UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON AT SEATTLE

AMIGA, INC., a Delaware corporation,

Plaintiffs,

v.

HYPERION VOF, a Belgium corporation,

Defendant.

No. 07-0631-RSM

SECOND DECLARATION OF HANS-JÖRG FRIEDEN IN OPPOSITION TO AMIGA DELAWARE'S MOTION FOR PRELIMINARY INJUNCTION

HANS-JÖRG FRIEDEN, under penalty of perjury, declares and states as follows:

1. I am an independent contractor working as a Senior Software Engineer for Hyperion Entertainment, VOF, a software company located in Belgium. I currently reside in the Federal Republic of Germany, and I am a German citizen. I am over the age of 18, and I am competent to testify.

2. I am 38 years of age (born 14. August, 1968), and I worked in various positions in the IT industry since about 1985. I started out doing COBOL programming on mainframe machines for custom commercial database applications. I also wrote a BASIC interpreter for an x86-based CP/M system. I have attended the University of Trier from 1991 to 1996 studying computer-science. I attended lectures in theoretical and practical computer science,

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six semesters of math, Databases, programming language design and implementation, computer graphics, parallel computing, operating systems and distributed system design and VLSI/Logic minimization. Since then I worked on game ports (Shogo, Heretic II, Freespace, NOLF on MacOS). I was one of the main implementors of Warp3D, a 3D programming API for AmigaOS, and due to my expertise on low-level 3D hardware programming, worked on a hardware 3D driver for an aircraft display system produced by Smiths Aerospace, a stock-market listed defense contractor. I also did work on the firmware adaptation of the AmigaOne.

3. I have knowledge in programming languages such as C, C++, Java, Python, COBOL., BASIC, and a few more esoteric ones. I worked on different operating systems, writing software for AmigaOS 3.x and 4.x, MacOS 9 and MacOS X, Linux, Windows 95 and Windows XP. I also worked as a system administrator for Windows NT and BSDi/386.

4. I have been contracted to work on AmigaOS 4.0, an operating system based on the "classic" AmigaOS, developed by Hyperion Entertainment VOF under license from Amiga, Inc., a Washington corporation ("Amiga Washington"). More specifically, I was appointed Technical Director of the AmigaOS development. I wrote Annex I of the November 2001 Agreement which sets out the contractual specifications of Amiga OS 4.0, and I attach a true and accurate copy of that contract as Exhibit A. Together with my brother Thomas Frieden, I was mainly working on the kernel ("ExecSG"), the program loader ("elf.library"), and the 3D support ("Warp3D" and "MiniGL"). Besides working on these, I also managed the general development and I am responsible for technical decisions relating to AmigaOS 4.0 development.

5. Based on my general educational background, my experience in the industry, and my specific knowledge of events related to Amiga, I have personal knowledge of the matters stated herein.

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6. I understand that Amiga Delaware is disputing the state and date of the finalization of AmigaOS 4.0. The milestones for the development of AmigaOS 4.0 and their release dates are:

[1] **"Developer Pre-Release"** the original first release of AmigaOS 4. Release date June 2004

[2] **"Update #1"** the first update. Release date October 2004

[3] **"Update #2"** a service release. Release date December 2004

[4] **"Update #3"** the third update. Release date June 2005

[5] **"Update #4"** the fourth update. Release date February 2006

[6] **"The Final Update"** the last update for AmigaOS 4.0, Released December 2006

Pursuant to the description and terminology in Annex I of the 2001 Agreement, tasks are assigned a priority, either *essential*, *important* or *optional*. (*See* Exhibit A.) In this context, "essential" means absolutely required, i.e. this feature is so fundamental that it cannot be omitted. An "important" feature is not required, but the feature is to be considered fundamental enough so that AmigaOS would feel incomplete without it. Finally, "optional" features are not critical and are only there to provide completeness.

7. For better understanding, PowerPC or PPC is a RISC microprocessor architecture created by the 1991 Apple–IBM–Motorola alliance, known as AIM. Originally intended for personal computers, PowerPC CPUs have since become popular embedded and high-performance processors as well. PowerPC was the cornerstone of AIM's PReP and Common Hardware Reference Platform initiatives in the 1990s, but the architecture found the most success in the personal computer market in Apple's Macintosh lines from 1994 to 2006 (before Apple's transition to Intel).

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8. As can be seen from the first full page of Annex I to Exhibit A, we had determined that a straight port of Exec to the PowerPC architecture was impossible. (The original Exec kernel is written in 68k assembler of the incompatible Motorola 68000 series of CPU's.) Exec was instead rewritten, from scratch (since the original 68k assembly code was useless in this context) as ExecSG. The feature was finalized and available in the original June 2004 "Developer Pre-Release" version of OS 4 and all subsequent versions thereafter. It has seen substantial upgrades since that time (among other things, the new memory system).

9. The next task listed in Annex I to Exhibit A is the Cyberstorm SCSI driver, SCSI drivers for PCI cards, and it too was deemed essential. The cyberscsi.device was completed at 9 September 2003 (version 50.3). Since the AmigaOne hardware that was eventually used was not the originally envisaged design (i.e. the Escena hardware), but rather a standalone motherboard from Mai Logic, the PCI SCSI support was treated with low priority. The essential on-board drivers for the AmigaOne hardware were finished in June 2004 already, and have been improved ever since. The feature is therefore rolled into the disk drivers for the AmigaOne hardware (see below).

10. The next task listed in Annex I to Exhibit A is the Disk Drivers for the AmigaOne hardware. It too was deemed essential. The AmigaOne hardware does not have a SCSI controller onboard, as was the original conception, but rather an IDE controller based on the VIA 686B chipset. Therefore, this driver was given preferential priority, and was available in June 2004 for public release.

11. The next task listed in Annex I to Exhibit A is thePicasso96 drivers, which again were deemed essential. Graphics cards drivers for Picasso96 for Voodoo 3/4/5, Permedia 2 and Radeon cards were completed with the June 2004 release, although the version in October 2004 was the first PowerPC-native one. Although the original specification called for support for

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graphics cards produced by the Canadian firm "Matrox", it was decided to drop Matrox support in favor of the graphics cards from ATI for a number of reasons, but mainly because ATI cards are more cost-effective as well as considerably faster than Matrox cards. Looking at today's graphics card market, this market is clearly dominated by the manufacturers nVidia and ATI, and while nVidia is generally not willing to support third-party development with documentation, ATI is, so ATI became the obvious choice. It also proved to be almost impossible to buy Matrox graphics cards in a normal retail store, not to mention that the price/performance ratio is not anywhere near ATI's.

12. The next task listed in Annex I to Exhibit A is the Integration of OS 3.5 and 3.9 changes, which again was deemed essential. Due to the failure and inability of Amiga Inc. to deliver the OS 3.5 and 3.9 source code (in spite of their contractual obligation to do so) this feature became very difficult to achieve. It was made even more difficult since Haage & Partner – also supposed to be involved with the Amiga OS 4.0 development, and leader contractors on the OS 3.5 and 3.9 development effort – pulled out of the project. The problems were compounded by Amiga's failure to deliver the source code of 3.5 and 3.9, and even the most basic 3.1, which had to be obtained from Olaf Barthel instead of Amiga Inc. Despite all of these hindrances, Hyperion managed to contact and contract with almost all Amiga OS 3.5 and Amiga OS 3.9 developers, and this feature was achieved in June 2004, with the exception of some minor, nonessential elements that could not be obtained because of Amiga's failure to deliver source code.

13. The next task listed in Annex I to Exhibit A is the Warp3D integration, and it was ranked important to essential. Warp3D, a 3D API for Radeon and Voodoo cards was available with the December 2004 release. Again, supporting Matrox cards did not make any

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sense from the performance, availability and price point of view, so support was dropped in favor of ATI support.

14. The next task listed in Annex I to Exhibit A is the OpenGL, which was ranked important. As it turned out, implementing OpenGL via the Mesa3D library was not feasible. Technical implications prohibited an implementation that would perform reasonably in the context of the Classic AmigaOS. For that reason, a different approach was taken in the form of MiniGL, a implementation of a subset of OpenGL (similar in functionality to OpenGL|ES), based on the Warp3D driver technology. The MiniGL library provides a smaller feature set to the full OpenGL implementation and it is sufficient to run a wide variety of Applications, including but not limited to games Quake 2 and Quake 3, Descent Freespace, and others. MiniGL was publicly available in the software development kit (SDK) in December 2004.

15. The next task listed in Annex I to Exhibit A is the Fast File System Rewrite, and it was ranked essential. FFS2, the fast file system rewrite by Olaf Barthel, was available from June 2004 onwards.

16. The next task listed in Annex I to Exhibit A is the New TCP/IP Stack, and it was rated important to essential. Like FFS2, "Roadshow", AmigaOS 4's TCP/IP stack, was available since June 2004.

17. The next task listed in Annex I to Exhibit A is the Virtual Memory System. It was ranked essential. ExecSG supported virtual memory from the first version onwards. It was a very important design goal to be able to use the full address space for memory mapping, since it would significantly cut down on memory fragmentation. This feature was implemented since June 2004. Later versions, especially the December 2006 Final Update, featured the all-new memory subsystem with improvements that go way beyond what the original specification asked for. (As a matter of fact, the Amiga OS 4 memory system is on par with Solaris or

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Windows XP when it comes to memory handling, providing segregated free lists, kernel caches, external fragmentation reduction, buddy allocation, extremely high performance, in some cases up to 20 times over the previous memory system).

18. The next task listed in Annex I to Exhibit A is the Minimal USB stack, which was merely optional. AmigaOS 4's Sirion USB stack is much more than "minimal". It is a complete USB stack, fully supporting USB 1.1, supporting HID and mass storage. It was fully implemented in October 2004.

19. The next task listed in Annex I to Exhibit A is the PPC-Native RTA (Retargetable Audio System), which again is only optional. AmigaOS 4.0 uses a PowerPC-native AHI with support for a wide range of audio cards, since October 2004. Please see also the next point.

20. The next task listed in Annex I to Exhibit A were described generally as "Various enhancements (PPC datatypes, new HD Toolbox, AHI Soundblaster driver, clipboard functionality, various bugfixes)." It was ranked important. All of these features have been implemented since the first release in June 2004 or no later than October 2004.

21. In conclusion, as of today most of the goals marked as "future work" in Annex I have already been implemented, in fact, some of them have been around since June or October 2004. The current GUI system (Graphical User Interface) is fully PowerPC native and has been that way since quite a while already. As of today, approximately 99% of all code within AmigaOS 4.0 is PowerPC native. Only a very minute fraction of code is still 68k, most notably those parts that Amiga was unable to provide source code for (AREXX for example). In this respect, Amiga OS 4.0 since June 2005 goes far beyond what was contractually specified in Annex I of the 2001 Agreement.

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22. In my professional opinion, AmigaOS 4.0, according to the specifications, design goals and task list put forward in Annex I of the original agreement, was finalized by December of 2004. All essential features, all important features, and a considerable number of optional features were present in December 2004. The design goals put forth in Annex I were fully met, most of them already in the so-called Developer Pre-Release of June 2004, but certainly in December 2004 with Update #2.

23. The highly acclaimed independent tech website "Ars Technica" reviewed the first update of Amiga OS 4.0 on 17 January 2005 and concluded: "*I have used PDAs that have similar CPU and RAM capacities as my AmigaOne and they do not provide the same speed and functionality that is already available in OS4. OS4 feels like a full desktop, yet has the resource requirements of a handheld.*" A true and accurate copy of that review is attached hereto as Exhibit B.

I DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF WASHINGTON AND THE FEDERAL REPUBLIC OF GERMANY THAT THE FOREGOING IS TRUE AND CORRECT.

20. May 2007
Date

HANS-JÖRG FRIEDEN

TRIER, GERMANY
Place

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(OEM) LICENSE AND SOFTWARE DEVELOPMENT AGREEMENT

This agreement (this "Agreement") is made and entered into as of this 03 day of November ~~October~~ 2001,

by and between:

1. Amiga Inc. (hereafter: "Amiga"), a State of Washington, U.S.A. corporation with its administrative seat at 34935 SE Douglas Street, Snoqualmie, WA 98065, USA

and

2. Hyperion VOF (hereafter : "Hyperion"), a Belgian corporation with its administrative seat at Brouwersstr. 1B, B-3000 Leuven;

3. Eyetech Group Ltd. (hereafter: "Eyetech"), an English corporation with its administrative seat at The Old Bank, 12 West Green, Stokesley, N. Yorkshire , TS9 5BB, England.

