

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOAST INC.,

Petitioner,

v.

GRATUITY, LLC,

Patent Owner.

Case IPR2023-01408
U.S. Patent 9,741,050 B2

**DECLARATION OF PROFESSOR IAN H.S. CULLIMORE, PH.D., IN SUPPORT
OF PATENT OWNER'S RESPONSE TO THE DECISION GRANTING
INSTITUTION**

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I. INTRODUCTION

1. My name is Professor Ian H.S. Cullimore, Ph.D., and I have been retained by Patent Owner, Gratuity Solutions, LLC and Gratuity, LLC (“Gratuity”) as an expert witness in this IPR.

2. I have been asked to review the Board’s Institution Decision of March 27, 2024, as well as the Toast’s Petition for Inter Partes Review of U.S. Patent No. 9,741,050, filed on September 18, 2023, including the supporting Declaration of Dr. Russ (Ex. 1002) in support of Toast’s Petition.

3. I have been asked to consider whether the claims of the ’050 patent would have been obvious under U.S. Patent law in view of the Marshall, Phillips, and Webb references (Exs. 1004-1006, respectively) cited in Grounds 1-4 of Toast’s Petition and as discussed by the Board in its Institution Decision of March 27, 2024. I was also asked to review and comment on a number of the technical statements made by Toast in its Petition, and by Dr. Russ in his Declaration in support of Toast’s Petition. As part of my consideration, I examined the patent’s claims, the specification, the patent’s file history including the original Examiner’s consideration and analysis of Marshall, Phillips, and Webb.

4. This Declaration summarizes my opinions on the ’050 patent’s claimed advancements over the prior art systems and methods disclosed in Marshall, Phillips, and Webb.

5. I reserve the right to amend this declaration to address any response by Toast and/or Dr. Russ.

6. This Declaration contains statements of my opinions formed to date regarding the prior art and the ’050 patent, and the bases and reasons for my opinions. I may offer

additional opinions based on further review of materials in this case, including opinions and/or testimony of other expert witnesses.

7. I reserve the right to revise, supplement, and/or amend my opinions in this Declaration based on future positions, and to rebut positions taken by Defendants and/or their experts, additional documents, testimony, or other information provided by Defendants or its witnesses, any orders from the Court, or as I may otherwise find necessary.

8. My educational and professional background, patents, and professional association memberships are listed in my *curriculum vitae* (CV), which is attached as Exhibit 1 to this declaration.

II. QUALIFICATIONS

9. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth herein.

10. In this section, I have summarized my educational background, work experience, and other relevant qualifications. A true and accurate copy of my curriculum vitae is attached as Exhibit 2001 to this declaration.

11. I am an entrepreneur and a design consultant in software, hardware, and electronics. I have over four decades of software and hardware engineering experience in handheld devices and portable computers (“PCs”). This includes work in the development of early handheld devices throughout the 1980s, 1990s and 2000s. Presently, I design software and hardware for the Internet-of-Things (“IoT”) in my UK-based lab, and I work as a consultant for companies developing their own technology and systems.

12. I earned a Bachelor of Science in Mathematics from King’s College in London in 1981. I earned a Doctor of Philosophy in Cognitive and Computer Science from the University

of Sussex in 2000. My Ph.D. thesis was titled “An Analysis and Implementation of Informal Human-Computer Interaction.”

13. Throughout my forty-plus-year career, I have had extensive experience developing hardware and software systems for handheld devices and portable computers. As part of my work with handheld devices, I have developed expertise in the development of ultra-low power designs, software operating systems, embedded systems, read-only memory basic input/output systems (“ROM BIOSs”), communications, back-end Internet server, Web Services, Cloud systems, and POS systems. Some of these products are closely aligned to the technology which is the subject of this declaration.

14. From 1984 to 1986, I worked as a video games programmer for Atari, Inc. and Psion PLC, which later became Symbian Ltd. During this time, I was one of the architects of the Symbian Operating System for smartphones developed by companies like Nokia Corporation and Motorola, Inc. Later, I transferred to the small team developing one of the world’s first handheld personal digital assistant computers (“PDA”), the Psion Organiser. At Psion, IO was involved in my first POS (Point Of Sale) systems development. In 1985 the giant UK retailer Marks & Spencer (‘M&S’) had need for an at-till charge card verification system, and we developed one for them based on the Psion Organiser. Psion also developed a fully-fledged hi-tech POS demonstration system for M&S.

15. In 1985, I founded Distributed Information Processing Ltd. (“D.I.P.”), where my team and I invented one of the first pocket PCs, specifically its hardware architecture and software systems. I also wrote an IBM PC compatible ROM BIOS for this device and architected its MS-DOS compatible operating system. The device was later licensed to Atari, Inc. and sold as the Atari Portfolio, as shown below:



16. In 1988, I co-founded the Silicon Valley-based Poqet Computer Corporation, which manufactured and sold the Poqet PC, a handheld DOS-based computing device which is shown below. The Poqet PC was one of the first subnotebook computers capable of running MS-DOS. I wrote and architected its ROM BIOS, as well as advanced ROM BIOS Extensions for the OS to control its power management.



17. From 1994 until 1996, I worked as a Software Director at Xircom, Inc. While there, I developed software for Palm devices to interface with cellular phones via the serial port, to enable various functionalities, including sending and receiving text (SMS) messages.

18. In 1996, I founded Informal Software. Continuing my Ph.D. research, I developed user interface designs, electronic annotation software, and hardware systems running on the connected PDA and smartphone devices of the day. These devices included Palm and Handspring PDAs and Microsoft Windows CE devices like the Compaq iPaq and HP Jornada. I developed web-based versions of this software and hardware prototypes of what would have been one of the first tablet computers at the time. In 2003 I developed a prototype product of a wireless handheld POS/Food Ordering System as part of a consulting project at 3M Corporation's Food Services Division in Minneapolis, based on the handheld, wireless and back-end server technology I had created at Informal.

19. I am a named inventor on nine U.S. patents and one European patent.

20. I am being compensated at my usual consulting rate of \$450 per hour for services I provide in connection with this proceeding. This compensation is not contingent upon my performance, the outcome of this proceeding, or any issues involved in or relating to this proceeding.

III. PRIOR TESTIMONY

21. I have been retained as an expert Witness in connection with 32 Cases to date, 24 Expert Reports written, 11 Depositions, 4 IPR cases, 1 Court Case at full trial, 1 attendance to give evidence at an Evidentiary Hearing at the American Arbitration Association, San Francisco, 1 other Court attendance.

22. A list of all such cases in which I have consulted or testified as an expert at trial or by deposition can be found in my CV in Exhibit 1.

IV. COMPENSATION

23. I am being compensated for my services at a rate of \$450 per hour. I am also

being separately reimbursed for any out-of-pocket expenses. My compensation is not contingent upon the outcome of this matter or any opinions that I express herein. I have no other interests in these actions or with any party.

V. MATERIAL CONSIDERED

24. My opinions are based on my experience in this field, and are necessarily formed by my own experiences, materials I have read over the years, and discussions I have had with colleagues during my career. In addition, I have reviewed and considered the following materials in forming my opinion:

- a. the '050 patent and its prosecution history;
- b. the Petition for Inter Partes Review filed by Toast on September 18, 2023, and all Exhibits cited therein;
- c. the art cited in the Petition in Grounds 1-4, including Marshall (Ex. 1004), Phillips (Ex. 1005), and Webb (Ex. 1006); and Grounds 1-4 set forth in the Petition; and
- d. the deposition transcript of Dr. Russ dated May 31, 2024.

