Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [X] To Chairmen
(D) [-] No distribution

Datasheet for the decision of 20 January 2021

Case Number: T 1148/15 - 3.5.04

Application Number: 07004089.4

Publication Number: 1830560

IPC: H04N5/00, H04N5/44

Language of the proceedings: EN

Title of invention:
A protocol for control of network or bus attached cable TV set-top box front-end functionality

Applicant:
Avago Technologies International Sales Pte. Limited

Headword:

Relevant legal provisions:
EPC 1973 Art. 56, 84, 113(1)
EPC R. 106

Keyword:
Inventive step - problem and solution approach
Inventive step - closest prior art
Inventive step - objective technical problem
Inventive step - selection of one of several obvious solutions
Inventive step - ex post facto analysis (no)
Claims - clarity (no)
Right to be heard - opportunity to comment (yes)
Objection under Rule 106 EPC (dismissed)

Decisions cited:
T 0698/10, T 2057/12, T 2201/10

Catchword:
see sections 3 to 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1148/15 - 3.5.04

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 20 January 2021

Appellant: (Applicant)	Avago Technologies International Sales Pte. Limited 1 Yishun Avenue 7 Singapore 768923 (SG)
Representative:	Bosch Jehle Patentanwaltsgesellschaft mbH Flüggenstraße 13 80639 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 17 December 2014 refusing European patent application No. 07004089.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	B. Müller
Members:	M. Paci
	A. Seeger

Summary of Facts and Submissions

I. The appeal is against the examining division's decision refusing European patent application No. 07004089.4, published as EP 1 830 560 A2.

II. The prior-art documents cited in the decision under appeal included the following:

D1: EP 1 478 172 A1
D2: WO 01/74079 A1

III. The decision under appeal was based on the following grounds:
- The subject-matter of claim 1 of the main request lacked novelty (Article 54 EPC) over the disclosure of document D2.
- Claim 1 of the first auxiliary request did not meet the requirements of Articles 83 and 84 EPC.
- Claim 1 of the second, third and fourth auxiliary requests did not meet the requirements of Article 84 EPC.
- The subject-matter of claim 1 of the fourth auxiliary request lacked novelty over the disclosure of document D1 (Article 54 EPC). The subject-matter of claim 9 of the fourth auxiliary request lacked inventive step over the combined disclosures of D1 and D2 (Article 56 EPC). The subject-matter of dependent claims 2 to 8 and 10 of the fourth auxiliary request lacked inventive step over the cited prior art (Article 56 EPC).

IV. With the statement of grounds of appeal, the appellant maintained all requests "*on file in the order as given at the end of the oral proceedings dated September 11, 2014*". It requested that the decision under appeal be

set aside and that a European patent be granted on the basis of the claims according to the main request or one of the first to fourth auxiliary requests which formed the basis for the decision under appeal. The appellant provided reasons as to why the claims of all requests met the requirements of Articles 54, 56, 83 and 84 EPC and indicated a basis in the application as filed for the claimed subject-matter.

V. The board issued a communication accompanying the summons to oral proceedings. The board provisionally found that the subject-matter of claim 1 of the main request was novel over the disclosure of document D2. Pursuant to Article 114(1) EPC 1973, the board introduced the US patent application published as US 2002/006437 A1 into the proceedings. It referred to it as prior-art document **D6** and expressed the preliminary opinion that the requests on file were not allowable for the following reasons:
- The subject-matter of claim 1 of the main request and of the first and fourth auxiliary requests lacked inventive step over the combined disclosures of D2 and D6 and the common general knowledge of the person skilled in the art (Article 56 EPC 1973).
- The subject-matter of claim 1 of the second and third auxiliary requests did not meet the requirements of Article 84 EPC 1973.

VI. By letter dated 10 December 2020, the appellant filed amended claims according to an auxiliary request 3a "*ranked after Auxiliary 3* [sic]" and submitted arguments as to why this request should be admitted into the appeal proceedings and as to why the main request, the first to third auxiliary requests and auxiliary request 3a were allowable.

VII. The board held oral proceedings on 20 January 2021.

During the oral proceedings, the appellant filed in writing a "*Formal objection under Art. 113(1) EPC*", which it confirmed to constitute an objection under Rule 106 EPC.

The appellant's objection under Rule 106 EPC reads as follows (underlining and **bold** typeface added by the appellant):

"***Formal objection under Art. 113(1) EPC***

During the Oral appeal Proceedings, Applicant has made the following formal objection under Art. 113(1) EPC.

Applicant's right to be heard under Article 113(1) EPC 1973 has not been observed because the board has not given any comprehensible reason in its communication or in the course of the oral proceedings why it was not applying inappropriate hindsight when choosing D2 as closest prior art for assessing inventive step.

According to established case law, a central consideration in selecting the closest prior art is that it must be directed ***to the same purpose or effect as the invention****, otherwise it cannot lead the skilled person in an obvious way to the claimed invention (ClBoA, 9th edition, p. 180, et seq.)*

According to T 606/89 the closest prior art for the purpose of objectively assessing inventive step is generally that which corresponds to a similar use requiring the minimum of structural and functional modifications (see also T 574/88, T 606/89, T 686/91, T 834/91, T 482/92, T 59/96, T 650/01, T 1747/12).

According to T 506/95 the closest prior art is the art most suitable for the purpose claimed by the invention, ***not the art superficially showing structural similarities.*** *Ideally,* ***that purpose shall already be mentioned in the prior art document as a goal worth achieving.***

The ***aim is that the assessment shall start from a situation as close as possible to that encountered by the inventor.*** *The real-world circumstances have to be taken into account. In the present case, one main object of the teaching of D2 is to simplify set-top box designs (D2, p. 4, 2nd sentence, all emphasis – also in the following – added):*

> *reducing costs to manufacturers and consumers. What is also needed is an* ***apparatus and/or method that can*** *address the above need and that can* ***simplify set-top box designs*** *with an increase in the overall processing and data*

Even more severe, D2 classifies internal set-top box hardware as complex and costly and explicitly characterizes required interfaces and data exchanges between the various hardware components as complex.

