Linked Open Data

NOKIOS 2012, 2012-10-30

Lars Marius Garshol, larsga@bouvet.no, http://twitter.com/larsga

Agenda

- What and why?
- Examples of use
- How to publish
- Linked Data
- Problems
- Conclusion

What and why?

Linked Open Data

connected to other data
self-documenting

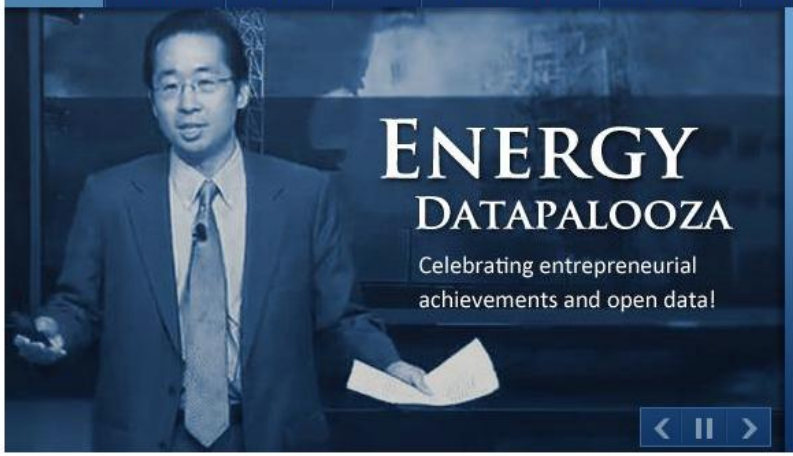
published
license allowing reuse
machine-readable

foundation for all IT functionality
no data – no service

DATA.GOV
EMPOWERING PEOPLE

Search Data.gov SEARCH

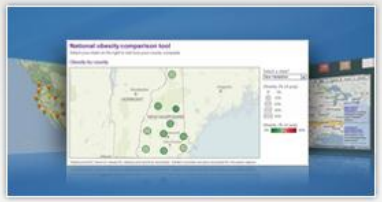
HOME | ABOUT | DATA | APPS | COMMUNITIES | METRICS | OPEN GOVERNMENT



Latest Datasets

- Natural Hazards Image Discovery Tool
- Marine Geology Data and Information...
- Marine and Lacustrine Geological...
- Marine Geophysical Data Viewer
- Index to Marine and Lacustrine...
- Neighborhood Stabilization Program Data...
- Historical Significant Events Imagery
- International Best Track Archive for...
- Species Information System (SIS)
- Tsunami Message

DATA AND APPS



- 378,529 raw and geospatial datasets
- 1,264 government apps
- 236 citizen-developed apps
- 103 mobile apps
- 172 agencies and subagencies
- Suggest a dataset or app!
- 2011 Next Generation Data.gov is interactive, explorable, and socially.

COMMUNITIES

Come explore, discuss, meet others in the same field, and develop the data and apps in the community that you care about. Join in the discussions by going to communities, some of which are listed below, that interest you.

EDUCATION | ENERGY
HEALTH | MANUFACTURING
OCEAN | SAFETY

OPEN GOVERNMENT

First open source code released for the Open Government Platform delivered by the governments of India and the U.S. Find out more and then download the code.

The 2012 International Open Government Data Conference will be held July 10-12 at the World Bank in Washington DC. We hope to see you there.

What's coming up on Data.gov? Check out our blog.

LEARN

SEMANTIC WEB

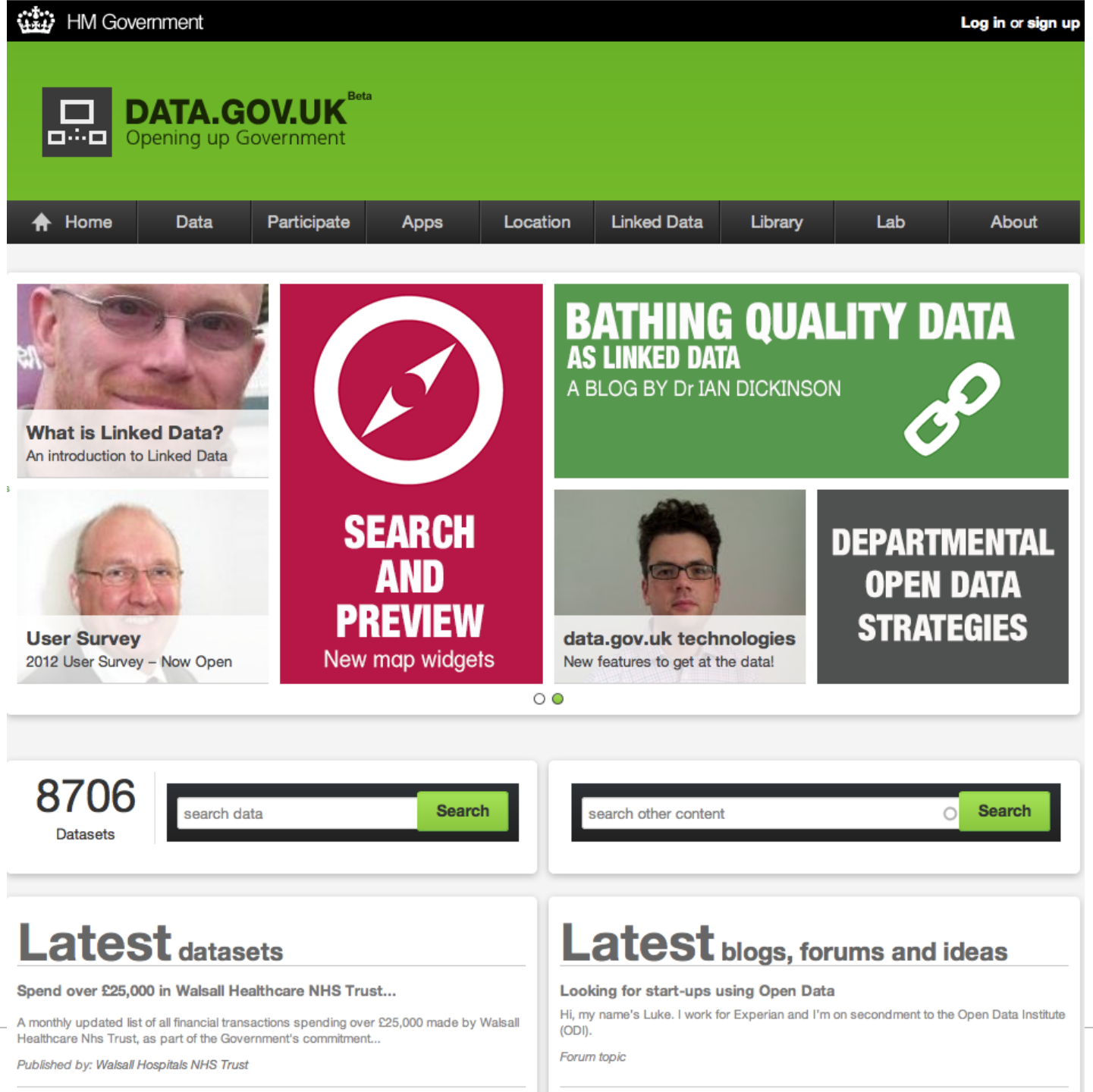
DEVELOPERS CORNER

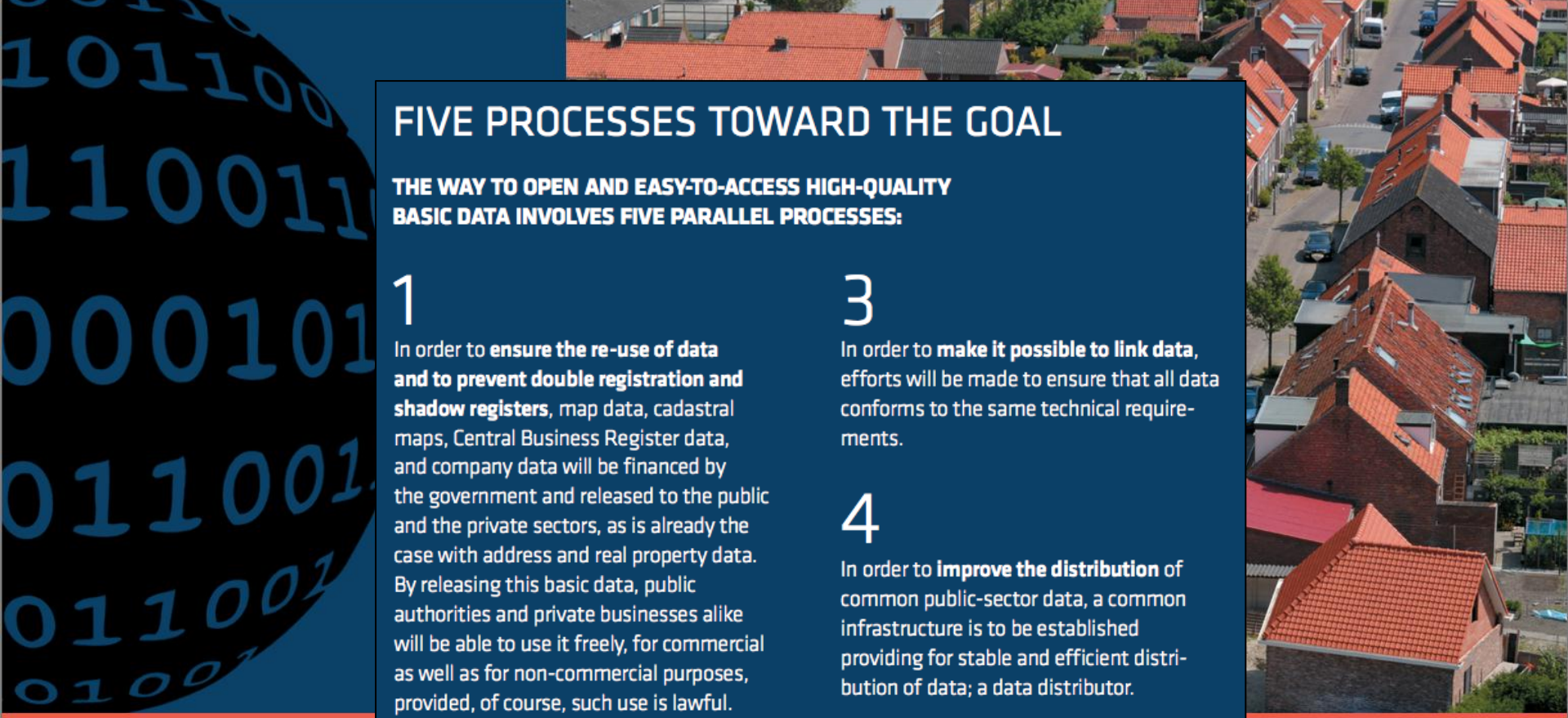
bouvet

US Government Works

- US copyright law states that
  - "a work prepared by an officer or employee of the U.S. government as part of that person's official duties"
- is
  - not entitled to domestic copyright protection

http://en.wikipedia.org/wiki/Copyright_status_of_work_by_the_U.S._government


HM Government
Log in or sign up
DATA.GOV.UK Beta
Opening up Government
Home
Data
Participate
Apps
Location
Linked Data
Library
Lab
About
What is Linked Data?
An introduction to Linked Data
SEARCH AND PREVIEW
New map widgets
BATHING QUALITY DATA
AS LINKED DATA
A BLOG BY Dr IAN DICKINSON
User Survey
2012 User Survey – Now Open
data.gov.uk technologies
New features to get at the data!
DEPARTMENTAL OPEN DATA STRATEGIES
8706
Datasets
search data
Search
search other content
Search
Latest datasets
Spend over £25,000 in Walsall Healthcare NHS Trust...
A monthly updated list of all financial transactions spending over £25,000 made by Walsall Healthcare Nhs Trust, as part of the Government's commitment...
Published by: Walsall Hospitals NHS Trust
Latest blogs, forums and ideas
Looking for start-ups using Open Data
Hi, my name's Luke. I work for Experian and I'm on secondment to the Open Data Institute (ODI).
Forum topic



FIVE PROCESSES TOWARD THE GOAL

THE WAY TO OPEN AND EASY-TO-ACCESS HIGH-QUALITY BASIC DATA INVOLVES FIVE PARALLEL PROCESSES:

1

In order to **ensure the re-use of data and to prevent double registration and shadow registers**, map data, cadastral maps, Central Business Register data, and company data will be financed by the government and released to the public and the private sectors, as is already the case with address and real property data. By releasing this basic data, public authorities and private businesses alike will be able to use it freely, for commercial as well as for non-commercial purposes, provided, of course, such use is lawful.

2

In order to **enhance the quality of data,** the registers of map data, real property data, address data, as well as business registers, will be expanded to include other necessary data. As a result, a number of existing registers will become redundant and therefore can be phased out.

3

In order to **make it possible to link data**, efforts will be made to ensure that all data conforms to the same technical require-ments.

4

In order to **improve the distribution** of common public-sector data, a common infrastructure is to be established providing for stable and efficient distri-bution of data; a data distributor.

5

In order to ensure **efficient, effective and coordinated development and use** of basic data, a cross-institutional basic-data committee is to be established.

http://www.digst.dk/Home/Servicemenu/English/Digitisation/~/media/Files/English/BasicDataUKweb20121008.ashx

difi Direktoratet for forvaltning og IKT

data.norge.no

Hjem | Data | Apps | Idéer | Blogg | Veiledning | Lisens | OSS | Om | Logg på

Registrer datasett

Har du ett eller flere datasett som kan deles med andre? Data.norge.no er et felles møtepunkt der du kan dele og gjenbruke offentlige data. Trykk på Registrer data for å starte registreringen. Før du kan legge inn dataene, må du registrere virksomheten din. Dette tar ikke lang tid.

Mer informasjon | Registrer

Brønnøysundregistrene åpner opp data for viderebruk

Forrige | Pause | Neste

Registrer app

Har du laget en app basert på offentlige åpne data? Registrer appen på data.norge.no - la oss hjelpe til med å gjøre appen kjent!

Registrer

Datahotell

Trenger du hjelp til å gjøre dine data maskinlesbare? Nå kan du bli kjent med vårt datahotell.

