



Enlazando datos abiertos históricos y en tiempo real

David Chaves Fraga, Ontology Engineering Group
Universidad Politécnica de Madrid, Spain

✉ dchaves@fi.upm.es

🐦 [@dchavesf](https://twitter.com/dchavesf)

📅 26/11/2018

📍 Ayuntamiento de Madrid

- Grupo de investigación de Ingeniería Ontológica (OEG)
 - Facultad de Informática - UPM
 - Node Open Data Institute (ODI) Madrid
 - Trabajo con datos abiertos
 - Integración, generación de vocabularios, etc.
- David Chaves-Fraga
 - Investigador en OEG
 - Coordinador del Open Summer of code España
 - Datos abiertos de Transporte Público
 - Ganador del 2º premio Datatón Madrid 2017



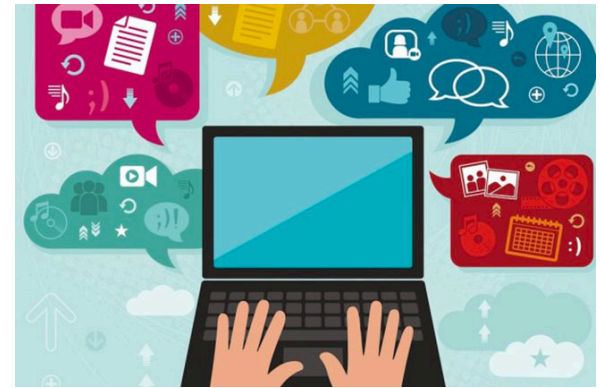
Portal de Open Data



Developers



Portal de Open Data

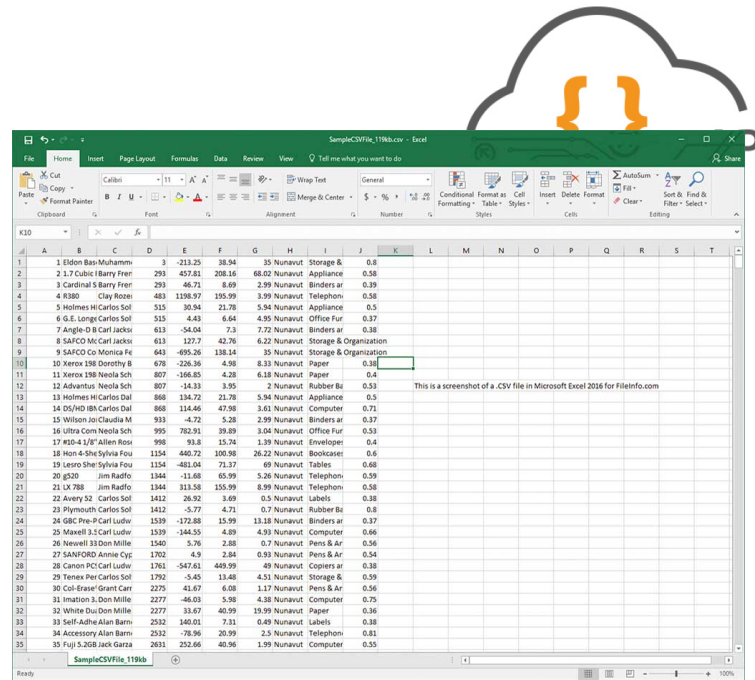


Developers



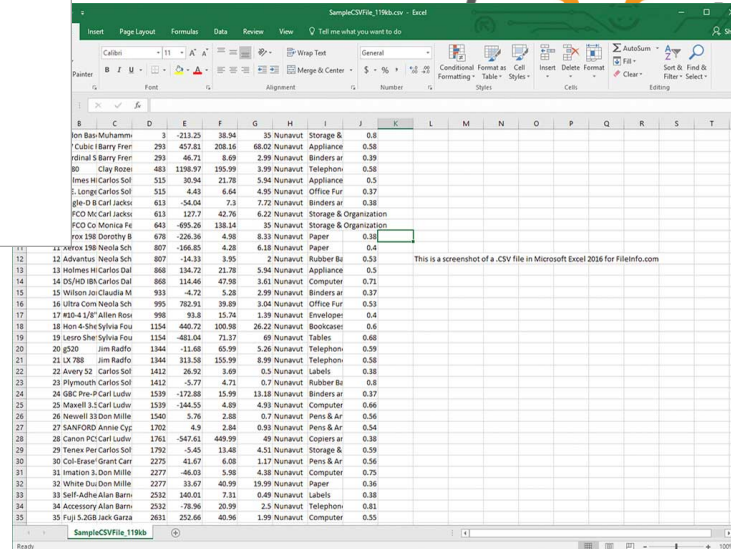
OEG





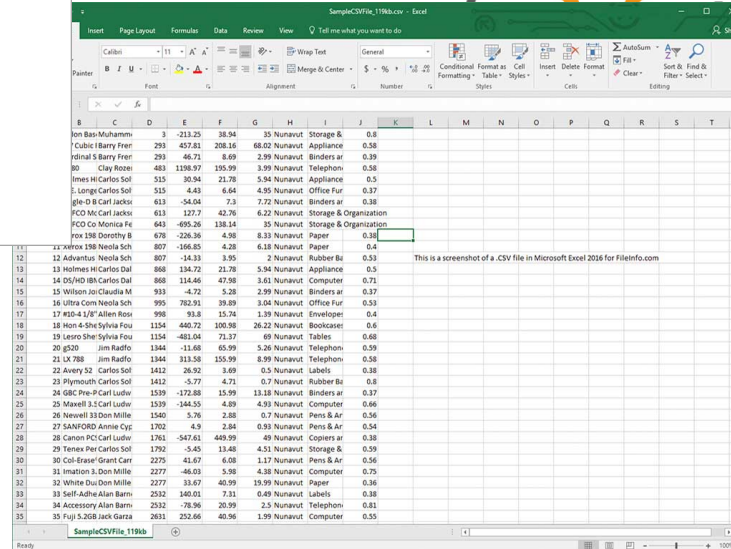
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	1	Eldon Bao-Muhamm	3	-213.25	38.94	35	Nunavut	Storage &		0.8										
2	2	1.7 Cubic (Barry) Frer	293	457.83	208.16	68.02	Nunavut	Appliance		0.58										
3	3	Cardinal S Barry Frer	293	-46.75	8.69	2.39	Nunavut	Binders ar		0.39										
4	4	8380 Clay Rozee	483	1286.97	195.99	3.99	Nunavut	Telephon		0.58										
5	5	Holmes HI Carlos Sol	515	30.94	21.78	5.94	Nunavut	Appliance		0.5										
6	6	G.E. Longe Carlos Sol	515	4.45	6.44	4.95	Nunavut	Office Fur		0.37										
7	7	Angle O B Carl Jacks	613	-54.06	7.3	7.72	Nunavut	Binders ar		0.38										
8	8	SAPCO Mc Carl Jacks	613	127.7	42.76	6.22	Nunavut	Storage & Organization												
9	9	SAPCO Co Monica Fe	643	-695.26	138.14	35	Nunavut	Storage & Organization												
10	10	Xerox 184 Dorothy B	676	-256.36	4.98	8.13	Nunavut	Paper		0.38										
11	11	Xerox 184 Neola Sch	807	-166.85	4.28	6.18	Nunavut	Paper		0.4										
12	12	Advantus Neola Sch	807	-14.33	3.95	2	Nunavut	Rubber Bu		0.53										
13	13	Holmes HI Carlos Dal	868	134.72	21.78	5.94	Nunavut	Appliance		0.5										
14	14	DS/HD IB Carlos Dal	868	114.46	47.58	3.61	Nunavut	Computer		0.71										
15	15	Wilson Jai Claudia M	933	-4.72	5.28	2.99	Nunavut	Binders ar		0.37										
16	16	Ultra Com Neola Sch	995	782.93	39.39	3.04	Nunavut	Office Fur		0.53										
17	17	430-418 Allen Ross	998	93.8	15.74	1.39	Nunavut	Envelope		0.4										
18	18	Hon 4-She Sylvia Fou	1154	440.72	100.98	26.22	Nunavut	Bookcase		0.6										
19	19	Leoro She Sylvia Fou	1154	-481.04	71.37	69	Nunavut	Tables		0.68										
20	20	g109 Jim Radlo	1344	-11.68	65.99	5.26	Nunavut	Telephon		0.59										
21	21	UX 788 Jim Radlo	1344	313.58	155.99	8.99	Nunavut	Telephon		0.58										
