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Transforming Smart Grid Devices into Open Application Platforms

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Products vs. Platforms

Product

- Examples: appliances, automobiles, GPS
- Thought-of as a complete package: software, hardware, all in one
- All from one vendor
- Lifetime needs known at the time of purchase
- Not upgradeable, or only by the original vendor

Platform

- Examples: personal computers, smart phones
- Thought-of as a supporting foundation for applications, a starting point
- Applications can come from many sources
- New needs are determined throughout the service life
- Owner/user upgradeable

Open Apps a Natural Evolution

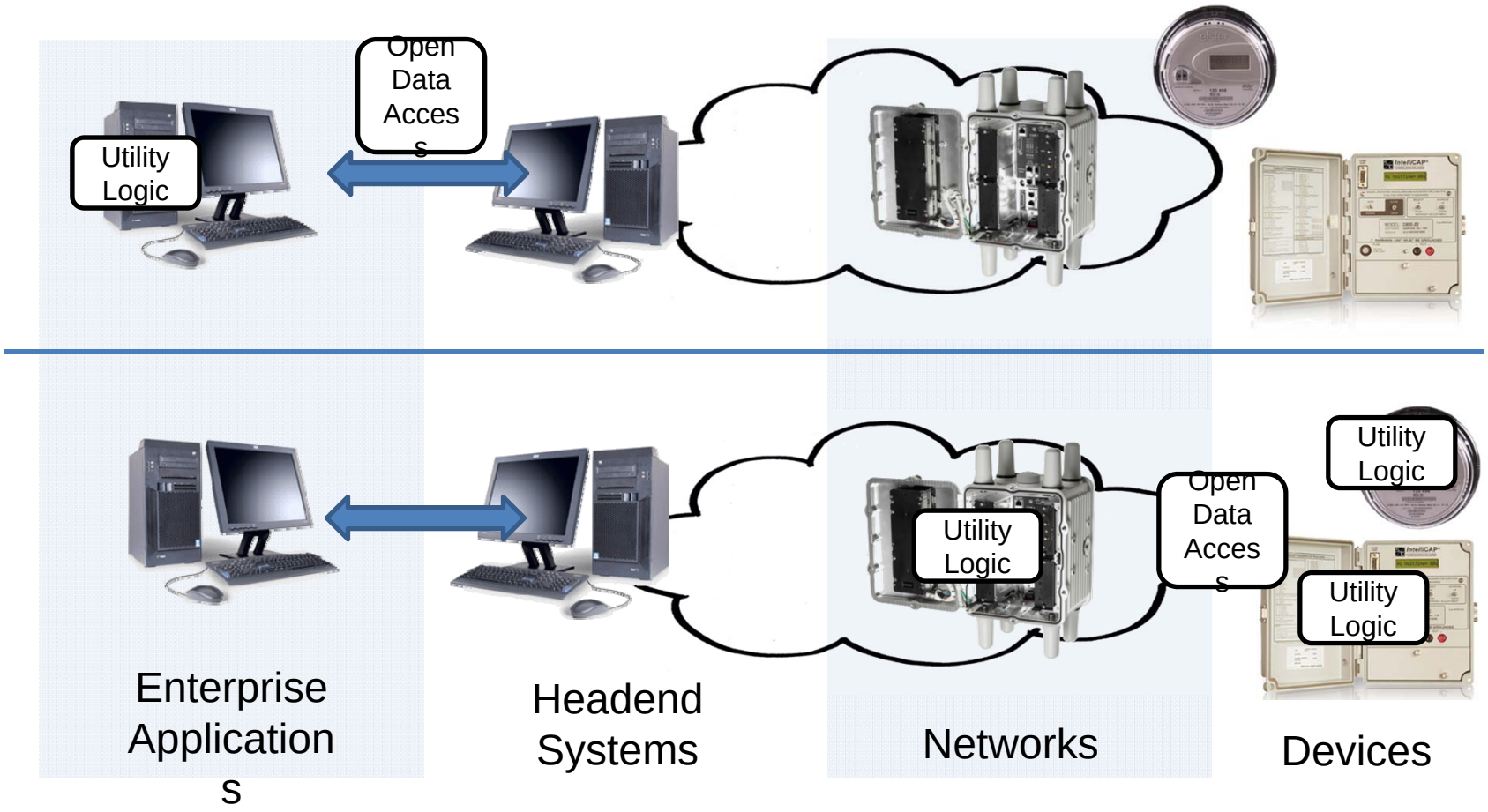
Television Example

Analog	Digital	Platform
No one can make changes	Manufacturer can make changes	User can make changes

Why Make Smart Grid Devices Platforms?