Mer informasjon

Åpne data på Twitter

#offdata Ukentlig is out! http://t.co/RGSEIDkK ‣ Top stories today via @NAGWTips @IeKaVa @AndantesRoar

Her er it-vinnerne i statsbudsjettet - http://t.co/7nBEAYMF http://t.co/jAp2sruN via @teknisk #statsbudsjett #itpol #offdata

Vi i Friprogsenteret kan melde om at vi har fått 4.5 mill på neste års statsbudsjett, vi gleder oss til et nytt år! #itpol #offdata

Vi i Friprogsenteret kan melde om at vi har fått 4.5 mill på neste års statsbudsjett, vi gleder oss til et nytt år! #itpol #offdata

Ressurser

Norsk lisens - NLOD
Norwegian Licence - NLOD
Ofte stilte spørsmål
Om
Veiledning

Nyeste datasett

- Forslag budsjett og økonomiplan 2013-2016 for Bergen kommune
- Datasett over offentlige virksomheter - kontaktinformasjon, kartkoordinater, kvalitetsvurderinger m.m.
- Utbetaling frå bingoentreprenør til organisasjon - oversikt 2011

Nyeste applikasjoner

- Trafikkflyt
- Enhetsregistersøk
- Polaric Droid

Søkefunksjon

Kunne vært fint med en mulighet til å søke i datasettene etter hvert som de blir flere.

Enig! Stemmer totalt: 442

Delta med dine idéer eller se hva

bouvet

http://www.regjeringen.no/nb/dep/fad/dok/rundskriv/2010/fellesforinger-tildelingsbrevene-for-201.html?id=624792

Bokmål | Nynorsk | Sá

regjeringen.no | Regjeringen Stoltenberg II | Departementene

Tema A-Å | Nettstedskart | Hjelp

FORNYINGS-, ADMINISTRASJONS- OG KIRKEDEPARTEMENTET

Søk hos Fornyings-, administrasjons- og kirkedepa

Søk på hele regjeringen.no

Del/Tips | Utskrift | a a a

Du er her: regjeringen.no / Fornyings-, administrasjons... / Dokumenter / Rundskriv / Fellesføringer i tildelingsbrevene for 2011

- Departementets forside
- Aktuelt
- Informasjonskampanjer
- Tema
- Pressesen
- Dokument
  - Statsbuds
  - Proposisj meldinger
  - Lover og
  - Rundskri
  - Høringer
  - NOU-er
  - Rapporter
  - Veiledning
  - Tildelings
  - Andre dok
- Om depart
- Lyd og bild
- Dokument

Rundskriv, 16.11.2010
Nr.: P 5/2010

Fellesføringer i tildelingsbrevene for 2011

5. **Tilgjengeliggjøring av offentlige data**
   "Etatene skal gjøre egnede og eksisterende rådata tilgjengelige i maskinlesbare formater. Dette gjelder informasjon som har samfunnsmessig verdi, som kan viderebrukes, som ikke er taushetsbelagte og der kostnadene ved tilgjengeliggjøring antas å være beskjedne (bortfall av inntekter ved salg av data anses som en kostnad). Formater og bruksvilkår må være i overensstemmelse med Referansekatalogen og FADs føringer på nettstedet data.norge.no. Informasjon om hvilke rådata som er tilgjengelige, skal publiseres på virksomhetens nettside. Dette bør ses i sammenheng med registrering av datasett på nettstedet data.norge.no.
   Etater som vurderer å etablere nye eller å oppgradere eksisterende publikumstjenester med utgangspunkt i rådata, skal normalt gjøre disse rådataene offentlig tilgjengelige i maskinlesbare formater, dersom ingenting er til hinder for slik tilgjengeliggjøring av rådata. Før virksomheten eventuelt selv etablerer nye publikumsløsninger basert på rådata, må det vurderes om det er mer kostnadseffektivt å tilgjengeliggjøre rådata i maskinlesbare formater som grunnlag for at andre kan utvikle tjenester. Det skal fremkomme av årsrapporten hvilke data som er gjort tilgjengelige. Dersom publikumstjenester blir etablert uten tilgjengeliggjøring av rådata, skal dette begrunnes i årsrapporten".

Alle fellesføringene skal følges opp innenfor budsjettrammene for 2011.

NAVIGASJON

- Hovedside
- Kategorier
- Populære sider
- Nye sider
- Om IT-avdelingen
- Om IT-hjelp
- Jeg vil bidra
- Hjelp

SØK

Gå

Søk

LENKER

- Registrer problem/ spørsmål
- Finn student/ansatt
- Webmail
- Kalender.uib.no
- SEBRA
- Mi side
- Intranett
- UiB på vev
- Flere lenker

VERKTØY

- Lenker hit
- Relaterte endringer
- Spesialsider
- Utskriftsvennlig versjon
- Permanent lenke
- Print as PDF

Åpne data

Under utvikling Denne siden er under utvikling og ble sist oppdatert 29.10.2012 av Edpck.

Vi gjør oppmerksom på at vi er helt i startfasen (betaversjon), slik at både vilkår og grensesnitt vil kunne endres.

Åpne data

Åpne data ved UiB består av forskjellige datasett. Felles for de alle er at det må registreres navn og epostadresse for å få tilgang til de via en api-nøkkel.

Disse dataene er i maskinlesbar form og er derfor først og fremst ment for systemer og applikasjoner.

- Registrer deg og få en api-nøkkel
- Liste/api over åpne data
- Lisens
- Ofte stilte spørsmål om åpne data
- Statistikk

Kategorier: IA | Sider under utvikling

Del på

©2010 Universitetet i Bergen

Adresse: Postboks 7800 5020 Bergen

Besøksadresse: Nygårdsgaten 5

Telefon: (+47) 55584700 Faks: (+47) 55548299

Why publish open data?

- To empower other people to do things
  - you can't afford
  - you don't have the time to
  - you don't want to
  - you couldn't imagine
- Again: no data, no service

Why is this so popular now?

- Because the advent of
  - ubiquitous computing,
  - cheap hardware and disk space,
  - cheap and fast networks
- has dramatically reduced the cost of distributing data
  - and building applications,
  - while dramatically increasing the value from such applications
- Also, fashion

Why is access to data important?

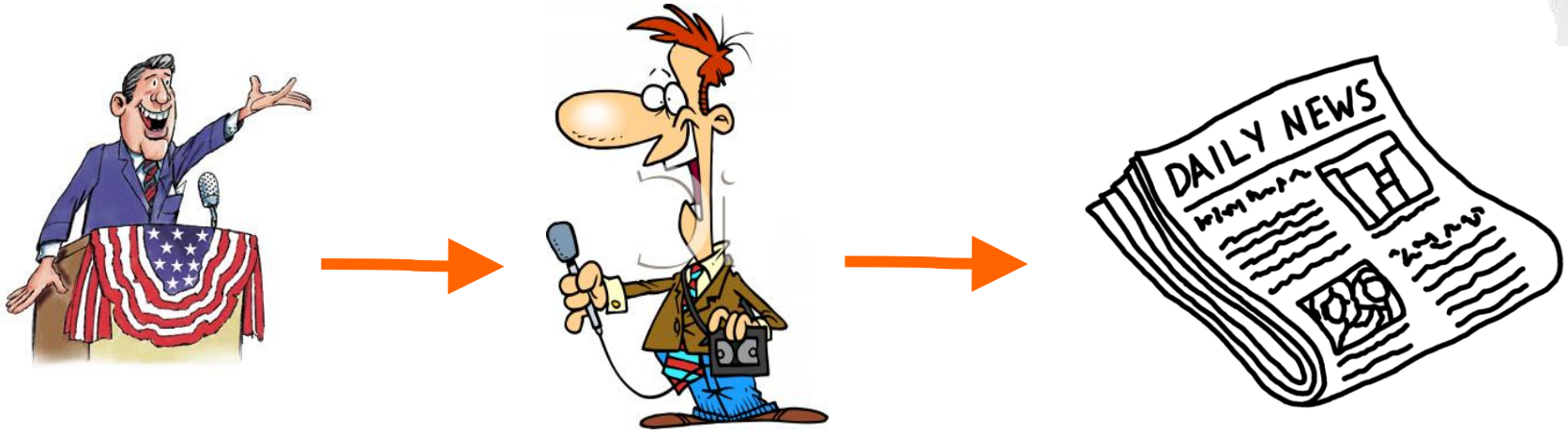
- It's necessary for democracy to function properly
  - voters and activists cannot make the right decisions if they don't have the necessary information
- It's important for economic growth
  - in a post-modern society, information is the life-blood of the economy
  - many companies make their living simply by selling repackaged information

Economic effects

- Making information more easily available
  - levels the playing field
  - benefiting smaller companies
  - improves competition
- Large companies have
  - advertising budgets,
  - money to extract data,
  - …
- Smaller entities don't

Two kinds of availability (1)

- Available to humans
  - this makes the raw data available to humans
  - only humans can then digest and process it, and ultimately pass it on to other humans



Two kinds of availability (2)

- Available to machines
  - that is, make the data available in machine-processable form
  - people can then build many different kinds of services based on the data
  - allows many different kinds of access to the data

TheyWorkForYou.com

Keeping tabs on the UK's parliaments & assemblies

mysociety | DONATE | MORE

TheyWorkForYou.com

Keeping tabs on the UK's parliaments & assemblies

Search [ ] Go

e.g. a *word*, *phrase*, *person*, or *postcode* | More options

Sign in Join | Your MP UK Parliament (change)

Overview | MPs | Lords | Debates | Written Answers and Statements | Bill Committees | Upcoming

Email me updates on Richard Benyon's activity

(no more than once per day)

Richard Benyon

Conservative MP for Newbury

Parliamentary Under Secretary of State (Natural Environment and Fisheries), Environment, Food and Rural Affairs (since 14 May 2010) (note about dates)

- **Entered Parliament on 5 May 2005** — General election

- **Send a message to Richard Benyon** (only use this for *your* MP) (via WriteToThem.com)
- **Get messages from your MP** (via HearFromYourMP)
- Help us add video by **matching a speech by Richard Benyon**
- **Voting record**
- **Topics of interest**
- **Most recent appearances**
- **Numerology**
- **Register of Members' Interests**
- **Expenses**

Search this person's speeches

[ ] GO

More useful links for this person

- **Maiden speech** (automated, may be wrong)
- **Guardian profile**
- **Wikipedia page**
- **BBC News profile**
- **Early Day Motions signed by this MP** (From edms.org.uk)
- **Election results for Newbury** (From The Guardian)

Previous MPs in this constituency

- **David Rendel**
- **Judith Chaplin**
- **Michael McNair-Wilson**
- **John Astor**

bouvet

Voting record (from PublicWhip)

How Richard Benyon voted on key issues:

Voted **very strongly against** allowing ministers to **intervene in inquests**. votes

Voted **very strongly against** equal **gay rights**. votes

Voted **moderately against** Labour's **anti-terrorism laws**. votes

Voted **strongly against** more **EU integration**. votes

Voted **moderately for** laws to **stop climate change**. votes

Has **never voted** on a **stricter asylum system**. votes

Voted **strongly for** increasing the **rate of VAT**. votes

Has **never voted** on a **transparent Parliament**. votes

Has **never voted** on automatic enrolment in occupational pensions. votes

Voted **a mixture of for and against** encouraging occupational pensions. votes

Voted **moderately against** a **smoking ban**. votes

Voted **very strongly for** greater **autonomy for schools**. votes

Voted **very strongly against** a more **proportional system** for electing MPs. votes

Voted **very strongly for** replacing **Trident**. votes

Voted **against** removing **hereditary peers** from the House of Lords. votes

Voted **a mixture of for and against** a **wholly elected** House of Lords. votes

Voted **very strongly for** an **investigation** into the Iraq war. votes

Voted **very strongly against** introducing **ID cards**. votes

Voted **very strongly for** university **tuition fees**. votes

Voted **for** raising England's undergraduate tuition fee cap to £9,000 per year. votes

*Read about **how the voting record is decided**.*

More on **well-known issues** (from the Guardian) & **their full record**

Hardly ever rebels against their party in this parliament.

U.S. Senate Profiles

That's My Congress

That's My Congress Profiles of United States Senators in the 112th Congress.

Methodology
Congressional scorecards at That's My Congress are generated from observations of roll call voting and bill cosponsorship behavior during the 112th Congress.

The *Liberal Action Score* for a member of Congress is calculated as the percentage of a slate of *possible* liberal actions that were *actually* taken by that member. The liberal standard for judging bills is defined according to these conditions:

- Respect for constitutional protections of American civil liberty
- Transparency and public access in government
- Equal treatment of people under law
- The respect and pursuit of empirical knowledge through support for science and education
- Protection of the Earth's environmental richness
- Strengthening of economic opportunity for all
- Pursuit of peaceful solutions and opposition to militarism in policy

Progressive Rankings and Contact Information for Members of the Senate in the 112th Congress
Brought to you by That's My Congress

House Profiles: Overall | By State | By Name
Senate Scorecards: Overall | By State | By Name
Click here for descriptions of the bills used to determine Senate scores

Follow the links below to find your Senators' profiles, containing liberal and conservative scores, contact information, news on their legislative behavior, and links to uncover campaign contribution secrets:

Strong Liberals. The following Senators have earned a Net Congressional Score between 70 and 100:

Senator Tom Harkin	(D-IA)	Liberal Score: 93/100	Conservative Score: 0/100	Net Score: 93	Phone: 202-224-3254	Contact online
Senator Jeff Merkley	(D-OR)	Liberal Score: 93/100	Conservative Score: 0/100	Net Score: 93	Phone: 202-224-3753	Contact online
Senator Bernard Sanders	(I-VT)	Liberal Score: 93/100	Conservative Score: 0/100	Net Score: 93	Phone: 202-224-5141	Contact online
Senator Sherrod Brown	(D-OH)	Liberal Score: 86/100	Conservative Score: 7/100	Net Score: 79	Phone: 202-224-2315	Contact online
Senator Richard Durbin	(D-IL)	Liberal Score: 86/100	Conservative Score: 7/100	Net Score: 79	Phone: 202-224-2152	Contact online
Senator Benjamin Cardin	(D-MD)	Liberal Score: 79/100	Conservative Score: 7/100	Net Score: 71	Phone: 202-224-4524	Contact online
Senator Patty Murray	(D-WA)	Liberal Score: 79/100	Conservative Score: 7/100	Net Score: 71	Phone: 202-224-2621	Contact online
Senator Ron Wyden	(D-OR)	Liberal Score: 79/100	Conservative Score: 7/100	Net Score: 71	Phone: 202-224-5244	Contact online

Somewhat Liberal. The following Senators have earned a Net Congressional Score between 40 and 69:

Senator Al Franken	(D-MN)	Liberal Score: 71/100	Conservative Score: 7/100	Net Score: 64	Phone: 202-224-5641	Contact online
Senator Tom Udall	(D-NM)	Liberal Score: 71/100	Conservative Score: 7/100	Net Score: 64	Phone: 202-224-6621	Contact online
Senator Barbara Boxer	(D-CA)	Liberal Score: 71/100	Conservative Score: 14/100	Net Score: 57	Phone: 202-224-3553	Contact online
Senator Kirsten Gillibrand	(D-NY)	Liberal Score: 71/100	Conservative Score: 14/100	Net Score: 57	Phone: 202-224-4451	Contact online
Senator Frank Lautenberg	(D-NJ)	Liberal Score: 64/100	Conservative Score: 7/100	Net Score: 57	Phone: 202-224-3224	Contact online

