Human Resource Development in the area of Embedded Systems in Korea

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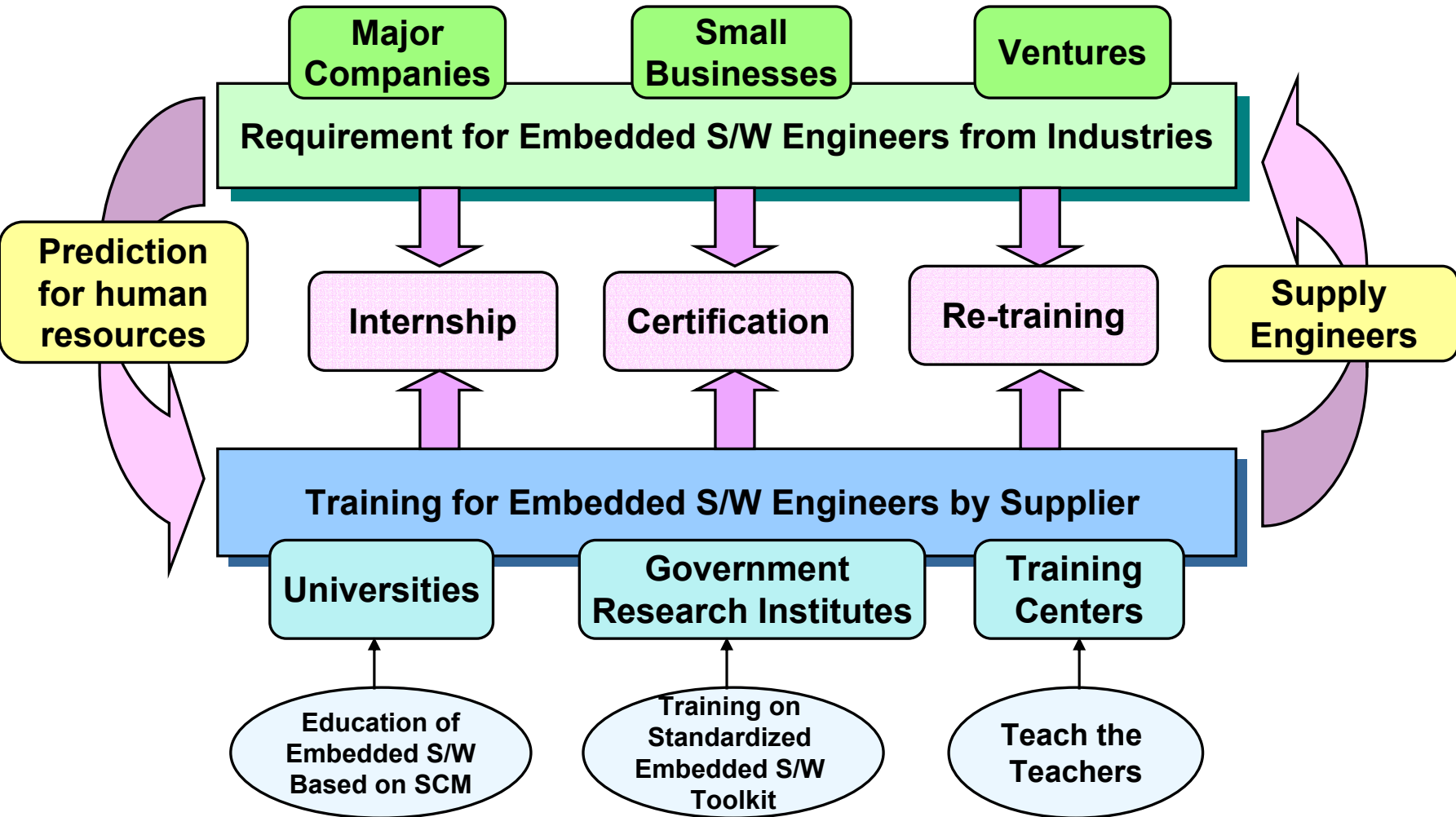- **Plan for embedded S/W engineer training**

