



- (51) **International Patent Classification:**
G06F 9/44 (2006.01) *G06F 9/445* (2006.01)
- (21) **International Application Number:**
PCT/MY2014/000144
- (22) **International Filing Date:**
26 May 2014 (26.05.2014)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
PI 2013003497 25 September 2013 (25.09.2013) MY
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(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, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, 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, 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).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

— with declaration under Article 17(2)(a); without abstract; title not checked by the International Searching Authority



WO 2015/047076 A2

A SYSTEM AND METHOD FOR AUTO-GENERATE CLOUD RESOURCE PROVISION APPLICATION

Field of the Invention

[0001] The present invention relates to cloud computing. More specifically, the
5 present invention relates to a system and method for automatically generating cloud
resource provision application.

Background

[0002] Cloud Computing refers to the provision of computational resources on
demand through a computer network. As shown in **FIG. 1A**, Cloud Computing resources
10 **103** can be provisioned via an interface **102**, such as Command Line Interface (CLI), or
web portal, which consume the cloud application programming interface (API).

[0003] To implement new requirements **112** as shown in **FIG. 1B**, resource
provision application **118** requires human interventions which involve tasks of coding
developments **114**, packaging **115** and deployment **116** of the applications, which are
15 done manually. As shown in **FIG. 1C**, when a CLI is used for provisioning the resources,
it involves many command lines usage. Each of the processes from approving request,
checking resources availability, checking user rights limitations and usage to provisioning
cloud resources requires users to input one or more command lines to initiate and control
it. In most occasions, the commands can only be inputted after the previous one is
20 executed. For example, to check resource availability, the user enters a command line to
call Open Nebula API, i.e. `oneimage list`, only then the system will return the list
of resource available as shown below in **FIG. 1D**. But until the list is rendered, nothing

can be done by the user. The user is being notified and updated with the status at each stage. These processes are however inflexible and difficult, if not impossible, to change process flow for enabling system administrator to “program” when/who/how to provide resources.

- 5 **[0004]** These tasks and processes are resource and time consuming, notwithstanding that multiple dependencies shall also be resolved in order to complete the resource provision application development.

Summary

- 10 **[0005]** In accordance with one aspect of the present invention, there is provided a method for generating cloud resource provision application. The method comprises acquiring an input from a user through an User Interface (UI), the input includes requirements for creating the cloud resources provision application; defining a flow design having at least one component based on the input; generating a project file that includes the components, the component descriptions, the application workflow, for
15 automating the cloud resource provision application generation; generating resource provision application; packaging the resource provision application; and deploying the resource provision application.

- 20 **[0006]** In one embodiment, the creating flow definition may comprise identifying application components through the input; identifying relationships of the application components; generating a flow definition based on the identified components and relationships; and storing the flow definition into a repository.

[0007] In another embodiment, generating the resource provision application may comprise validating the flow definition; calling a workflow API to generate application components; and verifying the generated application components. It is possible that validating the flow definition further comprises reading application rules from a rule repository; comparing an order and sequence of the flow definition; inspecting syntax of the flow definition; checking whether the flow definition complies with predefined rules, if the flow definition complies with the predefined rules, the workflow API is called, otherwise the flow definition status is recorded.

[0008] In another aspect of the present invention, there is also provided a system for generating cloud resource provision application. The system comprises an User Interface (UI) for receiving user's input for requirements for creating the cloud resources provision application; an auto-generator for processing the user's input to define application flow, generate, package and deploy application based on the application flow.

[0009] In one embodiment, the system is adapted for carrying out the aforesaid method for generating cloud resource provision application.

Brief Description of the Drawings

[0010] Preferred embodiments according to the present invention will now be described with reference to the figures accompanied herein, in which like reference numerals denote like elements;

[0011] **FIGs. 1A to 1D** is a known process of provisioning resources;

[0012] **FIG. 2** illustrates a process flow for auto-generating resource provision application in accordance with one embodiment of the present invention;

[0013] FIG. 3 illustrates a process flow of defining application and generating application for auto-generating cloud resource provision application in accordance with one embodiment of the present invention;

[0014] FIG. 4 illustrates a process flow of creating flow definition of FIG. 3 in accordance with one embodiment of the present invention;

[0015] FIG. 5 illustrates a process flow for generating resource provision application of FIG. 3 in accordance with one embodiment of the present invention; and

[0016] FIG. 6 illustrates a process of validating flow definition of FIG. 5 in accordance with one embodiment of the present invention.

10

Detailed Description

[0017] Embodiments of the present invention shall now be described in detail, with reference to the attached drawings. It is to be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

[0018] FIG. 2 illustrates a process flow for auto-generating resource provision application in accordance with one embodiment of the present invention. It is an objective of the embodiment to auto-generate cloud computing resource provisioning application based on user requirements. The process includes a user defines requirements via an User Interface (UI) at step 202, a system creates an application flow that defines the required series of actions, events and etc, for executing by the generator, based on the

requirements at step 204, the system generates cloud resources based on application flow, packages and deploys the resource application at step 206, and publishing the resource provision application for accessible via web portal at step 208.

