

**some
people
see**

















**virtual
guidance
line**

Ton van Helvert

public space mobility

what is it like for
the visually impaired?



public space mobility

- * unclear guiding cues
- * obstacles
- * traffic light without embedded sounds



public space mobility

- * stairs hard to recognize
- * marking only at top and bottom



public space mobility

* faded tactile lines...



public space mobility

* tactile paving with
(more) obstacles...



public space mobility

* tactile paving ends.....



public space mobility



To catch a bus:
..but which is mine?



UN rights of persons with disabilities

in 2006 adopted

in 2015 ratification in the Netherlands



UN rights of persons with disabilities

human rights to:

- inclusion
- personal autonomy
- participation based on equality



visually impaired persons

the Netherlands

the World

blind

76.000

39.000.000

low vision

223.000

246.000.000



more tactile paving?

...that is no option.....



what if...



these people want to go to the bus station?

what if...



he gives his destination

what if...



his smart device receives it

what if...



his smart device sends this information to the cloud

what if...



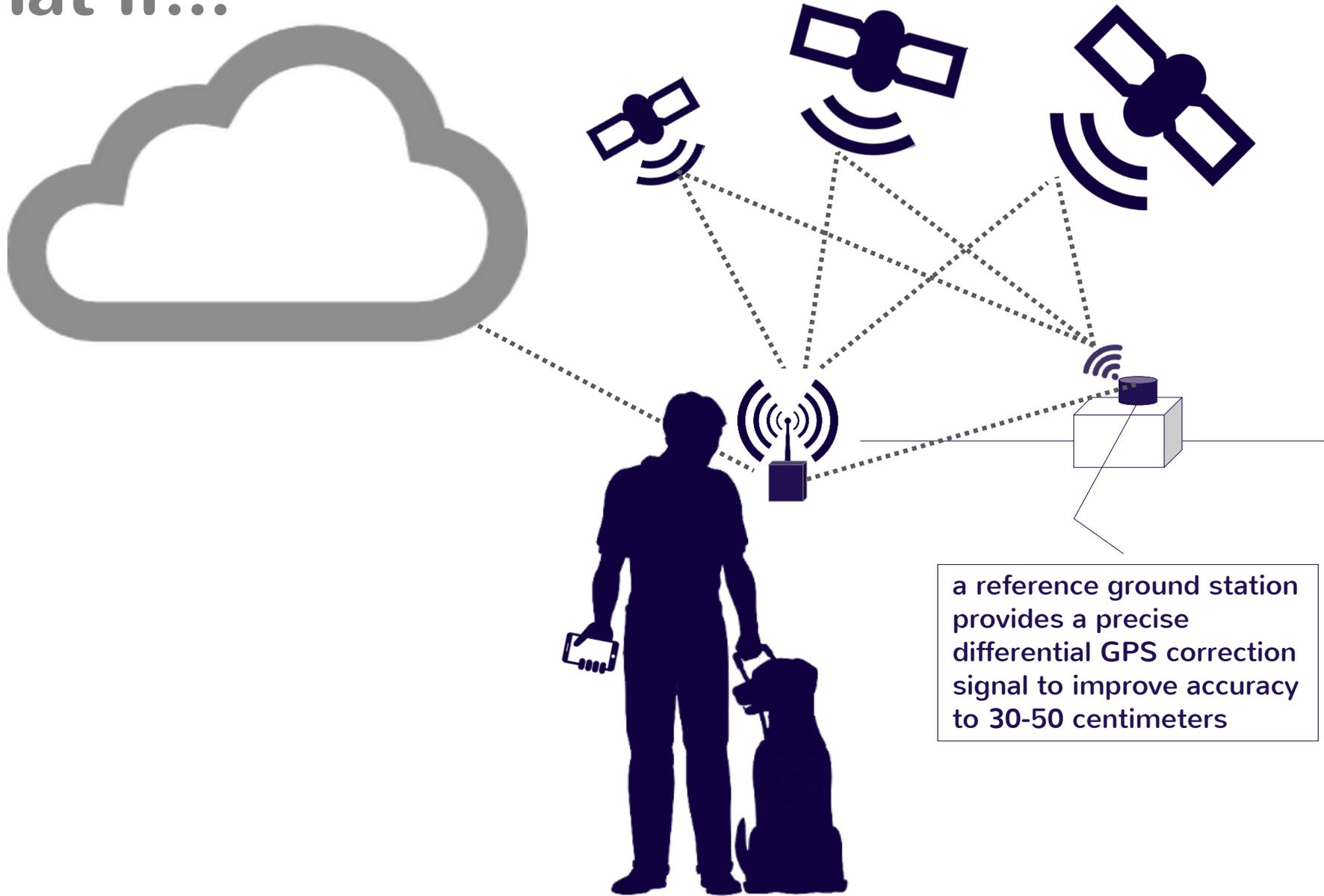
?

