

내장형 소프트웨어 기술동향

컴퓨터공학 특강

김형신

충남대학교 컴퓨터공학과 임베디드시스템연구실

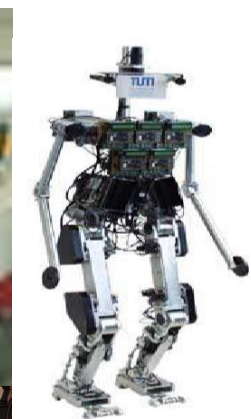
<http://eslab.cnu.ac.kr>

2016년 4월 6일

Outline

- **Part I. Embedded System and Embedded Computers**
 - History
 - Introduction and prospect
- **Part II. Technology Trend**
 - **Supporting Technologies**
 - ▶ Hardware
 - ▶ Software
 - **Embedded System**
 - ▶ Mobile Devices
 - ▶ Vehicles
- **Part III. Research topics at CESL**
 - Multicore
 - Mobile platform
 - Fault-tolerance

Embedded Systems – Computers inside



History

Usage



Watch



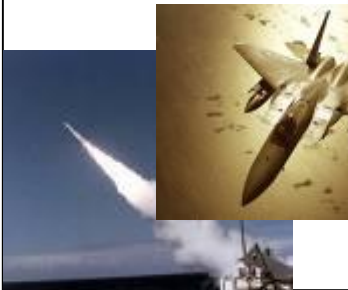
Glass



Band



Shoes



1960

1990

2000

2020

Why Embedded System is HOT ?

- Embedded systems everywhere now
- Future society will need more computation and intelligence in almost everywhere
- The more and more and more computers will be embedded and more....
- We are going to “Ubiquitous computing”
- 2014, “Internet of Things(IoT)”

