Outdoor AMRs Deployment enabled with Tele-Operations
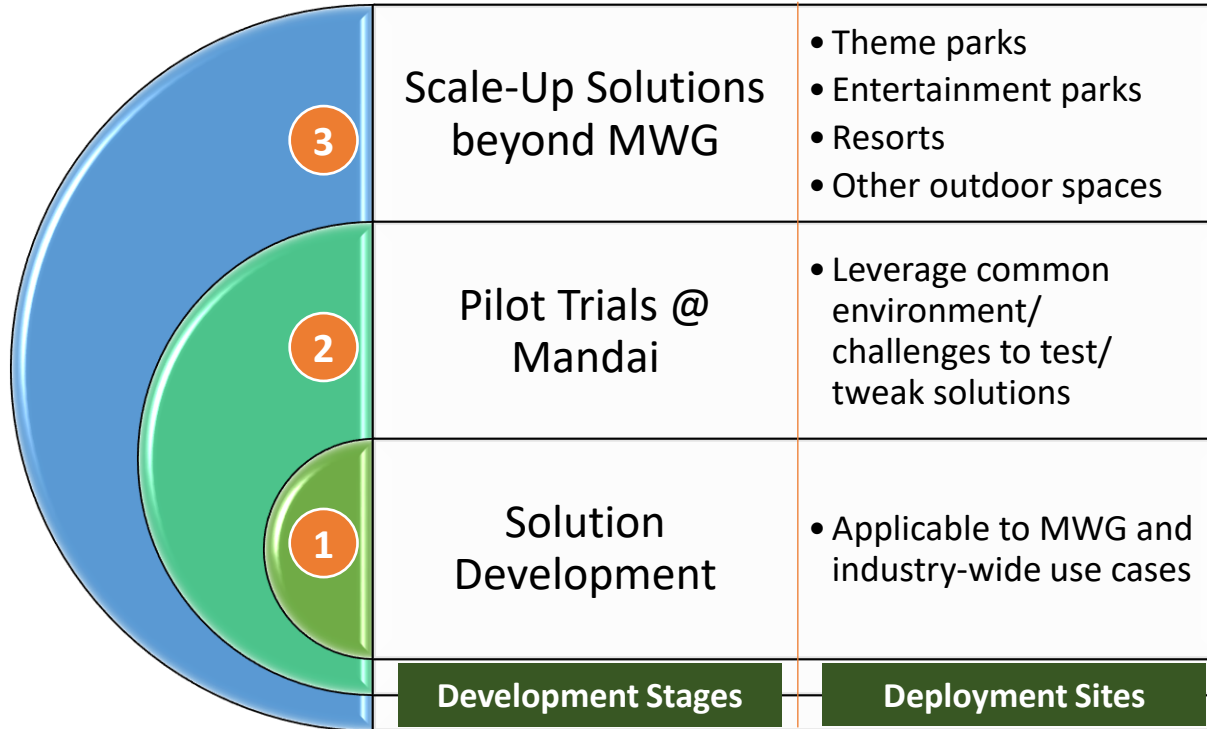
Joint Call for Proposals

19 September 2023

Objective:

Develop innovative solutions to address immediate market gaps and help enterprises to be future-ready with new capabilities, leveraging MWG as 'living lab for innovation'

Approach to Solutions Development & Deployment

Development Stages		Deployment Sites
3	Scale-Up Solutions beyond MWG	• Theme parks • Entertainment parks • Resorts • Other outdoor spaces
2	Pilot Trials @ Mandai	• Leverage common environment/ challenges to test/ tweak solutions
1	Solution Development	• Applicable to MWG and industry-wide use cases

Desired Outcomes

- **Operational Efficiency**
- **Cost Effectiveness**
- **New Product/ Service Development**
- **New Business/ Monetisation Opportunities**
- **Wider Industry Adoption**

