NeST DIGITAL

- **Concept to Commercialization:** Covering the full product lifecycle, from early-stage proof-of-concepts to large-scale manufacturing.
- **Integrated Teams:** Hardware, Software and clinical experts working collaboratively
- **Quality & Compliance:** Adherence to ISO/IEC standards & global regulatory standards for safety and reliability.

1 30+ Years of onestop shop solutions from concept to products

2 60+ Customers around the globe

3 3 Global Development Centers

Locations
India | USA | UK | Japan | UAE

NeST DIGITAL

sudipta.mukherjee@nestgroup.net
Contact us today to learn more about how we can help you to create Healthcare solutions perfectly tailored to meet your specific needs

Powering MedTech Innovation

From cutting-edge R&D to precision manufacturing and intelligent software integration, we deliver faster, compliant, and patient-centric solutions - empowering healthcare organizations to innovate with confidence and drive better outcomes.

Agenda

1	About NeST Group
2	Corporate Overview
3	MedTech Capabilities
4	Software Services
5	Software Consulting and R&D

6	Success Stories - Software
7	Hardware R&D & Manufacturing
8	Success Stories - Hardware
9	Engaging with NeST
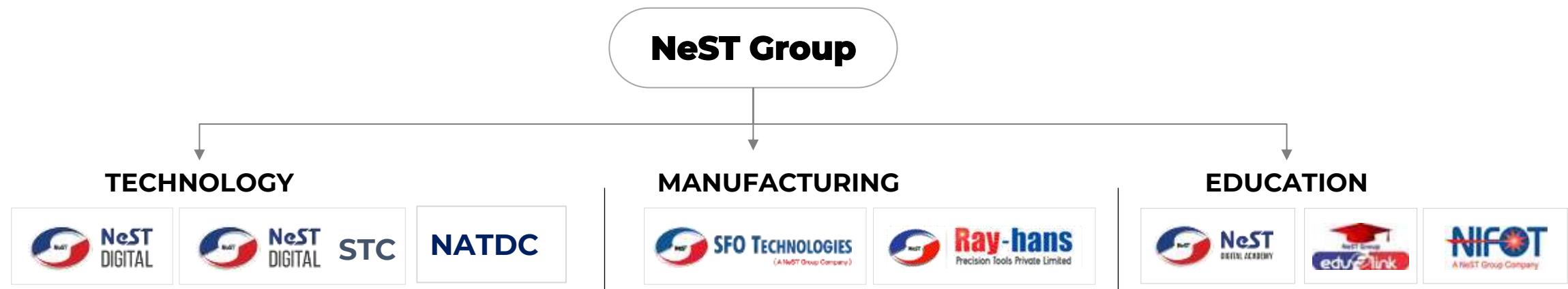
About NeST Group

A **Conglomerate** with **Hardware Design, Software, & Manufacturing** under one roof

35+ years & growing in diversified industries

"Partner of Choice" for Fortune **500** clients with **8000+** Employees

15 Factories & Offices Globally, **3** Software Development Centers

Presence across **6** Locations – India, UAE, UK, US, Thailand, & Japan

60+ Original Design Manufacturing customers with "trend setting products" around the globe

NeST Group

TECHNOLOGY

NeST DIGITAL | NeST DIGITAL STC | NATDC

1000+

Software Engineers with a good mix of experienced and junior level resources

MANUFACTURING

SFO Technologies (A NeST Group Company) | Ray-hans Precision Tools Private Limited

6500+

Employees in **Manufacturing and R&D** with an average of 8+ years of experience

EDUCATION

NeST DIGITAL ACADEMY | edueLink | NIFOT A NeST Group Company

100+

Trainers & support staffs with industry experience, who provide mentorship & guidance to the trainees based on real world scenarios

About NeST Digital

15+ Years

NeST Technology (V1.0)

Started in Techno park Trivandrum, with focus on traditional IT & technology solutions

5+ Years

NeST Digital (V2.0)

Became NeST Digital in 2020, with focus on Digital transformation. Which grew to almost 1000+ Software engineers

60+

Global Clients – With an average of 10+ years experience with key clients in various domains

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FOCUSED VERTICALS

BFS

- Compliance & Digital Banking Solutions
- UAE National Payment Systems Strategy (NPSS)
- SWIFT Messaging and Messaging Translator Services
- ISO 20022 messaging

GIS

- Enterprise GIS Implementations
- Geospatial Services for Utility Domain
- Facilities Management
- Risk & Disaster Management
- Transportation & Logistics
- Insurance Services

HEALTHCARE

- Modality application development
- Image Processing
- Clinical application development
- Wearable health monitors, diagnostics equipment, and medical robots

INDUSTRIAL & MANUFACTURING

- IoT Data Management
- Machine Monitoring
- Automation & Predictive Maintenance
- Early Warning System

MOBILITY

- Vehicle Electronics
- Digital Cockpits
- ADAS
- Electrification
- Telematics

AEROSPACE & DEFENSE

- Flight Data Analytics
- Safety Systems
- Avionics Hardware & Embedded Software
- Engine Health Monitoring

Global Presence

INDIA

- Offshore centres with presence in 4 locations (Kochi, Trivandrum, Bengaluru, & Pune)
- Abundant talent with competitive pricing
- Software centres & R&D
- Industrial, Automobiles, Banking, & Healthcare

JAPAN

- Manufacturing & R&D
- Focused on Industrial & Automobile domains

UAE

- One of the leading digital partner for the Banks in UAE
- Core focus on Banking & Digital Payments

THAILAND

Catering to clients in Industrial domain

UK

Catering to clients in Automobile domain

US

Working with top clients in Insurance, GIS, Industrial & Automobile domain

Service Delivery Centres

NeST Tech Park, Edachira, Cochin

NeST Towers, Kalamasserry, Cochin

Software Centre @ Infopark, Cochin

Software Centre @ Technopark, Thiruvananthapuram

Prestige Santiniketan (Bengaluru)

Corporate Office (Kochi)

Manufacturing (Ayutthaya, Thailand)

Manufacturing (Los Angeles, USA)

Manufacturing (Bengaluru)

Manufacturing (Pune)

Hardware & Software R&D (Trivandrum)

Key Customers

HEALTHCARE

GE HealthCare · Baxter · stryker
SIEMENS · Dräger · ZEISS
SAMSUNG · PHILIPS · FUJIFILM

INDUSTRIAL

THALES · Michael Baker INTERNATIONAL
Baker Hughes · MITSUBISHI ELECTRIC Changes for the Better
HITACHI · Telemecanique
ABB

MOBILITY

DENSO · KOSTAL · YAZAKI
RENAULT NISSAN MITSUBISHI · Wabtec CORPORATION

BANKING

Commercial Bank of Dubai · reem finance
Dubai Islamic Bank · ADIB · مصرف أبوظبي الإسلامي
BARCLAYS · ARAB BANK Success is a journey
INTESA SANPAOLO

INSURANCE

Verisk Analytics SERVE | ADD VALUE | INNOVATE · Seibels Insurance Technology & Services
BriteCore · Xactware A Verisk Business
ISO · IDP

GIS

PSOMAS · CALIFORNIA WATER SERVICE · ONIC
DataTrace · MAPTECH · FRI
NEXUS WATER GROUP · CenterPoint Energy · KNOWESIS

Quality Credentials

CMMI V2.0 ML5

ISO 27001:2013

ISO 26262:2011

ISO 9001:2015

CEMILAC

ISO 13485:2016

IETF 16949

AS9100 D

NeST Digital Confidential
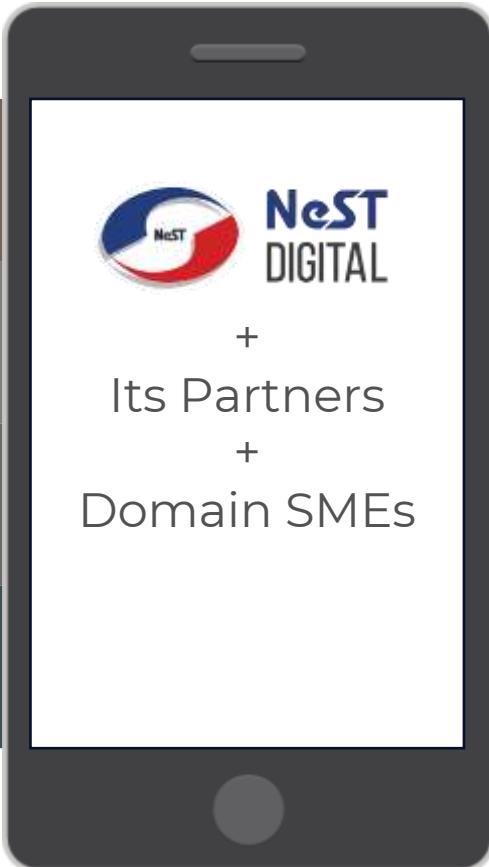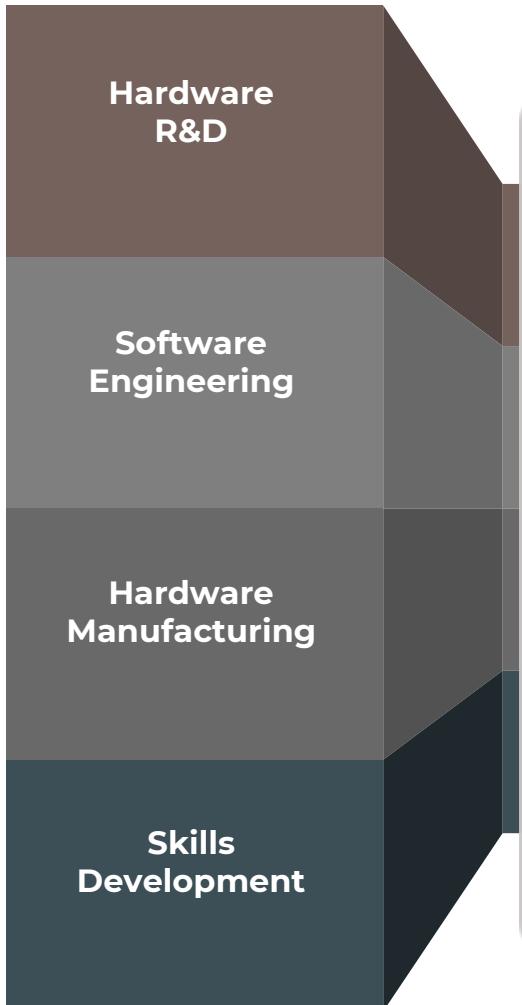
MedTech Capabilities

One Stop Solution Provider for MedTech

Hardware R&D

Software Engineering

Hardware Manufacturing

Skills Development

NeST DIGITAL
+
Its Partners
+
Domain SMEs

Access to hardware design labs
RESEARCH, DESIGN AND PROOF-OF-CONCEPT

Access to software services
END-TO-END SOFTWARE DESIGN, DEVELOPMENT & IMPLEMENTATION

Access to manufacturing facilities
LARGE SCALE PRODUCTION LINE AS PER YOUR REQUIREMENT

Access to skills development
CUSTOMIZED SKILLS DEVELOPMENT FOR YOU AND FOR YOUR CUSTOMERS

Product Development
Projects & Research
Techno-Clinical Consultancy
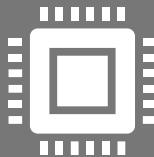
Our Services

Hardware Design

Advanced technology projects & build-to-spec solutions delivered to Fortune 500 companies on :-
- Electronics Design
- Power Electronics Design
- Industrial Design
- Photonics Design
- Mechanical Design

Software Services

Assessed at CMMI Dev v2.0/5 maturity level and a slew of ISO certifications that help us deliver world-class software solutions & services in :-

Firmware
Application Software
Embedded Software
Systems Integration
Enterprise Solutions
Digital Technologies

