Air travel hacking
For fun and (more) miles

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Who am I?

• Day job: VoIP geek
  • Built the freenet.de VoIP service
  • Now: Software Architect/Product Manager at VOIPFUTURE (Hamburg, Germany)
  • VoIP quality monitoring

• Spare time
  • Travel addict
  • 500+ flights, 29+ times around the globe, 60+ countries
  • Denied entry to the US only once ;-)
  • http://openflights.org/user/hs/
What am I talking about?

- Air fare basics
- Global Reservation System attack vectors
- Finding bugs
- The infamous 'fuel dump'
Introduction

Terminology
Terminology

- Service Class
  - The hard metal
  - Economy, Business, First

- Booking Class
  - Marketing class
  - 'dirt cheap Economy' vs. 'flexible Economy'
  - F,C,Y, A ... Z
  - Booking classes used for 'inventory'
    - F9 A4 C9 J5 Y9 W7 E4 K0
  - First character of fare basis = Booking Class
Terminology (2)

- Operating Carrier
  - Lufthansa owns a plane and operates LH401 to NYC
- Marketing Carrier
  - Lufthansa regional owns/operates the plane but Lufthansa sells the seat
- Codeshare
  - LH operates LH401, United sells seat on UA8840
- Plating/Issuing/Validating Carrier
  - United sells a ticket NYC-FRA-HAM with FRA-HAM on Lufthansa (codeshare) flight
  - ticket issued on 'United stock' (016 prefix)
Information on ticket (1)

- United ticket stock (016)
- Service Class
- seq #
- code share
- booking class
Information on ticket (2)

United ticket stock (016)

Passenger Name Record (PNR)
4th flight on this PNR (CPN = coupon)
Information on ticket (3)

Austrian ticket stock (257)

Service Class  location + agent ID  Booking class
Abnormal Ticket stock
Booking system history

- 1970s
  - Every airline had its own system
  - Think paper and stickers!
- 1980s
  - Multiple carriers in one system
  - Strong bias towards system owner
- 1990s
  - Global Systems: Amadeus, Worldspan, Galileo
- Now
  - Amadeus, Travelport, Sabre, Travelsky, Patheo, Abacus, Axxess, Topas
  - Systems include hotels and rental cars
Dissecting Fares

What makes a fare?
**Sample Fare: Lufthansa information**

Günstige Specials von Deutschland zu über 80 Zielen!

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fare Basis Code</td>
<td>LH: LNNPDE_ OS: TSSG6</td>
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</tbody>
</table>

### Afrika

<table>
<thead>
<tr>
<th>Land</th>
<th>Preis*</th>
<th>Buchungs-klasse</th>
<th>Anwendung</th>
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<tbody>
<tr>
<td>TUN</td>
<td>184 €</td>
<td>L</td>
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<td>ADD</td>
<td>196 €</td>
<td>L</td>
<td>LH</td>
</tr>
<tr>
<td>CAI</td>
<td>234 €</td>
<td>L/T</td>
<td>LH/OS</td>
</tr>
<tr>
<td>ASM</td>
<td>242 €</td>
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<tr>
<td>KIT</td>
<td>255 €</td>
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<tr>
<td>ALG</td>
<td>266 €</td>
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<td>LH</td>
</tr>
<tr>
<td>JNB</td>
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### Asien

<table>
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<tr>
<td>DELSBOM</td>
<td>239 €</td>
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<td>LH/OS</td>
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<tr>
<td>CAN</td>
<td>323 €</td>
<td>L</td>
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<tr>
<td>SEL</td>
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<tr>
<td>SHIA</td>
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<td>LH</td>
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<tr>
<td>COTIMA</td>
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<tr>
<td>BLR</td>
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<td>L/T</td>
<td>LH/OS</td>
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<td>HRG</td>
<td>423 €</td>
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<tr>
<td>SGN</td>
<td>450 €</td>
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<tr>
<td>KUL</td>
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<tr>
<td>SIN</td>
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<tr>
<td>JKT</td>
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### Naher Osten

<table>
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<tr>
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<td>LH/OS</td>
</tr>
<tr>
<td>KWI</td>
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<td>L</td>
<td>LH</td>
</tr>
<tr>
<td>THR</td>
<td>206 €</td>
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<td>LH/OS</td>
</tr>
<tr>
<td>AUN</td>
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<td>LH</td>
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<tr>
<td>VCT</td>
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<tr>
<td>BAH</td>
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</tr>
<tr>
<td>DON</td>
<td>402 €</td>
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</tr>
<tr>
<td>BGW</td>
<td>509 €</td>
<td>T</td>
<td>CS</td>
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</tbody>
</table>


Wichtige Konditionen:

- Gültigkeit/Anwendung:
  RT/CT/OJ; Afrika/Naher Osten/Asien: LH/ OS USA/Kanada/Mexiko: LH/ AC/ BD/ CO/ OS/ UA 6 Tage/SU US/CA/MX: SU 3 Monate

  - innerhalb von 72 Stunden nach Reservierung
  US/CA/MX: innerhalb von 24 Stunden nach Reservierung
  nicht gestattet
  gestattet (kein Sitzplatzanspruch)
  unbegrenzt, soweit durch Routing nicht begrenzt
  US/CA/MX: 5 pro Richtung gestattet
  3 frei in Europa pro Richtung
  2 frei in US/CA/MX pro Richtung

