

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.
Petitioner

v.

ZIKLAG IP LLC
Patent Owner

Case IPR2025-00700
Patent No. 6,182,128

**DECLARATION OF IAN McCULLOH, PH.D.,
UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PATENT OWNER'S
RESPONSE TO PETITION FOR *INTER PARTES* REVIEW**

I, Ian McCulloh, do hereby declare as follows:

I. INTRODUCTION

1. I am making this declaration at the request of Ziklag IP LLC in the matter of *Inter Partes* Review of U.S. Patent No. 6,182,128 ("the '128 patent") to Kelkar et al.

2. I am not being compensated for my work in this matter. I expect to be reimbursed for reasonable and customary expenses associated with my work and testimony in this proceeding. I will not be receiving any compensation contingent on the outcome of this matter or the specifics of my testimony.

3. I have been asked to provide my opinions regarding certain aspects of the analysis offered in the Declaration submitted by Petitioner's expert, Andrew B. Lippman, Ph.D. (Ex.1003). More particularly, I have been asked to address Dr. Lippman's portrayal of the architecture disclosed in U.S. Patent No. 6,182,128 (the "'128 patent") as inevitable, straightforward and obvious in the 1997–1998 timeframe. My opinions are grounded in systems engineering and distributed systems practice, with particular focus on what engineers could realistically assume about wide-area networks and multi-region system behavior during that 1997-1998 period. It is my opinion that Dr. Lippman's portrayal is flawed in numerous ways which I discuss in detail below.

4. In the preparation of this declaration, I have studied:

- a. the '128 patent, Ex. 1001;
- b. Dr. Lippman's Declaration (EX1003) submitted by Petitioner in this IPR; and
- c. contemporaneous measurement research on Internet behavior, including work by Paxson, as well as public documentation reflecting where major institutional engineering effort and funding were concentrated in the late 1990s, including U.S. Department of Defense digitization and enterprise information infrastructure initiatives (Paxson, 1996; Paxson, 1997; National Defense Authorization Act for Fiscal Year 1997, 1996; U.S. General Accounting Office, 1997).

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

5. My complete qualifications and professional experience are described in my *Curriculum Vitae*, a copy of which can be found in EX2010. The following is a brief summary of my relevant qualifications and professional experience.

6. I earned an engineering degree from the University of Washington in 1994.

7. I was commissioned in the U.S. Army, where I served as the officer in charge of the Advanced Warfighter Experiment in 1995, the first tactical deployment of distributed computing within the U.S. Army. I later founded the Army's Network Science Center at West Point.

8. I earned a Ph.D. in Computer Science from Carnegie Mellon University.

9. Currently I am the Director of and lead the AI Executive and Professional Education portfolio at Johns Hopkins University. I am also the Assistant Program Manager, AI, DS, CS, ISE, Cyber, Robotics at Johns Hopkins.

10. My experience includes both hands-on deployment and academic research in distributed systems operating under real-world constraints.

11. Based on my experience and education, I believe that I am qualified to offer opinions as to the knowledge and level of skill of a person of ordinary skill in the art ("POSITA") at the time of the invention of the '128 patent, as well as the nonobviousness of the '128 patent's claimed inventions (which I further describe below).

III. INTRODUCTION TO THE '128 PATENT AT ISSUE

12. The '128 patent discloses and teaches a novel architectural system committed to active, distributed orchestration, not passive distribution. With today's infrastructure, it is easy to blur the distinction between maintaining a centralized catalog with regional copies and a system that actually performs per-request discovery, initiation, and routing across multiple regional libraries. Those are materially different designs.

13. Passive approaches, such as indexing content, staging it in advance, or replicating it based on popularity, can operate without a real-time control plane.

14. True multi-region orchestration, by contrast, must reliably execute per-request decisions across independent regions while managing failure, consistency, and user-visible latency. In distributed systems practice, that is where complexity resides.

IV. KNOWLEDGE SHARED BY A PERSON OF ORDINARY
SKILL IN THE ART ("POSITA") AS PORTRAYED IN
DR. LIPPMAN'S BACKGROUND DISCUSSION

15. Dr. Lippman concludes his background discussion with the assertion that "all of the features and functionality described in this Background were well known in the late 1990s, and a POSITA would have been familiar with them." EX1003 ¶ 35. I disagree with Dr. Lippman's conclusory overstatement. Dr. Lippman has described isolated generic components (servers, databases, networks), while ignoring the relevant question: whether the prior art discloses, teaches or suggests the specific claimed architecture and functions combined in the claims of the '128 patent. Indeed, Dr. Lippman's "Background" omits and fails to address the constraints that would have taught a POSITA away from real-time inter-regional routing in that era, including bandwidth allocation realities, latency, and operational instability across distributed cable networks.

