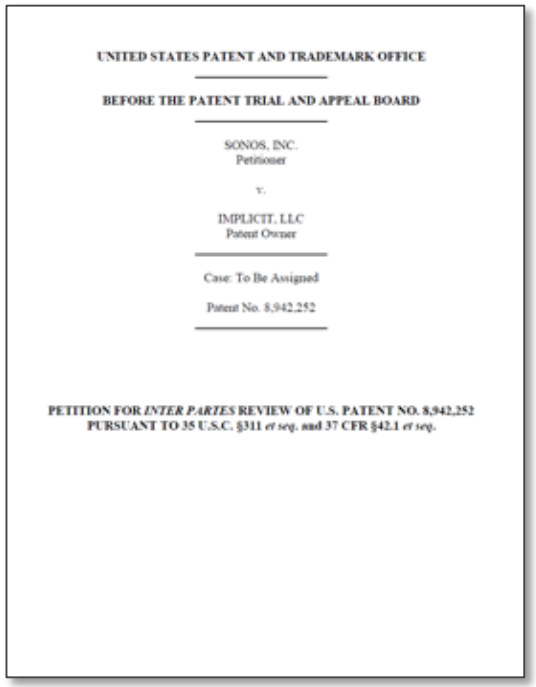
SONOS, INC. V. IMPLICIT, LLC

IPR2018-00766
U.S. Pat. No. 7,391,791

IPR2018-00767
U.S. Pat. No. 8,942,252

SONOS ESTABLISHED UNPATENTABILITY OF EACH CLAIM



UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.
Petitioner

v.

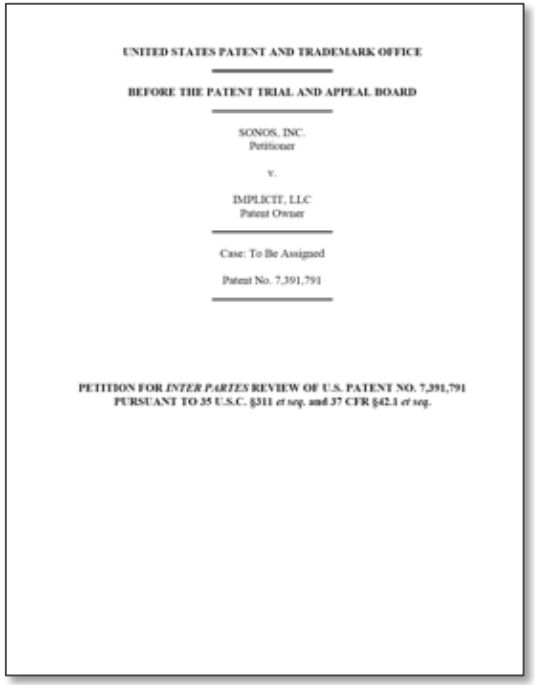
IMPLICIT, LLC
Patent Owner

Case: To Be Assigned

Patent No. 8,942,252

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,942,252
PURSUANT TO 35 U.S.C. §311 *et seq.* and 37 CFR §42.1 *et seq.*

Sonos Petition
'791 Patent



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PURSUANT TO 35 U.S.C. §311 *et seq.* and 37 CFR §42.1 *et seq.*

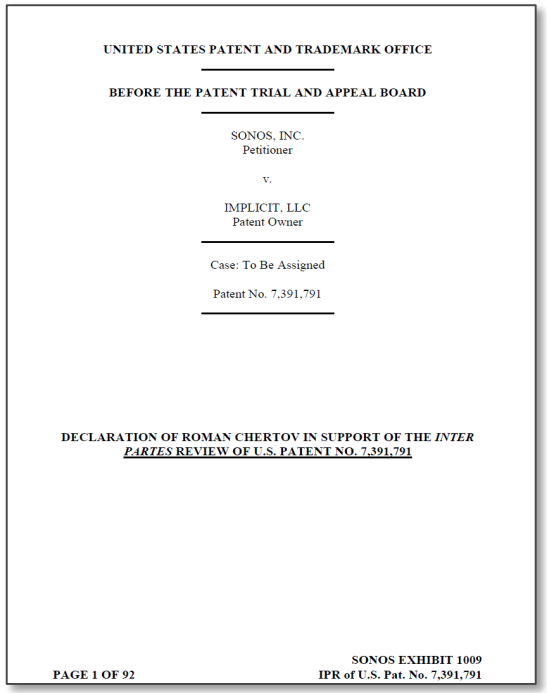
Sonos Petition
'252 Patent

- Janevski anticipates the '791 patent claims
- Janevski + any "clock synchronization" reference renders the '252 patent claims obvious

IPR2018-00766, -00767 EXHIBIT 1028

Sonos '791 Pet., pp. 38-68; Sonos '252 Pet., pp. 35-64.

SONOS'S PETITIONS ARE BASED ON EVIDENCE



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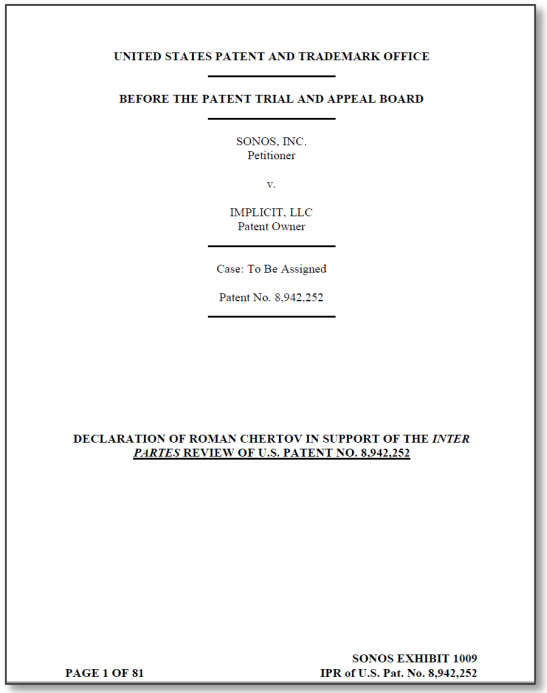
Patent No. 7,391,791

DECLARATION OF ROMAN CHERTOV IN SUPPORT OF THE *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

PAGE 1 OF 92

SONOS EXHIBIT 1009
IPR of U.S. Pat. No. 7,391,791

Dr. Chertov Declaration
'791 Patent
Ex.1009



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PAGE 1 OF 81

SONOS EXHIBIT 1009
IPR of U.S. Pat. No. 8,942,252

Dr. Chertov Declaration
'252 Patent
Ex.1009

- Sonos's petitions rely on Dr. Chertov's expert testimony regarding the invalidity of the patents

IMPLICIT'S DEFENSES FAIL

Implicit's attack on the prior art fails

- It is unsupported attorney-argument
- Prior art invalidates all claims

Implicit's swear-behind defense fails

- It fails legally
- It fails substantively

Sonos Reply, pp. 1, 12, 22. 4

IMPLICIT FAILED TO REBUT SONOS'S PETITIONS WITH EVIDENCE

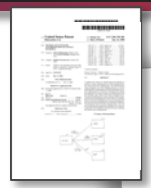
Elbit Systems of America, LLC v. Thales Visionix, Inc., 881 F.3d 1354, 1359 (Fed. Cir. 2018)

"Elbit fails to present any evidence supporting this contention beyond attorney argument . . .

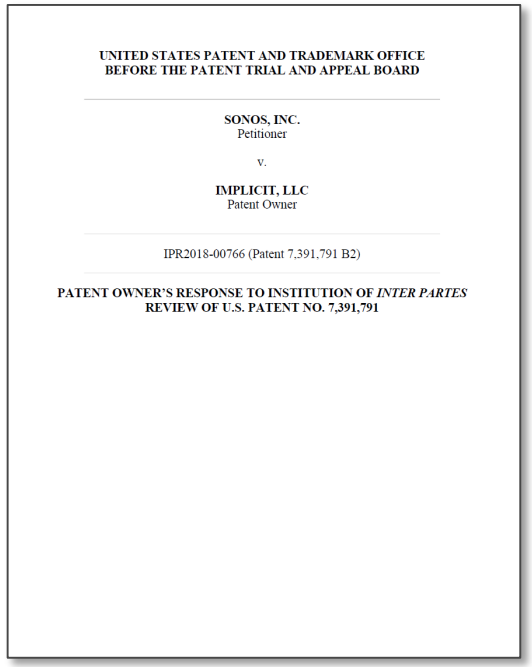
'[A]ttorney argument is not evidence' and cannot rebut other admitted evidence."

Sonos Reply, pp. 22-23.

IMPLICIT CHALLENGES JANEVSKI'S DISCLOSURE OF "DEVICE TIME"



23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:



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IPR2018-00766 (Patent 7,391,791 B2)

PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

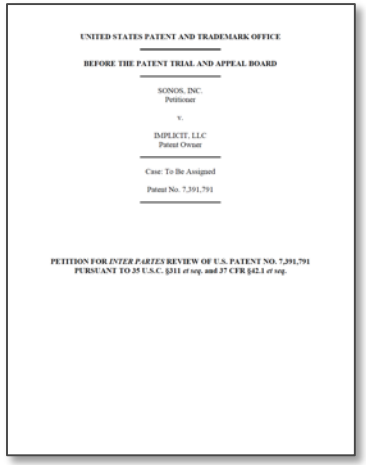
Implicit POR
'791 Patent

1. Janevski Fails to Disclose the "Device Time" Limitations

Implicit POR, pp. 32-33.

JANEVSKI DISCLOSES "DEVICE TIME"

23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:



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Patent No. 7,391,791

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791 PURSUANT TO 35 U.S.C. §311 *et seq.* and 37 CFR §42.1 *et seq.*

Sonos Petition
'791 Patent

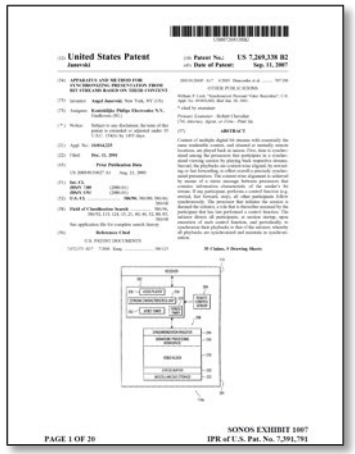
A. "device time"

The '791 Patent states that a rendering device's "device time" is "the time as indicated by a designated clock (e.g., system clock) of the rendering device." Ex.1001, 2:16-17. Consistent with this disclosure, Petitioner proposes that the term "device time" be construed here as "a time indicated by any clock of a given rendering device."

JANEVSKI DISCLOSES "DEVICE TIME"

23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:

Each PVR has a "time count" provided by the PVR's "video timer":



Janevski Ex.1007

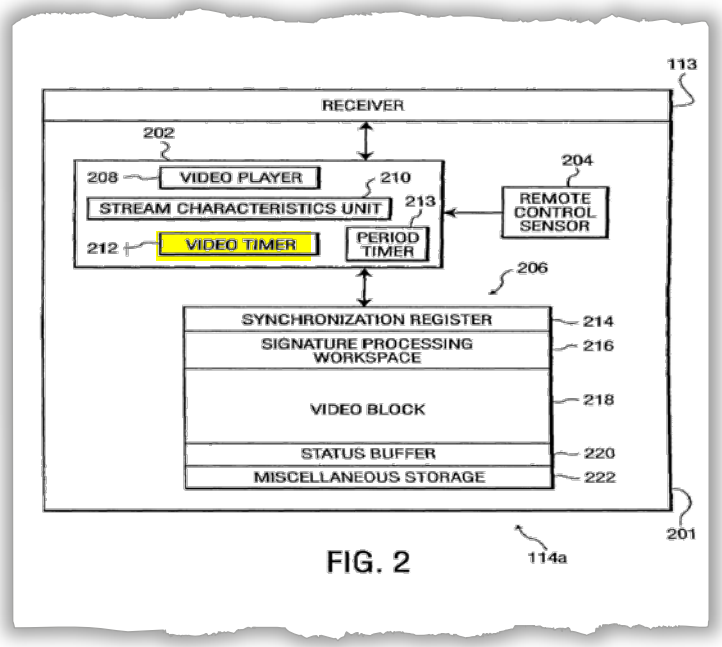


FIG. 2

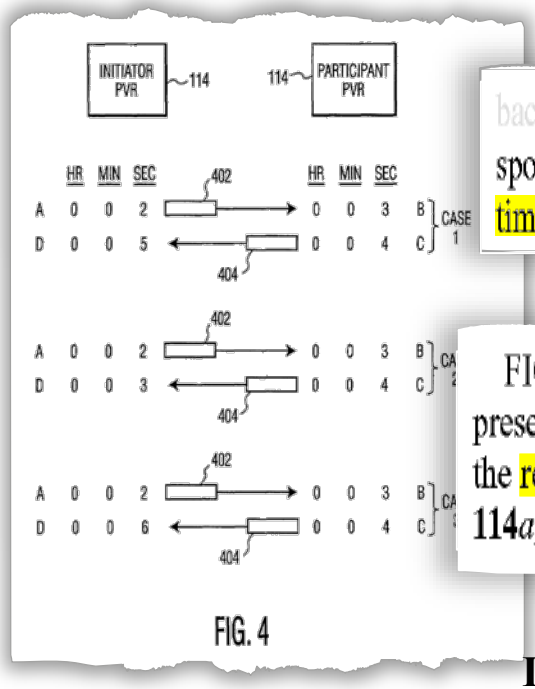


FIG. 4

backs. When any PVR fast forwards or rewinds, this correspondingly and synchronously advances or rolls back the time count of its respective video timer.

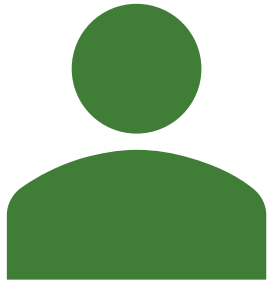
FIG. 4 depicts a possible message flow design in the present invention to determine the misalignment, if any, in the respective timings of the video timers **212** of two PVRs **114***a, b*, so that the timers can be synchronized. For sim-

IPR2018-00766, -00767 EXHIBIT 1028

Janevski (Ex.1007) at 2:21-23, 8:39-42, Figs. 2, 4; Sonos Pet, p. 39.

JANEVSKI DISCLOSES "DEVICE TIME"

23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:

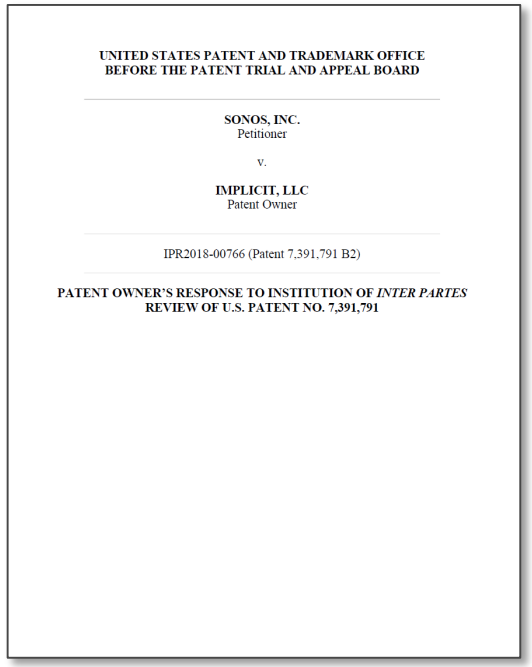


Dr. Roman Chertov
Sonos's Expert Witness

102. Further, Janevski discloses that each PVR has a "time count" provided by the PVR's "video timer." In my opinion, the PVR's "video timer" amounts to a clock of the PVR, and the "time count" provided by the "video timer" amounts to the claimed "device time" that is in a "time domain" of the PVR. *Id.* at FIGs. 2 & 4, 7:51-62, 8:39-10:3.

IMPLICIT ARGUES THAT OUTPUT OF "VIDEO TIMER" IS NOT "DEVICE TIME"

23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:



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IPR2018-00766 (Patent 7,391,791 B2)

PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

Implicit POR
'791 Patent

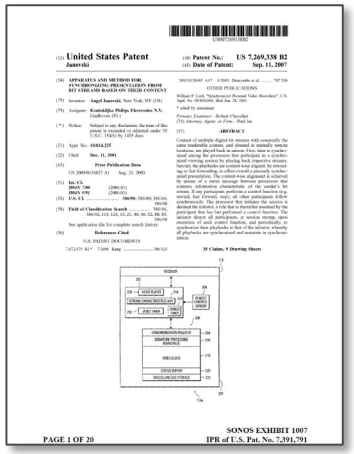
The Petitioner has not shown that the video timer data is a device time. The video timer is not linked to any clock of the PVR or a device within the DVR. It is undisputedly not a system clock, and it is noteworthy that Janevski calls it a "timer," as opposed to a clock. The purpose of a device clock is to synchronize the operations on the device, and Janevski does not disclose that the video timer performs that functionality.

Implicit POR, p. 33.

JANEVSKI'S "VIDEO TIMER" IS A CLOCK THAT OUTPUTS "DEVICE TIME"

Dr. Roman Chertov
Sonos's Expert Witness

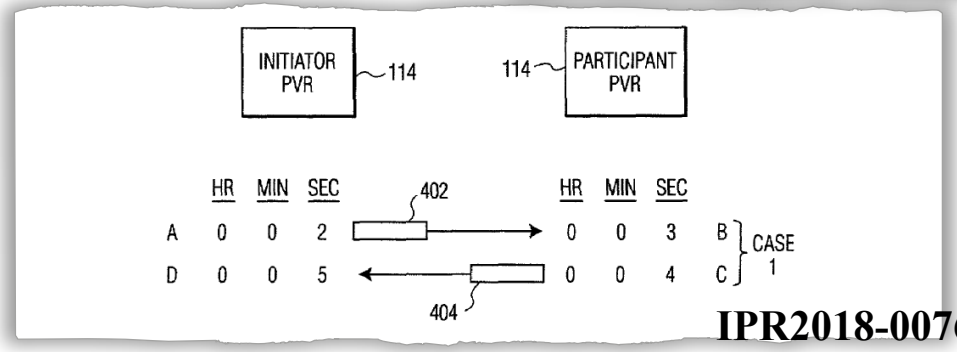
102. Further, Janevski discloses that each PVR has a "time count" provided by the PVR's "video timer." In my opinion, the PVR's "video timer" amounts to a clock of the PVR, and the "time count" provided by the "video timer" amounts to the claimed "device time" that is in a "time domain" of the PVR. *Id.* at FIGs. 2 & 4, 7:51-62, 8:39-10:3.



Janevski
Ex.1007

FIG. **4** depicts a possible message flow design in the present invention to determine the misalignment, if any, in the respective timings of the video timers **212** of two PVRs **114***a, b*, so that the timers can be synchronized. For sim-

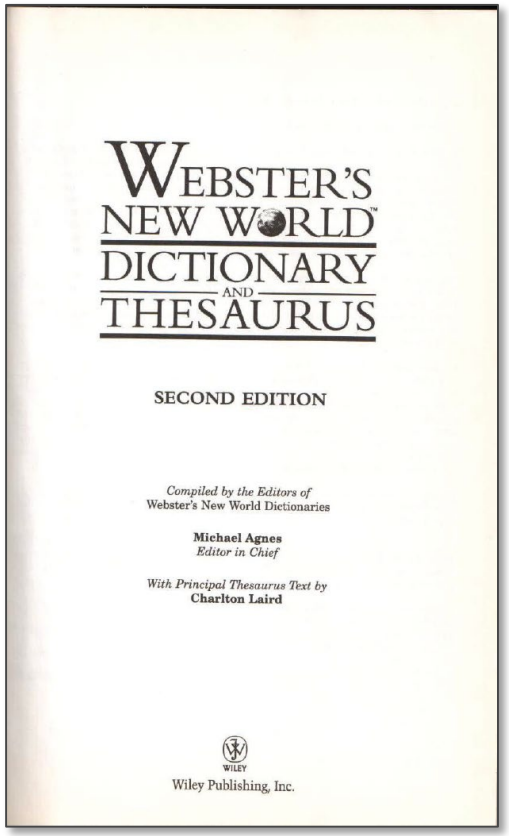
Time synchronization can be implemented in many different known ways. Distributed processors (nodes) in a network can broadcast their respective clock values periodically to maintain synchronization. "Fault-Tolerant Clock



IPR2018-00766, -00767 EXHIBIT 1028

Chertov Dec. (Ex.1009) at ¶102; Janevski (Ex.1007) at 8:39-42, 8:53-56; Sonos Reply, p. 24.

JANEVSKI'S "VIDEO TIMER" IS A CLOCK THAT OUTPUTS "DEVICE TIME"

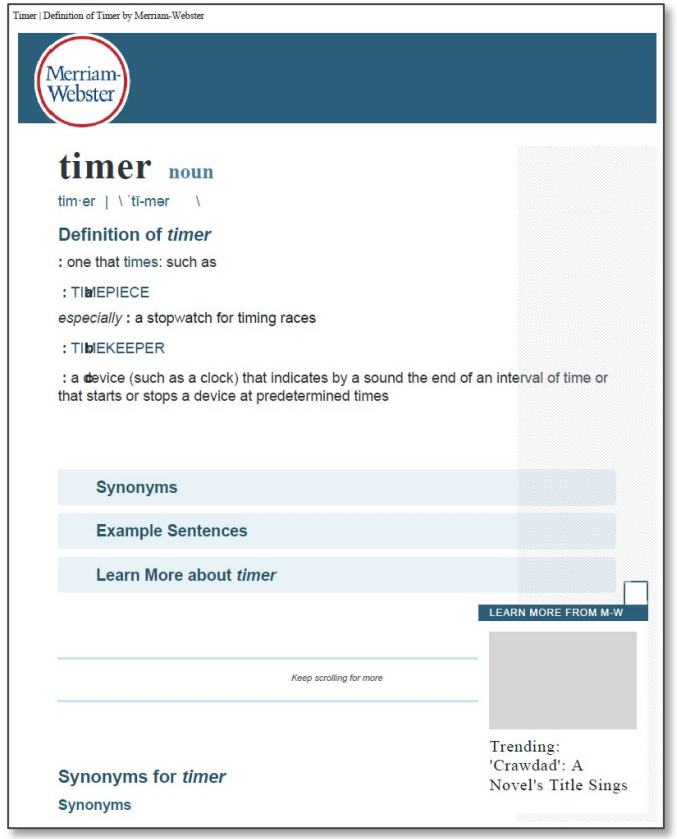


Webster's New World Dictionary
"clock"
Ex.1023

clock[1] (kläk) *n.* [ME *clokke*, orig., clock with bells < ML *clocca*, bell] a device for measuring and indicating time,

clock[1] *n.* timepiece, timekeeper, chronometer, timer, alarm clock, cuckoo clock, electric clock, grandfather clock, pendulum clock, atomic clock, digital clock, clock radio, hourglass, stopwatch, sundial, wristwatch; see also WATCH 1. —**around the clock** continuously, continually, twenty-four hours a day; see REGULARLY.

