IEEE Internet of Things

Internet of Things and the **Technical Staff Pipeline** Demands

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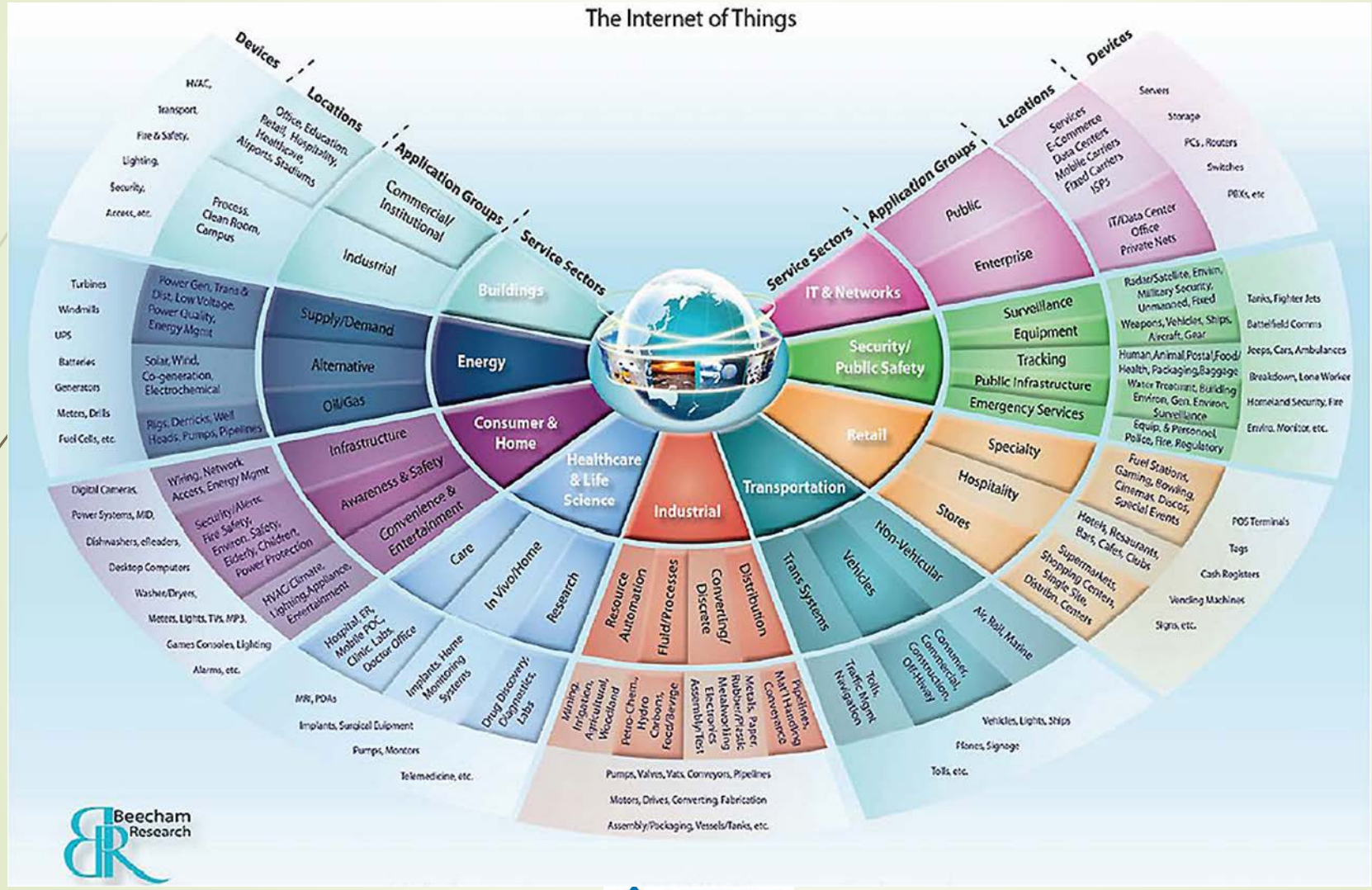
The World of IoT



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IoT Critical Areas*

Critical Impacts

- Sensor Technologies and their uses: light control, HVAC, security, …
- Healthcare: knowing what is going on and automatically raising the flag
- Connected, Autonomous Driving Automobiles and other transportation
- Waste Management Control
- Simplifying business and tools
- Uber!

