Light-footed and sustainable innovation for the health sector must be based on solid information models that uses thoughtful terminologies to express clinical concepts as precisely as necessary.
What do I do from day to day?

- Work close with healthcare professionals to develop clinical applications using DIPS Arena as a platform.
- Based on open international standards such as openEHR and SNOMED-CT.

### Me 2010-2020
- Acute ward
- Cancer registry
- Coloscopy report

### Me 2020-present
- Covid-19
- Safe EHR

Tools for clinical modelling

Patient administrative services

DIPS Arena as a platform
DIPS is the core system and communication hub in the hospital market in Norway with 86% market share.

DIPS has 100,000+ daily users and over 1,200 integrations.

DIPS is the...

Master of all...
- Clinical personnel data (authorization, access control and logging/tracking)
- Patient waiting lists, planning and logistics
- Planning and handling in operation theatres
- Patient records

Hub for all...
- Ordering and results from labs and radiology
- Communications with 3rd party systems (PACS, RIS, LAB, etc.) and other healthcare parties

Source for all...
- Documentation and reporting – internally and for the Government and Government bodies
DIPS is one of many players in a broad supplier landscape, with APIs for a common collaboration platform.

An interaction platform that realizes seamless patient pathways and information sharing across all levels and actors will be the hub, with open interfaces to system suppliers.
From humble beginnings to market leading EHR supplier in Norway…

1987  Founded at Nordland Hospital
1997  DIPS AS incorporated
2000  2nd generation EHR
2003  Contract Helse Nord
2007  Tender win Helse Sør-Øst
2008  Tender win Helse Vest
2013  Kick-off DIPS Arena development
2014  OUS implements DIPS
2018  AWC new owners
2019  DIPS Front acquired
2020 - 2021  5 acquisitions
2021  Reorganization to Kernel

DIPS Arena implementation initiated
DIPS Arena implementation initiated

NOK >1.3 billion invested in DIPS Arena from 2013

openEHR

Founded at Nordland Hospital
Kernel is a growth platform for connected best-of-breed solutions in healthcare

**What we believe in**
- Connected best-of-breed solutions are the future of enterprise IT
- The best companies are run by dedicated people with a simple goal
- We maintain speed and agility by actively avoiding bureaucracy and corporate red tape
- Security comes first

**How we operate**
- Overhead-light with CEO, CFO and experienced professionals
- Developing group strategy and attracting new partners
- Spawning new companies and projects
- Coordinating and reaping synergies

**Kernel operating companies**

**Acquisitions**

- **DIPS**
  - 420 MNOK
- **DIPS front**
  - 47 MNOK
- **Extensor**
  - 15 MNOK
- **ReMin**
  - 8 MNOK
- **deepinsight**
  - 13 MNOK
- **Indico**
  - 53 MNOK*

Note: * includes David Horn Communications
Norwegian public hospital system

- Four Regional Health Authorities (RHAs)
  - 24 Hospital trusts
  - 100% EHR adoption

- Two main EHR vendors
  - DIPS Arena 3 of 4 regions
  - EPIC implemented in the mid region

- Directorate of eHealth
  - A sub-ordinate institution of the Norwegian Ministry of Health and Care Services.
  - Responsible for steering and coordination of eHealth through close cooperation with regional health authorities, local authorities, technical organisations, and other interested parties
International standards:
Assessment of frameworks for common information models

**FHIR**
- should be used when preparing common information models where the primary area of use is information exchange. Other standards for information modeling can be used if a standard other than FHIR is to be used in the exchange.

**openEHR**
- should be used when preparing common information models where the primary area of use is storage in clinical systems based on openEHR, but can also be used for systems that are not based on openEHR.

**UML**
- should be used in the consolidation of common information models and in the preparation of other common information models than those that fall under points 1 and 2.

**DCM**
- The processes and requirements described in the DCM specification should be considered as part of the basis when preparing routines for quality and management of common information models.
openEHR and FHIR – in some clinical use-cases

Vital Signs and Colonoscopy Report
Vital Signs – integration example

• The need to synchronize vital signs data between the DIPS Arena EHR and Metavision ICU
• Should be
  • Use openEHR archetypes as “abstract information model”
  • Based on FHIR
  • Use SNOMED-CT as terminology
• Started June 2019
• Status October 2021
  • FHIR profile in v 0.8
  • Missing a way to distinguish “pulse” and “heartbeat”
  • AFAIK the problem is defining the right SNOMED-CT code
How we developed a complete colonoscopy report within a few weeks with

Ultimo October

November/December

Weekly sprints with doctor

December

• Form in production for initial usage
• More sprints with adjustments

March

• Arena upgraded with support for discharge summary
• Roll out to more doctors
Discharge summary and note generation

Automatic report to national registry

**Norwegian Colonoscopy Report**
Sending colonoscopy data for cancer screening to a central registry.

**PROJECT**

KOLOSKOPI (Bjørn Næss) 24-NOV-2020

Problemstilling: Screening

Sedasjon: Sedasjonsnivå (Tilfredsstillende)

Boston bowel preparation scale: 3+3+3

Ukomplicerert instrumentering til cæcum hvor appendixkyst og ileocealklaffen sikkert identifiseres.

Funn: Lesjon: Cæcum, 10 mm, O-ila Lav bresbaset, cancersuspekt, Passabel, Tilsatt av kirurg Komplett fjernet med Kald slyng, sendt til patolog, Glass 4

Divertikulose i Venstre kolon


Konklusjon: Legens konklusjon og sammendrag fra koloskopien
SNOMED-CT defines the anatomy in the colon
Colonoscopy – the need for new archetypes

Boston Bowel Preparation Scale – 3 months from initial need and testing into a national and global reviewed archetype.

openEHR has a governance model that works and scales!
Colonoscopy screening in the tooling
openEHR and FHIR – two levels of friendship operations

- FHIR is based on 80% rules for clinical content which means they cover a minor set of clinical data but often with high volume. openEHR have models for clinical content and covers a wide range of clinical domains.
  - FHIR look at openEHR CKM when they build new FHIR profiles.
  - FHIR and openEHR share the same value set needs.
  - Need to cooperate on the development and maintenance of those.

- Automatically create FHIR profiles based on reviewed openEHR templates.
- HL7 governance groups do technical, functional review and describe the enterprise architectural design patterns for the use-cases.
- Let’s create tools that automatically transform clinical reviewed openEHR templates into good FHIR profiles.
  - This will lower cost, improve quality and ease the governance of national eHealth systems.
openEHR data + FHIR API = Good clinical applications in a large ecosystem of systems