Tutorial
on
Data Interchange
in
Healthcare Information Systems

Norms & Standards

Data Interchange in HC IS

- **Introduction**

- **Standards for Interchange**
  - ◆ **HL7, DICOM, EDI**

- **Support for Communications**

- **Organisations**

- **Security & Deonthology**

Introduction

- **gains with electronic data interchange**
  - ◆ **"Zero Paper"**
    - *No delay (just in time) & No (human) fault*
    - *Broadcast & Tracability*
    - *Low cost (handling, transmission)*

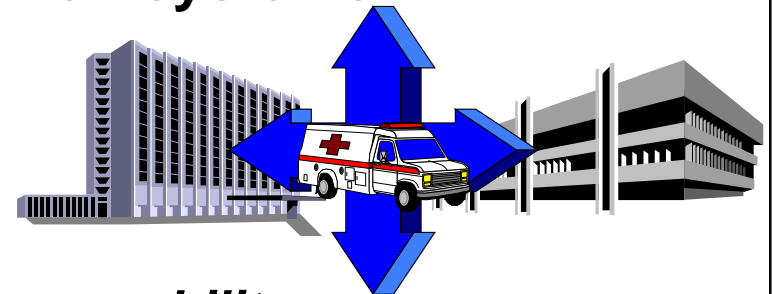- **why standardization of data interchange**
  - ◆ **a Patient appears
    in multiples (differents) information systems**
    - *Sharing, Distribution*

  - ◆ **Multi vendors solutions**
    - *application perenniality, planned interoperability*

Main Standards (in HC)

3 efforts of standardization of interchange among HC applications

- **HL7**
  - ♦ **interchange of healthcare administrative data**

- **DICOM**
  - ♦ **interchange of healthcare imaging data**

- **EDI**
  - ♦ **pluri-domains**
    - *banking, transportations, ... and healthcare*
  - ♦ **internationnal and nation-wide normalization groups**
  - ♦ **messages for healthcare administrative data interchange**

HL7 (Health Level 7)

- ## HL7 Group
  - ◆ **independent but accredited by ANSI**
  - ◆ **USA, Australia, Germany, Japan, the Netherlands, New Zealand**

- ## "Administrative Data"
  - ◆ **Version 2.2 (1987-95)**

    patient admission/registration discharge or transfer (ADT), queries, orders, results, clinical observations, billing, master file update information.

  - ◆ **Version 2.3 (in ballot now)**

    patient care, medical records, automated instruments, recording immunizations and drug reactions.

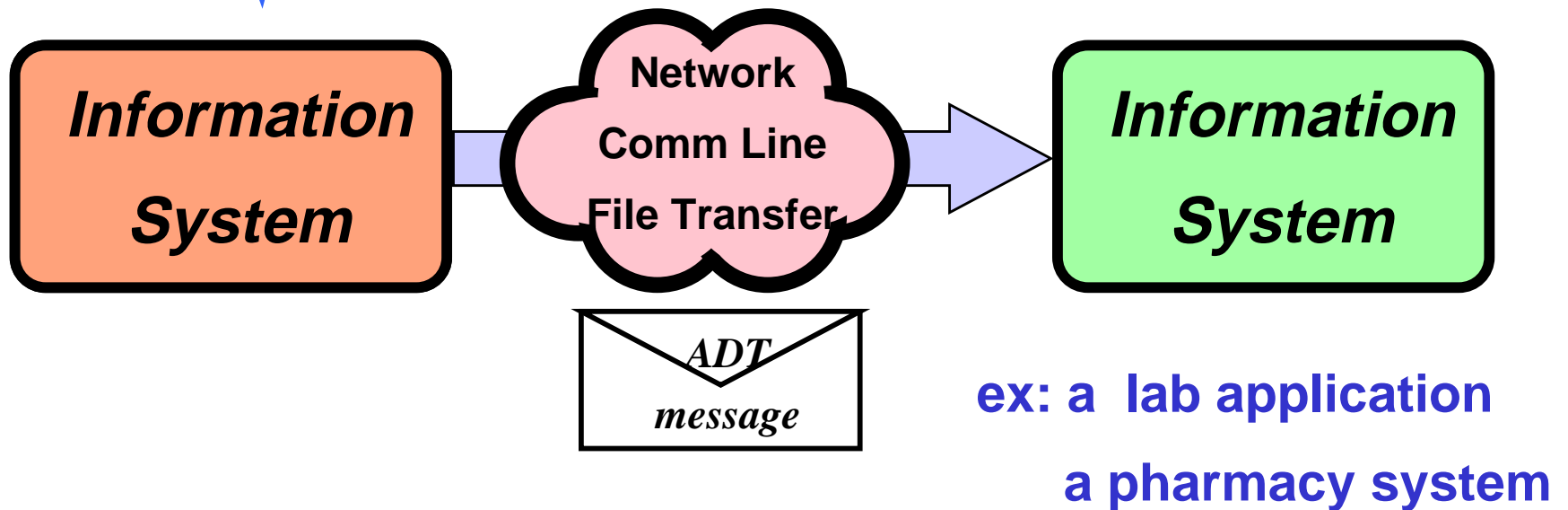 - ◆ **Version 3 (target ballot in May 1998)**

