LSDK INTRODUCTION

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SOFTWARE MANAGER

AUGUST 2017

SECURE CONNECTIONS
FOR A SMARTER WORLD

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PUBLIC

AGENDA

- What is LSDK
- Why change to LSDK
- LSDK in detail
- How to use LSDK
- Plan & Roadmap
- Summary

WHAT IS LSDK

Overview - Keywords

LSDK is NXP new generation of SDK for Layerscape productions

- **Disaggregation**

  The concept that many software components are available individually. This enables customers and 3rd parties to access them individually so they can integrate them into Linux distributions or systems by themselves.

- **LTS**

  Long Term Support, used to describe a kernel or Linux distribution that will be formally supported with prompt bug fixes, security updates, and limited feature additions for a defined time period.

- **Linux Distribution**

  A complete Linux kit from a specific provider. Includes kernel, tools, user space, etc.

- **Upstreaming**

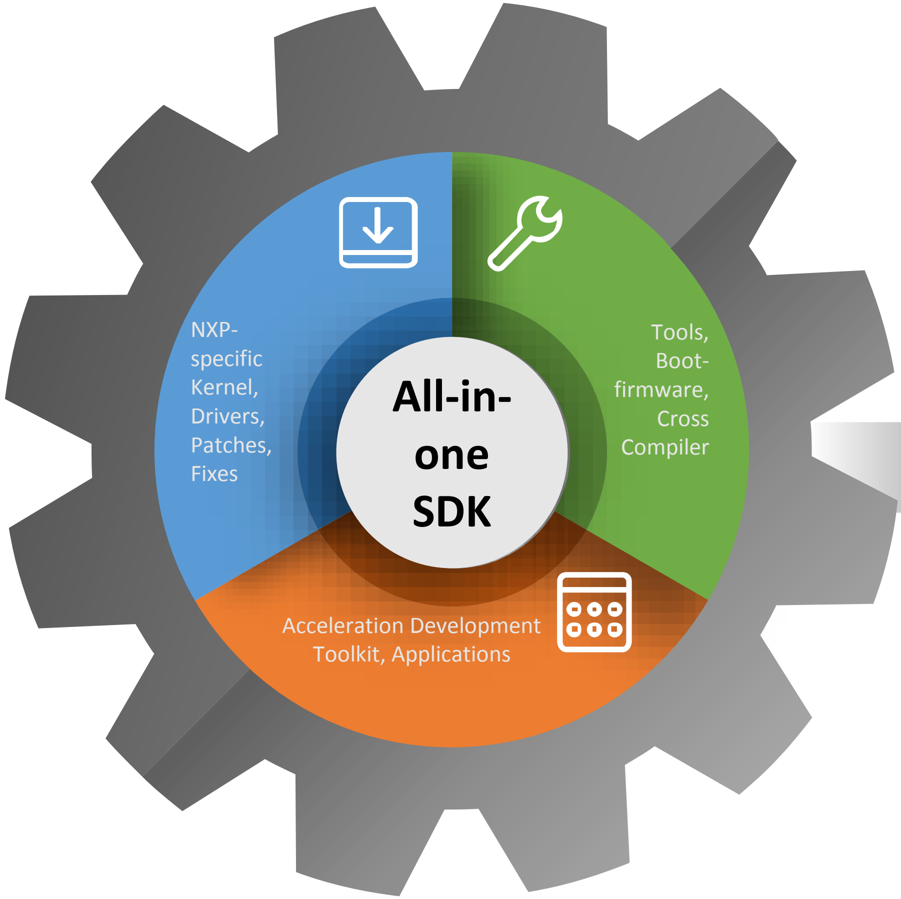
  The process of adding support for NXP-specific hardware or features to a community (non-NXP) software repository.

You can get the source code and related documents from:

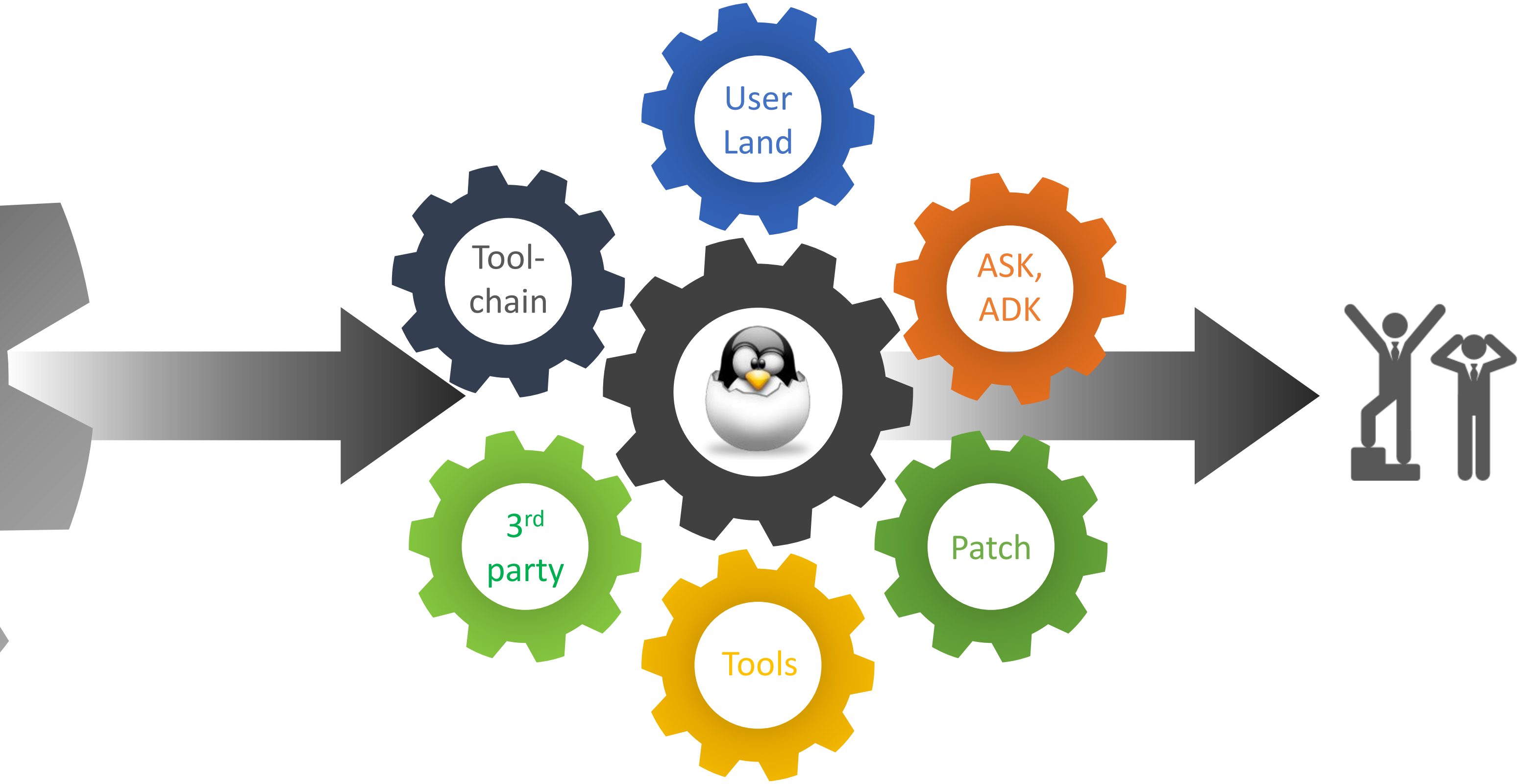
https://lsdk.github.io/

Overview - Evolution

Yocto-Based SDK Only


All-in-one SDK
NXP-specific Kernel, Drivers, Patches, Fixes
Tools, Boot-firmware, Cross Compiler
Acceleration Development Toolkit, Applications

