



# PACS in Finland

## - development and current status in eHealth environment

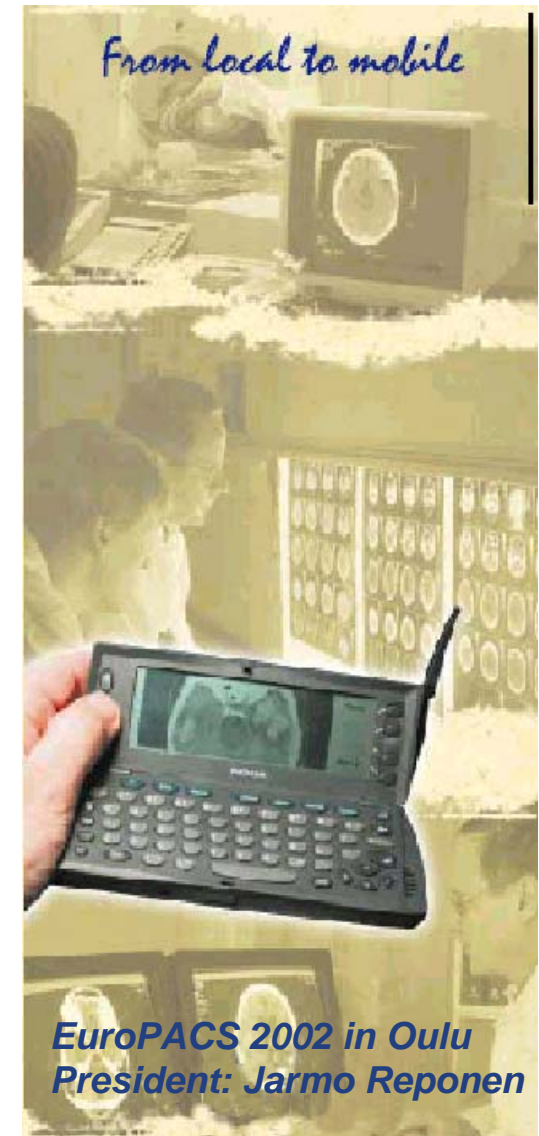
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FinnTelemedicum, Univ. of Oulu, Finland
- President, Finnish Society of  
Telemedicine and eHealth
- Past-President EuroPACS association

Scandinavian-Japanese Radiology Society, Vejle, Denmark, 07 September 2010

# Regional and national PACS-solutions - Contents:

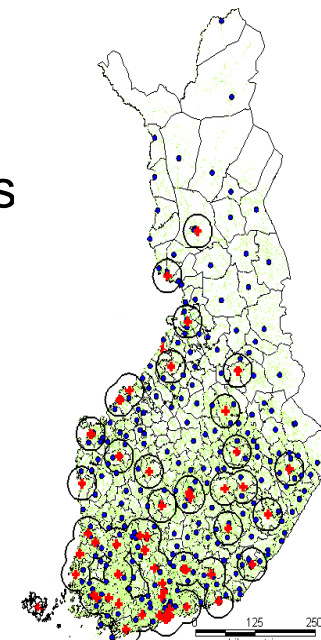
- Finnish Health Care System
- Results of the eHealth National Surveys – *Regional Care in Focus*
- New Laws and the national eArchive reform
- Case Examples of the regional PACS and or EPR integration projects in Finland
- Summary and Conclusions



# Introduction: Basics of health care organization in Finland

- Public sector covering about 85 % of HC
  - Specialized health care
    - 5 university hospital coverage areas
    - 21 hospital districts
      - provided by federations of municipalities
      - about 70 public hospitals
  - Primary health care
    - 229 health care centres
      - provided by municipalities
  - Private sector covering about 15 % of HC
- Basic and specialized health care

Somatic hospitals and health care centres with beds



Unique Patient ID code since 1963

Common structure for continuous medical records since 1972

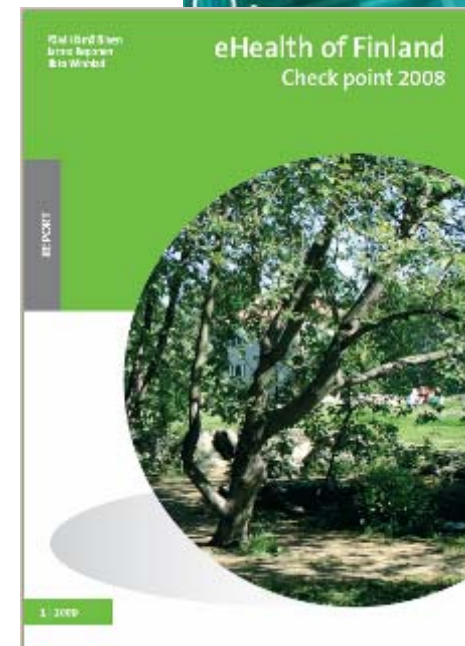


# Finnish eHealth Surveys 2003, 2005 and 2007

- Focus on the implementation of ICT in health care
- Assignment of the Ministry of Social Affairs and Health
- Conducted by **FinnTelemedicum** and **STAKES**
- Method:
- -a structured web based questionnaire
- Target:
- -all public HC providers, sample of private HC providers,
- -all ambulance service providers
- Coverage:
- -100 % = all the 21 hospital districts in specialized care
- -88 to 100 % population coverage in primary health care

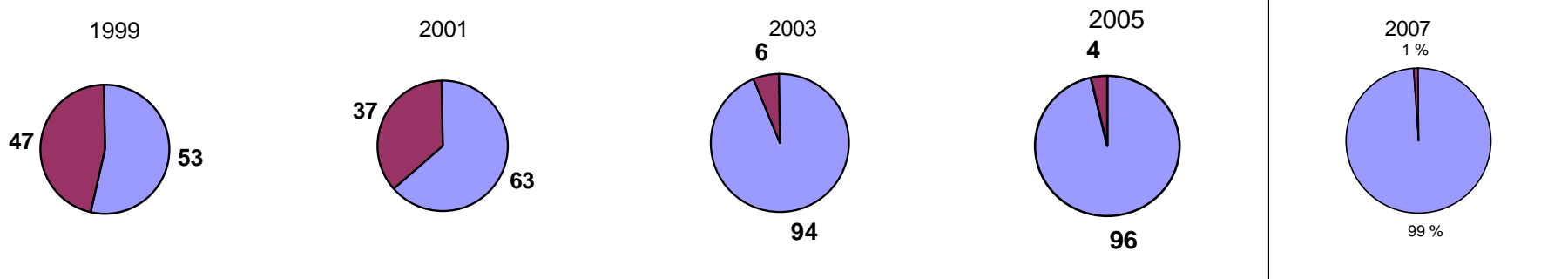
Most recent In English:

