REQUEST FOR INFORMATION (RFI) "Digital Twin"	
RFI #:039/2024	SUBMITTED TO: [NAME/TITLE COMPANY]
DATE: dd/mm/yyyy	
NEEDED BY: dd/mm/yyyy	SUBMITTED BY: [NAME/TITLE COMPANY]
PROJECT: to fill in	
PROJECT #: to fill in	

1. BACKROUND AND PURPOSE OF THE RFI

NTA Metropolitan Mass Transit System Ltd. ("**NTA**") is the company responsible for the design and construction of a mass transit system for the Tel Aviv metropolis (the "**Mass Transit System**"). Through this Request for Information (the "**RFI**") NTA wishes to receive relevant information about technological and innovative solutions, that could be integrated into NTA's Mass Transit System, to support the development of a "Digital Twin" (DT) that can enable urban rail projects delivery for all parts of the metro systems and all stages of planning, design, management, construction, operations, and maintenance. (the "**Solutions**").

This RFI is a preliminary process initiated by NTA, solely for receiving information and conducting its initial internal evaluation and consideration. This RFI does not, in any manner whatsoever, constitute a tender, bid, offer, proposal, or request for any of them, nor does it constitute an engagement, representation or warranty on behalf of NTA. Response to this request will not constitute a condition for participation in the tender, if any is subsequently issued, at NTA's sole discretion, and no advantage will be given in the tender to those who responded to the RFI. Based on the responses to this RFI, suitable companies may be invited for further deliberations by NTA, at its sole discretion. Responses are welcome from both single suppliers and / or consortia that can provide a range of Digital Twin solutions.

2. INTRODUCTION OF NTA

NTA is the governmental company responsible for the development of the Tel Aviv Metropolitan Mass Transit System, a network of light rail transit and future metro railway lines. NTA is leading an economic and cultural revolutionary transformation in the transportation sector by constructing the mass rail transit system of the Gush Dan region. The Mass Transit System is the largest and most complex transportation project in Israel.

The Mass Transit System integrates with all means of transportation, including three Light Rail Transit (LRT) lines and three Metro Lines as follows:

- ✓ The **Red Line** Project (RLP), that has recently commenced operating, extends from Bat Yam to Petach Tikva via Tel Aviv, Ramat Gan and Bnei Brak and is one of the most heavily used traffic corridors in the Tel Aviv Metropolitan area. It stretches, in total, over approximately 24 km, and comprises at-grade sections at both ends and a central underground section of approximately 12 km.
- ✓ The **Purple Line**. The total length of the line will stretch over approximately 27 km, with 46 stops. The line is entirely at-grade and includes bridges. At the eastern end of the line, a depot for heavy maintenance is located. Two Stops will be located on the bridges.
- ✓ The **Green Line.** The line connects between Rishon Le Zion at the south, Tel Aviv in the middle and Herzliya at the North. The line is 39 km long, with 4.5 km running underground. It has 62 stops, 4 of which are underground.
- ✓ The **Metro System** network includes 3 lines:
    1. The first line (M1) is 73 km long and includes two branches from the south and two from the north joining in a common section along the Ayalon-Namir corridor;
    2. The second line (M2) is 25 km long and serves the eastbound corridor from Petah Tikva to Ramat Gan, Tel Aviv and Bikat Ono;
    3. The third line (M3) is 32 km long and connects Tel Aviv north coast to the south coast via a half-ring to the east.

3. SUMMARY OF ADOPTING DIGITAL TWIN SOLUTION IN BIG-INFRASTRUCTURE PROJECTS

A "**Digital Twin"** ("The **Technology**") is a Virtual representation of a physical thing or process. Digital Twin can virtually model, visualize, predict and optimize the products we create and how we make, deliver and service them. Digital Twin in motion should host the capability of simulating construction of Network Metro traffic and operating systems. Digital Twin is not only applicable to infrastructure but also to dynamic elements such as Rolling-Stock. It is created by collecting and integrating real-time data from sensors, IoT ("Internet of Things") devices, cad and other design models and other sources to create a digital counterpart that mimics the physical entity's behavior and characteristics. Digital Twins are used for various purposes, including monitoring, simulation, analysis, and decision-making. They enable

organizations to gain insights, optimize operations, and improve the performance of physical assets or processes.