Manufacturing

World-class vertically integrated manufacturing facilities with capabilities in :-
Digital Electronics
Power Supplies, RF & Wireless
Tooling, Optronics, Magnetics
Cable & Wire harness, Stamping, Sheet metal fabrication,
Plastic molding, Machining, Relays
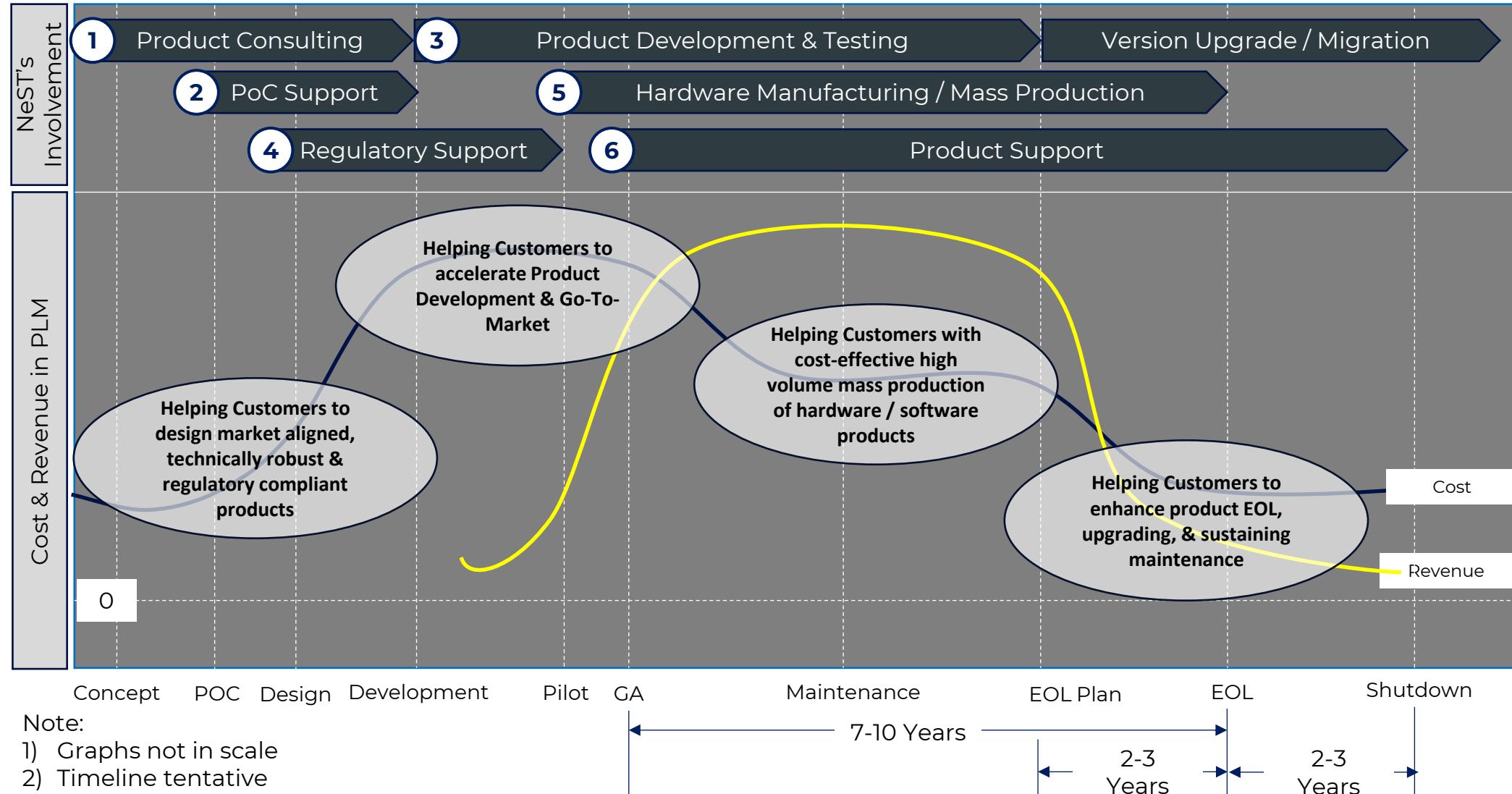
Training
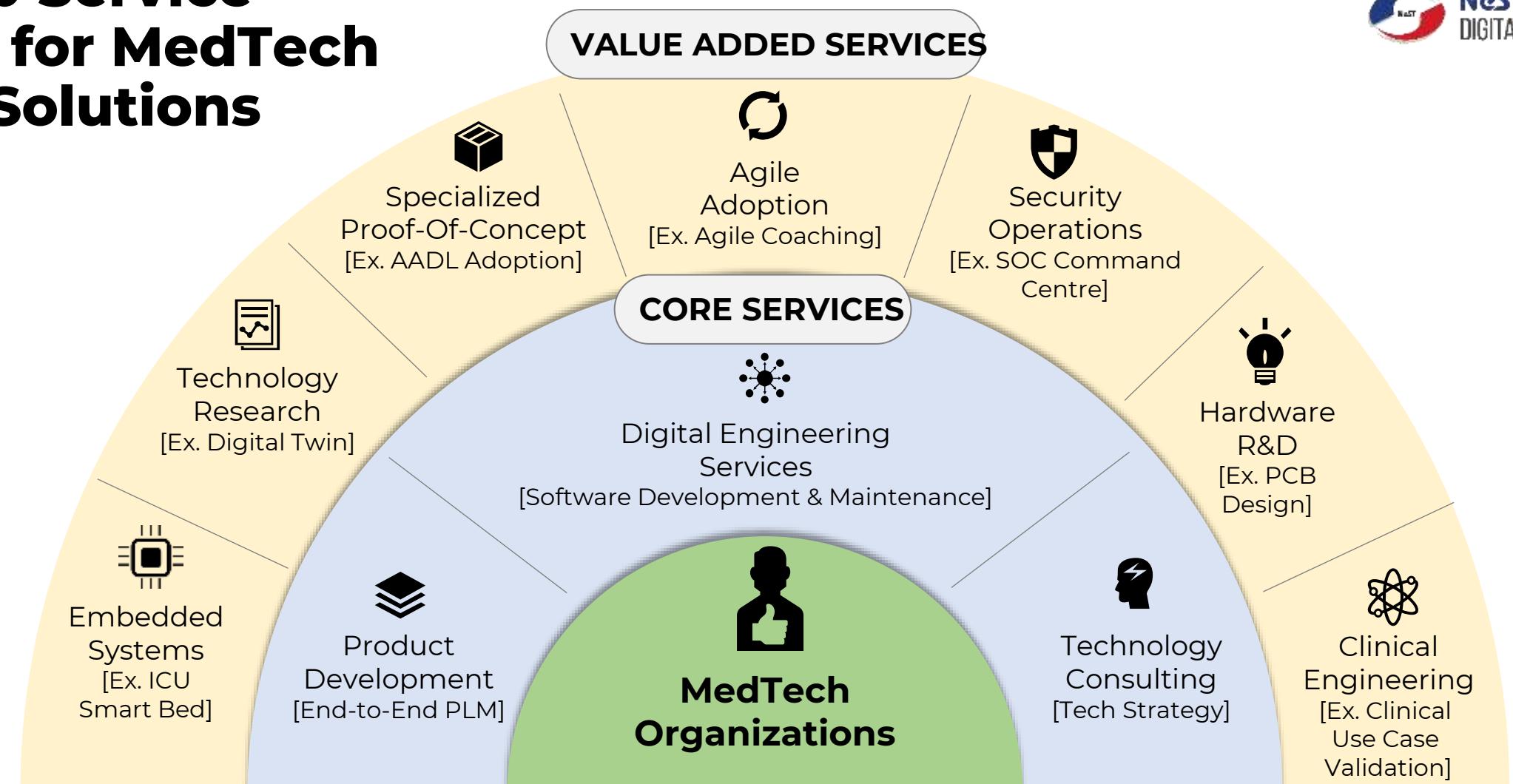
Customized skills development:-
Campus Connect (Internships, Certifications, Hackathons)
Training (Technology, Domain, Process & Soft Skills)
On-the-jobs (Projects, POCs)

NeST Digital Engagement in Medical Device Product Life Cycle

One-Stop Service Provider for MedTech & Allied Solutions

VALUE ADDED SERVICES

Specialized Proof-Of-Concept
[Ex. AADL Adoption]

Agile Adoption
[Ex. Agile Coaching]

Security Operations
[Ex. SOC Command Centre]

Technology Research
[Ex. Digital Twin]

CORE SERVICES

Digital Engineering Services
[Software Development & Maintenance]

Hardware R&D
[Ex. PCB Design]

Embedded Systems
[Ex. ICU Smart Bed]

Product Development
[End-to-End PLM]

MedTech Organizations

Technology Consulting
[Tech Strategy]

Clinical Engineering
[Ex. Clinical Use Case Validation]

Software Development	Quality Management	Risk Management	Safety Management	Information Security
IEC 62304	ISO 13485	ISO 9001	ISO 14971	IEC 60601	ISO 27001	SOC2
	CMMI L5			

MedTech Product Incubation Support

RESEACRH & DEVELOPMENT

Product Engineering

Clinical Validation

Regulatory Consulting

PRODUCTION & DISTRIBUTION

Access to Manufacturing

Access to Supply-Chain

SALES & MARKETING

Access To Marketing Support

Access to Joint GTM

ENTERPRISE OPERATIONS

Space for Lab Setup

Software Capabilities

Software Capabilities

DOMAIN

Digital Expertise
- Software Modernization
- IoT & Data Engineering
- Cloud Solutions

Imaging Solutions
- Enterprise Applications
- Viewers & Workstations
- Patient Management Systems

Interoperability
- Medical Equipment interface/data integration
- DICOM, HL7, FHIR Integrations
- EMR integrations

Device Development
- Firmware prototyping, design and development
- Middleware to Embedded applications
- Porting & Customizations

OFFERINGS

End to end automation test support, BDD, Automated UI testing, API testing, Performance/Scalability testing, Compatibility testing, Localization Testing

Analyze, Build, Orchestrate, Test and Deployment tasks. Implement CI/CD across various applications. Design and implement DevOps best practices. Support migration projects.

Penetration Testing, Vulnerability scanning and management, Static Application Security Test (SAST), Dynamic Application Security Test (DAST), HIPAA Compliance

Design, Development and Manufacturing process in compliance with ISO 13485:2016. Software development life cycle based on IEC 62304. Risk Management as per ISO 14971

PRACTICE & FRAMEWORK

SAFe Agile Practices

Multiple Engagement Models

Quality Management

After Market services

Technology Certifications @ NeST

Digital Expertise

Software Modernization

- Rewriting, re-architecting, porting of software from a legacy architecture
- Modernize Components (frameworks, database, technology)
- Microservices migration
- Cloud Transformation
- End to end automation using CI/CD
- Rich User Experience.
- Fast Development Cycle.

Cloud Solutions

- Cloud enabling & migration
- Cloud infra design and support
- Enterprise Transformation
- Next-generation architecture
- Data encryption and de-identification
- Identity-centric security & secrets management
- Privileged access management

IoT & Data Engineering

- Designing of Scalable IoT Infrastructure on public or hybrid clouds (Security, Performance, Geo Distribution)
- Monitoring and Management of Infrastructure for scalability, versioning, patches security etc.
- Formulate and document the data architecture, data governance, and data solutions
- End-to-end data management capabilities
- IoT Device Management solutions.
- Real time data streaming to cloud
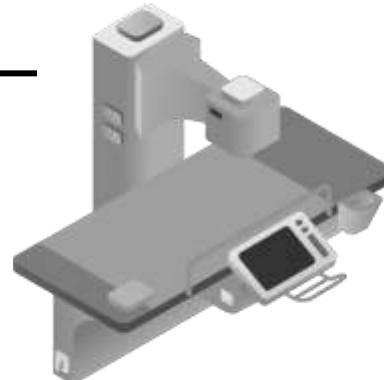
Imaging Solutions

X-Ray & Digital Radiography

- Fluoroscopy Workflow
- C-ARM dual monitor image viewer with advanced image processor unit
- Responsive multi-touch GUI application for X-Ray system.
- Image Enhancements
- X-ray calibration and hardware self-servicing features
- Intelligent measurement and annotation capabilities
- Subtraction and road mapping
- Structural Dose report generation
- Post Processing
  - Quick annotation support
  - USB Print / Export
- Adjustments, calibrations and hardware self-servicing features

CT

- Fusion of non-enhanced CT image and contrast agent applied CT with the help of registration algorithm (interfacing and implementation of customer provided algorithm)
- Annotations and Measurements
- Zoom/Pan, Punching, and manual alignments of datasets.
- Image Smoothening
- Windowing(Histogram based) on DICOM images

