



Mastering Medical Data with MGRID SQL

27th Annual Plenary & Work Group Meeting
Thursday Q3 – AID WGM

The MGRID SQL solution

- MGRID SQL is a clinical data platform targeted at integrating, storing and retrieving large amounts of medical data
- MGRID SQL includes medical features:
 - Native support for ISO-21090 datatypes
 - Terminology support for SNOMED CT, HL7, LOINC, ...
 - HL7v3 RIM Database
 - HL7v3/CDA message parsers
- MGRID SQL enables scale-out of large databases through sharding and parallel query



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Native support for ISO datatypes

- Enable precise database mapping of HL7v3 artefacts
 - no non-standard constructs, no workarounds, no caveats
 - knowing HL7v3 means knowing the database
- Create a query language that is powerful, fast and easy to learn
 - *powerful* query language – SQL & all PL/ languages
 - *fast*; most datatypes support indexes
 - *easy to learn*; the application programmer now has powerful, intuitive primitives



ISO datatypes: PQ

```
create table patient (name text, height pq, weight pq);
CREATE TABLE

insert into patient values
  ('Jack', '1.92 m', '92 kg')
,('Julia', '150 cm', '50 kg')
,('John', '188 cm', '84.3 kg')
,('Luke', '78 cm', '11800 g');
INSERT 0 4

create or replace function bmi(height pq, weight pq)
returns pq
as $$
  select convert($2, 'kg') / convert($1, 'm')^2;
$$ language sql immutable;
CREATE FUNCTION

select *, bmi(height, weight) from patient where height > '1.70 m'
order by weight;
  name | height | weight |          bmi
-----+-----+-----+
  John | 188 cm | 84.3 kg | 23.8512901765504753 kg/m2
  Jack | 1.92 m | 92 kg  | 24.9565972222222222 kg/m2
(2 rows)
```



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/* And now for something completely different:
 * what is the mean travel time of light, from the sun to the earth?
 */
select convert(pq '1 AU' / '[c]', 's');
  convert
-----
  499.0047838061356433 s
(1 row)
```



ISO datatypes: PQ

- AdPQs used to document observations
- Based on Unified Code for Units of Measure
 - 294 units – a.o. units from SI, ISO 1000, ISO 2955, ANSI X3.50, CGS, unified U.S. & British Imperial units
- Operations supported:
 - Comparison: `<`, `>` and friends
 - Arithmetic: `+`, `-`, `/`, `*`, **power**
 - Aggregation: **min**, **max**, **avg**, **sum**, **var**, **stddev**
- Indexable

ISO datatypes: Time and intervals

```
select canonical(ivl_ts '[2004;2005]' + ivl_ts '[2006;2007]') AS plus,
       canonical(ivl_ts '[2002;2010]' - ivl_ts '[2004;2005]') AS minus;
plus          |      minus
-----+-----
[2004;2005];[2006;2007] | [2002;2004[;]2005;2010]
(1 row)

create table medication (name text, effectivetime ivl_ts);
insert into medication values ('Pete', '[20100316;20100514]');
insert into medication values ('Pete', '[20100420;20100701]');
insert into medication values ('Pete', '[20101220;20110119]');
insert into medication values ('John', '[20100516;20100614]');
insert into medication values ('John', '[20100620;20100801]');
insert into medication values ('John', '[20101220;20110119]');

select * from medication where effectivetime @> '20100620';
 name |    effectivetime
-----+-----
 Pete | [20100420;20100701]
 John | [20100620;20100801]
(2 rows)

