

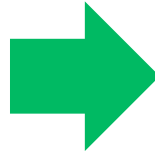
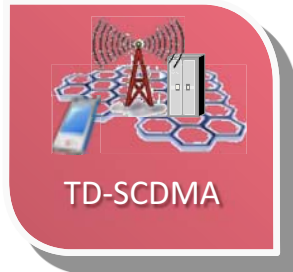


Some View on Next Generation Radio Interface

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Challenges for future 5G networks

Agility, openness, scalability, efficiency



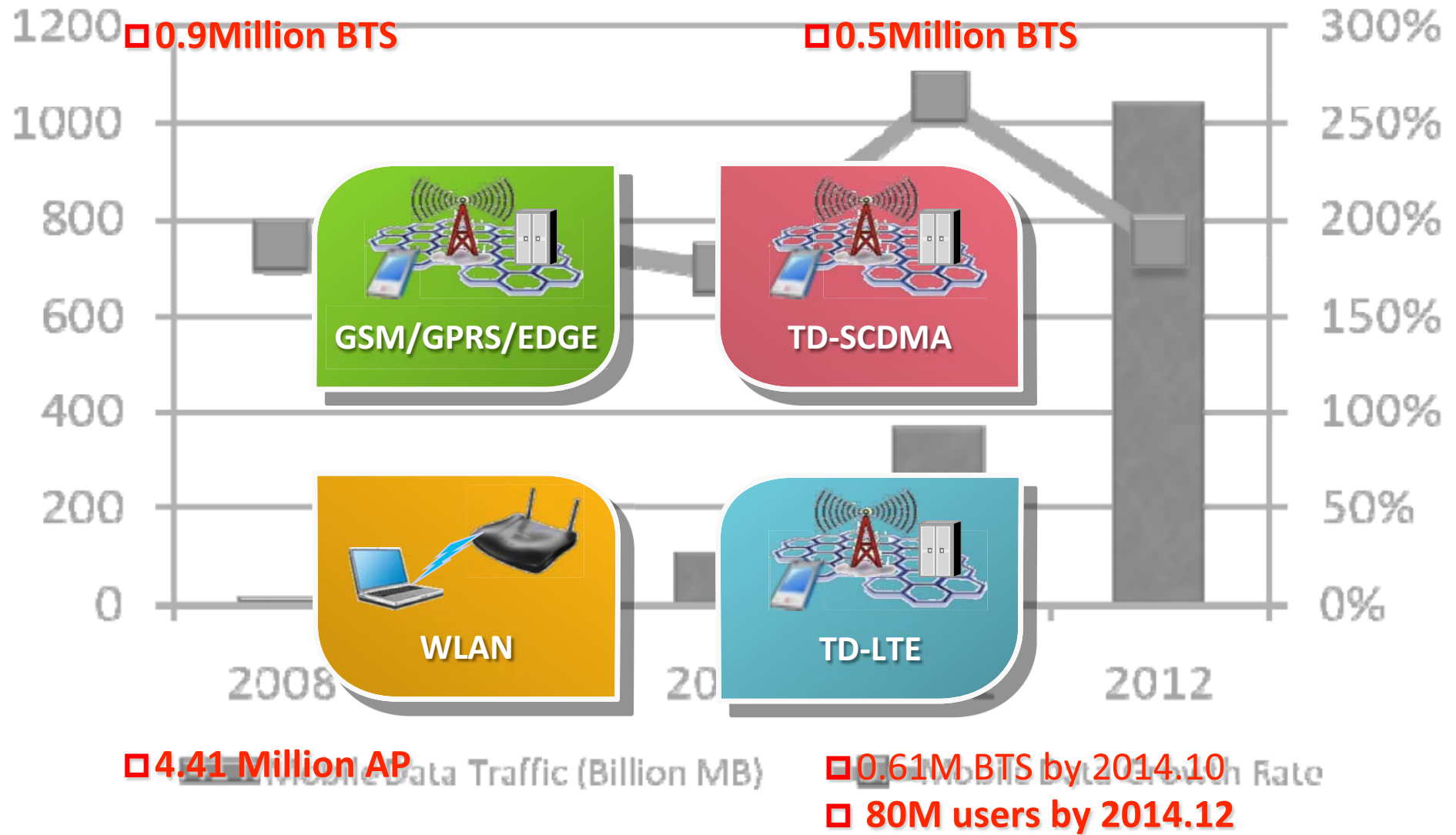
• So many issues for current “hard” mobile networks

