mobile **Cloud**

The Necessity of Cloud, our story

Caribbean FutureScape Experience

bcloud

mobile

TSTT Private Cloud Initiative

Software-Defined Data Center

bcloud

Tanya Muller / Keino Cox

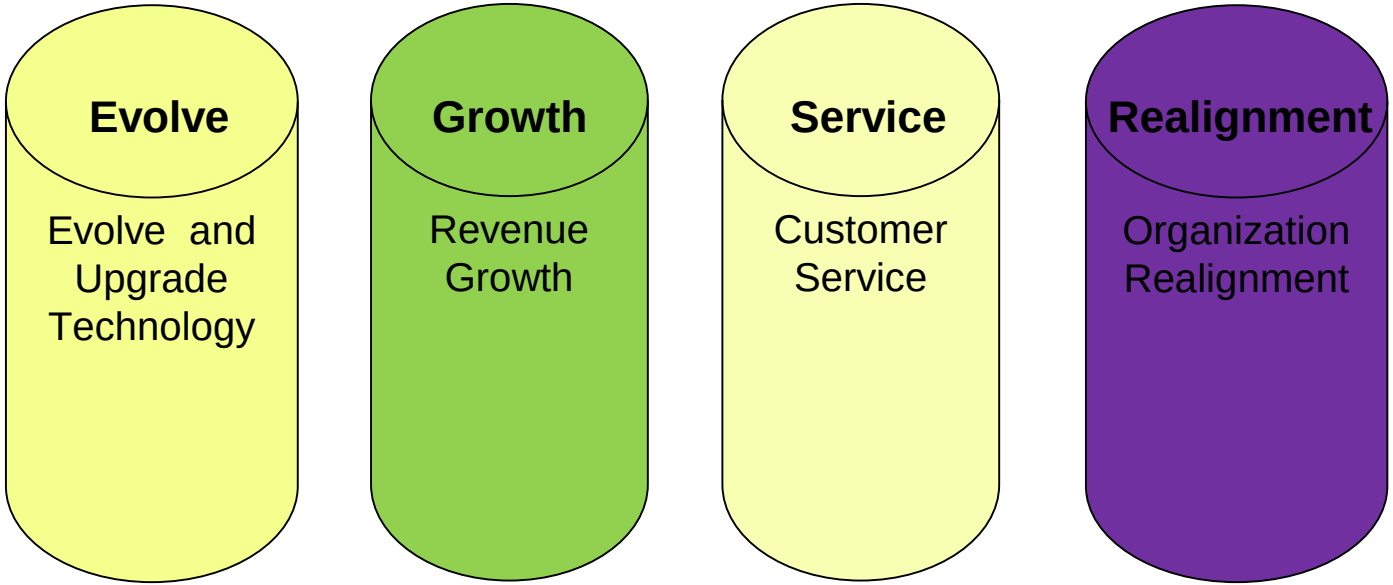
Executive Summary

Traditional telecommunication

Agile Broadband

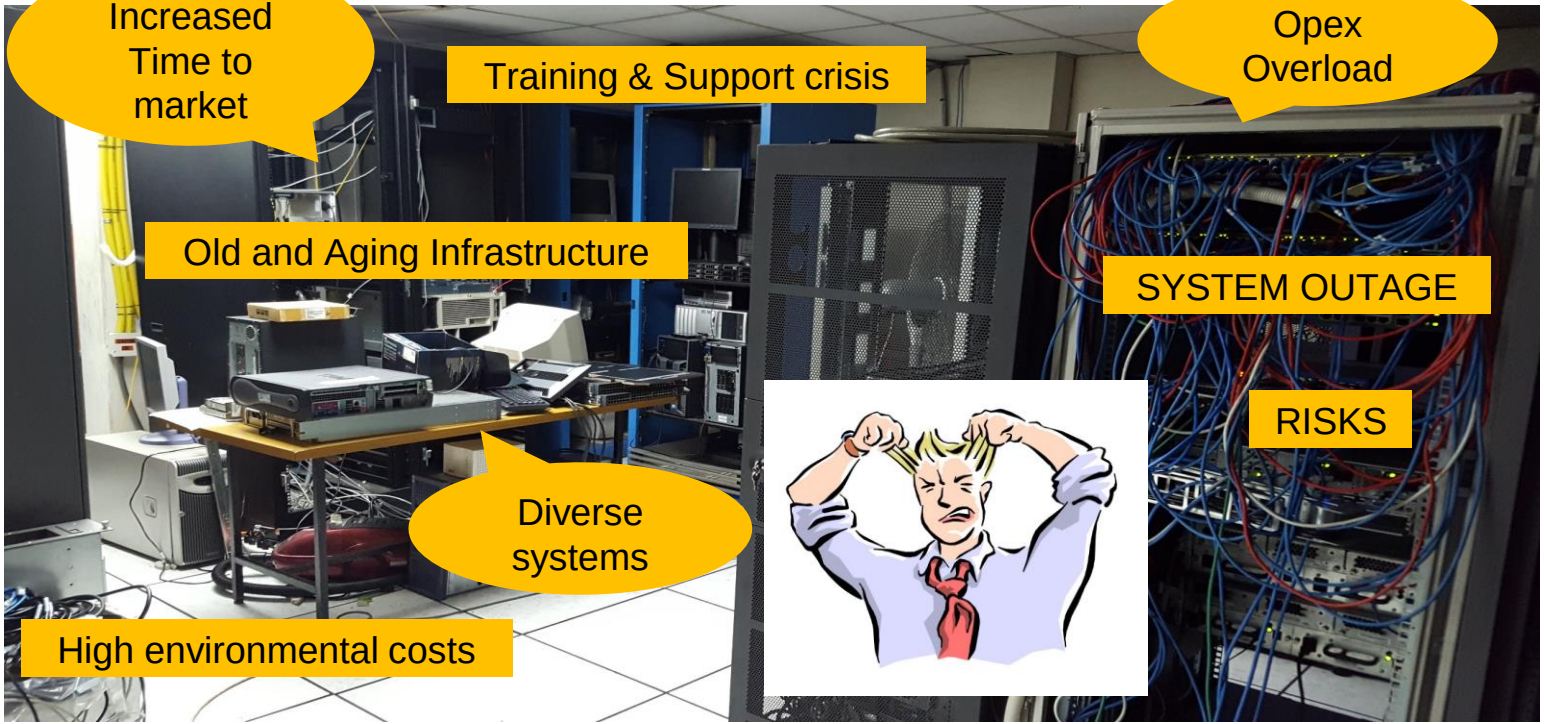
- To move from a traditional IT infrastructure to a cloud infrastructure
- To realize operational/cost efficiencies and modernization of our infrastructure.
- We request the approval of TT$32,961,074.10 in support of delivering this capability.

