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A Clarivate Analytics company

Overview of the 5G Landscape

Pop-Up Webinar

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A series of overlapping technologies (and standards) under the 3rd Generation Partnership Project (3GPP) defined as 5G NR (New Radio)

Will become part of the ITU's IMT-2020 standard in 2019

From a consumer perspective, provides for potential of 1Gbps data rates

Rests on:

- mmWave / 24GHz to 100GHz frequencies – providing much higher bandwidth
- Much lower latency (sub-10ms) compared to 20-40ms in current 4G
- Massive MIMO / beamforming technology – increasing capacity from a few thousand devices to >1m per cell
- Sidelinks and use cases beyond simply enhanced Mobile Broadband – Massive Machine-type (mMTC) and ultra reliable, low latency machine-type communications (URLLC): creates infrastructure for device-to-device, and V2V, V2I, V2N and V2X communication – the Internet of Things

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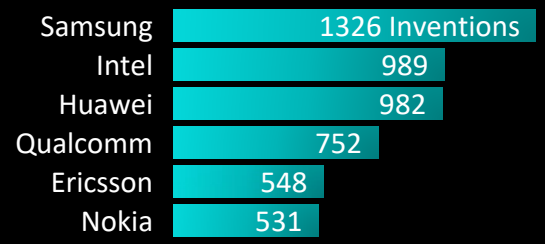
The 5G Patent Landscape

Defined by complex searches for individual 5G-specific technologies, or mentions of 5G-related standards

With thanks to the Taiwan Intellectual Property Office for permission to share our work

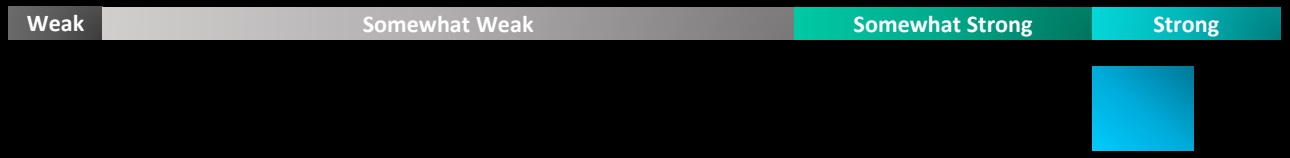
1,700 inventions before 2014

12,500 by Dec 2018



The "Big Six"…

…control 41% of the landscape



…and 54% of the strongest inventions

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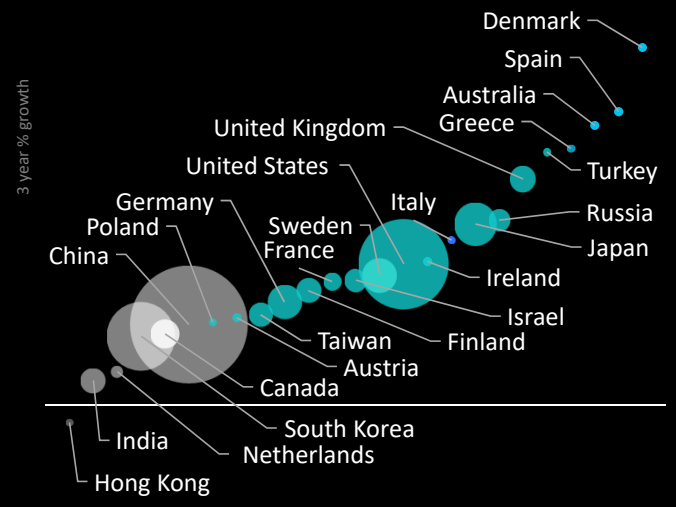
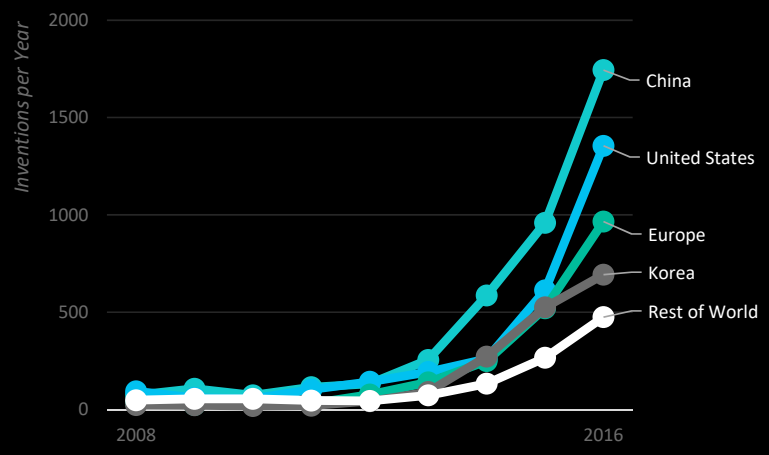
The 5G Patent Landscape

