



Harmonised Smart City APIs

A Cook Book for Cities

6Aika

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The aim of the 6Aika Open Data and Interfaces Spearhead Project is to bring the opening of data as part of the cities' normal operations and to help the cities facilitate the creation of data-based services and business.

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Boosting digital services and data driven business

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Open data is machine-readable and can be utilised by anyone free of charge.

The vast amount of data produced by cities is being opened up for companies and the talented developer community to use, bringing with it a world of opportunities – it can be used as raw material for data-based business and for developing smart applications and services that will immensely improve the quality of life in urban environments. However, the challenge

lies in the fact that cities produce data in many forms and from many sources, and the wide variety of formats makes it difficult to scale applications from city to city.

The answer? Harmonised application programming interfaces, or APIs, provide access to the cities' data even if the background systems are vastly different, making them a great way to attract and fully harness the huge potential offered by developers.

CitySDK and 6Aika APIs enable fast, easy development of scalable digital services in key areas of urban development, enabling the creation of services that make the citizens' lives easier, more enjoyable and get them involved.

Why harmonised APIs?

- » Boost development of smart applications and services that improve quality of life
- » Create a wider market for apps and services
- » Meet citizens' demands for 24/7 digital services
- » Engage with developers and citizens
- » Harness the potential of data harmonisation and open interfaces
- » Make better use of other cities' know-how and resources by implementing proven APIs

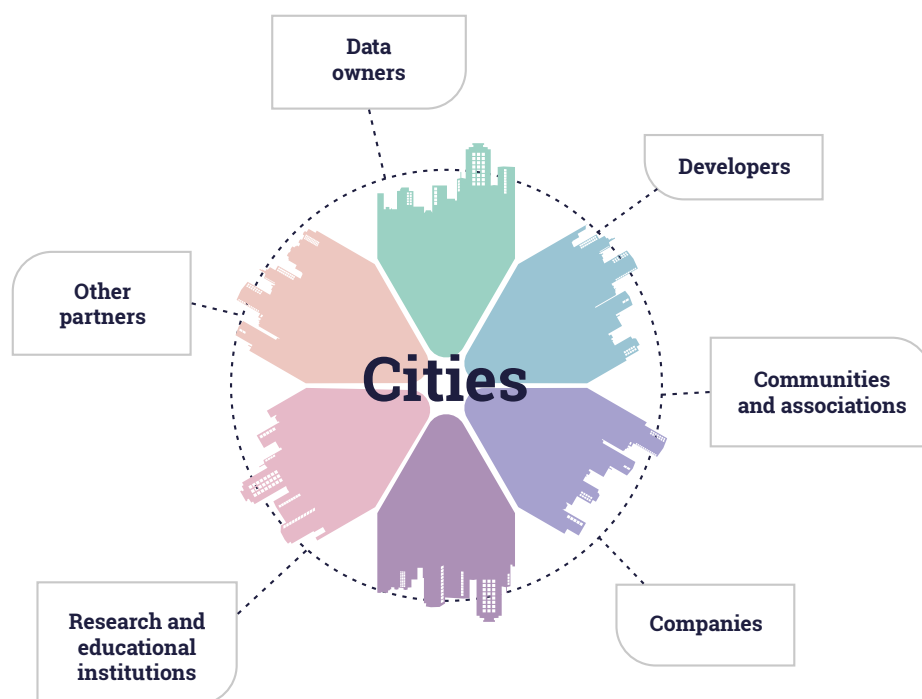
Today's information resources, tomorrow's digital services

What makes up a city? We primarily experience cities through their physical infrastructure – the bricks and mortar that give them their unique character and charm – but they are increasingly being designed, managed, and developed with the help of IT solutions. In fact, today, the availability and quality of digital services is perceived to be a hallmark of a well-functioning city.

In fact the demand for digital public services continues to grow at a time when municipal budgets are tightening. To improve their selection of services and ensure a good quality of life for their citizens, cities and other public bodies are looking to better engage with businesses and developers.

The best way to do this is to harmonise the cities' digital interfaces. Doing this opens up a world of possibilities for intercity collaboration as well as developer and citizen engagement, and lays the groundwork for the development of the digital public services as well as business of the future. CitySDK and 6Aika APIs were created to do just that.

The cities' cooperation as a part of the open data ecosystem.