Critical Risks

- Data Analysis
- Security
- Privacy
- Data Mis-use
- Poor Management

*From McKinsey & Company Report on IoT

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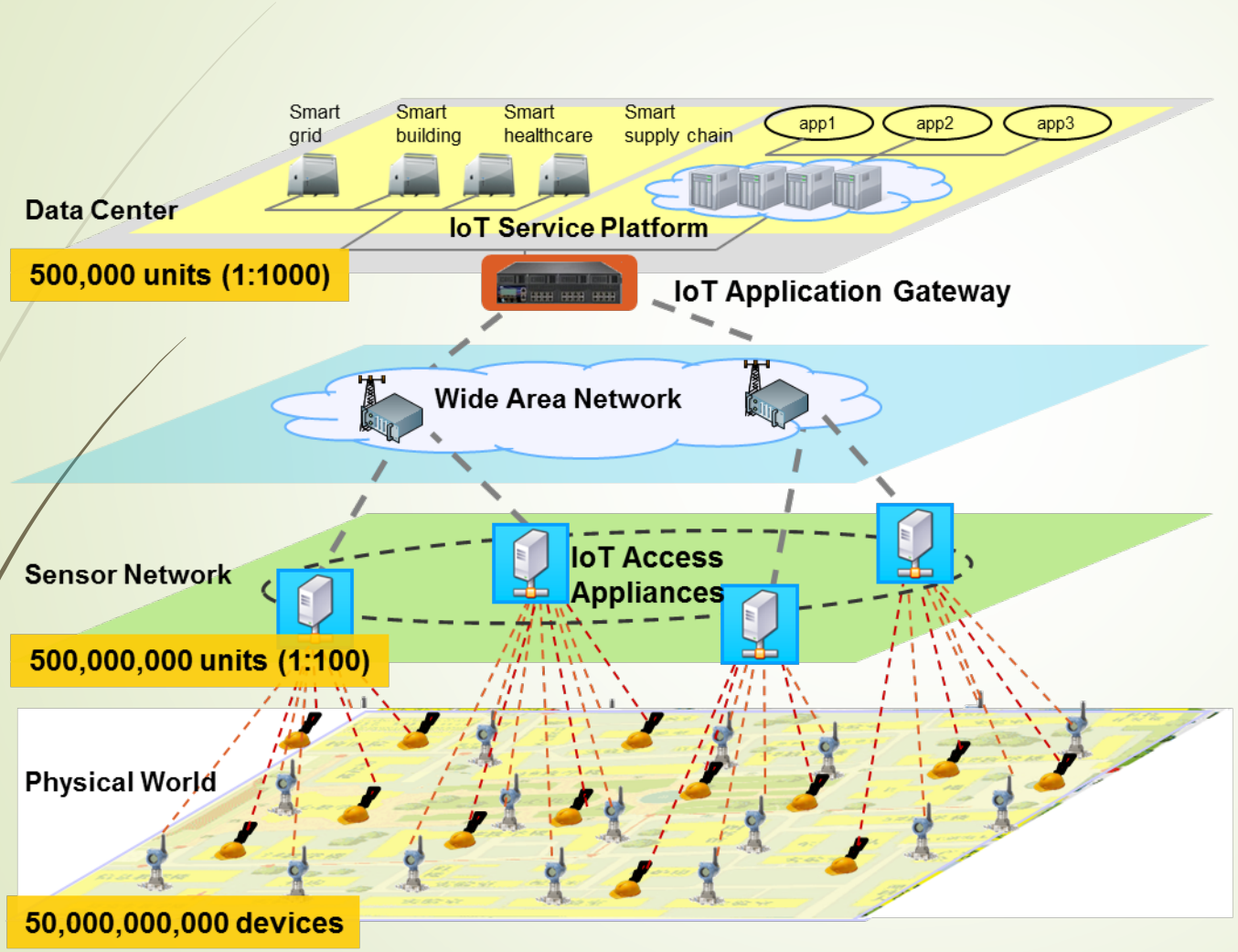
IoT Infrastructure Architecture