- Minimum Stay:
- Maximum Stay:
- Vorausbuchungsfrist:
- Ticketing/Bezahlung:
- Kinderermäßigung:
- Infantermäßigung:
- Transfers:
- Stopover:
- Buchungsklasse:
- Umbuchungen:
- Erstattung:
- Gruppen:
- Kombinationen:
- Miles & More Meilen: nicht gestattet
- gestattet mit allen Buchungsklassen gestattet
Sample Fare: Expertflyer.com

Fares for FRA to DXB on 11/05/19 with All results per page
Search: Departing FRA on 11/05/19 for DXB
Flying LH OS
Viewing in currency EUR
Show Fares for All Travel Dates

<table>
<thead>
<tr>
<th>Fare Basis</th>
<th>Airline</th>
<th>Booking Class</th>
<th>Trip Type</th>
<th>Fare (EUR)</th>
<th>Cabin</th>
<th>Effective Date</th>
<th>Expiration Date</th>
<th>Min / Max Stay</th>
<th>Adv Purchase Req</th>
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<tbody>
<tr>
<td>TBUYOS1D</td>
<td>OS</td>
<td>T</td>
<td>Round-Trip</td>
<td>211.00</td>
<td>E</td>
<td>11/04/16</td>
<td>11/09/30</td>
<td>SU / --</td>
<td>07</td>
</tr>
<tr>
<td>LNNPDE7</td>
<td>LH</td>
<td>L</td>
<td>Round-Trip</td>
<td>229.00</td>
<td>E</td>
<td>11/10/20</td>
<td>11/12/16</td>
<td>V / 12M</td>
<td>07</td>
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<tr>
<td>LSS6D</td>
<td>OS</td>
<td>L</td>
<td>Round-Trip</td>
<td>229.00</td>
<td>E</td>
<td>11/04/16</td>
<td>11/09/30</td>
<td>SU / 3M</td>
<td>07</td>
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<tr>
<td>LBUYOSD1</td>
<td>OS</td>
<td>L</td>
<td>Round-Trip</td>
<td>259.00</td>
<td>E</td>
<td>11/04/16</td>
<td>11/09/30</td>
<td>V / 12M</td>
<td>07</td>
</tr>
<tr>
<td>LBUYOS1D</td>
<td>OS</td>
<td>L</td>
<td>Round-Trip</td>
<td>295.00</td>
<td>E</td>
<td>10/12/01</td>
<td>11/12/31</td>
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<td>Round-Trip</td>
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<td>11/09/30</td>
<td>V / 12M</td>
<td>07</td>
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<tr>
<td>EBUYOSD1</td>
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<td>E</td>
<td>Round-Trip</td>
<td>309.00</td>
<td>E</td>
<td>10/12/01</td>
<td>11/12/31</td>
<td>V / 12M</td>
<td>07</td>
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<tr>
<td>KFLYOS1D</td>
<td>OS</td>
<td>K</td>
<td>Round-Trip</td>
<td>349.00</td>
<td>E</td>
<td>11/04/16</td>
<td>11/09/30</td>
<td>V / --</td>
<td>04</td>
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</table>
Sample Fare: Routing rules

<table>
<thead>
<tr>
<th>V FARE BASIS</th>
<th>BK</th>
<th>FARE</th>
<th>TRAVEL-TICKET</th>
<th>AP</th>
<th>MINMAX</th>
<th>RTG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 LNNPDE7</td>
<td>L‡R</td>
<td>325.00 E20OC</td>
<td>T14JN</td>
<td>7/1‡‡/12M</td>
<td>EH01 D16DE</td>
<td></td>
</tr>
</tbody>
</table>

PASSENGER TYPE-ADT AUTO PRICE-YES
FROM-FRA TO-DXB CXR-LH TVL-19MAY11 RULE-EPD7 IPREUME/22
FARE BASIS-LNNPDE7 SPECIAL FARE DIS-E VENDOR-ATP
FARE TYPE-XAN RT-APEX NONREFUNDABLE
EUR 229.00 2211 E20OCT11 D16DEC11 FC-LNNPDE7 FN-60
SYSTEM DATES - CREATED 10MAY11/1939 EXPIRES INFINITY

PUBLISHED RTG FRA-DXB/LH2211/TAR-EURG EF-11MAY11 DIS-INDEF

WITHIN THE EASTERN HEMISPHERE/
   FRA/DUS/BRU-SN/OS/LH-DXB
2. FRA-SN/OS/LH-ZRH/VIE/MUC/FRA/DUS/BRU-SN/OS/LH-DXB
3. FRA-SN/OS/LH-DXB
Fare rule: categories

• Travel restrictions, e.g. Blackout dates
• Minimum/Maximum stay
• Permitted flights/carriers
• Stopovers, Transfers
• Change/Cancellation handling
Combinations

ADD-ONS PERMITTED.

END-ON-END COMBINATIONS PERMITTED WITH DOMESTIC FARES. VALIDATE ALL FARE COMPONENTS. SIDE TRIPS PERMITTED WITH NO RESTRICTIONS.