**Hämäläinen P, Reponen J, Winblad I:  
eHealth of Finland. Check point 2008.,  
THL 1/2009. Helsinki 2009**

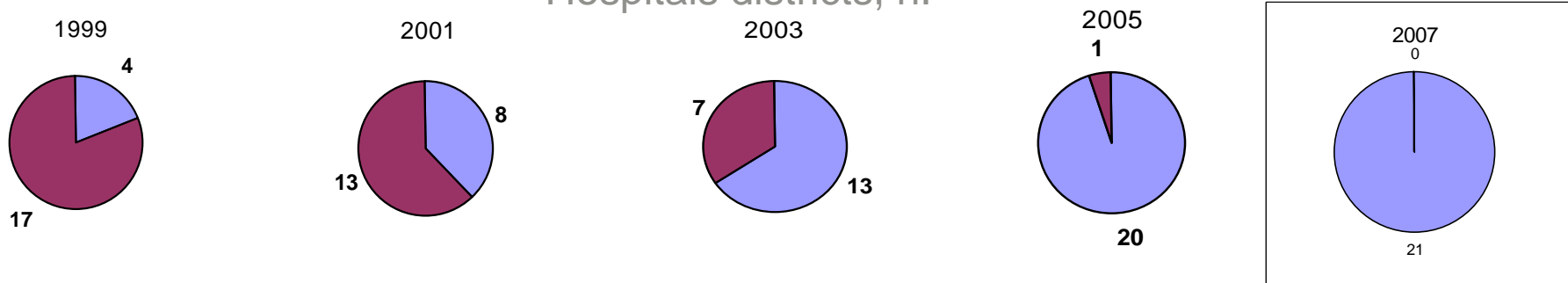


# EPR implementation in Finland 1999 - 2007

## Health centres, %



## Hospitals districts, n.



Sources: Hartikainen et al 1999, 2002

Kiviaho et al 2004, Winblad et al 2006,

Hämäläinen et al 2007, Winblad et al 2008, Hämäläinen et al 2009

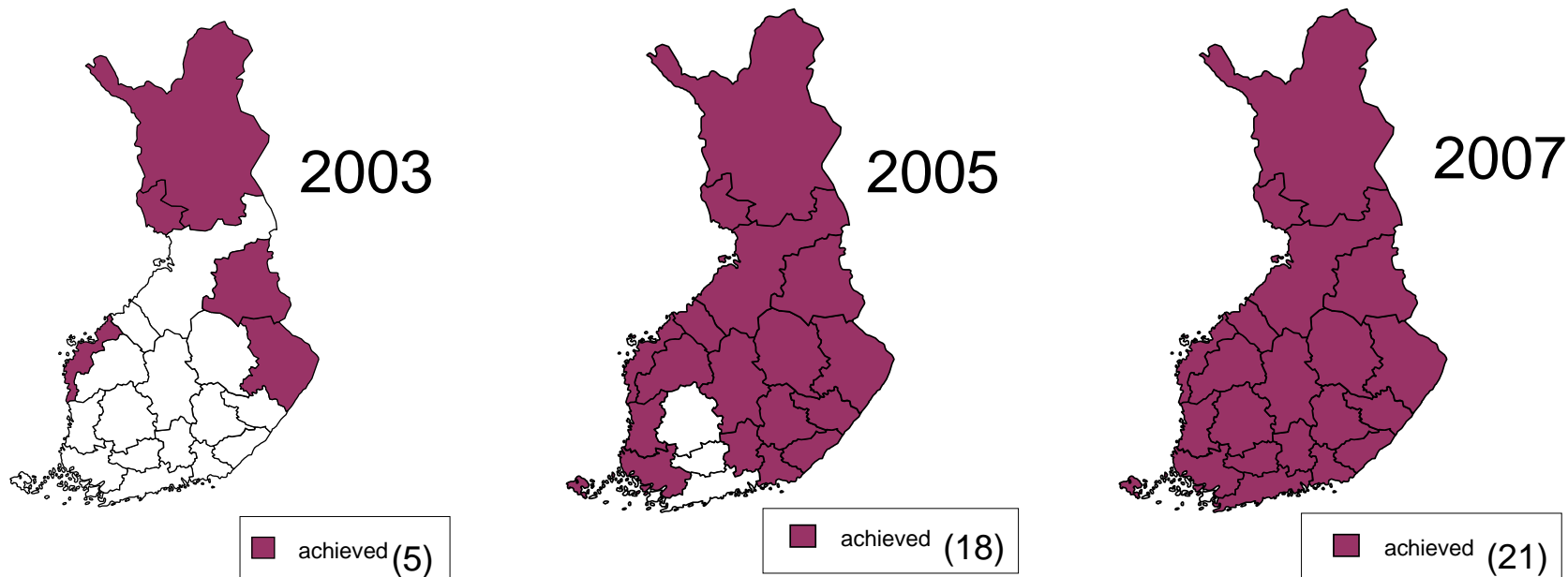
 In use  Not in use



# EPR as the main PR system in hospital districts

Criteria: usage rate over 50 %, used at least in 3/4 medical responsibility areas\* in 2003 and 2005

\* The usage of EHR covers evenly the departments of conservative, operative, emergency care and psychiatric treatment.



