

F R O S T & S U L L I V A N

**Mega
Trends**

Defining Our Future:
Are You Ready?

Strategic Opportunity Analysis of the Global Smart City Market

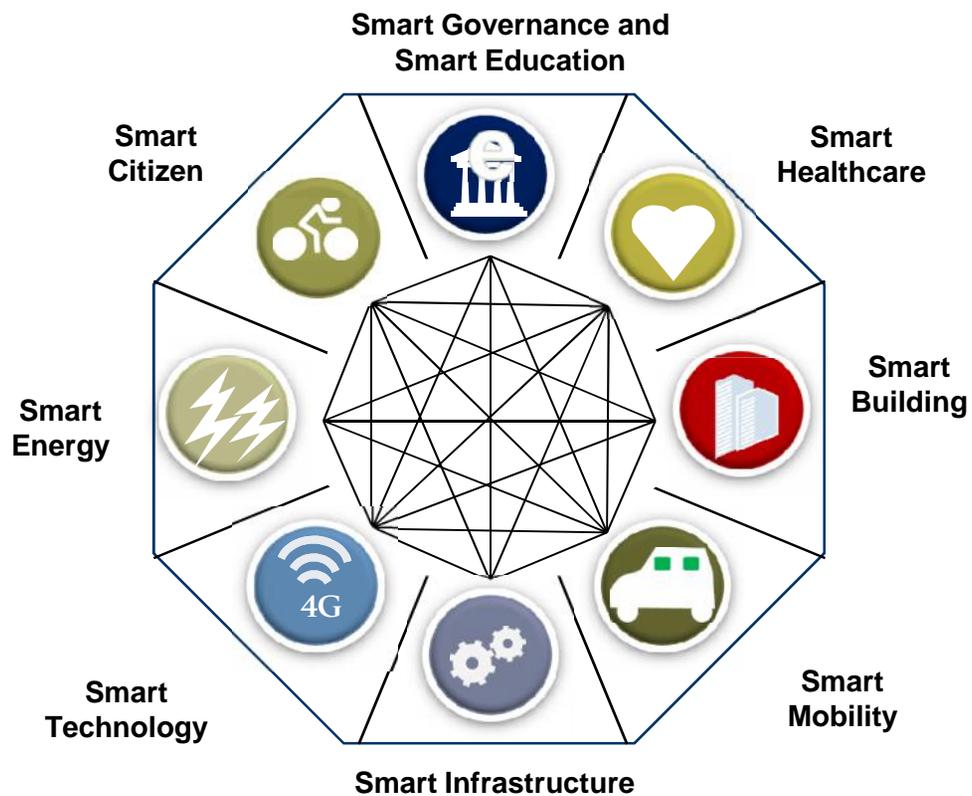
Smart City Market is Likely to be Worth a Cumulative \$1.565 Trillion by 2020

**M920-MT
August 2013**

Definition of Smart Cities

Smart cities are cities built on 'Smart' and 'Intelligent' solutions and technology that will lead to the adoption of at least 5 of the 8 following smart parameters—smart energy, smart building, smart mobility, smart healthcare, smart infrastructure, smart technology, smart governance and smart education, smart citizen

Smart City Concepts



Note: Smart Security is included as a part of Smart Infrastructure segment in this illustration.

Source: Frost & Sullivan

Key Parameters that will Define a Smart City in 2020

Smart Energy: Digital Management of Energy



- Smart grids
- Smart meters
- Intelligent energy storage

Smart Buildings: Automated Intelligent Buildings



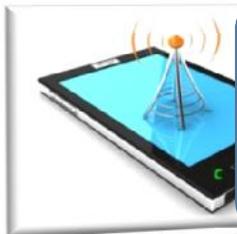
- Building Automation
- Intelligent Buildings: Advanced HVAC, Lighting Equipment

Smart Mobility: Intelligent Mobility



- Advanced traffic management system (ATMS)
- Parking management
- ITS-enabled transportation pricing system

