FioranoMQ®

Best Practices Guide

FIORANO END-USER LICENSE AGREEMENT

THIS FIORANO END-USER LICENSE AGREEMENT (THE "AGREEMENT") IS A LEGAL AGREEMENT BETWEEN YOU (HEREINAFTER "CUSTOMER"), EITHER AN INDIVIDUAL OR A CORPORATE ENTITY, AND FIORANO SOFTWARE, INC., HAVING A PLACE OF BUSINESS AT 718 UNIVERSITY AVE, SUITE 212 LOS GATOS, CA 95032, USA, OR ITS AFFILIATED COMPANIES (HEREINAFTER "FIORANO") FOR CERTAIN SOFTWARE DEVELOPED AND MARKETED BY FIORANO AS DEFINED IN GREATER DETAIL BELOW. BY OPENING THIS PACKAGE, INSTALLING, COPYING, DOWNLOADING, EXTRACTING AND/OR OTHERWISE USING THE SOFTWARE, YOU ARE CONSENTING TO BE BOUND BY AND ARE BECOMING PARTY TO THIS AGREEMENT ON THE DATE OF INSTALLATION, COPYING, DOWNLOAD OR EXTRACTION OF THE SOFTWARE (THE "EFFECTIVE DATE"). IF YOU DO NOT AGREE WITH ANY OF THE TERMS OF THIS AGREEMENT, PLEASE STOP INSTALLING AND/OR USING THE SOFTWARE AND PROMPTLY RETURN THE UNUSED SOFTWARE TO THE PLACE OF PURCHASE. BY DEFAULT, THE SOFTWARE IS MADE AVAILABLE TO CUSTOMERS IN ONLINE, DOWNLOADABLE FORM. THE TERMS OF THIS AGREEMENT SHALL APPLY TO EACH SOFTWARE LICENSE GRANTED BY FIORANO UNDER THIS AGREEMENT.

1. **DEFINITIONS.**
a. "**Affiliate**" means, in relation to Fiorano, another person firm or company which directly or indirectly controls, is controlled by or is under common control with Fiorano and the expression 'control' shall mean the power to direct or cause the direction of the general management and policies of the person firm or company in question.

b. "**Commencement Date**" means the date on which Fiorano delivers the Software to Customer, or if no delivery is necessary, the Effective Date set forth in this Agreement or on the relevant Order Form.

c. **"Designated Center"** means the computer hardware, operating system, customer-specific application and Customer Geographic Location at which the Software is deployed as designated on the corresponding Order Form.

d. **"Designated Contact"** shall mean the contact person or group designated by Customer and agreed to by Fiorano who will coordinate all Support requests to Fiorano.

e. **"Documentation"** means the user guides and manuals for installation and use of the Software. Documentation is provided in CD-ROM or bound form, whichever is generally available.

f. **"Error"** shall mean a reproducible defect in the Supported Program or Documentation when operated on a Supported Environment which causes the Supported Program not to operate substantially in accordance with the Documentation.

g. "**Excluded Components**" shall mean such components as are listed in Exhibit B. Such Excluded Components do not constitute Software under this Agreement and are third party components supplied subject to the corresponding license agreements specified in Exhibit B.

h. "**Excluded License**" shall mean and include any license that requires any portion of any materials or software supplied under such license to be disclosed or made available to any party either in source code or object code form. In particular, all versions and derivatives of the GNU GPL and LGPL shall be considered Excluded Licenses for the purposes of this Agreement.

i. **"Resolution"** shall mean a modification or workaround to the Supported Program and/or Documentation and/or other information provided by Fiorano to Customer intended to resolve an Error.

j. "**Residuals**" shall mean information in non-tangible form which may be retained by persons who have had access to the Confidential Information, including ideas, concepts, know-how or techniques contained therein.

k. **"Order Form"** means the document in hard copy form by which Customer orders Software licenses and services, and which is agreed to in writing by the parties. The Order Form shall reference the Effective Date and be governed by the terms of this Agreement. Customer understands that any document in the nature of a purchase order originating from Customer shall not constitute a contractual offer and that the terms thereof shall not govern any contract to be entered into between Fiorano and Customer. The Order Form herein shall constitute an offer to purchase made by the Customer under the terms of the said Order Form and this Agreement.

l. **"Software"** means each of the individual Products, as further outlined in Exhibit-A, in object code form distributed by Fiorano for which Customer is granted a license pursuant to this Agreement, and the media, Documentation and any Updates thereto.

m. **"Support"** shall mean ongoing support provided by Fiorano pursuant to the terms of this Agreement and Fiorano's current support policies. **"Supported Program" or "Supported Software"** shall mean the then current version of the Software in use at the Designated Center for which the Customer has paid the then-current support fee **("Support Fee")**.

n.   **"Support Hours"** shall mean 9 AM to 5 PM, Pacific Standard Time, Monday through Friday, for Standard Support.

o.   **"Support Period"** shall mean the period during which Customer is entitled to receive Support on a particular Supported Program, which shall be a period of twelve (12) months beginning from the Commencement Date, or if applicable, twelve (12) months from the expiration of the preceding Support Period. Should Fiorano withdraw support pursuant to section 1 (q), the Support Period shall be automatically reduced to the expiration date of the appropriate Software.

p.   **"Supported Environment"** shall mean any hardware and operating system platform which Fiorano provides Support for use with the Supported Program.

q.   **"Update"** means a subsequent release of the Software that Fiorano generally makes available for Supported Software licensees at no additional license fee other than shipping and handling charges. Update shall not include any release, option, feature or future product that Fiorano licenses separately. Fiorano will provide Updates for the Supported Programs as and when developed for general release in Fiorano's sole discretion. Fiorano may withdraw support for any particular version of the Software, including without limitation the most current Update and any preceding release with a notice of three (3) months to Customer.

2.   SOFTWARE LICENSE.

(a) **Rights Granted, subject to the receipt by Fiorano of appropriate license fees.**

(i) The Software is Licensed to Customer for use under the terms of this Agreement and **NOT SOLD**. Fiorano grants to Customer a limited, non-exclusive, world wide license to use the Software as specified on an Order Form and subject to the licensing restrictions in Exhibit C under this Agreement, as follows:

(1) to use the Software solely for Customer's operations at the Designated Center consistent with the use limitations specified or referenced in this Agreement, the Documentation for such Software or any Order Form accepted by Fiorano pursuant to this Agreement. Customer may not relicense, rent or lease the Software or use the Software for third party training, commercial timesharing or service bureau use;

(2) to use the Documentation provided with the Software in support of Customer's authorized use of the Software;

(3) to make a single copy for back-up or archival purposes and/or temporarily transfer the Software in the event of a computer malfunction. All titles, trademarks and copyright or other restricted rights notices shall be reproduced in any such copies;

(4) to allow third parties to use the Software for Customer's operations, so long as Customer ensures that use of the Software is in accordance with the terms of this Agreement.

(ii) Customer shall not copy or use the Software (including the Documentation) except as specified in this Agreement and applicable Order Form. Customer shall have no right to use other third party software or Excluded Components that are included within the Software except in connection and within the scope of Customer's use of Fiorano's Software product.

(iii) Customer agrees not to cause or permit the reverse engineering, disassembly, decompilation, or any other attempt to derive source code from the Software, except to the extent expressly provided for by applicable law.

