



Open Source Software  
Development:

# **A Case Study of FreeBSD**

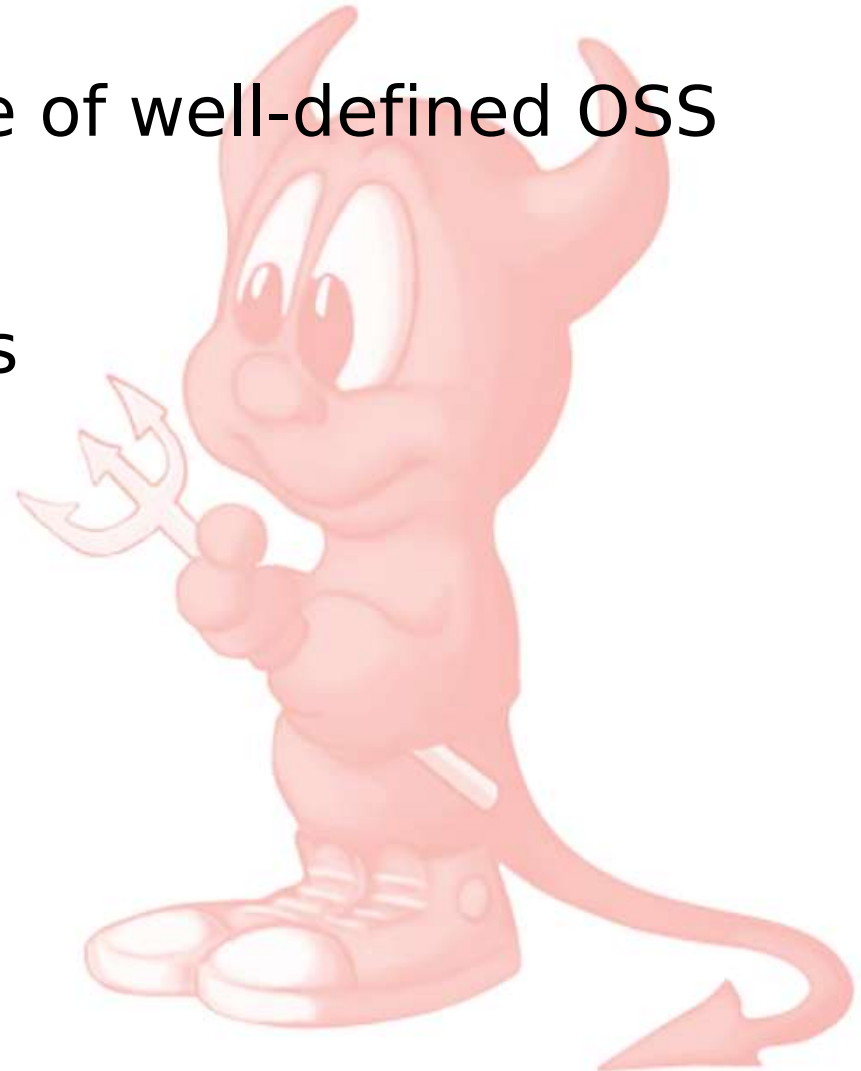
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# objective