Texas Legislature Online - Microsoft Internet Explorer
Fil Rediger Vis Favoritter Verktøy Hjelp
Adresse http://localhost:8080/txleg/index.html
Gå til
Texas Legislature Online
Putting the Texas Legislature on Your Desktop
HB 1707
View in the scope:
All
Legislature Members
House
Senate
Bills
House
Senate
Reports
House
Senate
Amendments
House
Senate
Legislative Subjects
Taxation
County
Franchise
Accounting
Committees
House
Senate
Author of Bill
D. R. Uher
Sponsor of Bill
Kenneth Armbrister
Legislative Session
76(R)
Description
Relating to registration of certain motor vehicles by a county tax assessor-collector.
Versions
The following state(s) of this Bill are available along with other resources for that version (i.e. Fiscal Report, Analysis):
Engrossed Version (view line-numbered text document)
Lokalt intranett

DATABLOG

Facts are sacred

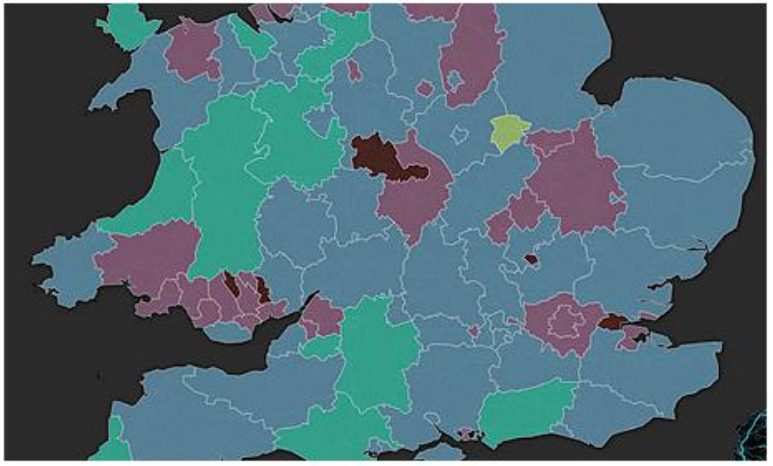
Previous Blog home

How devolution is killing open government data

Simon Rogers: Getting statistics for the whole of the United Kingdom - England, Scotland, Wales and Northern Ireland - is getting trickier as the regions move politically further apart. The problem is, it's killing national open data too. This is how we could fix that

• More data journalism and data visualisations from the Guardian

Share 8
Tweet 89
+1 1
Email



But is it the whole country? Map of happiness indicators

Posted by
Simon Rogers
Tuesday 9 October 2012
07.30 BST
guardian.co.uk

Jump to comments (7)

More on Scottish independence

Are you British or Scottish? Do you live in the UK or England & Wales?

http://www.guardian.co.uk/news/datablog/2012/oct/09/devolution-national-statistics-data

bouvet

Gravemaskinen.no

Gravejournalistenes søkemotor

Logg inn

Start nytt søk

Alle artikler

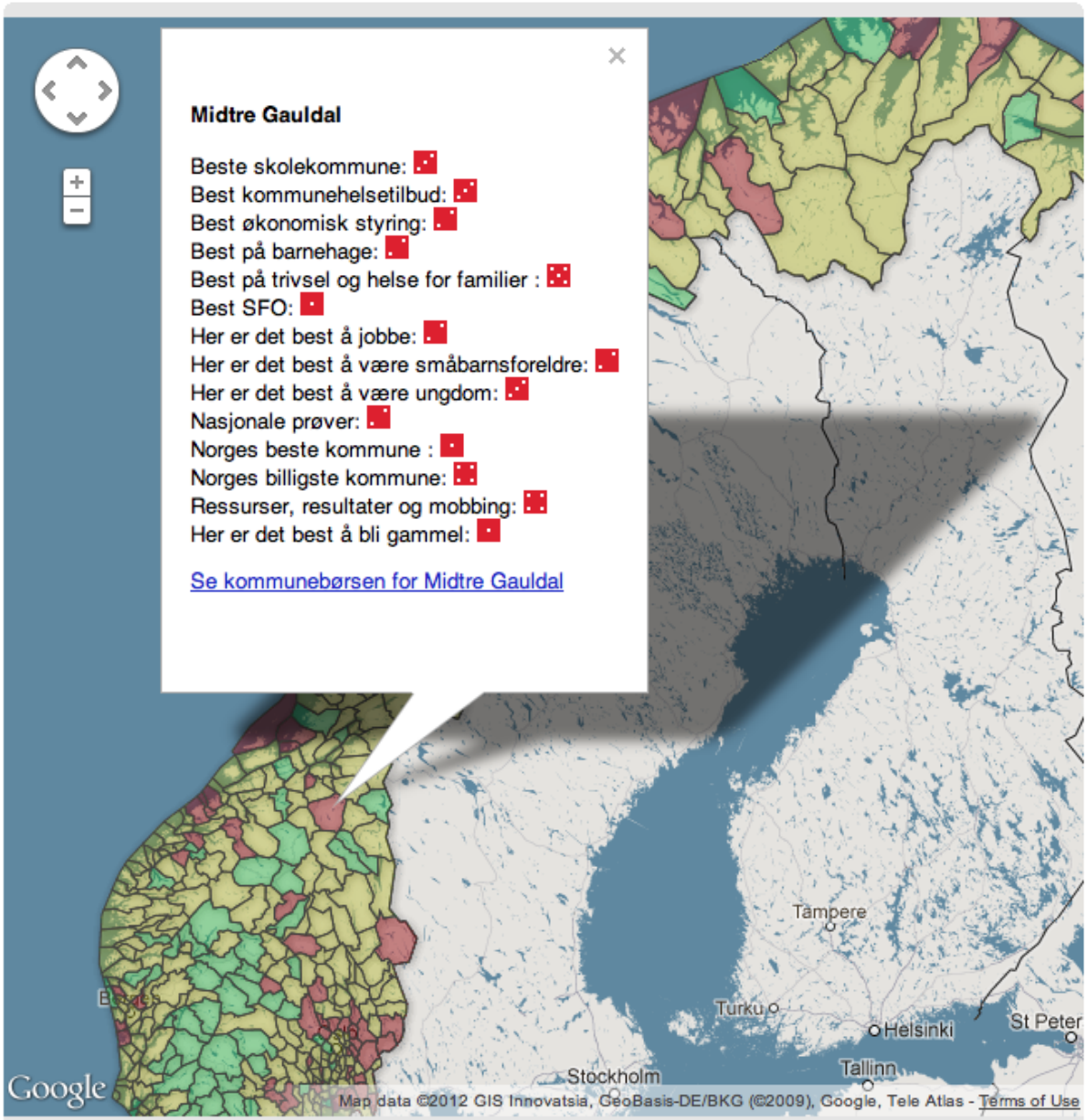
Siste Nytt | Kontekstsøk | Setningssøk | Artikler | Nettaviser | Journalister | Personer

Resultat 1–50 av 3,424,437 (csv | xls)

Dato	Tittel	Ingress	Nettavis	Journalist
2012-10-30 11:00	Snøkaos i Bodø		avisa nordland	
2012-10-30 11:00	Utforkjøringer og starthjelp		avisa nordland	
2012-10-30 11:00	Nye ruter for Norwegian	Flere direkteruter fra Evenes og Tromsø. Ingen fra Bodø?	avisa nordland	
2012-10-30 11:00	Rent bord for Skyfall	Fulle saler hele helgen.	avisa nordland	
2012-10-30 11:00	Holdt sjuåring i fast grep	Bodø: 39-åring tiltalt for å truet, forstyrret og plaget tilfeldige mennesker i Glasshuset.	avisa nordland	
2012-10-30 11:00	Skjøt jerv	Saltdal::	avisa nordland	
2012-10-30 11:00	Supermanna fra himmelen	Manna har gjenoppstått: Møt Supermanna. Hør bandets nye single «Fred og frihet» her.	avisa nordland	
2012-10-30 09:10	Over 50 hjem ødelagt i brann New York etter Sandy	Brannvesenet i New York melder at over 50 hjem er ødelagt i brann i bydelen Queens.	aftenposten	Arild Færaas
2012-10-30 09:05	Annenhver lærerstudent stryker i matte	Strykprosenten på grunnskolelærerstudiet har skutt i været.	aftenposten	Pål Vegard Hagesæther
2012-10-30 09:05	Windows Phone 8 kommer først til Europa	Microsoft med svært forbrukerrettet lansering.	digi.no	Harald Brombach
2012-10-30 09:03	OSLO B◆S - MATCHING HALT		oslo børs	Sas Ab

feedback

Examples of use



Klikk på kartet for å sjekke din kommune.

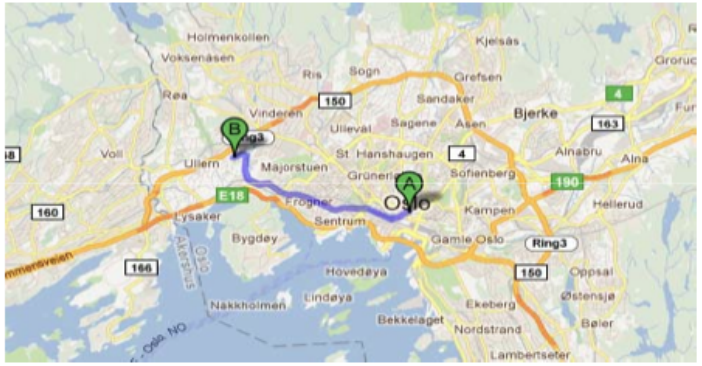
Kategoriene: Alle NORGES BESTE KOMMUNE Best økonomisk styring
Beste skolekommune Nasjonale prøver Ressurser, resultater og mobbing
Best kommunehelsetilbud Best å jobbe Best på barnehage Best SFO
Best å være småbarnsforeldre Best å være ungdom Norges billigste kommune

http://www.dagbladet.no/kommunebørsen/

bouvet

Environmental friendly behaviour (Use Case 2)

- **Problem statement**: Faced with different transportation options for a short trip, which are the most environmental-friendly options given constraints like time, weather, traffic and private preferences.



- Typically different options
  - Public transportation (bus/tram/metro/train)
  - Private car (electric/gas/diesel) car, taxi
  - Cycling, walking
- Constraints: Time, avoid bad weather, polluted zones, traffic, private preferences
- Environmental parameters: CO2 emissions, energy efficiency
- **Added value proposition**: Enable smarter/faster environmental friendly decision making for local trips when options are available
  - Assist the user's decision making wrt travelling from his current position to the position of the next event in the user's calendar

Research project by SINTEF and Computas

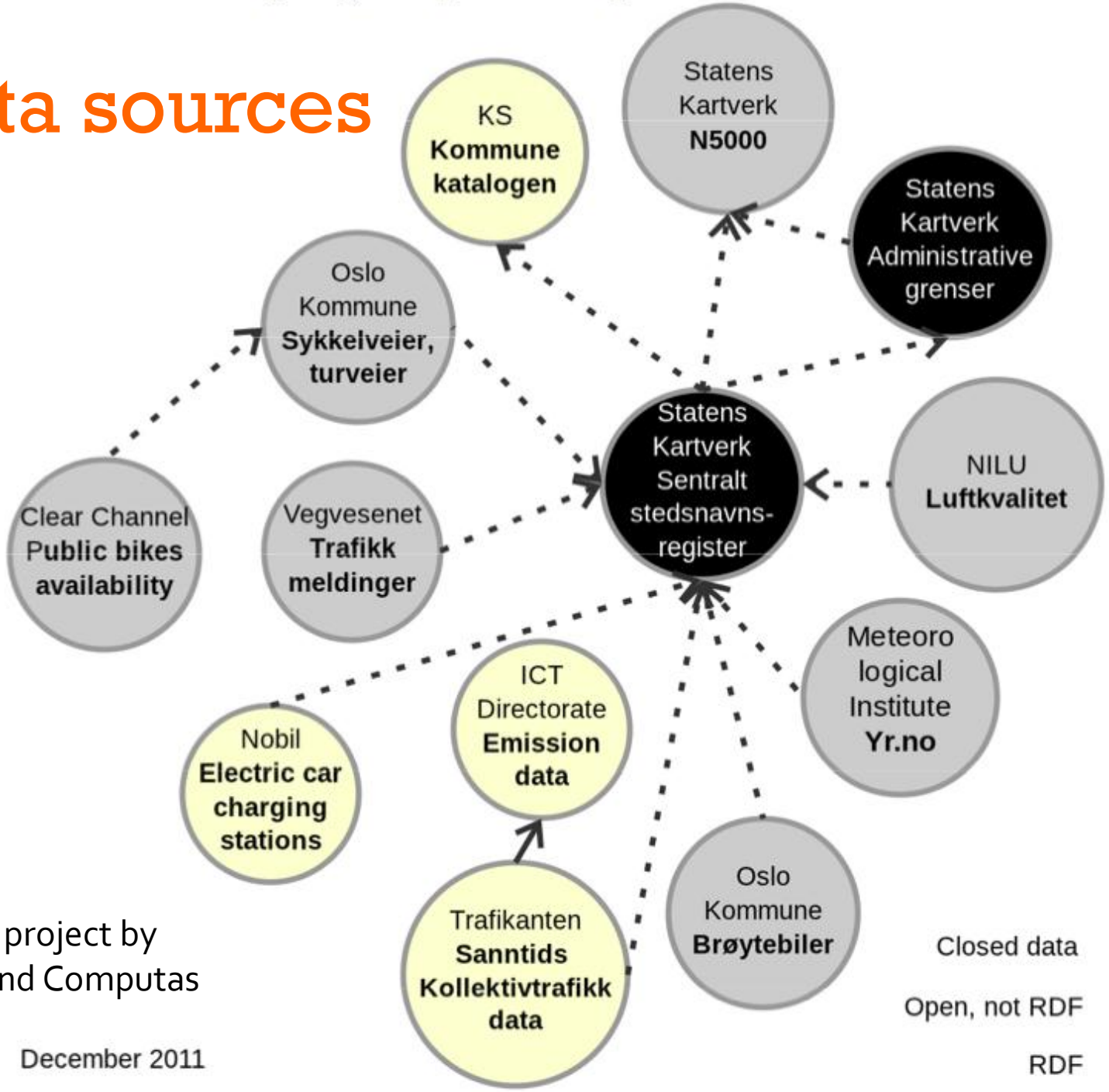
bouvet

Must be at meeting at 1345. Three transport alternatives.