Leading Market – 1



Leading Market – 2



Leading Market – 3



PART II. Technology Trend

Researches at CESL

What you will do in Embedded System Research



**Everything
to implement Embedded System**

Design, Analyze, monitoring tools
Reliable, safe, real-time software



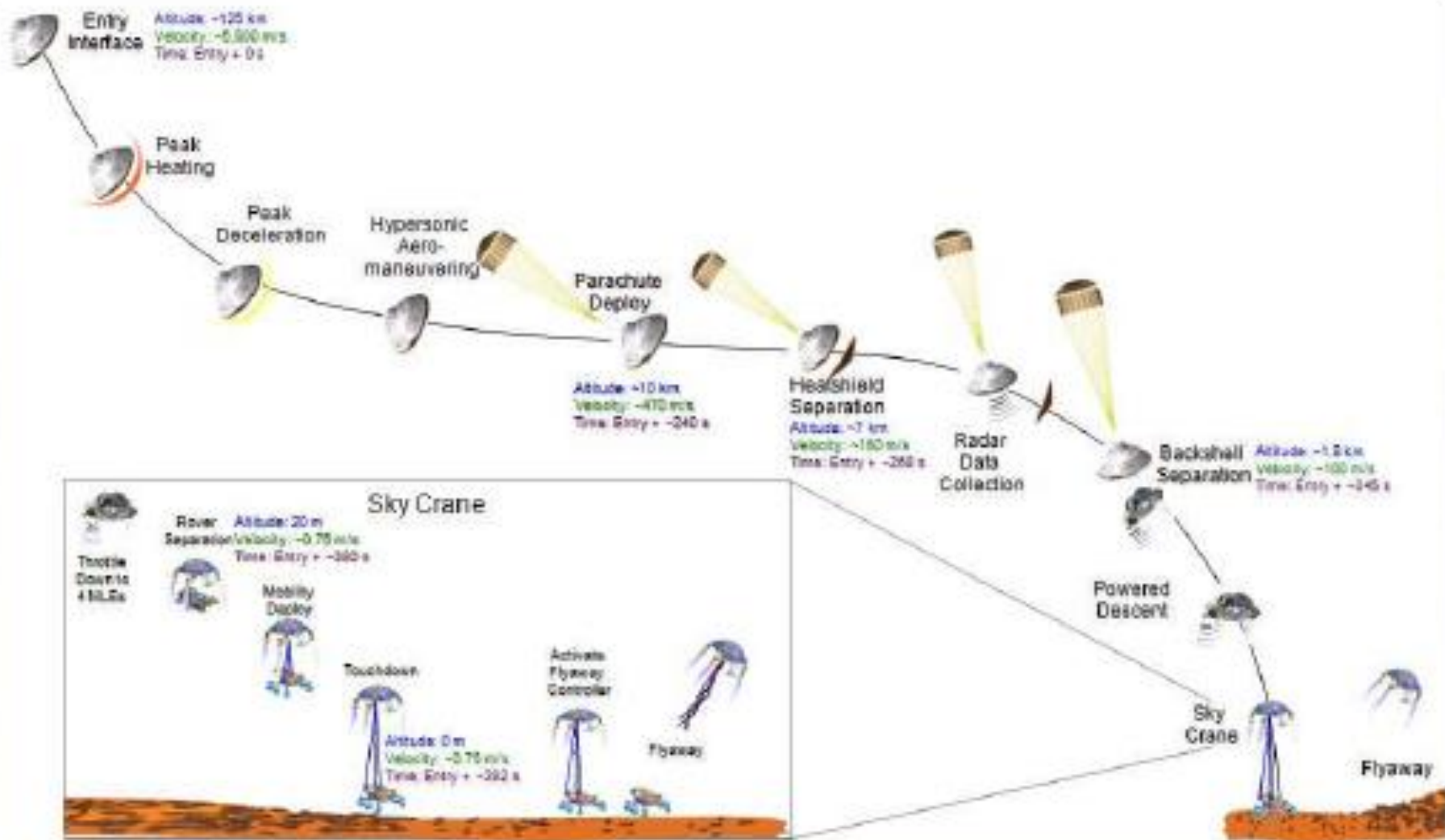