OPEN JAWS/ROUND TRIPS/CIRCLE TRIPS

End-on-End:

Add-on:

A

B

C

A

B

C

Sample Fare: rules explained
Taxes, fees, surcharges

Fare 1: Carrier CO LJXNNZGB LON to EWR (rules)
Passenger type ADT, round trip fare, booking code L
Covers LHR-DUB (Coach), DUB-EWR (Coach) €82.53

Fare 2: Carrier AC LJXNNZGB NYC to LON (rules)
Passenger type ADT, round trip fare, booking code L
Covers LGA-YYZ (Coach), YYZ-LHR (Coach) €82.53

**CO YQ surcharge (YQ)** €58.00
USDA APHIS Fee (XA) €3.55
US Immigration Fee (XY) €4.97
US Customs Fee (YC) €3.91
Irish Passenger Charge (UP) €2.00
US International Arrival Tax (US) €11.58
**United Kingdom Air Passengers Duty (GB)** €68.78
United Kingdom Passenger Service Charge (UB) €25.89
Irish Inspection/Pre-Clearance Charge (UQ) €7.50

**AC YQ surcharge (YQ)** €100.30
Toronto Airport Improvement Fee (SQ) €2.91
Canadian Harmonized Sales Tax (ON) (RC) €0.38
US International Departure Tax (US) €11.58
US September 11th Security Fee (AY) €1.78
US Passenger Facility Charge (XF) €3.20

Subtotal per passenger €471.33
Number of passengers x1

**Total airfare & taxes** €471.33
Global Distribution Systems (GDS)

The booking process
GDS/CRS overview

not pictured: ATPCO/SITA, Yield Management, much more

fare basis
routing rules

src-dst price
src-dst price
src-dst price

inventory

PNR

fare database

GDS functions

booking engine

Airlines

provisioning

GDS
GDS/CRS attack vectors

- typos, logical mistakes
  - fare basis
  - src-dst price
  - src-dst price
  - src-dst price
  - wrong price

- wrong routing
  - routing rules
  - ‘relaxed’ rules

- Point of Sale (POS) differences
  - PNR
  - fare database
  - inventory
  - GDS functions
  - booking engine
  - cost miscalculation
  - typical web problems
Booking Engine Exploits

Skytours pricing
E-Ticket
1 x Adult(s)

Total Airfare
US$ 981.25

Hamburg; Germany - New York City - All Airports; United States

Fri, 26 Aug 2011 9:00 AM
HAM → EWR 11:45 AM
7605 Lufthansa
LH 7605 CONTINENTAL AIRLINES

New York City - All Airports; United States - Hamburg; Germany

Mon, 29 Aug 2011 5:40 PM
EWR → HAM 7:30 AM
0074 Continental Airlines

Mon, 29 Aug 2011 5:40 PM
EWR → HAM 7:30 AM
1500 United Airlines Inc
UA 1500 CONTINENTAL AIRLINES

Book It
Skytours (2)

