Developing the API Mindset

A guide to using Private, Partner, & Public APIs

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NORDIC APIS
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Preparing Your Business for Private, Partner, and Public APIs

Nordic APIs

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Forward: Developing the API Mindset

Open, semi-open, or closed? The degree of an API's openness was the question we had on our minds at the beginning of 2014. We had been running into many people that were dismissing APIs because they weren't interested in or able to launch public APIs. People were coming to our events, but leaving disappointed because they weren't able to open up their services. This recurring phenomenon showed us that there was an association in many peoples' minds between APIs and unfettered data access. We wanted to break this incorrect stereotype that an API is *always* a public one.

We started this with a series of blog posts that we published on our site. It was great to see how engaged people were with this content. We connected with more and more people online, showing that APIs can also be very useful for internal purposes and within a partner network.

This was a good start, but we wanted to really drive this point home and move the industry beyond this incorrect mindset. To this end, we set off on a tour that took us to Sweden, Denmark, Finland and Norway. In four days, we met a couple hundred people who were implementing APIs in these four cities. We were joined by regional and international API thought leaders that reinforced the notion that APIs are sometimes public but often private or semi-open. Since this Nordic tour, we have held various other events and are

committed to continually publish content that plays a part in the ongoing development of the API scene. This publication is an example of this determination.

Irrespective of how open or not open your API may end up, this e-book is intended to help you develop a successful API strategies. To do this, we show very clearly in this book that there are three key API adoption patterns:

- Private APIs, AKA internal or enterprise APIs;
- Partner APIs that facilitate integration between a business and their partners; and
- Public or open APIs.

Launching a successful API starts with the right mindset. Should you develop your API for internal use, for partners, for the general public, or a mix of these? Should you plan to be closed at first, but then open up over time? What are the consequences of this strategy? What aspects of your API program should you prioritize at what points? After reading this e-book, you will be able to answer these questions and many others. With the correct outlook on how open your API should be, you will be able to execute your API strategy with confidence.

As you read this book (and afterwards), check out the Nordic APIs YouTube channel for a deeper dive into the fascinating presentations that were shared on our 2014 tour. Also, surf over to our site and make plans to attend an upcoming event. Signup to our newsletter to be notified of new events, e-books, blog posts, and other info.

Thanks again, to our sponsors, presenters, participants, and the online blogosphere for helping build a dynamic, forward-

thinking business community. I'm very glad to be apart of it, and happy that Nordic APIs can play a part in the API scene.

Travis Spencer, Nordic APIs, Co-founder


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How to use this E-book

Our Goal

Application Programming Interfaces (APIs) are at the centre of a digital transformation that is enabling businesses to do more with less, to reach new markets, and to speed up product and service development time. (See a complete definition of APIs in the introduction.)

This e-book aims to help maximise the Return on Investment (ROI) you are able to generate through the use of APIs. We will explain the potential entry points for businesses embarking on an API strategy, help you prepare a strategic API vision and roadmap, and identify best practices and key

resources that have been designed to assist you while building your successful API portfolio.

Prerequisites

No prior knowledge is assumed in this e-book; it is aimed at three key audiences:

- **Business Developers and Managers** who are starting their API journey. This applies to those who have managed an API pilot project and now want to incorporate an API-driven approach into their organisational business plan.
- **Developers** working within a business, who need a resource guide for best practices. This includes those responsible for ensuring that the API implementation is aligned with an overall business approach.
- **Enterprise architects** who lead technological integration efforts. These are the individuals who document how processes and technology can be leveraged to improve business workflows and multiply the impact of the business value chain.

Structure of this E-book

The following is an introductory section on the types or the category of APIs that can be implemented. Subsequent sections focus on each of these API types in detail, and follow this general outline:

- A summary overview of the particular type of API

- The benefits of the API type
- Challenges and security issues to consider when implementing this type of API
- A case study for each API type showing how businesses currently implement it
- A set of reflective questions that prompt you into considering ways to implement the API type, and help you use all this new information in a practical way
- Further resources and community outlets.

A final section discusses some of the roadmap and implementation issues facing businesses as they increase the use of APIs in their enterprise. It also assists any businesses that have started with closed APIs – accessible to a select group of either internal stakeholders or to key partners – and explains how to manage the process of opening these APIs to a wider audience.

Inviting your Feedback

This is our second Nordic APIs e-book, and we have future plans to support businesses with a range of other online and print resources. To help us improve this and future publications, we invite you to share your feedback and thoughts. Please tweet your comments about this e-book using the hashtag #nordicapis. You can also post on our Facebook wall, or email us at info@nordicapis.com.

Definitions – An API by any Other Name

API stands for 'Application Programming Interface'. Technically, an API describes how to connect a dataset or business process with some sort of consumer application or another business process. Although you may not always recognize a functioning API, you are probably familiar with a lot of the big names that use APIs all the time. For example, whenever you use your Facebook account to join another site, your *login request* is being routed via an API. Whenever you use the *Share functions* of an application on your mobile device, those apps are using APIs to connect you to Evernote, Twitter, Instagram, etc.

In addition, when you are accessing a location data, or performing a state-abbreviation or postcode lookup in cloud computer software, the function is often accomplished by the cloud service calling an API. Frequently, APIs are the connectors that are doing the heavy work of moving data and performing specialized capabilities. We may not be aware of this, because they are performing behind the scenes.

The sidebar, *API Examples* briefly illustrate other possible functions an API can perform.

API Examples

One common example is a *mapping* API. When you search for an address, an API helps interact with a map database to identify the latitude and longitude, and other related data, for that address. The API also makes it possible for a mapping interface to then display the address on the map, and any additional information such as the directions to that destination.

An API could also do things such as route machine data to a program that will automate the analysis of that input and send certain messages depending on the results. In this scenario, the API ensures that the data is in a format that can be understood clearly by a computer program (i.e. it is "machine readable"). APIs help you monitor data automatically, and share it only if something special happens.

An API can assist you in recognising when someone has placed an order on a website. It may then monitor the order data to see if information needs to be forwarded to someone responsible for same-day shipping, or whether it should be sent to the normal shipping delivery queue.

Finally, imagine an API that can make it easier for a business to pull relevant data out of a database and add it to a useful report. The API provides a common format that allows different applications to speak to one another. You can also use an API with reporting software that must display the extracted data in a usable format.

As you can infer from the many examples of APIs, these services are much more than just a description of how to access a database or how to help a machine read the data. > **APIs enable a business to become a platform**. APIs help you break down your business products and

services into composable functions you can share with other businesses for direct insertion into their processes.

APIs provide a way for businesses to leverage new markets. APIs allow partners and third-party developers to access a business' database assets, or create a seamless workflow that accesses a business' services.

For example, by opening up a business' product catalogue via an API, online retailers could include that API provider's products in their marketplace. This would allow such a business to reach new customers in new markets. A further example might be a business that provides printing services. By exposing this core service as an API, a third-party app developer could offer a printing service directly from their mobile apps, helping the printer reach new audiences. In this case, the app developer doesn't provide the printing service; they just route the request via an API through their app to the printing business, which charges and manages the service request.

**An API is also a legal contract. **API documentation includes a 'terms of service' agreement. This explains how data can be used, and any costs associated with the requests the consumer makes via the API. In this manner, a business can stipulate how their data or services can be used by commercial and third-party developers. It also establishes a pricing mechanism for use of the data or function exposed by the API.

In all of these examples, the company providing the API must decide how open they wish their API to be. Generally speaking, there are three degrees of openness that a business may adopt.

Introduction: Choosing Between Private, Partner and Public APIs

APIs enable businesses to funnel data and services across their organisation and to their wider network of suppliers, partners and end customers.

Releasing a Public API can also have a long-term effect on customer loyalty. Customers who use a business' API are likely to spend more and remain a customer for longer. This happens because they are embedding the API provider's services and products into some part of their own business value chain.

Understanding and identifying the different benefits and limitations of Private, Partner and Public APIs is a conversation currently being held amongst industry stakeholders all around the world. It is a conversation being picked up by existing businesses outside of the internet and Cloud-based startup circles. The discussion is widening because

more organisations are seeing that a view of APIs through a Private/Partner/Public lens can provide a more concrete understanding of what businesses really need to know when embarking on an API strategy. To see how this vantage point can be helpful, let's examine these three degrees of API openness.

Private API Models

Two types of Private APIs can be utilised within a business. The first type are those that are set up internally to link two datasets or processes together. These are paired with business logic in a very tight manner. This type of Private APIs are often set in place by a top-down management process, and their use is enforced behind the scenes by an IT department. This type of Private API may also be used to expose a business' data to its own mobile applications. In this case, the Private API makes it possible for a business to access its data through a mobile interface, such as an iPhone app. The API lets a business get out from behind the desktop (or laptop) and provide access to the data from any remote device.

The second type of Private APIs are those akin to Web services, provided as a part of a Service-Oriented Architecture (SOA). This kind of Private API provides an integration component that is made available to anyone within the business. They encouraged and facilitate reuse. This can often be a bottom-up or horizontally-instituted API strategy. An API of this type is created to encourage other departments to share data or processes, and to facilitate team collaboration across the business. This forms a sort of private library of APIs. These can include self-paced resources that inform internal

developers across an enterprise on how they can use an API to integrate and consume data source or business service.

Private APIs of either sort are often the preferred starting point for many businesses. For businesses seeking to extend their existing service-oriented solutions, the ability to automate internal data usage, and reduce duplicated processing of information across departments, is a natural starting point. Private APIs also have the advantage of not overexposing the business as it learns about APIs. A strategy that begins with the launch of Private APIs allows a business to see where their APIs are inadequate, or where difficulties occur when using their APIs themselves. This is preferred because any failures may occur will only affect the API provider itself. Conversely, businesses that initially expose APIs to partners and customers may lose their trust if the partners or customers are inconvenienced by an improperly functioning API.

In and of themselves, Private APIs create multiple benefits for businesses, without the need to open up the API any further. Private APIs are at the core of a business' digital transformation, and generate efficiencies and productivity improvements across a business' operations.

While Private APIs allow a business to learn through experience, it is no short cut. Private APIs require resourcing in order to create the productivity gains that are promised in an API-enabled environment. This may mean providing a suite of user services, for example, documentation, Software Development Kits (SDKs), training videos, and detailed error messaging. These should assist internal developers to successfully integrate an API into their business functions.

