Safe Harbor for Forward-Looking Statements

This presentation will contain forward-looking statements under the Private Securities Litigation Reform Act of 1995 including those relating to our expectations regarding financial guidance for the fourth quarter of 2017, including revenue, operating costs and expenses, earnings per share and estimated, fixed, long-term projected tax rates. Such forward-looking statements are based on current expectations, estimates and projections, management’s beliefs and certain assumptions made by Rambus’ management. Actual results may differ materially. Our business is subject to a number of risks which are described more fully in our periodic reports filed with the Securities and Exchange Commission. Rambus undertakes no obligation to update forward-looking statements to reflect events or circumstances after the date hereof.

This presentation contains non-GAAP financial measures, including operating costs and expenses, operating margin, operating income (loss), adjusted EBITDA and net income (loss). In computing these non-GAAP financial measures, stock-based compensation expenses, acquisition-related transaction costs and retention bonus expense, amortization expenses, non-cash interest expense and certain other one-time adjustments were considered. The non-GAAP financial measures should not be considered a substitute for, or superior to, financial measures calculated in accordance with GAAP, and the financial results calculated in accordance with GAAP and reconciliations from these results should be carefully evaluated. Management believes the non-GAAP financial measures are appropriate for both its own assessment of, and to show investors, how the Company’s performance compares to other periods. Reconciliation from GAAP to non-GAAP results are made available and more fully described on our website.
Rambus At-a-Glance

Corporate Facts
- NASDAQ: RMBS, Inc. in 1990; IPO 1997
- Headquartered in Sunnyvale, CA
- Operations throughout North America, Europe & Asia
- Q317 Revenue: $99.1M
- 2016 Revenue: $336.6M
- ~800 employees
- ~2,500 patents & applications

Markets Served

Data Center
- Acceleration + lower power
- System-level architectures
- Innovative products to support needs

Mobile Edge
- Secure endpoints = secure data
- Hardware root-of-trust
- Value and monetization for end-user services
Our Journey So Far

Key Milestones

- **1990**: Rambus founded
- **1990**: Nintendo64 ships with RDRAM®
- **2000**: PCs ship with RDRAM®
- **2000**: Sony PLAYSTATION 2 ships
- **2010**: Sony PLAYSTATION 3 ships
- **2017**: Acquired Bell ID and Ecebs
- **2017**: Amplified with products from Semtech and Inphi

Revolutionizing the Memory Market — Diversified and Expanded Out Product Offering
Moving Data Faster, Safer, and Smarter
The Data Center

Data • Faster

**Cores**

SerDes PHYs
Move data from chip to chip

Memory PHYs
Move data between chips and memory

**Chips**

Server DIMM Chipsets
Enables more capacity at high performance
Growth Through Acquisition for Data Center Needs

- **Architecture License**
  - Foundational IP

- **Cores**
  - DDRx PHYs
  - SerDes PHYs

- **Chips**
  - Buffer chips

**Historic Business**
- High margin; predictable; fuels investment

**Cloud**
- High growth; differentiated margin
Growing Opportunity in Data Center

DIMM Chipset Ecosystem

- Chip/DIMM Validation
- DIMM Validation List
- DRAM/Module Mfrs
- RDIMMs & LRDIMMs
- Data Center
- Enterprise

Graph:
- Revenue
- Architecture Licensing and Cores
- Chips

Bar Chart:
- 2016
- 2016 SAM
- 2018 SAM
- 2021 SAM

Revenue:
- $0
- $200
- $400
- $600
- $800
- $1,000
- $1,200
- $1,400
Moving Data Faster, Safer, and Smarter
The Mobile Edge

Data • Safer

**Embedded Security**
- Secure Cores
  - Embedded device protection
- CryptoManager Platform
  - Secure provisioning and key management

**Secure Services**
- CryptoManager Trusted Services
  - IoT Security Service

**Secure Software**
- Mobile Payments
  - Secure payments and trusted transactions
- Smart Ticketing
  - Simplified travel with mobile ticketing
Growth in Services at the Mobile Edge

- Foundational Embedded Security
  - Architectural Licenses, Cryptographic IP Cores
  - Historic Business

- Secure Device Management
  - CryptoManager Core in Customer Chips
  - Hardware Root of Trust & Provisioning Infrastructure

- In-field secure services
  - Trusted Transactions
  - Smart Transport
  - IoT Security
Growing Opportunity in Mobile Edge