his smartphone
GPS is only about
2-5 meters
accurate



the cloud needs the precise location of the user
the geo-location of his destination is now known

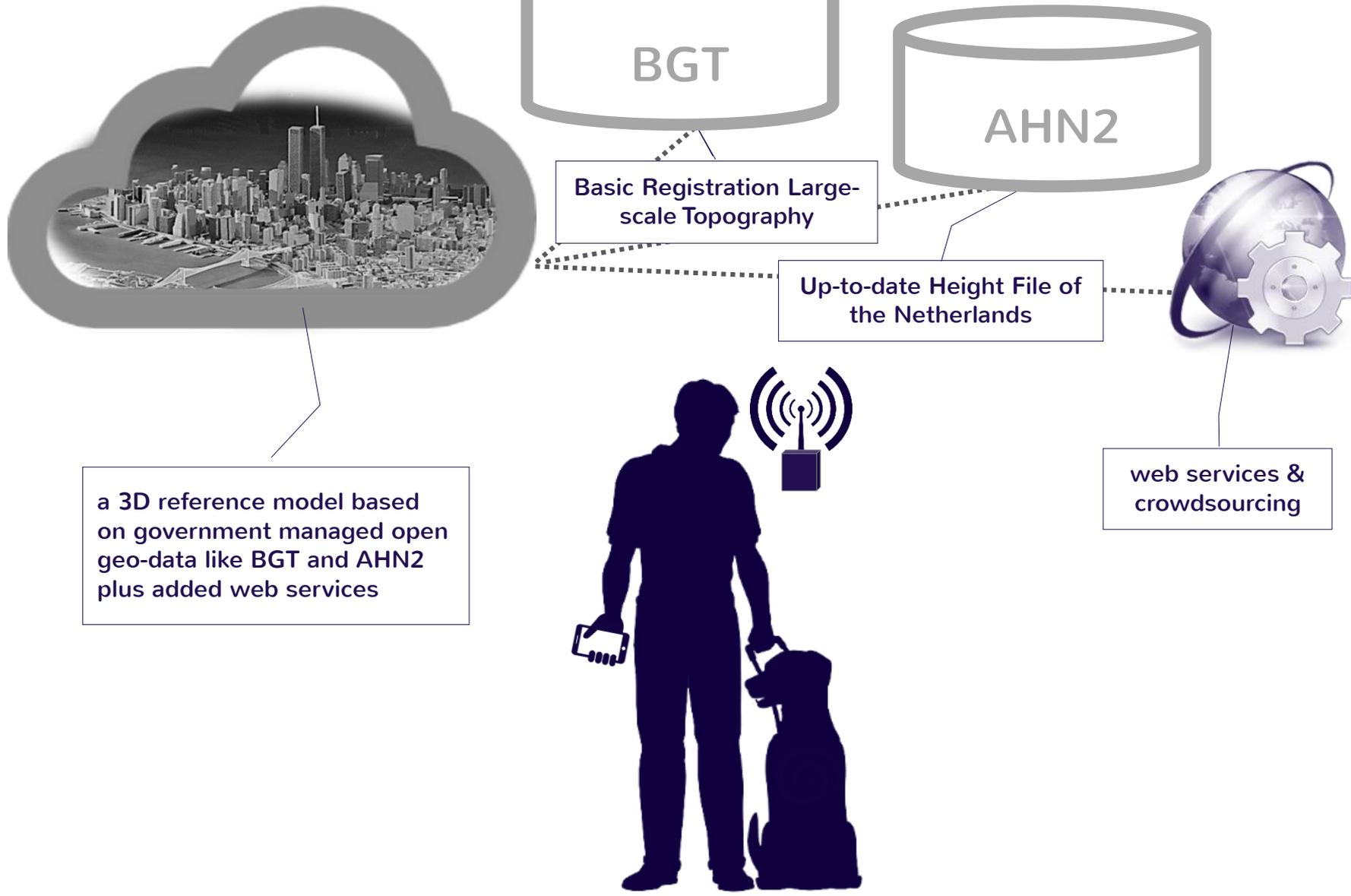
what if...



