

Artist rendering of SES-15 (manufactured by Boeing
and launched using Ariane 5 rocket in Q2 2017)

SES▲

Building the Next Generation Satellite fleet

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Summary

- ▲ SES is procuring the next generation of satellites today
- ▲ SES's satellites are at the core of an evolving and expanding global network
- ▲ SES is driving further technical innovation to deliver tomorrow's next generation satellite

SES's new satellite mantra

	Issue/opportunity	SES [^] solution
1 Light in weight	<p>~50% of total payload mass is traditionally propellant; of which ~$\frac{2}{3}$ burnt in a few days</p>	<p>Electric propulsion</p>
2 Efficient in beams	<p>Communication ecosystem is evolving with additional need for more efficient, affordable data connectivity solutions</p>	<p>HTS capacity Digital processing</p>
3 Fast to market	<p>Currently takes ~3 years to design, build and launch a GEO satellite</p>	<p>New launch vehicles Exploring other possibilities (e.g. modular construction, reusable rockets)</p>

Advancing capabilities through innovation

Seven satellites under procurement

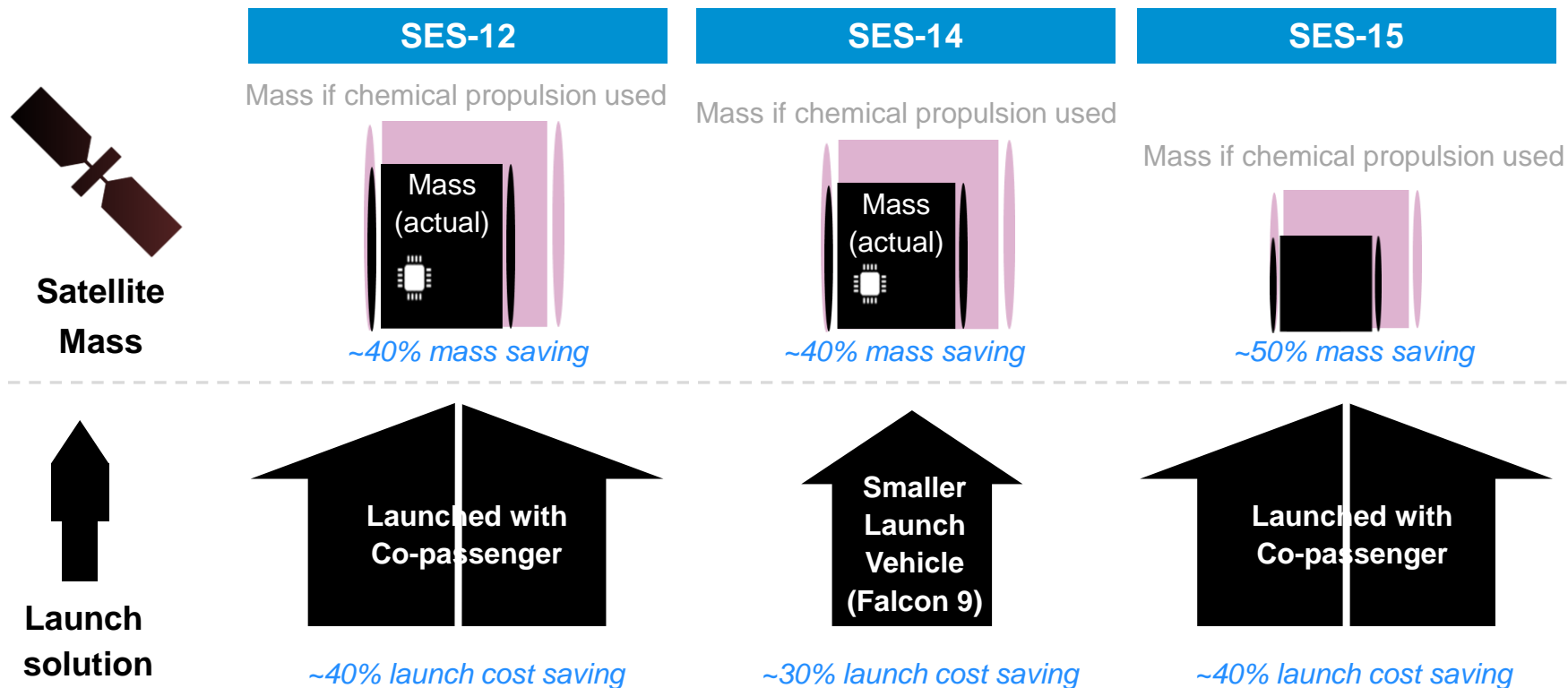
	Q3 2015	2016		2017			
	SES-9	SES-10	SES-11	SES-12	SES-14	SES-15	SES-16/ GovSat ⁽¹⁾
Payload Type	Shaped	Shaped	Shaped	14 GHz HTS + Shaped	12 GHz HTS + Shaped	10 GHz HTS + Shaped	Fully steerable spot beams
Digital Processing				2.6 GHz	2.5 GHz		
Satellite Propulsion	Electric	Chemical	Chemical	Electric	Electric	Electric	Chemical
Launch Vehicle	Falcon 9	Falcon 9	Falcon 9	Ariane 5	Falcon 9	Ariane 5	Falcon 9

