# M2M

## Use Case Evolution

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# The world of 2012

– 7 Billion People

– Over 15 Billion Connected devices

M2M, the Biggest trend of our time.
RFID to Satellites, sensors everywhere, explosive growth .
In every Industry.

# M2M is becoming pervasive

Every Industry is beginning to exploit M2M, Each Industry is unique but there are significant commonalities

COMMUNICATIONS, MEDIA, ENTERTAINMENT

CONSUMER INDUSTRIES AND RETAIL

ENERGY


FINANCIAL SERVICES

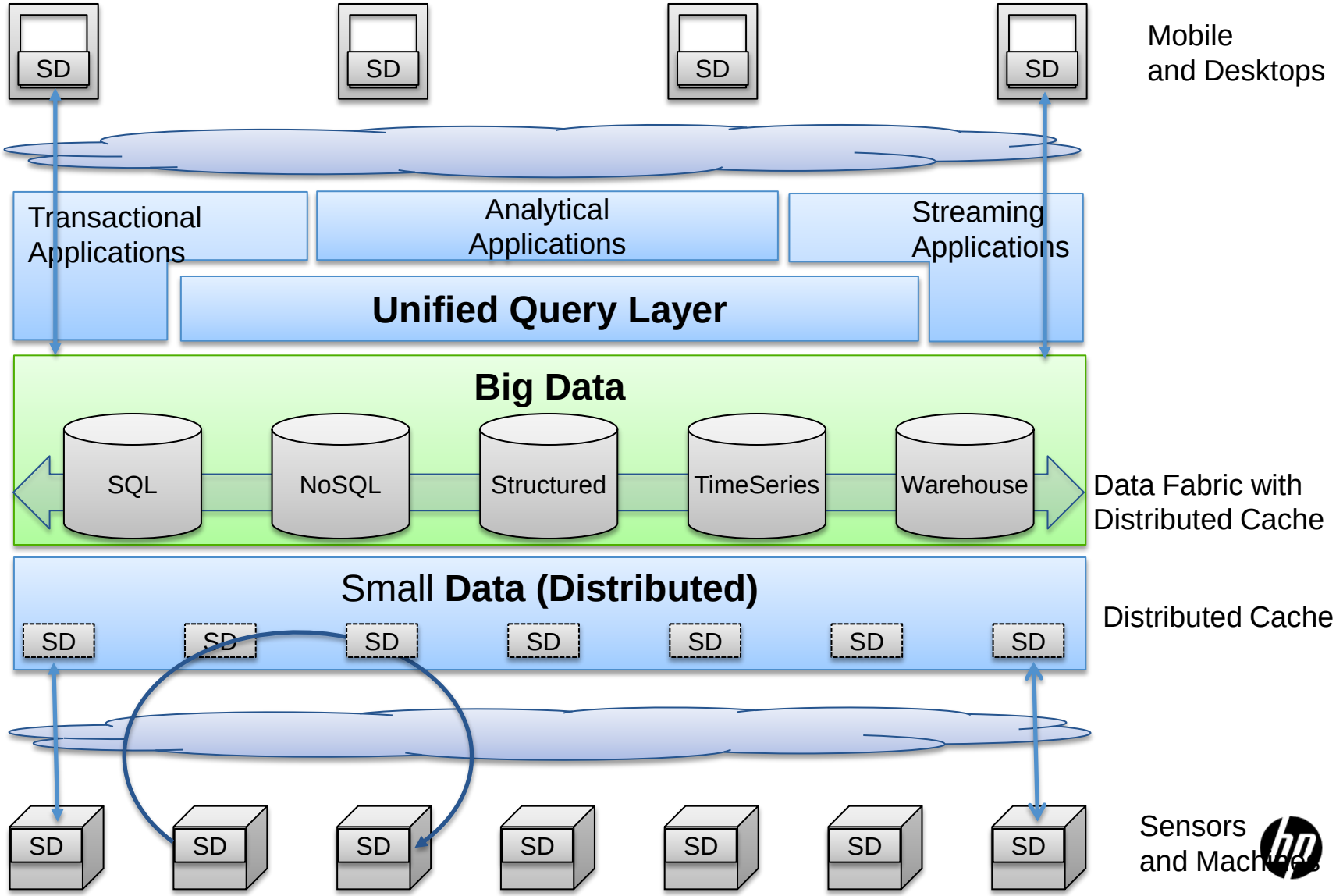
HEALTH and LIFE SCIENCES

MANUFACTURING

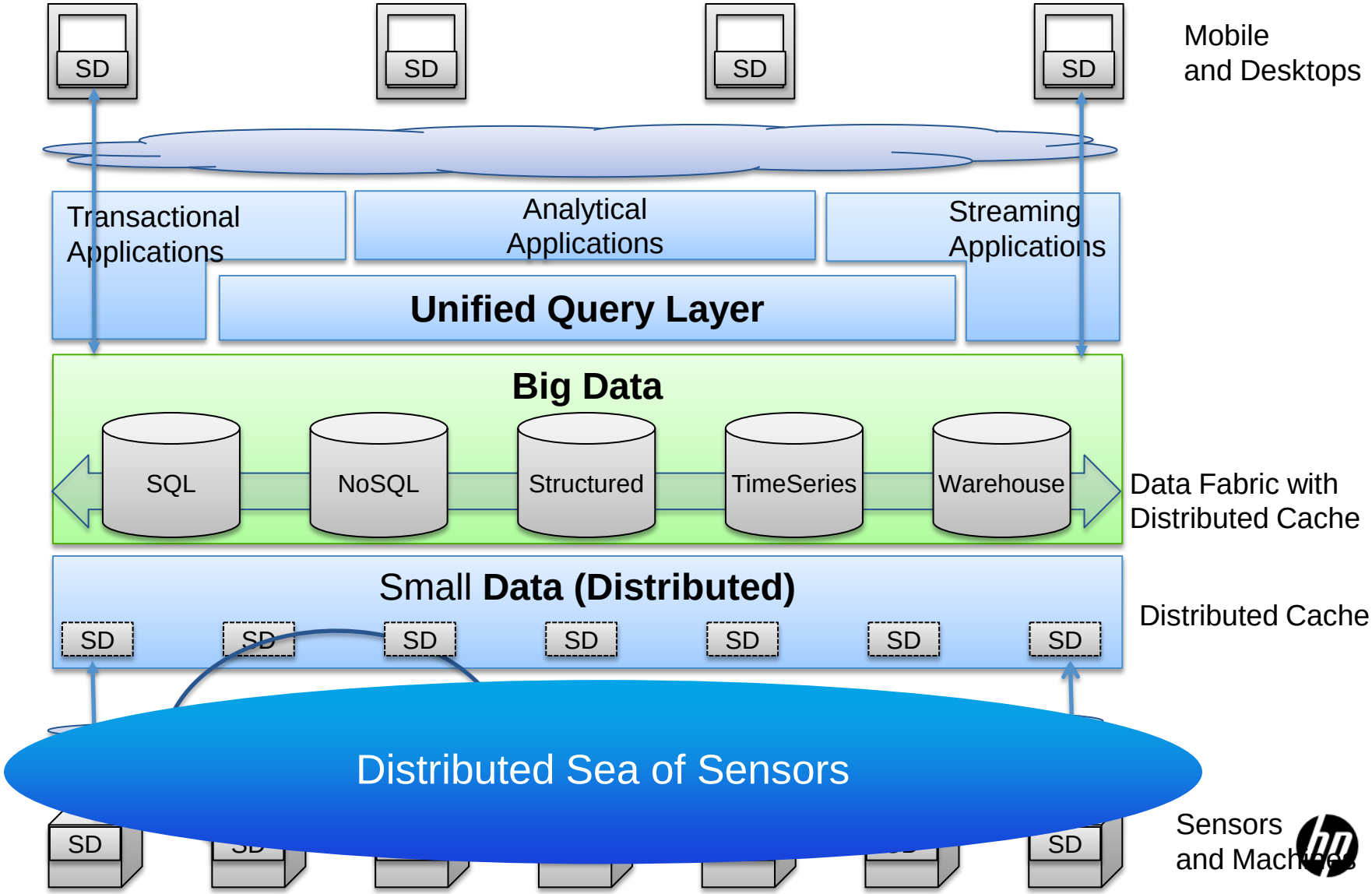
PUBLIC SECTOR

TRANSPORTATION

