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Thank you.

Hello everyone, I'm pleased to meet **all of you** here today.

My name is Daewon Kim, and I'm a director of "Vehicle Component Dept" at Thinkware in Korea.

Today, I would like to present e-Call, and ADAS combined device its benefit and potential business opportunities.

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Let's get started with the "Thinkware" company overview.

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Thinkware began with a location-based service, car navigation system, in 1987 in South Korea. It has expanded to the dashcam and automotive components area. As progress, it occupies one of the top brands and significant market share with strong **intellectual** properties and **patents**.

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Thinkware owns a factory that is capable of 2million units per year in South Korea.

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Also, Thinkware has many automotive OEM, ODM, DIO references.

Since 2020, Thinkware has been a **Tier-1 supplier** of Hyundai Kia Motor Company and BMW.

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For the Korean market, Thinkware covers all aspects of the value chain and provides excellent customer satisfaction.

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Thinkware delivers one of the best values to the customer for the global market with its branches and sales channels.

You can see US, Canada, China, and Japan branches.

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And many sales partners around the globe.

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Here are some evidence for the global brand competitiveness, such as the recommendations from famous IT media, twice winner of CES innovation awards, and many international product design awards as well.

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Now, I would like to show you dashcam technology.

Most of these technologies are driven first by Thinkware in the market.

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Particularly in connected dashcam services,

Thinkware has provided **a kind of proprietary e-Call service** for more than **five** years.

But it turns out there are limitations in proprietary e-Call service.

Initially, the cost should be higher on both **the operation** and **the device price**.

High cost **leads** to **a low** market **penetration** rate.

The small number of customers **leads** to **high** operating **costs** and reduces the chance for **direct** collaborating with a **rescue agency**.

As a result, it ends up with "delayed rescue" and no customer satisfaction.

So we need to step to the next level.

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Here is Thinkware's first e-Call and ADAS combined device.

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This device consists of three parts, camera, main controller, and touch screen indicator.

The main features are composed of three functions, ADAS, e-Call, and dashcam.

It has deep learning capable CPU and GPU with an automotive 9-Axis IMU sensor and an **ultra-sensitive** image sensor that can detect lanes and vehicles at night, even without headlights.

Let me show you **a short demo** here.

The left side is recorded in this device. So you can see everything, while on the right side you can only see nothing but taillights. Sometimes in extreme weather conditions, the human eye can't see lane mark like this.

At the bottom on the left side, you can see the estimated **distance** in the meter unit. All right next.

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Here is the Korean NCAP Forward Collision Warning test result

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And Lane Departure Warning test result.

With NCAP style ADAS test results,

I can say that ADAS quality **is the same as** automotive products.

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You can see a wide range of environmental and electrical specification test results that give product reliability, especially in HW.

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On the other hand, precise accident detection and analysis are **essential** for e-Call. Thinkware has been collecting more than 4,000 real car accident videos with IMU data by now. Two thousand two hundred actual car accident data and **several crash test data** have been analyzed.

I will show you two examples here.

First, This is a collected **real** car accident video.

Second, e-Call crash test video.

You can see **raw data**, after **calibration** data, and **estimated** impact amount, respectively.

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This device isn't just a prototype. Thinkware sold about 20,000 units in the year 2019 in Korea with the help of a government ADAS subsidy program. But unfortunately, there was no available Automatic Emergency Response Centre, and I had to make the e-Call feature disabled and removed some HW parts. Back then, there was no choice.

But, as you can see significant effects.

Injured people had reduced 34%, and accidents had decreased 30%. What an impressive result!

But when it comes to fatality, the decrease was only 16%.

Why?

Well, this result comes from ADAS, not from e-Call.

As far as I can see, none of the ADAS today can prevent fatal accidents perfectly. However, I believe if we could have e-Call, we would see more fatality drops in tomorrow.

So, why should we consider ITU-T e-Call in the first place?

First, it is based on international standards, not proprietary, **so** many companies can participate, encouraging competition and reducing cost. Second, we can apply it to new cars and a large number of existing cars effectively.

As a result, ITU-T e-call will be a more affordable and cost-effective way to save lives and will be able to reduce a **tremendous** amount of **social costs** from car accidents.

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Thinkware is looking forward to the wide adoption of ITU-T e-Call in the globe.

Then, we will see many life-saving and more sustainability.

I hope to see that moment with you soon.

We want to find business opportunities with you in many ways.

For example, we can provide a turn-key solution, perform a POC project, sell reference HW/SW.

Or We can make it even better.

Please don't hesitate to get in touch with me, if you need further information.

Thank you

I appreciate your time and attention.

Q&A session

Q1. What makes you decide to combine e-Call and ADAS in one device?

A1.

Actually, Thinkware implemented three things, ADAS, e-Call, and dashcam, into one device.

There are some reasons.

First, preventing is always better than rescuing faster.

Second, the installation cost is relatively high even with one featured device.

In other words, we can make one featured device cheaper, but then the installation cost is almost the same level as the device itself.

Last but not least, drivers want to have a dashcam function if it has a camera in any way.

Q2. What are the advantages of ITU-T e-Call when it is compared with others?

A2.

With proprietary e-Call, I already remarked its limitations.

ITU's e-Call is cost-effective and easy to adopt than other standard e-Call such as EN 15-7-22 or IETF RFC 81-47.

Without an expensive automotive mobile communication module, it can work with the driver's smartphone tethering.

So we can install it in new cars and existing cars.

The penetration rate is essential when you want to see an impressive result. For example, in 2019, the Korean government subsidy program applied only 20 tons of heavy-duty trucks. That is less than 10% of all trucks. We can see only 6-10% of drops in the year 2020 data. Not impressive at all.

Why?

My assumption is simple.

A car accident happens with other cars, usually not happened alone.

Let's image two cars involved accident model.

We randomly pick up two toy cars out of a box, containing only 10% of toy cars that have e-Call. So then we will get about a 20% chance to get at least one of them to have an e-Call.

But if 50% of toy cars in a box have e-call, we will get about a 76% chance of being rescued with the help of e-call.

We better spread e-Call widely.