Production benefits of Longer Range, NLOS Collision avoidance.

Presented by

Richard Doyle

Greek Goddess Theia

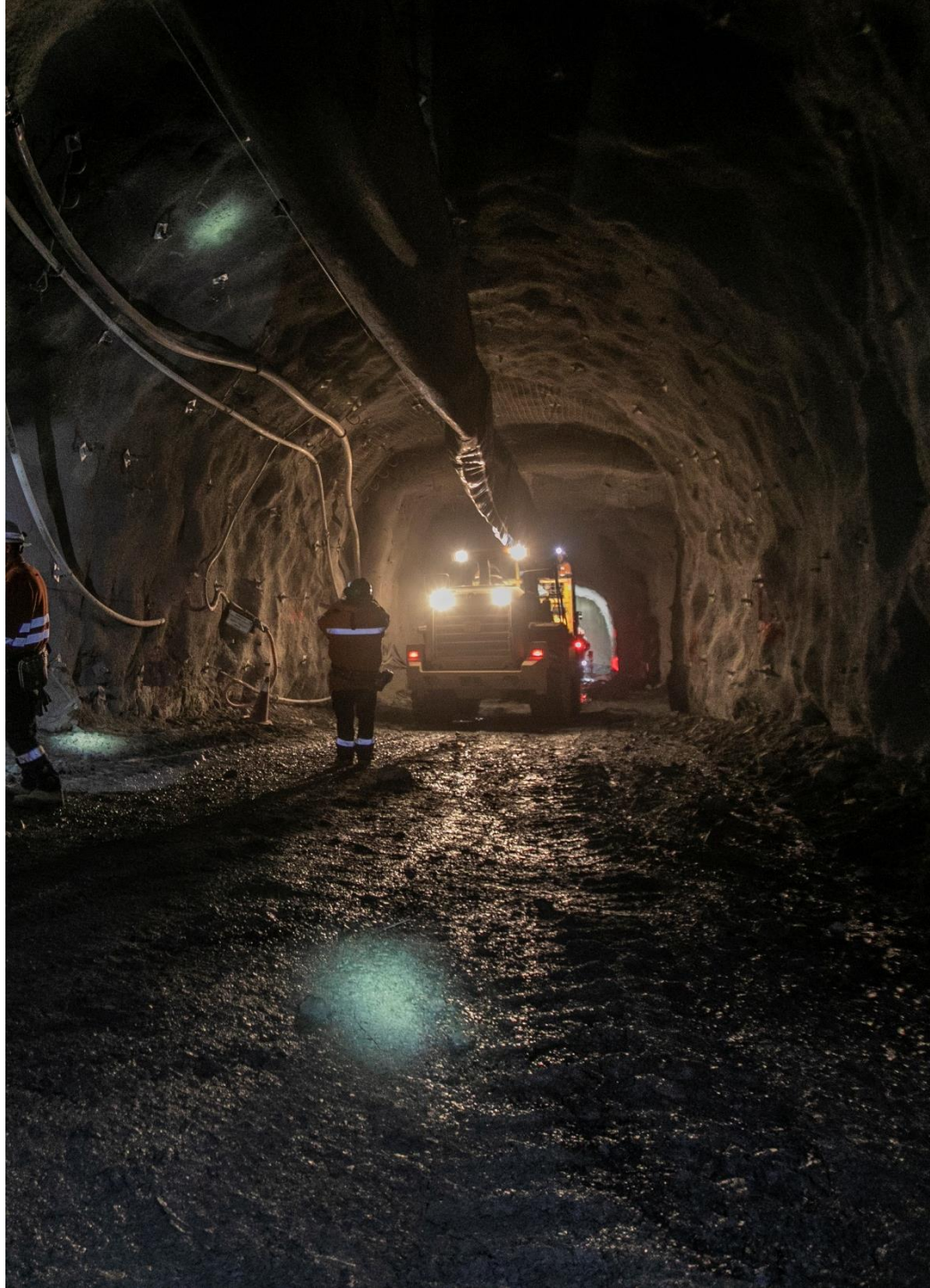
- The **Greek goddess of sight and vision**, and by extension the goddess who endowed gold, silver, and gems with their brilliance and intrinsic value.

