Informational System to Support Development and Usage of Linux Interface Standards

Denis Silakov

Institute for System Programming, RAS
http://ispras.ru/
Linux Verification Center
http://linuxtesting.org/

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Linux Ecosystem

- System components *~ 5.000*
  (kernel, libraries, utilities, …)
  - developed independently
  - “release early, release often”
- Distributions *~ 500*
  - based on “upstream” system components
  - add their own patches
  - a set of selected applications
- Applications *~ 10.000*
  - want to run on many distributions

Components in Distributions

Distributions released November, 2009

Component versions and number of functions exported by component libraries

	Mandriva 2010	Fedora 12	openSUSE 11.2
GLIBC	**2.10** *2275* functions	**2.11** *2283* functions	**2.10** *2275* functions
GTK	**2.18.3** *4518* functions	**2.18.3** *4915* functions	**2.18.1** *4915* functions
ALSA	**1.0.21** *1623* functions	**1.0.21** *1623* functions	**1.0.21** *1609* functions

Application Portability

- Thoroughly test in every system
  - by application developers
  - by maintainers in distributions
  - requires significant resources
- Give source code to users
  - also necessary for distribution maintainers
  - not everyone wants to share source code
- Follow standards
  - API – recompile for every system
  - ABI – use binary executables and libraries 'as is'
  - development of a standard can be a challenge

Modern Interface Standard

- Target Area
  - A Linux distribution: **1.500** libs, **1.000.000** functions
  - Applications use from **10** to **10.000** functions
  - POSIX: **1.500** functions, LSB: **40.000** functions
  - How to select what to standardize?
  - Profiles?