- ✓ Time-to-market
- ✓ Service innovation
- ✓ Energy efficiency
- ✓ TCO
- ✓ Interoperability
- ✓ ...

Special Challenge for CMCC



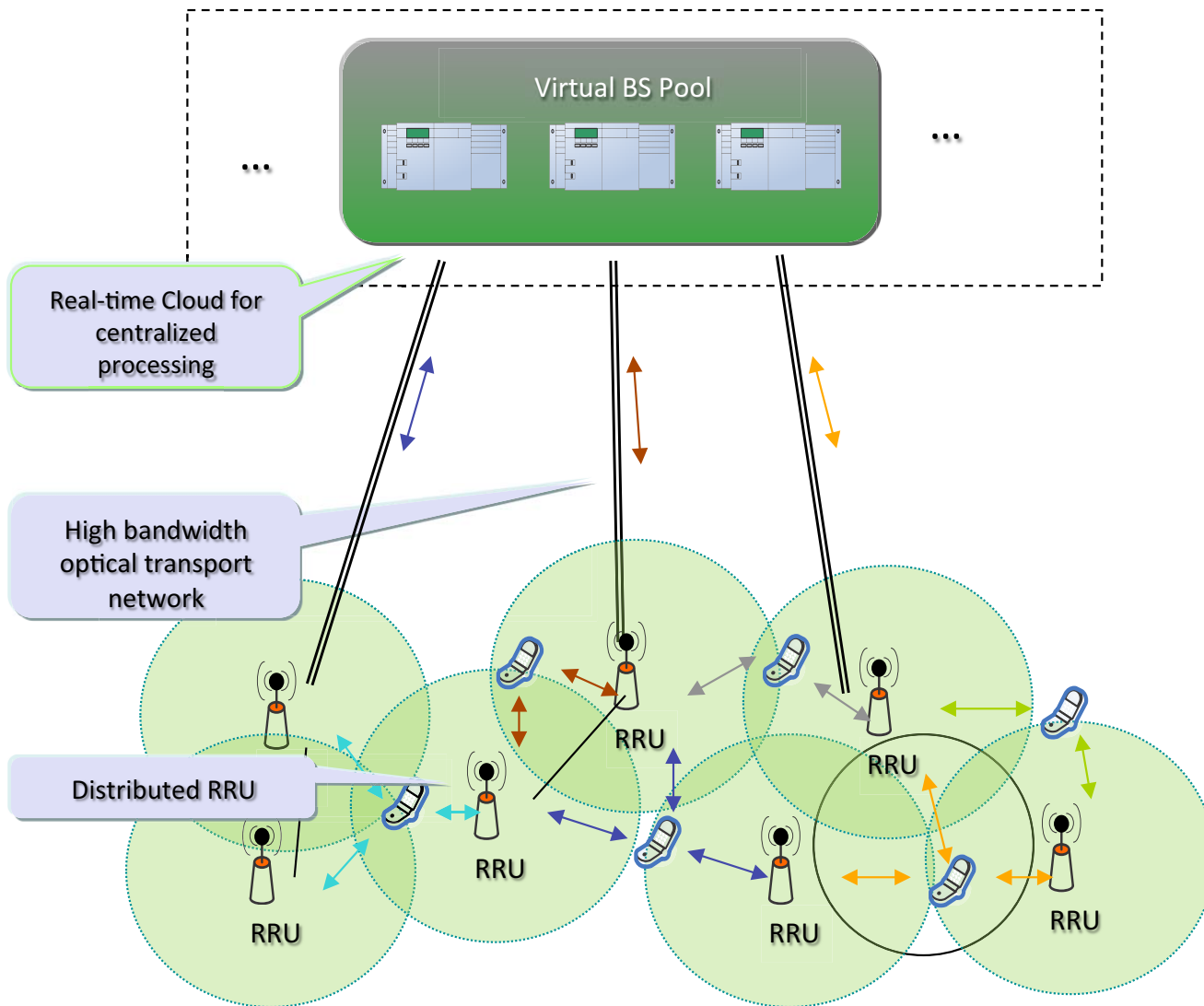
How to coordinate our four networks to satisfy user needs? **81x**
from 2008 to 2012