Curiosity

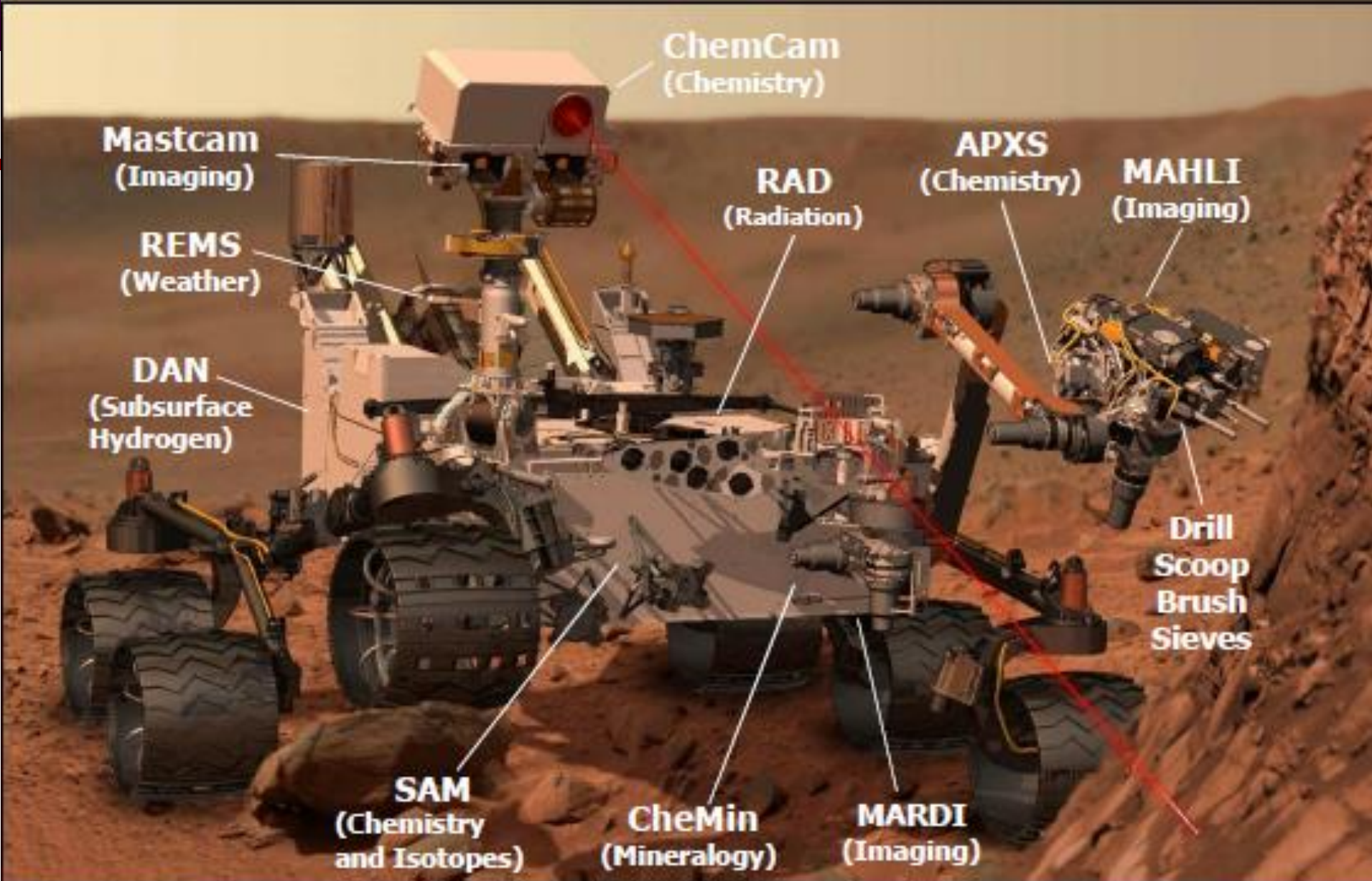
The Mars Science Laboratory mission's Curiosity rover, the most technologically advanced rover ever built, landed in Mars' Gale Crater the evening of Aug. 5 PDT (morning of Aug. 6 EDT), 2012 using a series of complicated landing maneuvers never before attempted.



