Safe Harbor Notice

Except for the historical information contained herein, the matters addressed in this presentation are forward-looking statements that involve certain risks and uncertainties that could cause actual results to differ materially, including but not limited to weather, impact of competitive products and pricing, industry-wide shifts in the supply and demand for semiconductor products, rapid technology change, semiconductor industry cycle, and general economic conditions.

Except as required by law, Andes undertake no obligation to update any forward-looking statement, whether as a result of new information, future events or otherwise.
Agenda

- Overview of Andes Technology Corporation
- Operating Results
- Product Applications
- New Products and Ecosystems
- Andes Awarded
- Concluding Remarks
Overview of Andes Technology Corporation

Andes Highlights

• Founded in March 2005 in Hsinchu Science Park, Taiwan, ROC.
• Well-established high technology IPO company
• Just over 170 people; 80% are engineers.
• EETimes' Silicon 60 Hot Startups to Watch (2012)
• TSMC OIP Award “Partner of the Year” for New IP (2015)
• A founding member of RISC-V Foundation (2016)
• MCU innovation award by China online press (2018)

Andes Mission

• Innovate performance-efficient processor solution for low-power SoC

Emerging Opportunities

• Smart and Green electronic devices
• Cloud Computing and Internet of Things and Machine Learning
Operating Results
>160 commercial licensees

- Geographically distributed in Taiwan, China, Korea, Japan, Europe, and USA.

>250 license agreements signed

AndeSight™ IDE:

- >14,000 installations

Eco-system:

- >140 partners

>3.6B Accumulative SoC Shipped by the end of 2018
Agreement Growth Analysis

- **IP agreements**
  - 2006: 1
  - 2007: 2
  - 2008: 3
  - 2009: 6
  - 2010: 12
  - 2011: 16
  - 2012: 16
  - 2013: 24
  - 2014: 27
  - 2015: 27
  - 2016: 31
  - 2017: 39
  - 2018: 43

- **Accumulated IP agreements**
  - 2006: 1
  - 2007: 3
  - 2008: 6
  - 2009: 12
  - 2010: 24
  - 2011: 40
  - 2012: 56
  - 2013: 80
  - 2014: 107
  - 2015: 134
  - 2016: 165
  - 2017: 204
  - 2018: 247
1Q19 Revenue Analysis

**1Q19 Revenue Analysis**

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Revenue (NT$ thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Q18</td>
<td>34,681</td>
</tr>
<tr>
<td>4Q18</td>
<td>125,624</td>
</tr>
<tr>
<td>1Q19</td>
<td>78,386</td>
</tr>
</tbody>
</table>

**Year-over-Year (YoY)**

+126.0%

**Quarter-over-Quarter (QoQ)**

-37.6%
1Q19 Top 10 Customers Analysis by Revenue

Top 10 Customer Contributed
88% Revenue

(NT$ thousands)
Total Customers Annual and Accumulated Shipment

(Unit: M ps)

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Shipment</td>
<td>590</td>
<td>1,132</td>
</tr>
<tr>
<td>Accumulated Shipment</td>
<td>2,500</td>
<td>3,632</td>
</tr>
</tbody>
</table>
1Q19 Royalty Analysis

QoQ -16.4%
YoY +152.8%

(NT$ thousands)

- 35,000
- 30,000
- 25,000
- 20,000
- 15,000
- 10,000
- 5,000
- 0

1Q18 4Q18 1Q19

9,501 28,744 24,021
1Q19 Top Ten Royalty Contributors Analysis by Application

Top 10 Royalty Customers Contribution Analysis: 96%

(NT$ thousands)
Consolidated Gross Margin

(NT$ thousands)

<table>
<thead>
<tr>
<th></th>
<th>1Q18</th>
<th>4Q18</th>
<th>1Q19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Profit</td>
<td>34,548</td>
<td>125,574</td>
<td>78,098</td>
</tr>
<tr>
<td>Gross Margin</td>
<td>99.62%</td>
<td>99.96%</td>
<td>99.63%</td>
</tr>
</tbody>
</table>
Consolidated Operating Expenses

YoY +83.9%
QoQ +19.8%

(NT$ thousands)

<table>
<thead>
<tr>
<th>Date</th>
<th>R&amp;D expenses</th>
<th>Administration expenses</th>
<th>Selling expenses</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Q18</td>
<td>23,933</td>
<td>12,644</td>
<td>19,123</td>
<td>55,700</td>
</tr>
<tr>
<td>4Q18</td>
<td>39,928</td>
<td>15,138</td>
<td>30,457</td>
<td>85,523</td>
</tr>
<tr>
<td>1Q19</td>
<td>54,110</td>
<td>18,088</td>
<td>30,226</td>
<td>102,424</td>
</tr>
</tbody>
</table>