In other words, D2 rather aims at reducing the number of complex hardware components and the interfaces between them to reduce the costs (D2, p. 3, last four sentences):

> *graphics processing, etc.). Consequently, the* ***internal set-top box hardware*** *may be somewhat* ***complex and costly.*** *In addition, the layout of the hardware within the set-top box may also be* ***complex*** *in order to accomplish the required* ***interfaces and***

data exchanges between the various hardware components. *These factors can also* ***lead to increased costs*** *for the manufacturer and ultimately for consumers. Accordingly, it is* ***desirable to simplify the design of a set-top box*** *without a decrease in, and preferably with an increase in, the overall processing and data handling performance of the set-top box.*

In this situation, it is hardly conceivable that the skilled person would have decided to ignore these objects to simplify the design of set-top boxes and the interfaces between their hardware components.

In other words, it is seems absolutely ***not realistic in the sense of*** *T 2057/12 that – starting from D2 – the skilled person would have considered to introduce* ***a further complex hardware component*** *such as a further CPU that would have increased the complexity of the design, let alone that he would have considered to introduce* ***a separate interface*** *between the CPUs beyond the PCI bus in Fig. 3 of D2 so that the further CPU can receive instructions from the CPU.*

As a result, identifying reducing the load of the common CPU as a problem in D2 – as done in section 5.5 of the preliminary opinion – appears as an inadmissible interpretation of the teaching of D2 with deviating focus as influenced by the problem solved by the invention (ClBoA, 9th edition, chapter I.D.6., p. 199, section 6., 2nd para; T 5/81, T 63/97, T 170/97, T 414/98).

In this regard, Applicant has presented arguments that the problem and solution approach is wrongly applied if document D2 is chosen as the starting point, since from

this prior art no relevant technical problem can be formulated without inappropriate hindsight.

The board has also not explained why it intends to deviate from the case law of the boards of appeal, in particular the above mentioned decisions. Without receiving any reasons for the board's divergent view, Applicant's representative is not been [sic] *in a position to provide a substantiated reply to the board on this decisive aspect."*

The appellant's final requests were that the decision under appeal be set aside and a European patent be granted on the basis of the claims of the main request or the first to third auxiliary requests underlying the decision under appeal, of auxiliary request 3a filed with the letter dated 10 December 2020, or of the fourth auxiliary request underlying the decision under appeal, in this order.

At the end of the oral proceedings, the chair announced the board's decision.

VIII. Claim 1 according to the appellant's **main request** reads as follows:

"A set-top box (200) configured to interface with a communications medium, comprising:

a front-end portion (202) having an input and an output coupled to said communications medium, said front-end portion (202) having:

a plurality of front-end circuits (280, 281, 270, 306) configured to receive and transmit signals over said communications medium; and

a front-end processor (252) configured to control said plurality of front-end circuits (280, 281, 270, 306);

a back-end portion (204) coupled to said front-end portion (202), said back-end portion (204) having:

a plurality of back-end circuits (216, 218, 222) configured to process baseband signals that correspond to said transmit and receive signals of said front-end portion (202); and

a back-end processor (254) configured to control said back-end circuits (216, 218, 222) and to provide instructions to said front-end processor (252) for controlling said front-end circuits (280, 281, 270, 306)."

IX. Claim 1 according to the appellant's **first auxiliary request** reads as follows:

"A set-top box (200) configured to interface with a communications medium, comprising:

a front-end portion (202) having an input and an output coupled to said communications medium, said front-end portion (202) having:

a plurality of front-end circuits (280, 281, 270, 306) configured to receive and transmit signals over said communications medium; and

a front-end processor (252) configured to control said plurality of front-end circuits (280, 281, 270, 306);

a back-end portion (204) coupled to said front-end portion (202), said back-end portion (204) having:

a plurality of back-end circuits (216, 218, 222) configured to process baseband signals that correspond to said transmit and receive signals of said front-end portion (202); and

a back-end processor (254) configured to control said back-end circuits (216, 218, 222) and to provide instructions to said front-end processor (252) for controlling said front-end circuits (280, 281, 270, 306) wherein the front-end processor (252) is configured to control said plurality of front-end circuits (280, 281, 270, 306) by issuing commands via a port (257) to said plurality of front-end circuits (280, 281, 270, 306) both independently and based on said instructions received from the back-end processor (254)."

X. Claim 1 according to the appellant's **second auxiliary request** reads as follows:

"A set-top box (200) configured to interface with a communications medium, comprising:

a front-end portion (202) having an input and an output coupled to said communications medium, said front-end portion (202) having:

a plurality of front-end circuits (280, 281, 270, 306) configured to receive and transmit signals over said communications medium; and

a front-end processor (252) configured to control said plurality of front-end circuits (280, 281, 270, 306);

a back-end portion (204) coupled to said front-end portion (202), said back-end portion (204) having:

a plurality of back-end circuits (216, 218, 222) configured to process baseband signals that correspond to said transmit and receive signals of said front-end portion (202); and

a back-end processor (254) configured to control said back-end circuits (216, 218, 222) and to provide instructions to said front-end processor (252)

for controlling said front-end circuits (280, 281, 270, 306);

said front-end processor (252) and said back-end processor (254) configured to communicate said instructions using a remote front-end control protocol."

