

Linux goes safety and takes it to the next level.

Carsten Emde

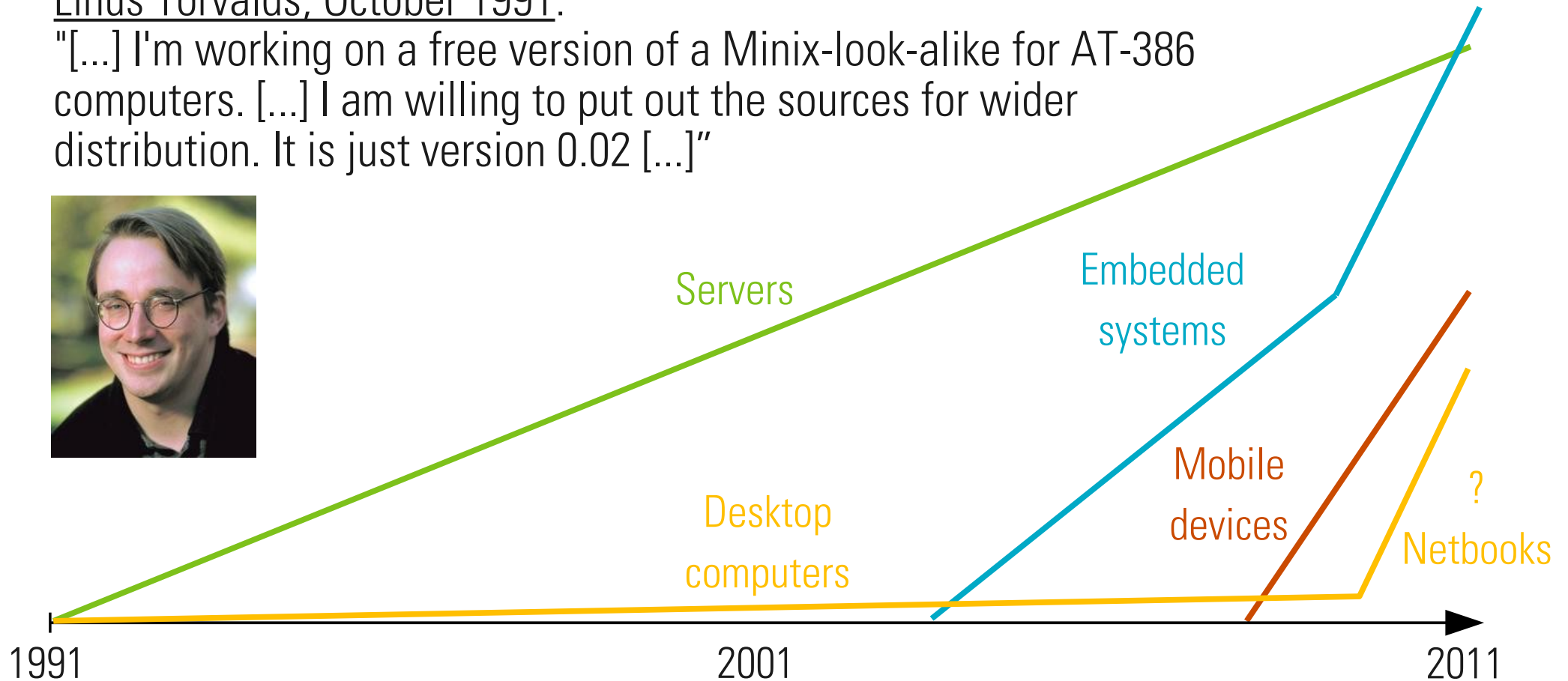
Open Source Automation Development Lab

(OSADL) eG

Why is Linux so successful?

Linus Torvalds, October 1991:

"[...] I'm working on a free version of a Minix-look-alike for AT-386 computers. [...] I am willing to put out the sources for wider distribution. It is just version 0.02 [...]"



