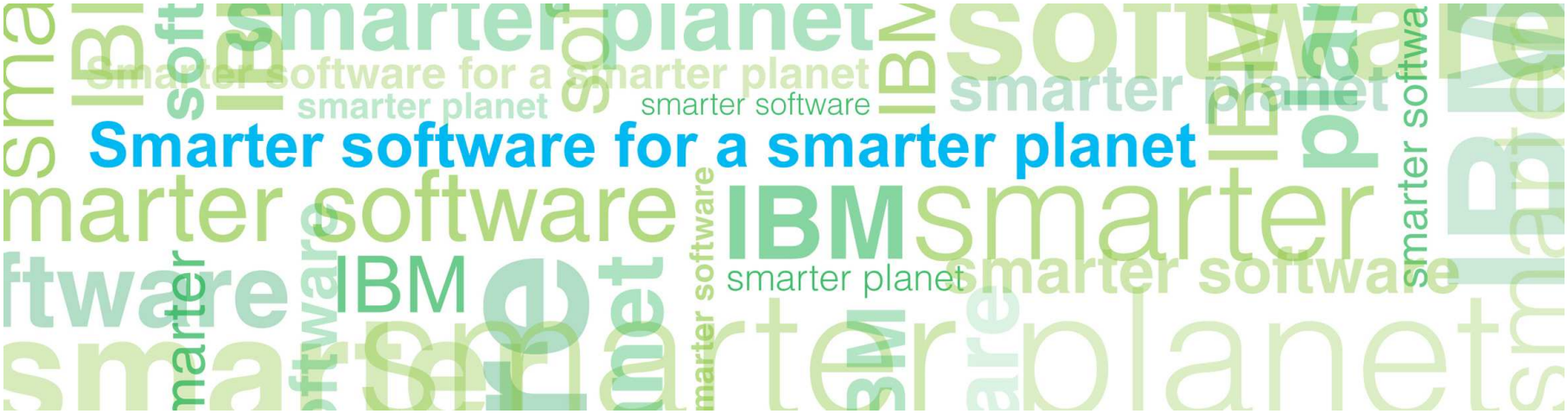
LanguageWare Resource Workbench 7.2

Data modeling



Introduction

- **Module overview**
  - Some thoughts around modeling
  - Some lessons learned from various customer/Demo work
  - It's not really a complete how to
  - May not even be best practice
  - Description of how they fit together and the logic behind them
  - Some questions to ask yourself when modeling to help with using these methods
- **Target audience:**
  - All audiences

Module objectives

After this module you will be able to:

- Start thinking about data modeling
- Start learning how to use LanguageWare Workbench to create annotators and data extraction models

Module roadmap

– **Data modeling**
  - What is modeling?
  - Some thoughts about modeling good practices and methods?
  - Some lessons learned from various customer/Demo work
  - Some questions to ask yourself when modeling to help with using these methods.