select name, canonical('2010' - SUM(effectivetime)) as nomeds
  from medication
 group by name;
name |          nomeds
-----+-----
John | [20100101;20100516[;]20100614;20100620[;]20100801;20101220[
Pete | [20100101;20100316[;]20100701;20101220[
(2 rows)
```



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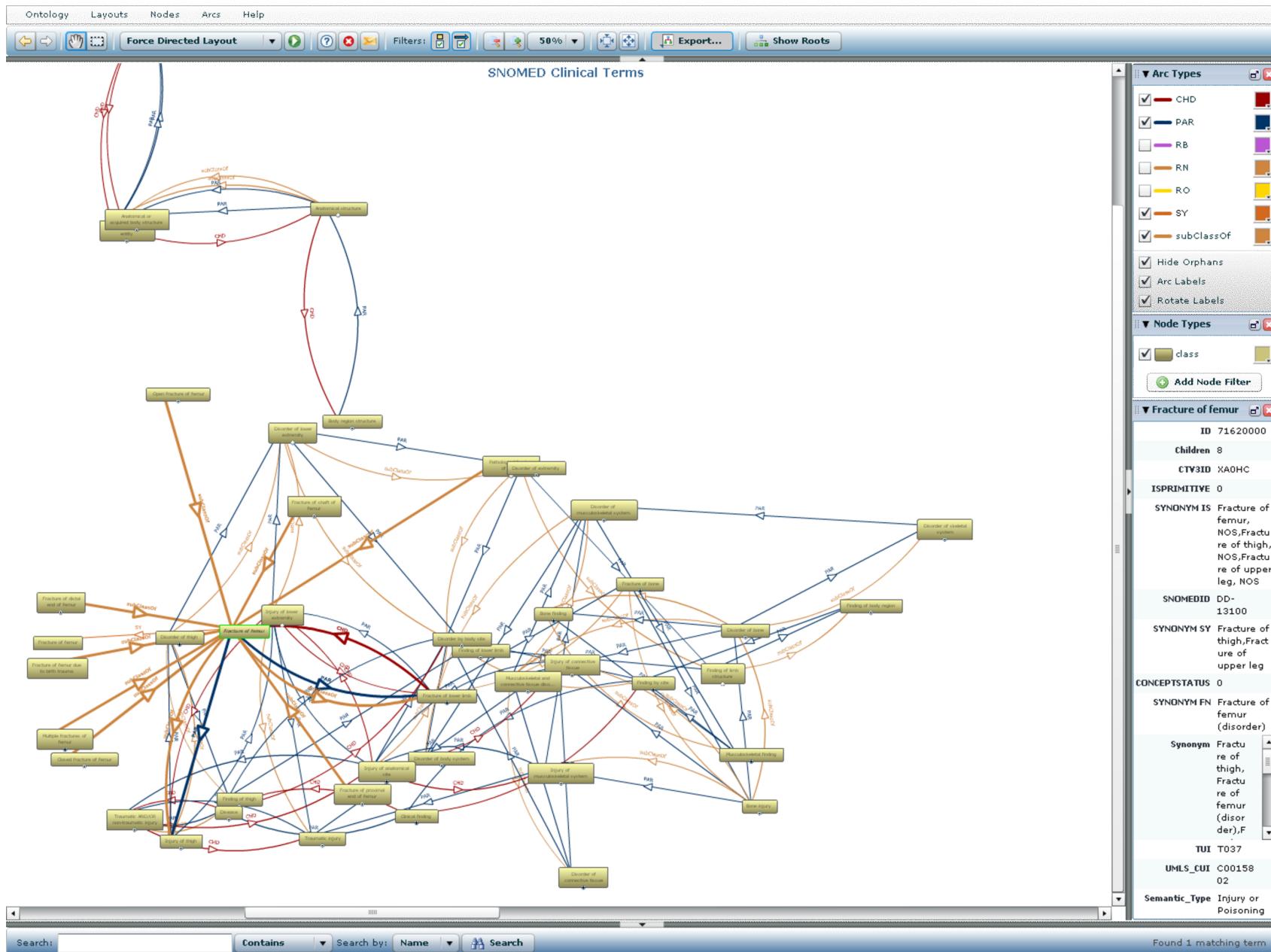


Terminology Support

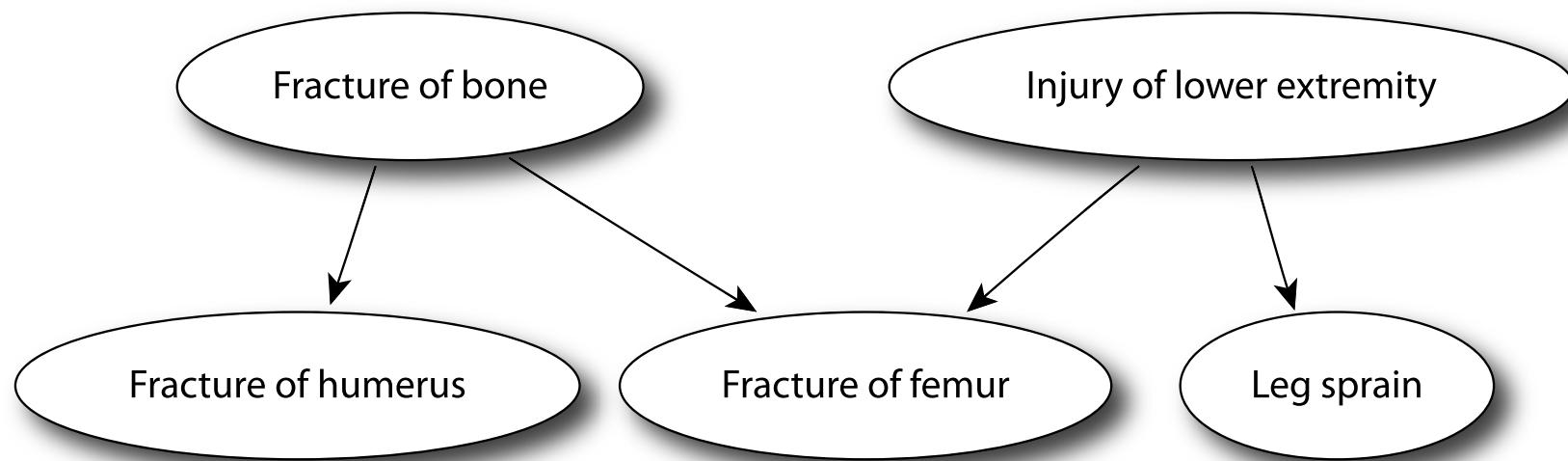
- Controlled vocabularies in medical informatics
 - record information unambiguously
 - allow codesystem based information retrieval
- ISO datatype Coded Value (CV) implementation
 - Supports code systems with hierarchies
 - Indexable
- Support for a large number of codesystems:
 - ~300 HL7 codesystems per edition
 - SNOMED-CT
 - LOINC



Terminology support: SNOMED CT



Terminology support: SNOMED CT



Terminology support: SNOMED CT

