NXP Semiconductors

Smart Grid, Smart Mobility

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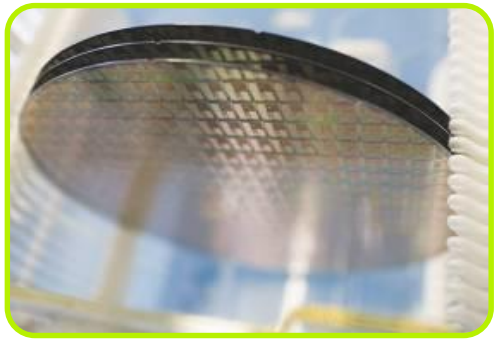
NXP Semiconductors

- **Established in 2006** (formerly a division of **Royal Philips**)
- **Nasdaq listed (NXPI)**
- **Net sales**: >$4.8 billion in 2013
- **Employee base**:
  - ~ 25,000 employees in more than 25 countries
  - R&D in Europe, Asia and US
  - Manufacturing in Europe and Asia
- **Addressing new innovative and growing markets**:



Energy	Health	Mobility	Security

Secure Connections for a Smarter World

Connected Car

Cyber Security

Portable & Wearable

Internet of Things

The electronics industry is being driven by **four mega trends** that are shaping our society:

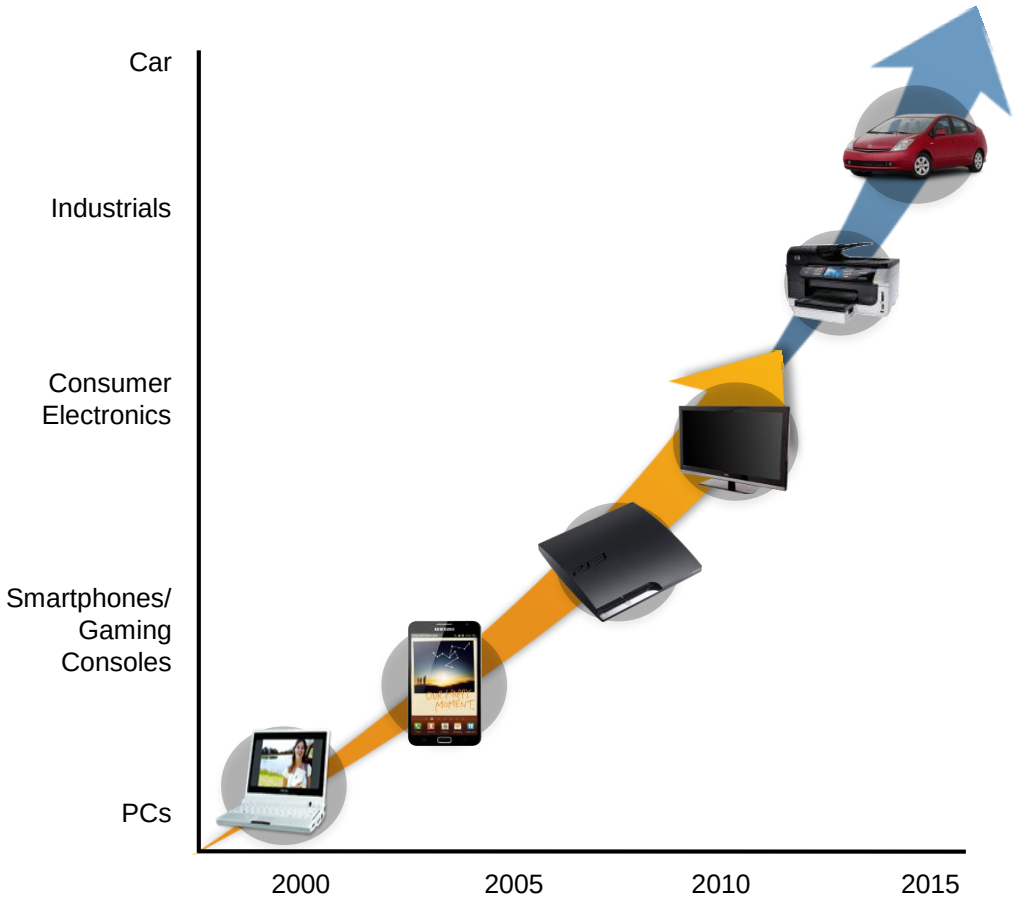
Energy Efficiency, Connected Devices, Security and Health