RECITALS

WHEREAS Amiga intends to release a new version of its Classic Amiga operating system tentatively called "Amiga OS 4.0";

WHEREAS Amiga has decided to contract with Eyetech for the development of the Amiga One product;

WHEREAS Hyperion has partnered with Eyetech Ltd. in the AmigaOne project;

WHEREAS the successful roll-out of the AmigaOne hardware hinges in part on the availability of Amiga OS 4.0;

WHEREAS Amiga has decided to contract with Hyperion for the development of Amiga OS 4.0;

NOW, THEREFORE, for good and valuable consideration, receipt and sufficiency of which is hereby acknowledged, and intending to be legally bound, the parties hereto agree as follows:

Article I.
DEFINITIONS

1.01 **Definitions**. For purposes of this Agreement, in addition to capitalized terms defined elsewhere in this agreement, the following defined terms shall have the meanings set forth below:

"Amiga One" means the PPC hardware product developed by Escena Gmbh for the Amiga One Partners, initially intended to operate in conjunction with an Amiga 1200;

"Amiga One Partners" means Eyetech and Hyperion collectively;

"Amiga OS Source Code" means the Source Code of the Classic Amiga OS including but not limited to the Source Code of Amiga OS 3.1, 3.5 and 3.9;

"Classic Amiga OS" means the operating system owned and developed by Amiga Inc. and largely based on the

operating system shipped with the Commodore Amiga line of computers sold in the 1980's and early '90's;

"Confidential information" means any business and technical information of a party hereto that is treated as confidential by such party and furnished to the other party, and which includes but is not limited to computer programs, Source code, Object code, algorithms where such information, if in writing, is identified in writing to the other party as confidential prior to or concurrently with the transmission of such information, and, if conveyed orally, is identified orally as confidential prior to or concurrently with the transmission of such information and confirmed in writing within seven (7) days thereafter. Source Code is hereby designated as Confidential Information.

"Object Code" means software in a machine readable form that is not convenient to human understanding of the program logic, and that can be executed by a computer using the appropriate operating system without compilation or interpretation. Object Code specifically excludes Source Code.

"OS 4.0" means the version of the Classic Amiga OS developed by Hyperion pursuant to this Agreement with the functionality described in Annex I hereof;

"OS 4" means any version of the Classic Amiga OS developed by Hyperion pursuant to this Agreement;

"Software" or "the Software" means the Source Code of Amiga OS 3.1 and the upgrades of Amiga OS 3.1 including but not limited to OS 3.5 and 3.9 and associated "Boing Bags";

"Source Code" means software when written in a form or language understandable to humans, generally in a higher level computer language, and further including embedded comments in the English language.

"Target-Hardware" means the PPC based hardware developed and marketed for the Amiga platform including but not limited to the hardware developed and marketed by Phase 5, DCE and the AmigaOne hardware developed by Escena under contract with the Amiga One Partners.

ARTICLE II.
OBLIGATIONS OF THE AMIGA ONE PARTNERS; APPOINTMENT

2.01 **Appointment**. Amiga hereby grants the Amiga One Partners a right and license to use and modify the Software and an exclusive right and license to market and distribute OS 4 as a standalone version for the Target Hardware and as an OEM version shipped with the Amiga One. Amiga furthermore grants the Amiga One Partners a right and license to use the Amiga trademarks in conjunction with the Amiga One. Hyperion shall develop Amiga OS 4.0 for the Target-Hardware with the minimal feature-set set out in Annex I and pursuant to the development guidelines set out in Annex I. Amiga acknowledges and accepts that Hyperion will bring in third party contractors (Annex II) to fulfill its contractual obligations.

2.02 **Timeline**. Hyperion shall use best efforts to ensure that Amiga OS 4.0 is ready for release before March 1, 2002.

2.03 **Royalties**.

(A) **Standalone version**. Other than for OS 4.0 for which no royalties shall be due by Hyperion, Hyperion shall pay Amiga a royalty of 20 USD for each standalone version of any subsequent versions of OS 4 developed by Hyperion pursuant to this Agreement.

(B) **OEM version**. Eyetech shall pay Amiga a royalty of 25 USD per unit of Amiga OS 4, said royalty shall moreover be considered payment in full for the Amiga One Partners right and title to use the Amiga trademarks in conjunction with the Amiga One.

(C) **Upgrades**. In the event upgrades are made available at a price which exceeds a reasonable amount for shipping and administrative costs, Hyperion and/or Eyetech shall pay Amiga a pro rata royalty which shall be calculated by comparing the suggested retail price (SRP) in Germany of a standalone version of OS 4 with the

SRP in Germany of the upgrade package.

2.04 **Records and inspection**. During the term of this Agreement, the AmigaOne Partners shall deliver to Amiga bi-monthly reports within thirty (30) days after the end of bi-monthly period setting forth the sales of the OS 4. Following such bi-monthly report, accrued royalties shall promptly be wired to Amiga. Amounts of less than Two Thousand (2000) USD shall be carried over to the next bi-monthly period. The AmigaOne Partners shall maintain or acquire complete and accurate records of sales to permit the determination of the sums payable by the AmigaOne Partners to Amiga. The AmigaOne Partners shall, upon fourteen (14) days advance written notice by Amiga, permit reasonable inspection of such records by Amiga or its outside accountants. The finding of errors in such records shall not of itself constitute a material breach of this Agreement. Amiga shall bear all of its own costs of such inspection even if it finds errors in the Amiga One Partners' records unless the inspection reveals more than 5% underpayment on the part of one of the Amiga One Partners in which case said partner shall bear the costs of inspection which shall not be unreasonable.

2.05 **Interest**. Interest shall accrue on any delinquent amount owed by the AmigaOne Partners at the rate of one percent (1%) per month, or the maximum rate permitted by the law of the State of Washington, U.S.A, whichever is less.

2.06 **Ownership**. Amiga shall retain ownership of the Software. Other than the rights and licenses granted to the AmigaOne Partners and Hyperion and Eyetech individually, nothing in this Agreement shall be construed as limiting Amiga's right and title in the Software. At any time prior to the completion of OS 4.0 and no later than six (6) months thereafter and provided Amiga makes the payment pursuant to article 3.01 hereof, Hyperion shall transfer all Source Code, interest and title in OS 4.0 to Amiga to the extent it can do so under the agreements concluded with third party contractors. Hyperion shall use best efforts to secure the widest possible rights from third party contractors. Amiga hereby acknowledges and accepts that some third parties may only grant an Object Code license or may otherwise restrict the rights granted to Hyperion.

2.07 **Bankruptcy**. In the event Amiga files for bankruptcy or becomes insolvent, the Amiga One Partners are granted an exclusive, perpetual, world-wide and royalty free right and license to develop (at their sole expense), use, modify and market the Software and OS 4 under the "Amiga OS" trademark.

2.08 **Contingency**. In the event Amiga decides to halt development of the Classic Amiga OS for the Target Hardware, the Amiga One Partners are granted an exclusive, perpetual, worldwide right and license to develop, use, modify and market the Software and OS 4 under the "Amiga OS" trademark and at their sole expense. Royalties due to Amiga shall be calculated in accordance with article 2.03 hereof. Amiga shall be deemed to have halted development of the Classic Amiga OS in the event that no substantially new version of the Classic Amiga OS for the Target Hardware is released within 6 (six) months after the completion of OS 4.0 by Hyperion.

ARTICLE III.
OBLIGATIONS OF AMIGA.

3.01 Amiga may, at any time but no later than six (6) months after the completion of OS 4.0, elect to pay Hyperion Twenty Five Thousand USD (25,000 USD) in order to acquire the Object Code, Source Code and intellectual property of OS 4.0 pursuant to and within the limits set out in article 2.06 hereof. Said payment will first be applied against the balance of any outstanding invoices by the AmigaOne Partners vis ˆ vis Amiga. In the event Amiga does not elect to carry out the aforementioned payment, all ownership and title in the enhancements of and additions to the Software effected by Hyperion and its subcontractors pursuant to this Agreement, shall rest with Hyperion.

3.02 Amiga shall provide Hyperion with all necessary Source Code and documentation to allow Hyperion to carry out its contractual obligations under this Agreement.

ARTICLE IV.
WARRANTIES AND INDEMNIFICATIONS

4.01 **Warranty and Covenant of Original Development by Amiga**. Amiga represents, warrants and covenants that: (a) it is and shall be the owner of all intellectual property rights in the Software under copyright, patent, trademark, trade secret, and other applicable law; (b) the Software delivered or licensed to the Amiga One Partners hereunder is and shall be of original development by employees of Amiga in the conduct of their duties as employees or by third parties who prepared such materials for Amiga pursuant to a contract between Amiga and said third parties and who assigned to Amiga his or its entire right, title and interest in the Software; (c) the Software does not and shall not infringe or otherwise violate any patent, copyright or trade secret of any third party anywhere in the world; (d) it has not received, as of the date of the delivery of the Software to Hyperion, actual notice of any claim that the Software or the use thereof infringes any intellectual property right of any third party anywhere in the world or that any third party has any proprietary interest in or to the software, or any invention, patent, work of authorship, copyright, trade secret, know-how or a similar right to the software.

4.02 **Indemnification**. Amiga shall indemnify and hold Hyperion harmless from and against all claims, suits, demands, actions, judgments, penalties, damages, costs and expenses (including attorney's fees and costs), losses or liabilities of any kind arising from a claim that the Software infringes a patent, copyright or other intellectual property right of any other person anywhere in the world.

4.03 **Indemnification**. Hyperion shall indemnify and hold Amiga harmless from and against all claims, suits, demands, actions, judgments, penalties, damages, costs and expenses (including attorney's fees and costs), losses or liabilities of any kind arising from a claim that OS 4.0 or any other version of the Classic Amiga OS developed pursuant to this Agreement infringes a patent, copyright or other intellectual property right of any other person anywhere in the world.

4.04 **Notice**. Amiga and Hyperion shall promptly notify the other party of any actions brought or claims asserted whose outcome may affect the rights granted to Hyperion and/or Amiga pursuant to this Agreement.

4.05 **Organization and Standing.** Hyperion is a corporation duly organized, validly existing and in good standing under the laws of the kingdom of Belgium. Amiga is a corporation duly organized, validly existing and in good standing under the laws of the State of Washington, USA. Eyetech is a corporation duly organized, validly existing and in good standing under the laws of England.

4.06 **Power to grant rights**. Amiga represents and warrants that: (a) it has the right, power and authority to grant the rights and licenses granted in this Agreement and fully perform its obligations hereunder; (b) the making and performance of this Agreement by Hyperion does not and shall not violate any separate agreement, right or obligation existing between Amiga and any third party; and (c) there are no outstanding liens, security interests or other encumbrances of any kind whatsoever in or to the Software or to any of the intellectual property rights therein.

ARTICLE V.
CONFIDENTIALITY

(a) Each party may disclose to another party Confidential Information as may be necessary to further the performance of this Agreement. Each party agrees to treat another's Confidential Information in the manner prescribed herein.

(b) Amiga and the Amiga One Partners shall protect any other party's Confidential Information as follows:

(I) Except as specifically provided herein or otherwise permitted by the other parties in writing, any party may disclose Confidential Information of another party only to those employees and agents required to have knowledge of same to perform their duties pursuant to this Agreement. Each party shall require each such employee or agent to enter into a written non-disclosure agreement containing provisions substantially consistent with the terms hereof prior to the disclosure of Confidential Information to such employee or agent. Each party shall treat the Confidential Information of another party with the same degree of care as it protects its own Confidential Information, and in no event less than a reasonable degree of care.

(II) Except as may specifically be permitted herein, upon the termination of this Agreement, each party shall

return to the other, or, if so requested, destroy all Confidential Information of the other party in its possession or control, except such Confidential Information as may be reasonably necessary to exercise the rights that survive the termination of this Agreement.

(c) The foregoing obligations of confidentiality shall not apply with respect to any party's Confidential Information to the extent that it:

(I) is within or later falls within the public domain through no fault of the party receiving the Confidential Information; or

(II) is, or becomes, available to the receiving party from third parties, who, in making such disclosure, have breached no written confidentiality agreement; or

(III) is previously known by the receiving party;

(IV) is independently developed by or for the receiving party without use of the Confidential Information.

(d) In the event any party receives a request to disclose any Confidential Information under the terms of a valid and effective subpoena or order issued by a court of competent jurisdiction or a governmental body, such party shall (I) immediately notify the party that furnished such Confidential Information of the existence, terms and circumstances surrounding such request, (II) consult with such party on the advisability of taking legally available steps to resist or narrow such request, and (III) exercise reasonable best efforts, at the expense of the party producing such Confidential Information, to obtain an order or other reliable assurance that confidential treatment will be accorded to such portion of the Confidential Information as may be disclosed.

ARTICLE VI.
TERM; TERMINATION

6.01 **Term**. This Agreement shall continue indefinitely, unless terminated as provided herein.

6.02 **Termination for Material Breach**. Any party may, at its option, terminate this agreement in the event of a material breach by another party. Such termination may be effected only through a written notice to another party, specifically identifying the breach or breaches on which termination is based. Following receipt of such notice, the party in breach shall have thirty (30) days to cure such breach or breaches and this Agreement shall terminate in the event that such a cure is not made by the end of such period. The claim of material breach justifying termination shall be limited to the specific breached set forth in the above written notice as explained, supported and negated by evidence.

6.03 **Consequences of Termination**. In the event this Agreement is terminated in accordance with article 6.02 hereof, this Agreement shall remain in force with respect to the parties other than the party found in material breach of this Agreement pursuant to article 6.02 hereof. Articles IV, V, VI and VII shall in any event survive termination of this Agreement.

