EMC2 Workshop: The S3P project

Paris, Sept, 28th, 2016
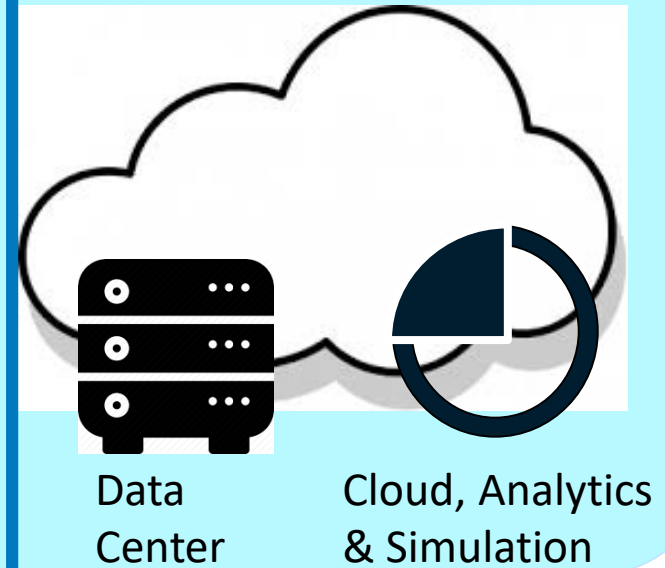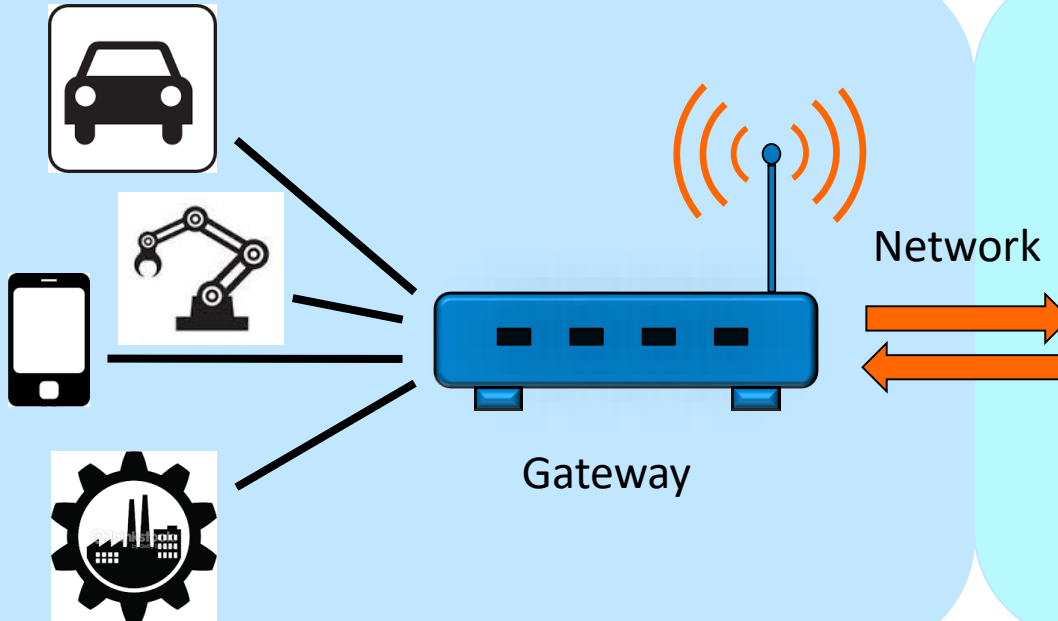
Fundamental Elements of IoT

"Collect"	"Connect"	"Correlate"
With Things	**With Network**	**With Cloud/Data**
Sensors and Connectivity		

Distributed Software & Communication

Our Focus

S3P

Embedded Side

Cloud/Analytics/Simulation Side

Gateway

Network

Smart & Connected Things

Data Center

Cloud, Analytics & Simulation

S3P Charter in Summary

- **An Embedded Execution Platform for IoT Devices:**

  o **A consistent set of run-time software stacks and design tools open to third parties added value, and supporting next generation multicore processors**

- **That is both Smart:**

  o **Technically and Economically efficient**

- **And Safe & Secure:**

  o **Compatible with system integrators safety/security requirements, ensuring privacy and trust to end-users**

Use Case-Based Technology

Consortium

- **<u>Driven by End-users</u> from different domains:**
  - Airbus, Alstom, Altran Connected Solutions, AXA, Continental Automotive, Eolane, Safran, Schneider Electric, Sorin, SurTec, Thales...