Mining is Foundational

- **Infrastructure**
- **Technology**
- **Industry**

NLOS Collision Awareness & Productivity

- **Hazard**
- **Technology**
- **Productivity**

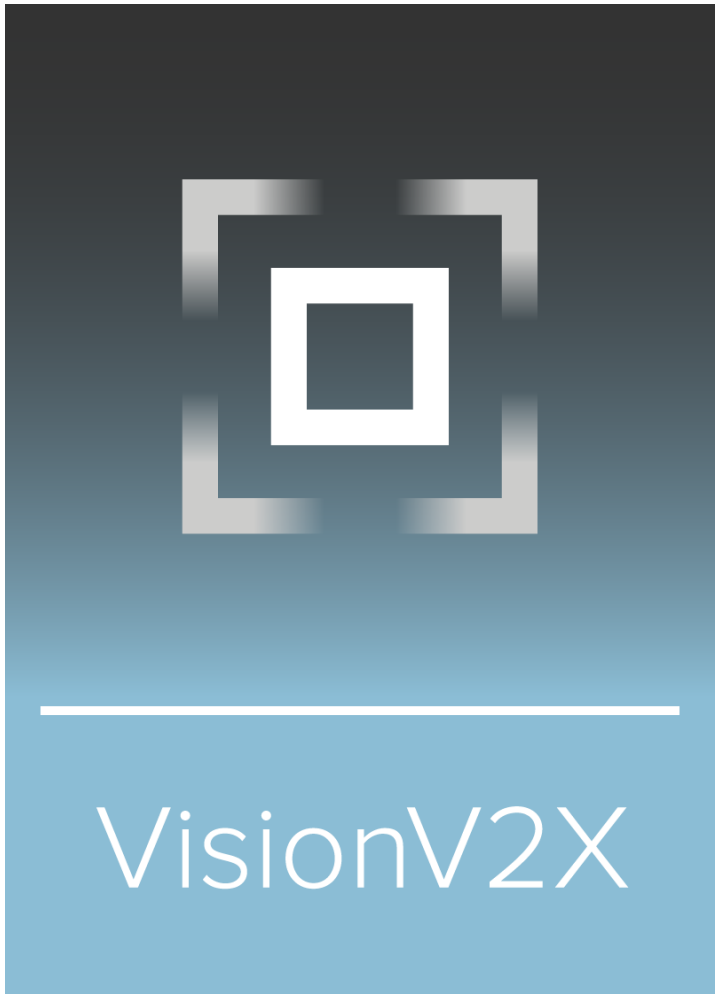


Underground Mining Safety Challenge

- **Mobile equipment interactions underground as most hazardous**.
- **30%-40% of industry deaths** are attributable to failures of **vehicle-to-vehicle (V2V) or Vehicle to Personnel (V2P) interaction controls**.
- It is crucial to understand the positioning of vehicles to vehicles and to pedestrians.
- **GNSS** deprived environments represents a huge challenge in that aspect.
- It cannot be assumed that surface CAS technology can work the same way or be as effective underground