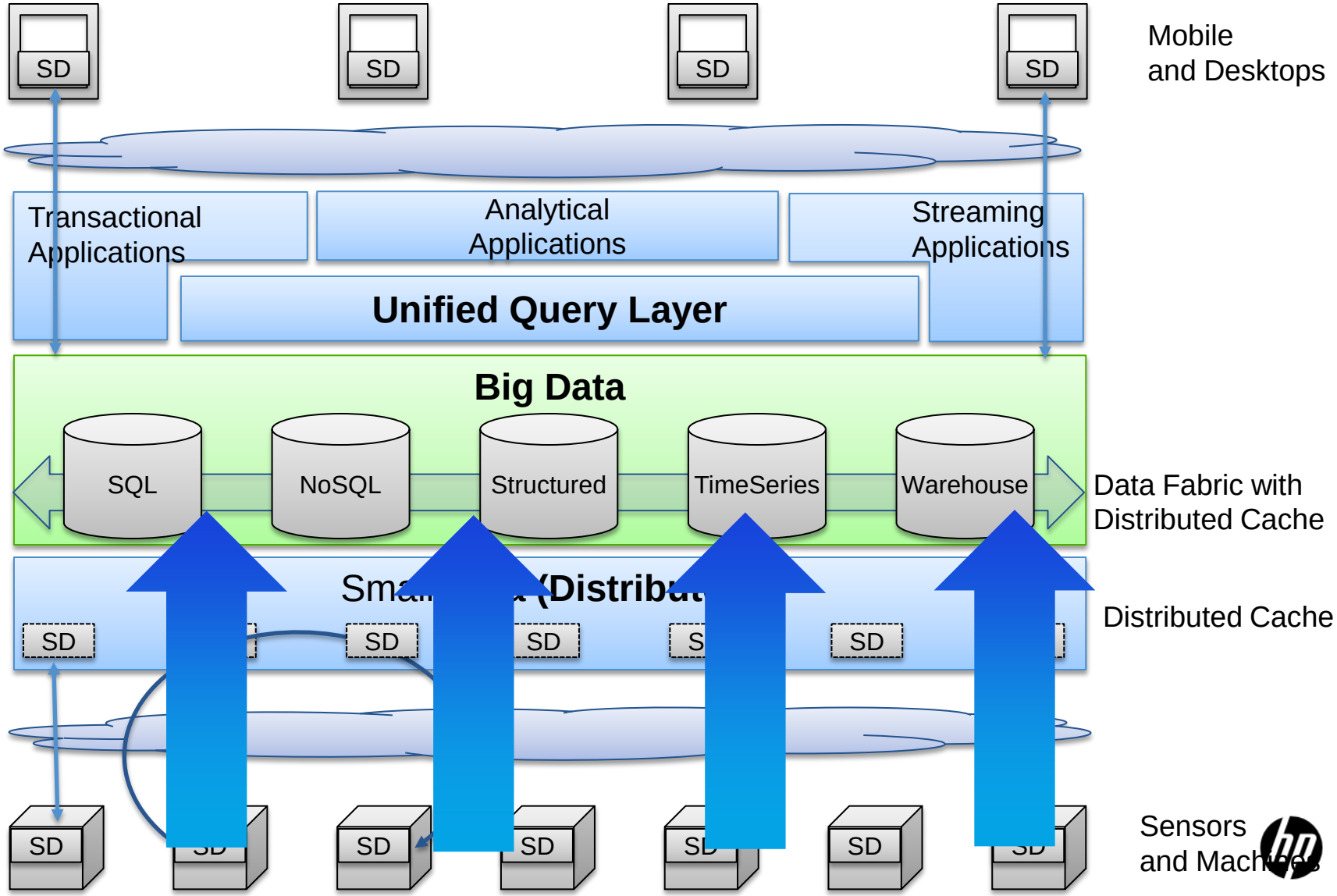
# M2M typical architecture



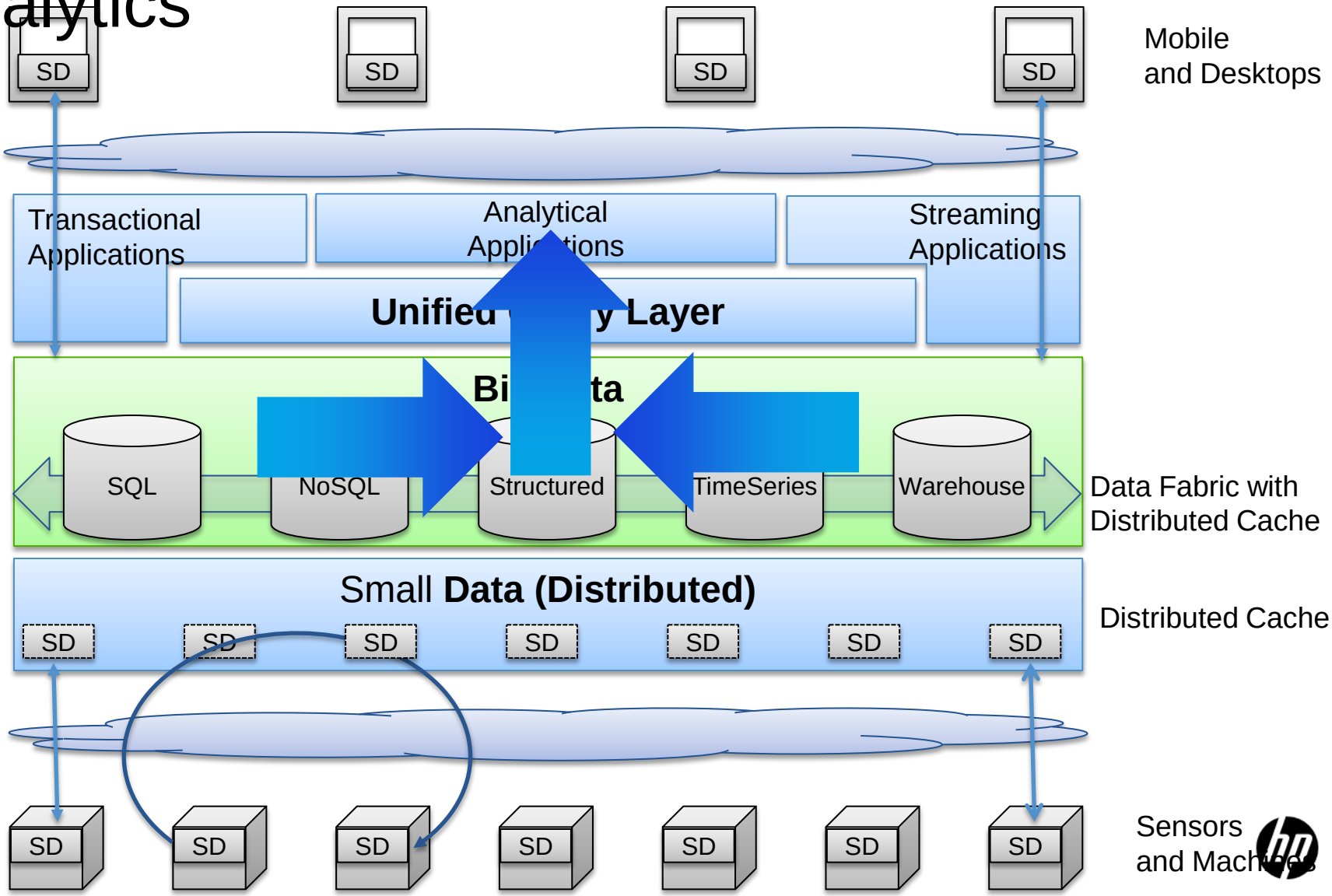
# M2M typical architecture



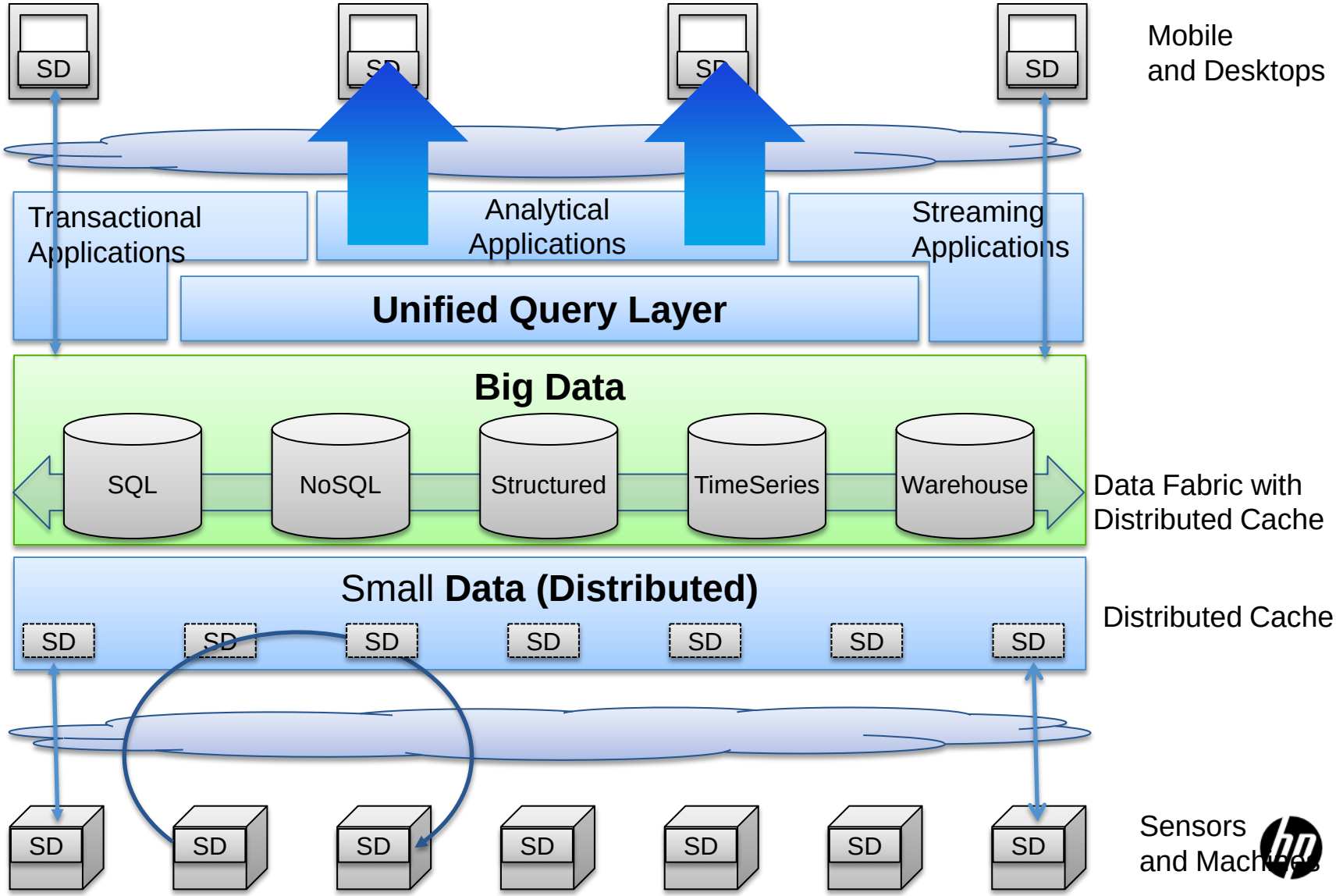
# Collect Real-Time time series data from sensors