Mobile Payments Ecosystem

License software and apps

Merchant Acquirers

Retailers

License software and apps

UPP Software & App

License software and implementation services

HCE & Tokenization Software

Issuing Banks

Mobile Wallet

OEM

Card Schemes

Source: ABI Research, Strategy Analytics, Gartner and Rambus estimates

2016 Rev
2016 SAM
2018 SAM
2021 SAM

RSD Revenue
Architecture Licenses and Cores
IoT Security
Mobile Payment
Smart Ticketing

$M

0
500
1,000
1,500
2,000
2,500
3,000
Security from Chip to Cloud to Crowd

- Trust by Design
- Secure Assets & Clusters
- Device Configurations & Customer Demands
- Applications & Services
- Customer Data & Intelligence

Manufacturing
- Over 9 billion chips/year with DPA license
- CryptoManager Cores and Infrastructure with Qualcomm and others
- Over 1.5 billion chips configured since 2016

In-field
- 100s of billions of payment and ticketing transactions secured
- Recently announced CryptoManager IoT Device Management Service

Moving Data Faster & More Securely
Growing Revenue Base

Large portion of our revenue is fixed & predictable

- Q3'17 revenue up 10% Y/Y
- Memory & Interfaces Division up 9% Y/Y
- Security Division up 17% Y/Y

Revenue ($M); Q4'16 includes revenue contribution from acquisitions that closed midway through Q3'16
## Non-GAAP Income Statement

<table>
<thead>
<tr>
<th></th>
<th>Q3 2016</th>
<th>Q4 2016</th>
<th>Q1 2017</th>
<th>Q2 2017</th>
<th>Q3 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>$89.9</td>
<td>$97.6</td>
<td>$97.4</td>
<td>$94.7</td>
<td>$99.1</td>
</tr>
<tr>
<td><em>Growth from product revenue, royalties and incremental licensing agreements</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Operating Expenses</strong></td>
<td>$60.8</td>
<td>$67.5</td>
<td>$66.8</td>
<td>$69.3</td>
<td>$64.6</td>
</tr>
<tr>
<td><em>Actively manage expenses through effective cost management</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating Income</strong></td>
<td>$29.0</td>
<td>$30.1</td>
<td>$30.6</td>
<td>$25.4</td>
<td>$34.5</td>
</tr>
<tr>
<td><em>Operating Income consistently in line with expectations</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating Margin</strong></td>
<td>32%</td>
<td>31%</td>
<td>31%</td>
<td>27%</td>
<td>35%</td>
</tr>
<tr>
<td><em>Operating Margin expansion</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Diluted Earnings Per Share</strong></td>
<td>$0.16</td>
<td>$0.16</td>
<td>$0.17</td>
<td>$0.14</td>
<td>$0.19</td>
</tr>
<tr>
<td><em>Delivering profitable growth</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Please refer to reconciliations of non-GAAP financial measures included in this presentation and in our earnings release.
# Financial Strength

<table>
<thead>
<tr>
<th>In Millions</th>
<th>Q3 2016</th>
<th>Q4 2016</th>
<th>Q1 2017</th>
<th>Q2 2017</th>
<th>Q3 2017</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cash &amp; Marketable Securities</td>
<td>$150.8</td>
<td>$172.2</td>
<td>$187.6</td>
<td>$167.9</td>
<td>$183.6</td>
<td>$50M of cash used for share repurchase in Q2 2017</td>
</tr>
<tr>
<td>Total Assets</td>
<td>$800.3</td>
<td>$783.5</td>
<td>$826.2</td>
<td>$806.0</td>
<td>$824.1</td>
<td>Strong balance sheet with limited debt</td>
</tr>
<tr>
<td>Shareholder Equity</td>
<td>$552.8</td>
<td>$552.8</td>
<td>$601.6</td>
<td>$570.2</td>
<td>$589.5</td>
<td></td>
</tr>
<tr>
<td>Adjusted EBITDA¹</td>
<td>$32.5</td>
<td>$33.6</td>
<td>$34.0</td>
<td>$28.7</td>
<td>$37.8</td>
<td>Solid cash generation continues</td>
</tr>
</tbody>
</table>

¹Please refer to reconciliations of non-GAAP financial measures included in this presentation and in our earnings release
## Investment Summary

