Hosting Model (2023)

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Purpose

This strategy will describe the wider LINZ ICT hosting model, which includes STEP and LI cloud hosting. This model will ultimately provide a preferred – cloud first – target state for our application hosting and describes the roadmap over the last 5 years and for the next 2 years, until end-2025. It provides a guardrail for those making application hosting decisions over that time.

The trigger to review our hosting model is the Cloud First Policy being refreshed and the directive to strengthening cloud adoption across the public service by Cabinet (April 2023).

Overview

In the past, a qualitative analysis of the hosting landscape for Toitū Te Whenua LINZ has been undertaken and this has led to a set of recommendations to guide our application hosting decisions (see Objective reference#).

This hosting analysis weighed up the available and emerging industry offerings against our requirements and constraints to arrive at the preferred future state for application hosting. We have concluded that the preferred solution is a public cloud offering that delivers economies of scale and is hosted in New Zealand to address social licence concerns and provide best performance of our applications for customers. The level of investment and innovation seen in public cloud services has led to rapid improvements in capability and made it difficult for traditional government hosting services to remain competitive.

The New Zealand based large scale public cloud solution we seek does not yet exist today; however, we expect it to be available around 2024 for Microsoft Azure and for Amazon AWS. We have developed a roadmap to show how we expect to get to such multi-cloud hosting model over the next few years, while continuing to support current workloads and efficiently building the new sustainable Landonline of the future.

Our recommendation is to establish that our preference for hosting is to use public cloud in NZ when available. There are likely to be some services and requirements that can justify using an alternative hosting approach, however these should be the exception rather than the norm and they may well be temporary.

The subsequent pages are split in four stages of the model:

1. Original Hosting Model – a summary of the original STEP and LI decisions (in 2018) with an emphasis on STEP and LI development in AWS
2. Amended Hosting Model – a couple of sections that describe what did and is happening in Azure (2018 to 2023) and how Azure impacts the hosting model
3. Interim Hosting Model – the elements added to the hosting model in the interim (2022 to 2023) to keep the AWS platform viable for STEP and LI
4. Target Hosting Model – the clean multi-cloud hosting model that the strategy will deliver after onshoring of public cloud providers (2024 and beyond) and transitioning of business applications into these public cloud environments

Original Hosting Model

Background

Cabinet's 2012 Cloud First Policy requires agencies to adopt cloud services in preference to traditional IT systems and hosting arrangements because they are more cost effective, agile, are generally more secure, and provide greater service choices than existing onshore data centres.

LINZ adopted an Information Systems Strategic Plan (ISSP 2018) that signalled the move to adopt public cloud and use commodity software-as-a-service where possible. Public cloud is recognised as delivering cost effective consumption-based computing and supporting the new delivery paradigms of automation and self-service. Commodity services are recognised as an effective way of sourcing computing services for business functions that are standardised across many organisations and agencies.

Cabinet in 2023 has agreed to four key new areas of the Cloud First policy:

1. **Te Tiriti-based principles**. Agencies that are making decisions about adopting cloud services, need to consider commitments and associated Māori expectations and interests. Guidance material is being finalised and will be made available.
2. **Security assurance considerations**. There will be further refinements, tools, and services for new controls. The aim is that RESTRICTED information will be hosted in New Zealand. Centralised security certification for public cloud data centres will reduce agency efforts, where agencies remain responsible for C&A of any residual and agency specific risks.

3. **Presumption against on-premise**. On-premise investments will only be allowed on an exception basis and will require GCDO approval. Our position may be that on-premise investments are still needed for our solutions, even if that is temporary.
4. **Revoking 2012 IaaS directive**. Discontinuing the Infrastructure-as-a-Service (IaaS) contracts may impact our continuity of service, which needs attention.

DECISION: Toitū Te Whenua LINZ decided to adopt a hybrid multi-cloud model in the interim. The target strategy is multi-public cloud only, allowing to utilise the strengths and efficiencies of the different public cloud service providers. The workload will be transferred to NZ when available and suitable.

This decision aligns with the latest Cloud First (2023) policy changes.

Hybrid-Multi-Cloud Model

This is the current LINZ hosting model, the table below shows how we envisioned this model back in 2018.

