2017 03/29-30

北京 · 国际会议中心

中国慢性病与信息大会

China Chronic Disease and Information Conference

【信息化在基层慢性病防控中的应用】

即时精准的慢性病防控分析

Real-Time Precision Chronic Disease Analysis

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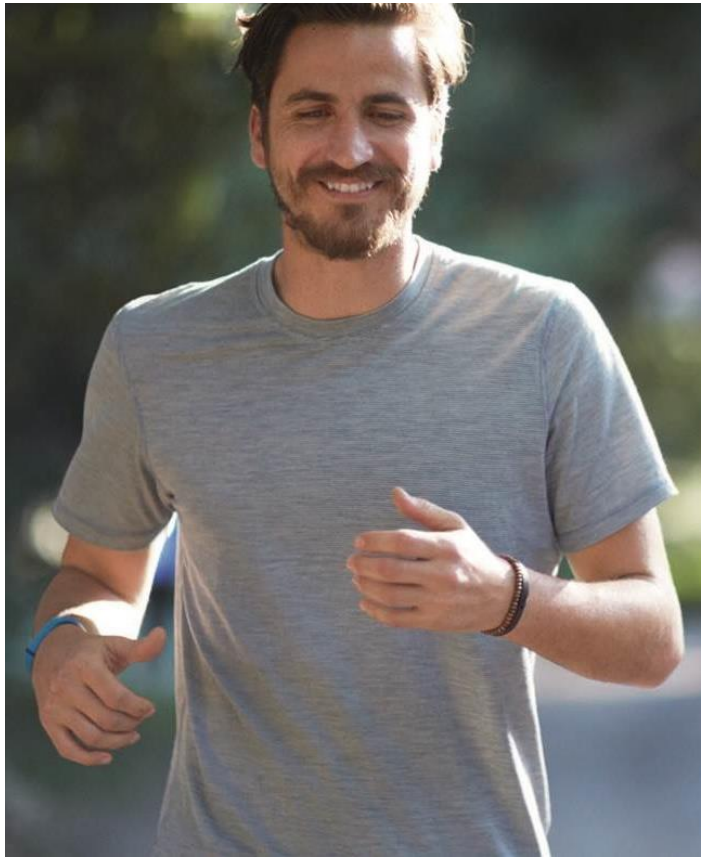
内容

