



# IT SOLUTIONS FOR HEALTHCARE

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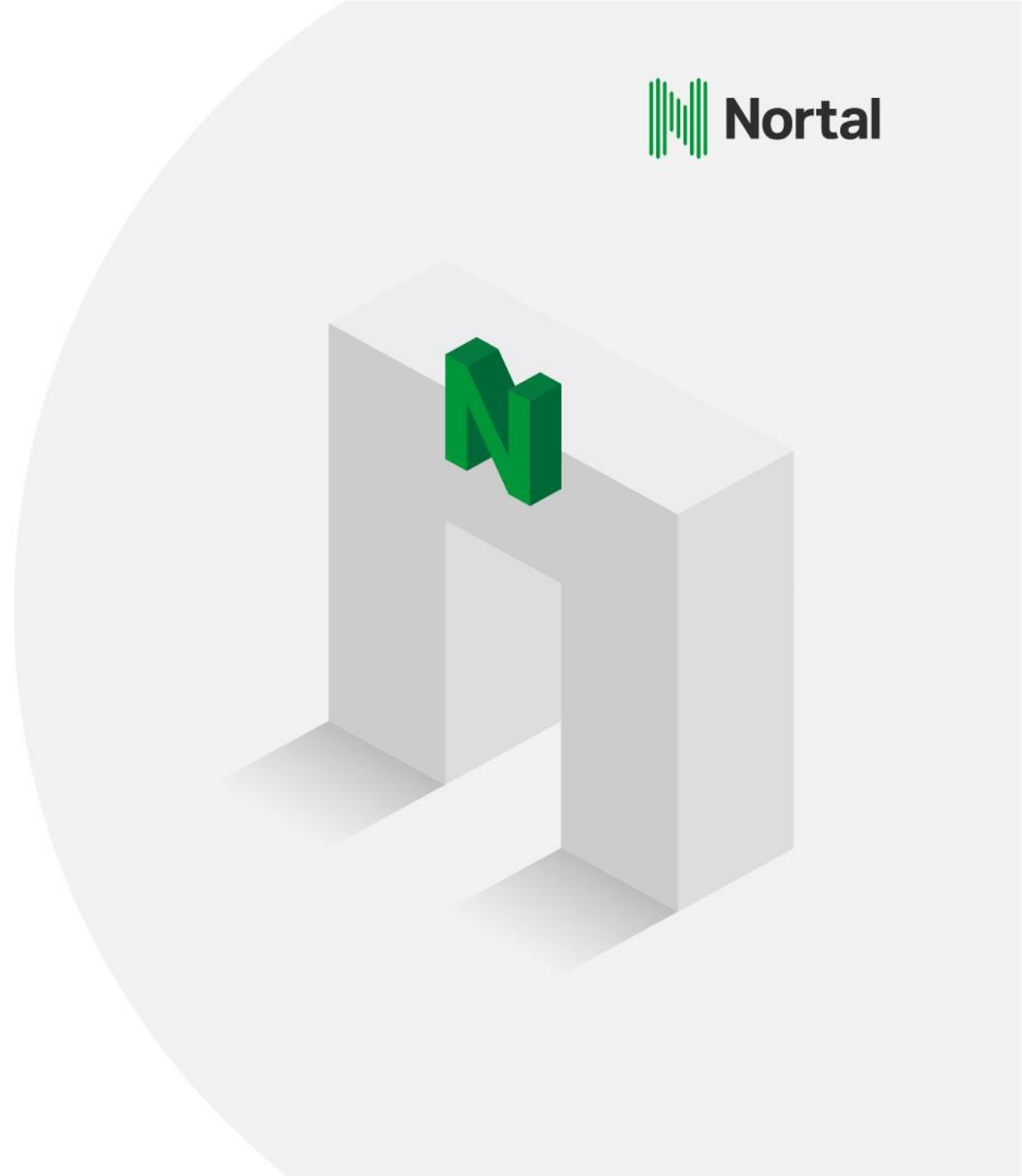
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# AGENDA

ABOUT NORTAL	1
CURRENT CHALLENGES IN HEALTHCARE	2
ECOSYSTEM THINKING	3
NORTAL HIS	4
CRM	5
ERP	6
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# ABOUT NORTAL