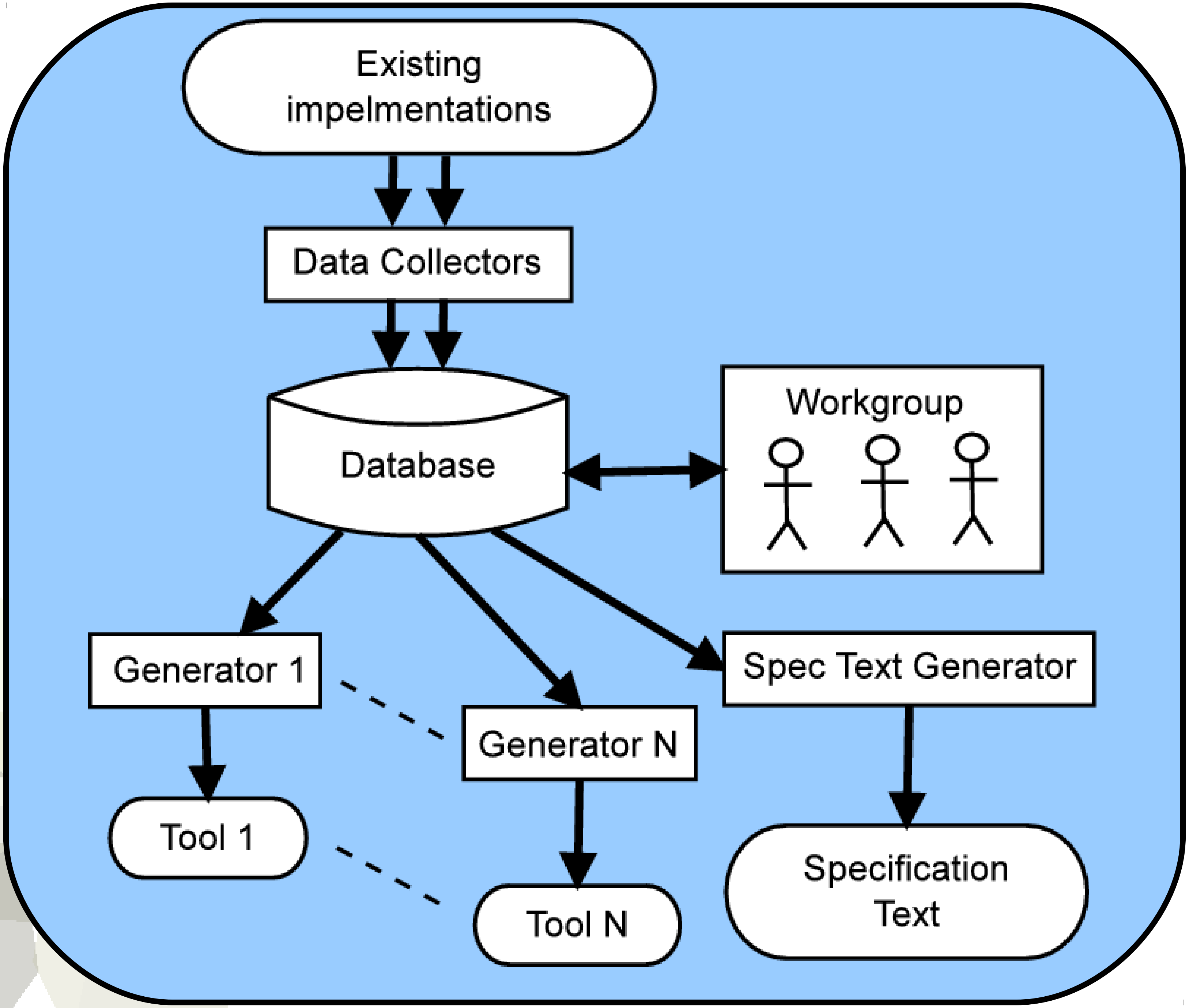
Standard Environment

- Accompanying Products
  - Test suite
  - Build environment
  - Sample implementation
  - …
  - Should be kept synchronized

Developing a Standard

- Constant monitoring of the Linux Ecosystem
  - Interfaces provided by leading distributions
  - Interfaces used by popular applications
  - Can be automated
- Selection of candidates for next Standard version
  - Formal rules based on the monitoring results, e.g.: *interfaces present in all systems released after 2008*
  - Can be automated, too
- Finalization of list of candidates, manual actions
  - Create documentation
  - Develop tests
  - ...

Workflow


Existing impelmentations
Data Collectors
Database
Workgroup
Generator 1
Generator N
Spec Text Generator
Tool 1
Tool N
Specification Text