```
select name, code(disorder), codesystemname(disorder),
       displayname(disorder) from observation;
   name |   code    | codesystemname |      displayname
-----+-----+-----+-----+
Willem | 71620000 | SNOMED-CT      | Fracture of femur
Yeb    | 66308002 | SNOMED-CT      | Fracture of humerus
Henk   | 262994004 | SNOMED-CT      | Leg sprain
(3 rows)
```

```
select name, displayname(disorder) from observation
where disorder << '284003005|Fracture of bone'::cv('SNOMED-CT');
   name |      displayname
-----+
Willem | Fracture of femur
Yeb    | Fracture of humerus
(2 rows)
```

```
select name, displayname(disorder) from observation
where disorder << '127279002|Injury of lower extremity'::cv('SNOMED-CT');
   name |      displayname
-----+
Willem | Fracture of femur
Henk   | Leg sprain
(2 rows)
```



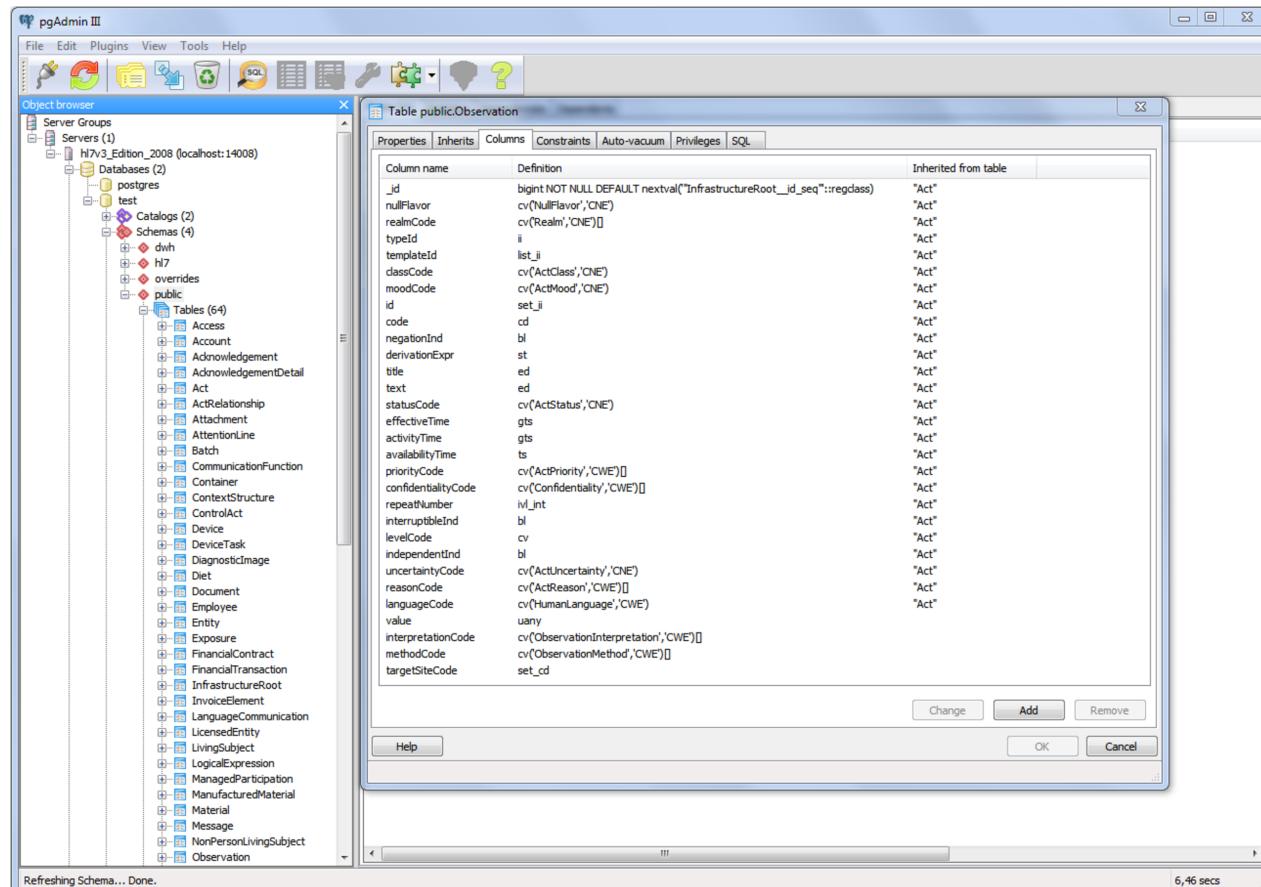
