5G HEART

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WHAT'S IN IT FOR US?

WHOSE PROBLEMS ARE 5G EMPOWERED SOLUTIONS ADDRESSING IN THE CASE OF CONGENITAL HEART DISEASE?

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Telenor
Philips

5G HEALTH AQUACULTURE AND TRANSPORT VALIDATION TRIALS

Outline

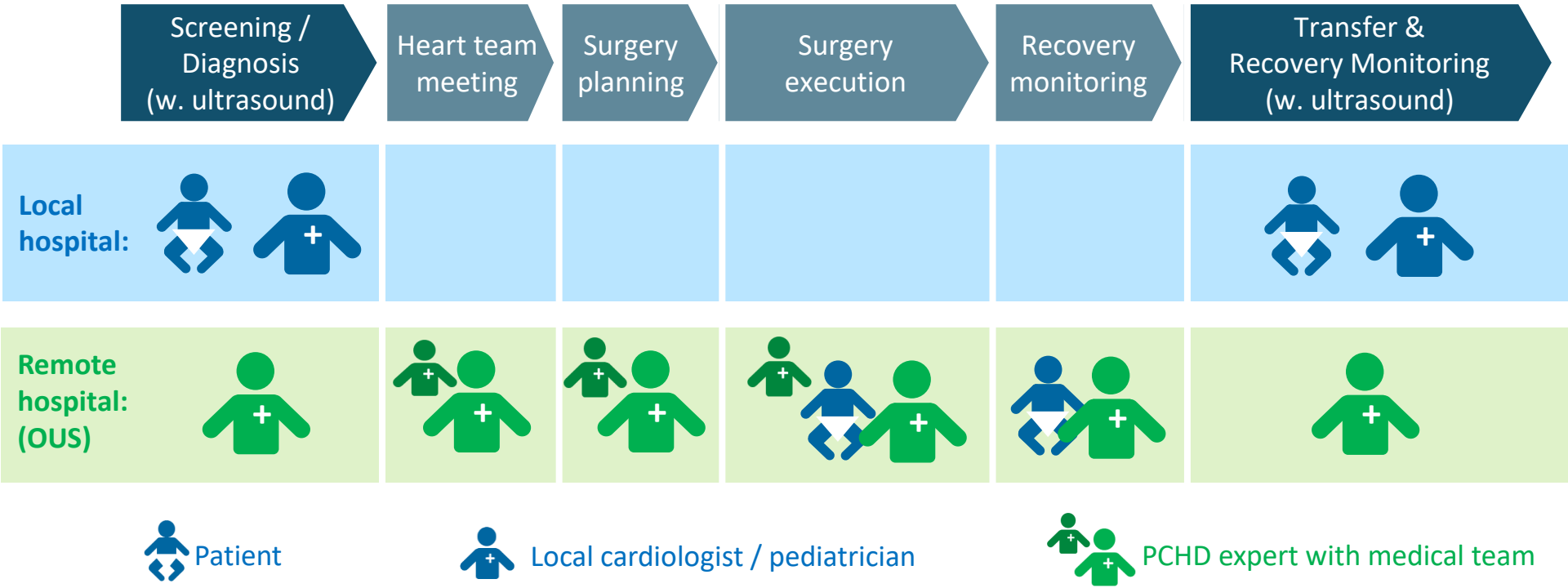
1. Use case motivation & assessment
2. Methodology for judging functionality and usability
3. The need for 5G and the 5G-HEART testing facilities
4. Conclusions

1 Use case motivation & assessment

Pediatric and Congenital Heart Disease (PCHD)

- Congenital Heart Disease (CHD):
  - Serious heart defect(s) present from birth (early fetal development)
  - Structural abnormalities (ventricles, valves, major vessels in/out, …)
  - Prevents effective pumping or reduces amount of oxygen in blood
- Of all children, 0.8% are born with a CHD
- Fetal screening has only 50% detection rate
- Early detection, diagnosis and treatment is essential, and ultrasound plays a key role