- The specialized landing sequence, which employed a giant parachute, a jet-controlled descent vehicle and a bungee-like apparatus called a "sky crane," was devised because tested landing techniques used during previous rover missions could not safely accommodate the much larger and heavier rover.

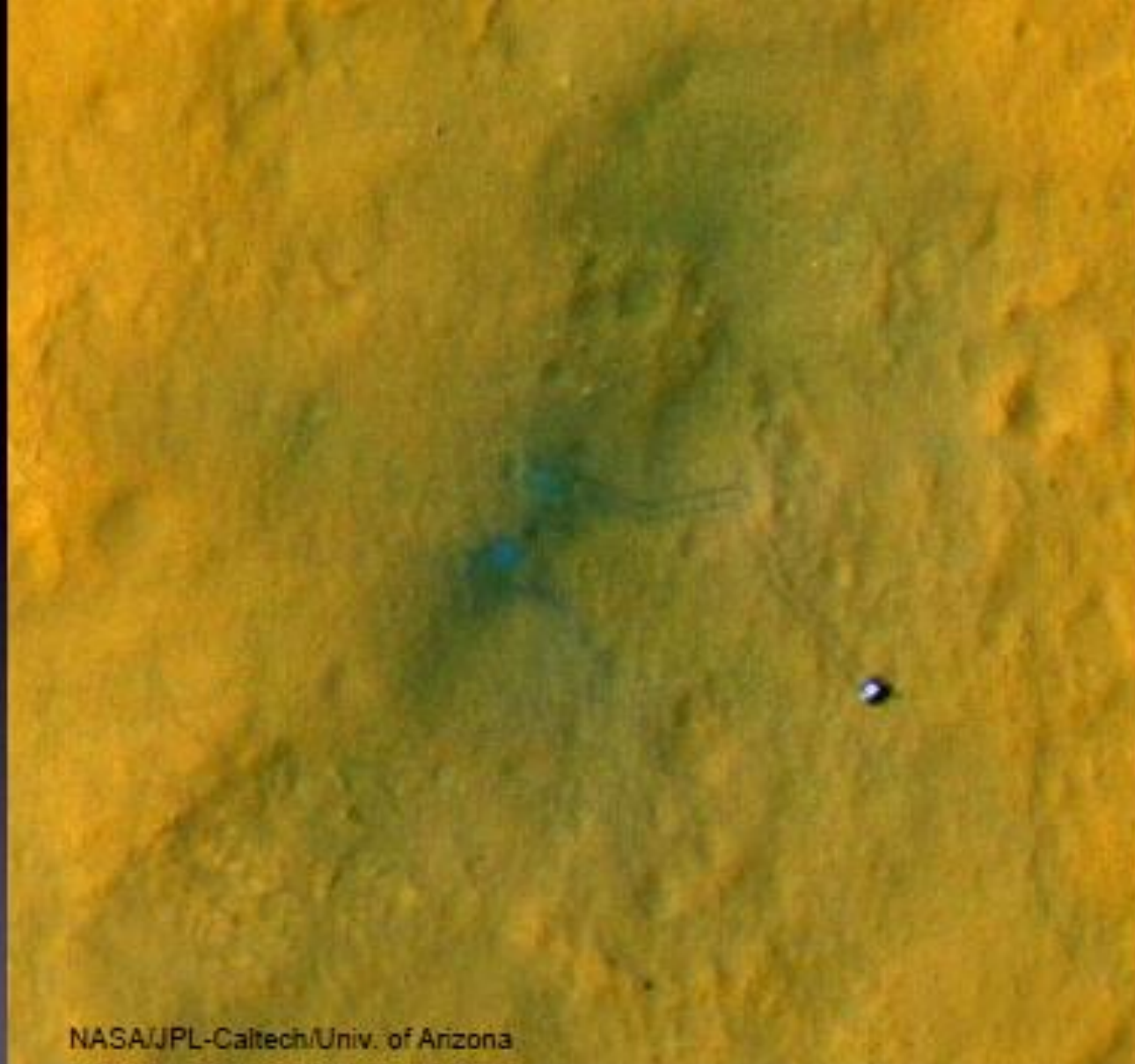
Entry Descent and Landing





Curiosity's Science Payload

내장형시스템 기술동향, 2016년 4월 6일



Curiosity and its tracks captured by HiRISE on the Mars Reconnaissance Orbiter



Topics

- **Energy/Resource-aware context sensing(2014~2017, NRF)**
 - 웨어러블 기기들을 이용한 센싱 응용에서 에너지를 어떻게 절약할 수 있나
 - 웨어러블 기기들을 모바일폰과 연동해서 상황정보를 인식하는 플랫폼을 개발하자
- **Energy-aware Beacon system (2014~2017, MST)**
 - BLE 기반 비콘 시스템의 에너지 소모량을 최적화
 - 비콘 기반 시스템의 위치 정확도를 개선
- **Partitioning System software for Multicore parallel architecture (2011~2016, NRF, NSL)**
 - 임베디드 가상화 시스템 소프트웨어 기술 연구
 - 임베디드 RTOS의 파티셔닝을 통한 소프트웨어 재사용성 개선 연구
 - 고신뢰성 시스템에서의 고장허용성 개선방안
 - ARM Cortex A9, LEON4 과 같은 SMP, AMP 형 멀티프로세서, 멀티코어 컴퓨터에서의 응용프로그램의 병렬화 방법 연구
 - 멀티프로세서, 멀티코어 컴퓨터에서의 병렬 스케줄링 기법 연구
 - 멀티프로세서, 멀티코어 컴퓨터에서 실시간 스케줄링 기법 연구
- **Analysis of wearable OS (2015~2016, MST)**