VI. PERSON OF ORDINARY SKILL IN THE ART

25. I understand that the asserted claims must be interpreted from the perspective of what would have been known or understood by a POSITA as of the earliest claimed priority date of the asserted claims, which I have assumed is September 4, 2012.

26. The relevant technical field for the asserted patents covers computer hardware and software. In my opinion, a POSITA in this technical field on September 4, 2012, would have had a Bachelor of Science in computer science, computer engineering, electrical engineering, or similar major with at least two years of experience related to research,

evaluation, design, development, testing, etc. of computer hardware and software. This definition is approximate, and more experience may substitute for education or vice versa. My opinions regarding the level of ordinary skill in the art are based on, among other things, my experience in the relevant field, my understanding of the basic qualifications that would be relevant to an individual tasked with implementing computer security hardware, software, and firmware, and my familiarity with the backgrounds of researchers and practitioners in the related areas, including work colleagues and other individuals, both past and present, who work in these areas.

27. I disagree with Dr. Russ's definition of a POSITA that they would have had "two to three years of experience in point of sale systems, time management systems, and/or restaurant management computer systems." This is a specialized area of computer development. I would not expect a POSITA at that juncture in their working life, unless unusually attracted to POS systems and technology, to have focused on that area.

28. My opinions herein regarding the understanding of a POSITA and my other opinions set forth herein would remain the same if the POSITA were determined to have somewhat more or less education and/or experience than I have identified above. Although my knowledge and skill exceed that of a POSITA, my opinions herein reflect and are made from the understanding that a POSITA would have had as of September 4, 2012.

VII. FUNCTIONAL IMPROVEMENTS OF THE INVENTION

29. With regard to independent claims 1 and 8 of the '050 patent, its functional improvements include:

- a. The gratuity management system (GMS) **100** is situated in the cloud, rather than being replicated on each and every client business system

108. This placement of **GMS 100** significantly eases the burden of hardware and software maintenance. If, instead, the **GMS 100** were to be placed in each client business system, then maintenance of the **GMS 100** software would fall upon all the client business system's **118** owners, rather than upon the one **GMS 100**'s cloud service provider.

- b. The gratuity sync client (**GSC 206**), located in the point of sale system **110**, allows one **GMS 100** in the cloud to interface with and extract data from each client business system **108**. Without the **GSC 206** or its equivalent, transaction and employee information generated by the point of sale system **110** could not be shared with the **GMS 100**.
- c. Because the **GSC 206** is network-connected to the **GMS 100**, any corrections, updates, or improvements in the **GSC 206** software can be managed by the **GMS 100**'s cloud service provider and downloaded from the cloud into each client business system as needed.
- d. The web portal **120** provides a viewport into the gratuity information calculated by processor **102**, using employee gratuity distribution rules **106**, and stored in database **104**. Because the web portal **120** is network-connected to **GMS 100**, this viewport is available to both managers and employees from any web-connected device (e.g. PCs, smartphones, tablets).

VIII. CONTRAST WITH OTHER METHODS

30. With regard to claim 1 of the '050 patent, alternative implementations are possible but less desirable.

- a. Claim 1 requires that gratuity management system **100** be implemented in the cloud ('050 patent, 22:58-59). As explained in the specification, an alternative placement of the GMS **100** would be to replicate it in each and every point of sale system **110**. This alternative placement of the GMS **100** is less desirable because it would push hardware and software maintenance of the GMS **100** onto each owner of a client business system **108**, rather than upon the single GMS **100** cloud service provider.
- b. Claim 1 requires a distinct “server connected to a computer network” ('050 patent, 22:40). If the GMS **100** server **102** is not connected to a computer network, then the GMS **100** must either be (1) replicated in each client business system **108** or (2) the server **102** must have individual point-to-point (*i.e.*, non-networked) communications means (*e.g.*, telephone lines) to each and every client business system **108**. Replication of the GMS **100** is undesirable from the point of view of hardware/software maintenance. The use of point-to-point communications (*e.g.*, telephone lines) is likewise undesirable because, to serve N client business systems **108**, the GMS **100** would need N point-to-point communication links rather than one connection to the Internet **208**.
- c. Claim 1 requires “a database accessible by the server” ('050 patent, 22:44). Without a database **104** in which to store transaction information, employee information, and each client's gratuity distribution rules, the server would be unable to associate any single transaction (and thus any single gratuity amount) with any individual employee. An alternative implementation would be to force the point of sale system **110** to communicate a single transaction to the GMS **100**,

then determine the identity of the employee identified in the single transaction record, then examine all the employee information to locate all employees (and their roles) that were active at the date and time of the single transaction, and then compute, on an employee-by-employee basis, the appropriate gratuity split for each single transaction. This would be highly inefficient when compared to the batch-processing model enabled by the GMS **100** server's **102** database **104**.

- d. Claim 1 requires that each client business system **108** contain “at least one point of sale server” that is distinct from the GMS server ('050 patent, 22:50). Without a point of sale server within the point of sale system **110**, transaction and employee information could not be accumulated over the course of one business accounting period. An alternative but highly inefficient scenario would be for each client business system **108** to transmit to GMS **100** information regarding each and every single transaction that the client business system **108** generated.
- e. Claim 1 requires “a gratuity sync client application installed on the respective client business system” ('050 patent, 22:51-52). Absent a gratuity sync client, a collection of M client business systems would require mounting M individual programming projects to develop data exchange agents to manage communications between each of the M client business system **108** and the GMS **100**.
- f. Claim 1 requires the GMS **100** to “execute, independently for each client, gratuity distribution rules ... without requiring the client business systems to execute the gratuity distribution rules” ('050 patent, 22:65-23:8). The alternative is to require

each client business system **108** to execute all the operations of the GMS **100** locally within each client business system **108**.

IX. THE BACKGROUND OF THE INVENTIONS UNDERLYING THE '050 PATENT

31. At the time of the inventions of the '050 patent, it was customary in the hospitality and other service industries for a customer to leave a gratuity (tip) for employees who provided the service. In the context of a restaurant, although the customer may have primary contact with only one employee (*e.g.*, waiter, bartender), many other employees may have been involved to varying degrees in providing service to the customer, such as a host, food runner, busser, valet, bar back, steward, bartender, sommelier, captain, etc. Thus, it was customary for individuals and groups of individuals besides the primary contact to share the proceeds of the gratuity pool. ('050 patent, 1:17-36.)

32. This sharing of gratuities was often calculated manually and documented haphazardly, thereby complicating compliance with tax and labor regulations, and obscuring the process surrounding the computed distributions. As a result, there was no straightforward way for employees to view or verify the completeness or accuracy of the gratuity split. ('050 patent, 1:36-41.)

33. Thus, there was an outstanding need for gratuity management systems and methods that could allocate gratuities in a transparent, accurate, cost-effective and timely fashion. ('050 patent, 1:41-44.)

34. A conventional computerized restaurant management system (RMS) at the time of the invention would have been similar to that depicted as **108** in Figure 1. A conventional RMS would have consisted of a point of sale system **110**, an employee records system **112**, a business records system **116**, and a payroll system **118**. However, without

additional computational and communications software and network connectivity between them, these systems alone were incapable of solving the gratuity distribution problem.