Research project by SINTEF and Computas

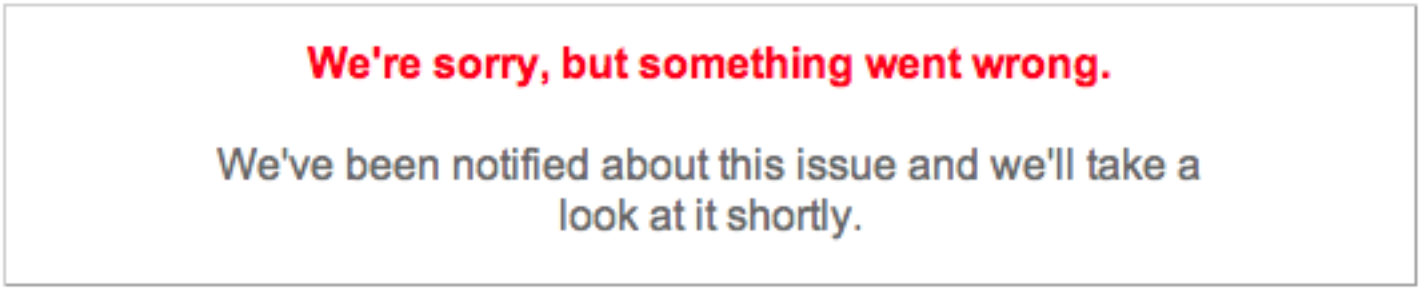
bouvet

Data sources



Research project by
SINTEF and Computas

Bygninger.no



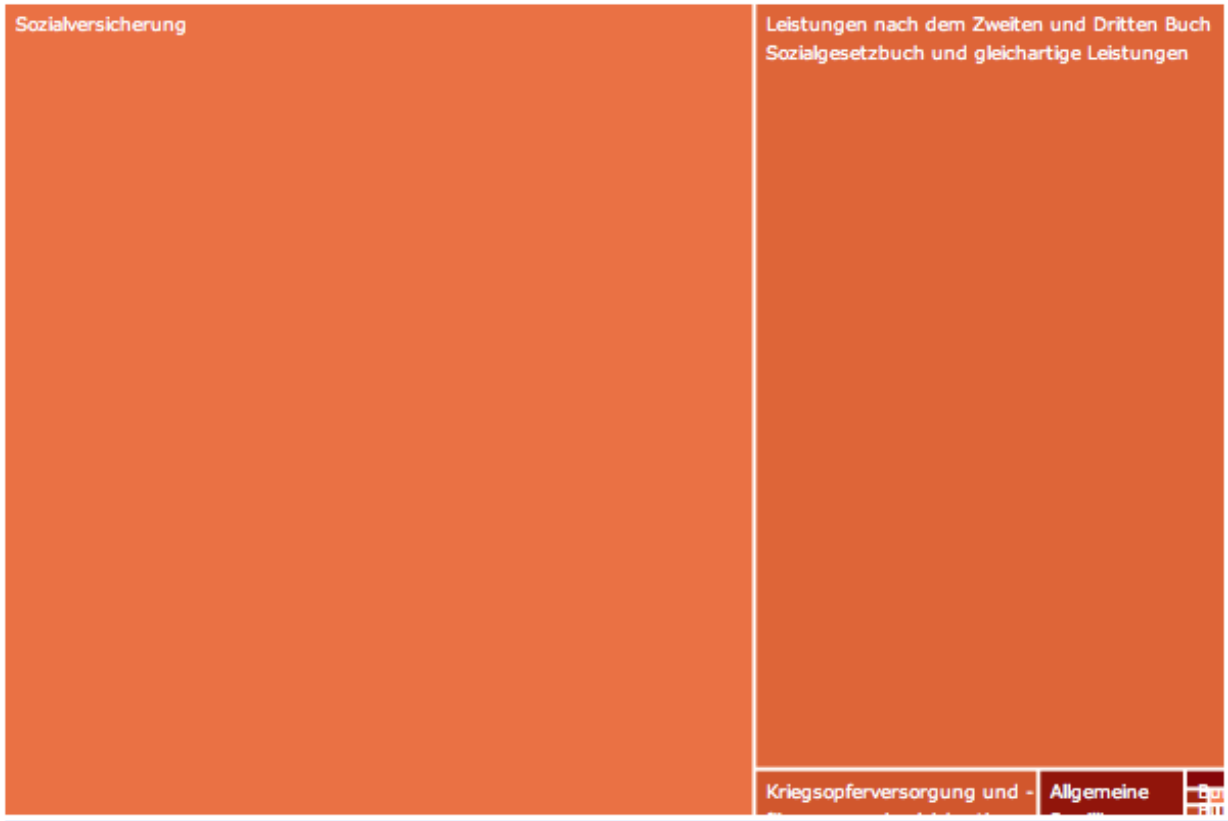
(Database is over free limit.)

German Federal Budget

http://bund.offenerhaushalt.de/

Social Security Ministry

Bundesministerium für Arbeit und Soziales



ID:	11
Ausgaben:	131.293.000.000

Zahlenwerte **anzeigen**.

Finanzministerium:	**Quellseite** **Erweitertes PDF**
Datenexport:	**JSON · RDF/XML**

bouvet

Cleaning customer data

- I did work deduplicating a customer database
- We wanted to look at cleaning the data automatically
  - ie: picking which of the duplicate records to use
- Decided at the time it couldn't be done automatically
  - because company data not available online
- Now it is available…

http://dbpedia.org/About

- Not really an application
  - but a very important data set
- Basically Wikipedia as Linked Open Data
  - Wikipedia fact boxes etc extracted as RDF
  - 400 million statements about 3.77 million things

About: Rælingen

An Entity of Type : administrative region, from Named Graph : http://dbpedia.org, within Data Space : dbpedia.org

Rælingen is a village and municipality in Akershus county, Norway. It is part of the traditional region of Romerike. The administrative centre of the municipality is the village of Fjerdingby. Rælingen was separated from the municipality of Fet on 1 July 1929.

Property	Value
dbpprop:mayor	Øivind Sand
dbpprop:mayorAsOf	2007 (xsd:integer)
dbpprop:mayorParty	dbpedia:Labour_Party_(Norway)
dbpprop:munwebpage	www.ralingen.kommune.no
dbpprop:name	Rælingen
dbpprop:populationAsOf	2004 (xsd:integer)
dbpprop:populationDensityKm	261 (xsd:integer)

Fork me on GitHub

Postnummer.info

På grund av att Posten AB skickat ett cease and desist brev till mig är tjänsten tyvärr nerstängd. Anledningen anges som att jag skulle ha kopierat och spridit deras postnummerdatabas, vilket inte är sant. All information som gick få från API:et hämtades från postens publika hemsida. Information vem som helst kan se. Vill ni använda data ur postens tjänst och använder Ruby kan ni använda gem:et som API:et använde för att hämta data. Ni hittar det på github, postnummer. Ni får då ruby objekt som innehåller datan ni söker fram istället för JSON.

Ruby bibliotek @fredrikwallgren walle

How to publish

Ten Principles for Open Gov't Data

1. Completeness
2. Primary
3. Timeliness
4. Ease of access
5. Machine readable
6. Non-discrimination
7. Use open standards
8. Licensing
9. Permanence
10. Usage cost

http://sunlightfoundation.com/policy/documents/ten-open-data-principles/

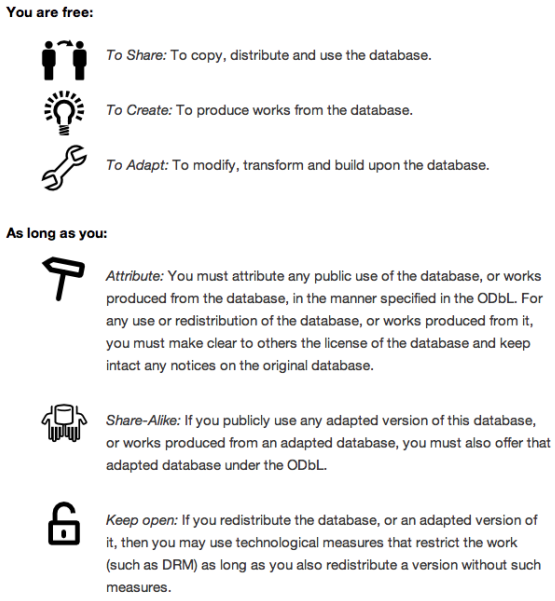
5-star model

- Available, open license
- Machine-readable format
- Non-proprietary format
- URIs as identifiers
- Linked to other data

http://5stardata.info/

Data licenses

- Necessary so users know what they are allowed/not allowed to do with the data
- Open Data Commons has licenses you can reuse:
  - http://opendatacommons.org/licenses/
- Such as
  - public domain (anything goes)
  - attribution license (must give credit)
  - attribution share-alike
- Norwegian license
  - http://data.norge.no/nlod/en
  - Norwegian Licence for Open Government Data



Machine-readable

Readable

- CSV
- XML
- Microsoft Excel
- RDF
- JSON

Not readable

- Microsoft Word
- PDF
- HTML
- Flash

```
>>> import csv
>>> r = csv.reader(open('countries-mondial.csv'))
>>> r.next()
['id', 'country', 'capital', 'area']
>>> r.next()
['4202', 'Malta', 'Valletta', '320']
>>> int(r.next()[3]) * 247.105
3330975.4000000004     # area of next country in acres
```

Non-proprietary

- Microsoft Excel is a proprietary format
  - it's owned and controlled by Microsoft
  - it's also very complicated to read
- An open alternative is CSV
- Open, standardized alternatives are
  - XML, RDF, JSON

Ways to publish

- **Download**
  - this is the easiest
  - just put up static data files for download
  - *vastly* better than nothing
- **API**
  - build an API people can use for interacting with the data
  - fashionable, but not really necessary
- **Stream**
  - publish streams of changes, for easy syncing
  - using SDshare, for example
  - very useful, but can be costly

How hard is it to publish data?

- Depends on how you do it
- Dumping CSV from a relational database is trivial
  - can literally be as simple as just a few lines of code
- The more ambitious you are, the more work it becomes
  - filtering out sensitive records
  - using better formats than CSV
  - linking to other data
  - documenting
  - adding streaming
  - …

URIs as identifiers

- URIs are globally unique
  - thanks to their use of domain names
  - anyone with a domain name can make URIs
- Benefits
  - identifiers that can be reused anywhere, and still remain unique
  - can be resolved to an explanation of what they identify

Linking to other data (1)

- Data becomes more valuable when it is connected to other data
  - because this reduces the cost of reusing and processing the data
- Imagine reusing the data below
  - how do you connect with country data from other sources?

ID	COUNTRY	CAPITAL	AREA
4202	Malta	Valletta	320
19654	Moldova	Chisinau	25333
8715	Kazakstan	Almaty	2717300

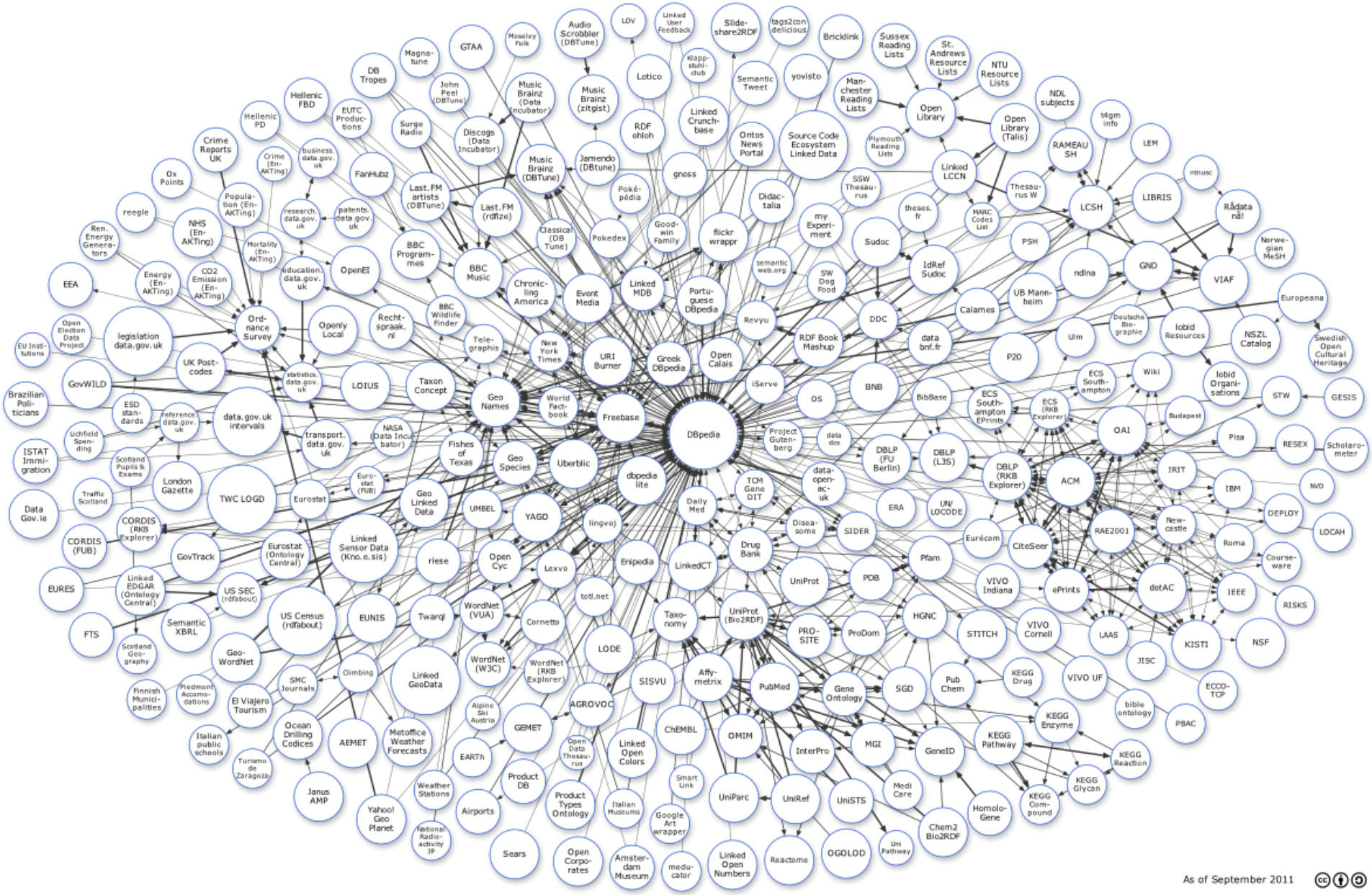
Data from Mondial

Linking to other data (2)

- By using common URIs for your concepts you can make data reuse much easier

ID	COUNTRY	CAPITAL	AREA
http://dbpedia.org/resource/Malta	Malta	Valletta	316
http://dbpedia.org/resource/Moldova	Moldova	Chişinău	33846
http://dbpedia.org/resource/Kazakhstan	Kazakhstan	Almaty	2717300

Data from DBpedia



As of September 2011

47

Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. http://lod-cloud.net/

bouvet

Linked Data principles

1. Use URIs as names for things

1. Use HTTP URIs so that people can look up those names.

1. When someone looks up a URI, provide useful information, using the standards (RDF*, SPARQL)

1. Include links to other URIs so that they can discover more things.

http://www.w3.org/DesignIssues/LinkedData

An example

```
<result>
  <heading>VEGMELDINGER - Viktigste</heading>
  <messages>
    <message>
      <heading>Oslo (Ulven) - Karihaugen, ved [41] Furuset</heading>
      <messagenumber>64952</messagenumber>
      <version>1</version>
      <ingress>To felt stengt på grunn av vedlikeholdsarbeid i periodene: Onsdag og torsdag fra
22:00 til 05:30 (neste dag). Fare for kø.</ingress>
      <messageType>Redusert framkommelighet</messageType>
      <urgency>X</urgency>
      <roadType>Ev</roadType>
      <roadNumber>6</roadNumber>
      <validFrom>2012-10-24 22:00:00.0 CEST</validFrom>
      <validTo>2012-10-26 05:30:00.999 CEST</validTo>
      <actualCounties>
       <string>Oslo</string>
      </actualCounties>
      <coordinates>
       <crs>EPSG:4326</crs>
       <startPoint>
        <xCoord>10.889964</xCoord>
        <yCoord>59.937266</yCoord>
       </startPoint>
      </coordinates>
```

Are these helpful ways to refer to route E6 and the county of Oslo?