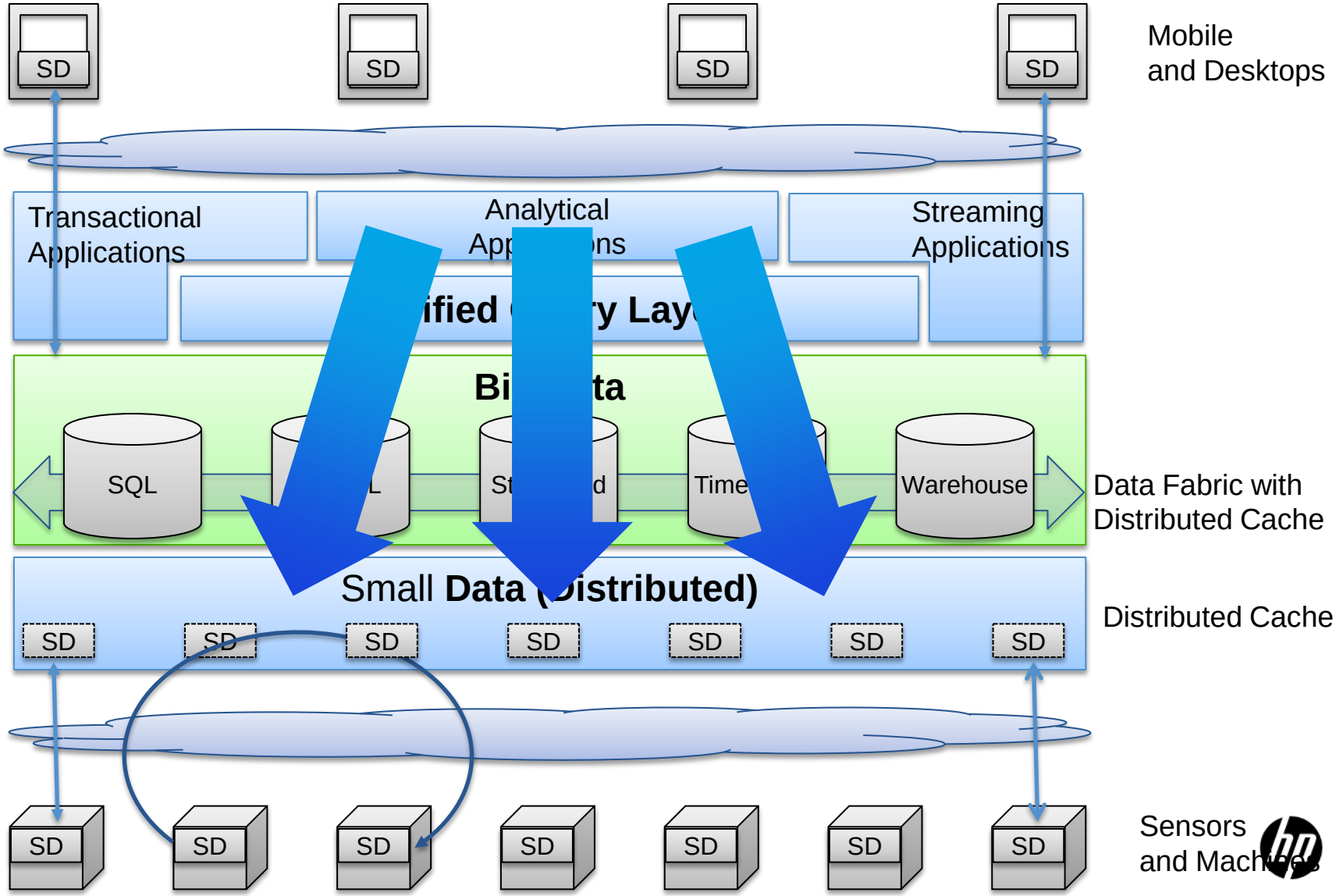
# Formulate Insight and Real-Time Policies, based on time-series history, using analytics