Interface Properties

We consider **binary** applications only

- Structural – can be analyzed statically

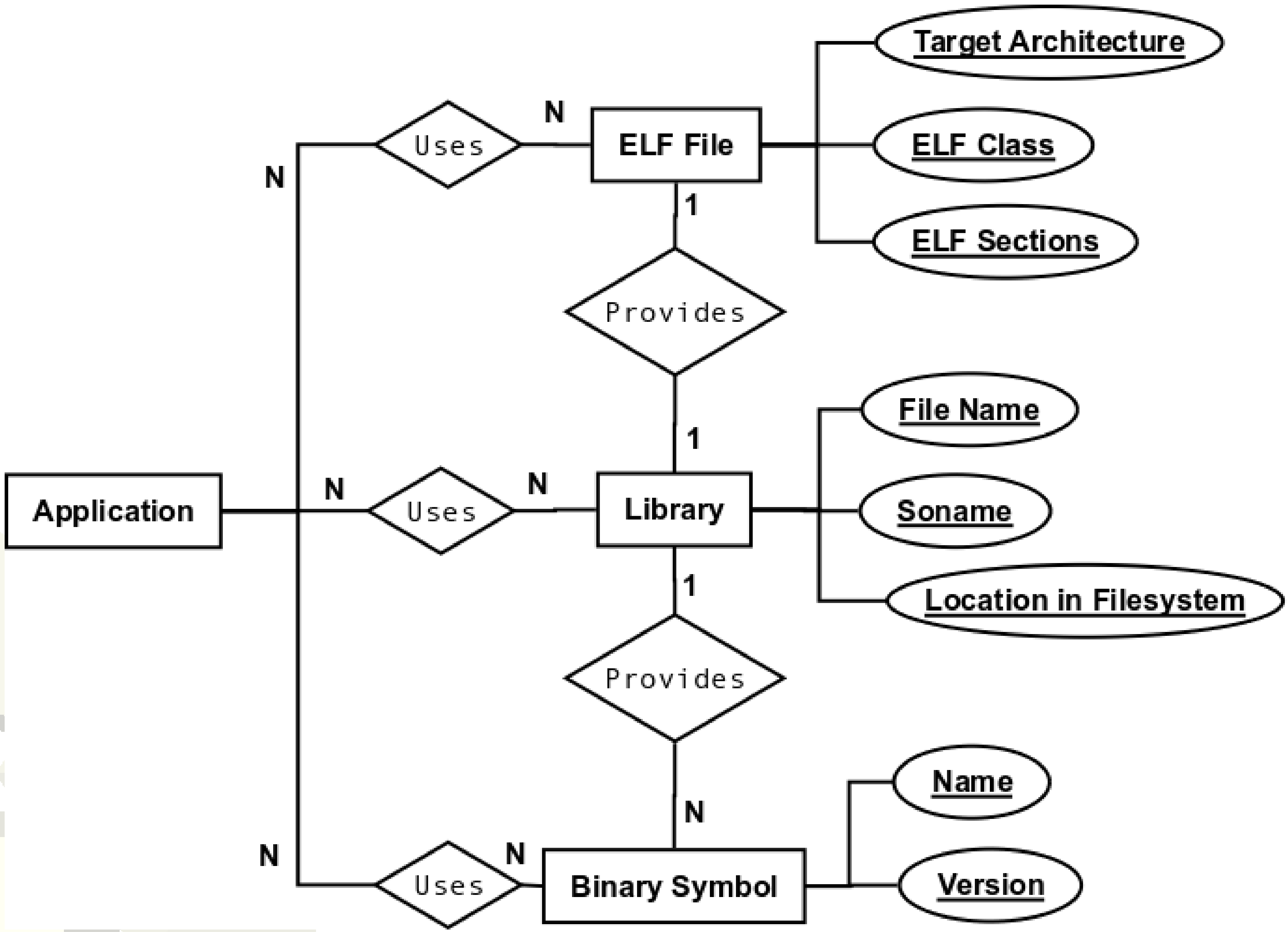
  e.g., synopsis of functions in header file

- Semantic – require interface invocation to be analyzed

  e.g., function behavior

Analysis of structural properties is enough to check if application can be **launched** in distribution

Model of Linux Interfaces



Tracking Standard Evolution

Temporal Relationship Model (TRM)

- Extension of 'usual' relational model
- Life period for every element: `[`T_s`..`T_e`]`, possible values for T_s`..`T_e –
  – standard versions + `NULL`
- Can be served by relational DBMS, but improvements requierd in tools that work with database

Time Intervals

- Discrete time, small set of possible values
- Dependencies by time between connected items

Function	*Assigned to Header*	*Appeared in*	*Withdrawn in*
gets	stdio.h	1.0	1.2
fgets	stdio.h	1.0	*NULL*
puts	stdio.h	2.0	*NULL*

Header	*Appeared in*	*Withdrawn in*
stdio.h	1.0	NULL

LSB Database

Standardized Elements

- Information about all LSB versions
- LSB 4.0: **~40.000** functions from **57** libraries

Linux Ecosystem

- **250** distributions
- ~**1400** applications

Auxilliary

- Test coverage
- URLs to online documentation for functions
- ...

