

# SOFTWARE DEFINED DATA CENTER: TIME TO REIMAGINE THE CORE



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# Abstract

The gap between business demands and IT innovation has closed tremendously with needs and turnarounds moving at the speed of thought. Today's scale, explosion and availability of data has business, expecting a powerful intervention to exploit it. It is getting difficult to firm up the Data Center roadmap with solutions and products getting launched so rapidly. This whitepaper attempts to give a perspective on Software Defined Data Center (SDDC) technology and drives attention to the white spaces and possible gaps which a customer should consider while embarking on this Data Center Transformation Journey.

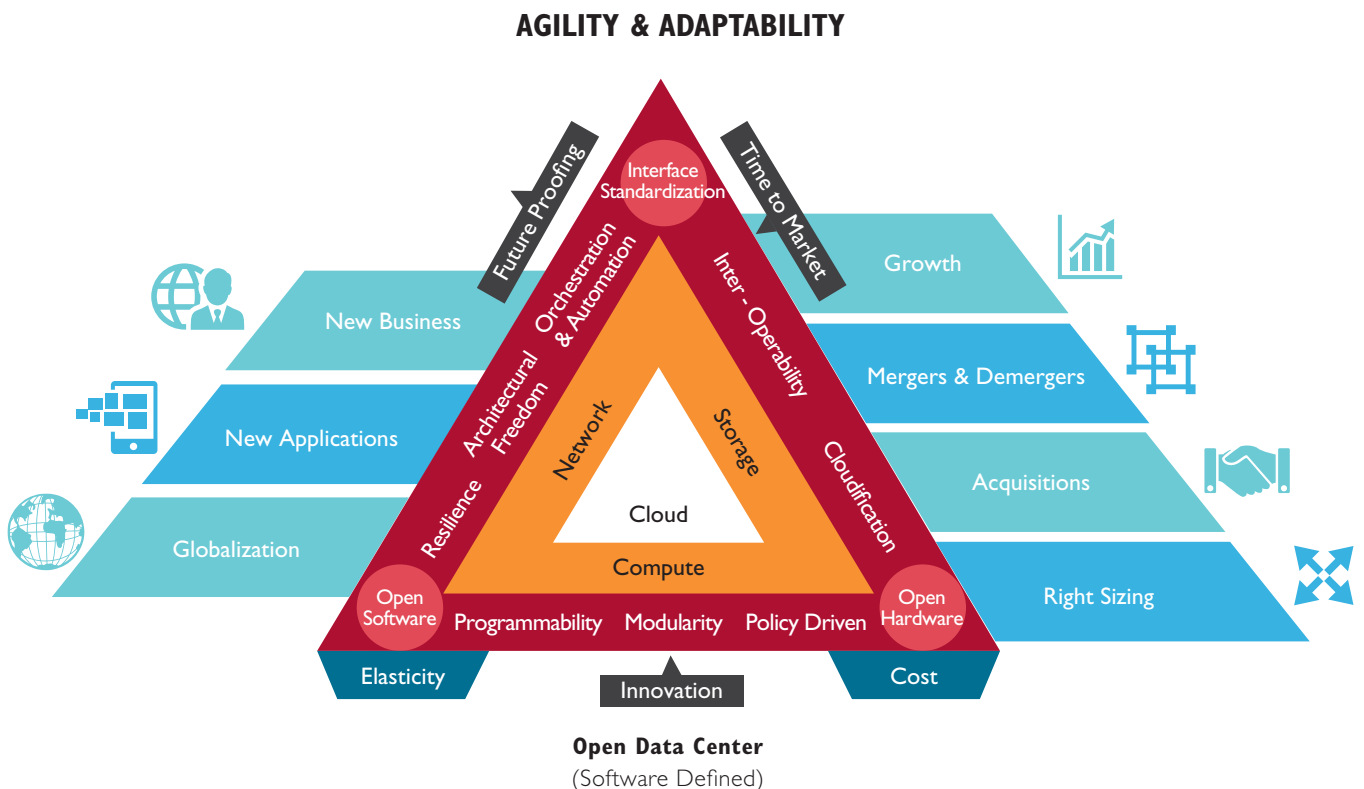
"The only thing that is constant is change" by Heraclitus seems to be the eternal truth in today's context. The story of technology is no different. IT has been changing, moreover catering to the changing need of the era, whether it is data digitization, process automation, cost optimization or agility; an outward ever growing spiral.

Now is the time in IT when organizations need to move from a reactive approach of disruptive change to a more proactive, accommodating and organic approach. They have to inculcate and make change as a paramount principal of the future technology "platform". And to achieve this organizations will have to reimagine the core (Data Center) and define the pillars of the Software Defined Data Center (SDDC) platform.

SDDC is a platform which should be imagined to be built on three pillars - hardware, software and standard interfaces. The abstraction of

components has helped create this as a perfect platform for supporting, adopting and nurturing almost all future changes in this industry. This is a platform which will enable customer to be agile, flexible, vendor agnostic while optimizing the cost.

It is very important to have a clear roadmap and implement the same in it's true spirit to reap the maximum benefits of SDDC. A clear vision, weighing the benefits, evaluating multiple solutions to defining the roadmap and architecture platform of your future Data Center are the most important pre-requisites of successful deployment. The overall setup and solution has to be analyzed both from provider and consumer view point and this makes a consultants role very important to provide an unbiased, vendor agnostic and pragmatic solution. Let us try and have a broad look at SDDC vision, benefits, and available vendor solutions.



## SDDC Vision

Datacenters have been evolving and innovating perpetually but still provide siloed infrastructure services. With separate management for each components and human intervention required in different phases, service delivery has become sluggish.

But with the advent of "Software Defined concept", data centers now have the vision around which they can evolve to enable IT as true business enabler.

