*It's not an embedded Linux distribution –
It creates a custom one for you.*

The Yocto Project Overview and Update

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***It's not an embedded
Linux distribution***

●

***It creates a
custom one for you.***

Agenda

- **What is the Yocto Project**
  - Overview
  - Community

- **Overview of Poky – the build system**
  - OpenEmbedded Core
  - Bitbake
  - Layers
  - Hob2 Show & Tell

- **The Yocto Project Update**
  - 1.2 Features
  - 1.3 Release

Yocto Project Concepts

- **The Yocto Project is an open source collaboration project**
  - Provides templates, tools and methods to help you create custom Linux-based systems for embedded products regardless of hardware architecture.
- **Focused resources for system application developers who need to customize a Linux distribution for a device**
- **Validated and tested BSPs in a common format**
- **Automatically creates an application development SDK customized for each specific device**

What makes up the Yocto Project

- **Embedded tools and a distribution build environment**
  - Eglibc, prelink, pseudo, swabber, along with other tools
- **Support ARM, MIPS, PPC, x86 (32 & 64 bit)**
- **Shares core meta data (OE-core) with Opemembedded community**
- **Complete Embedded Linux OS with meta data**
- **Releases at on a 6 month (or so) cadence**
  - Latest (stable) kernel, toolchain and packages, documentation
  - App Development Tools including Eclipse plugins and emulator
- **BSPs are available from various Vendors**

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Yocto Project Concepts

- **Supported by embedded industry leaders across multiple architectures (IA, ARM, PowerPC, MIPS, etc)**

- **Is a great starting point for "roll your own" embedded developers and commercial distribution vendors.**

- **Enables easy transition from Proof of Concept (POC) to supported Commercial Linux with no loss of optimizations, code or design**

- **Proprietary code can be included in build structure within a separate layer, which can be kept private. (security)**

- **Project hosted by the Linux Foundation**

Participating Organizations

Silicon Vendors

TILERA · intel · LSI

CAVIUM NETWORKS · NETLOGIC MICROSYSTEMS · MINDSPEED BUILD IT FIRST

TEXAS INSTRUMENTS

OSVs

timesys · WIND RIVER

Mentor Graphics · ENEA software · montavista

Embedded Tools, Consulting Services, Users...

RidgeRun Embedded Solutions · Secret Lab · SAKOMAN INC

HUAWEI · DELL · openembedded · Panasonic ideas for life USA

THE LINUX FOUNDATION

Contact the Linux Foundation if you are interested in becoming a participating organization.
(Take part in Governance, Advisory Board, Advocacy and Communications)

