

# SOFTWARE IN HET GROOT, UITDAGINGEN EN KANSEN IN HET GROOT

*Door software werd het anders: de impact van software bij de industriële partners van TNO-ESI*

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# INTRODUCTIE ESI (TNO)

- Bridging the Gap
  - verbinden van universiteiten en industrie
  - van ideeën naar industriële toepassingen en andersom
- Partnerraad bepaalt de agenda van ESI onderzoek
- Onderzoek → Toepassing in de praktijk
  - *embedding leading methodologies in the Dutch high-tech systems industry to cope with complexity*
  - **Industry-as-a-lab**



# DE “SOFTWARE “ TREND BIJ ONZE PARTNERS

- Innovaties beginnen vaak in hardware, software is ondersteunend
  - nieuwe technische mogelijkheden → nieuwe apparaten
  - embedded software “to make it tick”
- Software krijgt een centrale rol:
  - “dommere componenten”
  - de functionaliteit wordt door software gerealiseerd
- Software krijgt de grootste waarde:
  - “het systeem” is stabiel en dominant voor de BoM → kostenreductie
  - software realiseert de innovatieve klantwaarde → R&D kosten
  - klant-specifieke systeem configuraties

ASML

PHILIPS

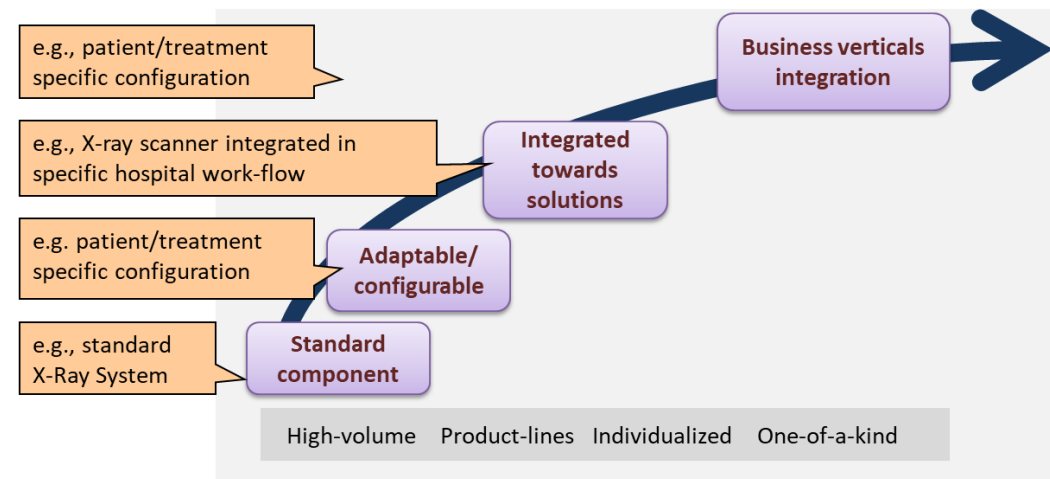
Canon  
CANON PRODUCTION PRINTING

ThermoFisher  
SCIENTIFIC

nexperia

# HIGH-TECH APPARATEN: HET SPEL VERANDERT

- leveren van apparaten → leveren van oplossingen
- leveren van standaard apparaten → leveren van klant-specifieke apparaten/oplossingen
- groeiend belang van software R&D kosten en waarde
- groeiende complexiteit en kosten van systeem testen en vrijgave
- groeiende complexiteit en kosten van life cycle/installed base management
- met de introductie van AI/ML en autonoom gedrag wordt het nog ingewikkelder



# EEN VOORBEELD: INTERVENTIONELE X-RAY SYSTEMEN (PHILIPS)

- Philips Integris uit 1989
- Waar zit de waarde van het system?
  - beeldkwaliteit
  - de Röntgenbuis
  - de Röntgendetector
  - de C-arm en de patiënttafel (positioneren)
  - bediening



# EEN VOORBEELD : PHILIPS IXR

- Waar zit de waarde van het system?
  - lage dosis/hoge beeldkwaliteit + software
  - de detector: high-res en patiënt-toegang
  - software, software, software, ...



**Seamless user experience to enhance decision making**

To support fast, informed clinical decisions, you can control compatible applications, such as our physiology and imaging platform IntraSight, Philips Interventional Hemodynamic system and interventional tools, via the central touch screen and FlexVision Pro at table side. This allows you to confidently evaluate and decide in the sterile field, saving time and helping avoid delays.

**Software**



**Deepen insight of coronaries**

The 12' flat detector provides high-resolution imaging over a large field of view (FOV). You can visualize the aortic valve and a significant portion of the aortic arch or the entire coronary tree in a single view. Thanks to the compact design, a full range of projection angles can be made.