**VISION: A Workload centric architecture which will cut across vertical layers through Cloud, Compute, Storage, Networking and Non-IT (DCIM) to harness the complete capability of a heterogeneous Infrastructure & cloud in a variablized consumption model.**

TRADITIONAL DC	SOFTWARE DEFINED FEATURES	SOFTWARE DEFINED DC
<ul style="list-style-type: none"> <li>• Box by Box Management</li> </ul>	Abstraction	<ul style="list-style-type: none"> <li>• Creation of logical layer for boxes/devices to integrate with single management layer</li> </ul>
<ul style="list-style-type: none"> <li>• Every box has own</li> </ul>	Central Management	<ul style="list-style-type: none"> <li>• Application centric dynamic allocation /de-allocation of Infrastructure/resources</li> </ul>
<ul style="list-style-type: none"> <li>• Manual allocation/ de-allocation of resources</li> </ul>	Automation	<ul style="list-style-type: none"> <li>• Application centric dynamic allocation /de-allocation of Infrastructure/resources</li> </ul>
<ul style="list-style-type: none"> <li>• Programmability deter-mined by vendor solution</li> </ul>	Programmability	<ul style="list-style-type: none"> <li>• Restful APIs to integrate customized application</li> </ul>
<ul style="list-style-type: none"> <li>• Policy management done at different set of devices</li> </ul>	Policy management	<ul style="list-style-type: none"> <li>• Policies managed centrally for all kind of devices</li> </ul>
<ul style="list-style-type: none"> <li>• Not much innovation: heterogeneous vendor devices managed individually</li> </ul>	Instrumentation	<ul style="list-style-type: none"> <li>• Instrumentation of infra-structure for monitoring, publishing and intelligent analytics</li> </ul>
<ul style="list-style-type: none"> <li>• Manual tasks by administrators consuming time and resources</li> </ul>	Orchestration	<ul style="list-style-type: none"> <li>• Automation of tasks with policy based optimization &amp; enforcement</li> </ul>

Figure 2 SDDC Features

# Benefits of SDDC

Enterprise adoption of SDDC would fulfil the needs of evolving data centres focussed on agility, flexibility, scalability and security along with lower total cost of ownership (TCO). Abstraction of software from the hardware infrastructure layer will continue to be a key

driver. Intelligent software controls the hardware configurations and will help integrate with, and transform the traditional data centres of enterprises, which typically were hardware and device driven.

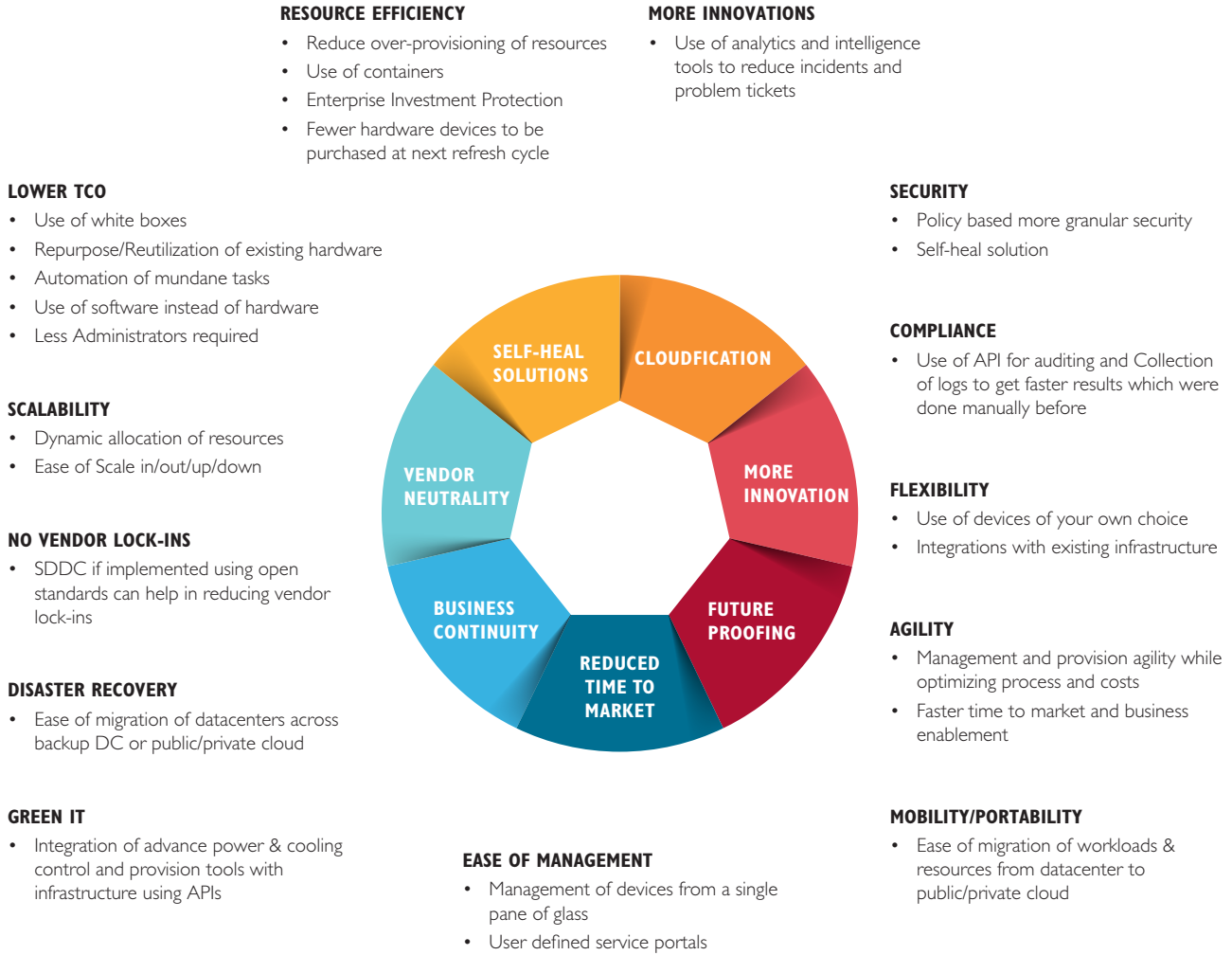


Figure 3 SDDC Benefit

# SDDC Architecture

The architecture which forms the basics of SDx concept is shown in Figure 1. There are two distinct interfaces in the SDDC high level