NTA considers to purchase Digital Twin (DT) technology to support the planning, design, construction, operation & maintenance of the metro systems. The Digital Twin system must support the development of a Federated Model that will be used by the client to provide one comprehensive and integrated model of the system, including the light rail and metro lines as well as interchanges with other systems. Therefore, the aim of using Digital Twin is to leverage advanced "Smart City" solutions, integrating the public Transportation systems and all relevant data asset for developing a sustainable, accessible, secure, predictive, intelligent, reactive and user-friendly traffic network model. The DT is to be considered also as a data-driven decision-making support tool for all phases of the project: a service development platform; a collaborative space for interconnecting stakeholders; a real-time asset management and the basis of simulation models using also **"Artificial Intelligence" (AI)**.

"Building Information Models" (BIM) are the foundations for building a digital representation of each element of the project. All the elements will be coordinated into Digital and Visual Database that will constitute the future Digital Twin of the Models. It encompasses the entire lifecycle of a building, from design and construction to operation and maintenance. BIM integrates 3D models, 2D drawings, data and functional characteristics about components and systems. BIM allows stakeholders in the construction and infrastructure industry to collaborate more effectively, reduce errors, and improve decision-making throughout the project's lifecycle. According to the ISO 1950 series, BIM models relate to Design technologies and Project processes. Therefore, BIM 3D design models can be developed to extended Dimensions (i.e., 4D-Time, 5D-Costs, 6D-Sustainability,7D-Facility Management). Moreover, the concepts of 'BIM Levels' (from 'BIM Level 0' to 'BIM Level 3') are the maturity definitions of criteria required to be deemed BIM-compliant.

The integration of BIM models with **"Geographic Information System" (GIS)** technologies, creating managing, analysing and mapping different types of data, is crucial for the Digital Twin evolution. GIS connects data to a map, integrating location data with all types of descriptive information. Rail can reach its full potential with GIS-BIM models linking that improve performance through real-time decision-support systems. This moment calls for a comprehensive digital transformation and an ability to leverage location intelligence GIS technologies can be used for different purposes, such as:

- Asset Management and Maintenance,
- Operations,
- Project Delivery and Environmental Sustainability,
- Infrastructure and Property Management,
- Safety and Security,

- Performance and Monitoring.

The concept of **"Federated Model"** refers to a collection of separate BIM models that represent various aspects of a building or infrastructure project. These BIM models are created by different parties involved in the project, such as architects, engineers, contractors, and facility managers. Each model focuses on specific aspects / disciplines like civil works, architectural design, structural analysis, MEP (mechanical, electrical, plumbing) systems, and more assets (track, energy, signalling, telecom etc.). Federated models are integrated to provide a holistic view of the entire project, combining these different aspects into a single cohesive representation. The successful approach of the BIM strategy is the capacity, under collaborative design in a "Common Data Environment" (CDE), to digitally integrate the various disciplines and offer an integrated design view. This BIM Federated Model of the disciplines and its maturity is the first step towards the digital coordination of tangible assets and abstract assets. In big infrastructure projects, federated models are used to manage the complexity of such large-scale projects by breaking them down into manageable parts, allowing different teams to work on specific aspects of the project.

In summary, Digital Twins provide a holistic view of large infrastructure projects, while BIM and federated models are essential components for detailed design, construction coordination, and lifecycle management. These technologies collectively contribute to more efficient and effective execution of complex infrastructure projects.

