MYRROR

Briefing Note

March, 2025

Automated Creation of Process Digital Twins across Fragmented, Heterogeneous Systems

Capturing the Digital Twin of any large scale, heterogeneous, distributed system without altering the messages, reconfiguring the services, installing agents on data-stores, or refactoring production

Introduction

Large organisations are defined by complex, dynamic processes, executing across fragmented IT systems comprised of multiple domains, platforms and messaging environments.

Operational and risk management controls coupled with increasing regulatory scrutiny is requiring all large organisation's to precisely document these systems and for this documentation to remain current with system change.

This is a complex challenge recently simplified by advances in AI and the emergence of the Process Digital Twin. Initial mapping of these implementations is a resource hungry, highly manual, error prone task.

The HELIXsystem Process Assembler™[1] automates the creation of The Digital Twin of the Organisation by capturing every system interaction as these execute and compiling a continuously updating representation of the live environment.

The HELIXsystem Process Assembler™ documents even the most complex infrastructure without altering the messages, reconfiguring the services, installing agents on data-stores, or refactoring production. This enables the organisation's Process Digital Twin to be generated in a fraction of the time and at a fraction of the cost than can be achieved using any alternative approach.

Keywords: Complex processes, AI, Process Digital Twin, Digital Twin of the Organisation

Definitions

Business Systems - businesses are defined by an interlinked contiguous collection of systems, each of which executes specific sets of business processes. Examples of a Business System include financial management, customer relationship management, employee management, product procurement, and facilities management.

Business Process - a business process is an assembly of interlinked, atomic activities, each of which is represented by a service interaction. These interactions, also described as "bindings", generate observable system behaviour. This behaviour is able to be captured and compiled into a continuously updating representation of the executing system semantics.

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[1] The HELIXsystem Process Assembler™ is protected technology by US patent grant No 8,554,594 "Automated Process Assembler"

Digital Twin - a Digital Twin of the Organisation, which may also be described as a Process Digital Twin is a continuously updating graphical ontology of the system bindings. This representation is best expressed using a meta-model using a standard graphical notation, providing a machine-readable description of the syntactic parameters of the executing environment[2].

The Problem

Extracting the system semantics of large complex organisations is non-trivial. The conventional approach is to compile a static representation of historical activity by extracting event information from thousands of distributed log files.

These files are invariably in numerous formats, including the XES, OCEL and CSV standards or may be in a non-standard format as is often the case with legacy implementations, such non-standard formats often failing to provide sufficient high quality, structured data to enable the system semantics to be extracted.

Regardless of the formats being employed the extracted samples from the log files need to be cleaned, formatted and standardised before an ontology can be generated. This is necessary as the extracted files will be found to have missing, duplicated or inaccurate information, with the native timestamps made available by each of the sub-system being in differing formats and varying levels of granularity.

Cleaning and standardising the extracted log files is a time consuming and resource hungry process, a problem compounded by the size, distribution and heterogeneity of large complex organisations.

Given the resource demands of extracting, cleaning and standardising the semantic information contained in the event log files, file sampling is used to contain resource demand.

Sampling generates a further level of complexity in the capture of the system semantics. The smaller the sample, the less resource required together with the increased likelihood of failing to capture the infrequently executing system activity; the larger the sample, the more costly the event log harmonisation procedure.

The HELIXsystem Process Assembler™

The Myrror Corporation's unique, patent protected technology, the HELIXsystem Process Assembler™ ("Process Assembler"), automatically compiles a Digital Twin of any complex, heterogenous environment.

The Process Assembler is system agnostic able to be deployed across any industry, military or public service vertical.

The Process Assembler captures every service binding as these occur, and assigns a highly granular, standard format timestamp to all observable system interactions.

These interactions are sorted into their logical order and presented as an end-to-end system ontology displaying all execution sequences including concurrent and parallel execution traces.

This is achieved without changing the messages, installing agents on repositories, refactoring production, introducing a point of system failure or requiring any aspect of the production environment to be referred to QA.

The ontology generated by the Process Assembler continuously updates with ultra-low latency, capturing implementation changes as these occur. This enables the Process Assembler to deliver the Process Digital Twin of any organisation regardless of the fragmentation, complexity or heterogeneity of the underlying environment.

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[2] See Appendix I

This real-time representation of system state may be used to simulate and test proposed system changes for unintended consequences prior to such changes being introduced to production. Once such proposed changes are tested across the Process Assembler Digital Twin, the Process Assembler may be used to automatically generate the code required to introduce such changes into production.

The Myrror Corporation's patent protected technology represents, for the first time, the convergence of the separate disciplines of Process Mining, AI and Digital Twin Architectures enabling current state representations of an organisations run-time systems to be compiled into a continuously updating and complete representation of a system's executing semantics regardless of the complexity of the underlying implementation.

