

## Mifare® Classic Customer Media Phase Out – Card Comparison Study

Card Type	CMD 1/3 Mifare® 1K/4K	CMD2 Generic Micro-Processor	CMD8 Calypso	CMD7 Mifare® DESFire Card
<b>Introduction</b>	The most widely used card in the ITSO environment; a memory card. Simple. Comparatively low cost compared to competitors. Originally developed by Micron in Austria in early 1990s. Chips supplied by NXP semiconductors, formerly a division of Philips based in Eindhoven, Netherlands.	Many cards that operate with an ISO 7816 compliant command set and filing system can be certified to this CMD. This includes implementations on the popular JCOP 'Java Card Open Platform' family of micro-processor cards; an open platform smart card which can be used across a wide variety of application fields, developed by IBM Zurich, maintained by NXP semiconductors.	A platform of the ITSO Specification, that uses an ISO 7816 complaint command set and filing system. Predominantly used by a group of European based transit operators. Based in Belgium.	A microprocessor based product. Uses a command set compatible with but not compliant to ISO 7816. Contains more hardware security features than a standard Mifare® Classic product. Chips supplied by NXP semiconductors.
<b>Examples of usage</b>	The majority of TCAs within ENCTS. Oyster Card – Transport for London.	Bracknell Forest UA (SmartCitizen) Accord Card, Aberdeen	STIB – Brussels, Belgium Metropolitano de Lisboa – Lisbon, Portugal Paris Transportation Network – Paris, France	Nanjing Public Transport – Nanjing, China NASA access cards – Marshall Space Flight Centre, Alabama, USA.
<b>Can it be used in the ITSO environment?</b>	Yes <b>(until 31/12/2016)</b>	Yes	Yes	Yes
<b>Currently used in ENCTS?</b>	Yes	Yes	No	No
<b>Benefits</b>	Contactless technology. Wide circulation in ENCTS. Relatively inexpensive. Successfully implemented across a range of public transportation.	Contactless technology. ISO 14443A 1-4 compliant. ITSO compliant cards are already in circulation in ENCTS (Bracknell Forest UA).	Contactless technology. Fast, safe transaction (decentralised security) ISO 14443 1-4 compliant. Microprocessor based cards with good security at a reasonable cost.	Contactless technology. ISO 14443A 1-3 compliant. More secure than previous Mifare® products. (Does not use Mifare® Classic cryptography.)
<b>Drawbacks</b>	Concerns about exposed algorithm security. <b>Due to be phased out of ITSO environment by 31/12/2016.</b>	More expensive than Mifare® Classic. Some examples have issues with longer transaction times; as a result <b>ITSO phasing out cards with slower transaction times above 600ms.</b> For the avoidance of doubt, this drawback does not apply for the use of this CMD within ITSO on ITSO compliant readers. In order to use this ITSO CMD as an alternative to Mifare® Classic for non-ITSO applications outside of the ITSO environment; the readers used by the non-ITSO application may need replacing, unless they are already ITSO compliant.	For the avoidance of doubt, this drawback does not apply for the use of this CMD within ITSO on ITSO compliant readers. In order to use this ITSO CMD as an alternative to Mifare® Classic for non-ITSO applications outside of the ITSO environment; the readers used by the non-ITSO application may need replacing, unless they are already ITSO compliant.	For the avoidance of doubt, this drawback does not apply for the use of this CMD within ITSO on ITSO compliant readers. In order to use this ITSO CMD as an alternative to Mifare® Classic for non-ITSO applications outside of the ITSO environment; the readers used by the non-ITSO application may need replacing, unless they are already ITSO compliant..