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Current Status

- **Severe shortage of skillful engineers : only a few hundreds.**
  - By 2007, 12,000 engineers are needed more.
  - Development activities of new technologies are rare.
  - Most industries focus on marketing.
  - Many industries employ foreign engineers (India, US, etc.)
- **Insufficient education in universities,**
  - Weak education in basic courses, especially system software, computer architecture, co-design of hardware and software, etc.
  - Recently, LG economic research institute reported that the education investment efficiency index is very low (20th among 23 OECD countries)
  - Poor English skill!: reading, writing, hearing, speaking
- **Korea MIC tries to develop human resources very quickly.**
  - Is it possible?
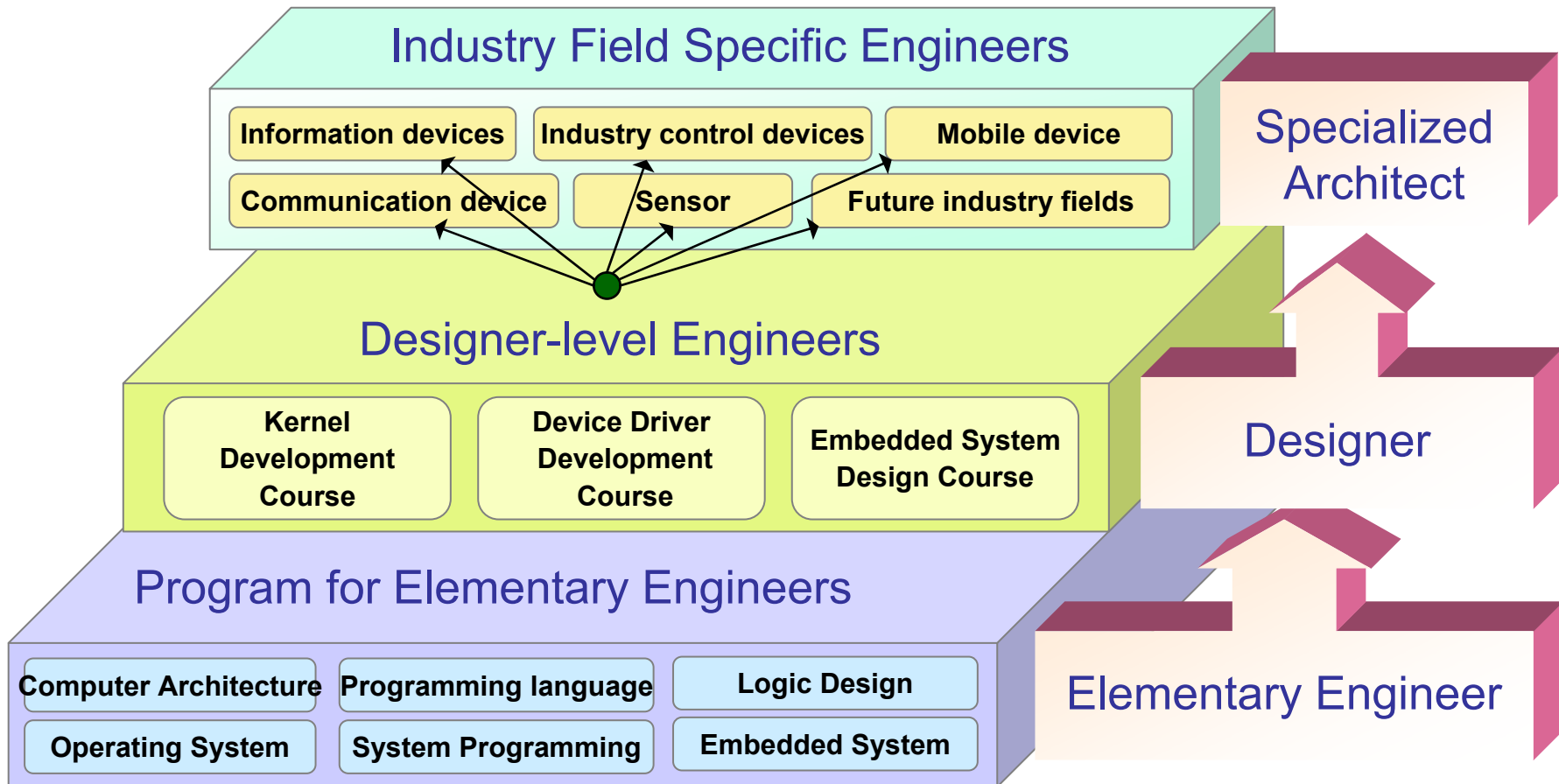
Approach - overview

