

**WinterGreen Research, INC.**

3

**Sea Change Series: Orchestration Software in the Mega Data Center**

**Mega Data Center Depends on Orchestration Software to Control Operations,  
Implement Microservices**



**WinterGreen Research, Inc.**

**Lexington, Massachusetts**

[www.wintergreenresearch.com](http://www.wintergreenresearch.com)

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REPORT # SH27005197

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75 TABLES AND FIGURES

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### **Abstract: Orchestration Software Automates Data Center Infrastructure**

The four superstar companies that are able to leverage IT to achieve growth, Microsoft, Google, Facebook, and the leader AWS all use Clos architecture. What is significant is that systems have to hit a certain scale before Clos networks work. Clos networks are what work now for flexibility and supporting innovation in an affordable manner. Orchestration software is used to create the infrastructure and application layers in the data center. Orchestration software supports nonblocking architecture so that any node can communicate with any other node.

### **About the Sea Change Series:**

Sea Change Series from WinterGreen Research is targeted to C-Level Executives and addresses mammoth change in some market. This study is one of the data center Sea Change series of 25 modules that address the changes coming as enterprise data centers become obsolete and are replaced not just by cloud computing, but by mega data center cloud computing as is currently configured by Amazon Web Services, Google, and Microsoft.

Category 5 Ethernet cable is spread throughout the existing enterprise data centers and utilized by the servers that achieve data communications using that cable. The servers and cable are a problem, the cable is too slow to handle all the data coming at us in the new digital age, and the associated technology that operates at Ethernet category 5 cable speeds is too slow as well, this is why the entire set of existing enterprise data centers is a bottleneck.

## **CHECK OUT THESE KEY TOPICS**

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**As More Digital Data is Generated and Processed, Business Systems Move to the Cloud, But Not All Cloud is the Same, Mega Data Centers Provide Economies of Scale**

**Orchestration Software In The Mega Data Center**  
Realign IT Cost Structure  
Mega Datacenter Physical Infrastructure  
Automation of Mega Data Center  
Networking Fabric  
Exchange Of Data Between Servers  
Complex Automation Of Process  
Applications Customized For Each User  
Machine-To-Machine  
Management of Traffic Growth  
Fabric Network Topology  
Building-Wide Connectivity  
Highly Modular Data Center Design

**Scale Capacity**  
Back-End Service Tiers  
Applications Scaling  
Mega Data Center Network Fabric  
Next-Generation Data Center Network Design  
Pod Unit of Network  
Mega Data Center Server Pods  
Non-Blocking Network Architecture  
Data Center Auto Discovery  
Large-Scale Network  
Rapid Deployment  
Architecture  
Expedites Provisioning And Changes  
Programmable Access To Network Stack

**Software Defined Networking (SDN)-Supports Scale and Automation**  
Compute Engine Load Balancing  
Load Balanced Requests Architecture  
Scale-Out: Server And Storage Expansion  
Switches and Routers  
Deployed in Fabrics  
Mega Data Center  
Multipathing  
Routing Destinations  
Clos Topology Network  
Capacity Scalability  
Aggregation Switches  
Intelligent Cloud Platform  
Linux For Azure

**Mega Data Center Scale to 100,000 Processors and 100,001 Switches Market Analysis:**

**Orchestration Software Automates Data Center Infrastructure**

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LEXINGTON, Massachusetts (April 25, 2017) – The 2017 module has 115 pages and 74 tables and figures. Orchestration Software in the Mega Data Center is used to tie a fabric architecture together that fills up an entire building with 100,000 processors and 100,001 switches. The mega data center described in the study is effective because it leverages the economies of scale. This orchestration software infrastructure study module is part of a longer study that addresses the business issues connected with data center modernization. There are 26 module parts to the larger study comprised of detailed analysis of how new infrastructure layers will work to support management of vast quantities of data.

Business growth depends on technology spending. Intelligent, automated process, not manual labor systems are what speed business growth. We have had the situation in the data center where 93% of spending is just to keep current systems running, many of those plagued with manual input. Mega data centers change that pattern of IT manual process.

The Internet has grown by a factor of 100 over the past 10 years. To accommodate that growth, mega data centers have evolved to provide processing at scale. Facebook for one, has increased the corporate data center compute capacity by a factor of 1,000, virtually eliminating much manual process. Orchestration software is a key aspect of that process. To meet future demands on the Internet over the next 10 years, companies with that capacity need to increase capacity by the same amount again while the other companies struggle to catch up. Nobody really knows how to get to increasing compute capacity by another factor of 1,000.