22	22	Avery 52 Carlos Sol	1412	26.92	3.69	0.5	Nunavut	Labels		0.38										
23	23	Plymouth Carlos Sol	1412	-5.77	4.71	0.7	Nunavut	Rubber Bu		0.8										
24	24	GBC Pre-P Carl Ludw	1539	-172.88	15.99	13.18	Nunavut	Binders ar		0.37										
25	25	Maxell 3.5 Carl Ludw	1539	-144.55	4.89	4.93	Nunavut	Computer		0.66										
26	26	Novell 33 Don Mille	1540	5.76	2.86	0.7	Nunavut	Pens & Ar		0.56										
27	27	SANCOSS Annie Cyp	1702	4.5	2.84	0.83	Nunavut	Pens & Ar		0.54										
28	28	Canon PC Carl Ludw	1761	-547.61	449.99	49	Nunavut	Copiers ar		0.38										
29	29	Temex Per Carlos Sol	1792	-5.45	13.48	4.51	Nunavut	Storage &		0.59										
30	30	Col-Ener/Great Car	2275	-41.67	6.08	1.17	Nunavut	Pens & Ar		0.56										
31	31	Imation 3 Don Mille	2277	-46.03	5.98	4.38	Nunavut	Computer		0.75										
32	32	White Du Don Mille	2277	33.67	40.99	19.99	Nunavut	Paper		0.36										
33	33	Self-Adhe Alan Barn	2532	140.03	7.31	0.49	Nunavut	Labels		0.38										
34	34	Accessory Alan Barn	2532	-78.96	20.99	2.5	Nunavut	Telephon		0.81										
35	35	Fuji 5.2GB Jack Garza	2631	252.66	40.96	1.99	Nunavut	Computer		0.55										

```
<schools>
<school name="Brown University" href="http://www.brown.edu" conference="Ivy Group"
conf_href="http://www.ivyleaguesports.com" division="I" state="RI" full_state="Rhode Island"/>
<school name="Columbia University-Barnard College" href="http://www.columbia.edu" conference="Ivy Group"
conf_href="http://www.ivyleaguesports.com" division="I" state="NY" full_state="New York"/>
<school name="Cornell University" href="http://www.cornell.edu" conference="Ivy Group"
conf_href="http://www.ivyleaguesports.com" division="I" state="NY" full_state="New York"/>
<school name="Dartmouth College" href="http://www.dartmouth.edu" conference="Ivy Group"
conf_href="http://www.ivyleaguesports.com" division="I" state="NH" full_state="New Hampshire"/>
<school name="Harvard University" href="http://www.harvard.edu" conference="Ivy Group"
conf_href="http://www.ivyleaguesports.com" division="I" state="MA" full_state="Massachusetts"/>
<school name="Princeton University" href="http://www.princeton.edu" conference="Ivy Group"
conf_href="http://www.ivyleaguesports.com" division="I" state="NJ" full_state="New Jersey"/>
<school name="University of Pennsylvania" href="http://www.upenn.edu" conference="Ivy Group"
conf_href="http://www.ivyleaguesports.com" division="I" state="PA" full_state="Pennsylvania"/>
<school name="Yale University" href="http://www.yale.edu" conference="Ivy Group"
conf_href="http://www.ivyleaguesports.com" division="I" state="CT" full_state="Connecticut"/>
</schools>
```



