing has two particularly valuable use cases: organizations wanting to deliver a product fast without building up or hiring infrastructure expertise, and organizations that want to elastically scale their capacity to deliver to end users and customers. Cloud was promised to radically change the way organizations run their infrastructure, and some bought into the promise of infinite connectivity, infinite compute, and infinite storage. But there is a cost for such things, and cloud vendor bills for storing the massive amounts of data being fed into AI models have elicited hints of buyer's remorse. Some organizations are starting to explore the possibility of repatriating that data, bringing it back into their own data centers and using on-premise systems and expertise to manage it. There is a real cost, however, to moving large amounts of data from the cloud, so the best answer is one that allows letting data remain wherever it makes the most sense and without restricting the important work you need to do with it and making the problem worse. In 2024, more organizations will hone their “return from the cloud” skills in a way that drives new innovations while optimizing the costs of working with data, transferred and not.

The year in brief

Interestingly, all these trends share a common thread: They are all about data gravity and the methods by which we move data or the applications that need it around the network. Technology systems in place today can barely keep up with the burgeoning storage and use of data worldwide, and we are continuously finding new ways to process, move, and store information. Sparks of intense interest, whether individual or commercial, will bring new ideas to bear on the problem sets we are encountering and new software-defined systems that will meaningfully shape businesses, the infrastructure we run on, and the networks that tie all of those systems together. 2024 is definitely going to be an exciting year for innovation!