CAR 2 CAR Communication Consortium

DCC Workshop

Audi, Ingolstadt, Germany

July 11th 2012

ETSI DCC Standardization Activities

Report of the ETSI STF 420/447 activities

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CAR 2 CAR COMMUNICATION CONSORTIUM

Joint work – CAR 2 CAR and ETSI

- ETSI created a Specialist Task Force STF 420 to address the aspect of multi-channel operations
  - **STF 420 Members**:
    1. Jan de Jongh – TNO
       Paul Spanderman – TNO
    2. Friedbert Berens – FBConsulting
    3. Jérôme Härri – EURECOM
    4. Fritz Kasslatter (leader) – Siemens AG
  - STF Document: **ETSI TS 102 724**

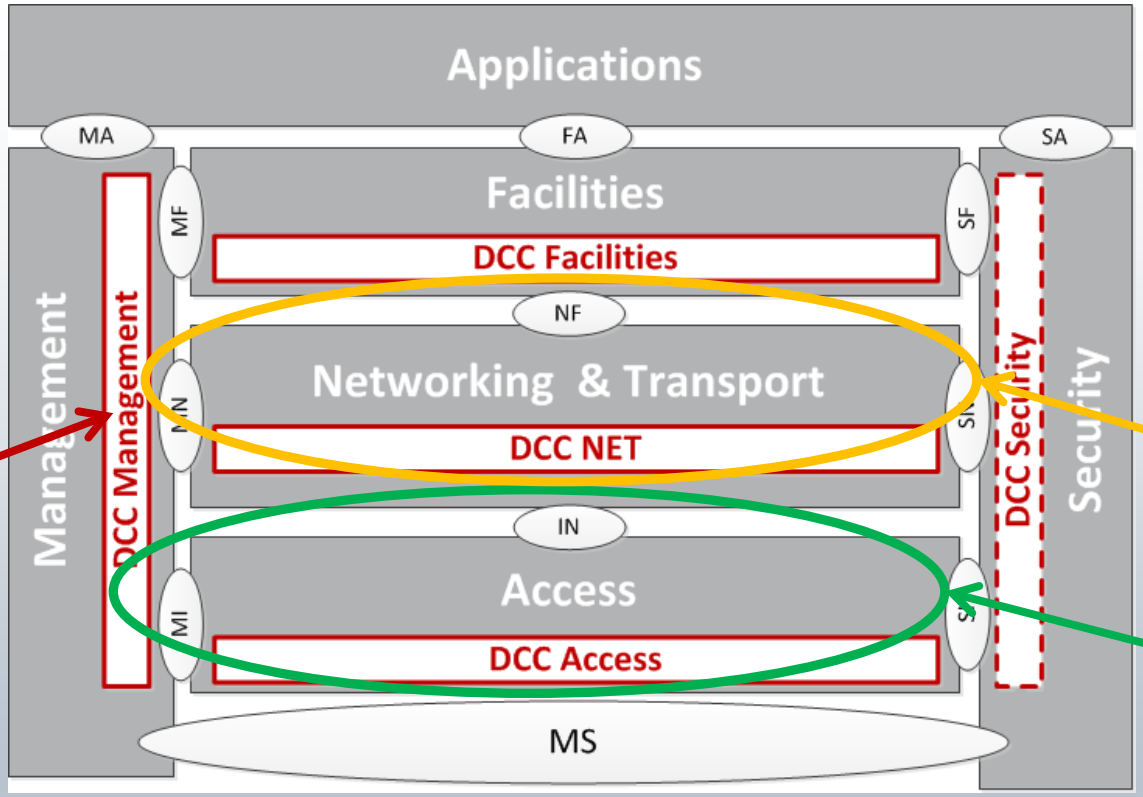
- The CAR 2 CAR WG COM also provided a Position Paper on multi-channel operations
  - **CAR 2 CAR Position Paper authors**:
    1. Achim Brakemeier – Daimler AG
    2. Christian Wewetzer – Volkswagen
    3. Andreas Kwoczek – Volkswagen
    4. Oliver Klemp – BMW