    subtential reconceptualization

HL7 - Events and Messages

Trigger Event

ex: a patient is admitted

ex: a lab test is ordered

Information System

Network Comm Line File Transfer

ADT message

Information System

ex: a lab application

a pharmacy system

HL7 - Data Format

- ## Normalized Usages

  MESSAGE = sequence of segments

  SEGMENTS = logical grouping of data fields

  ADT message = {

  MSH seg

  EVN seg   event type

  PID seg   patient ID

  NK1 seg   next of kin
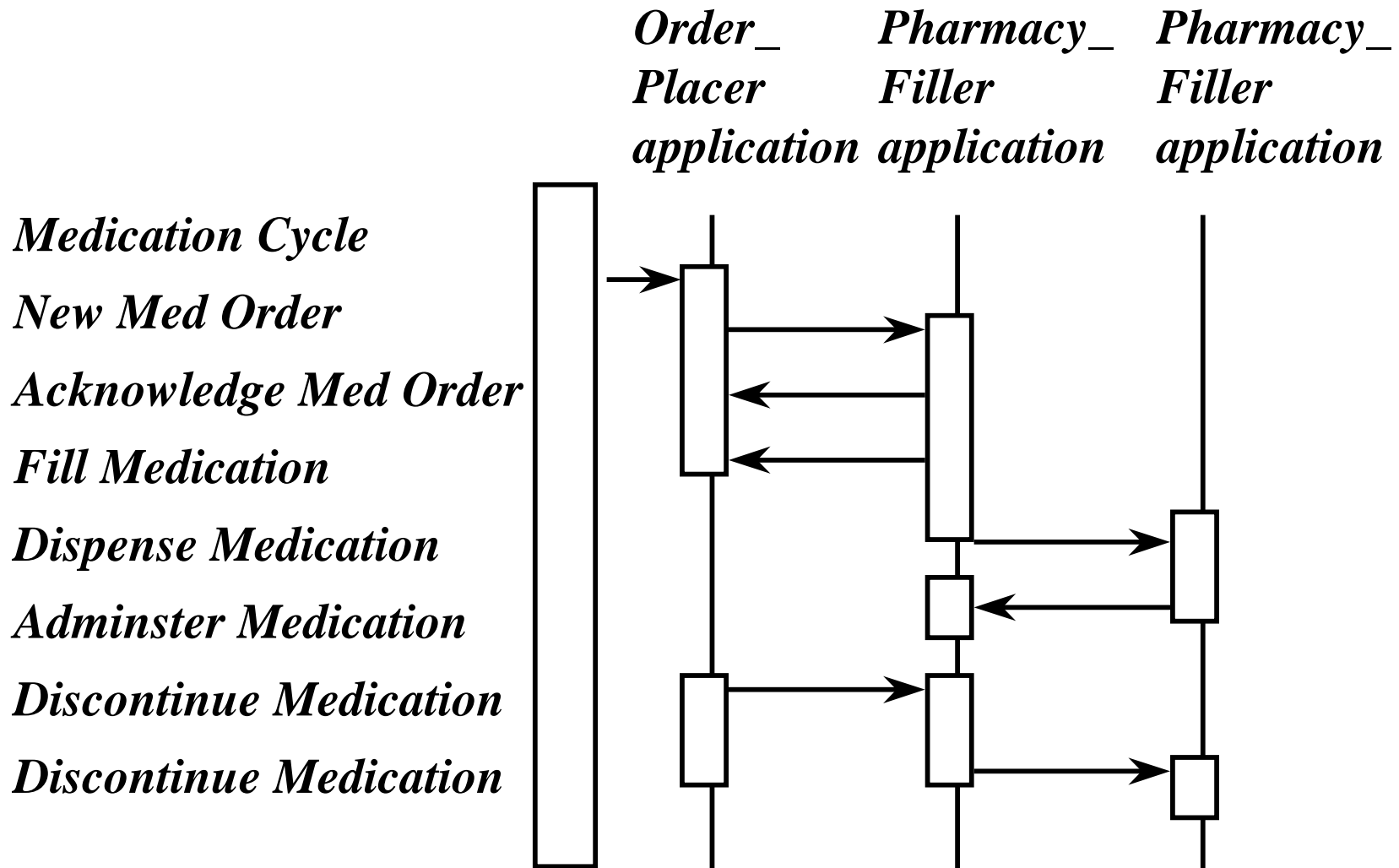
  PV1 seg   patient visit

  }

  ```
  MSH|^~\&||||||199607301742||ADT^A01|1|T|2.1|
  EVN|A01|199607301742|
  PID|||123456||Smith^Sally^L||19750606||||125 W
          Paddington|
  NK1|1|
  PV1||E|2^203|
  ```

- ## but HL7 accepts site specific uses

  - tables, code definitions, segments, messages

HL7 - Example

Order_
Placer
application

Pharmacy_
Filler
application

Pharmacy_
Filler
application

Medication Cycle

New Med Order

Acknowledge Med Order

Fill Medication

Dispense Medication

Adminster Medication

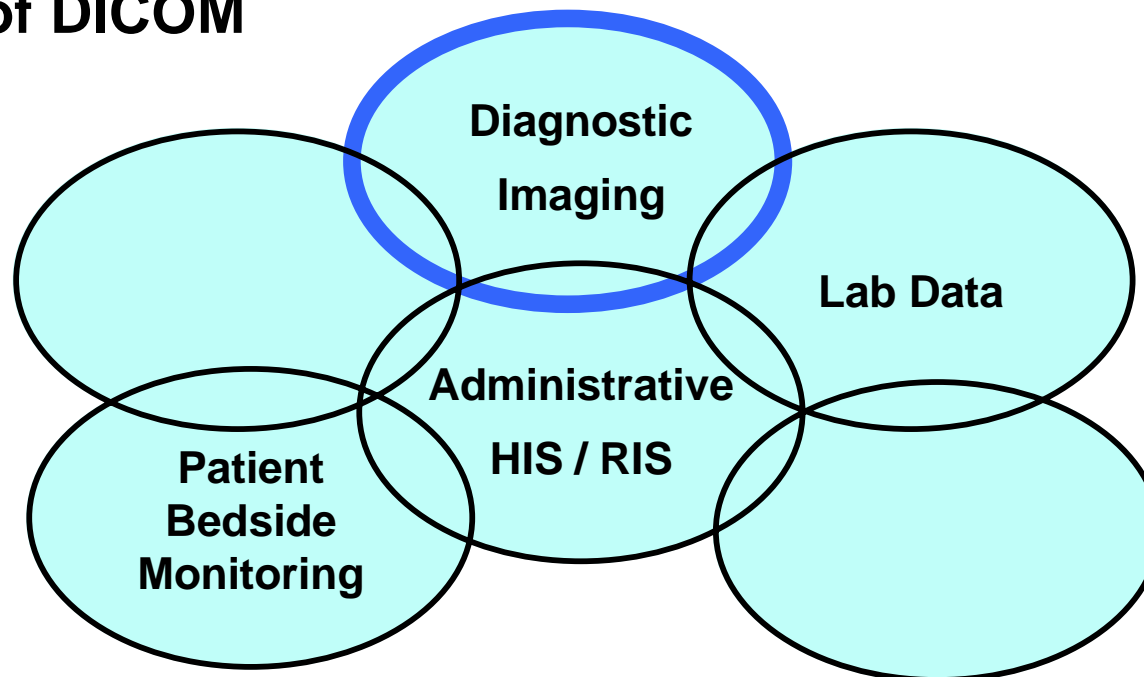Discontinue Medication

Discontinue Medication

DICOM
Digital Imaging and COmmunications in Medicine

V1 published in 1985, V3 in 1992

ACR - American College of Radiology

NEMA - National Electrical Manufacturers Association

♦ **formatting and exchanging**
images and associated information
between Medical Imaging Equipments