- Advancements in microprocessor and memory technology have made it practical
- Advancements in connectedness and 2-way communication technology have made it achievable
- Need for cohesive & consistent behavior across mixed devices and systems
- Upgrading functionality over the service life (utility equipment is long-life)
- Enabling new system-level functionality
- Fostering innovation

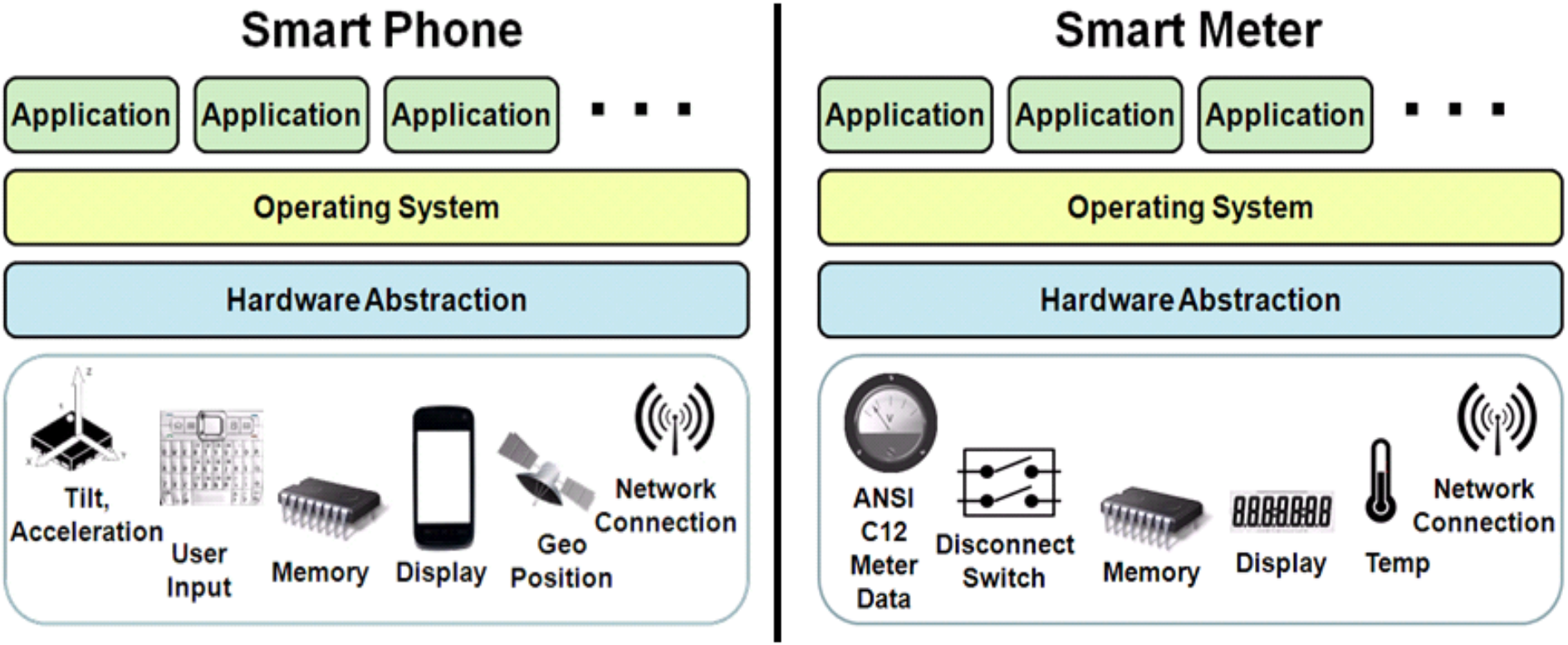