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HL7v3 RIM Database

- MGRID SQL RIM = HL7v3 RIM
- Database structure and inheritance *generated* straight from the specification

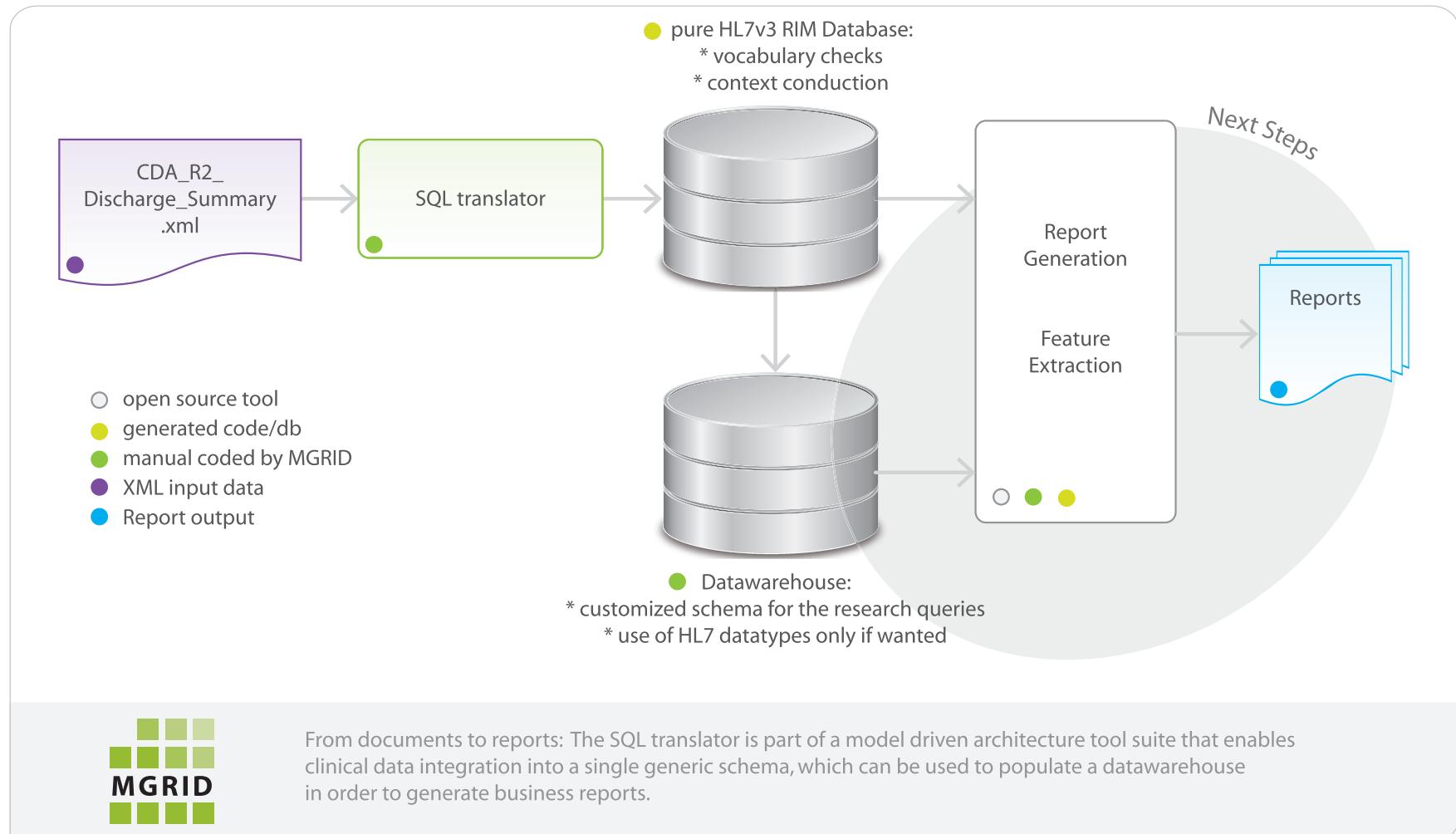


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- MGRID SQL enables high performance and scalability through sharding and parallel query

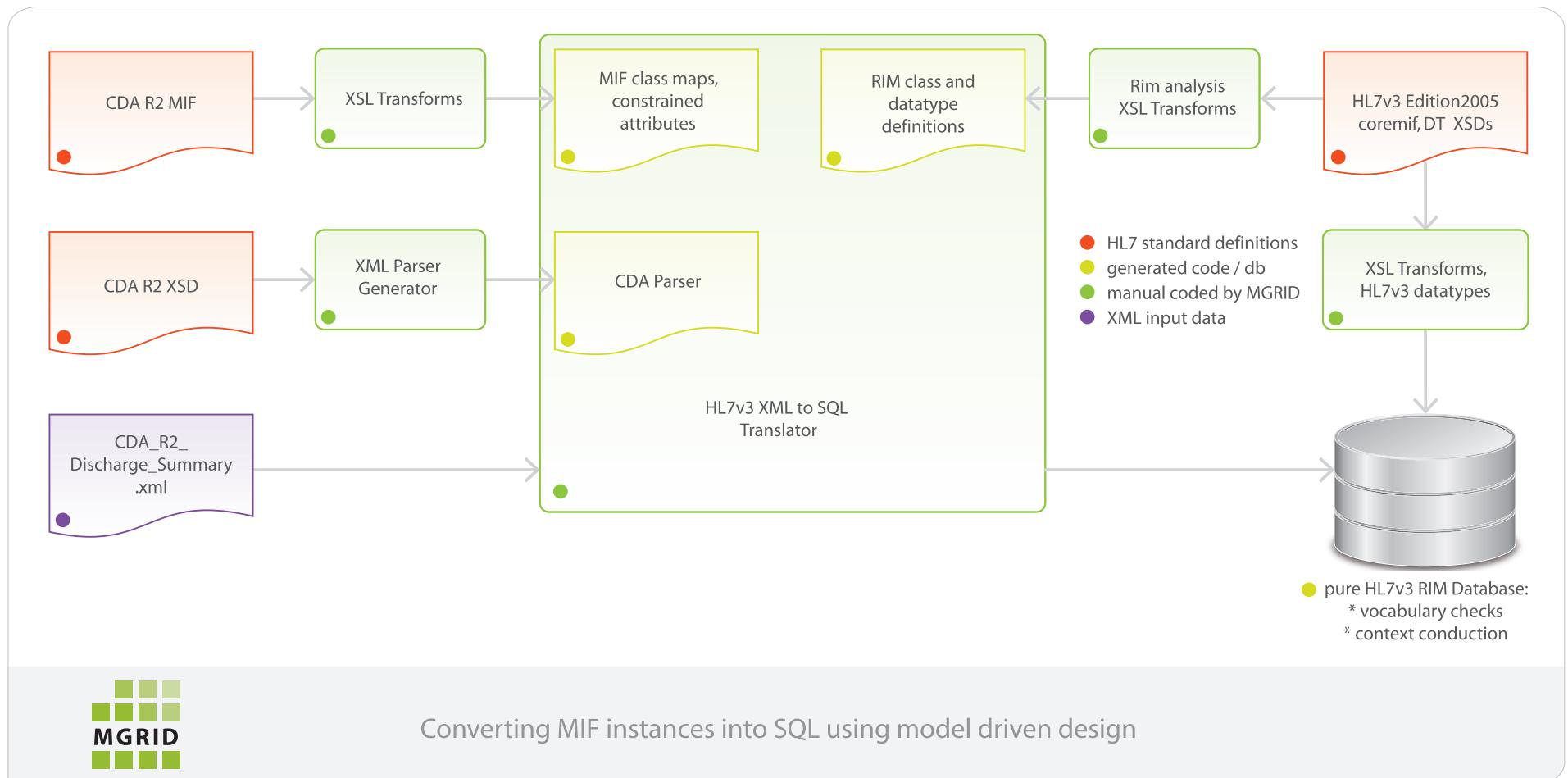