The answer: **Green** and **Soft**

C-RAN: the revolutionary evolution towards 5G, proposed by CMCC in 2009

“Soft BS” in C-RAN virtualization/cloudization



Centralized Control and/or Processing

- Centralized processing resource pool that can support 10~1000 cells

Collaborative Radio

- Multi-cell Joint scheduling and processing

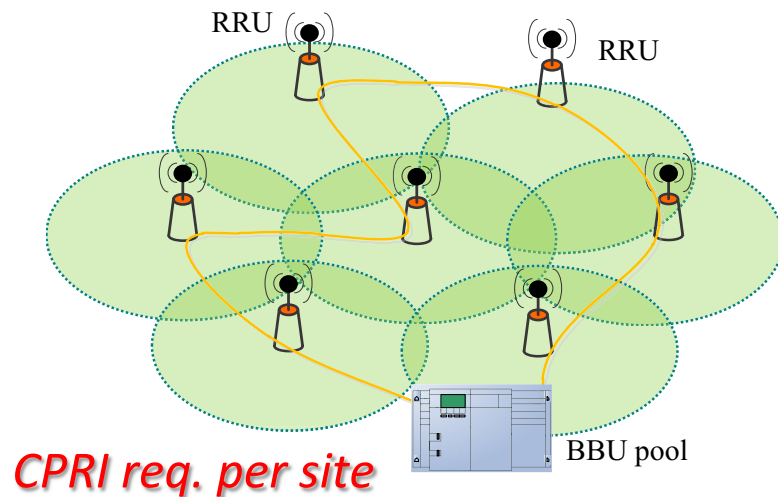
Real-Time Cloud

- Target to Open IT platform
- Consolidate the processing resource into a Cloud
- Flexible multi-standard operation and migration

Clean System Target

- Less power consuming
- Lower OPEX
- Fast system roll-out

Fronthaul is a major challenge for C-RAN deployment



Challenge by fronthaul b/w BBU and RRU

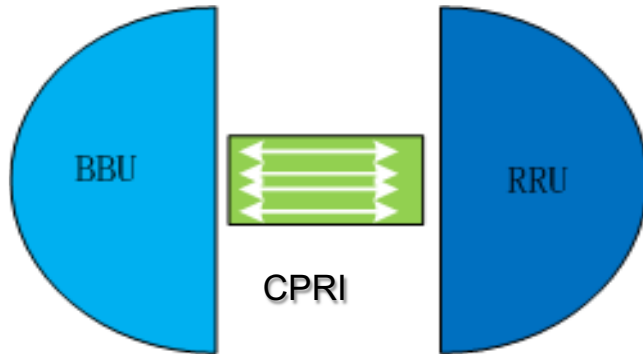
- Data rate b/w BBU and RRU using CPRI is **as high as 9.83Gbps** for 8-antenna TD-LTE, requiring **4** fibers for each carrier with 6G SFP

	Typical configuration	# of carriers	CPRI data rate per carrier	Total CPRI data rate before compression
GSM	3 RRU, S6/6/6	36	40Mbps	1.44Gbps
TD-S	3 RRU, S3/3/3	9	300Mbps	2.7Gbps
Current TD-LTE	3 RRU, S1/1/1	3	10Gbps	30Gbps
Medium term TD-LTE	S2/2/2	6	10Gbps	60Gbps

In addition, CPRI has critical requirements on synchronization and latency.

