

INTEROPERABILITY

What it
means
and what we
need it to do





Hoe is het? Leuk om jou te ontmoeten!



Lack of interoperability
results in **cost** or **danger**



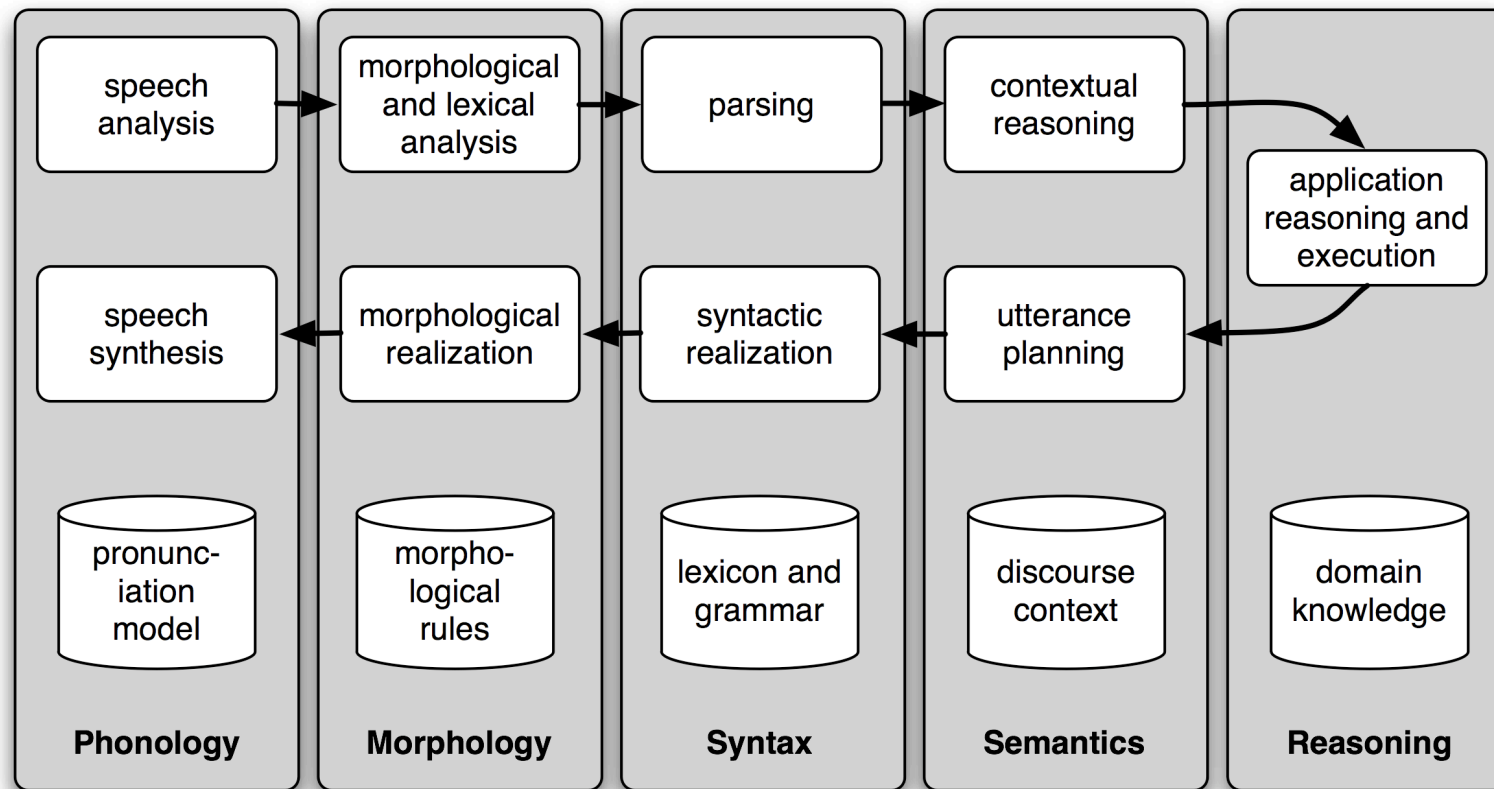
A *shared language* is practical and important