- 雾计算时代
- 雾计算在慢病预防中的应用
- 隐私与安全
- 总结

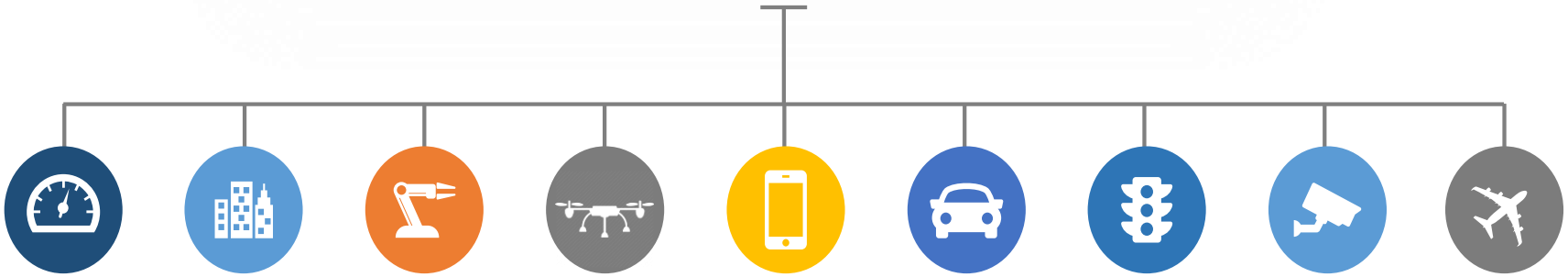


雾计算

CLOUD

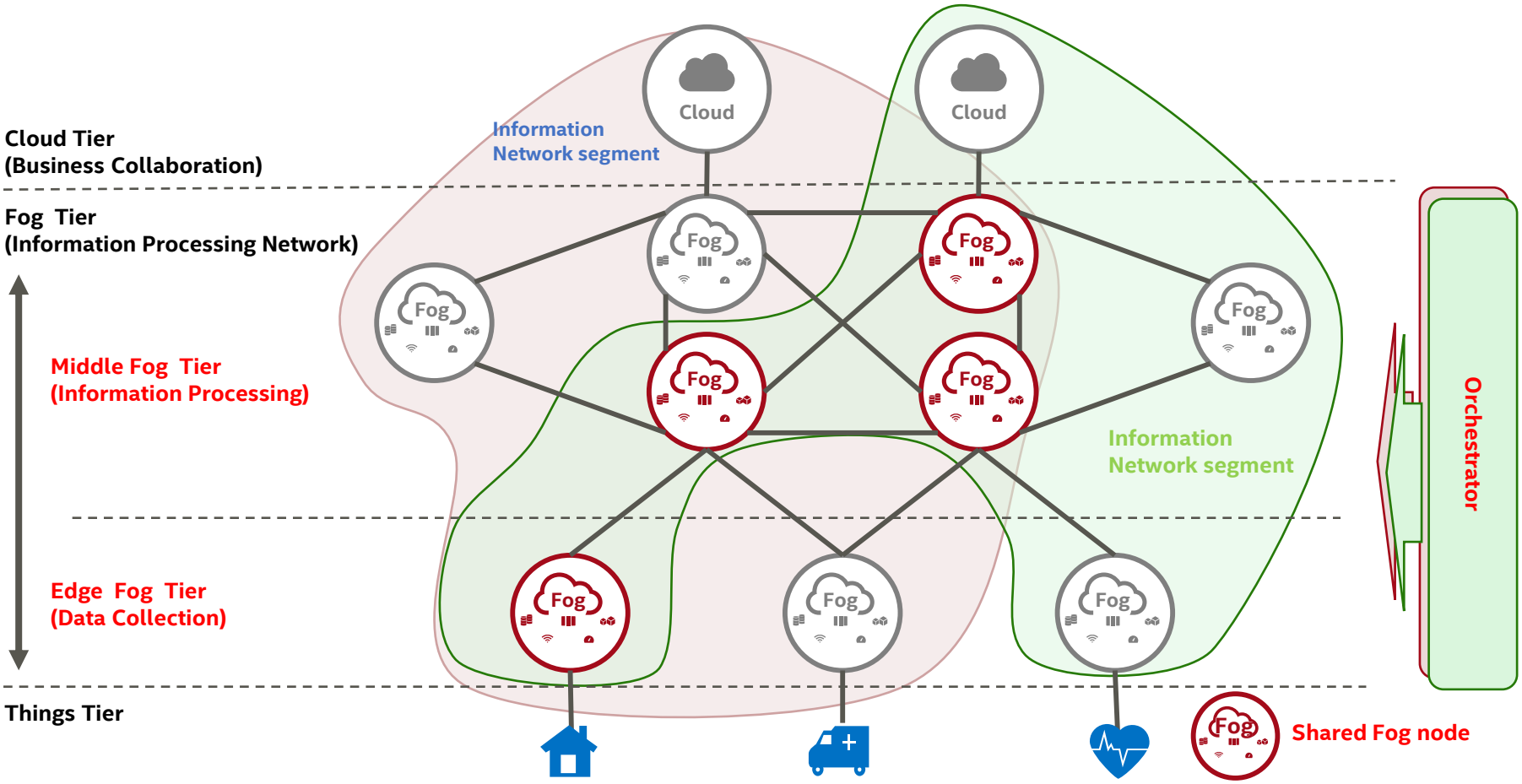
FOG COMPUTING

A system-level horizontal architecture that distributes computing, storage, and networking closer to users, and anywhere along the Cloud-to-Thing continuum



复杂的系统	跨行业	整体架构	持续性
System-Level	Horizontal	Architecture	Cloud-to-Thing Continuum

雾计算网络举例


Cloud Tier
(Business Collaboration)
Fog Tier
(Information Processing Network)
Middle Fog Tier
(Information Processing)
Edge Fog Tier
(Data Collection)
Things Tier
Cloud
Cloud
Information
Network segment
Information
Network segment
Fog
Orchestrator
Shared Fog node