▲ Combining industry-leading procurement standards with the latest satellite innovations

1) Procured by LuxGovSat

Optimising mass to generate launch cost savings

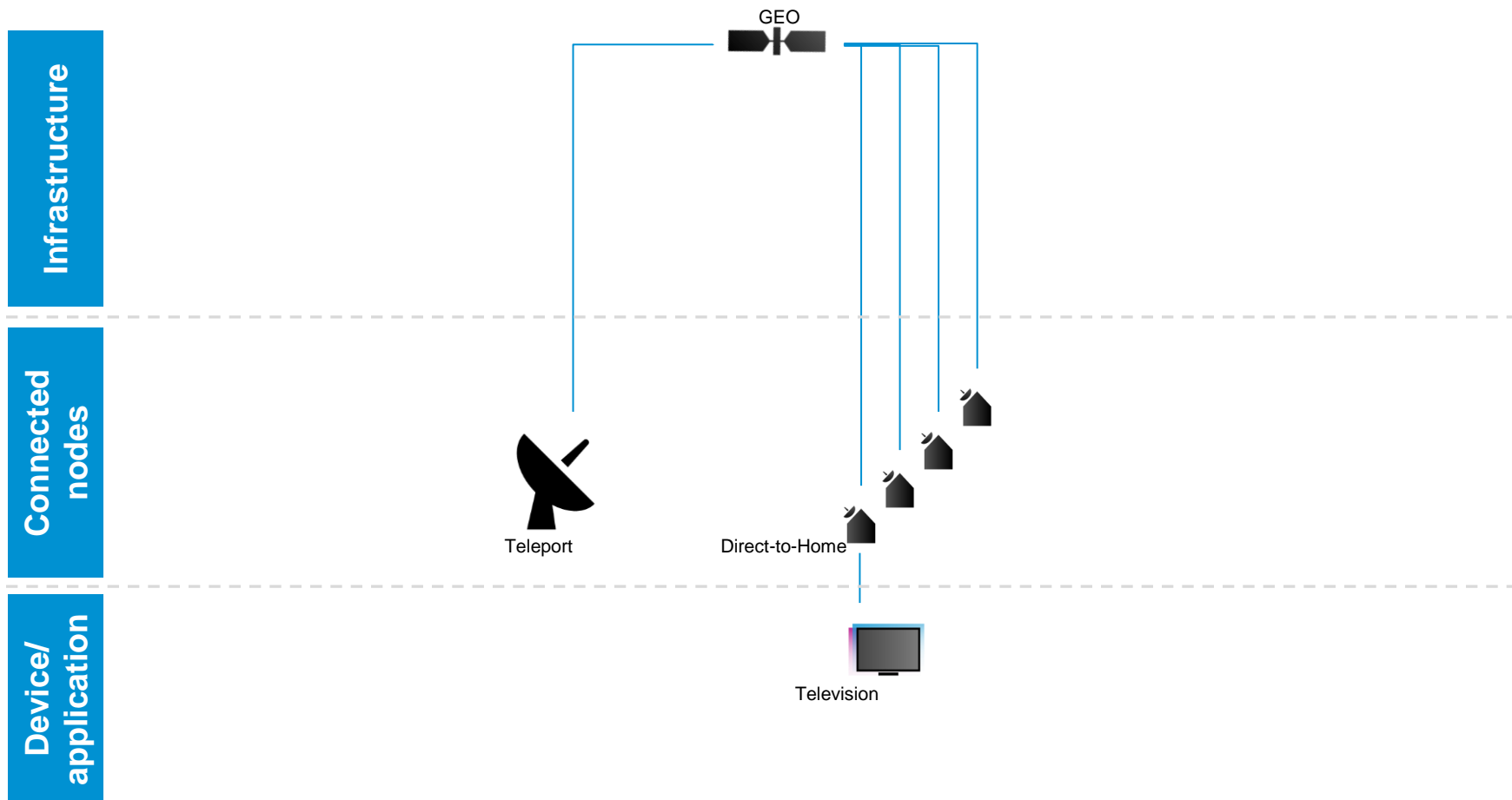
Mass and launch cost savings achieved by using electric propulsion



