

**UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLUMBIA**

UNITED STATES OF AMERICA,

Plaintiff

v.

GOOGLE INC.

and

ITA SOFTWARE, INC.

Defendants.

Case: 1:11-cv-00688 (RLW)

**[PROPOSED] FINAL JUDGMENT**

WHEREAS, Plaintiff United States of America (“United States”) filed its Complaint on April 8, 2011, the United States and Defendants Google Inc. and ITA Software, Inc., by their respective attorneys, have consented to entry of this Final Judgment without trial or adjudication of any issue of fact or law, and without this Final Judgment constituting any evidence against or admission by any party regarding any issue of fact or law;

AND WHEREAS, Defendants agree to be bound by the provisions of the Final Judgment pending its approval by the Court;

AND WHEREAS, the United States requires that Defendants agree to undertake certain actions and refrain from certain conduct for the purpose of remedying the loss of competition alleged in the Complaint;

AND WHEREAS, Defendants have represented to the United States that the actions and conduct restrictions can and will be undertaken and that Defendants will later raise no claim of

hardship or difficulty as grounds for asking the Court to modify any of the provisions contained below;

NOW THEREFORE, before any testimony is taken, without trial or adjudication of any issue of fact or law, and upon consent of Defendants, it is ORDERED, ADJUDGED AND DECREED:

I. **JURISDICTION**

This Court has jurisdiction over the subject matter of and each of the parties to this action. The Complaint states a claim upon which relief may be granted against Defendants under Section 7 of the Clayton Act, as amended (15 U.S.C. § 18).

II. **DEFINITIONS**

As used in this Final Judgment:

- A. “AAA” means the American Arbitration Association.
- B. “Affiliate” means, with respect to any entity, another entity that controls, is controlled by or is under common control of the first entity.
- C. “Airline Customer” means a Customer that operates an airline or is an Affiliate of an airline.
- D. “Availability Information” means information about the availability of a seat at a specific booking class on a specific flight obtained by ITA as an input to QPX, including information in ITA’s Dynamic Availability Calculating System and its system for processing other types of availability data, including Availability Status (“AVS”) and Numeric Availability Status (“NAVS”), but excluding fully computed pricing and shopping results.

E. “Covered Employee” means an employee of a Defendant having as a job responsibility the day-to-day development of, or day-to-day strategic decision-making with respect to, the Google Consumer Flight Search Service, other than an Excepted Employee.

F. “Customer” means a company that has entered into a QPX Agreement or an agreement for InstaSearch with Defendants. Customer does not include Google or ITA.

G. “Customized Software” means any version of QPX or the InstaSearch Service that is modified specifically for a Customer in response to a request made by a Customer for particular features or functionality not included in the commercially available version of QPX or the InstaSearch Service. If the modified version is made available to other Customers (other than Affiliates of the requesting Customer), it no longer qualifies as “Customized Software” (provided that Customized Software that is provided in response to good faith requests from two or more Customers may be substantially similar).

H. “Database Query,” with respect to any OTI, has the definition set forth in the QPX Agreement in effect between ITA and such OTI (or a definition given therein for “observation query”).

I. “Defendants” means Google and ITA, as defined below, and any successor or assign to all or substantially all of the business or assets of Google and ITA involved in the provision of QPX, the InstaSearch Service, or the Google Consumer Flight Search Service.

J. “Embedded Software” means any version of QPX or the InstaSearch Service that is modified from the commercially available version for the purpose of integrating it into software that provides significantly greater functionality than QPX or the InstaSearch Service,

such as a passenger reservation system or Internet booking engine. The software into which such version of QPX is integrated shall also be deemed “Excluded Software.”

K. “EU” means an execution unit (a measure of the independent processing cores in a server). For example, a single core such as an Intel Pentium 4 has one EU, whereas a dual core chip such as the Intel Pentium D has two EUs. A dual Intel Pentium D server, in turn, would have four EUs.

L. “Excepted Employee” means an individual employed by ITA at the time of the complaint in this matter who has been designated in writing by Defendants and approved by the United States. With the consent of the United States, which shall not be unreasonably withheld, Defendants shall be entitled to designate a replacement for any Excepted Employee who is no longer employed by Defendants or ceases to have day-to-day job responsibilities involving QPX or InstaSearch.

M. “Excluded Information” means:

- (1) information available to the public or obtained by a Defendant from a third-party not under an obligation of confidentiality to the OTI licensee of QPX who disclosed such information to a Defendant;
- (2) information obtained by Google as part of its web search business;
- (3) information provided to a Defendant in connection with a product or service other than QPX or the InstaSearch Service; and
- (4) schedule, fare, flight or availability information of any airline.

Nothing in any QPX Agreement shall be read as modifying the definition of Excluded Information so as to require Defendants to treat any Excluded Information as OTI Confidential Information pursuant to this Final Judgment.

N. “Excluded Software” means (i) Customized Software; (ii) Embedded Software; and (iii) Experimental Software.

O. “Experimental Software” means a beta or test version of QPX or the InstaSearch Service that is made available to a limited number of customers, for a limited period of time, specifically for the purpose of testing new or modified features prior to the commercial release of those new or modified features as part of QPX or the InstaSearch Service. While Defendants remain free to determine whether a new or modified feature is ever ultimately incorporated into the commercially available version of QPX or the InstaSearch Service that must be licensed pursuant to this Final Judgment, Defendants may not use the exclusion of Experimental Software to circumvent the licensing obligation set forth in Section IV.E.

P. “Final Offer” means the proposed pricing terms for a QPX Agreement and/or InstaSearch Agreement, pursuant to which Defendants will provide QPX and/or InstaSearch to the OTI.

Q. “Google” means Defendant Google Inc., a Delaware corporation headquartered in Mountain View, California, any successor to all or substantially all of its business or assets, and its subsidiaries (whether partially or wholly owned), divisions, groups, Affiliates, partnerships, and joint ventures, and their directors, officers, managers, agents, and employees (but excluding in all cases ITA, as defined below).

R. “Google Consumer Flight Search Service” means a publicly available website, product or service owned or operated by a Defendant that provides airfare price, schedule or Availability Information to consumers based on results returned from an airfare pricing and shopping engine, as well as any syndicated versions thereof.

S. “Google Services” means websites, products or services owned or operated by a Defendant, including but not limited to the Google Consumer Flight Search Service.

T. “InstaSearch” means a technology under development by ITA prior to the date of the Complaint herein in which specified pricing and shopping queries are pre-computed using QPX, stored in a cache and made available to one or more Customers from the cache.

U. “InstaSearch Agreement” means an agreement between a Defendant and an OTI, negotiated pursuant to the terms of this Final Judgment, providing such OTI the right to submit queries to the InstaSearch Service, subject to the terms and conditions set forth in Section IV.H of this Final Judgment.

V. “InstaSearch Proof of Concept” means a specific implementation of InstaSearch, incorporating a QPX cache and associated interfaces, that ITA, prior to the date of the Complaint herein, agreed to deliver as a proof-of-concept to a Customer, as more fully defined in a Solution Document/Interface Definition Document (the “InstaSearch POC Solution Document”), attached to this Final Judgment as Exhibit 1.

W. “InstaSearch Service” means the service to be offered by Defendants to OTIs as required by this Final Judgment having the same InstaSearch functionality as the InstaSearch Proof of Concept but permitting an OTI to vary the number of covered markets and the targeted refresh rate.

X. “ITA” means Defendant ITA Software, Inc., a Delaware corporation headquartered in Cambridge, Massachusetts, and its subsidiaries (whether partially or wholly

owned), divisions, groups, Affiliates, partnerships, and joint ventures, and their directors, officers, managers, agents, and employees (but excluding in all cases Google, as defined above.)

Y. “Level 1 Query” means a specific type of pricing and shopping query, with the definition and input and output data definitions specified in the InstaSearch POC Solution Document, which, when submitted to the InstaSearch Service, returns certain cached results. As explained in detail in the InstaSearch POC Solution Document, a Level 1 Query will return data that enables the OTI to populate a map showing to the user the best price to a range of destinations from a particular origin over a particular range of dates.

Z. “Level 2 Query” means a specific type of pricing and shopping query, with the definition and input and output data definitions specified in the InstaSearch POC Solution Document, which, when submitted to the InstaSearch Service, is passed through to QPX and is not intended to return cached results. As explained in detail in the InstaSearch POC Solution Document, a Level 2 Query narrows the result set to the particular destination selected during the user’s Level 1 Query, and returns the cheapest solution for a range of departure days and stay lengths.

AA. “Level 3 Query” means a query submitted to the InstaSearch Service other than a “Level 1 Query” or “Level 2 Query.”

BB. “Live Query,” with respect to any OTI, has the definition set forth in the QPX Agreement in effect between ITA and such OTI (or a definition given therein for “user query”).

CC. “OTI,” or online travel intermediary, means a website offering (or proposing to offer) airfare search functionality to consumers in the United States, other than a website owned

or operated by an airline. Provided, however, that in the case of an OTI that is a line of business, business unit, subsidiary, or Affiliate of a company that also has non-OTI lines of business, business units, subsidiaries or Affiliates, the provisions in this Final Judgment that apply to OTIs will only apply to that line of business, business unit, subsidiary or Affiliate that offers airfare search services to consumers, and not to lines of business, business units, subsidiaries or Affiliates that do not offer airfare search services to consumers.

DD. “OTI Confidential Information” means confidential and proprietary inventions, products, designs and ideas (including computer software), functionality, concepts, processes, internal structure, external elements, user interfaces, technology, and documentation belonging to an OTI, OTI Configuration Information, as well as confidential and proprietary information relating to the OTI’s operations, plans, opportunities, finances, research, technology, developments, know-how, and personnel, that is disclosed to a Defendant by an OTI pursuant to a QPX Agreement or an InstaSearch Agreement to which such OTI is a party, except to the extent that such information is Excluded Information.

EE. “OTI Configuration Information” means information related to an OTI’s configuration or tuning of QPX or the InstaSearch Service or the parameters used by the OTI for particular types of queries.

FF. “OTI Plan Information” means confidential information related to an OTI’s current or future product or marketing plans that is disclosed by such OTI to a Defendant pursuant to a QPX Agreement or InstaSearch Agreement to which such OTI is a party, except to the extent that such information is necessary to implement a feature or features for the OTI or represents Excluded Information.



GG. “QA Information” means Query Information or other information related to the performance, quality or accuracy of any software or service provided by a Defendant in connection with a QPX Agreement or InstaSearch Agreement, or one or more results generated by any such software or service, including:

- (1) reports of bugs or defects;
- (2) information related to the success or failure of an attempt to book or otherwise use a pricing and shopping solution provided by Defendants;
- (3) information related to the existence of solutions which potentially should have been, but were not, included in the results provided by Defendants;  
and
- (4) information related to instances in which other sources of information or methods of calculation lead to a different fare than that calculated by Defendants’ products or services for a particular pricing and shopping solution (without regard to the merits of the different calculations).

QA Information may include OTI Configuration Information to the extent that it is associated with a particular query, result, report or request, provided that Defendants may not access the information in order to separate OTI Configuration Information from the QA Information as a whole, or to use the OTI Configuration Information for a purpose prohibited by Section VI.

HH. “QPX” means the airfare pricing and shopping engine and Related Software deployed in production by ITA for Customers as of the date of the Complaint herein (provided

that nothing in this Final Judgment shall confer any rights to use the Related Software other than to the extent that such Related Software is used by QPX), together with any enhancements, upgrades, updates, or bug fixes thereto that Defendants must develop or license pursuant to Sections IV.E and IV.F of this Final Judgment, whether or not licensed under the name QPX, provided that in no event shall QPX include:

- (1) fare management capabilities that are part of ITA's Rule and Fare Display System;
- (2) refund/reissue capability using Airline Tariff Publishing Company ("ATPCO") Category 31 and Category 33;
- (3) award travel or frequent flyer related functionality;
- (4) InstaSearch in any form (including but not limited to that comprised in the InstaSearch Proof of Concept or required to be licensed pursuant to this Final Judgment), or any other technology having substantially greater or different hardware requirements than QPX as deployed in production by ITA for Customers (other than any Excluded Software) as of the date of the Complaint herein that is not otherwise required to be licensed pursuant to existing QPX Agreements or the terms of this Final Judgment;
- (5) middleware or other applications that may be related to, but are separate from, the base airfare pricing and shopping engine;

- (6) any website or consumer-facing interface, application or technology, whether or not syndicated to multiple websites, including but not limited to the Google Services;
- (7) any product, service, application, technology, feature, or functionality not made available to Customers, whether or not derived from or based upon QPX, including, but not limited to, any product, service, application, technology, feature, or functionality that is exclusively used in or by one or more Google Services; or
- (8) Excluded Software.

II. “QPX Agreement” means an agreement, other than an InstaSearch Agreement, between a Defendant and a Customer permitting the Customer to submit queries to or otherwise use QPX, whether denominated as a License Agreement, Services Agreement, or otherwise.

JJ. “Qualifying Complaint” means a written complaint from an OTI that (i) identifies the OTI on behalf of whom the complaint is submitted; and (ii) alleges that Google is violating this Final Judgment or acting, directly or indirectly, in an unfair manner in connection with flight search advertising in the United States.

KK. “Query Information” means information related to the execution and results of a particular query, including the query submitted to such service, the results returned in response to such query, operational data related to the execution of the query (e.g. the particular server(s) on which it was executed, the time it was received, the length of time needed to execute it, etc.), any intermediate results or errors generated during the execution of the query, and any information

that is known or received regarding the success or failure of the query for the Customer (e.g. bookability or pricing errors in the results).

LL. “Related Software” means availability management and other software operated by ITA in connection with the provision of pricing and shopping results to Customers as of the date of the Complaint herein.

MM. “Reporting Period” means the period beginning upon the entry of this Final Judgment and expiring at the earlier of (i) five years from the entry of the Final Judgment; or (ii) two years from the date that Google launches a Google Consumer Flight Search Service.

