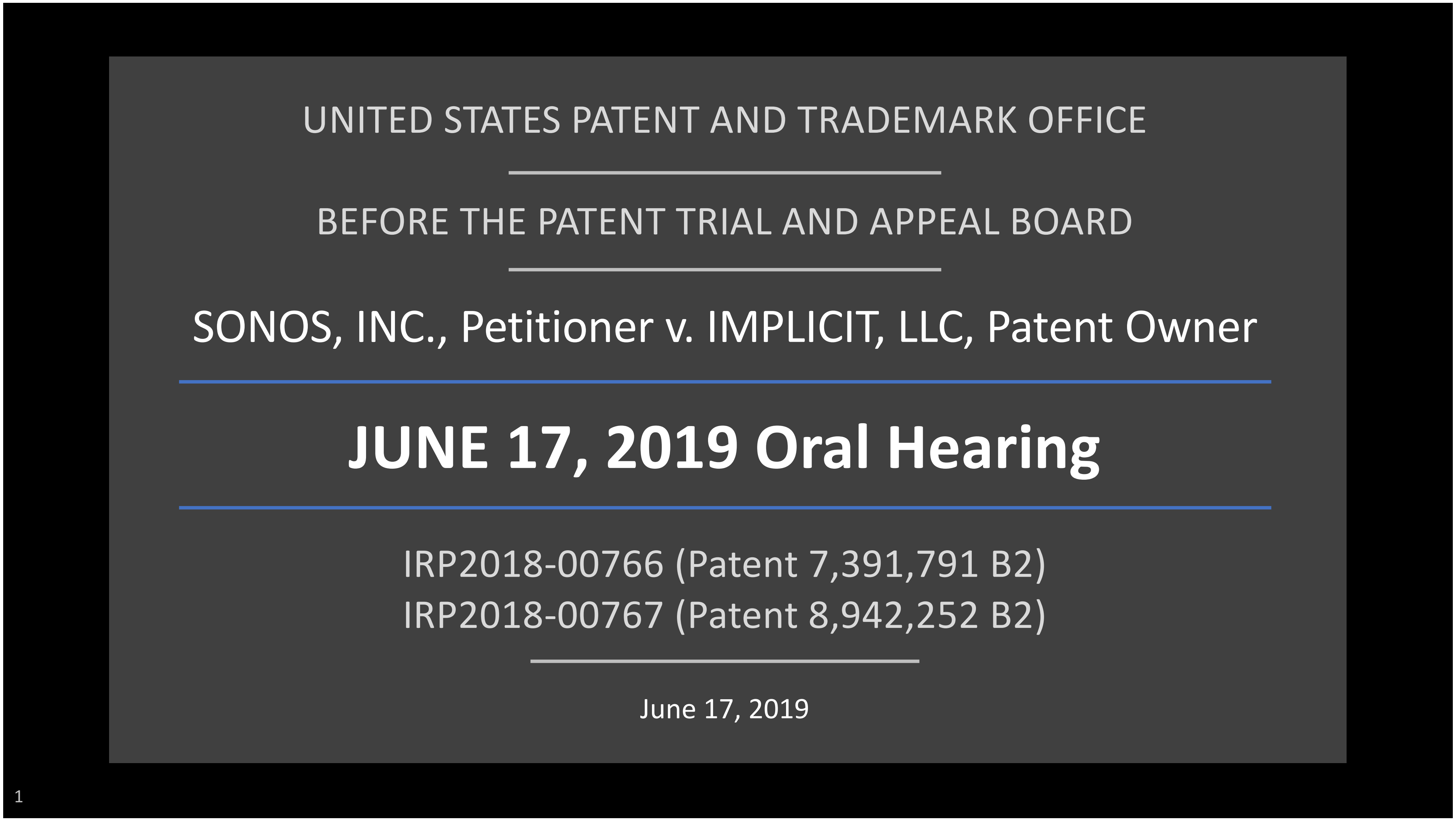


UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

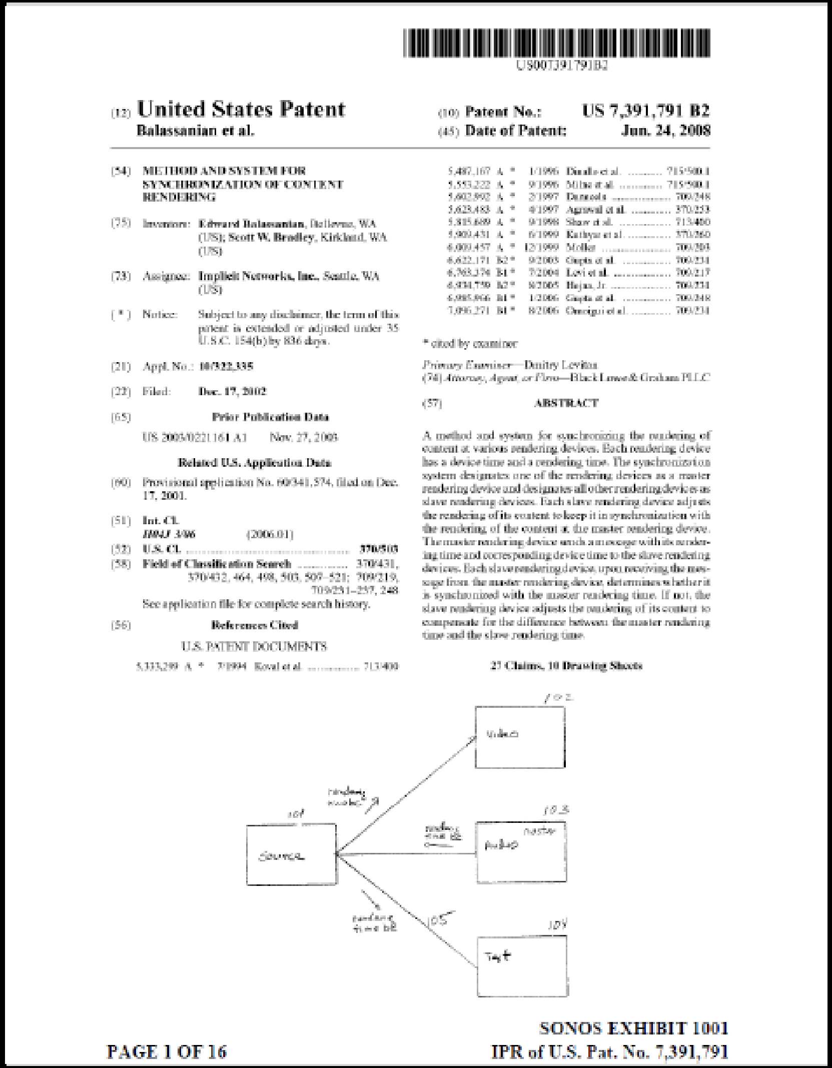
SONOS, INC., Petitioner v. IMPLICIT, LLC, Patent Owner

JUNE 17, 2019 Oral Hearing

IRP2018-00766 (Patent 7,391,791 B2)
IRP2018-00767 (Patent 8,942,252 B2)

June 17, 2019

1



US007391791B2

(12) **United States Patent**
Balassanian et al.

(10) **Patent No.: US 7,391,791 B2**
(45) **Date of Patent: Jun. 24, 2008**

(54) **METHOD AND SYSTEM FOR SYNCHRONIZATION OF CONTENT RENDERING**

(75) Inventors: **Edward Balassanian**, Bellevue, WA (US); **Scott W. Bradley**, Kirkland, WA (US)

(73) Assignee: **Implicit Networks, Inc.**, Seattle, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 836 days.

(21) Appl. No.: **10/322,335**

(22) Filed: **Dec. 17, 2002**

(65) **Prior Publication Data**

US 2003/0221161 A1 Nov. 27, 2003

Related U.S. Application Data

(60) Provisional application No. 60/341,574, filed on Dec. 17, 2001.

(51) **Int. Cl.**
H04J 3/06 (2006.01)

(52) **U.S. Cl.** **370/503**

(58) **Field of Classification Search** 370/431, 370/432, 464, 498, 503, 507–521; 709/219, 709/231–237, 248
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,333,299	A *	7/1994	Koval et al.	713/400
5,487,167	A *	1/1996	Dinallo et al.	715/500.1
5,553,222	A *	9/1996	Milne et al.	715/500.1
5,602,992	A *	2/1997	Danneels	709/248
5,623,483	A *	4/1997	Agrawal et al.	370/253
5,815,689	A *	9/1998	Shaw et al.	713/400
5,909,431	A *	6/1999	Kathyar et al.	370/260
6,009,457	A *	12/1999	Moller	709/203
6,622,171	B2 *	9/2003	Gupta et al.	709/231
6,763,374	B1 *	7/2004	Levi et al.	709/217
6,934,759	B2 *	8/2005	Hejna, Jr.	709/231
6,985,966	B1 *	1/2006	Gupta et al.	709/248
7,096,271	B1 *	8/2006	Omoigui et al.	709/231

* cited by examiner

Primary Examiner—Dmitry Levitan
(74) *Attorney, Agent, or Firm*—Black Lowe & Graham PLLC

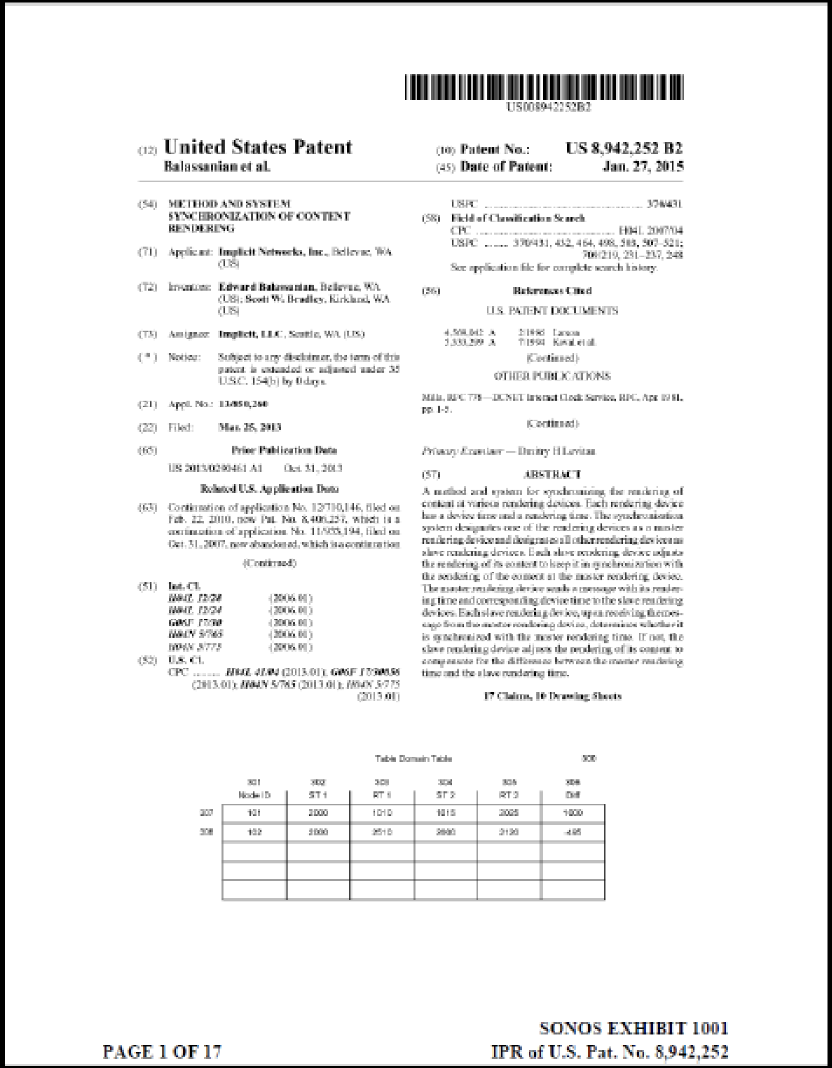
(57) **ABSTRACT**

A method and system for synchronizing the rendering of content at various rendering devices. Each rendering device has a device time and a rendering time. The synchronization system designates one of the rendering devices as a master rendering device and designates all other rendering devices as slave rendering 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 rendering device sends a message with its rendering time and corresponding device time to the slave rendering devices. Each slave rendering device, upon receiving the message from the master rendering device, determines whether it is synchronized with the master rendering time. If not, the slave rendering device adjusts the rendering of its content to compensate for the difference between the master rendering time and the slave rendering time.

27 Claims, 10 Drawing Sheets

SONOS EXHIBIT 1001
PAGE 1 OF 16 **IPR of U.S. Pat. No. 7,391,791**

’791 Patent



US008942252B2

(12) **United States Patent**
Balassanian et al.

(10) **Patent No.: US 8,942,252 B2**
(45) **Date of Patent: Jan. 27, 2015**

(54) **METHOD AND SYSTEM SYNCHRONIZATION OF CONTENT RENDERING**

(71) Applicant: **Implicit Networks, Inc.**, Bellevue, WA (US)

(72) Inventors: **Edward Balassanian**, Bellevue, WA (US); **Scott W. Bradley**, Kirkland, WA (US)

(73) Assignee: **Implicit, LLC**, Seattle, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/850,260**

(22) Filed: **Mar. 25, 2013**

(65) **Prior Publication Data**

US 2013/0290461 A1 Oct. 31, 2013

Related U.S. Application Data

(63) Continuation of application No. 12/710,146, filed on Feb. 22, 2010, now Pat. No. 8,406,257, which is a continuation of application No. 11/933,194, filed on Oct. 31, 2007, now abandoned, which is a continuation

(Continued)

(51) **Int. Cl.**
H04L 12/28 (2006.01)
H04L 12/24 (2006.01)
G06F 17/30 (2006.01)
H04N 5/765 (2006.01)
H04N 5/775 (2006.01)

(52) **U.S. Cl.**
CPC *H04L 41/04* (2013.01); *G06F 17/30058* (2013.01); *H04N 5/765* (2013.01); *H04N 5/775* (2013.01)
USPC 370/431

(58) **Field of Classification Search**
CPC H04L 2007/04
USPC 370/431, 432, 464, 498, 503, 507–521; 709/219, 231–237, 248
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,569,042	A	2/1986	Larson
5,333,299	A	7/1994	Koval et al.

(Continued)

OTHER PUBLICATIONS

Mills, RFC 778—DCNET Internet Clock Service, RFC, Apr. 1981, pp. 1-5.

(Continued)

Primary Examiner — Dmitry H Levitan

(57) **ABSTRACT**

A method and system for synchronizing the rendering of content at various rendering devices. Each rendering device has a device time and a rendering time. The synchronization system designates one of the rendering devices as a master rendering device and designates all other rendering devices as slave rendering 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 rendering device sends a message with its rendering time and corresponding device time to the slave rendering devices. Each slave rendering device, upon receiving the message from the master rendering device, determines whether it is synchronized with the master rendering time. If not, the slave rendering device adjusts the rendering of its content to compensate for the difference between the master rendering time and the slave rendering time.

17 Claims, 10 Drawing Sheets

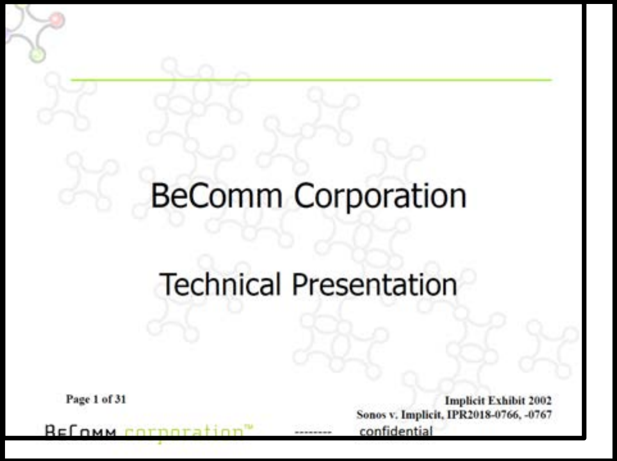
Table Domain Table 300

	301 Node ID	302 ST 1	303 RT 1	304 ST 2	305 RT 2	306 Diff
307	101	2000	1010	1015	2025	1000
308	102	2000	2510	2600	3120	-495

SONOS EXHIBIT 1001
PAGE 1 OF 17 **IPR of U.S. Pat. No. 8,942,252**

’252 Patent

2



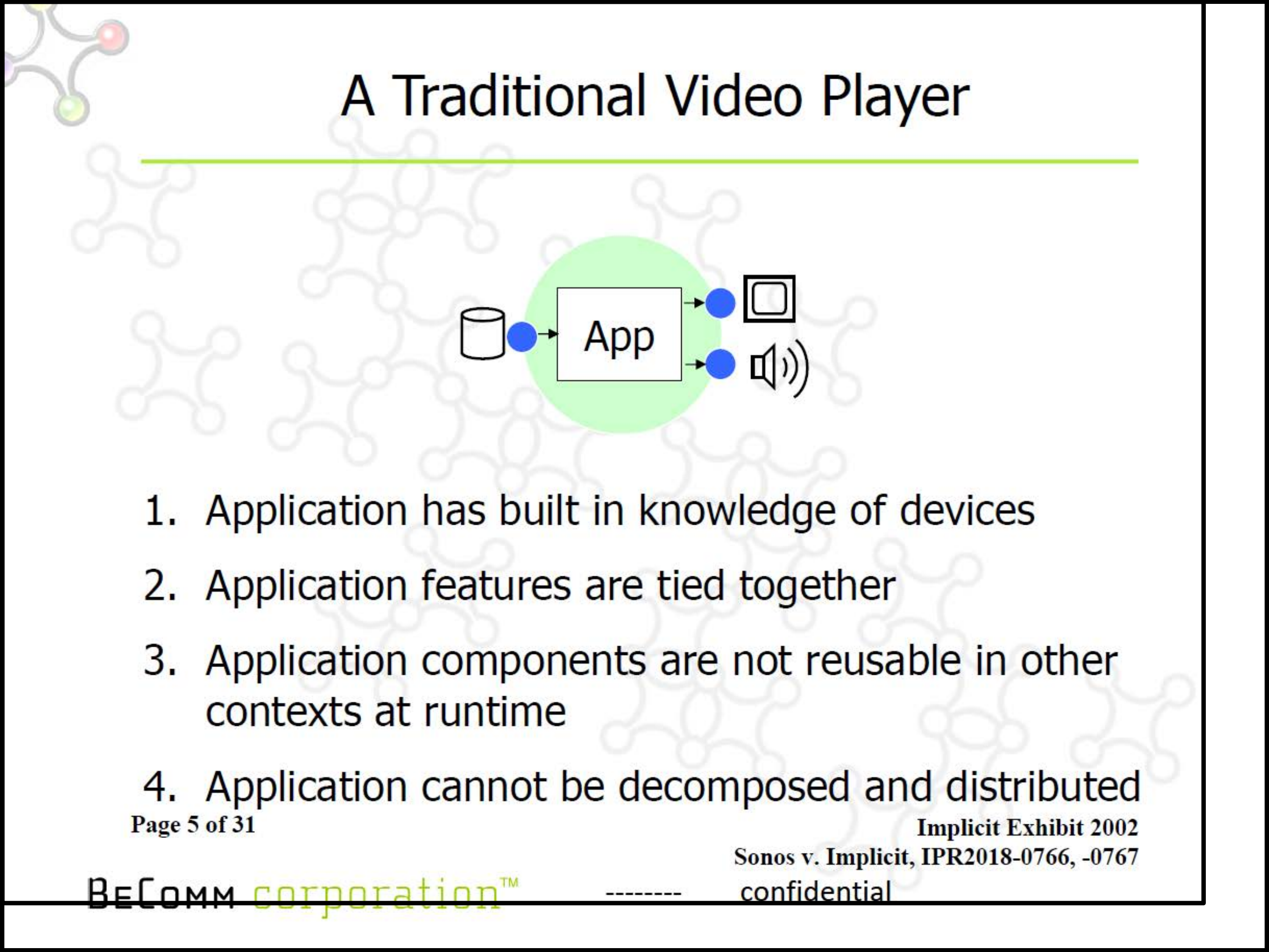
BeComm Corporation

Technical Presentation

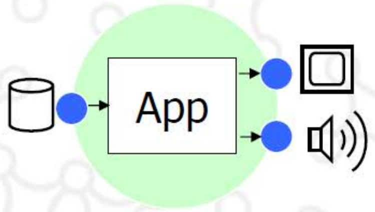
Page 1 of 31

Implicit Exhibit 2002
Sonos v. Implicit, IPR2018-0766, -0767

BeComm corporation™ -------- confidential



A Traditional Video Player



1. Application has built in knowledge of devices
2. Application features are tied together
3. Application components are not reusable in other contexts at runtime
4. Application cannot be decomposed and distributed

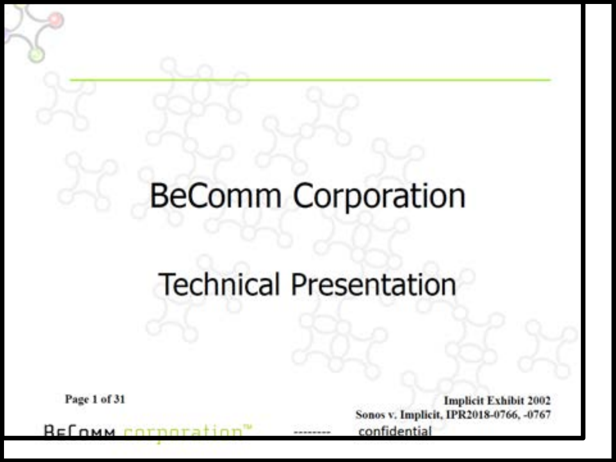
Page 5 of 31

Implicit Exhibit 2002
Sonos v. Implicit, IPR2018-0766, -0767

BeComm corporation™ -------- confidential

3

Exh. 2002 at 5



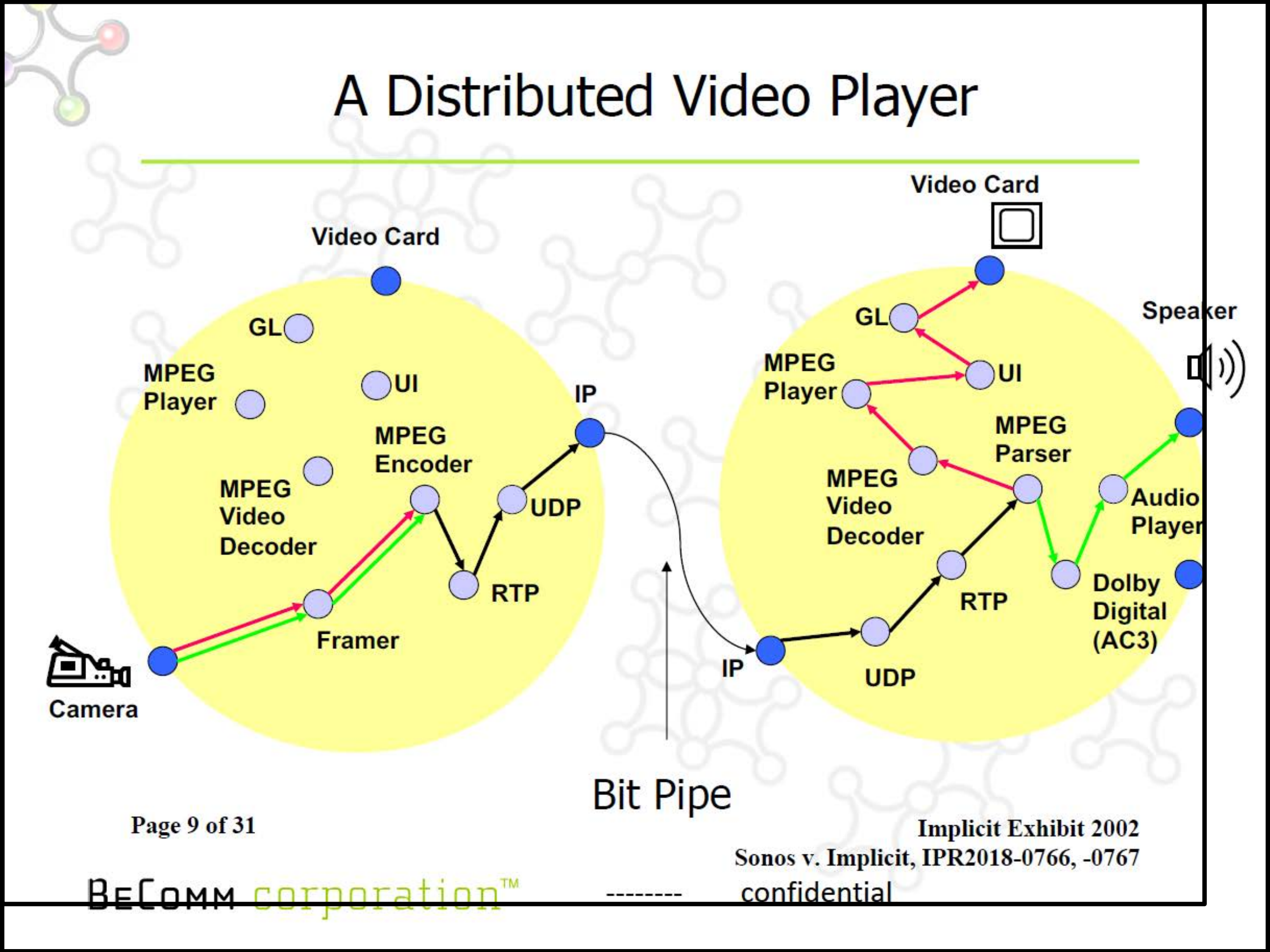
BeComm Corporation

Technical Presentation

Page 1 of 31

Implicit Exhibit 2002
Sonos v. Implicit, IPR2018-0766, -0767

BeComm corporation™ -------- confidential



A Distributed Video Player

Page 9 of 31

Implicit Exhibit 2002
Sonos v. Implicit, IPR2018-0766, -0767

BeComm corporation™ -------- confidential

4

Exh. 2002 at 9

"...you know, the one from the previous millenium that uses VHS tapes."

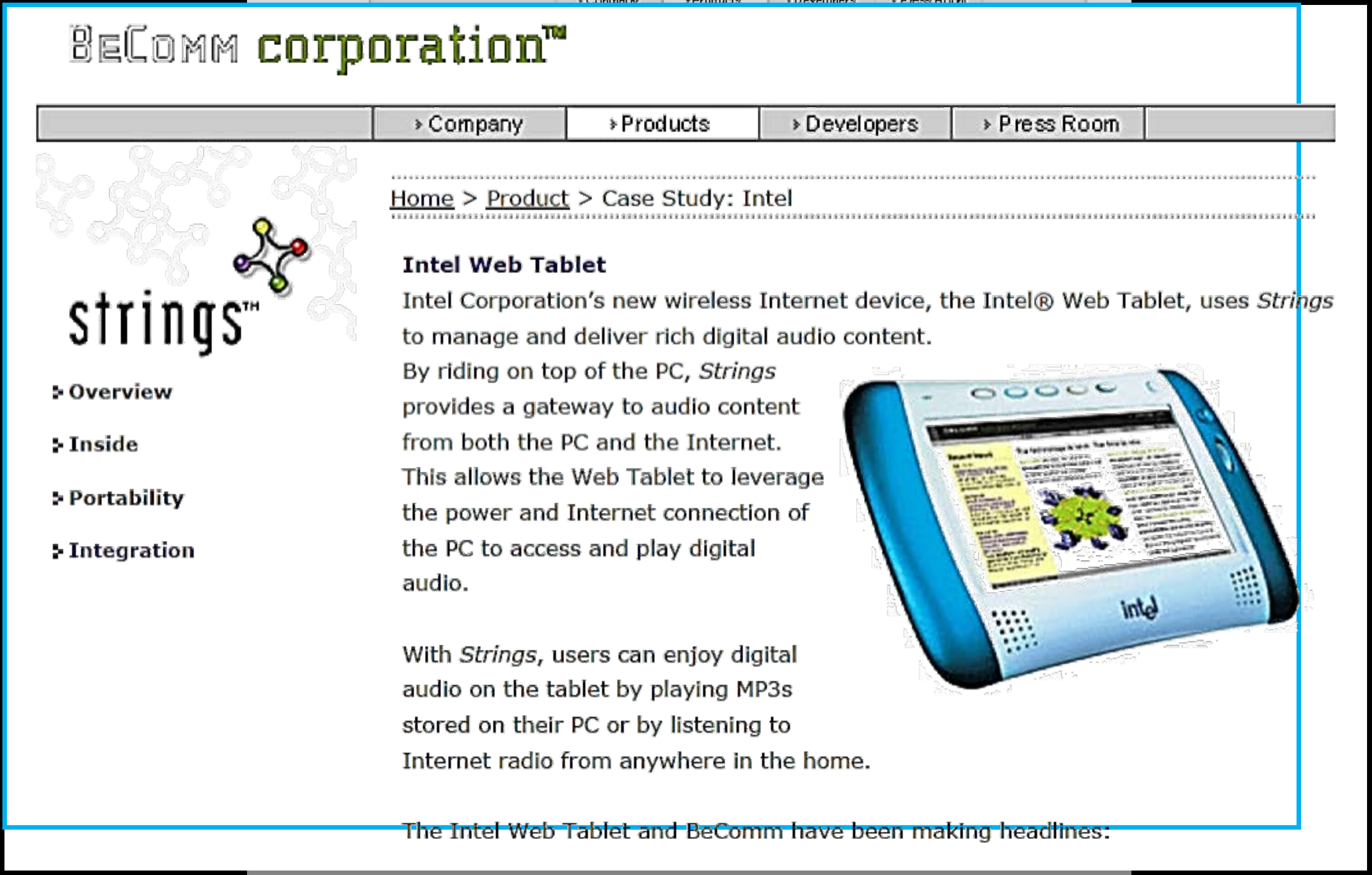
Page 10 of 13

Implicit Exhibit 2004
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2004 at 10

5

Exh. 2005



BeComm corporation™

› Company › Products › Developers › Press Room

strings™

- Overview
- Inside
- Portability
- Integration

Home > Product > Case Study: Intel

Intel Web Tablet

Intel Corporation's new wireless Internet device, the Intel® Web Tablet, uses *Strings* to manage and deliver rich digital audio content. By riding on top of the PC, *Strings* provides a gateway to audio content from both the PC and the Internet. This allows the Web Tablet to leverage the power and Internet connection of the PC to access and play digital audio.

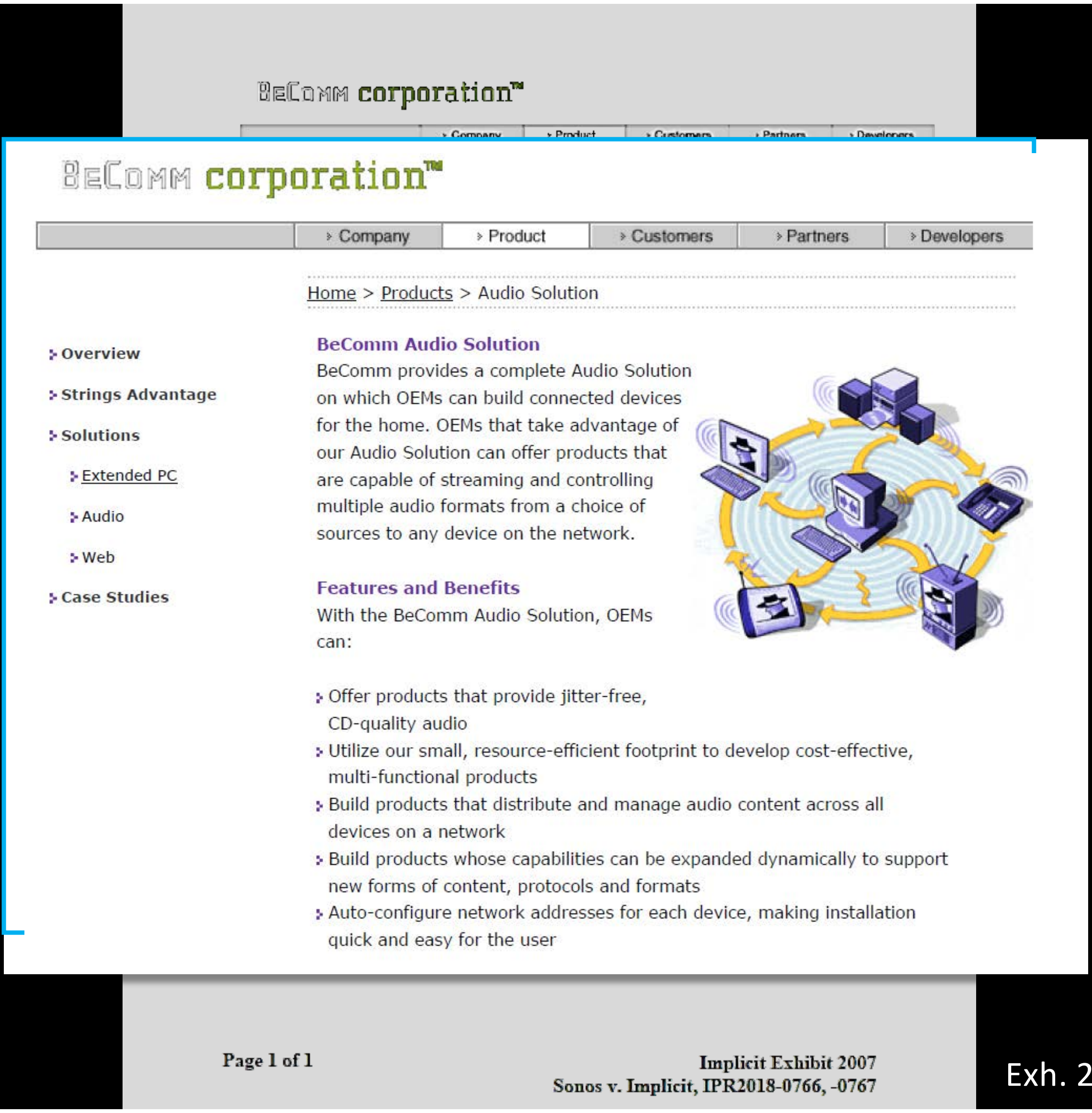
With *Strings*, users can enjoy digital audio on the tablet by playing MP3s stored on their PC or by listening to Internet radio from anywhere in the home.

The Intel Web Tablet and BeComm have been making headlines:

Page 1 of 1

Implicit Exhibit 2006
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2006



BeComm corporation™

› Company › Product › Customers › Partners › Developers

Home > Products > Audio Solution

› Overview

› Strings Advantage

› Solutions

› Extended PC

› Audio

› Web

› Case Studies

BeComm Audio Solution

BeComm provides a complete Audio Solution on which OEMs can build connected devices for the home. OEMs that take advantage of our Audio Solution can offer products that are capable of streaming and controlling multiple audio formats from a choice of sources to any device on the network.

Features and Benefits

With the BeComm Audio Solution, OEMs can:

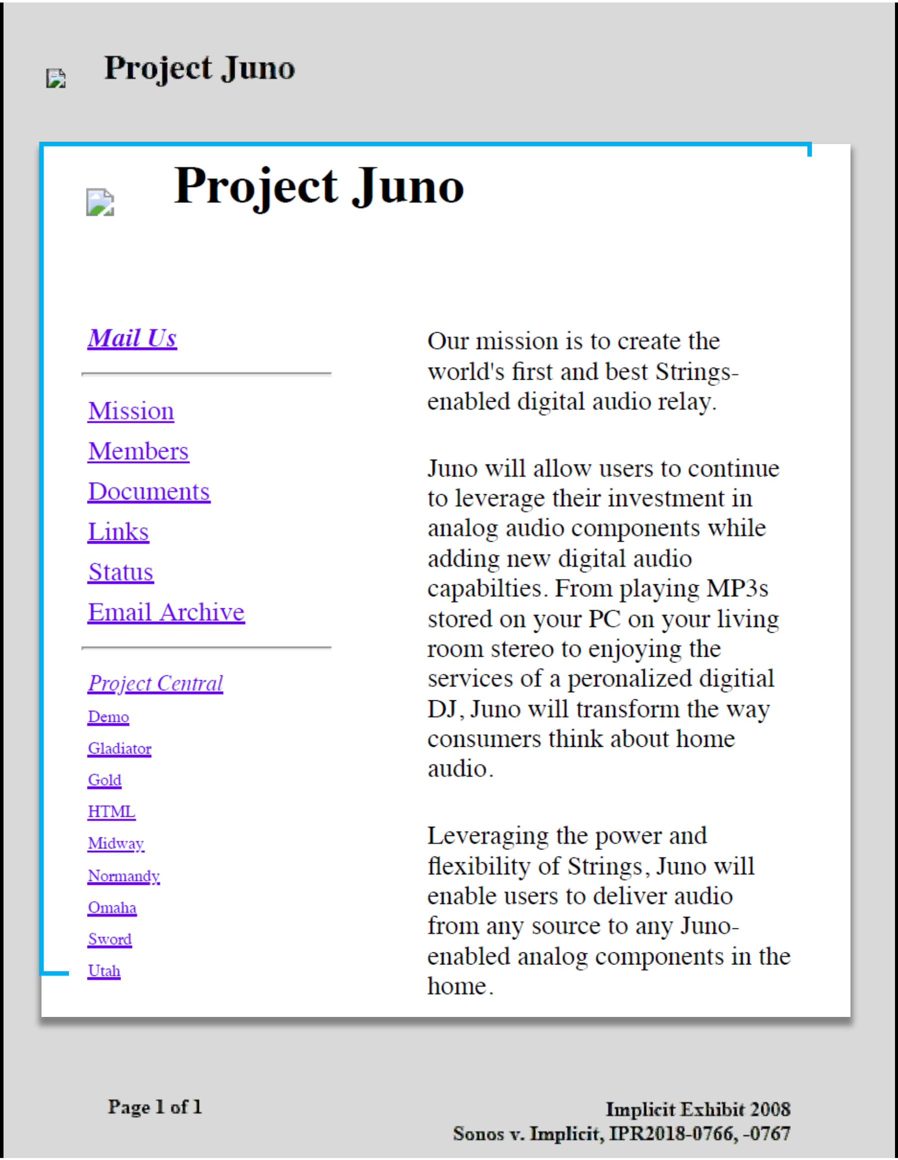
- Offer products that provide jitter-free, CD-quality audio
- Utilize our small, resource-efficient footprint to develop cost-effective, multi-functional products
- Build products that distribute and manage audio content across all devices on a network
- Build products whose capabilities can be expanded dynamically to support new forms of content, protocols and formats
- Auto-configure network addresses for each device, making installation quick and easy for the user

Page 1 of 1

Implicit Exhibit 2007
Sonos v. Implicit, IPR2018-0766, -0767

8

Exh. 2007



Project Juno

Project Juno

Mail Us

Mission
Members
Documents
Links
Status
Email Archive

Project Central
Demo
Gladiator
Gold
HTML
Midway
Normandy
Omaha
Sword
Utah

Our mission is to create the world's first and best Strings-enabled digital audio relay.

Juno will allow users to continue to leverage their investment in analog audio components while adding new digital audio capabilties. From playing MP3s stored on your PC on your living room stereo to enjoying the services of a peronalized digitial DJ, Juno will transform the way consumers think about home audio.

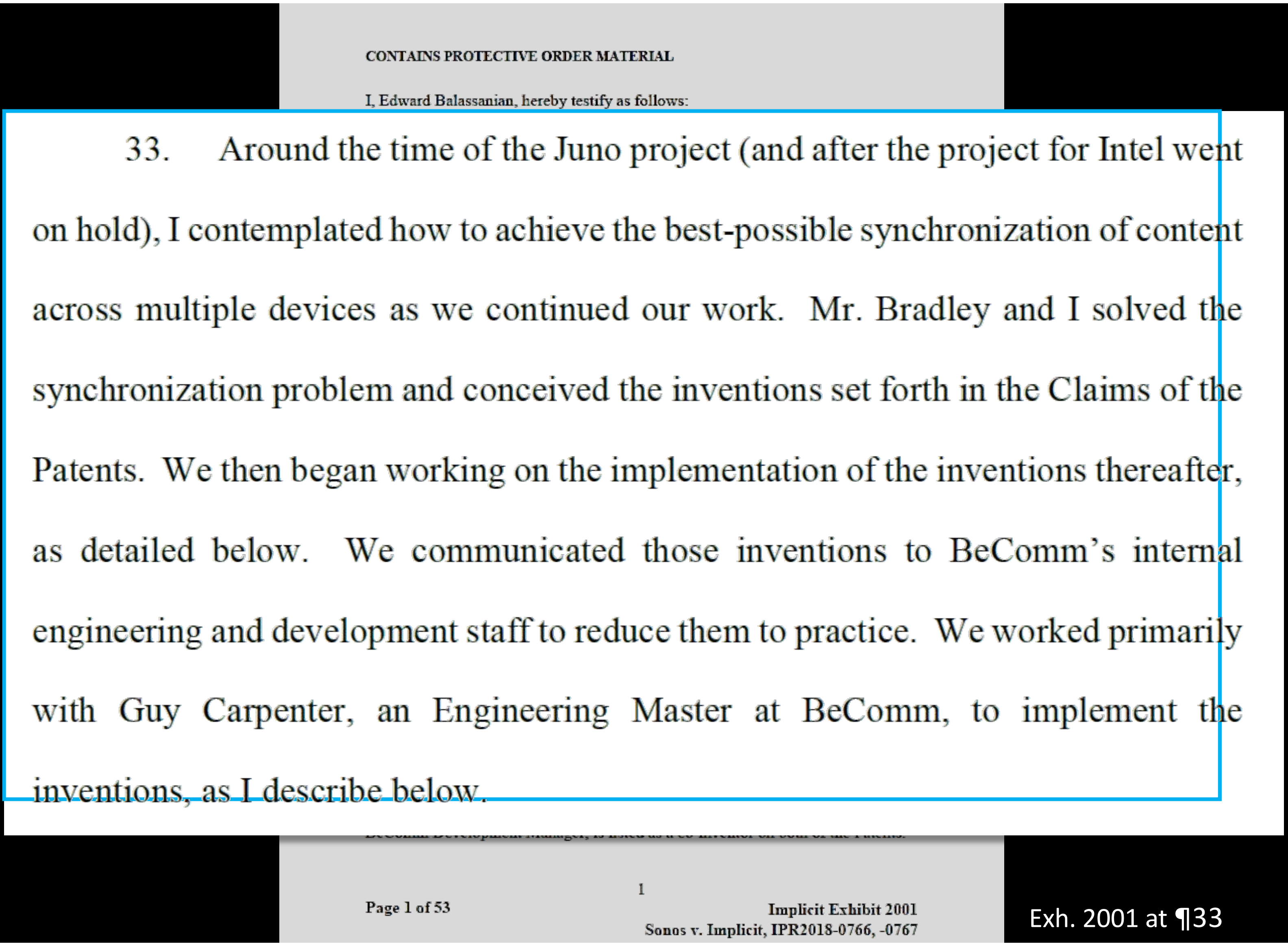
Leveraging the power and flexibility of Strings, Juno will enable users to deliver audio from any source to any Juno-enabled analog components in the home.

Page 1 of 1

Implicit Exhibit 2008
Sonos v. Implicit, IPR2018-0766, -0767

9

Exh. 2008



CONTAINS PROTECTIVE ORDER MATERIAL

I, Edward Balassanian, hereby testify as follows:

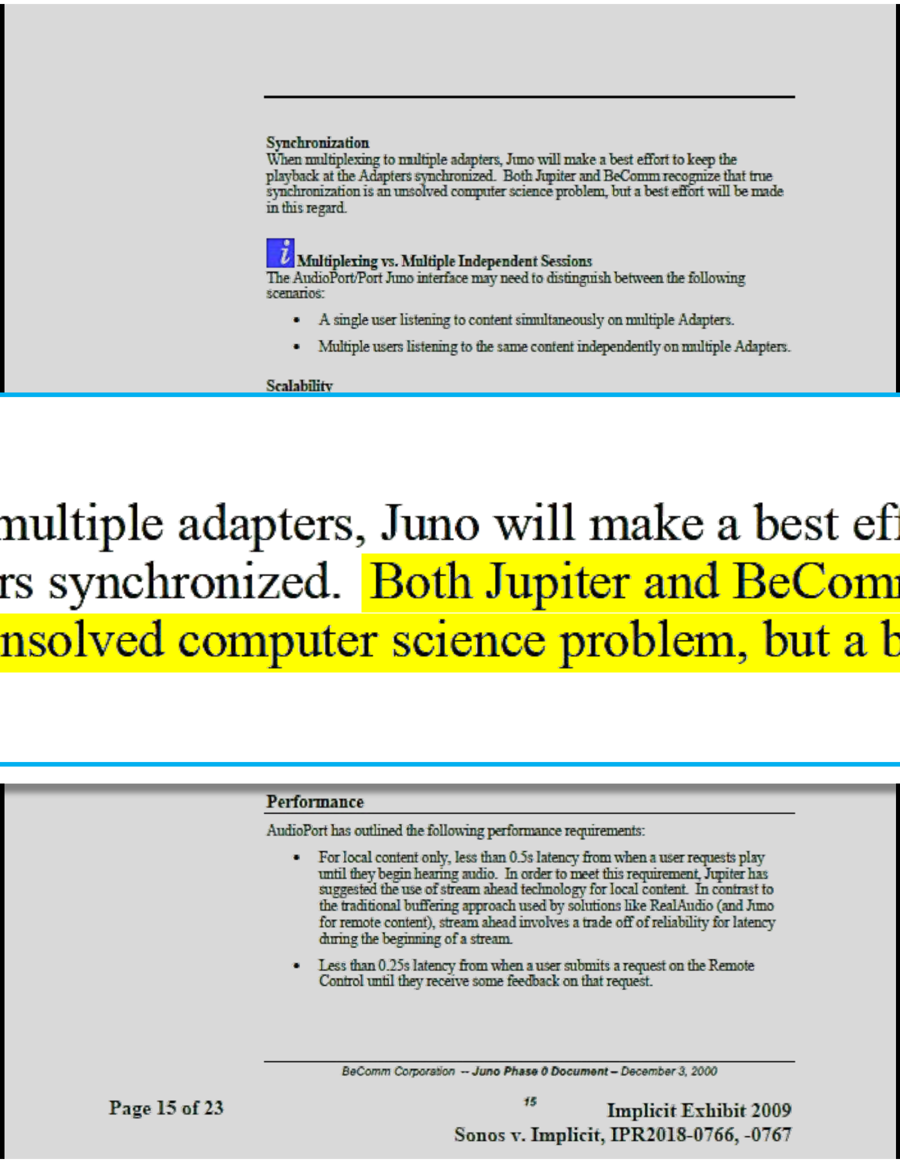
33. Around the time of the Juno project (and after the project for Intel went on hold), I contemplated how to achieve the best-possible synchronization of content across multiple devices as we continued our work. Mr. Bradley and I solved the synchronization problem and conceived the inventions set forth in the Claims of the Patents. We then began working on the implementation of the inventions thereafter, as detailed below. We communicated those inventions to BeComm's internal engineering and development staff to reduce them to practice. We worked primarily with Guy Carpenter, an Engineering Master at BeComm, to implement the inventions, as I describe below.

1

Page 1 of 53

Implicit Exhibit 2001
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2001 at ¶33



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.

Multiplexing vs. Multiple Independent Sessions
The AudioPort/Port Juno interface may need to distinguish between the following scenarios:

- A single user listening to content simultaneously on multiple Adapters.
- Multiple users listening to the same content independently on multiple Adapters.

Scalability

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.

Performance
AudioPort has outlined the following performance requirements:

- For local content only, less than 0.5s latency from when a user requests play until they begin hearing audio. In order to meet this requirement, Jupiter has suggested the use of stream ahead technology for local content. In contrast to the traditional buffering approach used by solutions like RealAudio (and Juno for remote content), stream ahead involves a trade off of reliability for latency during the beginning of a stream.
- Less than 0.25s latency from when a user submits a request on the Remote Control until they receive some feedback on that request.