[0019] FIG. 3 illustrates a process flow of defining application 310 and

5 generating application 320 for auto-generating cloud resource provision application in accordance with one embodiment of the present invention. The process of defining application 320 includes reading inputs from user at step 312 and creating a flow definition based on the user input at step 314. Specifically, the flow definition includes flow components, relationships, data input and output for the cloud resource provision
10 application. For example, an xml syntax for a flow definition 'To Add Virtual Network (VNET) into Cloud Computing Resources' is exemplified below:

```

15 <ADD_VNET>
    <ACCEPT_PARAM_ADMIN>
        <VNET_NAME> ONE_Vnet</VNET_NAME>
        <CLUSTER_NAME> Cluster_ONE</CLUSTER_NAME>
        <TYPE> FIXED</TYPE>
        <IP>
            <IP_1> 10.1.24.240</IP_1>
            <IP_2> 10.1.24.241</IP_2>
20        </IP>
    </ACCEPT_PARAM_ADMIN>
    <APPROVE_ACTION> YES/NO </APPROVE_ACTION>
    : (multiple action form)
    :
25    :
    </ADD_VNET>

```

[0020] The flow definition may be made available on a repository that stores all

the flow definition information and rules, which are conveniently selectable by the user
30 as the input through an interface. Besides the xml syntax, the flow definition can also be

available in any other coding such as GUI component based language. Once the user enters the inputs, a flow engine generates an application automatically based on inputs. A flow definition file is generated in this step.

[0021] Still referring to **FIG. 3**, the step of generating application **320** further comprises generating resource provision application in step **322**, packaging application at step **324** and deploying application at step **326**. The resource provision application is generated based on the flow definition file generated in the preceding step. The flow definition provides the relevant flow design of descriptions for one or more of the required components. The components may include, but not limited to, any of web portal, workflow software, web services, xml nodes (parent or child or sub nodes) and cloud computing resources. An application workflow is generated based on the descriptions to render a project file that contains one or more flow definition files. With the project file, resource provision application is generated at step **322**, and the resource provision application is then packed up at step **324** and deployed at step **326**. The resource provision application can be accessible through a remote repository.

[0022] **FIG. 4** illustrates a process flow of creating flow definition **314** of **FIG. 3** in accordance with one embodiment of the present invention. The process of creating flow definition **314** further comprises reading inputs from user at step **402**; identifying application components based on user input at step **404**; identifying components relationships at step **406**; generating a new flow definition based on identified components and relationships at step **408**; and storing the new generated application definition into a definition repository at step **410**. Once the flow definition is generated, it is used for generating resource provision application through the resource provision application engine at the step **322**.

[0023] **FIG. 5** illustrates a process flow for generating resource provision application **322** of **FIG. 3** in accordance with one embodiment of the present invention. The process further comprises validating flow definition at step **502**; calling a workflow API to generate application components at step **504**; verifying the generated application components at step **506**; packaging the generated application components for deployment at step **508**; and deploying the generated application **510**.

[0024] **FIG. 6** illustrates a process of validating flow definition **502** of **FIG. 5** in accordance with one embodiment of the present invention. The process comprises reading application rules from a rule repository at step **602**, comparing the order and sequence of the flow definition at step **604**, inspecting the syntax of the flow definition at step **606**, and inspecting the syntax of the flow definition. When the syntax of the flow definition is being inspected, it checks if the flow definition complies with the definition rules at step **608**. If it complies with the definition rules, the workflow API is called to generate application components as provided in the step **504** of **FIG. 5**. If it does not comply, the flow definition status is being update at step **614** and the auto-generation process is terminated. User will be notified on the validation status.

[0001] While specific embodiments have been described and illustrated, it is understood that many changes, modifications, variations, and combinations thereof could be made to the present invention without departing from the scope of the invention.

Claims

1. A method for generating cloud resource provision application, the method comprising:

5 acquiring (312) an input from a user through an User Interface (UI), the input includes requirements for creating the cloud resources provision application;

defining a flow design having at least one component based on the input;

generating a project file that includes the components, the component descriptions, the application workflow, for automating the cloud resource provision

10 application generation;

generating (322) resource provision application;

packaging (324) the resource provision application; and

deploying (326) the resource provision application.

2. The method according to claim 1, wherein creating (314) flow definition

15 comprising:

identifying (404) application components through the input;

identifying (406) relationships of the application components;

generating (408) a flow definition based on the identified components and relationships; and

storing (410) the flow definition into a repository.

3. The method according to claim 1, wherein generating (322) the resource provision application comprising:

validating (502) the flow definition;

5 calling (504) a workflow API to generate application components; and

verifying (506) the generated application components.

4. The method according to claim 3, wherein validating (502) the flow definition comprising:

reading (602) application rules from a rule repository;

10 comparing (604) an order and sequence of the flow definition;

inspecting (606) syntax of the flow definition; and

checking (608) whether the flow definition complies with predefined rules, if the flow definition complies with the predefined rules, the workflow API is called (504), otherwise the flow definition status is recorded.