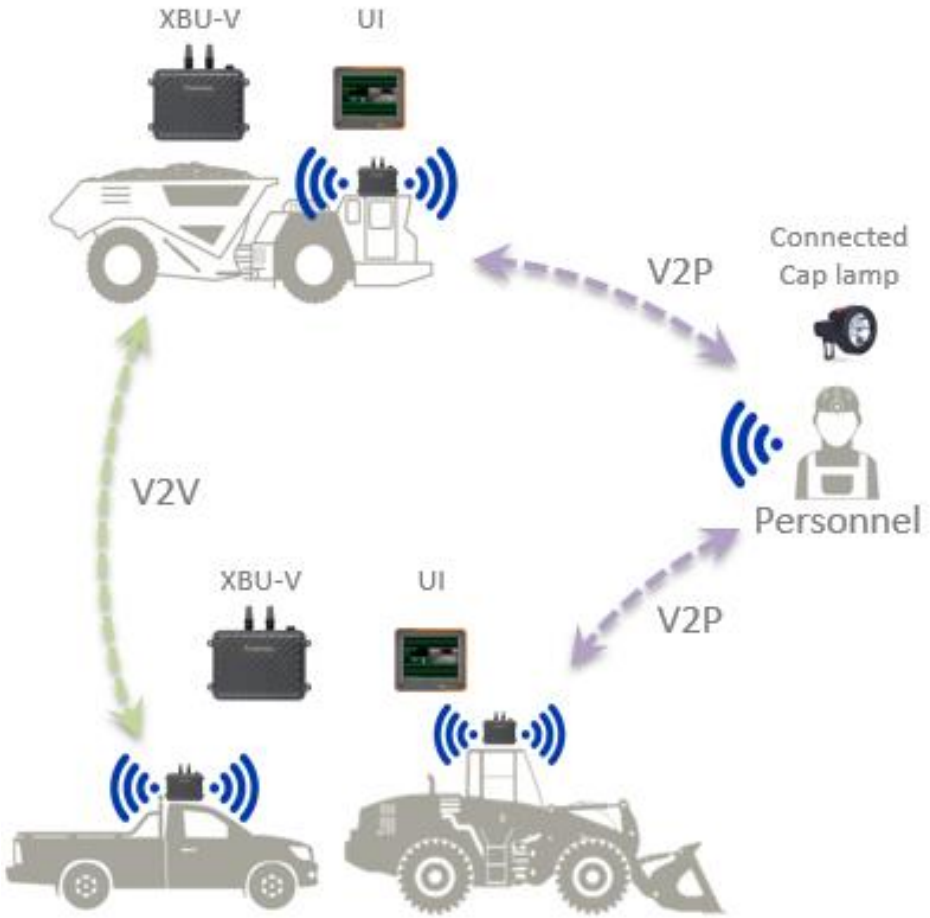
Introducing VisionV2X ?

- VisionV2X is a Safety System developed for underground mining.
- VisionV2X delivers, by way of V2X technology, ranging & positioning data even in GNSS-denied environments
- VisionV2X is an existing solution with a major deployment as a reference with almost 2 million operational testing hours
- With VisionV2X, Maptek is actively engaged in EMESRT process and associated initiatives



VisionV2X - How does it work?

Working Principle - designed to deliver detection without the need for infrastructure



