



# More-than-Moore Roadmapping Update



# More Moore & More than Moore: Definitions

- **“More Moore”**: **Scaling**

Continued shrinking of physical feature sizes of the *digital functionalities* (logic and memory storage) in order to improve *density* (cost per function reduction) and *performance* (speed, power).

- **“More than Moore”**: **Functional Diversification**

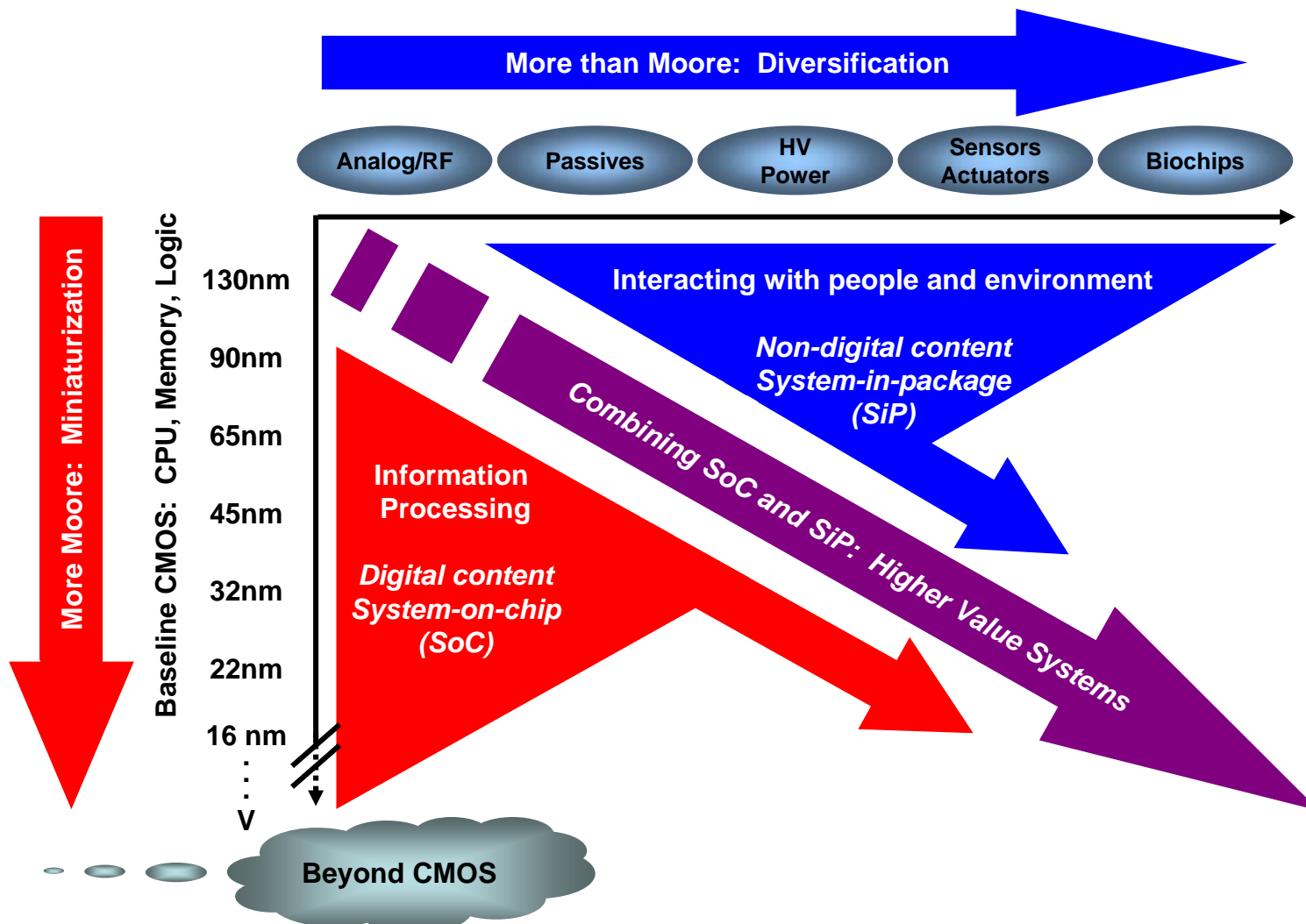
Incorporation into devices of functionalities that do not necessarily scale according to "Moore's Law", but provide additional value in different ways. The "More-than-Moore" approach allows for the *non-digital functionalities* to migrate from the system board-level into the package (SiP) or onto the chip (SoC).