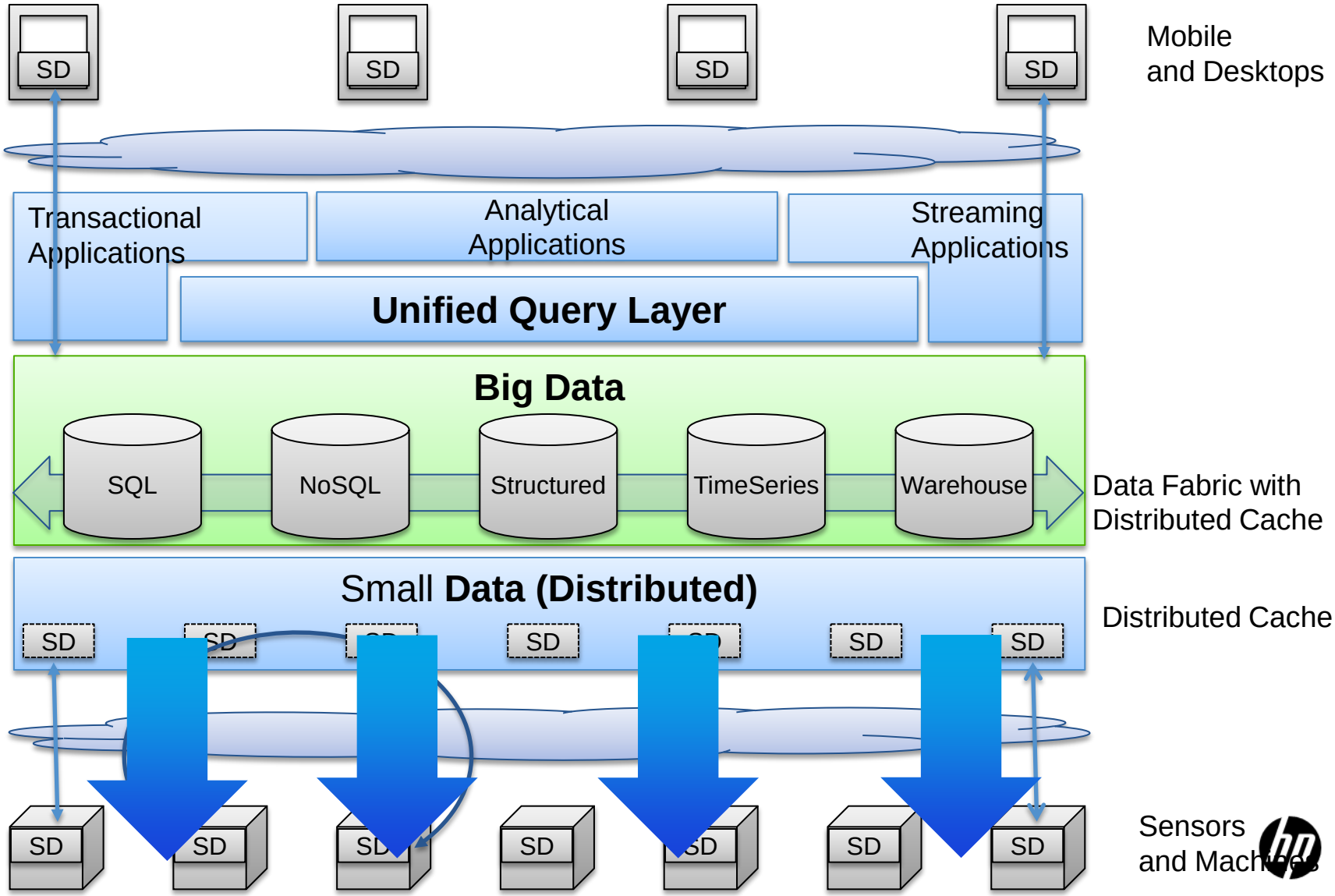
# Insight Consumption by People



# Distribute Real-Time Policies



# Enforce Distributed Real-Time Policies



# So why the interest now?

- The business opportunity is enormous – ($300 billion market in 2012)
  - Forecasted >15B Connected Devices by 2015; >50B by 2020!
- Analysts, academics, journalists, not to mention service providers are all talking about M2M.
- Subscriber saturation in the U.S. has occurred.  There are now more mobile subscriptions than U.S. residents.
- Machines and sensors represent the clearest way for mobile revenue and services to grow.
- Many telemetry applications do not use much bandwidth.
  - Attraction is similar to short message service: high margins, low bandwidth consumption.
- Industrial and other specialized M2M applications will be more churn resistant than traditional “man” vs. machine subscribers.

# What is M2M…

## It more than just a bunch of machines talking

- **M2M is defined as:**

  (M2M) or Machine-to-Machine refers to technologies that allow both wireless and wired systems to communicate with other devices or data acquisition and response systems. M2M uses a device (such as a sensor or meter) to capture an event (such as temperature, inventory level, etc.), which is then relayed through a network (wireless, wired or hybrid) to an application server, that translates the captured event into meaningful information. The “Internet of things” is a general term used to describe M2M.

- **The core problem solving opportunities for CSP’s in M2M include:**
  - Connection of remote devices, locations and people
  - Smart Grid enablement
  - Connected Vehicle enablement
  - Service Platform
  - Application Developer ecosystem:
    - Home automation
    - Home control
    - Any type of sensing or control system

# …What is M2M

## It's a Smart Grid

- **Smart Grid is defined as:**

  Providing bidirectional communication of power quality, supply, and demand across the power grid to utilize electricity more dynamically resulting in increased energy efficiency and power grid reliability. This change is necessary to manage the increased variability caused by renewable resources, the increased peak demand created by energy intensive consumers such as electric vehicles, and to minimize the environmental impact of ever increasing aggregate demand for electrical power.