16. Dr. Lippman's analysis, in my opinion, suffers from the common misconception that because distributed computing existed in some form in the 1990s, the '128 patent's disclosed distribution architecture must have been obvious. But enterprise distributed computing and consumer entertainment distribution are fundamentally different domains with very different technical pressures.

17. Distributed systems research in the 1997-1998 time period focused primarily on enterprise environments; file servers, high-performance computing clusters, database replication, and academic experiments in grid computing. In the mid-to-late 1990s, nearly all distributed systems work was aimed at solving enterprise problems: keeping databases consistent, improving file server availability, handling internal corporate data replication, and building scientific computing clusters. These systems were not dealing with millions of consumer endpoints, nor did they need to support real-time streaming of high-bitrate audio or video. They had no reason to track user-level consumption for billing or marketing, and they had no licensing restrictions that required content to be managed by region.

18. I believe much of the commercial push was to support U.S. Department of Defense (DoD) requirements for sharing intelligence at greater speed and scale than existed in the late 1990s when I was developing them for the DoD. Those systems were not designed for consumer-facing, on-demand multimedia delivery. They emphasized reliability and consistency rather than the low-latency, high-

throughput, user-driven experience that the inventions taught in the '128 patent enables.

19. The entertainment use case, particularly music and video (to which the inventions of the '128 patent are directed), introduced constraints that enterprise systems simply did not have to address. Content had to be delivered instantly, without buffering, to a large and unpredictable user population. Users needed to be billed or tracked individually based on what they accessed. The delivery system had to search multiple geographically separate libraries, move content across regions on demand, and do all of this fast enough to support real-time playback. These challenges required a fundamentally different thinking about how distributed networks should operate.

20. From my own work in the 1990s, both inside government and in academic research, I can say with confidence that real-time content routing across regional networks for consumer media delivery was not something engineers were thinking about, let alone building at the time relevant to when the '128 patent inventions were conceived.

21. Even today, when we look at how the big streaming platforms function, we can see how different the entertainment problem is from generic distributed computing. Entertainment systems must optimize for latency, bandwidth, content popularity patterns, user-specific analytics, licensing regions, and unpredictable spikes in demand for individual titles. Those were exactly the kinds of issues that the

'128 patent addressed at a time when almost no one in the field was working on these problems.

22. Further, a central flaw in Dr. Lippman's misleading portrayal of the background and context relevant to the inventions claimed by the '128 patent is that Dr. Lippman apparently imports modern assumptions into an earlier era.

23. When evaluating the background and context relevant to the '128 patent, it is important to focus on the real-world technological landscape of 1998. Today we take cloud regions, global content delivery networks, edge servers, and real-time media streaming for granted, but none of these capabilities existed at that time in the form we now know. At the time the inventions disclosed and claimed by the '128 patent were conceived, there was no AWS, no distributed microservices ecosystem, no mature broadband infrastructure, and no established model for delivering digital media in real time to millions of consumers.

24. In the late 1990s, the public Internet did not behave as a stable, predictable substrate on which engineers could safely build interactive, cross-region control loops by default. It was, and remains, an interconnection of independent networks. Routes changed, paths were often asymmetric, and end-to-end performance varied in ways that were difficult to diagnose or control. Paxson's measurement studies are widely cited precisely because they quantified this

variability and showed that wide-area paths could not be treated as stable or uniform across time and space (Paxson, 1996; Paxson, 1997).

25. From an engineering standpoint, building a system that depends on real-time coordination across multiple regions was not simply a matter of connecting known components. It was an architectural bet against the variability, latency, and failure modes that engineers routinely observed in wide-area networks in the 1997-1998 time period. As a result, engineers at that time generally avoided designs that required tight, real-time orchestration across heterogeneous regions. This background and context is critical to the correct understanding of the '128 patent's claimed inventions and why they would not have been obvious to a POSITA.

26. Examining where major engineering effort was concentrated in the late 1990s further illustrates what was considered normal or expected at the time. Public records show substantial institutional focus on defense digitization, enterprise information infrastructure, and command-and-control modernization rather than consumer-grade, interactive media streaming across heterogeneous public networks. This reflects the engineering “center of gravity” of the 1997-1998 time period and reinforces that multi-region, per-request orchestration for consumer-like media delivery was not an obvious or inevitable next step.