Smart Technology*: Seamless Connectivity



- 4G connectivity
- Super broadband
- Free Wi-Fi
- 1Gbps download speeds

Smart Infrastructure: Digital Management of Infrastructure



- Sensor networks
- Digital water and waste management

Smart Governance and Smart Education: Government-on-the-Go



- eGovernment
- eEducation
- Disaster management solutions

Smart Healthcare: Intelligent Healthcare Technology



- Use of eHealth and mHealth systems
- Intelligent and connected medical devices

Smart Citizen*: Civic Digital Natives



- Use of green mobility options
- Smart lifestyle choices

Smart Security: Next Generation 911



- Surveillance
- Biometrics
- Simulation modeling and crime protection
- C2 and response

*Smart citizen and smart technology are integrated and not covered separately in this analysis.
Source: Frost & Sullivan

Executive Summary—Key Findings of the Study

Smart City Market: Key Take Aways, Global, 2011–2025

- 1** Around 26 global cities and more than 90 sustainable cities are to developed by 2025. Around 50% of these smart cities will be from North America and Europe.
- 2** The smart city market will be valued at \$1.565 trillion in 2020. Out of this share, 24.6% of projects is likely to be in the smart governance and smart education segment.
- 3** The need for complex and integrated citywide solutions will drive and foster convergence in the smart city space. Companies will actively partner and converge with other players in the smart city ecosystem to create and offer intelligent services. Convergence between pure-play product vendors, networking companies, and system integrators will create the most smart solutions in the market.
- 4** As cities evolve into clusters of smart communities, the importance of ICT participants will increase as a fresh league of such companies begin to participate in areas, such as smart energy, industrial automation, and building technology that were previously not envisioned by traditional leaders in these spaces. Similarly, utility providers will begin to compete with telecom providers while deploying ICT network within a city.
- 5** Smart cities will be measured on the level of intelligence and integration of infrastructure connecting sectors of healthcare, energy, buildings, transportation, and governance. The construction of this ICT network will have 4 main models: BOO, BOT, BOM, and Open Network.

Source: Frost & Sullivan

Executive Summary—Key Findings of the Study (continued)

Smart City Market: Key Take Aways, Global, 2011–2025

- 6 The smart energy segment will witness the highest growth rate by 2020. With a CAGR of 25.2%, the market is anticipated to be valued at \$248.36 billion, constituting 15.8% of the global smart city market.
- 7 Smart mobility solutions are likely to be in high demand in the next 15 years. Latin America, Middle East and Africa, and Central and Eastern Europe will be the growing segments, at 45.8%, 39.1%, and 31.4%, respectively, by 2025.
- 8 eServices to Citizens, such as ePayments, eExchange, eSharing, etc., will empower citizens with real-time access to personal data and related services. More than 60% of citizens of smart cities will have full access to eServices in the next 10 years.
- 9 All smart city market participants will assume one or more of the four main roles in the ecosystem: integrators (the end-to-end service provider); network operators (the M2M and connectivity providers); product vendors (hardware and asset providers); and managed service providers (third-party providers overseeing management/operation of smart solutions/services).
- 10 The pace of smart city market development will depend on how quickly companies converge and tap into each other's industry value chains. In addition to identifying best partners, the first mover advantage in offering integrated solutions to city governments will also become vital as cities look for centralized operation centres. Cloud-based smart city services, in this context, will become imperative.

Source: Frost & Sullivan

Executive Summary—Comparative Analysis of Smart City Solution Providers

Smart City Solution Providers, Global, 2012

Company	Smart Energy	Smart Healthcare	Smart Building	Smart Mobility	Smart Infrastructure	Smart Governance and Smart Education	Smart Security
IBM	Medium	High	Medium	High	High	High	High
GE	High	High	High	High	Medium	Low	High
ABB	High	Low	High	High	Medium	Low	Medium
Schneider Electric	High	Low	High	High	High	Low	Low
Siemens AG	High	High	High	High	High	Low	Low
Cisco	Medium	High	Medium	Medium	High	High	High
Accenture	Medium	Medium	Medium	Medium	Low	Medium	Medium
Oracle	Low	High	Low	Medium	Medium	High	High
Ericsson	Medium	High	Low	Medium	Medium	High	Medium