- **The core problem solving opportunities for CSP's in Smart Grid include:**
  - Grid Reliability, Repair, and Resilience
  - Information security, privacy & management
  - Communications reach, reliability, and capacity
  - Geographic distribution of customers
  - Power supply / demand management
  - Consumer / business awareness and control of energy usage at both the consolidated level (total power consumption to residence / business) as well as individual device level

# …what is M2M

## It's a Connected Vehicle

- **The Connected Vehicle is defined as:**

  An in-vehicle solution concept that is based on completely new services and business models. These new services are enabled by bi-directional network connectivity, innovative in-vehicle hardware and software systems, cloud computing, cloud storage, and value-added network assets such as content management, location services, presence, identity, security, and billing – resulting in intelligent vehicle solutions. The Connected Vehicle creates an entirely new mobile platform by bringing together leading automotive makers, network operators, component suppliers and content providers.

- **The core opportunities which can be addressed through ICT solutions Include:**
  - Application developer ecosystem
  - Content provider network
  - Service Platform
  - Vehicle-centric and travel-centric applications and services:
    - commercial services
    - operational and consumer oriented services

# …what is M2M

It’s a Sensing platform for the planet

- **Sensing is defined as:**

  A sensor is a device which receives and responds to a signal. A sensor's sensitivity indicates how much the sensor's output changes when the measured quantity changes. Sensors that measure very small changes must have very high sensitivities. Sensors also have an impact on what they measure; for instance, a room temperature thermometer inserted into a hot cup of liquid cools the liquid while the liquid heats the thermometer. Sensors need to be designed to have a small effect on what is measured; making the sensor smaller often improves this and may introduce other advantages. Technological progress allows more and more sensors to be manufactured on a microscopic scale as microsensors using MEMS technology.