a reference ground station provides a precise differential GPS correction signal to improve accuracy to 30-50 centimeters

he carries with him a precise positioning device

what if...



a 3D reference model based on government managed open geo-data like BGT and AHN2 plus added web services

web services & crowdsourcing

in the cloud there is a 3D reference model of his surroundings

what if...



pedestrian crossings, traffic lights, bus stops

what is pedestrian area and what not

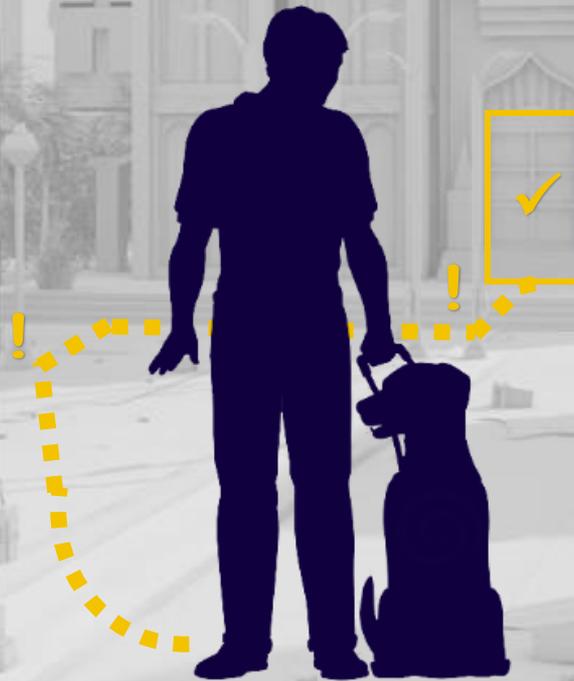
doors of buildings, stairs

obstacles like lamp posts, benches, trees, bollards



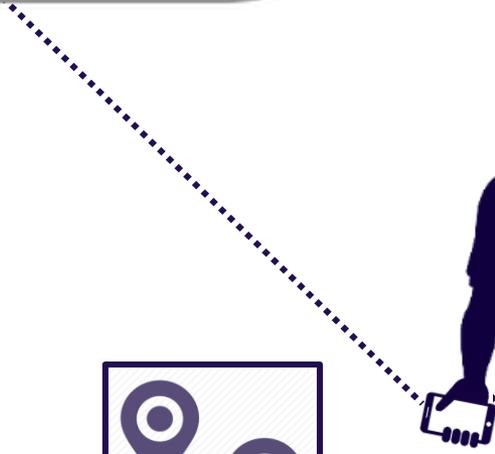
the 3D reference model knows most of his surroundings

what if...



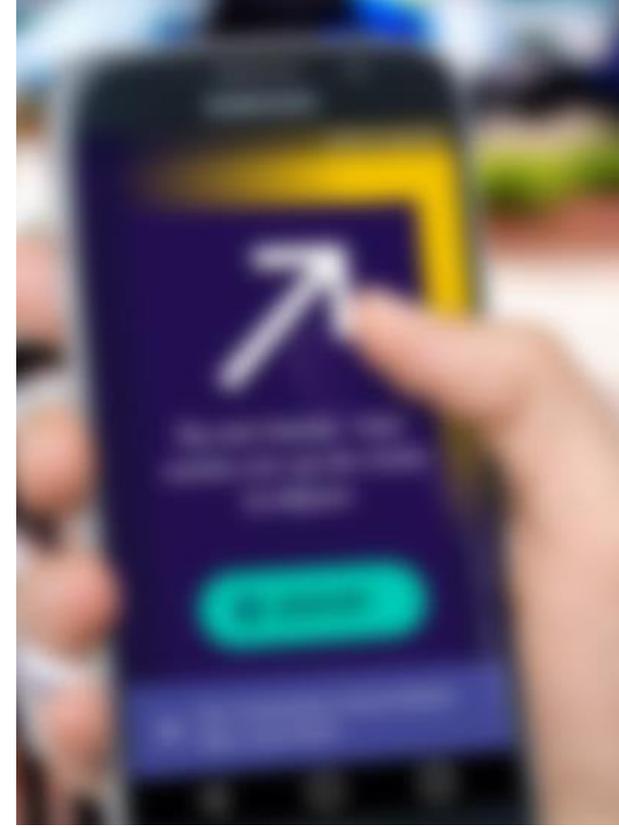
a routing engine then generates an ideal virtual guidance line

what if...



his devices receive his virtual guidance line and precise position

what if...



smart devices show an accessible app for persons with low vision

what if...

