

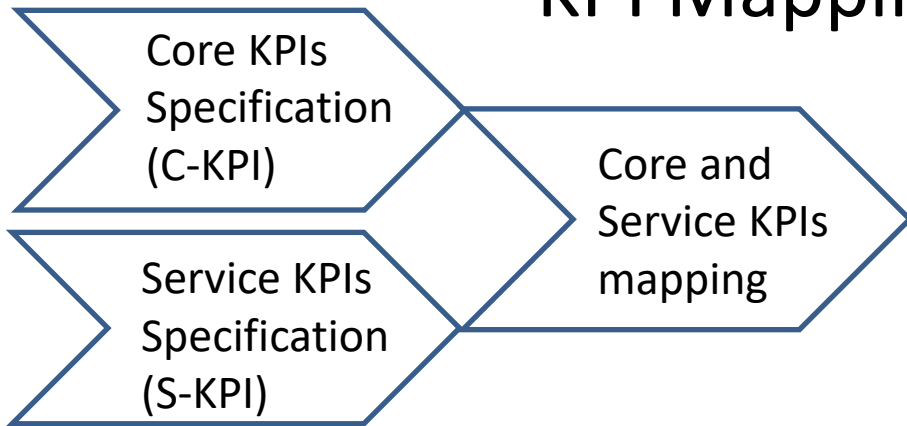
5G-PPP TMV Vertical TF

Industry 4.0
Luca Valcarengi
Scuola Superiore Sant'Anna
5Growth

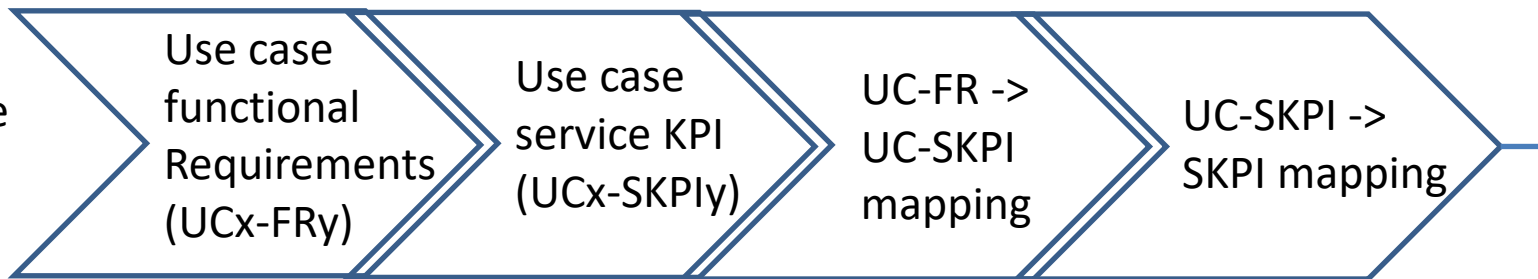
- Main achievements in 5Growth
- Mapping service/vertical KPIs to core/network KPIs
- Motivations
- Conclusions

Vertical/Service to Core/Network KPI Mapping

General



Per PoC
Use Case



Mapping in 5Growth first version

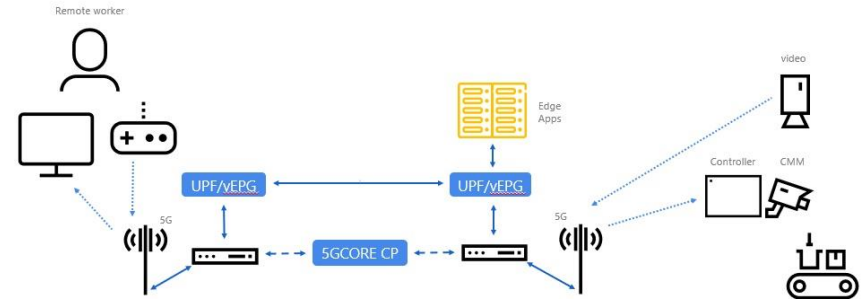
5GR-SKPIs	Core 5G KPIs										
	CKPI-1	CKPI-2	CKPI-3	CKPI-4	CKPI-5	CKPI-6	CKPI-7	CKPI-8	CKPI-9	CKPI-10	CKPI-11
5GR-SKPI-1					X	X					
5GR-SKPI-2	X	X									
5GR-SKPI-3				X	X					X	X
5GR-SKPI-4		X	X					X	X		
5GR-SKPI-5	X				X						
5GR-SKPI-6		X	X		X						
5GR-SKPI-7	X	X	X	X	X		X				
5GR-SKPI-8		X	X								
5GR-SKPI-9	X		X		X						
5GR-SKPI-10					X						
5GR-SKPI-11	X										