- **The core opportunities which can be addressed through ICT solutions Include:**
  - Application developer ecosystem
  - Content provider network
  - Service Platform

# Timing of the M2M opportunity

Market Drivers

| Now | 1 – 5 Years | 5 Years & Beyond |
|---|---|---|
| • *Home Control & Home Automation*<br>• *Fleet Management*<br>• *Industry-specific verticals*<br>  • *Digital signage*<br>  • *Connected vending*<br>  • *Equipment monitoring* | • *Telemedicine*<br>• *Electric Vehicle Adoption*<br>• *Location-Enhanced Services*<br>• *In-Vehicle Connectivity*<br>• *Exponential growth of concurrent device connections* | • *Increasingly portable, always-on devices*<br>• *Remote Device re-deployment*<br>• *City / Muni Automation* |

Market Opportunities

| | | |
|---|---|---|
| • Access & Transport network services<br>• Cross network connectivity<br>• M2M Service Platforms (remote management, self diagnostics, data collection, etc.) | • Software configurable gateways<br>• Dynamic class of service & QoS solutions<br>• Managed device security<br>• Data collection & aggregation services | • Device diagnostics and predictive maintenance vertical solutions |

# Timing of the smart grid opportunity

Market Drivers

| Now | 1 – 5 Years | 5 Years & Beyond |
|---|---|---|
| • *Renewable generation mandates*<br>• *Aging power plants*<br>• *Optimized energy usage and utilization*<br>• *Consumer awareness of consumption*<br>• *Industrial / Commercial DR* | • *Electric Vehicle charging*<br>• *Micro-generation (PV)*<br>• *Time of use pricing*<br>• *Residential DR* | • *Distributed generation*<br>• *Distributed storage*<br>• *Real-time demand based spinning reserve*<br>• *Inter-utility settlement / pre-paid energy* |

Market Opportunities

| | | |
|---|---|---|
| • Smart meter connectivity (AMI)<br>• Building Management Automation & Control<br>• Data collection & aggregation<br>• Industrial / Commercial demand response<br>• Residential Energy Usage | • Home Area Network enablement & support<br>• Residential demand response<br>• Feeder /sub-station automation<br>• Data analytics | • Micro-generation management<br>• Distributed energy storage management & control<br>• Energy as a service |

# Timing of the connected vehicle opportunity

Market Drivers

| Now | 1 – 5 Years | 5 Years & Beyond |
|---|---|---|
| • *Content Portability / In-vehicle entertainment*<br>• *Route & Dispatch Optimization* | • *Electric Vehicle charging*<br>• *Advanced OBD & vehicle maintenance*<br>• *Emergency Assistance*<br>• *Route Management* | • *Vehicle control and navigation*<br>• *Driver / Operator monitoring*<br>• *Location-enhanced advertising* |

Market Opportunities

| | | |
|---|---|---|
| • Network access and backhaul<br>• Device provisioning & billing<br>• Application & service exposure | • Device capability repositories<br>• Configuration management platform<br>• Cross-network connectivity<br>• Application hosting and QoS Management | • Remote network to network provisioning |

# Timing of the sensing opportunity

Market Drivers

| Now | 1 – 5 Years | 5 Years & Beyond |
|---|---|---|
| • *Seismic Understanding*<br>• *Structural integrity*<br>• *Human Wellness* | • *Correlated sensing*<br>• *Taste*<br>• *Smell* | • *Predictive Sensing*<br>• *Advanced analytics*<br>• *Machine reasoning* |

Market Opportunities

| | | |
|---|---|---|
| • Exploration<br>• Infrastructure Monitoring<br>• Patient care | • Hazardous chemical alerting<br>• Poison detection<br>• Hazardous gas alerting<br>• Correlated events | • Earthquake prediction<br>• Weather prediction<br>• Automated machine response |

# Similarities between the opportunities…

- Management
  - Device/Gateway
    - Device monitoring and diagnostics
  - Service
  - Subscription (applies to all areas of management)
    - Identity/information model management
  - Group
  - SLA
  - Operation & Maintenance
    - Fault monitoring and prevention
  - Application management at the device level
    - Lifecycle management

# … Similarities between the opportunities

- Communication/network layer
  - QoS (Smart Grid applications for latencies of approximately 10's of milliseconds)
  - NNI
  - Should consider Access vs. Backhaul
  - Local area network (Gateway to Device Communication)
- Gateway (functionality in single or multiple devices)
  - Protocol translation
  - Local application
  - Routing

# Machine to Machine - opportunity

1. Connection of remote devices, locations and people
2. Smart Grid enablement
3. Connected Vehicle enablement
4. Service Platform
   - SIM provisioning & management
   - Data collection, aggregation, mediation & analysis
   - Gateways
   - Provisioning & activation
5. Application Developer ecosystem:
   - Home automation
   - Home control
   - Any type of sensing or control system