QoQ +19.8%

R&D expenses
Administration expenses
Selling expenses
Consolidated Operating Income (Loss)

- **QoQ**
  - **-160.7%**
- **YoY**
  - **+15.0%**

**(NT$ thousands)**

<table>
<thead>
<tr>
<th>Period</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Q18</td>
<td>(21,152)</td>
</tr>
<tr>
<td>4Q18</td>
<td>40,051</td>
</tr>
<tr>
<td>1Q19</td>
<td>(24,326)</td>
</tr>
</tbody>
</table>
Consolidated Operating Margin

YoY +29.96 pt
QoQ -62.91 pt

(NT$ thousands)

1Q18 4Q18 1Q19

31.88%

(60.99%) (31.03%)
Consolidated Net Income (Loss)

- YoY: +10.4%
- QoQ: -158.9%

Consolidated Net Income (Loss)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Net Income (Loss) (NT$ thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Q18</td>
<td>(21,380)</td>
</tr>
<tr>
<td>4Q18</td>
<td>40,070</td>
</tr>
<tr>
<td>1Q19</td>
<td>(23,599)</td>
</tr>
</tbody>
</table>
Consolidated Net Profit Margin

- QoQ: -62.01 pt
- YoY: +31.54 pt

(NT$ thousands)

1Q18: 31.90%
4Q18: (30.11%)
1Q19: (61.65%)
Consolidated Earnings Per Share

Consolidated Earnings Per Share

QoQ -1.48  YoY -0.05

(NT$)

0.90
0.60
0.30
0.00
(0.30)
(0.60)
(0.90)

1Q18
(0.50)

4Q18
0.93

1Q19
(0.55)
1Q19 Revenue Analysis by Payment Model

(1Q19 New Agreements: 7)

- License Fee: 41%
- Running Royalty: 31%
- Custom Computing Service: 21%
- Maintenance & Others: 7%
1Q19 Revenue Analysis by Region

- **Taiwan**: 51%
- **China**: 18%
- **USA**: 22%
- **Europe**: 6%
- **Korea**: 2%
- **Japan**: 1%

*Confidential*
2018 Customer Application Analysis

*Based on agreement number

- IoT: 28%
- Artificial Intelligence: 19%
- Storage: 14%
- Others: 9%
- Sensing: 9%
- Navigation: 7%
- Networking: 7%
- Automotive: 5%
- 5G: 2%
1Q19 Customer Application Analysis

*Based on agreement number
1Q19 Revenue Analysis - RISC-V

(NT$ thousands)

<table>
<thead>
<tr>
<th></th>
<th>1Q18</th>
<th>4Q18</th>
<th>1Q19</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30,305</td>
<td>90,918</td>
<td>57,779</td>
</tr>
<tr>
<td>V3</td>
<td></td>
<td>34,706</td>
<td></td>
</tr>
<tr>
<td>RISC-V</td>
<td>4,376</td>
<td></td>
<td>20,607</td>
</tr>
<tr>
<td></td>
<td>13%</td>
<td>28%</td>
<td>26%</td>
</tr>
</tbody>
</table>
Product Application
Andes Updates

- A 14-year-old public CPU IP company
- >1B Andes-Embedded SoC shipped in 2018. >3.6B cumulatively.
- A founding member of the RISC-V Foundation
- A major open source maintainer/contributor
- Active involvement in standard extensions
  - Chair of P-extension (Packed DSP/ SIMD) Task Group
  - Co-chair of Fast Interrupt Task Group

GNU Toolchains
LLVM
Linux
Example Applications of Andes-Embedded™ SoC

**Consumer**
- Touch Screen
- eBook/eDictionary
- Power management
- Bio-medical device
- CMNB
- MCU
- TCON

**Storage & Sensor**
- USB3.0
- SSD, eMMC
- Anti-virus
- Sensor Hub
- mSATA
- Secure SD
- Fingerprint Recognition

**Communication & IoT**
- Wireless display
- WiFi, Bluetooth
- GPS, GPON, NFC
- Gateway/router
- Portable Karaoke
- Sigfox LP WAN
- IoT Cat0 base station
- IoT MCU
- ESL
- Smart Meter
- Smart Lighting

**Industrial & Video**
- Motor Control
- Wireless Charger
- Surveillance
- Barcode scanner
- ADAS
- VEDR
- 4K2K CODEC
- 8K4K CODEC
- and more....
IoT Application - 1

- Bluetooth Speaker
- Sigfox LPWAN
- Healthcare device
- Wearable device
- Electronic price tags
- Sensor Hub
IoT Application -2

- Wearable devices
- Drone
- Portable Karaoke
- WiFi/ GPS/ FM/ Bluetooth combo
- GPS/ Beido in shared bikes
- Contactless payment (NFC)
Andes Embedded in Smart Phones