Ultrasound

- Filter Implementation
  - Spatial Filters (2D/3D)
  - Diffusion based filters
  - Wavelet based filters
- Ultrasound Cardiac Workstation
- Ultrasound Modality Machine Maintenance
- Structured reporting implementation.
- Biopsy Application for Ultrasound
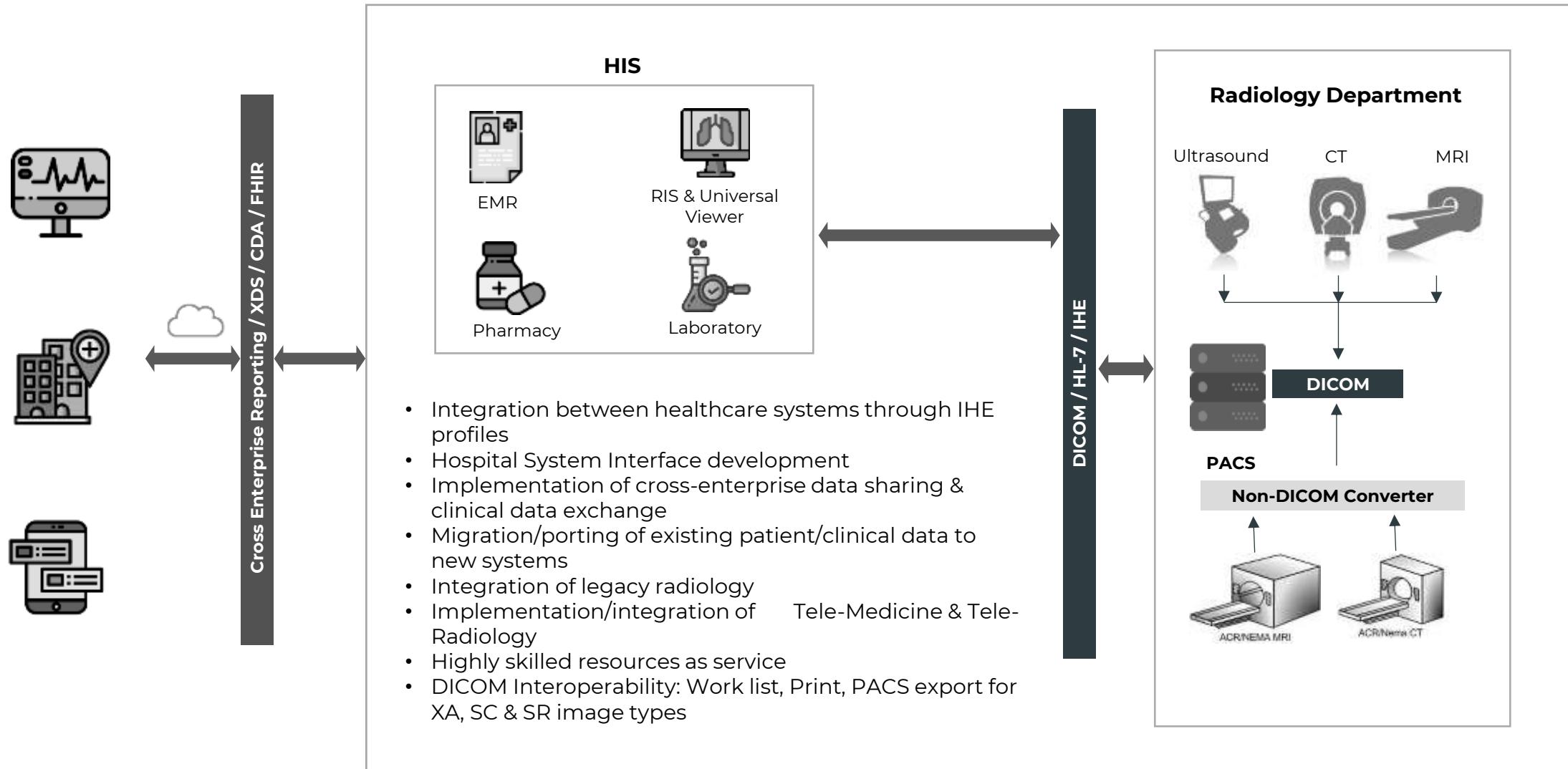
MR

- Scalp Removal And Cerebrum Segmentation
- FCD Analysis
- Image processing operations
- 3D Visualization Expertise

Interoperability

HIS

- EMR
- RIS & Universal Viewer
- Pharmacy
- Laboratory

Cross Enterprise Reporting / XDS / CDA / FHIR

DICOM / HL-7 / IHE

Radiology Department

- Ultrasound
- CT
- MRI

DICOM

PACS

Non-DICOM Converter

- ACR/NEMA MRI
- ACR/Nema CT

- Integration between healthcare systems through IHE profiles
- Hospital System Interface development
- Implementation of cross-enterprise data sharing & clinical data exchange
- Migration/porting of existing patient/clinical data to new systems
- Integration of legacy radiology
- Implementation/integration of   Tele-Medicine & Tele-Radiology
- Highly skilled resources as service
- DICOM Interoperability: Work list, Print, PACS export for XA, SC & SR image types

Device Development

Embedded Development

- Embedded application development
- Embedded HMI & User Interface design and development
- MCU based core firmware applications
- Device driver development / customization or porting for low end RTOS
- Integration of Wi-Fi, BT, BLE, ZigBee drivers
- Embedded Linux Kernel and Boot loader customization
- Schematic preparation, Component selection and BOM optimization.
- PCB Design, Fab & assembly
- Board Bring-up
- Test code development, Power-Up and sanity testing of boards and board V&V.

Product Consultation and optimization
- Product realization
- Identify suitable platform and tech-stack
- Finalize the optimal deployment model

Design Development and Test
- Design and develop scalable applications on top of IOT Infrastructure on cloud.
- Perform functional testing along with Load testing and performance monitoring
- Migrate existing Systems to IOT Infrastructure like AWS, Azure etc.

User Experience
- Review and design UI and other user interface touch points
- Wearables, hand held apps and HMI interface

Security and Compliance
- Identify and implement the requirement for security, encryption and authentication
- Ensure regulatory compliance
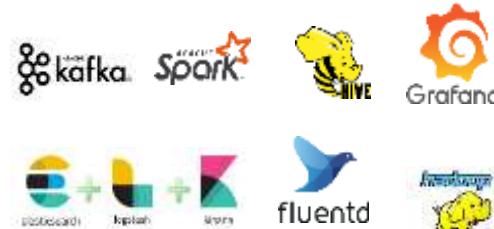
Technology Stack Expertise

Full Stack - Cloud

HTML5, ANGULAR, React, node JS, express, mongoDB, {REST}, Spring Boot, Azure Cosmos DB, MySQL, Azure, aws, Google Cloud Platform

Data Solutions

kafka, Spark, Hive, Grafana, elasticsearch, logstash, kibana, fluentd, Hadoop

Device - Embedded Application

Qt, QML, C, C++, NXP, Phytech, timesys, yocto LINUX, TEXAS INSTRUMENTS, Atmel, MICROCHIP, QUECTEL, maxim integrated, InvenSense

Automation Testing

qTest, QTP, Se, specflow cucumber for .net, APACHE JMeter, cucumber, JASMINE, JUnit, nunit, Auton, Azure Test Plans

CI/CD

Jenkins, docker, kubernetes, GitHub, GitLab, HELM, Terraform, ANSIBLE

Interoperability

DICOM, HL7, FHIR

Communication - IOT

Bluetooth, LoRa, WiFi, MQTT.ORG, BLE, RFID, EtherNet, ZigBee, NFC, NB-IoT, 2G, 4G LTE

Cyber Security

sonarQube, BurpSuite, Flawfinder Finds vulnerabilities in C/C++ source code, NMAP, OpenVAS

Software Consulting & Research

Enhancing your Healthcare product and services value multi-fold through technology collaboration

Technology Consulting Unit Of NeST Digital

Centralized & works with all Business Units

Contains a team of experts from multiple technology domains

Provide services to multiple industry verticals

Single point of contact to solve business & technology challenges
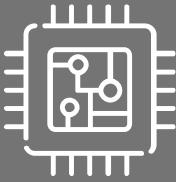
Having partnerships with Industry Experts & HR service providers to bring expertise

Pillars

Solution Consulting
Business Study & Tech Interventions
Digital Transformation Roadmap
Product Architecture / Design

Application / Integration
Custom / Embedded System Design
Platform Architecture
Technology Architecture

Secure IT & Business
Strategic Consulting
Security Assessments & Compliance
Product Security Testing & Pre-Certification

Digital Infrastructure
DevOps Consulting
Cloud Infrastructure Design
Cloud Infrastructure Security

Data for Decisions
AI System Design / Modelling
Data Consulting
Data MVPs

Offerings

Solution Consulting

Business Understanding
- Business model, products, customers, competition
- Processes, tools, people, OT, IT
- Pain points to business, imperatives for change

Business Transformation Roadmap
- Identify the problems
- Map to solution elements, including technology
- Prioritize domains for transformation

Business Outcomes
- Driven by the technology
- Unlock untapped value in the business

Application & Integration

System Design
- APIs, Components, Code

Technology Architecture
- UI, Data, Security, Test, Performance

Operations Architecture
- Deployment, RASP, Monitoring

IT Infrastructure

Cloud Infrastructure Management
- Design and implement cloud environments

Cloud Infrastructure Security
- Identify and implement security services

DevOps Consulting
- DevOps patterns and practices, cloud migration strategy, cyber security
- Container Orchestration, CI/CD, IaC and Monitoring

Data & Analytics

Data Consulting
Data Models and Catalog
Data Security & Privacy
Data Storage and Lifecycle
Data Architecture
Data Operations (DataOps)
Data lake, data lake house and mesh
Data engineering pipeline optimization

Data MVPs
Build data intelligence
Build self-service data access solutions
Build data lake house platform
Build a data discovery service

Cyber Security

Strategic Consulting
- Secure SDLC consulting
- Attack surface evaluation
- Threat Modelling, Security Risk assessment and remediation's

Security Assessments & Compliance
- Industry Standards / Certifications: ISO21434, PCI DSS, IEC-62443
- CIS Benchmarking, GDPR
- DevSecOps Design, Tooling and Implementation

Product Security Testing & Pre-Certification
- SAST, SCA, DAST, FUZZ testing, Vulnerability Assessment and Penetration Testing
- NIST 800-53, IoT Device certifications

Sustain & Grow the Business → Services Integration for Efficiency → Dynamic & Scalable Infrastructure → Data for Business Value → Secure the Business & Customer Information
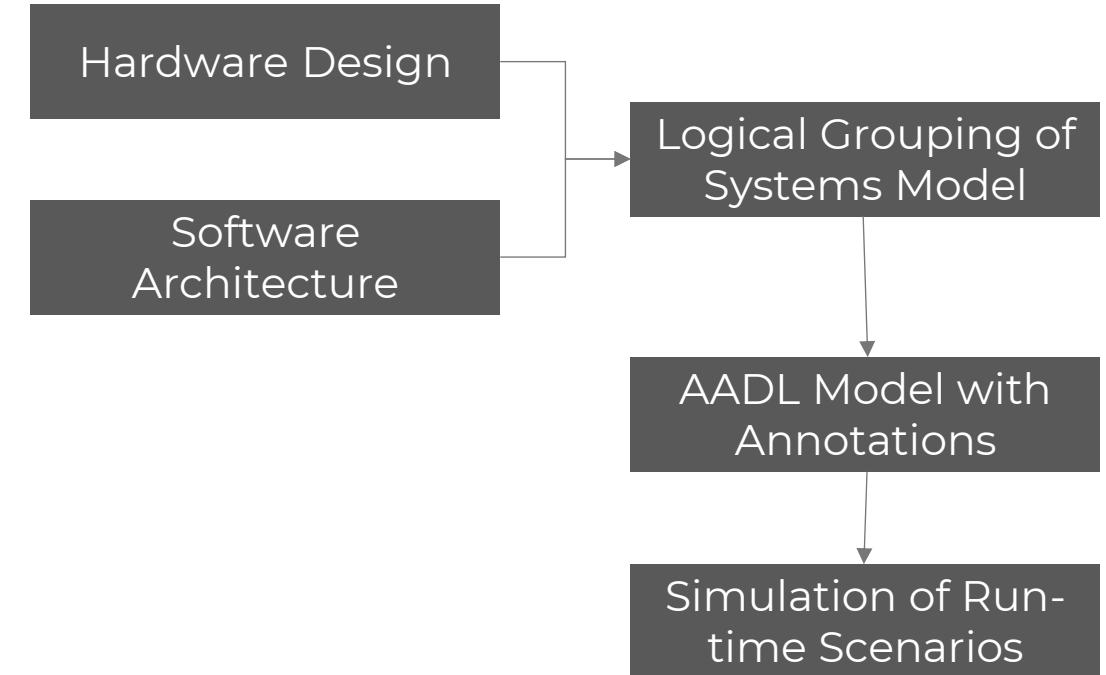
Architecture Analysis & Design Language for MedTech Device Quality Assurance

What is AADL?

- An international standard using Domain-Specific Modeling Language, to ensure performance, safety, and security.

- Widely used in automotive and aerospace for complex systems like avionics and autonomous platforms.

- Managed by the Software Engineering Institute, Carnegie Mellon University.

Role of NeST Digital

·Defines guidelines for design and analysis using Domain-Specific Modeling Language (DSML).

·Ensures performance, safety, and security in complex systems.

·Applied across industries like automotive, aerospace, and cyber-physical systems.

Approach

Focuses on system execution dynamics, covering runtime interactions of hardware and software components, with fault/error annotations in AADL models for automated safety analysis.

```
Hardware Design ─┐
                 ├─→ Logical Grouping of Systems Model
Software         ─┘              │
Architecture                     ↓
                        AADL Model with Annotations
                                 │
                                 ↓
                        Simulation of Run-time Scenarios
```

Digital Twin Framework for Industrial Devices

What is Digital Twin?
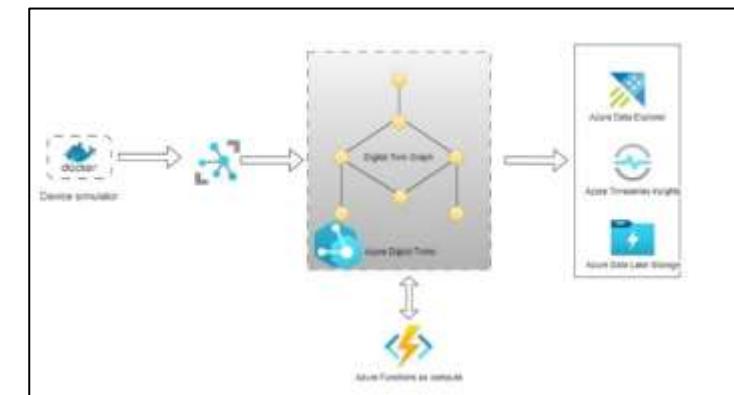
A digital replica of a real-world product, system, or process used for simulation, testing, monitoring, integration, and maintenance.