By country of residence of the inventors…

We are well used to the fastest growth coming from Asia

Not the case in 5G





US and European patented innovation output now greater than China

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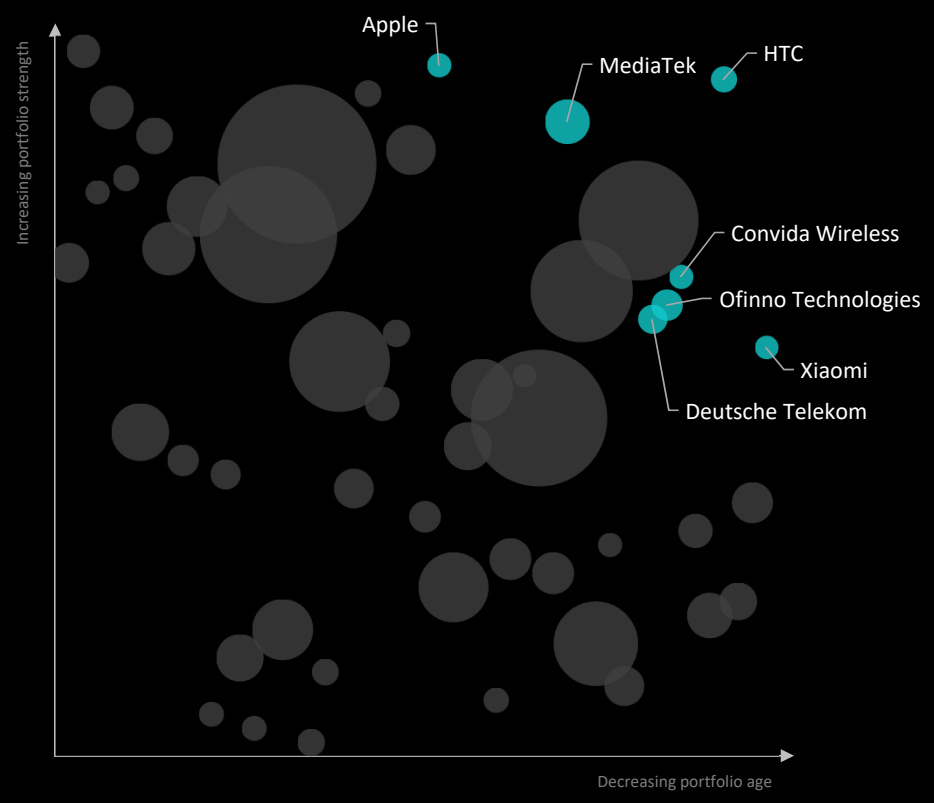
The 5G Patent Landscape

Modelling the Top 50



- Strength of the Big 6 evident
- Impact of academia, particularly Chinese academia, is limited
- Automotive entities are here, and early
- The ones to watch:

  Apple, MediaTek, HTC, Deutsche Telekom, Xiaomi, Convida Wireless, Ofinno Technologies