Partner API Approaches

To leverage business relationships in a distributed environment, companies are also beginning to turn to partner-based APIs as a way of collaborating effectively. This allows partners to utilize the customer relationships of one business with another. For instance, the Swedish Digital PR agency, Deportivo, uses the APIs exposed by various Cloud providers to facilitate partnership communication. Deportivo's Art Director, Arvid Dyfverman, said the agency uses APIs from project management tools like Trello and Basecamp to involve partners in their creative design projects.

Danish business network platform, Tradeshift, has created a Public API to help customers more easily integrate business networking services into their legacy systems. To help end customers achieve this, Tradeshift has also created a suite of Partner APIs that are designed with the end customer in mind. As a result, the Partner APIs enables broader adoption of the company's Public APIs. This type of multifaceted API strategy is indicative of one developed by an organisation that has progressed beyond one of API provider to that of an API platform.

Public API Releases

Public, or open APIs, can rapidly grow a business' market share and customer base. Swedish online retailer Fyndiq, for instance, found their sales volumes per month grew significantly after making their product catalogue available via API. Once they launched their API, their problem became keeping

up with sales, not getting sales, co-founder and CTO, Micael Widell, told Nordic APIs readers.

Other companies are finding they can monetize their API as a new commercial product or service, with developer-customers willing to pay for access to the stream of data or functionality opened up via an API.

Tom Burnell, from API management provider, Axway, shared details of several Nordic businesses that are opening up their data and capabilities via public-facing APIs. He points to Essent, the Swedish energy company that uses APIs to help customers optimize their energy usage. Nordic telecommunications company, 3G, is using APIs to allow customers to top up their prepaid phones. This is creating a new direct revenue channel for them in addition to their existing model that relied on sales made solely through value-added resellers.

Meanwhile, some of the Nordics' fastest-growing online businesses, such as Moves in Finland, Spotify in Sweden, and Podio in Denmark, are making use of Public APIs as part of their hyper-growth strategies.

The Origin of your API Journey

It is often said that businesses can expect very high impacts from releasing Public APIs. In reality, however, it will most likely take an extensive period of time to build recognition and adoption of your API among third-party developers. This is clear when you consider it likely that you must more or less coax an ecosystem into existence.

While Private APIs make sense for automating data processes and encouraging collaboration in larger businesses, it is Partner APIs that have a high potential for quickly generating

positive business impacts. Depending on the size of the enterprise, it may be the best starting point for a business' API strategy.

Beginning with a public-facing API is recommended with caution. As mentioned before, there are a lot of opportunities to learn from deploying an API internally or with partners first. This is important as trust can be lost so quickly. The detrimental effects of accidentally exposing a third-party's business data could immediately undo any adoption or recognition you have gained for your API. Starting with Private or Partner APIs will also help a business identify the normal range of API consumption. This makes it easier to make accurate capacity plans and set appropriate rate limits, so resources are not overused by low-priority consumers. It also helps to monetize high-end users as you pivot to a public API release.

The following sections shares how Nordic businesses are implementing business-wide API strategies and offers guidance for businesses anywhere in the world who are seeking the benefits of each of these three categories of API.

Additional Resources

- The rise of the API economy and consumer-led ecosystems

1.1 Overview: Why Start with Private APIs

"While each business and situation is different, we've seen many organisations choose to launch a private or partner API rather than a public one out of the gate," says Ronnie Mitra, Director of API Design at CA Technologies. Starting with a Private API addresses the reluctance and concerns some businesses have when starting their API journey. These fears are lessened by Private APIs because they ensure that an organisation can:

- Make mistakes and changes behind closed doors;
- Staff up on the resources needed to properly support a public API offering after obtaining success with a private one; and
- Realign the business to benefit fully from the effects of an open API.

Ronnie added that "many API owners have longer-term visions of opening up APIs to the public and use a closed API as a springboard." He says that this closed-first-open-eventually strategy results in the infrastructure build-out required to solve longer-term needs of the business. Ronnie also pointed out that product owners often have an eye on the future, and use this initial foray into APIs to incrementally expand to a broader audience.

Even without a clear case for eventually opening up an API, a Private API approach can add significant benefits to a business. For example, any process that requires data to be copied from one system or process to another can be automated via an API. This has the advantage of reducing human errors that may be introduced when moving data from one place to another. Automation also improves productivity by alleviating the need for duplicate tasks. Using Private APIs for internal data transfer also reduces errors introduced when multiple versions of a dataset are strewn across an organisation. Reliance on a Private API improves data integrity and reduces clutter.

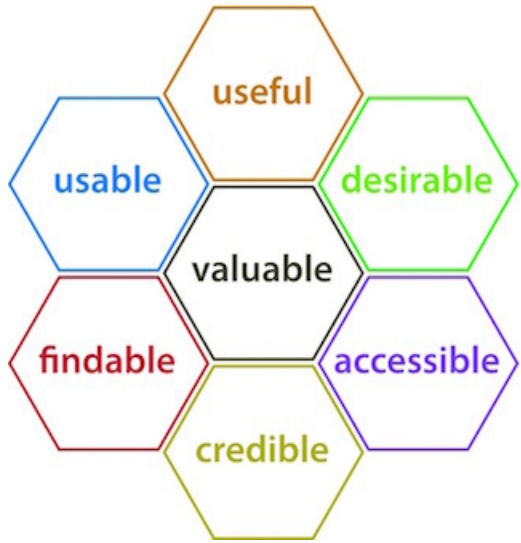
APIs can also be used to speed up process and authorisation movements across a business. For example, businesses often have accounting policies that require appropriate authorisation for anyone purchasing above a certain amount. Private APIs can be used to trigger workflow approvals automatically, reducing risks and workload in moving tasks along a business' operational flow.

Private APIs are similarly used in new product and service development. Private APIs can trigger automatically when other departmental teams or stakeholders need to be involved. This action can make a set of common resources available to

everyone involved in the production teams.

Focus on User Experience

One goal of a Private API is to ensure that it is tightly controlled and will restrict access only to internal users. Thinking about Private APIs in this way can help lower the priority of API usability. Private APIs often have a poor user experience. This should not be the case. In a manner similar to the way a company's intranet is often much less user-friendly than their public-facing website, Private APIs tend to neglect the developer experience.



Research data from Nielsen Norman shows that companies investing in intranet usability receive productivty increases worth eight times the design costs required to achieve them. Research indicates that this factor increases for larger com-

panies. The same sort of productivity benefits can be hypothesized about an investment in the design of usable Private APIs. While not proven through similar research, the correlations are strong enough to suggest that new users can make the most of the private APIs when focusing on the following areas:

- API design,
- Documentation,
- Error handling,
- Testing,
- Inclusion of SDKs, and
- Internal knowledgebases.

A Common Approach to Private APIs

When a use case identifies the advantage of a Private API, it is important to consider other potential uses of the dataset, or functional capability exposed by the potential API. This ensures that APIs are not created for each individual use case. If each one is unique to a given problem, the enterprise will be encumbered by the initial APIs as it continues along its API journey. This generalization of an API can also help avoid dataset duplication and ensure consistent API design practices are adhered to across APIs. This is important because in many successful cases Private APIs are opened up to a wider user base than originally expected. In the case of legacy APIs it is especially important to follow this practice to avoid problems and tying up developer resources.

Businesses often repeat the same problems when trying to open up their datasets via APIs. Depending on which system is used, the data can have different names, allow different string length, or have different identifiers. Michael Widell from e-commerce vendor Fyndiq says this is one of the benefits of starting with Private APIs: you can focus on making sure the data you expose has consistent naming conventions and other formatting rules. If you expose the data via an API, you can manage the formatting and naming in one place – the API – as you scale the usage to partners or the general public.

Identifying Internal API Use Cases

Anne-Sofie Nielsen from enterprise, data-scraping company, Kapow Software, has seen how her business customers are using internal APIs to create efficiencies and to encourage staff to concentrate on more interesting, useful work. "If you automate internal processes there are cost savings," she says. "Whenever you eliminate people having to manually update or extract information from internal systems, it's a pretty easy calculation to see how many resources you free up. In many cases, companies have more productive things their employees could be doing, which ultimately enables them to grow revenue," Anne-Sofie further explains.

She has seen how some customers have used APIs to significantly reduce burdensome data transactions between internal and external systems. "Obviously there are cost savings from reducing the customer support response times from, in one customer's case, ninety minutes to approximately four minutes." However, she adds, "but I am sure that will also have a long-term effect on their customer's perception of

the company, which will have effects on customer retention numbers."

Anne-Sofie shared with attendees of one of our events in Copenhagen how her customers are using internal APIs that follow a basic principle: Use people to accomplish what a computer cannot do as well. As she explained in the recorded version of the presentation, "Let's put humans to work where we need human minds, and let's automate the rest. This frees up resources for higher-value tasks." This could include:

- HR automating manual reporting processes
- HR extracting data on current salary levels in other companies' job ads to be able to make market-competitive salary offerings to new candidates
- IT automating complex workflows around defect tracking
- Accounting automatically validating partner rates versus client rates, using humans when exceptions arise rather than having to audit every invoice.

Robust Private APIs Become Partner APIs

At Finnish software company PlanMill, the first twelve months of using the API was a period of uncertainty. Marjukka Niinioja, Senior Consultant and Manager at PlanMill, says that staff were unsure how to sell the API features to partners and customers. They were also initially unclear on how to provide the best usability and ensure supportability with regard to testing, API key registrations, documentation, and

other factors. They learned these things incrementally by using the API themselves. This so-called practice of "eating your own dog food" gave the PlanMill team a deep insight into the potential and power while also helping them build awareness of the drawbacks and challenges of using their API before it was integrated with partner systems. "I never want to see dog food again," Marjukka joked when presenting to our Helsinki event audience about the steep learning curve. It was worth it though, she added. Because of their initial internal testing, their eventual public API was better designed. Later testing and usage was not such hard going, and they were able to "swap from dog food to donuts!"

To encourage internal stakeholders to integrate their systems via the API, Marjukka repeated several mantras whenever talking with her colleagues:

- Who has some great examples of using our API?
- Have you tested that with the API?
- Have you added that to the API documentation?
- You can do this quicker and cheaper using our API.