♦ **Scope of DICOM**

Diagnostic Imaging

Lab Data

Administrative HIS / RIS

Patient Bedside Monitoring

DICOM - Protocols and Formats

- ## Information Model
  - ◆ **real world objects :   Patient, Study, Serie, Image, ...**

- ## Object
  - **represent by a set of Tagged Values *(Data element)***
  - **contain an UID (according to the Information Model)**

- ## Service = Command / Notification
  - **C-Store: Store an Object**
  - **C-Get: Retreive information from peer**
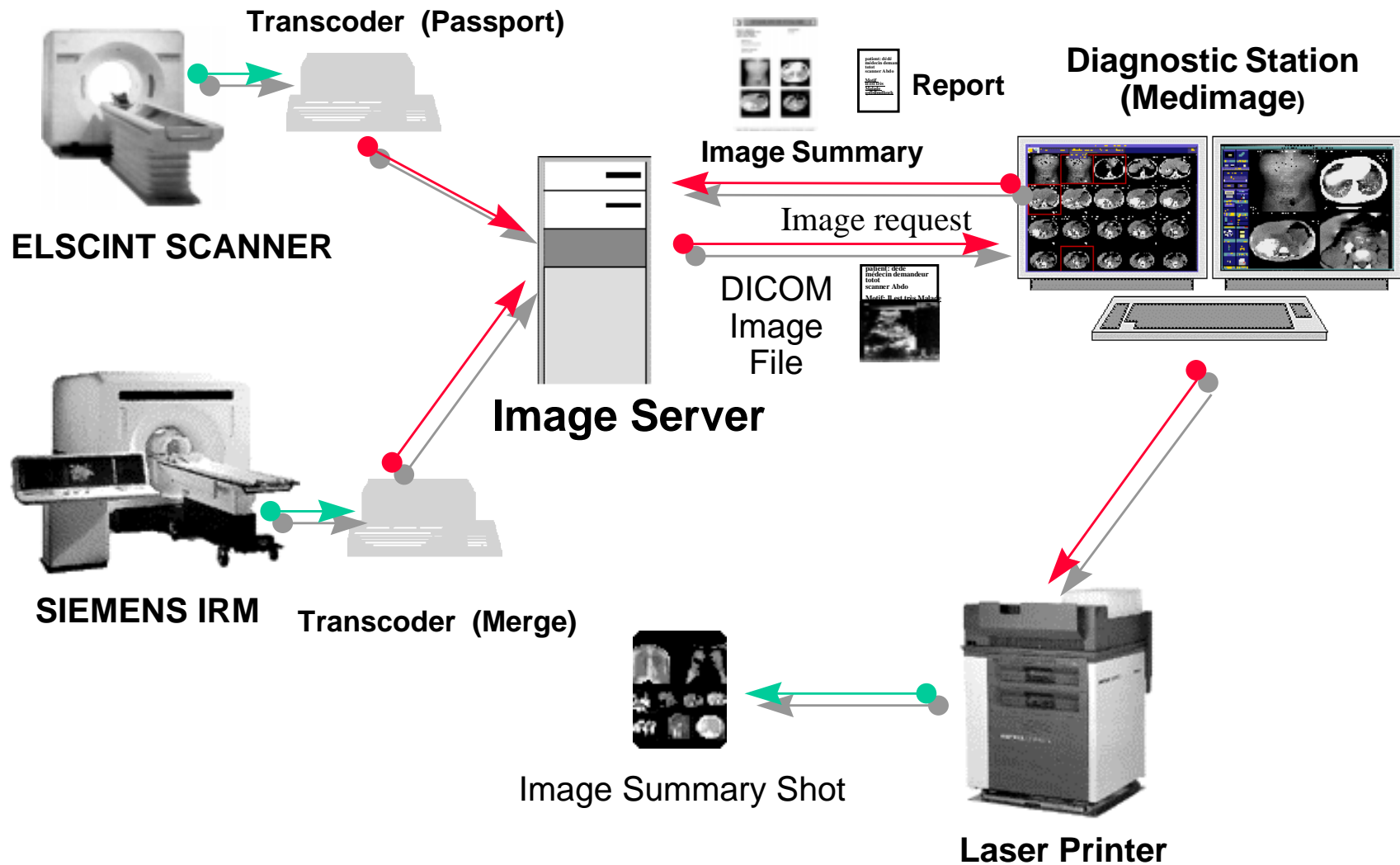 - **N-Set: Modify attributs of an object**
  - **...**