Disaggregation then supporting many distributions



WHY CHANG TO LSDK

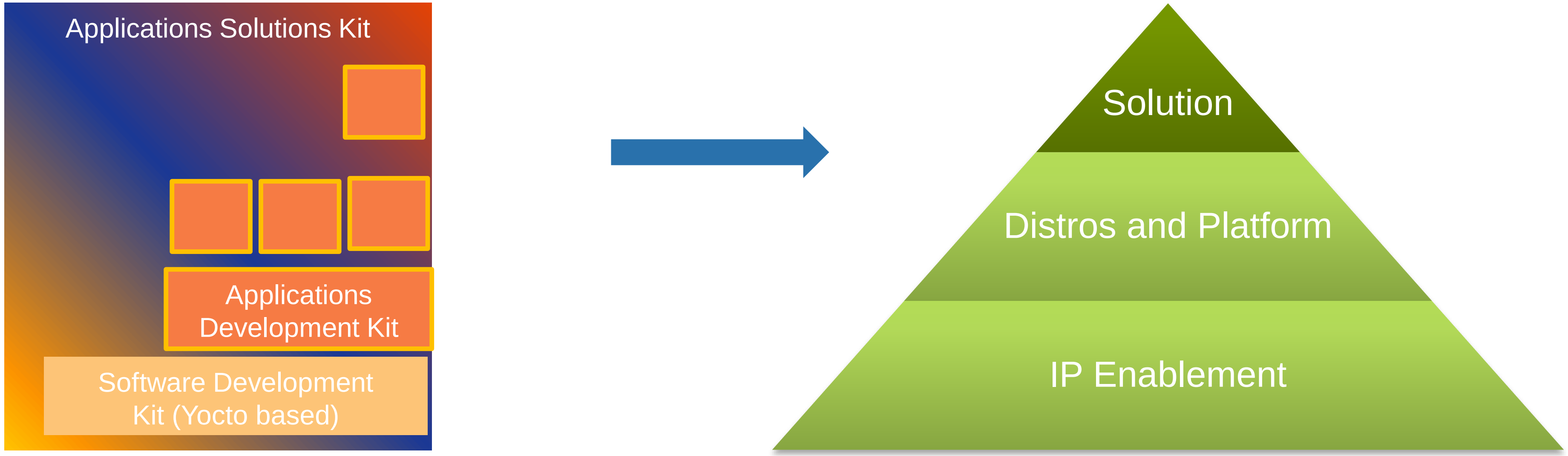
Changing Requirements for Linux Distributions

- Requirements are changing due to technology shifts and convergences
  - SDN/NFV
  - Appliance / Server convergence
- Demand broadens away from embedded (and NXP SDK) towards enterprise and some enterprise-derived special purpose distributions.
- Biggest reason is convergence of network appliances & servers but also
  - **Server ecosystem dominance in ARMv8**
  - **More powerful SoCs**
  - **Intel encroachment (WB switches)**
  - **Ease of use in some cases**
  - **Standardization**

Details of the Changes

- **Server ODMs, OEMs and operators require a single stable image for consolidating all of their server equipment**
  - One unified asset to deploy to all of their equipment (of the same type)
  - Control OPEX related to validation of platforms and management of equipment
- **Embedded Solutions (Yocto, Linaro, Enea) insufficient (for this usage)**
  - Server users (e.g. carrier operators) use automated provisioning to perform a one-time install of a certified Enterprise image to white box & NFV servers
  - Requires inclusion of QorIQ platform support and drivers (esp. net driver)
- **Rely on commercial distributions**
  - Linux kernel and suite of server applications certified to work against it
  - Kitchen sink approach : distribution contains all the platform software the operator may conceivably need, pre-built (i.e. in binary form) and pre-tested
  - Long-term support provided against a stable (i.e. well-tested in field) configuration
- **Limited set of vendors:**
  - Red Hat (primary)
  - Canonical (new entrant – largest platform vendor for OpenStack cloud): Ubuntu
  - SUSE (predominantly Europe)

Changes for DN SW



Applications Solutions Kit

Applications Development Kit

Software Development Kit (Yocto based)