From documents to reports



From documents to reports: The SQL translator is part of a model driven architecture tool suite that enables clinical data integration into a single generic schema, which can be used to populate a datawarehouse in order to generate business reports.

Message parsers using MDA



Model Driven Architecture

- MGRID SQL includes generators for RIM Databases and Message Parsers
- All HL7v3 Normative Editions supported
- Keep up with HL7's rapid pace of change

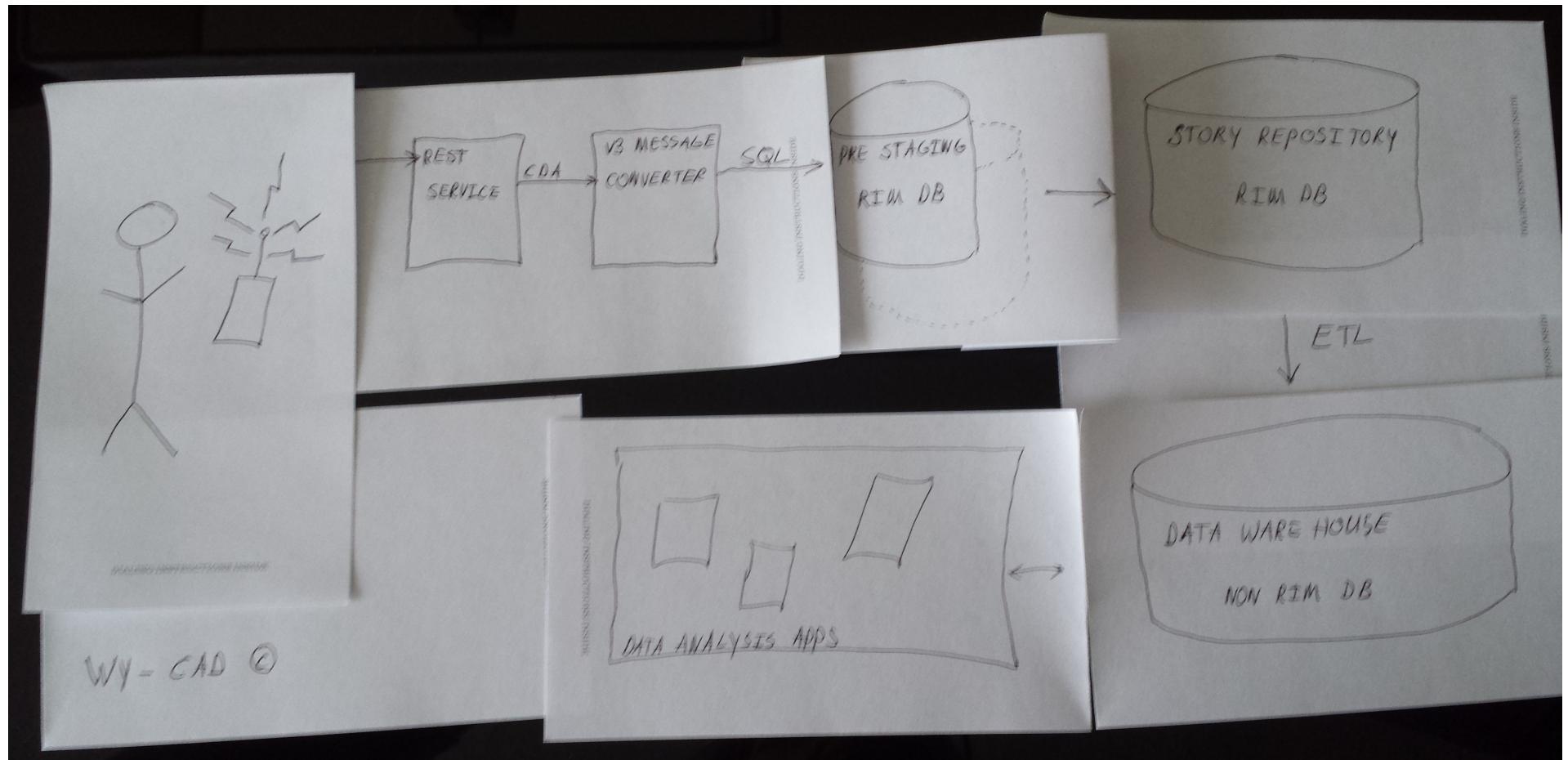


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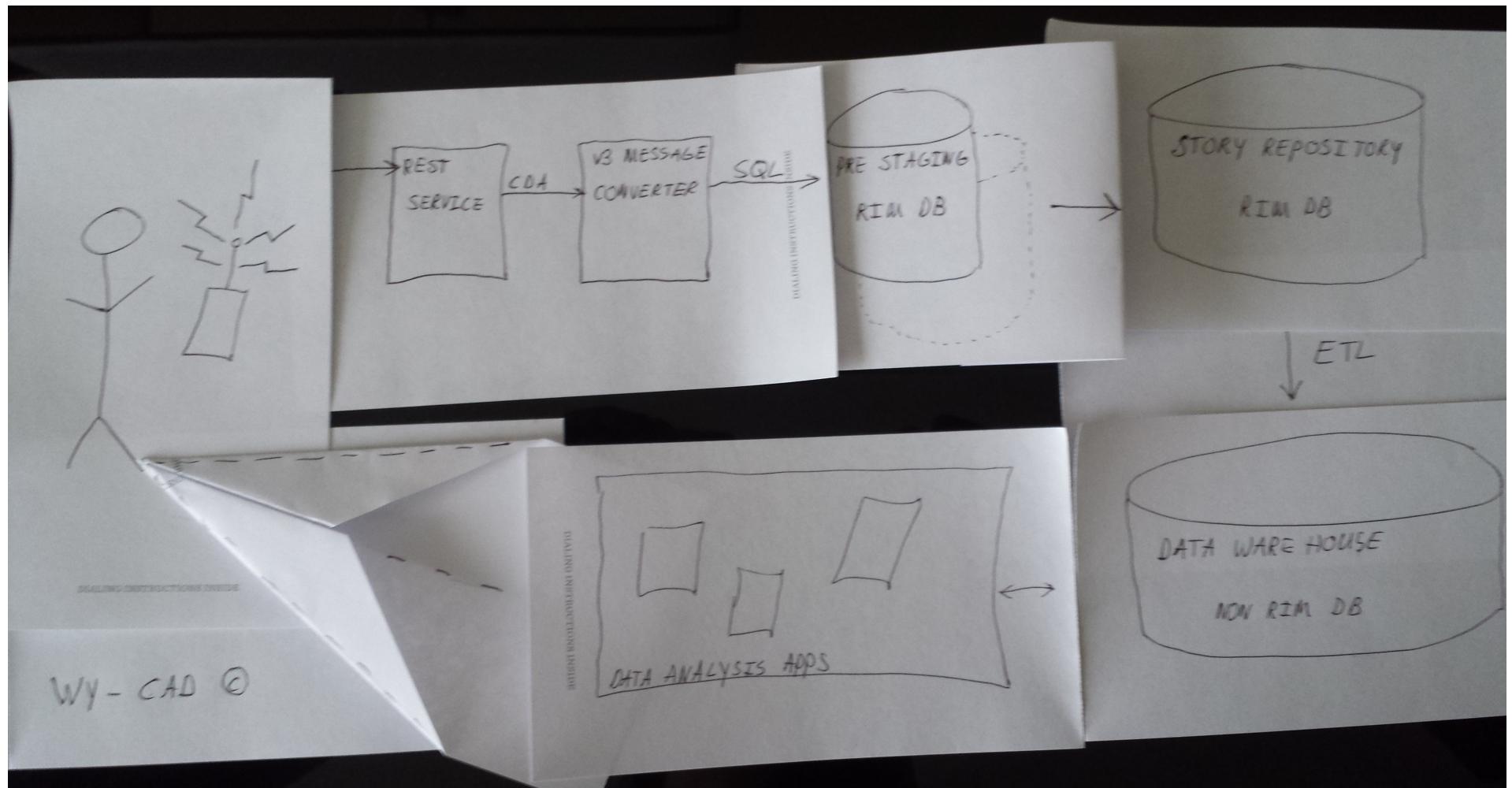
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Dangerous Demo



Dangerous Demo



More Information

- website: www.mgrid.net
- email: info@mgrid.net
- We blog infrequently: www.mgrid.net/blog