35. The **Gratuity Distribution & Management System** (the title of Figures **2A** and **2B**) as disclosed in the common specification of the '050 patent is the inventive solution to this problem. In the '050 patent, a *gratuity management system 100* ('050 patent, claim 1, 22:38-23:8) provides the cloud-based computational hardware, software and networking missing from the conventional restaurant management system **108**.

36. No system was capable of collecting and manipulating this data into a single cohesive set, which could then be quickly and efficiently manipulated to determine payroll for the various employees. Time lost making these calculations at the end of the night or the pay period was extensive, as was time spent adjusting faulty calculations, leading to employee dissatisfaction and difficulties in retention and morale.

X. A BRIEF HISTORY OF POINT-OF-SALE SYSTEMS

37. In response to petty theft from cash drawers in bars and shops, the first mechanical cash register was invented in 1879 by James Ritty and patented as "Ritty's Incorruptible Cashier." It had no receipt printer or cash drawer; instead, a display showed the total of each individual sale while an internal compartment tallied total receipts.

38. Ritty's company was sold to John Patterson in 1884, who renamed it as the National Cash Register Company (NCR since 1974) and added a paper roll to print individual transaction receipts and a second one for recording all transactions for internal bookkeeping.

39. Electronic calculators became popular in the 1960s, and from there electronic cash registers followed in the 1970s.

40. The first microcomputer-based point of sale (POS) system was developed by

IBM in 1973 and used local area network (LAN) technology to control up to 128 separate tills. Graphical user interfaces were added in the 1980s (coincident with Microsoft's switch from DOS to Windows), and Microsoft introduced a POS system for Windows in the 1990s after the Internet became more commonplace.

41. The combination of Internet connectivity and cloud-based system thereafter made it possible to offer electronic point of sale (EPOS) systems as SaaS (Software as a Service) systems. The gratuity management system of the '050 patent is an example of SaaS (where gratuity management is the service).

42. Cloud-based POS system were introduced in the UK in 2002, with many of those systems operating on industry-grade touchscreen PCs.

43. The iPhone was introduced in 2007 and the iPad in 2010; also in 2010 the Square Reader (which plugged into the headphone jack of an iPhone or iPad) became available and enabled merchants to accept credit card payments using the Square credit card reader. Enterprising software designers (Gratuity Solutions LLC among them) then took advantage of the iPhone, iPad, Android, Internet, and cloud-computing revolutions to launch various versions of point of sale software that were compatible with this modern environment.

44. However, to the best of my knowledge, none of these POS systems had a gratuity management system with the capabilities recited in the '050 patent.

XI. THE INVENTION OF THE '050 PATENT

A. '050 Patent Explanation

45. The *gratuity management system* **100** (GMS) is a sophisticated and non-conventional distributed arrangement of three network-connected components: a processor **102**, a database **104** and a configuration module **106**. In the context of the '050 patent's claim 1 the

GMS is cloud-based (“...wherein the gratuity management system is a cloud computing system...”; ’050 patent at 22:58-59).

46. The GMS processor **102** provides computational and communications functionality for the GMS database **104** and the GMS configuration module **106** (*see* Figure 1 and ’050 patent at 4:2-4).

47. The GMS database **104** is a repository for transaction and employee data (“...storing the received transaction information and the employee information in a database...”; ’050 patent at 2:7-8).

48. The GMS configuration module **106** contains the gratuity distribution formulae by which gratuity distributions are computed for each employee (“...the gratuity management system includes a configuration module **106** that may be used to establish the distribution rules to be applied by the system...”; ’050 patent at 5:19-21).

49. A restaurant management system (RMS) **108** consists of four modules: a point of sale (POS) system **110**, an employee records system **112**, a business records system **116**, and a payroll system **118**. The components of the RMS may be implemented locally (*i.e.*, within the business enterprise) or in the cloud. “[T]he point of sale system **100** and/or the employee records system **112** may be implemented in cloud computing systems...” (’050 patent at 4:66-5:1) and “...wherein the payment management computer system is a cloud computing system...” (’050 patent at 24:10-11).

50. The point of sale system **110** provides transaction and employee information to the GMS **100**. “[T]he system **100** may receive transaction information from a point of sale system **110**” (’050 patent at 4:25-26) and “...system **100** may receive employee information from an employee records system **112**...” (’050 patent at 4:37-39).

51. Transaction information provided by POS **110** may include the type of transaction (cash or credit), sales amount, gratuity amount, employee identification, date, time, credit card processing fees, etc.

By way of illustration, the system **100** may receive transaction information from a point of sale system **110**. The point of sale system **110** may provide a record of sales transactions. Each transaction information associated with the sales records may include the type of transaction (e.g., cash or credit card), the amount of the transaction, and the amount of a gratuity associated with the transaction. The transaction information may also include the employee who processed the transaction (e.g., a server or bartender) as well as the date and time of the transaction. Other information, such as credit card processing fees or items purchased, may be include[d] in the transaction information as desired. ('050 patent at 4:25-36.)

52. The employee records system **112** provides employee information and may include biographic information, job title or code, and work records (e.g., hours worked).

The gratuity management system **100** may receive employee information from an employee records system **112**. The employee information may include biographic information about each employee such as a job title or code (e.g. server, host, busser) that may be used to determine how the employee participates in the gratuity system. The employee information may also include work record data, such as the hours for each employee. The employee records system **112** may be a time keeping system used to track the hours worked by employee[s]. In some embodiments, the employee records system **112** and the point of sale system **110**

may be components of a management system used for administering the service business. ('050 patent at 4:37-49.)

53. The business records system **116** receives from the GMS **100** gratuity allocations on an employee-by-employee basis that it can record and then provide to a payroll system **118**. "The business records system **116** is configured to receive the determine[d] gratuity allocations for use in distributing the gratuity payments to employees." ('050 patent at 6:19-21.)

54. The GMS **100** communicates its computed gratuity allocations to a payroll system **118** for inclusion into the employee's next payroll check. "[C]ommunicating the determined gratuity allocation for each employee to an employer payroll system and distributing the determined gratuity allocation to each employee through a payroll check." ('050 patent at 2:51-54.)

55. Web portal **120** can notify employees about their gratuity data and can then serve as a viewport through which employees can access their own data and employers can access all employee data.

The method for allocating gratuities may also include ... a web-portal configured to be accessed by employees, wherein the web-portal is configured to display the determined gratuity allocation for a given employee, and providing a web-portal configured to be accessed by an employer, wherein the web-portal is configured to display the determined gratuity employees for the plurality of employees. ('050 patent at 2:50-60.)

B. '050 Claim 1 Explanation

56. As its name implies, the *gratuity management system* **100** does indeed

calculate gratuity distributions for employees. “The gratuity management system **100** determines how to allocate the gratuities collected.” (’050 patent at 5:49-50.) *But the GMS invention is far more than a gratuity calculation engine*; it is a software agent whose operations are essential for coordination with all other software agents within the business enterprise.