교육과학기술부
국가우주연구소

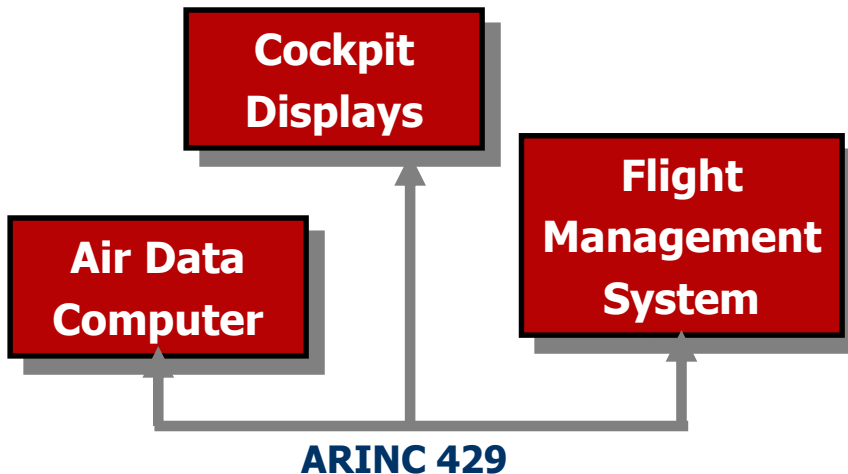


Laboratory for
Spacecraft Software Platform Research
범용 플랫폼 및 임무에 적용
가능한 위성용 SW개발

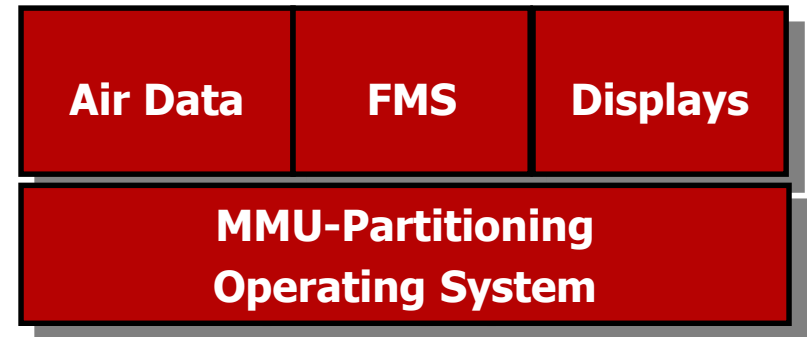
Funding from NSL Program
NRF, 2011.7 ~ 2016.6