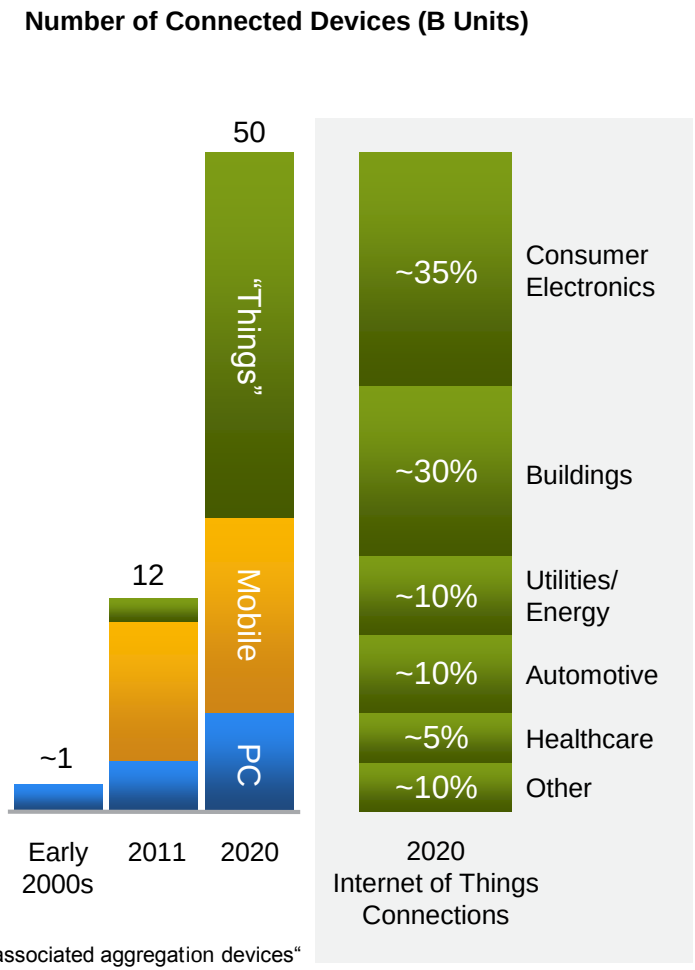
Addressed by NXP solutions …

… enabled by RF, Analog, Power Management, Interface, Security and Digital Processing innovations

… allowing differentiation through features, cost of ownership and time-to-market

The internet of things – the next big wave





Source: WSTS (extrapolated after 2011), Cisco, Machina Research / GSMA
Note: connected devices = "Connections to remote sensing, monitoring and actuating devices, together with associated aggregation devices"

Secure Connections for a Smarter World

SMART GRIDS

- End-to-end smart grid security solutions
- Contactless energy pre-payment systems
- Zigbee Smart Energy home area networking

SMART BUILDINGS

- Wireless smart lighting systems
- Low power wireless networking for climate, energy, security systems
- Wired intelligent lighting and building control
- Ultra low power building multi-sensors
- Contactless building & room level access systems
- Network authentication and cyber security solutions

SHOPPING

- NFC based secure mobile transactions
- NFC assisted shopping & self-check-out
- RFID based store security & logistics

SMART HOMES

- Wireless smart lighting
- Energy harvesting wireless switches
- Low power wireless networking
- Ultra low power building multi-sensors
- Smart appliance technologies
- NFC based pairing of home network devices
- Residential energy monitoring

eGOVERNMENT

- Secure e-government documents
- Wireless intelligent street lighting

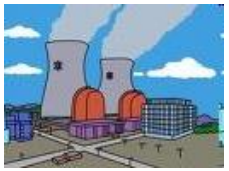
TRANSPORTATION

- Intelligent Traffic Systems
- Contactless public transport ticketing
- Intelligent road tolling systems
- Wireless car safety & telematics systems

Smart Grid Applications

Hybrid & Electric Vehicles	Efficient charging, Roaming, Vehicle-to-Grid
Distributed Energy Generation	Intermittent alternative energy sources, 2-way use of grid, distributed energy storage, micro-grids
Grid Optimization	Eg Dynamic transformer voltage management
Demand Response	Active load management, Dynamic pricing
AMI	Remote reading, remote (dis)connect, tampering & theft protection, pre-payment