Examples from the ’050 patent include:

- a. “[T]he gratuity management system **100** includes a processor **102** and a database **104**” (’050 patent at 4:21-23);
- b. “The gratuity management system **100** may receive employee information from an employee records system **112**.” (’050 patent at 4:37-39);
- c. “[T]he gratuity management system **100** may interface with one or more components of such a restaurant management system **108**.” (’050 patent at 4:56-58);
- d. “The gratuity management system **100** may similarly be implemented in a cloud computing system that interface[s] with the cloud-based point of sale and/or employee records systems.” (’050 patent at 5:2-5);
- e. “[T]he gratuity management system presently disclosed is contemplated to operate in conjunction with both local and cloud-based point of sale and/or employee records systems.” (’050 patent at 5:8-11);
- f. “The gratuity management system **100** may then communicate with a business records system **116** that may include a payroll component **118**.” (’050 patent at 6:16-19);
- g. “In one embodiment, the system **100** includes a web portal **120**.” (’050 patent at 6:55-56);

- h. “The gratuity management system includes an interface component **206** that integrates with the business’s systems.” (’050 patent at 7:50-51);
- i. “[T]he gratuity management system may be cloud-based, and the communication between the gratuity management system and cloud-based business systems may be through dedicated interfaces.” (’050 patent at 8:12-15); and
- j. “[T]he gratuity management system **100** interfaces with the cloud-based point of sale system using a cloud to cloud replication or synchronization.” (’050 patent at 8:51-53).

57. For simplicity, I describe the GMS **100** as operating in the context of a restaurant, although the GMS **100** can be used in any gratuity-generating enterprise, such as a hotel, casino, or cruise ship.

- a. “The system and method may be applied in other settings, such as hotels, casinos or other organizations in the hospitality or other industries that receive and distribute gratuities among at least a portion of the employees” (’050 patent at 4:15-19);
- b. “This configuration may be particularly effective for cruise ships or other environments with limited connectivity to external computing resources” (’050 patent at 8:62-65); and
- c. “By way of illustration, the operator of a cruise ship may prefer to host the gratuity management system using onboard computing systems to reduce the need for communication to or from the cruise ship while the ship is at sea” (’050 patent at 9:1-5).

58. A single instance of the GMS **100** as shown in Figure 1 and as described in the

specification and in claim 1 is a cloud-based computing system (*i.e.*, a physically remote, network-connected computation enterprise that is typically a third-party system not owned or operated by the client business).

- a. “The gratuity management system 100 may similarly be implemented in a cloud computing system that interface[s] with the cloud-based point of sale and/or employee records system.” (’050 patent at 5:2-5);
- b. “[T]he gratuity management system may be cloud-based...” (’050 patent at 8:10-11); and
- c. “[W]herein the gratuity management system is a cloud computing system remote from the plurality of client business systems...” (’050 patent at 22:58-60).

59. A *gratuity sync client* (GSC) **206** application is installed on the point of sale server **200** within each client business system **108**. The GSC **206** extracts transaction information (*e.g.*, sales amounts and tips) and employee information (who worked, for how long, in what role) and transfers that data to the GMS **100**.

60. The *gratuity sync client* **206** (labeled as *Grat Sync Client* in Figures **2A** and **2B**) is specialized software, unique to each installed point of sale system **110**, because it allows the POS server **206** to exchange information with the GMS **100**. The ’050 patent explains the GSC’s unique operations as follows:

- a. “[T]he gratuity management system includes an interface component **206** that integrates with the business’s systems to extract the transaction information and the employment information...” (’050 patent at 7:50-53);

- b. “The example of an interface component **206** in FIG. **2A** is labeled ‘Grat Sync Client Application’ and is indicated as being installed on server **200**” (’050 patent at 7:53-56);
- c. “[T]he interface component **206** may be adapted to interface with a variety of client systems of different types without requiring modification to the database or processor” (’050 patent at 8:2-5);
- d. “[T]he interface component **206** gather[s] configuration and setting information...” (’050 patent at 8:6-7);
- e. “[T]he interface component **206** initiates all communication with other components...” (’050 patent at 8:8-10);
- f. “[T]he interface components **206** may include an application programming interface defined and implemented so that the gratuity management system is able to extract the necessary transaction information and employee information from the cloud-based business systems” (’050 patent at 8:16-21);
- g. “The processor **212** and/or the database **214** may accept incoming data from the interface component **206**” (’050 patent at 8:24-26);
- h. “In a cloud to cloud system, the interface component **206** still facilitates the transfer of the data from the point of sale system to the gratuity management system” (’050 patent at 8:53-56).

61. Business data (*e.g.*, sales, employees, job roles, hours worked) are processed by the POS server **200**, stored in a POS database **202**, and shared via the Internet **208** with other business, accounting, recordation, payroll, and reporting functions. The web portal **120** also serves as an interface for business data; management can input and update employee

information and employees can view their gratuity allocations.

62. The GMS **100** is network-connected to multiple client business systems **108**, each of which independently operates a point of sale system **110**, an employee records system **112**, a business records system **116**, and a payroll system **118**. These four systems may each operate locally or in the cloud.

63. A point of sale system **110** collects financial data about sales, including at least an identification of the employee who made the sale, an amount of the sale before taxes and gratuity, taxes, gratuity, total sale amount, and an indication of whether the payment was made via cash or credit card.

64. The employee records system **112** operates as a time-and-attendance server, recording who worked when, for how long, and in what role(s).

65. The GMS business records system **116** (which may optionally include a payroll system **118**) uses the sales information from point of sale system **110**, employee work data from employee records system **112**, and gratuity distribution rules from configuration module **106** to compute, for each employee and for each accounting time period, an appropriate share of the total gratuities generated during that accounting time period.

66. The payroll system **118** uses information from the employee work records system **112** and the gratuity management system **100** to generate paychecks (and paycheck notifications) for employees. The payroll system **118** also ensures compliance with employment law (*e.g.*, minimum wage rules).

67. The GMS **100** is sophisticated, non-conventional, and not abstract. As of the filing date of the '050 patent, a conventional restaurant management system **108** would be locally operated within the physical confines of the business itself.

68. The technology advantage of claim 1's GSM 100 is that by placing the GSM 100 in the cloud, one instance of the GSM 100 can provide computational support to any number of client business systems 108 (a restaurant management system is one example of a client business system). This advantage of having one GSM 100 in the cloud vs. adding a complete GSM to each and every client business system is significant because now there is only one GSM 100 to maintain. An improvement to one cloud-based GSM 100 means that all client business systems immediately obtain the advantage of that improvement without any further software distribution. Without putting the GSM 100 in the cloud, each GSM 100 within each client business system 108 has to be maintained separately.

XII. ELEMENTS OF THE '050 PATENT THAT ARE NOT PRESENT IN MARSHALL, PHILLIPS OR WEBB

69. Marshall, Phillips and Webb all perform their processing locally at a client system. For example, Marshall Figures 3-4, ¶¶0097; 0105-0107; Phillips at Fig. 1, ¶¶70; 114; Webb at 1:40-61; 4:23-41, and do not disclose a cloud-based system, as in Claim 1 of the '050 patent:

“wherein the payment management computer system is a cloud computing system remote from the plurality of client business systems and configured to receive the extracted information from the plurality of client business systems and to store the received extracted information in the database.”

70. Indeed, nowhere in the Marshall, Phillips and Webb patents is the word ‘cloud’ used.

71. Note also that none of Marshall, Phillips and Webb use the term ‘farm’ or ‘server farm’. Indeed, it is only Dr. Russ’s Declaration that uses the term ‘server farm’, and then just once.