4. SPECIFICATIONS FOR REQUESTED SOLUTIONS

Responses to this RFI are welcome from big Suppliers / Consortia / Start-ups which have developed a holistic Digital Twin model implemented in similar Metro/Transportation projects embracing all main project's lifecycle, as well as from Digital Twin providers in different 'fields of application' which do not totally comply with the Specifications (i.e., the Criteria and Standards specified in this section below) but nevertheless consider their Solutions suitable for this project.

The Digital Twin (DT) solution system should satisfy the following main **Criteria**:

- Design Teams and Contractors are required to design using the BIM system.
- The DT shall support and be compatible with the implementation of a rich Federated BIM Model of the facility to control and manage Design and Construction asset for management and operation purposes.
- The DT must be inter-connected with the "Autodesk Construction Cloud" (ACC) Design Platform.
- Allow easy DT update and maintenance over time from engineering data stored in the ACC platform
- The DT must be compatible with GIS systems.
- The DT must be compatible with Aconex systems.

- The DT outputs shall be integrated into the "Business Intelligence" BI-systems with an API.
- The DT must be integrated with the "Maintenance Management Information Systems" MMIS during the Operation and Maintenance phase.
- The DT shall ensure that an intelligent, integrated, optimized, sustainable, secure, fully accessible and smart transport system is delivered.
- The DT shall support all phases of the development life cycle from early planning and design, to detailed design and construction, commissioning, operations, management and maintenance in a seamless manner.
- The DT shall support the development of all aspects of the design, delivery and operations of the new metro system and the operation of the light railway system, including main Infrastructure elements & assets such as:
    - Rolling stock design and testing considering, *inter alia*, user-centered design (UCD) engagement and analysis.
    - Design optimization and testing of Civil Works / Infrastructure (i.e. Site, Tunnels, shafts, cross-passages, structures, roads, bridge, Track etc.).
    - Station design, construction, operations (i.e., crowd simulation/pax simulation) and maintenance, including design of the station box and its construction fit out, testing design configuration against UCD principles, and using the DT technology to optimize responses to design with key stakeholders.
    - System design and testing of relevant elements supporting construction and operations (including MEP, TVS systems etc.) with the aim of minimizing energy consumption and carbon emissions; Energy, Signaling, Telecom elements and data control for a fully automated rail network system.
    - Depots and other elements of the operational infrastructure.
    - Other elements of the network and relevant data /assets / tools needed for the design, monitoring, simulation and optimization of the DT system.
- The DT system shall comply with the following main **Standards**:
    - ISO 19650-1:2018: Concepts and principles.
    - ISO 19650-2:2018: Delivery phases of the assets.
    - ISO 19650-3:2020: Operational phases of the assets.
    - ISO 19650-4:2021: Information exchange.
    - ISO 19650-5:2020: Security-minded approach to information management.

- ISO/IEC 27001: Information security, cybersecurity and privacy protection. Information security management systems requirements.
- ISO 16739-1:2018: Industry Foundation Classes (IFC).
- DIN SPEC 91391: Common Data Environments (CDE) for BIM projects - Function sets and open data exchange between platforms of different vendors.
- ISO 10303-239/242: Product life cycle support / Managed model-based 3D engineering.
- ISO 21930: Sustainability in buildings and civil engineering works.
- ISO 23386: Building information modelling and other digital processes used in construction.
- ISO/TS 12911:2012: Framework for building information modelling (BIM) guidance.
- ISO/TS 19166: Geographic information — BIM to GIS conceptual mapping (B2GM).
- PD ISO/TR 23262:2021: GIS (Geospatial) / BIM interoperability

5. A LIST OF DATES FOR THIS RFI

- Date of publication of the RFI – 15/1/2024.
- The deadline for submission of clarification questions by the Participants – 29/1/2024.
- The deadline for submission of responses to the RFI – 26/2/2024.