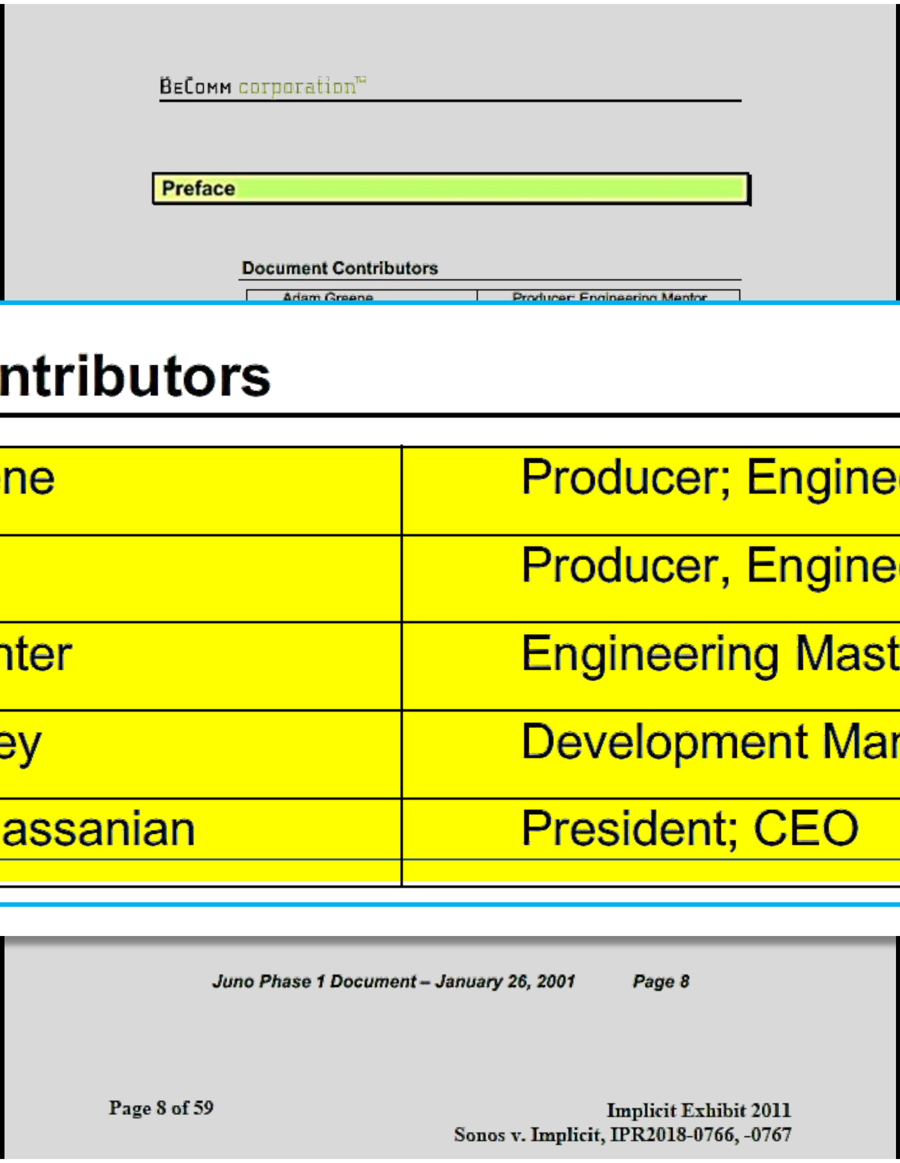
BeComm Corporation -- Juno Phase 0 Document – December 3, 2000

15

Page 15 of 23

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

Exh. 2009 at 15



BeComm corporation™

Preface

Document Contributors

Adam Greene | Producer; Engineering Mentor

Document Contributors

Adam Greene	Producer; Engineering Mentor
Neil Mintz	Producer, Engineering Mentor
Guy Carpenter	Engineering Master
Scott Bradley	Development Manager
Edward Balassanian	President; CEO

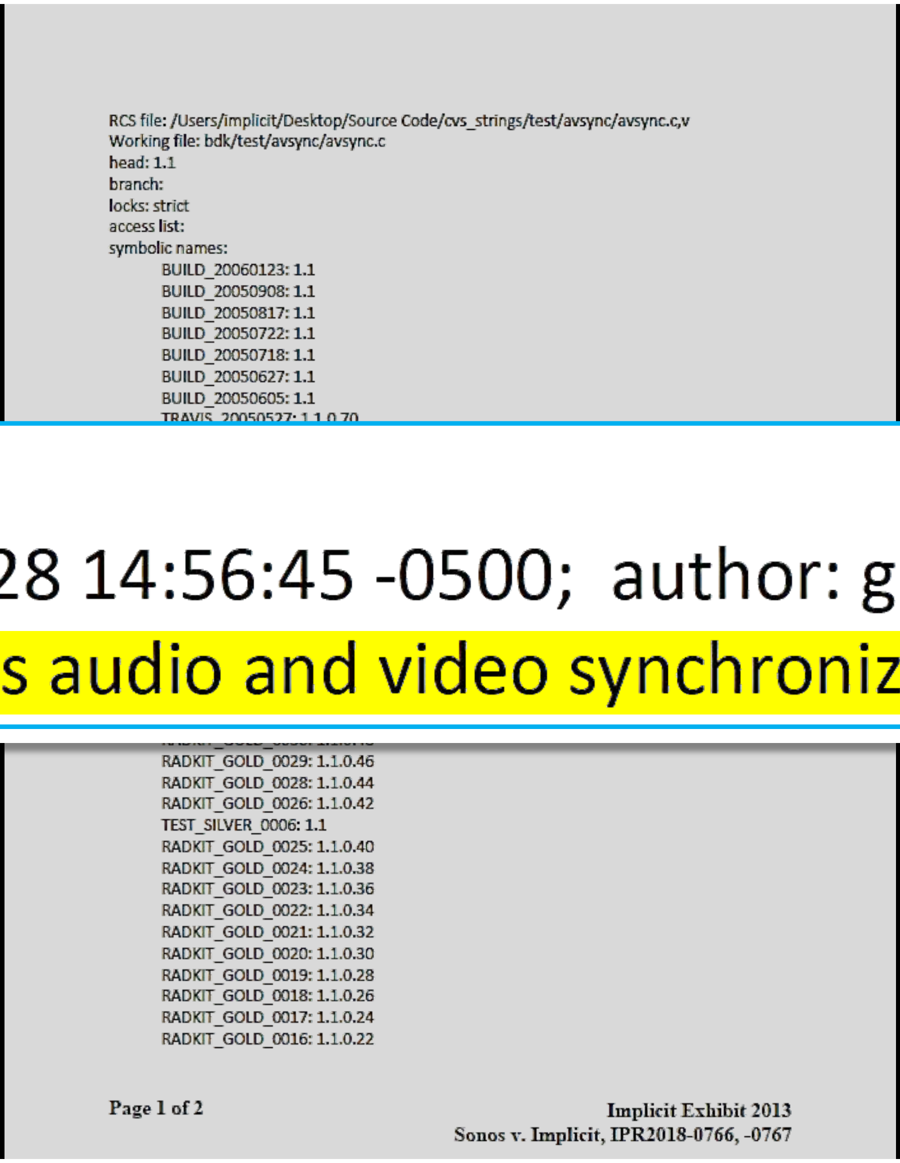
Juno Phase 1 Document – January 26, 2001 Page 8

Page 8 of 59

Implicit Exhibit 2011
Sonos v. Implicit, IPR2018-0766, -0767

12

Exh. 2011 at 8



```
RCS file: /Users/implicit/Desktop/Source Code/cvs_strings/test/avsync/avsync.c,v
Working file: bdk/test/avsync/avsync.c
head: 1.1
branch:
locks: strict
access list:
symbolic names:
        BUILD_20060123: 1.1
        BUILD_20050908: 1.1
        BUILD_20050817: 1.1
        BUILD_20050722: 1.1
        BUILD_20050718: 1.1
        BUILD_20050627: 1.1
        BUILD_20050605: 1.1
        TRAVIS_20050527: 1.1.0.70
```

revision 1.1

date: 2001-08-28 14:56:45 -0500; author: guyc; state: Exp;

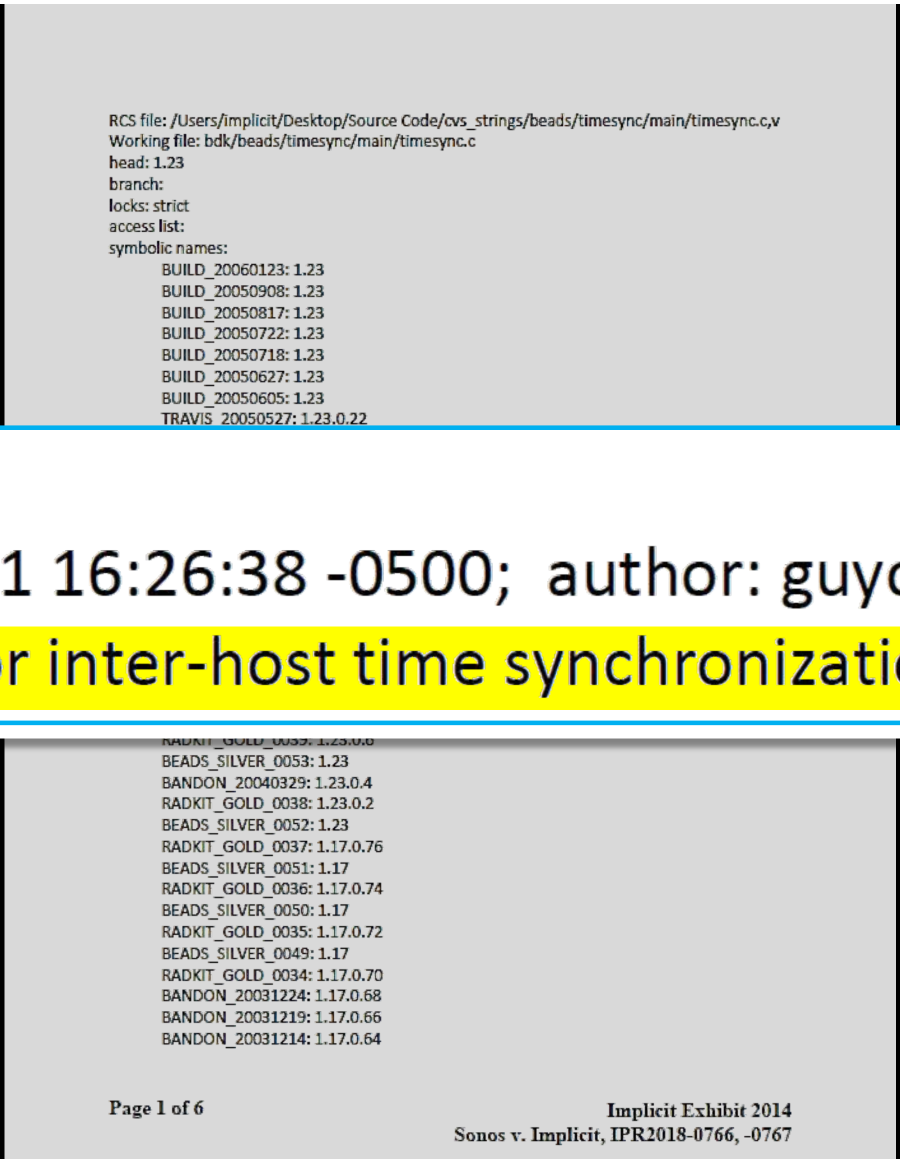
New test checks audio and video synchronization code.

```
        RADKIT_GOLD_0029: 1.1.0.46
        RADKIT_GOLD_0028: 1.1.0.44
        RADKIT_GOLD_0026: 1.1.0.42
        TEST_SILVER_0006: 1.1
        RADKIT_GOLD_0025: 1.1.0.40
        RADKIT_GOLD_0024: 1.1.0.38
        RADKIT_GOLD_0023: 1.1.0.36
        RADKIT_GOLD_0022: 1.1.0.34
        RADKIT_GOLD_0021: 1.1.0.32
        RADKIT_GOLD_0020: 1.1.0.30
        RADKIT_GOLD_0019: 1.1.0.28
        RADKIT_GOLD_0018: 1.1.0.26
        RADKIT_GOLD_0017: 1.1.0.24
        RADKIT_GOLD_0016: 1.1.0.22
```

Page 1 of 2

Implicit Exhibit 2013
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2013 at 2



```
RCS file: /Users/implicit/Desktop/Source Code/cvs_strings/beads/timesync/main/timesync.c,v
Working file: bdk/beads/timesync/main/timesync.c
head: 1.23
branch:
locks: strict
access list:
symbolic names:
        BUILD_20060123: 1.23
        BUILD_20050908: 1.23
        BUILD_20050817: 1.23
        BUILD_20050722: 1.23
        BUILD_20050718: 1.23
        BUILD_20050627: 1.23
        BUILD_20050605: 1.23
        TRAVIS_20050527: 1.23.0.22
```

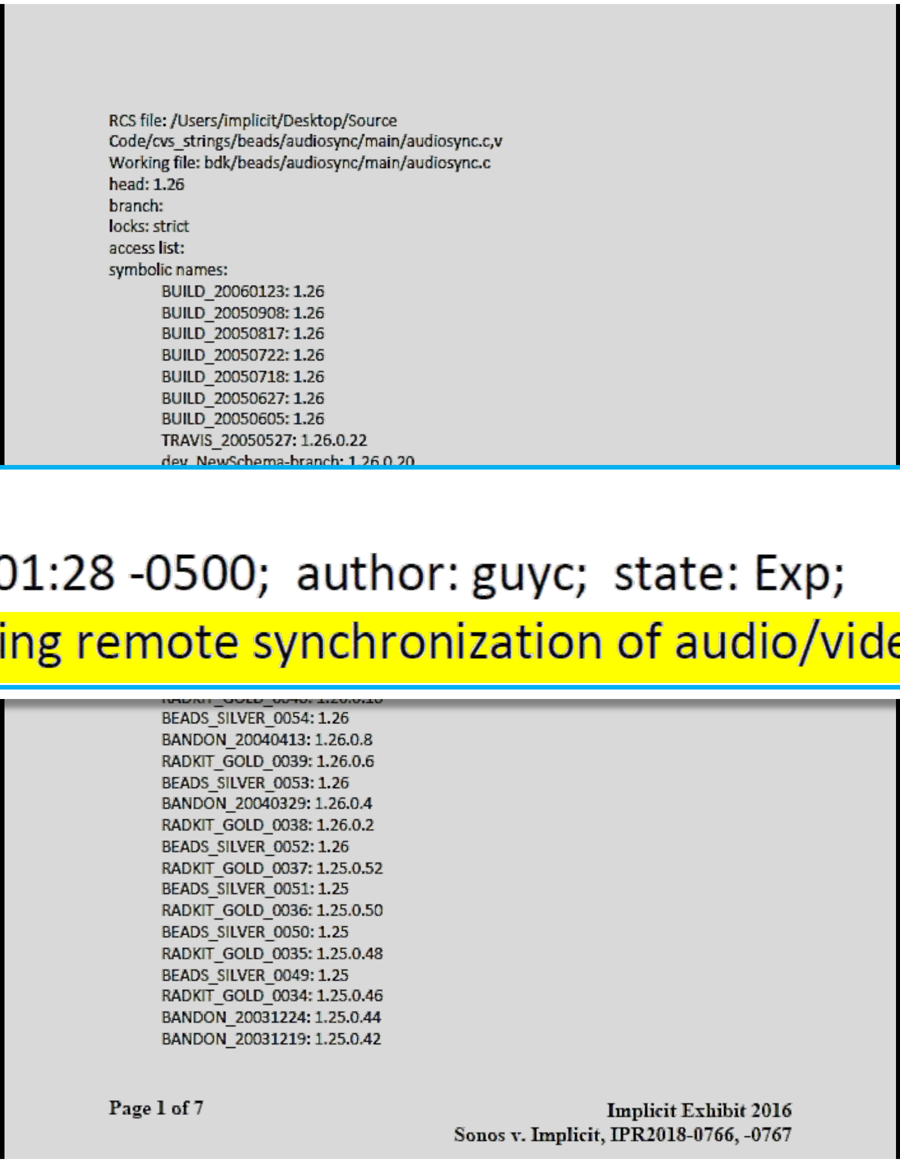
```
revision 1.1
date: 2001-08-31 16:26:38 -0500;  author: guyc;  state: Exp;
New protocol for inter-host time synchronization (incomplete)
```

```
        RADKIT_GOLD_0039: 1.23.0.6
        BEADS_SILVER_0053: 1.23
        BANDON_20040329: 1.23.0.4
        RADKIT_GOLD_0038: 1.23.0.2
        BEADS_SILVER_0052: 1.23
        RADKIT_GOLD_0037: 1.17.0.76
        BEADS_SILVER_0051: 1.17
        RADKIT_GOLD_0036: 1.17.0.74
        BEADS_SILVER_0050: 1.17
        RADKIT_GOLD_0035: 1.17.0.72
        BEADS_SILVER_0049: 1.17
        RADKIT_GOLD_0034: 1.17.0.70
        BANDON_20031224: 1.17.0.68
        BANDON_20031219: 1.17.0.66
        BANDON_20031214: 1.17.0.64
```

Page 1 of 6

Implicit Exhibit 2014
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2014 at 6



```
RCS file: /Users/implicit/Desktop/Source
Code/cvs_strings/beads/audiosync/main/audiosync.c,v
Working file: bdk/beads/audiosync/main/audiosync.c
head: 1.26
branch:
locks: strict
access list:
symbolic names:
        BUILD_20060123: 1.26
        BUILD_20050908: 1.26
        BUILD_20050817: 1.26
        BUILD_20050722: 1.26
        BUILD_20050718: 1.26
        BUILD_20050627: 1.26
        BUILD_20050605: 1.26
        TRAVIS_20050527: 1.26.0.22
        dev_NewSchema-branch: 1.26.0.20
```

revision 1.1

date: 2001-09-10 14:01:28 -0500; author: guyc; state: Exp;

New package for testing remote synchronization of audio/video over the network.

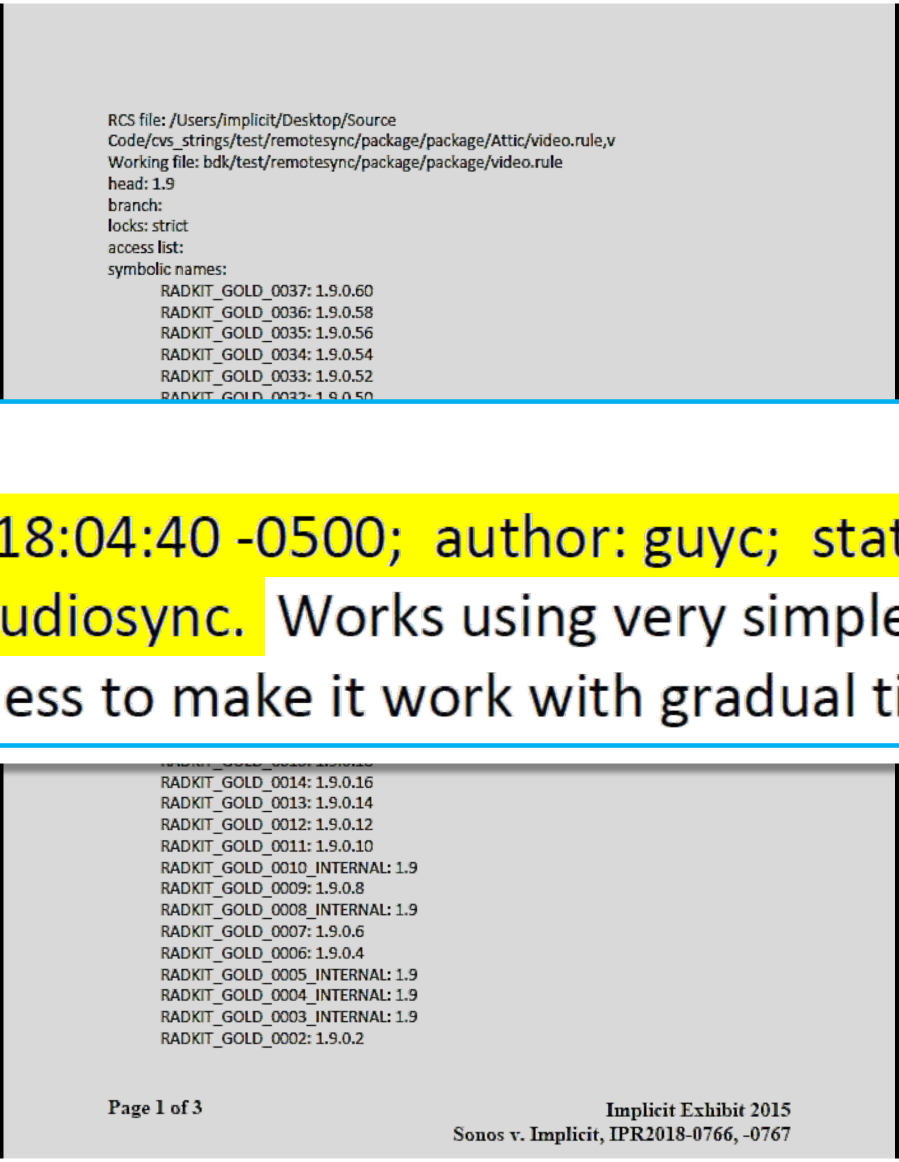
```
        RADKIT_GOLD_0040: 1.26.0.10
        BEADS_SILVER_0054: 1.26
        BANDON_20040413: 1.26.0.8
        RADKIT_GOLD_0039: 1.26.0.6
        BEADS_SILVER_0053: 1.26
        BANDON_20040329: 1.26.0.4
        RADKIT_GOLD_0038: 1.26.0.2
        BEADS_SILVER_0052: 1.26
        RADKIT_GOLD_0037: 1.25.0.52
        BEADS_SILVER_0051: 1.25
        RADKIT_GOLD_0036: 1.25.0.50
        BEADS_SILVER_0050: 1.25
        RADKIT_GOLD_0035: 1.25.0.48
        BEADS_SILVER_0049: 1.25
        RADKIT_GOLD_0034: 1.25.0.46
        BANDON_20031224: 1.25.0.44
        BANDON_20031219: 1.25.0.42
```

Page 1 of 7

Implicit Exhibit 2016
Sonos v. Implicit, IPR2018-0766, -0767

15

Exh. 2015 at 2



```
RCS file: /Users/implicit/Desktop/Source
Code/cvs_strings/test/remotesync/package/package/Attic/video.rule,v
Working file: bdk/test/remotesync/package/package/video.rule
head: 1.9
branch:
locks: strict
access list:
symbolic names:
        RADKIT_GOLD_0037: 1.9.0.60
        RADKIT_GOLD_0036: 1.9.0.58
        RADKIT_GOLD_0035: 1.9.0.56
        RADKIT_GOLD_0034: 1.9.0.54
        RADKIT_GOLD_0033: 1.9.0.52
        RADKIT_GOLD_0032: 1.9.0.50
```

```
        RADKIT_GOLD_0014: 1.9.0.16
        RADKIT_GOLD_0013: 1.9.0.14
        RADKIT_GOLD_0012: 1.9.0.12
        RADKIT_GOLD_0011: 1.9.0.10
        RADKIT_GOLD_0010_INTERNAL: 1.9
        RADKIT_GOLD_0009: 1.9.0.8
        RADKIT_GOLD_0008_INTERNAL: 1.9
        RADKIT_GOLD_0007: 1.9.0.6
        RADKIT_GOLD_0006: 1.9.0.4
        RADKIT_GOLD_0005_INTERNAL: 1.9
        RADKIT_GOLD_0004_INTERNAL: 1.9
        RADKIT_GOLD_0003_INTERNAL: 1.9
        RADKIT_GOLD_0002: 1.9.0.2
```

Page 1 of 3

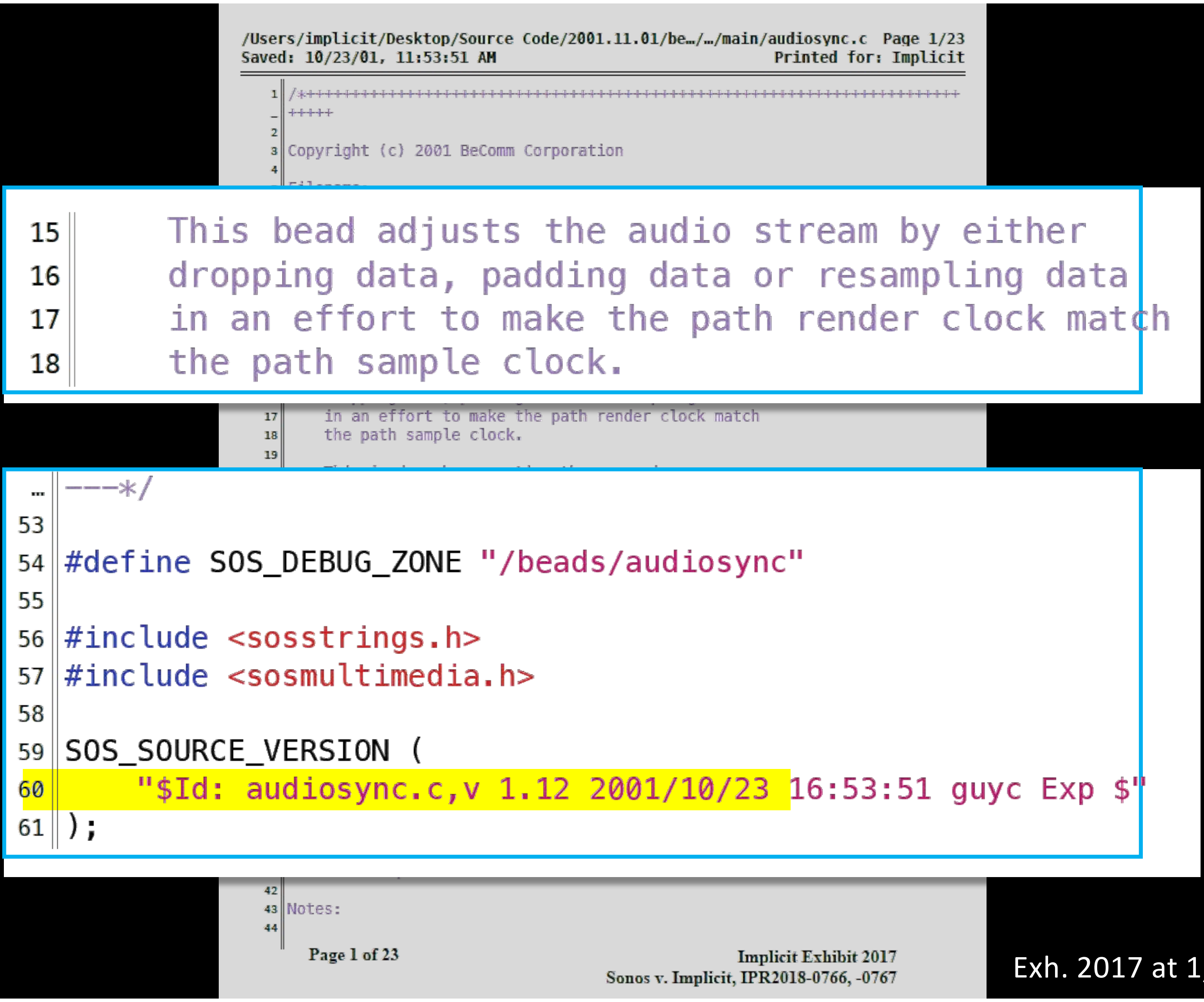
Implicit Exhibit 2015
Sonos v. Implicit, IPR2018-0766, -0767

revision 1.1

date: 2001-09-28 18:04:40 -0500; author: guyc; state: Exp;

Initial checkin of audiosync. Works using very simple silence/dropping logic. Requires finess to make it work with gradual time drift.

Exh. 2016 at 7



```
/Users/implicit/Desktop/Source Code/2001.11.01/be…/…/main/audiosync.c  Page 1/23
Saved: 10/23/01, 11:53:51 AM                                 Printed for: Implicit

/*+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++

Copyright (c) 2001 BeComm Corporation
```

```
        This bead adjusts the audio stream by either
        dropping data, padding data or resampling data
        in an effort to make the path render clock match
        the path sample clock.
```

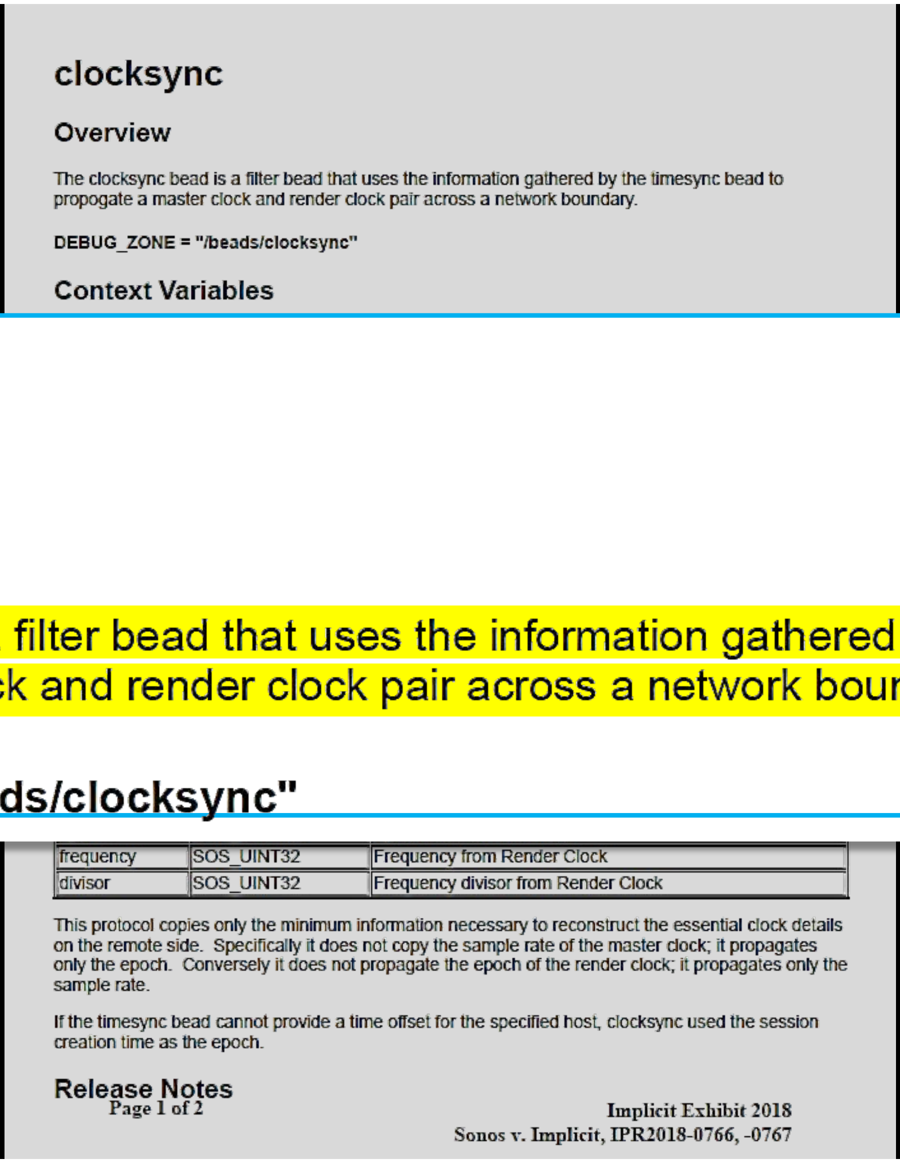
```
---*/

#define SOS_DEBUG_ZONE "/beads/audiosync"

#include <sosstrings.h>
#include <sosmultimedia.h>

SOS_SOURCE_VERSION (
    "$Id: audiosync.c,v 1.12 2001/10/23 16:53:51 guyc Exp $"
);
```

```
    in an effort to make the path render clock match
    the path sample clock.

Notes:
```

Page 1 of 23

Implicit Exhibit 2017
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2017 at 1, 2



clocksync

Overview

The clocksync bead is a filter bead that uses the information gathered by the timesync bead to propogate a master clock and render clock pair across a network boundary.

DEBUG_ZONE = "/beads/clocksync"

Context Variables

frequency	SOS_UINT32	Frequency from Render Clock
divisor	SOS_UINT32	Frequency divisor from Render Clock

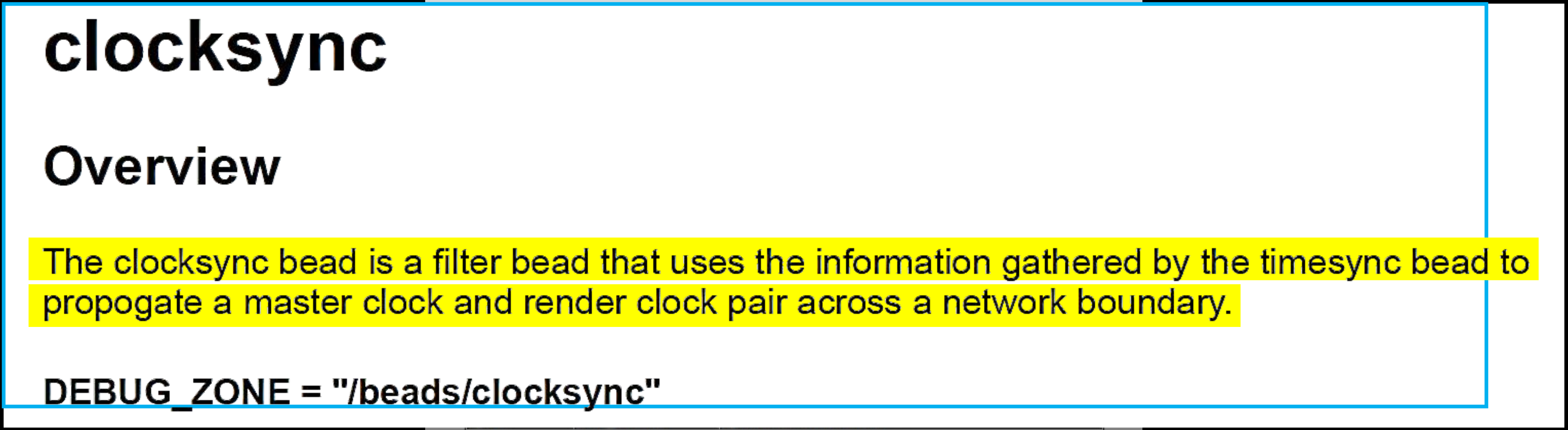
This protocol copies only the minimum information necessary to reconstruct the essential clock details on the remote side. Specifically it does not copy the sample rate of the master clock; it propagates only the epoch. Conversely it does not propagate the epoch of the render clock; it propagates only the sample rate.

If the timesync bead cannot provide a time offset for the specified host, clocksync used the session creation time as the epoch.

Release Notes

Page 1 of 2

Implicit Exhibit 2018
Sonos v. Implicit, IPR2018-0766, -0767



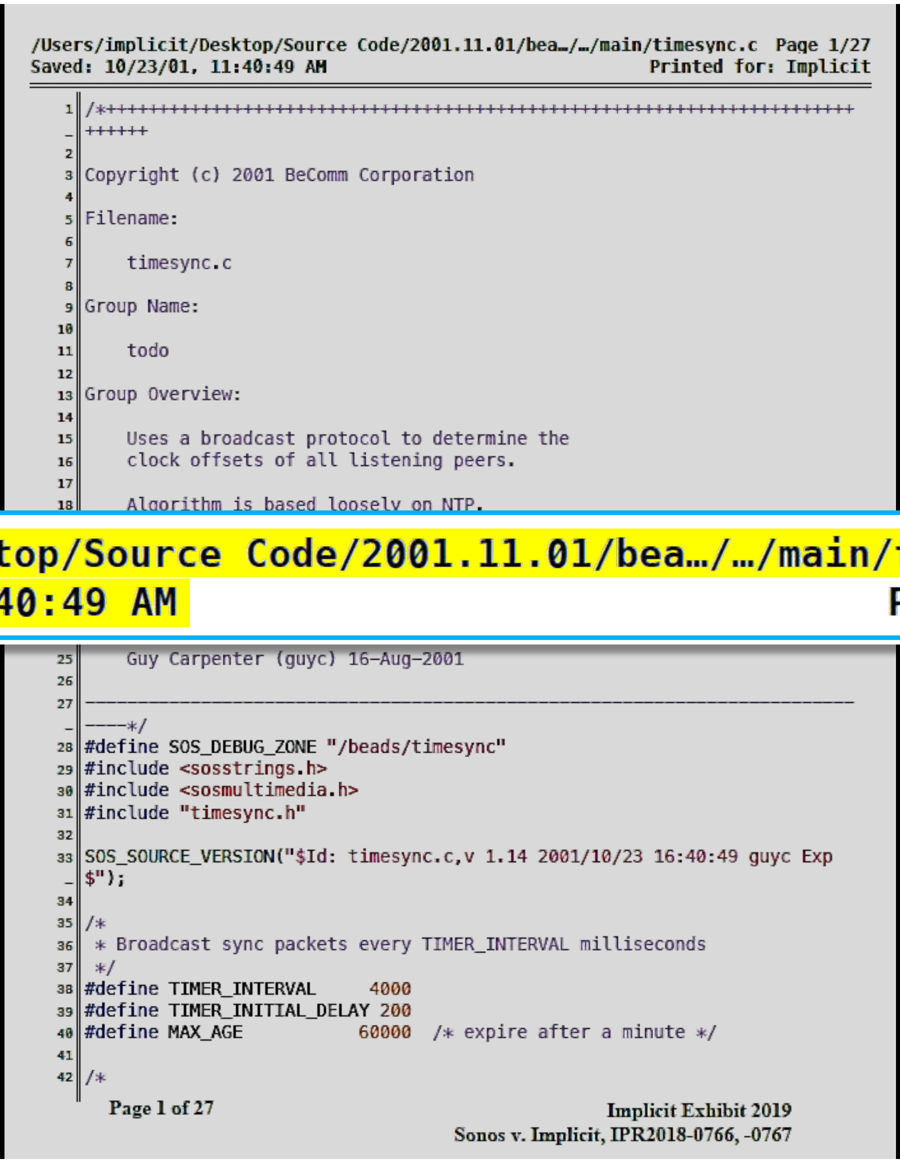
clocksync

Overview

The clocksync bead is a filter bead that uses the information gathered by the timesync bead to propogate a master clock and render clock pair across a network boundary.

DEBUG_ZONE = "/beads/clocksync"

Exh. 2018 at 1



```
/Users/implicit/Desktop/Source Code/2001.11.01/bea…/…/main/timesync.c  Page 1/27
Saved: 10/23/01, 11:40:49 AM                                    Printed for: Implicit
```

```
/*+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++

Copyright (c) 2001 BeComm Corporation

Filename:

    timesync.c

Group Name:

    todo

Group Overview:

    Uses a broadcast protocol to determine the
    clock offsets of all listening peers.

    Algorithm is based loosely on NTP.
```

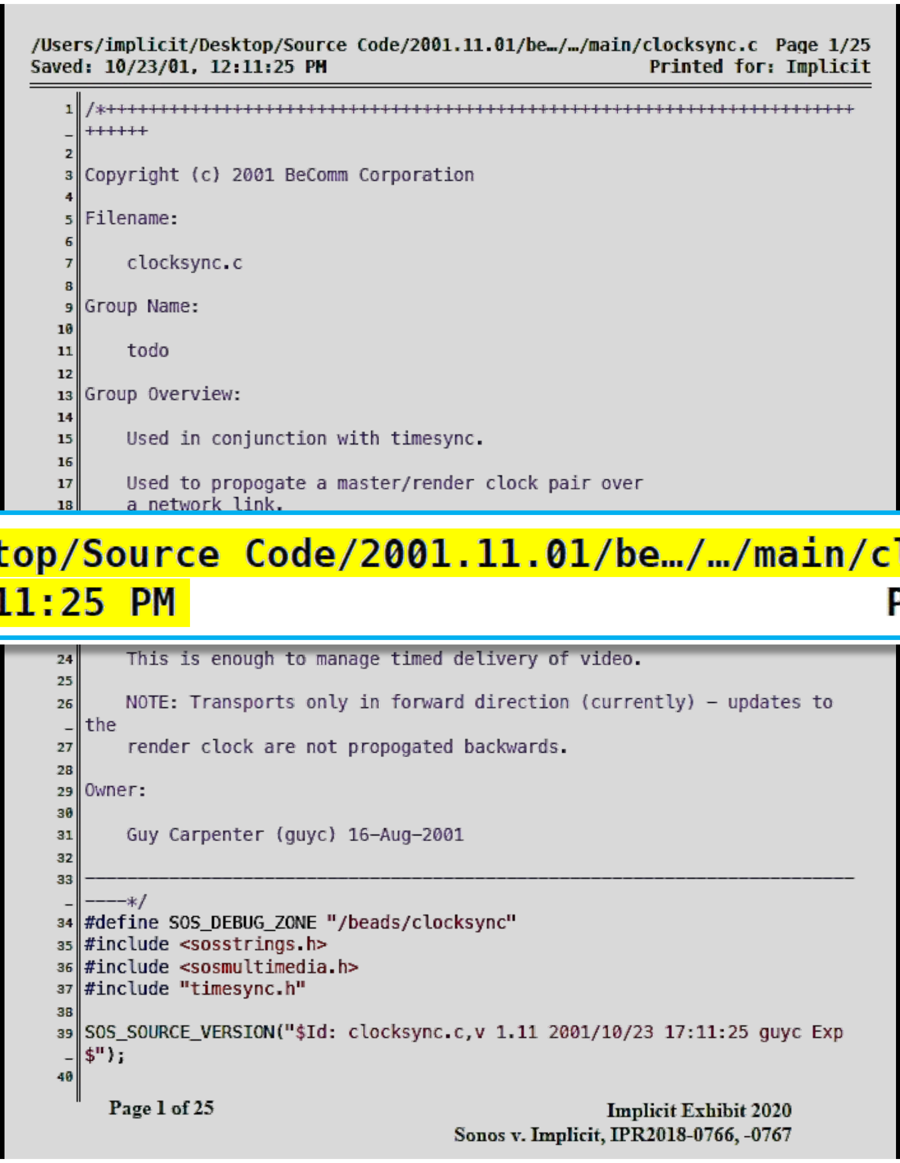
/Users/implicit/Desktop/Source Code/2001.11.01/bea…/…/main/timesync.c Page 1/27
Saved: 10/23/01, 11:40:49 AM Printed for: Implicit

```
    Guy Carpenter (guyc) 16-Aug-2001

--------------------------------------------------------------------------
----*/
#define SOS_DEBUG_ZONE "/beads/timesync"
#include <sosstrings.h>
#include <sosmultimedia.h>
#include "timesync.h"

SOS_SOURCE_VERSION("$Id: timesync.c,v 1.14 2001/10/23 16:40:49 guyc Exp
$");

/*
 * Broadcast sync packets every TIMER_INTERVAL milliseconds
 */
#define TIMER_INTERVAL     4000
#define TIMER_INITIAL_DELAY 200
#define MAX_AGE           60000  /* expire after a minute */

/*
```

Page 1 of 27

Implicit Exhibit 2019
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2019 at 1



/Users/implicit/Desktop/Source Code/2001.11.01/be…/…/main/clocksync.c Page 1/25
Saved: 10/23/01, 12:11:25 PM Printed for: Implicit

```
/*+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Copyright (c) 2001 BeComm Corporation

Filename:

    clocksync.c

Group Name:

    todo

Group Overview:

    Used in conjunction with timesync.

    Used to propogate a master/render clock pair over
    a network link.
```

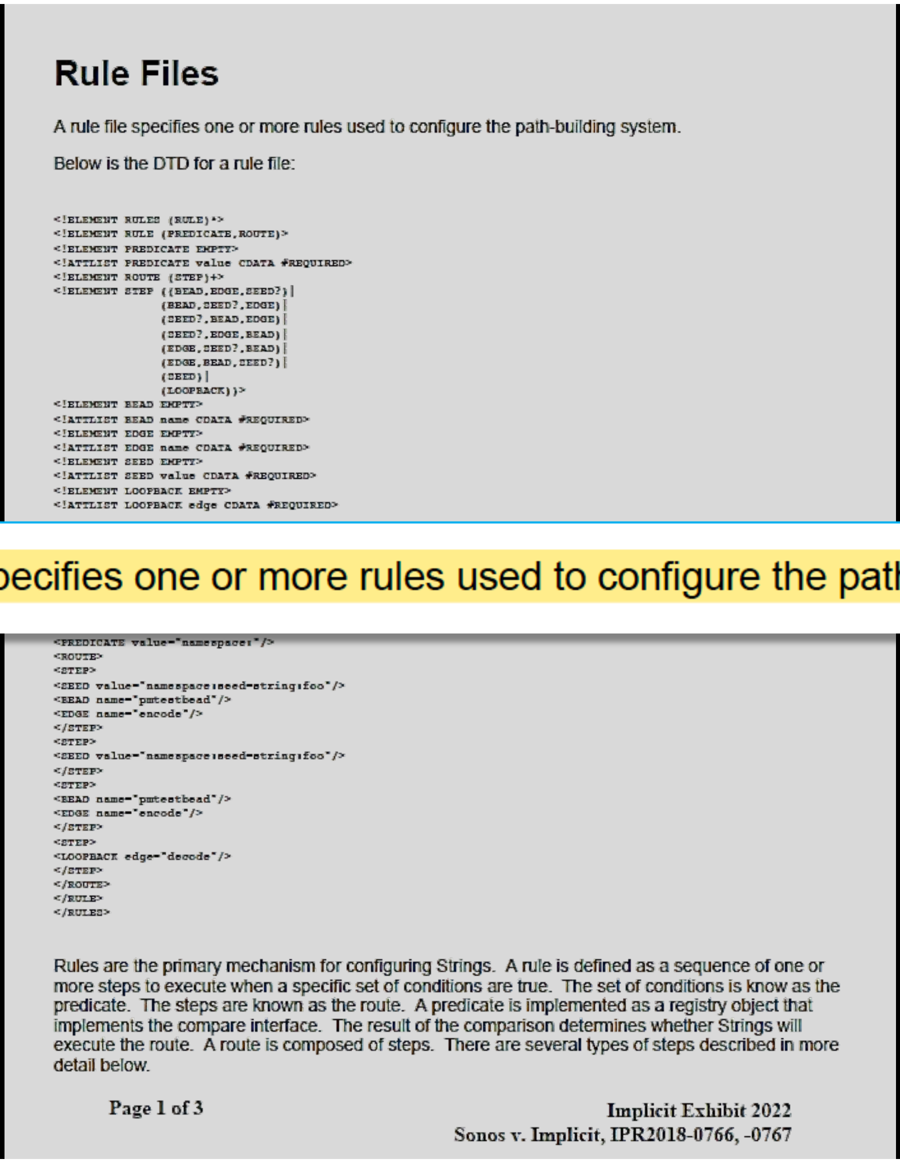
/Users/implicit/Desktop/Source Code/2001.11.01/be…/…/main/clocksync.c Page 1/25
Saved: 10/23/01, 12:11:25 PM Printed for: Implicit

```
    This is enough to manage timed delivery of video.

    NOTE: Transports only in forward direction (currently) - updates to the
    render clock are not propogated backwards.

Owner:

    Guy Carpenter (guyc) 16-Aug-2001

------------------------------------------------------------------------------*/
#define SOS_DEBUG_ZONE "/beads/clocksync"
#include <sosstrings.h>
#include <sosmultimedia.h>
#include "timesync.h"

SOS_SOURCE_VERSION("$Id: clocksync.c,v 1.11 2001/10/23 17:11:25 guyc Exp $");
```

Page 1 of 25

Implicit Exhibit 2020
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2020 at 1



Rule Files

A rule file specifies one or more rules used to configure the path-building system.

Below is the DTD for a rule file:

```
<!ELEMENT RULES (RULE)*>
<!ELEMENT RULE (PREDICATE,ROUTE)>
<!ELEMENT PREDICATE EMPTY>
<!ATTLIST PREDICATE value CDATA #REQUIRED>
<!ELEMENT ROUTE (STEP)+>
<!ELEMENT STEP ((BEAD,EDGE,SEED?)|
               (BEAD,SEED?,EDGE)|
               (SEED?,BEAD,EDGE)|
               (SEED?,EDGE,BEAD)|
               (EDGE,SEED?,BEAD)|
               (EDGE,BEAD,SEED?)|
               (SEED)|
               (LOOPBACK))>
<!ELEMENT BEAD EMPTY>
<!ATTLIST BEAD name CDATA #REQUIRED>
<!ELEMENT EDGE EMPTY>
<!ATTLIST EDGE name CDATA #REQUIRED>
<!ELEMENT SEED EMPTY>
<!ATTLIST SEED value CDATA #REQUIRED>
<!ELEMENT LOOPBACK EMPTY>
<!ATTLIST LOOPBACK edge CDATA #REQUIRED>
```

A rule file specifies one or more rules used to configure the path-building system.

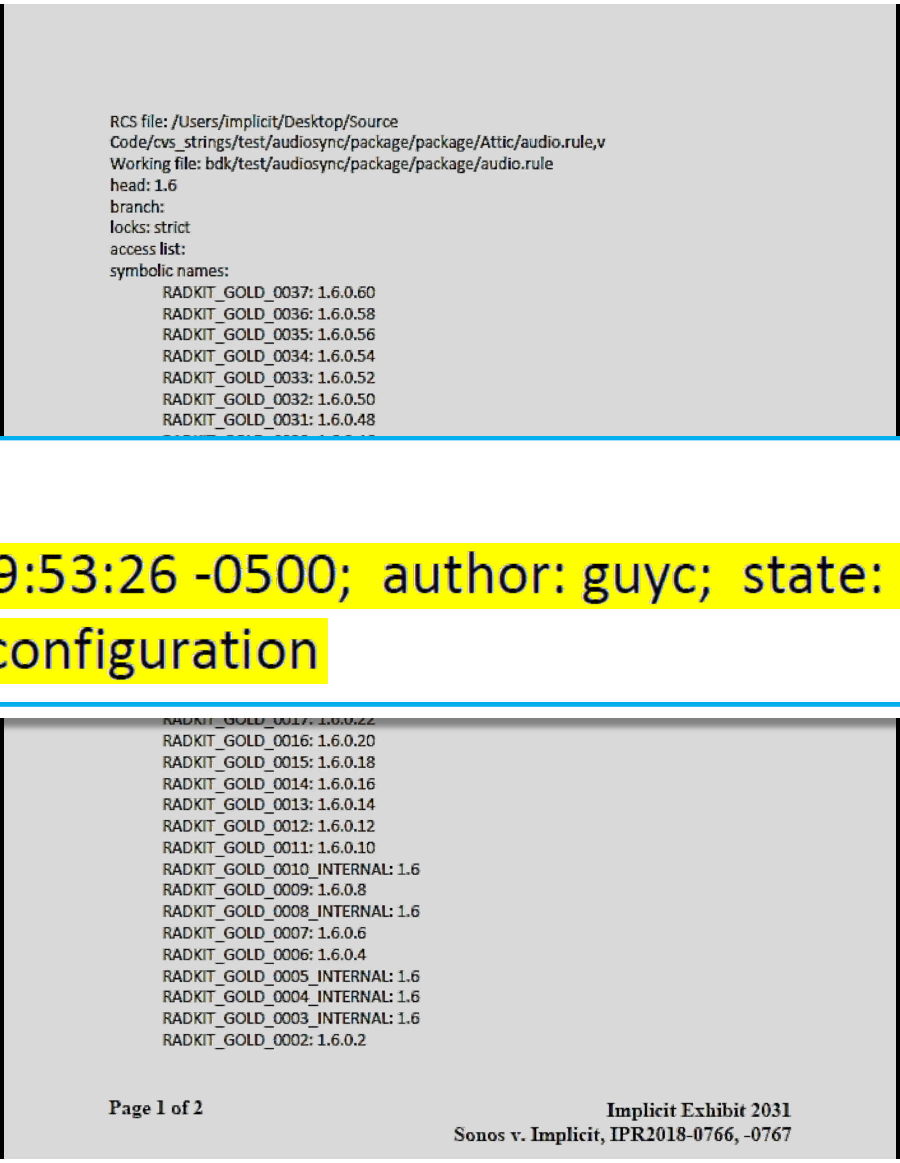
```
<PREDICATE value="namespace:"/>
<ROUTE>
<STEP>
<SEED value="namespace:seed-string:foo"/>
<BEAD name="pmtestbead"/>
<EDGE name="encode"/>
</STEP>
<STEP>
<SEED value="namespace:seed-string:foo"/>
</STEP>
<STEP>
<BEAD name="pmtestbead"/>
<EDGE name="encode"/>
</STEP>
<STEP>
<LOOPBACK edge="decode"/>
</STEP>
</ROUTE>
</RULE>
</RULES>
```

Rules are the primary mechanism for configuring Strings. A rule is defined as a sequence of one or more steps to execute when a specific set of conditions are true. The set of conditions is know as the predicate. The steps are known as the route. A predicate is implemented as a registry object that implements the compare interface. The result of the comparison determines whether Strings will execute the route. A route is composed of steps. There are several types of steps described in more detail below.