Why is Linux so successful? (2)

Linus Torvalds, 1997:

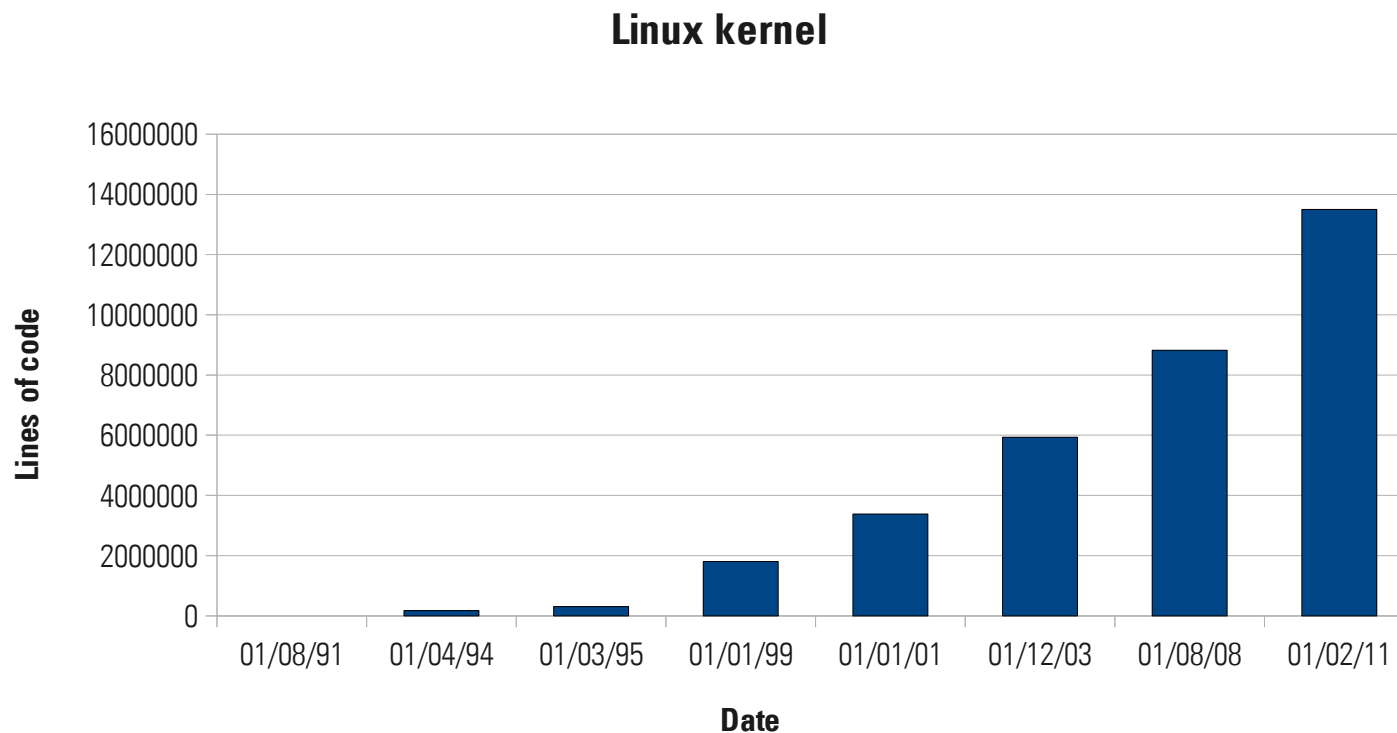
"Making Linux GPL'd was definitely the best thing I ever did"

Date	Linux version	Lines of code
August 1991	<i>Start of development</i>	
March 1994	1.0	176.250
March 1995	1.2	310.950
January 1999	2.2	1.800.847
January 2001	2.4	3.377.902
December 2003	2.6	5.929.913
August 2008	2.6.26.3-rt3	8.817.595
March 2011	2.6.38-rc5	~13.500.000

Why is Linux so successful? (3)

Linus Torvalds, 1997:

"Making Linux GPL'd was definitely the best thing I ever did"



What is the GPL?

The GNU GPL (General Public License) is a software license with “copyleft”.

The typical rules of an Open Source license with copyleft are:

Four Rights („freedoms“): Software may be ...

- used
- **analyzed***
- passed on (obligation must be obeyed)
- **modified***

without any restriction.