Getting Started with Private APIs

Private APIs may well be the best way for some enterprises to commence their API strategy. Starting with internal APIs can help identify the best integration pathways. In addition, this approach lets you design a roll-out strategy that will encourage ownership and commitment from across all business operations.

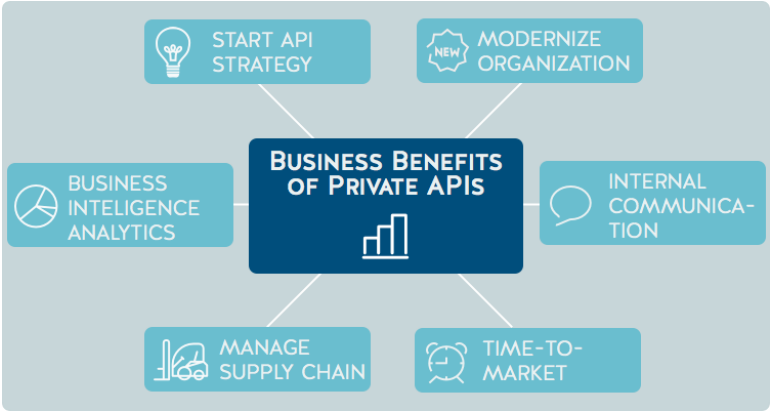
One of the best places to start is by asking staff to identify those occasions when they have to cut and paste data from

one process to another. Seek to find datasets that are used across an organisation, or by multiple staff members. Review previous problems, and what new ones are arising from a lack of version control of data. See if those problems could have been solved by having a single dataset. When you determine the cause of the problems, you may discover another key starting point for your Private API implementation plan.

You can also identify all workflows where a decision must be made about the state of a process before the next step is activated. In some of these cases, the discretion of an authorised manager will be required to decide whether or not to move the process forward. In many such cases, the only decision being checked is assuring that the previous process has met certain post conditions (e.g., adherence to company spending limits). A Private API can automate many of the processes that involve decisions based on a policy definition.

1.2 Business Benefits of Private APIs

For many businesses, there can be a great reluctance to opening data assets and business capabilities via APIs to external partners or to third-party developers. One way to start assessing the benefits of an API business strategy is to begin using APIs internally. Private APIs can lead to faster time to market (TTM) for new products and services. This in turn can lead to the opening of new market channels. Private APIs can help to ensure that any one organizational process does not create bottlenecks in the business' workflow.



Private APIs Can Commence the Journey

According to Mark O'Neill, VP of Innovation at Axway, an international API management service provider, many businesses face a 'push-pull' demand for using APIs. Businesses may be requested by partners and suppliers to connect via API; they may also find a competitor has an API. In such cases, they realise they, too, need and API, and are pulled in that direction. Mark sees Private APIs as a good way for businesses to remain stable as the market pulls them further into the API playing field.

"A lot of businesses started by deploying SOA [Service Oriented Architecture] inside their organisation and moved on to using APIs beyond the firewall in the so-called omni-channel world," Mark said. "Often it goes that the first thing people do is internal integrations, then they might have a partner that wants to integrate which creates the requirements for an API that works across the firewall and all the security that comes with that."

Private APIs Modernize Organisations

As companies begin using Private APIs to manage internal processes, they often discover the opportunity to restructure and modernise their business to enable the "composable enterprise". The key concept behind the composable enterprise approach is this: by breaking down a business' functionalities and services into LEGO-like pieces, it is possible to create

new links in the business value chain by composing services, data and functionalities into new configurations. It also allows businesses and enterprises to access a greater range of resources by enabling many non-core business operations to be moved to external providers and Cloud-based services.

Private APIs Improve Collaboration and Internal Communication

Internal – or Private APIs – can offer substantial benefits in efficiency and productivity. A study by the McKinsey Global Institute estimates that companies can achieve a 20 to 25 percent increase in productivity by improving internal collaboration: a strategy that is only possible with the use of APIs.

It is a benefit that Eva Sjökvist from the Absolut Company sees in the global alcohol beverages enterprise. Eva told attendees of our first annual event in Stockholm that Using an API across their organisation has meant a greater shared awareness of the company's data models. It has also created greater clarity by enabling consistent data to be used when analysing the business' operations. Internal business stakeholders had more "confidence in the data models and structure creating greater leverage for new ideas", Eva went on to say.

Private APIs Speed Up Time to Market

As mentioned above, internal APIs can significantly speed up TTM for new products and services. In part, this is an extension of the benefit from improved internal collaboration, as Joakim Skog from the Swedish business information company Bisnode points out. He says that Bisnode works "with APIs internally when we design new [business] services. Everything we have internally from data sources and services like that are on APIs." (For more on Bisnode, see the case study at the end of this chapter.) However, there are other ways that using APIs speed up TTM. Joakim Rapp, Lead Developer at Nordic online content provider Viaplay, says that using private APIs brings more efficient allocation of internal resources. This allows the company to create and release new features to the market more quickly.

According to Joakim, "When you develop new features in general, APIs make it possible to have a team working on the user interface and another on the business logic layer, for example. You don't have to have all your developer team working on everything and it creates a better flow."

More Efficiently Manage the Value Chain

Joakim from Viaplay also explains how the composable enterprise approach results in a more efficient business value chain. One of these benefits becomes apparent when implementing new features: "When delivering new functionality, it is impor-

tant that it doesn't impact existing services," he advises. "We want a robust architecture that makes it easier to develop one component that works well and makes it easier to build and integrate new components as we go."

The value of this approach can also apply when managing existing service delivery to customers. He gives the following example of how two of Viaplay's internal APIs are managed:

> One API is used to check a customer's current subscription level, to see if their account is active, and if they have the right subscription to access specific content.
>
> Another API makes it possible to re-commence the subscriber's content at the last known viewing point.

If these two aspects are interlocked in just one value chain, any slight error in determining what content was last viewed could disable the customer's whole account until the playback error is resolved. So, while the ability to restart the viewer's content at the point where they left off enhances the customer experience, it is not an essential feature. Through their use of APIs, Viaplay ensures that if there is a problem, the customer's account remains active and they can still access content (even if they have to restart it manually from where they left off). This approach is much preferred over a situation where the customer is unable to access their account because, "the supply chain falls over due to a single, errant, intertwined process."

Private APIs Provide Precise Business Intelligence

Internal APIs allow businesses to better identify where there are problems in their operations. A composable enterprise that is assembled together from numerous private APIs, provides numerous points at which the company can monitor the system for problems. Joakim from Viaplay explains: "One other perk of decoupling business services via APIs is that it gives a better view of what parts of our system might slow down. It is easier to manage single components. We can monitor response times, uptimes, and the load on the servers and share the analytics that are important for the C-level of the business." In this way, private APIs help detect errors and provide actionable intelligence to decision makers.

1.3 Private API Challenges: When a Private API is Not Private

Businesses often start by creating a Private API that can serve data to a mobile application. This could be an app that replicates the business' website, or offers specific services to mobile users. It could also be an employees-only mobile app that supports a Bring Your Own Device (BYOD) program of the enterprise, in which case employees need access to business data. Even Corporately Owned, Personally Enabled (COPE) devices need such data access. In all these scenarios, a Private API is being used to communicate between the user-facing interface and a business' back-end system. Even the simplest apps often use some kind of API.

Without appropriate security provisions though, it can be very easy to see what network traffic takes place between such a mobile app and the server. This would allow third-party developers to see how the app's API works, even if it is not documented. This means that a Private API for a mobile application is actually a thinly-veiled Public API.

How your Private API is Reverse Engineered

There are several tools to intercept a private, undocumented API. For example, the tool Charles Proxy can capture all the traffic sent to and from your phone via this proxy, which runs on your computer. By installing some certificates, this and other tools like it can also intercept SSL-encrypted traffic and show it as plain text. SSL is good, but in this case it actually does nothing.

There are cases where developers have used these tool to identify what traffic is being sent to and from an app. By inspecting the resulting data, they are able to figure out how to use the API as if it were a Public API, even if it is only intended for internal use. In some cases, developers even share their research on GitHub, more or less documenting a Public API so other developers can also use your Private API.

Security Implications

The main lesson from this very real example is that security through obfuscation is not a viable option if the data your API exposes is of any worth. Just because you do not have a public webpage for your API, or have not made any public announcements that you even have an API, does not mean that external parties can't find it and learn how to use it. Hiding APIs via obfuscation can be sidestepped in a few minutes. Anyone can see how your API is designed, what API credentials (e.g., API keys) you use, and what data is sent back and forth.

Do not despair. Even if others can see the traffic between their phone and your server, it does not mean that unauthorised users should be able to easily access your API. If your application's API gets documented and used by developers, you have a great confirmation that there is a market for a public API. Treat this as **free** market research. Try to see traffic interception as an opportunity and not a threat.

The main lesson is to design your API as if it were public even if you only plan to use it in your own mobile app. Protecting the data comes down to your API security scheme. If you are using API keys, HTTP Basic, or similar protocols, all the credentials will be visible to intermediaries. Anyone can snatch your API consumer's keys to access your data, so use a protocol, like OAuth 2, that authenticates not only the app but also the end user.

1.4 Case Study: Bisnode

> We've had web services and APIs as a part of our offering for a very long time, but since Bisnode used to be a group of 70 companies in 19 countries, every company working with integration of our data and services in our customers systems had their own strategy and architecture.
>
> Now as we are joining forces. This will converge over time, but it needs to be managed and well thought through to build a solid platform for future growth. So, APIs and integration are increasingly becoming more important as a way of creating a standardized internal platform for accelerated development of new products and services.

Joakim also told us that before the company is ready to move towards Public, open APIs, it first needs to implement efficiencies by using Private APIs internally.

> Apart from being able to explain the concept of APIs to C-levels, you also have to work on the

> numbers, because although implementing APIs is a no-brainer and more or less a hygiene factor from a development perspective, you still need the business case to show green numbers. Some people listen to the dreams of tomorrow, some on how today's work can become more effective, and some only look at the numbers. You need to have the story set for all of them.

Joakim believes that by focusing on the business case for using Private APIs, the culture will be created for later acceptance of open APIs as outward-facing commercial opportunities:

> The first time I started talking internally about open APIs back in 2010 I was quite heavily criticized, and the lesson there was that I wasn't pedagogical enough. There are many misconceptions around APIs and when raising a topic like that in a company where the core asset is refined information, you need to first explain what APIs are before you can put it in relation to your line of business.