Page 1 of 3

Implicit Exhibit 2022
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2022



```
RCS file: /Users/implicit/Desktop/Source
Code/cvs_strings/test/audiosync/package/package/Attic/audio.rule,v
Working file: bdk/test/audiosync/package/package/audio.rule
head: 1.6
branch:
locks: strict
access list:
symbolic names:
        RADKIT_GOLD_0037: 1.6.0.60
        RADKIT_GOLD_0036: 1.6.0.58
        RADKIT_GOLD_0035: 1.6.0.56
        RADKIT_GOLD_0034: 1.6.0.54
        RADKIT_GOLD_0033: 1.6.0.52
        RADKIT_GOLD_0032: 1.6.0.50
        RADKIT_GOLD_0031: 1.6.0.48
```

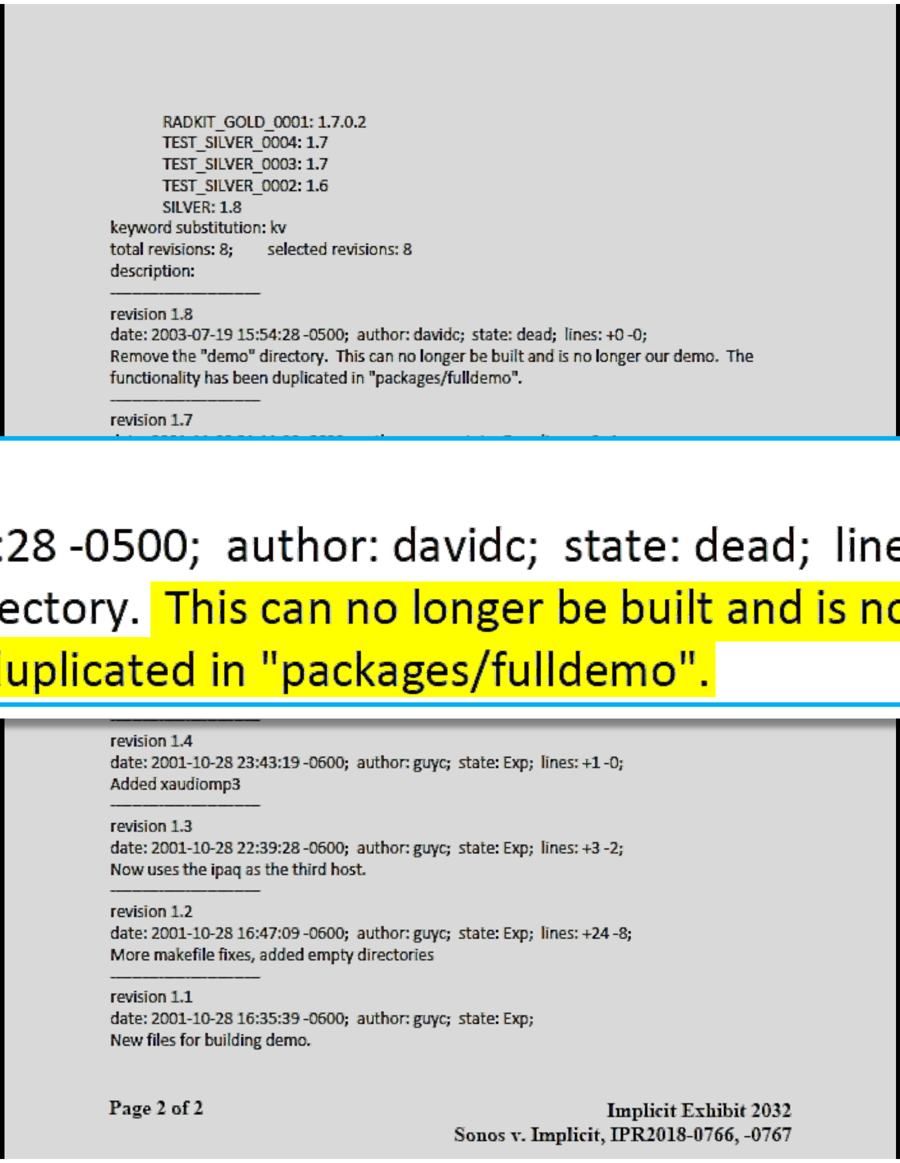
```
revision 1.3
date: 2001-10-10 19:53:26 -0500;  author: guyc;  state: Exp;  lines: +102 -0;
Changes for demo configuration
```

```
        RADKIT_GOLD_0016: 1.6.0.20
        RADKIT_GOLD_0015: 1.6.0.18
        RADKIT_GOLD_0014: 1.6.0.16
        RADKIT_GOLD_0013: 1.6.0.14
        RADKIT_GOLD_0012: 1.6.0.12
        RADKIT_GOLD_0011: 1.6.0.10
        RADKIT_GOLD_0010_INTERNAL: 1.6
        RADKIT_GOLD_0009: 1.6.0.8
        RADKIT_GOLD_0008_INTERNAL: 1.6
        RADKIT_GOLD_0007: 1.6.0.6
        RADKIT_GOLD_0006: 1.6.0.4
        RADKIT_GOLD_0005_INTERNAL: 1.6
        RADKIT_GOLD_0004_INTERNAL: 1.6
        RADKIT_GOLD_0003_INTERNAL: 1.6
        RADKIT_GOLD_0002: 1.6.0.2
```

Page 1 of 2

Implicit Exhibit 2031
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2031 at 2



```
        RADKIT_GOLD_0001: 1.7.0.2
        TEST_SILVER_0004: 1.7
        TEST_SILVER_0003: 1.7
        TEST_SILVER_0002: 1.6
        SILVER: 1.8
keyword substitution: kv
total revisions: 8;     selected revisions: 8
description:
----------------------------
revision 1.8
date: 2003-07-19 15:54:28 -0500;  author: davidc;  state: dead;  lines: +0 -0;
Remove the "demo" directory.  This can no longer be built and is no longer our demo.  The
functionality has been duplicated in "packages/fulldemo".
----------------------------
revision 1.7
```

revision 1.8

date: 2003-07-19 15:54:28 -0500; author: davidc; state: dead; lines: +0 -0;

Remove the "demo" directory. This can no longer be built and is no longer our demo. The functionality has been duplicated in "packages/fulldemo".

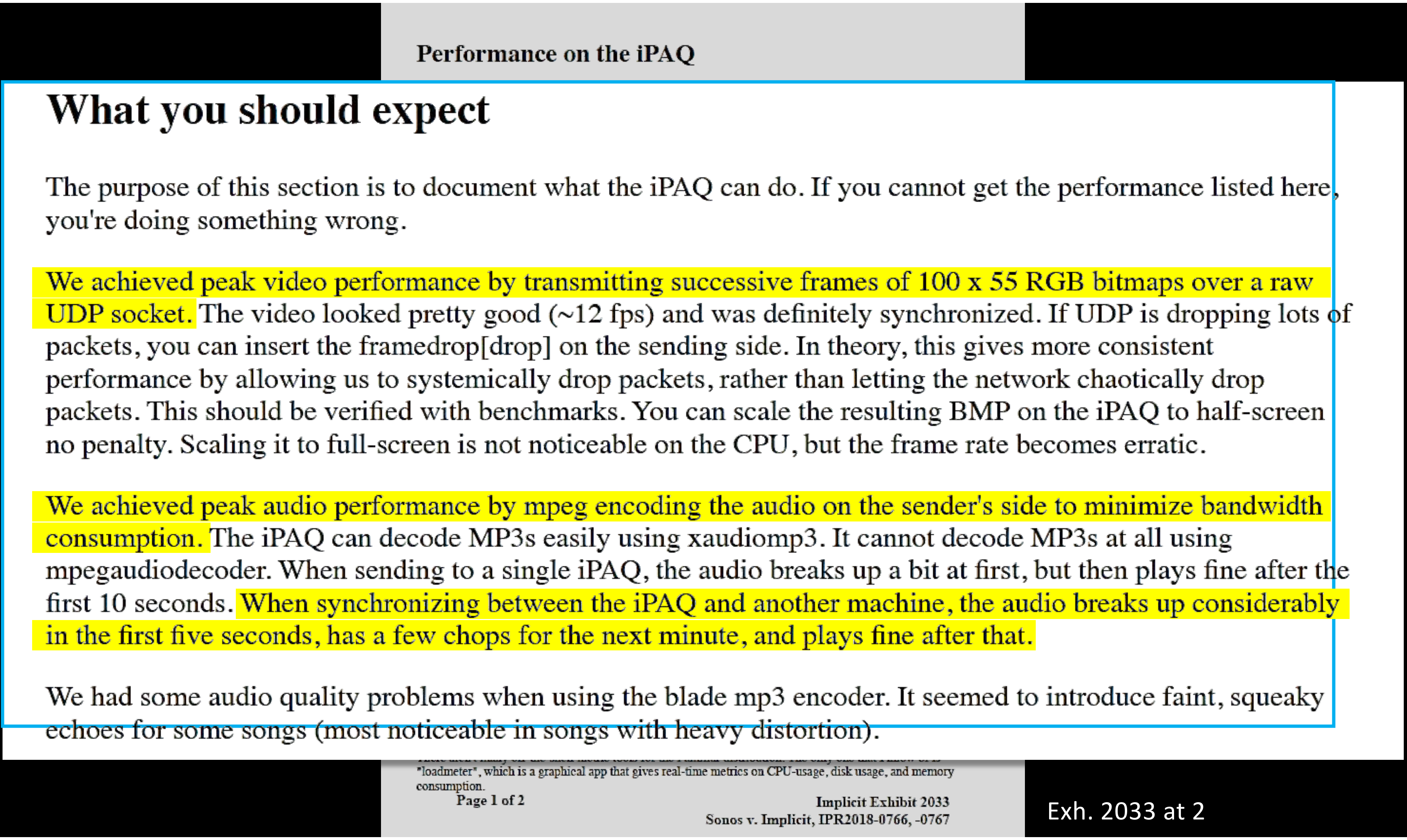
```
----------------------------
revision 1.4
date: 2001-10-28 23:43:19 -0600;  author: guyc;  state: Exp;  lines: +1 -0;
Added xaudiomp3
----------------------------
revision 1.3
date: 2001-10-28 22:39:28 -0600;  author: guyc;  state: Exp;  lines: +3 -2;
Now uses the ipaq as the third host.
----------------------------
revision 1.2
date: 2001-10-28 16:47:09 -0600;  author: guyc;  state: Exp;  lines: +24 -8;
More makefile fixes, added empty directories
----------------------------
revision 1.1
date: 2001-10-28 16:35:39 -0600;  author: guyc;  state: Exp;
New files for building demo.
```

Page 2 of 2

Implicit Exhibit 2032
Sonos v. Implicit, IPR2018-0766, -0767

23

Exh. 2032 at 2



Performance on the iPAQ

What you should expect

The purpose of this section is to document what the iPAQ can do. If you cannot get the performance listed here, you're doing something wrong.

We achieved peak video performance by transmitting successive frames of 100 x 55 RGB bitmaps over a raw UDP socket. The video looked pretty good (~12 fps) and was definitely synchronized. If UDP is dropping lots of packets, you can insert the framedrop[drop] on the sending side. In theory, this gives more consistent performance by allowing us to systemically drop packets, rather than letting the network chaotically drop packets. This should be verified with benchmarks. You can scale the resulting BMP on the iPAQ to half-screen no penalty. Scaling it to full-screen is not noticeable on the CPU, but the frame rate becomes erratic.

We achieved peak audio performance by mpeg encoding the audio on the sender's side to minimize bandwidth consumption. The iPAQ can decode MP3s easily using xaudiomp3. It cannot decode MP3s at all using mpegaudiodecoder. When sending to a single iPAQ, the audio breaks up a bit at first, but then plays fine after the first 10 seconds. When synchronizing between the iPAQ and another machine, the audio breaks up considerably in the first five seconds, has a few chops for the next minute, and plays fine after that.

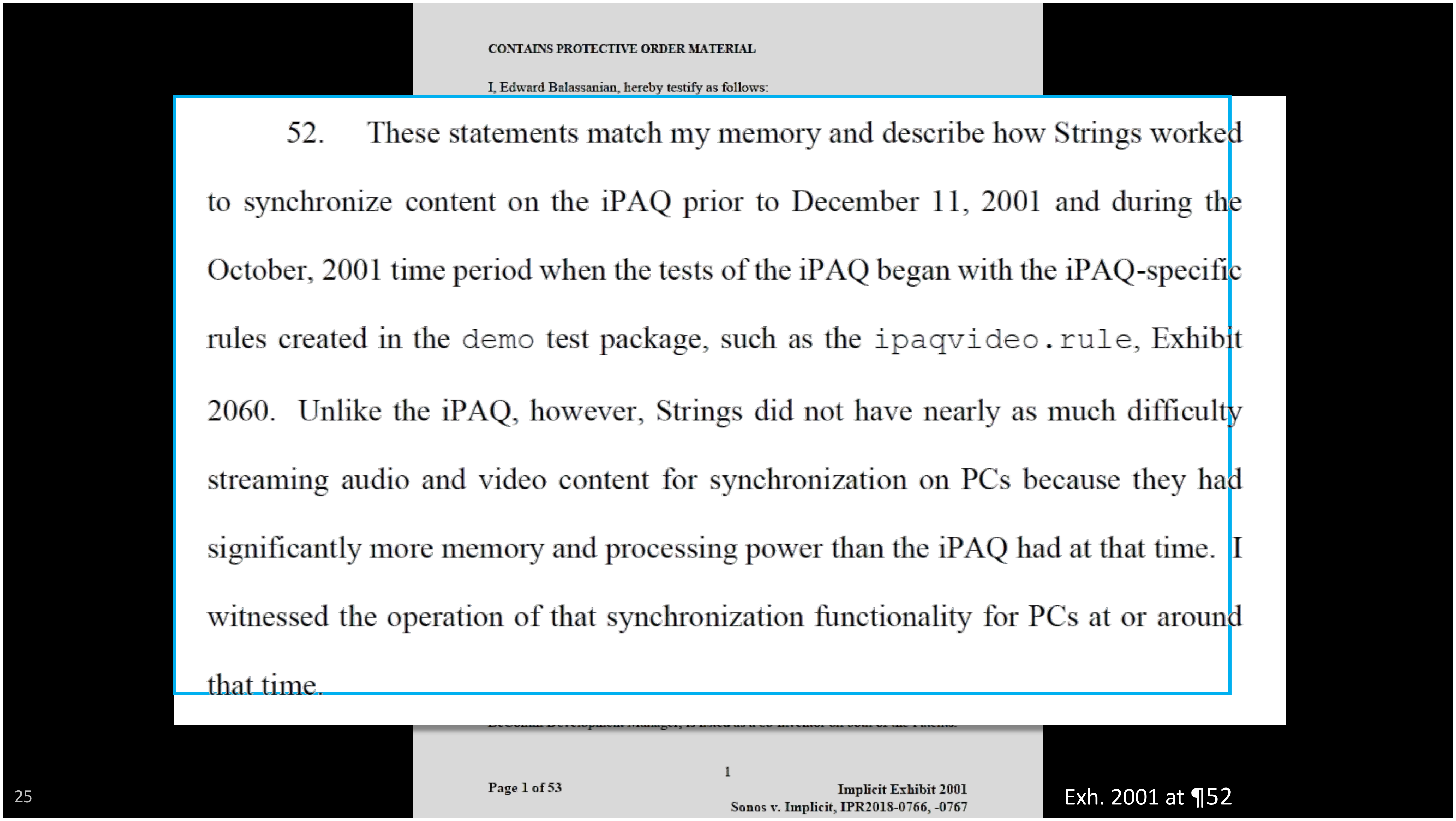
We had some audio quality problems when using the blade mp3 encoder. It seemed to introduce faint, squeaky echoes for some songs (most noticeable in songs with heavy distortion).

"loadmeter", which is a graphical app that gives real-time metrics on CPU-usage, disk usage, and memory consumption.

Page 1 of 2

Implicit Exhibit 2033
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2033 at 2



CONTAINS PROTECTIVE ORDER MATERIAL

I, Edward Balassanian, hereby testify as follows:

52. These statements match my memory and describe how Strings worked to synchronize content on the iPAQ prior to December 11, 2001 and during the October, 2001 time period when the tests of the iPAQ began with the iPAQ-specific rules created in the `demo` test package, such as the `ipaqvideo.rule`, Exhibit 2060. Unlike the iPAQ, however, Strings did not have nearly as much difficulty streaming audio and video content for synchronization on PCs because they had significantly more memory and processing power than the iPAQ had at that time. I witnessed the operation of that synchronization functionality for PCs at or around that time.

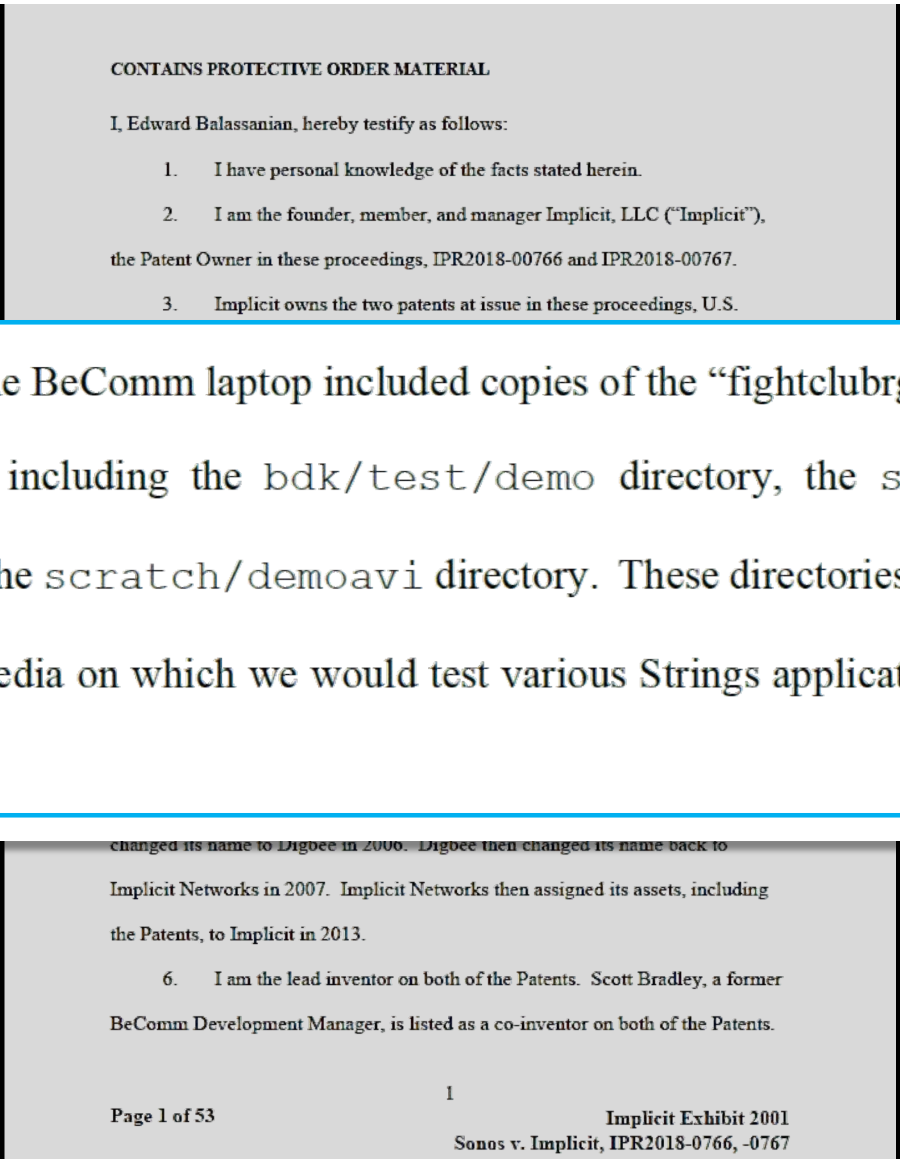
Page 1 of 53

1

Implicit Exhibit 2001
Sonos v. Implicit, IPR2018-0766, -0767

25

Exh. 2001 at ¶52



CONTAINS PROTECTIVE ORDER MATERIAL

I, Edward Balassanian, hereby testify as follows:

1. I have personal knowledge of the facts stated herein.

2. I am the founder, member, and manager Implicit, LLC ("Implicit"), the Patent Owner in these proceedings, IPR2018-00766 and IPR2018-00767.

3. Implicit owns the two patents at issue in these proceedings, U.S.

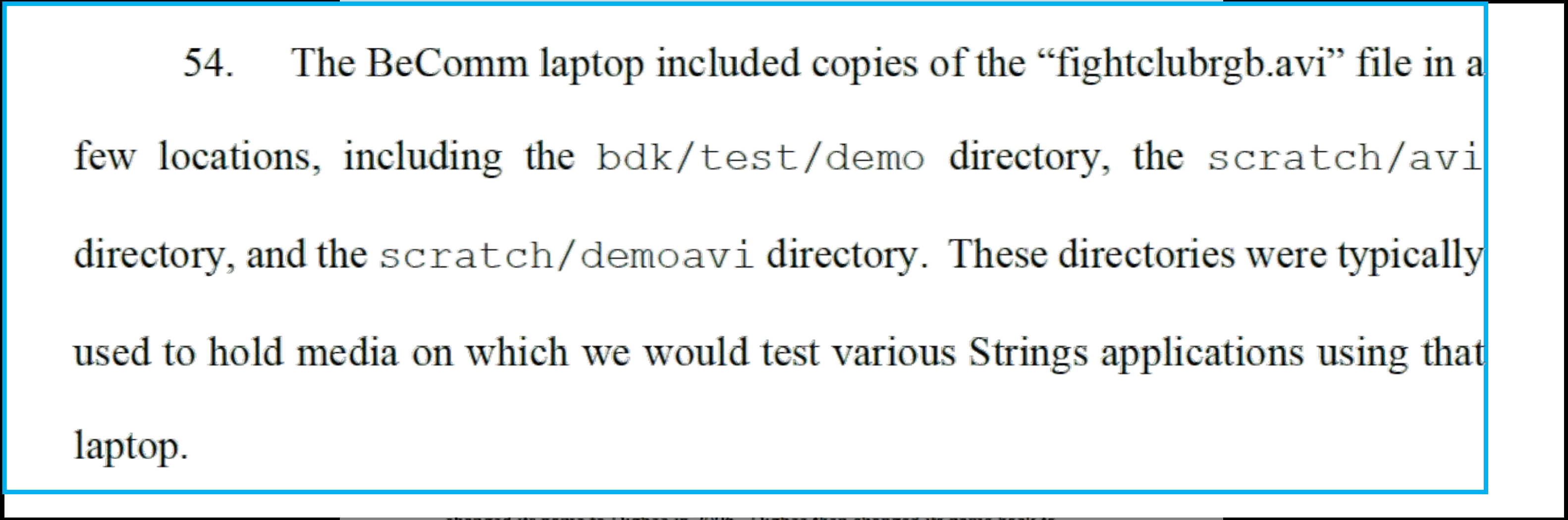
changed its name to Digbee in 2006. Digbee then changed its name back to Implicit Networks in 2007. Implicit Networks then assigned its assets, including the Patents, to Implicit in 2013.

6. I am the lead inventor on both of the Patents. Scott Bradley, a former BeComm Development Manager, is listed as a co-inventor on both of the Patents.

1

Page 1 of 53

Implicit Exhibit 2001
Sonos v. Implicit, IPR2018-0766, -0767



54. The BeComm laptop included copies of the "fightclubrgb.avi" file in a few locations, including the `bdk/test/demo` directory, the `scratch/avi` directory, and the `scratch/demoavi` directory. These directories were typically used to hold media on which we would test various Strings applications using that laptop.

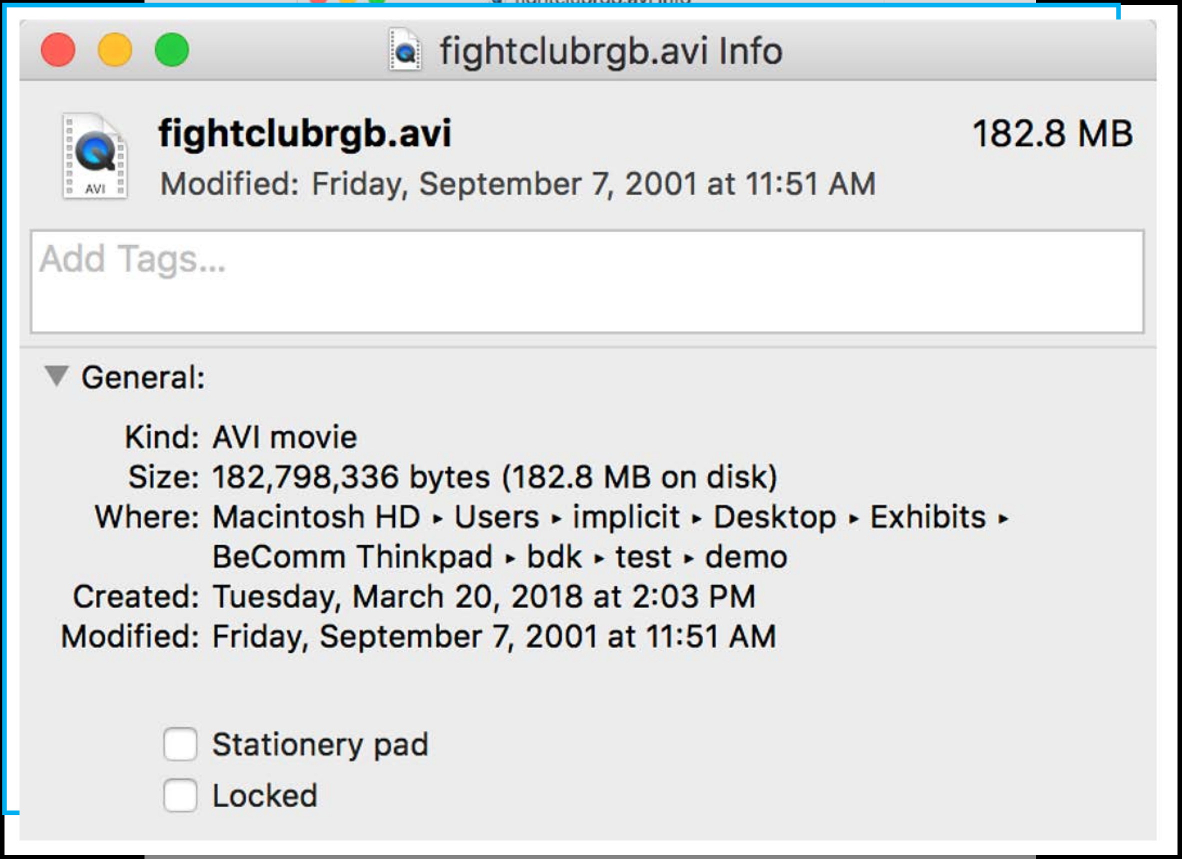
Exh. 2001 at ¶54

Page 1 of 1

Implicit Exhibit 2024
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2024

Exhibit 2024 (fightclubrgb.avi)



fightclubrgb.avi Info

fightclubrgb.avi 182.8 MB

Modified: Friday, September 7, 2001 at 11:51 AM

Add Tags...

General:

Kind: AVI movie
Size: 182,798,336 bytes (182.8 MB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸ BeComm Thinkpad ▸ bdk ▸ test ▸ demo
Created: Tuesday, March 20, 2018 at 2:03 PM
Modified: Friday, September 7, 2001 at 11:51 AM

☐ Stationery pad
☐ Locked

Page 21 of 79 21 Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

28

Exh. 2077 at 21

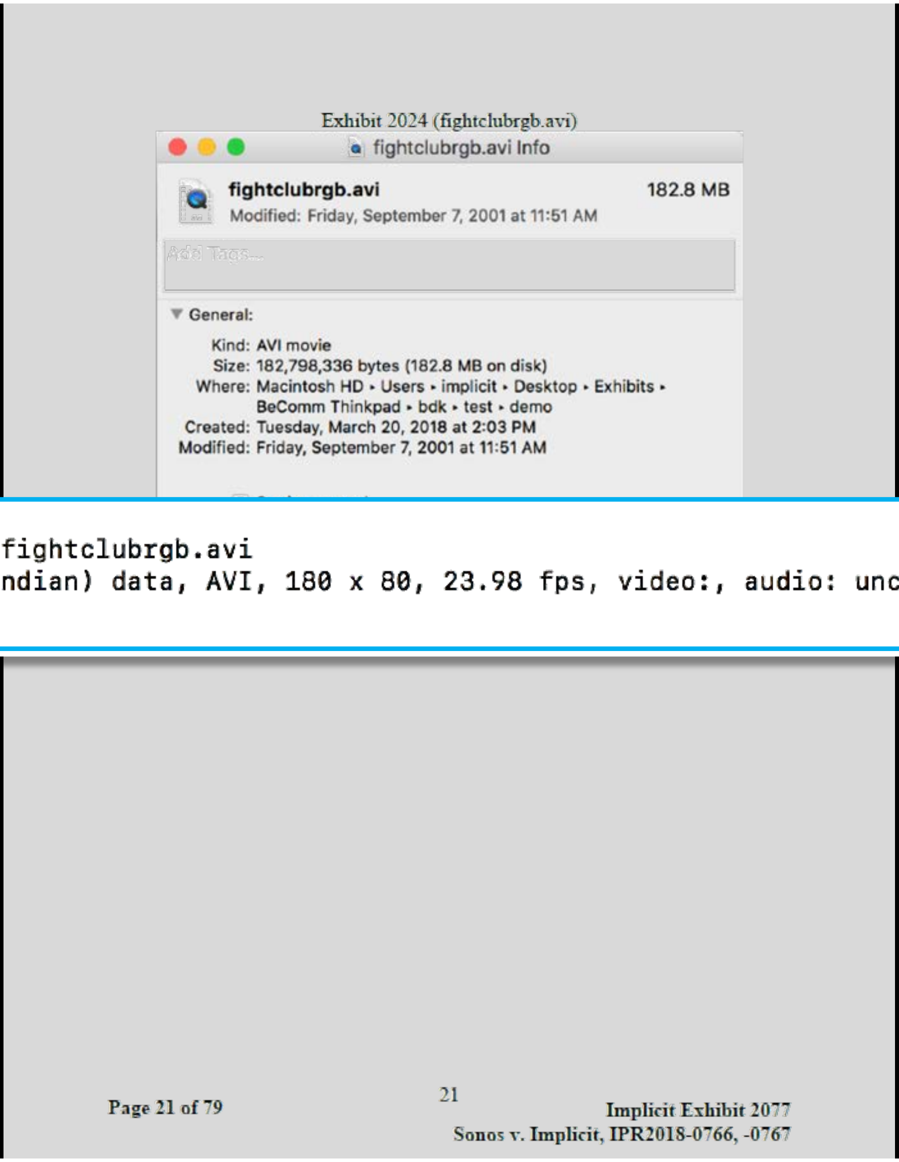


Exhibit 2024 (fightclubrgb.avi)

fightclubrgb.avi Info

fightclubrgb.avi 182.8 MB
Modified: Friday, September 7, 2001 at 11:51 AM

Add Tags...

General:

Kind: AVI movie
Size: 182,798,336 bytes (182.8 MB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸ BeComm Thinkpad ▸ bdk ▸ test ▸ demo
Created: Tuesday, March 20, 2018 at 2:03 PM
Modified: Friday, September 7, 2001 at 11:51 AM

Page 21 of 79

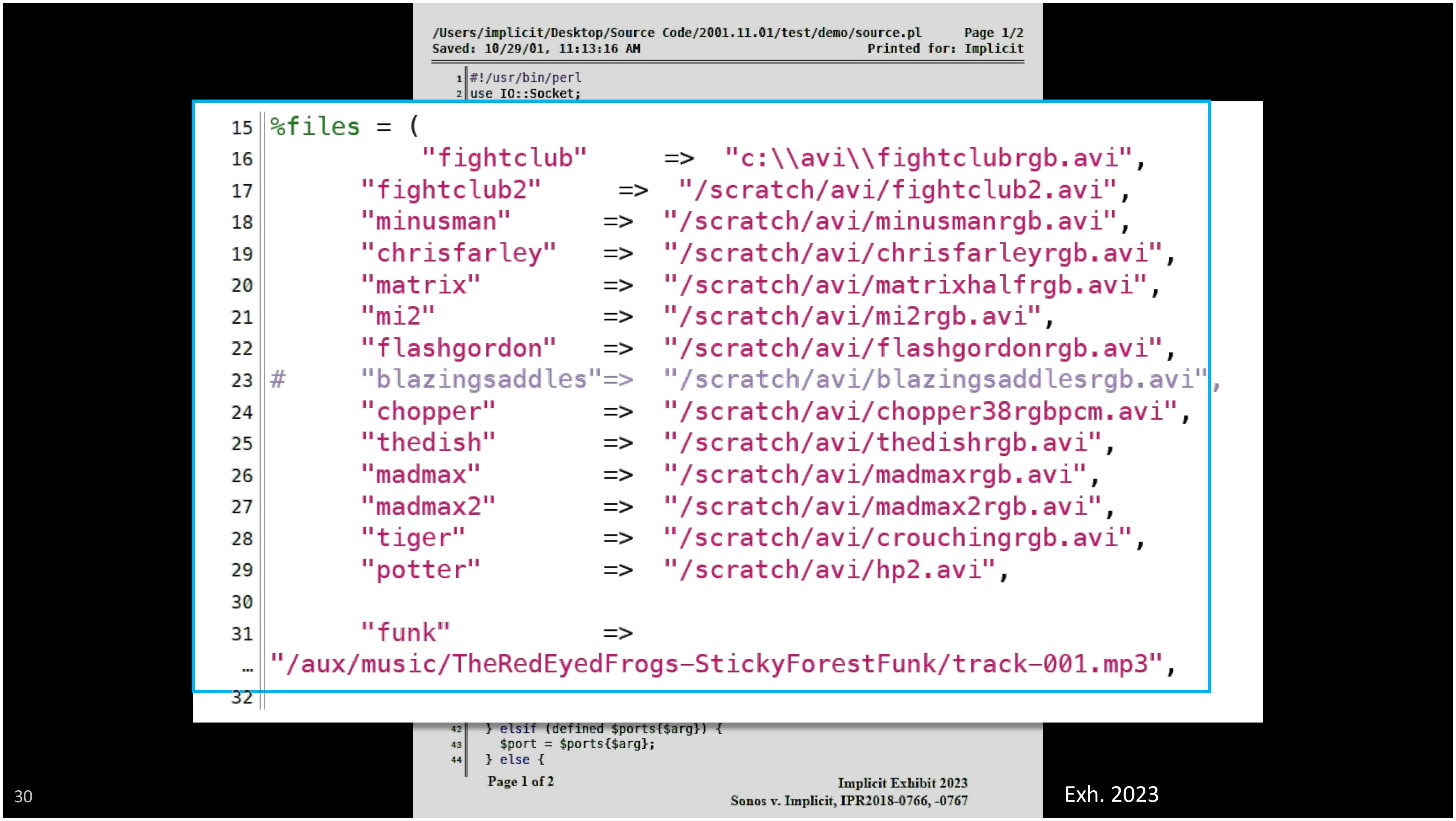
21

Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

```
MacBook-Pro:demo implicit$ file fightclubrgb.avi
fightclubrgb.avi: RIFF (little-endian) data, AVI, 180 x 80, 23.98 fps, video:, audio: uncompressed PCM (stereo, 44100 Hz)
MacBook-Pro:demo implicit$
```

29

Exh. 2077 at 22



/Users/implicit/Desktop/Source Code/2001.11.01/test/demo/source.pl   Page 1/2
Saved: 10/29/01, 11:13:16 AM   Printed for: Implicit

```
#!/usr/bin/perl
use IO::Socket;
```

```
%files = (
          "fightclub"      =>  "c:\\avi\\fightclubrgb.avi",
      "fightclub2"     =>  "/scratch/avi/fightclub2.avi",
      "minusman"      =>  "/scratch/avi/minusmanrgb.avi",
      "chrisfarley"   =>  "/scratch/avi/chrisfarleyrgb.avi",
      "matrix"        =>  "/scratch/avi/matrixhalfrgb.avi",
      "mi2"           =>  "/scratch/avi/mi2rgb.avi",
      "flashgordon"   =>  "/scratch/avi/flashgordonrgb.avi",
#     "blazingsaddles"=>  "/scratch/avi/blazingsaddlesrgb.avi",
      "chopper"       =>  "/scratch/avi/chopper38rgbpcm.avi",
      "thedish"       =>  "/scratch/avi/thedishrgb.avi",
      "madmax"        =>  "/scratch/avi/madmaxrgb.avi",
      "madmax2"       =>  "/scratch/avi/madmax2rgb.avi",
      "tiger"         =>  "/scratch/avi/crouchingrgb.avi",
      "potter"        =>  "/scratch/avi/hp2.avi",

      "funk"          =>
"/aux/music/TheRedEyedFrogs-StickyForestFunk/track-001.mp3",
```

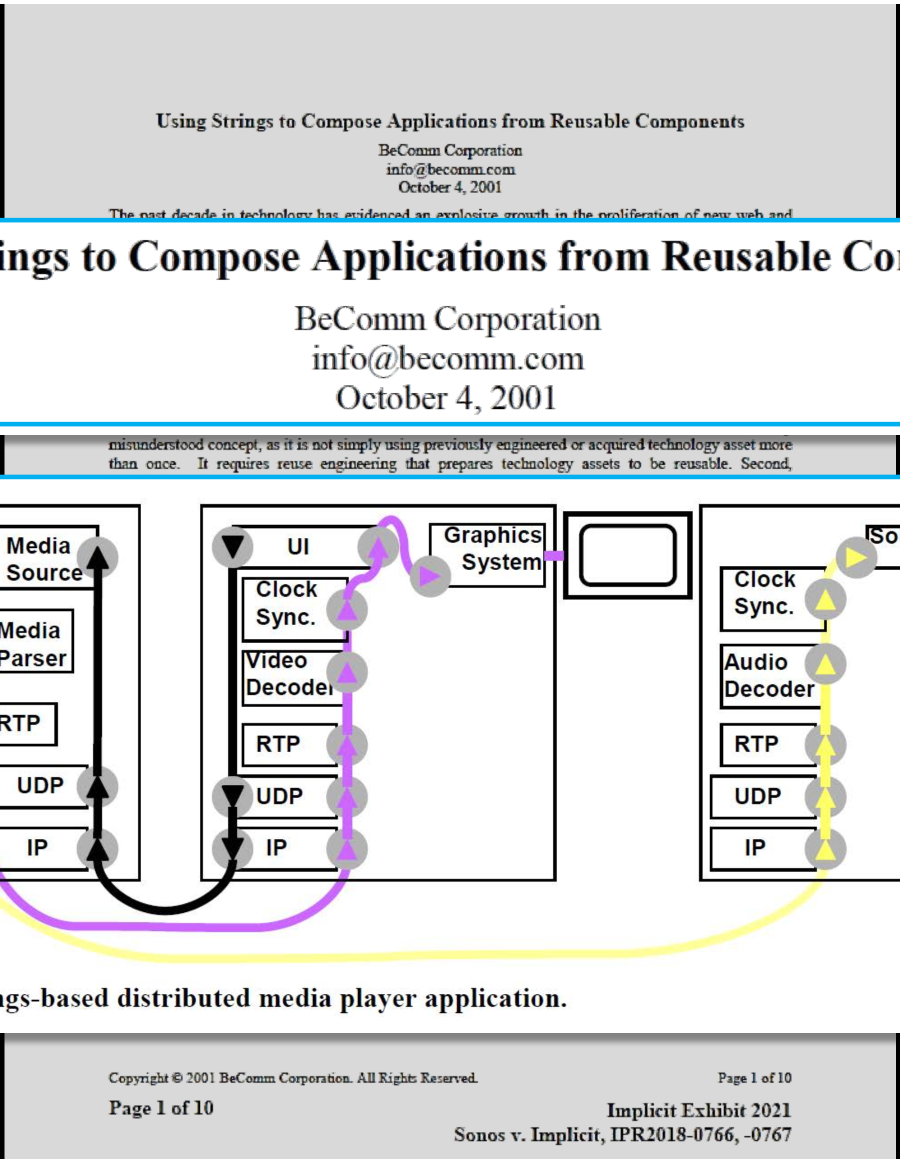
```
  } elsif (defined $ports{$arg}) {
    $port = $ports{$arg};
  } else {
```

Page 1 of 2

Implicit Exhibit 2023
Sonos v. Implicit, IPR2018-0766, -0767

30

Exh. 2023



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

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,

Page 1 of 10

Page 1 of 10

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

Using Strings to Compose Applications from Reusable Components

BeComm Corporation
info@becomm.com
October 4, 2001

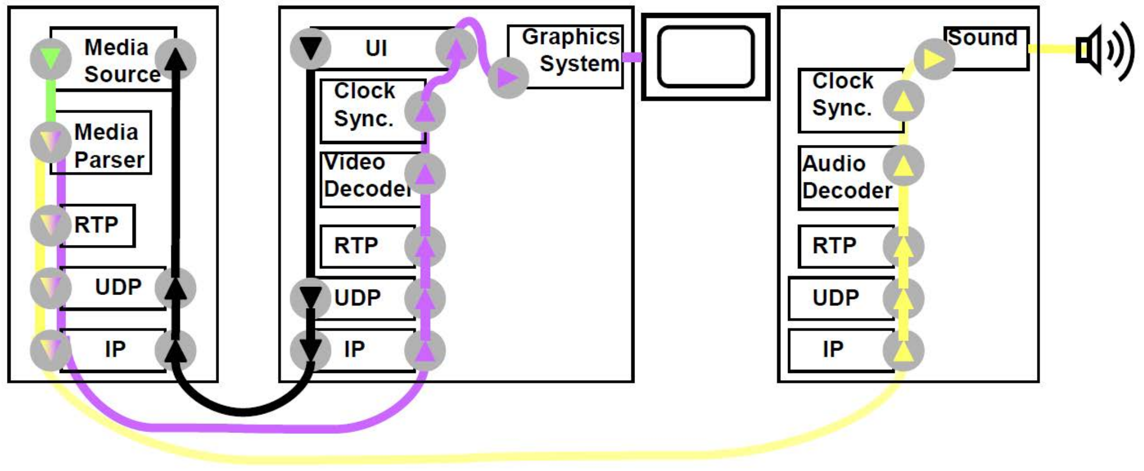
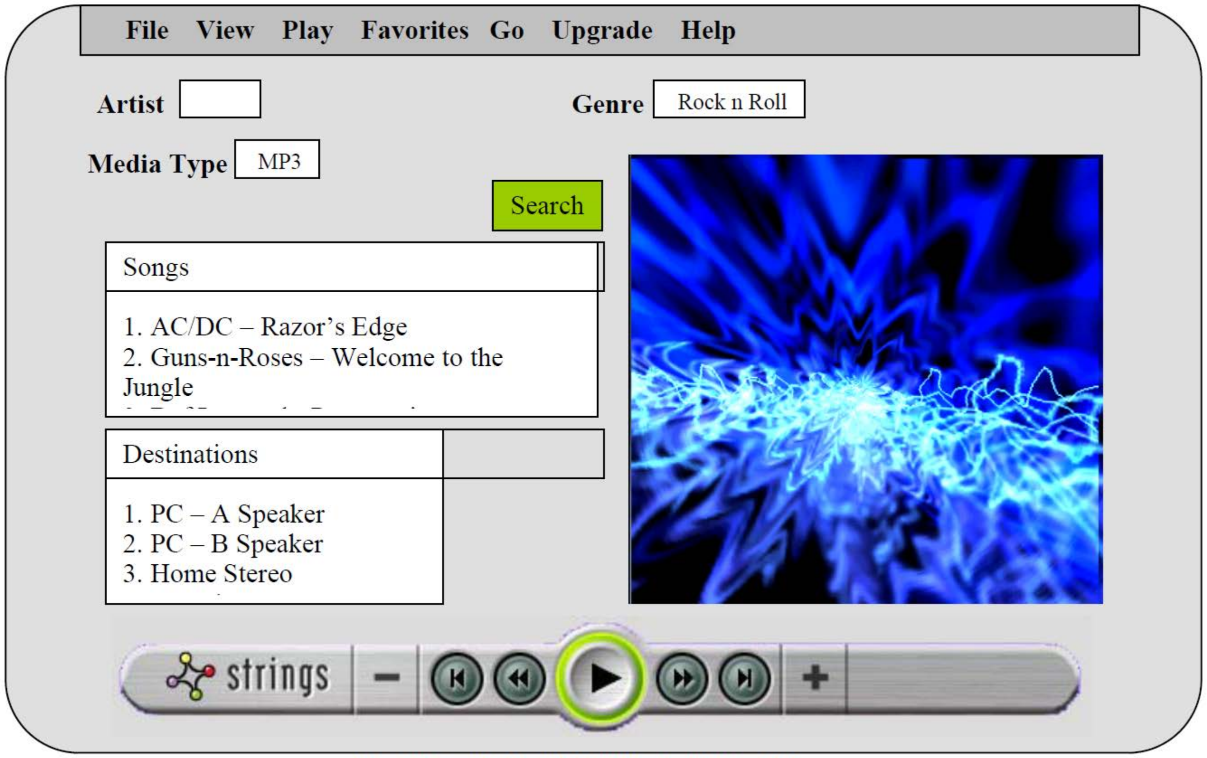


Figure 9. Strings-based distributed media player application.

Exh. 2021 ; Figure 9, at 9

BeComm™ Corporation



Artist

Genre: Rock n Roll

Media Type: MP3

Songs
1. AC/DC – Razor's Edge
2. Guns-n-Roses – Welcome to the Jungle

Destinations
1. PC – A Speaker
2. PC – B Speaker
3. Home Stereo

Fig. 2 Example Distributed Media Player GUI

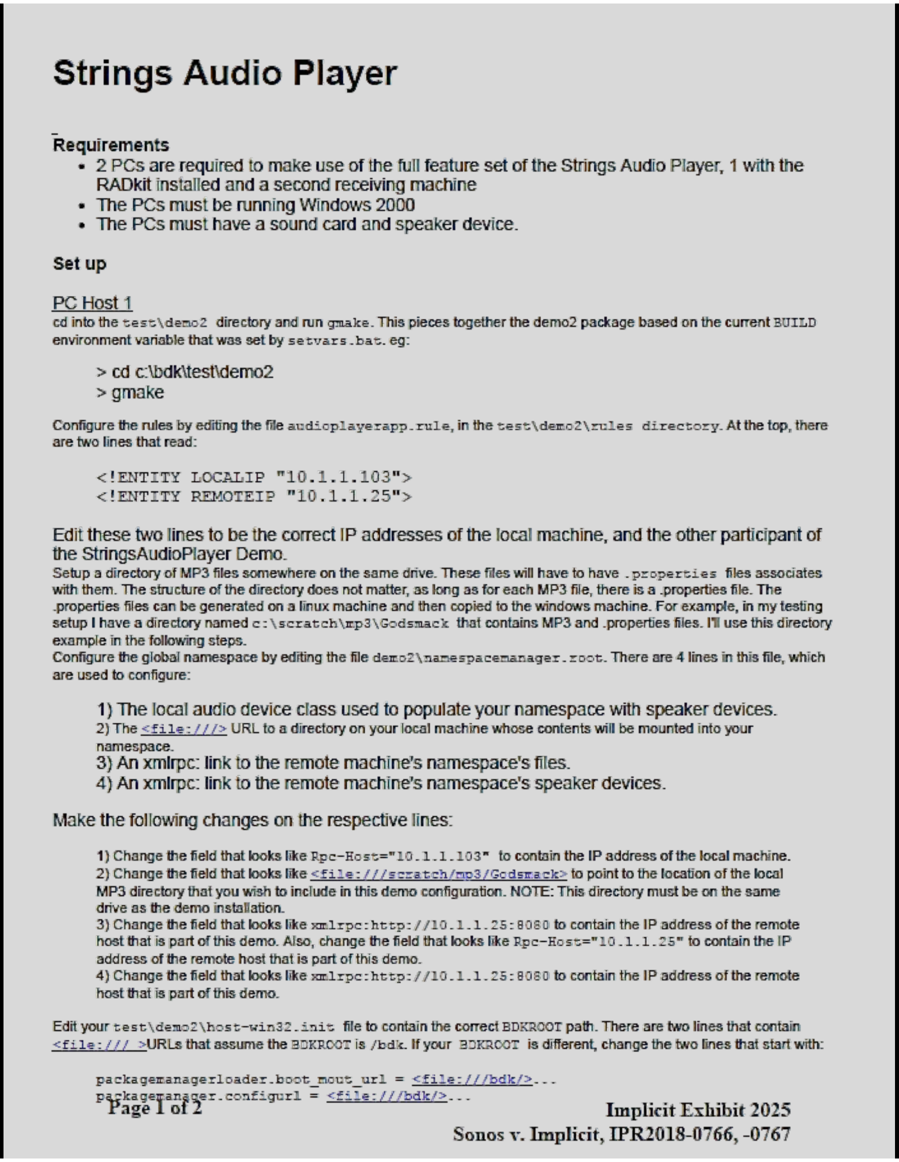
http://www.becomm.com

Page 1 of 9

Implicit Exhibit 2029
Sonos v. Implicit, IPR2018-0766, -0767

32

Exh. 2029; Figure 2, at 5



Strings Audio Player

Requirements

- 2 PCs are required to make use of the full feature set of the Strings Audio Player, 1 with the RADkit installed and a second receiving machine
- The PCs must be running Windows 2000
- The PCs must have a sound card and speaker device.

Set up

PC Host 1

cd into the `test\demo2` directory and run `gmake`. This pieces together the demo2 package based on the current `BUILD` environment variable that was set by `setvars.bat`. eg:

```
> cd c:\bdk\test\demo2
> gmake
```

Configure the rules by editing the file `audioplayerapp.rule`, in the `test\demo2\rules directory`. At the top, there are two lines that read:

```
<!ENTITY LOCALIP "10.1.1.103">
<!ENTITY REMOTEIP "10.1.1.25">
```

Edit these two lines to be the correct IP addresses of the local machine, and the other participant of the StringsAudioPlayer Demo.
Setup a directory of MP3 files somewhere on the same drive. These files will have to have `.properties` files associates with them. The structure of the directory does not matter, as long as for each MP3 file, there is a .properties file. The .properties files can be generated on a linux machine and then copied to the windows machine. For example, in my testing setup I have a directory named `c:\scratch\mp3\Godsmack` that contains MP3 and .properties files. I'll use this directory example in the following steps.
Configure the global namespace by editing the file `demo2\namespacemanager.root`. There are 4 lines in this file, which are used to configure:

1) The local audio device class used to populate your namespace with speaker devices.
2) The <file:///> URL to a directory on your local machine whose contents will be mounted into your namespace.
3) An xmlrpc: link to the remote machine's namespace's files.
4) An xmlrpc: link to the remote machine's namespace's speaker devices.

Make the following changes on the respective lines:

1) Change the field that looks like `Rpc-Host="10.1.1.103"` to contain the IP address of the local machine.
2) Change the field that looks like <file:///scratch/mp3/Godsmack> to point to the location of the local MP3 directory that you wish to include in this demo configuration. NOTE: This directory must be on the same drive as the demo installation.
3) Change the field that looks like `xmlrpc:http://10.1.1.25:8080` to contain the IP address of the remote host that is part of this demo. Also, change the field that looks like `Rpc-Host="10.1.1.25"` to contain the IP address of the remote host that is part of this demo.
4) Change the field that looks like `xmlrpc:http://10.1.1.25:8080` to contain the IP address of the remote host that is part of this demo.