Benefits of Yocto Project

- **As Linux is becoming increasingly popular for Embedded, the industry needs a common build system and core technology**
- **Non-commercial and commercial embedded Linux has many distros**
  - Developers spend lots of time porting or making build systems
  - Leaves less time/money to develop interesting software features
- **Industry leaders have joined together to form the Yocto Project, the benefit of doing so is:**
  - Less time spent on things which don't add value (build system, core Linux components)
  - Increased ability to enable key silicon features
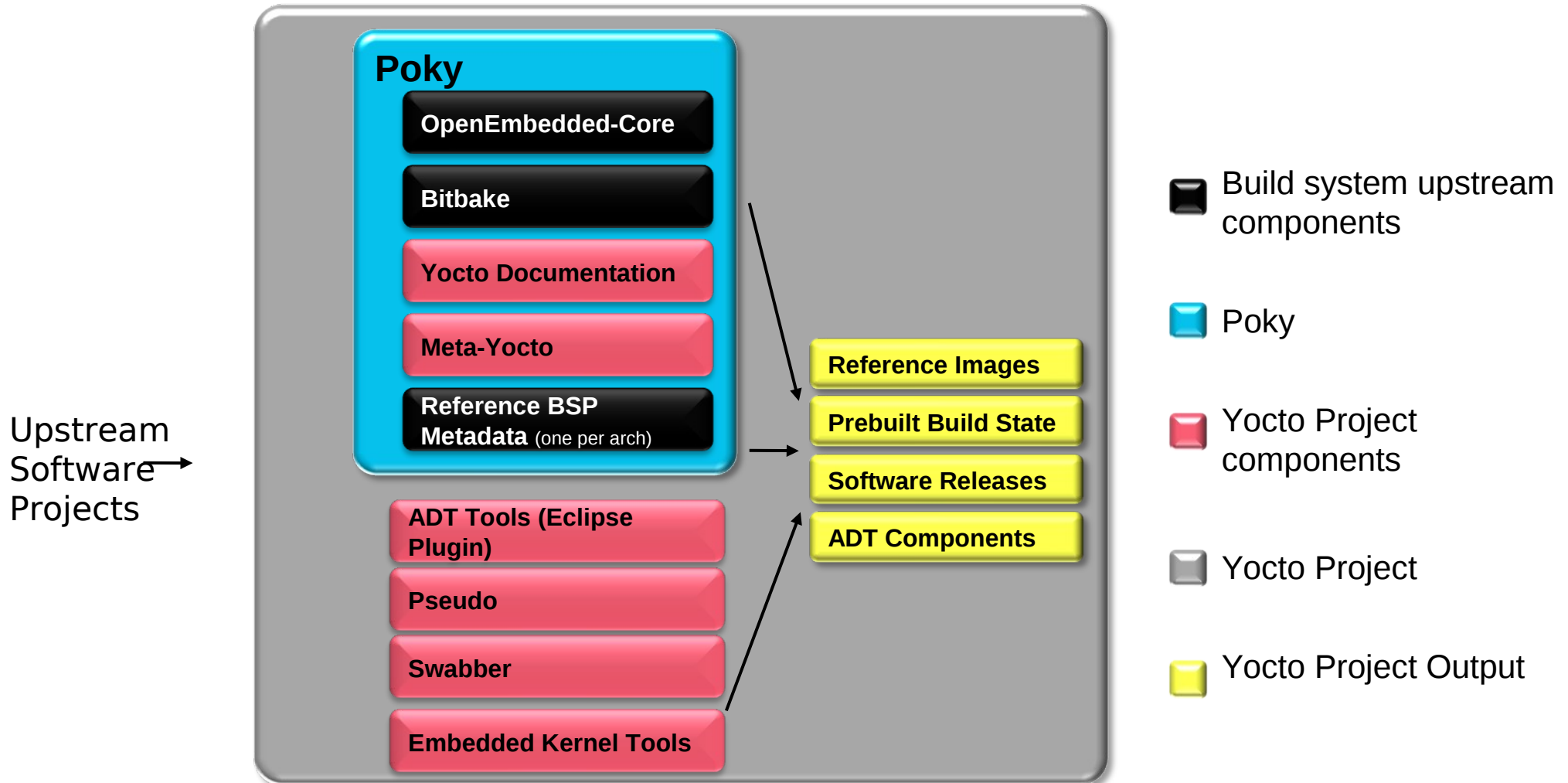 - Linux grows more in embedded

Why does it matter to you?

- **Start with a know validated set of packages**
  - Toolchain, kernel and userspace
- **Bootable Embedded Linux Image in about 1 hour**
- **Excellent Application & System Developer tools**
  - Eclipse, performance, debug
  - Tracing, power analysis
- **Flexible kernel development tools**
  - Configuration and patch management
- **Porting to new hardware is easy**
  - Change or create a new config file and rebuild
- **Easy path to the commercial Embedded Linux Market**
  - Mentor Graphics, Montavista Timesys, Wind River

