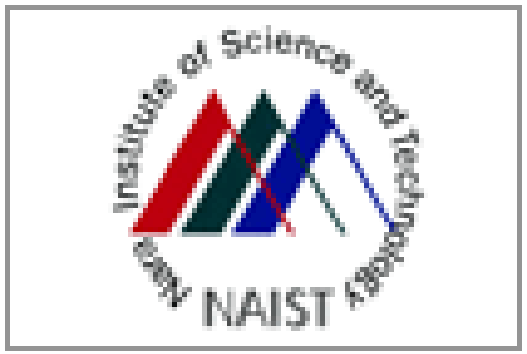
An Empirical Illustration to Validate a FLOSS Development Model using S-shaped Curves



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Motivation

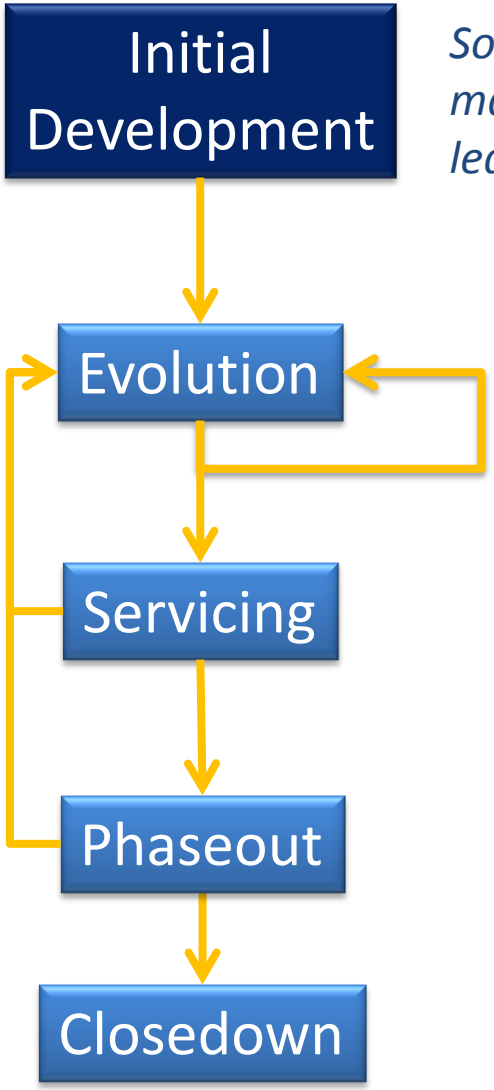
- OSS/FLOSS → An homogeneous phenomenon?
- FLOSS based software solutions →Applicable to other types of software?
- Need for: A well established Development Model for FLOSS

A FLOSS Development Model

The Adapted Staged Model for FLOSS [Capiluppi et al., 2007] (ASMF):

- Adaption of the Staged Model [Rajilich and Bennet, 2000]
  - Takes into account various maintenance tasks
- Built upon observations from various cases studies:
  - FLOSS and
  - Traditional development

The Adapted Staged Model FLOSS ASMF



Some projects maybe never leave this stage

Design, first coding and testing

Long-lived SW

Continuous feedback → Bug Fixing, Improvements, New Requirements

Mature System → Only fixes, its size does not change overall (stabilization points)

No fixes, nor new implementation occur

Approach
How to validate the ASMF?

Stage	LOC	Fixed Bugs	Improvements	New Features
Initial	↑	↗	↗	
Evolution	↗	↑	↑	↑ ↗ →
Servicing	↗ →	↗ →	↗ →	
Phase Out				

↑ Fast growth ↗ Slow growth → Stabilization

Approach
How to identify the different ASMF stages?

