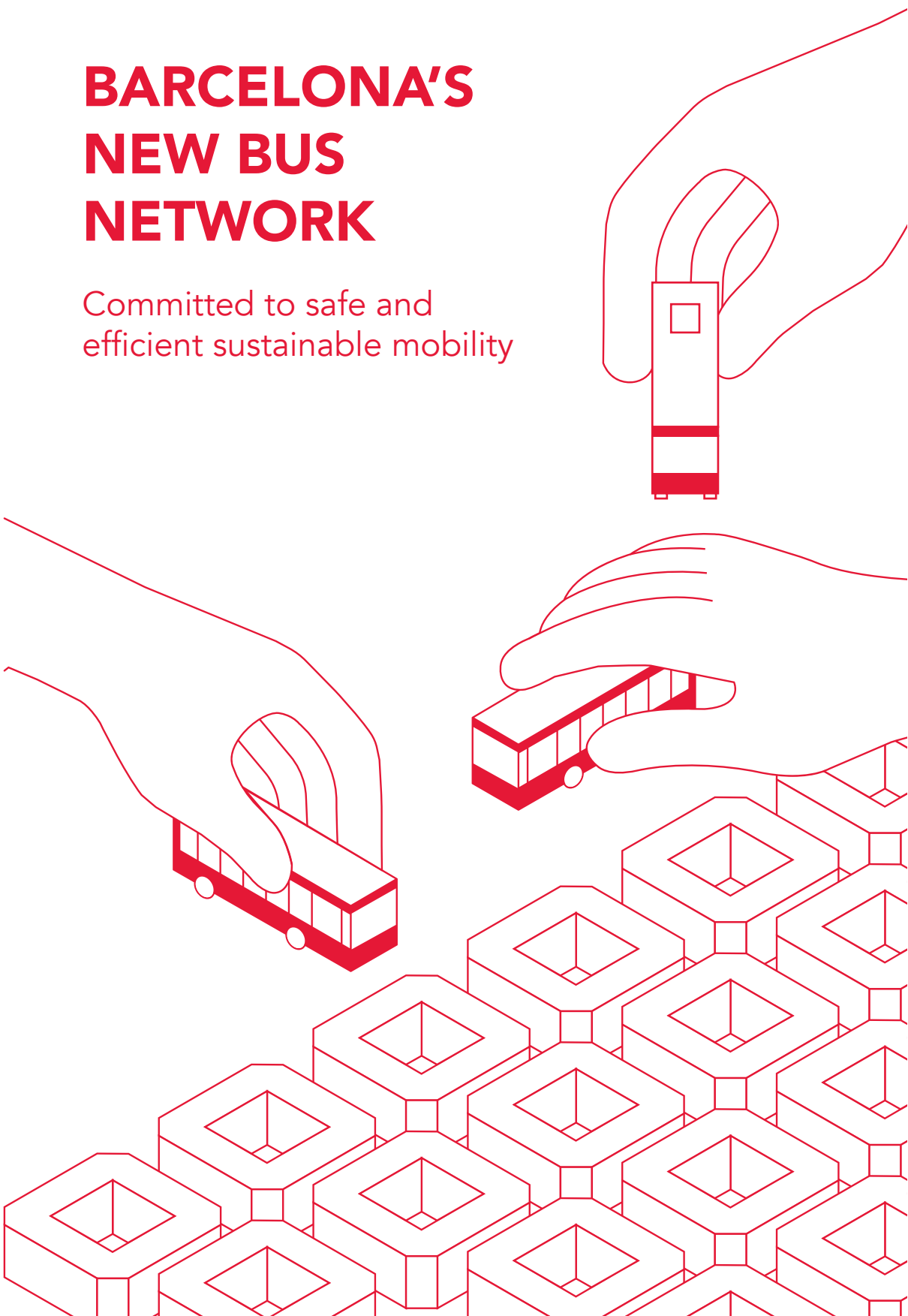


BARCELONA'S NEW BUS NETWORK

Committed to safe and
efficient sustainable mobility



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BARCELONA'S NEW BUS NETWORK

Committed to safe and
efficient sustainable mobility

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**BARCELONA,
A CITY MOVING
FORWARD**

1

Barcelona, a city moving forward

With 101.9 km² and 1,650,358 registered inhabitants (1 January 2019), Barcelona is a compact and densely populated city located between the coastal mountain range, the Mediterranean, the Besòs river and Montjuïc mountain. The Catalan capital is the main urban centre of the metropolitan region – which comprises the Alt Penedès, Baix Llobregat, Barcelonès, Garraf, Maresme, Vallès Occidental and Vallès Oriental counties and has 4,747,000 inhabitants – and the Barcelona Metropolitan Area, made up of 36 municipalities and with a population of 3,225,000 people. At present, it is the Spanish city with the best quality of life (Mercer, 2018), the second largest city in Spain in terms of population and economic importance, and the eleventh largest in the European Union by number of inhabitants.

Well-connected by land (with a large network of roads, motorways and railways of which the high-speed train [AVE] connecting it to Madrid and the French border is particularly worth noting), sea (with one of the main Mediterranean sea ports and the fastest growing sea port in Europe in 2017) and air (with the second largest airport in Spain and seventh in Europe in terms of passenger numbers (over 47 million in 2017)), Barcelona also has a significant public transport network composed mainly of its bus, metro, tram, railway and shared bicycle system (Bicing), which allows its residents and visitors to move quickly, comfortably, cheaply and in a sustainable way from one end of the city to the other and around the metropolitan area.

For some years now, Barcelona City Council has been driving a mobility model which, as the 2013-2018¹ Urban Mobility Plan (PMU) makes clear, provides alternative ways of reclaiming the city as a quality urban space by increasing the number of safe, sustainable, fair and efficient journeys, be they on foot, by bicycle or by public transport. In particular, the PMU has helped increase the number of journeys undertaken by public transport in Barcelona by 3.5%.

¹ <http://mobilitat.ajuntament.barcelona.cat>

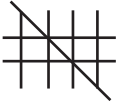
In 2012, taking into account its citizens' new needs, the wish to move towards more friendly mobility, the city's firm commitment to more sustainable public transport and the wish to increase people's quality of life, Barcelona posed the question of what its bus network should be like.

This is a network that dates back to 1906, when the first bus route between Plaça de Catalunya in Barcelona and the current district of Gràcia was created, although the extension works did not start until 1922. Since then, and for over a hundred years, this has been done through the gradual incorporation of various routes, many originally for trams – a type of transport that started running in the city in 1872 and which had more than 220 km of tramlines by 1929 – or trolley buses. The car boom of the 1960s led to a gradual replacement of trams by buses – as trams got in the way of motor vehicles – and they were gradually introduced in parallel with the growth of the city.

During this time, urban planning in the Catalan capital and its layout evolved with the creation of new urban spaces, new central areas and new pedestrian areas that did not exist when the first bus routes were created. Bus routes were thus extended and overlapped with each other to create a poorly planned network that, in addition to being hard to understand and become familiar with, was inefficient, with redundancies between routes and route designs that resulted in slower journeys and lower bus frequency.

At the same time and for over a century, Barcelona has grown with the construction of new public transport infrastructures, such as the metro, the FGC railway network, the Rodalies commuter train service, Bicing, taxis, etc., which now cover routes that could initially only be travelled by bus. This evolution, added to the fact that the number of bus users was gradually decreasing due to the network's inefficiency, made it necessary to rethink the city's bus network.

The Barcelona bus network in figures



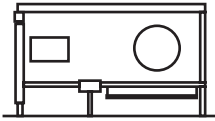
101

routes



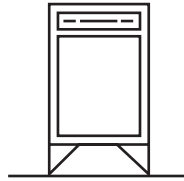
2,590

stops



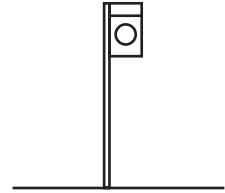
1,417

bus
shelters



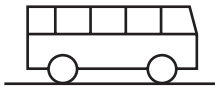
753

stops with electronic
information panels



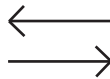
1,173

bus stop
posts



211.72

km of bus lanes



829.68

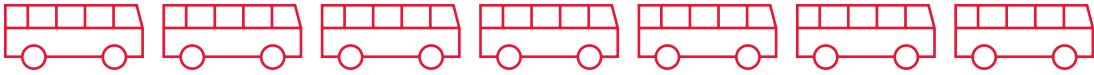
km of bus routes

How do citizens travel?

Goal of the Barcelona Urban Mobility Plan 2013-2018

2011

2018



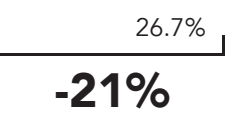
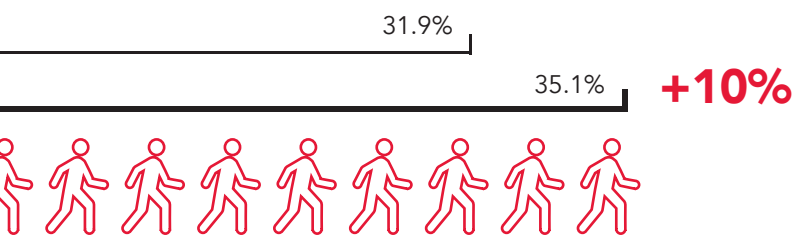
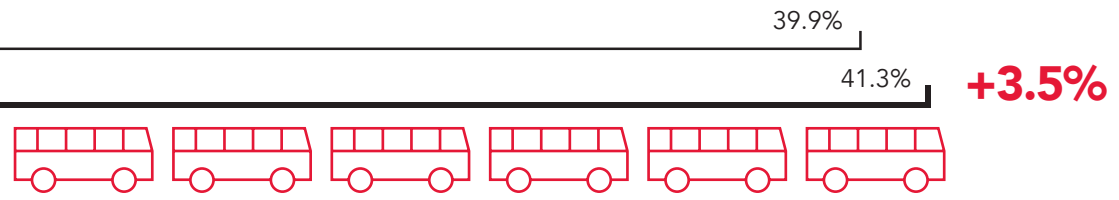
1.5%

2.5%

+67%



21.1%



THE NEW BUS NETWORK

2

The new bus network

With the aim of restructuring Barcelona's bus network and making it more efficient and easier to understand, in 2012 the City Council, together with Transports Metropolitans de Barcelona (TMB) – the public transport operator in Barcelona – embarked on the execution of an ambitious city project to redefine the regular bus network in accordance with criteria of rationality, ease of use, connectivity, efficacy and efficient use of resources criteria in order to give the public the best possible service. It is worth noting that there was technical consensus on the desirability of restructuring the bus network into one that was easier to use, more reliable and instilled users with confidence.

This was not a new need, as various documents show that the people with responsibility in the municipal government had been aware of the need to restructure the city's bus routes since as far back as the 1960s. For this reason, various approaches to carrying out this restructuring were considered at different stages, but it was not until 2012 that, after assessing a number of proposals, the project entitled "Nova Xarxa de Bus de Barcelona" (NXB – "Barcelona's New Bus Network") was launched.

The new bus network represents the transformation of Barcelona's bus network. This is a concept based on introducing 28 high-performance routes – 17 vertical, 8 horizontal and 3 diagonal – that are as straight as possible, with more and better information and signage, and on promoting measures for giving buses priority over private vehicles. This grid of high-performance routes complements some of the conventional routes operating in the city (with or without modifications) and the local routes.