OpenFog Consortium

2017·中国慢性病与信息大会
China Chronic Disease and Information Conference

OpenFog

www.OpenFogConsortium.org

Affiliations

Barcelona Supercomputing Center
Centro Nacional de Supercomputación
IEEE ComSoc
IEEE Communications Society
IoT Acceleration Consortium

Founders

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pioneers of fog computing
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imec
TTTech
ASU
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Bringing Intelligence to Storage
National Taiwan University
NEC
relayr.
SRC
Redefining possible
ABBALab
MITSUBISHI ELECTRIC
NTT Communications
Aalto University
國立交通大學
National Chiao Tung University
IIJ
Internet Initiative Japan
WAYNE STATE
ITRI
Industrial Technology Research Institute

55 members strong, headquartered in 14 countries as of February 2017

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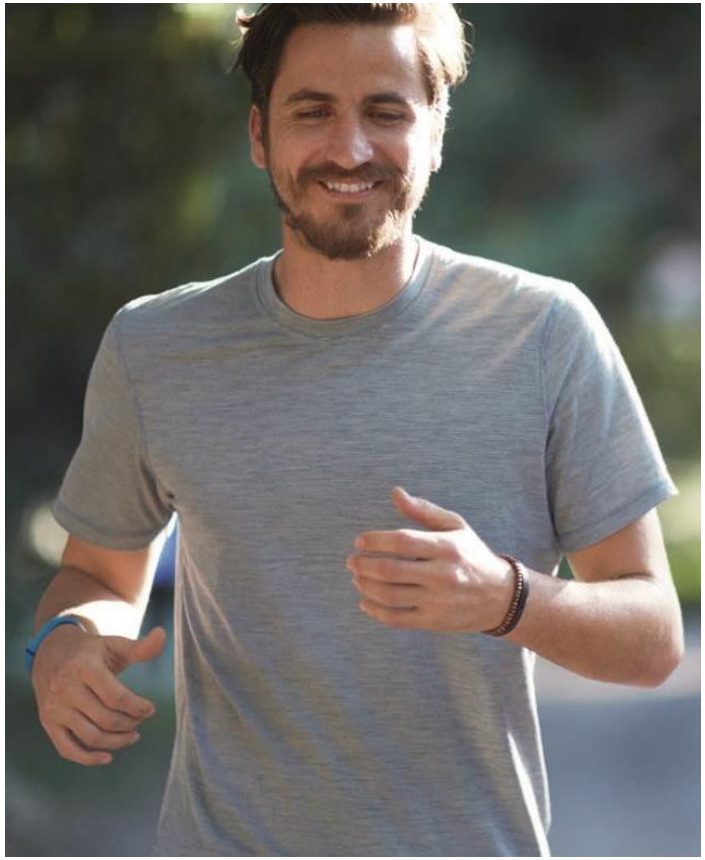


医疗健康应用领域

- 硬件即服务 HaaS
  Drive new top-line revenue via IoT - HaaS
  - 医疗及影像设备
    Connected Medical and Imaging Devices
  - 医疗数据分析
    Medical Data Analytics
  - 资产追踪及工作流优化
    Asset Tracking and Workflow Optimization
  - 环境控制 Environmental Controls
  - 数据去重
    Eliminate Device Duplication
  - 文档自动化 Automated Documentation
  - 跌倒预防 Fall Prevention
  - 娱乐系统 Entertainment System Management
  - 报警管理 Alarm Management
  - 维护预测 Predictive Maintenance

- 网络功能虚拟化 NFV
  Boost operational efficiency via NFV
  - 虚拟设备 Virtual Customer Premise Equipment
  - 虚拟防火墙 Virtual Firewall
  - 虚拟路由 Virtual Routing
  - 虚拟无线接入网络 Virtual Radio Access Network
  - 虚拟内容分发网络 Virtual Content Delivery Network
  - 移动边缘计算 Mobile Edge Computing
  - 虚拟分组核心演进 Virtual Evolved Packet Core
  - 虚拟IP多媒体子系统 Virtual IP Multi-Media Subsystem
  - 虚拟会话边界控制 Virtual Session Border Control

跌倒预防

挑战 Challenge

美国每年有70万人在医院跌倒
700,000 people in the United States fall in the hospital

跌倒会导致骨折、撕裂、内出血等
A fall may result in fractures, lacerations, or internal bleeding, leading to increased health care utilization.

