

# Barriers to FOSS4G Adoption

## OSGeo-Live case study

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September 10, 2014



# Definitions

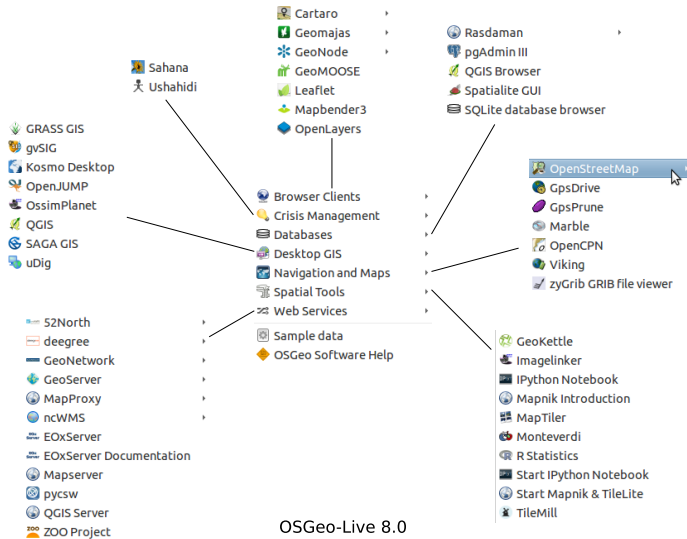
- ▶ Knowledge Diffusion - spread of awareness of an innovation
- ▶ Adoption - actual implementation of knowledge, innovation, or product
- ▶ Barrier - something that slows or stops the rate of diffusion or adoption <sup>1</sup>
- ▶ Pro-innovation Bias - tendency to cast diffusion and adoption as positives

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<sup>1</sup>Barrier is a negative term, as opposed to studying how to increase rates.



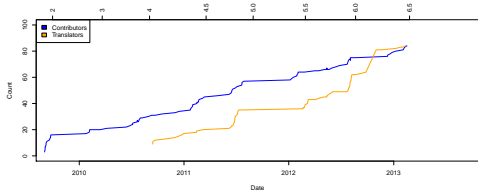
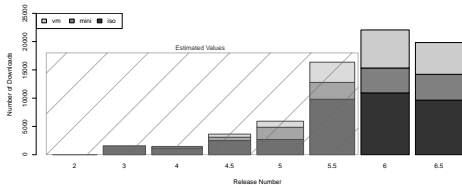
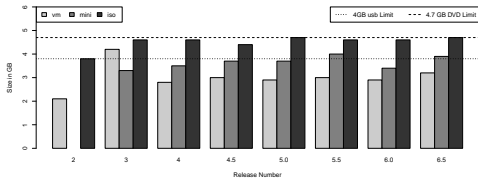
# OSGeo-Live



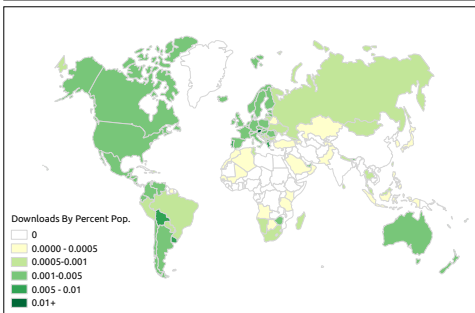
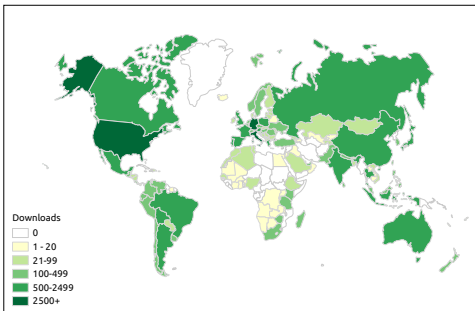
OSGeo-Live 8.0  
*Portland*



# History



# Maps



# OSGeo-Live Downloads: Top 10 Countries

(Versions 6.0 & 6.5)

**Table:** Total Downloads

| <b>Country</b> | <b>Downloads</b> |
|----------------|------------------|
| United States  | 5171             |
| Germany        | 3385             |
| Italy          | 2634             |
| Argentina      | 1812             |
| Mexico         | 1786             |
| Spain          | 1533             |
| France         | 1427             |
| Brazil         | 1245             |
| Indonesia      | 1162             |
| United Kingdom | 1041             |