Main components of **spoken** language

- A **phoneme** is the smallest unit of sound that may cause a change of meaning within a language but that doesn't have meaning by itself.
- A **morpheme** is the smallest unit of a word that provides a specific meaning to a string of letters (which is called a phoneme).
- A **lexeme** is the set of all the inflected forms of a single word. A basic abstract unit of meaning.
- **Syntax** is the set of rules by which full sentences are constructed
- **Context** is how everything within language works together to convey a particular meaning [i.e. semantics]

Main components of **written** language

- A **grapheme** is the smallest unit of writing that represents a sound (e.g. individual letters, diphthongs, or combinations such as “igh”)
- A **morpheme** is the smallest unit of a word that provides a specific meaning to a string of letters (phoneme or grapheme).
- A **lexeme** is the set of all the inflected forms of a single word. A basic abstract unit of meaning.
- **Syntax** is the set of rules by which full sentences are constructed
- **Context** is how everything within language works together to convey a particular meaning [i.e. semantics]



Our communication pathway

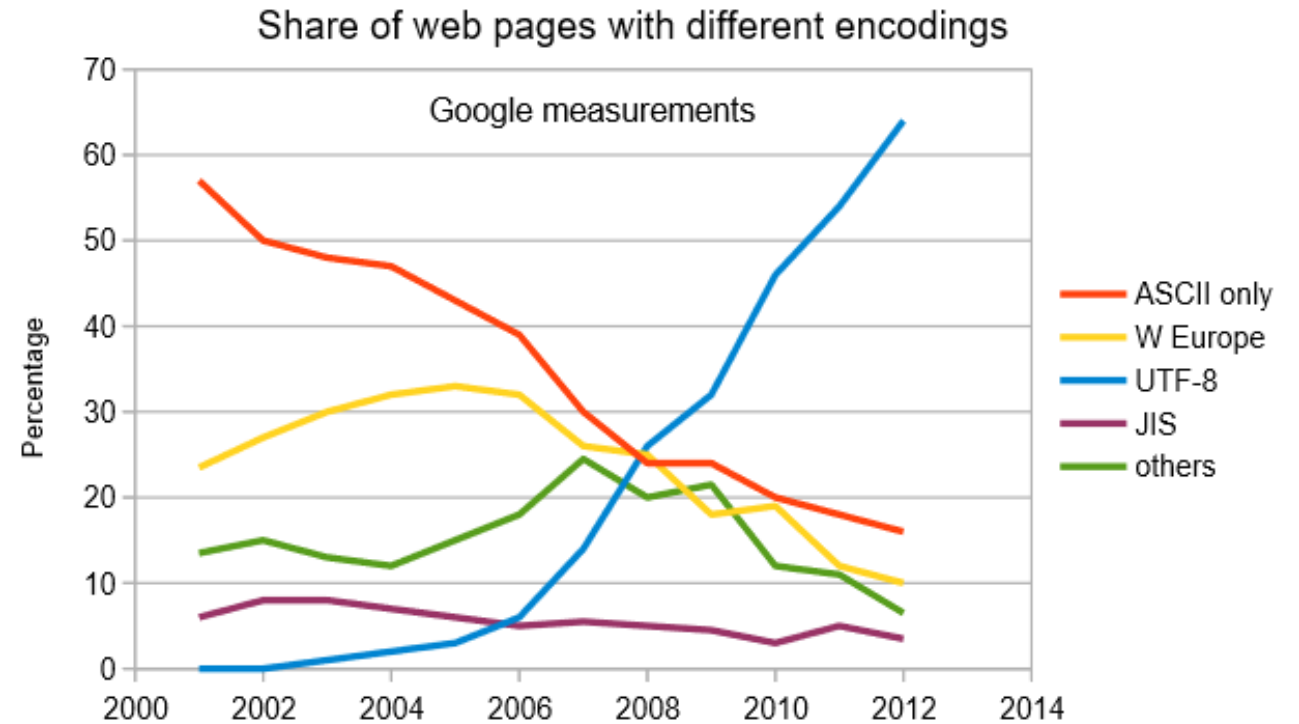
How does
morphology
apply to
computers?

Human	Computer
Character set [e.g. “abcd” vs ”αβγδ”]	Character set [e.g. “ascii” vs ”utf-8”]

In natural written language we have different scripts to represent the sounds we make in speech. Computers use ‘encoding’ and ‘character sets’ for the same purpose. Using the same encoding speeds up interoperability. It makes things much easier.