- Under the hybrid cloud model, LINZ will be taking advantage of the strengths and overall fit of each offering. Most services will be migrated from the All-of-Government private cloud to the Amazon Web Services (AWS) and Microsoft Azure public cloud environments with a small Government private cloud footprint being retained as long as required.
- AWS is the preferred environment for bespoke developed applications and associated environments (both production and non-production) due to market leadership in this space.
- Azure will be used for Microsoft-based solutions, particularly at the application layer (such as Office 365, CRM and Sharepoint) or using the underlying platform components such as MS SQL database and Azure Active Directory.
- A small Government Cloud footprint will be retained to house legacy systems that are yet to be migrated to the public cloud or services that need to be housed within NZ either for performance, data sovereignty or security reasons.
- Identity services across the public cloud services will be provided by Microsoft Azure Active Directory services.
- An interconnect network will be established where data and transactions flow between all the hosting environments providing fast and secure network connections. Subject to the requirements this could be via private circuits (AWS DirectConnect, Microsoft Express Route) or a VPN using TaaS constructs.

Software as a Service (SaaS) hosting

Consideration of SaaS service hosting is mostly excluded from the hosting options analysis, as hosting decisions for these services are managed by the service vendor. SaaS (and managed) services are preferred and in use at LINZ include Azure AD, Office 365 (including Mail), CRM Dynamics, Power BI, Objective, Atlassian (Confluence and Jira), Tech One, and LINZ Data

Services (Koordinates). Some guardrails may still apply for SaaS delivery, for instance whether data sovereignty rules apply (NZ and AU only) or security assessment of the data centre.

Trans-Tasman network considerations for STEP

Today all AWS and MS Azure public cloud data centres are located offshore with the closest to New Zealand being in Sydney. Transferring data between NZ and Sydney is much slower than transferring data within the same data centre or between data centres within NZ.

The current legacy Landonline application is hosted within two Datacom data centres in New Zealand with production in one (Orbit) and backup in the other (Abel Smith). Most traffic within the systems flows over fast connections within the one data centre.

Under the hybrid multi-cloud model, the new STEP Landonline front-end applications are hosted in AWS in Sydney and share data with legacy Landonline hosted in the Datacom data-centre in NZ. This introduces a Trans-Tasman network delay into new Landonline every time data is moved between the database and the application and between the application and the end user back in New Zealand. This configuration also means that both Datacom and AWS data centres and the Trans-Tasman network are required for New Landonline to function properly, adding complexity and increased operational risk to the system.

There are mitigations planned to minimise the impact of the Trans-Tasman network on New Landonline. These include caching copies of some non-personal data into AWS in Sydney and to set up a higher-grade network connection between Datacom and AWS (and Azure) in Sydney. However, these design enhancements come at a cost to the STEP project primarily in terms of additional time and effort, therefore detracting from the project's ability to deliver business functionality.

Testing and use of the production pilot have identified some performance impacts in specific functional areas and for larger surveys due to the network latency introduced by this geographical split between application and database. Initial investigation has identified multiple additional code-level mitigations.

The Survey squad continues to investigate and address these though it is currently unclear whether the ongoing application of mitigations will be possible or sustainable. This leaves open the possibility that future pivots (paths in the roadmap) may be necessary.

Public cloud options and implications

Given that for an extended period - possibly the entire STEP programme timeline and even beyond - the Landonline database will remain onshore New Zealand, STEP needs to consider whether increasing the breadth of its "hybrid" application stack (applications in AWS Sydney and database in New Zealand) is feasible and/or sensible. This table shows some possible responses. Note that they are not necessarily mutually exclusive - more that one could be taken.

Response	Implications	Recommendation
Do nothing - continue on our current strategy without change	We run the risk of significant refactoring if we later need to move to Azure and/or onshore. Note that this includes continuing to add cached data in AWS as a performance mitigation for reads.	This may be where we land in the long-term but only after other options have been considered. In the short-term we can continue as we are.
Re-architect to split services for performance	We'd need to think through which services would benefit from this. Our current approach using point caches in AWS will probably be sufficient for now.	Keep up our sleeve as an option but don't actively pursue until there is a better indication of the need.
Move development from AWS to Azure	We would probably start with new services such as Titles. This would position us for a possible move to Azure onshore.	Too early to go down this route.
Move deployment for production (at least) into a New Zealand hosting service	This would tend to drive us toward portability (in the "lowest common denominator" sense) and we could the move across to Azure onshore (or offshore for that matter). There is significant setup and environment management effort required.	We should not dismiss this but the time is fast approaching where we need to commit. If we are going down this route we should choose and do it properly. At the moment there are better responses.
"Dial up" portability as an NFR	We take a much more conscious decision to use portable and/or readily replaceable services as we need them This does not preclude using AWS specific services but the impact of this would be consciously assessed and a decision recorded.	Adopt this as a risk mitigation for any later drive to move (either to Azure or to some other onshore hosting solution). Don't go crazy and insist that everything is absolutely portable - just make sure that it's always considered and they we know the impact of our decisions.