**De Röntgen detector**



**Easily mark relevant details on 2D images on screen**

Via the marker tool on the touch screen, you can mark an area of interest on 2D images. The markings are clearly displayed on the fluoroscopy and reference images, and they scale and pan with the image. This can be useful for marking a bifurcation, side branches and other relevant details. With the marker tool, there is no need for a separate marker application in the lab.

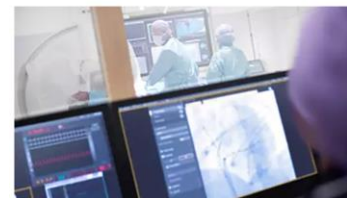
**Software**



**Increase viewing flexibility**

The FlexVision Pro offers a flexible status bar area, allowing you to display full resolution high definition images next to each other. This can be useful for increasing the visibility of small details during electrophysiology procedures.

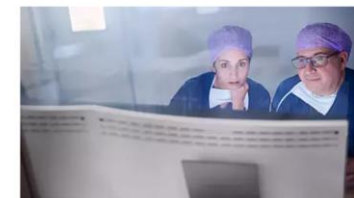
**Software**



**Do more with flexible working**

This system has been specifically designed to save time. Team members can work on multiple activities - at one or more workspots in the control and exam room - without interrupting each other. So while fluoroscopy/exposure is being done, staff in the control room can review previous images from the patient, prepare the next exam or finish reporting on another patient.

**Software**



**Safeguard clinical performance over time**

The standard Windows® 10 platform can help support compliance with the latest security and standards to protect patient data. It can also accommodate new software options to extend your system's clinical relevance over time.

**Software**



**Streamline workflow**

FlexSpot enables you to efficiently view, control and manipulate all applications from a single point in the control room. This integrated, clutter-free work spot has one or two 27-inch widescreen monitors and one mouse and keyboard. From here you can control multiple external sources, set-up screen layouts and access available applications. Add more FlexSpots as needed.

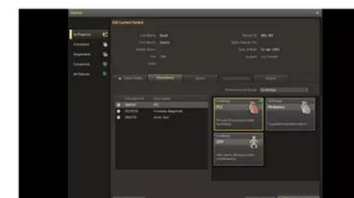
**Software**



**Manage dose efficiently**

The Azurion 7 Series also includes Clarity/iQ, our X-ray imaging technology provides high quality imaging for a comprehensive range of clinical procedures, achieving excellent visibility at ultra-low X-ray dose levels for patients of all sizes. It is part of our comprehensive suite of DoseWise Solutions, which help you take control over patient care, staff safety and regulatory compliance.

**Low-dose and Software**



**Standardize set-up and operation**

The system uses ProcedureCards to simplify and standardize system set-up, from routine to mixed procedures. For example, the system automatically selects the relevant ProcedureCard(s) based on the RIS/HIS/CIS code of the scheduled procedure. Presets (e.g. most-frequently used, default protocols and user-specified settings) facilitate you in increasing exam consistency.

**Software**



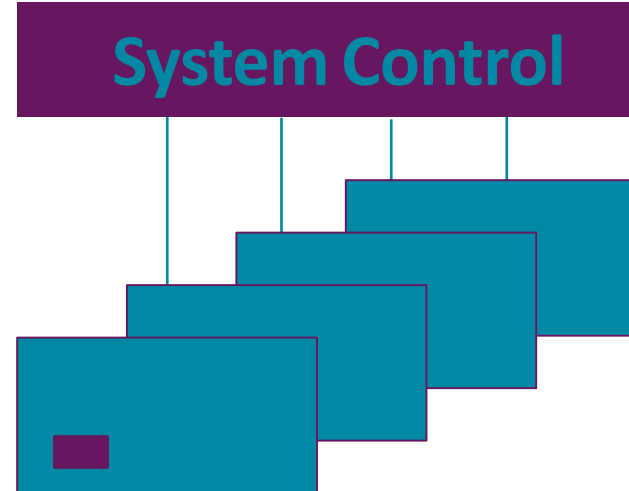
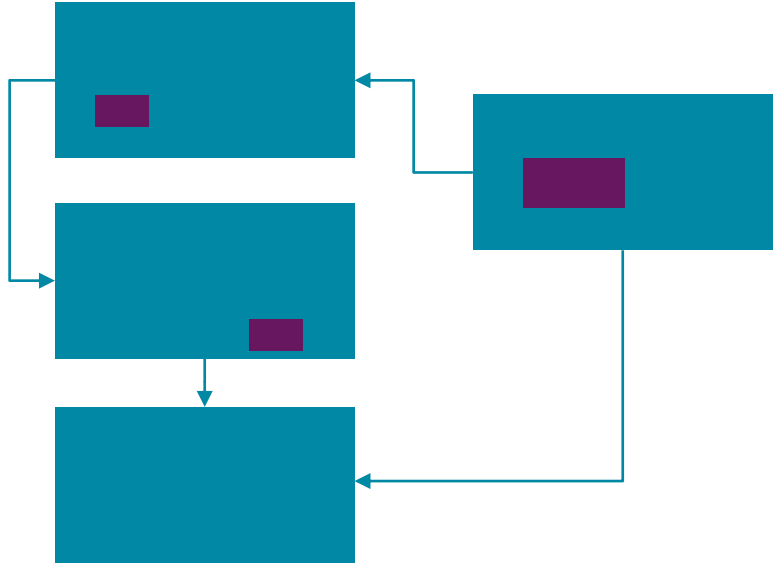
**Clinical demands are getting more specific. So are we.**