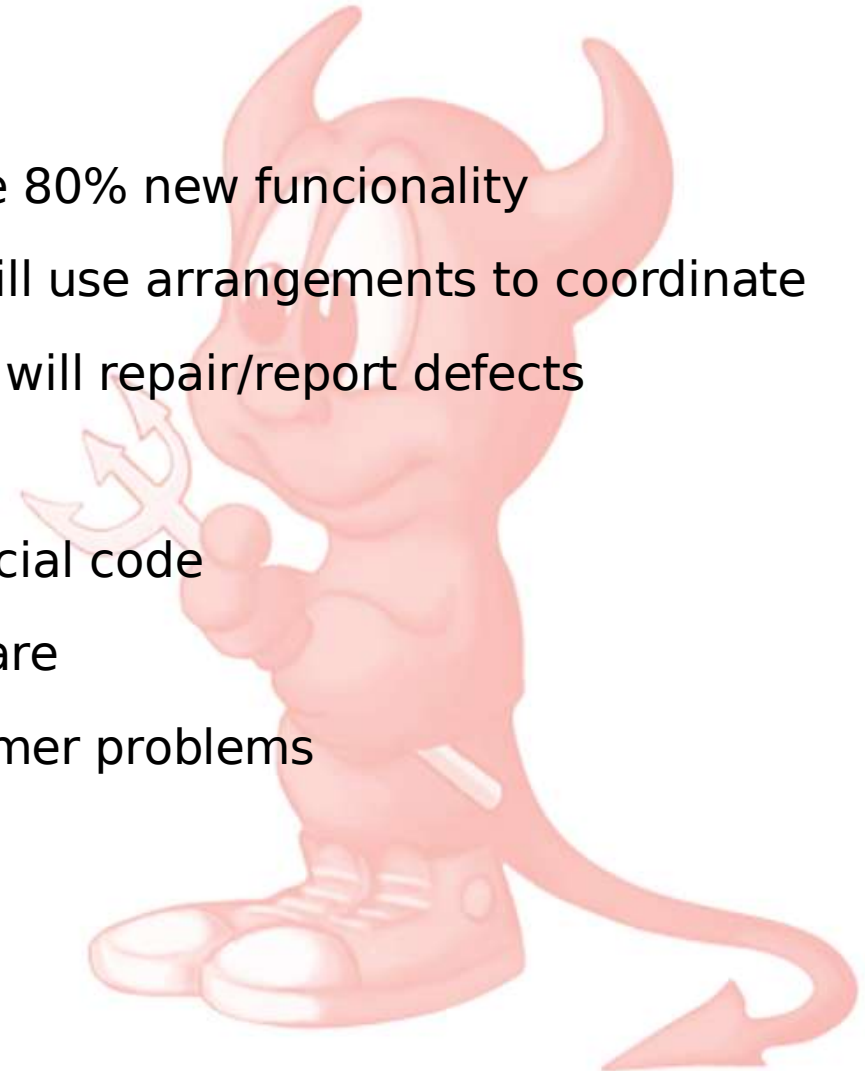
- Study of FreeBSD as sample of well-defined OSS
- Based on Mockus' Doc
  - Mozilla & Apache projects
- Study based on hypotheses





# hipotheses

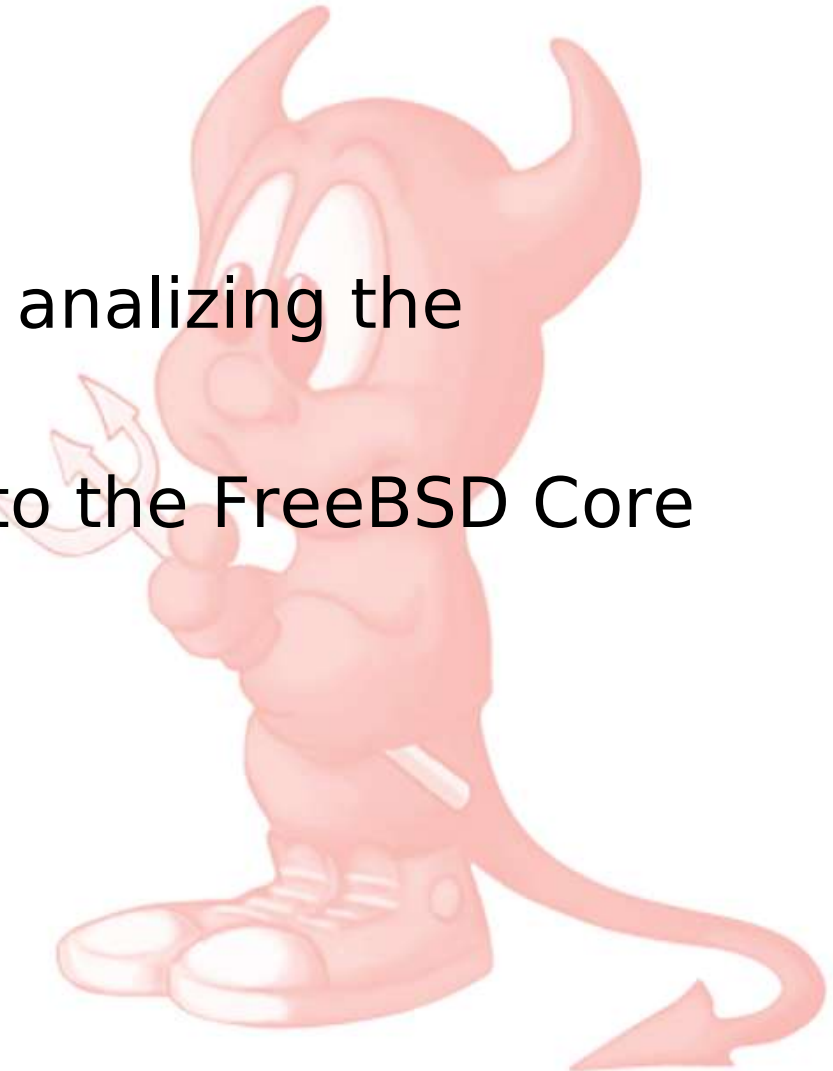
- H1: A core of 10/15 developers will create 80% new functionality
- H2: Projects with more than 15 people, will use arrangements to coordinate
- H3: Groups much larger than Core Team will repair/report defects
- H4: OSS without contributors will fail
- H5: OSS defects will be lower than comercial code
- H6: Developers will be users of the software
- H7: There will be rapid response to customer problems