The new bus network diversifies the bus service, and the overall grid is formed by a set of networks that complement each other:

- High-performance network
- Conventional and local network
- Neighbourhood bus network

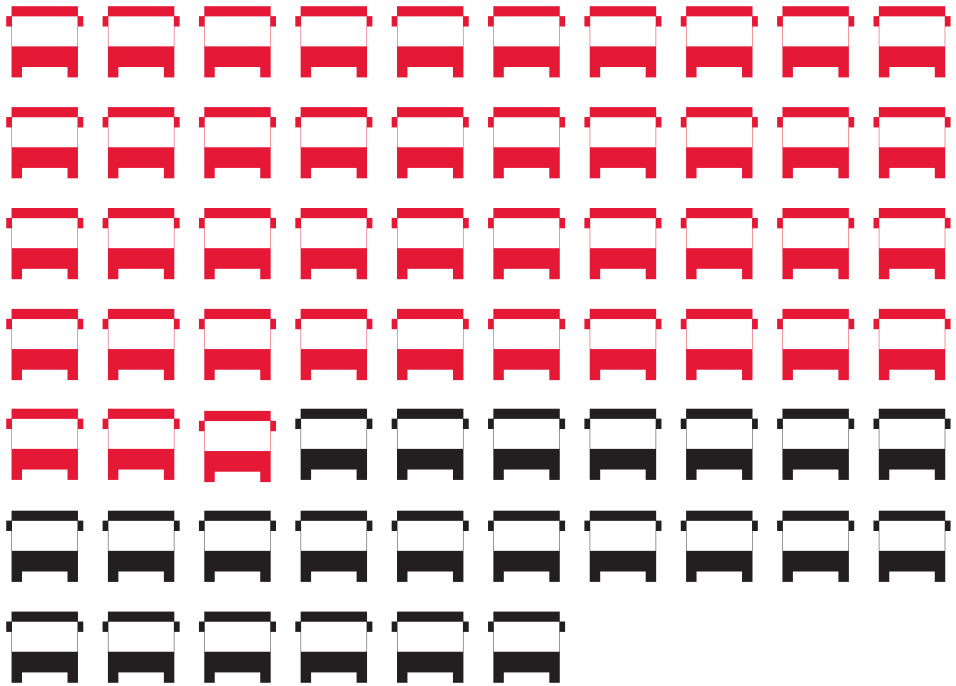
There have been two distinct moments in the new bus network implementation process. An initial stage, from 2012 to June 2018, in which the new bus network was rolled out using constant resources, i.e. by redistributing the available buses according to the contract-programme, and a second stage in which resources have been increased.

This has meant that the service to users has improved in two ways. During the first stage and among other things, the available buses were used more intelligently and efficiently, with more direct routes, making more and wider bus lanes and giving buses priority over other vehicles at traffic lights. The same buses were thus more productive and efficient and therefore provided a better service to the public.

In the second stage, besides using the buses more intelligently and continuing to work on achieving an efficient, safe and sustainable bus network, the number of vehicles in the network was also increased. Specifically, the revamping of the entire bus service has meant that, in the final phase (2017-2018), 66 more vehicles were brought in to meet the higher demand of recent years (+4.5% in 2016, and +3.2% in 2017) and local residents' needs as identified in the consultation and information process.

The gradual introduction of the New Bus Network has been an unprecedented strategic project for the city, the result of a broad social and political consensus that has included, among other actions, specific working groups (Mobility Pact, Senior Citizens' Council, etc.), open information and consultation sessions in all city districts, information talks at schools and visits to bus garages. Since 2017, this enterprise has been supported by the digital participation platform [Decidim.barcelona](https://decidim.barcelona).

66 more vehicles have been added in the final phase



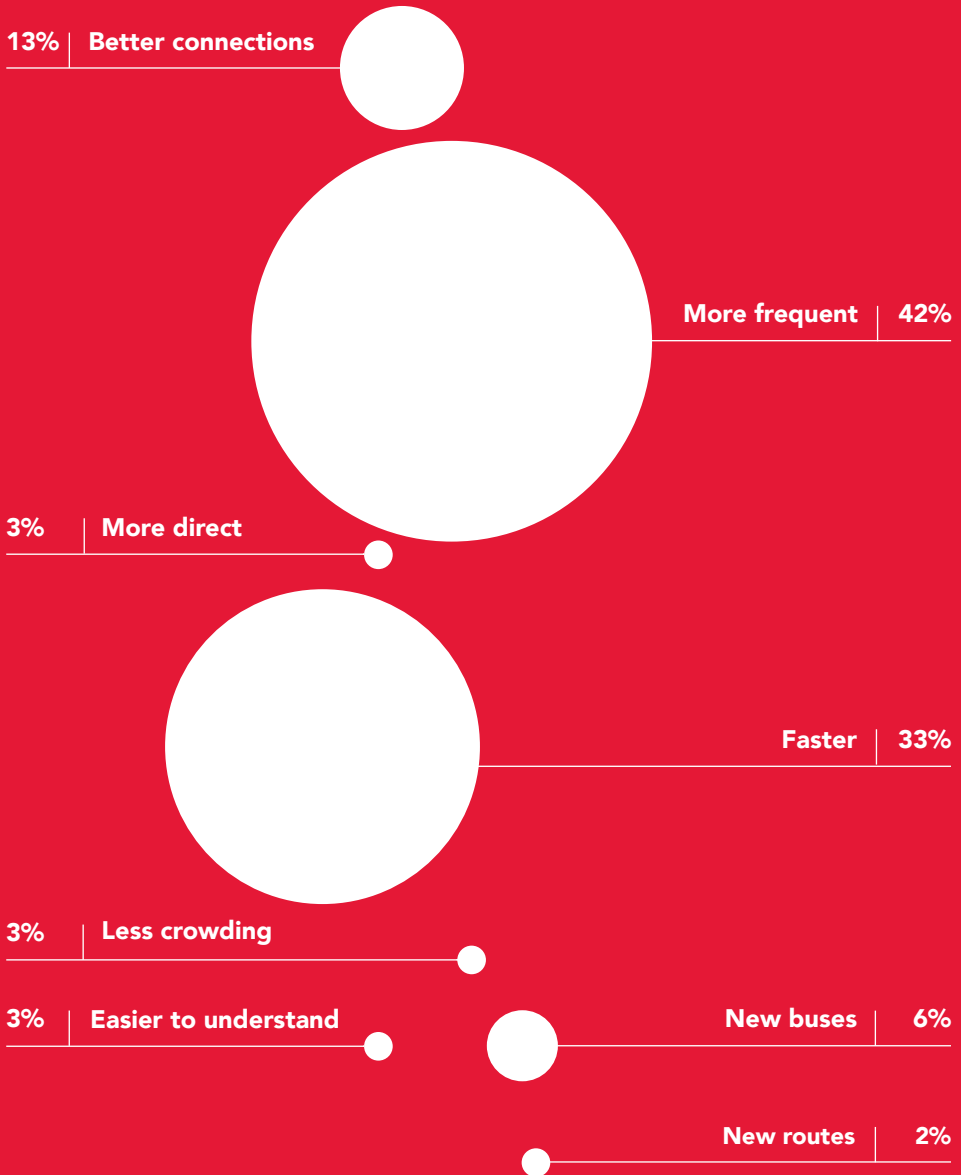
43 In new routes and high-demand traditional routes

23 In traditional and local routes

The new network model enables the regular bus service to be redesigned at a reasonable cost, boosting public transport, fighting pollution and improving the environment.

During the morning rush hour, there are around 900 buses in operation in Barcelona city.

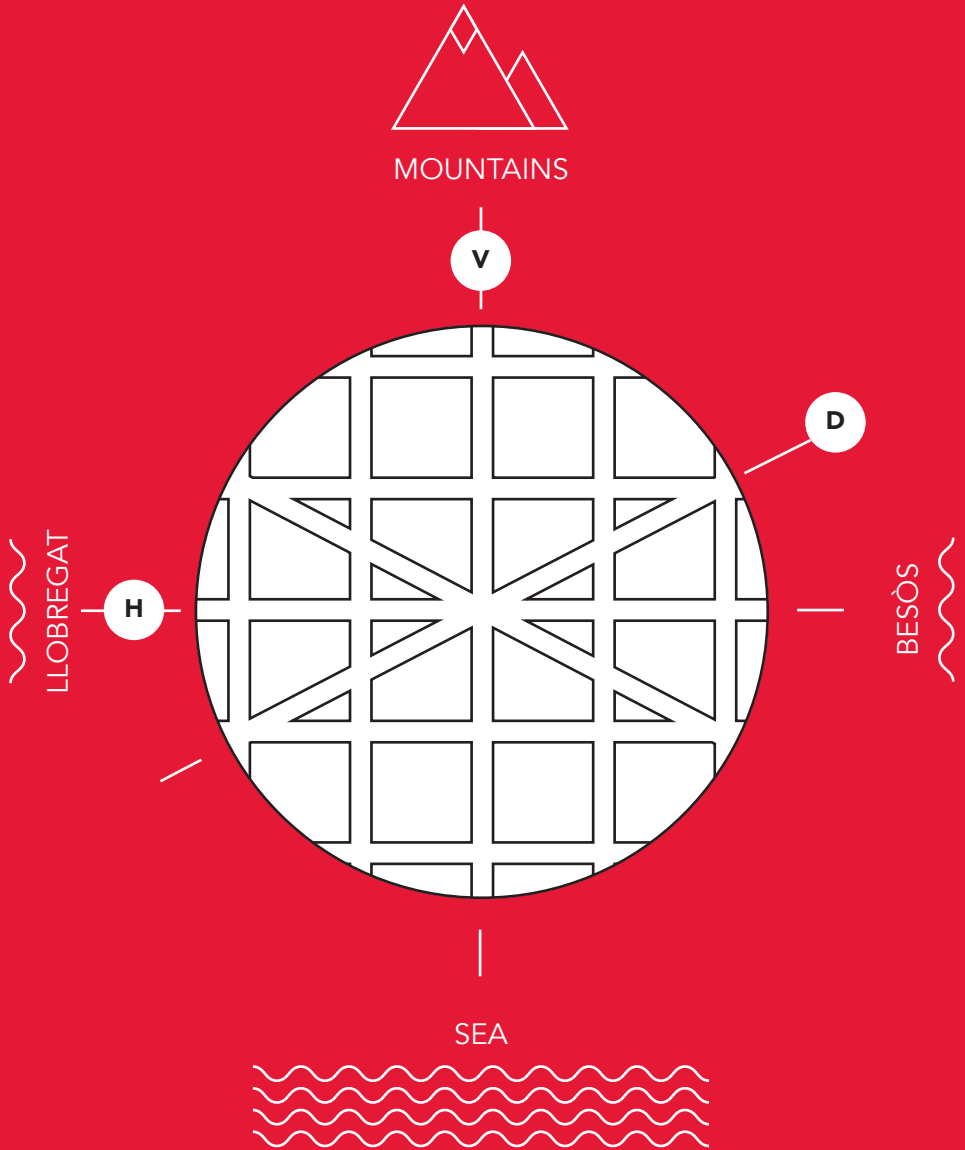
Aspects most highly rated by users



Designing the new network

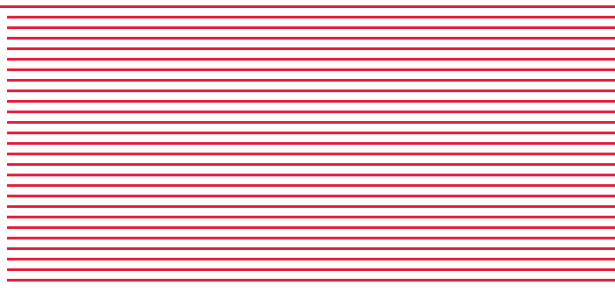
The new network pays special attention to Barcelona's structure and orography and seeks to ensure that mobility is as fair as possible. Thus it establishes orthogonal routes (that is, a set of horizontal Llobregat-Besòs routes identified in blue and with the letter H followed by an even number, and a set of vertical routes running from the sea to the hills which are identified in green and with the letter V followed by an odd number, which cross at right angles), and a set of diagonal routes (identified in purple and with the letter D followed by a number starting at 20 and increasing in tens), in order to avoid meandering journeys whenever possible, as they slow down the progress and disrupt the regularity of the service. In addition, these straight routes facilitate the implementation of measures to minimise stopping (both at traffic lights and at bus stops) and increase the regularity and commercial speed of the vehicles.