- **Software vendors addressing <u>safety/security</u> markets with high-quality, highly innovative solutions:**
  - Execution Platforms: IS2T, Krono-Safe, Prove & Run, SYSGO
  - Tools and Technologies: ANSYS (Esterel Technologies), PrismTech, TrustInSoft

- **<u>Electronics</u> Hardware providers**
  - STMicroelectronics, NXP (Freescale)

- **Industrial valorisation of <u>Academic</u> contributions**
  - CEA (Design & Verification tools), TelecomParisTech (Run-time support)

- **National and International <u>Dissemination</u> and Support to SMEs**
  - CAP'TRONIC, Eclipse Foundation, Embedded France

Organization

- **Duration 3 years (Start date October, 1st, 2015)**

- **Project Management ensured by ANSYS, (Esterel Technologies subsidiary)**

- **Leadership of S3P Foundation developments by 3 providers offering complementary technical features: SYSGO, KRONO SAFE and PROVE & RUN**

- **Industrial Use Cases led by THALES and ALTRAN Connected Solutions**

- **Total effort about 300 person.year**

- **Total budget of 45 M€ of which 18,5 M€ of french government funding (CGI/DGE) within the scope of the « Nouvelle France Industrielle » initiative**

Targetted Technical challenges

- **Tools and Libraries**
  - Model-Based Design of safety and non safety critical applications
  - High-level application and IoT systems models
  - **Multi-rate and Multi-Core Application software development, automatic & certified code generation and integration with Execution Platforms**
  - Re-usable Safe & Secure components
  - Formal analysis of Embedded Code Security

- **Execution Platforms**
  - Proven separation mechanisms for programs and data Remote administration and update
  - **Deterministic behavior and latency bounds**
  - **Support across hardware evolutions**
  - Hardware platform heterogeneity

Zoom on multicore code generation

- "Obtaining performance increases requires developers to invest in significant software modifications to in effect, transform current sequential applications into parallel ones. This modification is nontrivial and introduces new challenges spanning the traditional development phases of program analysis, design, implementation, debug, and performance tuning."

- The multicore association : http://www.multicore-association.org/workgroup/mpp.php

In a classic parallel design, developers have to :

- **Divide the problem into parts** that are intended to be executed simultaneously,
- **Limit the shared memory** manipulated by each parallel component to avoid as possible the dependencies between the parallel branch,
- **Limit the communications** between the components (the communications can easily induce an over cost that makes irrelevant the parallelization)
- **Handle the synchronization** mechanism between the parallel components

Why Choosing ANSYS SCADE ?

- **The Scade language is natively parallel**

  ○ **It is founded on Kahn Process Networks (KPNs) theory.**

- **Designing in Scade is inherently parallel**

  ○ **There is no control dependency but only data dependencies**

- **The generated C code has no side effect**

  ○ **each generated function has its own memory, and there is no risk of variable aliasing**

- **SCADE Suite Certified Code Generator determines precisely the required order for data computation**

  ○ **It properly schedules the Scade model into sequential C or Ada code.**

  ○ **This information order allows to place barriers, locks or semaphores into the code to ensure correct synchronization and efficiency of the different tasks for multi/many core code generation.**