▲ Electric propulsion also provides longer fuel at negligible marginal cost

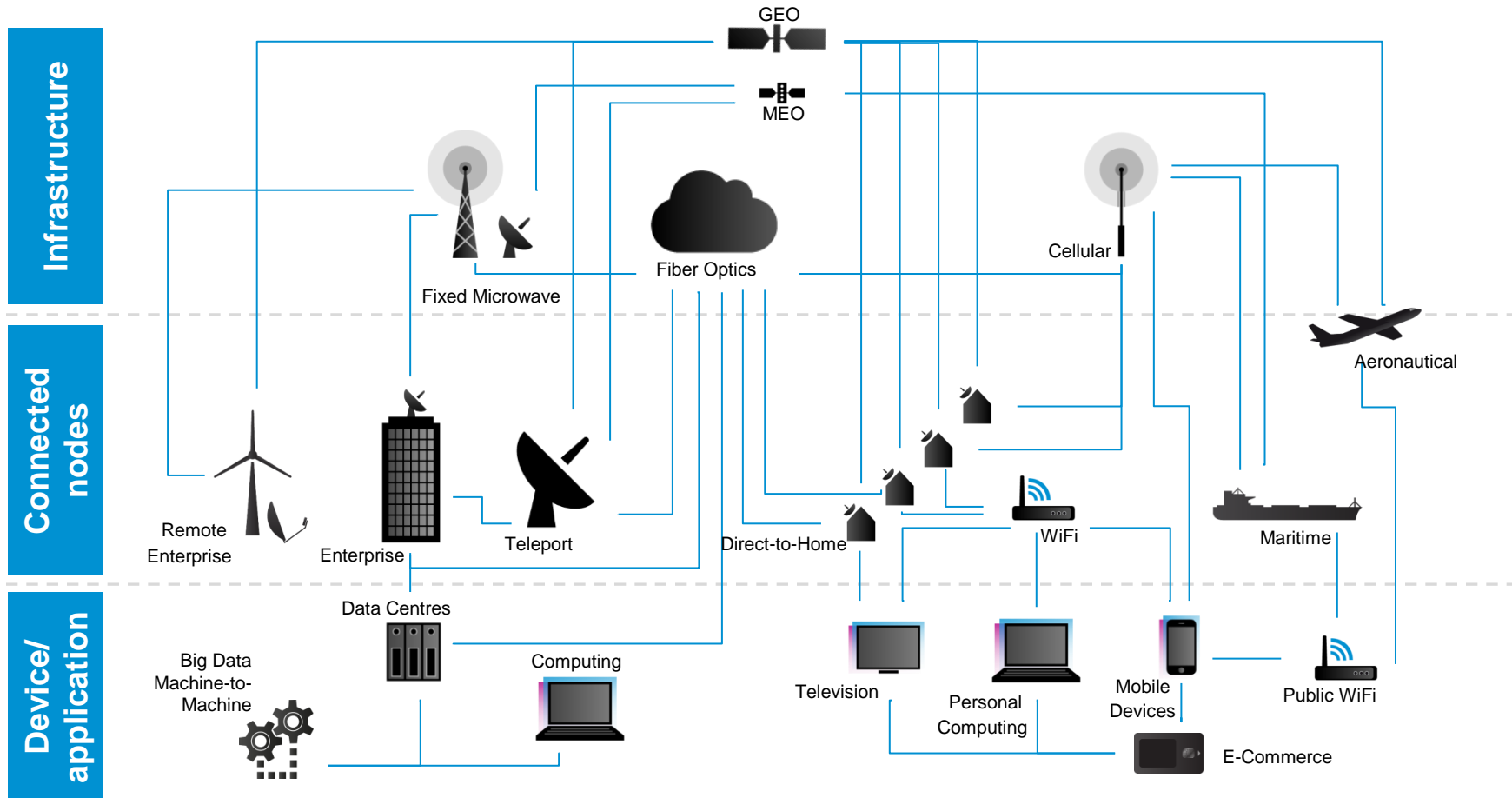
Communication ecosystem is evolving

Traditional ecosystem mainly connected linear broadcast customers



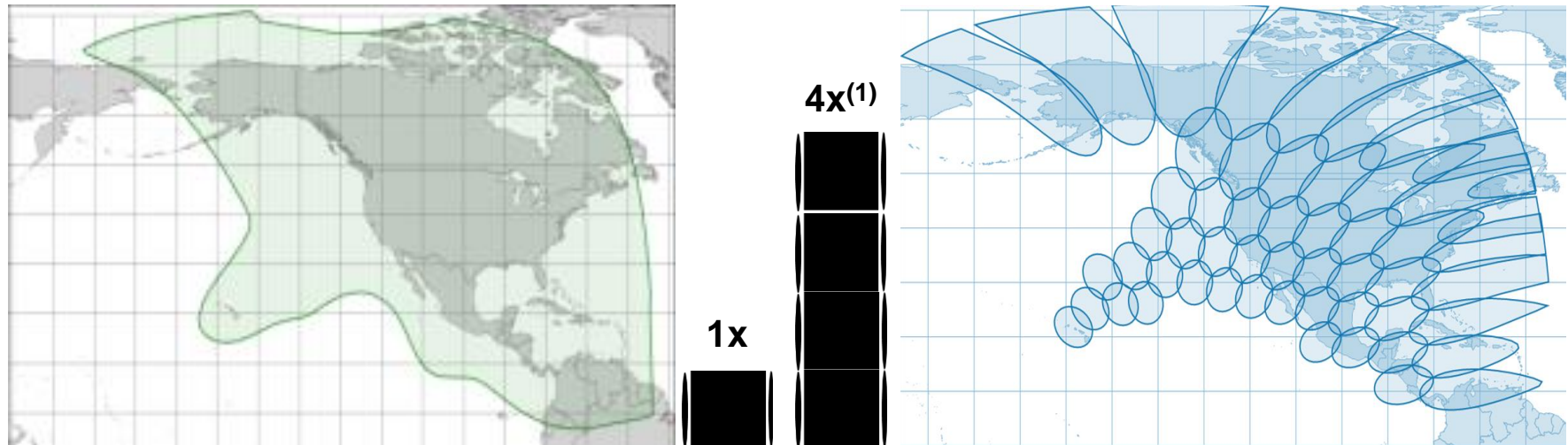