One Obligation:

- The four rights must be granted to the licensee when the software is passed on.

What is the GPL?

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without any restriction.

***requires access to the sources
 (“Open Source”)**

One Obligation:

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From Open Source to Open Innovation

Joint research and development of various different companies and institutions (including competitors)

- Goal of participating companies and institutions:
Joint added value
- Underlying concept:
Open knowledge economics
- Type of organization:
Collaborative environments

What are the possible advantages of Open Innovation?

User and provider

- Standardization of hardware and software interfaces
- Larger base of knowledge, expertise and experience
- Avoiding unnecessary parallel development
- Reduction of development cycles

User

- Participation at the innovation process

Provider

- Satisfied users

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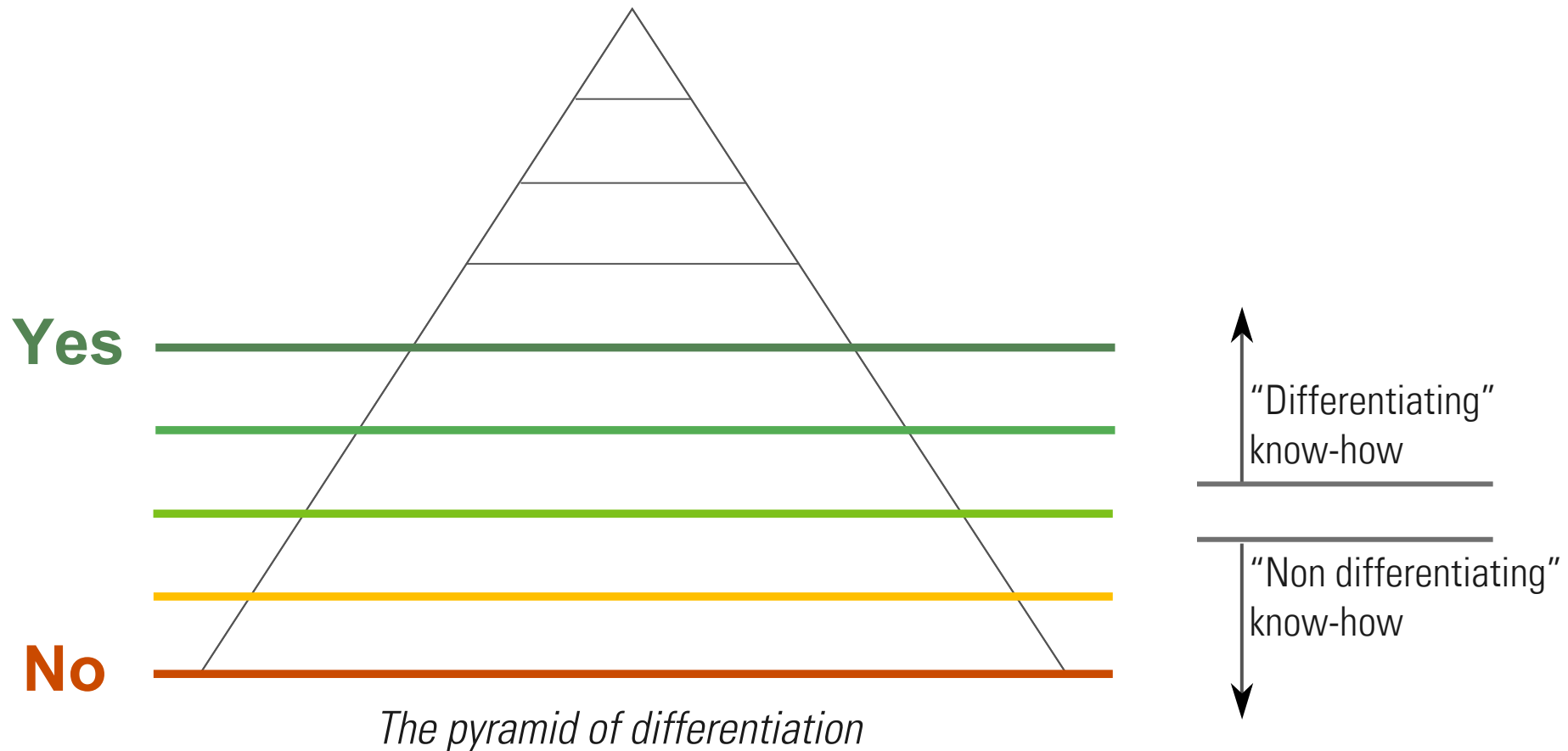
Provider