# hipotheseses

- We'll try to demonstrate them analyzing the project
- Research metod : questions to the FreeBSD Core Team





# The FreeBSD project

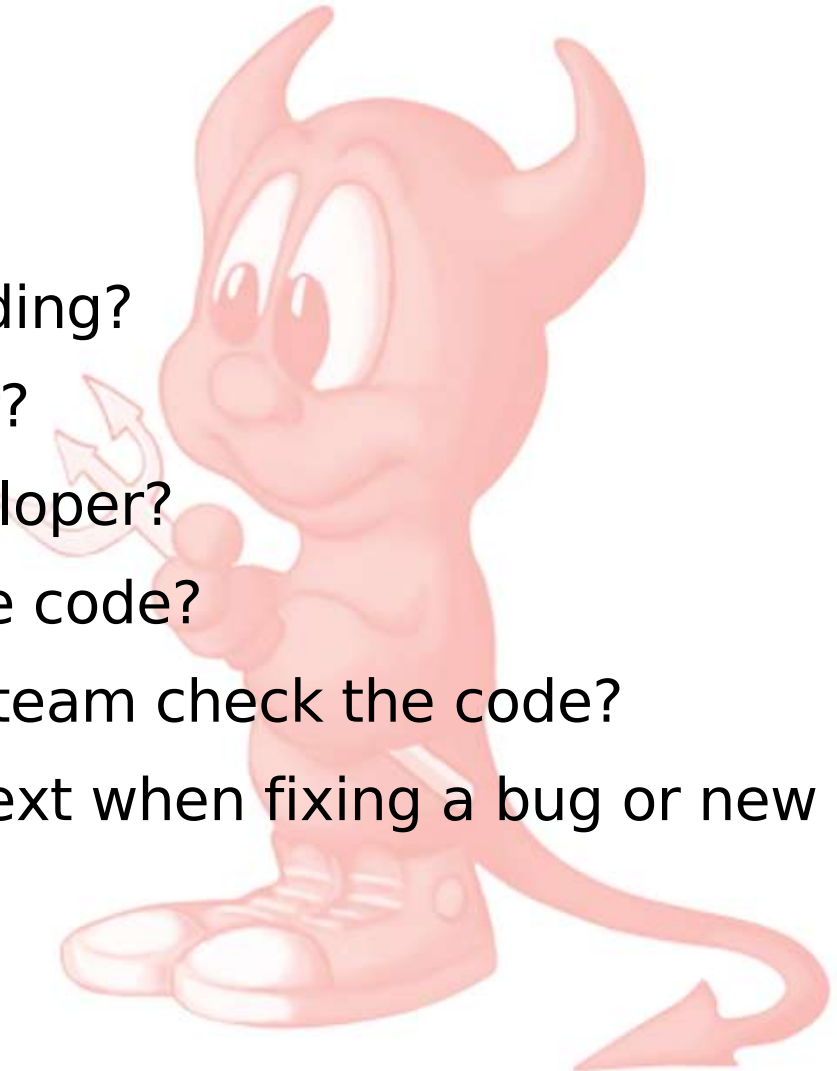
- A complete OS : Kernel + userland
- Committers / Core Team / Release Engineer
- Data Sources:
  - CVS
  - GNATS
  - email





