

قال تعالى:

(اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ (1) خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ (2) اقْرَأْ وَرَبُّكَ الْأَكْرَمُ (3) الَّذِي عَلَّمَ بِالْقَلَمِ
(4) عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ) صدق الله العظيم

العلق (5-1)

DEDICATION

I dedicate this thesis to:

My Family, friends and beloved ones

To Soul of Mohammad Abd-Elkarim and Waleed Abd-Alazim May

Allah Be Merciful To Them

And to everybody who supported me.

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ABSTRACT

The service delivery networks experienced many transformations during the past decade mean while virtualization constitutes the next big phase in the operators' strategies. One of the most promising technologies which might step in the coming years is Software Defined Networking (SDN), a more mature technology in data centers, which strives to revolutionize the current Next Generation Network (NGN) architecture. However, the integration of SDN components into the legacy network and the transition between phases need to be carefully addressed. This thesis aims to develop a new NGN (the network delivers triple play services) virtualization based architecture in order to solve challenges that traditional architecture faces. On-demand capacity expansion, network elasticity and high expenses is some of the challenges that the new model aims to solve through the deployment of Network Function Virtualization (NFV) and SDN. By describing the simulation details of the cloudified architecture, one of this thesis goals is to present the trade-off between preserving the traditional architecture and the actual benefits, along with the challenges that operators may face in adopting SDN and (NFV) in their deployments. To achieve this, a testbed was used based on a network simulation tools. The obtained results emphasize the flexibility in deploying such solutions. Furthermore, a detailed graphs of triple play services' performances are presented.

المستخلص

الشبكات هي احدى اهم الوسائل لتقديم الخدمات لعملاء مزودي الخدمات . و نظراً للطلب المتنامي للخدمات , تشهد هذه الشبكات عدة تحولات في بنيتها لمواجهة هذا الطلب المتزايد. على ذات الصعيد , بدأت التقنيات الافتراضية تسترعي انتباه مزودي الخدمات لامكانية استخدامها في بناء البنية التحتية لشبكاتهم. من اهم تلك التقنيات تقنية وظائف الشبكة الافتراضية (NFV) و برمجيات الشبكة المحددة (SDN) التي تعد من التقنيات الواعدة في مجال الاتصالات . بدأ إستخدام هذه التقنيات في مراكز البيانات منذ بدايتها قبل ان تتطور ليتم استخدامها في تطوير بنية شبكات الجيل التالي من الاتصالات. الدمج بين التقنيات الافتراضية و التقنيات التقليدية لبناء الشبكات من المواضيع التي يجب ان تسترعي انتباه الباحثين لمعرفة مراحل دمج التقنيات مع بعضها البعض لايصال خدمة افضل للعملاء.

تهدف هذه الاطروحة لتطوير بنية جديدة لشبكات الجيل التالي (الشبكة المستخدمة في ايصال خدمات التشغيل الثلاثي) قائمة على التقنيات الافتراضية من اجل التغلب على التحديات التي تواجه البنية التقليدية لهذا النوع من الشبكات. زيادة قدرة الشبكة عند الحاجة ,زيادة المرونة بالاضافة للنفقات العاليه هي من ابرز التحديات التي تهدف البنية الجديد لشبكات الجيل التالي لحلها باستخدام تقنيات وظائف الشبكة الافتراضية و برمجيات الشبكة المحددة.

من خلال تقديم وصف دقيق لنموذج المحاكاه للنموذج السحابي, تهدف هذه الاطروحة لتقديم مفاضله بين الحفاظ على الشبكة التقليديه و استخدام النموذج السحابي جنباً الى جنب مع العقبات التي يمكن ان تواجه المشغلين في استخدام التقنيات الافتراضية لبناء شبكاتهم.و لتحقيق ذلك تم بناء نموذج لمحاكاة النموذج السحابي قائم على مجموعه من ادوات محاكاة الشبكات. النتائج اثبتت على امكانية استخدام التقنيات الافتراضية لتقديم خدمات التشغيل الثلاثي . علاوة على ذلك تم تقديم رسوم بيانية لتوضيح جودة الخدمات الثلاثية على البنية السحابية .

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ABBREVIATIONS

Abbreviation	Meaning
API	Application Programming Interface
ASP	Applications Service Provider
AToM	Any Transport over MPLS
BGP	Border Gateway Protocol
B-RAS	Broadband Remote Access Server
CAPEX	Capital Expenditure
CLI	Command Line Interface
CO	Central Office
CSP	Communications Service Providers
CSR	Carrier Routing System
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Service
DSLAM	Digital Subscriber Line Access Multiplexer
EoMPLS	Ethernet over MPLS
GUI	Graphical User Interface
IaaS	Infrastructure as a Service
IP	Internet Protocol
ITU-T	International Telecommunication Union

KQI	Key Quality Indicator
MPLS	Multiprotocol Label Switching
MSAN	Multi-Service Access Node
NaaS	Network as a Service
NAT	Network Address Translation
NFV	Network functions Virtualization
NGN	Next Generation Network
NLB	Network Load Balancer
NSP	Network Service Provider
OF	OpenFlow
OPEX	Operational Expenditure
OVS	Open vSwitch
PCRF	Policy and Charging Rules Function
PE	Provider Edge
PoC	Proof of Concept
QoE	Quality of Experience
QoS	Quality of Service
REST	Representational State Transfer
SBC	Session Border Controller
SDAN	Software-defined Access Networks

SDN	Software Defined Networking
SNMP	Simple Network Management Protocol
SSL	Secure Sockets Layer
Tbps	Tera bits per second
TCO	Total Cost of Ownership
VMDK	Virtual Machine Disk
VNF	Virtual Network Function
VPN	Virtual Private Network