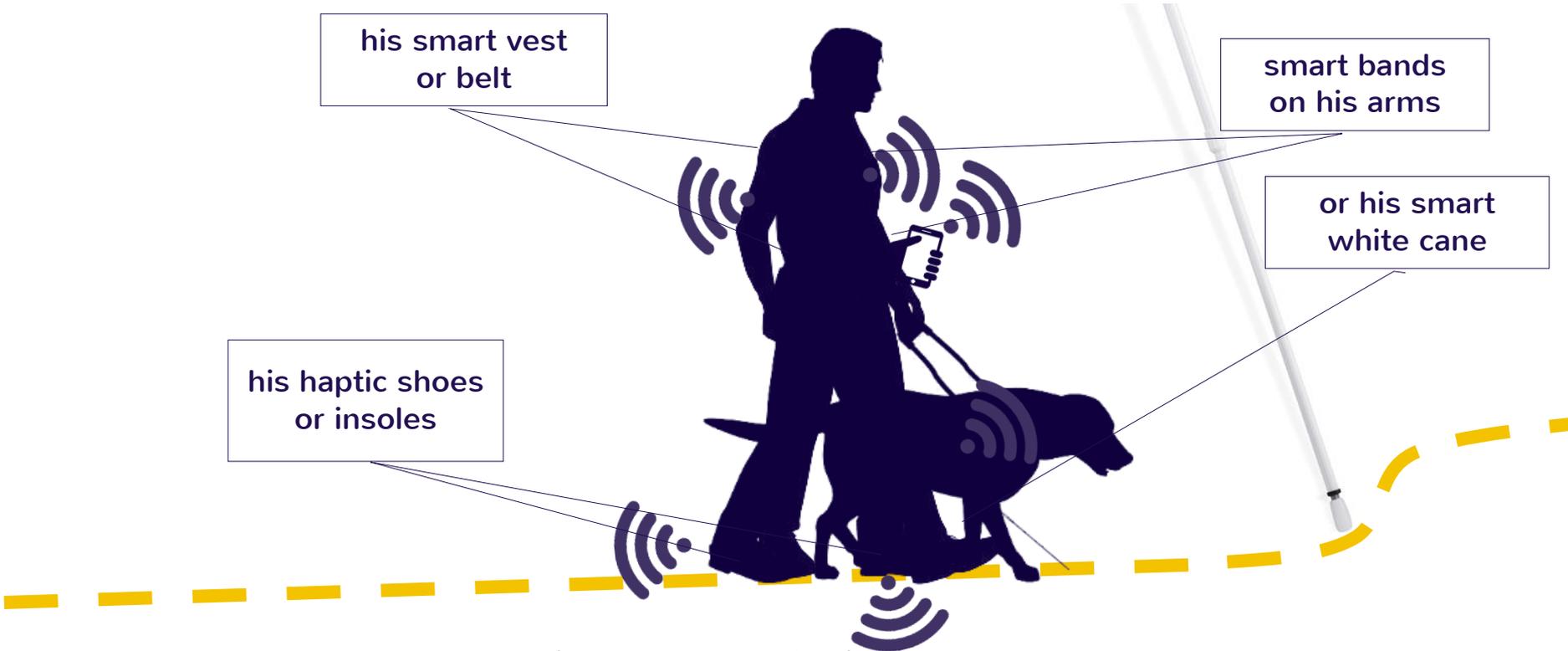


his smart vest or belt

smart bands on his arms

or his smart white cane

his haptic shoes or insoles



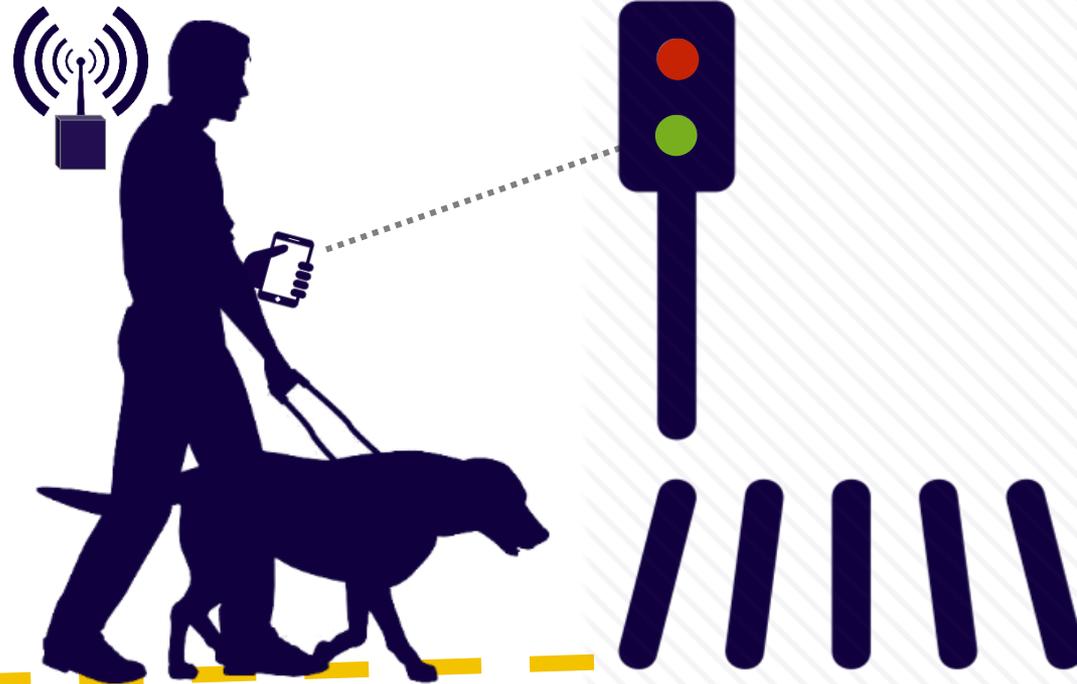
or use smart wearables (haptic/audio) to communicate

what if...



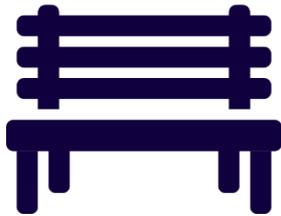
the wearables help him follow his virtual guidance line

what if...



