Proposal for

CapitaLand IT Outsourcing Managed Services

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1 Executive Summary

1.1 Context and Objective

CapitaLand is one of Asia's largest real estate companies headquartered and listed in Singapore. The company's core businesses are real estate development, hospitality and real estate financial services. With subsidiaries which include four real estate investment trusts (REITs), CapitaMall Trust, CapitaCommercial Trust, Ascott Residence Trust and CapitaRetail China Trust, as well as Australian property group Australand, CapitaLand is truly a global player.

We applaud CapitaLand's decision to integrate the IT Outsourcing Managed Services RFP with transformational requirements to embrace Public Cloud infrastructure – all managed, monitored and automated through a single Cloud Orchestration and Service Portal. Singtel is excited to have this opportunity to share with CapitaLand on how we plan to transform CapitaLand's IT Outsourcing Managed Services through better SLA, reduced cost, and increased manageability over the traditional and new platforms.

Singtel's proposal in this RFP aims to provide a broad vision for CapitaLand to achieve three key objectives:

- **Best-fit solution that meets the current needs and supports growth**. This includes an orchestration portal which can manage resources across multiple cloud service providers; automation engine for provisioning of current and future services; ITSM tool for a structured Global Service Desk workflow; ensuring an auditable and responsive delivery of IT services.
- **Future-ready solution** that is able to support a wide variety of cloud service providers with continuous service improvement methodology in place. The solution will form an inherent foundation for any future IT transformation in CapitaLand.
- **Cost-effective infrastructure** which the Cloud Orchestration and Service Portal will provide in-built business analytics to provide critical business statistics and resource usage insights for high visibility on cloud resource optimization. Central to our Cloud Orchestration is the extensive automation of IT processes to reduce the number of IT support headcounts required to deliver the desired SLA.

Singtel will be working with best of breed partners to bring together the collective strengths of our global organizations to deliver a best-in-class IT Outsourcing Managed Services for CapitaLand that meets the above objectives. For this RFP, Singtel has partnered with Microsoft, AWS, and AliCloud to bring about a solution which will address and exceed CapitaLand's requirements.

We will bring together our best team with strong Managed Services and Cloud related experience, collective resources of our global organizations, and years of experience in delivering successful execution of IT infrastructure projects. While our solution meets all the requirements of the RFP, it is also geared towards realizing your future vision to support the changing needs of your organization.

At Singtel, we believe that we are the best long-term partner for CapitaLand in its IT journey with a strongly differentiated value proposition and are excited to present our proposal for your kind consideration.

1.2 Our Differentiated Value Proposition

We have the expertise, proven track record, capabilities and tools to deliver the best-fit solution for your current and growing needs.

- Distinctive IT Outsourcing Managed Services to support CapitaLand's initiatives on profitable business growth.
- Equip with the right assets, strategic partnerships and experience to ensure that the solution is "future-ready".
- Team of experts from Singtel who specializes in infrastructure automation, SLA-delivery and cloud workload migration.
- Centralized Cloud Orchestration and Service Portal to manage and maximize CapitaLand's current and future infrastructures
- Unmatched experience in helping our clients reduce their IT operations costs through the introduction of automation and modern cloud-based infrastructure monitoring and management.
- Unique experience in building and managing highly secure IT environment garnered through Singtel's experience in the Singapore Government Cloud
- Ideal long-term partner for the cloud journey across CapitaLand based on Singtel's demonstrated expertise and partnership with the major Cloud providers in the industry

1.3 Highlights of Our Proposed Solution

Singtel believes in three key success factors for our proposed solution.

1.3.1 An Integrated Cloud Orchestration and Service Portal

The foundation of our solution is the Orchestrator and Service Portal which provides a common set of tools and processes to bridge existing CapitaLand IT infrastructure and future cloud environments.

This “nerve-centre” of CapitaLand’s IT environment will be built from a combination of our extensive tools, assets, and architecture; delivered through our people, processes, and technology.

Our people know the business of building and running Managed Services and Cloud solutions. We are committed to provide CapitaLand with the best team equipped with the experience and expertise in IT infrastructure and cloud deployments. We will engage CapitaLand in every step of the journey to make this an effective partnership.

Our processes are industry-recognised. Singtel is the first company to attain BS15000 certification from PSB in Singapore. We will use an ITSM Framework to enable a quality and responsive service level management. The ITSM Framework comprises a comprehensive suite of integrated processes designed and aligned with the IT Infrastructure Library (ITIL) best practices.

Our technology is based upon a proven IT project delivery framework and integrated solution across products to deliver the most comprehensive set of IT services.

1.3.2 Successful Service Management Framework

Our IT Service Management (ITSM) structures the process workflow for CapitaLand to optimize service delivery. At the same time, Singtel’s intelligent ITSM reduces the overhead man-power resources and consolidate roles across different categories to provide a productive and cost effective solution – while still focussed on achieving service levels. Singtel will also table a strong support structure to enable CapitaLand through the cloud transformation journey.

1.3.3 Continuous Service Improvement

Singtel believes in continuous innovation to deliver value to CapitaLand. Our systems and processes are designed to capture, develop, and effectively share any learning that is gathered through our day to day operations. Our tools continually Collect, Organize, and Analyze data resulting from problems encountered and solutions and improvements implemented. From this rich set of information, Knowledge Base articles will be created, and applied back to CapitaLand – ensuring that we promote a self-learning environment that will ultimately reduce time taken to resolve future issues as well as to promote a highly capable organization.

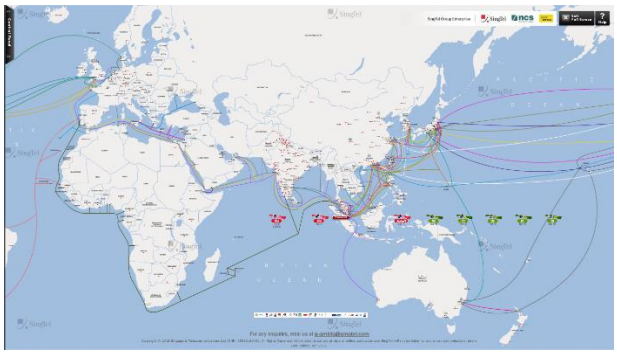
2 Company Profile

About Singtel

Singtel Group is one of the leading integrated service providers in Asia Pacific with significant operations in Singapore and Australia (through wholly owned subsidiary Singtel Optus). Serving both the corporate and consumer markets, the Group provides a comprehensive portfolio of services and is committed to bringing the best of global information and communications technology solutions to customers in Asia Pacific and beyond.

In Singapore, Singtel has had more than 130 years of operating experience, and has played an integral part in the development of the city as a major communications hub in the region. In Australia, Optus serves more than six million customers. It has driven the competition as the challenger brand, and led the way in technological innovations and breakthroughs.

Singtel's highly developed international network provides direct connections from Singapore to more than 100 countries. It is a major investor in many of the world's most sophisticated submarine cable and satellite systems. Singtel Group is the second largest satellite operator in the Asia Pacific region. With one of the most extensive and advanced telecommunications infrastructure, Singtel Group offers unparalleled reach in Australia and beyond.



Singtel is leading Managed Services and Cloud Solutions in the Asia Pacific region. We partner with the best of breed industry players, to offer a comprehensive suite of managed services solutions over our secure, reliable and industry leading IP-VPN network. These Managed Services Solutions include Managed Data Centre Hosting, Managed Unified Communications, Managed Security, Managed Network Infrastructure, WAN Acceleration and Cloud Computing. We also operate a pan-Asian chain of world class data centres branded as Singtel EXPAN, which provide a comprehensive suite of managed hosting solutions.

Singtel is able to provide the technology, consulting and integration expertise that are much sought after by our numerous clients. In addition, we also offer IT/network consultancy, as well as project and transition management services adopting industry IT management best practices such as IT Infrastructure Library (ITIL), to deliver project management excellence.

Singtel and our sister company, NCS has merged into Singtel Group Enterprise to become one of the largest ICT Services players in the Asia Pacific region. Singtel's capability to deliver Integrated Solutions, Managed Services and Connectivity across Asia Pacific is currently unrivalled. Singtel is now focused on providing Cloud and data center security solutions, and we endeavor to be CPG' one-stop ICT Solutions Provider.

Over the years, Singtel has transformed from a traditional telecommunications operator to a multimedia and integrated information and communications technology solutions company. With our experience and expertise, we are making significant strides in innovation to improve customer experience and also to enhance their businesses and lifestyles.

Singtel employs more than 23,000 people worldwide, and had a turnover of S$18.18 billion (USD 14.54 billion) and net profit after tax of S$3.61 billion (USD 2.89 billion) for the year ended 31 March 2013.

The Singtel Group is Asia's leading communications group. We provide a wide spectrum of multimedia and Information Communication Technology (ICT) solutions, IaaS (Infrastructure-as-a-Service) and SaaS (Software-as-a-Service) cloud service offerings, as well as voice, data and video services over fixed and wireless platforms.

Our main operations are in Singapore and Australia. Headquartered in Singapore, Singtel has more than 130 years of operating experience and has played a pivotal role in the country's development as a major communications hub. Today, we continue to lead and shape the local digital consumer market and the enterprise market. Our Australian arm, Optus, is a leader in integrated telecommunications, constantly raising the bar in innovative products and services.

We are a major communications player in Asia and Africa through our strategic investments in five regional mobile operators, namely Telkomsel (Indonesia), Globe Telecom (the Philippines), Advanced Info Service (Thailand) and PBTL (Bangladesh). The Group also has investments in Bharti Airtel (India), which has significant presence in Bangladesh, Sri Lanka and Africa.

We are a long term strategic investor and work closely with our associates to grow the business, by leveraging our scale in networks, customer reach and extensive operational experience. As at 31 March 2013, the Group served 468 million mobile customers around the world.

Singtel is largest listed company on the Singapore Exchange by market capitalization. We are also listed on the Australian Securities Exchange following our acquisition of Optus in August 2001. To serve the needs of multinational corporations, Singtel has a vast network of offices in countries and territories throughout Asia Pacific, in Europe and the USA while Optus has a network of offices around Australia. The Group employs more than 21,000 staff worldwide.

The Singtel Group is structured along three key businesses: Group Consumer, Group Digital L!fe, and Group Enterprise.

Group Consumer consolidates the Group's consumer-related functions, including our international business in the emerging markets, which leverages our mobile customer base of more than 400 million for optimized outcomes.

It focuses on setting new benchmarks in customer experience, so as to cement the Group's position as the leading provider of next-generation communication, infotainment and technology services to consumers and small businesses across Asia Pacific.

Group Digital L!fe drives the Group's efforts to be at the forefront of the digital arena. It strives to bring people together with an innovative and cutting edge mix of digital services such as NextGen TV, e-books, e-magazines, music, digital concierge, cloud-based gaming and hyperlocal content. It complements the offerings of the Group Consumer business with bundles and add-ons of state-of-the-art digital services.

Group Enterprise provides innovative and comprehensive ICT solutions to the Group's enterprise customers across geographical boundaries.

Both Singtel and Optus deliver satellite services, international data and managed services, cloud computing and enterprise mobility services. It also combines the capabilities of NCS in Singapore with Alphawest in Australia to provide customers with end-to-end solutions.

Subsidiaries

ΣXPAN

Singtel EXPAN is a network of world-class data centres, with one of the most extensive regional points of presence in the Asia Pacific. With more than 10 robust and secure data centre facilities located in four countries: Australia, Hong Kong, Japan and Singapore, combined with marketing alliances in China, India, Indonesia, Malaysia, the Philippines, South Korea, Taiwan, Thailand, Europe and USA, Singtel EXPAN extends its reach to other parts of Asia and beyond. To date, there are more than 30 data centre alliances in these countries.

Singtel EXPAN has been managing data centres since the early 1990s, and was the first to launch facility management operations in Singapore. Singtel EXPAN now offers world-class facilities and direct interconnectivity access, and a range of Information Communications Technology (ICT) Managed Services within secure and resilient environments – 24 hours a day, 7 days a week.

World-class colocation and network facilities make up only part of the story. Singtel EXPAN's managed services also allow organizations to outsource IT operations in the form of systems, storage, backup, security and database management. In addition, a team of dedicated IT professionals provide customized IT solutions including hardware and software procurement and provisioning for web and database setups.

EXPAN data centres are backed by Singtel fibre networks, cable networks and satellite infrastructure. By owning the cables that carry data from the wide-area network all the way to enterprises' premises, customers save from making investments in last mile connections, and enjoy a consistent level of service and quality throughout the entire network. The EXPAN network provides organizations with a wide variety of connectivity options for all their telecommunications needs, such as Singtel Internet Exchange (STiX) – Asia's leading internet backbone, and Singtel ConnectPlus for managed IP VPN, IPLC and Ethernet solutions.

NCS Pte Ltd is a leading regional ICT solutions provider with 18 offices across 10 countries in the Asia Pacific and Middle East. Formed in 1981 to support Singapore's public sector computerization programme, the now privatized company has built up an impressive portfolio of large-scale and mission-critical projects. NCS helps its customers gain a competitive edge through its extensive range of services, including consulting, development and integration, managed services, and technology solutions.

Having established itself the IT services provider of choice in the region's public sectors, NCS has since successfully extended its presence into defense and homeland security, education, transportation and logistics, airport and aviation, healthcare and life sciences, financial services, manufacturing, telecommunications and utilities sectors.

Optus is an Australian leader in integrated communications, serving over nine million customers each day. The company provides a broad range of communications services including mobile, national and long distance services, local telephony, business network services, Internet and satellite services, as well as Internet television.

Since commencing operations in 1992, Optus has invested more than A$16 billion in the construction of fixed, mobile and satellite networks across the country, including central business district and suburban local access networks. These networks provide the company with an advanced technology platform capable of delivering integrated communications, information and entertainment services.

Optus became a wholly-owned subsidiary of Singtel on 30 August 2001 and was listed on the Australian Stock Exchange on 10 September 2001.

Singtel Mobile is the market leader in Singapore with over three million customers who enjoy excellent local as well as overseas roaming coverage.

It also offers reliable Long Term Evolution (LTE) mobile broadband service, making it the first provider of such a service to both consumer and business customers in Singapore. The service offers theoretical download speeds of up to 75Mbps and typical download speeds between 3.4Mbps and 12Mbps. It makes possible mobile Internet access -- more than three times faster than existing 3G-based services, with one-fifth of the network latency.

Always at the forefront of technology, Singtel Mobile offers a suite of novel services and solutions to meet the changing lifestyles and communications needs of consumer and business customers. Its competitive edge lies in its strong emphasis on an unparalleled customer experience.

Its suite of infotainment mobile content and applications under the IDEAS brand provides updated news, sports and finance information, music, mobile TV, games and more. Leveraging the capabilities of LTE, Singtel Mobile brings to customers the latest applications such as cloud storage, video conferencing, music and e-books.

SingNet is the leading Internet Service Provider (ISP) in Singapore. Established in 1994, SingNet offers a full range of Internet services with different usage plans to cater to differing needs of home and business users. It was the first ISP in

Singapore to introduce broadband services using ADSL technology.

SingNet also offers a comprehensive array of affordable consumer and business applications on its high-speed fiber services. Leveraging the Next Generation Nationwide Broadband Network (Next Gen NBN) deployed by OpenNet (NetCo) and Singtel's own extensive Operating Company's (OpCo) fiber infrastructure, customers can look forward to a wide range of high speed fiber services with downlink speeds of up to 200Mbps, uplink speeds of up to 100Mbps and international bandwidth of up to 25Mbps.

Singtel Digital Media is the brainwave behind Singapore's premier web and mobile lifestyle destination, inSing.com. Launched in May 2009, inSing.com focuses on hyper-local content, user reviews and exclusive editorials to offer a uniquely Singaporean perspective on what to eat, things to do, shopping, hot deals and the best entertainment in town. Its extensive local search engine also helps users locate a business or service quickly from over 100,000 listings of businesses in Singapore.

Singtel Innov8 (Innov8) is a corporate venture capital fund with its own set of decision-making, approval and funding processes. With an initial fund size of S$200 million, Innov8 focuses its investments on technologies and solutions that lead to quantum changes in network capabilities, next generation devices, digital content services and enablers to enhance customer experience. It works closely with the ecosystem of leading innovators, developers, government agencies, R&D and capital providers to bring cutting-edge technologies and solutions to the various markets the Singtel Group operates in.

[a•mo•bee] is the global leader defining mobile advertising. [a•mo•bee] offers comprehensive mobile advertising solutions to the largest mobile operators, publishers, and advertisers. [a•mo•bee]'s advanced, proprietary mobile advertising technology delivers all forms of mobile advertising—from a simple text message to a rich media experience—supporting the vast array of connected devices in the marketplace.

[a•mo•bee] empowers its customers to exceed their mobile advertising objectives and achieve unparalleled ROI through the use of big data analytics to decide what is valuable to consumers, advertisers and publishers.

Overseas Investments

Overseas investments are an integral part of Singtel's strategy for long-term growth. The Singtel Group has expanded into overseas markets, with current investments in over 20 countries and territories. Singtel's focus is the Asia Pacific region, particularly in our core telecommunications businesses. Its most significant investments include:

Company	Country	Singtel's Stake
Advanced Info Service	Thailand	23%
Bharti Airtel Limited	India	32%
Globe Telecom	The Philippines	47%
Pacific Bangladesh Telecom	Bangladesh	45%
Telkomsel	Indonesia	35%

Advanced Info Service (AIS) is today the largest mobile operator in Thailand with over 97% nationwide coverage. The company and its subsidiaries operate varied telecommunication related businesses, including a mobile network operator, an international direct dialling service, a data communications service, a call centre service, sales and distribution of handsets and a SIM card, refill cards and payment service.

As at 31 March 2013, AIS had 37.1 million mobile customers.

Bharti Airtel Limited (Bharti Airtel) is a leading integrated telecommunications company with operations in 20 countries across Asia and Africa. In India, the company's product offerings include 2G, 3G and 4G services, fixed line, high speed broadband through DSL, IPTV, DTH, enterprise services including national and international long distance services to carriers. In the rest of the geographies, it offers 2G, 3G mobile services.

As at 31 March 2013, Bharti Airtel had 260 million mobile customers in Africa and South Asia.

Globe Telecom (Globe) is a leading full service telecommunications company in the Philippines, serving the needs of consumers and businesses across an entire suite of products and services including mobile, fixed, broadband, data connections, internet and managed services. Its principals are Ayala Corporation and Singtel who are acknowledged industry leaders in the country and in the region.

As at 31 March 2013, Globe had 35.1 million mobile customers.

Pacific Bangladesh Telecom Limited (PBTL) is Bangladesh's pioneering mobile communications company and has been in operations since 1989. PBTL is the only CDMA operator in Bangladesh and has an extensive network coverage of 90%. In 2009, PBTL introduced EV-DO technology to its existing suite of mobile services.

As at 31 March 2013, PBTL had 1.5 million mobile subscribers.

PT Telekomunikasi Selular (Telkomsel) is the leading operator of cellular telecommunications services in Indonesia, with over 44,000 radio base stations (including 3G Node B) providing nationwide coverage. Its network extends to cover the entire archipelago and has been the key to Telkomsel's success in bringing Indonesia toward the broadband-based telecommunication world.

As at 31 March 2013, Telkomsel had 121 million mobile customers.

Singtel's International Cable Infrastructure

Singtel's highly developed international network provides direct connections from Singapore to more than 100 countries. It is a major investor in many of the world's most sophisticated submarine cable systems, such as SEA-ME-WE 3, SEA-ME-WE 4, APCN, APCN 2, China-US, Japan-US, C2C, i2i and Southern Cross.

Completed in December 1999, SEA-ME-WE 3 is one of the world's longest and largest capacity submarine cable networks. Costing US$1.5 billion, the cable spans 38,000 km and has 39 landing points straddling the Pacific Rim, South East Asia, the Middle East, North Africa and Western Europe. The cable utilises 10 Gbps Wavelength Division Multiplexing (WDM) technologies with Synchronous Digital Hierarchy (SDH) transmission which offers unparalleled enhanced network resilience and connectivity. SEA-ME-WE 3 has been upgraded to a capacity of 70 Gbps.

SEA-ME-WE 4 is a high-capacity optical cable that spans some 20,000 km from Singapore to France via the Middle East. Completed in December 2005, it is the fourth in the series of cables connecting Asia, Europe and North Africa. Utilising Dense Wavelength Division technology, the system is able to carry up to a maximum of 64 wavelengths per fibre pair or a design capacity of 1.28 terabits per second. This is the equivalent of handling more than one million Internet users simultaneously having real-time access to a 1 Mb file. The SEA-ME-WE 4 cable system, costing some US$500 million, is among the most economical cable systems in the region offering unparallel enhanced network resilience and connectivity.

Singtel has major stakes in the two Asia Pacific Cable Network cables. The 12,000 km APCN network links Korea, Japan, Hong Kong, Taiwan, the Philippines, Thailand, Malaysia, Singapore and Indonesia. Commissioned in January 1997, it provides a direct optical link between Australia and the rest of Asia. APCN which costs US$640 million to build has a design capacity of 10Gbps.

APCN2, a 19,000 km cable, with a design capacity of 2.56 Tbps and a current equipped capacity of 160 Gbps, was completed end 2001. The cable, costing US$1.1 billion, links China, Hong Kong, Japan, Korea, Malaysia, the Philippines, Singapore and Taiwan.