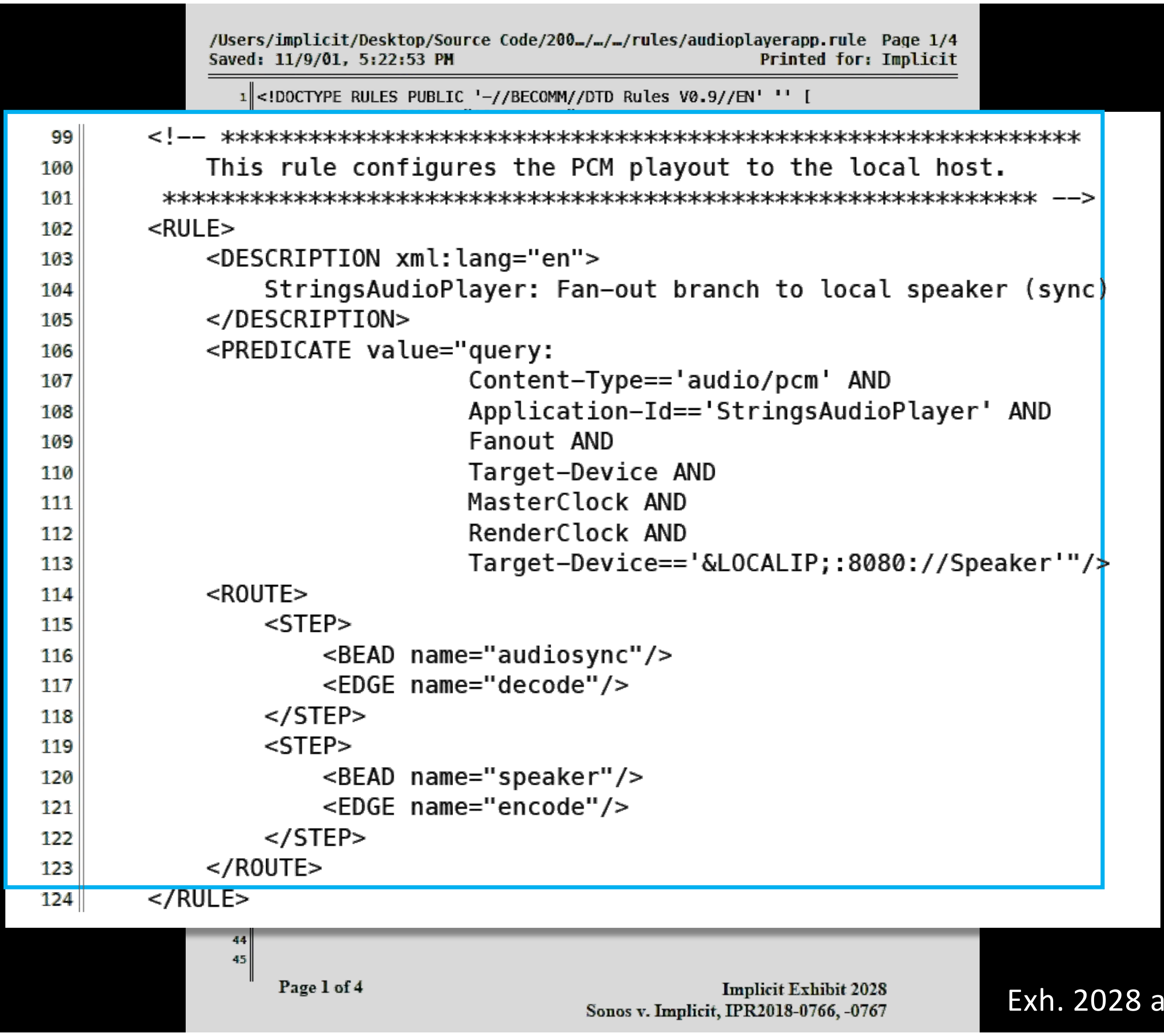
Edit your `test\demo2\host-win32.init` file to contain the correct `BDKROOT` path. There are two lines that contain <file:/// >URLs that assume the `BDKROOT` is `/bdk`. If your `BDKROOT` is different, change the two lines that start with:

```
packagemanagerloader.boot_mout_url = <file:///bdk/>...
packagemanager.configurl = <file:///bdk/>...
```

Page 1 of 2

Implicit Exhibit 2025
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2025



/Users/implicit/Desktop/Source Code/200…/…/…/rules/audioplayerapp.rule Page 1/4
Saved: 11/9/01, 5:22:53 PM Printed for: Implicit

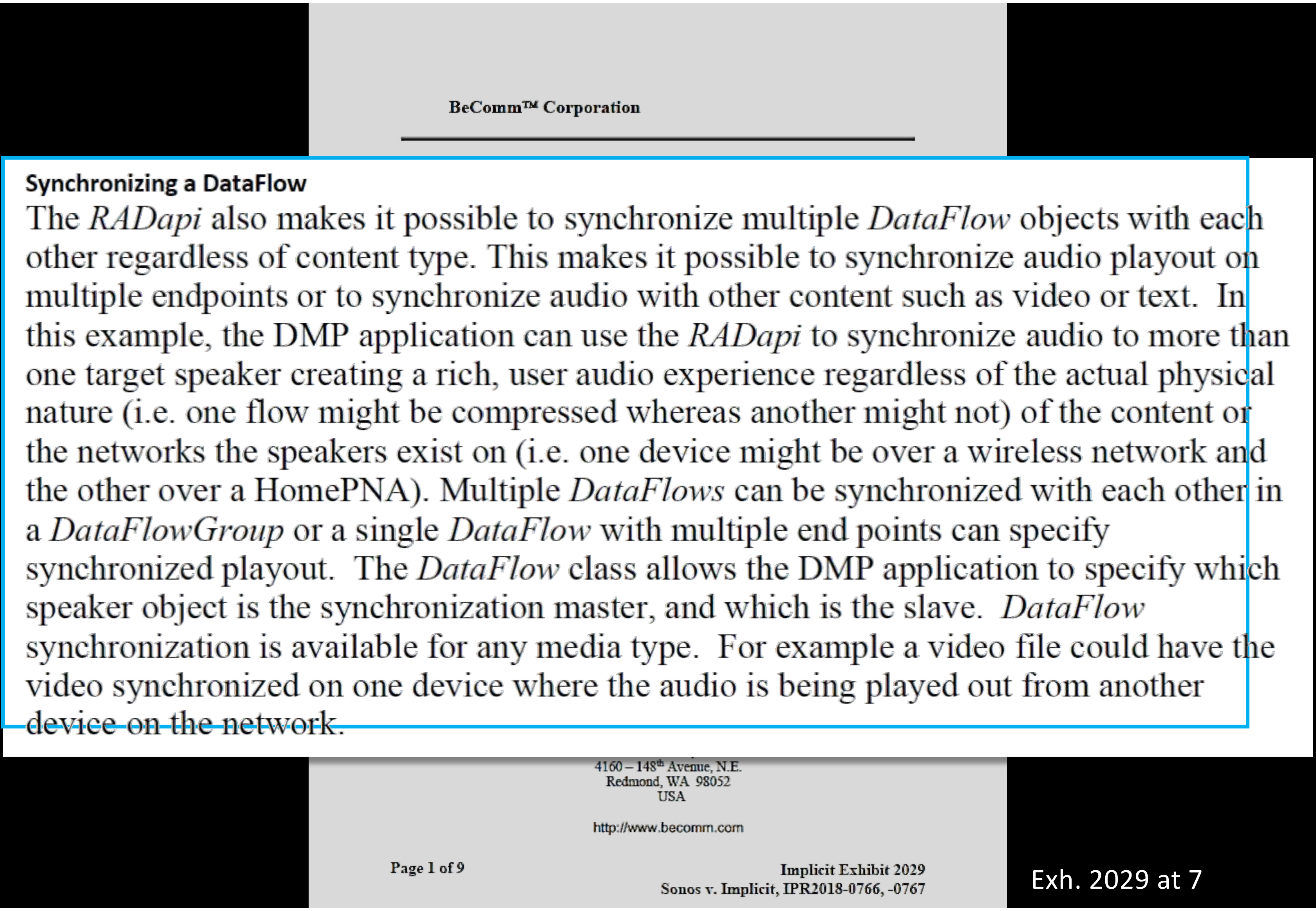
```
<!DOCTYPE RULES PUBLIC '-//BECOMM//DTD Rules V0.9//EN' '' [
```

```
    <!-- ***********************************************************
        This rule configures the PCM playout to the local host.
     ************************************************************ -->
    <RULE>
        <DESCRIPTION xml:lang="en">
            StringsAudioPlayer: Fan-out branch to local speaker (sync)
        </DESCRIPTION>
        <PREDICATE value="query:
                          Content-Type=='audio/pcm' AND
                          Application-Id=='StringsAudioPlayer' AND
                          Fanout AND
                          Target-Device AND
                          MasterClock AND
                          RenderClock AND
                          Target-Device=='&LOCALIP;:8080://Speaker'"/>
        <ROUTE>
            <STEP>
                <BEAD name="audiosync"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="speaker"/>
                <EDGE name="encode"/>
            </STEP>
        </ROUTE>
    </RULE>
```

Page 1 of 4

Implicit Exhibit 2028
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2028 at 3



BeComm™ Corporation

Synchronizing a DataFlow

The *RADapi* also makes it possible to synchronize multiple *DataFlow* objects with each other regardless of content type. This makes it possible to synchronize audio playout on multiple endpoints or to synchronize audio with other content such as video or text. In this example, the DMP application can use the *RADapi* to synchronize audio to more than one target speaker creating a rich, user audio experience regardless of the actual physical nature (i.e. one flow might be compressed whereas another might not) of the content or the networks the speakers exist on (i.e. one device might be over a wireless network and the other over a HomePNA). Multiple *DataFlows* can be synchronized with each other in a *DataFlowGroup* or a single *DataFlow* with multiple end points can specify synchronized playout. The *DataFlow* class allows the DMP application to specify which speaker object is the synchronization master, and which is the slave. *DataFlow* synchronization is available for any media type. For example a video file could have the video synchronized on one device where the audio is being played out from another device on the network.

4160 – 148th Avenue, N.E.
Redmond, WA 98052
USA

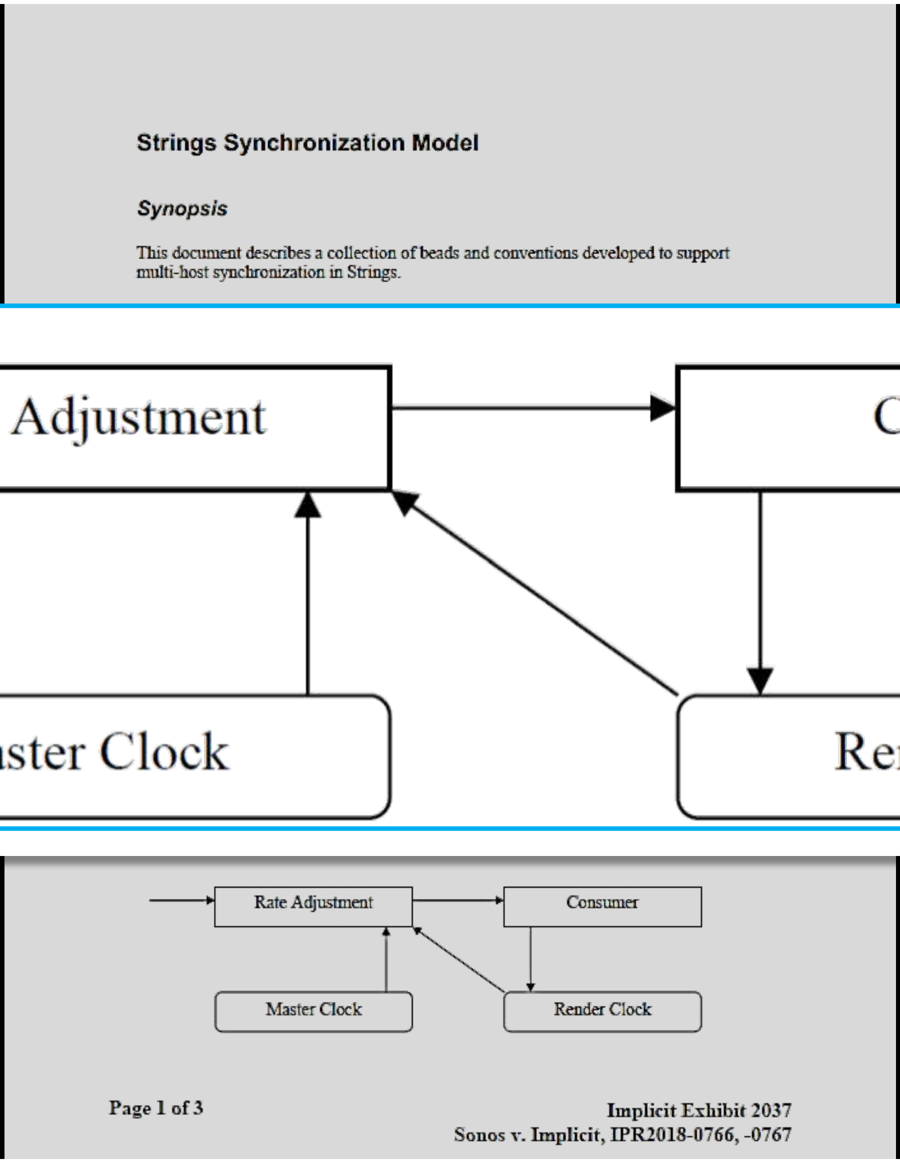
http://www.becomm.com

Page 1 of 9

Implicit Exhibit 2029
Sonos v. Implicit, IPR2018-0766, -0767

35

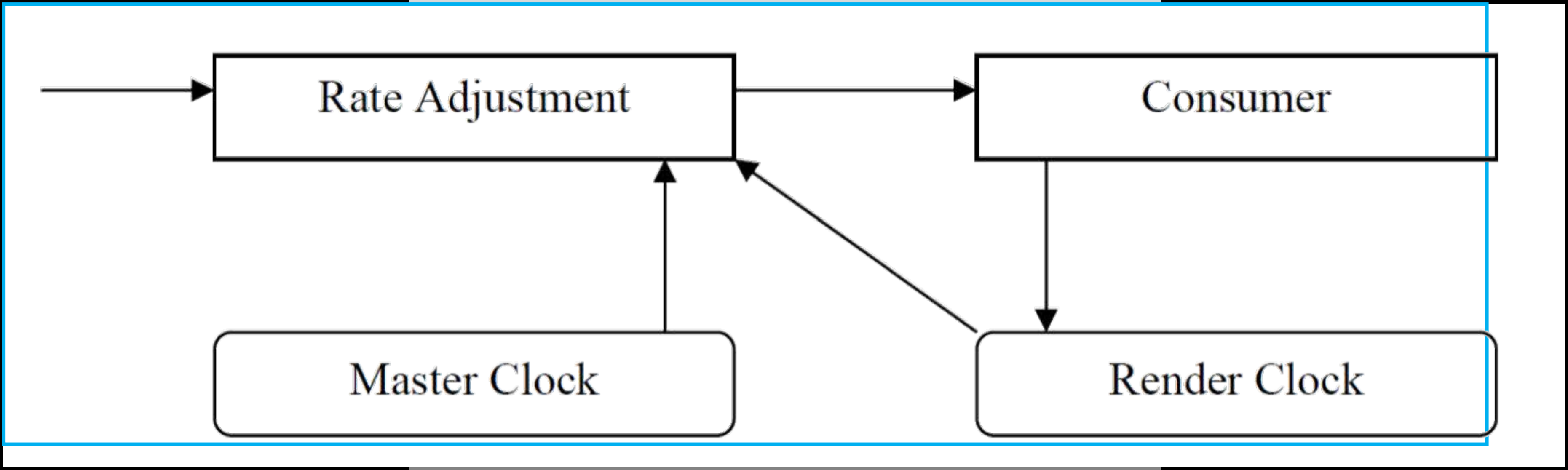
Exh. 2029 at 7

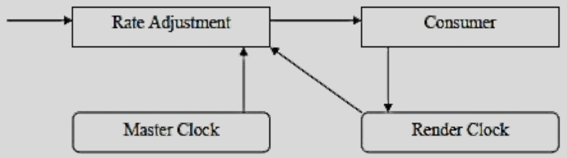


Strings Synchronization Model

Synopsis

This document describes a collection of beads and conventions developed to support multi-host synchronization in Strings.

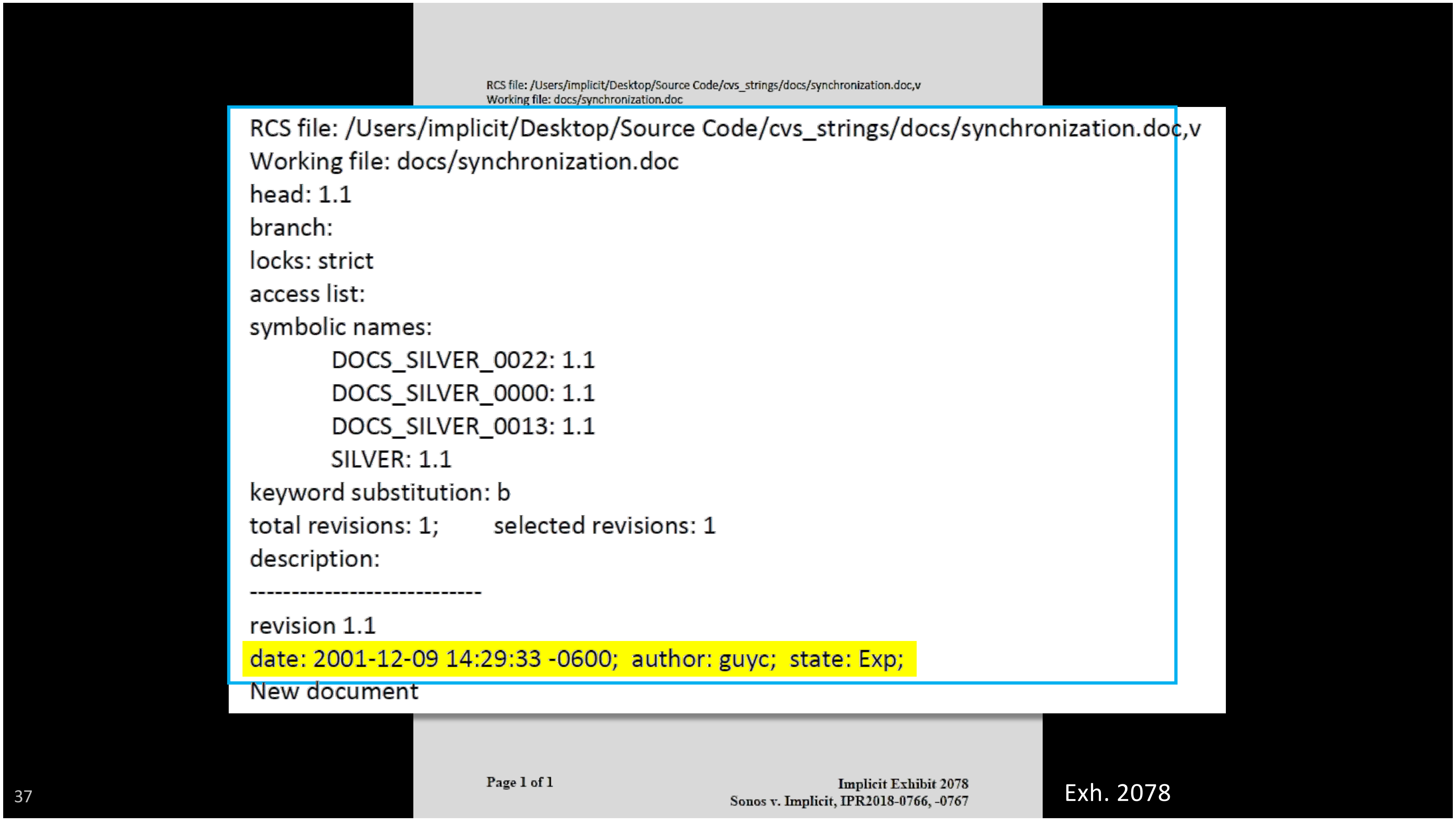




Page 1 of 3

Implicit Exhibit 2037
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2037 at 1



```
RCS file: /Users/implicit/Desktop/Source Code/cvs_strings/docs/synchronization.doc,v
Working file: docs/synchronization.doc
```

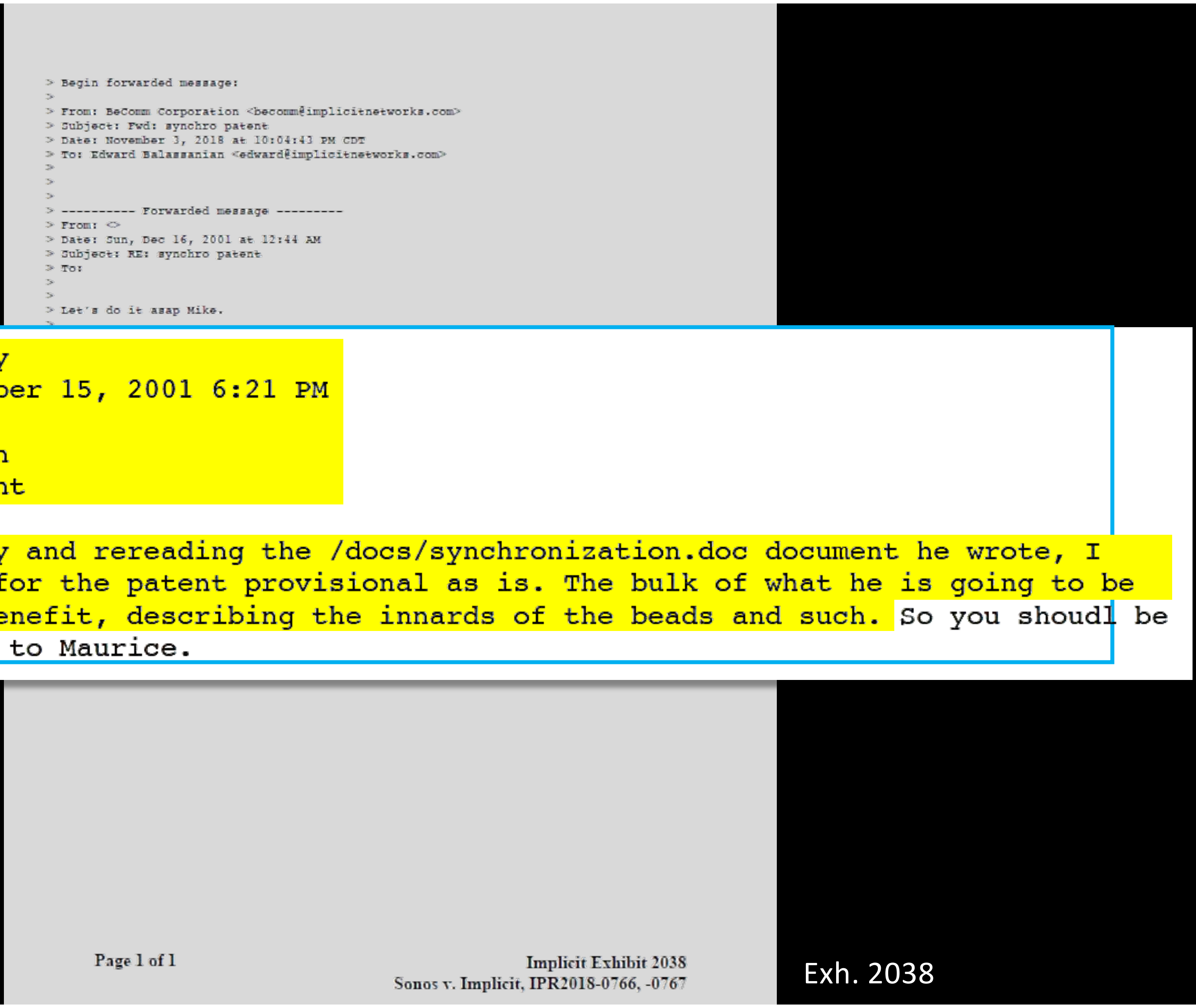
```
RCS file: /Users/implicit/Desktop/Source Code/cvs_strings/docs/synchronization.doc,v
Working file: docs/synchronization.doc
head: 1.1
branch:
locks: strict
access list:
symbolic names:
        DOCS_SILVER_0022: 1.1
        DOCS_SILVER_0000: 1.1
        DOCS_SILVER_0013: 1.1
        SILVER: 1.1
keyword substitution: b
total revisions: 1;     selected revisions: 1
description:
----------------------------
revision 1.1
date: 2001-12-09 14:29:33 -0600;  author: guyc;  state: Exp;
New document
```

Page 1 of 1

Implicit Exhibit 2078
Sonos v. Implicit, IPR2018-0766, -0767

37

Exh. 2078



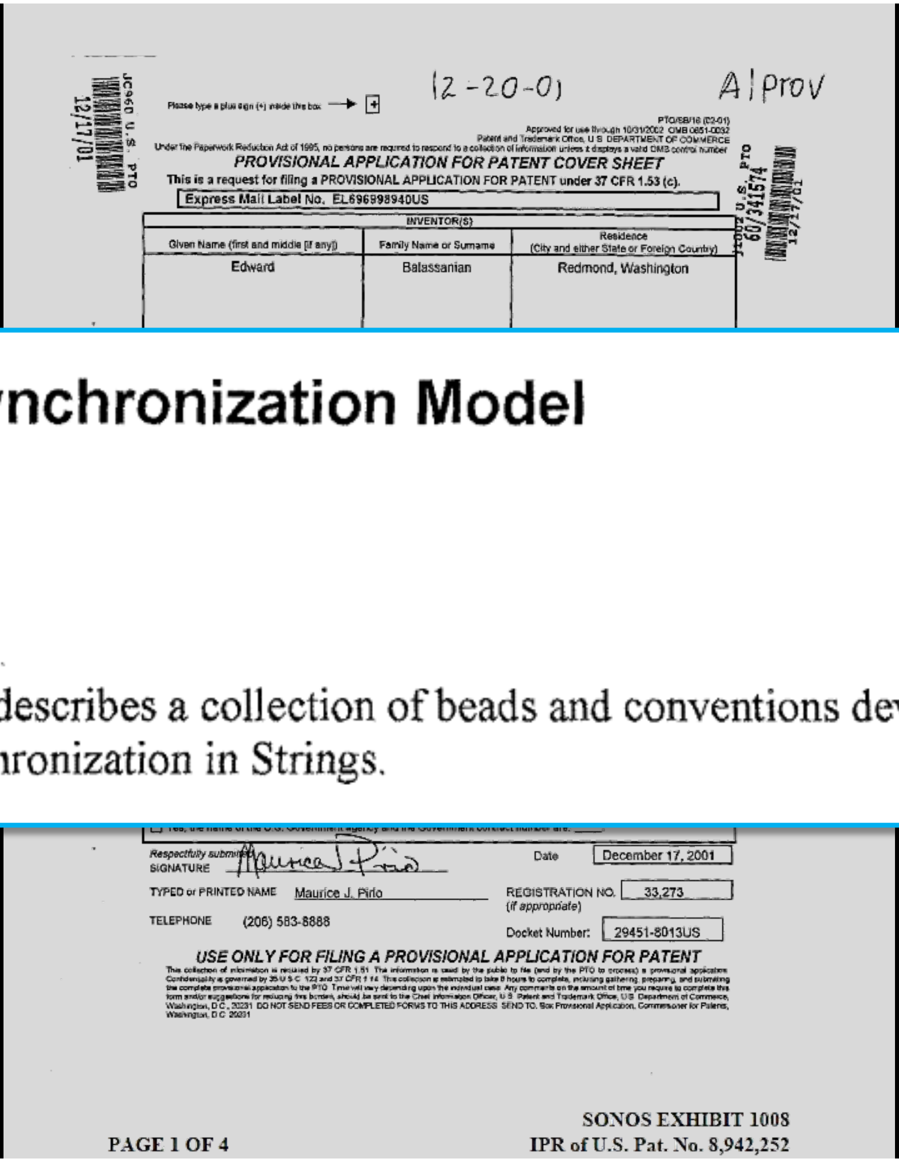
```
> Begin forwarded message:
>
> From: BeComm Corporation <becomm@implicitnetworks.com>
> Subject: Fwd: synchro patent
> Date: November 3, 2018 at 10:04:43 PM CDT
> To: Edward Balassanian <edward@implicitnetworks.com>
>
>
>
> ---------- Forwarded message ---------
> From: <>
> Date: Sun, Dec 16, 2001 at 12:44 AM
> Subject: RE: synchro patent
> To:
>
>
> Let's do it asap Mike.
```

```
> From: Scott W. Bradley
> Sent: Saturday, December 15, 2001 6:21 PM
> To: Mike Turner
> Cc: Edward Balassanian
> Subject: synchro patent
>
> After talking with Guy and rereading the /docs/synchronization.doc document he wrote, I
think it is sufficient for the patent provisional as is. The bulk of what he is going to be
adding is more for my benefit, describing the innards of the beads and such. So you shoudl be
good to go to give that to Maurice.
```

Page 1 of 1

Implicit Exhibit 2038
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2038



12/17/01 JC960 U.S. PTO

12-20-01 A|Prov

Please type a plus sign (+) inside this box → [+]

PTO/SB/16 (02-01)
Approved for use through 10/31/2002 OMB 0651-0032
Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

Express Mail Label No. EL696998940US

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Edward	Balassanian	Redmond, Washington

J1002 U.S. PTO 60/341574 12/17/01

Yes, the name of the U.S. Government agency and the Government contract number are: ____

Respectfully submitted,
SIGNATURE [illegible] Date December 17, 2001

TYPED or PRINTED NAME Maurice J. Pirio REGISTRATION NO. 33,273 *(if appropriate)*

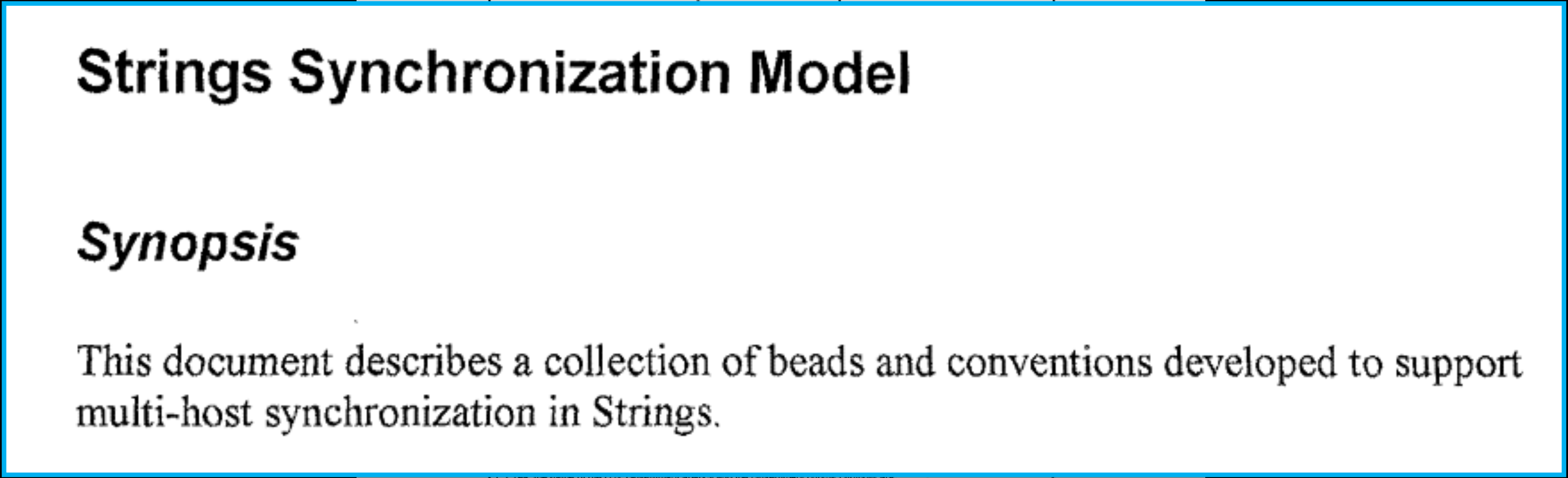
TELEPHONE (206) 583-8888 Docket Number: 29451-8013US

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C., 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Commissioner for Patents, Washington, D.C. 20231

PAGE 1 OF 4

SONOS EXHIBIT 1008
IPR of U.S. Pat. No. 8,942,252

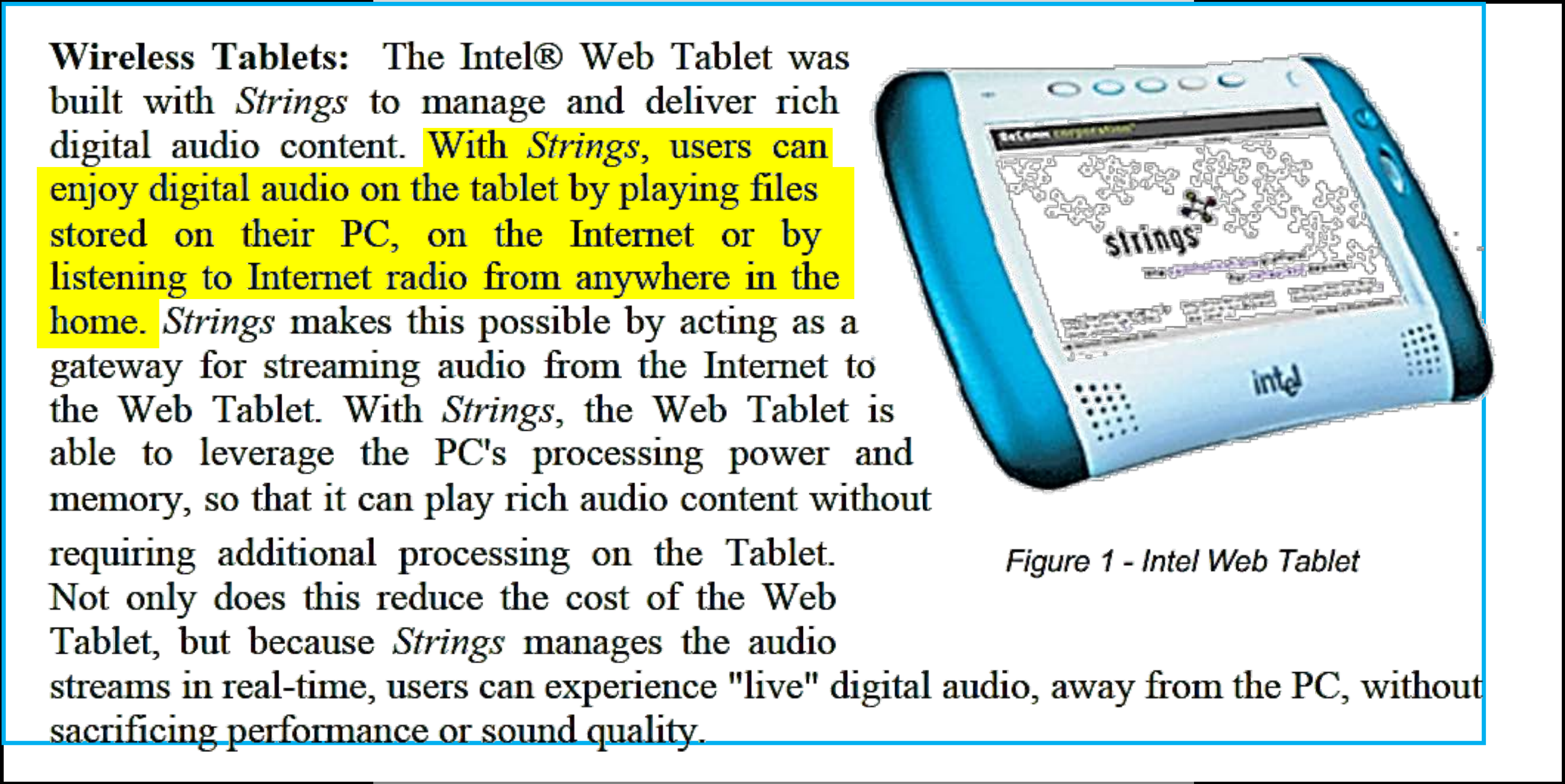


Strings Synchronization Model

Synopsis

This document describes a collection of beads and conventions developed to support multi-host synchronization in Strings.

Provisional Application, Exh. 1008



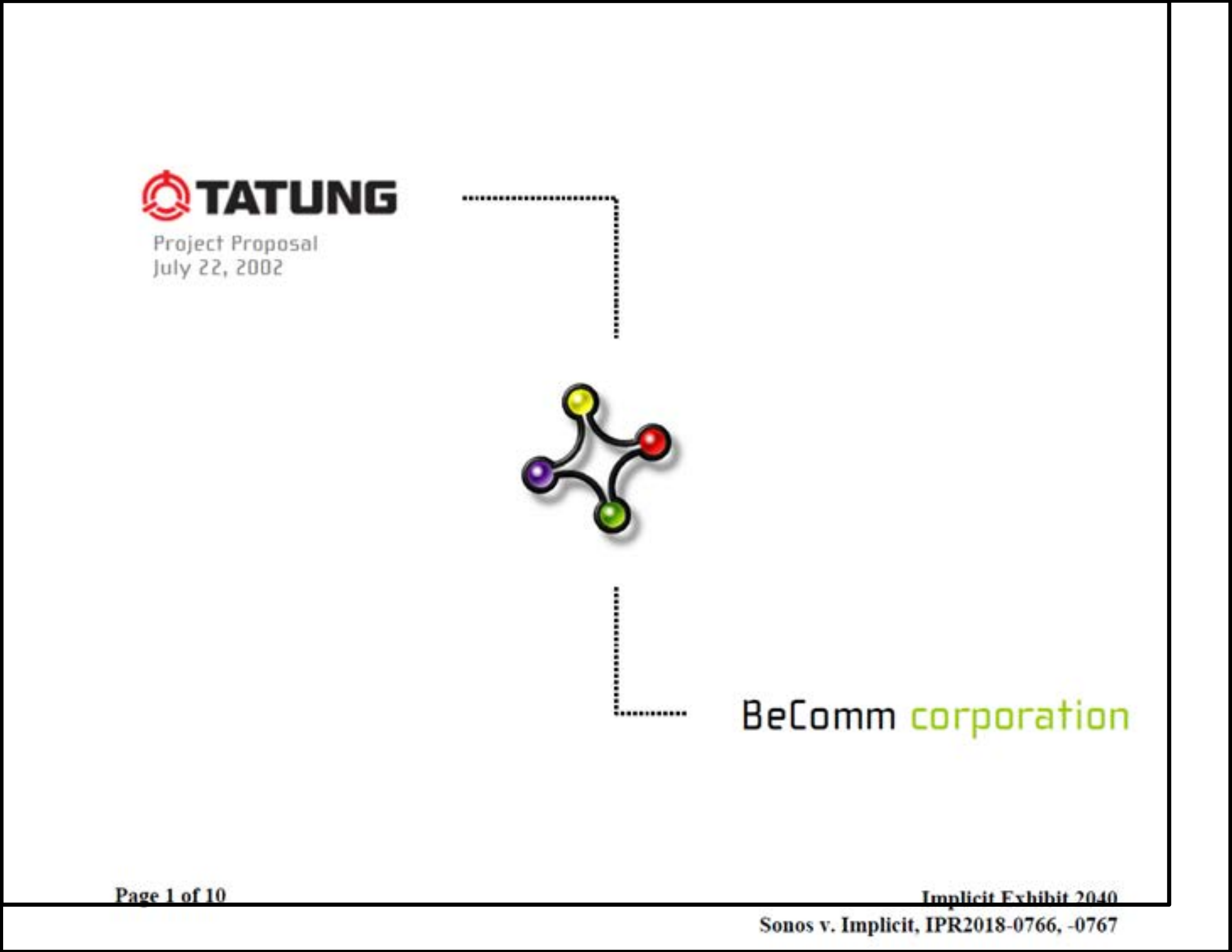
Wireless Tablets: The Intel® Web Tablet was built with *Strings* to manage and deliver rich digital audio content. With *Strings*, users can enjoy digital audio on the tablet by playing files stored on their PC, on the Internet or by listening to Internet radio from anywhere in the home. *Strings* makes this possible by acting as a gateway for streaming audio from the Internet to the Web Tablet. With *Strings*, the Web Tablet is able to leverage the PC's processing power and memory, so that it can play rich audio content without requiring additional processing on the Tablet. Not only does this reduce the cost of the Web Tablet, but because *Strings* manages the audio streams in real-time, users can experience "live" digital audio, away from the PC, without sacrificing performance or sound quality.

Figure 1 - Intel Web Tablet

Page 1 of 29

Implicit Exhibit 2039
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2039 at 9



TATUNG

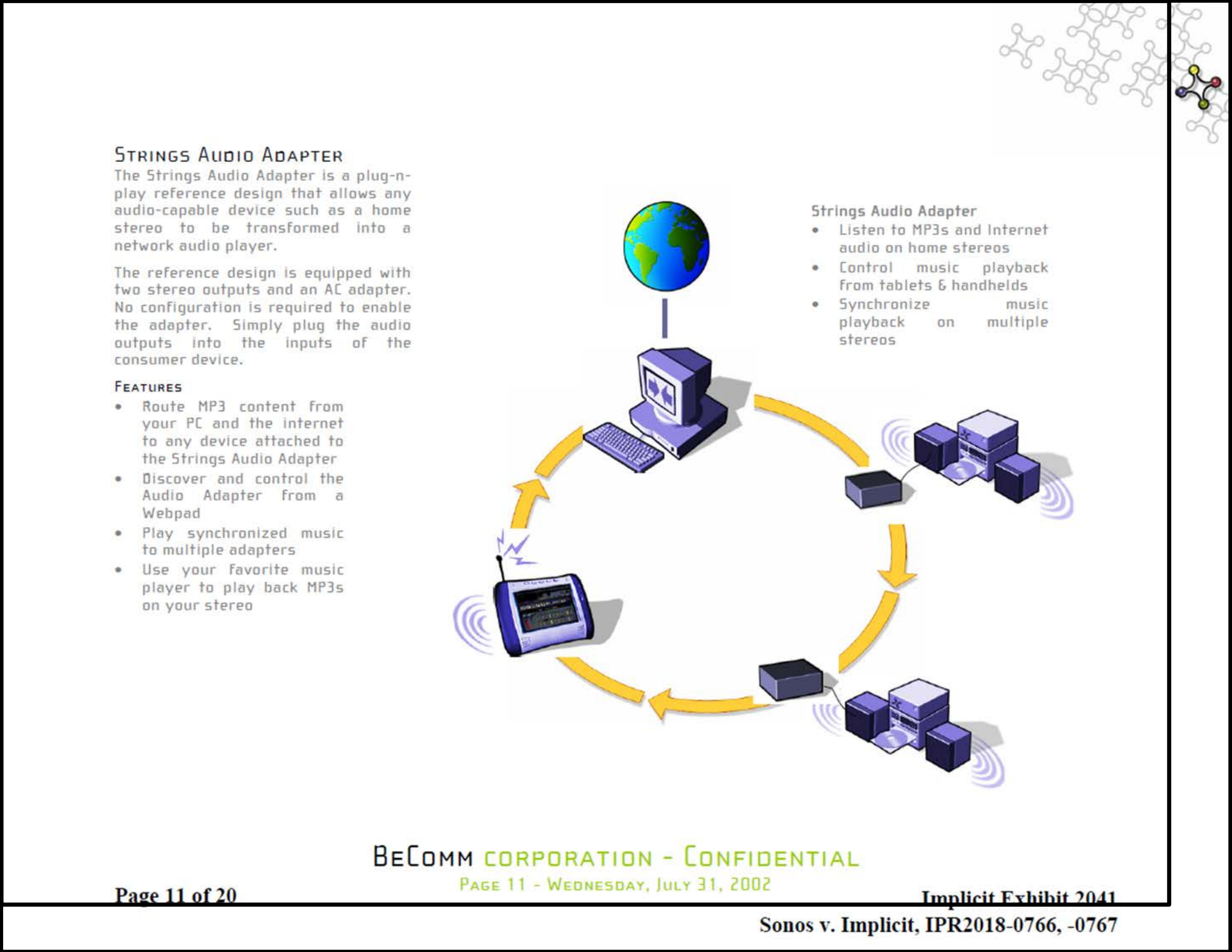
Project Proposal
July 22, 2002

BeComm corporation

Page 1 of 10

Implicit Exhibit 2040
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2040



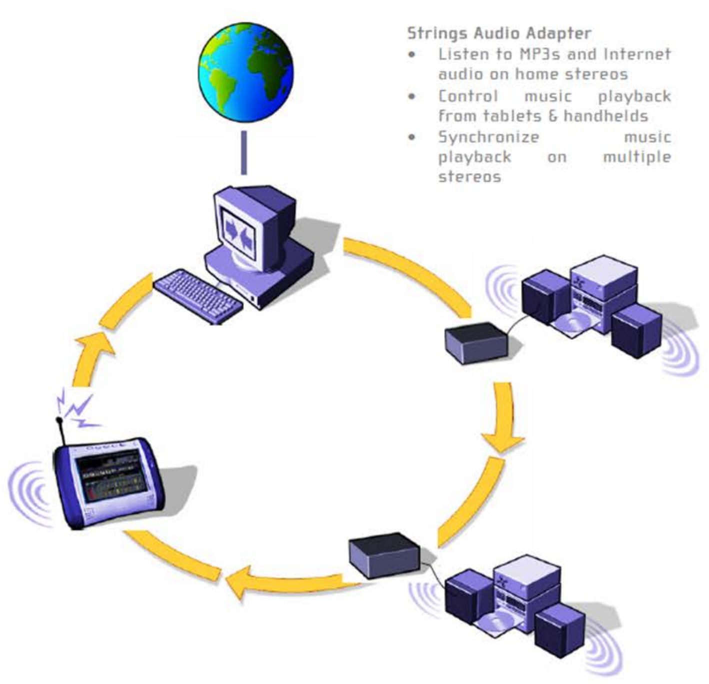
Strings Audio Adapter

The Strings Audio Adapter is a plug-n-play reference design that allows any audio-capable device such as a home stereo to be transformed into a network audio player.

The reference design is equipped with two stereo outputs and an AC adapter. No configuration is required to enable the adapter. Simply plug the audio outputs into the inputs of the consumer device.

Features

- Route MP3 content from your PC and the internet to any device attached to the Strings Audio Adapter
- Discover and control the Audio Adapter from a Webpad
- Play synchronized music to multiple adapters
- Use your favorite music player to play back MP3s on your stereo



Strings Audio Adapter

- Listen to MP3s and Internet audio on home stereos
- Control music playback from tablets & handhelds
- Synchronize music playback on multiple stereos

BeComm corporation - Confidential

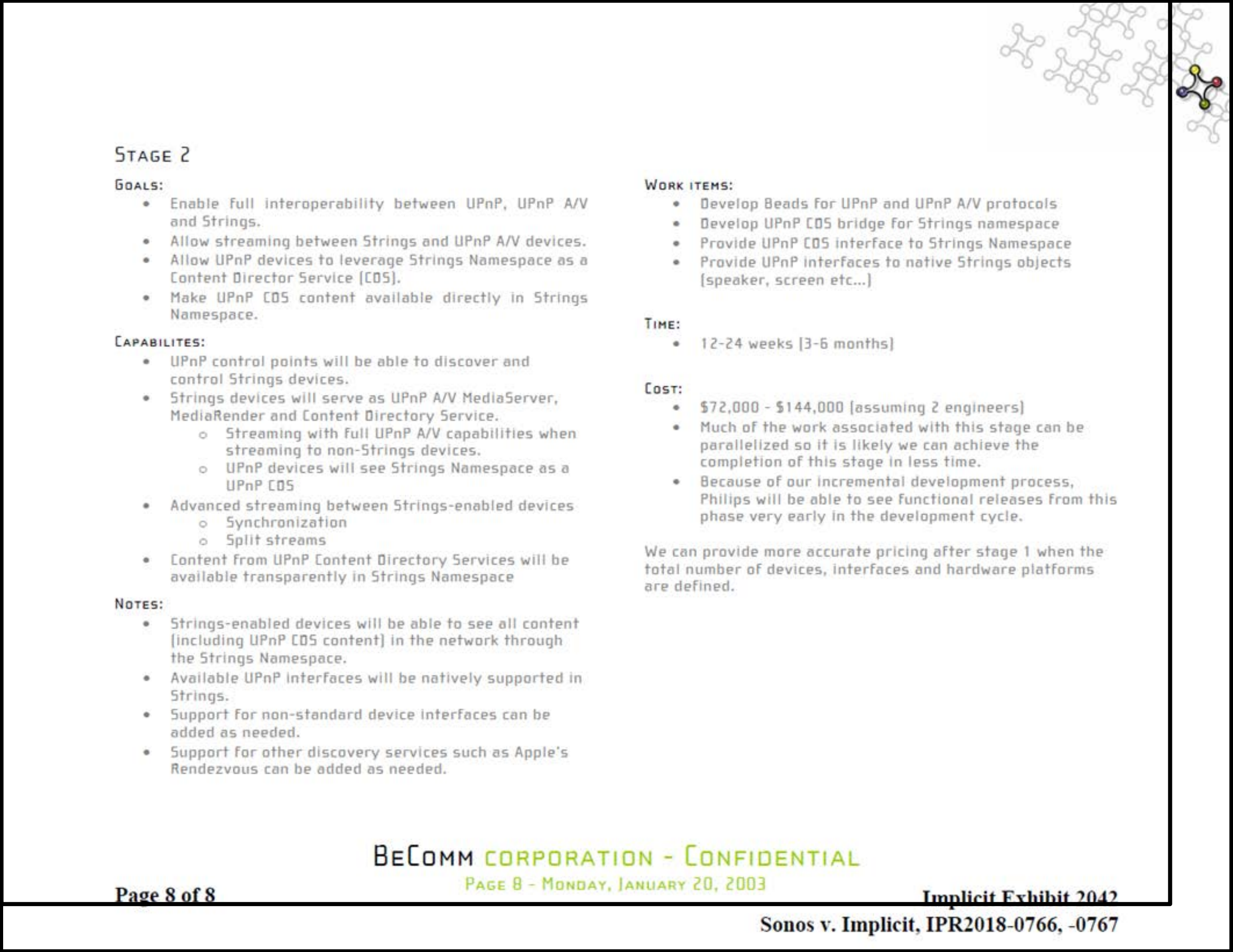
Page 11 - Wednesday, July 31, 2002

Page 11 of 20

Implicit Exhibit 2041

Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2041 at 11



Stage 2

Goals:

- Enable full interoperability between UPnP, UPnP A/V and Strings.
- Allow streaming between Strings and UPnP A/V devices.
- Allow UPnP devices to leverage Strings Namespace as a Content Director Service (CDS).
- Make UPnP CDS content available directly in Strings Namespace.

Capabilites:

- UPnP control points will be able to discover and control Strings devices.
- Strings devices will serve as UPnP A/V MediaServer, MediaRender and Content Directory Service.
  - Streaming with full UPnP A/V capabilities when streaming to non-Strings devices.
  - UPnP devices will see Strings Namespace as a UPnP CDS
- Advanced streaming between Strings-enabled devices
  - Synchronization
  - Split streams
- Content from UPnP Content Directory Services will be available transparently in Strings Namespace

Notes:

- Strings-enabled devices will be able to see all content (including UPnP CDS content) in the network through the Strings Namespace.
- Available UPnP interfaces will be natively supported in Strings.
- Support for non-standard device interfaces can be added as needed.
- Support for other discovery services such as Apple's Rendezvous can be added as needed.

Work items:

- Develop Beads for UPnP and UPnP A/V protocols
- Develop UPnP CDS bridge for Strings namespace
- Provide UPnP CDS interface to Strings Namespace
- Provide UPnP interfaces to native Strings objects (speaker, screen etc...)