Solution

Distros and Platform

IP Enablement

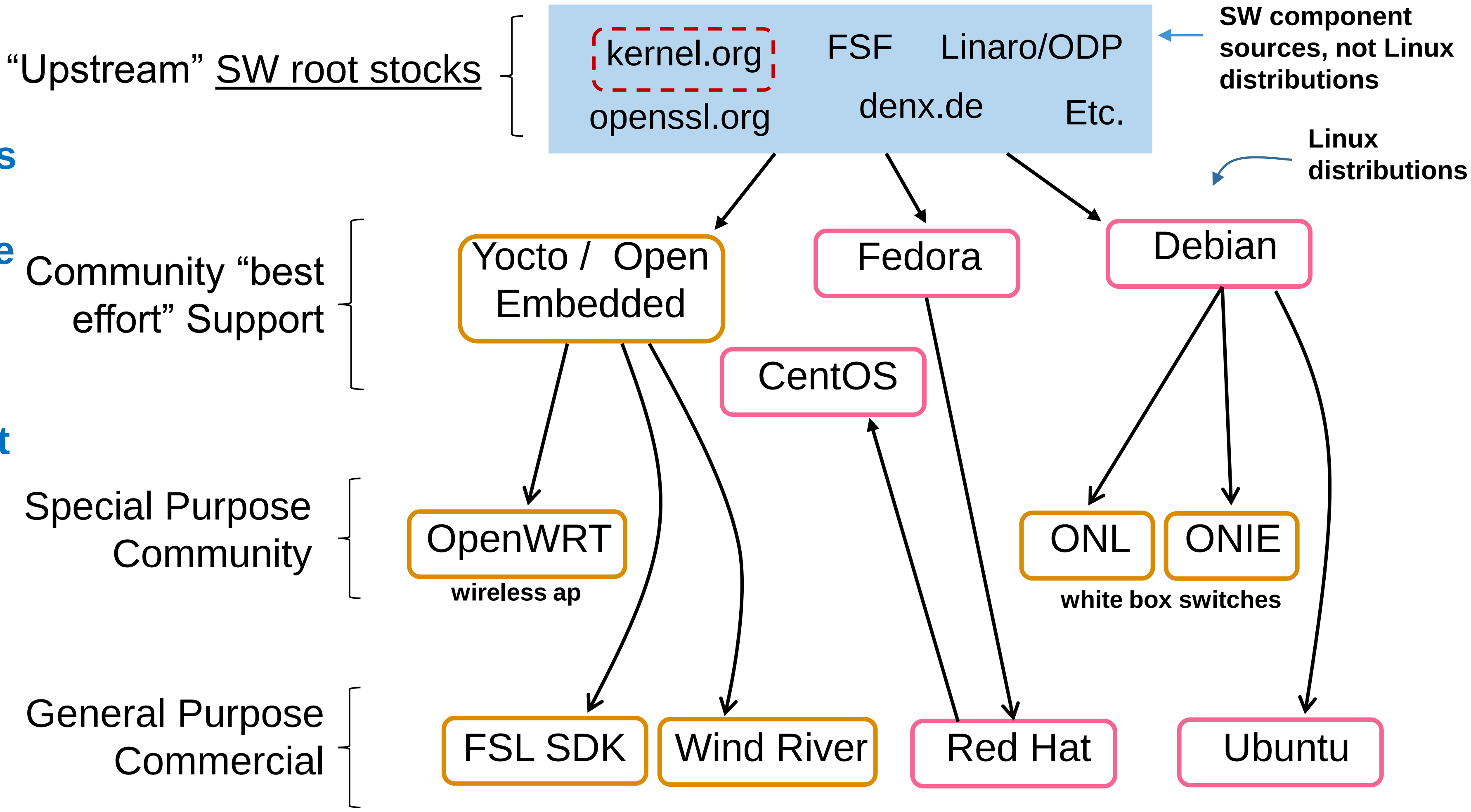
ISO
github
SOCIAL CODING

How doe DN SDK Respond?

How do we respond?

- **Make better use of ecosystem.**
- **“disaggregate” NXP-specific SW components so that**
  - **They fit into multiple distributions.**
  - **NXP can integrate them**
  - **3rd parties can use it**
  - **Customers can use**

Demand for embedded still exists



“Upstream” SW root stocks

kernel.org FSF Linaro/ODP
openssl.org denx.de Etc.