PCHD patient journey



Newborn Congenital Heart Disease dilemma: High urgency – lots of risks

Two realistic current alternatives used for diagnoses

1 Baby transported → Expert do US and assess

2 Local (poor) images of US screen → Send to expert → Expert inspect images and assess

Current pains and risks

Death: to live or die
Long term effects – whole life
Transportation harmful
Condition aggravation

Over/under diagnoses
Death/no recovery
Long term effects – whole life
Privacy violated

Future ultrasound solution
Local and high quality
CHD detection

Source: Minutes Oslo 2020-01-29
D3.1

Many roles and stakeholders: different pains points and benefits

- Patient – baby
- Parent

Beneficiary

- Remote expert
- Local pediatrician / cardiologist
- Local/central technicians

Executer

Customer

- Hospital management
- Hospital IT
- Expert center (OUS)
- Local authorities/hospital
- Government

Provider

- Health tech supplier (Philips)
- Network service provider (Telenor)

Regulator

- Infection control authorities
- Data protection

Business model: customer different from user & several providers involved

- Patient – baby
- Parent

Beneficiary

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Provisioning of solution

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Provider

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Regulator

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Remote expert, Henrik: we could increase probability for short and long term health effect for the baby, the family, and local community

'I am Henrik, a paediatric cardiologist at OUS. For me, one major pain point is getting sufficient ultrasound images to diagnose new born babies with severe heart disease in local hospitals, with as little risk as possible for the baby.

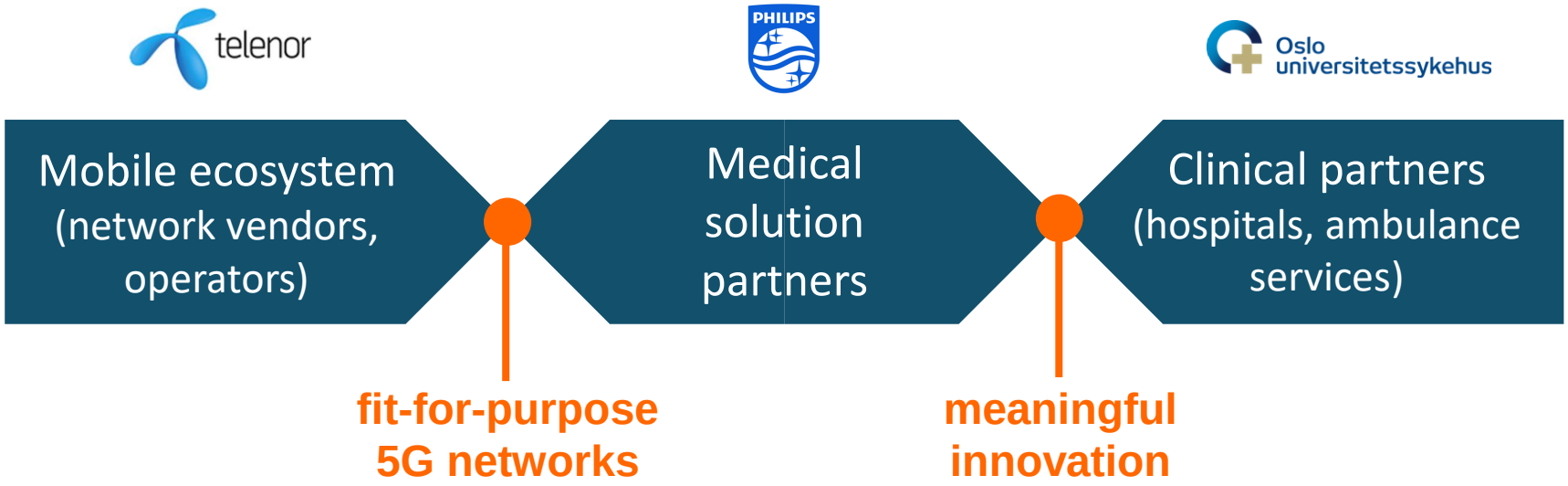
When in doubt, we may have to transport them to OUS at high risk of condition aggravation, and even death, or we are basing our diagnoses on images of US scanning sent to my mobile phone. The images are both illegal and poor, and lead to under- and over diagnosing.