How APIs are making a difference

The Issue Reporting API enables citizens to easily report problems that need attention directly to the city's feedback system.

The Linked Events API enhances the discoverability of nearby events by providing events data in a harmonised format.

The Open Decision API makes it easier for citizens to access city decisions by providing the decision data in a structured and harmonised format.

The Resource Reservation API enables 3rd parties – citizens and companies – to reserve resources managed by a city, making their use more effective.

The Linked Data API facilitates getting around by making public transport data more easily available.

The Tourism API enriches the visitor experience by enabling access to tourism-related data via a range of handy applications.

CitySDK and 6Aika in a nutshell

City Service Development Kit – CitySDK – is a software development kit that gathers tools and information to help cities better serve developers by providing a set of harmonised programming interfaces for developing digital service delivery in European cities. In keeping with the most common interactions that citizens have with their municipality, the main focus areas of CitySDK are participation, mobility, and tourism.

The work that started with the CitySDK project has been continued in Finland as part of the 6Aika strategy, a cooperation between the six largest cities in the country: Helsinki, Espoo, Vantaa, Tampere, Turku and Oulu. The main target of The 6Aika Open Data and Interfaces Spearhead Project is to boost data driven business by harmonising APIs and datasets, which enables the scalability of applications built on a specific city API to other cities providing a harmonised API. The cities have focused on four domains: participation, events information, decision making, and resource reservation.

6Aika



Do you know your SDKs from your APIs?

An SDK, or software development kit, is a programming package traditionally offered by technology companies that enables the development of applications for a specific platform. Typically an SDK includes one or more APIs, along with programming tools and documentation.

An application programming interface (API) is a set of routines, protocols, and tools for building software applications. APIs make a dataset understandable by applications or websites. For example, APIs are used to make train schedules understandable by route-planning applications. Popular examples include Google Maps APIs for embedding maps on webpages, or YouTube APIs for integrating YouTube functionalities into websites or applications.

Companies and developers – what's in it for you?

Harmonised city APIs give companies and developers access to a host of resources and information:

- » Harmonised APIs from various European cities
- » Access to various types of data
- » A wider potential market for their apps with minimum adaptation
- » Technology-agnostic APIs
- » Code libraries, apps, and platforms

Empowering Citizens

Has a street sign fallen down? Are the roads free of potholes? The best way to make sure everything works as it should in a city is to get the citizens involved.

The Open311-based Issue Reporting API allows citizens to send a wide variety of issue reports from external services directly to a city's feedback system, complete with images and location details. The API provides a much more efficient way to gather data and greatly increases engagement by providing two-way communication between citizens and civil servants: citizens can not only report issues to the city, but also track their progress.

The CitySDK Issue Reporting API was implemented by the City of Helsinki alongside the introduction of its new centralised feedback system in early 2013. The interface was built to operate between the new system and other platforms in order to enable citizens to send feedback directly to recipients in the city's administration staff.

The citizens and developers warmly welcomed the possibility to send feedback via third-party applications, bringing a steady flow of approximately 3,000 visitors a week to the *Metro fiksa* ("Metro Will Fix It") page on the local news site, Metro.

The new extended 6Aika Issue Reporting API by the six largest cities in Finland is based on the CitySDK Issue Reporting API with a few extensions.

The Six Cities have also created an open source reference implementation of the Issue Reporting API.



Where is the Issue Reporting API used?

- Helsinki, Finland
- Espoo, Finland
- Turku, Finland
- Oulu, Finland
- Amsterdam, the Netherlands
- Barcelona, Spain
- Lisbon, Portugal
- Lamia, Greece
- Province of Rome, Italy

What can you do with the Issue Reporting API?

- » Submit issue reports via third-party apps and services
- » Utilise a standardised reporting protocol with service-request categories defined by each city
- » Send media files and location details along with issue reports
- » Search and follow up on submitted reports and their status

The definition of Issue Reporting API:
github.com/6aika/api-palaute

The open source reference implementation of Issue Reporting API:
github.com/6aika/issue-reporting

“Citizens are the eyes and ears of the city. The Public Works Department cannot know that a traffic sign has fallen if no one tells them about it.