XI. Claim 1 according to the appellant's **third auxiliary request** reads as follows:

"A set-top box (200) configured to interface with a communications medium, comprising:

a front-end portion (202) having an input and an output coupled to said communications medium, said front-end portion (202) having:

a plurality of front-end circuits (280, 281, 270, 306) configured to receive and transmit signals over said communications medium; and

a front-end processor (252) configured to control said plurality of front-end circuits (280, 281, 270, 306);

a back-end portion (204) coupled to said front-end portion (202), said back-end portion (204) having:

a plurality of back-end circuits (216, 218, 222) configured to process baseband signals that correspond to said transmit and receive signals of said front-end portion (202); and

a back-end processor (254) configured to control said back-end circuits (216, 218, 222) and to provide instructions to said front-end processor (252) for controlling said front-end circuits (280, 281, 270, 306);

said front-end processor (252) and said back-end processor (254) configured to communicate said instructions using a remote front-end control protocol,

wherein the remote front-end control protocol:

enables said back-end processor (254) to control at least some functions of the front-end processor (252);

is implementable in an embedded environment;

is media-independent."

XII. Claim 1 according to the appellant's **auxiliary request 3a** reads as follows:

"A set-top box (200) configured to interface with a communications medium, comprising:

a front-end portion (202) having an input and an output coupled to said communications medium, said front-end portion (202) having:

a plurality of front-end circuits (280, 281, 270, 306) configured to receive and transmit signals over said communications medium; and

a front-end processor (252) configured to control said plurality of front-end circuits (280, 281, 270, 306);

a back-end portion (204) coupled to said front-end portion (202), said back-end portion (204) having:

a plurality of back-end circuits (216, 218, 222) configured to process baseband signals that correspond to said transmit and receive signals of said front-end portion (202); and

a back-end processor (254) configured to control said back-end circuits (216, 218, 222) and to provide instructions to said front-end processor (252) for controlling said front-end circuits (280, 281, 270, 306);

said front-end processor (252) and said back-end processor (254) configured to communicate said instructions using a remote front-end control protocol,

wherein the remote front-end control protocol:

enables said back-end processor (254) to control at least some functions of the front-end processor (252);

is implementable in an embedded environment so that it works when connecting said front-end processor (252) and said back-end processor (254) with USB and does not introduce overheads comprising External Data Representation (XDR) and Extensive Markup Language (XML) support;

is media-independent."

XIII. Claim 1 according to the appellant's **fourth auxiliary request** reads as follows:

"A set-top box (200) for cable television comprising:

a back-end processor (254); and

a front-end processor (252) comprising:

an interface (258) for coupling the front-end processor (252) to the back-end processor (254); and

a port (257) that is coupled to control at least the following modules in a front-end portion (202) of the set-top box (200):

a plurality of tuners (280); and

a plurality of demodulators (281);

wherein the port (257) is further coupleable to control a data over cable service interface specification, DOCSIS, module (270, 306) in the front-end portion (202) of the set-top box (200),

wherein each of said plurality of tuners (280) is coupled to one of said plurality of demodulators (281) and said DOCSIS module (270, 306);

wherein the front-end processor (252) is adapted to issue a command to said port (257) to control at least one of said plurality of tuners (280) and said plurality of demodulators (281) both independently and based on an instruction received via said interface

(258) from said back-end processor (254) to share control of said modules in the front-end portion (202) with the back-end processor (254) to share said plurality of tuners (280) and said plurality of demodulators (281) between DOCSIS and cable TV services."

Reasons for the Decision

1. The appeal is admissible.

The present application

2. The present application relates to a set-top box for cable television, comprising a front-end portion for receiving and transmitting signals over said cable and a back-end portion for further processing the signals received by or to be transmitted by the front-end portion. The front-end and back-end portions are controlled by a front-end processor and a back-end processor, respectively, which communicate with each other.

Main request - inventive step (Article 56 EPC 1973)

3. Problem-and-solution approach

The problem-and-solution approach has been developed by the case law of the boards of appeal of the EPO to ensure that inventive step is assessed objectively and avoid ex post facto analyses of the prior art (see Case Law of the Boards of Appeal of the European Patent Office (hereinafter "CLBoA"), 9th edition, July 2019, I.D.2).

The steps of the problem-and-solution approach may be summarised as follows:

(a) identifying the **closest prior art** and determining the **distinguishing features**, i.e. the features of the claimed subject-matter that are not disclosed by the closest prior art;
(b) determining the **technical effect** achieved by the distinguishing features and deriving from the technical effect the **objective technical problem** solved by the claimed subject-matter with respect to the closest prior art;
(c) examining whether the skilled person, starting from the closest prior art and having regard to the state of the art within the meaning of Article 54(2) EPC 1973, **would** have arrived at the claimed subject-matter **in an obvious manner**.

4. Closest prior art and distinguishing feature(s)

4.1 **The first step** of the problem-and-solution approach is to determine **the closest prior art**, i.e. the item of prior art which appears to be the most promising starting point for arriving at the claimed subject-matter in an obvious manner.

The main reason for identifying the closest prior art is that if it can be established that the skilled person would not have arrived at the claimed subject-matter in an obvious manner when starting from the closest prior art, then it can be reasonably assumed that the same conclusion would be true when starting from any other item of prior art.

However, the assumption that the remaining prior art is less relevant than the item of prior art identified as the closest may turn out to be wrong, for instance if it can be convincingly shown that the skilled person would have arrived at the claimed subject-matter in an obvious manner when starting from another item of prior art but not when starting from the identified closest prior art. In that situation, or even in case of doubt, the problem-and-solution approach may have to be repeated for any prior art that also qualifies as a suitable starting point.