Executive Summary



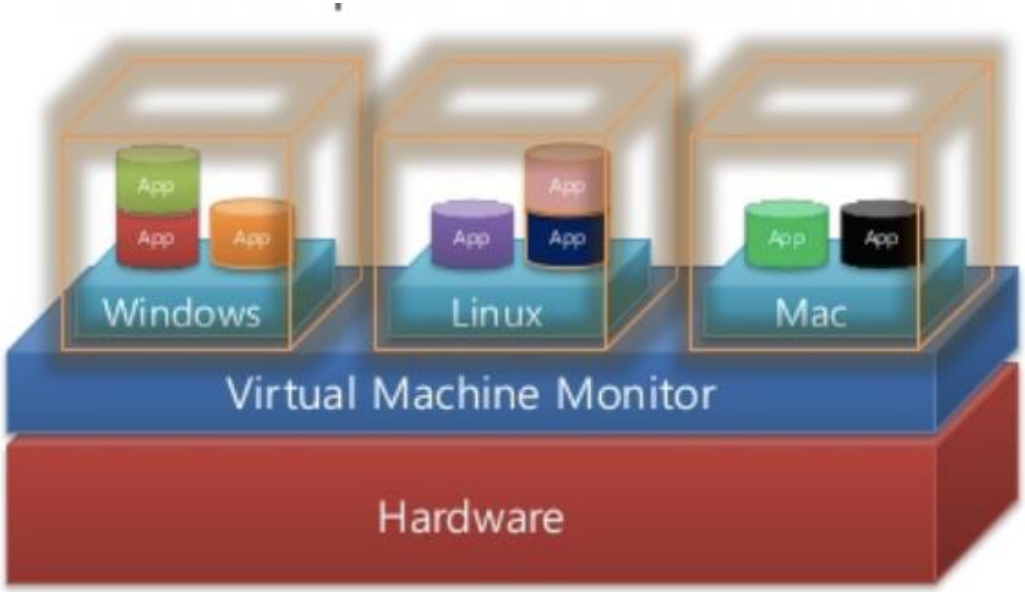
- This initiative enables the strategic plan's foundational pillars:

State of our Systems



What is Virtualization?

Virtualization refers to the creation of a virtual resource such as a server, desktop, operating system, file, storage or network.



What we needed to do !

- Move to a virtualized computing environment (Private Cloud)
  - Standardization of hardware, compute and networking

- Enhanced Storage Solution
- Shared resource environment
- Geo-redundancy and disaster avoidance
- Reduced Server footprint
- Reduced power, cooling etc.

Transformation of Systems

	Past	Present
Servers	>500	25
Storage	>500 Attached to each server	One Storage Area Network
Network	>1500 cables/ports	150 cables/ports
Facilities	>75 Racks	8 Racks

Transformation of Operations

	Present
Man Hours	Saving of an estimated 10,000 hours per year
Power / Cooling	Saving of 40% in Electricity Costs.
Redundancy / Resiliency	Now up to 100% on all virtualized applications
Vendor	Reduction of an estimated 40% associated costs
Training	Reduction in 70% of training costs

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TSTT Private Cloud Initiative

Digital Transformation – DO IT !