# IT SERVICES FROM YEAR 1985



**1985**

CCC Oy established in Oulu, Finland

**2000**

Webmedia established in Estonia

**2005**

International business starts

**2006**

Serbia operations start

**2009**

Qatar deliveries start

**2010**

Oman deliveries start

**2011**

CCC merges with Webmedia

**2012**

Company rebranding as Nortal

**2016**

Acquisition of Swedish Element AB

**2018**

New office in Düsseldorf, Germany; Acquisition of Dev9, USA

**2019**

New offices in UAE and USA

# GLOBAL EXPERIENCE WITH LOCAL DELIVERY CAPACITY

We create and implement user-friendly services out of complex processes



**800+**  
EXPERTS  
GLOBALLY



**20+**  
COUNTRIES &  
GLOBAL DELIVERY



**95%**  
ON TIME AND ON  
BUDGET



# CURRENT CHALLENGES IN HEALTHCARE



# CURRENT SITUATION



**OUTDATED  
TECHNOLOGY**



**CLOSED  
APIS**

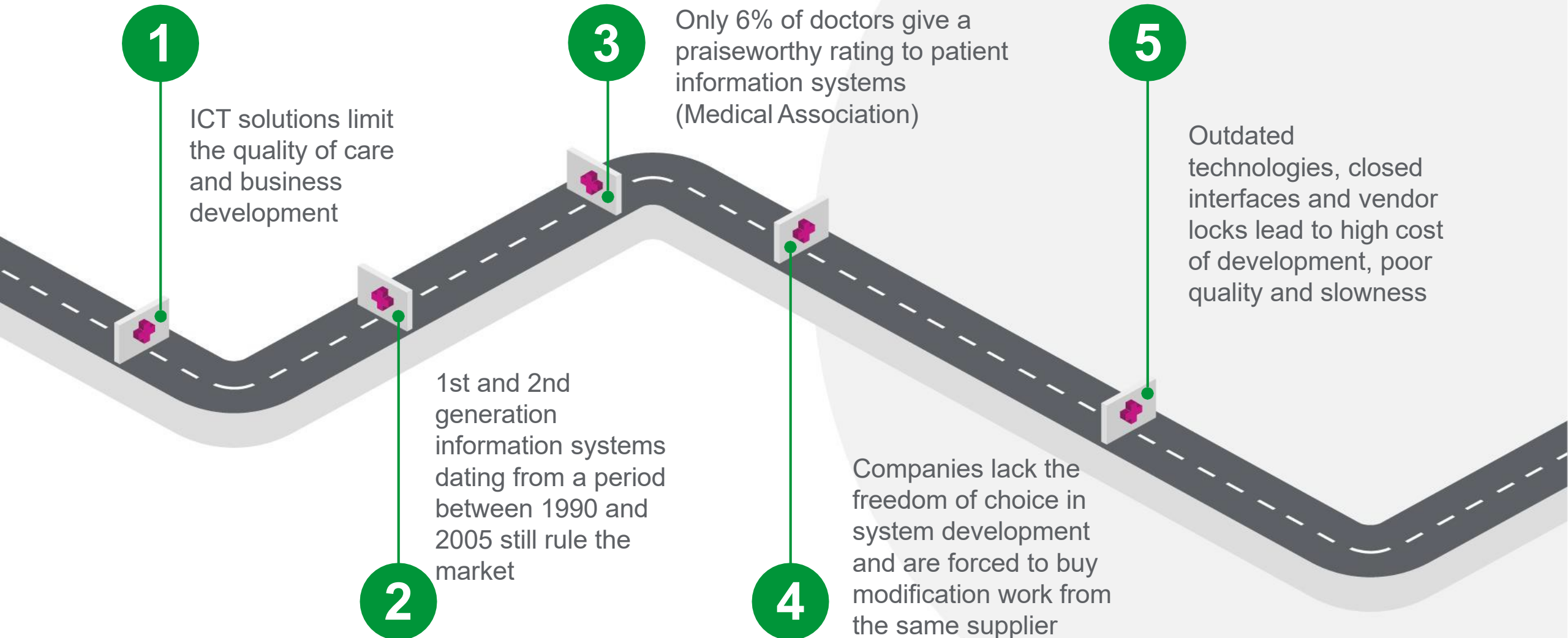


**POOR USER  
EXPERIENCE**



**VENDOR  
LOCK**

# KNOWN ISSUES





# NORTAL'S VISION



Reforming healthcare information systems in Finland is **essential**.



Healthcare professionals deserve state-of-the-art **modern information systems**.





# ECOSYSTEM THINKING



# NORTAL - HEALTHCARE ECOSYSTEM Nortal

Leading business solutions  
combined with a certified  
clinical system



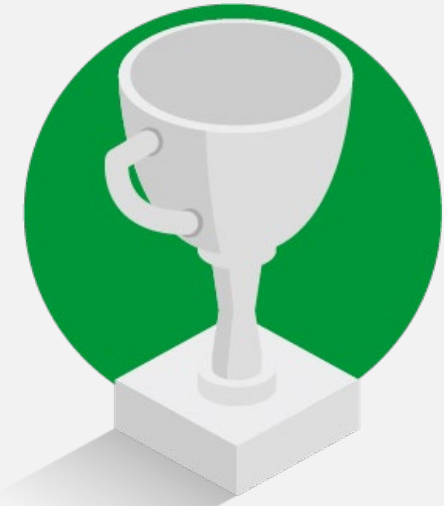
**NORTAL HIS**  
**MICROSOFT DYNAMICS 365**  
**AZURE, AWS, GCP**