the wearables alert at pedestrian crossings and read the traffic light

what if...



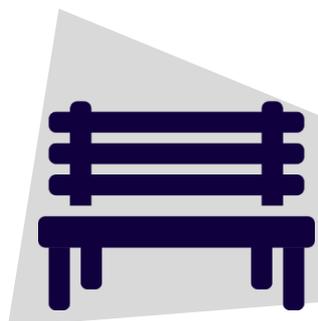
an audio device provides extra information on demand

what if...



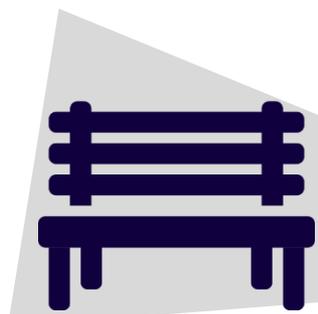
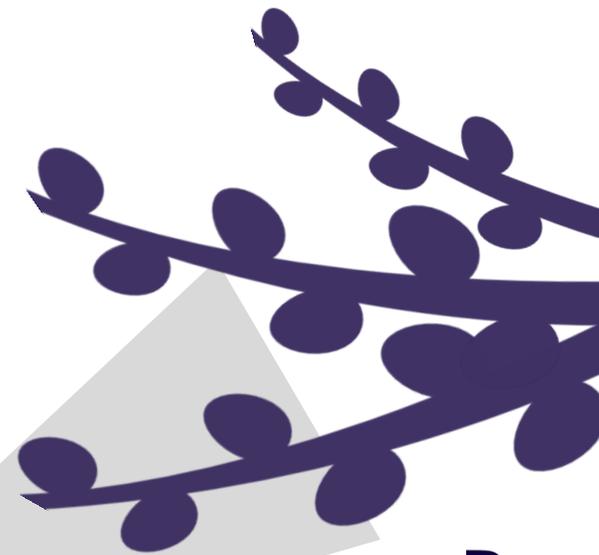
virtual guidance line leads to the right vehicle door at the bus station

what if...