The **China-US** cable, built to the cost of US$1.4 billion, supplements Singtel's cable capacity in the Trans-Pacific cable networks and offer enhanced cable diversity and reliability for international telecommunications services. With a capacity of 80 Gbps, the 29,000 km long cable has immense capacity to support the telecommunications needs between Asian Countries and the US.

The **Japan-US** cable network is a 4-fiber pair system with a design capacity of 640 Gbps. The 21,000 km cable network costs US$1.32 billion. Completed in September 2001, it is currently equipped up to 400 Gbps and offers enhanced cable diversity and reliability for international telecommunications services across the Pacific Ocean.

In March 2001, Singtel and Bharti Group formed a 50:50 private submarine cable development company, **Network i2i**, to build the world's largest cable network in terms of bandwidth capacity (8.4 Tbps). The US$220 million i2i cable network (i2icn) is a 3,100 km long cable linking Singapore and Chennai. The entire i2i cable network utilises the latest Dense Wavelength Division Multiplexing (DWDM) technology to provide transmission facilities, which can be upgraded, to ensure durability. i2icn will link to Singtel's extensive cable networks to the rest of the world. This includes the C2C cable network, SEA-ME-WE 3 and APCN2. The i2icn was completed in April 2002.

The Southern Cross cable lit up in November 2000 removing the bandwidth bottleneck between Australasia and the United States. Originally designed to deliver 120 Gbps of fully protected capacity, Southern Cross was expanded in the first quarter of 2003 to 240 Gbps, with the potential of increasing total protected network capacity to 480 Gbps. Southern Cross now has the potential to provide for Australasia's bandwidth requirements for the next five years, delivering 480 times the capacity of the PacRim system - enough to transfer a 3 km-high stack of typed documents or eight full-length motion pictures every second.

The **TIS** (Thailand-Indonesia-Singapore) cable began carrying commercial traffic in December 2003. The 1,100 km long cable network lands in Songkhla (Thailand), Batam (Indonesia) and Changi (Singapore) and is linked to Singtel's extensive submarine cable networks in Asia Pacific. The US$36 million consortium cable has an initial and design capacity of 30 Gbps and 320 Gbps respectively.

Satellite Systems

Satellite systems play a major role in providing diversity for cable circuits, as well as providing direct connection to countries which are otherwise not accessible by submarine cable.

In Singapore, Singtel has three satellite earth stations providing direct transmissions to over 80 countries. Singtel recently launched its second commercial satellite ST-2 in May 2011. With its wide-ranging footprint of C-band and Ku-band coverage including the Middle East, Central Asia, Indian sub-continent and South East Asia, it will cater to the growing customer demand for fixed and mobile satellite services. ST-2 will initially complement, and later replace ST-1.Singtel launched Singapore's first commercial satellite, ST-1 in 1998.

Besides being an investor in APT Satellite Holdings of Hong Kong with an overall interest of 20.33%, Singtel is also a customer of APT Satellite Company and has six C-Band transponders on **APSTAR V**. APSTAR V was launched on 29 June 2004 and operates from 138 degrees East longitude as a replacement satellite to APSTAR I.

Singtel is also a strategic partner and leading provider of Inmarsat and Iridium satellite services, offering a range of **mobile satellite solutions** to meet customers varied remote and wireless communications needs.

Singtel's **satellite capabilities** were further strengthened with the acquisition of Optus, the leading satellite communications provider in Australia with a satellite footprint covering Australia, New Zealand, Papua New Guinea and the Pacific. The Singtel Group is the largest satellite operator in the Asia Pacific region (excluding Japan), providing access to more than 38 geo-stationary satellites.

Optus Satellites

Optus is a leader and innovator in satellite-based communications services in the Australasia region providing a comprehensive range of advanced digital satellite services. With the largest fleet of domestic satellites in Australia and New Zealand, Optus delivers the majority of satellite services in those countries, including subscription-TV, free-to-air TV, radio, Internet, voice, and data services.

With over 25 years of experience in satellite services, Optus has an unmatched track record in delivering these services to rural and remote areas in Australia. Optus has the expertise and proven capability to effectively meet all domestic and regional business communication needs.

Optus owns and operates five satellites, Optus, B3, C1, D1, D2 and D3 satellites. Five older satellites (A1, A2, A3, B1 and B3) were retired at the end of their operational lives. Optus' satellite footprints

cover Australia, New Zealand, Asia, Hawaii, Norfolk Island, Papua New Guinea, Lord Howe Island, Cocos Island Christmas Island and McMurdo Sound.

Three Hughes HS-376 satellites were launched and have provided nearly flawless service to Australia. A1 was de-orbited in August 1993 and exceeded its expected life by one year. A2 was de-orbited in April 2001 and A3 was de-orbited in 2008.

The Optus A-series satellites were replaced by two B-series satellites (B1 and B3). To date, the Optus B3 satellite is still operational in inclined orbit at 164ºE and still carries services for the MobileSat product supporting many customers till the satellites EOL which is planned for 2014/15.

Optus C1 was launched in June 2003. Its role was to replace B3 to provide broadcast television services. As well as subscription television and remote area broadcasting, C1 also carries a communications payload for The Department of Defence.

Optus D1 satellite was launched in October 2006 and replaced the B1 satellite. The B1 satellite was operated in inclined orbit for MobileSat services until early 2008.

The D2 satellite was launched in Oct 2007 and replaced the B3 satellite which also was placed into inclined orbit to replace the B1 satellite. In early 2008 the MobileSat services were transferred from the B1 to the B3 satellite, and the B1 satellite decommissioned.

In August 2009 the Optus D3 satellite was launched and went into service in Oct 2009 providing increased capacity at the 156E orbit location where C1 & D3 are co-located. With the completion of launching the three D-series satellites, Optus ensure business continuity and growth well beyond 2020.

Singtel's Awards and Accolades

Singtel's leadership position and competitive strengths continue to receive industry and customer recognition. Recent awards include:

- Asia Communications Awards
  Best Cloud Service (2011, 2012)
  Best Enterprise Service – Connectivity-as-a-Service (2013)
  Best SME Service – myBusiness
- ComputerWorld Singapore Customer Care Award 2013
  Cloud Services (2012, 2013)
  Telecommunications Services (2008 – 2013)

- NetworkWorld Asia Readers' Choice Product Excellence Awards
  Best Cloud Infrastructure Provider (2013)
  Best Managed Infrastructure Services (2013)
  Best Managed Services (2008 – 2013)
  Best IP Services Infrastructure and Managed Services (2012)
- NetworkWorld Asia Information Management Awards 2013
  Best Security-as-a-Service (2012, 2013)
- 2013 Frost & Sullivan Singapore Excellence Awards
  Asia Pacific Product-line Strategy Excellence Award for Unified Communications-as-a-Service
  Beyond Connectivity Service Provider of the Year
  Singapore Telecom Service Provider of the Year
  Singapore Carrier Ethernet Service Provider of the Year
- IDC
  Leader for Data Center and Hosted Cloud Services
  IDC Service Provider of the Future
- ComputerWorld Readers' Choice Awards
  Best Data Centre and Hosting Services Provider
  Best Managed Connectivity Services Provider
- Asia Business Continuity Awards (ABCA) 2013
  Business Continuity Provider of the Year (BCM Services)
  Business Continuity Provider of the Year (Recovery Site)
- ComputerWorld Hong Kong Awards
  Best Managed Services & IT Outsourcing Provider (2011 - 2013
- Ethisphere Institute
  2014 World's Most Ethical Company®
- SingTao Square IT Editors' Choice Awards 2013
  Best Managed Service Provider 2013 – Hong Kong
  Best IT Conference 2013 - i.luminate Hong Kong 2013
  Best Innovative Managed ICT Service Provider – China
- HardwareMag (HWM) and HardwareZone.com Tech Awards
  Best Telco
  Best Fibre Broadband Service
  Best 4G Network
- Carrier Ethernet Awards
  Best Carrier Ethernet Business Application
  Best Wholesale Ethernet Service
- MEF Asia Pacific Carrier Ethernet Service Provider Awards 2013
  Best Wholesale Ethernet Service
- Global Carrier Ethernet Service Provider Awards 2013
  Best Carrier Ethernet Business Application
- Investors' Choice Awards organized by the Securities Investors Association Singapore

Board of Diversity Award
Internal Audit Excellence Award
Inducted into the Corporate Governance Hall of Fame for achieving high Corporate Governance standards

- IDC Telecom Service Provider Innovation Awards 2013
  Service Provider of the Future

- Singapore Tourism Board Singapore Excellence Awards
  Trade Conference of the Year for i.luminate 2012

- Contact Centre Association of Singapore (CCAS) International Contact Centre Awards 2013
  Contact Centre Awards (Client Biz):
  Silver – Best Outsourced Contact Centre (Below 100 seats): STCC
  Bronze - Best Outsourced Contact Centre (above 100 seats): Ministry of Manpower Contact Centre

- 2013 Frost & Sullivan Asia Pacific ICT Award
  Service Provider CEO of the Year
  Data Communications Service Provider of the Year

- HardwareMag and Hardware Zone.com Tech Awards
  Best Mobile Operator
  Best Provider of Mobile and Fibre Broadband service

- International Quality & Productivity Centre Process Excellence
  Best Business Process Management project (Honorary Mention) Project - Project Domdata
  Best Business Process Excellence Program (Notable Mention) - Higher and Further Where Eagles Dare
  Winner of Deployment Leader of the Year - Yew Ker Ling, Vice President (Centre of Operational Excellence)

- Best Bottom-line IT
  By IDC Asia Pacific and Fairfax Business Media

- IDC Topline Report
  Market Leadership for International MPLS IP VPN Services APEJ
  Market Leadership for International Dedicated P2P Services

- Superbrands Singapore 2012
  Business Superbrands

3 Reference Customers

Customer / account name	Infocomm Development Authority of Singapore
Summary of project	Singapore Government Cloud (G-Cloud)
Project description	The G-Cloud is a whole-of-government private cloud infrastructure that is multi-tenanted and meets the required security assurance for the government. The G-Cloud delivers benefits of cloud computing which includes virtualisation, multi-tenancy, automation with on-demand provisioning and rapid scalability of G-Cloud resources. The G-Cloud addresses the different levels of security and governance requirements. It also paves the way for the standardisation and sharing of computing resources and applications across all government agencies thus leading to greater agility and the lowering of IT operating costs. With innovation being one of the cornerstones of the G-Cloud's design, its versatile and extensible platform is also used as a test-bed to pilot new and innovative applications without upfront cost and ownership of asset. The adoption of the G-Cloud services has redefined the government sector's delivery of e-services, both internally and to the public. G-Cloud opens the gateway for more government e-services to be delivered more quickly, securely, at lower costs and on-demand, anywhere and anytime.
Approximate Cost	Confidential

Customer / account name	NTUC
Summary of project	Managed IaaS, Facility management, End-user computing and Managed services
Project description	Host NTUC infrastructure in Singtel Managed Cloud that is multi-tenanted and meets the required security assurance. This paves the way for the standardisation and sharing of computing resources and applications across the group, thus, leading to more predictable and better cost effective OPEX model for business continuity planning. Provision of onsite IT personnel resources to manage daily operation, virtual machine, patched management, system management as well as service desk. Provision of Full DR services
Approximate Cost	SGD 16M

Customer / account name	ANZ
Summary of project	End to End Global Managed Services
Project description	The contract consists of (but not limited to) the following services: • Australian Data & Voice carriage to 900 locations, • Global Data & Voice Carriage 31 countries, • WAN/LAN/WLAN refresh in Australia across 900 sites, • TelePresence to over 70 global locations (initially 32 locations), • TDM & IPTel voice globally, • 3000 seat Genesys/Avaya global contact centre, • Australia & Singapore mobile, • Data Centre space & management in Singapore, • End to End global Managed Services for all above.
Approximate Cost	SGD 500M

Customer / account name	NTUC Income
Summary of project	Cloud + EUC
Project description	We won NTUC EWO Contract which includes the services mentioned below and Cloud A3 services. NTUC has opted to use Singtel Cloud Alatum 3.0 as their virtual datacentre from their previous VM environement which they traditionally host with Datacentres. The EWO contract includes • Helpdesk services • Desktop services • Software distribution • Facilities management • Asset management.
Approximate Cost	SGD 9.5M

Customer / account name	Leading Gateway & Food Company
Summary of project	Facility management, End-user computing and Managed services
Project description	IT Managed Helpdesk for 11,000 staff including IT outsourcing for 4,000 end points. Managed full inventory of equipment at 2 x DCs. SingTel worked closely with Customer to ensure that key operational applications that dealt with cargo handling, resource planning and tracking, flight activities tracking, and meal preparation and production did not suffer any disruption during and after the migration. As part of its portfolio of Managed ICT Services, SingTel delivered a best-in-class total outsourcing solution, including hardware, software, professional services and 24x7 monitoring and support of the entire IT infrastructure.
Approximate Cost	Confidential

Customer / account name	Calsonic Kansei
Summary of project	Managed Services + Cloud Services
Project description	Calsonic Kansei is a global automotive parts maker with businesses in over 50 locations around the world. They have adopted Singtel's Global IP-VPN Service, Managed Services, and Cloud Services. This acclaimed, high-quality and stable cloud service creates a technology network that enables Calsonic Kansei to perform at the highest level.
Approximate Cost	Confidential

Customer / account name	CPG Corporation
Summary of project	Cloud + Managed Services
Project description	Supply of outsourced managed services for Data Centre, Service Desk, and 650 end user support with CPG including FM office and remote sites in Singapore. Deliver cloud transformation services via transformation planning framework and cloud capability framework.
Approximate Cost	Confidential

Customer / account name	Government Agency
Summary of project	Microsoft Private Cloud
Project description	Government Cloud
Approximate Cost	Confidential

4 Proposed Solution

4.1 Introduction

We put forth a solution based on our understanding of the requirements specified in the tender document and information gathered through clarification questions. The proposal will include the following:

IT Service Management and Governance

SingTel adopts service delivery based on industry standards like ISO and ITIL. Our very own service delivery framework is based on ITIL which gives our customers the assurance that all our processes and methodologies are aligned with recognized and reputed frameworks.

Transition and Transformation

Part of SingTel's proposal is the Transition where we will plan for the smooth take-over of services from the incumbent service provider. The transition will follow a well-established framework and governance to mitigate risks and minimize downtimes.

Our service offering will focus on infrastructure management which will cover datacentre operations, server and storage management, network and security management, and platform management. When applicable, Singtel will deploy the appropriate tools to perform the service management.

Data Centre Operation Management

Singtel has a network of world-class data centres, with one of the most extensive regional points of presence in Asia Pacific. With our experience in running data centres, Singtel is able to extend and share our expertise to manage CapitaLand's 3 x data centres in Singapore and 2 x data centres in China.

Infrastructure Service Management

As one of the biggest player in Singapore in IT outsourcing, SingTel would like to propose our managed services to support CapitaLand. Our pool of well-trained, certified and experienced engineers will manage the entire spectrum of the infrastructure covering servers, storage, virtualization, security, network switches, hubs, wireless controllers and access points. Singtel's 24x7 Command Centre will provide round-the-clock monitoring of all networked devices.

Platform Management

As part of our service offering and in compliance with the tender requirement, Singtel will also perform platform management covering AD management, database, messaging, servers, storage, middleware and ERP support.

Also included in this proposal is the end-user support covering service desk and EUC field service. Singtel offers a consolidated end-to-end support for the end-users of CapitaLand.

Service Desk

SingTel's Service Desk operations adhere to ITIL and COPC (Customer Operations Performance Centre) standards. The team members are fluent in English and are technically sound with numerous years of experiences in the IT industry. The Service Desk operates based on agreed service level giving assurance to our customers that the end-users' incidents encountered in the system are handled, escalated and resolved in a timely manner.

End-User Support

Together with Service Desk, SingTel will extend our support to CapitaLand by incorporating end-user support services in this proposal. Our EUC support operates in 2 modes – remote and on-site. By deploying connectivity and tools, SingTel would be able to provide technical support remotely reducing the time for engineers to move around. For more severe cases, the on-site engineers will handle them and will be escalated to the appropriate party if there is a need to.

The above services will collectively form the IT Outsourcing Managed Services to be provided by Singtel to CapitaLand.

4.2 Proposal for IT Service Management and Governance

Singtel has put in place a Global Delivery Methodology to provide quality and differentiated ICT solutions to enterprise customers across the region. The methodology is a collective suite of integrated delivery methodologies, capabilities, technical practices, templates and checklists which support our business operations and incorporate industry best practices and international standards such as ITIL, eTOM, PMBOK, IS09001, ISO27001, ISO20000 and ISO22301.

Years of practical delivery experience and industry best practice have been injected into our Global Delivery Methodology which our operational teams utilise to deliver quality services to our customers.

4.2.1 Singtel ITSM Framework

The Singtel Global Delivery Methodologies suite consists of four key methodologies. They guide the way Singtel delivers reliable and high-quality solutions and services to our customers, through built-in professional disciplines and quality assurance practices. The methodologies can be configured to suit a wide spectrum of projects across diverse technology platforms and project complexity.

- **Transition and Transformation Methodology**; Utilised when taking over enterprise-wide outsourcing contracts or large and complex customer transformation projects
- **Project Management Methodology**; Which provides a consistent framework that details how project processes are executed
- **Design and Build Methodology**; For the design and deployment of ICT solutions, systems integration and engineering projects
- **Service Management Methodology**; Which defines how we manage, operate and deliver our services across the entire services lifecycle

As an overarching framework the Singtel Global Delivery Framework consists of organisational components, enterprise architecture, delivery methodologies, operating models, cost models and enterprise tools architecture

To complement each of the delivery methodologies Singtel has put together a set of technical practices to guide teams to “do it right the first time” and improve consistency across all Singtel business units. The technical practices associated with each methodology contain standard operating procedures and best practices. Together they form a robust process framework for delivery. For the scope of this tender, only the Transition and Transformation Management and Service Management will come into play.

4.2.2 Transition and Transformation Management (TTM)

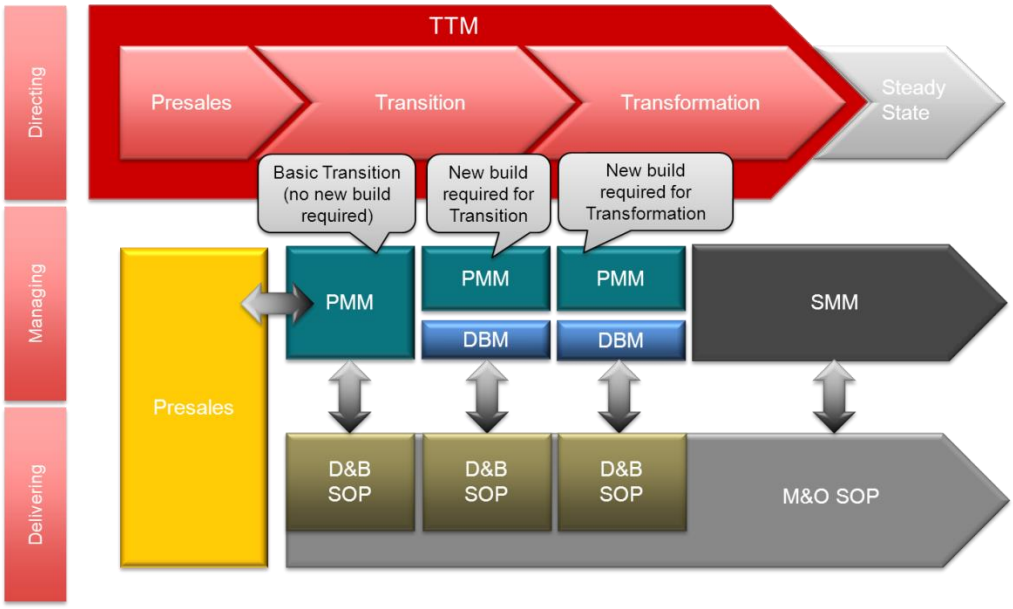
The TTM is an integrated approach intended to guide our teams in the transition management of ICT infrastructure outsourcing programme when the ICT infrastructure management services are outsourced to us. The TTM covers the mobilization and transition stages; and Service Management Methodology (SMM) will then be used for the operations stage of the ICT infrastructure outsourcing programme.

4.2.2.1 Programme Management Overview

The Singtel Transition & Transformation Methodology (hereafter referred to as Singtel TTM) provides a standardised approach and framework for the analysis, design and implementation phases of IT Outsourcing Programmes.

This section will provide an overview of the TTM stages, activities, governance and RACI to support IT Outsourcing Programme's from presales to steady state. It will also provide complementary processes and activities to ensure individual project outputs and risks are aggregated and managed at the Programme level.