# FreeBSD research method

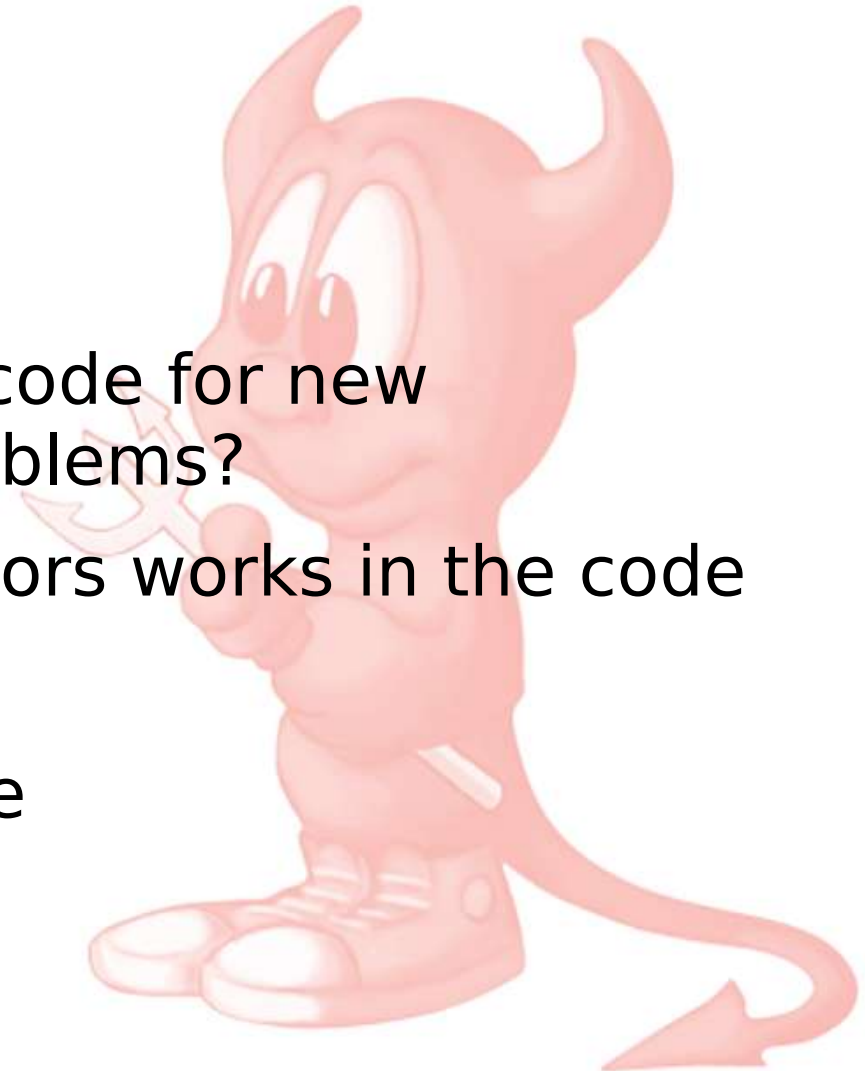
- Questions to the Core Team:
  - How many roles are involved in coding?
  - How does one become a developer?
  - How does one become a core developer?
  - How does normal person contribute code?
  - How does the release engineering team check the code?
  - How does one decide what to do next when fixing a bug or new functionality?