– **Summary and best practices**

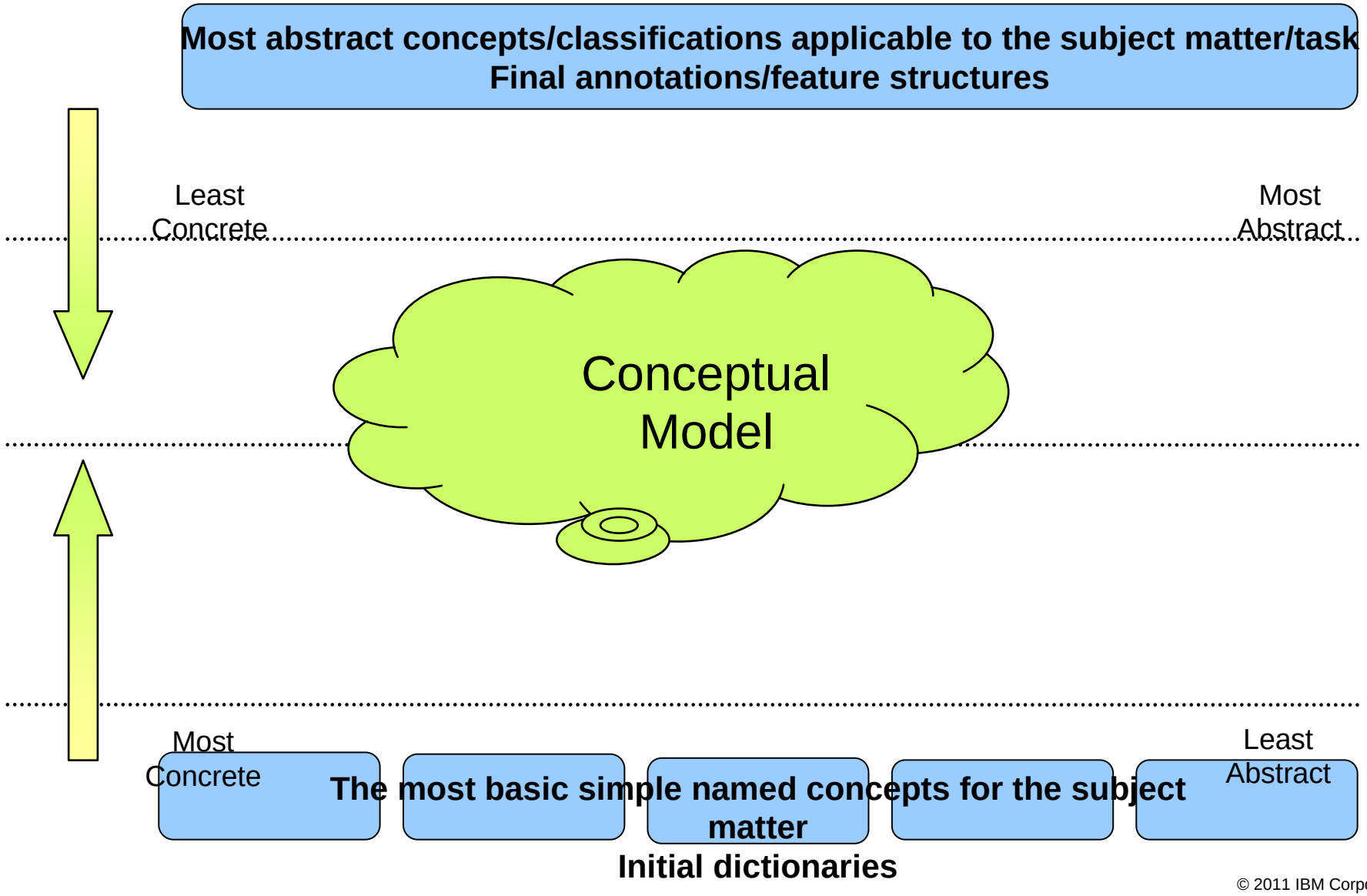
Before you start modeling

- LanguageWare is a very powerful, adaptable language processing engine
- BUT it is not a silver bullet that will solve every problem in one go
- Do not try to stretch a model to make it solve every problem. This may be possible, but hacks or over-fitting a model make maintainability a nightmare
- When modeling if you run into a brick wall ask yourself if the problem might be easier solved by pre/post processing…if so try to push it out to those stages

Where do you start?

- Start at both ends of the problem and work towards the middle
- Every subject matter/Text Analytics task has an abstract notion of how the information fits together
- Think about any Centralized Type-system, ontology or taxonomy that describes or defines what you want to extract
- Use this to define the start and end points of your model, i.e. the initial dictionaries, and the final annotations/feature structures you want, and what features they have/need
- Consider how the smallest functional elements of the model combine to form more meaningful units
- Consider how the abstract notions can be “broken apart” or are composed of smaller meaningful chunks