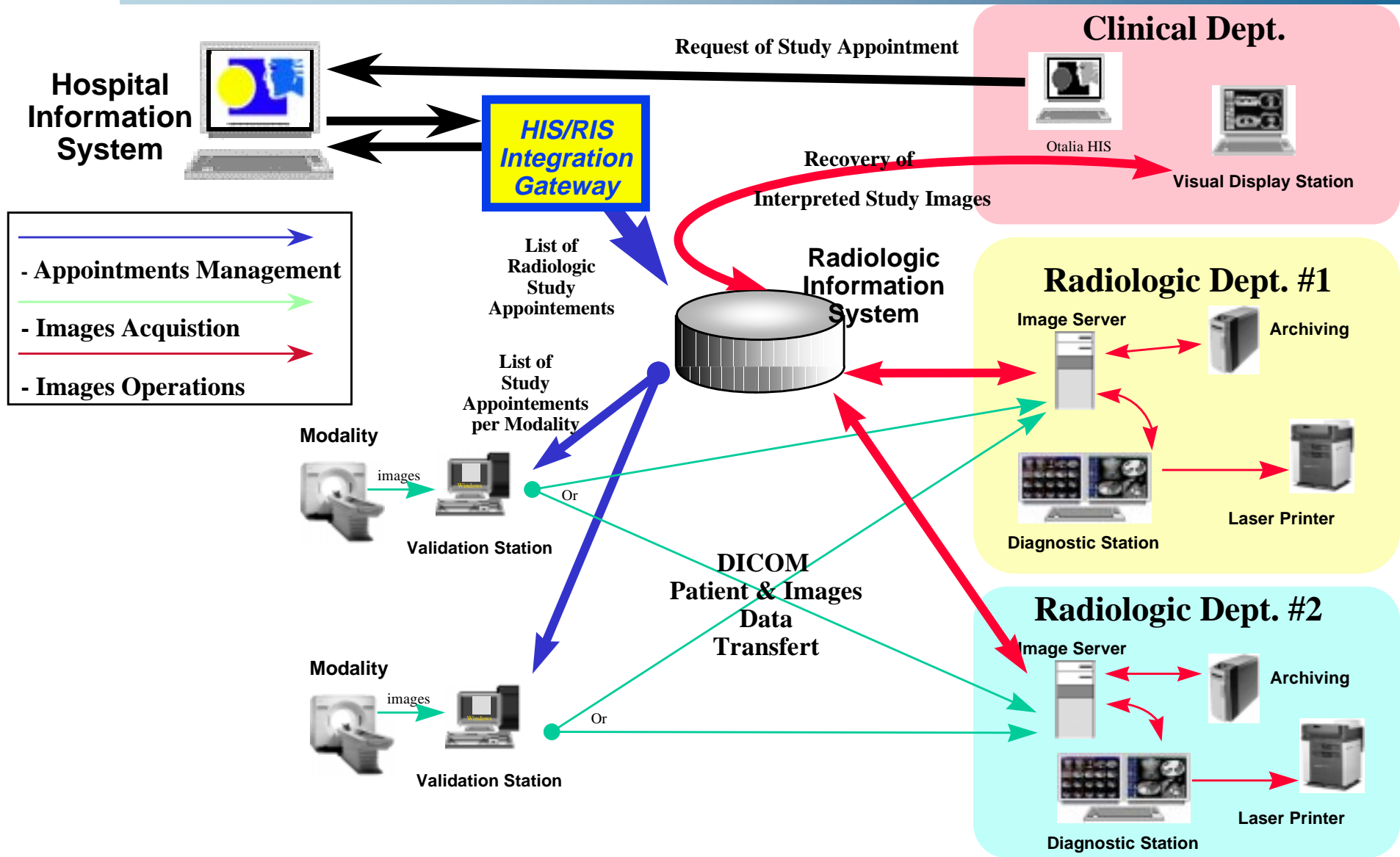- ## Service Object Pair
  - **a request with an Object as parameters**

DICOM – Example : a scenario from the ISAR Image Server
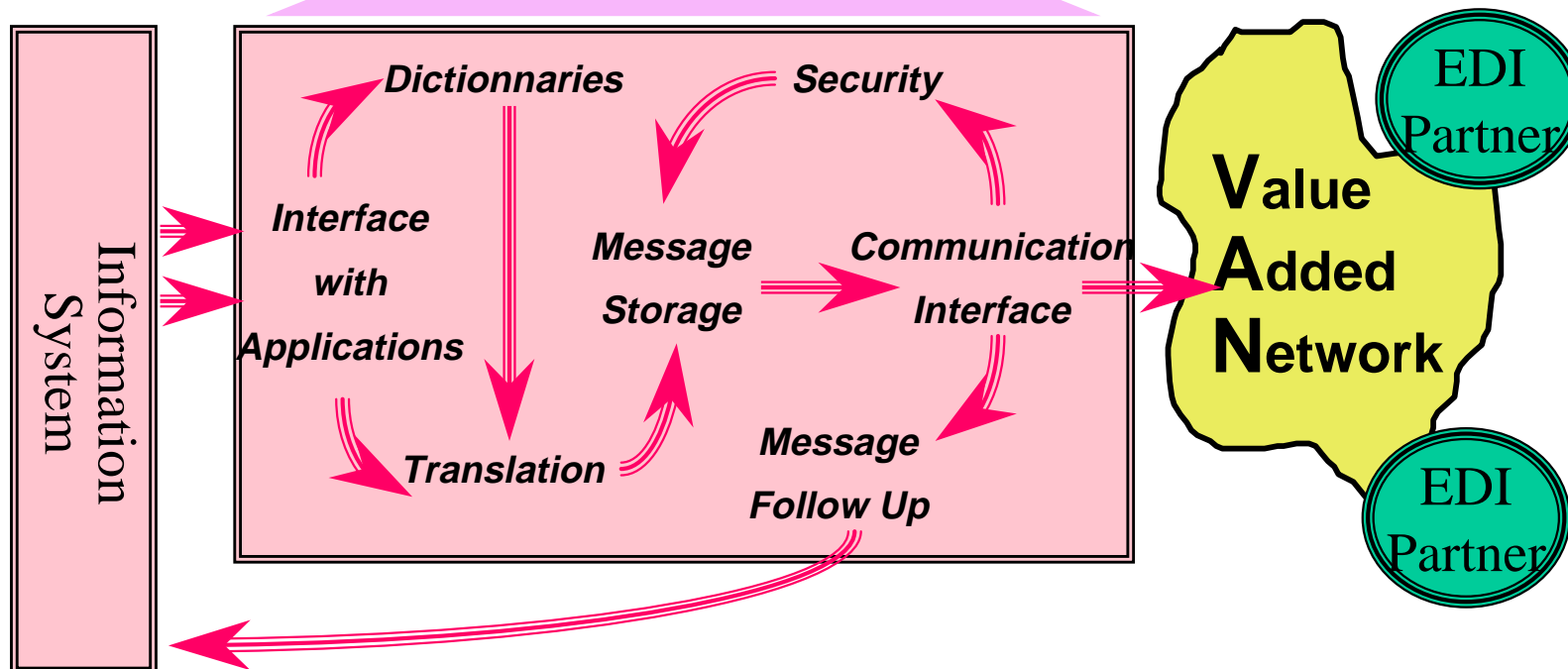
Transcoder (Passport)

Report

Image Summary

Diagnostic Station (Medimage)

ELSCINT SCANNER

Image Summary

Image request

DICOM Image File

Image Server

SIEMENS IRM

Transcoder (Merge)

Image Summary Shot

Laser Printer

DICOM - Example : the DICOM SOPs

Service request

DICOM *Service* Provider

other Image Server

DICOM Providers

SCANNER ELSCINT

Transcoder (Passport)

SIEMENS IRM

Store

Store

Transcoder (Merge)

Images

Images + Data

Store

DICOM Providers

Image requests (ForeLoading)

DICOM Providerss

Update

Update

Radiologic Information System

Store

DICOM Providers

Store

Image Server

Images

DICOM Store Provder

Images Request

Move

Search Request

Find

Request of a Diagnotic Update

Set

Diagnostic Station

Laser Printer

DICOM Print Provider

Images

Print

DICOM - Example : HIS/RIS integration

Request of Study Appointment

Clinical Dept.