Time:

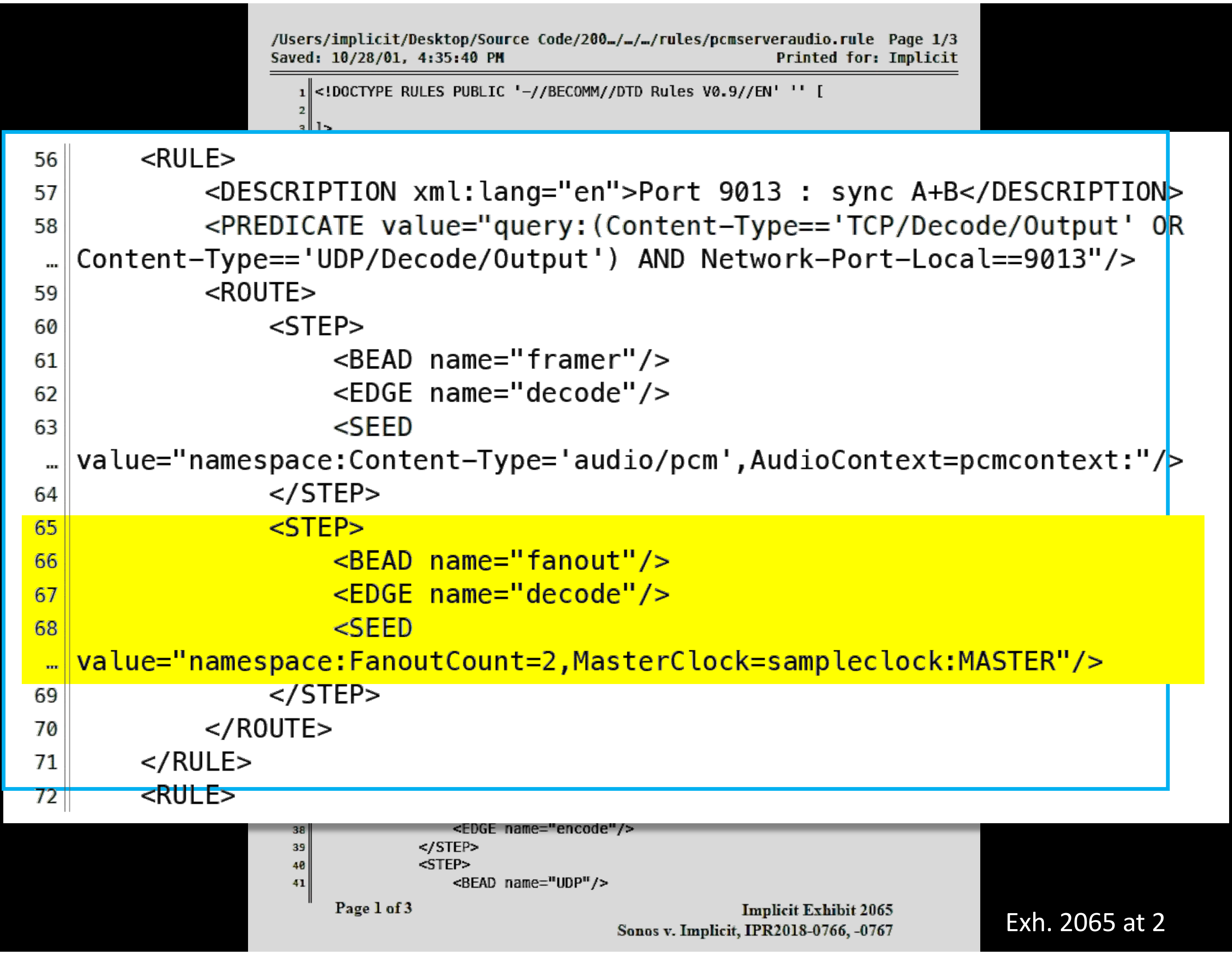
- 12-24 weeks (3-6 months)

Cost:

- $72,000 - $144,000 (assuming 2 engineers)
- Much of the work associated with this stage can be parallelized so it is likely we can achieve the completion of this stage in less time.
- Because of our incremental development process, Philips will be able to see functional releases from this phase very early in the development cycle.

We can provide more accurate pricing after stage 1 when the total number of devices, interfaces and hardware platforms are defined.

Exh. 2042 at 8



```
/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' '' [

]>
```

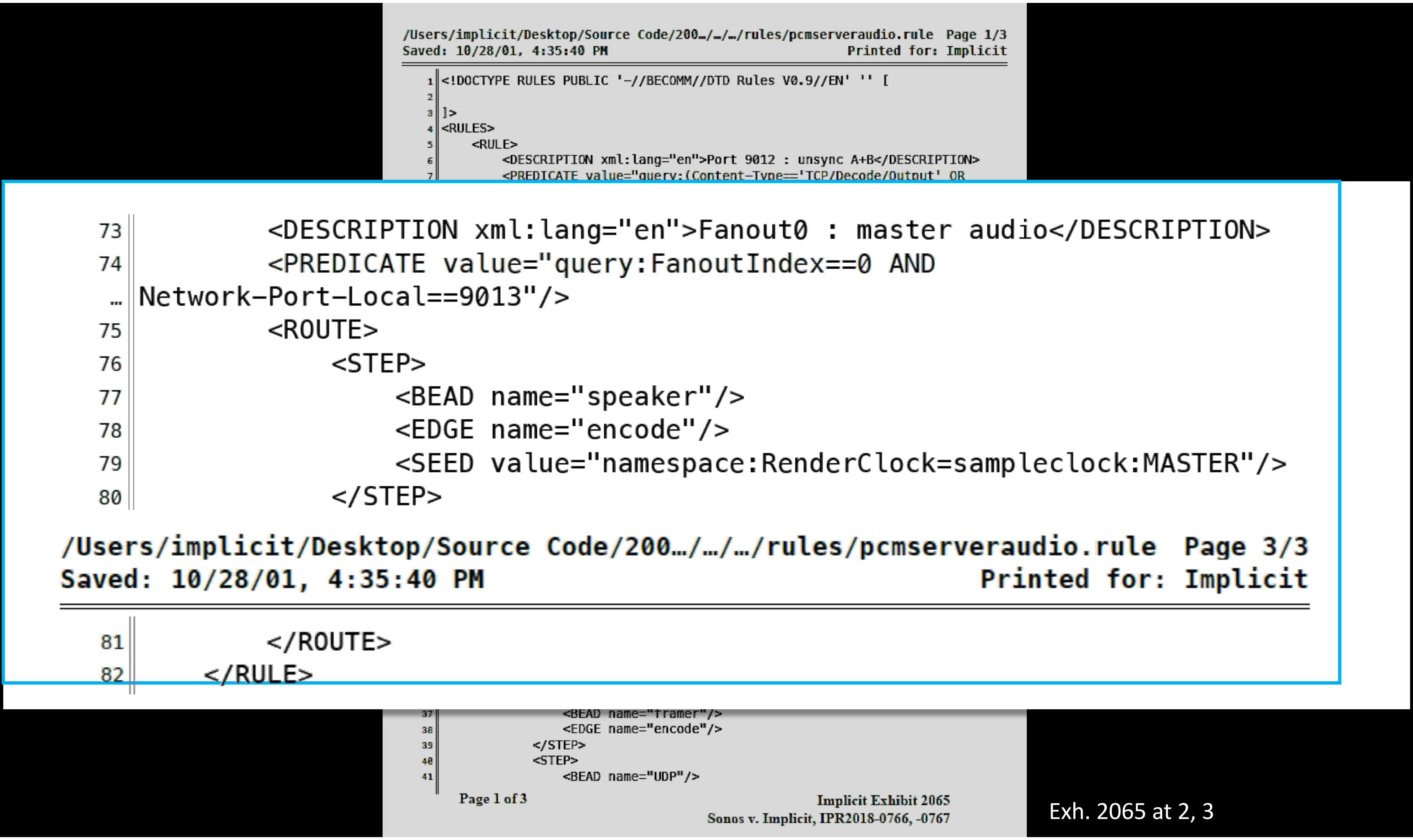
```
    <RULE>
        <DESCRIPTION xml:lang="en">Port 9013 : sync A+B</DESCRIPTION>
        <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9013"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <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,MasterClock=sampleclock:MASTER"/>
            </STEP>
        </ROUTE>
    </RULE>
    <RULE>
```

```
                <EDGE name="encode"/>
            </STEP>
            <STEP>
                <BEAD name="UDP"/>
```

Page 1 of 3

Implicit Exhibit 2065
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2065 at 2



```
/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
```

```
        <DESCRIPTION xml:lang="en">Fanout0 : master audio</DESCRIPTION>
        <PREDICATE value="query:FanoutIndex==0 AND
Network-Port-Local==9013"/>
        <ROUTE>
            <STEP>
                <BEAD name="speaker"/>
                <EDGE name="encode"/>
                <SEED value="namespace:RenderClock=sampleclock:MASTER"/>
            </STEP>
```

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

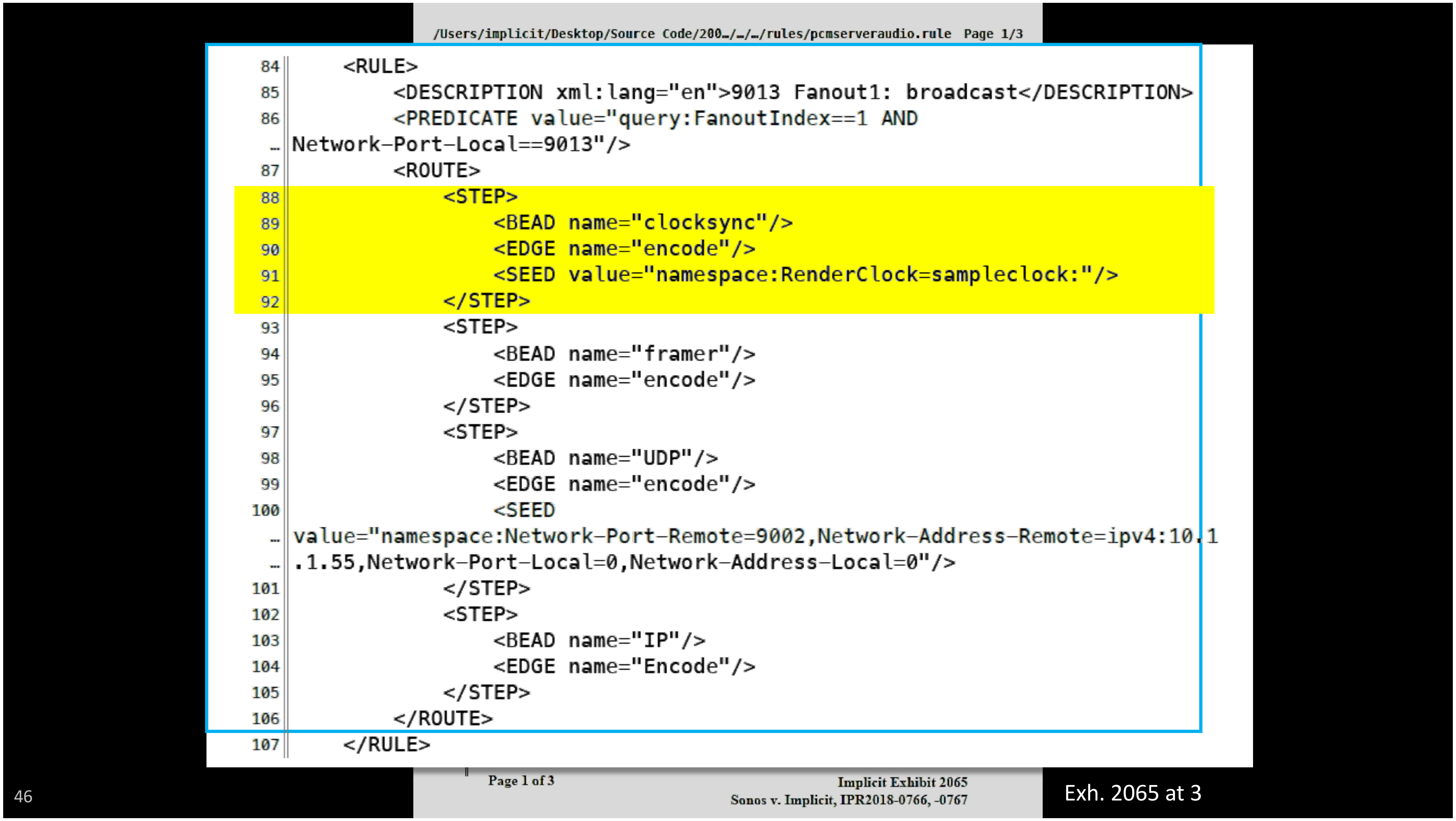
```
        </ROUTE>
    </RULE>
```

```
                <BEAD name="framer"/>
                <EDGE name="encode"/>
            </STEP>
            <STEP>
                <BEAD name="UDP"/>
```

Page 1 of 3

Implicit Exhibit 2065
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2065 at 2, 3



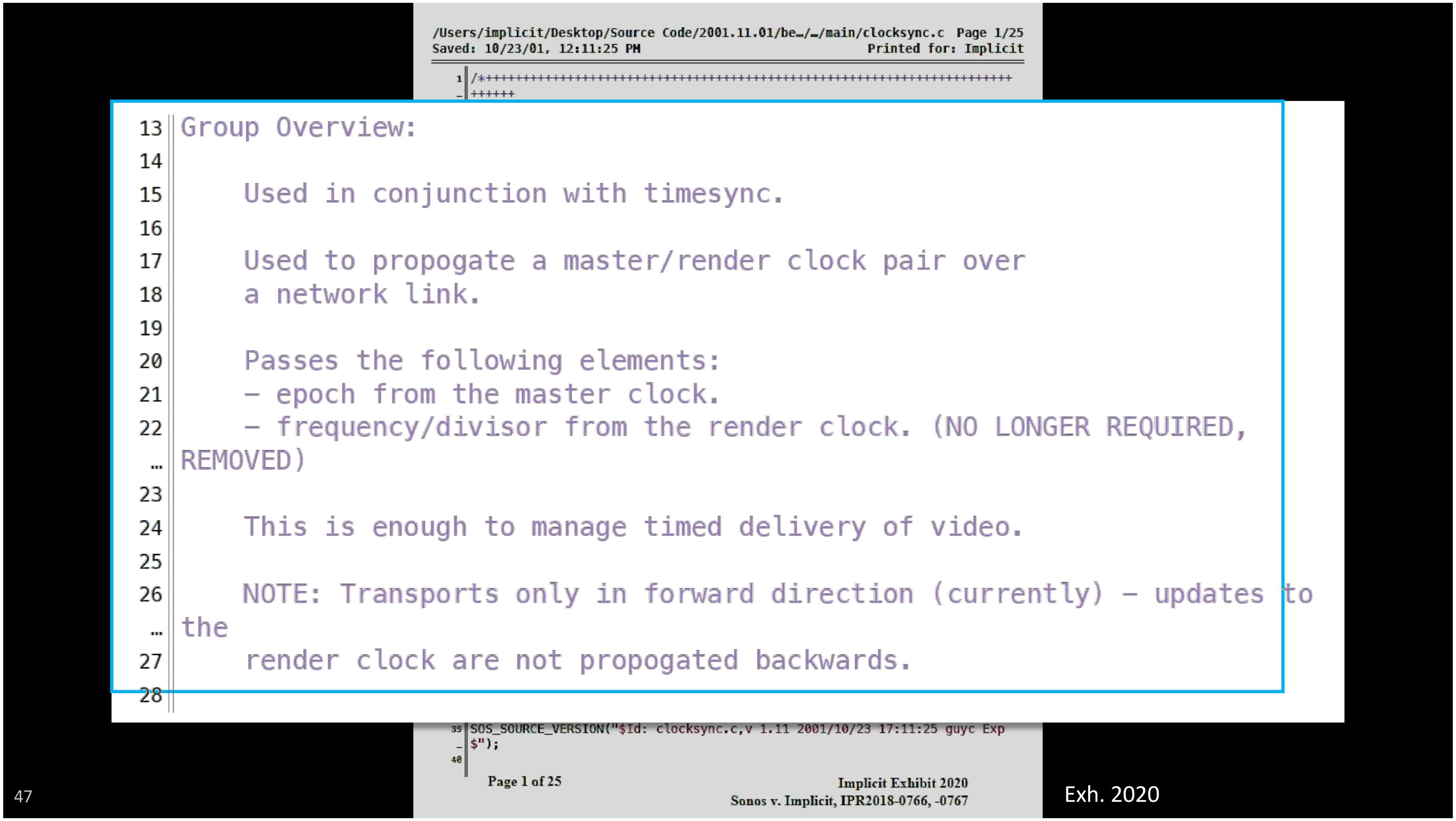
/Users/implicit/Desktop/Source Code/200…/…/…/rules/pcmserveraudio.rule Page 1/3

```
    <RULE>
        <DESCRIPTION xml:lang="en">9013 Fanout1: broadcast</DESCRIPTION>
        <PREDICATE value="query:FanoutIndex==1 AND
Network-Port-Local==9013"/>
        <ROUTE>
            <STEP>
                <BEAD name="clocksync"/>
                <EDGE name="encode"/>
                <SEED value="namespace:RenderClock=sampleclock:"/>
            </STEP>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="encode"/>
            </STEP>
            <STEP>
                <BEAD name="UDP"/>
                <EDGE name="encode"/>
                <SEED
value="namespace:Network-Port-Remote=9002,Network-Address-Remote=ipv4:10.1
.1.55,Network-Port-Local=0,Network-Address-Local=0"/>
            </STEP>
            <STEP>
                <BEAD name="IP"/>
                <EDGE name="Encode"/>
            </STEP>
        </ROUTE>
    </RULE>
```

Page 1 of 3

Implicit Exhibit 2065
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2065 at 3



/Users/implicit/Desktop/Source Code/2001.11.01/be…/…/main/clocksync.c Page 1/25
Saved: 10/23/01, 12:11:25 PM Printed for: Implicit

```
/*++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Group Overview:

    Used in conjunction with timesync.

    Used to propogate a master/render clock pair over
    a network link.

    Passes the following elements:
    - epoch from the master clock.
    - frequency/divisor from the render clock. (NO LONGER REQUIRED,
REMOVED)

    This is enough to manage timed delivery of video.

    NOTE: Transports only in forward direction (currently) - updates to
the
    render clock are not propogated backwards.
```

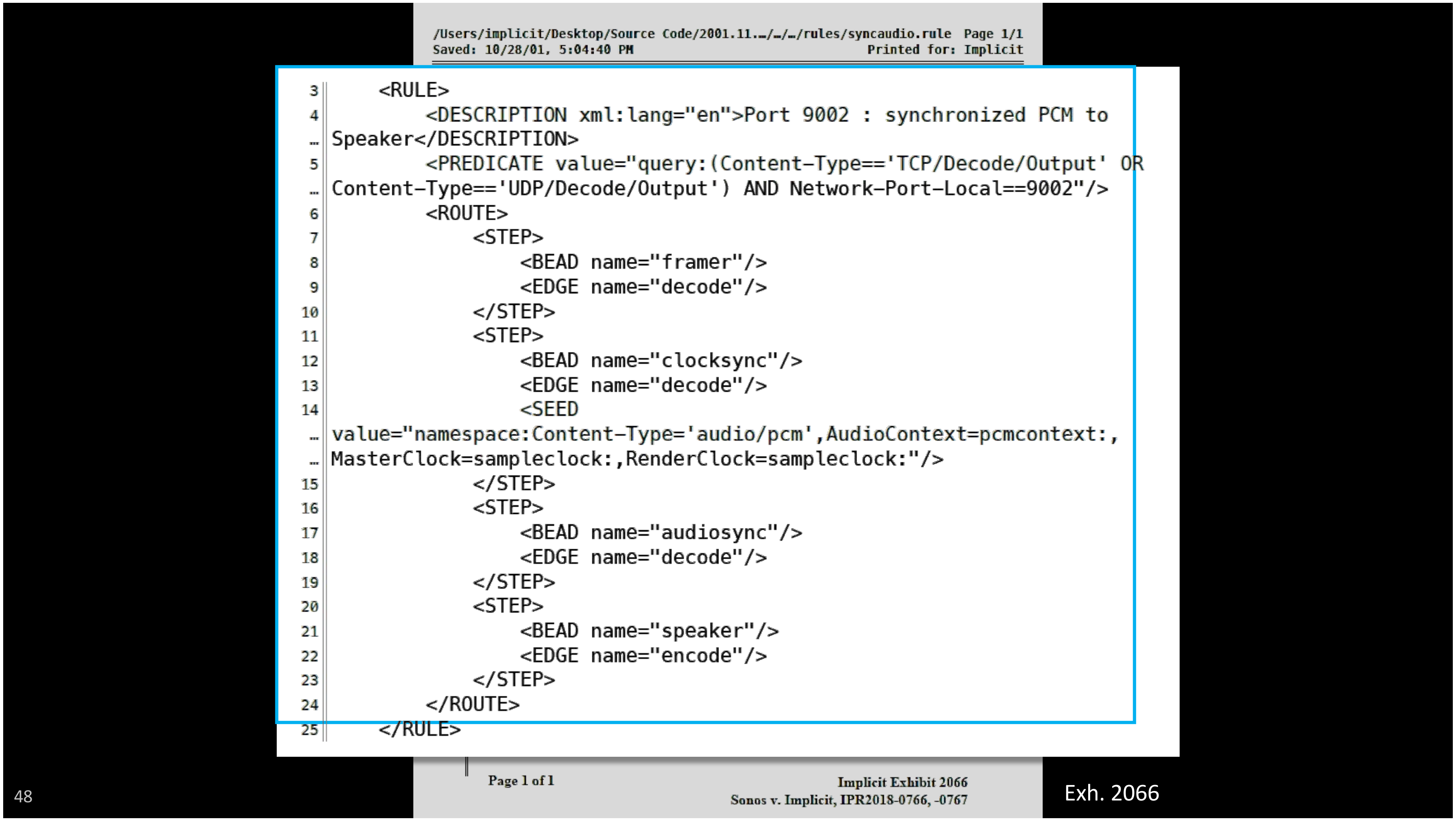
```
SOS_SOURCE_VERSION("$Id: clocksync.c,v 1.11 2001/10/23 17:11:25 guyc Exp
$");
```

Page 1 of 25

Implicit Exhibit 2020
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2020

47



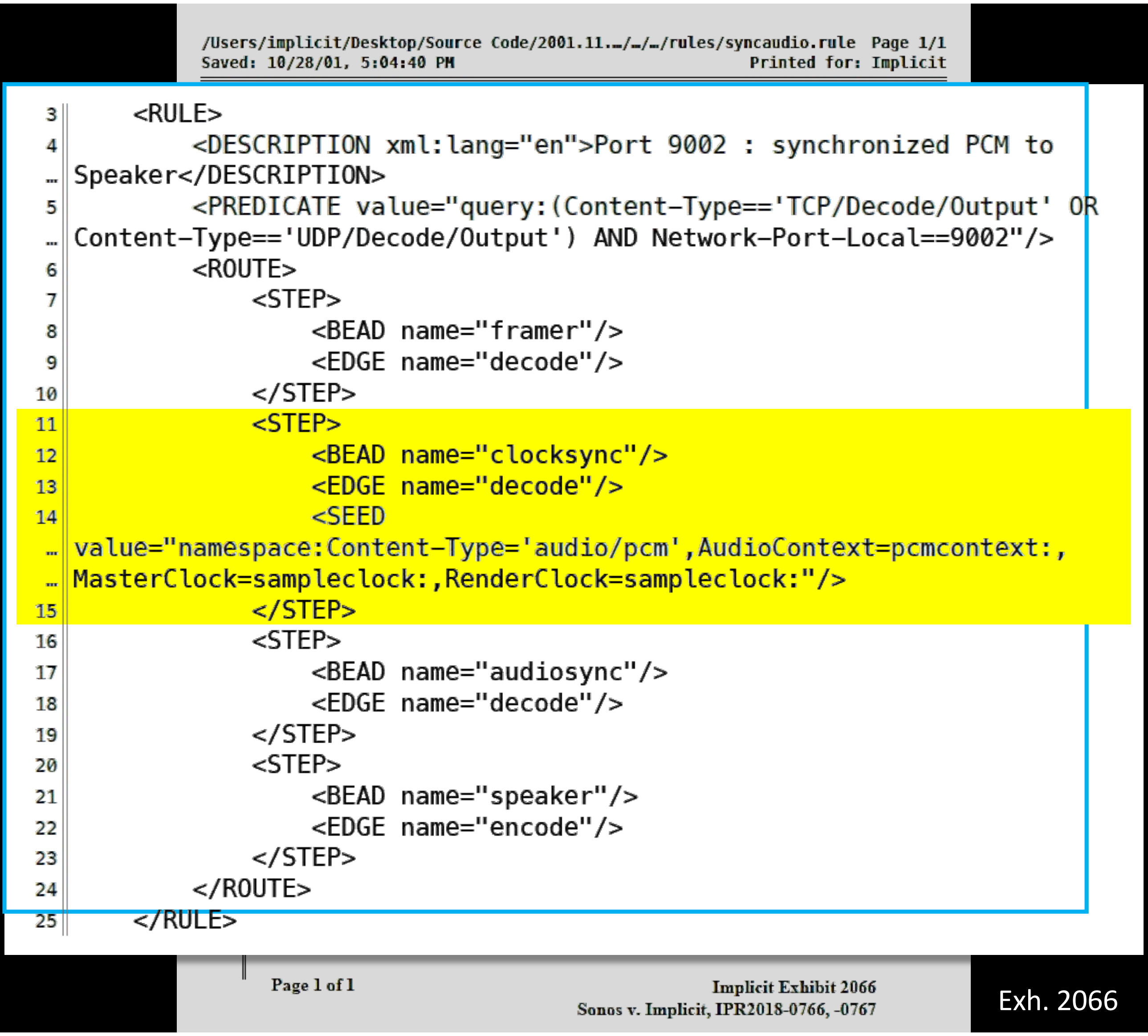
```
/Users/implicit/Desktop/Source Code/2001.11.../.../.../rules/syncaudio.rule  Page 1/1
Saved: 10/28/01, 5:04:40 PM                               Printed for: Implicit
```

```
    <RULE>
        <DESCRIPTION xml:lang="en">Port 9002 : synchronized PCM to
Speaker</DESCRIPTION>
        <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR
Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9002"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="clocksync"/>
                <EDGE name="decode"/>
                <SEED
value="namespace:Content-Type='audio/pcm',AudioContext=pcmcontext:,
MasterClock=sampleclock:,RenderClock=sampleclock:"/>
            </STEP>
            <STEP>
                <BEAD name="audiosync"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="speaker"/>
                <EDGE name="encode"/>
            </STEP>
        </ROUTE>
    </RULE>
```

Page 1 of 1

Implicit Exhibit 2066
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2066



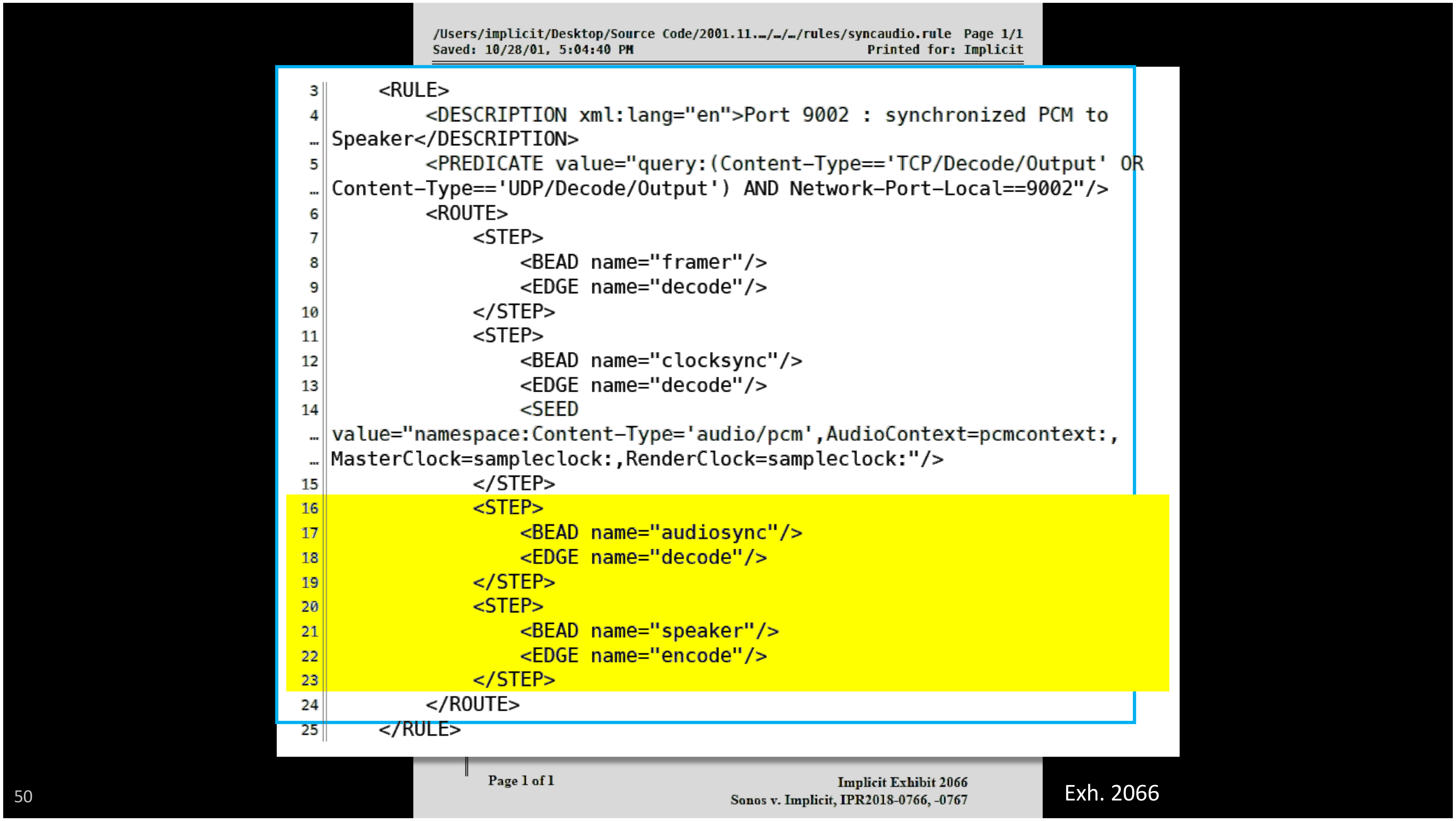
/Users/implicit/Desktop/Source Code/2001.11…/…/…/rules/syncaudio.rule Page 1/1
Saved: 10/28/01, 5:04:40 PM Printed for: Implicit

```
    <RULE>
        <DESCRIPTION xml:lang="en">Port 9002 : synchronized PCM to
Speaker</DESCRIPTION>
        <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR
Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9002"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="clocksync"/>
                <EDGE name="decode"/>
                <SEED
value="namespace:Content-Type='audio/pcm',AudioContext=pcmcontext:,
MasterClock=sampleclock:,RenderClock=sampleclock:"/>
            </STEP>
            <STEP>
                <BEAD name="audiosync"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="speaker"/>
                <EDGE name="encode"/>
            </STEP>
        </ROUTE>
    </RULE>
```

Page 1 of 1

Implicit Exhibit 2066
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2066



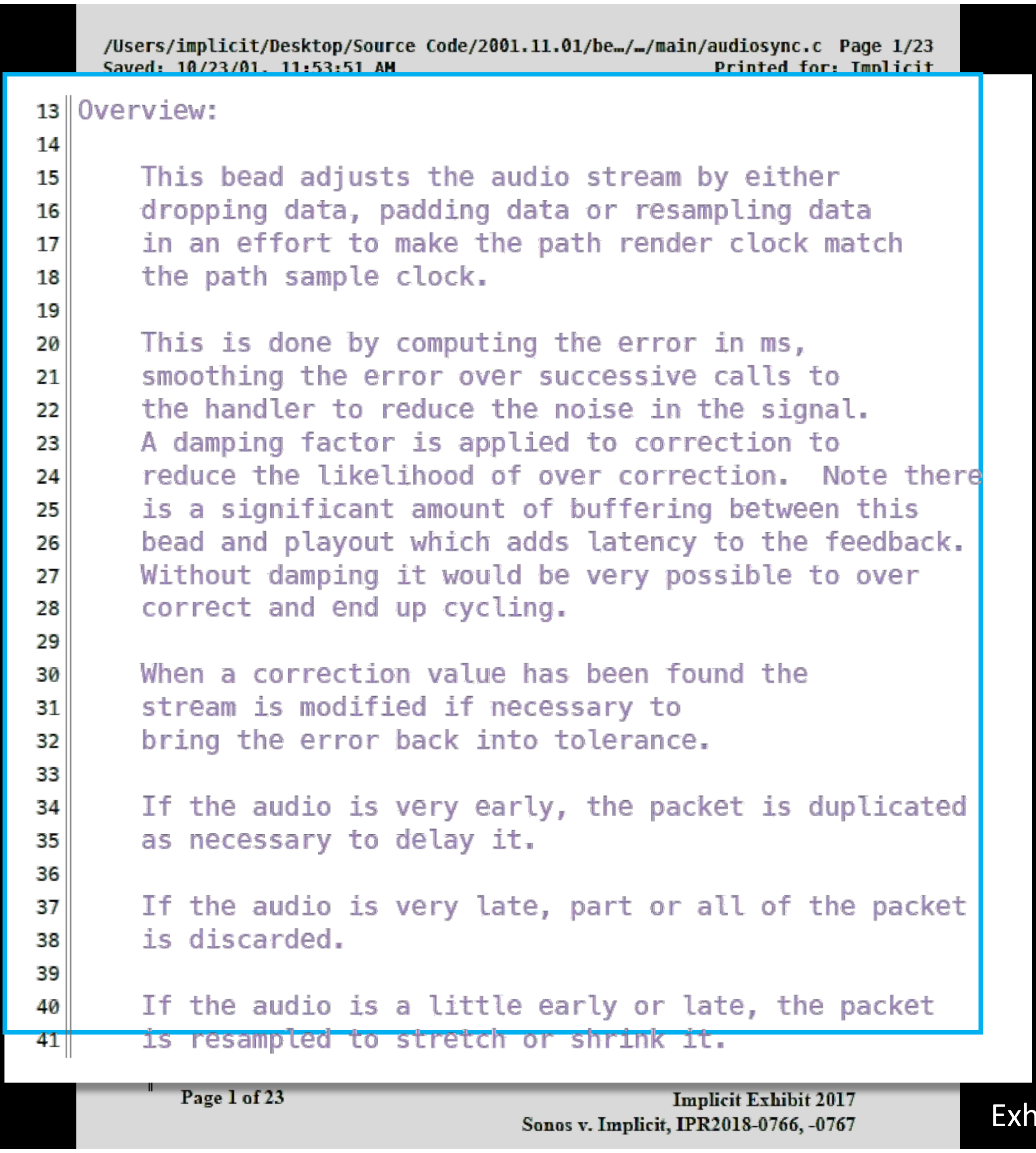
/Users/implicit/Desktop/Source Code/2001.11…/…/…/rules/syncaudio.rule Page 1/1
Saved: 10/28/01, 5:04:40 PM Printed for: Implicit

```
    <RULE>
        <DESCRIPTION xml:lang="en">Port 9002 : synchronized PCM to Speaker</DESCRIPTION>
        <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9002"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="clocksync"/>
                <EDGE name="decode"/>
                <SEED value="namespace:Content-Type='audio/pcm',AudioContext=pcmcontext:,MasterClock=sampleclock:,RenderClock=sampleclock:"/>
            </STEP>
            <STEP>
                <BEAD name="audiosync"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="speaker"/>
                <EDGE name="encode"/>
            </STEP>
        </ROUTE>
    </RULE>
```

Page 1 of 1

Implicit Exhibit 2066
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2066



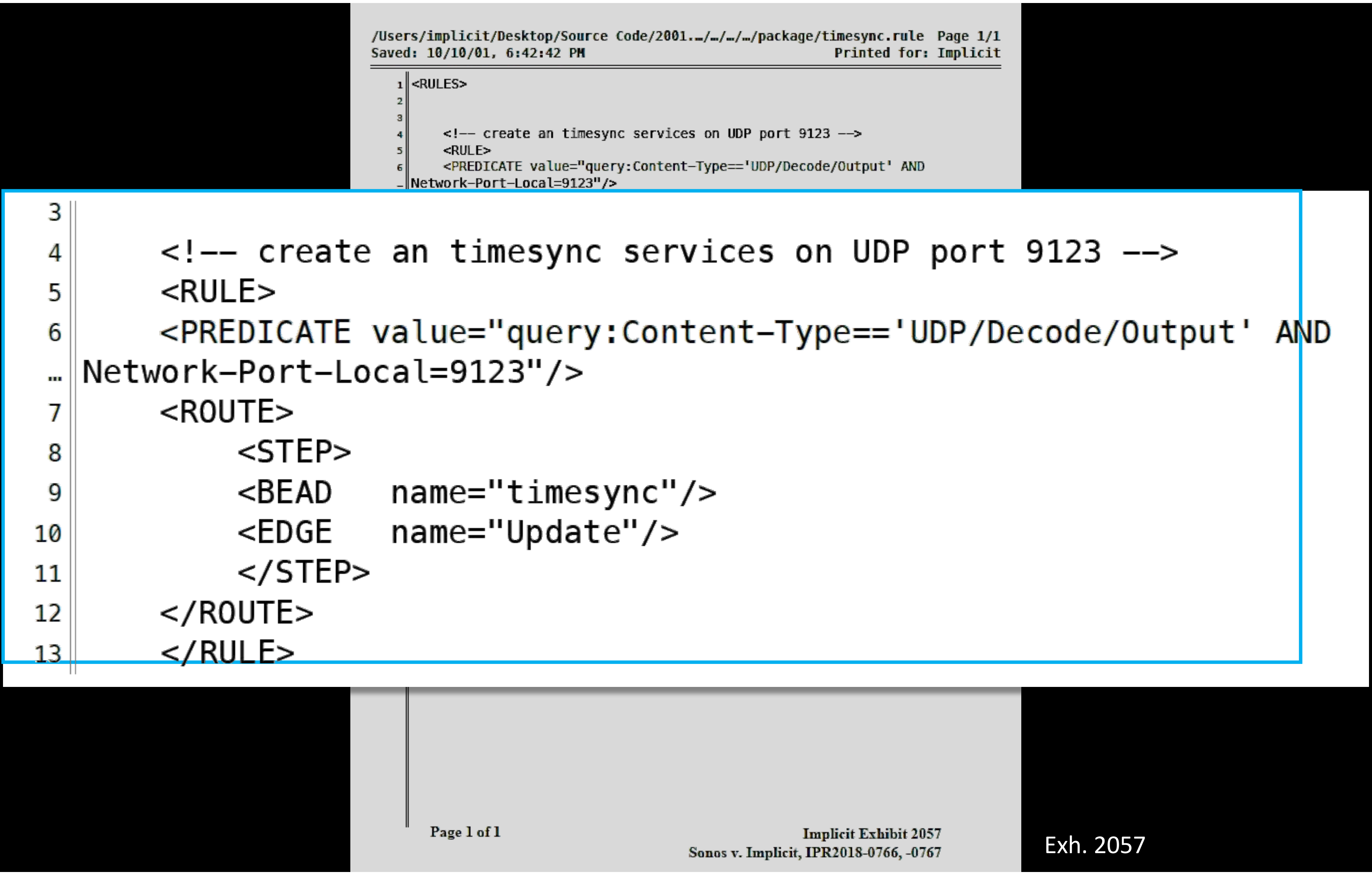
```
/Users/implicit/Desktop/Source Code/2001.11.01/be…/…/main/audiosync.c  Page 1/23
Saved: 10/23/01, 11:53:51 AM                                Printed for: Implicit
```

```
Overview:

    This bead adjusts the audio stream by either
    dropping data, padding data or resampling data
    in an effort to make the path render clock match
    the path sample clock.

    This is done by computing the error in ms,
    smoothing the error over successive calls to
    the handler to reduce the noise in the signal.
    A damping factor is applied to correction to
    reduce the likelihood of over correction.  Note there
    is a significant amount of buffering between this
    bead and playout which adds latency to the feedback.
    Without damping it would be very possible to over
    correct and end up cycling.

    When a correction value has been found the
    stream is modified if necessary to
    bring the error back into tolerance.

    If the audio is very early, the packet is duplicated
    as necessary to delay it.

    If the audio is very late, part or all of the packet
    is discarded.

    If the audio is a little early or late, the packet
    is resampled to stretch or shrink it.
```

Page 1 of 23

Implicit Exhibit 2017
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2017



/Users/implicit/Desktop/Source Code/2001…/…/…/…/package/timesync.rule Page 1/1
Saved: 10/10/01, 6:42:42 PM Printed for: Implicit

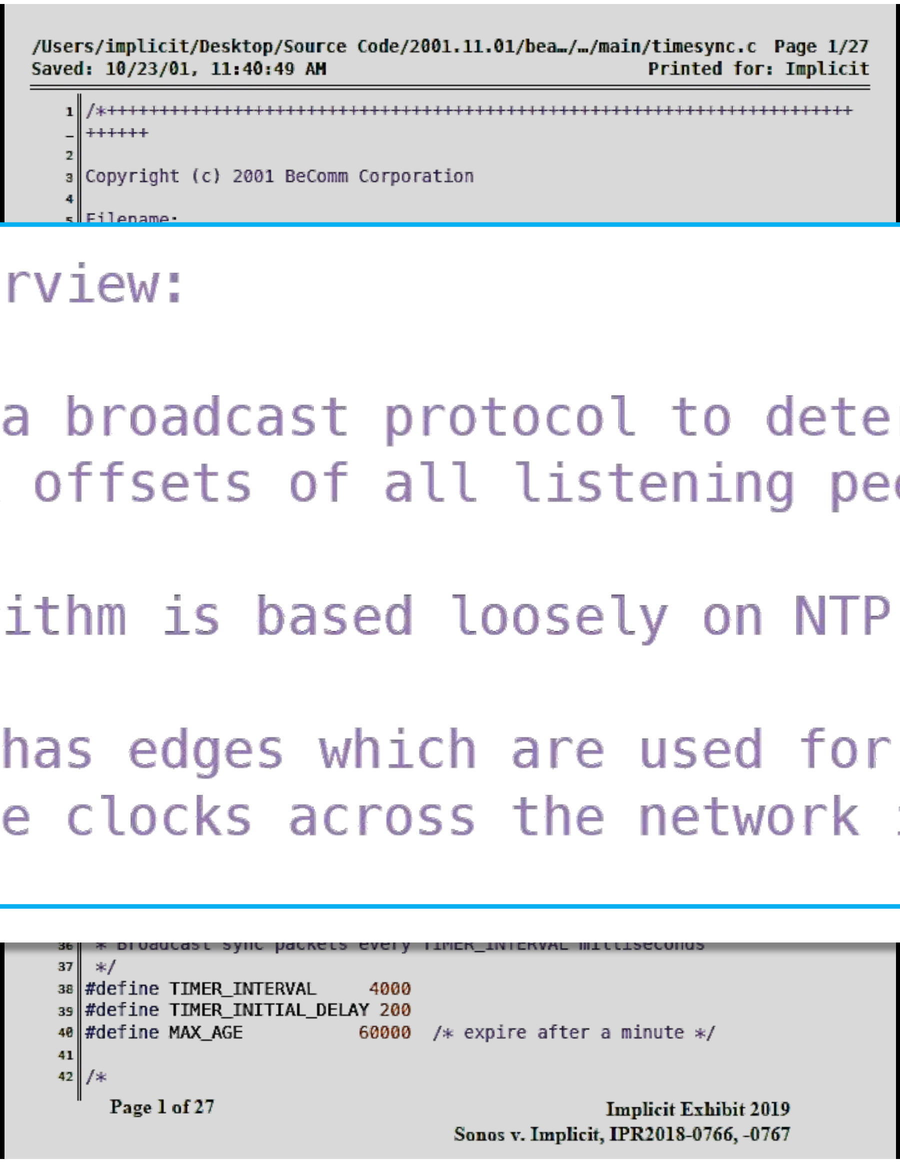
```
<RULES>


    <!-- create an timesync services on UDP port 9123 -->
    <RULE>
    <PREDICATE value="query:Content-Type=='UDP/Decode/Output' AND
Network-Port-Local=9123"/>
```

```

    <!-- create an timesync services on UDP port 9123 -->
    <RULE>
    <PREDICATE value="query:Content-Type=='UDP/Decode/Output' AND
Network-Port-Local=9123"/>
    <ROUTE>
        <STEP>
        <BEAD   name="timesync"/>
        <EDGE   name="Update"/>
        </STEP>
    </ROUTE>
    </RULE>
```

Page 1 of 1

Implicit Exhibit 2057
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2057



```
/Users/implicit/Desktop/Source Code/2001.11.01/bea…/…/main/timesync.c  Page 1/27
Saved: 10/23/01, 11:40:49 AM                                    Printed for: Implicit

/*++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++

Copyright (c) 2001 BeComm Corporation

Filename:
```

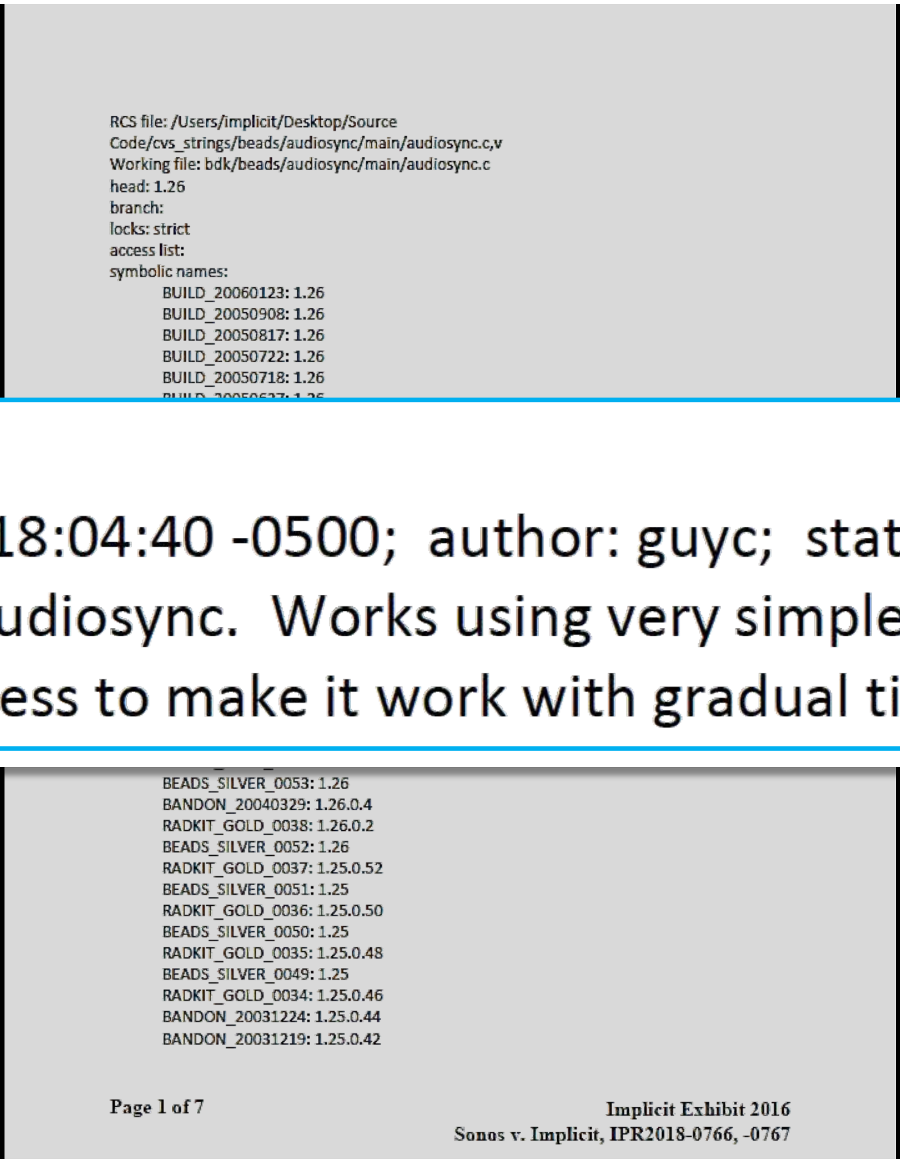
```
Group Overview:

    Uses a broadcast protocol to determine the
    clock offsets of all listening peers.

    Algorithm is based loosely on NTP.

    Also has edges which are used for passing
    sample clocks across the network in a path.
```

```
 * broadcast sync packets every TIMER_INTERVAL milliseconds
 */
#define TIMER_INTERVAL      4000
#define TIMER_INITIAL_DELAY 200
#define MAX_AGE            60000  /* expire after a minute */

/*
```

Page 1 of 27

Implicit Exhibit 2019
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2019



```
RCS file: /Users/implicit/Desktop/Source
Code/cvs_strings/beads/audiosync/main/audiosync.c,v
Working file: bdk/beads/audiosync/main/audiosync.c
head: 1.26
branch:
locks: strict
access list:
symbolic names:
        BUILD_20060123: 1.26
        BUILD_20050908: 1.26
        BUILD_20050817: 1.26
        BUILD_20050722: 1.26
        BUILD_20050718: 1.26
```

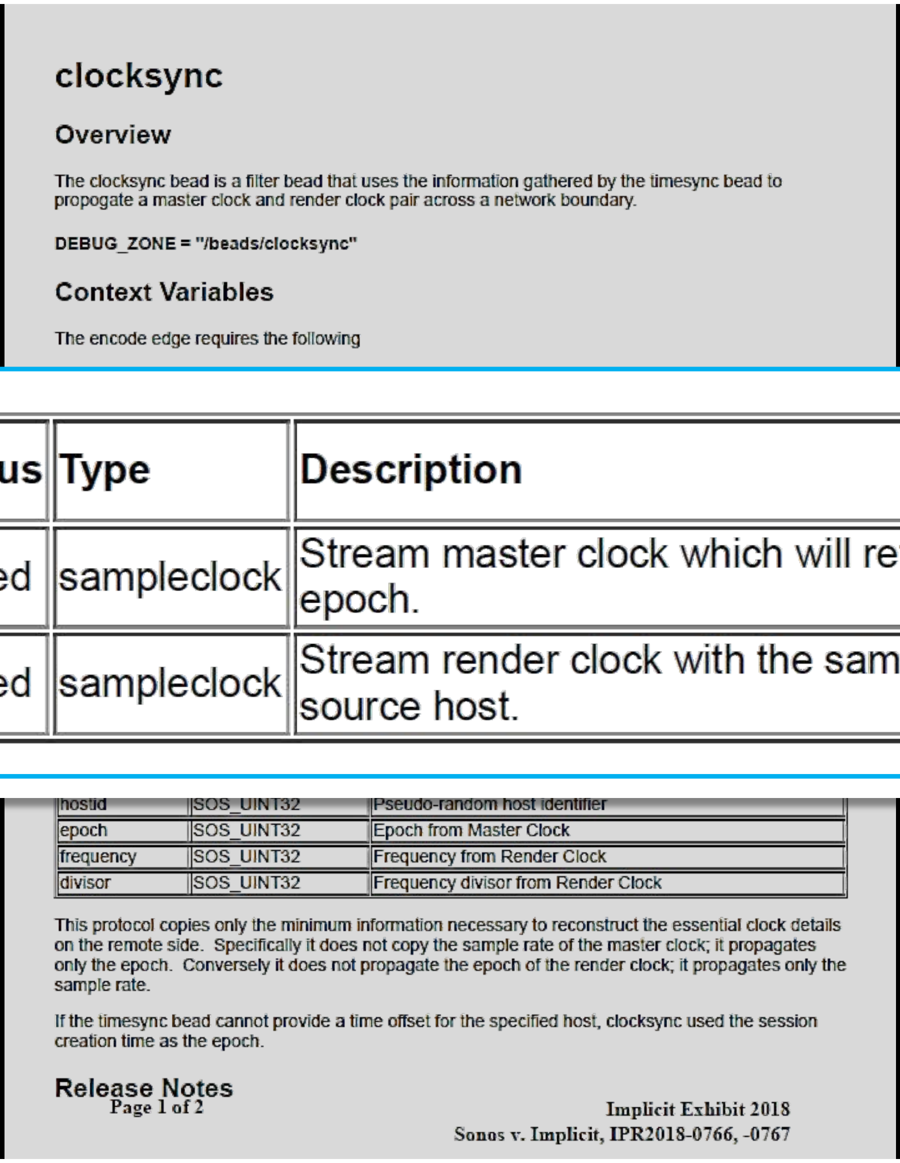
```
revision 1.1
date: 2001-09-28 18:04:40 -0500;  author: guyc;  state: Exp;
Initial checkin of audiosync.  Works using very simple silence/dropping
logic.  Requires finess to make it work with gradual time drift.
```

```
        BEADS_SILVER_0053: 1.26
        BANDON_20040329: 1.26.0.4
        RADKIT_GOLD_0038: 1.26.0.2
        BEADS_SILVER_0052: 1.26
        RADKIT_GOLD_0037: 1.25.0.52
        BEADS_SILVER_0051: 1.25
        RADKIT_GOLD_0036: 1.25.0.50
        BEADS_SILVER_0050: 1.25
        RADKIT_GOLD_0035: 1.25.0.48
        BEADS_SILVER_0049: 1.25
        RADKIT_GOLD_0034: 1.25.0.46
        BANDON_20031224: 1.25.0.44
        BANDON_20031219: 1.25.0.42
```

Page 1 of 7

Implicit Exhibit 2016
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2016



clocksync

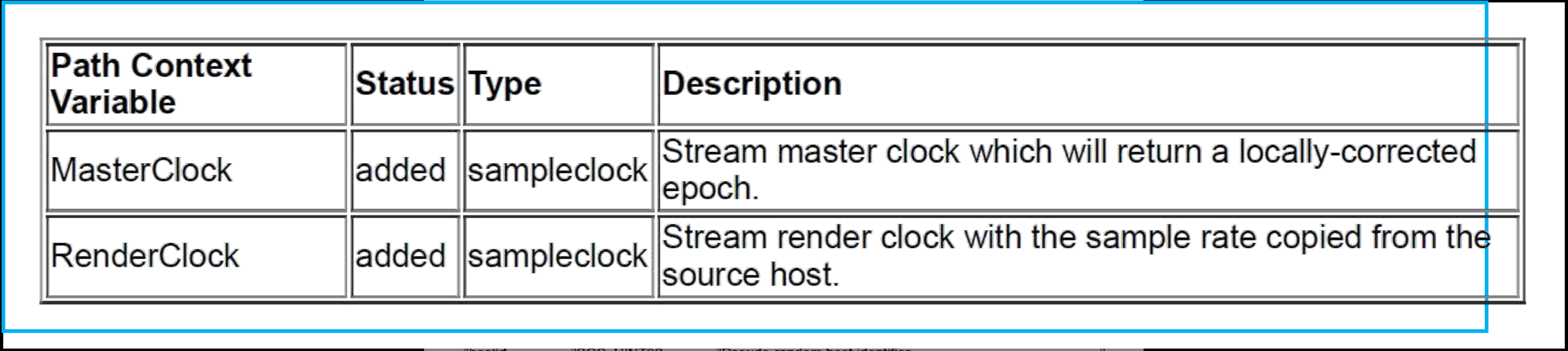
Overview

The clocksync bead is a filter bead that uses the information gathered by the timesync bead to propogate a master clock and render clock pair across a network boundary.