Efficient fronthaul solution is required to enable C-RAN large-scale deployment

Time to rethink FH for the sake of 5G evolution



1

CPRI for 5G? Probably NOT

- Too high data bandwidth
- Scalability issue to support 5G evolution
- Lower efficiency due to TDM mode

3

Initial work in SDOs

- NGMN conducted initial function split solutions for LTE
- Newly founded project in CCSA to study the requirements, scenarios and the key technologies
- Discussion in ITU-T and IEEE TSN recently

2

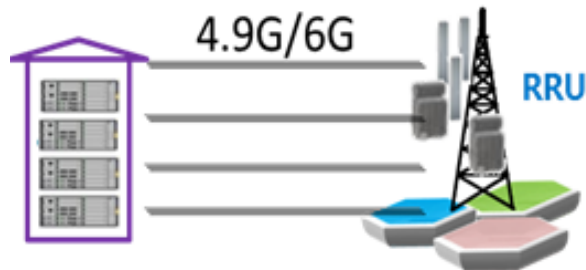
Rethink FH

- Traffic dependent to enjoy and enable statistical multiplexing for FH transport networks
 - Decoupling cell processing and UE processing
 - Decoupling UL and DL
 - Support key 5G technologies, e.g. LSAS, CoMP etc.
- A new FH requires joint design from both wireless and transport perspectives
 - Function split b/w BBU and RRU
 - Careful transport network design to address the latency, jitter and in particular, synchronization requirements
 - *More radically, could we relax the critical CPRI requirements* (e.g. 0.002ppm sync. requirement)?

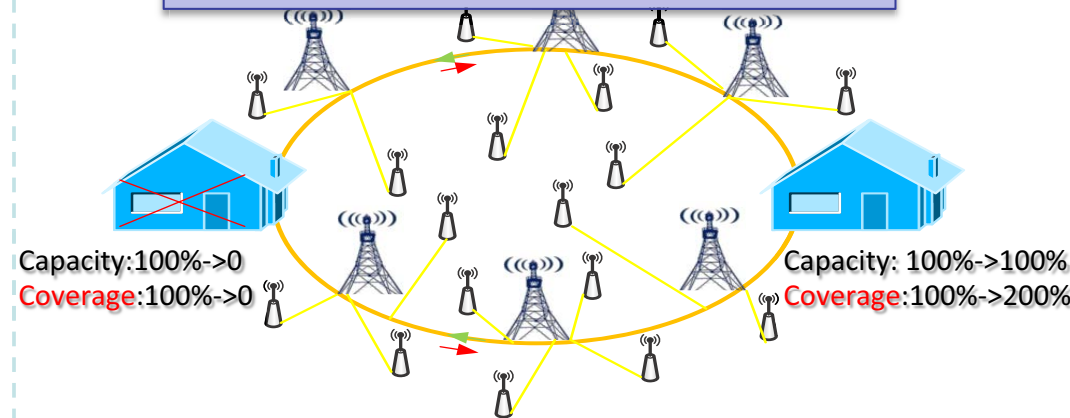
Expected benefits



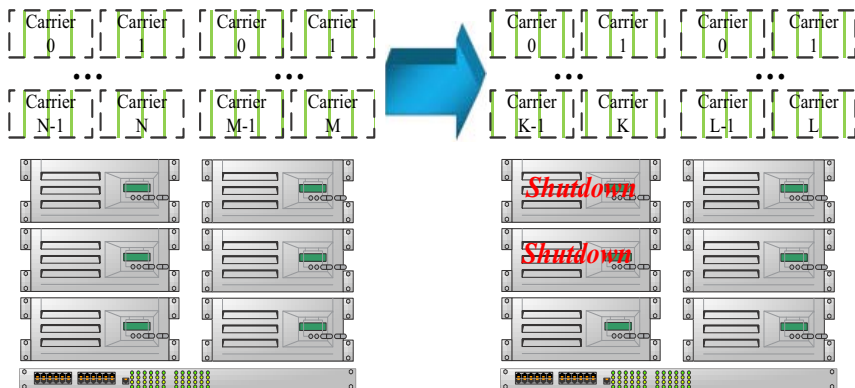
Reduced FH bandwidth
and therefore the cost