- Compelling growth drivers in Data Center and Mobile Edge markets
- Large portion of our revenue is fixed, and committed long term with high, predictable margins
- Strong balance sheet to support strategic initiatives in exciting markets
- Accelerating our growth through strategic acquisitions & execution on key programs
- Growth initiatives provide leverage to operating model and improved cash flow
Thank You
## Reconciliation of Non-GAAP Financial Measures

<table>
<thead>
<tr>
<th></th>
<th>Q3 2016</th>
<th>Q4 2016</th>
<th>Q1 2017</th>
<th>Q2 2017</th>
<th>Q3 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAAP Net Income (Loss)</td>
<td>4</td>
<td>(3)</td>
<td>3</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Adjustments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock-based compensation</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Acquisition-related transaction costs &amp; retention bonus</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Purchase accounting adjustment for inventory fair value step-up</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Amortization</td>
<td>10</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Impairment of long-lived assets</td>
<td>2</td>
<td></td>
<td></td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Adjustment to contingent consideration</td>
<td>(7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-cash interest expense</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Provision for (benefit from) income taxes</td>
<td>(5)</td>
<td>(9)</td>
<td>(3)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
<tr>
<td>Non-GAAP Net Income</td>
<td>18</td>
<td>19</td>
<td>19</td>
<td>16</td>
<td>22</td>
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</table>

<table>
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<tr>
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<th>Q2 2017</th>
<th>Q3 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAAP Operating Income</td>
<td>12</td>
<td>1</td>
<td>13</td>
<td>8</td>
<td>17</td>
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<td>0</td>
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<tr>
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<td>1</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-GAAP Operating Income</td>
<td>29</td>
<td>30</td>
<td>31</td>
<td>25</td>
<td>35</td>
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<tr>
<td>Depreciation</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Adjusted EBITDA</td>
<td>32</td>
<td>34</td>
<td>34</td>
<td>29</td>
<td>38</td>
</tr>
</tbody>
</table>

Certain amounts may be off $1M due to rounding.
## Revenue and Licensing Billings

<table>
<thead>
<tr>
<th></th>
<th>Q1'16</th>
<th>Q2'16</th>
<th>Q3'16</th>
<th>2016 YTD</th>
<th>Q1'17</th>
<th>Q2'17</th>
<th>Q3'17</th>
<th>2017 YTD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royalty Revenue</td>
<td>62.9</td>
<td>62.8</td>
<td>68.3</td>
<td>194.0</td>
<td>69.0</td>
<td>70.0</td>
<td>72.8</td>
<td>211.7</td>
</tr>
<tr>
<td>Product Revenue</td>
<td>3.3</td>
<td>3.9</td>
<td>7.1</td>
<td>14.3</td>
<td>10.9</td>
<td>8.4</td>
<td>8.7</td>
<td>28.0</td>
</tr>
<tr>
<td>Contract and Other Revenue</td>
<td>6.5</td>
<td>9.8</td>
<td>14.5</td>
<td>30.7</td>
<td>17.6</td>
<td>16.3</td>
<td>17.7</td>
<td>51.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>72.7</td>
<td>76.5</td>
<td>89.9</td>
<td>239.0</td>
<td>97.4</td>
<td>94.7</td>
<td>99.1</td>
<td>291.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Q1'16</th>
<th>Q2'16</th>
<th>Q3'16</th>
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<td>70.0</td>
<td>72.8</td>
<td>211.7</td>
</tr>
<tr>
<td>Licensing Billings¹</td>
<td>61.7</td>
<td>66.6</td>
<td>71.5</td>
<td>199.8</td>
<td>68.6</td>
<td>72.9</td>
<td>71.5</td>
<td>213.0</td>
</tr>
<tr>
<td><strong>Variance</strong></td>
<td>-1.2</td>
<td>3.8</td>
<td>3.3</td>
<td>5.8</td>
<td>-0.4</td>
<td>2.9</td>
<td>-1.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

¹ Licensing billings reflect amounts invoiced to our patent and technology licensing customers during the period.

In Millions. Certain amounts may be off $0.1M due to rounding.
Product Overview
The Data Center

Data • Faster

- **Cores**
  - SerDes PHYs
    - Move data from chip to chip
  - Memory PHYs
    - Move data between chips and memory

- **Chips**
  - Server DIMM Chipsets
    - Enables more capacity at high performance
Optimized for power and area, our line-up of SerDes Interface solutions deliver maximum performance and flexibility for today’s most challenging systems.

