(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 September 2025 (11.09.2025)

WIPO | PCT

(10) International Publication Number
WO 2025/186159 A8

(51) International Patent Classification:
G06F 30/20 (2020.01) *G16B 5/00* (2019.01)

(21) International Application Number:
PCT/EP2025/055648

(22) International Filing Date:
03 March 2025 (03.03.2025)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
24305332.9 05 March 2024 (05.03.2024) EP

(71) Applicant: **MERCK PATENT GMBH** [DE/DE]; Frankfurter Strasse 250, 64293 Darmstadt (DE).

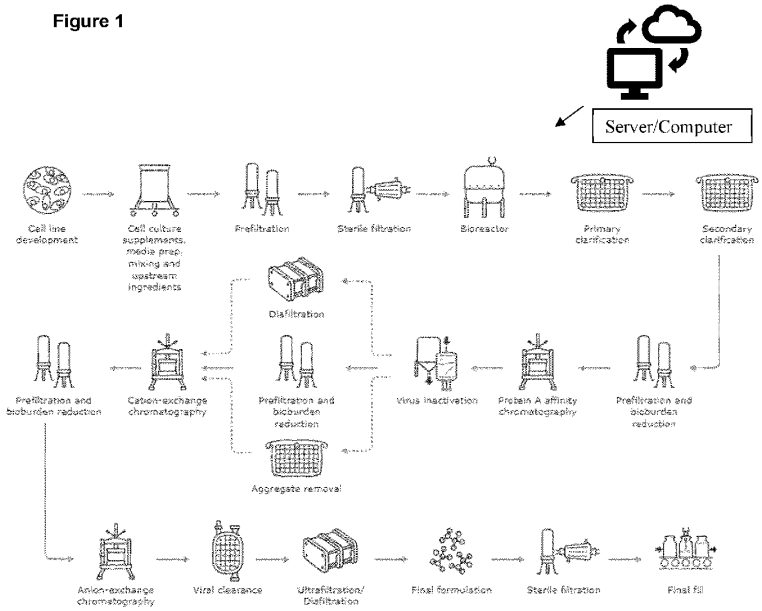
(72) Inventors: **REBAI, Adlane**; c/o Millipore S.A.S., 39, Route Industrielle de la Hardt, 67120 MOLSHEIM (FR). **EBERHARD, Philippe**; c/o Millipore S.A.S., 39, Route Industrielle de la Hardt, 67120 MOLSHEIM (FR). **COUTOULY, Marie Aude**; c/o Millipore S.A.S., 39, Route Industrielle de la Hardt, 67120 MOLSHEIM (FR). **GERLING, Jean-Luc**; c/o Millipore S.A.S., 39, Route Industrielle de la Hardt, 67120 MOLSHEIM (FR).

(74) Agent: **MERCK PATENT ASSOCIATION**; c/o Merck Patent GmbH, 64271 Darmstadt (DE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,

(54) Title: ONTOLOGY-BASED MODEL COMPOSITION IN BIOPROCESSING

Figure 1



(57) **Abstract:** A Method and a System for integrating at least two software-based models in a Target Digital Twin simulating a bioprocess via a computer, comprising the following steps of A Standardized Model Integration Step wherein a common ontology is defined by a user for the Target Digital Twin including the at least two software-based models; A Data Integration Step wherein the computer uses the ontology to facilitates the integration of heterogeneous data from various sources and the at least two software-based models; After these two steps a Data Mapping Step wherein the computer maps the ontology-integrated at least two software-based models to the designated bioprocess; An Inter-model Communication Step wherein the computer uses the ontology to exchange data about the Bioprocess between the at least two software-based models; A Simulation and Analysis Step, wherein the computer uses the ontology to align the at least two software-based models regarding their computations, inputs, and outputs to facilitate the integration of

[Continued on next page]

WO 2025/186159 A8

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UY, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

(48) Date of publication of this corrected version:
02 October 2025 (02.10.2025)

(15) Information about Correction:
see Notice of 02 October 2025 (02.10.2025)

the at least two software-based models into an end-to-end simulation of the bioprocess in form of the Digital Twin; and An Application Step of using the Digital Twin to simulate the bioprocess and its respective hardware instruments and optimize the hardware instruments and/or process settings with the respective simulation results.