Federated System & IMA

Federated System

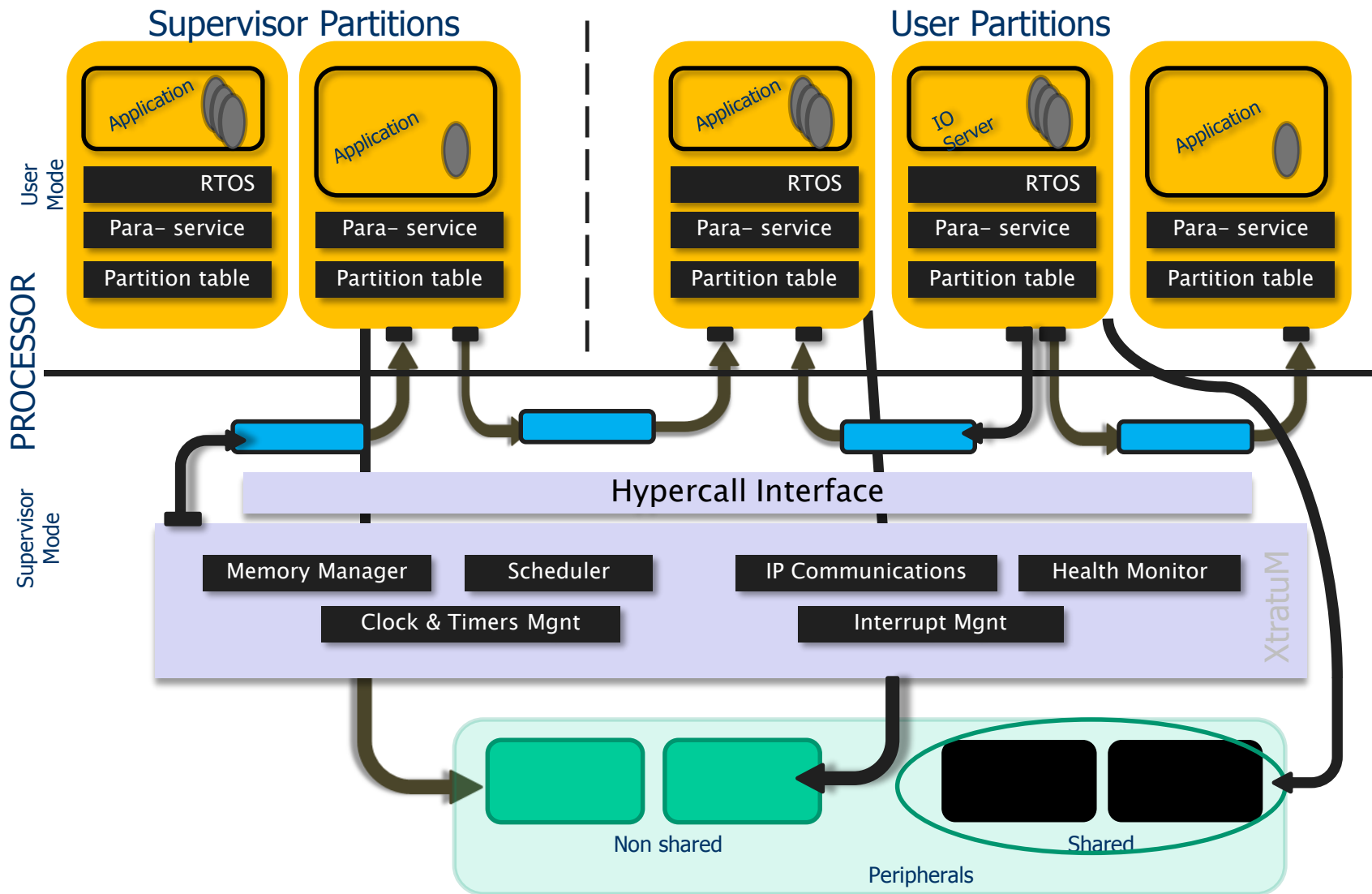


Integrated Modular Avionics (IMA)