SW component sources, not Linux distributions

Linux distributions

Community “best effort” Support

Yocto / Open Embedded

Fedora

Debian

CentOS

Special Purpose Community

OpenWRT

wireless ap

ONL

ONIE

white box switches

General Purpose Commercial

FSL SDK

Wind River

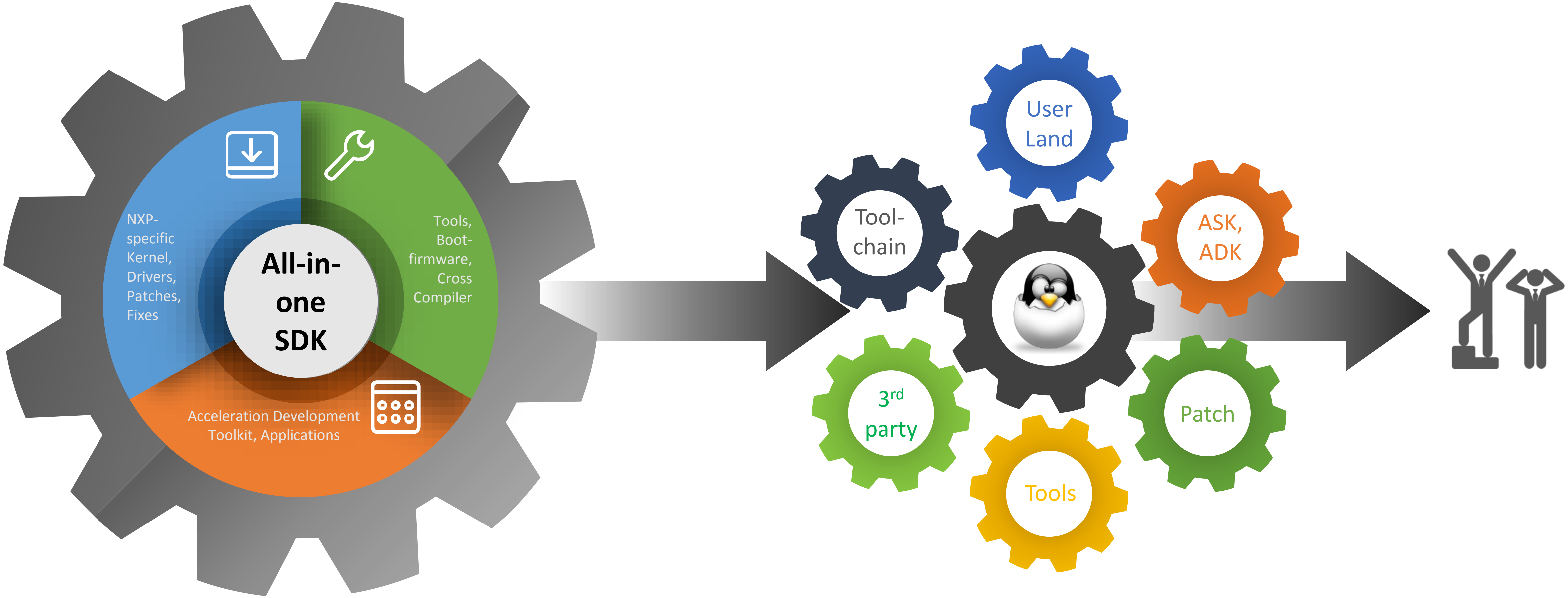
Red Hat

Ubuntu

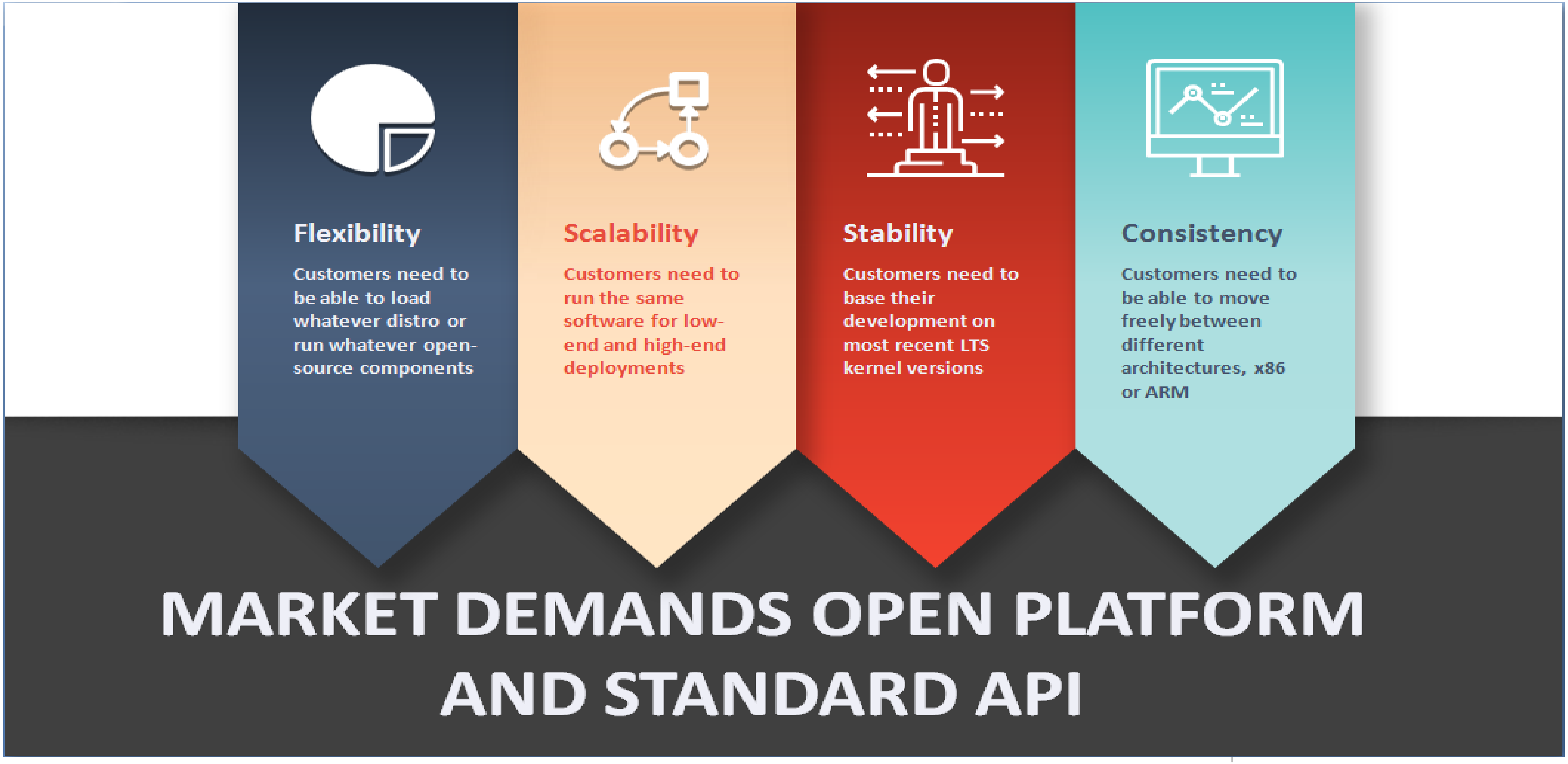
Brush Up on Overview

Yocto-Based SDK Only

Disaggregation then supporting many distributions


NXP-specific Kernel, Drivers, Patches, Fixes
Tools, Boot-firmware, Cross Compiler
All-in-one SDK
Acceleration Development Toolkit, Applications
User Land
Tool-chain
ASK, ADK
3rd party
Patch
Tools

The Benefit of New SDK - LSDK



Flexibility

Customers need to be able to load whatever distro or run whatever open-source components

Scalability

Customers need to run the same software for low-end and high-end deployments

Stability

Customers need to base their development on most recent LTS kernel versions

Consistency

Customers need to be able to move freely between different architectures, x86 or ARM

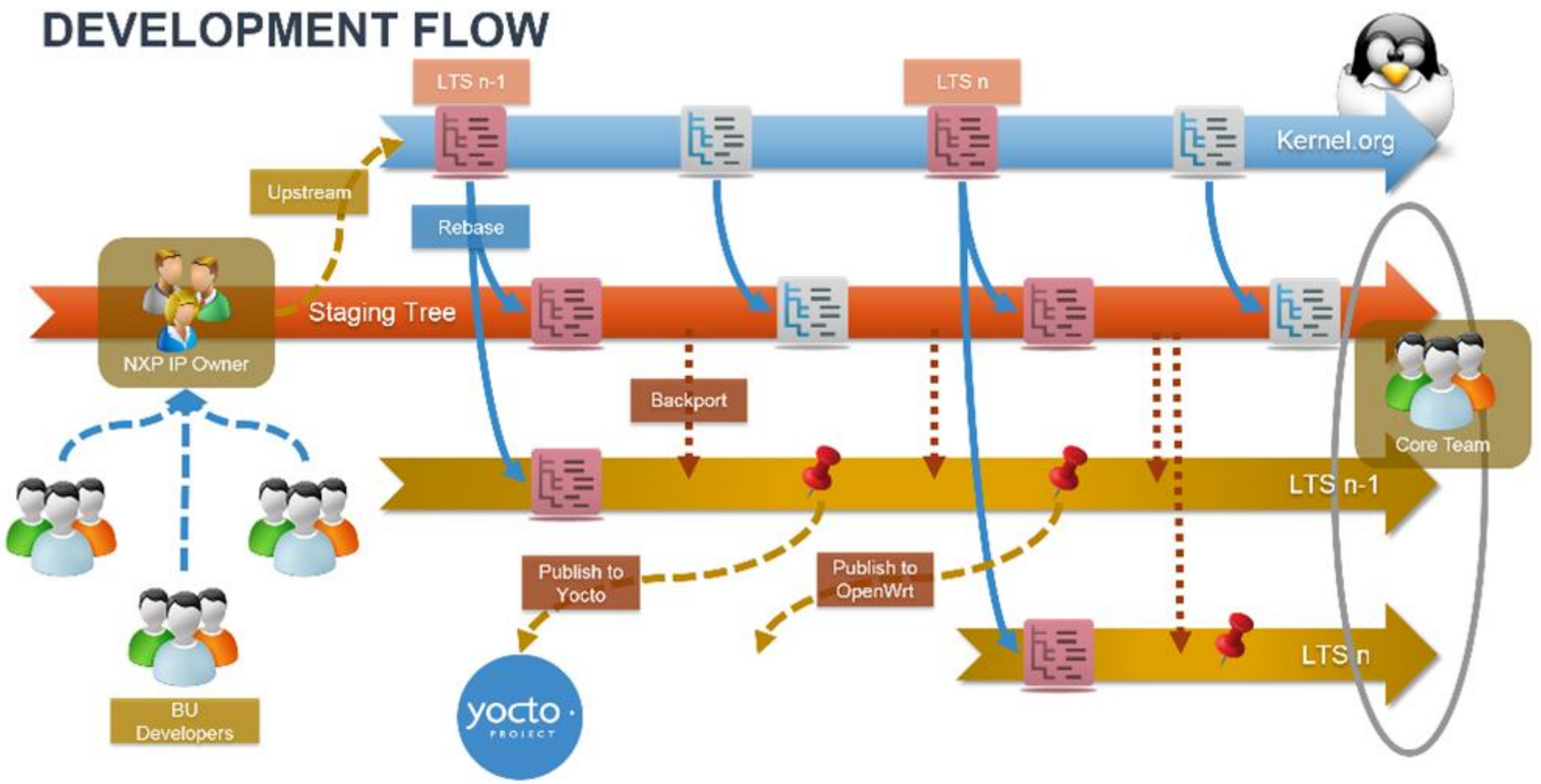
MARKET DEMANDS OPEN PLATFORM AND STANDARD API