72. Neither do Marshall, Phillips or Webb disclose the use of a remote gratuity managements system server that is separate and distinct from any client business system's point-of-sale (POS) server as required in the '050 patent independent claims. The "client business systems" as claimed in the '050 patent are expressly claimed in the independent claims as not calculating gratuity allocations or payment information, which are expressly disclosed and claimed as occurring at the server associated with the remote cloud-based gratuity management system. (Ex. 1001 at claims 1 and 8; 23:7-8; 24:24-25.)

73. None of Marshall, Phillips, or Webb disclose or suggest the use of a "gratuity sync client application" or "interface component" (as recited in the '050 patent independent claims) that extracts and initiates transfer of selected transaction and/or employee information to a remote, cloud-based gratuity management system for calculation of gratuity allocations, on a client-by-client basis, or the return of gratuity allocations to each client business system via the "gratuity sync client application" or "interface component."

XIV. DR RUSS'S DECLARATION

74. I have reviewed Dr. Russ's Declaration in support of the Petition for Inter Partes Review, and find myself disagreeing with several aspects of it, as follows.

75. PDF page 33, paragraph 56: I disagree. Cloud servers are and were not the same as Server Farms. A POSITA would not have considered them to be equivalent. Also, cloud implementations are not necessarily better than server solutions, there are pros and cons.

76. PDF page 65, paragraph 117: I find Dr. Russ' quote to be misleading as it appears to suggest the quote comes from the Marshall reference when it is actually from the claim language of the independent claims 1 and 8. To the extent Dr. Russ further relies on this paragraph in his Declaration, (e.g. paragraphs 123, 155, 270, 300, 302,), I also find the quote

potentially misleading.

77. PDF page 69, paragraph 124: I disagree, this is too simplistic an argument. A POSITA would have taken a bigger-picture view of the overall architectural setup of the POS, gratuity, and other systems as to whether they are local or remote.

78. PDF page 99, paragraph 172: I disagree, this is too simplistic an argument. A POSITA would have taken a bigger-picture view of the overall architectural setup of the POS, gratuity, and other systems as to whether they are local or remote.

79. PDF page 104, paragraph 184: Russ states “A POSITA would further understand that a web portal would be a logical, easily implementable system for permitting such access. Such a system would be well within the skill of a POSITA.” I disagree. This is over-simplifying the software engineering effort that would go in to developing a robust web portal system. There would be significant technical engineering challenges.

80. PDF page 114, paragraph 207: I disagree it would have been obvious to combine with Webb as Webb’s time-clock technology is too dissimilar with that of Marshall.

81. PDF page 158, paragraph 316: This is a dubious argument, as it is too simplistic and does not explore the complexities and subtleties of such systems.

82. PDF page 160, paragraph 322: I disagree with Dr. Russ’s conclusion technically. Browsers and their applications are client-side and web portals are server-side.

83. PDF page 161, paragraph 325: I disagree with Dr. Russ’s opinions that confuse ‘payment systems’ with ‘gratuities.’

84. PDF page 166 ,paragraph 337: I again disagree with Dr. Russ’s confusion of ‘payment systems’ and ‘gratuities.’

85. PDF page 168, paragraph 344: I again disagree with Dr. Russ’s confusion of

‘payment systems’ and ‘gratuities.’”

86. PDF page 169, paragraph 346: I disagree it would have been obvious to combine Webb with either Marshall or Phillips as its “time-clock” is too dissimilar a field of technology.

XV. WHY A POSITA WOULD NOT HAVE FOUND IT OBVIOUS TO DEVELOP A CLOUD-BASED SOLUTION

87. There are many reasons a POSITA might choose to not combine a cloud-based solution with a POS System:

88. A typical technology growth plan for a client/server-based system would be two-fold:

- a) Develop the client and server software internally, e.g. with the client developed on a Windows desktop system, and the server (Windows, or more likely Linux) also on the internal network (e.g. at an IP address such as 192.168.1.1)
- b) Test the system and go ‘live’ with it, this time with the server on an external IP address accessible from the outside world, with the server hardware still in the inside office environment for ease of keeping and eye on, upgrading software, etc. Such a static IP address might be resolved by a URL like ‘www.my-pos-system.com’

89. At this point decisions have to be made about how to potentially ‘scale-up’ the system, and there are a number of alternatives:

- i) Keep the servers in-house, set up multiple servers with load balancing. Upsides are that this gives the most control. Downsides are overheads in maintaining the servers, up-time, power shortages, internet down-time.
- ii) Shift the physical servers to a Server Farm. This has the advantage of keeping your

own physical servers running, with normally guaranteed excellent up-times.

- iii) Rent third-party servers from a Server Farm. Same as above, but someone else maintains the servers for you.
- iv) Transition to a Cloud-based server system.

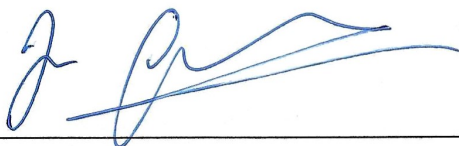
90. Transitioning to a Cloud system is far from an obvious choice. There are many downsides, and some upsides:

- 1) The server code will likely have been originally in say C on a Linux server, or Java, or some other server platform development environment.
- 2) This will have to be ported to a Cloud-system, such as Amazon's AWS, or Microsoft Azure.
- 3) This means probably 'ripping up' the original code and starting again, which is time consuming. Cloud-based systems tend to use large scale server-centric programming systems, such as Java, C#, and extensive and rich APIs (Application Programming Interfaces) such as AWS or Azure - such architectures have large numbers of new APIs to master. It would take significant effort to 'port' to new platforms.
- 4) There's sometimes a paranoia amongst software developers as to what's really going on at the Cloud platform – is the code and data secure? How do I know it's not being copied? Can I trust the reporting statistics (Service Level Agreements etc)? Where are the servers physically located? Are they safe and secure?
- 5) Also, a POSITA might be anxious that taking the decision to port to a Cloud-based system might backfire and be detrimental to the company. For instance, the development,

testing and roll-out of such a system would likely be time-consuming, costly, and at risk of failing (or at least not working as well as expected at first). There would have to be financial and engineering justification for 'junking' existing systems which the company had put time, effort and money in to developing. The business and financial models for an in-house server-based system and a Cloud-based one would need to be examined and discussed by various departments in the company. There might be unknown financial implications of switching to the financial costing models as defined by the Cloud provider, such as Amazon or Microsoft. Indeed, such a major development direction switch would likely need senior management or even Board level decisions. The company's legal department would have to be called in to review Service Level Agreement.

91. For these reasons, it is not at all obvious for a POSITA to have decided to use a cloud-based server solution.

I hereby declare that all statements made herein are of my own knowledge are true and correct, and that all statements made on information and belief are believed to be true and correct, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

A handwritten signature in blue ink, appearing to read 'I. Cullimore', is written over a horizontal line.