Business growth depends on technology spending. Intelligent, automated process, not manual labor systems are what speed business growth. We have had the situation in the data center where 93% of spending is just to keep current systems running, many of those plagued with manual input. Mega data centers change that pattern of IT manual process.

Realigning data center cost structures is a core job of orchestration software. The enterprise data centers and many cloud infrastructure operations all have similar problems of being mired in administrative expense. Containers address that issue by creating vastly more efficient operations for data center infrastructure.

According to Susan Eustis, lead author of the team that prepared the study, “The only way to realign cost structure is to automate infrastructure management and orchestration. Mega data centers automate server and connectivity management using orchestration software to manage multiple application containers. Other systems automate switching and storage, along with hypervisor, operating system, and virtual machine provisioning. “

As IT relies more on virtualization and cloud mega data center computing, the physical infrastructure is flexible and agile enough to support the virtual infrastructure. Comprehensive infrastructure management and orchestration is essential.

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The Enterprise Data Center has become a bottleneck, it needs to be completely replaced. Category 5 and Category 6 Ethernet cable is spread throughout the existing enterprise data centers and is too slow to handle all the digital data coming through the data center. Cat 5 and Cat 6 Ethernet utilized by the servers to achieve data transport using that cable does not keep up with the data coming through the data center the way optical cable and optical transceivers do.

The existing servers and cable are a problem because they are too slow for modern systems. The cable is too slow to handle all the data coming at us in the new digital age, and the associated technology that operates at Ethernet category 5 and category 6 cable speeds is too slow as well, this is why the entire set of existing enterprise data centers is a bottleneck.

Mobile data traffic is set to increase by a factor of eight between 2015 and 2020. Growth is anticipated at 53 percent per year, faster than systems revenue or industry revenue.

The theme of this study is that the pace of data expansion creates the need for more modern means of managing data. There are some companies that are doing a better job, better than others of adapting to IT infrastructure to the wild influx of data.

The four superstar companies that are able to leverage IT to achieve growth, Microsoft, Google, Facebook, and the leader AWS all use Clos architecture. What is significant is that systems have to hit a certain scale before Clos networks work. Clos networks are what work now for flexibility and supporting innovation in an affordable manner. There is no dipping your toe in to try the system to see if it will work, it will not and then the IT says, "We tried that, we failed," but what the executive needs to understand is that scale matters. A little mega data center does not exist. Only scale works.

Many companies are using digital technology to create market disruption. Amazon, Uber, Google, IBM, and Microsoft represent companies using effective strategic positioning that protects the security of the data. As entire industries shift to the digital world, once buoyant companies are threatened with disappearing. A digital transformation represents an approach that enables organizations to drive changes in their business models and ecosystems leveraging cloud computing, and not just hyperscale systems but leveraging mega data centers. Just as robots make work more automated, so also cloud based communications systems implement the IoT digital connectivity transformation.

WinterGreen Research is an independent research organization funded by the sale of market research studies all over the world and by the implementation of ROI models that are used to calculate the total cost of ownership of equipment, services, and software. The company has 35 distributors worldwide, including

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Global Information Info Shop, Market Research.com, Research and Markets, electronics.ca, and Thompson Financial. It conducts its business with integrity.

The increasingly global nature of science, technology and engineering is a reflection of the implementation of the globally integrated enterprise. Customers trust wintergreen research to work alongside them to ensure the success of the participation in a particular market segment.

WinterGreen Research supports various market segment programs; provides trusted technical services to the marketing departments. It carries out accurate market share and forecast analysis services for a range of commercial and government customers globally. These are all vital market research support solutions requiring trust and integrity.