Article VII.
Miscellaneous

7.01 **Four Corners.** This Agreement collectively sets forth the entire agreement and understanding between the parties hereto with respect to the subject matter hereof and, except as specifically provided herein, supersedes and merges all prior oral and written agreements, discussions and understandings between the parties with respect to the subject matter hereof, and neither of the parties shall be bound by any conditions, inducements or representations other than as expressly provided for herein.

7.02 **Independent Contractors**. In making and performing this Agreement, Amiga and the Amiga One Partners act and shall act at all times as independent contractors and nothing contained in this Agreement shall be

construed or implied to create an agency, partnership or employer and employee relationship between Amiga and the AmigaOne Partners. At no time shall either party make commitments or incur any charges or expenses for or in the name of the other party.

7.03 **Amendments; Modifications**. No amendment, modification or attempt to supersede or cancel any of the terms, covenants, representations, warranties or conditions hereof shall be effective unless such amendment, modification or direction to supersede or cancel such term, covenant, representation, warranty or condition is executed in writing by Amiga and Hyperion or, in the case of a waiver, by or on behalf of the party waiving compliance. No waiver by any party of any condition, or of any breach of any term, covenant, representation or warranty contained in this Agreement, in any one or more instances, shall be deemed to be a further or continuing waiver of any such condition or breach or a waiver of any other condition or of any breach of any other term, covenant, representation or warranty.

7.04 **Severability**. The provisions of this Agreement shall be severable, and if any of them are held invalid or unenforceable for any reason, such provision shall be adjusted to the minimum extent necessary to cure such invalidity. The invalidity or unenforceability of one or more of the provisions contained in this Agreement shall not affect any other provisions of this Agreement.

7.05 **Waivers**. The waiver of any breach of any provision of this Agreement or failure to enforce any provision hereof shall not operate or be construed as a waiver of any subsequent breach.

7.06 **Governing Law**. This Agreement shall be governed by and interpreted in accordance with the internal laws of Washington State, USA without regard to conflicts of laws principles. The obligations set forth in this Agreement are intended to supplement and not to supersede the protections afforded Amiga under the Uniform Trade Secrets Act or similar law or laws as may be in effect from time to time within the State of Washington.

7.07 **Dispute settlement.** Before filing any suit (with the exception of injunctive relief related to the protection of intellectual property) both parties shall submit to mediation to be completed within 30 days after written notice. In the event of any dispute between the parties that arises out of this Agreement, the substantially prevailing party shall be entitled to reimbursement for its attorneys' and experts' costs, fees and expenses. The provisions of this Agreement shall not be construed as limiting any rights or remedies that either party may otherwise have under applicable law and shall be in addition to all other rights and remedies of such party, including any which may arise out of any other written agreement involving the parties.

7.08 **Forum**. The exclusive jurisdiction and venue of any lawsuit between the parties arising under this Agreement or out of transactions contemplated hereby shall be the Superior Court of Washington for King County or the United States District Court for the Western District of Washington at Seattle and each of the parties hereby submits itself to the exclusive jurisdiction and venue of such court for the purposes of such lawsuit.

7.09 **Counterparts**. This Agreement may be executed in any number of counterparts, each of which when so executed shall be deemed to be an original and all of which when taken together shall constitute one Agreement.

7.10 **Signatures by Facsimile**. Any facsimile signature of any party hereto shall constitute a legal, valid and binding execution hereof by such party.

7.11 **Construction**. This Agreement is the product of joint draftmanship and shall not be construed against one party more strictly than against another.

7.12 **Effect**. The Agreement shall be binding upon and inure to the benefit of each party hereto, and their successors and assigns. Neither party shall assign or subcontract the whole or any part of this Agreement without the other party's prior written consent.

7.13 **Headings**. The headings in this Agreement are inserted merely for the purpose of convenience and shall not affect the meaning or interpretation of this Agreement.

IN WITNESS WHEREOF, the parties, by their authorized representatives, have executed this Agreement.

FOR AMIGA INC.

BY: _____

NAME (PRINTED) Bartle Jon Moss

TITLE CTO, Amiga

FOR HYPERION VOF

BY: _____

NAME (PRINTED) BEN HERMANS

TITLE Managing partner

FOR EYETECH GROUP LTD

BY: _____

NAME (PRINTED) A. M. Reijthalss.

TITLE Managing Director

OS 4 Schedule and Feature List

Hans-Jörg Frieden,
Senior software engineer, Hyperion Entertainment

This document describes the tasks required to get to OS 4 running on the AmigaOne and CyberStorm PPC hardware. Tasks are categorized as *essential*, *important* or *optional* depending on their importance. *Essential* tasks must be carried out to get bare minimum functionality. *Important* tasks are task that are not essential for functionality, but are to be considered so fundamental that OS 4 would rather be incomplete without them. Finally, *optional* tasks are things that can be considered if time and resources don't run out. They would be nice to have, but not critical.

Design Goals of OS 4

The following summarizes the desired design goals of OS 4.0:

- Essentially, OS 3.9 running on the AmigaOne and CyberStorm PPC without using the 68k CPU, using a 68k Emulator, possibly the JIT compiler, but may work with a non-JIT for starters. The kernel is a PPC native Exec with Haage & Partner's emulator (or the JIT emulator under development by a third party) running instead of the on-board 68k.
- As much PPC-native as necessary as soon as possible. This in combination with the 68k emulation (as opposed to cache-flushing needed to keep both CPU's memory image in sync) would mean a tremendous boost in performance, also carried by the fact that the memory interface and PCI/AGP bus can achieve a substantially faster throughput as the old Zorro III or PCI-Bridges. Not to mention that the CPU will be a good deal faster.
- New file system replacing the old FFS, preferably PPC-Native if possible. The old file system has turned out to be one of the major bottlenecks. It is outperformed by e.g. Linux ext2 by a factor of 10.
- Virtual Memory System. Most modern games, most modern applications require a tremendous amount of memory. Having virtual memory as part of the system is a key factor for tighter development schedules.
- Runs on the AmigaOne as well as the "classic" hardware. Blizzard version probably undesirable/impossible (performance reasons), but CyberStorm PPC required. Anything else would mean replacing one small market of weak machines with another small market with strong machines. The key factor must be for software developers to widen the market, making Amiga development feasible, and offer an upgrade path for A1200 owners to a top-of-the-line hardware.

Tasks

Task: Port Exec to PPC, adapt WarpOS and the 68K emulator
Priority: Essential
Prerequisite: AmigaOne
Required for: AmigaOne
Performed by: Alexander Lohrmann, Almos Rajnai, Hyperion & Haage&Partner
Estimated time: ?

It was decided that the cleanest and technologically most satisfying solution is a PPC port of Exec which handles both the PPC tasks and the emulated 68K tasks.
Porting WarpOS will essentially mean writing a new warphw.library. This should be relatively straightforward, since this was one of the design goals for WarpOS. Once this is done, the emulator must be adapted to run on this. Possibly, there would need to be some adaptations to the G3 processor.
The emulator would either be the 68K emulator by Haage & Partner or the JIT emulator by Almos Rajnai or a combination of both. Whilst JIT emulation is to be preferred because of its higher speed, it is unclear at this point if the JIT emulator will be finished in time to coincide with release of OS 4.0.

Task: CyberStorm SCSI driver / SCSI PCI card
Priority: Essential
Prerequisite: n/a
Required for: OS 4 on classic hardware + Amiga One SCSI on PCI support
Performed by: Ignatios Souvatzis
Estimated time: 2 months

Work on the CyberStorm SCSI drivers is already underway. The basic motivation is that the original cybppc.device does not work on the emulator due to MMU page size restrictions. Furthermore this driver may be later adapted to work with PCI SCSI cards as a lot of existing users have SCSI rather than IDE based hardware.

Task: Disk drivers for the AmigaOne hardware
Priority: Essential
Prerequisite: AmigaOne hardware
Required for: AmigaOne only
Performed by: ?
Estimated time: ?

Since this task might be very similar to the aforementioned CyberStorm SCSI driver, it might be conceivable to contract Mr. Souvatzis for this task, too. Maybe a solution would be to use a PCI SCSI controller in the AmigaOne with the same chipset as the CyberStorm PPC.

Task: Picasso96-Drivers for the CyberVisionPPC and possibly G-REX/Predator
Picasso96-Drivers for the Matrox G450/G550, Voodoo 3/4/5, Permedia 2
Priority: Essential

Prerequisite: n/a
Required for: OS 4 on classic hardware
Performed by: Mark Olsen, Alexander Kneer, Tobias Abt
Estimated time: ?

The Picasso96 RTG system must fully support all hardware that is targeted for AmigaOS 4. Therefore the most frequently used card, the CyberVisionPPC, must also be supported. Work on this is already underway, but made more complicated by the fact that the CSPPC's flash rom already sets up some of the Permedia2 for the passthrough option.

With Picasso96 drivers already present for the Prometheus PCI bridge as well as the Mediator solution (albeit still with the issue of non-conformance with the Picasso96 authors' license), the only remaining PCI boards to be supported would be G-REX or the Predator. Support of these boards requires cooperation with DCE/Thomas Dellert.

Supported graphics card for OS4 should at the least cover Permedia2, Voodoo 3 and possible S3 ViRGE (the latter because of its still wide-spread use and cheap PCI versions).

Task: Integration of changes in OS 3.5 and OS 3.9 into the 3.1 CVS
Priority: Essential
Prerequisite: n/a
Required for: OS 4
Performed by: Olaf Barthel and/or others.
Estimated time: ?

Changes made after OS 3.1 must be incorporated into the main tree in the CVS repository. If a new kickstart ROM is desired, this would include the kickstart source code as well as all modifications done by the SetPatch program.

There might be license issues involved with this, for example for the Reaction GUI system. License issues are outside the scope of this document.

Task: Warp3D/Ami3D drivers for all supported graphics cards
Priority: Important to Essential
Prerequisite: G550, working G450, other cards including Permedia 2, Voodoo 3/4/5
Required for: OS 4
Performed by: Hans-Jörg Frieden, Thomas Frieden
Estimated time: 1.5 month per card (assuming full-time work, partially done)

All graphics cards supported by OS 4 should have proper 3D graphics support. Note that drivers for the Voodoo 3, Permedia2 and ViRGE graphics chips are already present. This means that essentially only the Matrox cards would need to be handled at this point.

Note that the estimated time for this task does not include changes on the API or naming scheme for Ami3D. However, the author's opinion on this is that for OS 4 the name "Warp3D" and the naming scheme "Warp3D.library" and "Warp3DPPC.library" should still be employed, and Ami3D should come with OS 4.2, or later as a boing bag for OS 4.

Task: OpenGL implementation based on Mesa
Priority: Important
Prerequisite: 3D hardware
Required for: OS 4.0
Performed by: Hans-Jörg Frieden, Thomas Frieden
Estimated time: 1.5 month

OpenGL is the only cross-platform API for handling 3D graphics (in contrast with Direct3D which is a proprietary Microsoft API). The availability of an OpenGL implementation would allow for simplied porting of OpenGL based games and applications to Amiga OS.

The proposed OpenGL implementation would be based on Mesa 4.0, an open source implementation of the OpenGL 1.3 specification (see: http://mesa3d.sourceforge.net).

Task: Fast File System rewrite
Priority: Essential
Prerequisite: n/a
Required for: OS 4
Performed by: Olaf Barthel
Estimated time: Already in beta-test

The rewrite of the fast file system should be regarded as a performance issue, and therefore essential. Since the

FFS2 is already in beta-test, the only remaining issue (besides bugfixes) is conversion to PPC.
Task: New TCP/IP Stack
Priority: Important to Essential
Prerequisite: n/a
Required for: OS 4
Performed by: Olaf Barthel
Estimated time: Already in beta-test
No operating system is complete without a tcp stack. Possibly old systems like Miami and/or Genesis/AmiTCP may not work anymore.
Like with the FFS2 conversion to PPC is still required.
Task: Virtual Memory System
Priority: Essential
Prerequisite: n/a
Required for: OS 4
Performed by: Haage & Partner
Estimated time: PPC conversion pending, probably low time requirements.
According to Haage & Partner, this task is already finished except for PPC conversion, which they said should be a very easy task.
Task: Minimal USB stack
Priority: Highly optional
Prerequisite: AmigaOne hardware/USB Hardware
Required for: OS 4 on AmigaOne, PCI USB card
Performed by: ?
Estimated time: ?
In order to enable stand-alone usage of the AmigaOne board, a minimal USB stack would be "a cool thing to have", i.e. It is not required to actually get the project done, but would a) allow the AmigaOne to be used in standalone mode and b) would help those people related to the project that do not have access to an A1200.
It might be possible to recycle some source code from Linux for that, or alternatively from a BSD clone because of the more liberal license (Microsoft **do** have a point about the GPL's viral properties).
As I said, this is highly optional.
Task: PPC-Native RTA system (AmiRTA)
Priority: Optional, probably OS 4.2 only
Prerequisite: n/a
Required for: n/a
Performed by: ?
Estimated time: ?
The current Audio systems is either hardware-dependent (audio.device, direct DMA sound access) or AHI (and hence slow, 68k only, and with a lot of shortcomings). A new Audio system is absolutely required for at least OS 4.2, preferably earlier. This system should be able to cope with modern sound cards including 3D-Sound, and should be useful for both game programmers as well as multimedia programmers/studio musicians.
What's wrong with AHI? The API is divided in a low-level or high-level API. Both are rather awkward to use (for example, the low-level API only offers a callback mechanism that is triggered when a samples buffer *starts* playing, not when it finishes playing or reaches a certain position in the sample stream). Also, essential functionality is missing (for example, find out where the current sample playback position is). It also doesn't support any features of modern soundcards, or features of Amiga-specific sound cards like the Delfina.
More importantly, it is known to be extremely slow. Its mixing routines are slow, so people roll their own. Even with sound cards is is much slower than the audio device (compare Shogo or Wipeout XL with or without AHI sound).
Task: Various enhancements (PPC datatypes, new HD Toolbox, AHI Soundblaster driver, clipboard functionality, various bugfixes)
Priority: Important, OS 4.0
Prerequisite: Hardware (Soundblaster EMU 101k)
Required for: OS 4.0
Performed by: Oliver Roberts, Andrea Vallinotto, Martin Blom, Philippe Ferrucci
Estimated time: ?