JANEVSKI'S "VIDEO TIMER" IS A CLOCK THAT OUTPUTS "DEVICE TIME"


Timer | Definition of Timer by Merriam-Webster

Merriam-Webster

timer noun

tim·er | \ ˈtī-mər \

Definition of *timer*

: one that times: such as

: TIMEPIECE

especially : a stopwatch for timing races

: TIMEKEEPER

: a device (such as a clock) that indicates by a sound the end of an interval of time or that starts or stops a device at predetermined times

Synonyms

Example Sentences

Learn More about *timer*

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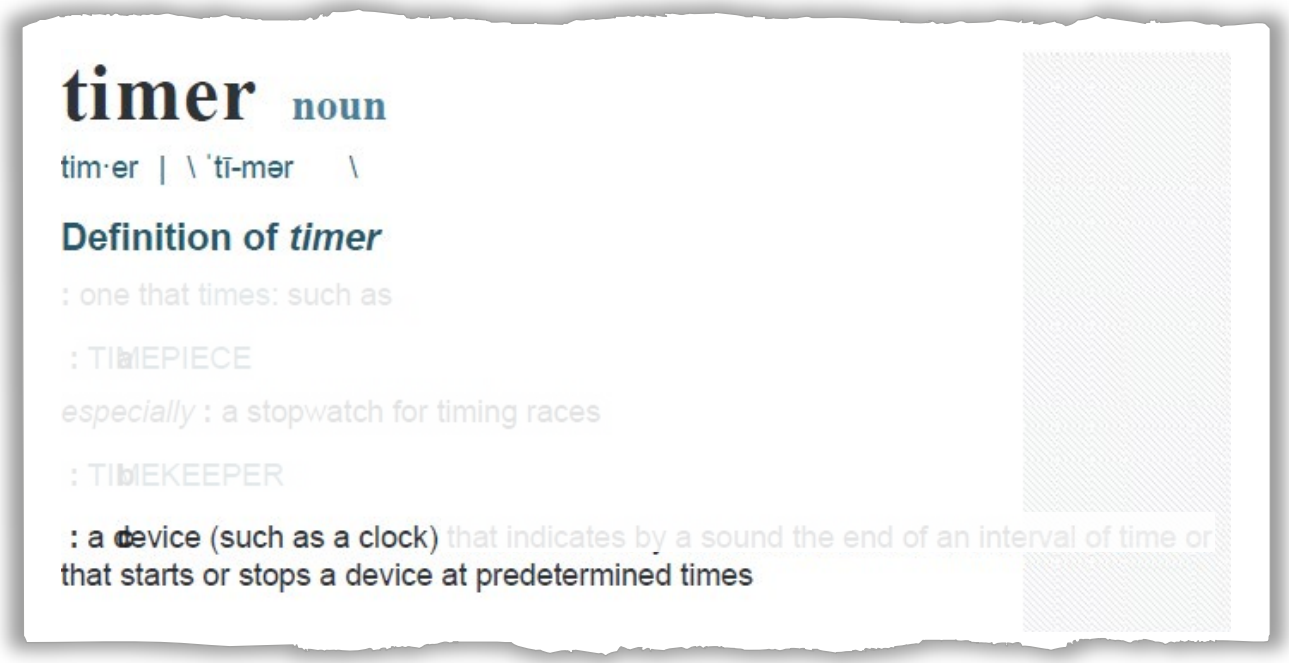
Synonyms for *timer*

Synonyms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tim·er | \ ˈtī-mər \

Definition of *timer*

: one that times: such as

: TIMEPIECE

especially : a stopwatch for timing races

: TIMEKEEPER

: a device (such as a clock) that indicates by a sound the end of an interval of time or that starts or stops a device at predetermined times

Merriam-Webster Online Dictionary
"timer"
Ex.1024

JANEVSKI'S "VIDEO TIMER" IS A CLOCK THAT OUTPUTS "DEVICE TIME"

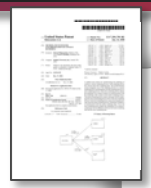
LITIGATION CONSTRUCTION	IPR CONSTRUCTION
"[a] time indicated by a designated clock of the [master/slave] device"	"a time indicated by any clock of a given rendering device"

Dr. Roman Chertov
Sonos's Expert Witness

102. Further, Janevski discloses that each PVR has a "time count" provided by the PVR's "video timer." In my opinion, the PVR's "video timer" amounts to a clock of the PVR, and the "time count" provided by the "video timer" amounts to the claimed "device time" that is in a "time domain" of the PVR. *Id.* at FIGs. 2 & 4, 7:51-62, 8:39-10:3.

Sonos Pet., p. 17; Chertov Dec. (Ex.1009) at ¶102; Sonos Reply, p. 24.

IMPLICIT CHALLENGES JANEVSKI'S DISCLOSURE OF "TIME DOMAIN"



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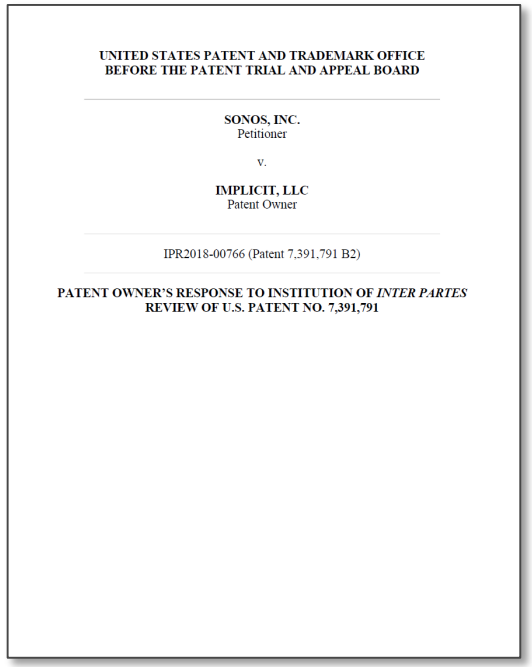

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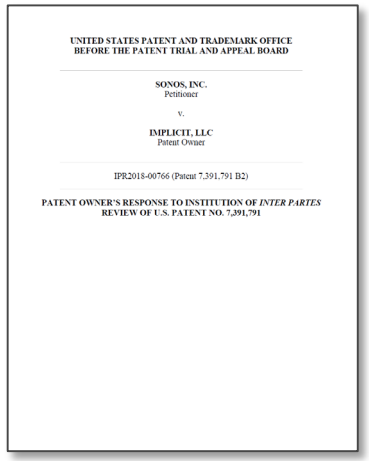
PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

Implicit POR
'791 Patent

2. Janevski Fails to Disclose the "Time Domain" Limitations

Implicit POR, p. 36.

JANEVSKI DISCLOSES THE "TIME DOMAIN" ELEMENTS



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Implicit POR
'791 Patent

The "time domain" terms should be construed as "the way a device clock tracks time," which Implicit also proposed in the co-pending litigation. Exhibit

* * * *

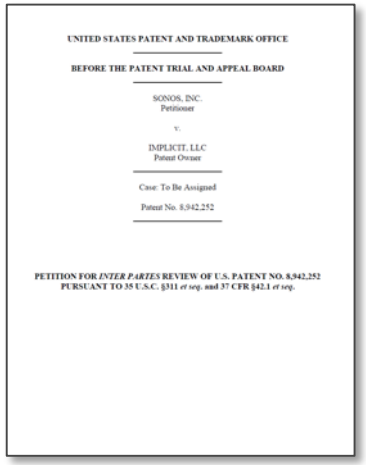
Claims. The Petition does not show how the initiator and participant PVRs in Janevski track device time relative to one another. The video timer does not indicate a device time, but how long the PVR has been playing the video for. The query

Dr. Roman Chertov
Sonos's Expert Witness

107. In my opinion, Janevski discloses claim element 23.2. For instance, Janevski discloses an example message flow for exchanging "synchronization messages" between the "initiator" and "participant" PVRs that include information regarding the PVRs' respective "time counts." *Id.* at FIG. 4, 8:39-10:3. It is my opinion that this disclosure amounts to the claimed functionality of "exchanging time domain information between the master and one or more slave devices" under the "broadest reasonable construction" set forth in Sonos's Petition.

Implicit POR, pp. 37-38; Chertov Dec. (Ex.1009) at ¶107; Sonos Reply, p. 25.

JANEVSKI DISCLOSES THE "TIME DOMAIN" ELEMENTS



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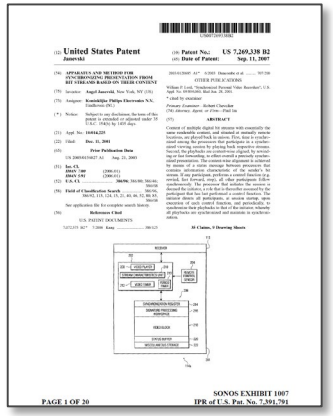
Sonos Petition
'791 Patent

Janevski discloses a message flow for exchanging "synchronization messages" between "initiator" and "participant" PVRs that include information regarding the PVRs' respective "time counts." Ex.1007, FIG. 4, 8:39-10:3. This disclosure

In fact, as noted above, Janevski's message flow for exchanging "synchronization messages" between the "initiator" and "participant" PVRs disclosed is nearly identical to the preferred message flow for exchanging "time domain information" that is disclosed in the '791 Patent. Ex.1009, ¶¶81-86, 108.



(12) United States Patent
Janevski

(10) Patent No.: US 7,269,338 B2
(45) Date of Patent: Sep. 11, 2007

(54) APPARATUS AND METHOD FOR SYNCHRONIZING PRESENTATION FROM BIT STREAMS BASED ON THEIR CONTENT

ABSTRACT

PAGE 1 OF 20

SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791

Janevski
Ex.1007

In the embodiment depicted herein, time synchronization is performed by the initiator PVR **114***a* individually with each participant PVR **114***b*, and involves sending an originating synchronization message **402** from the initiator PVR **114***a* to a participant PVR **114***b* and sending a reply synchronization message **404** from the participant PVR **114***b* to the initiator PVR **114***a*. It is assumed that the transmission

The time misregistration, TM, between the respective video timers **212** of the initiator and participant PVRs **114***a*, *b* is given by the formula:

$$TM=\tfrac{1}{2}[(A+D)-(C+B)] \quad (1)$$

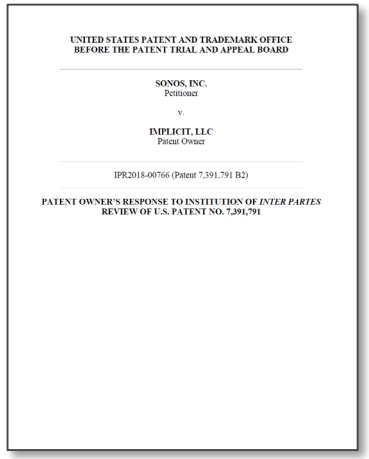
IPR2018-00766, -00767 EXHIBIT 1028

Sonos Pet., p. 41; Janevski (Ex.1007) at 8:65-9:34.

OBVIOUSNESS ARGUMENTS FOR THE '791 PATENT CAN BE DISREGARDED

- The petition included an alternative obviousness ground for claim 1 to the extent Implicit disputed whether Janevski inherently disclosed the "source time domain" element
- Implicit did not dispute this
- Implicit's "objective evidence" is deficient in any event

IMPLICIT DISPUTES OBVIOUSNESS OF THE '252 PATENT



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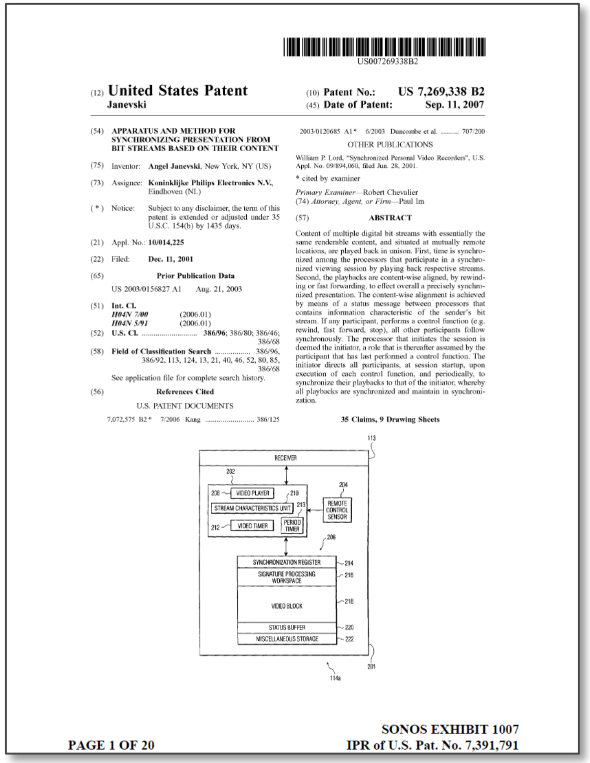
Implicit POR
'252 Patent

1. The Petition Fails to Show a *Prima Facie* Case

IPR2018-00766, -00767 EXHIBIT 1028

Implicit POR, p. 32.

JANEVSKI + ANY "CLOCK SYNCHRONIZATION" REFERENCE RENDERS '252 CLAIMS OBVIOUS



US007269338B2

(12) **United States Patent**
Janevski

(10) **Patent No.:** **US 7,269,338 B2**
(45) **Date of Patent:** **Sep. 11, 2007**

(54) **APPARATUS AND METHOD FOR SYNCHRONIZING PRESENTATION FROM BIT STREAMS BASED ON THEIR CONTENT**

(75) Inventor: **Angel Janevski**, New York, NY (US)

(73) Assignee: **Koninklijke Philips Electronics N.V.**, Eindhoven (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1435 days.

(21) Appl. No.: **10/014,225**

(22) Filed: **Dec. 11, 2001**

(65) **Prior Publication Data**

US 2003/0156827 A1 Aug. 21, 2003

(51) **Int. Cl.**
H04N 7/00 (2006.01)
H04N 5/91 (2006.01)

(52) **U.S. Cl.** **386/96**; 386/80; 386/46; 386/68

(58) **Field of Classification Search** 386/96, 386/92, 113, 124, 13, 21, 40, 46, 52, 80, 85, 386/68
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,072,575 B2 * 7/2006 Kang 386/125
2003/0120685 A1 * 6/2003 Duncombe et al. 707/200

OTHER PUBLICATIONS

William P. Lord, "Synchronized Personal Video Recorders", U.S. Appl. No. 09/894,060, filed Jun. 28, 2001.

* cited by examiner

Primary Examiner—Robert Chevalier
(74) *Attorney, Agent, or Firm*—Paul Im

(57) **ABSTRACT**

Content of multiple digital bit streams with essentially the same renderable content, and situated at mutually remote locations, are played back in unison. First, time is synchronized among the processors that participate in a synchronized viewing session by playing back respective streams. Second, the playbacks are content-wise aligned, by rewinding or fast forwarding, to effect overall a precisely synchronized presentation. The content-wise alignment is achieved by means of a status message between processors that contains information characteristic of the sender's bit stream. If any participant, performs a control function (e.g. rewind, fast forward, stop), all other participants follow synchronously. The processor that initiates the session is deemed the initiator, a role that is thereafter assumed by the participant that has last performed a control function. The initiator directs all participants, at session startup, upon execution of each control function, and periodically, to synchronize their playbacks to that of the initiator, whereby all playbacks are synchronized and maintain in synchronization.

35 Claims, 9 Drawing Sheets

PAGE 1 OF 20 SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791

Janevski
Ex.1007

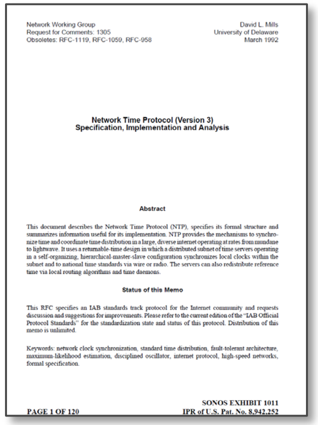
+

Fault-Tolerant Clock Synchronization for Distributed Systems with High Message Delay Variation

Abstract

1: Introduction

Azevedo
Ex.1010



Network Working Group David L. Mills
Request for Comments: 1305 University of Delaware
Obsoletes: RFC-1119, RFC-1059, RFC-958 March 1992

Network Time Protocol (Version 3)
Specification, Implementation and Analysis

Abstract

Status of this Memo

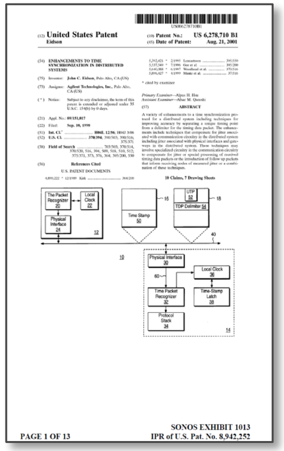
PAGE 1 OF 120 SONOS EXHIBIT 1011
IPR of U.S. Pat. No. 8,942,252

Mills
Ex.1011

Time Synchronization Over Networks Using Convex Closures

PAGE 1 OF 13 SONOS EXHIBIT 1012
IPR of U.S. Pat. No. 8,942,252

Berthaud
Ex.1012



United States Patent
Edison

PAGE 1 OF 13 SONOS EXHIBIT 1013
IPR of U.S. Pat. No. 8,942,252

Edison
Ex.1013

IPR2018-00766, -00767 EXHIBIT 1028

Sonos Pet., pp. 35, 57.

SONOS ESTABLISHED A MOTIVATION TO COMBINE WITH EVIDENCE

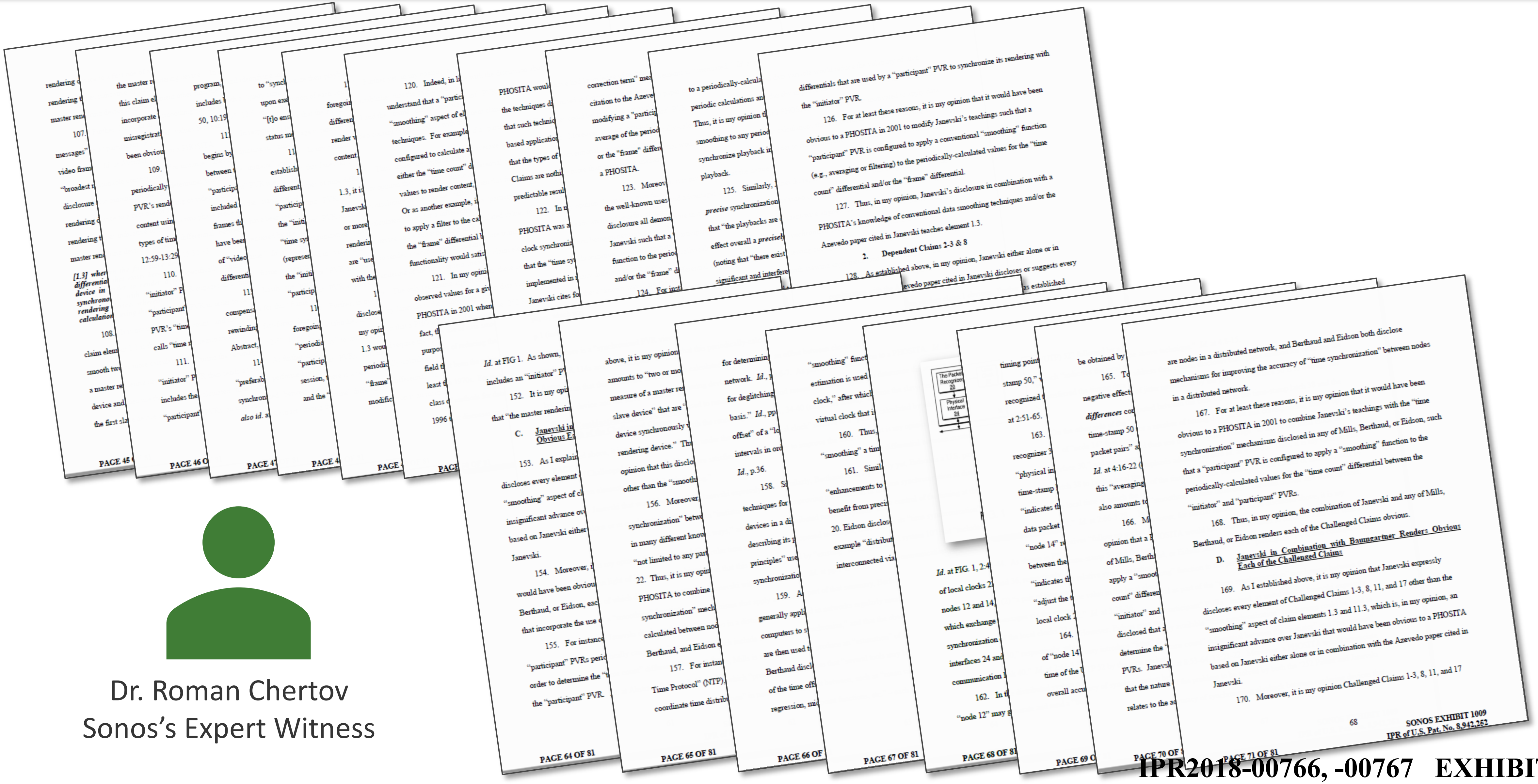
Dr. Roman Chertov
Sonos's Expert Witness

153. As I explained above, it is my opinion that Janevski expressly discloses every element of Challenged Claims 1-3, 8, 11, and 17 other than the "smoothing" aspect of claim elements 1.3 and 11.3, which is, in my opinion, an insignificant advance over Janevski that would have been obvious to a PHOSITA based on Janevski either alone or in combination with the Azevedo paper cited in Janevski.

154. Moreover, it is my opinion that Challenged Claims 1-3, 8, 11, and 17 would have been obvious in light of Janevski as combined with either Mills, Berthaud, or Eidson, each of which disclose "time synchronization" mechanisms that incorporate the use of a "smoothing" function.

Chertov Dec. (Ex.1009) at ¶ 153-54; Sonos Reply, p. 58.

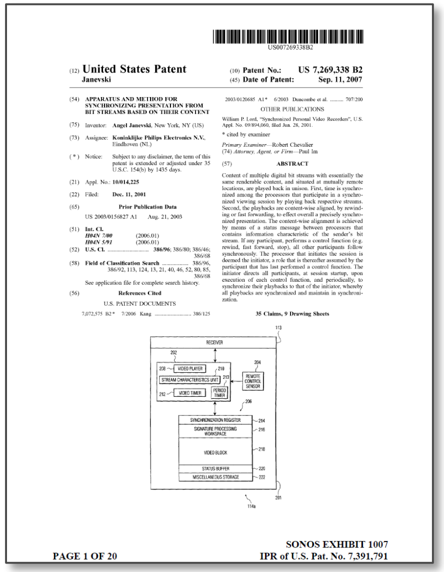
SONOS ESTABLISHED A MOTIVATION TO COMBINE WITH EVIDENCE



Dr. Roman Chertov
Sonos's Expert Witness

Chertov Dec. (Ex.1009) at ¶¶109-129, 153-168; Sonos Reply, p. 58.

SONOS ESTABLISHED A MOTIVATION TO COMBINE WITH EVIDENCE


United States Patent
Janevski
Patent No.: US 7,269,338 B2
Date of Patent: Sep. 11, 2007
PAGE 1 OF 20
SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791

Janevski
Ex.1007

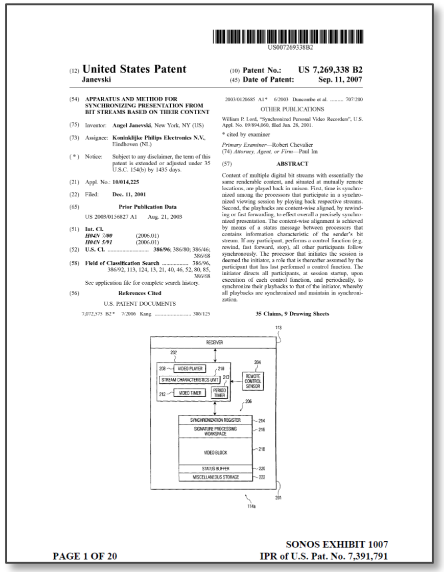
Moreover, the present invention, however, is not limited to any particular time synchronization method.

Time synchronization can be implemented in many different known ways. Distributed processors (nodes) in a network can broadcast their respective clock values periodically to maintain synchronization. "Fault-Tolerant Clock Synchronization for Distributed Systems with High Message Delay Variation", Azevedo, Marcelo Moraes de, et. al., Irvine, Calif. (1995). Synchronization messages may be relayed between source and destination processors, where relaying nodes discard messages recognized as coming from a faulty node. "Communication Protocols for Fault-Tolerant Clock Synchronization in Not-Completely Connected Networks", Pfluegl, Manfred J. et. al., Irvine, Calif. (1992).

IPR2018-00766, -00767 EXHIBIT 1028

Sonos Pet., pp. 38-39; Janevski (Ex.1007) at 8:53-64, 13:22-23.

SONOS ESTABLISHED A MOTIVATION TO COMBINE WITH EVIDENCE


United States Patent
Janevski
Patent No.: US 7,269,338 B2
Date of Patent: Sep. 11, 2007
PAGE 1 OF 20
SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791

Janevski
Ex.1007

(57) **ABSTRACT**

Content of multiple digital bit streams with essentially the same renderable content, and situated at mutually remote locations, are played back in unison. First, time is synchronized among the processors that participate in a synchronized viewing session by playing back respective streams. Second, the playbacks are content-wise aligned, by rewinding or fast forwarding, to effect overall a precisely synchronized presentation. The content-wise alignment is achieved

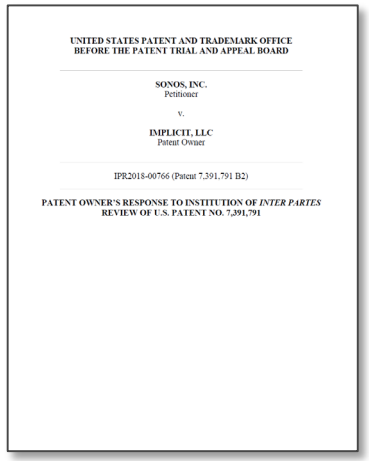
To achieve precise synchronization, the present invention compares corresponding content or "landmarks" of pairs of video playbacks to be synchronized, determines video replay "distance" between the landmark pairs, and slows down or speeds up selected playbacks in accordance with these distances.