# research results

- Answers to the research:
  - Process used to develop
  - How many people wrote code for new functionality/ reported problems?
  - Where the code contributors works in the code
  - Functions about the roles
  - Defect density in the code





# research results

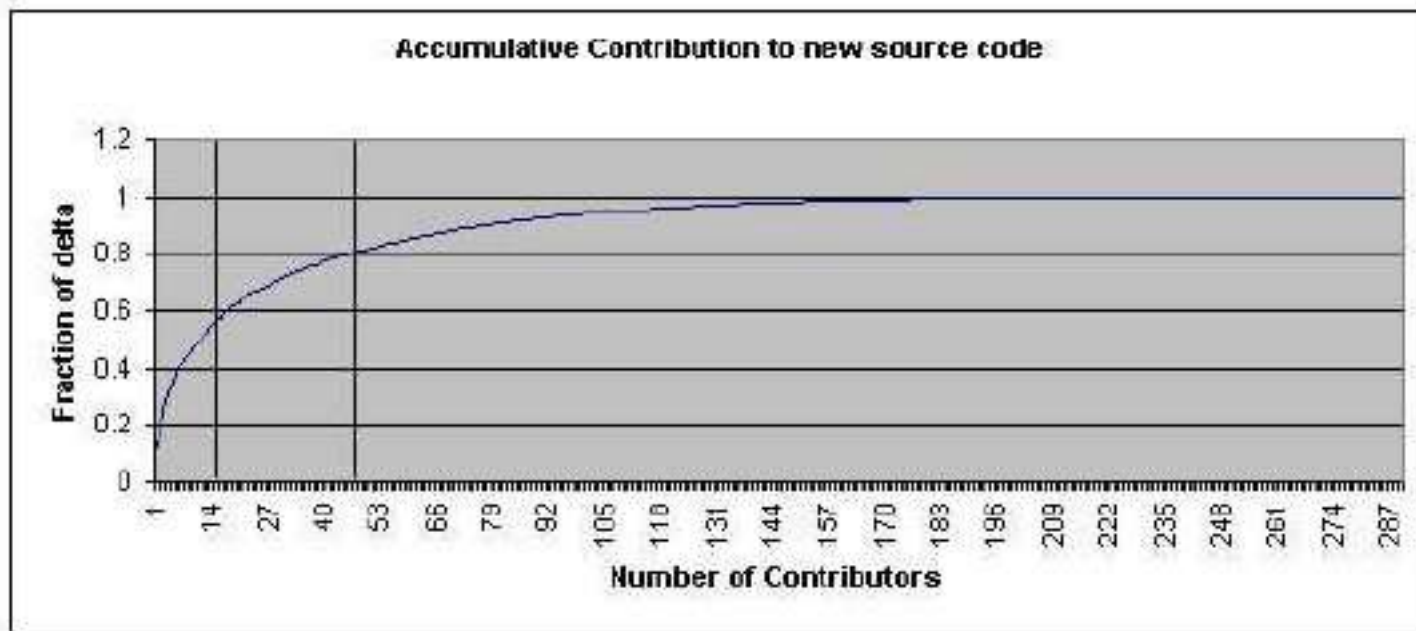


Figure 2. Distribution among developers (committers) of source code deltas to add new features.