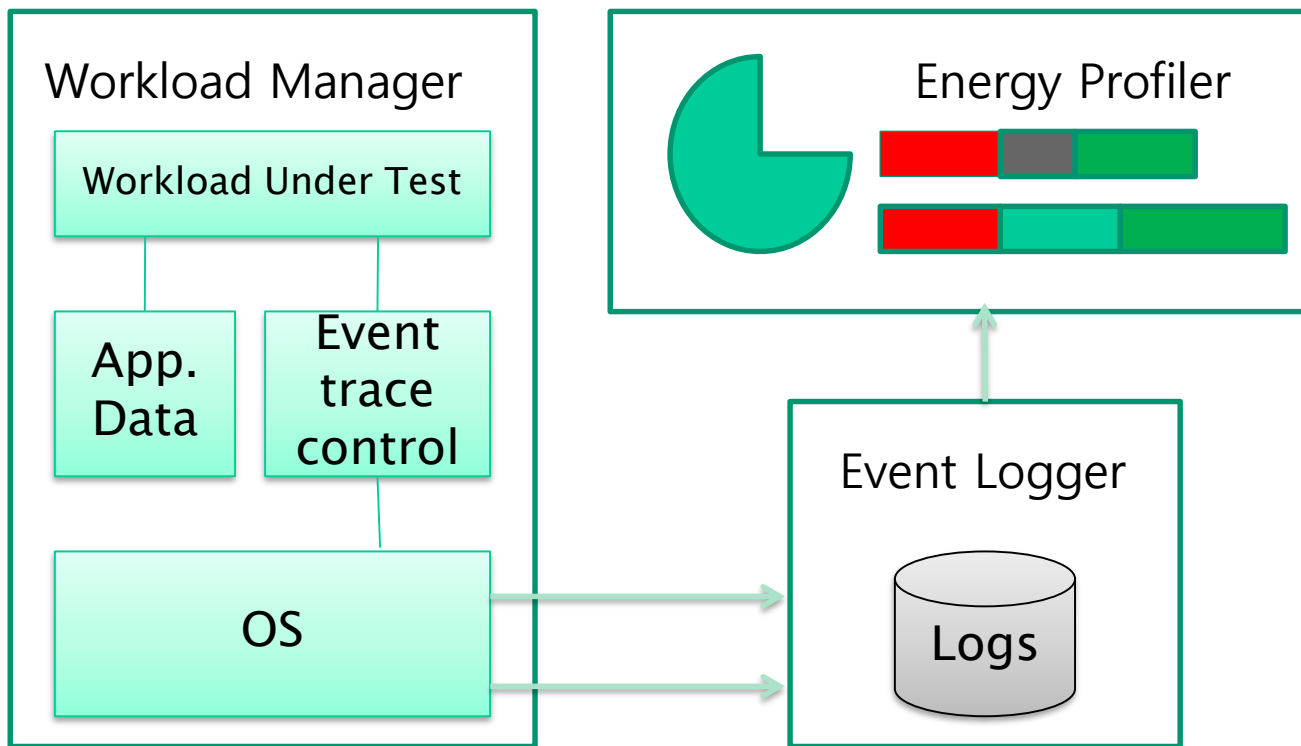


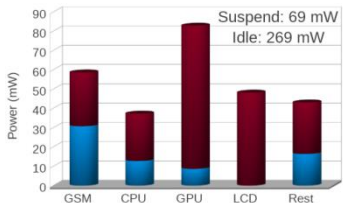
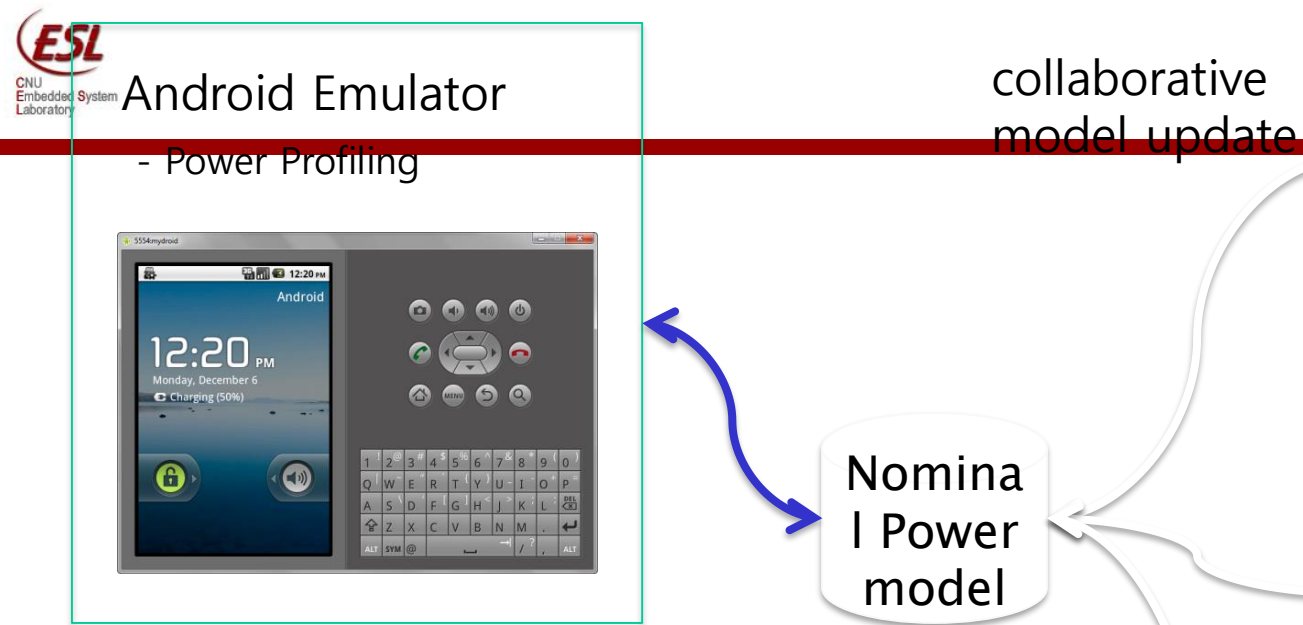
Hypervisor/Partitioning Kernel



모바일 기기 소모전력 최적화 연구

Power Consumption Optimization in Smart phone (2011~2014, NRF)