**Fully Standards-Compatible**
- Compliant with the latest industry-standard specifications
- Support for multi-modal functionality

**Enhanced Design Flexibility**
- Support for multiple packaging options
- Enhanced margin and yield

**Reduced Power**
- Improved power efficiency
- Lower signaling and stand-by power

**Improved Performance**
- Increased data rates
- Improved bandwidth
- Higher capacity
Rambus High-Speed SerDes PHY Solutions

Complete Solutions: SerDes PMA+ PCS, MAC (Partners)

16G
28nm & 14nm
- PCIe 4/3/2
- CEI 11/6
- XFI/XAUI
- SATA
- SAS

28G
14nm & 7nm
- CEI-28/25/11/6
- 100/50/25GbE
- 10G-KR
- FC28
- XFI/XAUI

56G
10nm
- CEI-56G MR
- CEI-56G LR
- CEI-28/25/11
- 400GbE
- PAM-4/NRZ

112G
7nm
- 112G Single Lane
- CEI-56G MR
- CEI-56G LR
- CEI-28/25
- PAM-4/8

LEAD CUSTOMERS

IN DEVELOPMENT

Integrated tools for easy bring-up and characterization

- Easy-to-use PC Interface
- Interface to 3rd party software
- Pre-defined test scripts
- System characteristics and analysis
- PHY control settings

Validated solutions with partners

PLDA  avery design systems  CoMIRA solutions
With their reduced power consumption and industry-leading data rates, our lineup of enhanced memory interface solutions support a broad range of industry standards with improved margin and flexibility.

**Fully Standards-Compatible**
- Compliant with the latest JEDEC and industry-standard specifications
- Support for multi-modal functionality

**Enhanced Design Flexibility**
- Support for multitude packaging options
- Enhanced margin and yield

**Reduced Power**
- Improved power efficiency
- Lower signaling and stand-by power

**Improved Performance**
- Increased data rates
- Improved bandwidth
- Higher capacity
## Rambus Memory PHY Solutions

### Memory PHY Solutions for Networking and Data Center

<table>
<thead>
<tr>
<th>Technology</th>
<th>Technology Node</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDR4/3</td>
<td>28nm</td>
<td>- 3200Mbps&lt;br&gt;- x16 – x72-bits&lt;br&gt;- 1-4 Ranks&lt;br&gt;- DFI 4.0</td>
</tr>
<tr>
<td>HBM2</td>
<td>14nm</td>
<td>- 2000Mbps&lt;br&gt;- 1024-bit&lt;br&gt;- 2.5D design architecture</td>
</tr>
<tr>
<td>HBM3</td>
<td>7nm</td>
<td>- Expected 4000Mbps&lt;br&gt;- Complex design architectures</td>
</tr>
<tr>
<td>DDR5</td>
<td>7nm</td>
<td>- Expected 4800 – 6400Mbps</td>
</tr>
</tbody>
</table>

### Integrated tools for easy bring-up and characterization

- Easy-to-use PC Interface
- Interface to 3rd party software
- Pre-defined test scripts
- System characteristics and analysis
- PHY control settings

### Validated solutions with partners

- **Data • Faster • Safer**
- **ARM**
- **Mobiveil**

---

**IN DEVELOPMENT**
Built for speed, power efficiency and reliability, the DDRn chipsets for RDIMM, LRDIMM and NVDIMM server modules delivers the top-of-the-line performance and capacity needed to meet the growing demands on enterprise and data center systems.

Industry-leading Performance
• Fully-compliant with the latest JEDEC standards
• Operational speeds up to 3200 Mbps

Enhanced Margin
• Wide margin I/O design with advanced programmability
• Exceed JEDEC reliability standards for ESD and EOS

Optimized Power
• Advanced power management
• Frequency-based, low-power optimization

Superior Debug and Serviceability
• Integrated tools for bring-up and debug
• Works out-of-the-box with no BIOS changes required
Rambus Server DIMM Chipset Solutions