# research results

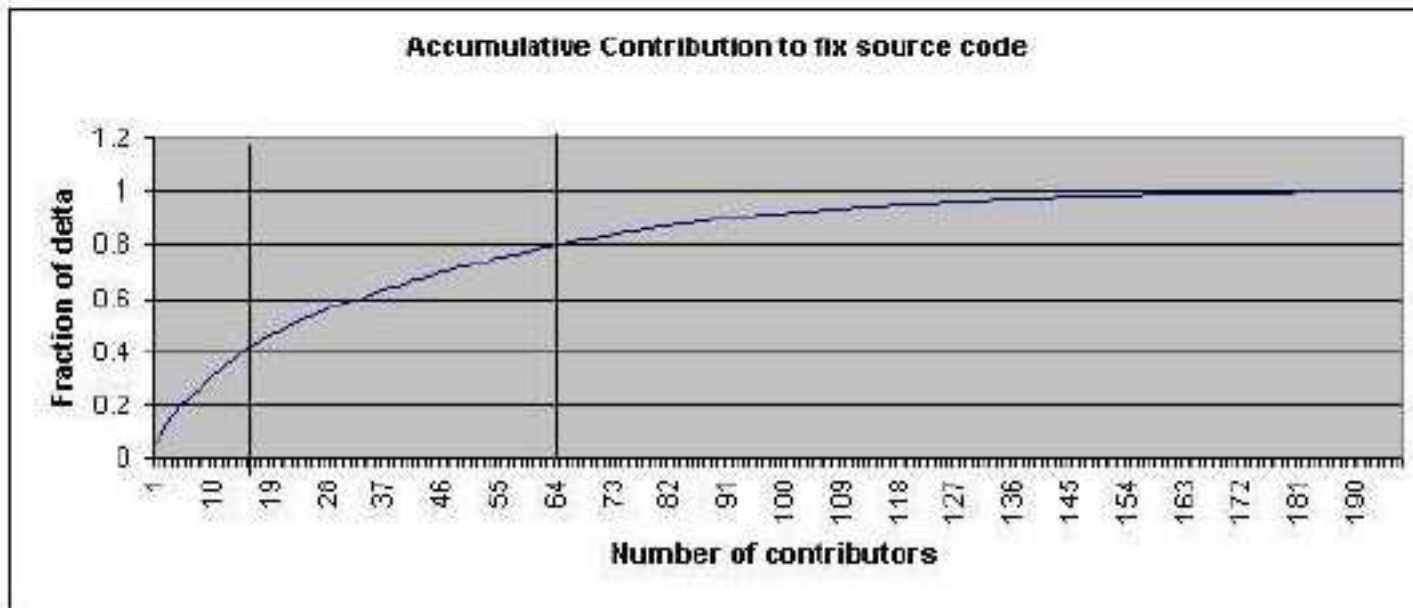


Figure 3. Distribution among developers (committers) of source code deltas to fix errors.