– **Pekka Sauri**
Deputy Mayor, City of Helsinki

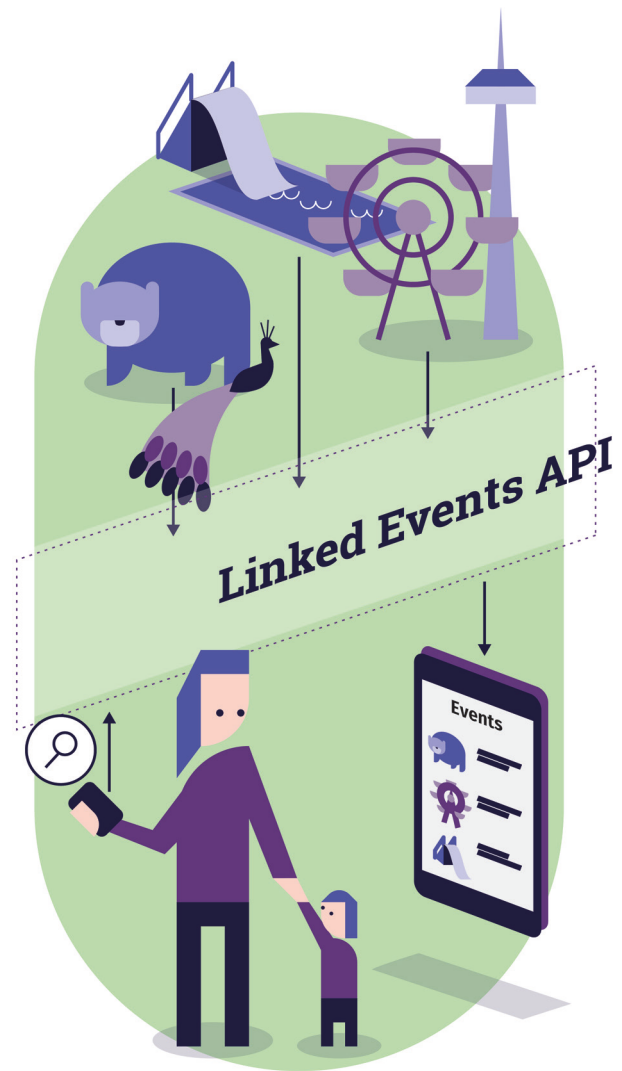
Easy Access to Event Information

From classical concerts to sports events and culinary festivals, cities are always buzzing with action. However, trying to navigate the abundance of events via multiple sources can feel a bit overwhelming. Linked Events was created to help citizens easily find events that interest them.

Linked Events collects event data from various sources into a city-specific API. Harmonised Linked Events APIs make it easy to create scalable intercity event applications. This enables citizens to access event information whether they are on the move in their hometown or exploring a new city. The harmonised API also promotes accurate information as the data is not copied and pasted from the database but directly accessed in a harmonised format through the API.

In Helsinki, the location information is also linked to the City of Helsinki registry of service units which contains e.g. information about accessibility.

In Finland, the API is currently used by several apps, for example the City of Helsinki's own Events Calendar, the *Eventmore* mobile app, the *Eventz.today* service and the *messis.fi* online services.



Where is the Linked Events API used?

- Helsinki, Finland
- Turku, Finland
- Espoo, Finland
- Tampere, Finland

What can you do with the Linked Events API?

- » Search for categorised event data in a harmonised and machine-readable format
- » Search for event data by date, keywords and location
- » Search for event data in a specified area

The definition of Linked Events API:
github.com/6aika/api-linked-events

The open source implementation of Linked events API:
github.com/6aika/linkedevents

“With the help of 6Aika city content, we have built a fantastic event management platform that we now licence to our customers. The Linked Events API is great! I would love other European cities to be in the same forefront with us.”