(Partially) Generated Using LSB DB

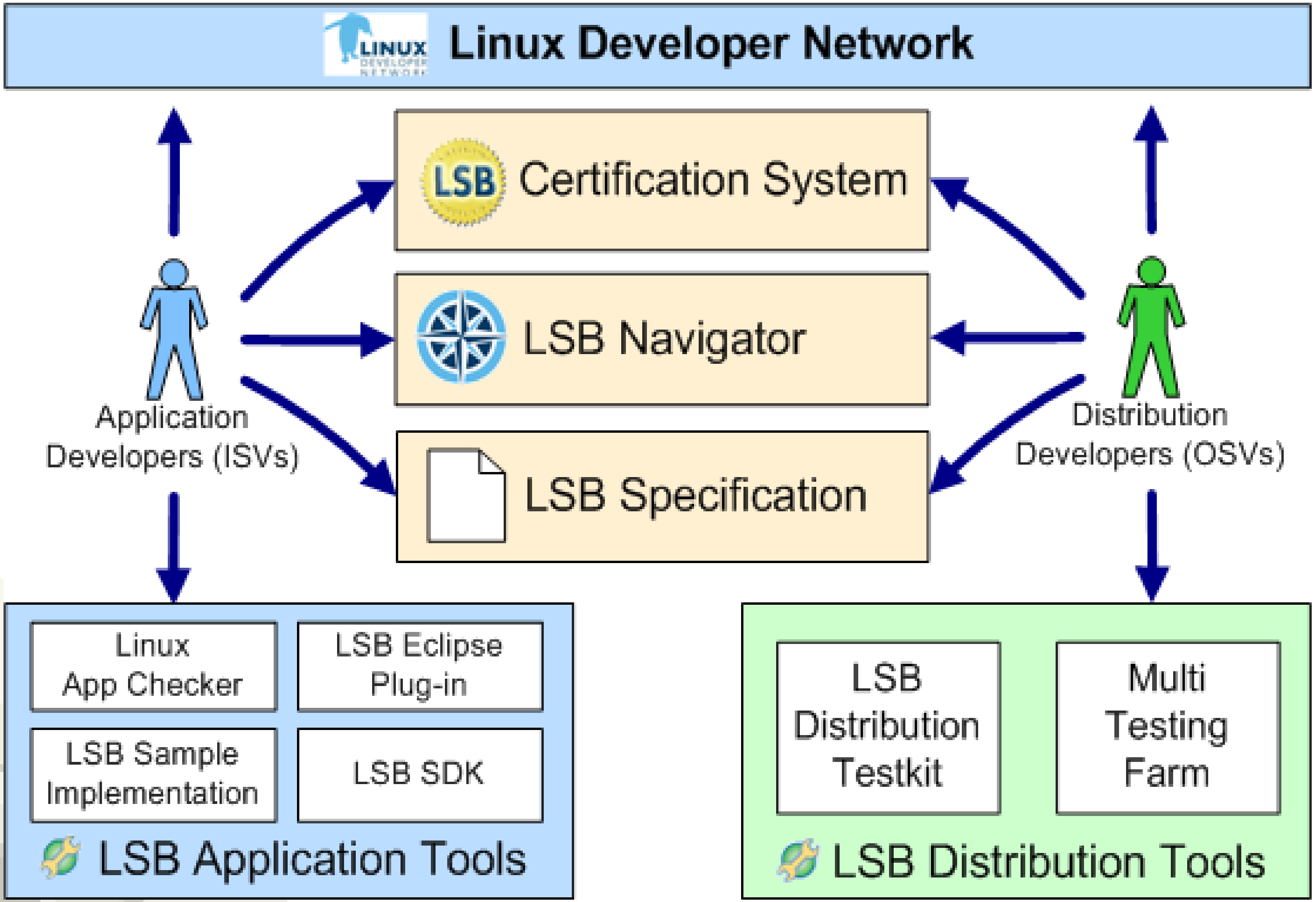
- LSB specification text
- Some test suites for distributions
- Linux Application Checker
- LSB Build Environment

LSB Navigator

A Web system upon the LSB DB

- Browsing the database
- Statistical queries
- Analytical queries (decision making support)
  - Interface usage in applications
  - Interface presence in distributions
  - ...

LSB Environment



URLs & Contacts

- LSB Infrastructure Project
  http://ispras.linuxfoundation.org
- LSB at the Linux Development Network
  http://ldn.linuxfoundation.org/lsb
- Denis Silakov
  silakov@ispras.ru