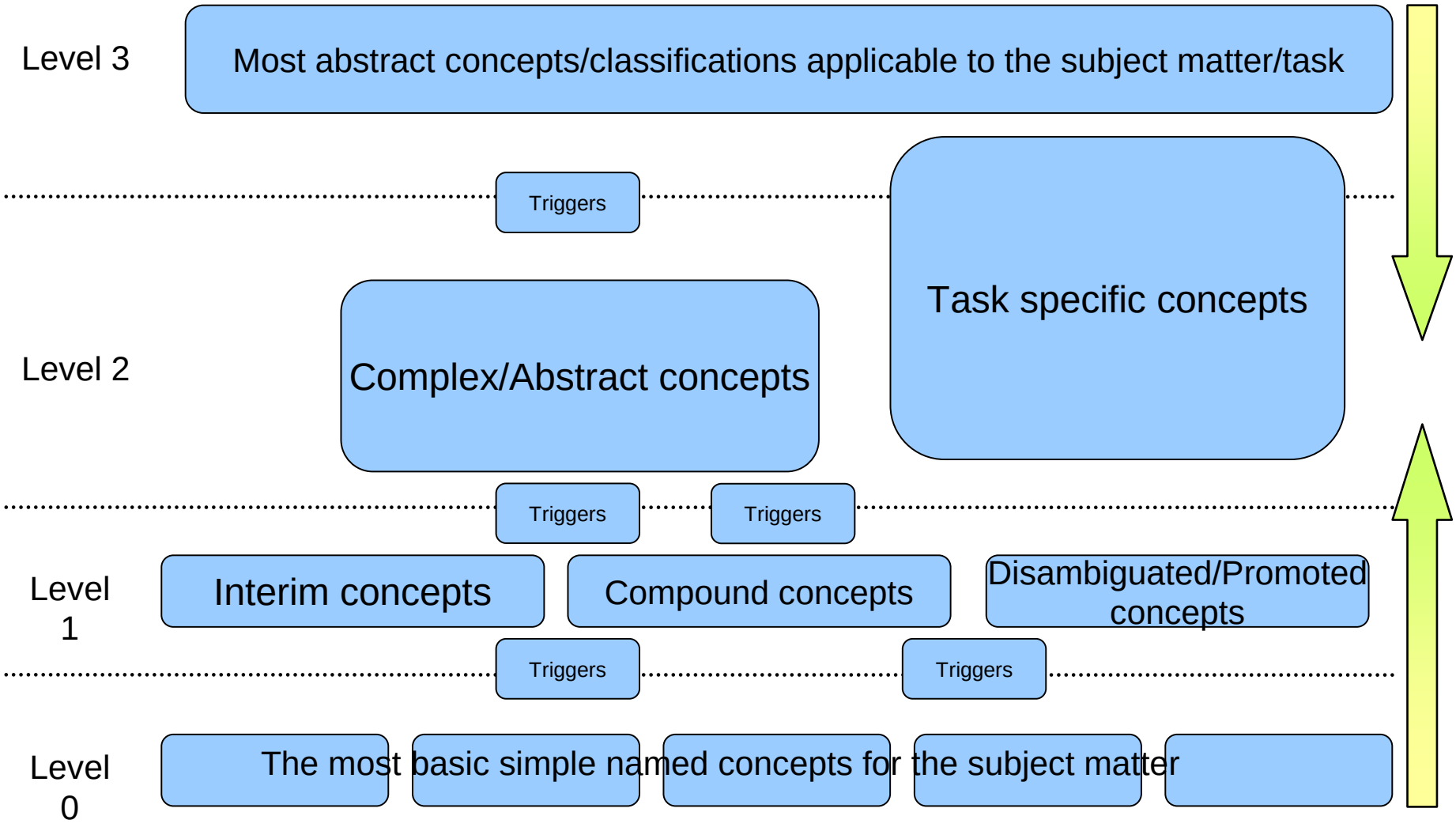
Where do you start?



Filling in the middle ground

- Once the end points are defined fleshing out the model is a matter of
  - Composing the simple (dictionary) elements to create more meaningful units using rules
  - Decomposing the abstracted end points to provide basic logic to drive rules development
- To move upwards in the model ask “how can I combine these things into something else?” and then write that rule
- To move downwards in the model ask “What is this made up of?” and then write that rule
- In both cases when deciding on the format of a rule ask “What sort of things are usually found near this?”
  - If those things are already defined in the model, rules logic will fill the gap
  - If not, additional trigger word/phrase dictionaries, or interim annotations might be needed
- This will not guarantee a complete model but gives a good structure which should be easily maintained and extended

The bigger picture



Types of dictionaries and rules

- Modeling in this way gives rise to 2 types of dictionary distinguished by both their usage and the type of “thing” they recognize
- Likewise 3 types of rule can be distinguished based on their function and the function of the annotations they create
- These rule and dictionary types are only general guidelines, but can be good for helping to separate and define the work done by the various resources