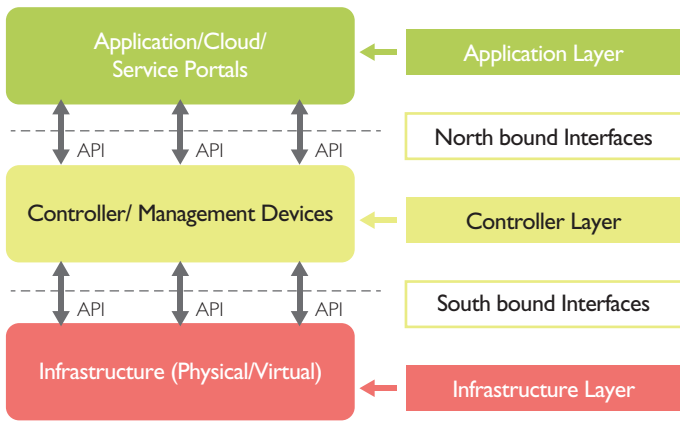


Figure 4 High Level view of SDDC Architecture

cloud, orchestration and management layer. The north-bound interface is pretty much standardized as REST APIs (Representational State Transfer - Application Programming Interface) is present in all the SDDC controllers that are available today. The southbound interface is specific to the vendor's implementation. Some use open standards based protocols while some use proprietary interfaces.

architecture. The southbound interface which talks to the infrastructure layer and the northbound interface that speaks to

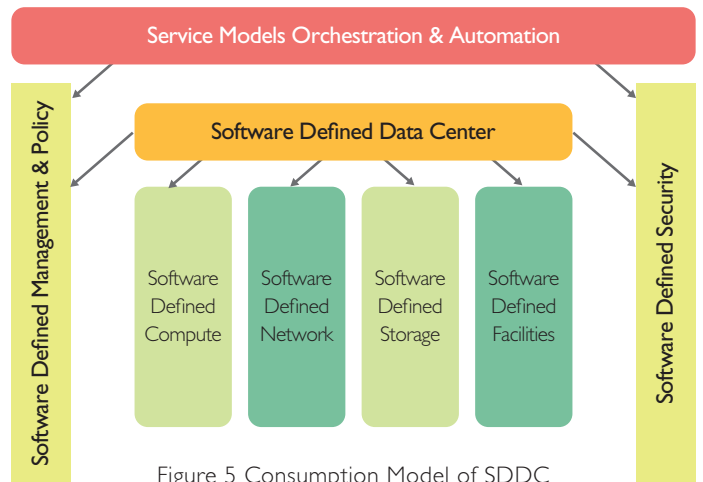
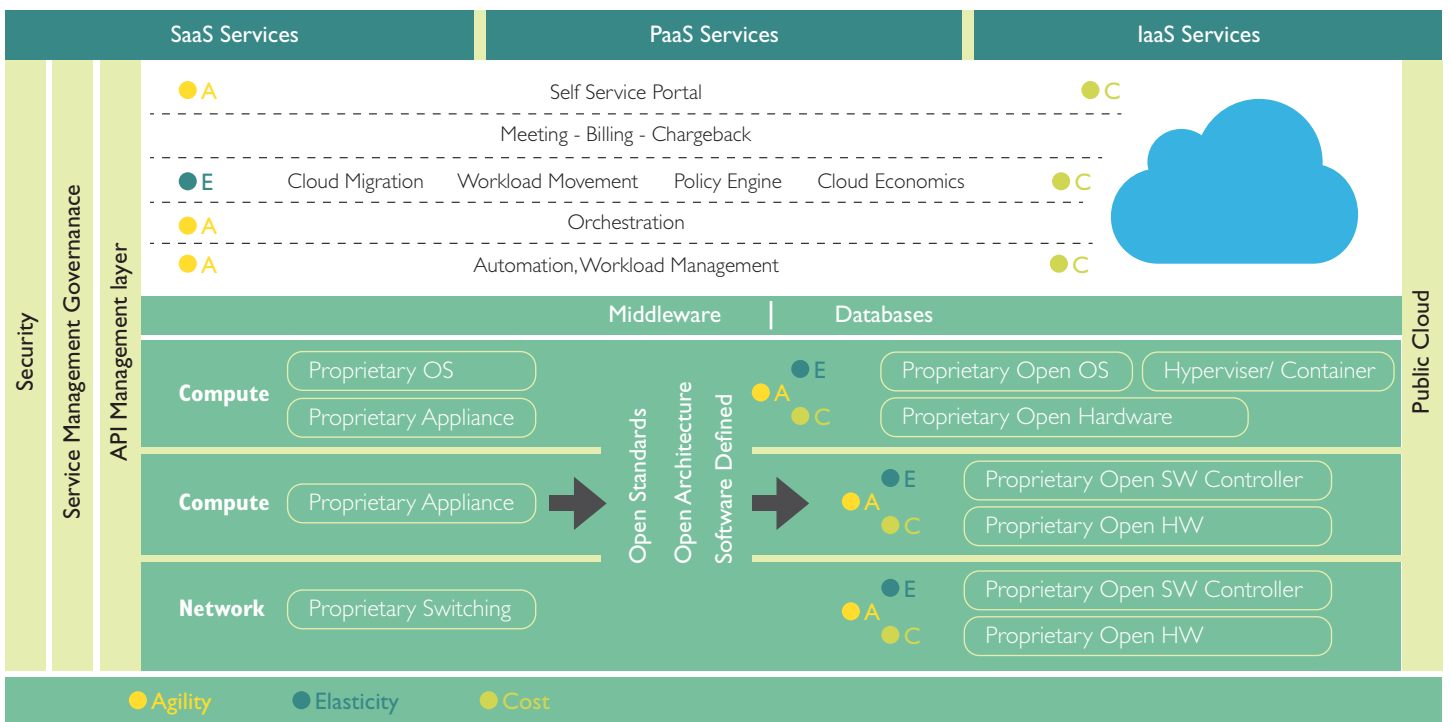