The present invention provides a system that allows two or more people with personal video recorders (PVRs) to precisely synchronize their time-shifted viewing.

IPR2018-00766, -00767 EXHIBIT 1028

Janevski (Ex.1007) at Abstract, 3:52-57, 5:3-5; Sonos Reply, pp. 22-23.

IMPLICIT MISCONSTRUES LEGAL STANDARD OF OBVIOUSNESS



UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.
Petitioner

v.

IMPLICIT, LLC
Patent Owner

IPR2018-00766 (Patent 7,391,791 B2)

PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

Implicit POR
'252 Patent

Because the "smoothing a rendering time" differential is not disclosed in the prior art, the Petition had to establish that "smoothing a rendering time" limitation was an insignificant enough difference to render obvious the invention as a whole. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 405 (2007). The Petition did not clear

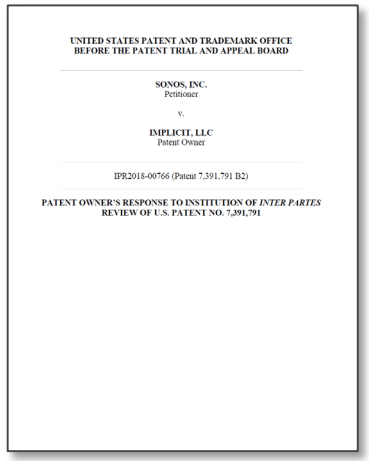
KSR Int'l Co. v. Teleflex Inc.,
550 U.S. 398 (2007)

"Section 103(a) forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious . . . to a person having ordinary skill in the art to which said subject matter pertains. '"

IPR2018-00766, -00767 EXHIBIT 1028

Implicit POR, p. 33; Sonos Reply, p. 21.

IMPLICIT'S "TEACHING AWAY" ARGUMENT IS LEGALLY AND FACTUALLY FLAWED



UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.
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IPR2018-00766 (Patent 7,391,791 B2)

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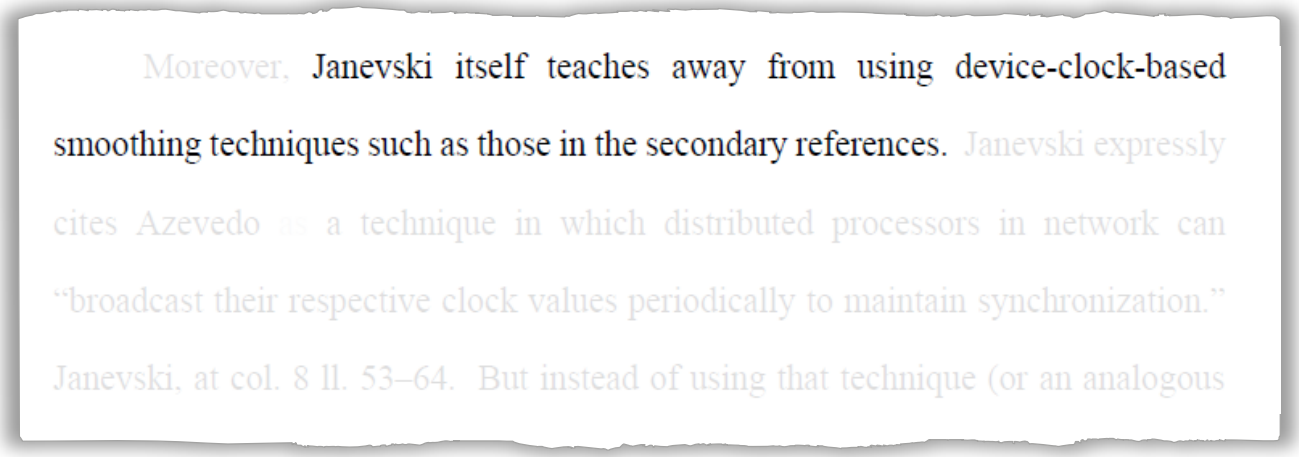
Implicit POR
'252 Patent



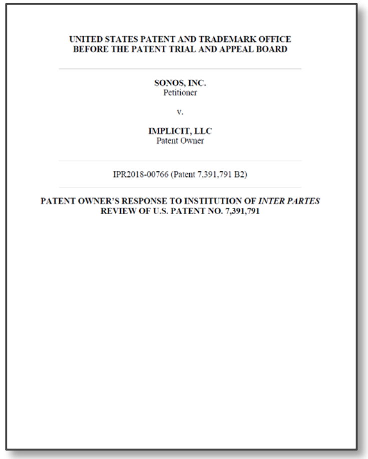
Moreover, Janevski itself teaches away from using device-clock-based smoothing techniques such as those in the secondary references. Janevski expressly cites Azevedo as a technique in which distributed processors in network can "broadcast their respective clock values periodically to maintain synchronization." Janevski, at col. 8 ll. 53–64. But instead of using that technique (or an analogous

Arctic Cat Inc. v. Bombardier Recreational Prod. Inc.,
876 F.3d 1350 (Fed. Cir. 2017)

"Prior art teaches away when 'a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.'"

Implicit POR, p. 33; Sonos Reply, pp. 22-23.

IMPLICIT'S "TEACHING AWAY" ARGUMENT IS LEGALLY AND FACTUALLY FLAWED



Implicit POR
'252 Patent

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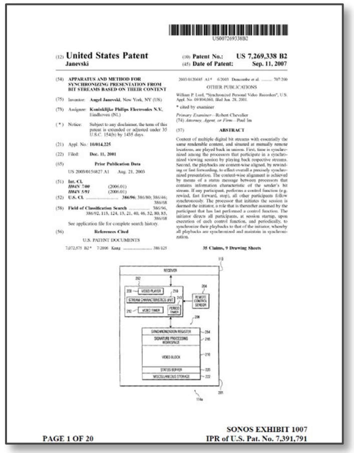

Janevski
Ex.1007

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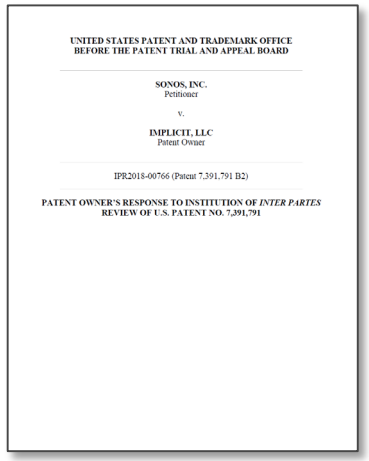
IPR2018-00766, -00767 EXHIBIT 1028

Implicit POR, p. 33; Janevski (Ex.1007) at 8:53-59; Sonos Reply, p. 22-23.

EVIDENCE SHOWS HOW A POSITA WOULD HAVE APPLIED "SMOOTHING"



UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.
Petitioner

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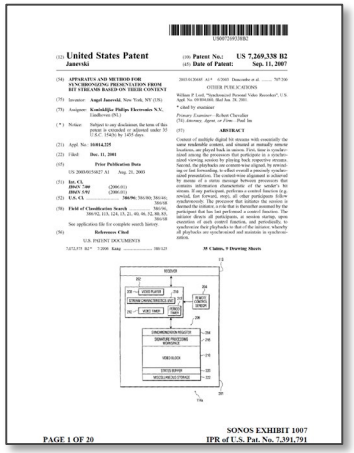
IPR2018-00766 (Patent 7,391,791 B2)

PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

Implicit POR
'252 Patent

> Challenged Claims. But there is no indication in any of the references of how a skilled artisan would have applied the smoothing techniques from the secondary references to Janevski to obtain a working system that smoothed a rendering time differential.

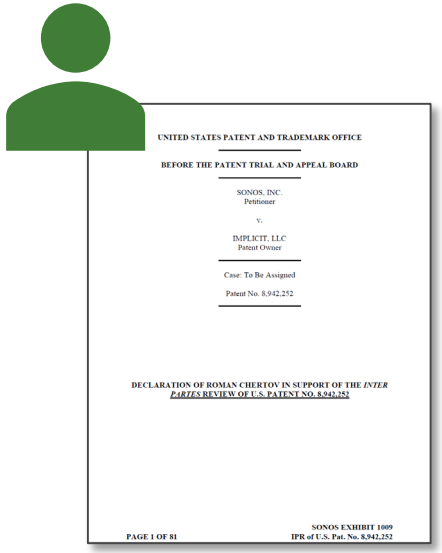


United States Patent
Janevski

US 7,269,338 B2
Sep. 11, 2007

SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791
PAGE 1 OF 20

Janevski
Ex.1007



UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.
Petitioner

v.

IMPLICIT, LLC
Patent Owner

Case: To Be Assigned

Patent No. 8,942,252

DECLARATION OF ROMAN CHERTOV IN SUPPORT OF THE *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,942,252

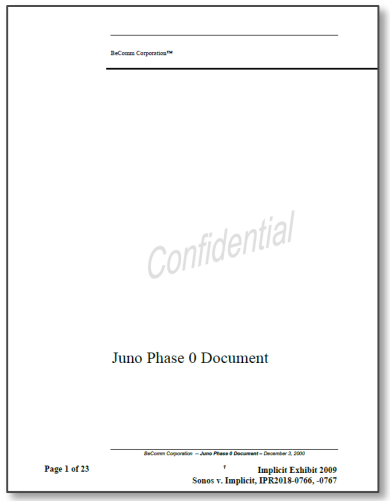
SONOS EXHIBIT 1009
IPR of U.S. Pat. No. 8,942,252
PAGE 1 OF 81

Dr. Roman Chertov Declaration
Ex.1009

IMPLICIT'S OBJECTIVE EVIDENCE ARGUMENTS ARE UNSUPPORTED

- No evidence of ***long-felt*** but unmet need
- No evidence that purported licenses exist or have a ***nexus*** with the claims
- No evidence that commerical success has a ***nexus*** with the claims

IMPLICIT FAILS TO ESTABLISH LONG-FELT NEED


BeComm Corporation™

Confidential

Juno Phase 0 Document

BeComm Corporation – Juno Phase 0 Document – December 2, 2000

Page 1 of 23

Implicit Exhibit 2009
Sonos v. Implicit, IPR2018-0766, -0767

Juno Phase 0
(Dec. 2000)
Ex.2009

Synchronization

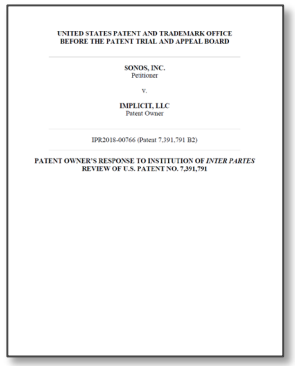
When multiplexing to multiple adapters, Juno will make a best effort to keep the playback at the Adapters synchronized. Both Jupiter and BeComm recognize that true synchronization is an unsolved computer science problem, but a best effort will be made in this regard.

Ecolochem, Inc. v. S. California Edison Co.,
227 F.3d 1361
(Fed. Cir. 2000)

One-year time between identification of problem and patent solution was found to be a "shortly-felt requirement" rather than a "long-felt need"

Juno Phase 0 (Ex.2009) at 15; Implicit POR, pp. 35-36; Sonos Reply, pp. 24-25.

IMPLICIT'S LICENSING "EVIDENCE" IS DEFICIENT



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IPR2018-00766 (Patent 7,391,791 B2)

PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

Implicit POR
'252 Patent

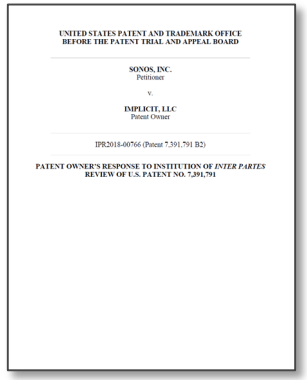
> The licensing of that technology, including by Intel, further reflects that it is not technology that would have been obvious when the '252 Patent was effectively filed. The patents flowing from BeComm's innovations, of which the Patent is a part, were later licensed for significant value beginning in 2007 to companies such as Intel, Microsoft, Google, Cisco, HP, AMD, Apple, and others. Ex. 2001, at ¶ 10.

Edward Balassanian
Lead Inventor & Founder

> 10. I am the inventor on over 25 issued U.S. Patents that stem from my work at BeComm. Companies such as Microsoft, Apple, Google, Intel, AMD, Cisco, HP, Palo Alto Networks, and a number of other companies have licensed that patent portfolio for significant value.

Implicit POR, p. 37; Balassanian Dec. (Ex.2001) at ¶10; Sonos Reply, pp. 24-25.

IMPLICIT FAILS TO ESTABLISH NEXUS FOR COMMERCIAL SUCCESS


UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

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IPR2018-00766 (Patent 7,391,791 B2)

PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

Implicit POR
'252 Patent

> Intel's willingness to pay significant value for the technology of the Juno project is another indicator of nonobviousness. The prospect to BeComm for the

> Companies that use the synchronization technology of the Challenged Claims have also achieved (and continue to achieve) significant commercial success. That includes Sonos. The purpose of Sonos is to "fill every home with music." Ex. 2089,

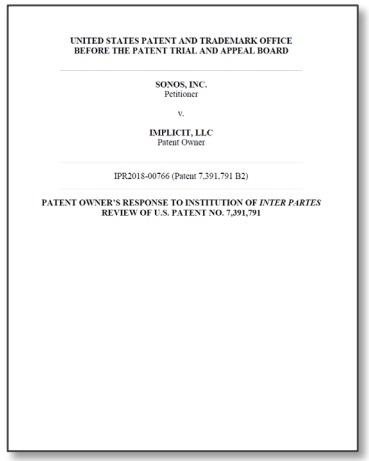
ABT Sys., LLC v. Emerson Elec. Co.,
797 F.3d 1350
(Fed. Cir. 2015)

"[R]eliance on commercial success is undermined as a matter of law by [patentee's] failure to introduce evidence related to the nexus."

IPR2018-00766, -00767 EXHIBIT 1028

Implicit POR, p. 36-37; Sonos Reply, pp. 24-25.

JANEVSKI DISCLOSES "MASTER DEVICE TIME" OF '252 CLAIM 2



UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

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v.

IMPLICIT, LLC
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IPR2018-00766 (Patent 7,391,791 B2)

PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

Implicit POR
'252 Patent

b. Janevski Does Not Disclose a "Master Device Time"

Janevski does not disclose a master device time. The Petitioner has not shown that the query time stamp is a master device time. Janevski does not indicate if the query time stamp contains a time indicated by a designated clock of any particular device, let alone the initiator device. The reference simply states that the initiator device "inserts . . . a query time stamp" into a message, Janevski, col. 10 ll. 17–24—but it does not state that the initiator's device time is within that time stamp.

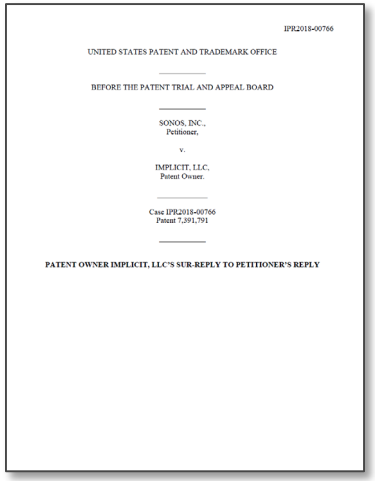
Dr. Roman Chertov
Sonos's Expert Witness

129. In my opinion, Janevski discloses claim element 2.0. For instance, as discussed above, Janevski discloses that the "initiator" PVR (which amounts to the claimed "master rendering device") periodically sends each "participator" PVR a "status message" that contains an indication of the "initiator" PVR's "time into the [video] program" as well as a "query time stamp" for "a frame that the initiator has just played or has recently played." *Id.* at Abstract, 7:36-50, 10:19-35, 12:5-36. It is my opinion that this disclosure amounts to the claimed functionality of sending "a master device time at which the master rendering device renders content."

IPR2018-00766, -00767 EXHIBIT 1028

Implicit POR, p. 39; Chertov Dec. (Ex.1009) at ¶129; Sonos Pet., p. 48.

DR. CHERTOV'S OPINIONS ON "RENDERING TIME" ARE ENTIRELY CONSISTENT



IPR2018-00766

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.,
Petitioner,

v.

IMPLICIT, LLC,
Patent Owner.

Case IPR2018-00766
Patent 7,391,791

PATENT OWNER IMPLICIT, LLC'S SUR-REPLY TO PETITIONER'S REPLY

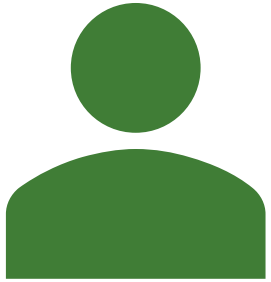
Implicit Sur-Reply
'791 Patent

not to answer those questions based on "scope." *Id.* at 144:1–145:13. But Dr. Chertov's conflicting application of the "rendering time" terms weighs heavily on Dr. Chertov's credibility regarding the Implicit Source Code. The conflicting testimony (and Sonos's corresponding discovery tactics) cast significant doubt on all of Dr. Chertov's testimony in favor of Sonos. Implicit thus respectfully requests that the Board decline to credit any of Dr. Chertov's testimony proffered in support of Sonos, whether in support of invalidity or in support of their positions on Implicit's Source Code.

IPR2018-00766, -00767 EXHIBIT 1028

Implicit Sur-Reply, p. 9.

DR. CHERTOV'S OPINIONS ON "RENDERING TIME" ARE ENTIRELY CONSISTENT



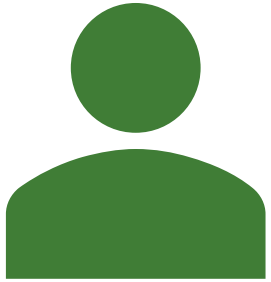
Dr. Roman Chertov
Sonos's Expert Witness

24. The construction of "rendering time" I have applied and used in formulating my opinions is "a time measure of the amount of content that has already been rendered by a given rendering device." I understand that Implicit and Dr. Hashmi have not challenged this construction of "rendering time."

25. When applying this construction of "rendering time" to the Implicit Source Code, it is my opinion that the Implicit Source Code fails to practice any of the "rendering time" limitations of the Challenged Claims of the '791 Patent.

Chertov Dec. (Ex.1022) at ¶¶ 24-25; Sonos Reply., p. 14.

DR. CHERTOV'S OPINIONS ON "RENDERING TIME" ARE ENTIRELY CONSISTENT



Dr. Roman Chertov
Sonos's Expert Witness

IX. CLAIM CONSTRUCTION

69. My opinions regarding the issue of patentability of the '791 Patent are based upon the "broadest reasonable constructions" proposed in Sonos's Petition for *Inter Partes* Review of the '791 Patent (the "Petition"), which I have reproduced in tabular form below.

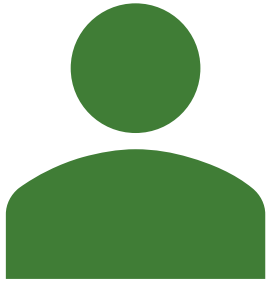
Claim Element(s)	Broadest Reasonable Construction
"device time"	"a time indicated by any clock of a given rendering device"
"rendering time"	"a time measure of the amount of content that has already been rendered by a given rendering device"

103. Further yet, Janevski discloses that each PVR keeps track of the amount of content in a given video program that has already been rendered by the PVR in terms of "the time or frame into the program." In my opinion, this "time or frame into the program" maintained by a PVR amounts to the claimed "rendering time." *Id.* at 1:65-2:5, 7:41-50.

IPR2018-00766, -00767 EXHIBIT 1028

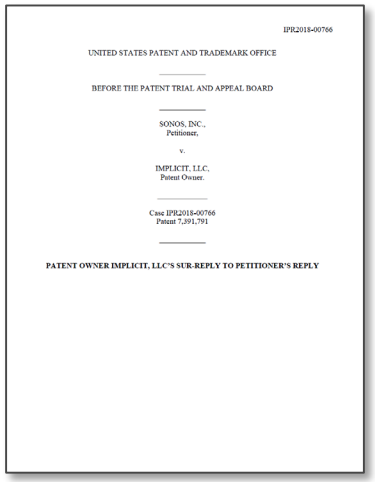
Chertov Dec. (Ex.1009) at ¶¶ 69, 103; Sonos Pet., p. 39.

DR. CHERTOV'S OPINIONS ON "RENDERING TIME" ARE ENTIRELY CONSISTENT



Dr. Roman Chertov
Sonos's Expert Witness

> 103. Further yet, Janevski discloses that each PVR keeps track of the amount of content in a given video program that has already been rendered by the PVR in terms of "the time or frame into the program." In my opinion, this "time or frame into the program" maintained by a PVR amounts to the claimed "rendering time." *Id.* at 1:65-2:5, 7:41-50.



IPR2018-00766

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.,
Petitioner,

v.

IMPLICIT, LLC,
Patent Owner.

Case IPR2018-00766
Patent 7,391,791

PATENT OWNER IMPLICIT, LLC'S SUR-REPLY TO PETITIONER'S REPLY

Implicit Sur-Reply
'791 Patent

> that term in the Petition. In seeking review, Sonos and Dr. Chertov contended that the "time or ***frame into the program***," when applying the claims to Janevksi to assert invalidity, "amounts to the claimed 'rendering time.'" Paper No. 1, at 39 (emphasis added)

IPR2018-00766, -00767 EXHIBIT 1028

Chertov Dec. (Ex.1009) at ¶ 103; Implicit Sur-Reply, p. 9; Sonos Pet., p. 39.

IMPLICIT'S SWEAR BEHIND IS LEGALLY DEFECTIVE

- Implicit's swear behind does not address the ***claimed*** subject matter
- Implicit's swear behind lacks ***independent*** corroboration
- Implicit's swear behind improperly relies on ***incorporated*** material

IMPLICIT'S SWEAR BEHIND DOES NOT ADDRESS THE CLAIMED SUBJECT MATTER

Fina Oil & Chem. Co. v. Ewen,
123 F.3d 1466, 1473
(Fed. Cir. 1997)

"Conception is the touchstone to determining inventorship."

Coleman v. Dines,
754 F.2d 353, 359
(Fed. Cir. 1985)

To establish conception, a party must show possession of ***every feature*** recited in the ***claim***, and ***every limitation*** of the ***claim*** must have been known to the inventor at the time of the alleged conception.

IMPLICIT'S SWEAR BEHIND DOES NOT ADDRESS THE CLAIMED SUBJECT MATTER

- Balassanian states that he and Bradley "originally conceived of the inventions set forth in the Claims of the Patents and they were actually reduced to practice before December 11, 2001"

Ex. 2001, ¶6

- To make this declaration, Balassanian must have had some understanding of what the claims of the patents mean

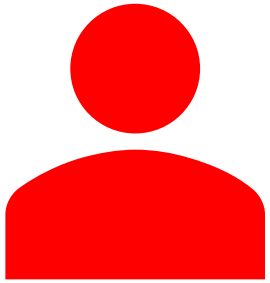
IMPLICIT'S SWEAR BEHIND DOES NOT ADDRESS THE CLAIMED SUBJECT MATTER

- Balassanian repeatedly testified during his deposition that he could not, and would not, provide his understanding of "the inventions set forth in the Claims of the Patents"

Ex.1019, 20:16-22:24; 26:5-16; 36:3-19; 39:18-41:12; 44:22-45:3; 47:6-49:20; 50:11-22; 51:22-52:4; 53:1-24; 165:9-166:10

- Balassanian was asked for ***his*** understanding of the claimed invention, ***not*** a lawyer's understanding

BALASSANIAN REFUSED TO PROVIDE HIS UNDERSTANDING OF THE CLAIMS



Edward Balassanian
Lead Inventor & Founder

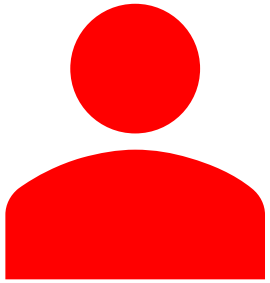
Q. What inventions set forth in the Claims of the Patents did you conceive of?
A. The specific inventions detailed in the claims.
Q. What are those inventions?
A. They are what the claims state they are. And I am not going to construe claims for you.
Q. Do you have any understanding of how the Claims of the Patents are construed?
A. I do not purport to understand claim construction.
Q. Have you read the claims?
A. At some point, yes, I have.
Q. And did you understand the claims when you read them?
A. My understanding of the claims is simply as a layman. I do not have a legal perspective on the claims.
Q. Can you tell me what that understanding is?
A. Not without reading the claims.

*****

Q. Okay. Having just read Claim 1 of the 791 patent, can you tell me your understanding of the invention of Claim 1?
A. Claim 1 is, specifically, what Claim 1 says. And for me to say anymore than that would mean I'm construing what it means. And I am not going to do that. I am not a lawyer.

Balassanian Dep., Ex. 1019 at 47:6-48:24; Sonos Reply, pp. 2-3.

