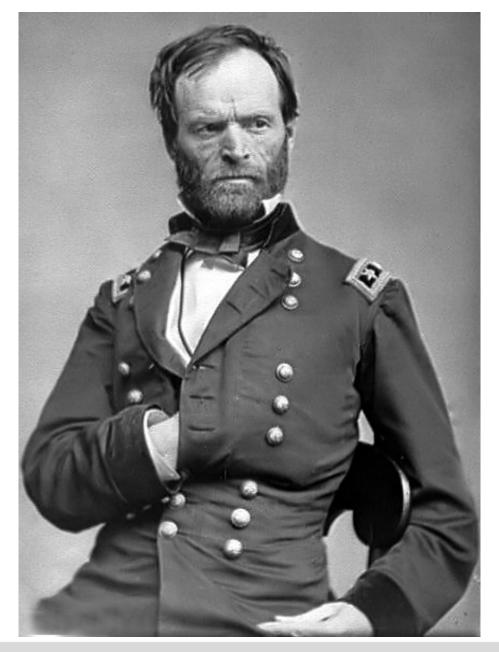


## OWL: An Integration & Analysis Hub for O&G IT

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### General William Tecumseh Sherman clark parsia



"If I owned Hell and Texas, I'd live in Hell and rent out Texas."

### Semantic Web and Business

Early industrial adopters include

• HCLS

- $\circ$  heavy users of ontologies, including OWL
- $\circ$  at least one novel scientific discovery w/ OWL already

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- Financials: we think future is *very bright,* ironically:
  - OWL loves policy & regulatory apps
  - $\ensuremath{\circ}$  automated compliance checking, forensics
- Defense
  - $\circ$  OWL for integration across product lifecycle
  - Decision support & analysis apps (UAV planning)

#### Enterprise IT

 $\circ$  a laggard, but coming around slowly

### What is the view globally?

- The EU is ahead and pulling away:
  - EU is ahead of the world and investing *heavily* in semantics
    - Defense is a special case
    - small startups (!!) -- a historic reversal
  - $\circ$  Far ahead in "heavy industry"
  - EU centralized funding (FP7, currently) matters
- US is uncertain, though there are some signs of life:
  - HCLS is probably world leader; but really LS dominated

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- Oracle's OWL product is crucial
- China and Japan are mixed
  - China doing cutting-edge CS (including OWL) now
  - Japan leading in "digital cities", ubiquitous & small device apps

### What about "heavy" industry?

- Lags behind other front-line industries w/r/t SW adoption
- Signs of change:
  - o ISO 15926 & POSC Caesar
  - Product Modeling Ontology (<u>PMO</u>) from SWOP (FP6)
     this workshop

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- Analogues in associated industries:
  - BIM (Building Information Modeling); see, e.g., <u>NBIMS</u>
  - Model-based Systems Engineering in manufacturing; see <u>http://mbse.sysmod.de/</u>
- These are *precursor* technologies: they will lead to SW adoption because of technical needs & "network effect"

### Answering two questions...

What are we all doing here? I assume we're trying to see:

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- 1. if there's enough "fit" between O&G and SW to make a match, and
- 2. if so, is there anything W3C can do to help

So:

- 1. What sorts of IT problems is Semantic Web technology especially well-suited to solve?
- 2. What sorts of IT problems do O&G companies have?

# What is SW tech good for?

#### 1. Information Integration

o abstract, declarative, high-level knowledge formalisms

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- to enable, in a standardized & web-friendly way, integration of data *models* rather than data *sources*
- with computational & logical guarantees & properties:
  - Iogical consistency, automated alignment & fusion
  - automated explanations, biz rules, high-level query
- 2. Decision Support & Analysis
  - represent complex problem domains in machinereadable form via ontology modeling

use existing tools & custom code to build analysis apps
Integrating (1) and (2)...The "hub" idea...

### **Integration & Analysis**

 Simply put, the more integration you do, the more analysis you can do

• The more analysis you do, the more integration you *must* do

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- The NASA workforce analytics example:
  - Analysis needs (locate experts) fueled integration
  - which makes possible additional analysis (career planning)
  - $\circ$  requiring additional integration
  - $\circ$  etc etc etc
- We've seen this pattern repeated in HCLS, defense, financial, enterprise IT, etc.

## Does O&G IT do any of this?

- Looking at ISO 15926, talking to people in O&G IT, and looking at the papers in this workshop...
- O&G IT face integration, analysis, configuration management, optimization problems at large scales, both of data and conceptual complexity, of the sort that other industries increasingly turn to SW tech to address

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• In short: yes!

# Next Steps

- Many possibilities, some of which require W3C help
- C&P focuses on <u>OWL infrastructure tools</u> particularly delivering value using automated reasoning & inference
- Requires serious commitment to standards
- <u>OWL 2</u> contains some "new stuff" that is O&G relevant:
  - $\circ$  improved expressivity, limited datatype reasoning
  - profiles, especially OWL 2 RL, OWL 2 QL
  - $\ensuremath{\circ}$  annotations as an extension mechanism
  - OMG/UML interop & cooperation
- Till the next round of standardization:
  - o integrity constraints, fine-grained closed world reasoning
  - o more equational reasoning, datatype reasoning:
    - temporal, spatial, units & quantities
  - $\circ$  description graphs for part-whole relations

### Clark & Parsia LLC

 License OWL and other Semantic Web components for use in commercial products & in-house apps

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- Build in-house apps for Fortune 500 customers & govt
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