- Satisfied users

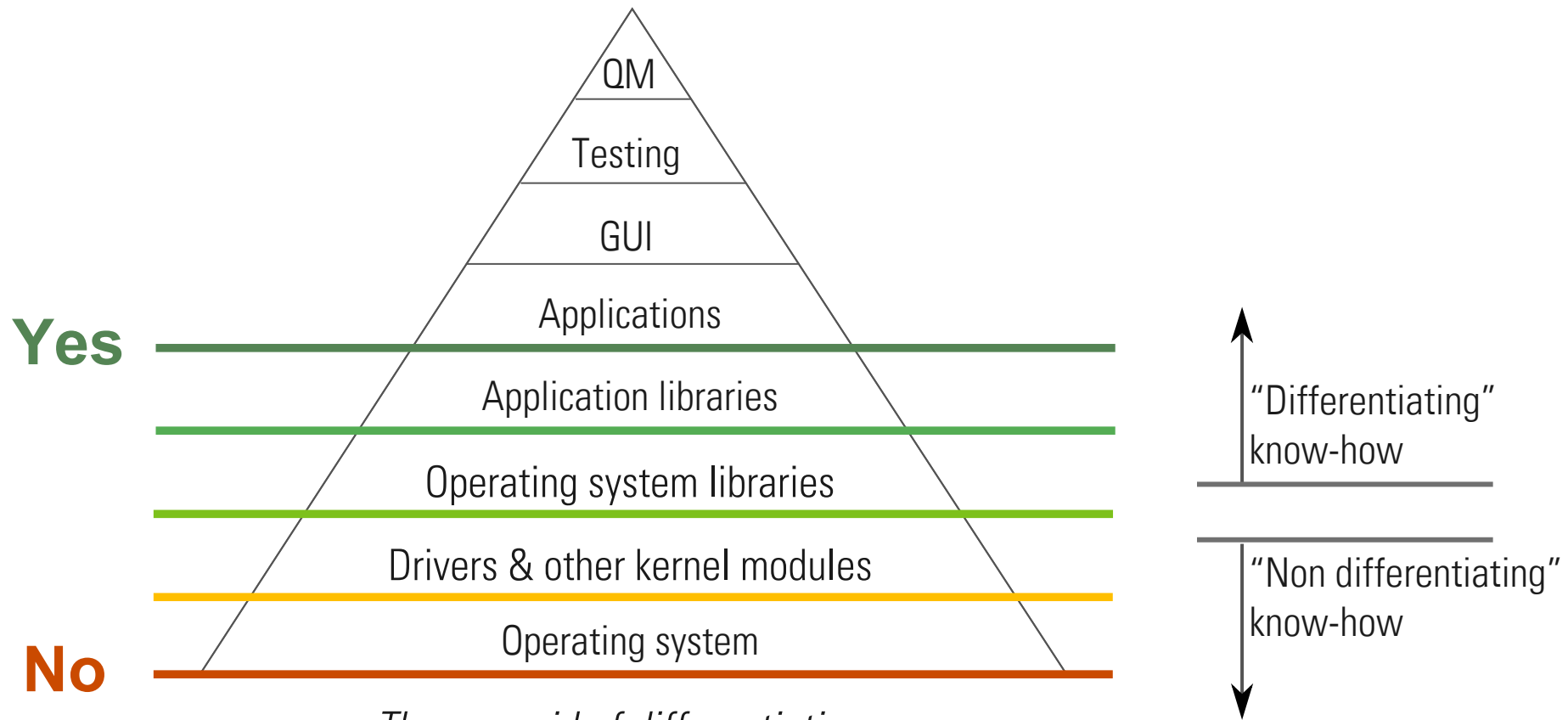
Cost reduction



Is Open Innovation appropriate for a particular project?