BALASSANIAN IMPROPERLY CONNECTED CONCEPTION TO SPECIFICATION



Edward Balassanian
Lead Inventor & Founder

Q. And so when you said: "According to the invention that Mr. Bradley and I conceived of earlier in 2001." Are you referring to the claims of the 791 and the 252 patents?

A. No, I'm referring to the general concept of synchronizing audio and video content.

Q. So, anytime throughout this declaration when you're testifying that tests and demos synchronize content according to the invention, am I correct in saying that you are not referring to the claims in the invention?

A. In this particular sentence, I am saying that the demonstration synchronized content according to the invention in my references in regards to the concept of synchronizing multimedia content in the network. I am not speaking to the invention as claimed in the patent or any other references to invention in here. Unless you want to specifically call them out and I can tell you what I think I meant by them.

Balassanian Dep., Ex. 1019 at 143:20-144:14; Sonos Reply, p. 3.

IMPLICIT'S SWEAR BEHIND DOES NOT ADDRESS THE CLAIMED SUBJECT MATTER

- Unable to formulate an understanding of "the inventions set forth in the Claims of the Patents," Balassanian cannot competently testify regarding any conception of the ***claimed inventions*** of the patents at issue, let alone when such conception occurred

- For this reason alone, the Board should reject Implicit's swear behind

IMPLICIT'S SWEAR BEHIND IS LEGALLY DEFECTIVE

- Implicit's swear behind does not address the ***claimed*** subject matter
- Implicit's swear behind lacks ***independent*** corroboration
- Implicit's swear behind improperly relies on ***incorporated*** material

IMPLICIT'S SWEAR BEHIND LACKS INDEPENDENT CORROBORATION

Mahurkar v. C.R. Bard, Inc.,
79 F.3d 1572, 1577
(Fed. Cir. 1996)

It is well established that when a party seeks to prove conception through an inventor's testimony, the party must proffer evidence, "in addition to [the inventor's] own statements and documents," corroborating the inventor's testimony.

IMPLICIT'S SWEAR BEHIND LACKS INDEPENDENT CORROBORATION

Chen v. Bouchard,
347 F.3d 1299, 1309
(Fed. Cir. 2003)

The requirement of independent corroboration exists to prevent an inventor from "describ[ing] his actions in an unjustifiably self-serving manner."

Medichem, S.A. v. Rolabo, S.L.,
437 F.3d 1157, 1171-72
(Fed. Cir. 2006)

"Even the most credible inventor testimony is *a fortiori* required to be corroborated by independent evidence."

IMPLICIT'S SWEAR BEHIND LACKS INDEPENDENT CORROBORATION

In re NTP, Inc.,
654 F.3d 1279, 1291
(Fed. Cir. 2011)

The sufficiency of the proffered corroboration is determined by a "rule of reason" analysis.

Cooper v. Goldfarb,
154 F.3d 1321, 1330
(Fed. Cir. 1998)

But, even under the "rule of reason" analysis, the "evidence of corroboration must not depend solely on the inventor himself."

IMPLICIT'S SWEAR BEHIND LACKS INDEPENDENT CORROBORATION

- Implicit's swear behind relies exclusively on the declaration and documents of ***inventor*** Balassanian, who is also Implicit's founder, sole member, and manager

Ex. 2001, ¶¶2-6

- Without any independent corroboration, the Board should reject Implicit's swear behind

IMPLICIT'S SWEAR BEHIND IS NEARLY IDENTICAL TO THE ONE REJECTED IN *APATOR*

FACTS IN APATOR	FACTS HERE
Patent owner attempted to swear eighteen days behind prior art's filing date.	Patent owner has attempted to swear seven days behind prior art's filing date.
Patent owner proffered an inventor declaration in support of its swear behind.	Patent owner has proffered an inventor declaration in support of its swear behind.
In his declaration, the inventor cited to several different documents, such as emails, a presentation, an image file, and numerous drawings, related to his invention.	In his declaration, the inventor has cited to several different documents, such as video file, internal literature, and certain test packages, related to his invention.
Patent owner attempted to corroborate inventor testimony with documents, but the documents only provide corroboration with help from the inventor's testimony.	Patent owner has attempted to corroborate inventor testimony with documents, but the documents only provide corroboration with help from the inventor's testimony.
Inventor's declaration and documents were not independently corroborated.	Inventor's declaration and documents have not been independently corroborated.

Apator Miitors ApS v. Kamstrup A/S, 887 F.3d 1293, 1294-97 (Fed. Cir. 2018); *Sonos Reply, pp. 6-8.*

IMPLICIT'S SWEAR BEHIND LACKS INDEPENDENT CORROBORATION

- With respect to the source code written by Guy Carpenter, Implicit presents no evidence (other than Balassanian's uncorroborated testimony) that the inventors communicated the invention to Carpenter

Ex. 2019, lns. 23-25 ("Owner: Guy Carpenter"); Ex.2017 (same); Ex.2020 (same).

KAYAK Software Corp. v. IBM Corp., IPR2016–00608, 2017WL3425957 (P.T.A.B. Aug. 7, 2017)

The record is devoid of evidence that Carpenter's work inured to the benefit of the inventors and thus the Board should not rely on the code for conception or RTP.

IMPLICIT'S SWEAR BEHIND LACKS INDEPENDENT CORROBORATION

- As an expert hired by Implicit for this IPR to analyze source code and compare it to the Challenged Claims, Dr. Hashmi cannot corroborate Balassanian's invention testimony

Ex. 2080, ¶¶1-3

Tavory v. NTP, Inc.,
297 F. App'x 976, 979
(Fed. Cir. 2008)

Weaver v. Houchin,
467 F. App'x 878, 881
(Fed. Cir. 2012)

Effective corroborative testimony must be based on the ***personal*** observations of an ***independent*** witness who recognized and appreciated the claimed invention ***at the time the work was done.***

IMPLICIT'S SWEAR BEHIND IS LEGALLY DEFECTIVE

- Implicit's swear behind does not address the ***claimed*** subject matter
- Implicit's swear behind lacks ***independent*** corroboration
- Implicit's swear behind improperly relies on ***incorporated*** material

IMPLICIT'S SWEAR BEHIND IMPROPERLY RELIES ON INCORPORATED MATERIAL

ZTE (USA), Inc. v. Elec. and Telecomm. Research Inst.,
IPR2015-00028, Paper 12 at 7
(P.T.A.B. Mar. 20, 2015)

"A brief must make all arguments accessible to the judges, rather than ask them to play archeologist with the record."

Cisco Sys., Inc. v. C-Cation Tech., LLC,
IPR2014-00454, Paper 12 at 9
(P.T.A.B. Aug. 29, 2014)
IBG LLC v. Trading Tech., Inc.,
CBM2016-00054, Paper 36 at 3-4
(P.T.A.B. Apr. 7, 2017)

When a party fails to adequately explain its reasoning in its principal brief, and instead merely cites to a declaration or claim chart exhibit, the Board routinely finds an improper incorporation by reference.

IMPLICIT'S SWEAR BEHIND IMPROPERLY RELIES ON INCORPORATED MATERIAL

Here, Implicit made no attempt in its ***POR*** to tie its source code to the actual limitations of the Challenged Claims.

- Instead, Implicit defers to its expert declaration (Ex. 2080) and accompanying claim chart (Ex. 2081)

See POR at pp. 15, 25, 28-31

As such, Implicit has improperly incorporated these arguments by reference into its POR in contravention of 37 C.F.R. §§42.6(a)(3), §42.24(b)(2)

IMPLICIT'S SWEAR BEHIND FAILS SUBSTANTIVELY

- The code fails to synchronize between a master and a slave
- The code fails to meet "rendering time"

Sonos Reply, pp. 13, 15.

THE '791 CLAIMS REQUIRE SYNCHRONIZING BETWEEN MASTER AND SLAVE

1. A method for synchronizing a rendering of a content provided by a source at one or more devices which are nodes of a network, the content having a rendering time, the method comprising:

designating one of the one or more devices a master device, the master device having a master device time and a master rendering time;

designating remaining devices among one of the one or more devices as at least one slave device, the at least one slave device having a slave device time and a slave rendering time;

receiving the content for rendering by the master and at least one slave device;

sending from the master device to the at least one slave device an indication of when the master device renders content corresponding to the master rendering time;

determining a master device time domain, a slave device time domain, and a source time domain;

determining whether a time domain differential exists between the master rendering time, the slave rendering time; and

adjusting, based on the received indication, the rendering of the content at the at least one slave device within the slave device time domain and in proportion to the time domain differential when present to account for variation between when the master device and the at least one slave device to render content that should be rendered at the same time.

16. A method for synchronizing rendering of content at devices which are nodes of network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:

designating one of the devices as a master device having a master rendering time and the one or more slave devices having a slave rendering time;

sending to each device content to be rendered at that device synchronized with the content sent to the other devices;

sending from the master device to the one or more slave devices a master device time corresponding to the master rendering time of the master device; and upon receiving the sent master device time at the one or more slave devices,

exchanging time domain information between the master and one or more slave devices;

determining at least one time domain differential between the master rendering time and the slave rendering time between the master device and the one or more slave devices;

adjusting the rendering of the content at the one or more slave devices to account for a difference in the slave rendering time and the master rendering time calculated based on the master device time adjusted for a difference in time domains of the one or more slave devices and the master device.

23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:

designating one of the devices as a master device having a master rendering time and the one or more slave devices having a slave rendering time; and for each slave device,

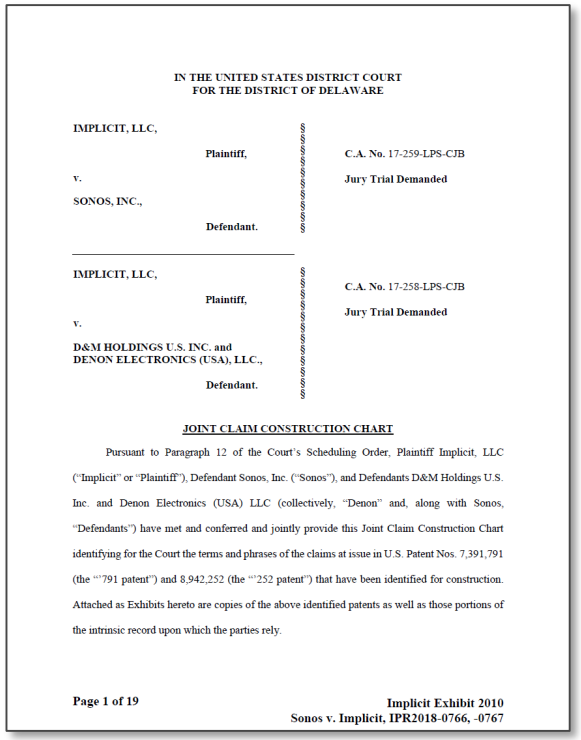
exchanging time domain information between the master and one or more slave devices;

calculating a time domain difference between the master rendering time of the master device and the slave rendering time of the slave device based on a master device time adjusted for a difference in time domains of the slave device and the master device; and

rendering content at the slave device to account for the calculated time domain difference.

'791 Patent (Ex.1001) at cls. 1, 16, 23; Sonos Reply, pp. 15-16.

THE '791 CLAIMS REQUIRE SYNCHRONIZING BETWEEN MASTER AND SLAVE



IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

IMPLICIT, LLC,

Plaintiff,

v.

SONOS, INC.,

Defendant.

C.A. No. 17-259-LPS-CJB

Jury Trial Demanded

IMPLICIT, LLC,

Plaintiff,

v.

D&M HOLDINGS U.S. INC. and
DENON ELECTRONICS (USA), LLC.,

Defendant.

C.A. No. 17-258-LPS-CJB

Jury Trial Demanded

JOINT CLAIM CONSTRUCTION CHART

Pursuant to Paragraph 12 of the Court's Scheduling Order, Plaintiff Implicit, LLC ("Implicit" or "Plaintiff"), Defendant Sonos, Inc. ("Sonos"), and Defendants D&M Holdings U.S. Inc. and Denon Electronics (USA) LLC (collectively, "Denon" and, along with Sonos, "Defendants") have met and conferred and jointly provide this Joint Claim Construction Chart identifying for the Court the terms and phrases of the claims at issue in U.S. Patent Nos. 7,391,791 (the "'791 patent") and 8,942,252 (the "'252 patent") that have been identified for construction. Attached as Exhibits hereto are copies of the above identified patents as well as those portions of the intrinsic record upon which the parties rely.

Page 1 of 19

Implicit Exhibit 2010
Sonos v. Implicit, IPR2018-0766, -0767

Joint Claim Construction Chart
Ex. 2010

Further, the parties state that they have stipulated to the following constructions for the following claim terms:

- '791 patent, claims 1-3, 6-9, 12, 16, 19, 23-25: the **preambles** are limiting
- "master device time" / "slave device time" / "device time" of a "slave" means "time indicated by a designated clock of the [master/slave] device"

The parties jointly and respectfully request that, if the Court deems it appropriate, the Court include these stipulated constructions in its claim construction order.

The parties respectfully submit the following chart setting forth their proposed constructions and intrinsic evidence for the claim terms proposed for construction.

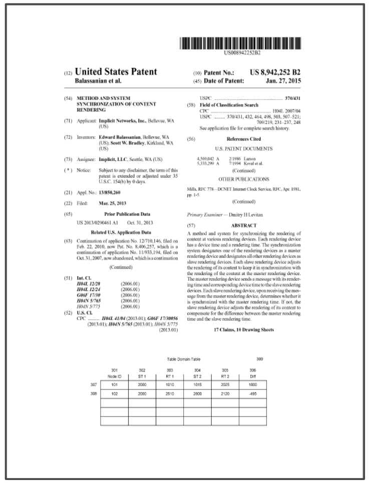
Proposed Claim Constructions and Intrinsic Evidence[1,2,3,4]

Term/Phrase	Patents/Claims	Plaintiff's Proposed Construction and Intrinsic Evidence	Defendants' Proposed Construction and Intrinsic Evidence
"time domain"	'791 patent, claims 1-3, 6-9, 12, 16, 19, 23-25	"the way a device clock tracks time"	"a reference of time" '791 patent at 1:36-49

IPR2018-00766, -00767 EXHIBIT 1028

Joint Claim Const. Chart (Ex.2010) at 2; Sonos Reply, p. 16.

THE ‘252 CLAIMS REQUIRE SYNCHRONIZING BETWEEN MASTER AND SLAVE



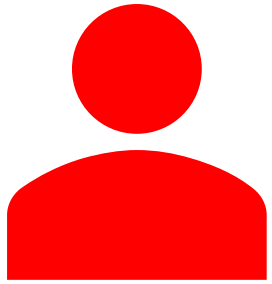
‘252 Patent

1. A method, comprising:
a master rendering device rendering a first content stream; and
sending, from the master rendering device to a first one of a plurality of slave devices, a plurality of master rendering times indicative of statuses of the rendering the first content stream at the master rendering device at different times;
wherein the first slave device is configured to smooth a rendering time differential that exists between the master rendering device and the first slave device in order to render a second content stream at the first slave device synchronously with the rendering of the first content stream at the master rendering device, wherein smoothing the rendering time differential includes calculations using the plurality of master rendering times.

11. A method, comprising:
receiving, at a slave device, a particular content stream;
receiving, at the slave device from a master rendering device, a plurality of master rendering times indicative of status of rendering a different content stream at the master rendering device;
the slave device determining a smoothed rendering time differential that exists between the master rendering device and the slave device, wherein the determining is based on calculations using the plurality of master rendering times and a plurality of slave rendering times corresponding to rendering the particular content stream at the slave device; and
based on the smoothed rendering time differential, the slave device rendering the particular content stream synchronously with the master rendering device rendering the different content stream.

‘252 Patent (Ex.1001) at cls. 1, 11; Sonos Reply, p. 15.

INTENDED PURPOSE IS SYNCHRONIZING BETWEEN MASTER AND SLAVE



Edward Balassanian
Lead Inventor & Founder

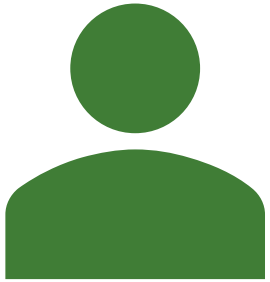
47. The description of those test packages matches my memory of participating in tests and demonstrations of Strings that operated for its intended purpose to synchronize the rendering of audio and video in accordance with the inventions set forth in the Claims of the Patents.

56. The file system metadata information for the "fightclubrgb.avi" in that folder indicates that the movie was last modified on September 7, 2001, Exhibit 2077, at 21, which is consistent with my memory of about when I remember participating in tests and demonstrations of the synchronization that began to use the Fight Club trailer. The file contains the Fight Club content whose rendering we synchronized prior to December 11, 2001, starting in the September, 2001 time period. During this time, we tested and demonstrated synchronized rendering of content in the "fightclubrgb.avi" file across multiple devices. The testing and demonstrating of the system worked for its intended purpose to synchronize the rendering of the audio and video across a master device and one or slave devices.

68. I participated in multiple tests and demonstrations of the Strings Audio Player to synchronize audio between two devices during this period, prior to December 11, 2001. The software worked for its intended purpose to synchronize the audio playback between a master device and at least one slave device. With regard to the synchronization functionality of the Claims of the Patents, the Strings Audio Player operated like the demonstration in the earlier `test/demo` package, reflected in the `audioplayerapp.rule` file above.

Balassanian Dec. (Ex.2001) at ¶¶ 47, 56, 68; Sonos Reply, p. 17.

IMPLICIT'S CODE FAILS TO SYNCHRONIZE BETWEEN MASTER AND SLAVE

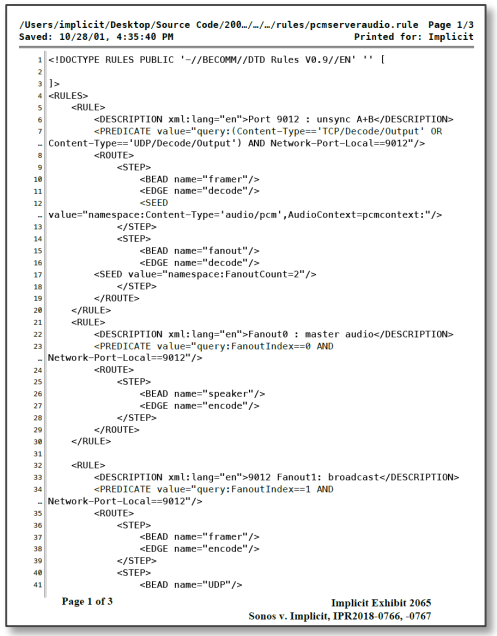


Dr. Roman Chertov
Sonos's Expert Witness

60. The Implicit Source Code makes clear that the configurations relied on by Dr. Hashmi in his Expert Declaration were designed such that the designated "master" device would function to receive media content from a source, render the received media content, and then send the received media content to the designated "slave" device(s) only after the "master" device had rendered that media content. *See, e.g.*, Ex. 2065; Ex. 2072. In other words, the configurations relied on by Dr. Hashmi were specifically designed to have the designated "master" device begin rendering media content ***before*** even sending that media content to the designated "slave" device(s) for rendering – which means that these configurations were also specifically designed to have the "master" device begin rendering media content before the "slave" device(s) could ever begin rendering that media content as opposed to having the designated "master" and "slave" devices render content simultaneously. *See id.* Because of this design, it is my opinion that the Implicit Source Code does not practice a method of synchronizing rendering of content between the "master" and "slave" rendering devices as required by the '791 Patent.

Chertov Dec. (Ex.1022) ¶60; Sonos Reply, p. 17.

IMPLICIT'S CODE FAILS TO SYNCHRONIZE BETWEEN MASTER AND SLAVE



/Users/implicit/Desktop/Source Code/200…/…/…/rules/pcmserveraudio.rule Page 1/3
Saved: 10/28/01, 4:35:40 PM Printed for: Implicit

```
<!DOCTYPE RULES PUBLIC '-//BECOMM//DTD Rules V0.9//EN' '' [

]>
<RULES>
    <RULE>
        <DESCRIPTION xml:lang="en">Port 9012 : unsync A+B</DESCRIPTION>
        <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR
Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9012"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="decode"/>
                <SEED
value="namespace:Content-Type='audio/pcm',AudioContext=pcmcontext:"/>
            </STEP>
            <STEP>
                <BEAD name="fanout"/>
                <EDGE name="decode"/>
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            </STEP>
        </ROUTE>
    </RULE>
    <RULE>
        <DESCRIPTION xml:lang="en">Fanout0 : master audio</DESCRIPTION>
        <PREDICATE value="query:FanoutIndex==0 AND
Network-Port-Local==9012"/>
        <ROUTE>
            <STEP>
                <BEAD name="speaker"/>
                <EDGE name="encode"/>
            </STEP>
        </ROUTE>
    </RULE>

    <RULE>
        <DESCRIPTION xml:lang="en">9012 Fanout1: broadcast</DESCRIPTION>
        <PREDICATE value="query:FanoutIndex==1 AND
Network-Port-Local==9012"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="encode"/>
            </STEP>
            <STEP>
                <BEAD name="UDP"/>
```