– **Mikko Lintunen**
Eventz International

More Transparency to Decision-Making

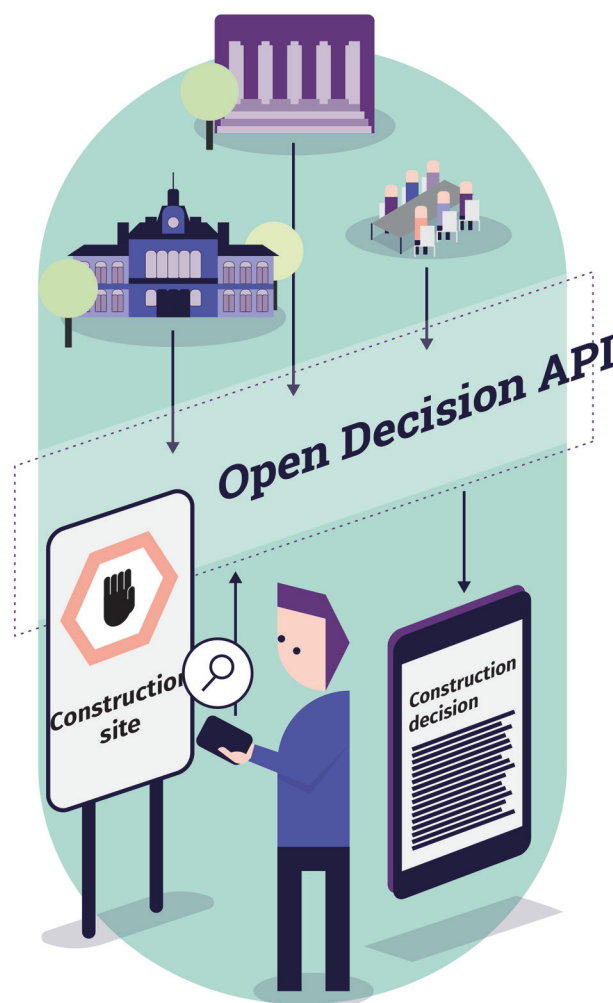
Affordable housing, new bicycle lanes or perhaps a school renovation? Easy-to-use applications help citizens find out what the future has in store for their neighbourhood.

The **Open Decision API** makes municipal decisions and decision-making processes more transparent and accessible to the citizens. For example, city council, committee and board agendas and records can be published along with their attachments as open data. The data can be filtered by date, keywords, and location for easy access. The API also enables combining the information with data from other sources.

When information is published in a structured format as open data, it can be utilised in many different ways. For example, applications can combine data from several cities or include data from other sources.

In addition to the API definition, the Six Cities have also created an open source reference implementation of the Open Decision API.

The international Popolo standard (www.popolo-project.com), a model for relationships between organisations and people, has been utilised in the information model.



Where is the Open Decision API used?

- Helsinki, Finland
- Espoo, Finland (in test use)
- Vantaa, Finland (in test use)
- Tampere, Finland (in test use)
- Turku, Finland (coming)
- Oulu, Finland (in test use)

What can you do with the Open Decision API?

- » Make use of categorised data on city decisions
- » Obtain decision data in a harmonised and machine-readable format
- » Search for data by date, keywords and location

The definition of the Open Decision API:

github.com/6aika/api-paatos

The open source implementation of the Open Decision API:

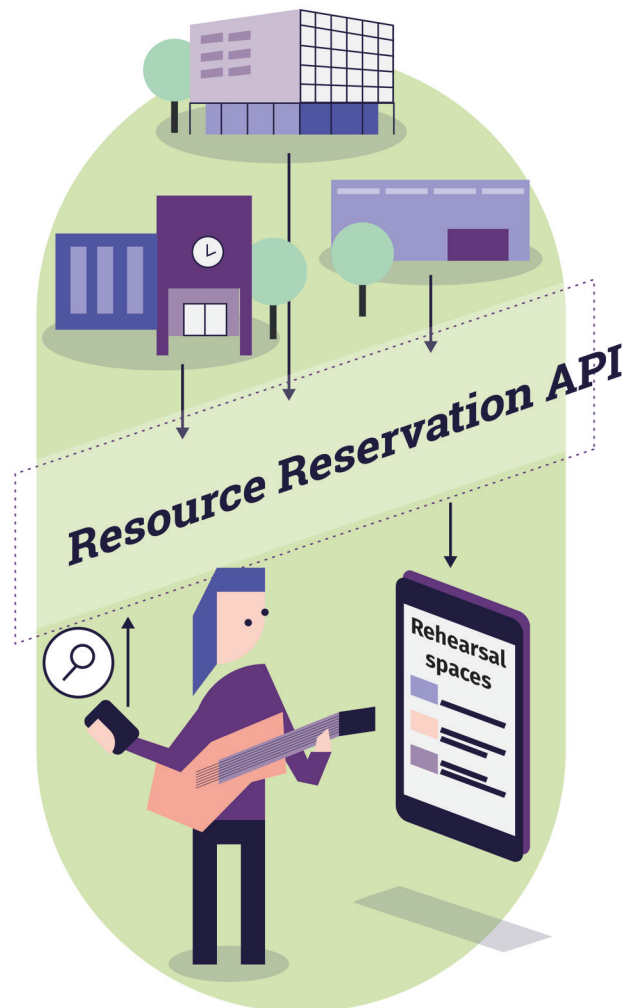
github.com/6aika/paatos

Making Use of the City's Facilities

Looking for a place to hold a book club meeting, park your boat or work up a sweat? Citizens need public spaces for a wide variety of things – hobbies, meetings and work.