NN. “Similarly Situated OTIs” means, with respect to any particular OTI seeking to enter into a QPX Agreement or InstaSearch Agreement, other OTIs having actual, reasonably expected (in terms of the OTI’s own projections of its expected volume), and/or minimum QPX or InstaSearch query volumes (in the aggregate and as to specific types of queries) and, for QPX Agreements, fee metrics (e.g. per-query, per-ticket or per-Passenger Name Record (“PNR”)), that are similar to those of such OTI (but excluding the OTI itself and its Affiliates). This provision shall be interpreted broadly so as to avoid, where reasonably possible, the situation where an OTI has no or few Similarly Situated OTIs.

### III. APPLICABILITY

This Final Judgment applies to Defendants, as defined above, and all other persons in active concert or participation with any of them who receive actual notice of this Final Judgment by personal service or otherwise.

IV. **REQUIRED CONDUCT**

**Licensing of QPX**

A. Defendants shall honor the terms of all QPX Agreements in effect as of the entry of this Final Judgment (including terms related to customization and query tuning services for QPX), except and unless the terms of this Final Judgment provide additional rights to, or eliminate restrictions on, OTIs, in which case Defendants may not enforce such terms against the OTI.

B. At the request of any OTI who is a party to a QPX Agreement as of the entry of this Final Judgment, Defendants shall negotiate an extension of such OTI's QPX Agreement for a term set at the reasonable discretion of the OTI (but that shall be no less than one year and that need not extend beyond five years from the entry of this Final Judgment, provided that if such extension would commence more than four years from the entry of this Final Judgment, its term shall expire five years from the entry of this Final Judgment), on:

- (1) commercial terms (e.g. price, functionality, minimum query volumes and permitted uses of QPX, as well as customization and query tuning services for QPX) that are substantially similar to those governing such OTI's use of QPX as of the entry of the Final Judgment, and
- (2) other terms (e.g. audit rights, choice of law and indemnification) that are fair, reasonable, and non-discriminatory.

Notwithstanding anything in this paragraph, Defendants shall not require an OTI to include in an extension any provision that Defendants would be prohibited from requiring in a new QPX

Agreement pursuant to section IV.D of this Final Judgment, provided that, if an OTI elects to remove such a provision from the extension, or requests an extension with a different term than its QPX Agreement in effect as of the entry of the Final Judgment, the commercial terms of such extension shall be modified in a corresponding manner that is fair, reasonable and non-discriminatory in light of the commercial terms of QPX Agreements in effect between Defendants and Similarly Situated OTIs as of or subsequent to the date of this Final Judgment.

C. At the request of any OTI who is not party to a QPX Agreement, or whose QPX Agreement will expire within one year of such request, Defendants shall negotiate a QPX Agreement with such OTI for a term set at the reasonable discretion of the OTI (but that shall be no less than one year and that need not extend beyond the date that is five years from the entry of this Final Judgment, provided that if such QPX Agreement would commence more than four years from the entry of this Final Judgment, its term shall expire five years from the entry of this Final Judgment), on:

- (1) commercial terms (e.g. price, functionality, minimum query volumes and permitted uses of QPX, as well as customization and query tuning services for QPX) that are fair, reasonable and non-discriminatory judged exclusively in relation to the OTI's chosen contract term, desired fee metrics (e.g. per-query, per-ticket, or per-PNR), reasonably expected query volume, the minimum query volume to be included in such QPX Agreement, and the commercial terms of QPX Agreements in effect between Defendants and Similarly Situated OTIs as of or subsequent to the date of this Final Judgment, and

- (2) other terms (e.g. audit rights, choice of law, and indemnification) that are fair, reasonable, and non-discriminatory.

D. Defendants may not require that a QPX Agreement entered into pursuant to Section IV.B or Section IV.C of this Final Judgment prevent the OTI from using alternative products to QPX sold by companies other than Defendants. Defendants and the OTI may, however, enter an exclusive QPX Agreement if Defendants offer the OTI a non-exclusive agreement on fair, reasonable, and non-discriminatory terms.

E. All QPX Agreements with OTIs shall include the right to use ordinary course upgrades to QPX that Defendants make available to Customers without additional charge during the term of such QPX Agreement. If Defendants make an ordinary course upgrade to QPX available to Customers, but require the payment of an additional charge, Defendants may condition the use of such upgrade pursuant to this paragraph upon the payment of an equivalent charge, provided that such charge is fair, reasonable, and non-discriminatory. Defendants shall make available to OTIs the same version of QPX as they make available to Customers, including but not limited to any version made available to Airline Customers. This paragraph does not require Defendants to make available to OTIs InstaSearch or any other product, feature or technology excluded from the definition of QPX above, including the Excluded Software.

F. Defendants shall, on an annual basis, devote substantially as many (or more) engineering resources (in terms of budget and full-time-equivalent employees) to the research and development and maintenance of QPX and the InstaSearch Service (other than resources devoted to the development of the InstaSearch Proof of Concept as required by agreements entered into by ITA prior to the date of the Complaint herein) for the use of Customers as ITA

did in the average of the two years prior to the filing of the Complaint herein (excluding resources devoted by ITA to any aspect of its passenger service system, reservations system, inventory system or Internet booking engine, including but not limited to the integration of QPX into such system, and resources devoted to the development of products or services that are excluded from the definition of QPX in this Final Judgment, including but not limited to ITA's InstaSearch). Defendants shall make commercially reasonable efforts to respond to Customers' requests for development of QPX, consistent with ITA's past practice prior to the date of the Complaint herein. Provided, however, that:

- (1) if the amount of revenue derived by Defendants from third-party licensing of QPX materially decreases during the term of the Final Judgment, Defendants shall be permitted to make a corresponding reduction in the amount of resources committed pursuant to this paragraph, provided that Defendants shall obtain the consent of the United States prior to making such reduction, which consent shall not be unreasonably withheld or delayed; and
- (2) the degree to which particular efforts benefit Defendants or Google Services shall not be considered in evaluating whether such efforts qualify as "research and development and maintenance of QPX for the use of Customers," so long as those efforts are legitimately beneficial to Customers and not solely beneficial to Defendants or Google Services.

G. Nothing in this Final Judgment shall require Defendants to provide to any third party any product, service, or technology (or feature thereof) that Defendants develop



exclusively for use in the Google Services, nor shall any such product, service, or technology, or the relative functionality of one or more Google Services (including, but not limited to, the Google Consumer Flight Search Service) when compared to third-party websites using QPX, be considered in determining Defendants' compliance with any provision of this Final Judgment.

### **Licensing of InstaSearch**

H. At the request of any OTI, Defendants shall negotiate an InstaSearch Agreement with such OTI for a term set at the reasonable discretion of the OTI (but that shall be no less than one year and that need not extend beyond five years from the entry of this Final Judgment, provided that if such InstaSearch Agreement would commence more than four years from the entry of this Final Judgment, its term shall expire five years from the entry of this Final Judgment). Such InstaSearch Agreement shall:

- (1) offer the OTI the same functionality as the InstaSearch Proof of Concept, except that Defendants shall permit the OTI to increase the number of markets covered and contemplated cache refresh rate beyond that of the InstaSearch Proof of Concept, subject to the payment of appropriate fees as set forth below (and such InstaSearch Agreement shall expressly provide that Defendants shall have no obligation to implement any other functionality);
- (2) at Defendants' option, disclaim any representations, warranties, guarantees, or service level agreements as to the performance of the InstaSearch Service, or its fitness for any use, notwithstanding any statements to the contrary made by ITA in connection with the InstaSearch Proof of Concept, including but not limited to in the InstaSearch POC Solution Document, provided that if, during the term of

such QPX Agreement, Defendants make any representations, warranties, guarantees or service level agreements to any Customers as to the performance of the InstaSearch Service, Defendants shall offer the same representations, warranties, guarantees or service level agreements to OTIs with equivalent projected usage of the InstaSearch Service (including the number and types of markets to be covered, refresh rate, provisioned hardware and total expected volume), subject to such OTI agreeing to pay a fair, reasonable and non-discriminatory fee for the receipt of such representation, warranty, guarantee or service level agreement, which may differ from the pricing structure and limits set forth in Section IV.H.4 below.

- (3) provide that Defendants shall have no obligation to improve the InstaSearch Service, except that:
  - (a) if during the term of such InstaSearch Agreement, Defendants provide their Customers, including solely Airline Customers, an implementation of InstaSearch with greater functionality than the InstaSearch Service described herein without requiring them to pay an additional charge (other than in Excluded Software), Defendants shall make reasonable commercial efforts to also make such improved version available to the OTI pursuant to its InstaSearch Agreement (recognizing that not all implementations will be suitable for all types of Customers even after the use of reasonable commercial efforts), under the same pricing terms provided for in such InstaSearch Agreement; and

- (b) if Defendants require its Customers, including its Airline Customers, to pay an additional fee to obtain an upgrade which can be provided to OTIs with reasonable commercial efforts, Defendants shall offer the upgrade to OTIs with an InstaSearch Agreement, but may condition availability of the upgrade on payment of a fair, reasonable, and non-discriminatory charge (which may differ from the pricing structure and limits set forth in Section IV.H.4 below);
  
- (4) obligate the OTI to:
  - (a) provision with Defendants a number of EUs for its InstaSearch Service that, in Defendants' discretion, which shall be applied in a fair, reasonable, and non-discriminatory manner, is reasonable given the OTI's intended covered markets and refresh rate, and to pay a monthly per-EU fee for each EU so provisioned (including any EUs used for computing, storing, managing or retrieving cached results) equal to the lesser of (i) for OTIs with a QPX Agreement in effect, the per-EU fee set forth in such QPX Agreement (giving effect to all volume discounts and aggregating EUs provisioned for InstaSearch with those provisioned for other purposes, including, but not limited to, QPX.); or (ii) a per-EU fee that is fair, reasonable, and non-discriminatory solely in light of the EU fees charged by Defendants to Similarly Situated OTIs in QPX Agreements then in effect.

- (b) pay a fair, reasonable and non-discriminatory per-query fee for each Level 1 and Level 2 Query it submits to the InstaSearch Service that shall be (i) greater than the effective per-query fee paid by such OTI for Database Queries (or, if no such rate exists, an amount that is fair, reasonable, and non-discriminatory in light of the effective per-query fees then charged by Defendants to Similarly Situated OTIs for Database Queries), and (ii) less than the effective per-query fee paid by such OTI for Live Queries (or, if no such rate exists, an amount that is fair, reasonable, and non-discriminatory in light of the effective per-query fees then charged by Defendants to Similarly Situated OTIs for Live Queries); and
- (c) pay a per-query fee for each Level 3 Query it submits equal to the effective per-query fee paid by such OTI for Live Queries (or, if no such rate exists, an amount that is fair, reasonable, and non-discriminatory in light of the effective per-query fees then charged by Defendants to Similarly Situated OTIs for Live Queries).

I. Defendants shall make commercially reasonable efforts to ensure that the InstaSearch Service conforms to the technical specifications set forth in the InstaSearch POC Solution Document, but it is specifically understood that, other than as set forth in any representations, warranties, guarantees or service level agreements that Defendants are otherwise required to make pursuant to this Final Judgment, or that Defendants make in any particular InstaSearch Agreement, Defendants make no representation, either to the United States, the

Court or to any Customer that the InstaSearch Service will prove commercially useful for any Customer.

J. Nothing in this Final Judgment shall be deemed to require Defendants to permit an OTI to host any portion of the InstaSearch Service, or the EUs used for such service, on the OTI's own hardware, notwithstanding any provisions of such OTI's QPX Agreement.

### **Arbitration**

K. Defendants shall negotiate in good faith with any OTI seeking a QPX Agreement or an InstaSearch Agreement pursuant to this Final Judgment (including, but not limited to, existing licensees seeking to renew their agreements). If Defendants and the OTI are unable to reach agreement on the amount to be charged for any type of query pursuant to Sections IV.B.1, IV.C.1, or IV.H.4 of this Final Judgment, Defendants shall submit the matter to binding arbitration under the following conditions:

- (1) Prior to submitting any matter to arbitration, Defendants and the OTI shall each designate a contact having the proper authorization to resolve the dispute in a final and binding fashion, who shall meet in person or by telephone for a period of 30 days (or such other period of time as Google and the OTI shall mutually agree) in an attempt to resolve the dispute. The contact for Defendants shall be Google's General Counsel or his or her designee.
- (2) No arbitration shall be commenced unless the OTI (i) has certified to the United States that it negotiated in good faith, including participation in the

resolution procedure described in the preceding paragraph; and (ii) has obtained the consent of the United States, in its sole discretion, to initiate arbitration.

- (3) Arbitration pursuant to this Final Judgment shall be conducted in accordance with the AAA's Commercial Arbitration Rules and Expedited Procedures, except where inconsistent with specific procedures prescribed by this Final Judgment. As described below in Section IV.J.12, the arbitrator shall select the Final Offer of either the OTI or the Defendants and may not alter, or request or demand alteration of, any terms of those Final Offers. The decision of the arbitrator shall be binding on the parties as to the matters properly submitted to arbitration pursuant to this Final Judgment, and Defendants shall abide by the arbitrator's decision by offering an executable QPX Agreement or InstaSearch Agreement (as appropriate) to the OTI incorporating the pricing terms selected by the arbitrator.
- (4) Defendants and an OTI may, by agreement, modify any time periods specified in this Section IV.J.
- (5) Upon obtaining the consent of the United States to initiate arbitration, the OTI may commence arbitration by filing with the AAA and furnishing to the AAA and the United States its Final Offer. Within five business days of the commencement of an arbitration, Defendants shall file with the AAA and furnish to the United States their Final Offer. After the AAA

has received Final Offers from the OTI and Defendants, it will immediately furnish a copy of each Final Offer to the other party.

- (6) Within five business days of the commencement of an arbitration, the OTI and the Defendants each shall furnish a legally binding writing to the other and to the United States committing to maintain the confidentiality of the arbitration and of any Final Offers and discovery materials exchanged during the arbitration, and to limit the use of any Final Offers and discovery materials to the arbitration. The writing shall expressly state that all records of the arbitration and any discovery materials may be disclosed to the United States.
- (7) At any time after the commencement of arbitration, the OTI and Defendants may agree to suspend the arbitration, for periods not to exceed 14 days in the aggregate, to attempt to resolve their dispute through negotiation. The OTI and the Defendants shall effectuate such suspension through a joint writing filed with the AAA and furnished to the United States. Either the OTI or the Defendants may terminate the suspension at any time by filing with the AAA and furnishing to the United States a writing calling for the arbitration to resume.
- (8) The AAA, in consultation with the United States, shall assemble a list of potential arbitrators, to be furnished to the OTI and Defendants as soon as practicable after commencement of the arbitration. Such potential arbitrators shall, to the greatest extent possible, be individuals familiar

with the travel industry as well as this Final Judgment. Within five business days after receipt of this list, the OTI and Defendants each may submit to the AAA the names of up to 20 percent of the persons on the list to be excluded from consideration, and shall rank the remaining arbitrators in their orders of preference. The AAA, in consultation with the United States, will appoint as arbitrator the candidate with the highest ranking who is not excluded by the OTI or Defendants.