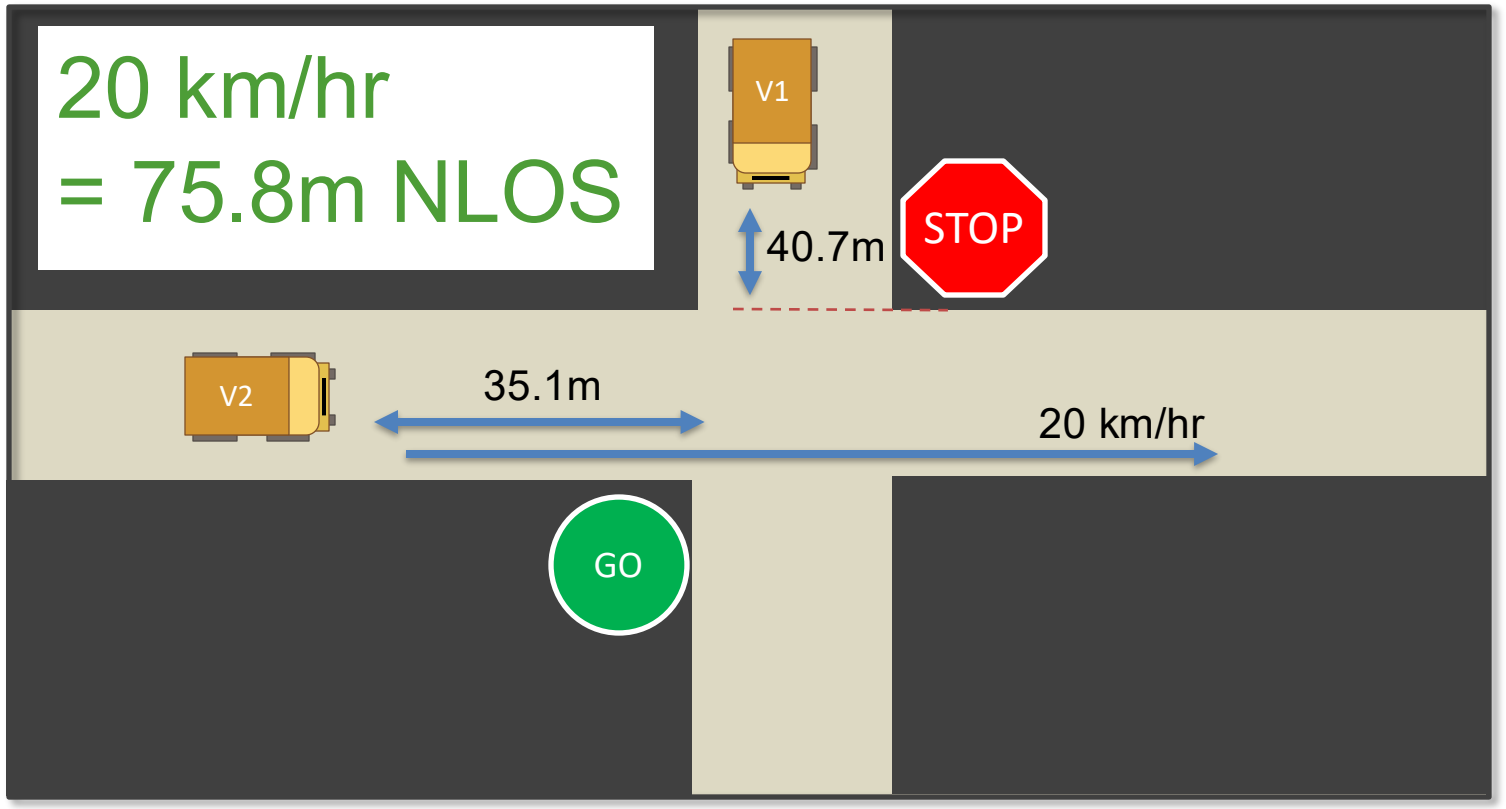
Vehicle to Vehicle




- XBU-V (On Board Unit)
- **DSRC** Dual IEEE 802.11p, CAN, Ethernet 100 Base-T
- Rugged PC panel

Vehicle to Personnel


- software embedded on a small tag
- Personal tag Integrated in cap lamp or belt tag

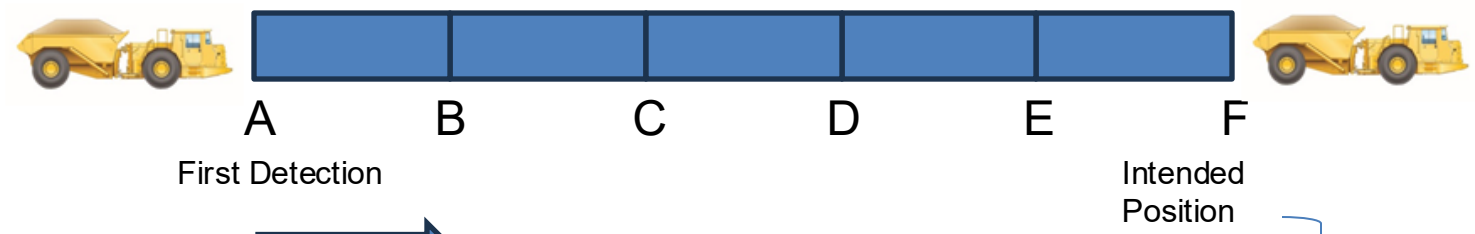


Scenario

- V1 slows down and comes to a stop at the intersection
- V2 continues through the intersection