Making better use of the city's spaces benefits both the owner of the space and its users, as well as the whole area by livening it up and boosting business.

The Resource Reservation API makes making reservations for facilities and resources quick and easy. The API enables users to find and reserve public spaces and resources, such as 3D printers, video projectors, or sewing machines. The results can be filtered for example based on type, purpose, location and availability. The API also makes it possible to implement booking applications that are scalable from city to city.



Where is the Resource Reservation API used?

- Helsinki, Finland
- Espoo, Finland

What can you do with the Resource Reservation API?

- » Make reservations for resources managed by a city
- » Search for available rooms
- » Make and modify reservations

The definition of the Resource Reservation API:
github.com/6aika/api-resurssienvaraus

Keeping the Citizens Moving

The availability of real-time, location-based information through user-friendly services makes choosing the most suitable transport option easier, encourages more citizens to use public transport, and also invites visitors to explore the city.

The CitySDK Linked Data API offers unified and direct access to open transport, mobility, and location data from government, commercial, and citizen sources. Designed to work closely with other open source projects such as OpenTripPlanner, Analyst, Open311 and OpenStreetMap, the API opens up a multitude of possibilities for linking datasets and providing location-based information to users via a variety of platforms.

Amsterdam, the lead pilot city in the mobility domain, is using the CitySDK Linked Data API to improve both the availability and richness of location-based information. Several apps have been developed using the API, including a simple web app that provides public transport timetable information based on the user's location.

The API allows multiple layers of data to be snapped to the base OpenStreetMap layer. For example, based on your GPS location the API can give direct access to relevant data such as multilingual information from Wikipedia, as well as the Official



Monuments database and messages on its Facebook page, Foursquare, and many more. The API enables this by making the connection between a location's unique identifier in each of these datasets.

Where is the Linked Data API used?

- Amsterdam, The Netherlands
- Istanbul, Turkey
- Lamia, Greece
- Manchester, UK
- Province of Rome, Italy

What can you do with the Linked Data API?

- » Find bus stops in specified routes or areas
- » Find traffic information for specific roads
- » Search for hotels that have charging stations for electric cars in a specified area
- » Search for roads that contain a specified word

“The CitySDK Linked Data API is an important link in the success of open data. It makes developing apps based on open data easier and thus promotes reuse. Moreover, it significantly reduces the costs of running these apps.

— **Ron van der Lans**
Program Manager, Open Data Amsterdam Economic Board

Building a Whole New Experience for Tourists

When visitors can easily access information on points of interest, events, and services they are more likely to explore, spend, and recommend. By facilitating the provision of novel digital services, cities can enhance the visitor experience and boost their economies.

The CitySDK Tourism API gives developers access to points of interest as well as route and event datasets, enabling the creation of innovative tourism services that can boost a city's economy. The API's single point of entry allows cities to be added to an application as long as the same data is available.

In early 2013, Lisbon became the first city to implement the Tourism API. It builds on existing open data initiatives such as the Open Data Lx, which provides access to more than 300 POIs. Applications based on the API give tourists the opportunity to experience the city in a completely new way by suggesting, for example, interesting attractions, themed walks, and nearby services. One example is Spot in Lisbon, which gives tourists access to information on points of interests and events, and features an online map as well as the ability to add favourite locations and view images of the city's main attractions.



Where is the Tourism API used?

- Lisbon, Portugal
- Amsterdam, the Netherlands
- Lamia, Greece
- Province of Rome, Italy

What can you do with the Tourism API?

- » Find points of interest in a given city
- » Search for event descriptions for future and past events
- » Search for routes, for example for planning themed walks and other exploration-based activities

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“By giving an access to open data such as points of interest or events, cities are providing developers with the essential building blocks for the creation of innovative services and apps that can greatly improve the visitor experience.