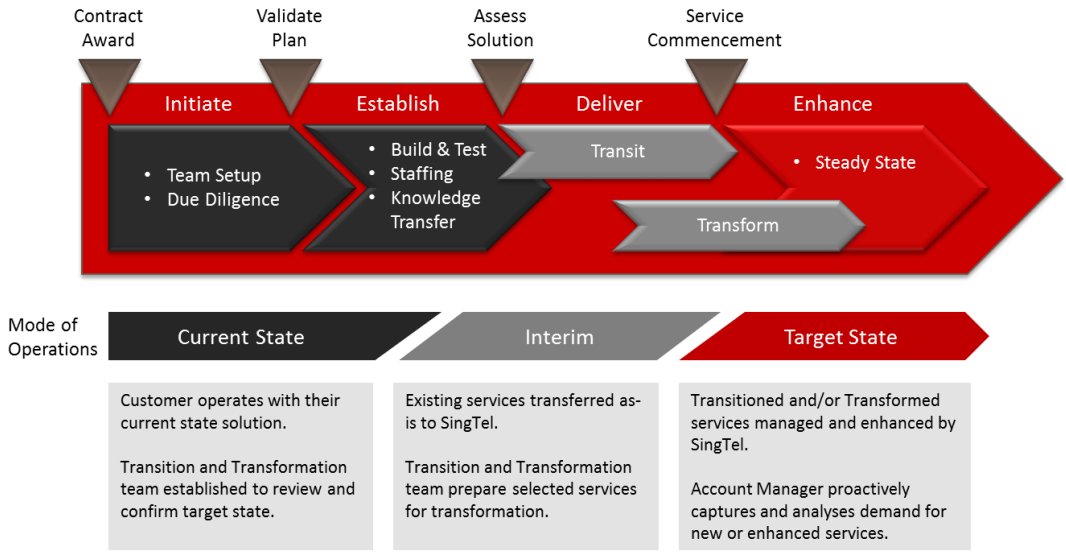
The relationship between Singtel TTM and the other Singtel methodologies is represented in the following diagram.



Programmes provide a governance umbrella under which related projects can be managed, to ensure the customer's strategic objectives are met. In alignment with the overall Singtel Global Delivery Framework, Singtel TTM will utilise the Singtel Project Management Methodology (Singtel PMM), to manage the delivery of the individual projects within the IT Outsourcing programme. Singtel PMM will in turn interface with the Singtel Design and Build Methodology (Singtel DBM) when a new build is required.

4.2.2.2 *Transition & Transformation Methodology Lifecycle*

Singtel will provide a Program Manager to ensure that IT Outsourcing Transition and Transformation Programmes' deliverables are initiated, established, delivered and closed to meet customer's strategic objectives.



Effective Programme Governance contributes to assure that:

- The project deliverables meet the planned timelines, cost and scope against the Customer's objectives.
- The programme life cycle is managed and benefits are realised, where outcomes are aligned with business needs, and balanced with the desires of interested parties and risk profiles are managed to acceptable levels.
- The project deliverables outputs meet the agreed acceptance criteria.

4.2.2.3 *Proposed Transition Management for CapitaLand*

The above methodology will come into play when CapitaLand decides to move the applications from existing environments to the new cloud infrastructure. Each application transition or migration to the new platform will be treated as a separate project with defined timeline, milestones and success criteria. The applications may have different business owners and groups of users, thus Singtel would need CapitaLand's assistance in coordinating the transition activities.

For each application (treated as a PROJECT), the project manager will oversee and manage the execution, so that deliverables are handed over to the application owners and end-users as per scheduled time. The PM will provide regular update on transition status to CapitaLand's management.

4.2.2.4 *Proposed Transition Timeline*

A list of milestones, deliverables is provided in separate project template (MPP file) after project kick-off. High level timeline are provided here.

ID	Milestone Description	Deliverables & Acceptance Criteria	Forecast Completion Date (2016)
1	Confirmation of Award	Official Contract Signage	February 1
2	Kick-off Meeting.	Orientation of team structures & review of transition plans meeting	Within 1 week of confirmation of award.
3	Finalization of project scope and agreement of Work Order.	Project & technical scope and agreement of Work Order.	Within 2 weeks after Kick-off Meeting.
4	Procurement of Server / Storage and Network and Security equipment, if any.	Requires Work Order.	The lead-time is assumed to be 8 weeks from placement of order.
5	Begin installation & configuration of Server / Storage and Network and Security equipment. Start with Cloud Broker Portal and System Centre components integration.	Facilities to be ready. Singtel will work with CapitaLand to fine-tune the actual required readiness data for the 10 other location server rooms.	Start after hardware procurement.
6	Proposed date to start transition Managed Services.	IT Services transition development project schedule discussion, developing matrix of resources / skills & establishing transition milestones to aligned with CapitaLand expectations.	12 weeks prior to June 30th.
7	Information gathering & knowledge transfer stage	Assimilation of existing processes, procedures & documentations.	Early of April 2016.
8	IT Managed Services (Service Desk, ISM, PSM, DCOM, NOC, Field Services) shadowing with existing service renderer	Officiate signage of IT services being successfully transition.	Within 12 weeks prior to June 30th.
9	Build Stabilize and Deploy	Key objectives of build deliverables	By/before June 30, 2016
10	User Acceptance Testing	Documentation of Day 1 build & Knowledge Transfer to IT Managed Services.	By/before June 30, 2016
11	Day 1 Complete	Day 1 Project Closure Officiate Signage	By/before June 30, 2016

4.2.3 Service Management Methodology (SMM)

Our Service Management Methodology incorporates ITIL best practices and ISO20000 IT service management standard requirements to plan and deliver our ICT managed services portfolio. It adopts a service lifecycle approach with each stage in the lifecycle embracing proven processes and practices.

Starting with strategy and moving through design, transition, operation and continual improvement across the services lifecycle, our methodology provides a standard set of delivery capabilities. These tie together the functions, processes, technologies and partners we use to effectively deliver and manage our products and services.

Whilst we have incorporated ITIL best practices in our Service Management methodology, we have also leveraged eTOM, the most widely used and accepted standard for business processes in the telecommunications industry, to complement ITIL best practices in our methodology.

4.2.3.1 Singtel Delivery Capabilities

In addition to our standard suite of delivery methodologies, our Singtel teams across the region comprise of 4,000 IT certified professionals including more than 1,000 ITIL certified professionals, who hold qualifications in partner, technology and process certifications.

We have the internal capabilities to provide end-to-end solutions, from design of ICT infrastructure and services to the implementation, commissioning and ongoing maintenance and support of solutions. Some of the specialist organisational delivery capabilities that underpin our delivery methodology are set out below;

Service Strategy and Planning

Strategy and planning teams operating within Singtel are responsible for driving a clear services strategy across the group and consider how capabilities, functions, tools and processes operate in unison to meet customer requirements. Product and practice management teams work with the Singtel strategy and planning teams to achieve a holistic view of how our products and services are developed and introduced into the portfolio.

Service Design and Architecture

The introduction of new services into the service portfolio requires careful consideration of each aspects of the service lifecycle to be deployed successfully. Teams responsible for capability

management and architecture provide specialist skills to improve, maintain, or develop the organizational capabilities that exist within the services organization into strategic assets which can be leveraged by the operational teams in delivering services to our customers. These teams ensure quality outcomes from a customer's perspective are built into the service and capabilities from the outset.

The solution design team provides the specialist technical capability to manage and improve the ownership of technical solutions offered to our customers. Solution designers and technical pre-sales work between our sales and our Singtel operational delivery teams to design solutions taking into account customers' technologies, transition needs and ongoing support requirements. Our design specialists are responsible for developing enterprise-wide outsourcing, whole of business solutions and any customised solutions needed to fulfil specific customer needs.

Service Implementation

Our service implementation team is responsible for the technical design, build, installation, and transition of the infrastructure and technical components of customer ICT solutions and technology projects. Our domain experts also use their technical capabilities to help customers determine what technology options are feasible and the benefits they can deliver.

Customer Delivery Management

Customer Delivery Management works closely to manage the end-to-end service delivery relationship between our customers and the Singtel delivery team including suppliers. We charge the customer delivery management team with giving customers a positive experience during transition and effective delivery of services during regular operations ensuring services are delivered to agreed plans and targets. They also work with customers to ensure service reviews and service improvement plans are coordinated, customer feedback and communications are managed effectively and clear paths for customer escalations are provided.

Service Provisioning

Our service provisioning teams use robust processes to coordinate request fulfilment and change activity associated with provisioning of data, fixed voice, mobile and ICT managed services. The deployment of change models provides the basis for the team to apply appropriate levels of control when recording, tracking and implementing different types of changes when provisioning services. This approach helps balance the need for operational efficiency when processing standard changes with the requirements for complex changes where more evaluation and assessment activity is needed to ensure consistency and minimize risk.

Technical Delivery

Technical Delivery Manager will be appointed to manage the technical aspects of the service delivery. When on premise, technical support resources are assigned to support Technical Delivery Managers to oversee on-site and day-to-day delivery operations.

Technical Operations

Technical operations centres provide specialist technical services. They provide an escalation point for the service desk for the resolution of more complex issues. In the case of critical faults, we initiate major incident procedures and appoint a manager to oversee resolution. For managed services customers that operate in multiple locations or use multiple services and suppliers, we appoint a dedicated incident manager to coordinate activities across multiple locations, services and suppliers.

Within the network operations centre tier 1 technical analysts provide service assurance while teams of tier-2 and tier-3 technical analysts provide specialist technical support. This group also provides 24x7 proactive services monitoring, alerting, event management, request fulfilment and incident resolution. The members of this team also provide valuable input into planning and implementation activities of changes across the managed ICT services portfolio.

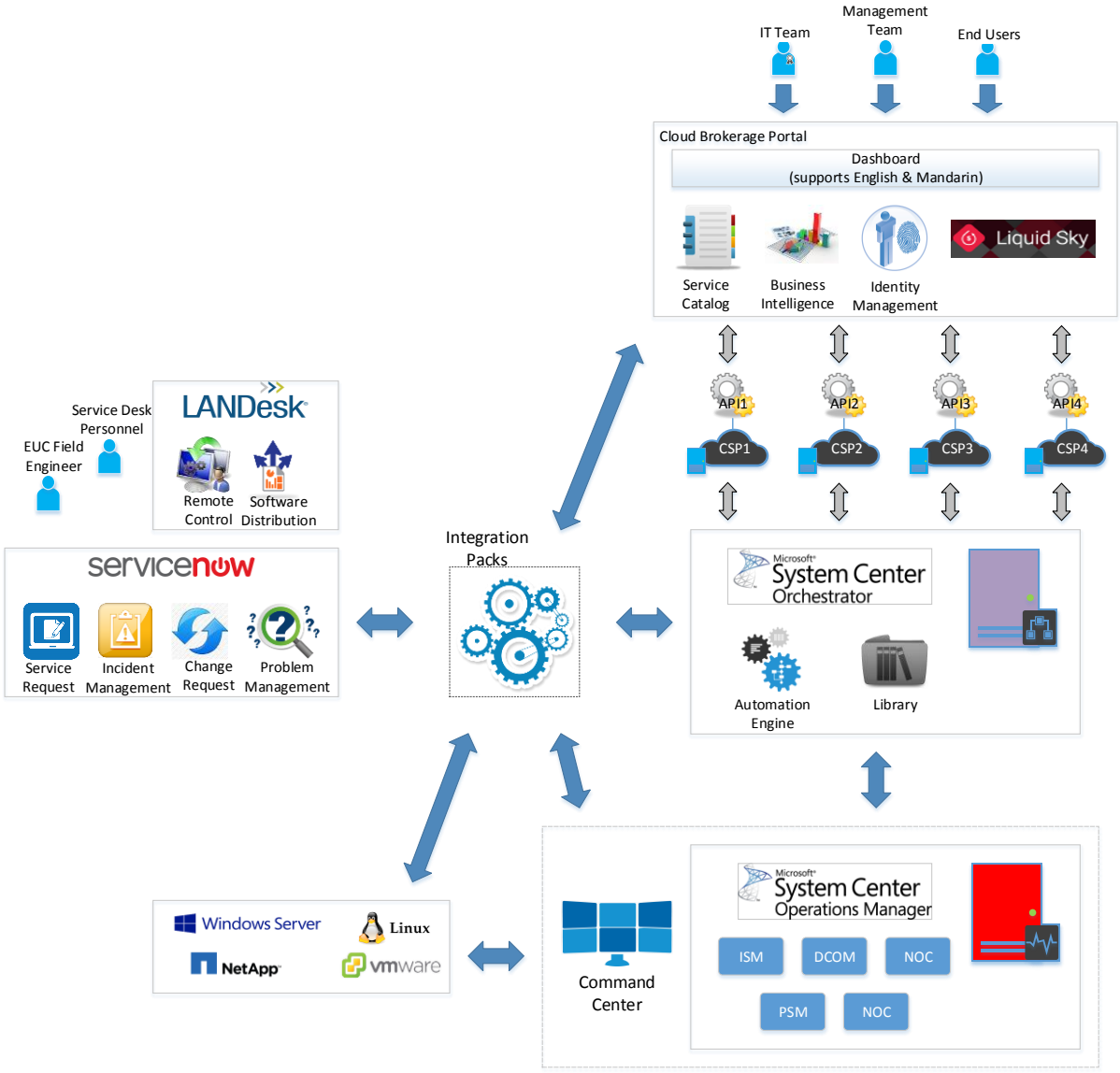
Service Desk

Singtel service desk provides a single point of contact for users to report incidents, request services or submit change requests. Based on the type of customer engagement we can provide dedicated service desk analysts to individual customers, or locate a dedicated service desk at the customer's premises. The service desk tracks all interactions with the user and escalates more complex issues to technical specialists. Using request fulfilment processes the service desk provides end users with access to, and information about, standard services. They also follow established asset and inventory management procedures to track services and equipment that need to be recorded for traceability.

4.3 Proposal for IT Infrastructure Management

4.3.1 Introduction

While the tender calls for managed services that can be delivered using traditional methodologies, Singtel takes a more modern approach by automating many of the tasks. At the heart of this solution is an orchestration tool which allows for centrally managing services across different datacentres. The diagram below shows the overall solution architecture.



The details of each block is discussed in the following sections.

4.3.2 Proposed Tools

4.3.2.1 Cloud Brokerage Portal

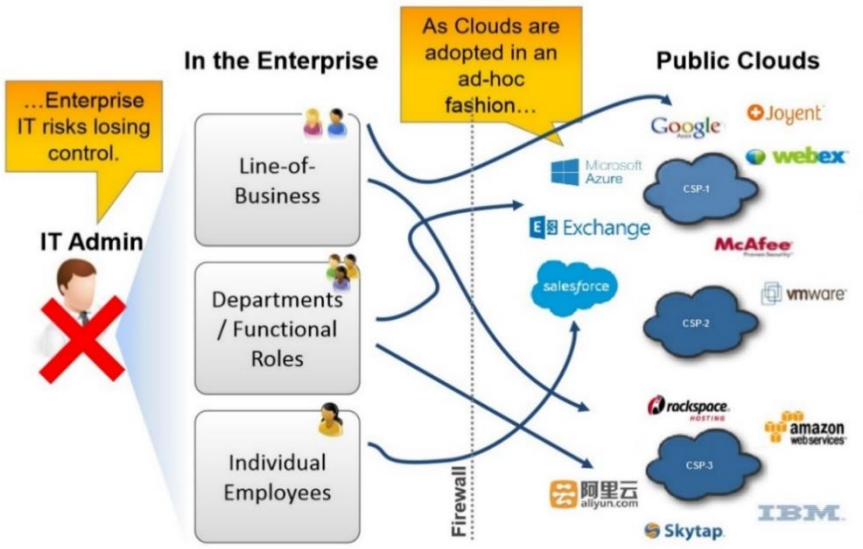
Singtel will be proposing a Cloud Brokerage Portal (CBP) to extend the capability of the current datacentres to the cloud. In recent years, the IT industry has seen steady growth in cloud adoption. Cloud computing would be the trend in running applications, thus it makes practical sense to provision for a technology that will it easier for CapitaLand to extend their IT services to the cloud.

Below shows some of the drivers of cloud adoption and CapitaLand would have at least 2 of these drivers.

According to KPMG cloud survey report 2014, we can deduce that the primary objectives of today's enterprises is to leverage on public CSP to drive cost efficiencies & better enablement of mobile workforces. By leveraging on public CSP enterprises are also able to leverage data to provide insight by looking to drive the greatest transformation of their business models using cloud computing.

There is a noticeable trend of today's enterprises shifting away from purely a cost-driven mind-set to a more customer-centric. The focus has shifted to better align with customer and gaining greater insights using analytics. The adoption of mobile workforces' enablement has also gained significantly, today's users no longer bound to their desktops in order to be productive.

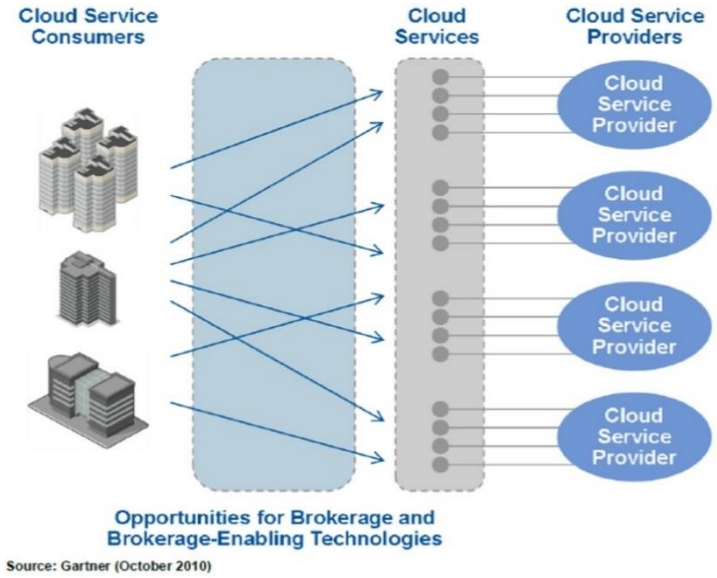
4.3.2.1.1 Problem in Today's Enterprises of Over-Scaling



As enterprises grows, IT infrastructure scale according to the business needs as well, this presented a risk of IT services grows quicker than IT administrators can be in control of managing its IT resources.

Distributed business needs may have attributed the ad-hoc clouds adoption fashion to meet its immediate pre-requisites without IT department realizing it. Henceforth it has come to a point of IT department unable to centrally manage all available resources within its organization.

4.3.2.1.2 Addressing the Core Issue

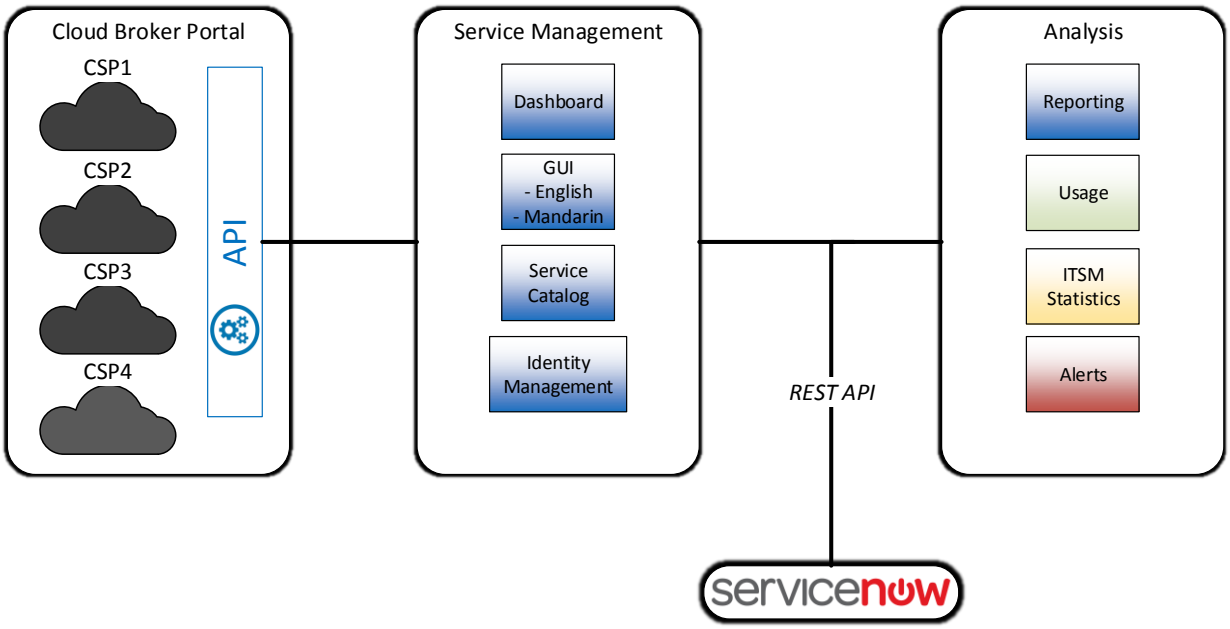


Singtel would like to take this opportunity to share with CapitaLand how we've derived the solution. Traditionally cloud service consumers (users/management/IT admins) have to login to individual

cloud services provider portal through their designated websites in order to access these cloud enabled services. As a result, cloud service consumers may have to login to variety of portal by remembering multiple credentials so that they can manage these cloud services.

This has created a technological opportunity for Singtel to take on and develop a cloud brokerage portal for CapitaLand to ease cloud service consumer to have simplified identity to interface with multiple cloud service provider.

4.3.2.1.3 Application Program Interface (API) & Integration Pack (IP)



Essentially API is the core component of CBP to communicate/integrate with each of the cloud service providers. The proposed CBP have the ability to centralize managed all CapitaLand CSP (Refer to RFP Section 3.13.14). Singtel also plans to integrate ServiceNow as an additional value-added service by utilizing the readily available integration packs. Henceforth it provides cloud service consumers with the consistent experience throughout managing these services & the visibility of across all integrated platforms.

