PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 36100-WO-17	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/IL2017/050277	International filing date *(day/month/year)* 07 March 2017 (07.03.2017)	Priority date *(day/month/year)* 08 March 2016 (08.03.2016)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant B. G. NEGEV TECHNOLOGIES AND APPLICATIONS LTD., AT BEN-GURION UNIVERSITY		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

    In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

    ☒ Box No. I   Basis of the report

    ☐ Box No. II   Priority

    ☐ Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

    ☐ Box No. IV   Lack of unity of invention

    ☒ Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

    ☐ Box No. VI   Certain documents cited

    ☐ Box No. VII   Certain defects in the international application

    ☐ Box No. VIII   Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 11 September 2018 (11.09.2018)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Simin Baharlou e-mail: pct.team9@wipo.int

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

<table>
<tr><td>
To:

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P.O. Box 5352
Beer Sheva 8415202
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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)
</td></tr>
</table>

| | Date of mailing *(day/month/year)* | 14 Jun 2017 |

| Applicant's or agent's file reference | **FOR FURTHER ACTION** |
| 36100-WO-17 | See paragraph 2 below |

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IL2017/050277	07 Mar 2017	08 Mar 2016

| International Patent Classification (IPC) or both national classification and IPC |
| IPC (2017.01) G06F 21/56 G06F 21/60 G06F 21/55 G06F 21/50 |

| Applicant |
| B. G. NEGEV TECHNOLOGIES AND APPLICATIONS LTD., AT BEN-GURION UNIVERSITY |

1. This opinion contains indications relating to the following items:

   ☒ Box No. I Basis of the opinion

   ☐ Box No. II Priority

   ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   ☐ Box No. IV Lack of unity of invention

   ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

   ☐ Box No. VI Certain documents cited

   ☐ Box No. VII Certain defects in the international application

   ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

   If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

   If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

   For further options, see Form PCT/ISA/220.

| Name and mailing address of the ISA:
Israel Patent Office
Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel
Facsimile No. 972-2-5651616 | Date of completion of this opinion

11 Jun 2017 | Authorized officer
COPPENHAGEN Uri

Telephone No. 972-2-5657811 |

Form PCT/ISA/237 (cover sheet) (January 2015)

| **Box No. I** | **Basis of this opinion** |

1. With regard to the **language**, this opinion has been established on the basis of:

   [X] the international application in the language in which it was filed.

   [ ] a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. [ ] This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. [ ] forming part of the international application as filed:

      [ ] in the form of an Annex C/ST.25 text file.

      [ ] on paper or in the form of an image file.

   b. [ ] furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. [ ] furnished subsequent to the international filing date for the purposes of international search only:

      [ ] in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      [ ] on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. [ ] In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-7	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	1-7	NO
Industrial applicability (IA)	Claims	1-7	YES
	Claims		NO

2. Citations and explanations:

2. Reference is made to the following documents:

D1: US20140047544 (A1) JAKOBSSON, 13 February 2015 (2015-02-13)
D2: US20070277241 (A1) REPASI et al., 29 November 2007 (2007-11-29)

2.1 Inventive step

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-7 lacks an inventive step in the sense of Article 33(3).

Regarding independent claim 1: D1 discloses a system for protecting IoT devices (See D1: ¶0024 "networked units" and ¶0029 "examples of networked units can be ... virtually any other device that includes a processor and a memory, including what is commonly referred to as "the Internet of things") from malicious code (See D1: Abstract "system that detects and classifies malware"), which comprises an extracting module (See D1: ¶0025 "proxy") at each of the IoT devices, for extracting content (See D1: ¶0025 "wherein the proxy is an agent that negotiates the collection of interaction data") from the IoT device, and sending the same content to an in-cloud server (See D1: Abstract "server-side system" and ¶0024 "detection and classification unit"); and an in-cloud server for receiving content, and performing an integrity check for the possible existence of malicious code within the content (See D1: ¶0046 "interaction data is further analyzed by the detection and classification unit in order to identify patterns associated with known or unknown malware").
The D1 teaching does not explicitly state applying its method to a copy of content residing in the internal memory of an IoT device. However, performing an integrity check for malware on content extracted from internal memory has been disclosed by D2 (See D2: ¶0008 " Firmware is often provided on Flash ROMS" and ¶0023 "analyzing the copy of the firmware to determine if the firmware has been modified by malware") for the sake of detecting malware on a processing system (See D2: Abstract).
Given that D1 discloses a system to detect malware on an IoT device by doing a check on a copy of the device content externally to the device and that D2 discloses obtaining the copy of the content to be checked by extracting a copy of the content from a device's internal memory, a person skilled in the art would consider it obvious and straightforward to combine the teaching of D1 and D2, in order to perform an external integrity check for a possible existence of malicious code within the memory content of an IoT device. Therefore claim 1 lacks an

inventive step in light of the teaching of D2 over D1.

Regarding dependent claim 2: D1 discloses a system according to claim 1, wherein an in-cloud server performs analysis of the memory to find malicious behavior using behavioral and heuristics methods (See D1: Fig 6 and ¶¶0051-0055) and a cross-view check and validation of memory contents of a plurality of IoT devices (See D1: ¶0040 "the detection and classification unit can compare the received value to the known value and determine based on a comparison if the particular networked device is corrupted"). Thus, claim 2 lacks an inventive step.

Regarding dependent claim 3, D1 discloses a system wherein following the integrity check, the in-cloud server reports the results, raising a warning or an alert in a case of detection of an unexpected code or behavior (See D1: ¶0063 "alerts resource providers"). Thus, claim 3 lacks an inventive step.

Regarding dependent claim 5, D1 discloses a system wherein the memory extraction module is embedded within a kernel of a respective operating system of the IoT device (See D1: ¶0028 "the proxy can be implemented as a hardware or firmware component associated with the modem processor of a networked device"). Thus, claim 5 lacks an inventive step.

Claims 4, 6 and 7 do not contain features which in combination with the features of any claims to which they refer, meet the requirements of the PCT in respect to an inventive step in the sense of Articles 33(3) PCT , because of those features not yielding any surprising technical effect for person skilled in the art and are considered merely as design options.

2.2 Industrial Applicability

The invention defined in the claims 1-7 is considered to meet the requirements of industrial applicability under Article 33(4) of the PCT.