Role of NeST Digital

- Goal is to develop a digital twin for an industrial compressor to simulate its real-world behavior.

- Supports real-time monitoring, predictive maintenance, and interactive user learning to enhance user experience and extend device lifespan.

- Delivers actionable feedback to manufacturers for improving design, manufacturing, and customer support.

Approach

- Azure IoT Hub / IoT Central – Manage device communication, telemetry collection, real-time processing, and simulations.

- Azure Digital Twin – Create digital replicas of real-world compressors.

- ADLS – Store historical data for long-term access.

- Azure Data Explorer (Optional) – Perform exploratory analytics on real-time data.

- Azure Synapse & Azure ML (Optional) – Implement and run machine learning models.

Software Success Stories

X-RAY C-ARM View Station Software

OVERVIEW

- C-ARM dual monitor image viewer with advanced image processor unit

- Real-time viewing, digital image processing, and archival with low dose usage

- Responsive multi-touch supporting application GUI

- DICOM work list mode and standalone workflow mode

- Self-servicing capabilities for C-ARM

- Integration on Freescale i.mx6q multicore board

CHALLENGE
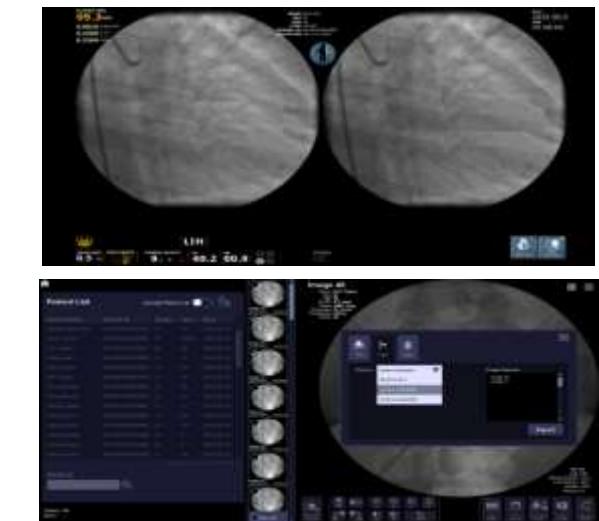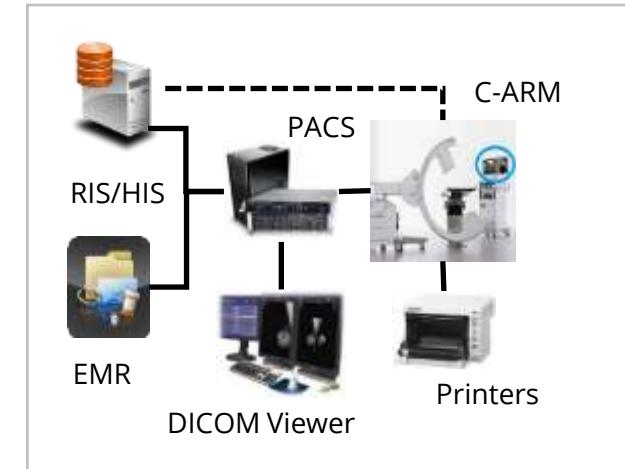
- Achieving reliable DICOM interfacing and interoperability

- Implementing XCS protocol within medical imaging systems

- Ensuring accuracy and performance in medical image processing

- Developing responsive UI under Linux for multi-touch environments

- Maintaining strict compliance with ISO 13485 and IEC 62304 standards

SOLUTION

- Intelligent measurement and annotation capabilities

- X-Ray calibration and hardware self-servicing features

- Seamless integration with hardware components

- Easy portable application software adaptable to multiple platforms

- Workflow management, data transfer, and printing support

- DICOM interoperability ensuring smooth hospital system integration

IMPACT

- Improved system reliability with hardware self-servicing capabilities

- Seamless workflow integration for both standalone and hospital networked modes

- Consistent quality through compliance with medical device standards

- Cross-platform adaptability enabling scalability and portability

X-RAY C-ARM View Station Software

Technologies

- C, C++
- QT/QML
- OpenGL
- Qtest

Tools

- QT Creator
- MergeCOM
- SQLite
- Git, SVN
- Visual Studio 2015
- SonarQube
- Lcov - Coverage
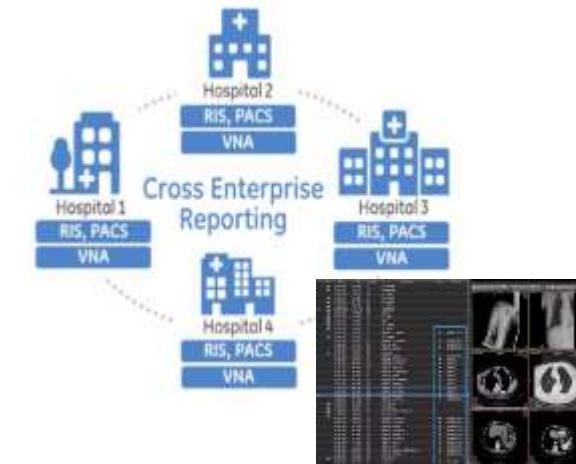
Universal Viewer

OVERVIEW

- Universal viewer with Smart Hanging

- Protocol Adaptive streaming engine for efficient image delivery

- Intelligent work allocation for radiologists

- Cross-enterprise framework supporting multi-modality image review

- Access to patient reports and comparison studies across sources

SOLUTION

- Support for Smart Hanging Protocols for efficient image display

- Adaptive streaming engine - smooth delivery of images and reports

- Advanced visualization integration with radiology client and server apps

- Intelligent prioritization of images/data

- EMR integration and remote patient data access in IHE-PIX

CHALLENGE

- Handling large volumes of radiological images and reports across enterprises

- Ensuring seamless integration with diverse imaging systems (multi-modality)

- Maintaining interoperability with EMR and IHE-PIX environments

- Managing intelligent prioritization of images/data based on user behaviour

IMPACT

- Improved radiologist productivity through

- Faster access to comparison studies

- Enhanced diagnostic accuracy with measurements on MPR and annotations

- Streamlined cross-enterprise collaboration with seamless data access

- Compliance with medical imaging standards (DICOM, EMR integration)

Universal Viewer

Technologies

- Java
- C++
- C#
- .Net
- Angular JS
- Javascript

Tools

- Eclipse
- Visual Studio 2013
- Visual Studio Code
- MergeCOM
- SQLite
- Git, SVN
- TFS
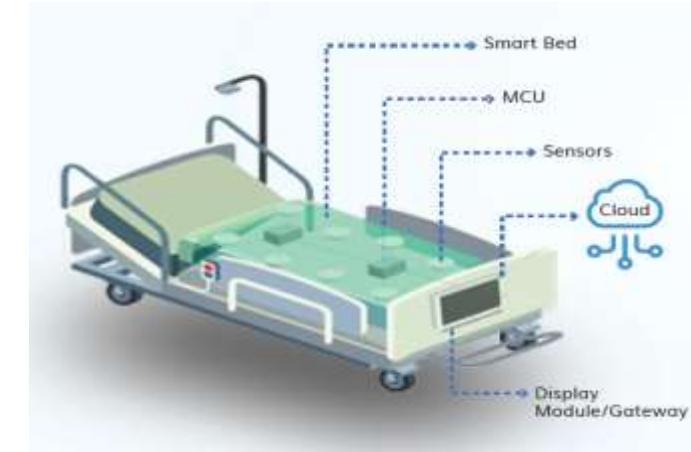
SMART ICU Bed Embedded System

OVERVIEW

- ICU Smart Bed monitors patient weight, lying position, and geo-location.

- Data transferred to cloud for analysis and ulcer detection.

- Bedside display module controls sensors, shows data, and sends it to cloud.

SOLUTION

- Embedded sensors + microcontroller + gateway in the smart bed.

- Real-time monitoring of weight and position.

- Display module shows patient data and triggers alarms.

- Gateway with NB-IoT GSM for direct cloud connectivity.

- GPS/AGPS for bed location tracking.
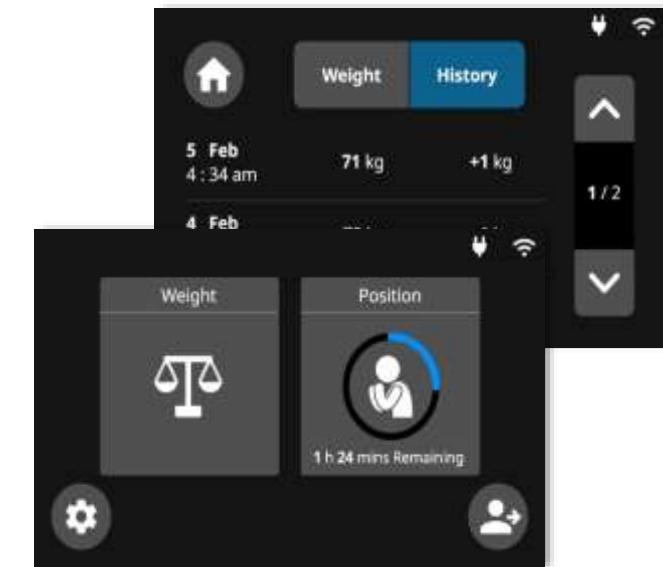
CHALLENGE

- Preventing pressure ulcers through continuous monitoring.

- Need for reliable real-time data capture and transfer.

- Integration of sensors, display, and communication in a single system

IMPACT

- Early detection of patient risks (e.g., pressure ulcers).

- Faster response through real-time alerts and notifications.

- Secure cloud-based data for advanced analysis.

- Improved ICU efficiency and patient safety

SMART ICU Bed Embedded System

Technologies

- IMX6
- STM32, BG96
- Wi-Fi 802.11 a/b/g/n
- AGPS
- HTTPS, MQTT
- Qt
- Microsoft Azure IoT SDK

ECG Device
Revamp & Gateway Integration

OVERVIEW

- ECG device with external Cardiac Gateway (CGW) transferring data to cloud.

- Requirement: integrate CGW features into the core ECG machine.

- New platform acquires, processes, displays, prints, and streams ECG data to cloud.

SOLUTION

- Legacy code porting and product realization.

- New system architecture design with acquisition module & GUI.

- Hardware + firmware application development.

- Integrated Wi-Fi driver for direct cloud connectivity.

CHALLENGE
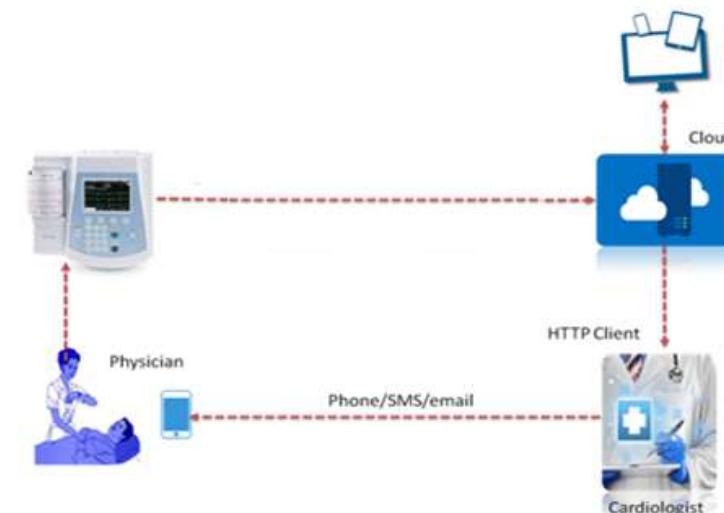
- Revamping legacy ECG system to integrate cloud and CGW features.

- Real-time acquisition, analysis, and secure transmission.

- Need for seamless hardware-software integration with high reliability.

IMPACT

- 12-lead simultaneous ECG acquisition with advanced analysis.

- Cloud-enabled ECG reporting in multiple formats.

- Compact device with touchscreen, keypad, alarms, and thermal printer.

- Enhanced usability with USB, Ethernet/Wi-Fi, GSM, and long battery life.

ECG Device

Revamp & Gateway Integration

Technologies

- Technologies
- Embedded wizard
- RTOS
- TLS1.3
- Embedded Wi-Fi stack
- HTTP, MQTT, SFTP

Tools

- Embedded wizard studio
- Git, TFS
- NXP IDE

Ventilator Display Software

OVERVIEW

- Low-cost ventilator supporting patients with Acute Respiratory Distress Syndrome (ARDS).

- High-performance UI displaying real-time ventilation data.

- Simultaneous display of 3 waveforms with audio-visual alarms.

SOLUTION

- Qt GUI design & development with UI in Linux.

- Decoupled UI and business logic for flexibility.

- Scene Graph & Rendering (OpenGL ES) for high-performance graphics.

- State machine-based workflow handling for consistent operation.

- Test-driven architecture to ensure reliability and compliance.

CHALLENGE

- Ensuring system reliability and safety under critical conditions.

- Need for robust data transfer and communication.

- Handling workflow recovery and restoration during failures.

IMPACT

- Accurate real-time monitoring with clear visualization.

- Safe and reliable operation with alerts, recovery, and rollback features.

- Scalable, service-oriented architecture enabling easy upgrades.