Professor Ian H.S. Cullimore PhD

Dated: June 20 2024

Professor Ian Cullimore BSc PhD

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Member of the ACM

SYNOPSIS

Computer Patent and other Expert Witness (34 Cases to date, 25 Expert Reports written, 11 Depositions, 4 IPR cases, 1 Court Case at trial, 1 attendance to give evidence at an Evidentiary Hearing at the American Arbitration Association, San Francisco, 1 other Court attendance). Experienced hi-tech CEO/CTO-level technology expert, yet still very hands-on (architecting, coding). Much experience both in the UK and California (Silicon Valley & LA) in companies ranging from small startups to large corporations, and in building and managing software and hardware teams. Specialize in IoT, embedded, handhelds, smartphones, mobile, operating systems, device drivers, communications, ultra-low power systems, interfacing to the Cloud, Android, iOS, Symbian OS, Windows, WinCE, games consoles OS, mobile gaming, Linux, software/firmware/hardware design, electronics, FPGA, VHDL, Digital Audio (DSP, AES67, CobraNet, Dante). Entrepreneur; start-up and young company specialist. Raised Angel and VC rounds. Taken startups to Exit. Much experience interfacing with Boards, Investors, and sales/marketing/bizdev groups.

Patent and Other Expert Witness Work

- Feb 2024 - *Fall Line v Arby's et al* (For the Defendants). Alston & Bird, Atlanta GA. Ref Katie Donald. Re computerized questionnaire systems.
- Dec 2023 - *Toast v Gratuity* (For Gratuity). Devlin Law, DC. Ref Alan Wright. Expert Report Written re hospitality gratuity (tips) systems.
- Oct 2023/24 *Tiare v Starbucks & Walmart* (For the Defendants). Alston & Bird, Atlanta GA. Ref Carter Babaz. Expert Report Written. re handheld wireless ordering systems. *CASE SETTLED OUT OF COURT.*
- April 2023 - *Softex LLC v Absolute Software Corporation, Dell, HP, Lenovo, et al.* (For the Defendants). Cooley LLP, Palo Alto CA, Ref Samuel Whitt. Low-level software security systems in ROM BIOS. Re US Patents 8,752,101; 8,909,809; 9,769,427. Expert Report Written for Claims Construction. Deposition given by Zoom November 2023.
- Mar 2022 - *Future Link Systems, LLC v Realtek Semiconductor Corporation.* ITC # 337-TA-1295 (For the Defendants). K&L Gates, Ref Theodore Angelis. Re US patents 7,685,439 & 8,099,614, alleged infringement of ARM Cortex A53 design.
- 2021 - *Ikorongo Tech. LLC v Lyft, Inc.*, C.A. No. 20-258-ADA (USDC - W.D. Tex.). (For the Defendants). Fish & Richardson, Ref Sara Fish. Re proximity software and hardware technologies. Expert Report written.
- 2021 - *Ikorongo Tech. LLC v Bumble Trading LLC*, C.A. No. 20-256-ADA (W.D. Tex.). (For the Defendants). Fish & Richardson, Ref Sara Fish. Re 'dating app' software and hardware technologies.
- 2021 - *Wireless Discovery LLC v Bumble Trading LLC et al*, C.A. No. 6:20-CV-762-ADA (W.D. Tex.). (For the Defendants). Fish & Richardson, Ref Sara Fish. Re 'dating app' software and hardware technologies.
- 2021 - 22 *Mynette Technologies, Inc. v US Government, Idemia Identity & Security USA LLC, Gemalto, & Unisys.* (For the Defendants). Armstrong Teasdale LLP, St. Louis, MO. Re RFID screening technology for passports.
- 2021 - *Express Mobile, Inc. v. Adobe Inc. and X.Commerce Inc. d/b/a Magento*, (Case No. 3:20-cv-08297-RS, for the Defendants). Arnold & Porter Kaye

Scholer LLP. Ref Marty Koresawa. IPR of patent US 9,063,755, re presenting information on mobile devices. Expert Report written.

- 2020 *Atari Interactive, Inc. v Target Corporation* (Case No. 0:20-cv-00054-PJS-BRT, for the *Defendant*). Trade Dress infringement case (*Target were using in-store displays which mimicked the Atari 'Pong' game*). Ref Kelly Fermoye, Peter Routhier, Faegre Drinker Biddle & Reath LLP, Minneapolis. Expert Report written. Settled Out Of Court Nov 2020.
- 2019 - 2020 *Facebook v Blackberry* (For the *Defendant*). Ref John McKee, Quinn Emanuel Urquhart & Sullivan, NYC. Patent infringement case, (*concerning software and user interface design issues on smartphones*), Inter Partes Review (IPR). Expert Report written. Deposition given (by video, Zoom) April 2020.
- 2019 - 2020 *Bot M8 LLC v Sony Corporation* (For the *Plaintiff*). Ref Aaron Frankel, Kramer Levin, NYC. Patent infringement case (*Video games design aspects*). Expert Report written. Deposition given (by video, Webex) May 2020.
- 2019 - 2020 *Innovation Sciences v Resideo (was Honeywell)* (For the *Defendant*), Ref Kate Cappaert, Steptoe & Johnson, Washington DC. Patent infringement case, at the International Trade Commission (ITC) (*design and use of Internet communications systems, wired and wireless*). Deposition given May 2020 (by video, Zoom).
- 2018 - 2019 *Abe v Apple* (For the *Defendant*). Patent infringement case (*smartphone user interface design issues*). Ref Vincent Zhou, O'Melveny & Myers LLP, Los Angeles. Expert Report Declaration written in support of petition by Apple for an Inter Partes Review (IPR). *Status: settled out of court*.
- 2018 - 2019 *Parkridge Limited et al v Indyzen, Inc. et al.* (For the *Plaintiff*). Ref Zach Clark, Adam Wolek, Taft Stettinius & Hollister LLP, Chicago. *Investigating claims of inadequate performance and quality in a set of subcontracted software programs*. Expert Report written. Deposition given March 2019, Redwood City, CA. Source Code Review undertaken. Attended Arbitration Hearing at the American Arbitration Association (AAA), San Francisco, May 2019 where I gave Evidence.
- 2018 - 2019 *Qualcomm Incorporated v Apple Inc.*, Civil Action No. 3:17-CV-02403-CAB-MDD in the Southern District of California (for the *Defendant*). **Note: Two Separate Patent Cases.** Fish & Richardson (Houston TX), ref Thad

- Kodish, Sara Fish. Expert Report written on Claim Construction, and Deposition given on this July 2018 (Atlanta GA). (*Smartphone user interface design issues*). Status: settled under the Qualcomm-Apple Grand Settlement.
- 2017 *Semcon v MediaTek* (for the *Defendant*). LTL Attorneys (Los Angeles). Expert Report on *embedded Linux and Android power management technologies for smartphones and smart TVs*. Source code reviews. Case currently stayed.
- 2015 - 2017 *Phoenix v VMware* (for the *Defendant*). Morrison Foerster (San Francisco), ref Diana Kruze. *Re software license agreement*. Expert Report on technology issues written. Source Code Review undertaken. Deposition given. Attended Court case Oakland, CA, May - June .2017. Status: settled in full favor of the *Defendant*.
- 2015 - *Papst Licensing GmbH v Hewlett Packard Corporation* (for the *Defendant*). Fenwick & West (Mountain View, CA), ref Charlene Morrow. *Re infringement*. Technical analysis undertaken. Case currently stayed, looks like it is restarting.
- 2015 - 2017 *Smart Skins LLC v Microsoft Corporation* (for the *Plaintiff*). Proskauer Rose LLP (Boston, MA). Ref John M. Kitchura, Jr. *Re infringement and invalidity*. Claims Construction Expert Report written. Validity Expert Report written. Infringement Expert Report written. Undertook a teardown of Microsoft Surface keyboard designs and reverse-engineered the (serial and USB) communications protocols. Deposition given (April 2016). Expert Report written for IPR proceedings. Case settled.
- 2013 - 14 *Monec v Samsung* (for the *Defendant*). Fish & Richardson (Washington DC). Expert Report written. Deposition given. Ref Linhong Zhang, Chris Winter, Joseph Colaianni. *Re Smartphone design issues*.
- 2013 *Cradle IP v Texas Instruments* (for the *Defendant*) Covington & Burling (Redwood City, CA). Expert Report written. Ref Anupam Sharma, Hyun Byun. *Re Power management issues*.
- 2012 *St. Clair Intellectual Property Consultants, Inc., v. Motorola Mobility Inc.* (for the *Defendant*). (Representing Motorola Mobility; case stayed).
- 2012 *Zynga v King.com* (for the *Defendant*). Origin Ltd, London. Ref Peter Langley, Colm MacKernan. Online video game copyright infringement.

