

IEEE SG for Security, Reliability, and Performance for Software
Defined and Virtualized Ecosystems

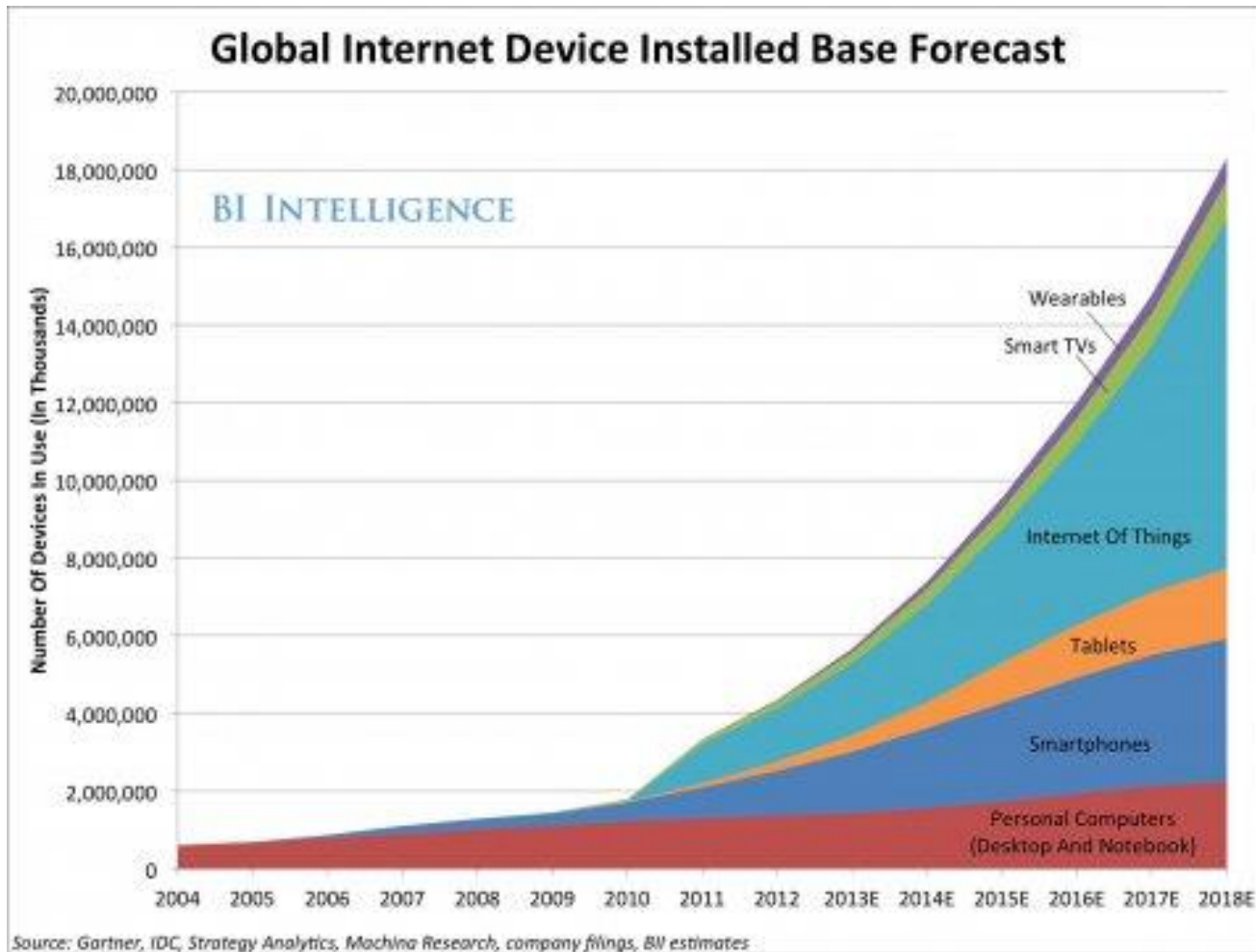
Performance of Software Defined and Virtualized Ecosystems: Gap Analysis and PAR Options

Mohammad Asad Rehman Chaudhry (PhD)
Vice Chair: Performance IEEE SRPSDVE Study Group
Soptimizer, and University of Toronto
masadch@ieee.org