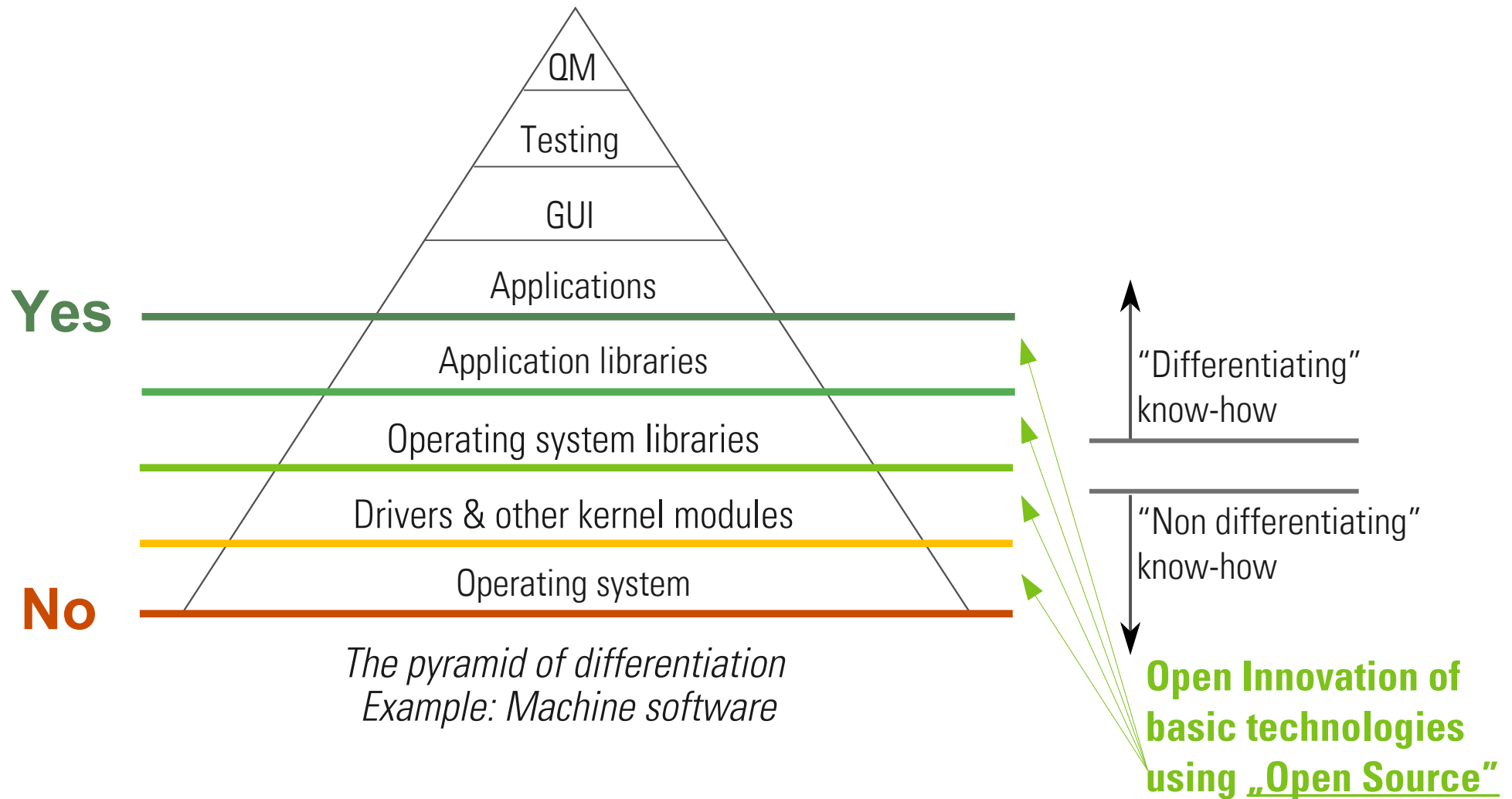


Is Open Innovation appropriate for a particular project?

