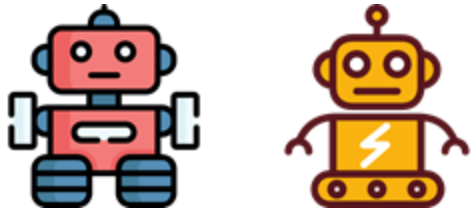
Robotics Middleware For Healthcare (RoMi-H) Empanelment Program 2025

Pre-empanelment briefing

Changi General Hospital
SingHealth

Challenges in Multi-Fleet deployments in Healthcare



Lack of interoperability

Lack of communication and integration between robots, medical devices, building infrastructure and health IT systems

Infrastructure constraints

Need to interface with lifts and doors

Dynamic environments

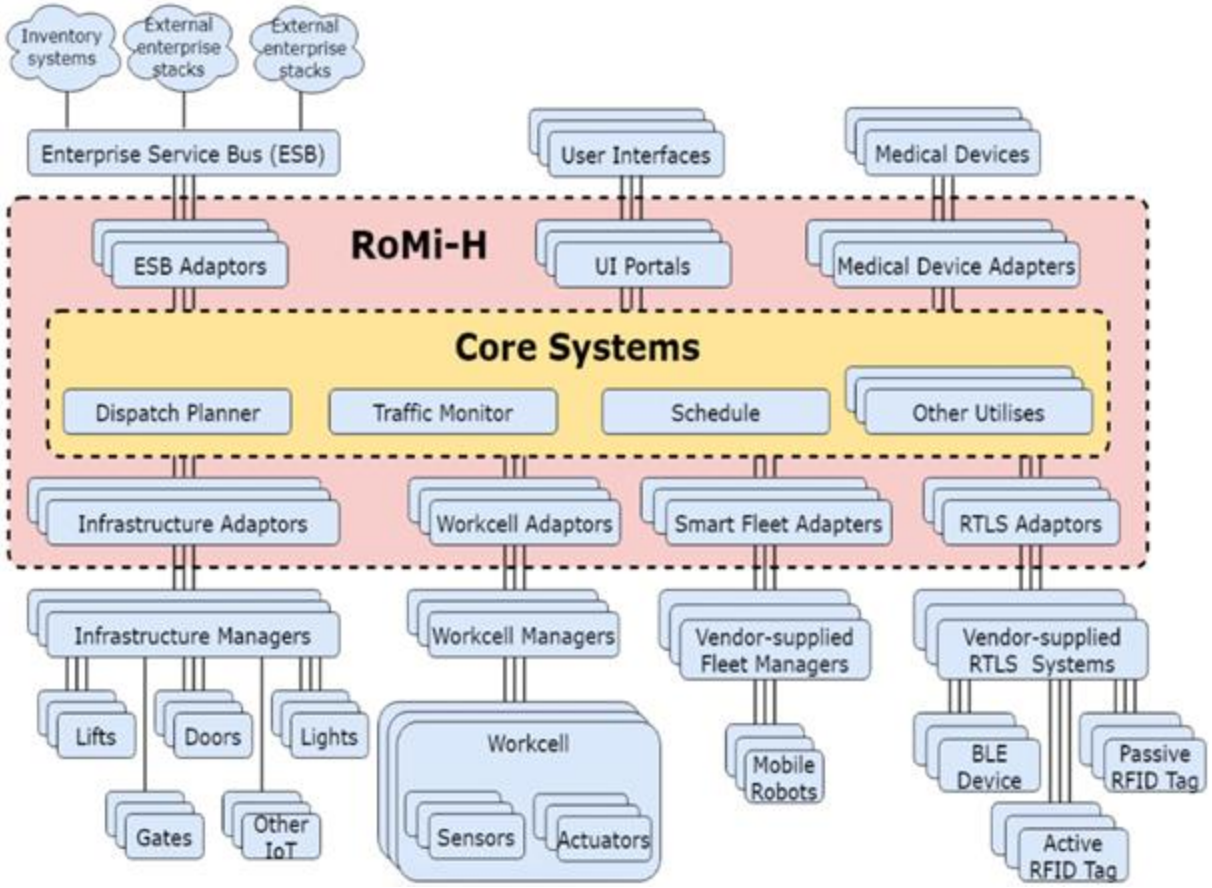
Dynamic human traffic and crowds

Cybersecurity concerns

Increased reliance on network for data transmission

What is Robotics Middleware for Healthcare (RoMi-H)