Figure 5 Consumption Model of SDDC

Above depicted SDDC architecture helps in providing unified view and management of resources including network, storage, compute, facilities managed securely via automation and orchestration layer and delivered via service models as shown in figure2.

We will discuss them individually now.



# SDDC Component

## SOFTWARE DEFINED NETWORK

Network Virtualization techniques are not something new in the network world. VLANs, tunneling, and VPNs have been around for quite long. Talking about SDN, following the lines similar to the software defined concept it intends to centralize all intelligence in the

network on a software layer allowing centralized control and abstraction of the underlying complex infrastructure. Theoretically all network nodes would only need the muscle (forwarding or data plane) to push packets out which results in better management and control over network.

### SDN Approaches:

	Underlay	Overlay	Hybrid
Focus	On virtual and physical network (Overall Fabric Management)	On hypervisor and uses tunneling and encapsulation	Combines both Underlay and Overlay approach
Implementation	Puts Software defined network in every point in your network	On top of existing network infrastructure, multiple networks and multiple layers	

## Software Defined Storage

Similarly to SDN, different kinds of storage solutions can now be managed using storage resource manager which can in turn work with storage controllers to provide SDDC benefits along with automation of storage tiering, de duplication. In short, storage allocation can now be application driven with faster and optimal storage allocations. SDS also provides benefits of seamless integration with cloud storage, migration and archival of storage to public/private cloud or secondary DC. With enormous increase in storage requirement SDS can provide an economical solution for backup, disaster recovery, test and development environment. The savings can be anything between 20% to 50% both in capital and operating expense.

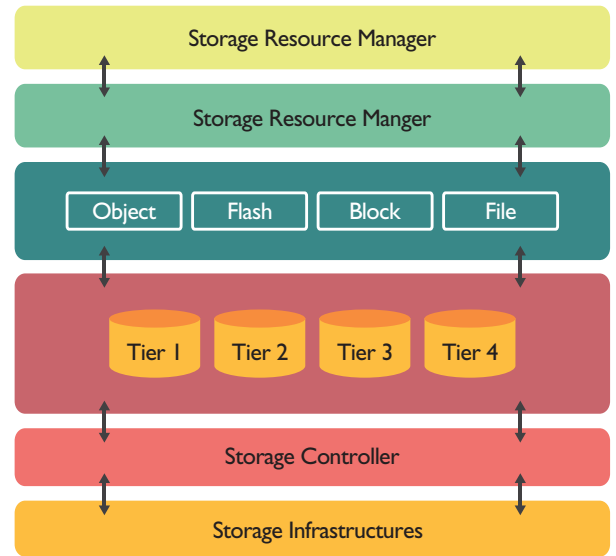


Figure 2 SDDC Features

## Software Defined Compute

Though the compute world has undergone virtualization a decade before, but it was specific to compute. SDC talks about abstraction of virtualization across different layers of physical servers, hosts, containers and virtual machines to provide unified management function.

Concept of containers is not something new, though it has received lot of attention recently, especially with declaration of support from many technology leaders. Several startups have popped up to focus on a host of container issues that haven't been addressed yet, from storage to networking.

Containers have brought higher abstraction in virtualization. A container virtualizes a single OS for multiple applications (Shown in Figure). In simple terms, a container does effective OS process isolation. Containers are ideal tools for those applications that require agile development and change, horizontal compatibility and scalability.

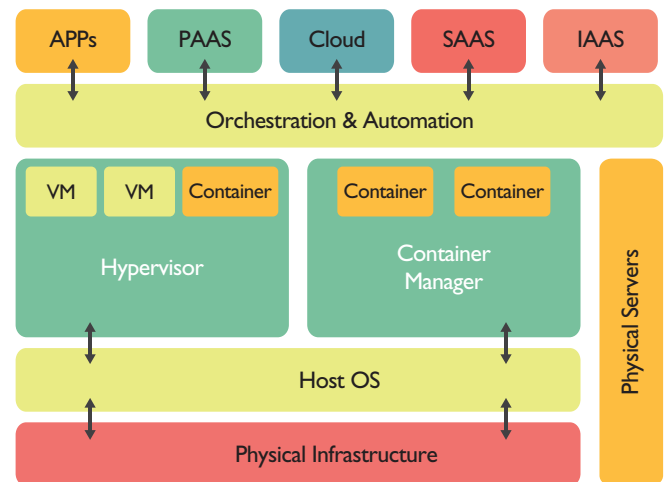


Figure 8 SDC Architecture

## Software Defined Facilities

With greater storage requirements and increment of virtualization, IT infrastructure requires more managed and device centric cooling and power supply. SDDC concept can help in integrating power/cooling management tools, DCIM tools (Data center Infrastructure Management), HVAC components (Heating, Ventilating and air conditioning) to have unified management of facilities of data center from a single plane of glass. This can help in averting possible device