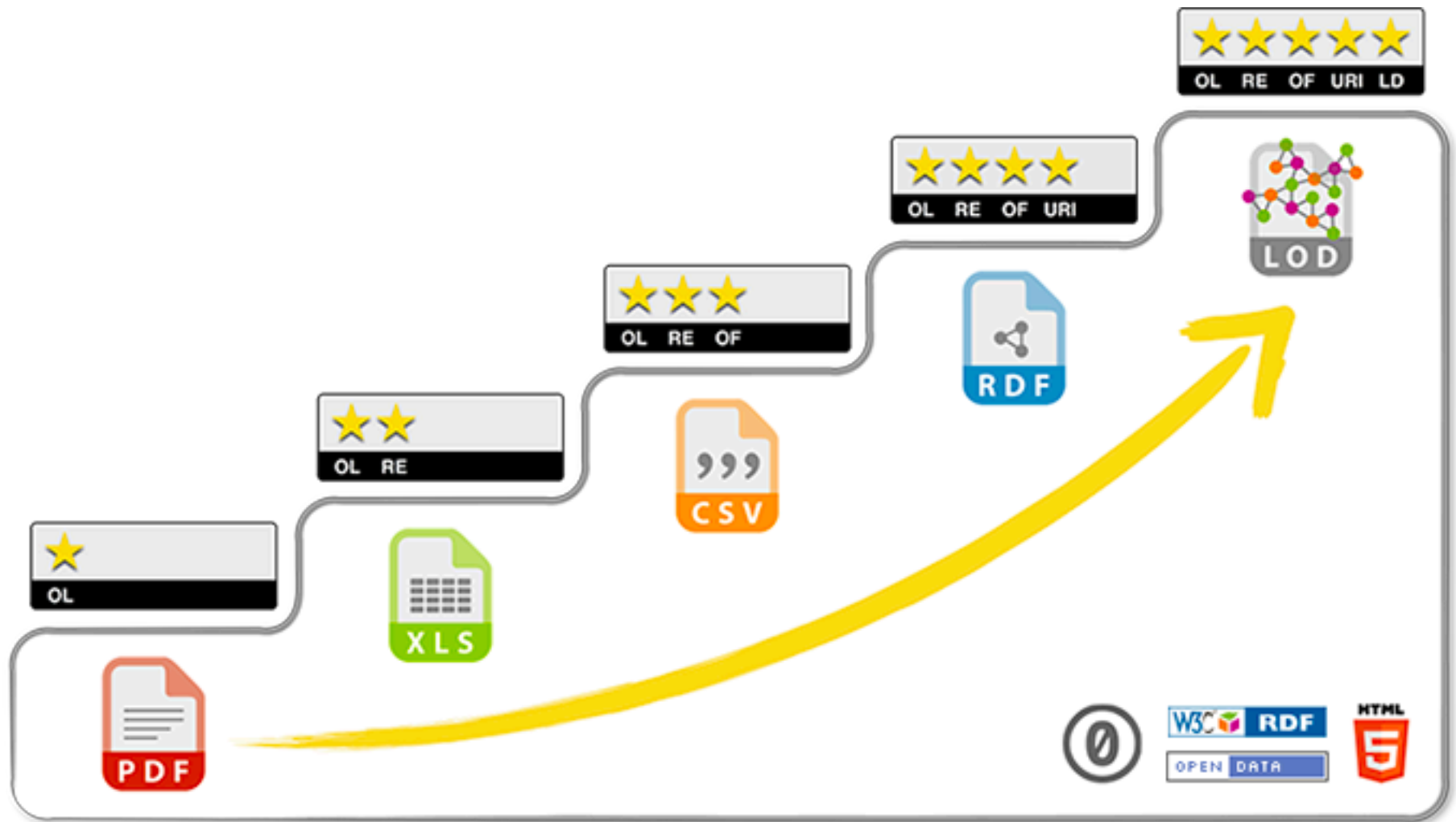
	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	ton Bao-Muhamm	3	-213.25	38.54	35	Nunavut	Storage &	0.8											
2	Cubic (Barry) Frer	293	457.83	208.16	68.02	Nunavut	Appliance	0.58											
3	Donald S Barry Frer	293	46.71	8.69	2.39	Nunavut	Binders ar	0.39											
4	BD Clay Rozer	483	1108.97	195.99	3.99	Nunavut	Telephon	0.58											
5	Imes H Carlos Sol	515	30.94	21.78	5.94	Nunavut	Appliance	0.5											
6	L Longe Carlos Sol	515	4.45	6.44	4.55	Nunavut	Office Fur	0.37											
7	gle B R Carl Jacks	613	-54.06	7.3	7.72	Nunavut	Binders ar	0.39											
8	PCO McCarl Jacks	613	127.7	42.76	6.22	Nunavut	Storage & Organization												
9	PCO Co Monica Fe	643	-695.26	118.14	35	Nunavut	Storage & Organization												
10	res 188 Dorothy B	676	-226.36	4.98	8.13	Nunavut	Paper	0.38											
11	21 Xerox 188 Neola Sch	807	-166.85	4.28	6.18	Nunavut	Paper	0.4											
12	12 Advantus Neola Sch	807	-14.33	3.95	2	Nunavut	Rubber Bz	0.53											
13	13 Holmes H Carlos Dal	868	134.72	21.78	5.94	Nunavut	Appliance	0.5											
14	14 DS/ND IBH Carlos Dal	868	114.46	47.58	3.61	Nunavut	Computer	0.71											
15	15 Wilson Jai Claudia M	933	-4.72	5.28	2.99	Nunavut	Binders ar	0.37											
16	16 Ultra Com Neola Sch	995	762.93	39.39	3.04	Nunavut	Office Fur	0.53											
17	17 400-411P Allen Ross	998	93.8	15.74	1.39	Nunavut	Envelope	0.4											
18	18 Hon 4-She Sylvia Fou	1154	440.72	200.98	26.22	Nunavut	Bookcase	0.6											
19	19 Leoro She Sylvia Fou	1154	-481.04	71.27	69	Nunavut	Tables	0.68											
20	20 g109 Jim Radlo	1344	-11.68	65.99	5.26	Nunavut	Telephon	0.59											
21	21 LX 788 Jim Radlo	1344	313.58	155.99	8.99	Nunavut	Telephon	0.58											
22	22 Avery 52 Carlos Sol	1412	26.92	3.69	0.5	Nunavut	Labels	0.38											
23	23 Plymouth Carlos Sol	1412	-5.77	4.71	0.7	Nunavut	Rubber Bz	0.8											
24	24 GBC Pre-P Carl Ludw	1539	-172.88	15.99	13.18	Nunavut	Binders ar	0.37											
25	25 Maxwell 3.5 Carl Ludw	1539	-144.55	4.89	4.93	Nunavut	Computer	0.66											
26	26 Newell 33 Don Mille	1540	5.76	2.86	0.7	Nunavut	Pens & Ar	0.56											
27	27 SAN/CSD Annie Cyp	1702	4.9	2.84	0.83	Nunavut	Pens & Ar	0.54											