DEBUG_ZONE = "/beads/clocksync"

Context Variables

The encode edge requires the following



Path Context Variable	Status	Type	Description
MasterClock	added	sampleclock	Stream master clock which will return a locally-corrected epoch.
RenderClock	added	sampleclock	Stream render clock with the sample rate copied from the source host.

hostid	SOS_UINT32	Pseudo-random host identifier
epoch	SOS_UINT32	Epoch from Master Clock
frequency	SOS_UINT32	Frequency from Render Clock
divisor	SOS_UINT32	Frequency divisor from Render Clock

This protocol copies only the minimum information necessary to reconstruct the essential clock details on the remote side. Specifically it does not copy the sample rate of the master clock; it propagates only the epoch. Conversely it does not propagate the epoch of the render clock; it propagates only the sample rate.

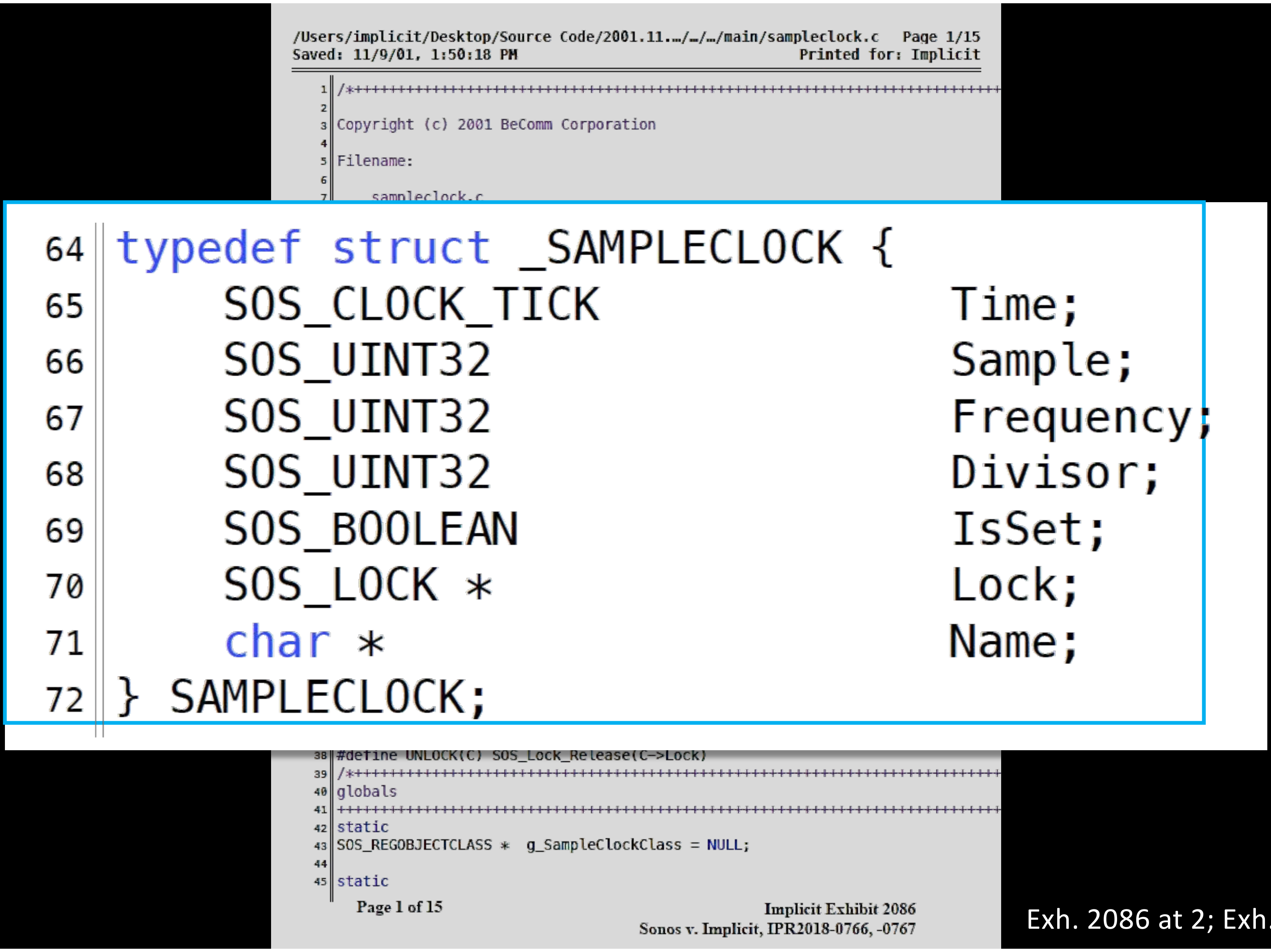
If the timesync bead cannot provide a time offset for the specified host, clocksync used the session creation time as the epoch.

Release Notes

Page 1 of 2

Implicit Exhibit 2018
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2018



```
/Users/implicit/Desktop/Source Code/2001.11…/…/…/main/sampleclock.c    Page 1/15
Saved: 11/9/01, 1:50:18 PM                                  Printed for: Implicit

/*+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Copyright (c) 2001 BeComm Corporation

Filename:

    sampleclock.c
```

```
typedef struct _SAMPLECLOCK {
    SOS_CLOCK_TICK                          Time;
    SOS_UINT32                              Sample;
    SOS_UINT32                              Frequency;
    SOS_UINT32                              Divisor;
    SOS_BOOLEAN                             IsSet;
    SOS_LOCK *                              Lock;
    char *                                  Name;
} SAMPLECLOCK;
```

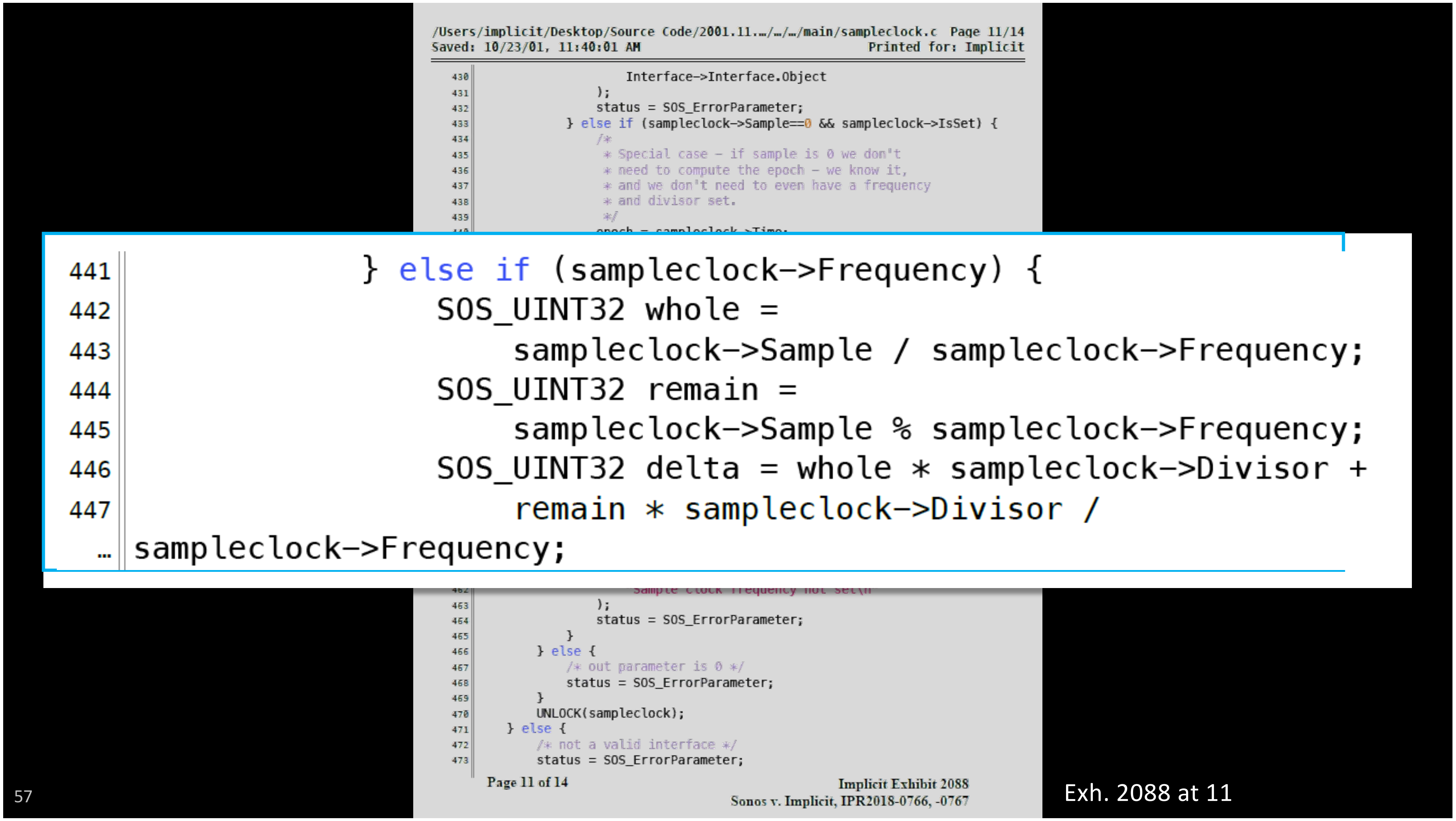
```
#define UNLOCK(C) SOS_Lock_Release(C->Lock)
/*+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
globals
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
static
SOS_REGOBJECTCLASS *  g_SampleClockClass = NULL;

static
```

Page 1 of 15

Implicit Exhibit 2086
Sonos v. Implicit, IPR2018-0766, -0767

56

Exh. 2086 at 2; Exh. 2088 at 2



```
/Users/implicit/Desktop/Source Code/2001.11…/…/…/main/sampleclock.c  Page 11/14
Saved: 10/23/01, 11:40:01 AM                                Printed for: Implicit
```

```
                        Interface->Interface.Object
                    );
                    status = SOS_ErrorParameter;
                } else if (sampleclock->Sample==0 && sampleclock->IsSet) {
                    /*
                     * Special case - if sample is 0 we don't
                     * need to compute the epoch - we know it,
                     * and we don't need to even have a frequency
                     * and divisor set.
                     */
                    epoch = sampleclock->Time;
```

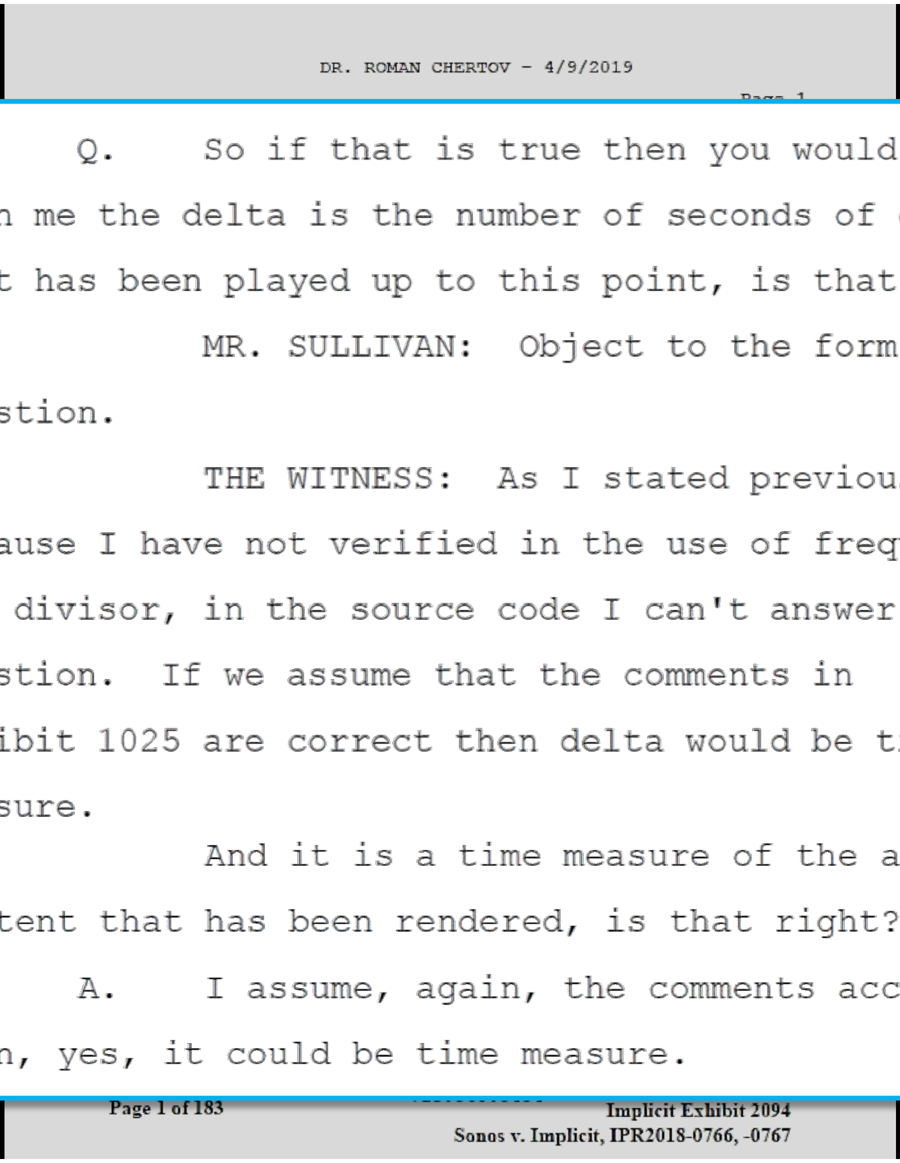
```
                } else if (sampleclock->Frequency) {
                    SOS_UINT32 whole =
                        sampleclock->Sample / sampleclock->Frequency;
                    SOS_UINT32 remain =
                        sampleclock->Sample % sampleclock->Frequency;
                    SOS_UINT32 delta = whole * sampleclock->Divisor +
                        remain * sampleclock->Divisor /
sampleclock->Frequency;
```

```
                        "Sample clock frequency not set\n"
                    );
                    status = SOS_ErrorParameter;
                }
            } else {
                /* out parameter is 0 */
                status = SOS_ErrorParameter;
            }
            UNLOCK(sampleclock);
        } else {
            /* not a valid interface */
            status = SOS_ErrorParameter;
```

Page 11 of 14

Implicit Exhibit 2088
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2088 at 11


DR. ROMAN CHERTOV - 4/9/2019

Page 1

Q. So if that is true then you would agree with me the delta is the number of seconds of content that has been played up to this point, is that right?

MR. SULLIVAN: Object to the form of the question.

THE WITNESS: As I stated previously because I have not verified in the use of frequency of the divisor, in the source code I can't answer this question. If we assume that the comments in Exhibit 1025 are correct then delta would be time measure.

And it is a time measure of the amount of content that has been rendered, is that right?

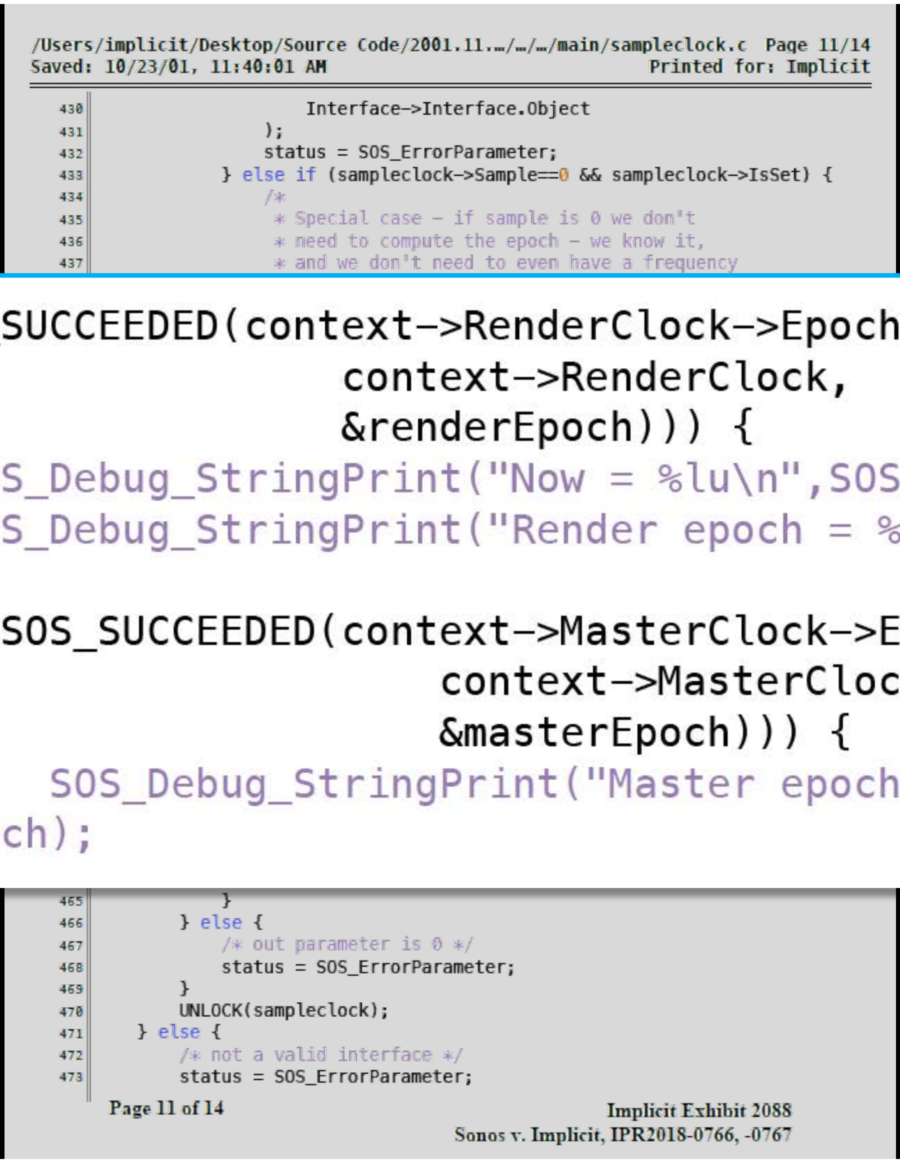
A. I assume, again, the comments accurate then, yes, it could be time measure.

Page 1 of 183

Implicit Exhibit 2094

Sonos v. Implicit, IPR2018-0766, -0767

Chertov Depo at 83:19-84:10



/Users/implicit/Desktop/Source Code/2001.11…/…/…/main/sampleclock.c Page 11/14
Saved: 10/23/01, 11:40:01 AM Printed for: Implicit

```
                    Interface->Interface.Object
                );
                status = SOS_ErrorParameter;
            } else if (sampleclock->Sample==0 && sampleclock->IsSet) {
                /*
                 * Special case - if sample is 0 we don't
                 * need to compute the epoch - we know it,
                 * and we don't need to even have a frequency
```

```
        if (SOS_SUCCEEDED(context->RenderClock->EpochGet(
                                    context->RenderClock,
                                    &renderEpoch))) {
//              SOS_Debug_StringPrint("Now = %lu\n",SOS_Clock_TickGet());
//              SOS_Debug_StringPrint("Render epoch = %lu\n",renderEpoch);

            if (SOS_SUCCEEDED(context->MasterClock->EpochGet(
                                        context->MasterClock,
                                        &masterEpoch))) {
//                  SOS_Debug_StringPrint("Master epoch =
%lu\n",masterEpoch);
```

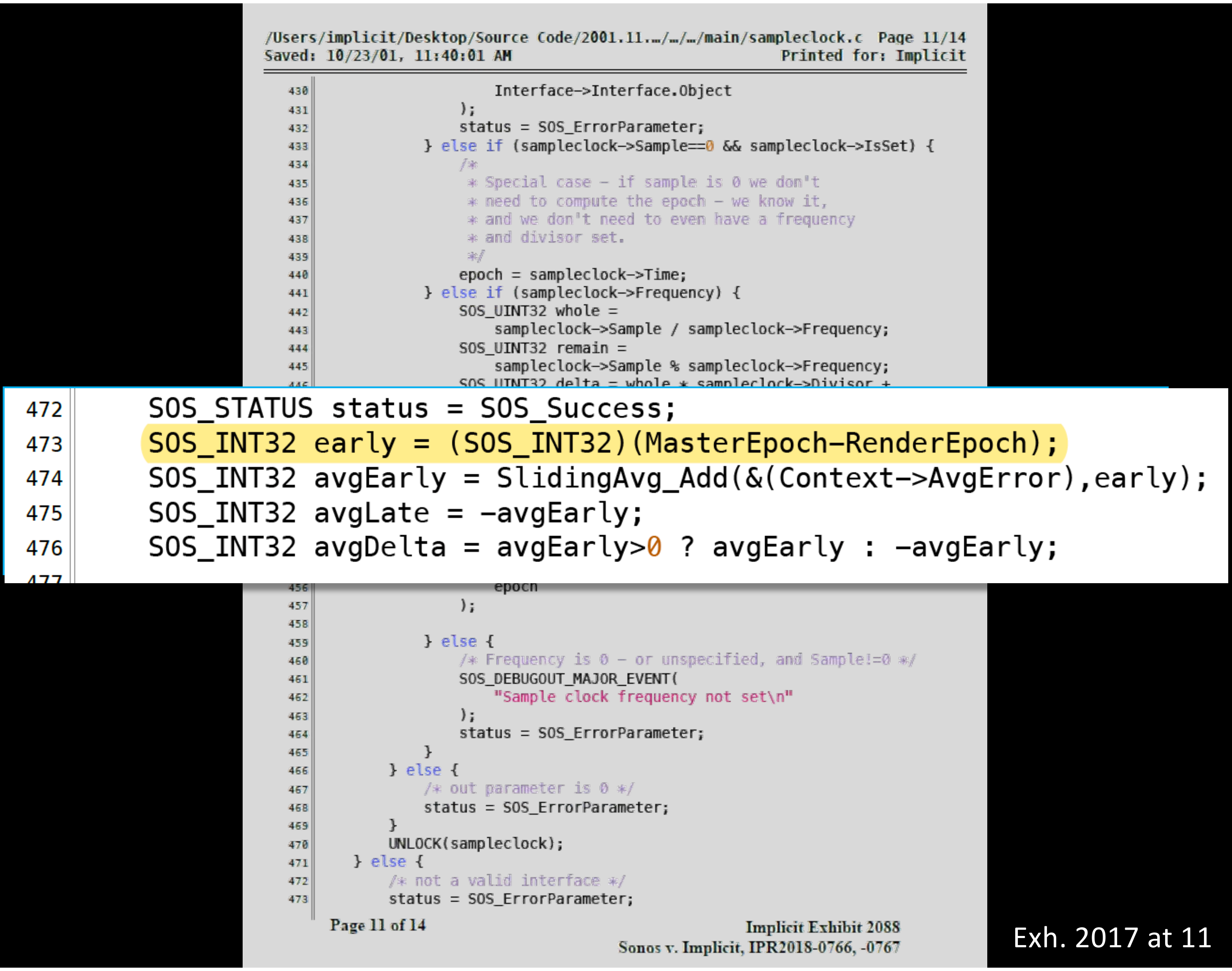
```
            }
        } else {
            /* out parameter is 0 */
            status = SOS_ErrorParameter;
        }
        UNLOCK(sampleclock);
    } else {
        /* not a valid interface */
        status = SOS_ErrorParameter;
```

Page 11 of 14

Implicit Exhibit 2088
Sonos v. Implicit, IPR2018-0766, -0767

59

Exh. 2017 at 17



/Users/implicit/Desktop/Source Code/2001.11…/…/…/main/sampleclock.c Page 11/14
Saved: 10/23/01, 11:40:01 AM Printed for: Implicit

```
                    Interface->Interface.Object
                );
                status = SOS_ErrorParameter;
            } else if (sampleclock->Sample==0 && sampleclock->IsSet) {
                /*
                 * Special case - if sample is 0 we don't
                 * need to compute the epoch - we know it,
                 * and we don't need to even have a frequency
                 * and divisor set.
                 */
                epoch = sampleclock->Time;
            } else if (sampleclock->Frequency) {
                SOS_UINT32 whole =
                    sampleclock->Sample / sampleclock->Frequency;
                SOS_UINT32 remain =
                    sampleclock->Sample % sampleclock->Frequency;
                SOS_UINT32 delta = whole * sampleclock->Divisor +
```

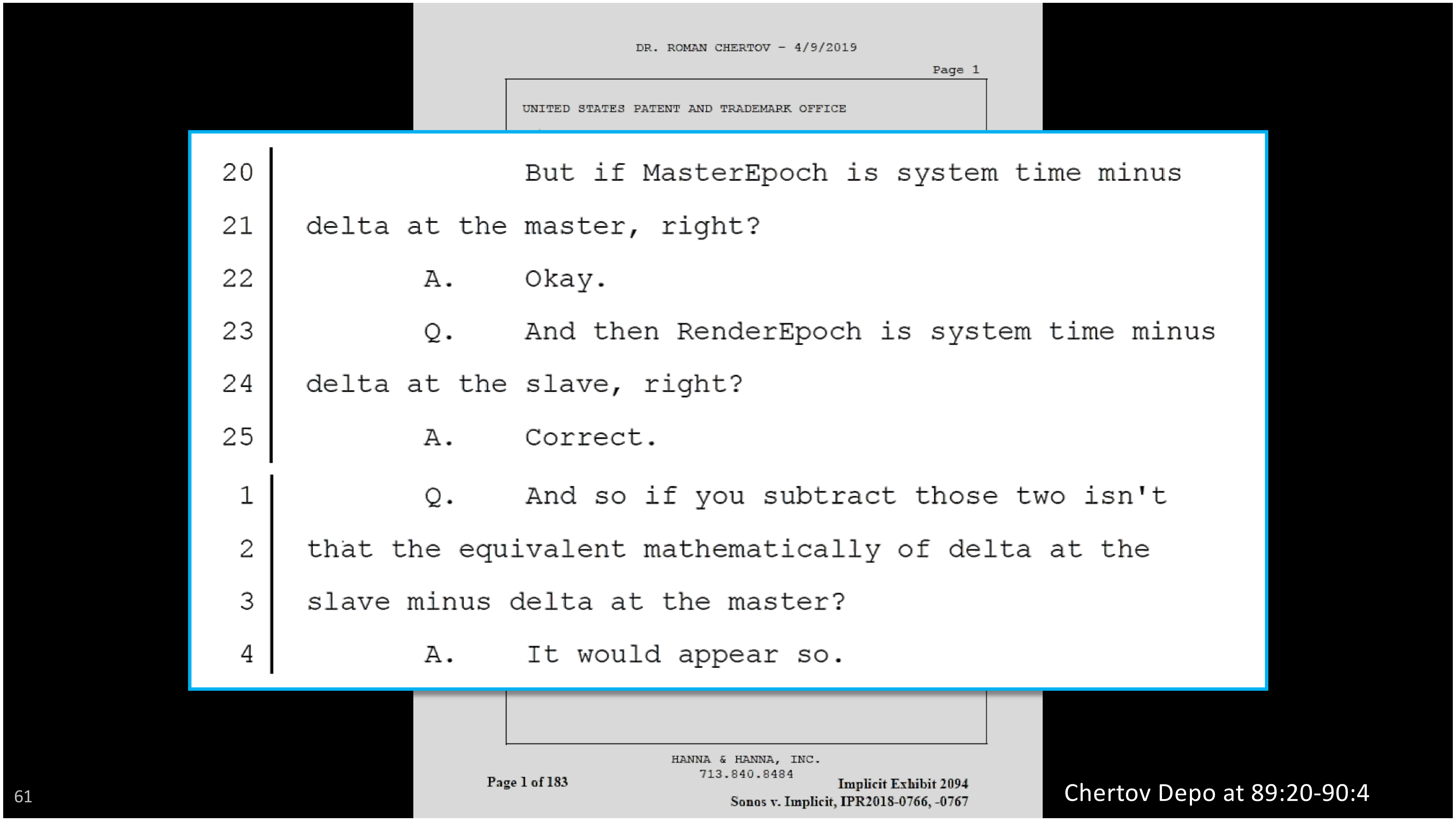
```
    SOS_STATUS status = SOS_Success;
    SOS_INT32 early = (SOS_INT32)(MasterEpoch-RenderEpoch);
    SOS_INT32 avgEarly = SlidingAvg_Add(&(Context->AvgError),early);
    SOS_INT32 avgLate = -avgEarly;
    SOS_INT32 avgDelta = avgEarly>0 ? avgEarly : -avgEarly;
```

```
                    epoch
                );

            } else {
                /* Frequency is 0 - or unspecified, and Sample!=0 */
                SOS_DEBUGOUT_MAJOR_EVENT(
                    "Sample clock frequency not set\n"
                );
                status = SOS_ErrorParameter;
            }
        } else {
            /* out parameter is 0 */
            status = SOS_ErrorParameter;
        }
        UNLOCK(sampleclock);
    } else {
        /* not a valid interface */
        status = SOS_ErrorParameter;
```

Page 11 of 14

Implicit Exhibit 2088
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2017 at 11


DR. ROMAN CHERTOV - 4/9/2019

Page 1

UNITED STATES PATENT AND TRADEMARK OFFICE

But if MasterEpoch is system time minus delta at the master, right?

A. Okay.

Q. And then RenderEpoch is system time minus delta at the slave, right?

A. Correct.

Q. And so if you subtract those two isn't that the equivalent mathematically of delta at the slave minus delta at the master?

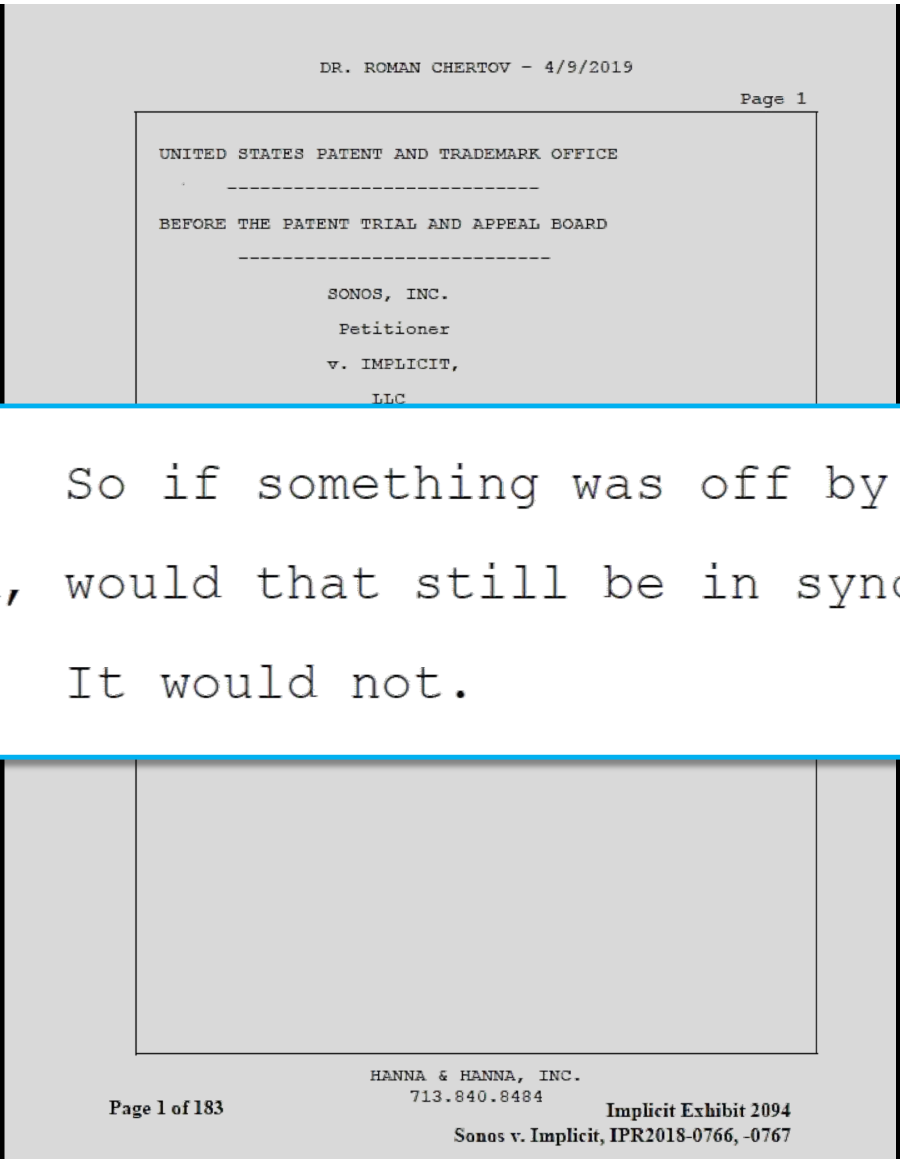
A. It would appear so.

HANNA & HANNA, INC.
713.840.8484

Page 1 of 183

Implicit Exhibit 2094
Sonos v. Implicit, IPR2018-0766, -0767

Chertov Depo at 89:20-90:4


DR. ROMAN CHERTOV - 4/9/2019

Page 1

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.

Petitioner

v. IMPLICIT,

LLC

Q. So if something was off by one-tenth of a millisecond, would that still be in sync?

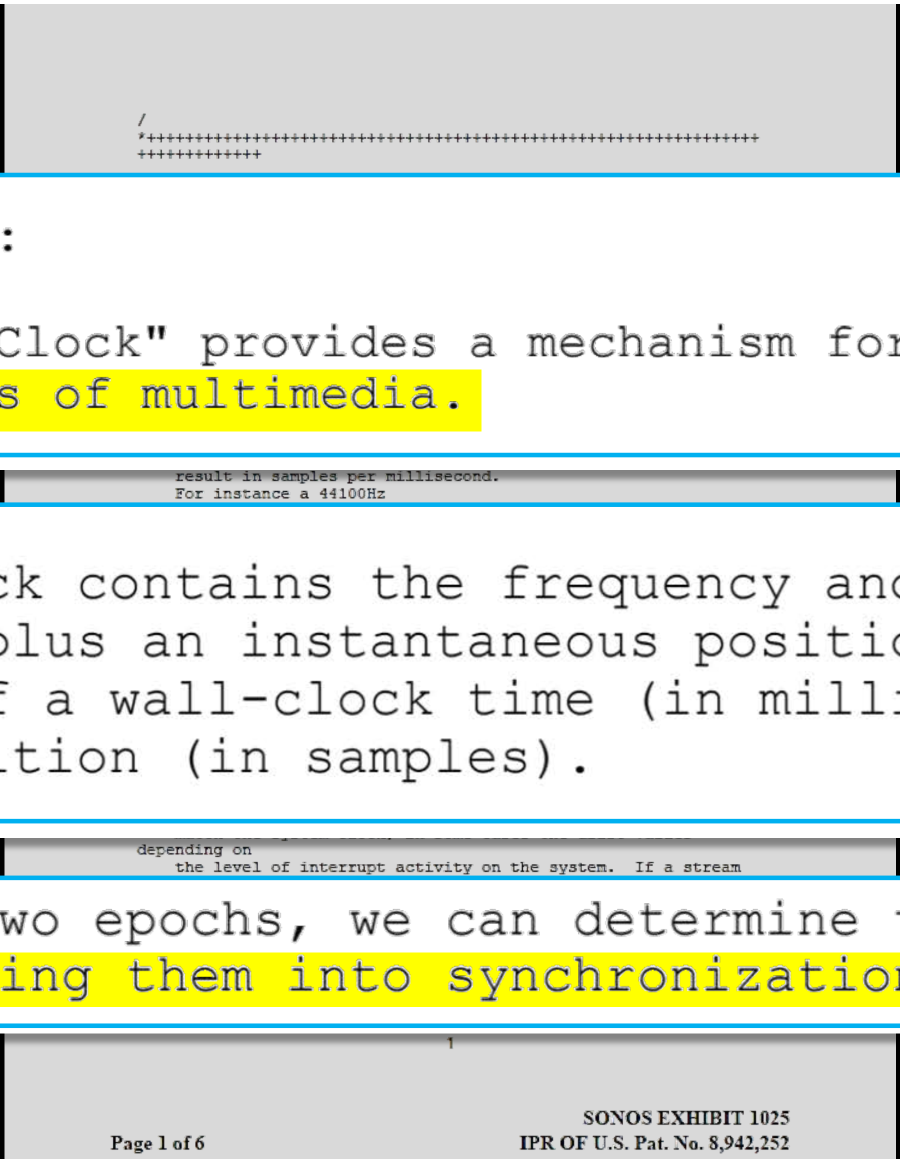
A. It would not.

HANNA & HANNA, INC.
713.840.8484

Page 1 of 183

Implicit Exhibit 2094
Sonos v. Implicit, IPR2018-0766, -0767

Chertov Depo at 159:2-4



```
/
*+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++++++
```

Group Overview:

A "Sample Clock" provides a mechanism for synchronizing two streams of multimedia.

```
    result in samples per millisecond.
    For instance a 44100Hz
```

A sample clock contains the frequency and divisor for the stream, plus an instantaneous position mark, consisting of a wall-clock time (in milliseconds) and a sample position (in samples).

```
depending on
    the level of interrupt activity on the system.  If a stream
```

By comparing two epochs, we can determine the time shift required to bring them into synchronization.

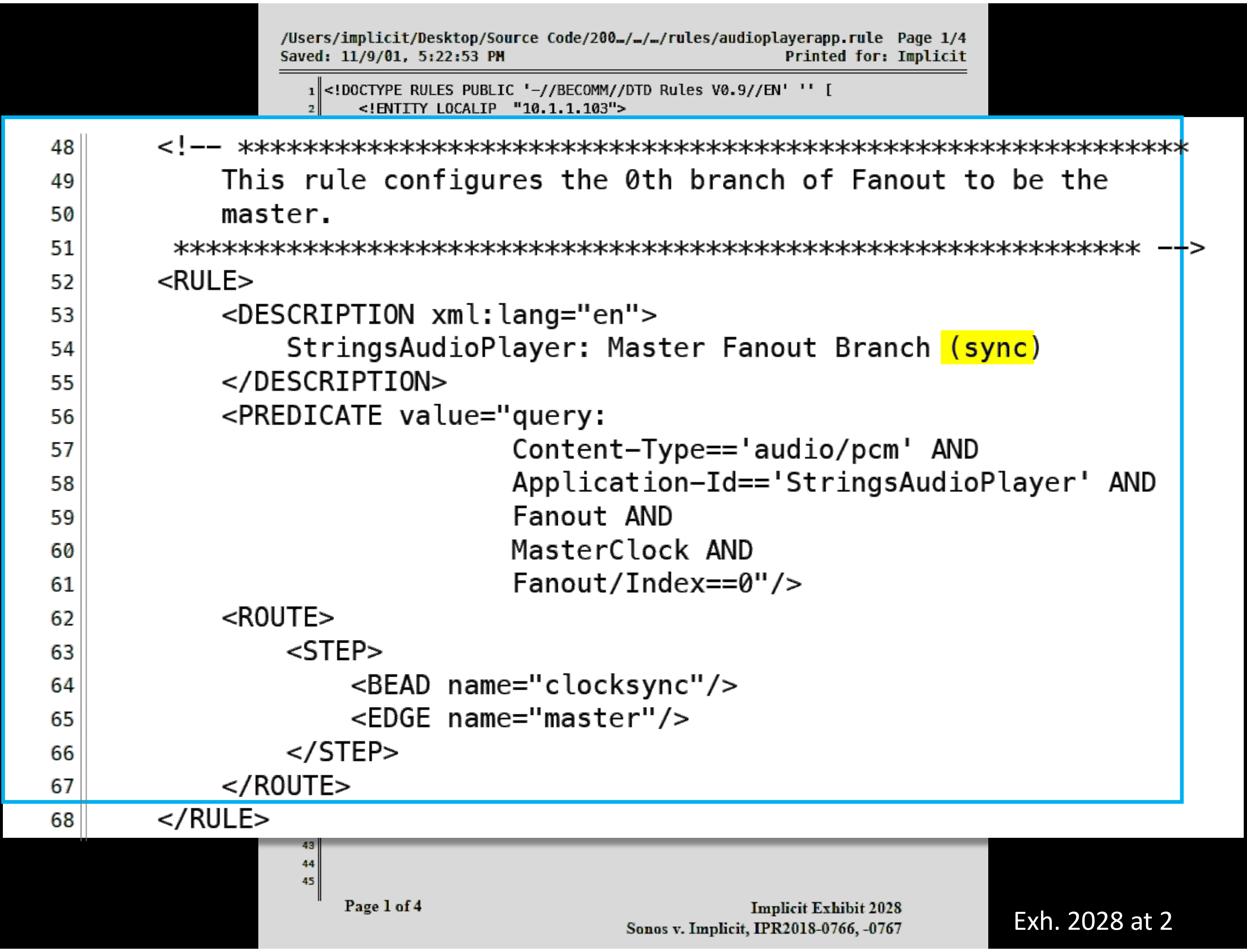
1

Page 1 of 6

SONOS EXHIBIT 1025
IPR OF U.S. Pat. No. 8,942,252

Sonos Exh. 1025

63



/Users/implicit/Desktop/Source Code/200…/…/…/rules/audioplayerapp.rule Page 1/4
Saved: 11/9/01, 5:22:53 PM   Printed for: Implicit

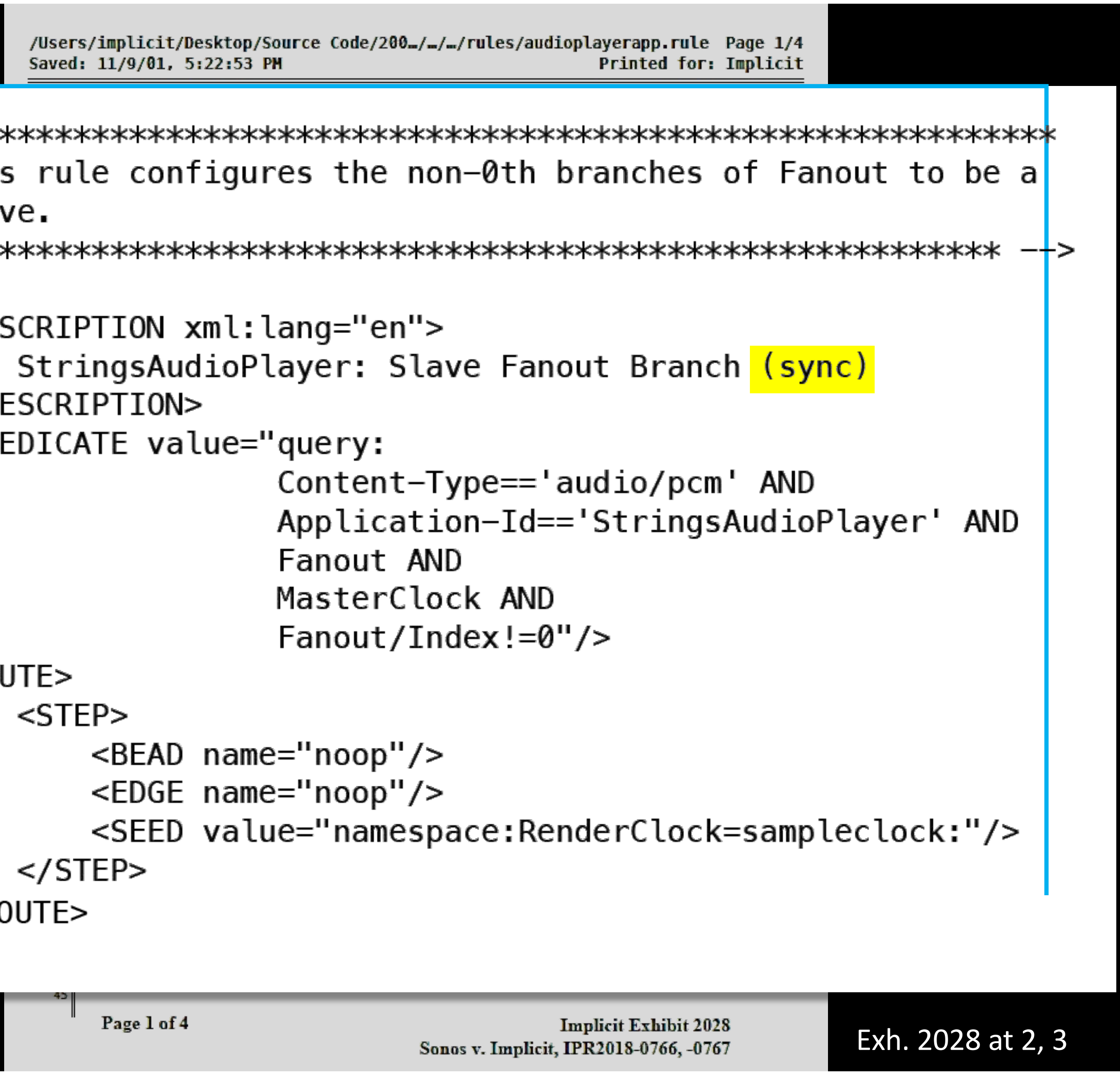
```
<!DOCTYPE RULES PUBLIC '-//BECOMM//DTD Rules V0.9//EN' '' [
    <!ENTITY LOCALIP  "10.1.1.103">
```

```
    <!-- ***********************************************************
        This rule configures the 0th branch of Fanout to be the
        master.
     ********************************************************** -->
    <RULE>
        <DESCRIPTION xml:lang="en">
            StringsAudioPlayer: Master Fanout Branch (sync)
        </DESCRIPTION>
        <PREDICATE value="query:
                          Content-Type=='audio/pcm' AND
                          Application-Id=='StringsAudioPlayer' AND
                          Fanout AND
                          MasterClock AND
                          Fanout/Index==0"/>
        <ROUTE>
            <STEP>
                <BEAD name="clocksync"/>
                <EDGE name="master"/>
            </STEP>
        </ROUTE>
    </RULE>
```

Page 1 of 4

Implicit Exhibit 2028
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2028 at 2

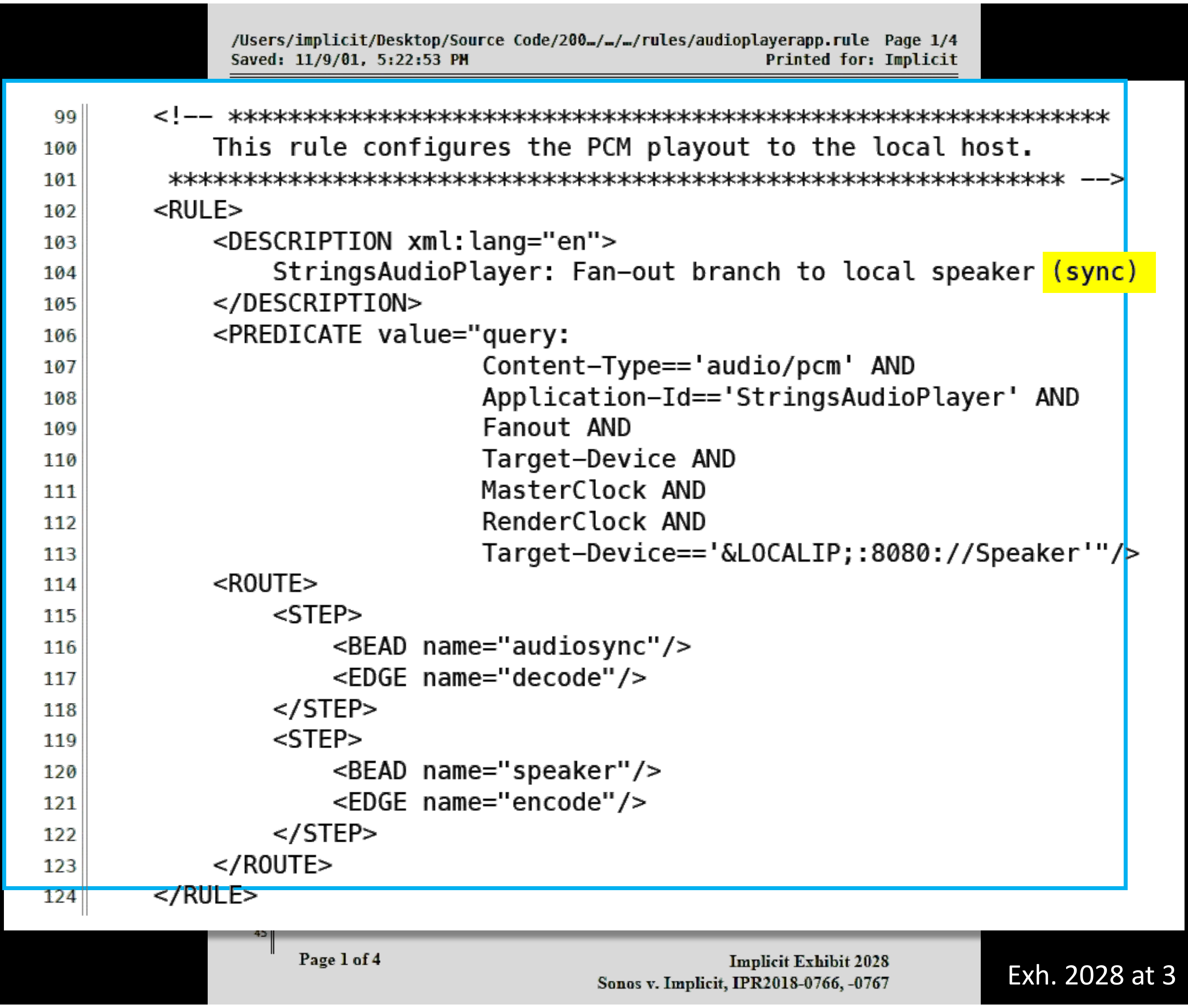

/Users/implicit/Desktop/Source Code/200…/…/…/rules/audioplayerapp.rule Page 1/4
Saved: 11/9/01, 5:22:53 PM Printed for: Implicit

```
    <!-- ***********************************************************
        This rule configures the non-0th branches of Fanout to be a
        slave.
     ************************************************************ -->
    <RULE>
        <DESCRIPTION xml:lang="en">
            StringsAudioPlayer: Slave Fanout Branch (sync)
        </DESCRIPTION>
        <PREDICATE value="query:
                                  Content-Type=='audio/pcm' AND
                                  Application-Id=='StringsAudioPlayer' AND
                                  Fanout AND
                                  MasterClock AND
                                  Fanout/Index!=0"/>
        <ROUTE>
            <STEP>
                <BEAD name="noop"/>
                <EDGE name="noop"/>
                <SEED value="namespace:RenderClock=sampleclock:"/>
            </STEP>
        </ROUTE>
    </RULE>
```