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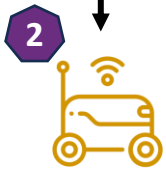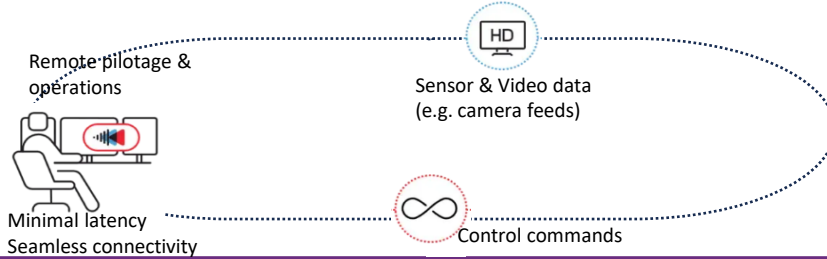
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Use Cases and Requirement Specifications

4 Key Use Cases – ATMP + Delivery, Concierge, Surveillance

1 AMR Tele-Operations Management Platform (ATMP)
Centralised platform which allows for remote pilotage as well as management and orchestration of multiple fleets of robot

Remote pilotage & operations

HD

Sensor & Video data (e.g. camera feeds)

Minimal latency
Seamless connectivity

∞ Control commands

2 Delivery AMR to:
- Transport staff meals across 16 stations on 2 routes
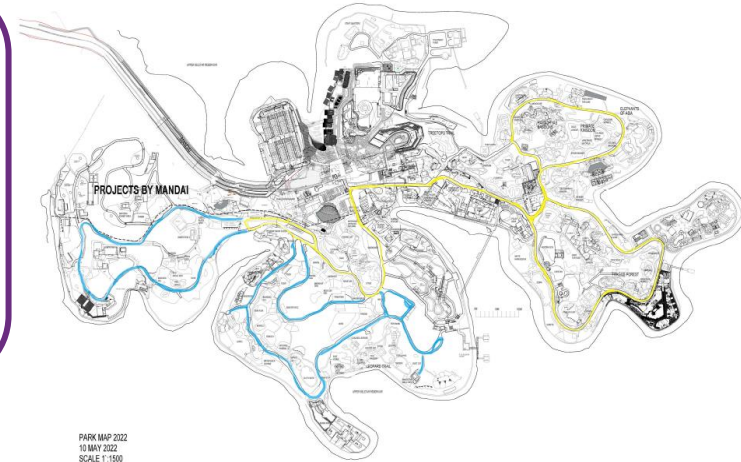- Provide F&B to meet visitors' orders via app

3 Concierge AMR to provide way-finding, general info as well as manage ticket purchases & crowd control.

4 Surveillance AMR to provide patrolling in non-flat surface, low-light areas (e.g. night safari parks), incident reporting, detection of faulty light, animal & intruders.

PROJECTS BY MANDAI

PARK MAP 2022
10 MAY 2022
SCALE 1:1500

F&B delivery route
Future expansion

* As Mandai Resort and RFN is still under construction, it's scope is not included here. But will be expanded to those areas once construction is completed

* Ideally, **if possible**, a single AMR should be able to serve multiple functions and use cases, subjected to specifications limitations
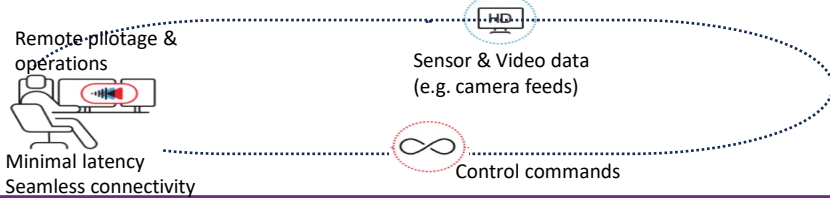
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Use Case #1: Centralised Operations

AMR Tele-Operations Management Platform (ATMP)
Centralised platform which allows for remote pilotage as well as management and orchestration of multiple fleets of robot

Remote pilotage & operations

Sensor & Video data
(e.g. camera feeds)

Minimal latency
Seamless connectivity

Control commands

MWG, as it revamps existing systems and builds new systems, needs a centralized operations platform to manage and operate various AMRs that it plans to deploy across the park premises.