 High
  Medium
  Low

Source: Frost & Sullivan

Executive Summary—Sustainable and Eco-Cities in 2025

Global Snapshot of Sustainable and Eco-Cities in 2025

■ Sustainable or eco-city in 2025

○ Sustainable or eco-city built from scratch



Note: Eco-cities are cities built on a green initiative, from buildings to transport, governance, city planning, energy, and technology. These cities are either upgraded or built from scratch.

Source: Siemens Green Index; Frost & Sullivan

Executive Summary—Types of Smart City Participants

There are four different roles smart city participants can take.

1 Integrators



Smart city integrators are project integrators that bring together various sectors of the smart city through pre-packaged platforms, thereby providing a unified, holistic, and end-to-end integration of multiple sectors.

Example: IBM, Oracle, Accenture

2 Network Service Providers



Smart city network providers offer collaborative networks, data analytics and enterprise working solutions that connect people, assets, systems and products by leveraging on their networking and M2M capabilities.

Example: Cisco, Verizon, Ericsson, AT&T

3 Pure-Play Product Vendors



Smart city product vendors provide 'hard assets,' such as smart meters and distribution devices (e.g., automated switches, controllers for capacitor banks and voltage regulators) that operate as the main nodes of connectivity.

Example: Eaton, Honeywell, ABB, Schneider Electric, Siemens AG

4 Managed Service Providers



Smart city managed service providers offer round-the-clock monitoring, complete management, compliance monitoring, and on-site consulting. These services are provided either in house, co-managed, or are completely outsourced (third-party providers).

Example: IBM, Serco, SAIC, Infosys

Source: Frost & Sullivan

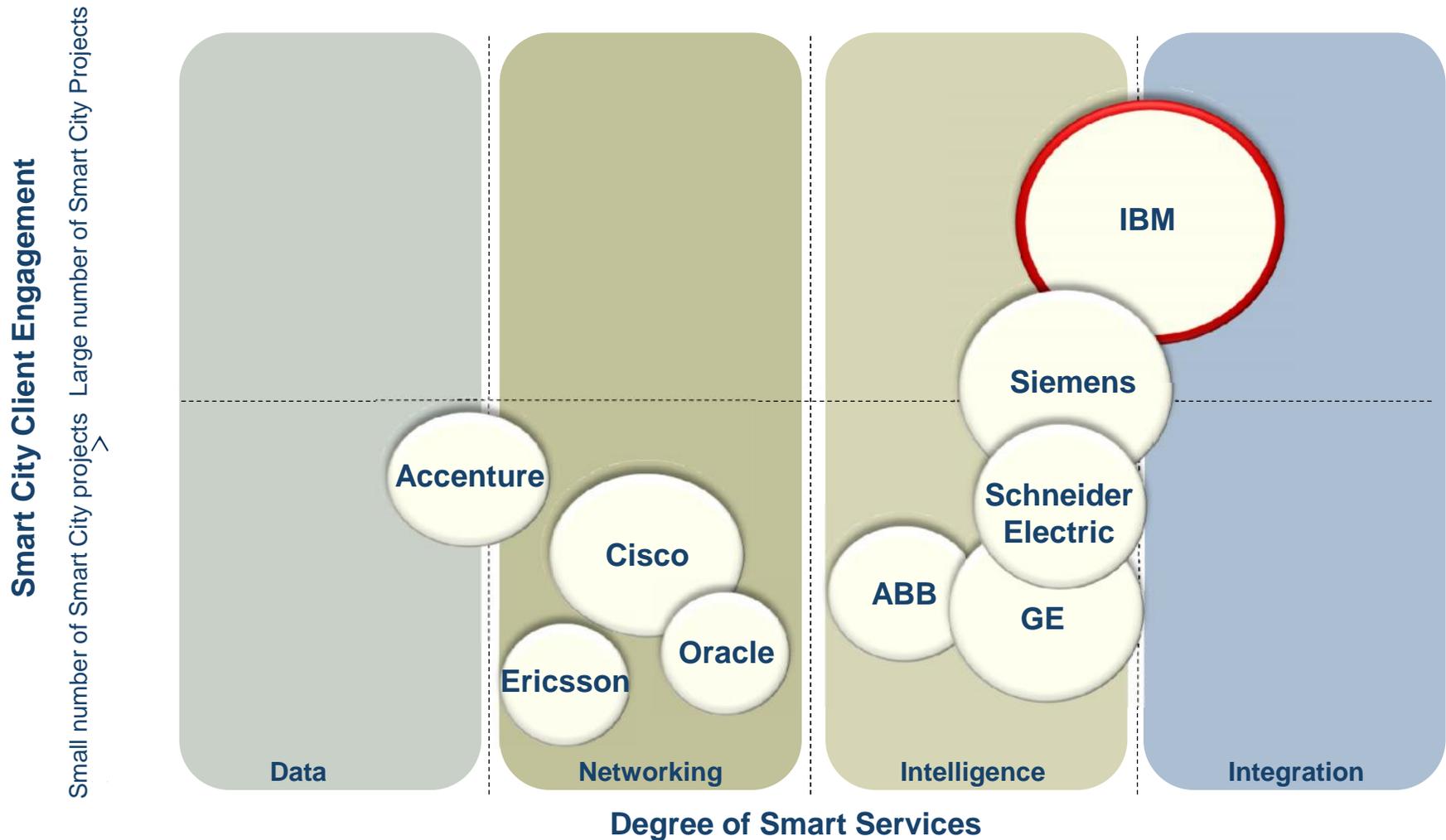
Executive Summary—Smart City Participants and Typical Suite of Solutions (Examples)*