— **Developer**
Vodafone BIG Apps Lisbon

Ready to kick-start digital service development with harmonised APIs?

Visit citysdk.eu and databusiness.fi today!

How to get started with open APIs



Ready to get started? These guidelines contain advice and tips to help you get started with designing and implementing an open API. These are general guidelines that can be applied to any API.

1. Create an API that serves a purpose

Make sure that there is a need for an API. The need can arise either from a city organisation or an outside party, for example a company or the developer community. Design the API to be user friendly.

Design the format of the API to match its purpose.

APIs facilitate the use of data, but it's not always best practice to publish all data through an API. The format of the API (and whether it is needed at all) depends on the nature and scope of the data and its most common uses. For example, it may not be necessary to publish materials that are updated only once a year through an API, as in these cases a structurally formatted file (such as a CSV table, XML file or JSON file) may suffice.

It may be justified to create an API if the data is updated constantly or the intention is to offer more diverse functionalities. The data accessed through the API is just as up-to-date as the data accessed directly from the database, but outsiders do not need to be granted access to the database itself.

The diverse functionalities of an API come in use if the goal is to be able to filter the data e.g. by time or location. For example, an API providing access to public transportation timetables and route information includes many functionalities that facilitate the use of the data.

It may also be necessary to implement two-way APIs, through which the data is transferred from the user to the database and from the database to the user. For example, feedback can be processed with the help of a two-way, functional API: it can be used to submit feedback to the city, but also to search for feedback using various criteria.

Sometimes it may be a good idea to offer an updatable batch processing file alongside the API. This enables the creation of parallel solutions, and the implementation of the API will not pose restrictions on the way the data can be used.

2. Find out what others have done

It's not necessary to reinvent the wheel. For example, the 6aika APIs contain many useful features that have been proven to work and are being utilised in several applications and by several companies. Find out what experiences other cities have had when implementing APIs. You should also test the services they have created. What issues have they come across and what things have been especially useful for them in their projects? Finalise your own plans only after gathering enough information.

3. Convince your organisation of the API's benefits

In order to convince your city to create an API, be active and well-prepared. Find out who the key people that can get the project up and running are and try to win them over. Also make sure that you find an owner for the API as early on in the project as possible. At this point you should also think of the ways in which the API could benefit the city.

These benefits may be

- Better availability of information both internally and outside the city
- Less overlapping work within the city and between cities
- Simplified work processes
- Cost-savings resulting from less overlapping work and simplified processes
- Better-quality data (e.g. feedback format, harmonised event data, more real-time data)
- Reduced silo-effect (APIs can increase the interaction between the city and its interest groups)

You can get most use out of the API if it can also be utilised internally in the organisation. For example, it is possible to distribute information to other departments in the organisation without having to train them to use the source system. The API can also be used as the basis for your online services. The possibilities are endless.

If the API is also utilised by the organisation itself for its own purposes, its weaknesses and areas of improvement will come up faster. This ensures the functionality of the API and guarantees a seamless information service.

Key people may be

- CIOs and ICT managers
- Technical experts with knowledge of the field and its needs
- Communications managers
- Representatives of relevant fields (for example, you may need assistance from representatives of the Public Works Department or equivalent when planning an issue reporting API, or the Department for Communications to implement an event API)
- Representatives of other relevant parties, such as the finance department or the planning department

Get the most use out of the API by using it as a part of your city's services.

Think of the questions you want to ask ahead of time. These, of course, depend on the kind of API you wish to implement. When planning an issue reporting API, it's a good idea to ask representatives of the Public Works Department to provide information on the kind of feedback they receive, its format, what systems are used to process the feedback and whether there are any problems with the way it is currently handled that could be solved with the help of a new application. Typical feedback issues include abandoned vehicles, potholes, broken streetlights, and so on.

In the case of an event API, on the other hand, you should ask the departments that handle event data to provide information on the types of event data they maintain, what systems they use, what format the data is stored in, whether they are required to input the data in multiple systems, and if there are any problems with the current way things are handled.

4. Assess and evaluate the background systems, data sources and processes

In order to create a sustainable solution, you should determine the best way to implement the API in your city in particular. For example, cities usually already own a case management system or a system for processing feedback. You should take into consideration the lifecycle of the system and assess whether you should implement the API into the existing system. Sometimes it may be a good idea to wait until the end of the old system's lifecycle and include the open API in the procurement order for the new system that replaces it.