IoT End-to-End Services
(Management & Operation)

Enhanced Middleware for IoT

IoT Application Gateway

Wireless Network Edge Appliance for IoT

IoT Access Appliance

New Technology for IoT

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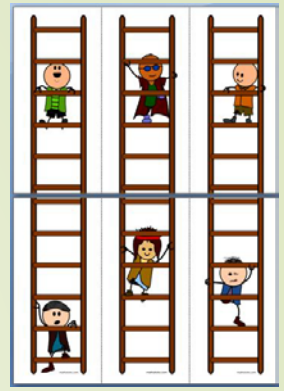
Challenges to Management

- Tracking Technology trends to keep products ahead.
- Complex Supply Management
- Interface complexities and lack of standards
- Design for Security
- Strong Technical Staffing across the company
  - **This creates the need for the “technical pipeline”**

Technical Pipeline

- The Technical Pipeline is the ladder parallel to management defining technical seniority and leadership
- Technical Leadership is both a management and technical leader responsibility
- Management must distribute its technical leaders across the company to impact products at all aspects
- Typically research and architecture are first, but ignoring enablement and support can cost the bottom line.

Staff Development Ladder



GTOWTH

- Engineer
  - Senior Engineer
    - Principle Engineer
      - Fellow
        - **CTO**
  - Manager
    - Director
      - Vice President
        - Senior Vice President

Many sub-steps can exist

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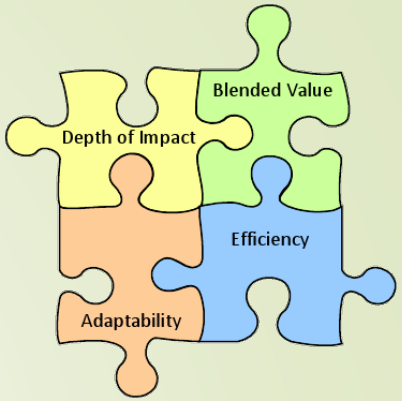
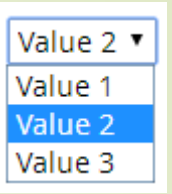
Typical Key Criteria

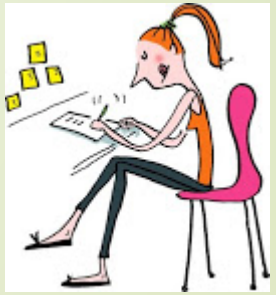


- Technical Expertise – represent individual knowledge
  - Patents, Papers, Presentations
  - Feature designs, solutions to customer's technical problems, internal processes
- Leadership and Strategy
  - Recognized leader in the company and even outside
  - Consistent technical contributions
- Role Model and Mentor – interest and track record of mentoring others
- Embrace Business Requirements
  - Business strategy and its technical needs
  - Communication and influence particularly with the customer

Common Selection Process



- Evaluation Team representing management and technical leaders
- Candidates internal or external but criteria is essential
- Balance business revenue to senior technical staff count
  - Often a rank ladder is used
- Focus on areas where company needs expertise
  - Research
  - Product Architecture
  - Enablement and Support
  - Manufacturing



Business Technical Pipeline Values

- Smart current and future Product Design
  - VPs need this technical advise to make funding decisions

- Keeping up with technology velocity
- Global recognition of technical excellence
- Knowing competitor's technical areas

- Smart Enablement for customer demands
  - Particularly true with complex technical products where the end user is rarely technically skilled but the product is
  - Customer recognition of brand and quality

Sample Cases

- Numerous examples from research and development
  - Products (PC, iPhone, Wearables, …)
  - Elements (USB, hinges, power systems, etc.)
- Two examples from Instrumentation and Support
  - Iot Instrumentation
  - Product design changes, power delivery example