Map base by Genimap Oy

Source:

Hämäläinen P, Reponen J, Winblad I. eHealth of Finland. Check point 2008. THL Report 1/2009

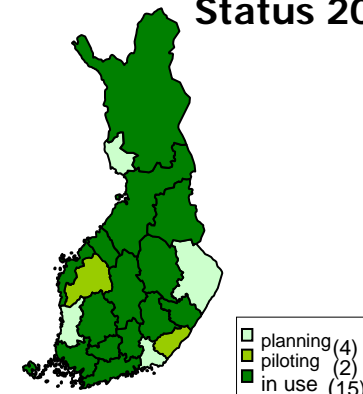
15.9.2010 © Jarmo Reponen / FinnTelemedicum

# Regional Image Archives: PACS in hospital districts (n=21) in 2003,2005 and 2007\*

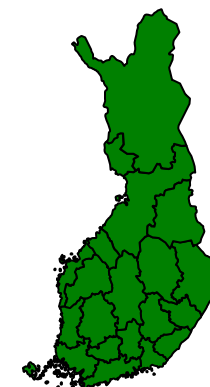
measure:	2003	2005	2007
PACS in production	12/21	15/21	21/21
PACS in pilots	4/21	2/21	NA
PACS in construction	10/21	4/21	NA
<i>PACS usage &gt; 90%</i>	<i>6/21</i>	<i>15/21</i>	<i>21/21</i>
<i>PACS usage 50 - 90%</i>	<i>3/21</i>	<i>1/21</i>	<i>NA</i>
<i>PACS usage &lt; 50%</i>	<i>4/21</i>	<i>1/21</i>	<i>NA</i>

**Primary care** filmless PACS was in use in 17 % of health centres in 2003 and in 53 % in 2005.

Status 2005



Status 2007

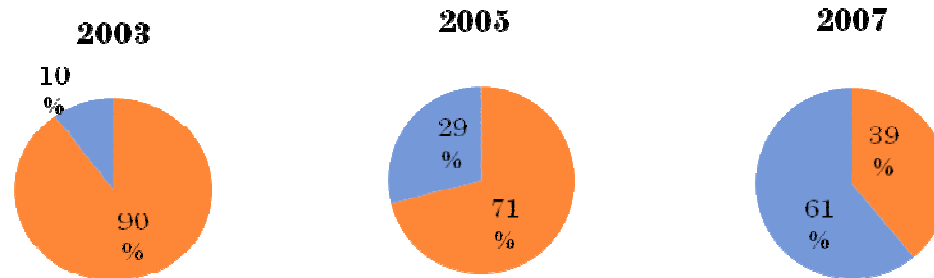


Source:

Hämäläinen P, Reponen J, Winblad I. eHealth of Finland. Check point 2008. THL Report 1/2009

# Progress of the coverage of TELERADIOLOGY

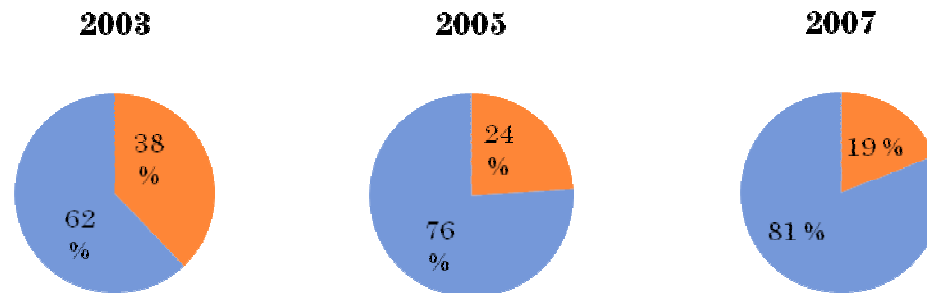
## Health centres



■ In use      ■ Not in use



## Hospitals



Source:

Hämäläinen P, Reponen J, Winblad I. eHealth of Finland. Check point 2008. THL Report 1/2009





# Government decision 2006; a new legislation in effect since 2007:

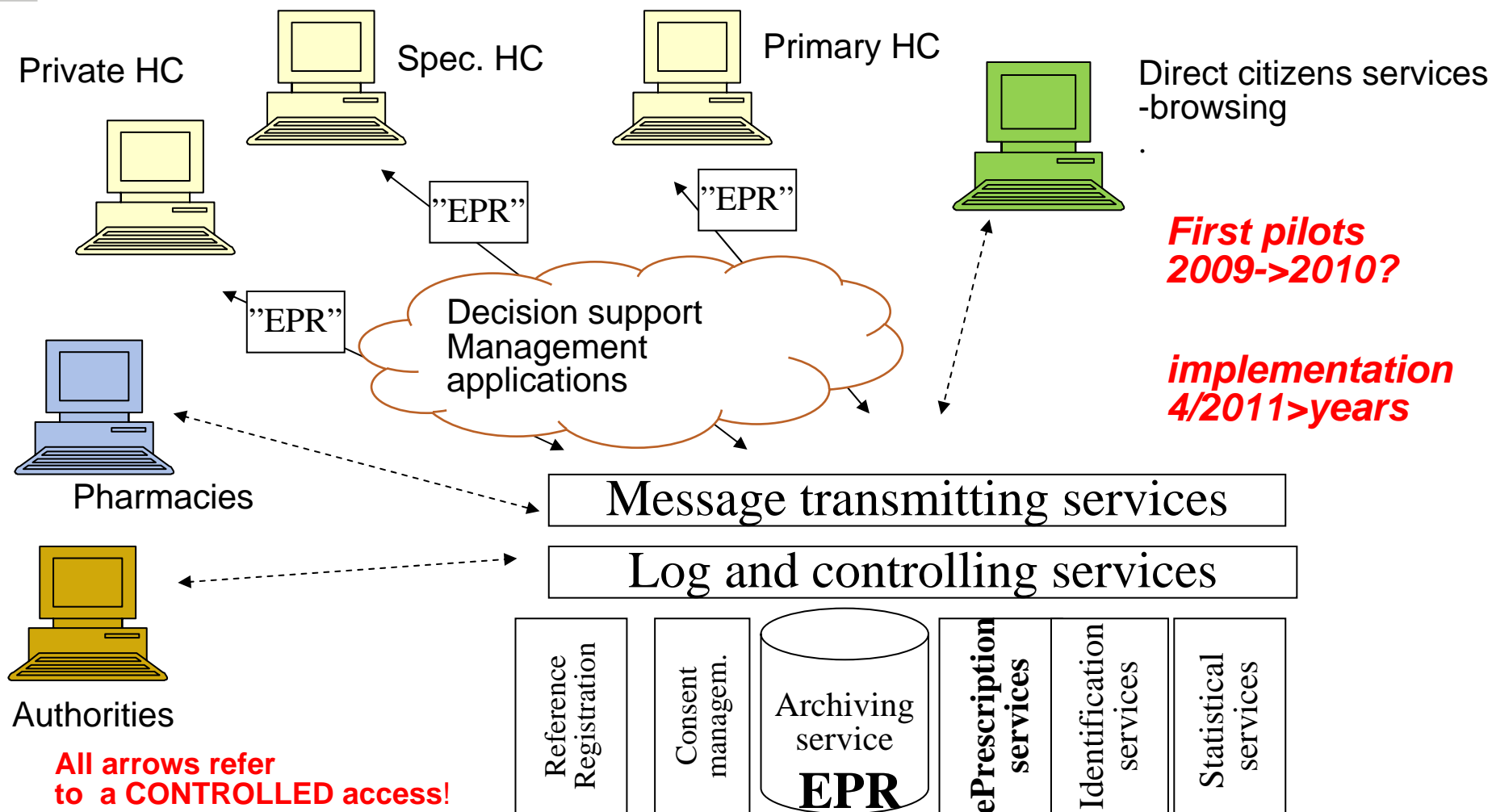
- **(1) eArchive:** The national digital archive of (life long) patient documents (all the originals to be stored)!
- The National Social Insurance Institute (Kela) will provide the archive.
- National PKI system for professionals by the National Authority for Medico Legal Affairs (VALVIRA)
- **(2) ePrescription:** a separate service using same security infrastructure.
- **(3) eView:** Citizens will have access (log + health data)