If we could offer remotely assisted ultrasound for babies, we could decrease complications and increase probability of short and long term health effects for the baby, the family and local community.'

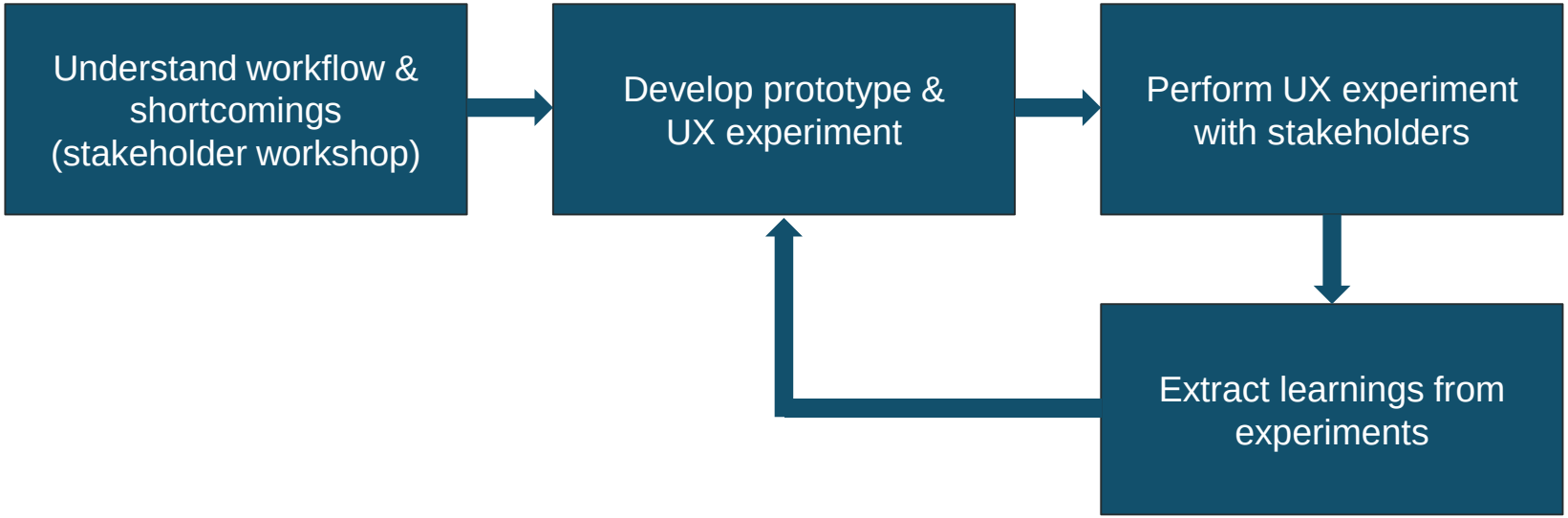
We could observe success through number of babies being sufficiently diagnosed earlier in their treatment cycles. We could also observe success through other use of remotely supervised ultrasound. Finally, we could observe fewer unapproved images on experts' mobiles.