WAN



NAN

HAN

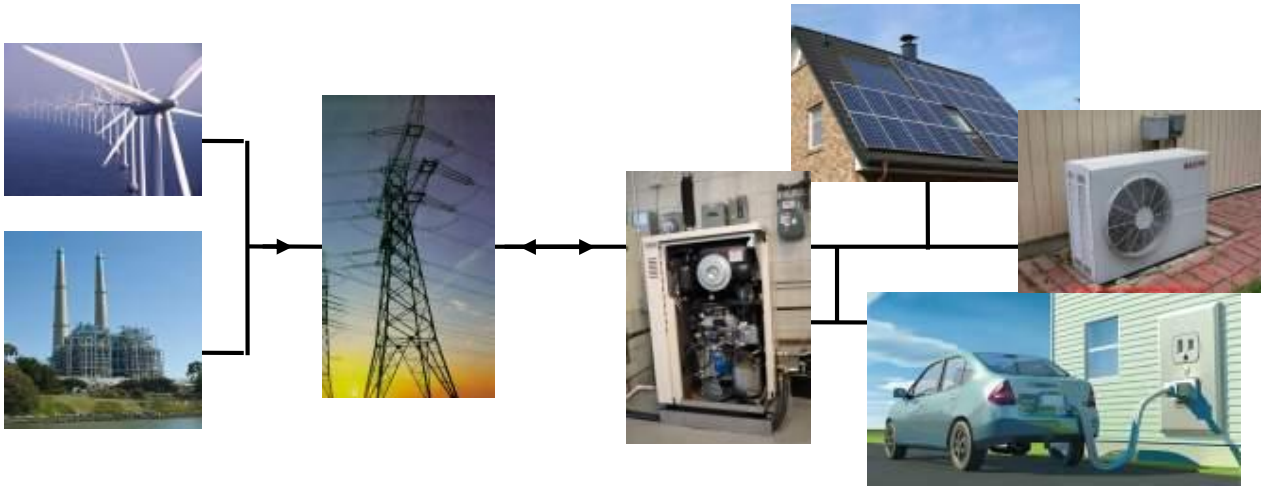
Authentication & Security

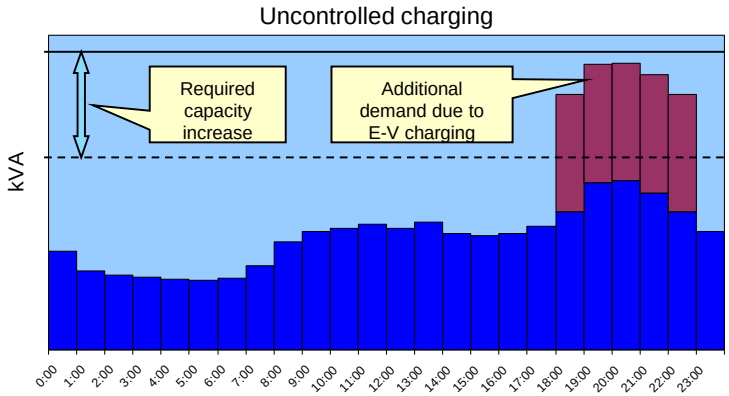
WAN = Wide Area Network; NAN = Neighborhood Network; HAN = Home Area Network

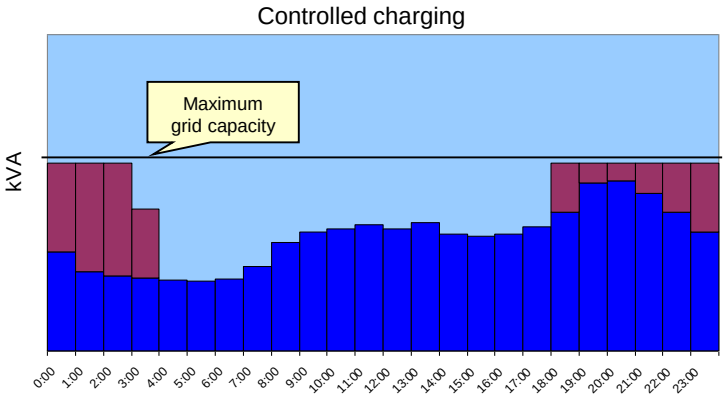
Load balancing

Driven by

- Intermittent sources: solar, wind
- E-vehicle charging
- Overall demand outgrowing capacity