27. In my opinion, Dr. Lippman's characterization of the background and context relevant to the '128 patent's claimed inventions also suffers from a hindsight

perspective. Such a hindsight perspective would be powerfully shaped by high-visibility developments that occurred slightly later than the time of the inventions at issue.

28. In 1999, products and events such as TiVo's commercial launch, Napster's emergence, early CDN commercialization, and increasing visibility of streaming initiatives helped make on-demand media culturally and technically salient. These developments make it easier, in retrospect, to tell a story in which streaming-style distribution appears inevitable or obvious. But that narrative reflects an ecosystem maturation after the time period relevant to the '128 patent's inventions, not the expectations a skilled engineer would reasonably have held in 1997–1998.

29. There is no reason to believe that the enterprise distributed computing trajectory of the 1990s would have naturally evolved into the novel and nonobvious distribution architecture described in the '128 patent. Without the specific pressures of the entertainment industry, the design choices embodied in the '128 patent would simply not have emerged.

V. DR. LIPPMAN'S OVERVIEW OF THE '128 PATENT

30. In my opinion, Dr. Lippman's overview of the '128 patent also presents somewhat of a misleading picture. The inventors of the '128 patent recognized a set of challenges that the industry had not yet begun to solve. The system described in the '128 patent utilizes an architecture that combines several elements that were not

found together in any prior art: a single central controller capable of searching multiple geographically separated content libraries, orchestrating transfers across regional nodes, initiating real-time delivery to users over cable networks, and simultaneously logging user-specific requests for billing and personalization. Each of these components addressed a real technical constraint of the 1997-1998 time period, and the way they were brought together reflected an understanding of the future that simply was not typical of the field in the late 1990s.

31. The '128 patent reflects an architectural commitment to active, distributed orchestration, not passive distribution. With today's infrastructure, it is easy to blur the distinction between maintaining a centralized catalog with regional copies and a system that actually performs per-request discovery, initiation, and routing across multiple regional libraries. Those are materially different designs. Passive approaches, such as indexing content, staging it in advance, or replicating it based on popularity, can operate without a real-time control plane. True multi-region orchestration, by contrast, must reliably execute per-request decisions across independent regions while managing failure, consistency, and user-visible latency. In distributed systems practice, that is where complexity resides.

32. Dr. Lippman asserts that all the concepts he discusses in the overview of the '128 patent were well known as of the priority date of the '128 patent. EX1003

¶ 40. I disagree. Dr. Lippman essentially conflates the existence of streaming-related protocols with the invention of a multi-region orchestration architecture.

33. In 1998, the Real Time Streaming Protocol (RTSP) was published as RFC 2326, describing a standardized way for a client to control a streaming session (Schulzrinne et al., 1998). RTSP is essentially a session-control protocol. It does not specify or imply the higher-order architecture embodied in the '128 patent, such as multi-region library discovery, cross-region retrieval decisions, or centralized orchestration across independent repositories. The timing is also notable: the '128 patent was filed in March 1998, and RTSP was published in April 1998, underscoring that relevant standards and ecosystem assumptions were still emerging rather than being long-settled -- contrary to Dr. Lippman's obviousness assertions.

34. In my opinion, the novel and nonobvious architecture taught by the '128 patent did not flow naturally from the state of the art in 1998. It required the inventors to anticipate a direction for digital media distribution that the industry would not fully embrace until a decade or more later. That foresight is one of the clearest markers that the '128 invention was novel and nonobvious at the time it was created.

VI. CONCLUSION

35. In my expert opinion, from a systems engineering perspective, Dr. Lippman's characterization of the '128 patent's architecture as inevitable or obvious applies post-2000 assumptions to a 1997–1998 question. The late-1990s Internet did

not reliably support the kind of predictable, low-latency, cross-domain coordination that makes multi-region orchestration feel routine today. Protocols such as RTSP do not supply the core architectural concepts embodied in the '128 patent and covered by the patent's claims. Subsequent market and infrastructure developments explain why such architectures may now appear obvious, but that is hindsight, not a reliable measure of what engineers would have expected at the time of the inventions described in the '128 patent.

36. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and that these statements were made with 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.

Dated: January 4, 2025

A handwritten signature in black ink, appearing to read 'Ian McCulloh', is written over a horizontal line.

Ian McCulloh, Ph.D.