An alternative

```
<result>
  <heading>VEGMELDINGER - Viktigste</heading>
  <messages>
    <message>
      <heading>Oslo (Ulven) - Karihaugen, ved [41] Furuset</heading>
      <messagenumber>64952</messagenumber>
      <version>1</version>
      <ingress>To felt stengt på grunn av vedlikeholdsarbeid i periodene: Onsdag og torsdag fra
22:00 til 05:30 (neste dag). Fare for kø.</ingress>
      <messageType>Redusert framkommelighet</messageType>
      <urgency>X</urgency>
      <road>http://dbpedia.org/resource/European_route_E06</road>
      <validFrom>2012-10-24 22:00:00.0 CEST</validFrom>
      <validTo>2012-10-26 05:30:00.999 CEST</validTo>
      <actualCounties>
        <county>http://dbpedia.org/resource/Oslo</county>
      </actualCounties>
      <coordinates>
        <crs>EPSG:4326</crs>
        <startPoint>
          <xCoord>10.889964</xCoord>
          <yCoord>59.937266</yCoord>
        </startPoint>
      </coordinates>
```

Now we're using URIs as names for these concepts. And, what's more, the names resolve to more information.

HTML

```
[larsga@Lars-Marius-Garshols-MacBook-Pro-6 ~]$ telnet dbpedia.org 80
Trying 194.109.129.58...
Connected to dbpedia.org (194.109.129.58).
Escape character is '^]'.
GET /page/European_route_E06 HTTP/1.0

HTTP/1.1 200 OK
Date: Wed, 24 Oct 2012 07:16:21 GMT
Content-Type: text/html; charset=UTF-8
Content-Length: 44484
Connection: close
Vary: Accept-Encoding
Server: Virtuoso/06.04.3132 (Linux) x86_64-generic-linux-glibc212-64 VDB
Accept-Ranges: bytes
Expires: Wed, 31 Oct 2012 07:16:20 GMT
Link: <http://dbpedia.org/data/European_route_E06.rdf>; rel="alternate";
type="application/rdf+xml" ...

<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML+RDFa 1.0//EN"
"http://www.w3.org/MarkUp/DTD/xhtml-rdfa-1.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
   xmlns:dbpprop="http://dbpedia.org/property/"
   xmlns:foaf="http://xmlns.com/foaf/0.1/"
   version="XHTML+RDFa 1.0" xml:lang="en">
```

This is the green type of DBpedia web page you've already seen for Rælingen.

RDF/XML

[larsga@Lars-Marius-Garshols-MacBook-Pro-6 ~]$ **telnet dbpedia.org 80**
Trying 194.109.129.58...
Connected to dbpedia.org (194.109.129.58).
Escape character is '^]'.
GET /data/European_route_E06.rdf HTTP/1.0

HTTP/1.1 200 OK
Date: Wed, 24 Oct 2012 07:36:03 GMT
Content-Type: **application/rdf+xml**; charset=UTF-8
Content-Length: 24377
Connection: close
Vary: Accept-Encoding
Server: Virtuoso/06.04.3132 (Linux) x86_64-generic-linux-glibc212-64 VDB
Accept-Ranges: bytes
Expires: Wed, 31 Oct 2012 07:36:03 GMT
Link: ...

```
<?xml version="1.0" encoding="utf-8" ?>
<rdf:RDF
        xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
        xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
        xmlns:owl="http://www.w3.org/2002/07/owl#"
        xmlns:foaf="http://xmlns.com/foaf/0.1/"
        xmlns:dbpedia-owl="http://dbpedia.org/ontology/"
        xmlns:dcterms="http://purl.org/dc/terms/"
        xmlns:dbpprop="http://dbpedia.org/property/"
        xmlns:ns7="http://www.w3.org/ns/prov#"
        xmlns:ns8="http://dbpedia.org/ontology/Infrastructure/" >
 <rdf:Description rdf:about="http://dbpedia.org/resource/European_route_E06">
  <rdf:type rdf:resource="http://dbpedia.org/ontology/Place" />
  <rdf:type rdf:resource="http://dbpedia.org/ontology/Infrastructure" />
  <rdf:type rdf:resource="http://schema.org/Place" />
```

Linked Data

Weaknesses in traditional formats

- Cannot be imported directly
  - must always be translated/interpreted somehow
- Cannot be automatically merged
  - no concept of identity
- Schema information is not linked
  - types and properties not connected to other types and properties
- Linked Data solves all of these problems
  - Linked Data ≈ RDF

How RDF works

relational table 'PERSON'

ID	NAME	EMAIL
1	Stian Danenbarger	stian.danenbarger@
2	Lars Marius Garshol	larsga@bouvet.no
3	Axel Borge	axel.borge@bouvet

RDF-ized data

SUBJECT	PROPERTY	OBJECT
http://example.com/person/1	rdf:type	ex:Person
http://example.com/person/1	ex:name	Stian Danenbarger
http://example.com/person/1	ex:email	stian.danenbarger@
http://example.com/person/2	rdf:type	Person
http://example.com/person/2	ex:name	Lars Marius Garshol
…	…	…

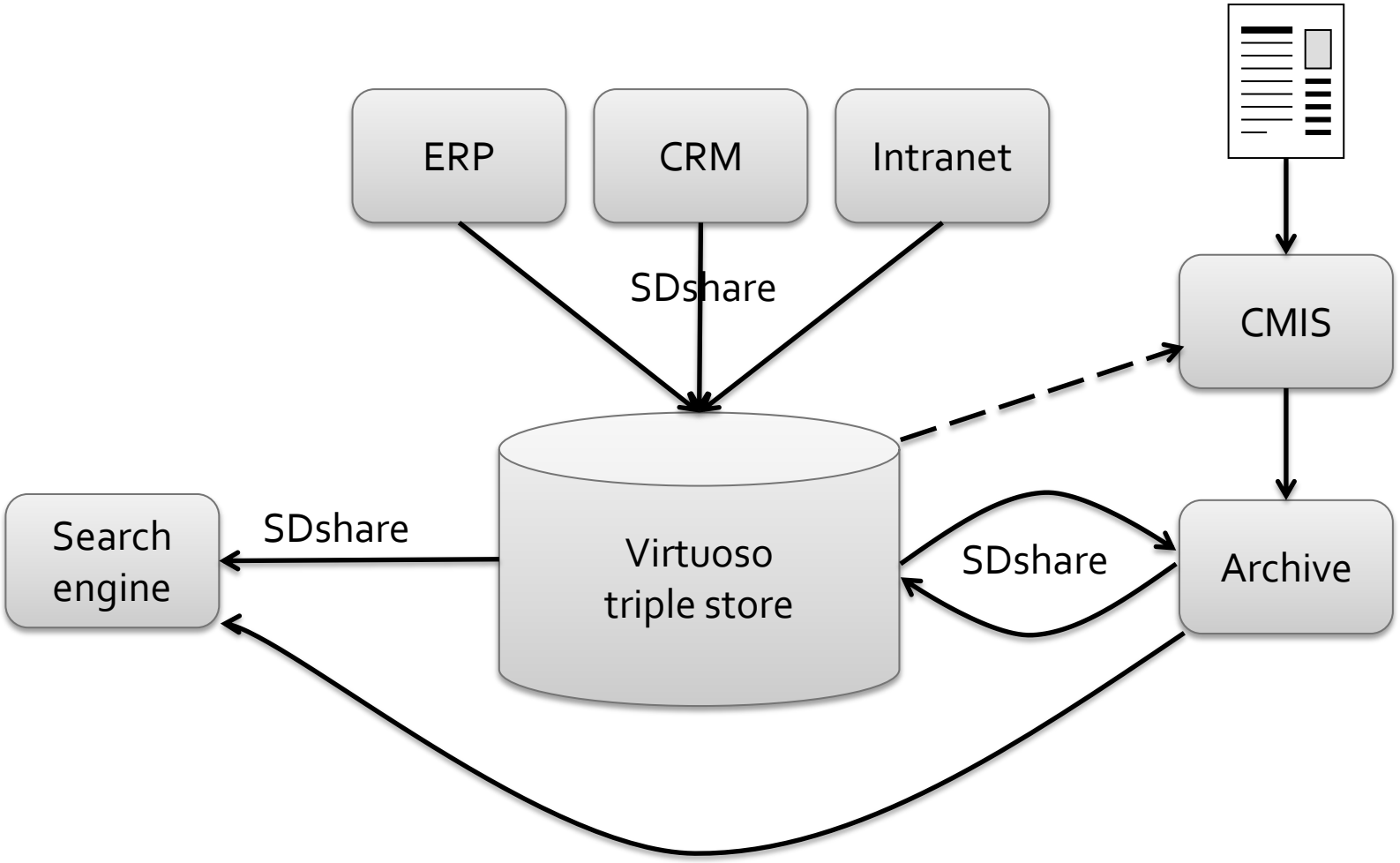
Important RDF standards

- RDF/XML — Exchange format.
- Turtle — Human-readable format.
- NTriples — Braindead simple format.
- SPARQL — The query language.
- RDFS — Simple schema language.
- OWL — Extremely powerful schema language.

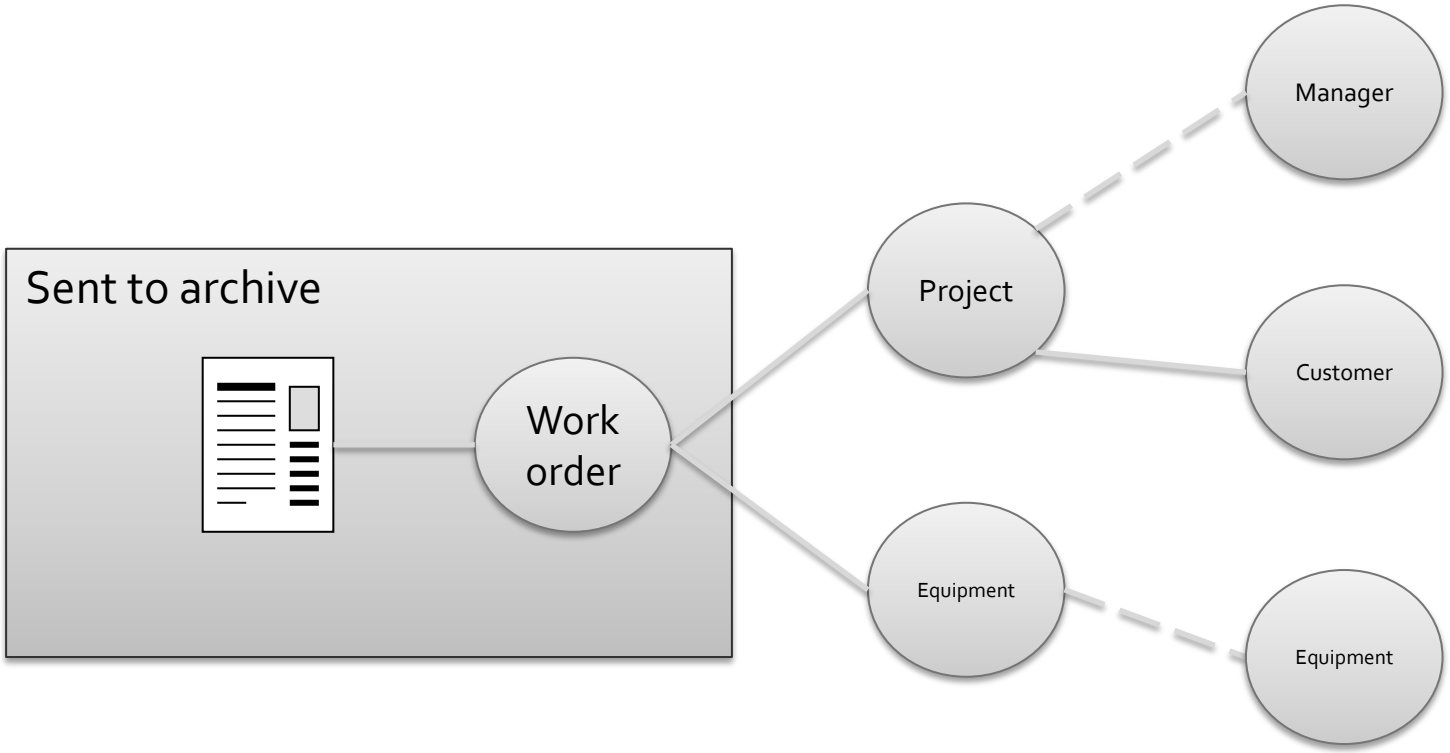
Hafslund SESAM

- An archive system, really
- Automatically enriches metadata on documents when archived
- To do this, must collect data from enterprise systems