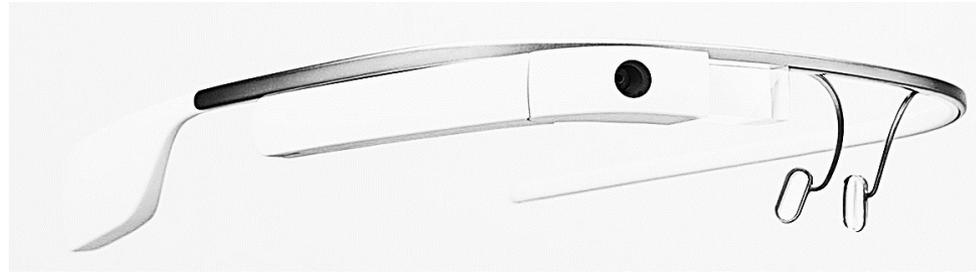
sensors help to detect obstacles

what if...



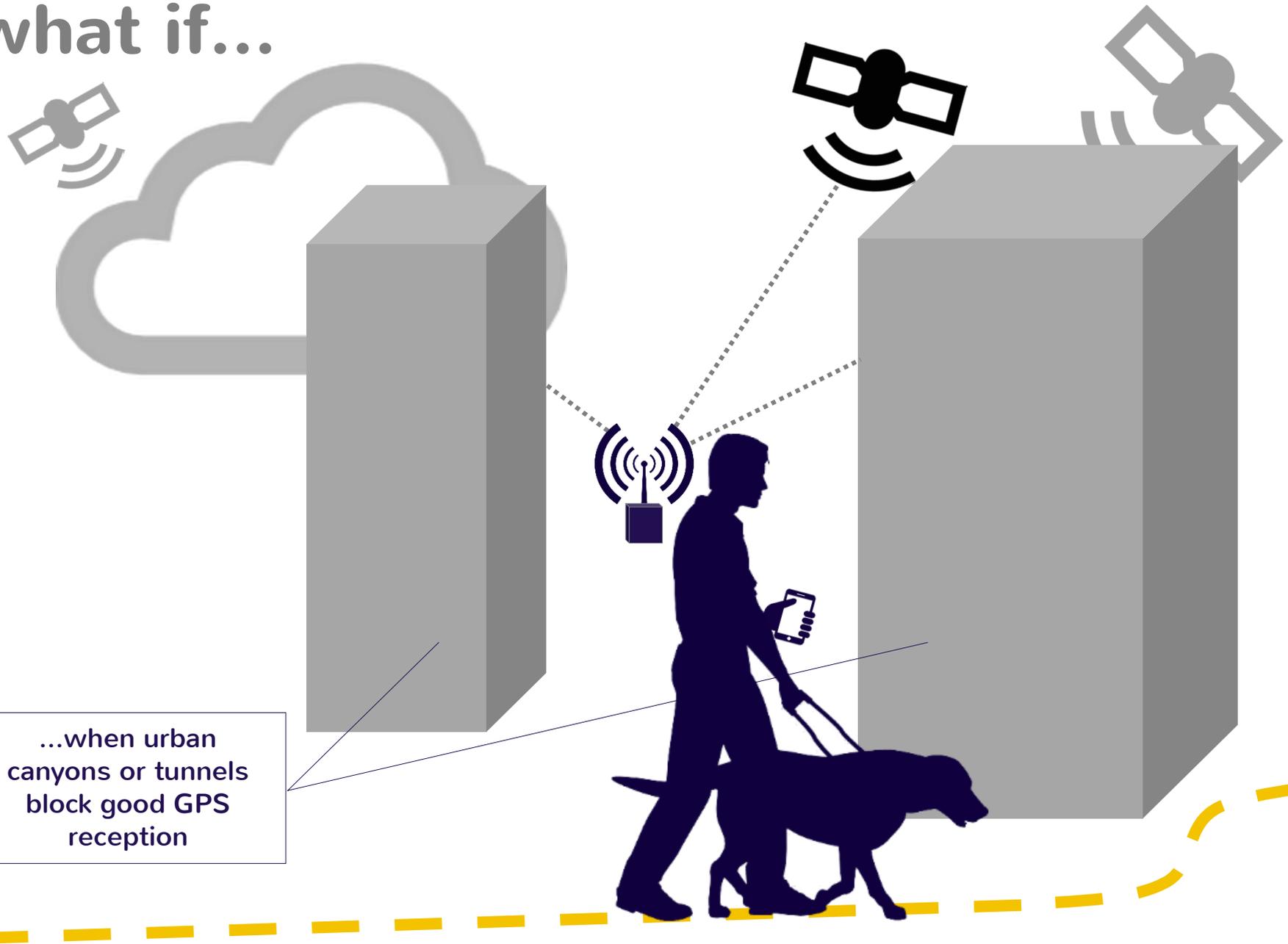
Or with help from the crowd – VGI – obstacles will be detected

what if...



sensors help to recognize important targets

what if...