Thank You

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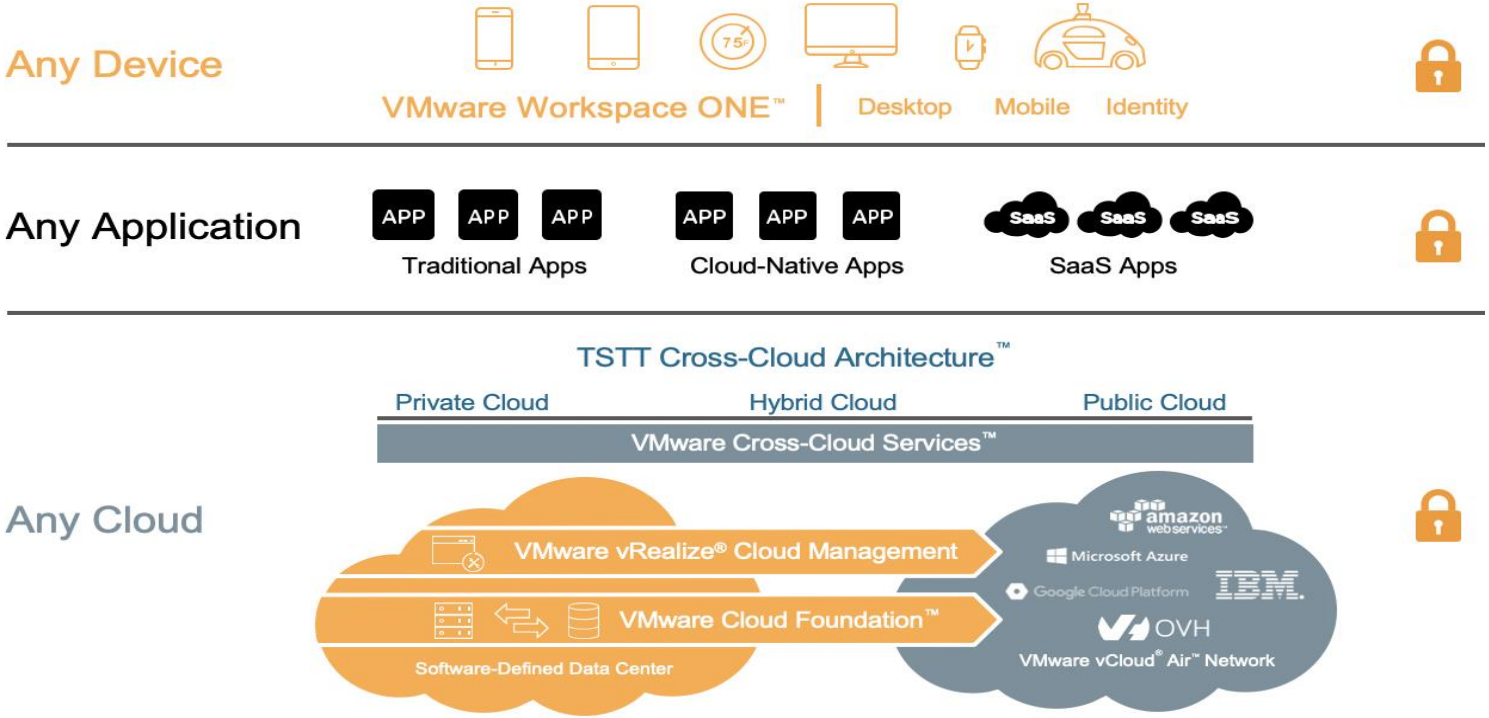
TSTT Data Center

- ✓ *TIA-942-B Accredited*
- ✓ *SOC II Type 1*
- ✓ *Concurrently Maintainable*
- ✓ *Uptime Institute Tier III Compliant*
- ✓ *BICSI Compliant*
- ✓ *EN50600 Class 3 Availability*
- ✓ *Multiple Locations*
- ✓ *Uptime of 99.999% (100% - 7 Years)*
- ✓ *Safe and Secure – Low risk of disaster*

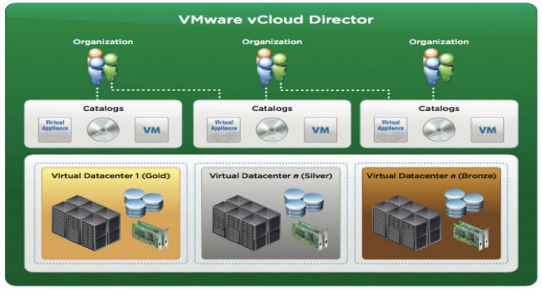
Enable with TSTT's Integrated Architecture

- Empower Digital Workspaces
- Integrate Public Clouds
- Modernize Data Centers
- Transform Security

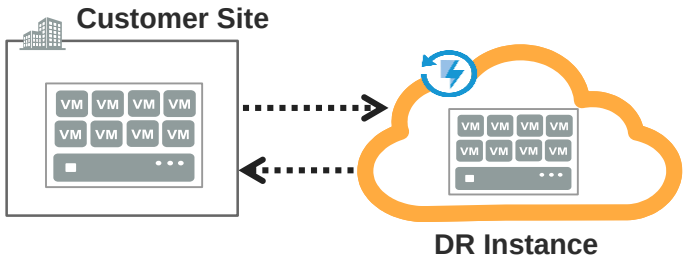


TSTT Data Center Services

Infrastructure as a Service



Disaster Recovery as a Service



Backup as a Service

COMMVAULT

- ✓ *Advanced Networking and security built in software.*
- ✓ *Hyperconverged Infrastructure offering unified, compute, storage and networking.*