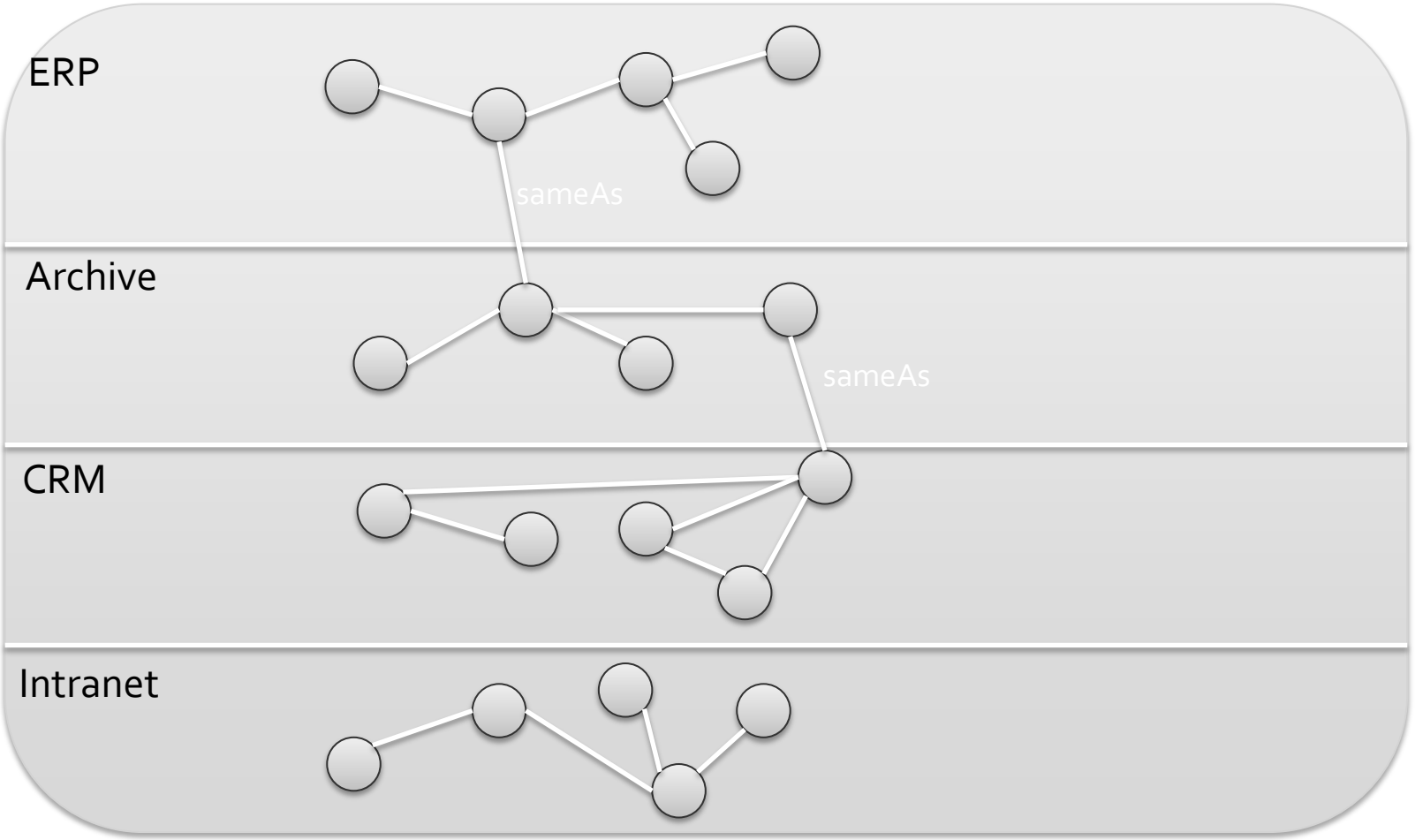
High-level architecture



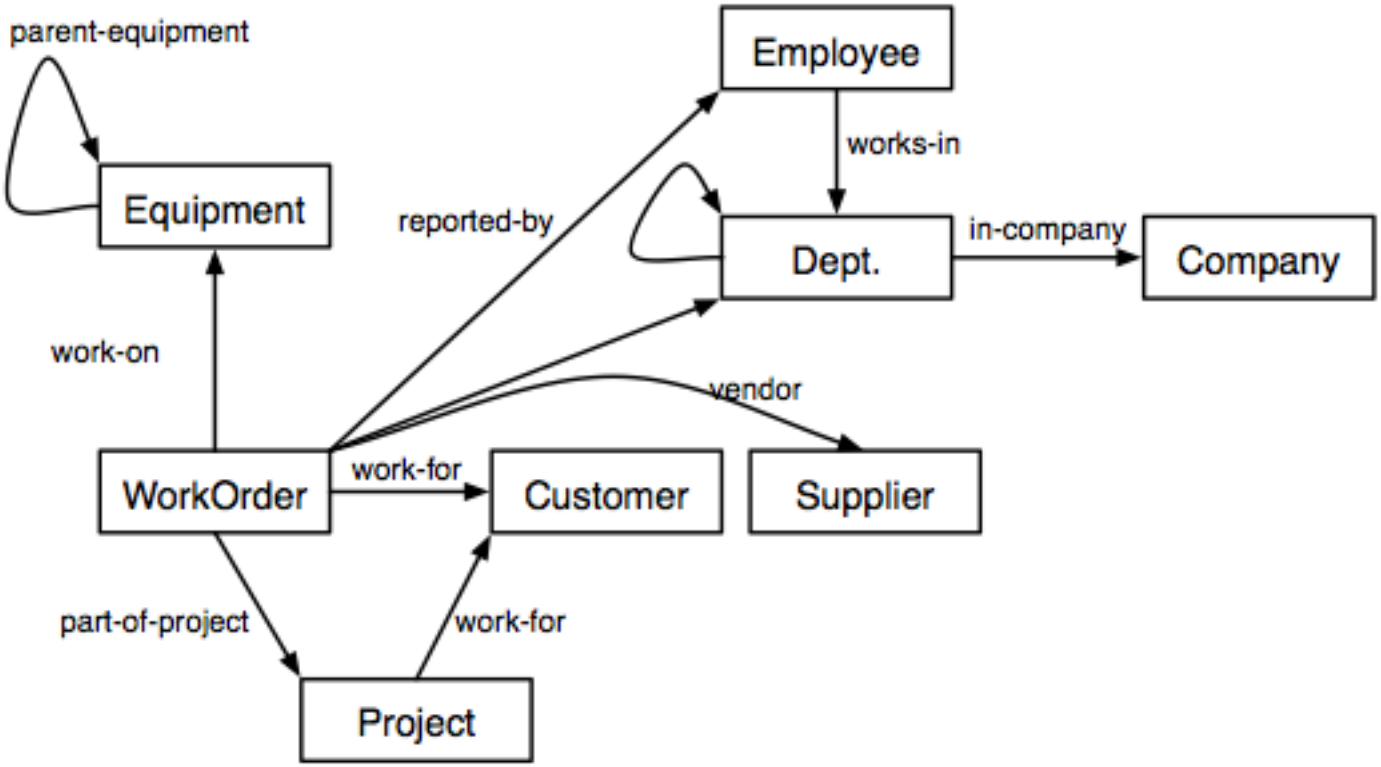
Auto-tagging



Data structure in triple store

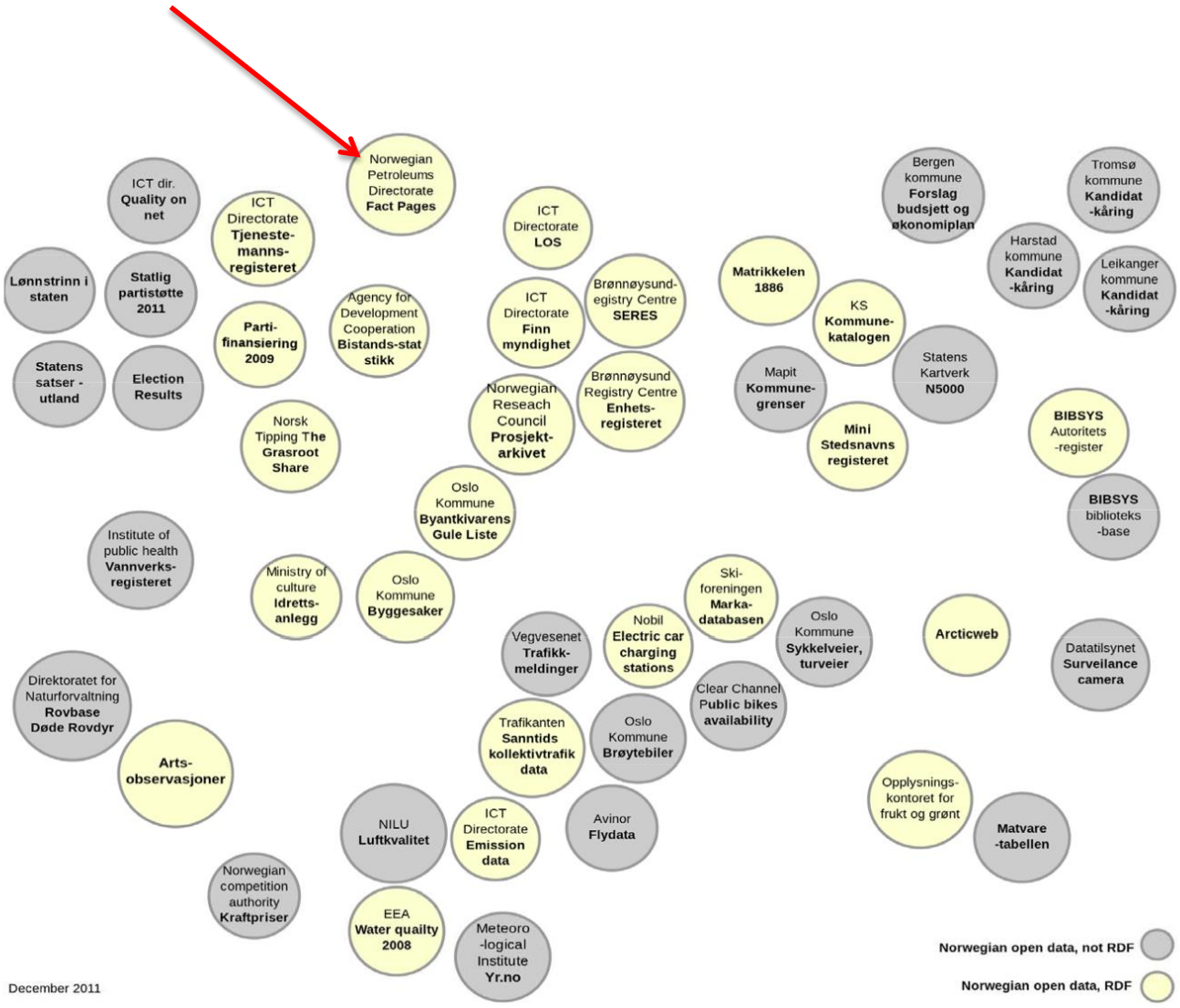


Simplified core ontology



A simple example

- We were building an internet service for DSS for use in the ministries
  - based on RDF
- Were looking for open data which internal data at the ministries could be connected to
  - all for display in the intranet


Norwegian Petroleums Directorate Fact Pages
ICT dir. Quality on net
ICT Directorate Tjeneste-manns-registeret
Lønnstrinn i staten
Statlig partistøtte 2011
Parti-finansiering 2009
Agency for Development Cooperation Bistands-statistikk
Statens satser - utland
Election Results
Norsk Tipping The Grasroot Share
ICT Directorate LOS
ICT Directorate Finn myndighet
Brønnøysund-egistry Centre SERES
Norwegian Reseach Council Prosjekt-arkivet
Brønnøysund Registry Centre Enhets-registeret
Oslo Kommune Byantkivarens Gule Liste
Bergen kommune Forslag budsjett og økonomiplan
Tromsø kommune Kandidat-kåring
Harstad kommune Kandidat-kåring
Leikanger kommune Kandidat-kåring
Matrikkelen 1886
KS Kommune-katalogen
Mapit Kommune-grenser
Statens Kartverk N5000
Mini Stedsnavns registeret
BIBSYS Autoritets-register
BIBSYS biblioteks-base
Institute of public health Vannverks-registeret
Ministry of culture Idretts-anlegg
Oslo Kommune Byggesaker
Ski-foreningen Marka-databasen
Oslo Kommune Sykkelveier, turveier
Arcticweb
Datatilsynet Surveilance camera
Vegvesenet Trafikk-meldinger
Nobil Electric car charging stations
Clear Channel Public bikes availability
Direktoratet for Naturforvaltning Rovbase Døde Rovdyr
Arts-observasjoner
Trafikanten Sanntids kollektivtrafik data
Oslo Kommune Brøytebiler
Opplysnings-kontoret for frukt og grønt
Matvare-tabellen
NILU Luftkvalitet
ICT Directorate Emission data
Avinor Flydata
Norwegian competition authority Kraftpriser
EEA Water quailty 2008
Meteoro-logical Institute Yr.no
December 2011
Norwegian open data, not RDF
Norwegian open data, RDF

Linked Open NPD FactPages at Linked Open NPD FactPages

http://sws.ifi.uio.no/npd/LinkedOpenNPDFactPages

Property	Value
void:classes	41 (xsd:integer)
dcterms:contributor	npd:NPD
dcterms:created	2011-08-01 (xsd:date)
dcterms:creator	<http://folk.uio.no/martige/foaf#me>
void:dataDump	<http://sws.ifi.uio.no/project/npd/npddump.n3>
wv:declaration	The content on the Norwegian Petroleum Directorate's website can be copied and used free of charge as long as all materials are marked with their date, reference and link to their source. This information must appear prominently.
dcterms:description	A linked open data representation of NPD FactPages, which contain information regarding the petroleum activities on the Norwegian shelf.
void:distinctObjects	117382 (xsd:integer)
void:distinctSubjects	139168 (xsd:integer)
void:exampleResource	npd:company/StatoilPetroleumAS npd:discovery/30-6-15OsebergVest npd:facility/TrollA npd:field/Ekofisk npd:lithostratigraphicunit/SolaFM npd:productionlicence/001
void:feature	<http://www.w3.org/ns/formats/RDF_XML> <http://www.w3.org/ns/formats/Turtle>
foaf:homepage	<http://sws.ifi.uio.no/project/npd/>
dcterms:issued	2011-11-24 (xsd:date)
rdfs:label	Linked Open NPD FactPages
dcterms:modified	2011-11-24 (xsd:date)
foaf:page	<http://factpages.npd.no/factpages/> <http://sws.ifi.uio.no/snorql/npd/> <http://sws.ifi.uio.no/sparqler/npd/>
void:properties	189 (xsd:integer)
dcterms:publisher	<http://folk.uio.no/martige/foaf#me>
dcterms:source	<http://factpages.npd.no/factpages/>
void:sparqlEndpoint	<http://sws.ifi.uio.no/sparql/npd>
dcterms:subject	<http://dbpedia.org/resource/Category:Oil_companies_of_Norway> <http://dbpedia.org/resource/Category:Oil_fields_in_Norway> <http://dbpedia.org/resource/Category:Oil_platforms_in_Norway> <http://dbpedia.org/resource/Norwegian_continental_shelf>
dcterms:title	Linked Open NPD FactPages
void:triples	1350199 (xsd:integer)
rdf:type	void:Dataset
void:uriSpace	http://sws.ifi.uio.no/npd/
void:vocabulary	<http://sws.ifi.uio.no/vocab/npd>
wv:waiver	<http://www.npd.no/en/About-us/Information-services/Use-of-content/>

