

FROST & SULLIVAN

*VOLTSERVER INC.*

**2022**  
**TECHNOLOGY**  
**INNOVATION**  
**LEADER**

*NORTH AMERICAN INTELLIGENT  
POWER DISTRIBUTION INDUSTRY*

## Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. VoltServer Inc. excels in many of the criteria in the intelligent power distribution space.

AWARD CRITERIA	
<i>Technology Leverage</i>	<i>Business Impact</i>
Commitment to Innovation	Financial Performance
Commitment to Creativity	Customer Acquisition
Stage Gate Efficiency	Operational Efficiency
Commercialization Success	Growth Potential
Application Diversity	Human Capital

### ***Commitment to Innovation and Commitment to Creativity***

Class 1 power circuits, such as Alternating Current (AC) power outlets, and Class 2 limited power circuits,

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*Frost & Sullivan is impressed with VoltServer’s ability, through its DE system, to distribute high power at long distances while maintaining safety that is comparable to limited power distribution networks.”*

**- Paritosh Doshi,  
Senior Research Analyst**

such as Power over Ethernet (PoE) are the two prevalent power distribution technologies. AC circuits can deliver high power; therefore, any faults during operation can result in fire and loss of life. Certified personnel are required to set up these circuits, and strict regulations must be followed. On the other hand, PoE is safe to operate, typically does not require certified personnel for setup, and are not heavily regulated by compliances; however, these systems only carry limited power. Even though PoE circuits have a 100-Watt (W) power limit, because of voltage drops in

wires, they typically provide only 75W to 90W of actual power to the load. PoE also has a distance limit of 100 meters due to the limit of the data connection.

Founded in 2011, US-based VoltServer Inc. developed its innovative Digital Electricity™ (DE)-based power distribution system with the following three main components: DE transmitter, structured cable, and DE receiver. This DE system takes in electricity from AC or direct current (DC) power sources, such as grid electricity, onsite generators, onsite renewable power plants, and batteries. The DE transmitter breaks the input electricity into hundreds of digital packets per second that are then distributed through structured cable. After sending each packet, the system carries out a safety check, wherein if any anomaly is detected, such as short circuit, resistive fault, human contact with the wire, or open circuit, the system will completely stop the power flow and will not send another packet of energy. Each packet contains only a small amount of energy, and when a fault occurs, the system limits the amount of energy to halt; therefore, DE is classified as a limited power source. DE can deliver thousands of watts of power but with the wiring practices of PoE; therefore, VoltServer's DE is well equipped to fill the gap between the two conventional extremes of high-powered, high-risk AC power circuits and low-powered, safe PoE.

Historically, AC power distribution circuits have not witnessed a strong uptake of technologies aimed at improving system safety. VoltServer's intelligent DE system, on the other hand, can monitor itself for faults and then take immediate action when any faults occur; therefore, the safety offered by this DE system is unprecedented in the global high power distribution industry. PoE's capabilities are limited to 100W of power and up to about 300 feet. DE, on the other hand, can deliver up to 1,000W of power over 1,400 feet, thus achieving superior cost efficiency, compared to PoE, when distance or power threshold requirements are higher than that of PoE's capability.

Frost & Sullivan is impressed with VoltServer's ability, through its DE system, to distribute high power at long distances while maintaining safety that is comparable to limited power distribution networks.

### ***Stage Gate Efficiency***

Conventionally, when buildings are powered with onsite renewable energy generators, such as solar panels or wind power, a DC-to-AC converter is used because onsite renewable power plants produce DC power, whereas buildings use AC power distribution systems; however, most modern electric devices, such as laptops, mobile phones, Internet of Things (IoT), and cameras, run on DC power. These devices use adapters to convert AC electricity from the plug to DC electricity. The adapters are manufactured with a primary focus on cost efficiency and are often energy inefficient, thus wasting a significant amount of energy. In this conventional infrastructure, despite the power generation source offering DC electricity and electric devices requiring DC electricity, the following two power conversions are made: once from DC to AC and then again from AC to DC. These power converters have a conversion efficiency of about 80 to 90%, resulting in significant energy losses.