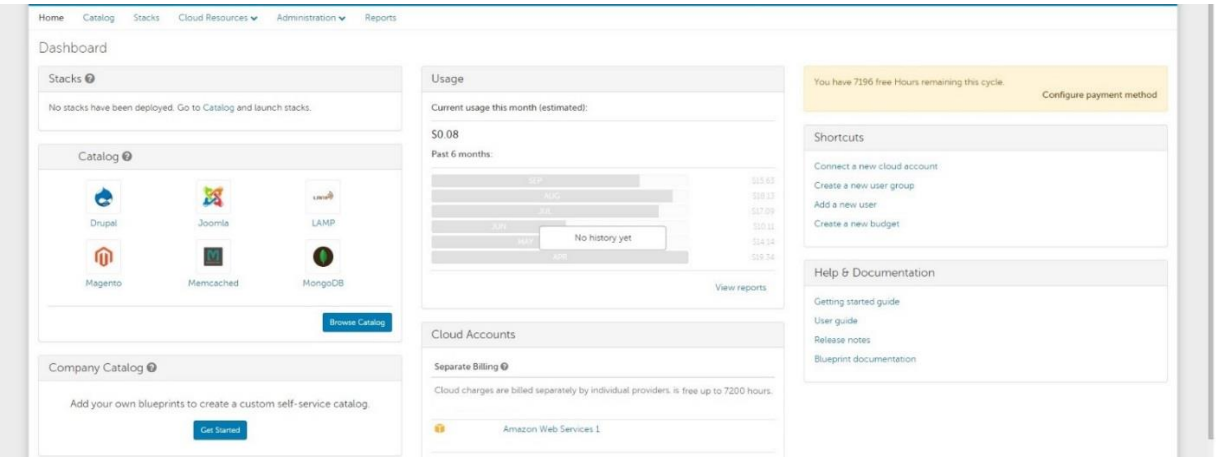
The consistent experience of CSP will enhanced the productivity of cloud service consumers & enable them to fully focus on day-to-day critical tasks.

As a result of this integration the proposed CBP will have the additional value-added functionality that will be mention in the next section.

4.3.2.1.4 Proposed CBP Functionality

Singtel understands that CapitaLand is a multi-national enterprise that has presence on multiple countries around the world. Knowing that English being the primary business language whilst not forgetting Mandarin being the world most used 2nd language, therefore we proposed that the CBP with native bilingual option of English & Mandarin to address CapitaLand needs for China cloud consumers to be able to have the consistent experience consuming these resources.

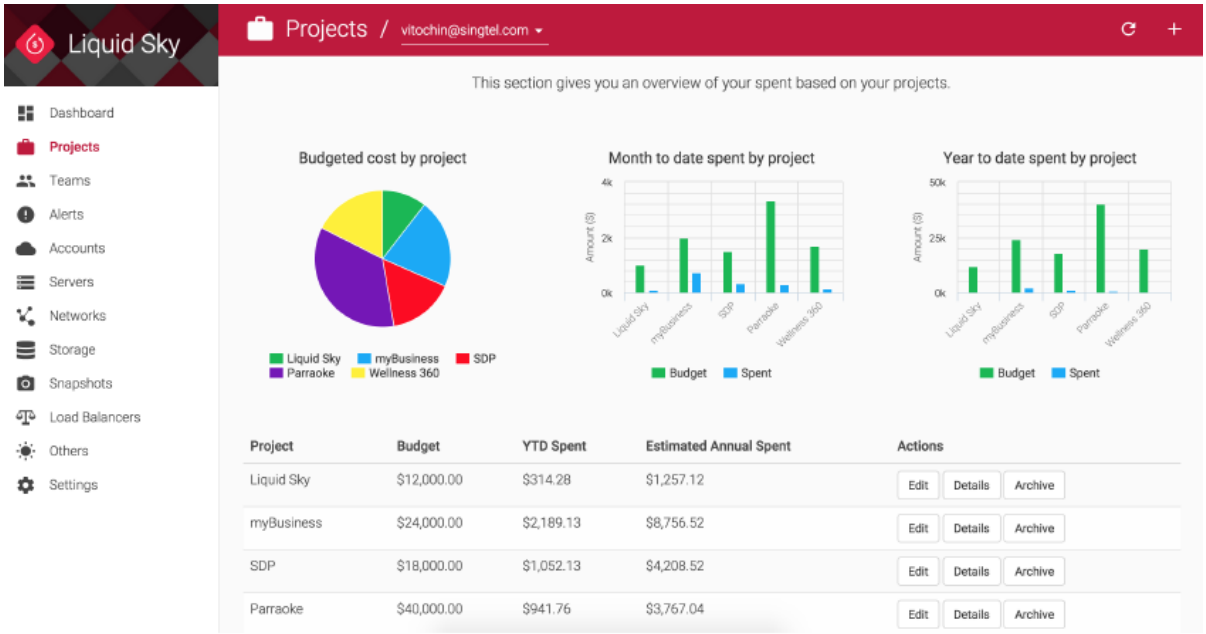
The screenshot below shows an example view of the dashboard of CBP.



CBP integrated identity management with Active Directory users with different role-based access, this allow CBP to present different Dashboard view accordingly with logged in users' roles and permissions. CBP by default will have 3 dashboard views (IT User, Management, End-User).

CBP present a service catalogue, this service catalogue consists of CapitaLand approved and allowed applications or services to be readily consumable by CapitaLand user. CBP allow user to have the ability to deploy service, application or virtual machine to CSP.

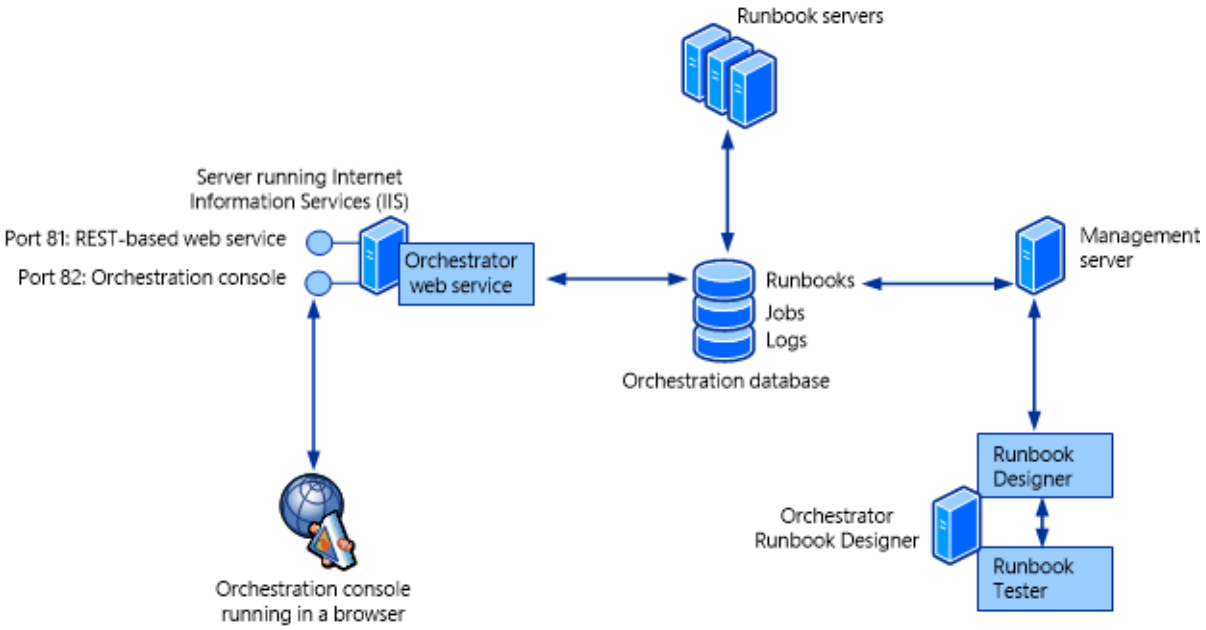
As a value-added-service Singtel will include the functionality of CBP to extract multiple CSP billing information / resource consumables through the API and to be process by Liquid Sky. This feature allows users to centrally managed & view information directly from a single consistent interface.



The CBP portal also includes the feature of business intelligence information will be extracted through integration packs (IP) from SCOM & ServiceNow to be published to the CBP. It will allow users to perform analytics details for management reports.

4.3.2.2 Microsoft System Center Orchestrator

Microsoft System Center Orchestrator (SCO) is a workflow management solution for the data centre. SCO consist several components for automation engine, particularly Orchestration database and runbook servers. Orchestration database is a library to store all the automation scripts, codes and programs' API to connect to different platform. While runbook servers will be the automation engine which execute and monitor tasks processing. Runbook servers can be scale out to increase redundancy and scalability to meet increasing performance demands. To further increase the exposure of automation to broader scale, Integration Packs (IP) will be installed to enable integration of SCO with ServiceNow Service Management too.



For the proposed solution, SCO will be used for automation the following way:

- Create / Get / Update ServiceNow ticket
- Alert based automation tasks, e.g. create ticket based o system alert
- Repetitive service requests automation, e.g. password reset
- SAN provisioning automation

4.3.2.2.1 Orchestrator & ServiceNow Integration Pack

The Kelverion Integration Pack for ServiceNow is a compliant integration for the Microsoft System Center 2012 Orchestrator IT Process Automation Solution. This Integration Pack enables users to create, update, get and delete records in ServiceNow. The pack delivers a range of re-usable activities to automate IT-Functions such as:

Service Desk - create service records from a wide range of enterprise management tools or custom sources.

Monitor Service Records – monitor for new or changed service records to automate the diagnostic/remediation process.

Configuration Management – to initiate automated changes and transform and populate ServiceNow data into CMDB or Asset Systems.

ServiceNow Activities

Create Record – activity dynamically creates new ServiceNow records using standard or customized ServiceNow forms.

Get Record – activity returns records meeting specific filter conditions

Update Record – activity updates specific records

Delete Record – activity deletes specific records

Monitor Record - monitor for new or updated ServiceNow records

Upload Attachment – activity uploads attachment to ServiceNow record

Download Attachment - activity downloads attachment from ServiceNow record

Import Set - activity inserts a record into a ServiceNow import set table

Run Query - retrieves records from a ServiceNow table using a ServiceNow encoded query string

Run Scripted Web Service - runs a ServiceNow scripted web service

Activities subscribe and publish data to the Orchestrator databus.

4.3.2.2.2 NetApp Integration Pack

Orchestrator Integration Packs (OIPs)

The Orchestrator Integration Packs enable CapitaLand create workflows to automate complex processes. There is an OIP for provisioning and cloning, one for disaster recovery, and another for commonly used data storage operations. OIPs do not support clustered environments.

Cloning and Provisioning Integration Pack

The Cloning and Provisioning Integration Pack enables CapitaLand to create workflows to provision storage, clone virtual machines, and manage storage system credentials. Template cloning only supports LUN-LUN cloning in 7-Mode.

Disaster Recovery Integration Pack

The Disaster Recovery Integration Pack enables CapitaLand to create disaster recovery workflows that replicate data across two sites in both failover and failback scenarios.

Data ONTAP Toolkit Integration Pack

The Data ONTAP Toolkit Integration Pack enables CapitaLand to invoke commands from System Centre Orchestrator.

CapitaLand can also use the activities individually as an alternative to using the command-line interface and PowerShell scripting workflows.

4.3.2.2.3 EMC Integration Pack

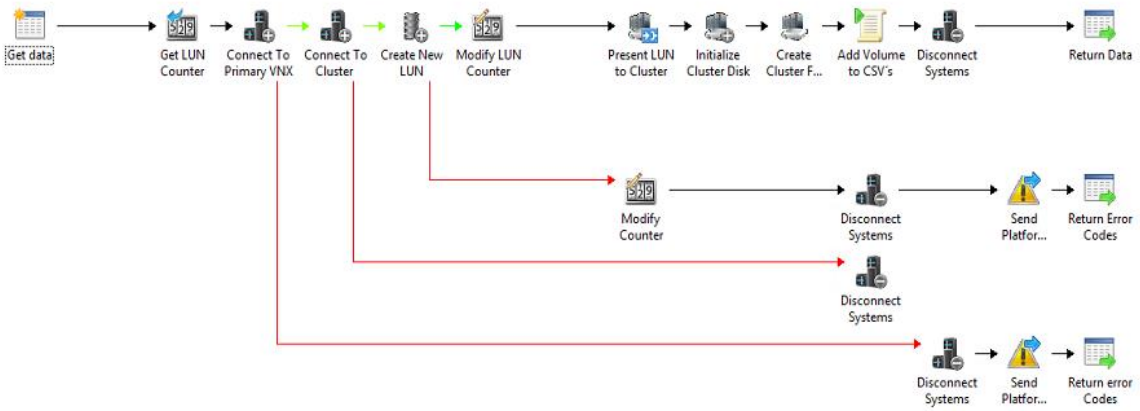
EMC´s ESI provides an Integration Pack (IP) for Microsoft´s System Center Orchestrator.

Orchestrator itself allows you to Automate repeating Tasks (Services) in your Datacenter.

The Idea of Integration Packs is to avoid Massive Scripting and provide drag and Drop Functionalities for common activities.

The activities get linked together and composed as a Runbook.

Here is a view of a typical runbook made of Activities from EMC´s ESI Integration Pack:



4.3.2.2.4 VMware Integration Pack

The Integration Pack for VMware vSphere enable CapitaLand to automate actions in VMware vSphere to enable full management of the virtualized computing infrastructure.

Feature Summary

The Integration Pack includes the following activities:

- Add Network Adapter
- Add VM Disk
- Clone Linux VM
- Clone Windows VM
- Create VM
- Customize VM
- Delete VM
- Get Cluster Properties
- Get Datastore Capacity
- Get Hosts
- Get Resource Pool Runtime Info
- Get Resource Pools
- Get VM List
- Get VM Properties
- Get VM Status
- Migrate VM
- Move VM

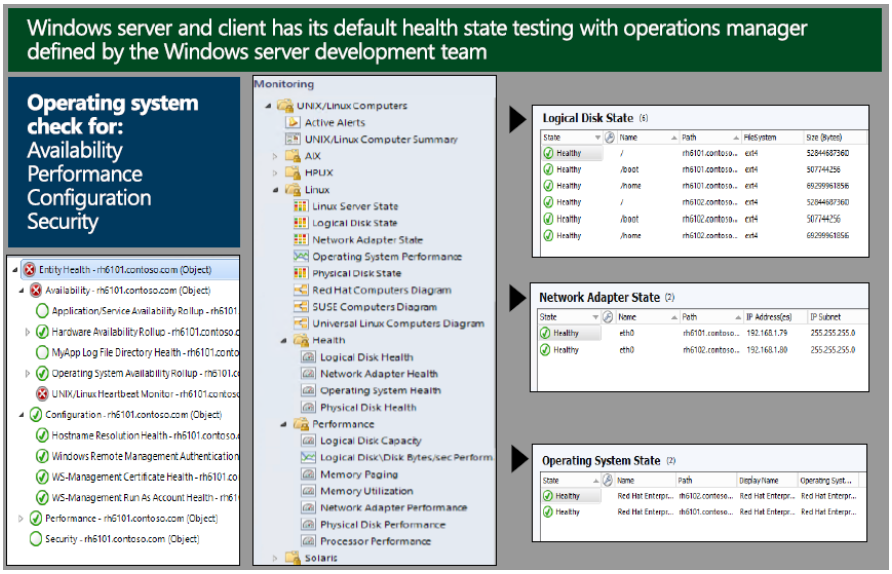
- Reconfigure VM
- Reset VM
- Revert VM Snapshot
- Set Guest Info Variables
- Set VM CD/DVD to ISO Image
- Set VM Networks
- Start VM
- Stop VM
- Suspend VM
- Take VM Snapshot
- Maintenance Mode
- Get Host Properties
- Get Host Datastores

4.3.2.3 Microsoft System Center Operations Manager

System Centre Operations Manager (SCOM) is a cross-platform data centre management system for operating systems and cloud environment. It uses a single interface that shows state, health and performance information of computer systems. It also provides alerts generated according to some availability, performance, configuration or security situation being identified.

Serve as a baseline for operations monitoring, SCOM can be integrated with Orchestrator to extend the alert generated in SCOM to ITSM platform. In such, a proper IT process workflow can be enforced to ensure alert are travel through designated channel and get resolved within SLAs.

Next, with SCOM management packs (MP) administrators can extend Operations Manager capabilities to a wide variety of technologies, including operating systems and applications. In fact, numerous management packs are available for more than 60 Microsoft and third-party products, such as SQL Server and Exchange Server. The image below shows the SCOM Windows Server Management Packs dashboard.



Microsoft System Center Operations Manager 2012 provides the ability to discover and monitor network routers and switches, including the network interfaces and ports on those devices and the virtual LAN (VLAN) that they participate in. Operations Manager can tell you whether network devices are online or offline, and can monitor the ports and interfaces for those devices.

Operations Manager 2012 can monitor network devices that support SNMP, and can provide port monitoring for devices that implement interface MIB (RFC 2863) and MIB-II (RFC 1213) standards. Operations Manager may provide more detailed processor or memory monitoring for some network devices. This Microsoft Excel spreadsheet lists the devices, vendors, model names, and versions of network devices that have extended monitoring capability. The Devices worksheet includes processor and memory columns for each device to indicate whether Operations Manager can provide extended monitoring for either or both aspects for each device. The devices that covered in System Centre Operations Manager 2012 and System Centre 2012 SP1 - Operations Manager in the excel list from this download link.

Off-the-Shelf Management Packs:

- Windows Server Operating System Monitoring Management Pack
- System Centre 2012 Monitoring Pack for Internet Information Services 8.0 in Windows Server 2012
- Monitoring Management Pack for Windows Server Internet Information Services 7.0
- SQL Server Monitoring Management Pack
- System Centre 2012 Management Pack for Hyper-V Manager in Windows Server 2012

- Reference: http://social.technet.microsoft.com/wiki/contents/articles/16174.microsoft-management-packs.aspx

NetApp Management Packs:

NetApp OnCommand Plug-in for Microsoft offers easy monitoring and management of unified storage and non-disruptive operations. NetApp OnCommand Plug-in for Microsoft integrates with Microsoft System Center 2012 R2 for award-winning management of NetApp storage.

Install OnCommand Plug-in for Microsoft to:

- Isolate problems using System Centre Operations Manager (SCOM) alerts and health explorer views.
- Enable high availability and load balancing of management servers with OpsMgr Management Server Resource Pool.
- Leverage System Centre Virtual Machine Manager and System Centre Orchestrator for workflow automation.
- Report on clustered Data ONTAP MetroCluster storage.

OnCommand Plug-in for Microsoft enables administrators to discover and monitor NetApp SAN and SMB shares. You can use the included Virtualization Pack to discover and monitor Windows Server Hyper-V VMs and alert VM administrators of potential storage issues.

OnCommand Plug-in for Microsoft supports clustered Data ONTAP software, which provides non-disruptive operations, seamless scalability, and proven efficiency for Microsoft physical, virtual, and private cloud environments.

Furthermore, SCOM also can be further extend with Management Packs to monitor datacentre facility with IP Addressable devices, with standardized protocol ICMP, SNMP v1 and later, RMON. This is the requirement required by CapitaLand RFP 4.3.2.1.

EMC Management Packs:

Monitor storage health with in-depth storage topology view and components health state. ESI for Windows Suite comes with a management pack for Microsoft System Center Operations Manager (SCOM). With the management pack, ensuring storage health becomes easier with ability to roll up and drill down elements' health state. ESI SCOM management packs surface storage health state, alerts and events with configurable threshold to storage admin for immediate action. The storage in-depth view enables quick infrastructure problem identification and on-point remediation plan.

The ESI Monitoring Management Pack is used to discover EMC storage system components. The discovery and monitoring of these components is through SCOM agents. The monitoring agent retrieves data from the ESI Service by using a RESTful HTTPS connection, which in turn retrieves the data from the storage systems. The monitoring data is inserted into the SCOM database.

Figure below shows the overall topology of storage systems used in this solution. A capacity alarm was configured to trigger an alert when storage pool utilization went above 90 percent. Storage pool capacity was then exceeded, triggering the alerts as shown in the diagram.

VMware Management Pack:

Microsoft System Center administrators require real-time monitoring and visibility of their Microsoft Hyper-V and VMware vSphere environments to power their Always-On Business. Veeam MP provides complete app-to-metal visibility for both your virtual and physical environments, creating the "big-picture" view of your entire virtualized infrastructure – and all from within the native System Centre Management console. With Veeam MP, IT administrators get access and insights to their mission critical applications, including insights into their Veeam Backup & Replication services – delivering on the promise of Availability for the Modern Data Centre.

For the true app-to-metal picture, enhance your System Centre investment with a management pack that fully understands the relationship between your physical and virtual resources. Veeam MP delivers deep visibility of your entire environment, all from a single pane-of-glass within the System Centre Operation Manager console. Veeam MP gives you complete, real-time data to help solve problems fast and plan for the future. From the Veeam Morning Coffee Dashboard for a broad view of critical metrics to start your day, to detailed alert management and reporting, Veeam MP provides the visibility you need to manage your missioncritical applications and services.

Veeam MP includes strategic, capacity-planning tools with reports that forecast and help model on-premises and cloud resources needed to efficiently power your business. This includes deep-dive reports on oversized and undersized VMs, zombie VMs, lost storage and real-time alerts to notify you if your Veeam Backup Repository will run out of capacity or if a Hyper-V or vSphere cluster will run out of memory.