- Data stored on client side
- Fare basis details
- Pricing information

```html
<input type="hidden" name="far_sel" value="PUB"/>
<input type="hidden" name="far_bas_cod" value="SKNCDEW"/>
<input type="hidden" name="alt_num" value="0"/>
<input type="hidden" name="alt_num_all" value="01"/>
<input type="hidden" name="cached" value="0"/>
<input type="hidden" name="scenario" value="3"/>
<input type="hidden" name="ttl_far_ori" value="674.25"/>
<input type="hidden" name="cur_cod_ori" value="EUR"/>
<input type="hidden" name="currency" value="USD"/>
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<input type="hidden" name="bp" value="355.00"/>
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<input type="hidden" name="courseFO" value="1.000000"/>
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```
<table>
<thead>
<tr>
<th>Flight 1</th>
<th>Flight 2</th>
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<tbody>
<tr>
<td><strong>Friday, August 26, 2011</strong></td>
<td><strong>Monday, August 29, 2011</strong></td>
</tr>
<tr>
<td><strong>Lufthansa</strong></td>
<td><strong>Continental Airlines</strong></td>
</tr>
<tr>
<td>7605</td>
<td>0074</td>
</tr>
<tr>
<td>Hamburg; Germany</td>
<td>New York - Newark, NJ; United States</td>
</tr>
<tr>
<td>New York - Newark, NJ; United States</td>
<td>Hamburg; Germany</td>
</tr>
<tr>
<td>9:00 AM</td>
<td>5:40 PM</td>
</tr>
<tr>
<td>11:45 AM</td>
<td>7:30 AM</td>
</tr>
</tbody>
</table>
Screen scraping
Automated brute force searches
Why Screen scraping?

- Avoid human interaction
- Find cheap fares without a specific reason

Procedure
- Use known origin + destination airport
- Use known date
- Search lots of engines for cheap flights
- Repeat as required (brute force)
  - change dates/airports
Screen scraping setup

- Use of Perl WWW::Mechanize module
- Targets
  - Huge sites like Expedia, Orbitz, Zuji
    - More likely to honor mistakes
  - Meta search engines
    - Let somebody else do the work
  - Sites with known issues
    - Skytours, LAN, Expedia
  - Different Point of Sales (POS)
    - Currency fluctuations, different availability
Results (1)

• Feature set
  • 10+ sites and different POS
  • Heavy use of AJAX, Web 2.0 technologies
  • WWW::Mechanize rocks!

• Lessons learned
  • At least one website changed every week
  • Only useful if you know what to search for
    - Origin/destination and dates required
  • Re-active rather than pro-active
Results (2)

• Screen scraping might be considered illegal
  • Check your local laws!
• Chasing changes is hard work
  • Often not worth the work
• Next?
  • Get closer to the source (GDS)
Global Distribution Systems

Fat finger typos aka 'error fares'
GDS targets

- 'error' and 'mistake' fares
  - Cheap fares
- Routing tricks
  - Improve routing/travel experience
  - Can be used as fuel dump
- 'fuel dump'
  - Save money by not paying for fuel
Error fares

Identification & fare hunting
Error fare metrics

- Introduction of a Key Performance Indicator (KPI) for (base) fares
- CPM = cents per mile
  - FRA-JFK: 3855 miles distance
  - Sample fare is $80
  - Price 8000 cents / 3855 miles = 2.08 cpm
- CPM became de-facto standard
  - Often including taxes
  - Don't confuse pre/post tax/bonus values
  - CPM calculation is complex if routing is
Decreasing the CPM cost

- Improve routing
  - Broken routing rules/missing restrictions
- A $40 fare increase resulted in $40 base fare
  

- Missing digits
  - $100,40 instead of $1040,00
Error fare search automation

- Again: Perl WWW::Mechanize to the rescue
- Obtain route+base fare combinations from web
  - Ask me for source!
  - Check what KVS tool does
  - Amadeus/Sabre/Galileo access costs money
- Calculate CPM for each fare
  - Use of GCMap.com (Great Circle Mapper)
- Alarm if worth mentioning
  - Database for comparison, trends
  - Detection of price drops
Faresql.pl implementation

- SQLite DB
  - Airport to area mapping
  - Route distances
  - Per route 'best price'
  - Raw listing of all known fares
- Ask me for source
  - Feedback/help well appreciated
- HTML output & source code
  - http://dedi3.fuckner.net/~hscholz/
- SQLite database
  - Nice queries!
SQLbrowser

- ~6 mio entries
- Too large for my laptop to display quickly
Sample find: SFO-AUH $170++
The infamous 'fuel dump'

Fly more – save money
## Trans-Atlantic trip for 224 Euro

### Itinerary

<table>
<thead>
<tr>
<th>Segment 1</th>
<th>Departure</th>
<th>Arrival</th>
<th>Flight</th>
<th>Cabin</th>
<th>Baggage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturday 15 November 2008</td>
