THE MEDICAL INFORMATICS PLATFORM
Deployment Pack

Executive Summary

(Introduction to the MIP)

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HBP   Human Brain Project

MIP   Medical Informatics Platform

Contents

1. Introduction to the MIP

The main objective of this document is to provide the reader (hospital or health organization director and decision maker) with an introduction to the MIP and its capabilities, a description of the benefits that the MIP offers in terms of research capabilities once deployed within the organization, and finally outlines how the organization, working with the MIP deployment and support team, shall proceed to deploy the MIP on premise.

Introduction

Brain diseases and related medical conditions, considered as a whole, affect 165 million European citizens, many whom are being at least partly managed in hospitals. The clinical data collected from these patients represent a unique source of information for better understanding and treating brain diseases and related medical conditions but are unfortunately not usually available for research.

The MIP has been developed by the Human Brain Project, an EU Horizon 2020 Flagship project, in order to facilitate access to clinical data stored in hospitals for research purpose, while preserving data privacy. The MIP aims at enabling breakthrough medical progress in the field of brain diseases and related medical conditions through access to an unprecedented volume of patient's data.

2. MIP Description

The MIP is an innovative data analysis and data collection system that provides an interface for various investigators (clinicians, neuroscientists, epidemiologists, researchers, health managers) enabling them to access and analyze anonymized medical data currently locked in hospital, research centers and public databases, without moving the data from the hospital where they reside, and without infringing on patient privacy.

The MIP is designed to help clinicians and researchers aiming to adopt advance analytics for diagnosis and research in clinics and to promote collaborative neuroscience research using hospital data.

MIP 2-Tier Architecture

The MIP has been designed adopting a 2-tier architecture which guarantees total hospital data protection and privacy by design. The MIP is divided in two main components, the MIP-Local and the MIP-Federated node, which shall be installed on two different servers when installed at participating hospitals.

The MIP-Local Node contains pseudo-anonymized data that can only be accessed and analyzed by the Local Data Manager and its accredited staff from within the hospital.

The MIP-Federated Node contains anonymized data and can be connected to other MIP-Federated Nodes located in other hospitals when the decision is made to join the MIP Network (medical condition-based federations of hospitals) and to provide access to hospital data to members of the network.

Upon signed agreement between hospital data providers from the MIP Network, accredited researchers can query multiple MIP federated Nodes and obtain aggregated results. Queries of the MIP-Federated Nodes does not allow to copy or upload any data, nor to see individual patient's data.

The 2-tier MIP architecture (MIP Local, MIP-Federated) has been designed in order to address the specific challenges of:

- local deployment adapted to each hospitals' environment,

- capturing and processing heterogeneous type of data (e.g. socio-demographic, clinical, biological and neuroimaging data),

- fulfilling privacy rules, policies and best practices to enable efficient and secure data sharing,

- harmonizing data through Common Data Elements for cross-site comparisons, and

- integrating readily available statistical and machine learning tools.
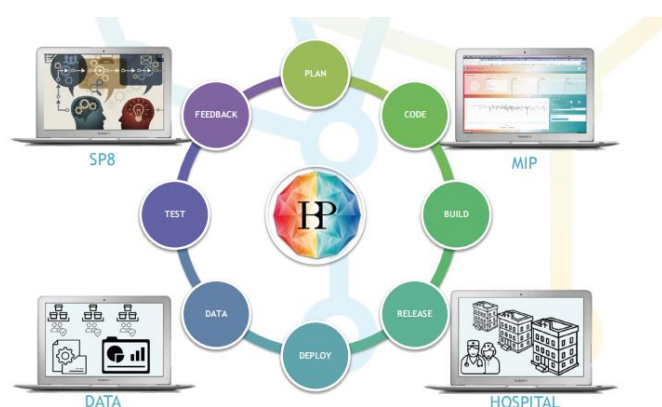
For further technical information about the MIP, please refer to the HBP sub-project 8.5 reporting document: D8.5.3_SGA2_M20v5.0_3-2019.12.06 located **here**, particularly the Appendix B, MIP Architecture.

3. MIP functionalities

The MIP, after installation at hospital, provides the main components and end-user functionalities briefly described here after.

FUNCTIONALITY OF THE MEDICAL INFORMATICS PLATFORM	
Components	Description
Portal	The portal acts as the main entry point to the business offerings of the MIP for researchers and clinicians
API Layer	The API layer offers a protected layer of functionality exposed in a uniform and interoperable manner. It acts as a gateway to the MIP offerings, providing horizontal reuse, vertical specialization and separation of concerns and technological restrictions through the employment of a microservices architecture
Authentication	The authentication mechanism uses proven standards to allow for a wide range of interoperability between the authenticated clients and the platform services
Operational data	A set of operational data assist in the streamlined communication and interaction between the clients and the MIP services
Data Factory	The Data Factory set of services facilitate the ingestion of hospital data within the MIP
Deployment Stack	The deployment stack of the MIP can be split to facilitate disjoint but complementary deployments • MIP Local offers enhanced services and analytical capabilities within the boundaries of each hospital • MIP Federated offers federated analysis over anonymized data, across multiple hospitals
End-user functionality	Description
Import and analyse local data	Pseudo-anonymise selected local data sets and run experiments using AI algorithms with the MIP
Join a federation/pathology	Elect to submit and analyse data for a particular MIP federation
Select and analyse federation variables	Capability to selectively analyse variables for a particular federation
Save & filter variables	Filter and save selected variable analyses
Run experiments using AI algorithms	Select AI algorithms compatible with selected datasets and variables

Key Benefits from being part of the MIP Network

Since the beginning of the Human Brain Project (HBP) the MIP has been developed and installed in an increasing number of participating hospitals. The Lausanne university hospital (CHUV) is the HBP partner coordination this activity.