Key Lessons

- Involve team members from each department in integration planning and building buy-in for implementing APIs internally
- Prepare a one-pager and an elevator pitch explaining APIs so that you are able to start the conversation at whatever level of sophistication your internal stakeholders may be – usually at the very beginning!

- Treat internal stakeholders as you would external customer segments. Be prepared with the legal benefits of using APIs for the legal department, potential revenue benefits for the sales staff, and bottom line business benefits for the C-level.
- Research your business case: use studies like the Nielsen Norman research to quantify potential productivity benefits derived from using APIs.

1.5 Reflections

- What initial use case is motivating an exploration of APIs? What processes that involve copying and moving data from one system to another are performed most often? What data entry processes are prone to the greatest amount of human error?
- What datasets are employed in this use case? What other internal stakeholders use this dataset?
- Does the dataset have a data dictionary that includes common naming conventions and rules for defining how to maintain time and date, location, currency, etc? Are these rules standard across the entire business or do some parts of the company use the datasets differently?
- Who are the internal customers who will be consuming the API, and who will be responsible for integrating it into their departmental systems? Who will be receiving the value from automating processes or accessing business data via this API? How are you involving these players in the API design project?
- What resources are available for your business's intranet? Can some of that be allocated to the * Have you identified metrics to assess the effectiveness of the private API, such as time saved over current manual processes, reduction in accidents or errors from integrating data to avoid re-entering it from one system to another, etc?
- Do you have a process to track API calls? What about error messages? Is there an existing alerting and moni-

toring system in use that you should leverage with your new API (e.g., one that is being used with your website).

- Are there Cloud-based software tools that you are currently using in your business? Do you use their APIs to integrate the software with your legacy systems and databases? Do you use their tools to make it easier to use their software across business departments? What feedback can you get from business stakeholders who are using these APIs in their work?

MoreResources

- Adapting to an API Enabled World (Panel Debate)
- The Business Impact of Private, Partner and Public APIs
- Twitter accounts to follow:
  - Ronnie Mitra
  - Nordic APIs
  - Tweet feed of **all** past, present and future Nordic APIs presenters
- Nordic APIs newsletter

2.1 Overview: Building a Successful Partner API Strategy

Using specifically-designed APIs to work more collaboratively with partners can build trust in business relationships and enable 24-hour access to your business' supply chain. However, one-off Partner API strategies can also be costly to manage. They can challenge existing relationships with trusted suppliers and business contractors. The following sections address some of these issues.

Where to Start with Partner APIs

When starting with Partner APIs, Mark O'Neill, VP of Innovation and Product at API management provider Axway,

encourages businesses to start with the 'low-hanging fruit', which is usually what partners are looking for anyway:

> Often there are clear interfaces that make sense with APIs: price catalogs, order status lookups and shipment lookups, for example. B2B will require ways to go in and look at these interfaces, so they are good candidates to have available to partners as an API.
>
> Beyond these more straight-forward API use cases, identifying Partner API opportunities often requires case-by-case communication at the start. When the first use case is identified, as with Internal APIs discussed previously, it is important to look for a similar use case with other partners. This can help identify common datasets, and makes it easier to scale a Partner API with additional partners at a later stage.

With all types of Partner APIs, monitoring of API access is essential for measuring the value and future potential of a Partner API strategy.

Building Partner APIs That Can Scale

Swedish banking and insurance group Skandia is working with partners who have not previously had an API to help them integrate with the group's IT systems. This has created challenges for the financial institution as they have sought to scale their partner strategy. Dennis Skantz, Solution Architect at Skandia Norden explains:

" Historically, we have not been able to bring on new partners and integrate them easily with APIs. So, it makes it really expensive to take on new partners, as in the end we have ended up with a specific service for each partner."

Dennis is confident that Partner APIs will be the answer. As a

financial company, Skandia aims to keep its focus on its core business, and is keen to build secure systems that will restrict data access to selected partners only. For example, by using an API rather than a one-off system, Skandia's partners will be better able to build customer-facing apps.

"Our APIs are primarily for partners. We don't currently have any plans to release an open or even semi-open API. We may do so in the future though," Dennis hints. This successive opening of APIs is very normal.

To manage the way Skandia works with Partner APIs as it grows, Dennis uses a term from the Swedish traffic authority. "They have a 'zero vision' where their goal is to have zero fatal accidents in traffic. So, they need to design roads such that it is not possible to have a fatal accident. I like to think of our work as having a zero vision: we should need to have zero lines of code to integrate with a new partner. It is naive. You will never reach that, but that's the goal in our API design."

According to Dennis, there is a clear-cut business motive for striving towards scalable partnership APIs in future:

"Collaboration is not going away. Business success will depend on who can collaborate with the most partners at the least cost. We want to create a platform for Skandia where we don't just bet on one horse. We want a platform where it doesn't hurt us so much to work with multiple partners."

Making Partner APIs work effectively, and being able to scale the on-boarding process when bringing in new collaborators is still a business process in its infancy.

In fact, many companies find it difficult to create scalable API infrastructure. They find themselves taking relationship-specific approaches with the APIs they provide to external

partners. This challenge has by no means been solved, but innovators like business network platform Tradeshift as well as Skandia are at the international forefront of experimenting with processes they hope will reveal new ways to conduct partnership on-boarding.

Partner APIs Reflect Your Business Relationships

Tradeshift sees that for many partners it all comes down to the ability to communicate around API needs. "It's a people thing," says Jeremy Glassenberg, Platform Architect at Tradeshift. He adds:

"You need to be able to just hear what the partner's particular challenges are. You'll talk with partners to understand their needs and coordinate on the design of a compelling solution, and from there, you will support them on a technical level throughout development. What I found on any good enterprise platform team, is the ability to properly listen to partners. Don't just listen for the features they're requesting, but rather ask why they want that feature. You may hear a proposed solution first, but it's important to dive into their problem. From there, you can give a different perspective that results in a higher quality, and easier-to-build solution."

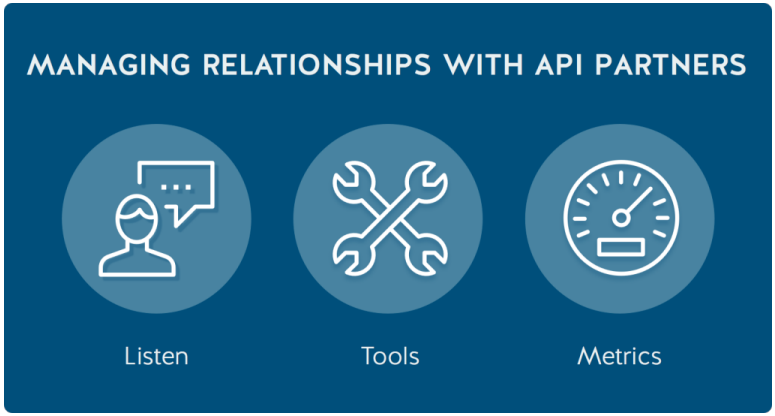
Sumit Sharma, Director of API Solutions at B2B integration and API management provider MuleSoft, echoes Jeremy's engineering advice.

"This notion of B2B integration is nothing new," Sumit says. The means of achieving connectedness has progressed, he says, but "there has always been the objective that we need to

collaborate. We have always been trying to securely transact relationships with partners. What is different is that now there are multiple B2B protocols spreading out and that requires a much more thorough orchestration and integration play."

Sumit strongly suggests that a 'whiteboarding approach' is needed when designing B2B APIs. Mapping out the process flow, identifying data and other sources, and ensuring all stakeholders are involved is important when designing Partner APIs. He also urges API developers to use API service descriptions as part of a best practice design, so that partners are better aware of how to consume and integrate the API into their systems.

As APIs become a key tool enabling businesses to communicate and share information effectively across their boundaries, API service descriptions will allow the humans managing the interactions to better understand each other – and what is possible via API capabilities. While not there yet, Sumit sees a time when API service descriptions will be written in plain language that can be composed by non-developers. This will allow other than engineers to understand what data and functionality an API is enabling.



Using Metrics to Understand Partner API Usage

Skandia, Tradeshift and Norwegian life insurance company Storebrand all look to API metrics to help them understand partner usage and to control access. This may involve setting usage quotas, such as number of calls per hour, and setting up throttling limits for excessive usage.

Jeremy at Tradeshift notes that setting quotas may not necessarily lead to rate throttling. More supportive techniques are available to improve the flow of data with business partners, he explains:

> Try to understand what your partners are doing. They might be polling APIs out of necessity, and would be more than happy to work with webhooks or long-polling if you can provide it. That could reduce performance hassles for you and for your partners. That path can help you avoid

> having to set restrictions that limit the ability of connected apps, and creating more challenges for partners.

Life insurance company Storebrand has a sophisticated measurement system in place, according to Terje Borgen, Platform and Integration Department Manager:

> We have our own custom-made monitoring system and a custom logging system as well. The monitoring system monitors selected services, and the logging system logs all traffic including errors, payload, response time and more.

Mark O'Neill from Axway agrees on the need to measure partnership usage of APIs. By tracking partnership API consumption, it may be possible to see new product development opportunities down the track. He states that: "For business partner APIs, you can still set quotas. Then you can see trends over time that can help you see the take-up of the partner service. This can help enable ecosystem development and lets you later introduce monetization strategies, which you can't do if you don't have a quota in place."

2.2 Business Benefits of Partner APIs

Partner APIs are an ideal starting point for smaller businesses, where the productivity benefits from using private APIs is less urgent. For enterprises that have seen the benefits of using private APIs, it may now make sense to start opening APIs to external consumers in a controlled manner. Partner APIs are a great place to start.

Partner APIs are an extension of good business relationships. The types of benefits that can be expected from strong relationships with suppliers, resellers, agents, and partners can manifest more quickly when you use APIs that enable communication and the sharing of resources.

APIs also generate benefits that are much harder to leverage through other forms of relationships or shared work. Speed and efficiency when communicating in highly regulated business environments, and facilitating the availability of your products and services to your partner's customer base, are two major benefits that are much more difficult to realise without using APIs.