RDF description of the data set, using Dublin Core and VOID

http://sws.ifi.uio.no/npd/page/LinkedOpenNPDFactPages

OPENLINK SOFTWARE

Facets | Description | Metadata | Settings

About: http://sws.ifi.uio.no/vocab/npd#Field Sponge Permalink

An Entity of Type : owl:Thing, within Data Space : localhost:8890 associated with source dataset(s)

Command: Start New Facet Go

Attributes	Values
is type of	TORDIS
	STATFJORD ØST
	GULLFAKS
	MURCHISON
	VALE
	»more»

Alternative Linked Data Views: ODE Raw Data in: CXML | CSV | RDF (N-Triples N3/Turtle JSON XML) | OData (Atom JSON) | Microdata (JSON HTML) | JSON-LD About

OpenLink Virtuoso version 06.04.3132, on Mac OS X (universal-apple-macosx10.5-32), Standard Edition
Data on this page belongs to its respective rights holders.
Virtuoso Faceted Browser Copyright © 2009-2012 OpenLink Software

About: STATFJORD ØST

Sponge Permalink

An Entity of Type : http://sws.ifi.uio.no/vocab/npd#Field, within Data Space : localhost:8890 associated with source dataset(s)

Type: http://sws.ifi.uio.no/vocab/npd#Field Command: Start New Facet Go

Attributes	Values
type	http://sws.ifi.uio.no/vocab/npd#Field
label	STATFJORD ØST
http://sws.ifi.uio...b/npd#datesyncNPD	2011-08-19(xsd:date)
http://sws.ifi.uio.no/vocab/npd#status	PRODUCING
http://sws.ifi.uio...ab/npd#hasCompany	Statoil Petroleum AS
http://sws.ifi.uio...pd#completionDate	1976-11-07(xsd:date)
http://sws.ifi.uio...b/npd#hasWellbore	33/9-7
http://sws.ifi.uio...b/npd#factPageUrl	http://factpages.npd.no/FactPages/default.aspx?nav1=field&nav2=PageView|All&nav3=43672
http://sws.ifi.uio.no/vocab/npd#hasOwner	STATFJORD ØST UNIT
http://sws.ifi.uio.no/vocab/npd#idNPD	43672
http://sws.ifi.uio.no/vocab/npd#name	STATFJORD ØST
http://sws.ifi.uio...ab/npd#factMapUrl	http://www.npd.no/FactMapSearch?NPDID_field=43672
is http://sws.ifi.uio.no/vocab/npd#hasField of	http://sws.ifi.uio.no/npd/field/StatfjordOEst/licensee/TotalEPNorgeAS/period/2009-11-01--2010-01-01 http://sws.ifi.uio.no/npd/field/StatfjordOEst/licensee/NorskHydroProduksjonAS/period/2002-01-02--2003-03-22 33/9-M-2 AH 33/9-7 STATFJORD ØST http://sws.ifi.uio.no/npd/field/StatfjordOEst/licensee/EnterpriseOilNorwegianAS/period/2000-07-24--2001-01-11 »more»

« First ‹ Prev Next › Last » Page 1 of 6 1 Go

Data on this page belongs to its respective rights holders.

Virtuoso Faceted Browser Copyright © 2009-2012 OpenLink Software

OPENLINK SOFTWARE

Facets | Description | Metadata | Settings

About: Statoil Petroleum AS

Sponge Permalink

An Entity of Type : http://sws.ifi.uio.no/vocab/npd#Company, within Data Space : localhost:8890 associated with source dataset(s)

Type: http://sws.ifi.uio.no/vocab/npd#Company Command: Start New Facet Go

Attributes	Values
type	http://sws.ifi.uio.no/vocab/npd#Company
label	Statoil Petroleum AS
http://sws.ifi.uio...b/npd#datesyncNPD	2011-08-19(xsd:date)
http://sws.ifi.uio...d#hasCompanyGroup	http://sws.ifi.uio.no/npd/company/group/StatoilPetroleumAS
http://sws.ifi.uio...onLicenceOperator	1(xsd:integer)
http://sws.ifi.uio...cab/npd#shortName	STATOIL PETROLEUM AS
http://sws.ifi.uio.no/vocab/npd#idNPD	17237817
http://sws.ifi.uio.no/vocab/npd#name	Statoil Petroleum AS
http://sws.ifi.uio...onLicenceLicensee	1(xsd:integer)
http://sws.ifi.uio...onLicenceLicensee	1(xsd:integer)
http://sws.ifi.uio...onLicenceOperator	1(xsd:integer)
http://sws.ifi.uio.no/vocab/npd#orgNo	https://ws.brreg.no/lod/enhet/990888213
is http://sws.ifi.uio...asCurrentOperator of	TROLL B TROLL E TROLL C 34/8-A-17 A 34/8-A-16 A »more»

« First ‹ Prev Next › Last » Page 1 of 21 1 Go

Alternative Linked Data Views: ODE Raw Data in: CXML | CSV | RDF (N-Triples N3/Turtle JSON XML) | OData (Atom JSON) | Microdata (JSON HTML) | JSON-LD About

OpenLink Virtuoso version 06.04.3132, on Mac OS X (universal-apple-macosx10.5-32), Standard Edition
Data on this page belongs to its respective rights holders.
Virtuoso Faceted Browser Copyright © 2009-2012 OpenLink Software

https://ws.brreg.no/lod/page/990888213

STATOIL PETROLEUM AS

Enheten har Org. nr. 990888213

Forretningsadressen er

Forusbeen 50
4033 STAVANGER
Norge

Informasjon i RDF/XML format kan lastes ned her

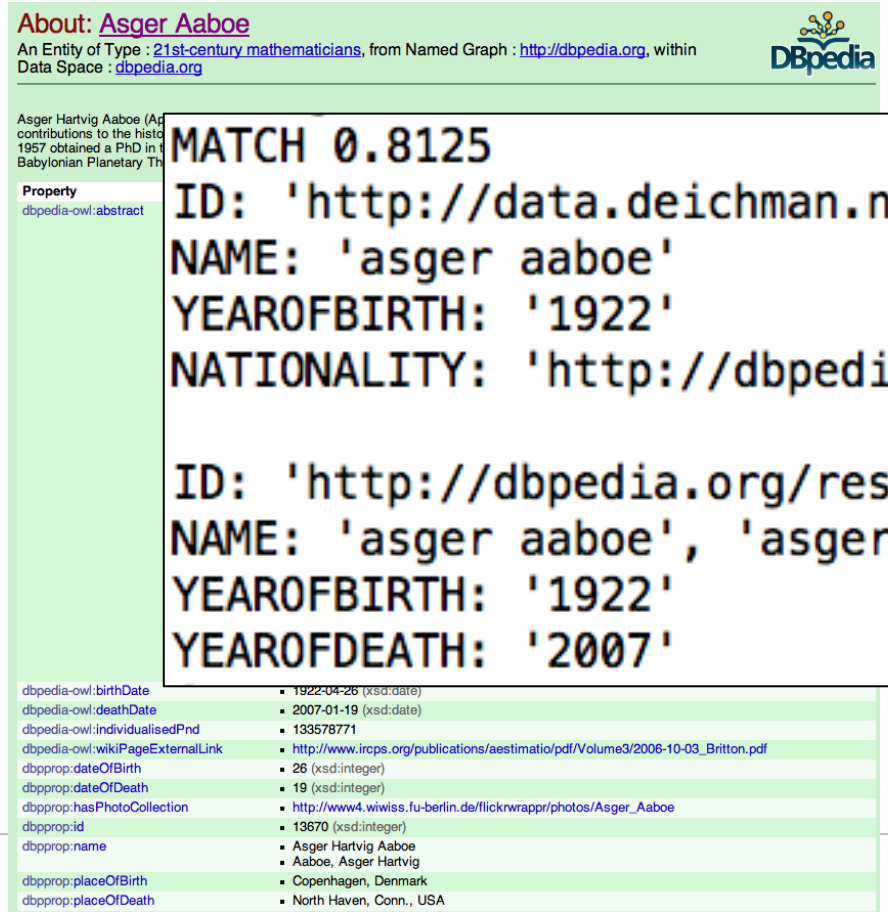
```
<rdf:RDF xmlns:enhet="https://ws.brreg.no:443/lod/enhet/"
         xmlns:vocab="https://ws.brreg.no:443/lod/vocab/"
         xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  <vocab:Enhet rdf:about="https://ws.brreg.no:443/lod/enhet/990888213">
    <vocab:orgnr>
      990888213
    </vocab:orgnr>
    <vocab:navn>
      STATOIL PETROLEUM AS
    </vocab:navn>
    <vocab:adresse>
      <vocab:Adresse>
        <vocab:adresse1>
          Forusbeen 50
        </vocab:adresse1>
        <vocab:postnr>
          4033
        </vocab:postnr>
        <vocab:poststed>
          STAVANGER
        </vocab:poststed>
        <vocab:land>
          Norge
        </vocab:land>
      </vocab:Adresse>
    </vocab:adresse>
  </vocab:Enhet>
</rdf:RDF>
```

How hard would it be to use?

- We loaded the data locally in a few minutes
- We already have the ability to display arbitrary data from RDF
- All that's missing is connections from existing data
  - organization numbers is one way
  - statistical analysis is another

Linking data without common ids

- It's possible, using statistical techniques
  - in many cases not even that hard
  - http://code.google.com/p/duke/




```
MATCH 0.8125
ID: 'http://data.deichman.no/person/Aaboe_Asger_1922-'
NAME: 'asger aaboe'
YEAROFBIRTH: '1922'
NATIONALITY: 'http://dbpedia.org/resource/Denmark',

ID: 'http://dbpedia.org/resource/Asger_Aaboe'
NAME: 'asger aaboe', 'asger hartvig aaboe'
YEAROFBIRTH: '1922'
YEAROFDEATH: '2007'
```

```
ntax-ns#> .

> .
/> .

@prefix ns7: <http://def.bibsys.no/xmlns/radatana/1.0#> .
ns2:x27785200ns7:catalogueName   "Aaboe, Asger" .
@prefix ns8: <http://data.deichman.no/> .
ns2:x27785200ns8:lifespan "1922-" ;
      foaf:firstName      "Asger" ;
      foaf:lastName"Aaboe" .
@prefix ns9: <http://data.deichman.no/work/> .
ns9:x27785200_episoder_fra_matematikkens_historie    ns0:creator
```

Are there any tools out there?

Modelling

TopBraid Composer™

protégé

ENTERPRISE ARCHITECT

Reasoners

RacerPro 2.0

KAON2

clark&parsia pellet

APIs

semantic web framework Jena

dotNetRDF An Open Source C#.Net Library for RDF

Redland RDF Libraries

Triple stores

IBM DB2

ORACLE

Stardog

OPENLINK VIRTUOSO

BrightstarDB

Linked Schemas

- Objects are identified by URI
  - but so are properties and classes
- Means you can describe your properties and classes in terms of others
  - you can build on existing schemas
- RDF provides very powerful ways to do this

RDFS and OWL

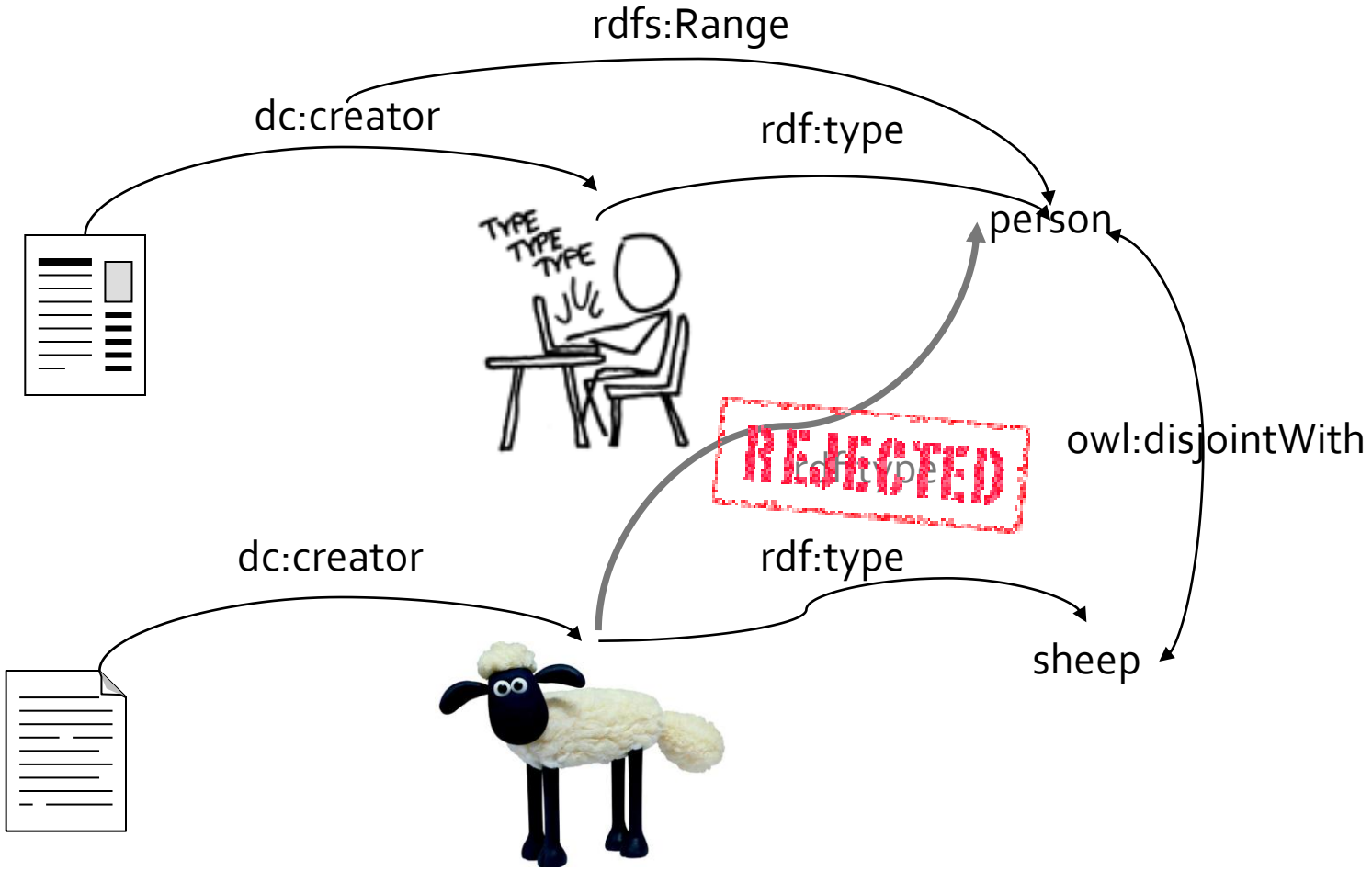
- Schema languages for RDF
  - used to describe classes and properties
  - in many ways like XML Schema or a database schema
- Represented in RDF
  - just like the data
  - means you can say anything you want about the data
- However, it doesn't work like you expect
  - based on Open World Assumption
  - based on logical reasoning