Offer support to external users to ensure the usability of the API.

To ensure a smooth integration, find out what systems and operational models the new API will be implemented on. You should also find out how the introduction of the API will affect the existing operational models and what kind of staff training is needed, so that the introduction of the API as part of the city's services is as successful as possible.

You should also determine how to best support the developers and companies that show interest in the API. This work can also be brought up and ordered when procuring the API.

5. Design a management model and define the areas of responsibility

Maintaining the open API is part of the city's services. Make sure that the API has a dedicated owner in the city who is responsible for the overall service. Carefully design the processes, roles and responsibilities that are needed to make sure that the API is functional even under extraordinary circumstances. This is especially important if the responsibility over maintaining the API is divided up between several parties. If the data provided through the API is updated often (e.g. events data), remember to also take into consideration matters related to data content maintenance.

APIs can greatly improve your city's services.

Users of the API are bound to send in questions, requests and ideas that have as much to do with the functionality of the API as the data content itself, for example possible mistakes in the content. You should make sure that the feedback is directed to the right place right away: technical requests to technical support and content requests to the party responsible for the content. Oftentimes, content creators will also send in API development requests.

If several cities are involved in the project, you should start planning a joint management model in good time.

Ensure harmonised APIs by designing a joint management model.

In the joint management model, you should agree on how to set up the development and the version control of the API. You should strive for light processes. The decision-making process must be as clear as possible in order for everyone to understand the grounds for accepting new features as a part of the API definition, so that the definition remains uniform.

The cities should appoint a person to be in charge of the joint development and version control of the API, who collaborates with the people in charge of the API in specific cities.

You should plan carefully what kinds of changes require approval from all of the cities and what should be done if one of the cities wants city-specific features to be added to the definition. You should also define how often meetings should be held, who the people taking part in the meetings are, and how matters should be handled in between the meetings.

In the maintenance model, you should also agree on possible joint maintenance and development fees, how to become a user of the API, and how to withdraw from the cooperation.

6. Determine and design the API integration or implementation

Make sure that you have recognised the basic needs that are being met by the API and the related systems, operational models and people. It is important that a specific department and a specific person from that department has been appointed as the owner of the API, in order to make sure that there is no confusion over who is responsible for making the decisions concerning the API.

If possible, use an agile software development model. This makes it easier to define the API. Of course, it is also possible to use a traditional procurement model. In this case, remember to take into consideration the matters dealt with in this document. Include further development and maintenance in the procurement order, as well.

If the city already has a related database, define how the new API services will be connected to it and how they will cooperate with it. If the system is widely used outside the city, ask other cities to take part in defining the API already at this point. This allows you to save costs in case you decide to develop or procure the API together.

If the goal is to develop an open API definition, also invite system integrators to take part in the collaboration. Many of them are interested in developing their own product according to the users' needs and wishes. Also invite future users of the API to participate in the definition work to make sure that the API will benefit all parties.

Collaborate with other cities, developers and companies to create an API that benefits both its users and creators.

7. Implement and test carefully

Present the API to the developer community as soon as possible to gain useful insights.

In **agile methods**, early and regular testing is included in the operational model, but testing and collecting user feedback can also be included in the procurement order.

To make sure the API meets its users' needs, you should present the first version of the API to the developer community as soon as possible. It is strongly recommended to test the API out on parties that have not participated in its development. They often notice things that people working on the project may have

become blind to. If the API is published for testing, both errors and good observations almost always crop up from new points of view.

It is strongly recommended that you create an independent virtual testing environment for the API, where outside developers can test their applications without it affecting the production environment.

Big cost-savings can be achieved in the implementation and development of APIs if the project is supplied to the world-wide developer community through GitHub or an equivalent service. Collaboration through open software version control services may commit developers to the project and bring up solutions that are worth considering when developing new open standards.

8. Arrange training

Implementing a new digital service is a good thing, but if the city staff has not been prepared for it properly, there's trouble in store. For example, the people who process feedback should be trained to handle feedback from the new API and to respond to it. You should also determine which parts of the personnel's replies are going to be published through the API. Each digital service that the city's staff plays a part in requires training.