The new network – which is fairer, easier to use and understand, and more intermodal – requires a significant change in people's habits when it comes to travelling by bus. The regular arrangement and logical naming of the routes make it easier for them to understand and remember how the network operates.

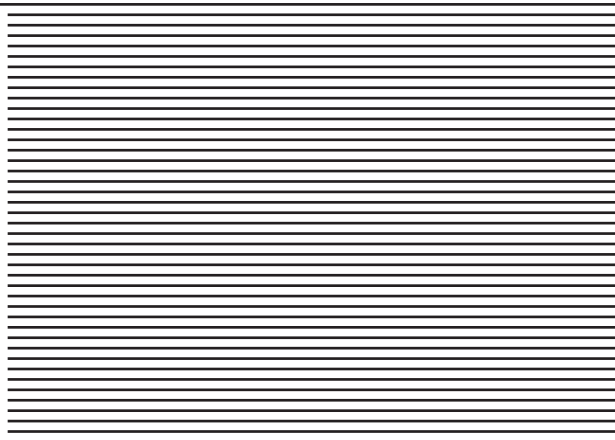


TMB has 98 bus routes in Barcelona

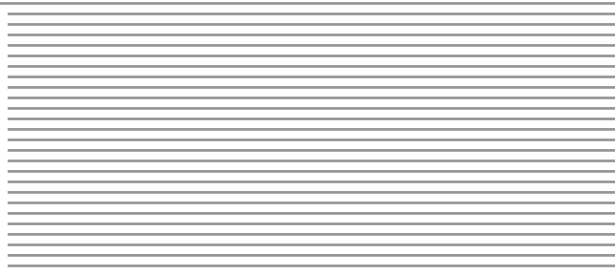
**28 high-performance
routes**



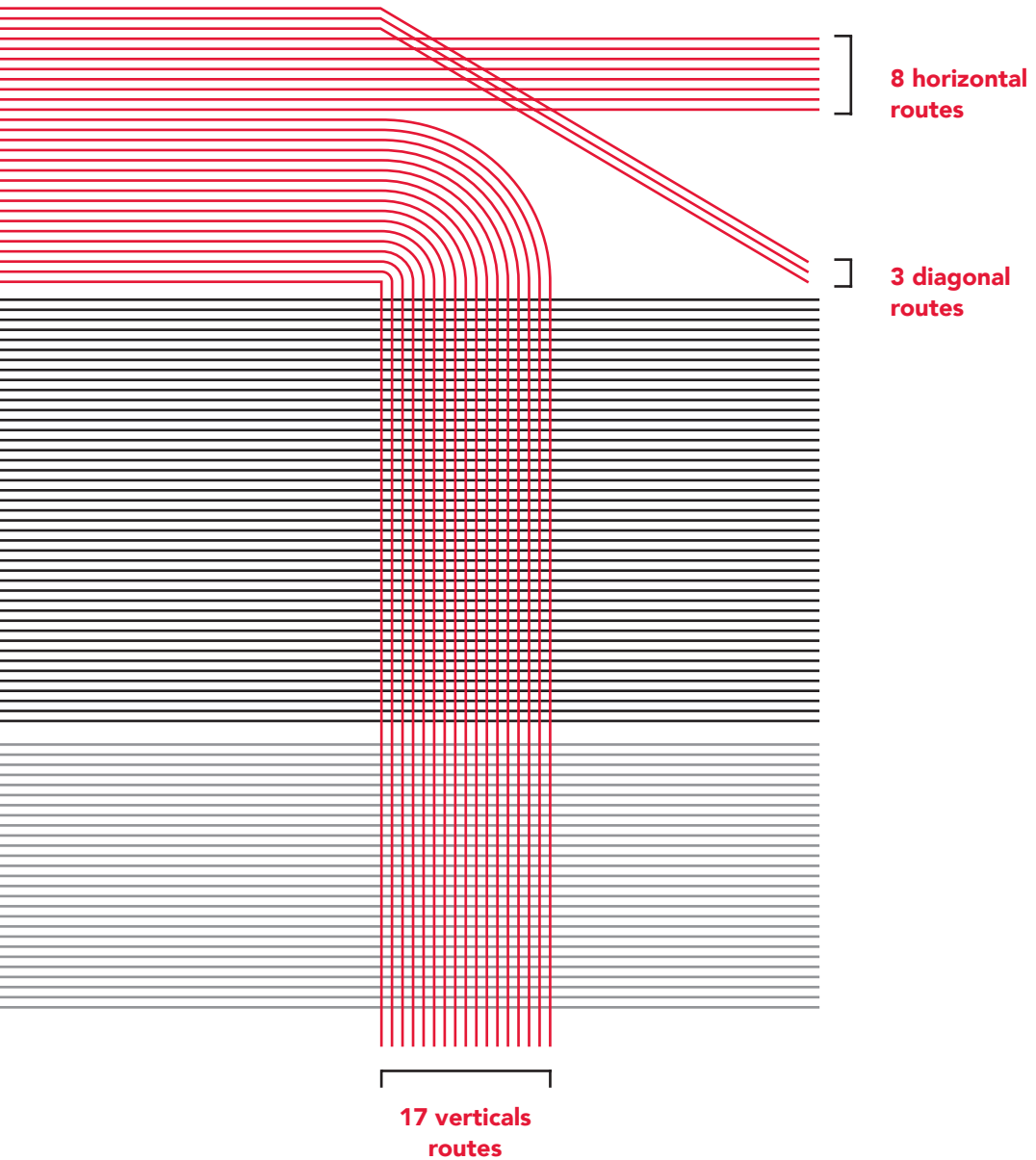
**43 traditional
and local routes**



**27 neighbourhood
bus routes**



The 28 routes in the new bus network carry around **442,300 users** per day, accounting for around **60% of overall demand**.



Aims of the participatory process



1

To validate the roll-out of the network with the city's stakeholders who are committed to mobility.

2

To involve users in the proposal for improvements to be made to the service, taking advantage of the roll-out of the new routes.



3

To inform and receive the contributions of the main territorial social stakeholders.



4

To open spaces for informing all interested residents and receiving their contributions.

5

To sporadically open information and participation spaces for specific groups.

Citizen participation process

Barcelona City Council and TMB have carried out a broad information, participation and consultation process to explain to local residents, organisations and traders the impacts, benefits and changes associated with the roll-out of the various phases of the new network. Various meetings were held with advisory and neighbourhood mobility committees and citizen councils in each area for this purpose.

More specifically, from the beginning the City Council and TMB held a number of meetings to present the new routes to groups of neighbourhood association representatives from the various city districts. These presentations, which included visits to the bus garages and the Bus Control Centre (CCB) and a preview of the official routes in the form of bus journeys, had a twofold purpose. On the one hand, to explain the change of model, the reasons for it, the outline, how it would work and the expected benefits of transforming Barcelona's surface transport system, and on the other hand, to gather any proposals or suggestions for improvement that could be added before putting the new routes into service.

As the implementation of the new network evolved, the participatory process focused not so much on explaining the new model as on the coverage offered by the various routes and the operation of the new bus network, particularly the interchange areas.

One of the initiatives that took place in this second stage of the participatory process started with a bus network proposal to the Mobility Pact's Public Transport Working Group. The work carried out with participants resulted in various contributions that were assessed and incorporated into the proposal, as far as they were feasible.

An intense amount of internal work with the districts was then carried out to reach a technical and political agreement on the proposal for the bus network. A total of four internal meetings – one diagnosis meeting, one presentation meeting and two feedback meetings – were held per district to decide exactly what changes had to be made to the original proposal in view of the needs and concerns detected in each district.

Once the changes to the original proposal had been made, the open citizen information and consultation process was carried out by means of a number of sessions held in all of the city's districts.

In addition, a proposal assessment and feedback session was held with the Mobility Pact's Public Transport Group. A similar session with a specific working group of the Senior Citizens' Council was also held, as 27% of bus passengers are aged over 60, a segment of the population that requires specific information on the safe use of public transport.

The goal of the territorial sessions was to share the full proposal for the New Bus Network in order to fully understand it, discuss it and make it easier for people to put forward improvements, based on their own everyday knowledge, before it went into operation.

It is worth highlighting that each route has required an exhaustive study of the journey to analyse aspects such as how it crosses other routes, where to place stops, interchanges, or how to favour travel to priority facilities such as healthcare centres, schools, etc. This is a painstaking task aimed at achieving a fully connected network designed step by step in a very densely populated city to provide high-quality surface public transport.

The last phase of the process has also involved, and been complemented by, the digital participation platform [Decidim.barcelona](https://decidim.barcelona). This is where announcements for in-person events (to facilitate attendance by interested parties), all the documents worked on (such as plans and presentations), and the minutes and proposals from sessions have been published. In parallel to this, the public has submitted a considerable number of proposals online, some of which coincided with those made at the face-to-face sessions. The platform ensured open, shared and active participation in the process.

A total of 1,750 people took part in the participatory process in person, and 384 proposals were received. Of these, 259 arose from the information and consultation sessions, and the remaining 125 were proposed directly by the public through the [Decidim.barcelona](https://decidim.barcelona) platform.

Of all the contributions analysed, 60% were resolved either as improvements to be made to the project (41 requests incorporated) or by justifying and explaining the various aspects of the project.

The new bus network is the result of a painstaking task aimed at achieving a fully connected and intermodal network that is easy to understand, designed step by step in a very densely populated city to provide quality surface public transport.

THE NETWORK IN OPERATION

3

The network in operation

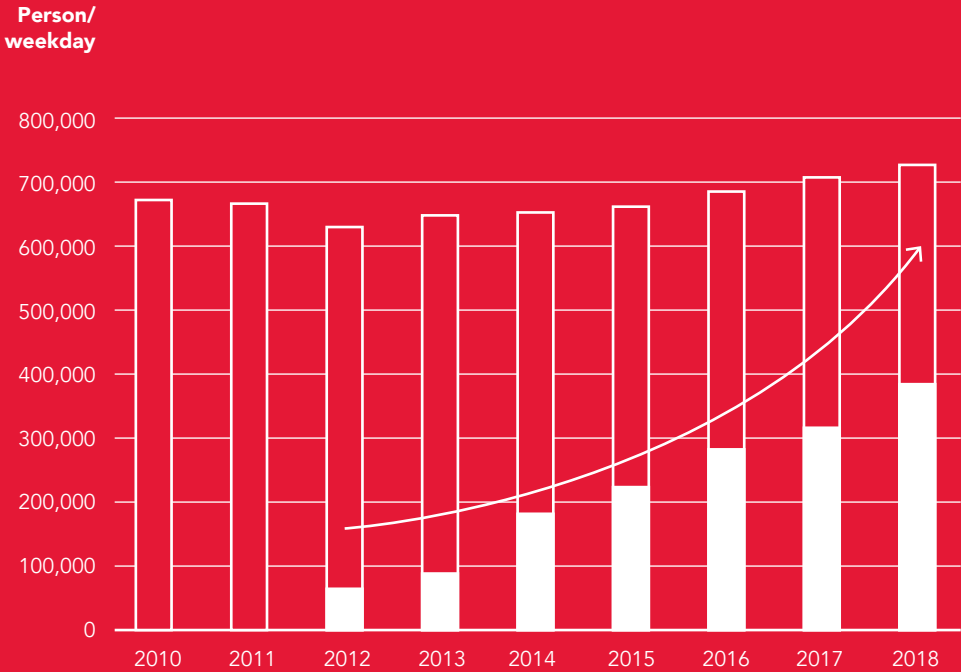
In view of the complexity of deploying the new network and the change in mobility habits that it entails, it was finally decided to carry it out in a number of phases, with a view to assessing and improving the various aspects and issues that might arise in its roll-out and to gradually consolidate management of the change in the city.