VoltServer offers an alternative mechanism, where DC output from renewable power generators is converted to DE, which can be converted back to DC at demand centers. These DC-to-DE and DE-to-DC converters have an energy conversion efficiency of 95%. When transmission line loss is considered, VoltServer's DE distribution system will deliver an energy efficiency of 89 to 91%. This is compared to conventional systems that deliver an energy efficiency of about 85%. VoltServer's system, therefore, has the potential to transform electricity distribution systems for onsite renewable power generators.

Based on the energy efficiency advantages of the DE system, Hardee Fresh, an indoor farming company, contracted VoltServer to provide a power distribution solution. Hardee Fresh uses the most sustainable technologies to produce organic vegetables and thus powers its facility with 1.1 megawatts (MW) of solar panels and has deployed highly advanced IoT-based automation. Furthermore, Hardee Fresh consistently looks for automation technologies that can improve its operational efficiency. VoltServer's DE technology provides Hardee Fresh with a significantly more efficient power distribution infrastructure for distributing electricity from solar panels and energy storage systems to IoT devices, intense lighting devices, and other IT infrastructure. Furthermore, VoltServer's DE enables Hardee Fresh to achieve superior control of its lights and automation infrastructure. For example, when requirements for food produce change, Hardee Fresh can adjust the controls, lighting, and environment within seconds. This better control and flexibility have allowed Hardee Fresh to broaden its portfolio because it is now well equipped to grow any kind of leafy greens, herbs, and microgreens. VoltServer's solution, therefore, meets Hardee Fresh's three important requirements of higher energy efficiency, better control, and safer environment.

Frost & Sullivan commends VoltServer's ability to improve the operational efficiency, flexibility, and safety of its clients' operations.

### **Commercialization Success and Application Diversity**

VoltServer's DE solution can serve a wide range of applications, including telecom applications, such as wireless 4G and 5G, PoE switches, IoT cameras, powering and communicating IoT devices that are located too far for PoEs to manage, and indoor agriculture. With its combination of broad applicability and superior performance within a short period since inception, the company is already powering over a thousand venues, including airports, such as Los Angeles International Airport; stadiums, such as Mercedes-Benz stadium in Atlanta; office towers, such as the 108-story Willis Tower in Chicago; Circa

Resort & Casino in Las Vegas; and historical buildings, such as the Hotel Marcel in New Haven, Connecticut.

*"Application diversity and the ability to provide high-performing and cost-efficient solutions, where conventional solutions fail, are the main drivers behind VoltServer's success."*

**- Paritosh Doshi,  
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4G and 5G radios often have electricity demands well beyond PoE capabilities. When 4G and 5G connections are required in old buildings, stadiums, and open-area structures, such as marquees, AC plugs at deployment sites of 4G and 5G radios may be unavailable. In these cases, separate AC cables are deployed in addition to

fiber optic cables for data. The fiber and AC power must be physically isolated in different pathways through the venue and typically require 2 separate contractors, thus incurring additional costs and resources. VoltServer's DE system can use the pathways and contractors as fiber, and they can even share the same cable, known as hybrid cable. This allows a single contractor to install a single cable that delivers high bandwidth data via fiber and significant power via DE. Therefore, in these cases, VoltServer offers a more capable and cost-competitive solution than traditional AC or PoE.

One of VoltServer's major projects was at the Long Island Railroad Jamaica Station, which is the fourth-busiest station in North America. During weekdays, ridership for this station exceeds 20,000 passengers, and the station has congested urban spaces, concrete infrastructure barriers, and underground platforms. A large number of radios were needed to equip this station with high-performing 4G and 5G connectivity. The station, however, has six platforms with thousands of square feet of area to be covered.

The conventional approach of branching off power from AC mains would have been expensive and time-consuming; therefore, the customer chose VoltServer's DE solution to provide minimally invasive, cost-efficient, and time-efficient power distribution to power a large network of 4G and 5G radios. In addition, DE powers public Wi-Fi access points on the same DE platform. As a result, the Long Island Railroad Jamaica Station now offers unparalleled network connectivity without any dead zones in the station.

Frost & Sullivan believes that application diversity and the ability to provide high-performing and cost-efficient solutions, where conventional solutions fail, are the main drivers behind VoltServer's success.

### ***Growth Potential***

VoltServer's biggest challenge is the lack of awareness of its technology among the general public and in the commercial sector. The main competing technology for the company's DE is AC circuits, which are highly commoditized; therefore, for most electric power distribution applications, AC circuits become the natural choice for most users.