Enabling New System Functionality



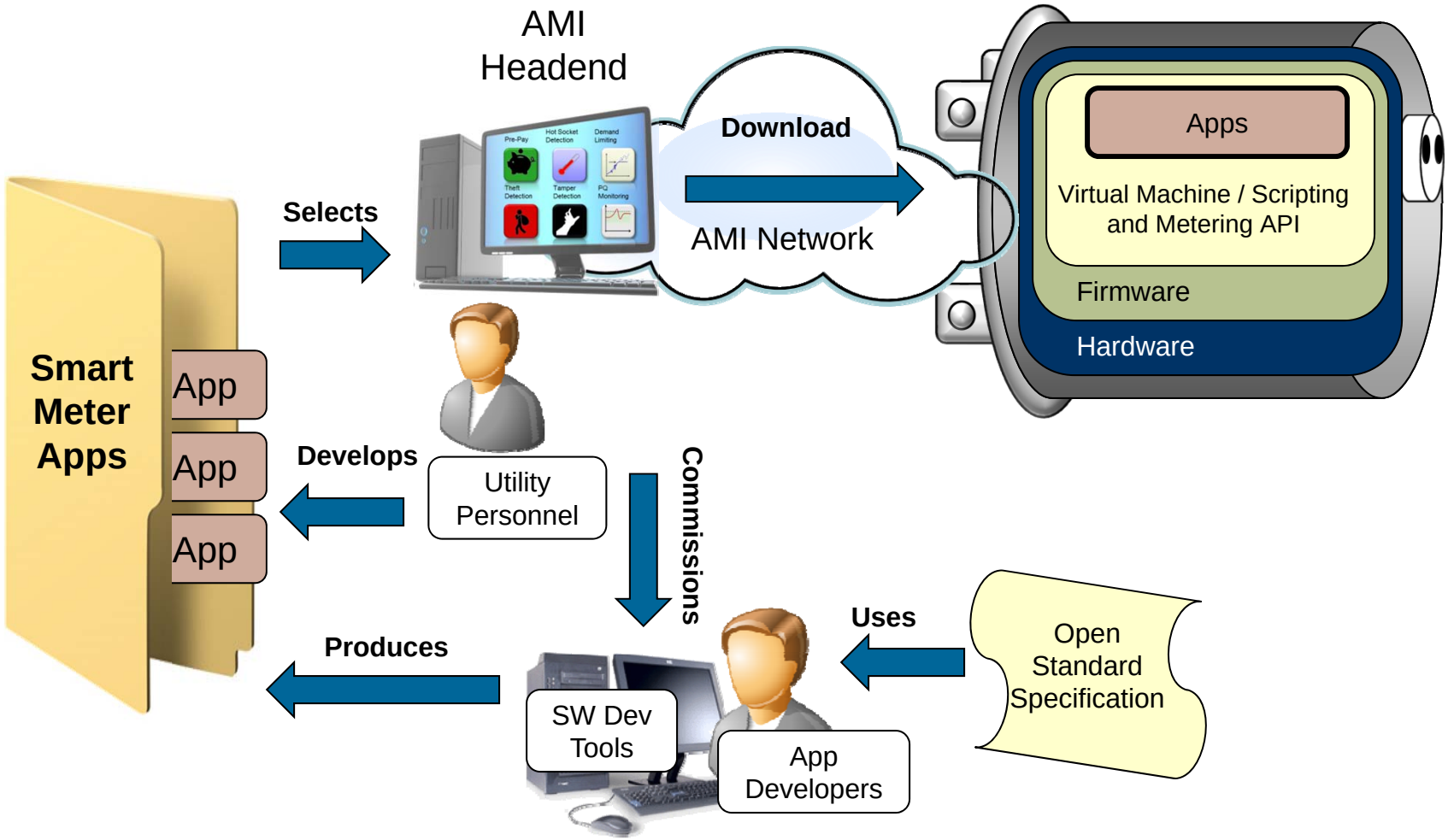
Two Principles:

- Open data access out to the system edge
- Ability to plant “logic” throughout

Smart Meter / Smart Phone Analogy



Open App Platform Ecosystem



Smart Meter Open Applications Project

- Meeting weekly to develop the open platform specification for smart meters
- Other utilities and meter/AMI vendors encouraged to join the discussion
- Working towards a demonstration