Partner APIs Build Trust with Suppliers and Business Partners

Providing partners with access to key information via API so that they can better manage their own supply chain is an

ideal starting point when creating a Partner API. This is why experts like Mark O'Neill from API management provider Axway recommend opening order tracking and product catalogs via Partner APIs. By opening up real-time information from these two data sources, partners are better able to manage their own workflow without having their systems grind to a halt while they check for updated information.

Access to real time information is especially important in a global business environment, where time differences may mean a partner's workflow is taken offline for a whole working day while they await information. Product information and order tracking are often lower-risk datasets to open up. They provide an opportunity to control API deployment outside the enterprise in a low-risk environment, while also strengthening the interdependence between a business and its partners.

Partner APIs Help Scale Partner Onboarding

Working with new partners and agents can create a lot of additional administrative work. This workload is often repeated with each additional partner or agent that is brought on board. For example, businesses often work in partnership with creative agencies to manage the brand and implement marketing strategies. By sharing digital assets via APIs, a business can ensure non-disclosure arrangements are agreed upon, and that there is a commitment to following a brand's design guidelines. This also allows a creative agency to work independently alongside a business. The terms of service for a Partner API can include a non-disclosure agreement, and

the business can ensure that only defined branded content assets are available via the API – thus reducing the amount of 'hand-holding' a creative partner needs during the design phase. This speeds up subsequent projects with the same or other creative agency partners.

Partner APIs Enable Access to New Customer Markets

Jeremy Glassenberg, Head of Platform Applications at business network platform Tradeshift, an international startup with a strong base in Denmark, says that "for our enterprise customers, we provide standard features out of the box, but then these customers have unique, one-off needs. So, for these customers, in addition to open API connectors, we provide them with a flexible API and supportive code to build a custom integration." By doing this, Tradeshift can leverage the relationship with their business partners to offer services to their partner's customer base. For example, by providing Partner APIs that allow Tradeshift's services to be seamlessly integrated into their partners' financial and ordering systems, their partners' customers can make use of Tradeshift services from within their existing operational systems. For Tradeshift, a whole new market segment is reached.

Partner APIs Improve External Communications

Businesses can also use Partner APIs to integrate their team collaboration tools so that communication with external part-

ners is as reliable and consistent as with internal team members. Some businesses use Software-as-a-Service (SaaS) tools such as Salesforce, Podio, Basecamp and Trello to manage joint projects across business boundaries. The APIs of these SaaS tools can be used as a type of Partner API that allows integration of shared collaboration tools into each business partner organisation, while also controlling what information is made available through the partnership.

Other businesses use APIs created for their proprietary software that can build an external communication flow. For example, this could provide for access to shared project management calendars, common datasets explaining project resources, or procedural guides.

Partner APIs Automate Industry Regulatory Requirements

At Norwegian life insurance company Storebrand, the problem is not just integrating to match the specific needs of their business partners, but requiring the APIs as tools that can integrate with partners, while recognising the insurance sector's specific legislative and regulatory requirements. An additional complication: they must meet requirements that may differ in each of the countries where their partners are operating.

Terje Borgen, Platform and Integration Department Manager at Storebrand Life Insurance describes some of the challenges in setting up Partner APIs:

> The main issue is connecting to a partner that does a B2B connection for the first time. Other

> issues may be Nordic script in certificates, and insurance certificates that may need to be progressed through a number of chains (that is, more than one legal chain).
>
> In Sweden, there is an standard called SSEK that describes both the message headers and the security setup that is mandatory for communication between insurance companies. In Norway, it differs more from solution to solution. But there, two-way SSL and XML signatures seem to have become a standard for most APIs.

For Storebrand, using Partner APIs is reducing the regulatory burden when working with partners across different regulatory frameworks in different countries. Once a Partner API is created that addresses the specific regulatory and legislative requirements in one country, Storebrand's partner relationships can focus on providing services and building quality products, rather than repeating potentially error-prone and burdensome regulatory processes.

Partner APIs Identify Commercial API Opportunities

In many cases, monitoring a partner's use of business information can help identify new commercial opportunities. This may become apparent in a number of ways.

For example, Tom Burnell from Axway also refers to how Storebrand has used Partner APIs to extend their market reach. A business partner has been able to leverage Storebrand's data via APIs as part of creating a health insurance

price comparison website. This website is now a source of new business for Storebrand. The business partner is able to provide a valuable service to its customer base by cutting down the research customers need to undertake to compare insurance products. As for Storebrand, they are able to demonstrate how favorable their products are to a harder-to-reach customer market segment.

For Finnish software provider PlanMill and Danish software provider Kapow Software, seeing how partners were using API integrations in their business systems was a valuable insight into what the software providers could suggest to other partners and customers as possible use cases. In both cases, PlanMill and Kapow have also been able to create new product offerings in partnership with some early adopters of their Partner APIs.

Swedish online retailer Fyndiq initially opened their product catalog via an API to a small selection of partners. This helped them identify some shortcomings with their overall business model. Rather than aiming towards the boutique market, they saw how their partners were making use of their API and realised they could provide a greater selection and range of products to the market. After seeing how the Partner API generated increased sales volume, and having confidence in the robustness of their API product, Fyndiq was able to move towards opening the API to third-party developers. These developers were treated as additional partners in the business' ecosystem.

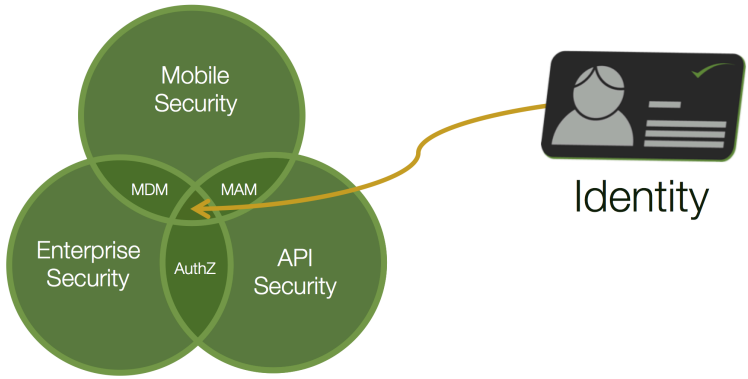
2.3 Partner API Challenges: User Authentication to Manage External Access to Data

Partner APIs need to be designed with the same levels of security that should be used for robust Public (open) APIs. This also makes it easier to mature and grow an API when businesses want to start opening up their Private and Partner APIs to a wider developer audience. Travis Spencer, CEO of Twobo Technologies, advocates for businesses to use the Neo-security Stack to safeguard all of their APIs, including those to be used with business partners.

"In an increasingly social, mobile, and cloud-enabled business environment, data and user interaction must be managed across the entire supply chain," Travis says. "When this flow of information is between partners across organisational boundaries, security systems should not require that the end user is continuously prompted for usernames and passwords. Instead, organisations should rely upon a set of technologies known as the Neo-security Stack, which delivers a framework of open standards."

Travis explains that at the base of this suite of protocols is

OAuth 2 and OpenID Connect. “These technologies allow businesses that are creating Partner APIs to construct systems where users can authenticate themselves and access specific data and business functions that are in line with their roles and access rights.”



David Gorton, Product Manager at identity management security provider Ping Identity, explains how authentication and authorisation ensure data security when deploying a Partner API:

“There are two parts to OAuth. The first,” he explains, “is around the issuance of a token that represents a user who has authenticated. The other is when that token is submitted to an API and the provider must determine if the client should be allowed to access the requested resource.” David adds that, “identity management and user authentication are like providing keys to unlock your house, but they still let you control where in the house your guests can go. In the enterprise, you need to leverage federation and authentication protocols to let business partners access your APIs. Alongside this, you also need a robust auditing framework in order to show compliance with any industry regulations and to

demonstrate adherence to security standards. Using existing identity management standards allows increased adoption, reduced risk, interoperability, and flexibility."

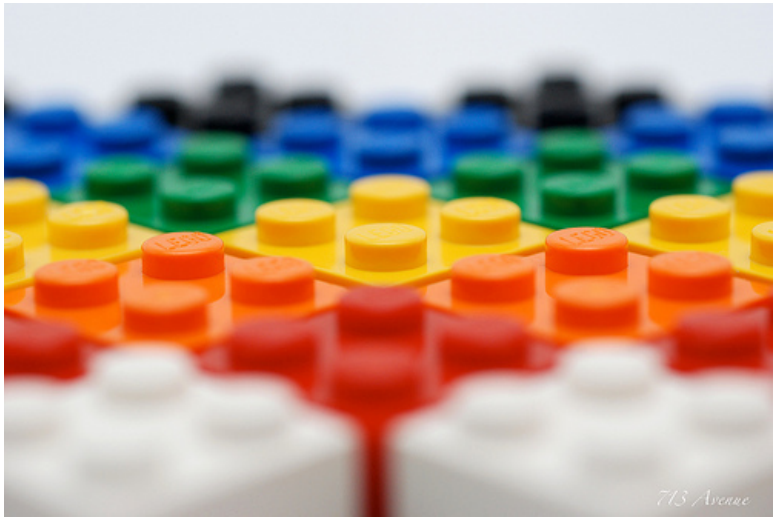
David says that, currently, most industry players with an eye for best-practice identity management and user authentication are emoloying OAuth 2 and SAML. While the emerging standard OpenID Connect is still seen as "the new kid on the block" by many, however, it is now being implemented by Google, Salesforce, and many others. This increased adoption is part of the reason it is expected to become the preferred federation protocol over SAML in the not-too-distant future.

Neo-security frameworks put in place for Partner APIs can also be used with Public APIs. In fact, in some cases, the Partner API can be opened up to a wider audience, perhaps just by setting stricter access rights than partner users are granted. So, enforcing neo-security is not an impediment to scaling a business' API strategy, but should instead be part of a solid foundation that makes growth possible.

Additional Resources

- Twobo Technologies Neo-security stack
- Ping Identity blog

2.4 Case Study: LEGO



Danish toy-making phenomenon LEGO uses APIs with selected partners in order to best manage the way customers log into their LEGO accounts, creating a seamless portal whether customers are entering directly at a LEGO website or via a partner website.