Brocade Storage Area Network (SAN) Management Pack:

Brocade Management Pack for Microsoft System Center integrates Storage Area Network (SAN) management information into Microsoft System Center, extending the server administrator's view beyond the server and into the SAN. It monitors the health and performance of the SAN

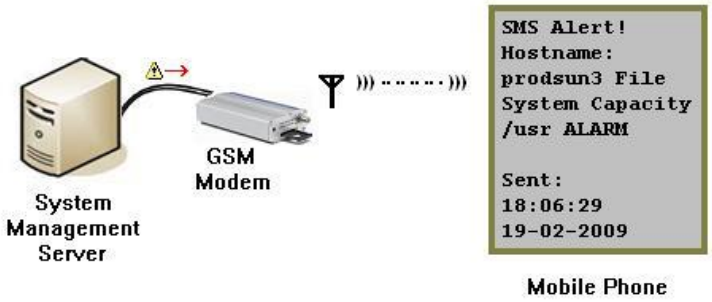
infrastructure, alerting server administrators to data access issues that can jeopardize the performance of virtualized workloads. Brocade offers the only management pack solution that leverages both Host Bus Adapter (HBA) and switch data to help server administrators manage virtual server workloads.

Brocade brings network expertise to organizations relying on Microsoft System Center Operations Manager (SCOM) for the management of their systems infrastructure. Brocade SAN Management Pack for SCOM is enabled within Brocade Network Advisor to provide seamless integration with SCOM. Brocade Network Advisor is the industry's first and only unified network management solution for data, storage, application, and converged networks. It manages Brocade Fibre Channel SANs, Fibre Channel over Ethernet (FCoE) networks, IP switching and routing, wireless, and Multiprotocol Label Switching (MPLS) networks—providing end-to-end network visibility and comprehensive lifecycle management capabilities across these different network types. Through the Brocade SAN Management Pack for SCOM plug-in, Brocade Network Advisor populates SCOM with fabric and switch details, statistics, and call-home events. This information enables server administrators to quickly identify whether the SAN is causing poor application performance or other issues, improving coordination across administrative silos and dramatically reducing Mean Time To Resolution (MTTR). Launched directly within SCOM, Brocade SAN Management Pack for SCOM retrieves call-home events from one or multiple Brocade Network Advisor servers. This proactive notification enables technical support organizations to respond to incidents before they affect service. Additionally, Brocade SAN Management

Pack for SCOM displays and tracks link details of important traffic flows (configured within the fabric as end-to-end monitors). With this information, Brocade Network Advisor helps Microsoft server administrators quickly identify network bottlenecks in the environment, providing view of performance statistics or Cyclic Redundancy Check (CRC) errors that could be hampering application performance.

SMS Gateway

SCOM can be installed in conjunction with SMS Gateway for alert notification.



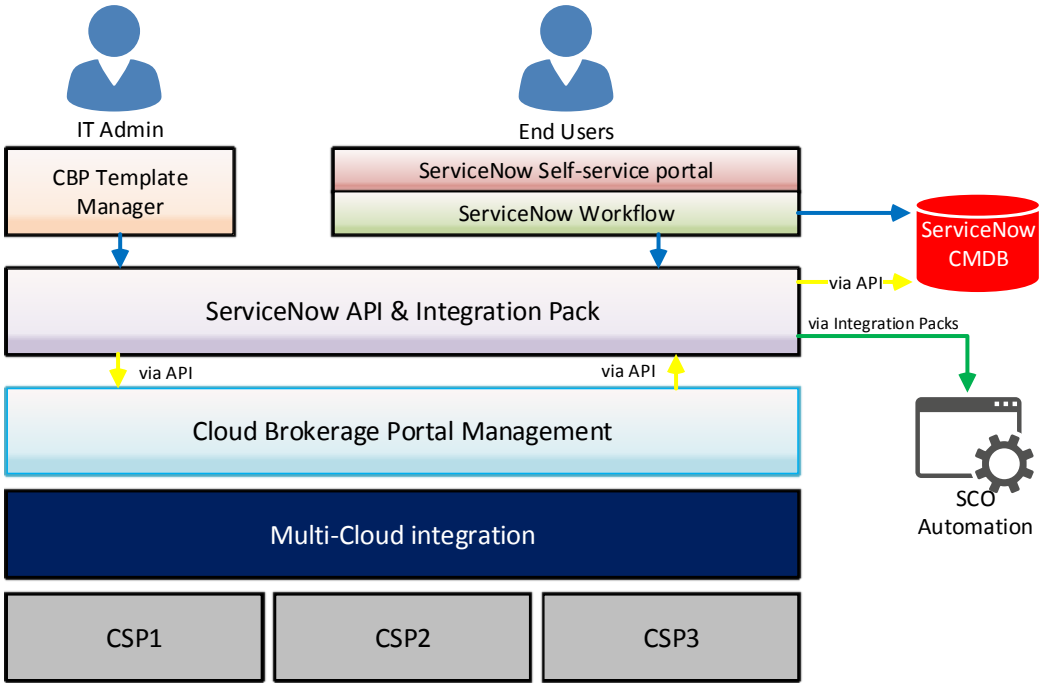
4.3.2.4 IT Service Management Tool

The delivery of the above capabilities will be supported by the Singtel service management framework through various tools. Singtel will largely leverage on ServiceNow for service management.

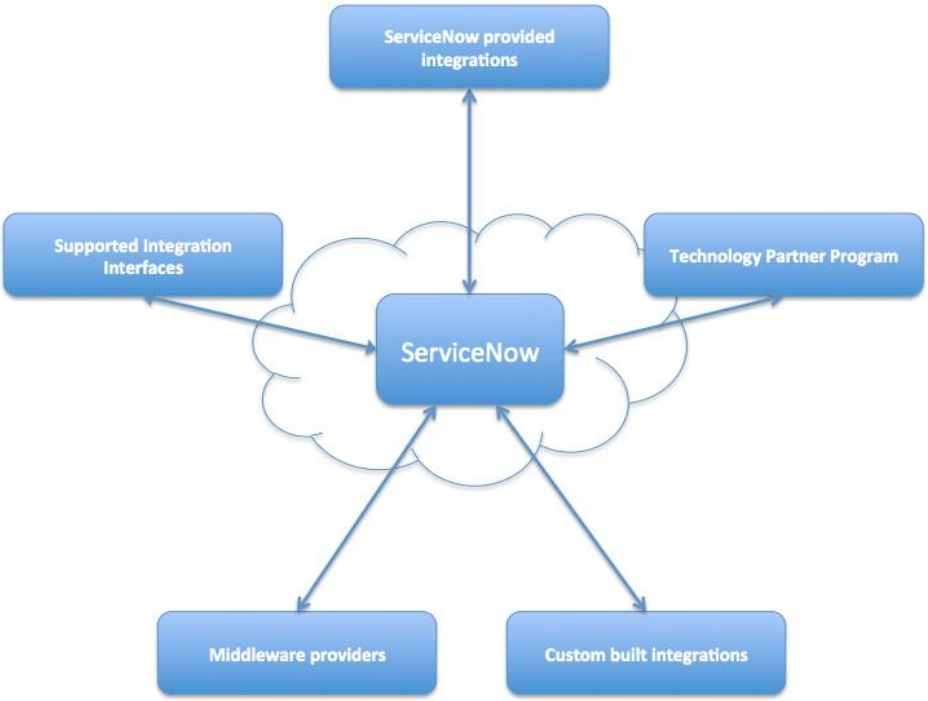
ServiceNow automates daily support tasks and helps in tracking, measurement, and process any unit of work. It offers a complete set of IT service management applications, including:

- Incident, problem, change, and request management
- Asset tracking and configuration
- Self-service portal and knowledge base
- Reports and dashboards

The proposed solution also extends the capabilities of ServiceNow service management tool further to support the Cloud Brokerage Portal for business analytics. Cloud Brokerage Portal will be connected to CMDB via REST API readily available from ServiceNow platform, and CRUD (Create, Read, Update, Delete) of incidents, problems, changes, services requests can be all retrieve from CMDB.



Above workflow shows the integration between multiple products including Cloud Brokerage Portal, ServiceNow and also orchestrator. IT Admin can publish a template of service to be available from end users' self-service portal. Once the end users signed up for a service, each component will be work in harmony with APIs and integration packs in-placed to provision the service into CSP, with service requests logged onto ServiceNow CMDB.



Above diagram shows the ServiceNow users can obtain additional value by integrating ServiceNow with third-party applications. Integration is achieved using a variety of protocols: SOAP, JSON, JDBC, and ODBC. Integration increases operational efficiency, reduces total cost, and increases quality. ServiceNow customers have a number of options for integrating with third-party applications.

4.3.2.5 Leverage on CapitaLand's LANDesk

Singtel proposed solution leverage on existing LANDesk client management solution which CapitaLand already invested, this will ensure simplified architecture and minimal experience shift during transition period with consistent user experience on software distribution workflow. This will comply with requirement stated under refer to RFP section 5.5 Software Distribution.

Being a leader in Gartner Quadrant, LANDesk also provides variety of features to help improve EUC daily operation and user production. For example, LANDesk client can be used as first level EUC support, have the ability to remote control user screen, chat and drawing function on a secured connection. Refer to RFP Section 5.3.7.2.

4.3.2.6 System Infrastructure Sizing

To deliver the above tools, Singtel would need to setup some equipment both in CapitaLand and Singtel's premises. Below are the servers needed to setup the tools.

VM Hardware Requirements:

QUANTITY	CPU	MEMORY	STORAGE	SOFTWARE
2	4	8	200	API
2	4	8	200	CBP
3	8	32	500	SCO
2	6	12	500	SCO-DB
2	8	32	500	SCOM-DB
3	12	24	1000	SCOM-MG
2	16	64	5000	ServiceNow

Physical Hardware Requirements:

- 2 x Rack-Mount Servers (2x Intel Xeon 10Cores, 192GB Memory)
- 1 x SAN Storage
- 2 x 10Gbe Network Switch

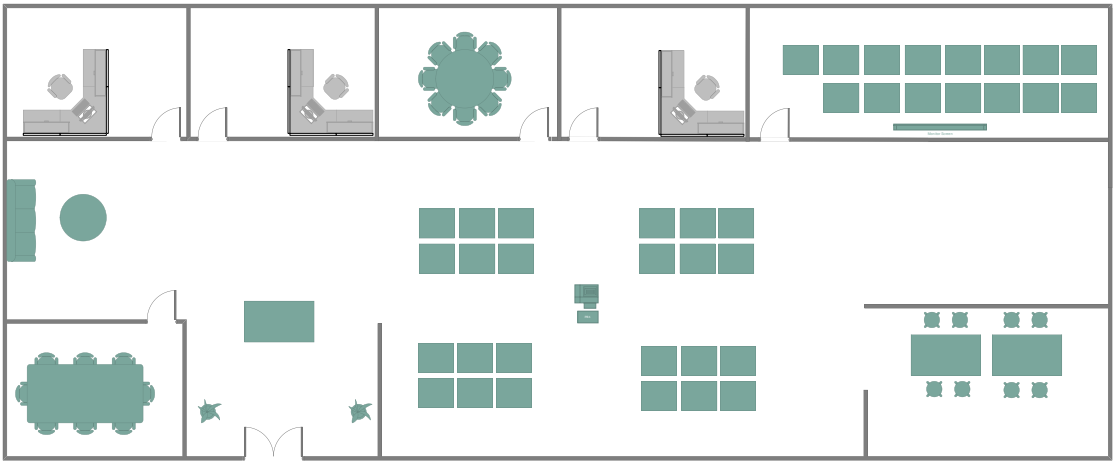
Software Requirements:

- 2x Windows Server 2012 R2 Datacentres
- Microsoft System Center 2012 R2 Datacentres
- Microsoft SQL Server 2014 Standard
- ServiceNow
- Kelverion Integration Pack for Orchestration
- NetApp Integration Packs for Orchestration
- VMware Integration Pack for Orchestration
- EMC Integration Pack for Orchestration
- NetApp Management Packs for Operation Manager
- VMware Management Pack for Operation Manager
- EMC Management Pack for Operation Manager
- Brocade Storage Area Network (SAN) Management Pack for Operation Manager
- SMS Gateway

4.3.3 Facilities

4.3.3.1 Command Centre

Singtel will provide a remote command centre office to support its service offerings. The command centre is built dedicated to CapitaLand's managed services use and will resiliency and security features to allow round-the-clock operation. Depicted below is the floor plan of the command centre.



4.3.3.1.1 Command Centre Mission & Objectives

The Command Centre's mission can be best understood in terms of three vital tasks:

- **Communication and Intelligence**. The Command Centre must be able to effectively communicate and receive information. It is critical to inform everyone about an event. It is equally important to undertake intelligence gathering to manage an incident and to provide notification to crisis managers, customers and the public.
- **Command and Control**. The Command Centre must provide the command and control functions necessary to put multiple response and recovery plans into action – triggering them as needed, providing the triage structure required to allocate resources and personnel, and assuring effective direction of the response operations.
- **Coordination and Documentation**. The Command Centre must create a mechanism to coordinate all of the steps taken to respond to an event and create a record of those actions to protect employees, infrastructure, and shareholder value, as well as demonstrate adherence to "best practices" by documenting all information received and steps taken.

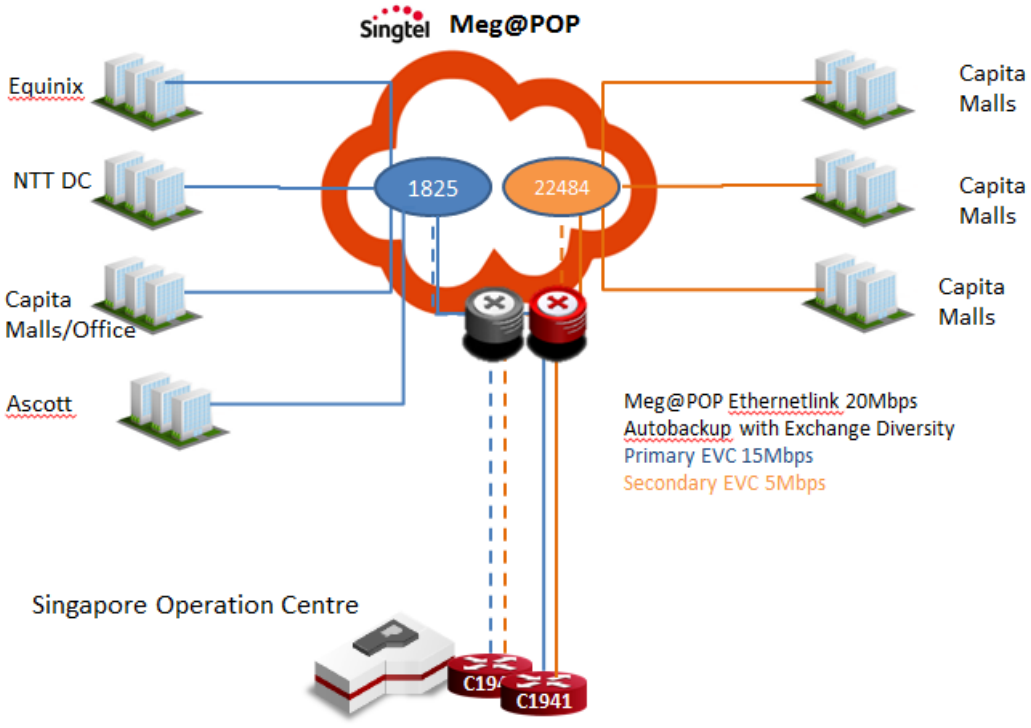
4.3.3.1.2 Physical Security

Singtel Command Centre will be equipped with security device and management as below:

Security Type	Singtel Authorized staff	CapitaLand staff	CC staff	Vendors	Cleaners
Magnetic Door Access for entire office	Yes	No	Yes	No	No
Authorized personnel for Command Centre Operation room	Yes	Yes	Yes	No	No
Isolated room for Command Centre Operation	NA	NA	NA	NA	NA
Security Badge with photo	Yes	Yes	Yes	No (Visitor pass)	No (Visitor pass)
CCTV	NA	NA	NA	NA	NA
24x7 Security provided by Building Management	NA	NA	NA	NA	NA

4.3.3.1.3 Connectivity

Show below is the proposed connectivity between Singtel Command Centre and CapitaLand network. Two (2) links are proposed both with auto-backup feature and exchange diversity which ensures resiliency of the links.



4.3.3.1.4 Resiliency

Singtel understands that outages can bring huge deficit to business profitability, hence business continuity and emergency planning will be top consideration in today's business challenges. Whether it is an accident, earthquake, fire, flood, storm, or act of violence, organization is always at risk of disastrous events. A comprehensive plan will ensure that corporate risk damages can be minimizes. Below is Singtel's approach in disaster recovery in the command centre:

1. One change at a time (and track all changes) via ITSM
2. Focus on restoring service first, but list out the root causes as you come across them. Remember most root cause analysis and work comes long after service is restored.
3. Ensure configuration information is documented and maintained through the changes
4. Go back to the last known stable configuration (back out all changes if necessary to get back to the stable configuration).
5. Follow established commander (one for technical, one business interface) and ensure full command centre support. Program director will communicate updates to business management and vice versa.
6. Overwhelm the problem (escalate and bring in the key resources – yours and the principle's). Don't dribble in responsibility as everyone are to do best for business and service restoration.
7. Work in parallel wherever reasonable and possible. This should include spawning parallel activities (and technical bridges) to work multiple reasonable solutions or backups.
8. Follow the clock and use the command centre to ensure activities stay on schedule. Commander must be able to decide when a path is not working and focus resources on better options and the clock is a key component of that decision. Escalation and communication must occur with rigor so maintain confidence and bring necessary resources to bear.
9. Peer plan, review and implement. If everything done in an emergency situation (here, to restore service and fix a problem) is highly likely to inject further defects into your systems. Peer planning, review, and implementation will significantly improve the quality of the changes engineer implement.
10. Be ready for the worst, have additional options and have a back out plan for the fix, save time and more creative in driving better solutions if you address potential setback proactively rather than waiting for them to happen and then reacting.

4.3.4 Datacentre Operations

Singtel will provide an operation team to manage on CapitaLand's Data Centre daily tasks which include Data Centre Management, Remote Smart Hand Service, Operations and Management, and Facilities Management as optional. The operation hour will go by 24x7 shift for Data Centre Operation Services to CapitaLand to make sure the daily production on-going without any issue.

Datacenter Operations Team	
Responsibility	• Develop an annual preventive maintenance schedule • Coordination and tracking of all service visits • Physical site inspecting • Execute Service request • Co-operate on tape management handling • Review of all service reports • Resolution of service issues
Scope of activities	• Data center cleaning • Air conditioning equipment • Rack-based air handling equipment • Building HVAC • UPS & Batteries • Static switching equipment • Free standing & rack-based power distribution equipment • Power & data cable physical inspection • Infrared power connection scanning • Generator and automatic transfer switch equipment • Fire suppression & detection equipment • Sprinkler systems

4.3.5 Infrastructure Service Management

Using the framework, tools and facilities discussed above, Singtel offers the full suite of service management to support CapitaLand's infrastructure. Singtel is able to deliver the service in a very efficient manner through workflow automation process. Discussed below are some part of service management showcasing the workflow and the tools used.

4.3.5.1 Incident Management

"Incidents" are unplanned disruption or degradation of service. The notification can be triggered by the system monitoring tools or initiated by users through emails or phone calls. The first goal of the incident management process is to restore a normal service operation as quickly as possible and to minimize the impact on business operations, thus ensuring that the best possible levels of service quality and availability are maintained.

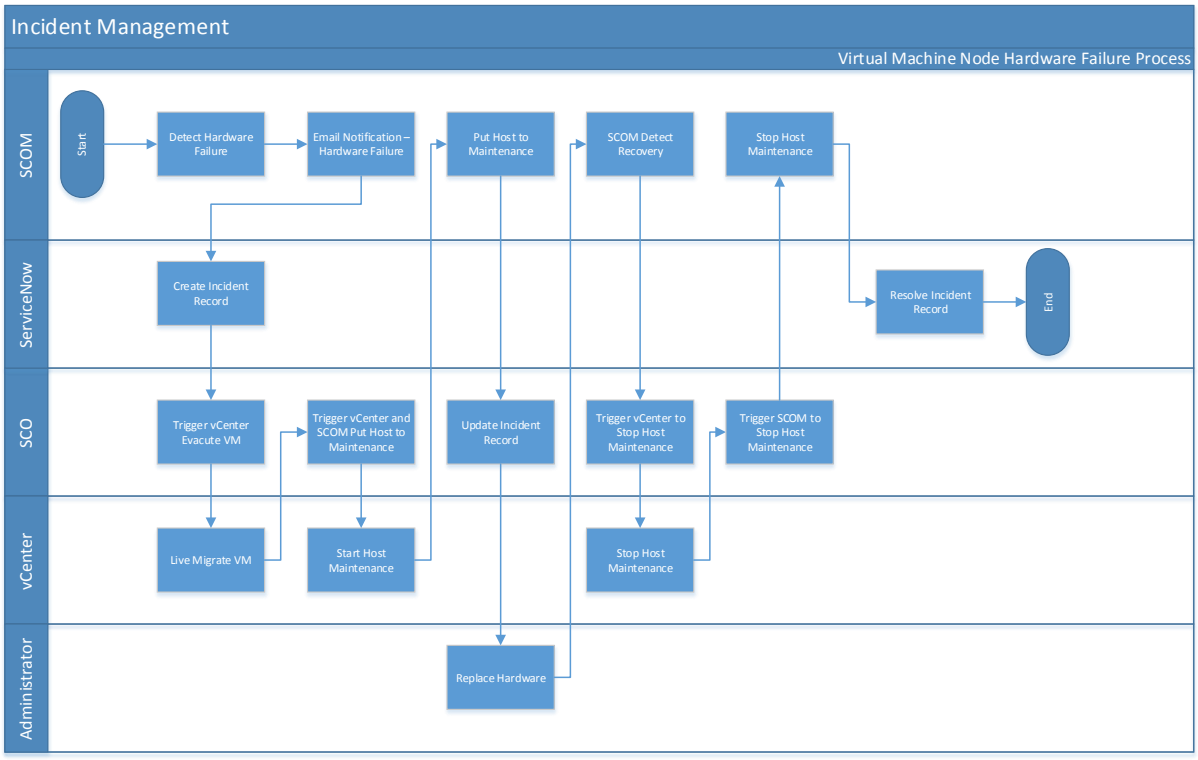
Singtel will use primarily the Operations Manager to detect system problems and send out email alerts to the ServiceNow. The same email notification will be sent out to the Service Desk agents would be able to view, update and escalate the tickets. Once a ticket is closed, an email notification will be sent out to Service Manager to update the local copy of the same ticket.