LSDK IN DETAIL

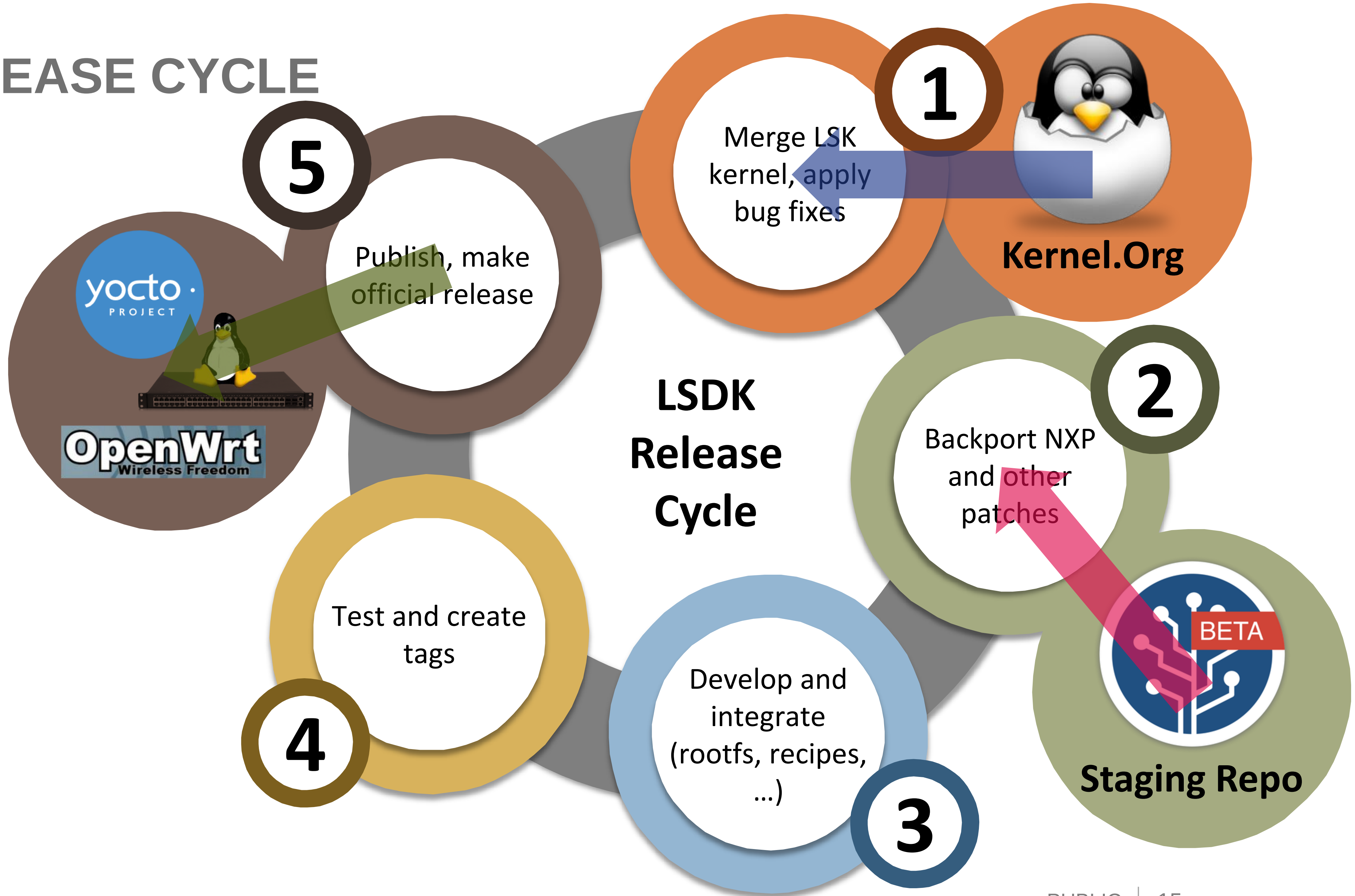
Basic Elements of LSDK

- **Two key components**
  - Linux kernel – standardized to a stable configuration / revision level
  - Root file system – containing user space applications and dynamically loadable kernel modules for standard drivers
- **Commercial distributions usually rely on kernels and user space packages derived from an upstream community-driven distribution (feeder)**
  - E.g. Debian, Slackware,Gentoo
  - Generally share build tools, package management system, etc. with progenitor
  - Frequent cross-pollination between feeder and derivative (i.e. not strictly a *fork*); e.g. derivative re-bases off new feeder releases, bug fixes, enhancements submitted upstream
  - Some commercial distros sponsor community distros; e.g. Red Hat → Fedora, CentOS
- **All derive from a release branch of the mainline kernel.org Linux kernel development tree**
  - Often distinguished by how closely they track to kernel.org releases
  - Community distributions typically released more frequently and closer to kernel.org releases
  - Enterprise distros focus on stability with less frequent releases – based on long-term support “branches”

LTS Kernel Development



RELEASE CYCLE



LSDK Release Cycle

1 Merge LSK kernel, apply bug fixes

Kernel.Org

2 Backport NXP and other patches

Staging Repo

3 Develop and integrate (rootfs, recipes, …)

4 Test and create tags

5 Publish, make official release

WHAT’S ON THE BOARD

- Boards are shipped with:
  - NOR image in Bank0/Bank4
  - Boot image and rootfs on SD card
- NOR Image consists of:
  - Boot firmware (u-boot)
  - RCW
  - PHY firmware
  - DPAA firmware (fman, MC)
  - Minimal busybox rootfs
- Installer to install Ubuntu rootfs on SD consists of:
  - Standard distro rootfs
  - NXP specific user space: restool, aiop_tool, fmc

BETTER CUSTOMER EXPERIENCE

Majority Customers

- Self-sufficient
- Download toolchain from Linaro, distros from somewhere, NXP components from GIT, …

Curious Customers

- Demand integrated vertical solution software
- Solution team delivers package on target hybrid distro

Old-School Customers

- NPI or Support team produces the YOCTO-based SDK

LSDK Memory Map

Region 1 (4KB)	Region 2 (64MB)	Region 3 (20MB)	Region 4 (300MB)	Region 5 (remaining space of disk)
MBR/GPT	Firmware	Partition 1 (FAT32) EFI	Partition 2 (EXT4) Boot Partition	Partition 3 (EXT4) rootfs
	RCW U-boot or UEFI Eth PHY firmware QE/uQE firmware FMan firmware MC firmware PPA firmware kernel image DTB Ramdisk RFS	BOOTAA64.EFI grub.cfg	Kernel image DTBs Flex_installer_<arch>.itb Distro boot scripts Secure headers Other	Ubuntu or Ubuntu-Core or CentOS or Debian