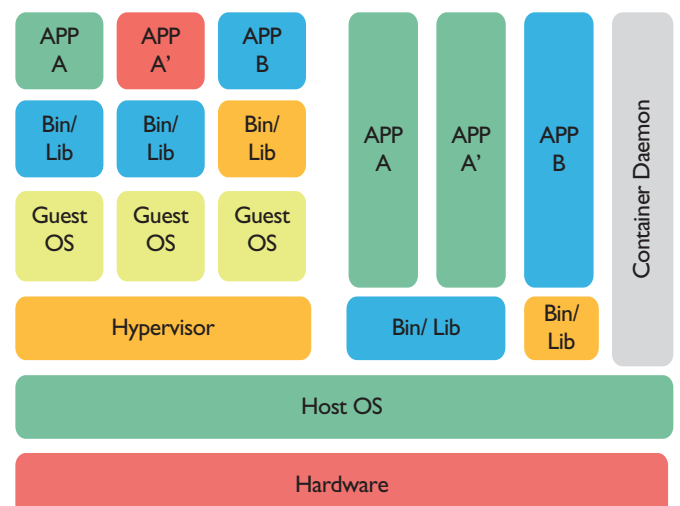


Figure 8 SDC Architecture



failures, reducing the over provisioning of facilities resources and most importantly better management of resources. This will also help bring

the UPS, cooling, cabling, power monitoring and management to a central portal integrated with cloud layer.

## Software Defined Security

Multiple startups on lines similar to SDDC architecture have come up with security tools which can have policy or application or resource based security managed centrally. There are existing vendors also which provide security management along with their SDx solution.

One of the major concerns in SDDC is security, but SDDC if implemented properly can help in overcoming existing security concerns.

Security Challenges	Traditional Approach	SDDC based Approach	Benefits
<b>New Security Threats</b>	<ul style="list-style-type: none"> <li>Though threat might get detected but it keeps on spreading across network and difficult to trace path</li> <li>Threats are cured mainly manually</li> </ul>	<ul style="list-style-type: none"> <li>Provides network visibility derived from centralized configuration and network state</li> <li>Easier to track and automate cure of the threats</li> </ul>	<ul style="list-style-type: none"> <li>Self-Healing</li> <li>Visibility</li> </ul>
<b>Perimeter Security</b>	<ul style="list-style-type: none"> <li>Each device must be statically configured individually</li> <li>All traffic for each physical object must be monitored, typically using a single policy</li> </ul>	<ul style="list-style-type: none"> <li>Perimeter defined through application-layer concepts (groups, type of device, etc.)</li> <li>Traffic can be monitored independent of the physical location of the source</li> </ul>	<ul style="list-style-type: none"> <li>App-Centricity</li> <li>Granular Management</li> </ul>
<b>Velocity and Proactive patch management</b>	<ul style="list-style-type: none"> <li>Difficult to achieve in a consistent manner due to finite resource availability in the embedded device</li> </ul>	<ul style="list-style-type: none"> <li>Continuous, zero-touch centralized patch management</li> <li>Rapid analysis and response to ever-changing threats without the need to patch each individual networking device</li> </ul>	<ul style="list-style-type: none"> <li>Simplicity</li> <li>Agility</li> <li>Dynamic</li> </ul>
<b>Scalability</b>	<ul style="list-style-type: none"> <li>Requires proportional increase in hardware</li> </ul>	<ul style="list-style-type: none"> <li>Virtualized security processing reduces hardware demands</li> </ul>	<ul style="list-style-type: none"> <li>Low Touch Configurations</li> </ul>

## Automation and Orchestration

This layer provides integration of all resources and components we talked above and automation of their management /allocation from a single pane of glass.

Integration could be with applications, cloud (Public/ Private), IaaS, PaaS, SaaS, tools involving monitoring, analytics, troubleshooting, governance, logging, auditing or any other third party tools (provided they have APIs).

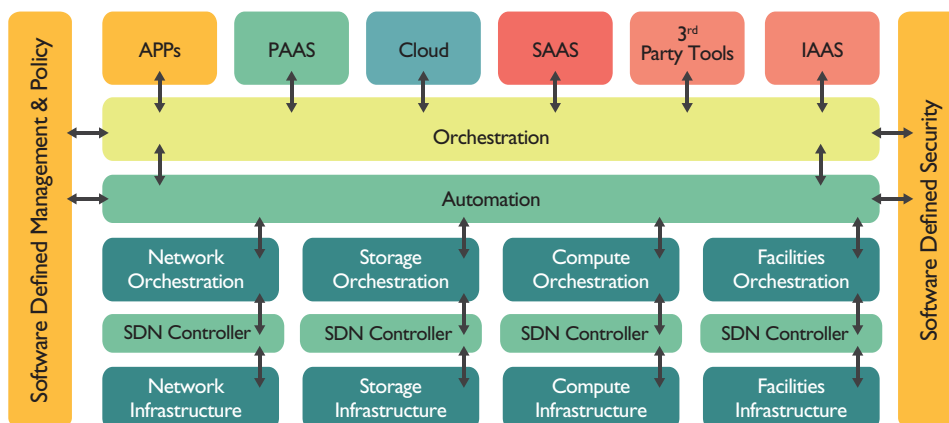
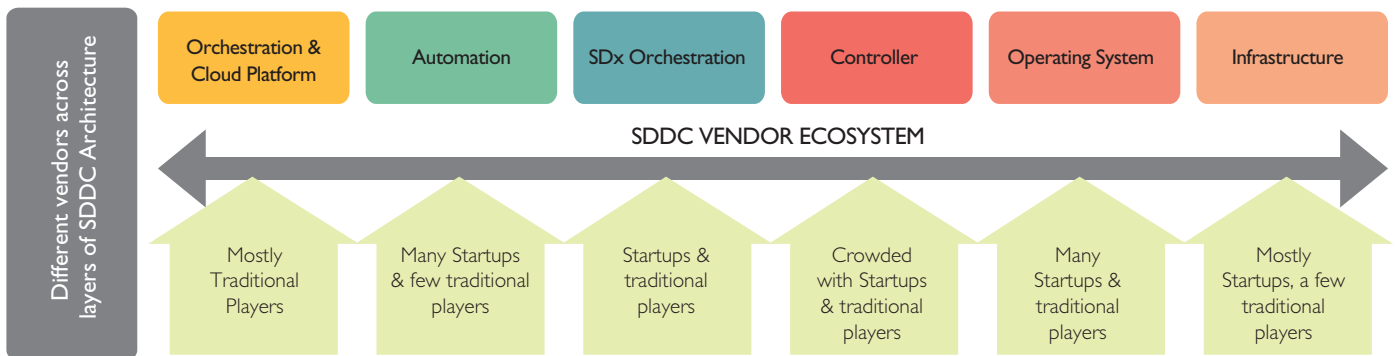