28	28 Canon PC/L Carl Ludw	1761	-547.61	449.99	49	Nunavut	Copiers ar	0.38											
29	29 Temex Per Carlos Sol	1792	-5.45	13.48	4.51	Nunavut	Storage &	0.59											
30	30 Col Enser/Great Carl	2275	41.67	6.08	1.17	Nunavut	Pens & Ar	0.56											
31	31 Imation 3 Don Mille	2277	-46.03	5.98	4.38	Nunavut	Computer	0.75											
32	32 White Duo Don Mille	2277	33.67	40.99	19.99	Nunavut	Paper	0.36											
33	33 Self-Adhe Alan Barn	2532	140.03	7.31	0.49	Nunavut	Labels	0.38											
34	34 Accessory Alan Barn	2532	-78.96	20.99	2.5	Nunavut	Telephon	0.81											
35	35 Fuji 5.2GB Jack Garza	2631	252.66	40.96	1.99	Nunavut	Computer	0.55											


```
<schools>
  <school name="Brown University" href="http://www.brown.edu" conference="Ivy Group"
  conf_href="http://www.ivyleaguesports.com" division="I" state="RI" full_state="Rhode Island"/>
  <school name="Columbia University-Barnard College" href="http://www.columbia.edu" conference="Ivy Group"
  conf_href="http://www.ivyleaguesports.com" division="I" state="NY" full_state="New York"/>
  <school name="Cornell University" href="http://www.cornell.edu" conference="Ivy Group"
  conf_href="http://www.ivyleaguesports.com" division="I" state="NY" full_state="New York"/>
  <school name="Dartmouth College" href="http://www.dartmouth.edu" conference="Ivy Group"
  conf_href="http://www.ivyleaguesports.com" division="I" state="NH" full_state="New Hampshire"/>
  <school name="Harvard University" href="http://www.harvard.edu" conference="Ivy Group"
  conf_href="http://www.ivyleaguesports.com" division="I" state="MA" full_state="Massachusetts"/>
  <school name="Princeton University" href="http://www.princeton.edu" conference="Ivy Group"
  conf_href="http://www.ivyleaguesports.com" division="I" state="NJ" full_state="New Jersey"/>
  <school name="University of Pennsylvania" href="http://www.upenn.edu" conference="Ivy Group"
  conf_href="http://www.ivyleaguesports.com" division="I" state="PA" full_state="Pennsylvania"/>
  <school name="Yale University" href="http://www.yale.edu" conference="Ivy Group"
  conf_href="http://www.ivyleaguesports.com" division="I" state="CT" full_state="Connecticut"/>
</schools>
```