A few key benefits to expect from joining the MIP network are the followings:

- Participate in the largest ever funded Europe wide brain research initiative,

- Train and use novel state-of-the-art analytical tools, including machine learning algorithms,

- Investigate and discover novel findings from its own data using the MIP-Local Node

- Participate or lead Federated analyses on big data available in the network of MIP-Federated Nodes

- Develop new scientific collaborations

- Increase the chance of future successful national or European grant applications
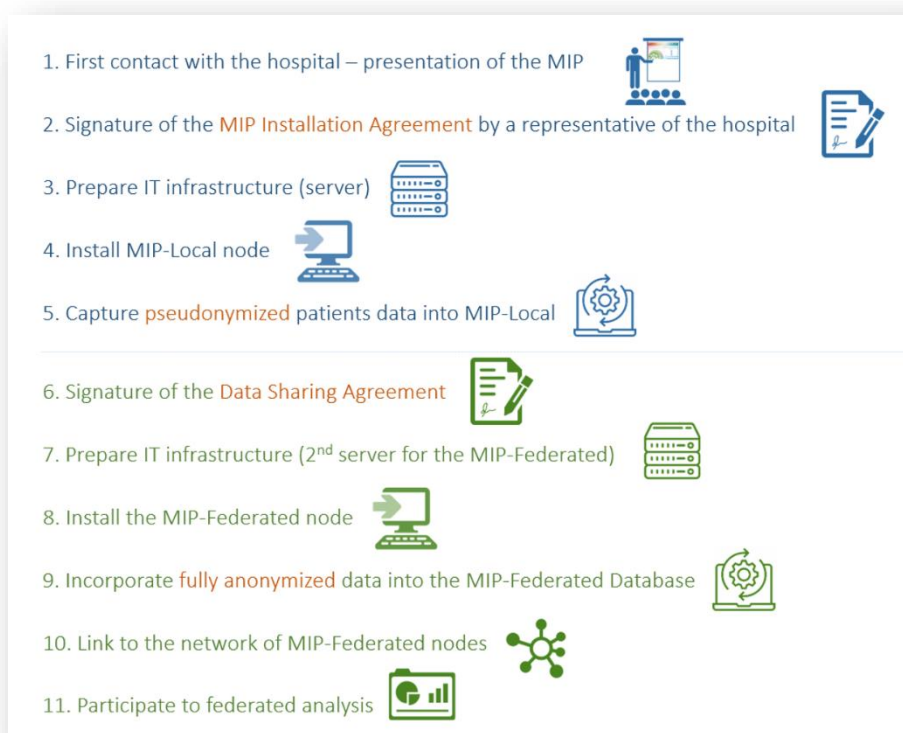
4. MIP Deployment Process

The MIP deployment process follows several steps to facilitate the installation flow and progressively allow the hospital staff to gain experience along the implementation process (see Figure 2).

The first 5 steps fall within the scope of installing a local version of the platform – the MIP-Local – which allows researchers to compare their data with the public databases already included in the MIP:

1. Identify all relevant hospital staff required to proceed to MIP deployment and present them the platform and the deployment process.
2. Secure signature of the MIP Installation Agreement by both the Hospital and CHUV legal representatives. This agreement covers installation of the MIP software, but not data sharing.
3. Prepare the IT infrastructure (e.g. server) needed to install the MIP-Local according to its specifications. This preparation is typically performed by the Hospital IT staff with the SP8 team assistance, if needed.
4. Install the MIP-Local software, usually through a combined effort of the Hospital IT staff and the MIP-CHUV deployment team. Part of the installation can be performed remotely through VPN connection, if required by the Hospital. On site, hospital-specific tuning is often required.
5. Capture into MIP-Local pseudonymized patients' data from the Hospital or research department aiming to use the MIP, in full compliance with all local ethics and regulatory procedures. This step is undertaken under the full responsibility of the Hospital or research department and its local Data Coordinator. Once data have been captured in MIP-Local, the Local Data Coordinator and his accredited local staff can use the MIP to analyse their data. No other stakeholder has access to these data.

Thus, researchers have the opportunity to test the MIP and apply its algorithms to their own datasets in combination with public pre-existing cohorts. In case they want to create a federation together with other centres, they have to follow the next steps:

1. Secure the signature of the MIP Data Sharing Agreement by both the Hospital and CHUV legal representatives. This agreement covers the possibility to perform federated analyses of fully anonymized data captured in the MIP-Federated node of the hospital.
2. Secure participation of the Local Data Coordinator to the relevant MIP DGSC disease-specific board.
3. Prepare the IT infrastructure (e.g. server) to install the MIP-Federated Node software (same procedure as previously described in step 3).
4. Install the MIP-Federated Node software (same procedure as previously described in step 4).
5. Proceed to full anonymization of the data stored in MIP-Local and then push these data into the MIP-Federated Node database. This step is undertaken under the full responsibility of the Local Data Coordinator.
6. Perform federated analysis.

1. First contact with the hospital – presentation of the MIP
2. Signature of the MIP Installation Agreement by a representative of the hospital
3. Prepare IT infrastructure (server)
4. Install MIP-Local node
5. Capture pseudonymized patients data into MIP-Local

6. Signature of the Data Sharing Agreement
7. Prepare IT infrastructure (2nd server for the MIP-Federated)
8. Install the MIP-Federated node
9. Incorporate fully anonymized data into the MIP-Federated Database
10. Link to the network of MIP-Federated nodes
11. Participate to federated analysis

5. Contacts

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