15 5. A system for generating cloud resource provision application, the system comprising:

an User Interface (UI) for receiving user's input for requirements for creating the cloud resources provision application; and

an auto-generator for processing the user's input to define application flow, generate, package and deploy application based on the application flow.

6. The system according to claim 5, the system carries out the method according to claim 1.

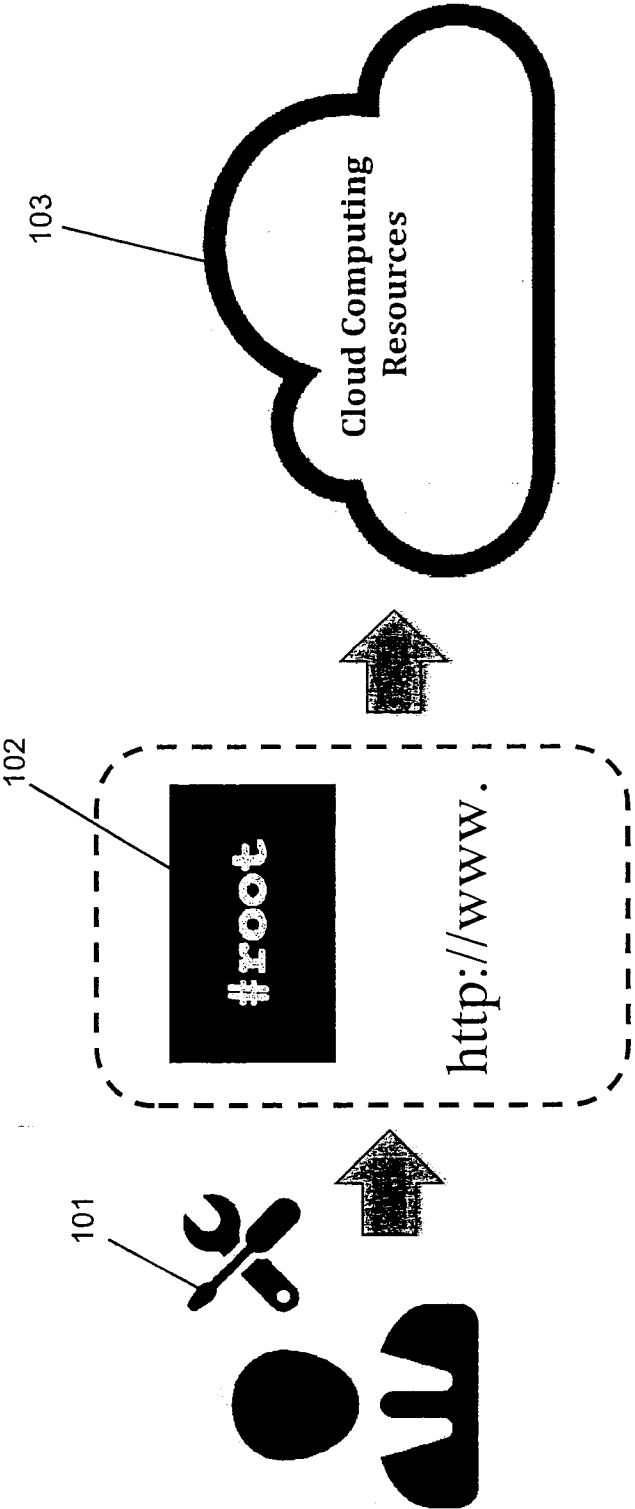


FIG. 1A

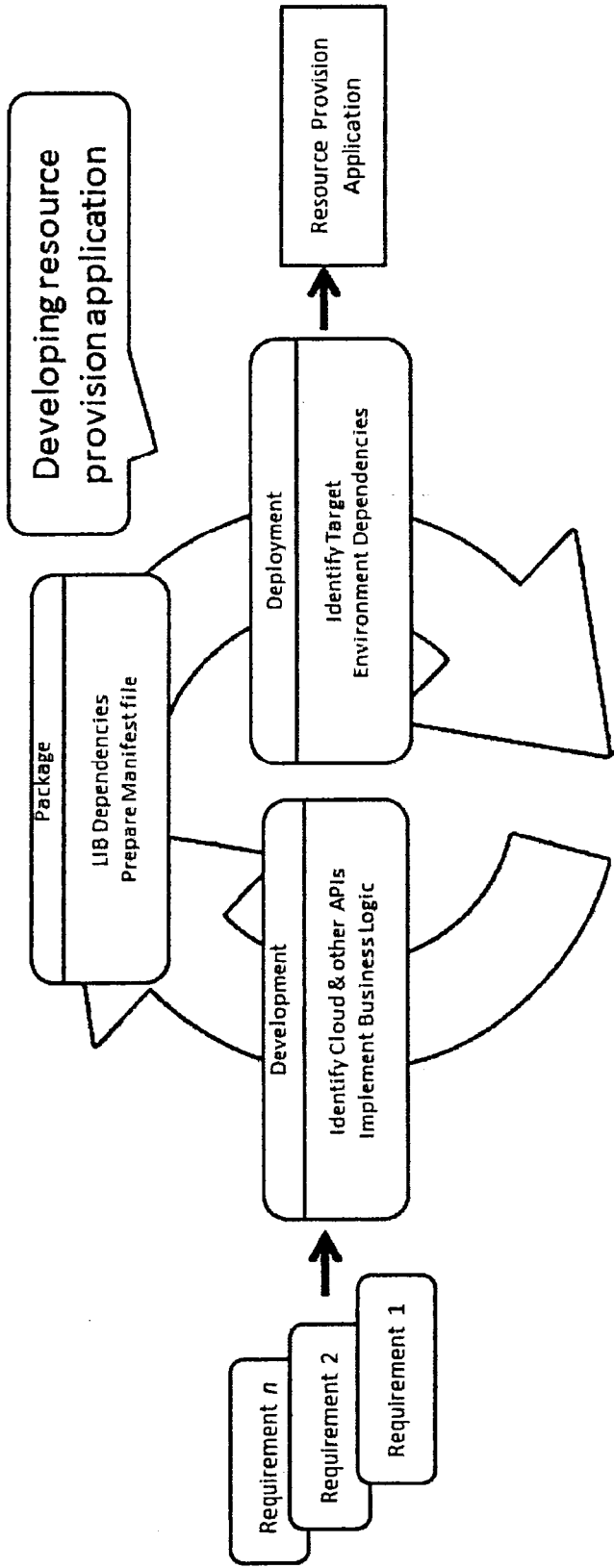


FIG. 1B

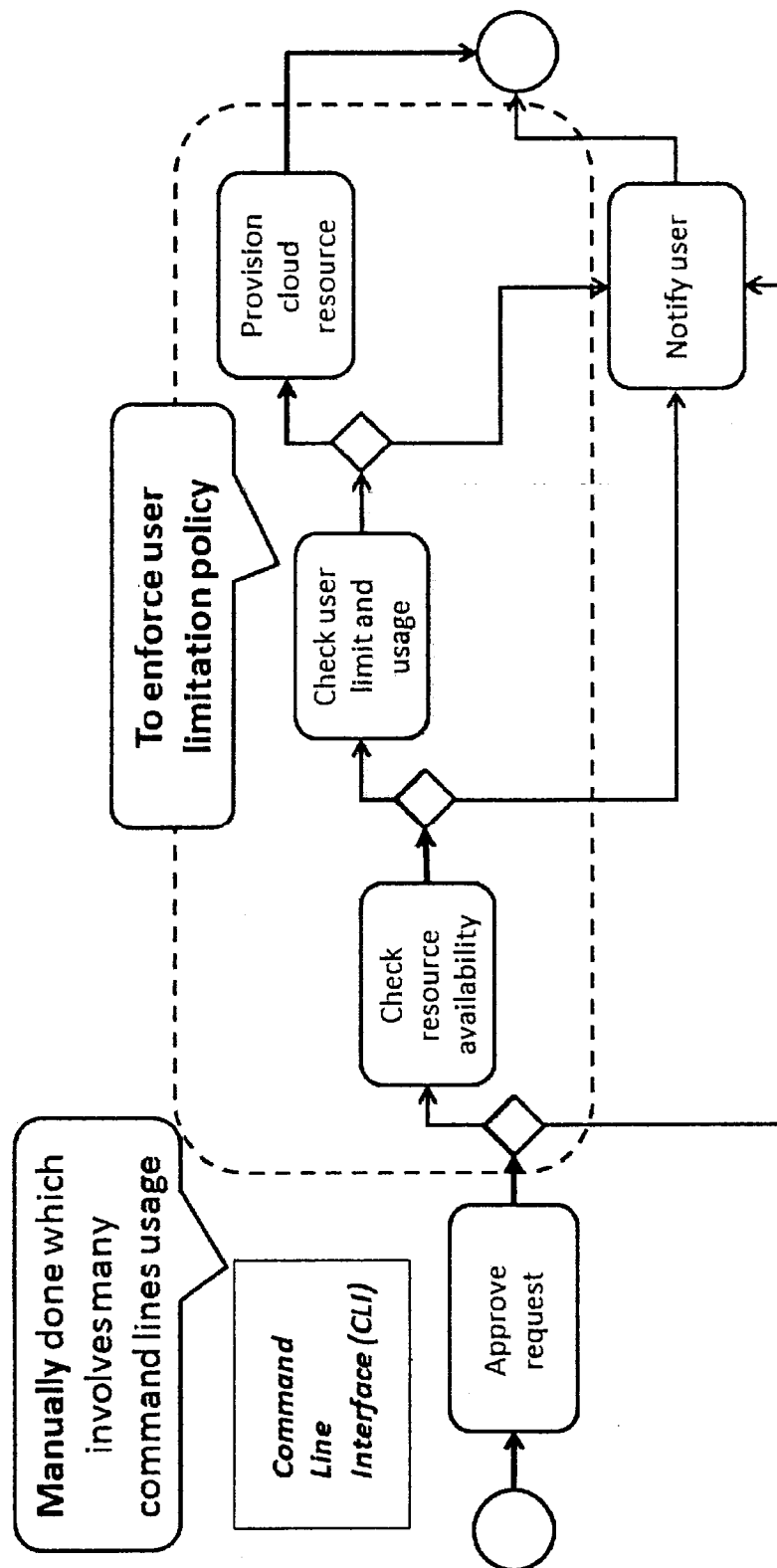


FIG. 1C

* Documentation: <https://help.ubuntu.com/>
You have new mail.
Last login: Wed Aug 14 10:15:49 2013 from 10.1.23.179
oneadmin@one-frontend:~\$ oneimage list