Server DIMM Chipsets: Delivering performance and capacity

**DDR3**
- JEDEC compliant
- Speeds up to 2133
- Multiple OEM qualifications

**DDR4**
- JEDEC compliant
- Speeds up to 3200
- Multiple OEM qualifications

**DDR4 NVRCD**
- JEDEC compliant
- Speeds up to 3200
- Ongoing qualifications

**DDR5**
- Consistent with JEDEC direction

Available in Production

Smart tools for easy integration and reduced time to market

- LabStation Platform
- Buffer Bios Integration Tool

Validated solutions with partners

- Samsung
- SK hynix
- Micron
Introducing DDR5 Server DIMM Chips

Rambus Announces Industry’s First Functional Silicon of Server DIMM Buffer Chipset Targeted for Next-generation DDR5 Memory Technology

Provides data center architects early path to next-generation memory speeds

SUNNYVALE, Calif. – Sept. 20, 2017 – Rambus Inc. (NASDAQ: RMBS) today announced functional silicon of a double data rate (DDR) server DIMM (dual inline memory module) buffer chip prototype for the next generation DDR5 memory technology. This represents a key milestone for Rambus and the industry’s first silicon-proven memory buffer chip prototype capable of achieving the speeds required for the upcoming DDR5 standard.
The Mobile Edge

Data • Safer

**Embedded Security**
- Secure Cores
  - Embedded device protection
- CryptoManager Platform
  - Secure provisioning and key management

**Secure Services**
- CryptoManager Trusted Services
  - IoT Security Service

**Secure Software**
- Mobile Payments
  - Secure payments and trusted transactions
- Smart Ticketing
  - Simplified travel with mobile ticketing
Embedded Security Cores

### DPA Resistance

**DPA Resistant Cores**
- Cores and services
- Accelerate integration & TTM

![Diagram of DPA Resistance Cores]

- Entropy In
- Key In
- Ctrl/Status

---

### Anti-Counterfeiting

**CryptoFirewall Cores**
- Consumable authentication
- Major printer OEMs

---

### Content Protection

**CryptoMedia Cores**
- Integrated into Set top boxes
- Broadcast and OTT

---

**Legend**
- Keys and Configuration Data
- Rights or EMM data
- ECM or content data
- DVB-CSA or AES Descrambler
- Trust Boundary
- Device authentication
- CW or Content decryption key
- Data from head-end or server
- Cache with (back-end) Encrypted messages
- Untrusted communication
- Peripheral
- Device SoC
- Interface Logic
- Masking
- LMDPL AES Engine
- PRNG
- Key Schedule
- State Machine
- Data In
- Data Out
- Keysound and Configuration Data
- Device SoC
From security cores to high performance secure device provisioning, the CryptoManager Embedded Security platform is a family of hardware security cores and provisioning infrastructure that creates a trusted path from the SoC manufacturing supply chain to downstream service providers with a complete silicon-to-cloud security solution.

**Improved Profitability**
- Improved time-to-market and reduced inventory waste
- Dynamic SKU and feature management lowers inventory costs
- Reduced operating costs through unified manufacturing and provisioning systems

**Superior Security**
- Provide a robust hardware root-of-trust
- Secure valuable secret keys, identity credentials, intellectual property, and other sensitive data
- Protect against cloning, counterfeiting, and reverse engineering

**Control the Value Chain**
- Actively monitor production status, availability, and inventory levels
- Validate process information through secure logs
- Proven in today’s high-volume manufacturing facilities
CryptoManager Embedded Security Infrastructure

**CryptoManager Service**
Control center used for monitoring and managing all provisioning activity, typically located in chip maker data center

**Root Server**
System Root-of-Trust, manages high value keys, kept in secure facility, authorizes all provisioning activity

**CryptoManager Appliances**
Tamper proof HSM-enabled devices that connect directly to testers in the manufacturing facility
Flexible cloud-to-silicon secure provisioning platform to host, operate and manage on device security services, lifecycle management and applications services for OEMs, service providers and operators.

**Device Lifecycle Management**
- Cloud-to-silicon security ecosystem
- Secure provisioning, authentication, and device protection

**Seamless Secure Connectivity**
- Proven platform used to provision billions of chipsets
- Establish independent trust between devices and services

**Flexible Platform Integration**
- Provisioning infrastructure offered both as a cloud service and as a standalone product
- Secure services implemented via a hardware or software root-of-trust
CryptoManager Platform Ecosystem

CryptoManager Platform

- Sell hosted service
- License software + sell appliances
- License cores + sell appliances

IoT Security Service

CM SDK and Infra

CM Core and Infra

Service Provider

Platform as a Service (PaaS) Provider

OEM

Chip Maker

Connected Devices
Certified and award-winning management software to enable secure integration with mobile OEM pay and independent mobile wallets for banks and retailers.