Android Phone 1
- power profiler



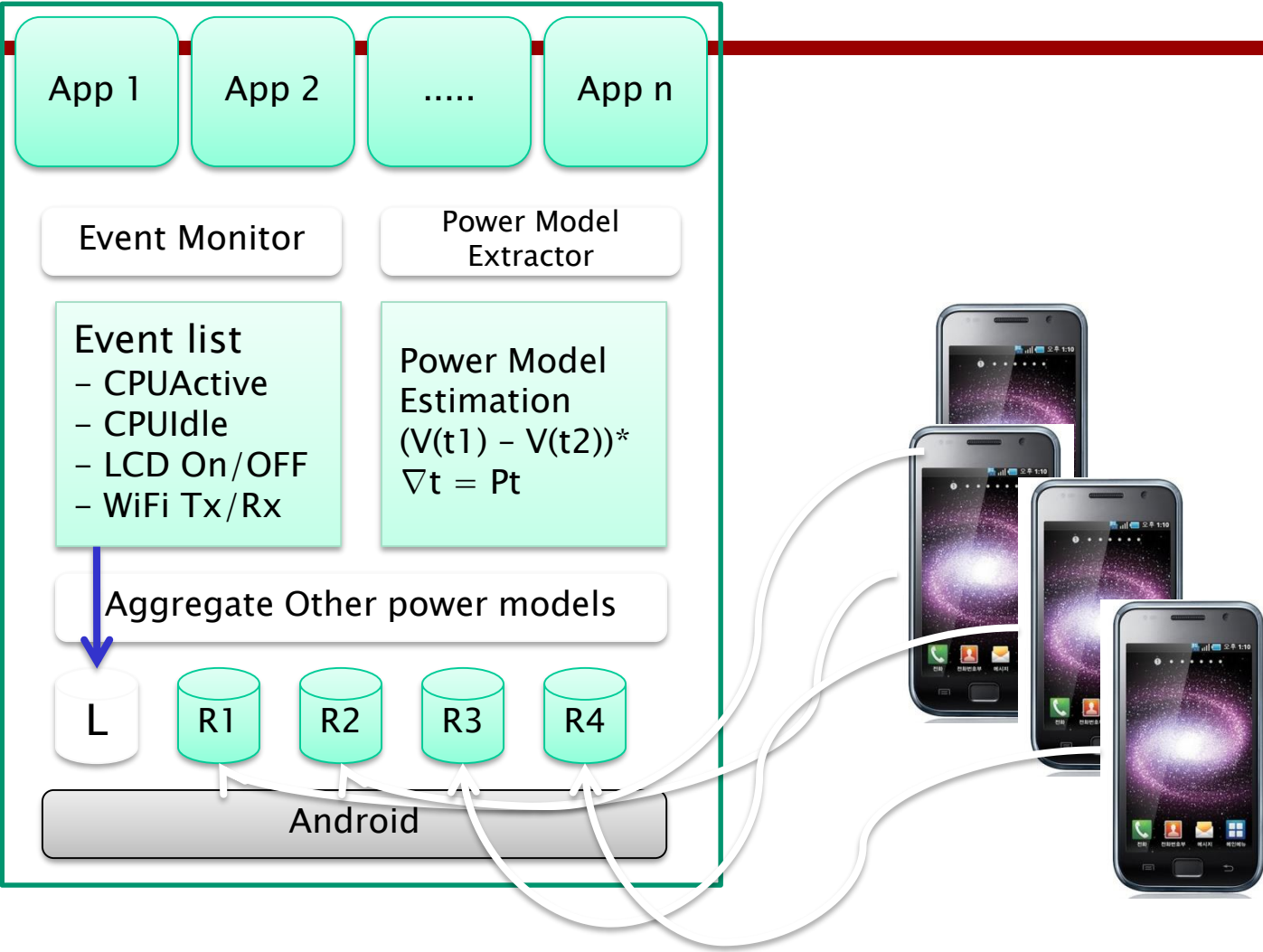
Android Phone 2
- power profiler



Android Phone 3
- power profiler



collaborative
model update



Angry Bird Result