1/3的跌倒是可预防的
Research shows 1/3 of falls can be prevented

有跌倒风险的病人需要24小时监护
Patients at risk of falling require 24/7 observation.

解决 Solution

视频监控
Provide flexible video surveillance management platform.

工作人员通过高清IP摄像头观察多名患者
High definition IP cameras deployed throughout the facility enable staff to observe multiple patients simultaneously.

运动传感器提供辅助信息
Built-in motion detectors provide additional cues t o staff of potential movements.

价值 Impact

减少床旁监护人员数量
Reduce overhead by eliminating the majority of the facility's one-on-one bedside observation staff.

及时报警
Alerts to staff allow for notifications wherever you are.

降低成本和再入院比率
Telehealth technology reduces costs by better engaging and educating patients, promoting adherence to treatment and early intervention to keep readmissions at a minimum.

dimension data

1080P 高清摄像头
High Definition 1080p Camera

双向音视频通讯
Two-Way Video and Audio Communications

无线和有线连接
Cisco Medical Grade Wireless and Cisco Wired Connectivity

脚轮固定
Stable Footprint with Medical Grade Locking Casters

8小时备用电源
Up to Eight Hours of Reserve Power

视频分析 Video analysis
噪音分析 Noise analysis
传感器集成 Sensor integration

9个月部署应用实践： Nine Month Case Study

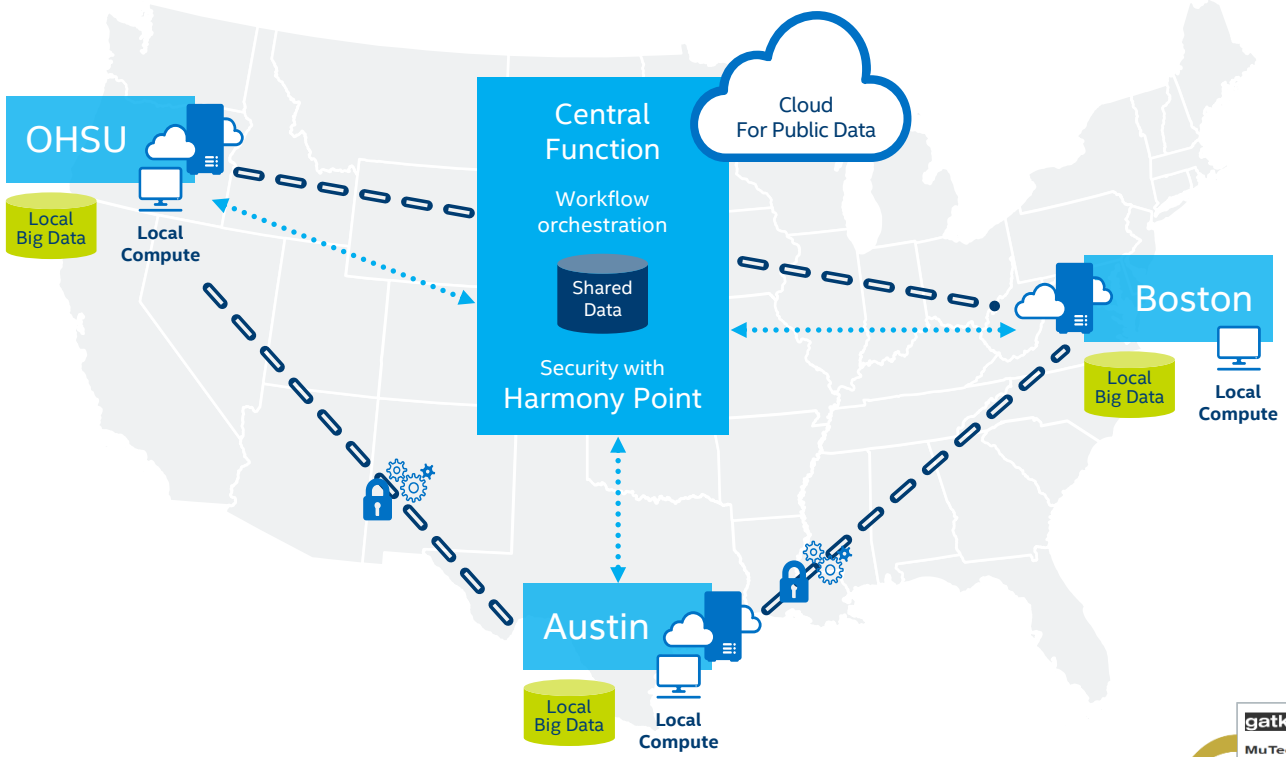
部署了40台监控设备 40 cameras deployed

预防57次跌倒事件 57 fewer falls

减少了77%的人工监视时间 77% reduced monitored hour cost

降低了近20万美元人工成本 USD 194,436 savings in staffing costs

癌症分析诊断

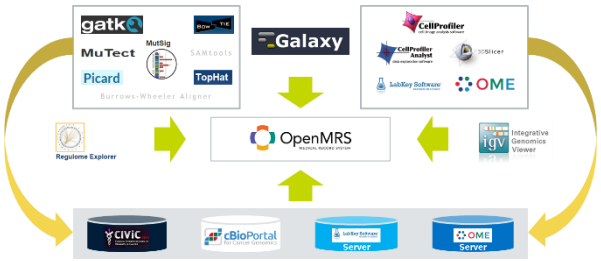


1. 数据交换云共享
在医院/机构保存数据
发送计算力到数据

2. 加速组学和影像工作流
加速运行时一个量级
一天完成

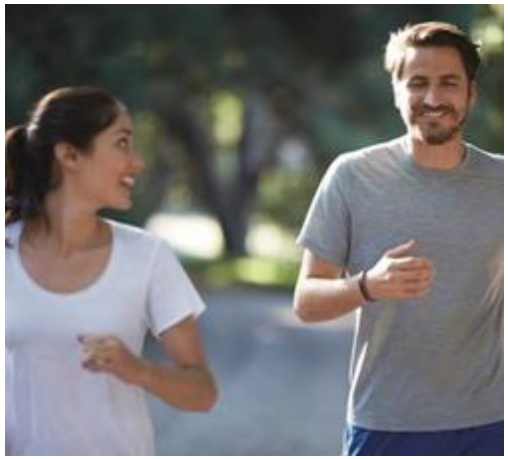
3. 隐私保护数据共享
在保持隐私的同时执行多个站点的安全联合计算
安全共享

4. 可扩展的基因组数据库
存储大量患者变异数据并执行数据库计算
各级可扩展性



所有开源技术、互操作与社区标准和最佳实践