- 2011 *Optimum Power Solutions LLC v Apple, Inc.* (for the Defendant). Hogan Lovells (Washington DC) Ref Joseph Rafferto, Celine Crowson.
- 2011 *St. Clair Intellectual Property Consultants Inc. v Acer America Corporation, Acer Inc, Dell Inc, Gateway Companies Inc, Gateway Inc, Intel Corp, Lenovo (United States) Inc, Microsoft Corporation, Toshiba America Inc, Toshiba America Information Systems Inc., and Toshiba Corporation* (for the Defendants). Fish & Richardson (Washington). Expert Report written. ref Scott Elengold. 'The Function Call Monitoring Patents'. (Power management issues). Also counterclaim led by Microsoft: *Microsoft Corporation v St Clair Intellectual Property Consultants Inc.* For the Plaintiff.
- 2011 *St. Clair Intellectual Property Consultants v Apple Inc.* (for the Defendant). Cooley LLP (Palo Alto) Ref Timothy Teler.
- 2008 *Microsoft Corporation v Tom Tom; SPT v Tom Tom; Garmin v Tom Tom; Bosch v Tom Tom.* (for the Defendant). Expert Report written. Origin Ltd, London. Ref Peter Langley, Colm MacKernan
- 2008 *Symbol Technologies Inc. v Janam Technologies LLC* (for the Defendant). Expert Report written. Deposition given. Kenyon & Kenyon, New York, ref John Kenny.
- 2004-5 *Khyber Technologies Corporation v Hewlett Packard Company* (for the Defendant). Expert Report written. Deposition given. Kenyon & Kenyon, New York ref Michael J Lennon
- 1986-87 *The Crown v Dye et al.* (for the Plaintiff). Expert Report written. Computer Forensics Expert Witness in Old Bailey (Central Criminal Courts, London) case, largest drugs bust case to that date. Defendant had saved deleted data on his computer, which I was able to retrieve.
- 1985 For *Wilkinson Kimbers* (London). Copyright infringement case concerning video games ROM code. Extracted ROMs from motherboards, did forensic examination on code to show copying had taken place.
- present One Court appearance (UK); One testimony given at the American Arbitration Association (San Francisco); One Court attendance (Oakland, USA).

Patents Held in My Name

Ultra-Small, Ultra-Low Power Single-Chip Firewall Security Device with Tightly-Coupled Software and Hardware (US 9,705,848 B2)

TCP/IP Stack-Based Operating System (US 9,436,521 B2)

Ultra-Low Power Single-Chip Firewall Security Device, System and Method (US 8,875,276 B2)

Massively Multicore Processor and Operating System to manage Strands in Hardware (US 8,607,086 B2)

TCP/IP Stack-Based Operating System (US 8,335,864)

Apparatus and method of communicating with RFID tags (US 7,455,217)

Method of RFID Data Tracking (US 7,040,532)

Computer Power Management System (US 5,560,024)

Computer Power Management System (US 5,428,790)

Compact Portable Computer, EP 0479915

Employment/Consulting/Start-Ups

2/2020 – *Self-employed Soft/Firm/Hardware/Electronics/FPGA/VHDL Contract Engineer*

Consulting for Peavey Electronics (USA, UK); developing VHDL for FPGAs, board bring-up, DSP (Digital Signal Processing), digital and analog audio, for the Professional PA Market.

6/2015 – *Self-employed – Software/Hardware Designer and Developer, Hi-tech Startup Specialist, Patent (and other) Expert Witness, Consulting and Contract Engineering projects.*

I currently specialize in operating system design and development for advanced small devices, IoT ('Internet of Things') hardware and software product designs, and Expert Witness (patents, computer forensics etc.) consulting.

I trade through my personal UK corporation Crushproof Ltd. I am currently developing an IoT security device, have designed the hardware, and am developing embedded software (with my own Operating System design and firmware for the unit), as well as a

back-end Internet server software system Platform (C/C++, LAMP), and iPhone and Android apps. US Provisional Patents filed.

- 10/2012 – 5/2015 *Paqet Systems Corp* (Sunnyvale, CA, and UK)
Co-founder and CTO. Silicon Valley & UK startup specializing in Ultra Low Power software operating systems for Machine-to-Machine ('M2M'), Sensor Hubs, Wearables and Internet Of Things ('IoT') devices on ARM microprocessors. Two provisional patents filed. Developing ultra-low power IoT node and bridge embedded operating systems software.
- 11/2010 – 9/2012 *IOTA Computing, Inc.* (Palo Alto, CA, and UK)
Co-founder and CTO. Invented innovative combination Internet-Centric Software Operating System and MCU chip for the Internet of Things ('IoT'). Multiple patents granted and pending. Extreme Ultra Low Power. Helped raise \$2.5m funding. Managed and grew software and hardware development team.
- 2008 – 2010 *Self-employed - Independent Consultant.*
Wide range of software and hardware development, consulting, and especially Patent Expert Witness litigation and forensics work.

Did two projects for 3M Rochford Thompson (3M acquired the UK passport scanner manufacturer in 2007), developing software for their passport scanners (and e-passport readers) as used across the world in international airports and other border control points. Also developed communications software for mobile passport scanning.
- 2006 – 2008 *Martian Gaming Ltd (London)*
Co-founder and CTO of innovative Online Mobile Gaming platform technologies organisation. Established company. Raised Angel finance (\$1m). Launched in Ukraine with major Telecoms provider (Life). Had exclusive contract with PartyGaming. Also with Zero36, 888Mobile. Developed native and Java (J2ME) apps for mobiles phones, web/cloud server solutions (LAMP, J2EE) to interface to mobile phone network operators and online gaming platforms. Much business with gaming operator PartyGaming in Gibraltar, Eastern European gaming and telecoms companies (especially

Ukraine and Russia), and Israel (gaming operators and software development companies).

