Service Delivery für eHealth Applications

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Service Delivery for e-Health Applications

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e-Health Service Lifecycle

What is required, what has to be provided?
- adapt to new user needs, train users
- maintain, update systems, change management
- provide services (SLA, hotline, central / on-site support, ...)

⇒ but not only IT-services … what about organisation and governance
Organisation and Governance

point-to-point

- bilateral: low organisational / governance demands

hub-to-spoke

- multilateral: - potential domination at the “hub“
  - limited spoke – spoke cooperation

- extending the view: scaling it up
Organisation and Governance

- Multiple clusters
- Cluster reflect local / regional service provision / cooperation
- Cluster – cluster cooperation gets difficult, potential competition
- Hospitals at cluster borders face a problem
- Overall higher cost
  - Maintenance and administration per cluster
  - Interoperability

→ Assigning responsibilities in a multi-layer approach
# Multi-layer Approach

<table>
<thead>
<tr>
<th>layer</th>
<th>contents</th>
<th>example related to teleradiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>organisation, business process</td>
<td>medical, clinical cooperation</td>
<td>weekend or night shift, remotely controlled exams</td>
</tr>
</tbody>
</table>

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### 3LGM² - Three Layer Graph-based Meta-Model (Winter et. al. 2003)

<table>
<thead>
<tr>
<th>domain</th>
<th>enterprise function, entity types</th>
<th>second opinion, referral, online consultation</th>
</tr>
</thead>
<tbody>
<tr>
<td>logical tool</td>
<td>application components</td>
<td>DICOM and Web-Services for image / report handling</td>
</tr>
<tr>
<td>physical tool</td>
<td>infrastructure components</td>
<td>IT-systems, server, network</td>
</tr>
</tbody>
</table>

- IT-layers as conceived by the 3LGM²
- amendment: organisational / business process layer
From theory to practise

The challenge: State-wide e-Health services° for
- teleradiology
- second opinion
- emergency consultation
- remotely controlled examination
- teleconsultation

Mecklenburg Vorpommern
- lowest population density in Germany
  (71 persons/km² on average)
- low number of hospitals at a distance (ca. 50 km)

Objectives:  - sustainable e-health services (for at least 3 years)
- accessible for hospitals and practices
- extensible for further services
- compliant to regulations and data protection laws

°grant of the Ministry for Social Affairs and Health, taken by the Institut für Angewandte Informatik an der FH-Stralsund
The concept

IT-view
- centralized infrastructure shared by all → low cost
- „hub-to-spoke“ topology
- data transfer (DICOM / Web)
  hospital – infrastructure - hospital
- single interface to each hospital

cooperation view
- hospitals with equal rights
- mutual cooperation
- change in cooperation easily accomplished
The implementation

- Infrastructure for high-availability
- Redundant network connection and HW
- Secure connection to hospitals (VPN based)
The implementation

- DICOM Forward (hospital – infrastructure – hospital)
- Pseudonymisation (de-identify DICOM objects)
- DICOM Webserver (DICOM / JPEG access via Internet)
The implementation

domain layer

clinical services
- second opinion
- emergency consultation
- remotely controlled examination

services for business process support

in addition

services for surveillance and business continuity
The implementation

- surveillance services using Nagios: infrastructure – hospital network level („critical“) and application level („warning“)

![Graph showing state history]

- quality control compliant to DIN 6868-159: hospital – hospital Java application TR-DIN for transfer times of reference data sets

![Graph showing average transfer times]

=> services for infrastructural surveillance

=> end-to-end quality control
The implementation

- contracts and agreements
- fees for second opinion and consultation
- fees for remotely controlled examinations
- support for regulatory approval with
  - data and IT security analysis
  - risk analysis and mitigation plan
- contractual framework for
  - data management by third parties
  - service level agreement
    - hotline, training
- contractual framework for
  - data management by third parties

→ level assignment: business process → hospitals
  IT-layers → contracted provider
The results

successful operation sind 6/2010
- 15 hospitals / 2 practises
- ca. 50000 images / month
- ca. 1000 image series / month
- > 100 GByte / month
- multiple changes in cooperation and partnership

difficulties and problems
- technological (HW failure)
- application (transfer syntax)
- marketing, establishing new cooperation scenarios, state-wide coverage
Conclusion

- 4 layer approach allows for different assignment of responsibilities
- central infrastructure assures scalibility
- an independent service provisioning for the IT-layers guarantees
  - equal rights and access for each partner
  - cost-effective operation, maintainance, hotline and training
  - reduction of efforts for regulatory approval / hospital
- hospitals are releaved from keeping up multiple separate connections
- improved access to healthcare services for patients

Outlook

- comparable approach for nation-wide cooperation for managing trauma patients (emergency consultation, second opinion, transfer decision)
- up to 800 hospitals organized in 55 so-called trauma networks
- pilots starting end of October 2011
- routine operation from January 2012
Service Delivery für eHealth Applications

Questions ?

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