All the public health care providers must join in!



# National archiving system in a nutshell:



# Why a centralized national solution?

- **Availability of patient information independently of producers and EHR-systems**
  - possibility to change structures and procedures within health care
- **Participation of citizens and patients**
  - access to own patient information and log data
  - management of consents, denials and advanced directives (t.ex living will )
- **National solution for electronic long term archiving**
  - average is 12 years after death
  - cheaper and safer to do once nationally than >4000 times locally
- **Decision support for National Health Policy**
  - On-line statistics and reports based on central DataWarehouse
  - t.ex. statistics on vaccination coverage, H1N1 spreading...

•Source: Anne Kallio, Finnish Ministry of Health and Welfare , 2010



# The reality since 2010:

## - eARCHIVE, a gradual approach

- First phase 2011-2013
  - medication
  - **medical record narratives – personal and life long**
  - coded core information (dg, procedures, medical risks)
  - referral and discharge letters
  - radiology referrals and statements
  - summary of nursing information
  - laboratory results
  - necessary archiving documents
- Next steps 2014-
  - medical statements sent electronically
  - dental health care
  - **Radiology, endoscopy etc images...**
  - biosignals...

•Source: Anne Kallio, Finnish Ministry of Health and Welfare , 2010

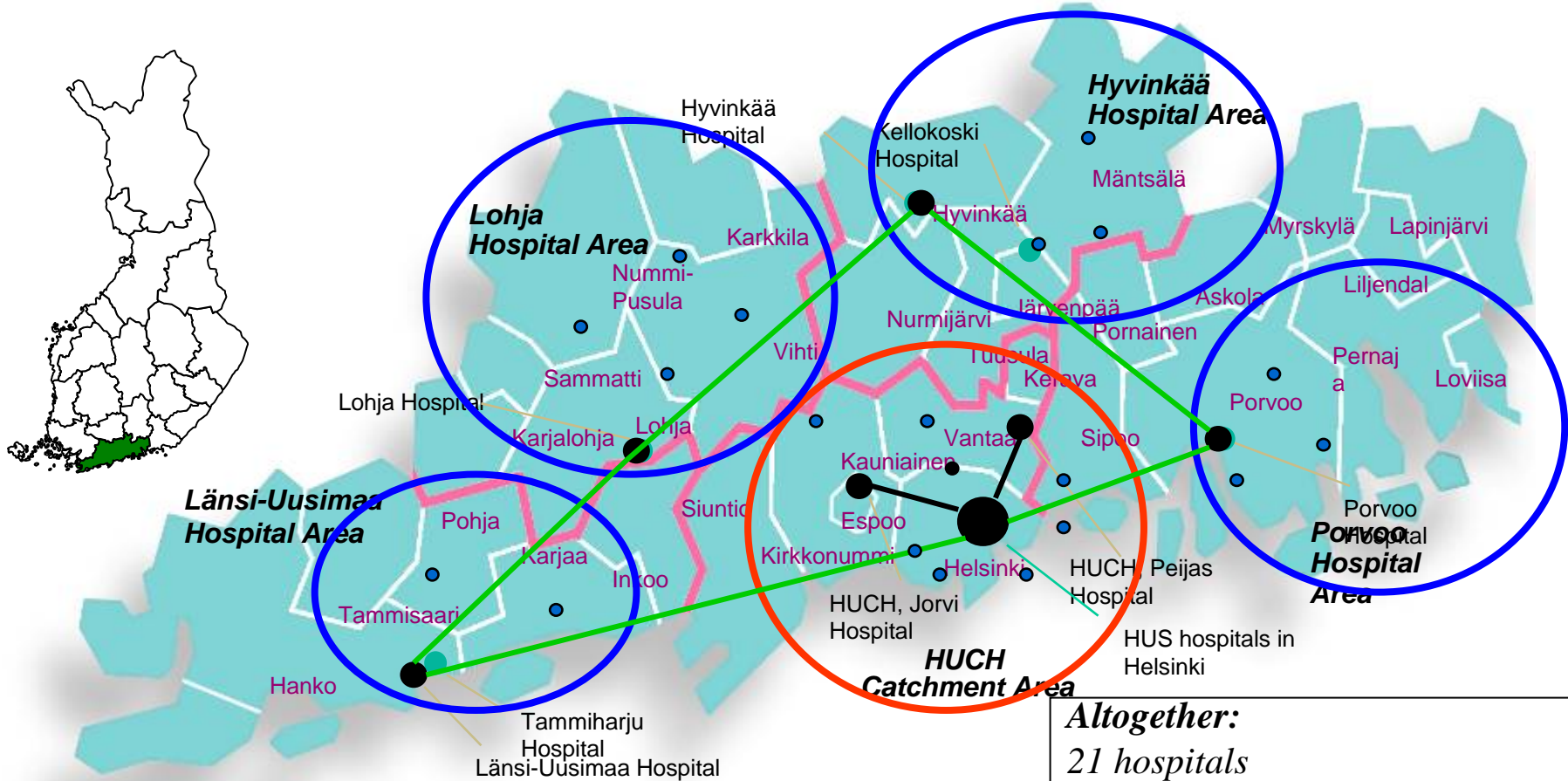




# Examples of Regional PACS solutions



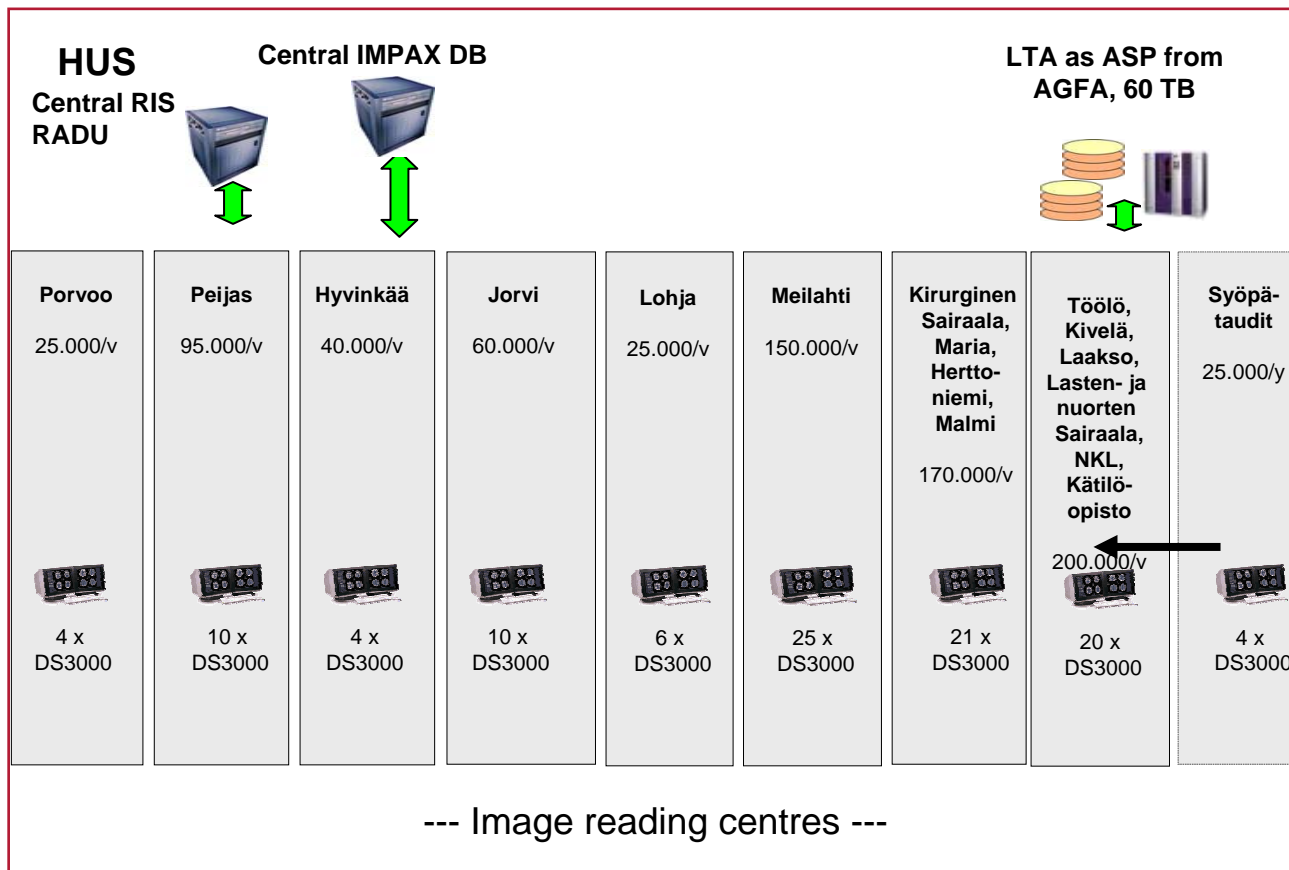
# HUSpacs since 2000 – serving the Hospital district of Helsinki and Uusimaa



•Source: Helsinki Univ Central Hosp and Agfa Finland

**Altogether:**  
 21 hospitals  
 32 communities  
 53 primary health care centres  
 9 primary health care hospitals

# HUSpacs –image archiving and distribution, loose regional connectivity via a web interface



- 300 modalities
- 150 workstations
- 8 workflow managers (local cache)
- 6 web1000 servers
- DB size 200 GB
- over 900 000 studies per year
- New 20 TB/year
- 2000 Web1000 users
- Regional access via a web interface after registering patient's consent
- Locally produced images accessed immediately
- Taken in to use before EPR implementation

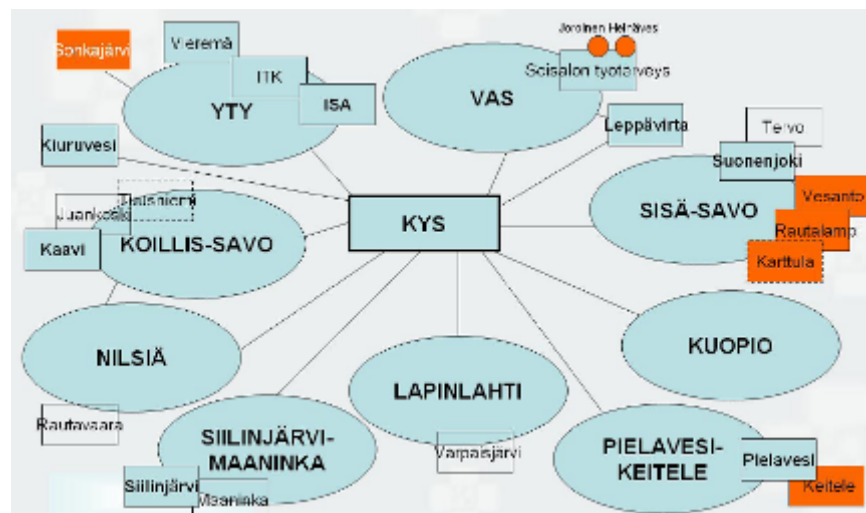
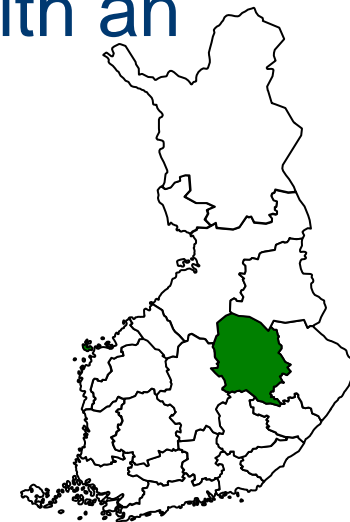
•Source: Helsinki Univ Central Hosp and Agfa Finland