ID	USER	GROUP	NAME	DATASTORE	SIZE	TYPE	PER	STAT	RMS
17	oneadmin	oneadmin	30GB-DB.qcow2	ds-image	30G	DB	No	used	1
31	naza	users	Ubuntu-12.04-vn	ds-image	2.2G	OS	Yes	used	1
299	raju	dept-acl	testing12345cen	ds-image	3.4G	OS	Yes	used	1
330	raju	dept-acl	cc02	ds-image	30G	DB	Yes	used	1
331	raju	dept-acl	cc03	ds-image	30G	DB	Yes	used	1
332	oneadmin	oneadmin	ebs-50F805D7	ds-image	30G	DB	Yes	used	1
382	oneadmin	oneadmin	ubuntul204lts	ds-image	2.4G	OS	No	rdy	0

FIG. 1D

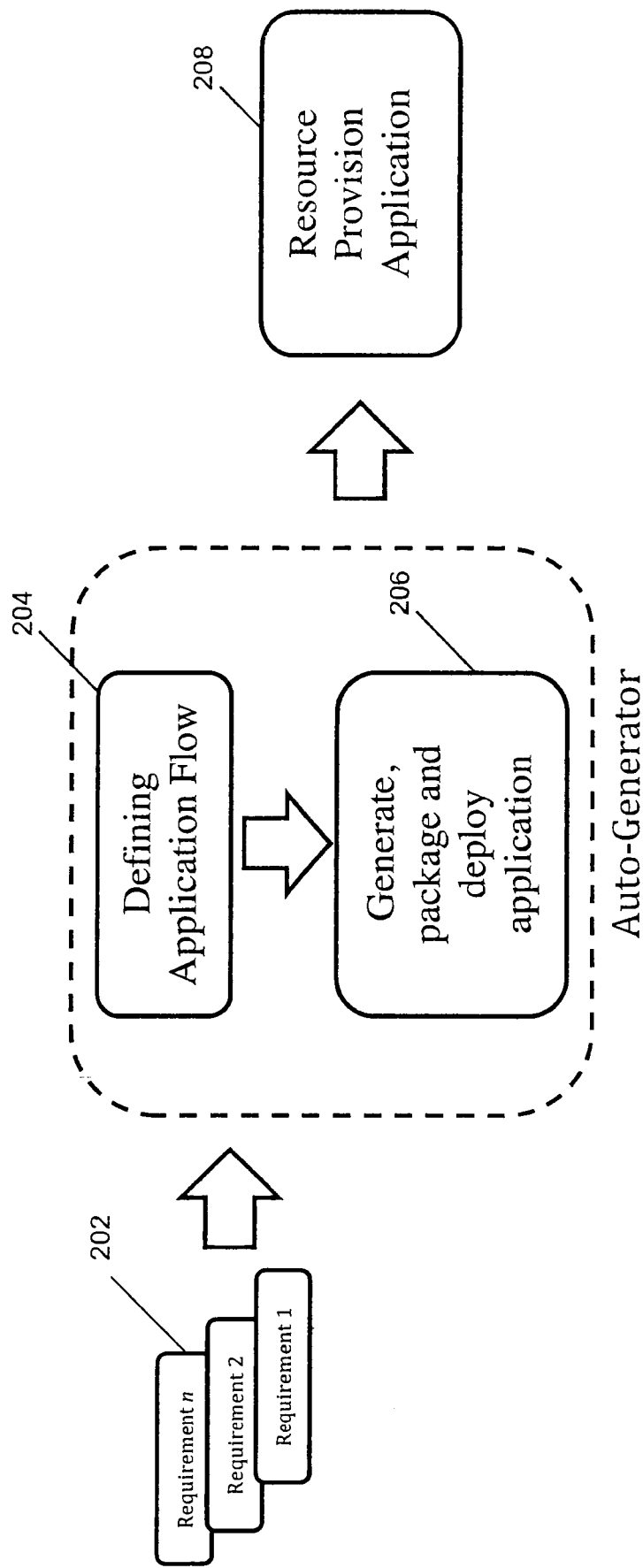


FIG. 2

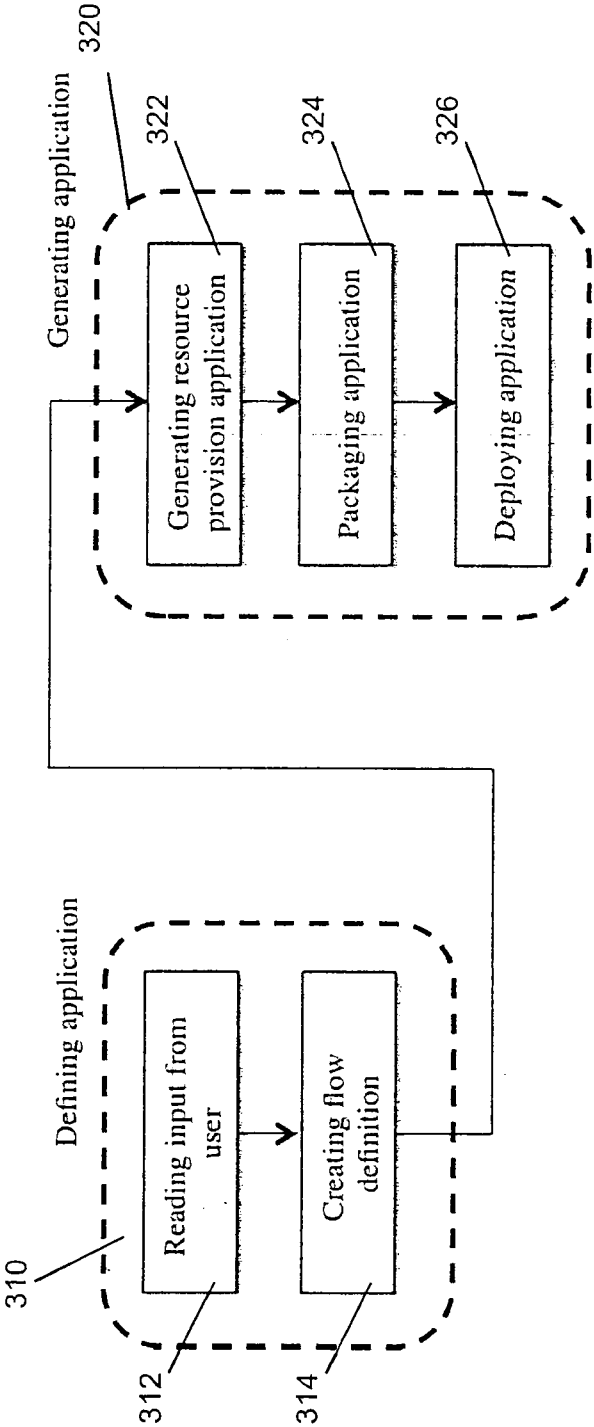
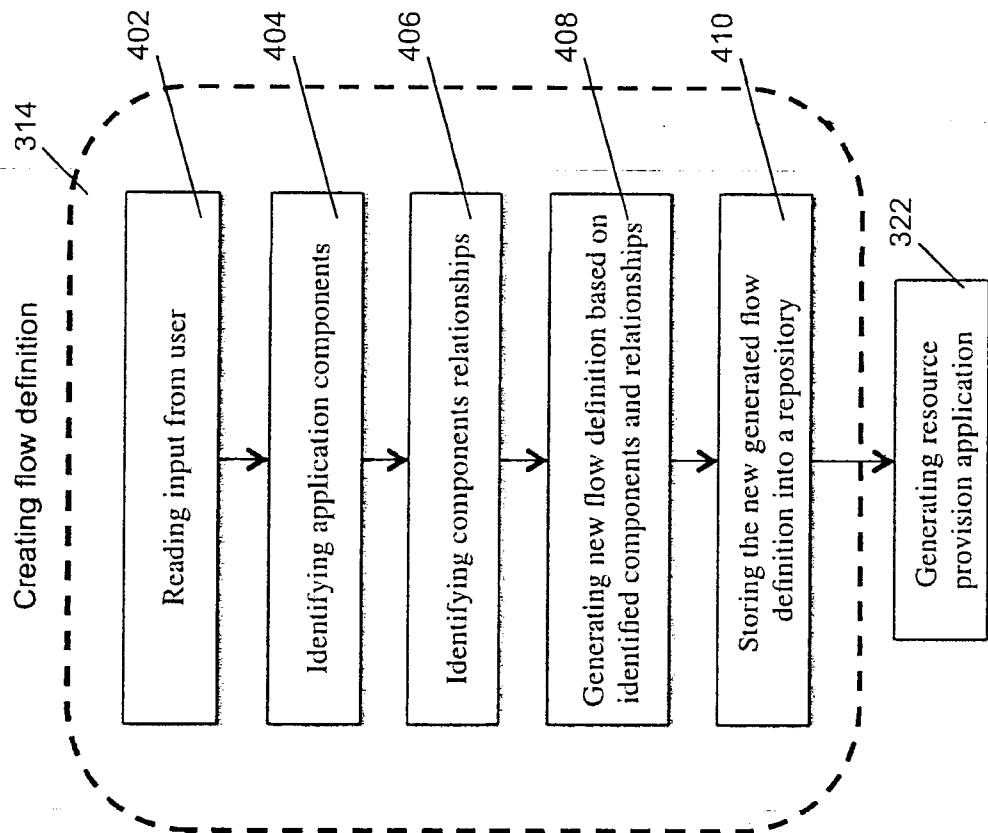