Page 1 of 3 Implicit Exhibit 2065
Sonos v. Implicit, IPR2018-0766, -0767

pcmserveraudio.rule
Ex. 2065

```
73          <DESCRIPTION xml:lang="en">Fanout0 : master audio</DESCRIPTION>
74          <PREDICATE value="query:FanoutIndex==0 AND
…Network-Port-Local==9013"/>
75          <ROUTE>
76              <STEP>
77                  <BEAD name="speaker"/>
78                  <EDGE name="encode"/>
79                  <SEED value="namespace:RenderClock=sampleclock:MASTER"/>
80              </STEP>
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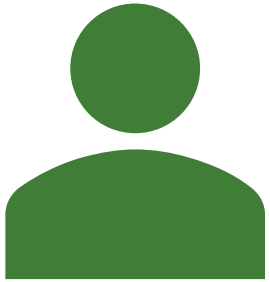
```
84      <RULE>
85          <DESCRIPTION xml:lang="en">9013 Fanout1: broadcast</DESCRIPTION>
86          <PREDICATE value="query:FanoutIndex==1 AND
…Network-Port-Local==9013"/>
87          <ROUTE>
88              <STEP>
89                  <BEAD name="clocksync"/>
90                  <EDGE name="encode"/>
91                  <SEED value="namespace:RenderClock=sampleclock:"/>
92              </STEP>
93              <STEP>
94                  <BEAD name="framer"/>
95                  <EDGE name="encode"/>
96              </STEP>
97              <STEP>
98                  <BEAD name="UDP"/>
99                  <EDGE name="encode"/>
100                 <SEED
…value="namespace:Network-Port-Remote=9002,Network-Address-Remote=ipv4:10.1
….1.55,Network-Port-Local=0,Network-Address-Local=0"/>
101             </STEP>
102             <STEP>
103                 <BEAD name="IP"/>
104                 <EDGE name="Encode"/>
105             </STEP>
106         </ROUTE>
107     </RULE>
```

IMPLICIT'S CODE FAILS TO SYNCHRONIZE BETWEEN MASTER AND SLAVE



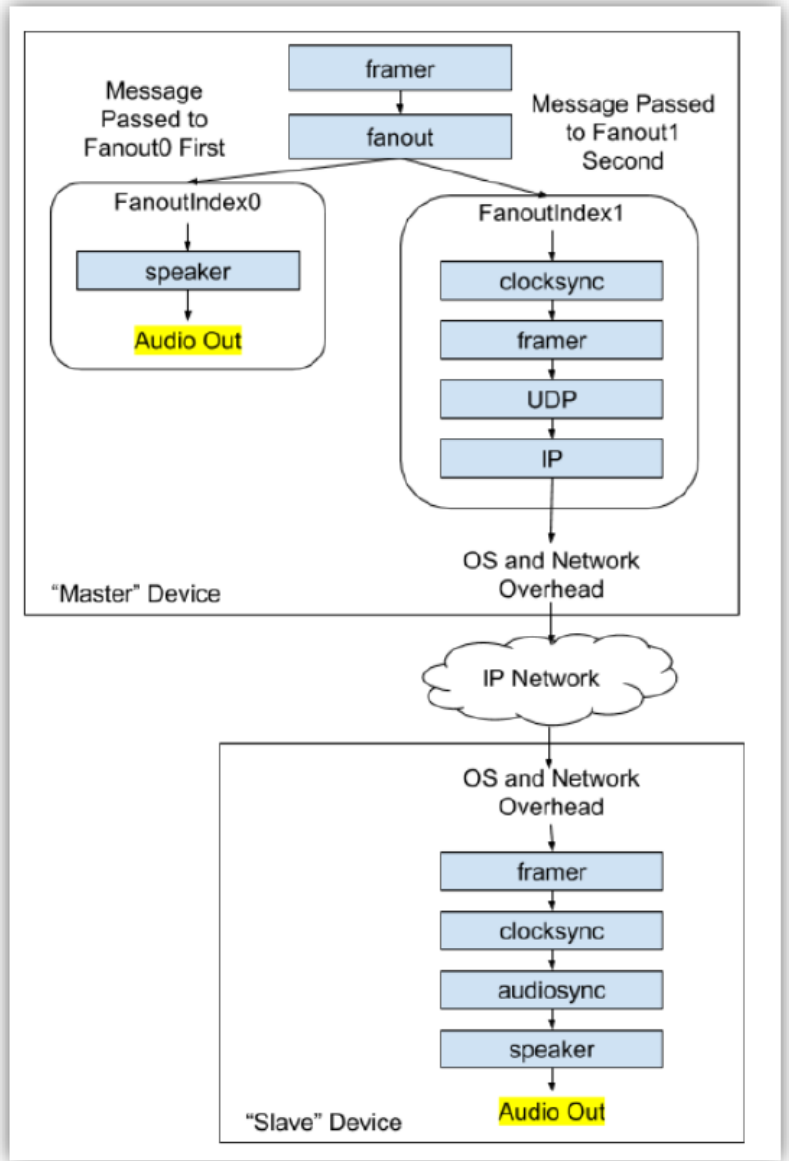
Dr. Roman Chertov
Sonos's Expert Witness

65. Based on my evaluation, it is my opinion that the Implicit Source Code was designed to run the `Fanout0` path in `pcmserveraudio.rule` to completion before starting the `Fanout1` path. This understanding is based on several different aspects of the code.

71. I further note that, even if the Implicit Source Code was designed to run the `Fanout1` path in the `pcmserveraudio.rule` file in parallel with the `Fanout0` path (which I have seen no evidence of), this does not change my opinion that the "master" device begins rendering an audio frame before sending that audio frame to the "slave" device – and thus before the "slave" could ever begin rendering that audio frame. There are several reasons for this.

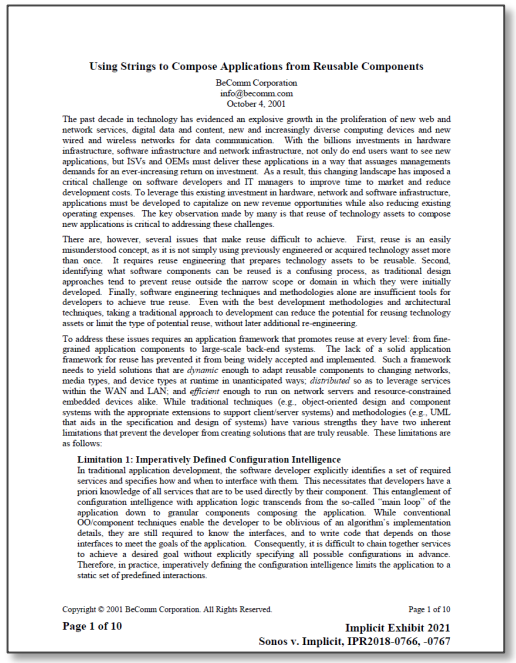
Chertov Dec. (Ex.1022) ¶¶ 65, 71; Sonos Reply, p. 18.

IMPLICIT'S CODE FAILS TO SYNCHRONIZE BETWEEN MASTER AND SLAVE



Chertov Dec. (Ex.1022) ¶¶72-74; Sonos Reply, pp. 18-20.

IMPLICIT'S GOAL WAS SYNCHRONIZING BETWEEN SLAVES



Using Strings to Compose Applications from Reusable Components

BeComm Corporation
info@becomm.com
October 4, 2001

The past decade in technology has evidenced an explosive growth in the proliferation of new web and network services, digital data and content, new and increasingly diverse computing devices and new wired and wireless networks for data communication. With the billions investments in hardware infrastructure, software infrastructure and network infrastructure, not only do end users want to see new applications, but ISVs and OEMs must deliver these applications in a way that assuages managements demands for an ever-increasing return on investment. As a result, this changing landscape has imposed a critical challenge on software developers and IT managers to improve time to market and reduce development costs. To leverage this existing investment in hardware, network and software infrastructure, applications must be developed to capitalize on new revenue opportunities while also reducing existing operating expenses. The key observation made by many is that reuse of technology assets to compose new applications is critical to addressing these challenges.

There are, however, several issues that make reuse difficult to achieve. First, reuse is an easily misunderstood concept, as it is not simply using previously engineered or acquired technology asset more than once. It requires reuse engineering that prepares technology assets to be reusable. Second, identifying what software components can be reused is a confusing process, as traditional design approaches tend to prevent reuse outside the narrow scope or domain in which they were initially developed. Finally, software engineering techniques and methodologies alone are insufficient tools for developers to achieve true reuse. Even with the best development methodologies and architectural techniques, taking a traditional approach to development can reduce the potential for reusing technology assets or limit the type of potential reuse, without later additional re-engineering.

To address these issues requires an application framework that promotes reuse at every level: from fine-grained application components to large-scale back-end systems. The lack of a solid application framework for reuse has prevented it from being widely accepted and implemented. Such a framework needs to yield solutions that are *dynamic* enough to adapt reusable components to changing networks, media types, and device types at runtime in unanticipated ways; *distributed* so as to leverage services within the WAN and LAN; and *efficient* enough to run on network servers and resource-constrained embedded devices alike. While traditional techniques (e.g., object-oriented design and component systems with the appropriate extensions to support client/server systems) and methodologies (e.g., UML that aids in the specification and design of systems) have various strengths they have two inherent limitations that prevent the developer from creating solutions that are truly reusable. These limitations are as follows:

Limitation 1: Imperatively Defined Configuration Intelligence

In traditional application development, the software developer explicitly identifies a set of required services and specifies how and when to interface with them. This necessitates that developers have a priori knowledge of all services that are to be used directly by their component. This entanglement of configuration intelligence with application logic transcends from the so-called "main loop" of the application down to granular components composing the application. While conventional OO/component techniques enable the developer to be oblivious of an algorithm's implementation details, they are still required to know the interfaces, and to write code that depends on those interfaces to meet the goals of the application. Consequently, it is difficult to chain together services to achieve a desired goal without explicitly specifying all possible configurations in advance. Therefore, in practice, imperatively defining the configuration intelligence limits the application to a static set of predefined interactions.

Implicit Exhibit 2021
Sonos v. Implicit, IPR2018-0766, -0767

Strings Whitepaper
Ex. 2021

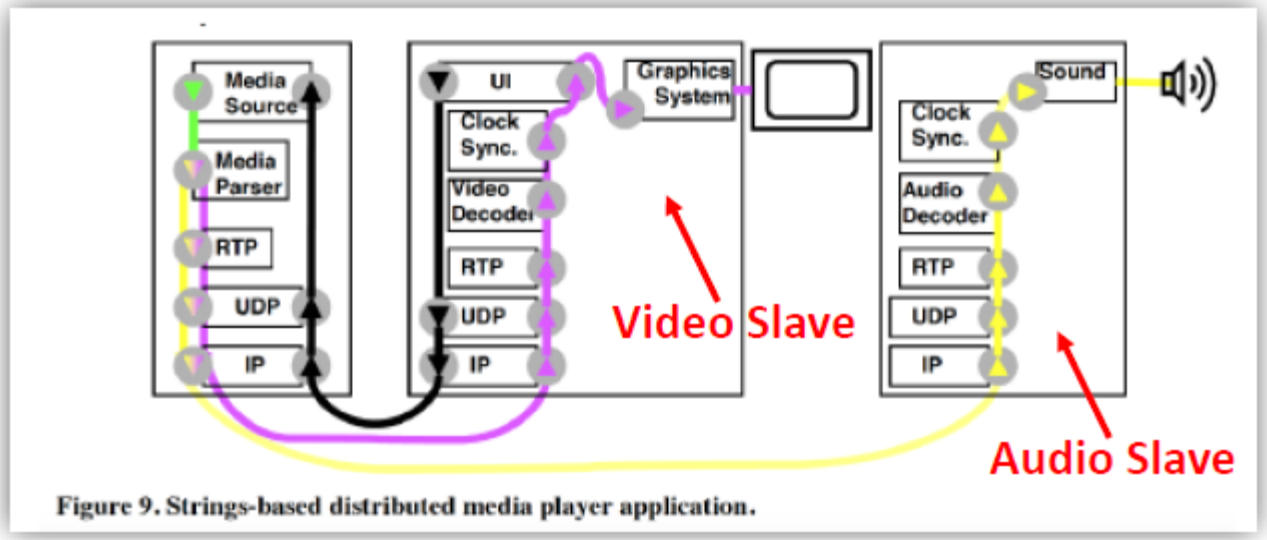
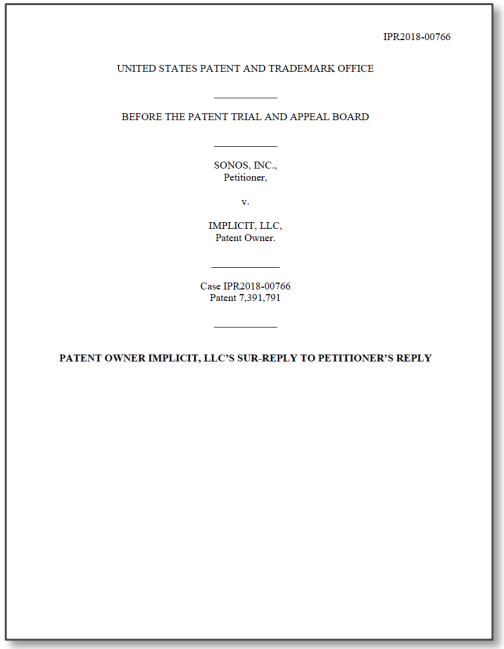


Figure 9. Strings-based distributed media player application.

IPR2018-00766, -00767 EXHIBIT 1028

Strings Whitepaper (Ex.2021) (annotations added); Sonos Reply, p.21.

IMPLICIT'S SUR-REPLY ON "SYNCHRONIZATION"



IPR2018-00766

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.,
Petitioner,

v.

IMPLICIT, LLC,
Patent Owner.

Case IPR2018-00766
Patent 7,391,791

PATENT OWNER IMPLICIT, LLC'S SUR-REPLY TO PETITIONER'S REPLY

Implicit Sur-Reply
'791 Patent

Sonos's second position—that the source code does not provide actual "synchronization," which all the claims allegedly require—simply lacks credibility.

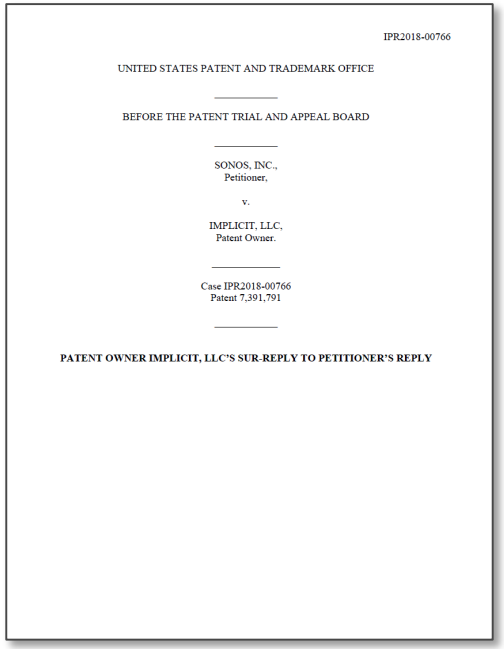
Substantial contemporaneous documents and source code show "synchronization,"

examples including:

IPR2018-00766, -00767 EXHIBIT 1028

Implicit Sur-Reply, p. 16.

IMPLICIT'S SUR-REPLY ON "SYNCHRONIZATION"



IPR2018-00766

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Patent 7,391,791

PATENT OWNER IMPLICIT, LLC'S SUR-REPLY TO PETITIONER'S REPLY

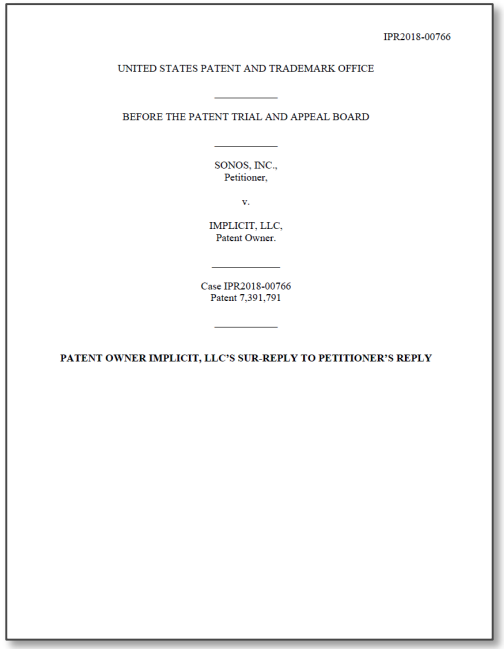
Implicit Sur-Reply
'791 Patent

opinion also does not match the facts from the source code. Dr. Chertov opines that the "master" and "slave" will not play in "sync" because the source code always has the "master" play the content first (on Fanout 0) and the "slave" plays second (on Fanout 1), and that a scenario in which the slave plays first is "impossible." Exhibit

2094, at 26:14–217. But the source code contains embodiments in which the slave is the local device on Fanout 0 (and thus "plays first") and the master is a remote device on Fanout 1 (and thus plays second). Exhibit 2063; Exhibit 2067. In those

Implicit Sur-Reply, p. 18.

IMPLICIT'S SUR-REPLY ON "SYNCHRONIZATION"



IPR2018-00766

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Patent 7,391,791

PATENT OWNER IMPLICIT, LLC'S SUR-REPLY TO PETITIONER'S REPLY

Implicit Sur-Reply
'791 Patent

Moreover, nothing in the Patents requires the level of synchronization Sonos asserts. The '791 Patent claims only state: "A method for synchronizing a rendering of a content" in the preamble and "to render content that should be rendered at the same time" in the body (claim 1). Other claims are similar. *E.g.*, claim 23 ("synchronizing" in the preamble; "rendering content . . . to account for the calculated time domain difference" in the body). No claim requires absolute synchronization (something only theoretically possible). Nor does the specification. Sonos's reading of the claims would exclude essentially all real-world devices.

IPR2018-00766, -00767 EXHIBIT 1028

Implicit Sur-Reply, p. 19.

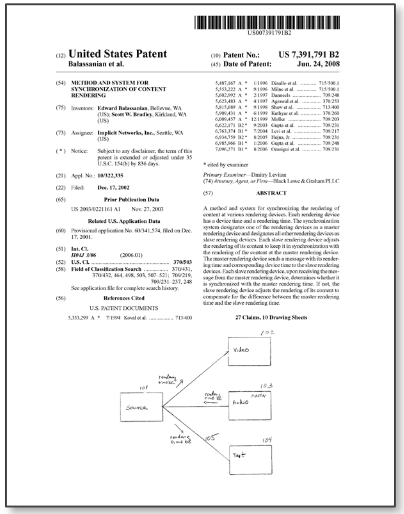
IMPLICIT'S SWEAR BEHIND FAILS SUBSTANTIVELY

- The code fails to synchronize between a master and a slave

- The code fails to meet "rendering time"

Sonos Reply, pp. 13, 15.

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS


United States Patent
Balassanian et al.
Patent No.: US 7,391,791 B2
Date of Patent: Jun. 24, 2008
METHOD AND SYSTEM FOR SYNCHRONIZATION OF CONTENT RENDERING

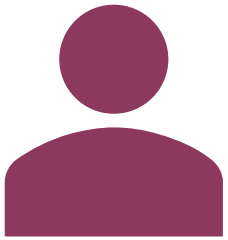
'791 Patent

DETAILED DESCRIPTION

A method and system for synchronizing the rendering of content at various rendering devices is provided. In one embodiment, each rendering device has a device time and a rendering time. The device time is the time as indicated by a designated clock (e.g., system clock) of the rendering device. **The rendering time is the time represented by the amount of content that has been rendered by that rendering device.** For example, if a rendering device is displaying 30 frames of video per second, then the rendering time will be 15 seconds after 450 frames are displayed. The rendering time of content

'791 Patent (Ex.1001) at 2:18-19; Sonos Reply, p. 13.

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS



Dr. Atif Hashmi
Implicit's Expert Witness

16. For the purposes of my analysis in this declaration, I applied the claim constructions that Dr. Chertov applied (Sonos Exhibit 1009 in the IPR of the '791

Q. So what construction of rendering time did you use?

A. **So I used the construction that is on page 28 of Sonos Exhibit 1009 for the 791 patent, which states, "A time measure of the amount of content that has already been rendered by a given rendering device."**

Hashmi Dep. (Ex.1020) at 80:13-22 (objs. omitted);Sonos Reply, p. 13.
Hashmi Dec. (Ex.2080) at ¶16; Implicit Sur-Reply, p. 15.

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS

CONTAINS PROTECTIVE ORDER MATERIAL

U.S. Patent No. 7,391,791	Application of Claim Language to Source Code
Claim 1	
[1 Preamble] A method for synchronizing a rendering of a content provided by a source at one or more devices which are nodes of a network, the content having a rendering time, the method comprising:	**Source Code Folders:** `SOFTWARE_STRUCTURE = \test\demo\rules\` `SOFTWARE_CODE = \beads\` The Implicit Source Code specifies a distributed system consisting of a plurality of devices that are nodes of a network ("devices"). These devices execute a method for synchronizing rendering of content provided by a source, where each device maintains a rendering time corresponding to the device time when the device renders content. An architecture of one such distributed system comprising a plurality of devices is defined in files `videomulti.rule`, `videoclient.rule`, `ipaqvideo.rule`, `pcmaudioserver.rule`, `syncaudio.rule`, and `timesync.rule`.[1,2]
[1a] designating one of the one or more devices a master device, the master device having a	The distributed system architecture described in file `videomulti.rule` designates one of the network devices as a master device having a master device time[3] and a master clock that provides the master rendering times.[4,5]

[1] These files are contained in folder `SOFTWARE_STRUCTURE\`
[2] Another similar distributed system that renders synchronized content streams is described by the rules files in folder `\test\audiosync\`
[3] See file `SOFTWARE_STRUCTURE\audiosync\package\package\timesync.rule`
[4] Defined at lines 6 to 133 in file `SOFTWARE_STRUCTURE\videomulti.rule`
[5] See lines 10 to 15 in file `SOFTWARE_STRUCTURE\videomulti.rule`

Page 1 of 31 — 1 — Implicit Exhibit 2081
Sonos v. Implicit, IPR2018-0766, -0767

Dr. Atif Hashmi
'791 Claim Chart
Ex.2081

content stream.[9] This master rendering clock `IAudioClock` generates a plurality of master rendering times that are indicative of the of statuses of the rendering the combined audio and video content stream by the master rendering device at different times.

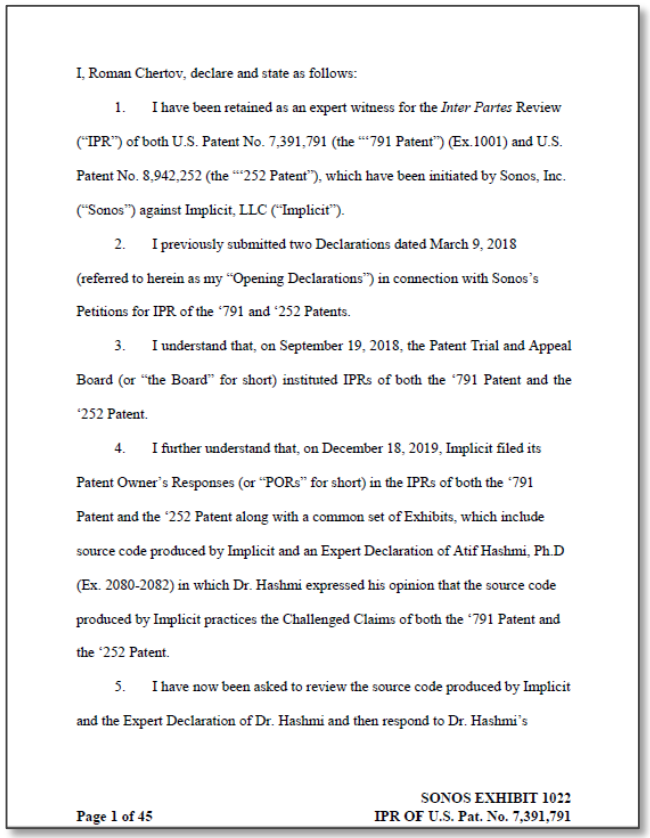
As described above, the master device sends to the slave devices an indication of when the master device renders content corresponding to the master rendering time. Through invoking the `clocksync` bead, the mater device encodes a master rendering time that indicates when the master device renders.[78,79] The master device then sends

Each slave rendering device has a slave rendering time. Specifically, each slave device runs a `clocksync` bead that maintains a rendering clock `RenderClock` that tracks the rendering time for the slave device.[29] Furthermore, each slave device runs

The slave rendering device runs an `audiosync`[116,117] bead that calculates, adjusts, and smoothens a rendering time differential between the master rendering device and the slave rendering devices. The `audiosync` bead implements a function `AudioSync_MessageHandler`.[118] Function `AudioSync_MessageHandler` obtains the master rendering time[119] and the slave rendering time[120] and calls function

Ex.2081, pp. 2, 5, 11, 17.

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS



I, Roman Chertov, declare and state as follows:

1. I have been retained as an expert witness for the *Inter Partes* Review ("IPR") of both U.S. Patent No. 7,391,791 (the "'791 Patent") (Ex.1001) and U.S. Patent No. 8,942,252 (the "'252 Patent"), which have been initiated by Sonos, Inc. ("Sonos") against Implicit, LLC ("Implicit").

2. I previously submitted two Declarations dated March 9, 2018 (referred to herein as my "Opening Declarations") in connection with Sonos's Petitions for IPR of the '791 and '252 Patents.

3. I understand that, on September 19, 2018, the Patent Trial and Appeal Board (or "the Board" for short) instituted IPRs of both the '791 Patent and the '252 Patent.

4. I further understand that, on December 18, 2019, Implicit filed its Patent Owner's Responses (or "PORs" for short) in the IPRs of both the '791 Patent and the '252 Patent along with a common set of Exhibits, which include source code produced by Implicit and an Expert Declaration of Atif Hashmi, Ph.D (Ex. 2080-2082) in which Dr. Hashmi expressed his opinion that the source code produced by Implicit practices the Challenged Claims of both the '791 Patent and the '252 Patent.