- Improved user experience with efficient, modern UI.

Ventilator Display Software

Technologies

- C++
- QT/QML/QtWidget
- SQL lite
- Shellscript

Tools

- QT Creator
- Git, SVN, TFS
- QTest, LCOV
- Valgrind, QML Profiler

Medical Device Data Connect

OVERVIEW

- Data Connect Solution digitizes hospital-defined protocols, care pathways, and Early Warning Scores (EWS).

- Prioritizes clinicians' attention to the most critical patient cases.

- Enables responsive, timely, and compliant care across the health system.

SOLUTION

- IoT Cloud Infrastructure & Gateway implementations for seamless data flow.

- Patient population management to proactively identify high-risk patients.

- Analytics framework for predictive and actionable insights.

- Department-level dashboards offering both high-level and drill-down views.

CHALLENGE

- Reducing time-to-intervention for high-risk patients.

- Managing large-scale patient populations with varying hospital protocols.

- Delivering actionable insights across multiple departments in real time.

IMPACT

- Faster intervention and reduced patient risk.

- Improved clinical decision-making through real-time insights.

- System-wide visibility across departments with actionable dashboards.

- Enhanced compliance and care quality through standardized protocols.
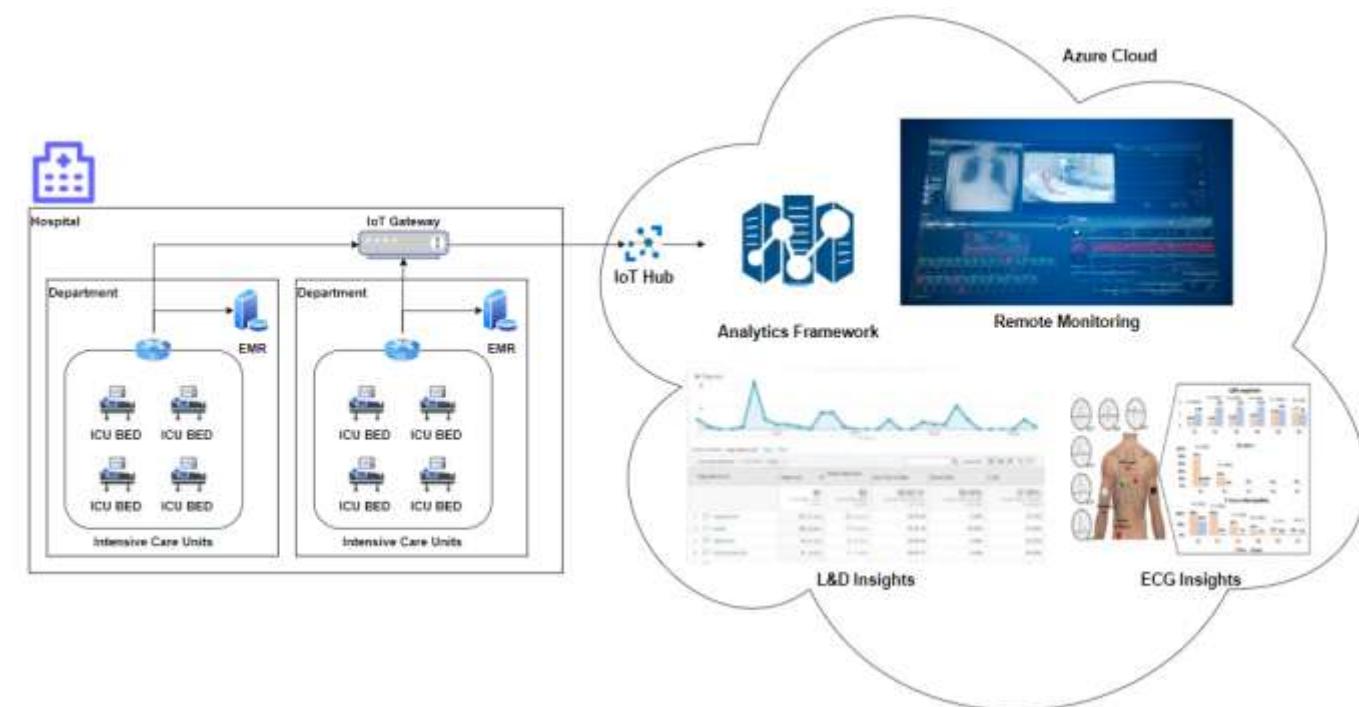
Medical Device Data Connect

Technologies

- Azure IoT, ADF, ADLS, Data bricks, Tableau
- Angular, Jasmine, Karma
- Java, Spring Boot, Selenium
- Cucumber, JBehave
- Docker, Kubernetes

Tools

- Visual Studio Code
- IntelliJ, Eclipse
- Jenkins
- SonarQube
- Lyniate Rhapsody

Medical Device Management Portal

OVERVIEW

- Customer solution to acquire clinical data from IV Pumps, Monitors, Ventilators, and Anesthesia Machines.

- Clinical gateways transform data into HL7 format and transmit in real time.

- Device Management Portal manages the device connectivity workflow.

CHALLENGE
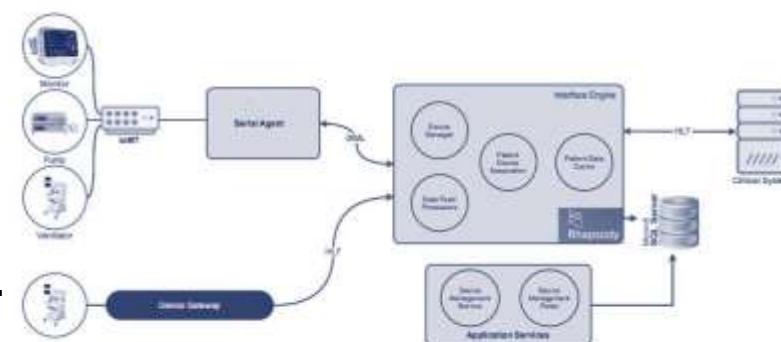
- Ensuring real-time and reliable device connectivity.

- Managing multiple devices with different protocols and connection parameters.

- Enabling secure, authorized communication for critical clinical environments.

SOLUTION

- Start & Stop serial device connections with monitoring of status.

- APIs to configure devices, locations, drivers, and ports.

- Whitelisting-based authorization for device connections.

- HL7 integration using Lyniate Rhapsody Engine.

- New feature design, coding, and unit testing.

- Verification & validation testing for releases.

- Ongoing maintenance and support.

IMPACT

- Seamless integration of diverse medical devices into hospital IT systems.

- Standardized clinical data exchange via HL7.

- Improved reliability and compliance in critical care environments.

- Sustained performance with continuous feature upgrades and support

Medical Device Management Portal

Technologies

- Angular, Jasmine, Karma
- Java, Spring Boot
- Selenium
- Cucumber, JBehave
- Docker

Tools

- Visual Studio Code
- IntelliJ, Eclipse
- Git
- Jenkins
- SonarQube
- Lyniate Rhapsody

NeST Model of Digital Twin in Healthcare

OVERVIEW

- Digital Twin: a digital replica of physical objects, processes, or systems (e.g., medical equipment, buildings, cities).

- Integrates IoT, AI, and analytics to simulate performance and outcomes.

- Real-time data generation enables predictive analysis and improved decision-making.

SOLUTION

- Development of Proof of Concept for digital twin solutions.

- Design, coding, and unit testing of digital twin models.

- Automation testing for performance and scalability.

- Verification testing for reliability in real-world scenarios.

CHALLENGE
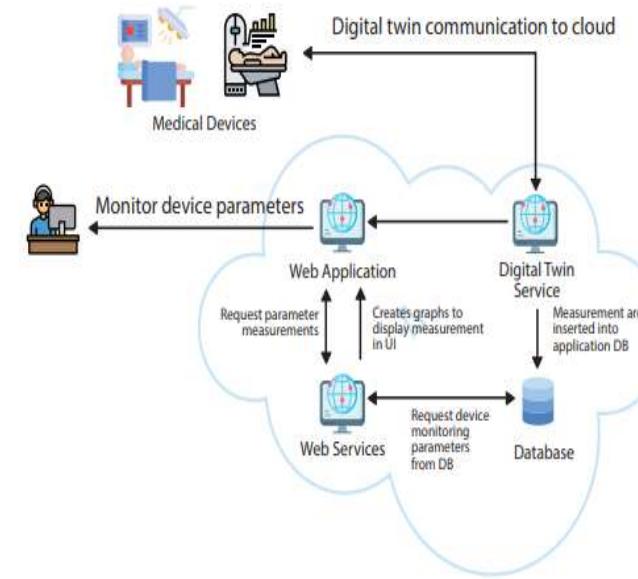
- Need to predict failures and reduce downtime in critical systems.

- High costs in healthcare and industrial maintenance.

- Limited situational awareness leading to inefficiencies.

IMPACT

- Extended life of assets and equipment through predictive insights.

- Reduced maintenance costs via preventive maintenance.

- Improved situational awareness and faster response to downtime.

- Operational efficiencies uncovered, enabling cost savings and new opportunities.

- Enhanced healthcare outcomes via personalized monitoring and predictive care.

Ambulatory Infusion Pump & Medication Delivery Software

OVERVIEW

- Small, lightweight, battery-powered infusion pump enabling patient mobility.

- Optimized for low power usage with advanced medical delivery software.

- Integrated with Master Drug Library (MDL) and EMR via Wi-Fi.

SOLUTION

- Qt-Based Workflow UI – Linux-compatible interface with customization, decoupled from business logic, and simulation support.

- BarcodeIntegration – Ensures medication safety and enables workflow automation.

- AlertSystem – Audio-visual notifications for alarms and status updates.

- SmartControl – Infusion programming (volume, dose, rate) with embedded microcontroller support.

CHALLENGE

- Need for secure and reliable infusion data integration into hospital EMR.

- Ensuring patient safety with accurate drug delivery and alerts.

- Supporting clinical workflows while maintaining usability and portability.

IMPACT

- Enhanced mobility, flexible therapy options, and optimized power usage for extended device life.

- MDL compliance and barcode-driven workflows ensure safer treatments.

- ReliableEMR integration for consistent and accurate medical records.

- Remotediagnostics, lower maintenance costs, and robust UI design.

Ambulatory Infusion Pump & Medication Delivery Software

Technologies

- C, C++
- QT/QML/QtWidget
- MQTT
- C#, Selenium

Tools

- QT Creator
- Git, SVN, Gerrit, JIRA
- Coverity

Anaesthesia Safety ECU Unit

OVERVIEW

- Anaesthesia device with an embedded Safety ECU for patient safety.

- Functions as both an integral unit and an independent safety module.

- Monitors ventilation, electrical, pneumatic, and battery parameters to keep device safe.

SOLUTION

- Implemented continuous monitoring of oxygen inlet, inspiratory/expiratory pressures, and safety valve operations.

- Real-time tracking of supply rails, sensor board voltage/current, and battery charging states.

- ·Integrated fault detection for ABV/CGO valves, blower temperature, and diver faults.

- Enabled safety pulse generation with flow-glow feedback, UART-based inter-processor communication, system log transmission, and boot loader support.

CHALLENGE

- Ensuring continuous patient safety in case of ventilation or system failures.

- Monitoring multiple parameters: pressure, flow, power rails, sensors, valves, blower temperature.

- Maintaining safe operation through reliable fault detection and alarms.

IMPACT

- Independent safety monitoring mechanisms to safeguard patients.

- Early fault detection with alarms to ensure uninterrupted performance.

- Battery monitoring and controlled charging for reliable power supply.

- Continuous safe-state assurance during anaesthesia delivery with regulatory-ready architecture and system logs.

Anaesthesia Safety ECU Unit

Technologies

- Embedded C
- Bare metal
- Google test
- Python
- I2C, SPI protocols

Tools

- MCUXpresso, PyCharm
- Git, TFS, JIRA, Bitbucket
- Docklight scripting,
- Logic analyzer
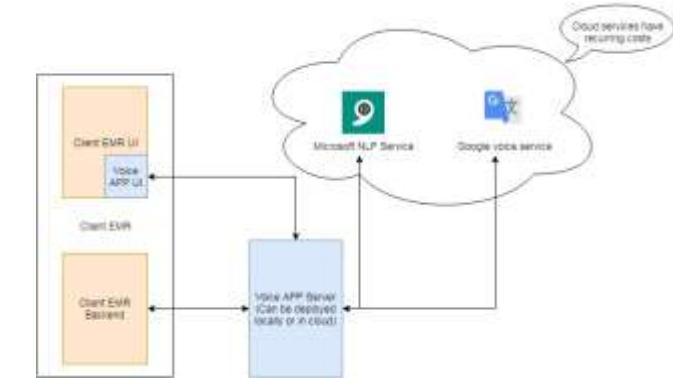
AI BOT - Virtual Assistant for Doctors

OVERVIEW

- Doctors interact with EMR mainly using keyboard and mouse.

- 35–45% of their time spent on computer screens.

- Only 30–40% of time spent directly with patients.

SOLUTION

- AI-powered, voice-enabled virtual assistant integrated with EMR.

- Uses Microsoft LUIS NLP for natural language understanding.

- Supports voice, keyboard, and mouse inputs.