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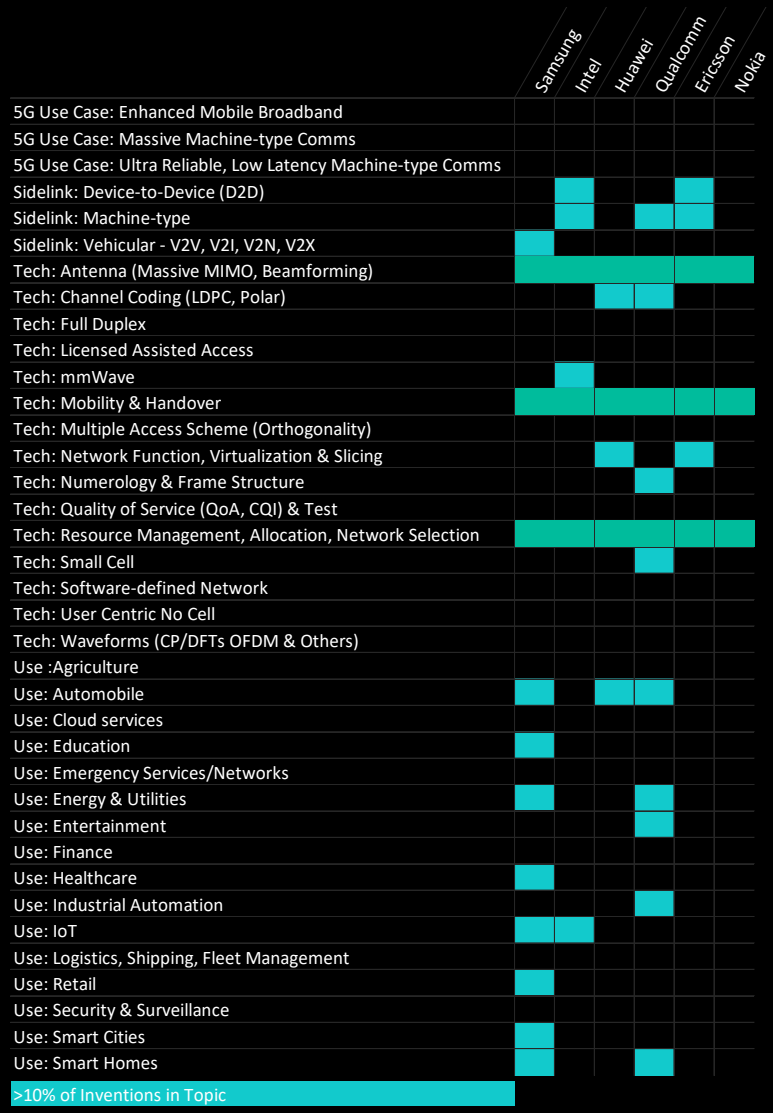
The 5G Patent Landscape

Identifying technical focus

- There is a core to 5G, evident in the concentration of patent activity of the top 6
- Key differentiators
  - Advanced antenna directionality, vastly increasing capacity and bandwidth within a cell
  - Resource management – technologies to enable frequency hopping, resource allocation to individual devices and handoff/mobility to other cells and spectrum bands (or backup 4G/LTE)



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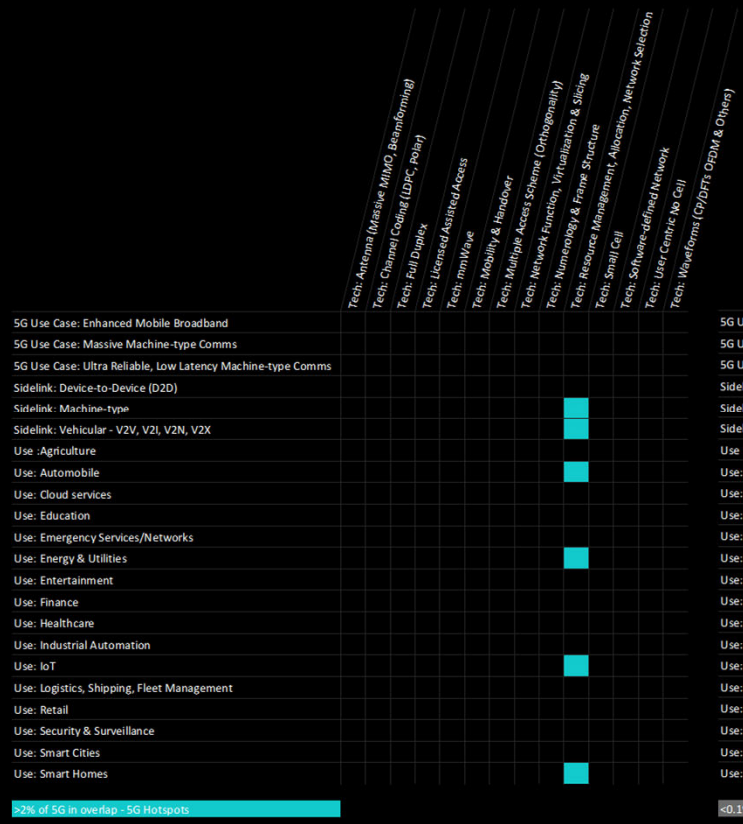
The 5G Patent Landscape