- A collection of libraries and tools that facilitates interoperability among different robotic fleets, infrastructures, sensors and automation systems
- Provides visibility of status of interconnected systems
- Adds intelligence to the overall interconnected system through resource allocation and de-conflict shared resources



RoMi-H System Integrators' role

Develop adapters (lifts, doors, fleets, and other IoT or robotic devices)

Develop application systems containing business logics based on user workflows

Develop configurable UI, visualization tools, and dashboards

Why get empaneled

- Recognised by industry (both commercial and public sectors) as RoMi-H System Integrator (SI)
- Eligibility to submit Technical Proposals as System Integrator (SI) for Robotics and Automation (R&A) implementation via RoMi-H in Public Health Institutions (PHIs)

Empanelment fees

Registration - Free

Empanelment Fees (for successful applicants/ down-selected for empanelment)

- S$2,000 (excl GST) - applicants with record of operational deployment of OpenRMF
  - S$2,180 (incl GST)
- S$4,000 (excl GST) - New SIs
  - S$4,360 (incl GST)

Invoicing of empanelment fees

Invoice will be sent to company appointed point of contact (to be provided when notified of successful down select)

- Please make payment within 30 days upon receipt of invoice
- For bank transfer/ GIRO payment/ PayNow to 'CHANGI GENERAL HOSPITAL PTE LTD co MOHH': DBS Bank Ltd Current A/C:8858021403
- Swift Code:; DBSSSGSG or PayNow UEN Proxy: 198702955E02S
- Email payment details / remittance advice to: fss.non.patient.ar@1fss.com.sg
- Interest@prime rate +3% may be levied on outstanding amounts that are due payable
- For enquiries, please email to SundryBilling@1FSS.com.sg or contact at 65114330

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Requirements of successful empaneled participant

Empanelment will be awarded to the registered company

Empaneled companies will be awarded a 2-year certification

- A full scope empanelment certification will be conducted prior to award
- Surveillance (based on partial empanelment certification scope) will be conducted in the next year post-empanelment (Certification will be revoked if knowledge / skillset is not maintained)

Responsibilities of the lead SI engineer

- A lead SI engineer (endorsed by CHART) will need to be appointed throughout the empanelment validity period
- The lead SI engineer will be responsible as the signatory and first technical check / signing off RoMi-H deployment projects
- The company will need to propose a replacement (endorsed by CHART) if the appointed lead SI engineer no longer works for the company, to continue to be qualified to sign off or submit RoMi-H related proposals

Companies that are empaneled will be required to provide a competency currency management plan within 3 months after award of empanelment certification

RoMi-H Empanelment

Objective

To assess system integrators' capabilities for possessing the required skills and level of understanding to deploy RoMi-H

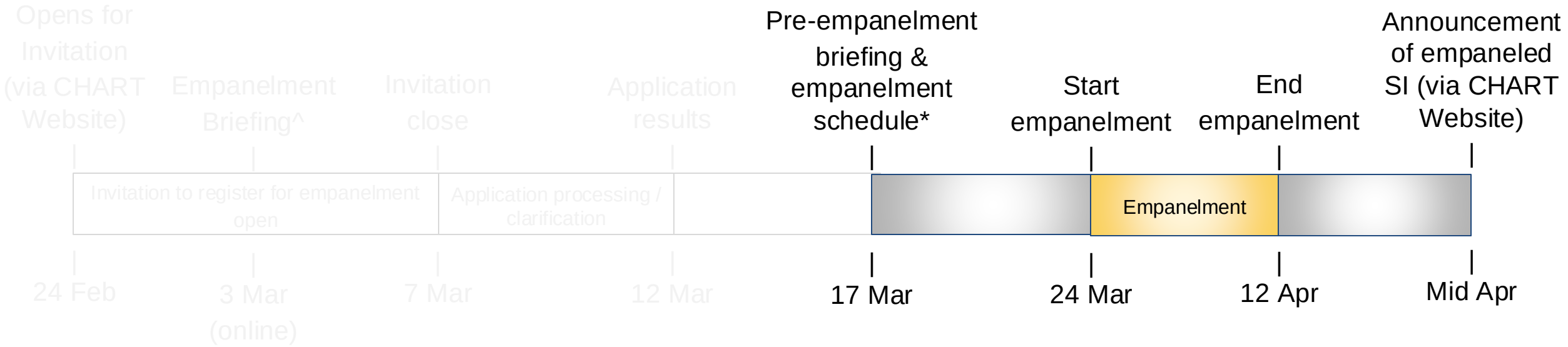
Previous empanelment

- Held in 2019 to meet 2019 Smart Nursing Ward (SNW) Open Request-For-Proposal (RFP)
- Covers very basic usage of OpenRMF(e.g. writing adapters and running an instance of OpenRMF)
- Validity of empanelment was set to be 2 years