- **The Challenge**: **Integration of MM with MtM**

Creation of heterogeneous compact systems.



# Moore's Law & More



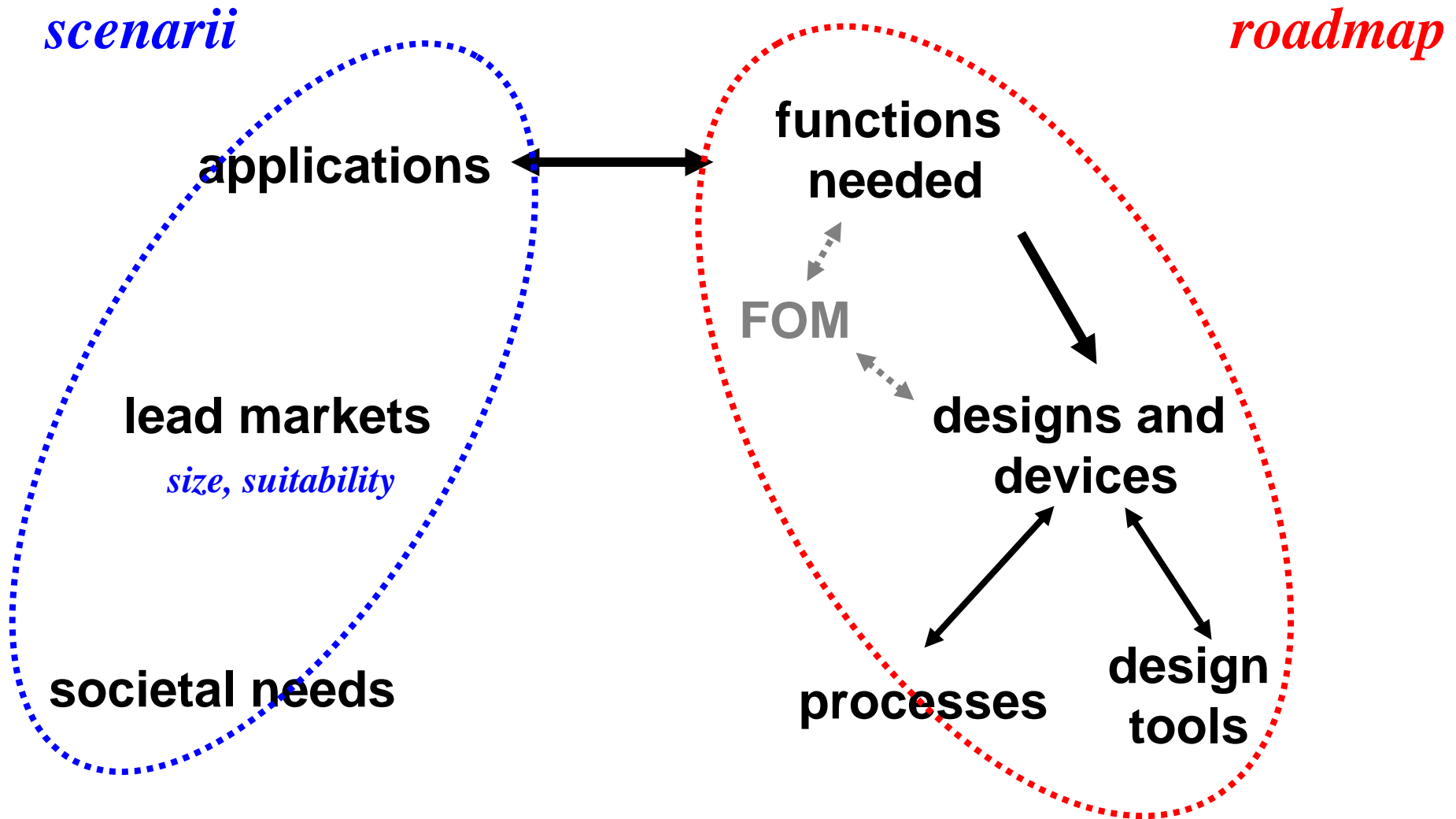


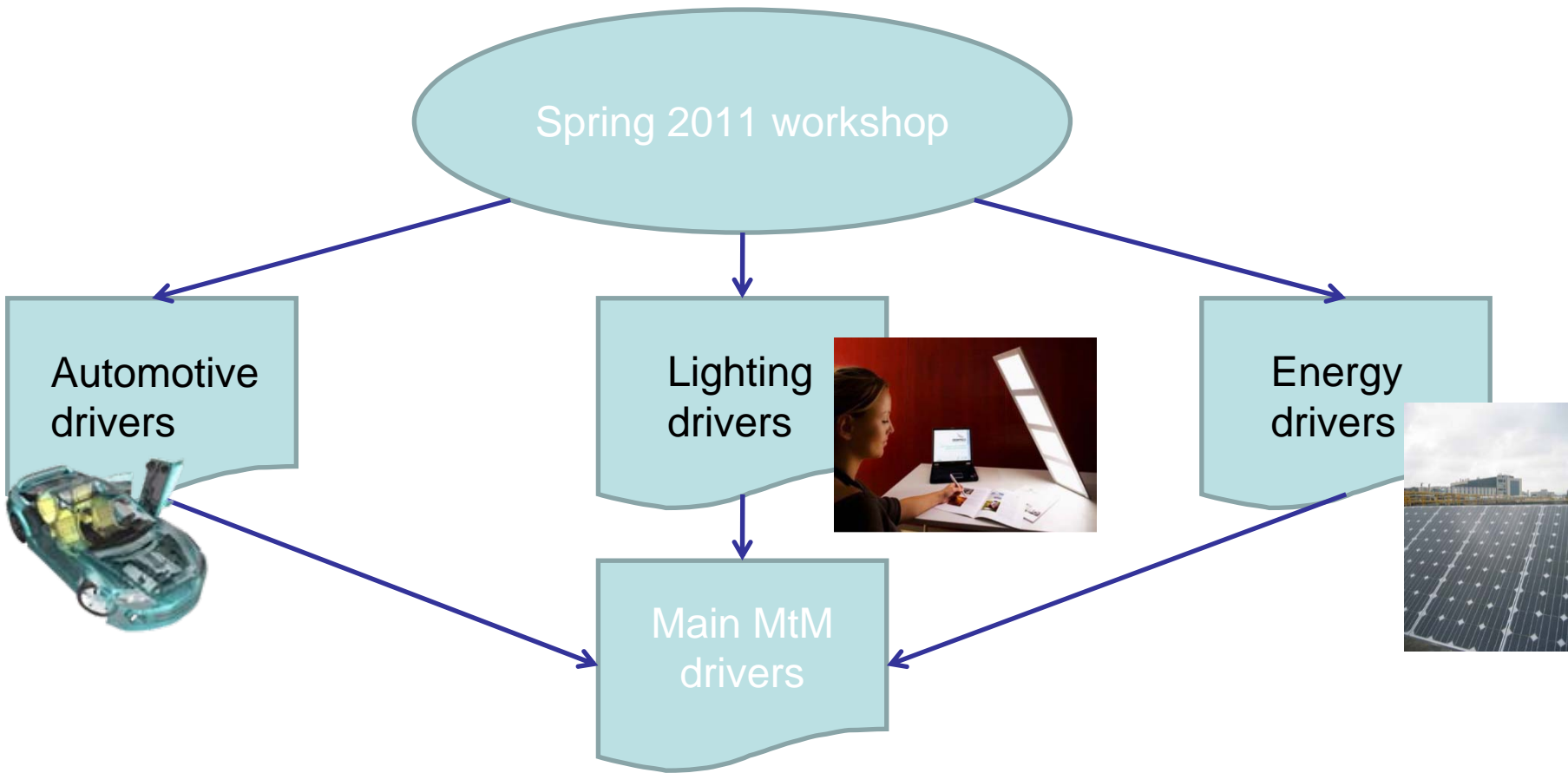
# Why a More than Moore roadmap ?

- ITRS has demonstrated value of roadmapping for CMOS
  - Identify pre-competitive research domains, enabling cooperation between industries, institutes and universities.
    - Sharing of R&D efforts
    - Reduction of development costs and time
  - Synchronization of the E&M community with the Manufacturing community
  - Increase resource efficiency through focus
  - Promote market growth and job creation
- More than Moore roadmapping offers a similar but more challenging opportunity
  - Need to propose a roadmapping methodology
    - White paper