Page 1 of 4

Implicit Exhibit 2028
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2028 at 2, 3



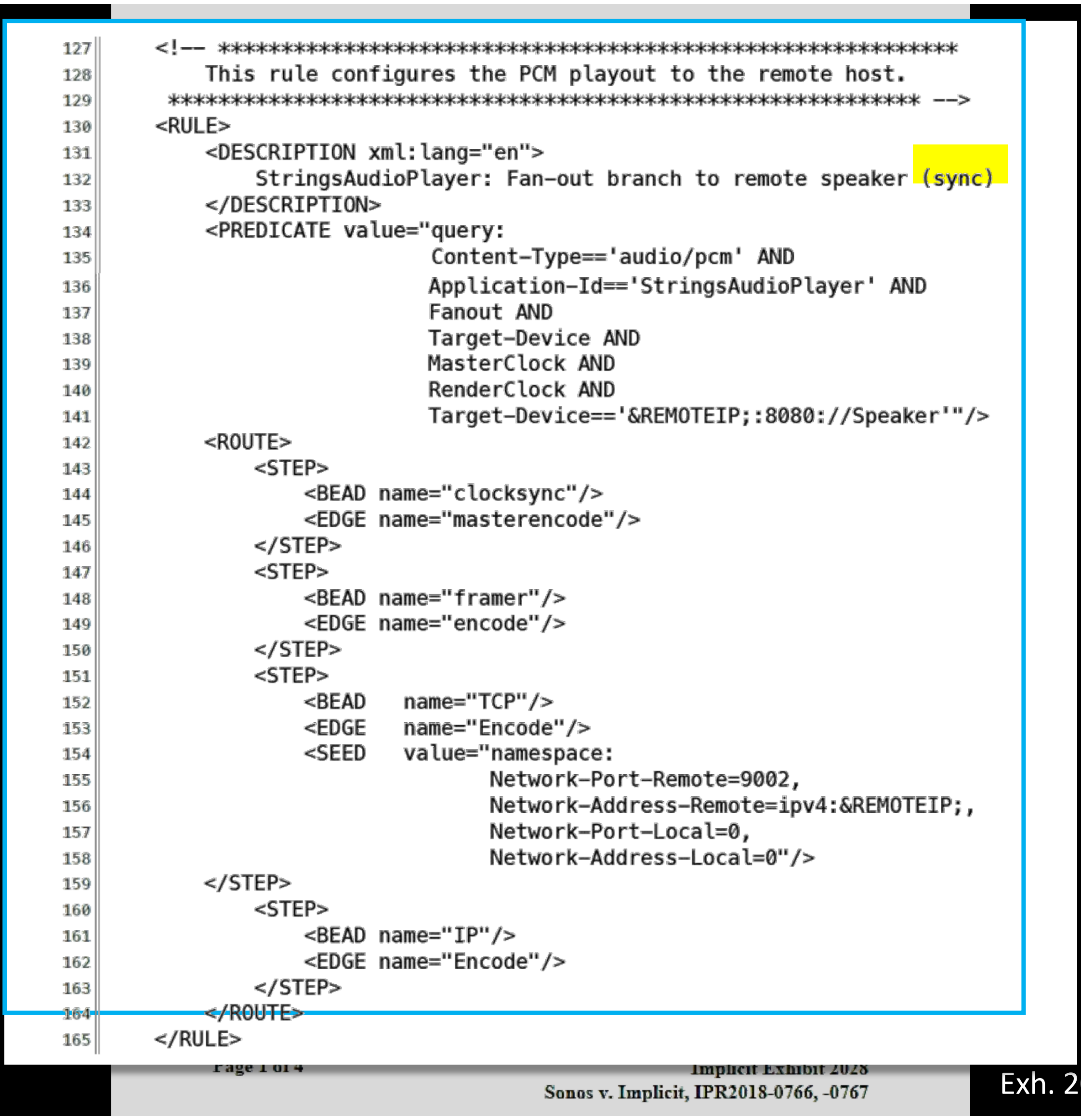
/Users/implicit/Desktop/Source Code/200…/…/…/rules/audioplayerapp.rule Page 1/4
Saved: 11/9/01, 5:22:53 PM Printed for: Implicit

```
<!-- ************************************************************
    This rule configures the PCM playout to the local host.
 ************************************************************ -->
<RULE>
    <DESCRIPTION xml:lang="en">
        StringsAudioPlayer: Fan-out branch to local speaker (sync)
    </DESCRIPTION>
    <PREDICATE value="query:
                  Content-Type=='audio/pcm' AND
                  Application-Id=='StringsAudioPlayer' AND
                  Fanout AND
                  Target-Device AND
                  MasterClock AND
                  RenderClock AND
                  Target-Device=='&LOCALIP;:8080://Speaker'"/>
    <ROUTE>
        <STEP>
            <BEAD name="audiosync"/>
            <EDGE name="decode"/>
        </STEP>
        <STEP>
            <BEAD name="speaker"/>
            <EDGE name="encode"/>
        </STEP>
    </ROUTE>
</RULE>
```

Page 1 of 4

Implicit Exhibit 2028
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2028 at 3



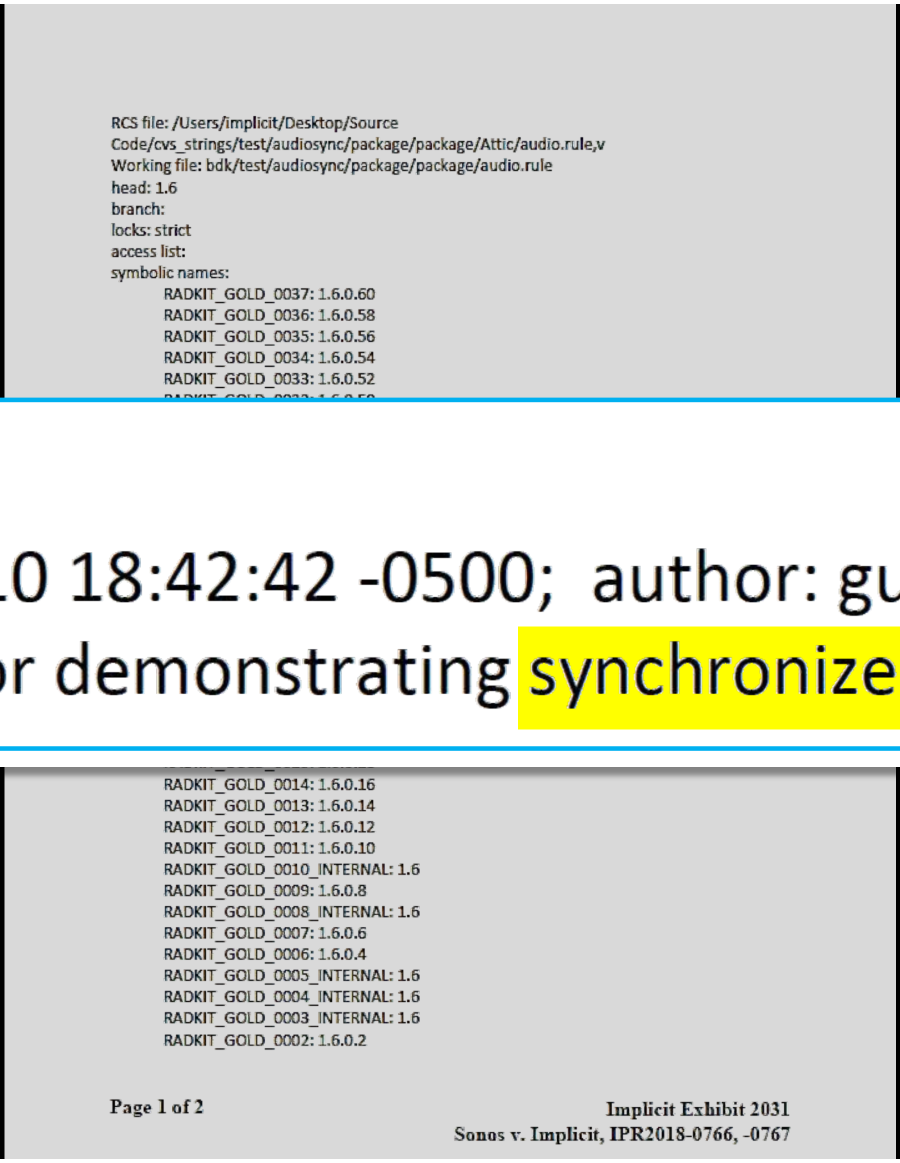
```
<!-- ************************************************************
    This rule configures the PCM playout to the remote host.
 ************************************************************ -->
<RULE>
    <DESCRIPTION xml:lang="en">
        StringsAudioPlayer: Fan-out branch to remote speaker (sync)
    </DESCRIPTION>
    <PREDICATE value="query:
                  Content-Type=='audio/pcm' AND
                  Application-Id=='StringsAudioPlayer' AND
                  Fanout AND
                  Target-Device AND
                  MasterClock AND
                  RenderClock AND
                  Target-Device=='&REMOTEIP;:8080://Speaker'"/>
    <ROUTE>
        <STEP>
            <BEAD name="clocksync"/>
            <EDGE name="masterencode"/>
        </STEP>
        <STEP>
            <BEAD name="framer"/>
            <EDGE name="encode"/>
        </STEP>
        <STEP>
            <BEAD   name="TCP"/>
            <EDGE   name="Encode"/>
            <SEED   value="namespace:
                        Network-Port-Remote=9002,
                        Network-Address-Remote=ipv4:&REMOTEIP;,
                        Network-Port-Local=0,
                        Network-Address-Local=0"/>
    </STEP>
        <STEP>
            <BEAD name="IP"/>
            <EDGE name="Encode"/>
        </STEP>
    </ROUTE>
</RULE>
```

Page 1 of 4

Implicit Exhibit 2028
Sonos v. Implicit, IPR2018-0766, -0767

67

Exh. 2028 at 3, 4



```
RCS file: /Users/implicit/Desktop/Source
Code/cvs_strings/test/audiosync/package/package/Attic/audio.rule,v
Working file: bdk/test/audiosync/package/package/audio.rule
head: 1.6
branch:
locks: strict
access list:
symbolic names:
        RADKIT_GOLD_0037: 1.6.0.60
        RADKIT_GOLD_0036: 1.6.0.58
        RADKIT_GOLD_0035: 1.6.0.56
        RADKIT_GOLD_0034: 1.6.0.54
        RADKIT_GOLD_0033: 1.6.0.52
```

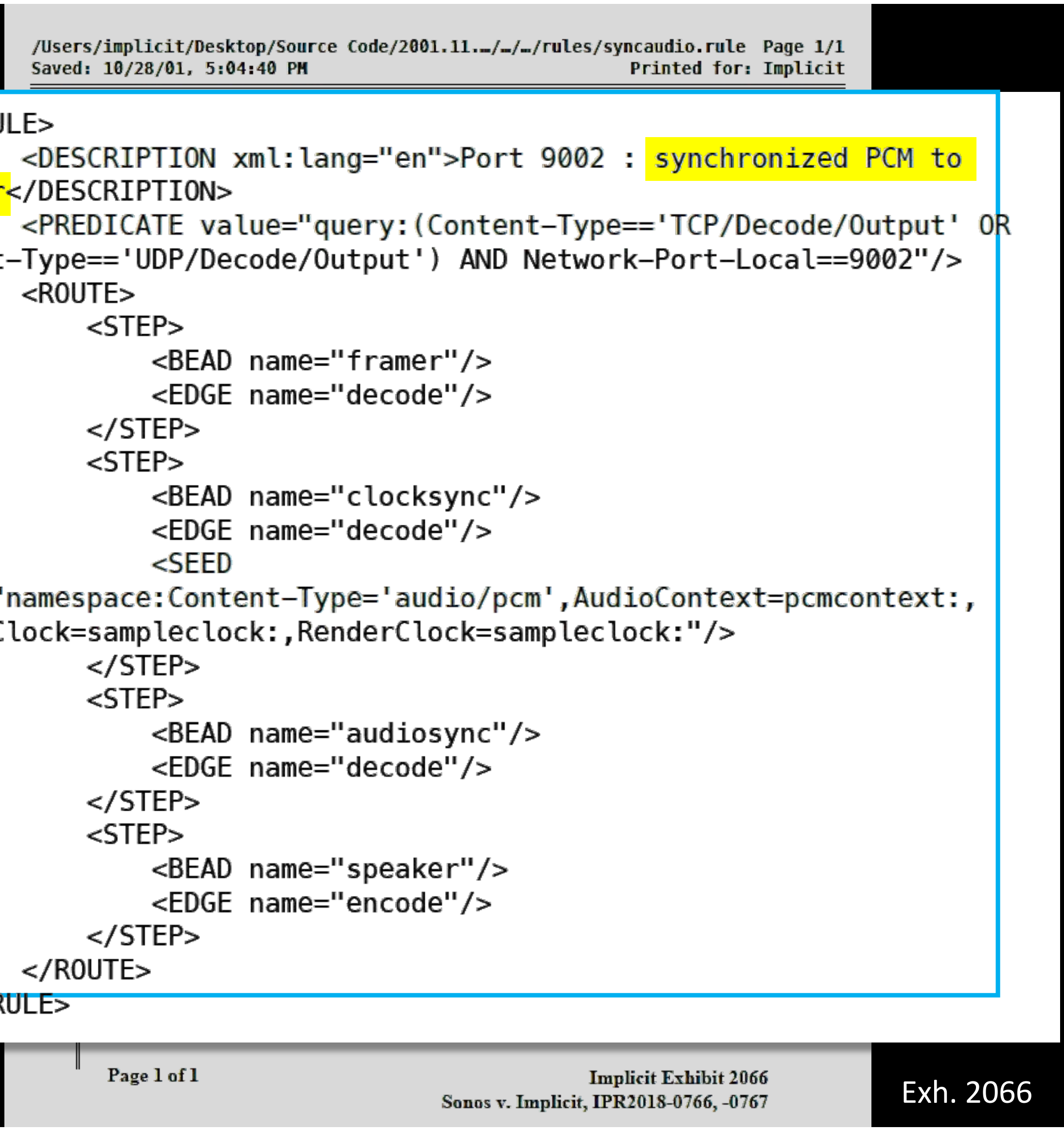
```
revision 1.1
date: 2001-10-10 18:42:42 -0500;  author: guyc;  state: Exp;
New package for demonstrating synchronized audio
```

```
        RADKIT_GOLD_0014: 1.6.0.16
        RADKIT_GOLD_0013: 1.6.0.14
        RADKIT_GOLD_0012: 1.6.0.12
        RADKIT_GOLD_0011: 1.6.0.10
        RADKIT_GOLD_0010_INTERNAL: 1.6
        RADKIT_GOLD_0009: 1.6.0.8
        RADKIT_GOLD_0008_INTERNAL: 1.6
        RADKIT_GOLD_0007: 1.6.0.6
        RADKIT_GOLD_0006: 1.6.0.4
        RADKIT_GOLD_0005_INTERNAL: 1.6
        RADKIT_GOLD_0004_INTERNAL: 1.6
        RADKIT_GOLD_0003_INTERNAL: 1.6
        RADKIT_GOLD_0002: 1.6.0.2
```

Page 1 of 2

Implicit Exhibit 2031
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2031 at 2



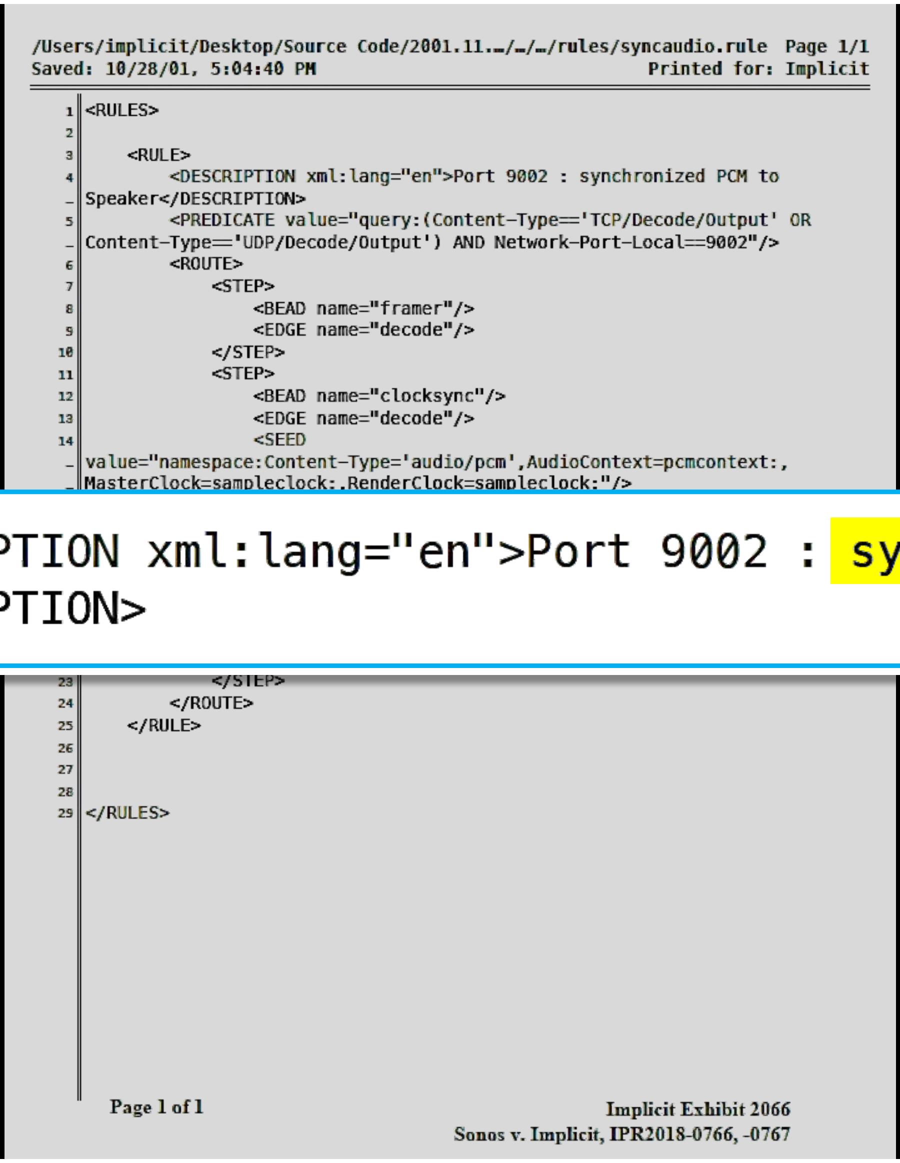
/Users/implicit/Desktop/Source Code/2001.11…/…/…/rules/syncaudio.rule Page 1/1
Saved: 10/28/01, 5:04:40 PM Printed for: Implicit

```
    <RULE>
        <DESCRIPTION xml:lang="en">Port 9002 : synchronized PCM to 
Speaker</DESCRIPTION>
        <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR 
Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9002"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="clocksync"/>
                <EDGE name="decode"/>
                <SEED 
value="namespace:Content-Type='audio/pcm',AudioContext=pcmcontext:,
MasterClock=sampleclock:,RenderClock=sampleclock:"/>
            </STEP>
            <STEP>
                <BEAD name="audiosync"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="speaker"/>
                <EDGE name="encode"/>
            </STEP>
        </ROUTE>
    </RULE>
```

Page 1 of 1

Implicit Exhibit 2066
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2066



```
/Users/implicit/Desktop/Source Code/2001.11…/…/…/rules/syncaudio.rule  Page 1/1
Saved: 10/28/01, 5:04:40 PM                                Printed for: Implicit

<RULES>

    <RULE>
        <DESCRIPTION xml:lang="en">Port 9002 : synchronized PCM to
Speaker</DESCRIPTION>
        <PREDICATE value="query:(Content-Type=='TCP/Decode/Output' OR
Content-Type=='UDP/Decode/Output') AND Network-Port-Local==9002"/>
        <ROUTE>
            <STEP>
                <BEAD name="framer"/>
                <EDGE name="decode"/>
            </STEP>
            <STEP>
                <BEAD name="clocksync"/>
                <EDGE name="decode"/>
                <SEED
value="namespace:Content-Type='audio/pcm',AudioContext=pcmcontext:,
MasterClock=sampleclock:,RenderClock=sampleclock:"/>
```

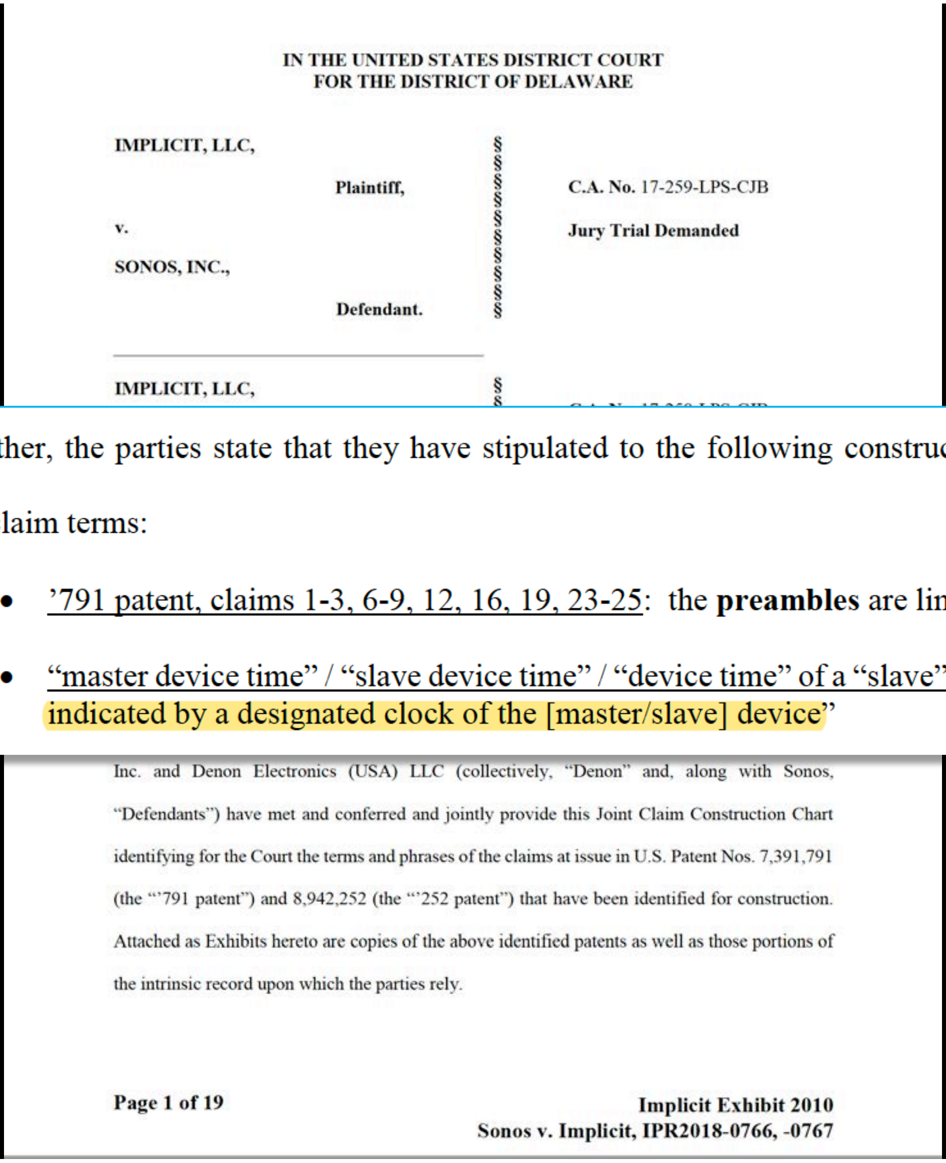
```
        <DESCRIPTION xml:lang="en">Port 9002 : synchronized PCM to
Speaker</DESCRIPTION>
```

```
            </STEP>
        </ROUTE>
    </RULE>



</RULES>
```

Page 1 of 1

Implicit Exhibit 2066
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2066



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,

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”

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

Exh. 2010 at 2

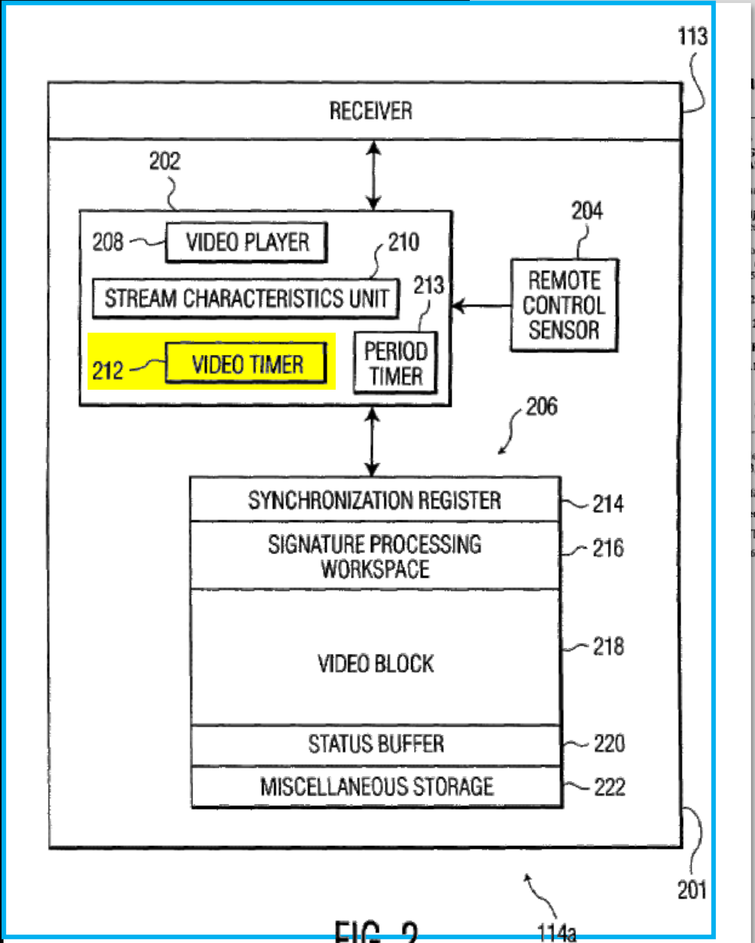
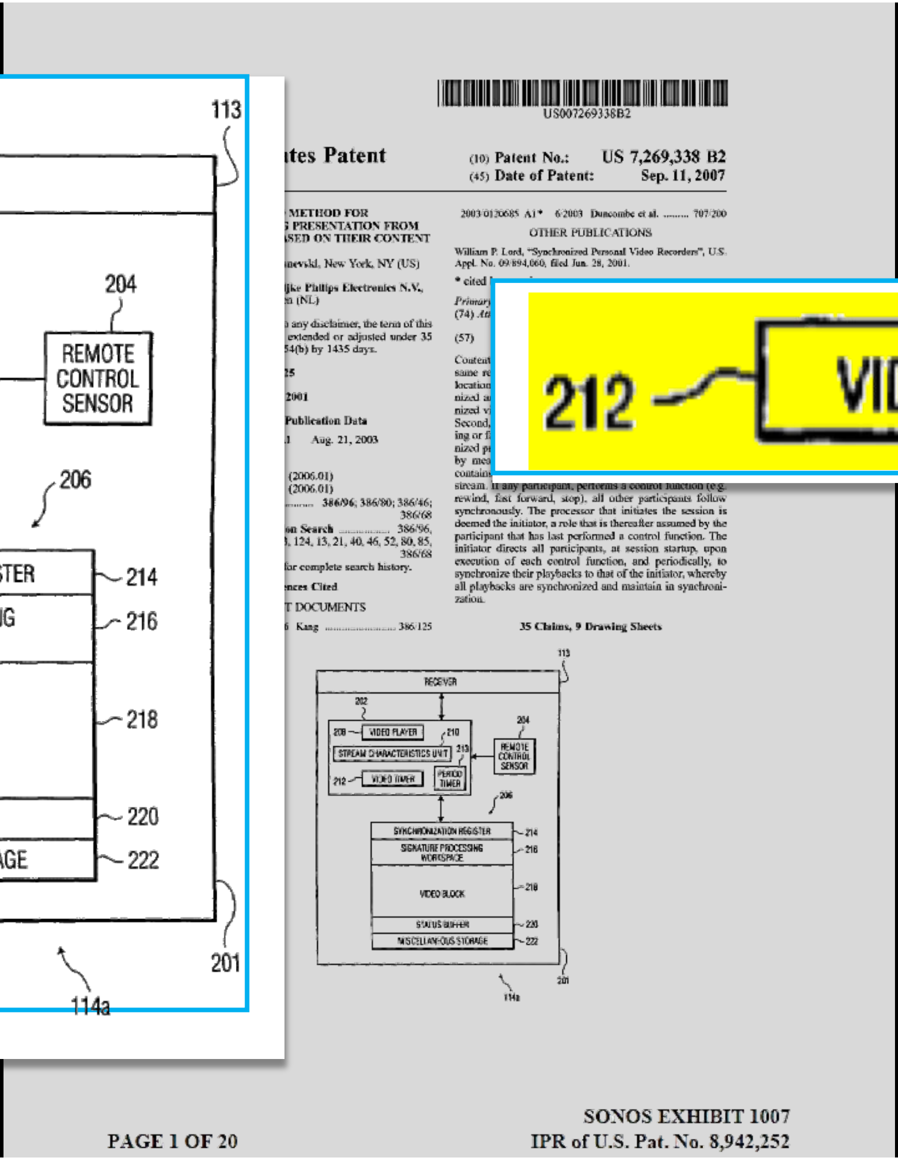


FIG. 2



US007269338B2

tes Patent

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

METHOD FOR
G PRESENTATION FROM
ASED ON THEIR CONTENT

nevski, New York, NY (US)

ijke Philips Electronics N.V.,
n (NL)

any disclaimer, the term of this
extended or adjusted under 35
54(b) by 1435 days.

25

2001

Publication Data

1 Aug. 21, 2003

(2006.01)
(2006.01)
.... 386/96; 386/80; 386/46; 386/68

on Search 386/96,
3, 124, 13, 21, 40, 46, 52, 80, 85, 386/68

for complete search history.

ences Cited

T DOCUMENTS

6 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

Primary
(74) *Att*

(57)

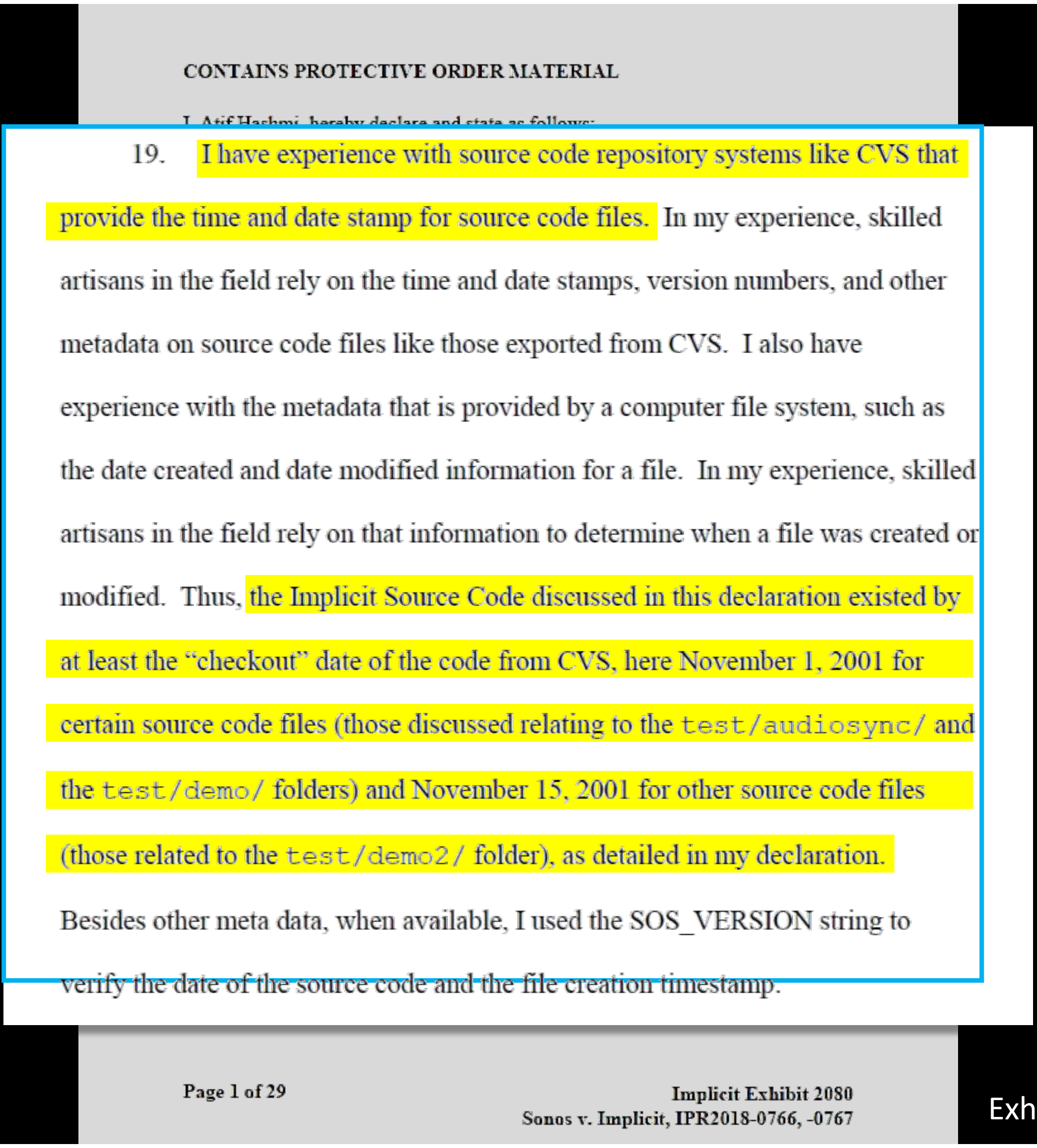
Content
same re
location
nized a
nized vi
Second,
ing or f
nized p
by mea
contain
stream. If any participant, performs a control function (e.g. rewind, fast forward, stop), all other participants follow synchronously. The processor that initiates the session is deemed the initiator, a role that is thereafter 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. 8,942,252

’338 Patent, Fig. 2



CONTAINS PROTECTIVE ORDER MATERIAL

I, Atif Hashmi, hereby declare and state as follows:

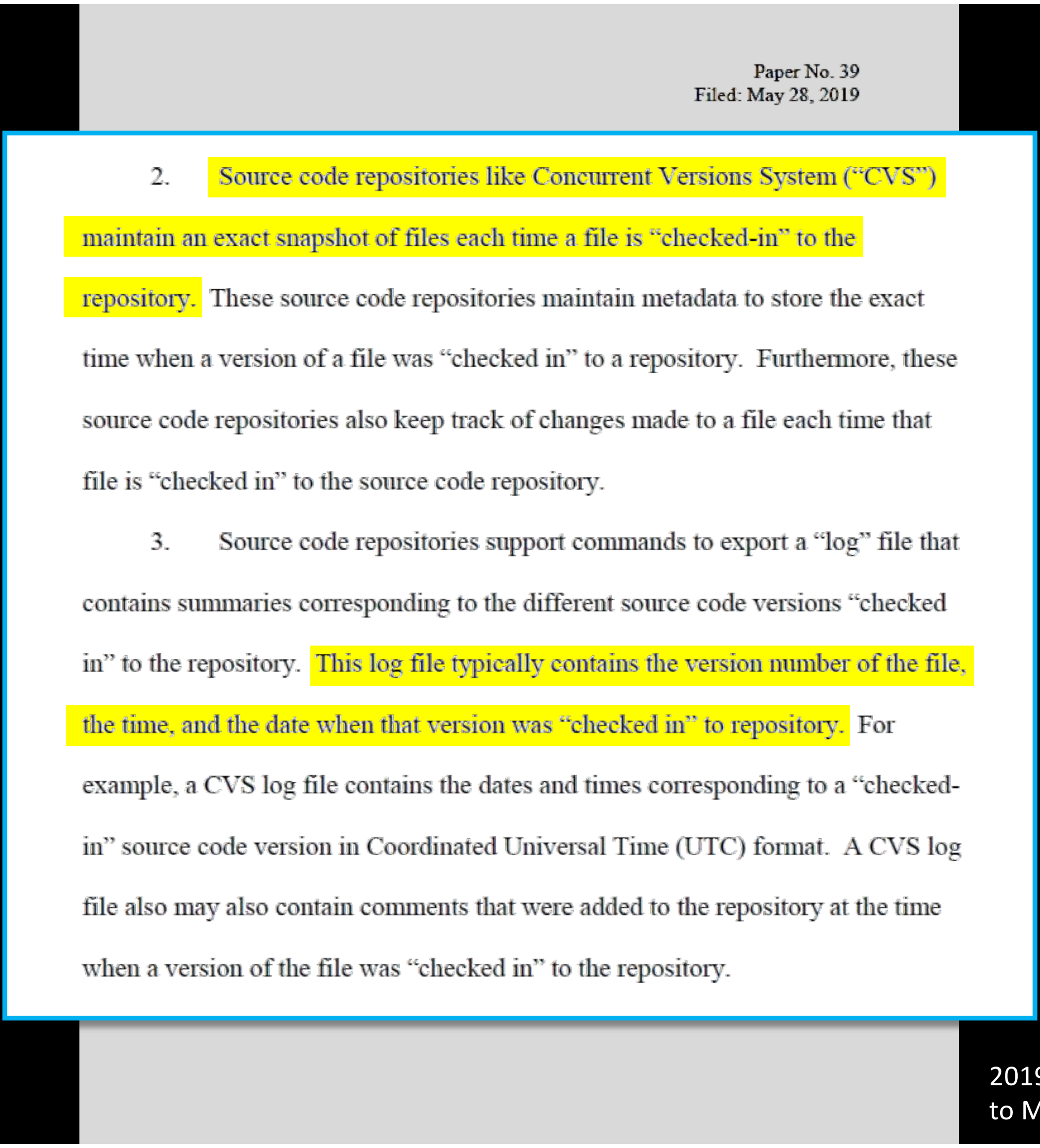
19. I have experience with source code repository systems like CVS that provide the time and date stamp for source code files. In my experience, skilled artisans in the field rely on the time and date stamps, version numbers, and other metadata on source code files like those exported from CVS. I also have experience with the metadata that is provided by a computer file system, such as the date created and date modified information for a file. In my experience, skilled artisans in the field rely on that information to determine when a file was created or modified. Thus, the Implicit Source Code discussed in this declaration existed by at least the "checkout" date of the code from CVS, here November 1, 2001 for certain source code files (those discussed relating to the `test/audiosync/` and the `test/demo/` folders) and November 15, 2001 for other source code files (those related to the `test/demo2/` folder), as detailed in my declaration. Besides other meta data, when available, I used the SOS_VERSION string to verify the date of the source code and the file creation timestamp.

Page 1 of 29

Implicit Exhibit 2080
Sonos v. Implicit, IPR2018-0766, -0767

73

Exh. 2080

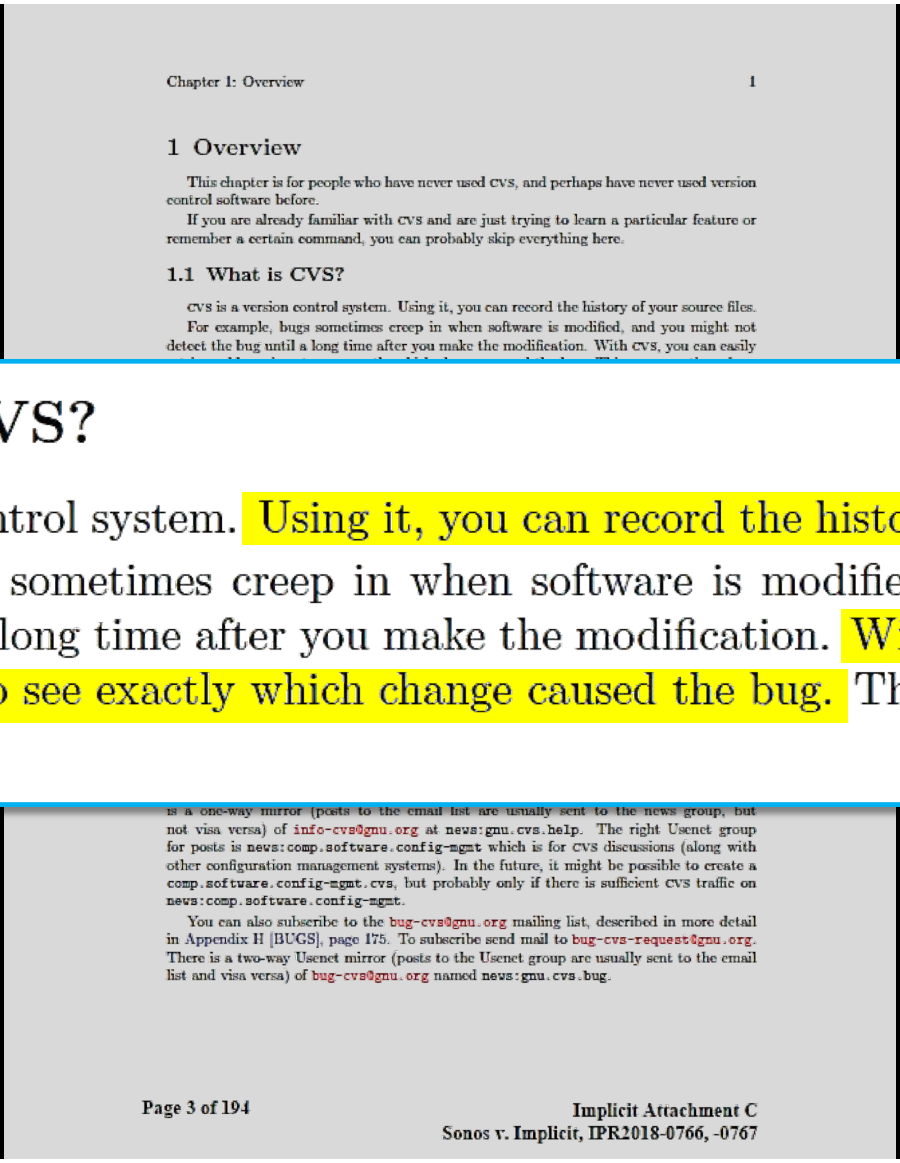


Paper No. 39
Filed: May 28, 2019

2. Source code repositories like Concurrent Versions System ("CVS") maintain an exact snapshot of files each time a file is "checked-in" to the repository. These source code repositories maintain metadata to store the exact time when a version of a file was "checked in" to a repository. Furthermore, these source code repositories also keep track of changes made to a file each time that file is "checked in" to the source code repository.

3. Source code repositories support commands to export a "log" file that contains summaries corresponding to the different source code versions "checked in" to the repository. This log file typically contains the version number of the file, the time, and the date when that version was "checked in" to repository. For example, a CVS log file contains the dates and times corresponding to a "checked-in" source code version in Coordinated Universal Time (UTC) format. A CVS log file also may also contain comments that were added to the repository at the time when a version of the file was "checked in" to the repository.

2019.05.28 IPR2018-00766 Opposition to Motion to Exclude; Attachment D



1 Overview

This chapter is for people who have never used CVS, and perhaps have never used version control software before.

If you are already familiar with CVS and are just trying to learn a particular feature or remember a certain command, you can probably skip everything here.

1.1 What is CVS?

CVS is a version control system. Using it, you can record the history of your source files.

For example, bugs sometimes creep in when software is modified, and you might not detect the bug until a long time after you make the modification. With CVS, you can easily

1.1 What is CVS?

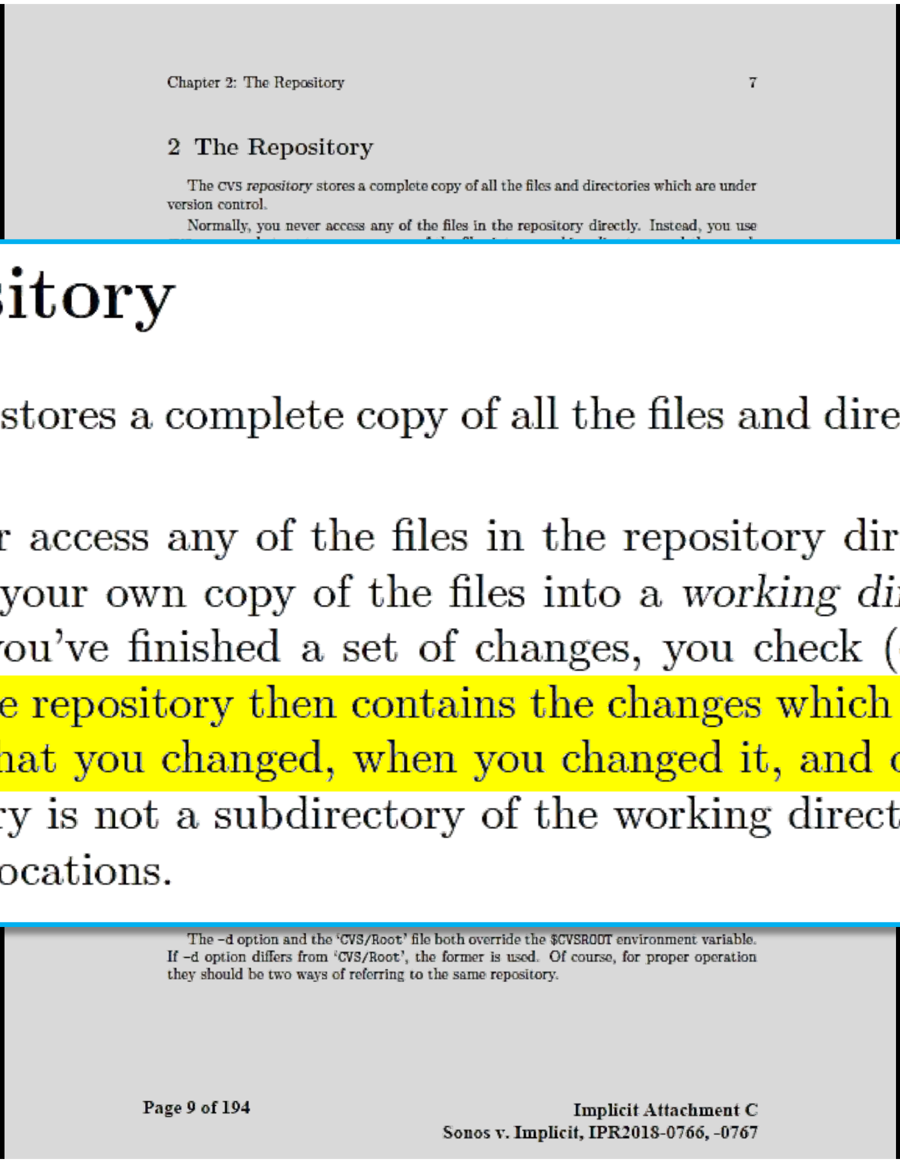
CVS is a version control system. Using it, you can record the history of your source files.

For example, bugs sometimes creep in when software is modified, and you might not detect the bug until a long time after you make the modification. With CVS, you can easily retrieve old versions to see exactly which change caused the bug. This can sometimes be a big help.

is a one-way mirror (posts to the email list are usually sent to the news group, but not visa versa) of info-cvs@gnu.org at news:gnu.cvs.help. The right Usenet group for posts is news:comp.software.config-mgmt which is for CVS discussions (along with other configuration management systems). In the future, it might be possible to create a comp.software.config-mgmt.cvs, but probably only if there is sufficient CVS traffic on news:comp.software.config-mgmt.

You can also subscribe to the bug-cvs@gnu.org mailing list, described in more detail in Appendix H [BUGS], page 175. To subscribe send mail to bug-cvs-request@gnu.org. There is a two-way Usenet mirror (posts to the Usenet group are usually sent to the email list and visa versa) of bug-cvs@gnu.org named news:gnu.cvs.bug.

2019.05.28 IPR2018-00766 Opposition to Motion to Exclude; Attachment C



2 The Repository

The CVS *repository* stores a complete copy of all the files and directories which are under version control.

Normally, you never access any of the files in the repository directly. Instead, you use

2 The Repository

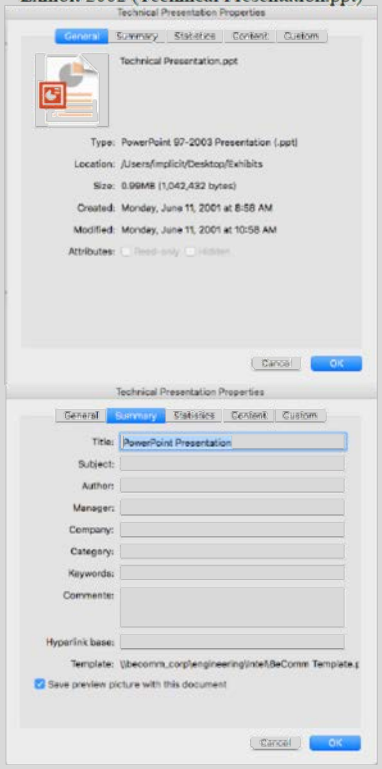
The CVS *repository* stores a complete copy of all the files and directories which are under version control.

Normally, you never access any of the files in the repository directly. Instead, you use CVS commands to get your own copy of the files into a *working directory*, and then work on that copy. When you've finished a set of changes, you check (or *commit*) them back into the repository. The repository then contains the changes which you have made, as well as recording exactly what you changed, when you changed it, and other such information. Note that the repository is not a subdirectory of the working directory, or vice versa; they should be in separate locations.

The -d option and the 'CVS/Root' file both override the $CVSROOT environment variable. If -d option differs from 'CVS/Root', the former is used. Of course, for proper operation they should be two ways of referring to the same repository.