实时人群健康分析

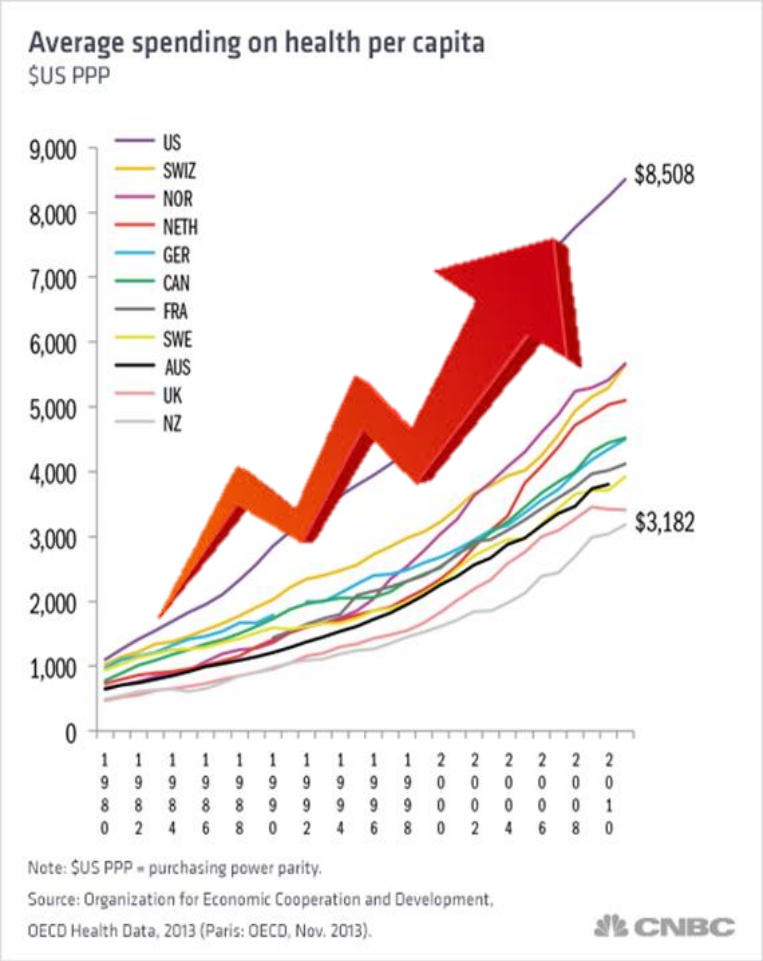


活动追踪养成健康习惯
Activity Tracking Promotes Healthy Habits

积极参与 Participate
收集追踪 Collect and Track
亲友互动 Connect with Peers
提升健康 Improve Health

预测分析进行早期干预
Predictive Analytics Enables Early Intervention

Engage 客户互动
Identify trends 了解趋势
Track progress 跟踪进展
Support decisions 决策支持

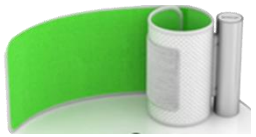


实时人群健康分析（续）

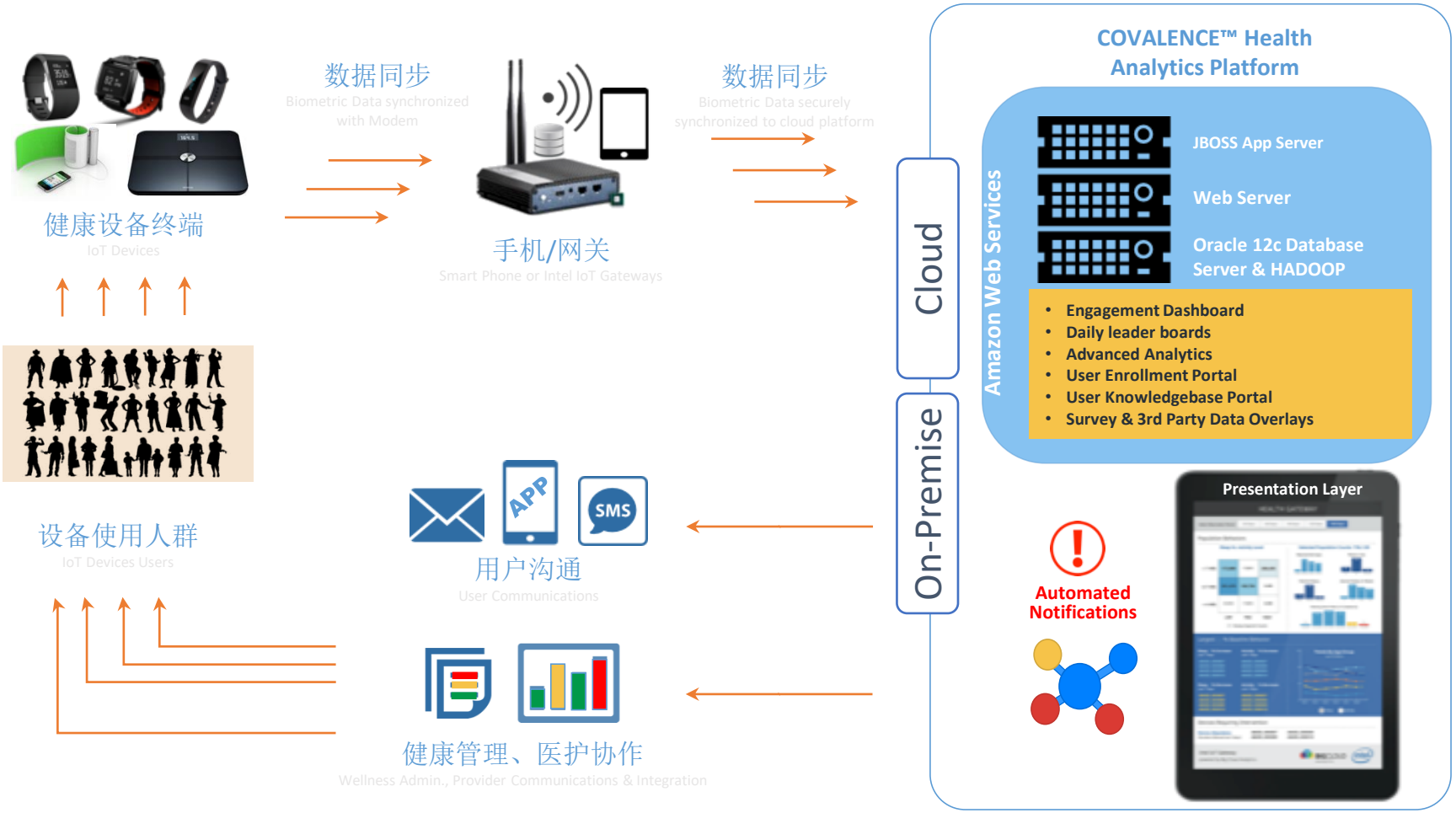
- 端到端的解决方案，综合来自设备和其他源的数据，形成洞察与行动计划
  End-to-end solution synthesizes device and exogenous data streams into insights & actions
- 预装的最权威的分析算法
  Pre-loaded analytics honed by Chief Data Scientist Dr. V. Kumar, world's most published authority on customer engagement
- 独到的分析、评价等工具集
  Unique analytics, scores and industry toolbox
- 在澳大利亚国家银行首次大规模部署
  First scaled deployment at National Australia Bank