General Notes

Olaf Barthel will function as the build master (apologies to Olaf because his name is mentioned quite frequently throughout this document).
Work should start as soon as possible on the CyberStorm PPC hardware. To work around the lack of a SCSI driver, the initial work can be carried out with an IDE disk connected to the A4000's internal IDE port. Admittedly this is not the fastest option, but a workable one.
All parties involved should have read access to the CVS at all time, and also have access to nightly/weekly builds of the OS. A mailing list should be established. From time to time a meeting of all parties involved would be desirable.

Future Work

It is clear that the primary concern should be to get OS 4 up and running on both the AmigaOne as well as the CyberStorm PPC cards as soon as possible. After the basic work is done, further updates and goodies may be made available as boing bag upgrades on the road to OS 4.2. Listed below are a few things that come to mind:

WarpInput. WarpInput is an API drafted by Hyperion Entertainment (draft available on request. Contact Hans-JoergF@Hyperion-Entertainment.com), the purpose of which is to allow unified access to multimedia controller devices like Joysticks, steering wheels, trackballs and similar devices as well as the mouse and keyboard, from a multimedia or games programmers point of view. Could be renamed "AmiInput" (or some more prosaic name) and reused on AmigaDE and OS 4.2.
PPC-Native GUI system. At the moment it is painful to write fast applications with GUI's PPC-native. This is because every call like `intuition.library/GetMsg()` requires a cross-CPU context switch. Porting Boopsi to PPC and also porting a toolkit like Reaction would help this effort tremendously.
Gradual changes to PPC code. More OS code can be moved to PPC as time permits.

Appendix: Migration to PPC-Native libraries (Proposal)

OS 4.0 could provide a way to implement PPC native libraries and devices incrementally, that is, allow libraries and devices to coexist as the original 68k version as well as a new PPC native version. This document tried to outline the principle.
There is one fixed address in the Amiga system. This is address 0x4, the `ExecBase`. To open a library (or a device, which is a special form of library) you call the Exec function `OpenLibrary` to obtain a base pointer. Currently there is only one address 0x4.
The principle doesn't change when the 68k emulator is involved – yet. However, this may be changed. An MMU setup will be able to write- and read-protect the first page of the Amiga memory. This way an exception is generated when a read access to the `ExecBase` pointer is performed. The system may now decide if a PPC task or an emulated 68k task tried to access the `ExecBase` and return a different pointer, one for the traditional `ExecBase`, and one for a special PPC version of `ExecBase`.
We now have a way to have a PPC-native Exec library that can provide the same functionality as the traditional Exec, plus new functions that are unique to the PPC/OS4 version. The new functionality can be implemented this way without interfering with 68k programs.
The new PPC Exec can now provide its own `OpenLibrary` function to open other PPC-native libraries. Theoretically, there could be a PPC-Native version of e.g. Intuition, as well as a 68k version. However, this is not needed in all cases, and can be a continuous process.
If a PPC program tries to open a library that is not available as a PPC native library, the runtime system could generate a PPC stub library on the fly, by generating a library base with stubs that automatically hand over control to the appropriate 68k function via the emulator. The same could be done for 68k programs, making it possible to replace system libraries completely.

Example:

Consider the following:

```
struct Library *ExampleBase;

ExampleBase = (struct Library *)OpenLibrary("example.library", 0);
if (!ExampleBase) exit(0);
```

```
// Call an example library function
int i = ExampleFunc(x,y);
```

What happens is the following. To call the `OpenLibrary` function, the compiler generates an address lookup at `_SysBase`, which is usually internally taken from address `0x00000004` at program startup. To call the function, the appropriate jump address is taken from the `_SysBase` minus the offset of the function. The resulting address is what the program jumps to. On a PPC this jump mechanism works a bit different from the 68k, but in principle this is the same. The only problem is that a PPC program wants PPC code that it can jump to, while a 68k program expects 68k code at the jump target.

The only solution is to have separate base pointers for libraries on PPC and 68k. For `exec.library` this is done by providing a PPC-native (or almost PPC-native) exec with all the functionality as its 68k counterpart. A PPC program reading address four will generate a page fault, and the runtime system will be able to return a different address than that of the 68k base.

As soon as this distinction is made, the rest of the system will fall in place automatically. On 68k, the call to `OpenLibrary` will proceed normally; on PPC, the PPC exec might for example look in a different directionry (for example, `PPCLIBS:` as opposed to `LIBS:`), or add a prefix/suffix (`"ppcexample.library"` as opposed to `"example.library"`), or any other way to keep them apart.

In any case, the result is that a program can be compiled on both PPC and 68k from identical source code. Furthermore, the two exec's can cooperate; for example, signaling, message passing and semaphores can be shared between them (remember that we can re-compile exec and also make modifications to the 68k version). In the above example, the `ExampleBase` pointer returned is a PPC library on the PPC side, and a 68k library on the 68k side. Furthermore, this system works dynamically, as will be outlined below.

Migration

In order to allow incremental development of OS 4 into as much PPC native code as possible, the PPC version of the `OpenLibrary` call can actually verify if there is a PPC version of the library in question and selectively choose to *fail* if this is not the case, or instead construct a new library on-the-fly from the 68k counterpart. The PPC `exec` would look up the library on the 68k side, and if found, construct a new base and substitute all entries by simulated context switches into the 68k side, using the 68k emulator. If the need should arise, a scheme could be applied in which a PPC library need only implement parts of its own functionality, and make automatic context switches/emulator jumps into its 68k counterpart. This way for example a PPC version of `Intuition.library` could still use the 68k version of `OpenScreen`, but have its own PPC implementation of the more frequent calls like `OpenWindow` or similar. On a related topic, this scheme could be applied to time-critical functions in other system library, for example the drawing functions in `graphics.library`.

Likewise, the original library may be patched (either via `SetFunction` or via a newly compiled version) to use the new PPC version. This requires some possibility of the 68k emulator to inline PPC code, for example by executing an `INVALID` function, or by a jump to an uneven address (the emulator would strip out the LSB to get a new address with PPC code instead of 68k code).

To summarize the critical points:

1. The runtime system must be able to decide which "CPU" (either the PPC or the emulated 68k) is accessing address `0x00000004` to decide which value to return. If this is not possible, the new scheme could only be applied to programs written for OS4, and the startup code would need to be modified to ignore the usual base address and load a different one.
2. A scheme must be derived where both 68k and PPC libraries with the same name can co-exist. This does not only apply to on-disk representations, but also to in-memory representations. Exec in its current form stores all resident libraries in a list in its base; since we have two bases, there may be two lists. However, some libraries depend on being run from their `ROMTAG` or resident structure.
3. The runtime system must be able to construct a library on the fly at an `OpenLibrary` call. This is no problem at all, since this is exactly what is done when a library is first loaded from disk (`exec.library/MakeLibrary`, `exec.library/AddLibrary`). Furthermore, it must be able to decide which offsets are valid (i.e. Point to PPC code) and which must be redirected; setting these to invalid `NULL` jumps, or invalid instructions would be a possibility.
4. The emulator must be able to switch from 68k and from 68k to PPC quickly, so that replacing original 68k functions with PPC functions gives a noticeable speedup even for old 68k programs. Good speed-up candidates for this kind of optimizations are `dos.library`, `graphics.library`, `intuition.library` and `Picasso96API.library`. Since there is already work being done for a PPC-native Picasso96, this work can be recycled this way and even give "old" programs a bit of extra speed

(Most notably for thinks like C2P/WritePixelArray etc.)

Annex II - List of subcontractors (subject to change)

- Hyperion Entertainment VOF

Hans-Joerg Frieden, Thomas Frieden, Steffen Haeuser, Peter Annuss, Joe Sera etc.

- Haage & Partner GmbH

Jochen Becher, Markus Poelmann, Martin Steigerwaldt etc.

- Olaf Barthel

- P96 team (Kneer & Abt GbR)

Alexander Kneer, Tobias Abt

- Alexander Lohrmann

- Almos Rajnai

- Mark Olsen

- Ignatios Souvatzis

- Andrea Vallinotto

- Martin Blom

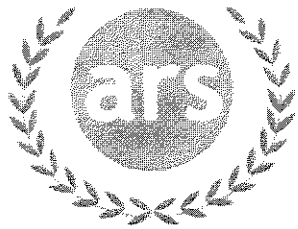
- Philippe Ferrucci

- Oliver Roberts

The Micro-AmigaOne and Amiga OS4 Developer Prerelease (Update 1)

by Jeremy Reimer

Version 1.0 – January 17, 2005



The Micro-AmigaOne and Amiga OS4 Developer Prerelease (Update 1)

by Jeremy Reimer

Introduction

The Amiga computer was a machine ahead of its time. When it was released in 1985, its color screen (4096 colors in HAM mode!), four-channel sampled stereo sound, preemptive multitasking GUI, and custom chips to accelerate both sound and graphics made the year-old Macintosh seem antiquated and the PC positively Paleolithic. Steve Jobs was reported to be extremely worried about the Amiga, but fortunately for him and Apple, Commodore had absolutely no idea what they were doing.

Many jokes have been made about Commodore being unable to sell water to a dying man in the desert, and sadly, these jokes were not that far from the truth. After a showy introduction at the Lincoln Center, which included pop star Deborah Harry and artist Andy Warhol, Commodore stopped all production and advertising of the Amiga 1000, in anticipation of the imminent release of the new 2000 and cost-reduced 500 models. These didn't appear until 1987, and much early momentum was lost. Commodore continued to make terrible mistakes, suffered financially from declining C-64 sales, and eventually went bankrupt in April 1994.

The Amiga, by this time, had carved out a small but devoted niche, especially in digital video. The Video Toaster, closely tied to the Amiga hardware, replaced hundreds of thousands of dollars worth of TV editing equipment for under US$8,000. Bundled with this hardware was Lightwave, a 3D modeling and rendering program that was used to make the pilot and first season of Babylon 5 (in the remaining seasons, they continued to use Lightwave, but this time on Alpha and Intel computers).

Third-party developers, not willing to wait for the protracted Commodore bankruptcy to resolve itself, developed add-ons for the Amiga giving it access to the new 24-bit SVGA graphics cards coming from the PC world, freeing the dependence on the now-aging custom graphics chips, as well as PowerPC upgrade cards that worked like massive coprocessors for applications rewritten to support them.

However, the lack of a new Amiga computer hurt the platform greatly. Commodore was bought at liquidation by Escom AG, a German PC firm who wanted only the Commodore brand name and logo, and had no interest in the Amiga. Escom itself went bankrupt a few years later, and the Amiga was briefly bought out by set-top manufacturer VISCorp, before they too filed for liquidation.

Its third owner was none other than Gateway Computers, who were interested mainly in Commodore's old patent portfolio, but claimed to be interested in resurrecting the platform. However

it became increasingly clear that Gateway was never going to do anything with the Amiga, so a consortium of investors calling themselves Amino Development bought out the rights to the Amiga hardware and OS in 1999. The new company was called Amiga, Inc., the same name as the original group headed by Jay Miner that had started the computer company in 1982 before Commodore bought them out. Amiga had come full circle!

In the heady days of the dot-com boom, Amiga Inc. had all sorts of grandiose plans for resurrecting the platform. A new OS based on QNX, then Linux, as well as a Java-like "Amiga Anywhere" development environment or AmigaDE were proposed. Of these three, only the last ever came to fruition before Amiga Inc. ran out of money when the bubble burst. There had been some talk of a new, PowerPC-based version of the classic AmigaOS, version 4.0, but as Amiga, Inc. had no more resources, everyone assumed it was dead. WIRED magazine even gave OS4 a special vaporware award, beating out even Duke Nukem Forever!