Requirement Specifications:

- *Remote-piloting:* Pilot and control multiple autonomous robots via tele-operations platform

- *Fleet Management & Orchestration:* Manage and coordinate multiple fleets of heterogenous robots

- *Connectivity & Communications:* Ensure seamless, reliable and secure connectivity to AMRs, external systems and IoT devices

- *Task assignment:* Schedule specific tasks to designated robots and report task status

- *AMR location identification:* Track the AMR's location, both historically and in real-time

- *AMR parking & charging operations:* Manage and coordinate AMRs' parking & charging operations

- *System & Infrastructure integration:* Integrate with AMRs deployed, external systems and existing infra

Use Case #2: F&B Delivery AMR (for staff and visitors food delivery)

Currently, MWG assigns more than 20 buggies with 2 staff each (1 driver & 1 asst) to collect meal boxes for staff from the central collection point and deliver to 16 stations across the park premises. This causes heavy traffic at collection point, delays. MWG aims to minimize the manpower resources and time taken in food delivery.

Requirement Specifications:

- *Fully autonomous model for bulk storage & delivery:* Support the meal delivery of 50 – 80 meal bento boxes, fruits, drinks and desserts (with easy to clean compartments and hot and cold temperature preservation, disinfection capability, and animal proof tampering), or equivalent in terms of parcels or boxes for logistical movements.

- *Live monitoring system:* Real time location tracking for users to monitor the AMR's location

- *Enhanced notification system:* Real time notification of AMR's delivery status

- *Dynamic delivery operation:* Adaptable to changes in environments or delivery requirements (e.g. route changes due to construction activities or ad-hoc demands)

- *Intelligent autonomous navigation:* Capability to operate in crowded areas, adhere to keep left rule, execute safe overtaking maneuvers and conduct recovery path planning

- *Dynamic obstacle avoidance:* Detect and avoid dynamic obstacles (e.g. foliage, vehicles etc)

- *Environment agnostic:* Navigate in low light and rainy conditions

- *Integration with external systems:* Integrate with external systems (e.g. ATMP & MWG systems)

Use Case #3: Concierge AMR (for visitor management & crowd control)

MWG receives millions of tourists and local visitors annually. As the rejuvenation of the parks would lead to more visitors and congregation, MWG intends to streamline the ticket purchases and provide guidance on locations, highlights etc for an enriched guest experience.

Requirement Specifications:

- *General information display system:* Dynamic large screen with touch interface to allow for 2-way interaction with users

- *Crowd control capability:* Facilitate crowd control and management

- *Assistive Way-finding:* Provide directions for users to reach their desired location (with additional Guest Follow Me feature)

- *Intelligent autonomous navigation*: Capability to operate in crowded areas, adhere to keep left rule, execute safe overtaking maneuvers and conduct recovery path planning

- *Environment agnostic:* Navigate in low light and rainy condition

- *Dynamic obstacle avoidance:* Detect and avoid dynamic obstacles (e.g. foliage, vehicles etc)

- *Integration with external systems:* Integrate with external systems (e.g. ATMP & MWG ticketing systems)

Use Case #4: Surveillance AMR

MWG manages 6 parks spread across more than 50 hectares of land. This sprawling environment poses challenges for security personnel in patrolling lowly-lit, undulating areas as well as attending to immediate needs of guests and/or emergency incidents.

Requirement Specifications:

- *Video analytics for patrolling:* Augmented with video analytics solutions (e.g human/animal detection, fallen treen branches, unsafe hazards throughout the park, etc)

- *Non-flat surface traversing:* Navigate uneven terrain and cross-enclosures

- *Faulty light detection:* Detect faulty lights and provide alerts for rectification

- *Intelligent autonomous navigation:* Capability to operate in crowded areas, adhere to keep left rule, execute safe overtaking maneuvers and conduct recovery path planning

- *Environment agnostic:* Navigate in low light and rainy condition

- *Dynamic obstacle avoidance:* Detect and avoid dynamic obstacles (e.g. foliage, vehicles etc)

- *Integration with external systems :* Integrate with external systems (e.g. ATMP & MWG systems)

IMDA Funding Support & Eligibility

Components of Funding Support
Manpower
Software
Hardware
Materials/ ICT Services
IP/ Licenses
Professional Services (3rd Party)
Others[1]

Develop solutions and applications

Pilot trials & user acceptance tests

Funding Support
- Up to 50% of qualifying cost, per project[2]

Note:
1. Cost components must contribute directly to the product development
2. Projects should not exceed 12 months

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Evaluation Criteria

01

Technical Feasibility
- Innovativeness – effectiveness in addressing the use case requirements, market gaps/ needs and leading to cost savings, improved productivity etc.