Figure 9 Automation and Integration in SDDC

# SDDC Vendor EcoSystem

Models Types	Software Only Model		Cloud based Model	Converged and Hyper-converged Model		Hardware for SDDC Solutions
What?	Software without associated hardware		Pay-as-you-go model	Preconfigured Systems	Build-your-own-model	Hardware for SDDC
How?	Management, orchestration, controller software, operating systems, security, monitoring and logging tools, third party applications, customized applications etc. with APIs		<ul style="list-style-type: none"> <li>Hosting the SDDC platform on a public cloud infrastructure, can also be delivered as a virtual private cloud</li> <li>Offers APIs for integrations</li> <li>Some offers cloud management/orchestration tools as well</li> </ul>	Software-centric architecture that tightly integrates resources and other technologies in a commodity hardware box supported by a single vendor		<ul style="list-style-type: none"> <li>Hardware boxes for installation of SDDC environment</li> <li>White and brite boxes (NetworkDevices)</li> <li>Open Compute</li> </ul>
	Open Source	Proprietary				
Vendors	Communities and new startups	Traditional vendors and multiple startups	Few existing cloud players and new startups	Many startups and few traditional vendor collaborations	Mostly traditional players	New Startups and traditional players trying to enter
Pros	<ul style="list-style-type: none"> <li>Easy to install</li> <li>Affordable</li> <li>Less capex</li> <li>Granular Features</li> <li>Modularity</li> </ul>		<ul style="list-style-type: none"> <li>On the fly provision</li> <li>Pay as per use</li> <li>No capex</li> <li>Scale up/down on demand</li> </ul>	<ul style="list-style-type: none"> <li>Preconfigured and tested solutions from vendors</li> <li>Easy adoption</li> <li>Hardware and software support from a single vendor in many cases</li> </ul>		<ul style="list-style-type: none"> <li>High scope of innovation</li> <li>Less TCO</li> <li>Increased Flexibility</li> </ul>
Cons	<ul style="list-style-type: none"> <li>Support of hardware and software from different vendors</li> <li>Most of the software have their own HCL list (Hardware compatibility list) leading to interoperability issues</li> </ul>		<ul style="list-style-type: none"> <li>No transparency of infrastructure</li> <li>General public cloud concerns like security, network latency</li> </ul>	<ul style="list-style-type: none"> <li>Inability to make granular upgrades or tweaks</li> <li>Dependence on hardware vendor to maintain competitive pricing</li> <li>Limitation in choosing additional hardware and dependence on HCL</li> <li>Upgradation requires addition of hardware</li> </ul>		<ul style="list-style-type: none"> <li>New concept</li> <li>Compatibility guidelines need to be followed as per providers</li> <li>Inability to make granular upgrades or tweaks</li> </ul>



# SDDC Challenges

## CHALLENGES

## BUYER'S GUIDE

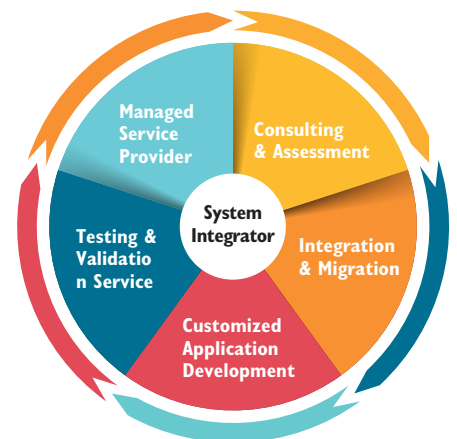


## System Integrator: Filling the Gaps

Given the wide ecosystem and adoption challenges of SDDC implementation, there is a requirement of service providers who have the right skill set to analyze the customer environment, offer best solution for customers apt to their environment needs, assist in integration and provide end to end services.

To make sure that system integrators do not create an additional level of complexity in SDDC environment, they need to evolve and adapt themselves to facilitate and smooth the SDDC adoption journey of customers.