But an amazing thing was happening. Three companies were actually working on a new Amiga platform. One, bplan Gbmh (formed from the ashes of Phase 5, an Amiga accelerator card company) was originally going to be a licensee of Amiga Inc. and produce hardware to run OS4. They had a falling-out with the moribund Amiga Inc., merged with Thendic to became Genesi, and decided instead to produce both the hardware and an "Amiga-like" OS themselves. These were released as the PegasosPPC motherboard and MorphOS in late 2001.

A second company, Eyetech UK, was to be the second licensee of OS4. Eyetech had been an Amiga hardware and add-on distributor, and formed a partnership with a Taiwanese company to produce modified Teron PowerPC motherboards. The third company, Hyperion Entertainment, was hired by Amiga, Inc. to write OS4 itself. As Amiga, Inc. had no money, Hyperion signed a contract that would give them the rights to OS4 if Amiga, Inc. went bankrupt. Hyperion was a small company that produced ports of Windows games for the Macintosh, Amiga and Linux market.

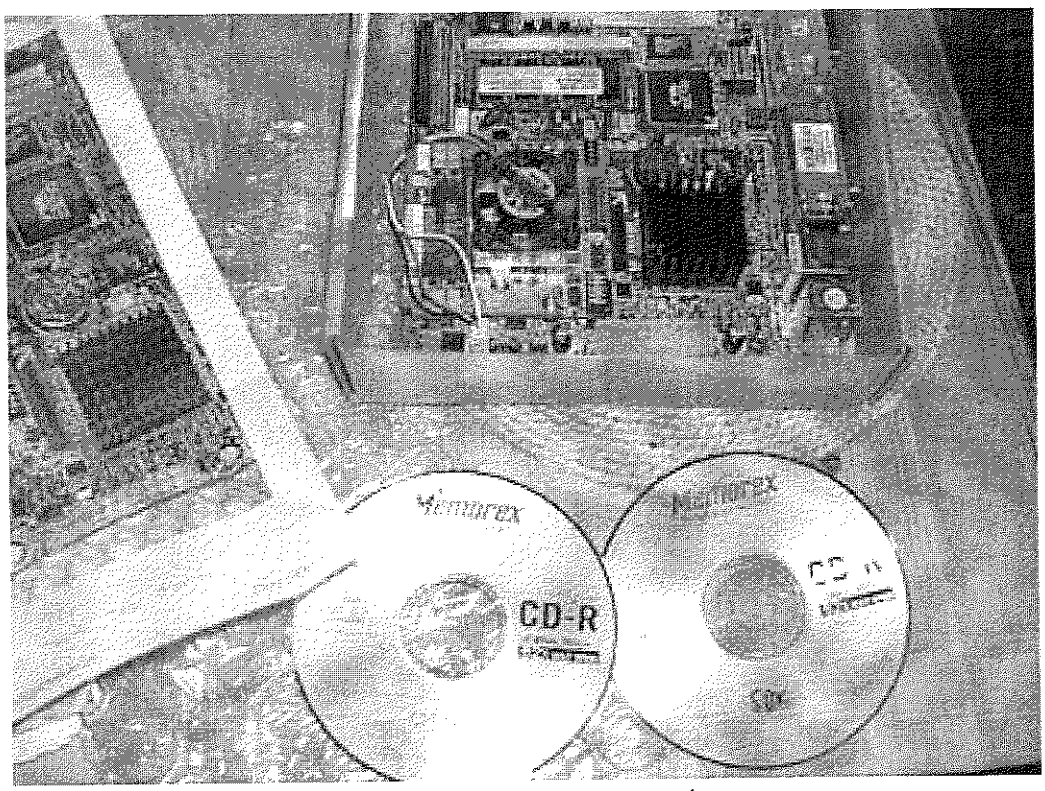
The first AmigaOne motherboards were released in 2002, but there was no OS4 to go with them, so they shipped with Debian PPC Linux instead. Was Hyperion too small a company to manage this massive task, the first operating system project they had ever attempted? While MorphOS gained a small but dedicated following, AmigaOne owners anxiously awaited any kind of news. Finally, after an agonizing 18-month wait, the first Developer Prerelease CD of OS4 was shipped to AmigaOne owners worldwide. Eyetech, meanwhile, had announced a new batch of AmigaOne motherboards, this time coming in the tiny mini-ITX form factor. An update to OS4 was delivered to coincide with their release. The prospect of exploring a brand new operating system plus the possibilities of doing hardware design around a tiny, low-power motherboard were too much for me and I bit the bullet and ordered an AmigaOne Micro with OS4 on November 2004.

The motherboard

The AmigaOne Micro C"model measures 17cm x 17cm and contains an 800MH IB PPC 750FX or B CPU (ommonly known as the G) This CPU is on a removable daughter card so it can be replaced with a G (PPC 74xx)module (00MH ones are available now, faster ones are in development, including a 1.5B G from Freescale) It comes with 256MB of PC-133 RAM onboard, plus an extra SO-DIMM slot. Onboard graphics are provided by a Radeon 7000 with 32 megabytes of memory.

Sound (media) 10/100 Ethernet (com)and two USB1.1 ports are also onboard, as well as PS/2 connectors for a mouse and keyboard, serial, parallel and game ports. Motherboard ribbon connectors are provided for one extra serial and two extra USB ports.

The motherboard is a modified Teron Mini design. It uses a VA 82C686B northbridge chipset and an Artica-S southbridge. It has a single PCI slot and two IDE connectors, one for standard IDE cables, the other for laptop-sized 2.5"drives. There is no connector for a floppy drive.



The Micro AmigaOne, in its shipping box

The BIOS for the motherboard is called UBoot, and was written by Hyperion themselves. It allows both menu-based and command-line interaction, and is quite powerful. It includes a built-in bootloader that allows the user to select multiple operating systems, such as OS4, Debian Linux, SUSE Linux, and Yellow Dog. Apparently you can even run Mac OS X on top of Debian using the program "Mac On Linux" although I have not tested this out personally.

The price for the motherboard varies depending on the dealer you are purchasing from (yes, there still Amiga dealers in existence!) but is around US$700. This includes the motherboard with CPU, 256 megabytes of RAM, and a licensed copy of OS4, the final version of which will be shipped out to owners when it is finished. While this is clearly much higher than equivalent PC or even Macintosh hardware prices, one has to remember that economies of scale come into play at the low volumes of a project like this. Basically, these are "early adopter" prices.

Hardware compatibility

OS4 runs only on Eyetech AmigaOne boards, including the ATX form factor AmigaOne XE-G3 and XE-G4 models, and the new Micro AmigaOne "C" model that is reviewed in this article. Many people have asked whether or not they can install OS4 on their Macintosh, since both use PowerPC hardware. The answer is no, as OS4 requires a custom ROM embedded on all AmigaOne motherboards in order to boot. This was done under agreement between Eyetech and Hyperion, in order to cut down on piracy and to reduce the number of hardware combinations that Hyperion needed to test and support. However, Hyperion is working on versions of OS4 for classic Amigas (such as the A1200) that have been enhanced with PowerPC upgrade boards such as the Blizzard and Cyberstorm.

The reason Eyetech and Hyperion chose to go with PowerPC-based motherboards over x86-based ones mostly comes down to compatibility: there are many applications for the Classic Amiga that were enhanced with PowerPC code to run on the various accelerator boards mentioned previously. The goal is to be able to run all of these apps without recompiling or modification under OS4. However there are some other advantages to this choice, such as the extremely low power draw of chips like the IBM 750FX (less than 10W under maximum load!)

As far as add-on cards, the AmigaOne comes with standard PCI slots and the XE-G3 and XE-G4 come with an AGP slot for adding graphics cards. Currently OS4 supports only ATI Radeon cards and 3DFX Voodoo cards, but a driver for NVIDIA GeForce cards is in the works. Most Soundblaster and C-Media sound cards are supported, as are about a half-dozen models of Ethernet cards. Wireless PCI cards using the Prism chipset are supported thanks to an OS4 driver ported over from Linux. For a complete hardware compatibility list, click here.

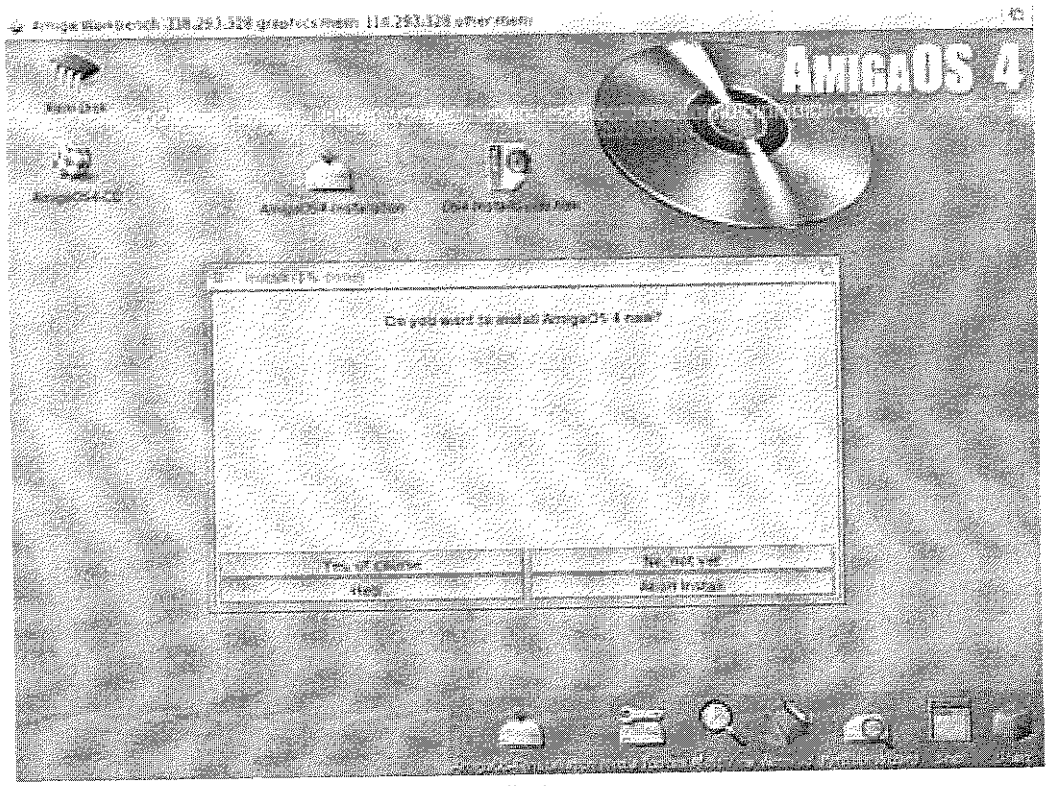
Installing OS4

OS4 came on a single, self-booting CD-ROM. Installation was quite straightforward. Complete instructions along with screenshots were provided from Hyperion at this website. Older AmigaOnes

required a firmware update to UBoot, but my A1 Micro already came with the latest version of UBoot installed, so I did not have to go through that step.

The installer, like all Amiga installers, allows three levels of interaction: Beginner, Intermediate and Advanced. Advanced mode merely allows the confirmation of some of the hardware drivers, for example the Radeon driver, whereas the other modes install them automatically. The only confusing part was the need to check the new partition as bootable in the partition manager. This could probably be done automatically in future releases, at least in beginner and intermediate modes.

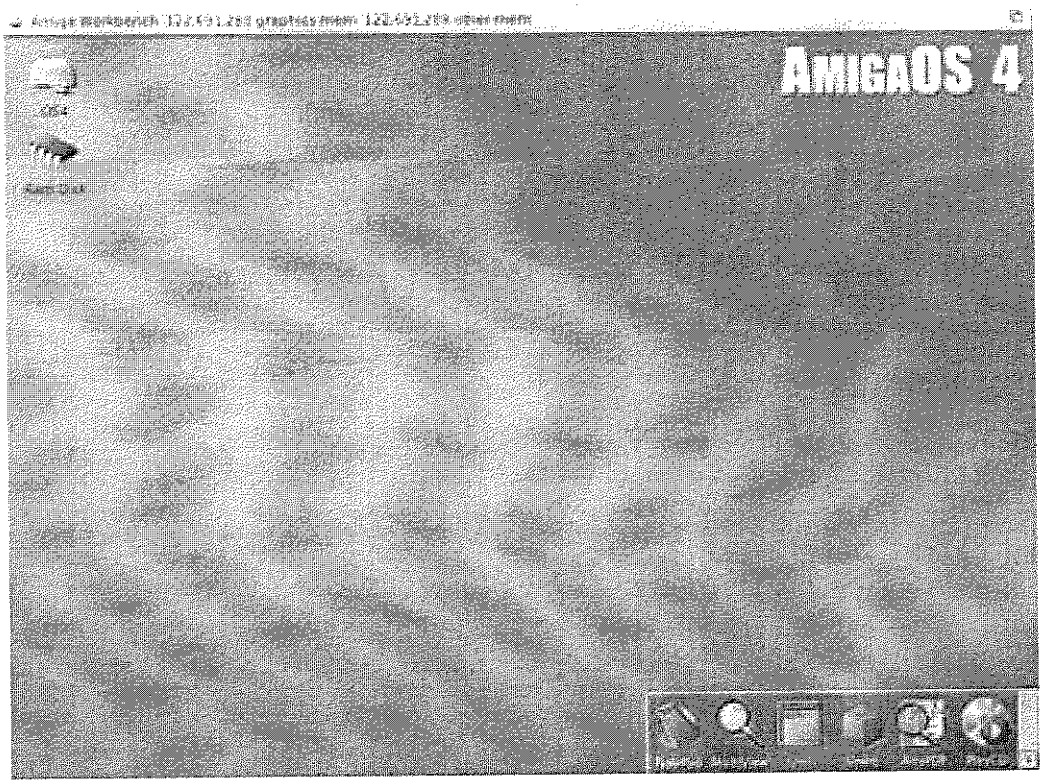
There is a single reboot involved if you have repartitioned a blank hard drive. The only technical input that was required (apart from partitioning) was the refresh rate of my monitor;however, the default setting would have worked even if I did not know how to do this. I was prompted for my location, allowed to set up my keyboard and mouse preferences and set my time zone. Interestingly, unlike OS X, there is an option for both Canadian -French *and* Canadian -English!The whole process was remarkably painless and took less than half an hour. The installation guide was also available on the CD for those without an Internet connection or who didnt want to print it out.