Open World Assumption

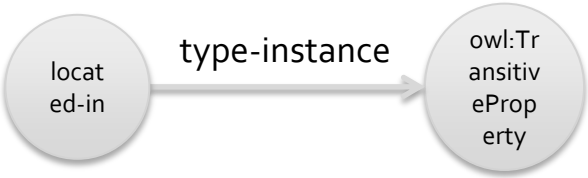
- That nobody's said it, doesn't mean it's not true
  - that we don't have the date of death doesn't mean the person is alive
  - that we have two different rows in the PERSON table doesn't mean we have two different people
- In other words, data may be connected in unexpected ways
  - this usually doesn't apply in single systems
  - but when you're on the open web…

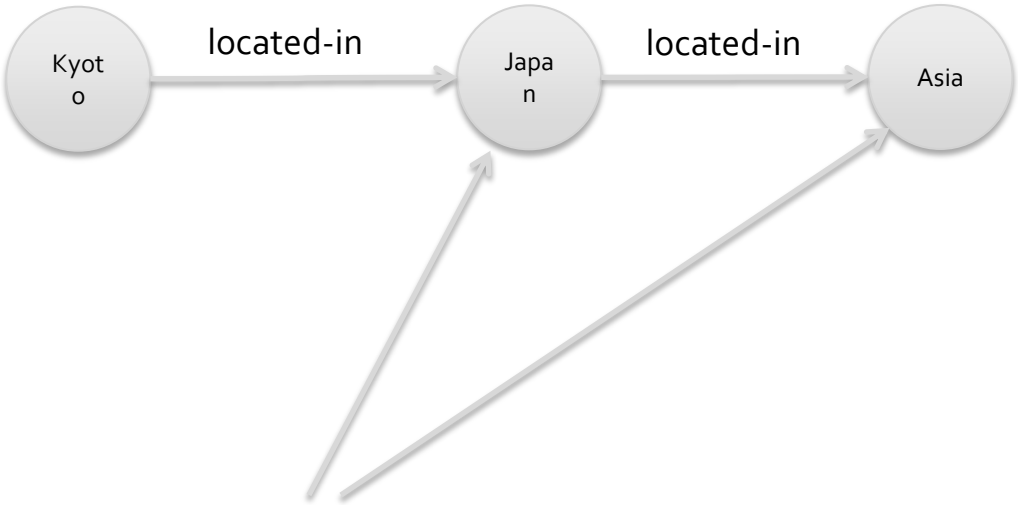
Open World Assumption

Rule: The value of dc:creator must be a person



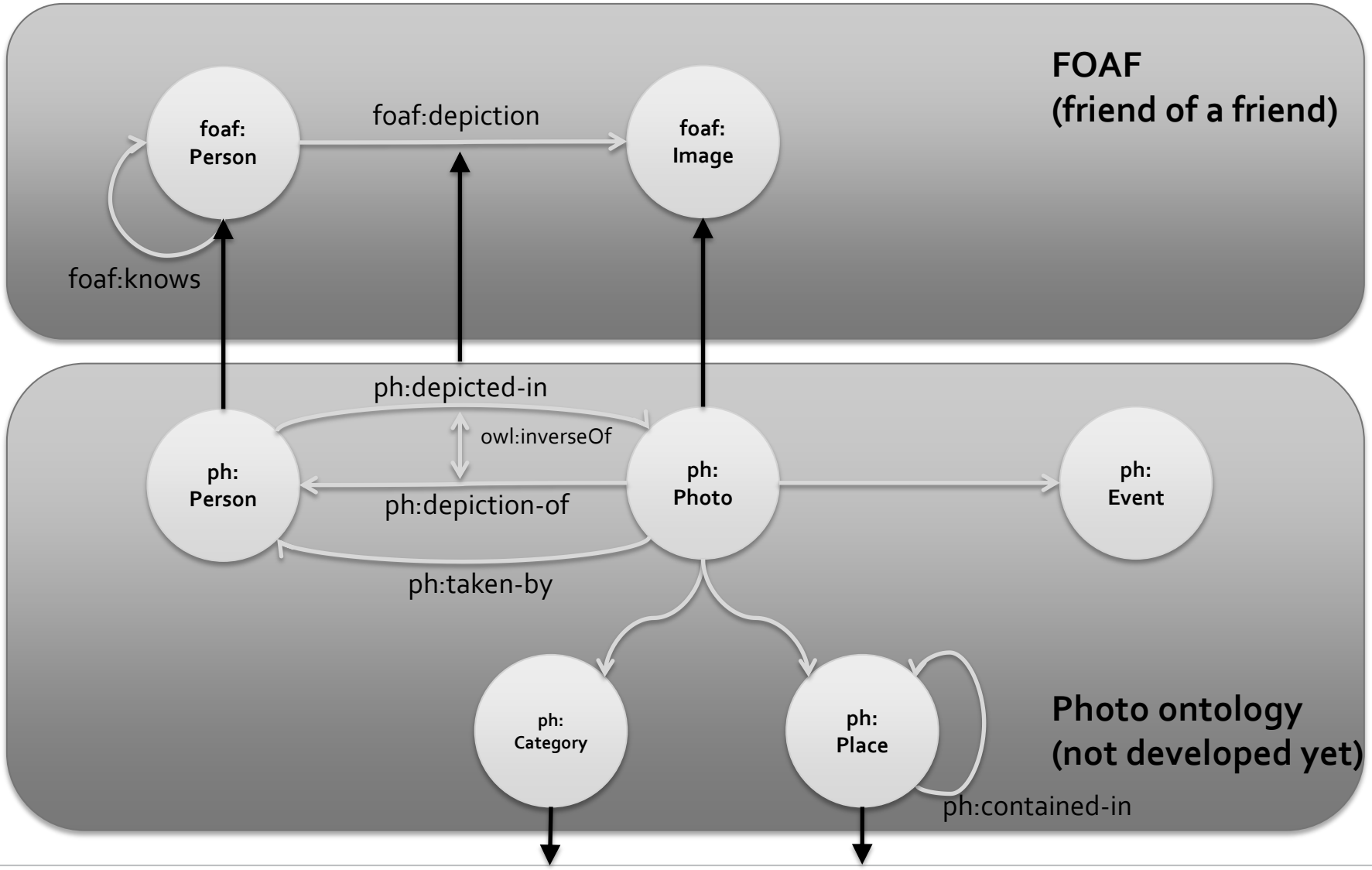
Is Kyoto in Asia?





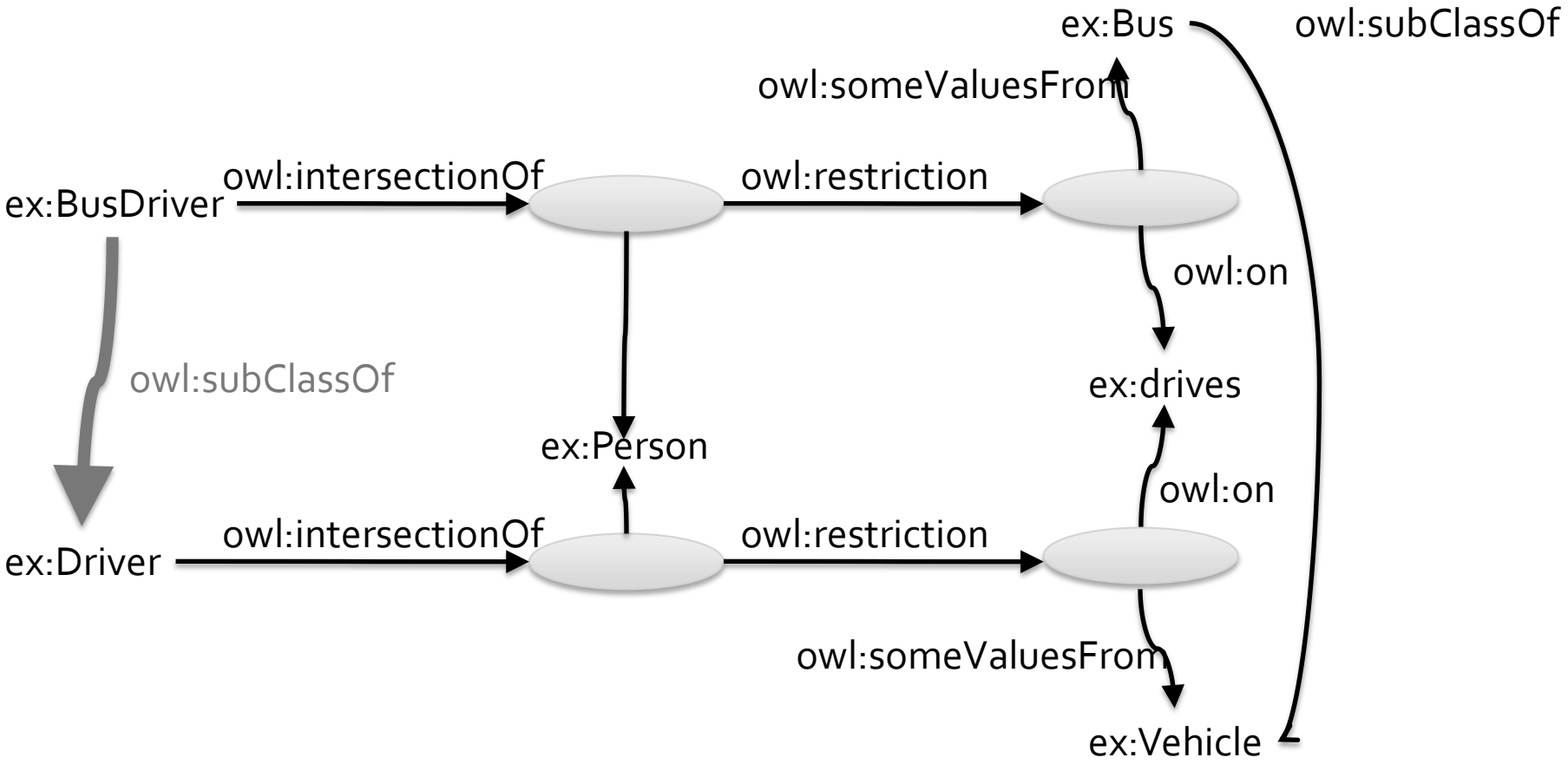
select ?c where { Kyoto located-in ?c . }

One model can extend another



Serious logic

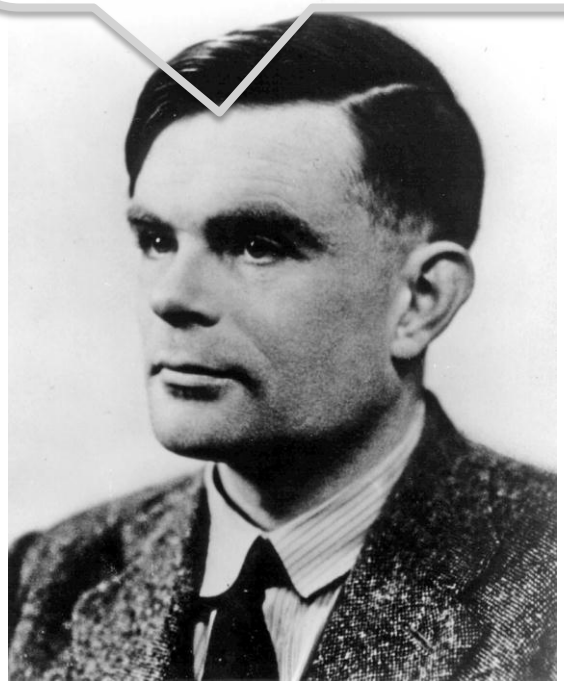
- Bus drivers are people who drive buses
- Drivers are people who drive vehicles
- Therefore bus drivers are drivers!



http://owl.man.ac.uk/2003/why/latest/

But … you have to speak logic

$$
\begin{aligned}
\mathfrak{I}, n \models C \sqsubseteq D \quad &\text{iff} \quad \{d \mid (n,d) \in C^{\mathfrak{I}}\} \subseteq \{d \mid (n,d) \in D^{\mathfrak{I}}\},\\
\mathfrak{I}, n \models \neg\varphi \quad &\text{iff} \quad \mathfrak{I}, n \not\models \varphi,\\
\mathfrak{I}, n \models \varphi \wedge \psi \quad &\text{iff} \quad \mathfrak{I}, n \models \varphi \text{ and } \mathfrak{I}, n \models \psi,\\
\mathfrak{I}, n \models \bigcirc\varphi \quad &\text{iff} \quad \mathfrak{I}, n+1 \models \varphi,\\
\mathfrak{I}, n \models \varphi \mathcal{U} \psi \quad &\text{iff} \quad \exists m \geq n \ (\mathfrak{I}, m \models \psi \text{ and } \forall n \leq k < m \ \mathfrak{I}, k \models \varphi).
\end{aligned}
$$



- A serious challenge for most people
- Must be very precise about what you say
- People mostly use just small fractions of OWL

Problems

Sensitive data

- Some data is sensitive due to
  - privacy concerns
  - public security concerns
- These concerns are real, and must be addressed
  - data may need to be filtered, or
  - in the worst case, not published at all
- A rule of thumb
  - if it's available on paper or in human-readable form, machine-readable should be OK, too

Will people understand the data?

- People can and will misunderstand anything
  - this not your responsibility
  - but you can help
- How to avoid
  - document the data
  - use self-describing linked data

Capacity issues

- What if the data become too popular, could there be overloading issues?
  - yes, this happens
- What to do
  - scale up (more hardware)
  - implement download restrictions, and charge for use above limit
  - let a data hotel host the data
    - http://data.norge.no/datahotellet

Data quality

- What if the data is not 100% correct?
- No data set is perfect
  - there are always problems with data
  - in the worst case you can add a disclaimer
  - all use is at own risk, in any case
- Rules of thumb
  - if you take the trouble to use and maintain the data, it's good enough for the public, too
  - if the data is too poor to publish, you should probably delete it

Media outrage

- What if someone analyses the data and finds evidence of a scandal?
- Does that mean it was wrong to publish the data?
- Discuss!

The end

Conclusion

- Open data is important
  - for democracy, and for the economy
- Open data is Norwegian gov't policy
  - (per letter from FAD in 2010)
- There are different kinds of open
  - human-readable is good
  - machine-readable is easier, and often better
  - linked data is best (but not necessary)

Where to learn more

- These slides
  - http://slideshare.net/larsga
- FADs viderebruksveileder
  - http://no.wikibooks.org/wiki/Viderebruksveileder
- Free ebook on Linked Open Data
  - http://linkeddatabook.com/editions/1.0/