EVP, Products & Strategy
Strategy Session - MaaS
Erez Dagan
The Mobility Supply challenge
Serve individual A-to-B-at-T demand instances, while minimizing *latencies*, *costs* and *collateral/societal burden*.

**Existing solutions**
- Vehicle ownership
- Driver on demand: Taxi
- Driver on demand: Hailing
- Public transport

**Economical Inefficiencies**
- 94% Idle time, parking space
- Dispatch inefficiencies, DPP
- Fleet-level inefficiencies, DPP
- Stiff route, size & time, ETA

**Societal burden**
- Reduced Traffic flow & street space
- Mobility affordability and accessibility is limited
- Inefficient energy use
- Noise & air pollution
Mobility Market – Inefficiencies & opportunity

Exemplified by cost/mile, relative units

Mobility on demand

- Taxi
- Ride hailing
- Robotaxi
- RT-pooling

Vehicle ownership

- Metropolitan
- Urban
- Sub urban

Public transport

- Bus
- Commuter rail
- Heavy rail

Fleet level dispatch automation
Driver's owned vehicle
Driver commission, commoditized, is still ~75% of cost
Expensive driver acquisition, high attrition

No driver
Centralized, coordinated fleet
Optimized utilization of capital & energy

Higher capital and maintenance

(2 riders on avg)

*V_{PRT} >> V_B

~1% of US mobility miles
TAM for MaaS (B of $)

RT MaaS TAM is expected to reach $160B at 2030, by conservative estimates representing a 30% take of MOD market

- ~1600 cities by 2030
- # of trips by city size
- Avg annual spend 160-240$
- RT CAGR ~50%
The future value of Consumer-Facing Mobility service

**Mobility : The next economical revolution to unfold**

Transportation is a commonly unaccounted-for transaction cost.

**Mobility** and **physical traffic** are both shaping up as marketplaces for optimizing this inefficient behemoth economical factor.

Hence - **Mobility demand-exposure & supply-management** - will evolve to fuel a broad set of new transaction types and mobility products.

- Vehicle ownership
- Driver on demand
- Vehicle on demand
- Public transport
- Consumer AV
- Mobility as a service
- Mobility Marketplace
- Traffic Marketplace
- Peer-to-Peer AV
- Inward/outward traffic bundles
- City planning tool
While Robotaxi TAM expectation is $160 billion by 2030 - The overall passenger economy – as high as $7 trillion by 2050
**Consumer autonomy**
- The next market-wide automotive product.
- Self driving systems will constitute a sizeable portion of the vehicle value.

**MaaS : self-driving-system’s first productization arena**
ME/Intel MaaS proposition will forge our self-driving product towards its mass-market phase: consumer AV

- Safety & Regulation
- Geo expansion
- Cost/Value optimization

**MaaS will govern self-driving productization pace**
Consumer AV market will be **timed** by SDS productization and consequent cost/value optimization steps

Developing MaaS and driving it to quick convergence is critical to secure our SDS product fit, and to dominate the consumer AV ramp up ahead of the industry learning curve.

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**MaaS : corridor to consumer vehicle automation**

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1“Accelerating the Future: The Economic Impact of the Emerging Passenger Economy Report”, June 2017, Strategy Analytics
MaaS, at scale, is Imperative to our roadmap

MaaS plays a crucial role in shaping Self-Driving-Systems as a commercial product:

- Battle-testing and certifying the technology globally.
- Gaining regulatory and market credibility
- Cardinal data generator to fuel the future advances of this industry

1. **Optimization**:
   To optimize the SDS product-fit towards the consumer AV phase, all factors above must be maximally amplified by operating at scale

2. **Co-Optimization**:
   SDS is undoubtedly the value-engine that propels MaaS.
   Its characteristics have profound impact on shaping all value nodes on top:
   + Teleoperation protocols
   + Self driving vehicle interfaces and design
   + Rider experience and HMI
   + Fleet operation and diagnostics routine
   + Control center

All the way up to the **customer facing service** layer and **GTM strategy**.
MaaS layers & crosstalk

MaaS Layer 5  
Service & in-ride experience

MaaS Layer 4  
Mobility Intelligence

MaaS Layer 3  
Fleet Operations

MaaS Layer 2  
Self-Driving Vehicles

MaaS Layer 1  
Self-Driving System

Value Determinants
- Optimized SLA & ETA
- Experience & Services
- Safety & Safety perception

Cost Determinants
- HW- Vehicle & SDS
- Capital Utilization
- Efficient Teleoperation support
- Mixed fleet burdens
MaaS layers & crosstalk

MaaS Layer 5: Service & in-ride experience
MaaS Layer 4: Mobility Intelligence
MaaS Layer 3: Fleet Operations
MaaS Layer 2: Self-Driving Vehicles
MaaS Layer 1: Self-Driving System

Supported ODD
Realtime diagnostics
HD map status and growth

Interfaces
Installation
Connectivity
Homologation
Safety schemes

Diagnostics
Maintenance
Repair

Technical ➔ Psychological safety
ETA estimations
GTM for maximal utilization
### Self Driving System (SDS)

#### Layer 5
**Service & ride experience**
- MaaS UX
- Content
- Advertisement / O2O

#### Layer 4
**Mobility Intelligence**
- Mobility Frontend
- Mobility Backend
- Fleet Intelligence Platform

#### Layer 3
**Fleet Operations**
- Mixed Fleet
- Fleet Operations Platform
- Service Hubs/Depots
- Fleet Financing/Insurance