(iv) Customer hereby warrants that it shall not, by any act or omission, cause or permit the Products or any part thereof to become expressly or impliedly subject to any Excluded License.

(v)   Fiorano and its Affiliates shall retain all title, copyright and other proprietary rights in the Software. Customer does not acquire any rights, express or implied, in the Software, other than those specified in this Agreement.

(vi)   Customer agrees that it will not publish or cause or permit to be published any results of benchmark tests run on the Software.

(vii)   If the Software is licensed for a specific term, as noted on the Order Form, then the license shall expire at the end of the term and the termination conditions in section 4(d) shall automatically become applicable.

(b) Transfer. Customer may transfer a Software license within its organization upon notice to Fiorano; transfers are subject to the terms and fees specified in Fiorano's transfer policy in effect at the time of the transfer. If the Software is licensed for a specific term, then it may not be transferred by Customer.

(c) Verification. At Fiorano's written request, Customer shall furnish Fiorano with a signed certification verifying that the Software is being used pursuant to the provisions of this Agreement and applicable /Order Form. Fiorano (or Fiorano's designee) may audit Customer's use of the Software. Any such audit shall be conducted during regular business hours at Customer's facilities and shall not unreasonably interfere with Customer's business activities. If an audit reveals that Customer has underpaid fees to Fiorano, Customer shall be invoiced directly for such underpaid fees based on the Fiorano Price List in effect at the time the audit is completed. If the underpaid fees are in excess of five percent (5%) of the aggregate license fees paid to Fiorano pursuant to this Agreement, the Customer shall pay Fiorano's reasonable costs of conducting the audit. Audits shall be conducted no more than once annually.

(d) Customer Specific Objects.

(i)   The parties agree and acknowledge, subject to Fiorano's underlying proprietary rights, that Customer may create certain software objects applicable to Customer's internal business ("Customer Specific Objects"). Any Customer Specific Object developed solely by Customer shall be the property of Customer. To the extent that Customer desires to have Fiorano incorporate such Customer Specific Objects into Fiorano's Software (and Fiorano agrees, in its sole discretion, to incorporate such Customer Specific Objects), Customer will promptly deliver to Fiorano the source and object code versions (including documentation) of such Customer Specific Objects, and any updates or modifications thereto, and hereby grants Fiorano a perpetual, irrevocable, worldwide, fully-paid, royalty-free, exclusive, transferable license to reproduce, modify, use, perform, display, distribute and sublicense, directly and indirectly, through one or more tiers of sublicensees, such Customer Specific Objects.

(ii)   Any objects, including without limitation Customer Specific Objects, developed solely or jointly with Customer by Fiorano shall be the property of Fiorano.

(e) Additional Restrictions on Use of Source Code.

Customer acknowledges that the Software, its structure, organization and any human-readable versions of a software program ("Source Code") constitute valuable trade secrets that belong to Fiorano and/or its suppliers Source Code Software, if and when supplied to Customer shall constitute Software licensed under the terms of this Agreement and the Order Form.   Customer agrees not to translate the Software into another computer language, in whole or in part.

(i)   Customer agrees that it will not disclose all or any portion of the Software's Source Code to any third parties, with the exception of authorized employees ("Authorized Employees") and authorized contractors ("Authorized Contractors") of Customer who (i) require access thereto for a purpose authorized by this Agreement, and (ii) have signed an employee or contractor agreement in which such employee or contractor agrees to protect third party confidential information. Customer agrees that any breach by any Authorized Employees or Authorized Contractors of their obligations under such confidentiality agreements shall also constitute a breach by Customer hereunder.

(ii) Customer shall ensure that the same degree of care is used to prevent the unauthorized use, dissemination, or publication of the Software's Source Code as Customer uses to protect its own confidential information of a like nature, but in no event shall the safeguards for protecting such Source Code be less than a reasonably prudent business would exercise under similar circumstances. Customer shall take prompt and appropriate action to prevent unauthorized use or disclosure of such Source Code, including, without limitation, storing such Source Code only on secure central processing units or networks and requiring passwords and other reasonable physical controls on access to such Source Code.

(iii)   Customer shall instruct Authorized Employees and Authorized Contractors not to copy the Software's Source Code on their own, and not to disclose such Source Code to anyone not authorized to receive it.

(iv)   Customer shall handle, use and store the Software's Source Code solely at the Customer Designated Center.

(f) Acceptance tested Software

Customer acknowledges that it has, prior to the date of this Agreement, carried out adequate acceptance tests in respect of the Software. Customer's acceptance of delivery of the Software under this Agreement shall be conclusive evidence that Customer has examined the Software and found it to be complete, and in accordance with the Documentation, in good order and condition and fit for the purpose for which it is required.

3.   TECHNICAL SERVICES.

(a) Maintenance and Support Services. Maintenance and Support services will be provided under the terms of this Agreement and Fiorano's support policies in effect on the date Support is ordered by Customer. Support services shall be provided from Fiorano's principal place of business or at the Designated Center, as determined in Fiorano's sole discretion. If Fiorano sends personnel to the Designated Center to resolve any Error in the Supported Program, Customer shall pay Fiorano's reasonable travel, meals and lodging expenses.

(b) Consulting and Training Services. Fiorano will, upon Customer's request, provide consulting and training services agreed to by the parties pursuant to the terms of a separate written agreement.

(c)   Incidental Expenses.   For any on-site services requested by Customer, Customer shall reimburse Fiorano for actual, reasonable travel and out-of-pocket expenses incurred (separate from then current Support Fees).

(d)   Reinstatement.   Once Support has been terminated by Customer or Fiorano for a particular Supported Program, it can be reinstated only by prior approval from Fiorano and then only upon payment of the reinstatement fee applicable at the time of reinstatement.

(e) Supervision and Management. Customer is responsible for undertaking the proper supervision, implementation and management of its use of the Supported Programs, including, but not limited to: (i) assuring proper Supported Environment configuration, Supported Programs installation and operating methods; and (ii) following industry standard procedures for the security of data, accuracy of input and output, and back-up plans, including restart and recovery in the event of hardware or software error or malfunction. Fiorano does not warrant (i) the performance of, or combination of, Software with any third party software, (ii) any implementation of the Software that does not follow Fiorano's delivery methodology, or (iii) any components not supplied by Fiorano.

(f)   Training. Customer is responsible for proper training of all appropriate personnel in the operation and use of the Supported Programs and associated equipment.

(g) Access to Personnel and Equipment. Customer shall provide Fiorano with access to Customer's personnel and its equipment during Support Hours. This access must include the ability to dial-in from Fiorano facilities to the equipment on which the Supported Programs are operating and to obtain the same access to the equipment as those of Customer's employees having the highest privilege or clearance level. Fiorano will inform Customer of the specifications of the modem equipment and associated software needed, and Customer will be responsible for the costs and use of said equipment.

(h) Support Term. Upon expiration of an existing Support Period for a particular Supported Program, a new Support Period shall automatically begin for a consecutive twelve (12) month term ("Renewal Period") so long as (i) Customer pays the Support Fee within thirty (30) days of invoice by Fiorano; and (ii) Fiorano is still offering Support on such Supported Program.

(i)   Annual Support Fees. Annual Support Fees shall be at the rates set forth in the applicable Order Form.