- Evolution of Selected Metrics using S-Shaped Curves
- Growth Rates comparison

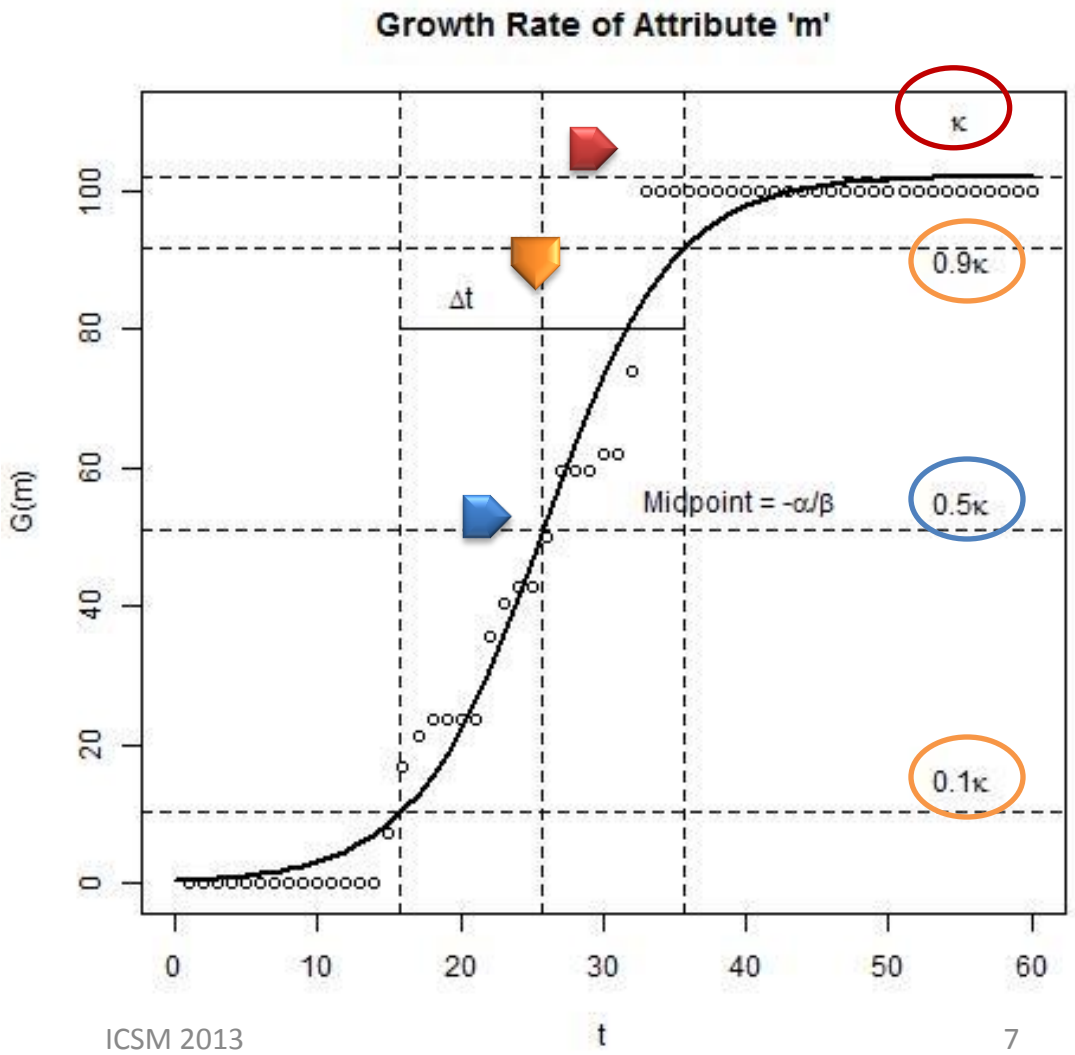
Approach
S-Shape Curves

$$G(m) = \frac{\kappa}{1+e^{-(\alpha+\beta t)}}$$

κ: *Limit of Growth*

$$Midpoint = -\alpha/\beta$$

$$\Delta t = \ln 81/\alpha$$



Case Study

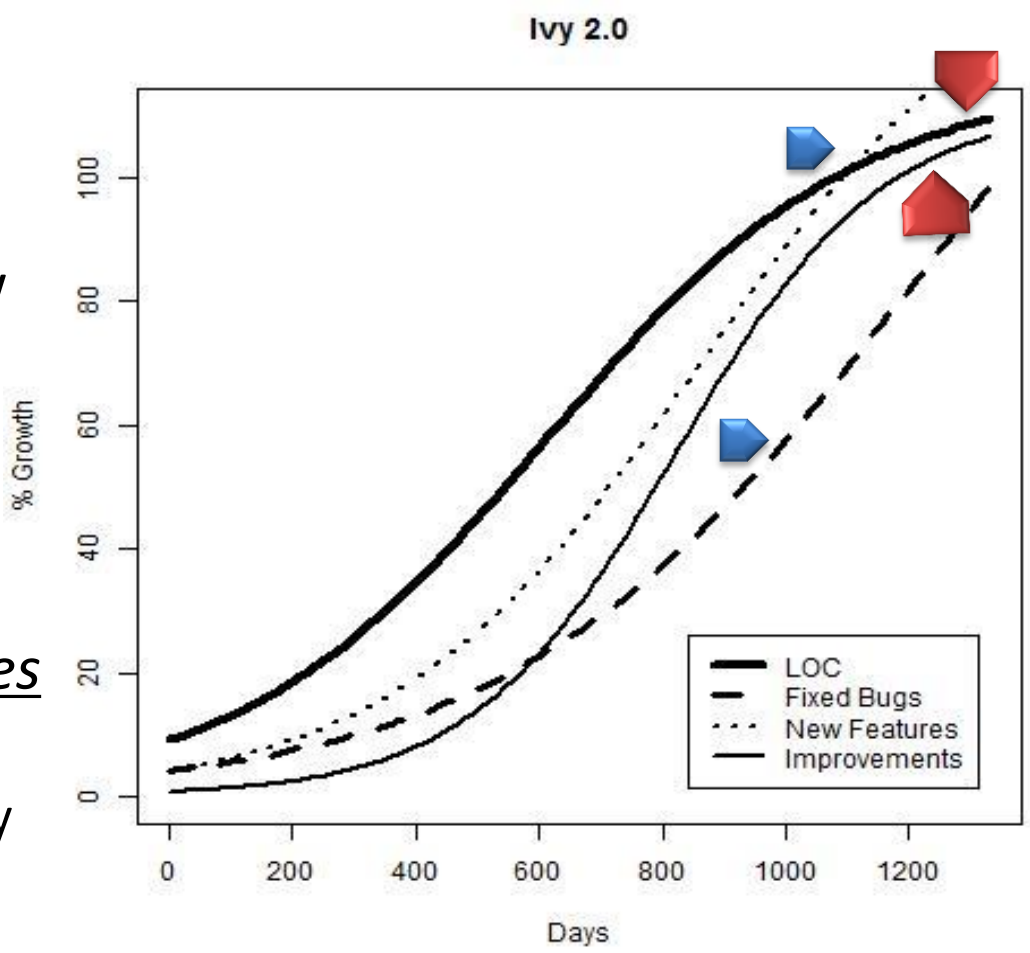
- Four releases of Apache Ivy 2.0 → 2.3
- History Logs:
  - Code Repository
  - Issue Tracking System
- Daily dataset, per Java file:
  - LOC