Key words: Scale In The Mega Data Center , Realign IT Cost Structure, Mega Datacenter Physical Infrastructure, Automation of Mega Data Center , Networking Fabric, Exchange Of Data Between Servers , Complex Automation Of Process, Applications Customized For Each User, Machine-To-Machine Management of Traffic Growth, Fabric Network Topology, Building-Wide Connectivity, Highly Modular Data Center Design , Scale Capacity, Back-End Service Tiers , Applications Scaling , Mega Data Center Network, Fabric Next-Generation Data Center Network Design, Pod Unit of Network, Mega Data Center Server Pods, Non-Blocking Network Architecture, Data Center Auto Discovery, Large-Scale Network, Rapid Deployment Architecture, Expedites Provisioning And Changes, Programmable Access To Network Stack , Software Defined Networking (SDN)-Supports Scale and Automation, Compute Engine Load Balancing, Load Balanced Requests Architecture, Scale-Out: Server And Storage Expansion, Switches and Routers Deployed in Fabrics, Mega Data Center Multi-pathing, Routing Destinations, Clos Topology Network , Capacity Scalability, Aggregation Switches, Intelligent Cloud Platform, Linux For Azure,

## Companies Profiled

### Market Leaders

Amazon  
Microsoft

Google  
Facebook

## Orchestration Software Automates Data Center Infrastructure

### Report Methodology

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This is the 700th report in a series of primary market research reports that provide senior executive analysis in communications, telecommunications, the Internet, computer, software, telephone equipment, health equipment, and energy. Automated process and significant growth potential are a priority in topic selection. The project leaders take direct responsibility for writing and preparing each report. They have significant experience preparing industry studies. They are supported by a team, each person with specific research tasks and proprietary automated process database analytics. Forecasts are based on primary research and proprietary data bases.

The primary research is conducted by talking to customers, distributors and companies. The survey data is not enough to make accurate assessment of market size, so WinterGreen Research looks at the value of shipments and the average price to achieve market assessments. Our track record in achieving accuracy is unsurpassed in the industry. We are known for being able to develop accurate market shares and projections. This is our specialty.

The analyst process is concentrated on getting good market numbers. This process involves looking at the markets from several different perspectives, including vendor shipments. The interview process is an essential aspect as well. We do have a lot of granular analysis of the different shipments by vendor in the study and addenda prepared after the study was published if that is appropriate.

Forecasts reflect analysis of the market trends in the segment and related segments. Unit and dollar shipments are analyzed through consideration of dollar volume of each market participant in the segment. Installed base analysis and unit analysis is based on interviews and an information search. Market share analysis includes conversations with key customers of products, industry segment leaders, marketing directors, distributors, leading market participants, opinion leaders, and companies seeking to develop measurable market share.

Over 200 in depth interviews are conducted for each report with a broad range of key participants and industry leaders in the market segment. We establish accurate market forecasts based on economic and market conditions as a base. Use input/output ratios, flow charts, and other economic methods to quantify data. Use in-house analysts who meet stringent quality standards.

Interviewing key industry participants, experts and end-users is a central part of the study. Our research includes access to large proprietary databases. Literature search includes analysis of trade publications, government reports, and corporate literature.

Findings and conclusions of this report are based on information gathered from industry sources, including manufacturers, distributors, partners, opinion leaders, and users. Interview data was combined with information gathered through an extensive review of internet and printed sources such as trade publications,

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trade associations, company literature, and online databases. The projections contained in this report are checked from top down and bottom up analysis to be sure there is congruence from that perspective.

The base year for analysis and projection is 2011. With 2011 and several years prior to and after that as a baseline, market projections were developed for 2017 through 2023 available in the market research on this topic. These projections are based on a combination of a consensus among the opinion leader contacts interviewed combined with understanding of the key market drivers and their impact from a historical and analytical perspective.

The analytical methodologies used to generate the market estimates are based on penetration analyses, similar market analyses, and delta calculations to supplement independent and dependent variable analysis. All analyses are displaying selected descriptions of products and services.

This research includes referencde to an ROI model that is part of a series that provides IT systems financial planners access to information that supports analysis of all the numbers that impact management of a product launch or large and complex data center. The methodology used in the models relates to having a sophisticated analytical technique for understanding the impact of workload on processor consumption and cost.

WinterGreen Research has looked at the metrics and independent research to develop assumptions that reflect the actual anticipated usage and cost of systems. Comparative analyses reflect the input of these values into models.

The variables and assumptions provided in the market research study and the ROI models are based on extensive experience in providing research to large enterprise organizations and data centers. The ROI models are useful for comparing products from different manufacturers, for example servers from different manufacturers, Systems z models from IBM, and labor costs by category around the world.

This information has been developed from WinterGreen research proprietary data bases constructed as a result of preparing market research studies that address the software, energy, healthcare, telecommunications, and hardware businesses.