Otalia HIS

Visual Display Station

Hospital Information System

HIS/RIS Integration Gateway

Recovery of Interpreted Study Images

- Appointments Management
- Images Acquistion
- Images Operations

List of Radiologic Study Appointements

Radiologic Information System

Radiologic Dept. #1

Image Server

Archiving

Diagnostic Station

Laser Printer

List of Study Appointements per Modality

Modality

images

Windows

Validation Station

Or

DICOM Patient & Images Data Transfert

Radiologic Dept. #2

Image Server

Archiving

Diagnostic Station

Laser Printer

Modality

images

Windows

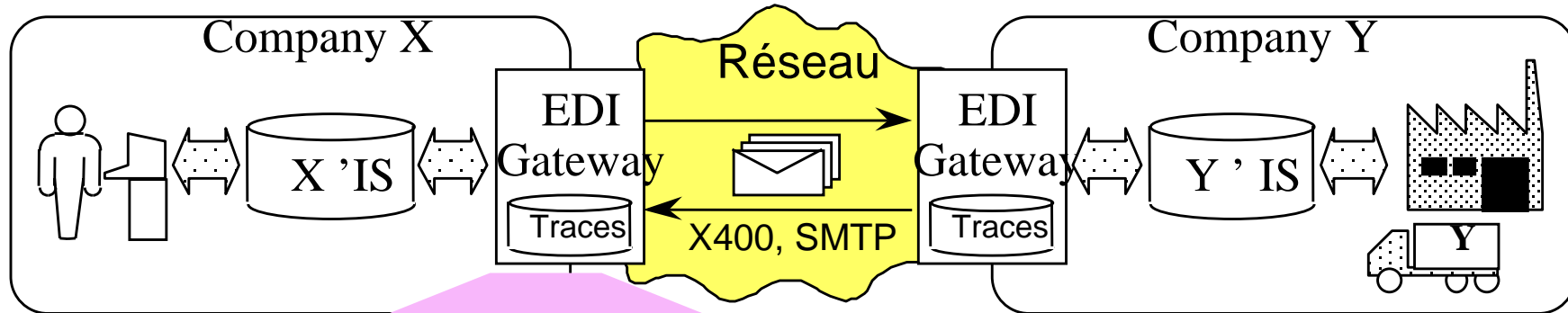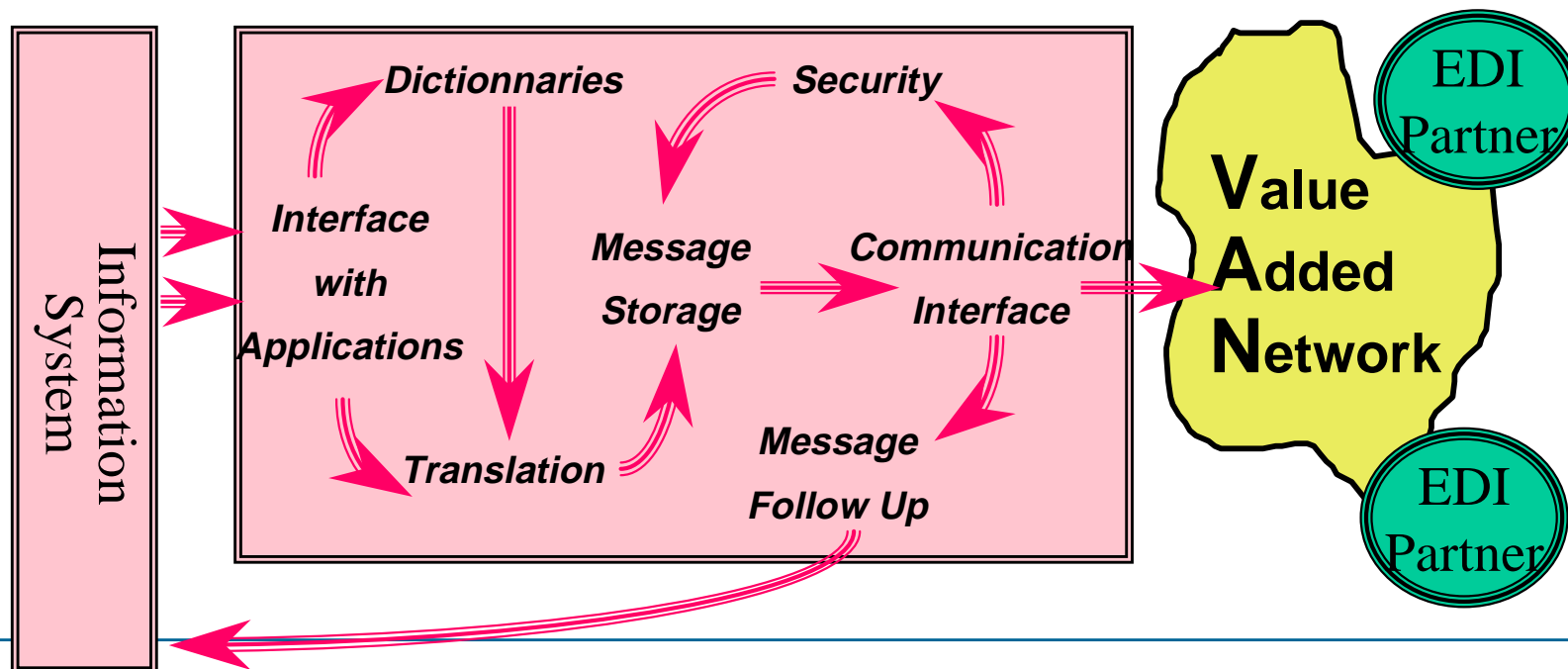**Validation Station**