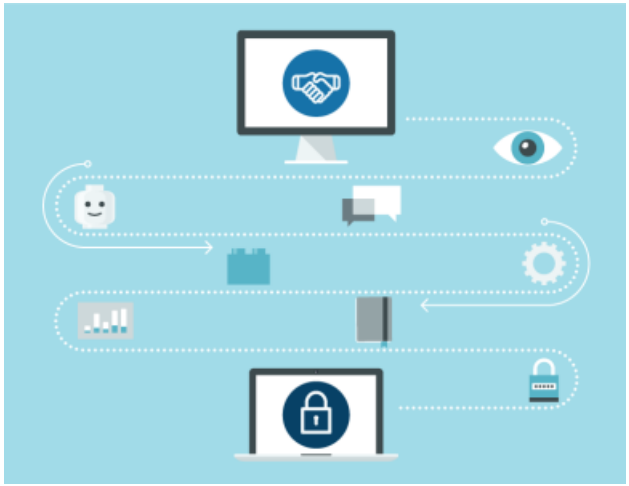
LEGO's API maturity journey is somewhat unique. The need for an API emerged in business discussions with their video game partners, Warner Bros and Funcom, who were creating LEGO-themed video games compatible with a range of devices from Microsoft, iPad, and for the web.

"It has always been a business decision that when someone has to log into any LEGO system, they should only log into

one system…, so that's why we started collaborating," Dennis Bjørn Petersen, Platform Architect at LEGO explains. "In that way, we ensure we know what sort of information we are collecting from users, as we are often working with children under thirteen, and being clear about what information is collected is crucial for us," Dennis adds.

Around the world, many countries have strict regulations about what data can be collected from children using the internet, and this is not a data responsibility that LEGO takes lightly or would consider passing on to a business partner to be responsible for. Dennis says this is not a reflection on any of their business relationships but that "it is in our mutual interest that this is covered by us."

As work on the API design progressed, the company was also looking to upgrade its own 'LEGO ID' identification/authentication processes. Dennis' team immediately saw the benefits of using the API they were creating for internal authentication processes as well. In this way, the Partner API came first and led to it being used as a Private (internal) API by the company as well. "So we decided we may as well create an API for both external and internal developers. It is used in games, on our message board, in our rewards program. It's used everywhere you need to log in with a Lego ID," Dennis says.



While LEGO is a global organisation, the toymaker-turned-API-provider has to date been able to manage the API through a series of resource-light tools and approaches. Dennis shares some of the simple strategies they use in their partnership and internal work:

Documentation: "We have created a JavaScript API; we created a small test site with examples of snippets of code that you need to add."

API metrics: "We really don't track our API use at the moment. It is a manual process if we do. We are still looking into usage metrics, we can see that usage is increasing, so we are looking into an API management tool to take the load off our backs."

Error logging: "We do have an error logging tool, so we monitor that, but luckily we aren't big enough that people don't know how to get help. There are only about 100 developers in the organisation so people know who to contact if they need help. We do like to keep an eye on how our API is being used

and if it is being used correctly."

Mentorship/pair programming: "When working with external games developers, we normally do a code review, and we send one of our developers to sit with our external partners and work on the first integrations. It's not that our API is complicated, its just that game developing is different to web application development, so it is just easier and faster to sit with them."

Key Lessons

- Start with low-hanging fruit: identify the data or services that you regularly communicate with partners, suppliers and agents
- Track usage metrics: at a minimum track API calls made, error messages sent and, if possible, find out how partners are integrating the API into their systems
- Make your developer team available to sit with external developers using a 'pair programming' or other mentor-based methodology when external partners first start using your Partner API.

2.5 Reflections

- Can you open up your product catalog or a service directory via an API with selected partners?
- What dataset(s) would be referenced when working with business suppliers, partners and agents? What information is most often requested by partners and how is this currently provided?
- Who is considered your most valuable partners? Who manages these relationships? What do these relationship managers - and the partners themselves - think would be most valuable to open up as a shared resource via an API?
- What regulation guides your industry? What specific tracking must you perform to ensure communications are documented as required, or that shared information is stored correctly? How is this currently done and can this process of ensuring authorisation of shared information and storage be done via an API?
- What customer market segments do your partners provide services to? What services or products would you like to offer to these customer segments? Can you package your products and services is a way that allows your partners to be the front-end for making these available to their customer segments?
- What metrics will you need to put in place to monitor the commercial opportunities that might be available if you open Partner APIs to a wider audience? What API resources are requested most often? What are the

use cases that your partners are implementing via your API? What resources are seeing the greatest increase in use? For what reason?

- Are there cloud-based software tools that you are currently using in your business? Do you use their APIs to integrate the software with your legacy systems and databases? Do you use their tools to integrate use of the software with external teams?

Additional Resources

- *Why everyone speaking "Apish" makes your whole business more agile*, by Marjukka Niinioja of PlanMill
- Who Cares About APIs? by Anne-Sofie Nielsen of Kapow Software

3.1 Overview: Building a Platform and Ecosystem with Public APIs

One of the biggest challenges facing businesses today is the need to move towards a platform and ecosystem model. This is the natural extension of becoming a "composable enterprise" model. In a composable enterprise configuration, a business makes its services and data available in a components-type of format so that external businesses and customers can plug directly into the services and data they need for their own value chain.

Instead of businesses creating products with a perceived end value in mind, businesses open up their services and assets

in a way that allows end customers to create the value they want.

As a result, businesses are transforming into platforms that enable other businesses and customers to create the value they want, using (and paying for) resources directly. Public APIs are speeding up this transformation and extending a business' value base beyond its traditional markets. Facebook, Salesforce and Twitter have been able to leverage exponential growth by letting third-party developers and customers create new products and services by using their Public APIs.

The composable model also enables a business to commercialize the investment it has made in some of its own processes and capital. In the same way that Amazon allows customers to store data on its web servers – thus creating an opportunity to monetize its investment in building large data servers – there may be previously income-neutral aspects of a business that can be opened up in a similar way with an API. Businesses that carry out large scale data processing, for example, are leasing access to this analytics power to others who need such services, and this is often enabled via an API.

Other businesses are selling access to their research database using APIs. Previously, this had been a resource cost that other businesses had to pay to carry out its core functions. Now firms supplying the data are able to monetize this cost by making the research available to third parties via an API, and the recipients are able to save time and money.

Building a Scalable Public API Strategy

One of the greatest benefits of starting with Private and Partner APIs before moving to a Public API strategy is the ability to see what data and services are being consumed, and what internal resources this consumption has in common.

While it is beneficial to start with an individual use case when first considering the benefits an API may bring to a business, it is important to then widen this perspective. It's important to consider what other use cases may be relevant, and what datasets or service functionalities these use cases have in common. This prevents building an API for each use case, and avoids the risk of having multiple APIs all calling the same dataset in only slightly different ways. When moving to a public API strategy, it is important to have already mapped the underlying data model that is being exposed to ensure that any public API is scalable.

A key tactic to ensure that any public API created remains fit for its purpose is to use it internally as well. Andreas Krohn, Principal at API consultancy agency Dopter AB, encourages businesses to "use public APIs internally." Andreas gives two examples of testing the value of a Public API: "If your API isn't good enough to use even as a widget on your website, you need to rethink it. If you are still doing SQL queries down into your database instead of using your API, you need to rethink your public API."

Replicating the Customer Reach Lessons from Partner APIs

One of the benefits of Partner APIs is the potential to reach exterior established customer markets. As described in section 2.2 above, businesses are able to almost 'white label' their services and products via an API so that key partners can offer these services to their customers with a sense of ownership. In this way, Partner APIs enable a business to reach new market segments that may have been difficult to connect with previously.

When this strategy has begun generating new sales revenue and is shown to have had success in a business's operations, the natural extension is to widen the reach by making this Partner API available to third party developers. This can be done in a controlled manner or in a completely open manner depending on how a business has defined the risks to its brand reputation, or the value of the data and services it is opening up.

Some businesses widen the API reach to any third-party developer. The API itself is monetized so that developers pay for the number of API call transactions above a certain threshold. Often, a free level of access is provided to demonstrate the value of the integration, and to assist third-party developers in ramping up their customer base before having to pay for data access. This is usually referred to as a "freemium" business model.

Other businesses choose a semi-public API. While documentation may be public, rather than allowing open access, providers may request specific details on how the API will be used. Services like Pinterest and Twitter, for example, use

this approach as a way to curate how their brand appears in third-party applications and websites. This approach often necessitates more sophisticated business models, including revenue sharing models, and affiliate commission-like agreements. Businesses may test multiple revenue models to see what is most appropriate for the resource(s) being exposed.

Special Note: Creating a Business Around an API-as-a-product

APIs are also facilitating the creation of entirely new businesses where the API itself is the product. This is the case with Twilio, for example. The Twilio API enables access to SMS and now VoIP services, and is offered as a product to other businesses. The API is a hybrid between a Partner and a Public API as it is open to any third-party developer, but those who integrate the API into their business functions are often akin to partners as well as customers.

At its onset, Twilio began with a Minimal Viable Product (MVP) and iterated the API features based on customer demand. At Nordic APIs events across Sweden, Denmark, Finland and Norway in April 2014, Ben Nunney, European Marketing Director for Twilio, provided a number of insights into Twilio's growth and shared several use cases.

An innovative example involves Internet of Things (IoT) technologies. Nunney showed how Coca-Cola's vending machines perform self-diagnostics. When repair problems are identified, the vending machine automatically looks up available repair contractors in the local area and sends a text via Twilio to submit a service request detailing the malfunction.

Copenhagen-based shipping API startup Shipbeat has also been deploying lean methods to offer a public API. According to Shipbeat Co-Founder Kenneth Svenningsen, throughout his current and previous ventures, "there was a significant need for deep integration of multiple shipping providers to automate processes, improve customer experience and to reduce cost."

> "If the e-commerce company is active in multiple markets, then they need to work with even more shipping carriers. In both cases, we were looking for solutions externally here in Europe and we had a hard time finding something matching our needs. Thus, after some time my co-founder and I concluded it was time to build this service ourselves, as we believe we have a validated customer need.
>
> "When online companies implement payment solutions, they do it through a service that aggregates multiple payment options – no one builds their own solutions for this from scratch. Secondly, we have observed how the payment industry online is moving from old school and legacy payment solutions like DIBS in Scandinavia to solutions like Stripe, Braintree and Paymill. We believe that the shipping solutions for e-commerce companies must follow the same trajectory".
>
> "So for shipping, the following must happen: first, shipping services and partners (local and global) should be accessible through one service,

> and secondly, this service should be very developer/user friendly to allow easy implementation and management."