6. COMMERCIAL CONFIDENTIALITY AND WAIVER OF CLAIMS

1. NTA may use any information it receives during or in connection with the RFI from a Participant or any third party (the "**Information**") for any purpose it deems fit, including for preparing specifications or any other documents. NTA may transfer any such Information to any of its consultants or any person on its behalf. In addition, as a Governmental Company, NTA may be obligated by Laws (such as the Freedom of Information Act or the Mandatory Tenders Regulations) to disclose information to third parties .
2. The supplier of the Information waives all claims and demands of any kind against NTA in connection with NTA's abovementioned rights, including (but not limited to) copyrights, commercial confidentiality, privacy, etc.
3. Without derogating from the above, the Participants may mark, in a clear, complete and legible manner, Information contained in the Response which is considered commercially sensitive or of a confidential nature. To the extent permitted by applicable laws, and at its sole discretion, NTA shall consider refraining from disclosing such Information (if so requested).
4. The Participant declares and confirms that the provided Information is free from any violations of third-party rights, including (but not limited to) copyrights, commercial confidentiality, privacy etc.

The Participant shall bear full and exclusive responsibility for any claims or demands arising from such third-party rights violations subsequent to this RFI, and all related expenses will be solely borne by the Participant

7. INSTRUCTIONS REGARDING THE SUBMISSION OF THE RESPONSE TO THE RFI

1. The Participants are requested to fill-in all the information on **Annex A**. Each question should be addressed separately.
2. It is recommended to attach supporting information in a visual format such as presentations, videos, photos, brochures, etc.
3. The response to the RFI shall be submitted in Hebrew or English. Appendices and technical specifications can be attached unlimited in scope.
4. The response to the RFI must be submitted in a digital copy by the deadline for submitting responses, as specified in section 5 above, via email: **Tender1@nta.co.il**. The email's subject line will state: "A response to RFI to receive relevant information about technological and design innovative solutions to support the development of a "Digital Twin"".
5. NTA may postpone the response submission deadline at its sole discretion. A notice to that effect shall be posted on NTA's website. The notice shall specify the new response submission date .

8. EXAMINATION OF THE RESPONSE

1. NTA reserves the right, at its sole discretion, to contact, as necessary, all or some of the Participants with requests for information and clarifications, for presentations and demonstrations, for visits to the Participants' sites and the sites of their clients, etc.
2. As part of the response examination process, NTA reserves the right to invite any Participant to present the solution proposed by it to a professional team on its behalf at a location and at a time determined by NTA.
3. As part of the response examination process, NTA reserves the right, at its sole discretion, to invite all or some of the Participants to launch a pilot project.

9. QUESTIONS AND CLARIFICATION REQUESTS

1. Clarification questions regarding this RFI must be submitted only in writing, via e-mail to NTA's contact person, as specified in section 10 below. The questions must be submitted no later than the deadline for clarification questions as detailed in section 5 above.

2. The Participant must verify that its questions were received by the contact person, as specified in section 10 below, by phone.
3. NTA reserves the right to conduct one or more rounds of clarification questions at its sole discretion.
4. The clarification questions will be submitted in Hebrew or in English, in the following format:

Number of the section in the RFI	Question

5. Answers to the clarification questions will be posted on NTA's website.
6. It is clarified that the clarification answers will be worded in a way that does not reveal the identity of the inquirer.

10. RESERVATIONS AND NTA'S DISCRETIONS

1. NTA may publish a new Request for Information, an invitation to pre-qualify, tender proceedings and/or any other proceedings with respect to the Project or any part thereof and/or with respect to any other project whatsoever, in any manner which it will deem appropriate. Without derogating from the above, NTA may pursue any engagement based on the information submitted in this FRI, whether through the conduct of a bid or a tender, or without conducting such proceedings, as NTA deems fit.
2. NTA may request additional information (in writing or otherwise) as it deems necessary, request to visit sites or facilities constructed or operated by the Participant, or carry out professional inquiries regarding any Participant (including by way of contacting third parties).
3. The Participants shall not be entitled to any payment for the information provided by them pursuant to this RFI. All expenses incurred by a Participant or anyone on its behalf shall be borne solely by the Participant. Participants shall not be entitled to any reimbursement or compensation for expenses in connection to their participation in this RFI.
4. NTA shall not be responsible or liable towards a Participant or anyone on its behalf in connection with this RFI, including in connection with information provided by or to NTA pursuant to or in connection with this RFI.
5. NTA may amend, withdraw or cancel this RFI, at any time and without providing reasons or justifications for doing so.