4. TERM AND TERMINATION.

(a) Term. This Agreement and each Software license granted under this Agreement shall continue unless terminated under this *Section 4* ("Term and Termination").

(b) Termination by Customer. If the Software is licensed for a specific term as noted on an Order Form, Customer may terminate any Software license at the end of the term; however, any such termination shall not relieve Customer's obligations specified in *Section 4(d)* ("Effect of Termination").

(c) Termination by Fiorano. Fiorano may terminate this Agreement or any license upon written notice if Customer breaches this Agreement and fails to correct the breach within thirty (30) days of notice from Fiorano.

(d) Effect of Termination. Termination of this Agreement or any license shall not limit Fiorano from pursuing other remedies available to it, including injunctive relief, nor shall such termination relieve Customer's obligation to pay all fees that have accrued or are otherwise owed by Customer under any Order Form. Such rights and obligations of the parties' which, by their nature, are intended to survive the termination of this agreement shall survive such termination. Without limitation to the foregoing, these shall include rights and liabilities arising under Sections **2 (a)(iii), 2(a)(iv)** ("Rights Granted")**, 2(d)** ("Customer Specific Objects"), **4** ("Term and Termination"), **5** ("Indemnity, Warranties, Remedies"), **6** ("Limitation of Liability"), **7** ("Payment Provisions"), **8** ("Confidentiality") and **9** ("Miscellaneous") Upon termination, Customer shall cease using, and shall return or at Fiorano's request destroy, all copies of the Software and Documentation and upon Fiorano's request certify the same to Fiorano in writing within thirty (30) days of termination. In case of termination of this Agreement or any license for any reason by either party, Fiorano shall have no obligation to refund any amounts paid to Fiorano by Customer under this Agreement. Further, if Customer terminates the agreement before the expiry of a term for a term-license, then Customer shall be obliged to pay the entire license fee for the entire licensed term.

5. INDEMNITY, WARRANTIES, REMEDIES.

(a) Infringement Indemnity. Fiorano agrees to indemnify Customer against a third party claim that any Product infringes a U.S. copyright or patent and pay any damages finally awarded, provided that: (i) Customer notifies Fiorano in writing within ten (10) days of the claim; (ii) Fiorano has sole control of the defense and all related settlement negotiations; and (iii) Customer provides Fiorano with the assistance, information and authority at no cost to Fiorano, necessary to perform Fiorano's obligations under this **Section 5** ("Indemnities, Warranties, Remedies"). Fiorano shall have no liability for any third party claims of infringement based upon (i) use of a version of a Product other than the most current version made available to the Customer, (ii) the use, operation or combination of any Product with programs, data, equipment or documentation if such infringement would have been avoided but for such use, operation or combination; or (iii) any third party software, except as the same may be integrated, incorporated or bundled by Fiorano, or its third party licensors, in the Product licensed to Customer hereunder.

If any Product is held or claimed to infringe, Fiorano shall have the option, at its expense, to (i) modify the Product to be non-infringing or (ii) obtain for Customer a license to continue using the Software. If it is not commercially reasonable to perform either of the above options, then Fiorano may terminate the license for the infringing Product and refund the pro rated amount of license fees paid for the applicable Product using a twelve (12) month straight-line amortization schedule starting on the Commencement Date. This **Section 5(a)** ("Infringement Indemnity") states Fiorano's entire liability and Customer's sole and exclusive remedy for infringement.

(B) **WARRANTIES AND DISCLAIMERS.**

(I)   SOFTWARE WARRANTY. EXCEPT FOR EXCLUDED COMPONENTS WHICH ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, FOR EACH SUPPORTED SOFTWARE LICENSE WHICH CUSTOMER ACQUIRES HEREUNDER, FIORANO WARRANTS THAT FOR A PERIOD OF THIRTY (30) DAYS FROM THE COMMENCEMENT DATE THE SOFTWARE, AS DELIVERED BY FIORANO TO CUSTOMER, WILL SUBSTANTIALLY PERFORM THE FUNCTIONS DESCRIBED IN THE ASSOCIATED DOCUMENTATION IN ALL MATERIAL RESPECTS WHEN OPERATED ON A SYSTEM WHICH MEETS THE REQUIREMENTS SPECIFIED BY FIORANO IN THE DOCUMENTATION. PROVIDED THAT CUSTOMER GIVES FIORANO WRITTEN NOTICE OF A BREACH OF THE FOREGOING WARRANTY DURING THE WARRANTY PERIOD, FIORANO SHALL, AS CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND FIORANO'S SOLE LIABILITY, USE ITS REASONABLE EFFORTS, DURING THE WARRANTY PERIOD ONLY, TO CORRECT ANY REPRODUCIBLE ERRORS THAT CAUSE THE BREACH OF THE WARRANTY IN ACCORDANCE WITH ITS TECHNICAL SUPPORT POLICIES. IF CUSTOMER DOES NOT OBTAIN A SUPPORTED SOFTWARE LICENSE, THE SOFTWARE IS PROVIDED "AS IS." ANY IMPLIED WARRANTY OR CONDITION APPLICABLE TO THE SOFTWARE, DOCUMENTATION OR ANY PART THEREOF BY OPERATION OF ANY LAW OR REGULATION SHALL OPERATE ONLY FOR DEFECTS DISCOVERED DURING THE ABOVE WARRANTY PERIOD OF THIRTY (30) DAYS UNLESS TEMPORAL LIMITATION ON SUCH WARRANTY OR CONDITION IS EXPRESSLY PROHIBITED BY APPLICABLE LAW. ANY SUPPLEMENTS OR UPDATES TO THE SOFTWARE, INCLUDING WITHOUT LIMITATION, BUG FIXES OR ERROR CORRECTIONS SUPPLIED AFTER THE EXPIRATION OF THE THIRTY-DAY LIMITED WARRANTY PERIOD SHALL NOT BE COVERED BY ANY WARRANTY OR CONDITION, EXPRESS, IMPLIED OR STATUTORY.

(II) MEDIA WARRANTY. FIORANO WARRANTS THE TAPES, DISKETTES OR ANY OTHER MEDIA ON WHICH THE SOFTWARE IS SUPPLIED TO BE FREE OF DEFECTS IN MATERIALS AND WORKMANSHIP UNDER NORMAL USE FOR THIRTY (30) DAYS FROM THE COMMENCEMENT DATE. CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND FIORANO'S SOLE LIABILITY FOR BREACH OF THE MEDIA WARRANTY SHALL BE FOR FIORANO TO REPLACE DEFECTIVE MEDIA RETURNED WITHIN THIRTY (30) DAYS OF THE COMMENCEMENT DATE.

(III) SERVICES WARRANTY. FIORANO WARRANTS ANY SERVICES PROVIDED HEREUNDER SHALL BE PERFORMED IN A PROFESSIONAL AND WORKMANLIKE MANNER IN ACCORDANCE WITH GENERALLY ACCEPTED INDUSTRY PRACTICES. THIS WARRANTY SHALL BE VALID FOR A PERIOD OF THIRTY (30) DAYS FROM PERFORMANCE. FIORANO'S SOLE AND EXCLUSIVE LIABILITY AND CUSTOMER'S SOLE AND EXCLUSIVE REMEDY PURSUANT TO THIS WARRANTY SHALL BE USE BY FIORANO OF REASONABLE EFFORTS FOR RE-PERFORMANCE OF ANY SERVICES NOT IN COMPLIANCE WITH THIS WARRANTY WHICH ARE BROUGHT TO FIORANO'S ATTENTION BY WRITTEN NOTICE WITHIN FIFTEEN (15) DAYS AFTER THEY ARE PERFORMED.