# Kuopio PACS 2002-2008

## - a regional PACS highly integrated with an electronic patient record

- Requests are written and reports are read in EPR.
- Images are viewed through EPR-WEB-interface by the clinicians.
- Either XML or HL7 interface between each of the two EPRs and one master RIS.
- Workflow EPR->RIS-> PACS.
- RIS and PACS high end workstations at the radiology department.
- One University Hospital, two local regional hospitals and 10 primary health care centre consortiums together.
- One regional archive.
- With a patient's consent, images from other institutions are visible.
- Project completed in era, when EPR systems are in comprehensive use.



•Source: Kuopio Univ Hosp, Kati Tuovinen





# Kuopio PACS at Northern Savolax Hosp. Dist.



## SECTRA PACS

### PACS

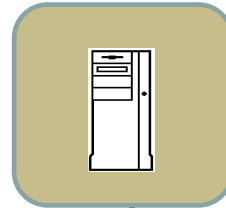
- 250 000 examinations
- 5 756 users
- 2 248 web-workstations
- 934 IDS workstations



## COMMIT; RIS

### RIS

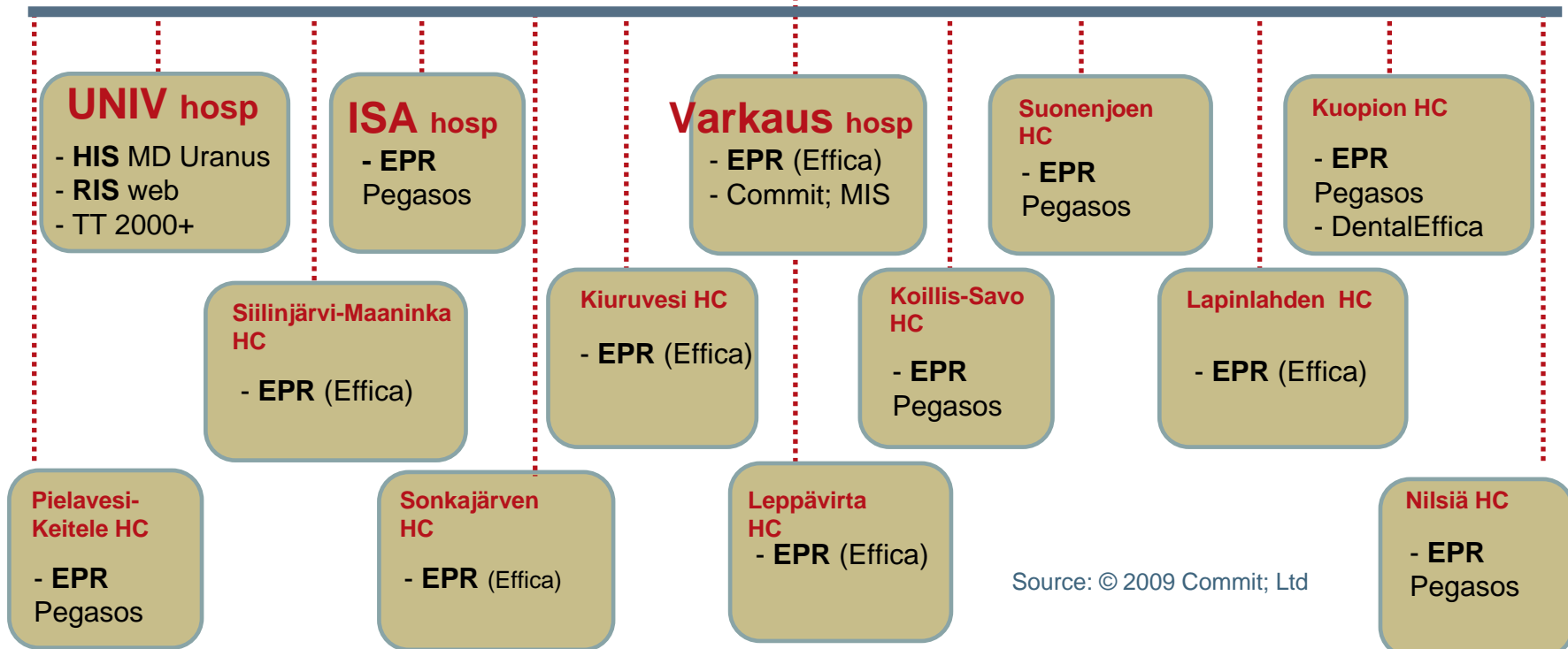
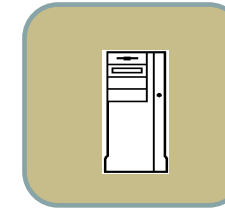
- 240 000 examinations
- 200 users
- 15 HIS connections



## COMMIT; RIS web

### RIS WEB

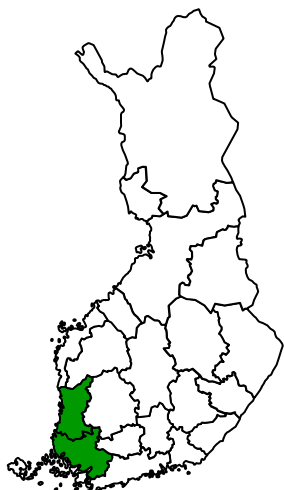
- 2000 users



Source: © 2009 Commit; Ltd



# Turku PACS



- 1600 beds, 5700 employees in the Hospital district of Southwest Finland & 3800 employees in the Satakunta hospital district.
- 280 employees in MIC (Medical Imaging Centre of Southwest Finland)
- >300000 imaging studies per year, 90 modalities
- 9,5 TB /year, 7500 web users
- Carestream PACS **since 1995**, filmless since 2002
- A common archive & RIS for users of secondary & primary care in **two hospital districts**.
- Integrated to the EPR systems