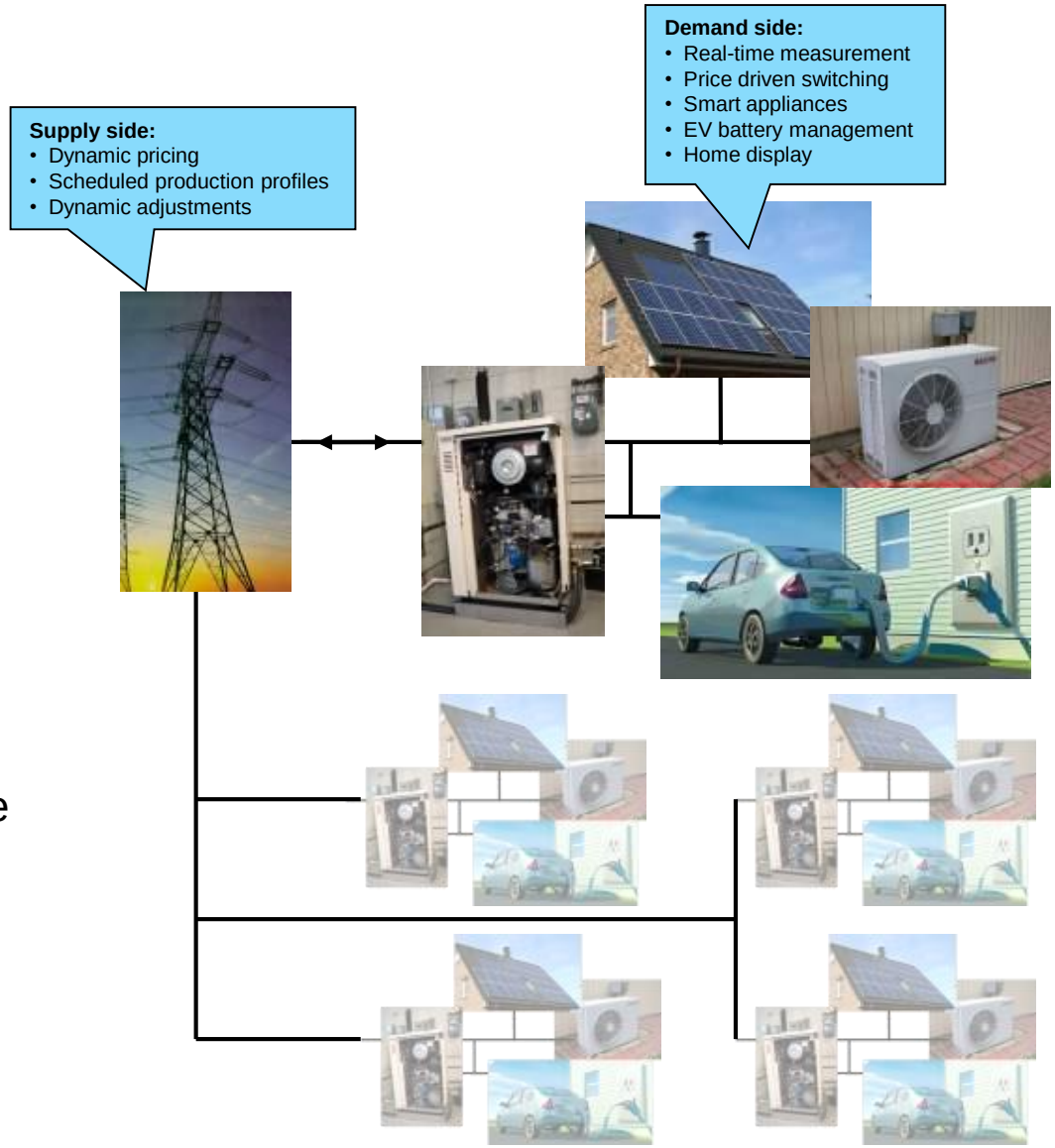




Power market

Homes and buildings negotiate with the grid

- Alternative approaches:
  - 24h scheduling based on accurate prediction at house and district level
  - Dynamic price based supply-demand equilibrium
  - …
- All ask for
  - Fine granular sub-metering
  - (remote) switchable smart appliances
  - Negotiation protocol and engine with grid
  - Secure elements for communication and transaction (a.o. ensuring privacy)