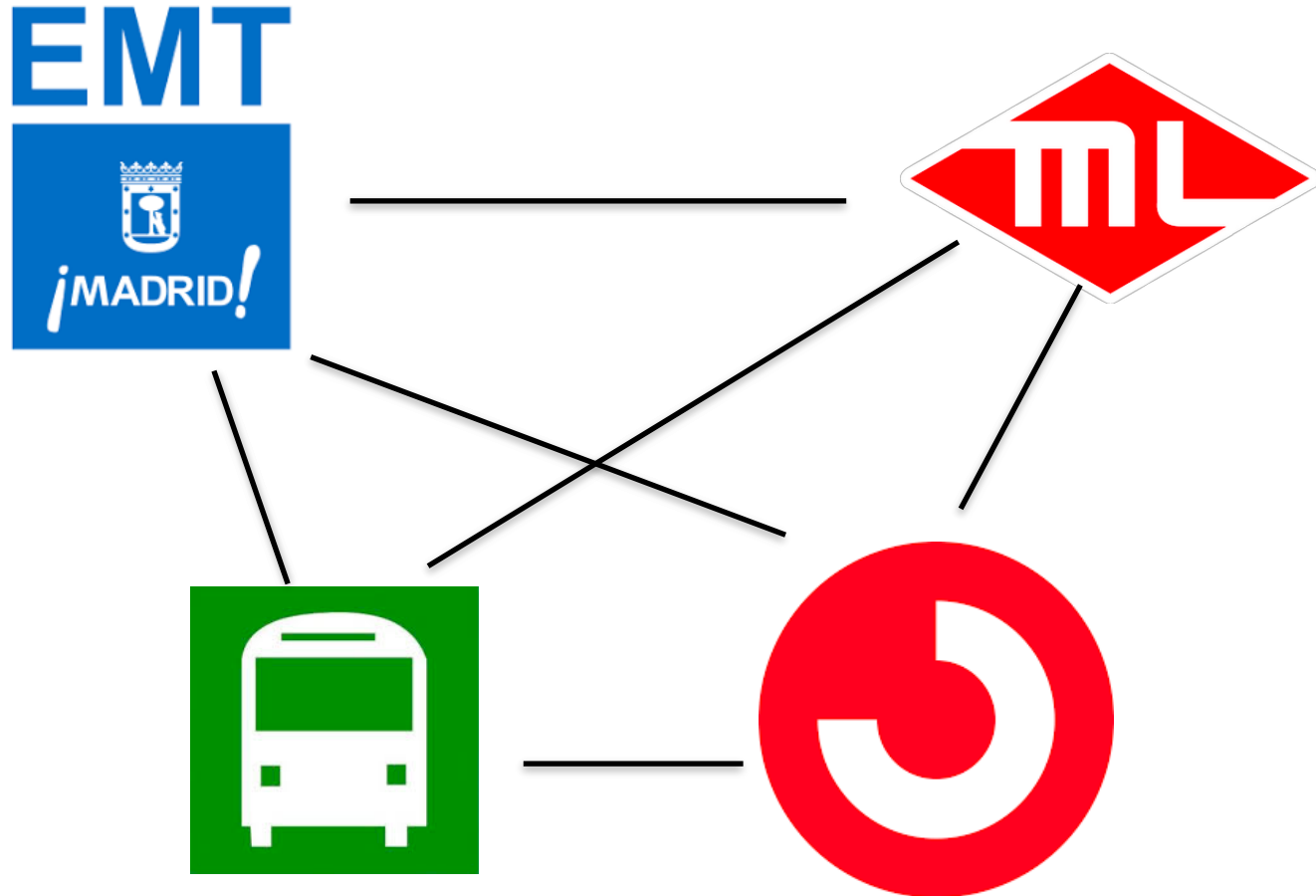


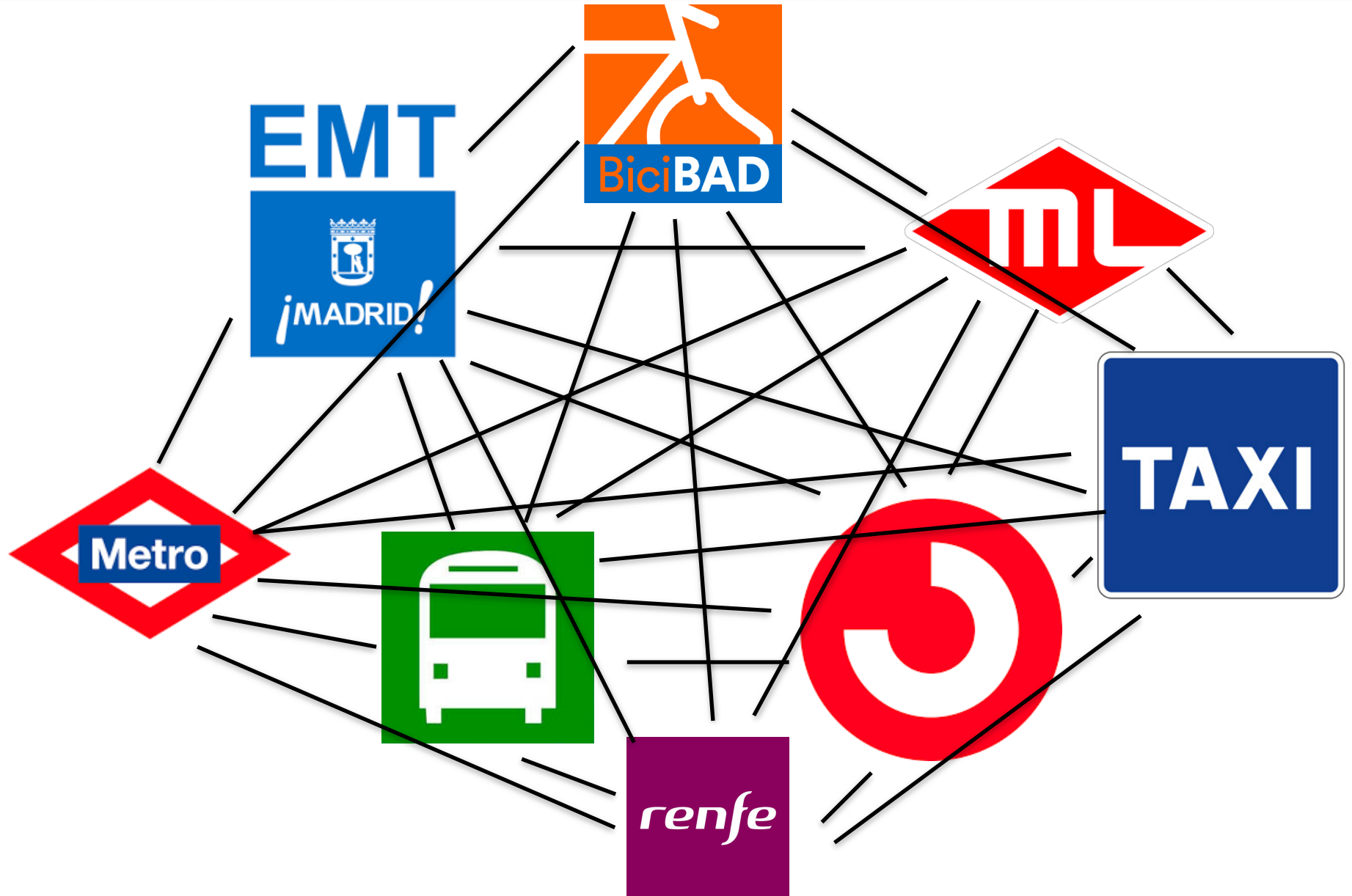
	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
11	ton Bao-Muhamm	3	-213.25	38.54	35	Nunavut	Storage &		0.8										
12	Cubic (Barry Fre	293	457.83	208.16	68.02	Nunavut	Appliance		0.58										
13	idinal S Barry Fre	293	46.71	8.69	2.39	Nunavut	Binders ar		0.39										
14	10 Clay Rosee	483	1198.97	195.99	3.99	Nunavut	Telephon		0.58										
15	Imes H Carlos Sol	515	30.94	21.78	5.94	Nunavut	Appliance		0.5										
16	L Longe Carlos Sol	515	4.45	6.44	4.55	Nunavut	Office Fur		0.37										
17	gle B R Carl Jacks	613	-54.06	7.3	7.72	Nunavut	Binders ar		0.39										
18	PCO Co Carl Jacks	613	127.7	42.76	6.22	Nunavut	Storage & Organization												
19	PCO Co Monica Fe	643	-695.26	118.14	35	Nunavut	Storage & Organization												
20	res 188 Dorothy B	676	-226.36	4.98	6.13	Nunavut	Paper		0.38										
21	11 Xerox 188 Neola Sch	807	-166.85	4.28	6.18	Nunavut	Paper		0.4										
22	12 Advantus Neola Sch	807	-14.33	3.95	2	Nunavut	Rubber Bu		0.53										
23	13 Holmes H Carlos Dal	868	134.72	21.78	5.94	Nunavut	Appliance		0.5										
24	14 DS/HD IB Carlos Dal	868	114.46	47.58	3.61	Nunavut	Computer		0.71										
25	15 Wilson Jai Claudia M	933	-4.72	5.28	2.99	Nunavut	Binders ar		0.37										
26	16 Ultra Com Neola Sch	995	762.93	39.39	3.04	Nunavut	Office Fur		0.53										
27	17 400-418 Allen Ross	998	93.8	15.74	1.39	Nunavut	Envelope		0.4										