(IV) DISCLAIMER OF WARRANTIES. **SUBJECT TO LIMITED WARRANTIES PROVIDED FOR HEREINABOVE, AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, THE SOFTWARE, DOCUMENTATION AND SERVICES (IF ANY) ARE PROVIDED *AS IS AND WITH ALL FAULTS*, FIORANO HEREBY DISCLAIMS ALL OTHER WARRANTIES AND CONDITIONS, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY (IF ANY) IMPLIED WARRANTIES, DUTIES OR CONDITIONS OF MERCHANTABILITY, OF FITNESS FOR A PARTICULAR PURPOSE, OF RELIABILITY OR AVAILABILITY, OF ACCURACY OR COMPLETENESS OF RESPONSES, OF RESULTS, OF WORKMANLIKE EFFORT, OF LACK OF VIRUSES, AND OF LACK OF NEGLIGENCE, ALL WITH REGARD TO THE SOFTWARE, AND THE PROVISION OF OR FAILURE TO PROVIDE SUPPORT OR OTHER SERVICES, INFORMATION, SOFTWARE, AND RELATED CONTENT THROUGH THE SOFTWARE OR OTHERWISE ARISING OUT OF THE USE OF THE SOFTWARE. ALSO, THERE IS NO WARRANTY OR CONDITION OF TITLE, QUIET ENJOYMENT, QUIET POSSESSION, CORRESPONDENCE TO DESCRIPTION OR NON-INFRINGEMENT WITH REGARD TO THE SOFTWARE.**

6.   LIMITATION OF LIABILITY. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL FIORANO BE LIABLE FOR ANY SPECIAL, INCIDENTAL, PUNITIVE, INDIRECT, OR CONSEQUENTIAL DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFITS OR CONFIDENTIAL OR OTHER INFORMATION, FOR BUSINESS INTERRUPTION, FOR PERSONAL INJURY, FOR LOSS OF PRIVACY, FOR FAILURE TO MEET ANY DUTY OF GOOD FAITH OR OF REASONABLE CARE, FOR NEGLIGENCE, AND FOR ANY OTHER PECUNIARY OR OTHER LOSS WHATSOEVER) ARISING OUT OF OR IN ANY WAY RELATED TO THE USE OF OR INABILITY TO USE THE SOFTWARE, THE PROVISION OF OR FAILURE TO PROVIDE SUPPORT OR OTHER SERVICES, INFORMATION, SOFTWARE, AND RELATED CONTENT THROUGH THE SOFTWARE, OR OTHERWISE UNDER OR IN CONNECTION WITH ANY PROVISION OF THIS EULA, EVEN IN THE EVENT OF THE FAULT, TORT (INCLUDING NEGLIGENCE), MISREPRESENTATION, STRICT LIABILITY, BREACH OF CONTRACT OR BREACH OF WARRANTY OF FIORANO, AND EVEN IF FIORANO OR ANY SUPPLIER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

NOTWITHSTANDING ANY DAMAGES THAT MAY BE INCURRED FOR ANY REASON AND UNDER ANY CIRCUMSTANCES (INCLUDING, WITHOUT LIMITATION, ALL DAMAGES AND LIABILITIES REFERENCED HEREIN AND ALL DIRECT OR GENERAL DAMAGES IN LAW, CONTRACT OR ANYTHING ELSE), THE ENTIRE LIABILITY OF FIORANO UNDER ANY PROVISION OF THIS EULA AND THE EXCLUSIVE REMEDY OF THE CUSTOMER HEREUNDER (EXCEPT FOR ANY REMEDY OF REPAIR OR REPLACEMENT IF SO ELECTED BY FIORANO WITH RESPECT TO ANY BREACH OF THE LIMITED WARRANTY) SHALL BE LIMITED TO THE PRO-RATED AMOUNT OF FEES PAID BY CUSTOMER UNDER THIS AGREEMENT FOR THE PRODUCT, USING A TWELVE (12) MONTH STRAIGHT-LINE AMORTIZATION SCHEDULE STARTING ON THE COMMENCEMENT DATE. FURTHER, IF SUCH DAMAGES RESULT FROM CUSTOMER'S USE OF THE SOFTWARE OR SERVICES, SUCH LIABILITY SHALL BE LIMITED TO THE PRORATED AMOUNT OF FEES PAID FOR THE RELEVANT SOFTWARE OR SERVICES GIVING RISE TO THE LIABILITY TILL THE DATE WHEN SUCH LIABILITY AROSE, USING A TWELVE (12) MONTH STRAIGHT-LINE AMORTIZATION SCHEDULE STARTING ON THE COMMENCEMENT DATE. NOTWITHSTANDING ANYTHING IN THIS AGREEMENT, THE FOREGOING LIMITATIONS, EXCLUSIONS AND DISCLAIMERS SHALL APPLY TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EVEN IF ANY REMEDY FAILS ITS ESSENTIAL PURPOSE.

The provisions of this Agreement allocate the risks between Fiorano and Customer. Fiorano's pricing reflects this allocation of risk and the limitation of liability specified herein.

7.   PAYMENT PROVISIONS.

   (a) Invoicing. All fees shall be due and payable thirty (30) days from receipt of an invoice and shall be made without deductions based on any taxes or withholdings. Any amounts not paid within thirty (30) days will be subject to an immediately due and payable late payment fee equivalent to: the sum of $50.00 plus an interest equal to the lower of (a) the maximum applicable legal interest rate, or (b) one percent (1%) per month.

   (b) Payments. All payments made by Customer shall be in United States Dollars for purchases made in all countries except the United Kingdom or the European Union, in which case the payments shall be made in British Pounds Sterling or Euros respectively. Payments shall be directed to:

Fiorano Software, Inc.

230 S. CALIFORNIA AVENUE,

SUITE 103 PALO ALTO, CA 94306 USA

Attn: Accounts Receivable.

If the product is purchased outside the United States, payments may have to be made to an Affiliate as directed by Fiorano Software, Inc.

    (c) Taxes. The fees listed in this Agreement or the applicable Order Form does not include Taxes. In addition to any other payments due under this Agreement, Customer agrees to pay, indemnify and hold Fiorano harmless from, any sales, use, excise, import or export, value added or similar tax or duty, and any other tax not based on Fiorano's net income, including penalties and interest and all government permit fees, license fees, customs fees and similar fees levied upon the delivery of the Software or other deliverables which Fiorano may incur in respect of this Agreement, and any costs associated with the collection or withholding of any of the foregoing items (the "Taxes").