# Process







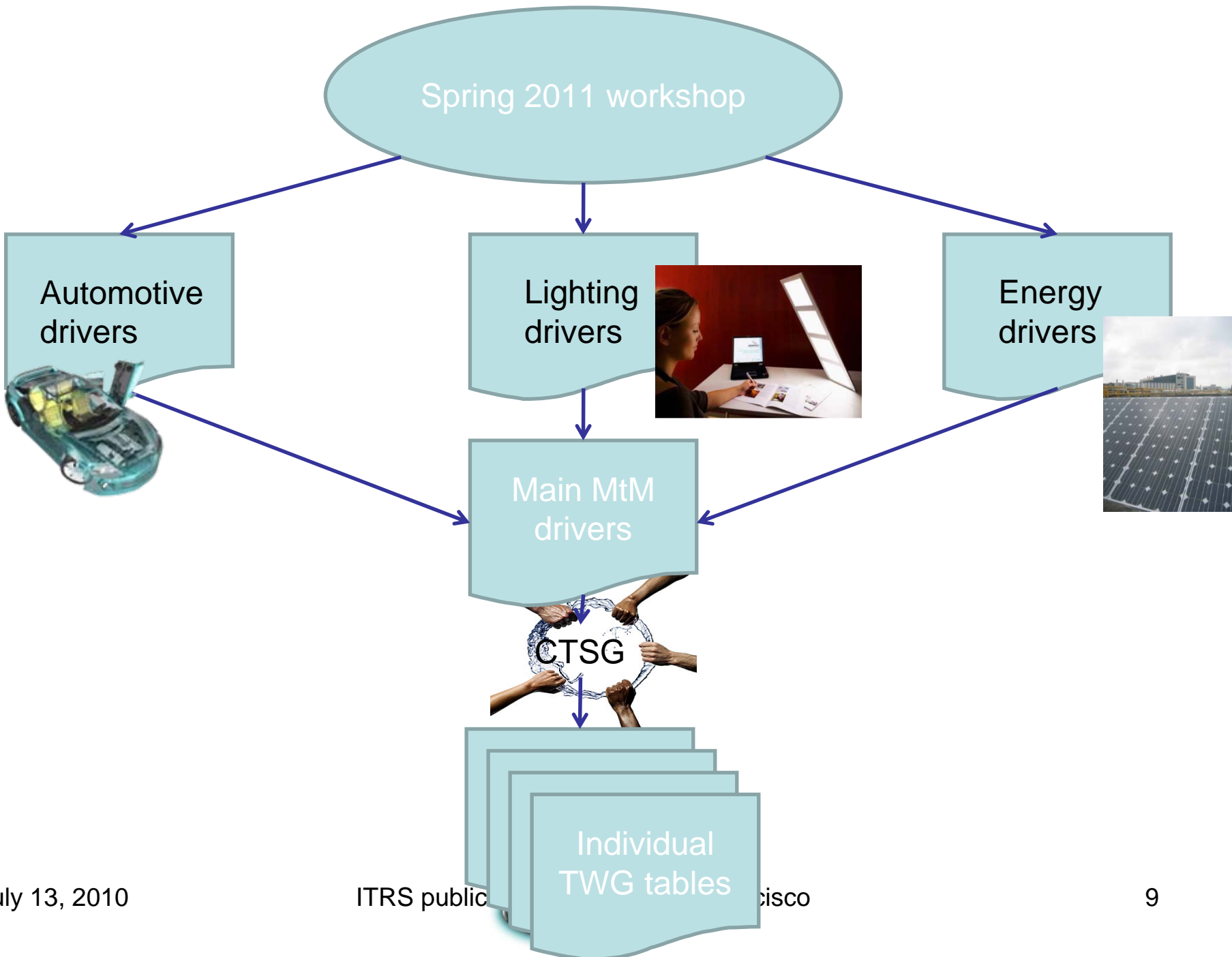
# Main MtM drivers (from workshop)

	Drivers	Automotive	Lighting	Energy
Functionalities	Smart-card like security	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	Reliability	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Smart grid connection	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Energy mgt	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Generic technologies / devices	Energy storage devices	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	mmW comm.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	Heat mgt	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Sensors & actuators	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Energy generation devices			<input checked="" type="checkbox"/>
	ULP components			<input checked="" type="checkbox"/>



# MtM roadmapping next steps

- Cross TWG Study Group officially launched yesterday
  - A&P, MEMS, Design & System drivers, RF/AMS
- 2nd MtM workshop during 2012 Spring meeting
  - April 25th, in the Netherlands
  - Each group of CTSG presents status of tables derived from the main drivers
- Quarterly conf calls in-between
  - First one to be held October 10th, 5pm CET, 8am PST
    - Check on progress
    - Add/withdraw drivers
    - Extend CTSG membership





# Questions ? Feedback ?