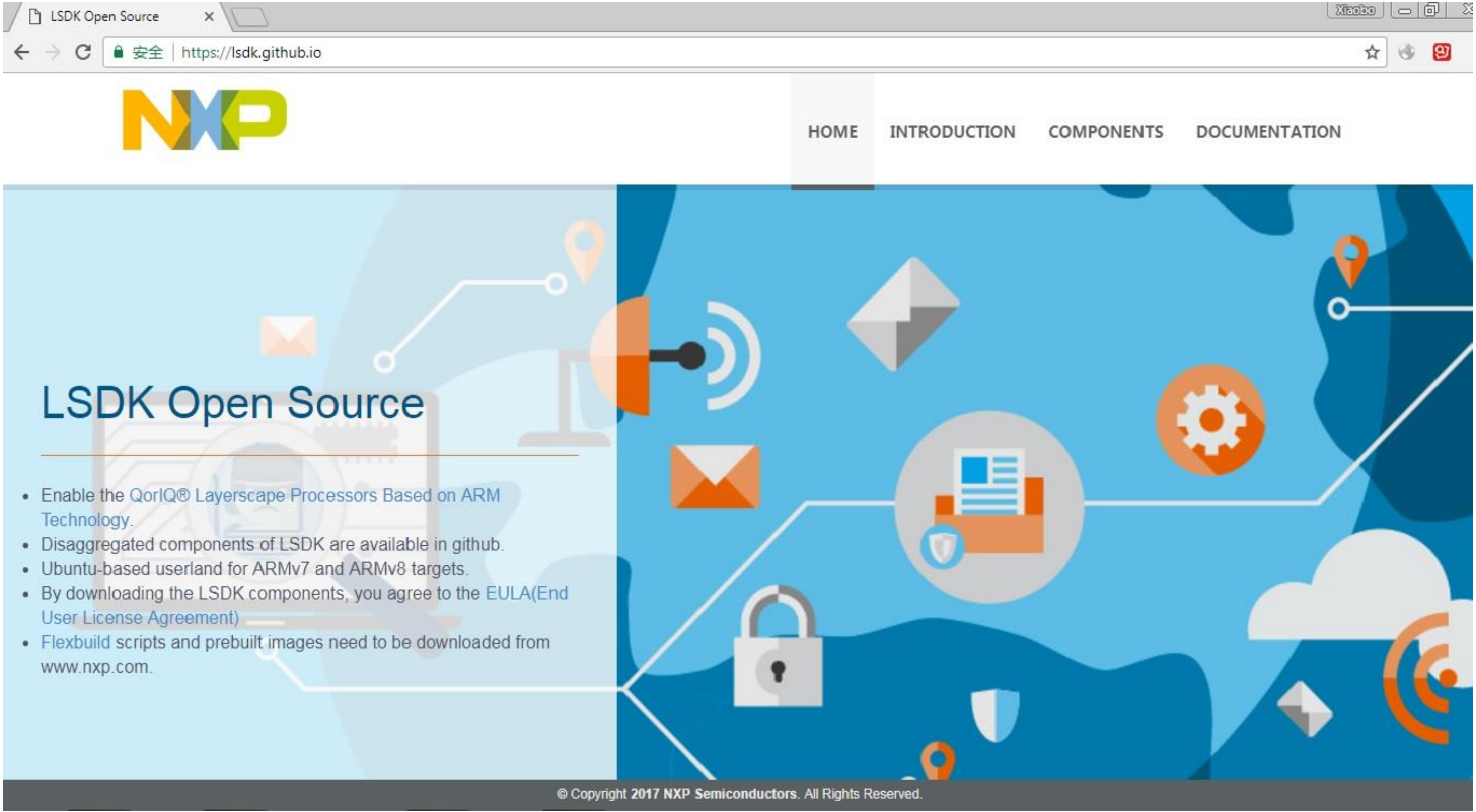
Layerscape SDK vs. QorIQ SDK

	QorIQ SDK	Layerscape SDK
Platforms supported	P, B, T – series and LS – series	LS, LX, LA – series
Features	LTS kernel, platform drivers, tools	**Choice of 2** LTS kernels, platform drivers, tools **Available as components too.**
User-space	Yocto	Ubuntu
Build-tool	Yocto	**Ubuntu, make, flexbuild**
Build Environment	Host	Host, **Target**
Boot/recovery options	Flash, network	Flash, network, **SD card, HDD**
Package Installation	Integrate into Yocto, build image, re-flash board.	**Apt-get over network**
Downloadable	Giant ISO with sources and binaries for all platforms	**Individual Binaries,** **Individual components source**

Layerscape SDK **provides more, not less**.
Layerscape SDK is **Easier to Use**

HOW TO USE LSDK

GitHub Access for LSDK



LSDK Open Source

- Enable the QorIQ® Layerscape Processors Based on ARM Technology.
- Disaggregated components of LSDK are available in github.
- Ubuntu-based userland for ARMv7 and ARMv8 targets.
- By downloading the LSDK components, you agree to the EULA(End User License Agreement)
- Flexbuild scripts and prebuilt images need to be downloaded from www.nxp.com.

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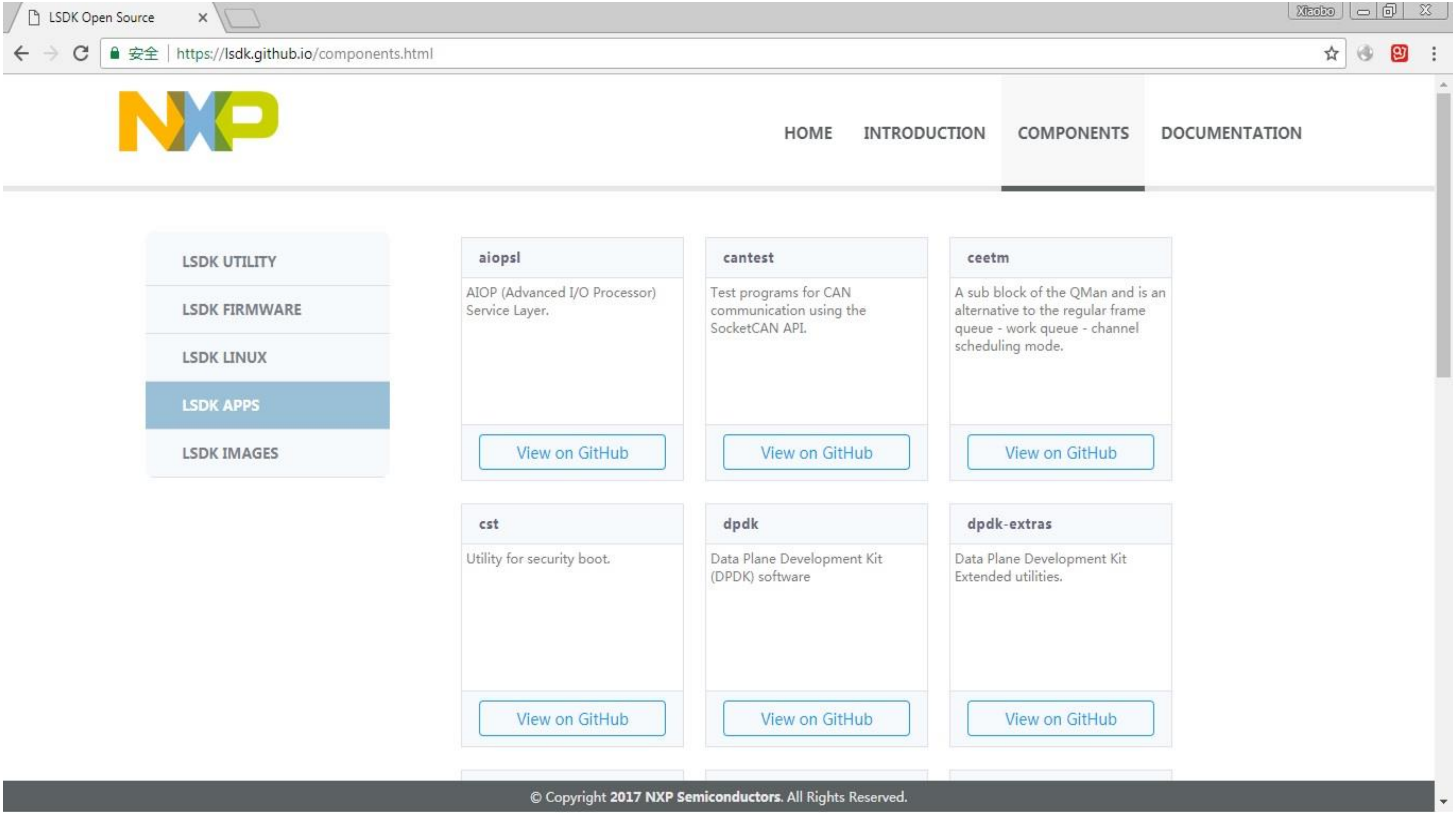
Download Components from GitHub