8. CONFIDENTIALITY.

    (a) Confidential Information. "Confidential Information" shall refer to and include, without limitation, (i) the source and binary code of Products, and (ii) the business and technical information of either party, including but not limited to any information relating to product plans, designs, costs, product prices and names, finances, marketing plans, business opportunities, personnel, research, development or know-how;

    (b) **Exclusions of Confidential Information.** Notwithstanding the foregoing, "Confidential Information" shall not include: (i) Information that is not marked confidential or otherwise expressly designated confidential prior to its disclosure, (ii) Information that is or becomes generally known or available by publication, commercial use or otherwise through no fault of the receiving party, (iii) Information that is known to the receiving party at the time of disclosure without violation of any confidentiality restriction and without any restriction on the receiving party's further use or disclosure; (iv) Information that is independently developed by the receiving party without use of the disclosing party's confidential information, or (v) Any Residuals arising out of this Agreement. Notwithstanding, any Residuals belonging to Source Code shall belong exclusively to Fiorano and Customer shall not have any right whatsoever to any Residuals relating to Source Code hereunder.

    (c) **Use and Disclosure Restrictions.** During the term of this Agreement, each party shall refrain from using the other party's Confidential Information except as specifically permitted herein, and from disclosing such Confidential Information to any third party except to its employees and consultants as is reasonably required in connection with the exercise of its rights and obligations under this Agreement (and only subject to binding use and disclosure restrictions at least as protective as those set forth herein executed in writing by such employees).

    (d) **Continuing Obligation.** The confidentiality obligation described in this section shall survive for three (3) years following any termination of this Agreement.Notwithstanding the foregoing, Fiorano shall have the right to disclose Customer's Confidential Information to the extent that it is required to be disclosed pursuant to any statutory or regulatory provision or court order, provided that Fiorano provides notice thereof to Customer, together with the statutory or regulatory provision, or court order, on which such disclosure is based, as soon as practicable prior to such disclosure so that Customer has the opportunity to obtain a protective order or take other protective measures as it may deem necessary with respect to such information.

9. MISCELLANEOUS.

(a) Export Administration. Customer agrees to comply fully with all applicable relevant export laws and regulations including without limitation, those of the United States ("Export Laws") to assure that neither the Software nor any direct product thereof are (i) exported, directly or indirectly, in violation of Export Laws; or (ii) are intended to be used for any purposes prohibited by the Export Laws, including, without limitation, nuclear, chemical, or biological weapons proliferation.

(b) U. S. Government Customers. The Software is "commercial items," as that term is defined at 48 C.F.R. 2.101 (OCT 1995), consisting of "commercial computer software" and "commercial computer software documentation" as such terms are used in 48 C.F.R. 12.212 (SEPT 1995). Consistent with 48 C.F.R. 12.212 and 48 C.F.R. 227.7202-1 through 227.7202-4 (JUNE 1995), all U.S. Government Customers acquire the Software with only those rights set forth herein.

(c) Notices. All notices under this Agreement shall be in writing and shall be deemed to have been given when mailed by first class mail five (5) days after deposit in the mail. Notices shall be sent to the addresses set forth at the beginning of this Agreement or such other address as either party may specify in writing.

(d) Force Majeure. Neither party shall be liable hereunder by reason of any failure or delay in the performance of its obligations hereunder (except for the payment of money) on account of strikes, shortages, riots, insurrection, fires, flood, storm, explosions, acts of God, war, governmental action, labor conditions, earthquakes, material shortages or any other cause which is beyond the reasonable control of such party.

(e) Assignment. Neither this Agreement nor any rights or obligations of Customer hereunder may be assigned by Customer in whole or in part without the prior written approval of Fiorano. For the avoidance of doubt, any reorganization, change in ownership or a sale of all or substantially all of Customer's assets shall be deemed to trigger an assignment. Fiorano's rights and obligations, in whole or in part, under this Agreement may be assigned by Fiorano.

(f)   Waiver. The failure of either party to require performance by the other party of any provision hereof shall not affect the right to require such performance at any time thereafter; nor shall the waiver by either party of a breach of any provision hereof be taken or held to be a waiver of the provision itself.

(g) Severability. In the event that any provision of this Agreement shall be unenforceable or invalid under any applicable law or court decision, such unenforceability or invalidity shall not render this Agreement unenforceable or invalid as a whole and, in such event, any such provision shall be changed and interpreted so as to best accomplish the objectives of such unenforceable or intended provision within the limits of applicable law or applicable court decisions.

(h) Injunctive Relief. Notwithstanding any other provisions of this Agreement, a breach by Customer of the provisions of this Agreement regarding proprietary rights will cause Fiorano irreparable damage for which recovery of money damages would be inadequate, and that, in addition to any and all remedies available at law, Fiorano shall be entitled to seek timely injunctive relief to protect Fiorano's rights under this Agreement.

(i)   Controlling Law and Jurisdiction. If this Software has been acquired in the United States, this Agreement shall be governed in all respects by the laws of the United States of America and the State of California as such laws are applied to agreements entered into and to be performed entirely within California between California residents. All disputes arising under this Agreement may be brought in Superior Court of the State of California in Santa Clara County or the United States District Court for the Northern District of California as permitted by law. If this Software has been acquired in any other jurisdiction, the laws of the Republic of Singapore shall apply and any disputes arising hereunder shall be subject to the jurisdiction of the courts of Singapore, Singapore. Customer hereby consents to personal jurisdiction of the above courts. The parties agree that the United Nations Convention on Contracts for the International Sale of Goods is specifically excluded from application to this Agreement.

(j) No Agency. Nothing contained herein shall be construed as creating any agency, partnership or other form of joint enterprise or liability between the parties.

(k) Headings. The section headings appearing in this Agreement are inserted only as a matter of convenience and in no way define, limit, construe or describe the scope or extent of such section or in any way affect such section.

(l) Counterparts. This Agreement may be executed simultaneously in two or more counterparts, each of which will be considered an original, but all of which together will constitute one and the same instrument.

(m) DISCLAIMER. THE SOFTWARE IS NOT SPECIFICALLY DEVELOPED OR LICENSED FOR USE IN ANY NUCLEAR, AVIATION, MASS TRANSIT OR MEDICAL APPLICATION OR IN ANY OTHER INHERENTLY DANGEROUS APPLICATIONS. CUSTOMER AGREES THAT FIORANO AND ITS SUPPLIERS SHALL NOT BE LIABLE FOR ANY CLAIMS OR DAMAGES ARISING FROM CUSTOMER'S USE OF THE SOFTWARE FOR SUCH APPLICATIONS. CUSTOMER AGREES TO INDEMNIFY AND HOLD FIORANO HARMLESS FROM ANY CLAIMS FOR LOSSES, COSTS, DAMAGES OR LIABILITY ARISING OUT OF OR IN CONNECTION WITH THE USE OF THE SOFTWARE IN SUCH APPLICATIONS.

(n) Customer Reference. Fiorano may refer to Customer as a customer in sales presentations, marketing vehicles and activities. Such activities may include, but are not limited to; a press release, a Customer user story completed by Fiorano upon implementation of the Software, use by Fiorano of Customer's name, logo and other marks, together with a reasonable number of technical or executive level Customer reference calls for Fiorano.

(o) Entire Agreement. This Agreement, together with any exhibits, completely and exclusively states the agreement of the parties. In the event of any conflict between the terms of this Agreement and any exhibit hereto, the terms of this Agreement shall control. In the event of any conflict between the terms of this Agreement and any purchase order or Order Form, this Agreement will control, and any pre-printed terms on Customer's purchase order or equivalent document will be of no effect. This Agreement supersedes, and its terms govern, all prior proposals, agreements or other communications between the parties, oral or written, regarding the subject matter of this Agreement. This Agreement shall not be modified except by a subsequently dated written amendment signed by the parties, and shall prevail over any conflicting "pre-printed" terms on a Customer purchase order or other document purporting to supplement the provisions hereof.