Two types of dictionaries

- **Type 1** – A list of things that are classified in the same way
  - Enumerable lists of “things”
  - Basic concepts with a semantic type (such as FirstName, Organization, Location..)
  - Eg. Town names, Car Manufacturers
  - Used predominantly at lower levels

- **Type 2** – *Stuff* that’s found in the vicinity of interesting *stuff*
  - Hard to classify as a single semantic type. Corresponds to the notion of a “trigger” or an “indicator”, that appears in the vicinity of important entities(example inc and & Co for companies)...
  - Anything from pronouns/prepositions to sub sentential units
  - Not always the same type of “thing”
  - Usually short lists
  - Eg. street, avenue, “was awarded to,” inc., corp.,
  - Used throughout a model for promotions, disambiguations and rule structure

Three types of rules

- **Type 1** – Disambiguation and promotion rules
  - Useful for confirming and overriding dictionary matches
  - Mapping into generic container types to drive more abstract rules
  - Create confirmed annotations
  - Used throughout the model but should become less frequent as things get more abstract
  - Annotations created by these rules are usually useful to more complex/abstract rules or to the end user/consumer
- **Type 2** – Rules that create something useful, an end type, a feature of an end type
  - Combining simple elements
  - Constructing complex annotations
  - Creating feature structures
  - Used at higher and lower levels of abstraction
  - Annotations created by these rules are usually useful to the end user/consumer
- **Type 3** – Rules which manipulate annotations creating task specific concepts
  - Combines simple and/or complex elements for a specific task
  - Driven more by the task at hand than semantics
  - Can provide insight that can be used to drive disambiguation/promotion rules, eg. spotting sections, lists
  - Used mainly in the middle ground
  - Annotations created by these rules are usually useful only to the model and just drive rules

Abstraction at the lowest level

- Proved very useful in customer engagements
- Can help reduce the number of dictionaries needed, hence reduces the rules workload…hopefully makes the whole model much simpler
- Keep similar things together, and ask “Can the distinctions be described as differing values of the same/similar features?”

Abstraction at the lower levels (Dictionaries) – Example

- **Example, we are interested in how people feel about the condition of a car in a Sentiment Analysis model.**
  - NegativeCarConditionSentimentIndicators: “dented” “scratched” “filthy” etc
  - PositiveCarConditionSentimentIndicators: “gleaming” “pristine” “like new” etc
  - Rules then have to work on both dictionary types
  - Introducing a new sentiment (indifference or unsafe) requires creating a new dictionary type and new rules to support it
- **Taking an abstracted approach to the data**
  - CarConditionIndicator has an attached sentiment feature: “dented[neg]” “gleaming[pos]” “scratched[neg]” “pristine[pos]” etc
  - Rules work on a single dictionary type and extract the feature which is passed up to inform higher level annotations
  - Introducing a new sentiment means simply adding the appropriate vocabulary to the dictionary with the associated sentiment feature value
  - Introducing a new feature (eg: interior or exterior) to add granularity to higher annotations is simply a matter of updating the dictionary and passing that feature up in rules, i.e. no new rules should be needed

Module roadmap

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– **Summary and best practices**

Summary and best practices

- The more abstract the concepts the better: Granularity can be achieved through features or through further annotations. This also allows you to write rules on “superclass” type annotations
- Features/Structures of higher annotations should be dictionary driven to as large an extent as possible: Updating the contents of complex annotations then becomes a matter of updating the dictionary
- If something needs to be a feature of an annotation you create in a rule, ask yourself can it be a feature associated with a dictionary type?: This makes it easier to abstract the problem, and also makes the features available as tests for rules
- Where multiple dictionaries are used to contribute to the same annotation (eg. Mesh/SnoMed Diseases) or where in context disambiguation is to be used (eg. negation), write rules on a container type into which the dictionary types are promoted/disambiguated using context and other triggers

Contacts

- If you have any questions, comments or suggestions, contact us using the LanguageWare email address *EMEALAN@ie.ibm.com* or on the developerWorks® Forum.

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