Our clinical suites are tailored to meet your specific challenges, while offering you the flexibility to carry out procedures in the easiest, most efficient way. We have a flexible portfolio of integrated technologies and services to support the full interventional spectrum. We also offer Hybrid OR solutions that create an innovative care environment for performing open and minimally invasive surgical procedures.

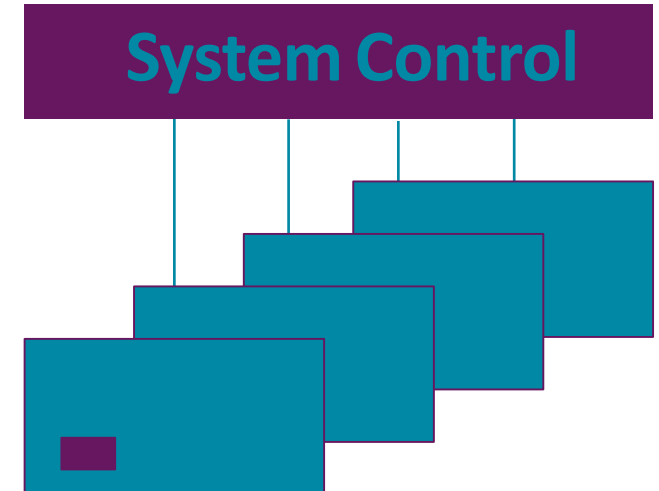
**Software**

## SOFTWARE IN SYSTEMEN

- Stap-voor-stap bepaalt software
    - het systeem gedrag/functionaliiteit
    - de waarde van het systeem
- software is het systeem  
→ de digitale transformatie



## Toegang op afstand Processing “in the cloud” Systems-of-Systems



# DE ESI-PROGRAMMA'S, METHODIEKEN/TOOLS

- Focus op drie aspecten
  - software op (multi-disciplinaire) systeem niveau
  - benutten van de mogelijkheden die software biedt
  - beheersen van de complexiteit die software veroorzaakt

Herbruikbare, beproefde kennis  
en hulpmiddelen (vaak open source)



## System dependability

System dependability focuses on design for system availability, reliability, maintainability, and maintenance support performance.



## System evolvability

System evolvability anticipates future developments with the aim of minimizing any possible negative consequences to prolong the useful economical life of products and systems.



## Exploiting systems context

Exploiting systems context focuses on how to enable systems to be aware of their context, to be open and to react to changes.



## System performance

System performance focuses on quantitative design criteria for embedded applications and their resource utilisation in trade-off with cost.



## System architecting

System architecting addresses the challenge of getting the system design right from the start by helping customers to translate market, product, and technology choices into system concepts.



## CONCLUSIE: UITDAGINGEN, KANSEN EN HULPMIDDELEN

- Software is een kernwaarde *en* software is een grote kostenpost
  - om het systeem te begrijpen moet je de software begrijpen
  - autonome system (AI en *machine learning*) maken dat nu en in de toekomst nog complexer *en* waardevoller
- “Software op Systeem niveau” vraagt om **Systeemdenken**
  - multidisciplinair
  - een SE-tool kopen is niet het juiste begin
- “Connected systems” (digital twins)
  - kans om velddata terug te brengen naar Systems Engineering
  - “continuous SE” → continue verbeteren
- Uitdaging: managen van de software/systeem complexiteit
- Geleerde lessen en de ontwikkelde tools vanuit ESI-partners zijn beschikbaar:
  - systeem architectuur, performance, interface management, diagnostiek, model-based SE

Twee mooie  
voorbeelden na  
deze presentatie

Ultimaker



# DANK U WEL!



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