4.2 The case law of the boards of appeal has established criteria for objectively identifying the closest prior art. When applied properly, these should normally prevent unrealistic starting points being used. The case law has emphasised the following two main criteria (see CLBoA, section I.D.3 and decision T 0698/10, point 3 of the Reasons):

(a) As a **first criterion**, the closest prior art should be related to the claimed invention, in the sense that it should disclose subject-matter conceived for the same purpose or aiming at the same objective, corresponding to a similar use, or relating to the same or a similar technical problem or, at least to the same or a closely related technical field.

(b) As a **second criterion**, the closest prior art should disclose subject-matter having the greatest number of technical features in common with the claimed invention, i.e. requiring the minimum of structural and functional modifications.

4.3 In the case in hand, the subject-matter of claim 1 essentially concerns a set-top box comprising two

portions: a front-end portion for receiving and transmitting signals over a communications medium, such as a cable, and a back-end portion for further processing the signals received by or to be transmitted by the front-end portion. The front-end and back-end portions are controlled by a front-end processor and a back-end processor, respectively, which communicate with each other.

4.4 Prior-art document D2 discloses a set-top box which comprises a front-end portion and a back-end portion (see 310 and 375 in Figure 1E), each comprising a plurality of circuits as defined in claim 1 (see Figure 3 of D2). By contrast with the set-top box of claim 1, however, the front-end and back-end portions in the set-top box of D2 are controlled by a single processor located in the back-end portion (see CPU block 360 in Figure 3).

The appellant did not dispute the above disclosure of D2 or that the subject-matter of claim 1 thus differed from the set-top box of D2 only by the following features:

a front-end processor configured to control a plurality of front-end circuits and
the back-end processor providing instructions to the front-end processor for controlling the front-end circuits.

4.5 The board regards document D2 as the closest prior art for the assessment of inventive step for the following reasons:

Document D2 belongs to the same technical field as the subject-matter of claim 1. Moreover, the set-top boxes

of both claim 1 and D2 are conceived for the same purpose, perform essentially the same functions and solve the same technical problems generally solved by set-top boxes. The **first criterion** is thus clearly met (see point 4.2 *supra*).

The set-top box of D2 has the greatest number of technical features in common with the set-top box of claim 1 (compared with D1 and the prior art acknowledged in the description of the application as filed), so the **second criterion** is also met (see point 4.2 *supra*).

4.6 The appellant's arguments may be summarised as follows (see also the text of the objection under Rule 106 EPC under point VII *supra*):

According to established case law, a central consideration in selecting the closest prior art was that it must be directed to the same purpose or effect as the invention, otherwise it could not lead the skilled person in an obvious way to the claimed invention (CLBoA, 9th edition, pp. 180 et seq.).

In the case in hand, the main teaching of D2 was to simplify set-top box designs (D2, page 4, second sentence) and reduce the number of complex hardware components and the interfaces between them to lower costs (D2, page 3, last four sentences).

In this situation, it was hardly conceivable that the skilled person would have decided to ignore these aims of simplifying the design of set-top boxes and the interfaces between their hardware components.

In other words, it seemed absolutely unrealistic within the meaning of decisions T 2057/12 and T 2201/10 that, starting from document D2, the skilled person would have considered introducing a further complex hardware component such as a further CPU that would have made the design more complex, let alone that they would have considered introducing a separate interface between the CPUs beyond the PCI bus in Figure 3 of D2 to allow the further CPU to receive instructions from the original CPU.

Hence, choosing D2 as the closest prior art constituted an ex post facto analysis.

4.7 The board did not find these arguments persuasive for the following reasons:

4.7.1 Document D2 belongs to the same technical field as the claimed invention, i.e. that of set-top boxes for cable television, and has the greatest number of technical features in common with the subject-matter of claim 1. This is not disputed by the appellant.

As a result, the first and second criteria under point 4.2 *supra* for identifying the closest prior art are met.

Therefore, according to the established case law, the set-top box of D2 may be regarded as the closest prior art for this reason alone.

4.7.2 The appellant appears to construe the case law of the boards of appeal, in particular in CLBoA, I.D.3.2 (pp. 180 et seq.) and decisions T 2057/12 and T 2201/10, to mean that even if an item of prior art is from the same technical field and has the greatest

number of technical features in common with the claimed invention, it cannot be the closest prior art if it teaches away from the distinguishing features of the claimed subject-matter.

In the board's view, the appellant is misunderstanding the case law for the reasons set out below:

According to CLBoA, I.D.3.2, first paragraph, "*a central consideration in selecting the closest prior art is that it must be directed to the same purpose or effect as the invention, otherwise it cannot lead the skilled person in an obvious way to the claimed invention*".

The appellant quoted the above sentence in its objection under Rule 106 EPC (see point VII *supra*) and appears to construe it to mean that the closest prior art should disclose the purpose or effect **of the distinguishing feature(s)**. In the board's view, this is incorrect. The "*purpose or effect*" in that sentence refers to the purpose or effect **of the claimed subject-matter as a whole**, not just of the distinguishing features. In fact, it is essentially the same as the first criterion under point 4.2 *supra*, i.e. that the closest prior art should disclose subject-matter conceived for the same purpose or aiming at the same objective, corresponding to a similar use, or relating to the same or a similar technical problem or, at least to the same or a closely related technical field.

If the closest prior art also had to disclose the purpose or effect of the distinguishing feature(s), it would mean that only items of prior art which contained a teaching towards the distinguishing feature(s) would qualify as the closest prior art. However, this is not

required by the problem-and-solution approach because the teaching towards the distinguishing feature(s) may come from another item of prior art or from the skilled person's common general knowledge.