Communication ecosystem is evolving

Modern ecosystem also includes deeper networks/applications with a multitude of connectivity options



Improving spectrum efficiency with hybrid satellites

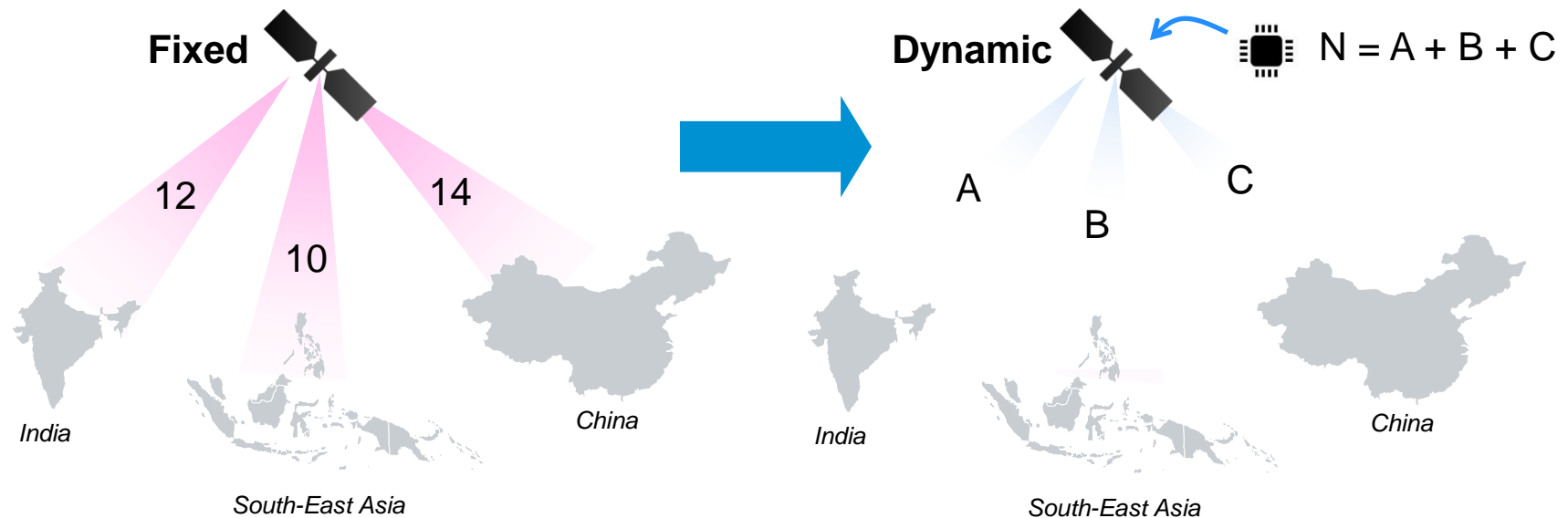
SES-15 shaped beam and spot beam coverage