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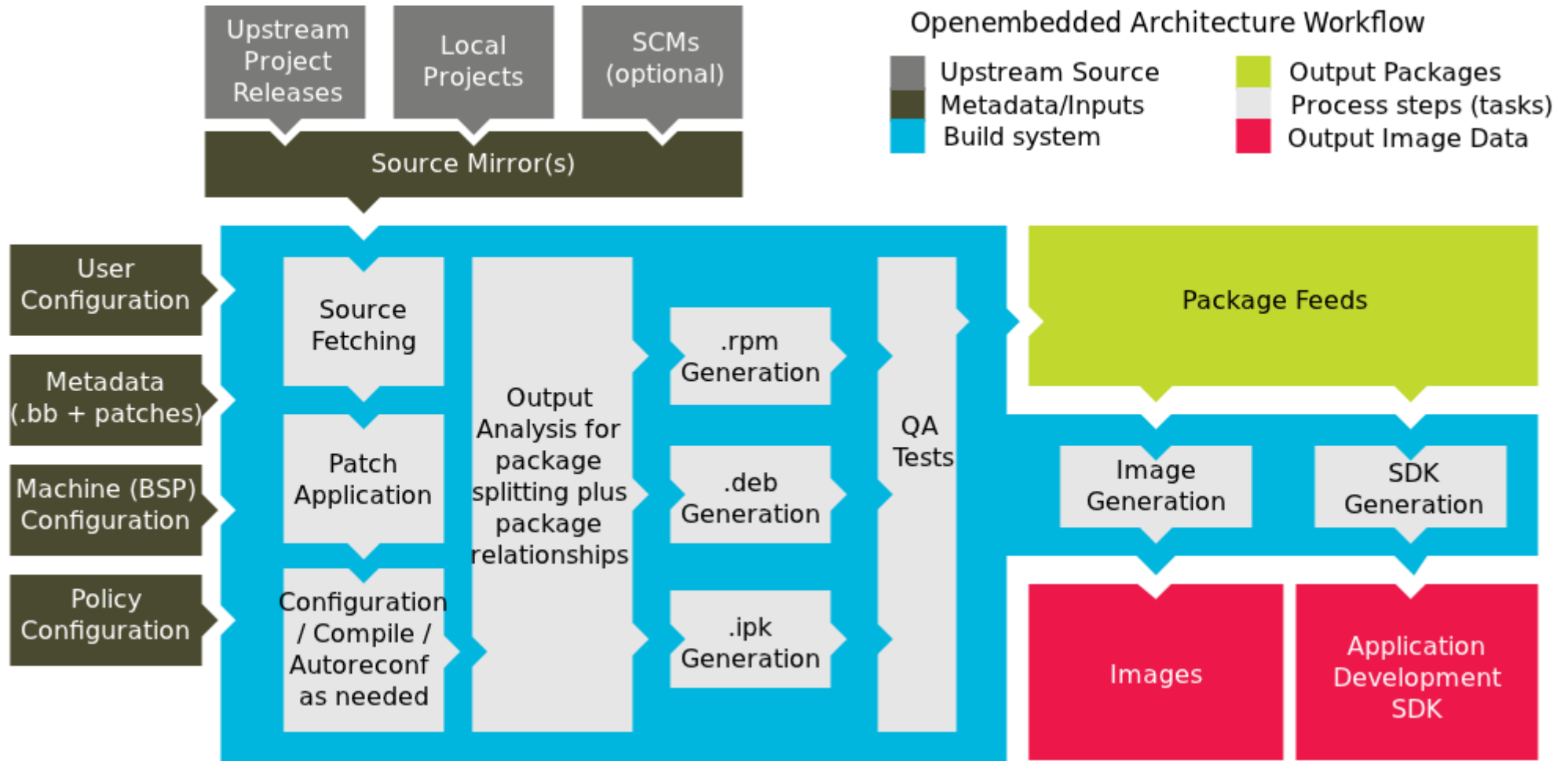
Yocto Project = Poky + Tools + Upstreams

Poky
- OpenEmbedded-Core
- Bitbake
- Yocto Documentation
- Meta-Yocto
- Reference BSP Metadata (one per arch)

ADT Tools (Eclipse Plugin)

Pseudo

Swabber

Embedded Kernel Tools

Reference Images

Prebuilt Build State

Software Releases

ADT Components

Upstream Software Projects

Legend:
- Build system upstream components
- Poky
- Yocto Project components
- Yocto Project
- Yocto Project Output