Open and modular  
architecture combined  
with high quality APIs



**HYBRID CLOUD**  
**100% API COVERAGE**  
**DEVOPS AND AUTOMATION**

User-centric design  
and world class  
user experience

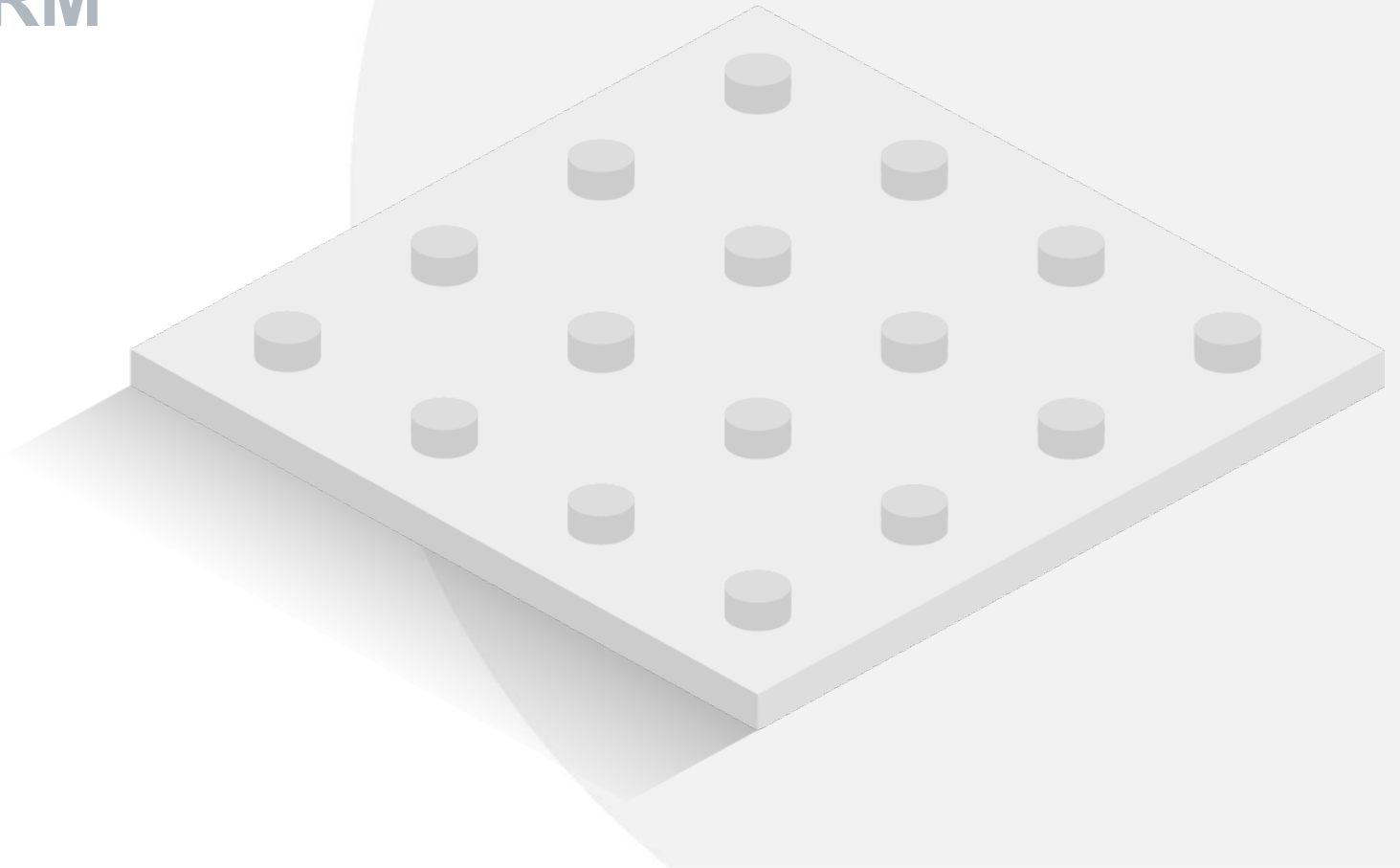


**DASHBOARDS**  
**MOBILE SUPPORT**  
**WORKFLOWS AND GUIDANCE**

# ECOSYSTEM