



CASE STUDY

APEX – Singapore

APEX⁹⁶ is a whole-of-government platform which establishes common application programming interfaces (APIs) (see Box 18) that allow public agencies to share data and services with other agencies and private entities. APEX simplifies the communication protocols by which different government programmes can talk to each other, providing uniform governance, consistency and reliable performance. It enables innovation through a central catalogue and self-service portal where innovators can select common protocols to create new services and experiences for citizens. APEX thus addresses one of the biggest systemic challenges facing governments in the pre-era of machine-to-machine learning and AI – data and system interoperability.



96. <https://portal.apex.gov.sg> (only accessible via intranet). The APEX Introduction Video can be downloaded here: <https://drive.google.com/file/d/0B84-8GIFcQYKNVdmVFMWHRVeWs/view?usp=sharing>.

THE PROBLEM

In today's fast-paced and digitalised world, government agencies need to evolve quickly to stay relevant. Old methods of data acquisition and transfer are now too slow to satisfy citizen's needs. Consequently, there is a desire for innovative and integrated government services through which data can be shared seamlessly between public agencies. Equally appealing are the potentially more tailored and citizen-centric products businesses can offer if given access to selected agency data. Government agencies therefore need technological solutions to efficiently share data and systems, in order to provide more complete and citizen-centric services. However, data and systems interoperability is not easy. Data-sharing standards are often inconsistent and fragmented, while security needs and privacy concerns frequently dissuade governments from attempting whole-of-government platforms. With the exception of the most technologically competent, the majority of civil servants will encounter difficulties in implementing these new processes and solutions.

AN INNOVATIVE SOLUTION

In 2017, the Government Technology Agency of Singapore (GovTech) launched APEX, a centralised whole-of-government platform designed to allow all government

Box 18: WHAT IS AN API?

An application programming interface (API) comprises a set of definitions, protocols and tools for building application software. Simply put, it is collection of methods that allow software components to interact with each other, making it possible to copy and paste text or other types of data from one application to another, for example. There are many different types of APIs for operating systems, applications or websites. A good API facilitates the development of a programme by providing all the building blocks, which are then assembled by a programmer.

Source: www.webopedia.com/TERMA/API.html.

agencies to share data among themselves and with private enterprises through APIs. Prior to the launch, APEX was a small feature within a platform-as-a-service (PaaS) product that allowed hosted services to expose APIs to external services. However, it became evident that the API-hosting technology could be extended to meet a wider need across government agencies, providing a simple way to share data. The government spun off APEX as a separate project with a much more ambitious scope – to secure data-sharing, make API management user-friendly and increase the visibility of available APIs.

Figure 36. The difference in data sharing through traditional methods and through API gateway



Source: Government of Singapore.