Or

Electronic Data Interchange

- **Interchange between Companies and Organizations**
  - **a car manufacturer with its windscreen subcontractor,**
  - **a supermarket with a haulage contractor, ...**
    - ◆ *and their Information Systems are different*

- **Pluri-sectors**
  - ◆ **banking, transport, insurance, ... , healthcare**

- **EDI gateway**
  - ◆ **is between your IS**
    - **and the World** *(normalized messages)*
    - **and restricted group of partners** *(custom messages)*
  - ◆ **manages the follow-up and the security of your IS.**

EDI Gateway

Company X   Réseau   Company Y

X 'IS   EDI Gateway   EDI Gateway   Y ' IS

Traces   X400, SMTP   Traces

Y

Dictionnaries   **Security**

Interface

with

Applications

Message

Storage

Communication

Interface

Translation

Message

Follow Up

Information System

Value **A**dded **N**etwork

EDI Partner

EDI Partner

EDI - Station EDI

- **automate interfaçant le SI avec l'extérieur**
  - ◆ **correspondance (messages <-> actions sur le SI)**
    assez complexe à mettre en œuvre

EDI Messages for HC

- **Some normalized messages (DISA) for HC sector**
  - ◆ **messages for administration and medical record**
    - **MEDADT Patient Administration**
    - **MEDDIS   Discharge Summary Letter**
    - **MEDAUT Medical Authorisation**
    - **MEDREC Medical Record**
    - **MEDPID   Patient Identification Details**
  - ◆ **messages for Pharmacy**
    - **MEDPRE Medical Prescription**
    - **MEDRUC Medical Resource Usage/Cost**
  - ◆ **...**

EDI - New Messages

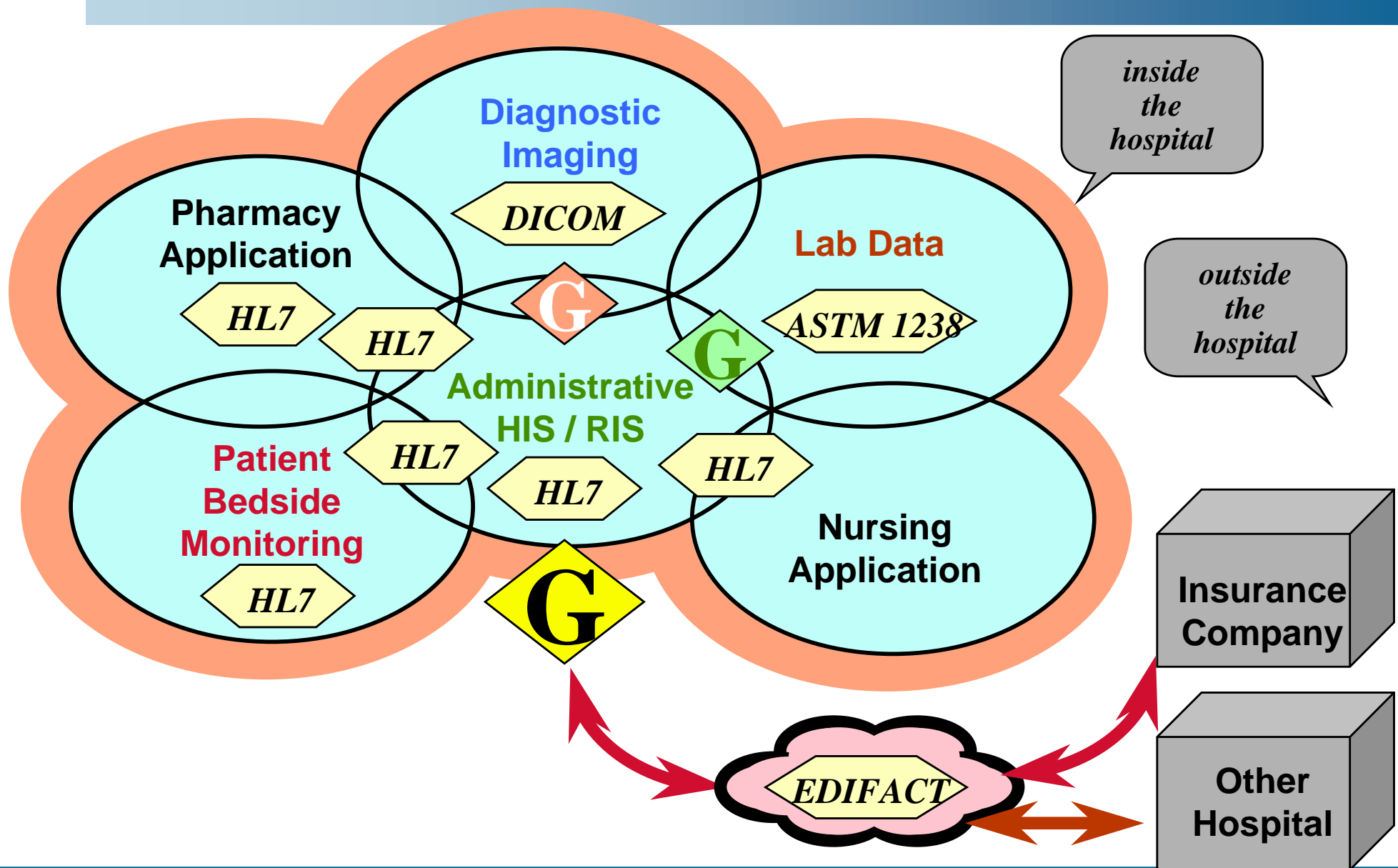- ## Design your EDI messages
  - ♦ **you try to EDI with a group of partners**
  - ♦ **use normalised messages**
  - ♦ **else define news messages**
    but try to reuse existing segments, messages

- ## Normalization Process
  - ♦ **submit your new message to your (national) sector group,**
  - ♦ **the new messages of a sector group**
    are submitted to international org.