5. I have now been asked to review the source code produced by Implicit and the Expert Declaration of Dr. Hashmi and then respond to Dr. Hashmi's

Page 1 of 45

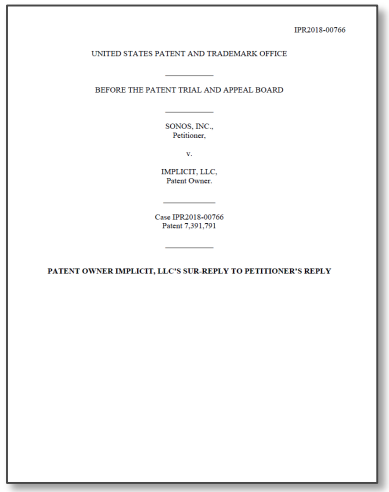
SONOS EXHIBIT 1022
IPR OF U.S. Pat. No. 7,391,791

Dr. Chertov Reply Declaration
Ex.1022

29. In the Claim Chart for the '791 Patent that is included as part of his Expert Declaration, Dr. Hashmi identifies certain aspects of the Implicit Source Code that allegedly practice the "rendering time" limitations of the Challenged Claims of the '791 Patent. However, I disagree that any of these aspects of the Implicit Source Code evidence that "a time measure of the amount of content that has already been rendered by a given rendering device" was maintained at either a "master" device or a "slave" device, or that such a "time measure" was otherwise used in the manner required by the Challenged Claims of the '791 Patent.

Chertov Reply Dec. (Ex.1022) at ¶29; Sonos Reply, p. 14.

IMPLICIT'S "RENDERING TIME" ALLEGATIONS ARE A MOVING TARGET



IPR2018-00766

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Patent Owner.

Case IPR2018-00766
Patent 7,391,791

PATENT OWNER IMPLICIT, LLC'S SUR-REPLY TO PETITIONER'S REPLY

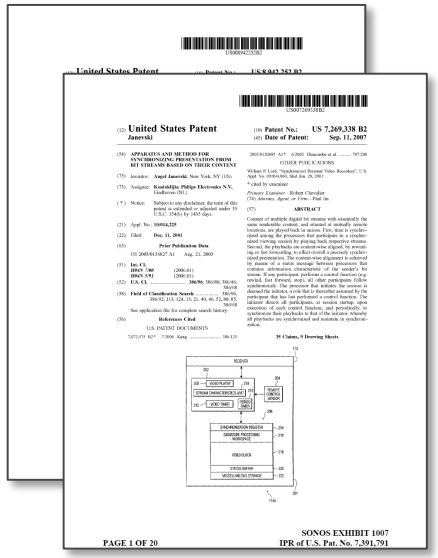
Implicit Sur-Reply
'791 Patent

The "Sample" variable within the `sampleclock` data structures identified by Dr. Hashmi is one form of a "rendering time," as Dr. Chertov and Sonos applied that term in the Petition. In seeking review, Sonos and Dr. Chertov contended that

that term. The structures identified by Dr. Hashmi are used to return an "epoch" value that incorporates the amount of time that has elapsed in the content at a particular device. That incorporated value, referred to as "delta" in the Source Code, is the number of samples that have been rendered in the content stream (`sampleclock->Sample`) divided by the frequency of the stream (`sampleclock->Frequency`), scaled to the desired time units (*e.g.*, seconds or milliseconds, depending on the `sampleclock->Divisor` variable).

Implicit Sur-Reply, p. 9, 12.

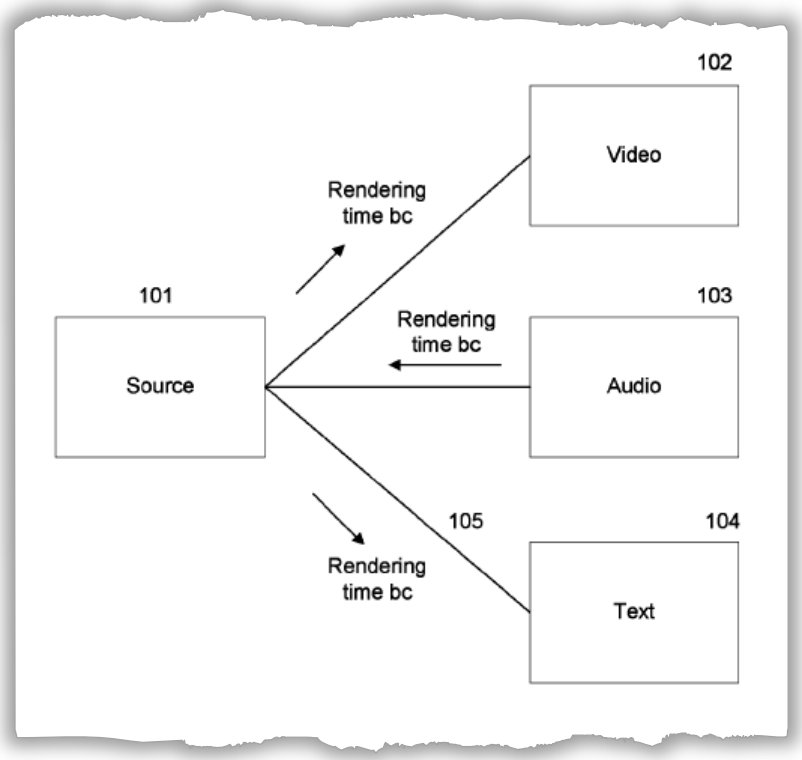
IMPLICIT PATENT OVERVIEW



‘791 Patent
‘252 Patent

Various rendering devices, however, may have different time domains that make the rendering of the multimedia presentation in a synchronized manner difficult. For example,

video and audio rendering devices may have system clocks that operate at slightly different frequencies. As a result, the video and audio content will gradually appear to the person viewing the presentation to be out of synchronization. The rendering of content in a synchronized manner is made even more difficult because some rendering devices may have multiple time domains. For example, an audio rendering device may have a system clock and a clock on a digital signal processing (“DSP”) interface card. In such a case, the combination of clocks may result in the presentation becoming even more quickly out of synchronization.

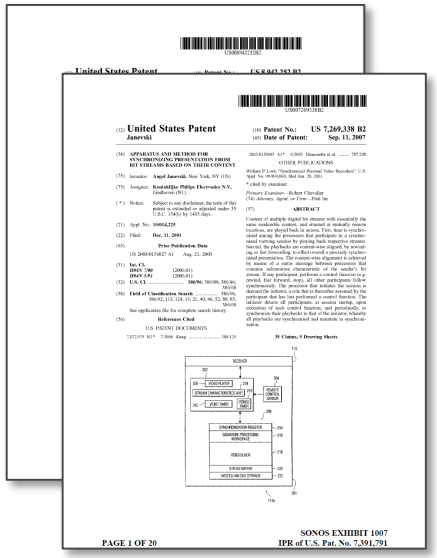


IPR2018-00766, -00767 EXHIBIT 1028

‘252 Patent (Ex.1001) at 1:40-53, Fig. 1; Sonos Pet., pp. 7-15.

IMPLICIT PATENT OVERVIEW

embodiment, each rendering device has a device time and a rendering time. The device time is the time as indicated by a



(12) United States Patent
Janevski

(10) Patent No.: US 7,269,338 B2
(45) Date of Patent: Sep. 11, 2007

(54) APPARATUS AND METHOD FOR SYNCHRONIZING PRESENTATION FROM BIT STREAMS BASED ON THEIR CONTENT

OTHER PUBLICATIONS

(75) Inventor: Angel Janevski, New York, NY (US)

(73) Assignee: Koninklijke Philips Electronics N.V., Eindhoven (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1455 days.

(21) Appl. No.: 10/014,219

(22) Filed: Dec. 11, 2001

(65) Prior Publication Data

US 2003/0152027 A1 Aug. 21, 2003

(51) Int. Cl.
H04N 7/00 (2006.01)
H04N 7/12 (2006.01)

(52) U.S. Cl. 386/96; 386/68; 386/69; 386/95

(58) Field of Classification Search 386/96, 386/92, 113, 124, 15, 21, 40, 46, 52, 68, 85, 386/68, 69, 95
See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

7,072,575 B2 * 7/2006 Janevski 386/125

35 Claims, 9 Drawing Sheets

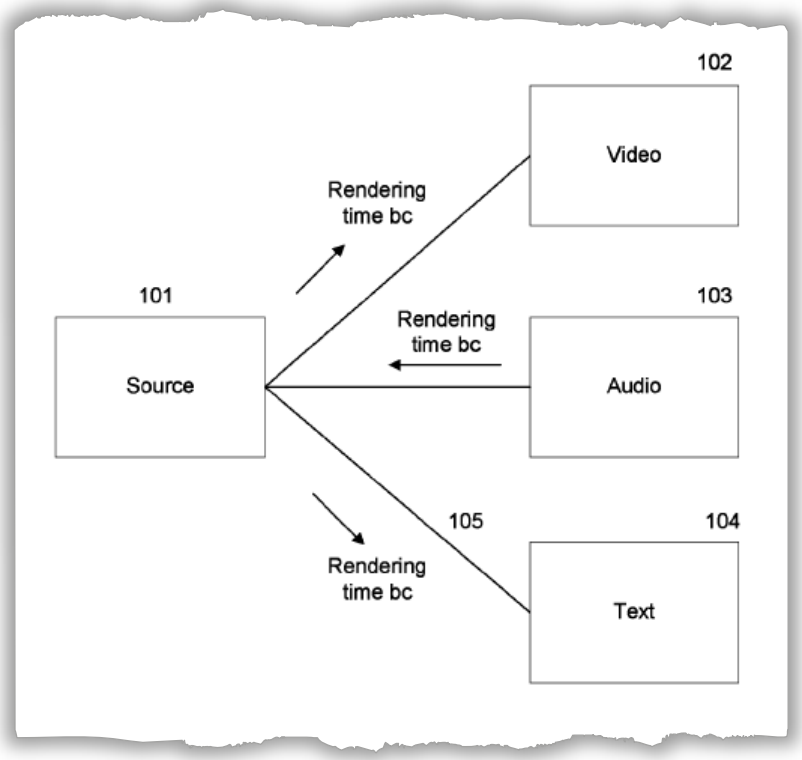
SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791

PAGE 1 OF 20

‘791 Patent
‘252 Patent

rendering time. The device time is the time as indicated by a designated clock (e.g., system clock) of the rendering device.

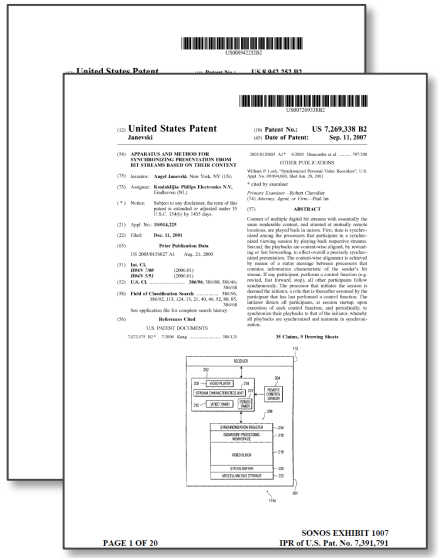
The rendering time is the time represented by the amount of content that has been rendered by that rendering device. For



IPR2018-00766, -00767 EXHIBIT 1028

‘252 Patent (Ex.1001) at 2:19-23, Fig. 1; Sonos Pet., pp. 7-15.

IMPLICIT PATENT OVERVIEW

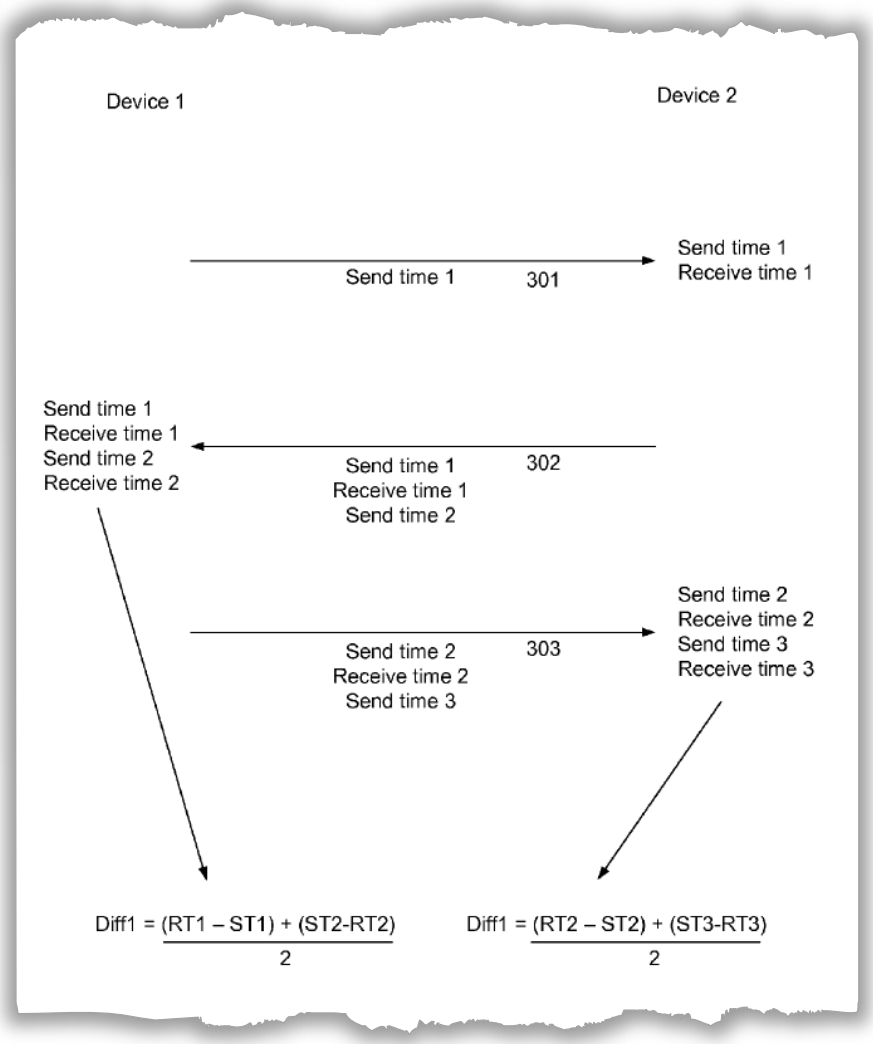


‘791 Patent

‘252 Patent

The synchronization system in one embodiment factors in the differences in the time domains of the various rendering devices when evaluating synchronization. The rendering devices exchange device time information so that the rendering devices can account for the differences in the time domains of the other rendering devices. Each rendering device may send to the other rendering devices a time domain message that includes its current device time (i.e., send time) along with the time it received the last time domain message (i.e., receive time) from each of the other rendering devices and the send time of that last time domain message. When a

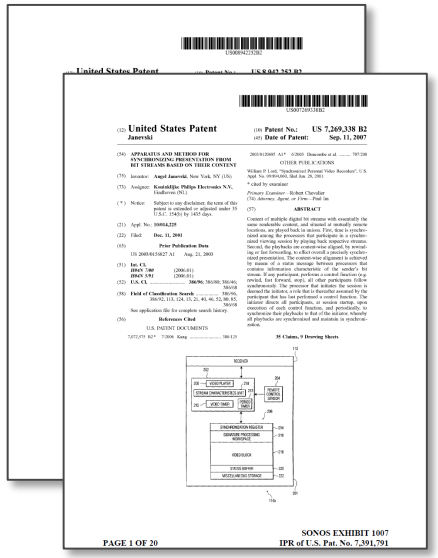
and the send time of that last time domain message. When a rendering device receives such a time domain message, it calculates the time differential between its time domain and the time domain of the sending rendering device. In one embodiment, the synchronization system calculates the time domain differential by combining the difference in send and receive times for the last messages sent to and received from another device in a way that helps factor out the transmission time of the messages. A slave rendering device can then use



IPR2018-00766, -00767 EXHIBIT 1028

‘252 Patent (Ex.1001) at 3:34-53, 47, Fig. 2; Sonos Pet., pp. 7-15.

IMPLICIT PATENT OVERVIEW



(12) **United States Patent**
Janevski

(10) **Patent No.: US 7,269,338 B2**
(45) **Date of Patent: Sep. 11, 2007**

(54) **APPARATUS AND METHOD FOR SYNCHRONIZING PRESENTATION FROM BIT STREAMS BASED ON THEIR CONTENT**

(75) Inventor: **Angel Janevski**, New York, NY (US)

(73) Assignee: **Koninklijke Philips Electronics N.V.**, Eindhoven (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1455 days.

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(22) Filed: **Dec. 11, 2001**

(65) **Prior Publication Data**

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(51) **Int. Cl.**
H04N 7/00 (2006.01)
H04N 7/12 (2006.01)

(52) **U.S. Cl.** **386/96**; 381/80; 386/46; 386/68

(58) **Field of Classification Search** 386/96, 386/92, 113, 124, 15, 21, 45, 46, 52, 68, 85, 386/68
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

7,072,575 B2 * 7/2006 Kang 386/125

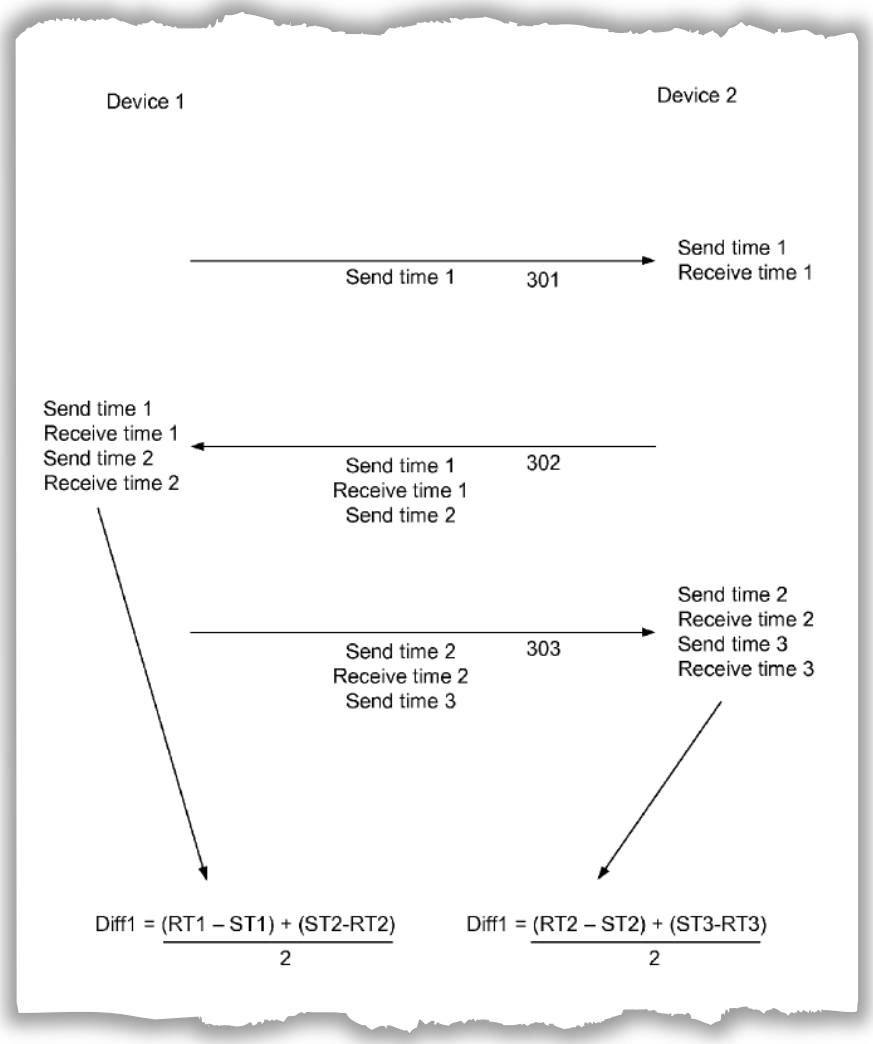
35 Claims, 9 Drawing Sheets

SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791

PAGE 1 OF 20

‘791 Patent
‘252 Patent

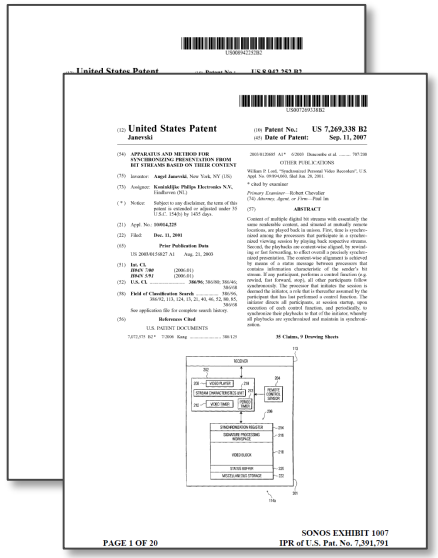
the time domain differential. In block 707, the component smoothes the time domain differential. The time domain differential can be smoothed using various techniques such as averaging the last several time domain differentials using a



IPR2018-00766, -00767 EXHIBIT 1028

‘252 Patent (Ex.1001) at 7:16-19, Fig. 2; Sonos Pet., pp. 7-15.

IMPLICIT PATENT OVERVIEW



(12) **United States Patent**
Janevski

(10) **Patent No.: US 7,269,338 B2**
(45) **Date of Patent: Sep. 11, 2007**

(54) **APPARATUS AND METHOD FOR SYNCHRONIZING PRESENTATION FROM BIT STREAMS BASED ON THEIR CONTENT**

(75) Inventor: **Angel Janevski**, New York, NY (US)

(73) Assignee: **Koninklijke Philips Electronics N.V.**, Eindhoven (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1455 days.

(21) Appl. No.: **10/014,219**

(22) Filed: **Dec. 11, 2001**

(65) **Prior Publication Data**

US 2003/0152027 A1 Aug. 21, 2003

(51) **Int. Cl.**
H04N 7/00 (2006.01)
H04N 7/16 (2006.01)

(52) **U.S. Cl.** **386/96**; 381/80; 386/46; 386/68

(58) **Field of Classification Search** 386/96, 386/92, 113, 124, 15, 21, 45, 46, 52, 68, 85, 386/68
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

7,072,575 B2 * 7/2006 Janevski 386/125

35 Claims, 9 Drawing Sheets

SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791

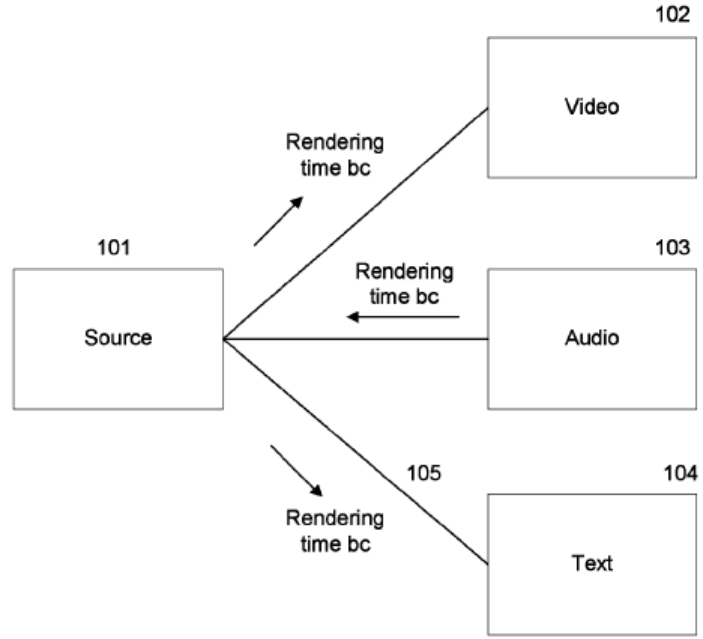
PAGE 1 OF 20

‘791 Patent
‘252 Patent

devices. Each slave rendering device adjusts the rendering of its content to keep it in synchronization with the rendering of the content at the master rendering device. The master ren-

designated as slave rendering devices. After the source starts sending the content to the rendering devices, the audio rendering device broadcasts a master rendering time message with its master device time and master rendering time to the slave rendering devices on a periodic basis. In this example,

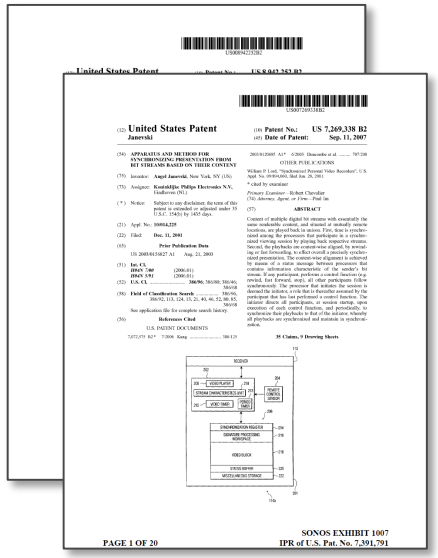
the slave rendering devices. Upon receiving the master rendering time message, the slave rendering devices convert the master device time to their own time domains and then calculate the difference between their slave rendering time and the master rendering time at a certain point in time. In one



IPR2018-00766, -00767 EXHIBIT 1028

‘252 Patent (Ex.1001) at 2:36-38, 4:25-28, 4:32-36, Fig. 1; Sonos Pet., pp. 7-15.

IMPLICIT PATENT OVERVIEW



(12) **United States Patent**
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(10) **Patent No.: US 7,269,338 B2**
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(54) **APPARATUS AND METHOD FOR SYNCHRONIZING PRESENTATION FROM BIT STREAMS BASED ON THEIR CONTENT**

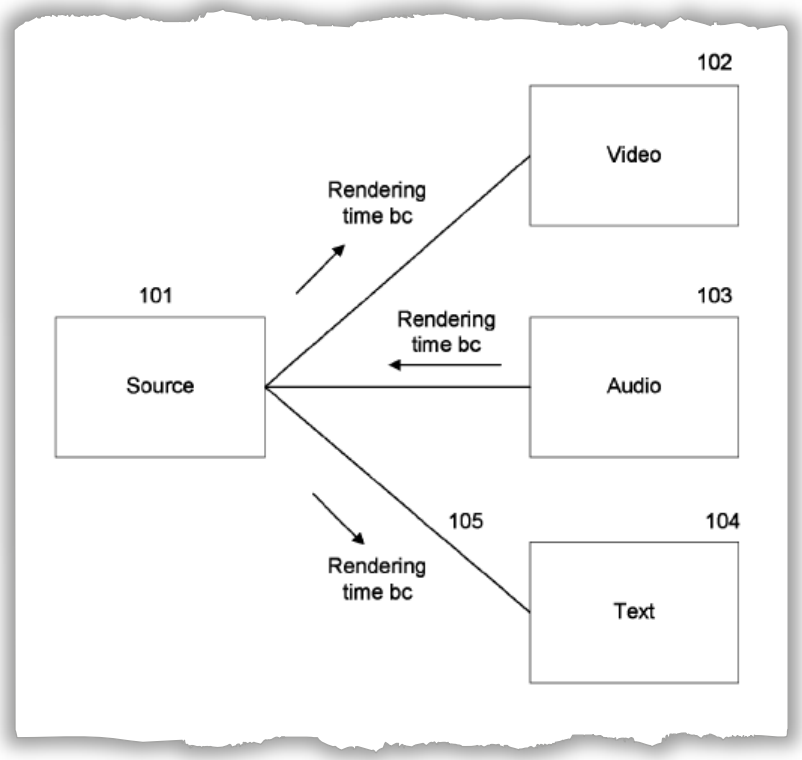
(57) **ABSTRACT**

PAGE 1 OF 20

SONOS EXHIBIT 1007
IPR of U.S. Pat. No. 7,391,791

‘791 Patent
‘252 Patent

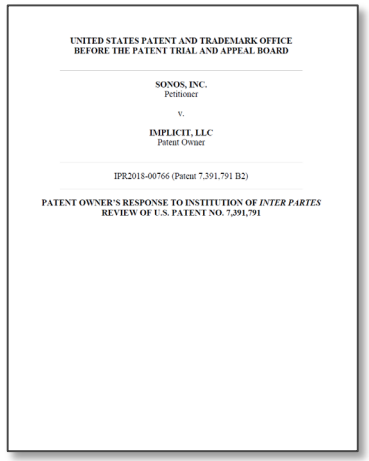
at a calculated start of sending as the point in time. The slave rendering devices then adjusts the rendering as appropriate to compensate for the difference. The rendering device adjusts



IPR2018-00766, -00767 EXHIBIT 1028

‘252 Patent (Ex.1001) at 4:38-40, Fig. 1; Sonos Pet., pp. 7-15.

A "TIME DOMAIN" IS NOT LIMITED TO A "DEVICE CLOCK"



UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.
Petitioner

v.

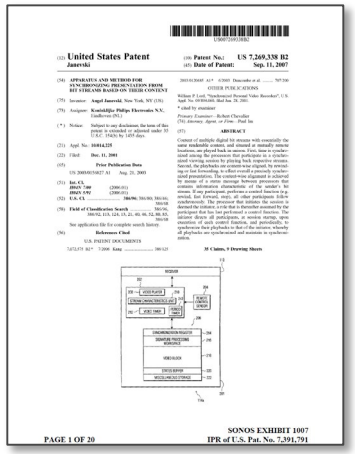
IMPLICIT, LLC
Patent Owner

IPR2018-00766 (Patent 7,391,791 B2)

PATENT OWNER'S RESPONSE TO INSTITUTION OF *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,391,791

Implicit POR
'791 Patent

> The "time domain" terms should be construed as "the way a device clock tracks time," which Implicit also proposed in the co-pending litigation. Exhibit



United States Patent
Janevski

US 7,269,338 B2
Sep. 11, 2007

APPARATUS AND METHOD FOR SYNCHRONIZING PRESENTATION FROM BIT STREAMS BASED ON THEIR CONTENT

SONOS EXHIBIT 1007
PAGE 1 OF 20
IPR of U.S. Pat. No. 7,391,791

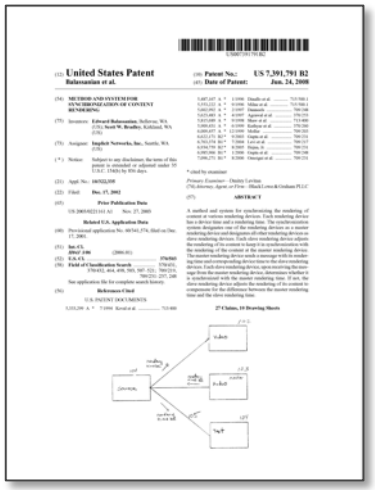
'791 Patent
Ex.1001

> Various rendering devices, however, may have different time domains that make the rendering of the multimedia presentation in a synchronized manner difficult. For example, video and audio rendering devices may have system clocks that operate at slightly different frequencies. As a result, the video and audio content will gradually appear to the person viewing the presentation to be out of synchronization. The rendering of content in a synchronized manner is made even more difficult because some rendering devices may have multiple time domains. For example, an audio rendering device may have a system clock and a clock on a digital signal processing ("DSP") interface card. In such a case, the combination of clocks may result in the presentation becoming even more quickly out of synchronization.

IPR2018-00766, -00767 EXHIBIT 1028

Implicit POR, p. 37; '791 Pat. (Ex.1001) at 1:44-47; Sonos Reply, p. 24-25.

JANEVSKI ANTICPATES CHALLENGED CLAIM 1



‘791 Patent

1. A method for synchronizing a rendering of a content provided by a source at one or more devices which are nodes of a network, the content having a rendering time, the method comprising:

designating one of the one or more devices a master device, the master device having a master device time and a master rendering time;

designating remaining devices among one of the one or more devices as at least one slave device, the at least one slave device having a slave device time and a slave rendering time;

receiving the content for rendering by the master and at least one slave device;

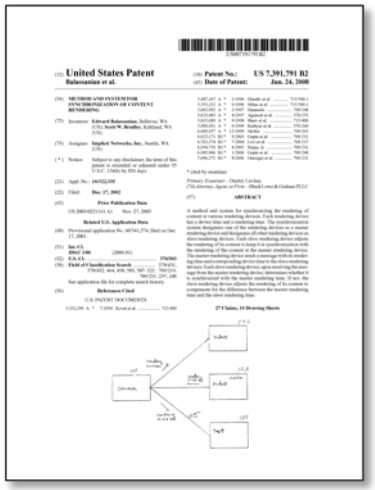
sending from the master device to the at least one slave device an indication of when the master device renders content corresponding to the master rendering time;

determining a master device time domain, a slave device time domain, and a source time domain;

determining whether a time domain differential exists between the master rendering time, the slave rendering time; and

adjusting, based on the received indication, the rendering of the content at the at least one slave device within the slave device time domain and in proportion to the time domain differential when present to account for variation between when the master device and the at least one slave device to render content that should be rendered at the same time.

JANEVSKI ANTICIPATES CHALLENGED CLAIM 16



'791 Patent

16. A method for synchronizing rendering of content at devices which are nodes of network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:

designating one of the devices as a master device having a master rendering time and the one or more slave devices having a slave rendering time;

sending to each device content to be rendered at that device synchronized with the content sent to the other devices;

sending from the master device to the one or more slave devices a master device time corresponding to the master rendering time of the master device; and upon receiving the sent master device time at the one or more slave devices,

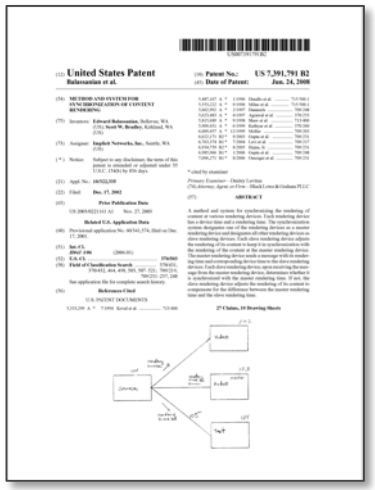
exchanging time domain information between the master and one or more slave devices;

determining at least one time domain differential between the master rendering time and the slave rendering time between the master device and the one or more slave devices;

adjusting the rendering of the content at the one or more slave devices to account for a difference in the slave rendering time and the master rendering time calculated based on the master device time adjusted for a difference in time domains of the one or more slave devices and the master device.

'791 Patent (Ex.1001) at cl. 16; Sonos Pet., pp. 47-54.

JANEVSKI ANTICIPATES CHALLENGED CLAIM 23



'791 Patent

23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:

designating one of the devices as a master device having a master rendering time and the one or more slave devices having a slave rendering time; and for each slave device,

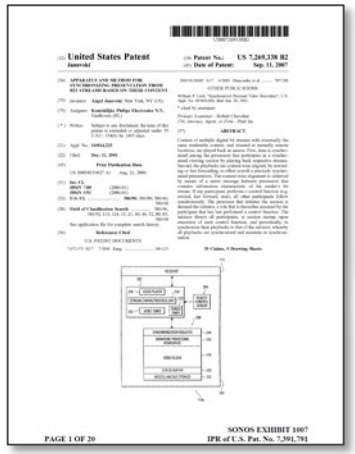
exchanging time domain information between the master and one or more slave devices;

calculating a time domain difference between the master rendering time of the master device and the slave rendering time of the slave device based on a master device time adjusted for a difference in time domains of the slave device and the master device; and

rendering content at the slave device to account for the calculated time domain difference.

JANEVSKI ANTICIPATES CHALLENGED CLAIM 23

23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:



Janevski
Ex.1007

1. Field of the Invention