Assumptions

> No infrastructure
> No GNSS
> Intersection with No line of sight
> Distance of first detection assessed per ISO 21815 - 3:2023(E)



T_{AB} Time to Detect
T_{BC} Time to Alert
T_{CD} Time to React
T_{DE} Time to Decelerate
T_{EF} Margin

T_{AC} = 1.5s

T_{CD} = 2.74s, 1.5s recognition, 1.24s action, ISO 21815 – 3:2023(E)

Deceleration = 2.75 m/s^2, ISO 19296:2018

D_{DE} = 4 m, 2m error + 2m safety

50 Metres Pseudo Standard?
Why?

NLOS – Detection distance at speed

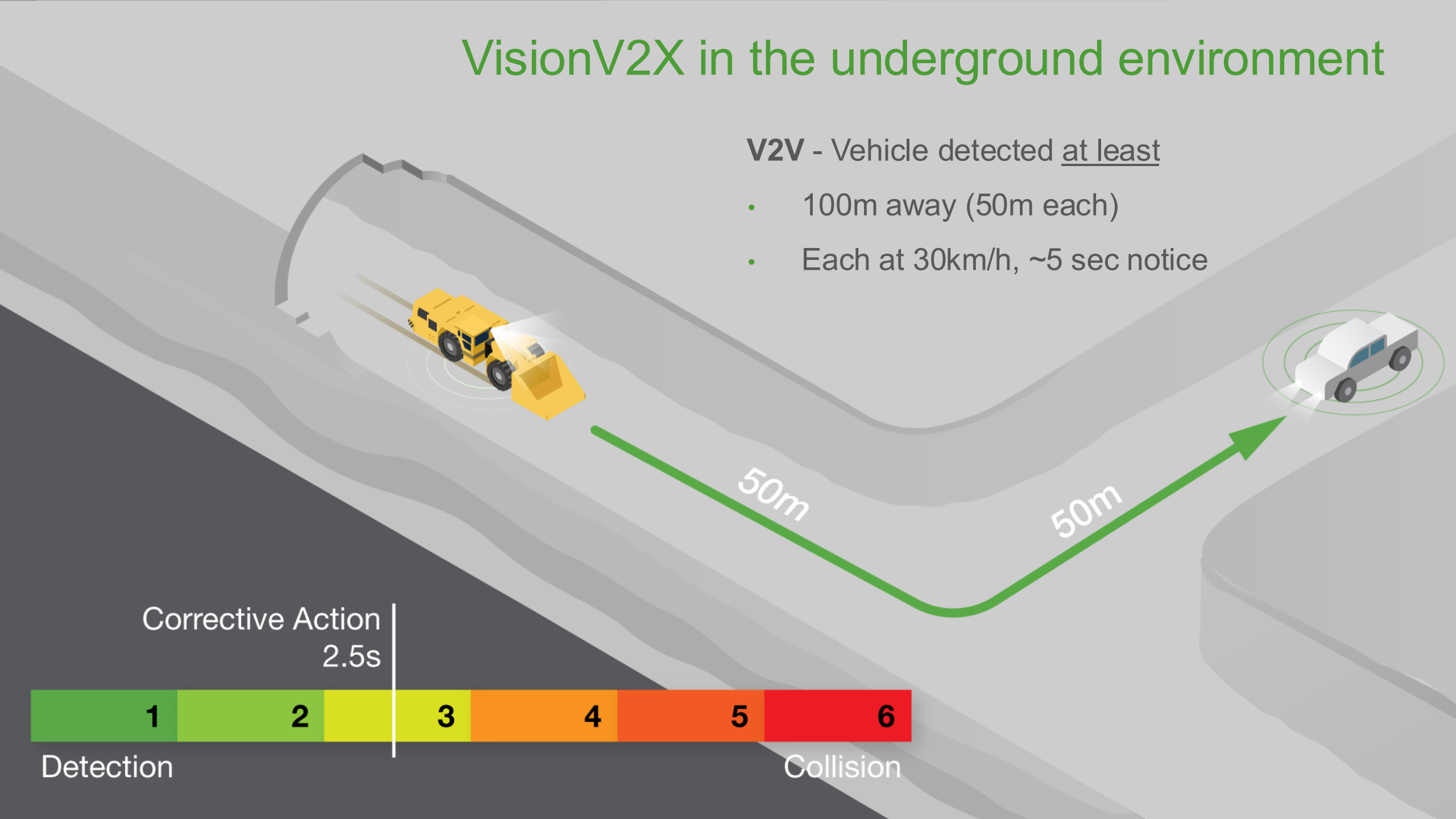
Speed [km/hr]	Total Distance [m]	Vehicle 1 Distance [m] *	Vehicle 2 Distance [m] *
30	122	55	67
25	**98**	**45**	**53**
20	76	35	41
13.5**	**50**	24	26
10	38	18	20
5	22	11	11