BUILDING BLOCKS



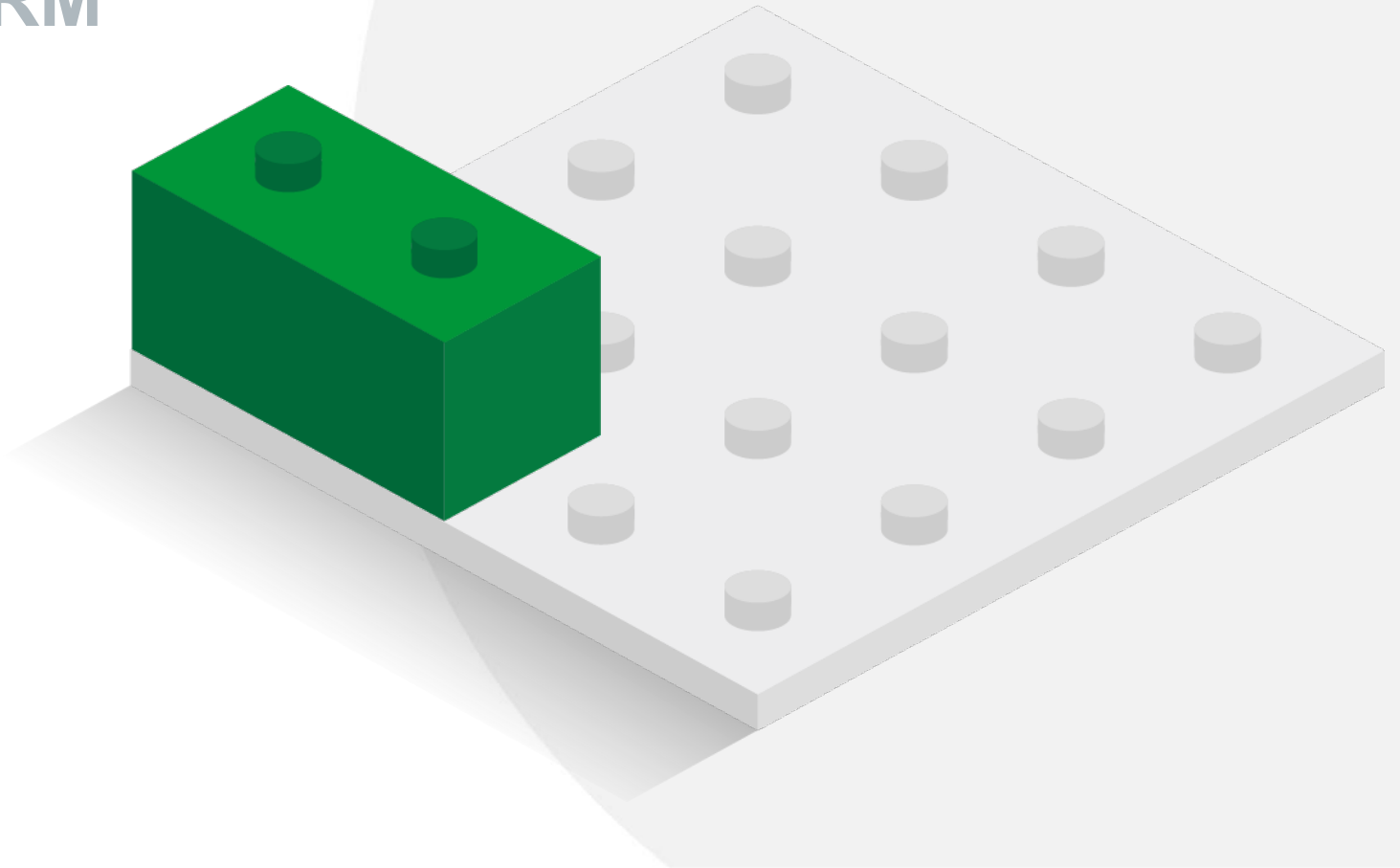
## 1 CLOUD PLATFORM



# ECOSYSTEM BUILDING BLOCKS



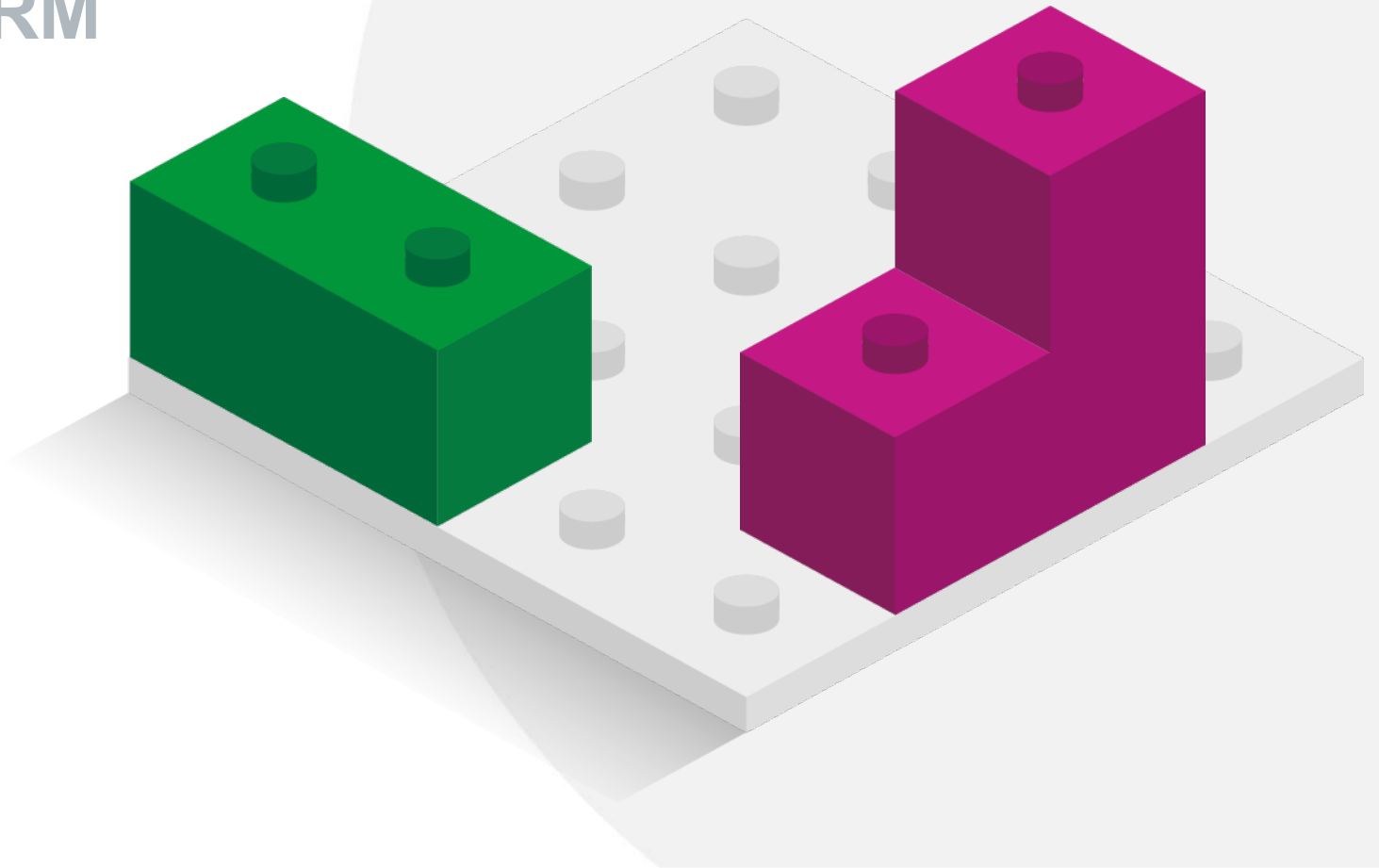
- 1 CLOUD PLATFORM
- 2 NORTAL HIS



# ECOSYSTEM BUILDING BLOCKS



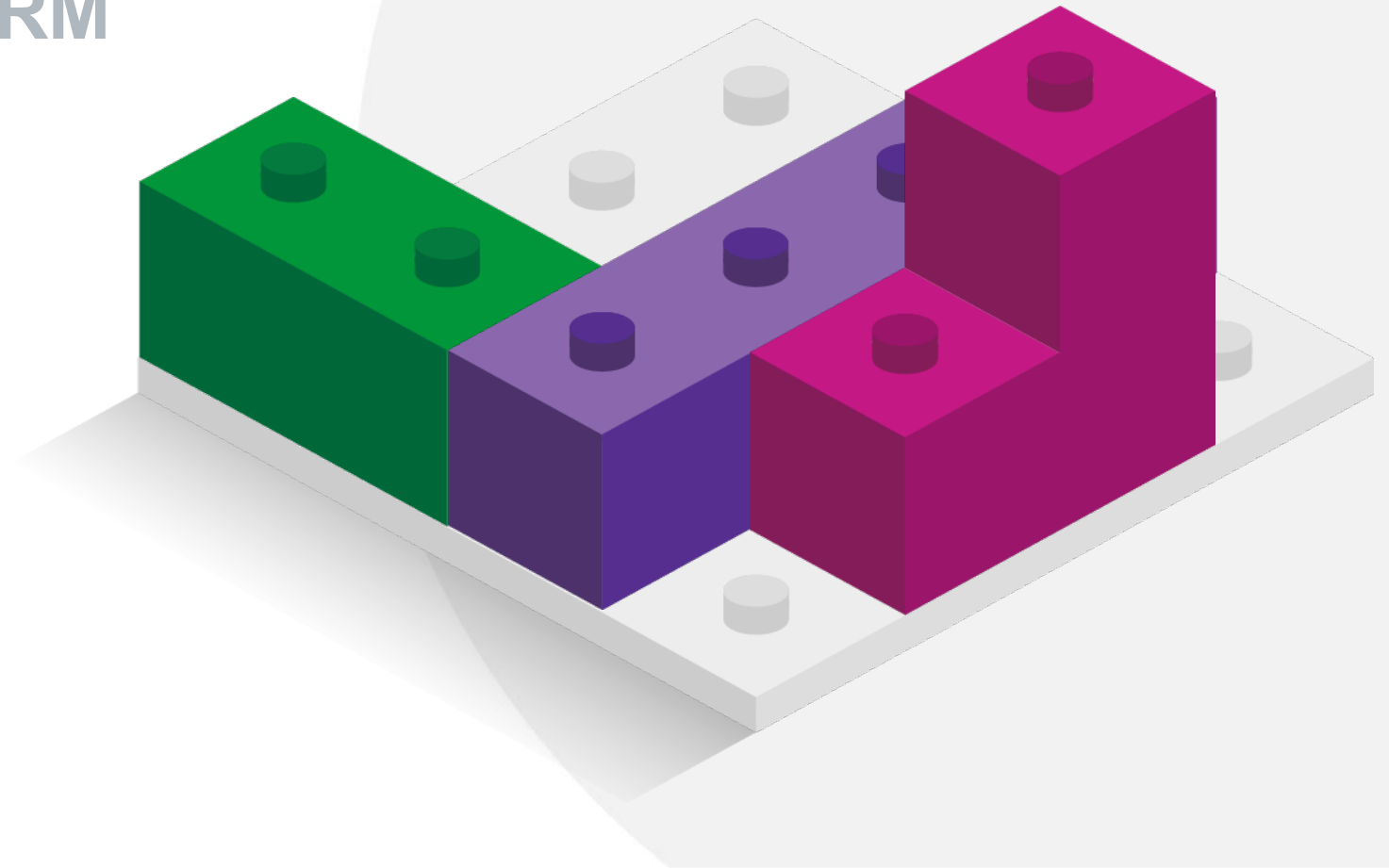
- 1 CLOUD PLATFORM
- 2 NORTAL HIS
- 3 ERP