The OS4 Installation screen

The OS4 environment

OS4 boots remarkably qickly. From a cold boot, including waiting for power up, BIOS messages, straight to a usable desktop took slightly over 30 seconds. A "warm boot," which bypasses the BIOS startup and merely reloads the operating system, takes slightly over 10 seconds. (You initiate the warm boot by holding down Ctrl and tapping the left and right Windows keys.) From there you are presented with the minimalist OS4 desktop:



The default OS4 desktop on first boot

AmiDock

The first thing you notice when you boot to the OS4 desktop is the Dock-like floating bar on the right hand side of the screen. This is called AmiDock, but hold the phone to Apple's lawyers: this is a refined version of the same AmiDock that was released with OS 3.9, the last update to the "Classic" Amiga OS that Amiga, Inc. released in 2000.

AmiDock can be resized, hidden, moved to any edge of the screen, and the transparency of the background is adjustable as well. Icons do not bounce, but they do glow briefly when you click them.

Program icons can be dragged onto the dock, but not dragged off, for that you must right click the dock and select "Edit..." to enter the AmiDock properties dialog.

Another new feature of the Dock is the ability to run small applets called "Dockies." These are icons similar to the docklings of Mac OS X 10.0 that can be dragged to the Dock and perform special features, such as a clock that shows the current time, a screen magnifier, or even a sub-dock object that opens other docks inside it. New Dockies are being written all the time.

Mousing

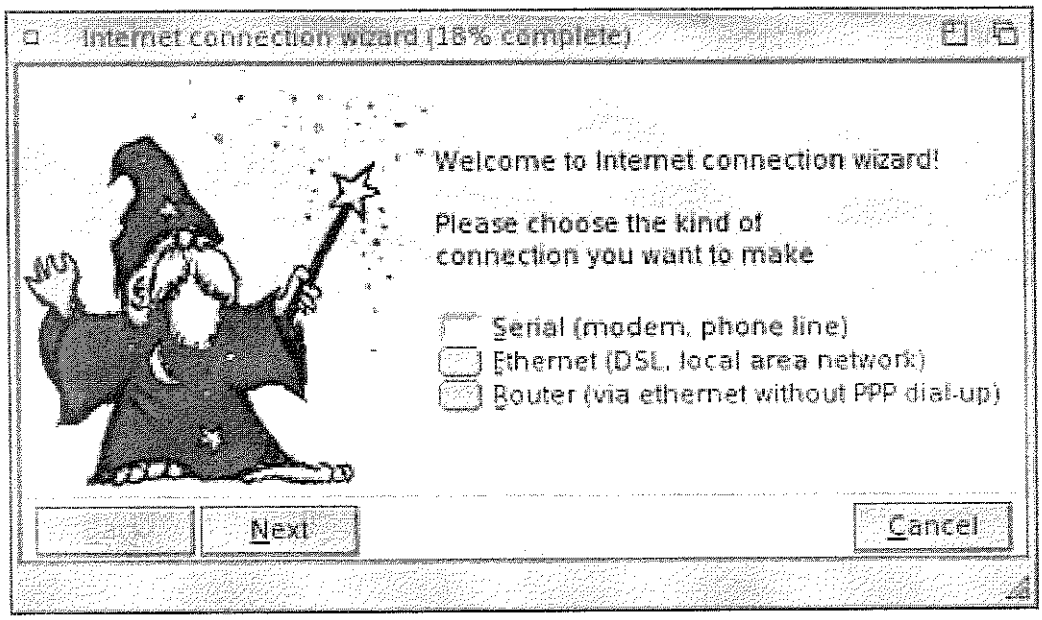
The default mouse pointer is a red arrow, as it was on the very first Amiga. This is often easier to spot than a black (Macintosh) or white (Windows) pointer, but the user can change the mouse pointer to any image and color they want, using the built-in pointer editor. Scrollbars on windows are on the right hand side by default, and are proportional. Like in NeXTstep, the up and down scroll arrows are next to each other right below the scroll bar. However, these don't get much use when one has a scroll wheel, which in this release works only with USB mice, but in the final release will work on PS/2 mice as well.

Desktop and drawers

There are two icons on the OS4 desktop by default. One is the icon representing your hard disk, which looks like a drive with a little red and white Boing ball in front of it. The other is the RAM Disk icon. AmigaOS has always had a built-in RAM disk, long before it ever had virtual memory, and many applications assume its presence. Items in the Clipboard, for example, will appear here.

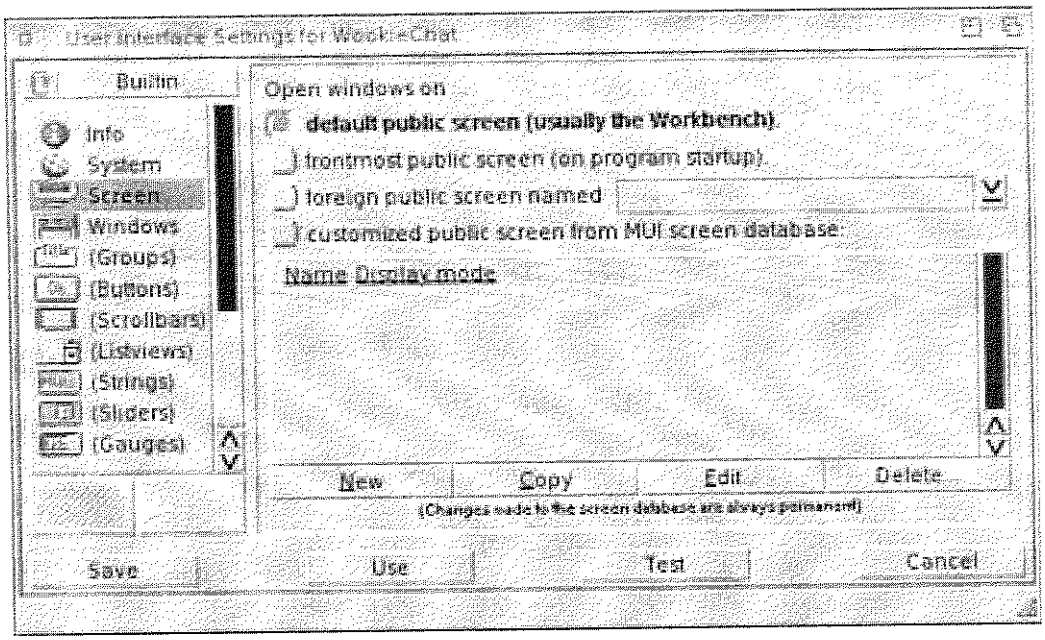
Clicking on your hard disk icon opens up the "root directory" of the Amiga file system. By default, there are nine folders (called "Drawers" in Amiga jargon) available. Devs contains things like printer drivers, Ethernet drivers, and something called "Datatypes," which was a pretty unique Amiga invention. Datatypes allow new file formats to be added to the OS that all applications can then recognize and use. So, for example, if you had an old graphics viewer that came out before PNG files existed, all you have to do is add the PNG datatype to the OS and now this app can load, display and save PNG files.

The next drawer is called Internet, and performs much the same functionality as Network Connections in Windows. Clicking "New Connection" will bring up the Internet Connection wizard, allowing the user to set up dial-up, LAN or router-based internet access. Except that on an Amiga, there really *is* a wizard!



The OS4 Internet Connection Wizard

Next comes the MUI Pawer. MUI stands for Magic User Interface and is a set of libraries developed as an add-on to classic AmigaOS and ported to OS4. MUI allows all kinds of customizations., allowing the user of MUI applications to change the appearance and behavior of all kinds of aspects of the GUI, from scrollbar preferences to popup bubble help to the default behavior of screens.



Example of a Magic User Interface Settings screen

AmigaOS has always supported running applications on separate screens. The idea was that you could open up new applications using any resolution and color depth you wanted, sort of the way games on Windows open up a new screen at the resolution you have specified for that particular game. On the Amiga, all applications have this ability.

One feature of the original custom Amiga graphics chips was that you could "pull" down screens with the mouse to see screens that were behind them. This feature, called "draggable screens," was never duplicated by any graphics card manufacturer since, so sadly it is not available on the AmigaOne. However, you can still switch between screens using the Left-Amiga-N and Left-Amiga-M control keys (The left and right Windows key substitute for the left and right Amiga keys on the classic Amiga keyboard. Keyboards without a right Windows key can map the Right Mouse Button key to perform the same function.)

Another interesting feature of AmigaOS is the way menus work. Like the Macintosh, programs use a single menubar at the top of the screen, but it is hidden by default until the user moves to the Workbench titlebar and holds down the right mouse button. However, if you click the right mouse button anywhere else on the screen, the application's full menu list is available from a popup menu. In terms of Fitt's Law, this is even more efficient than a top menubar, but for people who prefer using the menubar, there is a system setting to turn this off and have the right mouse button only pop up contextual menus that are relevant to the object clicked on.

The next icon is Prefs, the equivalent of the Control Panel or System Settings. Here you can adjust settings for the mouse, joystick, sound output, printers, USB, video modes, and miscellaneous Workbench features. (Workbench is the name of the AmigaOS shell, its Windows equivalent would be Windows Explorer) You can also manage fonts from this area. OS4 supports Bitstream, classic Amiga and TrueType fonts, and supports anti-aliasing, but not subpixel AA rendering (aka Cleartype)

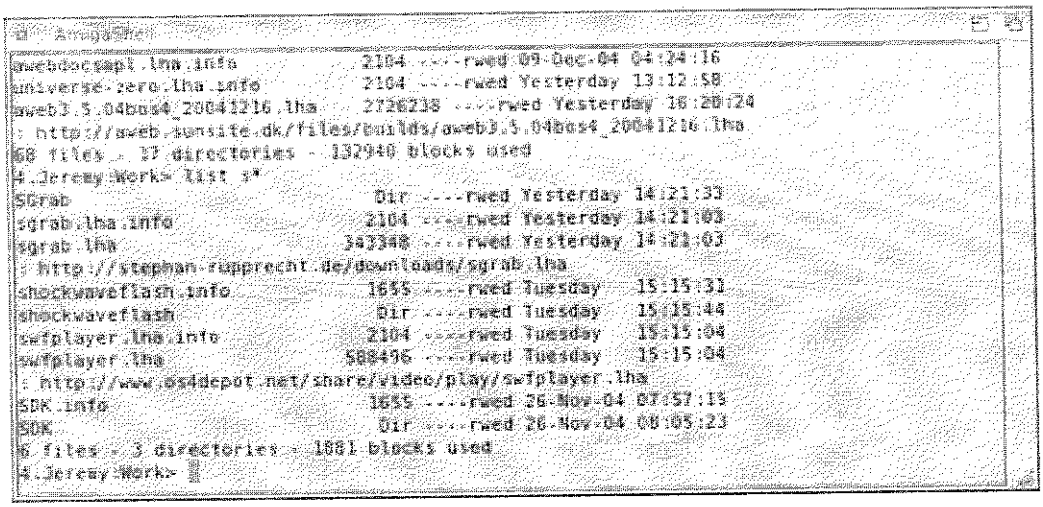
After Prefs comes Storage, which is kind of a duplicate of Devs, then System, which contains some utilities like Find (a Search tool), Format, GrimReaper (a program crash analyzer), and the AmigaDOS shell.

AmigaDOS shell

The shell is fairly standard, with command history and tab completion. AmigaDOS commands, however are not quite DOS commands and not quite Unix commands. Jay Miner once wrote that he wished AmigaDOS could have changed its commands to be more like DOS commands, as he felt it would have helped new users out.

For example, the COPY command's syntax is COPY FROM sourcedir/file TO destdir/file. Instead of cd .. to go up one directory, the command is cd /. The directory command is dir, but a single-column directory is list. Over the years, many Amigans who use multiple systems have created an elaborate system of aliases to make the AmigaDOS commands more closely resemble DOS or Unix ones.