- (9) The OTI and the Defendants shall exchange written discovery requests within five business days of receiving the other party's Final Offer, and shall exercise reasonable diligence to respond within 14 days. Discovery shall be limited to the following items in the possession of the parties: (i) previous agreements between the OTI and the Defendants; (ii) current and prior QPX Agreements and agreements relating to InstaSearch between the Defendants and other OTIs; and (iii) records of past arbitrations pursuant to this Final Judgment.
- (10) The scope of the arbitration shall be limited to the determination of a fair, reasonable and non-discriminatory fee to be charged for each type of query in dispute, judged exclusively in light of the following factors:
  - (a) The OTI's actual or reasonably expected query volume;
  - (b) The minimum query volume to be required in the QPX Agreement or InstaSearch Agreement for such query type;



- (c) The amounts charged for such queries to Similarly Situated OTIs pursuant to QPX Agreements in effect between Defendants and such OTIs, as appropriately adjusted for the change in the Consumer Price Index, for all Urban Consumers, Subgroup “All Items”, U.S. City Average, for (base Year 1982-84=100) subsequent to the date of such agreements; and
  - (d) if applicable, the nature and extent of any representations, warranties, guarantees or service level agreements offered to such OTI.
- (11) In reaching his or her decision, the arbitrator may consider only documents exchanged in discovery between the parties, testimony explaining the documents and the parties’ Final Offers, and briefs submitted and arguments made by counsel.
- (12) Arbitrations under this Final Judgment shall begin within 30 days of the AAA furnishing to the OTI and to the Defendants, pursuant to Section IV.J.5, each party’s Final Offer. The arbitration hearing shall last no longer than ten business days, after which the arbitrator shall have five business days to inform the OTI and the Defendants which Final Offer best reflects fair, reasonable, and non-discriminatory terms under this Final Judgment.
- (13) The Arbitrator shall have no authority to consider or determine Defendants’ compliance with the terms of this Final Judgment or with any

other agreement, or to determine the reasonableness of any provision of a proposed or negotiated QPX Agreement or InstaSearch Agreement other than those for which arbitration was specifically provided for above.

(14) Any Arbitrator's fees and any costs payable to the Arbitrator shall be shared equally by the parties to the arbitration. Each party to the arbitration shall bear its own legal fees and expenses.

L. Nothing in Section IV.K shall prevent Defendants from agreeing with an OTI (i) on fees or other terms that are more favorable to the OTI than those required by this Final Judgment, (ii) to withdraw a matter from arbitration prior to decision; or (iii) to supersede a previously arbitrated rate as a part of a freely negotiated contract or amendment.

M. Nothing in Section IV.K shall limit the ability of the United States to enforce this Final Judgment in Court, including as to matters covered by an existing or potential arbitration proceeding.

#### **Required Disclosures**

N. Google shall, throughout the Reporting Period, make available a web page at <http://itaqualifyingcomplaint.com> which shall contain a web form permitting OTIs to submit Qualifying Complaints, as well as a link to this Final Judgment, and shall, on a semiannual basis during the Reporting Period, furnish copies of any Qualifying Complaints received via such form to the Department of Justice.

O. To the extent that, during the Reporting Period, an attorney employed by Google's Legal Department (or an outside attorney retained by Google and acting at the direction

of Google's Legal Department) communicates with an OTI with respect to a written complaint that the Google attorney reasonably believes would, if submitted as set forth in the preceding paragraph, be a Qualifying Complaint, such attorney shall take reasonable steps to ensure that the OTI is informed of its right to submit a Qualifying Complaint and the web address at which it can do so.

V. **ADDITIONAL PROVISIONS**

A. Defendants shall not enter into any agreement with an airline that restricts that airline's right to share any Availability Information with parties other than Defendants, provided that this paragraph shall cease to apply to any type of Availability Information (regardless of source) if one or more airlines enters into an agreement with one or more of Defendants' competitors (either in the provision of airfare pricing and shopping services or in the provision of OTI services) that restricts that airline's right to share such Availability Information with parties other than such competitor(s).

B. To the extent that Defendants obtain Availability Information from any airline for use as an input to an airfare pricing and shopping engine used by the Google Consumer Flight Search Service, Defendants shall also incorporate such Availability Information into QPX results generated for all OTIs who are party to a QPX Agreement, unless the airline explicitly and unilaterally restricts the use of such Availability Information by or for one or more OTIs. Defendants shall not provide any incentive to an airline to restrict the use of Availability Information by another OTI.

C. Notwithstanding the foregoing, nothing in this Final Judgment shall (i) restrict Defendants' right to enter into agreements by which they become an authoritative source of an

airline's Availability Information for third parties (including, but not limited to, agreements to provide passenger service systems, reservations systems, availability hubs or similar systems); or (ii) be deemed to prohibit Defendants from obtaining access to or using Availability Information merely because the providing airline has not provided it to any party other than Defendants, so long as the airline retains the right to provide such Availability Information to another party at any time, in its unilateral discretion.

D. Defendants shall not condition the provision of QPX or the InstaSearch Service on whether or how much an OTI spends on other products or services sold by Google.

E. Nothing in this Final Judgment shall be deemed to alter, in any way, the terms of any agreement Defendants may have with any customer related to any product or service other than QPX or the InstaSearch Service.

## VI. FIREWALL

A. No Covered Employee shall access any OTI Configuration Information or any OTI Plan Information, except to the extent such information constitutes or is included within QA Information, or with the written consent of the OTI concerned.

B. Defendants shall not use OTI Confidential Information for any purpose other than:

- (1) in connection with the marketing, sale, or provision of any product or service to such OTI (or, with the consent of such OTI, or its Affiliates);

- (2) in connection with billing, invoicing, financial reporting, financial or capacity forecasting, compensation, audit, legal, compliance, or similar administrative or financial purposes;
- (3) in connection with the development, maintenance and improvement of QPX and the InstaSearch Service, in accord with ITA's past practices prior to agreeing to be acquired by Google; or
- (4) as permitted by such OTI in writing.

C. Notwithstanding anything in this Final Judgment, Defendants shall be permitted to access and use QA Information in connection with the development, maintenance and improvement of Defendants' airfare pricing and shopping engines (including those not made available to any Customers), provided that Defendants shall not extract any customer identifiable OTI Configuration Information or use any OTI Configuration Information for the purpose of changing, improving or comparing the Google Consumer Flight Search Service's use of any airfare pricing and shopping engine.

D. Defendants shall implement reasonable procedures to prevent OTI Confidential Information from being used or accessed by employees other than those having a legitimate need for such information in connection with the permitted uses of such information set forth in this Section VI. Nothing in this Final Judgment shall restrict Defendants' right to assign any employee to any job responsibility, or otherwise to restrict the ability of employees who have previously had access to or used OTI Confidential Information in the course of prior job responsibilities from subsequently assuming additional or different responsibilities for Defendants, provided that such employees shall not use OTI Confidential Information for any

purpose other than as permitted by this Final Judgment. An employee shall not be deemed to have “used” OTI Confidential Information solely on account of his or her prior access to OTI Confidential Information, absent evidence of intentional reliance on information other than information that is retained in the unaided memory of such employee (provided that memory is “unaided” if the employee has not intentionally memorized the information for the purpose of retaining and subsequently using or disclosing it) or an affirmative intention to violate or evade the terms of this Final Judgment. Defendants shall, upon the reasonable request of the United States, provide the United States with a list of employees who have had access to or used OTI Confidential Information at any point after the filing of the complaint in this matter who also have job responsibilities in addition to those set forth in Section VI.B, above.

E. Defendants shall, within thirty (30) calendar days of the entry of the Stipulation and Order, submit to the Department of Justice a document setting forth in detail the procedures implemented to effect compliance with Sections VI.A, VI.B, and VI.C of this Final Judgment. The Department of Justice shall notify Defendants within ten (10) business days whether it approves of or rejects Defendants’ compliance plan, in its sole discretion. In the event that Defendants’ compliance plan is rejected, the reasons for the rejection shall be provided to Defendants and Defendants shall be given the opportunity to submit, within ten (10) business days of receiving the notice of rejection, a revised compliance plan. If the parties cannot agree on a compliance plan, the United States shall have the right to request that the Court rule on whether Defendants’ proposed compliance plan is reasonable.

F. Defendants may at any time submit to the United States evidence relating to the actual operation of the firewall in support of a request to modify the firewall set forth in Section VI. In determining whether it would be appropriate for the United States to consent to modify

the firewall, the United States, in its sole discretion, shall consider the need to protect OTI Confidential Information and the impact the firewall has had on Defendants' ability to efficiently support OTIs and the Google Consumer Flight Search Service.

VII. **COMPLIANCE INSPECTION**

A. For purposes of determining or securing compliance with this Final Judgment, or of determining whether the Final Judgment should be modified or vacated, and subject to any legally recognized privilege, from time to time duly authorized representatives of the Department of Justice, including consultants and other persons retained by the Department of Justice, shall, upon written request of an authorized representative of the Assistant Attorney General in charge of the Antitrust Division, and on reasonable notice to Defendants, be permitted

- (1) access during the Defendants' office hours to inspect and copy, or at the option of the United States, to require Defendants to provide to the United States hard copy or electronic copies of, all books, ledgers, accounts, records, data, and documents in the possession, custody, or control of Defendants, relating to any matters contained in this Final Judgment; and
- (2) to interview, either informally or on the record, the Defendants' officers, employees, or agents, who may have their individual counsel present, regarding such matters. The interviews shall be subject to the reasonable convenience of the interviewee and without restraint or interference by Defendants.

B. Upon the written request of an authorized representative of the Assistant Attorney General in charge of the Antitrust Division, Defendants shall submit written reports or respond to

written interrogatories, under oath if requested, relating to any of the matters contained in this Final Judgment as may be requested. Written reports authorized under this paragraph may, at the sole discretion of the United States, require Defendants to conduct, at their cost, an independent audit or analysis relating to any of the matters contained in this Final Judgment.

C. No information or documents obtained by the means provided in this section shall be divulged by the United States to any person other than an authorized representative of the executive branch of the United States, except in the course of legal proceedings to which the United States is a party (including grand jury proceedings), or for the purpose of securing compliance with this Final Judgment, or as otherwise required by law.

D. If at the time information or documents are furnished by a Defendant to the United States, the Defendant represents and identifies in writing the material in any such information or documents to which a claim of protection may be asserted under Rule 26(c)(1)(G) of the Federal Rules of Civil Procedure, and the Defendant marks each pertinent page of such material, "Subject to claim of protection under Rule 26(c)(1)(G) of the Federal Rules of Civil Procedure," then the United States shall give the Defendants ten (10) calendar days notice prior to divulging such material in any legal proceeding (other than a grand jury proceeding). The United States will provide such notice electronically to an individual designated by Google to receive such notices.



VIII. **RETENTION OF JURISDICTION**

This Court retains jurisdiction to enable any party to this Final Judgment to apply to this Court at any time for further orders and directions as may be necessary or appropriate to carry out or construe this Final Judgment, to modify any of its provisions, to enforce compliance, and to punish violations of its provisions.

IX. **EXPIRATION OF FINAL JUDGMENT**

Unless modified by this Court, this Final Judgment shall expire five years from the date of its entry.

X. **PUBLIC INTEREST DETERMINATION**

Entry of this Final Judgment is in the public interest. The parties have complied with the requirements of the Antitrust Procedures and Penalties Act, 15 U.S.C. § 16, including making copies available to the public of this Final Judgment, the Competitive Impact Statement, and any comments thereon and the United States' responses to comments. Based upon the record before the Court, which includes the Competitive Impact Statement and any comments and response to comments filed with the Court, entry of this Final Judgment is in the public interest.

Date: \_\_\_\_\_

Court approval subject to procedures of the Antitrust Procedures  
and Penalties Act, 15 U.S.C. § 16.

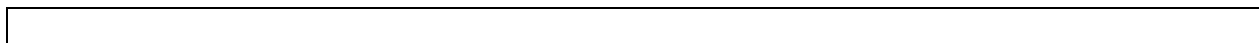
\_\_\_\_\_  
United States District Judge

# Exhibit 1

**Affinity Search  
Solution Document /  
Interface Definition Document  
for  
[REDACTED]**



**ITA Software, Inc.  
01 December, 2010**



[REDACTED] Affinity Search Solution Document / Interface Definition Document  
ITA Software, Inc.  
01 December, 2010



## VERSION HISTORY

v1.0	2010-12-Oct	Peter Fernandez Tom Kirchman Geoff Andrew David Olliges Any Meyer Andrzej Walczak
V2.0	2010-25-Oct	Merged with IDD + response to feedback from [REDACTED]
V3.0	2010-15-Nov	Revision with multiple clarifications
V4.0	2010-01-Dec`	Multiple clarifications for inclusion in agreement



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## 1 INTENT OF THIS DOCUMENT

The purpose of this document is to describe ITA's understanding of the requirements for the [REDACTED] Affinity Search project, as it pertains to ITA's major deliverables. This document can serve as a common source of understanding about the project, and a reference point in terms of deliverables, scope and major requirements.

## 2 INTRODUCTION

[REDACTED], one of the global leaders in air travel, has enlisted ITA to develop an airfare search tool that will be deployed on both the [REDACTED] and [REDACTED] websites. Dubbed Affinity Search, the ITA-hosted service will cater to travelers who have less specific travel plans, allowing searches by wide ranges of travel dates, destinations and lengths of stay. Using the latest in ITA's low fare search technology, Affinity Search will be deployed as two separate instances of a single implementation, with each instance tailored to the specific business and technical requirements of [REDACTED].