FIG. 3

**FIG. 4**

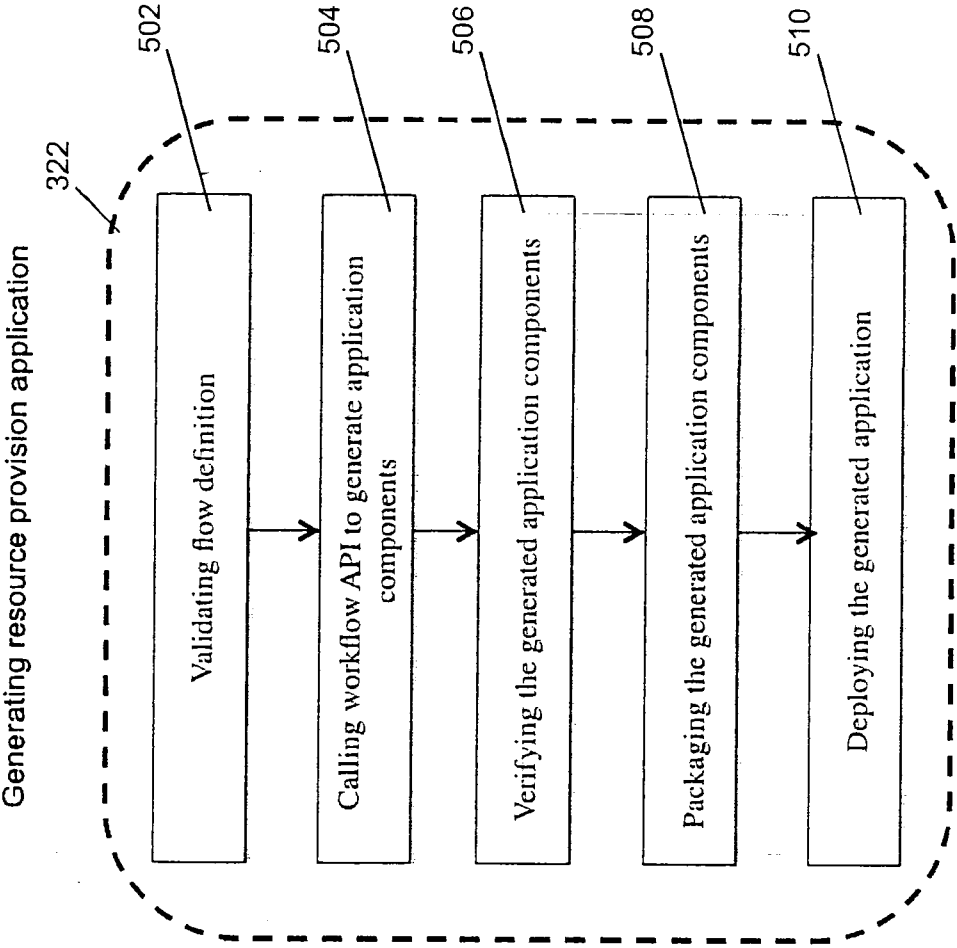
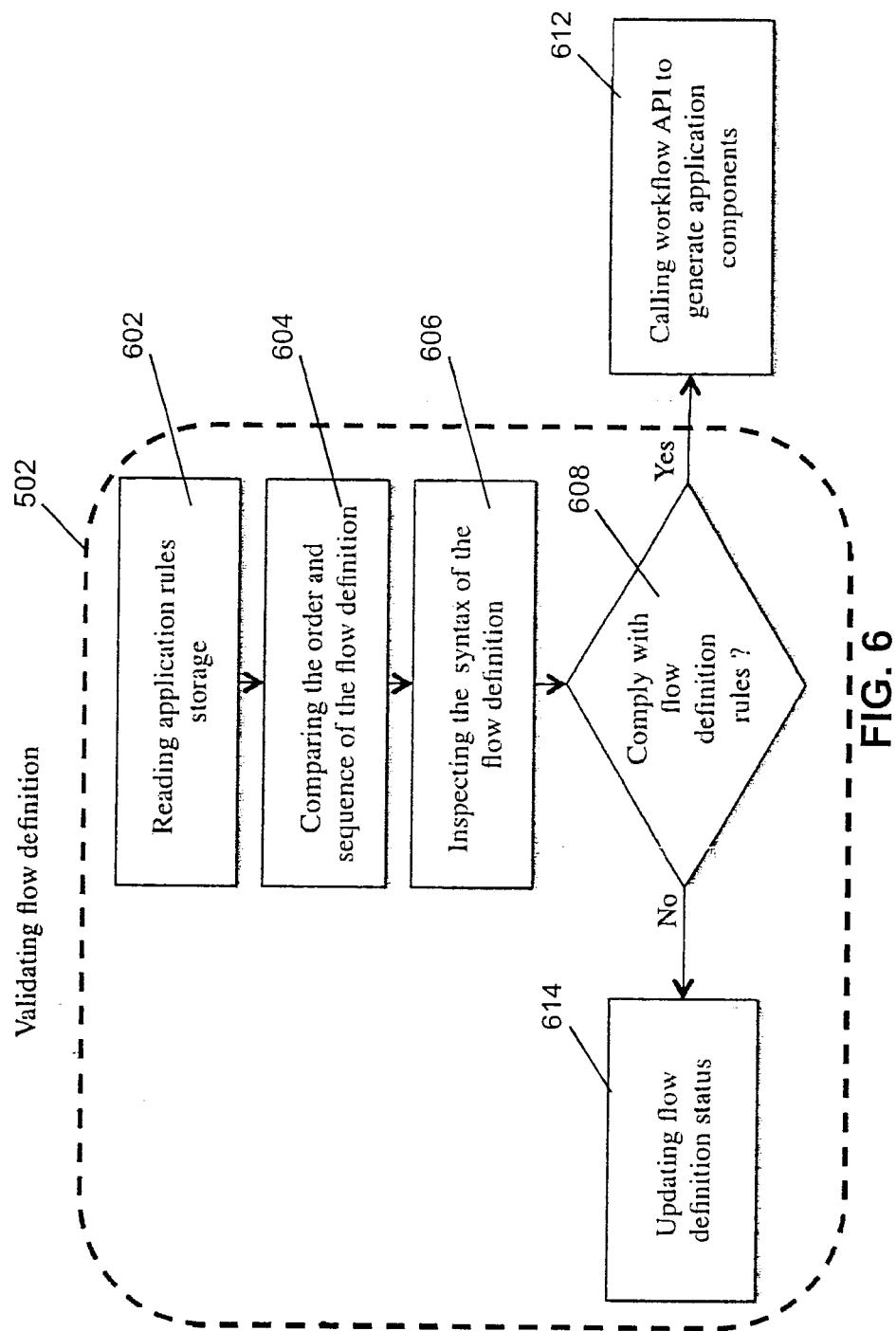