6. This RFI is subject to the law of the State of Israel, including the Mandatory Tenders Regulations, 5753-1993 and the obligation to disclose information in accordance with Section 14A thereof.

11.CONTACT PERSON ON BEHALF OF NTA

The contact person on behalf of NTA regarding this RFI is moran hen. phone number 03-7243439 email moranhe@nta.co.il.

12.ANNEX A - RESPONSE TO THE RFI

General:

- This Appendix must be digital.
- Additional information should be attached to the relevant Appendix.
- It is recommended to attach supporting information in a visual format such as presentations, videos, photos, brochures etc.

A. Information about the Participant:

Supporting documents for questions 1-2 will be attached in a separate file captioned "**Appendix 1**".

1. General details regarding the company submitting the response (the **"Participant"**):

Participant's name: (Name of company or individual submitting the response)	
Classification of the Participant: (corporation, association, authorized dealer, independent consultant, etc.)	
I.D number/Company Registration Number:	
Contact Person: (Full name, position)	
Address:	
Phone no.:	

E-mail:	
Should NTA decide at its sole discretion to launch a pilot, would the Participant be interested in participating?	

2. Details about the Participant's knowledge and experience in the field of Digital Twin modelling and in the implementation of digital technological solutions (if any):

B. Information about the proposed "Solution/s":

* Documents supporting answers to questions 3-13, complying where possible with the "Specifications" listed in section 4, will be attached in a separate file captioned "**Appendix 2**".

P.N. Responses are welcome from big Suppliers / Consortia / Start-ups which have developed a holistic Digital Twin model implemented in similar Metro/Transportation project embracing all main project's lifecycle, as well as from Digital Twin providers in different 'fields of application' which do not totally comply with the "Specifications" specified insection 4 but nevertheless consider their Solutions suitable for this project.

3. Provide a detailed description of the proposed DT system "Solution/s" *(one or more "Use Cases" Solution/s can be depicted, according to the different Assets managed and Project's phase of application).*

Report capabilities, advantages and limitations of your Digital Twin (DT) model/s for a Metro or Light Rail System environment, considering principal project lifecycles (Design & Built, Operation & Maintenance) and the main Infrastructure Assets: Stations, Track, Construction Sites, Tunnels, Systems (i.e. MEP, Signaling etc.), Vehicles (Rolling Stock), etc.:

4. Does / do the "Solution/s" combine technology and design elements? If so, please provide information on the subject. Report which kind of data assets / technologies / API / tools (i.e., BIM design data, usage of "Augmented Reality" (AR) visualizations, thermal/smart cameras, sensors, PPM data, CO2 data, HVAC / power data, GIS data, IoT, Signaling & other Systems, MMIS, Traffic pax data etc.) are integrated into your DT model/s.