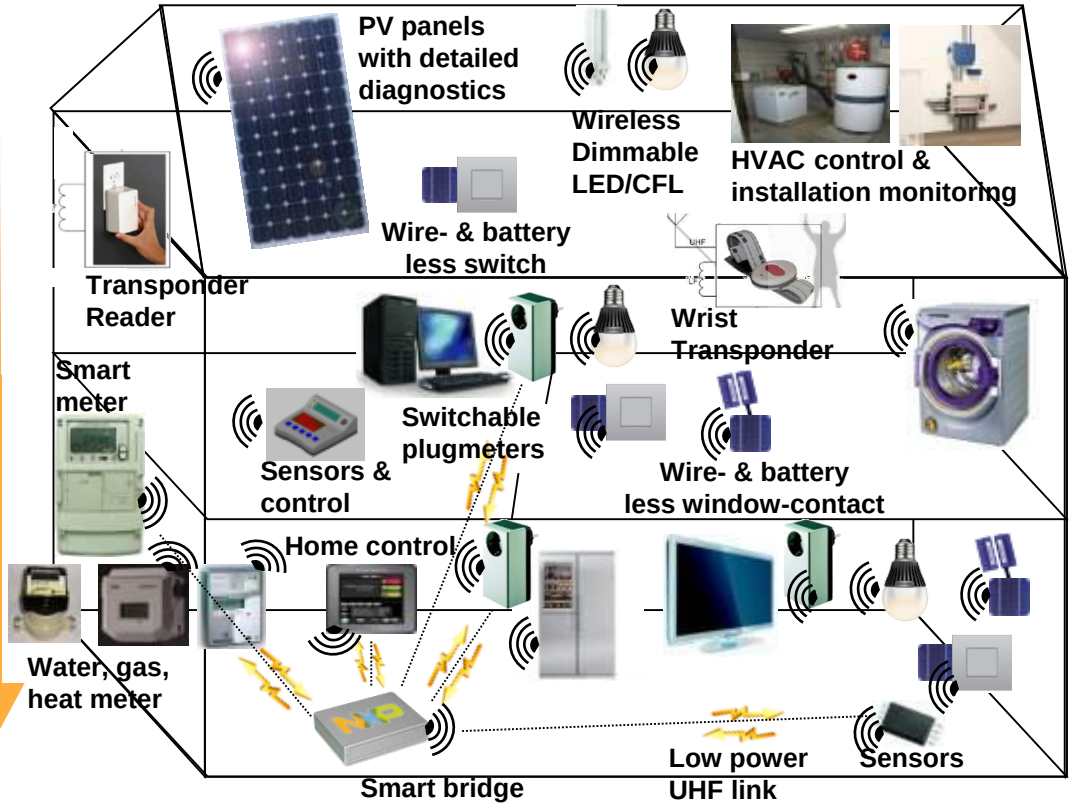
From Smart Grid to Smart Building/Smart Home

- Energy-usage feedback
- Distributed energy generation
- Load Balancing
- Smart diagnostics and maintenance
- Lighting Control
- Climate Control
- Independent Living