Exhibit A

Fiorano Product List

Each of the individual items below is a separate Fiorano product (the "Product"). The Products in this list collectively constitute the Software. Fiorano reserves the right to modify this list at any time in its sole discretion. In particular, Product versions might change from time to time without notice.

1. Fiorano SOA Enterprise Server

2. Fiorano ESB Server

3. FioranoMQ Server Peer / FioranoMQ (standalone version)

4. Fiorano Peer Server

5. Fiorano SOA Tools

6.   Fiorano Mapper Tool

7.   Fiorano Database Business Component

8.   Fiorano HTTP Business Component

9.   Fiorano SMTP Business Component

10.   Fiorano FTP Business Component

11.   Fiorano File Business Component

12.   Fiorano MOM Business Components (MQSeries, MSMQ, JMS)

NOTE: Other business components may be added to or removed from this list from time to time at Fiorano's sole discretion.

EXCLUDED COMPONENTS

(a) Any third party or open source library included within the Software

---

Exhibit C

Licensing Restrictions. The Software licensed hereunder is subject to the following licensing restrictions.

The parties understand that the modules of the Software are licensed as noted in this section. The term "Target System" means any computer system containing one or more Processors based upon any architecture, running any operating system, excluding computers running IBM MV-S, OS/390 and related "mainframe" operating systems. The Term "Processor" means a computation hardware unit such as a Microprocessor that serves as the main arithmetic and logic unit of a computer. A Processor might consist of multiple "Cores", in which case licenses shall have to be purchased on a per-Core basis. A Target System may have one or more Processors, each of which may have one or more Cores. In the sections below, Cores may replace Processors as applicable.

(a)   If the Software is Fiorano ESB Enterprise Server, FioranoMQ Peer, Fiorano SOA server or FioranoMQ Server (JMS), then the Software is licensed on a per Processor basis on a single Target System, where the total number of Processors on the Target System may not exceed the total number of Processors licensed, with the additional restriction that only a single instance of the Fiorano ESB Enterprise Server may run on a single Target System and that a separate license must be purchased for each instance of the Fiorano ESB Enterprise Server, Fiorano ESB Peer Server or FioranoMQ Server (JMS) Server for each Processor;

(b)   If the Software is Fiorano SOA Tools or Fiorano Mapper Tool , or any Fiorano Test and/or Development license, then the Software is licensed on a per-named-user basis, where the total number of named users may not exceed the total number of named users licensed;

(c)   If the Software is a Fiorano Business Component of any kind (including but not limited to Fiorano HTTP, File, SMTP, File, Database, and other Business Components, etc.), then the Software is licensed on the basis of the number of CPUs of the Target System on which the FioranoMQ Peer (to which the Business Component connects runs). A separate license needs to be purchased for each CPU of each Target System of each FioranoMQ Peer instance to which any Business Component connects.

Evaluations. Licenses used for evaluation cannot be used for any purposes other than an evaluation of the product. Existing customers must purchase new licenses to use additional copies of any Product and may not use evaluation keys in any form. All evaluation keys are restricted to 45-days and extensions need to be applied for explicitly. Any misuse of evaluation keys shall be subject to a charge of 125% (one hundred and twenty-five percent) of the license fee plus 20% support.

Non-Production Environments. For all non-production environments referenced on the Order Form (including all HA (high-availability), QA, Staging and Development environments), the following is understood: each non-production environment is an exact replica of the Production Environment from the standpoint of the number of copies of the Fiorano ESB Enterprise Server, FioranoMQ Peer, Fiorano SOA server and/or FioranoMQ Server (JMS) licensed. Each non-production environment is licensed on the exact same number and configuration of CPUs and/or Cores as the corresponding Production Environment.

Run-Time Libraries. The Fiorano ESB Enterprise Server, FioranoMQ Peer, Fiorano SOA server and FioranoMQ Server (JMS) products are "server" products, each of which has a runtime library associated with it. The runtime library may be freely bundled with and/or used for internal development purposes by all Users who have licensed at least one production copy of the corresponding Server Software.

Contents

Chapter 1: Performance Tuning And Deployment Parameters

This chapter explains the various parameters that should be modified, as per the requirements to obtain the best performance out of FioranoMQ. It also provides the information on deploying FioranoMQ in real world enterprise applications and additional software components provided with FioranoMQ to address various scaling and clustering issues.

Performance Tuning Parameters

The default configuration of FioranoMQ gives optimum performance under most traffic loads and most common message sizes ranging from 0-10 KB.

FioranoMQ administrators can tune in the following configurations to get much better performance from the FioranoMQ Server.

PTP Configuration Parameters

FioranoMQ provides the following configuration parameters to tune the point-to-point messaging model.

In-Memory Persistent Message Buffer

FioranoMQ Server buffers the persistent messages in its in-memory cache besides storing these messages in the persistent store. This buffering is done to ensure fast delivery of messages to the listening receivers. The variable named **PersistentInMemoryBufferSize** depicts the size of the in-memory buffer whose default value is 512 KB (512*1024). This can be increased to higher values when the message send rate is quite high in which case this buffer gets filled up faster than a scenario where the send rate of messages is lower.

Following steps enable you to configure this parameter through Fiorano Studio in an online mode:

1. Invoke the Fiorano Studio and login to the FioranoMQ Server.
2. Select **Destinations > Queues** sub-node from the Server Explorer pane.
3. Select the Queue name whose properties are to be displayed.
4. In the **Properties** pane, enter the new value against the property named **PersistentInMemoryBufferSize**.

In-Memory Non-Persistent Message Buffer

FioranoMQ Server stores the published non-persistent messages in an in-memory table. The size of this buffer is taken care by the parameter named **NPInMemoryBufferSize** and its default value is 1 MB. This buffer can get fully loaded if the message send rate is quite high as compared to the message receive rate. When this buffer fills up, the FioranoMQ senders cannot push any more new messages into the buffer and they are blocked till a receiver is activated on the concerned queue to empty the buffer.

Therefore, it is recommended to set the size of the buffer to such a value that the chances of its becoming full are minimal especially in those cases where the senders are sending messages at a much faster rate than the rate at which receivers are receiving them.

Following steps enable you to configure this parameter through Fiorano Studio in an online mode:

1. Invoke the Fiorano Studio and login to the FioranoMQ Server.

2. Select **Destinations > Queues** sub-node from the Server Explorer pane.

3. Select the Queue name whose properties are to be displayed.

4. In the **Properties** pane, enter the new value against the property named **PersistentInMemoryBufferSize**.

Prefetch Count

Prefetch count is the number of messages that a client will request from the server in one receive call. Prefetch count can be set through a parameter named **PrefetchCount** using Fiorano Studio in the offline mode. The default value of this variable is 3. PTP prefetching enables FioranoMQ Server to deliver at most prefetch count messages to the receiving client at each receive call.

Perform the following steps to configure this parameter:

1. Invoke the Fiorano Studio.

2. Select **Tools > Configure Profile** from the menu bar, select the **FioranoMQ** folder, and click the **Open** button. This shifts the FioranoMQ environment to the offline mode.