Multicore Code Generation Workflow
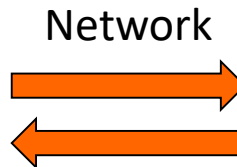

Scade program

Model of tasks and hardware

#par pragmas

KCG Multicore

Task and channel allocation mapping

C files

mapping.xml

Target Mapping

main.c

user_config.h

C compiler

Executable

                    24 February 2016
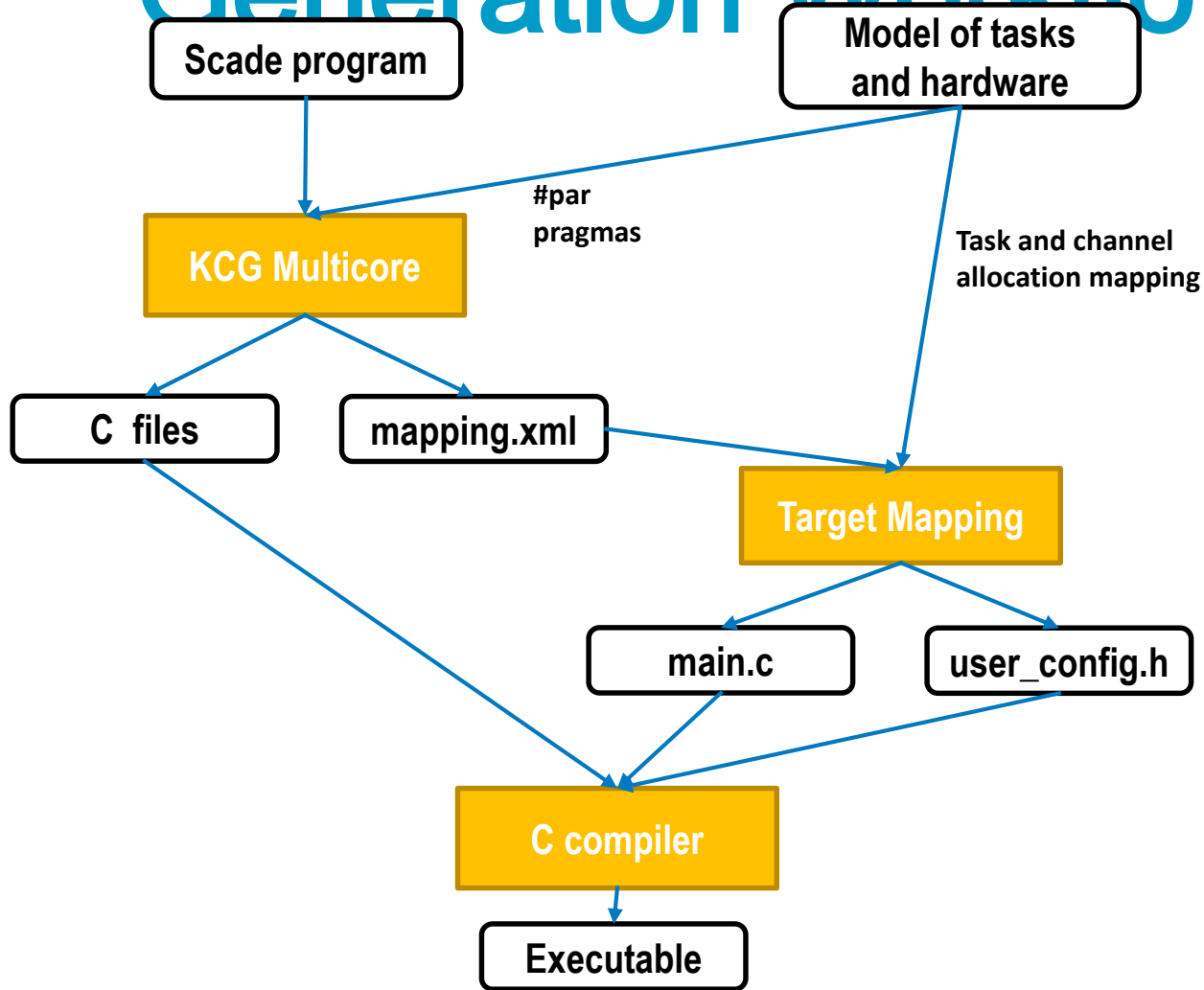
Technology Providers & Stack Summary

S3P Application Software
Development and Analysis tools

ANSYS **Cea tech** **TRUST IN SOFT**
Mathematical Guarantees Eliminate Software Risk

PRISMTECH **MICROEJ**

S3P Core & IoT Infrastructure
Secure execution engine & libraries

S3P Foundation
Safe, Secure Real-time kernels & hypervisors

KRONO-SAFE **SYSGO EMBEDDING INNOVATIONS** **PROVE & RUN**

Embedded Hardware
ST life.augmented **freescale semiconductor**

Device/Asset Operations Management

Big Data Analytics

Virtual Reality

Device/Asset Content Management

Digital Twins
ANSYS

More Apps..

Network

PRISMTECH **MICROEJ** **Cloud Services & Application Stores**

Cloud
IoT Applications and Services

Planned results

- **Mature software building blocks from ISVs**

  o **Integration validated IN PRACTICE**

- **Agreed architectural principles and interfaces**

- **Demonstration on (at least) 15 industrial Use cases:**

  o **Of the maturity and integration of the building blocks**

  o **Of the innovation potential for applications across vertical domains**

The S3P Alliance

S3P Alliance Goals

- **Gather users and interested parties of the S3P Platform to build more use cases and deployments**
  - o Gather vertical market needs and challenges
  - o Facilitate usage of S3P solutions
- **Integrate an ecosystem of Complementary Partners:**
  - o IoT Platform Providers
  - o Simulation, Big Data & Analytics providers
  - o Cloud & Networking providers
  - o System Integrators and Service Companies
  - o Application developpers
- **Ensure Consistency and Collaboration with the Other IoT initiatives (Industrial Internet Consortium, Industrie 4.0..) and IoT Platform providers**

S3P Alliance Details

- **« S3P Alliance » is created as an International WorkGroup of** **Embedded France** L'embarqué made in France

- **To Foster International cooperation Embedded France has joined the EICOSE partnership**

- **The only pre-requisite to join the S3P Alliance is to become a member of Embedded France or EICOSE Partner Clusters such as SafeTrans, and ECSEL Austria**

- **How to Join Embedded France ?**
  - **cedric.demeure@embedded-france.org**
  - **chahinez.hamlaoui@embedded-france.org**

S3P Alliance Value

- **Quarterly Workgroup meetings including:**
  - Use Case & Application example sharing
  - S3P project results & technology sharing
  - Proposal discussion for new use cases
  - Proposal discussion for added value services and business partnerships
- **Stepping Stone to join the S3P Consortium (if approved by S3P Consortium Members) to access Consortium IP**

S3P

SMART, **S**AFE & **S**ECURE **P**LATFORM

You are welcome to join !

Questions:

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