#### Layer 2
**Self-Driving Vehicles**
- Rider Sensing
- MaaS UX HW
- Completion Centers
- Base Vehicle + L4 ready

#### Layer 1
**Self-Driving System (AV-System/-Kit)**
- TeleOperation
- HD Map / Data Services
- SDS Software
- SDS Hardware

### Cardinal differentiation pivots
- **EQ** Overall HW costs and power consumption
- **REM** Seamless, selective geo scaling, ramp up
- **RSS** Technical/Psychological Safety & Ride duration
- **True redundancy** validation costs, generalization, ramp up
Teleoperation

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<td>SDS Hardware</td>
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Decision making delegated to human operator

SDS executes into control commands

Control Center

Real Time Data Feed

Policy Interventions

Edge Cases

- Primary and essential SDS extension, by regulation, tightly couples
- Operator-to-cars ratio - key cost efficiency factor
- Incident response/resolve time – key service level factor
## Self-Driving Vehicles

### Layer 1: Self-Driving System (AV-System/-Kit)

- TeleOperation
- HD Map / Data Services
- SDS Software
- SDS Hardware

### Layer 2: Self-Driving Vehicles

- Rider Sensing
- MaaS UX HW
- Completion Centers
- Base Vehicle + L4 ready

### Layer 3: Fleet Operations

- Mixed Fleet
- Fleet Operations Platform
- Service Hubs/Depots
- Fleet Financing/Insurance

### Layer 4: Mobility Intelligence

- Mobility Frontend
- Mobility Backend
- Fleet Intelligence Platform

### Layer 5: Service & ride experience

- MaaS UX
- Content
- Advertisement / O2O

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### User Experience

- Costs-per-passenger-km

### Safety/Security

- E.g. Cybersecurity

### Availability

- (no downtime)

### Vehicle lifetime

- Goal: 1 million km

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Leveraging our asset of well established automotive industry position and partnerships to affirm design-fit and timely SDV supply opportunities.

 redundance

dependency

no downtime

1 million km
Mobility Intelligence

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**Service & ride experience**
- MaaS UX Content
- Advertisement / O2O

**Fleet utilization models & algorithms**

**Ride request**
- A to B
- Time (now/scheduled)
- # Passengers

**Fleet model**
- Vehicle location & task queue
- Battery level & charging location
- Vehicle size/type
- Maintenance schedule

**Environment model**
- Current & predicted traffic
- Map & city planning
- Weather data

**Customer utility function**
- Wait time elasticity, Price elasticity
- Pick-up/drop-off location elasticity
- Sensitivity to trip duration

**Demand prediction**
- demand time / location patterns
- Special events & interest points

**Values**
- Maintaining service levels
- Optimizing utilization
- Value Pricing
Minimizing The Mixed-Fleet burden

At first stages, while the ODD is being broadened, drives outside the ODD must be referred to human drivers in order to ensure an effective service. These may be self-operated or partner services.

Co-planning of GTM strategy along with the SDS ODD (by leveraging on our dynamic mapping capabilities) are Key to minimize the mixed fleet overheads while protecting service levels.
**Content & Advertisement**

### Service & ride experience

- MaaS UX
- Content
- Advertisement / O2O

### Mobility Intelligence

- Mobility Frontend
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### Fleet Operations

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**MaaS User Experience**

**Key competitive advantage**

The user experience allows for key differentiation and competitive advantage. It is not just about getting from A to B, it is also about the experience, content and services, experiencing psychological safety.

Robotaxies will serve as Audio-Visual theaters supporting: relaxation, productivity, virtual content/experiences, etc.

**Key Value Determinant layer**

- Joyful experience with AR, VR, digital content & services
- Psychological safety
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**MaaS layers & crosstalk**

- **MaaS Layer 1**: Self-Driving System
- **MaaS Layer 2**: Self-Driving Vehicles
- **MaaS Layer 3**: Fleet Operations
- **MaaS Layer 4**: Mobility Intelligence
- **MaaS Layer 5**: Service & in-ride experience

**PINTA**

- Traffic User Cases:
  - Protected Crossing
  - Unprotected Crossing
  - Protected Left
  - Unprotected Left
  - Protected Right
  - Unprotected Right

- Traffic Regulation:
  - crossing
  - traffic_signals
MaaS Products Portfolio

MaaS Layer 5: Service & in-ride experience
MaaS Layer 4: Mobility Intelligence
MaaS Layer 3: Fleet Operations
MaaS Layer 2: Self-Driving Vehicles / AVs
MaaS Layer 1: Self-Driving System / AV-System/-Kit

MaaS Provider (B2C)
Inward/outward Traffic (B2B)

SDV Provider (B2A/B2B)
SDS Provider (B2B)
Mobileye outlines strategy for driving significant Growth

Mobileye is Intel’s fastest growing business year over year. The strength of the business today is largely attributable to a rapidly expanding advanced-driver-assistance systems (ADAS) market, and its future business will expand greatly with forays into data monetization and the nascent robotaxi market.

**ADAS/L2+**
- 50M chips shipped by end of year
- 75% ADAS adoption growth by 2025 from ~22% today
- 300 car models with 27 OEM partners
- 8 of 11 L2+ programs based on Mobileye
- New Design wins across EU, China, India

**Mapping**
- Fully automated crowd-sourced mapping of Europe by Q1 2020 and U.S. by end of 2020
- Monetizing data with smart cities by 2020
- Mapping “big 5” China, EMEA, India, Korea and the U.S.
- >20 customers
- Ordinance survey trial expands

**Robotaxi/av**
- $160B opportunity in mobility-as-a-service by 2030
- Volkwagen robotaxi in Tel Aviv on track
- Nio I4 design win