- ▲ Shaped beams provide wide broadcast coverage
- ▲ Spot beams deliver focused capacity for point-to-point or mesh needs
- ▲ Spot beam architectures maximise spectrum re-use providing greater theoretical bits/Hz

Improving capacity allocation with digital processing

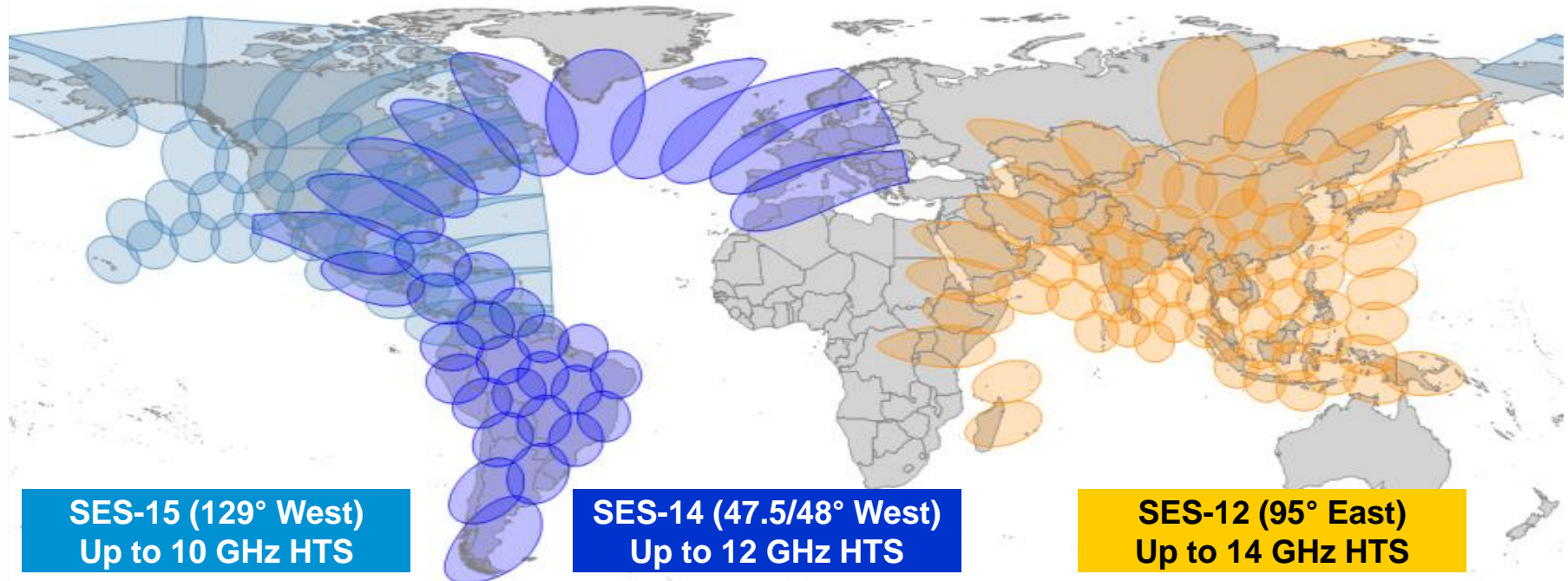
Advantages of digital processing



- ▲ Allocates capacity from one beam to another, increasing possible satellite configurations
- ▲ More processing equals more capacity which can be allocated to regions with high demand
- ▲ Shift towards smaller beams requires greater 'switch-ability'