Current State

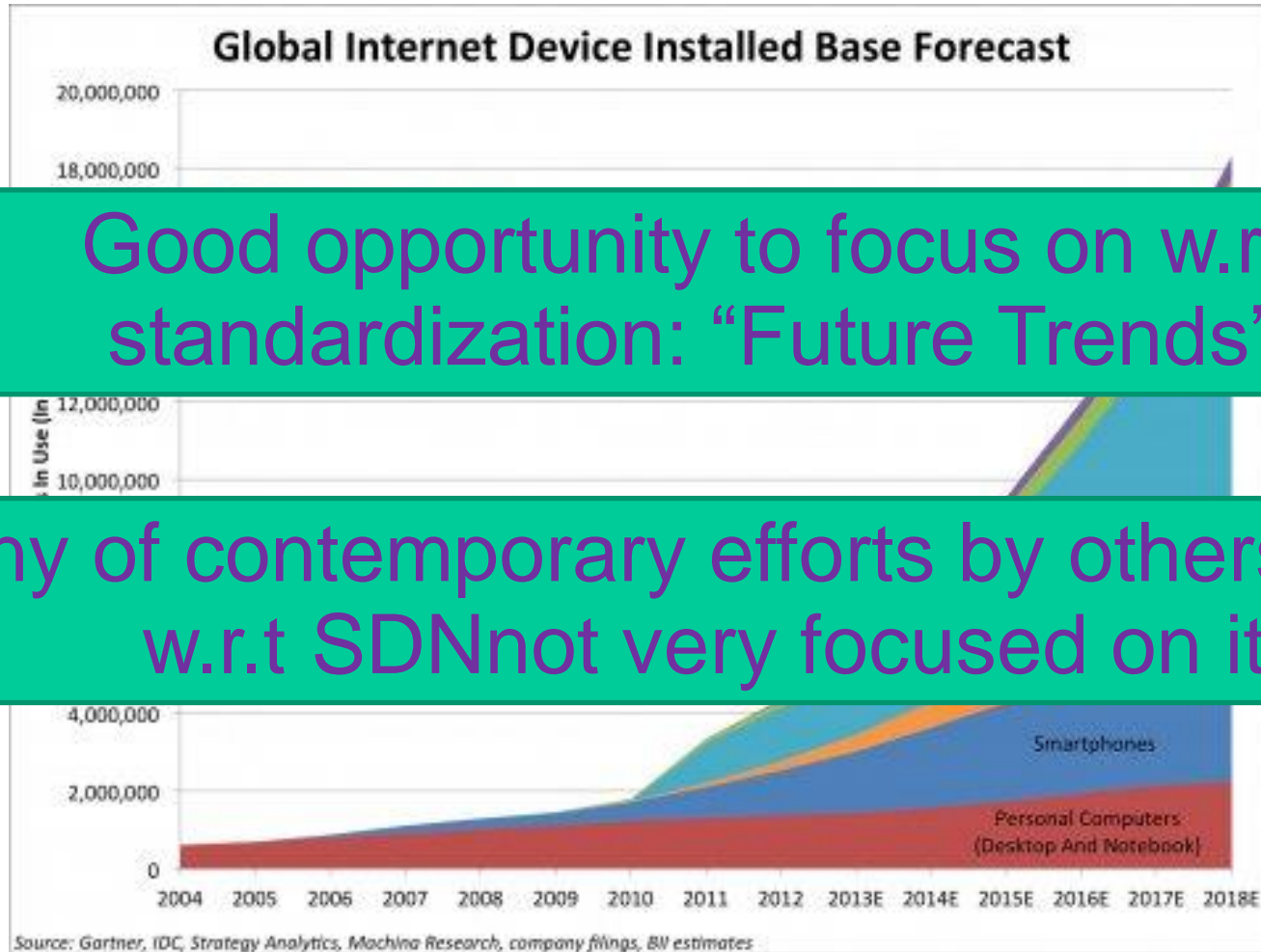
- **New Standard** almost every year
 - Silicon has longer developmental cycle
- Focused on **Carrier Grade**
- Focused on **L2** and above
- **Green Provisions /Energy Efficiency** not at core
- Focused on a set of contemporary applications:
 - DCs, Enterprises

Gap Analysis



Source: <http://www.businessinsider.com/growth-in-the-internet-of-things-2013-10>

Gap Analysis



Good opportunity to focus on w.r.t standardization: “Future Trends”

Many of contemporary efforts by others SDOs w.r.t SDN not very focused on it

Gap Analysis

- Connected Advertising /Marketing:
 - In top three IoT categories
 - Networked Billboards
- Other two in top three:
 - Smart Factories
 - Telecommuting Support Systems

Gap Analysis

- Intelligent traffic management systems
 - \$200 Billion by 2020
- Waste management systems
 - Pay as you Throw
- Smart Meters, and Intelligent Electronic Devices