As did Twilio, Svenningsen is first focusing on a minimum viable product for their Public API:

> "The API is currently a prototype. Our goal is to get it to an open public state very fast. The criteria for when this can happen is based on two main factors: - The API needs to be tested with an actual customer to our customer's satisfaction. It needs to be confirmed as working and fit for real life need and use cases. - The documentation needs to be written in a simple form where we can confirm that developers are able to understand it and able to start using the API based on this documentation."

3.2 Business Benefits of Public APIs

Creating a Public API is often a key turning point for many businesses. It is a time that is both filled with dread (that something will go wrong) and of immense hope (that transforming the business will create new market opportunities).

Building Public APIs from the successes of Partner APIs typically speeds up the growth curve of generating benefits. However, many providers may not realize success immediately, and any benefits may take a little time to become quantifiable. That is why it is important to communicate the longer-term benefits of Public APIs with an enterprise's C-level.

Public APIs Automate Processes

Using other business's Public APIs (and open data APIs) can help a business automate processes and develop better decision-making workflows. For example, a business can use the Public APIs of Zendesk, an online support desk service, and the Public APIs from Twilio, the messaging service, to create a business workflow where new customer service requests are automatically directed to the appropriate business team — and any priority customer requests are sent via text alert to a manager.

There may be opportunities for a business to open up its own internal workflows or data in a similar way with a Public API, so that this can be integrated into customer-facing applications and user interfaces. For example, a business could open its risk management intelligence data-gathering systems for third-parties to consume and embed within their own decision-making processes. In this way, the provider can extend data that has been collected for its own use to consumers to purchase and implement into innovative applications.

Public APIs Improve Customer Experience

Public APIs are tools that help respond to one of the greatest challenges today for business: the segmentation of customer markets. Each customer expects a personalized experience, and businesses are losing the economies of scale advantage — that of providing a generic product or service for everyone. Current market expectations are that businesses should be able to provide a relevant, personalized experience to each customer.

APIs enable a new balance of both providing generic products and services, and personalizing the experience by using contextual and user information to increase engagement. For example, Public APIs make it possible to identify a user's previous preferences (such as an interest in family-oriented content or services) and combine this with information about the user's current context (for example, whether they are using a smartphone or desktop). Content can be remixed to best suit the environment and personality of the end user

(such as serving up the most recent content that other family customers viewed, formatted to the appropriate screen-size). Deploying APIs can help build loyal customers by delivering a satisfying, personal experience.

Public APIs Reduce Costs

Public APIs can reduce the cost of new market entry by leveraging third-parties who already have access to key customer markets and industry relationships. The wearable technology sector is an excellent example of how this is playing out with the availability of Public APIs. Wearable tech like health monitoring devices may want to enter markets like extreme sports users, leisure golf retirees, or soccer moms.

In the past, each of these demographics has required investment into separate marketing strategies aimed at reaching these target customer segments. A wearable tech business can now release an API and encourage third-party developers who specialize in building applications for each of those markets to create an application that uses the business's device.

Reduced costs can also be seen in how telecommunications have leveraged value-added reseller markets to promote and share new product streams. Selling prepaid mobile phone packages, for example, has reduced the cost for telcos to market and distribute this service. They have done so by releasing Public APIs that allow resellers to more easily offer customers this product directly from their product catalog and services.

Public APIs Integrate with Flexibility

Public APIs reduce the need for creating an individual solution for each consumer. The costs associated with creating a customized integration are moved onto the developer consuming the API. Instead of a business, for example, having to pay the integration costs associated with connecting a third-party to their accounting system for managing payments and commissions, they can instead provide access to payment processing via an API. The end user then has the flexibility to integrate that API into their preferred system, while the business provider avoids the costs associated with providing a specific integration to each end user.

Noting how customers are integrating with a Public API also suggests use cases that can be promoted to other customers and partners. In response, a robust Public API should be flexible enough to be incorporated into various development environments.

Public APIs Provide Global Reach (To Suppliers, Channels, Markets)

Micael Widell, CEO of e-commerce vendor Fyndiq, shared with Nordic APIs an interesting example of how he has chosen which APIs to integrate with his business. When selecting a fraud prevention service for his e-commere startup, he was researching online after hours. This was an important task, causing Micael to work over the weekend to source the best solution.

As such, he chose a business supplier that offered the service with a Public API that could be tested and integrated immediately — over the weekend — and which was supported by user-friendly documentation.

Working in a global marketplace, businesses can miss out on opportunities if they are perceived as being unavailable outside their home country working hours. This 'round-the-clock' capability is something that key international businesses in such environments as the Nordic region – and increasingly amongst southern hemisphere-based businesses such as Australia and New Zealand – are using to their advantage.

Public APIs can provide 24/7 access to global markets. This empowers customers from across the globe to access a business's products and services whenever they are required, customizing their needs using open API documentation and accessibility.

Public APIs Increase Customer Lifetime Value

Public APIs build customer loyalty. Once an API is integrated into a customer or third-party developer's value chain, they remain as customers for a longer time, and are generally happier with their experience.

There are, however, some caveats with Public APIs. It is easy for customer trust to deteriorate if an API changes frequently. Once an API is integrated into a customer or developer's applications, systems and interfaces, it is troubling if there are constant error messages, or if the API ceases to work entirely.

To maintain customer loyalty, businesses providing a Public API need to clearly communicate updates and keep transparent change logs. In some cases, it may be best to support multiple versions of a Public API to maintain customers on earlier integrations while newer customers access the latest version. When an older version of an API is to be deprecated, it is preferable that you schedule a timeline for adjustment, and provide multiple messaging points to alert existing users. It may also be possible to ensure that newer versions are backward compatible, so that for long-term customers, there is no noticeable difference when a business upgrades to a newer version of its API.

For many initial API users, a Public API integration can be a 'set and forget' experience. Once the integration is established and any initial learning bumps are resolved, the API can be used consistently in an end customer's workflow. This can create an ongoing revenue stream for the provider. However, changes to an API terms of service must be clearly disseminated to the community, as any new versioning put in place that alters the way API calls are made can break older use cases and bring revenue to a grinding halt.

3.3 Public API Challenges

While Public APIs do create many new market and revenue opportunities, they may fill businesses with dread. This is due to the risks associated with exposing internal data and services with an API. The mere attention drawn to a business with a Public API may lead to attempts at gaining access to private data through insecure API gaps.

Using a federated authentication system as part of a neo-security stack (as described in section 2.3) is an important foundation.

However, merciless hackers may still target a businessâ€™s Public API merely because it is publicly available. This is often done to access social media accounts to use for spam advertising. Unfortunately, there are also an increasing number of attacks on businesses. APIs are being used as a gateway in attempts to gain access to customer passwords.

The social media tool Buffer found that by having a Public API they became a target for hackers trying to break into their systems. A forensic analysis of their 2013 security breach showed that hackers reviewed their documentation on GitHub multiple times trying to identify ways to access the API without an authorization key. After they had managed to breach Bufferâ€™s API keys storage, they then had access to encrypted information. The hackers then tweeted to ask if

anyone knew how to un-encrypt that particular type of file! (Maybe this gave them away).

The challenges of security never disappear, and as more businesses make use of Cloud and web-based services, these risks will continue to grow. It is not within a business's best interests to manage all of the potential security risks that arise from opening a Public API. Instead, it is necessary to work with a trusted supplier whose specialty is solely in security systems for APIs. Even when this is the case, regular security audits and having internal experts scan for potential security risks are still essential elements of a robust Public API work program.

A second challenge facing many internal API architects is the need to quickly demonstrate the returns on investment.

The time-to-return on investment can be longer than many businesses prefer. After all, there are two growth curves that need to be realized in order for a Public API to begin generating revenue opportunities.

First, there is the growth period in first establishing a strong community of developers integrating the Public API into their applications and web services. There is then is a second growth curve where those third-party applications and web services must establish their own end-user customer base.

It is important to have interim metrics that indicate how benefits will be reached. Using Public APIs internally to automate processes is one area where a strong business case argument can be demonstrated to show the productivity cost savings generated by using the API. These internal cost-savings can be used to demonstrate sustained investment in a Public API program, while awaiting revenue growth from the third-party developers using Public API offerings.

3.4 Case Study: Podio

How Podio's Success Depends on Third-Party Developer Success

Podio is a Danish cloud software company that has built interchangeable widgets for business-specific workflows and processes. Customers can create dashboards and project management toolkits for their HR, marketing, sales and finance operations. As a bonus, Podio can be used to oversee all stages of a particular project, such as new product development.

Podio's clients range from startups and independent contractors to enterprise customers wanting to use a composable project management software system that is flexible enough to match their specific needs.

The Podio API is a Public API designed for two audiences: > Customers can use the Public API to integrate their Podio workspaces with their existing enterprise and business systems (this is similar to a Partner API, in that you must already have a relationship with Podio to use the API in this way,) > Third party mobile app developers can build and commercialize new integrations and products using the Podio API. The products created by these developers are aimed at Podio customers as the primary target market.

To help developers use the Public APIs, Podio provides a range of support and educational materials including: - Immediate API key registration - Tutorials - SDKs in PHP, .NET, Ruby, Java, Python, Objective C and Mobile (iOS and Android) - Video examples - Developer code for sample projects stored on Github - Developer forums - A blog focused specifically on developers using the API and SDKs - Showcase pages and a marketplace webpage showing what developers have built with the APIs.

Gustav Jonsson, Product Manager at Podio, shared with Nordic APIs further details on two of the above strategies: making SDKs available, and showcasing pages that demonstrate what developers have built.

SDKs Speed Up Developer Onboarding

Gustav sees the SDKs as an important pathway to help developers get up and running quickly.

"We already have an active and dedicated developer community," says Gustav. "SDKs are an important part of that puzzle. It's really about creating a seamless and easy way for developers to get started with the API… we really saw the potential for developers building a lot more on mobile, and we wanted to make that a lot easier."

For other API providers planning to provide SDKs for their API, Gustav shared that "Historically PHP has had around 50% of the usage. With Ruby and .NET tied for second. We haven't really pushed mobile SDKs in the past and we're very

much looking forward to seeing what people will build on mobile."