Example scenarios of incident management

Scenario 1 – Virtual Machine node hardware failure.

In this example, we will describe how does the automation workflow addresses a hardware failure incident once it was detected. Below are the 4 components that is used in this automation process:-

1. System Centre Operation Manager (SCOM).
2. ServiceNow (SN).
3. System Centre Orchestration (SCO).

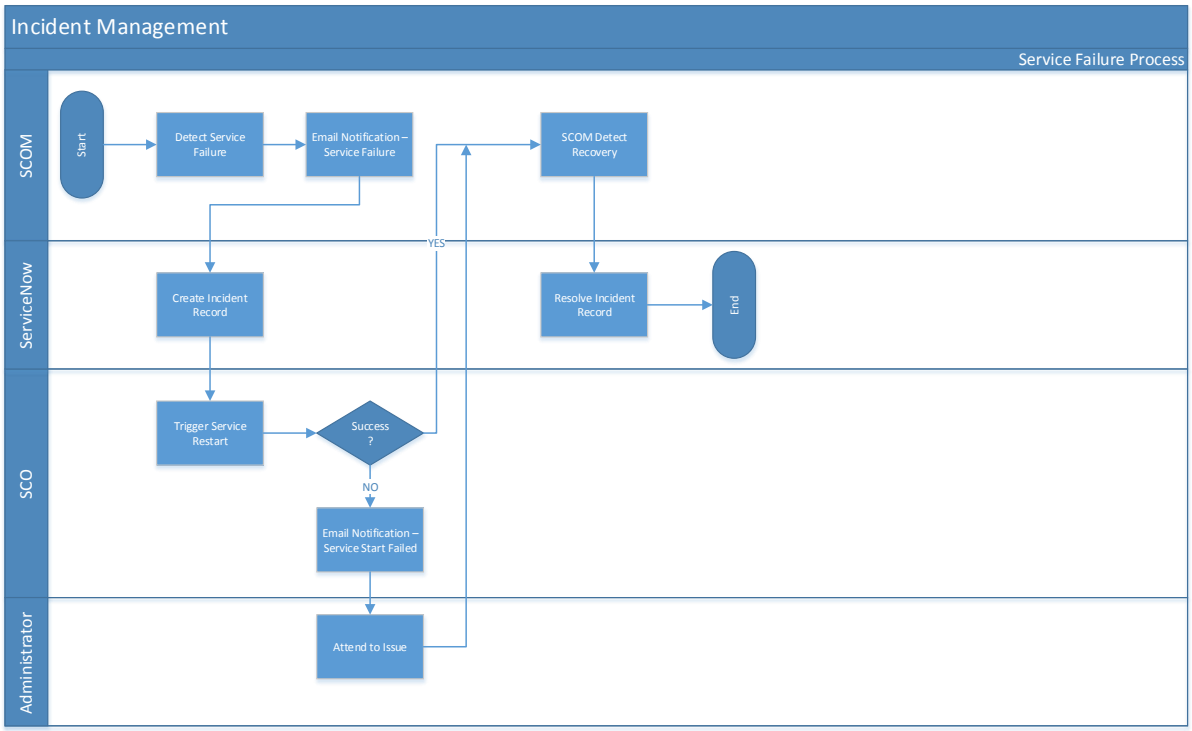


- **SCOM** detects hardware failure.
- **SCOM** notify **ServiceNow** on hardware failure.
- **ServiceNow** creates an INCIDENT TICKET and notify Administrator of the failure via e-mail.
- **ServiceNow** sends information to **SCO**.
- **SCO** triggers “Hardware Failure Workflow” and instruct vCentre to vMotion the VM’s out of failure node and put the node on “Maintenance” status.
- **SCO** sends notification to ServiceNow to update INCIDENT TICKET status.
- **SCOM** notifies ServiceNow on “Recovery” status.
- **ServiceNow** changes INCIDENT TICKET to RESOLVE.
- **SCO** triggers “Hardware Recovery Workflow” and remove the node from “Maintenance” status.
- **SCO** sends notification to ServiceNow to update INCIDENT TICKET status to RESOLVED.

Scenario 2 – Services Failure.

In this example, we will describe how does the automation workflow addresses a service failure incident once it was detected. Below are the 3 components that is used in this automation process:-

1. System Centre Operation Manager (SCOM).
2. ServiceNow (SN).
3. System Centre Orchestration (SCO).



- **SCOM** detect service failure.
- **SCOM** notify **SCO** on failure.
- **ServiceNow** creates an INCIDENT TICKET and notify relevant parties.
- **ServiceNow** sends instruction to SCO.
- **SCO** triggers “Service Failure Workflow” to attempt service restart. Retry limit 3 times.
- **SCOM** wait for service to return to normal operations mode.

If SUCCESS	**If FAIL**
- SCOM **notify** ServiceNow **on the recovery.** - ServiceNow **changes ticket status to** RESOLVED**, updates the incident ticket and notify relevant parties.**	- **SCOM** notify **ServiceNow** on failure. - **ServiceNow** updates the incident ticket and notify relevant parties. - Administrator work on troubleshooting. - If **SUCCESS**, **SCOM** notify **ServiceNow** on recovery. - **ServiceNow** changes ticket status to **RESOLVED**, updates the incident ticket and notify relevant parties.

4.3.5.2 Service Request Management

A Service Request is defined as a request from a user for information, or advice, or for a Standard Change or for access to an IT Service. The purpose of Service Request Management is to accept and register Service Requests and directly handling them according to the urgency.

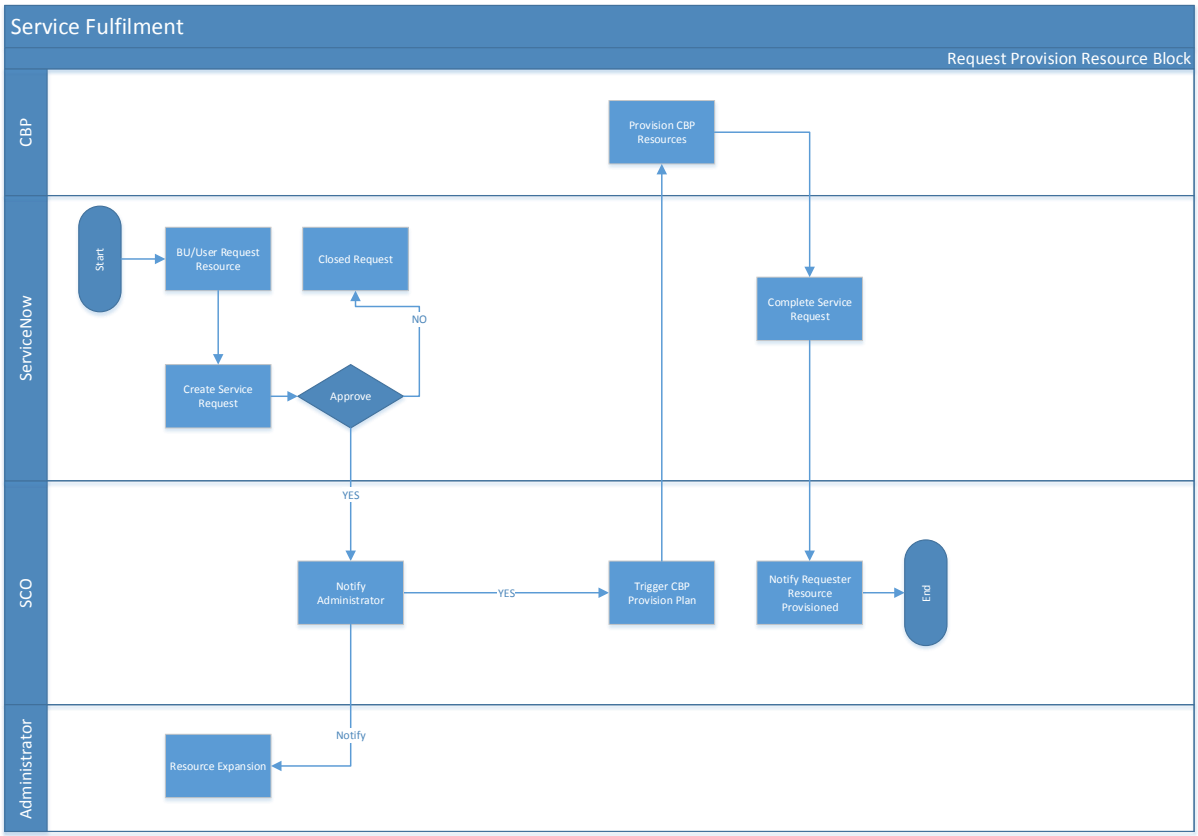
Similar to user-initiated incident report, Singtel proposed that Service Requests will be handled by CapitaLand's Service Desk. The corresponding tickets will be created manually by the SD agents, and the notification email will be triggered for ServiceNow so that a local copy of the ticket will be created. Singtel engineers will refer to this ticket to fulfill the request, will update and subsequently close the ticket once the SR has been completed. The closure will trigger a notification email to Service Desk which will update and close their own copy of the SR.

Example scenarios of SR management

Scenario 1 – Service Request: *Request provision resource block.*

In this example, we will describe how does the automation workflow addresses a service request for a new cloud tenant by a staff. Below are the 4 components that is used in this automation process: -

1. Cloud Brokerage Portal (CBP)
2. ServiceNow (SN)
3. System Centre Orchestration (SCO).
4. Administrator



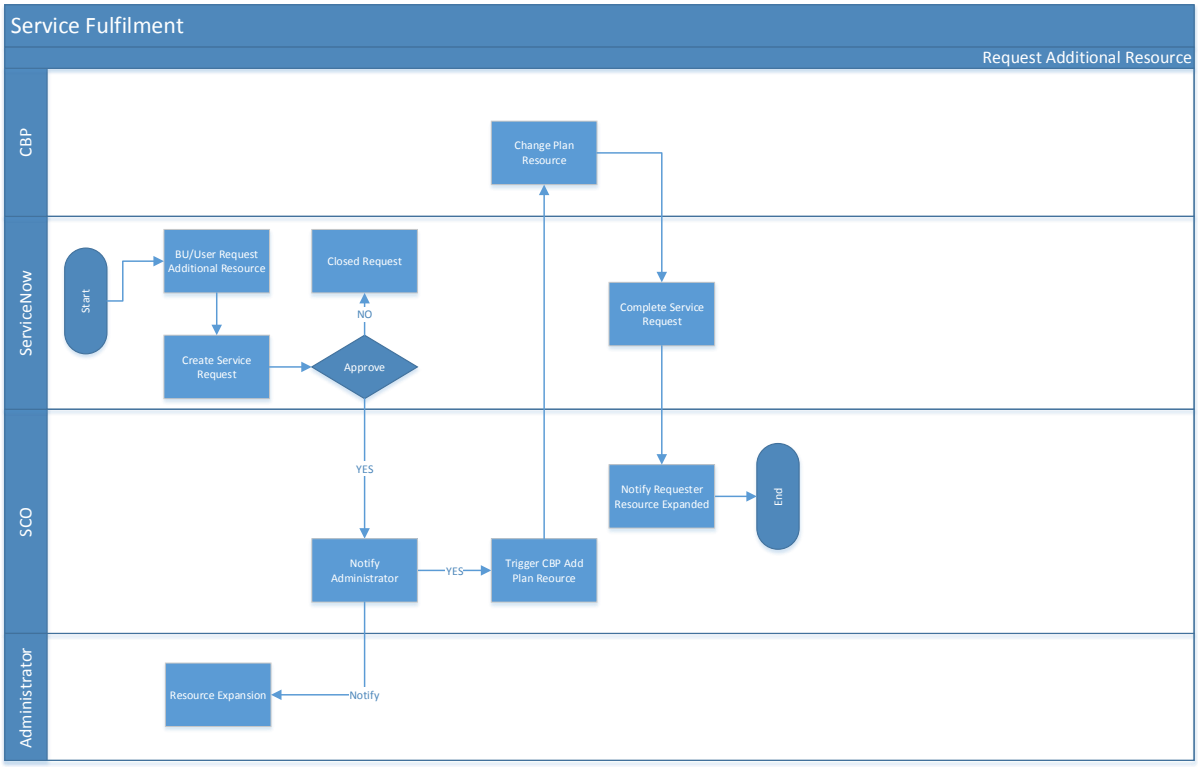
- User fills up Service Request form on **ServiceNow**.
- **ServiceNow** send request through approval workflow.

If APPROVE		**If REJECTED**
- **ServiceNow** sends instruction to **SCO**. - **SCO** triggers "**Request Provision Resource Block Workflow**" to identify resource availability.		- **ServiceNow** changes ticket status to **REJECTED**, updates the request ticket and notify relevant parties
If SUFFICIENT	If NOT SUFFICIENT	
- **SCO** triggers "**Provision Resource Block Workflow**" to provision and inform **SCO**. - **ServiceNow** changes ticket status to **COMPLETED**, updates the service request ticket and notify relevant parties.	- **SCO** notify Administrator - **ServiceNow** changes ticket status to **PENDING**, update the service request ticket and notify relevant parties.	

Scenario 2 – Service Request: *Request additional resource.*

In this example, we will describe how the automation workflow addresses additional resource increase request by a staff. Below are the 4 components that is used in this automation process:-

1. Cloud Brokerage Portal (CBP)
2. ServiceNow (SN)
3. System Centre Orchestration (SCO).
4. Administrator



- User fills up Service Request form on **ServiceNow**.
- **ServiceNow** send request through approval workflow.

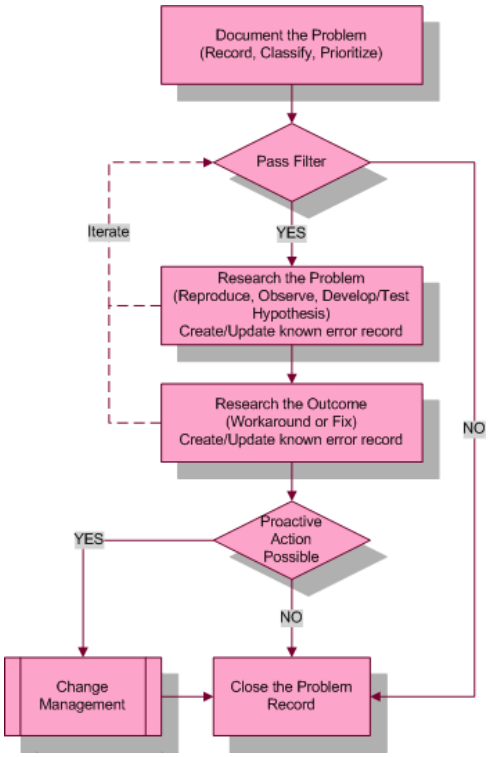
If APPROVE		**If REJECTED**
- **ServiceNow** sends instruction to **SCO**. - SCO triggers "Request additional resource Workflow".		- **ServiceNow** changes ticket status to **REJECTED**, update the incident ticket and notify relevant parties
If SUFFICIENT	If NOT SUFFICIENT	
- **SCO** triggers "**Request Additional Resource Workflow**" to provision the additional resource inform **ServiceNow**. - **ServiceNow** changes ticket status to **COMPLETED**, update the service request ticket and notify relevant parties.	- **SCO** notifies Administrator via e-mail. - **ServiceNow** changes ticket status to **PENDING**, update the service request ticket and notify relevant parties.	

4.3.5.3 Problem Management

ITIL defined problem as unknown cause of one or more incidents. The primary objectives of Problem Management are to prevent Incidents from happening, and to minimize the impact of incidents that cannot be prevented.

ServiceNow has a Management Pack (MP) called Problem Management which provides basic capabilities to document problems, link incidents and research the problems through basic search capability. Though it does not provide any workflows but the Singtel could extend it to include automated workflows to automate aspects of problem management process.

A typical problem management process flow is shown in the diagram below.



Singtel will leverage on ServiceNow and will customize the Problem Management MP to perform the following: problem creation from multiple incidents, capturing known errors, workarounds, problem review flag and auto resolution of linked incidents.

4.3.5.4 Change Management

Based on ITIL definition, a change is an event that results in a new status of one or more configuration items (CIs), and which is approved by management with a minimum risk to IT

infrastructure. The objective of change management is to ensure that standardized methods and procedures are used for efficient and prompt handling of all changes to control IT infrastructure, in order to minimize the number and impact of any related incidents upon service.

Singtel will configure ServiceNow to establish workflows for change and activity management. The customization will include but not be limited to the following:

- Create templates for recurring requests
- Configure email notification so that the relevant management staffs will be alerted whenever a change request is submitted.
- Define issue category, standard priority, effect and risk level in the template.

4.3.5.5 Availability Management

Availability Management is responsible for ensuring that all IT infrastructure, processes, tools, and roles are appropriate for the agreed availability targets.

Singtel will manage services availability through ServiceNow, Operations Manager and Cloud Brokerage Portal. The Operations Manager will produce the availability report which will show server uptime, downtime and warning state, planned maintenance and unplanned maintenance while the Cloud Brokerage Portal able to generate report on cloud usage. The report will be submitted to the management during the monthly meeting so that service level can be validated.

4.3.5.6 Service-Level Management

Service-level management provides for continual identification, monitoring and review of the levels of IT services specified in the Service-level agreements (SLAs). Service-level management ensures that arrangements are in place with internal IT support-providers and external suppliers in the form of Operational Level Agreements (OLAs) and Underpinning Contracts (UCs), respectively. The process involves assessing the impact of change on service quality and SLAs. The service-level management process is in close relation with the operational processes to control their activities. The central role of Service-level management makes it the natural place for metrics to be established and monitored against a benchmark.

Singtel will commit on the service level required by CapitaLand in the delivery of IT outsourcing services. The service level will be reported to CapitaLand management during the regular monthly meeting and during outages. Consistent health checks and service improvements will be done to ensure that the services adhere to the agreed service level.

4.3.5.7 Asset Management

Asset management provides for a high visibility of hardware and software deployed throughout CapitaLand. Singtel also understands that CapitaLand have equipped with LANDesk Management Suite solution, and to minimize the experience shift from one product to another, Singtel proposed to continue leverage on existing investment – LANDesk which fits the purpose perfectly.

LANDesk Asset management provide the following features:

- Complete software visibility
- Intelligent hardware device management
- Simply asset lifecycle tracking
- Software compliance
- Automatic discovery progress in term of hardware & software inventory

4.3.5.8 Knowledge Management

Knowledge management is the process of capturing, developing, sharing, and effectively using organizational knowledge. It refers to a multi-disciplined approach to achieving organizational objectives by making the best use of knowledge.

ServiceNow provides facility to create, update and share knowledge articles. For example, Singtel may create step-by-step guide on how to request for user password reset in Self-service portal and publish it to ServiceNow where CapitaLand users may access and read it.

4.3.5.9 Service Level Agreement

The table below shows the requested Service Level. Singtel will deliver the service to the best of its ability and committed to operate and manage the infrastructure based on the prescribed SLA.

Environment	Availability Per Month
Per Physical Server (Base OS) Per Physical Clustered Server (Base OS) Per Virtual Server (Base OS) Per Virtual Clustered Server (Base OS)	99.90% 99.95% 99.95% 99.95%
Per Server (Infrastructure & Application Tiered) Per Clustered Server (Infrastructure & Application Tiered)	99.90% 99.95%
Per Physical Network Device Per Physical Clustered Network Device	99.90% 99.95%

Per Physical Firewall/IDS/IPS Per Physical Clustered Firewall/IDS/IPS	99.90% 99.95%
Per SAN/ NAS Device (Controller)	99.95%

4.3.5.10 Backup and Recovery Services

Singtel understands failure might happen when the most unexpected incident happens, it could be data theft or corruption to human error. This leads to the importance of Backup service which ensure CapitaLand in control of the ability to roll back to recovery point to restore data.
Singtel will ensure existing backup solution that is currently used by CapitaLand will be able to meet requirement and service level defined in RFP Section 3.10.9.

Based on the Singtel understanding of CapitaLand RFP requirements, Singtel team will conduct frequent random backup recovery test to ensure the backup recovery is able to delivered CapitaLand expectation. Recovery testing will includes not only file level test but ensuring that the operating system are able to boot up successfully without any errors at any given time.

4.3.5.11 Disaster Recovery

After completion of kick-off meeting, Singtel will conduct a workshop to gather existing CapitaLand IT DRP to evaluate and understand the RTO / RPO requirements of each individual system. Service Delivery Manager will be the single point of contact between Singtel team and CapitaLand personnel for each DR drill & exercise required by CapitaLand.