In other words, it means that the closest prior does not have to disclose all the problems solved by the claimed invention. In particular, it does not have to disclose **the objective technical problem**, which is determined only in the next step of the problem-and-solution approach on the basis of the technical effect(s) provided by those features distinguishing the invention as claimed from the closest prior art (see T 0698/10, point 3.4 of the Reasons and CLBoA, I.D.3.3, third paragraph).

The appellant is similarly misunderstanding the second paragraph of CLBoA, I.D.3.2, part of which it quoted in its objection under Rule 106 EPC. The statements "*the closest prior art for the purpose of objectively assessing inventive step is generally that which corresponds to a similar use requiring the minimum of structural and functional modifications*", "*the closest prior art is the art most suitable for the purpose claimed by the invention, not the art superficially showing structural similarities*", "*Ideally, that purpose shall already be mentioned in the prior art document as a goal worth achieving*" and "*The aim is that the assessment shall start from a situation as close as possible to that encountered by the inventor*" all express the same idea as the first and second criteria under point 4.2 *supra,* with the additional nuance that the first criterion should be given more weight than the second. Contrary to the appellant's view, as explained above these statements do not imply that the closest prior art must disclose the

distinguishing features themselves, their technical effect or the objective technical problem.

Therefore, the appellant's above arguments for excluding the set-top box of D2 as the closest prior art, based on CLBoA, I.D.3.2, are founded on a flawed understanding of the problem-and-solution approach.

Decision T 2057/12, referred to by the appellant and cited on page 199 of the CLBoA, also fails to support the appellant's case because in that decision the board held that "*no argument is required as to whether the skilled person would select a document, as long as the closest prior art belongs to the same or a neighboring technical field of the person skilled in the art or to its common general knowledge*" (see point 3.2.2 of the Reasons), i.e. the opposite view to the appellant's contention. Only when the alleged closest prior art belonged to a remote technical field was it necessary to provide evidence and arguments in support of the idea that real-world circumstances would have led the skilled person to that technical field (see point 3.2.2 of the Reasons).

Decision T 2201/10 does not support the appellant's case either. In that decision, the board held that starting from document D1 as the closest prior art the skilled person would not have arrived at the claimed invention in an obvious manner because modifying the closest prior art in that way would have gone against a teaching described as essential in D1. The board nevertheless identified document D1 as the closest prior art for the assessment of inventive step (see section 5.1 of the Reasons). T 2201/10 thus undermines the appellant's argument in this appeal that a prior-art document teaching away from the distinguishing

features of the claimed subject-matter cannot qualify as the closest prior art.

4.8 For the above reasons, the board holds the set-top box of document D2 to be the closest prior art for the subject-matter of claim 1.

5. Technical effect and objective technical problem

5.1 In **the second step** of the problem-and-solution approach, **the technical effect** of the claimed subject-matter over the closest prior art is determined in order to formulate the **objective technical problem** solved by the claimed subject-matter with respect to the closest prior art (see CLBoA, I.D.4).

Since the distinguishing features are the only difference between the claimed subject-matter and the closest prior art, the technical effect in question is that achieved by the distinguishing features. The technical effect is usually one or more technical advantages (and possibly one or more accompanying disadvantages). When the claimed subject-matter is a process for making an object, it is also the object itself.

The determination of the technical effect is objective because it is based on an objective comparison of the claimed subject-matter with the closest prior art.

Determining the technical effect is a useful intermediate step for ensuring the proper formulation of the objective technical problem.

The objective technical problem determines the angle of vision that the skilled person will adopt when

considering the remaining prior art in **the third step** of the problem-and-solution approach. For a fair and objective assessment of inventive step, it is therefore important that the objective technical problem is formulated neither too narrowly nor too broadly. In particular, it should not contain pointers to the solution (see CLBoA, I.D.4.3.1). An exception to this rule applies only to inventions involving a mix of technical and non-technical features, in which case an aim to be achieved in a non-technical field may appear in the formulation of the problem as part of the framework of the technical problem that is to be solved, in particular as a constraint that is to be met (see CLBoA, I.D.9.1, in particular I.D.9.1.4).

In most cases, the objective technical problem can be be formulated as **how to achieve the technical effect**. It is usually a problem the skilled person is familiar with because it relates to known drawbacks of the prior art in the technical field of the invention.

5.2 In the case in hand, the distinguishing features (see point 4.4) state that a first processor controls the circuits in the front-end portion and a second processor controls the circuits in the back-end portion, and that the second processor can send instructions to the first processor for controlling the circuits in the front-end portion. By contrast, in D2 a single processor controls the circuits of both the front-end and back-end portions of the set-top box.

According to the application as filed, a problem of using a single processor for controlling the circuits of both the front-end and back-end portions is that "*(o)ne central processor is not capable of simultaneously controlling front-end circuits for Data*

Over Cable Serviced Interface Specification (DOCSIS) communication and back-end circuits for cable TV functions" (see paragraphs [0003] and [0005]).

The board understands the above sentence to mean that a single processor is not capable of coping with the workload of simultaneously controlling all the circuits in both the front-end and back-end portions.

From the above, it can be inferred that **the technical effect** achieved by the distinguishing features of claim 1 is that the load on the processor of D2 is reduced (see point 5.3 of the board's communication).

The objective technical problem may thus be formulated as **how to reduce the load on the processor of D2**.

5.3 The appellant's arguments regarding the objective technical problem may be summarised as follows:

(1) D2 addresses a different problem of simplifying set-top box designs (D2, page 4, second sentence) by reducing the number of complex hardware components and the interfaces between them to lower costs (D2, page 3, last four sentences). The board's objective technical problem is thus not derivable from D2 and amounts to an ex post facto analysis.

(2) The distinguishing features not only reduce the load on the processor of D2 but also provide more efficient control of the circuits in the front-end and back-end portions.