*Based on real cases but company/product names are not cited

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IoT Instrumentation

- Silicon Production Yield improvements
- IoT instrumentation and analysis of manufacturing facility
  - Add sensors to monitor machine parameters and continuously analyze big data (10TB/Wk) from IoT gateway feed to predict part failure
  - Analyze the relation between motor inaccuracies in oven from gateway feed
  - Employ high definition image analysis to identify both good and possibly bad parts
- Impacts
  - Sensor analysis provided timely replacement of parts before failure with a >90% accuracy
  - Motor inaccuracy points discovered to be tool pressure settings allowing correction
  - Image analysis improved part selection process
- Overall, significant cost reduction and yield improvements

Processor Design Change

- New processor changes power delivery requirements
  - Many power rails needed, depending on product – not one size fits all
  - Mobile systems have additional power restrictions to save battery life
- Vendor starts with “last years” design
  - Estimates $10 cost adder for mobile, $5 cost adder for desktop
- Managing the impact
  - Innovative co-design with vendor and partners
  - Redesigned power circuitry reduced delta $0.05 mobile, and $0.03 desktop
  - Ecosystem savings impact*
    - $327.5M (mobile) + $867.5(desktop) = $1195M Ecosystem Cost Savings
    - Someone would have to pay (end customer, vendor, processor provider)

* Market size source IDC 2014, 50% impact

Myths and Realities – Do's and Don'

- Individual side
  - Life has no GPS, there is no magic tool to guide you
  - People will not necessarily notice even if you are doing a great technical job
    - You need to show others your technical skills and impacts
    - Communicate at every opportunity
  - Balancing leadership and technical skills is not easy, you must find it.
  - Build relationships to evaluators
- Manager side (and "committee side")
  - Encourage and reward technical leadership and achievements
  - Look beyond the ones that are "nice" to you
  - New Teams should not rush and pick too soon, old teams look beyond "friends"
  - Look for leadership and mentors, not just technical depth alone
  - Discourage politics in criteria

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Summary

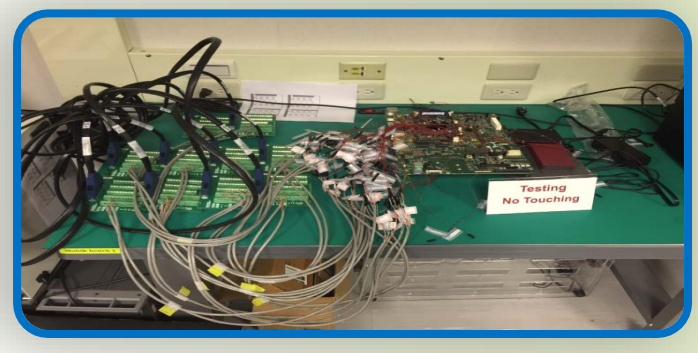
- IoT is bringing both challenges and opportunities for technical management, one being suitable placement and development of a staff technical pipeline
- The Technical Pipeline parallels management ladder defining technical seniority and leadership
- Both Technical leaders and managers have a key role in building a strong Technical Pipeline
- Management must distribute its technical leaders across the company to impact products at all aspects
- Typically research and architecture are first, but ignoring enablement and support can cost the bottom line.
- Be consistent in criteria, count what matters, focus on values not just friends or company establishments

Questions?

Globalization: being near the customer

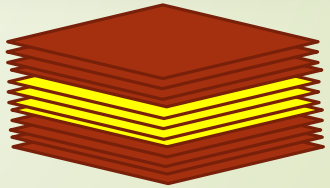
- Field engineers work hand an hand with customer design team
- One costly area is power testing that is often done together with the processor design team and PC vendor
- Senior engineers in the field can innovate and save both cost and time
- One effort moved testing power circuits from 7 days each test to 7 minutes† cooperating with ecosystem partners

from 7 days



to 7 mins†

†90% accuracy



With zero cost board modification, 100% accuracy