BIGCLOUD analytics

COVALENCE™



实时人群健康分析（续）


健康设备终端
IoT Devices
设备使用人群
IoT Devices Users
数据同步
Biometric Data synchronized with Modem
手机/网关
Smart Phone or Intel IoT Gateways
数据同步
Biometric Data securely synchronized to cloud platform
APP
SMS
用户沟通
User Communications
健康管理、医护协作
Wellness Admin., Provider Communications & Integration
Cloud
On-Premise
COVALENCE™ Health Analytics Platform
Amazon Web Services
JBOSS App Server
Web Server
Oracle 12c Database Server & HADOOP
Engagement Dashboard
Daily leader boards
Advanced Analytics
User Enrollment Portal
User Knowledgebase Portal
Survey & 3rd Party Data Overlays
Automated Notifications
Presentation Layer

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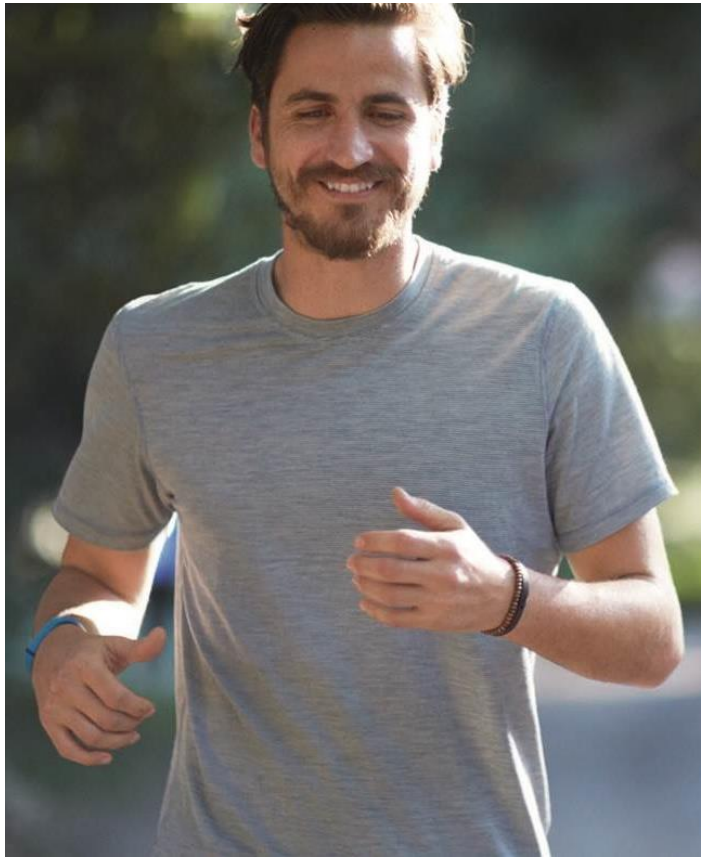
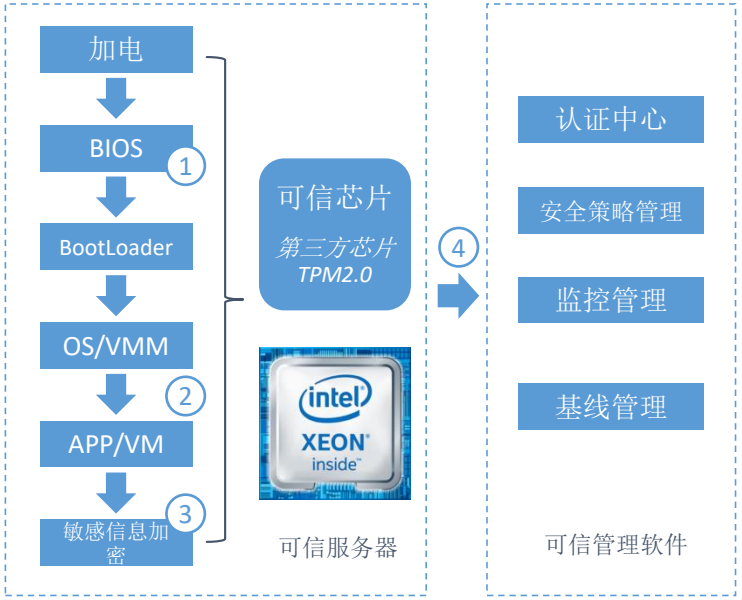