1 in 5 Smart Phones are with Andes Embedded
Andes Embedded in Consumer Devices, Cars and Datacenters

- Switch: MXIC Flash Ctrl
- Echo Dot2: Mediatek WiFi IoT
- Bike Sharing: GPS Ctrl
- X-Trail: ADAS Ctrl

- In leading machine learning computers for datacenter
- In tier-one switch routers for datacenter

- Recent applications: 5G networking, 802.11ax, machine learning processors (using Andes Custom Extension, ACE)
New Products and Ecosystems
Product Lines

♦ New A-series Cores released in Andes Embedded Forum 2018
Andes RISC-V Product Overview

Best extensions to RISC-V

**AndeStar™** Architecture V5

- Highly optimized design with leading PPA
- Professional IDE with high code quality
- Extensive SW stacks from bare metal, RTOS to Linux

**AndesCore™** Processors

**AndeSight™** Tools

**AndeShape™** Platforms

**AndeSoft™** Stacks

Driving Innovations™ 3
V5 AndesCore™ Processors

N22/D22
N25F/NX25F/D25F
A25/AX25
A25MP/AX25MP
### Launch of RISC-V Core IP Series

<table>
<thead>
<tr>
<th><strong>Cache-Coherent Multicores</strong></th>
<th><strong>A25MP</strong>&lt;sup&gt;a&lt;/sup&gt;</th>
<th><strong>AX25MP</strong>&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/2/4 A25, L2$, L1/IO coherence</td>
<td>1/2/4 AX25, L2$, L1/IO Coherence</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Linux with FPU/DSP</strong></th>
<th><strong>A25</strong></th>
<th><strong>AX25</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N25F, MMU, DSP</td>
<td>NX25F, MMU, DSP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Fast/Compact with FPU/DSP</strong></th>
<th><strong>N25F/D25F</strong></th>
<th><strong>NX25F</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V5/32b, FPU, PMP, DSP (D25F)</td>
<td>V5/64b, FPU, PMP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Slim and Efficient</strong></th>
<th><strong>N22</strong></th>
<th><strong>D22(F)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V5[e]/32b, 32/16 GPR</td>
<td>N22, DSP, FPU</td>
</tr>
</tbody>
</table>

- **A25MP**: 28HPC+ RVT, SS, 0.81V, 0C, with I/O constraints.
- **AX25MP**: 5-stage, A, C, E, >1.2GHz
- **NX25F**: 2-stage, 700 MHz
- **N22**: 2-stage, >1.2GHz
Bring Andes Strength to RISC-V Core Family

- Architecture beyond the kernel for diversified requirements
- Efficient processor pipeline for leading PPA
- Platform IP support to help speed up SoC construction
- AndeSight IDE, and compiler/library optimizations
- RTOS and Linux support, and middleware (such as IoT stacks)
- Commercial-grade verification for all products
- Mass production experience with high quality deliverables
- Professional supporting infrastructure
V5 AndesCores: 25-series

- **N25F: 32-bit, NX25F: 64-bit**
  - From scratch for the best PPA
  - Very configurable

- **AndeStar V5 ISA**

- **5-stage pipeline**

- **Configurable multiplier**

- **Optional branch prediction**

- **Flexible memory subsystem**
  - I/D Local Memory (LM): to 16MB
  - I/D caches: up to 64KB, 4-way
  - Optional parity or ECC
  - Hit-under-miss caches
  - load/store: unaligned accesses

- **N25F sample configurations @TSMC 28HPC+ RVT:**
  - Small config: 37K gates, 1.0 GHz (worst case)
  - Large config: 130K gates, 1.2GHz (worst case)
  - Best-in-class Coremark: 3.58/ MHz
V5 AndesCores: 25-series

- **Fast-n-small for control tasks in AR/VR, networking, storage, AI**

- **N25F/NX25F: +FPU**
  - +, −, x, x+, x−: pipelined 4 cycles
  - ÷, √: run in the background
    - 15 for SP, 29 for DP
  - FP load/store: support HP

- **A25/AX25: +FP +Linux**
  - Support RISC-V MMU and S-mode
  - 4 or 8-entry ITLB and DTLB
  - 4-way 32~128-entry Shared-TLB

- **Whetstone/MHz**:

![Chart showing performance comparison between N25F and competitor cores](chart.png)

- N25F CM7 CA7
- Competitor Core 1
- Competitor Core 2
- DP
- SP

40
V5 AndesCores: 22-series

- **AndeStar V5 or V5e ISA**
  - RV32-IMC or RV32-EMC
  - Plus Andes extension
- **2-stage pipeline with AHB-lite main bus**
- **Rich baseline options:**
  - I/D Local Memory (1KB~512MB), I cache
  - Fast or small multiplier, branch predictions
  - Up to 16-entry PMP, StackSafe
  - M-mode, or M+U-mode
  - APB private peripheral port, fast IO port
  - WFI, WFE, and PowerBrake
  - Vectored and preemptive interrupt controller
- **Advanced options: ACE, DSP, FPU**
- **28nm PPA:**
  - 700 MHz (worst case)
  - <15K gates (minimal)
- **Best per-MHz performance:**
  - 1.8 DMI PS (no inline)
  - 3.95 Coremark
A(X)25MP Cache-Coherent Multicore