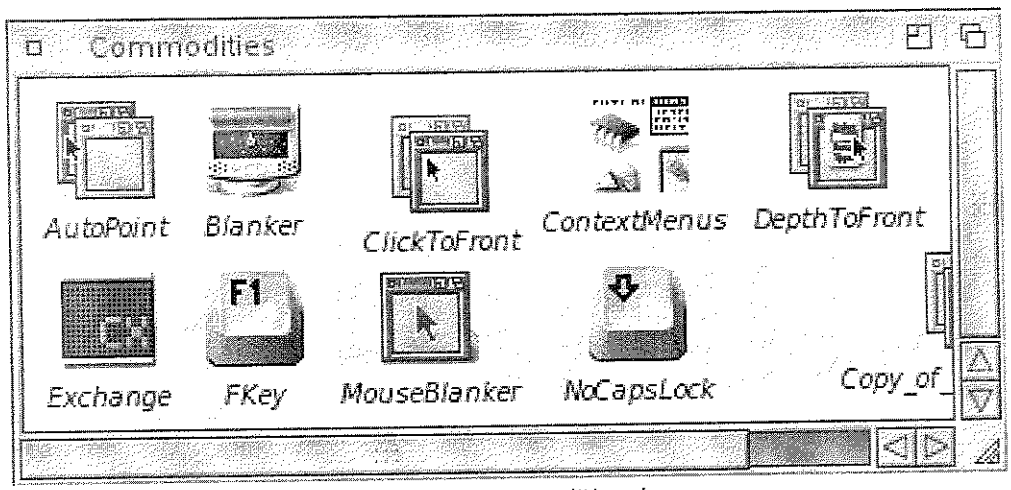
One nifty feature that you can see in the above screenshot is that any file that you have downloaded shows the full URL of the downloaded file on the right hand side in single-column view. This is very handy whenever someone asks you "where did you find that file?" Just copy and paste! The standard Amiga cut and paste shortcuts are right-Amiga-C and Right-Amiga-V, so they work everywhere, even in the shell.



The AmigaDOS shell

Tools

After System comes the Tools drawer, full of small utilities like the partition manager, calculator, Trash can, Dockies (mentioned earlier) and Commodities. Commodities are small utilities that change the default behavior of Workbench. They can be loaded by double clicking on their icons, or loaded in a startup script.



The AmigaOS Commodities drawer

Windowing

Windows in AmigaOS work somewhat differently to those in other windowing operating systems. The windowing system in AmigaOS is called Intuition, and was developed in 1985. The widget in the

upper left side of each window is a standard close widget, but the two on the right are not what they would seem.

The AmigaOS standard window widgets

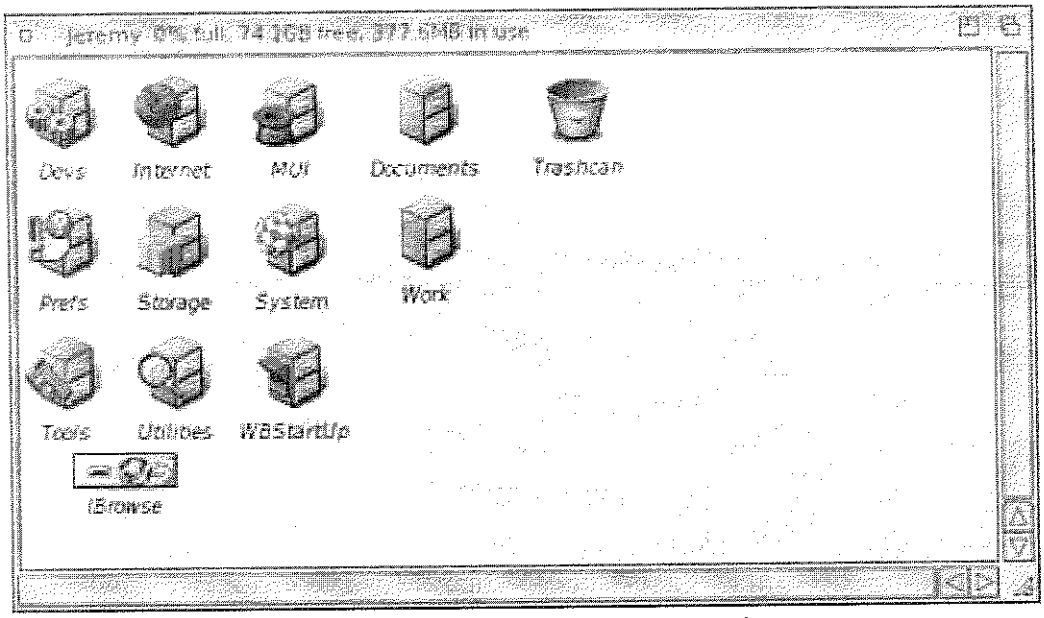
The first alternates the window size and position between the last two settings the user has selected. This is sort of like the "green" widget in OS X. The second, however, is unique to AmigaOS, but those of you who have used desktop publishing programs will understand it instantly. It alternates between "Push to back" and "Pull to Front." Windows can be moved up and down the stack in this way, which is somewhat surprising the first time you use it, but quickly becomes a natural way of working. Windows can be selected with a left mouse click and they become active (the titlebar and window frame turn from grey to blue) and usable even if they aren't at the front. However, sometimes you want to pull a window to the front when the widgets aren't visible, and that's where the Commodities come in.

Activating the commodity Click To Front will make any window pop to the front of the stack with a double left click. You can click anywhere on the window, not just the titlebar. Another Commodity, AutoPoint, mimics the default behavior of X Windows by automatically shifting the window focus whenever the mouse hovers over a new window. Still more commodities control the behavior of right clicking (discussed earlier) and the function keys.

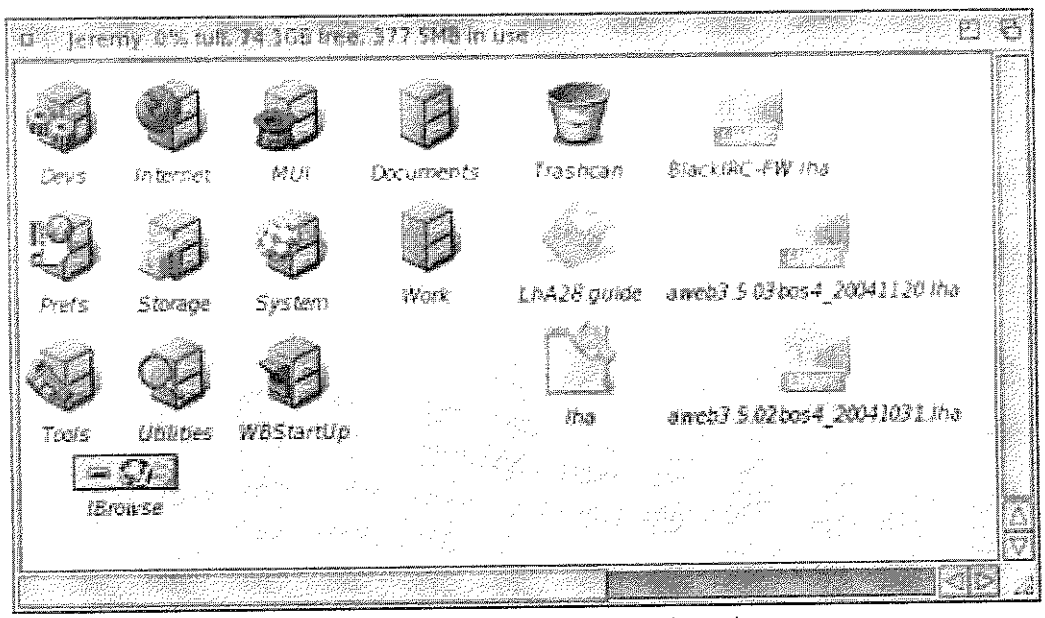
After the Tools drawer is Utilities, which for now contains just a clock, the native PDF viewer AmiPDF, the Postscript clone Ghostscript, Notepad, and Multiview, a graphics and text viewer integrated into the Workbench. The last drawer is WBStartup, which along with text-based startup scripts, allows the user to automatically run applications and utilities when Workbench starts.

The icons are nicely drawn and fairly minimalist. All Amiga icons have two states, one closed and one opened, so a drawer icon will appear open if the window is open somewhere. OS4 adds a halo effect (nothing to do with iPods, sorry!) around selected and opened icons as well. Apple users who marveled at OS X's ability to use huge, oversized icons will be interested to know that said feature actually originated in AmigaOS 1.2, circa 1985. It remains in AmigaOS to this day, allowing application vendors to create large, attractive icons that stand apart from the standard system ones.

An interesting feature of Workbench is that it does not automatically show all files in a directory. Only files that have a second file with an .info extension present will show up in Workbench windows by default. This allows application installers to present a clean window with only the necessary files visible for the user. On a per-drawer basis, the user can turn "Show All Files" on. Now all files appear as icons in the drawer, with the formerly hidden files semi-transparent:



A drawer before "Show All Files" is selected



A drawer after "Show All Files" is selected

AmigaOS4 architecture

The original AmigaOS was designed to work on a 7.14MHz 68000. While it was small and fast and supported full preemptive multitasking, there was no memory management hardware (or MMU) to support virtual memory and memory protection. Fatal crashes were common and every Amiga user got to know the funny error message in the flashing orange box: "Software failure. Guru Meditation. Press left or right mouse button to continue." (Neither button ever did anything useful at that point.)

Unfortunately, just as happened with the classic Macintosh OS, a large software base arose that assumed that it could have full control over the machine, and adding full protected memory was basically impossible without either breaking tons of legacy applications or becoming completely unstable or both, as Apple's doomed Copland project realized. Apple eventually solved the problem by brute force, loading a complete copy of the old operating system in a virtual machine every time the user needed to run a Classic application in OS X.

Hyperion realized that with the current state of the Amiga applications market, asking developers to write for a completely new operating system was unrealistic. After all, if you are going to do that, you might as well write for the Windows market and have your old users run old Amiga applications in an 68k Amiga emulator such as the excellent WinUAE. Instead, Hyperion decided to rewrite the old Exec kernel from AmigaOS 3.1 in PPC code, supporting virtual memory and memory protection, but leave the memory protection features turned off by default. This allows application developers to easily port their old 68k Amiga apps to PPC and 4.0 native code, often with a single recompile. The current plan is to introduce memory protection for OS4 apps in version 4.1. However, the kernel can watch for illegal memory accesses and when it finds them, it displays a "Grim Reaper" dialog that allows the user to kill the offending application.

Legacy Amiga applications, such as games, that were written to access the old custom chipset hardware directly, will not run in OS4.0. However, a port of WinUAE for OS4, called E-UAE, has been produced that will allow these games to be run as well. So-called "system friendly" legacy Amiga applications, the kind that were able to use PC-based graphics cards, run directly from the OS4 shell. The operating system launches a 68020 emulator seamlessly in the background when the application's icon is double-clicked. In this release of the OS, the emulator is interpretive only, and provides the speed of about a 50MHz 68040 on the 800Mhz AmigaOne hardware.

As many legacy Amiga applications were designed to run well on a 12MHz 68020 (the CPU of the popular Amiga 1200), this is often fast enough for undemanding apps. However, a JIT-compiled 68020 emulator engine called Petunia has been completed and is now in beta-testing. This will be included in the full release of OS4. The JIT adds a six- to seven-fold speedup to emulated applications.

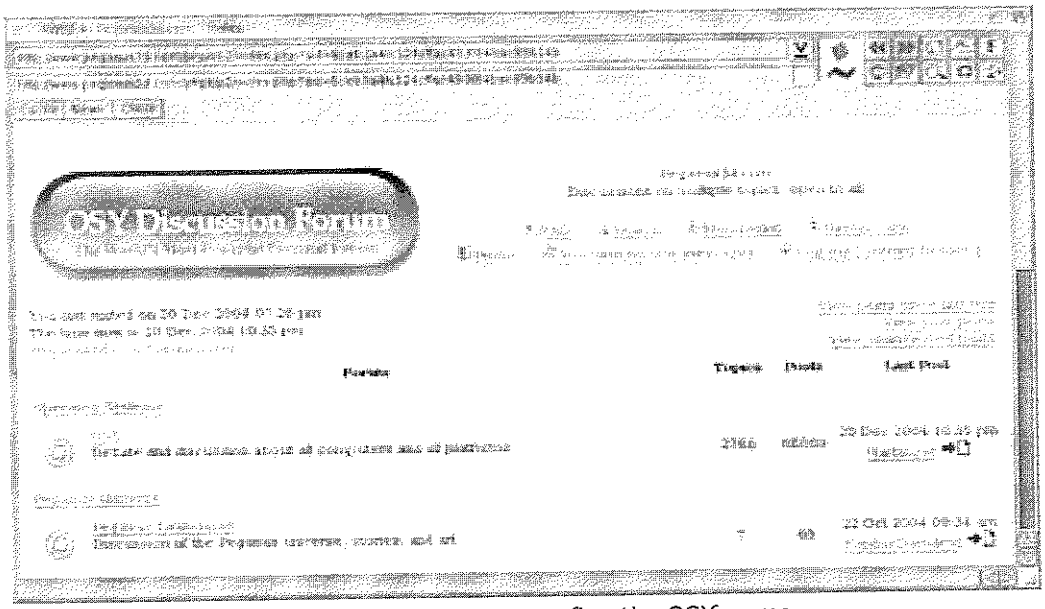
Legacy apps run under the assumption that they have full access to system memory, and buggy applications can currently take down the entire system, similar to 16-bit Windows applications under

the Windows 9x series. Applications that have already been programmed to take advantage of a PPC add-on card will be supported through the use of the WarpUP library, however, this is still being beta tested and was not available in this release of OS4.