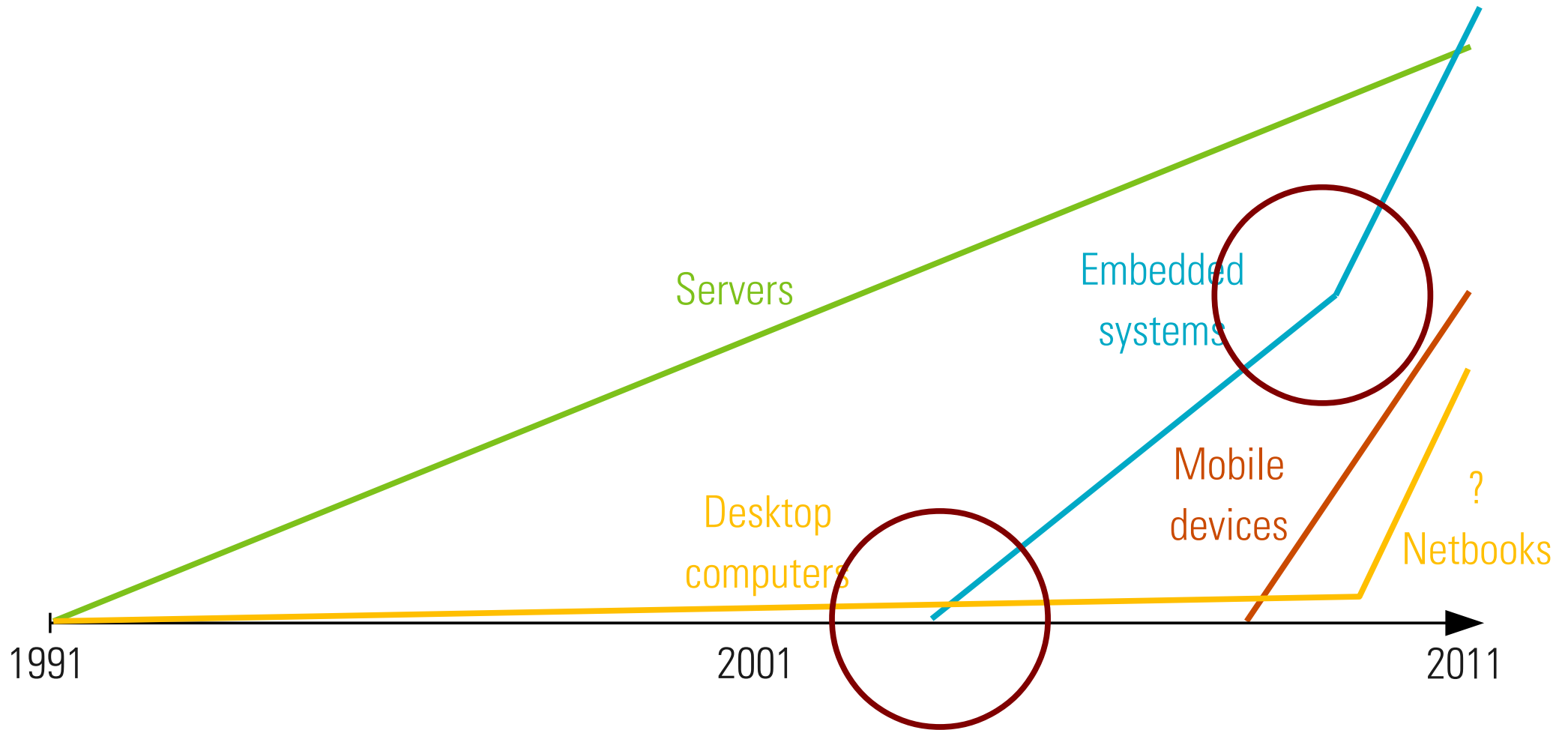


*The pyramid of differentiation
Example: Machine software*

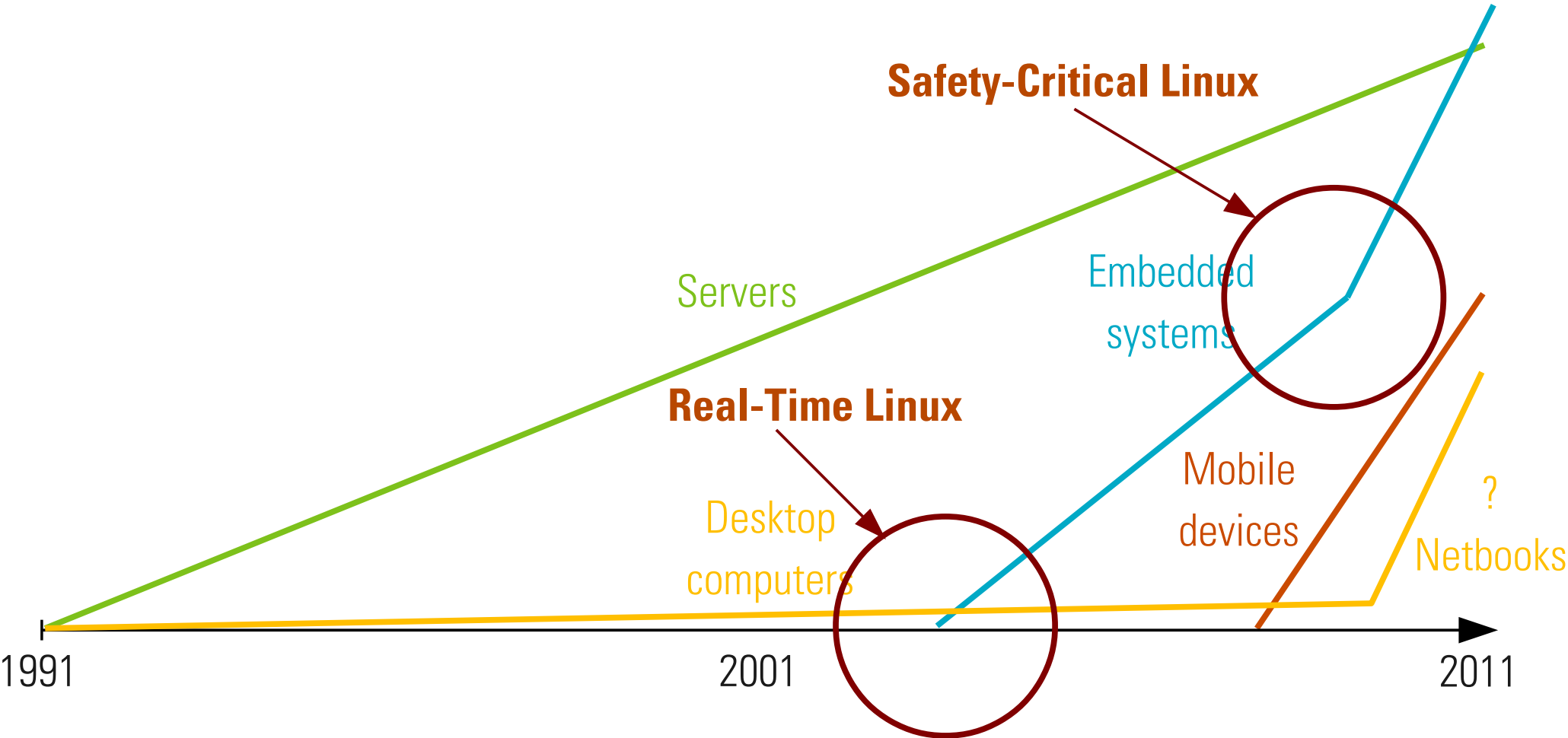
Is Open Innovation appropriate for a particular project?



Linux goes safety and takes it to the next level



Linux goes safety and takes it to the next level (2)



Conclusion

- **The success of Linux is closely related to its license (GNU GPL).**
- **When Linux is passed on, the sources must be made available.**
- **Never use Open Source, if the software contains differentiating know-how.**
- **A Linux community was able to convert a GPOS into an RTOS kernel.**
- **A Linux community should also be able to provide certification paperwork.**
- **Real-time and safety-critical Linux has the potential to replace any other operating system, as long as it must not contain differentiating know-how.**