FIG. 5



PATENT COOPERATION TREATY

PCT

DECLARATION OF NON-ESTABLISHMENT OF INTERNATIONAL SEARCH REPORT

(PCT Article 17(2)(a), Rules 13ter.1(c) and Rule 39)

Applicant's or agent's file reference 1O146.P064PCT	IMPORTANT DECLARATION	Date of mailing(<i>day/month/year</i>) 13 November 2014 (13-11-2014)
International application No. PCT/MY2014/000144	International filing date(<i>day/month/year</i>) 26 May 2014 (26-05-2014)	(Earliest) Priority date(<i>day/month/year</i>) 25 September 2013 (25-09-2013)
International Patent Classification (IPC) or both national classification and IPC G06F9/44, G06F9/445		
Applicant MIMOS BERHAD		

This International Searching Authority hereby declares, according to Article 17(2)(a), that **no international search report will be established** on the international application for the reasons indicated below

1. ☐ The subject matter of the international application relates to:
 - a. ☐ scientific theories
 - b. ☐ mathematical theories
 - c. ☐ plant varieties
 - d. ☐ animal varieties
 - e. ☐ essentially biological processes for the production of plants and animals, other than microbiological processes and the products of such processes
 - f. ☐ schemes, rules or methods of doing business
 - g. ☐ schemes, rules or methods of performing purely mental acts
 - h. ☐ schemes, rules or methods of playing games
 - i. ☐ methods for treatment of the human body by surgery or therapy
 - j. ☐ methods for treatment of the animal body by surgery or therapy
 - k. ☐ diagnostic methods practised on the human or animal body
 - l. ☐ mere presentations of information
 - m. ☐ computer programs for which this International Searching Authority is not equipped to search prior art
2. ☒ The failure of the following parts of the international application to comply with prescribed requirements prevents a meaningful search from being carried out:

☐ the description
 ☒ the claims
 ☐ the drawings
3. ☐ A meaningful search could not be carried out without the sequence listing; the applicant did not, within the prescribed time limit:

☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13ter.1(a) or (b).
4. Further comments:

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	Authorized officer SOMMERMEYER, Katrin Tel: +49 (0)89 2399-7677
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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 203

The subject-matter claimed relates to a method and system for generating a cloud resource provision application.

The wording of the claims does not go beyond well-known high-level commonplace concepts for generating of applications, such as acquiring user input comprising requirements, generating intermediate files and generating/packaging and deploying the application.

Whereas there are claimed features which are arguably of technical character (like system, user interface, file and deploying an application), these features were undoubtedly notoriously known at the time of priority of the present application and cannot contribute towards any inventive step. Further more, the cloud resource provision application, when eventually executed, does not necessarily lead to a technical effect, e.g. applications dealing with business aspects of the cloud resource provisioning clearly fall under the scope claimed, nor do the steps of generating this application encompass any specific technical teaching. The subject-matter claimed hence does not lead to any technical effect over the inherent effects of these features of technical character nor does it solve any technical problem.

For these reasons, and due to the very generic drafting and the extreme high abstraction level of the formulation of the claims and indeed of the entire patent application, no meaningful search is possible, Article 17(2)(a) PCT and the PCT guidelines, PCT/GL/ISPE, Part III, chapter 9.04.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.