- Provides intelligent e-prescription with print/fax integration.

- Designed to reduce consultation time and improve patient focus.

CHALLENGE

- Reduce EMR interaction time without compromising documentation quality.

- Support diverse clinical environments and hardware configurations.

IMPACT

- Voice interface extension for EMR increases efficiency.

- Doctors spend more time with patients and less on systems.

- Seamless workflow with multi-input support.

- Enhanced clinical efficiency with AI-driven documentation.

HIS/ EMR System

OVERVIEW

- Sophisticated Healthcare Information System (HIS) designed for multi-facility use.

- 24/7 operation ensures smooth departmental functioning and minimizes revenue loss.

- Integrates clinical, financial, and administrative sections of healthcare enterprises.

- Provides decision support tools to ease workload and improve care quality.

CHALLENGE

- Need to streamline operations across diverse healthcare departments.

- Reduce manual inefficiencies in clinical, financial, and administrative processes.

- Ensure continuous system availability to avoid workflow disruptions.

SOLUTION

- Patient Registration and Appointments modules for efficient patient flow.

- Billing & Revenue Management to reduce financial leakages.

- Pharmacy and Order Management for accurate, timely dispensing and tracking.

- Laboratory Management to handle diagnostics and reporting seamlessly.

- User-friendly interface with decision support tools for providers.

IMPACT

- Optimized healthcare practices through integration of key functions.

- Enhanced organizational performance with improved workflows.

- Reduced revenue loss via continuous operation and accurate billing.

- Better patient outcomes with streamlined registration, lab, and pharmacy processes.

Hardware Design & Manufacturing

Medical Device Manufacturing Expertise

Design, Engineering, Integration & Testing
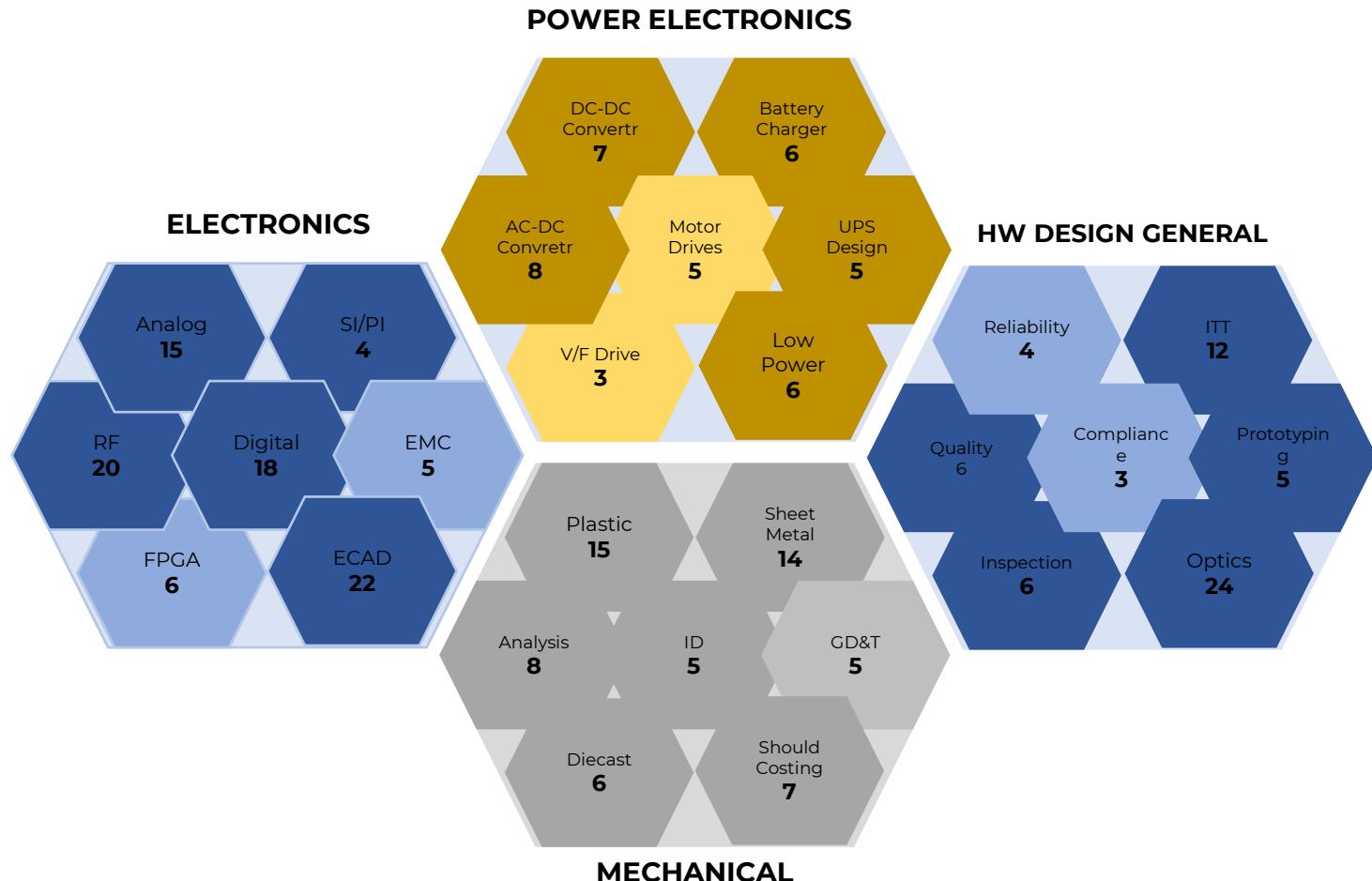
Finished Medical Device / High-Level Assembly / PCBA / Cable Harness / Sheetmetal Fab / Precision Machining / Plastics Molding / Magnetics

- **MR Coils** – HLA (PCBA / Cable Harness / Mechanical & Plastics)
- **Ultrasound Scanning Machine** – HLA / PCBA / Cable Harness / UI / Mechanical & Plastics
- **CT Subsystems** – Subsystem / HLA & Box build / PCBA / CH / Mechanical /Plastics / Machined Parts
- **ECG / Diagnostics Cardiology** – HLA / PCBA / Cable Harness / Magnetics / Mechanical & Plastics
- **LCS / Ventilator** - HLA / PCBA / Cable Harness / Sheet Metal Fab / Plastics
- **Infant Care** – PCBA / Cable Harness / Mechanical / Plastics
- **Surgery** - User Interface / PCBA / Cable Harness
- **Patient Monitoring Consoles** – PCBA & Cable Harness
- **X-Ray Equipment** – Subsystems / PCBA / Cable Harness / Mechanical
- **High Voltage Tank** – PCBA / Cable Harness / Precision Machined Parts
- **Mammography** - PCBA / Cable Harness / Precision Machined Parts
- **Nuclear Medicine & PET** – PCBA & Cable Harness / Sheet Metal Fab
- **Bioscience lab equipment** – PCBA / Cable Harness
- **Hospital Bedside Controls** – Subsystems / PCBA / Cable Harness / Mechanical & Plastics

Technical Resource Dashboard – Hardware Engineering

POWER ELECTRONICS

- DC-DC Convertr **7**
- Battery Charger **6**
- AC-DC Convretr **8**
- Motor Drives **5**
- UPS Design **5**
- V/F Drive **3**
- Low Power **6**

ELECTRONICS

- Analog **15**
- SI/PI **4**
- RF **20**
- Digital **18**
- EMC **5**
- FPGA **6**
- ECAD **22**

HW DESIGN GENERAL

- Reliability **4**
- ITT **12**
- Quality **6**
- Compliance **3**
- Prototyping **5**
- Inspection **6**
- Optics **24**

MECHANICAL

- Plastic **15**
- Sheet Metal **14**
- Analysis **8**
- ID **5**
- GD&T **5**
- Diecast **6**
- Should Costing **7**

Hardware Design : 250+

Electronics : 90	Mechanical : 60
Power Electronics : 40	

# Hardware Success Stories

Smart Hospital Bed
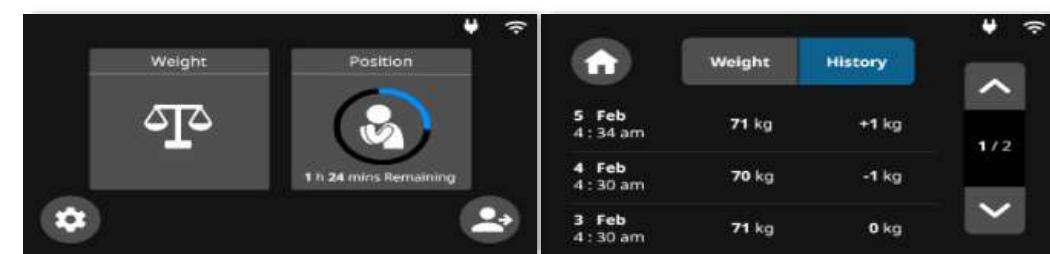
Overview – Smart hospital bed for real-time monitoring of patient weight and position, compatible with multiple hospital bed types.

- **Value Proposition**
- Customer - Global medical product company (USA)
- Multiple concept generation and PoC evaluation
- Industrial design, electronics, mechanical and software design, prototype development, verification, regulatory qualification, volume manufacturing, sustenance and support
- System with embedded sensors, a micro controller system and a Gateway to transfer the collected sensor data to the cloud
- iMX6 based solution, HTTPS, MQTT, Qt and Microsoft Azure IoT SDK
- Manufacturing of CDSCO Approved product

Max Team Size – 12
Duration – 18 months

Design and development of mid-segment ECG machine

Overview – Design & development of resting ECG machine with advanced features for real-time acquisition, processing, and display. Includes thermal printing and Wi-Fi-enabled cloud integration for seamless data sharing.

- **Value Proposition**

- Customer - Global medical product company (USA)

- Application – 12 lead resting ECG

- Replaced PSOC and FPGA with a crossover microcontroller & co-controller, adding feature and security enhancements with encrypted storage.

- Legacy code porting, architecture design, hardware/firmware development, Wi-Fi integration, and cybersecurity evaluation using Agile methodology.

- Prototype, DFM, functional/DVT testing, pre-compliance, and cost-conscious design leading to volume PCBA manufacturing.
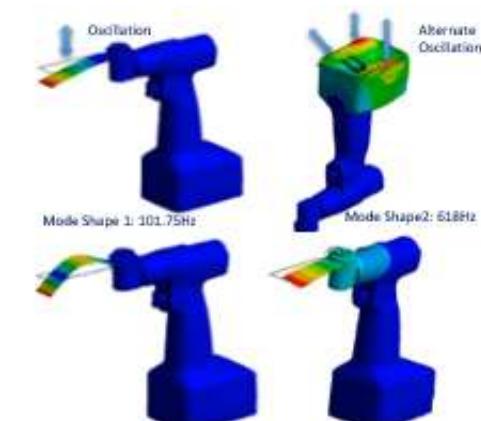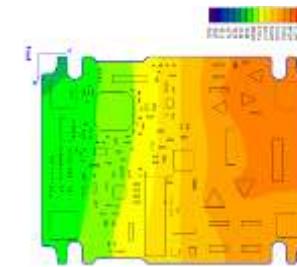
- **Max Team Size – 8**
- **Engagement Model - Turnkey development**
- **Duration – 3 years**

Cost reduction and design improvement of next generation surgical drill

Overview – Redesign of orthopaedic surgical drill to address thermal and vibration issues and achieve cost reduction for the Asian market.

- Customer – Global medical product company (USA)

- Improved design: BLDC motor, weight reduction, integrated battery management, injection molding + aluminum die-cast casing.

- Analysis: Thermal and structural reports with theoretical justification.

- Development: End-to-end industrial, hardware, and software design, prototyping, and verification.

- Status: Phase 1 demo completed; cadaver evaluation in progress.

- **Max Team Size – 8**
- **Engagement Model - Turnkey development**
- **Duration – 6 months**

Value Engineering of Telemetry Receiver and Transmitter

Overview – Mini-telemetry system for continuous wireless monitoring of maternal and foetal ECG, ultrasound, and uterine pressure, with 500m communication range across multiple frequency bands.

- Customer - Global medical product company (USA)

- PCB redesign: Retrofit assemblies, EOL component replacement, RoHS & IEC 60601-1 compliance.

- Optimization: Combined PCBs using CPLD with VHDL coding; converted linear AC-DC to SMPS module.

- Enhancements: Added gaskets/shields for EMI/EMC; resolved manufacturing and reliability issues.

- Execution: Prototyping, functional & benchmark testing, DFM, DVT, pre-compliance, and reliability testing.

- Outcome: 30% cost reduction and volume PCBA manufacturing.

- **Max Team Size – 8**
- **Engagement Model - Turnkey development**
- **Duration – 14 months**

Obsolescence Management of Printer board in Histology

Overview – Redesign of Inkjet Printer Control electronics board for life enhancement

Value Proposition

- Customer: Leading Anatomic Pathology Solutions company(Germany)

- Retrofit redesign: ~30% component replacement for EOL and RoHS compliance, firmware ported to new MCU with Azure RTOS, and updated service software.

- Complete development cycle: requirement generation, prototyping, testing (functional, benchmark, DFM, DVT, pre-compliance, reliability), and manufacturing package transfer.