**Table:** Downloads by Percent Population

| <b>Country</b>   | <b>Pop. Percent</b> | <b>Downloads</b> |
|------------------|---------------------|------------------|
| New Caledonia    | 0.016268            | 37               |
| Austria          | 0.011205            | 920              |
| Singapore        | 0.010070            | 469              |
| Cape Verde       | 0.009779            | 42               |
| Montenegro       | 0.008629            | 58               |
| Portugal         | 0.006967            | 746              |
| Northern Mariana | 0.006767            | 6                |
| Monaco           | 0.006067            | 2                |
| Guernsey         | 0.005828            | 4                |
| Uruguay          | 0.005380            | 188              |



# Breakdown

## Linux

Table: Total Downloads

| Country       | Count | Percent   |
|---------------|-------|-----------|
| United States | 831   | 16.070393 |
| Italy         | 661   | 25.094913 |
| Germany       | 575   | 16.986706 |
| Brazil        | 394   | 31.646586 |
| Argentina     | 358   | 19.757174 |
| Spain         | 353   | 23.026745 |
| Austria       | 352   | 38.260870 |
| Canada        | 348   | 36.287800 |
| France        | 329   | 23.055361 |
| Bolivia       | 293   | 58.019802 |

Table: Percent of Country's

| Country    | Percent   | Count |
|------------|-----------|-------|
| Tanzania   | 97.902098 | 140   |
| Cyprus     | 92.307692 | 12    |
| Estonia    | 84.090909 | 37    |
| Cape Verde | 71.428571 | 30    |
| Kenya      | 65.540541 | 97    |
| Madagascar | 64.912281 | 74    |
| Armenia    | 62.500000 | 5     |
| Bolivia    | 58.019802 | 293   |
| Venezuela  | 50.395778 | 191   |
| Ireland    | 44.444444 | 44    |

## Mac

Table: Total Downloads

| Country        | Count | Percent   |
|----------------|-------|-----------|
| United States  | 615   | 11.893251 |
| Singapore      | 423   | 90.191898 |
| Germany        | 167   | 4.933530  |
| France         | 132   | 9.250175  |
| Indonesia      | 122   | 10.499139 |
| Italy          | 108   | 4.100228  |
| United Kingdom | 101   | 9.702209  |
| South Africa   | 100   | 28.653295 |
| Canada         | 87    | 9.071950  |
| Spain          | 87    | 5.675147  |

Table: Percent of Country's

| Country      | Percent   | Count |
|--------------|-----------|-------|
| Singapore    | 90.191898 | 423   |
| Senegal      | 53.731343 | 36    |
| South Africa | 28.653295 | 100   |
| Australia    | 15.445545 | 78    |
| Switzerland  | 14.137931 | 41    |
| Mali         | 13.333333 | 2     |
| Japan        | 12.915851 | 66    |
| Finland      | 12.857143 | 9     |
| Qatar        | 12.500000 | 1     |
| Hong Kong    | 12.195122 | 5     |



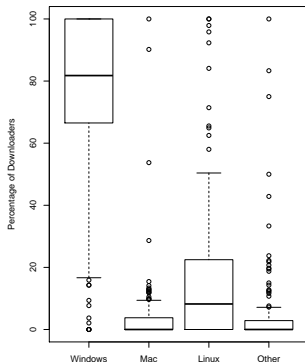
# Significant Variation

Table: World Internet connected desktop computers vs. OSGeo-Live downloaders.\*

|                        | Windows  | Mac      | Linux    | Other    |
|------------------------|----------|----------|----------|----------|
| Desktop Computers      | 92.02000 | 6.810000 | 1.16000  | 0.000000 |
| OSGeo-Live Downloaders | 68.6487  | 6.581052 | 20.78151 | 3.988733 |

Table: Operating System vs. OSGeo-Live variant downloaded.\*

|         | vm   | iso   | mini |
|---------|------|-------|------|
| Windows | 8290 | 14822 | 5647 |
| Mac     | 1435 | 818   | 504  |
| Linux   | 2241 | 4031  | 2434 |
| Other   | 385  | 907   | 379  |