Empanelment program 2025

To re verify existing empaneled system integrators (SIs) and to extend invitations to new SIs to be empaneled to support the ecosystem

Key dates



An email will be sent out regarding the exact dates for empanelment for each participant

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Empanelment program

For this empanelment, OpenRMF will be used as the baseline to evaluate the SIs' capability to deploy RoMi-H

Down-selection of Applicants

Applicants' relevant experiences and track records will be used to assess suitability of applicants to go to next stage

- Familiarisation with ROS and OpenRMF
- SIs with record of *operational* deployment of OpenRMF

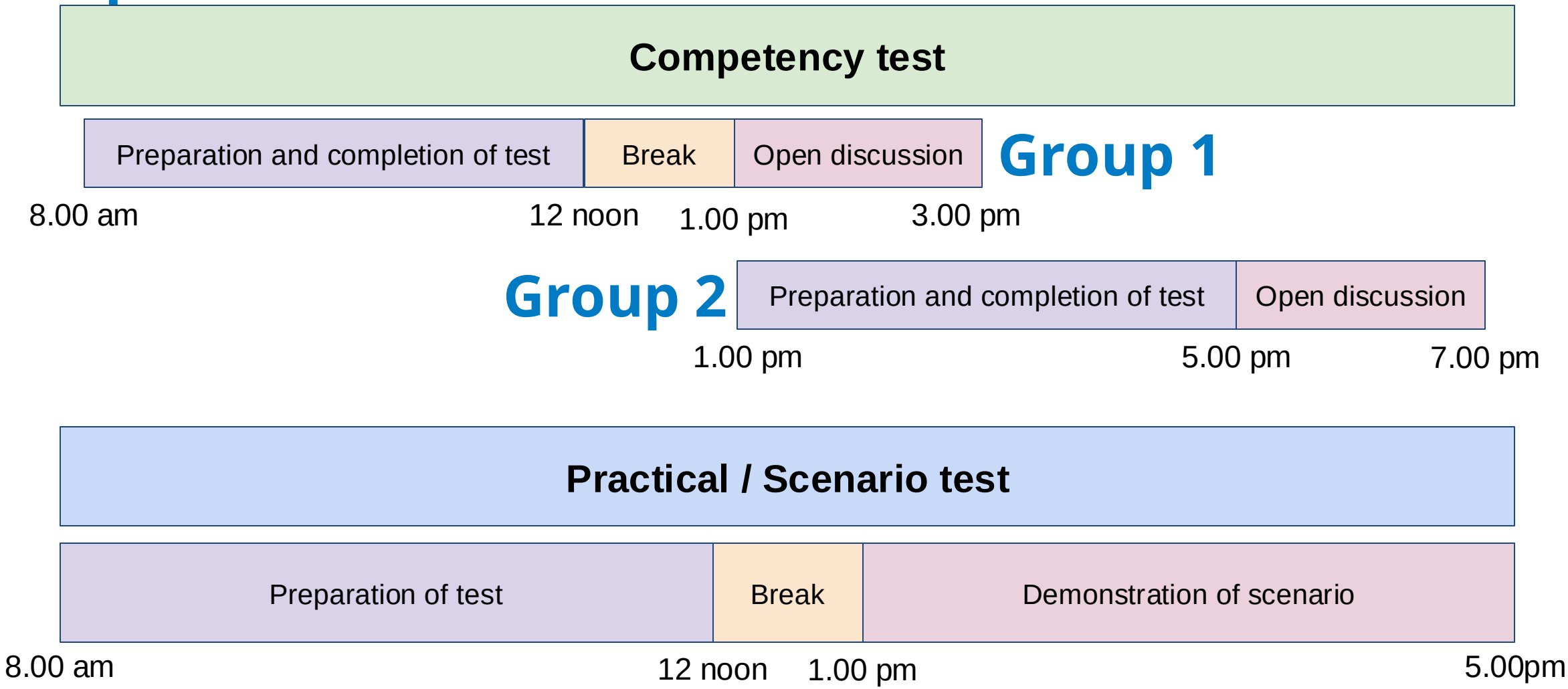
Day 1 - Competency test (all applicants, on site- @CGH)