The aim of this phased roll-out was to minimise the infeasibility of a transitional or adaptation period. It should be borne in mind that it was not possible to simply stop conventional buses running in order to test the new network, and that routes could not be replaced gradually (when New Bus Network routes are operating, the ones being replaced must disappear) because the lack of resources means they cannot all operate at the same time.

Furthermore, and to avoid overlapping and confusion, users have had to adapt to each phase of the new routes quickly. For this reason, a prior information campaign was carried out to make the change of routes easier. At the same time, the entire bus operation has had to make an effort to adapt to the requirements of the new network (new journeys, managing the regulation of new bus frequencies, signs, the Control Centre, etc.).

Barcelona City Council and TMB put the first new bus network routes into operation on 1 October 2012. These were the diagonal route D20, the horizontal routes H6 and H12, and the vertical routes V7 and V21. And autumn 2018 saw the last five routes deployed. During the final process some changes were made to eight existing routes of the new network: H6, H8, H10, H14, H16, V13, V15 and V17. Finally, 30 the network's 43 conventional routes have remained the same and 13 have been changed. As regards the local service, one route has been modified and three new ones have been created.

No. of weekday validations on the bus network route



Traditional and local routes



New network routes

Roll-out

The roll-out of the new bus network has entailed a significant change in surface mobility and has resulted in a number of infrastructure improvements. Barcelona City Council has been in charge of carrying out the necessary work to adapt the city to the new road layout required for the new bus network.

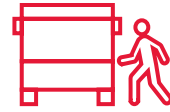
Among other things, this has involved creating or modifying bus lanes and pavements or roadways to facilitate bus manoeuvres, improving priority and signs at traffic lights, and measures to make the related public spaces more amenable and accessible to the new network: more information at bus stops, new paving, new pavement routing, conditioning and levelling tree pits at stops to improve accessibility, action on roadside trees and remodelling pedestrian crossings and turns to allow buses through.

All these actions have been carried out to improve the regularity of the bus routes in the city, reduce people's waiting times at stops, increase the convenience of stops – which are placed at intervals of 320 metres, i.e. less than the length of three blocks in L'Eixample, except in the city centre, where there is a stop every two blocks – and, overall, to achieve a more efficient use of the available resources. It is worth pointing out that stops are also less than 320 metres apart in hilly areas to facilitate user accessibility, in spite of the impact this has on bus speed and frequency on the routes concerned. In these areas, accessibility has been prioritised over commercial speed.

To make this possible, approximately €2 million has been allocated to each phase, and a total of about €10 million has been awarded for the execution of the works.

Benefits for the public and the city

The New Bus Network has been designed to benefit the public in their daily travel and to help Barcelona move towards a simpler, fairer and more sustainable mobility system that further encourages the use of public transport in the context of a smart city model. The new bus network benefits users and the city in several ways:



Easier to use

The new bus network is easier to understand and more intuitive to use, as the new routes are as direct and straight as possible, with the fastest possible journeys. They have been designed to be more logical, efficient and easier to use and understand, and always with users' convenience in mind.



Improved regularity

The aim of introducing priority for buses —by means of more bus lanes, segregating bus-lane zones, exclusive turns and traffic-light priority for buses— is to improve the regularity of bus services in order to guarantee the promised frequency as far as possible.



Faster journeys

thanks to various measures for prioritising buses in the city, such as the creation of bus lanes, priority at traffic lights, or double stops so that two buses can collect and drop off passengers at the same time, which saves time and results in more regular buses.



Greater Frequency

The buses are more frequent (arriving at intervals of approximately 8 minutes between 7:00 am and 9:00 pm on weekdays, and based on the demand for each route; the previous routes had buses running at an average interval of 12.3 minutes between those times). This means less time waiting at bus stops. The overall impact is less waiting time and improved quality without reducing services in any part of the city, helping to increase the appeal of surface public transport.



Maximum connectivity and better intermodality

(Taking advantage of the integrated fare system), as the network reaches every part of the city, from the Llobregat to the Besòs and from the coast to Collserola. Furthermore, it improves connections with other bus routes and other forms of public transport (such as the metro, Ferrocarrils de la Generalitat trains and the tram). The new bus network's orthogonal design results in greater efficiency, which means better use is made of limited public resources and the city is ensured a quality transport system for the future. It is worth noting that, in some cases, the new routes have made it possible to extend the coverage of the network by serving a part of the city that did not previously have a bus service.



Greater sustainability

The increased number of users, more efficient routes (fewer overlapping routes) and the use of less polluting vehicles (more electric and natural gas vehicles and fewer diesel vehicles) also result in an environmental improvement for the city, with fewer emissions and better air quality.



More information for the public

The interchange areas have been signposted and the dynamic information provided on electronic signs at stops, as well as on the buses themselves, is a step forward. Likewise the improved information provided by the TMB app mean this is now an information tool and a guide to the network. The travel assistance tool for the blind or visually impaired has also been improved. This is in addition to other actions and pilots, such as beacon technology.

With the network roll-out and reorganisation of the conventional routes, 80% of users travel on routes with intervals of 8 minutes or less.

Main actions on the roads

The roll-out of the new bus network has been accompanied by road infrastructure improvements to increase mobility, new route efficiency and network accessibility. Highlights:

New bus lanes: more high-quality bus lanes have been created in the various roll-out phases with a width of 3.15 to 3.20 metres. Notable examples are the double bus lane parallel to Gran Via de les Corts Catalanes, or the lane in the middle of Plaça d'Espanya, which have enabled priority to be given to bus traffic, thus making the service faster and more efficient.

More specifically, 11 new kilometres of bus lanes were created in 26 stages during the last phase of deploying the new bus network. In all, 28.4 kilometres of bus lanes have been created over the various phases, bringing the total number of kilometres of bus lanes in Barcelona to 211.72.

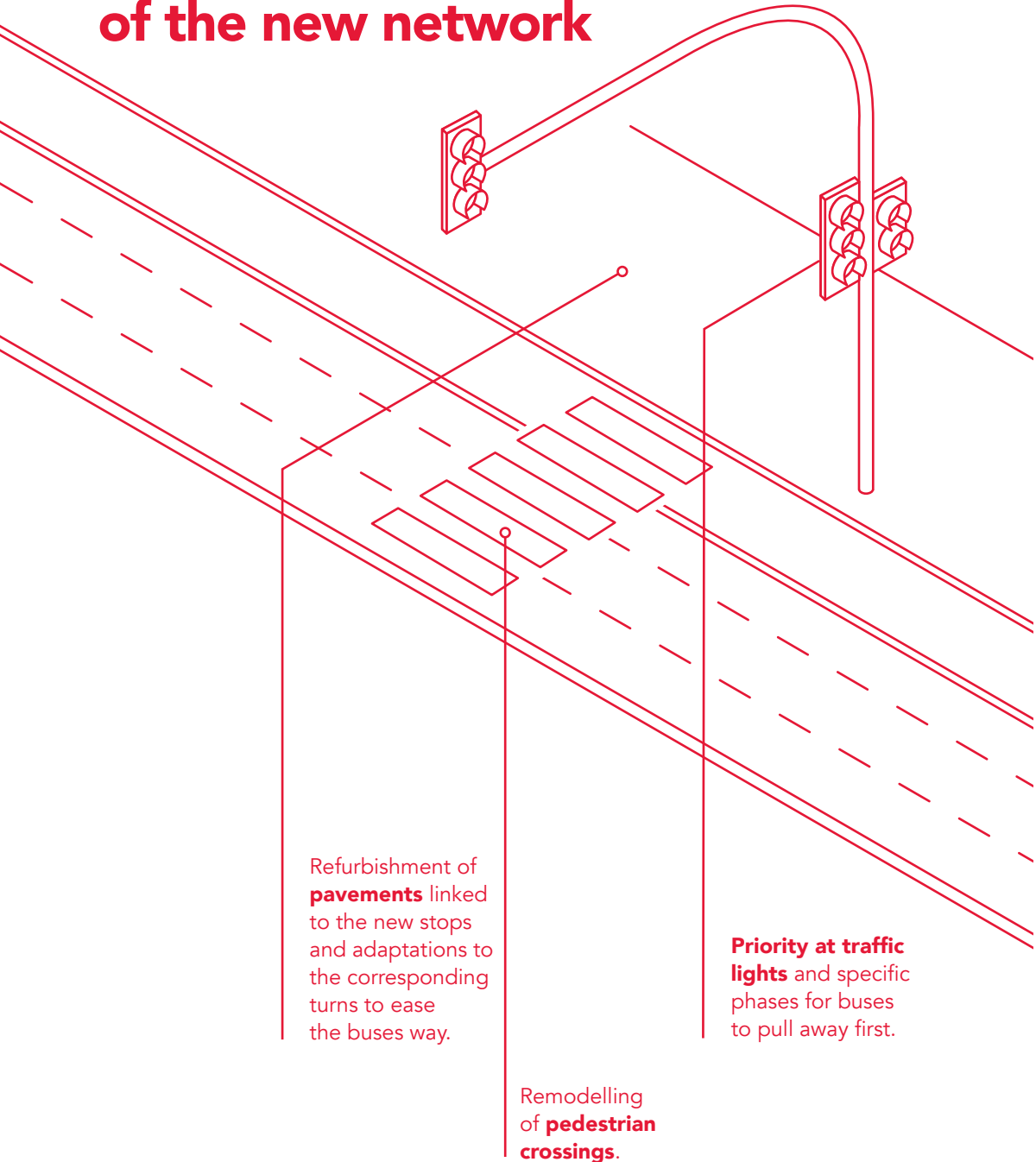
Improvements to give priority to bus traffic in the city: action has been taken to improve the speed and regularity. In that regard, traffic lights and road signs have been installed, and road markings added, to improve the fluidity of bus traffic and road safety. This includes installing new bus-specific lights and a staged plan for complementary road signs and markings.

Both the new lights for buses and the different traffic light priorities (at both micro and macro levels) give preference to buses, improving their speed and safety.

Improvements to the new network's public spaces and accessibility: these have involved building new stops, adapting some existing ones and removing others. In addition, the area round the new stops are located has been resurfaced, new pavement routing has been installed, and tree pits at and around stops have been levelled to improve bus accessibility.

Stops are one of the places where more emphasis has been put on refurbishment and improvements, as this is where the public wait and feel most vulnerable. For that reason, they have been equipped with as much information as possible, including information screens showing the bus numbers and when they are due, together with information maps of the area and each bus route. In addition, the location of interchange areas is shown by means of signs and markings. These are the places where vertical, horizontal and diagonal routes cross, in both directions, and where people can simply, easily and conveniently switch from one to another. Interchange areas – one of the new network's unique features – have been designed to give users the shortest possible distance between stops on the different routes and in accordance with accessibility criteria. In most cases, changing route at interchanges take less than five minutes. Furthermore, it should be noted that 90% of journeys can be done with a single change.