Integrators	Network Service Providers	Pure-Play Product Vendors	Managed Service Providers
Software Focused	Communication Focused	Infrastructure Focused	Operations Focused
<ul style="list-style-type: none"> • Enterprise resource planning for municipalities and governments • Central operations centers • Smart city consulting—reference architecture and framework planning • Big data smart city analytics • Cloud-based smart city services 	<ul style="list-style-type: none"> • Networking equipment, such as routers, switches, SIM chips • Geographical information systems • Remote access and monitoring • Wireless area network • M2M big data analytics and consulting • Unified communication 	<ul style="list-style-type: none"> • Smart devices and control systems • Sensors • Smart meters • Power and automation technologies • Turnkey substations • Utility hardware and software • Smart parking infrastructure • Mobility integration and parking infrastructure 	<ul style="list-style-type: none"> • Monitoring and management of smart-city-related IT infrastructure • Prevention, detection, and reporting of security threats • Feature solutions for premises, cloud, and hybrid environments • Support in-house, co-managed, and outsourced options • Manage risk and compliance

*The list is not exhaustive.
Source: Frost & Sullivan

Executive Summary—Next Game Changers in Smart City Business

IBM leads the way with integrated solutions combining state-of-the-art hardware, software, and services.



Size of bubble has been estimated based on number of client engagements, degree of partnership in smart city projects and level of investment in smart products and solutions

Source: Frost & Sullivan

Executive Summary—Smart City Stakeholder Dynamics

70% of successful smart city programs between 2013 to 2015 will be governed by joint ventures, with the government playing the leadership role.