Smart Meter Open Applications

Example Use Cases

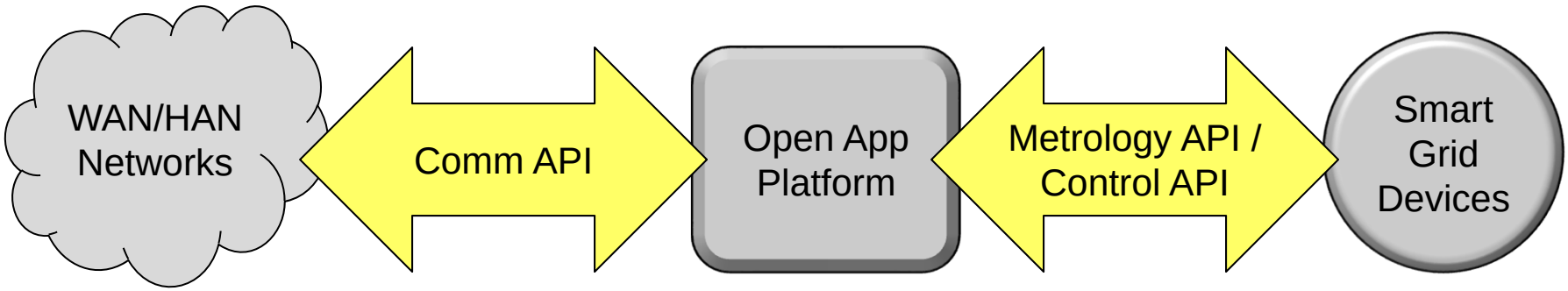
Use Case	Rationale for Including
Pushed Energy Consumption Reading for Billing Purposes	Universal, baseline meter application
Power Quality Monitoring	Selectively deployed
Outage Notification	Unifying behaviors across devices
Demand Limiting Application	International use case, uncommon
Over-Temperature Detection Application	Recently added application
Theft Detection at the Distribution Transformer Level	Multi-device, system-level application
Supervision of Motor Response to Voltage Sags	Innovation, New logic, a future addition.

Three Core API Sets

- APIs are standard high-level interfaces for apps
- Key component of the open platform effort

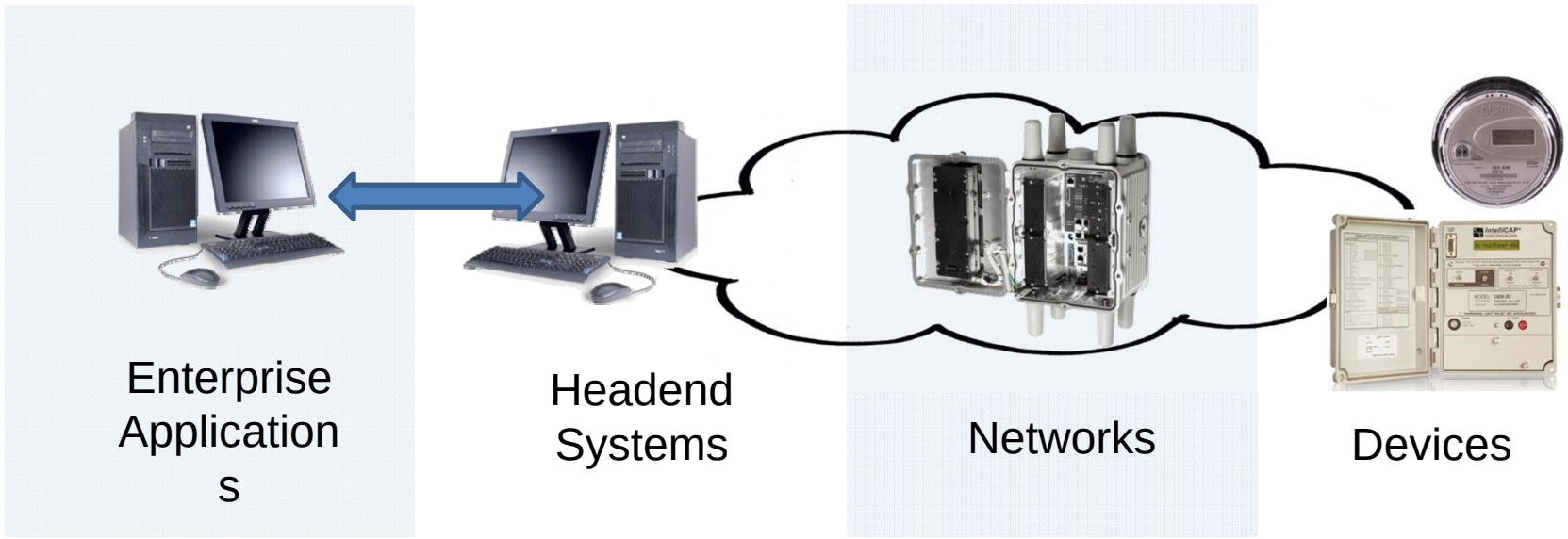
API Sets:

1. Metrology (i.e. reading data from meter: kWh, etc)
2. Communications
3. Control (power on/off, reset)



Common Information Model (CIM) for Metrology API

- Rationale:
  - Not reinventing the wheel
  - Utility enterprise systems speak this language
  - Minimizes unnecessary translation