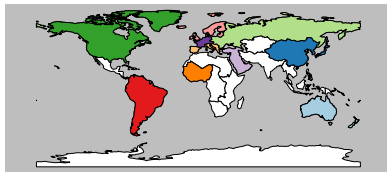
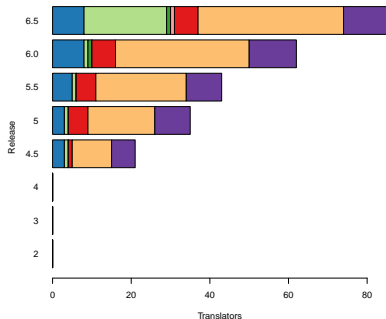
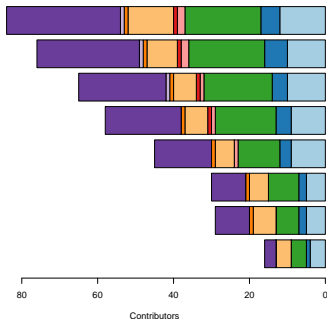


\*Contingency table G-Statistic significant.





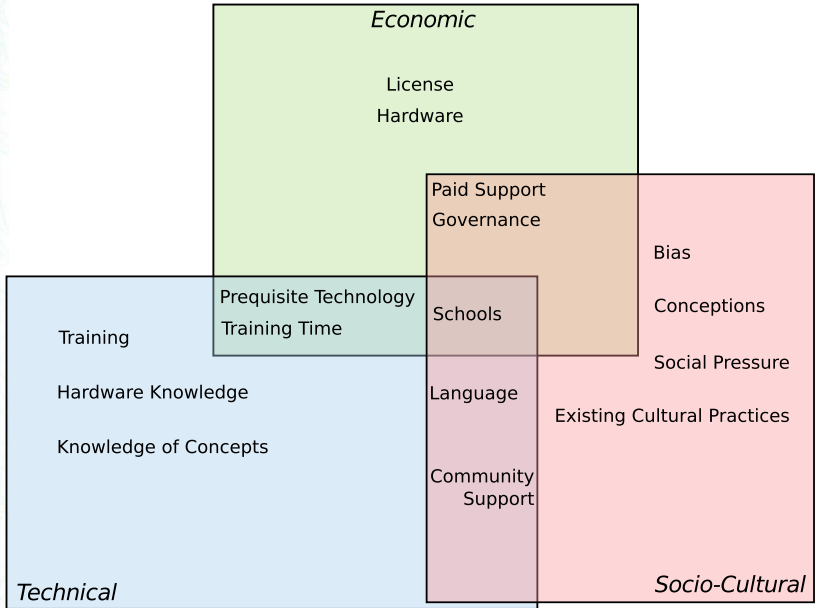
# Regional Participation



Kendall's Rank Correlation, strong correlation, downloaders and participants  $\tau = 0.436$  (p-value =  $3.668e-12$ )



# Barriers



# Potential Barriers

| Variable        | Description                                | Source             |
|-----------------|--|--------------------|
| downloads       | Total Number of Downloads                  | OSGeo-Live         |
| pop             | Population                                 | Natural Earth      |
| downbypop       | Downloads/Population                       | calculated         |
| economy         | Economic ranking 1-7                       | Natural Earth (UN) |
| income          | Income ranking 1-5                         | Natural Earth (UN) |
| OoklaAverage    | Average Internet speed                     | Ookla              |
| ITUbroadband    | Population % wired Internet above 256 kbps | ITU                |
| AkUniqueIP      | Total Unique IP Addresses                  | Akamai             |
| AkAverage       | Average Internet Speed                     | Akamai             |
| AkPeak          | Peak Internet Speed                        | Akamai             |
| AkHighBroadband | Population % wired Internet above 10 Mbps  | Akamai             |
| AkBroadband     | Population % wired Internet above 4 Mbps   | Akamai             |
| AkNarrowband    | Population % wired Internet below 4 Mbps   | Akamai             |
| DemIndex        | Democracy Index                            | EIU                |



# Details

**Table:** Economy Classification

1. Developed region: G7
2. Developed region: nonG7
3. Emerging region: BRIC
4. Emerging region: MIKT
5. Emerging region: G20
6. Developing region
7. Least developed region