5.4 The board does not find the appellant's arguments persuasive for the following reasons:

Re argument (1)

The objective technical problem is formulated on the basis of an objective comparison of the claimed subject-matter with the closest prior art. There is no requirement for the closest prior art to mention the objective technical problem. Instead, according to established case law, what matters is what the skilled person would have objectively recognised as the problem when comparing the closest prior art with the claimed invention (see CLBoA, section I.D.4.3.1).

Moreover, contrary to the appellant's view, the stated goal in D2 is not only to simplify the design of the set-top box by using a modular architecture, but also to increase the overall processing and data handling performance of set-top boxes (see page 4, first paragraph of D2). The latter is closely related to the problem of reducing the load on the single processor: in order to increase the overall processing and data handling performance of the set-top box, it was necessary to remove the performance bottlenecks in D2. If the single processor was a performance bottleneck at the priority date according to the application as filed, it would also have been one at least to some extent in the set-top box of D2 shortly before that priority date. The skilled person would thus have been aware of this problem and would have had to address it in order to increase the overall processing and data handling performance of the set-top box.

Re argument (2)

The board does not share the appellant's view that the distinguishing features of claim 1 achieve the technical effect of more efficiently controlling the

circuits in the front-end and back-end portions. Merely using two processors instead of a single processor does not necessarily imply that this is more efficient or that the two processors are more specialised. Claim 1 does not contain any features which would make the two processors more efficient than a single processor. Moreover, the fact that the two processors communicate with one another does not make controlling the circuits any more efficient than if a single processor were controlling all the circuits.

The sole technical effect achieved by the distinguishing features of claim 1 is thus to reduce the load on the single processor of D2.

6. Obviousness

6.1 In **the third step** of the problem-and-solution approach, according to the established case law of the boards of appeal, in order to determine whether the claimed invention would have been obvious to the skilled person starting from the closest prior art and having regard to the state of the art within the meaning of Article 54(2) EPC 1973, the boards apply the **"could-would approach"**. This means asking not whether the skilled person **could** have arrived at the claimed invention by modifying the closest prior art, but whether they **would have done** so in the expectation of solving the objective technical problem or in the expectation of some improvement or advantage (see CLBoA, I.D.5).

6.2 As explained under point 5.4 *supra*, D2 suggests that the overall processing and data handling performance of the set-top box should be increased (see page 4, first paragraph of D2). For the reasons given under point 5.4

supra, it was obvious to the skilled person that the performance bottlenecks had to be removed in order to do so and that the single processor of D2 was one of the bottlenecks.

It was part of the skilled person's common general knowledge that there were two well-known solutions to the problem of a performance bottleneck at a processor:
(1) using a faster processor or
(2) using two or more processors instead of a single processor.

The second solution fell under the well-known concept of "distributed computing", which had been widely used before the priority date of the application, most notably by replacing a single CPU (central processing unit) with a CPU and a GPU (graphics processing unit) in personal computers. The appellant did not dispute that distributed computing was common general knowledge at the priority date.

In distributed computing, it was standard practice to use separate processors for tasks which could be executed separately so that necessary exchanges of data between processors, which would slow down calculations, were minimised. It was also common general knowledge that the separate processors still had to exchange data and/or instructions in order to carry out and coordinate the execution of the tasks.

By applying this common general knowledge to the set-top box of D2, it would have been obvious to the skilled person that a performance bottleneck at the single processor of D2 could be overcome by using two processors instead of one. Since the set-top box of D2 – like that of the invention – was divided into a

front-end portion and a back-end portion performing tasks that could mostly be executed separately, it would have been straightforward to reduce the load on the processor of D2 by putting a processor in both the front-end and back-end portions for controlling the circuits in those portions. Since those two portions were not completely independent from each other, the two processors would have had to be able to communicate with each other.

The skilled person would thus have arrived at the subject-matter of claim 1 in an obvious manner.

6.3 The appellant argued that document D2 taught away from replacing one processor with two processors because it taught simplifying set-top box designs (D2, page 4, second sentence) by reducing the number of complex hardware components and the interfaces between them to lower costs (D2, page 3, last four sentences). The skilled person would therefore not have wanted to go against this clear teaching by replacing the single processor of D2 with two processors. If the performance of the set-top box of D2 had to be increased, the skilled person would have replaced the processor with a faster processor.

6.4 The board does not find the appellant's arguments persuasive for the following reasons:

According to the passages of D2 cited by the appellant (page 3, last four sentences, and page 4, second sentence), the goal of D2 is to simplify the design of set-top boxes while increasing their overall processing and data handling performance.

The appellant equates simplifying the design with reducing the number of complex hardware components.

However, as explained in the paragraph bridging pages 15 and 16 of D2, the design is simplified not by reducing the number of complex hardware components, but by using **a modular architecture** including different functional blocks, each dedicated to a specific function. Using a modular architecture simplifies the manufacture of the set-top box and makes it possible to customise modules according to the requirements of different markets without having to redesign the whole set-top box.

In the board's view, the modular architecture of D2 does not teach away from using a processor in both the front-end and back-end portions. Since these two portions are two different functional blocks, according to the teaching of D2 they should be in two different modules. In a modular architecture of that kind, having a processor in each module for controlling the circuits in them would be no more complicated than having a single high-performance processor for controlling the circuits of all the modules.

For the above reasons, the board does not share the appellant's view that document D2 teaches away from replacing the single processor with two separate processors.

The appellant is correct that replacing the single processor of D2 with a faster processor would have been another solution to the problem of increasing the overall processing and data handling performance of the set-top box of D2.