- 1/2/4 A25 (32-bit)/ AX25 (64-bit) CPUs
  - RV-IMACFD ISA, supporting SMP Linux
  - With the latest P-extension (DSP/SIMD ISA), Andes’ contribution to RISC-V

- Hardware Multicore Cache Coherence
  - Support MESI cache coherence protocol by ACU (Andes Coherence Unit)
  - Support I/O coherence without data caches

- Level-2 Cache Controller
  - 0/128/256K...2MB, 32-byte line, 16-way
  - ECC, SECDED support

- Bus Interfaces
  - AXI bus master interface
  - Local memory slave port, for each A25/AX25 CPU
  - I/O coherence slave port
  - MP subsystem vs. bus interface synchronous N:1 clock ratio

- Platform Level Interrupt, Debug and Trace Support
ACE: Andes Custom Extension

COPilot
Custom-OPtimized Instruction deVelopment Tools

Automated Env. For Cross Checking

Test Case Generator

Extended RTL
Extended ISS

Compiler
Asm/ Disasm
Debugger
IDE

CPU ISS (near-cycle accurate)

CPU RTL

Extensible Baseline Components

Executable or library

Source file

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Aggressive in RISC-V Community

Foundation Task Groups (partial list)

- Contributing hardware architecture extensions
  - Chair of the P-extension (Packed SIMD/DSP) Task Group
  - Co-chair of Fast Interrupts Task Group
  - Closely reviewing activities of other Task Groups
Andes Helps Strengthen RISC-V Ecosystem

► More choices for customers are good
► Andes works closely with partners to grow RISC-V ecosystem
RISC-V Software Ecosystem: GNU Toolchain

- **GCC, binutils**: May, 2017
- **Newlib**: Aug, 2017
- **Glibc (rv64i)**: Feb, 2018
- **GDB**: Mar, 2018
- **OpenOCD**: July, 2018
- **Glibc (rv32i)**:
  - Submitted in July 2018 (by Andes)
  - Review in progress
RISC-V Software Ecosystem: LLVM Compilation

- **LLVM:**
  - RV32IMAFDC: June, 2018
  - Relaxation: May, 2018 (by Andes)
  - 64b support: Nov, 2018
  - Missing hard=float calling convention

- **compiler-rt:** Mar, 2018

- **LLD:** Aug, 2018 (by Andes)
  - Initial port (relocation and TLS) in Oct. 2017
  - Dynamic linking review in progress since Oct, 2017
  - Missing link-time relaxation
- **U-boot**: Jan, 2018 (by Andes)
- **Kernel (rv64i)**: Jan, 2018
- **Key utilities**: (by Andes)
  - Perf: Feb, 2018
  - Kernel Module: May, 2018
  - Ftrace: May, 2018
- **Kernel (rv32i)**: Jun, 2018 (by Andes)
- **Kernel with CONFIG_FPU**: Oct, 2018 (by Andes)
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Andes Position in RISC-V

- Complete product portfolio
- Reliable RISC-V core IP provider
- RISC-V cores that run Linux
- Extreme low power consumption, high computing efficiency
- World’s leading Customer-Extension Capable RISC-V Core

Driving Innovations™
Two Ecosystems: Andes and Knect.me
Built up Ecosystem **knect.me** to help IoT Developing
- **knect** solutions - Silicon IP’s, SW stacks, tools, applications, systems and products

Includes:
- SoC IP Platforms
- Software Stack
- Development Boards
- Development Tools

To Form a IoT League
- **knect** chip vendors, partners, application developers, system vendors
Andes Awarded
Leader of the Emerging Technology

“2018 Top25 emerging tech solutions provider”
— CIO Advisor Magazine

CIO Advisor honors
Andes Technology Corporation
with
Top 25 APAC Emerging Tech Solution Providers - 2018
For exhibiting excellence in delivering Emerging Tech solutions for the Asia-Pacific region.
Concluding Remarks
Andes revealed new RISC-V processor cores (N22, A(X)25MP, D25F) to fit in more applications from customers.

Andes aggressively involved in RISC-V Foundation new technology development, contributing and leveraging RISC-V eco-system.

Andes has successively signed more than fifteen contracts with design service houses to authorize ASIC design to embed RISC-V core (i.e. Andes RISC-V Easy Start Program) for a win-win creation for Andes, design service houses and customers.