2 Methodology for judging usability and functionality

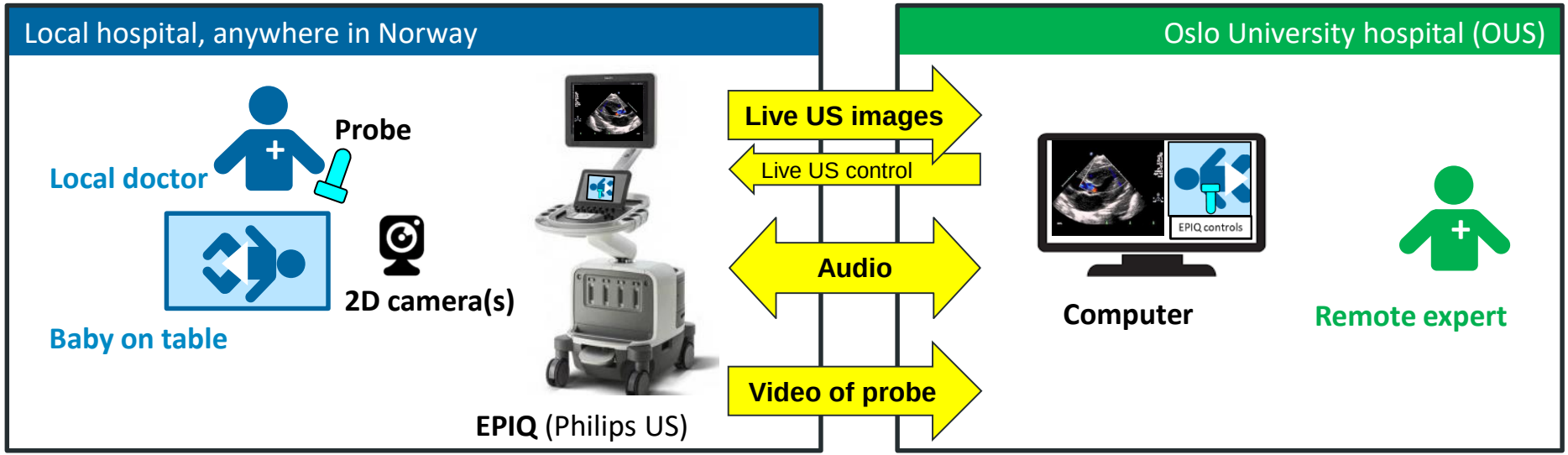
Partnering along the value chain