Recommendations

Based on our analysis we seek endorsement of the following recommendations.

- Note that Landonline master production data will continue to be hosted in New Zealand in line with previous decisions.

- Note that hosting environments is a rapidly evolving area and the hosting road map may need to be reviewed and updated as changes emerge in the market.
- Note that currently and prior to public cloud hosting becoming available in NZ STEP will continue to host the application front end and middle tier in AWS in Australia. If in the short-term application hosting is required in NZ to solve performance or other issues, then the AWS Outpost is our preferred solution.
- Note that we are investigating and building a case for moving non-Landonline workloads from DCSG into Azure in Australia with a view to bringing them back onshore once Azure is available in NZ so long as Microsoft can offer an acceptable path back to NZ and that the items being moved do not include any registry like workloads.
    - Implication: Requires setup of support and foundations for hosting bespoke systems in MS Azure
    - Implication: Likely to require some level of application refactoring
- Agree that when making new hosting decisions or as part of enhancement investments our preference for hosting workloads and capabilities is to use public cloud in NZ (as per All of Government directive).
- Agree to continuing with our hybrid multi cloud hosting strategy until public cloud becomes available in NZ and then move to multi-cloud.
    - Implication: We will continue to mature our support capability both in MS Azure and AWS

Amended Hosting Model

The amended hosting model section will focus on the changing role of Microsoft Azure between 2018 and 2023. Where initially a very passive role for this public cloud provider was envisaged, which changed for a short period when its NZ onshoring was announced, now some targeted workloads start or will be using the Microsoft Azure platform.

Azure hosting path

On the previous page, an Azure recommendation was embedded in the STEP/Landonline recommendations. It stated that a case was made for moving non-Landonline workloads from DCSG into Azure. Initially in Australia, with a view to bringing them back onshore once Azure becomes available in NZ. This is dependent on Microsoft offering an acceptable path back to NZ and that the items being moved do not include any registry workloads.

Azure public cloud hosting followed an almost independent path from AWS cloud where STEP and LI acted as driving stakeholders. There was opposition against Azure, as it was seen as a duplicate effort. There was also the awareness that government cloud (DCSG) still hosted most applications. Azure was initially kept in the mix to use the platform for integration into software products and services. The fact that Azure announced onshoring in New Zealand (2020) a year before AWS improved their position.

A couple of decisions and (potential) implementations have solidified this position:

1. Azure AD as IAM provider
    1. Identity
    2. B2B
    3. B2C
2. Adding scope to Azure setup
    1. PaaS
    2. IaaS
3. Migrating Azure workloads
    1. Trial migrations
    2. Testing migration
4. Providing data and reporting
5. Consider alternative for STEP
6. Taking over some custom apps
7. Move to Copilot development

Azure AD as IAM provider

Toitū Te Whenua LINZ has selected and have established Azure AD as Software as a Service (SaaS), with the capability of being the identity provider and authentication and role-based access service provider for all applications.

The identity provider service for internal users still requires swapping the master repository from on-premises AD to Azure AD. The introduction of B2B for trusted organisations (e.g., other government agencies) has gone smoothly, while the introduction of B2C for external users – especially for STEP – is showing significant strategic progress.

The positioning of Azure AD may also be relevant if the Government introduces new identification processes and/or legislation for alternative identity providers, something that has been announced but has not yet been realised.

Azure setup scope

One of the key strengths of the Azure offering is the products and software services that Microsoft provide, mostly ‘as-a-Service’. Next to Azure AD, this includes Office 365 (including Mail), CRM Dynamics, Power Platform including Power BI, and Microsoft procured services such as GitHub (Code Repository, CI/CD Actions and AI Copilot).