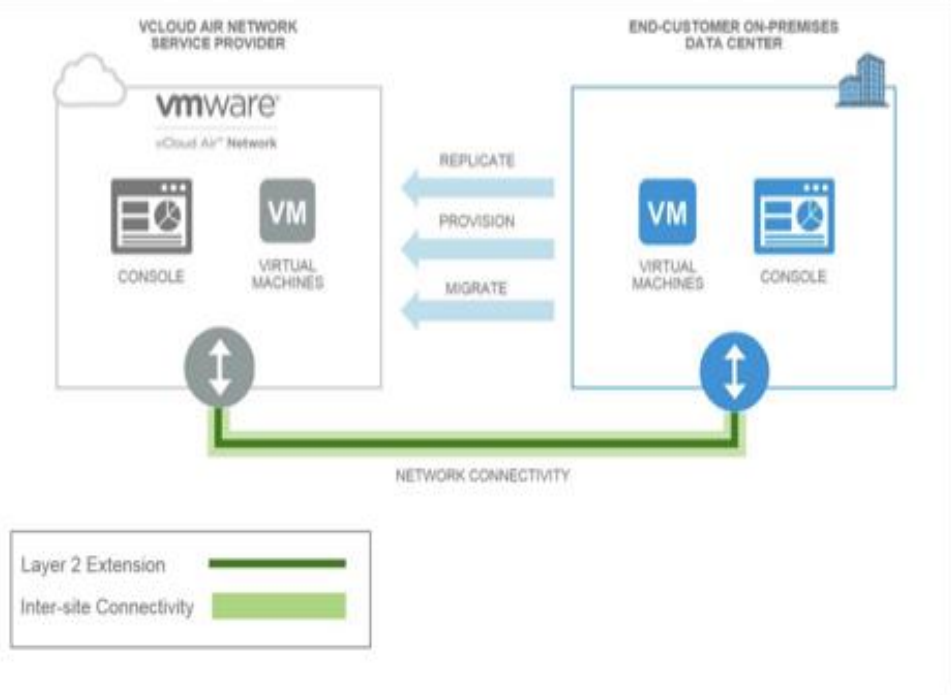
Infrastructure as a Service

Features -

- *Virtual Data Centers*
- *Virtual Machines*
- *Networking and Security*
  - *Load Balancing*
  - *Firewall*
- *Self-Service Portal*
- *Reporting Portal*
- *Local Support*
- *Multiple Operating Systems*
- *All Flash Storage*

Disaster Recovery as a Service

- *Self-service protection, failover, failover test, and failback per VM*
- *RPO: from 15 min to 24 hours*
- *RTO: Time it takes for the VM to power on*
- *IP Address Conservation*
- *Up to 24 previous restore points*
- *End-to-end encryption*

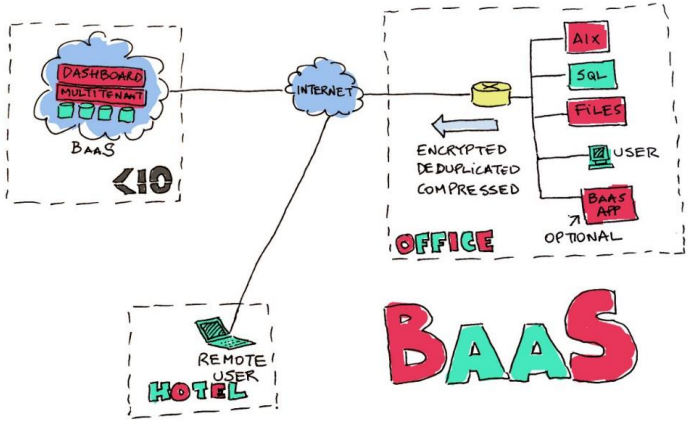


Back-up as a Service

Service Offerings:

Our solution focuses on recovery time objectives, recovery point objectives utilizing performance targets, strict SLA's and specific objectives.

- ***Flexible RTO/RPO***
- ***Built for the modern data center***
- ***Simple off-site backup and replication***
- ***Fully integrated cloud based disaster recovery***
- ***Superior modern storage integration***
- ***Proactive visibility***
- ***On-Site /Off Site configurations***
- ***It will deliver!***



COMMVAULT

TSTT Positioning

- ✓ *Regional Data Centre of "choice"*
- ✓ *Agile Broadband Company*
- ✓ *TSTT has the highest rated Data Centre in the Caribbean*
- ✓ *Located south of the Hurricane belt*
- ✓ *Our products ensure continuity of services in the event of a disaster.*
- ✓ *Finally, TSTT/bmobile also presents our best in-class SaaS (Software as a Service) application, e-Tender.*

This offers:

- RFP Tender Administration
- Document Management
- Online Tender Evaluation
- Contract Administration
- Cloud Storage

TSTT Private Cloud Initiative

Software-Defined Data Center

(IT and Broadband - Storage and Virtual Augmentation)

Executive Summary

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This project moves us from a traditional IT infrastructure to a virtualized cloud infrastructure which provides operational/cost efficiencies and modernization of our infrastructure. We request the approval of TT$32,961,074.10 in support of delivering this capability.

TECHNOLOGY

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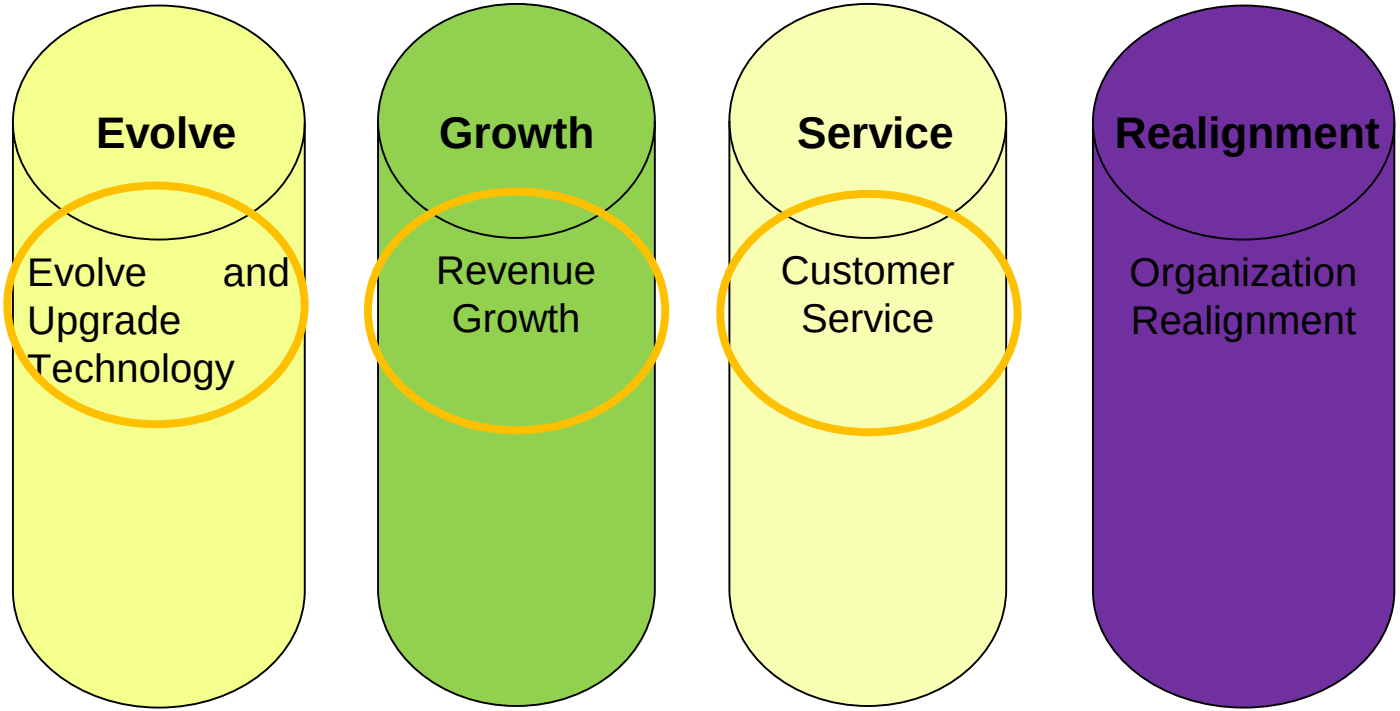
Executive Summary