Delivering greater flexibility of market coverage

SES-12, SES-14 and SES-15 HTS spot beam footprints



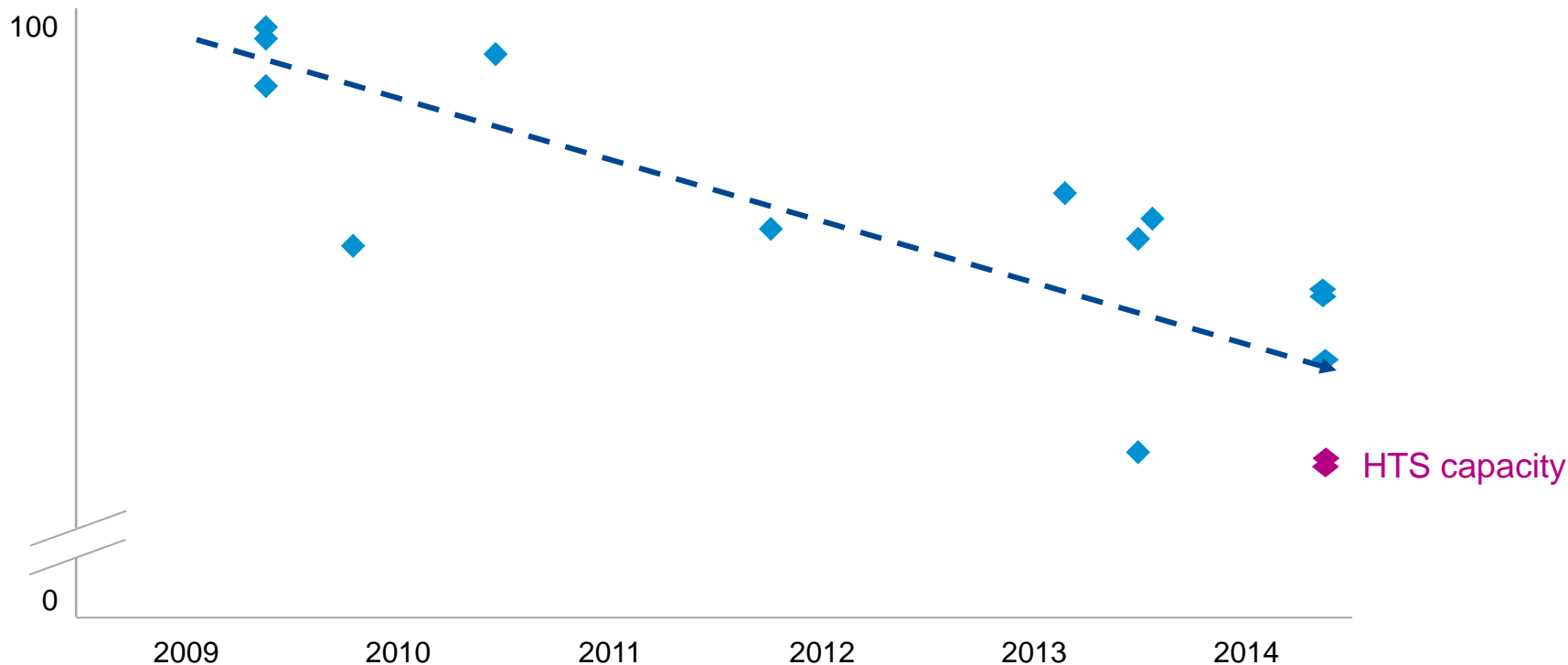
- Spot beams laying down high volume of capacity globally
- + Digital processing optimally allocating capacity to key areas

- = On-orbit capability to pivot from one market opportunity to another

Reducing normalised CapEx requirement

Satellite and launch cost (at date of contract placing)