Joint work – CAR 2 CAR and ETSI

- ETSI created a Specialist Task Force STF 447 to address the aspect of DCC-NET
  - **STF 447 Members**:
    1. Jan de Jongh – TNO
    2. Dieter Smiely – Kapsch
    3. Jérôme Härri – EURECOM
    4. Tessa Tielert – KIT
  - STF Document: **ETSI TS 102 636-4-2**

- ETSI created a Specialist Task Force STF XYZ proposed by Friedbert Berens to address the aspect of DCC-Management

DCC at the ETSI – Global View



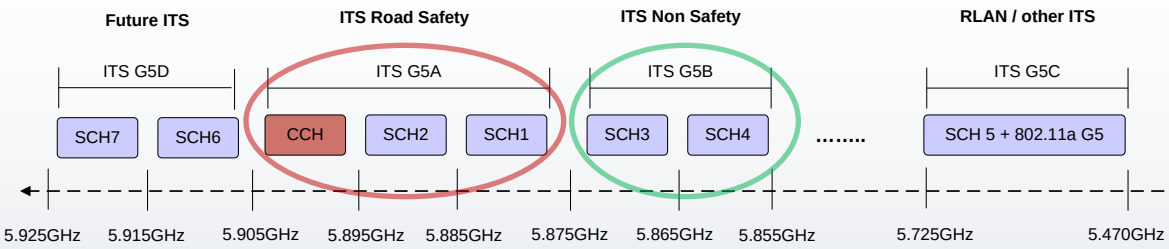
STFxyz

STF447

STF395A
STF420

ITS Message Set and Frequency Band

- ITS G5 Frequency Band (ETSI ES 202 663)