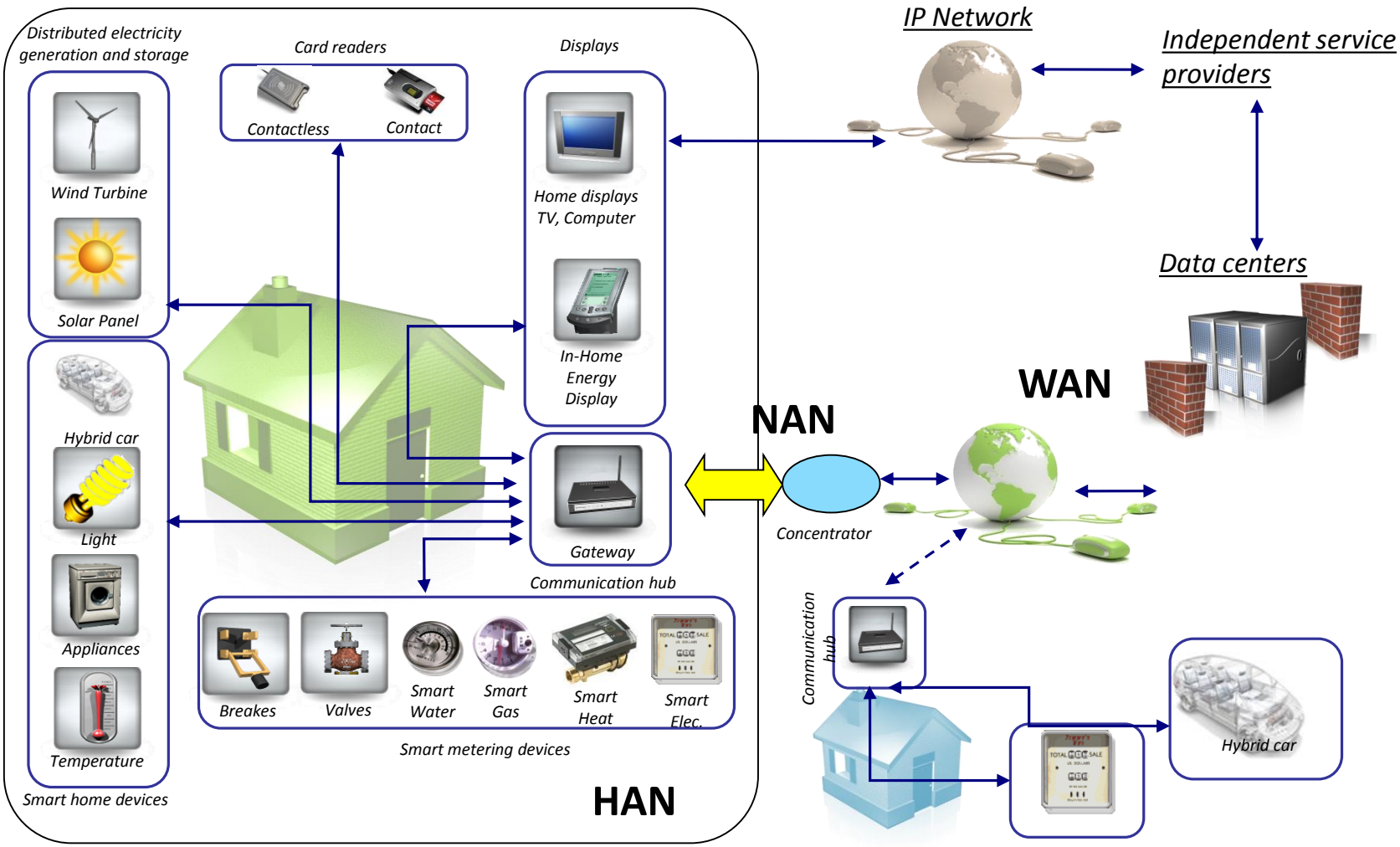
Smart Grid

Energy efficiency

Comfort



Smart Grid / Smart Home overview

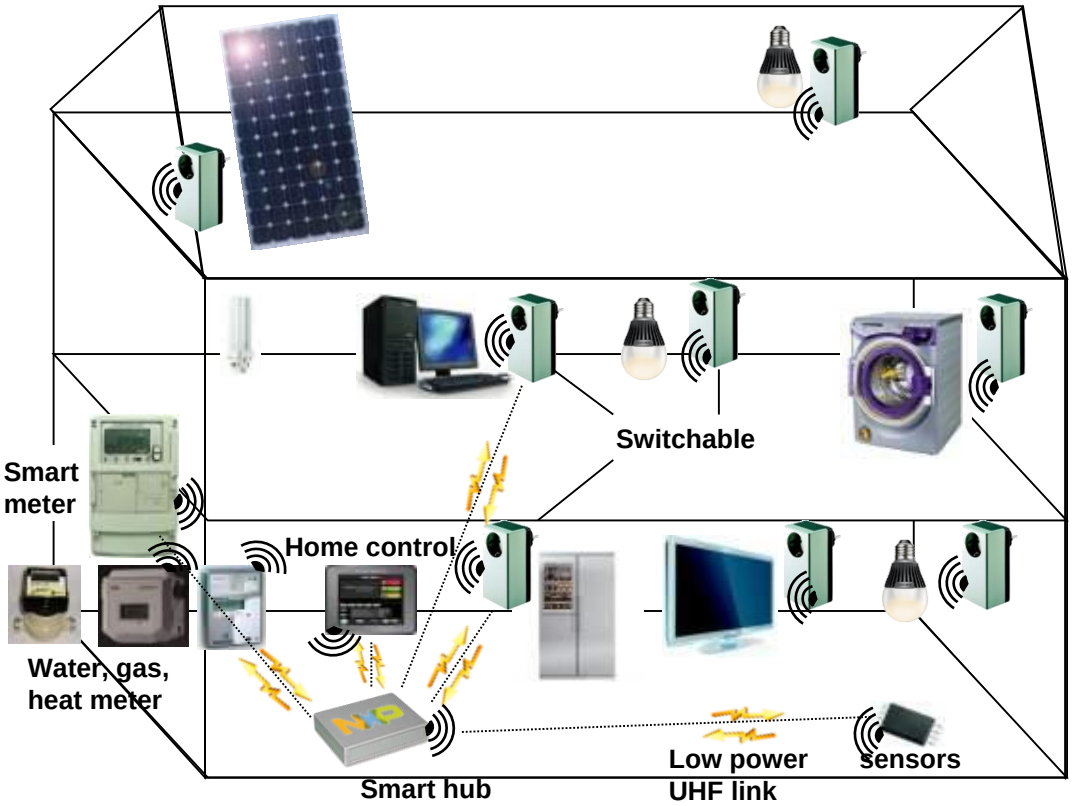


The need for submetering
non-billing metering

- Direct feedback reduces energy use by 10-15%
- Load balancing in smart grid: remote switching
- State-of health monitoring
- Power management in ICT industry, e.g. server farms

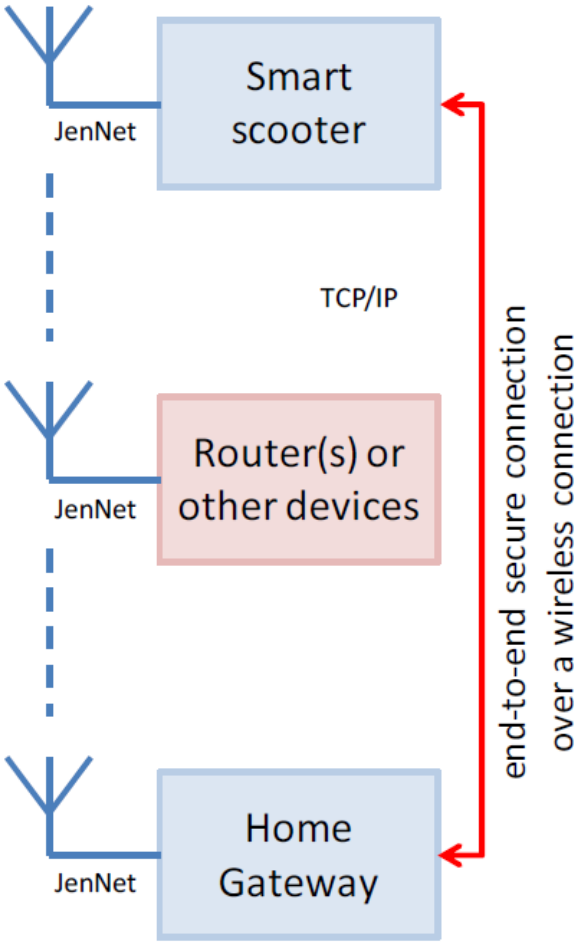
☞ Measuring/switching at low power: 20 nodes @ 1W/node = 200kWh/yr
→ need factor 5-10 better

"no control without measurement"



Need for end-to-end security

- Protect from
  - Data theft
  - Credit theft
  - Privacy infringement
  - Denial of Service (DDoS)
  - ...
- Any connection is potential attack entry into network



Summary and conclusions

- Advanced semiconductor technology essential for convenient and economic “smart” into the Smart Grid
- Basic template and architecture for embedded smartness in any “smart system”, e.g.
  - Smart Grid
  - Smart Buildings
  - Smart eMobility
- Advanced Semiconductor technology:
  - (Ultra) low power
  - Miniaturization
  - Function integration
  - Cost and complexity reduction
- Secure connectivity is an essential element

Smart eMobility: VIBe

VIBe STUURGROEP

AutomotiveNL · TU/e · BOM · Driessen Autogroep · NXP · SGC

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Smart eMobility: VIBe

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