Identifying patent gaps, identifying opportunity



- Primary thickets come from 5G network resource allocation in: V2X and machine sidelinks; utilities, IoT and Smart Home applications
- Principal patent gaps: Full Duplex mode (simultaneous transmit/receive – can double capacity) and “Cell-less”(UCNC) architecture to reduce latency

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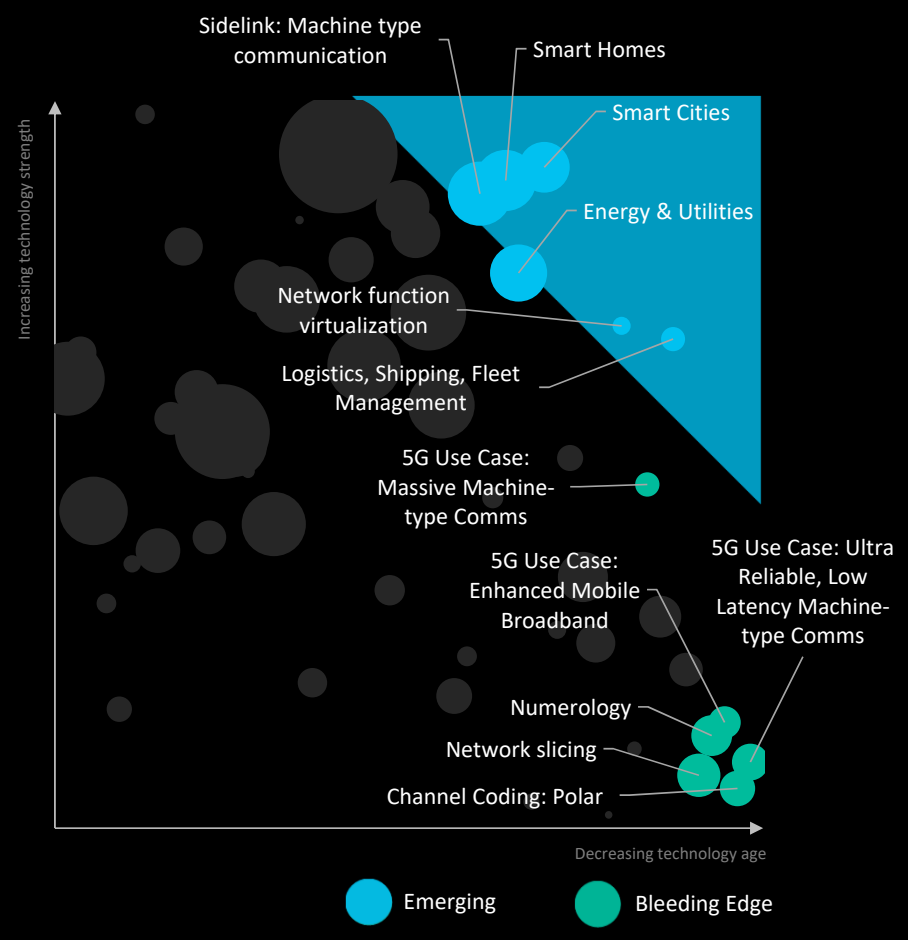
The "Crystal Ball"

The road to 6G?