How does **morphology** apply to computers? (cont.)

UTF-8 has been the dominant character encoding for the World Wide Web since 2009, and as of August 2018 accounts for 92.0% of all web pages and 95.5% of the top 1,000 highest ranked web pages. W3C recommends UTF-8 as the default encoding in XML and HTML.



Recommendation 1: Use UTF-8 for character encoding

How does **parsing** apply to computers?

In natural written language we have pauses and inflection in the sounds we make in speech to separate words and sentences. In written text we use punctuation and paragraphs. Computers use markup for the same purpose [1]. Using the same markup speeds up interoperability. It makes things much easier.

Recommendation 2:

Use a flexible, known machine-readable format specification such as XML or JSON. [<http://www.w3.org/TR/dwbp/#dataFormats>]

The eXtensible Markup Language (XML) is a set of syntactic rules that allow users to develop their own annotations, and more precisely, their own markup languages.

The ability to easily create, read and modify one's own document structures using a standard template facilitates syntactic interoperability. In the case of XML, this is achieved through a hierarchical structure composed of elements and attributes.

Alternatively, JSON adopts a less cluttered format based on attribute key-value pairs to

[1] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4434901/>

What does semantic interoperability mean for computers?

The adoption of a generalized markup language such as XML is not sufficient to create interoperability.

Both sides of a communication need to be able to interpret the information exchanged. To achieve semantic interoperability, controlled vocabularies, and standard taxonomies are required.

A more generic solution is achieved through the adoption of ontology languages. Such Semantic Web techniques allow the encoding of knowledge about specific domains by augmenting existing documents with attributes that denote meaning.

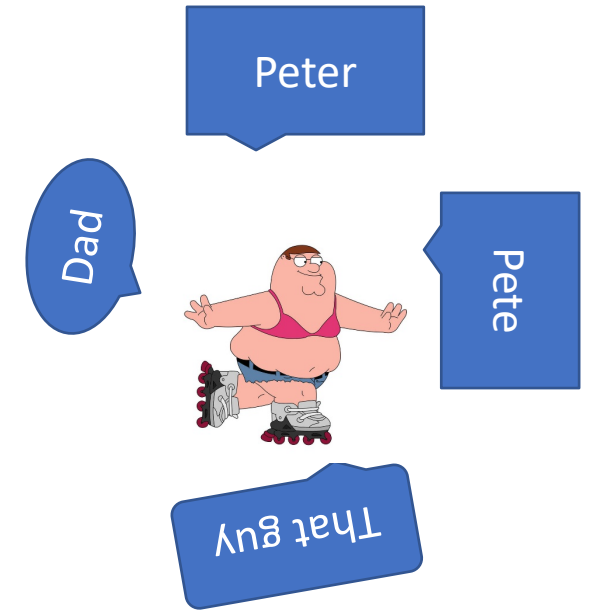
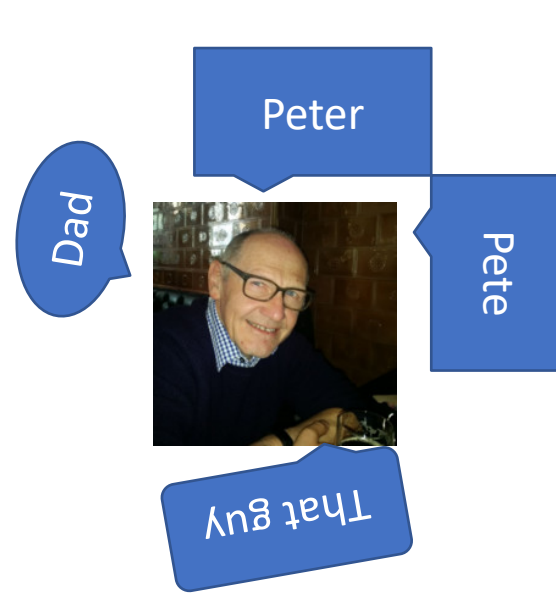
This allows information to be exchanged meaningfully and accurately, even when terms are expressed in different languages, or when two or more terms refer to the same concept but are not easily recognized as synonyms.

What does semantic interoperability mean for computers?