<td><strong>07:15</strong> Hamburg (HAM)</td>
<td><strong>08:00</strong> London (LHR)</td>
<td>BA963</td>
<td>Economy-S</td>
<td>2PC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Segment 2</th>
<th>Departure</th>
<th>Arrival</th>
<th>Flight</th>
<th>Cabin</th>
<th>Baggage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturday 15 November 2008</td>
<td><strong>19:15</strong> London (LHR)</td>
<td><strong>21:45</strong> Boston (BOS)</td>
<td>BA239</td>
<td>Economy-O</td>
<td>2PC</td>
</tr>
</tbody>
</table>

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<th>Segment 3</th>
<th>Departure</th>
<th>Arrival</th>
<th>Flight</th>
<th>Cabin</th>
<th>Baggage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday 16 November 2008</td>
<td><strong>08:15</strong> Boston (BOS)</td>
<td><strong>19:35</strong> London (LHR)</td>
<td>BA238</td>
<td>Economy-O</td>
<td>2PC</td>
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</table>

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<th>Segment 4</th>
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<th>Arrival</th>
<th>Flight</th>
<th>Cabin</th>
<th>Baggage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 17 November 2008</td>
<td><strong>07:50</strong> London (LHR)</td>
<td><strong>10:25</strong> Hamburg (HAM)</td>
<td>BA964</td>
<td>Economy-S</td>
<td>2PC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Segment 5</th>
<th>Departure</th>
<th>Arrival</th>
<th>Flight</th>
<th>Cabin</th>
<th>Baggage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturday 10 January 2009</td>
<td><strong>06:40</strong> Buenos Aires (AEP)</td>
<td><strong>08:00</strong> Cordoba (COR)</td>
<td>LA4200</td>
<td>Operated by LAN ARGENTINA</td>
<td>2PC</td>
</tr>
</tbody>
</table>

### Fare

<table>
<thead>
<tr>
<th></th>
<th>Fare</th>
<th>Tax</th>
<th>Total (EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Adult num 1</td>
<td>147.00</td>
<td>81.74</td>
<td><strong>228.74</strong></td>
</tr>
<tr>
<td>Discount 3% LAN.com USA</td>
<td>-4.41</td>
<td>0.00</td>
<td>-4.41</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>142.59</td>
<td>81.74</td>
<td><strong>224.33</strong></td>
</tr>
</tbody>
</table>

### Fare regulations

- Does not allow for changes or refunds.
- [View fare rules and regulations](#)
Trans-Atlantic trip for 170 Euro

Prix total de ce voyage : 169,57 €

1 Détails des vols

> sam. 13 févr. 10

- Hambourg (HAN) avec Newark (EWR)
  Partir 09:00
  Arriver 12:00
  Terminal 1
  Terminal C
  Durée : 9h 0min

  Classe Économie, Boeing 757

  Distance totale : 6 136 km
  Durée totale : 9h 0min

> dim. 14 févr. 10

- Newark (EWR) avec Hambourg (HAM)
  Partir 17:50
  Arriver 07:30 +1 jour
  Terminal C
  Terminal 2
  Durée : 7h 40min

  Classe Économie, Boeing 757

  Distance totale : 6 136 km
  Durée totale : 7h 40min

> jeu. 4 mars 10

- Los Angeles (LAX) avec San Francisco (SFO)
  Partir 07:10
  Arriver 08:35
  Terminal 4
  Terminal 3
  Durée : 1h 25min

  Classe Économie, MDC MD88

  Distance totale : 544 km
  Durée totale : 1h 25min
How does it work?

- YQ = fuel surcharge
  - Also available as Q surcharge (base ticket price)
- YQ is collected by plating/validating carrier
- YQ may be part of other carriers fare
- Plating carrier fails to collect YQ
  - Interline agreements
  - Plating carrier often keeps YQ
- Fuel dump process:
  - Force ticket to be issued on 'forgetful' carrier
Perfect forgetful carrier

• British Airways (BA) has YQ
• American Airlines (AA) did not have YQ
  • And won't collect it for BA
• Go to AA ticket counter in London
  • Buy BA flight on AA ticket stock
  • Never pay YQ
• Got changed a few years back :-(
Fuel dump Basics

- Methods
  - 3<sup>rd</sup> strike (3x); add-on flight
  - Open Jaw (OJ)
  - Double OJ (DOJ)

- Codenames
  - “I've attempted C1-C2-C1 for the RT and Y-X w/ 13 miler and pineapple poke as my 3x's with no luck”
  - “Cable Beach”
  - “Windy City to Steelers”
## Open Jaw fuel dump example

<table>
<thead>
<tr>
<th>Flight</th>
<th>Airports/times</th>
<th>Stops</th>
<th>Duration/equipment</th>
<th>More information</th>
</tr>
</thead>
</table>
| United 951 | Depart: **BRU** Jan 23 12:10  
Arrive: **IAD** Jan 23 14:46 | Non-stop | 8h 36m  
**Boeing 777** | > Flight info  
View seats  
🌟 Autumn in North America sale |
|        | <<< connecting to >>>                      |       |                    |                  |
| United 7135 | Depart: **IAD** Jan 23 17:00  
Arrive: **CLE** Jan 23 18:19 | Non-stop | 1h 19m  
**Bombardier CRJ-200** | > Flight info  
View seats  