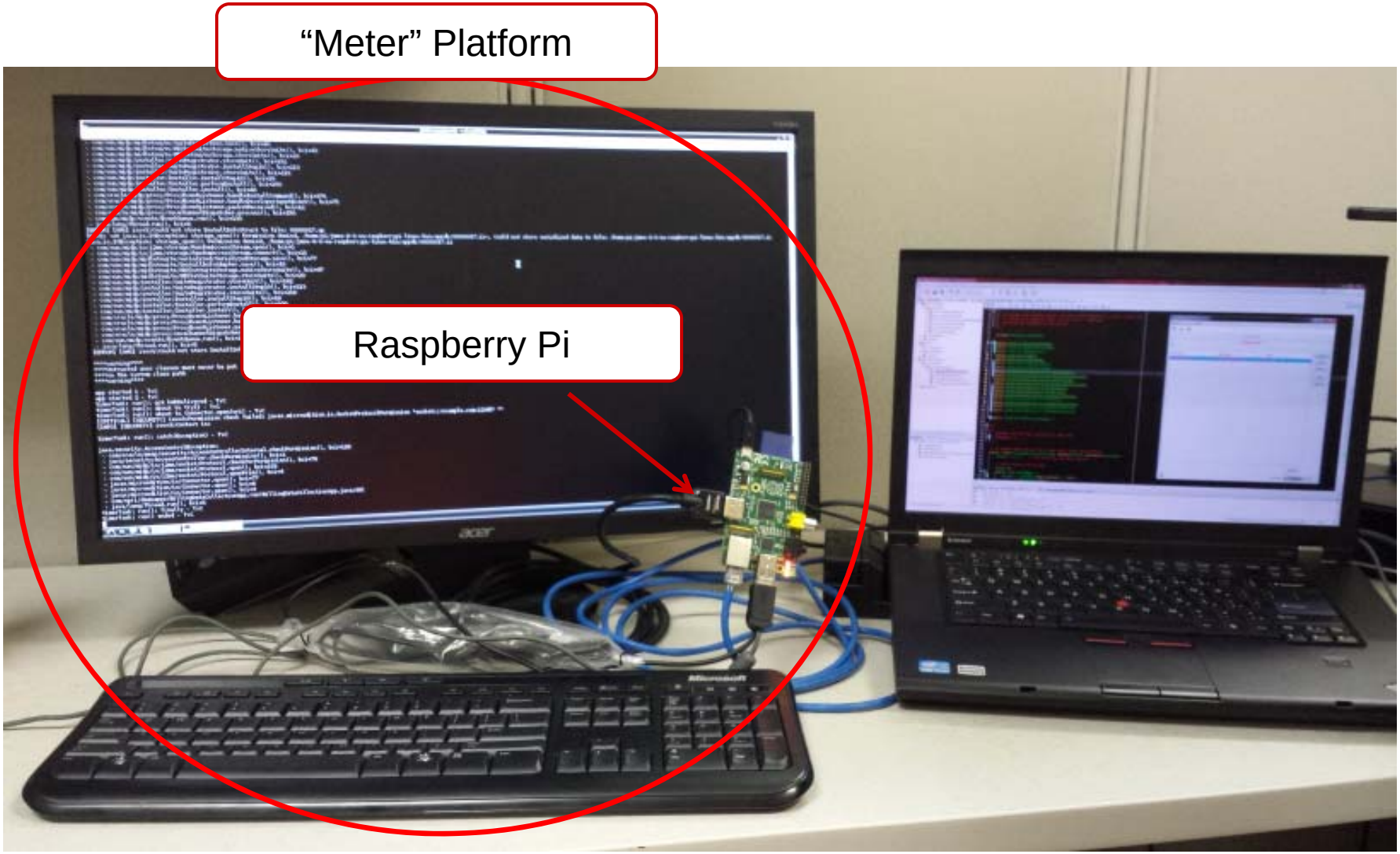


Demonstrations Using the Java Platform

Java selected for these demos because:

- Maturity/availability
- Large developer/third-party software ecosystems
- Existing libraries
  - Application models, threading models, file systems
  - Complex networking/communications/security libraries
- Open source implementations

Raspberry Pi as Development Platform



Example:
Comm Node as an Open App Platform

- Duke Energy Initiative
- Coalition of companies – devices, meters, controls, communications
- Demonstrated at DistribuTech 2014
- Phase 2 in process

Next Steps

- Field Demonstrations
  - multiple products
  - independently developed apps
- Standardization
- Certification and Compliance
  - for platforms
  - for apps
- Launch of work on other Smart Grid Devices
- RFPs based on standardization and certification

Discussion

Together…Shaping the Future of Electricity