Yocto Project provides best of upstream for a stable base
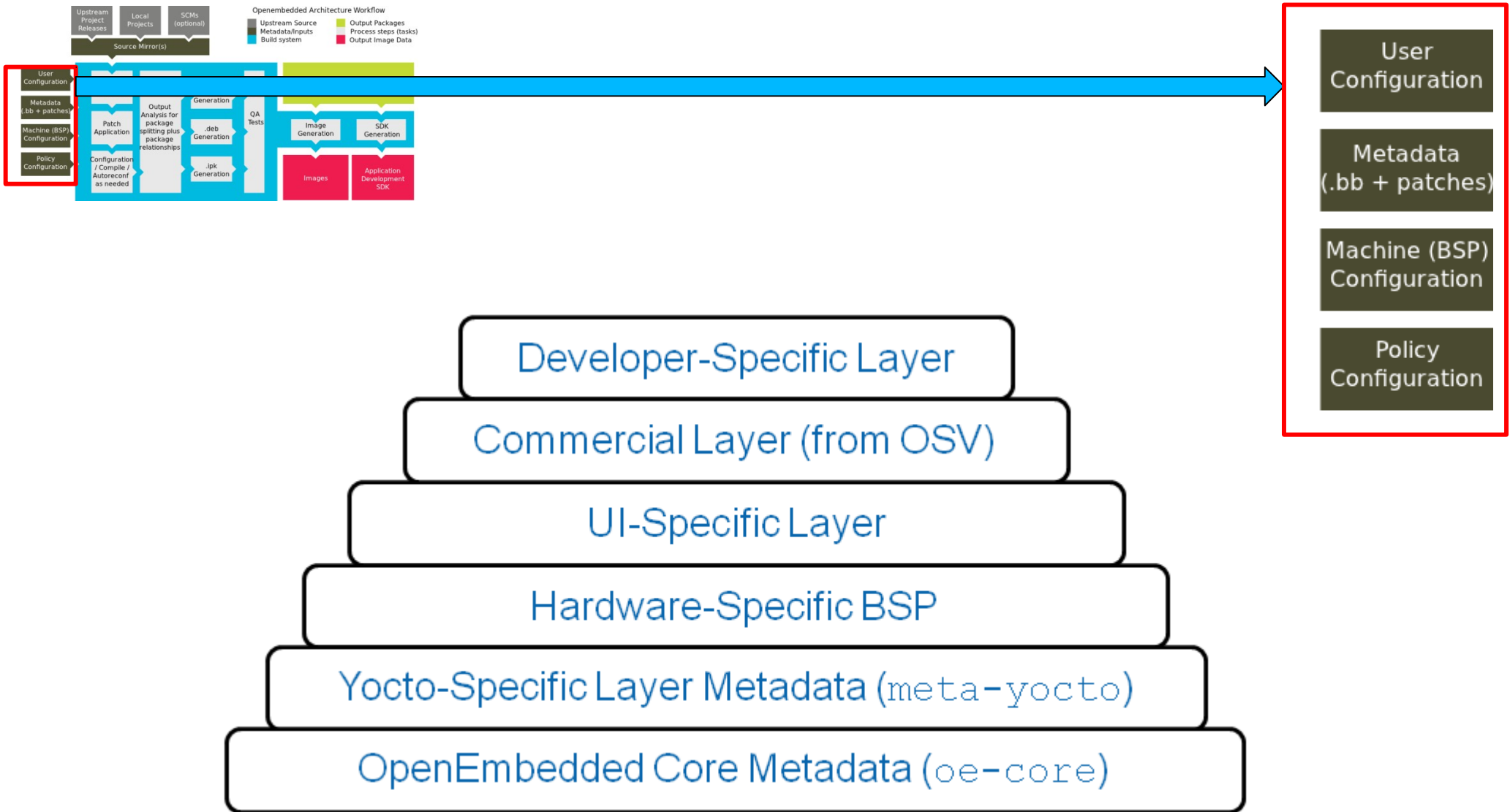
What's OE-Core