🌟 Autumn in North America sale |
| United 7881 | Depart: **CLE** Jan 24 6:00  
Arrive: **ORD** Jan 24 6:27 | Non-stop | 1h 27m  
**Embraer 145** | > Flight info  
View seats  
🌟 Autumn in North America sale |
|        | <<< connecting to >>>                      |       |                    |                  |
| United 638 | Depart: **ORD** Jan 24 9:00  
Arrive: **EWR** Jan 24 11:56 | Non-stop | 1h 56m  
**Airbus A320** | > Flight info  
View seats  
🌟 Autumn in North America sale |
| United 9256 | Depart: **EWR** Jan 24 16:45  
Arrive: **DUS** Jan 25 6:05  
Arrives next day | Non-stop | 7h 20m  
**Airbus A340-300** | > Flight info  
View seats  
🌟 Autumn in North America sale |
The 3rd Strike

(Optionally) fly more, pay less
The 3rd Strike approach

- Addition of flight to ticket to modify ticketing properties
  - Optionally fly 3x ticket
- Find 3x using ITA
  - http://matrix.itasoftware.com/
  - Use of 'nearby' feature
  - Use small carriers/locations
  - e.g. LAX-SFO area, intra-Caribbean, intra-Hawaii
- Good base fare needed
  - Promotion fares, subscribe to airline news
  - Low base, high fuel surcharge (YQ)
  - Add-ons have to be allowed
ITA sample 3rd strike search

<table>
<thead>
<tr>
<th>Departing from</th>
<th>Honolulu International, HI (HNL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination</td>
<td>Kona Keahole, HI (KOA)</td>
</tr>
<tr>
<td>Dates</td>
<td>Search exact dates</td>
</tr>
<tr>
<td>Outbound date</td>
<td>7/12/2011</td>
</tr>
<tr>
<td>Adults</td>
<td>1</td>
</tr>
<tr>
<td>Cabin</td>
<td>Cheapest available</td>
</tr>
<tr>
<td>Stops</td>
<td>No limit</td>
</tr>
<tr>
<td>Other</td>
<td>Allow airport changes</td>
</tr>
<tr>
<td>Sales city</td>
<td>Hamburg, Germany</td>
</tr>
</tbody>
</table>

Find the best flight deals with Matrix

Find airports near Honolulu, HI

Select airports below
- Honolulu International, HI (HNL) - 4 miles
- Hooliehu Molokai, HI (MKK) - 50 miles
- Kalaupapa, HI (LUP) - 58 miles
- Lanai City, HI (LNY) - 68 miles
- Kapalua, HI (JHM) - 79 miles
- Kahului, HI (OGG) - 96 miles
- Lihue Kauai Island, HI (LIH) - 105 miles
- Hana, HI (HNM) - 124 miles
- Kona Keahole, HI (KOA) - 159 miles
- Kamuela, HI (MUE) - 167 miles
- Hilo Int'l, HI (ITO) - 212 miles

Preferred times

We're currently hiring great people
Learn about careers at ITA Software
## ITA sample results

<table>
<thead>
<tr>
<th>Nonstop</th>
<th>Pacific Wings, L.L.C.</th>
<th>Mokulele Flight Service</th>
<th>Island Air</th>
<th>Hawaiian</th>
<th>Mesa</th>
</tr>
</thead>
<tbody>
<tr>
<td>From €43</td>
<td>From €46</td>
<td>From €48</td>
<td>From €61</td>
<td>From €78</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 stop</th>
<th>Pacific Wings, L.L.C.</th>
<th>Mokulele Flight Service</th>
<th>Island Air</th>
<th>Hawaiian</th>
<th>Mesa</th>
</tr>
</thead>
<tbody>
<tr>
<td>From €47</td>
<td>From €98</td>
<td>From €59</td>
<td>From €89</td>
<td>From €139</td>
<td></td>
</tr>
</tbody>
</table>

### One-way: HNL, MKK, LUP, LNY, JHM, OGG, LIH, HNM, KOA, MUE, ITO to KOA, MUE, ITO, HNM, LUP, MKK, HNL, LIH - Tue, Jul 12

<table>
<thead>
<tr>
<th>PRICE</th>
<th>AIRLINE</th>
<th>DEPART</th>
<th>ARRIVE</th>
<th>DURATION</th>
<th>FROM/TO</th>
<th>STOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>€43</td>
<td>Pacific Wings, L.L.C.</td>
<td>6:30am</td>
<td>7:05am</td>
<td>0h 35m</td>
<td>OGG to KOA</td>
<td>--</td>
</tr>
<tr>
<td>€43</td>
<td>Pacific Wings, L.L.C.</td>
<td>7:35am</td>
<td>8:10am</td>
<td>0h 35m</td>
<td>KOA to OGG</td>
<td>--</td>
</tr>
<tr>
<td>€43</td>
<td>Pacific Wings, L.L.C.</td>
<td>12:35pm</td>
<td>1:10pm</td>
<td>0h 35m</td>
<td>KOA to OGG</td>
<td>--</td>
</tr>
<tr>
<td>€43</td>
<td>Pacific Wings, L.L.C.</td>
<td>3:30pm</td>
<td>4:05pm</td>
<td>0h 35m</td>
<td>KOA to OGG</td>
<td>--</td>
</tr>
<tr>
<td>€43</td>
<td>Pacific Wings, L.L.C.</td>
<td>7:35pm</td>
<td>8:10pm</td>
<td>0h 35m</td>
<td>KOA to OGG</td>
<td>--</td>
</tr>
<tr>
<td>€43</td>
<td>Pacific Wings, L.L.C.</td>
<td>9:15pm</td>
<td>9:50pm</td>
<td>0h 35m</td>
<td>OGG to KOA</td>
<td>--</td>
</tr>
<tr>
<td>€43</td>
<td>Pacific Wings, L.L.C.</td>
<td>10:05pm</td>
<td>10:40pm</td>
<td>0h 35m</td>
<td>KOA to OGG</td>
<td>--</td>
</tr>
<tr>
<td>€44</td>
<td>Pacific Wings, L.L.C.</td>
<td>8:00am</td>
<td>8:30am</td>
<td>0h 30m</td>
<td>MKK to HNL</td>
<td>--</td>
</tr>
</tbody>
</table>
## ITA sample results (POS: BOS)

<table>
<thead>
<tr>
<th>Flight</th>
<th>From</th>
<th>To</th>
<th>Duration</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific Wings, L.L.C.</td>