SDM will coordinate with CapitaLand individual application owners with designated work place to ensure application owners can perform their task accordingly.

After each DR drill and exercise SDM will review the results with CapitaLand to ensure it's being delivered as per CapitaLand expectation.

As part of the document updates and review, Singtel will adopt the ITIL Continuous Service Improvement (CSI) methodology to address each activities short-coming and further enhanced the service delivery to exceed CapitaLand expectation.

4.3.6 Platform Service Management

Using the framework, tools and facilities discussed above, Singtel offers the full suite of service management to support CapitaLand's platform. Singtel is able to deliver the platform availability in a very efficient manner through workflow automation process and monitoring tools.

Platform that are covered under the scope of Platform Service Management service team would be the following as proposed, it can be further tweak and amend based on continuous improvement framework.

- Command Centre (Platform Monitoring Services)
- Management of Servers (Windows, Linux and Unix)
- Active Directory Services
- Management of Database (Oracle, MYSQL and MS SQL) environment
- Management of Messaging Infrastructure
- Management of Storage and Backup environment
- Management of Middleware and SAP environment
- Management of Sharepoint environment

4.3.7 General Security and Audit

Singtel is committed to adhere and comply with CapitaLand's IT Security and Management Policies, Standards, Procedures and Guidelines.

An IT Security Officer (ITSO) will be deployed as part of the project and will be responsible for setting up information security processes and guidelines. The ITSO is also expected to research the latest industry security practices and technologies as well as emerging threats and vulnerabilities, and to educate and raise awareness of users' community regarding security policies and security threats/issues.

4.3.7.1 Annual Independent Audit Expert Report

Our services are engineered and operated with security in mind. On an annual basis, Singtel shall provide annual independent audit expert report on the security adequacy and compliance in respect of the operations and services provided. We will engage the services of experienced consultants, well-versed in auditing and assessing Cloud Service Providers' operational practices from a security perspective.

Our engaged consultants will develop an assessment scheme, which will be based on:

- ISO27001 (information security)
- ISO20000 (service management)
- Requirement catalogue for Cloud-Certifications
- NIST definition of Cloud Computing

The output will be a detailed expert report, including assessment results and recommendations.

The annual report highlights the cloud environment's weak spots and offers guidance on how to improve the management system to guarantee security adequacy and compliance.

The focus of the assessment will vary from year to year, evaluating the different core areas.
Focus areas which have been assessed in previous years will be re-evaluated in the following year, making sure that changes to the environment are taken into account over the years.

4.4 Proposal for End-User IT Services

Another major part of the CapitaLand's requirement is the end-to-end End-User IT Outsourcing services. Singtel hereby propose its managed services expertise and capabilities to provide the following:

- Service Desk
- End-User Computing (EUC) Field Service

4.4.1 Call Centre

The Call Centre is a centralized location for all service desks' call to be routed and response to requests and incidents. Call centre is seated with highly trained personnel to have the ability to provide swift response with assistance of Interactive Voice Response (IVR) and call recording for consistent experience of users, with continuous improvement of service.

Refer to Section 5.8 Call Pick-up Rate, SLA requirement of 95% answered telephone calls within 15 seconds. Singtel consider the SLA is the time between the call's first ring and IVR response. After selecting the IVR choices, call will be route to a human service personnel.

Service desk personnel are trained to handle First-Call Resolution (FCR) where first level troubleshooting will be perform remotely, and FCR are expected to be completed within 15 minutes. Next point of escalation will route to EUC Field Services or Level 2 Server Admin respectively. FCR are expected to resolve at least 60% of the incident report calls.

4.4.2 EUC Field Support Service

EUC Field Support Service comprise of a team of highly trained desktop engineers that will be dispatched upon EUC Service desk ticket assignment. As all tickets are logged directly to EUC Service Desk, Service Desk will determine whether field service visits are required before assigning the ticket to EUC Field Support Service Team.

Singtel understand based on the RFP the total amount of IMAC request tickets per month PLUS on-site incident support for field services is approximately at 450, dedicated field support engineer manpower resources will be allocated sufficiently to support CapitaLand needs.

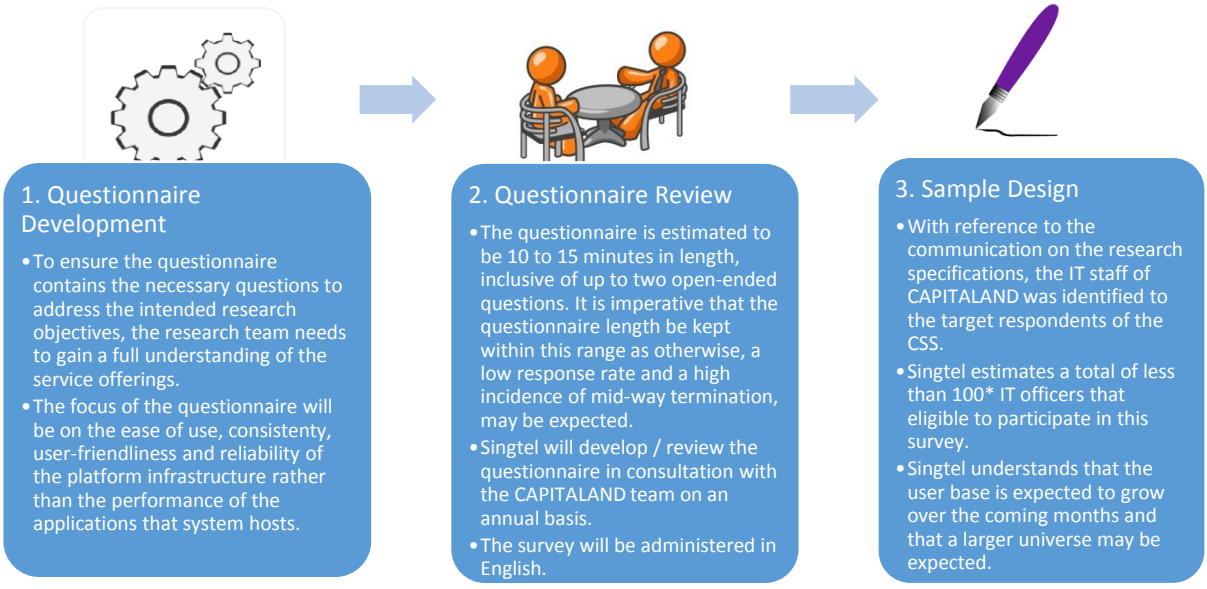
4.4.3 Customer Satisfaction Survey

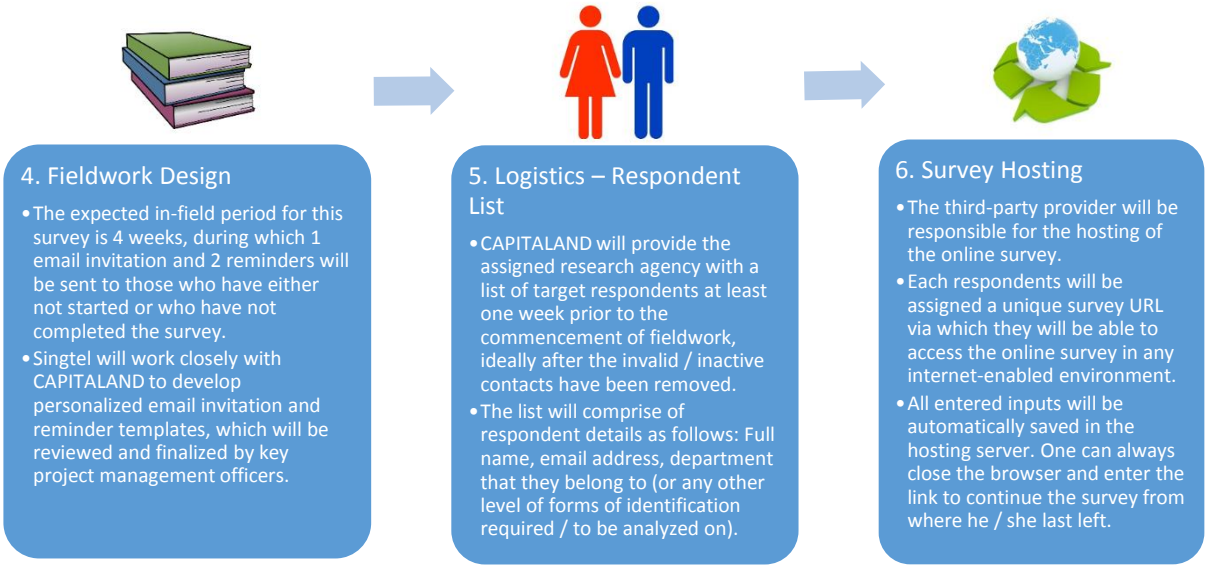
Singtel business priority is to develop a strong relationship with its customers by providing high quality services in today's highly competitive IT environment. This over-arching objective may be achieved by having a solid understanding of customers' ever increasing expectations and an assessment of how well Singtel's current services have been fulfilling them; by presenting opportunities of improving Singtel's current service delivery as well as launching new offerings, when required.

Other than serving as a valid instrument to measure and monitor customer experience as well as satisfaction levels with the EUC specifically servicing for CapitaLand Group, the Customer Satisfaction Survey that Singtel is looking to administer will also form the basis from which to develop Service Improvement Plans. Subsequent conducts of this survey will allow Singtel to monitor changes in its customers' service experiences and resultant satisfaction levels.

4.4.3.1 Survey Design

Singtel, through an independent party, will design the survey in the manner that will reflect the level of satisfaction of the end-users while consume IT services. Below is a sample survey design showing various steps in preparing and conducting the customer satisfaction survey.





4.4.3.2 CSS Scope of Work

For each conduct of survey, Singtel and the third-party provide will undertake the following scope of work.

- Development, review, revision and finalization of the questionnaire.
- Scripting and programming of an online survey.
- Management of fieldwork, including the mail-out of email invitations and reminders to target respondents, management of the listings provided, as well as the provision of regular project status updates to the CapitaLand project team (at least once a week).
- Processing of the data.
- Analysis of the findings, including the preparation of a topline and a full report.
- A presentation of the findings, based on the final report.

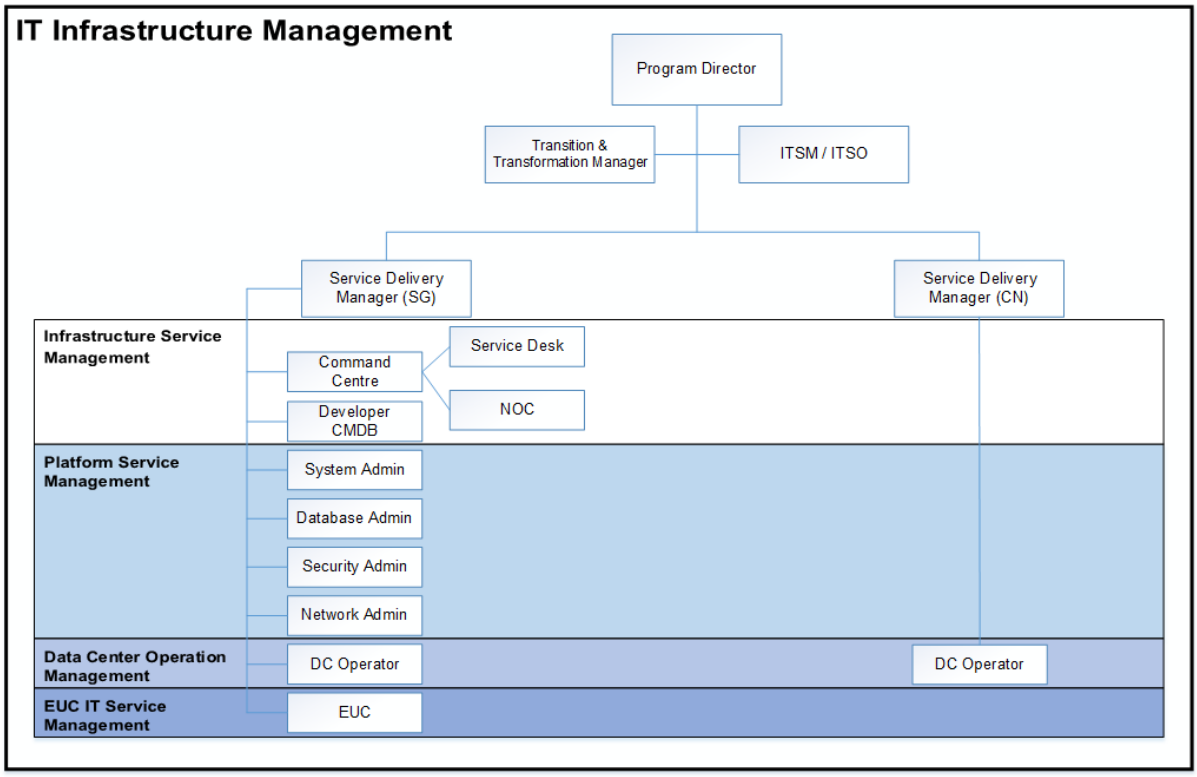
4.4.3.3 Key Deliverables

For each survey, the following will be the committed deliverables:

- Weekly project status updates.
- 1 topline report (including key satisfaction ratings – in '.ppt'. Format).
- 1 full report based on the full findings (in '.ppt' format).
- Presentation to CapitaLand management team to facilitate understanding of the research findings.

4.5 Proposed Team Structure

To support the operation of EUC, Singtel proposes the following team structure. A team of engineers will provide 24x7 on-site support on rotating shifts, ensuring the fast turn-around time when serious incidents occur in the System. The CVs of key personnel will be submitted when Singtel is selected.



4.5.1 Roles and Responsibilities

The roles and responsibilities of the members of support team are defined as follows:

Program Director

- The Program Director oversees the coordination and administration of all aspects of an ongoing program including planning, organizing, staffing, leading, and controlling program activities.

Transition Manager

- Probe and develop an in-depth understanding of customer's existing networking, communication setup and operating environment.
- Develop high quality migration and UAT plan for customers
- Work closely with our delivery team and program direction to implement the services defined in proposal.
- Provide documentation of the services implemented.

- Manage any technical escalation issues including working with internal and external teams to identify root cause of issues and develop a solution.

ITSM

- The ITSM Consultant will provide guidance on service management to ensure that they are aligned to Singtel's service management framework.
- Perform periodic reviews and audits to ensure that all necessary activities and controls are incorporated in the service management plan that they comply with established standards and are carried out according to the plan
- Highlight issues on processes and services to the SDM and to the project board.

ITSO

- Establish information security processes and guidelines.
- Setup Network security alerts and log files.
- Audit security logs and reports to trap security breach.
- Ensure total compliance with IT standards and procedures.
- Research the latest industry security practices and technologies as well as emerging threats and vulnerabilities.
- Train IT staff on new security measures and insure full implementation.
- Educate and raise awareness of users' community regarding security policies and security threats/issues.

SDM / Operation Manager

- The TSM is overall-in-charge for the day to day operation and ensuring SLAs are met.
- Ensure the company tools and information systems are utilized correctly and relevant information is provided.
- Specify systems, processes and methodologies, to ensure effective monitoring, control and support of service delivery.
- Ensure reports are provided to an agreed schedule (or on request), including management and account performance reports.

Operator – Command Centre, NOC

- Responsible for the accurate gathering of information in regards to outages in CapitaLand datacentres
- Record and process Calls Reports and Escalation Reports for incident.
- Carry out post outages investigation and communicate with stake holders to find out the root causes of the problem.
- Provide Tier 1 and Tier 2 support for issues escalated from Customer Service. Service these requests by researching, troubleshooting, or escalating as documented.
- Managing planned maintenance activities and approval.
- Analyse technical actions taken by other Tier 3 engineering groups, vendors support and provide alternatives to any discrepancies.
- Generate key reports for management in regards to system availability, service level agreements, uptime, etc.
- Ensure the accuracy of reports and delivery of reports to key management in a timely fashion.
- Verify & approval of Network Change Request (NCR). Communicate NCR activities to the 24 by 7 to operation manager.

- 24 by 7 hours round the clock standby duties for Technical Helpdesk and NOC.

Service Desk Personnel

- Provide first level technical assistance and support related to IT issues to customers and clients
- Submission of weekly report to ITSM/operation manager
- Working with ServiceNow tracks of open tickets with reporter
- Ensure users' issues and problems are solved in accordance with the policy and standards
- Escalate issues to higher level of support as and when needed
- Troubleshoot and configure software via remote support

End-user Computing

- Perform Asset Management of Infrastructure and Computing Devices
- Provide computer support services (Troubleshooting, patching, configuration, testing and maintenance) for any supported software and hardware
- Provide onsite support for end-user computers, e.g. desktops, laptops and devices
- Provide administrative guide and FAQ on basic computer usage guide.

System Admin - Server, Network & Storage

- Support the operation and management of the System Centre.
- Support and maintain the application & platform service management (PSM)
- Perform regular health checks on the physical servers, networks and storages.
- Provide Level 2 point of escalation from Service Desk on ISM / PSM incident or request

Security Support Engineer

- Execute security plans developed by ITSO
- Review security logs and network devices
- Provide monthly reports on security, potential risks and fix updates
- Involve in security project proposals, requirements gathering, workflow analysis, development, user acceptance, post-implementation review and user / vendor management.
- Monitor, analyse and response to Cyber security incidents, conduct investigative procedures and implement counter attack measures
- Responsible for security infrastructure deployed e.g. SIEM, Firewall, IDS/IPS and SSL-VPN gateways
- Responsible for the conduct of regular internal IT security audits / inspection to ensure that IT Security policies / procedures are implemented and there is no IT security breach.
- Perform audit logs review to detect IT security breaches.
- Conducts vulnerability assessments and risk analysis in relation to security alerts and incidents and recommend the appropriate course of action.
- Responsible for timely completion of corrective actions on IT security deficiencies found during the audit logs and/or Company's internal / external audit and verify its effectiveness.
- Implement IT security industrial best practices.

Database Admin

- Act as the primary point of administration and support for all database infrastructure of CapitaLand

- Ensure the integrity, availability and confidentiality of data, database systems and supporting services
- Optimize performance of database and data warehouse infrastructure
- Work with analysts and engineers to ensure adherence to best practices and data standards
- Act as the technical point of contact for architectural changes and improvements to a first-class data and analytics infrastructure
- Test and benchmark current and future releases of database server software and related hardware technologies

CMDB Developer

- Analyse user's needs and customize the software and applications via API.
- Maintenance and support on the Cloud application integration.
- Involved in the system development life cycle: application development, implementation and post implementation review.
- Assist in handling service request, system quality review and integration testing, user acceptance testing and user guide through ITSM.
- Design and implement user-driven templates and interface for ease of use
- Integrate Web application with database-driven or API-driven back-ends

4.6 Assumptions

Our IT Outsourcing solution for CapitaLand is developed based on the following assumptions:

4.6.1 Assumptions on infrastructure components

The following infrastructure components are assumed existed in CapitaLand, which our proposed system can leverage upon and integrate to. Hence these solution components are excluded from the scope of our proposal:

1. China FM contract is not within the scope of this proposal
2. Our solutions built on existing infrastructure and assumed that existing infrastructure will have sufficient resources to allow the solutions to be built upon. This includes ServiceNow management suite, Microsoft System Center suite and Cloud Brokerage Portal
3. Installation and integration with LANDesk management solution are not required by our solution
4. MPLS WAN infrastructure and WAN routers between all in-scope CapitaLand data centres are assumed available
5. Internet subscription and Internet routers are CapitaLand's responsibility
6. Sufficiently sized backup systems at data centres to cater for the proposed solution - backup servers, backup/deduplication appliances, tape libraries, FC SAN switches and cables for backup system connectivity, tape media and tape cleaning media
7. Equipment racks with available rack space for the proposed systems at CapitaLand's data centres.
8. KVM switches/consoles, cables and accessories at CapitaLand's data centres.
9. Data centre hosting facilities at each site, such as data centre raised flooring, structured cabling, patch panels, power sources and UPS systems, data centre cooling, environment monitoring systems, data centre physical security systems, etc.
10. EUC field services engineer devices, e.g. administrator workstations, personal computers, laptops, peripherals such as printers and scanners, and mobile devices (where applicable)

4.6.2 Assumptions on software components and licenses

The following software components and licenses assumed existing which our proposed solution can leverage upon and integrate to (where applicable). Our proposal assumes that CapitaLand will separately procure/purchase these software licenses if/where required. Hence, these components/licenses are excluded from the scope of our proposal:

1. LANDesk Management Suite
2. ServiceNow
3. Microsoft Windows Server operating system licenses
4. Microsoft SQL Server licenses

5. Microsoft System Center 2012 R2 Datacentre software licenses, including:
    a. Operations Manager
    b. Orchestrator
6. Kelverion ServiceNow Integration Pack
7. VMWare
8. Microsoft Windows desktop/PC licenses
9. All application and Database Management System (DBMS) licenses
10. Provision of any Commercial-Off-The-Shelf (COTS) applications, databases, data warehousing, big data analytics, or any other applications software

4.6.3 Assumptions on implementation services scope

Our solution proposal is based on the following assumptions:

1. CapitaLand will allow and support the setup and connectivity of baseboard management controllers (BMC) for remote administration of the proposed hardware, if any.
2. CapitaLand network traffic is routable across all sites with address given under RFP Annex A.6

The following implementation services are excluded from the scope of our proposal:

1. Applications development, installation, re-installation, configuration, re-configuration, scripting, customization, fine-tuning, integration, upgrade/migration or testing services
2. Database installation, re-installation, configuration, re-configuration, scripting, customization, fine-tuning, integration, upgrade/migration or testing services
3. Configuration/Implementation or testing of application-clustering solutions, such as:
4. Microsoft SQL Server Clustering
5. Microsoft SQL Server log shipping or AlwaysOn
6. Business Continuity Planning (BCP) consultancy or documentation services
7. Installation/configuration/integration of CapitaLand existing backup software
8. Guest OS and data backup operations leveraging existing backup solution

5 Pricing

Please refer to the Pricing Table as provided separately.