Mapping in 5Growth updated

5GR-SKPIs	Core 5G KPIs										
	CKPI-1	CKPI-2	CKPI-3	CKPI-4	CKPI-5	CKPI-6	CKPI-7	CKPI-8	CKPI-9	CKPI-10	CKPI-11
5GR-SKPI-1					X	X					
5GR-SKPI-2	X	X									
5GR-SKPI-3		+	+	X	X					X	X
5GR-SKPI-4		X	X					X	X		
5GR-SKPI-5	X				X						
5GR-SKPI-6		X	X		X						
5GR-SKPI-7	X	X	X	X	X		X				
5GR-SKPI-8	+	X	X								
5GR-SKPI-9	-		X		X						
5GR-SKPI-10					X						
5GR-SKPI-11	X		+								

Example Use Case 1: Connected Worker Remote Operation of Quality Equipment

- Remote operation of an industrial machine, called Coordinate-Measuring Machine (CMM).
- An expert located at the headquarter controls the movement of the CMM in a remote location using a virtual joystick, while receiving visual information through low-latency video stream.



From Use Case Functional Requirements to Service KPIs to Core KPIs

Functional Requirement	Use Case Service KPI	Service KPI	Core KPI
Real time video streaming to see the movement of the CMM	High-resolution Real-time Video Quality	5GR-SKPI-4 High-resolution Real-time Video Quality	CKPI-2 Packet Loss, CKPI-3 Guaranteed Data Rate, CKPI-8 Data Volume, and CKPI-9 Jitter

Core KPIs Definition in 5Growth

CKPI Id	CKPI Name	CKPI Description	Units
CKPI-2	Packet Loss	The number of packets that fail to reach their destination, measured in specific interfaces of the use case logical architecture	%
CKPI-3	Guaranteed Data Rate	The data rate is the number of bits per unit of time sent over a specific interface of the use case logical architecture. The guaranteed data rate is the minimum expected data rate for the overall use case to function correctly.	M/s
CKPI-8	Data Volume	The total quantity of information transferred over a given interface during specific use case operations, measured in bits.	Gbits
CKPI-9	Jitter	Variation of the end-to-end latency for the communications between specific components of the use case. This core KPI is useful to correlate QoE KPIs for the different video visualizations performed in the use cases.	ms

Service KPI to Core KPI Mapping: Motivations

- SKPI-4: High-resolution Real-time Video Quality
- This SKPI evaluates the QoE of the users consuming the video feed that supports a given use case.
- Real-time video requires monitoring the packet-loss, the minimum guaranteed data rate, the available data volume, and the jitter (core KPIs).
- Motivations
 - Specifically, real-time video is limited by the minimum data rate necessary for the video transmission at a certain quality.
 - The minimum data rate is defined to avoid possible queuing or dropping of video frames which degrade the quality of the video transmitted.
 - The jitter and the packet loss can directly affect the quality of the real-time video, as the variation between frame latency and retransmissions caused by packet loss. This typically results in video discontinuity.
 - The volume of data available to the application can also impact the quality of the real-time video, as the available data volume is essential to determine at which quality a video can be streamed

- Vertical/Service KPI definitions might slightly differ
- Procedure for mapping vertical/service KPIs to common Core/Network KPIs
- Procedure example in 5Growth

- Paola Iovanna, Ericsson Italy
- Manuel Lorenzo, Ericsson Spain
- Aitor Zabala, Telcaria
- All the 5Growth partners