Smart City Market: Analysis of Types of Smart City Stakeholders, Global, 2012–2015

		Role in Smart City	Value Proposition
Smart City Stakeholder Analysis Direct Stakeholders—City as a Customer Indirect Stakeholders—Enabling City as a Customer	<ul style="list-style-type: none"> • Municipal Government Management 	Support to plan and execute a governance system	Use intelligence to make better tactical decisions
	<ul style="list-style-type: none"> • Municipal Government Service Delivery 	Develop and administer advanced, targeted services	Use intelligence and insight to create plans and support decisions
	<ul style="list-style-type: none"> • Municipal Infrastructure and Services 	Deliver fundamental services that operate in coordination across a city	Use intelligence and insight to build and operate municipal infrastructure
	<ul style="list-style-type: none"> • Citizens 	Live in a safe community with sufficient access to all services	Beneficial returns on taxes paid, reliable and useful services
	<ul style="list-style-type: none"> • Enterprises in the City 	Location in an environment that supports and promotes prosperity	Supports world-class services with reliable and effective infrastructures
	<ul style="list-style-type: none"> • Technology and Application Providers 	Responsible for creating the elements of the digital foundation of a smart city	Enables the generation of intelligence that makes a smart city 'smart'
	<ul style="list-style-type: none"> • Systems Integrators 	Construct the digital infrastructure of the smart city	Provide the logical and information framework that enables intelligence
	<ul style="list-style-type: none"> • Infrastructure Services Providers and Operators 	Interface with and often operate the intelligent infrastructure of the city	Create and deliver advanced services to direct stakeholders

Source: Frost & Sullivan

Executive Summary—Smart Convergence

Companies in the smart city space will not only partner and converge among themselves to offer ‘smart’ capabilities but would also start converging with different participants in the ecosystem.

Smart City Market: Convergence of Competition, Global, 2012–2025

Point of Convergence

Telecom Participants

- Broadband and Internet service providers
- Phone lines
- Mobile communications
- Networked IT services

Security

- Firewalls, Internet protocol security
- Physical implementation of systems and monitoring
- Managed and monitoring services
- Cloud-based services
- Identity management, smart cards

IT Participants

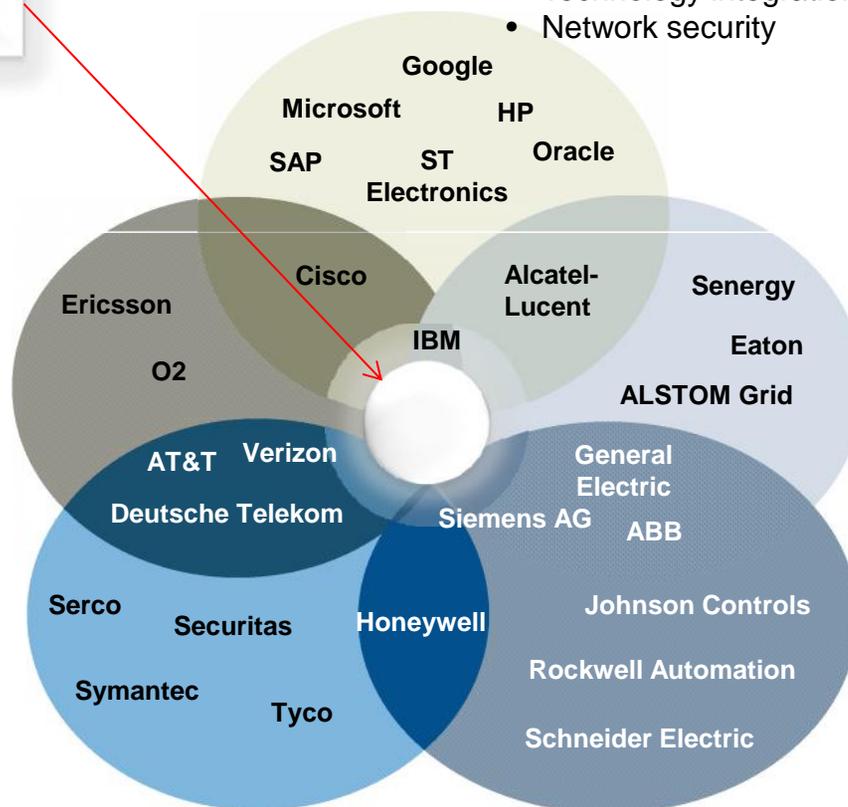
- IP networks
- Digital technology
- Analysis software
- Technology integration
- Network security