Improvements to the public space and the accessibility of the new network



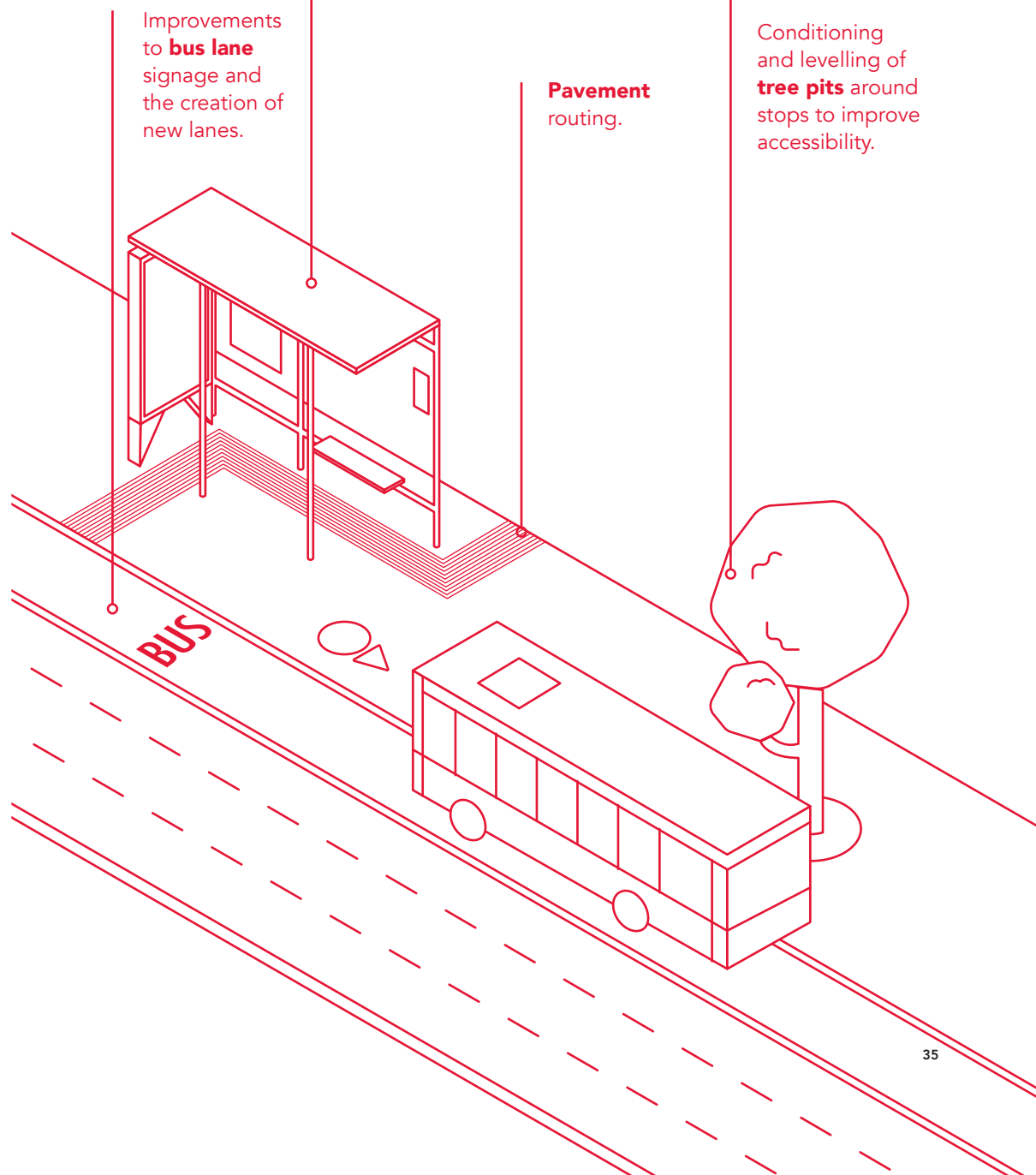
Actions at **bus stops:** construction of new stops, and the adaptation and removal of others.

Improvements to **bus lane** signage and the creation of new lanes.

Pavement routing.

Roadside tree actions (pruning, staking, replacement).

Conditioning and levelling of **tree pits** around stops to improve accessibility.



Roll-out of the network

The roll-out of the new bus network began in 2012 with the first phase and has been implemented in several phases or stages over six years. The aim of deploying the new network was to totally transform the network, so the creation of a high-performance route included modifying or removing existing conventional routes and adjustments to local or neighbourhood routes.

2012

2013

2014

2016

2017

2018



Addition of
new routes



Restructuring of
existing routes

H6 Zona
Universitaria
-
Fabra i Puig/
Onze de
Setembre

H12 Gornal
-
Besòs/
Verneda

V7 Pl. Espanya
-
Sarrià

V21 Pg Marítim
-
Montbau

D20 Pg Marítim
-
Ernest Lluch

H8 Camp Nou
-
Bon Pastor

H10 Pl. de Sants
-
Olímpic de
Badalona

H16 Pg zona
Franca
-
Fòrum/
Campus
Besòs

V3 Zona Franca
-
Can Caralleu

V17 Port Vell
-
Vall d'Hebron

H14 Paral·lel
-
Sant Adrià

H16 Pg Zona
Franca
-
Fòrum/
Campus
Besòs

V15 Barceloneta
-
Av. Tibidabo

V27 Pg Marítim
-
Canyelles

H4 Zona
Universitària
-
Bon Pastor

V11 Estació
Marítima
(WTC)
-
Bonanova

V13 Pla de Palau
-
Av. Tibidabo

V5 Mare de
Déu de Port
-
Pedralbes

V29 Diagonal
Mar
-
Roquetes

V31 Trinitat Vella
-
Mar Bella

D40 Pl. Espanya
-
Via Favència

H2 Av.
d'Esplugues
-
Trinitat Nova

V1 Dte. Gran
Via l'Hosp.
-
Av.
Esplugues

V9 Poble-Sec
-
Sarrià

V19 Barceloneta
-
Pl. Alfonso
Comín

V23 Nova Icària
-
Can Marcet

V25 Nova Icària
-
Horta

Fòrum
Campus
Besòs
-
V33 Santa
Coloma

Paral·lel
-
D50 Ciutat
Meridiana

The following three routes are highlighted by way of example:



V7, a resounding success

Plaça Espanya - Sarrià

V7 is a new route based on the old route 30. This was a meandering route used by about 5,000 people per day. V7 has transformed route 30, linking Plaça d'Espanya and Sarrià by a straighter, more direct route, thus achieving a more attractive route for users that serves approximately 15,400 people per day.



Zona
Universitària
-
Fabra i Puig/
Onze de
setembre



Camp Nou
-
Bon Pastor



Pl. de Sants
-
Olímpic de
Badalona



Paral·lel
-
Sant Adrià



Pg Zona
Franca
-
Fòrum/
Campus
Besòs



Pla de Palau
-
Av. Tibidabo



Barceloneta
-
Av. Tibidabo



Port Vell
-
Vall
d'Hebron



D40, the outcome of
experience and listening
to the city's residents

Plaça Espanya – Via Favència

D40 is a diagonal route that did not feature in the original 2012 design. It was decided it would be put into operation following the experience of implementing the first routes and after receiving the contributions in the participatory process. This route, which is based on the old route 32, carries around 26,200 users per day, as compared to the previous 22,000 users. Changing route 32 into route D40 has enabled it to be restructured, giving it greater capacity.

This is also the case with the new D50 route (Paral·lel - Ciutat Meridiana). This route, based on routes 50 and 51, is also the outcome of listening to citizens' proposals. It is a diagonal route that now serves around 17,000 users per day.