This initiative enables the strategic plan's foundational pillars:



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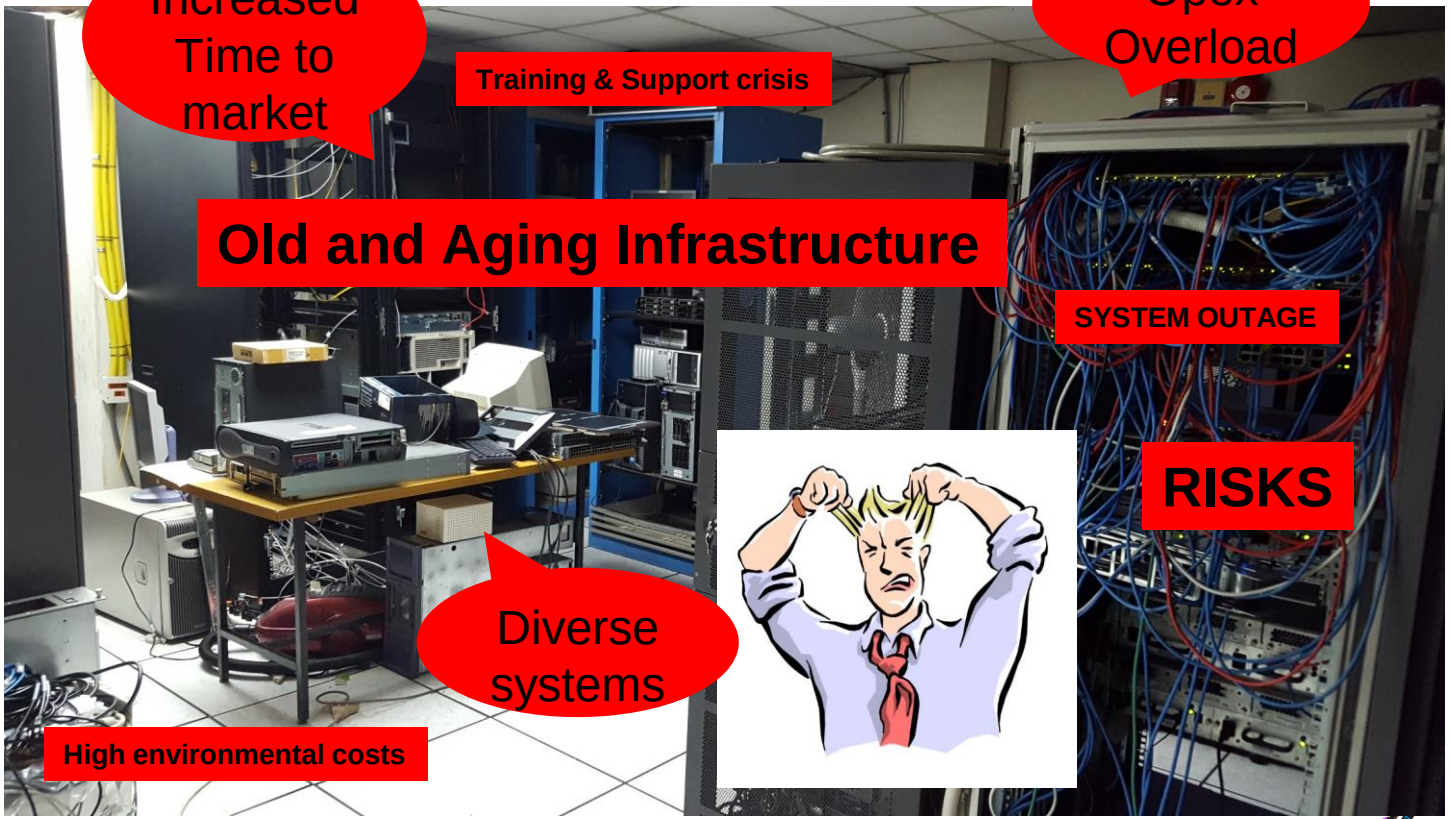
Current State



Current state of our IT infrastructure is old, diverse and Inefficient

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Current State

TSTT's current IT and Broadband Legacy Environments have the following:

- Several End of Life Systems
  - Increased Outages
- Silo processes for procurement – list price payment
- Many different systems to support
  - Extremely Diverse training plan
  - More staff required
  - Over 50 support contracts with different vendors
- Single solutions (limited redundancy)
  - Increased downtime
- Huge Server foot print

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Future State

- Simplification of support.
- Certification for staff on fewer components
- Less man-power/hour required to administrate.
- Reduced environmental requirements (cooling, electrical and space)

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Solution – Future State

This solution utilizes the following:

- A Virtualized computing environment (Private Cloud) - VMWare
- Standardization – CISCO compute and networking
- Enhanced Storage Solution – EMC^2 Storage
- Shared resource environment
- Geo-redundancy and disaster avoidance
- Reduced Server footprint
  - Reduced power, cooling etc.