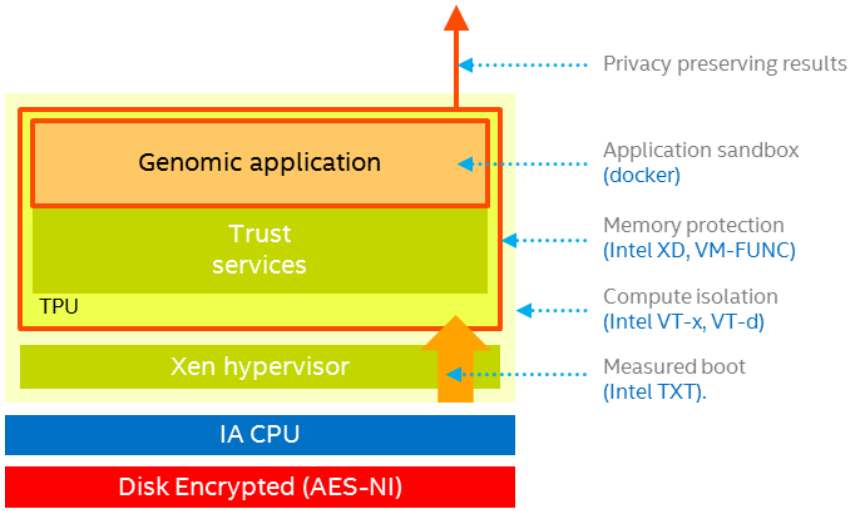


可信计算



可信计算通过在硬件上引入可信芯片，从平台加电开始，到应用程序的执行，构建完整的信任链，一级认证一级，一级信任一级，未获认证的程序不能执行，从而使系统实现自身免疫，构建起高安全等级的防护系统

- 防御：攻击者进不去
- 保护：重要信息拿不走
- 加密：窃取的信息看不懂
- 加固：系统和数据篡改不了
- 审计：非法行为赖不掉



1.安全启动可以阻止未知固件、设备、系统异常引导程序执行

2.可信链传递，保证OS/VMM, APP/VM的完整性

3.敏感信息加密

4. 认证中心进行认证及授权

安全策略配置主机策略

及时监控及告警，保证软硬件运行过程安全

基于等保要求的基线管理，保证满足合规要求

区块链

总结

雾计算在慢性病预防分析中有许多潜在应用。
There should be many potential fog applications in chronic disease analysis.

可信计算技术以及区块链技术为病人数据安全和隐私提供保障。
Trusted computing and blockchain enhance patient privacy and data security.

英特尔与生态伙伴和医疗客户广泛合作，推动慢病信息化发展。
Intel propels HIT development together with ecosystem partners and healthcare customers.

Thank You

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