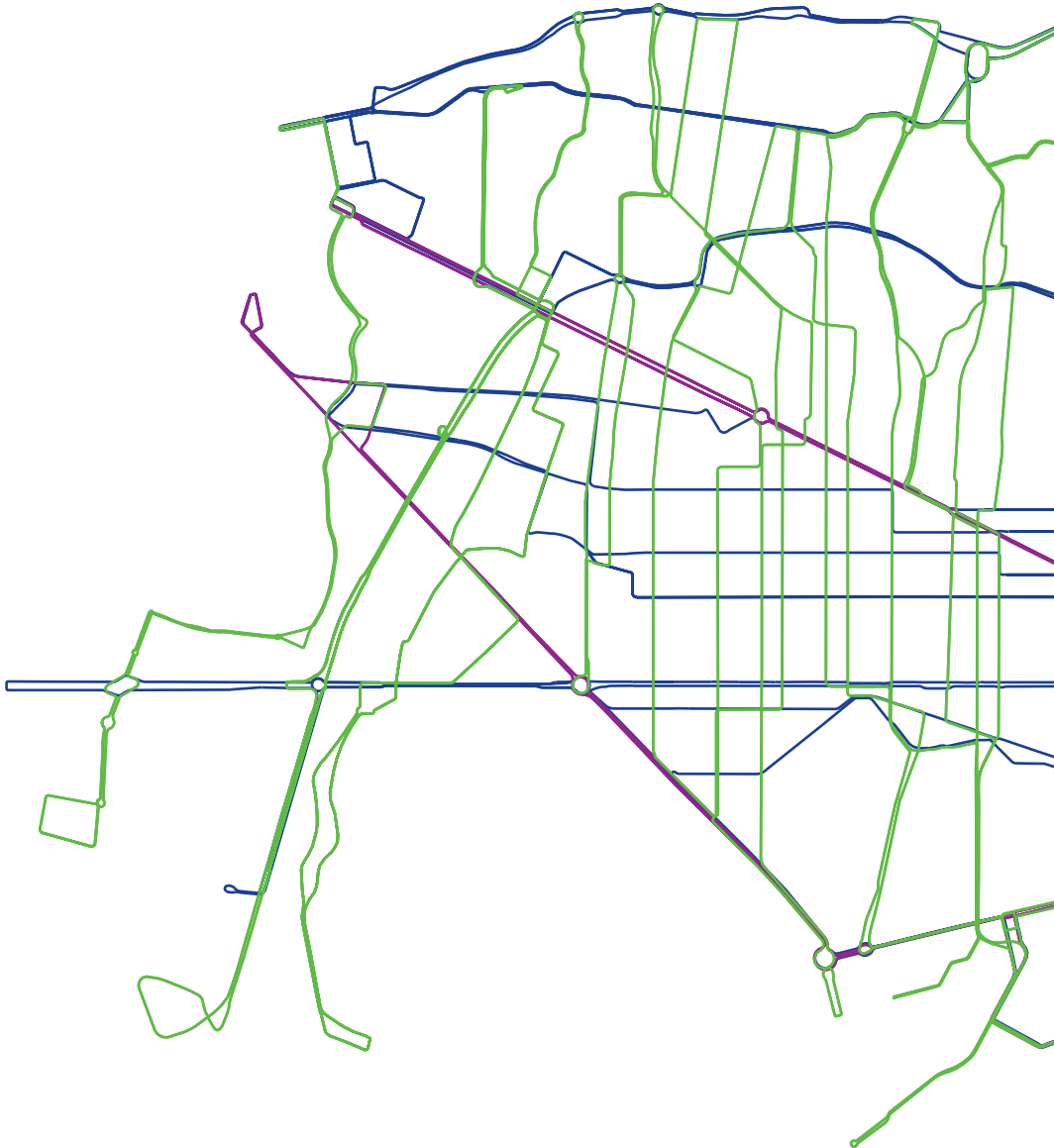


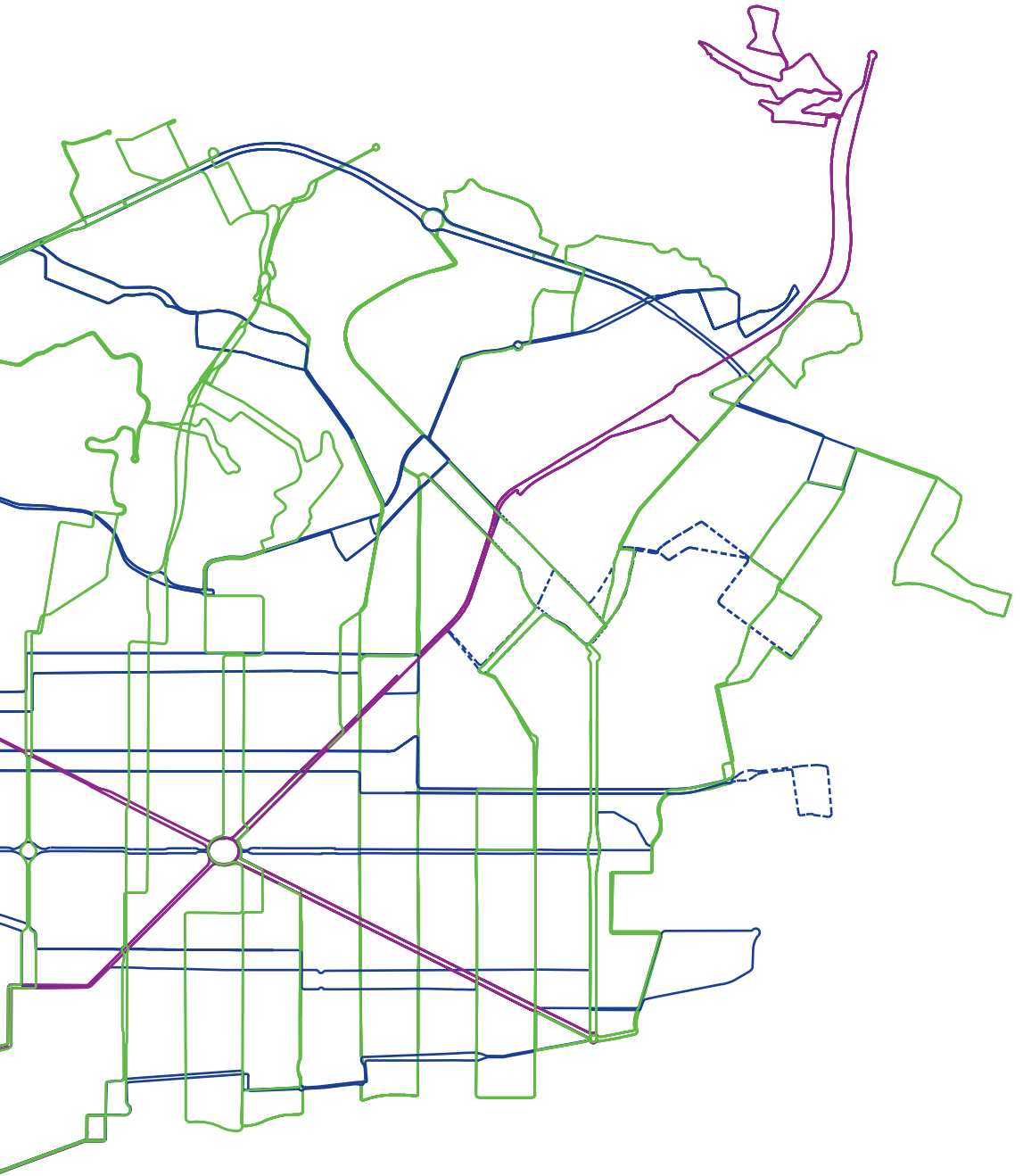
H6, the busiest

**Zona Universitària –
Fabra i Puig / Onze de setembre**

Of all the routes in the city, the H6 horizontal route is the most frequent and the one that carries the most people. It is currently substituting the future metro line 9 (under construction) and is helping to reduce congestion on Ronda del General Mitre. In its latest phase, a dual destination has been introduced on working days. Hence, some vehicles start/finish at Fabra i Puig and others at Onze de Setembre. During peak times, buses run at 4-minute intervals and carry over 36,000 users per day.

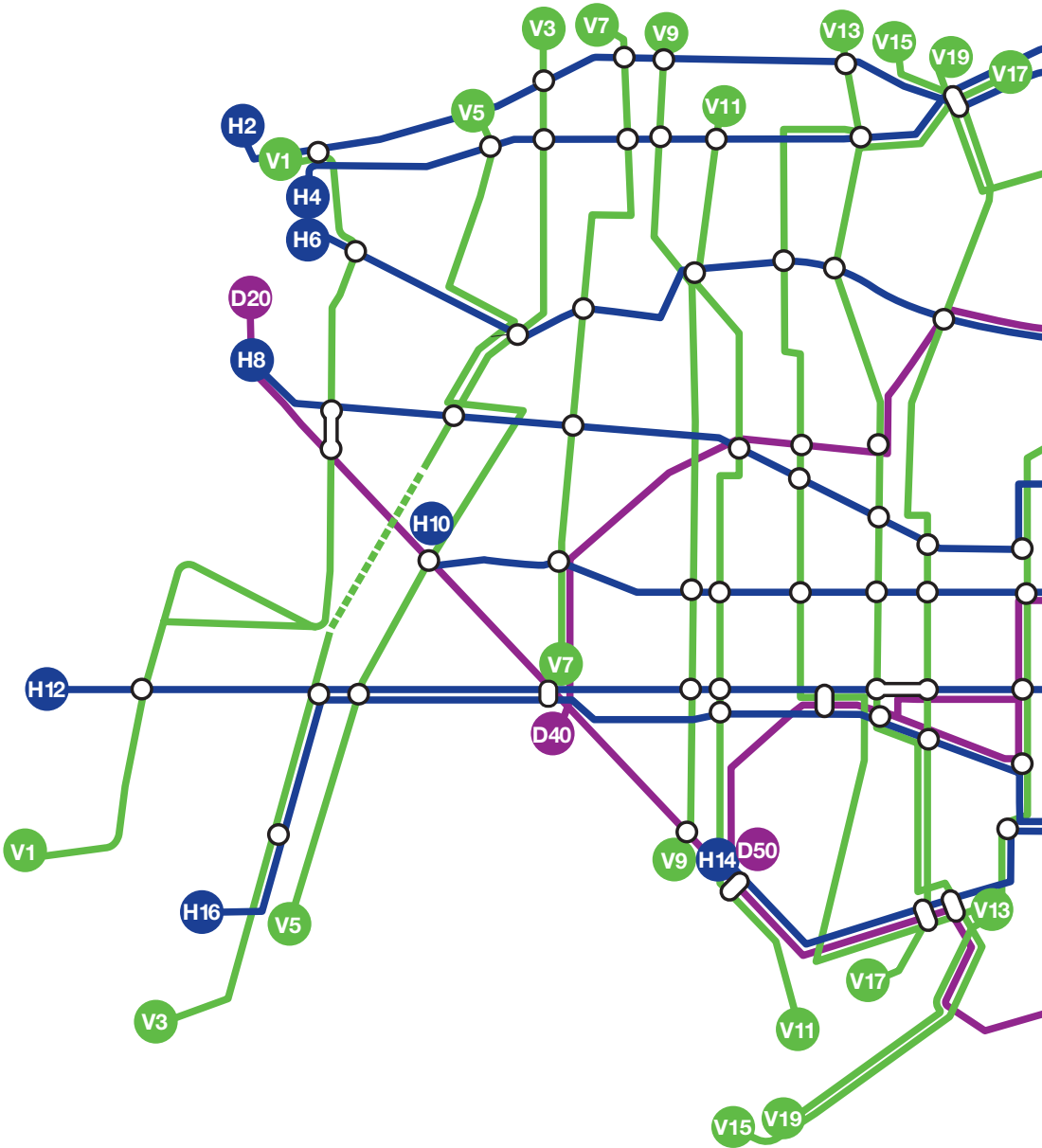
Map of the original proposal for the new network drawn up in 2012





● Vertical routes ● Horizontal routes ● Diagonal routes

Map of the new Barcelona bus network in 2018





Nov. 2012  62,000

May 2013  80,000

Nov. 2013  150,000

May 2014  170,000

Nov. 2014  220,000

Oct. 2015  230,000


May 2016  300,000


May 2017  322,000

May 2018  381,000

Oct. 2018  384,190

Dec. 2018 

 10,000
validations

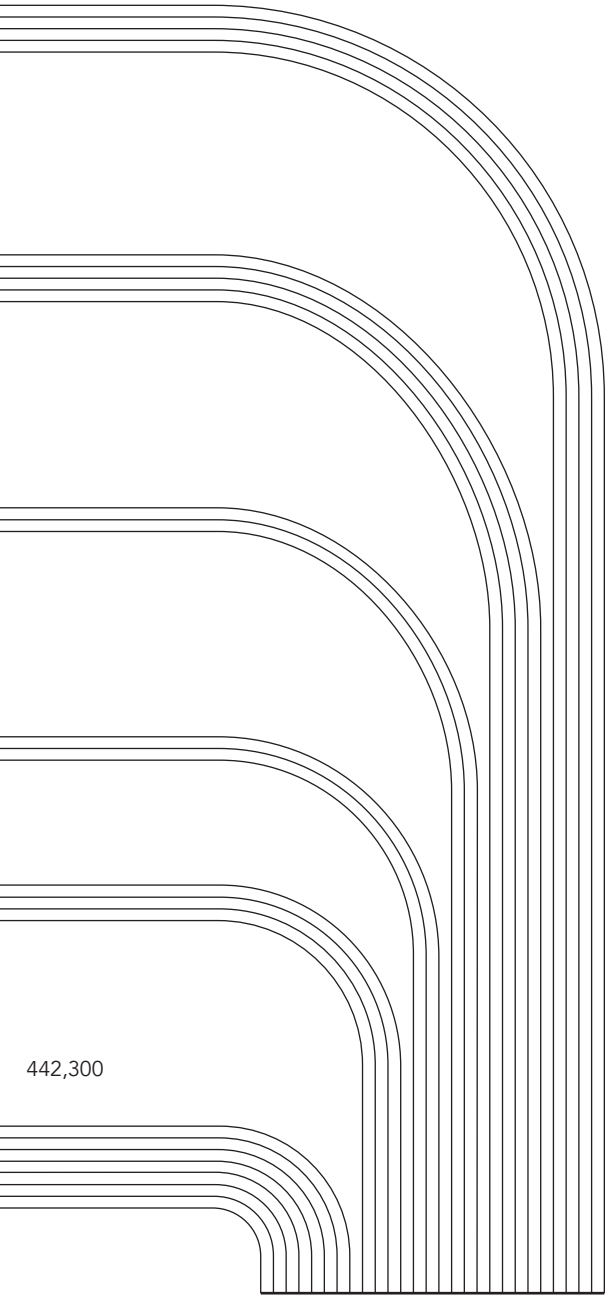
 Addition of routes to
the new bus network

Upward trend in demand

Weekday validations on New Bus Network routes

As part of the overall increase in public transport users in the city, the table shows an increase in demand when new bus network routes go into service, but also during other periods, such as from May to November 2013, when demand rose by 70,000 users, or from May to October 2018, which saw an increase of 44,000 users.

This consolidates the changes introduced, as they become routes that users want because buses are more frequent and they are more direct.