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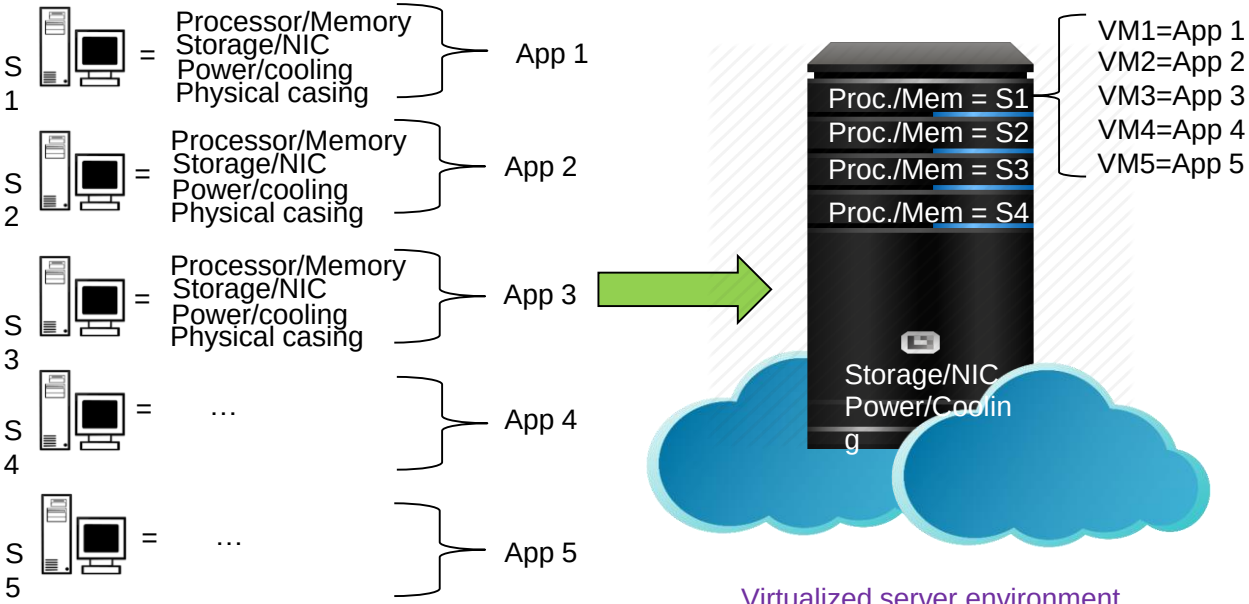

The main goal of virtualization is to manage workloads by radically transforming traditional computing to make it more scalable.

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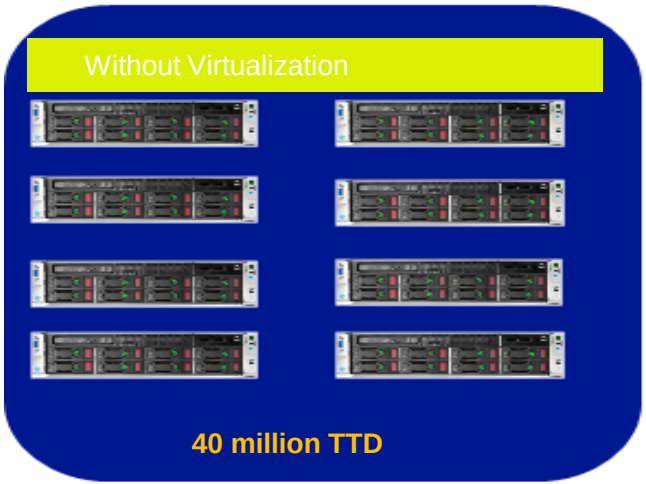
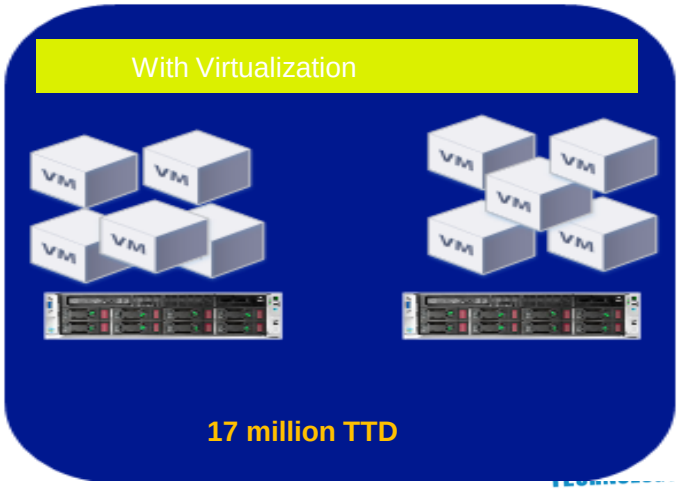
Virtualization Highlights

	Currently	After
Servers	>500	25
Storage	>500 Attached to each server	One Storage Area Network
Network	>1500 cables/ports	150 cables/ports
Facilities	>75 Racks	8 Racks
	>200 power cables	20 power cables