  - Fixed Bugs, Improvements and New Features

Results and Observations
Ivy 2.0 (1330 Days)

Analyzing κ, Δt *and the MidPoint:*

- *LOC* and *Improvements* grew faster
  - →90% of its total growth @ day 1302 and 1243

- *Fixed Bugs* and *New Features* grew to a slower rate
  - → 50% of its total growth @day 955 and 1167



Conclusion for Ivy R 2.0 (1330 Days)

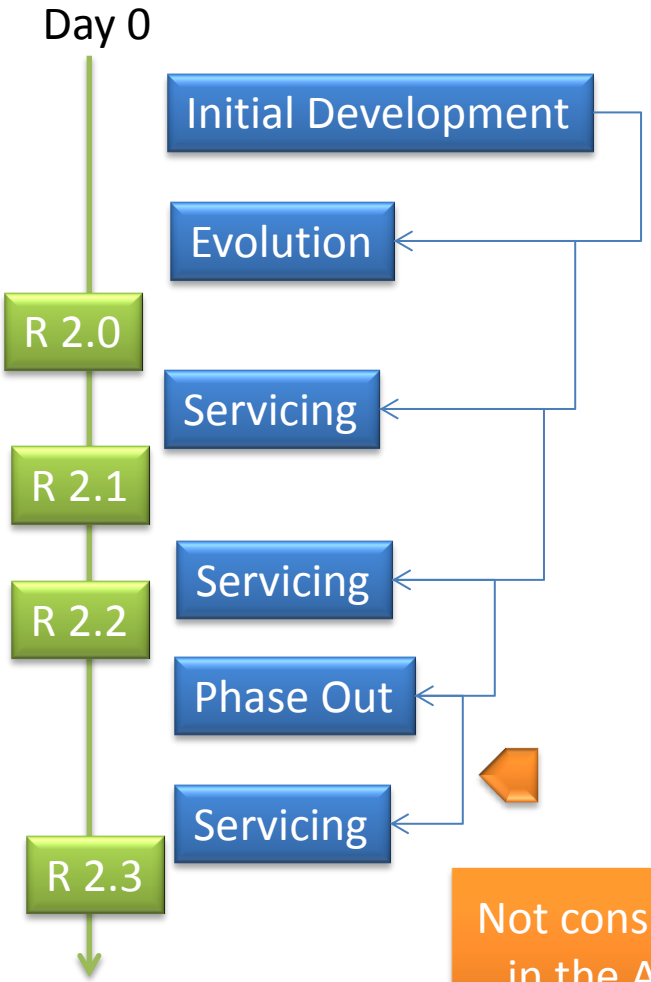
- The initial development → [Initial Development]
- The latest development → [Evolution]