AmigaOS features and applications

This prerelease of AmigaOS4 does not come with many applications by default. There is NotePad, for simple documents, a graphical port of Emacs, a graphical de-archiver shell called Unarc, AmiPDF for PDF viewing, PlayCD to play audio CDs, and on the install CD but not installed by default is a demo version of the web browser iBrowse. The demo has a 30-minute time limit for browsing, but is friendly enough to allow the user to exit and restart for another 30 minutes. The full version of iBrowse supports features such as tabbed browsing.

Another Amiga web browser, AWEB, has been open-sourced and has been recompiled for OS4. It is a fast and highly configurable browser. Every keystroke and menu option can be defined by the user. However, both iBrowse and AWEB are quite dated by current browser standards. Neither browser supports CSS, for example, which on many websites merely degrades the appearance somewhat, but on some sites messes up the formatting completely. Also, some poorly-coded Javascript code will sometimes cause problems with AWeb and iBrowse.



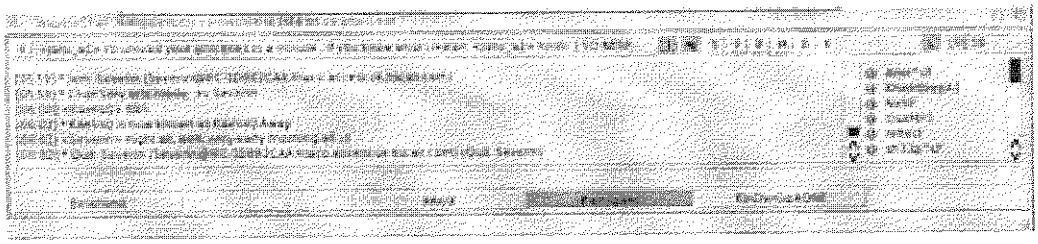
The AWEB PPC web browser, surfing the OSYforums

However, help is on the way. The AWEB team has taken the KTML code (the same code that Apple used as the core of their Safari browser) and is working on integrating it with the AWEB interface. The iBrowse team is also working on a CSS-compatible rendering engine for the next update of their

browser. There is also an effort underway to port Firefox and Mozilla, and a bounty of over US$9,000 has been raised for the first coder who is able to do so. So far, the porting process has been extremely slow, but as more people buy AmigaOnes and OS4, it is likely to improve.

Flash support is somewhat limited. A legacy Amiga OS 3.x Flash viewer/player is available, and someone has already recompiled it for OS4, although the OS4 version does not yet support sound. QuickTime support and a DivX player have been demonstrated on a more recent build of OS4, but I have not had a chance to test them myself.

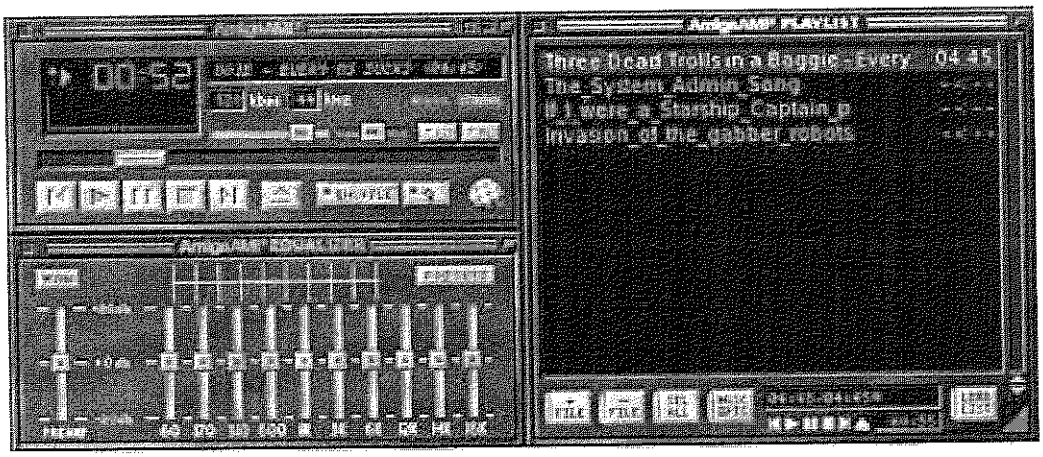
For chatting purposes, WookieChat is a nice, basic free IRC application that has been recompiled for OS4 and works well. For more advanced features there is AMIRC, which is still a Classic application but runs very quickly on OS4. Mail can be read with classic applications such as YAM, and Usenet news by apps such as New York and NewsRog. FTP support is built into the shell, and Classic versions of graphical FTP utilities are available, although the one I tried, AmiFTP, did not work on this release of OS4. There are also messenger applications that can use the AIM, MSN and ICQ networks.



WookieChat, a simple IRC application.

MP3 files can be played by a number of Amiga players, such as AMPlifier and AmigaAMP. These two mimic WinAMP's functionality and can even use WinAMP skins. While they are both 68k applications, someone has helpfully updated the mpega.library used to decode MP3 files to PPC code.

Installing these applications showed the flexibility of OS4 when it comes to moving from a Classic environment — both apps launched and played seamlessly, and all I had to do to update the decoder engine is drag and drop the new mpega.library file into the Libs: directory. I was still playing MP3s, but I no longer had the performance hit from emulating a 68020 to decode them.



The AmigaAMP MP3 player

Video files can be played using multiple player programs. The program AMP2 will play most video formats, including DivX, although I was only able to test it with MPEG1 video files. DVPlayer will play DVDs and MPEG2 files.

Text editing is handled expertly with the well-renowned CygnusEd, which runs very quickly even in emulated mode. Desktop publishing can be done with Pagestream, a classic Amiga application that is still being updated today, including an OS4-native version currently in the works. Graphics manipulation can be handled by several Classic Amiga programs including Photogenics (a Photoshop clone), fxpaint and ImageFX (the latter is currently available in PPC-enhanced version, but a true OS4 version is not available yet).

The one really sore spot in the applications department is in Word Processing and Office-style programs. The legendary Final Writer does not currently work under this build of OS4, and neither does AmigaWriter. Papyrus software has announced an Amiga version of its office suite but as they do not offer a demo version I was unable to test it for this review. There has been talk of porting over OpenOffice, but the gargantuan task of moving over hundreds of megabytes of strange source code has so far proven too daunting for Amiga enthusiasts.

OS4-native games are quite rare at this point, although the porting of the Linux SDL graphics and sound library has allowed a ton of 2D sidescroller ports. An OS4 version of Freespace 1 is available from Hyperion today, and they expect to port the rest of their Amiga game library (which includes titles like Shogo, SiN, and others) as soon as they can. Quake I and II have been ported, along with other old classics like Duke Nukem 3D. Emulators such as MAME, the Ultima 7 emulator Exult, the LucasArts emulator SCUMMVM and the PlayStation emulator FPSE have also been ported to OS4.

Performance

Many people, upon reading the hardware specs of the Micro Amiga One, will feel that the performance (800MHz PowerPC 970, SDR RAM) is far below modern gear. This is true to a certain extent, but it does not give the whole picture. AmigaOS was originally written for a 7.14 MHz 68000, and the last Classic version released by Commodore, 3.1, was optimized for a 12 MHz 68020 platform. According to Hyperion, over 90% of the OS code has been converted from 68k to PPC, and the only code yet to be translated (serial port code, AREXX macro routines), does not typically impact on performance.

Because the OS is so small (About 60MB on disk for a complete install), it fits very nicely in 256MB of RAM, with room for several applications, most of which have a similarly small memory footprint. This means that you can run the OS and multitask between several applications without ever swapping to the disk. In fact, although the new ExecSG kernel in OS4 supports virtual memory, it appears to be turned off in this build.

Running the OS and all its apps completely in memory provides a very different user experience than one is used to from modern operating systems. Switching applications is instantaneous, as is switching screens (providing you are running separate screens at the same monitor resolution, otherwise you have to wait for your monitor to resync).

Scrolling is about as fast as on my 2.4GHz P4 PC. While the PC clearly blows away the AmigaOne on pure CPU performance (for example, unarchiving files, or ripping to MP3), for general use they "feel" about the same. The A1 feels much faster than my 733MHz Pentium 3 running XP, and makes my poor 500MHz G3 iBook running OS X feel like a pig stuck in molasses.

There are some areas in which the OS is slower than modern operating systems such as OSX and Windows — the TCP/IP stack in particular seems rather slow at this point in time. A completely unscientific test had an FTP download taking over twice as long on my AmigaOne as on my PC (although to be fair, the PC was being used as a router for the Amiga, so I do not consider these timings strictly accurate). However, this is still a beta OS and things should improve over time.

Of course all this speed is addictive and fun, but the lack of proper memory protection (and the fact that this is a beta OS with many issues still to be worked out) can be extremely annoying. The saving grace is that with a three-finger salute (Ctrl-Windows-Windows) the operating system can be back up again in less than ten seconds. I liken OS4 at this point to the dune buggy in Half Life 2 — it's a blast to drive, but you're going to flip it over often.

Conclusions

I was not a classic Amiga owner in the old days, although I was aware of the existence of the platform. It was my desire to learn more about the history of Commodore and the Amiga that led me

to Panorama, the Vancouver chapter of the Commodore Computer Users Club, which still exists to this day. One of the club members donated a fully loaded Amiga 500 with 30 megabyte hard drive to me, along with a huge stack of old Amiga magazines to help me with my research for my book I had decided to write about the computer and its history.

Playing with the old Amiga was fun, but hearing about the new AmigaOne and OS4 really piqued my interest. The sheer audacity of attempting to revive a platform that everyone in the world had long-since pronounced dead and buried is interesting in itself, but as I began to play with a friend's A1 at club meetings I realized something else, something that perhaps has allowed the new mystery company KMOS to find investors that allowed it to purchase the moribund Amiga, Inc. outright.

The AmigaOS is small (tiny, even!) fast, and Internet-ready, yet already has a large library of supported applications, exactly what is needed for the next generation of cell phones and other handheld devices. I have been playing around with Compact Flash to IDE adapters, and have installed the OS (as you can see from the screenshots, the OS plus all the applications and data I was testing took up only 377 megabytes) onto a 512MB compact flash card for a prototype wireless tablet I am developing.

Will Amiga, Inc. and KMOS succeed where Be, Inc. and so many others have failed? It is perhaps too soon to tell, but the story has been more than interesting thus far.

At the moment OS4 is not pretending to be anything more than an enthusiast OS for a niche market. Both Eyetech and Hyperion have other projects that have bankrolled them this far (peripherals for Eyetech and game ports for Hyperion), and they do not expect A1/OS4 sales to fund their companies any time soon. In speeches around the world, Alan Redhouse of Eyetech always opens by saying that everyone always asks them: "Why are you doing this?" And the answer he gives, with a smile, is "We don't know!" There is an infectious enthusiasm among Amiga users, who have waited almost a decade for a new Amiga, and are very excited to have one.

However, as cell phones, PDAs and living room set-top media boxes become more prevalent in the future, there is a chance that the A1 and OS4 could find a profitable niche. I have used PDAs that have similar CPU and RAM capacities as my AmigaOne and they do not provide the same speed and functionality that is already available in OS4. OS4 feels like a full desktop, yet has the resource requirements of a handheld. There is a chance, albeit a small one, that the Amiga might play a small role in this arena.

Clearly, OS4 as it stands today is not ready for general public consumption. There are many rough edges with this version of the OS, stability is still an issue, and the web browsing situation clearly needs to be improved. For Classic Amiga owners with a large library of older applications that they would like to run on more modern hardware, it is almost a no-brainer, but it has less to offer "switchers" from the PC or Macintosh camps at this point in time.

However, a curious thing happened as I began writing this article on my AmigaOne. I found I was switching less and less from the A1 back to the PC, and I was enjoying my typical PC using experience (browsing, writing and chatting on IRC) more than I typically did. Had I succumbed to a particularly virulent form of Amiga madness? Perhaps, but it is a madness that I recognize from days gone by and thought was gone forever: the sheer joy of computing and the fun of discovering a new platform.

Postscript

Just prior to publication, Hyperion announced that the second major update of OS4 was available for registered owners to download. I have not had a chance to test this out yet, but I am told it adds support for mass-storage USB devices (such as digital cameras) and includes an update to the kernel, display drivers and many other subsystems, as well as a bundled PPC movie player called MooVid.

Revision History

Date	Version	Changes
January 17, 2005	1.0	Release