# ECOSYSTEM BUILDING BLOCKS



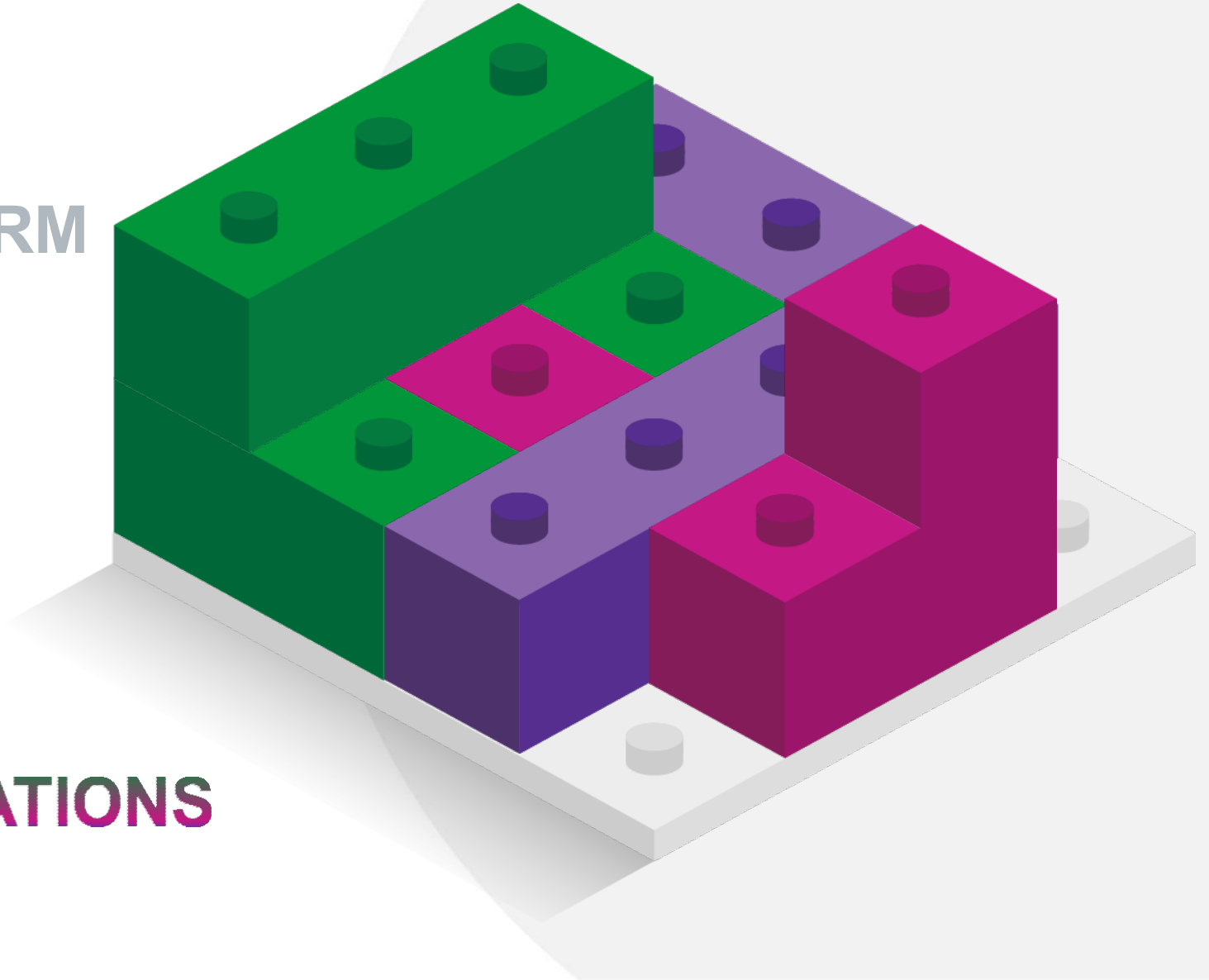
- 1 CLOUD PLATFORM
- 2 NORTAL HIS
- 3 ERP
- 4 CRM



# ECOSYSTEM BUILDING BLOCKS



- 1 CLOUD PLATFORM
- 2 NORTAL HIS
- 3 ERP
- 4 CRM
- 5 OTHER APPLICATIONS





# DEVELOPMENT PRINCIPLES



Open APIs



Customer-centric design

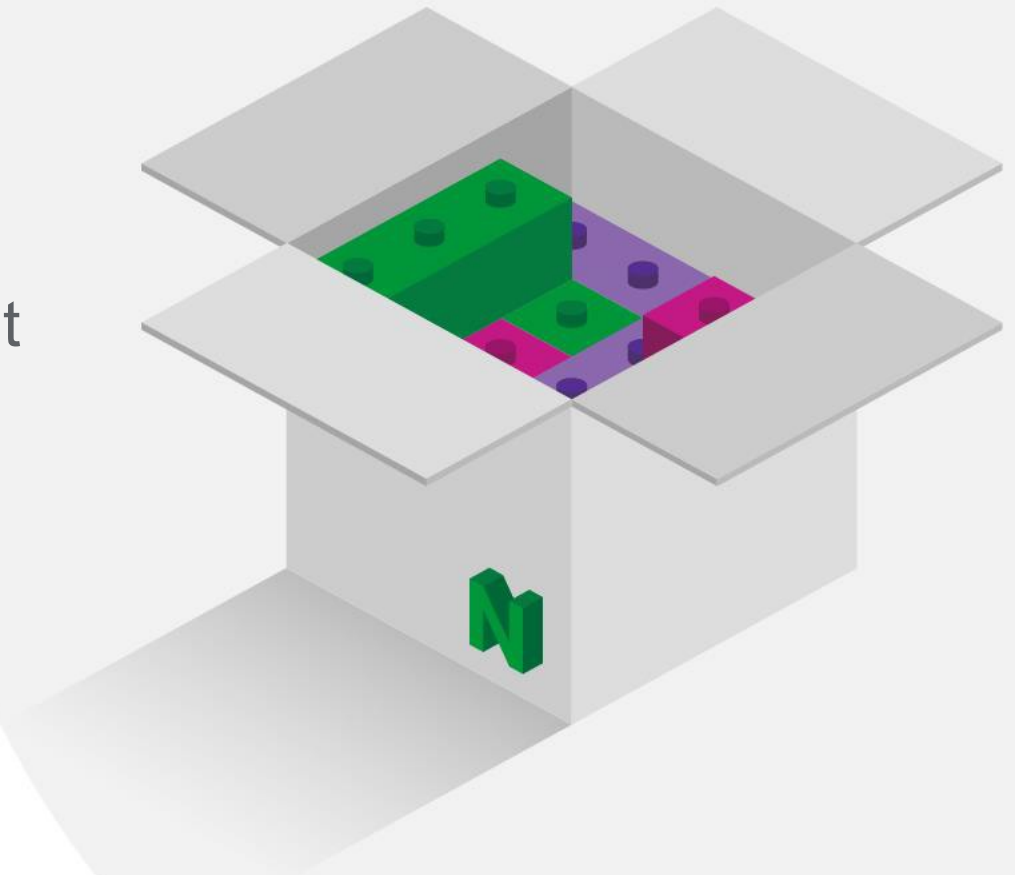


Proper focus on lifecycle management



Controlled tailoring of the system

- Customer-specific business rules
- Automation of manual processes
- User interface tailoring
- Integrations



- NORTAL HIS
- NORTAL (CUSTOM)
- MICROSOFT DYNAMICS FINANCE & OPERATIONS
- MICROSOFT DYNAMICS SALES
- OTHER PARTNER OFFERING
- EXTERNAL SYSTEM

USERS

DASHBOARDS

**Microsoft Dynamics 365**

**ERP WORLD**

**OPERATIONS AND MANAGEMENT**

- Demand planning
- Production planning
- Field service management
- Materials management
- Organization structure
- Resource profiles
- Product parameters
- Product variations
- Product pricing