•Source: Turku Univ Hosp, Jari Siekkinen



# Tampere area PACS (AKU)

## - Towards a univ. hospital catchment area PACS



### Tampere University Hospital (2008)

- TUH main site : =125.000/yr

### Current AKU Sites (2008)

- Virrat =3.042/yr
- Ruovesi =1.938/yr
- Orivesi =3.119/yr
- EPTHKY =6.138/yr
- Kangasala =7.231/yr
- Nokia =7.634/yr
- Kangas alan tk:n tth = 456/yr
- Parkano =2.456/yr
- Pirkalla =1.293/yr
- Ikaalinen =1.085/yr
- Hämeenkyrö =2.399/yr

### NEW AKU Sites (Estimates)

- Radius hosp =17.500/yr
- Mänttä district hosp =10.500/yr
- Vammala district hosp =18.000/yr
- Valkeakoski district hosp =20.000/yr

### Total

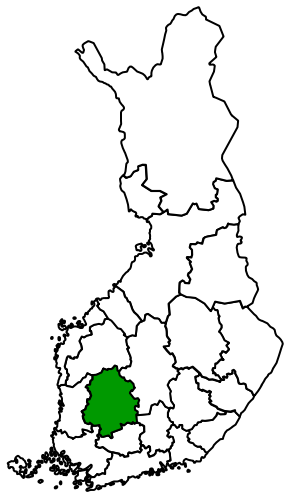
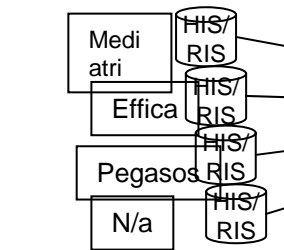
= 227.791/yr



# BUT today AKU only one of the three players... - patient consent management in the centre

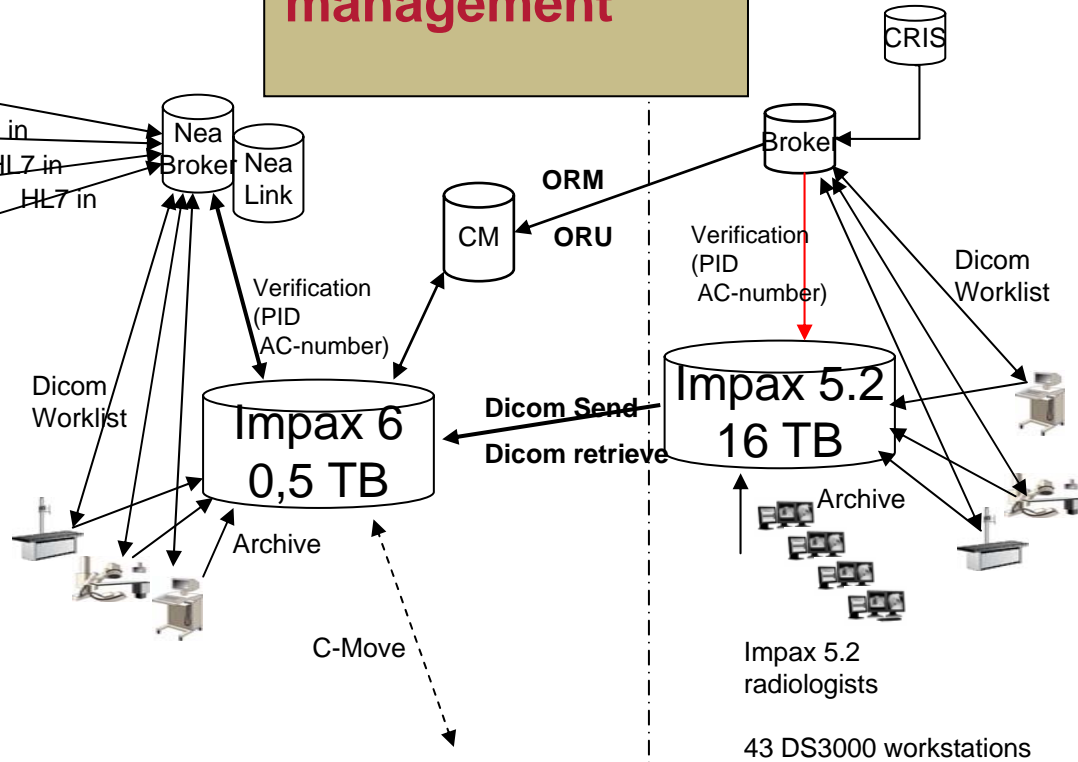
## AKU

9 healthCare centers  
200 Impax 6 clients



## Patient consent management

## Tampere Univ Hosp



## TAMPERE city hospital



# Kajaani hospital district / Oulu Univ. Hosp. area

- primary and secondary care under one organisation
- no extra consent needed

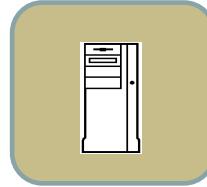
## PACS

- 65 000 exams
- 1 278 users
- 769 web-workstations
- 20 IDS high-end workstations