[REDACTED] is pursuing a target launch date of [REDACTED], with the release of the new search product to a single point of sale. The system will be deployed more widely as deemed appropriate, and continuing into a six month total trial deployment.

### 2.1 Business Context

The objective of Affinity Search is to attract new types of customers, and provide an improvement to [REDACTED] conversion ratio.

### 2.2 Major Milestones

ITA has been tasked with providing 3 high-level deliverables for the Affinity Search project:

1. An Interface Definition Document (IDD), that describes the mechanisms for passing searches to the system, and consuming and interpreting the results. This document will also define processes for auxiliary services of the system, such as a BIS-like feedback / solution quality assurance mechanism. This will be delivered in the form of a Microsoft Word document containing example syntax, XSD's, field definitions and special instructions.
2. A functional test system ready for integration testing. This system will support both level 1 and level 2 queries, though will be limited in some functional ways (ie, promotions will likely not be fully implemented, but will be complete in terms of interface, so that work will not have to be re-done on the [REDACTED] side)
3. A live production environment ready for service prior to the culmination of UAT.

Other relevant services by ITA will be provided in support of these basic deliverables, such as integration of critical data feeds, server and network deployments, pricing consultation, reporting, project management and work covered by a Service Level Agreement (SLA) to be agreed upon by ITA and [REDACTED].

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## 2.3 Project Milestone Delivery Timeline

The following milestone dates for the Affinity Search project has been identified.

- [REDACTED]

These milestones will be tracked in a comprehensive project plan delivered weekly to [REDACTED] with the ITA weekly status report and issue log.

It should be noted that the above timeline dates are independent of the implementation of the [REDACTED] and [REDACTED] projects (see section 6).

## 2.4 Relevant Documents

Further description of business goals and general requirements can be found in the following documents, available upon request from [pfernandez@itasoftware.com](mailto:pfernandez@itasoftware.com):

RFP\_AffinitySearch.doc, dated 9 April 2010

PID Inspire – Affinity Search\_v1 draft, dated 5 October 2010

User interface and ITA data v0.12.mpp, dated 29 September 2010

These documents were supplemented by in-person meetings in [REDACTED] and Cambridge to solidify requirements and make agreements on the implementation. This document is the product of these sources.

## 2.5 General Assumptions

The following assumptions are made by ITA in composing this solution document and planning the Affinity Search project.

- [REDACTED] are responsible for the implementation of the front end application, and collaborating with a design firm to create the user interface and all graphical elements
- [REDACTED] front end applications will directly access two separate ITA API services, one for cached queries and one for live QPX queries (see section 3.2 for details)
- [REDACTED] has decided to forego the development of an alternate level 1 interface, as ITA and [REDACTED] will make every effort to represent markets in the cache that have the most commercial value. Those not present in the cache will be of low enough commercial value to be considered unnecessary for inclusion
- The [REDACTED] solution is not a necessary element to have in place for the launch of Affinity Search. The [REDACTED], however, is considered a key dependency for launch (see section 6 for a list of key dependencies)
- Management of this document and the project as a whole will be conducted as per the governance model outlined in the project charter document



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## 2.6 Success Criteria

[REDACTED] have identified the following criteria which will be factored into their consideration of the success of the Affinity Search project.

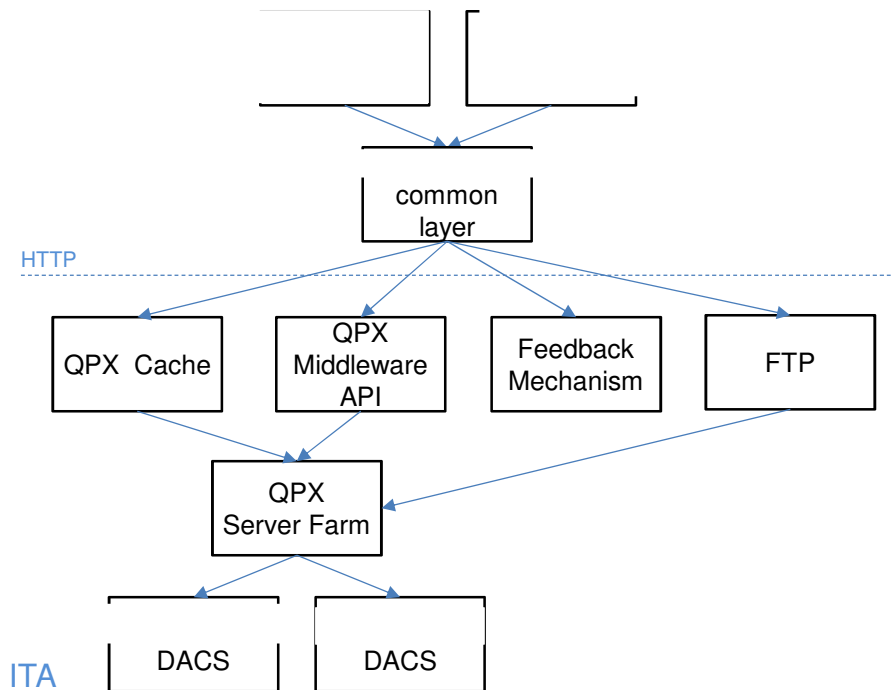
- Affinity Search services must be available 99,5%
- Trip availability must match with the [REDACTED] and [REDACTED] websites at a rate of at least 90%
- Fare/Quote information (including taxes and surcharges) must be accurate up to an equivalent of 5 euro difference
- Promotion data must be 95% accurate with a backlog of max 1 day.
- System performance meets the requirements outlined in the original RFP
- Positive internal feedback by users [REDACTED] website
- Response times of services must be less than or equal to 3 seconds

## 2.7 Change Control

Any changes to the scope as outlined in this document after official signoff must go through a formal change request process, as described in the Project Charter, with the understanding that changes in functional requirements may impact the agreed-upon delivery schedule.

# 3 SOLUTION ARCHITECTURE

## 3.1 Overview



**Figure 2:** [REDACTED] Affinity Search Functional Model

The above diagram illustrates the core logical units of the Affinity Search project.

- [REDACTED] **Website** – [REDACTED] and all country sites
- [REDACTED] **Website** – [REDACTED] and all country sites
- [REDACTED] **Common Layer** - the middleware layer that both carrier websites will use to communicate to ITA systems
- **QPX middleware API** – High-level XML interface that sends live queries to the QPX Server Farm
- **QPX Cache** – the database of collected airfare pricing information populated by an automated process that queries the QPX Server Farm on a regular basis. It is accessed via an HTTP API
- **QPX Server Farm** – the collection of QPX Execution Units (EU's) that respond to airfare pricing queries from the live QPX interface and automated cache process. Accepts and returns XML
- **Feedback Mechanism** – the specialized XML API for providing ITA comparative itineraries between ITA and the [REDACTED] host system for solution quality evaluation
- **FTP** – an ITA-hosted FTP server to which [REDACTED] will transfer custom data files (see section 5)
- [REDACTED] **DACS** – provides availability information for [REDACTED] and its partners to QPX queries for use in returning pricing solutions. Similar to the [REDACTED] DACS, this is being implemented by ITA under a separate, but closely integrated project.

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- [REDACTED] **DACS** – provides availability information for [REDACTED] and its partners [REDACTED] to QPX queries for use in returning pricing solutions

The architecture and functions of each unit are described in detail in the following sections.

## 3.2 Service Model

All servers and data needed to return airfare pricing solutions for Affinity Search will be hosted by ITA and accessed by [REDACTED] via internet-based connectivity. Additional data specific to [REDACTED] will be provided to ITA and integrated into the functions of the pricing engine and related applications. Uptime and performance of all ITA services is subject to the Service Level Agreement (SLA), described in the Master Services Agreement (MSA) between ITA and [REDACTED].

### 3.2.1 QPX middleware API

[REDACTED] will use the QPX middleware API, also known as “Boombox”, to send queries to live QPX servers through a specified custom XML interface. The API will run one or more QPX queries and return aggregated results directly to the calling application.

### 3.2.2 QPX Cache

The QPX Cache is designed to return highly compact airfare pricing information very quickly, to fulfill [REDACTED] requirement to be able to retrieve results in less than three seconds. The QPX Cache will maintain a collection of availability-checked fare market data pulled from QPX that will be used to populate the responsive, interactive interface for Affinity Search. The cache will be tailored for [REDACTED] to best advance their business goals, and be updated on a schedule that optimizes server usage, solution quality and the amount of data that can be stored.

The QPX Cache will be populated based on the following basic parameters:

- A list of points of sale & markets (origins & destinations) specified by [REDACTED] to be included in the cache, which will be shared by the two carriers.
- A total of 300,000 solution sets, across both brands and all points of sale, will be represented in the cache. In this context, a solution set is defined as a unique combination of point of sale, origin and destination and carrier. This number is based on a consistent cache refresh rate of 48 hours for every solution set in the cache, and is subject to reduction if [REDACTED] elects to refresh some markets more frequently than every 48 hours.
- For each solution set included in the cache, all trips departing between the day the query takes place and the following 180 days will be included in the cache
- For each solution set included in the cache, and each departure date, all trips that have a length of stay between 1 and 31 days will be included in the cache
- Only round-trip, single adult passenger solutions are considered

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For each of the 300,000 specified solution sets, the cache will contain a price for each departure date and each trip duration. The price may be simply the ticket price, or it may include taxes or taxes and booking fees, depending on the POS and market. It is up to [REDACTED] to indicate which markets / points of sale require which kind of price data. In addition, each market, POS, departure date and trip duration cell will include a Boolean indicator whether the price corresponds to a promotional fare.

### 3.2.3 QPX Server Farm

Affinity Search airfare pricing solutions will be launched into production running the current release version of QPX, running on servers hosted by ITA. As determined necessary, ITA will integrate new data sources for information required to properly return [REDACTED] solutions, such as schedules, taxes, and private fares. When possible, ITA will integrate custom [REDACTED] data, such as business rules that affect what schedules and fares may be included in results. See section 5 for descriptions of all required custom data.

ITA will also endeavor to fulfill [REDACTED] requirements to match the pricing of [REDACTED] host system. ITA will implement a mechanism to monitor solution quality to aid in this effort, described in section 4.3.

### 3.2.4 [REDACTED] and [REDACTED] DACS

To supplement the Affinity Search pricing solutions with optimal availability data, [REDACTED] and [REDACTED] are implementing dynamic inventory calculation solutions with ITA. The [REDACTED] DACS is a key dependency for the Affinity Search project. The availability systems for [REDACTED] and [REDACTED] are being implemented by ITA under separate, but closely-integrated projects, with their own timelines and deliverables.

## 4 SOLUTION REQUIREMENTS

### 4.1 Overview

The Affinity Search application's basic feature is to allow the traveler without specific journey plans to select from a wide variety of options for destinations over a wide date range. The selection process takes place through 2 basic interfaces, coined "level 1" and "level 2", both powered by queries to ITA services. ITA's interaction ends when the traveler has picked an origin, destination, and travel dates, though full itinerary and fare information is sent back via ITA's feedback mechanism (section 4.3) for quality assurance purposes. The [REDACTED] website interface will then use those parameters to pick specific itineraries and pricings based on direct queries to the [REDACTED] host system's [REDACTED] product.

### 4.2 Level 1 Query

The "level 1" query serves as the point of entry into Affinity Search, and is the dominant feature of the application, using Google Maps as a key component of the interface. The traveler, having entered the website via the country site pick list, is presented with an origin list to pick from. Once one or more origins is selected, a query is sent to ITA to present an array of destinations available for that origin, represented by markers on the geographical locations of those

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destinations in the Google Maps interface. Input controls in the level 1 interface allow the traveler to refine the results by date of departure, length of stay, and maximum price.

The level 1 query results will be populated by a query to the QPX Cache, which will return the lowest price for each destination in the departure date range with no greater than 800 destinations (and prices) returned per query. Each set of solutions will contain one solution per destination, regardless of how many origins are entered as input.

Solutions from the QPX Cache will be processed by the application layer of the carrier's websites to display, for each point on the map, the total number of destinations for that map region, as well as the lowest price for all destination / date combinations for that region.

## 4.2.1 Interface Definition

### 4.2.1.1 Connectivity

ITA Cache Search is accessed through a stateless protocol a la REpresentational State Transfer (REST) architecture. This means that all query parameters, which specify the requested information, need to be included with each query. This is also the case with HTTP connections that allow multiple queries per connection, utilizing the HTTP 1.1 keep-alive feature.

#### 4.2.1.1.1 HTTP Request

Requests for information are presented to the ITA Cache Search servers using the HTTP protocol over the TCP/IP stack. Clients of ITA Cache Search access the information through a specified IP address resolving to the **cachesearch.ita software.com** domain name. The current server supports parts of the HTTP 1.0 and HTTP 1.1 protocol. An HTTP 1.1 request looks like the following:

```
GET /prices.xml?from=BOS&to=ORL&minDepartureDate=2010-08-14&maxDepartureDate=2010-09-14&minTripLength=14&maxTripLength=21&POS=[REDACTED] HTTP/1.1
Host cachesearch
User-Agent Mozilla/5.0
Accept-Encoding gzip, deflate
Keep-Alive 300
Connection keep-alive
Referrer http://cachesearch/demo/destinationSearch.html
```

The only accepted HTTP method is GET, where the absolute path of the resource is followed by a question mark and ampersand delimited parameters. Interpreted HTTP headers include *Accept-Encoding*, *Keep-Alive*, *Connection* and, *Referrer*. *Accept-Encoding* may specify that the client wishes for a compressed version of the data which reduces the data flow and transmission times. *Keep-Alive* and *Connection* specify that the connection to the server will be maintained, reducing the number of connection attempts and latencies due to TCP's three way handshake. *Referrer* is used for accounting in the case of the XSS usage scenario.