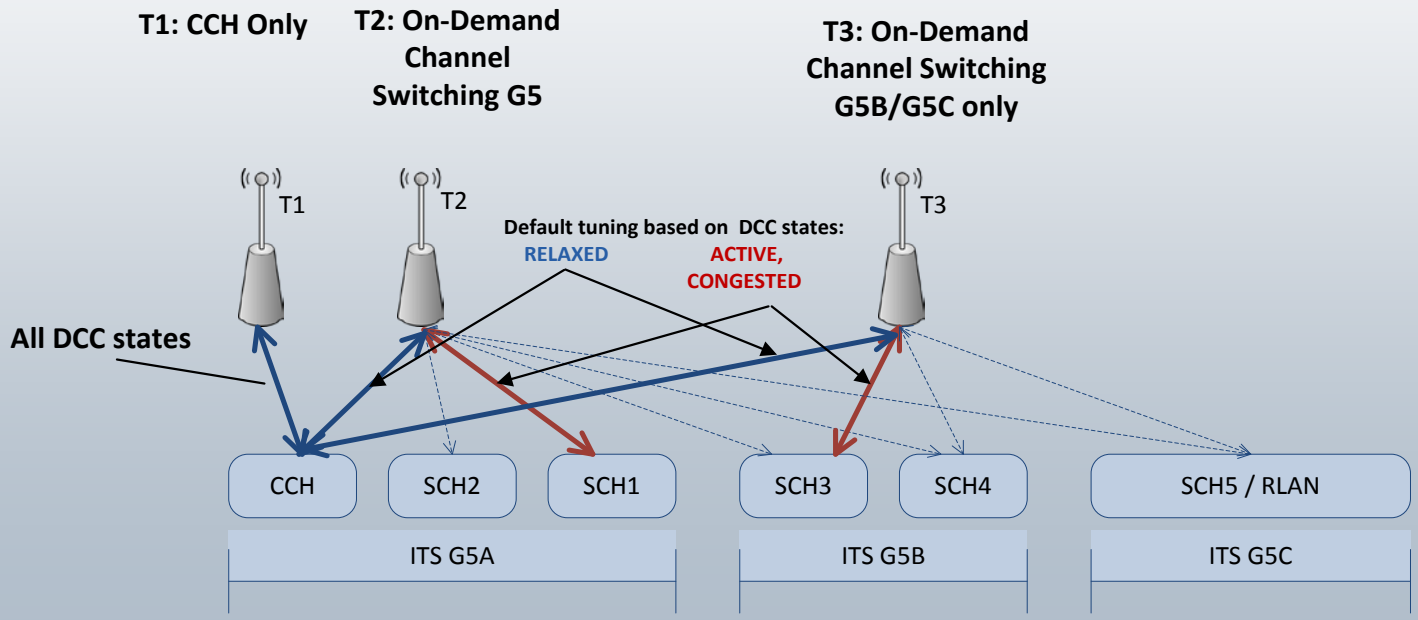


- Message Set for DAY 1 Applications
  - Cooperative Awareness Message (CAM - ETSI EN 102 637-2)
  - Decentralized Environmental Notification Message (DENM - ETSI EN 102 637-3)
  - Signal Phase and Timing Message (SPaT - SAE J2735)
  - Service Announcement Message (SAM – ETSI TS 102 890)
  - MAP - Geometric Intersection Description (MAP-SAE J2735)

ITS Non-Safety ITS Road Safety

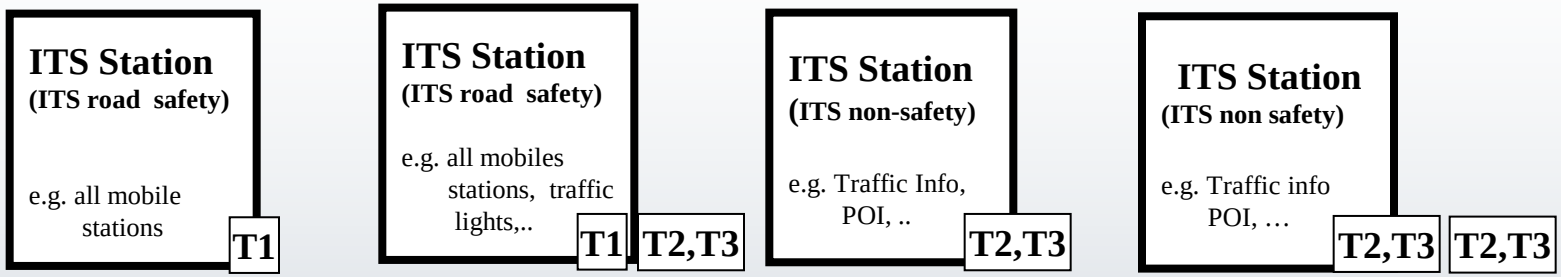
ITS G5 Fonctional Transceiver Configuration

- **ITS Transceiver Multi-Channel Configuration:**
  - Single Transceiver ITS Road Safety: T1
  - Dual Transceiver ITS Road Safety: T1 + T2
  - ITS Non-safety: T2, T3 or T2+T3



ITS G5 Fonctional Transceiver Configuration

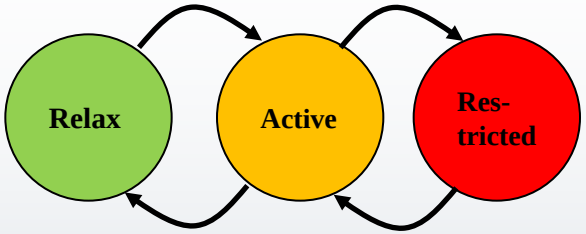
- **ITS Station Multi-Transceiver/Multi-Channel Architecture**