28	18 Hon 4-She Sylvia Fou	1154	440.72	100.98	26.22	Nunavut	Bookcases		0.6										
29	19 Leoro She Sylvia Fou	1154	-481.04	71.37	69	Nunavut	Tables		0.68										
30	20 glen Jim Radflo	1344	-11.68	65.99	5.26	Nunavut	Telephon		0.59										
31	21 LX 788 Jim Radflo	1344	313.58	155.99	8.99	Nunavut	Telephon		0.58										
32	22 Avery 52 Carlos Sol	1412	26.92	3.69	0.5	Nunavut	Labels		0.38										
33	23 Plymouth Carlos Sol	1412	-5.77	4.71	0.7	Nunavut	Rubber Bu		0.8										
34	24 GBC Pre-P Carl Ludw	1539	-172.88	15.99	13.18	Nunavut	Binders ar		0.37										
35	25 Maxwell 3.5 Carl Ludw	1539	-144.55	4.89	4.93	Nunavut	Computer		0.66										
36	26 Newell 33 Don Mille	1540	5.76	2.86	0.7	Nunavut	Pens & Ar		0.56										
37	27 SANCOSS Annie Cyp	1702	4.5	2.84	0.83	Nunavut	Pens & Ar		0.54										
38	28 Canon PC Carl Ludw	1761	-547.61	449.99	49	Nunavut	Copiers ar		0.38										
39	29 Temex Per Carlos Sol	1792	-5.45	13.48	4.51	Nunavut	Storage &		0.59										
40	30 Col Etnar Grant Carl	2275	-41.67	6.08	1.17	Nunavut	Pens & Ar		0.56										
41	31 Imation 3 Don Mille	2277	-46.03	5.98	4.38	Nunavut	Computer		0.75										
42	32 White Du Don Mille	2277	33.67	40.99	19.99	Nunavut	Paper		0.36										
43	33 Self-Adhe Alan Barn	2332	140.03	7.31	0.49	Nunavut	Labels		0.38										
44	34 Accessory Alan Barn	2332	-78.96	20.99	2.5	Nunavut	Telephon		0.81										
45	35 Fuji 5.2GB Jack Garza	2631	252.66	40.96	1.99	Nunavut	Computer		0.55										