#### 4.2.1.1.2 HTTP Response

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The ITA Cache Search service may respond with any of the following HTTP Status Codes:

Status Code	Description
<b>200 OK</b>	Success
<b>304 Not Modified</b>	There was no new data to return.
<b>400 Bad Request</b>	The request is invalid! The server includes a short explanatory message.
<b>401 Not Authorized</b>	Either the client needs to provide authentication credentials, or the credentials provided were not valid.
<b>403 Forbidden</b>	This is a valid request, but ITA Cache Search refuses to fulfill it. The server includes an explanatory error message.
<b>404 Not Found</b>	Either the requested URI is invalid, the resource in question doesn't exist, or the information for the query parameters specified wasn't found.
<b>500 Internal Server Error</b>	The servers could not serve the request. The error has been noted and will be investigated.
<b>502 Bad Gateway</b>	The servers are down or being upgraded.
<b>503 Service Unavailable</b>	The servers are up running but are overloaded with requests.

Most error codes are accompanied by an explanatory error message. In the case when everything was fine, the response may look like this:

```
HTTP/1.1 200 OK
Date: Fri, 17 Oct 2008 17:55:29 GMT
Server: IS.API/2.x.x
Content-Type: application/xml
Keep-Alive: timeout=60
Connection: Keep-Alive
Content-Length: 147

<results count="1" version="2.x" type="prices">
  <solution price="228.50" from="BOS" to="ORL" departs="2008-11-01" returns="2008-11-15"/>
</results>
```

This indicates a few things:

- ITA Cache Database Server version was *IS.API/1.3.1*.
- The content served back to the user has the MIME type of *application/xml*.
- The server will keep the connection alive for *60* seconds and expects the client to do the same.



- The content, which follows after one empty line terminated with LF/CR, is 147 bytes long.

## 4.2.1.2 Syntax

### 4.2.1.2.1 The Prices Query

When looking at the URI used to access the ITA Cache Search service, the first part after the host name and before the query parameters, as marked by a question mark, is the access method.

```
http://cachesearch/prices.xml?from=BOS&to=ORL&tripLength=14
```

### 4.2.1.2.2 Parameters

When looking at the URI used to access the ITA Cache Search service, the part after the host name, access method, and question mark, is called the query string. This query string includes the query parameter. In the example below, there are four query parameters with their values: *from*, *to*, *departureDate*, *tripLength*.

```
http://cachesearch/prices?from=BOS&minDepartureDate=2009-11-02&maxepartureDate=2009-12-15&minTripLength=7&maxTripLength=14&pos=[REDACTED]
```

Each query parameter is a key-value pair, where the key is separated from the value with an equal sign, '='. The key-value pairs are delimited by an ampersand, '&', or by a semicolon, ';'. The interpretation of each value depends on its associated key. With some parameters, the server takes only the first value specified. With other parameters the server will accept multiple values as specified after the equal sign (such as origins or destinations). Multiple values to a parameter can be separated with space (which is represented as '%20' or '+' when URL encoded) or with a comma, ','. Instead of listing multiple values under one key, the client may specify multiple key-value pairs, each of varying length. The resulting set of values will be the union of all value sets for all key-value pairs for the given key. The server accepts properly URL encoded query lines, where special characters like the space are escaped using the URL encoding schema.

### 4.2.1.2.3 Encoding

ITA Cache Search servers can produce data at a rate much higher than usual hard disc writes and network throughput. Since transmission times are the main part of time spent before results of the query are available to the client, the ITA Cache Search servers usually encode the response using GZIP as specified by the HTTP standard. This behavior is regulated by the client request HTTP header line stating with *Accept-Encoding*. The presence of the *gzip* flag in the value instructs the server to send gzipped responses. The server will not encode the response if this flag is missing, or if the size of the content is below some specified threshold (usually 1 KB). When the server does send gzipped content, the HTTP response header will include *Content-Encoding: gzip*. The debug GET parameter *?gzip=false* will override the default browser-server behavior and switch off the gzip encoding.

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#### 4.2.1.2.4 Authentication

The ITA Cache Search server supports the following authentication schemata. For a proxy based usage scenario the client will be authenticated by their IP address, access port on the IS Server, and assigned clientID.

An additional level of security can be attained by using a secret exchange schema, where the web page authentication server holds a mutual secret with the ITA Cache Search servers and uses the secret to authenticate online clients by securely hashing the secret with the online client IP. This authentication schema is especially useful in a XSS usage scenario, when the simple HTTP referrer based authentication is not sufficient for the customer.

#### 4.2.1.2.5 Input

The following input parameters can be included in the level 1 query to the QPX Cache:

PARAMETER	NAME	[REDACTED] Mapping	SAMPLE	M?	DESCRIPTION
BRAND	N/A	brandCode	N/A	N/A	This will map to the port of the QPX Cache server constructed to accept requests for that brand
ORIGIN	From	Station->code	[REDACTED]	Yes	Comma or space separated three letter city or airport codes of the origin location of the first slice.
DEPARTURE DATE RANGE – BEGIN	minDepartureDate	DeparturePeriod->startDate	2010-12-01	Yes	A date specifying the beginning of range of requested dates of departure
DEPARTURE DATE RANGE – END	maxDepartureDate	DeparturePeriod->endDate	2010-12-31	Yes	A date specifying the end of range of requested dates of departure.



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POINT OF SALE	Pos	PointOfSale->officeID	[REDACTED]	Yes	Valid office ID
MAXIMUM PRICE	<b>maxPrice</b>		1-...	No	The maximum price in the currency designated for the point of sale
DAYS OF STAY RANGE – BEGIN	<b>minTripLength</b>		1 ... 60	Yes	A number specifying the minimum of the range of trip durations in days used for the trip.
DAYS OF STAY RANGE – END	<b>maxTripLength</b>		1 ... 60	Yes	A number specifying the maximum of the range of trip durations in days used for the trip.
DEPARTURE DAY OF WEEK	<b>departureDayOfWeek</b>	DeparturePeriod->daysOfWeekDeparture	0 - 6 (modulo 7 days of a week; 0 = Sunday)	No	One or more valid days of week
RETURN DAY OF WEEK	<b>returnDayOfWeek</b>	DeparturePeriod->daysOfWeekReturn	0 - 6 (modulo 7 days of a week; 0 = Sunday)	No	One or more valid days of week

#### 4.2.1.2.6 Input Example

```
http://cachesearch/prices.xml?from=[REDACTED]&minTripLength=18&maxTripLength=24&minDepartureDate=2010-11-01&maxDepartureDate=2010-12-31
```

#### 4.2.1.2.7 Output

Results are presented in XML. The root element is *results*, and the attribute *count* describes the number of solutions returned. The attribute *type* is the direct reflection of the method used for the search.

Each solution will include the attribute *price*, specifying the total sale price of the solution in the currency associated with the point of sale. The attributes *from* and *to* specify locations of the

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origin and destination of the trip. The cities are uppercase the airports are lowercase three letter acronyms. The attributes *departs* and *returns* specify the departure and return dates of the solution in the time zone of the trip origin and destination, respectively.

The following fields will be returned from the QPX Cache for each market in a Level 1 query. Note that the level 1 query returns the lowest price for each market across the entire date range searched:

PARAMETER	NAME	[REDACTED] Mapping	SAMPLE	DESCRIPTION
ORIGIN	Results/solution@from		[REDACTED]	3-letter city code of trip origin
DESTINATION	results/solution@to		[REDACTED]	3-letter <b>city</b> code of trip destination
CURRENCY CODE	results/solution@currency	currencyCode	EUR / USD	3 letter currency code used in the solution's price
PRICE	results/solution@price	Price	500	Numeric value of cost of solution
PROMOTION FLAG	results/solution@promo	promotionCode	YES / NO	Boolean indicating whether solution is a promotional fare

#### 4.2.1.2.8 Output Example

The response is excerpted, as there would normally be many more rows:

```
<results count="416" version="ITA.CS.API/v2.x.x" type="prices">
<solution price="168.00" currency="EUR" from="AMS" to="LON"
promo="NO"/>
<solution price="956.50" currency="EUR" from="AMS" to="cur"
promo="NO"/>
<solution price="170.50" currency="EUR" from="LON" to="MAD"
promo="NO"/>
<solution price="268.50" currency="EUR" from="AMS" to="ROM"
promo="YES"/>
<solution price="143.50" currency="EUR" from="PAR" to="bcn"
promo="NO"/>
<solution price="236.50" currency="EUR" from="AMS" to="gva"
promo="NO"/>
<solution price="518.00" currency="EUR" from="LON" to="NYC"
promo="NO"/>
<solution price="255.50" currency="EUR" from="PAR" to="MIL"
promo="NO"/>

etc...

</results>
```



#### 4.2.1.2.9 Error Handling

Errors are signaled using HTTP response status codes or using an error response content. Errors 'value error' caused by incorrect parameter values and 'zero results' caused by incorrect query specification are signaled using the HTTP 200 OK status and a proper error content for output formats: XML, JSON, and JS.

Example XML: [/prices.xml?from=B0S](#)

```
<results count="0" version="2.x.x" type="prices">
  <error type="value error" key="from" value="B0S" reason="value
  is not a proper location code"/>
</results>
```

The condition *value error (Bad Request)* is only signaled if the ITA Cache Search server detected that the given set of parameters doesn't pose a valid query. This is done only at parameter validation time. The condition *zero results (Not Found)* signals that the ITA Cache Search server could not find any results, because it could prove that the given parameters would yield an empty set of search results.

HTTP code *Internal Server Error* is returned, when the server was not able to perform the search due to unspecified reasons. The connection to the client is then closed even if a keep-alive flag was set. *Internal Server Error* is always signaled at the HTTP protocol level using HTTP response code. The client application should also handle the case when the server doesn't respond to the request and doesn't close the connection.

#### 4.2.2 Level 2 Query

The level 2 query narrows the result set to the destination selected in level 1, and returns the cheapest solution for each day in a range of one full month of departure days for the origin and destination specified. A price will be returned for each of seven days of stay.

If the GUI will contain multiple calendar months in its display, an additional query will be needed to retrieve data for each month. ITA recommends that multiple queries be performed serially to optimize server usage.

The level 2 interface will employ direct queries to QPX to return fully-priced, availability-checked pricing solutions. Queries will be processed via the QPX middleware, and one or more queries sent to QPX. Results will be collected by the middleware and returned to the calling application.

Settings to be applied to these queries include:

- Only round-trip solutions are considered
- A range of dates for days out from the day the query was made, to 330 days into the future, with a 31 day range in each query.
- Lengths of stay can be specified in a range not exceeding 7 days. The range can begin or end anywhere between 1 and 330 days (with the understanding that solutions likely will not exist for ranges past 330 days)
- Multiple passengers and types will be permitted

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- Solutions are returned for all date combinations that conform to the 7-day maximum layover range

#### 4.2.2.1 Interface Definition

##### 4.2.2.1.1 Connectivity

The Boombox API server supports XML requests over HTTP. HTTP response codes and session handling are the same for all protocols. The HTTP header "Accept-Encoding: gzip" is required, and enables gzip'd output for responses.

##### 4.2.2.2 Input

The following values can be passed to the level 2 query for consideration in QPX results.

PARAMETER	NAME	[REDACTED] ] Mapping	SAMPLE	M?	DESCRIPTION
ORIGIN	inputs@origin	Station->Code	[REDACTED]	Yes	3-letter airport code or city code to use as journey origin
DESTINATION	inputs/destination	Station->Code	[REDACTED]	Yes	3-letter airport or city code to use as journey destination – maximum of 20 allowed
PASSENGER TYPE	inputs/passengers	PaxType->code/ PaxType->number	ADT, INF, CNN, SRC	Yes	One or more passenger type codes, one for each passenger to be included in the search
DEPARTURE DATE	inputs/departure	DeparturePeriod->startDate	2010-11-12	Yes	Beginning date for 30 day range of trip departure
POINT OF SALE	inputs@officeID	PointOfSale->officeID	[REDACTED]	Yes	Valid Office ID
LENGTH OF STAY – MIN	inputs@minStay	Stay->minNumber OfDays;	Integer	Yes	Integer value representing minimum desired number of days of stay

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LENGTH OF STAY – MAX	inputs@maxStay	Stay->maxNumber OfDays	Integer	Yes	Integer value representing maximum desired number of days of stay. Note difference of max length of stay and min length of stay must not exceed 7 days
BRAND	search@key	Brand->brandCode	[REDACTED]: ym Rz0AbZICqLLtuFn VqhPs [REDACTED]: iaLF QhmTxglnrVDwaz FNFu	Yes	Unique key identifying the Boombox query to be used – this will be individual between [REDACTED] and [REDACTED]
SUMMARIZER	search/summarizer	N/A	pricePerDate	Yes	The pre-configured output mask that will be used to return results.

#### 4.2.2.3 Input Example

```
<?xml version="1.0" encoding="UTF-8"?>
<search key="EdQCLyJBt1AfLwNtIFRTU1" name="multiDate" version="?">
  <inputs departure="2008-10-27" maxStay="9" minStay="3"
officeID="test123" origin="BOS">
    <destination>[REDACTED]</destination>
    <passengers adults="1"/>
  </inputs>
  <summarizer>pricePerDate</summarizer>
</search>
```

#### 4.2.2.4 Output

The following values will be returned in the level 2 query results.