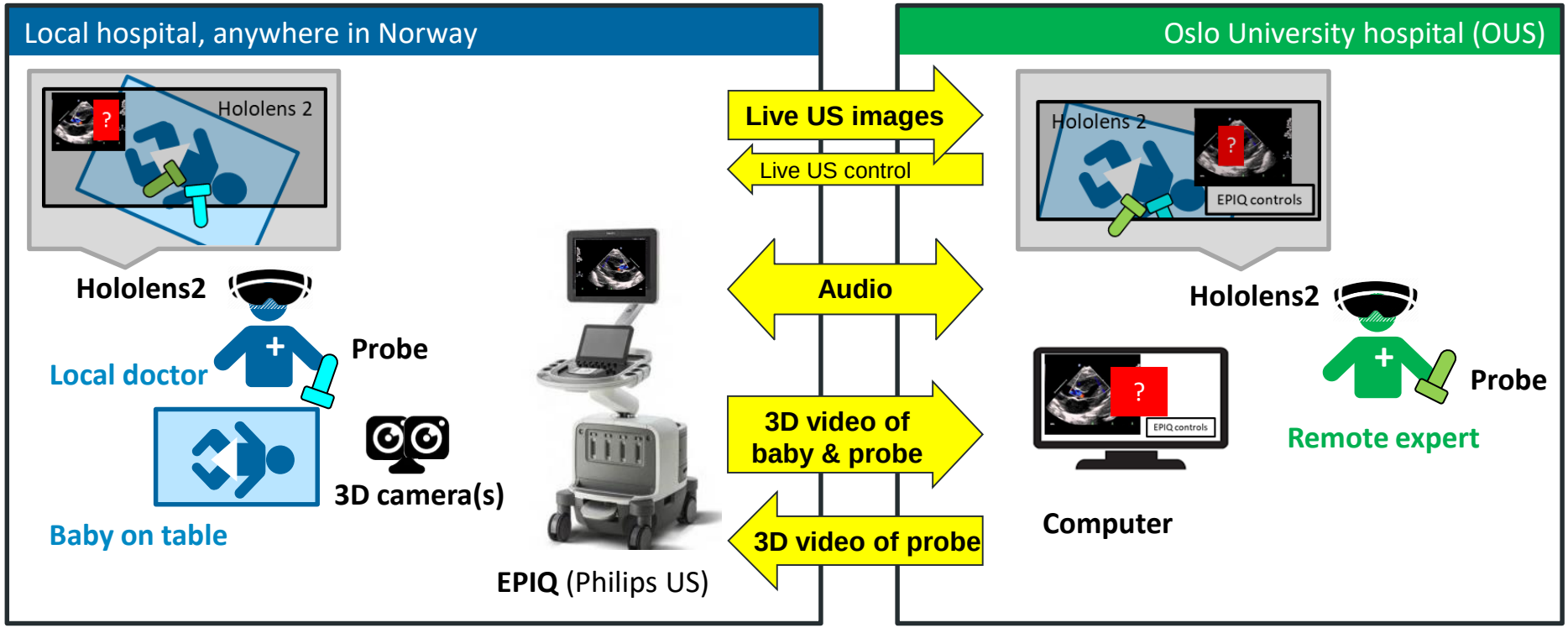
Agile development with key stakeholders



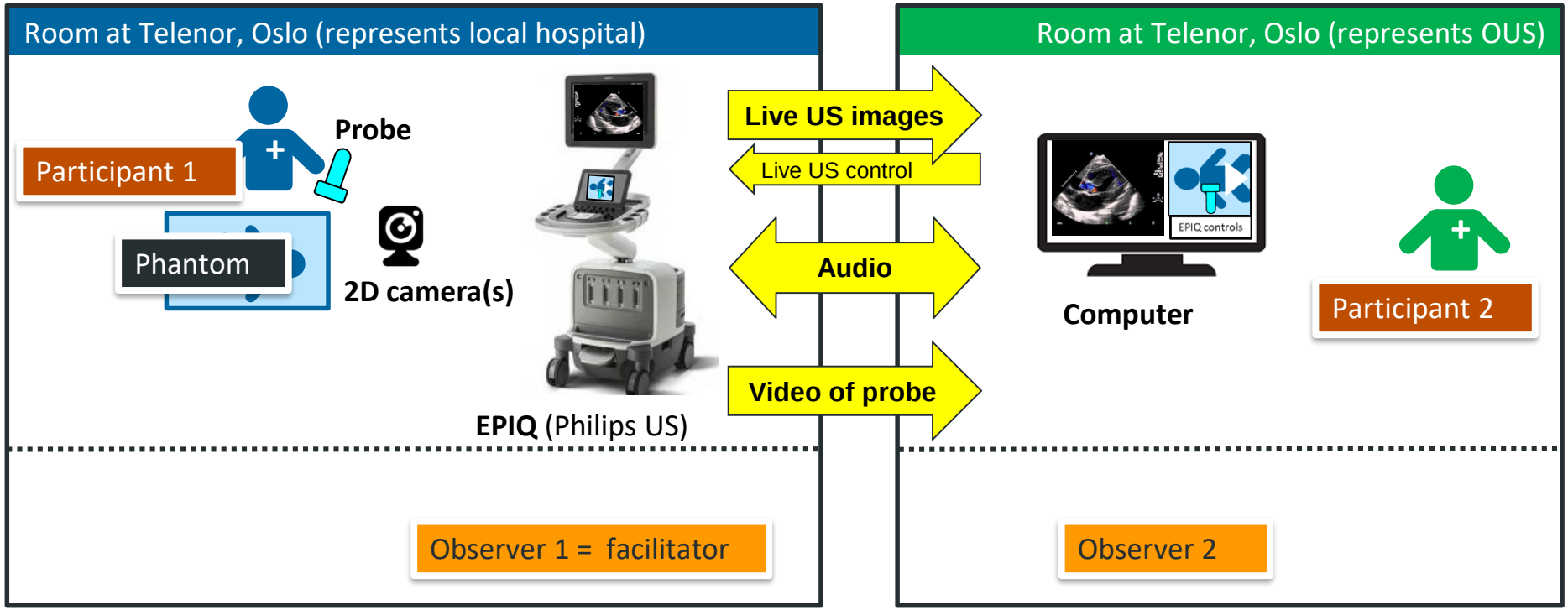