    EDIFACT   (UN-EC)
    X12   (ANSI)

Summary

Didier DONSEZ - MIE 96 - Copenhagen

Communication supports for Interchange

- ## Client Server Model
  - ◆ RPC
  - ◆ Object Brokers (CORBA, OLE)

- ## Messaging
  - ◆ OSI X400
  - ◆ Internet SMTP

- ## Batch
  - ◆ Diskettes, Tapes, Shared Disks...

Organisations

- ## HL7 Group

- ## ACR / NEMA

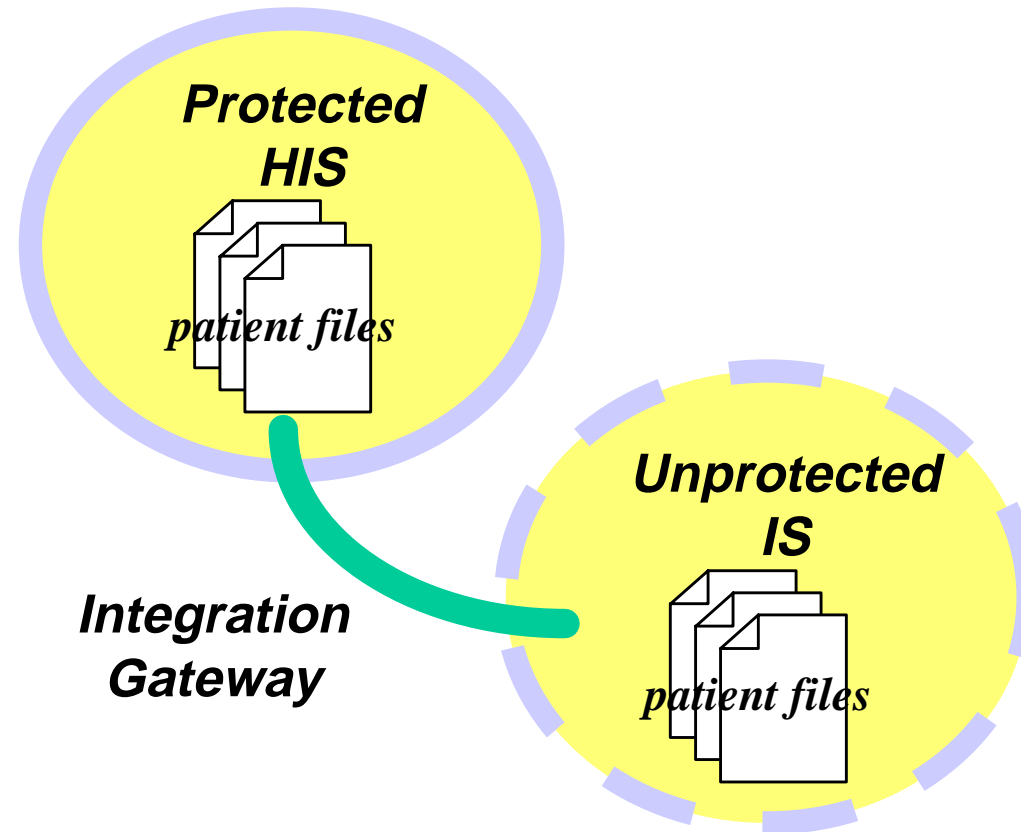- ## EDI

  - ### UN/EC EDIFACT

  - ### ANSI ASC X12 (DISA)

- ## CEN/TC 251

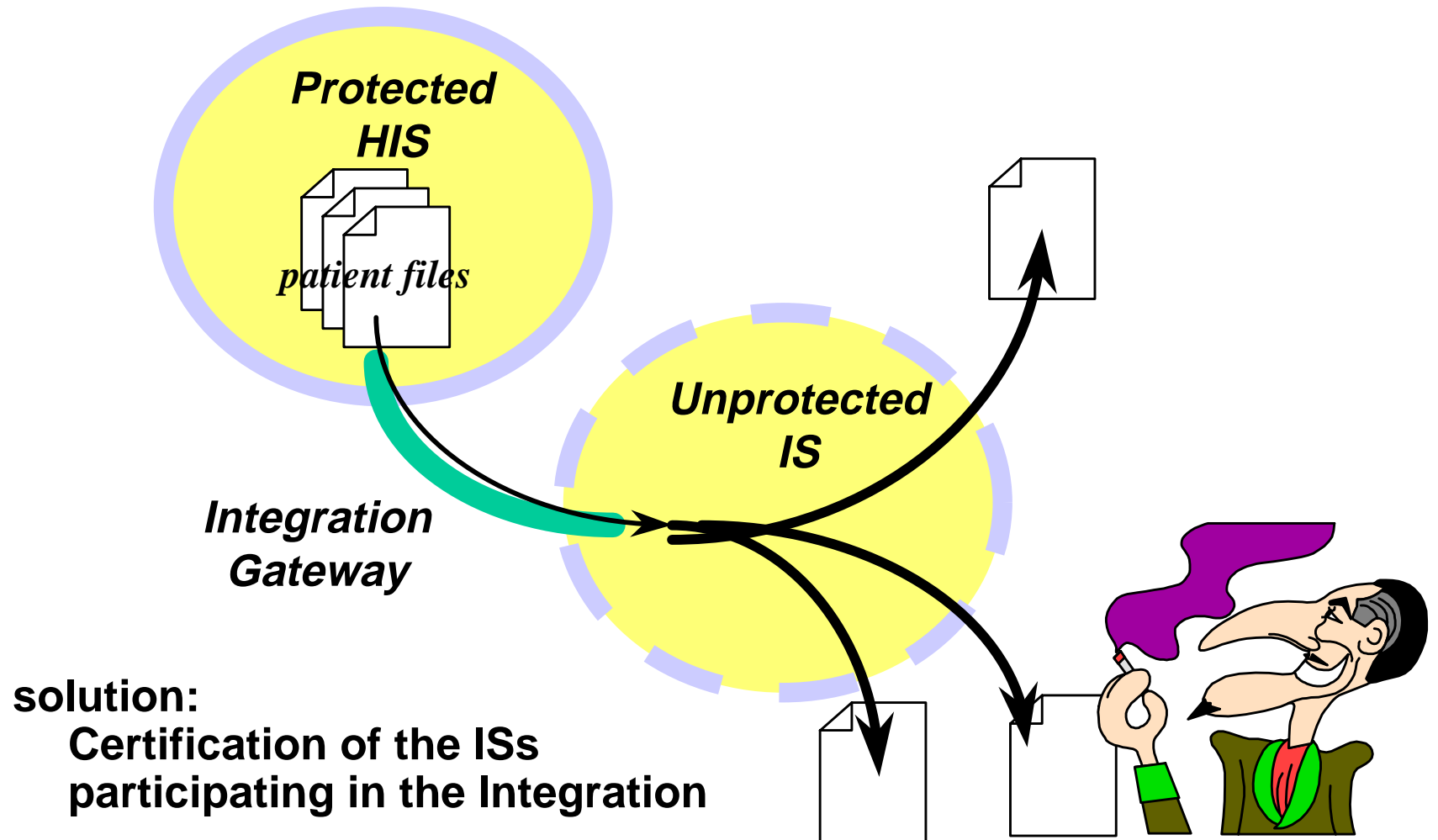 - ### European Standardisation Requirements for Healthcare Informatics and Telematics