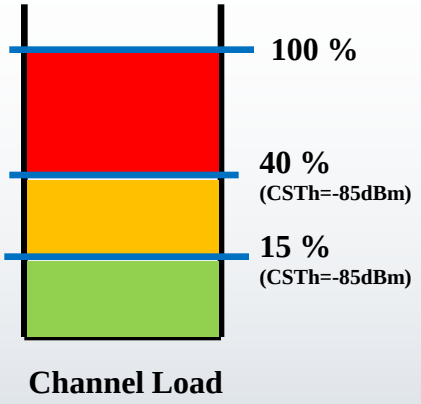


	Safety	General-Purpose ITS	Commercial
Single-Transceiver	T1		
		T2	
			T3
Dual Transceiver	T1	T2	
		T2, T2	
		T2	T3
			T3, T3

DCC-based Channel Access Policies (Proposal)

- Access Specifications and Restrictions are based on the DCC state of each channel
  - ETSI DCC: TS 102 687





- Per-Message Access Proposal

Message	CCH Relaxed	CCH Active	CCH Restrictive
CAM	CCH	CCH	CCH
DENM	CCH	CCH 1st hop SCH1 else	CCH 1st hop SCH1 else
SPaT/MAP	CCH	CCH/SCH1	CCH/SCH1
SAM	*SCH1/SCH3*	*SCH1/SCH3*	*SCH1/SCH3*
IP (over geonet)	CCH	SCH1/SCH..	SCH1/SCH

Multi-transceiver required

Message on CCH	AC_VI	AC_VO	AC_BE	AC_BK
CAM		✓		
DENM	✓			
SPaT/MAP			✓	
SAM			✓	
IP (over geonet)				✓

DCC-based Channel Access Policies (Proposal)