*** Distances are rounded to the nearest m**
*** * 50m NLOS is often requested by clients**

VisionV2X in the underground environment

V2V - Vehicle detected <u>at least</u>

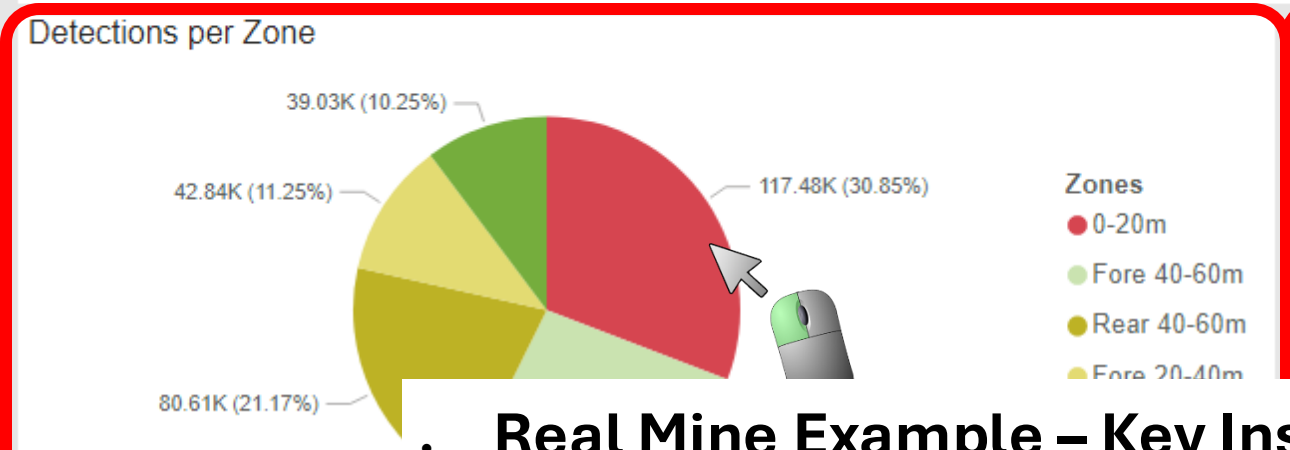
- 100m away (50m each)
- Each at 30km/h, ~5 sec notice