The initial intent was to only use software (SaaS) and platform (PaaS) services from Azure. This included the use of Dynamics for CRM (SaaS) and Power BI for reporting (PaaS). The PaaS platform was also required for migration and integration of SaaS applications, specifically for Landonline CRM.

This setup changed to include infrastructure (IaaS) when the application workload migration became an opportunity supported by Microsoft and Datacom.

Azure workload migration

There were opportunities to work along with Microsoft on a roadmap to migrate workloads into Azure from government cloud. The 'public cloud first' policy from Government (in 2018) shifted the hosting strategy target from 'hybrid public multi-cloud' to 'public multi-cloud'.

Key attributes of this Azure workload migration were:

- Migration to Azure started with lower risk workloads, many of which already used Microsoft products
- Developing foundations and moving low risk workloads into Azure early prepared the way for future porting of high risk workloads
- While a direction is set, actual migration happened slowly and allowed check points along the way to confirm direction

The cloud migration and cloud setup were obviously an interim solution, as modern architecture and design principles were ignored. It required the enablement of IaaS in the Azure cloud and even required Domain Controllers (effectively mimicking on-premises AD) in the Azure Heritage cloud. The migration results were not very successful either and were basically limited to the user acceptance testing environment.

The choice to enable IaaS for Azure also required setup of support and foundations for hosting the bespoke systems in Azure, while still having to undertake a level of application refactoring.

Providing data and reporting

Azure is the home of Microsoft Power BI and within this Azure tenancy a well-architected reference data architecture is gradually being implemented. This data architecture will contain components for the source data, persisted data, data mart, business intelligence & analytics, data service, machine learning, data management, and data governance. A similar reference data architecture could fully or partially be implemented in AWS, if required.

The choice of Power BI is closely linked to our M365 licensing where users get access to the software for user-based reporting. Low code/no code development using PowerApps is often linked to the Azure choice. A single instance Premium P1 license is implemented for any high-volume processing.

The reference data architecture in Azure consists of components to deliver data and information that are accessible to the whole organisation. It provides a consistent set of architectural and industry best practices underpinned by suitable products or services. The purpose of this reference data architecture implementation is to guide projects and business units.

The reference data architecture is based on multiple industry standard patterns and tested against a range of potential Toitū Te Whenua use cases. This specific architecture aligns with our short- and long-term goals. The characteristics of a modern data architecture described by the Eckerson Group form the basis for the reference data architecture.

Azure for STEP

The original technology strategy for STEP was to develop a bespoke application in AWS and migrate the Landonline database into AWS alongside the move from Informix to PostgreSQL.

In STEP, the Tranche 1 applications (Search and Notice of Change) were built using AWS as the platform. A limited number of AWS specific application services such as SES have been used.

There are two key events that require the programme to consider how it continues its build activities:

1. The STEP Board has decided that it unacceptable, for reasons of data sovereignty and social licence, to move the Landonline database (specifically the land register and the cadastre) to a hosting facility outside New Zealand.
2. Microsoft has announced its intention to create one or more Azure facilities within New Zealand.

In response to decision #1, STEP has undertaken some investigation of options for deploying the application and/or database in Azure. This is no longer considered as an active option, as AWS also announced their on-shoring in New Zealand.

Azure for custom apps

The questions became, as the migration of workloads into Azure was a problem and the use of Azure for STEP was no longer a consideration, what to do in Azure cloud. The answer came from the ITSM contract with Datacom, in which Toitū Te Whenua LINZ were funding a Datacom development team to maintain and support a range of applications.

These custom applications will now be maintained and supported in-house, while still using Datacom resources to reduce the risk. The 6R approach will be applied, where **retaining** in DCSG is not an option and **re-hosting** or **re-platforming** was not working (see workload migration), an application assessment is made to consider **retiring** or **re-purchasing** before the remaining applications will use **re-factoring** to move them properly into the Azure cloud.

Azure Copilot development

One of the proposals early on was to move STEP development from AWS to Azure, as was shown previously in the public cloud options section. At this stage this proposal will not apply to STEP apps, but can apply to some of the GenAI adoption with Azure ChatGPT.

Two specific example of GenAI are initially trialled:

- Domain analysis using Azure ChatGPT based on Landonline stored procedures and database definitions. It requires a trial environment with Copilot X and an Azure account, for which permission was granted by Microsoft. This trial will be leading to the generation of domain models for future microservices.
- Coding using pairing, where GitHub Copilot is actively used. The Large Language Model (LLM) is running in external Azure environment and provides code suggestions directly back to the developers IDE.