aiopsl

AIOP (Advanced I/O Processor) Service Layer.

cantest

Test programs for CAN communication using the SocketCAN API.

ceetm

A sub block of the QMan and is an alternative to the regular frame queue - work queue - channel scheduling mode.

cst

Utility for security boot.

dpdk

Data Plane Development Kit (DPDK) software

dpdk-extras

Data Plane Development Kit Extended utilities.

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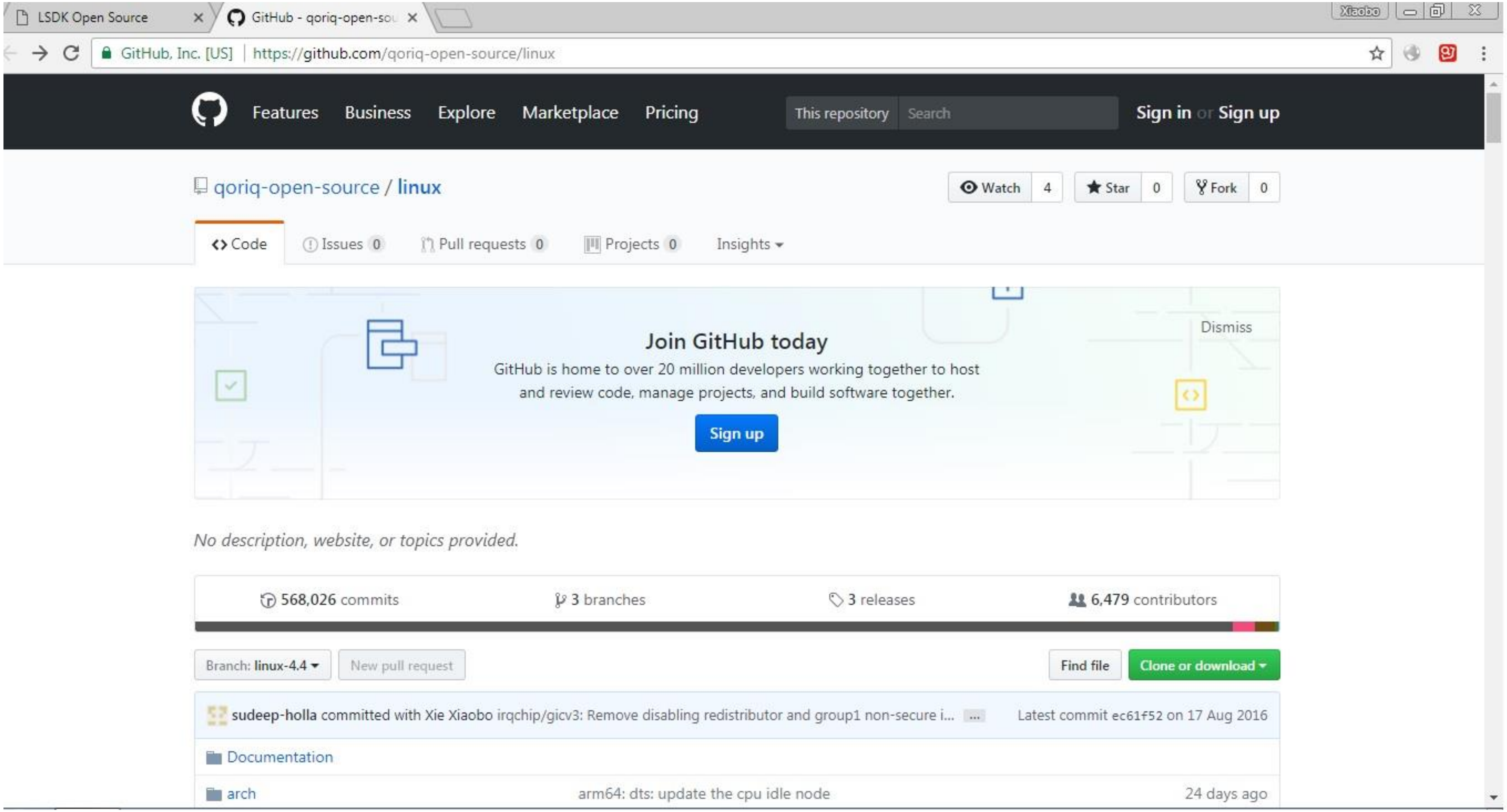
Clone Linux from GitHub



qoriq-open-source / linux

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GitHub is home to over 20 million developers working together to host and review code, manage projects, and build software together.

No description, website, or topics provided.

568,026 commits   3 branches   3 releases   6,479 contributors

sudeep-holla committed with Xie Xiaobo irqchip/gicv3: Remove disabling redistributor and group1 non-secure i... … Latest commit ec61f52 on 17 Aug 2016

Documentation		
arch	arm64: dts: update the cpu idle node	24 days ago

LSDK Utility - Flexbuild

Flexbuild is a integrated build system with flexible system build and distro installation.

The LSDK build system includes three major components: package builder, rootfs maker and image installer.

The utility can run on x86 host of Ubuntu 16.04, arm targets and docker container.