2019.05.28 IPR2018-00766 Opposition to Motion to Exclude; Attachment C

Exhibit 2002 (Technical Presentation.ppt)


Technical Presentation Properties

Technical Presentation.ppt

Type: PowerPoint 97-2003 Presentation (.ppt)
Location: /Users/implicit/Desktop/Exhibits
Size: 0.99MB (1,042,432 bytes)
Created: Monday, June 11, 2001 at 8:58 AM
Modified: Monday, June 11, 2001 at 10:58 AM
Attributes: ☐ Read-only ☐ Hidden

Technical Presentation Properties

Title: PowerPoint Presentation
Subject:
Author:
Manager:
Company:
Category:
Keywords:
Comments:
Hyperlink base:
Template: \\becomm_corp\engineering\intel\BeComm Template.
☑ Save preview picture with this document

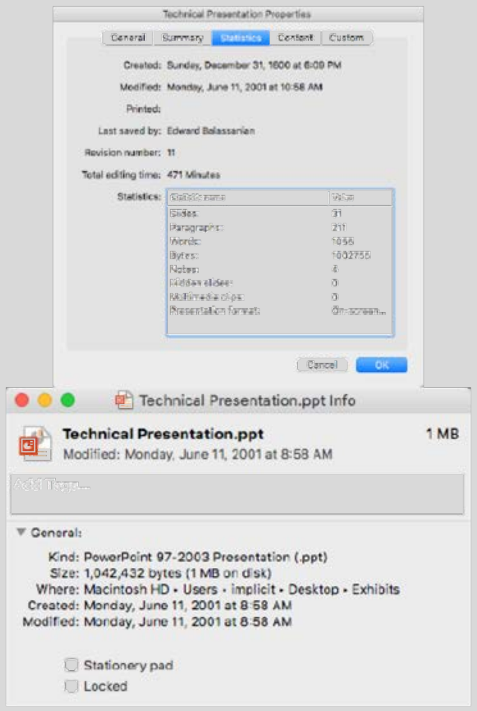
Page 1 of 79

1

Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

77

Exh. 2077 at 1



Technical Presentation Properties

General | Summary | Statistics | Content | Custom

Created: Sunday, December 31, 1600 at 6:00 PM
Modified: Monday, June 11, 2001 at 10:58 AM
Printed:
Last saved by: Edward Balassanian
Revision number: 11
Total editing time: 471 Minutes
Statistics:

Statistic name	Value
Slides:	31
Paragraphs:	211
Words:	1058
Bytes:	1002755
Notes:	4
Hidden slides:	0
Multimedia clips:	0
Presentation format:	On-screen...

Cancel | OK

Technical Presentation.ppt Info

Technical Presentation.ppt 1 MB
Modified: Monday, June 11, 2001 at 8:58 AM

Add Tags...

General:

Kind: PowerPoint 97-2003 Presentation (.ppt)
Size: 1,042,432 bytes (1 MB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits
Created: Monday, June 11, 2001 at 8:58 AM
Modified: Monday, June 11, 2001 at 8:58 AM

☐ Stationery pad
☐ Locked

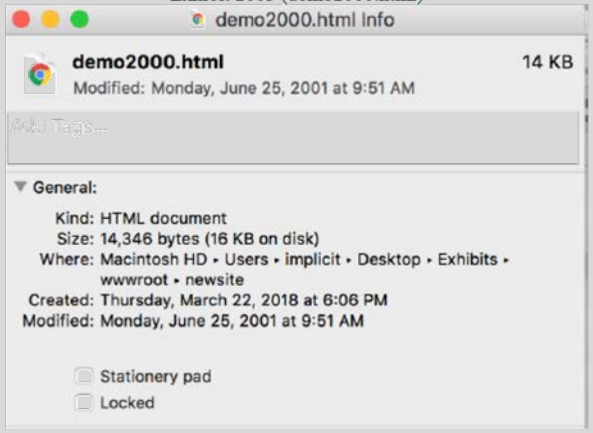
Page 2 of 79

2

Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2077 at 2

Exhibit 2003 (demo2000.html)


demo2000.html Info

demo2000.html 14 KB

Modified: Monday, June 25, 2001 at 9:51 AM

Add Tags...

General:

```
    Kind: HTML document
    Size: 14,346 bytes (16 KB on disk)
   Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸
          wwwroot ▸ newsite
 Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Monday, June 25, 2001 at 9:51 AM
```

☐ Stationery pad

☐ Locked

Page 3 of 79

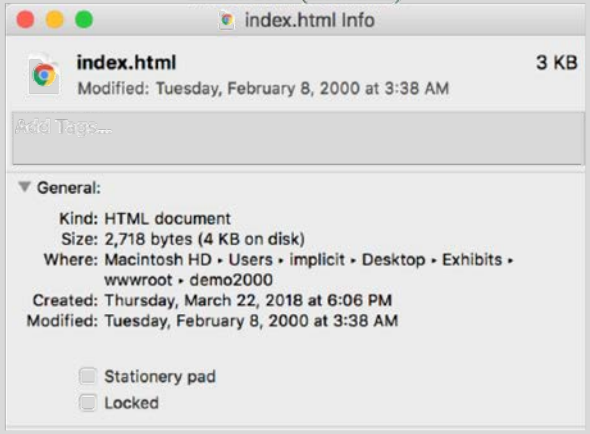
3

Implicit Exhibit 2077

Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2077 at 3

Exhibit 2004 (index.html)


index.html Info

index.html 3 KB
Modified: Tuesday, February 8, 2000 at 3:38 AM

Add Tags...

General:

Kind: HTML document
Size: 2,718 bytes (4 KB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸ wwwroot ▸ demo2000
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Tuesday, February 8, 2000 at 3:38 AM

Stationery pad
Locked

Exh. 2077 at 4

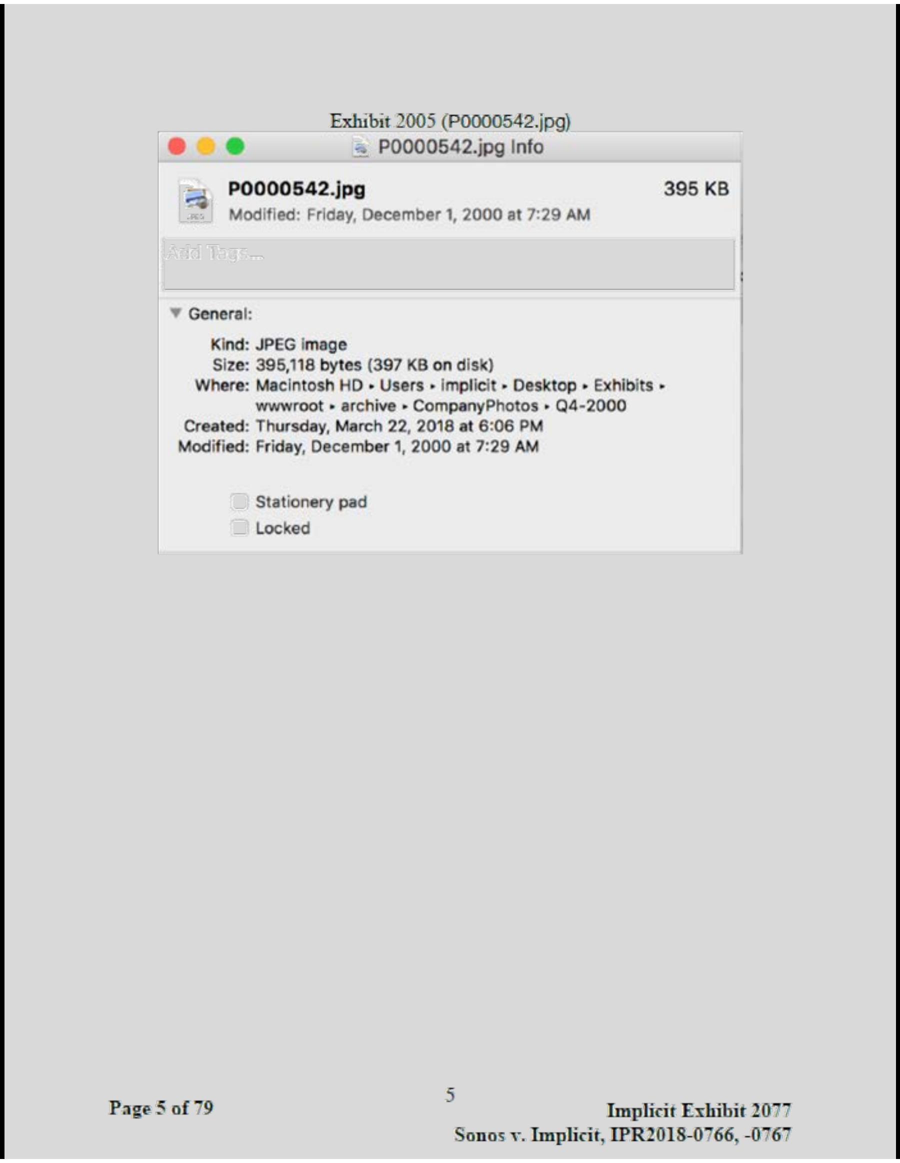


Exhibit 2005 (P0000542.jpg)

P0000542.jpg Info

P0000542.jpg 395 KB

Modified: Friday, December 1, 2000 at 7:29 AM

Add Tags...

General:

Kind: JPEG image
Size: 395,118 bytes (397 KB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸ wwwroot ▸ archive ▸ CompanyPhotos ▸ Q4-2000
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Friday, December 1, 2000 at 7:29 AM

☐ Stationery pad
☐ Locked

5

Page 5 of 79

Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2077 at 5

81

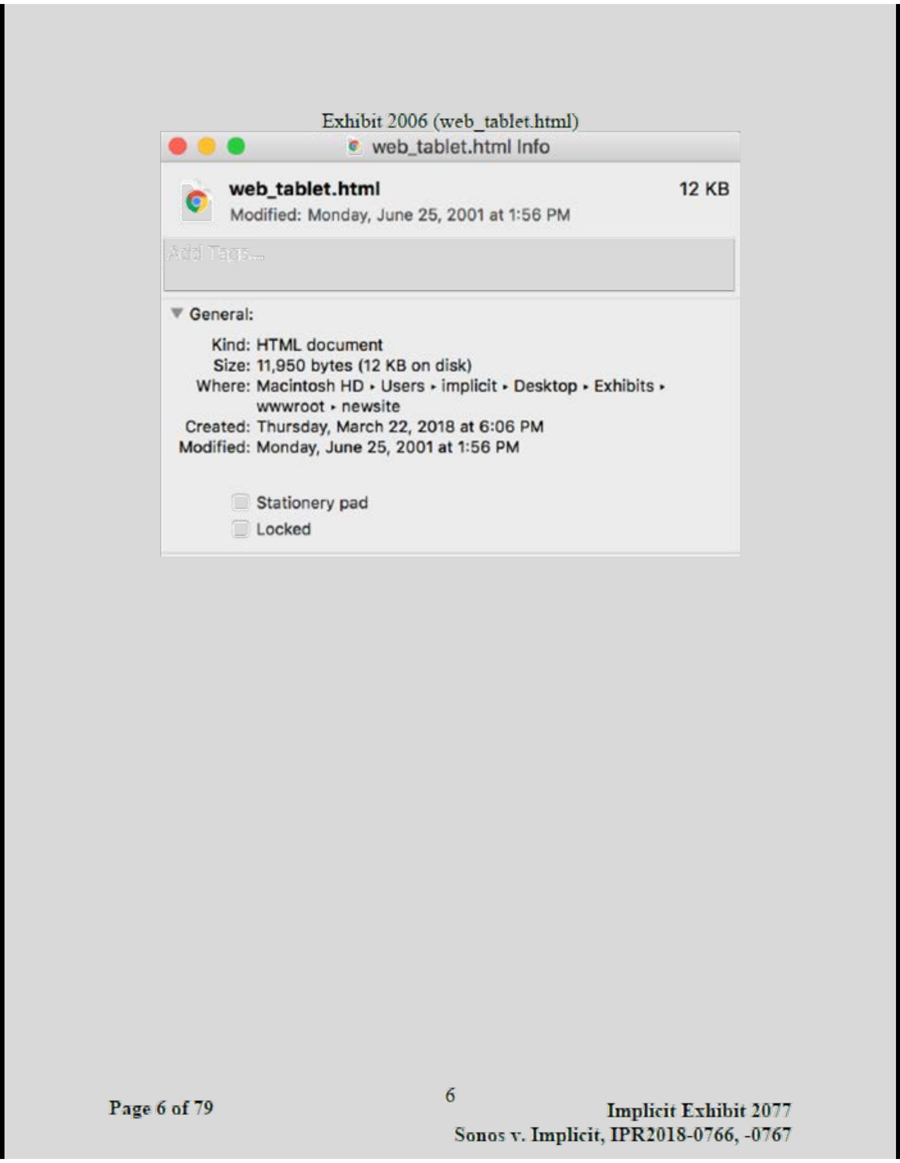


Exhibit 2006 (web_tablet.html)

web_tablet.html Info

web_tablet.html 12 KB
Modified: Monday, June 25, 2001 at 1:56 PM

Add Tags...

General:

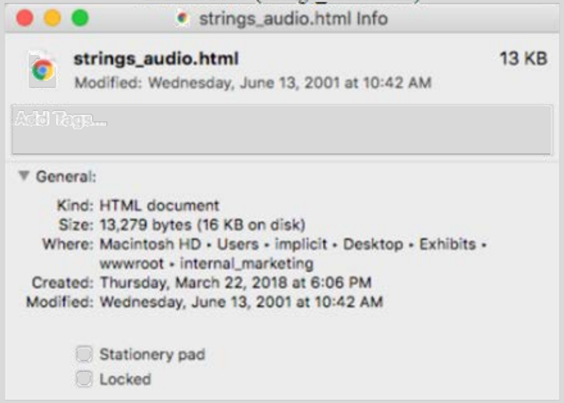
```
    Kind: HTML document
    Size: 11,950 bytes (12 KB on disk)
   Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸
          wwwroot ▸ newsite
 Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Monday, June 25, 2001 at 1:56 PM
```

☐ Stationery pad
☐ Locked

Page 6 of 79 6 Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2077 at 6

Exhibit 2007 (strings_audio.html)



strings_audio.html Info

strings_audio.html 13 KB

Modified: Wednesday, June 13, 2001 at 10:42 AM

Add Tags...

General:

Kind: HTML document
Size: 13,279 bytes (16 KB on disk)
Where: Macintosh HD • Users • implicit • Desktop • Exhibits • wwwroot • internal_marketing
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Wednesday, June 13, 2001 at 10:42 AM

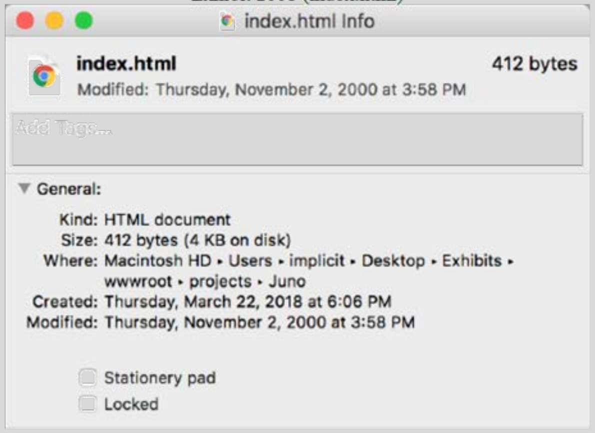
☐ Stationery pad
☐ Locked

Page 7 of 79 7 Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

83

Exh. 2077 at 7

Exhibit 2008 (index.html)



index.html Info

index.html 412 bytes

Modified: Thursday, November 2, 2000 at 3:58 PM

Add Tags...

General:

Kind: HTML document
Size: 412 bytes (4 KB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸ wwwroot ▸ projects ▸ Juno
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Thursday, November 2, 2000 at 3:58 PM

☐ Stationery pad
☐ Locked

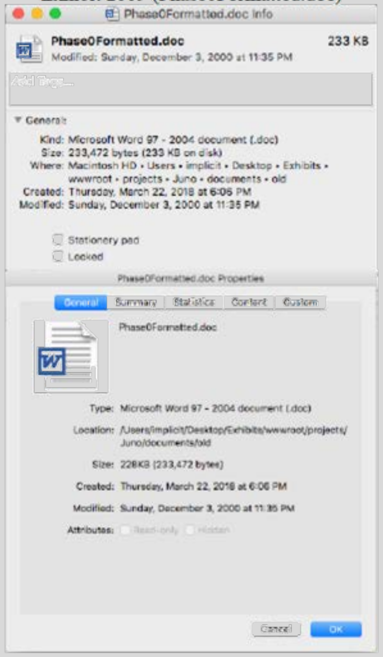
8

Page 8 of 79

Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2077 at 8

Exhibit 2009 (Phase0Formatted.doc)



Phase0Formatted.doc 233 KB
Modified: Sunday, December 3, 2000 at 11:35 PM

▼ General:

Kind: Microsoft Word 97 - 2004 document (.doc)
Size: 233,472 bytes (233 KB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸ wwwroot ▸ projects ▸ Juno ▸ documents ▸ old
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Sunday, December 3, 2000 at 11:35 PM

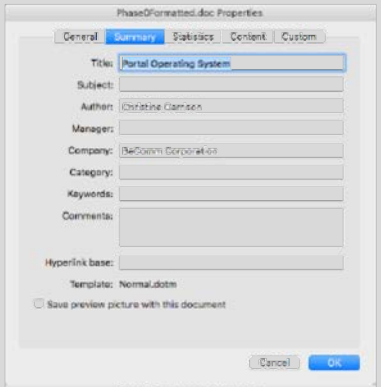
☐ Stationery pad
☐ Locked

Phase0Formatted.doc Properties

Phase0Formatted.doc

Type: Microsoft Word 97 - 2004 document (.doc)
Location: /Users/implicit/Desktop/Exhibits/wwwroot/projects/Juno/documents/old
Size: 228KB (233,472 bytes)
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Sunday, December 3, 2000 at 11:35 PM
Attributes: ☐ Read-only ☐ Hidden

Exh. 2077 at 9



Title: Portal Operating System

Subject:

Author: Christine Carrison

Manager:

Company: BeComm Corporation

Category:

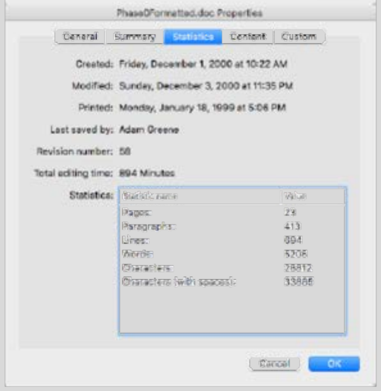
Keywords:

Comments:

Hyperlink base:

Template: Normal.dotm

☐ Save preview picture with this document



Created: Friday, December 1, 2000 at 10:22 AM

Modified: Sunday, December 3, 2000 at 11:35 PM

Printed: Monday, January 18, 1999 at 5:06 PM

Last saved by: Adam Greene

Revision number: 58

Total editing time: 894 Minutes

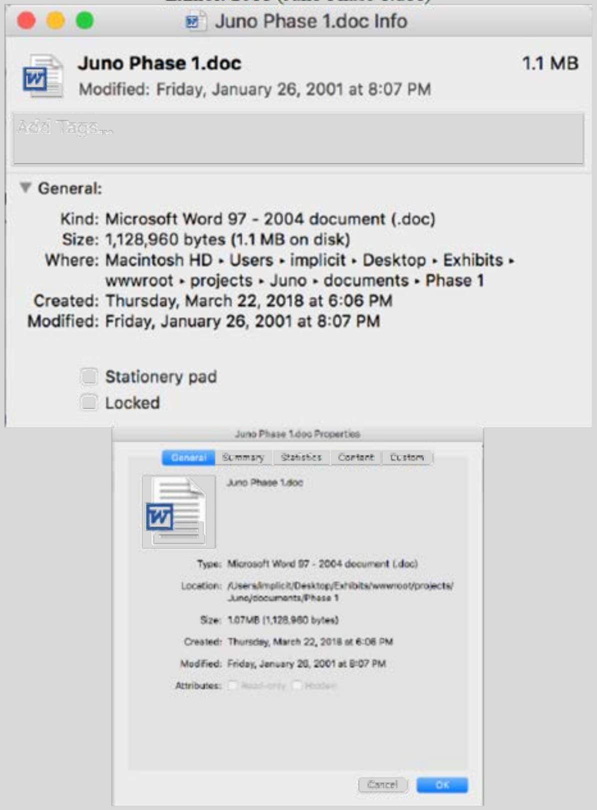
Statistics:

Statistic name	Value
Pages:	23
Paragraphs:	413
Lines:	894
Words:	5206
Characters:	28812
Characters (with spaces):	33885

86

Exh. 2077 at 10

Exhibit 2011 (Juno Phase 1.doc)



Juno Phase 1.doc Info

Juno Phase 1.doc 1.1 MB

Modified: Friday, January 26, 2001 at 8:07 PM

Add Tags...

General:

Kind: Microsoft Word 97 - 2004 document (.doc)
Size: 1,128,960 bytes (1.1 MB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸ wwwroot ▸ projects ▸ Juno ▸ documents ▸ Phase 1
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Friday, January 26, 2001 at 8:07 PM

☐ Stationery pad
☐ Locked

Juno Phase 1.doc Properties

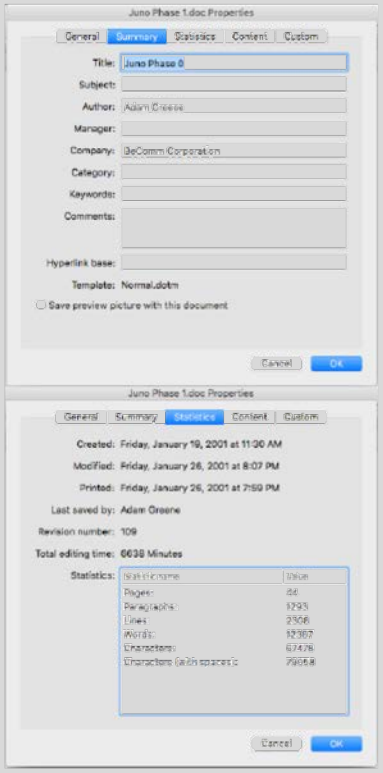
Juno Phase 1.doc

Type: Microsoft Word 97 - 2004 document (.doc)
Location: /Users/implicit/Desktop/Exhibits/wwwroot/projects/Juno/documents/Phase 1
Size: 1.07MB (1,128,960 bytes)
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Friday, January 26, 2001 at 8:07 PM
Attributes: ☐ Read-only ☐ Hidden

Page 11 of 79 11 Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

87

Exh. 2077 at 11



Title:	Juno Phase 0
Subject:	
Author:	Adam Greene
Manager:	
Company:	BeComm Corporation
Category:	
Keywords:	
Comments:	
Hyperlink base:	
Template:	Normal.dotm

Save preview picture with this document

Created:	Friday, January 19, 2001 at 11:30 AM
Modified:	Friday, January 26, 2001 at 8:07 PM
Printed:	Friday, January 26, 2001 at 7:59 PM
Last saved by:	Adam Greene
Revision number:	109
Total editing time:	6638 Minutes

Statistics:

Statistic name	Value
Pages:	44
Paragraphs:	1293
Lines:	2308
Words:	12367
Characters:	67478
Characters (with spaces):	79958

Page 12 of 79

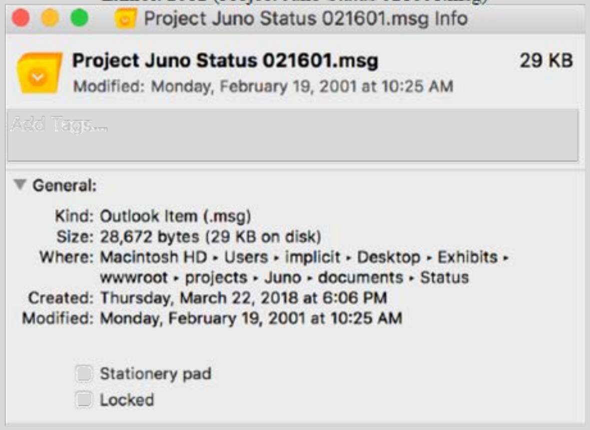
12

Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

88

Exh. 2077 at 12

Exhibit 2012 (Project Juno Status 021601.msg)



Project Juno Status 021601.msg Info

Project Juno Status 021601.msg 29 KB
Modified: Monday, February 19, 2001 at 10:25 AM

Add Tags...

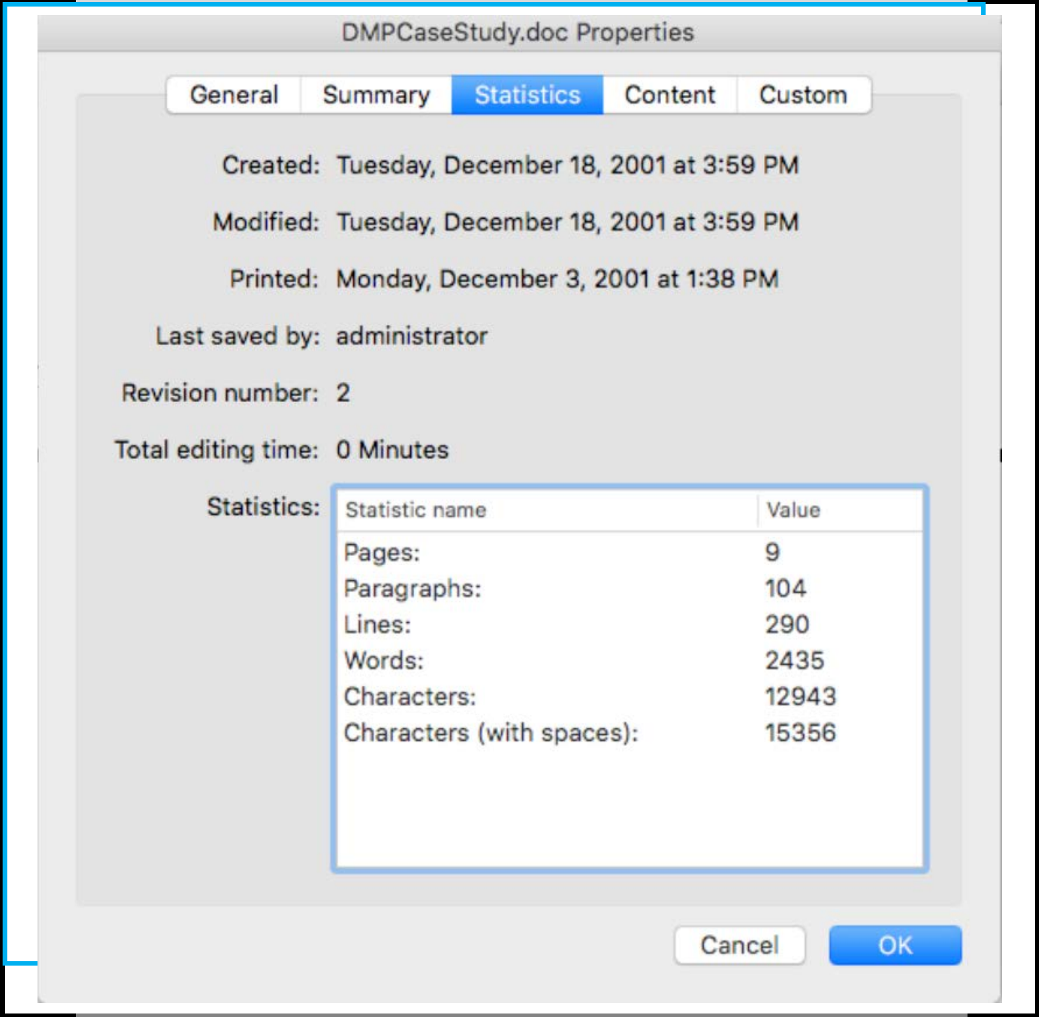
General:

Kind: Outlook Item (.msg)
Size: 28,672 bytes (29 KB on disk)
Where: Macintosh HD ▸ Users ▸ implicit ▸ Desktop ▸ Exhibits ▸ wwwroot ▸ projects ▸ Juno ▸ documents ▸ Status
Created: Thursday, March 22, 2018 at 6:06 PM
Modified: Monday, February 19, 2001 at 10:25 AM

☐ Stationery pad
☐ Locked

Page 13 of 79 13 **Implicit Exhibit 2077**
Sonos v. Implicit, IPR2018-0766, -0767

Exh. 2077 at 13



DMPCaseStudy.doc Properties

Created:	Tuesday, December 18, 2001 at 3:59 PM
Modified:	Tuesday, December 18, 2001 at 3:59 PM
Printed:	Monday, December 3, 2001 at 1:38 PM
Last saved by:	administrator
Revision number:	2
Total editing time:	0 Minutes

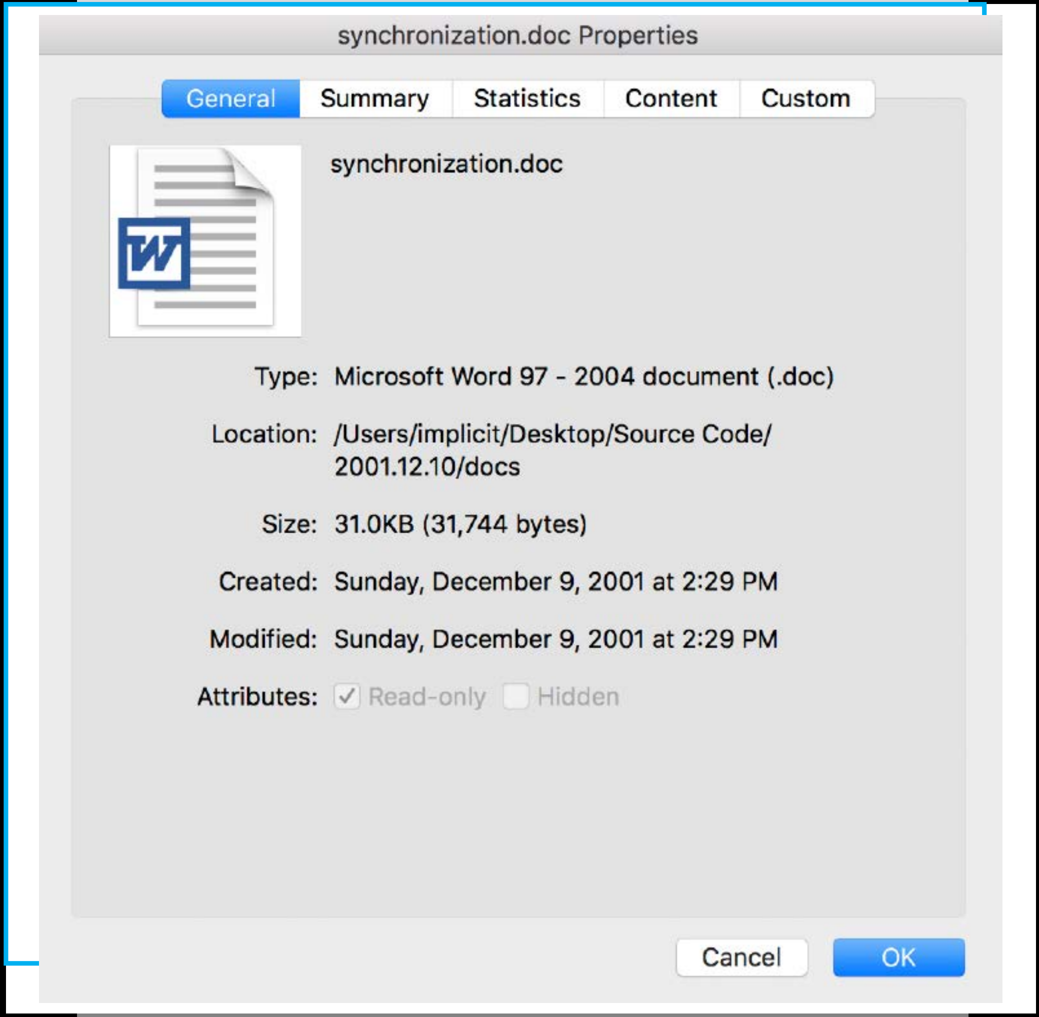
Statistics:

Statistic name	Value
Pages:	9
Paragraphs:	104
Lines:	290
Words:	2435
Characters:	12943
Characters (with spaces):	15356

Page 21 of 79 21 Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

90

Exh. 2077 at 30


synchronization.doc Properties

synchronization.doc

Type: Microsoft Word 97 - 2004 document (.doc)

Location: /Users/implicit/Desktop/Source Code/2001.12.10/docs

Size: 31.0KB (31,744 bytes)

Created: Sunday, December 9, 2001 at 2:29 PM

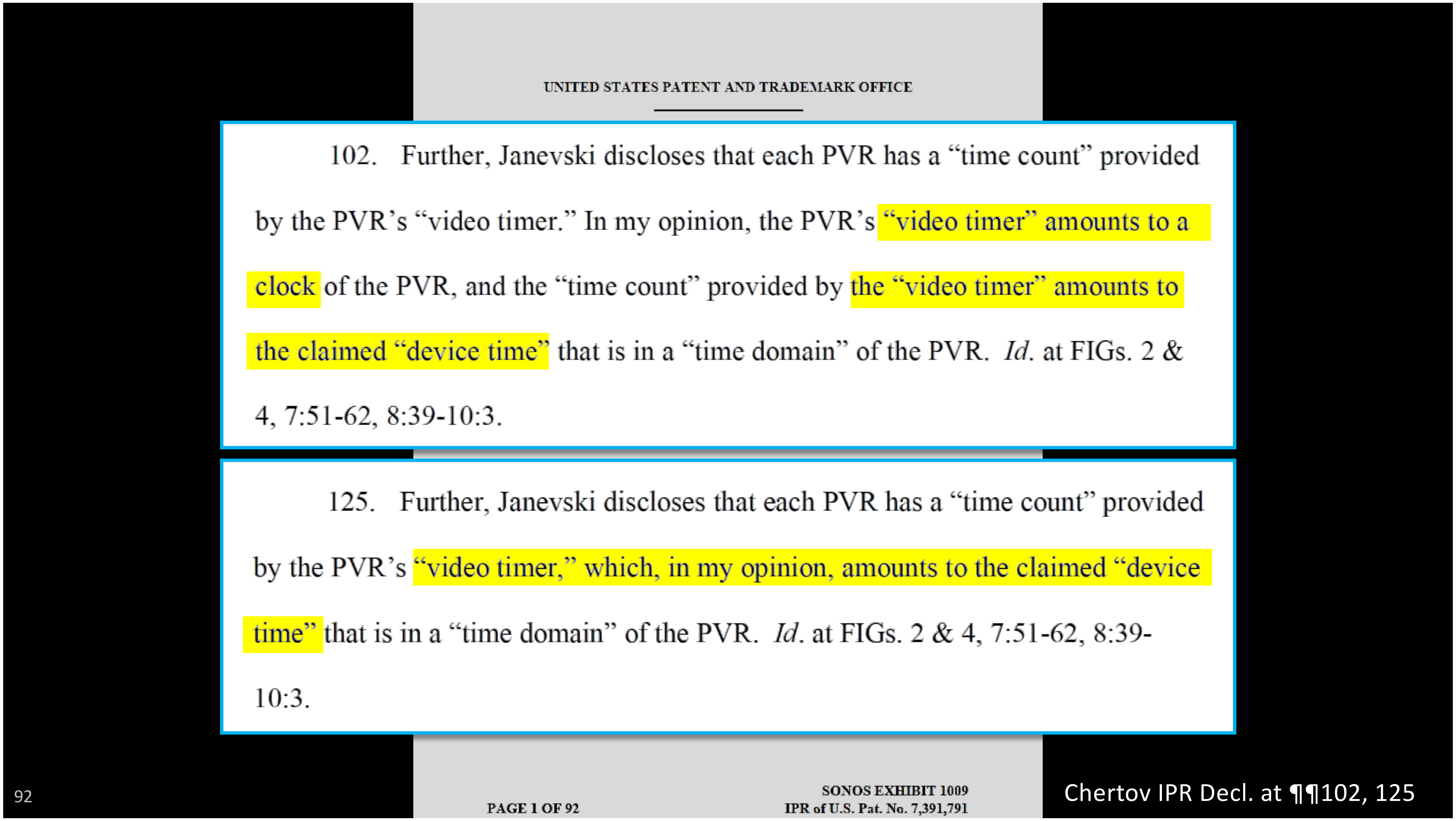
Modified: Sunday, December 9, 2001 at 2:29 PM

Attributes: [✓ Read-only] Hidden

Page 21 of 79 21 Implicit Exhibit 2077
Sonos v. Implicit, IPR2018-0766, -0767

91

Exh. 2077 at 33


UNITED STATES PATENT AND TRADEMARK OFFICE

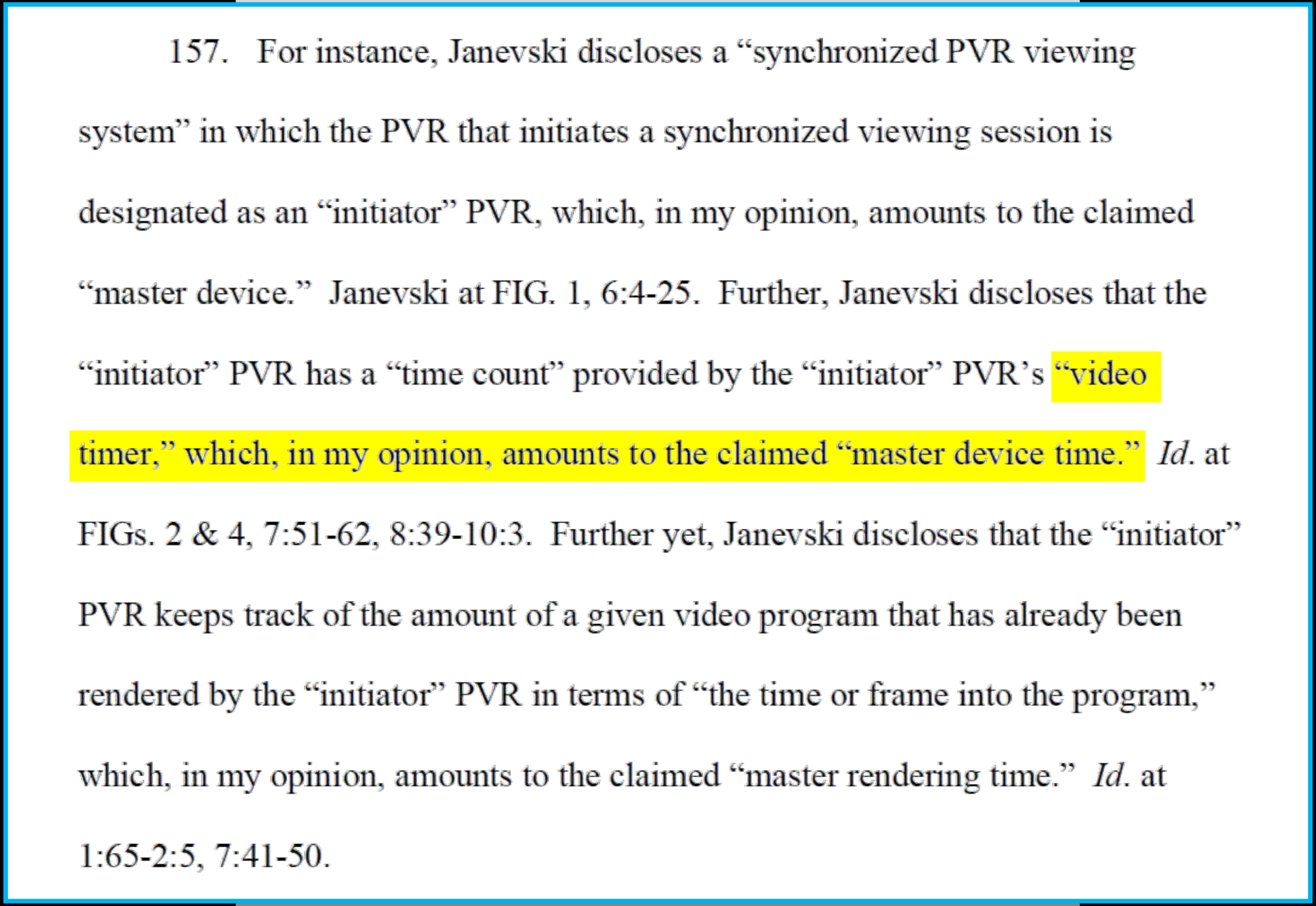
102. Further, Janevski discloses that each PVR has a "time count" provided by the PVR's "video timer." In my opinion, the PVR's "video timer" amounts to a clock of the PVR, and the "time count" provided by the "video timer" amounts to the claimed "device time" that is in a "time domain" of the PVR. *Id.*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

125. Further, Janevski discloses that each PVR has a "time count" provided by the PVR's "video timer," which, in my opinion, 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.

PAGE 1 OF 92

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

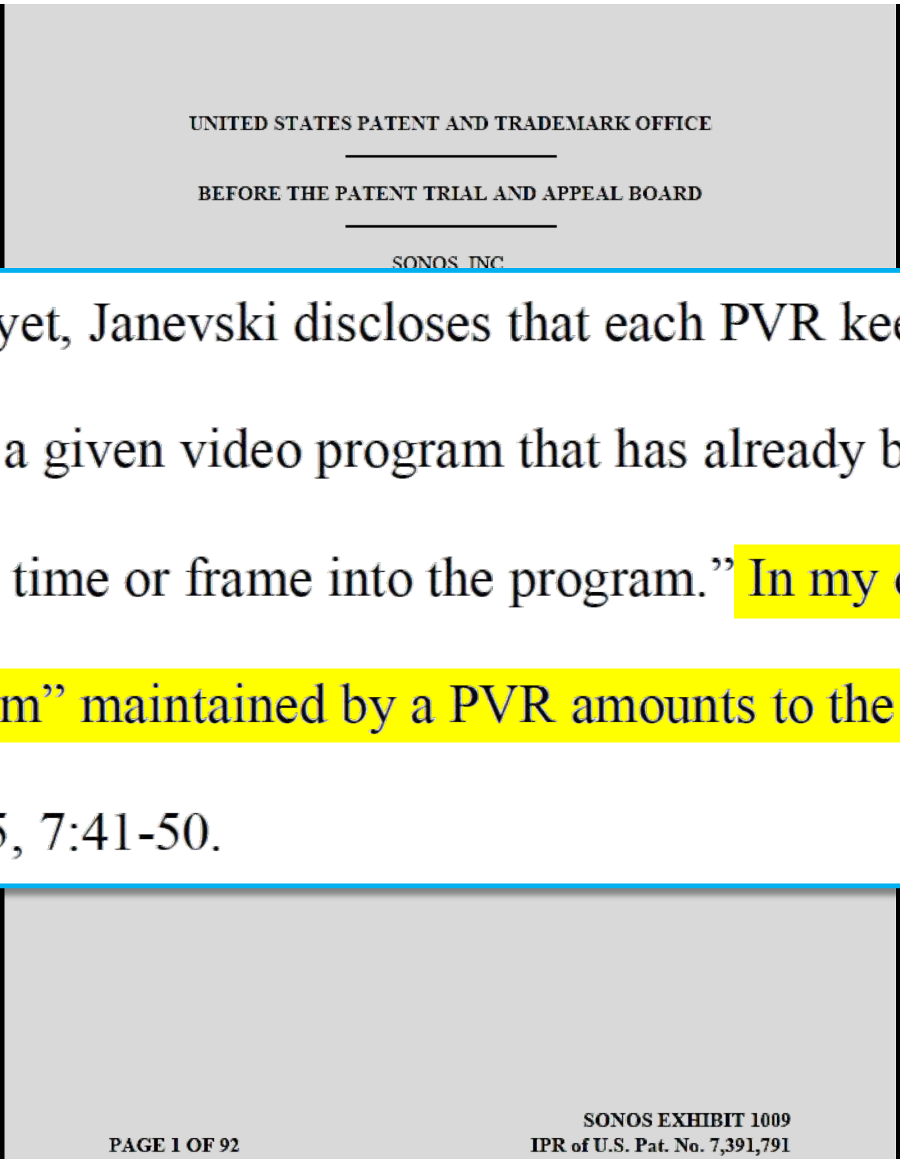
Chertov IPR Decl. at ¶¶102, 125


157. For instance, Janevski discloses a "synchronized PVR viewing system" in which the PVR that initiates a synchronized viewing session is designated as an "initiator" PVR, which, in my opinion, amounts to the claimed "master device." Janevski at FIG. 1, 6:4-25. Further, Janevski discloses that the "initiator" PVR has a "time count" provided by the "initiator" PVR's "video timer," which, in my opinion, amounts to the claimed "master device time." *Id.* at FIGs. 2 & 4, 7:51-62, 8:39-10:3. Further yet, Janevski discloses that the "initiator" PVR keeps track of the amount of a given video program that has already been rendered by the "initiator" PVR in terms of "the time or frame into the program," which, in my opinion, amounts to the claimed "master rendering time." *Id.* at 1:65-2:5, 7:41-50.

PAGE 1 OF 92

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

Chertov IPR Decl. at ¶157


UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

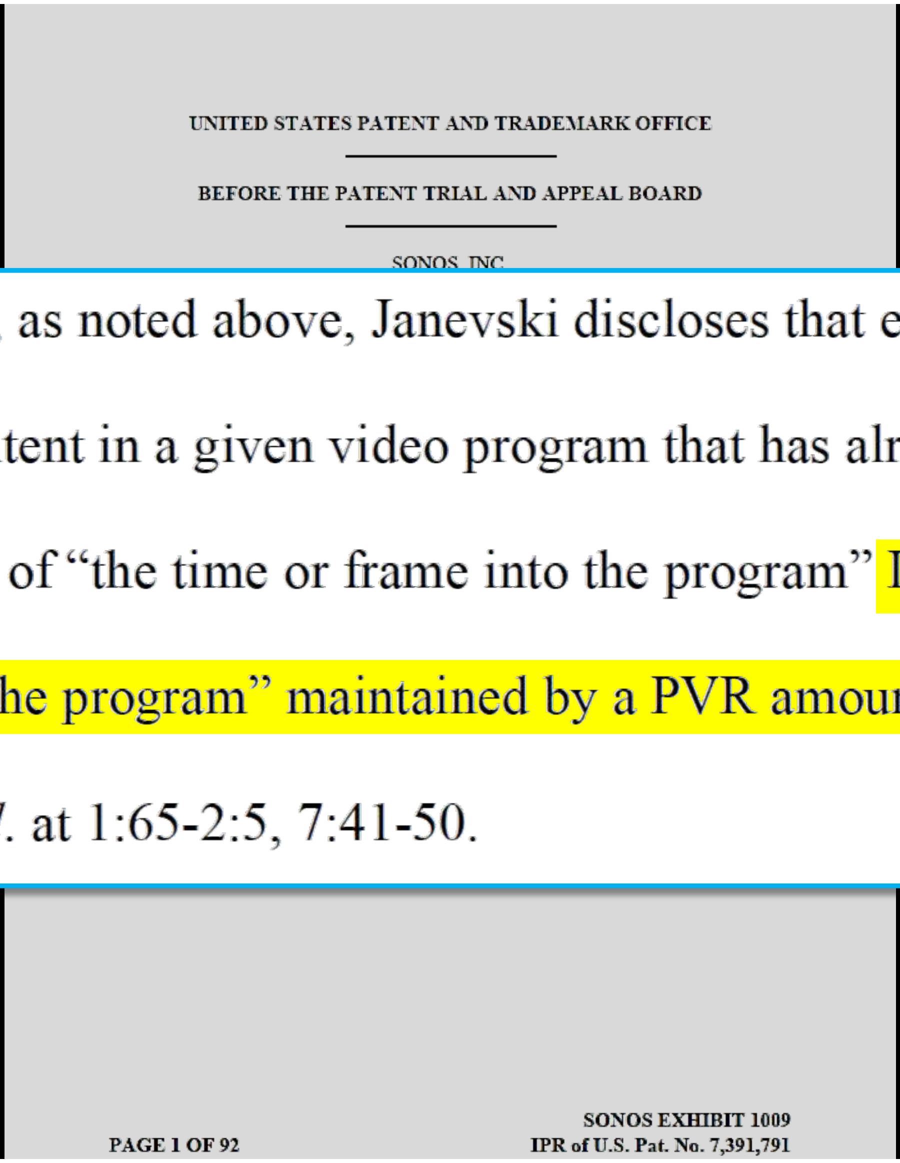
SONOS, INC.

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.

PAGE 1 OF 92

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

Exh. 1009, Chertov Decl. at ¶103



UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

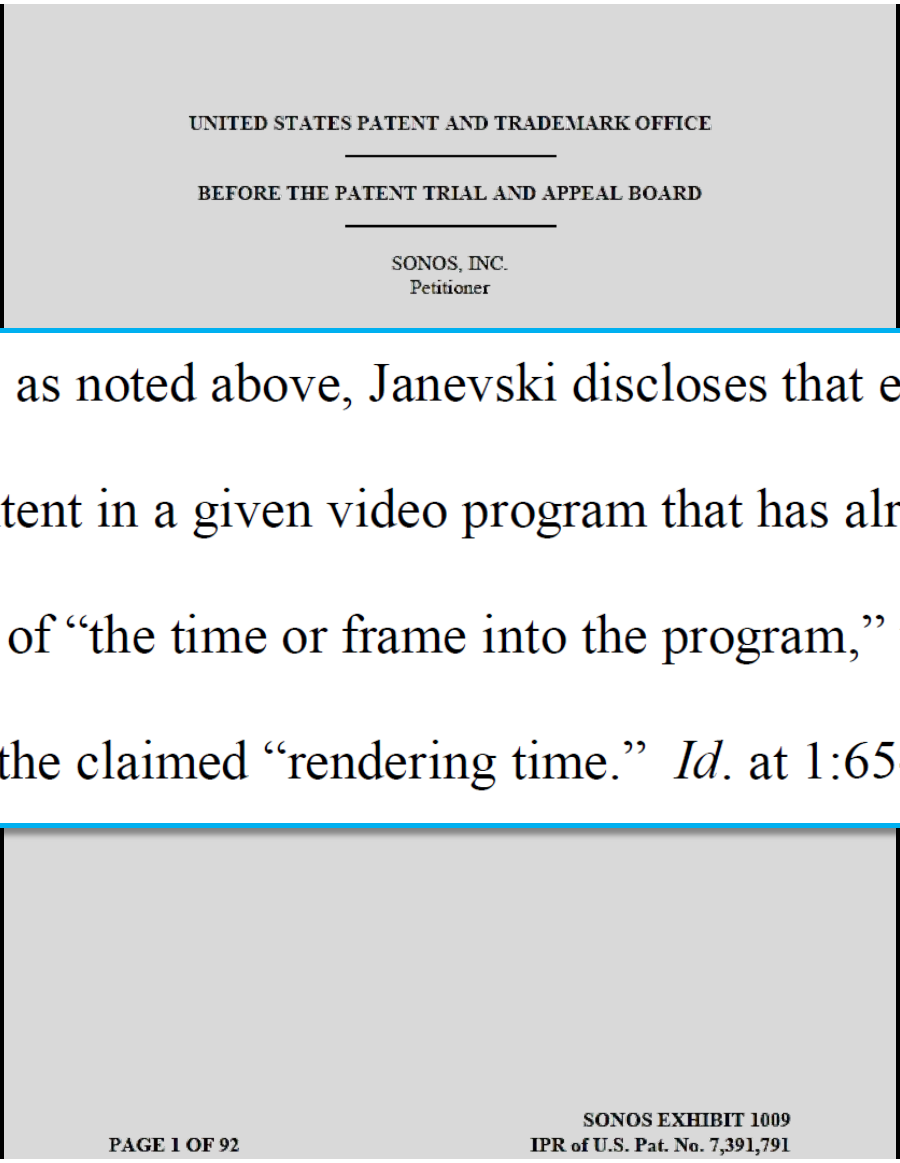
SONOS, INC.

105. Further, as noted above, 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.

PAGE 1 OF 92

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

Exh. 1009, Chertov Decl. at ¶105



UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONOS, INC.
Petitioner

129. Further, as noted above, 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," which, in my opinion, amounts to the claimed "rendering time." *Id*. at 1:65-2:5, 7:41-50.

PAGE 1 OF 92

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

Chertov IPR Decl. at ¶129