FHIR at Lithuanian National Health System

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Estonia: 1,3 mil
Lithuania: 2,9 mil
Paris: 2,3 mil
LT NHS project in Numbers

- Start of project: 2013-12 .. 2014-01
- Go-LIVE: 2015-09
- Budget: 1,2 MEUR
Project goals

- Develop standard and platform for health information exchange.
- Centralize health-related classifiers and registries.
- Gather medical information from Healthcare Providers.
- Provide access to health related information for:
  - Patients;
  - Health-care providers;
  - Government.
Deliverables

- Standards and documentation
- Central server for NHS
- Communication HIS <-> NHS
- Specialist portal
- Patient portal
- e-Prescription
- ImageBank
Architecture
Technology

- Oracle 12c
- Fuse ESB
- OSGI
- REST + XML
- Angular
- Java 7
NHS on all devices
FHIR implementation

- DSTU-1
- Paradigm: REST + Documents
- Conformance: yes
- FHIR implementation:
  - Server: custom;
  - Client: HAPI-FHIR
- Profiles: no
FHIR Resources used

- AdverseReaction
- Alert
- AllergyIntolerance
- Binary
- Composition
- Condition
- DiagnosticOrder
- DiagnosticReport
- DocumentReference
- Encounter
- ImagingStudy
- Immunization
- ImmunizationRecommendation
- List
- Media
- Medication
- MedicationPrescription
- Observation
- Order
- OrderResponse
- Organization
- Patient
- Practitioner
- Procedure
- Provenance
- Query
- Specimen
- Substance
Additions to standard FHIR

- \_modified – to get lastUpdated resources;
- Custom search params for Resources:
  - Order;
  - Alert;
  - Composition.
- Valuesets/Terminology – leverages Nortal Classifiers platform.
Lessons learned: general

- Early implementer considerations
  - Limited number of Resources available. No Referral, Appointment.
  - Resource structure, classifiers not consistent among different resources. (Medication, Immunization, ImmunizationRecommendation).
  
  It’s a DRAFT standard.
  
  pre-DSTU-1 -> DSTU-1 → DSTU-2 takes time

- Paper/Document based thinking (in co-operation with HL7 v3 and CDA) has had big impact on clients – hard to change paradigm.
Lessons learned: general

- Use existing libraries
  
  <Hapi/>
  
  HAPI-FHIR
  fhir made simple.

- Synchronization of resources
  - _lastUpdated available since DSTU-2

- Valuesets with URL-pattern should reference to valueset itself.
Lessons learned: search

Resource is the most granular set of data.
- For displaying a list of resources it might be too costly.
- Yes, there’s the _summary keyword, but this means additional effort from Server.

_history numbers should be incremented from 1 for each Resource

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<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>01.</td>
<td>..//Patient/33/_history/1</td>
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<td>01.</td>
</tr>
<tr>
<td>02.</td>
<td>..//Patient/33/_history/2</td>
<td></td>
<td>02.</td>
</tr>
<tr>
<td>03.</td>
<td>..//Patient/33/_history/3</td>
<td></td>
<td>03.</td>
</tr>
</tbody>
</table>
Lessons learned: search

- Composite search params are hard to read and use of $ sign might cause implementation errors

```
GET [address]/..?state-on-date=new$2013-05-04,active$2013-05-05
```

- url-encoding of REST search parameters

```
GET [address]/..?state-on-date=new&2013-05-04&active&2013-05-05
GET [address]/..?state-on-date=new%242013-05-04%2Cactive%242013-05-05
```
Lessons learned: search

- FHIR search is flexible, but it’s not SQL.
- The flexibility depends a lot on server
  - how deep can you go with
    - _include
    - chained search
FHIR search case-study I

„Give me the pending Orders of a Patient“

01. GET [address]/OrderResponse?code=pending&_include=OrderResponse.request
FHIR search case-study I

„Give me the pending Orders of a Patient“

```
01. GET [address]/Composition?type=57133-1&subject:Patient={IN_PATIENT_ID}&section-content:Order.response:OrderResponse.code=pending&section-content-list:Order.validity=1$%3E{validity_date1},2$%3E{validity_date2},4$%3E{validity_date4}&status=final&documentreference.docstatus=Signed

02. GET [address]/List?_id={Q1_LIST_ID[1], Q1_LIST_ID[2], ...}

03. GET [address]/Order?_id={Q1_ORDER_ID[1], Q1_ORDER_ID[2], ..., Q2_ORDER_ID[1], Q2_ORDER_ID[2], ...}&_include=Order.source&_include=Order.target

04. GET [address]/Organization?_id=
{Q3_SOURCE_ORG_ID[1],Q3_TARGET_ORG_ID[1],Q3_SOURCE_ORG_ID[2],Q3_TARGET_ORG_ID[2],...
```
Conclusion

- Use of FHIR simplified the implementation process a lot.
- Implementing a modern standard is FUN!
- You cannot take away the complexity...
Questions?
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