The present invention relates generally to digital image playback, and more particularly to techniques for synchronizing playback of two or more digital streams based on renderable content of those streams.

The system **110** preferably has two communication networks associated therewith. The first is an Internet network **118** that interconnects the PVRs **114***a, b* located at the two different locations (e.g. House **1** and House **2**). The Internet network **118** supplies the means **119** for communicating information between the PVRs **114***a, b* such that synchronization may be achieved. The second communication net-

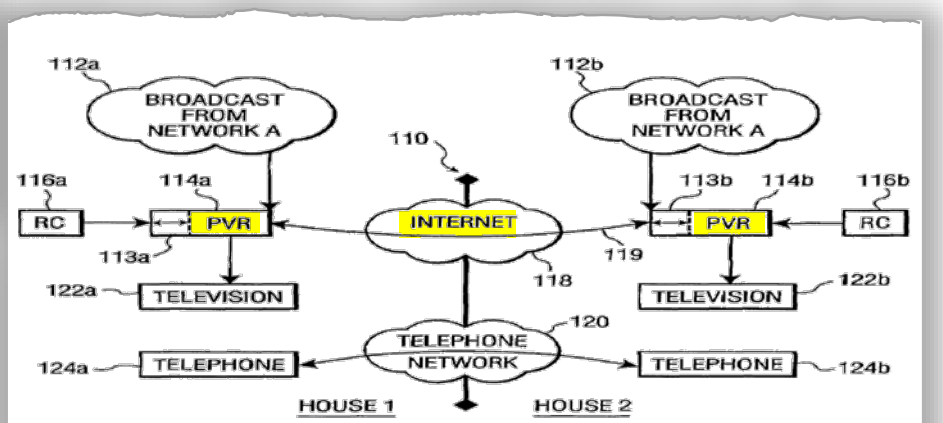


FIG. 1

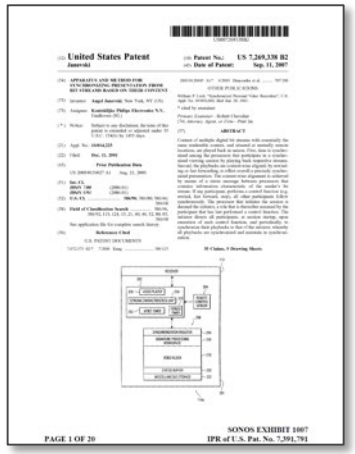
IPR2018-00766, -00767 EXHIBIT 1028

Janevski (Ex.1007) at 1:7-11, 6:45-51, Fig. 1; Sonos Pet., p. 39.

JANEVSKI ANTICIPATES CHALLENGED CLAIM 23

23. A method for synchronizing rendering of content at devices which are nodes of a network, each device having a device time and a rendering time, the device time of a device being in a time domain of the device, the method comprising:

Each PVR keeps track of "the time or frame into the program":



Janevski
Ex.1007

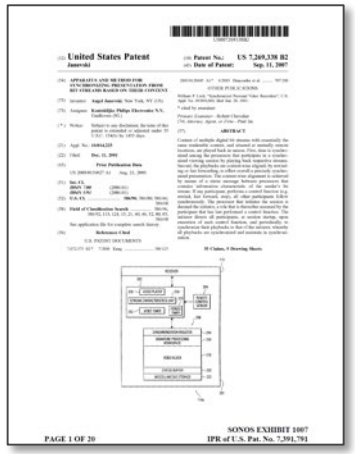
PVR 114*a* that initiated the session. The status message is also transmitted with each command that is broadcasted in response to a participant performing a control function. The status message includes an indication of the program being watched, the current mode of watching (e.g., normal play, fast forward, pause), an indication of the time into the program, and information characteristic of content of a digital bit stream from which playback to the message sender is being generated. The characteristic information is

to update the synchronization. Within the message is an identifier of the program being watched or to be watched, an indicator of the mode of watching (e.g. normal play, fast forward, pause, etc.), and the time or frame into the program. The time or frame allows the recipient PVR to synchronize its replay with that of the sending PVR, by comparing the time or frame in the message with its own the current time or frame.

Janevski (Ex.1007) at 1:65-2:5, 7:39-47; Sonos Pet., p. 39.

JANEVSKI ANTICIPATES CHALLENGED CLAIM 23

designating one of the devices as a master device having a master rendering time and the one or more slave devices having a slave rendering time; and for each slave device,



Janevski
Ex.1007

Referring to FIG. **1**, an example of a synchronized PVR viewing system **110** in accordance with the present invention is illustrated. As illustrated in FIG. **1**, broadcasts **112***a, b* of PVRs **114***a, b*. Hereinafter, the suffix "a" refers to the "initiator", and the suffix "b" refers to a "participant", in a synchronized viewing session. Initially, the "initiator" is the PVR that starts the session, although that role is handed off to any PVR that, as directed by its user, performs a control function (e.g., stop, pause, fast forward, reverse). All other PVRs participating in the session are "participants".

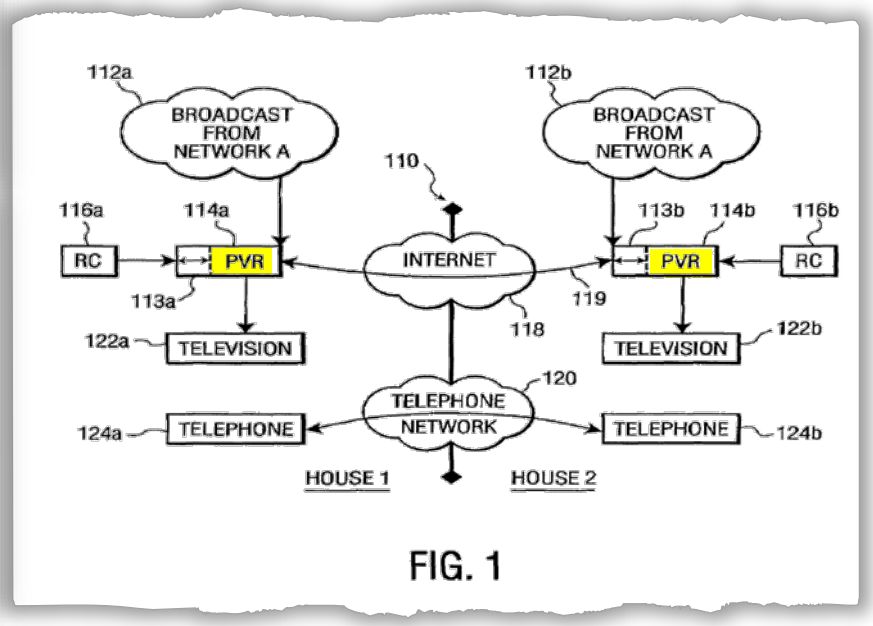


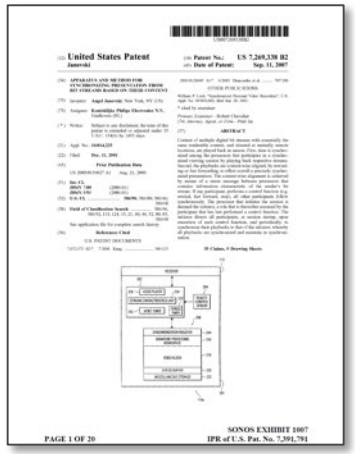
FIG. 1

IPR2018-00766, -00767 EXHIBIT 1028

Janevski (Ex.1007) at 6:4-7, 6:16-23, Fig. 1; Sonos Pet., p. 39.

JANEVSKI ANTICIPATES CHALLENGED CLAIM 23

exchanging time domain information between the master and one or more slave devices;



Janevski
Ex.1007

Time synchronization can be implemented in many different known ways. Distributed processors (nodes) in a network can broadcast their respective clock values periodically to maintain synchronization. "Fault-Tolerant Clock Synchronization for Distributed Systems with High Message Delay Variation", Azevedo, Marcelo Moraes de, et. al., Irvine, Calif. (1995). Synchronization messages may be relayed between source and destination processors, where relaying nodes discard messages recognized as coming from a faulty node. "Communication Protocols for Fault-Tolerant

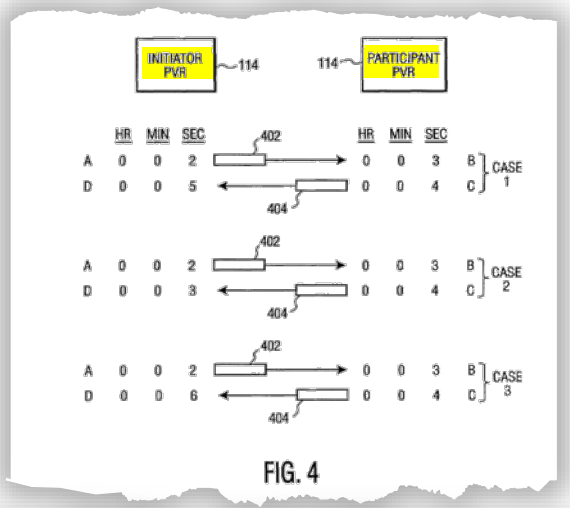


FIG. 4

FIG. 4 depicts a possible message flow design in the present invention to determine the misalignment, if any, in the respective timings of the video timers **212** of two PVRs **114***a, b*, so that the timers can be synchronized. For sim-

In the embodiment depicted herein, time synchronization is performed by the initiator PVR **114***a* individually with each participant PVR **114***b*, and involves sending an originating synchronization message **402** from the initiator PVR **114***a* to a participant PVR **114***b* and sending a reply synchronization message **404** from the participant PVR **114***b* to the initiator PVR **114***a*. It is assumed that the transmission

Janevski (Ex.1007) at 8:53-62, 8:39-42, 8:65-9:4, Fig. 4; Sonos Pet., p. 39.

JANEVSKI + ANY "CLOCK SYNCHRONIZATION" REFERENCE RENDERS '252 CLAIMS OBVIOUS

1. A method, comprising:

a master rendering device rendering a first content stream; and

sending, from the master rendering device to a first one of a plurality of slave devices, a plurality of master rendering times indicative of statuses of the rendering the first content stream at the master rendering device at different times;

wherein the first slave device is configured to smooth a rendering time differential that exists between the master rendering device and the first slave device in order to render a second content stream at the first slave device synchronously with the rendering of the first content stream at the master rendering device, wherein smoothing the rendering time differential includes calculations using the plurality of master rendering times.

11. A method, comprising:

receiving, at a slave device, a particular content stream;

receiving, at the slave device from a master rendering device, a plurality of master rendering times indicative of status of rendering a different content stream at the master rendering device;

the slave device determining a smoothed rendering time differential that exists between the master rendering device and the slave device, wherein the determining is based on calculations using the plurality of master rendering times and a plurality of slave rendering times corresponding to rendering the particular content stream at the slave device; and

based on the smoothed rendering time differential, the slave device rendering the particular content stream synchronously with the master rendering device rendering the different content stream.

'252 Patent (Ex.1001) at cls. 1, 11; Sonos Reply, p. 15.

JANEVSKI + ANY "CLOCK SYNCHRONIZATION" REFERENCE RENDERS '252 CLAIMS OBVIOUS

1994 IEEE Workshop on Fault-Tol. Par. and Dist. Syst., College Station, TX, June 13-14. (Appears in Fault-Tol. Par. and Dist. Syst., D. Pradhan and D. Avresky, eds., IEEE Comp. Soc. Press, pp. 268-277.)

Fault-Tolerant Clock Synchronization for Distributed Systems with High Message Delay Variation*

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Department of Electrical and Computer Engineering
University of California, Irvine
Irvine, CA 92717

Abstract

Fault-tolerant clock synchronization is an important requirement in many distributed systems, especially in time-critical and safety-critical applications. Frequently, interactive convergence algorithms are used for fault-tolerant clock synchronization, providing advantages such as fully distributed operation, low message exchange overhead, and simplicity of implementation. This paper presents the measured performance of three interactive convergence clock synchronization algorithms. Our experiments were conducted in a distributed UNIX environment featuring high message delay variation, which poses severe constraints on the clock synchronization tightness that may be achieved. The algorithms that were tested are: FTMA (fault-tolerant midpoint algorithm) [1], AEFTMA (adaptive exponential averaging fault-tolerant midpoint algorithm) [2], and SWA (sliding window algorithm) [3]. Our experimental results indicate that SWA outperforms the other algorithms in this environment, being able to achieve tighter synchronization under different simulated fault conditions. The superiority of SWA can be attributed to its high degree of fault tolerance, combined with its ability to treat messages with much longer than expected delays as faults.

1: Introduction

In distributed systems, computers cooperate to provide the expected functionality to a given application. Some tasks that are often found in such systems are: synchronizing activities that occur at different points of the system, ordering events in time, enforcing deadlines, and measuring elapsed time. A system with one or more of these requirements must use proper synchronization mechanisms to establish an agreed upon global time scale among its components. Particularly in the case of safety critical applications, synchrony must be maintained in spite of the presence of faults in the system.

Frequently, fault-tolerant clock synchronization is achieved via *interactive convergence algorithms* in which nodes exchange their clock values and determine clock correction terms at regular intervals. This paper presents the measured performance of three interactive convergence algorithms: the sliding window algorithm (SWA) [3], the fault tolerant midpoint algorithm (FTMA) [1], and the adaptive exponential averaging fault tolerant midpoint algorithm (AEFTMA) [2]. The measurements were carried out with an application-level implementation running in a distributed UNIX environment [2]. This environment poses some practical constraints to clock synchronization, in particular a high variation in the

*This research was supported in part by Conselho Nacional de Desenvolvimento Cientifico e Tecnologico (CNPq - Brasil), under Grant 200.192/82-1, by the National Science Foundation under Grant CCR-9119-05, and by the California Space Institute under Grant CS-54-92.

Azevedo
Ex.1010

AEFTMA in the previous round. Instead of using $CORR^r_{FTMA}$ as the correction term during the rth resynchronization interval, AEFTMA computes its correction term by

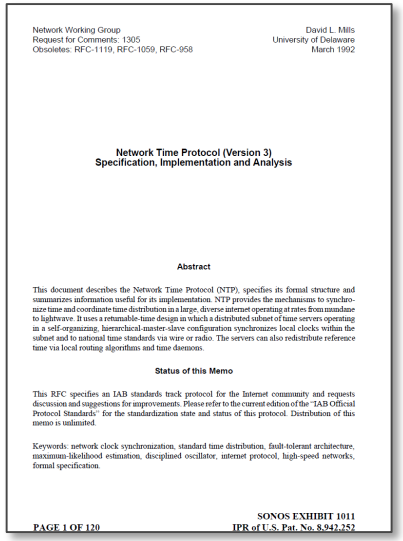
$$CORR^r_{AEFTMA} = \beta(r) \cdot CORR^r_{FTMA} + (1 - \beta(r))CORR^{r-1}_{AEFTMA}.$$

$\beta(r)$ is a weight factor in effect during the rth resynchronization interval, such that $0 \leq \beta(r) \leq 1$. The weight factor "smooths" the clock correction term $CORR^r_{AEFTMA}$, introducing a lagging mechanism between adjacent rounds. This approach follows the assumption that correction terms of similar magnitude are expected at every resynchroniza-

IPR2018-00766, -00767 EXHIBIT 1028

Azevedo (Ex.1010), p. 4; Sonos Pet., pp. 44.

JANEVSKI + ANY "CLOCK SYNCHRONIZATION" REFERENCE RENDERS '252 CLAIMS OBVIOUS



Network Working Group
Request for Comments: 1305
Obsoletes: RFC-1119, RFC-1059, RFC-958

David L. Mills
University of Delaware
March 1992

Network Time Protocol (Version 3)
Specification, Implementation and Analysis

Abstract

This document describes the Network Time Protocol (NTP), specifies its formal structure and summarizes information useful for its implementation. NTP provides the mechanisms to synchronize time and coordinate time distribution in a large, diverse internet operating at rates from mundane to lightwave. It uses a retunable-tune design in which a distributed subnet of time servers operating in a self-organizing, hierarchical-master-slave configuration synchronizes local clocks within the subnet and to national time standards via wire or radio. The servers can also redistribute reference time via local routing algorithms and time daemons.

Status of this Memo

This RFC specifies an IAB standards track protocol for the Internet community and requests discussion and suggestions for improvements. Please refer to the current edition of the "IAB Official Protocol Standards" for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Keywords: network clock synchronization, standard time distribution, fault-tolerant architecture, maximum-likelihood estimation, disciplined oscillator, internet protocol, high-speed networks, formal specification.

SONOS EXHIBIT 1011
PAGE 1 OF 120
IPR of U.S. Pat. No. 8,942,252

Mills
Ex.1011

peer.dispersion ← min($\varepsilon_0 + \varepsilon_\sigma$, NTP.MAXDISPERSE);
end clock-filter procedure

The peer.offset and peer.delay variables represent the clock offset and roundtrip delay of the local clock relative to the peer clock. Both of these are precision quantities and can usually be averaged over long intervals in order to improve accuracy and stability without bias accumulation (see Appendix H). The peer.dispersion variable represents the maximum error due to measurement error, skew-error accumulation and sample variance. All three variables are used in the clock-selection and clock-combining procedures to select the peer clock(s) used for synchronization and to maximize the accuracy and stability of the indications.

4.2. Clock-Selection Procedure

The clock-selection procedure uses the peer variables Θ, Δ, E and τ and is called when these variables

JANEVSKI + ANY "CLOCK SYNCHRONIZATION" REFERENCE RENDERS '252 CLAIMS OBVIOUS

Time Synchronization Over Networks
Using Convex Closures

Jean-Marc Berthaud

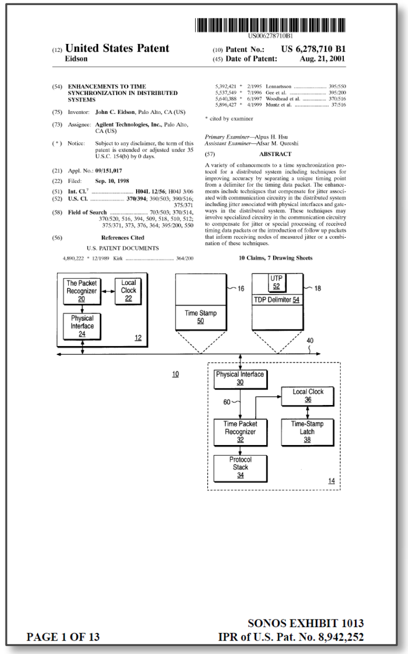
SONOS EXHIBIT 1012
PAGE 1 OF 13 IPR of U.S. Pat. No. 8,942,252

Berthaud
Ex.1012

Then, an estimation is produced from that set of observation(s), and several tools may be used in the estimation evaluation process, such as: mean value, weighted average, linear regression, midpoint functions, etc. (see [8] and [9] for an ex-

At last, the estimation is used to determine the amount by which a slave should adjust its local clock. To reflect the adjustment, it can either modify its local clock, either produce a virtual clock that is calculated by adding that amount to the local clock. The new value output by the system is then considered valid until the next synchronization round. In both cases, the adjustment can be discrete [2], [4], [5], [8], or can be introduced continuously [3], [8].

JANEVSKI + ANY "CLOCK SYNCHRONIZATION" REFERENCE RENDERS '252 CLAIMS OBVIOUS


(12) United States Patent
Eidson
(10) Patent No.: US 6,278,710 B1
(45) Date of Patent: Aug. 21, 2001
(54) ENHANCEMENTS TO TIME SYNCHRONIZATION IN DISTRIBUTED SYSTEMS
PAGE 1 OF 13
SONOS EXHIBIT 1013
IPR of U.S. Pat. No. 8,942,252

Edison
Ex.1013

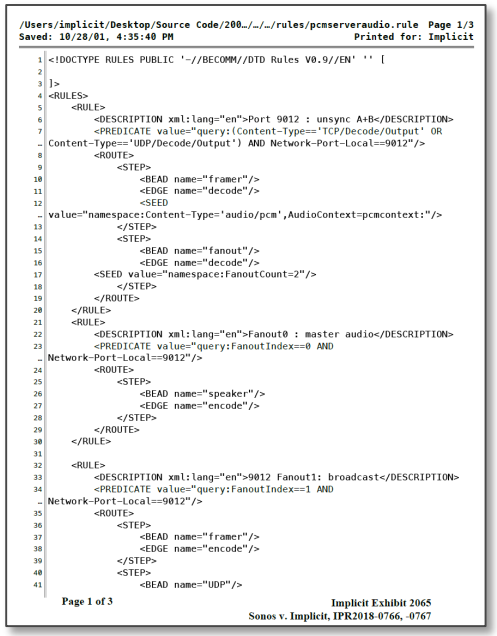
systems. More particularly, this invention relates to enhancements to time synchronization in distributed systems.

One method for reducing the negative effects of jitter introduced by the physical interface 30 is to average the differences computed between the time value in the time-stamp latch 38 and the time-stamp 50 for a number of timing data packet and corresponding follow up packet pairs. This computed average may then be used to adjust the local clock 36.

For example, the time packet recognizer 20 may generate a timing data packet once per second along with a corresponding follow up packet. The time packet recognizer 32 latches a time value from the local clock 36 upon detection of each UTP of the received timing data packets and then computes a difference between the latched time value and the time-stamp contained in the corresponding follow up packet. These differences are then averaged for, for example, 10 timing data packets, and the averaged result is then used to adjust the local clock 36. The averaging may be performed by the time packet recognizer 32 or by processor associated with the protocol stack 34.

Edison (Ex.1013) at 1:8-20, 4:16-22, 4:23-35; Sonos Pet., pp. 60-63.

IMPLICIT'S CODE FAILS TO SYNCHRONIZE BETWEEN MASTER AND SLAVE



/Users/implicit/Desktop/Source Code/200…/…/…/rules/pcmserveraudio.rule Page 1/3
Saved: 10/28/01, 4:35:40 PM Printed for: Implicit