**FINANCE**

- Ledgers
- Retail (POS)
- Invoicing
- Assets
- Practitioner provisions
- Purchase agreements

**Nortal HIS**

**CLINICAL WORLD**

**CORE FEATURES**

- Journal
- Medication
- Treatment plan
- Reception
- Referral response
- Appointments
- Schedules
- Statements & Certificates

**CARE PATHS**

- Care protocols
- Personal care paths
- Patient overview 360

**OCCUPATIONAL HEALTH**

- Personal risk factors
- Sick leave management
- Health checks

**HOSPITAL FUNCTIONS**

- Anesthesia
- Ward
- Operating theater
- Clinical reporting

**POPULATION HEALTH**

- Personal data (PHR)
- Remote appointments
- Notifications & Alerts
- Health coaching
- Care coordination
- Personal care healthplan
- Best practices
- Analytics & AI

**PUBLIC HEALTHCARE**

- Clinical reporting
- Outsourced services
- Treatment evaluation
- Maternity

**INTERNAL COMMUNICATION**

- 1-on-1 chat
- Group chat
- Video consultation
- Calendar sharing

**BACKGROUND FEATURES**

- Logging
- Product admin
- Registers & Codes
- Resources
- Clinical reporting

**OTHER HEALTHCARE SYSTEMS**

- Laboratory
- Imaging
- Clinical decision support
- Physiotherapy
- Dental care
- Patient safety
- Medical equipment delivery

**Microsoft Dynamics 365**

**CRM WORLD**

**SALES TOOLS & REPORTS**

- Customer management
- Customer 360
- Sales activities
- Sales reports
- Marketing permissions
- Marketing automation

**CONTRACTS**

- Occupational health
- Public healthcare
- Insurance
- Customer

**PRODUCTS**

- Sales products
- Product packages
- Price lists

**OCCUPATIONAL HEALTH**

- OC action plans
- OC annual plans
- Visits & Activities
- Workplace surveys

**SOCIAL CARE SYSTEMS**

- Elderly services
- Maternity & Child care services
- Home care
- Drug abuse & Mental health

**CUSTOMERS**

**APPS & SERVICES**

- Mobile apps
- Webapps
- Self-registration

**PARTNERS**

**APPS & SERVICES**

- Extranet solutions

API

API

BUSINESS DOMAIN SERVICES (API)

PRODUCTION DOMAIN SERVICES (API)

API MANAGEMENT

**ANALYTICS & INFORMATION MANAGEMENT**

- Reporting
- IoT
- GDPR
- AI
- DW
- Data Lake
- Master Data

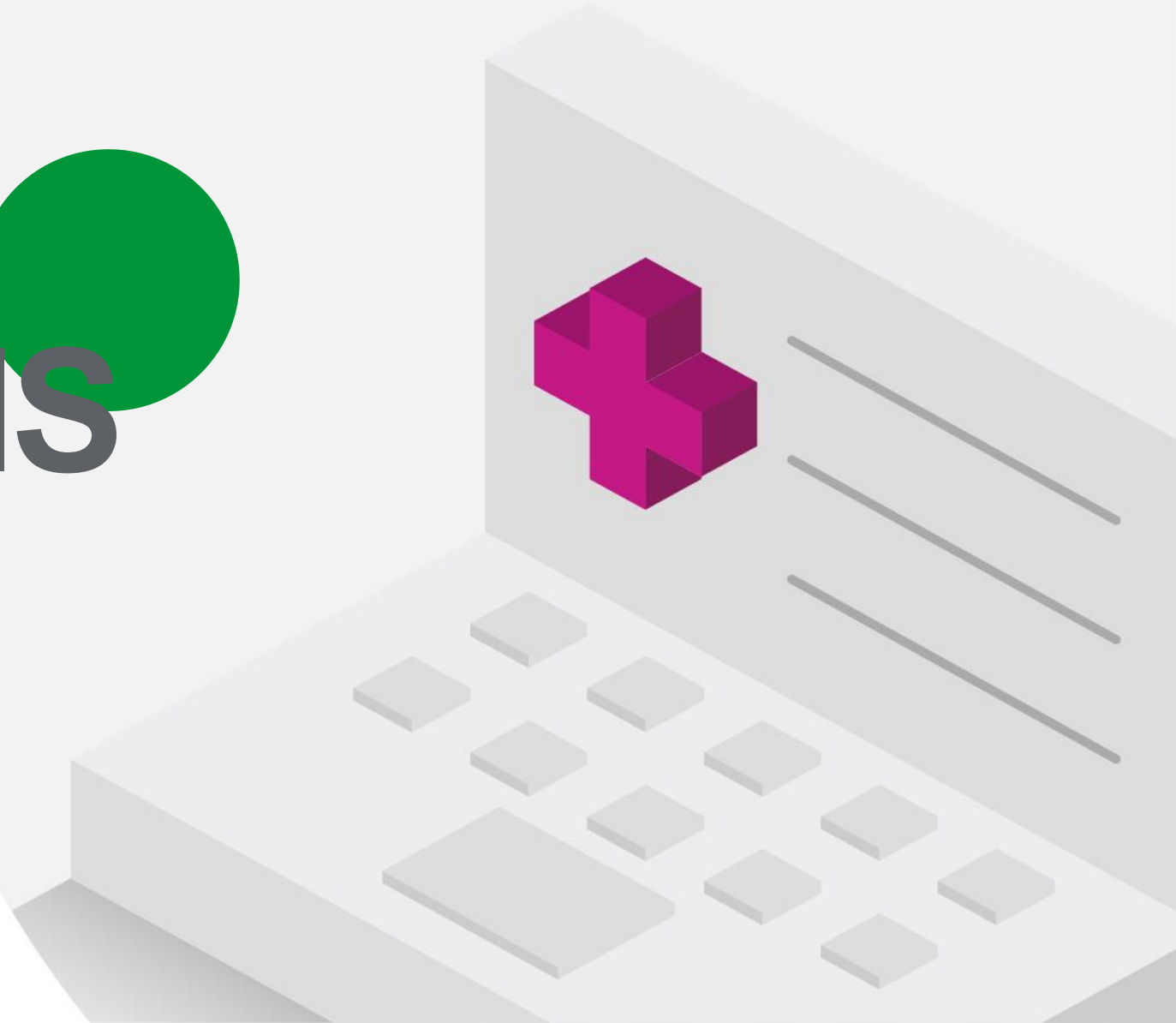
**COMMON BASE SYSTEMS**

- IAM
- AD
- HR
- Customer service
- Office 365

**EXTERNAL SYSTEMS**

- National social & healthcare systems
- Financial institutions
- Insurance

# NORTAL HIS



# OVERVIEW



## FUNCTIONS

- Regulatory compliance
- Appointments
- Reception
- Laboratory
- Diagnostics
- Hospital operations
- Occupational health
- Medication
- Referral-Response