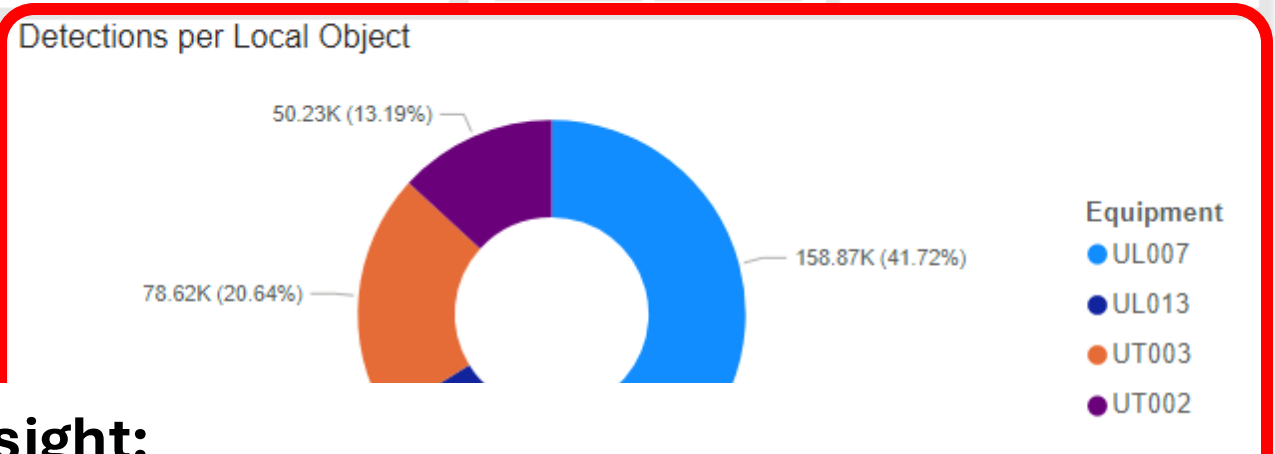


L7 - Site Zone Analysis

Date 3/03/2021 3/03/2021

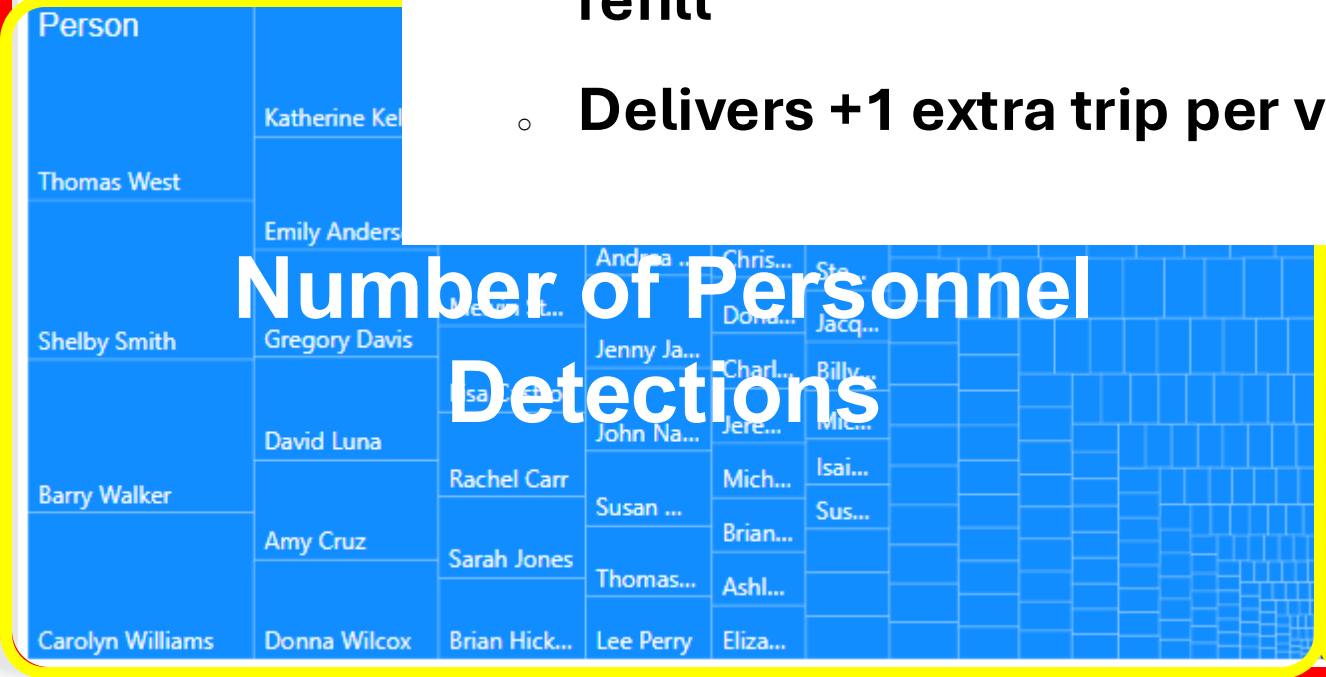
Shift: Day — Day | Night

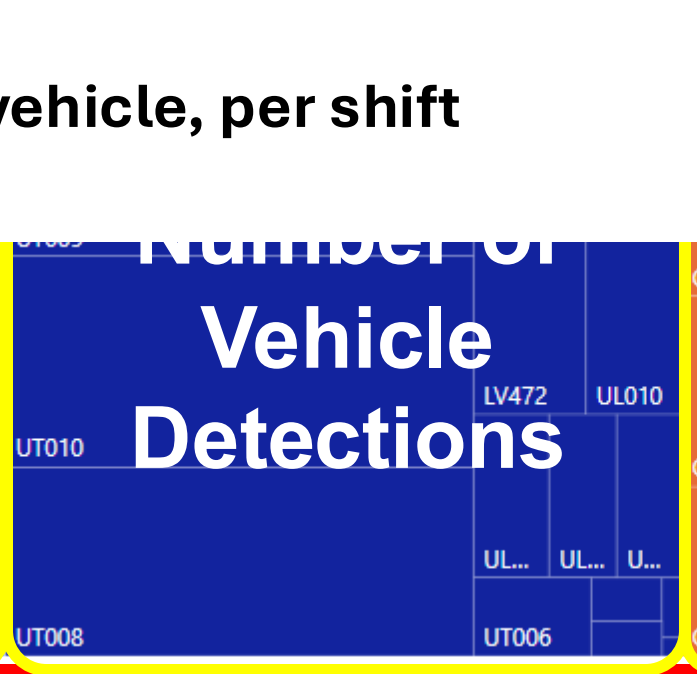


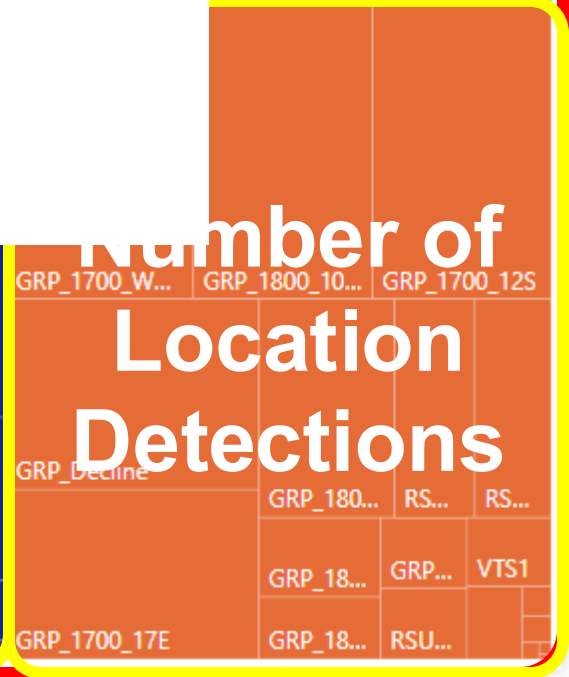


- **Real Mine Example – Key Insight:**
  - **+2 km/h speed increase** over **80% of return route to refill**
  - **Delivers +1 extra trip per vehicle, per shift**

Detections per Remote Ob







Conclusions

- **Scenario and vehicles**
- **Data collected**
- **Conclusion**

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Questions?