```
<!DOCTYPE RULES PUBLIC '-//BECOMM//DTD Rules V0.9//EN' '' [

]>
<RULES>
    <RULE>
        <DESCRIPTION xml:lang="en">Port 9012 : unsync A+B</DESCRIPTION>
        <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR
Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9012"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="decode"/>
                <SEED
value="namespace:Content-Type='audio/pcm',AudioContext=pcmcontext:"/>
            </STEP>
            <STEP>
                <BEAD name="fanout"/>
                <EDGE name="decode"/>
        <SEED value="namespace:FanoutCount=2"/>
            </STEP>
        </ROUTE>
    </RULE>
    <RULE>
        <DESCRIPTION xml:lang="en">Fanout0 : master audio</DESCRIPTION>
        <PREDICATE value="query:FanoutIndex==0 AND
Network-Port-Local==9012"/>
        <ROUTE>
            <STEP>
                <BEAD name="speaker"/>
                <EDGE name="encode"/>
            </STEP>
        </ROUTE>
    </RULE>

    <RULE>
        <DESCRIPTION xml:lang="en">9012 Fanout1: broadcast</DESCRIPTION>
        <PREDICATE value="query:FanoutIndex==1 AND
Network-Port-Local==9012"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="encode"/>
            </STEP>
            <STEP>
                <BEAD name="UDP"/>
```

Page 1 of 3 Implicit Exhibit 2065
Sonos v. Implicit, IPR2018-0766, -0767

pcmserveraudio.rule
Ex. 2065

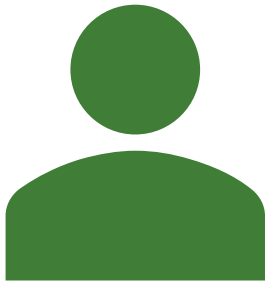
/Users/implicit/Desktop/Source Code/200…/…/…/rules/**pcmserveraudio.rule** Page 1/3
Saved: 10/28/01, 4:35:40 PM Printed for: Implicit

```
1  <!DOCTYPE RULES PUBLIC '-//BECOMM//DTD Rules V0.9//EN' '' [
2
3  ]>
4  <RULES>
5      <RULE>
6          <DESCRIPTION xml:lang="en">Port 9012 : unsync A+B</DESCRIPTION>
7          <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR
…  Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9012"/>
8          <ROUTE>
9              <STEP>
10                 <BEAD name="framer"/>
11                 <EDGE name="decode"/>
12                 <SEED
…  value="namespace:Content-Type='audio/pcm',AudioContext=pcmcontext:"/>
13             </STEP>
14             <STEP>
15                 <BEAD name="fanout"/>
16                 <EDGE name="decode"/>
17         <SEED value="namespace:FanoutCount=2"/>
18             </STEP>
19         </ROUTE>
```

IMPLICIT'S CODE FAILS TO SYNCHRONIZE BETWEEN MASTER AND SLAVE

```
73          <DESCRIPTION xml:lang="en">Fanout0 : master audio</DESCRIPTION>
74          <PREDICATE value="query:fanoutIndex==0 AND
…  Network-Port-Local==9013"/>
75          <ROUTE>
76              <STEP>
77                  <BEAD name="speaker"/>
78                  <EDGE name="encode"/>
79                  <SEED value="namespace:RenderClock=sampleclock:MASTER"/>
80              </STEP>
```

pcmserveraudio.rule *(Ex.2065); Sonos Reply, p. 18.*

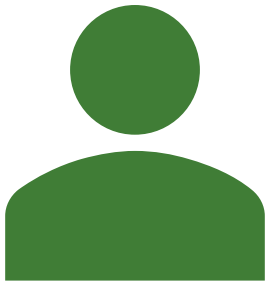


Dr. Roman Chertov
Sonos's Expert Witness

63. The `Fanout0` path only includes a single bead, which is the `speaker` bead. Ex. 2065 at ln. 73-82. When the decoded PCM audio frame is passed to this `speaker` bead, it causes the "master" device to render the decoded PCM audio frame by writing it to the "master" device's audio output device via a `Speaker_DeviceWrite` function. *Id.*; Ex. 2051 at ln. 512-526. Further, immediately before writing the PCM audio frame to the "master" device's audio output device, **the `speaker` bead calls an `Update` function** via the `ISampleClock` interface structure. This causes an update of a `SAMPLECLOCK` data structure at the "master" device, **which involves copying the current system time of the "master" device into the `Time` variable of the `SAMPLECLOCK` data structure** in a manner similar to that described above. Ex. 2051 at ln. 484-506.[3]

Chertov Dec. (Ex.1022) ¶63; Sonos Reply, p. 18.

IMPLICIT'S CODE FAILS TO SYNCHRONIZE BETWEEN MASTER AND SLAVE



Dr. Roman Chertov
Sonos's Expert Witness

64. In turn, the `Fanout1` path is comprised of four beads that are run in sequential order. Ex. 2065 at ln. 84-107. A high-level summary of the operations performed by this sequence of beads when the `Fanout1` path is run is as follows:

- First, when the decoded PCM audio frame is passed to the `clocksync` bead, it functions to determine a "master epoch" for the decoded PCM audio frame in the manner described above – which involves reading the `SAMPLECLOCK` data structure updated by the `speaker` bead in the `Fanout0` path and then passing that `SAMPLECLOCK` data structure into the EpochGet function defined in the `sampleclock.c` file – and then encode that "master epoch" into a message that is to be sent to the "slave" device. Ex. 2065 at ln. 88-92; Ex. 2020 at ln. 280-292; Ex. 2086 at ln. 475-545.
- Second, the `framer` bead functions to encode the previously-decoded PCM audio frame into the message that is to be sent to the "slave" device. Ex. 2065 at ln. 93-96; Ex. 2047.
- Third, the `UDP` bead functions to format the message according to the User Datagram Protocol (UDP). Ex. 2065 at ln. 97-101; Ex. 2053. The same bead also sends a UDP message via `UdpSend` function, which will transmit the message over an IP network to a "slave" device having an IP address of 10.1.1.55. Ex. 2065 at ln. 102-105;
- Fourth, the `IP` bead is responsible for "holding (and sharing) the IP addressing information so the PsTcp and PsUdp protocols can access it." Ex. 1026 at ln. 14-16.

Chertov Dec. (Ex.1022) ¶64; Sonos Reply, p. 18.

```
84      <RULE>
85          <DESCRIPTION xml:lang="en">9013 Fanout1: broadcast</DESCRIPTION>
86          <PREDICATE value="query:FanoutIndex==1 AND
…   Network-Port-Local==9013"/>
87          <ROUTE>
88              <STEP>
89                  <BEAD name="clocksync"/>
90                  <EDGE name="encode"/>
91                  <SEED value="namespace:RenderClock=sampleclock:"/>
2               </STEP>
3               <STEP>
4                   <BEAD name="framer"/>
5                   <EDGE name="encode"/>
6               </STEP>
7               <STEP>
8                   <BEAD name="UDP"/>
9                   <EDGE name="encode"/>
0                   <SEED
…   value="namespace:Network-Port-Remote=9002,Network-Address-Remote=ipv4:10.1
…   .1.55,Network-Port-Local=0,Network-Address-Local=0"/>
1               </STEP>
2               <STEP>
3                   <BEAD name="IP"/>
4                   <EDGE name="Encode"/>
5               </STEP>
6           </ROUTE>
7       </RULE>
```

pcmserveraudio.rule *(Ex.2065); Sonos Reply, p. 18.*

DR. HASHMI DID NOT RUN THE CODE TO SHOW OTHERWISE

Dr. Atif Hashmi
Implicit's Expert Witness

Q. Can you point me to somewhere in your declaration, Exhibit 2080, where you offer an opinion regarding the reduction to practice?

A. I don't offer an opinion on reduction to practice.

Hashmi Dep. (Ex.1020) at 19:10-15;
Sonos Reply, p. 12.

DR. HASHMI DID NOT RUN THE CODE TO SHOW OTHERWISE

Dr. Atif Hashmi
Implicit's Expert Witness

Q. Do you have an opinion on whether the inventions of the 791 and 252 patents were reduced to practice?

A. I did not run the source code.

Hashmi Dep. (Ex.1020) at 17:17-22 (objs. omitted) ;
Sonos Reply, p. 12.

Q. [D]o you know for certain that the source code could be compiled and run successfully?

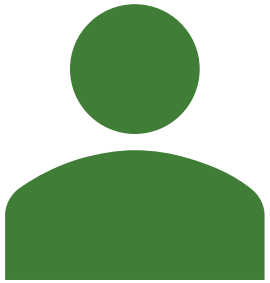
A. I did not compile the code. I did not run the code. I don't have an opinion on that.

Hashmi Dep. (Ex.1020) at 22:2-6 ;
Sonos Reply, p. 12.

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS

U.S. Patent No. 7,391,791	Application of Claim Language to Source Code
master device time and a master rendering time;	This master rendering device receives a combined audio and video content stream sent by a source device.[6] Upon receiving the combined audio and video content stream, the master rendering device uses the `avidemux` bead to separate the combined audio and video stream into separate audio and video streams.[7,8] The `avidemux` bead instantiates a master rendering clock `IAudioClock` associated with the audio content stream.[9] This master rendering clock `IAudioClock` generates a plurality of master rendering times that are indicative of the of statuses of the rendering the combined audio and video content stream by the master rendering device at different times. The Implicit Source Code implements a distributed system that runs on network devices including master rendering devices and slave rendering devices. Specifically, for synchronized audio and video rendering by master and slave rendering devices, the Implicit Source Code specifies a distributed system architecture in file `rule`. Within file `videomulti.rule`, a master rendering device a master rendering clock that provides master rendering times when the master renders media content.[10] This master rendering to receive combined audio and video content stream at port 8013.[11] ering device receives a combined audio and video content stream at its

Hashmi Claim Chart (Ex.2081) at 2; Sonos Reply, p. 13.



Dr. Roman Chertov
Sonos's Expert Witness

31. First, I disagree with Dr. Hashmi's contention that `IAudioClock` is a "clock" that "generates" time values. To the contrary, the Implicit Source Code makes clear that `IAudioClock` is merely an interface structure that allows for modification of an instance of `SAMPLECLOCK`, which is itself a ***data structure*** that is periodically updated via the `IAudioClock` interface such that it contains a snapshot of the time value indicated by a "master" device's system clock. *See, e.g.*, Ex. 2086 at ln. 64-72. Hence, neither `IAudioClock` nor `SAMPLECLOCK` is a separate "clock" that "generates" time values. Various aspects of the Implicit Source Code confirm this. For instance:

Chertov Dec. (Ex.1022) at ¶31; Sonos Reply, p. 14.

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS

```
101     SOS_UINT32              AudStreamIndex; /* index of audio stream */
102     WAV_FORMAT              AudStreamFormat;/* audio format from wav */
103     SOS_IAUDIOCONTEXT *     IAudioContext;  /* propagates format     */
104
105     SOS_ISAMPLECLOCK *      IAudioClock;    /* master sample clock   */
106     SOS_ISAMPLECLOCK *      IVideoClock;    /* slave sample clock    */
107
108     SOS_UINT32              AudioSampleCount;/* total samples sent   */
109     SOS_UINT32              AudioSampleBytes;/* bytes per sample     */
```

avidemux.c (Ex.2043); Chertov Dec. (Ex.1022) ¶31.

```
64  typedef struct _SAMPLECLOCK {
65      SOS_CLOCK_TICK              Time;
66      SOS_UINT32                  Sample;
67      SOS_UINT32                  Frequency;
68      SOS_UINT32                  Divisor;
69      SOS_BOOLEAN                 IsSet;
70      SOS_LOCK *                  Lock;
71      char *                      Name;
72  } SAMPLECLOCK;
```

sampleclock.c (Ex.2086); Chertov Dec. (Ex.1022) ¶31.

```
484   SOS_CLOCK_TICK now = SOS_Clock_TickGet();

                    * * *

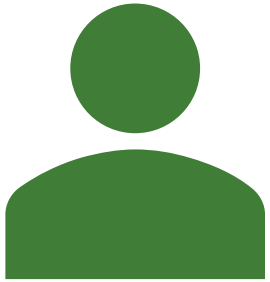
503   context->ISampleClock->Update(
504       context->ISampleClock,
505       now,
506       sample
```

speaker.c (Ex.2031); Chertov Dec. (Ex.1022) ¶31.

U.S. Patent No. 7,391,791	Application of Claim Language to Source Code
master device time and a master rendering time;	This master rendering device receives a combined audio and video content stream sent by a source device.[6] Upon receiving the combined audio and video content stream, the master rendering device uses the `avidemux` bead to separate the combined audio and video stream into separate audio and video streams.[7,8] The `avidemux` bead instantiates a master rendering clock `IAudioClock` associated with the audio content stream.[9] This master rendering clock `IAudioClock` generates a plurality of master rendering times that are indicative of the of statuses of the rendering the combined audio and video content stream by the master rendering device at different times. The Implicit Source Code implements a distributed system that runs on network devices including master rendering devices and slave rendering devices. Specifically, for synchronized audio and video rendering by master and slave rendering devices, the Implicit Source Code specifies a distributed system architecture in file `videomulti.rule`. Within file `videomulti.rule`, a master rendering device is defined to have a master rendering clock that provides master rendering times corresponding to when the master renders media content.[10] This master rendering device is set up to receive combined audio and video content stream at port 8013.[11] The master rendering device receives a combined audio and video content stream at its

Hashmi Claim Chart (Ex.2081) at 2; Sonos Reply, p. 13.

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS



Dr. Roman Chertov
Sonos's Expert Witness

34. To the contrary, depending on the operating system of a rendering device, the system time returned by the `SOS_Clock_TickGet()` function would reflect the system clock's measure of the amount of time that has passed since an arbitrary start date/time such as January 1, 1970 at 00:00:00 (for Unix) or the date/time when the device's operating system started (for Windows[2]) – which bears no relationship to "the amount of content that has already been rendered by [the] rendering device." Or put another way, a rendering device's system time is measured from a start date/time that is entirely independent of the rendering device's rendering of content, and as a result, the system time returned by the `SOS_Clock_TickGet()` function provides no indication of "the amount of content that has already been rendered by [the] rendering device."

Chertov Dec. (Ex.1022) at ¶34; Sonos Reply, p. 14.

33. Indeed, as noted above, the `Time` variable of a `SAMPLECLOCK` data structure at a "master" device is set using the `SOS_Clock_TickGet()` function, which returns the current time value indicated by the "master" device's system clock, or in other words, the "master" device's system time. *See* Ex. 2051 at ln. 406-438, 484-506; Ex. 2086 at ln. 337-399.[1] However, a "master" device's ***system time*** does not provide "a time measure of the amount of content that has already been rendered by [the] rendering device." *See, e.g.*, Ex. 2051 at ln. 406-438, Ex. 2086 at ln. 337-399.

Chertov Dec. (Ex.1022) at ¶33; Sonos Reply, p. 14.

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS

U.S. Patent No. 7,391,791	Application of Claim Language to Source Code
	rendering device encodes the decoded RGB video frames using the `framer` bead.[59,60] Specifically, function `Framer_EncodeHandler`[61] of bead `framer` encodes the decoded RGB video frame. Afterwards, the master rendering device transfers the master rendering time and the encoded RGB video frame to over the IP network, which sends the encoded master rendering times and the encoded RGB video frame to a remote network port 8002 using the User Datagram Protocol ("UDP").[62] As discussed earlier, the master rendering device uses the `avidemux` bead to split the combined audio and video content stream into separate audio and video streams. Once the audio and video content stream has been separated, the master rendering device uses another instance of the `fanout` bead to distribute the audio content stream to the two processing pathways.[63] The first processing pathway corresponding to index `FanoutIndex` 0 outputs the audio content stream using the `speaker` bead to the audio output device of the master rendering device.[64,65] **Within second processing pathway,[66] the master rendering device uses the `clocksync` bead to encode the master rendering times.** After encoding the master rendering time, the master rendering device encodes the PCM audio frames using the `framer` bead. Afterwards, the master rendering device transfers the master rendering time and the encoded PCM

Hashmi Claim Chart (Ex.2081) at 9; Sonos Reply, p. 14.

36. In his Claim Chart for the '791 Patent, Dr. Hashmi also contends that a "master" device "uses the `clocksync` bead to encode the ***master rendering times***" that are sent to the "slave" devices. Ex. 2081 at p. 8-9, 11 (emphasis added). I disagree – the time value encoded by the `clocksync` bead is <u>not</u> a "master rendering time" as the parties have construed that term for purposes of this IPR, because it is not "a time measure of the amount of content that has already been rendered by [the] rendering device." Rather, the Implicit Source Code makes clear that the time value encoded by the `clocksync` bead at a "master" device would have been an adjusted ***system time*** of the "master" device – which does not provide "a time measure of the amount of content that has already been rendered by [the] rendering device" for the same reasons discussed above.

Chertov Dec. (Ex.1022) ¶36; Sonos Reply, p. 14.

Dr. Roman Chertov
Sonos's Expert Witness

IMPLICIT'S CODE FAILS TO MEET "RENDERING TIME" LIMITATIONS

```
280         if (Flags & FLAG_MASTEREPOCH) {
281             SOS_UINT32 epoch;
282
283             SOS_DEBUGOUT_DETAIL("Encoding master epoch\n");
284
285             status = Context->IMasterClock->EpochGet(
286                 Context->IMasterClock,
287                 &epoch
288             );
289             if (SOS_SUCCEEDED(status)) {
290                 *ptr++ = SOS_HTOLEL(epoch);
291                 actualFlags |= FLAG_MASTEREPOCH;
292             }
```

clocksync.c (Ex.2020);
Chertov Dec. (Ex.1022) ¶37.

```
475 SampleClock_EpochGet(

          * * *

508   epoch = sampleclock->Time - delta;
```

sampleclock.c (Ex.2086);
Chertov Dec. (Ex.1022) ¶¶38-39.

U.S. Patent No. 7,391,791	Application of Claim Language to Source Code
	rendering device encodes the decoded RGB video frames using the framer bead.[59,60] Specifically, function Framer_EncodeHandler[61] of bead framer encodes the decoded RGB video frame. Afterwards, the master rendering device transfers the master rendering time and the encoded RGB video frame to over the IP network, which sends the encoded master rendering times and the encoded RGB video frame to a remote network port 8002 using the User Datagram Protocol ("UDP").[62] As discussed earlier, the master rendering device uses the avidemux bead to split the combined audio and video content stream into separate audio and video streams. Once the audio and video content stream has been separated, the master rendering device uses another instance of the fanout bead to distribute the audio content stream to the two processing pathways.[63] The first processing pathway corresponding to index FanoutIndex 0 outputs the audio content stream using the speaker bead to the audio output device of the master rendering device.[64,65] Within second processing pathway,[66] the master rendering device uses the clocksync bead to encode the master rendering times. After encoding the master rendering time, the master rendering device encodes the PCM audio frames using the framer bead. Afterwards, the master rendering device transfers the master rendering time and the encoded PCM

Hashmi Claim Chart (Ex.2081) at 9;
Sonos Reply, p. 14.