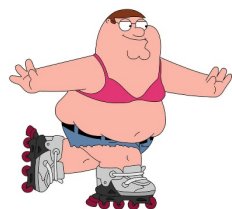
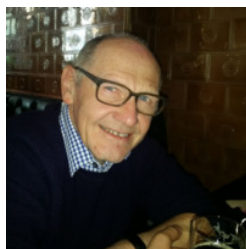
A key point is to make sure the dataset, or its documentation, provides enough (human- and machine-readable) context so that data consumers can retrieve and exploit the standardized meaning of the values. In the context of the Web, using unambiguous, Web-based identifiers (URIs) for standardized vocabulary resources is an efficient way to do this, noting that the same URI may have multilingual labels attached for greater cross-border interoperability. The European Union's multilingual thesaurus, Eurovoc, provides a prime example

Recommendation 3: Use terms from shared vocabularies, preferably standardized ones, to encode data and metadata. [<http://www.w3.org/TR/dwbp/#dataVocabularies>]

Is it good practice to use labels, such as names, as identifiers when working with digital information?



Labels are not
enough.
They are not
good
identifiers
because they
can be reused
ambiguously.



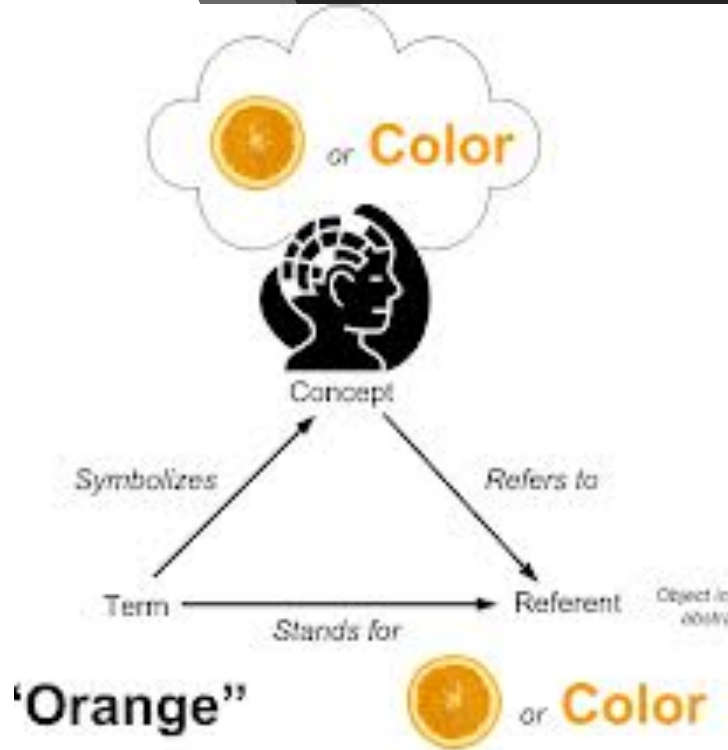
Dad

That
guy

Peter

Pete

How can computers get a 'triangle of reference'?



Recommendation 4:

Use persistent URIs as identifiers [

<http://www.w3.org/TR/dwbp/#DataIdentifiers>]

- The **triangle of reference** is a model of how linguistic symbols are related to the objects they represent. The triangle was published in *The Meaning of Meaning* by Ogden and Richards.
- Computers can share **systems of persistent identifiers** to ensure that facts or statements can be assessed as referring to the same 'thing'. Identifiers take many forms and are used extensively in every information system. Adopting a common identification system enables basic data identification and comparison processes by any stakeholder in a reliable way. They are an essential pre-condition for proper data management and reuse.
- Options include HTTP(S) URIs and Digital Object Identifiers (DOI)

Next Steps: #1 - Identifiers

- Policy - http URLs as persistent (immutable) identifiers
- ‘minting’ definitive identifiers for things \Rightarrow
 - vocabulary of things
 - vocabulary of terms

- Use VocBench and Skosmos to create and publish terminology as SKOS Concept Schemes
- see <http://51.15.194.251/Skosmos/en/>

Next Steps: #2 - Terms

Next Steps: #3 - Models

- Use “Core Vocabularies” and Ontologies to share metamodels
- See <https://pwin.github.io/CPOV-AP-SCOT/index-en.html>
- See <https://ec.europa.eu/isa2/sites/isa/files/corevocabularies-poster.pdf>

ISA² Core Vocabularies



The Core Vocabularies have been developed under the ISA² Programme of the European Commission, namely the action "Improving semantic interoperability". ISA² is a EUR 150 million programme supporting the modernisation of public administrations in Europe through the development of eGovernment solutions. More than 20 solutions are already available, with more to come soon. All solutions are open source and available free of charge to any interested public administration in Europe.