### YOU MUST HAVE THIS STUDY

#### Orchestration Software Automates Data Center Infrastructure

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### Orchestration Software: Executive Summary

The study is designed to give a comprehensive overview of the Orchestration Software: Data Center automation market segment. Research represents a selection from the mountains of data available of the most relevant and cogent market materials, with selections made by the most senior analysts. Commentary on every aspect of the market from independent analysts creates an independent perspective in the evaluation of the market. In this manner the study presents a comprehensive overview of what is going on in this market, assisting managers with designing market strategies likely to succeed.

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## ABOUT THE COMPANY

**WinterGreen Research**, research strategy relates to identifying market trends through reading and interviewing opinion leaders. By using analysis of published materials, interview material, private research, detailed research, social network materials, blogs, and electronic analytics, the market size, shares, and trends are identified. Analysis of the published materials and interviews permits WinterGreen Research senior analysts to learn a lot more about markets. Discovering, tracking, and thinking about market trends is a high priority at WinterGreen Research. As with all research, the value proposition for competitive analysis comes from intellectual input.

**WinterGreen Research**, founded in 1985, provides strategic market assessments in telecommunications, communications equipment, health care, Software, Internet, Energy Generation, Energy Storage, Renewable energy, and advanced computer technology. Industry reports focus on opportunities that expand existing markets or develop major new markets. The reports access new product and service positioning strategies, new and evolving technologies, and technological impact on products, services, and markets. Innovation that drives markets is explored. Market shares are provided. Leading market participants are profiled, and their marketing strategies, acquisitions, and strategic alliances are discussed. The principals of WinterGreen Research have been involved in analysis and forecasting of international business opportunities in telecommunications and advanced computer technology markets for over 30 years.

The studies provide primary analytical insight about the market participants. By publishing material relevant to the positioning of each company, readers can look at the basis for analysis. By providing descriptions of each major

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participant in the market, the reader is not dependent on analyst assumptions, the information backing the assumptions is provided, permitting readers to examine the basis for the conclusions.

WinterGreen Research is positioned to help customers facing challenges that define the modern enterprises. The increasingly global nature of science, technology and engineering is a reflection of the implementation of the globally integrated enterprise. Customers trust wintergreen research to work alongside them to ensure the success of the participation in a particular market segment.

WinterGreen Research supports various market segment programs; provides trusted technical services to the marketing departments. It carries out accurate market share and forecast analysis services for a range of commercial and government customers globally. These are all vital market research support solutions requiring trust and integrity.

### ABOUT THE PRINCIPAL AUTHOR

**Susan Eustis**, President, co-founder of WinterGreen Research is a senior analyst. She has done research in healthcare, communications and computer markets and applications. She has written about computer assisted coding and participated in the research on that topic for the past seven years. She holds several patents in microcomputing and parallel processing. She has the original patents in electronic voting machines. She has new patent applications in format varying, mulit-processing, and electronic voting. She is the author of recent studies of the Internet, Mega Data Centers, Cloud computing, Surgical Robots, drones, Agricultural robots, Industrial robots, Solar Renewable Energy, Wind Energy, Thin Film Batteries, Business Process Management marketing strategies, Internet equipment, biometrics, a study of Internet Equipment, Worldwide Telecommunications Equipment, Top Ten Telecommunications, Digital Loop Carrier, Web Hosting, Web Services, and Application Integration markets. The company wrote the first Internet study. They are experts in oxygen markets. Ms. Eustis is a graduate of Barnard College. Worldwide Who's Who named her Top Female CEO of 2012, 2013, 2014, 2015, 2016.

**About the WinterGreen Research Team:** The WinterGreen Research Team is comprised of senior analysts that prepare the market research and analysis that is offered to the client and developed using an iterative process to achieve a final study. Typical projects include providing market/viability research. The team can look at how drones can be applied to critical infrastructures safety, including: type of market existing, Barriers, Forecast demand and competitors, SWOT and competitive advantages, Price Analysis, product design recommendations (marketing orientation).

Research is typically for many different regions or localities, for example EU countries including Spain, UK, Nordic, Germany, and France. Typical projects profile the United States and areas of Asia. It is common to three representative

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countries from South America, Brazil, Argentina, Chile, and Mexico. Representative countries from Asia APAC typically include Japan, China, India, and Australia.

Critical infrastructure safety, including: type of market existing, barriers to entry and to faithful execution of product provision, forecast of demand, market share, SWOT, competitive advantage of major competitors, identification of new technologies and new companies, price performance analysis, product design recommendations, and marketing considerations are typical topics covered.

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