However, it is established case law that selecting one solution from a host of obvious solutions does not render the selected solution inventive, in the absence of an unexpected technical effect associated with that selection (see CLBoA, I.D.9.19.8 and I.D.9.19.10).

It should be noted that this does not contradict the could-would approach because the skilled person would be aware of the pros and cons of each of the obvious solutions and **would** want to choose whichever of them best matched the pros and cons they were looking for on the basis of various external considerations (design, costs, specifications, etc.). For instance, in the case in hand, the skilled person would be well aware of the pros and cons of using a faster single processor or two separate processors. A single faster processor would have the advantage of requiring fewer changes to the architecture of the set-top box, but would have the disadvantages of consuming more power, producing more heat, possibly costing more, and requiring faster peripheral components such as faster memory. Two processors would have the advantage of possibly costing less, enabling the use of specialised processors and producing less heat, but would have the disadvantage of requiring more changes to the architecture of the set-top box. The skilled person **would** thus have good reasons to choose either of these two solutions. The board cannot see any unexpected technical effect achieved by the distinguishing features of claim 1.

6.5 For the above reasons, the subject-matter of claim 1 according to the main request does not involve an inventive step in view of prior-art document D2 and common general knowledge.

7. Conclusion on the main request

Since claim 1 does not meet the requirements of Articles 52(1) EPC and 56 EPC 1973, the appellant's main request is not allowable.

First auxiliary request - inventive step (Article 56 EPC 1973)

8. Claim 1 of the first auxiliary request differs from claim 1 of the main request by the following additional features:

"*wherein the front-end processor (252) is configured to control said plurality of front-end circuits (280, 281, 270, 306) by issuing commands via a port (257) to said plurality of front-end circuits (280, 281, 270, 306) both independently and based on said instructions received from the back-end processor (254)*".

9. In the board's view, the above additional features do not add anything inventive because they are merely the result of a straightforward implementation of the set-top box of claim 1 of the main request. Indeed, the "port" may be nothing more than the output of the front-end processor and it was common for processors in distributed computing environments to act both independently and in response to instructions from other processors.

10. The appellant did not submit specific inventive-step arguments for the first auxiliary request, relying instead on the arguments put forward for the main request.

11. For the above reasons, the subject-matter of claim 1 according to the first auxiliary request does not

involve an inventive step in view of prior-art document D2 and common general knowledge.

12. Conclusion on the first auxiliary request

Since claim 1 does not meet the requirements of Articles 52(1) EPC and 56 EPC 1973, the appellant's first auxiliary request is not allowable.

Second auxiliary request - inventive step (Article 56 EPC 1973)

13. Claim 1 of the second auxiliary request differs from claim 1 of the main request by the following additional features:

"*said front-end processor (252) and said back-end processor (254) configured to communicate said instructions using a remote front-end control protocol*".

14. In the board's view, the above additional features do not add anything inventive because they are merely the result of a straightforward implementation of the set-top box of claim 1 of the main request. The front-end and back-end processors inevitably use some kind of protocol in order to communicate with each other.

15. The appellant did not submit specific inventive-step arguments for the second auxiliary request, relying instead on the arguments put forward for the main request.

16. For the above reasons, the subject-matter of claim 1 according to the second auxiliary request does not involve an inventive step in view of prior-art document D2 and common general knowledge.

17. Conclusion on the second auxiliary request

Since claim 1 does not meet the requirements of Articles 52(1) EPC and 56 EPC 1973, the appellant's second auxiliary request is not allowable.

Third auxiliary request - clarity (Article 84 EPC 1973)

18. Claim 1 of the third auxiliary request differs from claim 1 of the second auxiliary request by the following additional features:

"*wherein the remote front-end control protocol:*
enables said back-end processor (254) to control at least some functions of the front-end processor (252);
is implementable in an embedded environment;
is media-independent".

19. The board considers that these additional features render claim 1 unclear (Article 84 EPC 1973) for the following reasons:

19.1 The feature that "t*he remote front-end control protocol [...] is implementable in an embedded environment*" introduces an unclear limitation on the control protocol because what can be implemented in an embedded environment is more a matter of cost than a technical matter. In other words, it seems that almost any protocol may be implemented in an embedded environment provided that sufficient funds are available. It is thus unclear for which technical reasons, the above feature would exclude certain protocols.

19.2 The expression "*the remote front-end control protocol [...] is media-independent*" does not have a clear

meaning because "*media-independent*" could refer to so many different things, such as the type of media for the television programmes processed by the set-top box (e.g. DVD, Blu-ray), the source of the television programmes (e.g. which programme provider), the transmission type (e.g. satellite, cable, internet) or the physical data link between the two processors. Even if this expression were to be interpreted in the light of the description, which states that "*The protocol should also be media-independent for use with different data links between the front-end processor 252 and back-end processor 254*" (see paragraph [0037], last sentence, of the description of the application as filed), it would still be unclear what technical features are implied by the fact that the protocol may be used with different, unspecified data links.

20. The appellant did not submit arguments with regard to the above objections.

21. For the above reasons, the subject-matter of claim 1 according to the third auxiliary request does not meet the requirement of clarity of Article 84 EPC 1973.

22. Conclusion on the third auxiliary request

Since claim 1 does not meet the requirements of Article 84 EPC 1973, the appellant's third auxiliary request is not allowable.

Auxiliary request 3a - clarity (Article 84 EPC 1973)

23. Claim 1 of the auxiliary request 3a differs from claim 1 of the third auxiliary request by the following underlined additional features:

"*is implementable in an embedded environment so that it works when connecting said front-end processor (252) and said back-end processor (254) with USB and does not introduce overheads comprising External Data Representation (XDR) and Extensive Markup Language (XML) support;*

is media-independent".