9. Document

Create a website for the API and its technical specifications. Illustrate how developers can test out the API. Swagger and other such tools can be used to create a joint documentation and a browser-based user interface that can be used to test the API. You should also create instructions for the city staff on how the implementation of the API affects the service process. Describe the operational model and explain, for example, how to process feedback through the API.

If the goal is to implement the API in other cities as well, create clear instructions on how to do this.

Good documentation helps developers get started with your API effortlessly.

10. Determine the terms and conditions, the data licence and the source code licence

Document the API's terms and conditions, the licence for the data accessible through the API and the licence for the possible source code on the API's website.

Terms and conditions

Determine who can use the API and how. Keep the terms simple: create a few basic rules on how developers can use the API and what they can do with the data. For example, describe the practices of joining the API and the possible limitations for the number of data queries.

Data licence

Licence the data supplied through the API as open data using the Creative Commons (*creativecommons.org*) licence family. It is recommended to use the CC4.0 licence that also enables commercial use of the data, as long as the source is credited. Do not create your own licences, as this will only confuse the users. If images are supplied through the API, remember to also check the terms for their use and licence them accordingly.

Be clear with your licencing to avoid confusion amongst possible users of your API or code.

Source code licence

If source code is connected to the API, you also need to licence it using an open source code licence, if possible. When the code is open, the users of the API can make development suggestions on it, other users can modify the code to suit their needs and it is easier to integrate the code into different background systems.

When you choose the licences and terms and conditions for the API, make sure that it is easy for other cities to implement the code and the solutions and that the licences enable further use.

11. Go live with your API

Good discoverability of the API ensures its widespread use.

When it comes to finding users, publishing the API is not enough. The API also needs to be brought into the users' attention. It is important to get the city to commit to the API: it has a much better chance for finding its users if the key people stand behind it and the API is actively communicated about.

You should list the API in data catalogs, such as HRI (www.hri.fi/en) or Lounaistieto (www.lounaistieto.fi), as well as suitable websites (e.g. www.citysdk.eu, www.programmableweb.com). Present the API to companies at industry events and to developers at local developer events. Also make sure that all the departments in the city that might be interested in the API are using it.

12. Ensure maintenance and further development

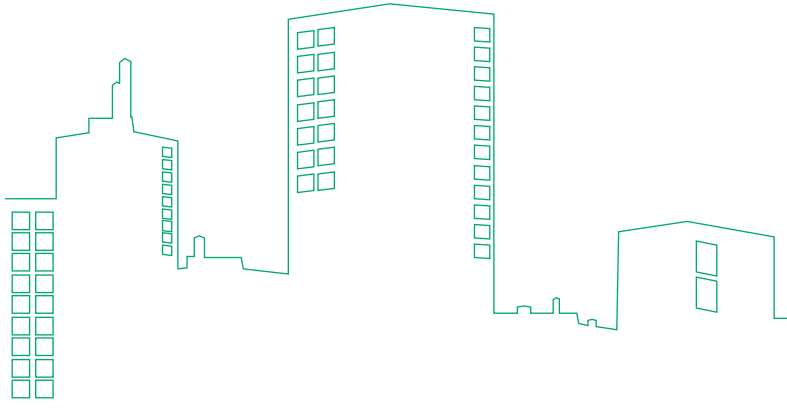
Going live with the API is only the beginning. Developers prefer to spend their time on APIs that are maintained and developed further – not on ones that stop functioning and disappear after the project or hackathon is over. You should thus design the lifecycle of the API as you would design the lifecycle of any other system. Take into consideration the lifecycle of the entire service when designing the API.

Companies are only interested in developing their business on top of APIs that have a sufficient service level agreement (SLA).

The goal should be to get the city to use the API for its own purposes, as well. This way any weaknesses or areas of improvement are discovered quickly.

In addition, it is important to receive feedback from the companies and developers utilising the API, to learn from their experiences and to improve the API based on their feedback. At best, a lively developer community will form around the API that tests and uses it and is happy to provide ideas for further development. You should create a website for the API that displays its features and lists the applications that make use of it, and where people can discuss the API. Good examples of API websites include:

- HSL:
dev.hsl.fi
- The City of Helsinki:
dev.hel.fi
- Finnish Transport Agency:
www.liikennevirasto.fi/web/en/open-data#.WDhGliOLQy4



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6Aika

Leverage from
the EU
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