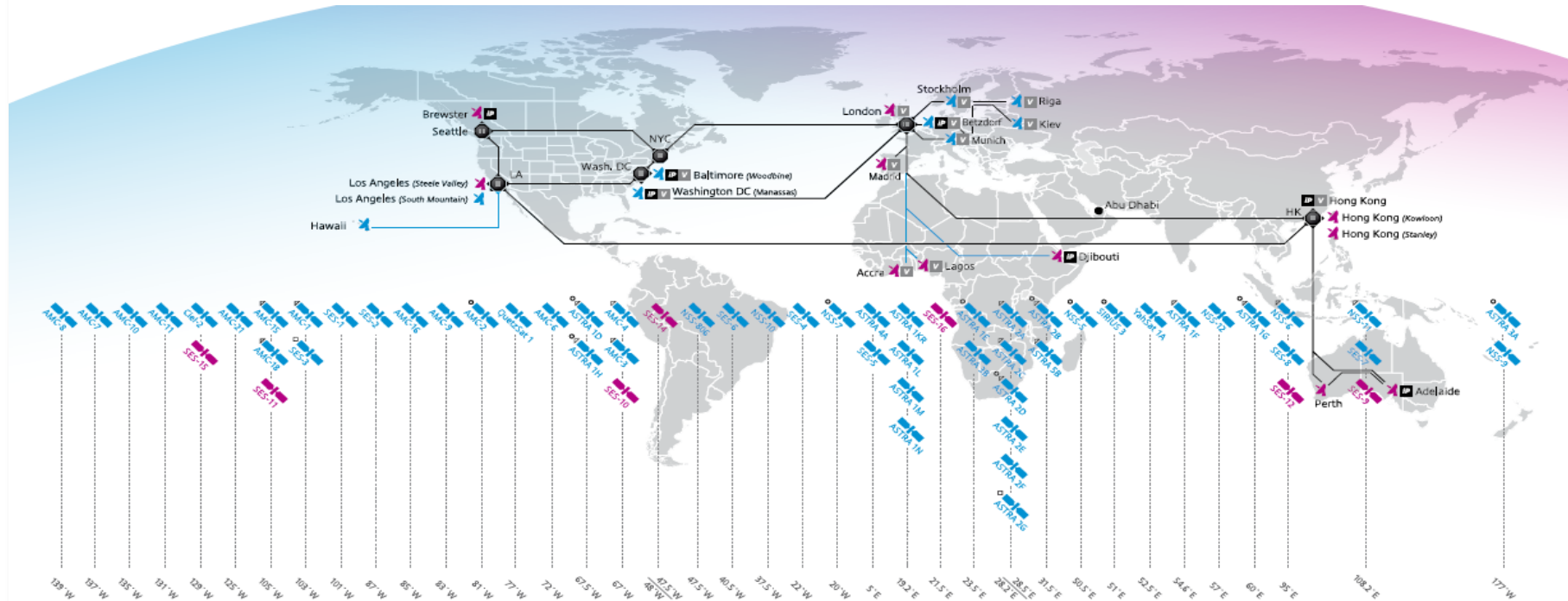
Cost per TPE per year (Dec-2009 = 100)



▲ Achieving ~12% programme cost savings; on track to deliver target of up to 20% by 2018

Globalised business with strong local presence

SES's global satellite fleet and access network



- ▲ Industry-leading network performance (over 99.99% network availability)
- ▲ Unmatched technical understanding customer relationships (average 8.9/10 rating of technical excellence in customer service)

Keeping satellite at the heart of the global network


Key advantages of satellite within the global communications network

- ▲ Wide coverage – global footprint and unparalleled global reach
- ▲ Broadcast – bit-efficient dissemination of data
- ▲ Instantaneous and scalable throughput – new network node easily built with a new antenna

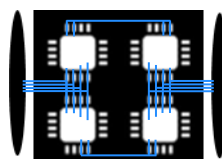
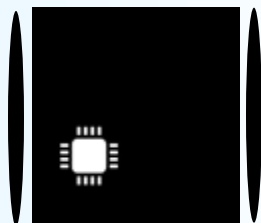
Key attributes for satellite to remain at the heart of the digital ecosystem

- ▲ ‘Switch-ability’ to adapt capacity to network need and maintain fill rates
- ▲ Cost efficiency of new capacity to maintain/enhance the attraction of satellite