24. The above additional features do not clarify the expression "is media-independent" in claim 1, so the clarity objection raised in point 19.2 *supra* also applies to claim 1 of auxiliary request 3a.

25. For the above reasons, the subject-matter of claim 1 according to auxiliary request 3a does not meet the requirement of clarity of Article 84 EPC 1973.

26. Conclusion on auxiliary request 3a

Since claim 1 does not meet the requirements of Article 84 EPC 1973, the appellant's auxiliary request 3a is not allowable.

Fourth auxiliary request - inventive step (Article 56 EPC 1973)

27. The wording of claim 1 of the fourth auxiliary request differs from the wording used in claim 1 of the preceding requests. However, the subject-matter of claim 1 of the fourth auxiliary request essentially corresponds to that of claim 1 of the main request with the following additional features:

(a) the circuits in the front-end portion comprise a plurality of tuners, a plurality of demodulators and a DOCSIS module; and

(b) each of said plurality of tuners is coupled to one of said plurality of demodulators and said DOCSIS module [...] to share said plurality of tuners and said plurality of demodulators between DOCSIS and cable TV services.

28. Re additional features (a)

As acknowledged in paragraphs [0003] and [0004] of the application as filed, conventional set-top boxes included features (a). Therefore, these additional features cannot render the claimed subject-matter inventive.

29. Re additional features (b)

Additional features (b) essentially state that the tuners are shared between demodulators and the DOCSIS module.

As acknowledged in paragraphs [0003] and [0004] of the application as filed, conventional set-top boxes commonly included a DOCSIS module in the front-end portion.

DOCSIS(Data Over Cable Service Interface Specification) was an international standard which defined the communications and operation support interface requirements for a data over cable system. It enabled the addition of high-speed data transfer to an existing cable TV (CATV) system and was commonly used by many cable television operators to provide internet access over their existing hybrid fibre coaxial (HFC) infrastructure.

Sharing tuners between different downstream circuits was a commonly used technique in television programme receivers in order to minimise the number of tuners. Since DOCSIS channels and CATV channels were similar, it would have been obvious to the skilled person to share tuners between the DOCSIS module and the demodulators for CATV in order to minimise the number of tuners.

The skilled person would thus have arrived at the subject-matter of claim 1 in an obvious manner.

30. The appellant did not submit arguments with regard to the above objections.

31. For the above reasons, the subject-matter of claim 1 according to the fourth auxiliary request does not involve an inventive step in view of prior-art document D2 and common general knowledge.

32. Conclusion on the fourth auxiliary request

Since claim 1 does not meet the requirements of Articles 52(1) EPC and 56 EPC 1973, the appellant's fourth auxiliary request is not allowable.

Objection under Article 112a and Rule 106 EPC

33. The objection under Rule 106 EPC is based on an alleged violation of Article 113(1) EPC 1973 (see text of the objection under point VII *supra*).

Article 113(1) EPC 1973 (like Article 113(1) EPC) reads: "*The decisions of the European Patent Office may only be based on grounds or evidence on which the*

parties concerned have had an opportunity to present their comments".

33.1 The appellant essentially argued that its right to be heard under Article 113(1) EPC 1973 had not been observed because the board had not given any comprehensible reason in its communication or in the course of the oral proceedings as to why it was not applying inappropriate hindsight when choosing D2 as the closest prior art for assessing inventive step. The appellant had presented arguments that the problem-and-solution approach would not be correctly applied if document D2 were chosen as the starting point since no relevant technical problem could be formulated from this prior art without inappropriate hindsight. The board had also failed to explain why it had deviated from the case law of the boards of appeal, in particular decision T 2057/12. Without receiving any reasons for the board's divergent view, i.e. this deviation, the appellant's representative had not been able to give the board a substantiated reply on this decisive aspect.

33.2 The board notes that before the board announced its decision, the appellant had had the opportunity to present its point of view that the problem-and-solution approach would not be correctly applied if document D2 were chosen as the starting point since no relevant technical problem could be formulated from this prior art without inappropriate hindsight.

33.3 In these appeal proceedings and in particular during the oral proceedings, the board gave detailed reasons as to why it disagreed with the appellant on the determination of the closest prior art.

In the oral proceedings on 20 January 2021, the board clearly explained its view on how to identify the closest prior art for the assessment of inventive step to the appellant. The board stated that the closest prior art should be related to the claimed subject-matter, in the sense that it should disclose subject-matter belonging to the same technical field and relating to the same or a similar technical problem, but that it was not essential for the closest prior art to explicitly mention the objective technical problem or for the closest prior art to solve all the problems solved by the claimed invention. The appellant was also informed why the board did not agree with the appellant's interpretation of the case law of the boards of appeal and why document D2 did not teach away from the distinguishing features of claim 1. By giving the appellant all this information, the board thus did explain why, in its opinion, it was not applying inappropriate hindsight when choosing D2 as the closest prior art for assessing inventive step.

33.4 In its written objection, the appellant also submitted that the board had not substantiated why its view deviated from an earlier decision of the boards of appeal.

33.5 In the course of the oral proceedings the board explained why it had not deviated from the established case law regarding the problem-and-solution approach, and in particular the decisions that the appellant had relied on in this respect. This is laid out in greater detail in sections 4 to 6 *supra*.

33.6 In the light of the above, the board considered that the appellant's right to be heard under Article 113(1) EPC 1973 had been observed in the case in hand. The

board therefore dismissed the appellant's objection under Rule 106 EPC.

Order

For these reasons it is decided that:

1. The objection under Rule 106 EPC, filed in writing during the oral proceedings before the board, is dismissed.

2. The appeal is dismissed.

The Registrar: The Chairman:

K. Boelicke B. Müller

Decision electronically authenticated