- Support & sustenance: Dedicated team for mechanical, electronics, firmware, software, and V&V; includes end-of-line test fixture development.

- **Max Team Size – 7**
- **Engagement Model - Turnkey development**
- **Duration – 10 months**
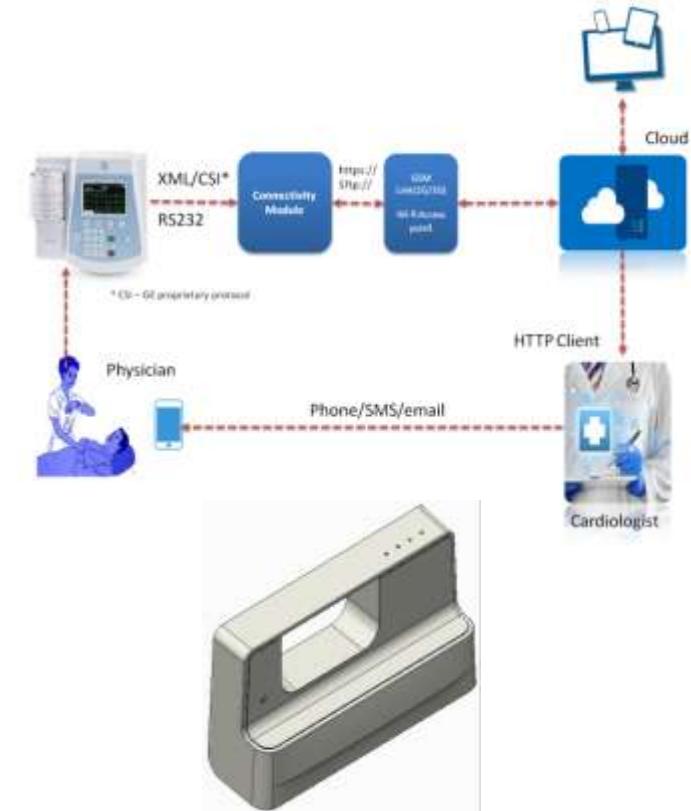
Development of Wi-Fi Dongle in Cardiology

Overview –Development of a **Wi-Fi dongle** as a **generic gateway platform** to interface with an ECG device, capturing data via **serial port** and securely transferring it to a **cloud server** for diagnostic cardiology applications.

Value Proposition

Customer - Global Medical product company headquartered in USA

- Design of WiFi Dongle without modifying the host medical device

- Hardware, Firmware, Mechanical design and development

- DFM, Prototype development, DVT, Reliability, Tooling, Compliance Testing, Product Certification and in-country testing coordination

- Volume manufacturing

- **Max Team Size – 10**
- **Engagement Model - Turnkey development**
- **Duration – 16 months**

Thermal analysis of critical care medical device
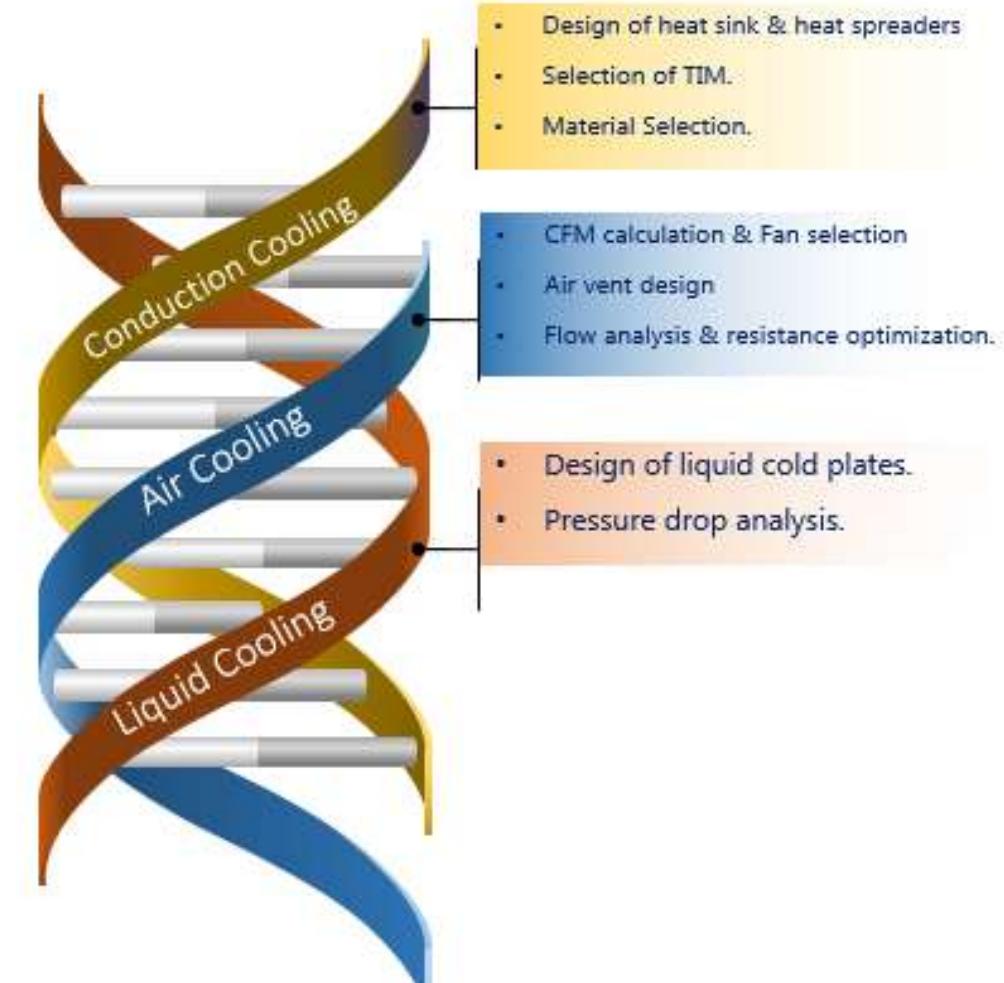
Overview –Performed thermal analysis of a critical care product to ensure reliable perfor and safety for acute patient care applications.

Value Proposition

Customer - Global Medical product company headquartered in Sweden
- Thermal analysis as an independent service
- Pre-analysis, pre-processing, Solving and optimization and post processing
- Analysis report with model defeaturing, mesh, boundary conditions and post processed details of pressure plot, velocity plot and temperature distributions, details of solver settings and recommendation for thermal improvement.

- **Max Team Size – 2**
- **Engagement Model - Turnkey development**
- **Duration – 6 months**

- Design of heat sink & heat spreaders
- Selection of TIM.
- Material Selection.

- CFM calculation & Fan selection
- Air vent design
- Flow analysis & resistance optimization.

- Design of liquid cold plates.
- Pressure drop analysis.

Conduction Cooling
Air Cooling
Liquid Cooling

Development of conceptual functional module- Integrated C Arm

Overview –PoC development of Conceptual Functional Module, of the Integrated C-Arm - developed to combine the MVS and Main C-Arm for advanced medical imaging applications.
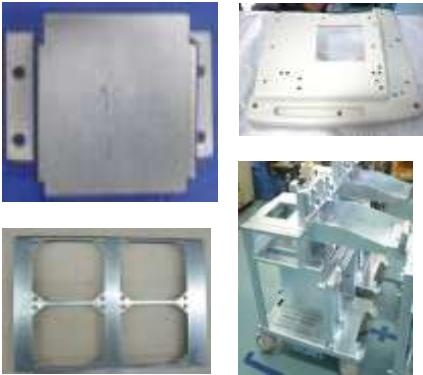
Value Proposition

• Customer - Global Medical product company headquartered in USA

• Design of PoC- Mechanical design

• Basic thermal analysis

• Development of new components as per integrated concepts

• Reuse and modification of components from existing machine

• Product integration and demonstration at customer site

• **Max Team Size – 4**
• **Engagement Model - Turnkey development**
• **Duration – 2 months**

Ultrasound Machine

Sheet Metal
Location-Bangalore

Cables
Location-Cochin

PCBAs , Power Supply & Processor
Location-Cochin

Better control on Quality & Delivery
Improved Coordination
Elimination of Profit stacking

Plastic Parts
Location-Bangalore

Over 50% of the Value of the Ultrasound Machine Manufactured In-house

High Level Assemblies
Locations- Cochin & Bangalore

X-ray Fixed & Mobile Unit

- High-Frequency generator technology with switching range from 80-250 kHz
- Near Zero leakage radiation
- 3.5 kW dual processor monoblock generator with proprietary radiation shielding technology
- Ideal for use in Neurology, Orthopaedic, Urology, Gastrointestinal, Pain management, Interventional & Peripheral Vascular Images
- Shipped Already 300 + Unit

- 32kW HF Fixed RAD System
- kVp: 40kV-125kV in steps of 1kVmA: 10mA-400mA in 17 steps mAs range: 0.32 mAs to 630 mAs in 34 steps
- Exposure Time Range: 5 ms to 5 sec.
- Integrated tube head with no bulky cables
- Rotating Anode with Dual Focal Spots
- Fully motorized Horizontal and Vertical movements
- 5 Sample by Aug 22
- Planned Capacity – 15 Units per Month

Controller for CyberKnife Robotic Radiosurgery Systems

LPDU

Rear view

MCC

E-GUN

MODULATOR

Sheet Metal
Location-
SFO Bangalore
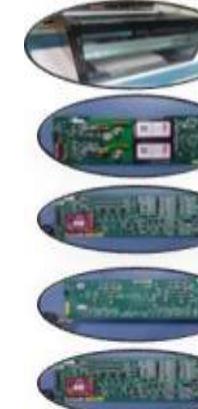
Plastic Parts
Location-
SFO Bangalore

PCBAs , Power
Supply &
System Level
Integration and
Testing

Location-SFO
Kochi

Cables
Location-SFO Kochi

Engage with NeST Digital

Engagement Models
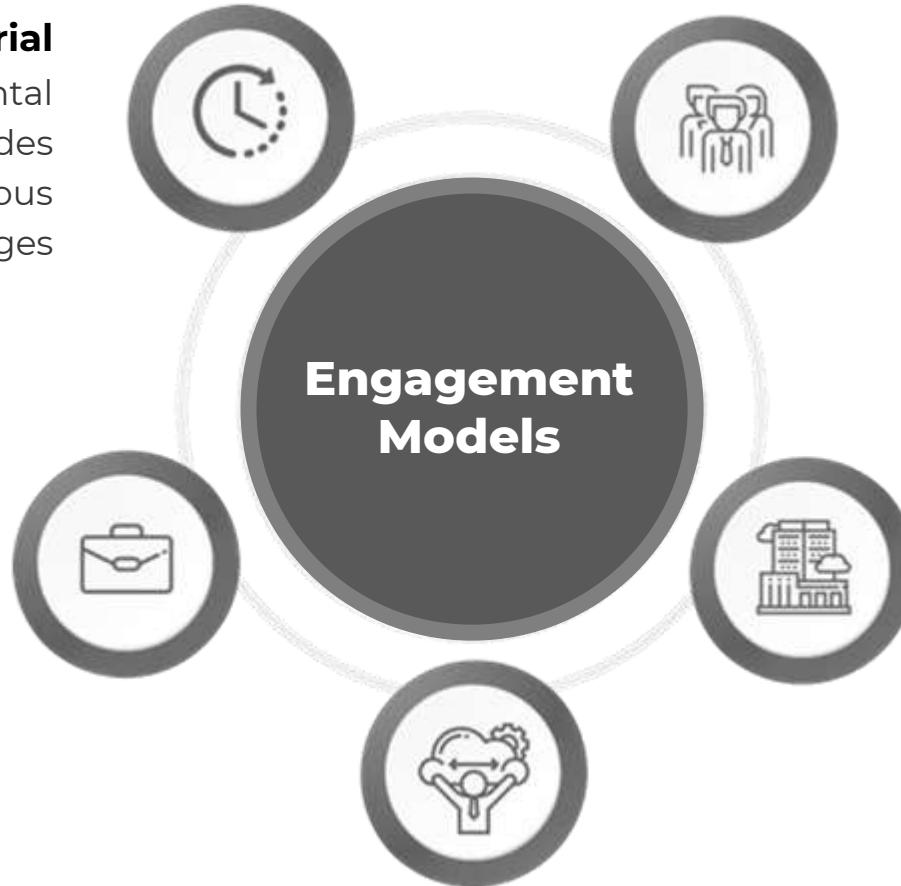
Time & Material

Best fit for iterative and incremental application development. Provides flexibility and adapt to continuous requirement changes

Staff Augmentation

Providing quality talent to our global customers, to help them achieve their business goals