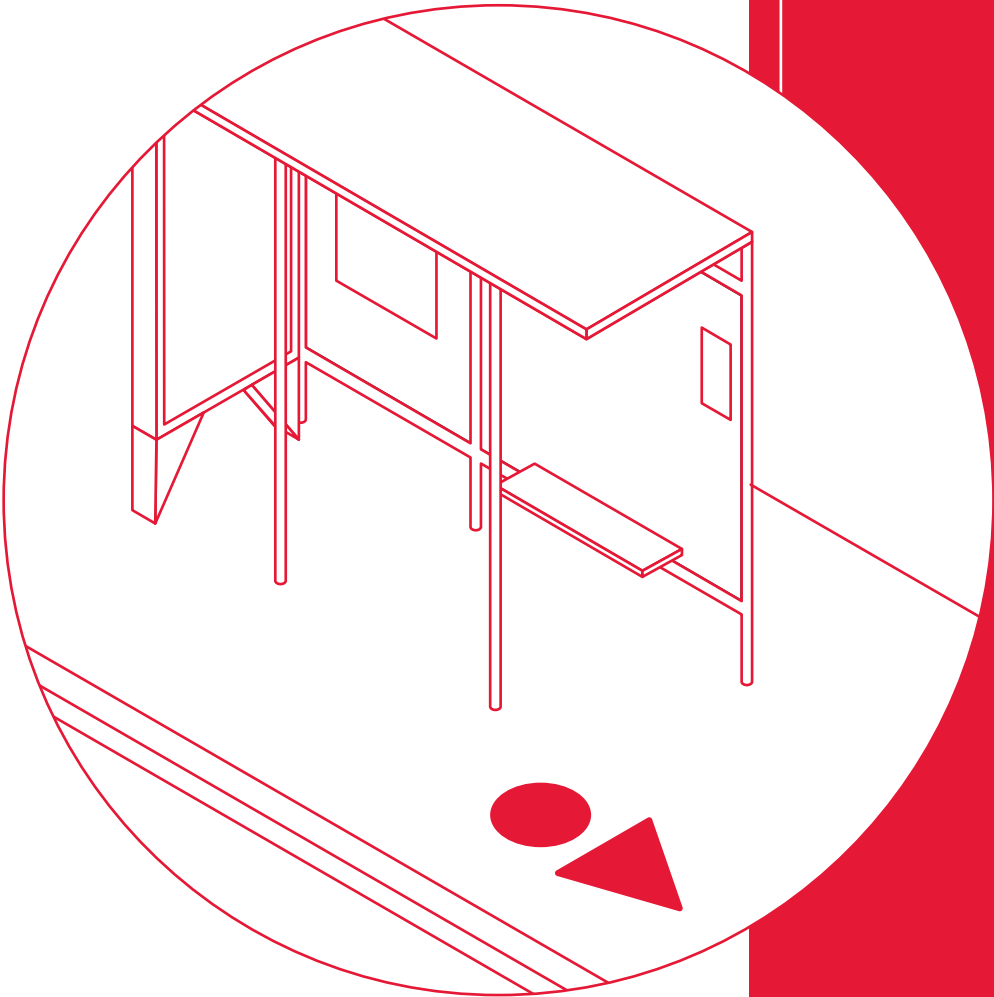


442,300

28 NEW BUS NETWORK ROUTES

Features of the new signage of the interchange areas

Horizontal guidance signs to highlight the best interchange options.

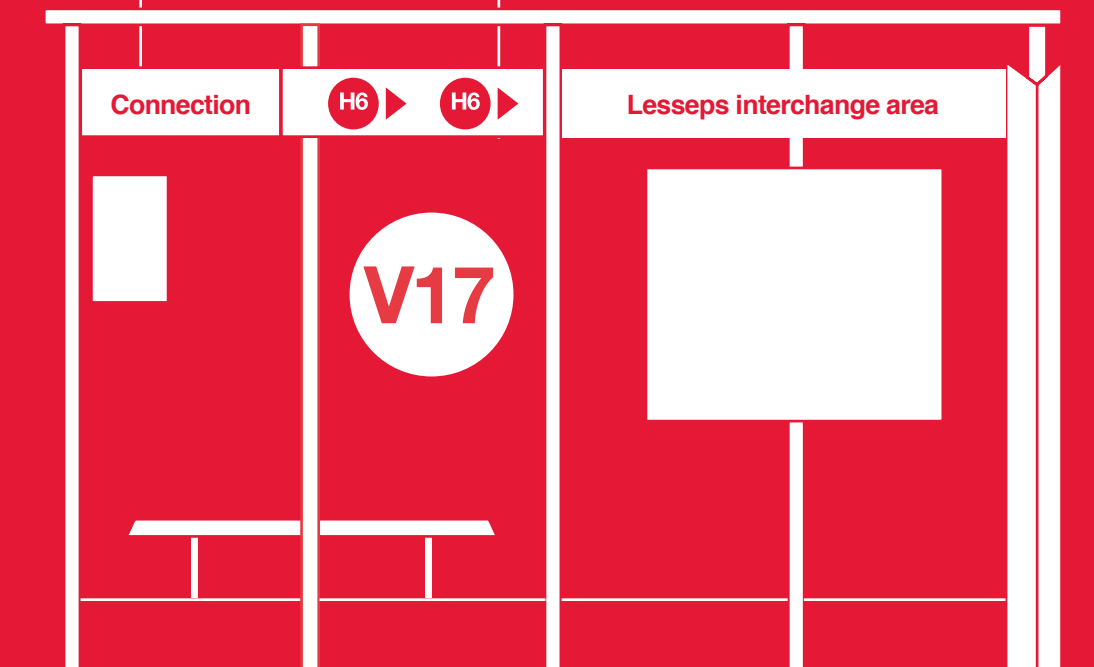


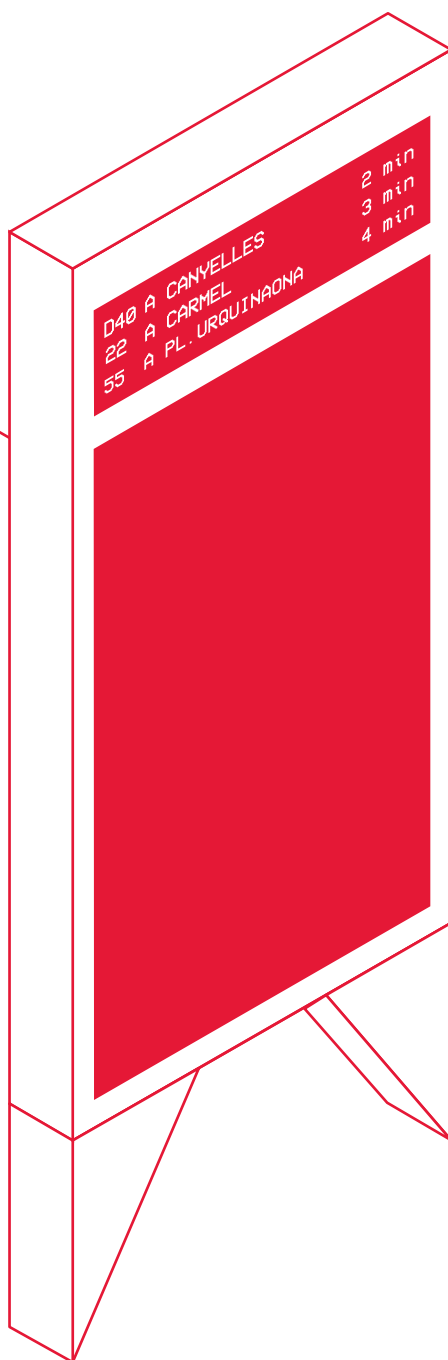
Map of the interchange area with its name.

Large signs on bus shelters, with the name of the stop, the route name and the direction.

Direction signs on the back of bus shelters showing the distance to the new bus network stops with which the route intersects.

Information panels with a map of the new network routes and detailed maps of the interchange area.





A smart network

The new bus network project has involved the use of technological advances to provide a bus network with better services for the city's residents.

- All the buses in the city have been connected and located from a number of control centres for years. In recent years, the development of EAS (Exploitation Aid System) technology has moved forward. This technology makes it possible to manage and regulate the network's bus routes to improve the location of vehicles and the system for forecasting their arrival at bus stops.
- We are working on microregulation at specific points of the routes by using tags or sensors installed on buses. This system identifies when a bus goes past and adjusts the traffic light phase to give it priority.
- Information screens have been fitted at stops to provide information on bus progress and on incidents on the network. At present, Barcelona city has 753 stops with screens showing when buses are due. This information is also available on the TMB application.
- The information provided by on-bus screens has been improved to include connections at stops and highlight interchange areas. In addition, information accessibility has been improved by adding audio.
- The TMB app has been optimised to differentiate the high-performance routes from the rest, improve the "I want to go to" section using location, provide information on incidents on routes, and the development of routing (travel assistant), which gives you real-time directions on your journey.
- There are five above-ground ticket machines at strategic points to provide a better service to users.
- In 2018 the model for the online provision of information on incidents affecting the network from the Bus Control Centre was developed. This was initially done from social media. This model will be fully implemented in 2019 and will provide information to the bus network's other dynamic channels.

Barcelona City Council and TMB have carried out an extensive information campaign to explain the changes in the network in the context of the project as a whole and of all other surface mobility-related matters with a triple focus: the city, users and the local area.

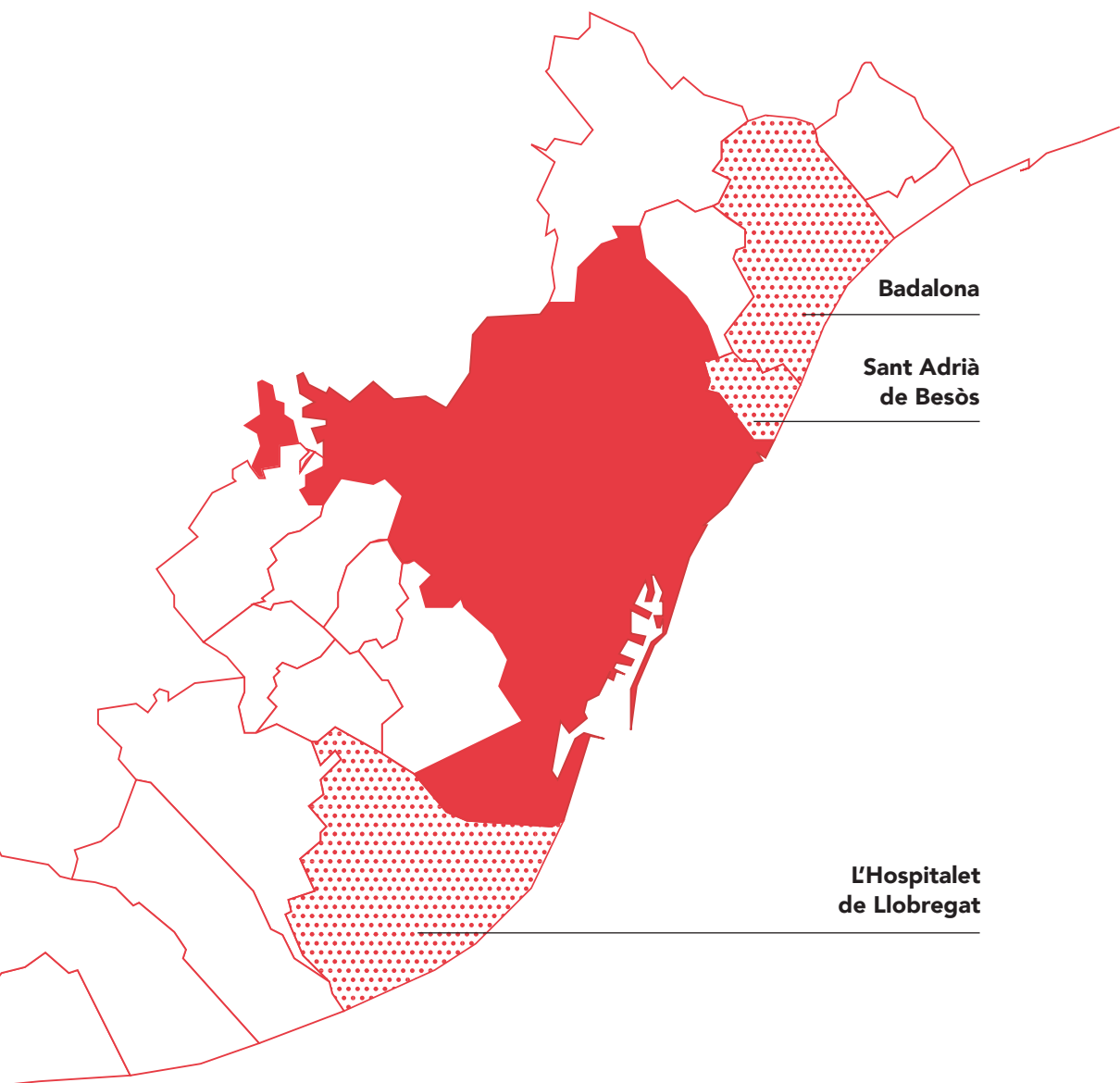
Well-informed citizens

In order to provide the public with as much information as possible about each phase of the New Bus Network and make users' travel easier, the City Council and TMB have carried out a variety of communication campaigns to publicise the details of the roll-out of the various routes and all their associated changes.