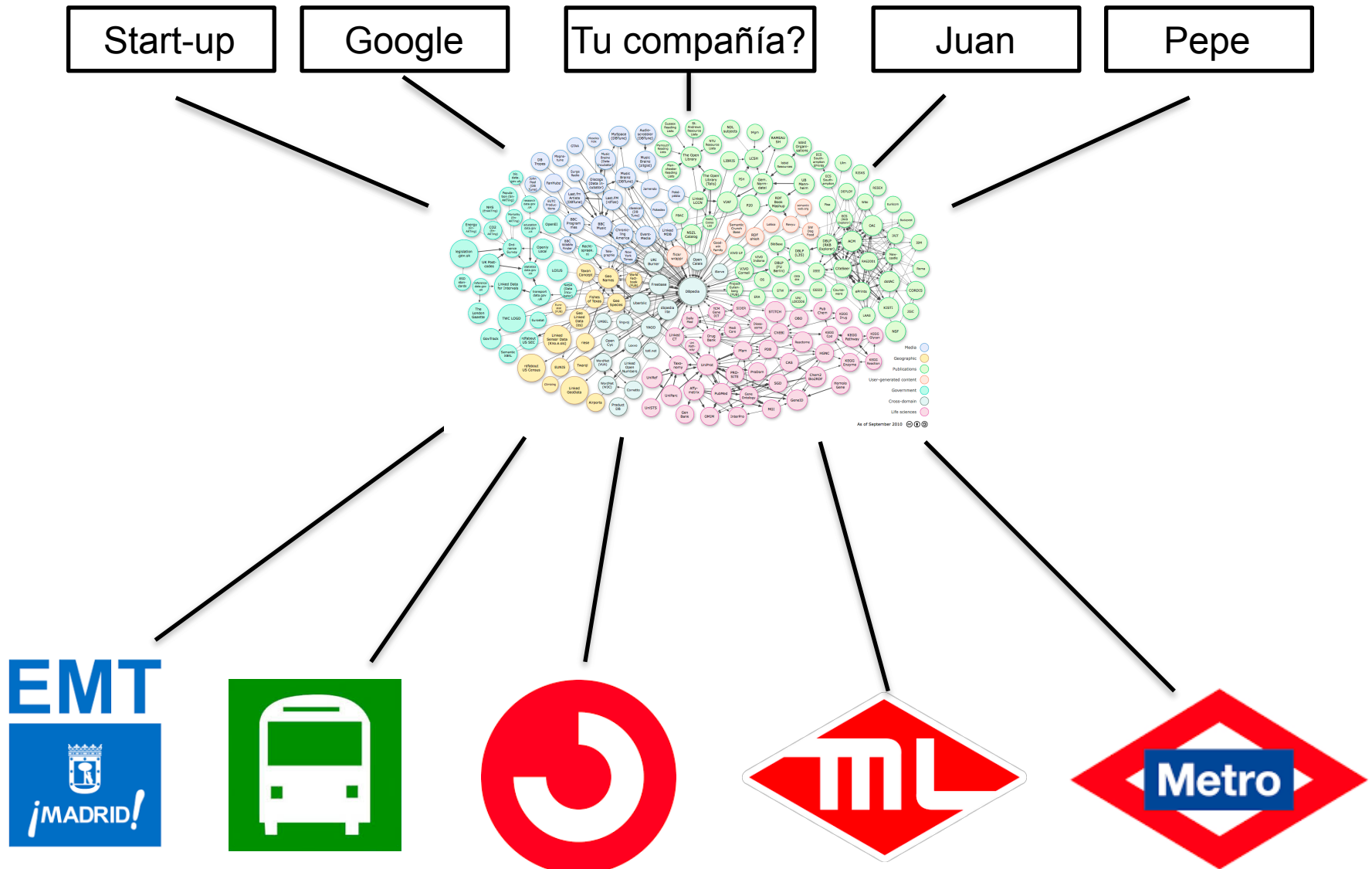
- El caso del tráfico:
 - Múltiples conjuntos de datos y formatos (XML, CSV)
 - Tiempo real, históricos, estáticos