- **OpenEmbedded (oe-classic)**
  - Large Community (founded in 2005)
  - Lots of recipes, machines & distros
  - Uses bitbake as the task executor
- **Poky**
  - One of a number of commercially supported distros
  - Limited number of current recipes for base construction
  - Tested and updated regularly
- **Layered approach (more later)**
  - OE-Core as base – Machine / Distro neutral
  - Others can build on it

Bitbake - The Cook's Tour

Openembedded Architecture Workflow

Upstream Source
Metadata/Inputs
Build system

Output Packages
Process steps (tasks)
Output Image Data

Slides and video: http://bit.ly/it9rkB

Layers & Metadata

Developer-Specific Layer

Commercial Layer (from OSV)

UI-Specific Layer

Hardware-Specific BSP

Yocto-Specific Layer Metadata (`meta-yocto`)

OpenEmbedded Core Metadata (`oe-core`)

User Configuration

Metadata (.bb + patches)

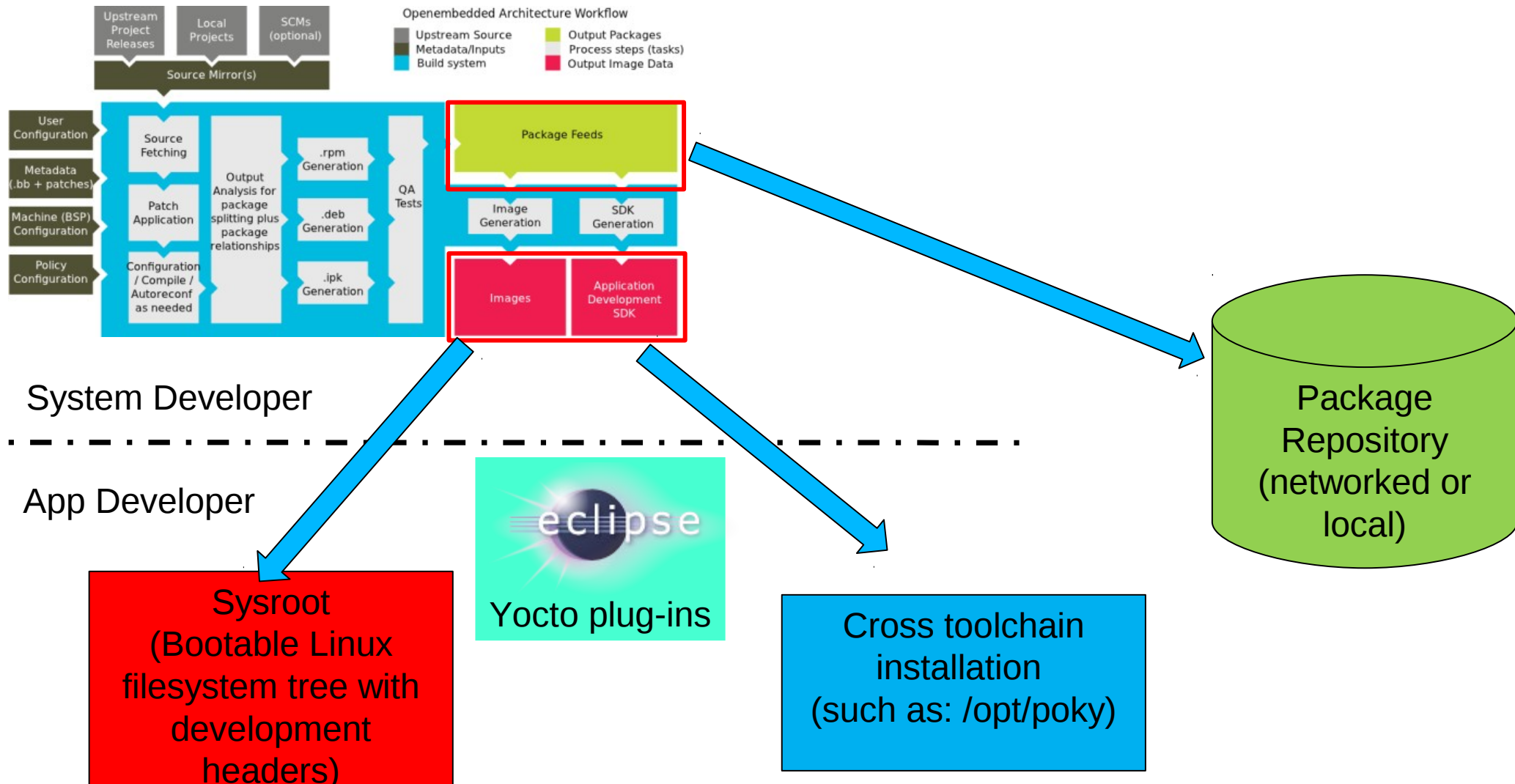Machine (BSP) Configuration

Policy Configuration

BSP Layers

- **Layers contain extensions and customizations to base system**
- **Can include image customizations, additional recipes, modifying recipes, adding extra configuration**
  - Really just another directory to look for recipes in
  - Added to the BBLAYERS variable in build/conf/bblayers.conf
- **BSPs are layers that add machine settings and recipes**
- **Machine settings are specified in a layer's conf/machine/xxx.conf file(s)**
- **Examples:**
  - Routerstation Pro (MIPS)

  $ meta-yocto/conf/machine/routerstationpro.conf

Kernel Development

- **We try to develop upstream wherever possible**
- **Two major advances in the Yocto Project:**
  - Branching tools: Per-BSP git branches contain machine-specific kernel sources. Tools collect up the relevant tree of branches
  - Kernel features: patches and configuration fragments managed as a functional block
- **Results:**
  - Can turn on a collection of features for a given BSP
  - Less code duplication
  - Easier to choose a config fragment and patches

Setting up the App Developer

Openembedded Architecture Workflow

- Upstream Source
- Metadata/Inputs
- Build system
- Output Packages
- Process steps (tasks)
- Output Image Data

System Developer

App Developer

Sysroot