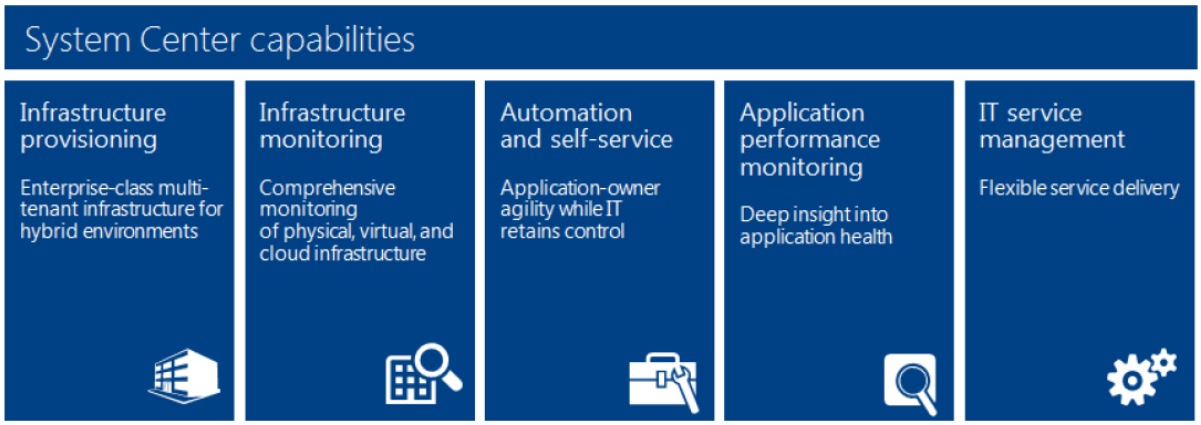
Appendix B: Product Brochure, description, technical functionalities

Microsoft Private Cloud Based on System Center 2012 R2 and Windows Azure Pack

This section highlights key features of the components proposed for CapitaLand IT outsourcing managed services.

Microsoft System Center 2012 R2

Microsoft System Center 2012 R2 delivers unified management across on-premises, service provider, and Microsoft Azure environments, thereby enabling the Microsoft Cloud OS. System Center 2012 R2 offers exciting new features and enhancements across infrastructure provisioning, infrastructure monitoring, automation and self-service, and IT service management.



Capabilities

Infrastructure provisioning

System Center enables enterprises and service providers with the provisioning of physical, virtual, and cloud infrastructures that meet key requirements such as workload scale and performance, multi-tenancy, and chargeback.

System Center can provision standardized or customized infrastructure for on premise clouds, service provider clouds, or Microsoft Azure public cloud. With integration with VMware vCenter, SCVMM can manage VMware ESXi and virtual machines.

System Center features the management of virtual and cloud environments with full support for Windows Server capabilities, including industry-leading Hyper-V scale and performance. It also delivers robust support for Linux-based environments, with full support for Dynamic Memory. To drive down storage costs for business-critical workloads, it enables cluster creation of scale-out file server clusters. System Center delivers reliable and cost-effective automation to help drive operational efficiency.

Automation and Self-service

Service templates can be used for faster and repeatable application and workload provisioning.
System Center enables dynamic capacity expansion to support application needs through robust automation workflows (based on Windows PowerShell and the System Center Orchestrator component).

IT Service Management

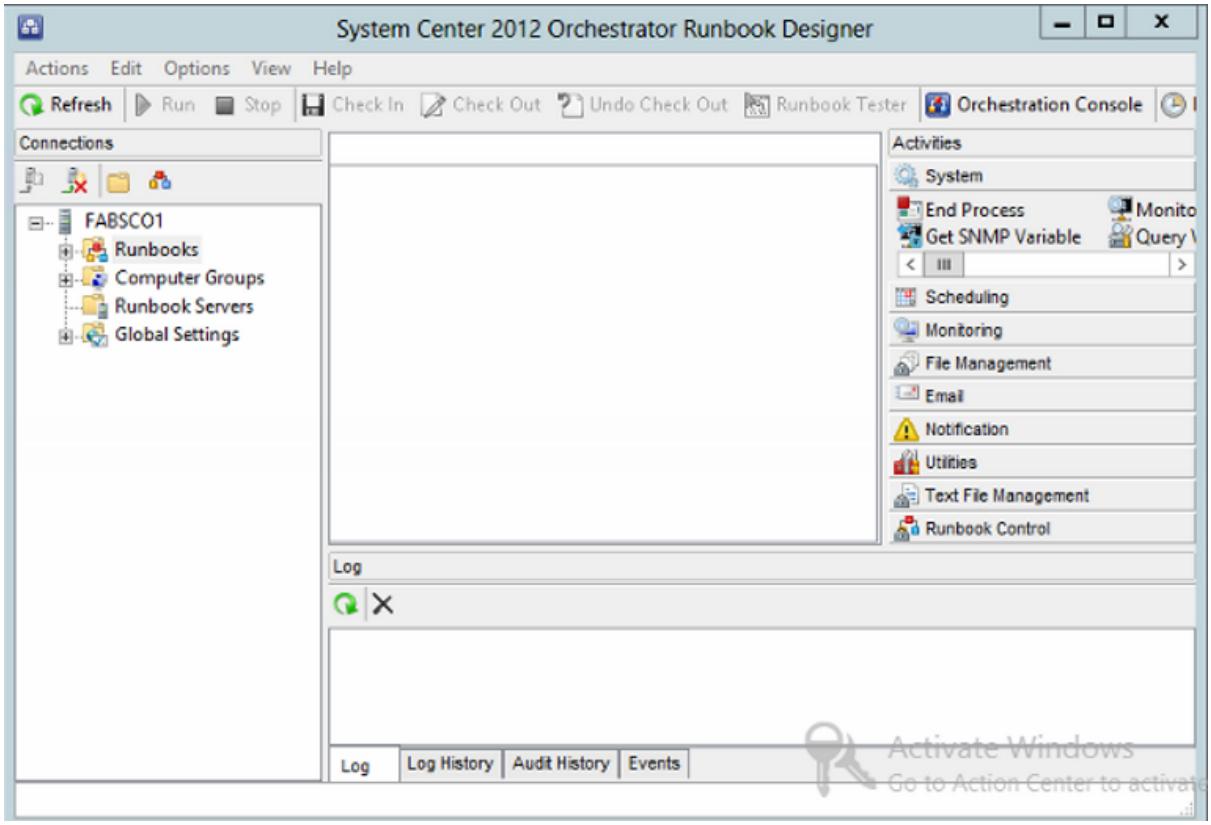
System Center offers easy publishing and consumption of IT services by enabling self-service requests for private cloud capacity through a Service Catalog and Cloud Service Process Pack. Deep integration of people, process and knowledge is enabled via a CMDB, as well as pre-defined industry-standard workflows for core data centre processes.

Microsoft System Center Orchestrator (SCO)

Microsoft System Center Orchestrator is a workflow management solution for the data centre. Orchestrator facilitates automating the creation, deployment and provisioning of the cloud resources in CSP environment.

Orchestrator uses a drag-and-drop Runbook Designer graphical interface to allow ease of runbook creation. Orchestrator translates these visual representations into .NET scripts, PowerShell or SSH commands to automate workflows. It is capable of managing multiple operating systems, and can also handle complex workflows customizable to CapitaLand's specific needs.

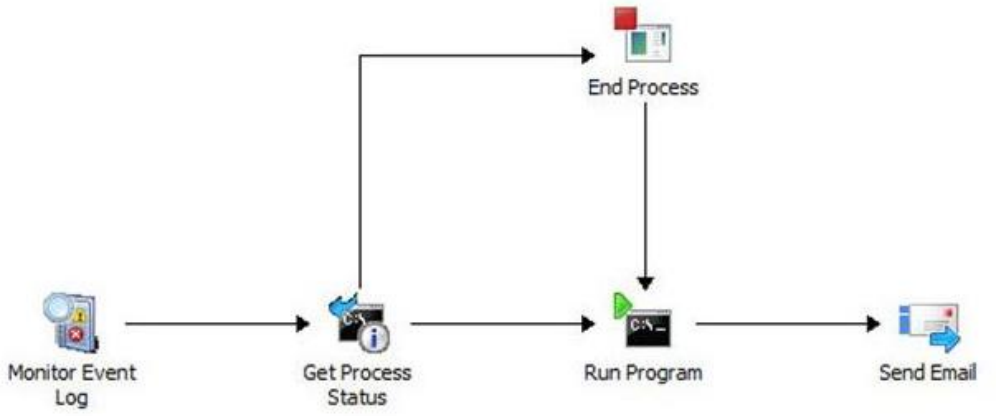
Orchestrator allows the connection of complex actions or processes, making them into single tasks that can then be run automatically through scheduling or in response to service requests.



Automation by using Runbooks

With Orchestrator, Windows PowerShell runbooks can be defined, run and tested to reduce human errors, and in turn enhance productivity. A runbook is a logical representation of a sequence of activities that orchestrates a workflow, which is a series of actions that take place against targeted systems, networks, and other resources.

The Runbook Designer (as shown above) is used to create a runbook. To create an automated process workflow (herein called a "runbook"), activities/actions are selected from the integration packs, with configuration of the parameters, and then linked up in the required execution order.

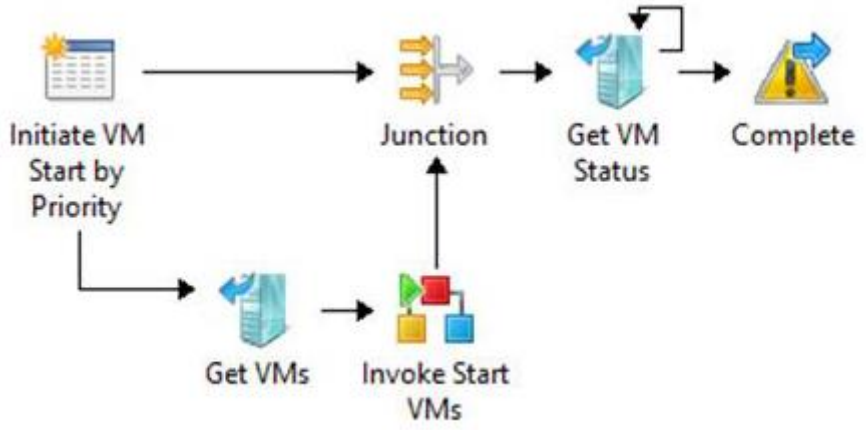


Singtel can work with CapitaLand to understand CapitaLand's IT environment automation needs, and if required, provide separate advisory and implementation services to create CapitaLand-specific runbooks, such as to deploy automated workflows that trigger CBP resource provisioning or other functionalities.

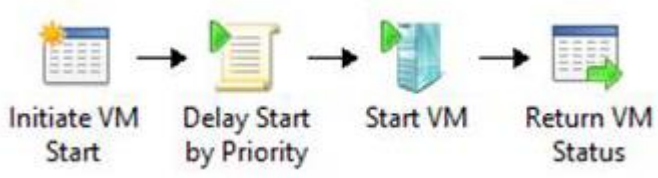
The following IaaS run books are included in our proposal:

1. Incident Management: Virtual Machine Node hardware failure
2. Incident Management: Services failure
3. Service Request: Increase of resource capacity
4. Service Request: Request for a new user creation
5. Change Request: Scheduled system maintenance

A sample runbook is illustrated as follows:



A simple workflow is illustrated as follows:



System Center Orchestrator deployment comprises of the following components:

- Runbook Designer – a graphical design tool that allows the creation of new runbooks, configuration and modification of activities in a runbook, and performing runbook management tasks
- Runbook Tester – a tool that facilitates the validation testing of runbooks created
- Runbook Server – server that runs the runbook management service, and runs instances of runbooks
- Deployment Manager – tool used to deploy runbook servers, Runbook Designer instances, and integration packs
- Orchestration Database – database, based on Microsoft SQL Server, that stores Orchestrator configuration information, logs, runbooks, and jobs
- Management Server – server that provides communications between the orchestration database and the Runbook Designer
- Orchestration Web Service – a REST-based web service that allows the use of applications/scripts to start/stop runbooks, and retrieve information about their operations
- Orchestration Console – a web-based tool for viewing the list of runbooks, current status and history of runbooks, and events related to runbook servers

Microsoft System Center Operations Manager (SCOM)

Microsoft System Center provides best-of-breed Windows Server monitoring, as well as robust cross-platform monitoring support. Physical, virtual, and cloud infrastructure health can be ensured via a common Operations Manager console.

The infrastructure monitoring capability delivered by the System Center Operations Manager provides comprehensive monitoring across physical, virtual, and cloud infrastructure, irrespective of where these components reside. Infrastructure monitoring features include:

- Best-of-breed Microsoft Windows monitoring, and rich cross-platform monitoring including Linux, UNIX, VMware and Citrix (if required)
- Network monitoring, including physical and virtualized device views
- Datacenter monitoring with IP addressable devices via standardized network protocol
- Integration with CBP via Orchestration with REST API and Integration Pack

System Center provides comprehensive monitoring of hardware, virtual machines, operating systems, services, devices, and operations, which helps ensure overall system health, availability and performance in order to deliver on CapitaLand's business and operational SLA's (Service Level Agreements).

System Center Operations Manager uses agents to collect information from the systems being monitored (i.e. the target systems). Agent software can be deployed via either push installation (discovery) or from installation media. With the necessary firewall ports opened on the target systems, Operations Manager discovers the physical components via a built-in network topology discovery capability, and produces a dashboard view of performance metrics across network, compute, and storage.

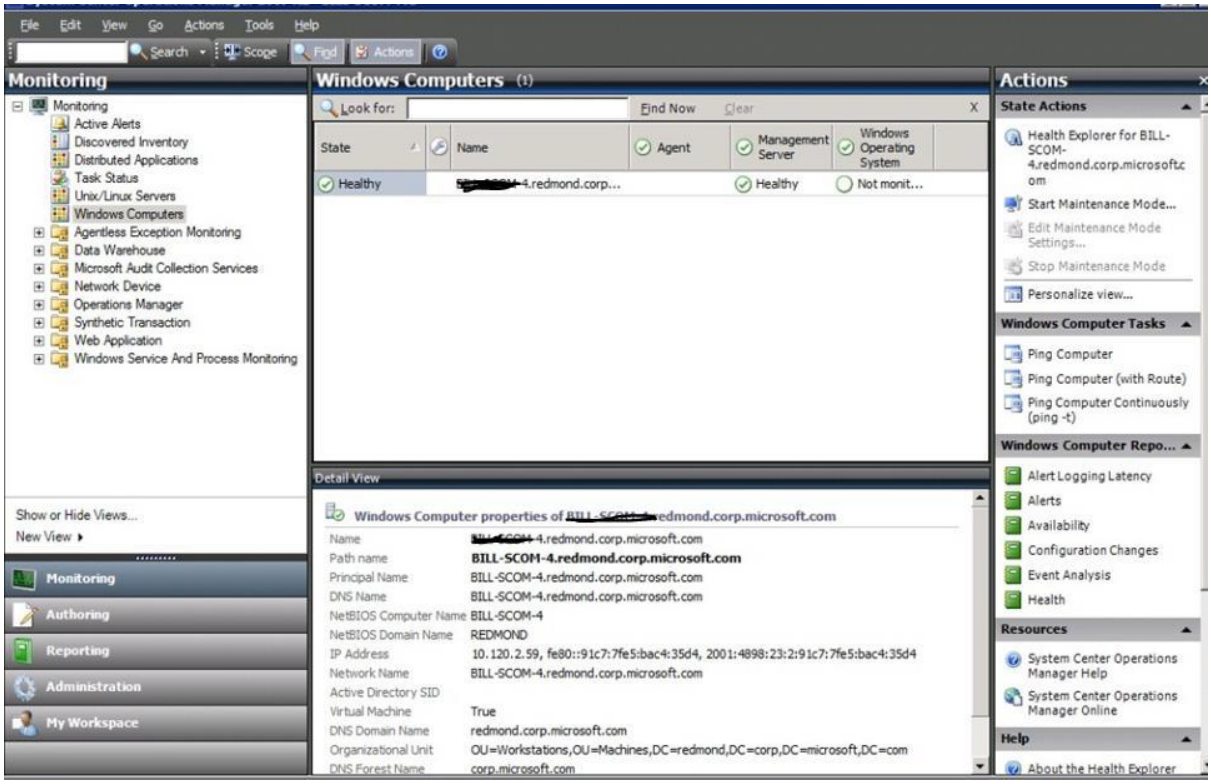
Physical network components (such as routers, switches, firewalls, and load balancers in the physical network) can be discovered to generate a network topology diagram showing how these components are interconnected. This provides visibility into the health and performance of the proposed network infrastructure, to help identify when service failures are caused by network problems.

Operations Manager can also be used to monitor Windows servers that have been configured as failover clusters. In addition, the Microsoft Windows Cluster Management Pack provides discovery and monitoring of cluster shared volumes.

In cases where agentless monitoring is required, information collection from a system that does not have an agent installed can be done by using a proxy agent installed on another system.

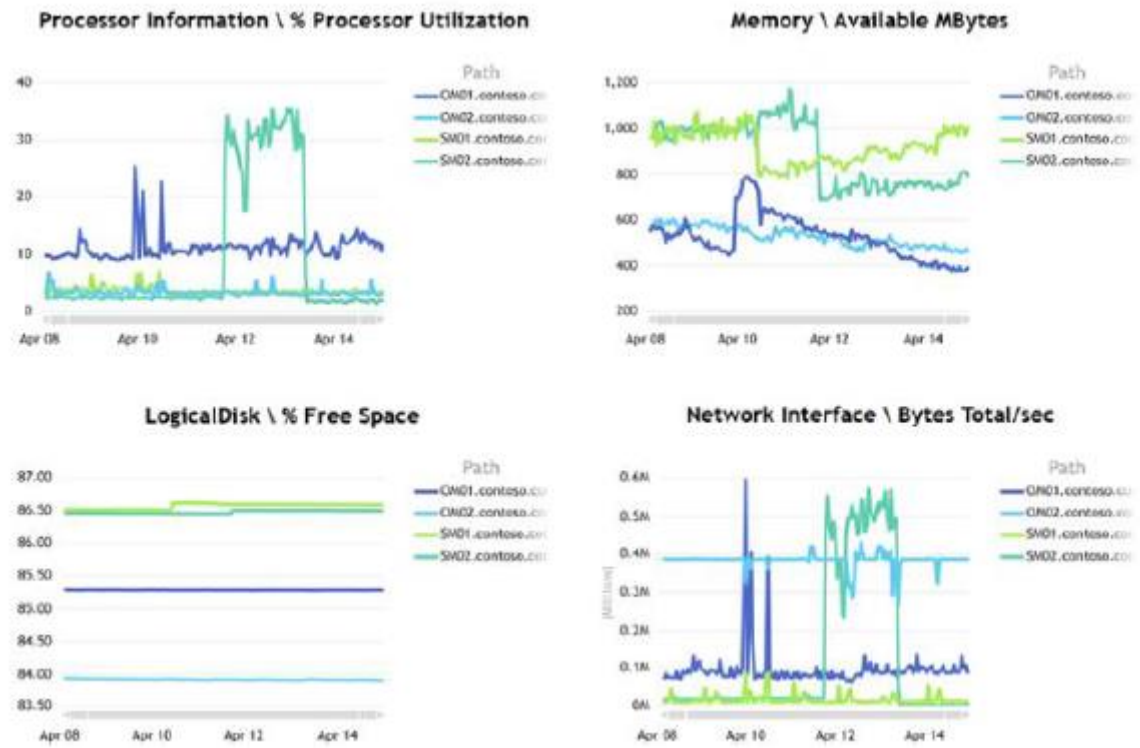
The deployment architecture of System Center Operations Manager comprises of:

- 1x operational database – to contain the configuration data for the management group
- 1x data warehouse database – contains the historical monitoring and alert information collected from the systems being monitored
- 1x management server – administers the management group configuration and databases, and collects information from the systems being monitored
- 1x reporting server – generates reports from the information stored in the data warehouse database



Operations Manager allows Singtel to generate detailed reports to assist in the optimum operations

The Operations Manager dashboard includes health metrics on a variety of resources, such as hosts, virtual machines, host clusters, storage Logical Unit Numbers (LUNs), storage pools, file servers, etc.



System Center Operations Manager console provides the following workspaces for ease of management and operations:

- Monitoring workspace – provides details of the health of the managed components, including hardware, Hyper-V hosts, and virtual machines
- Diagram view – provides a diagrammatic view of system health, for identification of managed systems with current issues/alerts
- Administration workspace – for configuration of monitoring settings, including devices, management packs, network management, notifications, security, etc.

Authoring workspace – for creation and configuration of management packs, management pack objects, and groups