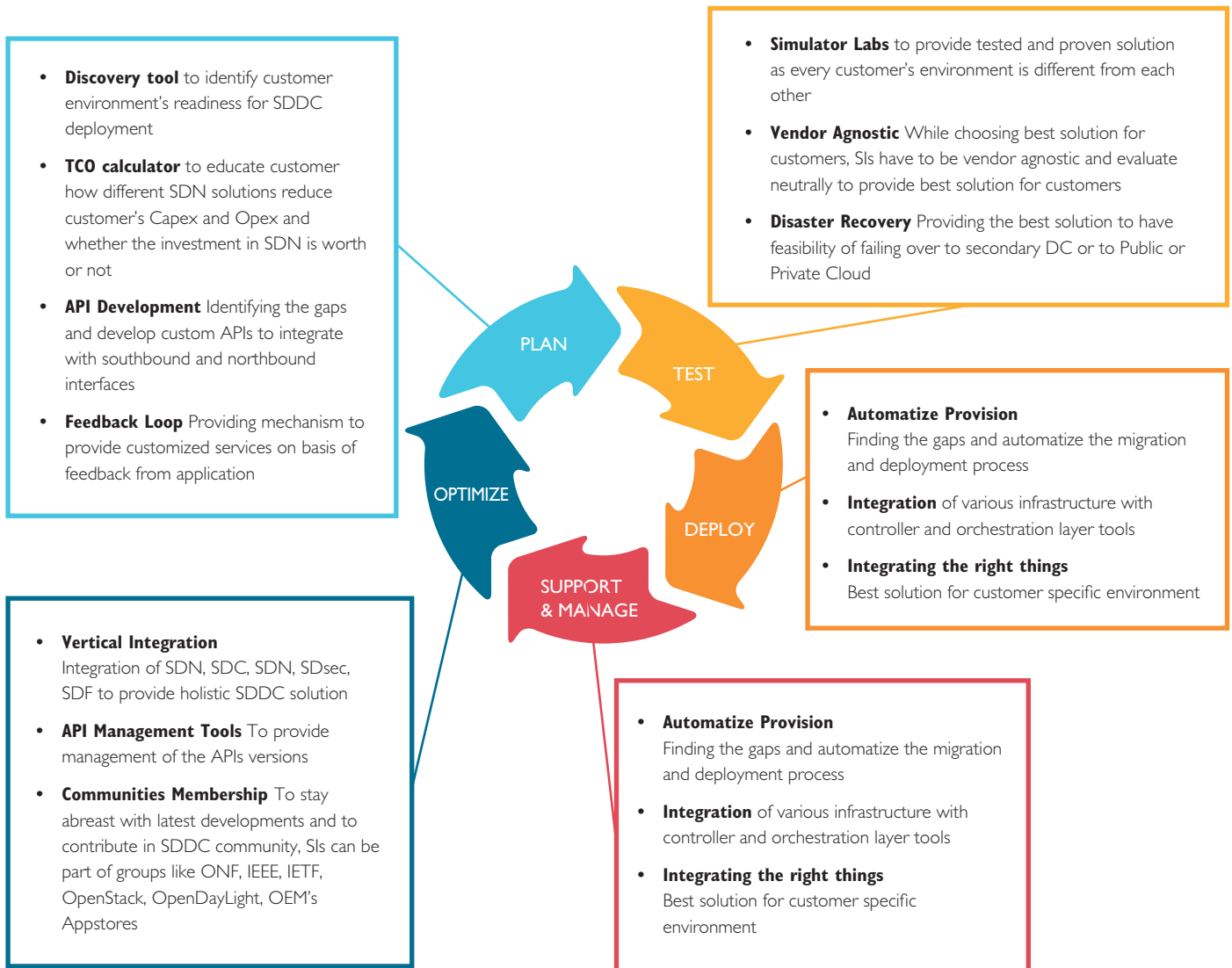
Figure 10  
System  
Integrator  
Offerings



## I. SDDC impact on organization and their data centers and the value a system integrator can bring in

ORGANIZATION COMPONENTS	TRADITIONAL APPROACH	SDDC BASED APPROACH
<b>Product</b>	<ul style="list-style-type: none"> <li>Infrastructure will be now delivered as service rather than as individual devices/solutions</li> <li>Build your own device models, given the modularity functionality offered by SDDC solutions</li> <li>"Datacenter in a Box" solutions for faster adoption</li> <li>Customized application developments and integration with existing infrastructure</li> <li>DevOps friendly environment</li> </ul>	<ul style="list-style-type: none"> <li>Provide comprehensive solutions and become single POC for solutions</li> <li>Find the best use case for client and accordingly "integrate the right things"</li> <li>API development and management tools</li> <li>Service portals for developers to understand the resource allocations and management</li> </ul>
<b>Process</b>	<ul style="list-style-type: none"> <li>ITIL Framework of delivery would be changed</li> <li>Self-service interfaces/portal rather than manual administration</li> <li>SLAs will be changed as most of tasks will be automated</li> <li>Many processes will be more automated and delivered as service</li> </ul>	<ul style="list-style-type: none"> <li>Modification of service delivery process to get best suit for software defined data center</li> <li>Creation of customer specific SLA plans like "create your own SLA"</li> <li>Developing and managing self-help portals as per requirements</li> <li>Identification of the white spaces and automating the processes to provide more agility</li> </ul>
<b>People</b>	<ul style="list-style-type: none"> <li>Selling pattern and revenue model of sellers will be changed</li> </ul>	<ul style="list-style-type: none"> <li>More aligned to business with very flexible consumption models</li> </ul>
<b>Partners</b>	<ul style="list-style-type: none"> <li>Data center services will involve multiple partners involvement</li> <li>Sellers will have to remain on their toes to involve with new partners and compatibilities with their solution</li> </ul>	<ul style="list-style-type: none"> <li>Vendor agnostic approach</li> <li>Enhance the partner ecosystem</li> <li>Contract and relationship management with vendors</li> <li>Single window support with ownership of the overall solution – a Truly Hybrid Cloud on your terms</li> </ul>
<b>Skill Set</b>	<ul style="list-style-type: none"> <li>Dual skill set ( Development + Administration )</li> <li>Cloud administration skills</li> </ul>	<ul style="list-style-type: none"> <li>Provide right skilled resources</li> <li>Provide Training to Customer Staff on Multiple technologies</li> </ul>
<b>Organization Structure</b>	<ul style="list-style-type: none"> <li>Environment will become more service focused</li> <li>More Level 1 and Level 3 administrators (Developers + Administration skills) would be required and level 2 engineers might not be required</li> <li>New designations like cloud service architects, service experts would rise</li> </ul>	<ul style="list-style-type: none"> <li>Can provide consulting and help customers align the organization structure to the changing trends and needs</li> <li>Identify the gaps and help develop required skill set</li> </ul>
<b>System</b>	<ul style="list-style-type: none"> <li>Data/ Resources will be more mobile ( movement from public/private cloud)</li> <li>Security compliance concerns would increase</li> <li>Infrastructure will become more app-centric</li> </ul>	<ul style="list-style-type: none"> <li>Develop APIs which could be integrated to provide security standard specific desired results</li> <li>Help in App rationalization and containerization to foster portability of applications across different environments</li> </ul>
<b>Strategy</b>	<ul style="list-style-type: none"> <li>Changes in service models will be observed Pay as you use / Pay per consumption models would rise</li> <li>Flexible and open based solutions will be preferred</li> </ul>	<ul style="list-style-type: none"> <li>Provide customized service delivery models and solutions</li> <li>Deliver an open environment based solution open to new solutions</li> <li>SI are rightly placed to provide help in true consumerization of IT</li> </ul>