PARAMETER	NAME	[REDACTED] Mapping	SAMPLE	DESCRIPTION
DEPARTURE	result/pricePerDate/depart	DepartureDate-	YYYY-MM-DD	Date and time of

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DATE	ure@date	>departuredate		trip departure
LENGTH OF STAY	result/PricePerDate/depart ure/options/return/length OfStay		5	Integer indicating duration of stay at destination
PRICE	result/pricePerDate/depart ure/options/return/solution /displayTotal@amount	Calendar- >minimumPrice	321.40	Price in local currency of the cheapest solution to the entry's destination, displayed according to price detail instructions (see section 5.9)
CURRENCY	result/pricePerDate/depart ure/options/return/solution /displayTotal@currency	Calendar- >currencyCode;	EUR	3-letter code of the currency in which price is display
PROMOTION	solution/ext/@promo	ReturnDate- >promotionCode	Alphanumeric	Indicates whether the cheapest solution in this market is a special marketing promotion (see section 4.5.3 for details)
SOLUTION ID	result/PricePerDate/depar ture/options/return/solutio n/Id		Alphanumeric	Unique identifier for a specific solution, used in the Get Itinerary query to retrieve complete solution information
SOLUTION SET	result/solutionSet		Alphanumeric	Unique ID for this set of solutions, stored in the Boombox session

#### 4.2.2.5 Output Example

```
<?xml version="1.0" encoding="UTF-8"?>
<result id="?" session="?" solutionCount="217" solutionSet="?">
```

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```

<pricePerDate>
  <departure date="2008-10-27">
    <options>
      <return lengthOfStay="3">
        <solution id="00D">
          <displayTotal amount="2210.37" currency="EUR"/>
          <ext promo="ABC"/>
        </solution>
      </return>
      <return lengthOfStay="4">
        <solution id="00T">
          <displayTotal amount="1373.37" currency="EUR"/>
        </solution>
      </return>
      <return lengthOfStay="5">
        <solution id="00T">
          <displayTotal amount="1373.37" currency="EUR"/>
        </solution>
      </return>
      <return lengthOfStay="6">
        <solution id="00P">
          <displayTotal amount="609.37" currency="EUR"/>
        </solution>
      </return>
      <return lengthOfStay="7">
        <solution id="00H">
          <displayTotal amount="592.37" currency="EUR"/>
        </solution>
      </return>
      <return lengthOfStay="8">
        <solution id="00J">
          <displayTotal amount="592.37" currency="EUR"/>
        </solution>
      </return>
      <return lengthOfStay="9">
        <solution id="00N">
          <displayTotal amount="592.37" currency="EUR"/>
        </solution>
      </return>
    </options>
  </departure>
  <departure date="2008-10-28">
    <options>
      <return lengthOfStay="3">
        <solution id="00E">
          <displayTotal amount="2210.37" currency="EUR"/>
        </solution>
      </return>
      <return lengthOfStay="4">
        <solution id="00S">
          <displayTotal amount="1373.37" currency="EUR"/>
        </solution>
      </return>
      <return lengthOfStay="5">
        <solution id="00K">
          <displayTotal amount="609.37" currency="EUR"/>
        </solution>
      </return>
      <return lengthOfStay="6">

```

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```

    <solution id="00J">
      <displayTotal amount="592.37" currency="EUR"/>
    </solution>
  </return>
<return lengthOfStay="7">
  <solution id="00F">
    <displayTotal amount="592.37" currency="EUR"/>
  </solution>
</return>
<return lengthOfStay="8">
  <solution id="00K">
    <displayTotal amount="592.37" currency="EUR"/>
  </solution>
</return>
<return lengthOfStay="9">
  <solution id="000">
    <displayTotal amount="592.37" currency="EUR"/>
  </solution>
</return>
</options>
</departure>
...

```

#### 4.2.2.6 Get Itinerary

The level 2 query has a follow-up query available to retrieve all information about a specific solution. This will be used to pass information from the carrier website layer to the ITA Feedback Mechanism, described in the next section.

Some notes about the Get itinerary query:

- Returns details on a specific solution
- Uses session and solution set from Level 2 query
- solution input is the solutionSet/solutionId from the previous response

##### 4.2.2.6.1 Input

PARAMETER	NAME	[REDACTED] ] Mapping	SAMPLE	M?	DESCRIPTION
KEY	summarize@key		Alphanumeric	Yes	The unique key to identify the source of the query. This will be individual to [REDACTED] and [REDACTED]
SESSION	summarize/session		Alphanumeric	Yes	The unique session id used in the initial level 2 query, to ensure that this



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					followup query refers to the correct set of results
SOLUTION SET	summarize/solutionSet		Alphanumeric	Yes	Unique ID for the set of solutions returned in the initial level 2 query
SOLUTION	summarize/inputs/solution		Alphanumeric	Yes	The unique ID for the specific solution for which details are being requested
SUMMARIZER	summarize/summarizer		Details	Yes	Required, the name of the output mask to be used to return itinerary details

#### 4.2.2.6.2 Input Example

```
<?xml version="1.0" encoding="UTF-8"?>
<summarize key="EdQCLyJBtLlAfLwNtIFRTU1" session="?" solutionSet="?"
version="?">
  <inputs solution="?" />
  <summarizer>details</summarizer>
</summarize>
```

#### 4.2.2.6.3 Output

PARAMETER	NAME	[REDACTED] Mapping	SAMPLE	DESCRIPTION
ID	result@id		Alphanumeric	Unique ID of the specific solution
SESSION	result@session		Alphanumeric	Session ID from initial level 2 query
SOLUTION SET	result/SolutionSet		Alphanumeric	Unique ID of the solution returned
SOLUTION	result@solutionCount		Numeric	The ordinal of the

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COUNT				solution in the original level 2 query
ORIGIN	result/details/itinerary/slice/segment/origin		[REDACTED]	3 letter airport code for flight origin
DESTINATION	result/details/itinerary/slice/segment/destination		[REDACTED]	3 letter airport code for flight destination
DEPARTURE DATE	result/details/itinerary/slice/segment/depaurture		2010-10-27T3:00-4:00	Departure date and time of flight
RETURN DATE	result/details/itinerary/slice/segment/returnDate		2010-10-27T3:00-4:00	Return date and time of flight
FLIGHT DETAIL	result/details/itinerary/slice/segment/flight		[REDACTED]	Carrier code and flight number of flight
TOTAL PRICE	result/details@displayTotal		EUR500.00	Complete total price of solution
BOOKING CODE	result/details/pricing/fare/bookingInfo@bookingCode		Y / J / C ...	One-letter booking code
FARE	result/details/pricing/fare/bookingInfo@fareCode		Alphanumeric	Fare basis code used in solution
PASSENGERS	result/details/pricing/passenger/ptc		ADT, INF, CNN, SNR	Valid passenger type code; this will repeat for each passenger
EXT EBT	result/details/ext@ebt		Alphanumeric	URL-encoded string of all necessary data sufficient to be passed to the feedback mechanism

#### 4.2.2.6.4 Output Example

```
<?xml version="1.0" encoding="UTF-8"?>
<result id="?" session="?" solutionCount="217" solutionSet="?">
  <details>
    <displayTotal amount="2210.37" currency="EUR"/>
  </details>
</result>
```

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```

<ext ebt="?"%2C1%2C1%2C2%2CS%2CYEERT%2CS%2CYEERT%2C1%2C1%2CADT%2C2%2C2008-
10-27T23%3A00-04%3A00%[REDACTED]%2CBOS%2C2008-10-
30T15%3A10%2B01%3A00%2CBOS%2C[REDACTED]" />

<itinerary>
  <slice>
    <segment departure="2008-10-27T23:00-04:00" destination="[REDACTED]"
origin="BOS"/>
  </slice>
  <slice>
    <segment departure="2008-10-30T15:10+01:00" destination="BOS"
flight="[REDACTED]" />
  </slice>
</itinerary>
<pricing>
  <fare>
    <bookingInfo bookingCode="S" fareCode="YEERT" />
  </fare>
  <fare>
    <bookingInfo bookingCode="S" fareCode="YEERT" />
  </fare>
  <passenger>
    <ptc>ADT</ptc>
  </passenger>
</pricing>
</details>
</result>

```

#### 4.2.2.7 The “Clear” Query

ITA recommends sending the clear query at the time the calling application clears out a shopper’s web session. This is an optional step.

```

POST /services/xml HTTP/1.1
Content-Type: text/xml
...
<clear key="FqDazRWkytwzuALGYwtNOE"
  verstion="17"
  session="9xGJernoIzK28jE8UEUkws29Z0000LaJ3WSw6RDB0" />

```

#### 4.2.2.8 Level 2 / Get Itinerary Error Handling



HTTP responses from Boombox will include one of the following status codes:

- 200 - Success
- 400 - Invalid parameters
- 500 - Internal error
- 503 - Capacity exceeded

Responses with status codes 200, 400, and 500 contain:

- an error type,
- an optional error code,
- a textual description of the error, and
- a result ID.

500-level errors indicate Boombox encountered an error. 400-level errors indicate that there is an issue on the [REDACTED] side, such as submission of bad data (e.g., an airport code that we know nothing about).

#### 4.2.2.8.1 Error Example