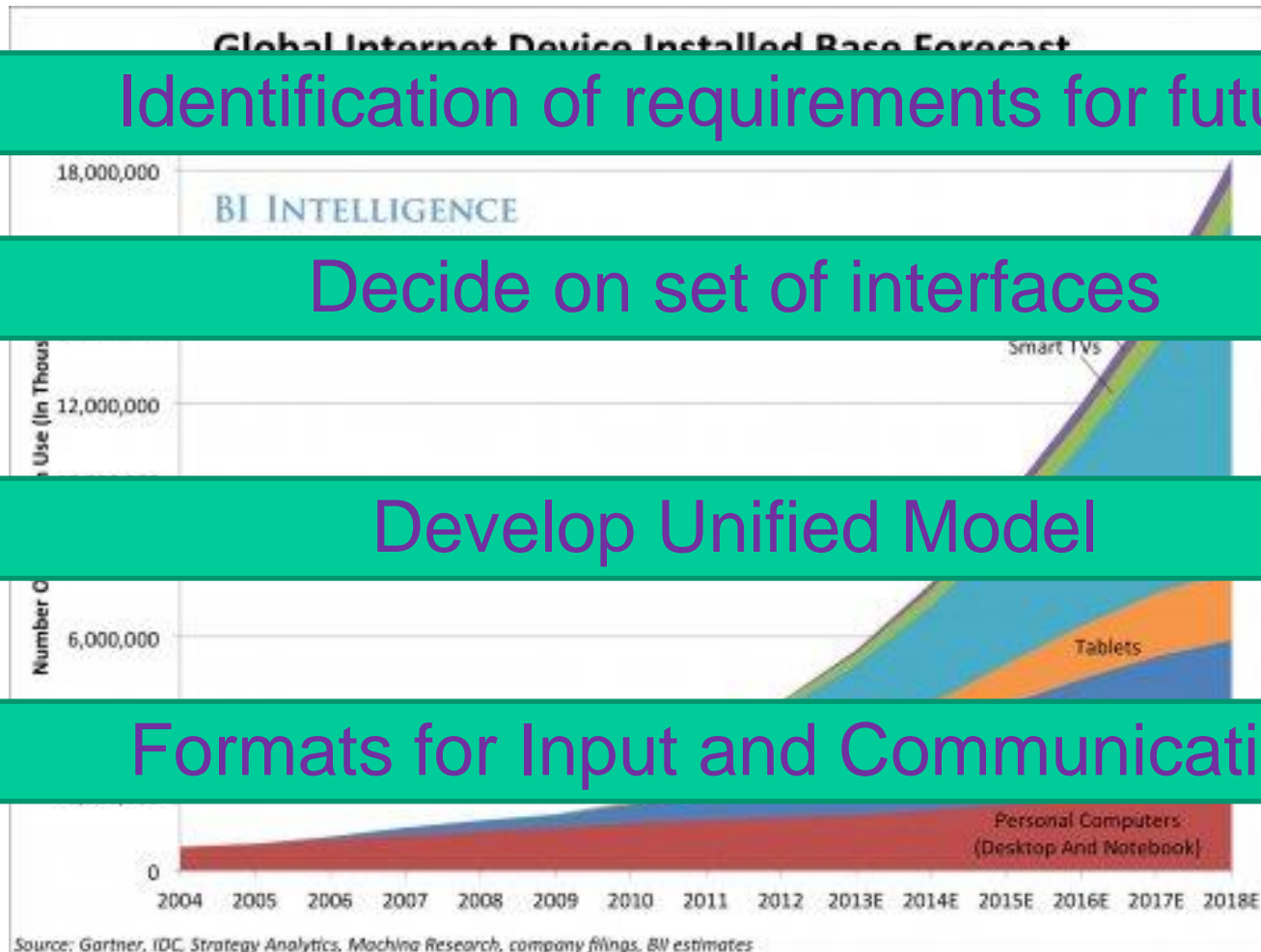
Gap Analysis/ PAR Options

Identification of requirements for future

Decide on set of interfaces

Develop Unified Model

Formats for Input and Communication



Gap Analysis

- DCs Electricity Consumption: 2% of world's total electricity
- Network devices alone consumed around **3 billion KWh** in year 2006

Sources:

1. Z. Asad University of Toronto
2. How Dirty is your Data? Report-Greenpeace
3. Richard Brown et al., "Report to congress on server and data center energy efficiency: Public law 109-431," Lawrence Berkeley National Laboratory, 2008.

Gap Analysis/ PAR Options

- Network devices are responsible for 20% -30% of the total energy

SDN/NFV Orchestrator models and requirements to incorporate energy efficiency, (voltage and frequency scaling etc)

Sources:

1. Z. Asad University of Toronto
2. Yunfei et al, "Energy-aware routing in data center network" ACM SIGCOMM WGN.
3. Brandon Heller et al "Elastictree: Saving energy in data center networks" NSDI.

Gap Analysis/ PAR Options

- Emergence of hybrid traffic (Wireless + Wired)
 - Different requirement for MAC
 - Scheduling
 - Coding
- SDN/NFV interfaces, API to enable choose between scheduling, coding etc
- Need for requirements, architectures for a testbed
 - Use Cases

Gap Analysis

- Security, Reliability–vs- Performance
 - Heartbleed issue and SDN
 - Open Vswitch
 - Open SSL
 - TLSv1 (similar to SSL3)
- Critical Infrastructures
 - Utilities
 - Availability –vs- other KPIs

Gap Analysis/ PAR Options

- End-to-end operation
- Isolation “True End-to-End”
- QoS
- QoE

Level of abstraction/ Abstraction Models

Gap Analysis/ PAR Options

- Coupling between Apps and Resources
- Extent of granularity of control
- KPIs
- Scalability
- Service Level Agreements

Profiles (vendors, providers, users) for increased portability, commonality, and interoperability

Gap Analysis/ PAR Options

- Interoperability
- Live migration
- Hypervisor level migration
- Transient effects
- Network locality –vs- Across different domains

Interfaces, formats, and operational conventions.