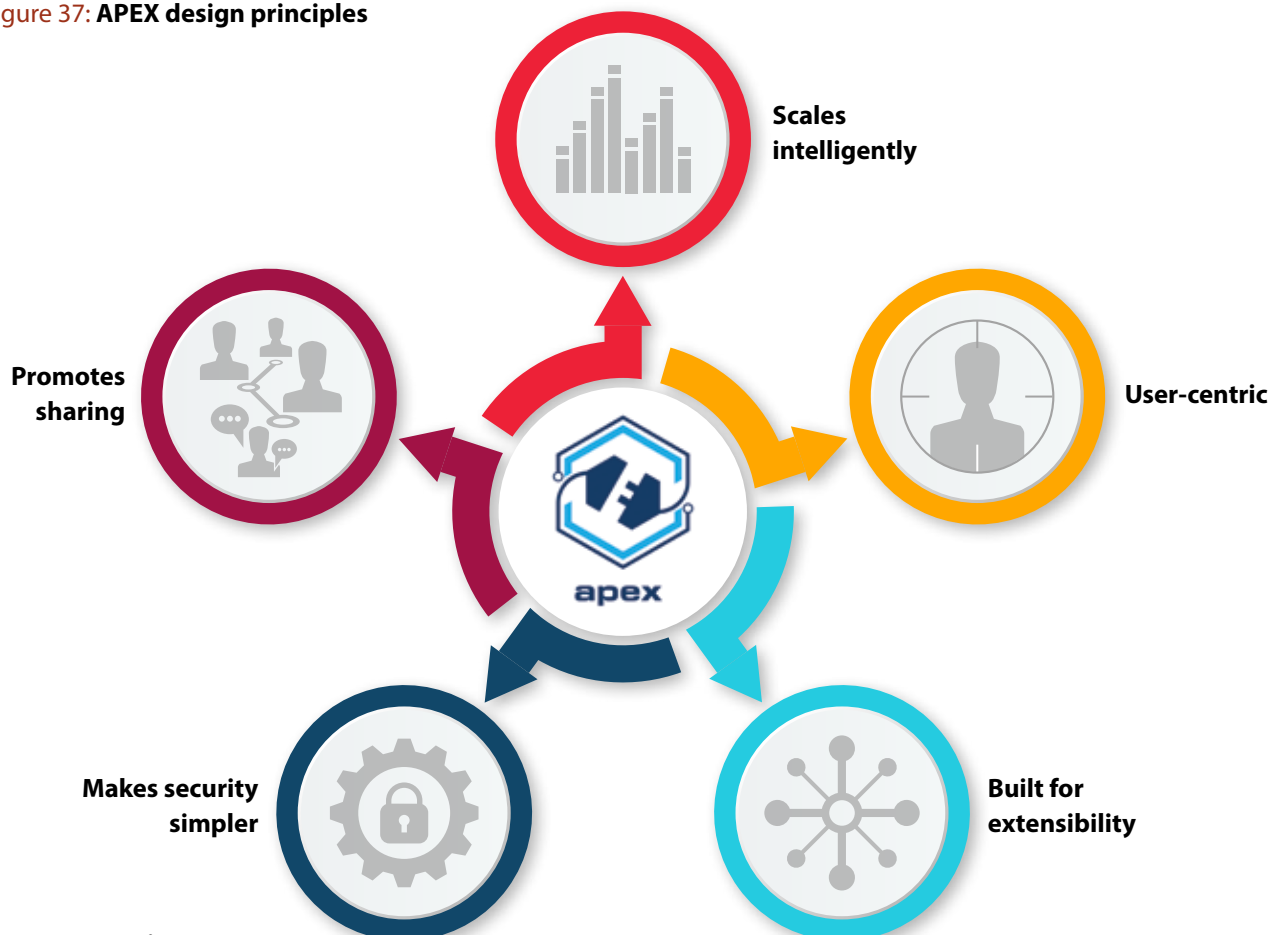
Trend 2: Systems approaches and enablers

APEX provides a secure data-sharing environment where agencies' APIs are protected by authentication policies that conform to the latest security standards (see Figure 36). Round-the-clock monitoring and transaction logging also ensure high system availability and access tracking. Most importantly, APEX allows data to be shared between the government intranet and the public internet by providing a bridge between the two networks in a safe and secure setup. This makes it possible for government agencies to publish APIs in order to share data hosted in the intranet with commercial entities deploying services on the internet. For example, one of the pilot projects, myInfo, was developed to share basic citizen data hosted on agency databases with banks to make it more convenient for citizens to set up bank accounts. This allows the private sector to build businesses using open government data. It also reduces substantially the number of times citizens need to register their information with the government – from multiple occasions to just once.⁹⁷

97. See www.singpass.gov.sg/myinfo/intro.

Importantly, APEX simplifies API management by providing a user-friendly portal for both experts and ordinary users within the public sector (see APEX design principles in Figure 37). This is a rarity in government – the creation of user-friendly systems inside the public sector is often overshadowed by the prioritisation of intuitive solutions on the front-end for citizens. Yet, making such systems work inside the public sector – where IT skills remain scarce – is the foundation for future innovation. In addition, APIs served through APEX are registered in an API catalogue that can be freely browsed by other users. This encourages sharing and avoids the creation of digital silos or duplication of efforts. Users can browse and search the catalogue for relevant APIs, which may spark ideas for collaboration with other agencies or combining data in creative ways. The ability to perform self-registrations and request access to other agencies' APIs, enables agencies to begin using the data they need without significant administrative overheads. The portal also provides a repository of information to guide users in on-boarding as data consumers or providers. APEX professional services also assist agencies to improve their general standards of API design and security.