<td>10:05pm</td>
<td>10:40pm</td>
<td>0h 35m</td>
<td>$59</td>
</tr>
<tr>
<td>Pacific Wings, L.L.C.</td>
<td>8:00am</td>
<td>8:30am</td>
<td>0h 30m</td>
<td>$62</td>
</tr>
<tr>
<td>Pacific Wings, L.L.C.</td>
<td>12:05pm</td>
<td>12:35pm</td>
<td>0h 30m</td>
<td>$62</td>
</tr>
<tr>
<td>Mesa</td>
<td>8:55am</td>
<td>9:31am</td>
<td>0h 36m</td>
<td>$65</td>
</tr>
<tr>
<td>Mokulele Flight Service</td>
<td>8:55am</td>
<td>9:31am</td>
<td>0h 36m</td>
<td>$65</td>
</tr>
</tbody>
</table>
ITA search processing

• Search for
  • Cheap fares (low base, high YQ)
  • Add-Ons allowed
• Base fare sources
  • faresql.pl output
  • http://dedi3.fuckner.net/~hscholz/
  • Flyertalk Mileage Run forums
Fuel dump execution

• Find flight you want
  • E.g. via ITA
  • Not all can be combined (Add-Ons)
• Enter on Orbitz, Expedia, ...
• Add 3\textsuperscript{rd} strike
• Enjoy savings
• Don't call the airlines!
Fuel dump example

- faresql hit

2011-Oct-06 10:52 LAX NRT Continental Airlines KKX03CJ1 163.00 CAD CPM: 2.99
2011-Oct-06 10:52 LAX NRT United KKX03CJ1 163.00 CAD CPM: 2.99
2011-Oct-06 10:52 LAX NRT Delta Air Lines TRX7KSL0 141.00 CAD CPM: 2.58
2011-Oct-06 10:52 LAX NRT Continental Airlines KLX73CJ1 141.00 CAD CPM: 2.58
2011-Oct-06 10:52 LAX NRT United KLX73CJ1 141.00 CAD CPM: 2.58
2011-Oct-06 10:52 LAX NRT Continental Airlines KLX33AJ8 133.00 CAD CPM: 2.43
2011-Oct-06 10:52 LAX NRT United KLX33AJ8 133.00 CAD CPM: 2.43
2011-Oct-06 10:52 LAX NRT Delta Air Lines TRXKSL8 163.00 CAD CPM: 2.99

- Rules allow End-to-End and Add-ons
Fuel dump fare breakdown

• Huge $576 fuel surcharge (YQ)

Provide this information to a travel agent to help them match the fares found.

Make sure to provide the exact booking and fare codes shown.

**Make sure to provide the exact booking and fare codes shown.**

**Fare 1:** Carrier CO KLX73CJ1 LAX to TYO (rules)  
Passenger type ADT, round trip fare, booking code K  
Covers LAX-NRT (Coach)  

Fare 1: Carrier CO KLX73CJ1 LAX to TYO (rules)  
$66.00

**Fare 2:** Carrier CO KLX33AJ8 TYO to LAX (rules)  
Passenger type ADT, round trip fare, booking code K  
Covers HND-LAX (Coach)  

CO YQ surcharge (YQ)  
US International Departure Tax (US)  
US September 11th Security Fee (AY)  
US Passenger Facility Charge (XF)  
USDA APHIS Fee (XA)  
US Immigration Fee (XY)  
US Customs Fee (YC)  
Japan International Passenger Facility Charge (SW)  
US International Arrival Tax (US)  

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO YQ surcharge (YQ)</td>
<td>$576.00</td>
</tr>
<tr>
<td>US International Departure Tax (US)</td>
<td>$16.30</td>
</tr>
<tr>
<td>US September 11th Security Fee (AY)</td>
<td>$2.50</td>
</tr>
<tr>
<td>US Passenger Facility Charge (XF)</td>
<td>$4.50</td>
</tr>
<tr>
<td>USDA APHIS Fee (XA)</td>
<td>$5.00</td>
</tr>
<tr>
<td>US Immigration Fee (XY)</td>
<td>$7.00</td>
</tr>
<tr>
<td>US Customs Fee (YC)</td>
<td>$5.50</td>
</tr>
<tr>
<td>Japan International Passenger Facility Charge (SW)</td>
<td>$26.10</td>
</tr>
<tr>
<td>US International Arrival Tax (US)</td>
<td>$16.30</td>
</tr>
</tbody>
</table>

Subtotal per passenger  
$788.20

Number of passengers  
$1

TOTAL AIRFARE & TAXES  
$788.20
Cost calculation

- How much can we theoretically save?
- 3rd strike flight costs (base + taxes)

<table>
<thead>
<tr>
<th>item</th>
<th>regular</th>
<th>fuel dump</th>
</tr>
</thead>
<tbody>
<tr>
<td>base fare</td>
<td>$128.50</td>
<td>$128.50</td>
</tr>
<tr>
<td>fuel surcharge</td>
<td>$576</td>
<td>$0</td>
</tr>
<tr>
<td>other fees, taxes</td>
<td>$83.20</td>
<td>$83.20</td>
</tr>
<tr>
<td>cost of 3rd strike</td>
<td>$0</td>
<td>$79 (+fees, taxes)</td>
</tr>
<tr>
<td>total</td>
<td>$788.20</td>
<td>~$300 (-$488 -62%)</td>
</tr>
</tbody>
</table>
First attempt: partial fuel dump

- $60 3^{rd} strike ticket + fees, taxes
Better 3rd strike option
Improve routing

/VIA THE PACIFIC/
Improved routing

- Note: stopovers may impose additional charges
- Use ITA to maximize routes
- Geek bonus points: Try to get on NH 787!
Improved routing result

• Map created via GCmap.com
• 12394 miles traveled for $436
• San Francisco, Osaka and Honolulu added
Fuel dump downsides

- Airlines may figure out what you are doing
- ADM: automated debit message
  - Travel agency has to pay difference
- You have to pay YQ (never seen)
- Cancellation of ticket
  - Esp. if you don't fly 3rd strike segment
  - Just add it at the end, not beginning
- Best savings if YQ is high
Bag 'o tricks

Assorted goodies
Fare Rule Mistake

- Rule for Trans-Atlantic fare (Area 2 to Area 1)