- 2004 – 2006 *CTO, Cibenix Ltd (Dublin, Ireland)*
- Mobile phone On-Device Portal (ODP) software company. Led server (LAMP, Java - J2EE) and client (Symbian & Java - J2ME) development. Managed software team of 14 engineers.
- Press release about my appointment:
<http://www.tornado-insider.com/press/presses.asp?pressid=7031>
- 2003 – 2004 *Self-employed - Independent Consultant.*
- Various software and hardware development projects, and Patent Expert Witness work.
- 1997 – 2003 *Informal Software (UK & Santa Clara, CA, USA)*
- Founder, CEO & CTO.
Established innovative software company based on my 'Informal Interface' PhD research. Raised \$8m Angel and VC finance. Licensing negotiations with Apple and Adobe. Grew company to 40+ people on both sides of the Atlantic. Won **DemoGod** Award. Worked with POS manufacturer Alphameric plc (London Stock Exchange listed company). Developed POS system ("Wireless Food Ordering System") for 3M Food Services Division (Minneapolis) under \$50K NRE contract. Also part-time Consultant. One of the Architects of the **Symbian Operating System (1997)**.
- 1996 - 1997 *Two Way TV (London)*
- CTO (consultant).
Two Way TV was an innovative interactive TV company, making user-interactive television and games in the latter days of analogue broadcasts, and the transitioning to digital (DVB standards).
The company designed its own set-top box (and associated systems software), custom handheld remote control, bank-end server systems, billing, and interactive program content.
- 1994 – 1996 *Xircom, Inc. (Thousand Oaks, California, USA)*

Software Director. Created award-winning innovative Ethernet/modem installer software products. Invented 'plug & play' for Windows 95 before Microsoft. As a consultant, developed software for Palm devices to interface to cellular phones via the serial port, to enable sending & receiving of text (SMS) messages etc.

1992 – 1994

Digital Research Inc.('DRI') (Hungerford, UK and Monterey, California USA)

DR DOS, Netware Operating System and PalmDOS development work. Created DOS power management systems. DRI was acquired by Novell. Developed secure login software client.

1988 – 1991

Poqet Computer Corp.(Silicon Valley, California, USA)

Co-Founder and Vice President, Software R&D
Established the company. Wrote proprietary power-managing ROM BIOS, DOS power management drivers. Created the whole PCMCIA ('PC Card') industry standard. Created software and hardware power management techniques to make the Poqet PC palmtop computer to run for 100 hours on two 'AA' batteries. Advised Intel on low-power CPU design (386SL). Managed software team of 12 people.

EXIT: Company acquired by Fujitsu.

1986 – 1988

D.I.P. Ltd (Guildford, Surrey)

Founder & CTO. Invented world's first 'pocket PC'. Licensed to Atari as 'The Atari Portfolio'. Wrote PC-compatible ROM BIOS. Wrote MS-DOS clone o/s. Invented hardware and software ultra low-power systems. Pocket PC ran for 50 hours on 3 'AA' batteries.

EXIT: Company acquired by Phoenix Technologies.

1984 – 1986

Psion Ltd (London).

One of the first software engineers at Psion. (Psion Software became Symbian in 1998). Video games developer. Developed hand-held PDA operating system and communications software, tool chains. Helped develop innovative POS (Point of Sale) systems for their project with Marks & Spencer retailers. Firmware, software design.

- 1983 – 1984 *Thorn EMI (Wardour Street, London)*
Video games programmer (Atari 800, Commodore 64, Sinclair Spectrum, TI 99/4A, BBC Micro). Developed video games in assembler programming languages (6502, Z80).
- 1981 – 1983 *British Aerospace.(Brooklands, Weybridge, Surrey)*
Software programmer. Projects included some work for Concorde. Wrote programs in assembly language for IBM System/370 mainframes.

Education

- 2023 - *Visiting Professor, University of Hereford, UK (aka NMITE)*
- 2019 - 2023 *Visiting Lecturer, University of Hereford, UK (aka NMITE)*
- 2004 – 2007 *Honorary Senior Research Fellow, University of Birmingham, UK*
- 1991 – 2000 *PhD, Cognitive & Computer Science, University of Sussex, UK (part-time) Specialized in HCI – Human-Computer Interaction. Thesis: "An Analysis and Implementation of Informal Human-Computer Interaction"*
- 1986 Imperial College London, Alumnus – MSc Computer Science (started course but had to put it on hold it owing to the success and time commitments of my new start-up).
- 1978 – 1981 *BSc (Honours) Mathematics, King's College, University of London*
- President of the Maths Society

Continuing Education, Online & Distance Learning

- 2010 *Law Degree, Bachelors. University of London, Distance Learning. Started course but decided not to pursue it further after the first semester.*
- 2017 *The discovery of the Higgs Boson, The Open University, UK. Achieved 98% pass marks for online tests, proved the mathematics of the 'God Particle' from first principles.*
- 2019 *The Philosophy of Science. Oxford University, UK.*

Books, Appearances & Publications

Corporate Counsel – Best of 2019

https://images.law.com/media/cc/supplements/Best_CC_2019/mobile/index.html (Page 5)

Guest Panelist, *MAPOS (Mobile Applications and Operating Systems)*, London, February 2005

Speaker, *Roth Capital Investment Symposium*, Laguna Niguel, CA, February 2001

Guest Panelist, *Digivations Conference*, CA, September 2000

Live Interview, *Sky News Business Report*, June 2000

Live Interview, *CNBC Power Lunch Report*, June 2000

Live Webcasts, *CEOCast.com*, February 2000 & February 2001

“Pen & Paper, the Stylus, and Today’s Computing Needs” Tradespeak.com, February 2000

“A New Pen and Paper Paradigm”, Colorado Springs Business Journal, December 1999

Communicating With Microcomputers (1987), Sigma Press (Distributed by John Wiley & Sons). ISBN 1-85058-055-3

White House Papers (University of Sussex, 1992) *Informal Interfaces*

White House Papers (University of Sussex, 1994) *Informal Interfaces: Informality in Human-Computer Interaction*

White House Papers (University of Sussex, 1995), *An Application of AI Techniques to a Consumer Software Product*

Technologies

Extremely fluent and experienced in Assembler, C, C++, Java, Prolog, PHP, etc, VHDL, Verilog, etc. Multiple Operating System and CPU designs and architectures. All aspects (almost) of Software and Hardware. Web technologies. Communications and Internet protocols. Specialize in Power Management, PDAs, palmtops, operating systems, HCI (Human-Computer Interaction), VHDL design for FPGAs, CPLDs.

Awards

DemoGod Award, Demo 2000, Palm Springs

PC Magazine Award for Technical Excellence, Comdex Fall, Las Vegas, 1989

US Work Visas Held

O-1 : *'for the individual who possesses extraordinary ability'*. For Iota Computing Inc, 2011-2014

H-1B : US Temporary Work Visa, for Xircom, Inc. 1994-1997

H-1: US Temporary Work Visa, for Poqet Computer Corp. 1988-1991

Other Associations for 'Full-Disclosure' (Start-Ups, Consulting, Contracting):

Peavey Commercial Audio – hardware, firmware, software design consulting.

3M Rochford Thompson (Newbury, UK) – passport scanner software.

BTS Technology Inc (Santa Barbara, CA). RFID and wireless PDA applications for the Wine industry.

Indigo (Santa Barbara, California) – Omega IR camera control software.

3M (Food Division, Minneapolis) – PDA Wireless Food Ordering System.

Mobile Travel Technologies Ltd (London) – mobile applications for travel planning and booking.

Nokia (Tampere, Finland) – Research report on *Global Software Development Strategies*.

Psion Dacom (Milton Keynes). Advised on GSM Stacks in Symbian OS.

Microscribe (Wales, 1991) Developed an MS-DOS version of their CP/M ruggedized handheld device.

Brandwidth (Windsor, UK) – Windows Mobile software development for Toyota Cars.