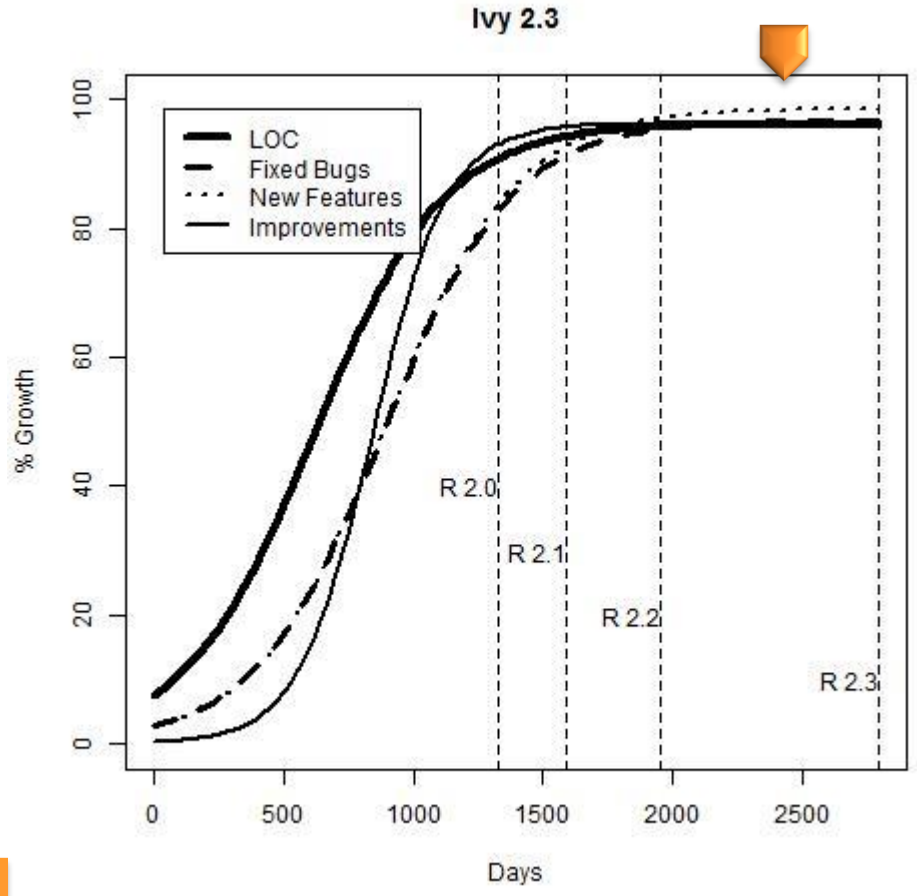
Stage	LOC	Fixed Bugs	Improvements	New Features
Initial	↑	↗	↗	
Evolution	↗	↑	↑	↑ ↗ →
Servicing	↗ →	↗ →	↗ →	
Phase Out				

↑ Fast growth ↗ Slow growth → Stabilization

General Observations and Conclusions

Some New Features implemented at [Servicing]





Not considered in the ASMF

Summary

- An illustration of an empirical method to validate the ASMF
  - 4 selected metrics
  - S-Shaped curves
- Successfully identified different development stages of 4 releases of Ivy
- Two observations did not comply with ASMF
  - [Servicing] → [Evolution]
  - Small number of Improvements at [Servicing]

Thank you for listening!

Questions/Comments ?

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