**Occupational  
health  
Doctor's  
dashboard**





**Patient visit  
Prescription**

**Advanced  
calendar  
management**

**Diagnosis**

**Patient  
intake  
summary**

# DESIGN PRINCIPLES

-  User centric
-  Co-creation: we create and design together with and for the healthcare professionals
-  Professional and experienced development team
-  Continuous Improvement



# PERSONAL DESKTOP



Dashboard Calendar Patients Invoicing Companies M. Korhonen General practitioner Tikkurila

**TODAY 29.12.2018**

- 10:38 **Matti Anttila** 250481-999X ♂ 36  
206 Lorem ipsum sample
- 10:42 **Mikko Korhonen** 250481-999N ♂ 37  
206 Lorem ipsum sample
- 10:46 **Mikko Korhonen** 250481-999N ♂ 37  
206 Lorem ipsum sample
- 10:50 **Mikko Korhonen** 250481-999N ♂ 37  
206 Lorem ipsum sample
- 10:54 **Matti Anttila** 250481-999X ♂ 36  
206 Lorem ipsum sample
- 10:58 **Mikko Korhonen** 250481-999N ♂ 37  
206 Lorem ipsum sample
- 11:02 Create appointment | Reserve
- 13:00 **Mikko Korhonen** 250481-999N ♂ 37  
206 Lorem ipsum sample
- 13:04 **Mikko Korhonen** 250481-999N ♂ 37  
206 Lorem ipsum sample
- 11:02 Create appointment | Reserve
- 16:00

**5 FLAGGED PATIENTS**

- Matti Anttila** 250481-999X ♂ 36  
R10.4 Lorem ipsum
- Kalle Montonen** 250481-999X ♂ 32  
K07.63 Lorem ipsum
- Jussi Välimäki** 150888-939V ♂ 29  
R52.9 Lorem ipsum
- Mika Airinen** 150889-999A ♂ 28  
R52.2 Lorem ipsum
- Pertti Anttila** 250486-999X ♂ 36  
R52.2 Lorem ipsum dolor sit.

**5 NOTES AND REMINDERS**

**TODAY 29.12.2018**

- 28.12.2018  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris.
- 11:15  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore.
- 15:30  
Lorem ipsum dolor sit amet.

**TODAY**

- Eija Vihurin seuranta  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore.

**MONDAY 31.12.2018**

- TODAY**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore.

**5 OCCUPATIONAL HEALTHCARE CUSTOMERS**

- > New employee healthchecks 1
- > Periodical healthchecks 16
- > Workplace surveys 4

**14 RESULTS**

- Matti Anttila** 250481-999N ♂ 36  
Laboratory test (2) 29.12.18
- > Laboratory 3
- Imaging 3
- Pekka Saarinen** ♂ 28  
Lorem ipsum
- Mika Airinen** ♂ 28  
Lorem ipsum
- > Consultation 1
- > Hospital 8

2

# PERSONAL DESKTOP



Dashboard Calendar Patients Invoicing Companies M. Korhonen

General practitioner Tikkurila

DECEMBER 2018

WEEK 52 | 25.12.-31.12.2018

Day Week Month

	25. Monday	26. Tuesday	27. Wednesday	28. Thursday	29. Friday	30. Saturday	31. Sunday
06:00							
07:00							
08:00		Demo Clinic					
09:00							
10:00							
11:00							

FRIDAY 29.12.2018

Appointment

Mikko Korhonen 250472-999N

Demo Clinic Room 206

14:00 14:15 15 MIN

Payer  
Prime Example Ltd.

Complaint \* Not mandatory  
Lorem ipsum

Additional information \* Not mandatory  
Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque.

Cancel Change

Tikkurila

07:30 Demo Patient

08:00 Demo Patient

08:30 Demo Patient

08:45 Demo Patient

08:20 Demo Patient

09:00 Demo Patient

10:00 Demo Patient 30 min

Demo Clinic

07:00 Break 15 min

07:45 Reserved 35 min

# PATIENT VISIT



Dashboard Calendar Patients Invoicing Companies **M. Korhonen** General practitioner Tikkurila

**PATIENT** Mikko Korhonen 250472-999N ♂ 46 MA 22.2.2019 10:30 - 11:30 22 min Visit

**Health information** Height 175 cm Weight 78 kg BMI 25,47 Blood pressure 120/80 Blood group AB+

**Allergies** Activelle Dilac Nut Raspberry Kiwi

**Risk factors** Obesity Transplant

**Diagnosis (permanent)** E11 Diabetes mellitus

**Medication (permanent)** Metformin Actavis 500 mg

**Vaccinations** Hepatite B - 13.3.2019 Tetanus - 4.1.1993

**Visit history**

- MO 22.2.2019 (Today)**
  - Me Visit: 10:30 - 11:30 Visit reason: Sed ut perspiciatis unde omnis ...
- THU 5.1.2019**
  - Me GP OHC J11.1 (ICD-10) - Influenza with other respiratory manifestations ...
  - Jenna Rastas OHC A09 (ICPC-2) - Sweating issues
  - Hannele Kreuzenberg GP E J15.4 (ICD-10) - Pneumonia due to other streptococci
- WE 4.1.2019**
  - Hannele Kreuzenberg OHC E J15.4 (ICD-10) - Pneumonia due to other streptococci
- 2018**
  - TU 12.6.2018**
    - Hannele Kreuzenberg OHC E J15.4 (ICD-10) - Pneumonia due to other streptococci

**Visit details**

Time: 10:30 - 11:30 Date: 22.2.2019

Service event: Telia Oyj Occupational Health Tags: 1.1.2019 - 23.4.2019 Kristiina Kärkkäinen GP OHC

Episode of care: Influenza Document template: Occupational healthcare Delay visibility for patient: No delay

**Initial status**

**Complaint**  
Sed ut perspiciatis unde omnis iste natus error sit voluptatem.

**Anamnesis**  
Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia.

**Observations and clinical examinations**

**Current status**  
Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia.

Physical measure

Prescription Form Diagnosis Physiotherapy Imaging Laboratory Hospital

Encrypted Close visit



# PATIENT VISIT



Dashboard Calendar Patients Invoicing Companies M. Korhonen General practitioner Tikkurila

**PATIENT** Mikko Korhonen 250472-999N ♂ 46

**Health information** Invoicing

Height 175 cm Weight 78 kg BMI 25,47  
Blood pressure 120/80 Blood group AB+

**Allergies**  
• Activelle • Dilac  
• Nut • Raspberry  
• Kiwi

**Risk factors**  
• Obesity • Transplant

**Diagnosis (permanent)**  
• E11 Diabetes mellitus

**Medication (permanent)**  
• Metformin Actavis 500 mg

**Vaccinations**  
• Hepatite B - 13.3.2019  
• Tetanus - 4.1.1993

**ADD DIAGNOSIS**

Recent ICD-10 ICPC-2

Filtering Timespan 1.4.2016 30.4.2019

Diagnosis Type  
 All  
 ICD-10

M53.0 - Cervicocranial syndrome  
 C16.01& - Neoplasma malignum cardiae  
 C16.4& - Pylorus