Concept 1: Basic 2D video



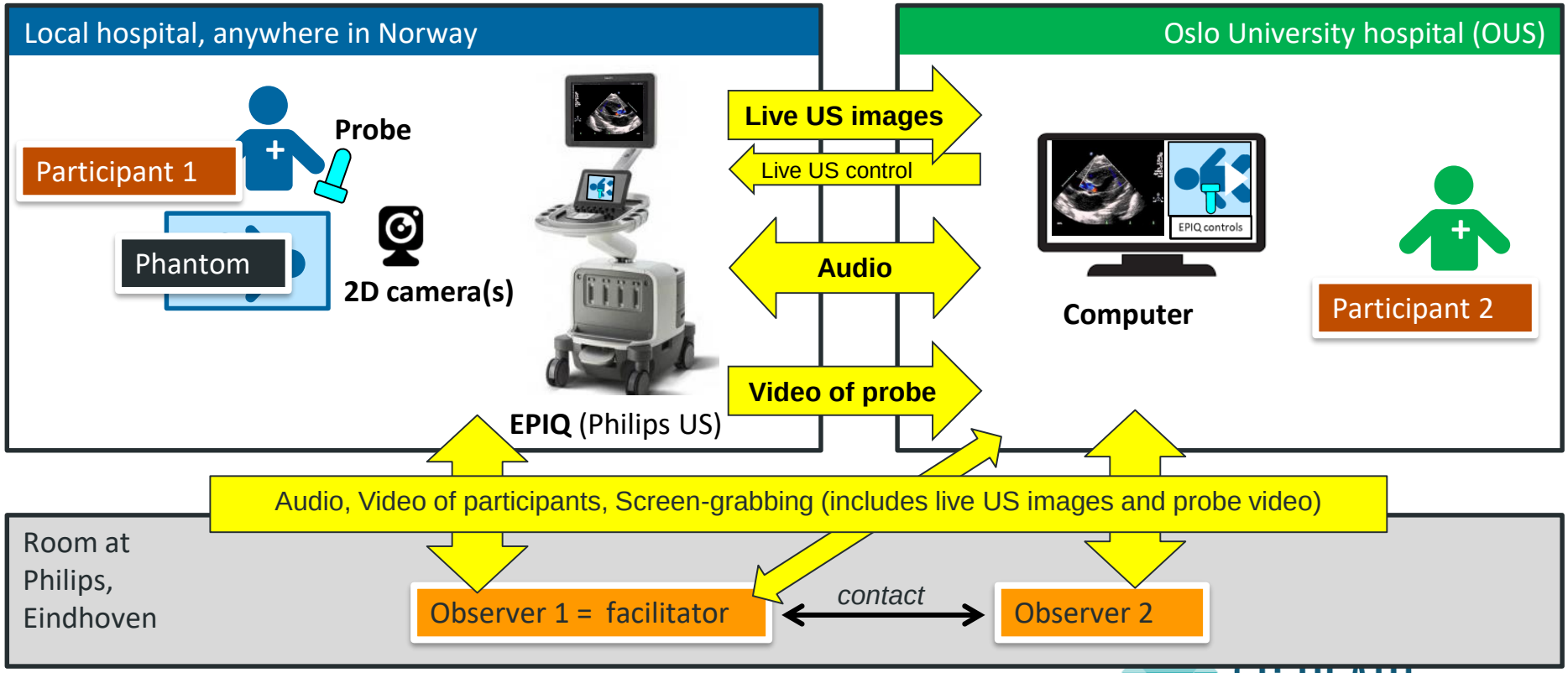
Concept 2: 3D Mixed reality



Experimental setup (concept 1)