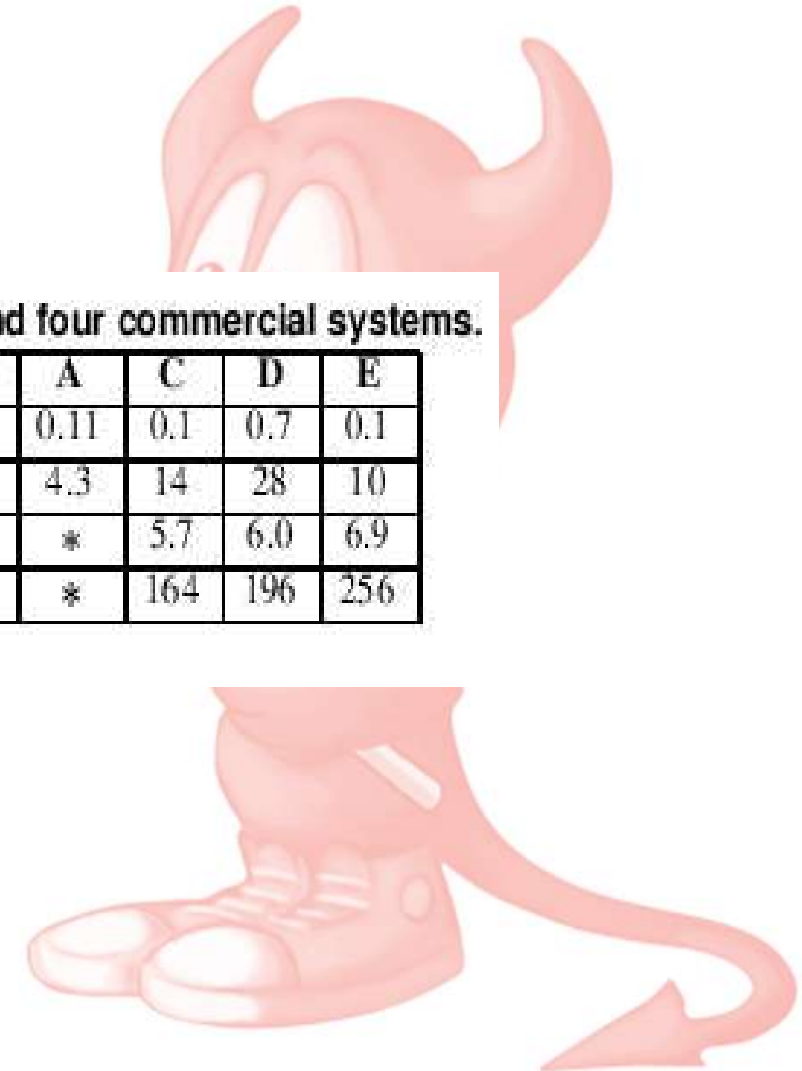




# research results

**Table 1. Defect densities in FreeBSD, Apache, and four commercial systems.**

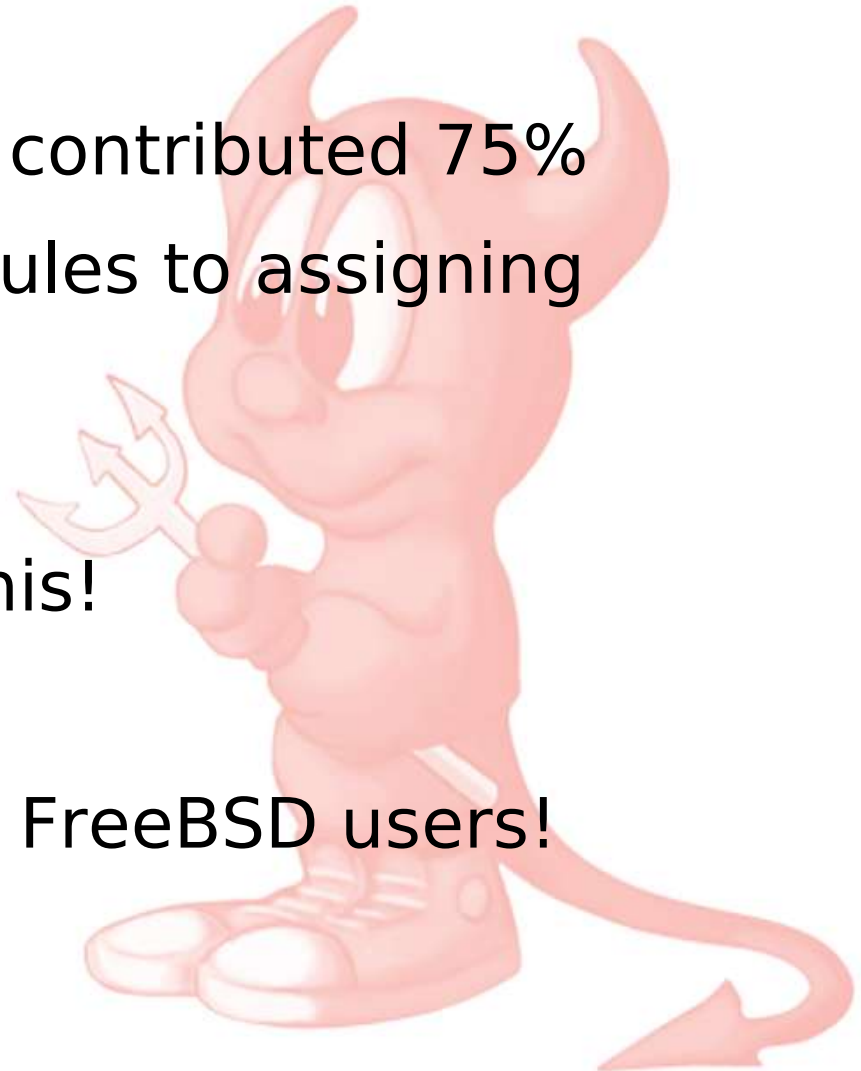
Measure	FreeBSD	Apache	A	C	D	E
Post-release defects/KLOC	3.35	2.64	0.11	0.1	0.7	0.1
Post-release defects/Kdelta	68.39	40.8	4.3	14	28	10
Post-feature defects/KLOC	3.35	2.64	*	5.7	6.0	6.9
Post-feature defects/Kdelta	68.39	40.8	*	164	196	256