## 2. How SI can help in SDDC adoption and optimize the delivery process



## Summary : SI Helping in Achiving SDDC Vision

SDDC provides vision for today's data center solutions and most importantly provides great opportunity in channelizing existing data center solutions to provide agility, scalability, app-centricity and programmability which resonates with what is required from today's business.

“Change may be risky but routine will be lethal” .Though the adoption may have few challenges, but a System Integrator can help

in reducing those adoption challenges and can give a comprehensive solution to reap the best benefits of SDDC.

Figure 11 shows some gist & recap of how SI can help in adoption journey



Figure 8 Roadmap for achieving SDDC benefits

## About the Authors

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**Anuj Bhalla** is a Vice President and Global Business Head for -System Integration, Maintenance Services, and Products in Global Infrastructure Services, Wipro Limited. His recent initiatives have been Wipro Open Data Center, SDI Center of Excellence launched recently in Bangalore Wipro Campus, under his belt, which is first for any System Integrator or Technology Provider in the country.

With over 20 years of Professional Experience across the entire spectrum of IT including Business Development, Practice Development, Pre-Sales & Delivery, to IT Strategy, Transformation especially on new areas like Hybrid Cloud, Open Source / Open Stack and IOT. Also, he is in the panel of their Partner Advisory board. Joined in as a trainee graduate from Symbiosis, Pune in 1996, he has grown ranks and has been instrumental in turning around various businesses that he has spearheaded within Wipro. He is proven to be a transformational leader rolling out initiatives on Telecom Support or new areas of Open Source namely in Open-stack, Cloud, SDX, and SD to cover a few.



**Gaurav Chaturvedi** is an experienced engineering graduate and IT professional with 14+ years of experience in Enterprise IT services encompassing System Integration, Support services, Service Delivery, Datacenter Architecture, and Pre-sales, have strong tecno-commeritial understanding and have design large complex DC Transformation solutions and delivery. He has handled various roles in delivery, pre-sales & practice, he is passionate about technology and have been instrumental in launching and help driving the new practice successfully. He is currently heading Software Defined Infrastructure (Open Data Center) CoE leading development, integration, Validation and testing of multiple SDDC, SDS, SDN solutions and tools.



**Manjari Sharma** has been a part of the Global 100 Intern program at Wipro and is currently enrolled in the Post Graduate Program at Indian Institute of Management, Calcutta, Before starting her management journey, she worked for five and a half years in infrastructure management services at IT majors such as Infosys and Wipro. Her experience is primarily in computing and Network platform. She has a keen interest in Technology and Marketing.

## About Global Infrastructure Services

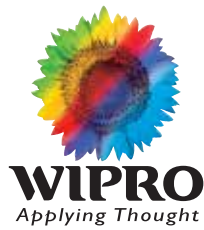
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Global Infrastructure Services (GIS), a unit of Wipro Limited, is an end to end IT infrastructure & outsourcing services provider to global customers across 60 countries. Its suite of Technology Infrastructure services spanning Data Center, End User Computing, Networks, Managed Services, Business Advisory and Global System Integration. Wipro, is a pioneer in Infrastructure Management services and is amongst the fastest-growing providers across the world. GIS enables customers to do business better by enabling innovation via standardization and automation, so that businesses can be more agile & scalable, so that they can find growth and succeed in their global business. Backed by our strong network of Integrated ServiceNXT™ Operation Centers and 14 owned data centres spread across US, Europe and APAC, this unit serves more than 700+ clients across with a global team of 32,000+ professionals and contributes to over 28% of Wipro's IT Services revenues of Wipro Limited.

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Wipro Ltd. (NYSE:WIT) is a leading information technology, consulting and business process services company that delivers solutions to enable its clients do business better. Wipro delivers winning business outcomes through its deep industry experience and a 360 degree view of "Business through Technology." By combining digital strategy, customer centric design, advanced analytics and product engineering approach, Wipro helps its clients create successful and adaptive businesses. A company recognized globally for its comprehensive portfolio of services, strong commitment to sustainability and good corporate citizenship, Wipro has a dedicated workforce of over 160,000, serving clients in 175+ cities across 6 continents. For more information, please visit [www.wipro.com](http://www.wipro.com)



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