Covers basics of OpenRMF features and understanding of the middleware with simulation

Day 2 - Scenario test (applicants with record of operational deployment of OpenRMF exempted; on site CHART@CGH)

Focuses on re-creating a given scenarios and working with real systems/ devices

Empanelment overview



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Competency test (successful / down selected applicants)

General requirements

- Demonstrate proficiency in creating simulations using OpenRMF/ Gazebo.
- Showcase comprehensive understanding of OpenRMF's features and functionalities through simulations.
- Demonstrate troubleshooting skills to identify potential issues related to OpenRMF.
- Able to present a well-thought-out deployment architecture with OpenRMF as its central component.
- Exhibit a solid grasp of robotic deployment techniques and a deep understanding of the technical aspects of OpenRMF

Scenario test (exempted for applicants with record of operational deployment of OpenRMF)

General requirements

- Demonstrate the ability to write adapters to integrate different systems to OpenRMF
- Able to influence the navigational behaviour of OpenRMF in runtime
- Able to influence OpenRMF to responses to emergencies
- Able to call custom APIs using OpenRMF

Instructions for tests

- Maximum of 5 representatives* from a participant are allowed to register for the empanelment (minimum of a team of 3 is recommended to cover the scope within the stipulated time allocated).

- It is recommended that the participants splits the workload/questions evenly so there is enough time to finish all the questions.

- Participants are required to bring their own laptops for the tests
  - While the empanelment does not restrict the choice of laptops, the participants are recommended to have the requirements as shown in the *Recommended laptop configuration* slide.

- The contents of the test will be shared once all participants are ready at the examination site and all work/coding must be done in the given stipulated time.
  - **Note:** Participants are required to have github accounts with username information shared prior to the empanelment day

*Representative is NOT allowed to take any empanelment test (competency and/or scenario test) for more than one participating company

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Instructions for tests

- All codes must be submitted to CHART at the end of the examination for code verification and final review
  - **Note:** the code/documentations provided must be sufficient for the results to be re-created on a reference system as shown in the *Evaluator reference system* slide.

- Participants are allowed to bring in their own robotic fleets for the scenario test if desired (logistics to be arranged on your own + arrange to perform robot mapping in the test site)

Useful resources for tests

OpenRMF Multi-robot book	https://osrf.github.io/ros2multirobotbook/
OpenRMF GitHub main page	https://github.com/open-rmf/rmf
OpenRMF simulations	https://github.com/open-rmf/rmf_demos
OpenRMF lift adapter template	https://github.com/open-rmf/lift_adapter_template
OpenRMF door adapter template	https://github.com/open-rmf/door_adapter_template
OpenRMF fleet adapter template	https://github.com/open-rmf/fleet_adapter_template
ROSCon 2024 sharing	https://roscon.ros.org/2024/talks/The_State_of_Open-RMF.pdf
More about RoMi-H	https://www.cgh.com.sg/Chart/Pages/sharp/romi-h.aspx

Recommended laptop configuration

- The specifications below will be the system that is recommended for the participants to have

Specifications	
Operating System (OS)	Ubuntu 24.04
Robot Operating System (ROS)	Jazzy
CPU	x86 / AMD64
RAM	16 GB
Storage	128 GB

Dependencies

- OpenRMF's main branch with all its dependencies (recommend to build before coming)
- Gazebo Version 8

Other softwares

- Powerpoint or equivalent presentation creation tools (to prepare visual aids during the competency test)
- Word or equivalent document editing tools (to produce documentations and writing thought processes and considerations

Evaluation reference system

- The specifications below will be the system that the evaluators will be using to re-run the codes provided by the participants

Specifications	
Operating System (OS)	Ubuntu 24.04
Robot Operating System (ROS)	Jazzy
CPU	ARM64 / x86 / AMD64
RAM	16 GB
Storage	128 GB

Dependencies

- OpenRMF's main branch with all its dependencies (version will be set and freezed on the date of empanelment)
- Gazebo Version 8

CHART address

Address	2 Simei Street 3, Singapore 529889
Point of contact (POC)	Tan Jun Kiat / chart@cgh.com.sg

Questions