```java
if [ purchased in Area 1 ] ; then
    fuel surcharge = $150
else if [ purchased in Area 2 ] ; then
    fuel surcharge = 100 Euro
fi
```

- Solution: Issue ticket outside Area 1 or 2, e.g. Japan!
  - Happened to KLM
More routing improvements

• Fare types
  • MPM = Maximum Permitted Miles
  • Route based = fixed list of possible routes
• Both have to comply with fare rules
• Potential results:
  • More stops, more miles
  • E.g. SFO-HNL-LAX instead of SFO-LAX
• Not covered in this talk due to time
  • Ask me!
Not Covered

- Point of Sale tricks
  - Better inventory in foreign countries
- Fare Wars
  - Airlines compete for markets and make mistakes
- Routing Optimization
  - Avoid United Kingdom to save surcharges
- Currency Fluctuations
  - Book in Australia/New Zealand (countries change!)
Conclusions

What next?
Reasonable Disclosure

• Deals end up on Fatwallet, Slickdeals, ...
  • Are not honored
  • Die quickly
• Do not abuse these findings to make money!
• Do not call the airlines!
• Give back to the community!
**Cruise for a dollar?**

![Price Table](image)

### Inside Cabins

<table>
<thead>
<tr>
<th>Cabin Type</th>
<th>Cabin</th>
<th>Cabin Photo</th>
<th>Cabin Price Details</th>
<th>1st / 2nd Per Person Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside Stateroom</td>
<td></td>
<td><img src="image" alt="Image" /></td>
<td>Per Passenger (2) $2</td>
<td>Your Rate $2&lt;sup&gt;+&lt;/sup&gt; Interline Special</td>
</tr>
<tr>
<td>Category KK - Deck: 5</td>
<td>138 sq ft</td>
<td></td>
<td>Cruise TOTAL $4</td>
<td></td>
</tr>
<tr>
<td>INSIDE</td>
<td>Convertible lower beds, pullman bed, pullout bed.</td>
<td>No window</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Suite Cabins

<table>
<thead>
<tr>
<th>Cabin Type</th>
<th>Cabin</th>
<th>Cabin Photo</th>
<th>Cabin Price Details</th>
<th>1st / 2nd Per Person Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penthouse</td>
<td></td>
<td><img src="image" alt="Image" /></td>
<td>Per Passenger (2) $1,199</td>
<td>Your Rate $1,199&lt;sup&gt;+&lt;/sup&gt;</td>
</tr>
<tr>
<td>Category AE - Deck: 9, 9</td>
<td>286 sq ft</td>
<td></td>
<td>Cruise TOTAL $2,398</td>
<td></td>
</tr>
</tbody>
</table>
Hotel for cheap?

- Holiday Inn on Bali

<table>
<thead>
<tr>
<th>Room type</th>
<th>Conditions</th>
<th>Max</th>
<th>Rate for 5 nights</th>
<th>Nr. rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean Double or Twin Room</td>
<td>Non refundable</td>
<td>2</td>
<td>US$ 50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>FREE cancellation</td>
<td></td>
<td>US$ 1028.50</td>
<td>0</td>
</tr>
<tr>
<td>Ajana Suite</td>
<td>Non refundable</td>
<td>2</td>
<td>US$ 1164.50</td>
<td>1 (US$ 50)</td>
</tr>
<tr>
<td></td>
<td>Breakfast included</td>
<td></td>
<td>Smart price</td>
<td></td>
</tr>
<tr>
<td>Superior Double or Twin Room</td>
<td>Non refundable</td>
<td>2</td>
<td>US$ 750</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>FREE cancellation</td>
<td></td>
<td>US$ 968</td>
<td>0</td>
</tr>
<tr>
<td>Special Offer - Ocean Double or Twin Room</td>
<td>Non refundable</td>
<td>2</td>
<td>US$ 1101.50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Breakfast included</td>
<td></td>
<td>Smart price</td>
<td></td>
</tr>
<tr>
<td>Special Offer - Superior Double or Twin Room</td>
<td>Non refundable</td>
<td>2</td>
<td>US$ 859.50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Breakfast included</td>
<td></td>
<td>Smart price</td>
<td></td>
</tr>
</tbody>
</table>

You will pay the hotel in local currency at the exchange rate on the day of payment. Exchange rates are subject to change. The email confirmation is immediate! Only 2 rooms left.
References

- http://matrix.itasoftware.com/
- http://www.expertflyer.com/
  - Look out for up to 20% rebate vouchers
- http://www.flyertalk.com/
  - 'Mileage run deals' sub-forum
- http://www.milepoint.com/
  - 'Trick it' thread
- http://www.farecompare.com/
Summary

- Air travel hacking is lots of fun
- Next iteration hackers vs. GDS
  - Amadeus will introduce real-time updates
- Allows you to go to places you never knew existed
- Goal: get even closer to GDS

Q&A

hs@123.org