The setup of these environments and the scope of the trials are not part of this hosting paper. There are new opportunities when developing on one platform and by using the existing GitHub Actions CI/CD practices, applications that are running in Azure and/or AWS public cloud can be targeted.

In many ways, Microsoft is leading the way in its use of Generative AI – with embedded services in M365 Copilot and development with GitHub Copilot/Microsoft Visual Studio. The use of Azure environments for development could be a game changer, but it is not proposed as the way forward.

Interim Hosting Model

Hosting Roadmap

The interim hosting model is often referred to as the hosting roadmap within STEP and is primarily AWS focussed. It was required to fill the gap from where we were to where we wanted to go, with the target hosting model still out of reach. The roadmap shows how we move towards the future hosting environment over the next four years. It is based on what we know today and will be regularly reassessed because the hosting landscape is rapidly evolving.

Host Landonline data in NZ

The following clarification of the decisions that have been made at the STEP Board and in subsequent discussion, has been provided by the Kaihautu Digital Delivery and endorsed by the Chief Executive and members of the STEP Board to remove any ambiguity.

- Toitū Te Whenua LINZ has been part of the debate as to the “social and cultural licence” we obtained to move systems and data offshore, specifically we have accepted that there is significant concern with our preference to host the core land registries that we manage offshore. These registries form the core of our master production data for the Landonline application.

DECISION (in 2020): We will continue to host the Landonline master production database in New Zealand.

Note that the Cloud First policy (2023) has a key area related to Te Tiriti-based principles. The historical decision to continue hosting the Landonline master production database in New Zealand reflects our ongoing commitments and associated Māori expectations and interests.

- We do not think these concerns will be resolved in the near future, we do not have the resources to drive for change in this area nor do we want to take the risk of being an early adopter or industry leader.

DECISION: LINZ will participate in all of government activity to consider social & cultural licence in relation to off-shoring but we will not lead this or drive it alone.

DECISION: If and when risks are overcome, Toitu Te Whenua LINZ may follow other agencies to offshore data, but we will not lead this trend.

It should be noted that the original drivers for off-shoring of data was the adoption of public cloud. However, as major cloud vendors Microsoft and AWS now have plans for datacentre deployment into NZ, the driver to off-shoring has significantly diminished.

Our planning assumption is that the master production database for Landonline, including the core registries and in-flight transactions, will be hosted in New Zealand. We are now challenged with developing the best way to achieve this goal with an eye to the medium-term adoption of on-shore public cloud.

AWS Outpost

- To mitigate the performance risks with survey functionality within STEP, where logic in Australia and database in New Zealand are physically separated.

DECISION (in 2022): To mitigate risk, implement AWS Outpost in Datacom datacentre for production instance only.

AWS Outposts is a fully managed service that extends AWS infrastructure, AWS services, APIs, and tools to virtually any datacentre for a truly consistent hybrid experience. Outpost allows native AWS services to run locally near the Landonline (Informix) database.

Assumptions

The following assumptions have been made in developing the roadmap:

- High level of portability is desired for new Landonline and other bespoke applications to avoid lock-in to one vendor

    - *Comment: STEP are currently leveraging AWS services to its advantage. Most services will have an Azure equivalent but portability of IaaC scripts is not prioritised. STEP is using AWS CDK not Terraform.*
- Current hosting usage mix is 90% Datacom NZ, 5% AWS, 5% Microsoft Azure and other SaaS
- STEP programme assumes a high level of automation in our hosting environment
- New Landonline environment will be evergreen and continue regularly to evolve over time
- Microsoft Azure Public cloud will be available in NZ in 2024
- AWS Public cloud will be available in NZ in 2024

Hosting roadmap areas of uncertainty

The following are unknowns that will further inform and shape our hosting roadmap as we learn more.