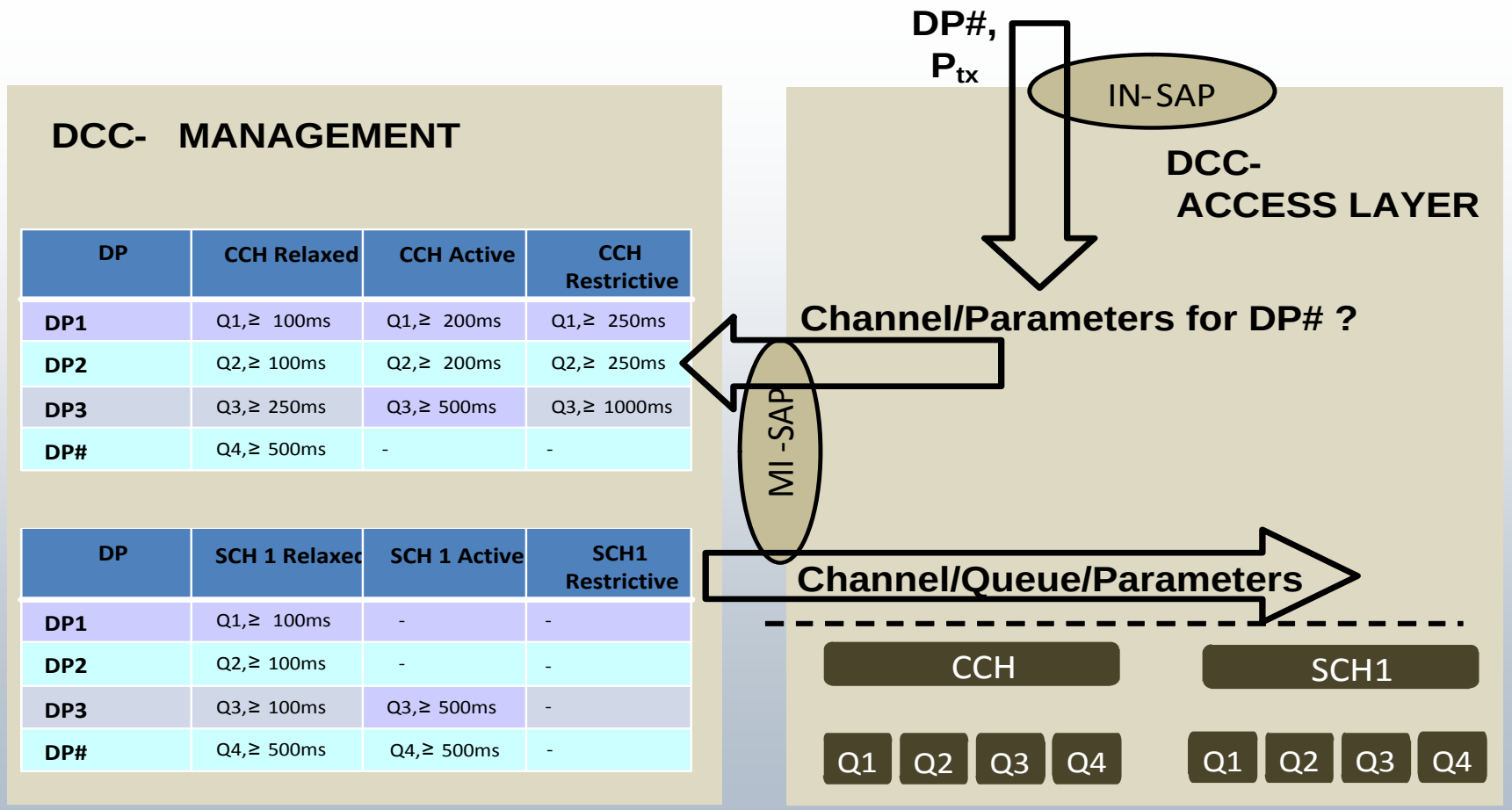
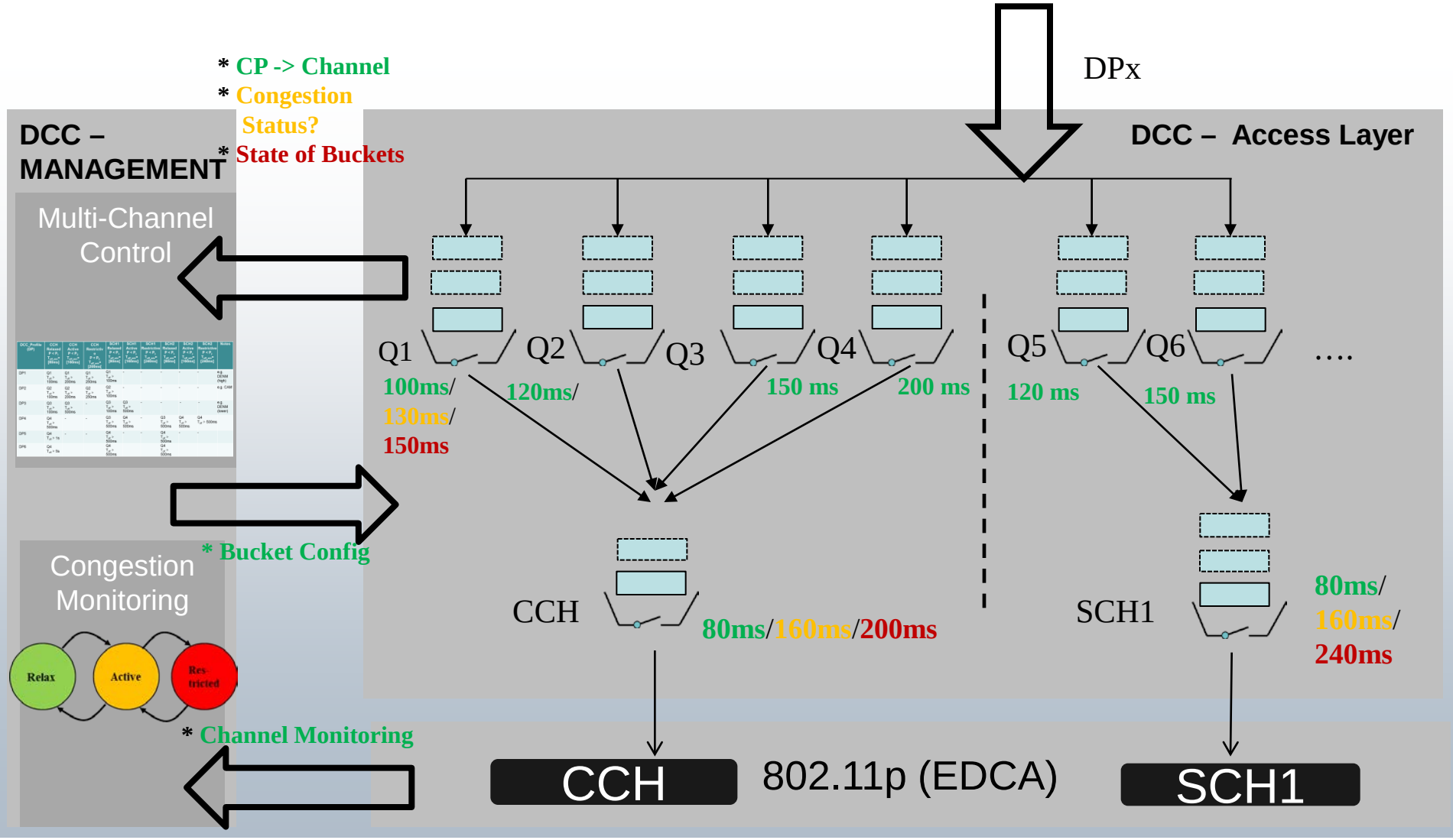