...when urban canyons or tunnels block good GPS reception

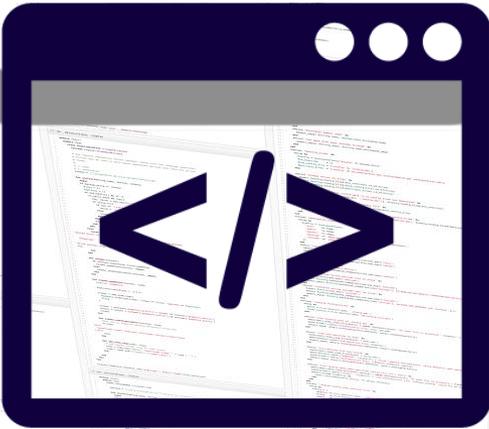
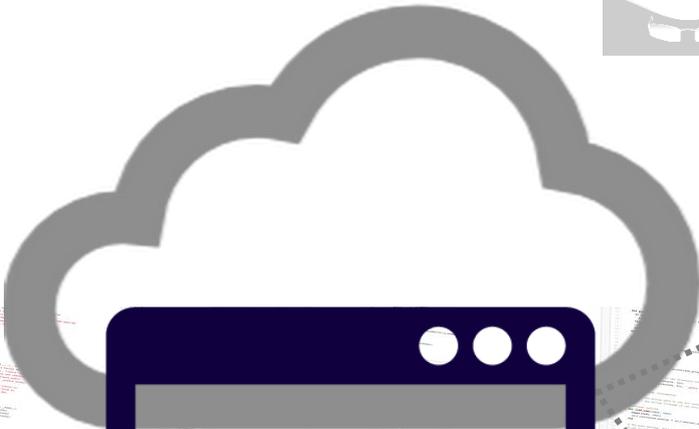
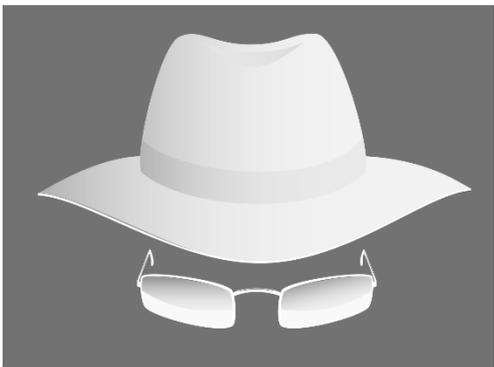
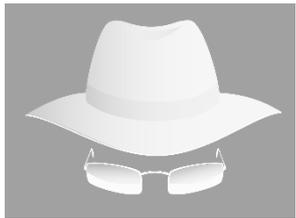
sensors help the precision positioning device

what if...



local beacons help the precision positioning device (also indoors)

what if...



open source



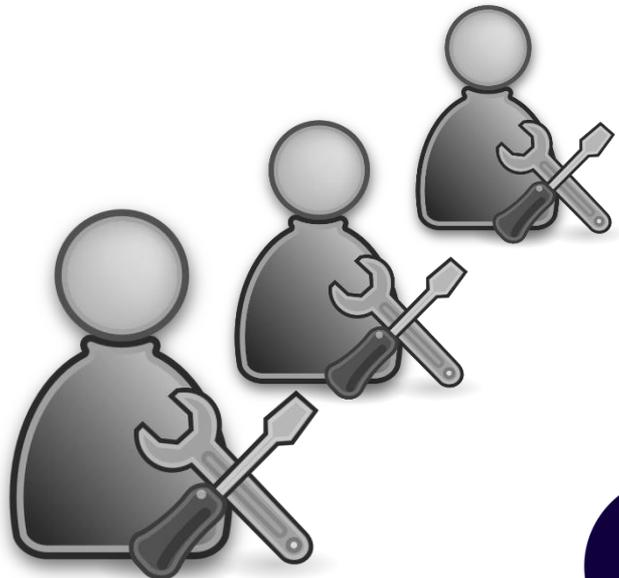
open source developers and helpful hackers help improve system

what if...



the users are actively involved in co-creating

what if...