Experimental setup (concept 1) – COVID proof



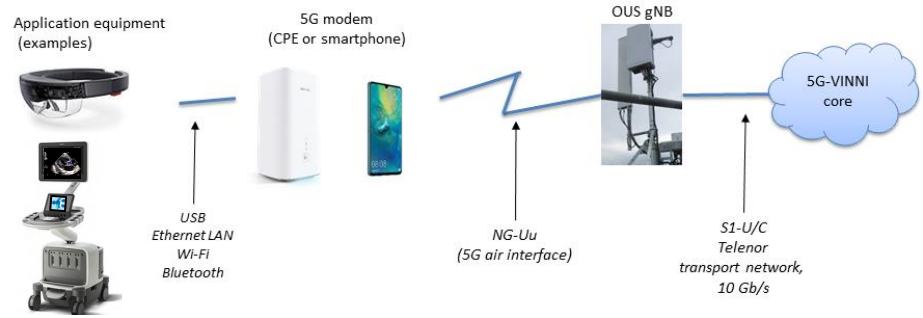
3 The need for 5G and the 5G-HEART testing facilities

Why 5G?

- High bandwidth (3D mixed reality) > 50 Mb/s
- Short latency (real-time cooperation) < 20 ms
- High reliability & availability (critically ill patient) > 99.9%

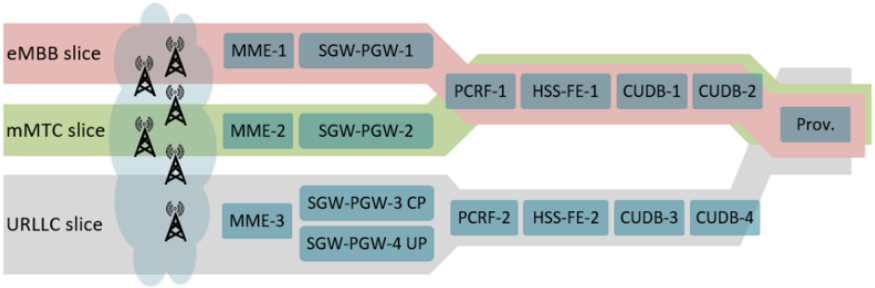
The 5G facilities in Norway

5G NR setup	
RAN architecture	Non-Standalone (NSA), option 3
Carrier frequency and bandwidth	LTE anchor: • Band 1: 2.1 GHz FDD • BW: 5 MHz 5G NR: • Band n78: 3.6 GHz TDD • BW: 80 MHz
5G NR antenna	64T64R active beamforming antenna
LTE antenna	4T4R RRU and passive antenna



Connecting to 5G-VINNI, phase 1

5G-VINNI core network	5G Core	Cloud platform	E2E service orchestration	Slice def and management
	Ericsson Virtual EPC (NSA)	Nokia Central NFVI and VIM	Nokia FlowOne	DECOR



5G-VINNI Norway Facility Slices Phase 1

4 Conclusions

Conclusions

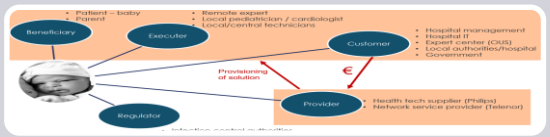
Motivation

Ultrasound essential in diagnosis & follow-up of newborns' congenital heart disease

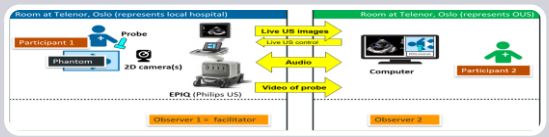
Lack of skills in local hospital affects quality of images & diagnosis

Real-time cooperation with remote expert could address this problem

Method



Explored stakeholders and their pain points



Planning for iterative user experience experiments involving stakeholders

- "Basic 2D video"
- "3D Mixed reality"

Subsequently envision testing on 5G facilities in Norway

THANK YOU
FOR YOUR ATTENTION

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