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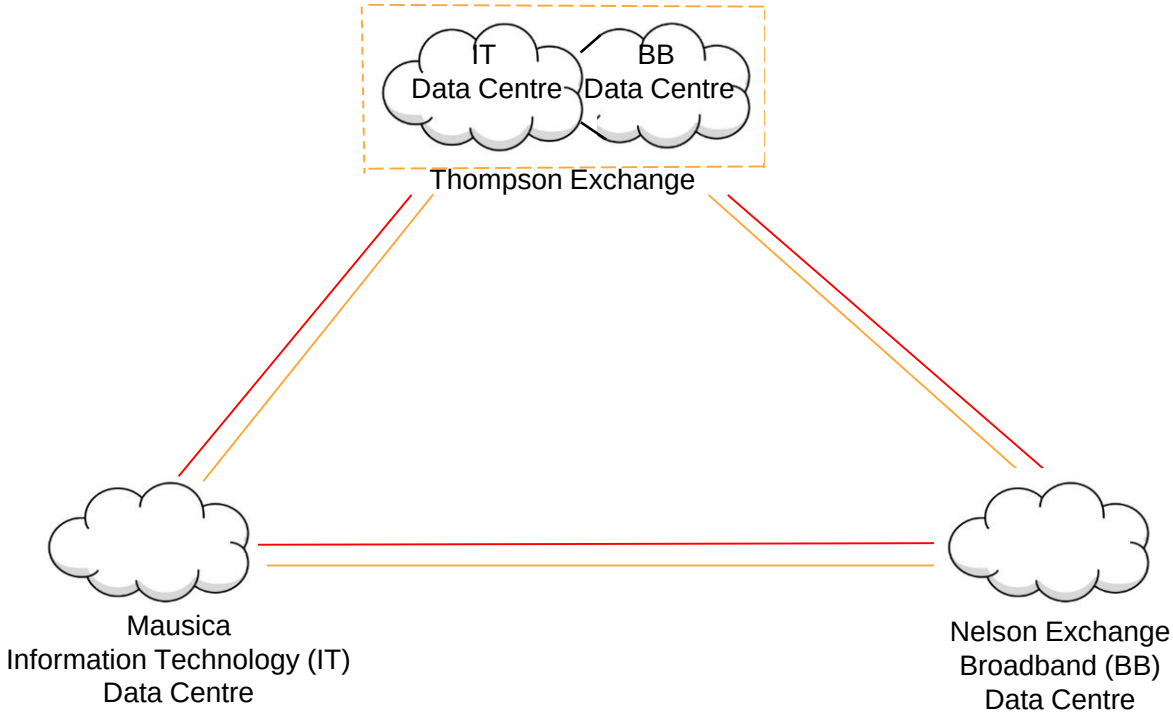
Geo-Redundant Solution



Multi-location redundancy for zero (0) outage and reduced risk

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Benefits

Revenue Generation

- Revenue enablement towards facilitating the revenue objectives in the 5-year Strategic Plan.
  - Solution expected to sustain well beyond the 5-year plan's cycle, only requiring minor upgrades.

Cost reductions

- Reductions in IT operating cost due to reduced hardware foot print
  - Approx. 10,000 man/hours to be saved per year
  - 70-80% reduction in Data Center space, power and cooling infrastructure.
- A reduction of approx. $2 million per year for hardware/software/license refreshes.

Customer satisfaction / experience

- Outage avoidance created by the geo-redundancy built into the solution, allowing a better broadband customer experience through:
  - Increased service availability and reliability.
  - Improved business reputation

System Resilience and Flexibility

- Enhanced business continuity and disaster recovery capabilities
- Simplification of the implementation of new services and applications
  - Reduction in server and application deployment from 20-40 hours to 15-30 minutes

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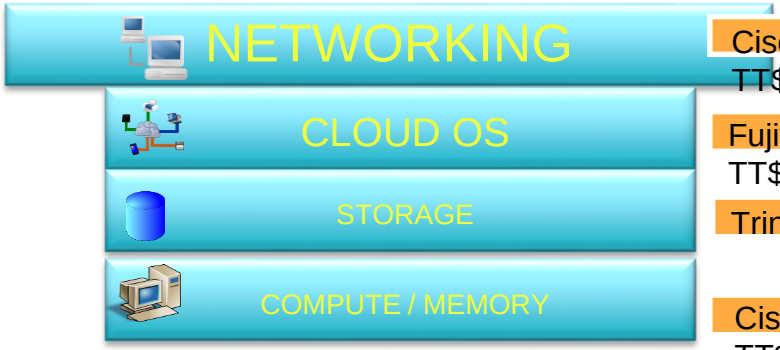
Solution Cost