The National Electric Code (NEC) in the United States plans to adopt the new Class 4 electric code by 2023. Class 4 circuits comprise fault-managed power systems (FMPS) that can continuously monitor faults and control the power current to limit the fault energy. FMPs are not power limited and can deliver hundreds or even thousands of watts of power. VoltServer's DE technology is a perfect fit for the Class 4 code and is one of the biggest driving forces behind the introduction of this new class. Following the introduction of Class 4, VoltServer's DE technology will likely be among the first technologies to be listed in this class, allowing VoltServer to gain more recognition and address its biggest challenge of lack of awareness.

In addition, VoltServer is increasing the awareness of its DE system by working with a number of information, communication, and technology (ICT) training service providers and the National Electrical Contractors Association (NECA) and by taking part in ICT and clean energy conventions to educate electricians and industry personnel about DE and the Class 4 electric code.

The three classes of EV charging are level 1, level 2, and level 3. Level 1 EV chargers that have a 120-V capacity and are compatible with any ubiquitous household outlet. Level 2 has a 240-V capacity and is designed for charging inside the household or at remote charging stations. Level 3 is the fastest charging method and uses DC electricity for charging. In the future, the company plans to develop its DE infrastructure to be used for level 2 and level 3 EV chargers, and its long-term vision is to replace the entire AC distribution infrastructure with safer DE infrastructure.

Frost & Sullivan believes that VoltServer's active efforts and favorable regulatory policies will likely drive the company's short-term growth, while its research and development will ensure it maintains a high growth trajectory over the long term.

## Conclusion

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AC power distribution circuits have not witnessed a strong uptake of technologies aimed at improving system safety. Instead, strict and expensive installation regulations are required to ensure safety. VoltServer's DE system, on the other hand, is an intelligent system that can monitor itself for faults and then take immediate action when any faults occur. The safety offered by VoltServer's DE system, therefore, is unprecedented in the high-power distribution industry.

VoltServer's DE system can deliver thousands of watts of power but with the wiring practices of PoE; therefore, the company's technology is well equipped to fill the gap between the two conventional extremes of high-powered, high-risk AC power circuits and low powered, safe PoE.

VoltServer's DE system serves a wide range of applications, including indoor agriculture to power controls, sensors and LED grow lighting, telecom applications, such as Wi-Fi, and wireless 4G/5G, and In-building applications such as PoE switches, security cameras and building controls for powering and communicating with IoT devices that are too load intensive or located too far for PoE to support. VoltServer's DE solutions, therefore, offer application diversity and the ability to provide high-performing and cost-efficient solutions, where conventional solutions fail, which are the main drivers behind VoltServer's success.

For its strong overall performance, VoltServer Inc earns Frost & Sullivan's 2022 North American Technology Innovation Leadership Award in the intelligent power distribution industry.

## What You Need to Know about the Technology Innovation Leadership Recognition

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Frost & Sullivan's Technology Innovation Leadership Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

### Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

#### *Technology Leverage*

**Commitment to Innovation:** Continuous emerging technology adoption and creation enables new product development and enhances product performance

**Commitment to Creativity:** Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

**Stage Gate Efficiency:** Technology adoption enhances the stage gate process for launching new products and solutions

**Commercialization Success:** Company displays a proven track record of taking new technologies to market with a high success rate

**Application Diversity:** Company develops and/or integrates technology that serves multiple applications and multiple environments

#### *Business Impact*

**Financial Performance:** Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

**Customer Acquisition:** Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

**Operational Efficiency:** Company staff performs assigned tasks productively, quickly, and to a high-quality standard

**Growth Potential:** Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

**Human Capital:** Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

## About Frost & Sullivan

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## The Growth Pipeline Engine™

Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.

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### Key Impacts:

- **Growth Pipeline:** Continuous Flow of Growth Opportunities
- **Growth Strategies:** Proven Best Practices
- **Innovation Culture:** Optimized Customer Experience
- **ROI & Margin:** Implementation Excellence
- **Transformational Growth:** Industry Leadership



## The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

### Analytical Perspectives:

- **Mega Trend (MT)**
- **Business Model (BM)**
- **Technology (TE)**
- **Industries (IN)**
- **Customer (CU)**
- **Geographies (GE)**