```

HTTP/1.1 400 Bad Request
Content-Type: text/xml
...
<?xml version='1.0' encoding='UTF-8'?>
<result id="13DeOm26f0000LaJ1qaB7"
  solutionSet="sx0A3TdJVU6bSVSjuFRXWAotA"
  session="9xGJernoIzK28jE8UEUkws29Z0000LaJ3WSw6RDB0">
  <error type="input">
    <message>
      QPX Warning. Latest departure time of first slice (2007-11-
      09T05:59 UTC) is in the past; current time is 2008-11-07T14:08
      UTC.
    </message>
  </error>
</result>

```

More description of errors is available in Section 9, QPX errors.

### 4.3 Quality Feedback Mechanism

When a traveler selects a departure and return date in Level 2, the browser exits the Affinity Search application and transfers control to the booking tool. The booking tool accepts values passed from the Level 2 query page to display the best solutions for the included parameters. It is a key element of the Affinity Search application that at least one solution be available in EBT at the price quoted by ITA for each Level 2 to EBT transition. Based on the RFP, the goal is for the price for the dates chosen in the level 2 query to match the EBT lowest price 90% of the time with a tolerance of 5 Euros.

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ITA will implement a service that will enable [REDACTED] application layer to transmit and record the cheapest ITA solution returned for an O&D date combination, as well as the corresponding cheapest solution from the [REDACTED] host system. This will allow monitoring of the following states:

- ITA and [REDACTED] match prices.
- [REDACTED] returns a cheaper price than ITA.
- [REDACTED] returns a more expensive price than ITA.
- ITA itinerary not available in [REDACTED]

This mechanism is based on ITA's Booking Information Stream (BIS) technology, which was designed to allow ITA to audit bookability of solutions returned. It is therefore ideally suited for this purpose, as even though the ITA price will not be used for booking, the demands of the Affinity Search application in terms of matching prices is just as high.

### 4.3.1 Interface Definition

#### 4.3.1.1 Connectivity

To communicate with the BIS, the customer application will send data to ITA's server via an authenticated HTTP POST request. The BIS server will first log all data, then attempt to validate formatting.

- If data validation succeeds, the server will respond with an HTTP 200 OK status.
- If validation fails, the server will respond with an HTTP 400 BAD REQUEST status.
- Any other status code indicates that the server did not successfully process the request, and if possible it should be repeated.

ITA offers access to the BIS over public internet. Customer applications can submit to **<https://itabis.itasoftware.com/report>** once login credentials have been issued. ITA can also offer access to the BIS via a customer's private lines. Please contact the ITA account service manager to coordinate this.

The body of each BIS client request should consist of HTML form urlencoded data, containing any number of name-value pairs, each with name *a*. Each value should contain a record consisting of a single line of comma-delimited ASCII text, encoding a sequence of fields as specified below.

#### 4.3.1.2 Syntax

The new XML interface, designed with [REDACTED] in mind, is currently under final review at ITA and will be communicated to [REDACTED] at the earliest possible time.

#### 4.3.1.3 Examples

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Example feedback submissions will be communicated at the time of the delivery of the new XML interface.

#### 4.4 Special Considerations

As part of the Affinity Search application, ITA will extend QPX to support custom business logic to meet [REDACTED] requirements as follows in the below sections.

##### 4.4.1 Business Rule data

ITA will accept custom data files with [REDACTED] business rules, and use those files to guide QPX in generating the correct fare market prices., These business rules determine the schedules and fares to be included in QPX solutions. See section 5 for a listing of the data elements needed.

##### 4.4.2 Booking Fees

QPX will require enhancements to support booking fees to be provided by [REDACTED]. These fees will be added to the total price for QPX solutions when appropriate.

Please see section 5.10 for a description of the data fields needed to properly implement booking and ticketing fees.

##### 4.4.3 Promotions

QPX will need to be enhanced to support custom functionality to indicate whether the price of a QPX solution is a special marketing promotion. This information will be fed to QPX via multiple processes: For [REDACTED], ITA will use ATPCO filed data. For [REDACTED], ITA will receive a data file via FTP.

Please see section 5.11 for a description of the data fields needed to properly implement the display of promotions indicators.

## 5 DATA REQUIREMENTS

Apart from the standard data feeds that are essential to QPX processing, from sources such as OAG, ATPCO and IATA, the Affinity Search application will require additional data specific to [REDACTED] to process solutions in accordance with requirements. The following table illustrates a normalized, logical model of the data ITA will need, including the source and brief descriptions of relevant fields. The below tables do not represent a definitive data model that ITA plans to implement, but are meant to enumerate the basic data requirements that need to be fulfilled for the Affinity Search queries to run properly. Please note that the processes used to update this information are still to be determined.

### 5.1 Data Update Process

ITA and [REDACTED] have agreed on a process to employ for updating of this data. ITA will generate sample comma-delimited data files based on the field structure itemized below. This data will be imported by [REDACTED] into an admin tool they plan to implement, which will

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allow business owners at [REDACTED] to manipulate the entries. Updated data files will then be exported from the [REDACTED] admin tool and transmitted to ITA via FTP. ITA automated processes will detect new files at the FTP server, and import the data into the Affinity Search services. This approach is effective for all data indicated below with the exception of [REDACTED] booking fees and promotions information, which will be derived from ATPCO data.

## 5.2 Data Update Specifications

The mechanism for receipt of custom data files is under final review at ITA, and will be communicated to [REDACTED] at the earliest possible time.

## 5.3 Origins

The origins table describes the various points of departure to be included in the QPX Cache. The information in this table will control multiple elements of how markets are represented in the cache data.

**Source:** [REDACTED] business

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website
POINT OF SALE	[REDACTED]	Valid office id of origin
AIRPORT / CITY CODE	[REDACTED]	3 letter airport or city code
PRIORITY	0-10000	Indicator of relative importance of origin for inclusion in cache – a higher number indicates higher priority; This value is used to determine the order of updating the cache
COVERAGE	0-10000	Indicator of relative emphasis of market in cache – higher number indicates more markets will be saved in the cache related to other markets with lower numbers; it has been agreed that this number will be the same across all markets at launch, as for any market represented in the cache, all possible destinations is desired
POLLING	FAST / SLOW	Indicates cache data refresh rate

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## 5.4 Destinations

In conjunction with the Origins data, the Destinations information indicates which locations will appear as options in level 1 query results

**Source:** [REDACTED] business

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website
AIRPORT / CITY CODE	[REDACTED]	3 letter airport or city code
PRIORITY	1-10000	Indication of relative importance of destination in cache – higher number indicates higher priority. This number is independent of the priority in the 'origins' table

## 5.5 Blackout Journeys

Blackout journeys represent markets that must be excluded from the cache

**Source:** [REDACTED] Business

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website
POINT OF SALE	[REDACTED]	Valid office ID or "World", which indicates the record is relevant for all office ids
ORIGIN	[REDACTED]	3 letter city or airport code
DESTINATION	[REDACTED]	3 letter city or airport code
CARRIER	[REDACTED]	2-letter carrier code specific to blackout market. "All" indicates the blackout should apply to all carriers

## 5.6 Maximum Travel Time

Maximum travel time allows the indication of trip time limits for markets where ITA returns solutions not returned by the [REDACTED] host system due to duration of travel.

**Source:** [REDACTED]

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website



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POINT OF SALE	[REDACTED]	Valid office ID or "World", which indicates the record is relevant for all office ids
ORIGIN	[REDACTED]	3 letter airport or city code
DESTINATION	[REDACTED]	3 letter airport or city code
CARRIER	[REDACTED]	2-letter carrier code. "All" indicates the threshold should apply to all carriers
MINUTES	0-10000	Threshold in minutes of maximum trip durations; solutions whose total trip durations exceed this number will be suppressed from solutions

## 5.7 Carriers / Fares

This data represents the inventory of carriers to be supported on each branded website, how many segments can be flown by this carrier in a single itinerary, and whether or not the carriers' fares should be supported.

**Source:** [REDACTED] Business

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website
POINT OF SALE	[REDACTED]	Valid office ID (citycode) or "World", which indicates the record is relevant for all office ids
ORIGIN	[REDACTED]	3 letter airport or city code
DESTINATION	[REDACTED]	3 letter airport or city code
CARRIER	[REDACTED]	2-letter carrier code
SEGMENTS	0-4	Count of maximum number of segments to be considered in solutions for this carrier
FARES	YES / NO	Indication of whether QPX should consider use of fares published by this carrier in addition to fares associated with the branded website's carrier ([REDACTED] or [REDACTED])
SORT ORDER	Integer	A number that represents the enumerated order in which

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		this row should be processed in relation to other rows
--	--	--

## 5.8 SPA Carriers

This information represents the inventory of carriers with interline agreements with [REDACTED]

**Source:** [REDACTED] Business

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website
POINT OF SALE	[REDACTED]	Valid office ID (city code) or "World", which indicates the record is relevant for all office ids
ORIGIN	[REDACTED]	3 letter airport or city code
DESTINATION	[REDACTED]	3 letter airport or city code
CARRIER	[REDACTED]	2-letter carrier code
TRANSFER POINTS	[REDACTED]	3 letter airport or city code, representing allowed connection points for the carrier from the [REDACTED] network

## 5.9 SPA Connecting Points

Allowed connecting points for interline partners

**Source:** [REDACTED] Business

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website
POINT OF SALE	[REDACTED]	Valid office ID or "World", which indicates the record is relevant for all office ids
CARRIER	[REDACTED]	2-letter carrier code
CONNECTING AIRPORT	[REDACTED]	3 letter airport code / 2 letter country code indicating an allowed connection point for the carrier partner within its own network

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## 5.10 Excluded Fares

The excluded fares information informs QPX which carrier's fares should be excluded for consideration in solutions returned via the level 1 and 2 queries.

**Source:** [REDACTED] Business

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website
POINT OF SALE	[REDACTED]	Valid office ID
ORIGIN	[REDACTED]	3 letter airport or city code
DESTINATION	[REDACTED]	3 letter airport or city code
CARRIER	[REDACTED]	2-letter carrier code
FARE BASIS CODES	Alphanumeric strings	List of farebasis codes to be excluded from solutions for this office id & market. Standard ATPCO wildcard allowed

## 5.11 Pricing Detail

This information indicates the currency to use for each point of sale, as well as how the price should be expressed.

**Source:** [REDACTED] business

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website
POINT OF SALE	[REDACTED]	Valid Office ID
CURRENCY	USD / EUR	3-letter currency code to use for the point of sale
PRICE DETAIL LEVEL	F / S / B	F = Fares only; S = Fares + taxes + surcharges; B = Fares + taxes + surcharges + booking fees

## 5.12 Booking Fees

This information represents the additional booking fees imposed by [REDACTED] on solutions based on regions and booking codes.

**Source:** [REDACTED]: ATPCO S4 records; [REDACTED]: manual file feed

COLUMN	SAMPLE DATA	DESCRIPTION
BRAND	[REDACTED]	Carrier website

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POINT OF SALE	[REDACTED]	Valid Office ID
ORIGIN	[REDACTED]	3 letter airport or city code / 2 letter country code
DESTINATION	[REDACTED]	3 letter airport or city code
AMOUNT	####	Numeric value of booking fee
CURRENCY CODE	USD EUR	3 letter code of currency in which fee is expressed
PASSENGER TYPE	ADT / INF	3 letter passenger type code to which fee applies
CABIN CLASS	F / C / Y	1 letter booking code to which fee applies

### 5.13 Promotions

The promotions data enables the indication that a solution is a special promotional offer created as part of [REDACTED] or [REDACTED] marketing initiatives.

**Source:** [REDACTED]: export from promotions web service; [REDACTED]: derived from ATPCO-filed rule data

COLUMN	SAMPLE DATA	DESCRIPTION
PROMOTION CODE	Alphanumeric string	Indicates unique promotional code for the offer
START DATE	Valid date	Indicates date the promotion becomes available
END DATE	Valid date	Indicates date the promotion stops being available
FARE BASIS CODE	Alphanumeric characters	Valid farebasis code to which promotion applies
TRAVEL DATE BEGIN	Valid date	Indicates valid travel begin date
TRAVEL DATE END	Valid date	Indicates valid travel end date
ORIGIN	Valid 3-letter airport code	Origin of the fare to which promo applies
DESTINATION	Valid 3-letter airport code	Destination of the fare to which promo applies

## 6 KEY DEPENDENCIES

The success of the Affinity Search project will be dependent on a number of factors, including the accurate definition of the features and functions considered as in scope for the initial launch. Access to subject matter experts at [REDACTED] will be critical in completing the

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scoping and sizing of this project, as well as access to documentation of relevant business rules as needed.

The following additional key dependencies exist.

- A signed Master Services Agreement (MSA) and Service Level Agreement (SLA) between ITA and [REDACTED]
- Due to the quality of availability data for [REDACTED] currently received by ITA, the [REDACTED] DACS has been identified as a requirement to have in place for the rollout of Affinity Search
- Relevant business data will be delivered and updated by [REDACTED]
- Development and deployment of all elements interacting to the ITA API's will be managed by [REDACTED]
- The [REDACTED] DACS, while not critical for launch, is still considered a key dependency for the project

## 7 NON-FUNCTIONAL REQUIREMENTS

The following components characterize the non-functional requirements for Affinity Search as they are currently known.

- **Test environment** – ITA will deploy a test environment sufficient to enable [REDACTED] to accomplish integration testing with other components of the Affinity Search front-end applications
- **Production environment** – ITA will deploy a production environment suitable to handle anticipated traffic and performance goals, subject to Operational support outlined in the SLA, in time for [REDACTED] UAT
- **Communications lines** – ITA will work with [REDACTED] to implement the network setup necessary to enable communication between [REDACTED]'s datacenters and the ITA system
- **Quality Feedback mechanism** – ITA will implement, support and monitor the described quality feedback mechanism to facilitate assurance of price matching with [REDACTED] host system



## 8 XSD DEFINITIONS

### 8.1 Level 2 Query

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:simpleType name="cityOrAirportCode">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z]{3}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="error">
    <xs:sequence>
      <xs:element name="message" type="xs:string"/>
    </xs:sequence>
    <xs:attribute name="code" type="xs:string"/>
    <xs:attribute name="type" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:enumeration value="internal"/>
          <xs:enumeration value="input"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:simpleType name="key">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Za-z0-9]{22}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="localDate">
    <xs:restriction base="xs:string">
      <xs:pattern value="\d{4}-\d{2}-\d{2}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="outputFormat">
    <xs:restriction base="xs:string">
      <xs:enumeration value="json"/>
      <xs:enumeration value="xml"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="resultId">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Za-z0-9]{22}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="sessionId">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Za-z0-9]{25}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="solutionSetId">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Za-z0-9]{23}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="version">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Za-z0-9]+"/>
    </xs:restriction>
  </xs:simpleType>

```

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```

    </xs:restriction>
  </xs:simpleType>
  <xs:element name="search">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="summarizer" maxOccurs="unbounded"
minOccurs="0">
          <xs:simpleType>
            <xs:restriction base="xs:string">
              <xs:enumeration value="pricePerDate"/>
            </xs:restriction>
          </xs:simpleType>
        </xs:element>
        <xs:element name="inputs" minOccurs="0">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="destination" maxOccurs="unbounded"
minOccurs="0" type="cityOrAirportCode"/>
              <xs:element name="passengers">
                <xs:complexType>
                  <xs:attribute name="adults" type="xs:int"/>
                  <xs:attribute name="children" type="xs:int"/>
                  <xs:attribute name="infants" type="xs:int"/>
                  <xs:attribute name="seniors" type="xs:int"/>
                  <xs:attribute name="youths" type="xs:int"/>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
            <xs:attribute name="departure" use="required"
type="localDate"/>
            <xs:attribute name="maxStay" use="required"
type="xs:int"/>
            <xs:attribute name="minStay" use="required"
type="xs:int"/>
            <xs:attribute name="officeID" use="required"
type="xs:string"/>
            <xs:attribute name="origin" use="required"
type="cityOrAirportCode"/>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
      <xs:attribute name="format" type="outputFormat"/>
      <xs:attribute name="key" use="required" type="key"/>
      <xs:attribute name="name" use="required">
        <xs:simpleType>
          <xs:restriction base="xs:string">
            <xs:enumeration value="multiDate"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:attribute>
      <xs:attribute name="requestId" type="xs:string"/>
      <xs:attribute name="session" type="sessionId"/>
      <xs:attribute name="solutionSet" type="solutionSetId"/>
      <xs:attribute name="version" use="required" type="version"/>
    </xs:complexType>
  </xs:element>
  <xs:element name="result">
    <xs:complexType>
      <xs:sequence>

```

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```

    <xs:element name="error" minOccurs="0" type="error"/>
    <xs:choice maxOccurs="unbounded">
      <xs:element name="pricePerDate">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="departure" maxOccurs="unbounded"
minOccurs="0">
              <xs:complexType>
                <xs:sequence>
                  <xs:element name="options" minOccurs="0">
                    <xs:complexType>
                      <xs:sequence>
                        <xs:element name="return"
maxOccurs="unbounded" minOccurs="0">
                          <xs:complexType>
                            <xs:sequence>
                              <xs:element name="solution"
minOccurs="0">
                                <xs:complexType>
                                  <xs:sequence>
                                    <xs:element
name="displayTotal">
                                      <xs:complexType>
                                        <xs:attribute
name="amount" use="required" type="xs:decimal"/>
                                        <xs:attribute
name="currency" use="required" type="xs:string"/>
                                      </xs:complexType>
                                    </xs:element>
                                    <xs:element name="ext"
minOccurs="0">
                                      <xs:complexType>
                                        <xs:attribute
name="promo" type="xs:boolean"/>
                                      </xs:complexType>
                                    </xs:element>
                                  </xs:sequence>
                                  <xs:attribute name="id"
use="required" type="xs:string"/>
                                </xs:complexType>
                              </xs:element>
                            </xs:sequence>
                            <xs:attribute name="lengthOfStay"
use="required" type="xs:int"/>
                          </xs:complexType>
                        </xs:element>
                      </xs:sequence>
                    </xs:complexType>
                  </xs:element>
                </xs:sequence>
              </xs:complexType>
            </xs:element>
          </xs:sequence>
          <xs:attribute name="date" use="required"
type="localDate"/>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:choice>
</xs:sequence>

```





```

    <xs:attribute name="id" use="required" type="resultId"/>
    <xs:attribute name="requestId" type="xs:string"/>
    <xs:attribute name="session" use="required"
type="sessionId"/>
    <xs:attribute name="solutionCount" use="required"
type="xs:int"/>
    <xs:attribute name="solutionSet" type="solutionSetId"/>
  </xs:complexType>
</xs:element>
</xs:schema>

```

## 8.2 Get Itinerary

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:simpleType name="airportCode">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z]{3}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="bookingCode">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z]{1,2}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="dateTime">
    <xs:restriction base="xs:string">
      <xs:pattern value="\d{4}-\d{2}-\d{2}T\d{2}:\d{2}([+-
]\d{2}:\d{2})?">
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="error">
    <xs:sequence>
      <xs:element name="message" type="xs:string"/>
    </xs:sequence>
    <xs:attribute name="code" type="xs:string"/>
    <xs:attribute name="type" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:enumeration value="internal"/>
          <xs:enumeration value="input"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:simpleType name="flightCode">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z0-9]{2}\d+[a-z]?">
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="key">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Za-z0-9]{22}"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="outputFormat">
    <xs:restriction base="xs:string">
      <xs:enumeration value="json"/>
    </xs:restriction>
  </xs:simpleType>

```

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```

    <xs:enumeration value="xml"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="paxTypeCode">
  <xs:restriction base="xs:string">
    <xs:pattern value="[A-Z _]{1,6}"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="resultId">
  <xs:restriction base="xs:string">
    <xs:pattern value="[A-Za-z0-9]{22}"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="sessionId">
  <xs:restriction base="xs:string">
    <xs:pattern value="[A-Za-z0-9]{25}"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="solutionId">
  <xs:restriction base="xs:string">
    <xs:pattern value="[A-Za-z0-9]{23}/[A-Za-z0-9]{25}"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="solutionSetId">
  <xs:restriction base="xs:string">
    <xs:pattern value="[A-Za-z0-9]{23}"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="version">
  <xs:restriction base="xs:string">
    <xs:pattern value="[A-Za-z0-9]+"/>
  </xs:restriction>
</xs:simpleType>
<xs:element name="summarize">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="summarizer" maxOccurs="unbounded">
        <xs:simpleType>
          <xs:restriction base="xs:string">
            <xs:enumeration value="details"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:element>
      <xs:element name="inputs" minOccurs="0">
        <xs:complexType>
          <xs:attribute name="solution" type="solutionId"/>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
    <xs:attribute name="format" type="outputFormat"/>
    <xs:attribute name="key" use="required" type="key"/>
    <xs:attribute name="requestId" type="xs:string"/>
    <xs:attribute name="session" use="required"
type="sessionId"/>
    <xs:attribute name="solutionSet" use="required"
type="solutionSetId"/>
    <xs:attribute name="version" use="required" type="version"/>
  </xs:complexType>
</xs:element>

