5G ACCELERATING ENTERPRISE DIGITAL TRANSFORMATION

CAROLINE CHAN
VICE PRESIDENT, DATA CENTER GROUP
INTEL CORPORATION
5G - DNA FOR THE INNOVATION PLATFORM OF TOMORROW

BY 2020

- AVG. INTERNET USER: 1.5 GB OF TRAFFIC / DAY
- AUTONOMOUS VEHICLES: 4 TB OF DATA/DAY
- CONNECTED AIRPLANE: 5 TB OF DATA/DAY
- SMART FACTORY: 1 PB OF DATA/DAY
- CLOUD VIDEO PROVIDERS: 750 PB OF VIDEO/DAY

5G

ENHANCED MOBILE BROADBAND
ULTRA-RELIABLE AND LOW LATENCY
ENTER 5G NR – A TRULY UNIFIED AIR INTERFACE

- **Responsive**: Sub-1 millisecond delay end-to-end for low latency apps
- **Flexible**: Subcarrier spacing, scalable numerology enable deployment in new scenarios
- **Reliable**: 10 to ~5 packet error rate/BLER .0001 for ultra reliable apps
- **Scalable**: Supports new bands up to 52.6GHz
- **Powerful**: Up to 20Gbps DL via mmWave for extreme mobile broadband
- **Efficient**: Dynamic TDD delivers better resource utilization

Intel Confidential – shared under NDA
NETWORK BECOMES A DISTRIBUTION OF DATA CENTERS

5G REDUCING LATENCY, INCREASING BANDWIDTH, COVERAGE AND INNOVATION

5G CLIENTS

BASE STATION

LOCAL CO

REGIONAL CO

CORE

CLOUD / OTT

Massive Data Sets

Data Sovereignty / Privacy

LATENCY= <5 MS

LATENCY= 10MS+

LATENCY= 40MS+

LATENCY= 100MS+
NETWORKS OF THE FUTURE

TODAY'S PUBLIC NETWORK
GENERAL PURPOSE

DISTRIBUTED NETWORKS ON / OFF PREMISE

SMART CITY/COMMUNITIES
Heterogeneous Small/ Macro Cells

VENUE / RETAIL
Network in a Box managed by the Enterprise

AIRCRAFT / PORTS
Network in a Box, Regional DC
Segmented Network

PRIVATE NETWORKS (E.G. HEALTH)

NETWORKS OF THE FUTURE

DISTRIBUTED NETWORKS ON / OFF PREMISE

SMART CITY/COMMUNITIES
Heterogeneous Small/ Macro Cells

VENUE / RETAIL
Network in a Box managed by the Enterprise

AIRCRAFT / PORTS
Network in a Box, Regional DC
Segmented Network

PRIVATE NETWORKS (E.G. HEALTH)
REIMAGINING THE EDGE
By 2025, 75% of data will be stored, analyzed, and acted on at the edge.\(^1\)

1. Gartner – Edge Computing for Infrastructure / Operations Leaders
KEY LEARNINGS

MULTI-ACCESS EDGE COMPUTE (MEC)

- HIGHER EFFICIENCIES
- SECURE TRANSACTIONS
- CONTENT CONTROL

BANDWIDTH / CONTROL OF CONTENT

LOW LATENCY / REAL TIME

CONSOLIDATED WORKLOADS

SECURE MOBILE TRANSACTIONS

ADDITIONAL SECURITY / PRIVACY

INCREASED RELIABILITY
CLOUDIFICATION OF THE NETWORK

2005-2016

2017+

THINGS

NETWORK

STORAGE

COMPUTE

ANALYTICS

STORAGE

COMPUTE

ANALYTICS

STORAGE

COMPUTE

ANALYTICS

STORAGE

COMPUTE

ANALYTICS

MARKET DRIVERS REQUIRING COMPUTE AT OR NEAR DATA SOURCE

CLOUD CAPABILITIES LEVERAGED TO ADDRESS EMERGING USE CASES REQUIRING STORAGE, COMPUTE AND ANALYTICS

NETWORK TRANSFORMATION FOUNDATIONAL
USE CASES ADOPTING EDGE

- WAREHOUSE & MANUFACTURING
- HOSPITALITY & CASINOS
- TRANSPORTATION
- CONNECTED CAR
- RETAIL
- SMART CITY
- EDGE CLOUD GAMING
- INSPECTION & INFRASTRUCTURE
- SMART STADIUMS
- VR/AR WITH LOCATION
- SECURITY, RECOGNITION, SURVEILLANCE
MEDIA AND EDGE/CLOUD GAMING – SHOWCASED @ MWC

**SCARECROW VS. BATMAN**

Technology:
- AR Over 5G
- Compute at the Edge / Cloud
- Latency < 12ms
- E2E Platform from Content Creation, Delivery to Consumption

**SPIDERMAN HOMECOMING 2**

Technology:
- Multi-Player, Multi-Booth VR over 5G
- Spiderman suit in a fully immersive manner
- Intel Core and Graphics (KBL-G)
- Rendering at the Edge
Massive Connectivity demanding capacity
Vchat/Multi-Angle viewing

Game Data Acquisition and Analysis

Edge Server reduced latency of live video chat from ~30s to ~0.5s

Retail and recommendation opportunities
Operational and Entertainment services
FAN EXPERIENCE

APPS:
- GAME DATA ACQUISITION AND ANALYSIS
- POLICIES/RIGHTS/DISTRIBUTION OF DATA
- AR, VR AND IMAGE OVERLAY
- GAMING CONSOLE
- REAL TIME GAMING IPHONE
- CORRELATION OF STATS FOR VIEWING AND GAMING

DATA COLLECTION ON THINGS AND PEOPLE
INTERACTIVE GAMING / BETTING (BLOCK CHAIN, AI, VISUAL CLOUD)
RETAIL DIGITIZATION

Supporting Applications:
- Store Analytics
- Inventory Mgmt
- Mobile Payment
- App Enabled
- Robotics/Al/Analytics
- Precision Marketing
- Customer Tracking
- Content Caching
- Self Service
- Mobile POS

BENEFITS: ADDITIONAL PRIVACY, LOW LATENCY, QOE, CONTROL OF LOCAL CONTENT, HIGHER EFFICIENCIES, WORKLOAD CONSOLIDATION
HEALTHCARE

REMOTE ADVISE

AR SURGERY

REMOTE BROADCAST

3D PRINT SURGERY

REAL-TIME DIAGNOSIS

REMOTE SURGERY

VR SURGERY

REMOTE LIVE EDUCATION
INDUSTRIAL PRIVATE NETWORK

MANUFACTURING MOVES COMPUTE & ANALYSIS TO THE EDGE WITH AI, BLOCKCHAIN, ...

- Metrology
- Mobile Robotics
- MOM Tablets
- Enterprise Security Framework Extended
- AR Repair & Assembly
- Security AI
- Tool Tracking
Summary

• 5G is just not connectivity. It’s an innovation platform of tomorrow for enterprises.
• Latency, increased bandwidth and improved coverage are the key 5G elements.
• More and more data will be captured, analyzed and monetized at the edge vs cloud.
• Intel is well positioned with its rich portfolio of products to support end-to-end transformation.
• Multiple use cases across the globe will drive the 5G to reality.
THANK YOU!