Looking towards the next generation of innovation

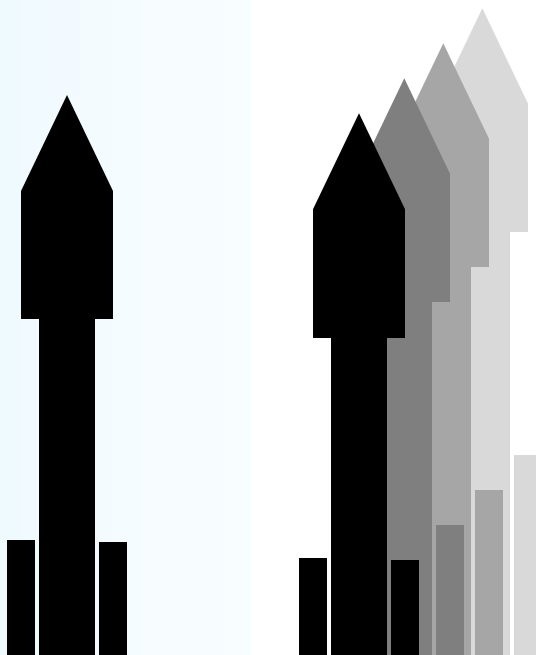
 'Hyper-advanced' payloads

Today Tomorrow



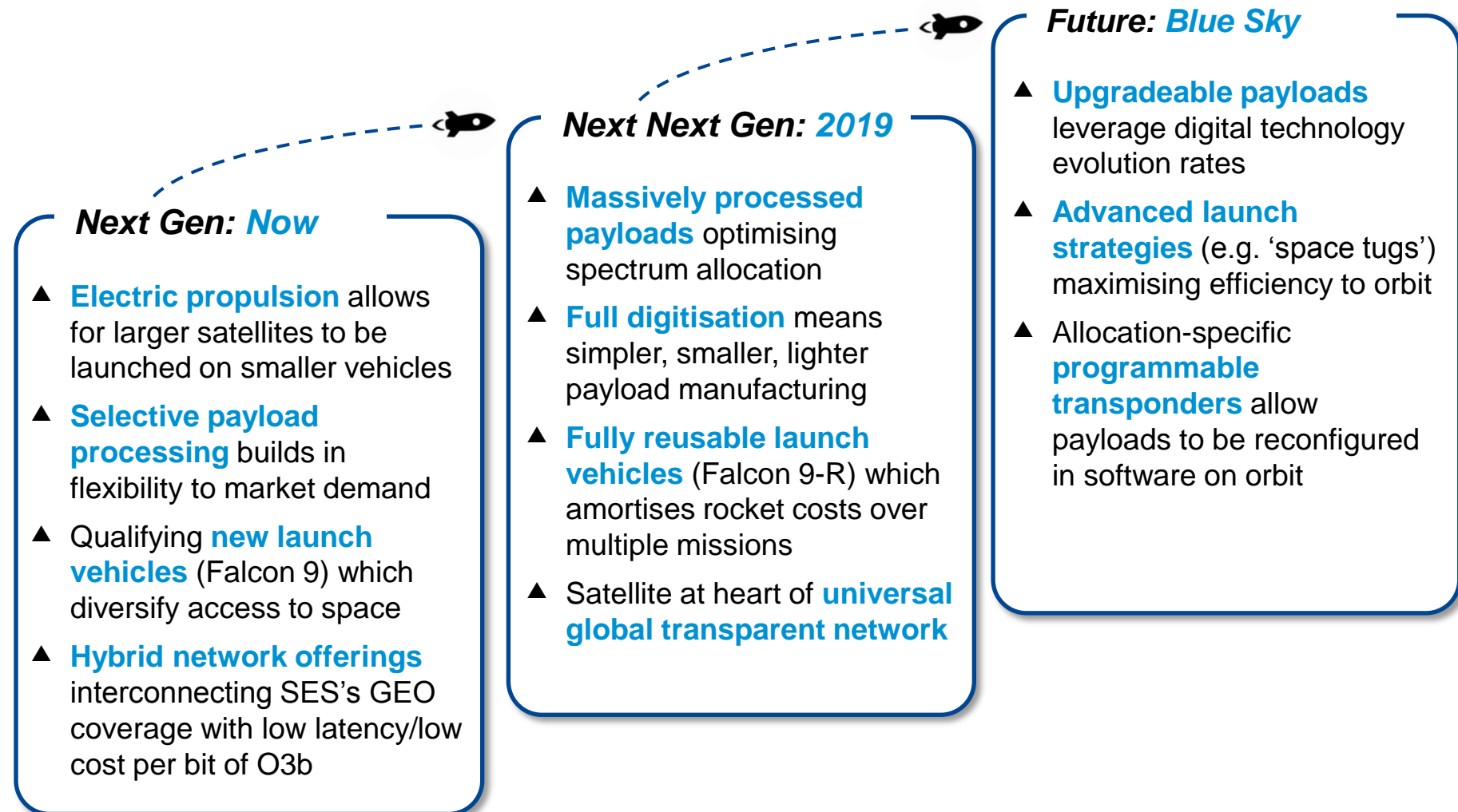
- ▲ Quadrupled processing power, means more capability to allocate capacity to meet future customer requirements
- ▲ Photonic-based front-end technologies reduce cost and mass for greater performance

 Multi-launch vehicles



- ▲ Fully reusable launch vehicles amortising rocket manufacturing costs over multiple payloads

Building SES's future technology infrastructure



Conclusion



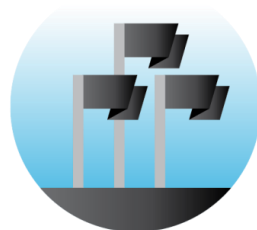
Video



Fixed Data



Mobility



Government

- ▲ Shaping future technology of the industry to enhance our core technical value
- ▲ SES's global satellite infrastructure remains integral to a global connected network
- ▲ SES is delivering the future of connectivity

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