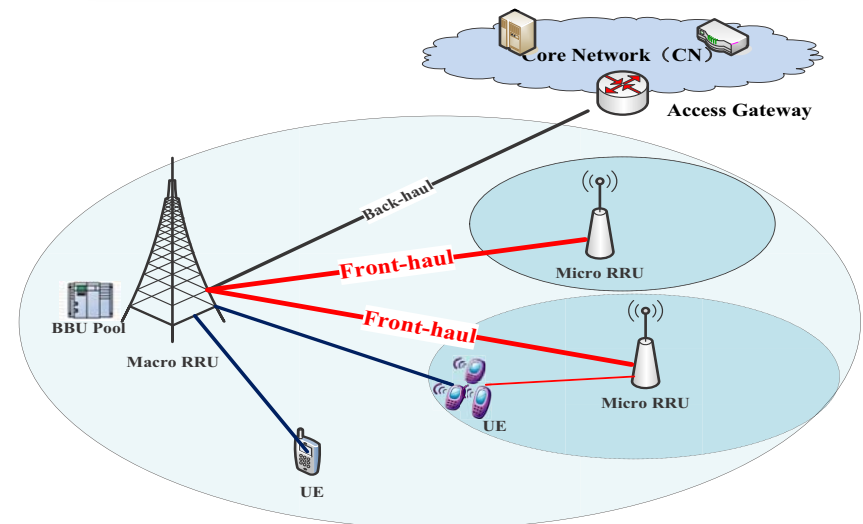
Disaster-tolerant backup thanks
to flexible mapping b/w BBU
pool and RRU



Better support for live
migration



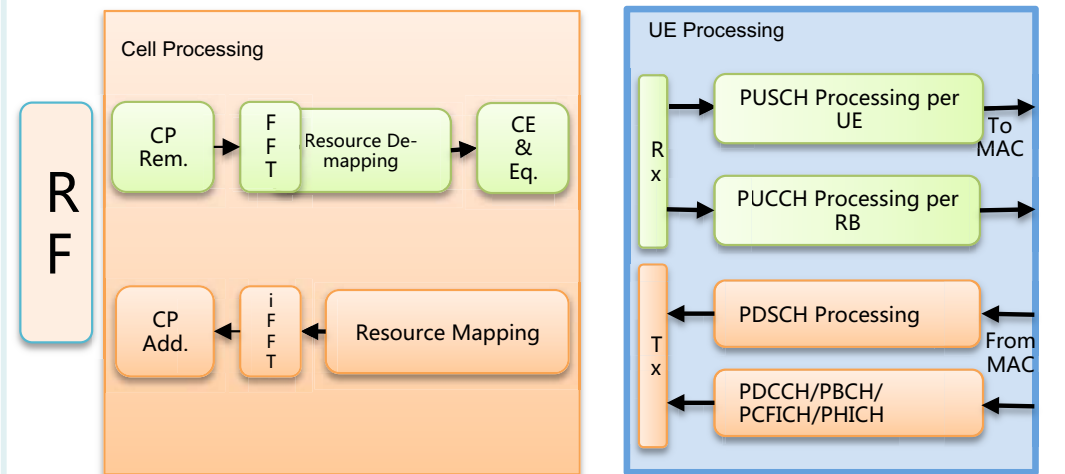
Better support for 5G
technologies due to the
flexible routing capability