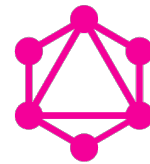
Enlazando datos abiertos: el caso del transporte público en Madrid





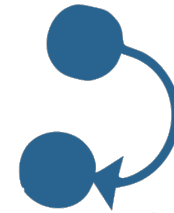


```
{
  "@id": "http://madrid.linkedconnections.org/tram/connections/1524048607000par_10_5010_I14-042_2017I14_12%3A35%3A00_1_193_10_4_2_",
  "@type": "Connection",
  "departureStop": "http://madrid.linkedconnections.org/tram/stops/par_10_50",
  "arrivalStop": "http://madrid.linkedconnections.org/tram/stops/par_10_68",
  "departureTime": "2018-04-18T10:50:07.000Z",
  "arrivalTime": "2018-04-18T10:53:30.000Z",
  "gtfs:trip": "http://madrid.linkedconnections.org/tram/trips/10_I14-042_2017I14_12%3A35%3A00_1_193_10_4_2_",
  "gtfs:route": "http://madrid.linkedconnections.org/tram/routes/10_ML4_",
  "gtfs:pickupType": "gtfs:Regular"
},
{
  "@id": "http://madrid.linkedconnections.org/tram/connections/1524048611000par_10_2910_I14-030_2017I14_12%3A36%3A00_1_145_10_3_",
  "@type": "Connection",
  "departureStop": "http://madrid.linkedconnections.org/tram/stops/par_10_29",
  "arrivalStop": "http://madrid.linkedconnections.org/tram/stops/par_10_30",
  "departureTime": "2018-04-18T10:50:11.000Z",
  "arrivalTime": "2018-04-18T10:51:52.000Z",
  "gtfs:trip": "http://madrid.linkedconnections.org/tram/trips/10_I14-030_2017I14_12%3A36%3A00_1_145_10_3_",
  "gtfs:route": "http://madrid.linkedconnections.org/tram/routes/10_ML3_",
  "gtfs:pickupType": "gtfs:Regular"
},
{
  "@id": "http://madrid.linkedconnections.org/tram/connections/1524048617000par_10_3410_I14-030_2017I14_12%3A23%3A00_1_144_10_3_",
  "@type": "Connection",
  "departureStop": "http://madrid.linkedconnections.org/tram/stops/par_10_34",
  "arrivalStop": "http://madrid.linkedconnections.org/tram/stops/par_10_35",
  "departureTime": "2018-04-18T10:50:17.000Z",
  "arrivalTime": "2018-04-18T10:51:40.000Z",
  "gtfs:trip": "http://madrid.linkedconnections.org/tram/trips/10_I14-030_2017I14_12%3A23%3A00_1_144_10_3_",
  "gtfs:route": "http://madrid.linkedconnections.org/tram/routes/10_ML3_",
  "gtfs:pickupType": "gtfs:Regular"
},
}
```



GraphQL

Linked Connections



<http://tripscore.eu>

<http://linkedconnections.oeg-upm.net/>

- Linked Open Data para:
 - Integrar múltiples fuentes
 - Asegurar la información en tiempo real
 - Enlazar con otras fuentes de datos
 - Generar vocabularios estándar del dominio
 - No duplicar información
 - No generar duplicidad
 -



Enlazando datos abiertos históricos y en tiempo real

David Chaves Fraga, Ontology Engineering Group
Universidad Politécnica de Madrid, Spain

✉ dchaves@fi.upm.es

🐦 [@dchavesf](https://twitter.com/dchavesf)

📅 26/11/2018

📍 Ayuntamiento de Madrid