(Bootable Linux filesystem tree with development headers)

Yocto plug-ins

Cross toolchain installation
(such as: /opt/poky)

Package Repository
(networked or local)

Yocto Project helps setup the embedded application developer

Hob 2 Demo

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Yocto Project / Poky 1.2

- **Hob2**
  - graphical interface for selecting options and packages and doing a build
  - Additional tool to assist with Deployment
- **Build Appliance**
  - Boots to a mini-x session and Hob2 using vmware or qemu
- **Build History**
  - Tools for comparing build results
- **Lots of usability and stability work**
  - Shared state (sstate-cache), License manifests
- **Multilib and x32 Support**
  - mix and match 32 and 64 bit binaries on the target
  - X86-64 systems running 64 bit registers and 32 bit data types – see meta-x32 repository

1.3 Release

- **Always working to improve the experience**
  - Error Handling and Output
  - Performance improvements (of build system)
- **Improvements to Hob and Build Appliance**
  - Proxy settings via preferences
  - Improved Deployment tools
- **Continual update of kernel, userspace**
  - Clean meta-data (License info, Descriptions, Packaging)
  - Improve documentation output and reduce warnings

Take Action Now

- **It's not an embedded Linux distribution – it creates a custom one for you**
  - YP lets you customize your embedded Linux OS
  - YP helps set up the embedded app developer
  - Both device and app development models supported
- **Getting started is easy**
  - Download the software today
  - Be sure you read the Quick Start to set up your system to use the Yocto Project
  - Build, test on QEMU or real hardware, develop apps

Make an impact – collaboration in its purest sense

Join the community

- **#yocto on freenode.irc.net**
- **http://www.yoctoproject.org**
- **http://wiki.yoctoproject.org**
- **Development through public mailing lists:**
  - **yocto@yoctoproject.org**, **poky@yoctoproject.org**
    http://lists.yoctoproject.org
  - **openembedded-core@lists.openembedded.org**
- **Git Code repositories**
  - **git://git.yoctoproject.org**
  - **git://git.openembedded.org**
- **Bug reporting and features requests via**
  - **http://bugzilla.yoctoproject.org**