Virtualized Environment

Private Cloud



Cisco Systems Inc.
TT$6,212,675.84

Fujitsu Trinidad Ltd
TT$9,607,210.88

Trinidad Systems Ltd TT$9,407,554.52

Cisco Systems Inc.
TT$7,733,632.86

TOTAL

TT$32,961,074.10

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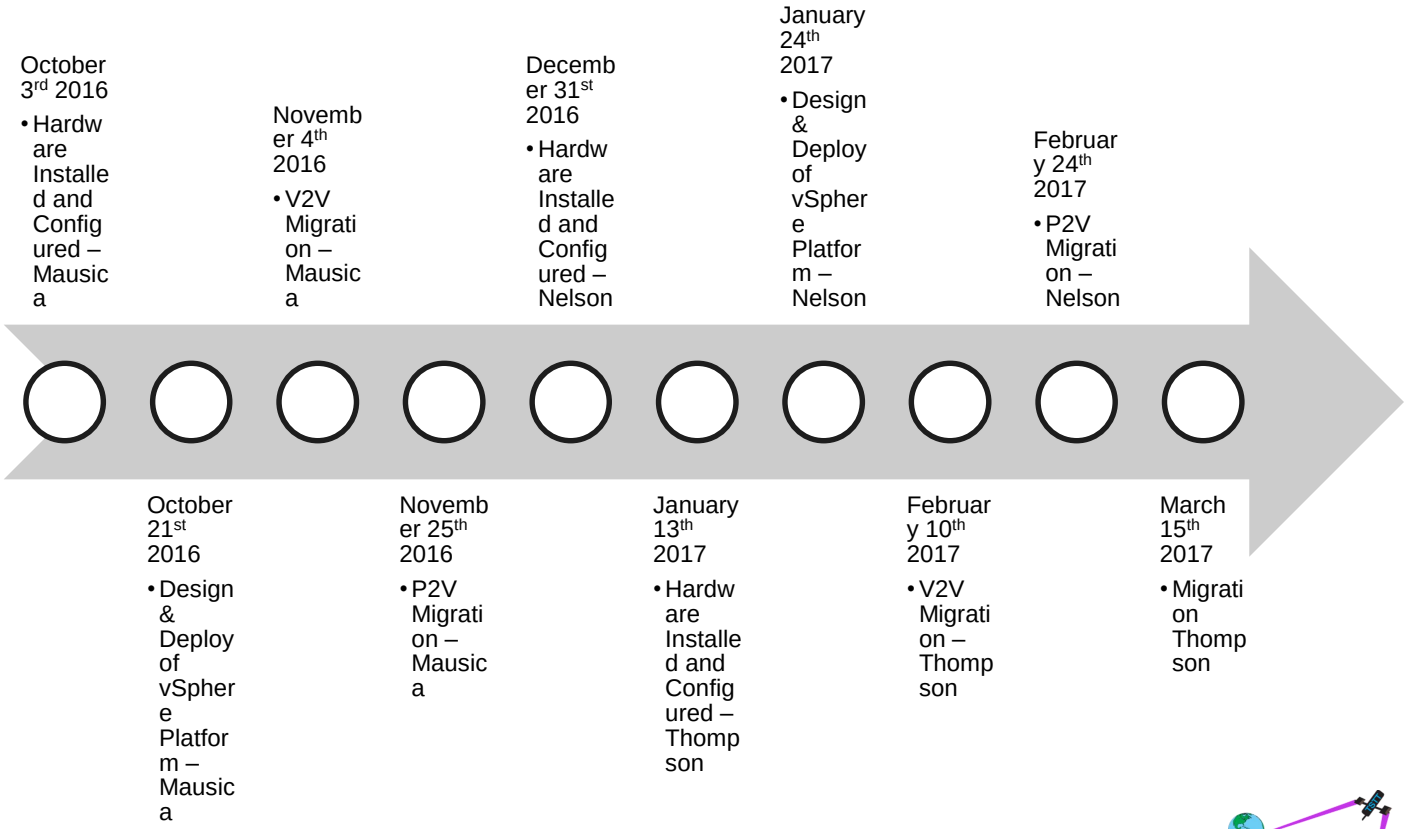
Major Risks and Mitigations

Risks	Impact	Mitigation for Risks
Legacy applications may not be compatible with new platform	LOW	Revert the application to its original legacy platform and old hardware maintained
Inefficient disaster recovery system as a result of running both new and legacy systems at the same time • Increased operating cost • Lack of failover for legacy systems	MEDIUM	Ensure adequate OPEX is allocated for the increased operating cost
Decreased customer satisfaction and business reputation as a result of poor implementation • Slow or unavailable applications	LOW	Ensure TSTT gets quality assurance agreement with vendor and ensure proper test plans are in place
Hidden costs from unexpected discoveries of deficient hardware and Infrastructure	MEDIUM	Have a Project Manager and SMEs on high alert to enact a quick response contingency plan
Delay of equipment delivery. • Not able to meet requirement of	LOW	Utilize project management to assist in

Schedule Summary



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Key Milestones

DETAILS	DURATION	START DATE	END DATE
Tenders Committee	1 day	29th Sept 2016	29th Sept 2016
Complete Equipment and Services Procurement process	2 weeks	29th Sept 2016	13th October, 2016
Equipment Delivery and Site preparation	3 months	13th October, 2016	13th January, 2017
Deployment and validation of the SDDC solution	3 months	13th January, 2017	15th March, 2017

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Total Cost of Ownership (TCO)

Description	2016/2017	Total
Capital Expenditure • Networking (Cisco Inc.) • Cloud OS (Fujitsu-VMWare) • Storage (TSL – EMC²) • Compute / Memory	 $6,212,675.84 $8,263,530.88 $8,385,140.52 $7,733,632.86	$30,594,980.10
Recurrent Expenditure • Cloud OS (Fujitsu-VMWare) • Storage (TSL – EMC²)	 $1,343,680.00 $1,022,414.00	$2,366,094.00
Total TCO	**$32,961,074.10**	**$32,961,074.10**

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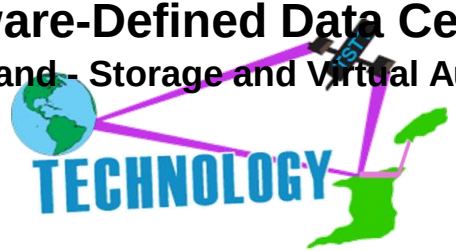
Request

- Group: Technology
- Department Name: IT Infrastructure
- Section Name: Information Technology
- Sponsor: Roger Richards
- Project: VMWare and EMC Implementation
- Capex Value: TT$30,594,980.10
- Opex Value: TT$2,366,094.00
- Budget: BAU 2016/17

TSTT Private Cloud Initiative

Software-Defined Data Center

(IT and Broadband - Storage and Virtual Augmentation)



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Thank You