```

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```

<xs:element name="result">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="error" minOccurs="0" type="error"/>
      <xs:choice maxOccurs="unbounded">
        <xs:element name="details">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="displayTotal">
                <xs:complexType>
                  <xs:attribute name="amount" use="required"
type="xs:decimal"/>
                  <xs:attribute name="currency" use="required"
type="xs:string"/>
                </xs:complexType>
              </xs:element>
              <xs:element name="ext">
                <xs:complexType>
                  <xs:attribute name="ebt" use="required"
type="xs:string"/>
                  <xs:attribute name="promo" type="xs:boolean"/>
                </xs:complexType>
              </xs:element>
              <xs:element name="itinerary">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="slice"
maxOccurs="unbounded">
                      <xs:complexType>
                        <xs:sequence>
                          <xs:element name="segment"
maxOccurs="unbounded">
                            <xs:complexType>
                              <xs:attribute name="departure"
type="dateTime"/>
                              <xs:attribute name="destination"
use="required" type="airportCode"/>
                              <xs:attribute name="flight"
use="required" type="flightCode"/>
                              <xs:attribute name="origin"
use="required" type="airportCode"/>
                            </xs:complexType>
                          </xs:element>
                        </xs:sequence>
                      </xs:complexType>
                    </xs:element>
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
              <xs:element name="pricing" maxOccurs="unbounded">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="fare"
maxOccurs="unbounded">
                      <xs:complexType>
                        <xs:sequence>
                          <xs:element name="bookingInfo"
maxOccurs="unbounded">
                            <xs:complexType>

```

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```

                                <xs:attribute name="bookingCode"
use="required" type="bookingCode"/>
                                <xs:attribute name="fareCode"
use="required" type="xs:string"/>
                                </xs:complexType>
                                </xs:element>
                                </xs:sequence>
                                </xs:complexType>
                                </xs:element>
                                <xs:element name="passenger"
maxOccurs="unbounded" minOccurs="0">
                                <xs:complexType>
                                <xs:sequence>
                                <xs:element name="ptc"
maxOccurs="unbounded" minOccurs="0" type="paxTypeCode"/>
                                </xs:sequence>
                                </xs:complexType>
                                </xs:element>
                                </xs:sequence>
                                </xs:complexType>
                                </xs:element>
                                </xs:sequence>
                                </xs:complexType>
                                </xs:element>
                                </xs:choice>
                                </xs:sequence>
                                <xs:attribute name="id" use="required" type="resultId"/>
                                <xs:attribute name="requestId" type="xs:string"/>
                                <xs:attribute name="session" use="required"
type="sessionId"/>
                                <xs:attribute name="solutionCount" use="required"
type="xs:int"/>
                                <xs:attribute name="solutionSet" use="required"
type="solutionSetId"/>
                                </xs:complexType>
                                </xs:element>
                                </xs:schema>

```

## 9 QPX ERROR MESSAGES

The errors returned from the level 2 live QPX queries may originate from QPX. The following table enumerates the types of errors that may be returned from QPX.

Code	Name	Severity	Meaning
200	UNCONNECTED-ORIGIN-AIRPORT	6 - User Warning	The search-start airports are unconnected (i.e. there are no flights between any origin airport and airports through which destination airports can be reached).
201	UNCONNECTED-DESTINATION-AIRPORT	6 - User Warning	The search-end airports are unconnected (i.e. there are no flights between any destination airport and airports that can be reached from an origin airport).

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202	EMPTY-TIME-WINDOW	4 - Query Data	The latest specified departure time is after the earliest specified arrival time.
203	NO-VALID-ORIGIN-AIRPORT	4 - Query Data	No origin airports have flights departing in the specified time period.
204	NO-VALID-DESTINATION-AIRPORT	4 - Query Data	No destination airports have flights arriving in the specified time period.
205	UNKNOWN-AIRPORT/CITY-CODE	4 Query Data	The identifier supplied is not in the QPX database of locations/airports/cities.
206	BAD-AIRPORT-SPECIFICATION	4 - Query Data	An unrecognized origin or destination airport identifier was provided.
207	NEXT-DEPARTING-FLIGHT	6 - User Warning	The next departure time of any flight from this airport is outside the requested departure time-window.
208	NEXT-ARRIVING-FLIGHT	6 - User Warning	The next arrival time of any flight to this airport is outside the requested arrival time-window.
209	COMMON-ORIGIN-AND-DESTINATION-AIRPORT	4 - Query Data	The scheduler was fed a common airport for origin and destination.
210	SEARCH-PRODUCED-NO-ITINERARIES	6 - User Warning	Scheduler search produced no answers, i.e. no flight options were found for this trip.
211	INCONSISTENT-ITINERARY-TIMES	6 - User Warning	See 308 - ERROR-INCONSISTENT-ITINERARY-TIMES
212	NO-ORIGIN-AIRPORT	4 - Query Data	No airport specified/matched for origin.
213	NO-DESTINATION-AIRPORT	4 - Query Data	No airport specified/matched for destination.
223	TOO-MANY-SLICES	4 - Query Data	The query specifies more than the maximum number of slices.
224	SLICE-NOT-COVERED-BY-SPECIFIED-CARRIERS	6 - User Warning	The carriers specified in the query do not cover this slice. This is a complex scheduler error message.
225	CROSS-SLICE-TR-MCT	6 - User Warning	No itineraries satisfy basic Traffic Restriction (TR) or Minimum Connection Time (MCT) constraints.
226	MIN-MAX-LAYOVER-TIME	6 - User Warning	Could not combine itineraries for two consecutive slices because of minimum/maximum layover restrictions at

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			the connecting point.
227	ITINERARIES-SOLD-OUT	6 - User Warning	No seats are available for this itinerary. This is a complex pricing error message.
300†	ERROR-MCT-VIOLATION	4 - Query Data	A connection time is shorter than the specified minimum connection time.
301†	ERROR-ILLEGAL-NUMBER-OF-SLICES	3 - Query Format	The number of slices specified is either less than one or more than the maximum number of slices permitted.
302†	ERROR-NO-ITINERARIES-FOR-SLICE	3 - Query Format	Within a pricing query, no itineraries were specified for a slice.
303†	MULTIPLE-ITINERARIES-FOR-SLICE	3 - Query Format	Within a pricing query, multiple itineraries were specified for a slice.
304†	ERROR-ILLEGAL-NUMBER-OF-FLIGHT-SEGMENTS	3 - Query Format	The number of flight segments is either less than one or more than the maximum number of slices permitted (50 at the time of this documentation).
305†	ERROR-MISSING-FLIGHT-SEGMENT	4 - Query Data	A flight segment was missing during pricing query processing.
306†	ERROR-STRUCTURAL-ITINERARY-PROBLEM	4 - Query Data	A structural consistency check on an itinerary failed, e.g. there wasn't an arrival or departure time for some leg, or the number of stopovers did not correspond properly to the number of legs.
307†	ERROR-DUPLICATE-AIRPORTS-IN-ITINERARY	4 - Query Data	An airport appeared more than once in an itinerary.
308†	ERROR-INCONSISTENT-ITINERARY-TIMES	4 - Query Data	Arrival and departure times do not make sense, e.g. departure time for a flight is more than its arrival time, or the arrival time for a flight is more than the departure time of the next flight.
309†	ERROR-SURFACE-GAP-IN-ITINERARY	4 - Query Data	A surface gap exists, i.e. a flight does not depart from the same place it arrives.
310	ERROR-TRAFFIC-RESTRICTION-VIOLATION	4 - Query Data	Itinerary is invalid because it violates traffic restrictions.
312†	ERROR-MCT-XXX-VIOLATION	4 - Query Data	A connection is prohibited, regardless of the connection time.
320	ERROR-FARE-	4 - Query	Illegal input was given for a fare reduction.

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	REDUCTION-SPECIFICATION	Data	
330#	ERROR-BAD-PASSENGER-SPECIFICATION	3 - Query Format	An ill-formed passenger specification was submitted, which can, during internal expansion, yield an empty age range or submit to a recursion loop.
331#	ERROR-BAD-ASSERT-GROUPS	3 - Query Format	An ill-formed assert group was detected.
332#	ERROR-BAD-SLICE-SPECIFICATION	3 - Query Format	An ill-formed slice specification was detected.
333#	ERROR-QUERY-LINE-ERROR	3 - Query Format	An unrecoverable error occurred during query pre-processing.
334#	ERROR-QUERY-LINE-WARNING	4 - Query Data	A recoverable error occurred during query pre-processing.
335#	ERROR-QUERY-LINE-UNKNOWN	3 - Query Format	An unknown error occurred during query pre-processing.
336#	ERROR-BAD-XML	3 - Query Format	The XML submitted did not translate correctly within QPX.
337	ERROR-BAD-QUERY-HEADER	3 - Query Format	A bad magic query header was specified.
338	ERROR-BAD-AVAILABILITY-SPECIFICATION	3 - Query Format	A bad availability specification was found.
339#	BAD-QUERY-GROUP-QUERY-NUMBER	3 - Query Format	A bad query group query number was specified.
340	TIMEOUT	5 - Timeout	A timeout occurred.
341	PROCESSING-ERROR	2 - Processing	An internal processing error occurred.
342	MISSING-TPM	6 - User Warning	The ticketed point mileage for a segment is missing, so a TPM will be constructed.
343	MULTIPLE-TPMS	4 - Query Data	There are multiple TPMs between the given cities, and the query did not include a global indicator that can be used to select which TPM should be used.
344	MISSING-ROUTING	6 - User Warning	Missing routing for a fare between two cities.
345	NO-MATCHING-FARE-BASIS	4 - Query Data	There was no matching fare basis found.
346	NO-MATCHING-FARE-TYPE	4 - Query Data	There was no matching fare type found.
347	CHECK-HIP	6 - User Warning	An IATA HIP check was supposed to take place against a "comparable fare," but no comparable fare could be found.

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350	CHECK-CTM	6 - User Warning	An IATA circle trip minimum check was supposed to take place against a "comparable fare," but no comparable fare could be found.
356	AIRPORT-TAX-MAY-APPLY	6 - User Warning	An airport tax may apply to one or more of the solutions returned.
357	NO-TAX-FARES	6 - User Warning	There are no fares for performing the tax calculation between locations.
358	AIRPORT-RESTRICTED-FARE	6 - User Warning	The fare for the city referenced is an airport-restricted fare.
359	ILLEGAL-DISPLAY-CURRENCY	4 - Query Data	The input currency is not permitted.
360	FAR-OFF-DEPARTURE-DATE	6 - User Warning	Departure date more than 30 days away.
361	DISALLOWED-CAT-15-CURRENCY	6 - User Warning	The sales currency is not allowed for the origin or destination country.
376	SLICE-DEP-TIME-IN-THE-PAST	4 - Query Data	The latest departure time specified for this slice is in the past.
400	WARNING-SWITCH-TO-UNKNOWN-AVAILABILITY	6 - User Warning	In situations where solutions cannot be priced because of availability, unknown availability has been accepted by QPX, in order to generate solutions.
401	ERROR-NO-ITINERARIES	6 - User Warning	None of the itineraries found are available.
403	ERROR-NO-INTERNATIONAL	6 - User Warning	When an international query completely fails to give answers, return this error.
404	WARNING-NO-ANSWER	6 - User Warning	When a query completely fails to give answers, and no other specific explanation for failure is produced, return this error.
405	WARNING-SINGLE-PASSENGER-CLASS	6 - User Warning	Multiple passenger classes submitted in a query have been merged down to a single class.
406	ITINERARIES-ALREADY-DEPARTED	6 - User Warning	The only flights found for this search have already departed. This is a complex scheduler error message.
408	TOO-TIGHT-MAX-LEGS-SEGMENTS-CONSTRAINTS	6 - User Warning	No flights were found within the constraints that the query imposed on the maximum number of legs or segments. This is a complex scheduler error message.
409	NO-	6 - User	The carriers specified in the query cover this



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	ITINERARIES-SUGGESTION-OTHER-TIME	Warning	slice, but the only flights are before the earliest time or after the latest time specified by the query. This is a complex scheduler error message.
410	NO-FARES	6 - User Warning	No fares were found between the specified cities. This is a complex pricing error message.
413	PRICING-CONDITIONS-NOT-MET	6 - User Warning	When trying to do a pricing query, no fares were found that passed the necessary rules and checks between the specified cities. This is a complex pricing error message.
450	TOO-TIGHT-MILEAGE-CONSTRAINTS	6 - User Warning	No flights were found within the constraints that the query imposed on the maximum or minimum mileage. This is a complex scheduler error message.
451	TOO-TIGHT-DURATION-CONSTRAINTS	6 - User Warning	No flights were found within the constraints that the query imposed on the maximum duration. This is a complex scheduler error message.
452	TOO-TIGHT-CONNECTION-CONSTRAINTS	6 - User Warning	No flights were found within the constraints that the query imposed on the maximum or minimum connection time. This is a complex scheduler error message.
453	TOO-TIGHT-ROUTE-LOCATIONS-CONSTRAINTS	6 - User Warning	No flights were found within the constraints that the query imposed on the permitted or prohibited route locales. This is a complex scheduler error message.
500	MISC-SUMMARY-INFO	6 - User Warning	Miscellaneous summary information.
501	MISSING-BSR-ICH	6 - User Warning	No conversion available from a particular currency to another.
502	MISSING-ROE	6 - User Warning	No ROE available for the currency in question in a QPX query.
<b>†Bad itinerary error</b>			
<b>‡Other input error:</b> Not for end-user viewing			