## SECTRA PACS

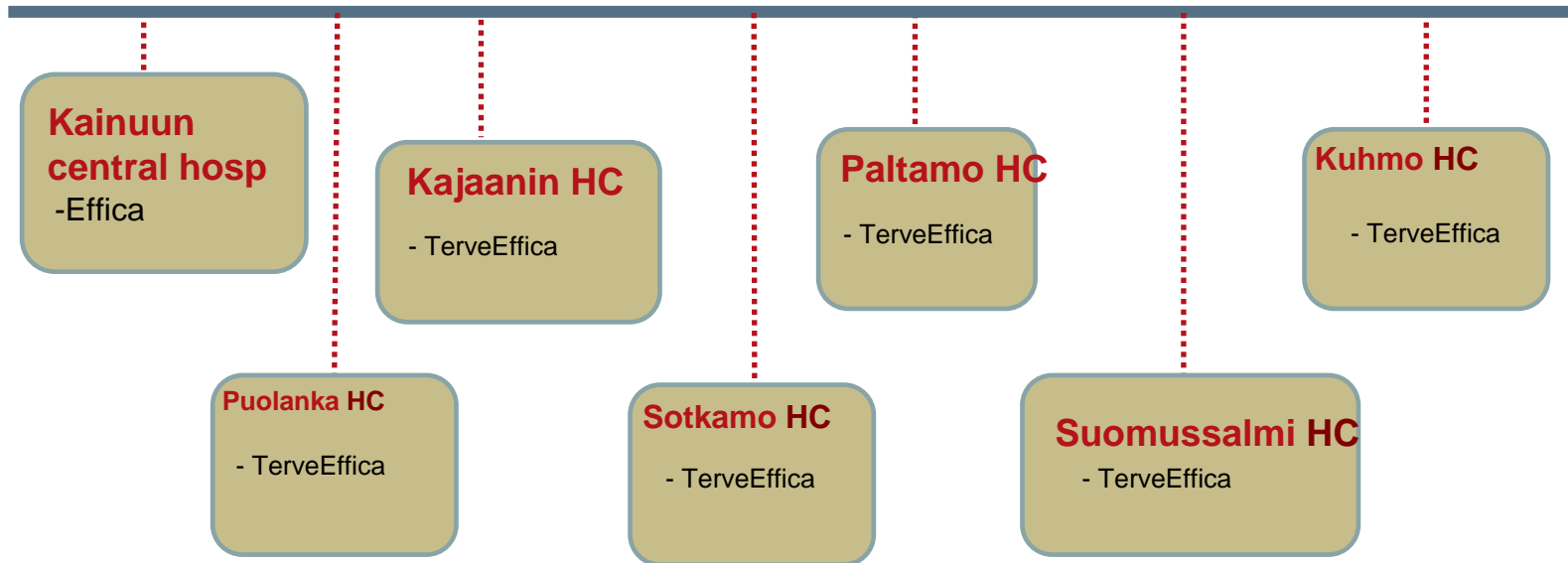
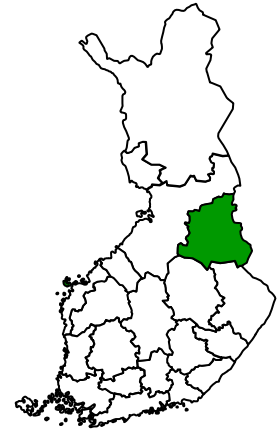


## COMMIT; RIS



## RIS

- 65 000 exams
- Visual light images
- Speech recognition

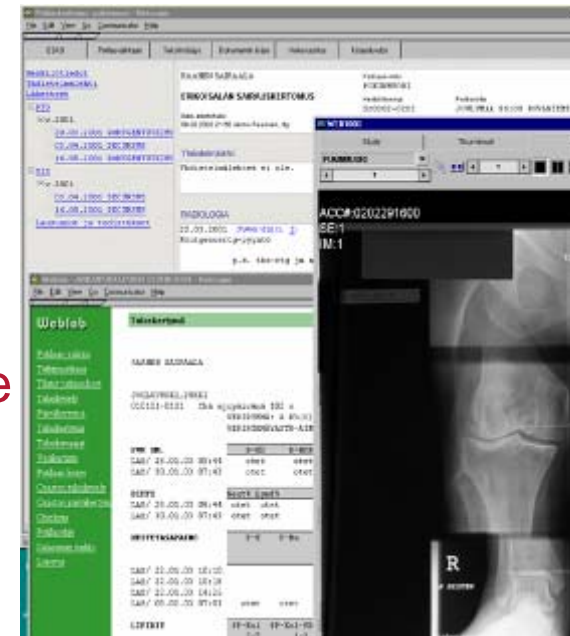


Source: © 2009 Commit; Ltd



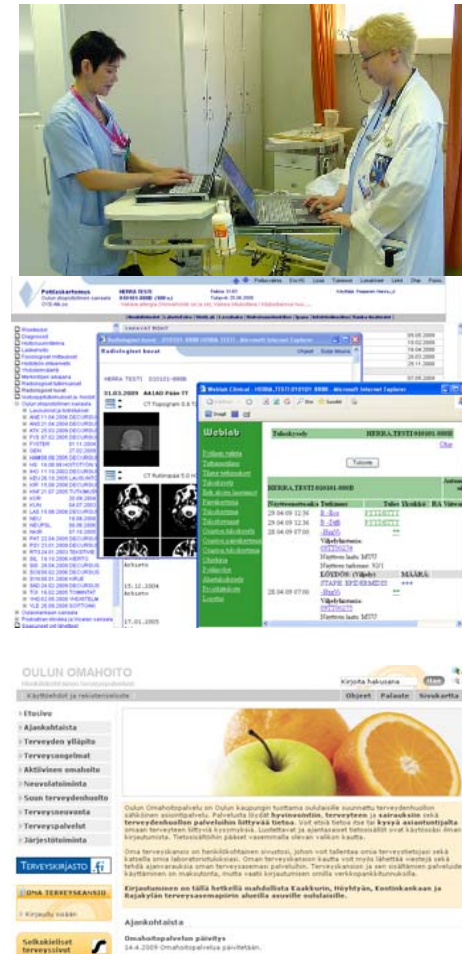
# Common ingredients in Finnish PACS installations:

- Regional approach within each of the 21 hospital districts.
- Unique nation wide patient ID makes integration easier.
- Tendency towards collaboration within the 5 university hospital catchment areas.
- **PACS/RIS highly integrated with a comprehensive EPR with narratives and laboratory results.**
- Tight data security a limitation, only with a patient's consent images from another repository available.
- Anticipation of a national solution/archive and/or modification of laws concerning patient's consent and ownership of data.



# Summary of general eHealth in Finland

- **First step: local EPR coverage, saturation reached**
- **Second step: regional level data exchange**
- **Third step: national level data exchange**
- **For direct eServices for citizens:**
  - Basic infrastructure is ready
  - Readiness for eHealth services among citizens is high
  - **This defines a good base for further implementations!**



*Thank you!*

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