Engagement Models

Fixed Price

Execute the projects on a fixed-price and billing basis. Best fit to control cost and complete the project within the budget
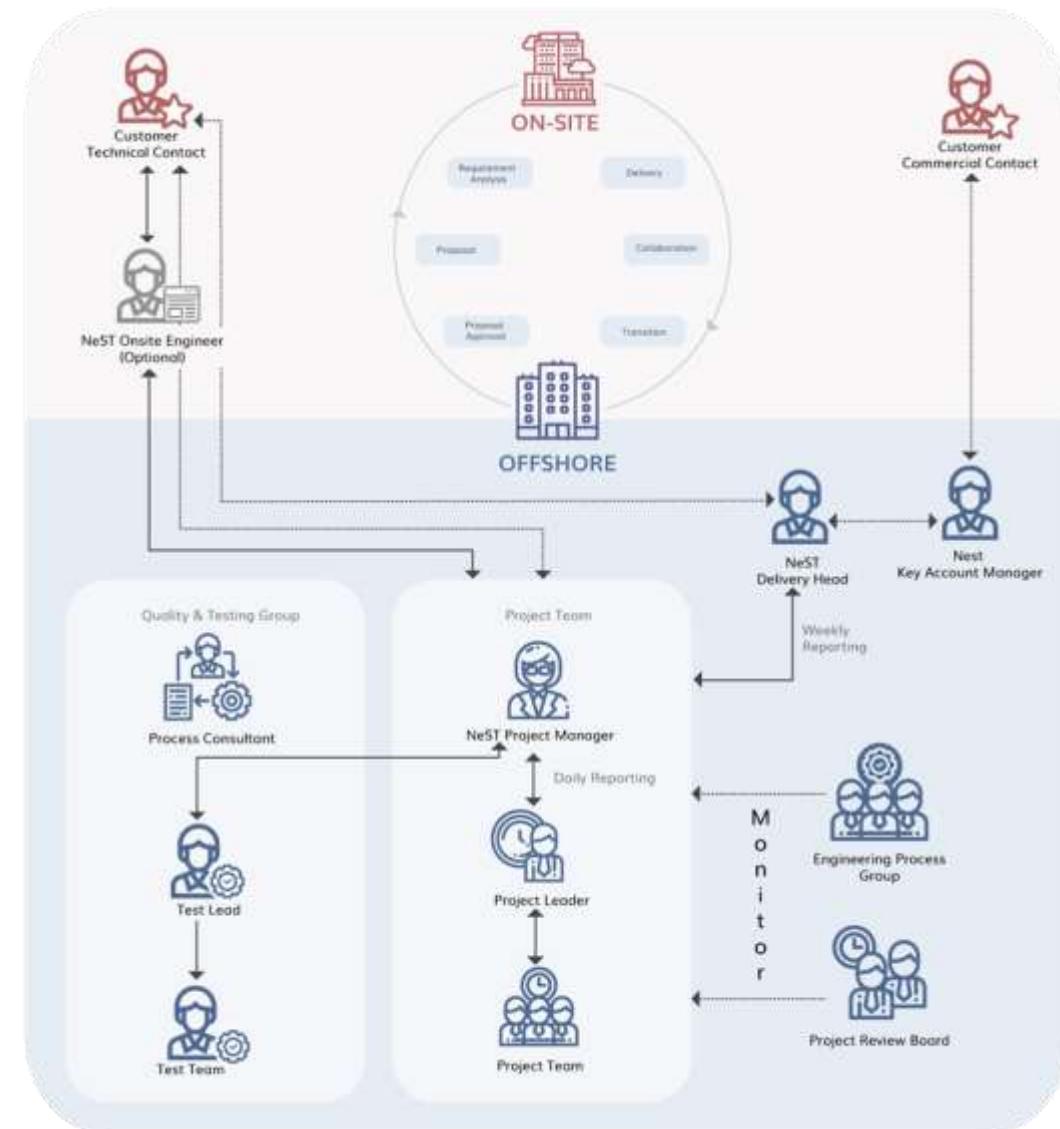
Offshore Development Center

Enables clients to quickly scale their IT infrastructure and resources in sync with market demands

Flexible

A model where risks, costs and revenue are shared among partners. Best fit for the enterprises when commercial success is targeted while keeping the risk under control.

Development Centre Model

Work Package Model				
Support (Run)		**Projects, CRs and Enhancements (Discretionary)**		**Enhancements (Non-discretionary)**
Fixed Capacity	**Flex Capacity**	**In-flight Projects**	**Planned Project**	**Capped Capacity**

Fixed Capacity- By Product
 	
Baseline
• SLA driven
• Ticket volume
• Current effort
		• Fixed annual budget
		• Planned capacity by Project
		• Y% of extensibility for high-priority business imperatives
		• Owned by Customer
		• Joint Change management committee to
		  • Priority revision for projects in the pipeline (approved by Steering committee)
		  • CRs and Enhancements
				• Effort fixed as % of Overall IT budget (3-5%)
				• Critical for launch
				• Regulatory requirements

Flex Capacity- Across all products Baseline • X% of Fixed Capacity • For enhancements less than X effort		Planned Project - Planned capacity by Project		

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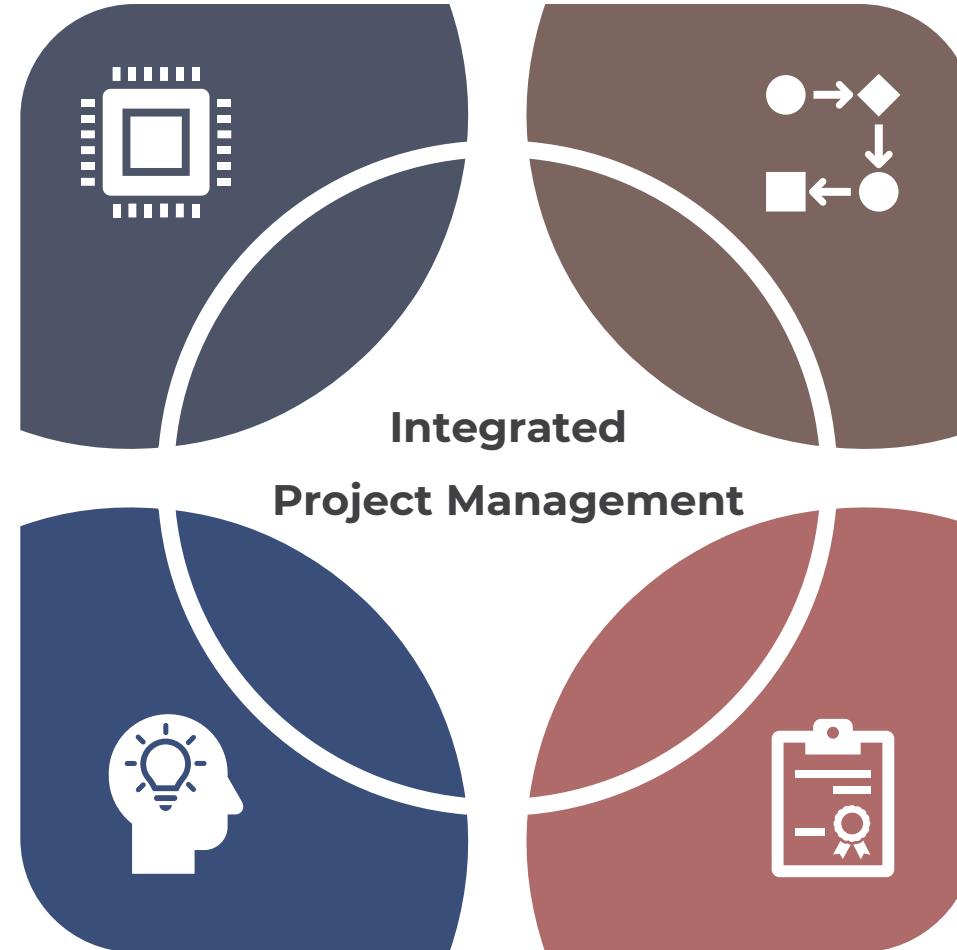
Delivery Management Standards

Technology Standards

- IEC 62304
- ISO 13485
- ISO 14971
- ISO 27001

Process Adoption

- PMI PMBoK
- ITIL
- Agile SDLC
- DevOps

Integrated Project Management

Best Practices

- Metrics Management
- Project Governance
- Risk Management
- Continuous Improvement

Quality

- CMMI
- ISO Standards

Engagement Governance Model

NeST DIGITAL

Transition

Steady State
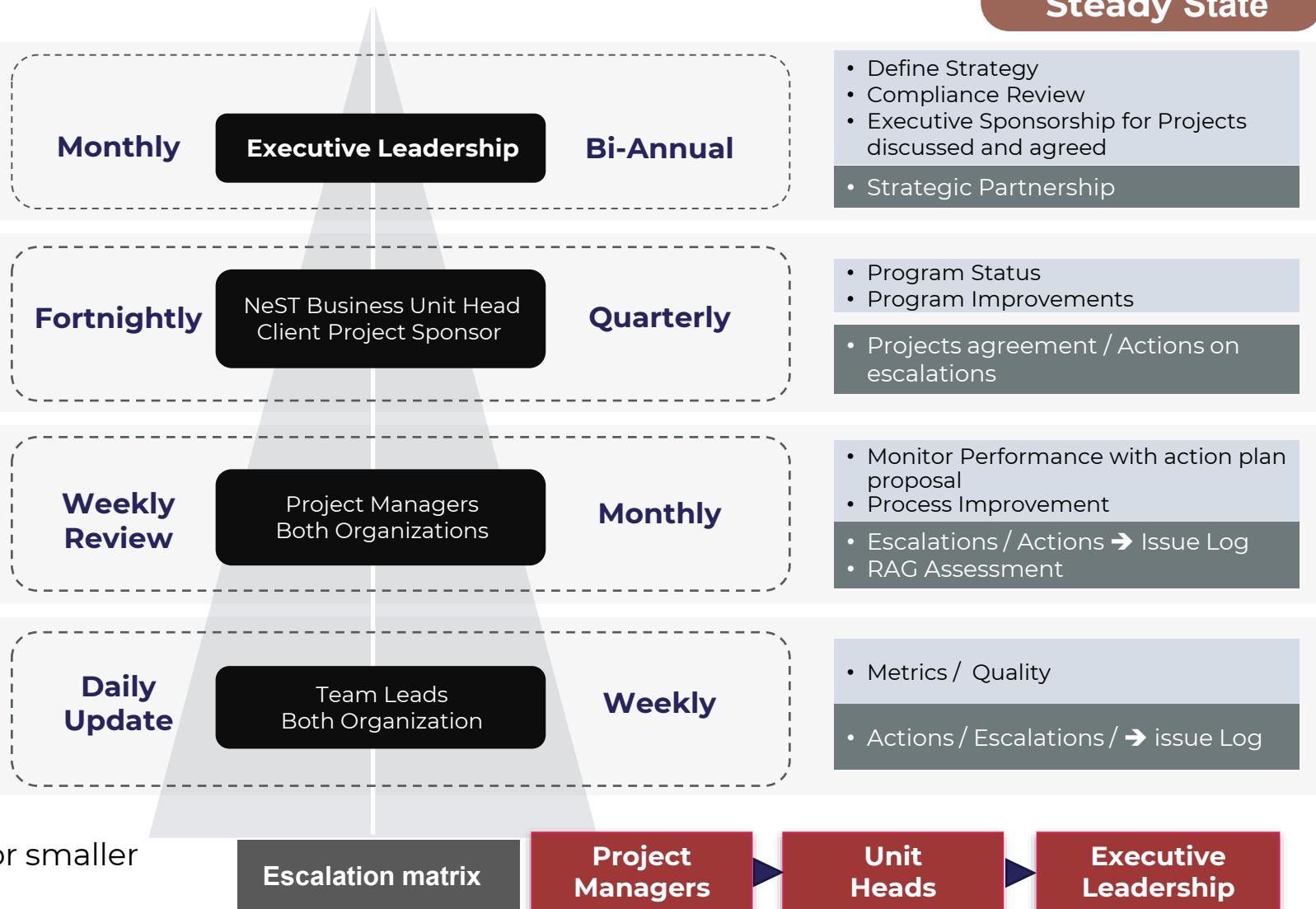
Transition	Cadence	Role	Cadence	Steady State
Monthly Pulse Check • Transition methodology and timeline • Identify risk areas and change management • Agree on milestones and toll-gate	**Monthly**	**Executive Leadership**	**Bi-Annual**	• Define Strategy • Compliance Review • Executive Sponsorship for Projects discussed and agreed • Strategic Partnership
Fortnightly Steering Committee Meeting • Review & Approve Toll Gates; Go/ No-Go; • Progress Against Plan; • Issue Resolution and Approvals	**Fortnightly**	**NeST Business Unit Head** **Client Project Sponsor**	**Quarterly**	• Program Status • Program Improvements • Projects agreement / Actions on escalations
Weekly Management Review • Review & Approve Toll Gates; Go/ No Go; • Progress Against Plan; Issue Resolution and Approvals	**Weekly Review**	**Project Managers** **Both Organizations**	**Monthly**	• Monitor Performance with action plan proposal • Process Improvement • Escalations / Actions ➔ Issue Log • RAG Assessment
Daily Execution Update • Transition Progress across all Work Streams; • Monitor Transition Process; • Approve Plan and Changes, • Transition Related Risks/ Mitigation and Issues	**Daily Update**	**Team Leads** **Both Organization**	**Weekly**	• Metrics / Quality • Actions / Escalations / ➔ issue Log

A scaled-down version to be used for smaller engagements

Escalation matrix	**Project Managers**	▶	**Unit Heads**	▶	**Executive Leadership**

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Thank You!