Table-based Channel Access Policies (Proposal)

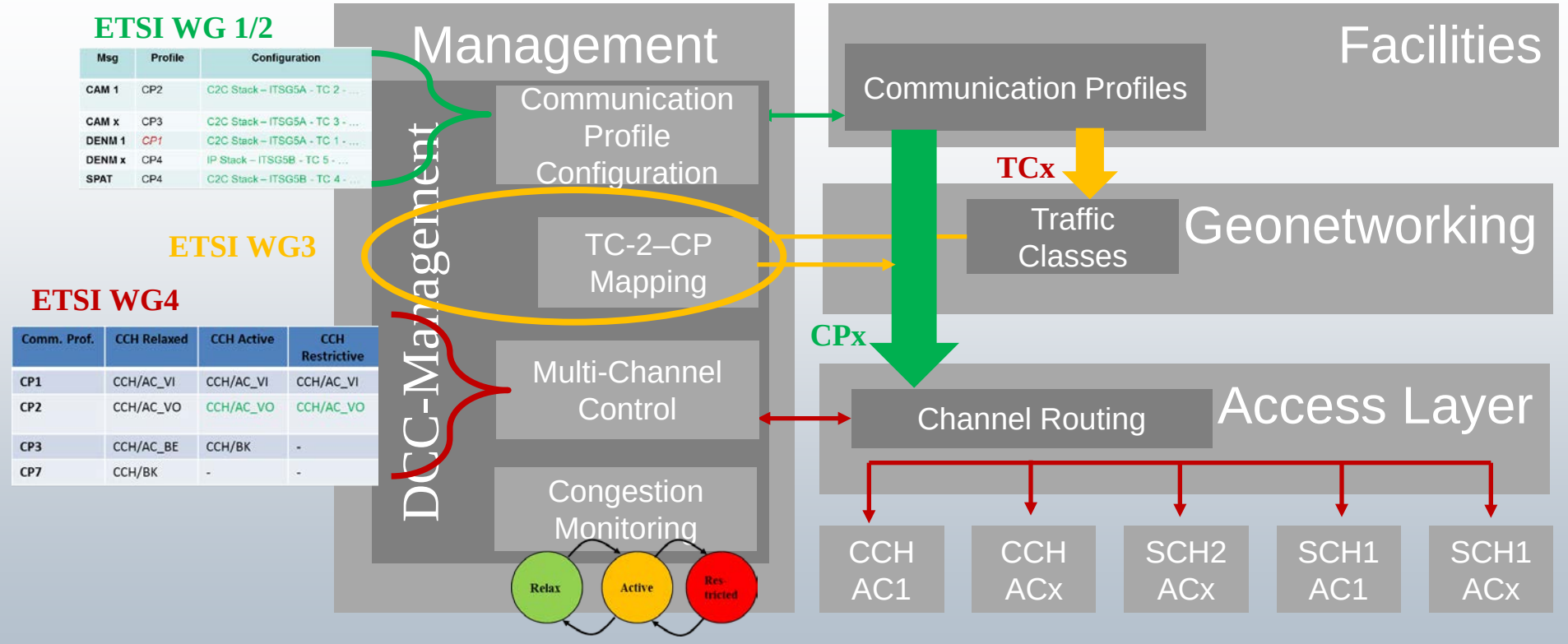
P: TX Power / Toff: Duty Cycle / Q: TX queues