3. Navigate to FioranoMQ -> Fiorano -> mq -> ptp -> QueuingSubSystem in the Profile Manager pane. The properties of the PTP Manager are displayed in the **Properties** pane.

4. Select **ellipsis** against the parameter **PrefetchCount**. Enter the new value in the resulting **PrefetchCount** dialog box and click **OK**.

5. Right-click on FioranoMQ domain in the **Server Explorer** pane and select the **Save** option.

Prefetch Threshold

Prefetch threshold denotes minimum number of messages in the local buffer of the client that will trigger a request for delivery of more messages to the client. Prefetch threshold can be set through a parameter named **PrefetchThreshold** using Fiorano Studio in the offline mode.

The default value of this variable is 1. The number of messages that are requested from the server when threshold limit is reached is equal to the prefetch count.

Perform the following steps to configure this parameter:

1. Invoke the Fiorano Studio.

2. Select **Tools > Configure Profile** from the menu bar, select the **FioranoMQ** folder, and click the **Open** button. This shifts the FioranoMQ environment to the offline mode.

3. Navigate to FioranoMQ -> Fiorano -> mq -> ptp -> QueuingSubSystem in the Profile Manager pane. The properties of the PTP Manager are displayed in the **Properties** pane.

4. Select **ellipsis** against the parameter **PrefetchThreshold**. Enter the new value in the resulting **PrefetchThreshold** dialog box and click **OK**.

5. Right-click on FioranoMQ domain in the **Profile Manager** pane and select the **Save** option.

PTP Prefetch size

This parameter is used to specify total size of messages (in bytes) that will be sent by FioranoMQ Server in every receive call made by the client. Prefetch size can be set through a parameter named **MaxPrefetchSize** using the Fiorano Studio in the offline mode. The default value of this variable is 512 KB. If both prefetch size and prefetch count are specified, then the number of messages sent by FioranoMQ Server is controlled by the minimum value among these two parameters.

Perform the following steps to configure this parameter:

1. Invoke the Fiorano Studio.

2. Select **Tools > Configure Profile** from the menu bar, select the **FioranoMQ** folder and click the Open button. This shifts the FioranoMQ environment to the offline mode.

3. Navigate to FioranoMQ -> Fiorano -> mq -> ptp -> **QueuingSubSystem** in the Profile Manager pane. The properties of the PTP Manager are displayed in the **Properties** pane.

4. Select **ellipsis** against the parameter **MaxPrefetchSize**. Enter the new value in the resulting **MaxPrefetchSize** dialog box and click **OK**.

5. Right-click on FioranoMQ domain in the **Profile Manager** pane and select the **Save** option.

Queue Sender blocking interval

This parameter denotes the time interval in milliseconds for which sender will be blocked when it is unable to push more messages in the in-memory buffer maintained by FioranoMQ Server. Blocking interval can be set using the parameter named **SenderBlockingInterval** through Fiorano Studio in an online mode. The default value of this variable is 10 milliseconds. This parameter is used only in case of persistent messages. Setting this parameter to -1 allows a sender to continuously publish messages without blocking. Sender blocking interval is ignored if no receivers are registered on a queue.

Perform the following steps to configure this parameter:

1. Invoke the Fiorano Studio and login to the FioranoMQ Server.

2. Select **Destinations > Queues** sub-node from the Server Explorer pane.

3. Select the Queue name whose properties need to be displayed.

4. In the **Properties** pane, enter the new value against the property named **SenderBlockingInterval** and press Enter.

PubSub Configuration Parameters

FioranoMQ offers a very high message throughput and low latency for non-persistent messages. The boost in delivery rates has been achieved through a series of algorithmic changes for multi-threaded scenarios, data-copy optimizations, transport layer enhancements, changes in flow-control semantics, and removing bottlenecks from the code.

FioranoMQ provides the following configuration options for tuning the publish-subscribe model:

Setting the Message Receipt Acknowledgement

In the **DupsOkBatchSize** mode, message receipt acknowledgement is sent after a configurable number of messages. By default the number is 20.

Following steps enable you to configure this parameter through Fiorano Studio in the offline mode:

1. Invoke the Fiorano Studio.

2. Select **Tools > Configure Profile** from the menu bar, select the FioranoMQ folder, and click the Open button. This shifts the FioranoMQ environment to the offline mode.

3. Navigate to **FioranoMQ -> Fiorano -> mq -> pubsub -> TopicSubSystem** in the Profile Manager pane. The properties of the CommonConfig are displayed in the **Properties** pane.

4. Select **ellipsis** against the parameter **DupsOkBatchSize**. Enter the new value in the resulting **DupsOkBatchSize** dialog box and click **OK**.

5. Right-click on FioranoMQ domain in the **Profile Manager** pane and select the **Save** option.

Setting in-memory buffers for Subscribers

Another mechanism to manage the flow control is to increase the size of the in-memory buffers of the topic and the subscribers with the Publisher slowdown algorithm option enabled. This will delay the initialization of publisher slowdown algorithm and increase the overall throughput. In scenarios where the subscriber receives messages slowly, increasing the buffer size may lead to the Publisher slowdown algorithm not initialize at all. This depends on the rate at which the messages are being published on the server. It is configurable using a parameter named **BasicAllowedSize** through Fiorano Studio in the offline mode. The default value of this variable is 1024 KB. This can be increased to a higher value depending on the scenario.

Following steps enable you to configure this parameter:

1. Invoke the Fiorano Studio.

2. Select **Tools > Configure Profile** from the menu bar, select the FioranoMQ folder and click the **Open** button. This shifts the FioranoMQ environment to the offline mode.

3. Navigate to **FioranoMQ -> Fiorano -> mq -> pubsub -> TopicSubSystem** in the Profile Manager pane. The properties of the PubSub Manager are displayed in the Properties pane.

4. Select the ellipsis against the parameter **BasicAllowedSize**. Enter the new value in the resulting **BasicAllowedSize** dialog box and click **OK**.

5. Right-click on FioranoMQ domain in the **Profile Manager** pane and select the **Save** option.

Setting Parameters for New Pubsub Algorithm to Handle Slow Subscribes

The previous releases of FioranoMQ had no option to disable slowing down of the publisher when the subscribers happen to be slow. In the default configuration, the publisher blocks by predefined timeout and flow control starts.

From this release of FioranoMQ Server, the option of persisting the message to disk when subscriber becomes slow and publisher slowdown is disabled. The fast subscriber never gets affected by any number of slow subscribers.

The following are the parameters that determine the different behaviors of the algorithm and these parameters can be configured from the profile in Fiorano Studio (**FioranoMQ->fiorano->mq->pubsub->TopicSubSystem**) when "**DemuxWhilePublishing**" flag is set to 'yes'.

Note: FioranoMQ->fiorano->mq->pubsub->Topics->TopicName->DemuxWhilePublishing flag should be set to **yes** to make the new pubsub algorithm work where **TopicName** is the name of the Topic created in the FioranoMQ Server.

- **StoreMessageToDisk**: When the session buffer in the client runtime overflows, the session state in server becomes passive and publisher starts pushing the message into temporary persistent queue in disk for that particular session. The slow subscriber will not receive the messages till the client's session buffer can accommodate more messages. Normal subscriber keeps receiving the message as publisher never slows down.