- Base technical development and usage diversification evident
- Strong, recent IPR surrounding network virtualization – indicating new frontier
- Pointers to 6G direction in URLLM, numerology techniques and polar channel coding techniques
- Common theme in recent innovation is machine-to machine-comms

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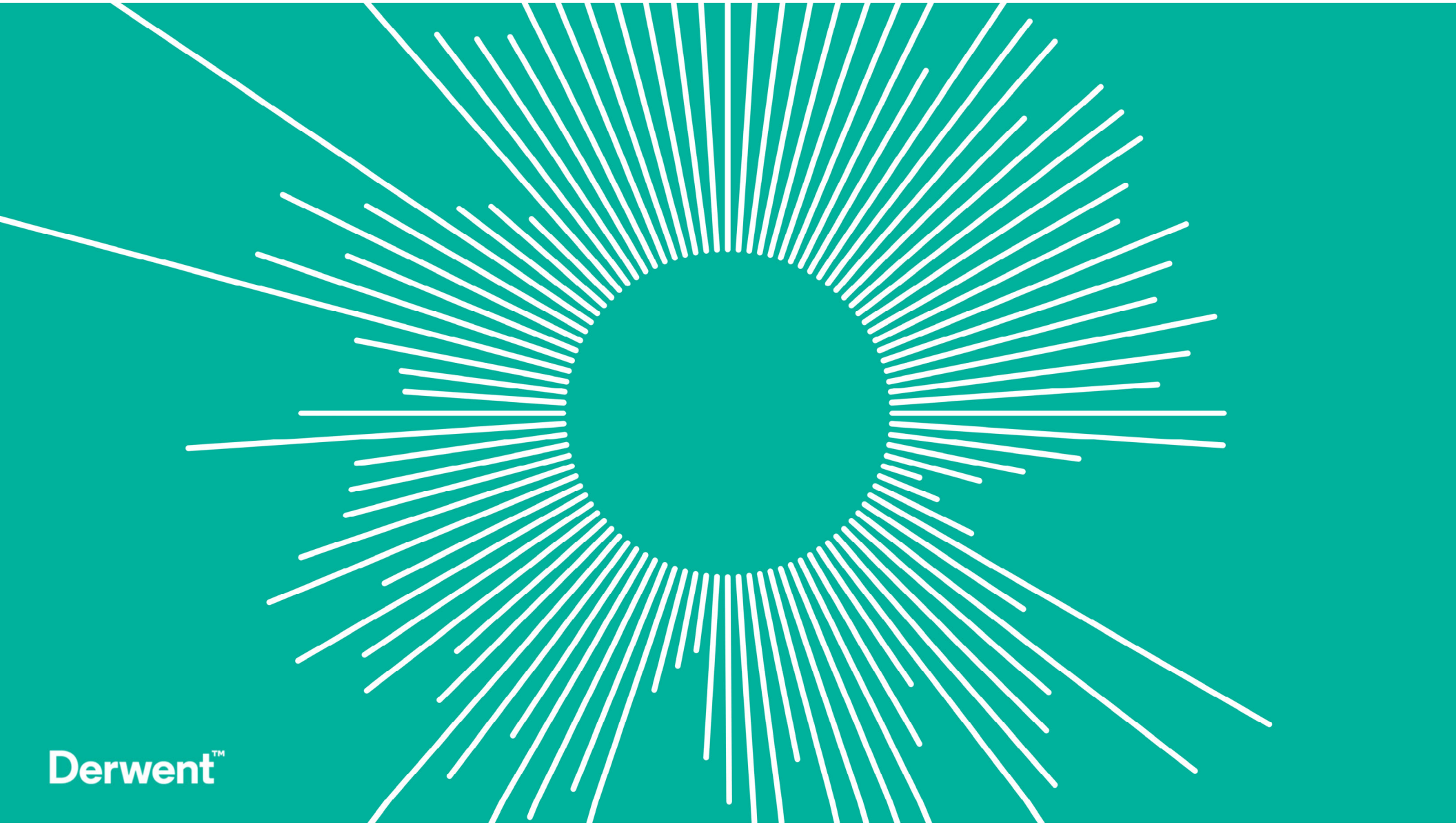
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