The Success of an API is Measured by the Success of its Users

Gustav shares: "I heard a quote from an executive at Amazon the other day which said, 'We want to build a platform to make others successful'. I think this also sums up our approach pretty well."

To demonstrate this, Podio has developed a number of showcase pages aimed at helping developers market the products and solutions they build using the Podio API.

The Podio Extensions showcase contains example apps built by third-party developers that can be connected to a Podio customer's existing account. These developers receive new business by either selling their extensions to Podio customers, or by using the extensions to market their services as a Podio-accredited partner that can help businesses optimize the use of Podio in their operations.

For example, Oval Business Solutions offers free apps like the Timeline for Podio. While this integration is free, when you click on the business link, you are also referred to Oval's home page, which offers business consultancy services to make best use of Podio in your business workflows and processes.

Meanwhile, Danish developer shops like BendixKiel and Phases are building 'freemium' or paid apps that use the Podio API, and marketing them to other Podio customers via Podio's Extensions showcase webpage.

"There are multiple ways that extension developers are charging for their products at the moment," Gustav adds. "We acknowledge that there could be multiple ways for the people using Podio to pay for the extensions. For example, a document printing extension might have a credit-type system where you pay for usage, while a Gantt-chart extension charges for the amount of users of the extension. We think that giving this freedom to the developers is a good thing, since they can be flexible in the ways that they'd like to charge. We want to share data with the developers on what model is most efficient, and that's in our plans for the future."

At present, while Podio builds up the developer ecosystem, API calls are free of charge. Although, Podio has begun metering API usage and "are looking at revenue share for the near future," confirms Gustav.

Key Lessons

- Build quality support materials including tutorials, videos, and clear API documentation.
- Help third-party developers commercialize off your API by helping market the products they develop with your API.
- Consider the use of SDKs in relevant coding languages to help speed up initial third-party product design.
- Offer a free version of your API to ignite your developer ecosystem, but start metering and measuring usage so you can see when it is time to introduce a revenue-sharing business model.
- Collate data on how third parties are leveraging the use of your API to generate new income. Be open to sharing

an analysis of this data in aggregated form to help third-party developers identify the most viable business model for their API usage idea.

3.5 Reflections

- What Public APIs can be used from external sources (e.g.. from partners or available in SaaS products used) that can generate productivity benefits and demonstrate business value?
- What Partner APIs are used regularly or at high volume? What are the use cases in which partners are using these APIs? Do similar use cases exist for customers and third-party developers?
- Can any of the following datasets be opened up with a Public API?
  - product catalogues
  - customer preferences
  - historical purchases
  - logistics information
  - seasonality of products and services
  - location of historical purchases
  - user recommendations
  - services providers and networks?

4.1 Conclusion: The Roadmap from Private to Public APIs

There are many pathways to API creation and design. Some businesses might start with Private APIs and then make them public (though this is rare). Others may jump straight in and start creating an open API (this is quite often the norm).

In any case, Ronnie Mitra, API Advisor with API management company Layer 7/CA Technologies urges businesses to ensure that basic API infrastructure is in place — and built with best practice principles in mind for Private and Partner APIs

(features like an API security gateway, a developer portal and API instance), so that if a business does decide to open up more broadly, they are robust and secure enough to be accessible and usable by third-party developers.

Experiences from the Partner to Public API Journey

One strategy is to start with a Partner API and move to an open API when the business feels confident enough. This is the approach taken by Marjukka Niinioja, Senior Consultant and Manager at Finnish software company PlanMill, and also by Peter Jervgren, head of Strategy & Architecture at the Swedish offices of international energy company E.ON.

While both businesses have a significant online presence, they are also both firmly rooted in working in more traditional business sectors, where their partners and customers may not be quite as API-conversant.

PlanMill is a Software-as-a-Service platform for businesses complete with components like CRM, invoicing, and project management. Their customers end up storing a lot of their business data in the system.

As Marjukka explains, "If you are our customer, you can use our API free or almost free-of-charge to connect to any of your own systems or to 3rd party systems. You can also give access to any of your customers and partners to access your system via the API. We do also let companies we are interested in becoming our partners to use the API,".

For energy and utilities company E.ON, Peter Jervgren says they are just getting started with Partner APIs, but have

a 'semi-open API' in their sights. "At the moment, we are focusing on internal and Partner APIs," Peter says. "However, E.ON acknowledges the user empowerment that comes with open APIs. E.ON wants customers and partners to be engaged in the future of energy solutions. But, the ramp-up towards open APIs will be done in a controlled way and according to the directives of the E.ON business strategy."

In both of these case studies, the businesses have started with Partner APIs. After they learn how to implement and manage the API with some external integrators, they will move towards opening them up more broadly as Public APIs.

By working with their network of business partners first, PlanMill has ended up with a suite of third-party apps that help them connect with new markets. In some cases, they even share the revenue generated from entering those markets with their partners. The infrastructure is then tested and in place as PlanMill opens up API access to new developers with whom they have no existing relationship.

"Letting partners and customers create integrations themselves with very little participation from us would have been totally impossible otherwise," says Marjukka. "For example, integration with Atlassian's Confluence wiki or Jira was done mainly by our customer Ambientia, and we are selling the Confluence integration together. Also, we were able to give Administer Oy the possibility to code purchase orders and invoice integration with PlanMill, and our customer Futurice built a complete time report mobile app and UI (FutuHours) on top of our API. In terms of externalizing development and shortening the time to develop things, an API is a must. Real-time integrations just cannot be done with a file import or export."

E.ON is thinking along similar lines. Globally, in the final quarter of 2013, energy and utility companies were the fastest growing sector creating mobile apps that routed data on energy consumption and usage from their APIs. "We think that 'Home Energy Management' and 'Smart Cities' are two examples where we can expect open APIs to soon emerge," Peter confirms. "This is also in agreement with E.ON's ambition to stay at the front in terms of investments to keep our globe and climate sustainable."

One characteristic that both PlanMill and E.ON stress in creating open APIs is to have clarity around business workflows and business logic. In many cases, it may be easier to resolve these questions when building an API with partners first, so that by the time it is opened to a public audience, you are confident it is robust.

"The first thought in our business when talking about APIs was that it was something techie and only an integration layer," Marjukka shared with us. "For many business users and managers, it has been really difficult to think of it from a business requirements perspective."

"Lots of times, we get a request from a customer company related to our API where a developer (usually fresh out of school or making his thesis) has been given the task of 'get our time reporting and XYZ things integrated between PlanMill and our X system'. They start to approach it as a programming task only and then they realize that they need to actually know a little bit of what is the process, where, when, how are things being created, edited and deleted, and, for example, which system is the master of the data. This brings us to the question of the whole business process."

In this case, PlanMill could work with partners to better

understand the potential use case, and get a real feel for how the API would enable more efficient business processes. This is valuable insight for identifying potential customer segments who may also find this type of integration useful, and for communicating the value proposition to these customer markets.

By deploying Partner APIs first, a business can also get a feel for the support requirements that may be necessary to manage a public release. "It has been — and still is — a huge learning experience internally how to support, consult and sell the API because it's so different from our base products with user interfaces," Marjukka said. "Plus the development: remembering that all the business logic checks done in the UI need to also be done in the backend, because you have to check data integrity."

Peter agrees. "We try very early on to introduce Lifecycle Management for implemented APIs. We think that a lot of competence and experience can be obtained by adopting best practice already present at the current line organization within E.ON IT. The unit is handling IT Services at the macro level according to the ITIL framework where service level agreements, release and change management are fundamental ingredients."

Moving to Public APIs

PlanMill are currently thinking through the 'what ifs' that have become more concrete now that they have started their API journey. As Peter asserts, "We are exploring possibilities to open up more of our localization and other data to the public, to customers who are not otherwise users of PlanMill,

although we will be requiring registration and most likely introducing some amount of fees, possibly according to usage."

E.ON is moving their Partner APIs to a semi-public type of access: "We think that we will start to introduce semi-open APIs to large customers and key accounts. These customer categories typically have a close partnership with E.ON so there can be a fruitful 'give and take' situation. All parties can benefit from an agile and refactoring style of development. E.ON is also participating in the EU initiative Finesce that is targeting the Future Internet for Smart Energy including machine-to-machine (M2M) communication and the Internet of Things."

However, Peter concludes that like any business opening up its APIs, E.ON points to a key discussion that needs to be resolved internally: "Our key considerations are related to security and intellectual property rights. Given that future E.ON Energy Solutions will include more IT-related services and many of these services will be aggregates of third-party services E.ON needs to ensure that exposed APIs are robust, secure and not violating any business agreements."

Other API Maturity Pathways

Of course there are other pathways that businesses can navigate towards opening up their APIs. This can include completely separate API journeys. For example, Private APIs may stay private and for internal use only, but the experience can give a business more confidence and practical knowledge when identifying other services or datasets that might be more suited to a Public API audience.

In some cases, it may be possible to expand a Private API to Partner, and then to Public. The examples given in this e-book that relate to product catalogs and order tracking are suited to this maturation, as is the opening up of such data as branded digital assets and store locator datasets.

Which API maturation pathway is best suited to a particular business is something that each business must decide. The strategies and case studies outlined in this e-book, along with the interactive exercises at the end of each chapter, are provided to help your business with this journey.

Reviewing API Types

Private APIs can help increase internal productivity and create efficiency savings across a business's operations. They can also help speed up time-to-market for product development and encourage greater cross-departmental collaboration.

Partner APIs are strategically shared in a B2B agreement. They can help strengthen external relationships and widen a business's reach to encompass partner customer markets as well.

Public APIs are open APIs, and can help a business monetize its data and capital assets, enter new markets and create new revenue streams.

All three API types have their own benefits, but can also create a multiplier effect when used along a pathway of API maturity. Most important of all is that API usage in a business assists in reorienting the business culture and mindset towards a platform model and 'composable enterprise' identity. This mindset is essential for stability and success in today's economy and emerging business environment.

For More Nordic APIs...

We look forward to hearing your experiences at future Nordic APIs events and in the Nordic APIs forums, including on Twitter @NordicAPIs, in our blog (use #NordicAPIs and #APImindset hashtags to share with our community), in our LinkedIn group, and by providing feedback to our newsletter team.

Endnotes

- User Experience Honeycomb by Peter Morville
- Identity-related Venn diagram by Gunnar Peterson
- LEGO bricks by 713 Avenue

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