02

Operational Feasibility
- Operational feasibility – developing solutions, taking into account operating environment, integration requirements, maintenance needs etc.
- Regulatory adherence - abiding by governance, standards and guidelines/ best practices to meet regulatory requirements

03

Business Viability
- Budget reasonableness – demonstrating rationale & breakdown of estimated project costs
- Commercialisation strategy – establishing clear business model and ROI for sustainable operations
- Scalability – proposing at least 2 other users beyond MWG as opportunities to scale solutions

04

Capacity & Capability
- Capacity and expertise to execute projects – providing info on track record, current and upcoming projects to demonstrate credibility and capacity.

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Stakeholders' Roles & Funding Approach

S/N	Elements of CFP	IMDA	MWG	Selected Tech Solution Providers (TSP)
1	**Roles & Responsibilities**	• Co-lead projects • Facilitate governance/ policy discussions (e.g. relevant govt agencies)	• Co-lead projects • Provide domain expertise and use cases • Advice on process requirements for solution development	• Develop proposed solutions • Conduct deployment at MWG • Scale up to wider industry
2	**Funding & Investment / Commitment**	• Provide *up to 50%* funding support to appointed TSP for solutions development	• Provide site(s) and manpower to support deployment • Offer procurement opportunities to TSPs upon successful deployment & assessment of ROI	• Incur development costs (i.e. manpower, hardware, software etc.) to co-develop the technology solutions.
3	**Intellectual Property (IP)**	• No IP ownership	• Subjected to commercial arrangements & grant requirements	

Joint Call for Proposals:

How to Participate

Calling Interested Parties to...

- Submit proposal(s) for specific individual project or combination of multiple projects
- Participate as a single entity or a consortium of partners
- Submissions will be evaluated on merit of individual project proposal(s)
- Project(s) may be awarded to a group of companies and/or partially to consortium

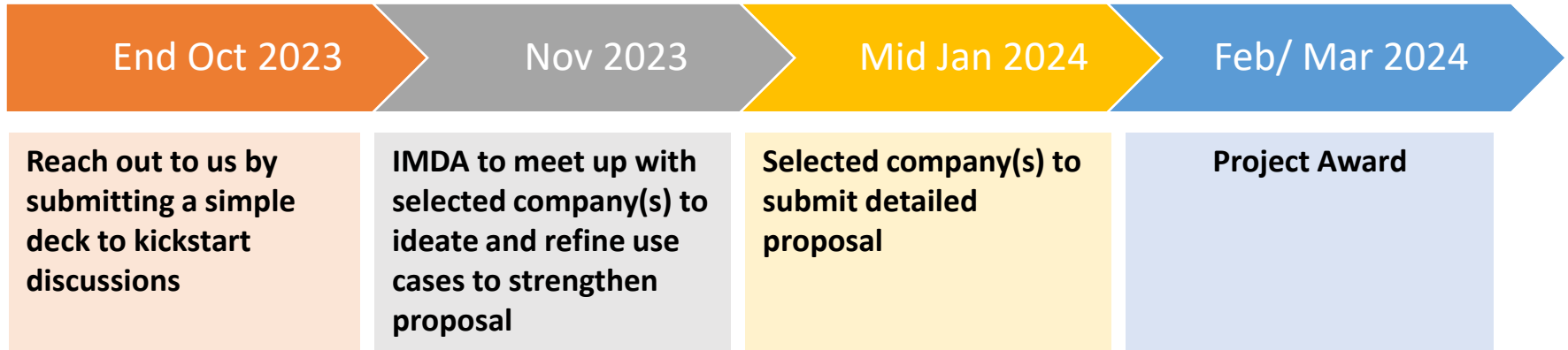**PowerPoint (up to 10 slides)**

Key Partners

Use Case & Impact

Scope, Estimated Cost, Timeline

Growth Potential

Indicate your interest by 31st October ➔ Email: Narayanan_A@imda.gov.sg

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Timeline

End Oct 2023	Nov 2023	Mid Jan 2024	Feb/ Mar 2024
Reach out to us by submitting a simple deck to kickstart discussions	IMDA to meet up with selected company(s) to ideate and refine use cases to strengthen proposal	Selected company(s) to submit detailed proposal	Project Award

CFP Details available at www.imda.gov.sg/proposal-submission

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THANK YOU