# evaluations hypotheses

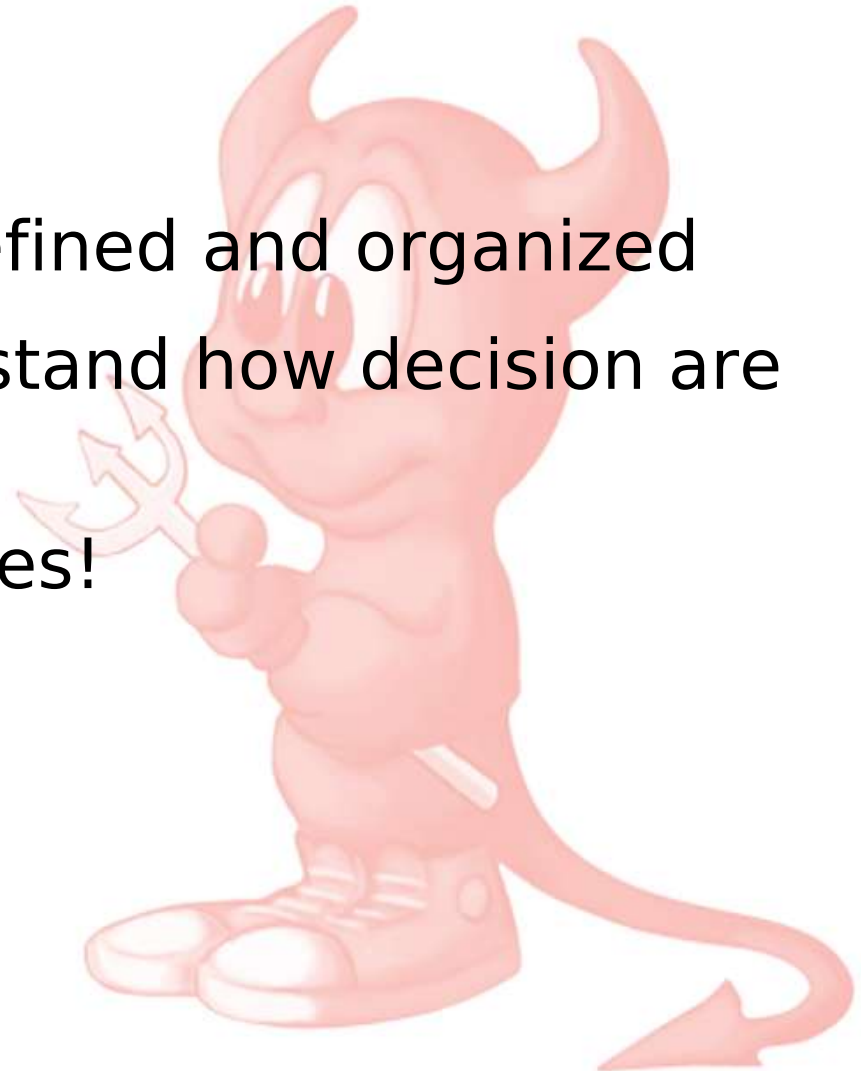
- H1: A total of 36 committers contributed 75%
- H2: FreeBSD uses informal rules to assigning tasks/testing/inspections
- H3: FreeBSD contributors
- H4: we could not evaluate this!
- H5: results consistent
- H6: FreeBSD developers are FreeBSD users!
- H7: no enough data :-)





# conclusions

- FreeBSD is fairly well-defined and organized
- Project members understand how decision are made
- Data supports hypotheses!





end

**Thanks!**