Comm._ Profile (CP)	CCH Relaxed $P < P_1$ T_{off_min}= [80ms]	CCH Active $P < P_2$ T_{off_min}= [160ms]	CCH Restrictive $P < P_3$ T_{off_min}= [200ms[	SCH1 Relaxed $P < P_x$ T_{off_min}= [80ms[	SCH1 Active $P < P_y$ T_{off_min}= [160ms]	SCH1 Restrictive $P < P_z$ T_{off_min}= [240ms]	SCH2 Relaxed $P < P_x$ T_{off_min}= [80ms]	SCH2 Active $P < P_y$ T_{off_min}= [160ms]	SCH2 Restrictive $P < P_y$ T_{off_min}= [240ms]	Notes
DP1	Q1 T_{off} > 100ms	Q1 T_{off} > 200ms	Q1 T_{off} > 250ms	Q5 T_{off} > 100ms	-	-	-	-	-	e.g. DENM (high)
DP2	Q2 T_{off} > 120ms	Q2 T_{off} > 250ms	Q2 T_{off} > 300ms	Q6 T_{off} > 100ms	-	-	-	-	-	e.g. CAM
DP3	Q3 T_{off} > 100ms	Q3 T_{off} > 500ms	-	Q5 T_{off} > 100ms	Q6 T_{off} > 500ms	-	-	-	-	e.g. DENM (lower)
DP4	Q4 T_{off} > 500ms	-	-	Q5 T_{off} > 500ms	Q6 T_{off} > 500ms	-	Q9 T_{off} > 500ms	Q9 T_{off} > 500ms	Q9 T_{off} > 500ms	
DP5	Q4 T_{off} > 1s	-	-	Q7 T_{off} > 500ms	-	-	Q9 T_{off} > 500ms	-	-	
DP6	Q4 T_{off} > 5s			Q7 T_{off} > 500ms			Q10 T_{off} > 500ms			

DCC -ACCESS – Rate/Traffic Shaping



DCC-Management and DCC-NET



Open Issues

- Harmonization with the **CAR 2 CAR WG COM/ARCH**
- Harmonization with **ETSI WG GeoNet Media-Dependent DCC**
  - Mapping between Traffic Classes and Communication Profiles
- **Shaping of the Buckets**
  - So far, purely periodic: support for bursty traffic?
  - Queue length?
- **NDL** and **default values** of DCC-Access
- Implementation and Test
  - Liaison with **CAR 2 CAR WG SIM** on the iTETRIS ITS Simulation Platform
- Harmonization with other layers and DCC_MGNT

BACKUP SLIDES

Container

Msg	Profile	Configuration
CAM 1	CP2	C2C Stack – ITSG5A - TC 2 - …
CAM x	CP3	C2C Stack – ITSG5A - TC 3 - …
DENM 1	*CP1*	C2C Stack – ITSG5A - TC 1 - …
DENM x	CP4	IP Stack – ITSG5B - TC 5 - …
SPAT	CP4	C2C Stack – ITSG5B - TC 4 - …