Integration, Security, Deontology

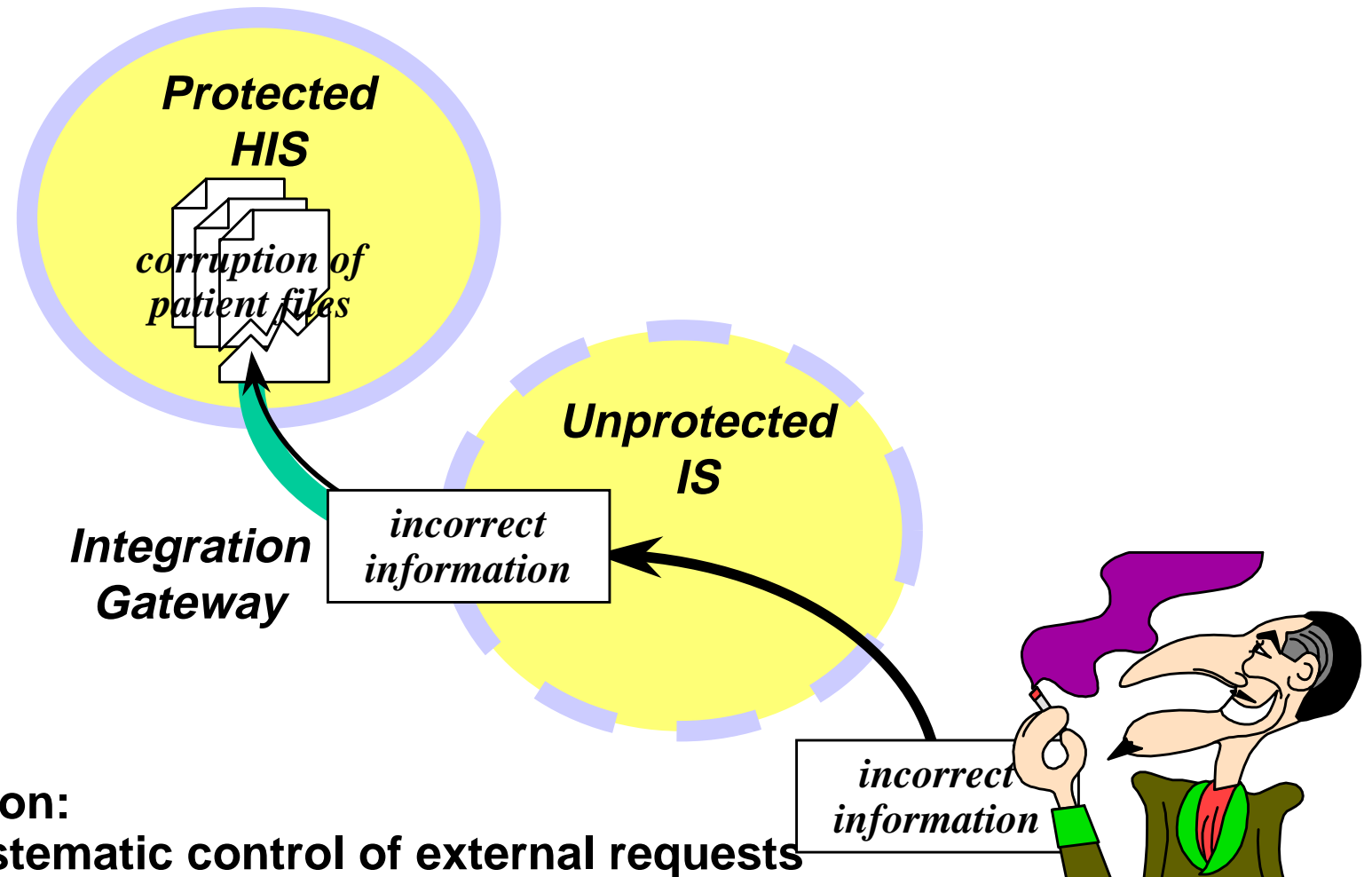"Data Interchange" means something
"Data Escape" or "Data Corruption"

Protected HIS

patient files

Unprotected IS

patient files

Integration Gateway

Integration, Security, Deontology

- ◆ **The "Data Escape"**

Protected HIS

patient files

Integration Gateway

Unprotected IS

solution:
Certification of the ISs participating in the Integration

Integration, Security, Deontology

- ♦ **The "Data Corruption"**

Protected HIS

corruption of patient files

Unprotected IS

Integration Gateway

incorrect information

incorrect information

Solution:
Systematic control of external requests

Conclusion

- ◆ **Standards are late !**
  - **you have to define some un-normalized messages**
- ◆ **one standard can't be the panacea !**
  - **HL7 for administrative, DICOM for images, EDI for external**
- ◆ **Some «standards» are not standard**
  - **because unused**
- ◆ **Toward standards syncretisation**
  - **HL7-DICOM Interoperability:**
    - **HIS/RIS - PACS Intercommunication**
      - **in a Mixed DICOM and HL7 Environment (1995)**
  - **HL7-ASC X12N, HL7- ASTM E31.11 , HL7-IEEE P1157 "MEDIX"**
- ◆ **Integration gateway tools already exist!**
  - **HealthView, CSF; …**