Recent  
2018  
MA 13.11.2018  
✓ M53.0 - Cervicocranial syndrome  
TI 5.8.2018  
C16.01& - Mahansuun alueen syöpä varhainen diffuusi mahan karsinooma  
C16.4& - Mahanportin syöpä  
2016  
KE 1.4.2016  
C16.01& - Mahansuun alueen syöpä varhainen diffuusi mahan karsinooma

Cancel Select

Prescription Form Diagnosis Physiotherapy Imaging Laboratory Hospital

Encrypted Close visit

**CRM**



# 360 CUSTOMER VIEW



# INCREASE SALES WITH BETTER CUSTOMER EXPERIENCE



Roles of automation, analytics and AI

SIGNIFICANT



SUPPORTIVE

ERP



# KEY AREAS

**Financial  
management**

**Fixed  
assets**

**Accounts  
ledger**

**Cashier**

**Project  
management**

**Product  
information  
management**

**Warehouse  
management**

**Acquisition**

# HOW WE WORK



No customization, but parametrization of the Dynamics 365 Finance and Operations product



Microsoft FastTrack support during the implementation phase



Development principles:

- Do not customize product internals
- Develop only based on extension points provided by Microsoft
- Leverage interfaces and build custom microservices “on-the-side”





**ANALYTICS**





# DATA ANALYTICS SERVICES



## Comprehensive data specialist team

- Data Engineers
- Data Scientists
- Business SME
- Application Developers



## Data platform services


- Data Ingestion
- Data Exploration / Visualization
- Data Transformation
- Modelling
- Deployment & Production





# INTEGRATIONS & DEVOPS

# ENTERPRISE ARCHITECTURE, INTEGRATIONS & DEVOPS

-  Domain-Driven Design and Domain APIs
-  Microservices architectures
-  DevOps and Cloud Native development
-  Hybrid cloud solutions



# API-DRIVEN ARCHITECTURE PRINCIPLES

## 1. PRODUCT-BASED ARCHITECTURE

- Product-based but product-agnostic architecture
- Leverage proven COTS products where applicable
- Favor products that expose high-quality APIs
- Avoid complex tailoring of COTS products

## 3. DOMAIN-BASED ARCHITECTURE

- Define architectural domains
- Expose Domain APIs
- Speak the same language as API consumers
- Hide the complexity of underlying products

## 2. MICROSERVICES ARCHITECTURE

- Smart endpoints and dumb pipes
- Lightweight API Management over heavy ESB
- Keep number of services manageable
- Extend products beyond their original capabilities

## 4. CLOUD-BASED ARCHITECTURE

- Do not fear the cloud, embrace it
- Highly-certified best-of-breed data centers
- Improved flexibility, productivity and stability
- Enhanced security against cyber attacks

# REFERENCE ARCHITECTURE (HYBRID CLOUD)

## AZURE CLOUD

### PUBLIC SERVICES (INTERNET)

#### ACCESS MANAGEMENT



Firewall (Simple)



API Management

#### CONTAINERS



Kubernetes



App Service

#### MESSAGING & EVENTS



Service Bus



Event Grid



Event Hubs

#### STORAGE & CACHE



SQL Database



Cosmos DB

#### LOGGING & MONITORING



Log Analytics



Application Insights



Monitor

### PRIVATE SERVICES (INTERNAL VNET)

#### ACCESS MANAGEMENT



Virtual Network



Firewall (Advanced)



API Management



App Service Environment

#### CONTAINERS



Kubernetes



App Service

#### MESSAGING & EVENTS



Service Bus



Event Grid



Event Hubs

#### STORAGE & CACHE



SQL Database



Cosmos DB



Storage Blob



Redis



Data Warehouse



Data Lake

#### LOGGING, MONITORING & ANALYTICS



Log Analytics



Application Insights



Monitor



Data Lake Analytics



HDInsight



Databricks

#### ORCHESTRATION



Logic Apps

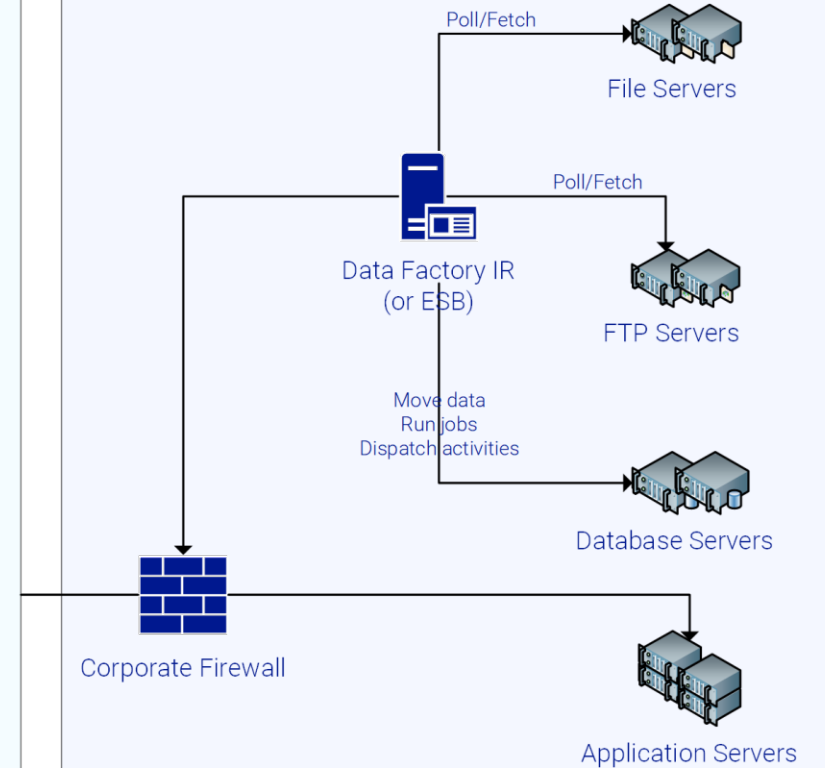


Functions



Data Factory

## ON-PREMISE





# REFERENCES



# HEALTHCARE REFERENCES



Largest University Hospitals in Estonia and Lithuania



+30 Clinics in Baltic countries



National Electronic Health Record in Lithuania



UAE Daman Thiqa & inHealth digital prescription



TBA

Private Healthcare Providers in Finland

# THANK YOU

Let`s start working together!  
I have 17 years of expertise in social healthcare ICT solutions



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