Build LSDK using Flexbuild

- **General build command**
  - $ tar xvzf flexbuild_<version>.tgz
  - $ cd flexbuild
  - $ source setup.env
  - $ flex-builder -i repo-fetch
  - $ flex-builder -i repo-tag   (check out tags specified in file build_lsdk1706.cfg)
- **Build custom kernel and update the boot partition**
  - $ flex-builder -c linux -B menuconfig
  - $ flex-builder -i uimg
  - $ flex-builder -i mkbootpartition
  - $ cd build/qoriq-linux/kernel/arm64/lib && tar cvzf modules.tgz modules
- **Build custom u-boot or application**
  - $ flex-builder -c uboot -m <machine> -b <boottype>   #build uboot for <machine> to generate specified nor/sd/qspi boot image
  - $ flex-builder -c <component> -a <arch>   #build single application component for specified <arch>

Deploy LSDK Images on the target board

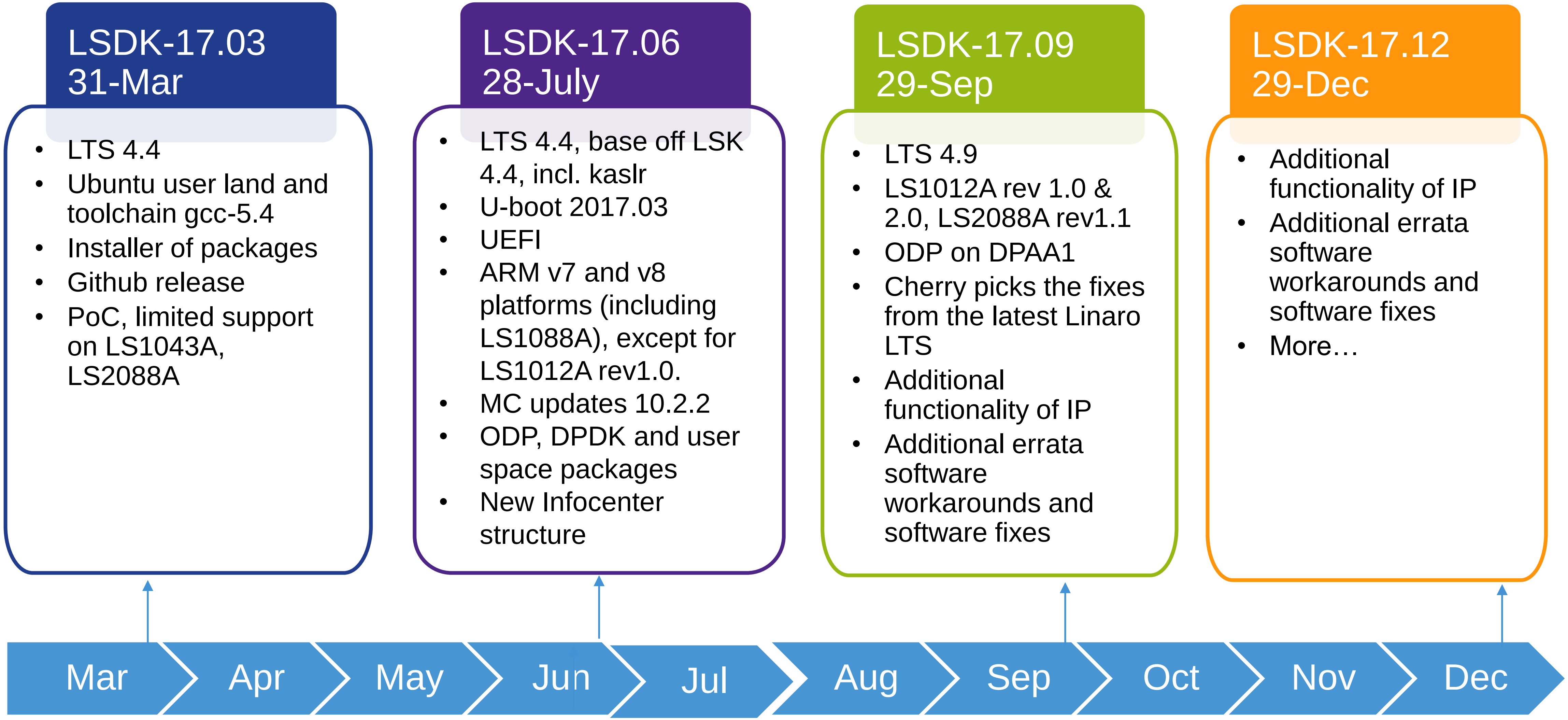
- **Deploy LSDK images from Linux Host**
  - $ wget http://www.nxp.com/lgfiles/sdk/lsdk1706/firmware_ls1088ardb_uboot_sdboot.img
  - Or $ flex-builder -i mkrfs -a <arch> -B additional_packages_list_full
  - $ flex-installer --bootpart=bootpartition_arm64.tgz --rootfs=build/images/ubuntu_xenial_arm64_rootfs.d --firmware=firmware_ls1088ardb_uboot_sdboot.img --machine=ls1088ardb --device=/dev/sdX
- **Deploy LSDK images from Target board**
  - Download LSDK composite firmware from NXP website
    - E.g. $ wget http://www.nxp.com/lgfiles/sdk/lsdk1706/firmware_ls2088ardb_uboot_norboot.img
  - Put LSDK composite firmware to a TFTP server, then download the firmware via TFTP to the target board under the U-Boot prompt
  - Reset the board and deploy boot partition and Ubuntu 16.04 userland to SD/USB/SATA.
    - Enable network connection to download LSDK images
    - Use flex-installer to create and format partitions
    - $ flex-installer -i install --bootpart=bootpartition_arm64.tgz --rootfs=ubuntu_xenial_arm64_rootfs.tgz --machine=ls2088ardb --device=usb

Add a Package using Flexbuild

- **How to add a package not officially supported by Ubuntu user land during build stage**
  - add extrinsic package name to extrinsic_packages_list in packages/apt-packages/additional_packages_list
  - put custom script of extrinsic package to packages/apt-packages/extrinsic-pkg (e.g. refer to nginx.sh)
  - run flex-builder -i mkrfs -a <arch> to generate new Ubuntu rootfs
  - install the new Ubuntu rootfs to target machine via flex-installer

PLAN AND ROADMAP

Layerscape SDK Roadmap



LSDK-17.03
31-Mar

- LTS 4.4
- Ubuntu user land and toolchain gcc-5.4
- Installer of packages
- Github release
- PoC, limited support on LS1043A, LS2088A

LSDK-17.06
28-July

- LTS 4.4, base off LSK 4.4, incl. kaslr
- U-boot 2017.03
- UEFI
- ARM v7 and v8 platforms (including LS1088A), except for LS1012A rev1.0.
- MC updates 10.2.2
- ODP, DPDK and user space packages
- New Infocenter structure

LSDK-17.09
29-Sep

- LTS 4.9
- LS1012A rev 1.0 & 2.0, LS2088A rev1.1
- ODP on DPAA1
- Cherry picks the fixes from the latest Linaro LTS
- Additional functionality of IP
- Additional errata software workarounds and software fixes

LSDK-17.12
29-Dec

- Additional functionality of IP
- Additional errata software workarounds and software fixes
- More…

SUMMARY

Summary

- LSDK is a new form of Linux from NXP DN, and consist of a set of disaggregated components based on Linux distributions.
- Meet market demand to more Linux distributions of more types, and satisfy the requirement from a wide variety of customers.
- We can use Flexbuild to build all packages from LSDK, make Root filesystem and generate the installer.

All you need to get your product to market faster!

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