Energy and Infrastructure Participants

- T&D technology
- Power electronics
- Renewable energy
- Integrated distribution management
- Substation automation
- AMI-enabled metering

Automation and Building Control Participants

- Building automation
- Demand-side management
- Device connectivity
- Monitoring and sensing
- Smart grid integration



Source: Frost & Sullivan

Executive Summary—Key Conclusions and Future Outlook

Smart Cities: Key Findings and Future Outlook, Global, 2020

26 smart cities
by 2025

Market
opportunity of
\$1.565 trillion

New services,
such as
eExchange,
eSharing

Networked
infrastructure
and cloud-
based
connectivity

Smarter
infrastructure
with efficient
utility systems

So What?

Collaborative Smart City Projects—'City Deals'

Governments of smart cities are transforming from a traditional model of a silo-based organization to a more collaborative, integrated service delivery model. Cities will collaborate with each other to drive smart city innovation by entering into partnerships with each other.

Convergence of Competition

Increase in technology and ecosystem convergence, collaboration and partnerships between stakeholders from different industries, such as energy and infrastructure, IT, telecoms and government will expedite delivery of integrated services.

Big Data Hubs

Smart cities will emerge as major big data hubs with data being collected, analysed and monitored in real-time by a central monitoring hub. This information will be used to optimize city operations and will also encourage open data platforms and crowdsharing.

New Public- Private Dynamic

Smart city enables enterprises to lead a new business model where firms could participate in the governance of cities and become a supplementary part to the government instead of being a contractor.

Source: Frost & Sullivan

Appendix

Comparative Analysis of Smart City Solution Providers

Smart energy solutions, and smart governance and smart security solutions need more focus from the smart city solution providers.

Smart City Solution Providers, Global, 2012

Company	Smart Energy	Smart Healthcare	Smart Building	Smart Mobility	Smart Infrastructure	Smart Governance and Smart Education	Smart Security
IBM	Medium	High	Medium	High	High	High	High
GE	High	High	High	High	Medium	Low	High
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Cisco	Medium	High	Medium	Medium	High	High	High
Accenture	Medium	Medium	Medium	Medium	Low	Medium	Medium
Oracle	Low	High	Low	Medium	Medium	High	High
Ericsson	Medium	High	Low	Medium	Medium	High	Medium



Source: Frost & Sullivan

Comparative Analysis of Digital Management of Energy by Various Smart City Solution Providers

Smart City Market: Comparative Analysis of Digital Management of Energy, 2012

Company	AMI (Advanced Meter Infrastructure)	Demand Response	Distribution Grid Management	High-voltage Transmission Technologies
IBM	✓	✓	✓	
GE	✓	✓	✓	✓
ABB	✓	✓	✓	✓
Schneider Electric		✓	✓	
Siemens AG	✓	✓	✓	✓
Cisco	✓		✓	
Accenture	✓	✓	✓	✓
Oracle	✓		✓	
SAIC	✓	✓	✓	✓

Source: Frost & Sullivan

Comparative Analysis of Automated Intelligent Building Technology by Various Smart City Solution Providers

Smart City Market: Comparative Analysis of Automated Intelligent Building Technology, 2012

Company	Facility Management	Life Security	Physical Security	Energy Management
IBM	✓	✓	✓	✓
GE	✓	✓	✓	✓
ABB	✓	✓	✓	✓
Schneider Electric	✓	✓	✓	✓
Siemens AG	✓	✓	✓	✓
Cisco	✓	✓	✓	✓
Accenture	✓	✓		✓

Source: Frost & Sullivan

Comparative Analysis of Intelligent Mobility Technology by Various Smart City Solution Providers

Smart City Market: Comparative Analysis of Intelligent Mobility Technology, 2012

Company	Intelligent Transportation System	Smart Mobility Solutions	EV Transport
IBM	✓	✓	✓
GE	✓	✓	✓
ABB	✓	✓	✓
Schneider Electric	✓	✓	✓
Siemens A	✓	✓	✓
Cisco	✓		

Source: Frost & Sullivan