Current Work Areas



Open access to Scotland's official statistics

Explore, visualise and download over 250 datasets from a range of producers. Start browsing by [theme](#), [organisation](#), or [geography](#). Or access programmatically using our [APIs](#).

Getting started

Introduction

An overview of the features of statistics.gov.scot.

Browse Data

Explore, filter and visualise all our datasets via the [Data](#) section.

Browse Areas

OSCR

Welcome to the Scottish Charity Regulator

24,754 Total charities registered

We are the Independent Regulator and registrar for Scotland's charities, including community groups, religious charities, schools, universities, grant-giving charities and major care providers.

You can search the Scottish Charity Register, the public register of charities in Scotland, by entering a Scottish Charity number, name or other details.

Charity name or number

[Click here to search our entire site and have more details downloaded here.](#)

Providing you agree to certain conditions, the Scottish Charity Register



National Performance Framework

Find information on Scotland's National Performance Framework and how Scotland is performing against it.



What it is

An overview of the framework

How it works

How Scotland can work together to achieve the national outcomes

National Outcomes

National outcomes that describe the kind of Scotland we want to see

Measuring progress

Data on how well Scotland is doing

Scotland's Wellbeing report

A report drawing together key trends and data across the National Outcomes

Sustainable Development Goals

Information on the United Nations Sustainable Development Goals

[Information on the United Nations Sustainable Development Goals](#)



Linked Data Resources

experimental site presenting SEPA data as Linked Data Resources

SEPA Linked Data Resources are published with a RESTful API implemented using [LDA](#) configurations.

The API layer is deployed in front of a SPARQL endpoint to provide:

- Generation of documents for the publishing of [Linked Data](#)
- Querying and data extraction without the need for users to write [SPARQL](#) queries
- Multiple output formats including html, RDF/XML, Turtle, CSV, TSV, [XML](#) and [JSON](#)

A SPARQL query form may be accessed [here](#)

The SPARQL endpoint may be accessed directly at <http://data.sepa.org.uk/sepa/sparql> with a SPARQL query in the query box.

The data currently available is that previously published under the reporting requirements of the [Water Framework Directive](#).

When using this data please be aware that the format of URIs and the predicates used may change as a result of future updates.

RESOURCES

Surface Water Bodies
Ground Water Bodies
River Basin Districts
Sub Basin Districts
Catchments
Bathing Waters

API DOCUMENTATION

Surface Water
Ground Water
River Basin
Sub Basin
Catchment
Bathing

Guides

User guides index

Search and browse our guides which are listed below.

In addition SEPA maintains a metadata catalogue which underpins the [interactive map](#) available on [SEPA](#)

Our data is available in a range of formats and can be used to make custom collections of data, which are listed below.

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Home Landlord performance For landlords For tenants About us Publications Search

Regulating to protect the interests of tenants, people who are homeless, and others who use social landlords' services.



Ordnance Survey

You are here: [linked-data](#) > [Ordnance Survey linked-data](#)

Ordnance Survey Linked Data

The Ordnance Survey is Great Britain's national mapping agency, providing the most accurate and up-to-date geographic data, relied on by government, business and individuals.

OS OpenData is the opening up of Ordnance Survey data as part of the drive to increase innovation and support the "Making Public Data Public" initiative. As part of this initiative Ordnance Survey has published a number of its products as Linked Data.

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Dataset Summary



License: OS Open Data License

Created: October 25th, 2010

Updated: August 19th, 2019

Size: 64,861,800 triples

Coverage: England, Scotland, Wales

Ontologies: Postcode Ontology

The administrative geography and civil voting area ontology
Geometry Ontology
Spatial Relations Ontology
50k Gazetteer

Export the dataset metadata as JSON, XML, or Turtle or download the raw data



What can we do with this?