  This parameter is navigated in the profile as follows:

  FioranoMQ->fiorano->mq->pubsub->TopicSubSystem->StoreMessageToDisk

  The default value of this parameter is set to "yes". The result of this parameter is not effective for non-persistent message that can be discarded.

- **PublishWait:** indicates the default time interval by which the publisher slows down when

  EnablePublisherSlowdown is set to "yes". As the size of Persistent Session Queue (PSQ) changes, the publisher blocking time also changes according to exponential back-off algorithm.

  This parameter is navigated in the profile as follows:

FioranoMQ->fiorano->mq->pubsub->TopicSubSystem->PublishWait

The default value of this parameter is 5 millisecond (this cannot take values less than equal to 0).

- *EnablePublisherSlowdown:* If it's set to "no" then the publisher while sending messages to the persistent queue, never slows down. It is used when publisher flow control is preferred and there are many slow subscribers. This option should be carefully selected considering different options as mentioned above. If this option is selected, the publisher will always slow down. The slow down time starts from the value specified by another parameter called **publishWait**. It increases according to the slowdown algorithm that depends on the size of persistent message queue for every slow subscriber. This slow down time dynamically changes as and when persistent storage keeps changing its size. This option dynamically balances the Publisher slowdown and the size of persistent message in the disk. It is recommended that the server should be run with a higher value of heap (> 256 MB) size, when it is run with **EnablePublisherSlowdown** flag set to false because the publisher accumulates messages into the disk at a speed faster than the speed at which it becomes empty.

This parameter is navigated in the profile as follows:

FioranoMQ->fiorano->mq->pubsub->TopicSubSystem->EnablePublisherSlowdown

The default value of this parameter is "no". If the user wants to have publisher flow control, then this parameter should be set to "yes" and the PublishWait parameter should be set accordingly.

- **DropOldestMessage:** If set to "yes", the publisher first drops the oldest message from the persistent store and pushes the latest one into the queue thereby ensuring the maximum size of persistent store.

  This parameter is navigated in the profile as follows:

  FioranoMQ->fiorano->mq->pubsub->TopicSubSystem->DropOldestMessage

  The default value of this parameter is set to "no". If the user wants to drop the latest message when the size of the total messages in the disk cross over a certain threshold, this parameter should be set to its default value.

- **MaxPersistentStoreSize:** indicates the maximum size of the total messages stored in persistent queue in the disk. Once the current size cross over this threshold, the publisher starts dropping them if DropOldestMessage flag is set to "no". If this flag is set to "yes", the publisher first drops the oldest message from the persistent store and pushes the latest one.

  This parameter is navigated in the profile as follows:

  FioranoMQ->fiorano->mq->pubsub->TopicSubSystem->MaxPersistentStoreSize

  The default value of this parameter is 1073741824 in bytes.

  Note: This algorithm needs the new profile to be used in running the server. Older profile has to be ported to the new profile. To port older profile to the current profile, configurations need to be replicated manually. The server is recommended to run with JVM heap size according to the following setting to be made in fiorano_vars.bat/.sh

  JVM_SERVER_ARGS=-server -Xms256m -Xmx512m (-Xms512m -Xmx1024m for enterprise operation)

Chapter 2: FioranoMQ Deployment Issues

FioranoMQ has been deployed in various real world JMS applications. Estimating the expected message traffic on the server can enhance the performance of the server in such real world application environments.

FioranoMQ Administrators can estimate this before deploying FioranoMQ. Once the message traffic numbers are estimated, the following parameters need to be configured to improve the performance of FioranoMQ:

- Number of CPUs
- Number of servers
- JVM heap size

Number of CPUs

In most of the multi-thread applications, increasing the number of CPUs improves the application performance dramatically. FioranoMQ is no exception in this regard. Increasing the number of CPUs of the machine on which MQ server is running improves its performance. For example, the performance of MQ increases by about 2.5 - 3 times when the numbers of CPUs are changed from 1 to 4.

Number of Servers

The optimum number of MQ servers in any scenario depends on the expected number of clients that will be connected at any point of time and distribution of producers and consumers depends on the JMS connections and destinations.

As the number of producers/consumers per connection increases, there will be different throughput observations. For example, having 1 publisher and 1 subscriber per connection in an n:n scenario will give better throughput rather than having more than 1 publisher or subscriber per connection.

Similarly there is a limit to the best throughput that can be extracted from the server by increasing the producers and consumers on a destination.

For example, the throughout of the FioranoMQ Server will be higher for cases where there are 10 producers and 10 consumers on a topic but the same will drop if this figure is increased to say 100 because now 100 clients will access the same destination in-memory buffer leading to slow processing of each request.

The in-memory buffer sizes explained in the section before this also govern the above mentioned performance changes.

From the above explanation it becomes clear that if the deployment scenario of FioranoMQ involves a large number of client applications (> 500) sending and receiving messages at high rates on a large number of destinations the throughout results can be increased by distributing the load of both the client connections and the data amongst different instances of the FioranoMQ Server.

The number of server's instances to be used depends solely on the number of JMS connections created to the server and the number of destinations used on the server.

In a sample scenario where there are about 100 producers and consumers each on about 500 destinations the most optimum throughput would be achieved by sharing the load across 2 FioranoMQ Server instances though one FioranoMQ Server would also be able to take the load however, might not give the desired throughput due to memory and CPU limitations. The administrators can divide 250 destinations on each server for better throughput.

JVM heap size

JVM heap size specifies the maximum amount of memory that can be consumed by the running java application.

FioranoMQ's memory consumption is mainly dependent on the following objects which are stored in its in-memory data structures:

- Connections/Sessions/Producers/Consumers objects
- Destinations (queues/topics) Objects
    - *In-memory queue to store non-persistent messages*
    - *In-memory queue to buffer persistent messages*
- Durable/Non-Durable Subscribers
    - *In-memory buffer queue*

The minimum JVM heap size can be calculated by adding the memory consumed by each of the above mentioned objects.

Minimum JVM size = (Memory consumed by Connection/Sessions/Producers/Consumers Objects) + (Memory Consumed by in-memory queues of the destination objects) + (Memory consumed by in-memory queues of the durable/non-durable subscribers)

+ (Other miscellaneous resources)

Consider a scenario in which 500 active connections (250 topic connections and 250 queue connections) are active at any point of time. Each Connection contains one session object, which is either associated with a producer or a consumer. There are 10 topics and 10 queues on which all the producers/consumers are evenly distributed.

The sizes of the various buffers are as follows:

Pubsub

- In memory topic buffer size: 0.5 MB

- In memory subscriber buffer size: 1 MB

PTP

- In memory NP message queue size: 1 MB

- In memory message buffer size: 1 MB

- Memory Consumption by various Connections/Sessions/Producers/Consumers objects: ~18 MB

- Memory Consumption by various Destinations:

    o *In memory queues to store non-persistent/persistent messages:*

        ▪ *Topics: 5 MB*

        ▪ *Queues: 10 MB*

    o *In -memory subscriber queues: 150 MB (60% of the buffer size is used at most times)*

- Total maximum memory consumption: ~183 MB

So a JVM heap size of 256 MB would be optimum for running the above mentioned high load scenario.

Note: This consumption of memory does not include the memory consumed by other resources like various internal threads started in the server, various file descriptors/data base connections, and so on.