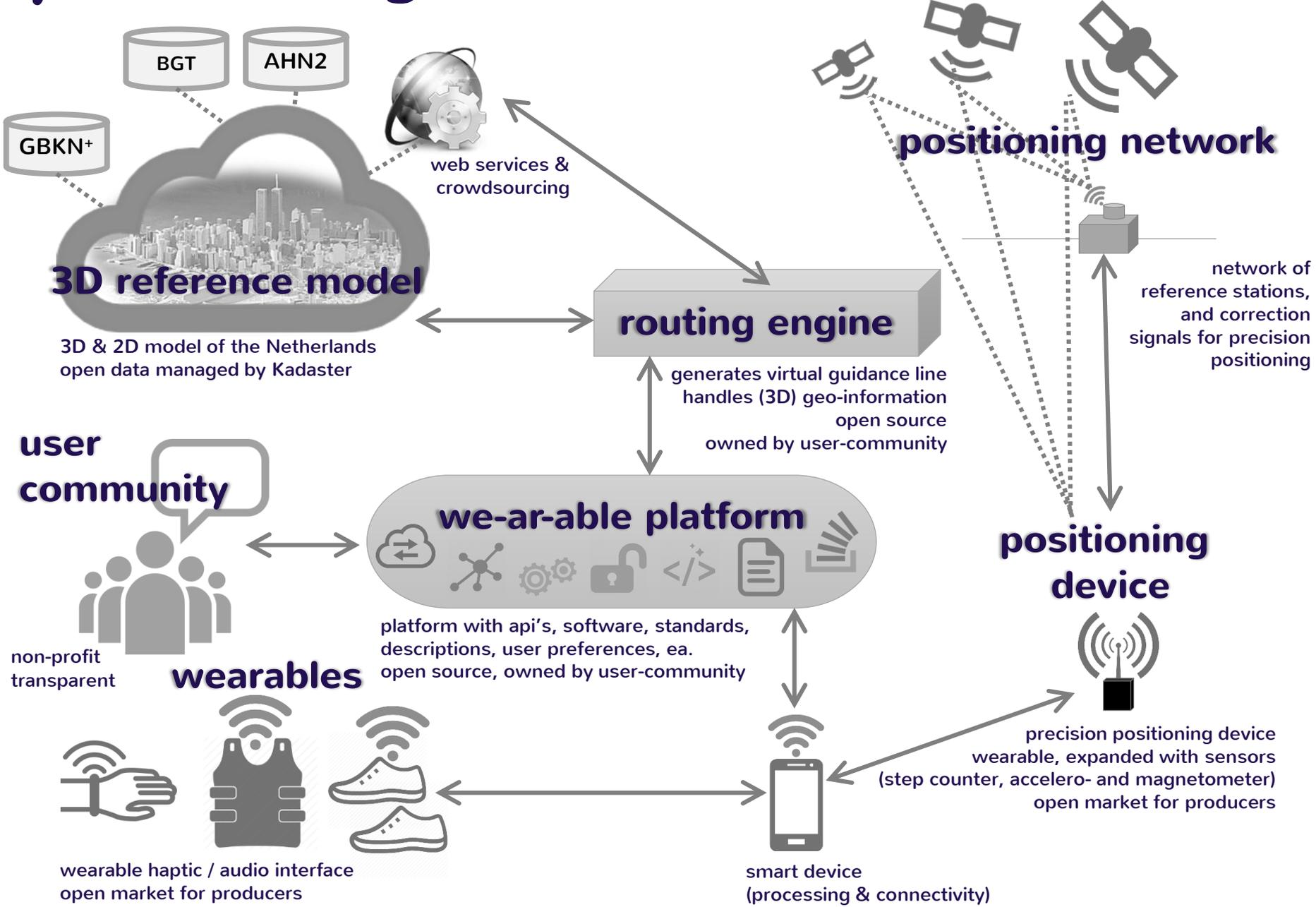


We are fully included. We own and control our virtual guidance line. We co-create.



the user community manages the virtual guidance line system

system design





virtual guidance line

Kadaster on FabCity

Amsterdam



Kadasterunit on FabCity





virtual guidance line

**for the visually impaired
an alternative for tactile paving
everywhere, always and personalised**



made possible by:



Windesheim  Flevoland



and
mrs Mara Breunesse