Each campaign has included general publicity on the new bus network in the press and social media, and on the radio and the internet, as well as on banners and other advertising supports in the city and on buses. In addition, information has been provided on municipal websites, at citizen help and information offices (OACs), via the citizen helpline 010, and TMB's own channels, which include its customer helpline, the TMB website, the TMB app, TransMet, MouTV, and the JoTM-Bé notification service. In addition and among other tools, the dedicated website www.novaxarxabus.bcn.cat and a specific section of the barcelona.cat/mobilitat site have been created to provide all kinds of details about the new routes in each phase and the main changes and modifications to the routes concerned.

The roll-out of the routes has been accompanied by substantial investment and resources to help people with the transition. Information has been provided on leaflets and maps showing the most significant changes to travel, taking into account the changes with the greatest impact and the most vulnerable groups. In addition, information staff have been deployed (over 200 people simultaneously during the last phase) at stops and interchange areas in the various neighbourhoods and at key facilities such as hospitals, primary care centres, old people's centres and schools in the areas affected, so that users are as informed as possible about the new routes, the conventional routes that have been replaced and the simultaneous modifications made to some routes.

In short, the information staff provided the public with essential support over a lengthy period ranging from the week prior to implementation to the week immediately following it, in order to deal with all the queries arising in each phase on the spot. An almost à-la-carte help service.




Badalona

**Sant Adrià
de Besòs**

**L'Hospitalet
de Llobregat**

 Barcelona

 Municipalities served by the new bus network

A project with a metropolitan vision

The bus network model adopted crosses Barcelona's municipal boundaries and is projected over the urban continuum, to give a structure the metropolitan area and increase access to the integrated public transport system.

So, Transports Metropolitans de Barcelona and the L'Hospitalet de Llobregat, Badalona and Sant Adrià de Besòs city councils have agreed to extend the new network to these three cities.

The H10 route (Pl de Sants - Olímpic de Badalona). That means the H10 bus mainly follows the routes of numbers 43 (Les Corts - Sant Adrià) and 44 (Estació de Sants - Olímpic Badalona), which have stopped running.

In addition, the H12 (Gornal - Besòs / Verneda) goes into L'Hospitalet de Llobregat, and both the H14 and the H16 go as far as Sant Adrià.

In 2018 the bus network's metropolitan focus was strengthened with new routes providing a service to L'Hospitalet de Llobregat (V1), Santa Coloma de Gramenet and Sant Adrià de Besòs (V33).

It should be noted that the reorganisation takes into account all the public transport services (metro, tram, the Rodalies commuter train service and daytime buses run by various operators) and is consistent with the goals of improving efficiency and making the best possible use of intermodality to favour the integrated fare system in force in the metropolitan region.

The environmental sustainability and technological development of the fleet

The new bus network has been designed for sustainability, as it moves towards a more streamlined network that avoids duplication and leads to greater regularity. It is accompanied by the technological development of the fleet, which complements the project. In that respect, TMB and Barcelona City Council are working on converting the bus fleet in accordance with both European and Catalan surface public transport guidelines for reducing emissions and improving air quality. While Barcelona's buses were already European leaders as regards low gas (CO₂ and NO_x) and unhealthy particle emissions in 2012, thanks to the use of compressed natural gas and the mass fitting of anti-pollution filters, recently efforts have also been aimed at improving efficiency, reducing consumption and restricting emissions of gases that contribute to global warming.

This has been achieved by applying hybrid technology as a first step towards the full electrification of buses, which we are also working on.

The TMB bus fleet currently includes 1,067 vehicles (excluding the tourist bus), 100% of which are adapted. Every year, those buses that have reached the end of their useful life (14-15 years in service) are replaced, and new ones – fully electric – are acquired, depending on the city's needs. The criterion of renewing and increasing the bus fleet has been to achieve an environmentally improved fleet comprising compressed natural gas (CNG) buses, hybrids and, more recently, some electric vehicles. In the case of diesel buses, two major projects have been carried out in order to reduce pollutant emissions (basically CO₂, NO_x, and PM₁₀): the fitting of particle filters with the SCRT system and the Retrofit project, which has enabled diesel and CNG vehicles to be turned into hybrids.

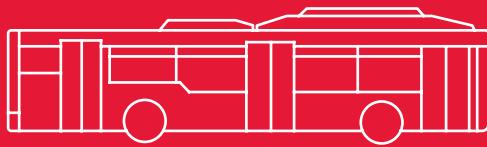
Type of bus



100%
adapted



neighbourhood buses



traditional buses



articulated buses



double-articulated buses

FUEL



383

natural gas buses



9

electric buses



439

diesel buses



309

hybrid buses

Maximum number
of buses operating at
any given time:

900

Average age
of the fleet:

9.15 years

The city now has the most advanced, environmentally friendly vehicles, including electric vehicles (articulated 18-metre and standard 12-metre buses), hybrids (double-articulated 24-metre, articulated 18-metre, and standard 12-metre buses), compressed natural gas vehicles and environmentally improved diesel vehicles, with the aim of reducing the impact bus traffic has on the environment, in terms of noise and gas emissions, and highlighting the benefits of public transport to improve air quality and protect public health.

The City Council and TMB are committed to electric buses. For that reason, a number of tests have been carried out under the European Union's ZeEUS project involving two different technologies: night charging and opportunity charging.

During the test period it was found that the night charging model does not yet meet the requirements for operating in a city like Barcelona, as the batteries do not last throughout the all the service hours. In spite of that, the plan is to see how the market develops.

As regards opportunity charging at bus terminals, tests showed this is a model that does meet the operational needs of Barcelona's bus routes. We are therefore working on electrifying the buses on the H16 route, which already has an electric charging point at the terminals and in 2019 will have seven electric buses operating on this route.

The target for 2021 is to add approximately 90 more buses and put in place the necessary electrical infrastructure to electrify four routes.

In addition, a minibus prototype has been developed under the RIS3CAT project to start electrifying the Neighbourhood Bus service. This prototype will start running in 2019 with a view to adding more electric minibuses until 2021.

Managing change

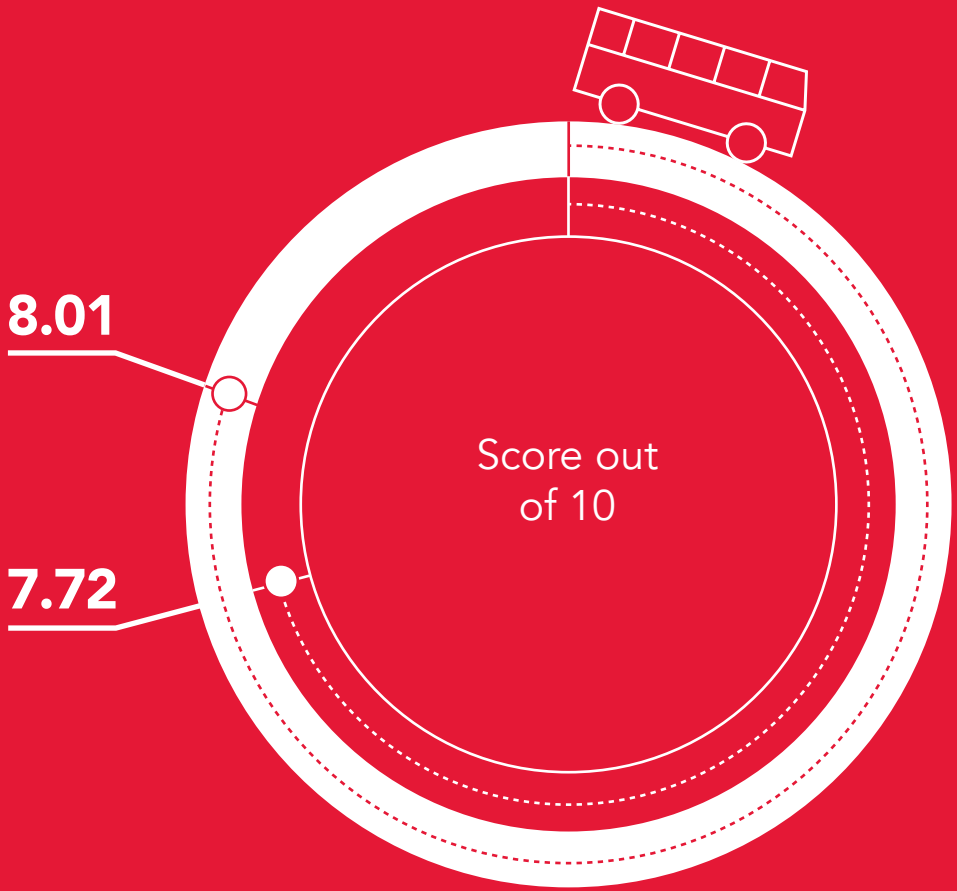
A project to transform a network of the size of the TMB network can only be carried out following a very sound technical analysis, with public participation and the strength of the human teams that have made these changes possible over six years.

In Barcelona, the transformation of the bus network has been possible thanks to the effort and involvement of the municipal and TMB technical teams, in fact, all of TMB's operating staff (drivers, control centres and route managers) whose professionalism has helped make the new network a reality by providing the public with as much information and assistance as possible and striving to constantly improve the network in order to ensure an excellent service.

Satisfied customers

Passengers using the new network rate it more highly than all the other lines. Specifically, they show an overall satisfaction rate of 8.01 out of 10 on new network lines, and 7.72 out of 10 for the conventional network, according to the 2018 customer-perception study.

Meanwhile, the overall customer satisfaction rate for the bus network is 7.88 out of 10 (compared to 7.24 in 2012).



 New bus network

 Traditional network

Final note

The roll-out of the high-performance bus network, set out in the 2013-2018 Urban Mobility Plan, has been carried out over seven years and is the most significant restructuring of the surface public transport system ever carried out in the city.

The service, which meets the needs of the 21st century, improves territorial coverage, connections between routes, waiting and travel times and bus frequency on weekdays, with intervals of approximately 5 to 8 minutes between 7 am and 9 pm, based on demand for each route.

From the first steps to the end result, the new bus network has experienced changes as a result of the participatory process, the experience acquired in the various phases and political change in the city.

Now the transformation of Barcelona's bus network has been completed, the city can be said to have a basic network enabling users to travel easily to any part of the city at very competitive intervals. The network is no longer radial, except for the conventional routes, which account for 30% of passengers and are still basically radial. This has resulted in more fairness, more frequent buses and faster travel due to the straighter routes and priority system.

Today, Barcelonians have a bus network that is simpler and easier to understand, with reduced waiting and travel times and improved connectivity between different modes of transport, one that fosters a more attractive and sustainable public transport system. More specifically, 95% of Barcelona's population enjoys a more versatile high-performance bus service less than 300 metres from their home. A bus service that takes into account the city's own peculiarities, which adapts to its changes and complements the other conventional, local, city and intercity bus routes operating in Barcelona.

Thanks to the NXB project (transformation of Barcelona's bus network), the city has a simpler and more efficient public transport system, both in terms of the service it provides as well as its environmental and financial aspects, and one that is consistent with a progressive city model focused on people.

For further information

barcelona.cat/mobilitat
#nxbus #busbcn



**Ajuntament
de Barcelona**



**Transports
Metropolitans
de Barcelona**