HELIXsystem Process Assembler™ - Features

- addresses the accelerating requirement for ultra-low latency system discovery and mapping
- eliminates conventional resource hungry, error prone time-stamp harmonisation processes
- removes all process discover batch processing activities
- renders redundant all event log sampling and associated ELT procedures
- deploys across any complex, fragmented, heterogeneous architecture
- captures and reports all system binding in real-time,
- enables ultra-low latency, bi-lateral synchronisation between the live implementation and the Process Digital Twin model

Summary

The Process Assembler delivers for the first time a capability that generates a continuously updating representation that directly mirrors the live implementation.

The Process Assembler eliminates the sub-optimal, ETL, timestamp harmonisation and batch processing procedures conventionally used in process mining by utilising real-time "push" data-streams to construct and maintain the Process Digital Twin.

This approach recognises that event-driven architectures are evolving co-ordinated sets of seamless, integrated activities supporting dynamic business processes.

This requires real-time end-to-end system observability to enabling continuous system development and modification.

To enable this, the Process Assembler delivers

- ultra-low latency system update responsiveness
- bi-lateral model-to-implementation integration
- context aware system modelling and simulations
- predictive analytics to provide insights into system bottlenecks / inefficiencies and intrusions
- continuous system improvement, optimisation and enhancement

The Process Assembler is the only available capability delivering real-time complex system "observability", with near-zero latency across the entire executing environment. Only the Process Assembler delivers a complete system representation with the precision and reliability demanded by modern complex event-driven architectures whilst simultaneously providing the predictive analytics to improve business process relevance and execution accuracy across any legacy implementation.

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Appendix 1

Process Digital Twin or "Virtual Twin" of an Executing Environment

Conventionally, Digital Twin technology is well recognised as a highly capable technology for representing complex physical systems. Digital Twin technology is now expanding to render virtual representations of complex, heterogeneous, distributed systems executing multi-strand long running processes.

These representations, described as "Process Digital Twins" or "Virtual Twins" of an executing system, provide continuously updating visibility of system state. These state representations have two dimensions:

- capture and representation of the system bindings, even when binding are dynamically provisioned - "Vertical Visibility"
- capture and representation of the processing steps required to deliver a specific objective - "Horizontal Visibility"

The relationship between the two is illustrated below.

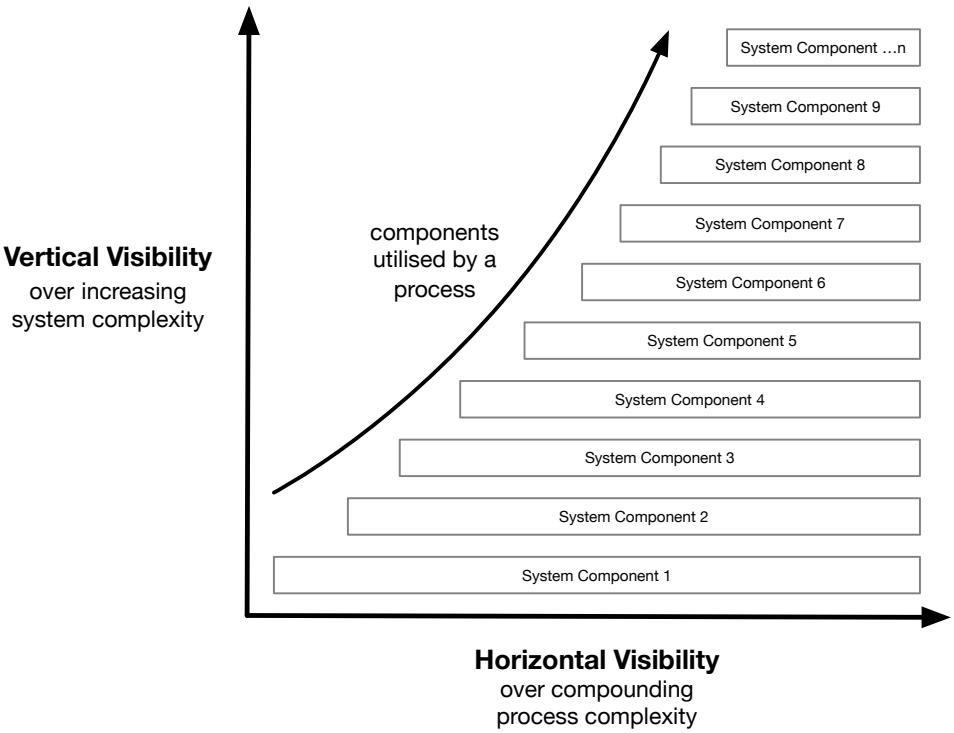

Figure 1: AI illustration of "Vertical Visibility" showing the binding across co-operating system components and "Horizontal Visibility" showing the interactions that aggregate to deliver a required process

The ability to simultaneously capture dynamically provisioned binding and concurrent behaviour renders Process Digital Twin technology particularly applicable to the mapping of multi-faceted processes executing across complex heterogeneous systems.