5. Describe how each of these assets / sources / tools are integrated and managed with the DT "Solution/s" to support the development of the model/s.
6. Has/have the "Solution/s" already been implemented in other similar big infrastructure 'projects' (i.e., metro system, light rail system, railway project etc.)? If the answer is positive, please provide information regarding these 'projects', including implementation project phase, dates, duration and overall results gained. If your DT is applied to different 'projects', and is also applicable to this Metro project, please provide information regarding these 'projects', including implementation project phase, dates, duration and overall results gained.
7. What is the best way to prove the capabilities of the proposed "Solution/s"? Please provide a description of a pilot that could be implemented to test the reliability and effectiveness of the proposed Solution/s.
8. Please describe how the "Solution/s" can support the development of the new Metro system which is at its early design stage and/or the Light Rail System (LRT): part of which has been recently opened to the public for the first time(Red Line) and some of which (Green and Purple Lines under construction) will be opened in the next few years.
9. Is this technology mature enough to be implemented in the complex megaprojects of Tel Aviv? What are the major constraints of the "Solution/s" in the actual scenario? What do you expect for the future years?
10. How does/do your "Solution/s" work with third-party systems? How well can it/they adapt to the wider objectives of the program? How can you ensure that even with different designers the DT model will be eventually a unique, unified and comprehensive network system model.

11. How do you measure the performance (i.e., KPIs) of your system? Please elaborate for each "Solution" the benefits that the Digital Twin can deliver and the benefits of using your system.
12. Kindly provide your opinion and perception of market constraints which should be taken into account and managed for DT technologies.
13. Based on experience in similar Metro, Rail and/or LRT projects, please advise which potential procurement strategy can be compatible and best suitable for the implementation of the project.
C. Information about the Digital Twin Framework and requirements: * Documents supporting answers to questions 14-18, will be attached in a separate file captioned "**Appendix 3**".
14. Which is the best BIM-strategy to be adopted to develop a robust Digital Twin Framework during design stages that will be ready for the further Construction and O&M phases? Specify the proper BIM dimensions, BIM Level, LOD/LOI, IFC class/Native files, tools required in each design phase (Initial Design – Intermediate design – Reference Design – Detail Design – As Built).
15. Which data assets should be integrated at each stage of the project life cycle to support Digital Twin Readiness and results?
16. Please specify the main requirements/recommendations to be included by NTA in the EIR (Exchange Information Requirements), PIR (Project Information Requirements), AIR (Assets Information Requirements).
17. Please specify the major constraints / suggestions that should be considered to set-up an efficient and holistic BIM Federated Model for different project's stakeholders, and to control, manage & review (i.e., clash detection) the Design and the DT project evolution (i.e., consideration on: best practice, tools, AI solutions, cybersecurity, CDE, EDMS etc.)

18. Describe the ways that can assure that even with 3 different Line Managers (1 per each Metro Line project: M1. M2, M3) and many Designers and Sub-Contractors eventually there will be a unique, unified and comprehensive Digital Twin network system model in a federated environment (integration of the 3 DT models), that can be tested for Operation and Maintenance purposes?

E. Information regarding maintenance of the proposed Solution:

* Documents supporting answers to question 19, will be attached in a separate file captioned "**Appendix 4**".

19. What is the required maintenance routine? How is it performed? What faults may appear in the Solution over time, including disabling faults? What is the treatment method?

F. Information regarding the Solution's privacy protection and information security measures:

* Documents supporting answers to question 20, will be attached in a separate file captioned "**Appendix 5**".

20. What measures exist in the Solution to guarantee the protection of privacy and the security of information?

G. Additional relevant information about the proposed technological Solution/s:

* Documents supporting further information will be attached in a separate file captioned "**Appendix 6**".

Add some examples

13.Annex B

Examples for Solutions from other projects:

1. VR and AR to support stakeholder engagement with design visualization (i.e, Site, Rolling Stock, Station), planning, logistics and UCD.
2. Smart glasses/AR app to enhance training and worker’s and pilot’s safety and performance.

3. Drones IoT Data combination with the Digital Twin in Construction. 4. Digital Twin for managing railway maintenance and resilience. 5. Achieving Sustainability through Digital Twin.6D BIM. 6. DT for a smart railway system & infrastructure. 7. DT to drive better outcomes from Asset lifecycle. 8. AI - Digital Twin app to empower Design and automate O&M.	
RESPONSE BY: [NAME, TITLE, COMPANY]	DATE:
ATTACHMENTS:	