**Improved Time-to-market**
- Reduce implementation time with a unified platform to connect to payment schemes and OEM Pay
- Compatible with existing EMV schemes and contactless infrastructure

**Enhanced User Experience**
- Retain branding and drive digital engagement with mobile wallet
- Support loyalty programs, gift cards and more for a unified purchasing experience

**Superior Security**
- Maintain user privacy without sharing data with schemes
- Utilizes HCE with tokenization to minimize unauthorized use of cardholder data

**Reduced Cost**
- Eliminate tokenization fees from payment schemes
- Save on transaction fees as the issuing and acquiring bank
Enabling Mobile Payments for NFC Devices

Token Service Provider

- Leverages Host Card Emulation (HCE) and tokenization to enable secure mobile payments
- Single interface to connect with multiple schemes and OEM Pay platforms
- Maintained up-to-date with latest TSP specifications
### Scan and Go with In-aisle Check Out

<table>
<thead>
<tr>
<th>New Account</th>
<th>In-Aisle Purchase</th>
<th>In-store Advertising</th>
<th>Mobile Check Out</th>
<th>Complete Shopping</th>
</tr>
</thead>
</table>
| • Create account with retailer  
  • Load CC info | • Chose an item, photo/scan to add to virtual cart  
  • Place item in cart or collect on check-out | • Receive in-store coupons and recommendations based on cart items or geo-beacons  
  • Order-ahead goods or services | • Check out on mobile device and skip the lines  
  • Automatically accrue loyalty points | • Print or show mobile receipt  
  • Collect items  
  • Go home happy |
| Enable account-based retail  
  Create integrated online-to-in store experience | Gather customer purchasing data, shopping trends | Increase upsell and cross-sell opportunities | Reduce CC transaction fees with integrated retail CC payments  
  Reduce staff requirements for check-out lines  
  Free up more in-store sq. footage for product | Better user experience drives customer loyalty and brand equity |

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**Data • Faster • Safer**

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Suitable for multi-modal transport solutions including rail, bus, ferry and taxi, our end-to-end smart ticketing solutions can be implemented in any transport scenario.

Ease of Integration
• Comprehensive solutions from back office, to mobile device, to smart card
• Compatible with existing smart systems and suppliers

Improved Profitability
• Enhanced business intelligence through account-based ticketing and data analytics
• Easy management of transaction data to ensure correct reimbursements

Superior Security
• Reduced risk of fraud with smart technology versus paper tickets
Integrated Smart Transport Ticketing

Smart Transport Ticketing

- End-to-end smart ticketing solutions from back office processing and traveler analytics to online purchasing and remote download of tickets
- Leverages secure NFC and mobile technology to replace paper tickets
- Integrated systems for operators to manage passenger journey transactions and analytics to optimize transport systems
Going Ticketless with Frictionless Travel

**New Account**
- Create account
- Add CC info

**Ticketless Travel**
- Go to train & get on – no ticket required
- Receive updated schedules automatically

**In-transit Services**
- Receive location-based coupons
- Pay In-app

**Easy Payment**
- Get off train and go – fare automatically debited
- Lowest fare automatically selected

**Travel Assistance**
- Auto-updated with travel times of frequently traveled routes
- Receive loyalty/frequent rider discounts

**Consumer**
- Enable account-based ticketing to capture metadata for every user

**Retailer**
- Enable mobile GPS, tap on/off or geo beacons track fare
- Reduce/eliminate ticketing machines and monetize new rental space

**Easy Payment**
- Increase revenue from ancillary services

**Travel Assistance**
- Optimize routes and dispatch fleet based on traveler traffic
- Better user experience drives customer loyalty and frequency of travel
Emerging Solutions
Data • Smarter

Emerging Solutions
From concept to reality
Innovation • Research • Development
A research program focused on improving the performance and power efficiency of next-generation computing through cryogenic memory architectures.

**Improved Performance**
- Cryogenic computing has potential to provide step function increases in speed, latency, and bandwidth.

**Enhanced Power Efficiency**
- Cryogenic Computing potentially provides a multiple order of magnitude reduction in CPU power.

**Spatial Density**
- Significant increase in bit density scaling and increase interconnect speeds.
Expanding to Prototypes
Thank you