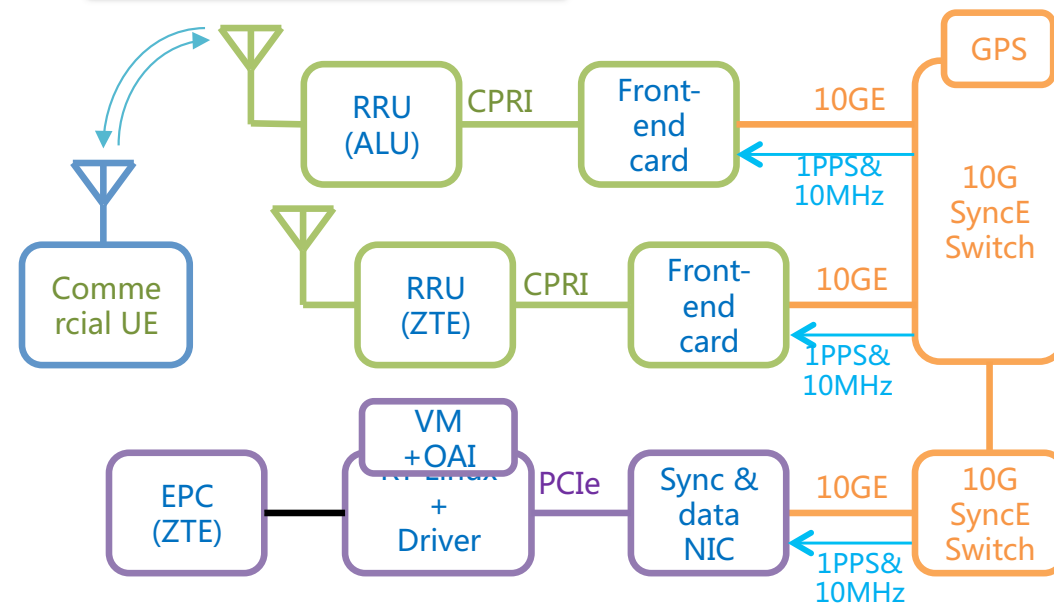
Some initial work in this front



- Initial study on BBU-RRU function split for LTE
- Design principle:
 - Traffic-dependent BW adaptation
 - Statistical multiplexing
 - Multiple mapping relationship b/w BBU and RRU
 - Independent of antenna number

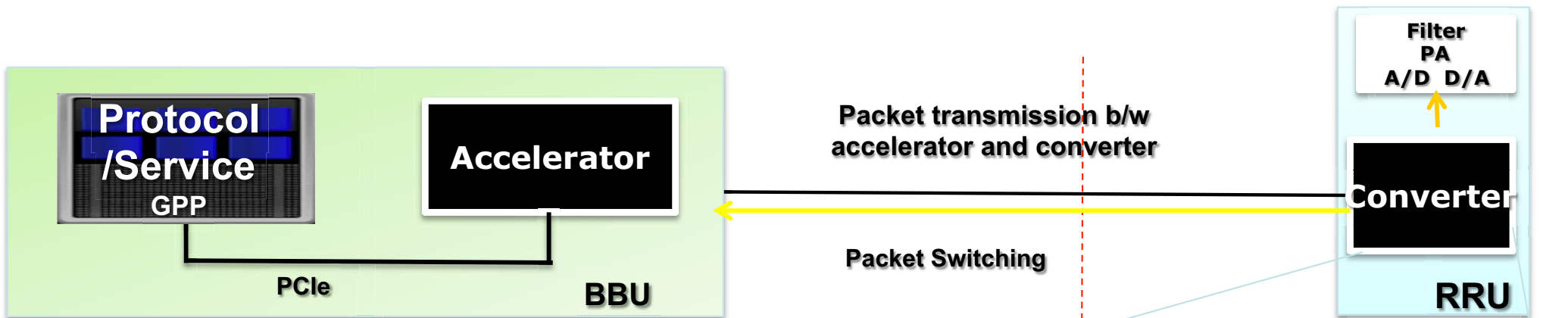


- Initial verification of the feasibility of CPRI over Ethernet
 - Simple point to point connection
 - CPRI I/Q sampling -> Ethernet packet of 512 Bytes
 - 1588v2 for RRU phase sync.