**Table:** Income Classification

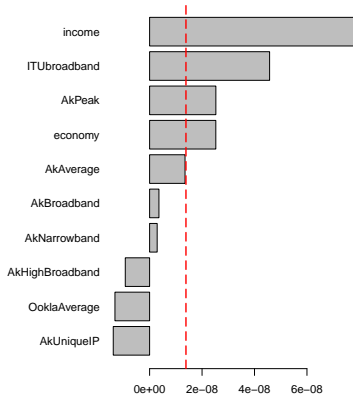
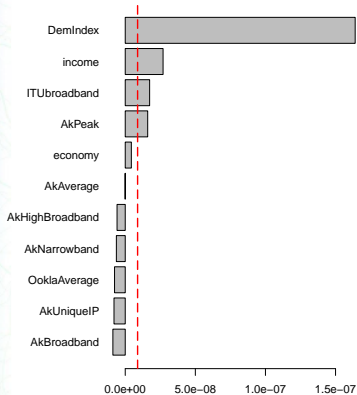
1. High income: OECD
2. High income: nonOECD
3. Upper middle income
4. Lower middle income
5. Low income

## **Listing 1:** Regression Analysis with Random Forests in R

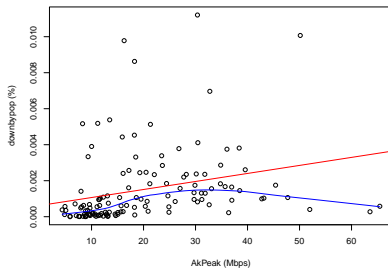
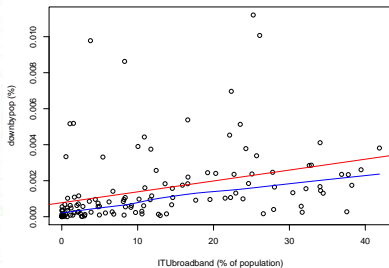
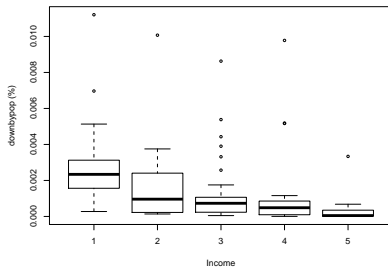
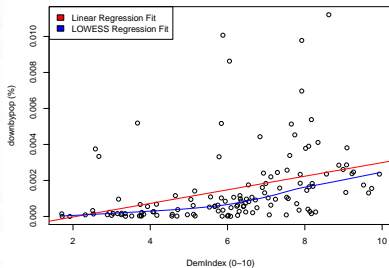
```
#Packages: party, caret, to use multi-core: parallel, doMC
mod1 <- train(downbypop ~ economy+income+OoklaAverage+
  ITUbbroadband+AkUniqueIP+AkAverage+AkPeak+AkHighBroadband
  +AkBroadband+AkNarrowband+DemIndex, data = downdata,
  method = "cforest", trControl = trainControl(method = "
  oob", allowParallel = TRUE, number = 10, repeats = 10),
  controls = cforest_unbiased(ntree = 10000))
test.varimp <- varimp(mod1$finalModel, conditional=TRUE)
```



# Important Variables



# Important Relationships



# Conclusions

- ▶ From the Data
  - ▶ Mac users like Virtual Machines
  - ▶ OSGeo-Live is popular with Linux users
  - ▶ Having participants in the same country corresponds to downloads.
  - ▶ Culture is a big barrier
  - ▶ Fiscal and Technical issues still exist with FOSS
- ▶ Key's to FOSS
  - ▶ Infinite Trial-ability
  - ▶ Re-invention potential
  - ▶ Translation?
  - ▶ Community
    - ▶ Supply Side Institutions (e.g. OSGeo)
    - ▶ Informal Social Networks (e.g. Local Chapters)



# What's Next

- ▶ Confirmation & Details - Survey Questionnaire
- ▶ How fast of internet is good enough?
- ▶ Compare Projects
- ▶ Test more specific data ...
  - ▶ Household income
  - ▶ English Proficiency
  - ▶ % of Higher Education
- ▶ Change over time





# Special Thanks

- ▶ OSGeo-Live Team and Community <http://live.osgeo.org>
- ▶ Jim Quinn and the [Information Center for the Environment](#)

Questions?

[@aimandel](https://github.com/wildintellect/OSGeoLive-analysis)