Figure 37: APEX design principles



Source: Government of Singapore.

APEX was built by an in-house engineering team around the concept of agile development, thus allowing the rapid addition of new features to the platform. Further modularity was ensured by building the platform on micro-services architecture powered by RESTful APIs.⁹⁸ This allows APEX to easily integrate with new systems both upstream and downstream.

NOVELTY

APIs and API gateways are no longer new or innovative technologies. The innovation and value of APEX stems from making these technologies more accessible and increasing their adoption in government. Interconnection and interoperability projects are currently receiving the greatest attention. For example, in Europe the ongoing Once-Only Principle Project⁹⁹ is working to pilot solutions for 50 organisations from the European Union and Associated Countries. When technology supports secure and seamless data exchange, the possibilities are endless.

98. Learn more here: <https://restfulapi.net>.

99. See www.toop.eu/about.

RESULTS AND IMPACT

APEX removes the need for users to handle many of the security challenges involved in serving APIs to a large consumer base. Since its launch in July 2017, APEX has steadily acquired new users, and on-boarded nine projects from across five agencies. These projects served a total of more than 625 000 API calls in a month. These figures are growing rapidly as APEX gains traction as a reliable API platform. For its success in this area, APEX recently received an award from ASEAN (see Figure 38).

USER PERSPECTIVE

The APEX team (see Figure 39) was deeply involved in the on-boarding of its initial users, many of which have become trusted partners. Their positive experience with APEX has spurred them to readily suggest new features to improve their services. APEX's professional services team regularly engages users in dialogue to better understand their needs. This enables them to identify and develop high-value, new user-centric features that can be added to APEX.

Figure 38. The APEX team receiving the silver award at the 2017 ASEAN ICT Awards Ceremony under the public category



From left to right: Dr Yaacob Ibrahim, Minister of Communications and Information, Singapore; Johnson Koh and John Tng of the APEX team; and H.E. Mr Masahiko Tominaga, Vice-Minister, Ministry of Internal Affairs and Communications of Japan. *Source:* Government of Singapore.

Trend 2: Systems approaches and enablers

CHALLENGES AND LESSONS LEARNED

APEX is a model of innovation within tight restrictions that has succeeded in holding on to its vision. The team has navigated extensive government procedures and standards to redefine what it means to share data securely. APEX is reliant on a dedicated team with diverse skill-sets able to provide a clear vision and the impetus to deliver it with speed. Starting small as an in-house project, they had the freedom to self-manage, experiment, fail fast and regroup quickly.

As APEX's success depends on getting partners on board, the platform had to be built with the user in mind. APEX needed to remove barriers to entry for agencies using the platform based on user feedback. As such, the APEX team followed the agile methodology to iteratively and incrementally design, build and validate features of the platform. This helped the team to break down large problems into incrementally deliverable parts and empowered them to respond promptly to user feedback, as well as experiment with new, high-value features. The team was thus able to focus on releasing a minimal viable

product early for testing. This drove a virtuous cycle of testing, iteration and extension, which allowed the team to release regular updates with enhanced features, bug fixes and the latest security patches.

There are, of course, obvious trade-offs between adhering to government security standards and providing seamless data-sharing between agencies which APEX needs to balance. Project challenges identified during the planning phase included the need to bridge an internet-intranet separated infrastructure and comply with strict security standards. These constraints shaped the architecture and design of APEX.

Continuing challenges include scaling APEX's systems to adapt to demand and maintaining system stability as the user base grows. The team has automated the deployment and configuration of most subsystems to quickly and reliably scale-up to meet demand. In order to maintain system stability, monitoring capabilities are continuously enhanced to ensure any system issues are noted and addressed in a timely manner.

Figure 39. The APEX team



Source: Government of Singapore.