- WP on Next-generation Radio Interface (NGRI) ongoing, to be published by March
- NGRI forum planned for Q1 2015 (contact: huangjinri@chinamobile.com)

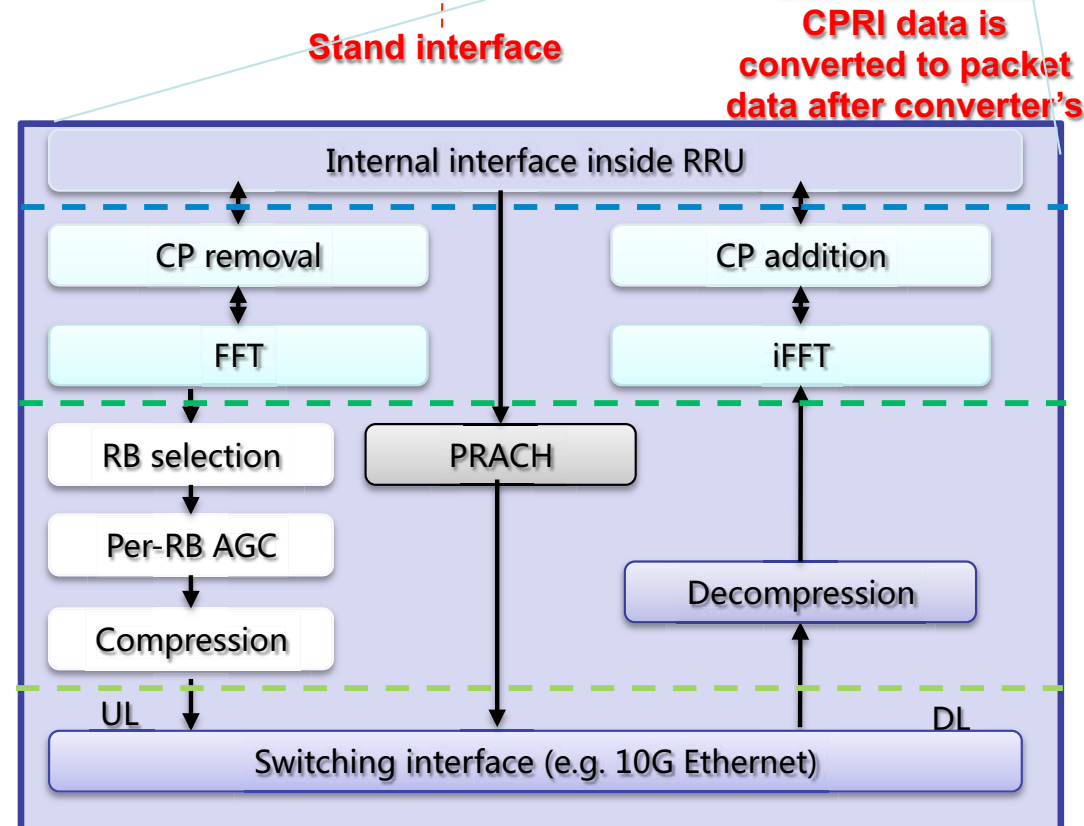
Initial study on BBU-RRU function split



Converter: to reduce bandwidth b/w BBU and RRU

- CPRI termination
- Pre-processing
- Switching interface
- BW proportional to traffic load
- Reduce maximum data rate to 1/5, e.g. 9.8Gbps to 2.1Gbps
- Make it possible for packetized CPRI and CPRI over ethernet

□ Still, other issues are under discussion



- NGRI requires joint re-design from both wireless and transport perspectives
- From wireless perspective:
 - BBU and RRU function split is required
 - A big impact on existing product form
 - Maintenance and future update are also concerns
- From transport perspective
 - Latency, jitter and synchronization issues on Ethernet

Thank you!