- The performance cost / risk of running the new Landonline products in a split NZ / AUS hosting model
    - *Comment: The performance considerations may impact the roll-out timing. The cloud hosting strategy intention to move from offshore to onshore remains.*
- The level of resilience risk for the trans-Tasman network. Some useful info here: https://aws.amazon.com/blogs/architecture/new-zealand-internet-connectivity-to-aws/
- The cost and effort of moving workloads between AWS and Microsoft Azure
- The cost and benefit of making new Landonline fully portable
- The viability of Datacom's government hosting platform over the next few years as public cloud usage grows
- How the social licence, cultural and data sovereignty views will evolve over the next few years. This will be informed by all of government data sovereignty work
- The actual availability of the announced AWS and Azure on-shore data centres
- Likelihood of another public cloud vendor setting up in NZ. e.g. Google

Interim outcomes

The interim high-level hosting outcomes are:

- Speed to market of customer value - agility
- High level of solution robustness - reliability
- Ability to add additional capacity and environments on demand - scalability
- Simplicity of solution with less moving parts and vendor hand offs - supportability
- Value for money, matching cost to usage, minimal up-front licencing, or infrastructure costs
- Social licence constraints continue to be addressed
- Acceptable performance for current Landonline until replaced and new Landonline products

- Ability to change hosting vendors - mobility.

Target Hosting Model

Future Characteristics

For the original hosting model[1], we identified several possible future states that could meet our hosting needs. After ranking them according to the likelihood of adoption and fit to Toitū Te Whenua LINZ requirements, we identified a preferred option. This preferred option is referred to as the 'target hosting model' and is best described as:

- **Public cloud**, with AWS and Azure already selected
- **Multi-cloud**, with rules for utilising public cloud providers
- **In-country**, expecting AWS and Azure to open datacentres in NZ
- **Secure**, where DIA assesses the onshore NZ datacentres and infrastructure
- **Value-based**, similar deployment structures to support cost comparisons

Target outcomes

The high-level outcomes for the target hosting model are:

- Speed to market and high agility
- Good and consistent performance in country
- High level of robustness and reliability
- On-demand self-service for provisioning of computing capabilities
- Rapid elasticity for provisioning and release of scalable capabilities
- Simplicity of solution, vendor hand offs and supportability
- Value for money, minimal up-front licensing or infrastructure costs
- Portability of workloads between hosting providers
- Social licence constraints do no longer apply
- Measured service where resource use is managed through metering

Public cloud for applications

Criteria for assigning applications to one or the other public clouds need to be simple:

- **Software-as-a-Service applications**; almost any public cloud provider is acceptable once their data centres are in NZ or AU: AWS, Azure, Google, Catalyst, etc. Management of the hosting environment is the responsibility of the SaaS vendor and comes as part of the SaaS service.

This option applies to consumption-based[2], accredited for security and well-managed services. Data centres that are not public cloud should be avoided, as per directive for 'public cloud first'.

- **Third Party developed applications**, avoid dependencies on external practices and data centres by using code packages that are assessed and deployed with internal CI/CD process and tools. For determining where the application runs, see subsequent criteria.
- **In-House developed applications**, mandated tools across all development environments include internal code repository and internal CI/CD process and tools (both GitHub). In the future the use of compliance tools may become mandatory (Codicy and Snyk). At this point in time, there are three high-level in-house development platforms, each using a different Infrastructure as Code tool (Cloud Development Kit - CDK, CloudFormation and Terraform):
    - **Survey and Title Enhancement Project (STEP)** - The preferred choice for Landonline replacement with React, Kotlin and PostgresSQL as ultimate target in AWS.
    - **Location Information (LI)** - The preferred choice for spatial applications is an environment with Python and PostgresSQL in AWS, using cloudfront, lambda and S3 buckets where possible.
    - **Application Services** - The preferred choice for non-spatial, custom applications (ex-Datacom) in Azure, with as target a low code - no code framework for professional developers (Pega or Appian) and a framework for data applications and for end-users (Microsoft Power Platform). Preferred languages are being standardised on C# .NET Core and Javascript.

Power Platform is recommended for:

Simple applications with low to medium number of users

Medium complexity applications with low number of users

Migration of on-premises applications to the Azure cloud

Use of a group activity or any initial cost/benefit assessment

Power Platform is NOT recommended for:

Complex applications requiring specialist knowledge

Large cross-organisation (with many users) or external facing applications

Integrated applications that are likely to require significant extensions

[1] Note that the ‘hybrid’ component, referencing to Datacom cloud services for government (DCSG), has been excluded for the target state.

[2] The moment software services are defined as managed (e.g., vendor uses dedicated instances, is controlling evergreen updates, is regulating insights, etc.) a further assessment of the offering is required.