- **Re-training existing human resources in the IT area.**
  - Unemployed university graduates
  - Industry employees
- **Strengthening university education programs for the embedded S/W area.**
  - Development of standard curriculum and teaching materials
  - Development of internship programs between universities and industries
- **Establishment of national infrastructure for human resource development.**
  - Demand-driven SCM (supply chain management)
  - Development of human resources specialized in specific branches of industry (CDMA, telematics, SoC, robot, etc.)
- **Promotion**
  - Embedded S/W contest (mainly for university students)
  - Innovative Embedded S/W award (for industry products)

SCM (Supply Chain Management) Model for Human Resource Development

Specialized training programs for specific fields

❑ Project-based training program to develop highly skillful engineers possessing both hardware knowledge and software techniques

Industry Field Specific Engineers

| Information devices | Industry control devices | Mobile device |
| Communication device | Sensor | Future industry fields |

Designer-level Engineers

| Kernel Development Course | Device Driver Development Course | Embedded System Design Course |

Program for Elementary Engineers

| Computer Architecture | Programming language | Logic Design |
| Operating System | System Programming | Embedded System |

Specialized Architect

Designer

Elementary Engineer

Plan for Embedded S/W Engineer Training

- **Embedded S/W Engineer Training Program based on the SCM model**
  - **Embedded S/W Training Program in Universities**
    - Model case of Embedded S/W curriculum : 19 Universities
    - Development of Standardized Training Toolkit for Embedded S/W Programming
      - Design training program, Curriculum, Syllabus, Lecture note, and Define the Skill-set
      - SoC, CDMA, STB, PDA, Telematics, Industrial Control
    - Embedded S/W ITRC(Information Technology Research Center) in Univ.
  - **Embedded S/W Training Program by Private Training Centers**
    - Samsung SDS, Bit Computer, LinuxOne, Hybus, etc.
  - **Internal Training Program in Industries**
    - Each company has its own internal embedded S/W training program with a specific embedded system platform
  - **Teach the Teachers (TTT) program**
  - **Enforcement of Internship between Universities and Industries**

Questions

- **Is the SCM model adequate for human resource development in the area of embedded S/W?**

- **Do we need embedded S/W engineers or embedded system engineers?**

- **Most training programs are based on a specific hardware platform (single mother board) and embedded Linux**
  - **Is it the right approach?**
  - **Conflict with industry demands.**

Tynux board from
Palmpalm tech.

etc.

Example of a course material (Hybus)

- **Part I (Backgrounds)**
  - **Introduction to Embedded Linux system**
  - **Basic usage of Linux**
  - **VI editor**
  - **Make utility**
  - **Embedded Linux kernel including process, memory, file, network managements**
  - **Arm assembler (based on SA1110 CPU)**
- **Part II (Practices)**
  - **Introduction to X-Hyper 250B board**
  - **X-Hyper 250B operation**
  - **Building development environment**
    - Toolchain, JTAG compiler, Boot loader compiling, Minicom execution, Bootp setup, tftp setup, Kernel image downloading, File system downloading, Target board kernel booting

- **Part II (cont'd)**
  - **X-Hyper 250B kernel compile**
  - **File system: Journaling Flash File System and Ramdisk**
  - **Device driver: frame buffer, ethernet, sound, UARTs, USB, PCMCIA & CF cards, Keypad & LED, Multimedia card**
  - **Boot Loader**
  - **JTAG (Joint Test Access Group)**
  - **Applications: installation of QT, a Web server (GoAhead), and a Web browser (Dillo) on X-Hyper 250B**
  - **Design and implementation of Linux device drivers**
    - FND device driver
    - AD/DA converter device driver
    - Step motor device driver
    - Key scan and char LCD device driver